APPENDIX A: MERCED SUBBASIN GSAS MEMORANDUM OF UNDERSTANDING

MEMORANDUM OF UNDERSTANDING
BETWEEN THE MERCED SUBBASIN GROUNDWATER SUSTAINABILITY AGENCY, THE MERCED IRRIGATION URBAN GROUNDWATER SUSTAINABILITY AGENCY AND THE TURNER ISLAND WATER DISTRICT GROUNDWATER SUSTAINABILITY AGENCY

THIS Agreement is entered into to be effective October 13, 2017 by and among the Merced Subbasin Groundwater Sustainability Agency (GSA), the Merced Irrigation Urban GSA, and the Turner Island Water District GSA.

RECITALS

WHEREAS, on September 16, 2014 Governor Jerry Brown signed into law Senate Bills 1168 and 1319 and Assembly Bill 1739, known collectively as the Sustainable Groundwater Management Act; and

WHEREAS, the Act went into effect on January 1, 2015; and

WHEREAS, the Act seeks to provide sustainable management of groundwater basins, enhance local management of groundwater, establish minimum standards for sustainable groundwater management, and provide local groundwater agencies with the authority and the technical and financial assistance necessary to sustainably manage groundwater; and

WHEREAS, each of the Parties overlie the Merced Subbasin (Basin Number 5-22.04, Department of Water Resources Bulletin 118) within the San Joaquin Valley Groundwater Basin, which has been designated as a high-priority basin by DWR; and

WHEREAS, the Merced Subbasin GSA elected to manage the groundwater over the boundaries of its members and act as the GSA pursuant to SGMA and notified DWR on or about March 28, 2017; and

WHEREAS, the Merced Irrigation Urban GSA elected to manage the groundwater over the boundaries of its members and act as the GSA pursuant to SGMA and notified DWR on or about May 31, 2017; and

WHEREAS, the Turner Island Water District GSA elected to manage the groundwater over the boundaries of the water district and act as the GSA pursuant to SGMA and notified DWR on or about March 22, 2017; and

WHEREAS, the Parties have previously collaborated on groundwater management through membership in the Merced Area Groundwater Pool Interests (MAGPI); and

WHEREAS, collectively, the boundaries of the Parties include all lands overlying the Basin;

WHEREAS, the Parties desire, through this Agreement, to coordinate the work of the GSAs and the management of the Basin, in accordance with SGMA; and

WHEREAS, the Parties shall designate a point of contact for the Merced Subbasin Groundwater Sustainability Plan development, who shall communicate with all other Parties.

NOW, THEREFORE, in consideration of the mutual promises, covenants and conditions herein set forth, the Parties agree as follows:

ARTICLE 1: DEFINITIONS

As used in this Agreement, unless the context requires otherwise, the meaning of the terms hereinafter set forth shall be as follows:

1.1 "Agreement" shall mean this Memorandum of Understanding among the Merced Subbasin GSA, Merced Irrigation Urban GSA and Turner Island Water District GSA.

1.2 "Basin" shall mean Merced Groundwater Subbasin, California Department of Water Resources Basin No. 5-22.04 as its boundaries may be modified from time to time in accordance with Cal. Water Code Section 10722.2.

1.3 "Coordination Agreement" shall mean a legal agreement adopted between two or more GSAs that provides the basis for intra-basin coordination of multiple GSPs within that basin pursuant to SGMA.

1.4 "**Coordination Committee**" is defined in Article 4 of this Agreement.

1.5 "DWR" shall mean the California Department of Water Resources.

1.6 "Effective Date" shall mean the date on which the last Party executes this Agreement.

1.7 "Groundwater Sustainability Agency" or **"GSA"** shall mean an agency enabled by SGMA to regulate a portion of the Basin cooperatively with all other Groundwater Sustainability Agencies in the Basin, in compliance with the terms and provisions of SGMA.

1.8 "GSAs" - shall mean the three (3) GSAs in the Merced Subbasin, namely the Merced Subbasin GSA, the Merced Irrigation GSA, and the Turner Island Water District GSA.

1.9 Groundwater Sustainability Plan" or **"GSP"** shall have the definition set forth in SGMA.

1.10 "**MID**" shall mean the Merced Irrigation District.

1.11 "**Notice**" is defined in Section 4.2 of this Agreement.

1.12 "Party" shall mean any of the signatories to this Agreement and "**Parties**" shall mean all of the signatories to this Agreement.

1.13 "SGMA" or "**Act**" shall mean the Sustainable Groundwater Management Act of 2014 and all regulations adopted under the legislation (SB 1168, SB 1319 and AB 1739) that collectively comprise the Act, as that legislation and those regulations may be amended from time to time.

ARTICLE 2: KEY PRINCIPLES

2.1. The Parties intend to work together in mutual cooperation to develop one GSP in compliance with SGMA, for the sustainable management of groundwater for that portion of the Basin collectively underlying the boundaries of all of the Parties.

2.2. The Parties intend to mutually cooperate to the extent possible to jointly implement the GSP within the Basin.

2.3. To the extent the Parties are not successful at jointly implementing the GSP within the Basin, or to the extent that any Parties wishes to independently implement the GSP within its boundaries, a Party may implement the GSP within its boundaries, and agrees to work together with all Parties to coordinate such implementation in accordance with the requirements of SGMA.

2.4. The Parties expressly intend that this Agreement shall not limit or interfere with the right and authority of any Party over its own internal matters, including, but not limited to, a Party's legal rights to surface water supplies and assets, groundwater supplies and assets, facilities, operations, water management and water supply matters. The Parties make no commitments by entering into this Agreement to share or otherwise contribute their water supply assets as part of the development or implementation of a GSP.

2.5. Nothing in this Agreement is intended to modify or limit the Parties' police powers, land use authorities, or any other authority.

2.6. The Parties further intend through this Agreement to cooperate to obtain consulting, administrative and management services needed to efficiently develop a GSP, to conduct outreach to other basin agencies and private parties, and to identify mechanisms for the management reasonably anticipated to be necessary for the purposes of this Agreement.

2.7. Each of the Parties acknowledges that SGMA requires that the entire Basin must be managed under one or more GSPs for the basin to be deemed in compliance with SGMA, and that if multiple GSPs are adopted within the Basin the GSAs must coordinate, and are required to use the same data and consistent methodologies for certain required technical assumptions when developing a GSP.

ARTICLE 3: PURPOSE AND POWERS

3.1. Purpose of the Agreement. The purposes of this Agreement is to:

a. Cooperatively carry out the purposes of SGMA;

b. Provide for coordination among the Parties to develop and implement a GSP and/or facilitate a Coordination Agreement, to the extent necessary;

c. Develop, adopt and implement a legally sufficient GSP covering those portions of the Basin that are within the jurisdictional boundaries of the Parties, subject to the limitations set forth in this Agreement;

d. Satisfy the requirements of SGMA for coordination among GSAs.

3.2. Authority Under the Agreement. To the extent authorized by the Parties and subject to the limitations set forth in this Agreement and the limitations of all applicable laws, the Parties acting collectively shall have the following authority including, but not limited to, the power:

a. To coordinate the implementation of SGMA among the Parties in accordance with this Agreement;

b. To recommend the adoption of actions, rules, regulations, policies, and procedures related to the coordination of the Parties for purposes of implementation of SGMA;

c. To perform all acts necessary or proper to carry out fully the purposes of this Agreement; and to exercise all other powers necessary and incidental to the implementation of the powers set forth herein.

3.3. Powers Reserved to Parties. Each Party will retain the sole and absolute right, in its sole discretion, to:

a. Be a GSA individually or collectively within the Party's boundaries;

b. Approve any portion, section or chapter of the GSP adopted by the Parties as applicable within the Party's boundaries;

c. Exercise the authorities granted to each Party as a GSA under SGMA;

d. Implement SGMA and any GSP adopted pursuant to this Agreement within its boundaries;

Notwithstanding anything to the contrary in this Agreement, this Agreement does not provide any Party the authority to undertake any activities within the geographic or service area boundaries of any of other Party pursuant to the GSP developed or adopted hereunder, unless the Parties have formally and expressly consented and agreed in writing to the activity proposed.

3.4. Term. This Agreement shall be effective as of the Effective Date and shall remain in effect until terminated in accordance with Article 7.3 of this Agreement.

3.5. Role of Party Agencies. Each of the Parties agrees to undertake such additional proceedings or actions as may be necessary in order to carry out the terms and intent of this Agreement. The support of all Parties is required for the success of this Agreement. This support will involve the following types of actions:

a. The Parties will provide support to a Coordination Committee and any third party facilitating the development of the GSP by making available staff time, information and facilities within available resources;

b. Policy support shall be provided by the Parties to either approve, or respond quickly to, any recommendations made as to funding shares, operational decisions, and other policy areas;

c. Contributions of public funds and of personnel, services, equipment or property may be made by any Parties for any of the purposes of this Agreement provided that no repayment will be made for such contributions.

3.6. Other Officers and Employees. To the extent the Parties, or any third party facilitating the development of the GSP, need support from employees, officers, consultants or otherwise need to hire employees, the Parties may do the following:

a. Provide that any employee of any Party with the express approval of that Party, may work on behalf of the Parties under this Agreement, and shall perform, the same various duties under the direction of the Coordination Committee as for his or her other employer in order to carry out this Agreement. This work may be completed and funded under the existing employment with one of the Parties. In the alternative, the Coordination Committee may recommend that the Parties to this Agreement enter into agreements to compensate, off-set costs, or otherwise fund the cost of the employment for work performed under this Agreement;

b. The Parties shall collectively contract or hire consultants and/or employees to perform work under this Agreement. The Parties may designate one Party to administer the contract. For each contract that will require cost sharing amongst the parties, the proposed contract will be presented to the Coordination Committee for review, and each Party must approve the contract pursuant to that Party's approval requirements. Such contracts shall be drafted in a manner to reflect that consultants hired to perform work under this Agreement are working on behalf of all the Parties and will be expected to work with the Parties on a collective basis and with each Party on an individual basis. Such contracts shall be made to be enforceable by all applicable Parties. Additionally, the contracts must include appropriate indemnity, insurance, and non-disclosures to protect all Parties. Once approved, no expansion, addition, or change to an approved scope of work in a signed contract involving and increase or decrease in compensation under the contract can be made by the contract administrator until approved by each Party pursuant to that Party's approval requirements.

ARTICLE 4: GOVERNANCE

4.1 Coordination Committee. The activities under this Agreement will be guided by a Coordination Committee made up of up to four (4) representatives from each of the Parties. The Coordination Committee shall work collaboratively under the terms of this Agreement to develop recommendations for the technical and substantive Basin-wide issues. These recommendations shall be reached by unanimous vote of the Coordination Committee and submitted to each Party's governing board for final approval. The governing body of each Party must approve the recommendations of the Coordination Committee prior to them becoming effective.

The Coordination Committee shall develop, but not be limited to, the following actions:

a. budget(s) and appropriate cost sharing for any project or program that requires funding from the Parties;

b. Propose guidance and options for obtaining grant funding;

c. Recommend the adoption of rules, regulations, policies, and procedures related to the Agreement;

d. Recommend the approval of any contracts with consultants or subcontractors that would undertake work on behalf of the Parties and/or relate to Basin-wide issues and, if applicable, recommend the funding that each Party should contribute towards the costs of such contracts;

e. Report to the Parties respective governing boards when dispute resolution is needed to resolve an impasse or inability to make a consensus recommendation;

f. Recommend action and/or approval of a GSP.

4.2. Dispute Resolution. Should any controversy arise among or between the Parties concerning this Agreement, or the rights and duties of any Party under this Agreement, such a controversy shall be addressed as follows:

a. Any Party may trigger the dispute resolution process by delivering, in writing to all Parties, a notification of a dispute or controversy that contains a specific description of the actions alleged to be contrary to this Agreement, and a proposed solution ("**Notice**"). Within thirty (30) days after receipt of Notice, the Parties shall attempt in good faith to resolve the controversy through informal means. If the Parties cannot agree upon a resolution of the controversy within sixty (60) days from receipt of Notice, the dispute shall be submitted to mediation prior to the commencement of legal action.

b. Mediation shall be no less than a full day (unless otherwise agreed upon by the Parties) and the cost of mediation shall be paid in equal proportion among the Parties.

c. The mediator shall be either voluntarily agreed to, or, if the Parties cannot agree upon a mediator, selected by the method set forth in (i) or (ii) below:

    i. Each Party shall appoint one mediator in writing. At the next meeting of the Coordination Committee, one member shall select the name of one mediator from the three randomly from a container.

    ii. If the three Parties do not voluntarily agree to in writing to the randomly selected mediator, then the mediator shall be appointed by the Superior Court upon motion for appointment of a neutral mediator.

d. Should the mediation process described above not provide a final resolution to the controversy raised, any Party may pursue any judicial or administrative remedies otherwise available. However, notwithstanding this Section 4.2, a Party may seek a preliminary injunction or other interlocutory judicial relief prior to completion of the mediation if necessary to avoid irreparable damage or to preserve the status quo.

ARTICLE 5: EXCHANGE OF DATA AND INFORMATION

5.1. Exchange of Information. The Parties acknowledge and recognize pursuant to this Agreement and SGMA, the Parties will need to exchange information amongst and between the Parties and the Parties' consultants.

5.2. Procedure for Exchange of Information. The Parties may exchange information through collaboration and/or informal requests made at the Coordination Committee level or through working/stakeholder subcommittees designated by the Coordination Committee. To the extent it is necessary to make a written request for information to other Parties, the following protocols shall be followed: Each of the Parties shall designate a representative to respond to information requests and provide the name and contact information of the designee to the Coordination Committee. Requests may be communicated in writing and transmitted in person or by mail, facsimile machine or other electronic means to the appropriate representative as named in this agreement.

5.3. Non-Disclosure of Confidential Information.

a. The Parties acknowledge that, in connection with their mutual activities under this Agreement, each of them may share sensitive and/or confidential information with the other Parties. To the fullest extent permitted by law, including but not limited to the Public Records Act, California Government Code Section 6250 et seq., each of the Parties shall maintain any information, documents or materials shared by the other Parties or mutually developed pursuant this Agreement, in confidence, and shall not voluntarily provide or reveal such information, documents or materials to any third party. If any Party receives a request or order from a third party that the receiving Party believes requires it to disclose any such information, documents or materials, the receiving party shall (i) immediately notify the other Parties in writing and provide them with a copy of such request or order, (ii) defer any disclosure of such information, documents or material for as long as legally permitted and (iii) cooperate with any other Party that wishes to pursue an order preventing the disclosure of such information, documents or materials.

b. The Parties further acknowledge and agree that, unless otherwise required by law, any documents, data or material designed as "DRAFT" that is shared with other Parties to this Agreement (1) shall remain confidential (2) will not be made final or shared with third parties (other than employees or consultants of that Party with a need to know), and (3) shall be used only for the purposes set forth in this Agreement.

c. If there is a breach or threatened breach of any provision of this Section 5.3, it is agreed and understood that the non-breaching Party shall have no adequate remedy in money or other damages and accordingly shall be entitled to injunctive relief; provided however, no specification in this Agreement of any particular remedy shall be construed as a waiver or prohibition of any other remedies in the event of a breach or threatened breach of this Agreement.

5.4. Model(s). The Parties will collectively adopt a single water resources model for purposes of preparing the GSP. Any Party may utilize the model for investigative runs, however, only runs made with assumptions and changes approved by the Parties will be accepted as official for inclusion within the GSP. The approved model will be located at Merced Irrigation District ("**MID**") until a future location is agreed upon by the Parties. All Parties shall receive copies of the model and shall have access to the model at MID during normal business hours.

ARTICLE 6: FINANCIAL PROVISIONS

6.1. Contributions and Expenses. Each of the Parties shall be responsible to fund its participation in this Agreement. Funding outside costs, such as consultants, projects, or other Basin-wide activities shall be determined separately for each project. For any such Basin-wide project, the Coordination Committee shall develop a scope of work and recommended a cost allocation for each of the Parties that would need to be approved by a Party's governing board before it is binding on that Party. With respect to sharing costs for GSP development, the Parties agree to the cost share allocation in **EXHIBIT A**, GSP Cost Share Allocation dated October 13. 2017.

6.2. Funding Responsibilities. Each Party will be solely responsible for raising funds for payment of that Party's share of operating and administrative costs. The obligation of each of the Parties to make payments under the terms and provision of this Agreement is an individual and several obligation and not a joint obligation with those of the other Parties. Each of the Parties shall be individually responsible for its own covenants, obligations, and liabilities under this Agreement. No Party shall be precluded from independently pursuing any of the activities contemplated in this Agreement. No Party shall be the agent or have the right or power to bind any other Parties without such Party's express written consent, except as expressly provided in this Agreement.

6.3. Alternate Funding Sources. The Parties may secure contributions of grant funding, state, federal, or other funding as funding or a portion of funding for projects between the Parties.

ARTICLE 7: CHANGES IN PURPOSE, PARTICIPATION, WITHDRAWAL AND TERMINATION

7.1. Changes in Purpose. This Agreement shall remain in place and all applicable provisions shall remain in effect, in the event the Parties determine it is not possible to develop a single GSP pursuant to this Agreement. In that instance, the Parties may develop separate, multiple GSPs, but agree that they will work together to amend this Agreement and utilize this Agreement and the Coordination Committee to meet the requirements of SGMA to utilize the same data and consistent methodologies as required by SGMA, coordinate implementation of the GPSs, and work together as necessary to comply with SGMA. Under those circumstances, this Agreement, as amended, shall constitute the Coordination Agreement required by SGMA.

7.2. Noncompliance. In the event any Party (1) fails to comply with the terms of this Agreement, or (2) undertakes actions that conflict with or undermine the compliance with SGMA and/or achieving sustainable groundwater management, as determined through mediation or by the Coordination Committee, the Party or Parties alleging non-compliance shall provide written notice summarizing the nature of lacking compliance. Further, the non-compliant Party agree to make best efforts to resolve or remedy any such non-compliance. Such actions may include, for example, failure to pay its agreed upon contributions when due; refusal to participate in GSA activities or to provide required monitoring of sustainability indicators; refusal to enforce controls as required by the GSP; refusal to implement any necessary actions as outlined by the approved GSP minimum thresholds that are likely to lead to "undesirable results" under SGMA.

7.3. Withdrawal and Termination.

a. A Party may, in its sole discretion, unilaterally withdraw from this Agreement, effective upon ninety (90) days' prior written notice to the governing boards of the other Parties, provided that (1) the withdrawing Party will remain responsible for its proportionate share of any obligation or liability duly incurred while a Party to the Agreement and (2) the withdrawing Party agrees to take all actions after termination to remain in full compliance with SGMA. The withdrawing Parties will not be responsible for its proportional share of any future obligation or liability after the written notice of termination has been given to the governing boards of the other Parties. Thereafter, the withdrawing Party shall not be responsible for any obligations or liabilities incurred by the remaining Parties. In the event the withdrawing Parties have any rights in any property or have incurred obligations, the Parties may not sell, lease or transfer such rights or be relieved of its obligations, except in accordance with a written agreement executed by it and the Parties. This Agreement shall remain in effect for the non-withdrawing parties after the withdrawal of a party.

b. This Agreement may be terminated by unanimous written consent of all the Parties. Nothing in this Agreement shall prevent the Parties from entering into another coordination agreement. However, in the event of termination each of the Parties will remain responsible for its proportionate share of all debts, liabilities and obligations incurred prior to the effective date of termination.

7.4. Disposition of Property Upon Termination. Upon termination of this Agreement, the Coordination Committee shall recommend the Parties distribute the assets between the successor entity and the Parties in proportion to how the assets were provided.

7.5. Use of Data. Upon withdrawal, any Party shall be entitled to use any data or other information developed during its time as a Party to the Agreement. Further, should a Party withdraw after completion of the GSP, the withdrawing Party shall be entitled to rely on and utilize the GSP for future implementation of SGMA within its boundaries.

ARTICLE 8: MISCELLANEOUS PROVISIONS

8.1. Indemnification.

a. Each of the Parties shall hold harmless, defend and indemnify the other Parties, and their agents, officers and employees, from and against any liability, claims, actions, costs, damages or losses of any kind, including death or injury to any person and/or damage to property arising out of the activities of the Agreement to the extent of their respective cost share allocation (as set forth in Exhibit "A").

b. The indemnification obligation set forth in Section 8.1.a shall exclude actions or claims alleged to have occurred in full, or in part, as a result of active negligence by any indemnified Party, its officers, agents or employees and except for actions or claims alleging dangerous conditions of public property that arise out of the acts or failure to act by the indemnified Party, its officers, agents or employees which are not created by an indemnifying Party.

c. The indemnification provisions contain in this Section include, but are not limited to, violation of applicable law, ordinance, regulation or rule, including, where the claim, loss, damage, charge or expense was caused by deliberate, willful, or criminal acts of any Party, or any of their agents, officers, or employees or their performance under the terms of this Agreement.

d. It is the intent of the Parties that where negligence or responsibility for injury or damages is determined to have been shared, principles of comparative negligence will be followed and each Party shall bear the proportionate cost of any loss, damage, expense and liability attributable to that Party's negligence.

e. Each Party shall establish procedures to notify the other Parties, where appropriate, of any claims, administrative actions or legal actions with respect to any of the matters described in this Section. The Parties shall cooperate in the defense of such actions brought by others with respect to the matters covered in this Agreement.

f. These indemnification obligations of this Section shall continue beyond the Term of this Agreement as to any acts or omissions occurring during this Agreement. The duty to indemnify set forth herein shall extend only to that period of time prior to a Party's withdrawal.

8.2. Liability Coordination Committee. Each Party must defend, indemnify and hold harmless the other Parties from the actions of their employees or agents taken within the scope of the authority of this Agreement.

8.3. Amendments. This Agreement may be amended from time to time by a unanimous vote of the Parties' respective governing boards.

8.4. Binding on Successors. Except as otherwise provided in this Agreement, the rights and duties of the Parties may not be assigned or delegated without a unanimous vote by the Parties. Any approved assignment or delegation shall be consistent with the terms of any contracts, resolutions, indemnities and other obligations then in effect. This Agreement shall inure to the benefit of, and be binding upon, the successors and Assigns of the Parties hereto.

8.5. Notice. Any notice or instrument required to be given or delivered under this Agreement may be made by: (a) depositing the same in any United States Post Office, postage prepaid, and shall be deemed to have been received at the expiration of 72 hours after its deposit in the United States Post Office; (b) transmission by facsimile copy to the addressee; (c) transmission by electronic mail; or (d) personal delivery, as follows:

If to Merced Subbasin Groundwater Sustainability Agency:

Ms. Lacey Kiriakou
Merced County
2222 M Street
Merced, CA 95340
Phone: 209.385.7654
Email: LKiriakou@co.merced.ca.us

If to Merced Irrigation Urban GSA:

Mr. Hicham Eltal
Merced Irrigation District
744 W. 20th Street
Post Office Box 2288
Merced, CA 95344-0288
Phone: 209.722.5761

Email: heltal@mercedid.org

If to Turner Island Water District GSA:

Mr. Lawrence Scott Skinner
Turner Island Water District
1269 W. I Street
Los Banos, CA 93535
Phone: 209.827.7700
Email: sskinner@wolfseninc.com

8.6. Counterparts. This Agreement may be executed by the Parties in separate counterparts, each of which when so executed and delivered shall be an original. All such counterparts shall together constitute but one and the same instrument.

8.7. Choice of Law. This Agreement shall be governed by the laws of the State of California.

8.8. Severability. If one or more clauses, sentences, paragraphs or provisions of this Agreement are held to be unlawful, invalid or unenforceable, it is hereby agreed by the Parties that the remainder of the Agreement shall not be affected thereby. Such clauses, sentences, paragraphs or provisions shall be deemed reformed so as to be lawful, valid and enforced to the maximum extent possible.

8.9. Headings. The paragraph headings used in this Agreement are intended for convenience only and shall not be used in interpreting this Agreement or in determining any of the rights or obligations of the Parties to this Agreement.

8.10. Construction and Interpretation. This Agreement has been arrived at through negotiation and each of the Parties has had a full and fair opportunity to revise the terms of this Agreement. As a result, the normal rule of construction that any ambiguities are to be resolved against the drafting Parties shall not apply in the construction or interpretation of this Agreement.

8.11. Entire Agreement. This Agreement constitutes the entire agreement among the Parties and supersedes all prior agreements and understandings, written or oral. This Agreement may only be amended by written instrument executed by all Parties.

IN WITNESS WHEREOF, the Parties hereto execute this Agreement on the last date written beside each Party representative's signature.

Merced Subbasin Groundwater Sustainability Agency

By: Robert D Kelley   Date: 10/12/2017

Name: Robert D Kelley

Merced Irrigation Urban Groundwater Sustainability Agency

By: ______________________________   Date: ______________________

Name: ______________________________

Turner Island Water District Groundwater Sustainability Agency

By: ______________________________   Date: ______________________

Name: ______________________________

EXHIBIT A
GSP DEVELOPMENT COST SHARE ALLOCATION
October 13, 2017

GSA	COST ALLOCATION
Merced Irrigation Urban GSA	40%
Merced Subbasin GSA	58%
Turner Island Water District GSA	2%
	100%

The percentage are derived from a ratio between irrigated and urban areas and groundwater production for the last 10 years, as derived from the latest available sources.

APPENDIX B: COMBINED MEETING MINUTES FROM COORDINATION COMMITTEE, STAKEHOLDER ADVISORY COMMITTEE, AND PUBLIC MEETINGS

MEETING NOTES – Merced GSP

SUBJECT: Merced GSP Coordination Committee Meeting

DATE/TIME: November 2, 2020 at 10:00 AM

LOCATION: Online - Microsoft Teams Meeting

Coordination Committee Members In Attendance:

	Representative	GSA
☒	Hicham ElTal	Merced Irrigation-Urban GSA
☐	Stephanie Dietz	Merced Irrigation-Urban GSA
☒	Justin Vinson	Merced Irrigation-Urban GSA
☐	Daniel Chavez	Merced Irrigation-Urban GSA
☒	Ken Elwin (alternate)	Merced Irrigation-Urban GSA
☒	Bob Kelley	Merced Subbasin GSA
☒	Mike Gallo	Merced Subbasin GSA
☒	Nic Marchini	Merced Subbasin GSA
☐	George Park (alternate)	Merced Subbasin GSA
☒	Larry Harris	Turner Island Water District GSA #1
☐	Scott Skinner (alternate)	Turner Island Water District GSA #1

Meeting Notes

1. CALL TO ORDER AND WELCOME
    a. Alyson Watson (Woodard & Curran) called the meeting to order.
2. ROLL CALL
    a. Coordination Committee members in attendance are shown in table above. The Committee had a quorum.
3. CONSENT CALENDAR
    a. Meeting notes from previous meeting (October 28, 2019) were approved.
4. REPORTS
    a. Update on Submittal of Groundwater Sustainability Plan and First Annual Report – Alyson Watson (Woodard & Curran) provided an update about GSP related submittals and reviewed GSP related commitments and timelines. The GSP and First Annual Report were submitted on time in early 2020. DWR is now in a 2-yr review of plans and expects GSAs to start implementation in interim. The next Annual Report due April 1, 2021.
        i. Hicham ElTal (MIUGSA) recommended that work on the second annual report should begin soon and the CC directed Woodard & Curran to prepare a timeline for the GSA representatives to review.

b. Severely Disadvantaged Communities Grant Status Update

   i. Matt Beaman (MID) provided a status update on the three grant-funded SDAC Projects: Planada Recharge Basin Pilot Project, El Nido Groundwater Monitoring Wells, and Meadowbrook Water System Intertie Feasibility Study, describing location, funding status, and details about projects and ongoing steps.

c. Coordination with neighboring basins

   i. Hicham ElTal provided updates:

      1. The Merced Subbasin has 3 neighboring basins (Turlock, Chowchilla, and Delta-Mendota). The GSAs have a formal cooperative MOU and an agreements with Turlock and Chowchilla, respectively.

      2. Ongoing coordination is occurring with Turlock Subbasin as that basin develops their GSP (not critically overdrafted, so on a later completion schedule than Merced).

      3. Subsidence is the main issue of concern for coordination with the Delta-Mendota and Chowchilla subbasin.

d. GSA Reports - Updates were provided from each GSA on activities they are undertaking in their own jurisdiction:

   i. Merced Subbasin GSA - Bob Kelly provided an update on past year activities, including:

      1. MSGSA joined the coordinated right to water application

      2. MSGSA is considering sustainability zones for GSP implementation, for example for subsidence. Outside consultant will be working on developing a summary of likely areas and reasons for development of separate sustainability zones within the GSA.

      3. Added Amsterdam Water District as a non-voting member to the GSA's Joint Powers Agreement. Set a board meeting schedule and continued to engage in the ad-hoc committee for implementation measures.

   ii. MIUGSA - Hicham ElTal provided an updated on recent activities, including:

      1. Generally keeping busy on technical work and now catching up on administration to build up capacity for MIUGSA.

      2. The coordinated effort towards a basin-wide water right to flood water application has been a key item and is described later in the meeting notes.

      3. On behalf of the basin, have been working on SDAC projects (also described later in meeting notes).

      4. Executed agreement with DWR for Prop 68 Planning Grant (described later in meeting notes)

   iii. TIWD GSA #1 - Larry Harris (TIWD) provided an update on recent activities, including:

      1. Joined in the coordinated water right application

      2. Completed the groundwater metering programs (all active wells are now metered).

      3. Current focus of attention is on locating some storage reservoirs to capture flood waters.

5. ACTIONS

a. Water Level and Water Quality Monitoring Networks – Approve RFQ for Monitoring Support Services

i. Matt Beaman (MID) gave a background on historical monitoring

1. Reviewed existing groundwater elevation (CASGEM) and water quality monitoring program
2. DWR has asked whether the voluntary wells from the CASGEM will continue to be reported. The voluntary wells are not part of the required reporting group for various reasons (questionable data results or don't meet construction requirements). A recommendation was made to discontinue reporting on these wells for CASGEM purposes.
3. Q: Monitoring well installed with telemetry as dedicated monitoring ~1 year ago (east end of MCWD/SWD area). Currently updates to DWR telemetry website. Should it be part of the GSP network? A: MID will take a look and if it meets the construction requirements, consider adding it to the network.

ii. Matt Beaman (MID) gave a background on current and future monitoring.

1. Q: In GSP, monitoring entities were sending information into data management system (DMS). What is different in what is being proposed? A: MIUGSA is assigned to submit the data for all monitoring wells throughout the basin (not per agency or well-owner). Measurements were submitted March and October (and December measurement coming up). But to meet GSP commitment, wells needs to start being measured more frequently (monthly instead of 2-3 times per year).
2. Q: How many wells are dedicated monitoring vs active production for irrigation/drinking water? A: The number in current monitoring network is 4 or 5 dedicated. 2 from SWD and 2 City of Merced and 1 from City of Atwater, plus 2 from MID former production but currently no pumps; rest are production.
    a. Follow-up Q: What concerns are there about moving to monthly monitoring for production wells (pumping impacts)? A: Many MID wells are dormant much of the time. For the most part, these wells need to be included to provide a complete subbasin picture.
3. Q: Nic Marchini has been taking elevations for several years in 12 wells that aren't necessarily part of CASGEM. Should these be included? A: It depends on Corcoran Clay and other CASGEM requirements for time between pumping. These would need to be reviewed individually.
4. Public Comment via chat: "Hello, my name is Jovana with Leadership Counsel. I have a question regarding the monitoring network. Our concern is that vulnerable communities will be overlooked, how is the monitoring network going to detect impacts to drinking water users, particularly for vulnerable communities?"
    a. MIUGSA: As we work on data gaps, we'll be looking at these issues, however the majority of these communities are served drinking water as part of community service districts that conduct routine water quality monitoring and meet all applicable drinking water regulations.
5. Q: What would it take to bring marginal/voluntary wells up to the technical standards to be able to consider them for the monitoring network? A: Most of the voluntary wells were production wells screened in multiple aquifers. It would

require a large level of effort to modify those to meet monitoring requirements. This is, however, an evaluation task under the Prop 68 planning grant work.

iii. ACTION approved by CC: Direct MID to prepare and issue a Request for Qualifications (RFQ) for the purpose of hiring one or more firms to conduct groundwater elevation monitoring, data compilation, reporting, general monitoring site maintenance, and other associated activities as needed. Selection of firm(s) and preparation of the scope of work subject to subsequent conversations among the GSAs prior to issuance of any contracts.

b. Proposition 68 Planning and Implementation Grants

i. Prop 68 Planning Grant: The scope for the $500,000 Planning Grant work was developed by a committee of GSA and stakeholder reps in Fall 2019. The GSAs were awarded the grant in early 2020. MID, as the GSAs' authorized rep, executed a grant agreement with DWR in May 2020. The grant scope includes 3 components: Developing a plan to address Data Gaps in the subbasin, field work to upgrade existing wells and potentially install new wells to augment the monitoring network, and development of a decision support tool.

1. Matt Beaman (MID) provided an overview of the work that needs to be started and recommended the GSAs request a scope/budget from Woodard & Curran for the Data Gaps Plan and Remote-sensing Tool, and issue an RFQ for the field work component.
2. Hicham ElTal (MID) suggested additional items that should be considered as part of data gaps plan development: assessment of CIMIS station for reliable location if considering satellite information in future, also add subsidence recommendations.
3. Bob Kelley (MSGSA) confirmed that work under the grant would be coordinated with all 3 GSAs since all will benefit.
4. ACTION approved: Direct Woodard & Curran to provide a scope and budget consistent with Prop 68 Grant Workplan to complete Data Gaps Plan and Remote Sensing components for review by GSAs.
5. ACTION approved: Direct MID to prepare and issue a Request for Qualifications (RFQ) for the purpose of hiring one or more firms to for well installation, well inspection, and other activities associated with Proposition 68 Grant Workplan. Selection of firm(s) and preparation of the scope of work subject to subsequent conversations among the GSAs prior to issuance of any contracts.

ii. Prop 68 Implementation Grant: DWR is releasing a solicitation for proposal for Prop 68 Implementation Grant funds. Matt Beaman (MID) provided an update on latest information on Prop 68 Implementation Grant Proposal Solicitation Package.

1. The three Merced Subbasin GSAs submitted a joint letter to DWR requesting an extension of the deadline to March 2021. DWR publicized the January 2021 deadline last week and is not expected to extend it.
2. MID recommended that the GSAs ask W&C to prepare a scope to prepare the grant application and the 3 GSAs would review the scope and decide how to move forward with grant application preparation and work with stakeholders to select most likely projects to compete for limited funds.
3. Q: Will projects need to be identified and scoped out before the grant app is submitted? A: Yes, W&C will have to come up with some assumptions about number of projects which will need to happen in parallel to grant preparation.

4. Public Comment: What actions will be taken to make sure funding for disadvantaged communities is appropriately allocated/addressed? A: GSAs will consider whether projects will benefit under-represented communities (URCs) during project selection. DWR will give preference to projects that meet requirements and benefit URCs so the basin has incentive to move those projects forward. Furthermore, most of the subbasin meets the definition of disadvantaged community or under-represented community.
5. ACTION approved: Direct W&C to prepare a scope for grant application preparation and for MID to serve as the subbasin representative in submitting the grant application and eventual contracting with DWR.

c. DWR Technical Support Services General Application

i. Matt Beaman provided an update on the status of the application. The three Merced Subbasin GSAs have coordinated on initial development of the General Application to DWR (effort primarily led by Lacey McBride (MSGSA)), and discussed the next steps for applying for DWR Technical Support Services.

ii. ACTION approved: Assign Groundwater Subbasin Coordinator (Hicham ElTal) to finalize and submit DWR Technical Support Services application and associated materials requesting various field activities. Application and submittal are subject to subsequent coordination among the GSAs.

6. Public Comment

a. No additional comments submitted besides the two noted earlier that were submitted during discussion of the monitoring network and Prop 68 agenda items.

7. Informational Items

a. Matt Beaman (MID) presented a brief summary of the Domestic Well Inventory project administered by Merced Integrated Regional Water Management Authority (MIRWMA), funded by DWR's Disadvantaged Community Involvement Grant

b. Hicham ElTal (MID) provided a summary of the Coordinated Water Right Application which has to do with use of periodic floodwater from most streams in the Subbasin.

   i. Application was submitted December 2019. It then took about five additional months to revise per State Water Resources Control Board staff feedback. Currently waiting for results of the review.

c. Other information items

   i. No items were raised.

8. Next steps and adjourn

a. Meeting frequency for Coordination Committee and Stakeholder Committee

   i. Hicham ElTal (MID) suggested some agenda items that could be discussed in future meeting(s):

      1. Establishing thresholds and sustainability criteria in areas without historical monitoring data or not monitored in past or without domestic wells.
      2. Meeting frequency and composition of stakeholder committee
      3. Consider changing general interest email address mercedsgma@woodardcurran.com to something that doesn't include a consultant or agency name like: mercedsgma@mercedsgma.org.

         a. W&C will look into this and report back.

   ii. GSP indicated CC and SC would meet quarterly.

1. The group expressed interest in CC meeting more frequently in the near term given pressing issues like the Prop 68 Implementation Grant application. The group agreed to schedule a meeting in early December and also consider a meeting in early January as well.

b. Confirm next meeting date

    i. Woodard & Curran will work on scheduling an early December meeting.

c. Meeting adjourned at 12:17 PM

Next Regular Meeting
TBD (expected early December)
Meeting to be conducted virtually (subject to change)
Information also available online at mercedsgma.org

MEETING NOTES – Merced GSP

SUBJECT: Merced GSP Coordination Committee Meeting

DATE/TIME: December 1, 2020 at 9:00 – 11:00 AM

LOCATION: Online - Microsoft Teams Meeting

Coordination Committee Members In Attendance:

	Representative	GSA
☒	Hicham ElTal	Merced Irrigation-Urban GSA
☐	Stephanie Dietz	Merced Irrigation-Urban GSA
☒	Justin Vinson	Merced Irrigation-Urban GSA
☐	Daniel Chavez	Merced Irrigation-Urban GSA
☒	Ken Elwin (alternate)	Merced Irrigation-Urban GSA
☒	Bob Kelley	Merced Subbasin GSA
☒	Mike Gallo	Merced Subbasin GSA
☒	Nic Marchini	Merced Subbasin GSA
☐	George Park (alternate)	Merced Subbasin GSA
☒	Larry Harris	Turner Island Water District GSA #1
☐	Scott Skinner (alternate)	Turner Island Water District GSA #1

Meeting Notes

1. CALL TO ORDER AND WELCOME

a. Samantha Salvia (Woodard & Curran) called the meeting to order.

2. ROLL CALL

a. Coordination Committee members in attendance are shown in table above. The Committee had a quorum.

3. CONSENT CALENDAR

a. Meeting notes from previous meeting (November 2, 2020) were approved.

4. PUBLIC COMMENT

a. Lou Myers (Merced Grasslands Coalition) provided public comment on the Stakeholder Committee reengagement agenda item. Lou represents a coalition of farmers and ranchers in the Merced Subbasin. Lou has reached out to members of the GSA and has submitted letters to DWR. The Merced Grasslands Coalition would like to be part of GSP discussions moving forward potentially through the stakeholder committee.

5. REPORTS

a. <u>Coordination with neighboring basins</u>

i. Hicham ElTal (MIUGSA) provided updates:

1. More information will be coming from the Turlock Subbasin including about their water budget.
2. There is a new proposed timeline for coordination between Delta-Mendota, Merced, and possibly Chowchilla Subbasins.

b. GSA Reports - Updates were provided from each GSA on activities they are undertaking in their own jurisdiction:

i. TIWD GSA #1 - Larry Harris indicated no updates since the last CC meeting.

ii. MIUGSA - Hicham ElTal expressed concern that this appears to be a dry year and it's uncertain how this may impact the GSP.

iii. Merced Subbasin GSA - Bob Kelly reported that MSGSA is working with Provost & Pritchard to determine potential sustainability zones in the GSA that may be used for management, monitoring, or projects in the future. The MSGSA's Technical Advisory Committee will be discussing these at ongoing meetings.

6. ACTIONS

a. Water Year 2020 Annual Report

i. Samantha Salvia (W&C) provided a brief background on the first annual report submitted for Water Years 2016-2019 and the requirement to submit a Water Year 2020 report by 4/1/2021 to DWR.

ii. Hicham ElTal and Bob Kelly indicated they'd like to start work on the annual report as soon as possible.

iii. Ken Elwin asked what is the total budget for this effort. Woodard & Curran confirmed it is about $85,000.

iv. Nic Marchini asked: will recent monitoring data be reported and what locations will be included? Matt Beaman and Hicham ElTal (MIUGSA) confirmed monitoring data was collected and submitted in March and MID is now finalizing data to submit to DWR from October for the whole monitoring network.

v. Bob Kelly (MSGSA) asked if agencies could be notified if there's data not received. Matt Beaman confirmed that data from all agencies were received for all of 2020 thus far.

vi. **ACTION approved by CC:** Recommend GSA Boards approve a contract amendment with Woodard & Curran to complete the Second Annual Report including data collection, analysis, report writeup, and submittal to DWR by April 1, 2021.

b. Proposition 68 Planning Grant Work

i. Basin awarded a $500,000 Prop 68 Planning Grant in early 2020

ii. MID has contracted with DWR for the grant and is ready to begin work

iii. At November meeting, CC requested Woodard & Curran prepare a scope and budget consistent with grant agreement for Data Gaps Plan and Remote-Sensing Tool part of grant scope.

iv. Hicham ElTal (MIUGSA) clarified that the work Woodard & Curran will be doing is the planning work for the data gaps plan and remote sensing and not the "field work" components which make up most of the grant amount.

1. Hicham indicated he'd like Woodard & Curran to determine DWR's direction for remote sensing data sources. The GSAs would like to be in alignment with the data source DWR is likely to consider standard.

v. Q: Will there be additional coordination on the Remote Sensing Decision Support Tool and its development? A: Yes. The scope includes stakeholder engagement and GSA coordination and input.

vi. Q: Will the Data Gaps Plan be used to update/refine the Subbasin's model? A: Modeling work is not directly part of the Data Gaps Plan, but down the road it's likely the model will be updated once additional monitoring locations are identified and data is collected.

vii. Q: Will the Data Gaps Plan be complete by end of February? A: Woodard & Curran will confirm a more detailed schedule, but likely will require more than two months to prepare a detailed plan with outreach.

viii. Hicham ElTal would like Woodard & Curran to connect with each GSA individually as the Data Gaps Plan is developed for locally-specific information.

ix. **ACTION approved by CC:** Recommend GSA Boards approve a contract amendment with Woodard & Curran to conduct Prop 68 Planning Grant work associated with Data Gaps Plan and Remote Sensing components as described in scope provided by Woodard & Curran.

7. DISCUSSION ITEMS

a. Prop 68 Implementation Grant Opportunity

i. Samantha Salvia (W&C) provided an overview of the Prop 68 Grant Implementation opportunity.

ii. Lacey McBride (MSGSA) reported that a group of GSA representatives have had several discussions about potential projects as well as posed some questions to DWR representatives about competitiveness of the grant. The small group has a shortlist of projects: recharge basins, El Nido improvement, and LeGrand Athlone intertie. Recommend that the CC direct the GSA representatives to select projects scoped to have a combined value within the $2-$5M grant requirements.

1. Black Rascal Creek flood control project was also identified but probably more appropriate for round 2 of implementation funding and won't be included in the project list for this grant application.

iii. Brad Samuelson provided a description of the LeGrand Athlone intertie project: a canal that links MID through Le Grand-Athlone Water District on southeast side of Subbasin, then continues to connect to Chowchilla River. Phase 1 would be connecting MID's booster 3 lateral to several creeks and would be just under $5M budget, but grant app could be adjusted to only include certain components. Overall the project is envisioned to bring floodwater into the Subbasin that otherwise would continue in Merced River or MID's service area. A feasibility study was completed in June 2020 and Summers Engineering is currently developing 30% drawings.

1. Brad Samuelson confirmed he should be able to pull together required project information for the grant on the intertie project. He can provide starting information to W&C. He also has information about the recharge basins and KMZ maps.

iv. Brad Samuelson provided background on the potential La Paloma recharge basin project: a wetland area that can be flooded by local supplies. The area is already used for some recharge. There's a good environmental enhancement at this site as a mutual benefit. There is an existing diversion point. The project budget is about $750K but could be scaled back if needed.

v. Hicham ElTal (MIUGSA) provided a description of the El Nido improvements project ($400-$500K).

  1. El Nido is on the tail end of MID's service area and moving water there and beyond is particularly challenging. The improvements would be in areas of major flow restrictions (e.g. increasing capability of moving water down El Nido system on the order of 1,000 AF). This would help MID move water to lower end of El Nido area during the flood event using existing floodwater licensing.
  2. MID could provide details on project in 2 days if group were to move forward with this. Woodard & Curran confirmed it will be tight but doable in this case.
  3. Also a plus from a grant app perspective is that this is in the subsidence area and supports a Disadvantaged Community.

vi. Hicham ElTal (MIUGSA) clarified that CC should make a decision today on whether to pursue round 1 funding and generally what project(s) should be in the application (with a little room for edit in next few days).

vii. Hicham ElTal (MIUGSA) requested that the cost for application preparation can be taken on by the GSA for which the proposed project benefits.

viii. Bob Kelly (MSGSA) expressed concern that project details, budget, etc. aren't refined enough and won't be in time for round 1 application due date. Discussion ensued on schedule feasibility.

ix. MIUGSA and MSGSA to provide project info by end of Thursday 12/3 for El Nido Improvements and scaled back versions of La Paloma recharge basin and Le Grand-Athlone Intertie project.

x. **ACTION approved by CC:** Authorize W&C to start working on and complete an application for Prop 68 Implementation grant funding, providing that the GSAs forward project descriptions, costs, and project benefits to W&C by Thursday 12/3/2020 and also that the GSAs benefiting from awarded (funded) projects would be burdened proportionally for the cost of preparing the application and not the whole Subbasin's typical GSA split.

b. Stakeholder Committee re-engagement (meeting frequency, review of member composition)

i. Samantha Salvia (W&C) provided a description of the Stakeholder Committee function and original formation. The committee was formed for development of the GSP through a public application process. The CC reviewed applications and recommended a stakeholder committee list to the GSA boards. The GSA boards approved the stakeholder committee. The committee met monthly prior to coordination committee meetings for the duration of GSP development.

ii. Q: how long are these members asked to serve? A: Original expectation was through the development of the GSP (end of 2019).

  1. Mike Gallo suggested the potential for implementing a term limit with option to renew to be in alignment with other committees (e.g. avoid asking for indefinite membership length).

iii. Additional Public Comment – the committee took additional public comment on this item:

1. Angela (Self-Help Enterprises): Previous manager Maria Herrera has left but SHE continues to engage with the Merced Subbasin and would like to continue to do so through the Stakeholder Committee.
2. Lou Myers: Suggested that future stakeholder participation should be explicitly for GSP implementation. Roughly 50% of the landmass is rangeland and roughly 3% of the interested parties represent that so the CC should consider this given the potential for recharge on rangeland.

iv. Hicham ElTal (MIUGSA) suggested that if virtual meeting attendance continues to be an option, it may make it easier for stakeholders to be involved.

v. Bob Kelly (MSGSA) indicated the MSGSA Technical Advisory Committee is meeting 12/2 and will discuss this. He agreed with a quarterly meeting frequency.

vi. Samantha Salvia (W&C) suggested staggering SC meetings so they occur before the corresponding CC meeting to provide time to consolidate feedback and transmit to CC.

vii. Hicham ElTal (MIUGSA) suggested reaching out to existing SC list to solicit interest in continued participation and defining responsibilities and requirements. MID has done something similar in the Integrated Regional Water Management (IRWM) process.

viii. W&C will start with the previous SC application description and update then pass to the CC for feedback.

c. Update the MercedSGMA general contact inbox from mercedsgma@woodardcurran.com to contact@mercedsgma.org and route messages to the three GSAs.

   i. CC agreed this is a good idea and the GSAs will each provide points of contact.

d. Approach for establishing thresholds and sustainability criteria in areas without historical monitoring data or not monitored in past or without domestic wells.

   i. Hicham ElTal (MIUGSA) is interested in identifying abandoned wells and thinks they might provide information on development of the aquifer over time. Also interested in shallow wells in Above Corcoran Clay that have been abandoned to be drilled deeper into the Below Corcoran Clay to give an idea of shallow aquifer health.

   ii. Q: If individual person has been taking historical groundwater elevations, how should they go about voluntarily submitting that data? (e.g. in Le Grand area, fairly regular elevation data has been collected, might be useful to fill data gaps). A: We can circle back on where those wells might be and data available. Per Matt Beaman (MIUGSA), there is a form to submit level data on MercedSGMA website. Official representative wells are required to meet state guidelines for the wells (e.g. construction and commitment to monitoring frequency) and would be up to CC or GSAs to incorporate if they can be demonstrated to meet the requirements.

   iii. Greg Young (MSGSA) noted that in model calibration there were wells in data gap areas and those can be valuable for understanding what might be representative wells and historical conditions in the area.

   iv. Hicham requested that W&C send a list of the options/venues to use to try to estimate or develop a threshold/sustainability criteria for CC feedback and further investigation.

      1. Example, PG&E had historical wells with significant data that were used previously.

8. Next steps and adjourn

a. Confirm next meeting date

   i. Woodard & Curran will schedule a February 22 meeting from 1:15-3:15pm.

    ii. Request was made to add standing item near end of future agendas for committee member thoughts/suggestions, etc.

b. Meeting adjourned at 10:57 AM

Next Regular Meeting
February 22 at 1:15-3:15 PM
Meeting to be conducted virtually (subject to change)
Information also available online at mercedsgma.org

MEETING NOTES – Merced GSP

SUBJECT: Merced GSP Coordination Committee Meeting

DATE/TIME: February 22, 2021 at 1:15 – 3:15 PM

LOCATION: Online – Zoom Meeting

Coordination Committee Members In Attendance:

	Representative	GSA
☒	Hicham ElTal	Merced Irrigation-Urban GSA
☐	Stephanie Dietz	Merced Irrigation-Urban GSA
☒	Justin Vinson	Merced Irrigation-Urban GSA
☐	Daniel Chavez	Merced Irrigation-Urban GSA
☒	Ken Elwin (alternate)	Merced Irrigation-Urban GSA
☒	Eric Swenson	Merced Subbasin GSA
☒	Mike Gallo	Merced Subbasin GSA
☒	Nic Marchini	Merced Subbasin GSA
☒	George Park (alternate)	Merced Subbasin GSA
☒	Larry Harris	Turner Island Water District GSA #1
☐	Scott Skinner (alternate)	Turner Island Water District GSA #1

Meeting Notes

1. CALL TO ORDER AND WELCOME

a. Samantha Salvia (Woodard & Curran) called the meeting to order.

2. ROLL CALL

a. Coordination Committee members in attendance are shown in table above. The Committee had a quorum.

3. CONSENT CALENDAR

a. Meeting notes from previous meeting (December 1, 2020) were approved.

4. PUBLIC COMMENT

a. No public comments.

5. REPORTS

a. <u>Coordination with neighboring basins</u>

i. Hicham ElTal (MIUGSA) provided updates:

1. There is an ongoing effort to schedule a coordination meeting between the Merced, Chowchilla, Delta-Mendota, and Madera Subbasins. This will be scheduled with GSA representatives soon.

2. Ongoing coordination is occurring with the Turlock Subbasin including about their water budget.

b. GSA Reports - Updates were provided from each GSA on activities they are undertaking in their own jurisdiction:

i. Merced Subbasin GSA – Lacey McBride shared that the MSGSA Board had a January meeting where proposed sustainability zones were discussed; more information is available on MSGSA website (https://www.co.merced.ca.us/2799/Merced-Subbasin-GSA). A Board workshop (2/24 at 2pm, open to the public) is upcoming to talk about goals and options for demand reductions.

1. Question (Hicham ElTal): What are the unique characteristics considered for identifying sustainability zones? Answer: Many factors, but they include hydrologic/hydrogeologic differences, land use, and jurisdictional boundaries.

ii. MIUGSA - Hicham ElTal shared that MIUGSA is administering various pieces of grant work (e.g. SDAC grants for well installations), the Meadowbrook Water System Intertie Feasibility Study is nearly complete, and MID is considering installing dry wells in the Planada area (recharge effort). MIUGSA is also working on setting policies related to the management framework discussed in GSP.

1. Request: Hicham ElTal requested that a standing agenda item be added to future CC meetings on current groundwater conditions, similar to updates that used to be provided at Merced Area Groundwater Pool Interest (MAGPI) meetings.

iii. TIWD GSA #1 - Larry Harris shared that now that monitoring/metering programs are completed, TIWD GSA #1 will be focusing on telemetry for some metering systems. Another focus in the next few months will be developing additional reservoirs for surface water storage.

6. ACTIONS

a. Stakeholder Advisory Committee Recommendation

i. Samantha Salvia (W&C) provided a brief background on the recent process for soliciting and reviewing applications for re-establishing the Stakeholder Advisory Committee during the GSP implementation process. 30 committee members were recommended by the GSA staff, with 5 alternates.

ii. Question: How long are the terms of the Stakeholder Advisory Committee? Answer: The application stated it should be considered a 2-year term.

iii. Question: If members were to drop from the Committee, is the list reviewed annually to fill vacant positions? Answer: In the past, when this happened, it was dealt with on an individual basis and often an alternate was filled in the position.

iv. Public Question: Is there an opportunity to still be a part of this committee? Answer: The application process has closed but Stakeholder Advisory Committee meetings are open to the public and have an option for public comment and input (as do Coordination Committee meetings).

v. Question: How many people on this list are representing disadvantaged communities and primarily drinking water interests? Answer: Multiple, some representatives include Planada, Livingston, and Winton.

vi. Question: What is the structure of the group? Answer: It is an advisory committee that will meet quarterly. There aren't any appointed positions or hierarchy – it provides input to the Coordination Committee.

vii. **ACTION approved by CC:** Recommend the GSA boards appoint the staff recommended applicants (shown on slide) to the Stakeholder Advisory Committee.

b. GSP Well Monitoring RFQ

i. Lacey McBride (MSGSA) provided a brief background on the GSP Well Monitoring Request for Qualifications (RFQ). Two submissions were received by the deadline. The GSAs coordinated the review of submissions and provided a recommendation of QK. Input was requested from the Coordination Committee on the amount of the contract and who would administer.

ii. Question: What kind of contract is this? Answer: This is up for discussion; a rate was provided in the RFQ response but a scope would need to be developed for each project. One thought is to have a Not to Exceed amount for a period longer than one year.

iii. Public Comment (Eric Swenson): "I would recommend that the Merced Subbasin administer the groundwater monitoring contract due to much of work being needed will be in the Merced Subbasin."

iv. Hicham ElTal noted that most monitoring currently is located in the MIUGSA portion of the Merced subbasin.

v. Mike Gallo (MSGSA) shared that during previous discussion he thought it made sense for contracting to go through MIUGSA so that one group pays and there's one bill, with a cost share separately on the backend (like with GSP development contracting).

vi. Lacey McBride (MSGSA) confirmed that all three GSAs will be involved from a technical standpoint of monitoring effort regardless of who is coordinating the administration of the contract.

vii. Garth Pecchenino (QK) agreed that a defined scope should be developed so a specific cost can be provided for purpose of contracting. Exact wells would need to be identified to develop read routing plan.

1. Hicham ElTal (MIUGSA) clarified that additional scope/budget should be considered for additional projects, such as installation/siting of a CIMIS station.

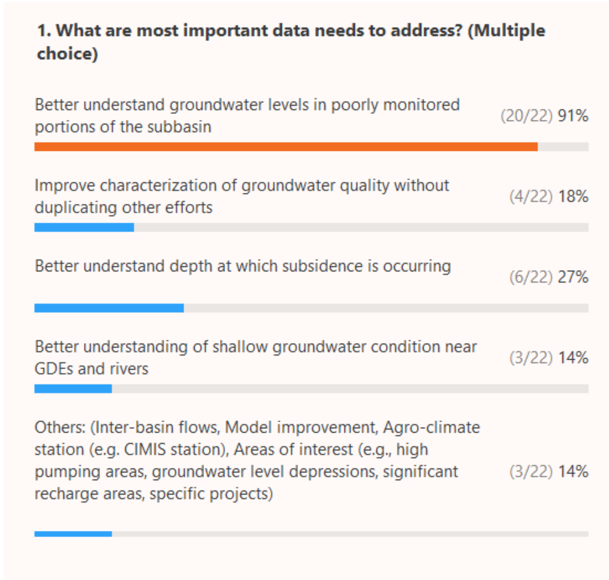
viii. Question: Do the GSAs do WQ monitoring at CASGEM wells? Answer: As described in the GSP, the GSAs review monitoring data collected by other monitoring programs. It could be part of the monitoring contract if identified as a need in the future.

ix. **ACTION approved by CC:** Recommend GSAs select QK as consultant for monitoring work under SGMA for Merced Subbasin. Authorize MIUGSA to enter into an agreement with QK. Provide QK with initial budget of $10,000 to conduct spring monitoring.

7. DISCUSSION ITEMS

a. Data Gaps Plan (Prop 68 Planning Grant funded work)

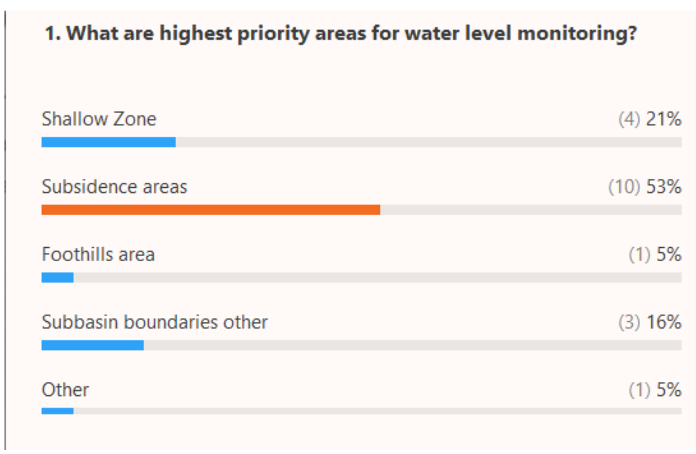
i. Jim Blanke (W&C) shared the approach and schedule for Data Gaps Plan development along with the results of the initial assessment and facilitated a discussion with the CC on priorities, including polls (results shared in screenshots below).

ii. 

iii. Question from Amanda Monaco: A big data gap is where domestic wells are and how deep they are. Are the GSAs going to fill in this data gap? Answer: Work funded by IRWM is evaluating locations and depths of domestic wells in key areas of the Subbasin.

iv. Public Comment (Eric Swenson): "I believe that existing production wells should be used when possible to provide additional SWL (static water level) monitoring in zones with data gaps. Short screened monitor wells may not provide the data desired."

v. Hicham ElTal (MIUGSA) shared that other basins are looking at what Merced Subbasin is doing. If Merced were to install monitoring wells along the Merced River, the Turlock Subbasin would be interested and likely reciprocate with additional well installations. He also brought up that there's an issue about the location of the groundwater ridgeline (e.g. where it slopes to southwest San Joaquin River vs sloping to the Merced River).

vi. 

vii. Hicham ElTal (MIUGSA) asked when a recommendation (e.g. the Data Gaps Plan) will be ready. Answer: A draft plan is expected to be presented at a public meeting in the April/May time period.

viii. Ken Elwin (MIUGSA) saw some empty locations in the map of monitoring well density in the Outside Corcoran Clay Principal Aquifer (UC Merced and another site) and suggested that some known wells could be available or useful to add to the monitoring network.

ix. Hicham ElTal (MIUGSA) shared that MID has a well near Fahrens Creek that may be able to be incorporated into the network.

x. George Park (MSGSA) said it would be useful to know what completion information and characteristics of wells would be ideal for identifying production wells that could be useful for filling data gaps, so well owners know what to look for in inventory.

1. Jim Blanke (W&C) responded that a key requirement is that wells need to be screened only in one aquifer.

b. Remote-sensing tool development (Prop 68 Planning Grant funded work)

i. Dominick Amador (W&C) described the approach and schedule for developing the tool, including a background on how crop evapotranspiration is estimated from remote sensing data, the various data products available, and the next analysis steps.

ii. Hicham ElTal (MIUGSA) shared that both METRIC and SEABAL depend on CIMIS data. The existing CIMIS station surrounding land use has changed and the station is no longer reliable.

iii. Public comment (Geoff Vanden Heuvel): "The GSA's that have adopted Land iQ like Semitropic, Lower Tule GSA, Pixley GSa all put in multiple weather stations to assure accuracy of the ETC data. It doesn't require all that much investment"

c. Sustainability Criteria Approaches for Additional Representative Monitoring Wells

i. At the December CC meeting, the CC requested that W&C return to the group with some information about potential approaches to use for setting sustainability criteria for wells that lack historical data. Chris Hewes (W&C) described two potential approaches.

ii. Question (Hicham ElTal): Will Sustainable Management Criteria methodology be part of the data gaps plan? Answer: No, but the Data Gaps plan can help inform the methodology and provide an opportunity to test the different methods in real world situations given the actual location of new wells.

iii. Public Comment (Eric Swenson): "Older domestic wells are typically those at highest risk of running out of water. New domestic wells not so much. Criteria in the Merced Subbasin should likely be by Sustainability Zone."

d. Prop 68 Implementation Grant

i. Samantha Salvia (W&C) provided a brief background on the grant application which was submitted on January 8, 2021 and seeks $5,000,000 in funding for two groundwater recharge related projects in the southern portion of the basin. Release of the draft funding list for Round 1 expected mid-March 2021, with final grant awards in May 2021.

8. Next steps and adjourn

a. Confirm next meeting date

i. Woodard & Curran will schedule an April 26 meeting from 1:15-3:15pm, shifting meetings to quarterly 4th Monday of January, April, July, and October.

b. Meeting adjourned at 3:26 PM

Next Regular Meeting
April 26 at 1:15-3:15 PM
Meeting to be conducted virtually (subject to change)
Information also available online at mercedsgma.org

MEETING NOTES – Merced GSP

SUBJECT: Merced GSP Coordination Committee Meeting

DATE/TIME: April 26, 2021 at 1:15 – 3:15 PM

LOCATION: Online – Zoom Meeting

Coordination Committee Members In Attendance:

	Representative	GSA
☒	Hicham ElTal	Merced Irrigation-Urban GSA
☐	Stephanie Dietz	Merced Irrigation-Urban GSA
☒	Justin Vinson	Merced Irrigation-Urban GSA
☐	Daniel Chavez	Merced Irrigation-Urban GSA
☒	Ken Elwin (alternate)	Merced Irrigation-Urban GSA
☒	Eric Swenson	Merced Subbasin GSA
☒	Mike Gallo	Merced Subbasin GSA
☒	Nic Marchini	Merced Subbasin GSA
☒	George Park (alternate)	Merced Subbasin GSA
☒	Larry Harris	Turner Island Water District GSA #1
☐	Scott Skinner (alternate)	Turner Island Water District GSA #1

Meeting Notes

1. CALL TO ORDER AND WELCOME

a. Samantha Salvia (Woodard & Curran) called the meeting to order.

2. ROLL CALL

a. Coordination Committee members in attendance are shown in table above. The Committee had a quorum.

3. CONSENT CALENDAR

a. Meeting notes from previous meeting (February 22, 2021) were approved with one correction to note a missing committee member in the attendance table (Mike Gallo motions, Ken Elwin seconded, none opposed or abstained).

4. PUBLIC COMMENT

a. Dennis Evans: Dennis shared that he emailed a report to contact@mercedsgma.org from the EPA about green infrastructure to help decision-makers assess the potential value of investment in green infrastructure and encourages committee members to read it. Dennis provided additional follow-up information via chat:

i. Please check out two links concerning Green Stormwater Infrastructure (GSI) epa.gov/smartgrowth and Enhancing sustainable communities with green infrastructure epa.gov/green-infrastructure. The report was prepared by the U.S. Environmental Protection Agency's Office of Sustainable Communities. The report Links and valuation tools will help guide community leaders' decision makers to potential cost saving in Merced.

The examples of how cost savings can be compared in Merced County please See (page 9-Exhibit 6), Supportive Strategies (page 20)

5. REPORTS

a. Current basin conditions

   i. Chris Hewes (Woodard & Curran) presented hydrographs for each principal aquifer to highlight new Spring 2021 groundwater measurements.

   ii. Hicham ElTal (MIUGSA) suggests considering in future GSP updates to move to quarterly monitoring instead of monthly monitoring.

b. Coordination with neighboring basins

   i. Hicham ElTal (MIUGSA) provided updates:

      1. Turlock Subbasin – Coordination is occurring through Merced Irrigation District (MID) and Merced County's involvement as member agencies in the East Turlock GSA during the Turlock Subbasin GSP Development process. Current discussions are focused on interconnected surfaces water and chronic lowering of groundwater levels. This is particularly relevant to flows into and out of the Merced Subbasin. A draft GSP is not expected for public review until a July timeframe.

      2. Chowchilla Subbasin – a meeting was sponsored by DWR for Chowchilla, Merced, Madera, and Delta-Mendota Subbasins to discuss subsidence. An additional meeting is expected (date TBD) to talk about the history of subsidence.

c. GSA Reports - Updates were provided from each GSA on activities they are undertaking in their own jurisdiction:

   i. Nic Marchini and Eric Swenson (MSGSA) provided updates:

      1. At the April 8 meeting, the MSGSA Board moved forwarded with sustainability zones for groundwater management. For now, they are not permanent and may be further refined. It will help MSGSA analyze subareas.

      2. The MSGSA Board also formed a demand reduction committee to explore options for implementing this management action in the GSA.

      3. The MSGSA Board has moved from quarterly to monthly meetings.

   ii. Hicham ElTal (MIUGSA) provided updates:

      1. MIUGSA is still looking to put forward several policies (similar to what was shared in February CC meeting).

      2. DWR has officially awarded the Merced Subbasin $4,999,800 for two projects under the Proposition 68 implementation grant program (DWR finalized a draft awards list released a couple months ago). MID will move forward with executing a contract with DWR.

   iii. Larry Harris (TIWD GSA-#1) provided updates:

      1. TIWD GSA-#1 is still focused on a telemetry project for metering and storage projects (permitting, financing, etc.).

6. DISCUSSION ITEMS

a. Meadowbrook Water System Intertie Feasibility Study

   i. Mark Reitz (AECOM) provided an overview of the Meadowbrook Water System Intertie Feasibility Study. The feasibility study evaluated possible connections to the City of Atwater and to the City of Merced systems. Details are presented in the separate slide deck.

   ii. Q: City of Merced has a nominal pressure of 44 psi, plus some various pressure drops, so does the cost estimate include a booster pump? A: Not yet, would need to check some of the observed pressures in the potential connection areas.

b. Stakeholder Advisory Committee update

   i. Samantha Salvia (Woodard & Curran) presented a summary of the first meeting of Stakeholder Advisory Committee for GSP Implementation, held on 4/12. Engagement was good (25/30 members in attendance). The meeting provided an overview of GSP commitments and the annual reports, and sought input on priorities for the Data Gaps Plan.

      1. Link to meeting minutes from 4/12: https://www.mercedsgma.org/assets/pdf/meeting-materials/2021-04-12-SC-Meeting-Minutes-final.pdf

c. Data Gaps Plan (Prop 68 Planning Grant funded work)

   i. Jim Blanke (W&C) shared the approach and draft results/recommendations from the data gaps plan effort.

   ii. Comment (Hicham ElTal): it would be nice to have wells near the Merced River stream gauging stations to correlate surface water and groundwater measurements. It would also be nice to have similar wells on the Turlock side of the basin.

   iii. Comment (Hicham ElTal): East of City of Merced along Bear Creek, MID installed gauging stations and put in two sets of wells (50 and 100 feet deep). It is possible we could add one of these wells to the network, though the gauging stations are not maintained.

   iv. Q: Numerous folks have offered up monitoring sites sourced from existing production wells. Are these included in the draft results? A: Yes, some have been included where depth information or recent monitoring data were available.

   v. Comment (Eric Swenson): Hard to review maps without roads or latitude/longitude coordinates.

      1. Woodard & Curran will generate some PDFs with a different basemap where you can zoom in on locations with more detail.

   vi. Comment (Eric Swenson): The intersection of Baxter and Buchanan Hollow roads is a suggested location for a new well that is a County dirt road.

   vii. Comment (Eric Swenson): Another tool for subsidence is looking at casing failures for production wells (vertical and lateral shear fractures). Depth at which this is occurring may shed light on compaction depth. If you can identify locations, the next question would be outreach to the landowners.

   viii. Comment (Hicham ElTal): Have looked at extensometers in the past and confirmed they are very expensive.

   ix. Comment (Eric Swenson): Thinks there are some consistent cropping areas in the Subbasin that might be good candidates for a new CIMIS station.

x. Comment (Hicham ElTal): Hoping the data gaps plan can look at topography and wind patterns to suggest a representative location for a new CIMIS station. Not sure if we need to talk to DWR or other weather forecasters. Wind is an important factor to consider.

    1. Next steps for additional siting evaluation will be outlined in the data gaps plan.

xi. Q: Why can't the CIMIS station be installed in an alfalfa field? Does it need to be grass? A: Hicham's understanding is that it could be, but would require some kind of adjustment factor.

xii. Q: Will the plan look at how many wells needed to look at interconnected surface waters? A: The preferential monitoring layer takes into account distance to stream boundaries and included some suggested well sites along both Merced and San Joaquin Rivers.

xiii. Woodard & Curran will consider putting out some draft maps for Committee members to provide input before the draft plan is published.

xiv. Q (Dennis Evans): Is Aquifer recharge monitored? A: It depends on the context of the question – some artificial recharge is measured directly while other measurements (e.g. rainfall, etc.) are used to help model and estimate recharge.

7. Next steps and adjourn

a. Confirm next meeting date – July 26
b. Meeting adjourned at 3:13 PM

Next Regular Meeting
July 26 at 1:15-3:15 PM
Meeting to be conducted virtually (subject to change)
Information also available online at mercedsgma.org

MEETING NOTES – Merced GSP

SUBJECT: Merced GSP Coordination Committee Meeting

DATE/TIME: July 26, 2021 at 1:15 – 3:15 PM

LOCATION: Online – Zoom Meeting

Coordination Committee Members In Attendance:

	Representative	GSA
☒	Hicham ElTal	Merced Irrigation-Urban GSA
☐	Stephanie Dietz	Merced Irrigation-Urban GSA
☒	Justin Vinson	Merced Irrigation-Urban GSA
☒	Daniel Chavez	Merced Irrigation-Urban GSA
☒	Ken Elwin (alternate)	Merced Irrigation-Urban GSA
☒	Eric Swenson	Merced Subbasin GSA
☒	Mike Gallo	Merced Subbasin GSA
☐	Nic Marchini	Merced Subbasin GSA
☐	George Park (alternate)	Merced Subbasin GSA
☐	Kel Mitchel	Turner Island Water District GSA #1
☒	Tim Allan (alternate)	Turner Island Water District GSA #1

Meeting Notes

1. CALL TO ORDER AND WELCOME

a. Samantha Salvia (Woodard & Curran) called the meeting to order.

2. ROLL CALL

a. Coordination Committee members in attendance are shown in table above. The Committee had a quorum.

3. CONSENT CALENDAR

a. Meeting notes from previous meeting (April 26, 2021) were approved. (Mike Gallo motioned, Tim Allan seconded, all voted in favor.)

4. PUBLIC COMMENT

a. No public comment. (comments and questions from the public were accepted during the meeting on agenda items)

5. REPORTS

a. Current basin conditions

i. Matt Beaman (MIUGSA) presented hydrographs for each principal aquifer to highlight recent new monthly groundwater measurements recorded since the last review of data collected in March 2021.

ii. Public Q: Is there anything in that data that is a reason for concern? A: Nothing concerning at this point. It's typical to see during summer irrigation season that levels trend lower and recover into the fall and winter.

b. <u>Coordination with neighboring basins</u>

i. Hicham ElTal (MIUGSA) provided updates:

1. Chowchilla, Delta-Mendota, Merced, and Turlock subbasins have held several coordination meetings on subsidence over the last few months. The agencies are sharing information on impacts and also defining the region of subsidence.

2. Hicham noted that it will be important for the State to recognize that subsidence is chronic and was a problem before SGMA. He noted the Merced started coordinating with Chowchilla subbasin as early as 2015.

c. <u>GSA Reports</u> - Representatives from each GSA provided updates on activities they are undertaking in their own jurisdiction:

i. Lacey McBride (MSGSA) provided updates:

1. At the MSGSA July 2021 meeting, the GSA adopted a Water Year 2025 target of 15,000 AFY reduction in groundwater use. The GSA Board wanted to formalize a target to help communicate to stakeholders that actions need to start soon.

2. MSGSA formed an ad-hoc committee on demand reductions and has been meeting regularly and reporting to the GSA Board.

3. MSGSA has a Technical Advisory Committee meeting on 7/29 to start discussing strategies for land repurposing.

4. Public Q: MSGSA is 330,000 acres total, correct? A: About 337,000 ac.

5. Public Q: Are the Merced Subbasin GSA meetings public? A: Yes (meeting in person but also remote Zoom access is available).

ii. Hicham ElTal (MIUGSA) provided updates:

1. A Stakeholder Guidance Committee meeting for MIUGSA is coming up to discuss policies for implementation of the GSP.

2. MIUGSA is evaluating financing options, whether basin-wide or GSA-wide projects.

3. MIUGSA expressed interest in Merced County providing a workshop to key staff of different GSAs in the County to discuss transferring of groundwater well permitting process oversight to the GSAs within their respective boundaries.

   a. Lacey McBride clarified that the proposal to the County for this process has no hard implementation deadline at this point. The County is also planning on offering such a workshop for GSAs possibly in August.

iii. Tim Allan (TIWD GSA-#1) Tim Allan introduced himself and was welcomed by the group to the Coordination Committee.

6. ACTION ITEMS

a. GSP Well Monitoring

i. Matt Beaman (MIUGSA) provided background on the contract for technical support related to monitoring and presented main elements of the proposed full contract for the next 12 months.

ii. Q: Is the current cover crop around the existing CIMIS station compliant with DWR guidance? A from MIUGSA: No – MIUGSA plans to work with DWR to identify locations and get recommendation for an additional site.

iii. Lacey McBride (MSGSA) clarified that today's action is for the Coordination Committee to agree to recommend to their respective GSA Boards to approve this monitoring contract.

iv. **ACTION (motioned by Hicham ElTal, seconded by Eric Swenson, approved by committee):** Recommend GSAs authorize Merced Irrigation-Urban GSA to enter into an agreement, on behalf of the GSAs, with QK for monitoring work and other technical support, as presented.

1. Duration 12 months, with opportunity to extend.
2. Not to Exceed $136,050.00
3. Share cost according to existing MOU

7. DISCUSSION ITEMS

a. Remote Sensing Decision Support Tool (Prop 68 Planning Grant funded work) – Dominick Amador (Woodard & Curran) presented an update on the remote sensing decision support tool development. The goal is to utilize satellite technology to estimate monthly Et at a parcel level and combine this with information on precipitation and surface water deliveries to provide a better understanding of net groundwater use at higher resolution than currently available. Dominick described the work to date, conducted utilizing previously purchased Et data from approximately 2008 through 2013 He provided a mockup of the dashboard the tool will provided for end users. Next steps include collecting parcel-level surface water delivery data from local irrigation districts as an input to the accounting steps of the tool.

i. Prior to opening up for committee discussion, Samantha Salvia reminded committee members that this tool is being developed under grant funding from DWR. Woodard & Curran is scoped to develop the tool itself and a technical support document summarizing the tool's capabilities and limitations. How the GSAs decide to use the tool is a policy matter – it may be used to identify trends in groundwater use, to support allocation framework discussions, or for other information purposes to help with basin management activities.

ii. Committee Member Discussion

1. Q: What is difference between ET_{actual} and $ET_{Applied\ Water}$? `A: ET_{actual} provided directly from METRIC independent of any other factors. $ET_{Applied\ Water}$ is essentially the evapotranspiration after processing (accounting for root storage, precipitation, etc.)
2. Comment (Eric Swenson): The real world won't be as neat and clean as this tool. For Merquin County Water District, the measured deliveries to individual parcels are a mix of surface and groundwater and hard to disaggregate. Some users have unusual water supplies like wastewater treatment plant effluent where data may not be readily available. Monthly data will likely be challenging and annual is probably more possible. Need to think about how to accurately measure in the

future moving forward. Suggest the tool have options for reporting on monthly, quarterly, and annual basis.. Getting the satellite data will be the easiest part, sorting out the other water use will be more challenging.

3. Comment (Hicham ElTal): METRIC data is good, especially for identifying trends – but have to understand its limitations. The method is as strong as the information used to calculate evapotranspiration (applied) and depends on a number of factors such as the quality of the CIMIS data.

iii. Public Questions Submitted Via Chat – a number of questions were submitted into the chat and are captured below. Due to time constraints, not all questions could be answered during the meeting.

1. Public Q: What are Metric rasters? A: A tool that uses satellite infrared imagery to get a heat signature off the land surface. Once it goes through a modelling process and account for solar radiation and other climatic data – the satellite image is transformed into a layer describing where there is crop evapotranspiration. They cover a large area at a 30m resolution. Overall – it uses satellite imagery to determine evapotranspiration on a high-resolution basis.
2. Public Q: What about sub-surface drip? A: The method of irrigation is independent of this method – it's measuring the crop evapotranspiration and thus generally operational methods don't matter.
3. Public Q: Applied water is different right? applied water includes ET and deep percolation and runoff which would need to be measured with meters…correct?
4. Public Q: Won't ET be elevated if the picture is taken while someone is irrigating?
5. Public Q: How is precipitation going to be measured from parcel to parcel? CC Q: How is precipitation measured and how does is variability incorporated? A: We use PRISM (from University of Oregon) which takes into account many factors to interpolate point data to provide a spatially complete (30m resolution) precipitation on a daily basis.
6. Public Q: How many ground based weather stations are going to be used to inform the satellite etc information.
7. Public Q: How will riparian water application be calculated? By that I mean surface water used that is not being provided by MID (e.g. creek lift pumps).
8. Public Q: What will be the procedure if the remote-sensing consumption numbers are not consistent with the numbers calculated by growers from a parcel-level… and they have data from meters, etc to support?

b. Stakeholder Advisory Committee update – Samantha Salvia (Woodard & Curran) presented a brief summary of the July 26 Stakeholder Advisory Committee meeting. She noted it was the second meeting of this group, listed topics covered, and summarized the group's discussion on moving to in-person meetings.

i. Lacey McBride (MSGSA) recommended keeping legal counsels involved when scheduling the next meeting because it's possible the Governor's Executive Order altering Brown Act requirements (e.g. allowing Zoom meetings) may expire at the end of September 2021.

ii. Hicham ElTal (MIUGSA) pointed out that the previous Merced IRWM stakeholder meeting process invited stakeholder input online at the same time as the agenda (e.g. ranking of issues, providing comment ahead of time) and asked if this could be considered for future Merced GSP stakeholder meetings.

c. Data Gaps Plan (Prop 68 Planning Grant funded work) – Samantha Salvia and Chris Hewes (Woodard & Curran) presented the findings and recommendations from the Data Gaps Plan. The goal of the plan is to identify and rank priority areas for the installation of monitoring wells or subsidence monitoring stations to support basin characterization and future GSP refinement. The Plan priorities were developed based on feedback from the SAC and CC April meetings and GSA staff review. The Plan will be finalized and sent to the GSAs this week.

   i. Hicham ElTal (MIUGSA) confirmed that reaching out to the Turlock Subbasin for coordination on planned monitoring adjacent to the Merced River is a good idea.

   ii. Hicham ElTal (MIUGSA) suggested additional consideration on areas outside the Corcoran relative to DACs

   iii. Eric Swenson (MSGSA): Suggested deprioritizing monitoring in areas that are unlikely to be pumped (e.g. because water may be saltier than typically used for ag)

d. Minimum Thresholds in Areas Lacking Historical Monitoring Data – Samantha Salvia (Woodard & Curran) described that the GSP adopted in January 2020 includes minimum thresholds set for 25 representative wells based on a methodology that utilizes historical data and proximity to domestic wells. The GSP acknowledged that during implementation the GSAs would need to develop a methodology for new representative wells that may lack historical data or are not within 2 miles of a domestic well. Samantha summarized recent discussion and analysis with GSA staff and recommendations on how to proceed with establishing MTs in areas lacking historical monitoring or domestic wells. The recommendation so far is to use the GSP methodology where possible, and to address others on a case-by-case basis. New minimum thresholds should be set as interim while additional data are collected.

   i. Hicham ElTal (MIUGSA) clarified that this is an ongoing process and it hasn't been figured out entirely yet. As a next step, it would be beneficial to evaluate some real-world examples (e.g. new monitoring wells in TIWD or El Nido).

e. Insights from DWR Comment Letter on Other GSPs – Samantha Salvia (Woodard & Curran) summarized DWR input on four GSPs it has reviewed so far and their potential relevance to the Merced GSP.

f. Legislation Update – Hicham ElTal (MIUGSA) provided a summary of SWRCB latest emergency rules/notices affecting surface water diversions and their potential implications for the basin.

   i. SWRCB recently published emergency rules due to the drought, including restrictions to both pre- and post-1914 diversion licenses in the San Joaquin River watershed. The priority date threshold for rights was set to 1883 in the previous drought (~2012-2016) but no priority date threshold has been determined this time for the San Joaquin Valley watershed (e.g. affects all rights). MID expects to have a normal diversion this year due to storage prior to the emergency rules. MID and the cities coordinated on a letter to the SWRCB urging them to consider establishing a priority date that would help MID and not prevent them from capturing next year's storms due to lack of storage space in their reservoir.

   ii. Lacey McBride (MSGSA) reported that AB 252 (Department of Conservation: Multibenefit Land Repurposing Incentive Program) is in the California legislature now and would create a Department of Conservation funding program. MSGSA signed a letter of support for the bill. The Governor put ~$500M aside for this land repurposing but the legislature may not approve it. MSGSA supports such a program because they anticipate they will need to utilize land repurposing as a strategy to reduce groundwater use in the GSA to meet sustainability goals.

g. Allocation Framework Update – With only a few minutes left in the meeting, there was not time for much discussion on this item. At a future meeting, the ad-hoc group will provide an update on the development of the allocation framework.

   i. Hicham ElTal (MIUGSA) quickly summarized several concerns related to MSGSA's 5 yr objective:

      1. What is the baseline from which MSGSA will measure their 15,000 AFY reduction goal for Water Year 2025? The difference between wet and dry year pumping is more than the 15TAF goal.

      2. MSGSA's goal is stated in terms of consumptive use. GSP water budget is based on groundwater pumping. Need to be on the same page re consumptive use vs pumping as basin moves forward.

      3. MSGSA has claimed the groundwater budget in the GSP indicates wetlands do not use groundwater, but they do.

      4. No progress has been made on the issues of final allocation and accounting for imported surface water.

   ii. Hicham agreed to type up a list of the concerns and send them out to assist in future discussions.

8. Next steps and adjourn

a. Confirm next meeting date – TBD based on identification of a meeting space and status of Brown Act requirements.
b. Meeting adjourned at 3:22 PM

Next Regular Meeting
TBD, expected in October 2021
Information also available online at mercedsgma.org

MEETING NOTES – Merced GSP

SUBJECT: Merced GSP Coordination Committee Meeting

DATE/TIME: October 25, 2021 at 1:15 – 3:15 PM

LOCATION: Online – Zoom Meeting

Coordination Committee Members In Attendance:

	Representative	GSA
☒	Hicham ElTal	Merced Irrigation-Urban GSA
☐	Stephanie Dietz	Merced Irrigation-Urban GSA
☒	Justin Vinson	Merced Irrigation-Urban GSA
☒	Daniel Chavez	Merced Irrigation-Urban GSA
☒	Ken Elwin (alternate)	Merced Irrigation-Urban GSA
☒	Eric Swenson	Merced Subbasin GSA
☒	Mike Gallo	Merced Subbasin GSA
☒	Nic Marchini	Merced Subbasin GSA
☐	George Park (alternate)	Merced Subbasin GSA
☒	Kel Mitchel	Turner Island Water District GSA #1
☐	Tim Allan (alternate)	Turner Island Water District GSA #1

Meeting Notes

1. **CALL TO ORDER AND WELCOME**
   a. Samantha Salvia (Woodard & Curran) called the meeting to order.
2. **ROLL CALL**
   a. Coordination Committee members in attendance are shown in table above. The Committee had a quorum.
3. **CONSENT CALENDAR**
   a. Approval of meeting notes from the previous meeting (July 26, 2021) was deferred to allow the committee more review time.
4. **PUBLIC COMMENT**
   a. No public comment (comments and questions from the public were accepted during the meeting on agenda items).

5. REPORTS

a. Current basin conditions

   i. Matt Beaman (MIUGSA) reported that the most recent basin conditions report (July to October 2021) was delayed due to technical issues with the data. The report will be sent out to the Coordination Committee by the end of this week.

b. Coordination with neighboring basins

   i. Chowchilla-Madera-Delta Mendota:

      1. Hicham ElTal (MIUGSA) reported that coordination with the Chowchilla and Delta-Mendota Subbasins is continuing and current work is focused on developing water budgets for each basin. The meeting facilitator sent out a questionnaire that Merced Subbasin has not yet responded to. Hicham noted the importance of ensuring the same baselines and datums in comparing basin information.

      2. Lacey McBride (MSGSA) noted that recent work has included providing a list of Merced Basin projects and discussing how to determine sub-Corcoran pumping in the subsidence-focused area. No activity since last meeting in September

   ii. Turlock

      1. Hicham reported that some of the Turlock GSP chapters are out for public comment. A later agenda item will cover this.

c. GSA Reports - Representatives from each GSA provided updates on activities they are undertaking in their own jurisdiction:

   i. MSGSA

      1. Lacey McBride reported that MSGSA has been developing a two-phase approach to implementation of the GSP and the Board is set to take action on the approach at their November meeting.

         a. Phase 1 – now through end of WY2025 – focused on meeting the target of reducing groundwater consumption by 15,000 AF annually through land repurposing and fallowing, importing surface water, and capturing flood waters. Other Phase 1 work will include the development of parcel-level water year budgets for growers, Prop 218 process for funding, and initiating discussions with stakeholders and the public regarding allocations (which are not anticipated to be adopted until Phase 2).

         b. Phase 2 – WY2026 through 2040 – includes adopting and implementing an allocation plan with continued land repurposing, fallowing, and securing surface supplies.

      2. MSGSA plans a public workshop (hybrid Zoom/in person) tentatively for November 18, with details to be released shortly.

      3. Eric Swenson noted that MSGSA is also looking at whether the Prop 218 process should fund filling data gaps and a well mitigation program

   ii. MIUGSA:

      1. Hicham ElTal reported that MIUGSA has held three Stakeholder Guidance Committee meetings to receive feedback from constituents related to the types of policies they would like to see for implementing the GSP. A fourth meeting is expected and will most likely be the final meeting. MIUGSA hopes to start policy

development in February 2022 and receive multiple iterations of public before publishing the policy, likely in the form of a rules and regulations guidebook. The main emphasis has been on agricultural uses, but conversations around urban use and their accelerated efficiency standards have continued.

iii. TIWD GSA-#1

1. Kel Mitchell reported that although WY2021 was difficult due to extended lack of surface water, the District had a 15-20% reduction in water use relative to WY2020 largely due to growers making crop changes. Data indicate that they met their target of 1.5 AF per acre during WY2021. Kel observed it was good to know that even in one of the most challenging years the District has experienced, they were able to meet the target.

d. Data Gaps Plan Update – Samantha Salvia (Woodard & Curran) reported that the Data Gaps Plan has been developed and will be modified as new information is collected. She noted that the grant the basin received to address data gaps includes funding for identifying and upgrading existing wells, and/or installing new wells which must be used by the end of 2022.

i. Matt Beaman (MIUGSA) added that the Data Gaps work has been slightly delayed to due to parallel work on developing a methodology for setting minimum thresholds for areas that don't have domestic wells. He also clarified that approximately $270K is remaining in the grant to support the Data Gaps work and MID will contract for this additional work. Matt noted that they have a proposal from QK and are going to review the cost estimate and perform their due diligence to ensure cost effectiveness.

6. ACTION ITEMS

a. None.

7. DISCUSSION ITEMS

a. Well Consistency Policy for Groundwater Well Permits – The Coordination Committee discussed options coordinating on well consistency determination policies.

i. Lacey McBride summarized the existing well permitting process. Well applications come into the County's Environmental Health Department, which permits all new wells. GSPs are in place in three of out four basins in Merced County and GSAs have been managing groundwater for the last two years. The County wants to shift determination of whether a well application is consistent with a GSP to the GSAs. Domestic wells would still be exempt, and the County would review and approve those permits.

1. New wells within GSA boundaries will be required to obtain a letter of consistency from a GSA after a consistency determination is made. Then, the applicant will file a permit with the County, who will review construction standards and inspect the well.

2. The proposed timeline for implementation is tentatively set for the end of 2021. Requires Board of Supervisors adoption.

3. Lacey requested the committee discuss the potential for consistency among the three GSAs' policies and potential development of a joint CEQA document

ii. Committee Member Discussion

1. Hicham ElTal (MIUGSA) noted it would be interesting to see what other basins are doing and agreed that consistency within the basin would be very helpful.

2. Eric Swenson (MSGSA) added that MSGSA is considering establishing allocations of sustainable yield and transition allocations to reach sustainability by 2040. He expects these numbers would be established by 2025 and asked what other GSAs timelines were.
    a. Hicham ElTal (MIUGSA) responded that MIUGSA hopes to establish allocations next year, although they will be subject to changes as the GSP is implemented and more data become available.
3. Lacey McBride (MSGSA) asked how MIUGSA will handle consistency determinations in the time between when the County adopts the updates in early 2022 and the development of their own policy.
    a. Hicham ElTal (MIUGSA) responded that MIUGSA will likely follow what the County has been doing until they have their own policy in place, but will need to discuss further with their legal counsel.
4. Eric Swenson (MSGSA) recommended that each GSA designate points of contact to continue coordination on this topic before the next Coordination Committee meeting.

iii. Public Questions Submitted Via Chat

1. Public Q: Is CEQA required for the development of an allocation or cap on groundwater extraction? A: Lacey clarified that the meeting discussion so far was related to CEQA coverage for well consistency determinations. Each GSA's legal counsel would need to advise on whether making a consistency determination on an individual well is a discretionary action.

b. Proposal Solicitation Package (PSP) for SGMA Implementation Grants

i. Matt Beaman (MIUGSA) presented the latest Draft Guidelines and PSP. Approximately $152M is made available for critically overdrafted basins in Round 1 (not competitive between basins, but it is competitive within basins); funds are divided equally at $7.6M for each basin.

1. $3.7M must be used for geophysical investigations, implementation of existing regional flood management plans that incorporate groundwater recharge, or projects that complement efforts of local GSP for floodplain expansion to benefit groundwater recharge or habitat; the remaining $3.9M can be used for a wide variety of projects, such as data gaps, long-term planning, annual reports, coordination activities, or installation of monitoring wells.
2. The Merced Basin is eligible for funding and would need to prepare a spending plan by Jan 31, 2022. The spending plan consists of developing a project list and evaluating and scoring projects using a process provided by the California Department of Water Resources (DWR). DWR will then review the spending plan and check the eligibility of the projects before developing a draft agreement.

ii. Discussion

1. Jim Blanke (Woodard & Curran) noted that in order to be eligible for grant funding, projects must be in an adopted GSP. He has reached out to DWR to find out how projects can be added and suggested the group consider commenting to request they allow projects that help meet the goals of the GSP and provide more flexibility.
2. It was recommended by the Coordination Committee that the following steps be taken:

a. Attend the public workshop hosted by DWR on November 16, 2021 from 2-4pm to learn more and ask questions.

b. Provide a single comment letter to DWR (signed by the three GSAs) requesting an extended deadline to allow for review of DWR comments on the Merced GSP and allowing projects that help meet the goals of the GSP be eligible for funding, not solely those listed in the GSP.

   i. Eric Swenson (MSGSA) offered to draft the comment letter and provide it to the GSAs for review.

c. Start identifying projects, select representatives to score projects, and begin preparation of the spending plan.

c. Turlock Subbasin GSP – The Coordination Committee discussed the draft Turlock Subbasin GSP and options for commenting.

   i. Matt Beaman (MIUGSA) provided a summary of the Turlock GSP and provided comparisons to the Merced GSP. He noted that 6 of 9 chapters are now available for public review and there are also opportunities for the Basin to comment during the 60-day public comment period that begins after the GSP is submitted (due by January 31, 2022). He suggested the basin might be most interested in commenting on the sustainable management criteria and projects & management actions.

   ii. Committee Member Discussion

      1. The group discussed Turlock's water budget which indicates the Merced River could lose additional water to the subbasin (budget indicates losses from Merced River could increase from 17 TAF/yr to 60 TAF/yr). It appears improvements in the subbasin's overdraft are partially the result of stream depletion, an undesirable result.

      2. The group discussed forum and timing for comments. The group agreed to continue to use informal comment mechanisms, including the County and MID's participation on Turlock's technical advisory committee, and to wait to submit formal written comments until DWR comments are received on the Merced GSP, so that the comments on the Turlock GSP would be more comprehensive.

d. Insights from DWR Comment Letter on Other GSPs – The Coordination Committee discussed the comments made by DWR on other GSPs and the recent SWRCB comment letter to the Merced GSP.

   i. Samantha Salvia (Woodard & Curran) summarized the status of DWR review of submitted GSPs. They have approved two GSPs and provided comments on two others (Cuyama and Paso Robles). DWR reports they will complete review of all submitted GSPs within their two-year deadline. Samantha expects the basin will receive comments requesting some corrective actions and have 180 days to respond.

   ii. Samantha presented a brief summary of the DWR comments provided on two GSPs with potential relevance to other Central Valley GSPs. Relevant comments were:

      1. Better justification for how minimum thresholds are consistent with avoiding undesirable results

      2. Concern about use of groundwater levels as a proxy for the Depletions of Interconnected Surface Water sustainability indicator

3. Request to add sustainable management criteria and a monitoring network for nitrates and arsenic (the Cuyama GSP only has criteria for salinity)

iii. Samantha gave a brief summary of the SWRCB comment letter, which was received substantially after the public comment period, noting the GSAs have previously decided not to respond to comments submitted to DWR, but rather to wait to receive DWR's comments.

8. Next steps and adjourn

a. The next Stakeholder Advisory Committee meeting is November 8, 2021.
b. The next Coordination Committee meeting date is TBD, but expected virtually in January 2022, based on identification of a meeting space and status of Brown Act requirements.
c. Meeting adjourned at 2:59 PM

Next Regular Meeting

TBD, but expected to be in January 2022 (later scheduled for December 22, 2021)

Information also available online at mercedsgma.org

MEETING NOTES – Merced GSP

SUBJECT: Merced GSP Coordination Committee Meeting

DATE/TIME: December 22, 2021, 1:00 to 3:00 PM

LOCATION: Online – Zoom Meeting

Coordination Committee Members in Attendance:

	Representative	GSA
☒	Hicham ElTal	Merced Irrigation-Urban GSA
☐	Stephanie Dietz	Merced Irrigation-Urban GSA
☒	Justin Vinson	Merced Irrigation-Urban GSA
☒	Daniel Chavez	Merced Irrigation-Urban GSA
☐	Ken Elwin (alternate)	Merced Irrigation-Urban GSA
☒	Eric Swenson	Merced Subbasin GSA
☒	~~Mike Gallo~~ By MSGSA Board resolution, Kole Upton is standing in for Mike Gallo for the 12/22 CC meeting and subsequent project scoring	Merced Subbasin GSA
☒	Nic Marchini	Merced Subbasin GSA
☐	George Park (alternate)	Merced Subbasin GSA
☒	Kel Mitchel	Turner Island Water District GSA #1
☐	Tim Allan (alternate)	Turner Island Water District GSA #1

Meeting Notes

1. **Call to Order and Welcome**
    a. Jim Blanke (Woodard & Curran) called the meeting to order at 1:03 pm.
2. **Roll Call**
    a. Coordination Committee members in attendance are shown in table above. The Committee reached a quorum.
3. **Consent Calendar**
    a. Nic Marchini motioned to approve all consent calendar items, Kel Mitchel seconded. All present voted in favor.

4. Public Comment

a. Jeff, a fairly new farmer in the Merced Subbasin located in the MIUGSA, introduced himself and raised the topic of recharging the aquifer with treated wastewater and desalinated brackish water. Eric Swenson (MSGSA) responded that the economics of this type of recharge are more difficult in agricultural areas. Matt Beaman (MID) encouraged Jeff to contact MID to initiate further discussion and suggestions.

5. Reports

a. None

6. Actions

a. None

7. Discussion Items

a. <u>Overview of Round 1 SGM Implementation Planning and Projects Grant Application Process</u>

   i. Jim Blanke (Woodard & Curran) discussed funding availability, project type considerations, and timeline for the Round 1 SGM Implementation grant.

b. <u>Informational item: Overview of Round 2 IRWM Implementation Grant Program</u>

   i. Jim Blanke (Woodard & Curran) provided an overview of the IRWM implementation grant. There are projects already lined up from Merced IRWM Authority to apply for the available funding.

   ii. Public Question: Is Clayton Water District part of Merced Subbasin? Answer from Lacey McBride (MSGSA): Clayton Water District was annexed in 2019 and 7,000 to 10,000 acres are part of Merced County. One project they are pursuing is to bring water from the Eastside Bypass into the Merced portion of the District.

   iii. Public Question: When is the next IRWM meeting? Answer from Matt Beaman (MID): February, with additional information to be available on the website: http://www.mercedid.com/index.cfm/water/groundwater1/mirwma-merced-integrated-water-management-authority/

c. <u>Scoring Criteria Review for Round 1 SGM Implementation Planning and Projects Grant</u>

   i. Liz DaBramo (Woodard & Curran) presented on the updated evaluation criteria, maps of Underrepresented Communities, and the Excel project scoring workbook.

   ii. Lacey McBride (MSGSA) requested that the technical team send the evaluation criteria to the project proponents so they can modify their project descriptions accordingly.

   iii. Question from Hicham ElTal (MIUGSA): Does DWR include anything about water rights in their evaluation criteria? Answer: Not explicitly, but the project must show quantifiable benefits and be reasonably accomplished.

   iv. Question from Kel Mitchel (TIWD GSA-#1): Can private agencies submit projects? Answer: No, public agencies must sponsor projects.

   v. Question from Eric Swenson (MSGSA): Which projects have specially funded projects for flagged DWR funds (e.g., AEM, etc.). Answer: Project proponents discussed their projects and verbally mentioned if the project incorporated an activity specially flagged. It was further noted that the requirement for certain project types included in the draft proposal solicitation package is not part of the final proposal solicitation package.

d. Review Projects to Be Scored for Round 1 SGM Implementation Planning and Projects Grant

   i. Jim Blanke (Woodard & Curran) discussed the project sources for initial scoring: GSP shortlist projects (3), GSP running project list (3), and new projects (14) – totaling 20 projects for grant consideration.

   ii. Question from Lacey McBride (MSGSA) to the Coordination Committee: How should we allocate funding – fully fund projects or partial fund a higher quantity of projects?

      1. Hicham ElTal (MIUGSA): Focus on projects that can receive benefits soon.

      2. Eric Swenson (MSGSA): Ask project proponents if partial funding is an option.

      3. Kole Upton (MSGSA): Focus on areas hardest hit by subsidence.

   iii. The following projects were briefly presented by project proponents and CC members asked intermittent questions:

      1. Amsterdam Water District Surface Water Conveyance and Recharge Project

         a. Question from Hicham ElTal (MIUGSA): What are the water rights for this project: Answer: Based on existing water rights and temporary permits until permanent water right is granted.

      2. Filling Data Gaps Identified in Data Gaps Plan

      3. Merced Water Resources Model Enhancement

      4. Merced Subbasin Recharge Project Decision-Support and Implementation Tool

      5. Merced Subbasin Integrated Managed Aquifer Recharge Evaluation Tool (Merced MAR)

         a. Project #3-#5 are complimentary and together update the basinwide modeling tool set.

      6. Buchanan Hollow Mutual Water Company Floodwater Recharge Project

         a. Question: Where is the basin located and have there been recharge tests yet? Answer: The basin will be located a few hundred feet from a creek. No investigations yet.

      7. Purdy Project (E. Purdy, W. Purdy, and Kevin Recharge Basins) (Project No. 38)

         a. The project will utilize existing water rights.

      8. Purdy Project (East Pike Recharge Basin) (Project No. 37)

      9. G Ranch Groundwater Recharge, Habitat Enhancement & Floodplain Expansion Project

         a. Question from Eric Swenson (MSGSA): Is there data that the water table is dropping in this location? Answer from Brad Samuelson: He can provide information that the water table is dropping, although that information is not included in the project description.

      10. LeGrand-Athlone Water District Intertie Canal – Phase 2

         a. Kole Upton expresses support for this project.

      11. Deadman Creek Canal Off Stream Storage and Recharge

a. Questions from Hicham ElTal (MIUGSA): Could this project proceed with partial funding? What is the acreage? Answer from Lacey: 250 acres of previously double-cropped land. Partial funding is okay.

b. Comment from Hicham ElTal (MIUGSA): They are looking for another surface water storage location to replace Black Rascal Creek for FloodMAR application. There is potential alignment with this project.

12. Merquin County Water District (MCWD) Sustainable Yield Management Plan and Plan Implementation

13. Project 31: Crocker Dam Modification

    a. Question from Eric Swenson (MSGSA): Have you estimated the quantity of water that could be saved from this project? Answer from Hicham ElTal (MIUGSA): Yes, 100,000 AF down Bear Creek is not unusual, and he will provide those number in the project application.

    b. Question from Eric Swenson (MSGSA): Does this project bring MID closer to charging canals in winter? Answer from Hicham ElTal (MIUGSA): Yes.

14. MIUGSA Groundwater Extraction Measurement Program

    a. The project will include 200 private wells.

15. Tri City's Water Recharge/Underground Storage Feasibility

    a. Comment from Hicham ElTal (MIUGSA): There is potential to revise the state's AEM survey pathway if there are locations that would support local underground/recharge investigations.

16. Vander Woude Storage Reservoir

    a. Question: What is the water right for this project? Answer: Flood water rights off of Mariposa Creek listed in the water rights application under review.

17. Vander Dussen Subsidence Priority Area Flood-MAR Project

    a. Eric Swenson (MSGSA) requested that the project proponents show quantities/probability of flooding in their project write up.

18. Turner Island Water District (TIWD) Water Conservation

    a. Question from Eric Swenson (MSGSA): Do you have a property already? Answer from Kel Mitchel (TIWD GSA-#1): Yes, would be on private property in TIWD – he has some locations in mind.

    b. Question from Hicham ElTal (MIUGSA): What are the water rights for this project? Answer from Kel Mitchel (TIWD GSA-#1): Contracted water from neighboring agencies.

19. TIWD Surplus Water Conveyance

20. TIWD Shallow Well Drilling

    a. Question from Eric Swenson (MSGSA): What is the source of the cost per well? Eric volunteered to share cost estimates and recommends a lower target flow rate with more wells to reduce drawdown. Response from Kel Mitchel (TIWD GSA-#1): The contractor included pump bowls, etc. in the cost estimate and he will follow up offline.

8. Next steps and adjourn

a. Jim Blanke (Woodard & Curran) adjourned the meeting at 3:08 pm.

Next Regular Meeting
February 7, 2022
Information also available online at mercedsgma.org

MEETING MINUTES – Merced GSP Stakeholder Advisory Committee

SUBJECT: Stakeholder Advisory Committee Meeting
DATE/TIME: April 12, 2021 at 1:00 PM
LOCATION: Zoom Virtual Meeting

Stakeholder Committee Members In Attendance:

	Representative	Community Aspect Representation
☐	Arlan Thomas	MIDAC member
☒	Ben Migliazzo (alternate)	Live Oak Farms
☒	Bob Kelley	Stevinson Representative
☒	Breanne Ramos	MCFB
☒	Craig Arnold	Arnold Farms
☒	Darren Olguin	Resident of Merced County
☒	Dave Serrano	Serrano Farms - Le Grand
☒	David Belt	Foster Farms
☒	Emma Reyes	Martin Reyes Farm/Land Leveling
☒	Gil Cardon	Merced Co. Hispanic Chamber of Commerce
☐	Greg Olzack	Atwater Resident
☒	Jean Okuye	E Merced RCD
☒	Joe Sansoni	Sansoni Farms/MCFB
☐	Joe Scoto	Scoto Brothers/McSwain School Dist.
☒	Jose Moran	Livingston City Council
☒	Lacy Carothers	Cal Am Water
☒	Lisa Baker	Clayton Water District
☒	Lisa Kayser-Grant	Sierra Club
☐	Mark Maxwell	UC Merced
☒	Maxwell Norton	Unincorporated area
☒	Nav Athwal	TriNut Farms
☒	Olivia Gomez	Community of Planada
☒	Parry Klassen	ESJWQC
☐	Reyn Akinoa	River Partners
☒	Rick Drayer	Merced/Mariposa Cattlemen
☐	Robert Weimer	Weimer Farms
☒	Simon Vander Woude	Sandy Mush MWC
☒	Susan Walsh	City of Merced
☒	Thomas Dinwoodie	Master Gardener/McSwain
☒	Trevor Hutton	Valley Land Alliance
☒	Wes Myers	Merced Grassland Coalition

Meeting Minutes

1. Call to Order and Welcome
   a. Charles Gardiners (Catalyst) welcomed the group.
2. Introductions and Roll Call
   a. Stakeholder Advisory Representatives for the Merced Subbasin GSP introduced themselves (see attendance record above).
   b. Representatives from the three GSAs introduced themselves (Lacey McBride with Merced Subbasin GSA, Larry Harris with Turner Island Water District GSA-#1, and Matt Beaman for Merced Irrigation-Urban GSA [MIUGSA]) as well as the consultant team from Woodard & Curran (Samantha Salvia, Chris Hewes, and Ali Taghavi).
3. Merced GSP Overview
   a. GSP Highlights/Commitments
      i. Samantha Salvia (Woodard & Curran) provided an overview of the Sustainable Groundwater Management Act (SGMA), the development of the GSP and two annual reports, and key elements of the GSP.
      ii. Matt Beaman (MIUGSA) provided an update on the status of priority projects identified in the GSP.
      iii. Q: Why did the initial Planada recharge project not work out? A: The grant application identified two potential areas to construct a recharge basin based on some preliminary studies looking at soils and available well completion reports. At both sites, there are shallow clay layers (~10 feet) that impede infiltration. The dry wells are the next alternative.
      iv. Q: Historically, what percentage is the volume of overdraft compared to current pumping? (or what is the volume of annual sustainable yield relative to water pumped historically) A: It's not a simple answer as pumping can change annually and the solution is not going to be as simple as an across the board cut to pumping. The long-term change in storage published in the Water Year 2020 Annual Report shows an average reduction of 132,000 Acre-feet per year (based on 2006-2020).
      v. Q: Did DWR have any noteworthy comments on the GSP? A: DWR has provided no feedback on any GSP thus far. The regulations provide DWR two years to review GSPs.
      vi. Q: In making projection for sustainable yield in the future, did the model include the likelihood of precipitation/runoff being less in the future than in last 100 years due to drought or climate change? A: The GSP includes model sensitivity runs for the effect of climate change which was identified and acknowledged as an uncertainty.
      vii. Public Question: Why hasn't green water infrastructure been mentioned in the sustainability plan? The cost and overall benefit seems like a win-win proposition. e.g. rainwater harvesting. What are the barriers to getting a discussion about green water infrastructure? Not just Flood-MAR which is one tool in the toolbox – there are other tools under the umbrella of green infrastructure that benefit communities. Many micro-projects can help enhance the water table. A: While the GSP does not use the term "green infrastructure," much of the analysis of how to reach sustainability has focused on capturing stormwater for recharge purposes. This is a component of several priority GSP projects. Our website has a place (on the Contact Us page) to submit ideas for additional projects.
      viii. Public Question: Does it make it any more urgent to have demand reduction be a focus rather than supply augmentation given that we potentially may not have surface water supplies that the GSP relies on, and recharge projects? A: The GSAs are currently evaluating 5-year objectives to move toward to the sustainability goal. The Merced Subbasin GSA already has a demand reduction management action from the GSP and is

thinking about this as well – it will be balanced between both demand reduction and supply augmentation.

b. GSP Implementation Progress
   i. Lacey McBride (Merced Subbasin GSA) provided an updated on GSP implementation since the GSP was submitted in January 2020, including Proposition 68 grant funded projects.

c. WY2020 Annual Report Summary
   i. Chris Hewes (Woodard & Curran) provided an overview of the Water Year 2020 Annual Report, including sustainable management criteria, groundwater level changes, and groundwater storage change.

d. Comments and questions
   i. Comment (Susan Walsh): As someone who has lived in Merced and has paid attention to growth in the valley in the last 30 years, feeling some cognitive dissonance in talking about limiting pumping yet City of Merced is about to annex a large acreage of land for new development. At what point is growth in the valley going to be collapsed into planning with groundwater? At meetings about safety, housing, etc., rarely do people mention the fact that groundwater is such an important and scarce commodity.
   ii. Comment (Maxwell Norton): The Monterey/Salinas area has some of the most expensive urban water in North America. There seems to be a lot of planning efforts and documents in San Joaquin Valley, but long-term water security doesn't seem to be merged with long-term growth projections.
   iii. Comment (Susan Walsh): Cities and suburban areas in Merced County have made efforts to reduce impacts on water systems, e.g. turf replacement/removal. Have we ever measured that or quantified how different landscapes look between 1980 and now? (some has been mandated for new development requirements). It would be helpful to measure what has been done in the past to apply to the future.
      1. Answer from Leah Brown (City of Merced): Every urban supplier has different information about what's happened in their area. The City of Merced doesn't have tracking of turf conversion projects. But it does have all kinds of data from the metering system. In 2015, a large scale metering project resulted in more complete metering in the City. Between July 2013 drought and July 2018, there was a 39% reduction in use. This urban water use reduction has maintained since then and is a cumulative 28% reduction as of the current Urban Water Management Plan effort.
   iv. Comment (David Serrano): Concerned that foothills in Madera and Merced have been developed from previously native pasture. Impact of reduced natural foothill recharge and increased draw on groundwater resources. With surface water prices increasing, concerned about being priced out of agricultural livelihood/legacy.
   v. Comment (Olivia Gomez): Hearing that California is going into drought again. There was a lot of education in the previous drought but it has stopped. This education is important to keep up because everyone's in it together – it's important to share perspectives. Going to start metering which will help conservation efforts. Education about conservation and preservation is key.
   vi. Comment (Gil Cardon): How have the wildfires affected soil conditions? A: We are not sure – it has not come up in GSA discussions. But we know that UC Merced faculty have been doing research in this area.
   vii. Comment (Joe Sansoni): As family farmers with small operations, water issues and availability are critical. We understand overdraft is an issue that needs solutions. Have spent a lot of effort to be more efficient already. Yields per acre and AF pumped are significantly more efficient than in the past and continuing to improve. This stands for most growers regardless of crop type and growers don't always get a lot of public credit for that.

This is also costly to implement. Something that has become an unfortunate reality in agriculture is big production investment agriculture – for instance, almond industry had several good years, thus thousands of acres were installed in last decade. If there's a downturn, investment agriculture can take a multi-year hit which would hurt smaller farmers. It feels like the large drawdowns are driven by investment agriculture.

viii. Q (Wes Myers): Some monitoring data is iffy, e.g. hatched areas. What opportunities or mechanisms exist to audit the model? GSPs are moving forward based on one assumption, but how do we know that it's correct? Does the state audit or a third party consultant come in and do this? A: Most Annual Report figures are based on actual monitoring data, not modeled data. The model is also informed by historical data. The model has been calibrated based on monthly records from 20-30 years. During the development and calibration process, there was an involved technical advisory panel including UC Merced, USGS, and DWR representation. The GSP includes some writeup about model uncertainty as well.

ix. Comment (Nav Athwal): One way to reduce overdraft is potentially the use of more efficient technology when it comes to irrigation of crops. Many folks have moved to drip irrigation and it's very efficient. But wondering if as a group and GSAs, has there been work in adopting better irrigation technology as a way to reduce demand without requiring fallowing and other negative consequences that come with that? In addition, thoughts about how to use water from parcels that would rather not irrigate (e.g. commodities with less demand) vs those who need the water to meet minimum ET – like a groundwater credits market to meet irrigation demand. Is there thought to fund resource conservation projects at a grower level?

1. Lacey McBride (Merced Subbasin GSA): The GSA is looking at and considering many different tools in the toolbox as options outside of fallowing land. One challenge is that you need to consider that efficiency should reduce overall groundwater use and not end up increasing it beyond historical due to more efficient use and less percolation. The Merced Subbasin GSA doesn't have a program (or funding now) to do something like funding a resource conservation project. Another future discussion will be how will the GSA generate revenue to pay for these types of programs.

x. Comment (Jean Okuye): With less than 20 years before we are to have balance and sustainable management it seems we need to address the demand. Are we looking at Sustainable Agricultural Lands Conservation? Award those doing the right thing, keep our water in our county, be sure we don't take from Peter to pay Paul, be sure the small farmers and communities can afford water? Who owns the water? Look at what Madera County is doing as they have received grant to help them manage water.

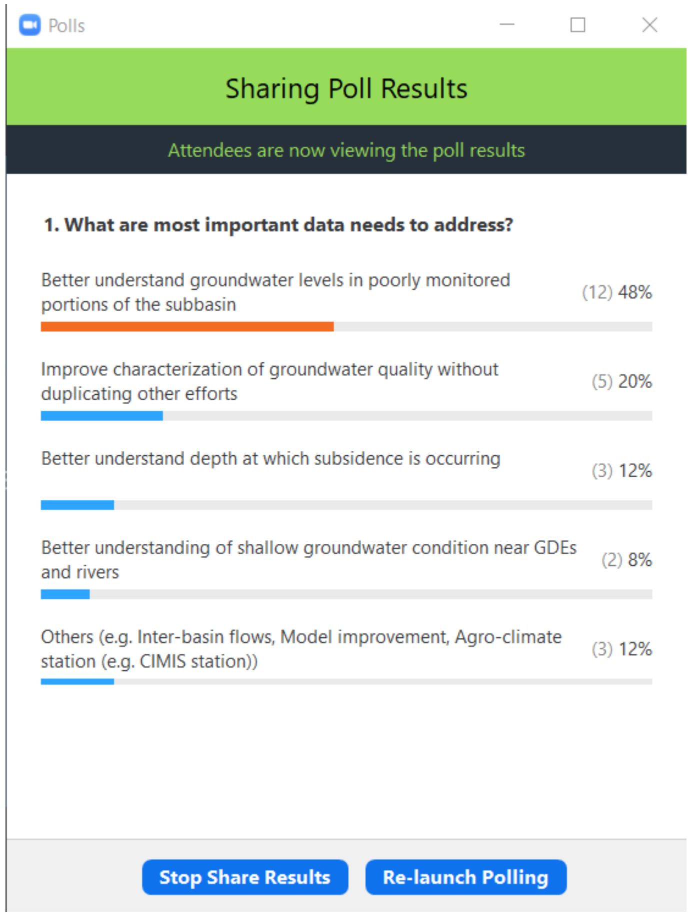
xi. Comment (Maxwell Norton): There's been a wide assortment of cost-sharing and straight funding through NRCS and others. Programs come and go based on the latest Farm Bill. Most improvements that are possible in production agriculture have been achieved.

4. What's Next?

a. Data Gaps Plan

i. Samantha Salvia (Woodard & Curran) provided an overview of the Data Gaps Plan effort and encouraged stakeholders to explore the slides in detail after the meeting as time was running short at this point in the meeting.

ii. Poll results:



iii.

iv. Amanda Monaco: Are the GSAs going to use the data gaps grant to fill in missing info about the location and vulnerability of domestic wells, so we can better understand potential impacts on their drinking water supply? A: Ongoing Integrated Regional Water Management (IRWM) work funded by DWR is evaluating locations and depths of domestic wells in key areas of the Subbasin.

1. Matt Beaman (MIUGSA): Report will be presented to Merced IRWM region likely in May and made public later.

b. Future Stakeholder Advisory Committee Meetings

i. Charles Gardiner (Catalyst) talked through options for the next meeting, likely July 6 or 12. A poll will go out to committee members to schedule this.

5. Public Comment

a. No comments.

6. Next steps and adjourn

Next Regular Meeting
July 12, 2021 from 1-3pm
Information also available online at mercedsgma.org

Note: If you need disability-related modification or accommodation to participate in this meeting, please contact Merced County, Community and Economic Development staff at 209-385-7654 at least 48 hours prior to the start of the meeting.

MEETING MINUTES – Merced GSP Stakeholder Advisory Committee

SUBJECT: Stakeholder Advisory Committee Meeting
DATE/TIME: July 12, 2021 at 1:00 PM
LOCATION: Zoom Virtual Meeting

Stakeholder Committee Members In Attendance:

	Representative	Community Aspect Representation
☐	Arlan Thomas	MIDAC member
☒	Ben Migliazzo (alternate)	Live Oak Farms
☒	Bob Kelley	Stevinson Representative
☒	Breanne Ramos	MCFB
☒	Craig Arnold	Arnold Farms
☐	Darren Olguin	Resident of Merced County
☒	Dave Serrano	Serrano Farms - Le Grand
☒	David Belt	Foster Farms
☒	Emma Reyes	Martin Reyes Farm/Land Leveling
☐	~~Gil Cardon~~ (has left committee, replacement TBD)	~~Merced Co. Hispanic Chamber of Commerce~~
☐	Greg Olzack	Atwater Resident
☒	Jean Okuye	E Merced RCD
☐	Joe Sansoni	Sansoni Farms/MCFB
☒	Joe Scoto	Scoto Brothers/McSwain School Dist.
☒	Jose Moran	Livingston City Council
☒	Lacy Carothers	Cal Am Water
☒	Lisa Baker	Clayton Water District
☒	Lisa Kayser-Grant	Sierra Club
☒	Mark Maxwell	UC Merced
☒	Maxwell Norton	Unincorporated area
☒	Nav Athwal	TriNut Farms
☒	Olivia Gomez	Community of Planada
☒	Amanda Monaco (alternate)	Leadership Counsel
☒	Parry Klassen	ESJWQC
☐	Reyn Akinoa	River Partners
☐	Rick Drayer	Merced/Mariposa Cattlemen
☒	Robert Weimer	Weimer Farms
☒	Simon Vander Woude	Sandy Mush MWC
☒	Susan Walsh	City of Merced
☒	Thomas Dinwoodie	Master Gardener/McSwain
☒	Trevor Hutton	Valley Land Alliance
☒	Wes Myers	Merced Grassland Coalition

Meeting Minutes

1. Call to Order and Welcome
    a. Charles Gardiners (Catalyst) welcomed the group.
2. Introductions and Roll Call
    a. Stakeholder Advisory Representatives for the Merced Subbasin GSP introduced themselves (see attendance record above).
    b. Charles Gardiners (Catalyst) provided a summary of responses to a survey of committee members conducted online ahead of the meeting (25 responses) about resuming in-person meetings.
        i. Comments ranged from wanting in person to desire for hybrid approach (both in person and option for virtual); the major limitation to a hybrid system is confirming a meeting space and the available technology.
        ii. Concern was raised over losing the voices of people who can't attend in-person if there's not a way to include them remotely.
        iii. Emma Reyes shared that vaccination status can be requested or can be stated as part of a policy, but participants don't need to provide that information as it is private medical information.
        iv. The Merced County Farm Bureau is working to upgrade their conference room for remote integration over the next several months which may be a possibility for future hybrid meetings.
        v. GSAs and W&C will explore technology and room availability to see if hybrid option is possible for October meeting.
3. Review of Topics Covered at April Stakeholder Advisory Committee Meeting
    a. Samantha Salvia (Woodard & Curran) briefly listed the topics covered at the April meeting and reminded the group all slides and meeting notes are posted on the www.MercedSGMA.org website. Topics covered:
        i. Overview of Merced GSP (sustainable management criteria, sustainability goal, etc.)
        ii. GSP Implementation Progress (grants, monitoring, projects)
        iii. Annual Report Summary (changes in gw levels in WY 2020)
        iv. Data Gaps Plan Development (gaps identified in GSP and grant funded work to prepare a plan to prioritize and address)
4. SGMA Overview
    a. Samantha Salvia (Woodard & Curran) explained that given the group only meets quarterly and the GSP is a large document, the GSAs want to start each meeting with some context. She provided a brief explanation of SGMA's purpose emphasizing that SGMA is meant to foster local management of groundwater and that SGMA gives GSAs authority to establish groundwater extraction allocations and collect fees. SGMA and GSPs adopted under SGMA cannot alter water rights.
    b. Lacey McBride (MSGSA) provided an informational update about how Merced County is considering updating the Groundwater Ordinance for well permitting (staff proposal currently being developed). The proposal would shift determination of consistency with GSPs from the County to the appropriate GSA. Lacey pointed out that under current conditions, the County is making a determination of whether well permit applications are consistent with GSPs they did not directly develop.
        i. Q: What about existing well replacement? A: Under the current staff proposal, well replacement would fall under the GSAs the same as for new wells. Existing exemptions would be pre-empted by the fact that the applicant is within jurisdiction of a GSA managing under a GSP.
        ii. Q: What about hardship such as replacement of a domestic well? A: That is something the GSAs will need to consider as they develop their policies if the proposal moves forward.

iii. Lisa Kayser-Grant: How many GSAs are considered under this policy? A: Merced County-wide has 17 GSAs across portions of several subbasins, but the Merced Subbasin only has 3 GSAs (and 1 GSP).
iv. Q: What is the level of oversight on consistency between GSPs? A: DWR reviews GSPs for consistency across each individual basin, and each GSP has to adhere to SGMA requirements as well.

5. Merced GSP Overview
   a. Samantha Salvia (Woodard & Curran) provided more information specific to the Merced GSP and ongoing review by DWR. She outlined what DWR has shared about its 3 review pathways for GSPs (approved, incomplete with corrective actions, inadequate). She described the feedback DWR has provided on the plans it has released public information on so far (2 approvals, and 2 "internal consultation"). She reiterated that DWR expects GSAs to be implementing their GSPs during the review process.
      i. Q: If there are questions from DWR's review, does this put us back to "zero" for Committees and decision-making? A: DWR feedback is more likely to be specifically targeted to areas of the GSP where DWR wants more information or support for analyses. Not so much a "redo" as a "refinement".
      ii. Q: Are the Plans that have already received feedback due to lack of documentation or weak implementation? A: Santa Cruz was approved while two others (Cuyama and Paso Robles) have started a more informal "internal consultation" with DWR (this information consultation avoids triggering the formal 180 day period for GSAs to address deficiencies, not fully declared "incomplete"). DWR's initial feedback is published publicly in the SGMA Portal.
      iii. Comment (Amanda Monaco): One takeaway from Leadership Counsel is that in addition to comments on sustainable management criteria and linkage to undesirable results, DWR wants to see as part of undesirable results that GSAs are looking at potential drinking water impacts and whether there will be impacts, as well as whether or not a mitigation program is required. .
   b. Samantha Salvia (Woodard & Curran) walked the group through the Merced GSP's estimates of water budgets, calculation of sustainable yield, and the development of the framework for allocation of the sustainable yield among the GSAs. The Merced GSP contains an explanation that GSAs intend to allocate water to each GSA but have not yet reached agreement on allocations or how they will be implemented. As the GSAs continue to work on basin-wide allocations, they are evaluating GSA-specific 5 yr targets to make immediate progress towards sustainability while allocation framework discussions are ongoing. Samantha invited each GSA rep to describe their 5 yr target.
   c. Matt Beaman (MIUGSA) described MIUGSA's tentative target as a goal of reducing pumping of native groundwater to 1.5AF/AC by 2025. He further explained that a public process is underway within the GSA to develop principles and guideline for GSP implementation within MIUGSA (meetings expected to start August). He said MIUGSA recognizes that the ultimate sustainable number might be lower (than 1.5 AF/AC) but they wanted to set an aggressive intermediate target. Info available at http://mercedgroundwater.org/
   d. Lacey McBride (MSGSA) shared that MSGSA adopted via resolution on 7/8/21 a 5 yr target of 15,000 AFY reduction in consumptive use of groundwater in MSGSA by 2025. She acknowledged that greater reductions will be needed, but that this target puts the GSA on a glidepath to allow time for programs and projects to get into place in the first five years, and then additional reductions in years afterward will need to be steeper.
   e. Kel Mitchell (TIWD GSA #1) confirmed that all wells in TIWD GSA#1 are metered and that 1.5 AF/AC is a likely achievable 5 yr target but nothing has gone to the TIWD GSA#1 board formally yet. He stated that 1.5 AF/AC will be subject to additional discussions and collaboration at the Coordination Committee level.

f. Q: MIUGSA to reduce to 1.5 AF/AC by when? Will the MSGSA target eventually include AF/AC limit to users? Any ideas on when that clarification will be made public?
    i. A (MIUGSA): MIUGSA board has not taken specific action on this. Additional technical work and the public process are ongoing.
    ii. A (MSGSA): There's no single silver bullet for MSGSA to reduce consumptive use – it will be accomplished through a variety of projects and programs. The GSA has a technical advisory committee that is looking at this. Land repurposing will likely be part of a solution because it can provide multiple benefits (habitat, protection of domestic wells around DACs, etc.) along with allocations.
g. Q: So is the thought is we'll reduce pumping by 1.5 acre feet and then to meet the rest of the gap, we'll come up with additional surface water sources or establish a trading market?
    i. A (MIUGSA): There is no set schedule beyond the five-year target at this time.
    ii. A (MSGSA): Similar to MIUGSA, not sure exactly when bigger discussion about trading/markets/etc. will happen down the road because there are more near-term framework discussions to be had. The intent of the 5 yr targets is to help us make progress while we figure out what sustainability ultimately looks like for this basin.
h. Q: How many wells are metered in the Subbasin? A: The GSAs do not have data on how many are metered currently, except for TIWD GSA-#1. Requiring metering on wells is one management option available to the GSAs.

6. Summary of April Coordination Committee Meeting
    a. Chris Hewes (Woodard & Curran) provided a summary of current basin conditions that were presented at the April Coordination Committee meeting, including spring 2021 measurements of groundwater levels.
    b. Samantha Salvia (Woodard & Curran) provided a summary of the April presentation to the Coordination Committee about the Meadowbrook Intertie Feasibility Study. The goal of the grant funded study was to evaluate the needs and feasibility of connecting the Meadowbrook water system to either the Atwater or Merced city water system. The study found that interties to both Merced and Atwater systems are feasible with costs ranging from $1M to $2.5M depending on location.
    c. Chris Hewes (Woodard & Curran) provided a summary of the methodology and progress to date on the Data Gaps Plan. The Data Gaps Plan is grant funded and with a goal of developing a plan that identifies and ranks priority areas for the installation of monitoring wells or subsidence monitoring stations to support basin characterization and future GSP refinement. Chris shared the results of the SAC's April meeting poll on priorities for data gaps to fill. The Plan is currently drafted and being reviewed by GSA staff. Chris shared preliminary results of the spatial analysis tool showing areas recommended for additional monitoring.
        i. Q: Can private well owners be compelled to have their wells participate in the GSP monitoring network? A: No.
        ii. Comment from Bob Kelley: I have let WC know that we have installed a dedicated internet item in monitoring well on the east portion of the Stevinson Area. It is close to an orange area you cite in your tool methodology. Contact Betty Lindeman for inclusion of this real time information. I'm sure you have her email address.
        iii. Q: Will there be outreach to well owners to encourage participation in the monitoring program? A: Yes, the next step in the implementation of the Data Gaps Plan will be to conduct outreach. There is currently a standing call for monitoring data on the MercedSGMA website.
        iv. Q: Is the alternate to volunteering for groundwater level monitoring to be expensive remote sensing? A: For groundwater levels, it is more likely that new dedicated monitoring wells would need to be installed in right-of-ways or by finding willing landowners. . Note: A Remote-sensing tool is also being developed under grant funding as a potential alternative to *metering*, which is very expensive.

v. Q: Do volunteered wells need construction information to be part of the network? A: SGMA doesn't necessarily require construction information but we do need to know which aquifer it is completed in; there's the possibility of running a camera down the well to determine this.
    1. Follow-up comment from Parry Klassen: ESJWQC asked well owners to volunteer wells for their Groundwater Quality Trend Monitoring program and were amazed at the number of owners who volunteered, but most didn't qualify as they didn't have construction information. The ESJWQC Board might agree to provide information previously collected for volunteers in the data gap areas to approach them to be part of the network.

vi. Written Comment in chat: I thought USGS was doing a lot of monitoring of the zone below Corcoran Clay. *Follow-up response in chat:* USGS has been in Stanislaus and Merced Counties monitoring domestic wells. 60-80 wells is planned I understand

7. Drought Preparedness
    a. Matt Beaman (MIUGSA) provided a description of drought-related resources as California continues to experience an extreme drought.
    b. Lacey McBride (MSGSA): MSGSA's Technical Advisory Committee met in May and discussed drought and domestic wells. The committee's recommendation was to gather better information about domestic well locations before considering a mitigation program (data from the County about post-1996 permitted domestic wells may overcount because it doesn't include records for destroyed wells.) For now the best resource for emergency water is Self Help Enterprises (SHE). They are the administrator of state funds to provide tanked water or help drill new wells.
8. Public Comment
    a. Ursula Stock (via email):
        i. Attached is a very good article on the status of water in California, and I hope it will be referenced when making decisions, and included with my public comment, https://thevalleycitizen.com/valley-water-belongs-to-the-people/
        The water of Merced County needs to stay in Merced County. The natural system of the entire valley is an "ecosystem" onto itself. Low snowpack is constantly blamed on global warming, but our handling of valley water is crucial to snowpack. Over 95% of the Valley wetlands have been drained, cutting evapotranspiration. As we divert surface water, reducing recharge and the health of valley biomes, we further impact snowpack. As we lower or dry out the groundwater basin, that has a on the snowpack too. The less moisture in the valley, the less there is to evaporate, form clouds and rain/snow in the mountains- to flow back down our rivers. It is all interconnected.
        For example, lowered groundwater tables become too deep for the tap roots of indiginois trees to reach, causes the death of the tree, stops the huge movement of water it transpires, and reduces soil biomes that are tree dependent. The loss of these biomes result in the loss of water retention around the tree. In the early spring, you can easily see this water retention due to trees, when green encircles the trunks, while surrounding treeless areas remain brown. The Tule Fog is impacted as ground water recedes, which stone fruits and many local plants "mine' for water, further reducing evapotranspiration. Water is a finite resource, and as we remove the water from the valley, and reduce the flow of that water, we impact its availability to snowpack and to the valley.
        Like the human body, which can sustain a sudden loss of up to 14% of its blood in a short incident, and at 15% begins to suffer dire consequences, our watersheds have a tipping point. That tipping point is desertification, and humans have done this all over the world. Will we do it here too, as we fuss about water rights, versus the viability of the entire valley and delta ecosystem upon which we depend?
        Keep the water of Merced County in Merced County, and work to find nature based solutions to " living within the means" provided by this magnificent Valley.
        Ursula Stock, Merced

b. No other public comment during the meeting.

9. Next steps and adjourn
   a. Q: Could we change time of meetings from 1pm to 1:30PM? A: GSAs and consultants will consider this along with evaluating options for hybrid meeting location.

Next Regular Meeting
TBD mid-October 2021
Information also available online at mercedsgma.org

MEETING MINUTES – Merced GSP Stakeholder Advisory Committee

SUBJECT: Stakeholder Advisory Committee Meeting
DATE/TIME: November 8, 2021 at 1:00 PM
LOCATION: Zoom Virtual Meeting

Stakeholder Committee Members in Attendance:

	Representative	Community Aspect Representation
☐	Arlan Thomas	MIDAC member
☒	Bob Kelley	Stevinson Representative
☐	Breanne Ramos	MCFB
☒	Craig Arnold	Arnold Farms
☒	Darren Olguin	Resident of Merced County
☒	Dave Serrano	Serrano Farms - Le Grand
☒	David Belt	Foster Farms
☒	Emma Reyes	Martin Reyes Farm/Land Leveling
☐	Greg Olzack	Atwater Resident
☐	Jean Okuye	E Merced RCD
☐	Joe Sansoni	Sansoni Farms/MCFB
☒	Joe Scoto	Scoto Brothers/McSwain School Dist.
☐	Jose Moran	Livingston City Council
☐	Lacy Carothers	Cal Am Water
☒	Lisa Baker	Clayton Water District
☒	Lisa Kayser-Grant	Sierra Club
☐	Mark Maxwell	UC Merced
☒	Maxwell Norton	Unincorporated area
☒	Nav Athwal	TriNut Farms
☐	Olivia Gomez	Community of Planada
☒	Amanda Monaco (alternate)	Leadership Counsel
☒	Parry Klassen	ESJWQC
☒	~~Reyn Akinoa~~ Darcy Brown	River Partners
☐	Rick Drayer	Merced/Mariposa Cattlemen
☐	Robert Weimer	Weimer Farms
☒	Simon Vander Woude	Sandy Mush MWC
☒	Susan Walsh	City of Merced
☒	Bill Spriggs (alternate)	Merced resident
☐	Thomas Dinwoodie	Master Gardener/McSwain
☒	Trevor Hutton	Valley Land Alliance
☒	Wes Myers	Merced Grassland Coalition

Meeting Minutes

1. Call to Order and Welcome
    a. Charles Gardiners (Catalyst) welcomed the group.
2. Roll Call
    a. Stakeholder Advisory Representatives for the Merced Subbasin GSP introduced themselves (see attendance record above).
3. GSA Reports
    a. Jim Blanke (Woodard & Curran) provided a brief overview of the 10/25/21 Coordination Committee (CC) meeting:
        i. Discussion items covered at both CC and today's SAC meeting: GSA updates, data gaps plan, new grant funding, and insights from DWR on other GSPs.
        ii. Interbasin coordination is ongoing with the Chowchilla and Delta-Mendota Subbasins, with focused discussions around subsidence and developing a uniform method to understand pumping by the various subbasins (e.g., water budgets) and impacts on subsidence.
        iii. The CC discussed options for coordinating on a Well Consistency Policy. Currently the County's Environmental Health Department intakes and reviews all new well permits but wants to shift determination of whether a well application is consistent with the GSP to the various GSAs. Domestic wells would still be exempt and the County would review & approve those permits. Discussions on this are ongoing.
        iv. The Committee discussed the draft Turlock Subbasin GSP and options for commenting on it – they agreed to continue using informal comment mechanisms like existing participation on a technical advisory committee, and wait to submit formal comments until DWR comments are received on the Merced GSP in order to be more comprehensive.
    b. Lacey McBride provided an update for the Merced Subbasin GSA:
        i. Over the past few months, the GSA Board has worked through a two-phased approach to GSP implementation.
            1. Phase 1 – now through end of WY2025 – focused on meeting the target of reducing groundwater consumption by 15,000 AF annually through land repurposing and fallowing, importing surface water, and capturing flood waters. Other Phase 1 work will include the development of parcel-level water year budgets for growers, Prop 218 process for funding, and initiating discussions with stakeholders and the public regarding allocations (which are not anticipated to be adopted until Phase 2).
            2. Phase 2 – WY2026 through 2040 – includes adopting and implementing an allocation plan with continued land repurposing, fallowing, and securing surface supplies.
            3. The GSA Board is going to consider a resolution to adopt the above phased approach at a meeting on 11/12 at 10AM.
            4. A public workshop is planned for 11/18 at 6PM in Merced College Business Resource Center (630 W 19th St in Merced) for landowners, growers, and the public in the GSA to kick off Phase 1 of the implementation approach.
    c. Matt Beaman provided an update for the Merced Irrigation-Urban GSA:
        i. The GSA has been holding several stakeholder guidance committee meetings that include representatives from agricultural, municipal, environmental, and DAC sectors – discussions have been focused on agricultural reductions. Have found that growers supplementing groundwater use with surface water are using about 1 AF/ac – but there are significant users relying only on groundwater.
        ii. Input from stakeholders about how the allocation method should work indicated interest in "high certainty" of what the allocation was going to be ahead of time with moderate flexibility in how to operate the allocation program; this would mean a relatively low initial

allocation (to prevent State intervention) but some flexibility in pooling water, longer allocation period, and potential for trading.

iii. Next steps: MIUGSA is drafting policies and intends to come back to their stakeholder committee next spring 2022 to review draft policies for implementing the GSP within its boundaries. At this point, no allocation volume has been set but MIUGSA's stakeholder committee is expressing a desire for high certainty (e.g., low allocation) while still providing some flexibility.

iv. Question (in chat): How can we find out about MIUGSA meetings to participate in discussions about projects and management actions? We would like to attend and participate in those stakeholder committee meetings. Answer: Meetings have been posted on www.mercedgroundwater.org and https://www.miugsa.org/ – projects page has the past presentations and minutes.

d. Kel Mitchel provided an update for the Turner Island Water District GSA #1:
   i. Previously had shared a soft target of 1.5 AF/ac – despite the difficulties with meeting irrigation demands in the last dry year, they were able to meet and exceed that (averaged around 1 AF/ac of use).
   ii. Kel provided some background about the May 2021 Renewable Resources Group acquisition of about 7,000 acres in TIWD; two out of five GSA board members stepped down and were replaced with Kel Mitchell and Tim Allen. Kel shared that Renewable Resources Group does not intend to operate the public agency (TIWD) as if it was an extension of the private firm.
   iii. To help operate TIWD, the board has retained an outside accounting service and hired a manager for the district, among other efforts, to maintain the public agency as a distinct entity, without co-mingled operations from a private firm.

e. SAC questions and discussion
   i. None.

4. DWR GSP Review
   a. Samantha Salvia (Woodard & Curran) provided an update on DWR review of other GSPs.
      i. DWR has reviewed and approved 2 GSPs (Santa Cruz and Salinas) and has communicated that they plan to complete reviews for others submitted in 2020 by January 2022. She shared some potential comments that Merced might expect based on what was observed in the two existing letters.
         1. Amanda Peisch-Derby (DWR) shared that DWR has hired a lot of new staff and Craig Altare (lead of GSP review) is following a plan to meet the deadline for providing comments. Amanda encouraged interested parties to sign up for the SGM newsletter to keep up to date with DWR news:
            a. https://listservice.cnra.ca.gov/scripts/wa.exe?SUBED1=DWR_SGMP&A=1
   b. Samantha also shared news about upcoming DWR grant funding, $152 million of which is designated for critically overdrafted basins like Merced.
      i. Jim Blanke added that DWR is expected to perform a relatively coarse scale airborne electromagnetic (AEM) survey of the Merced Subbasin in spring of 2022, as part of a statewide effort. There is opportunity to coordinate a local geophysical survey effort under the grant with the statewide AEM survey.
      ii. Question: What is AEM? Answer: It stands for Airborne Electromagnetic (AEM) and provides additional information about soils and groundwater. More information is available at: https://water.ca.gov/programs/SGMA/AEM.

5. Data Gaps Plan
   a. Review of results and status, Chris Hewes (Woodard & Curran) provided a brief overview of the first phase of the Data Gaps Plan effort and reviewed the results and latest status.
      i. The Data Gaps Plan was published in July 2021 (http://mercedsgma.org/resources#data-gaps-plan).

ii. Appendix B has detailed maps showing recommended monitoring sites for each principal aquifer, along with known existing wells within the Subbasin that aren't already part of the monitoring network: https://www.mercedsgma.org/assets/pdf/reports/Data-Gaps-Plan_Appendix-B_Results-of-groundwater-Monitoring-Network-Analysis-Tools.pdf. Additions to the monitoring network should be focused in or near those recommended areas.
iii. Phase 2 of the data gaps plan includes using approximately $270,000 of remaining grant funding to upgrade and incorporate existing wells into network as well as install new wells in critical locations.

b. Lacey McBride (Merced Subbasin GSA) pointed out that many of the identified data gaps and recommended new monitoring locations are within the Merced Subbasin GSA.
   i. She made a request to the SAC to help identify additional wells in these areas.
   ii. SAC committee members are encouraged to reach out to Lacey (Lacey.McBride@countyofmerced.com). If there's a potential monitoring site in the MIUGSA area, stakeholders can reach out to Matt Beaman (mbeaman@mercedid.org).
   iii. Maps showing the locations of recommended new monitoring sites can be found here: https://www.mercedsgma.org/assets/pdf/reports/Data-Gaps-Plan_Appendix-B_Results-of-groundwater-Monitoring-Network-Analysis-Tools.pdf

c. SAC discussion
   i. Question: What are the advantages to participating in the monitoring program? Answer: None of the wells in the monitoring program are being used in any way to penalize or target landowners for specific areas. The Subbasin has very diverse groundwater conditions - by building up the monitoring network, this builds a better understanding of the Subbasin and informs management actions that reflect the existing conditions rather than a guess. Data collected at the well can be shared with the well owner.
   ii. Jim Blanke added that this is intended to be a cost-efficient effort to avoid costly spending by the GSAs. He further noted that efficiencies of using existing wells can only happen with volunteers.
   iii. Question (in chat): What is the pipeline when integrating data from these new wells for the whole GSA (e.g., following current pipeline, new ones, etc.) or are these new wells just to help refine management locally/near to the new wells? Answer: Groundwater level data feeds into many different aspects of GSP management both local and regional, including Annual Reports where hydrographs and groundwater elevation maps are generated every year, Subbasin modeling, water budgets, calculation of Subbasin change in storage, etc.
   iv. Question: What are the criteria for using an existing well as monitoring well? Answer: MSGSA has generally been looking to identify wells that are not continuous production wells (or don't run for multiple months of the year). For the first pass, it would be ideal to know which aquifer the well is completed in (e.g., what depth and what screened interval depths) but there is funding to potentially video that well and determine that information if a well construction log is not available.
      1. Maxwell Norton added that irrigation wells are on a use program with PG&E or MID which means they're not being used during peak power periods each day.
      2. Jim Blanke added that there needs to be an access port for measuring groundwater levels and also would be ideal to avoid excessive oil – both of these items can be checked if well owner is not sure.
      3. Well owners were further encouraged to reach out to the GSAs if interested.

6. Drought Update
   a. Samantha Salvia (Woodard & Curran) provided an update on regional and statewide drought conditions. Precipitation is not the only component of drought – the state has seen some of the hottest temperatures this last water year, which further exacerbated conditions. Even a year of above average precipitation may not be enough to resolve the situation.

i. The latest state reservoir conditions were shared and can be found here: https://cdec.water.ca.gov/resapp/RescondMain
ii. Link to DWR's September drought presentation: https://cwc.ca.gov/-/media/CWC-Website/Files/Documents/2021/09_September/September2021_Item_9_Attach_1_DroughtPowerPoint_Final.pdf

b. Lacey McBride (MSGSA) shared more information about local actions being taken, including 9 tanked water supplies installed by Self-Help Enterprises (Jul-Oct 2021) and 33 "out of water" domestic well permits issued in the Merced Subbasin (Apr-Oct 2021). She also shared a list of emergency water resources in Merced County.
    i. Question (in chat): How do these numbers compare with earlier years? Answer: Merced County 2015 drought saw more like 100 tanked water locations county-wide, which covered a larger area and longer time period.

c. SAC discussion
    i. Joe Scoto: Without surface water, next year is going to be a challenge. Already trying to factor in what crops can be planted where there are known good wells.
    ii. Wes Myers: Less impact on grazing lands, but still a tough year.
    iii. Simon Vander Woude: Surface water helped this year; different ranches, especially in Le Grand it was tougher. In Merced area, Above Corcoran Clay wells are doing better – but without use of surface water in the winter, it will be a different story next year.
    iv. Bob Kelly: Echoes what the panelists have said.
    v. Amanda Monaco: Most folks she works with are on community water systems – more specifics may be available from the Merced representative of Leadership Counsel.
    vi. Dave Serrano: Heard that someone drilled a 21" well (full perforation) and going into bypassed strata and picking up shallower water in the El Nido area. This is making it more difficult for surrounding wells to access groundwater.

7. Public Comment
    a. Susan Walsh shared a thank you to Lacey McBride and City of Merced Leah Brown who gave an excellent presentation to the League of Women Voters and Sierra Club about SGMA and the GSP. Often, Susan hears that people don't understand the issues, but Lacey and Leah did a great job of describing groundwater issues and next steps.

8. Next steps and adjourn
    a. Lacey McBride (MSGSA) shared that the 11/16 County Board of Supervisors will be hearing a public presentation on the proposed changes to the groundwater ordinance which may be of interest to stakeholders.
    b. Samantha Salvia (Woodard & Curran) requested that the stakeholders provide feedback as desired on content for future meetings (this can be done by emailing Chris Hewes at cjhewes@woodardcurran.com or Charles Gardiner at Charles@catalystgroupca.com).
    c. Meeting was adjourned at 2:32 PM.

Next Regular Meeting
TBD January 2022
Information also available online at mercedsgma.org

MEETING NOTES – Merced GSP

SUBJECT: Merced GSP Coordination Committee Meeting

DATE/TIME: February 7, 2022, 10:00 AM to 12:00 PM

LOCATION: Online – Zoom Meeting

Coordination Committee Members in Attendance:

	Representative	GSA
☒	Hicham ElTal	Merced Irrigation-Urban GSA
☐	Stephanie Dietz	Merced Irrigation-Urban GSA
☐	Justin Vinson	Merced Irrigation-Urban GSA
☒	Daniel Chavez	Merced Irrigation-Urban GSA
☒	Ken Elwin (alternate)	Merced Irrigation-Urban GSA
☒	Eric Swenson	Merced Subbasin GSA
☒	Mike Gallo By MSGSA Board resolution, Kole Upton is standing in for Mike Gallo for SGM grant-related agenda items.	Merced Subbasin GSA
☒	Nic Marchini	Merced Subbasin GSA
☐	George Park (alternate)	Merced Subbasin GSA
☒	Kel Mitchel	Turner Island Water District GSA #1
☐	Tim Allan (alternate)	Turner Island Water District GSA #1

Meeting Notes

1. **Call to Order and Welcome**
   a. Jim Blanke (Woodard & Curran) called the meeting to order at 10:10 am.

2. **Roll Call**
   a. Coordination Committee members in attendance are shown in table above. The Committee reached a quorum.

3. **State of Emergency Teleconference Findings**

   ACTION (motioned by Eric Swenson (MSGSA), seconded by Mike Gallo (MSGSA), all present voted in favor): The Coordination Committee considered the circumstances of the State of Emergency and made the following findings per AB 361:

   a. The State of Emergency continues to directly impact the ability of the members to meet safely in person and/or

   b. State or Local Officials continue to impose or recommend measures to promote social distancing.

4. Approval of December 22, 2021 Meeting Minutes

a. **ACTION (motioned by Kel Mitchel (TIWD-GSA#1), seconded by Mike Gallo (MSGSA), all present voted in favor):** The Coordination Committee approves the December 22, 2021 Coordination Committee meeting minutes.

5. Public Comment

a. Geoff Vanden Heuvel (via chat): "If a discussion is had about future meetings, as an member of the public, I would respectfully request that a remote option continue to be available."

6. Reports

a. GSA Reports

i. *Merced Subbasin GSA.* Lacey McBride (MSGSA) reported that the MSGSA is working on multi-benefit land repurposing initiatives. They will be discussing land repurposing and Prop 218 at their upcoming Board meeting. They would like to have a plan for voting by summer 2022. Eric Swenson (MSGSA) added that the MSGSA has also been working on project selection for the SGM grant.

ii. *MIUGSA.* Hicham ElTal (MIUGSA) described that the GSA has been working on policies, rules, and stakeholder input for the GSA's Stakeholder Guidance Committee. Additionally, MIUGSA has continued to administer grant funding.

iii. *TIWD GSA #1*. Kel Mitchel (TIWD-GSA#1) has also been working on project selection for the SGM grant.

b. Current Basin Conditions

i. Matt Beaman (MIUGSA) illustrated the monthly groundwater levels for each monitoring well by principal aquifer (Above the Corcoran Clay, Below the Corcoran Clay, and Outside of the Corcoran Clay) to better understand how the Subbasin behaves on monthly basis (not just biannually). Over the last year, groundwater levels have been relatively consistent. Groundwater levels Below and Outside of the Corcoran Clay have dropped between approximately 5 and 15 feet over the course of the last year. There are some groundwater level anomalies, perhaps due to pumping or measurement issues.

ii. At several newly installed monitoring sites, pressure transducers have been recently calibrated, so more groundwater level data will be available with additional processing.

iii. Recent measurements available from representative monitoring wells appear to be above Minimum Thresholds (MTs). Two representative monitoring wells are within 25 feet of the MTs – one far east in the Subbasin and one in the City of Atwater.

7. Comments on Groundwater Sustainability Plan by the Department of Water Resources

a. Jim Blanke (Woodard & Curran) provided an overview of DWR comments on the GSP in the preliminary consultation letter (11/18/2021) and final determination (1/28/2022).

b. DWR outlined three primary GSP deficiencies:

i. *Non-consecutive dry years.* Drought-period declines do not apply to stream depletions, which currently rely on groundwater levels as a proxy.

ii. *Groundwater level sustainable management criteria (SMC).* DWR noted that NGO and other agency analyses suggested that the SMC for groundwater levels could potentially dewater domestic wells. Further investigation into data sources and studies will be conducted. Woodard & Curran will present current groundwater levels compared to other potential MTs (e.g., 2015 groundwater levels) at upcoming GSA technical meetings.

iii. *Subsidence.* The GSP currently allows for some level of continued subsidence, while DWR is looking to minimize or stop subsidence under sustainable conditions. Also, DWR noted that more work is needed to identify what is significant and unreasonable (for flood control and water supply infrastructure, etc.) and how differential subsidence between basins will play a role.

c. DWR did not criticize the GSPs' groundwater quality approach.

d. Response to DWR

i. GSAs have 180 days to respond (by 7/27/22) and address deficiencies. If deficiencies are not satisfactorily addressed, management is assumed by the SWRCB.

ii. The GSA representatives met with DWR on 1/10/2022 to review DWR's comments

iii. A likely deliverable to DWR will be an updated, redline version of the GSP

iv. Hicham ElTal (MIUGSA) described that GSAs will have only a few chances to work with DWR to appropriately address the deficiencies, so caution is advised for final determination of GSP updates.

e. **ACTION (motioned by Hicham ElTal, seconded by Eric Swenson, all present voted in favor):** Recommend GSA Boards approve a contract amendment with Woodard & Curran to develop modifications to the GSP in response to comments from DWR, as described in scope provided by Woodard & Curran

f. Kel Mitchel (TIWD-GSA#1) and Hicham ElTal (MIUGSA) recommend that Coordination Committee meetings be held monthly and that meetings could be cancelled if not needed.

8. Potential future funding opportunity

a. Mike Gallo (MSGSA) discussed a potential future funding opportunity from DWR. Mike Gallo is working with Karla Nemeth (DWR) to identify funding for projects that are ready to implement, can provide benefits quickly, and are scalable.

b. Eric Swenson (MSGSA) suggested using extra funding opportunity to fill gap of projects with lowered requested grant funding for SGM grant.

c. There are other funding opportunities through the federal government's Infrastructure Bill.

d. For those interested in participating in follow up conversations with DWR, contact Mike Gallo (MSGSA) within the next week or two to coordinate.

9. Round 1 SGM Implementation Planning and Projects Grant

a. Jim Blanke (Woodard & Curran) provided an overview of the project scoring and selection process, including the process and rationale for reranking. Coordination Committee members scored each project based on DWR evaluation criteria. GSA representatives reviewed the aggregate scores and recommended modifications to the ranking and funding request amounts based on other considerations including water rights, cost per acre-foot, project location, among other factors.

b. Project proponents will be notified of the revised grant request for each project to ensure they can proceed with the project with local/other funding sources.

c. Kole Upton (MSGSA) encourages GSAs to prioritize projects that keep water within Merced County. This may be discussed further at upcoming GSA meetings.

d. Project proponents will need to provide additional information including shapefiles and backup documentation, as well as prove eligibility (e.g., Agricultural Water Management Plans). GSAs need to provide resolutions authorizing MIUGSA to provide apply for the grant on the Subbasin's behalf.

Liz DaBramo (Woodard & Curran) will follow up with individual project proponents to provide required information.

e. **<u>ACTION (motioned by Eric Swenson, seconded by Hicham ElTal, all present voted in favor):</u>** Recommend GSA Boards direct staff to submit grant application for the projects, and share costs for preparation of grant application, as described in the presentation, incorporating $100,000 for grant administration.

10. Next steps and adjourn

a. Kel Mitchel (TIWD-GSA#1) motion to adjourn, Hicham ElTal (MIAGSA) seconded. Adjourned at 11:59 am.

Next Regular Meeting
TBD, but expected to be in March 2022
Information also available online at mercedsgma.org

MEETING NOTES – Merced GSP

SUBJECT: Merced GSP Coordination Committee Meeting

DATE/TIME: March 21, 2022, 10:00 AM to 12:00 PM

LOCATION: Hybrid meeting with physical location: County of Merced, Livingston Room, 2222 M Street, Merced, CA 95340 and on Zoom

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Coordination Committee Members in Attendance:

	Representative	GSA
☒	Hicham ElTal	Merced Irrigation-Urban GSA
☐	Stephanie Dietz	Merced Irrigation-Urban GSA
☒	Justin Vinson[1]	Merced Irrigation-Urban GSA
☐	Daniel Chavez	Merced Irrigation-Urban GSA
☒	Ken Elwin (alternate)	Merced Irrigation-Urban GSA
☒	Eric Swenson	Merced Subbasin GSA
☒	Mike Gallo	Merced Subbasin GSA
☒	Nic Marchini	Merced Subbasin GSA
☐	George Park (alternate)	Merced Subbasin GSA
☒	Kel Mitchel	Turner Island Water District GSA #1
☐	Tim Allan (alternate)	Turner Island Water District GSA #1

1. Justin Vinson arrived at Item #6 below.

Meeting Notes

1. Call to Order and Welcome

a. Jim Blanke (Woodard & Curran [W&C]) called the meeting to order at 10:10 am.

2. Roll Call

a. Coordination Committee members in attendance are shown in table above. The Committee did not reach a quorum until later in the meeting, so approval of meeting minutes and Emergency Teleconference Findings were moved to later in the agenda.

3. Public Comment

a. None received.

4. Reports

a. GSA Reports

i. *Merced Subbasin GSA.* Lacey McBride reported updates to the land repurposing program (short-term with 3-5 year contracts) being planned for implementation by the GSA. California Department of Conservation multi-benefit land repurposing grants are being pursued for later 10+ year projects. The GSA is also working on a Prop 218 proceeding may happen later in the summer to fund first phase of the two-phase approach. Workshops will be coming up in the next few weeks. A well consistency determination draft policy document has been made public (https://mercedsubbasingsa.org/wp-content/uploads/2022/03/MSGSA-Well-Consistency-Policy-Public-Draft-Clean-v2-03.16.22.pdf). Comments are due back by April 7.

ii. *MIUGSA*. Matt Beaman shared that MIUGSA has been holding MIUGSA-specific Stakeholder Guidance Committee meetings (3 meetings in late 2021 and a 4th meeting in March 2022). Recommendations have come from that Committee on general implementation rules, policies, and guidelines for the GSA implementation, including addressing terms for allocations (recommended that the MIUGSA board allocate on a 3-year term of 1.1 AFY/ac average – water could be used any time within that 3-year period). The recommendation also included some options for pooling between common landowners, carryover, and potential trading. A report is being provided (in draft now), soon to be publicized.

1. Q (Eric Swenson): What year will this allocation program be implemented? A: If not 2022, then 2023.
2. Q (Mike Gallo): How does an allocation work in a year where irrigation water allocation is 1.1 AF/ac? A: The grower has an option to use all or some of their allocated 3.3 AF of groundwater that they have available to them over the next 3 years. If they use all of that 3.3 AF, then they would not have the ability to pump groundwater for the next two years.

iii. *TIWD GSA #1*. Kel Mitchel (TIWD-GSA#1) had no updates.

b. Current Basin Conditions – no updates were generated for this meeting due timing and also the Annual Report presentation later in the agenda which includes a fall 2021 conditions update; a spring 2022 conditions updates is expected to be provided at a later Coordination Committee meeting.

c. Report on plan(s) to address changes to the Merced County Groundwater Ordinance

i. Lacey McBride (MSGSA) provided an overview of the updated Groundwater Mining and Export ordinance approved by the Board of Supervisors Feb 8, 2022 but not in effect until May 1, 2022.

ii. Hicham ElTal (MIUGSA) shared some concerns from MIUGSA that most of the wells will be looked at as a project requiring a lead agency, e.g. for potential linkage to CEQA. He expressed that no individual GSA should not be considered the lead agency. MIUGSA's approach has not been fully developed, but will make sure in response to the county on draft policy to make sure the lead agency issue is clear plus require certain well construction requirements, e.g. recommendation per MIUGSA Stakeholder Guidance Committee to install meters on new wells. The intention is that GSP policies will guide use of well(s) in the future.

1. Stanislaus County for instance passed a Programmatic EIR as a potential option.

iii. Kel Mitchell (ITWD GSA-#1) has the same major concern as MIUGSA about lead agency, e.g. high cost (money and time) of performing CEQA for each new well installation.

iv. Lacey McBride (MSGSA) has had an ad-hoc meeting working on this and it's been discussed at public board meetings as well.

1. The gist of the MSGSA policy is that it includes ways to find a consistency determination for replacement wells that are within the GSA and locating replacement wells on historical parcels served by original well. The MSGSA policy also includes a section for backup wells. It includes a section for wells that don't meet earlier criteria – then can go through a CEQA process to show the GSA that the proposed well doesn't have impacts. Purpose of the policy is to allow growers to maintain farming when needing to replace wells.
2. For the Corcoran Clay, there's a section addressing this; if a well currently exists in both layers and needs to be replaced, it allows flexibility in replacing in one or the other principal aquifer (or otherwise install two separate wells, one per aquifer) in recognition of potential that in future, there could be limitations in Sub-Corcoran pumping.
3. If landowner chose to do CEQA evaluation, landowner funds the work but the GSA would be the lead agency.
4. Policy is intended to be a bridge to get the GSA to when an allocation program is in place for long-term SGMA implementation. MSGSA expects that allocation program to have CEQA requirements.
5. Q: With exemption for replacement backup/replacement wells, will the GSA file the official exemption? A: Not determined yet, will be brought up with legal counsel.
6. Q: What happens to portion of Chowchilla basin that falls within the Merced Subbasin but is in Merced County? A: Subject to the county ordinance – will have to have a consistency determination with application package submitted to Merced County.

5. Grants

a. Round 1 SGM Implementation Planning and Projects Grant Update

i. Jim Blanke (W&C) described that the application was submitted and DWR has since shared that they do expect to fund the whole $7.6 million requested.

b. Prop 68 Round 3 Planning

i. Lacey McBride (MSGSA) shared that staff level conversations have been occurring on the second phase of the Data Gaps Plan to fund 2 shallow or 1 deep well plus some other activities to incorporate existing wells. Surrounding subbasins are also using Technical Support Services and the Merced GSAs would like to pursue this funding source as well. The GSAs have talked to the Stakeholder Advisory Committee as well as their Boards about potential additional wells. There's a running list of wells to be considered. Conversations are continuing.

ii. Jim Blanke (W&C) shared that the Remote Sensing Decision Support Tool development is ongoing, largely based on what kind of data is available. Time has been spent looking for accurate and cost-effective data. OpenET has been the latest focus, but the data is not quite available yet, though a preliminary copy has been obtained for initial review.

iii. Q: What's the status of the new CIMIS station? A: MID needs to meet with landowner and coordinate an agreement. MID has met with DWR to identify several candidate locations for the station on the parcel. Unsure of online date.

iv. Q: What other remote sensing options have you looked into? A: Formation and LandIQ.

1. TIWD GSA-1 has looked into LandIQ and found it to be more robust than OpenET. OpenET does not match up more with irrigation records.

v. Public Comment (Greg Young): "Just a note about OpenET…they have designed the platform to continue to refine and obtain more consistency between various remote sensing methods, which would get things closer to very specific analysis like LandIQ. This just may take time (a few years)."

c. 2020 SGM Implementation Grant

i. Matt Beaman (MID) shared the latest information on the two funded projects, both of which are in progress and on track (LGAWD Intertie and Recharge Project & El Nido Conveyance System Improvements).

1. Q: When is LGAWD construction expected to finish? A: Nic Marchini shared that he thinks it may be completed in late 2023.

d. SDAC Grant

i. Matt Beaman (MID) provided an update on a 2019 grant agreement covering 3 projects serving underrepresented communities.

ii. Q: Over time, do recharge basins have diminishing returns for volume recharged? A: Depends basin to basin on soil type and how it's maintained. It's like a natural log where you might see a drop in effectiveness over the first 2-3 years, but then should remain more consistent.

1. Under FLOOD-MAR, it is challenging when it comes to recharge basins because floodwater includes silt and other materials that can over time reduce recharge capability. But if you're taking (flood) water out of a reservoir, it's likely to be better quality.

iii. Q: When is Planada basin going into service? A: 2 sites with cone penetration tests found shallow clay, so moving to install dry wells at one site. Permitting is on schedule to be done over next 3-4 months and dry wells will be installed in summer 2022. Dry wells will be screened at 50 and 90-110 feet deep. Water is 190 feet deep. Water quality testing will be involved, as well as a settling tank.

6. State of Emergency Teleconference Findings

a. Motioned by Nic Marchini and seconded by Hicham ElTal. Motion passed unanimously.

7. Approval of February 7, 2021 Meeting Minutes

a. Motioned by Kel Mitchel and seconded by Hicham ElTal. Minutes were approved unanimously.

8. WY2021 Annual Report

a. Chris Hewes (W&C) provided key highlights from the recently drafted WY 2021 Annual Report that will be submitted to DWR by April 1.

b. Comment (Hicham ElTal): It would be interesting to look at change in storage per aquifer.

9. Comments on Groundwater Sustainability Plan by the Department of Water Resources

a. Jim Blanke (W&C) provided an overview of the schedule for the response to comments from the DWR on the Merced GSP, as well as an overview of the comments. He also presented some information on the technical analysis for the groundwater levels sustainability indicator, including potential options being considered for updated minimum thresholds.
b. Q: Did DWR also recommend looking at domestic wells? A: Yes, they noted the need to investigate domestic wells further to understand potential impacts.
c. Comment (Hicham ElTal): Expressed support for Option 1 (2015 GWLs) with interim milestones because the basin may run into issues with regulatory agencies in the future for levels below 2015 (e.g. such as a mitigation requirement), even though this is a harder option to implement.
d. Comment (Kel Mitchel): The GSAs need to consider balancing the need to be responsive to DWR's comment and reasoning for the comment against practicality – don't want to see the GSP do a hard pivot to a more restrictive threshold without careful consideration.
e. Comment (Eric Swenson) Don't think MSGSA can meet the 2015 levels scenario.
f. Q (Eric Swenson): Could the GSAs approach things differently within their regions? A from Hicham ElTal: Providing there can be a handshake in areas that influence MIUGSA, that's possible. Thinks 2015 levels are achievable if pumping reduces, but there are some areas that may need more careful attention.
    i. Kel Mitchel cautioned that other GSPs had comments from DWR about differences in policies between GSAs in the same GSP. Need to consider that as a potential secondary issue to avoid.
g. Eric Swenson proposed writing up an MT policy and discussing it in next 20 days to come to a consensus on minimum threshold approach, while W&C continues to develop the technical analysis to support. Hicham ElTal and Kel Mitchel supported the idea.
h. The Committee agreed on the need to put together questions for DWR and meet with the agency soon.
    i. Coordination Committee requested W&C to develop questions and send out for Coordination Committee review and input.
i. Q (Kel Mitchel): If groundwater levels were to decline to minimum threshold for option 3, what would be the impact to domestic users? Even if not dewatering, are there electricity or pump-resetting issues? A: Dataset doesn't exist to answer all those questions, per Eric Swenson. Pump companies have that kind of data, but doesn't exist in the county dataset and isn't typically made available.

10. Next steps and adjourn

a. Meeting adjourned 12:09 pm.

Next Regular Meeting
TBD, but expected to be April 25, 2022
Information also available online at mercedsgma.org

MEETING NOTES – Merced GSP

SUBJECT: Merced GSP Coordination Committee Meeting

DATE/TIME: April 25, 2022, 3:00 PM to 5:00 PM

LOCATION: Hybrid meeting with physical location at Merced Irrigation District, Franklin Yard Facility, 3321 North Franklin Road, Merced, CA 95348 and online via Zoom

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Coordination Committee Members in Attendance:

	Representative	GSA
☒	Hicham ElTal	Merced Irrigation-Urban GSA
☒	Stephanie Dietz[1]	Merced Irrigation-Urban GSA
☒	Justin Vinson	Merced Irrigation-Urban GSA
☒	Daniel Chavez	Merced Irrigation-Urban GSA
☐	Ken Elwin (alternate)	Merced Irrigation-Urban GSA
☒	Eric Swenson	Merced Subbasin GSA
☒	Mike Gallo	Merced Subbasin GSA
☒	Nic Marchini	Merced Subbasin GSA
☐	George Park (alternate)	Merced Subbasin GSA
☒	Kel Mitchel	Turner Island Water District GSA #1
☐	Tim Allan (alternate)	Turner Island Water District GSA #1

1. Stephanie Dietz joined around item 7(e) in the minutes below.

Meeting Notes

1. **Call to Order and Welcome**
    a. Jim Blanke (Woodard & Curran [W&C]) called the meeting to order at 3:00 pm.

2. **Roll Call**
    a. Coordination Committee members in attendance are shown in table above.

3. **State of Emergency Teleconference Findings**
    a. Motioned by Nic Marchini and seconded by Kel Mitchel. Motion passed unanimously.

4. **Approval of March 21, 2022 Meeting Minutes**
    a. Motioned by Kel Mitchel and seconded by Mike Gallo. Minutes were approved unanimously.

5. Public Comment

a. None received.

6. Reports

a. GSA Reports

i. *Merced Subbasin GSA*. Adriel Ramirez shared that the MSGSA adopted 4/14/22 well consistency determination policy. Also contacted by Department of Conservation to interview for application for multibenefit land repurposing program.

ii. *MIUGSA*. Hicham ElTal shared that the GSA is working on comments to the County updated groundwater ordinance. Working on setting up for future management of the GSA, e.g. software for water trades which will include accounting for surface water. Monitoring SWRCB curtailments and potential impact on basin sustainability.

iii. *TIWD GSA #1*. Kel Mitchel working through well consistency determination comments with GSA board.

b. Current Basin Conditions – Matt Beaman (MIUGSA) presented some figures showing groundwater levels recently recorded at monitoring wells, including some continuous pressure transducers at newer SGMA monitoring wells, others measured by QK, or others measured by City of Merced. He noted that not all wells are dedicated to monitoring and may be in use, or otherwise influenced by groundwater pumping by a nearby active well. Wells 53315 and 53316 have had some measurement challenges.

i. Q (public): Is the El Nido Firehouse well a dry or monitoring well? A: Monitoring well.

ii. Q (Nic Marchini): Where are stations 53315 and 53316 located? A: Off of Buchanan Hollow Rd, they are private wells.

7. Potential Revisions to the Groundwater Sustainability Plan

a. Jim Blanke (W&C) reviewed the three comments from DWR on the GSP which was determined "incomplete". He also refreshed the group on SGMA terminology related to sustainable management criteria.

b. Jim Blanke (W&C) reminded the group about several options that have been evaluated for different minimum thresholds (MTs), including (1) 2015 levels, (2) historical low, (3) deeper of historical low or shallowest domestic well + 10 ft, or (4) a combination of #2 in the area of subsidence and #3 elsewhere in the Subbasin.

i. Q (Eric Swenson, MSGSA): How would we respond to someone who says their well has been dewatered going forward because we didn't have information on it or wasn't covered by a representative well? A: Mitigation component is not something being discussed today. The GSAs can decide if a mitigation program is needed and what that should look like.

ii. Q (Joseph Angulo): Are all domestic wells considered in the minimum threshold, regardless of date installed or quality of water withdrawn? A: The domestic well data source starts from mid-1990s based on electronic well permitting database from Merced County. We've included nearly all domestic wells except statistically-defined outliers.

c. Jim Blanke (W&C) shared that we've expanded the domestic well search radius from 2 miles to 5 miles and included public water supply wells.
d. Jim Blanke (W&C) expanded on some additional considerations incorporated into the latest round of modeling for ongoing/future subsidence, including no cumulative change in storage (to avoid additional subsidence) over the long term, as well as no cumulatively negative storage in any year (e.g. dry years). These criteria are generally more protective than the MTs that take into consideration groundwater levels only.
    i. Q (Kel Mitchel, TIWD GSA-#1): How does the subsidence map look for 2015-2021 instead of 2012-2021? Should we consider expanding the "subsidence area" to the whole Below Corcoran Clay area because it could occur elsewhere in the future? A: W&C has not looked at that specifically and could consider expanding the region.
e. Jim Blanke (W&C) walked the group through the model results table.
    i. Q (Hicham ElTal, MIUGSA): Does the pumping reduction column include developed supply? A: Yes.
    ii. Q (Hicham ElTal, MIUGSA): Between modeling scenarios A, B, and C, could you add the stream depletions from the Merced River? A: Yes, W&C can do that.
    iii. Comment (Hicham ElTal, MIUGSA): From MIUGSA perspective, if the updated GSP uses any scenario that isn't 2015 groundwater levels, MIUGSA doesn't want to be responsible for mitigation. But, if using 2015 levels, then can look at scale of depletions between GSAs to share cost of mitigation that might occur.
        1. MIUGSA has comments to share later on expanded 5-mile radius used for domestic wells and for comparison to historical lows.
    iv. Q (Eric Swenson, MSGSA): What is the baseline gross extraction that the groundwater reductions are starting from? A: Around 620,000 AF.
    v. Jim Blanke (W&C) shared highlights of comments on the results table from the Stakeholder Advisory Committee earlier on 4/25. They ranged from support for 2015 levels and higher groundwater levels vs others concerned about economic impacts on the County with support for scenario C, potentially with projects or management actions to address dry year negative cumulative storage change.
        1. Kel Mitchel (TIWD GSA-#1) shared that he thought he heard that there was more interest in having a strong response (over-response) early on and then readjust later (rather than the opposite of not going far enough now and needing to be reactive later on).
    vi. Q (Kel Mitchel, TIWD GSA-#1): Where are the reductions occurring geographically? A: Modeling was based on reduced crop acreage. In the subsidence area, pumping reductions were focused primarily in the Below Corcoran, with less reductions in the Above Corcoran. Note that planned

supply side projects will reduce what is needed for magnitude of demand reductions, but not enough to fully offset.

vii. Public comment (from chat): It would be helpful to see what the specifics of the mitigation strategy to get the -40,000 [*AF shown in modeling scenario C*] to positive.
    1. Response: Likely, the strategy would primarily include land fallowing because there are limited water supplies to bring in those very dry conditions.

viii. Q (Kel Mitchel, TIWD GSA-#1): DWR's letter was specific about evaluating subsidence impacts on beneficial uses and users in the subbasin – anything we can do to think about that or address is more directly? A: W&C contacted USBR and reviewed some of their published Channel Capacity reports to see how subsidence would impact the Middle Eastside Bypass and its ability to convey flood flows. For instance, USBR Channel Capacity Report (2019, Appendix B) suggested impacts by 2031 for ability to meet goals for flood flow conveyance. We also know Delta-Mendota has had issues with conveyance through infrastructure.

ix. Jim (W&C) clarified that modeling scenario C involves historical low in Below Corcoran Clay in subsidence area, but shallowest domestic well (+10ft) everywhere else (including the Above Corcoran Clay aquifer in the subsidence area).

x. Q (Stephanie Dietz, MIUGSA): What are the impacts of pumping reductions on municipal wells? A: Hard to answer directly, but all these reductions will need to go through a process of allocation between the GSAs and then within each individual GSAs before it gets to individual wells.

xi. Q (Adriel Ramirez, MSGSA): What if we choose 2015 levels and don't get there at 2040? Can we address in a 5-year update to be less restrictive? A: The GSP is a living document and can be updated through a stakeholder process and with DWR approval.

xii. Public Question (in chat): Can you explain why the GSP scenario which reduces pumping 66,000 AFY has a -36,000 AF Minimum Annual change in storage below Corcoran and Scenario C which reduces pumping more at 70,000 AFY results in -40,000. What is going on in the model to make this result? A: There a few factors: the pumping reductions are not uniform throughout the Subbasin but also there are a series of revisions since the GSP model version was developed, so there are some model behavior differences.

xiii. Comment (Adriel Ramirez, MSGSA): Majority of pumping reductions are in MSGSA. They might be able to meet pumping reductions, but if can't get to 2015 levels, there's concern about negative impacts on the economy and not meeting goal. Might be too restrictive, too fast.

xiv. Comment (Kel Mitchel, TIWD GSA-#1): In comparing modeling scenarios B and C, there is a 45,000 AFY difference in pumping reductions. If an additional 45,000 AFY would need to be reduced from just the Below Corcoran aquifer, that's a huge volume of water for that area.

xv. Comment (Greg Young, MSGSA): If we go to 2015 levels, sounds like it would remove mitigation challenges, but there's a chance that 2015 levels might not be achievable by 2040 even if demand reductions are achieved. MSGSA is open to taking on some of the responsibility of mitigation (especially domestic wells) so MIUGSA isn't burdened for something that is not MIUGSA's responsibility.

Thinks modeling scenarios B or C are more implementable if we tie with another solution (e.g. mitigation program to be designed and shared).

1. Hicham ElTal (MIUGSA) replied:
    a. MIUGSA technically not looking at reduced pumping today, but it could happen in future because of SED and Bay Delta Plan.
    b. Concerned that groundwater levels below 2015 levels could be a slippery slope, even with consideration for mitigation responsibility by MSGSA. But willing to consider modeling scenario B or C if other GSAs serious about taking on mitigation responsibility (would need to be better defined).
    c. Concerned about recent observed declines in groundwater in MIUGSA's west side, which historically has been more resilient .

xvi. Kel Mitchel (TIWD GSA-#1) confirmed that in the case of 2015 groundwater levels goal, these don't need to be achieved in 2023 – the goal is 2040.

xvii. Hicham ElTal (MIUGSA) would like MSGSA to share more information on how they'll commit to 100% mitigation responsibility for domestic wells (if want to deviate from 2015 groundwater levels).

xviii. Jim Blanke (W&C) shared another option where 2015 levels could be the new measurable objective (MO), but set the MTs lower to reduce risk of violation. MIUGSA shared they're open to this and other creative solutions.

xix. Q (Adriel Ramirez, MSGSA): What happens to wells that go dry during implementation as we ramp down pumping to go for 2015 levels? A from Hicham ElTal (MIUGSA): Willing to do a proportional cost share based on the percentage of pumping percentage over the native yield.

xx. Q (Kel Mitchel, TIWD GSA-#1): How should we think about a goal for 2015 levels in Above Corcoran considering it was pretty high in 2015 and not pumped heavily? A: It would have a benefit to subsidence. However, we would need to look to impacts on groundwater dependent ecosystems (GDEs) and stream depletions due to increased pumping likely to occur in Above Corcoran.

1. Kel suggested that we would need a Below Corcoran Clay MT which would be 2015 or historical low. Then Above Corcoran Clay can't be tied to 2015.
    a. Hicham ElTal (MIUGSA) agreed with this.
    b. One additional suggestion could be 2015 levels minus some buffer. Hicham requested that Woodard & Curran look into this.

xxi. Comment (Eric Swenson, MSGSA): Has designed pumps for Above Corcoran wells in previous work; pumping rate for above wells is much smaller than Below Corcoran. Might need twice as many wells to meet same pumping volume. This could be complicated under well permitting, but addressable.

xxii. Adriel Ramirez (MSGSA) confirmed that they need direction from the MSGSA Board as next step on mitigation program responsibility; the next meeting will occur in the second week of May.

xxiii. Q (Nic Marchini, MSGSA): Are there any scenarios that are protective of domestic wells and address the other categories? A: Option C is lowest pumping value that is still protective in terms of domestic wells (meets minimum threshold definition, though may still allow some dewatering). But Option C doesn't address subsidence.

xxiv. Q (Nic Marchini, MSGSA): Would replacement of a very shallow well be part of a mitigation program? A: It will be up to the Committee and GSAs to put together a mitigation program, e.g. how to determine whether dewatering is due to GSP vs other conditions.

xxv. Q (Eric Swenson, MSGSA): How much detail would the updated GSP need to have about mitigation? A: Need to include an open and transparent impact of MTs on beneficial uses and users of groundwater in the Subbasin. Up to the GSAs to include or not include a mitigation program, but not necessarily required. For example, several other GSPs included a plan for how to consider development of a mitigation program. There's some flexibility.

f. Jim Blanke (W&C) described the schedule for incorporating edits into the GSP by end of July to address DWR's comments.

8. Next steps and adjourn

a. Meeting adjourned 4:45 pm.

Next Regular Meeting
TBD, but expected to be late May 2022
Information also available online at mercedsgma.org

MEETING NOTES – Merced GSP

SUBJECT: Merced GSP Coordination Committee Meeting

DATE/TIME: June 1, 2022, 1:00 PM to 3:00 PM

LOCATION: Hybrid meeting with physical location at Merced Irrigation District, Franklin Yard Facility, 3321 North Franklin Road, Merced, CA 95348 and online via Zoom

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Coordination Committee Members in Attendance:

	Representative	GSA
☒	Hicham ElTal	Merced Irrigation-Urban GSA
☐	Stephanie Dietz	Merced Irrigation-Urban GSA
☒	Justin Vinson	Merced Irrigation-Urban GSA
☐	Daniel Chavez	Merced Irrigation-Urban GSA
☒	Ken Elwin (alternate)	Merced Irrigation-Urban GSA
☒	Eric Swenson	Merced Subbasin GSA
☒	Mike Gallo	Merced Subbasin GSA
☒	Nic Marchini	Merced Subbasin GSA
☒	George Park (alternate)	Merced Subbasin GSA
☒	Kel Mitchel	Turner Island Water District GSA #1
☐	Tim Allan (alternate)	Turner Island Water District GSA #1

Meeting Notes

1. Call to Order and Welcome

a. Jim Blanke (Woodard & Curran [W&C]) called the meeting to order at 1:02 pm.

2. Roll Call

a. Coordination Committee members in attendance are shown in table above.

3. State of Emergency Teleconference Findings

a. The Coordination Committee considered the circumstances of the State of Emergency and determine whether to make the findings that any of the circumstances exist per AB 361: that the State of Emergency continues to directly impact the ability of the members to meet safely in person and/or State or Local Officials continue to impose or recommend measures to promote social distancing.

b. Action: Motion made, seconded, and carried

4. Approval of April 25, 2022 Meeting Minutes

a. Action: Motion made, seconded, and carried

5. Public Comment

a. None received.

6. Reports

a. GSA Reports

i. *Merced Subbasin GSA*. Adriel Ramirez shared that MSGSA applied for a multibenefit land repurposing grant program, but was unsuccessful in this funding round. As an additional $60 million may be added as a part of the Governor's proposed budget, the GSA is working to strengthen the application. Holding a public meeting on July 19 that, if successful, will fund their land repurposing program and fund the GSA executive director and domestic well mitigation program.

ii. *MIUGSA*. Hicham ElTal shared that MIUGSA approved 3.3. AF per acre for the period of April 1, 2023 through December 31, 2025 (equivalent to 1.1 AF/Ac annually) as sustainable native number for pumping allocations. MIUGSA is currently working through details of monitoring and enforcement and their Board will be approving certain numbers for recharge on a farm-by-farm basis. Matt Beaman shared that MIUGSA received the draft Grant Agreement with DWR for the SGM Implementation grant of $7.6 million; Mr. Beaman anticipates sending data requests to the respective project proponents to finalize the work plan, schedule, and budget. Hicham ElTal and Matt Beaman shared a presentation regarding an analysis of groundwater levels and pumping from 2016 to 2021 assuming pumping allocations at 1.1 AF per developed acre. Results show differences in the groundwater storage balance among the three GSAs. MIUGSA has a positive groundwater balance, even as groundwater levels have declined. Further, Mr. ElTal stated that MIUGSA believes that setting the minimum thresholds lower than 2015 levels may expose the GSAs to additional liability for impacts that may occur. Mr. ElTal stated that MIUGSA believes it should not bear mitigation or liability for setting minimum thresholds at historical lows and language in the GSP will need to reflect this.

1. Q: MSGSA has allocated funds for a domestic well mitigation program. What other mitigation measures may be included?
    a. Mr. ElTal responded that mitigation and liability are the two different issues. MIUGSA desires language broad enough to protect themselves at levels below 2015 levels, as all cities are in their GSA area. If the GSAs move forward with MTs set at 2015 levels, then MIUGSA does not require this language.
    b. Jim Blanke (W&C) added that the average pumping reduction between minimum thresholds set at historical lows (115 TAF) and those set at 2015 levels (175 TAF).
2. A question was raised about whether mitigation is required. Jim Blanke (W&C) clarified that the GSP must provide transparency around the impacts anticipated at minimum thresholds. Potential for state intervention could be triggered by missing an interim milestone.
3. MSGSA and MIUGSA discussed potential impacts of SWRCB intervention if consensus regarding mitigation/responsibility language could not be reached before the GSP revision deadline.
4. MSGSA requested MIUGSA provide the minimum thresholds options and related language for sharing liability for the MSGSA Board to consider.

MIUGSA committed to drafting language to provide to MSGSA and TIWD GSA #1 for review prior to next MSGSA Board meeting.

5. Jim Blanke (W&C) clarified that the GSAs will need to set measurable objectives and interim milestones based on a similar methodology of the selected minimum threshold.

iii. *TIWD GSA #1*. No update provided.

7. Potential Revisions to the Groundwater Sustainability Plan

a. Groundwater levels

i. Jim Blanke (W&C) shared progress on revising groundwater level minimum thresholds. GSAs have decided to pursue historical lows as the minimum threshold approach. Once pumping reductions are implemented through projects and management actions (ramping up after 2025), groundwater levels are projected to increase. Measurable objectives will be developed to provide operational flexibility (approach being evaluated at this time is to use fall 2011 groundwater levels) and interim milestones will be defined by anticipated GSP implementation and model simulated response. Meeting discussion included incorporating a domestic well mitigation program, with primary financial responsibility with MSGSA, and a management action to explore different levels above Corcoran in the subsidence area for more flexibility in responding to subsidence issues.

ii. Q (Kel Mitchel): Can interim milestones go below minimum thresholds?

1. A (Jim Blanke): Based on BMPs from DWR, yes, this is allowed.

b. Subsidence

i. Jim Blanke (W&C) presented the subsidence minimum threshold (and measurable objective) option under consideration by the GSAs: 0 feet per year, with condition of uncertainty. Other options include total subsidence (rather than rate) or the stipulation of a 5-year rolling average. USBR measurement issue is approximately +/- 1 inch and will be discussed with DWR. The final option is to set groundwater levels as a proxy for subsidence, which would involve extensive rework of the subsidence section. Interim milestones will assume some level of subsidence through 2040, both residual and new.

ii. Jim Blanke (W&C) introduced the proposed management action for the subsidence area: goal is to target pumping reduction (or recharge activities) within Subsidence Focus Area (defined by region with 2015-2021 average less than -0.15 ft/yr) to achieve positive annual storage change. Noted that exact details will be developed as part of the management action determined after GSP is updated.

iii. Comment (Hicham ElTal): Believes that the GSAs should accept DWR's position of 0 ft/yr for minimum threshold at this point and perform studies prior to 2040 to demonstrate that subsidence occurs in neighboring subbasins and argue that this is not a Merced Subbasin-specific problem.

iv. Comment (Kel Mitchel): Could be explicit in the GSP that the MTs for GWLs are protective of subsidence, since set at historical lows.

c. Domestic well mitigation

i. Jim Blanke (W&C) explained that, while identification of the need for a domestic well mitigation program will occur during GSP implementation, it is envisioned that a board or committee will review claims (which would need to be tied to regional groundwater conditions), with the primary financial responsibility coming from MSGSA, through negotiations.

ii. Mr. ElTal reiterated that MIUGSA should not be responsible for mitigation for minimum thresholds set lower than 2015, and restated the commitment to prepare options and language for other GSAs to review.

d. Adoption / public input opportunities

i. Jim Blanke (W&C) shared that, by next Coordination Committee meeting in late June, consensus on the minimum thresholds, measurable objectives, and interim milestones should be reached and the redline GSP should be drafted for Board review and adoption.

ii. Comment (Hicham ElTal): Propose to combine committee meetings in late June to incorporate revisions from Stakeholder Advisory Committee members live and reduce need to respond to comments multiple times.

8. Next steps and adjourn

a. Charles Gardiner (Catalyst) shared an update from the SAC meeting that most of group was content with the GSAs direction to select historical lows as minimum threshold, but some wanted to see 2015 levels as the minimum threshold.

b. Greg Young (MSGSA) requested MIUGSA to share analysis details from their table of estimated groundwater use and allocations included in their presentation under Item 6(ii).

i. Hicham ElTal (MIUGSA) agreed to share the analysis.

c. Meeting adjourned at 2:49 pm.

Next Regular Meeting

Tentatively scheduled for a joint meeting of the Stakeholder Advisory Committee and the Coordination Committee on June 27, 2022, 1pm

Information also available online at mercedsgma.org

MEETING NOTES – Merced GSP

SUBJECT: Merced GSP Joint Coordination Committee & Stakeholder Advisory Committee Meeting

DATE/TIME: June 27, 2022, 1:00 PM to 3:00 PM

LOCATION: Hybrid meeting with physical location at Merced Irrigation District, Franklin Yard Facility, 3321 North Franklin Road, Merced, CA 95348 and online via Zoom

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Coordination Committee Members in Attendance:

	Representative	GSA
☒	Hicham ElTal	Merced Irrigation-Urban GSA
☐	Stephanie Dietz	Merced Irrigation-Urban GSA
☒	Justin Vinson	Merced Irrigation-Urban GSA
☒	Daniel Chavez	Merced Irrigation-Urban GSA
☐	Ken Elwin (alternate)	Merced Irrigation-Urban GSA
☒	Eric Swenson	Merced Subbasin GSA
☒	Mike Gallo	Merced Subbasin GSA
☒	Nic Marchini	Merced Subbasin GSA
☒	George Park (alternate)	Merced Subbasin GSA
☒	Kel Mitchel	Turner Island Water District GSA #1
☐	Tim Allan (alternate)	Turner Island Water District GSA #1

Stakeholder Committee Members in Attendance:

	Representative	Community Aspect Representation
☐	Arlan Thomas	MIDAC member
☒	Ben Migliazzo (alternate)	MIDAC member
☐	Bob Kelley	Stevinson Representative
☐	Blake Nervino	Stevinson/Merquin
☒	Breanne Vandenberg	MCFB
☒	Craig Arnold	Arnold Farms
☒	Darren Olguin	Resident of Merced County
☒	Dave Serrano	Serrano Farms - Le Grand
☐	David Belt	Foster Farms
☒	Emma Reyes	Martin Reyes Farm/Land Leveling
☐	Greg Olzack	Atwater Resident
☒	Jean Okuye	E Merced RCD
☐	Joe Sansoni	Sansoni Farms/MCFB
☐	Joe Scoto	Scoto Brothers/McSwain School Dist.
☒	Jose Moran	Livingston City Council
☐	Lacy Carothers	Cal Am Water
☒	Lisa Baker	Clayton Water District
☐	Lisa Kayser-Grant	Sierra Club

☐	Mark Maxwell	UC Merced
☒	Maxwell Norton	Unincorporated area
☒	Nav Athwal	TriNut Farms
☐	Olivia Gomez	Community of Planada
☒	Nataly Escobedo Garcia (alternate)	Leadership Counsel
☒	Parry Klassen	ESJWQC
☐	Darcy Brown	River Partners
☐	Rick Drayer	Merced/Mariposa Cattlemen
☐	Robert Weimer	Weimer Farms
☒	Simon Vander Woude	Sandy Mush MWC
☒	Susan Walsh	City of Merced
☐	Bill Spriggs (alternate)	Merced resident
☒	Thomas Dinwoodie	Master Gardener/McSwain
☒	Trevor Hutton	Valley Land Alliance
☒	Wes Myers	Merced Grassland Coalition
☐	Lou Myers (alternate)	Benjamin Land LP

Meeting Notes

1. Call to Order and Welcome

a. Jim Blanke (Woodard & Curran [W&C]) called the meeting to order at 1:01 pm.

2. Introductions and Roll Call

a. Coordination Committee members in attendance are shown in the first table above.

b. Stakeholder Advisory Committee members in attendance are shown in the second table above.

c. Tom Dinwoodie requested list of members who haven't attended or attended only one meeting and no others. Charles Gardiner shared that it would be possible to summarize the attendance of the past meetings.

3. State of Emergency Teleconference Findings

a. The Coordination Committee considered the circumstances of the State of Emergency and determine whether to make the findings that any of the circumstances exist per AB 361: that the State of Emergency continues to directly impact the ability of the members to meet safely in person and/or State or Local Officials continue to impose or recommend measures to promote social distancing.

b. Action: Motion made (Nic Marchini), seconded (Eric Swenson), and carried.

4. Approval of June 1, 2022 Coordination Committee Meeting Minutes

a. Comments from Eric Swenson:
    i. Q: Item 6) a) ii) Was is the MID Board of MIUGSA that approved 3.3 AF/ac value? A: MIUGSA
    ii. In Item 7) a) i), Eric requested to add "Meeting discussion included" before the end of the last sentence, so it reads: "Meeting discussion included incorporating a domestic well mitigation program, with primary financial responsibility with

MSGSA, and a management action to explore different levels above Corcoran in the subsidence area for more flexibility in responding to subsidence issues."

b. Action: Motion made to accept minutes with the proposed change (Hicham ElTal), seconded (Eric Swenson), and carried

5. Public Comment

a. None received.

6. Review of Redline Edits to the Groundwater Sustainability Plan

a. Jim Blanke (W&C) reminded attendees about the DWR comments and provided an overview of the primary edits to the GSP in response to the comments, including the various sustainability management criteria for groundwater levels and subsidence, as well as the two new management actions to support those revised criteria.

b. Q (Eric Swenson): Is there a linear ramp between IMs between the 5-year increments for subsidence? E.g. linear, annual step, etc. A: This isn't defined by SGMA. Generally, we'll still want to measure ongoing conditions against thresholds for upcoming milestone years (thinking about it somewhat linearly between 5-year periods).

    i. Hicham ElTal: Its better to avoid being more detailed than necessary – we have a long way to go on subsidence due to coordination with neighboring subbasins.

c. Q (George Park): What are the most recent values for subsidence? What is the data source/back especially for the -0.75 ft/yr IM in 2025? A: Generally recent numbers aren't as high as -0.75 ft/yr, but the IMs are generally meant to cover a high level of ongoing and/or residual subsidence.

    i. Q: Has DWR agreed that the IMs are reasonable? A: They have been pushing for 0 ft/yr in 2040 for MT/MO. The didn't push against non-zero IMs in the GSP.

    ii. Matt Beaman (MIUGSA): last year's values in the Annual Report showed the highest magnitude of subsidence in the range of -0.3 to -0.45 ft/yr.

d. Q (Hicham ElTal): Does USBR have subsidence measurement points east of Highway 59? A: Yes they are marked as turquoise points on the subsidence map, but there seems to be a lower density compared to the central region of greater magnitude subsidence in the Chowchilla subbasin.

    i. Hicham ElTal raised concerns that the Above Corcoran Clay management action may not cover an area of the western Outside Corcoran Clay principal aquifer where shallow pumping could have an impact on the subsidence focus area. We might want to consider adjusting the area considered by the management action for pumping adjustments to be pushed west.

    ii. Brad Samuelson comment: Chowchilla Subbasin GSP has some flexibility built into their Western Management Area that could be a model to address this. In DWR consultations over last several weeks, this flexibility has not been requested by DWR to be taken out.

e. Comments (Eric Swenson):

    i. Regarding the Section 6.2.4 narrative in the GSP, it mentions there are few domestic wells in the Above CC. This doesn't seem correct because there are many in El Nido and Stevinson.

ii. Recently have noticed there have been challenges in designing wells for extraction in the Above Corcoran Clay principal aquifer. Will likely need to couple recharge actions with the increased Above Corcoran pumping action. Language should be added to the GSP to acknowledge that.

    1. Brad Samuelson: In the Prop 68 Round 1 funding, the Sandy Mush project (off MID Lateral) brings 20 cfs to this area for FloodMAR.

    2. Kel Mitchel: Agrees with Eric, but doesn't want to update the GSP to require all extraction to be paired with recharge – the intent is to provide flexibility for sustainable management.

        a. Eric Swenson: Acknowledged that TIWD could probably increase Above CC pumping without recharge, but it would be necessary in other areas like El Nido.

f. Eric Swenson (MSGSA) provided several comments on draft Section 6.2.3 (Domestic Well Mitigation Program management action):

    i. In the first sentence, add "occurring after 2015" after "regional overdraft conditions".

    ii. Second sentence, add language about types of additional issues not intended to be covered by the program.

        1. Hicham ElTal: Generally want to be less specific while still getting the point across.

        2. The group discussed and decided on "related to normal wear and tear"

    iii. In several spots, replace "work with" with "coordinate with"

    iv. In addition to allowing a Board or Committee to review claims, "or agency staff" should be added as well (as directed by a Board or Committee)

    v. Change "well rehabilitation, deepening, replacement" to "Setting well pump at deeper depths, replacement of well pump, or well replacement".

    vi. Change "In home treatment programs" to "Residence water treatment equipment".

    vii. Remove "infrastructure rehabilitation" and change to "other relevant projects".

    viii. In the paragraph for time table for initiation and completion, add "(by 2025)" to clarify the intended date.

    ix. Last sentence in Section 6.2.3 – that statement doesn't need to be in the GSP and can be handled via an MOU.

        1. Hicham ElTal clarified that it is important to MIUGSA to keep this sentence in the GSP.

        2. Mike Gallo (MSGSA) shared that he'd like to take this sentence to the MSGSA Board for review.

g. Adriel shared that MSGSA is moving their adoption meeting to July 19 special session to adopt and would likely discuss it at a special meeting sometime next week, otherwise July 14.

h. Jim Blanke (W&C): An updated redline version of the GSP should be available to the GSAs by end of day July 1.

i. Jim Blanke (W&C) shared the potential impacts of not adopting the GSP and what State intervention might look like, stressing the importance of finding agreeable language to all three GSAs.

j. Eric Swenson (MSGSA) shared additional comments on the GSP:

    i. Executive Summary page 8 with shortlist of projects: wants project #4 to be removed as it was done so in an Annual Report a few years ago.

    ii. Statement added in redlined Executive Summary: "Management actions will also include rewarding GSAs based on their extracted volumetric groundwater extraction, since 2015, proportioned to other GSAs in the basin." -> what does this mean?

        1. Hicham ElTal: It's meant to be a "fuzzy" sentence that encourages agencies to move faster to taking actions. Rewards are undefined and would be determined by the GSAs in the future.

k. Jim Blanke (W&C) walked the group through a brief description of future work as part of GSP implementation after the July 2022 revised GSP adoption.

l. Q (Tom Dinwoodie): When are we going to start public outreach to get people on board? e.g. someone going out and convincing people on what the program is and how they have to comply. Are there neighborhood meetings set up?

    i. Hicham ElTal: MIUGSA will be showing its stakeholder committee a detailed outreach program schedule soon.

    ii. Greg Young: The MSGSA is working on scheduling outreach with a focus on allocations.

m. Q (Parry Klassen): Are the GSAs tracking wells that are going or beginning to go dry as part of County responsibility? Reason for ask: in the Modesto/Turlock basin with the Valley Water management zone, people are starting to call about dry wells. They are sending them to Self-Help Enterprises (SHE) as part of a state grant program. A: Same program exists in Merced County.

n. Q (Simon Vander Woude): When do we find out if DWR approves the GSP? A: DWR has 6 months to review and make a determination.

o. Q (Tom Dinwoodie): What's the sequence for additional rounds of edits? A: There is no additional response or back and forth – this is the last chance for edits.

7. Reports

a. <u>GSA Reports</u>

    i. *Merced Subbasin GSA*. Adriel Ramirez shared that MSGSA likely will have its next Board meeting to adopt the GSP on July 19. The Prop 218 hearing will also be held on July 19 and all information is on their website: https://mercedsubbasingsa.org/proposition-218-landowner-fee-ii/

    ii. *MIUGSA*. Matt Beaman shared that MIUGSA doesn't have significant policy updates to share. Two ongoing projects with updates include:

        1. Received input from project proponents and submitted draft grant agreement edits to DWR (for the most recent grant agreement for Round 1 Planning-Implementation).

2. Regarding the pilot recharge project in Planada where it turned out that site soils were not good for traditional recharge – it was previously determined that it would be possible to pilot a dry well project. The water quality requirements and permitting are stringent, but MID has made good headway on this. Haven't gotten an official approval, but think it's very close. Merced County permits will be submitted soon. MID thinks the project will be installed in the next few months.
    a. Hicham Eltal shared that he hopes that this will be a good example project for individual farms.
    b. Q (Brad Samuelson): Are you filtering the recharge water? A: No, but it's screened. It is not pressurized (gravity fed). Recharging at approximately 50 ft and 100 ft.
    c. Q (Parry Klassen): Has RWQCB weighed in? A: Yes, working with the Fresno office. If this is not runoff from a farm, then it's easier to permit. Since it's coming from Merced River, it's more straightforward. Will also have to work with Division of Drinking Water.
    d. Comment (Brad Samuelson): Might be able to utilize the Governor's Executive Order to facilitate easier permitting. Response from MIUGSA: have submitted several NOAs for the project.
    e. Q (Simon Vander Woude): Is this flood water? A: It's in-district.

iii. *TIWD GSA #1*. No major updates to provide; discussions have been ongoing around the GSP edits. After July 2022, plan to get running on several projects that have been discussed for a while.

8. Next steps and adjourn

a. Comment (Parry Klassen): In the middle of September 2022, Parry will be resigning from ESJWQC to go work on nitrate control program management zones and a nonprofit. This is last meeting for Parry, but expects another ESJWQC member to take his place.

b. Meeting adjourned at 2:35 pm.

Next Regular Meeting
TBD, likely October 2022
Information also available online at mercedsgma.org

MEETING NOTES – Merced GSP

SUBJECT: Merced GSP Coordination Committee Meeting

DATE/TIME: October 19, 2022, 1:00 PM to 3:00 PM

LOCATION: Hybrid meeting with physical location at Merced Irrigation District, Franklin Yard Facility, 3321 North Franklin Road, Merced, CA 95348 and online via Zoom

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Coordination Committee Members in Attendance:

	Representative	GSA
☒	Hicham ElTal	Merced Irrigation-Urban GSA
☐	Stephanie Dietz	Merced Irrigation-Urban GSA
☒	Justin Vinson	Merced Irrigation-Urban GSA
☐	Daniel Chavez	Merced Irrigation-Urban GSA
☒	Ken Elwin (alternate)	Merced Irrigation-Urban GSA
☒	Eric Swenson	Merced Subbasin GSA
☒	Mike Gallo	Merced Subbasin GSA
☐	Nic Marchini	Merced Subbasin GSA
☒	George Park (alternate)	Merced Subbasin GSA
☒	Kel Mitchel	Turner Island Water District GSA #1
☐	Tim Allan (alternate)	Turner Island Water District GSA #1

Meeting Notes

1. Call to Order and Welcome

a. Jim Blanke (Woodard & Curran [W&C]) called the meeting to order at 1:05 pm.

2. Roll Call

a. Coordination Committee members in attendance are shown in table above.

3. State of Emergency Teleconference Findings

a. The Coordination Committee considered the circumstances of the State of Emergency and determine whether to make the findings that any of the circumstances exist per AB 361: that the State of Emergency continues to directly impact the ability of the members to meet safely in person and/or State or Local Officials continue to impose or recommend measures to promote social distancing.

b. Action: Motion made (Swenson), seconded (Gallo), and carried

4. Approval of June 27, 2022 Meeting Minutes

a. Action: Motion made (Mitchel), seconded (Gallo), and carried

5. Public Comment

a. None received.

6. Reports

a. <u>GSA Reports</u>

i. *Merced Subbasin GSA*. Adriel Ramirez (MSGSA) shared that since the last 6/27 CC meeting, the GSA has:

- Developed and established its phase 1 land repurposing program to reduce consumptive use of groundwater by 15,000 AFY no later than 2025. The application period closes 11/15 (recently extended by the GSA Board). 2 public workshops have been held about the program and mailers have been sent to all eligible landowners. Materials can be found on the GSA's website: https://mercedsubbasingsa.org/. Also, the GSA has approved new fees (through a Proposition 218 process) to fund programming.
- The Board has also approved principles to support allocation and recharge credit frameworks, as well as other GSA activities.
- The Strategic Planning Ad-Hoc Committee is preparing an allocation and recharge credit framework that will be presented in November to the GSA Board.

ii. Q (Ken Elwin): What is the timespan for the 15,000 AF value? How will that be monitored? A: Resolution approved by Board is reduction of 15,000 AFY by water year (WY) 2025. It will be a recurring annual amount to be reached starting at the latest in WY 2025. Land repurposing program will be mechanism. ET will be used to help monitor. Requiring that any wells permitted under current executive order must be metered.

iii. *MIUGSA*. Matt Beaman shared that:

- MIUGSA Board adopted a groundwater allocation in May 2022 in line with the GSP's sustainable yield, in effect from Apr 2023 – Dec 2025, of an average 3.3 AF/ac. A newsletter was recently sent that summarizes this program.
- At the last meeting, the Board adopted a well registration policy, with different deadlines by well type. Public wells need to be registered by end of 2022. Next, wells serving parcels >10 ac need to register by April 1, 2023. Paper and electronic forms will be made available.
- MID Board approved making developed supply available to its growers, so MIUGSA will be at 4 meetings with MID in mid-November to talk about SGMA and using developed supply as a SGMA compliance tool.
- MIUGSA is evaluating creation of allocations for urban water agencies, about halfway through the process so far. Stakeholder Guidance Committee meetings are upcoming on this topic.

iv. Q (Mike Gallo): Are there any plans to bring in rural communities that have wells into the urban systems? State seems to be pushing this idea more and more. A: This has been happening individually when small systems ask. Example, Franklin Beechwood study to potentially connect to City of Merced. Also a discussion about Black Rascal.

v. Q (Mike Gallo): For property owners that don't have wells, will they be allowed to drill a well? From County standpoint, there's no problem as far as getting a permit to drill a new well? A: Yes, they are allowed. For MIUGSA, if new well owner sticks with allocation, then it should be OK.

vi. Q (Eric Swenson): Where do new well permit applications go? A: They always start with the County, then get routed to the appropriate GSA.

vii. Q (Eric Swenson): Is there a plan for monitoring extraction amounts in MIUGSA in line with the allocation? A: In the beginning, it'll be based on ET/remote sensing, and then meters will be installed (which will take time).

viii. Q (Lacey McBride): MSGSA is working on a recharge framework that will track recharge into the basin and how much a project takes out. How is MIUGSA tracking recharge or extraction for developed supply? A (Hicham ElTal): In the case of developed water, there will be metering.

ix. Q (Greg Young): Is there an accounting mechanism and where is this tracking information entered? How will pumping of native vs developed supply be determined? Desire to be consistent in tracking across subbasin. A (Hicham ElTal): It is going to take some time to develop and refine. There is a policy that will measure how water is measured and reported. There is a process for which developed water is tracked first. This will be described in detail at any of the planned mid-November MIUGSA/MID joint meetings.

x. Q (Mike Gallo): When is the developed supply going to be available to the growers? A (Hicham ElTal): Board made it available to MID growers retroactive to 2015. From here on, anyone can come in and ask for water. Except that first 1-2 years starting now will be a bit of iterative testing out and MID anticipates additional rules to account for issues that arise.

xi. *TIWD GSA #1*. Kel Mitchell updated that:

1. GSA Board meeting recently discussed logistics for implementing projects funded by the grant funding that is approved.
2. Briefly discussed allocations, but mostly about maintaining consistency with the other GSAs.

b. Current Basin Conditions

i. Matt Beaman (MIUGSA) presented three hydrographs from 2012 to present, one for each principal aquifer. He explained some of the challenges related to collection and interpretation of monthly data when studying trends (e.g. summer pumping impacts).

1. Comment (Eric Swenson): Some high points in water level measurements could be reflective of falling water in the well.
2. Q (Ken Elwin): Is there an SOP in place before taking the measurements? A: Definitely yes, but it can be hard to get accurate measurements when a regionally neighboring well is pumping.
3. Comment (Eric Swenson): Recommends that manually sounded measurements and pressure transducers measurements may need to be colored differently in future graphs if they are to be included.

7. Recap of the Groundwater Sustainability Plan July 2022 Update

a. Jim Blanke (W&C) shared a summary of the edits to the revised GSP that was resubmitted to DWR in July 2022, including sustainable management criteria updates and new management actions.

b. Comment (Eric Swenson): Note that MSGSA has a current funding allocation within the Prop 218 process for a domestic well mitigation program.

c. Jim Blanke (W&C) summarized three comment letters that have been received in response to the resubmitted GSP. These letters are part of DWR's process for them to consider as part of their review of the revised GSP.
d. Q (Ken Elwin): Are any letters a particular concern? A: Hard to say. NMFS and Leadership Counsel both provided letters previously on the original GSP submission, so theoretically would have been considered by DWR in their initial review and "incomplete" determination.

8. 5-Year GSP Evaluation Lookahead

a. Jim Blanke (W&C) described the requirements for completing a 5-year evaluation of the GSP, given that it was submitted 2.5 years ago.

9. Prop 68 Implementation Planning & Projects Grant Round 2 (due Nov 30, 2022)

a. Jim Blanke (W&C) described the recently released grant application.
b. ***Note that the Merced Subbasin is eligible for up to $20 million in grant funding, not the amount reduced by funding received in round 1, as described in the meeting.***
c. Hicham ElTal (MIUGSA) shared some additional potential projects for grant application that are relatively inexpensive and could be combined and or regionalized:
    i. Empower MID growers to use surface water rights to recharge and do their own budgeting. Example of piloting a 20 acre property with a 1 acre recharge basin.
    ii. Another round of dry wells.
    iii. For owners with flood irrigation facilities, still use drip or irrigation, but in wet year do flooding and some measurement.
    iv. Those who rotate crops (typically sweet potato farmers), mostly sandy, do some other projects during fallow periods.
d. Matt Beaman (MIUGSA) described a metering project whereby well owners would install meters on wells. Project will also involve some standards development and piloting of telemetry (e.g. cellular or low frequency radio).
    i. Q (Adriel Ramirez): Where will you house metered data? Asks because other applicants have included administrative projects, so might be potential for GSAs to collaborate on a portal tool with this grant. A (Hicham ElTal): Working through a separate grant to develop a water accounting platform. Kern County, Sacramento Valley, and others are involved in the development, including both surface water/groundwater and only groundwater users covering a variety of priorities/needs. Might be able to bring MSGSA onboard relatively soon once it's built out a little more. It's same platform as Rosedale/Rio Bravo's water banking system based on OpenET data.
    ii. Comment (Eric Swenson): Might be good to obtain grant funding to study what would be the lowest cost radio network vs cellular to implement across a large area, e.g. a pilot program.
        1. Hicham ElTal: Matt is looking at both a local network and cellular or hybrid systems.
        2. Matt Beaman heard through East Turlock that DWR is encouraging applicants to apply for a full $20M, but giving offramps later, which provides some flexibility for applicants in preparing their suite of grant request projects.
e. Coordination Committee members confirmed they want to pursue this round 2 grant opportunity.

f. Jim Blanke (W&C) shared that project proponents need to provide scope, budget, schedule for each project as part of the application.
g. The Coordination Committee decided that representatives from each GSA will compiled potential projects by end of day Tuesday 10/25; each GSA should compile these lists and send them to Woodard & Curran.
h. Comment (Mike Gallo): Money for La Paloma received in Round 1 is short of the total need, could be part of Round 2. Hicham was in support of including this.
i. Comment (Lacey McBride): Lone Tree MWC is very interested in revisiting the Deadman Creek Canal project initially cut from Round 1 application.
j. Comment (Kel Mitchel): The TIWD GSA-#1 Board discussed potential projects to include in Round 2 application, but not positive as of today what that would be; interested in supporting unfunded projects from other GSAs in Round 1 first.

10. Contract Amendment with W&C for Preparation of WY 2022 Annual Report, Meeting Support, and an Optional Task for Preparation of the Prop 68 Implementation Planning & Projects Grant Round 2 Application

a. Jim Blanke (W&C) briefly described a proposal for additional support from Woodard & Curran over the next year.
b. Q (Eric Swenson): If there are more than 6 projects for Round 2 application, how does the cost change? A: Depends on the level of coordination needed (e.g. support in preparing additional materials vs having them fully compiled by project proponent)
c. Hicham ElTal: Request that W&C look at other venues for grants, e.g. NRCS for dry wells for growers. Might want to invite Scott from NRCS to talk about grant programs at next meeting. Look at project scoring criteria for 2023.
d. Q (Eric Swenson): When does this scope of work need to be approved? A: Ideally as soon as possible. MIUGSA can ask for a resolution via a special board meeting. Regular meeting is 11/9. Other GSAs would need to approve as well.

11. Ongoing and Upcoming Activities

a. Grant Updates - Matt Beaman (MIUGSA) shared that:
    i. MIUGSA signed the grant agreement last week for Prop 68 Implementation Planning & Projects Grant Round 1 (Jun 2022 – Jun 2025)
    ii. For the SDAC Grant, water was put into the dry wells in Planada recently. Data is being collected.
b. Evapotranspiration tools & methodologies update – Jim Blanke (W&C) provided a brief update on goals for collaboration of evapotranspiration tools within the subbasin.
c. Lessons learned from Madera and Chowchilla Subbasins – Greg Young (MSGSA) shared about ongoing activities and coordination in these two subbasins.
    i. Q (Hicham ElTal) For satellite imagery related to ET analysis – what is the next step? A: Only entity using any remote sensing is Madera County GSA in both subbasins. Other GSAs do not have any remote sensing tools employed. Example item currently being looked into is irrigation after harvest and impacts on ET signatures in Nov/Dec. IrriWatch is doing some refinement to their process to address questions that are coming up. Madera County GSA recognizes importance of remote sensing as a tool moving forward, and is working to move forward toward wider acceptance as a tool.

ii. Q (Hicham ElTal): Are they going to continue with using IrriWatch? A: There's still 3 years on the existing contract, lots of ongoing discussion, might bring in another third party as a comparison.

iii. Comment (Hicham ElTal): As we move forward, will share with CC what MIUGSA learns (moving forward with ET tools with consultant Olsson).

d. Water quality data sampling coordination

i. Jim Blanke (W&C) shared an update on anticipated ongoing coordination with ESJWQC on water quality data, including potential use of annual EC measurements to estimate TDS in future years.

e. DWR Flood-MAR Project

i. Hicham ElTal (MIUGSA) shared about a push from Governor's office to DWR to demonstrate streamlined Flood-MAR permitting and implementation process via example; DWR selected Merced to be this demonstration. MID has selected Mariposa & Owens Creeks watersheds for this work as opposed to some other options. The MID El Nido canal can also take water and release it to Deadman Creek or deliver directly to irrigators.

1. Has been difficult to coordinate locally, but benefited by DWR oversight and funding.

2. Latest plan with DWR is to try to get permit in November and start diversions if there are any storms starting in December. Lots of coordination happening in very short time (e.g. new meters in key spots).

ii. Q (Mike Gallo): How do you determine if allowed to take water out of not? A: Have historical trend by day for comparison to real-time measurements.

iii. Q (Eric Swenson): Who will the water master overseer? A: Not sure, won't be MID. Leaning on the local agencies.

12. Next steps and adjourn

a. Meeting adjourned at 3:02 pm.

Next Regular Meeting
TBD – expected January 2023
Information also available online at mercedsgma.org

MEETING NOTES – Merced GSP

SUBJECT: Merced GSP Coordination Committee Meeting

DATE/TIME: November 8, 2022, 2:00 PM to 3:00 PM

LOCATION: Online via Zoom

Coordination Committee Members in Attendance:

	Representative	GSA
☒	Hicham ElTal	Merced Irrigation-Urban GSA
☐	Stephanie Dietz	Merced Irrigation-Urban GSA
☐	Justin Vinson	Merced Irrigation-Urban GSA
☐	Daniel Chavez	Merced Irrigation-Urban GSA
☐	Ken Elwin (alternate)	Merced Irrigation-Urban GSA
☒	Eric Swenson	Merced Subbasin GSA
☒	Mike Gallo	Merced Subbasin GSA
☒	Nic Marchini	Merced Subbasin GSA
☐	George Park (alternate)	Merced Subbasin GSA
☐	Kel Mitchel	Turner Island Water District GSA #1
☐	Tim Allan (alternate)	Turner Island Water District GSA #1

Meeting Notes

1. Call to Order and Welcome

a. ***Coordination Committee members in attendance did not form a quorum, so the Coordination Committee meeting was not formally called to order.*** Chris Hewes (Woodard & Curran [W&C]) started the informal meeting at 2:05 pm. Agenda items 2 and 3 were skipped.

2. Roll Call

a. Agenda items 2 and 3 were skipped.

3. State of Emergency Teleconference Findings

a. Agenda items 2 and 3 were skipped.

4. Public Comment

a. None received.

5. Prop 68 Implementation Planning & Projects Grant Round 2 Application

a. Liz DaBramo (W&C) described the grant application and ran through summaries of each of the projects that have been submitted by project proponents to Woodard & Curran. She also presented the aggregate project ranking by Coordination Committee members (provided via Survey Monkey prior to the meeting) that will be used to indicate order of local preference for project funding if DWR is unable to fund the total request.

b. Meeting attendees discussed and decided to:

    i. Remove the relatively lower ranked "Merced ID Howard McCoy Regulating/ Recharge Reservoir and Well Site (Implementation)" project from the application entirely.
    ii. Modify the "MIUGSA Well Registration and Extraction Measurement Program (Implementation)" project to install up to 400 flow meters on production wells (up from 100), with a corresponding increase in budget at least partially offset from the removed Howard McCoy project.
    iii. Set aside $200,000 for grant administration; previously only $100,000 was reserved for the Round 1 application and Matt Beaman (MIUGSA) thinks the level of effort for this administration is generally higher than $100,000.
    iv. Hicham ElTal (MIUGSA) will work with the urban agencies to see if it's possible to identify an additional urban project to include as part of the grant application (by 11/11) within the remaining potential funds to bring the total grant application amount to $20M.
        1. Meeting attendees agreed with this proposal, with an understanding that the new proposed project will be populated in the same ranked order placement as the removed Howard McCoy Regulating/Recharge Reservoir and Well Site project.
        2. If a suitable urban project cannot be identified, Hicham was OK with leaving some additional funds on the table, given the need to have a strong aggregated application. Alternatively, MIUGSA may be able to add one more pilot project to the "MIUGSA Pilot, Small-Scale Recharge Projects (Planning)".
c. GSA staff discussed splitting the cost to prepare the application based on the share of dollars requested by each GSA in the grant application, rather than via the cost share in the GSA MOU. This is similar to previous grant application preparation efforts.

6. Next steps and adjourn

a. The informal meeting ended at approximately 2:45pm.

Next Regular Meeting
TBD – expected January 2023
Information also available online at mercedsgma.org

MEETING MINUTES – Merced GSP Stakeholder Advisory Committee

SUBJECT: Stakeholder Advisory Committee Meeting
DATE/TIME: January 31, 2022, 1:00 to 3:00 PM
LOCATION: Zoom Virtual Meeting

Stakeholder Committee Members in Attendance:

	Representative	Community Aspect Representation
☐	Arlan Thomas	MIDAC member
☒	Ben Migliazzo (alternate)	MIDAC member
☒	Bob Kelley	Stevinson Representative
☐	Blake Nervino	Stevinson/Merquin
☒	Breanne Ramos	MCFB
☐	Craig Arnold	Arnold Farms
☒	Darren Olguin	Resident of Merced County
☒	Dave Serrano	Serrano Farms - Le Grand
☐	David Belt	Foster Farms
☐	Emma Reyes	Martin Reyes Farm/Land Leveling
☐	Greg Olzack	Atwater Resident
☒	Jean Okuye	E Merced RCD
☐	Joe Sansoni	Sansoni Farms/MCFB
☒	Joe Scoto	Scoto Brothers/McSwain School Dist.
☐	Jose Moran	Livingston City Council
☒	Lacy Carothers	Cal Am Water
☒	Lisa Baker	Clayton Water District
☒	Lisa Kayser-Grant	Sierra Club
☒	Mark Maxwell	UC Merced
☒	Maxwell Norton	Unincorporated area
☒	Nav Athwal	TriNut Farms
☒	Olivia Gomez	Community of Planada
☒	Nataly Escobedo Garcia (alternate)	Leadership Counsel
☒	Parry Klassen	ESJWQC
☒	Darcy Brown	River Partners
☐	Rick Drayer	Merced/Mariposa Cattlemen
☐	Robert Weimer	Weimer Farms
☒	Simon Vander Woude	Sandy Mush MWC
☒	Susan Walsh	City of Merced
☐	Bill Spriggs (alternate)	Merced resident
☐	Thomas Dinwoodie	Master Gardener/McSwain
☒	Trevor Hutton	Valley Land Alliance
☒	Wes Myers	Merced Grassland Coalition
☐	Lou Myers (alternate)	Benjamin Land LP

Meeting Minutes

1. Call to Order and Welcome
    a. Charles Gardiner (Catalyst) welcomed the group.
2. Introductions and Roll Call
    a. Charles Gardiner (Catalyst) reviewed the agenda and meeting guidelines, conducted roll call, and reminded attendees that past meeting materials are available online at mercedsgma.org.
3. SGMA Implementation Grant Application
    a. Jim Blanke (Woodard & Curran) provided an overview of the existing projects and new projects considered, the project selection approach, application status, and next steps.
        i. $171 million is available in Round 1 grant funding and is not competitive between basins; therefore, funding will be split evenly between critically overdrafted basins, including Merced, at $7.6 million per basin. The $7.6 million may be reduced depending on the types of projects submitted in the San Joaquin Valley, due to complexities of DWR's funding sources.
            1. Round 2 is expected in 2023 and will be open to all medium and high priority basins not receiving money in Round 1.
        ii. Merced is considering 18 existing and new projects, including 11 storage and recharge projects and 7 interties and monitoring/management projects.
            1. Amsterdam Water District Surface Water Conveyance and Recharge Project
            2. Buchanan Hollow Mutual Water Company Floodwater Recharge Project
            3. Crocker Dam Modification (GSP Project 31)
            4. Deadman Creek Canal Off Stream Storage and Recharge
            5. G Ranch Groundwater Recharge, Habitat Enhancement & Floodplain Expansion Project - Planning
            6. G Ranch Groundwater Recharge, Habitat Enhancement & Floodplain Expansion Project - Implementation
            7. Purdy Project (East Pike Recharge Basin) (Project No. 37)
            8. Purdy Project (E. Purdy, W. Purdy, and Kevin Recharge Basins) (Project No. 38)
            9. Tri City's Water Recharge/Underground Storage Feasibility
            10. Vander Dussen Subsidence Priority Area Flood-MAR Project
            11. Vander Woude Storage Reservoir
            12. Filling Data Gaps Identified in Data Gaps Plan
            13. LeGrand-Athlone Water District Intertie Canal - Phase 2
            14. Merced Water Resources Model Enhancement
            15. Merquin County Water District Sustainable Yield Management Plan and Plan Implementation
            16. MIUGSA Groundwater Extraction Measurement Program
            17. Turner Island Water District (TIWD) Water Conservation
            18. TIWD Shallow Well Drilling
        iii. The funds requested by the 18 projects total approximately $27.4 million. In order to select the projects that will be submitted within the application to DWR, each project will be scored using 10 evaluation criteria defined by the state.
            1. Projects are currently being scored by the Coordination Committee, which will be compiled into a ranking.
            2. Modifications to the final rankings may be recommended by the SAC.

a. Modifications should "document and justify why a lower scoring project was included within the Spending Plan versus a higher scoring project." (from the grant's Proposal Solicitation Package)
b. Several factors may drive modifications, including:
    i. Feasibility (water rights, realistic recharge potential, project proponent ability to provide materials and meet grant requirements)
    ii. Location (subsidence, areas with declining groundwater, areas surrounded by domestic wells, priority areas according to the sustainability indicators, GSAs / geographic distribution)
    iii. Others as deemed important by the subbasin

3. GSA staff will review the scores and make recommendations, if any, to address specific, justifiable needs.
4. Lastly, the Coordination Committee will receive the aggregated scores and recommended modifications, and identify projects for submittal as part of the grant application due on February 28. Projects not selected will be retained for future funding opportunities.

b. SAC discussion
    i. Parry Klassen: If everything goes according to plan, when can we expect these projects to be implemented?
        1. Simon Vander Woude: Our project is designed and ready for construction within the next year.
        2. Bob Kelley: Our project is in environmental permitting phase.
        3. Matt Beaman: Our project is undergoing review and design; construction likely in next three years.
        4. Jim Blanke: Generally, implementation projects will be required to be completed in the next three years to utilize grant funding.
    ii. Charles Gardiner: SAC, are these appropriate projects? Are there other projects that should be added for future consideration?
        1. Susan Walsh: Is the scoring rubric based on state or local priorities? How can we balance state and county priorities in funding?
            a. Jim Blanke: Scoring criteria are set by the state. As long as projects are eligible for funding, the basin is given freedom to select projects that are deemed most beneficial.
            b. Matt Beaman: State gave initial preference to select project types (including geotechnical, floodplain enhancement, etc.), but the list of eligible project types is extensive and includes the projects presented today.
    iii. Susan Walsh: Are 'Underrepresented Communities', 'Small Water Systems', and 'Human Right to Water' terms defined by the state?
        1. Jim Blanke: Yes, there are definitions for each of these terms provided by the state in the grant Proposal Solicitation Package and Guidelines. For example, Underrepresented Communities are mapped by the state using census tract and community boundaries.
    iv. Jim Blanke: SAC, what criteria are reasonable for changing rankings or modifying funding amounts?
        1. Dave Serrano: Will projects in the northern and northeastern portions of the basin be ranked high due to groundwater aquifers flowing to the rest of the basin?

    a. Jim Blanke: Groundwater flow could be considered as part of potential modifications to scores if desired.
2. Jean Okuye: Can we prioritize projects where recharge could get into the aquifer the fastest and those that benefit underrepresented communities and small water systems? Could we explore other projects to more quickly inject water into aquifers?
    a. Jim Blanke: While there are not any active injection projects under consideration for this grant proposal, there are some similar projects being explored by TIWD and MID. The application gives higher scores to projects that benefit underrepresented communities and small water systems.
3. Darcy Brown: River Partners has worked with Rosemary Knight at Stanford in other basins and data provided by her lab team has been very insightful. Similar geophysical investigations in Merced could be a great addition to this slate of projects.
4. Parry Klassen: Noted that surface water injections may exceed strict drinking water quality standards and, after a few years, well casings can become blocked with biological and mineral accumulation.
5. Maxwell Norton: Be sure to consider, from an engineering perspective, that projects are feasible, not just desirable.
6. Reyn Akiona: Of the $7.6 million, are some projects required to address a few specific criteria (geophysical investigations, groundwater recharge, and floodplain expansion)?
    a. Jim Blanke: When the draft PSP was released, that was a requirement, but the requirements have since been made more broad and such requirements are no longer basin-specific.
7. Maxwell Norton: How realistic is it for the state to grant water rights to the projects?
    a. Matt Beaman: MID and other parties applied for a floodwater right at the end of 2019, but the SWRCB has not yet accepted the application. MID expects to hear somewhat soon, but timeline will depend on drought curtailment activities.
8. Lisa Kayser-Grant: When looking at the TIWD diversion proposal, will there be any impact or assessment of impact to westside seasonal wetlands? If rights are given to stormwater, how will that impact wetlands in the future? Want to ensure that health of wetlands is being considered.
    a. Kel Mitchel: TIWD has no intention of applying for stream diversion applications. As it stands, the project simply manages the TIWD's existing resources.
9. Trevor Hutton: Does any of the scoring take into account the possibility of continued drought? Which projects will be most effective in that case? I keep hearing mention of "wet years", but wet years may well be rarer in the near future.
    a. Jim Blanke: Scoring criteria provided by state doesn't consider duration of drought, but we can add that to list of potential modifications to rankings, if desired.

4. DWR GSP Comments
    a. Jim Blanke (Woodard & Curran) provided an update on DWR comments on the GSP and requested that SAC Representatives review the final determination letter ahead of the next meeting when potential solutions will be presented.
        i. The GSP was developed in a collaborative stakeholder environment, completed in November 2019, adopted in January 2020, and is currently being implemented.
        ii. Initial comments from DWR were provided in a consultation letter dates November 2021 and a final determination was released on January 28, 2022. The final determination identifies three potential deficiencies and potential corrective actions.
        iii. The three deficiencies were summarized.
        iv. The GSAs held a meeting with DWR staff on January 10, 2022 to discuss the potential deficiencies and pathways to approval. A technical team is currently evaluating new data and approaches to respond to the comments, focused on groundwater level thresholds and subsidence, and drafting approaches to be developed and shared with CC and SAC.
            1. Likely endpoint will be an updated version, with redline, for all or certain portions of the GSP that will be adopted by GSAs by late July 2022.
    b. SAC discussion
        i. Bob Kelley: Has the GSAs looked at the other studies cited by DWR regarding minimum thresholds?
            1. Jim Blanke: The GSAs are in the process of reviewing these studies and will incorporate relevant findings as necessary when revisiting the sustainable management criteria.
        ii. Susan Walsh: Finds the language posed by the state challenging; wants to thank those who thoughtfully worked on the GSP, including the SAC. It can be difficult to interpret the criticism provided by the state.
        iii. Bob Kelley: Seems that the most difficult deficiency to address will be subsidence, especially as it continues. In absence of other information, the state suggests zero subsidence, which will be a challenge to achieve without immediately addressing sub-Corcoran pumping.

5. Drought Update
    a. Jim Blanke (Woodard & Curran) provided an update on the drought.
        i. The Merced subbasin is still in a severe drought, but precipitation is slightly above the 1991-2020 average for the water year. Forecast is for continued dry conditions, however.
        ii. Self-Help Enterprises and the California Partnership for the San Joaquin Valley developed a map (https://arcg.is/WqOGD) of tanked water locations in the San Joaquin Valley.
    b. SAC discussion
        i. Maxwell Norton: There appears to be less tanked water locations than last year, maybe suggests that some wells have been drilled deeper?
            1. Lacey McBride: Between November and this meeting, no new tanked water participants were added in Merced County. Self-Help is now receiving applications to fund drilling of deeper wells.

6. GSA Reports
    a. Jim Blanke (Woodard & Curran) provided a brief overview of the 12/21/21 Coordination Committee (CC) meeting:

i. Focused on identifying projects to consider for inclusion in the SGM grant application and on the scoring process.

b. Lacey McBride provided an update for the Merced Subbasin GSA:
    i. The GSA has been working on Phase 1 of their two-phase GSP implementation, which seeks to achieve reductions in groundwater consumption.
        1. Phase 1 focuses on land repurposing and fallowing. The GSA is working through elements of the program to eventually achieve 15,000 AF annually in groundwater reduction.
        2. A public workshop was held in November 2021 to kick off Phase 1 of the implementation approach.
        3. Proposition 218 will be used to fund Phase 1. The target date for a public hearing and election is summer 2022 and a subcommittee is currently making recommendations for the fee structure.
            a. Next meeting is February 10, both virtual and in-person
    ii. The GSA is also developing a well consistency determination policy to address potential changes from the County of Merced Department of Environmental Health, which would require GSAs to ensure that wells are consistent with the goals of the GSP.
c. Matt Beaman provided an update for the Merced Irrigation-Urban GSA:
    i. The GSA has been holding several stakeholder guidance committee meetings to discuss agricultural reductions. At this point, no allocation volume has been set, but stakeholders are expressing a desire for high certainty (e.g., low allocation) while still providing some flexibility. The GSA is currently considering the stakeholder committee's feedback and preparing a recommendations document that will be presented at a meeting in March.
d. Kel Mitchel provided an update for the Turner Island Water District GSA #1:
    i. The GSA is currently preparing for the for 2022 irrigation season. Most recent work pertains to the water conservation project (discussed today), which is emblematic of what TIWD wants to achieve moving forward. Both the GSA Board and staff are working closely with other GSAs on collective plans to achieve these goals.
e. SAC discussion
    i. None.

7. Public Comment
    a. None.
8. Next steps and adjourn
    a. Meeting was adjourned at 2:56 PM.

Next Regular Meeting
TBD March 2022

Meeting to be conducted virtually (subject to change)
Information also available online at mercedsgma.org

MEETING MINUTES – Merced GSP Stakeholder Advisory Committee

SUBJECT: Stakeholder Advisory Committee Meeting

DATE/TIME: March 21, 2022, 1:00 to 3:00 PM

LOCATION: Hybrid meeting with physical location at Merced Irrigation District, Franklin Yard Facility, 3321 North Franklin Road, Merced, CA 95348 and online via Zoom

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Stakeholder Committee Members in Attendance:

	Representative	Community Aspect Representation
☒	Arlan Thomas	MIDAC member
☒	Ben Migliazzo (alternate)	MIDAC member
☐	Bob Kelley	Stevinson Representative
☐	Blake Nervino	Stevinson/Merquin
☒	Breanne Ramos	MCFB
☐	Craig Arnold	Arnold Farms
☐	Darren Olguin	Resident of Merced County
☒	Dave Serrano	Serrano Farms - Le Grand
☐	David Belt	Foster Farms
☐	Emma Reyes	Martin Reyes Farm/Land Leveling
☐	Greg Olzack	Atwater Resident
☒	Jean Okuye	E Merced RCD
☐	Joe Sansoni	Sansoni Farms/MCFB
☒	Joe Scoto	Scoto Brothers/McSwain School Dist.
☐	Jose Moran	Livingston City Council
☒	Lacy Carothers	Cal Am Water
☐	Lisa Baker	Clayton Water District
☒	Lisa Kayser-Grant	Sierra Club
☐	Mark Maxwell	UC Merced
☒	Maxwell Norton	Unincorporated area
☒	Nav Athwal	TriNut Farms
☐	Olivia Gomez	Community of Planada
☐	Nataly Escobedo Garcia (alternate)	Leadership Counsel
☐	Parry Klassen	ESJWQC
☐	Darcy Brown	River Partners
☐	Rick Drayer	Merced/Mariposa Cattlemen
☐	Robert Weimer	Weimer Farms
☒	Simon Vander Woude	Sandy Mush MWC
☒	Susan Walsh	City of Merced
☐	Bill Spriggs (alternate)	Merced resident
☒	Thomas Dinwoodie	Master Gardener/McSwain
☒	Trevor Hutton	Valley Land Alliance
☒	Wes Myers	Merced Grassland Coalition
☐	Lou Myers (alternate)	Benjamin Land LP

Meeting Minutes

1. Call to Order and Welcome
    a. Charles Gardiner (Catalyst) welcomed the group.
2. Introductions and Roll Call
    a. Charles Gardiner (Catalyst) reviewed the agenda and meeting guidelines, conducted roll call, and reminded attendees that past meeting materials are available online at mercedsgma.org. Attendees were also reminded that we're planning to meet again in April, May, and June.
3. Grants Updates
    a. SGM Implementation Planning and Projects Grant Update
        i. Jim Blanke (Woodard & Curran [W&C]) described the completed grant application and shared that DWR has recently approved the $7.6 million of requested project funding.
        ii. Q: How soon will grant agreements be in place? A: Likely a few months.
    b. Prop 68 Round 3 Planning
        i. Lacey McBride (MSGSA) shared that staff-level conversations have been occurring on the second phase of the Data Gaps Plan to fund 2 shallow or 1 deep well, plus some other activities to incorporate existing wells. Surrounding subbasins are also using Technical Support Services funding available from DWR and the Merced GSAs plan to make use of this funding as well. There's a running list of wells to be considered and conversations are continuing.
        ii. Jim Blanke (W&C) shared that the Remote Sensing Decision Support Tool is ongoing, largely based on what kind of data is available. Time has been spent looking for accurate and cost-effective data. OpenET has been the latest focus, but the data is not quite available yet, though a preliminary copy has been obtained for initial review.
            1. The Committee discussed CIMIS stations vs meters vs remote sensing.
            2. Madeline Harris (Leadership Counsel) provided comments and asked a question:
                a. Leadership Counsel has doubts about accuracy of remotely sensed evapotranspiration (ET) data. Strongly recommends basinwide metering. ET is OK to use as validation, but not primary source of measurement.
                b. Q: What is the timeline for the GSAs to start measuring GW use? A: Waiting for OpenET dataset finalization in next few months. Tool will be wrapped up by October 2022.
    c. 2020 SGM Implementation Grant
        i. Matt Beaman (Merced Irrigation District [MID]) shared the latest information on the two funded projects, both of which are in progress and on track (Le Grand-Athlone Water District [LGAWD] Intertie and Recharge Project & El Nido Conveyance System Improvements).
        ii. Comment (Dave Serrano) : Complications with LGAWD project. At a meeting held last Thursday, the Proposition 218 election was discussed which is coming up at end of March 2022. There is a land classification issue that has been noted where some parcels aren't registered in the right land use category.
    d. SDAC Grant

i. Matt Beaman (MID) provided an update on a 2019 grant agreement covering three projects serving underrepresented communities.

1. Q: What is the result/action coming out of the Meadowbrook Study? A: The study does not prescribe any particular recommendation option.
2. Q: Based on the Meadowbrook Study, what about wastewater treatment for agriculture or recharge? A: Hasn't been talked about yet. Lacey Carothers (Cal Am) shared that she's interested in talking about it more offline.
3. Q (Susan Walsh): Is the plan for Planada now to put in dry wells instead of a recharge basin? A: Yes. Matt Beaman provided some more technical information about the results of the recharge tests done at the site and the follow-up decision-making.
4. Q (Susan Walsh): For LGAWD, would City of Atwater or City of Merced need to vote? Are there potential political complications? A: MID is not one of those agencies, but shared that the intent of the study was to assess feasibility of intertie connection(s) for emergency and drought purposes. The grant funding only covered the feasibility study.

4. Water Year 2021 Annual Report

a. Chris Hewes (W&C) provided key highlights from the recently drafted WY 2021 Annual Report that will be submitted to DWR by April 1.

i. Comment (Arlan Thomas): The sub-Corcoran subsidence area has always been a problem.

1. Response: Yes, it may always have been a problem, but the question here is if it is better or worse than last year.

ii. Q: What are the estimated data points on the groundwater level change maps? A: These represent where Fall 2020, Fall 2021, or both were not recorded (or had a quality control issue noted), and an estimate was made based on historical and surrounding trends. It is anticipated that future mapping will require fewer estimates with better data collection.

iii. Q: Does DWR read and provide comments on the annual report? A: The reports are available for public comment on the SGMA data portal, but typically haven't received comments from public or DWR.

iv. Q: Will the Annual Report be on the website? Can it be emailed to the Committee? A: Yes, it will be published to Merced SGMA website and SGMA portal website. W&C will email a copy to the Committee once published.

5. Sustainable Management Criteria refresher

a. Jim Blanke (W&C) walked the Committee through a description of the SGMA terminology for sustainable management criteria, including minimum thresholds, undesirable results, measurable objectives, etc.

6. Comments on Groundwater Sustainability Plan by the Department of Water Resources

a. DWR comments overview

i. Jim Blanke (W&C) reviewed the three comments from DWR on the GSP which was determined "incomplete".

b. Groundwater levels

i. Jim Blanke (W&C) walked through some options that are being evaluated for different minimum thresholds, including (1) 2015 levels, (2) historical low, or (3) deeper of historical low or shallowest domestic well + 10 ft. He also described the pros and cons (challenges) of each potential option. It's challenging to know what DWR will accept. It's likely that all options are workable. There is more risk of disapproval by DWR with options 2 and 3, but they are harder to achieve.
ii. Comment (Arlan Thomas): 2015 groundwater levels are not achievable, even with several flood years.
iii. Public comment: "ET is incomplete, because it only measures evapo-transpiration, but would not measure water being sold out of area. ET also does not account for the water moving in the opposite direction, from soil to ground water because of plants. Cover-cropping, riparian buffers (native plants and trees bordering waterways), and trees all promote increased soil moisture, decrease rain water runoff and help carry water to the ground aquifers. Habitat restoration, and keeping cover crops on ag land (no bare soil) are necessary to restore water retention in both our soils and groundwater. This does not solve the abuse of the past decades but these practices do begin to address the issues we face with predicted, more severe and further spaced severe weather events such as droughts and precipitation."
iv. Q: When will you have extraction rates associated with each option? A: Next SAC meeting in April.
v. Q: Do we know what's happening in other areas of the Valley for these kinds of GSP comments? Are the methodologies similar or different for other basins? Can you give a quick rundown of how GSPs have been kicked back? A: North & South Yuba Subbasins and a few coastal aquifers have been approved but rest are not. The DWR comments have varied for other Central Valley GSPs. There is some level of coordination occurring between basins, but limited due to short timeframe to respond. Some interbasin coordination is occurring with subsidence.
vi. Q (Madeline Harris from Leadership Counsel): With the different options, such as #3 – is shallowest domestic well based on data available in 2015? Want the most protective option for drinking water. A: Updated domestic well data comes from the County and runs through December 2021.
vii. Q: When you get a permit to drill a well in Merced County, is other information recorded other than the construction depth? A: Information on the pump setting or water level after the well was constructed are not available in the permit record.
viii. Jim Blanke (W&C) provided an update on the domestic well analysis and other technical components related to the minimum threshold analysis. He also shared some options for managing Undesirable Results for groundwater levels and asked the SAC for their input on whether these are the right management considerations. Various questions and comments included:
    1. Q: Are there are areas where pumping levels aren't declining at the same rate? A: Likely yes, such as near rivers.
    2. A SAC member who is also a ranch owner shared that their ranch's Above Corcoran wells don't have much year-to-year variation in levels while Below Corcoran wells do have noticeable declines.
    3. This all seems to boil down to the need to reduce pumping and use more surface water.
    4. Group agreed that pumping reductions have to start ASAP with a sloping ramp down.

5. We may not ultimately know how much total pumping reduction is required until incremental reductions have been occurring for some time, like 10 years, and observations through time inform what the ultimate total should be.
6. If we make recharge projects viable, that mitigates a lot of the groundwater pumping reductions.
7. Waiting until 2040 is not an option.
8. 2024-2027 is too short of a time period for reduction implementations. Needs to be minimum 5 years of a ramping as long as it can be done without undesirable results.
    a. Others thought 5-year check-ins would be ideal over a 10 year ramp-down period.
    b. Ideal to get some results by 2035 for last GSP update before 2040.
    c. The Stakeholder Advisory Committee recommended faster cuts to hit goal by 2035 to be able to evaluate results before the Basin arrives at 2040.
9. Bay Area legislator is suggesting speeding up of SGMA implementation.
10. Recharge projects should be sooner than later and more the better.
11. Implementation of reductions in response to drought years – open to opportunities, but unsure how to evaluate against that given the number of variables.
12. Q: Have you looked at Madera for their ramp-down? A: A little, but not in great detail.

c. Subsidence
    i. Jim Blanke (W&C) shared information about the subsidence comment from DWR and some context for subsidence in the basin.
    ii. The group discussed about delayed subsidence occurring even after pumping reductions.
    iii. Comment: There is a hazard of setting the subsidence goal at 0 ft/yr: risk to have the SWRCB come in and take over control of the subbasin.
    iv. Q: Can the geographic discussion be brought into subsidence as well as for groundwater levels? And are there considerations for interbasin issues? A: Probably can't have a differing geographic area for minimum thresholds for subsidence, but SGMA does indicate that neighboring subbasins can't interfere with our ability to meet our sustainability goals.

d. Schedule
    i. Jim Blanke (W&C) described the schedule for incorporating edits into the GSP by end of July to address DWR's comments.
    ii. In April, W&C will be presenting some updated potential pumping reduction numbers to meet the different minimum threshold levels.
    iii. A request was made to focus on the topic of pumping reductions and not additional topics at the April SAC meeting.

7. GSA Reports
    a. Lacey McBride provided an update for the Merced Subbasin GSA:
        i. A land repurposing program is being developed (short-term 3-5 years) to achieve phase 1 goal that will be funded through a Proposition 218 effort. Public workshops will be coming up in the next several weeks.
        ii. MSGSA is looking to apply for Department of Conservation long-term 10+ year land repurposing funding.

iii. Lacey also provided an update on the well consistency policy that is being developed by the GSA.

b. Matt Beaman provided an update for the Merced Irrigation-Urban GSA: the MIUGSA stakeholder guidance committee met four times and has made recommendations for implementation of an allocation program, with a 1.1 AFY/ac that is averaged over a 3-year period, so that MIUGSA would allocated 3.3 AF/AC to be used over a 3 year allocation period.

c. Kel Mitchel did not have an update for the Turner Island Water District GSA #1.

d. SAC discussion

i. Q (Joe Scoto): Has there been any interest in voluntary land repurposing? A (Lacey McBride): While the Nov 2021 survey response was low, what was heard was that there was more interest in short-term programs for a portion of any individual parcel, which will also depend on the incentive provided by the GSA.

8. Public Comment

a. None.

9. Next steps and adjourn

a. Lacey McBride requested that the Stakeholder Advisory Committee meeting should be scheduled to occur before the Coordination Committee.

b. Meeting was adjourned at 3:17pm.

Next Regular Meeting
TBD in late April 2022

Meeting to be conducted hybrid (physical + virtual; subject to change)
Information also available online at mercedsgma.org

MEETING MINUTES – Merced GSP Stakeholder Advisory Committee

SUBJECT: Stakeholder Advisory Committee Meeting

DATE/TIME: April 25, 2022, 1:00 to 3:00 PM

LOCATION: Hybrid meeting with physical location at Merced Irrigation District, Franklin Yard Facility, 3321 North Franklin Road, Merced, CA 95348 and online via Zoom

Stakeholder Committee Members in Attendance:

	Representative	Community Aspect Representation
☒	Arlan Thomas	MIDAC member
☒	Ben Migliazzo (alternate)	MIDAC member
☐	Bob Kelley	Stevinson Representative
☐	Blake Nervino	Stevinson/Merquin
☐	Breanne Ramos	MCFB
☒	Craig Arnold	Arnold Farms
☐	Darren Olguin	Resident of Merced County
☒	Dave Serrano	Serrano Farms - Le Grand
☐	David Belt	Foster Farms
☐	Emma Reyes	Martin Reyes Farm/Land Leveling
☐	Greg Olzack	Atwater Resident
☒	Jean Okuye	E Merced RCD
☐	Joe Sansoni	Sansoni Farms/MCFB
☒	Joe Scoto	Scoto Brothers/McSwain School Dist.
☐	Jose Moran	Livingston City Council
☐	Lacy Carothers	Cal Am Water
☒	Lisa Baker	Clayton Water District
☒	Lisa Kayser-Grant	Sierra Club
☐	Mark Maxwell	UC Merced
☒	Maxwell Norton	Unincorporated area
☒	Nav Athwal	TriNut Farms
☒	Olivia Gomez	Community of Planada
☐	Nataly Escobedo Garcia (alternate)	Leadership Counsel
☒	Parry Klassen	ESJWQC
☐	Darcy Brown	River Partners
☐	Rick Drayer	Merced/Mariposa Cattlemen
☐	Robert Weimer	Weimer Farms
☒	Simon Vander Woude	Sandy Mush MWC
☒	Susan Walsh	City of Merced
☐	Bill Spriggs (alternate)	Merced resident
☒	Thomas Dinwoodie	Master Gardener/McSwain
☐	Trevor Hutton	Valley Land Alliance
☒	Wes Myers	Merced Grassland Coalition
☐	Lou Myers (alternate)	Benjamin Land LP

Meeting Minutes

1. Call to Order and Welcome
   a. Charles Gardiner (Catalyst) welcomed the group.
2. Introductions and Roll Call
   a. Charles Gardiner (Catalyst) reviewed the agenda and meeting guidelines, conducted roll call, and reminded attendees that past meeting materials are available online at mercedsgma.org.
   b. Jim Blanke (W&C) reminded the group that we are meeting again in May and June to stay up to date on the GSP update in response to DWR comments.

3. Potential Revisions to the Groundwater Sustainability Plan

   a. DWR comments overview
      i. Jim Blanke (W&C) reviewed the three comments from DWR on the GSP which was determined "incomplete". He also refreshed the group on SGMA terminology related to sustainable management criteria.
   b. Groundwater levels minimum threshold
      i. Jim Blanke (W&C) reminded the group about several options that have been evaluated for different minimum thresholds (MTs), including (1) 2015 levels, (2) historical low, (3) deeper of historical low or shallowest domestic well + 10 ft, or (4) a combination of #2 in the area of subsidence and #3 elsewhere in the Subbasin.
         1. Jim clarified that option 1 (2015 levels) is based on the year delineated by SGMA before which the basin is not responsible for responding to undesirable results (e.g. for conditions prior to 2015).
      ii. Q (Thomas Dinwoodie): Do you have depths for each of these three choices? Want to be able to put numbers to each of the depths. A: It varies for ~30 representative wells; we have the information and can share it, but it's not easy to show visually because of the variability throughout the Subbasin.
      iii. Q (Susan Walsh): Are the historical domestic well levels estimates? A: No, they are based on well permit records kept by Merced County.
      iv. Q (Thomas Dinwoodie): What do the colors on the map mean? A: The colors represent Above, Below, or Outside Corcoran Clay principal aquifer associated with each representative monitoring well.
      v. Q (Lisa Kayser-Grant): If a well went dry in 2015, are you removing them from the dataset? A: Not directly, no, as we don't have access to that level of information. If regional groundwater levels declined below the shallowest domestic well in a particular area, there is an assumption that it has been dewatered and the destruction was not recorded. The assumption is that shallowest domestic well has been replaced.
      vi. Comment (Lisa Kayser-Grant): If the GSP takes longer to finish updating and implement, does that mean groundwater levels can get deeper and the threshold can be deepened? That seems unreasonable as a process. For residential wells, it's not hard to figure out when they were replaced because they hook up to City water. Well destruction takes time but doesn't take time to have City water hookup and those records should be available.
      vii. Q (Nav Athwal): When you say options, what do you mean? Would all of these options pass muster with DWR? Why not choose the one that gives most flexibility? A: Generally shallower levels are more likely to be accepted, but we'll get into this in a little more detail in the next steps.
      viii. Q (Matt Beaman): Should we be comfortable with assigning a 5 mile radius laterally vs considering depth and location of principal aquifer? A: Shallow domestic wells completed within the Above Corcoran Clay tend to be located up

in the northwest of the Subbasin where there are more Above Corcoran Clay principal aquifer representative monitoring wells. There just aren't a lot of shallow domestic wells in the southern portion of the Subbasin. This can be something we look into a little more.

ix. Q (Kel Mitchel): For MT option 3's component of historical low, is it similar to the historical low used exclusively in option 2 where it could be a more recent Fall 2021 GWL? Would the measurable objective need to be revisited with MT options 1 and 2? A: It's the same historical low as option 2. The figure on the slide was just a schematic, but yes generally the MO would probably need to be revisited to make sure it's got some buffer above the MT.

x. Q (Thomas Dinwoodie): Would it be useful to share that domestic wells aren't located in the foothills in the GSP? A: Yes, that's a good idea to include percentage of map to confirm some numbers.

c. Jim Blanke (W&C) shared that we've expanded the domestic well search radius from 2 miles to 5 miles and included public water supply wells. He also shared that the GSAs are working on filling data gaps to add new representative wells, particularly in Merced Subbasin GSA.

   i. Q (Arlan Thomas): Doesn't that make the representative wells more general with an expanded representative area? A: Yes, to some extent. It's a tradeoff between including consideration of more domestic wells within that radius to be protective vs having values that represent a larger area and could be a little less meaningful.

d. Jim Blanke (W&C) expanded on some additional considerations incorporated into the latest round of modeling for ongoing/future subsidence, including no cumulative change in storage (to avoid additional subsidence) over the long term, as well as no cumulatively negative storage in any year (e.g. dry years). These criteria are generally more protective than the MTs that take into consideration groundwater levels only.

   i. Q (Lisa Kayser-Grant): It sounds like instead of reducing groundwater lost, criteria are being added that average it out over an area so subsidence may occur? A: We'll still be looking at the representative monitoring wells in the subsidence area. There's some averaging across the subsidence region, but it helps to focus on this region separately from rest of the Subbasin.

   ii. Q (Wes Myers): For the eastern side of Merced where there are data gaps, is there a grant program where there can be a cost-share for installing wells that can be used for both ranching and monitoring purposes? (e.g. solar pumps for cattle?) This is specifically for punching in new wells because there are old wells going dry. A: For existing wells, always open to folks who think they have a suitable well. Matt Beaman (MIUGSA) clarified that pretty much all monitoring has been volunteering to date so the GSAs welcome additional volunteers. Jim clarified that grant funding usually requires the well to be fully dedicated to monitoring, but ranching usually has low volume usage so that is worth exploring further if there is interest in volunteering a well.

   iii. Q (Thomas Dinwoodie): Thomas has seen good forecasts of climate data from a Nebraska data source. Has the GSP team looked at projections of hydrology and basin conditions under climate change? A: As part of the GSP, the GSP included an evaluation of climate change impacts on future conditions. Both higher evapotranspiration and changes in precipitation in the Central Valley, and also changes in snowpack in the mountains and associated impacts on reservoir systems. What we don't know (additional uncertainty), is when the droughts are going to occur and how frequent or how long.

e. Jim Blanke (W&C) walked the group through the model results table.

i. Q (Matt Beaman): Does the sustainable yield scenario include developed supply as extractions? A: Yes, it does include it.
    1. In the GSP, there's a bucket of water called "developed supply" and the bulk sourced by Merced Irrigation District (MID), ~120,000 AF. The GSP describes that this isn't available for allocation to the GSAs. This volume needs to be subtracted from the sustainable yield number. Once you take that out, you end up with a larger magnitude pumping reduction number. This developed supply is reallocated back to the entity that brings in the supply.

ii. Comment in chat (Nav Athwal): Downside of 2015 levels MT option is that it has a large negative impact on the economy and job market.

iii. Q (Simon Vander Woude): Do you think the DWR will have a problem with option C and the single-year cumulative change in storage of -40,000 AF? As a farmer and considering economic sustainability of farming, that's our best option. A: Yes, the DWR would have an issue with -40,000 AF shown as-is for single-year cumulative storage change in the subsidence area, but it might be possible to craft a project or management action that can address it with some different actions.
    1. Has the model taken into account the Prop 68 funded supply-side projects? A: No, but these can fairly interchangeably be used with demand reductions (e.g. reduce the reported demand reductions in the table by the amount of supply side projects).

iv. Comment (Arlan Thomas) – going to have to run closer to Option B, maybe starting with Option C. If stay at 70,000 AF pumping reduction, the basin condition will continue to worsen.

v. Comment (Wes Myers): Seconded comments that support Option C. Projections won't be right in 50 years. Issues with Option C might be addressed with region-specific pumping.

vi. Q (Nav Athwal): The sustainable yield scenario that we have is what DWR rejected and now we're coming up with a new threshold? Or how do these options correspond to the Sustainable Yield? A: Yes, but DWR rejected the GSP for several reasons besides just groundwater level minimum thresholds. The new pumping reduction scenario(s) take into account several additional factors beyond long-term basin-wide storage.

vii. Q (Lisa Kayser-Grant): Where does the 2- vs 5-mile radius come into the modeling results? A: The domestic well depths are considered in Options "GSP", C, and D. Options A and B are based on groundwater levels only.

viii. Q (Lisa Kayser-Grant): Highly concerned about happy-looking green colors in the table. 2015 groundwater level were a bad (dry) year. Given lack of snowpack and disappearance of glacial water sources, we would have to be extremely optimistic to expect developed supply numbers to continue as-is. To what extent is that factored in? A: Green colors are because groundwater levels today are well below 2015 levels. Future scenarios would have to involve dramatic reductions in pumping to return to previous conditions.
    1. Comment: 2015 levels aren't enough – can't wait longer to continue using 2015 dry year as a goal, especially when we know that the produced water supply is dwindling.

ix. Q (Susan Walsh): Am I hearing this right, that the scenario we are discussing will have substantially altered numbers next time we see it because as it is, it will not pass DWR review?? A: If group wanted to pursue Option C, there might need to be a project or management action included to address single year cumulative negative storage, but otherwise the modeling results are probably similar.

x. Comment in chat (Nav Athwal): Agreed… The cost of putting up a little fight with DWR will be a fraction of the economic cost to the region if we limit more pumping than we have to. Filling data gaps in the next few years will paint a much different picture.

xi. Comment (Susan Walsh): DWR has accessed past reports and discussions – can't do "just" anything. Has to be based on something solid. Has similar concerns that we can't wait to get to a bad year; have to talk about finding a place between 11% and 28% reductions.

xii. Q (Thomas Dinwoodie): Will DWR take into account that we will have good or bad 5-year reports in the GSP Updates? A: Based on today's information, in order to have a complete GSP, we shouldn't have a GSP that includes a negative single-year cumulative storage change below zero. DWR is flexible and amendable to management strategies that are backed up to address actions that would be taken to avoid this situation.

xiii. Q (Joe Scoto): Stakeholders are working now to install recharge basins that use floodwaters. Are these taken into account in the modeling? A: They're not directly included in the model, but you can put them into place instead of the demand reductions (e.g. supply-side efforts offset pumping reduction).

xiv. Comment (Arlan Thomas): Suggestion to modify between modeled scenarios B & C – probably not optimistic to get all the demand reductions offset by recharge projects.

xv. Q (Thomas Dinwoodie): Is there a short-term forecast (like 5- to 10-year projection in the modeling) instead of 50 years? e.g. restructure GSP to be just a 5-year plan. A: It is a 5-year plan to some extent in that there are 5-year evaluations, and it is a living document open to changes. But it has to focus on the long-term goal of sustainable conditions by 2040.

xvi. Comment (Susan Walsh): If DWR is open to adaptive management caveats in the plan, including the supply side efforts currently underway, that may be the way to go.

xvii. Comment (Jean Okuye): We have 18 years until 2040. We have developed supply. Climate change is real. We've really got to address demand reductions. Need to choose A or B. Concerned because supply won't be enough.

xviii. Q (Wes Myers): Is there anywhere in the model where all four categories are green? Until we have data gaps figured out, we don't have the hydrology of the area. Assuming there's certain geology in areas without eyes on it. So can we say we want to move for Option C and we'll fill in data down the road in a few years? e.g. model shows green conditions through 2026 and then re-evaluate. Thinks too much too early in earlier options. A: Model scenario B is the one where everything is green. Option C is likely green until there's a drought. Likely would need reduced pumping or temporary fallowing after some kind of drought trigger.

xix. Comment (Arlan Thomas): Problem with modeling scenario C is that if there's extreme drought weather, then pumping reductions would need to be reduced significantly. Moderate years can be increased pumping.

xx. Comment (Lisa Kayser-Grant): Adjustments to the baseline period for groundwater levels or pumping reductions are not ideal.

xxi. Comment (Ben Migliazzo): Economically in the area, drastically stopping pumping right now would be very negative. Need to ramp up to reductions. Lots of impacts on employment.

xxii. Q (Jean Okuye): Do we know how much reduction has occurred (maybe in other counties) because they don't have the water? Fallowing that has occurred more frequently elsewhere.

1. Because of surface water, several farming folks confirmed they have been fallowing this year.

xxiii. Comment from chat (Susan Walsh): I agree we need to be more aggressive that 11% but there is room to discuss middle options. the ramp up should be steeper as time goes on and data looks worse. This may support economic issues today but the speed at which we get to the cliff's edge is much faster.

xxiv. Q (Thomas Dinwoodie): When do the pumping reductions for the modeling scenarios go into place? A: 2025-2035 as a 10-year implementation/rampdown period.

1. Jim clarified that the basin-wide pumping reduction doesn't necessarily translate directly to individual farms – there are a lot of intervening factors like allocation between and within the GSAs and consideration of developed supply, etc.
2. Jim also clarified that the model is extended hydrologically through 2021 per the last Annual Report, but then starts on a 50-year projected hydrology because we don't know what's going to happen next year.

xxv. Comment from chat (Nav Athwal): I think a vote is in order so we can see where folks stand. We're almost at 11:30. Maybe a follow up survey so we can get responses in writing.

xxvi. Matt Beaman (MIUGSA): Mitigation for domestic well impacts (lowered groundwater levels, but maybe also electrical costs) is a concern. MIUGSA supports the modeling scenario A (2015 groundwater levels), primarily to avoid domestic well mitigation and water quality impacts.

xxvii. Comment (Thomas Dinwoodie): By the time we get to 2025, scenario A may be the only option because we're continuing to experience and contribute to subsidence.

xxviii. Q (Thomas Dinwoodie): Does the state have the ability to come in immediately and make changes? A (Matt Beaman, MIUGSA): Yes if the plan is not accepted, and also in the future if an initially-accepted plan violates minimum thresholds.

xxix. Comment (Lisa Kayser-Grant): Recommendation to make clear in future presentations/plans that the ramp-down occurs over 10 years (2025-2035) and that these percentage reductions shown in the model results table are not immediate reductions in 2025 (less of a shock to stakeholders).

xxx. Comment (Craig Arnold): Bounce between model scenarios C and A. Tends to be a little more cautious.

xxxi. Comment (Lisa Baker): Farmer in El Nido area, and would lean towards modeling scenario C.

xxxii. Q (Thomas Dinwoodie): If the delay in 3-4 years is for agencies to get plans together, could you in 2025 look at what's happened and make adjustments immediately between C and A? A: 2025 is first GSP update and is a first chance to course-correct.

xxxiii. Q (Ben Migliazzo): When the is the next plan update due? A: We'll have to check, either Jan 2025 or Jan 2026.

f. Schedule

i. Jim Blanke (W&C) described the schedule for incorporating edits into the GSP by end of July to address DWR's comments.

4. GSA Reports

a. Adriel Ramirez provided an update for the Merced Subbasin GSA: Department of Conservation invited MSGSA to interview for land repurposing grant application (long-term program), along with several partners on application. This is separate and in addition to the shorter-term Prop 218 land repurposing effort.

b. Matt Beaman provided an update for the Merced Irrigation-Urban GSA: Stakeholder Guidance Committee on May 4 from 1-3pm at MID Franklin Yard (specific to MIUGSA policies and the County's amended well ordinance impacts). Will be posted to the MIUGSA website.
c. Kel Mitchel provided an update for Turner Island Water District GSA #1: Recent Board meeting was held to discuss ongoing groundwater sustainability issues similar to what was discussed today.

5. Public Comment

a. None.

6. Next steps and adjourn

a. Meeting was adjourned at 11:49am.

Next Regular Meeting
TBD in late May 2022
Meeting to be conducted hybrid (physical + virtual; subject to change)
Information also available online at mercedsgma.org

MEETING MINUTES – Merced GSP Stakeholder Advisory Committee

SUBJECT: Stakeholder Advisory Committee Meeting

DATE/TIME: June 1, 2022, 9:30 to 11:30 AM

LOCATION: Hybrid meeting with physical location at Merced Irrigation District, Franklin Yard Facility, 3321 North Franklin Road, Merced, CA 95348 and online via Zoom

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Stakeholder Committee Members in Attendance:

	Representative	**Community Aspect Representation**
☒	Arlan Thomas	MIDAC member
☒	Ben Migliazzo (alternate)	MIDAC member
☐	Bob Kelley	Stevinson Representative
☐	Blake Nervino	Stevinson/Merquin
☒	Breanne Vandenberg	MCFB
☒	Craig Arnold	Arnold Farms
☐	Darren Olguin	Resident of Merced County
☒	Dave Serrano	Serrano Farms - Le Grand
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☐	Emma Reyes	Martin Reyes Farm/Land Leveling
☐	Greg Olzack	Atwater Resident
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☐	Darcy Brown	River Partners
☒	Rick Drayer	Merced/Mariposa Cattlemen
☐	Robert Weimer	Weimer Farms
☒	Simon Vander Woude	Sandy Mush MWC
☒	Susan Walsh	City of Merced
☐	Bill Spriggs (alternate)	Merced resident
☒	Thomas Dinwoodie	Master Gardener/McSwain
☒	Trevor Hutton	Valley Land Alliance
☒	Wes Myers	Merced Grassland Coalition
☐	Lou Myers (alternate)	Benjamin Land LP

Meeting Minutes

1. **Call to Order and Welcome**
    a. Charles Gardiner (Catalyst) welcomed the group.
2. **Introductions and Roll Call**
    a. Charles Gardiner (Catalyst) reviewed the agenda and meeting guidelines, conducted roll call, and reminded attendees that past meeting materials are available online at mercedsgma.org.
3. **Drought Check-in**
    a. Allocation started at 13 inches and is now at 27 inches due to series of late storms and demand remaining low.
    b. Merced Farm Bureau: Newsom administration has put out materials for land purchasing, pending final budget.
4. **Potential Revisions to the Groundwater Sustainability Plan**
    a. Jim Blanke (W&C) reminded the group that DWR's comments focused on chronic lowering of groundwater levels, impacts to beneficial users, and land subsidence.
    b. Groundwater levels
        i. Jim Blanke (W&C) shared that, after considering input from the committees, the GSAs have decided to pursue historical lows (Option B, as presented at the April meeting) as the minimum threshold approach. The GSAs are also incorporating a domestic well mitigation program, with primary financial responsibility with MSGSA, and a management action to explore different levels above Corcoran in the subsidence area for more flexibility in responding to subsidence issues.
        ii. Jim Blanke (W&C) reiterated that the GSA decision was based on balancing two competing interests (protecting beneficial uses and users and using available water resources) and noted that all sustainable management criteria can be reevaluated during the 5-year update if needed.
            1. Comment (Jean Okuye): Believe the Subbasin should go with 2015 groundwater levels (Option A) to get state approval. The GSAs should review Madera's Sustainable Agricultural Land Conservation (SALC) grant application and pull ideas and coordination techniques. The GSP should focus more on demand and land repurposing and less on supply. The GSAs should also consider the effects of climate change in the modeling scenarios.
            2. Comment (Nataly Escobedo Garcia): I second Jean's comments.
            3. Public Comment (Stacie Ann Silva): CDFW/WCB also have funding available for another Regional Conservation Investment Strategy which is a non-regulatory program which identifies areas for redevelopment and allows landowners to engage in the process to garner mitigation dollars.
            4. *Additional comments were provided, but details were lost due to technical issues.*
        iii. Jim Blanke (W&C) reviewed the modifications of measurable objectives and interim milestones to retain consistency with the revised minimum thresholds. The measurable objective will be developed to provide operational flexibility, while interim milestones will be developed based on phasing in of projects and management actions (which hope to stabilize and increase groundwater levels).
    c. Comments were provided, but details were lost due to technical issues.   Subsidence
        i. Jim Blanke (W&C) presented the subsidence minimum threshold option under consideration by the GSAs: 0 feet per year, with condition of uncertainty. Other options include total subsidence (rather than rate) or the stipulation of a 5-year rolling average. USBR measurement issue is approximately +/- 1 inch and will be

discussed with DWR. The final option is to set groundwater levels as a proxy for subsidence, which would involve extensive rework of the subsidence section.

1. Public Q (Geoff Vanden Heuvel): How do you explain the zero subsidence demand in light of the language of the SGMA law that talks about an undesirable result being damage to infrastructure of statewide importance. The undesirable result is what SGMA requires us to avoid, confused as to why working toward zero subsidence now. Suggest not conceding to DWR at this point.
    a. A: Clarified that DWR is leaning heavily on the legislative intent of SGMA and, in particular for Merced, concerns about Eastside bypass and impacts to this critical infrastructure.
    b. Wes Myers: Agreed. "0" Subsidence is an impossible objective considering residual subsidence/geology/etc. We should push back on DWR.
2. Name not given: How will residual subsidence be accounted for in the minimum threshold?
    a. A: Interim milestones will assume some level of subsidence through 2040, both residual and new.
3. Public Comment (Stacie Ann Silvia): If the IM are going to assume subsidence through 2040 it would seem that MT need to be rethought to include consideration that subsidence can occur without violating a Minimum Threshold over the implementation period.
4. Additional comments were provided, but details were lost due to technical issues.

ii. Jim Blanke (W&C) introduced the proposed management action for the subsidence area: goal is to target pumping reduction (or recharge activities) within Subsidence Focus Area (defined by region with 2015-2021 average less than -0.15 ft/yr) to achieve positive annual storage change. Noted that exact details will be developed as part of the management action determined after GSP is updated.

1. Hicham ElTal (MIUGSA) clarified that the area with maximum subsidence is within the Chowchilla Subbasin. Noted that GSAs and neighboring Subbasins will need to work together to ensure all are working to prevent subsidence.

d. Domestic well mitigation

i. Jim Blanke (W&C) provided an overview of the management action for a domestic well mitigation program. Explained that, while identification of the need for such a program will occur during GSP implementation, it is envisioned that a board or committee will review claims (which would need to be tied to regional groundwater conditions), with the primary financial responsibility coming from MSGSA, through negotiations. Details to be developed.

e. Adoption / public input opportunities

i. Jim Blanke (W&C) provided an overview of the remaining GSP revision process, which includes a meeting with DWR to review proposed changes and continued development of MOs/IMs to complete the redline GSP for Board review and adoption.

5. GSA Reports

a. Adriel Ramirez provided an update for the Merced Subbasin GSA: Applied for land repurposing grant funding (long-term program); unsuccessful in first round, but future funds may be available from the Department of Conservation next year. Committed to working with both the Department of Conservation and partners to strengthen application.

b. Matt Beaman provided an update for the Merced Irrigation-Urban GSA: MIUGSA performed a water balance analysis for 2016 to 2021. In the scenario used, pumping was set at 1.1 AF per developed acre; results show a large discrepancy in groundwater storage balance among the three GSAs. MIUGSA has been a positive contributor to the basin, even as groundwater levels have declined.
    i. Hicham ElTal stated that MIUGSA believes that setting the minimum thresholds lower than 2015 levels may expose the GSAs to additional liability for those impacts, and the need for additional liability for impacts that may occur. MIUGSA should not bear mitigation or liability for setting minimum thresholds at historical lows.

c. *No update provided for Turner Island Water District GSA #1.*

d. SAC questions and discussion
    i. Q (Jean Okuye): How does Merced River compare to Stanislaus and Tuolumne Rivers as to low groundwater levels?
        1. Hicham ElTal (MIUGSA) noted that all have similar issues depending on the groundwater levels modelled.
    ii. Comment (Jean Okuye): Think we should stick with 2015 GWLs as MTs.

6. Public Comment

a. None.

7. Next steps and adjourn

a. Meeting was adjourned at 11:53am.

Next Regular Meeting
Tentatively scheduled as a joint meeting of the Stakeholder Advisory Committee and the Coordination committee at 1:00pm June 27, 2022
Meeting to be conducted hybrid (physical + virtual; subject to change)
Information also available online at mercedsgma.org

MEETING MINUTES – Merced GSP Stakeholder Advisory Committee

SUBJECT: Stakeholder Advisory Committee Meeting
DATE/TIME: October 19, 2022, 9:30 to 11:30 AM
LOCATION: Hybrid meeting with physical location at Merced Irrigation District, Franklin Yard Facility, 3321 North Franklin Road, Merced, CA 95348 and online via Zoom

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Stakeholder Committee Members in Attendance:

	Representative	**Community Aspect Representation**
☒	Arlan Thomas	MIDAC member
☐	Ben Migliazzo (alternate)	MIDAC member
☒	Bob Kelley	Stevinson Representative
☒	Blake Nervino	Stevinson/Merquin
☐	Breanne Vandenberg	MCFB
☒	Alexis Rudich (standing in as alternate)	MCFB
☒	Craig Arnold	Arnold Farms
☒	Darren Olguin	Resident of Merced County
☐	Dave Serrano	Serrano Farms - Le Grand
☐	David Belt	Foster Farms
☒	Emma Reyes	Martin Reyes Farm/Land Leveling
☐	Greg Olzack	Atwater Resident
☒	Jean Okuye	E Merced RCD
☐	Joe Sansoni	Sansoni Farms/MCFB
☒	Joe Scoto	Scoto Brothers/McSwain School Dist.
☐	Jose Moran	Livingston City Council
☒	Lacy Carothers	Cal Am Water
☐	Lisa Baker	Clayton Water District
☒	Lisa Kayser-Grant	Sierra Club
☐	Mark Maxwell	UC Merced
☒	Maxwell Norton	Unincorporated area
☒	Nav Athwal	TriNut Farms
☐	Olivia Gomez	Community of Planada
☐	Nataly Escobedo Garcia (alternate)	Leadership Counsel
☐	Parry Klassen	ESJWQC
☐	Darcy Brown	River Partners
☐	Rick Drayer	Merced/Mariposa Cattlemen
☐	Simon Vander Woude	Sandy Mush MWC
☒	Susan Walsh	City of Merced
☐	Bill Spriggs (alternate)	Merced resident
☒	Thomas Dinwoodie	Master Gardener/McSwain
☐	Trevor Hutton	Valley Land Alliance
☒	Wes Myers	Merced Grassland Coalition
☐	Lou Myers (alternate)	Benjamin Land LP

Meeting Minutes

1. Call to Order and Welcome

a. Charles Gardiner (Catalyst) welcomed the group.

2. Introductions and Roll Call

a. Charles Gardiner (Catalyst) reviewed the agenda and meeting guidelines, conducted roll call, and reminded attendees that past meeting materials are available online at mercedsgma.org.

3. Drought Check-in

a. Adriel Ramirez (Merced Subbasin GSA [MSGSA]) shared countywide data from Self-Help Enterprises about bottled water, tanked water, and well program participation (see slide). He confirmed that there could be some overlap in participation between the programs, at least across the bottled water and other programs, but wasn't sure about the level of other program participation overlap.

b. Joe Scoto shared that farming has been difficult, some ground had already been fallowed by the time some surface water became available later. Other farmers agreed that similar steps had been taken.

4. Recap of the Groundwater Sustainability Plan July 2022 Update

a. Jim Blanke (Woodard & Curran [W&C]) shared a summary of the edits to the revised GSP that was resubmitted to DWR in July 2022, including sustainable management criteria updates and new management actions.

b. Q (Maxwell Norton): Has the revised GSP been approved by the state? A: It is pending review by DWR. There isn't a regulatory deadline for when a final determination will be made, but we've heard it will be a faster than previous 2 years. Initial input is that it might be announced by December 2022.

c. Q (Tom Dinwoodie): What's happening with counties around us in terms of what's been submitted and approved? A: Most surrounding counties/basins submitted revised GSPs in July, same as Merced, and are also waiting for DWR's review.

d. Q (Tom Dinwoodie): Has any of the mentioned subsidence coordination been done so far? A (Jim Blanke, W&C): Yes, there have been several meetings with the surrounding subbasins as part of a facilitated process to develop an understanding of the subsidence issue, how much pumping is occurring and where, and what each GSP's method is for responding to the issue. The GSAs are looking to continue this process.

e. Q (Tom Dinwoodie): Does the state care or know that an effort is being pursued for a regional solution to subsidence? A: Yes.

f. Comment (Bob Kelly): Doesn't see consistency between a 2021-2022 map he's seen (presented to the levee district by SJRRP) and what is in the subsidence slide depicting average subsidence 2015-2021.

    i. Mr. Kelly was asked to send the copy of the map to which he referred to Chris Hewes (W&C) for comparison. It makes sense that these may not match because they represent different time periods (2021-2022 vs longer-term 2015-2021).

g. Q (Maxwell Norton): It seems illogical that someone would pump from a deeper well when they can pump from shallower – is this not already done more widely because of limited yields or a water quality issue? A: It can be due to both reasons.
h. Q (Joe Scoto): If a well fails due to shifting/collapse, but you're below the Corcoran Clay, can it be replaced below the Corcoran? A: Through the well permitting process, wells generally have been approved to be replaced directly in the same aquifer if it's a straight replacement, but long-term goal is still to reduce below Corcoran Clay pumping.
i. Jim Blanke (W&C) summarized three comment letters that have been received in response to the resubmitted GSP. These letters are part of DWR's process for them to consider as part of their review of the revised GSP.
    i. **Link to SGMA Portal to view comment letters in response to the Revised Merced GSP: https://sgma.water.ca.gov/portal/gsp/comments/9 (then click on the button "Submitted During Resubmission Period" to filter to view the three letters discussed during the 10/19 meeting).**
j. Hicham ElTal (Merced Irrigation-Urban GSA [MIUGSA]) thinks that there is likely not content within the comment letters that would cause DWR to deem the GSP incomplete.
k. Q (Tom Dinwoodie): Did any of these three agencies submit comment letters for the prior letters? A: Yes, NMFS and Leadership Counsel. USBR SJRRP was a new letter; they were engaged specifically as part of the revised GSP update process.

5. 5-Year GSP Evaluation Lookahead

a. Jim Blanke (W&C) described the requirements for completing a 5-year evaluation of the GSP, given that it was submitted 2.5 years ago.
b. Q (Joe Scoto): How can DWR require an evaluation even though the Plan hasn't been approved yet? A: The timing and requirements are part of the regulations.

6. Reports

a. GSA Reports
    i. Adriel Ramirez (MSGSA) shared that since the last 6/27 meeting, the GSA has:
        - Developed and established its phase 1 land repurposing program to reduce consumptive use of groundwater by 15,000 AFY no later than 2025. The application period closes 11/15 (recently extended by the GSA Board). Two public workshops have been held about the program, and mailers have been sent to all eligible landowners. Materials can be found on the GSA's website: https://mercedsubbasingsa.org/. Also, the GSA has approved new fees (through a Proposition 218 process) to fund programming.
        - The MSGSA Board has also approved principles to support allocation and recharge credit frameworks, as well as other GSA activities.

- The Strategic Planning Ad-Hoc Committee is preparing an allocation and recharge credit framework that will be presented in November to the GSA Board.

ii. Q (Tim Dinwoodie): On the MSGSA Zoom call on 10/18, it was mentioned that only 2 applications have been received. Is this an indication that people in jurisdiction aren't interested? If more applications not received, will you have to implement harsher means to reach the goals? A: This morning, an additional 2 mailed applications were received. Some may have been delayed due to the protest of the Prop 218 fee. MSGSA is anticipating additional applications through the November deadline. It's possible that the allocation framework could have to be implemented earlier if the program doesn't reach its goal.

iii. Q (Ben Migliazzo): Is the goal a reduction of 15,000 AF every year or a single cumulative volume? A: It's an ongoing 15,000 AF every year by 2025. This year (2022) could reach 3,000 AFY but it needs to reach a larger, ongoing annual volume of 15,000 AFY by 2025.

iv. Matt Beaman (MIUGSA) shared that:
   - MIUGSA Board adopted a groundwater allocation in May 2022 in line with the GSP's sustainable yield, in effect from Apr 2023 – Dec 2025, of an average 3.3 AF/ac. A newsletter was recently sent that summarizes this program.
   - At the last meeting, the Board adopted a well registration policy, with different deadlines by well type. Largest and most immediate effort is that wells serving parcels >10 acres need to register by April 1, 2023. Paper and electronic forms will be made available.
   - MID Board approved making developed supply available to its growers, so MIUGSA will be at 4 meetings with MID in mid-November to talk about SGMA and using developed supply as a SGMA compliance tool.
   - MIUGSA is evaluating creation of allocations for urban water agencies. Stakeholder Guidance Committee meetings are upcoming on this topic.

ii. Q (Blake Nervino): How are you notifying people that have wells that they need to register them? A: Mailers will be sent out, considered to be the best outreach method given availability of contact information.

iii. Q (Joe Scoto): For MSGSA, what is your allotment per acre for extraction? Is there curtailment now? A: In the process of developing this. An allocation should be established by 2026. No curtailment until 2026 except through the voluntary land repurposing program.

v. Kel Mitchell (TIWD GSA-#1) shared that:
   - GSA Board meeting recently discussed logistics for implementing projects funded by the grant funding that is approved.
   - GSA Board briefly discussed allocations, but mostly about maintaining consistency with the other GSAs.

b. Current Basin Conditions – Matt Beaman (MIUGSA) provided a background on monitoring in the subbasin, including the shift from twice per year measurements to monthly measurements for most wells starting in 2021. He also explained some of the challenges related to collection and interpretation of monthly data when studying trends. He presented three hydrographs from 2012 to present, one for each principal aquifer.

   i. Q (Maxwell Norton): Is it reasonable to presume that a lot of the monitoring wells are influenced by cone of depression by neighboring wells? A: Yes.

c. SAC questions and discussion

   i. Q (Susan Walsh): What are we waiting for that we may have to react to? A: First, DWR assessment of revised GSP. Second: Watching groundwater levels and lots of outstanding items around monitoring, data gaps, and developing management actions.
   ii. Q (Tom Dinwoodie): Why aren't we looking at incentives for land repurposing throughout the rest of the county outside of MSGSA? A (Hicham ElTal, MIUGSA): MIUGSA's incentive is to recharge (via surface water rights), not repurpose land. MIUGSA is looking into opportunities to support growers to bank water.

7. Prop 68 Implementation Planning & Projects Grant Round 2 (due Nov 30, 2022)

a. Jim Blanke (W&C) described the recently released grant application.

b. ***Note that the Merced Subbasin is eligible for up to $20 million in grant funding, not the amount reduced by funding received in round 1, as described in the meeting.***

c. Hicham ElTal (MIUGSA) shared some additional potential projects for grant application:

   i. Empower MID growers to use surface water rights to recharge and do their own budgeting. Example of piloting a 20 acre property with a 1 acre recharge basin.
   ii. Another round of dry wells.
   iii. For owners with flood irrigation facilities, still use drip or irrigation, but in wet year do flooding and some measurement.
   iv. Those who rotate crops, mostly sandy, do some other projects.

d. Comment (Russ Spear, Water Holistic West): Have you applied in the past to put in water retention measures? (check dams, bioswales, etc.). This helps to recharge. Also announcing: WGBH Boston program that colleagues are putting on called "No trees, no rain".

e. Comment (Tom Dinwoodie): Recommends projects that can be used throughout California, e.g. recharge pilots. This might be beneficial in the application review process.

8. Ongoing and Upcoming Activities

a. ***Note that the meeting ran out of time at this point and so Jim Blanke (W&C) gave a brief update on the slides for each of these.***

b. Grant Updates

   i. Prop 68 Implementation Grant (May 2020 – Mar 2023)
   ii. Prop 68 Implementation Planning & Projects Grant Round 1 (Jun 2022 – Jun 2025)
   iii. SDAC Grant

c. Water quality data sampling coordination – coordination continuing with the water quality coalition

d. Evapotranspiration tools & methodologies update – coordination is occurring within the subbasin and with surrounding subbasins

e. Lessons learned from Madera and Chowchilla Subbasins

f. DWR Flood-MAR Project

   i. Hicham ElTal (MIUGSA) briefly shared that DWR is funding a project in the MID area for Flood-MAR.

g. SAC input on prioritization for future activities

   i. Comment to consider for future meetings (Blake Nervino): Where are we going to get surface water for recharge?

9. Public Comment

a. Susie Silvera – Amongst sweet potato farmer community, recent discussions involved a mailed notice about April 2023 well registration (from MIUGSA). Are there other sources of communication happening to farmers as a whole? General consensus was that they thought the MIUGSA notice was junk mail and almost missed it. They were surprised to do some research to hear [GSP] meetings have been ongoing for so long. Ms. Silvera also noted that there appears to be a large SAC group in terms of membership but only 15 people showing up in person.

   i. Response: MIUGSA has limited contact information, mostly mailing addresses. Expect to do some phone outreach in the future.

   ii. MSGSA is doing similar outreach and is also starting to present at additional public meetings like other agency meetings. Also have had several online and in person workshops.

10. Next steps and adjourn

a. Meeting was adjourned at 11:43am.

Next Regular Meeting
TBD – expected to be January 2023
Meeting to be conducted hybrid (physical + virtual; subject to change)
Information also available online at mercedsgma.org

MEETING NOTES – Merced GSP

SUBJECT: Merced GSP Coordination Committee Meeting

DATE/TIME: February 27, 2023, 1:00 PM to 3:00 PM

LOCATION: Hybrid meeting with physical location at Merced Irrigation District, Franklin Yard Facility, 3321 North Franklin Road, Merced, CA 95348 and online via Zoom

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Coordination Committee Members in Attendance:

	Representative	GSA
☒	Hicham ElTal	Merced Irrigation-Urban GSA
☐	Stephanie Dietz	Merced Irrigation-Urban GSA
☒	Justin Vinson	Merced Irrigation-Urban GSA
☐	Daniel Chavez	Merced Irrigation-Urban GSA
☒	Ken Elwin (alternate)	Merced Irrigation-Urban GSA
☒	Eric Swenson	Merced Subbasin GSA
☒	Mike Gallo	Merced Subbasin GSA
☐	Nic Marchini	Merced Subbasin GSA
☒	George Park (alternate)	Merced Subbasin GSA
☒	Kel Mitchel	Turner Island Water District GSA #1
☐	Tim Allan (alternate)	Turner Island Water District GSA #1

Meeting Notes

1. Call to Order and Welcome

a. Jim Blanke (Woodard & Curran [W&C]) called the meeting to order at 1:05 pm.

2. Roll Call

a. Coordination Committee members in attendance are shown in table above.

3. State of Emergency Teleconference Findings

a. The Coordination Committee considered the circumstances of the State of Emergency and determine whether to make the findings that any of the circumstances exist per AB 361: that the State of Emergency continues to directly impact the ability of the members to meet safely in person and/or State or Local Officials continue to impose or recommend measures to promote social distancing.

b. Action: Motion made (ElTal), seconded (Swenson), and carried

4. Approval of October 19, 2022 Meeting Minutes

a. Action: Motion made (Gallo), seconded (Elwin), and carried

5. Public Comment

a. None received.

6. Reports

a. GSA Reports

i. Lacey McBride (MSGSA) shared that she has no updates outside of the "Demand Reduction Discussion" agenda item later in the meeting.

ii. Matt Beaman (MIUGSA) shared that he has no updates outside of the "Demand Reduction Discussion" agenda item later in the meeting.

iii. Kel Mitchell (TIWD GSA-#1) shared that he has no updates outside of the "Demand Reduction Discussion" agenda item later in the meeting.

iv. Hicham ElTal (MIUGSA) presented an update on Flood-Managed Aquifer Recharge (Flood-MAR), including a background on Flood-MAR, permitting, and a pilot project for temporary short-term permit of Flood-MAR at Mariposa & Owens Creek.

1. Q (Eric Swenson): Are the dots on the "Overall Look" map in place currently? A: Intent is that they are existing or temporary diversions.
2. Comment (Brad Samuelson): Dairy Order obstacles limited a lot of diversion options (most on the El Nido Canal). Have been working with Western United Dairymen and Regional Water Quality Control Board to develop process to demonstrate low nitrogen leaching to make this more flexible in the future.
3. Q (Eric Swenson): To get credit for recharge from State Water Resources Control Board (SWRCB) for January storms (e.g. improvements to fields) may require additional documentation to support the request. Is it right that there would be additional obstacles beyond SWRCB for the flood permit? A: MID would be allowed to use it for multiple options. Farmers can enhance lands included in permit for recharge purposes.
4. Q (Eric Swenson): How much water was diverted? A: Don't have numbers today. In the 100s of AF.
5. Q (Ken Elwin): Are you going to check monitoring wells to see how the aquifer responded to Flood-MAR? A: Yes.
6. Q (George Park): For next year, are we still going to be battling a fish screen and temporary vs permanent pump issue? A: MID is working on proposed legislation to streamline the permitting process and requirements.
    a. Comment (Brad Samuelson): Big obstacle between now and next winter is the streambed alteration permits and temporary pumps.
7. Comment (Ken Elwin): Think we should take water when it reaches monitor stage. A: Agreed.
8. Q (Brad Samuelson): Should we spend money now to engage in minor streams now to be ready for discussion in future years? Dutchman, Deadman, etc. A: Yes.

b. Current Basin Conditions

        i. Jim Blanke (W&C) presented hydrographs of groundwater elevations measured over the last 11 years for each principal aquifer. He encouraged participants to look at high-level trends (e.g. decrease in 2012-2014 previous drought, flattening in 2015-2018, then some more downward trend during current drought), as well as increased frequency of monitoring in the last 1-2 years.

7. **WY 2022 Annual Report Preview**
    a. Chris Hewes & Jim Blanke (W&C) presented a summary of initial results from the Water Year (WY) 2022 Annual Report that is being drafted, including sustainability management criteria status, an update on using Electrical Conductivity values to estimate Total Dissolved Solids concentrations, and change in storage calculations based on the updated groundwater model.
    b. Q (Eric Swenson): Will EC be measured annually? A: Yes. The GSP 5-year evaluation process might involve a change in procedure for water quality sampling.
8. **Demand Reduction Discussion**
    a. Matt Beaman (MIUGSA) provided a high-level update on demand reduction activities occurring within MIUGSA including:
        i. Two major actions take in 2022 by MIUGSA Board:
            1. Adopted of groundwater allocation
            2. Developed well registration portal
        ii. Additional rules, regulations, and enforceable policies being finalized.
        iii. Participating as pilot partner in development of Groundwater Accounting Platform with Environmental Defense Fund and Water Data Consortium
        iv. Pilot Flood-MAR project (as described earlier by Hicham)
    b. Lacey McBride (MSGSA) provided a high-level update on demand reduction activities occurring within MSGSA including:
        i. Two phased GSP Implementation Approach
            1. Phase 1 – 2021-2025
                a. Goal is 15,000 AFY
                b. Land Repurposing program developed in 2022, with 16 applications selected in first round, with project lifetimes ranging 3-5 years, and cumulative 7,263 AFY water saved, with average savings $198/AFY.
                    i. Applications for second year expected to open in June/July.
                c. WY 2023 Recharge Framework and Registration Form approved, to record credits by growers for recharge in WY 2023. Looking forward to the future when the GSA will have an allocation program in place, while encouraging growers to recharge today.
                d. Parcel-based water budgets via EDF/Water Data Consortium Water Accounting Platform Pilot Project.
            2. Phase 2 – 2026-2040: Groundwater allocation program

        a. Strategic Planning Ad Hoc Committee created to make recommendations to the MSGSA Board. Expecting another set of recommendations to be published in March.

c. Kel Mitchel (TIWD GSA-1) provided a high-level update on demand reduction activities being considered by the GSA:
    i. Shifting cropping patterns
    ii. More efficient utilization of storage and pump infrastructure to minimize system losses of applied water
    iii. Design of and planning for upgraded and new infrastructure to curtail applied water needs

9. Grant Updates

a. Matt Beaman (MIUGSA) provided updates on projects related to each of the following rounds of GSP-related grant programs:
    i. Prop 68 Planning Grant (May 2020 – Mar 2023)
        1. New dual completion well scheduled for construction in March 2023
        2. Q (George Park): Is this well located in Clayton Water District? A: Yes.
    ii. Prop 68 Implementation Grant (Aug 2021 – Apr 2024)
        1. El Nido Conveyance System Improvements Project – four siphons replaced in spring 2022.
        2. Le Grand-Athlone Water District Intertie and Recharge Project (Phase 1) currently in design and working through permitting processes.
    iii. Prop 68 Implementation Planning & Projects Grant Round 1 (Jun 2022 – Jun 2025)
        1. Grant agreement executed in October 2022, so many projects are just starting up.
        2. Component 10 (Merquin County Water District Sustainable Yield Management Plan and Plan Implementation) has recently dropped out.
    iv. Prop 68 Implementation Planning & Projects Grant Round 2
        1. Application pending review by DWR (submitted Dec 2022 for 7 projects for $18.4M)
        2. Q (Kel Mitchel): Is there any indication DWR will pro-rate or instead prioritize subbasins not receiving funding to date? A: Unsure. We imagine that it'll be spread to broadest number of applicants.
            a. Jim Blanke (W&C) added that he has verbally heard draft awards could be provided in spring 2023.

10. Next steps and adjourn

a. The GSAs are considering a joint CC/SAC meeting for May 2023.
    i. Kel Mitchell supported this because it was helpful to have separate meetings during the GSP update process, but at this point, but it's a little repetitious given a different meeting purpose.

b. Meeting adjourned at 2:42 pm.

Next Regular Meeting

TBD – expected May 2023, likely a joint meeting with the Stakeholder Advisory Committee

Meeting to be conducted as an in-person meeting (subject to change)

Information also available online at mercedsgma.org

MEETING NOTES – Merced GSP

SUBJECT: Merced GSP Joint Coordination Committee & Stakeholder Advisory Committee Meeting

DATE/TIME: May 24, 2023, 10:00 AM to 12:00 PM

LOCATION: Merced Irrigation District, Franklin Yard Facility, 3321 North Franklin Road, Merced, CA 95348 and online via Zoom

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Coordination Committee Members in Attendance:

	Representative	GSA
☒	Hicham ElTal	Merced Irrigation-Urban GSA
☐	Stephanie Dietz	Merced Irrigation-Urban GSA
☒	Justin Vinson	Merced Irrigation-Urban GSA
☐	Daniel Chavez	Merced Irrigation-Urban GSA
☒	Ken Elwin (alternate)	Merced Irrigation-Urban GSA
☒	Eric Swenson	Merced Subbasin GSA
☒	Mike Gallo	Merced Subbasin GSA
☒	Nic Marchini	Merced Subbasin GSA
☒	George Park (alternate)	Merced Subbasin GSA
☒	Kel Mitchel	Turner Island Water District GSA #1
☐	Tim Allan (alternate)	Turner Island Water District GSA #1

Stakeholder Committee Members in Attendance:

	Representative	Community Aspect Representation
☒	Arlan Thomas	MIDAC member
☐	Ben Migliazzo (alternate)	MIDAC member
☐	Bob Kelley	Stevinson Representative
☐	Blake Nervino (alternate)	Stevinson/Merquin
☒	Breanne Vandenberg	MCFB
☒	Craig Arnold	Arnold Farms
☒	Darren Olguin	Resident of Merced County
☐	Dave Serrano	Serrano Farms - Le Grand
☐	David Belt	Foster Farms
☐	Emma Reyes	Martin Reyes Farm/Land Leveling
☐	Greg Olzack	Atwater Resident
☒	Jean Okuye	E Merced RCD
☐	Joe Sansoni	Sansoni Farms/MCFB
☐	Joe Scoto	Scoto Brothers/McSwain School Dist.
☐	Jose Moran	Livingston City Council
☐	Lacy Carothers	Cal Am Water
☒	Lisa Baker	Clayton Water District
☐	Lisa Kayser-Grant	Sierra Club

☐	Mark Maxwell	UC Merced
☐	Maxwell Norton	Unincorporated area
☐	Nav Athwal	TriNut Farms
☒	Olivia Gomez	Community of Planada
☒	Nataly Escobedo Garcia (alternate)	Leadership Counsel
☐	Caitie Diemel	ESJWQC
☐	Darcy Brown	River Partners
☐	Rick Drayer	Merced/Mariposa Cattlemen
☒	Simon Vander Woude	Sandy Mush MWC
☐	Susan Walsh	City of Merced
☐	Bill Spriggs (alternate)	Merced resident
☒	Thomas Dinwoodie	Master Gardener/McSwain
☒	Trevor Hutton	Valley Land Alliance
☒	Wes Myers	Merced Grassland Coalition
☐	Lou Myers (alternate)	Benjamin Land LP

Meeting Notes

1. Call to Order and Welcome

a. Charles Gardiner (Catalyst) called the meeting to order at 10:05 am.

2. Roll Call

a. Coordination Committee members in attendance are shown in the table above.

b. Stakeholder Advisory Committee members in attendance are shown in the table above.

3. Approval of February 27, 2023 Coordination Committee Meeting Minutes

a. Motioned (Gallo), seconded (ElTal), passed unanimously.

4. Public Comment

a. Arturo Martinez from Senator Caballero's office: Is there an opportunity to formally join the Stakeholder Advisory Committee? A (Charles Gardiner): The membership of the Stakeholder Advisory Committee is selected by GSAs via an application process and was most recently updated in early 2021 to support GSP implementation. Anyone is welcome to join meetings in general.

5. Reports

a. GSA Reports

i. Merced Subbasin GSA (MSGSA) – Lacey McBride provided several updates:

1. The GSA is continuing to work on developing an allocation policy. An ad-hoc committee of the GSA Board is making periodic recommendations to the full Board and currently working through issues around spatial variance around the Subbasin. The committee is collecting some additional local monitoring data from growers.
2. The second round of application for the land repurposing program is getting ready to kick off, likely to be open June 15 – July 31.

3. MSGSA is participating in the water accounting platform being developed by the Water Data Consortium and EDF, also used by MIUGSA. Testing will take place this summer with a full roll-out planned for next year.
4. MSGSA's technical consultant, EKI, is working on study to identify and instrument existing wells. EKI is working on scheduling field visits soon. This will inform future data gap projects when looking to install new wells.
5. Eric Swenson (MSGSA) added that, on 5/11/23, the MSGSA Board voted to authorize a contract with EKI to complete all tasks in 5 months. The tasks call for preliminary presentation of groundwater pumping allocations by sustainability zone in October 2023 and potential adoption by the GSA Board in December 2023.
6. Q (Hicham ElTal): Can you explain the sustainability zones? Is the intent that different zones would have different allocations? A (Eric Swenson): These are available on the MSGSA website, areas that have been identified with distinctly different hydrogeology. Second task for EKI is to refine and adjust current boundaries. Those zones already at 2015 groundwater elevations would likely have different pumping allocations than others.

ii. Merced Irrigation-Urban GSA (MIUGSA)

1. Matt Beaman first shared some DWR slides from a recent ACWA conference with an overview about SGMA/GSPs status, as well as other upcoming/ongoing activities that DWR is working on.
2. Q (Kel Mitchel): Approval of GSP for Merced came with "strings attached", what does that mean? A: DWR has a series of guidance documents they're preparing for GSAs. Likely won't see the Merced-specific letter until the guidance documents are finished.
3. MIUGSA is continuing to work on developing a comprehensive rulebook for implementing an allocation program within the GSA. A lot of this will be presented at the next MIUGSA Board meeting on June 14.
4. Hicham ElTal: MIUGSA's policy about groundwater allocation may seem aggressive, but it is being developed in a way to be flexible, given some unknowns about allocations in neighboring MSGSA. Hicham stressed that sooner would be better for MSGSA to decide on implementation of an allocation. While MSGSA's land repurposing program is a worthwhile effort, he thinks it will not be enough to reach sustainability without implementation of an allocation program.

iii. Turner Island Water District GSA-#1 (TIWD GSA-#1): Kel Mitchel provided two updates:

1. As a result of Round 1 grant funding, TIWD GSA-#1 is working on capture/storage of water, starting with planning activities.
2. Started discussing a recharge policy for landowners to develop private recharge projects, and plan to coordinate with the other two GSAs on that.
3. Q (Hicham ElTal): any updates on allocation development? A: Not yet. Focus is on shifting location of pumping from below to above the Corcoran Clay and also overall conservation/demand reduction.

b. <u>Current Basin Conditions and Data Collection Update</u>

i. Jim Blanke (W&C) shared three slides (one per Principal Aquifer), each with numerous hydrographs with groundwater elevations from January 2020 through April 2023, highlighting that we do see general increases in elevations in most wells during the wetter conditions this past winter.

ii. Q (Eric Swenson): Is it possible for wells with 2015 targets to show a historical trend for groundwater elevations back to 2015? A: Yes, we can add another graph or update in the next meeting. Might need to go back to 2014 in some cases.
iii. Public Q: Do you have reference data for ground surface elevation for these wells? It would be helpful to show these graphs in units of depth below ground surface. A: Yes, we have that information and could present it that way.
iv. Matt Beaman (MIUGSA): The GSAs committed to monitoring on a monthly basis in the GSP. Those measurements are being collected. Data QA/QC that was intended for the hired consultant has been shouldered by the GSAs and other consultants. Want to let the committees know that that GSA staff are collaborating on a plan on how to restructure the monitoring data contract moving forward to improve the follow-up steps after data are collected in the field.
v. Q (Nic Marchini): Where are we short in terms of the monitoring process? A: There are two pieces. (1) Collecting monthly measurements, especially in summer, is a little messy/inconsistent because wells are interfering. Schedule coordination for onsite visits is also a challenge on a monthly basis. (2) Some of the data collection is messier than you would expect in the field itself – so a quality control process is needed to make sure measurements are recorded properly and consistently.
vi. Comment (Nic Marchini): Maybe we need a small committee to help plan this out. Would be nice to get data presented to each GSA board meeting monthly or several times per year.
vii. Hicham ElTal (MIUGSA): We may need to find a new partner to help develop the monitoring program. As-is, not getting all the tasks completed.

6. Flood-MAR Pilot Project Presentation

a. Jim Wieking (DWR, Division of Planning) kicked off a presentation on the "Merced River Flood-MAR Reconnaissance Study", introducing a definition of what FloodMAR is, the long-term goals of this study and beyond, as well as some definitions of what the study looked at.
b. David Arrate (DWR) shared the study purpose & goals, an overview of the 8 integrated models, and a description of the variety of scenarios considered as part of the study. Continued work is planned to fine-tune the benefits across the various scenarios.
c. Daniel Mountjoy (Sustainable Conservation) presented on recharge optimization.
d. David Arrate presented key conclusions for the study specific to climate change scenarios, related to flood risk impacts, watershed changes, and management/operation impacts.
e. Daniel Mountjoy presented conclusions related to ecosystem benefits and overall recharge volume potential across time of year and location in the subbasin.
f. Ali Taghavi (Woodard & Curran) shared conclusions specific to the groundwater system and groundwater supply.
g. Jim Wieking provided some closing remarks to the presentation around a pathway to expanding use of FloodMAR to achieve increasing benefits, as well as specific next steps.
h. Hicham ElTal (MIUGSA) thanked the team for the presentation and expressed additional thoughts on potential for FloodMAR.
i. Q (Eric Swenson): Is there a step coming to do a model validation based on actual flows and recharge and monitoring of where water is going based on the actual application of FloodMAR by MID this last winter? A (Daniel Mountjoy): Groundwater Recharge Assessment Tool (GRAT) has been used with Madera Irrigation District and found that they were able to recharge more than GRAT predicted (the model is designed conservatively). A (Ali Taghavi): No verification plan has been presented for the

groundwater modeling, but Merced GSAs could use their MercedWRM tool to simulate what occurred and see the benefits.

j. Q (Simon Vander Woude): What about FloodMAR outside the MID boundary? DairyMAR issue to deal with – how will we work through that? A (Jim Wieking): The pilot study focused on MID's service area but the watershed studies are looking more broadly. A (Daniel Mountjoy): Just starting to collect information on the unincorporated area of the Merced Subbasin to be able to account for this and update the study.
    i. Matt Beaman (MIUGSA): Under "Grant Updates" item on the agenda, there's already a project to expand GRAT to the entire Subbasin.

7. Grant Updates

a. Update on SGMA Implementation, Round 2 Draft Awards
    i. Jim Blanke (W&C) shared the status update of the Round 2 application, including draft award of $3.4 million for 2 projects to Merced as the only critically overdrafted subbasin to receive funding.
        1. Q (Tom Dinwoodie): What is La Paloma Mutual Water Company? A (Lacey McBride): Provided information on La Paloma and its location in the Subbasin.

b. Filling Data Gaps (Current and Potential Future Funding Opportunities)
    i. Matt Beaman (MIUGSA) provided an overview of several ongoing efforts that the GSAs are trying to coordinate around filling data gaps, as well as next steps for those efforts.
    ii. Jim Blanke (W&C) described the DWR Technical Support Services (TSS) funding program and encouraged the Subbasin to continue planning to be in the queue for when additional funding becomes available in the future.

c. Merced Subbasin Integrated Managed Aquifer Recharge Evaluation Tool (MercedMAR)
    i. Matt Beaman (MIUGSA) described the MercedMAR project that was funded by SGMA Implementation & Planning Grant Round 1 that is kicking off soon.

d. Public question: Is there a way to have access to what qualified the Round 2 funded projects for grant funding? A (Jim Blanke): This is a good question that the GSAs would like to understand as well. The draft award just came out last week and we anticipate additional coordination with DWR on their decision process. The solicitation package for the grant has specific criteria for projects to be considered, but we still need to get more information from DWR on the rationale for the specific draft results.

8. GSP 5-Year Update Preview

a. Jim Blanke (W&C) presented a refresher on what's required for the GSP's 5-year update, as well as potential considerations for the update.

b. Hicham ElTal would like to add to the list of considerations to the plan: moving from once per month groundwater monitoring to quarterly. Also, he doesn't expect to see DWR's recommendation letter for some time.

c. Public Q: Did DWR say why they didn't complete the letter by March 30? A: They're working on it, it's not a regulatory deadline, just a goal that the DWR initially provided.

9. Next steps and adjourn

a. Jim Blanke (W&C) shared a list of next steps for the next several months.

b. Hicham ElTal: MID has worked on an amendment to the SB 23 flood bill from Senator Caballero to allow for things like the water right application for the Subbasin. Would be a huge win for the Subbasin.

c. Meeting adjourned at 12:00 pm.

Next Regular Meeting

TBD

Meeting to be conducted as an in-person meeting (subject to change)

Information also available online at mercedsgma.org

MEETING NOTES – Merced GSP

SUBJECT: Merced GSP Joint Coordination Committee & Stakeholder Advisory Committee Meeting

DATE/TIME: September 18, 2023, 10:00 AM to 12:00 PM

LOCATION: Merced Irrigation District, Franklin Yard Facility, 3321 North Franklin Road, Merced, CA 95348 and online via Zoom
SECONDARY TELECONFERENCE LOCATION: One member of the Coordination Committee teleconferenced from a secondary location: THE SANDBOX Paso Robles, 1345 Park Street, Paso Robles, CA 93446

Coordination Committee Members in Attendance:

	Representative	GSA
☒	Hicham ElTal	Merced Irrigation-Urban GSA
☐	Stephanie Dietz	Merced Irrigation-Urban GSA
☒	Justin Vinson	Merced Irrigation-Urban GSA
☒	Daniel Chavez	Merced Irrigation-Urban GSA
☒	Ken Elwin (alternate)	Merced Irrigation-Urban GSA
☐	Eric Swenson	Merced Subbasin GSA
☒	Mike Gallo	Merced Subbasin GSA
☐	Nic Marchini	Merced Subbasin GSA
☐	George Park (alternate)	Merced Subbasin GSA
☒	Kel Mitchel	Turner Island Water District GSA #1
☐	Tim Allan (alternate)	Turner Island Water District GSA #1

Stakeholder Committee Members in Attendance:

	Representative	Community Aspect Representation
☒	Arlan Thomas	MIDAC member
☐	Ben Migliazzo (alternate)	MIDAC member
☐	Bob Kelley	Stevinson Representative
☐	Blake Nervino (alternate)	Stevinson/Merquin
☒	Breanne Vandenberg	MCFB
☐	Craig Arnold	Arnold Farms
☐	Darren Olguin	Resident of Merced County
☐	Dave Serrano	Serrano Farms - Le Grand
☐	David Belt	Foster Farms
☒	Emma Reyes	Martin Reyes Farm/Land Leveling
☐	Greg Olzack	Atwater Resident
☒	Jean Okuye	E Merced RCD
☐	Joe Sansoni	Sansoni Farms/MCFB
☒	Joe Scoto	Scoto Brothers/McSwain School Dist.
☐	Jose Moran	Livingston City Council

☐	Lacy Carothers	Cal Am Water
☐	Lisa Baker	Clayton Water District
☒	Lisa Kayser-Grant	Sierra Club
☐	Adam Malisch	UC Merced
☒	Phillip Woods (alternate)	UC Merced
☒	Maxwell Norton	Unincorporated area
☐	Nav Athwal	TriNut Farms
☐	Olivia Gomez	Community of Planada
☒	Caitie Diemel	ESJWQC
☐	Darcy Brown	River Partners
☐	Rick Drayer	Merced/Mariposa Cattlemen
☒	Simon Vander Woude	Sandy Mush MWC
☒	Susan Walsh	City of Merced
☐	Bill Spriggs (alternate)	Merced resident
☒	Thomas Dinwoodie	Master Gardener/McSwain
☒	Trevor Hutton	Valley Land Alliance
☐	Wes Myers	Merced Grassland Coalition
☐	Lou Myers (alternate)	Benjamin Land LP

Meeting Notes

1. Call to Order and Welcome

a. Charles Gardiner (Catalyst) called the meeting to order at 10:03 am.

2. Roll Call

a. Coordination Committee members in attendance are shown in the table above. A quorum of members was not established.

b. Stakeholder Advisory Committee members in attendance are shown in the table above.

3. Approval of May 24, 2023 Coordination Committee Meeting Minutes

a. Tabled to the next meeting due to not establishing a quorum of the Coordination Committee.

4. Public Comment

a. None received

5. Reports

a. GSA Reports
   i. Merced Subbasin GSA (MSGSA) – Lacey McBride provided several updates:
      1. The MSGSA Board recently approved revised sustainability zones that take into account several new pieces of information since the first time the zones were drafted. Currently working on developing an interactive online map for viewing the new boundaries.
      2. In August, the MSGSA Board considered a schedule to adopt a GSA-specific allocation policy in 2024, implement a dry run in 2025, and fully implement in 2026.
      3. Land Repurposing

            a. Local program just finished 2nd application period; GSA approved 6 additional applicants (3,100 AFY reduction at total cost to GSA of $880,000).
            b. MSGSA received an $8.9M land repurposing grant from the State and will be developing and implementing a more detailed land repurposing plan.
        4. MSGSA finished a recent round of instrumenting wells (pressure transducers) in an effort to fill data gaps.
    ii. Merced Irrigation-Urban GSA (MIUGSA); Matt Beaman provided several updates:
        1. MIUGSA has been continuing to work on GSA rules (as previously reported in more detail); expect to be making a draft final version public soon.
        2. MIUGSA received a well permit consistency determination request for a well located in MIUGSA but that will likely serve land within MSGSA. MIUGSA would like to coordinate with MSGSA on this request due to the inherent complexities. MIUGSA thinks a comment letter from MSGSA may be useful.
            a. Comment (Maxwell Norton): Approving this well request will make it longer to bring that area into compliance with state law. This will extend the period that restrictions have to be imposed on existing irrigators.
            b. Q (Charles Gardiner): What is the timing on the approval? A: There is no deadline requirement for review; requested was received about a month ago. There is a desire to process these in a reasonable amount of time.
            c. Q (Susan Walsh): Will this set a precedent once a decision is made? A: Potentially, yes. There is a difference in practice vs what the ordinance language describes.
            d. Comment (Susan Walsh): Make sure it's a defensible choice because it's likely to come up again in the future.
            e. Comment (Lacey McBride, MSGSA): This is an important topic because it will likely come up again in future well permit consistency determination requests. Once the MSGSA has an allocation in place, this should be easier to coordinate on. During this interim time, MSGSA should be able to coordinate with MIUGSA on this current request.
    iii. Turner Island Water District GSA-#1 (TIWD GSA-#1): Kel Mitchel provided several updates:
        1. The GSA is moving forward with using grant funds to update infrastructure and reduce water usage in the GSA's area.
        2. The GSA has been continuing to develop a recharge policy.

b. <u>Current Basin Conditions</u>
    i. Matt Beaman (MIUGSA) provided an update on the current conditions of the basin. While edits to this segment of the meeting are still undergoing revisions (e.g. addition of summary statistics), some edits have been made in response to previous comments on making this more accessible.
    ii. Matt presented a subset of slides from a longer report that contains overview information as well as hydrographs for each individual wells. He also highlighted several wells recently installed, including Michael Rd located in the Above Corcoran Clay Principal Aquifer. The full set of slides were uploaded to MercedSGMA.org.

iii. Q (Maxwell Norton): In the El Nido region, what is the source of the recovery for Below CC? A (Hicham ElTal): It is likely due to a water transfer from MID, which reduced pumping in the area.
iv. Q (Charles Gardiner): Is it fair to say that recent groundwater levels in the Above Corcoran aquifer are higher because of rainfall, and higher in Below Corcoran aquifer because of reduced pumping? A: (Matt Beaman) Yes, plus an impact of delayed pumping in the Below Corcoran.

6. Stakeholder Advisory Committee Membership Update

a. Charles Gardiner (Catalyst) described that the GSAs intend to open an application period in the next several weeks to replace some seats on the SAC that have had low participation. Existing regularly attending committee members are welcome to stay on the committee. SAC members are encouraged to forward the application on to people they think may be interested in serving, especially as things get busier in the next year with the development of the 5-year update.
b. Matt Beaman (MIUGSA): The application will be very similar to what was used previously to gather membership for the current committee.

7. GSP 5-Year Update

a. Jim Blanke (Woodard & Curran) provided an update of why the 5-year update is required, a timeline of the GSP development and approval process to date, and then presented more information on the 9 corrective actions from DWR's initial GSP determination letter and an overview of strategies for how the GSAs are intending to address these in the GSP 5-year update.
b. Q (Maxwell Norton): Isn't the impact obvious for what declines of water levels will have on domestic wells? A: Yes overall, but it's more about quantification of the impacts – the estimated number of wells.
c. Q (Brad Samuelson): Is it a model run that would show how many domestic wells would be dewatered? A: It has more to do with developing a water level surface associated with interim milestones and then comparing this to the known information on domestic well locations.
d. Q (Hicham ElTal): What's the threshold for defining saline water? 2000 mg/L? Does the storage of the basin exclude saline? A: Yes, that threshold sounds about right and yes, the storage reported on the slide (45 MAF as of 2015) includes the freshwater portion only.
    i. Comment (Hicham ElTal): More concerned with impact of surrounding subbasins on the Merced Subbasin's storage.
e. Q (Maxwell Norton): There are many things that can be analyzed and detected in water. TDS is a strong overall indicator. Feels like the State is looking for something. Do you know what that might be? (nitrates, something else?) Concerned about making the GSAs into water quality regulatory agencies when there are lots of other agencies and efforts to manage this separately. A: You may be right. We think the DWR is juggling many things right now, especially focusing on interconnected surface waters. However, water quality is still important and thus we're continuing to see comments like this from DWR.
    i. Comment (Hicham ElTal): The original GSP specifically chose to stick with one indicator (TDS), even when challenged in the past. Agreed with recognizing existing programs that are in place.
    ii. Comment (Joe Scoto): Don't like the additional language that would require additional water quality regulation by the GSAs.
    iii. Comments (Charles Gardiner): Some water quality regulators/existing programs may be coming to the GSAs to discuss/enforce recharge policies in the future.

f. Jim Blanke (W&C) provided a preview of the 6 meeting topics planned for the CC and SAC in the next year as part of the GSP 5-year update.

g. Q (Tom Dinwoodie): What is the suspension/attendance deadline for getting SAC revitalized? Should we have a dedicated meeting to get new SAC members up to speed? A (Matt Beaman, MIUGSA): Yes, it would be good to have focused sessions, whether one-on-one, or in a specific group, with new folks to bring them up to speed rather than doing this with the whole group. We anticipate having new SAC members by the next meeting, though there may be some stragglers.

8. Contracting Recommendations

a. Matt Beaman (MIUGSA) shared three open contracting topics to solicit input/comments/direction from committee members before they are considered for execution.

   i. Merced GSP 5-Year Update

      1. Lacey McBride (MSGSA): GSP included an estimate of $800,000 of the GSP 5-year update as of 2020, so she considers this in the same ballpark from a budget standpoint. The original GSP had grant funding, but this one does not.
      2. Q (Maxwell Norton): While have enjoyed working with Woodard & Curran, should it be the long-term goal to develop internal capacity and expertise to carry out these functions? A (Hicham ElTal): Still need consultant support this effort, don't have a large enough team internally to carry this out. There are also enough varied parts where we may need various types of expertise based on how the implementation carries out through time or other DWR requirements in the future.

   ii. Merced Subbasin Integrated Managed Aquifer Recharge Evaluation Tool (MercedMAR)

      1. No questions or comments were received. This topic was already presented/discussed in more detail at the previous meeting.

   iii. Monthly Groundwater Level Monitoring

      1. Comment (Hicham ElTal): Some wells are production wells with accumulated oil sitting on top of the water which gets in the way of the sounding/measurement. MIUGSA may be coming back with a separate proposal to purge the oil accumulation.
      2. Q (Tom Dinwoodie): Is there an opportunity for UC Merced to participate in the data analysis side? A: Yes, it's possible and MIUGSA is willing to discuss with UC Merced. This would be more task-oriented and less research-oriented, which may not end up being a good fit.

9. Data Gaps Update

a. Lacey McBride (MSGSA) shared a map of wells that the MSGSA identified for potential monitoring, as well as a subset of wells that were instrumented with pressure transducers. She described that Woodard & Curran was requested to re-run the data gaps tool with a scenario that includes the new transducer location. Found that it didn't reduce the number of data gaps in Above/Below Corcoran but it did shift the data gaps/priorities locations.

   i. Last week, the MSGSA Board gave direction for MSGSA staff to work with the other GSAs to move forward with using grant funding to coordinate on installation of new wells.

b. Matt Beaman (MIUGSA): To group, if you do know an existing well, time is of the essence because there becomes a point of no return once you get far along enough on the new well permitting/installation process.
c. Hicham ElTal (MIUGSA): For surface water interactions, it gets more complicated because you need a location where you can do both groundwater level and streamflow monitoring. Also – does MSGSA allow higher/lower groundwater pumping in different sustainability zones?
    i. Lacey McBride (MSGSA): Nothing is finalized yet, but that has been discussed. There are also opportunities identified to match some monitoring with what is planned by Delta-Mendota on the opposite side of the San Joaquin River.
d. Q (Charles Gardiner): What kind of well outreach has occurred to fill data gaps with existing wells?
    i. Lacey McBride (MSGSA): Have come to the SAC and other groups several times. MSGSA has widely distributed a form that asks for information about potential existing wells. Have also done outreach through distribution list, Technical Advisory Committee, and Board Meetings.
e. Q (Simon Vander Woude): Where are the remaining data gaps? A: They are generally in the northwestern corner for Below Corcoran Clay. Also central portion of the Above Corcoran Clay.
    i. The draft results of the tool have been posted to MercedSGMA.org.
f. Comment (Maxwell Norton): There might be some frost protection wells maintained, but not used frequently, that would be good candidates. Response (Matt Beaman): These are likely mostly located in MIUGSA's area and that portion of the network is generally not prioritized for filling data gaps.

10. Next steps and adjourn

a. Jim Blanke (W&C) shared a list of next steps for the next several months.

b. Meeting adjourned at 11:43 am.

Next Regular Meeting

TBD, potentially November 2023

Meeting to be conducted as an in-person meeting (subject to change)

Information also available online at mercedsgma.org

MEETING NOTES – Merced GSP

SUBJECT: Merced GSP Coordination Committee Meeting

DATE/TIME: November 29, 2023, 10:00 AM to 12:00 PM

LOCATION: Merced Irrigation District, Franklin Yard Facility, 3321 North Franklin Road, Merced, CA 95348 and online via Zoom

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Coordination Committee Members in Attendance:

	Representative	GSA
☒	Hicham ElTal (remote)	Merced Irrigation-Urban GSA
☐	Scott McBride	Merced Irrigation-Urban GSA
☒	Justin Vinson	Merced Irrigation-Urban GSA
☐	Daniel Chavez	Merced Irrigation-Urban GSA
☒	Ken Elwin (alternate)	Merced Irrigation-Urban GSA
☒	Eric Swenson	Merced Subbasin GSA
☒	Mike Gallo	Merced Subbasin GSA
☒	Nic Marchini	Merced Subbasin GSA
☒	George Park (alternate)	Merced Subbasin GSA
☒	Kel Mitchel (remote)	Turner Island Water District GSA #1
☐	Tim Allan (alternate)	Turner Island Water District GSA #1

Meeting Notes

1. Call to Order and Welcome

a. Jim Blanke (W&C) called the meeting to order at 10:09 am.

2. Roll Call

a. Coordination Committee members in attendance are shown in the table above. A quorum of members was not established.

3. Approval of Meeting Minutes

a. Tabled to the next meeting due to not establishing a quorum of the Coordination Committee.

b. No comments received on the two sets of meeting minutes for review.

4. Public Comment

a. Joseph Gallagos (from Umida AG) – Presented a subsurface agriculture irrigation system product (Aquifer Pipe) that he said is able to reduce irrigation requirements. He indicated that Umida AG is starting to apply for grants to implement their product. His stated purpose of his public comment was to share with the GSAs that this exists and the grant application activities are occurring, in case questions were to be routed directly or indirectly to GSA staff.

5. Reports

a. GSA Reports

i. Merced Subbasin GSA (MSGSA) – Lacey McBride provided several updates:

1. Earlier in November, the GSA held presentations and a public workshop on the allocation development. A recording of the workshop from Nov 9 is posted on the Merced Subbasin GSA website.
2. In September, the GSA approved an update to the sustainability zone boundaries.
3. In October, the GSA determined a process where if an agricultural operation is bisected by the new sustainability zone boundaries, property owners can request to reclassify the parcel to be in one sustainability zone (with some limitations on size and timeline for making the request).
4. The GSA has made a request to all parties who provided water elevation data in the summer to provide updated fall monitoring data now ahead of the GSAs' preparation of the water year 2023 annual report.

ii. Merced Irrigation-Urban GSA (MIUGSA); Matt Beaman provided several updates:

1. Since the 9/18 CC meeting, the MIUGSA board has adopted the rules/regulations and governing plan. The rules go through how groundwater is allocated and managed at the account level and what opportunities there are to move water between groundwater accounts. This is the culmination of a 2.5 year effort.
2. MIUGSA continues to make progress on registering wells as part of the well registration policy discussed previously.
3. Potential edits to the Groundwater Export Ordinance have been discussed recently among staff; the current ordinance prohibits groundwater from leaving the basin it's in, but can leave Merced County if the basin crosses county lines. The proposed amendment would give GSAs ability to allow an export between subbasins (primarily within the County, unless the basin already crosses county lines) if the GSA for export origination and GSA who is receiving agree the transfer is in compliance with SGMA.
    a. Matt shared that MIUGSA thinks that proposed ordinance edits might be missing some important components or be inconsistent with other laws/ordinances (e.g., compliance with other state or federal laws like CEQA).
    b. Hicham ElTal (MIUGSA): When the original ordinance was first adopted years ago, certain board members were very active in trying to find a solution for challenges faced at the time with groundwater export. Concerned about moving backwards; don't want to accidentally create a market for water exports. MID can and does export water in an official agency capacity and wouldn't need to go through a third party. If the ordinance is going to be changed, it needs to be studied thoroughly to make sure sustainability of the basin is not impacted and a market isn't created to remove water from the basin.
    c. Q (George Park): who's proposing this change and why the rush? A (Lacey McBride): The change is coming from the County Board of Supervisors who directed staff to work with stakeholders throughout Merced County. In outreach, staff have included

stakeholders from all four subbasins, all GSAs, and multiple Water Districts. Meetings have been held over the last year.
            i. Matt Beaman (MIUGSA): Meetings have been held since February 2023; MIUGSA has been the only agency pushing back at the proposed changes.
        d. Public Q (Natlie, Leadership Counsel): Is this a new ordinance or update of existing? Is there public access to the proposed edits? A (Lacey McBride): This is the existing Merced County Groundwater Mining and Export Ordinance. There is a draft redline of the proposed changes available online on Merced County Board of Supervisors Agenda Center for 11/28/2023.
        e. Q (George Park): What wells are you requesting growers to register? A (Matt Beaman): All new drilled wells have to register. Agricultural wells serving over 10 acres had to register by 4/1/23. Agricultural wells serving less than 10 acres have a 1/1/24 deadline for registration. Deadline for private commercial/industrial is 6/30/24. All domestic wells must register by 12/31/24.
        f. Q (George Park): Do registration requirements apply to any drilled hole, regardless if there's a pump currently in place? A (Matt Beaman): If you think you're going to operate the well in the future, you should register it now.
    iii. Turner Island Water District GSA-#1 (TIWD GSA-#1): Kel Mitchel provided this update:
        1. The GSA has been working over the last month or two to reframe the water budget for the District and the GSA, leading to tracking/allocation of water usage. Over the next 6-12 months, they plan to have developed a framework to build an allocation upon for use within the GSA.
b. <u>Current Basin Conditions</u>
    i. Matt Beaman (MIUGSA) presented a subset of slides from a longer report that contains overview information as well as hydrographs for each individual wells.
        1. Generally seeing increases in groundwater levels over the last year.
        2. About 60 sites are being monitored on a monthly basis. It's been good to have more data, but analysis has been challenging. Will be looking at the necessity of continuing the monthly well sampling frequency.
        3. Comment (Public): It would be helpful to see on the hydrographs where the bottom of the Corcoran Clay is (for subsidence monitoring purposes).
        4. Q (Nic Marchini): Overall was it good since last year? A (Matt Beaman): Yes overall! Below Corcoran in the El Nido area in particular has seen surprisingly strong level increases, potentially because of MID water transfers.
    ii. The full set of slides were uploaded to MercedSGMA.org.

6. Consideration of Updates to Sustainable Management Criteria (SMC)

a. Jim Blanke (Woodard & Curran) walked the group through different sustainability indicators and considerations for updates to the SMC.
b. Reduction of groundwater storage
    i. Eric Swenson (MSGSA): GSP definition of storage includes TDS defined with a fairly high concentration which is too salty to be utilized for agriculture. That's why there aren't wells deeper than approximately 1,200 feet. More typical is 600-

800 ppm. One thing to look at might be: what is the storage volume with TDS of 1000 ppm or lower, rather than 2000 ppm.

1. Hicham ElTal (MIUGSA): Would rather not mix storage with water quality. Some crops can take higher TDS than others. There's a separate indicator for water quality. Hicham generally supports using groundwater levels as a proxy though.
2. Eric agreed with using groundwater levels as a proxy.

ii. Q (Nic Marchini): Would thresholds for storage be different by principal aquifer? A (Jim Blanke): We would need to show groundwater levels are connected to storage and likely it would just be connected to the single groundwater level SMC (not specific to principal aquifers), but need to evaluate options to be sure.

c. Degraded water quality

i. Eric Swenson (MSGSA): Nitrate and arsenic are two constituents that are heavily tested and there's a database for this already.

ii. Hicham ElTal (MIUGSA): Water quality is going to take a long time to figure out how we're going to use the authority of a GSA. Water quality issues can be very small in scale (e.g., well by well) and less often a large regional issue that is more suited to the GSAs. Several other agencies are more involved in this. It will take time to figure out how the GSP is going to address this in a meaningful way.

iii. Ken Elwin (MIUGSA): How do you control high constituent concentrations where they occur in small, local areas beyond the control of the GSAs? Not sure how the GSAs can really control for this.

d. Chronic lowering of groundwater levels (monitoring network and establishing SMC at new sites)

i. Eric Swenson (MSGSA): The other source for potential data in a linear regression analysis/extrapolation are the well pump companies. They typically measure static water elevations in wells when pulling pumps. A large owner might have some historical data to see how well the regression fits historical data.

ii. Hicham ElTal (MIUGSA): The way the well was made could influence trends observed in the linear regression (e.g., 1950s drilled well vs more recently installed wells). Might want to take into account cable tool vs gravel pack wells in the regression.

7. Next steps and adjourn

a. Meeting adjourned at 11:17 am.

Next Regular Meeting

January 24, 2024 at 10am

Meeting to be conducted as an in-person meeting with remote option (subject to change)

Information also available online at mercedsgma.org

MEETING NOTES – Merced GSP

SUBJECT: Merced GSP Coordination Committee Meeting

DATE/TIME: January 24, 2024, 10:00 AM to 12:00 PM

LOCATION: Merced Irrigation District, Franklin Yard Facility, 3321 North Franklin Road, Merced, CA 95348 and online via Zoom

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Coordination Committee Members in Attendance:

	Representative	GSA
☒	Hicham ElTal	Merced Irrigation-Urban GSA
☐	Scott McBride	Merced Irrigation-Urban GSA
☒	Justin Vinson	Merced Irrigation-Urban GSA
☐	Daniel Chavez	Merced Irrigation-Urban GSA
☒	Ken Elwin (alternate)	Merced Irrigation-Urban GSA
☒	Eric Swenson	Merced Subbasin GSA
☒	Mike Gallo	Merced Subbasin GSA
☒	Nic Marchini	Merced Subbasin GSA
☒	George Park (alternate)	Merced Subbasin GSA
☒	Kel Mitchel	Turner Island Water District GSA #1
☐	Tim Allan (alternate)	Turner Island Water District GSA #1

Meeting Notes

1. Call to Order and Welcome

a. Jim Blanke (W&C) called the meeting to order at 10:03 am.

2. Roll Call

a. Coordination Committee members in attendance are shown in the table above.

b. Kel Mitchel (TIWD GSA-#1) requested that Tim Allan be removed as alternate from the Coordination Committee as Mr. Allan no longer sits on the TIWD GSA #1 Board.

3. Approval of Meeting Minutes

a. No comments on the three sets of meeting minutes

b. Approval of the minutes was received unanimously.

4. Public Comment

a. George Park clarified that he was attending the meeting as a member of the public, not participating as an MSGSA board member or as an MSGSA alternate.

5. 2024 Rural Communities Water Managers Leadership Institute Introduction (Self-Help Enterprises)

a. Sue Ruiz (Self-Help Enterprises, SHE) provided an introduction to the 2024 Rural Communities Water Managers Leadership Institute and this year's particular focus on bringing in members of the north part of the region including Merced.
b. Agencies and community members can apply to participate (at no cost) online at https://bit.ly/SHELeadershipInstitute
c. Q (Lacey McBride, MSGSA): How are you looking to identify community members for this year's program participation? A: Many times SHE is attending public meetings like this to cast a wide net, but have generally found that word of mouth has been most effective. SHE is asking Coordination Committee members to reach out to their contacts to spread the word about this program.
d. Comment (Nic Marchini, MSGSA): SHE has done a lot for Planada and Le Grand which is much appreciated. Nic thinks there's more room to continue to grow leadership in Planada.

6. Reports

a. GSA Reports
    i. Merced Subbasin GSA (MSGSA) – Lacey McBride provided several updates:
        1. The MSGSA continues to work on the allocation policy and plans to release a policy statement on values in the coming weeks (on schedule) for public comment.
        2. Multi-benefit land repurposing grant ($8.9M grant awarded last summer) – in February, the GSA is going to evaluate releasing an RFP to select a firm/team to develop the plan, implement projects, perform outreach, and conduct monitoring (in addition to working with partners already identified).
    ii. Merced Irrigation-Urban GSA (MIUGSA) - Matt Beaman provided several updates:
        1. MIUGSA has been focused on the well registration policy because it feeds into groundwater accounts which benefits monitoring and tracking of the allocation MIUGSA has adopted.
        2. MIUGSA sent out a formal reminder in early December about the Dec 15 deadline to register wells of a certain size before a penalty is assessed. This resulted in ~800 additional wells registered.
        3. The MIUGSA Board took a recent action to provide some flexibility for staff to void penalty invoices if well owners register late by Jan 31.
        4. MIUGSA continues to manage several grant-funded projects, including some older projects that are wrapping up.
            a. Some remaining funding that's expiring soon may be used to purchase additional well transducers.
            b. Currently working with 8 different agency points of contacts through some logistical challenges around reimbursement of regular invoices. Matt stressed how important it is for all participants to follow the State invoicing guidelines so that everyone can be reimbursed on time because it's evaluated in bulk, not on an individual project basis.
            c. Most recent grant award for La Paloma MWC projects is undergoing grant agreement discussions with DWR.
        5. Hicham ElTal (MIUGSA): Yesterday, MID met with the SWRCB Director of the Water Rights Division to talk about MID's FloodMAR application. Topics of discussion included a water availability analysis and a state request to reduce the application volumetric amount requested.

a. The State has received a similar application from Turlock. During the last ACWA conference, Merced + Turlock discussed combining efforts.
b. Upcoming activities include updating the water availability analysis and holding ongoing discussions with SWRCB about maximizing the appropriation in the license application.
c. Q (Brad Samuelson): Previously discussed legislation to codify some of these concerns – what's the latest? A (Hicham ElTal): No major progress has been made, particularly due to a lot of other activities happening in the region and at the SWRCB level. It's still on the table as a future path to pursue.
d. Q (Nic Marchini, MSGSA): What are your thoughts about joining with Turlock Irrigation District (TID)? A (Hicham ElTal): Would like to go to Sacramento with TID to coordinate on the request.
e. Q (Eric Swenson, MSGSA): Did SWRCB give a timeline for this process? A (Hicham ElTal): No timeline was provided. The main focus of discussions has been on overall concepts and Hicham anticipates it being a long process.
f. Q (Brad Samuelson): Has the MIUGSA used well data (as part of the registration process) to define the Corcoran Clay and prepare allocations for above vs below? A (Matt Beaman): The allocation is agnostic to the Corcoran. As part of the well registration, MIUGSA did ask about well perforation depths. Some well owners have that information but others don't.
g. Q (Eric Swenson, MSGSA): Heard that a particular 20-30 acre grower who had an ideal site for locating a CIMIS station was approached by MID but was hesitant to participate because MID wouldn't guarantee irrigation deliveries in dry times. Can you comment? A (Hicham ElTal): Plans to approach the Board to discuss this in more detail. Hicham is the lead for further discussions on the CIMIS station topic.

iii. Turner Island Water District GSA-#1 (TIWD GSA-#1): Kel Mitchel provided this update:
1. No significant updates since the previous November 2023 Coordination Committee meeting. Discussions about allocation are ongoing.
2. Kel seconds Matt's earlier comments about the coordination on reimbursements for the grant-funded projects. The grant amount for TIWD's projects is approximately equal to their annual operating revenue which has made underwriting the grant project difficult.

b. <u>Current Basin Conditions</u>

i. Matt Beaman (MIUGSA) presented a subset of slides from a longer report that contains overview information as well as hydrographs for each individual well.
1. The Jefferson Rd well site (installed 2020 or 2021) has had some recent cellular reception issues so MIUGSA has been out to the site to replace equipment and try a new vendor.
2. Michael Rd was added in 2022 and has been measured for the last year. It should be instrumented soon to collect more frequent measurements.
3. Northwest of Lake Yosemite (North of City of Merced) there is an existing MID well that will be instrumented soon based on GSA + grant funding.

4. Another grant will be used to install 4-5 monitoring wells which do not yet have proposed locations. The grant agreement expiration is quickly approaching.
    a. Q (Nic Marchini, MSGSA): Generally where are wells needed? A (Matt Beaman): MSGSA did a recent analysis that identified the southwest of the Subbasin as being an ongoing data gap.
        i. Nic identified a ranch in the area that could be a potential location.
    b. Comment (Eric Swenson, MSGSA): The MSGSA has a data gaps plan with a schedule that will lead to budgets for spending. Eric thinks a basin-wide plan, schedule, and budget is necessary to coordinate overall. The grant is not going to cover all the basin data gaps.
    c. Matt Beaman (MIUGSA): Emphasized that the grant schedule is very tight and whatever approach the GSAs take, there needs to be some immediate near-term actions.
5. There have been spotty measurements due to oil at certain existing wells; Matt will be looking at what it would cost to resolve these issues.
6. Quality Well Drillers was recently hired to collect well measurements.
7. Matt would like to put together an operational data management system with ability to perform QA/QC in addition to reporting.
8. Comment (George Park): Lone Tree can provide additional data to collaborate with the contractor measurements collected at a subset of Lone Tree wells.

ii. The full set of slides were uploaded to MercedSGMA.org.

7. Discussion about 1/23/24 Merced County Board of Supervisors Meeting Considering Amendment to Merced County's Groundwater Ordinance Export Policy

a. Lacey McBride (MSGSA): The amendment would require the GSA in the originating basin and GSA in the receiving basin to provide a sustainability determination report on all exports. Right now the GSAs make the sustainability determination for new well installs, but it's specific to the GSP.
    i. Yesterday, the Board tabled the decision for one year unless the GSPs in Chowchilla, Delta-Mendota, Turlock are all approved earlier. In the meantime, the extension gives the GSAs time to prepare for a future policy change.
b. Q (Hicham ElTal): To move this forward, Hicham suggests Merced Subbasin (likely to be the originating basin for most future exports) should have a consistent agreement amongst the subbasin GSAs about natural groundwater (not banked or other), e.g. limit the volume of future exports to no more than the natural yield of groundwater.
    i. Eric Swenson (MSGSA): The natural/sustainable yield could change through time. Might be better to limit the quantity to a shorter time period that has to be refreshed through time.
c. Q (Jim Blanke): Would the CC like to include exports in the GSP update?
    i. Eric Swenson (MSGSA): Once the amendment is on track with the Board of Supervisors, an email should go out to the CC so they can collectively decide on a response to the final version being proposed.

    ii. Hicham ElTal (MIUGSA): Suggests reviewing and considering this sooner than later. Doesn't see a need to bring this into the GSP.
d. Comment (Nic Marchini, MSGSA): Generally supports Hicham's proposed policy about the limitation related to sustainable yield. Agrees with wanting to make a decision on this sooner than later.
e. Lacey McBride (MSGSA): Ordinance defines groundwater as anything pumped from the ground. In the past, when exporters mentioned a groundwater bank, then the County requires proof that it's not "groundwater".
f. Kel Mitchell (TIWDGSA-#1): Agrees with Hicham, but wants to keep it as simple as possible (e.g., avoid additional documents with different definitions than GSP).
    i. Hicham ElTal (MIUGSA): Let's pull out the proposed amendment language for the next CC meeting and compare it to the GSP definitions/policies.

8. Inelastic Land Subsidence Discussion

a. Jim Blanke (Woodard & Curran) provided an update on current/recent conditions of subsidence as well as a the recommended corrective actions provided by DWR and some potential approaches to respond.
b. Comment (Hicham ElTal, MIUGSA): Clarified that the uncertainty in each individual subsidence measurement value is +/- 0.08 ft.
c. Comment (George Park): Clarified that one or more recent subsidence monitoring points saw an increase in elevation so it's not necessarily considered "inelastic" per the title of this agenda item.
d. Q (Hicham ElTal): What's the depth of the groundwater in the Lone Tree MWC area? A (George Park): about 100 feet below ground surface in winter.
e. Art Machado (Woodard & Curran) provided an overview of the different approaches to subsidence SMC that have been taken in the Westside Subbasin and Kings Basin.
f. Jim Blanke (Woodard & Curran) reviewed some additional considerations for the GSAs to respond to the recommended corrective actions.
    i. Hicham ElTal (MIUGSA):
        1. Reclamation has performed a lot of modeling of the impacts on the Eastside Bypass and San Joaquin River; can't think of anything else or other groups to reach out to.
        2. Should continue to emphasize residual nature of subsidence and that subsidence is largely impacted by actions outside the Subbasin.
        3. Potentially consider non-regulatory thresholds that are used for local management.
    ii. Eric Swenson (MSGSA) was encouraged how rapidly subsidence abated during the wet winter of early 2023. There may need to be a better understanding of what happened – was that due to shallow soil swelling that masked the deeper mechanisms? Have heard about USGS work to look at subsidence rates at different depths.
    iii. Hicham ElTal (MIUGSA): consider comparing Merced-specific subsidence values compared to the focal point of subsidence to the south the Subbasin and use some percentage comparison.

9. **Minimum Data Standards for Groundwater Levels**
    a. Tabled for a future meeting due to lack of time.
    b. Lacey McBride (MSGSA) provided a brief summary of this point in anticipation of discussing it in more detail at a future meeting. The MSGSA has been collecting local data to fill some data gaps (measurements growers take manually). Many have been rejected from being included in the annual reports. Would like to consider a short-term exception to find a way to incorporate this information.
10. **Next steps and adjourn**
    a. Meeting adjourned at 12:05 pm.

Next Regular Meeting
March 20, 2024 at 1:30 pm
Meeting to be conducted as an in-person meeting with remote option (subject to change)
Information also available online at mercedsgma.org

MEETING NOTES – Merced GSP

SUBJECT: Merced GSP Coordination Committee Meeting

DATE/TIME: March 20, 2024, 1:30 to 3:30 PM

LOCATION: Merced Irrigation District, Franklin Yard Facility, 3321 North Franklin Road, Merced, CA 95348 and online via Zoom

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Coordination Committee Members in Attendance:

	Representative	GSA
☒	Hicham ElTal	Merced Irrigation-Urban GSA
☐	Scott McBride	Merced Irrigation-Urban GSA
☐	Justin Vinson	Merced Irrigation-Urban GSA
☐	Daniel Chavez	Merced Irrigation-Urban GSA
☒	Ken Elwin (alternate)	Merced Irrigation-Urban GSA
☒	Eric Swenson	Merced Subbasin GSA
☒	Mike Gallo	Merced Subbasin GSA
☐	Nic Marchini	Merced Subbasin GSA
☒	George Park (alternate)	Merced Subbasin GSA
☐	Kel Mitchel	Turner Island Water District GSA #1

Meeting Notes

1. Call to Order and Welcome

a. Jim Blanke (W&C) called the meeting to order at 1:32 pm.

2. Roll Call

a. Coordination Committee members in attendance are shown in the table above. A quorum was not present.

3. Approval of Meeting Minutes

a. Did not have quorum, so approval was tabled for a future meeting.
b. No comments were made on the draft minutes from 1/24/24.

4. Public Comment

a. None received.

5. Reports

a. GSA Reports
   i. Merced Subbasin GSA (MSGSA) – Ashlee Chan-Gonzalez provided several updates:
      1. MSGSA recently adopted an allocation framework that reflects the spatial variability and existing conditions of the sustainability zones. Sustainable yield (SY) plus an allowable pumping allowance (APA). Framework is available on the MSGSA website: https://mercedsubbasingsa.org/wp-content/uploads/2024/02/MSGSA-Board-Native-Groundwater-

Allocation-Policy-Framework-closed-ses-edits-02.01.24Clean.pdf. Workshops are planned to get input on the SY and APA in the near future.

2. Initial meetings planned soon to discuss the request for a new GSA from within MSGSA.

ii. Merced Irrigation-Urban GSA (MIUGSA) - Matt Beaman provided this update:

1. MIUGSA continues to work on the agricultural well registration program. The GSAs has registered 1,400 wells out of ~1,500 total expected. Penalty invoices have been sent to owners who didn't respond. Usage statements will be sent out soon, based on the GSA putting together groundwater use accounts for each well.

iii. Turner Island Water District GSA-#1 (TIWD GSA-#1): Kel Mitchel was not available to present.

b. Groundwater Export Policy

i. Matt Beaman (MIUGSA) presented slides that summarize what has occurred as well as an approach for next steps.

ii. Eric Swenson (MSGSA) suggested that it would be ideal if there was a reasonable way to implement long-term monitoring of the primary exit pathways for groundwater; this would encourage applications for permits for export in the future.

iii. Committee members discussed options for how to meet and discuss this topic in the future to ultimately draft an agreement between the GSAs.

iv. Q (Greg Young, MSGSA): Have all the members of the GSAs seen the proposed language as it was brought forward to the County? Greg characterized the concern that other GSAs might approve something and the MSGSA/MIUGSA would not have ability to intervene. A (Matt Beaman): MIUGSA's board has seen and discussed it. He would like to come up with a unified approach across all three GSAs to avoid issues down the road.

v. Hicham ElTal (MIUGSA) clarified that the intent would be to define rules for what kind of groundwater exports are allowed, without need for all three GSAs to review every single case-by-case request in the future.

vi. Next step is to form the ad-hoc committee to discuss this further.

vii. Charles Gardiner pointed out a high-level concern expressed during the Stakeholder Advisory Committee meeting on 3/20/24 that the most recent Board of Supervisors activity was a surprise, and that the Committee was not included in discussions.

c. CIMIS Station Report

i. Matt Beaman (MIUGSA) provided a refresher of the California Irrigation Management Information System (CIMIS) and an update on the last remaining site in Merced County. Merced site 148 is effectively decommissioned due to land use changes being made by the landowner. The equipment itself is functional, but the data it collects is not usable with the land use changes.

ii. Hicham ElTal (MIUGSA) suggested some kind of incentive, e.g. guaranteed allocation, for a landowner to be able to irrigate a pasture for the CIMIS station relocation.

iii. Eric Swenson (MSGSA) requested a copy of the CIMIS station siting requirements to forward onto MSGSA Board Member Pedretti who indicated he might have a potential site. Available here: https://cimis.water.ca.gov/Content/pdf/CIMIS_Station_Siting.pdf

d. Filling Data Gaps/Monitoring Wells

i. Matt Beaman (MIUGSA) provided an update on efforts to fill data gaps in the groundwater level monitoring network, including pointing out wells that have been removed, new wells that have been installed, and locations where there are plans to drill new wells or instrument existing wells.
ii. There have been challenges in the past installing wells on private property, so recent focus for new wells has been on County-owned property.
iii. MIUGSA will be fronting the cost of the wells before they're reimbursed by the grant from the State. MIUGSA would like to discuss the option of a cost share for the upfront cost before reimbursement happens. Matt proposed having staff make a projection of the costs over the next year and then have each GSA return to their Boards to discuss the GSA's upcoming budget.

e. Well Consistency Determination for Wells at Multiple GSAs
i. Matt Beaman (MIUGSA) provided a brief update on the process for making a well consistency determination. MIUGSA's rules generally don't allow new pumping, but do allow for replacement wells. A particular situation has arisen with a well located within MIUGSA that will serve outside of MIUGSA and the GSA is considering how to address.
ii. Comment (Greg Young): MSGSA's current policy (which would probably limit the approval of the current request) applies only for a short time longer before approval of the new proposed allocation soon. Would like to coordinate on this particular case that has come up.
iii. Jim Blanke (W&C) recommended that folks involved in the permit approval process to sit down in the same location to discuss in more detail.
1. Hicham ElTal (MIGUSA) confirmed the intent to set rules and policies to streamline this in the future, understanding that right now we're in an interim stage.
iv. Q (Mike Gallo, MSGSA): Are there rules for existing wells that serve parcels in a different GSA (in the same subbasin)? A: There are rules to address this that can be discussed more in detail offline. There are still some remaining challenges to work through though.
v. Comment (Mike Gallo): in the large scheme, these situations are relatively few, but they do exist and need to be addressed.

f. Potential Creation of New GSA
i. Eric Swenson (MSGSA) shared that proposed next steps that were shared at last week's MSGSA Board Meeting; he confirmed that Merquin County Water District and Stevinson Water District want to start taking the next steps (e.g. start regular meetings) as soon as April.
ii. Comment (Greg Young): MSGSA staff were directed by their Board at last week's meeting to start reaching out to the other GSAs on this topic. This outreach should occur very soon.

6. Water Year 2023 Annual Report Overview

a. Chris Hewes (Woodard & Curran) provided a presentation on the water year 2023 annual report.

7. Updates on Basin Conditions and Sustainable Management Criteria for GSP Update

a. Jim Blanke (Woodard & Curran) provided updates on several items, including:
i. Airborne electromagnetic (AEM) surveying being incorporated into the GSP
ii. An analysis performed to assess trends between various groundwater quality constituents and groundwater levels.

    iii. Recap of previously discussed approach for sustainable management criteria for subsidence and change in storage.

b. Comment (Eric Swenson, MSGSA): Recent DWR technical report suggested to GSAs that drilling in subsidence areas should be limited, plus limiting screened intervals.
c. Q (Hicham ElTal, MIUGSA): Do you think we'll have another dialogue with DWR to confirm our approach? A: It's possible, W&C can check with DWR on potential of having a check in on approach to response to corrective actions.

8. Next steps

a. Jim Blanke (Woodard & Curran) provided a preview of some components of the groundwater model scenario updates that are upcoming.
b. Hicham ElTal (MIUGSA): Wants to see realistic projects and management actions added to the model, not an over-projection.
c. Eric Swenson (MSGSA) asked about timing for model results. A: The next meeting in May will include an updated historical condition scenario output and current conditions scenario output. The projected condition, sustainable yield, and project/management actions scenarios may not be quite ready at that point.

9. Adjourn

a. Meeting adjourned at 3:11 pm.

Next Regular Meeting

Proposed for May 22, 2024 at 1:30 pm

Meeting to be conducted as an in-person meeting with remote option (subject to change)
Information also available online at mercedsgma.org

MEETING NOTES – Merced GSP

SUBJECT: Merced GSP Coordination Committee Meeting

DATE/TIME: May 22, 2024, 1:30 to 3:30 PM

LOCATION: Hybrid meeting with physical location at UC Cooperative Ext Merced Classroom, 2145 Wardrobe Ave, Merced, CA 95341 and online via Zoom

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Coordination Committee Members in Attendance:

	Representative	GSA
☒	Hicham ElTal	Merced Irrigation-Urban GSA
☐	Scott McBride	Merced Irrigation-Urban GSA
☐	Justin Vinson	Merced Irrigation-Urban GSA
☐	Daniel Chavez	Merced Irrigation-Urban GSA
☐	Ken Elwin (alternate)	Merced Irrigation-Urban GSA
☒	Dave Nervino	Merced Subbasin GSA
☐	Eric Swenson (alternate)	Merced Subbasin GSA
☒	Mike Gallo	Merced Subbasin GSA
☒	Nic Marchini	Merced Subbasin GSA
☐	George Park (alternate)	Merced Subbasin GSA
☐	Kel Mitchel	Turner Island Water District GSA #1

Meeting Notes

1. Call to Order and Welcome

a. Jim Blanke (W&C) called the meeting to order at 1:32 pm.

2. Roll Call

a. Coordination Committee members in attendance are shown in the table above. A quorum was not present.

3. Approval of Meeting Minutes

a. Did not have quorum, so approval was tabled for a future meeting.
b. No comments were made on the draft minutes from 3/20/24.

4. Public Comment

a. None received.

5. Reports

a. GSA Reports
   i. Merced Subbasin GSA (MSGSA) – Ashlee Chan-Gonzalez provided several updates:
      1. Allocation framework values
      2. Groundwater accounting platform update
      3. Update of Stevinson/Merquin Water District New GSA request
      4. Land Repurposing Program Update

5. Multi-benefit Land Repurposing Program Update

ii. Merced Irrigation-Urban GSA (MIUGSA) - Matt Beaman provided these updates:

1. Discussed MIUGSA rules and regulations, CIMIS station, and grant administration.
2. Q (Dave N.): (Question on how to use data network)
    a. MIUGSA's intention for roll out is to limit functionality and start "softer" to increase functionality as project goes on.
3. Q (Nic M.) What grant funds have come back to GSAs?
    a. None were left for other GSAs.
    b. Discussed grants and allocations for reimbursement.
4. Q: What minimum thresholds will be used for areas where no pre-2015 data exists?
    a. Jim Blanke (Woodard & Curran) discussed different evaluation methods to achieve this task; this is currently under development.

iii. Turner Island Water District GSA-#1 (TIWD GSA-#1): Kel Mitchel was not available to present.

1. Justin D. is filling in for Kel (recently joined Board). TWID is currently implementing more on-farm water reuse and updating measurement methods.

b. <u>CIMIS Station Report</u>

i. Matt Beaman (MIUGSA) provided update on CIMIS station siting and needs. He shared about why the CIMIS station is important over publicly available weather databases.

ii. Q (Nic M.): How encumbering is this device on the landowner's property?

1. It depends on the site. Someone would have to maintain the conditions around the station to achieve the most accurate results.

c. <u>Current Groundwater Conditions</u>

i. Matt Beaman (MIUGSA) provided an update on groundwater conditions.

1. Discussed the new wells installed, El Nido trends, and the Cardwell Ranches well – Deep and the anomalies from pressure transducer measurements.
2. Discussed water levels and groundwater conditions throughout the Subbasin.
3. Discussed obstruction in well 16, and peculiar trends in well 13
4. Misc info: 8 wells in rice fields

Comments (Dave N.): Discussed sampling timing and potential updating in sampling program. Potentially measuring quarterly, but TBD.

6. MercedWRM Modeling Scenarios Overview

a. Jim Blanke (Woodard & Curran) provided a presentation on MercedWRM framework and processes.

7. Draft Historical and Baseline Conditions Model Outputs

a. Andres Diaz (Woodard & Curran) provided a presentation on MercedWRM components.

b. Q (Nic M.): Why is the reduction in the model 46 inches but in reality it is 43 inches?

i. This is the ITRC reduction factor that is incorporated.

c. Q (Nic M.): What is the actual precipitation?

i. Certain percentage goes to runoff, other to ET, and the rest is infiltration.

d. Q (Nic M.): What is the USDA soil map for the modeling?

i. The model uses four different types of soils identified in the map that have distinct characteristics.

e. Q (Nic M.): Was the AEM survey a success? Does it show recharge viability?
   i. Yes, the resistivity logs show a precent coarseness where we can then differentiate lithology and ultimately recharge capabilities.
f. General comment (Hicham ElTal): DWR asked MIUGSA for locations preferred for surveying.
g. Discussion on groundwater conditions, interactions between basins (i.e., Chowchilla and Merced interaction), and cones of depressions due to extractions occurring in adjacent basins.

8. Next steps

a. Jim Blanke (Woodard & Curran) discussed the upcoming public workshop (evening of 5/22) and next meeting topics.
b. Q (Hicham ElTal, MIUGSA) : do we have a table of contents for the periodic evaluation?
   i. Jim: Yes, we can provide this to the CC to discuss the contents and structure of the evaluation.

9. Adjourn

a. Meeting adjourned at 3:11 pm.

Next Regular Meeting

Proposed for July 17, 2024 at 10am

Meeting to be conducted as an in-person meeting with remote option (subject to change)
Information also available online at mercedsgma.org

MEETING NOTES – Merced GSP

SUBJECT: Merced GSP Coordination Committee Meeting

DATE/TIME: July 17, 2024, 10 AM to 12 PM

LOCATION: Hybrid meeting with physical location at Merced County Farm Bureau conference room, 646 State Hwy 59, Merced, CA 95341 and online via Zoom

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Coordination Committee Members in Attendance:

	Representative	GSA
☒	Hicham ElTal	Merced Irrigation-Urban GSA
☐	Scott McBride	Merced Irrigation-Urban GSA
☒	Justin Vinson	Merced Irrigation-Urban GSA
☐	Daniel Chavez	Merced Irrigation-Urban GSA
☐	Ken Elwin (alternate)	Merced Irrigation-Urban GSA
☒	Dave Nervino	Merced Subbasin GSA
☐	Eric Swenson (alternate)	Merced Subbasin GSA
☒	Mike Gallo	Merced Subbasin GSA
☒	Nic Marchini	Merced Subbasin GSA
☒	George Park (alternate)	Merced Subbasin GSA
☒	Kel Mitchel	Turner Island Water District GSA #1

Stakeholder Committee Members in Attendance:

	Representative	Community Aspect Representation
☒	Alvaro Arias	UC Merced
☒	Arlan Thomas	MIDAC member
☒	Bill Eisenstein	River Partners
☐	Bob Kelley	Stevinson Representative
☐	Breanne Vandenberg	MCFB
☐	Caitie Diemel	ESJWQC
☐	Craig Arnold	Arnold Farms
☐	Daniel Melendrez	City of Merced
☒	Danielle Serrano	Serrano Farms - Le Grand
☐	David Belt	Foster Farms
☒	Eddie Rojas	E&J Gallo Winery
☐	Emma Reyes	Martin Reyes Farm/Land Leveling
☒	Jean Okuye	E Merced RCD
☐	Joe Sansoni	Sansoni Farms/MCFB
☐	Joe Scoto	Scoto Brothers/McSwain School Dist.
☐	Lisa Baker	Clayton Water District
☐	Lisa Kayser-Grant	Sierra Club
☐	Maxwell Norton	Unincorporated area

☒	Nav Athwal	TriNut Farms
☒	Simon Vander Woude	Sandy Mush MWC
☒	Susan Walsh	City of Merced
☒	Thomas Dinwoodie	Master Gardener/McSwain
☒	Trevor Hutton	Valley Land Alliance
☒	Wes Myers	Merced Grassland Coalition
☐	Zachary Hamman	Cal Am Water
☐	Phillip Woods (alternate)	UC Merced
☒	Ben Migliazzo (alternate)	Live Oak Farms
☐	Blake Nervino (alternate)	Stevinson/Merquin
☐	Scott Menefee (alternate)	Clayton Water District
☐	Bill Spriggs (alternate)	Resident City of Merced
☐	Lou Myers (alternate)	Benjamin Land LP

Meeting Notes

1. Call to Order and Welcome

a. Jim Blanke (W&C) called the meeting to order at 10:05 am.

2. Roll Call

a. Coordination Committee members in attendance are shown in the table above. A quorum was not present.

b. Stakeholder Advisory Committee members in attendance are shown in the table above.

3. Approval of Meeting Minutes

a. Did not have quorum, so approval was tabled for a future meeting.
b. No comments were made on the draft minutes from 5/22/24.

4. Public Comment

a. None received.

5. Reports

a. <u>GSA Reports</u>
   i. Merced Subbasin GSA (MSGSA) – Ashlee Chan-Gonzalez provided several updates:
      1. Draft allocation rule is posted for on MSGSA's website for public review (https://mercedsubbasingsa.org/groundwater-allocation/).
      2. PIN numbers were sent out for access to the groundwater accounting platform and
         a. Q (T. Dinwoodie): Was the response rate from parcel owners close to your goal? A: Hoping for about 20% of acreage to register by the time of the first workshop. Anticipating holding a second workshop.
      3. Land repurposing program year 3 is open until July 31. Three applications have been received so far.
      4. Valley Eco is developing refined scopes and timeline with all involved subcontractors and MSGSA Multi-Benefit Land Repurposing Program (MLRP) partners to kick off the program.

ii. Merced Irrigation-Urban GSA (MIUGSA) - Matt Beaman provided these updates:
    1. Well registration is ongoing, with only 12 remaining wells needing to register.
        a. Q: Is County prepared for increased cost on tax bill? A: There's a process that MIUGSA has to work with the County. There's been a lot of communication with County staff to prepare.
    2. Groundwater accounting functionality development continues, but also preparing first groundwater usage statements.
    3. An Urban Allocation Plan was adopted last month; 1.4 AF/ac over currently developed land through 2031, then reduces to 1.1 AF/ac by 2033.
    4. Continue to manage several grant funded projects.
    5. Submitted an application to USDA-NRCS Regional Conservation Partnership Program (RCPP). If awarded, would provide funding for "packages" of sensors: flow meters, soil moisture sensors, weather station/ET data. Will find out around October about award.

iii. Turner Island Water District GSA-#1 (TIWD GSA-#1): Kel Mitchel provided several updates:
    1. The GSA has been focusing on identifying loss between diversion and delivery points.
    2. Working on implementation of grants internally.
    3. Sit in Delta-Mendota basin partially, so have been busy with adoption of new GSP in that Subbasin.

b. <u>CIMIS Station Report</u>
    i. Matt Beaman (MIUGSA) confirmed that finding a new CIMIS station is still a high priority. MID has been coordinating with a potential landowner.

c. <u>Groundwater Export</u>
    i. Hicham Eltal (MIUGSA) shared that there is a temporary restraining order (TRO) put in place in Kings Subbasin that puts a hold on SGMA implementation. Would be a problem if County walks away from the groundwater export policy. It behooves this group to set up an ad-hoc of the Coordination Committee to come up with some ideas, with a goal of updating the rules on groundwater exports.
    ii. More info on the Kings Subbasin – DWR did not approve the GSP and it went to the SWRCB. Rules were put in that local stakeholders did not think were affordable. A judge has now put a hold on SGMA.
        1. *Clarifying correction to minutes after meeting – DWR has approved all GSPs within the Kings Basin.*
    iii. Comment (Kel Mitchell, TIWD GSA-#1): TRO was specifically against the probationary status of the GSP. The GSAs are still obligated to implement the GSP in the meantime. The TRO is against the SWRCB's determination.
        1. Hicham: I understand, but expect that additional TROs could be put on the entirety of SGMA implementation in the subbasin.
    iv. Q (T. Hutton): is Merced County going to walk away from groundwater export? A: Hicham thinks this may be the case.
    v. Comment (Kel Mitchel, TIWD GSA-#1): We could do this later in the year if it's in response to the TRO.
    vi. Q (S. Walsh): When you say the county, are you specifically referring to the CEO's office? A: No, the County as a whole.

d. <u>Current Groundwater Conditions</u>
    i. Matt Beaman (MIUGSA) provided an update on groundwater conditions and new monitoring wells.

        ii. Q (S. Vander Woude): how much data do you need to inform policy? A (Jim Blanke, W&C): Depends on how it's being used. Longer for sustainable management criteria. Immediately useful for other trending and analyses.

6. **Sustainable Management Criteria for New Representative Groundwater Level Monitoring Network Wells**
    a. Chris Hewes (Woodard & Curran) provided a description of the proposed approach for setting sustainable management criteria at new representative groundwater level monitoring wells.
    b. Comment (Hicham ElTal, MIUGSA): Will be interesting to look at DWR's assessment of this methodology, they may have different ways of looking at values and being consistent across the state. Hicham likes that the method uses historical data.
    c. Comment (Kel Mitchell, TIWD-GSA#1): Methodology makes sense, but hesitancy to establish MTs/MOs where aquifer zone hasn't been pumped, e.g. the Above CC in TIWD's region where there are plans to pump more shallow than deep.

7. **Modeling Results for Baseline Projected Conditions + Projects/Management Actions Scenarios**
    a. Andres Diaz (Woodard & Curran) walked the group through a presentation on multiple model scenario updates and conclusions about the impact of projects & management actions (PMAs) on the long-term Subbasin sustainability. He also presented on how the groundwater levels in neighboring subbasins will have a major impact on how successful implementation of activities in the Merced Subbasin will be long-term.
    b. Q (Kel Michell, TIWD-GSA#1): On annualized acre-feet per year (AFY), are you calculating by year types or is it statistical weighting? A: It is weighted by the 50-year hydrology of a different mix of water year types.
    c. Comment (Hicham ElTal, MIUGSA): 90/20 rule in the area is subject to the Delta being in excess. It is typically a much lower number.
    d. Q (George Park, MSGSA): If there are inaccuracies in the projects, should we share? Lone Tree project has additional land repurposing and the numbers don't look accurate. A: Yes! Will follow up separately.
    e. Q (Nic Marchini, MSGSA): Can you model if the neighboring subbasins are sustainable? A: Our PMAs scenario essentially makes this assumption. Hard to define exactly what sustainability is – we assumed they managed <u>above</u> their minimum thresholds.
    f. Q (Nic Marchini, MSGSA): Does Chowchilla agree with the subsurface flow directions? A (Hicham ElTal, MIUGSA): There's ongoing discussion about flows between above CC, but generally agreed on below.
    g. Q (T. Dinwoodie): Is there conversation between the Subbasins? A (Hicham ElTal, MIUGSA): Spent 2 years working with Madera on putting together an agreement to work together. While it's been signed, Hicham doesn't feel it has significant teeth.
    h. Q (Nic Marchini, MSGSA): After running the model with PMAs, there's no net change in storage. With PMAs, are there still problem areas within the Subbasin?

Hot spots? A: There is the option to analyze the model results that way. It's been most focused on the subbasin as a whole to date though.

i. Comment (A. Thomas): The success of the program depends on how much land can be taken out of production.
j. Q (Hicham ElTal, MIUGSA): Can you do groundwater contours for different years based on the model data? A: Yes, if change in groundwater levels is an appropriate metric we could try that.
k. Comment (Nic Marchini, MSGSA): Described that he needs more information on the sustainability zones because it's expected each zone will be managed somewhat different.
l. Q (Hicham ElTal, MIUGSA): Does MSGSA have a different model? A (Nic Marchini, MSGSA): No.
m. Comment (Matt Beaman, MIUGSA): We were somewhat conservative in providing yields from projects, based on concern that other GSPs were overly ambitious in what they reported.
n. Q (B.Eisenstein): Water budget has a row for stream seepage, is there a decrease from baseline? A: Yes, because of a rise in groundwater levels, there is a reduction in stream seepage.
o. Q (Nic Marchini, MSGSA): What flows are you using in the model for streams? A (Hicham ElTal, MIUGSA): Baseline model assumptions use historical streamflow.
    i. Andres confirmed that new FERC flows were not used. Used MercedSIM flows for the previous GSP.
    ii. Hicham confirmed good to use existing values as-is, but possible future item to incorporate.
p. Comment (Jim Blanke, W&C): Goal of today to present on assumptions and get input from folks on any assumptions that need to change.
q. Q (Charles Gardiner, Catalyst): Is it too late to add projects? A: Yes for modeling, but not too late to be helpful to GSP overall.
r. Q (Nic Marchini, MSGSA): Is the wildlife corridor modeled with any impact? Might help subsidence or groundwater levels.
    i. A: No, made the choice not to model specifically at this time, but this can be added as a narrative in the GSP.
    ii. Q (B.Eisenstein): Any plans to integrate MLRP thinking into the model? E.g. if a certain amount of land repurposing is unavoidable, then it might have a good double benefit of becoming recharge, or similar. A: Not yet, but this would be a good component to add as a goal in the Plan.
s. Climate change scenario
    i. Q (Hicham ElTal, MIUGSA) Is this a requirement? A: Yes.
    ii. Q (Nic Marchini, MSGSA): Where do you get information on what climate change will do? A: DWR developed values from global circulation models and downscaled it to California. They have their own hydrologic model grid and pulled out the precipitation and evapotranspiration values that were fed into MercedWRM.

8. Next steps

a. Jim Blanke (Woodard & Curran) discussed next steps.

b. Committed to sharing the public workshop date once it's scheduled.
c. Q (Hicham ElTal, MIUGSA): What is the status of the depletions? A: The state guidance has not come out yet. The project team is putting together an assessment methodology for the revised GSP.

9. Adjourn

a. Meeting adjourned at 11:52 am.

Next Regular Meeting

Proposed for October 16, 2024 at 10am

Meeting to be conducted as an in-person meeting with remote option (subject to change)

Information also available online at mercedsgma.org

MEETING MINUTES – Merced GSP Stakeholder Advisory Committee

SUBJECT: Stakeholder Advisory Committee Meeting

DATE/TIME: January 24, 2024, 1:30 to 3:30 PM

LOCATION: Hybrid meeting with physical location at Merced Irrigation District, Franklin Yard Facility, 3321 North Franklin Road, Merced, CA 95348 and online via Zoom

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Stakeholder Committee Members in Attendance:

	Representative	Community Aspect Representation
☒	Arlan Thomas	MIDAC member
☒	Ben Migliazzo (alternate)	MIDAC member
☐	Bob Kelley	Stevinson Representative
☐	Blake Nervino	Stevinson/Merquin
☒	Breanne Vandenberg	MCFB
☐	Craig Arnold	Arnold Farms
☐	Darren Olguin	Resident of Merced County
☐	Dave Serrano	Serrano Farms - Le Grand
☒	David Belt	Foster Farms
☒	Emma Reyes	Martin Reyes Farm/Land Leveling
☐	Greg Olzack	Atwater Resident
☒	Jean Okuye	E Merced RCD
☒	Joe Sansoni	Sansoni Farms/MCFB
☒	Joe Scoto	Scoto Brothers/McSwain School Dist.
☐	Jose Moran	Livingston City Council
☐	Lacy Carothers	Cal Am Water
☒	Lisa Baker	Clayton Water District
☒	Lisa Kayser-Grant	Sierra Club
☐	Adam Malisch	UC Merced
☐	Phillip Woods (alternate)	UC Merced
☒	Maxwell Norton	Unincorporated area
☒	Nav Athwal	TriNut Farms
☐	Olivia Gomez	Community of Planada
☐	Caitie Diemel	ESJWQC
☐	Darcy Brown	River Partners
☐	Rick Drayer	Merced/Mariposa Cattlemen
☒	Simon Vander Woude	Sandy Mush MWC
☐	Susan Walsh	City of Merced
☐	Bill Spriggs (alternate)	Merced resident
☐	Thomas Dinwoodie	Master Gardener/McSwain
☒	Trevor Hutton	Valley Land Alliance
☐	Wes Myers	Merced Grassland Coalition
☐	Lou Myers (alternate)	Benjamin Land LP

Meeting Minutes

1. **Call to Order and Welcome**
    a. Charles Gardiner (Catalyst) welcomed the group.

2. **Introductions and Roll Call**
    a. Charles Gardiner (Catalyst) reviewed the agenda, conducted roll call, and reminded attendees that past meeting materials are available online at mercedsgma.org.

3. **Questions/Comments from the Public**
    a. No questions/comments.

4. **2024 Rural Communities Water Managers Leadership Institute Introduction (Self-Help Enterprises)**
    a. Sue Ruiz (Self-Help Enterprises, SHE) provided an introduction to the 2024 Rural Communities Water Managers Leadership Institute and this year's particular focus on bringing in members of the north part of the region including Merced.
    b. Agencies and community members can apply to participate (at no cost) online at https://bit.ly/SHELeadershipInstitute
    c. Comment (Jean Okuye): Agreed that education was a great approach.

5. **Reports**
    a. GSA Reports
        i. Lacey McBride (MSGSA) shared the following updates:
            1. The MSGSA continues to work on its allocation policy and plans to release a policy statement on values in the coming weeks (on schedule) for public comment.
            2. Multi-benefit land repurposing grant ($8.9M grant awarded last summer) – in February, the GSA is going to evaluate releasing an RFP to select a firm/team to develop the plan, implement projects, perform outreach, and conduct monitoring (in addition to working with partners already identified).
            3. Q (Charles Gardiner): Would it be appropriate to distribute the allocation policy to the SAC email list? A: Yes! It will become public through MSGSA Board meetings and packets, but Lacey can pull it out and distribute it.
            4. Sue Ruiz (SHE): The Leadership Institute program would include skills useful for engagement with multi-benefit land repurposing program, not just SGMA.
        ii. Matt Beaman (MIUGSA) shared the following updates:
            1. MIUGSA has been focused on the implementation of the well registration policy because it feeds into groundwater accounts which benefits monitoring and tracking of the allocation MIUGSA has adopted.
            2. MIUGSA sent out a formal reminder in early December about the Dec 15 deadline to register wells of a certain size before a penalty is assessed. This resulted in ~800 additional wells registered.
            3. The MIUGSA Board took a recent action to provide some flexibility for staff to void penalty invoices if well owners register late by Jan 31.
            4. MIUGSA has been trying to evaluate sites for installation of an additional CIMIS station, but there are some challenges around siting it (need perennial grass), availability of irrigation water, and guaranteeing long-term access.

a. Comment (Maxwell Norton): It seems like it would be possible for the GSA to buy a ranchette and manage it yourself, without worrying about access. Response: That may be a potential worst-case scenario, but the GSA would like to avoid this route because it still carries a hefty cost that would need to be coordinated with all the GSAs.
b. Comment (Joe Sansoni): What are the size requirements? A: 600 ft x 600 ft (8 sq acres). The station itself is 10x10 feet with cattle gates (20 ft x 20 ft ultimately) but need perennial grass around that.
c. Comment (Simon Vander Woude): City of Merced has sewer land available that could be a possible location. Response: This region has been evaluated in the past and unfortunately doesn't have the right land cover type.
d. Q (Maxwell Norton): How is well registration process going for MSGSA? A (Lacey McBride): MSGSA has not started a well registration process. It may be considered in the future. The GSA plans to monitor the allocation program using evapotranspiration (OpenET to start).

5. MIUGSA and MSGSA have been developing a Water Accounting Platform using ET data which could be a good presentation topic for an upcoming SAC meeting.

iii. Kel Mitchell (TIWD GSA-#1) was not available to present.

a. Current Basin Conditions –

i. Matt Beaman (MIUGSA) presented a subset of slides from a longer report that contains overview information as well as hydrographs for each individual well.

ii. Key updates to the monitoring network include:

1. New dual completion well (above and below Corcoran Clay) at the same site at Harmon Rd in the very southern tip of the Subbasin. Trying a satellite connection in lieu of cellular in southern portion of basin due to cellular reception issue.
2. The Jefferson Rd well site (installed 2020 or 2021, both below and above Corcoran Clay) has had some recent cellular reception issues so MIUGSA has been out to the site to replace equipment and try a new vendor.
3. Michael Rd (south/central of the Subbasin, above Corcoran Clay) was added in 2022 and has been measured for the last year. It should be instrumented soon to provide more frequent measurements.
4. Northwest of Lake Yosemite (North of City of Merced) there is an existing MID production well that will be instrumented soon based on GSA + grant funding.
5. There are some additional sites in Le Grand and spread throughout the Subbasin that have had inconsistencies in measurements (e.g. oil in well); the GSAs are looking at fixing or replacing, as possible.

iii. Q (Joe Scoto): Why are there no wells in the TIWDGSA-#1 area? A: TIWD provides data from their wells for the annual report, but no wells are officially part of the monitoring network, so they don't show up on the presented current conditions slides/maps.

iv. Q (Sue Ruiz): Is there a way that community engagement could help collect the data? Do you need more domestic wells? A (Charles Gardiner): The process requires a lot of involved landowner/technical work to get the wells qualified and the data collected. A (Matt Beaman): The GSAs have been asking for years to help identify wells to add to the network. What they've found is that where there are willing participants, there is often lack of construction information (e.g., minimum data standards from the State can't be met). The majority of domestic wells in the Merced Subbasin are already in the MIUGSA area and the monitoring network already mostly adequately covers MIUGSA's region through the use of MID's production wells for monitoring. More wells are needed outside of the traditional domestic well and MID production zone.

1. Comment (Lacey McBride): If there are landowners out there that would allow the GSAs to drill a dedicated monitoring well on their property, that would be very helpful for outreach.

ii. The full set of slides were uploaded to MercedSGMA.org.

6. Discussion about 1/23/24 Merced County Board of Supervisors Meeting Considering Amendment to Merced County's Groundwater Ordinance Export Policy

a. Lacey McBride (MSGSA): The Board of Supervisors have been considering an amendment to the Groundwater Ordinance Export Policy which would require the GSA in the originating basin and GSA in the receiving basin to provide a sustainability determination report on all exports. Right now the GSAs make the sustainability determination for new well installs, but it's specific to the GSP.
   i. Yesterday, the Board tabled the decision for one year unless the GSPs in Chowchilla, Delta-Mendota, Turlock are all approved earlier. In the meantime, the extension gives the GSAs time to prepare for a future basinwide policy change.

b. Matt Beaman (MIUGSA) summarized the consensus reached at the Coordination Committee earlier in the morning which would involve foundational safeguards and rules for potentially allowing groundwater export to occur, but limited to the native/sustainable yield (e.g. excluding developed supply).

c. Comment (Maxwell Norton): Advisory committees like this one should be involved very early on in the process. Very interested in being involved.

d. Q (Lisa Kayser-Grant): Is everything that the SAC has been providing input on been included? A (Charles Gardiner): Clarification – input form the SAC has been taken into consideration for the GSP. This County well policy is a new and separate issue.

e. Overall – the group anticipates coming back to this topic at a future meeting when there's a little more to discuss and provide input on.

7. Consideration of Updates to Sustainable Management Criteria (SMC)

a. Jim Blanke (Woodard & Curran) walked the group through a reminder of the schedule overview of the GSP development, recommended corrective actions from DWR, and a schedule overview of the upcoming GSP Update. He also walked the group through different sustainability indicators and considerations for updates to the SMC.

b. Groundwater Storage
   i. Comment (Ben Migliazzo): Have to stick with groundwater levels since we're already tracking this. Could be downfalls to using storage volume directly.
   ii. Comment (Maxwell Norton): Groundwater levels are what people care about. For farmers, it determines the cost of pumping. For homeowners, they care about whether the well is dry or not.
   iii. Comment (Arlan Thomas): Setting storage volume is the ultimate barometer and he would support using that.
   iv. Q (Lisa Kayser-Grant): What additional information does the set storage volume method provide? What would be the accuracy of either method used through time? A: This is purely a calculated volume coming out of the groundwater model that ultimately relies on groundwater levels to calculate the difference. It's not directly measured. Through time, because they're using the same inputs, the "accuracy" or trend of either method would be relatively the same through time.

v. Q (David Belt): There's more than one type of storage. It doesn't mean that storage is available – it could be locked up in sand grains. Prefers the groundwater levels as a proxy.
vi. Comment (Joe Sansoni): Annual storage calculation involves more assumptions.
vii. Comment (Simon Vander Woude): Agree with a data driven approach (collecting groundwater levels directly).
viii. Public Q (Geoff Vanden Heuvel): Are you already calculating storage change for the Merced Subbasin in the annual report? Did you come up with a gross volume of water that's in storage? A: Yes. It's an output from the groundwater model. The model outputs a total volume of storage in addition to the change through time.
ix. Comment (Lisa Kayser-Grant): Concerned that there are a lot of assumptions used in calculating storage that deserve some attention as they're important. Also recognizes benefits of using groundwater levels as a proxy for this SMC.
    1. Response: Refinement of physical characteristics used in the model are always being updated where possible.

c. Groundwater Quality
    i. Comment (Joe Sansoni): Concur with everything presented. Think "already planned" and "potential new considerations" are obvious next steps to see if any additional actions are needed. Don't want to compete with other agency responsibilities. May need to go back to DWR on the validity of the recommendation to look closer at existing monitoring that's occurring.
    ii. Comment (Simon Vander Woude): Already do a lot of water quality monitoring through CAFO permits and Water Quality Coalition, etc. Would be a waste of time to redo it. Also additional management activities for water quality are being considered through programs like CVSALTS. In theory, recharge may help manage water quality concerns but it could contribute to issues in certain cases.
    iii. Comment (David Belt): David sits on several boards that develop/work with the Nitrate Control Plan. ILRP already pays for some of the costs. There is no way to solve nitrate program without help from SGMA Recharge. Thinks collaboration is needed, e.g. sharing data, on solving the problems.
    iv. Comment (Lisa Kayser-Grant): Is it true that if you have contaminated groundwater, you've reduced your supply. Wouldn't that feed into goals and measurements elsewhere in the GSP? It's impacted as a beneficial use.
        1. Response: That's correct, though it does depend on the contaminant type and location. For the GSAs and stakeholders, what tools do we have in our toolbox to change that concentration? Recharge projects can exacerbate or help, but septic tank approvals and other forces driving water quality concerns may be beyond the GSA jurisdiction. Coordination with other groups who do have that control will be important.

d. Filling Data Gaps in the Groundwater Level Monitoring Network
    i. Comment (Maxwell Norton): Performing a linear regression for retroactively estimating groundwater levels seems like a risky proposition given the complexity of the groundwater system.
        1. Response: It will likely be more complex than just linear, more like a multi-variate regression. The process will also involve testing and calibration against existing wells with a longer data history.

8. Next steps and adjourn

a. Charles Gardiner asked the SAC members to pay attention to when the public workshop is scheduled and asked for input on how to get folks to turn up to the workshops.

   i. Q (Simon Vander Woude): What will be the topic of the workshop? A: Partially a review of the GSP and Annual Report, but more focused on the proposed edits/updates to the GSP and the potential impacts on the community.
   ii. Comment (Breanna Vandenburg): Merced Farm Bureau is happy to help coordinate hosting a workshop at their office. Less focus on SGMA/GSP overview is needed because it's been covered a lot previously.
   iii. Jean: Resource Conservation District and UC Extension can be used as networks to publicize about the workshop.

b. Meeting was adjourned at 3:38pm.

Next Regular Meeting
Proposed for March 20, 2024 at 10am

Meeting to be conducted as an in-person meeting with opportunity to participate virtually (subject to change)
Information also available online at mercedsgma.org

MEETING MINUTES – Merced GSP Stakeholder Advisory Committee

SUBJECT: Stakeholder Advisory Committee Meeting

DATE/TIME: March 20, 2024, 10 am – 12pm

LOCATION: Hybrid meeting with physical location at Merced Irrigation District, Franklin Yard Facility, 3321 North Franklin Road, Merced, CA 95348 and online via Zoom

Stakeholder Committee Members in Attendance:

	Representative	Community Aspect Representation
☒	~~Adam Malisch~~ Alvaro Arias	UC Merced
☒	Arlan Thomas	MIDAC member
☒	Bill Eisenstein	River Partners
☐	Bob Kelley	Stevinson Representative
☐	Breanne Vandenberg	MCFB
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☐	Scott Menefee (alternate)	Clayton Water District
☐	Bill Spriggs (alternate)	Resident City of Merced
☐	Lou Myers (alternate)	Benjamin Land LP
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Meeting Minutes

1. **Call to Order and Welcome**
   a. Charles Gardiner (Catalyst) welcomed the group.

2. **Introductions and Roll Call**
   a. Charles Gardiner (Catalyst) reviewed the agenda, conducted roll call, and reminded attendees that past meeting materials are available online at mercedsgma.org.

3. **Questions/Comments from the Public**
   a. No questions/comments.

4. **Reports**
   a. GSA Reports
      i. Ashlee Chang-Gonzalez (MSGSA) shared the following updates:
         1. MSGSA recently adopted an allocation framework that reflects the spatial variability and existing conditions of the sustainability zones. Sustainable yield (SY) plus an allowable pumping allowance (APA). Framework is available on the MSGSA website: https://mercedsubbasingsa.org/wp-content/uploads/2024/02/MSGSA-Board-Native-Groundwater-Allocation-Policy-Framework-closed-ses-edits-02.01.24Clean.pdf. Workshops are planned to get input on the SY and APA in the near future.
         2. Initial meetings planned soon to discuss the GSA split.
         3. Q (Jean Okuye): What do you mean by "other GSAs" will be consulted on the process of establishing a new GSA? A: MIUGSA and TIWD-GSA#1 in addition to MSGSA.
         4. Q (Susan Walsh): Does the MSGSA have to give permission for this to occur? Why is it going through discussions? A: DWR approves the boundaries of the GSAs, so the discussions are primarily focused on the existing and new GSA coming to agreement, but the other GSAs are invited to be involved since there's one GSP and this is an overall complex issue to figure out.
         5. Q (Eddie Rojas): Could the new revised GSA boundary go past Stevinson? Concerned about property being in two GSAs. A: It depends. Coordination between the GSAs will need to address this to prevent overlapping jurisdictions.
         6. Q (Nav Athwal): Does this impact all the work done previously? (e.g. the allocation framework development). A (Matt Beaman): Speaking on behalf of MIUGSA, it's happening outside of MIUGSA and shouldn't have an impact on MIUGSA. MSGSA would need to speak more directly to the future potential impacts.
      ii. Matt Beaman (MIUGSA) shared the following updates:
         1. MIUGSA continues to work on the agricultural well registration program. The GSAs has registered 1,400 wells out of ~1,500 total expected. Penalty invoices have been sent to owners who didn't respond. Usage statements will be sent out soon, based on the GSA putting together groundwater use accounts for each well.
      iii. Kel Mitchell (TIWD GSA-#1) was not available to present.
   b. Groundwater Export Policy
      i. Comment (Susan Walsh): This was a surprise at January's SAC meeting and it would be worth presenting on and discussing this in the future. Would like it to be added to the agenda for the next meeting.

ii. Matt Beaman (MIUGSA) presented some slides that summarize what has occurred as well as an approach for next steps.
iii. Comments (Susan Walsh): Susan remembers being part of several discussions previously that resulted in consensus that groundwater should not be exported from the basin. Very surprised to not be involved in the planning process for the revision.
iv. Q (Maxwell Norton): Are principles listed on the slide from the Board of Supervisors? A: No, they are principles for the GSAs to start considering in future discussions.
v. Q (Trevor Hutton): There are 2 ideas of export being presented. Are we talking about export from the subbasin or the County? A: The existing ordinance does not allow water to leave originating subbasin (nor County). The proposed amendment would allow groundwater to leave an originating subbasin but still not leave the County (with a few exceptions).
vi. Comment (Joe Sansoni): The Merced County Farm Bureau executive team met with staff from the Merced County. His understanding is that the goal of the amendment specifically was to take decision making off the County itself and put it on the GSAs. Does not think it was a path to sell water outside of the County.
vii. Q (Nav Athwal): Why is this a County decision and not a GSA decision? A: Current ordinance allows exports if they go through CEQA. MIUGSA provided comment letters that included requests for protective safeguards.
viii. Q (Wes Myers): Assuming the intent of this policy, after SGMA, is for current operators/landowners that straddle GSAs to have flexibility? A (Matt Beaman): Under existing export policy, contiguous parcel(s) split between GSAs can export back and forth.

c. Potential Creation of New GSA
   i. Covered earlier and discussed in the MSGSA report.

d. CIMIS Station Report
   i. Matt Beaman (MIUGSA) provided a refresher of the California Irrigation Management Information System (CIMIS) and an update on the last remaining site in Merced County. Merced site 148 is effectively decommissioned due to land use changes being made by the landowner. The equipment itself is functional, but the data it collects is not usable with the land use changes.
   ii. Comment (Maxwell Norton): Used to have 3 stations (including a third in Gustine). The data from the stations was used for a lot of things.
   iii. Joe Sansoni and Eddie Rojas requested copies of the site requirements. Charles suggested Breanne as well. Available here: https://cimis.water.ca.gov/Content/pdf/CIMIS_Station_Siting.pdf
   iv. Q: are you considering compensating the site operators? A: Haven't thought about it to date, but think that could be an option in the future based on the high level of need.
   v. Q (Jean Okuye): Are you considering how many areas or where? A: More than one would be nice, but one at a minimum. Historically have looked at the center of the basin, but recognize that microclimates exist throughout. If are limited to one, then would likely be center of the basin.
   vi. Q (Joe Sansoni): Does soil type matter? A: No, just the land use around it.
   vii. Q (Simon Vander Woude): Would alfalfa work? More flexibility in site selection there. Can these stations move if needed? A: 10 years would be nice for commitment, but 20 years more ideal. DWR typically does not want a site with rotating crops.

e. Filling Data Gaps/Monitoring Wells

   i. Matt Beaman (MIUGSA) provided an update on efforts to fill data gaps in the groundwater level monitoring network, including pointing out wells that have been removed, new wells that have been installed, and locations where there are plans to drill new wells or instrument existing wells.
   ii. There have been challenges in the past installing wells on private property, so recent focus for new wells has been on County-owned property.

f. Well consistency determination for wells at Multiple GSAs
   i. Matt Beaman (MIUGSA) provided a brief update on the process for making a well consistency determination. MIUGSA's rules generally don't allow new pumping, but do allow for replacement wells. A particular situation has arisen with a well located within MIUGSA that will serve outside of MIUGSA and the GSA is considering how to address.
   ii. Q (Nav Athwal): Recap, there's a divergence on new well policies between in and out of MIUGSA – the consistency is supposed to address what? A: There is a MIUGSA policy that was intended to address wells within MIUGSA that serve within MIUGSA. The divergence is that now there's a well installed in MIUGSA but serves outside the MIUGSA.
   iii. Q (Nav Athwal): Doesn't the well export policy address this? Wouldn't the MIUGSA allocation apply? (based on location of the pumping) A: The Export policy is for groundwater leaving the subbasin. This is an intra-GSA situation which is different. Regarding the allocation, there is a component to consider where the water is applied in addition to where it's pumped.
   iv. Comment (Joe Sansoni): Whatever you decide will set precedent, so consider your decision carefully.
   v. Q (Nav Athwal): Where is the policy that would allow folks in adjacent GSAs to transact water? A: MIUGSA's policies allow some flexibility there. More details are described in the allocation policy. There are challenges because MSGSA doesn't have an adopted allocation policy to date.

5. Water Year 2023 Annual Report Overview

a. Chris Hewes (Woodard & Curran) provided a presentation on the water year 2023 annual report.
b. Q (Susan Walsh): Asked for explanation of the Undesirable Results (UR) column and the status column. A: The UR column is the definition of UR, not an indication that we are exceeding those URs. The current status is shown in the rightmost column.
c. Q (Nav Athwal): What's missing in that area, monitoring wells? (referring to the outside Corcoran map in the eastern corner). A: Correct, missing monitoring wells.
d. Q (Maxwell Norton) on 2023 vertical bar it shows change in storage in the negative, but the storage is going up? A: It's there to balance – a little counterintuitive – and demonstrate a positive change in storage.
e. The Committee requested that the Annual Report be sent out when it's been finalized.

6. Inelastic Land Subsidence Discussion

a. Jim Blanke (Woodard & Curran) provided an update on current/recent conditions of subsidence as well as the recommended corrective actions provided by DWR and some potential approaches to respond.
b. Q (Maxwell Norton): Is it presumed that the Below Corcoran Clay Aquifer is continuous throughout the County/San Joaquin Valley? A: Yes.
c. Q (Maxwell Norton): What technology is used to measure subsidence? A: GPS stations/control points**.**
d. Comment (Maxwell Norton): Kern County is involved in legal challenges due to damage to expensive infrastructure form subsidence. Fortunately the infrastructure in the Merced Subbasin is not as critical/expensive, but still a potential concern.

e. Q (Nav Athwal): Given the MT is 0 ft/yr, is there any level of GW pumping that would allow maintenance of that objective, especially time lag between declines and subsidence? A: There is still a lot that's not understood. Theoretically there should be some kind of equilibrium that's reached through time that would allow some ongoing pumping at a controlled rate, but we don't have quantified values for that. DWR has expressed interest in halting pumping completely in areas impacted by subsidence.
f. Q (Maxwell Norton): Do you think these are justified comments from DWR or more like busy work? The comments seem very nit-picky. A: Hard to say. Different areas of the Valley are experiencing different issues and rates. The State is generally heavily focused on subsidence in general.
g. Comment (Joe Sansoni): Give the relatively small scale and scope of these comments/requests, Joe sees this as a success for the GSP.

7. Next steps

a. Charles Gardiner requested input on potential public meeting locations
    i. Merced County Agricultural Center (cooperative extension meeting room) was raised as an idea.
    ii. Merced County Farm Bureau has a substantially sized meeting room with hybrid setup.
b. Jim Blanke (Woodard & Curran) provided a preview of some components of the groundwater model scenario updates that are upcoming.
c. Q (Nav Athwal): Can we provide input on the allocation framework? A: The allocations are performed at the GSA level, not in this GSP-wide committee.

8. Adjourn

a. Meeting was adjourned at 11:57pm.

Next Regular Meeting
Proposed for May 22, 2024 at 10am
Meeting to be conducted as an in-person meeting with opportunity to participate virtually (subject to change)
Information also available online at mercedsgma.org

MEETING MINUTES – Merced GSP Stakeholder Advisory Committee

SUBJECT: Stakeholder Advisory Committee Meeting

DATE/TIME: May 22, 2024, 10 am – 12pm

LOCATION: Hybrid meeting with physical location at UC Cooperative Ext Merced Classroom, 2145 Wardrobe Ave, Merced, CA 95341 and online via Zoom

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Stakeholder Committee Members in Attendance:

	Representative	Community Aspect Representation
☒	Alvaro Arias	UC Merced
☒	Arlan Thomas	MIDAC member
☐	Bill Eisenstein	River Partners
☒	Bob Kelley	Stevinson Representative
☒	Breanne Vandenberg	MCFB
☐	Caitie Diemel	ESJWQC
☐	Craig Arnold	Arnold Farms
☒	Daniel Melendrez	City of Merced
☒	Danielle Serrano	Serrano Farms - Le Grand
☐	David Belt	Foster Farms
☒	Eddie Rojas	E&J Gallo Winery
☐	Emma Reyes	Martin Reyes Farm/Land Leveling
☐	Jean Okuye	E Merced RCD
☒	Joe Sansoni	Sansoni Farms/MCFB
☒	Joe Scoto	Scoto Brothers/McSwain School Dist.
☐	Lisa Baker	Clayton Water District
☐	Lisa Kayser-Grant	Sierra Club
☐	Maxwell Norton	Unincorporated area
☐	Nav Athwal	TriNut Farms
☐	Simon Vander Woude	Sandy Mush MWC
☒	Susan Walsh	City of Merced
☒	Thomas Dinwoodie	Master Gardener/McSwain
☐	Trevor Hutton	Valley Land Alliance
☒	Wes Myers	Merced Grassland Coalition
☒	Zachary Hamman	Cal Am Water
☒	Phillip Woods (alternate)	UC Merced
☐	Ben Migliazzo (alternate)	Live Oak Farms
☐	Blake Nervino (alternate)	Stevinson/Merquin
☐	Scott Menefee (alternate)	Clayton Water District
☐	Bill Spriggs (alternate)	Resident City of Merced
☐	Lou Myers (alternate)	Benjamin Land LP

Meeting Minutes

1. Call to Order and Welcome

a. Charles Gardiner (Catalyst) welcomed the group.

2. Introductions and Roll Call

a. Charles Gardiner (Catalyst) reviewed the agenda, conducted roll call, and reminded attendees that past meeting materials are available online at mercedsgma.org.

3. Questions/Comments from the Public

a. Mike Temic – grower in Atwater. Commented that groundwater recharge is a primary key to achieve sustainability and shared information about a potential project for subsurface reverse tile drain.

b. Ngodoo Atume – SGMA technical assistant for local basins. Q: Are small farmers being considered in the Periodic Evaluation and Revised GSP during the implementation of PMAs in the Subbasin?

    i. Matt Beaman (MIUGSA) – We have not reached out to small farmers directly, but the average farm is ~40 acres.

    ii. Ashelee Chan-Gonzalez (MSGSA) – no program specifically for farmers, but the GSA is working on allocations. Grants are being developed for small farmers to apply and receive funds with incentives related to water use.

4. Reports

a. GSA Reports

    i. Ashlee Chan-Gonzalez (MSGSA) shared the following updates:

        1. Expecting to finish allocation framework program by July for public comment.
        2. Growers to register in platform, allocations won't be registered in accounting platform until 2026.
        3. Discussions with both entities (GSAs and growers) have taken place internally.
        4. Land repurposing update: third year applications open from June 15 through July 31. Applicants will receive a PIN. MSGSA will be sending out postcard reminders when the application is available.
        5. Q (Maxwell N.): What is a PIN?
            a. Unique PIN for each of the growers.
        6. Q (Joe S.): What is the allocation, 13 over X?
            a. Yes, the sustainable yield of native groundwater is 13 inches per acre. Once we hit the five-year mark allocations could be changed depending on groundwater levels.
            b. Comment (Joe S.): Could require additional restrictions.

    ii. Matt Beaman (MIUGSA) shared the following updates:

        1. Matt described how the GSA is homing in on urban allocations and refining numbers.
        2. Allocation is at sustainable yield, using evapotranspiration (ET) was difficult during wet year as a result of increased ET.
        3. The GSA is still evaluating and determining a location for the CIMIS station.
        4. Grant admin.:
            a. SGPG grant, completed in April 2024.
            b. SGM Grant – ongoing, SG Implementation Grant (Rounds 1 & 2)
            c. Funding secured for filling data gaps, measured groundwater levels at newly installed wells.

    iii. Kel Mitchell (TIWD GSA-#1) was not available to present.

b. CIMIS Station Report

i. Matt Beaman (MIUGSA) provided an update:
   1. Discussion with landowner, but no significant movement.
   2. Reaching out to other landowners in other areas and seeing how the station impacts them.
   3. Can provide information to landowners, have a list of people to talk to.

c. <u>Current Groundwater Conditions</u>
   i. Matt Beaman (MIUGSA) provided an update on groundwater conditions.
      1. Discussed certain trends in monitoring wells and areas of concern that he intends to focus on in the future.
      2. Wells are hand tagged for validation twice a year.
      3. Current conditions report has been posted to MercedSGMA.org.

d. <u>SAC questions and discussion</u>
   i. Q (Susan Walsh): Are we feeling hopeful about finding site for the CIMIS station? This is a critical piece of reporting tech.
      1. Matt Beaman (MIUGSA): We should be able to find a site and come up with an agreement to host a site. Main concern is not having ET data to track without station.
   ii. Q (from public, Ngodoo Atume): Asked some questions on wells about those above and below Corcoran Clay. Did we hit any undesirable results?
      1. Jim Blanke (Woodard & Curran): We did have a certain percentage of wells reach the undesirable result definition. However, as part of the process we established interim milestones (IMs) below the minimum threshold (MT) for the near term to get projects and management actions (PMAs) implemented.

5. Updates on Basin Conditions and Sustainable Management Criteria for GSP Update

a. Jim Blanke (Woodard & Curran) provided updates on several items, including:
   i. Airborne electromagnetic (AEM) surveying being incorporated into the GSP
      1. Some GSAs use AEM data for identifying paleo river channels
      2. Q: How accurate was the AEM data compared to boring logs?
         a. It was pretty good and aligned well.
         b. Having the flight lines helps correlate boring log data fairly well.
   ii. An analysis was performed to assess trends between various groundwater quality constituents and groundwater levels.
      1. Comment (Maxwell Norton): It makes you wonder if there is a localized source of pollution.
      2. General comment: Detection limit changes have caused potential issues.
   iii. Recap of previously discussed approach for sustainable management criteria for subsidence and change in storage.
      1. Q (Joe B.): What are we doing for subsidence impacts from our neighbors?
         a. We have to coordinate with the neighboring basins to make sure.
      2. Matt Beaman (MIUGSA): The four Subbasins have meet with DWR to have interbasin coordination.
      3. Q (Joe B.): What is the rationale for evaluating critical infrastructure impacts from subsidence? Are the GSAs liable for repairs?
         a. It is challenging to understand, but this requires coordination with the responsible agencies.
      4. Comment (Bob K.): We have to pay attention to subsidence because basins are going into probation because of it. Cites such as Kaweah and Tule Lake.
      5. Q (Thomas D.) : Are all the people impacted by the Corcoran meeting?
         a. There has been interbasin coordination.

6. Q (Susan W.): Follow-up on Joe's question. What is the implication for being liable for repair? Would GSAs be responsible for repairs? How is subsidence our issue given that it's been a widespread for 50+ years.
    a. Not likely for GSAs to be liable.

6. MercedWRM Modeling Scenarios Overview and Initial Draft Outputs

a. Jim Blanke (Woodard & Curran) presented the Merced Water Resources Model (MercedWRM) framework and how it assesses groundwater conditions in the Subbasin. He discussed modeling scenarios, calibration methods, and outputs.
b. Q: What do you think about boundary conditions with adjacent basins?
    i. Andres: We used a specified flux for the model update. Other basins use MTs, but it is dependent on what the GSAs assumptions would like to be.
c. Q: Is recent data from other GSAs available?
    i. Jim: Not the most recent data, so it is a challenge to get all information available.
d. Andres Diaz (Woodard & Curran) presented a more detailed overview of the recent update and enhancements to the MercedWRM.
e. Comment (Maxwell N.): 2022 land use trends have drastically changed in recent years. Hardened water demands have led to drops in crop yield.
f. Q: Why was there no urban use data?
    i. Andres: The urban data was good, but we updated the land use.
g. Q: Will well meters be used to incorporate into model?
    i. Andres: Definitely, if we have more specialized data we will use it.
h. Q: Will subsidence be added to model?
    i. Andres: Yes.

7. Next steps

a. Charles Gardiner (Catalyst) discussed upcoming SAC activities and the public workshop on the evening of 5/22.
b. Location for July meeting, TBD.

8. Adjourn

a. Meeting was adjourned at 11:59 am.

Next Regular Meeting
Proposed for July 17, 2024 at 10am
Meeting to be conducted as an in-person meeting with opportunity to participate virtually (subject to change)
Information also available online at mercedsgma.org

MEETING NOTES – Merced GSP Public Workshop

SUBJECT: Public Workshop
DATE/TIME: May 22, 2024, 6:30 pm – 8:30 pm
LOCATION: Hybrid meeting with physical location at Sam Pipes Room, Merced Civic Center, 678 West 18th Street, Merced, CA 95340 and online via Zoom

New signees

Name	Affiliation/Organization	Email
Martin Souza	Souza & Son	Souza8337@sbcglobal.net
Joe Souza	Souza Bros Dairy	sbdairy@hotmail.com
Judy Souza	Souza Bros Dairy	sbdairy@hotmail.com
Craig Johnson	Amsterdam Water District	oatgrower@gmail.com
Brad Samuelson	Consultant (Water & Land Solutions)	bsamuelson@waterandlandsolutions.com

Attendance count (excluding GSA and consultant staff)
In-person: 6
Online: 10

Public Questions/Comments

1. Q: How many acres for 175,000 AFY of allocated water?
   a. A: ~300,000 acres of irrigated land
2. Q: Where best in the basin should recharge be located to mitigate subsidence?
   a. A: Likely in the areas of observed subsidence impacts, such as the south/southwest portions and El Nido area
3. Q: What is the G Ranch project location?
   a. A: Mike Garula's property
4. Q: Can you confirm allocations cannot be reallocated to Zone F? If so, why?
   a. A: Yes, because this is an area of observed subsidence impacts and trading could worsen those impacts.
5. Q: Is water trading possible?
   a. A: Potentially in the future, but just within the GSA boundaries.
6. Q: The 5-year rolling bucket for allocations, can you explain better?
   a. A: It acts as an account, but it may pause when water levels reach a certain goal.
7. Q: What is the allocation change per zone?
   a. A: Within the groundwater accounting platform and based on evaluating groundwater conditions.

MEETING NOTES – Merced GSP Public Workshop

SUBJECT: Public Workshop
DATE/TIME: August 26, 2024, 6:30 pm – 8:30 pm
LOCATION: Hybrid meeting with physical location at Merced County Farm Bureau conference room, 646 State Hwy 59, Merced, CA 95341 and online via Zoom

New signees

Name	Affiliation/Organization	Email

Online

- Christine Serrano
- Danielle
- Justin Darnell
- Leadership Counsel ECV
- Lisa Baker
- Nav's AI Notetaker (Otter.ai)
- Alfredo

Attendance count (excluding GSA and consultant staff)
In-person: 11
Online: 7

Public Questions/Comments

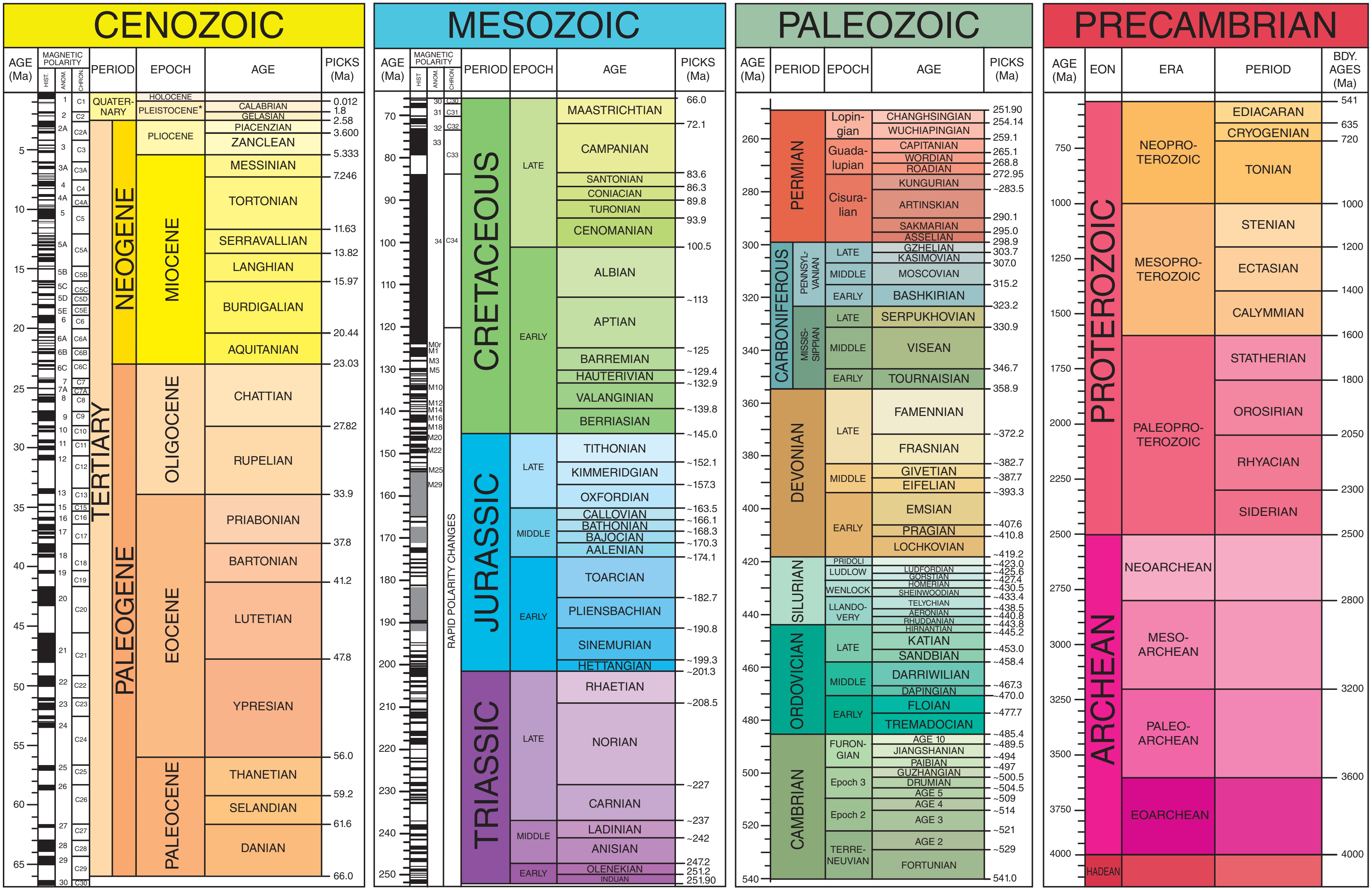
1. Q: Is 83,000 AFY of overdraft for the Subbasin as a whole? Is the value different by GSA? Isn't MID 0 or positive?
    a. A: It is a basin-wide number and is a 50-year long term average. The value varies across the GSAs, and is smaller in magnitude for agencies that have access to surface water like MIUGSA.
2. Q: Is 83,000 AFY of overdraft a historically based number? Does it take into account more efficient irrigation practices?
    a. No, it's not a historically based number – it's a 50-year average under projected conditions, taking into account the latest land use and farming practices.
3. Q: Is MIUGSA's well registration policy and graph for domestic wells?
    a. No, it's targeted to about 1,500 irrigation wells.
4. Q: Are MID wells impacted by pumping limitation regulations?
    a. A: (1) MID wells have to register with the GSAs. Have previously been publicly accounted for. (2) MID recharges water to the ground and is effectively limited by SGMA because it can pump less than it recharges.
5. Q: How do you calculate the recharge by MID?

a. A: Effectively via model exercises, based on soil and other physical characteristics, what's been delivered, etc.

6. Q: Consumptive use is calculate from ET because it's easy, right? (satellite data)
   a. A: Yes, it's convenient, but it's also preferable because metering brings additional management challenges, so OpenET is more consistent as well.
7. Q: Is there a variance between metering and OpenET?
   a. A: Other basins have been similarly weighing the pros and cons of both. Metering can be supplemental as backup if there's an issue.
   b. Comment: there's a variance in soil holding capacity for water, too.
8. Q: How do you have the precipitation amount?
   a. A: Currently working on this. Have until 4/1 to fill in some of the details, according to the proposed Allocation Rule. Looking into a way to make it consistent.
9. Q: Does the model show the leakage to outside of the San Joaquin and to Chowchilla? The cone of depression in Chowchilla that is causing loss of groundwater.
   a. A: Yes it does, more details on interbasin flows will be discussed at the end of the presentation.
10. Q: Is Turlock an overdrafted subbasin?
    a. A: They are not a critically overdrafted Subbasin, which is a State designation. They are 2 years delayed behind Merced's timeline for compliance.
11. Q: What's going on in Tulare County that is so different than here?
    a. A: To put it simply, Tulare submitted their plan in 2020 and the state came back with recommended corrective actions. SWRCB has now stepped in (which has made the news) because the state decided the corrective actions were not sufficient.
12. Q: Where are we at with the 400,000 AFY of water rights for flood flows?
    a. A: The state revamped some water rights processes specifically for floodwater. In 2019, local agencies came together to apply for one large floodwater right that would cover the whole Subbasin from Merced River and local creeks for flood control and recharge. As of today, SWRCB has not officially accepted receipt of the application (since submitted since Dec 2019). Since then, MID and some other local agencies has since applied for some temporary water rights permits, but benefits have been very limited for a few reasons.
13. Q: What's the status of unimpared flows?
    a. A: Not sure exactly, this is constantly changing.
14. Q: Pretty confident that by January 2025, the GSP will be acceptable to the State?
    a. A: Yes.

APPENDIX C: GEOLOGIC TIME SCALE

GSA GEOLOGIC TIME SCALE v. 5.0



Walker, J.D., Geissman, J.W., Bowring, S.A., and Babcock, L.E., compilers, 2018, Geologic Time Scale v. 5.0: Geological Society of America, https://doi.org/10.1130/2018.CTS005R3C. ©2018 The Geological Society of America

*The Pleistocene is divided into four ages, but only two are shown here. What is shown as Calabrian is actually three ages—Calabrian from 1.80 to 0.781 Ma, Middle from 0.781 to 0.126 Ma, and Late from 0.126 to 0.0117 Ma.

The Cenozoic, Mesozoic, and Paleozoic are the Eras of the Phanerozoic Eon. Names of units and age boundaries usually follow the Gradstein et al. (2012), Cohen et al. (2012) , and Cohen et al. (2013, updated) compilations. Numerical age estimates and picks of boundaries usually follow the Cohen et al. (2013, updated) compilation. The numbered epochs and ages of the Cambrian are provisional. A "~" before a numerical age estimate typically indicates an associated error of ±0.4 to over 1.6 Ma.

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REFERENCES CITED

Cohen, K.M., Finney, S., and Gibbard, P.L., 2012, International Chronostratigraphic Chart: International Commission on Stratigraphy, www.stratigraphy.org (accessed May 2012). (Chart reproduced for the 34th International Geological Congress, Brisbane, Australia, 5–10 August 2012.)

Cohen, K.M., Finney, S.C., Gibbard, P.L., and Fan, J.-X., 2013, The ICS International Chronostratigraphic Chart: Episodes v. 36, no. 3, p. 199–204 (updated 2017, v. 2, http://www.stratigraphy.org/index.php/ics-chart-timescale; accessed May 2018).

Gradstein, F.M, Ogg, J.G., Schmitz, M.D., et al., 2012, The Geologic Time Scale 2012: Boston, USA, Elsevier, https://doi.org/10.1016/B978-0-444-59425-9.00004-4.

Previous versions of the time scale and previously published papers about the time scale and its evolution are posted to http://www.geosociety.org/timescale.

APPENDIX D: MERCEDWRM MODEL DOCUMENTATION

Merced Water Resources Model (Merced WRM)

MERCED AREA GROUNDWATER POOL INTERESTS

Prepared by

WOODARD & CURRAN

September 2019

MERCED AREA
GROUNDWATER POOL INTERESTS

Merced Water Resources Model (MercedWRM)

WOODARD & CURRAN

1545 River Park Drive, Suite 425
Sacramento, CA 95815

September 2019

Table of Contents

List of Tables & Diagrams

List of Figures

Appendices

List of Abbreviations

AF	Acre-Feet
AFY	Acre-Feet per Year
C2VSim	California Central Valley Groundwater-Surface Water Simulation Model
CADs	Cowell Agreement Diverters
CALSIMETAW	California Simulation of Evapotranspiration of Applied Water
CDEC	California Data Exchange Center
CDL	Cropland Data Layers from US Department of Agriculture
CFS	Cubic Feet per Second
CVHM	Central Valley Hydrologic Model
CWD	Chowchilla Water District
DEM	Digital Elevation Model
DWR	Department of Water Resources, State of California
ET	Evapotranspiration
GWMP	Groundwater Management Plan
GSE	Ground Surface Elevation
GSP	Groundwater Sustainability Plan
GW	Ground Water
IDC	IWFM Demand Calculator
IGSM	Integrated Groundwater Surface Water Model
ITRC	Irrigation Training and Research Center
IWFM	Integrated Water Flow Model
IRWMP	Integrated Regional Water Management Plans
MAGPI	Merced Area Groundwater Pool Interests
MercedWRM	Merced Water Resources Model
METRIC	Mapping Evapotranspiration at High Resolution with Internalized Calibration
MID	Merced Irrigation District
MID-WBM	Merced Irrigation District Water Balance Model
NASS	National Agricultural Statistics Service
NRCS	Natural Resource Conservation Service
PRISM	Precipitation-Elevation Regressions on Independent Slopes Model
PSDI	Pore Size Distribution Index
SGMA	Sustainable Groundwater Management Act
SW	Surface Water
SWD	Stevenson Water District
TAF	Thousand Acre-Feet
TDS	Total Dissolved Solids
TWG	Technical Work Group
TID	Turlock Irrigation District
USDA	United States Department of Agriculture
USGS	United States Geological Survey
WDL	Water Data Library

Acknowledgements

The Merced Water Resources Model (MercedWRM) was developed by Woodard & Curran with funding contributions and technical support from the Merced Area Groundwater Pool Interests (MAGPI) and the California Department of Water Resources (DWR).

A Technical Work Group (TWG) was formed to provide quality assurance and technical support throughout the project, resulting in a groundwater model widely accepted by local shareholders and public agencies. The workgroup consisted of representatives from the Department of Water Resources (DWR), the United States Geological Survey (USGS), and several of the MAGPI member agencies.

The Project Team included:

- **Merced Irrigation District**
    - Hicham ElTal, Project Manager
    - Marco Bell, Project Engineer
- **Merced County**
    - Ron Rowe
- **City of Merced**
    - Ken Elwin
- **Technical Work Group**
    - Tariq Kadir, DWR
    - Steven Phillips, USGS
    - Hicham ElTal, Merced Irrigation District
    - Marco Bell, Merced Irrigation District
    - Ron Rowe, Merced County
    - Ken Elwin[1], City of Merced
    - Bob Kelly, Stevenson Water District
- **Consultant: Woodard & Curran**
    - Ali Taghavi, Project Manager
    - Dominick Amador, Project Engineer
    - Jim Blanke, Project Hydrogeologist
- **Department of Water Resources Representative**
    - Jason Preece

[1] Prior to Ken Elwin's involvement, Mike Wegley represented the City of Merced in the Technical Work Group

Chapter 1 Introduction

The Merced Water Resources Model (MercedWRM or Model) is a fully integrated surface and groundwater flow model covering approximately 1,500 square miles of the Merced Groundwater Region (Region). The MercedWRM, a quasi-three-dimensional finite element model, was developed using the Integrated Water Flow Model (IWFM) 2015 software package to simulate the relevant hydrologic processes prevailing in the Region. The Model integrates groundwater aquifers with the surface hydrologic system, land surface processes, and water operations. Using data from Federal, State, and local resources, the MercedWRM is calibrated for the hydrologic period of October 1996 through September 2015, by comparing simulated evapotranspiration, groundwater levels, and streamflow records with historical observed records.

Development of the Model includes the study and analysis of technical data and information that have (a) assisted in the understanding the hydrologic, hydrogeologic, water demand, groundwater, and water supply conditions within the Region; and (b) provided the basis for development and analysis of alternative water management scenarios. The results of this study include groundwater analysis suitable to assist the Sustainable Groundwater Management Act (SGMA) program in the Merced groundwater basin. This analysis includes:

- Hydrogeologic conditions –This study was used in the establishment of the basin's simulated conditions and to aid in model development. Information was collected from existing models, reports, and previous hydrogeologic studies that include, well logs, pump tests, and aquifer parameter data. The examination of this data led to the development of geologic cross sections, geologic zones, and water management subareas used to develop water budgets.
- Agricultural and urban water demands - Thorough analysis of the land and water use for the Region was completed using census data, land use surveys, historical crop acreage reports, and referenced standards for evapotranspiration and consumptive use fraction.
- Agricultural and urban water supplies - Detailed accounting of water sources for the Region were linked to the proper users. Extensive coordination between the local water purveyors was undertaken to collect and process available data. To this end, a detailed accounting of the various sources of water supplies (groundwater and surface water) for each user type and category was developed.
- Evaluation of regional water quality conditions – Water quality data for both Total Dissolved Solids (TDS) ad Nitrate (as NO3) was used to develop maps of TDS and NO3 distribution trends .Data collection efforts included loading of TDS and NO3 for various components such as applied water, irrigation canal water, and streamflow. .

1.1 Goals of Model Development

The goal of this project is to develop a comprehensive numerical integrated surface water and groundwater model that will help manage the water resources of the Merced Region at a localized scale. This model is to serve as a robust, defensible, established, publicly accepted analytical tool. This model would be used for analysis of water resources of the Region to evaluate the historical operations and hydrology of the Region, as well as support evaluation of water resources programs and water supply projects under baseline conditions reflecting the existing and future conditions in the Region.

As such, the model has been developed in an open and transparent process, with frequent workshops with the MAGPI members to review model data and assumptions, modeling process, as well as model results. In addition, a Technical Workgroup consistent of representatives of the Department of Water Resources, the US Geological Survey, and local agencies was formed to oversee the details of the model development and calibration process.

It is noteworthy that the Region is covered by the DWR's Central Valley Groundwater and Surface water Model (C2VSim), which can be used for simulation of the groundwater and surface water conditions at a much higher level, and evaluation of the interbasin flows across the model and the Region's boundaries. However, in order to evaluate the water resources conditions in the Region at a local scale, which reflects the details of the operations of the local Region, a detailed integrated hydrologic model is essential.

The specific objectives of development of the Merced Water Resources Model are:

Evaluate the Groundwater Region's Characteristics using the Model to:

- Assess historical and projected characteristics and behavior of the integrated SW & GW resources
- A robust and defensible analytical tool to support development of the Groundwater Sustainability Plan (GSP) for the basin
- Estimate historical water budgets for the basin
- Identify effects of historical operations of the basin on the groundwater resources and interaction of surface water and groundwater
- Estimate sustainable yield of the basin under historical, current, and projected land and water use conditions
- Evaluate interbasin flows across basin boundaries with the neighboring basins
- Evaluate the feasibility of conjunctive use management programs
- Assess natural recharge conditions
- Explore the nature of interaction of stream and aquifer system in various areas of the Region
- Estimate boundary flows between the Region and neighboring groundwater basins
- Assess the nature of operation of unlined canals and their interactions with the aquifer system
- Evaluate the effects of operation of upstream reservoir on the surface water supplies and groundwater system

Appraise Conditions of the Groundwater and Surface Water System Under Project Settings

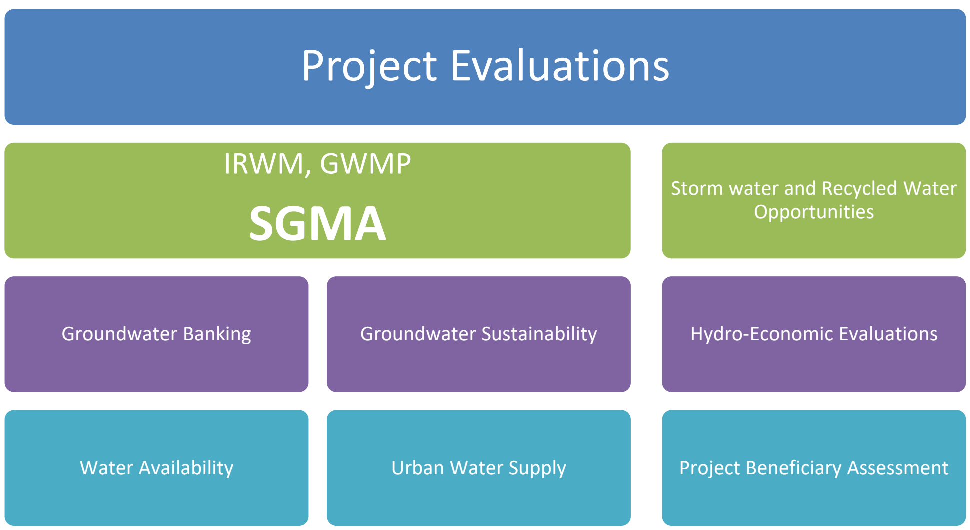
- Evaluate the basin operations under sustainable groundwater management conditions
- Estimate effects of demand side and supply side actions and plans for sustainable management of the basin
- Measures of assessing effects programs and projects considered under the Groundwater Sustainability Plan (GSP), Groundwater Management Plan (GWMP) and Integrated Regional Water Management Plans (IRWMP)
- Evaluate the effects of use of storm water and recycled water in the Region
- Assess effectiveness of groundwater storage and banking operations
- Estimate feasibility of surface water systems re-operations
- Evaluate GW & SW system responses to different pumping and recharge programs
- Estimate impacts of land use and water supply strategies on GW & SW systems
- Evaluate effects of urban growth on SW & GW systems
- Assess effect of basin operations on GW quality conditions
- Appraise benefits and costs for proposed project and programs
- Determine the effects of climate change on groundwater and surface water supplies and resources in the Region

Utilization of this model will provide MAGPI and other stakeholders with the ability to develop accurate analysis of the surface water and groundwater conditions in the Region. The model can evaluate the effects of changes in the land and water use, operations, irrigation practices, climate, water supply availability, conjunctive use, recharge, and other projects and operations on the groundwater and surface water resources in the Region.

It is anticipated the MercedWRM will be used in the evaluation of a variety of projects that include the evaluation of land and water use plans, water supply alternatives, recharge projects, conjunctive use options, water quality conditions, and many other surface and groundwater planning scenarios.

Although, the model development process began a few years prior to the 2014 passage of SGMA, the model, with some refinements and enhancements, is a well-established and defensible analytical tool to be used to support the development of the Groundwater Sustainability Plan (GSP) that will be undertaken in 2018-2019, due to the DWR by January 2020.

Diagram 1 Model Application Areas



1.2 Merced Groundwater Region

The Merced Groundwater Region (Figure 1) is primarily defined by the 491,000-acre Merced Groundwater Subbasin (Merced Subbasin), but it also includes portions of the Chowchilla Groundwater Subbasin to the south and the Turlock Groundwater Subbasin to the north, totaling approximately 608,000 acres. Its boundaries are defined to be the crystalline basement rock of the Sierra Nevada foothills on the east and the San Joaquin River to the west. The northern boundary is set at the northern edge of the Dry Creek Watershed and the southern boundary is formed by the Chowchilla River. The regional streams defining the north, west, and southern boundaries are recognized by the Department of Water Resources (DWR) through the Region Acceptance Process (RAP) as critical hydrological features distinguishing the Region from its neighbors.

Merced County is one of the top 5 agricultural producing counties in the state. In 2013, the County generated a gross of nearly 3.8 billion dollars[2] in commodities, much of which was produced on irrigated farmland. Land and water use in the Merced Region is dominated by agricultural uses, including animal confinement (dairy and poultry), grazing, forage, row crops, and fruit and nut trees. These uses rely heavily on surface water supply and private groundwater wells. Due to economic conditions and a strongly water-dependent

[2] 2013 Merced County Department of Agriculture Report on Agriculture

agricultural economy, water issues in the Region are well-understood and treated as high priority within the Region. Since the Merced Region plays a vital part in the economic future of California, managing the water resources of the Region is both a unique and challenging endeavor.

Furthermore, the Region is marked by a network of streams that are used for both conveyance and flood control. The Region's commitment to proper water resources management is evident by its long history of proactive management. In 1997, most of the Region's water agencies and purveyors formed the Merced Area Groundwater Pool Interests (MAGPI) to share technical data, encourage cooperative planning, and develop management strategies to improve the groundwater basin. Since then, MAGPI has played an active role in management of the groundwater resources in the Region.

1.3 Model Development Partners and the Technical Work Group

The development of the MercedWRM was overseen by the MAGPI board of directors and representative member agencies. The development environment was an open and transparent process, with public workshops during the project to review and reflect upon the data and assumptions used in the model, and to review the model results.

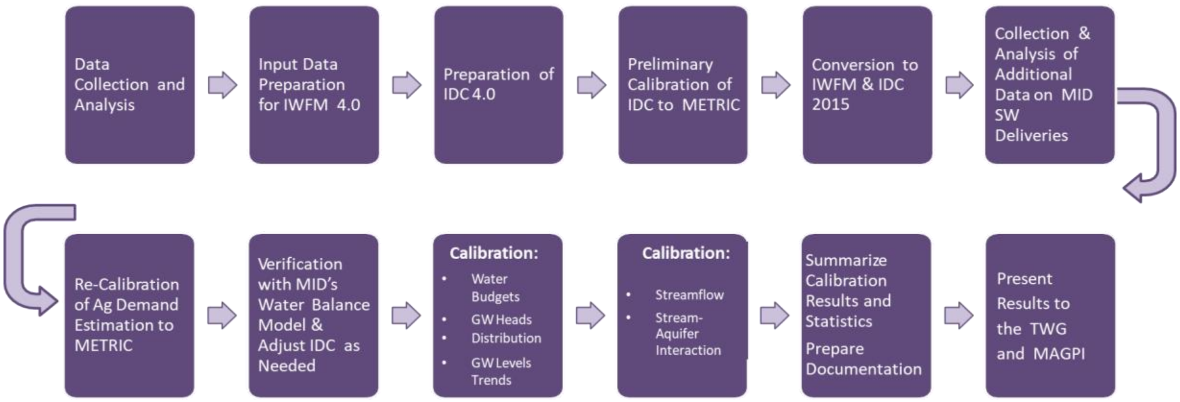
The Model was developed by financial contributions from the Merced Irrigation District, City of Merced, County of Merced, as well as a grant from the California Department of Water Resources.

A Technical Workgroup (TWG) was assigned to meet and oversee the details of the data, information and assumptions that are used in the Model development. This TWG consisted of representatives from the DWR, USGS, MID, Merced County, the City of Merced, and Stevinson Water District (SWD).

Chapter 2 Model Development

This section presents the data and analysis of input information undertaken during the development of the MercedWRM. It includes the spatial and temporal information regarding hydrologic and hydrogeologic data sets included in the model.

Diagram 2 - Model Development Process



2.1 Model Input Data

IWFM model files and associated Microsoft Excel worksheets are referenced below in Table 1.

Table 1: Merced Water Resources Model - Input Data

Major Data Category	Minor Data Category	Data Source	Report Section
Hydrogeological Data	Geologic Stratification	USGS Texture Model	2.8.2
		USGS Geospatial Database	2.8.2
		USGS Reports	2.8.2
	Aquifer Parameters	C2VSim	4.7
Hydrological Data	Stream Configuration	Merced Irrigation District	2.4
	Stream Inflow	USGS & CDEC Stream Gauges	2.4
	Calibration Gauges	USGS & CDEC Stream Gauges	4.3
	Precipitation	PRISM & CalSIMETAW	2.3
Agricultural Water Demand	Land Use	DWR	2.6
		CropScape	2.6
		Ag. Commissioner's Report	2.6
		MID-WBM	4.4.1
	Evapotranspiration	C2VSim	3.1
		METRIC	3.1
	Soil Properties	NASS Web Soil Survey	2.5
Agricultural Water Supply	Groundwater Pumping	Agency Well Locations	3.1.4
		Agency Well Production	3.1.4
		Private Well Production	3.1.5
	Surface Water Deliveries	Merced ID	3.1.3
		Stevinson WD	3.1.3
		Merquin County WD	3.1.3
		Turner Island WD	3.1.3
		Lone-Tree MWC	3.1.3
		Turlock ID	3.1.3
		Chowchilla WD	3.1.3
Urban Water Demand	Population	U.S. Census Bureau	3.2
	Per Capita Water Use	Merced UWMP	3.2
Urban Water Supply	Groundwater Pumping	Municipal Well Locations	3.2
		Municipal Well Production	3.2
Other	Boundary Conditions	DWR	2.10
	Initial Conditions	DWR	2.11
	Small Watersheds	MID	2.9
	Calibration Wells	Merced HydroDMS	4.5

2.2 Model Grid and Subregions

The MercedWRM is based around a two-dimensional finite element grid covering both the 950-square mile (608,000 acres) Region and a 550-square mile buffer zone (Figure 2). The grid consists of 17,696 nodes and 19,563 elements and is defined based on quarter mile discretization on all major hydrologic features while maintaining ½ mile discretization on district and city boundaries. Under this delineation, Model elements within the MAGPI subregions maintain an average area of 24 acres and follow the distribution shown in Figure 3. High grid resolution, along with the incorporation of fine data, makes it possible to provide detailed model results to support future hydrologic analysis of potential scenario runs.

The Region supports nine independently operating agricultural water purveyors and three major municipalities. Each of these agencies, in addition to the many unincorporated areas, have varying water resource practices and unique impacts on the groundwater hydrology. The MercedWRM is subdivided into 37 distinct subregions (Figure 4), 34 of which make up the Merced Groundwater Region, and 3 boundary zones. Delineating subregions help incorporate this variability and facilitate the zonal analysis of water budgets and hydrologic conditions.

2.3 Regional Hydrology

The development of the MercedWRM requires rainfall data for every model element. Rainfall data for the Region is derived from the PRISM (Precipitation-Elevation Regressions on Independent Slopes Model) dataset of the DWR's CALSIMETAW (California Simulation of Evapotranspiration of Applied Water) model. Daily precipitation data is available from October 1, 1921 on a 4-kilometer grid throughout the Region (Figure 5). The spatial distribution of precipitation data, to the model grid, was developed by mapping each of the model elements to the nearest of 621 available reference nodes, uniformly distributed across the model domain. The spatial intensity of the Region's precipitation is shown in Figure 8.

From the PRISM nodes within the Region, average annual rainfall and cumulative departure from the monthly mean is presented for the entire period of record in Figure 6 and for the current hydrological period (1970+) in Figure 7. Additional precipitation statistics are available in Table 2.

Table 2: PRISM Precipitation Statistics within the MercedWRM

	Long Term (1922-2015)		Hydrological Period (1970-2015)		Simulation Period (1996-2015)	
	Year	Precip (in)	Year	Precip (in)	Year	Precip (in)
Minimum	1977	4.90	1977	4.90	2007	6.29
Mean		11.94		11.95		12.52
Maximum	1958	25.59	1983	24.56	1998	23.16

2.4 Stream Configuration and Stream Flow Data

The surface water features of the MercedWRM, shown in Figure 9, include the 12 dynamically simulated streams (Table 3) divided into 71 distinct reaches for budgetary purposes. The streams and creeks listed below are represented in the model by 1548 stream nodes (Figure 10) on a quarter-mile interval. The high number of stream nodes and resolution provide increased accuracy when depicting the stream-groundwater interaction. Physical statistics, including the stream invert elevation, channel width, and a stream flow rating table, were provided by MID surveyed cross sections and USGS Digital Elevations Models (DEM).

Table 3 MercedWRM Simulated Streams

Major Streams within the Merced Region		
Merced River	Owens Creek	Dutchman Creek
Black Rascal Creek	Mariposa Creek	Chowchilla River
Bear Creek	Duck Slough	East Side Canal
Miles Creek	Deadman Creek	San Joaquin River

Metered streamflow data is available from 16 gauging stations that are reported by the USGS, the California Data Exchange Center (CDEC), and MID. Due to the availability of streamflow records, a few of the flow time series datasets were historically extrapolated to estimate flows in periods without recorded data. This process was completed by using the average monthly flow based on the DWR water year index. A detailed table of stream input data and a map of available stream gauge locations are found in Table 4 and Figure 11 respectively.

Table 4: Summary of MercedWRM Streamflow Data

Stream	Stream Node	Reporting Agency	Gauge Name	Period of Record
Merced River	1	USGS	Merced River at Northside Canal	October 1969 to September 2013
Merced River	35	CDEC	Merced River Near Snelling	March 1999 to September 2015
Merced River	85	USGS	Merced River at Shaffer Bridge	January 1970 to September 2015*
Merced River	103	CDEC	Merced River near Cressey	March 1999 to September 2015
Merced River	1127	USGS	Merced River at Stevinson	October 1969 to September 2015*
Bear Creek	225	CDEC	Bear Creek	October 1993 to September 2015
Owens Creek	450	CDEC	Owens Creek Dam	October 1993 to September 2015
Mariposa Creek	598	CDEC	Mariposa Creek Dam	July 1994 to September 2015
Chowchilla River	957	USGS	Chowchilla River at Buchanan	October 1969 to September 1990
San Joaquin River	1311	CDEC	San Joaquin River at Mendota Pool	December 1999 to September 2013

* Includes long periods without data.

2.5 Soils

IWFM, as an integrated surface water and groundwater model, simulates the interaction between surface features and the underlying aquifer system.

The soil types identified within the survey data are associated with one of four hydrological soil groups. Each soil group is categorized according to their runoff potential and infiltration characteristics. The Natural Resource Conservation Service (NRCS) defines these hydrological soil groups as follows:

> **Group A** – Soils in this group have low runoff potential when thoroughly wet. Water is transmitted freely through the soil. Group A soils typically have less than 10 percent clay and more than 90 percent sand or gravel and have gravelly or sandy textures. Some soils having loamy sand, sandy loam, loam or silt loam textures may be placed in this group if they are well aggregated, of low bulk density, or contain greater than 35 percent rock fragments.
>
> **Group B** – Soils in this group have moderately low runoff potential when thoroughly wet. Water transmission through the soil is unimpeded. Group B soils typically have between 10 percent and 20 percent clay and 50 percent to 90 percent sand and have loamy sand or sandy loam textures. Some soils having loam, silt loam, silt, or sandy clay loam textures may be placed in this group if they are well aggregated, of low bulk density, or contain greater than 35 percent rock fragments.

Group C – Soils in this group have moderately high runoff potential when thoroughly wet. Water transmission through the soil is somewhat restricted. Group C soils typically have between 20 percent and 40 percent clay and less than 50 percent sand and have loam, silt loam, sandy clay loam, clay loam, and silty clay loam textures. Some soils having clay, silty clay, or sandy clay textures may be placed in this group if they are well aggregated, of low bulk density, or contain greater than 35 percent rock fragments.

Group D – Soils in this group have high runoff potential when thoroughly wet. Water movement through the soil is restricted or very restricted. Group D soils typically have greater than 40 percent clay, less than 50 percent sand, and have clayey textures. In some areas, they also have high shrink-swell potential.

Hydrologic data, collected from the Natural Resource Conservation Service's (NRCS) Web Soil Survey (WSS), was used to develop hydrologic soil types and root zone parameters for each element within the model area (Figure 12).

2.6 Land Use and Cropping Patterns

The MercedWRM uses annual land use distribution by element. The model divides all land use types into four classifications: native, non-ponded, ponded and urban. For each element, an aerial percentage ratio is given to each of 11 agricultural categories, and each of the non-agricultural categories, which are urban, native, riparian, or wetlands. The total of the ratios among categories for each individual element must add up to one.

Land use classifications stem from two primary sources, the DWR Land Use Survey and the USDA CropScape Program. DWR conducts land use surveys by county approximately every seven to ten years to estimate changing land and water use patterns. DWR's Merced County Land Use Survey data, available in 1995, 2002, and 2012, is available on a parcel level and has been mapped to the MercedWRM grid. In addition to DWR land use surveys, the United States Department of Agriculture's National Agricultural Statistics Service (NASS) provides geospatial satellite data, known as cropland data layers (CDL), on an annual basis since 2007. Each CDL has a ground resolution of 30 meters (Figure 13), and the USDA reports an 85% to 95% classification accuracy of the CropScape datasets for major crop-specific land cover categories.

Due to the nature of the CropScape datasets and remote sensing in general, there is some deviation in the total agricultural acreage across the district. In order to minimize error and ensure the quality of the data, the 2012 CropScape was compared to both the 2012 DWR Land Use Survey and the 2012 Merced County Ag Commissioner's report. While all datasets demonstrated some variance at high resolution, subregional aggregation offered a comparable distribution leading to the acceptance of the CropScape datasets and methodology. Accuracy was further enforced through a series of manual detailed analysis, where ground truthing was performed in hydrologically critical areas by inspection of historic areal imagery. These adjustments are further documented within the corresponding land use Excel file.

Due to the discontinuous nature of the available land use data, linear interpolation was completed to connect the 1995 to 2002 DWR Land Use Surveys, and again to connect the 2002 DWR Land Use Survey with the 2007 CropScape data. The annual distribution of crop categories and acreages across the entire Model is available in Figure 14.

Land use trends from 1995 through 2015 show significant increases in total and irrigated agricultural acreage, with 290,000 irrigated acres at the beginning of simulation and 325,000 acres in production by 2015. This change from native to agricultural area brings additional stresses on the hydrological system, particularly as the majority of this increase comes from the increased popularity of permanent crops, specifically vineyards, almonds, and walnuts.

2.7 Drainage

Surface drainage patterns define how runoff from rainfall and applied water is processed within the model framework. As a majority of the model area is either urban or developed agriculture, drainage within the system is largely a factor of infrastructure and does not rely specifically on ground surface elevation and natural flow patterns. Due to this, delineation of small drainage watersheds, as defined by MID (Figure 15), was integrated into the model. Each drainage watershed was assigned a stream node to discharge. All elements in the watershed were assign their specific watershed discharge stream node. As improved surface watershed models of the basin are developed, Merced WRM can spatially be re-delineated so that the watersheds match the updated sub-basin definitions.

2.8 Geologic Structure and Model Layering

The following section highlights the hydrogeologic analysis of the Merced Region and the resulting stratigraphic layering of the MercedWRM.

2.8.1 Conceptual Aquifer Systems

The Merced Groundwater Management Plan (MAGPI 2006) provided a basis for understanding of hydrogeologic conditions in the Merced area. This document identified six aquifer systems, as described below.

Fractured Bedrock - Along the eastern edge of the Merced Subbasin, wells have been completed within the Valley Springs and lone Formations (Page and Balding 1973, Page 1977). These wells appear to be completed in fractured bedrock with limited and variable yields. Because of the limited extent and poor yields of the fractured bedrock aquifer, the fractured aquifer is not a significant source of water in the Merced Subbasin.

The Mehrten Formation - The Mehrten Formation outcrops over a large area in the Merced Subbasin. Many water supply wells in the eastern portion of the Merced Subbasin penetrate the formation, and the formation is a significant source of groundwater. The Mehrten is considered a confined aquifer where it occurs beneath the Corcoran Clay. There is insufficient data to determine the degree of confinement of the formation where the Mehrten does not underlie the Corcoran Clay.

Confined Aquifer- The confined aquifer occurs in older alluvium (and Mehrten Formation) deposits that underlie the Corcoran Clay. Many water supply wells in the western portion of the MGWB penetrate the Corcoran Clay into the confined aquifer, and the confined aquifer is a significant source of groundwater.

Intermediate Leaky Aquifer - The intermediate leaky aquifer occurs in older alluvium deposits that overlie the Corcoran Clay or are east of the Corcoran Clay. Where the Corcoran Clay is absent, the intermediate aquifer extends to the Mehrten Formation. In the eastern portion of the Merced Subbasin the intermediate aquifer consists of a series of interbedded coarse-grained layers (gravel and sand) separated by fine-grained layers (silt and clay). The fine-grained layers inhibit, but do not prevent vertical groundwater flow between layers and thus form a leaky-aquifer system. Many water supply wells in the Merced Subbasin are completed in the intermediate leaky-aquifer and it is a significant source of groundwater.

The Intermediate leaky-aquifer is the most extensively developed aquifer in Merced Subbasin. Measured well yields within the Merced Subbasin range from 670 to 4000 gallons per minute (gpm) (Page and Balding, 1973). Estimates of specific capacity of supply wells throughout the Merced Subbasin range from about 20 to 40 gallons per minute per foot of drawdown and indicate that the specific capacity increases from east to west.

Shallow Unconfined Aquifer - The shallow unconfined aquifer occurs in older and younger alluvium deposited above the shallow clay bed. Because of its shallow depth, few water supply wells are completed in the shallow unconfined aquifer. Where water levels in the intermediate leaky aquifer fall below the base of the shallow clay bed, groundwater in the intermediate aquifer becomes unconfined and water in the overlying shallow aquifer becomes perched. (MAGPI 2006)

2.8.2 Data Sources

Model stratigraphy was developed through a thorough analysis of local and regional datasets, including published geological reports and existing models. The analysis utilized the conceptual understanding of the aquifer system described in the Merced Groundwater Management Plan (MAGPI 2006). This conceptualization was based in part on existing reports, notably by Page and Balding (1973) and Page (1977). The source documents and models were used to define the depth, thickness, and extent of the major geologic units associated with the aquifer systems described by in the Merced Groundwater Management Plan. More recent data was incorporated into the analysis by utilizing textural data from the USGS (2010), completed as part of the development of the Central Valley Hydrologic Model (CVHM). Localized data sets and regional surficial geology provided additional details to identify the extent of certain layers. A summary of hydrogeologic data used in the development of the MercedWRM layering is shown in Table 5.

Table 5: Model Hydrogeologic data

Data Source	Authors	Date
Geology and Quality of Water in the Modesto-Merced Area, San Joaquin, California	R.W. Page and G.O. Balding	1973
Appraisal of Groundwater Conditions in Merced California and Vicinity	R.W. Page	1977
Geologic Map of the San Francisco-San Jose Quadrangle, California	D.L. Wagner, E.J. Bortugno, and R.D. McJunkin	1991
Central California Valley Groundwater-Surface Water Simulation Model	California Department of Water Resources	2013
Central Valley Hydrologic Model Texture Model	United States Geological Survey	2010
Merced Groundwater Basin Groundwater Management Plan	AMEC Geomatrix	2008

Published Cross Sections – The basis for much of the definition of the aquifer systems in the Merced Groundwater Management Plan is Page and Balding (1973) and Page (1977). Among other information, these USGS source documents provide cross sections defining the major stratigraphic units, which allows for definition of the extent, depth, and thickness. Units include:

- Unconsolidated deposits
    - Flood basin deposits and younger alluvium
    - Older alluvium
    - Continental deposits
- Consolidated rocks

- Mehrten Formation
- Valley Springs Formation
- Ione Formation
- Basement complex

Locations of cross sections from Page and Balding (1973) are shown in Figure 16, with the associated cross sections in Figure 17. Similarly, locations of cross sections from Page (1977) are shown in Figure 18, with the associated cross sections in Figure 19. Page and Balding (1973) was used for cross section development as these sections are more regional in nature. Page (1977) contained some additional detail, notably the presence of a shallow clay, which was incorporated into the layering.

The cross sections show units dipping to the west-southwest with steeper dips in the older units and gently dipping recent units. The cross sections show the Corcoran Clay as a regionally extensive unit across the western portion of the model area and a shallower clay unit present in much of the central portion of the area.

USGS CVHM Texture Model – The USGS CVHM texture model of the Central Valley was used to augment the information contained in the published cross sections, as the published cross sections did not incorporate more recent boring log data and were not spaced closely enough to allow for suitable interpolation. The USGS CVHM texture model is a three-dimensional model of sedimentary texture deposited within California's Central Valley. Originally compiled in 2004, the model was developed by analyzing over 150,000 drillers' logs describing lithologies up to 950 meters deep. After a subset of 8,500 boreholes was selected, a form of kriging geostatistical analysis was performed to determine the percentage of coarse-grained deposits over each 15-meter composite interval. (Faunt, Belitz, and Hanson 2009). For use within the MercedWRM, coordination with USGS staff members provided refined textural data at each model node on a 10-foot vertical interval.

The CVHM texture model generally shows coarser materials near the Merced River and above the continental deposits, both above and below the Corcoran Clay. Materials generally become more fine-grained with depth and with distance to the south-southeast.

Additional Data Sources – Additional data sources were used to define the surficial extent of layers, the base of the model, and the extent of shallow clays.

- The ground surface elevation was defined by the USGS Digital Elevation Model was available on a 1/3 arc-second (approximately 33 feet) level of discretization and is shown in Figure 20. The horizontal data is in North American Datum of 1983 (NAD 83) and the vertical data is North American Vertical Datum of 1988 (NAVD 88).
- The location where layers are present at the surface (outcrop) was refined based on the surficial geologic map developed by Wagner, Bortugno, and McJunkin (1991). This map, shown in Figure 21, assisted in further refining the interpolation between cross sections and further improving correlation between texture information and stratigraphic units. Presence of Mehrten Formation, Valley Spring Formation, and alluvium were used to constrain the extent of the layers in the cross sections.
- The extent of shallow clays was established using records of historical perched aquifer conditions provided by Merced ID. Presence of perched aquifer conditions in the local data were combined with the extent of shallow clays shown in the spatially limited Page (1977) cross sections to define the extent of shallow clays.
- Regional extent, depth, and thickness of the Corcoran Clay Member of the Tulare Formation is available on the USGS Central Valley Spatial Database. This digital dataset, (Figure 22 and Figure

23) was directly implemented into the Model layer definition for Aquitard 2, as an extensive impermeable, lacustrine deposit.

- The base of fresh water as defined by the California Central Valley Groundwater-Surface Water Simulation Model (C2VSim-2015) as enhanced by the DWR in 2017, was used to define the maximum thickness of the fresh water aquifer, shown in in Figure 25.
-
- The extent of the MercedWRM is bounded in the vertical direction by the base of the continental deposit as defined by C2VSim-2015, whose elevation is shown in Figure 26.

2.8.3 Model Layer Development and Approach

The texture data was analyzed on a three-dimensional grid and incorporated into the layering analysis by developing cross sections aligned with published cross sections from the Page and Balding (1973) and Page (1977) reports and tying together with surficial geology information in Wagner, Bortugno, and McJunkin (1991). Texture model cross sections were developed at regular intervals aligned with the MercedWRM grid, as shown in Figure 24. This analysis allowed for refinement of the published cross sections with the newer textural data, with care taken to adjust for interpolation within the texture model that prefers the horizontal plane, rather than a dipping plane. The analysis also allowed for improved interpolation in areas without existing published cross sections, using the spatially continuous texture data. Geospatial overlays of the published reports with the texture model are available in Figure 27 though Figure 29, as listed in Table 6.

Table 6: Reference Table of the Hydrogeological Cross-Sectional Overlay

Figure	Page and Balding 1973	Texture Model
27	Cross Section B-B'	Cross Section A-A'
28	Cross Section C-C'	Cross Section F-F'
29	Cross Section D-D'	Cross Section J-J'

These overlays were combined with the other collected information to finalize the layers, as described below.

2.8.4 Model Layer Definition

The MercedWRM is divided into five distinct freshwater aquifers, one saline aquifer, and two confining units. Descriptions of each of the model layers are listed below, from top to bottom.

Layer 1 The ground surface elevation (GSE), or the top Layer 1, maintains an upper bound set by the USGS Digital Elevation Model (DEM) at a resolution of 1/3 arc-seconds, or approximately 33 feet. The layer thickness is limited by the greater of the two bounding factors subsequently listed. The primary element, from within the IWFM framework, maintains that localized stream invert constraints force the top layer to be no thinner than 25 feet thick. Additionally, within the Region, there is a shallow clay unit that covers the valley floor. This clay, described as Aquitard 1 below, is observed at ranges between 20 and 70 feet below the ground surface and, when present, defines the bottom of the first layer. Layer 1 is equivalent to the Shallow Unconfined Aquifer described in the Merced Groundwater Management Plan (http://magpi-gw.org/index.cfm/groundwater-management-plan/).

Aquitard 1 Throughout the central area of the Merced Groundwater Basin there is a shallow confining clay unit that ranges in thickness up to 20 feet thick and primarily lies at a depth of 1/3 of the distance between the ground surface and the top of the Corcoran clay.

Layer 2 Layer 2 is principally bounded by the previously defined confining shallow clay unit, Aquitard 1, and the Corcoran Clay deposit, Aquitard 2. Additionally, a minimum thickness of 25 feet is set wherever Layer 2 exists, to meet suggested convergence constraining factors within IWFM. Layer 2 is equivalent to the Intermediate Leaky aquifer system described in the Merced Groundwater Management Plan.

Aquitard 2 Equivalent to the Corcoran Clay or E Clay, Aquitard 2 within the MercedWRM is a regionally extensive confining unit. Digital shapefiles of the extent, thickness (Figure 22) and depth (Figure 23), of the Corcoran Clay are available from the CVHM Central Valley Spatial Database. The MercedWRM uses these shapefiles to define Aquitard 2.

Layer 3 Layer 3 consists of the older alluvium below the Corcoran Clay, as defined in Aquitard 2, to the top of the continental deposits in Layer 4, defined using cross sections from Page and Balding (1973) in combination with the USGS CVHM textural model, surficial geology, and a maximum depth defined by the C2VSim base of fresh water. Where the Corcoran Clay is present, Layer 3 and Layer 4 are equivalent to the Confined Aquifer described in the Merced Groundwater Management Plan.

Layer 4 Below the older alluvium, as defined in Layer 3, are continental deposits with a base defined in the same manner as above: cross sections from Page and Balding (1973) in combination with the USGS CVHM textural model, surficial geology, and a maximum depth defined by the C2VSim base of fresh water. Where below the Corcoran Clay, Layer 3 and Layer 4 are equivalent to the Confined Aquifer described in the Merced Groundwater Management Plan

Layer 5 The Mehrten Formation is composed of consolidated rock - sandstone, breccia, conglomerate, tuff, siltstone, and claystone - and is an important water supply aquifer. The bottom of the Mehrten, as with layers above, is defined through cross sections from Page and Balding (1973) in combination with the USGS CVHM textural model, surficial geology, and a maximum depth defined by the C2VSim base of fresh water. The Valley Springs Formation underlies the Mehrten on the eastern side of the Merced Groundwater Basin and is not considered a significant source of water due to a matrix of clay and fine ash. This layer is equivalent to the Mehrten Formation described in the Merced Groundwater Management Plan, with the underlying Valley Spring Formation part of the Fractured Bedrock aquifer system from the same document.

Layer 6 Layer 6 consists of the saline water ranging from the base of fresh water to the base of continental deposits as defined by the fourth layer of C2VSim-2015 (equivalent to the base of the Fractured Bedrock as defined in the Groundwater Management Plan). A non-production zone, this layer was implemented as a refinement to the water quality model and for the potential use of scenario development for the simulation of deep well production.

Finalized cross sections of the model layering, shown in v Figure 30 through Figure 42.

2.9 Small-Stream Watersheds

Watersheds defined by both the California Department of Conservation through the California Watershed Portal and the U.S. Geological Survey Watershed Boundary Dataset were reviewed in defining the watersheds of the Merced Region. The USGS Watershed Boundary Dataset classifications were selected as more representative of the Merced Region because its watershed boundaries are determined solely upon hydrologic principles and do not favor any administrative boundaries.

The spatial delineation of the watersheds within the MercedWRM is highlighted in Figure 44 and are listed from north to south in Table 7. The IWFM small watershed package is used to simulate both surface and subsurface flows entering the model's eastern boundary. Though this package, hydrologic conditions are simulated based on site-specific parameters and calculated flow rates are attributed to boundary nodes. Each intersecting groundwater node receives equivalent flow relating to its specific watershed. Since most of the streams entering the Basin are regulated, and IWFM simulates unimpaired flows, stream inflow is superseded whenever gauged inflow is available.

Table 7: Small Stream Watersheds

Small-Stream Watershed	Area (acres)
Bear Creek	46,097
Burns Creek	34,375
Deadman Creek	17,588
Dutchman Creek	10,998
Mariposa Creek	32,340
Merced River	50,762
Miles Creek	9,301
Owens Creek	17,462

2.10 Boundary Conditions

Time series general head boundary conditions were defined for the MercedWRM for all boundary nodes on the northern, western and southern limits (Figure 45), while the Model's eastern boundary is controlled by the small watersheds. These boundary conditions were developed using the DWR's Water Data Library (WDL) and annual groundwater level contours available from the DWR South-Central Region.

2.11 Initial Conditions

Similar to the boundary conditions, groundwater heads for each model node at the beginning of the simulation were developed using the DWR's WDL. As it is not possible to determine perforation interval of the observation wells, the heads were averaged across all layers. Because of this, the initial conditions for the MercedWRM were based on observed fall 1993 water level data (Figure 46), corresponding to a simulation beginning with the start of the 1994 water year. It should be noted that, while the simulation begins with the start of the 1994 water year, the calibration period begins in 1995 with the realization that an initial period is necessary for hydraulic stabilization across the model layering.

Chapter 3 Water Supply and Demand Data

The following sections describe the development process of the MercedWRM water demand and supply calculations.

3.1 Agricultural Water Demand

Agricultural water demand within the MercedWRM is dynamically calculated every month for each model element using consumptive use methodology. The consumptive use analysis within the Region was performed using the IWFM Demand Calculator (IDC) in conjunction with the remote sensing technology Mapping Evapotranspiration at High Resolution and Internalized Calibration (METRIC), which was used to verify the consumptive use demand by the IDC. The investigation of water demand under both methods offered distinct but parallel results, emphasized in the following sections.

3.1.1 Evapotranspiration (METRIC Remote Sensing)

Developed by the University of Idaho in 2000, METRIC is the process of using LandSAT Thematic Mapper data to directly compute the actual evapotranspiration (ET_C) of vegetation as a residual to the surface energy balance. For use in the MercedWRM, the Irrigation Training and Research Center (ITRC) used a modified METRIC procedure to develop the nine years of evapotranspiration data, distributed between 1989 and 2013, and shown in Table 8. The following years of analysis were selected to cover a variety of hydrological year types, cropping patters, and the availability of LandSAT images.

Table 8: METRIC Datasets within the MercedWRM

Available METRIC Data					
Calendar Year	Hydrologic Classification	Calendar Year	Hydrologic Classification	Calendar Year	Hydrologic Classification
1989	Critical	2000	Above Normal	2008	Critical
1997	Wet	2001	Dry	2010	Above Normal
1998	Wet	2002	Dry	2013	Critical

A detailed explanation of the METRIC process and how it was directly applied to the Merced Region is available in Appendix B of this report. The utilized data is a series of monthly rasters exhibiting actual ET_C on a 30-meter spatial discretization.

As remote sensing data is not available on a continuous basis, the dataset was employed as a calibration tool rather than a direct method of demand measurement. The analysis of this dataset, along with other observed parameters were used as a calibration tool for the IDC during Model development and are covered in further detail in the calibration section of this report.

For additional details on the implementation of the METRIC datasets, please reference Section 4.2, Calibration of the IDC and Root-Zone Parameters.

3.1.2 Evapotranspiration (IWFM Demand Calculator)

Agricultural water demand is the amount of irrigation water that is required to satisfy the crops potential evapotranspiration requirement. The IWFM Demand Calculator (IDC) is designed to estimate the agricultural water demand for each element within the model area through consumptive use methodology, based on historical crop acreage, soil moisture requirements, effective rainfall (the portion of rainfall available for crop consumptive use), potential evapotranspiration, and localized soil parameters.

The IDC applied to the MercedWRM is a soil moisture routing simulation integrated with the groundwater model. Figure 47, from the IDC user's manual, highlights the simulated flow processes applied to the Merced Region. Within this framework, a base demand, or the potential evapotranspiration (ET_P) shown in Figure 48, can be employed to either fixed or adjustable water consumption. Due to the nature of private groundwater production in the Central Valley, all elements with irrigated agriculture are set to pump groundwater to meet all demands not met by surface water deliveries.

3.1.3 Surface Water Diversions

Major water purveyors within the model domain provided surface water delivery data for study and model implementation. Figure 49 displays the elements receiving surface water for agricultural use within the Region and Table 9 highlights the spatial and temporal discretization of available data across the entire model. Since complete monthly records are not available for all water purveyors, an analysis of available data was preformed and refined as follows:

Period of Record - The MercedWRM simulation period begins in October 1993 and ends in September 2015. When unavailable, estimations are made to approximate the surface water deliveries applied within the unknown time period. This process is completed by using the average monthly value for that district, according to the respective water year index.

Spatial Discretization – Surface water deliveries within IWFM require the user to specify the surface water destination to be an element, a group of elements within a single subregion, or a specific subregion. As high-resolution delivery data may not be available, and data may span multiple subregions, district and service area deliveries may be divided based on the agriculture area within a sub-section. Since IWFM has the capability to apply surface water deliveries to the element level, future model updates can benefit from enhanced applied water data, including data spatial discretization, quantity and timing.

Time Step Adjustments – The MercedWRM is run on a monthly time step and requires monthly data as input. While monthly data is available from MID, records with such delineation were not presented for use from Stevinson, Merquin County, Turner Island, or Chowchilla Water Districts. Because of this, monthly delivery data is estimated by applying the fraction of monthly versus annual stream diversions by MID off the Merced River.

Table 9: MercedWRM Surface Water Delivery Data

Agency	Period of Record	Resolution	Time-Step
Merced Irrigation District	Oct 1993 - Sept 2015	Parcel / Element	Monthly
Stevinson Water District	Oct 2000 - Sept 2013	District Total	Annual
Merquin County	Oct 2000 - Sept 2013	District Total	Annual
Turner Island Water District	Oct 2003 - Sept 2015	District Total	Annual
Chowchilla Water District	Oct 1993 - Sept 2013	District Total	Annual
Merquin County	Oct 2000 - Sept 2013	District Total	Annual
Turlock Irrigation District	Jan 1991 - Dec 2012	Service Area	Monthly

In conjunction with surface water deliveries used to meet agricultural water demand, the Region benefits from significant recharge as a result of local management practices, particularly the 563 miles of unlined canals operated by MID. Recharge from these and other surface water purveyors provided approximately 114,000 AF per year during 1996-2005 and increased to approximately 141,000 AF per year during 2006-2015 decade to reflect the consolidation of El Nido Water District into the MID service area.

It should be noted that any limitations in available data may lead to relative weaknesses in calibration at both the local and regional level. Additional coordination efforts through the SGMA process will aid in future refinement of MercedWRM.

3.1.4 Agricultural Groundwater Production (Agencies)

Groundwater pumping within the MercedWRM is separated into well and element-based pumping, the former of which is primarily comprised of Merced Irrigation District operated wells that feed into the surface water supply network. District pumping is available annually throughout the simulation period, with well specific data available within the 2007-2012 calendar years. To estimate historical pumping on a per-well basis, prior to 2007 and after 2012, the monthly distribution of annual pumping was developed based on water year type. This index was applied on the monthly timestep for each operational well. Figure 50 and Figure 51 respectively demonstrate the spatial distribution of MID wells and the historical annual pumping used within the model.

In addition to MID, several local water districts, provided annual pumping volumes for implementation within the model. District pumping within Stevinson, Merquin County, and Turner Island Water Districts were accounted for using element pumping in conjunction with private pumping.

3.1.5 Agricultural Groundwater Production (Private)

Private agricultural pumping is estimated by the agricultural demand in each element minus any surface water deliveries. Since no site-specific information is known for private agricultural wells, IWFM averages pumping across the element nodes. Element pumping within the IWFM framework also requires the vertical distribution pumping to be defined in each layer. Estimations for this delineation were made through analysis of the over 5,000 well depth records digitally available within the Merced County Well Database (Figure 53).

The County's database includes maximum well depth, and from this we can see that the majority of wells in the Region are pumping from within the top 500 feet of the surface (Figure 52). Since perforation information is unavailable, assumptions must be made on where groundwater is being extracted from. Through analysis of the wells within this database, it is assumed that the layer pumping distribution is taken from between the 25th and 75th percentile of total well depth (Figure 54 and Figure 55, respectively).

3.2 Urban Water Use

Total urban water demand is the sum of municipal and rural domestic groundwater extraction within the Merced Groundwater Basin. The population, and subsequent water use characteristics, of Merced County are extremely diverse, with approximately half of its population operating private groundwater wells outside of the urban centers.

Municipal pumping data for MAGPI member agencies, which includes the location and monthly pumping rates were analyzed and implemented into the MercedWRM. Figure 56 shows the spatial location of the wells by operating agency.

Population and per capita consumption, the factors IWFM uses to calculate urban demand, are available from a mix of sources that include:

- Local Urban Water Management Plans
- Local Groundwater Pumping Records
- United States Census Bureau

Monthly pumping records from MAGPI member agencies are directly inputted as part of the time-series pumping file. To ensure these records are equal to demands of the system, reflect the historical trends, and are able to project water consumption, the data was compared to population values from the US Census Bureau and the reported values for per capita water use from local Urban Water Management Plans.

Surveyed population data from the US Census Bureau, available on the tract level, is taken every ten years, but annual estimates are also available from the agency and were implemented in the MercedWRM. Census tracts within the model boundaries were incorporated directly, whereas the tracts near the boundary, with only a fraction in the Merced Region, were adjusted according to the participating land use fraction. Summarized between major member agency and rural domestic users, the population of the Merced Region is represented in Figure 57.

Records of urban water consumption are available for municipalities within the Region (Table 10). To estimate the per capita water uses of rural domestic water users, an average of the three major municipalities were used and applied to the corresponding population. Additionally, as pumping data is only available post-1998, historic trends of GPCD were extrapolated from the existing records based on the most senior data available.

Since complete records are not available for all water purveyors, an analysis of available data was preformed and refined as follows:

Period of Record - The MercedWRM simulation period begins in October 1993 and ends in September 2015. When unavailable, estimations are made to approximate groundwater production within the unknown time period. This process is completed by using the average monthly value for that agency. When volumetric data is not available, the IWFM Demand Calculator (IDC) was utilized to estimate demand based on the regional average consumptive use.

Spatial Discretization – Municipal providers within the Region use groundwater wells as their source of supplied water. Due to the lack of well perforation data available, groundwater production is simulated with elemental pumping within estimated layers.

Table 10: MercedWRM Pumping Data

Agency	Period of Record	Resolution	Time-Step
Atwater	Jan 1998 – Feb 2012	Well location	Monthly
Black Rascal	Jan 1998 – Oct 2012	Well location	Monthly
Le Grand	Jan 1998 – Dec 2012	Well location	Monthly
Livingston	Feb 1998 – Dec 2013	Agency	Monthly
Meadowbrook	Jan 1998 – Nov 2012	Well location	Monthly
Merced	Jan 1998 – Jan 2014	Well location	Monthly
Planada	Jan 1998 – Dec 2013	Well location	Monthly
Winton	Jan 1998 – Jan 2014	Well location	Monthly

The City of Merced provided urban consumptive use data through 2015, which was used to calculate GPCD, that was incorporated into the model. Such data has not been provided to date by the cities of Livingston and Atwater and therefore only calculated estimates were incorporated into the model. These estimations are shown at the annual and monthly time scale, in Figure 58 and Figure 59 respectively, while total urban groundwater pumping within the model is shown in Figure 60.

Chapter 4 Model Calibration

The objectives of model calibration are (1) to achieve a reasonable water budget for each component of the hydrologic cycle modeled (i.e., land and water use, soil moisture, stream flow, and groundwater budgets) and (2) to maximize the agreement between simulated results and observed values for groundwater levels at selected well locations and (3) streamflow hydrographs at selected gauging stations. These objectives are achieved through careful review of the model input and adjusted model parameters. The model results also provide insight to key components of the groundwater basin including historical recharge, subsurface flows, and changes in groundwater storage.

The model calibration period for the MercedWRM is October 1996 through September 2015.

4.1 Model Calibration

Model calibration begins after the data analysis and input data file development is complete. The calibration effort can be broken down into subsets that align with multiple packages within the IWFM platform. As an integrated groundwater model, the results of each part of the simulation are dependent on one another. The model calibration can be considered a systematic process that includes the following activities:

- Calibrate hydrologic demand,
- Calibrate Surface Water Features,
- Calibrate overall water budgets for the model area,
- Calibrate simulated groundwater levels to observed groundwater levels,
- Compare calibration performance with the calibration targets, and
- Conduct additional refinements to model as necessary.

4.2 Calibration of the IDC and Root-Zone Parameters

The goal of the IDC calibration process is to align the multiple references for local ET, determine agricultural demand, and develop the corresponding components of a balanced root zone budget. Calibration of these surface features are the foundation of the greater model processes as they are the primary stresses on the groundwater system. This part of the calibration effort was primary focused on refining the following budget items while ensuring accuracy in and maintaining reasonable parameters.

Land Use – As the foundation of consumptive use analysis, land use across the model domain was extensively investigated and ground-truthed adjustments were made when necessary. Beyond the initial land use modifications mentioned in Section 2.6, Land Use and Cropping Patterns, MID cropping patterns underwent further analysis and the CropScape datasets were evaluated alongside the distribution developed as a part of the Merced Irrigation District Water Balance Model (MID-WBM), which uses land use data available through the MID accounting records. This comparison was performed across the MID subregions for 2010 and 2013, and results are shown in Table 11.

Table 11: Land use comparison between the MercedWRM and the MID-BWM (acres)

Land Use Classification	MID-WBM 2010	MID-WBM 2013	MercedWRM 2010	MercedWRM 2013
Orchards	45,914	51,685	40,167	50,189
Pasture	14,310	13,736	12,735	13,251
Alfalfa	17,416	7,985	25,227	13,556
Field Crops	20,003	23,307	15,408	17,485
Truck Crops	11,743	11,503	9,763	7,614
Grains	13,899	7,667	14,625	13,163
Vineyards	226	2,025	3,406	4,892
Rice	2,124	1,721	2,143	1,306
Cotton	0	0	6,074	4,525
Citrus	0	0	30	15
Idle	2,020	5,044	0	0
Total	**127,655**	**124,673**	**129,579**	**125,996**

The variance within the two models, while significant, is due to the differing model framework and consequent definition of the MID boundaries. These boundaries cause IWFM subregional budgets to include some acreage not within the bounds of MID, as IWFM regions must be contiguous and follow the finite element grid, while the WBM is founded on parcel level analysis. These areas of difference are highlighted in Figure 61.

Consumptive Use - IWFM recognizes monthly potential evapotranspiration (ET_P) as a model input for each defined crop category. Initial values were taken from the California Central Valley Groundwater-Surface Water Simulation Model (C2VSim) and were calibrated using the localized data available from the following three sources:

- ET_0 from the California Irrigation Management and Information System (CIMIS).
    - ET_0 is the grass-based reference evapotranspiration and is used as a standardized reflection of the energy available to transport the water vapor from the ground up into the lower atmosphere.
- ET_C from the Irrigation Training and Research Center (ITRC).
    - ET_C is the crop-specific evapotranspiration under standard growing conditions and assumes optimum growing conditions devoid of production limiters such as nutrient and moisture availability, crop diseases and pests.
- ET_A from Mapping Evapotranspiration at High Resolution and Internalized Calibration (METRIC) datasets.
    - ET_A is the actual evapotranspiration as measured from LandSAT images and is calculated as the residual of the difference between the net radiation to the land surface and a combination of sensible and ground heat fluxes.

Each of these sources were reviewed during the calibration process, at which point the original IDC referenced ET_P were adjusted to meet trends highlighted in the METRIC dataset for actual ET_C. Calibration results can be seen in the comparative charts, Figure 62 and Figure 63 , which show ET_C for the model domain and the MID subregions respectively. Post-Calibration ET_P values were calibrated to within an average of 5% of the referenced METRIC datasets.

Consumptive Use and Agricultural Demand – Whereas evapotranspiration makes up the majority of the agricultural demand, it is important to recognize and account for other water uses within a system. Non-consumptive uses including deep percolation, return flow, frost protection, leaching of the root zone, and other beneficial uses, can all add stress to the groundwater system by significantly increasing agricultural water demand. The ratio of evapotranspiration to the total applied water is known as the consumptive use fraction (CUF).

$$Consumptive\ Use\ Fraction\ (CUF) = \frac{Evapotranpiration\ of\ Applied\ Water}{Applied\ Water}$$

To determine the regional CUF, there was extensive coordination between the MercedWRM and the Merced Irrigation District Water Balance Model (MID-WBM) development teams. With data on elemental root zone parameters, research into published reports, and discussions with local growers on their irrigation practices, both models concluded that an average consumptive use fraction, considering all crop types and management practices, of 65% is representative of the Merced Region, with various subregions reaching the upper-70s.

To facilitate this relationship, evapotranspiration and root-zone parameters, particularly the soil hydraulic conductivity and the pore size distribution index, were adjusted in accordance with their hydrologic soil group and subregion. Spatial reference of these calibrated parameters is available from Figure 64 though Figure 68.

4.3 Calibration of Surface Water Features

The MercedWRM simulates streamflow in eight small-stream watersheds and several major rivers and creeks across the model domain. Streamflow calibration is performed by comparing the simulated streamflow with local data from the eight stream gauges in the Region (Figure 11).

Small Stream Watersheds – Calibration of small-stream watersheds was performed by comparing the simulated stream flow of the watersheds with the available gauged data from the Merced River, Bear Creek, Owens Creek, Duck Slough and the Chowchilla River. Since most of the larger, gauged streams are impaired with local reservoirs, their inflows overwritten with historical data. Prior to the flow adjustment, annual volumes were analyzed for potential refinement to the nearby, ungauged watersheds. Parameter adjustments, including watershed size and evapotranspiration, were implemented across the smaller watersheds without flow data.

Merced River – The Merced River is the only stream in the model area with detailed flow records for calibration analysis. The Merced River stream inflow into the model area is based on the USGS stream gauge located at Merced Falls near the Northside Canal and has an average flow of 1450 ft^3/second during the calibration period.

Merced River flowrates are measured at the following gauges:

- USGS – Merced Falls near the Northside Canal
- CDEC – Merced River near Snelling
- USGS – Merced River at Shaffer Bridge
- CDEC – Merced River near Cressey
- USGS – Merced River near Stevinson

Stream flow calibration included refinement of the stream bed hydraulic conductivity and simulated values were compared to observed records, results of which are available in Figure 69 through Figure 73.

4.4 Calibration of Water Budgets

Proper calibration of water budgets within the MercedWRM ensures that the hydrologic characteristics of the groundwater basin are accurately represented. The goal of the water budget analysis is to develop a balanced system between supply and demand, while summarizing the hydrologic flow within the Region, particularly including the movement of all primary sources of water such as rainfall, irrigation, streamflow, and subsurface flows. During the calibration process, model output is reviewed and summarized into monthly and annual budgets referred to as the groundwater budget and the land and water use budget. Key budget components for each of the calibrated water budgets are listed in Table 12.

Table 12: Major Components of Water Budgets

	Groundwater Budget	Land and Water Use Budget
Budget Component	Deep Percolation	Ag. Pumping
	Stream Recharge	Ag. Diversions
	Canal Recharge	Ag. Supply Requirement
	Pumping	Urban Supply Requirement
	Outflow to Root Zone	Urban Pumping
	Subsurface Flow	
	Change in Storage	
	Cumulative Change in Storage	

During this stage of the calibration, key model datasets and parameters have been adjusted. Root zone and aquifer parameters, as well as water use data, including the location, amount, and timing of surface water diversion and groundwater pumping, are particularly important during this stage of calibration.

The MercedWRM results are summarized in the following sections. The model budget tables can be generated in either monthly or annual time steps for the period of simulation.

4.4.1 Land and Water Use Budget

The land and water use budget balances water supply and water demand in the study area. Calculation of this balance ensures that the model is properly representing the key hydrologic components of the study area. This balance includes agricultural and urban land use, agricultural and urban water demand, and overall water supply, consisting of surface water deliveries and groundwater pumping.

The average annual water demand for the Region within the calibration period was 896,000 AF, consisting of 814,000 AF agricultural demand and 82,000 AF of municipal and domestic demand. This demand was met by 329,000 AF of surface water deliveries, and 711,000 AF of groundwater production, 629,000 AF of agricultural and 82,000 AF of municipal and domestic pumping. The annual land and water use budget for the calibration period (water years 1996-2015) are presented in Figure 74.

4.4.2 Groundwater Budget

The major hydrologic processes affecting groundwater flow in the model area are incorporated in the MercedWRM. The primary components of the groundwater budget are:

- Inflows:
    - Deep percolation from rainfall and irrigation-applied water,
    - Recharge due to stream seepage,
    - Recharge from other sources such as irrigation canals and recharge ponds,
    - Boundary inflows from outside the model area, and
    - Subsurface inflows from adjacent subregions.
- Outflows:
    - Groundwater pumping,
    - Outflow to streams and rivers,
    - Subsurface outflows to adjacent subregions, and
    - Boundary outflows.
    - Change in groundwater storage

The groundwater budget (Figure 75) shows that within the calibration period, the primary sources of aquifer recharge are deep percolation and seepage from the surface water features. During the 1996-2015 simulation period, groundwater storage was reduced by an average of 111,000 acre-feet per year. The primary cause for this reduction is the 750,000 acre-feet of pumping, offset by 367,000 acre-feet of deep percolation, a net gain from stream of 148,000 acre-feet, 127,000 acre-feet of canal recharge, and a net boundary flow of 10,000 acre-feet annually.

4.5 Groundwater Level Calibration

The goal of this stage of calibration is to achieve a reasonable agreement between the simulated and observed groundwater levels at the calibration wells. Within the Region, 176 groundwater observation wells were selected from the Merced HydroDMS database to be representative of both the local and regional groundwater trends. The selected calibration wells provide reliable historical data that has served as a fair representation of the long-term conditions of the Basin.

Aquifer parameters, such as hydraulic conductivity, specific storage, and specific yield were modified to achieve calibration targets. The groundwater level calibration is performed in two stages:

- The initial calibration effort is focused on the regional scale to verify hydrogeological assumptions made during development and confirm the accuracy of general groundwater flow vectors. During this iteration, simulated groundwater elevation trends, flow directions, and groundwater gradients generally match the measured data.
- The second stage of calibration of groundwater levels is to compare the simulated and observed groundwater level at each calibration well. This comparison provides information on the overall model performance during the simulation period. The simulated groundwater elevations at the 176 calibration wells (Figure 76) were compared with corresponding observed values for long-term trends as well as seasonal fluctuations.

The results of the groundwater level calibration indicate that the MercedWRM reasonably simulates the long-term hydrologic responses under various hydrologic conditions. Figure 77 and Figure 78 offer a cursory overview of the groundwater level calibration across the model domain, while Appendix A contains groundwater hydrographs at all calibration wells.

4.6 Measurement of Calibration Status

The MercedWRM calibration status was measured using two metrics: simulated and observed groundwater level matching statistics and groundwater trend matching. The statistics were evaluated to meet the

American Standard Testing Method (ATSM). In addition to quantifiable metrics, the MercedWRM calibration was evaluated by generating reasonable regional groundwater flow directions and producing realistic water budgets.

The “Standard Guide for Calibrating a Groundwater Flow Model Application” (ASTM D5981-96) states that “the acceptable residual should be a small fraction of the head difference between the highest and lowest heads across the site.” The residual is defined as the simulated head minus the observed heads. An analysis of all calibration wells within the Region indicated the presence of 300+ feet of water level changes. Using 10 percent as the “small fraction”, the acceptable residual level would be 30 feet. Calibration goals for the groundwater level residuals were set such that no more than 10 percent of the observed groundwater levels would exceed the acceptable residual level of 30 feet.

- 87.2% of observed groundwater levels are within +/- 20 feet of its respective simulated values
- 97.8% of observed groundwater levels are within +/- 30 feet of its respective simulated values

The residual histogram for the Merced Region is shown in Figure 79. Additionally, a scatter plot of simulated vs observed values is shown in Figure 80.

4.7 Final Calibration Parameters

The California Central Valley Groundwater-Surface Water Simulation Model (C2VSim) served as the basis aquifer parameters within the MercedWRM. These parameters were adjusted throughout the calibration process such that hydraulic head of the simulated model was best aligned with the observed data. The parameters resulting from the calibration process are listed in the subsection below.

Horizontal Hydraulic Conductivity – The hydraulic conductivity (K_H) in the MercedWRM varies across the horizontal direction and across model layers. The fully calibrated values remain descriptive of the initial hydrogeologic analysis, range from 4 ft/day to 100ft/day, and the spatial distribution is represented in Figure 81 through Figure 85.

Vertical Hydraulic Conductivity – Primarily a constraining factor across the Corcoran Clay (Aquitard 2), the Vertical Hydraulic Conductivity (K_V) shown in Figure 86 facilitates the separation between the unconfined and confined aquifers within the MercedWRM. The K_V values of the Corcoran aquitard is found to be less than one one-thousandth of the horizontal conductivity of the surrounding aquifer systems.

Specific Storage – Specific Storage (S_S) is used to represent the available storage at nodes in a confined aquifer, where the hydraulic head is above the top of the aquifer. Specific Storage is the unit volume of water released or taken into storage per unit change in head. Calibrated specific storage is shown in Figure 87.

Specific Yield – Specific Yield (S_Y) is representative of the available storage in an unconfined aquifer and defined as the unit volume of volume released from the aquifer per unit change in head due to gravity. Calibrated specific storage is shown in Figure 88.

4.8 Sensitivity Analysis

Sensitivity analysis is an important step in the model development process. It is defined as “the study of distribution of dependent variables (e.g., groundwater elevations in a groundwater model) in response to changes in the distribution of independent variables, initial conditions, boundary conditions, and physical parameters” (AWWA, 2001). In general, a sensitivity analysis of an integrated groundwater and surface water model is performed for the following purposes:

- To test the robustness and stability of the model by establishing tolerance within which the model parameters can vary without significantly changing the model results;
- To understand the impact of inaccuracies in input data on model results (e.g., how model results can change because of a 10% error in the estimation of agricultural pumping); and
- To develop an understanding of the relative sensitivity of the components of the hydrologic cycle and data, so that an effective data collection and monitoring plan can be developed.

4.8.1 Metrics of the Sensitivity Analysis

A sensitivity analysis was performed using the MercedWRM to assess the sensitivity of model results to specific model parameters and input data. Two different metrics were selected to measure the sensitivity of the MercedWRM. A sensitivity metric is a single number derived from the MercedWRM model results and has a unique value for each model run corresponding to a given set of data or parameter value. The sensitivity metrics used here:

- Average groundwater elevation in the study areas, and
- Average root mean square (RMS) error of groundwater elevation aggregated from selected calibration wells.

Average groundwater elevation in the study areas is defined as a three-way average of simulated groundwater elevations at model nodes. The average is taken over:

- Layers,
- Nodes, and
- Time.

This can be mathematically expressed by:

$$\bar{H} = \frac{1}{M}\sum_{K=1}^{M} H_k$$

Such that,

$$H_k = \frac{1}{N}\sum_{i=1}^{N}\left[\frac{1}{L}\sum_{j=1}^{L} h_j\right]_i^k$$

Where,

M	total number of simulation time steps,
H_k	average head in the model area at k-th time step,
N	number of model nodes,
L	number of model layers in aquifer,
H_j	groundwater elevation at layer j, and
i, j, k	are indices for node, layer, and time, respectively.

The average RMS error at selected calibration wells is defined as the average of individual RMS error at each calibration well. The RMS error at a calibration well is defined as follows:

$$RMS_w = \sqrt{\left\{\frac{1}{N}\sum_{k=1}^{N_0}\left[h_{k,w}^0 - h_{k,w}^s\right]^2\right\}}$$

where,

N_0 is the number of observations at well k,

$h_{k,w}^0$ is the observed groundwater elevation at time step k, at well w,

$h_{k,w}^s$ is the simulated groundwater elevation at time step k, at well w.

4.8.2 Results of the MercedWRM Sensitivity Analysis

Adjustments of aquifer parameters, and the analysis the resulting groundwater head, was performed at all groundwater nodes within the model domain. Sensitivity analyses were performed for the MercedWRM for the following parameters.

- Hydraulic Conductivity (Horizontal)
- Specific Yield
- Specific Storage
- Hydraulic Conductivity (Vertical) of the Corcoran Clay

4.8.3 Hydraulic Conductivity (Horizontal)

The sensitivity of the MercedWRM to changes in hydraulic conductivity are presented in Figure 89 and Figure 90. Reduction of hydraulic conductivity to one fourth of the calibrated value results in 10.31 feet lower groundwater levels in the model, whereas increases to hydraulic conductivity increase the average groundwater levels by 1.67 feet. Changes to hydraulic conductivity have significant impacts to RMS values.

4.8.4 Specific Yield

The sensitivity of the MercedWRM to changes in specific yield are presented in Figure 91 and Figure 92. Reduction of specific yield to one fourth of the calibrated value results in 14.61 feet lower groundwater levels in the model, whereas increases to specific yield increase the average groundwater levels by 7.90 feet. Changes to specific yield have significant impacts to RMS values.

4.8.5 Specific Storage

The sensitivity of the MercedWRM to changes in specific storage are presented in Figure 93 and Figure 94. Reduction of specific storage to one fourth of the calibrated value results in approximately 0.16 feet lower groundwater levels in the model, whereas increases to specific storage increase the average groundwater levels by 0.74 feet. Changes to specific storage have slight impacts to RMS values.

4.8.6 Hydraulic Conductivity (Vertical) of the Corcoran Clay

The sensitivity of the MercedWRM to changes in vertical hydraulic conductivity across the Corcoran Clay are presented in Figure 95 and Figure 96. Reduction of this parameter to one fourth of the calibrated value results in 1.91 feet lower groundwater levels in the model, whereas increases to the vertical hydraulic conductivity increase the average groundwater levels by 7.90 feet.

4.8.7 Summary of Sensitivity Analysis

The results of the sensitivity analysis for the MercedWRM indicate that the model is a stable model and the system responds in the expected manner because of changes in aquifer parameters and input data.

Chapter 5 The Merced Water Quality Model

The Merced Water Quality Model (MercedWQM) was developed to simulate total dissolved solids (TDS) and nitrogen within the Merced Groundwater Region. This module uses the groundwater flow field from the MercedWRM flow module to simulate the transport of water quality constituents in the soil and vadose zones, surface water features, and the groundwater basin aquifers. This chapter describes the assumptions made, calibration process, and hydrologic and water quality results during the calibration period.

5.1 IGSM Code Update

The foundation of the MercedWQM is the water quality module of the Integrated Groundwater Surface Water Model (IGSM). As IGSM is the predecessor of IWFM and an independent framework separate from IWFM, refinements were necessary to allow for cross-platform integration. Extensive collaboration with DWR staff was undertaken to update the IWFM code, verify parameters and water budget components, and ensure the alignment of flow vectors between the IWFM flow module and the IGSM water quality module.

Water quality modeling in IGSM includes simulation of soil zone biochemical processes, transport and decay processes in the vadose zone, and transport and decay processes in the saturated zone. Soil zone biochemical process simulation for nitrogen includes mineralization, immobilization, adsorption, desorption, denitrification and plant uptake. The transport process in the saturated and vadose zones is simulated by IGSM by solving the mathematical equations of transport that include advection, dispersion adsorption, desorption, and decay. Water quality simulation in the stream system is based on mass balance and first order linear decay rate.

5.2 IGSM Processes

The processes modeled for water quality simulation in surface and subsurface systems depend on the quality constituent and hydrologic unit. The water quality module has a separate water quality simulation procedure for each of the hydrologic units simulated in the MercedWRM flow module:

- Soil zone
- Stream system
- Vadose zone
- Groundwater zone

5.2.1 Soil Zone

The following discussion uses nitrogen as an example of constituent being simulated in the MercedWQM.

Nitrogen inflows to the soil zone are of three forms: as ammonia in fertilizers (adsorbed nitrogen); as organic nitrogen in fertilizers and in dairy wastes; and as nitrate (soluble nitrogen) in applied water.

These three forms of nitrogen interact with each other and transform from one form to another due to biochemical processes taking place in the soil zone. Soil physicists and agronomists have formulated differential equations with first order kinetic reaction rates to describe these processes. MercedWQM uses the Runge-Kutta method for solving these ordinary differential equations for nitrogen transformation processes in the soil zone. These equations are solved on an element by element basis at every time step of simulation. The numerical solution scheme used in the soil zone quality submodel of MercedWQM ensures numerical accuracy and stability by allowing for smaller time steps within the monthly time step.

The input data for the soil zone quality simulation includes:

- the time history of applied fertilizer;

- animal waste disposal data;
- concentration of imported water applied on the land;
- concentration of wastewater discharges;
- waste increment due to water use;
- concentration of stormflow recharge;
- concentration of agricultural and urban return flow;
- concentration of rainwater;
- plant uptake rate;
- mineralization/immobilization rates;
- adsorption/desorption rates; leaching fraction; and
- denitrification coefficients.

This submodel of MercedWQM generates the amount of leachate mass from each model element in the underlying vadose zone.

5.2.2 Stream System

Stream system quality is simulated in MercedWQM by solving the mass balance equation at each stream node. Each stream node in assumed to act like a continuous mixed reactor. A user specified loss rate in each stream element defines a first order loss rate for nitrogen losses in the stream system due to biological processes.

The mass balance components of stream quality simulation are:

- constituents mass inflow associated with water inflow at the upstream node of the stream element;
- mass associated with direct runoff and return flow;
- mass associated with wastewater discharges to stream;
- mass leaving with stream diversions;
- mass entering or leaving the stream system due to gain or loss to underlying aquifer; and
- mass loss due to biochemical processes.

The input data for stream quality simulation includes concentration of boundary stream inflows from:

- major streams and mountain watersheds;
- concentration of wastewater discharges to streams;
- concentration of rain runoff; concentration of return flow from urban and agricultural use; and
- nitrogen loss rate at each stream node.

The solution of constituent mass balance equation for a stream element provides the downstream mass outflow for that element. This outflow is used as upstream inflow for the stream element that is downstream of the current stream element.

5.2.3 Vadose Zone

The mass that leaches from the soil zone with percolation water travels through the vadose zone on its way to the saturated zone. For nitrogen simulation, the predominant form of nitrogen that percolates from the soil zone as leachate is nitrate. The vadose zone quality submodel of MercedWQM simulates water quality in the vadose zone by solving the one-dimensional vertical advection-dispersion equation with adsorption, desorption, and decay. The vadose zone quality submodel of MercedWQM has two mass pools to incorporate these process dynamics in the vadose zone. These two mass pools are mobile mass pool and immobile mass pool.

The mobile mass pool represents mass that is associated with mobile water phase; the immobile mass pool includes mass associated with immobile water phase and mass attached with soil particles by ionic bonds. The mass transfer between these two pools is governed by two model assumptions:

- the mobile and immobile phases of water are completely mixed; and
- concentration in both mass pools are equal at the end of each time step.

Decay coefficient defines the mass removal due to denitrification. The denitrification process removes nitrogen from the mobile and immobile pools. The numerical solution of the mathematical equation representing vadose zone quality is obtained by using the results of vadose zone flow simulation. The computations are performed node by node and layer by layer. In addition to a mass balance on water flow, a constituent mass balance is also performed for each layer. The mass exchange between the vadose zone and saturated zone due to water table rise and fall is included in MercedWQM by keeping track of depth to groundwater and corresponding concentrations in unsaturated and saturated zones at the previous time step. The mass outflow from the overlying vadose zone layer becomes the mass inflow to the layer beneath and so on. The mass outflow from the lowest vadose zone layer is the mass inflow to the saturated zone at the corresponding node.

The input data for vadose zone water quality simulation includes:

- thickness of vadose zone layers;
- hydraulic conductivity; dispersivity; distribution coefficient;
- specific retention; and
- denitrification coefficient for each unsaturated zone layer.

5.2.4 Groundwater Zone

Water quality in the groundwater zone is simulated by MercedWQM by solving two-dimensional advection-dispersion with adsorption, desorption, and decay. The flow field generated by the flow module is used to solve this mathematical equation by finite element method. The solution provides the concentration at each groundwater node at each layer. The vertical connection between the aquifer layers is simulated by considering mass exchanges associated with the vertical flow from one layer to another. A user specified decay coefficient accounts for mass removal due to denitrification.

The input data for groundwater zone water quality simulation includes:

- concentration of subsurface inflows at model boundary;
- concentration of injection water;
- longitudinal and transverse dispersivity;
- specific retention; and

- denitrification coefficient; etc.

The flow related parameters are provided in the flow module and are transferred to the water quality module of MercedWRM through the binary output from the flow module.

5.3 Model Input and Assumptions

This section describes the model inputs required to run the MercedWRM water quality module and key assumptions made. Water quality data sufficient to calibrate the MercedWRM water quality module is largely unavailable, and most values are sourced from local knowledge of the basin. Work associated with the development of the Groundwater Sustainability Plan for the Merced Subbasin will involve collection of water quality data and is expected to begin starting in 2018. Due to the lack of data available, a series of assumptions were developed and implemented based on known characteristics of the MercedWRM area.

5.3.1 Model Input

Previously, the focus of the MercedWRM has been on estimating the hydrologic components that drive the water resources of the study area. For water quality modeling, a water quality must be assigned to each hydrologic component. The input data for the MercedWQM can be summarized to include:

- Binary output file from geometry and flow module;
- time series of imported water quality
- the chemical concentration of rainfall, tributary flows, return flows, etc.;
- chemical concentration of subsurface inflow through the model boundary;
- time series of another surface loading features; and
- transport and rate parameters.

Base information was collected from the following sources, from which a series of assumptions were taken to fill in data gaps.

- The Merced Salt and Nutrient Management Plan
- GeoTracker GAMA Online Database
- Local knowledge of farming practices
- UC Davis Cooperative Extension

5.3.2 Model Assumptions

Initial concentrations for the water quality module, adopted from the Merced Subbasin Salt and Nutrient Management Plan (SNMP). This dataset, while maintaining the greatest spatial coverage, was developed without consideration of the vertical extent and is therefore is limited in its implementation though a lack of vertical discretization. These referenced values were applied at each groundwater node for both TDS and Nitrate as shown in Figure 97 and Figure 98.

For other loading parameters, a generalized survey of local knowledge was undertaken as there is a lack of quantifiable water quality data within the Merced Region. The following assumptions, listed in Table 13, were made based on the best available information.

Table 13: Merced Water Quality Model Assumptions

	TDS	Nitrate (as N)

	(mg/L)	(mg/L)
Boundary Conditions		
Northern Boundary	196	6.84
Western Boundary	1,500	1.14
Southern Boundary	209	0.70
Surface Loading		
Agricultural	1,000	1,000
Urban & Municipal	500	500
Stream Quality		
Simulated Streams	35	3.5
Canal System	50	5.0

5.4 Merced Water Quality Model Calibration

The MercedWQM calibration was performed through comparison of observed constituent levels with those of the simulated shallow and deep aquifers. Within the Region, water quality monitoring wells were selected from GeoTracker GAMA Online Database to be representative of both the local and regional water quality. Since perforation intervals of observed monitoring wells were not available, it is important to note that both an average of the shallow aquifers (layers 1-2) and the deeper aquifers (layers 3-5) were considered during calibration.

The goal of this stage of calibration is to achieve a reasonable agreement between the simulated and observed groundwater levels at the calibration wells. The results of the water quality calibration indicate that the MercedWQM reasonably simulates the long-term responses under various hydrologic and loading conditions. Figure 99 and Figure 100 offer a cursory overview of the water quality calibration across the model domain for TDS while Figure 101 and Figure 102 highlight a few of the calibration targets and simulated values for Nitrate.

Chapter 6 Recommendations

The Merced Water Resources Model, in its current state, is a defensible and well-established model for use in assessment of the water resources in the Region under historical and projected conditions. However, the following recommendations are to be considered for further refinement and enhancement of the Model:

- **Boundary Flows**
  - Interbasin boundary conditions - The current boundary flows between the Merced Region and neighboring groundwater basins are developed based on groundwater head simulations within the buffer model zone. It is recommended to use the latest version of the C2VSimFG, as being enhanced by the DWR for SGMA support, in comparing and verifying the groundwater flows across the boundaries with the neighboring basins.
  - Small Watershed - The boundary flows from the foothills have been calibrated with limited data available for the native conditions in the foothills. It is recommended to collect additional data and information on the nature of the grazing and native lands in the foothills and refine the simulation of the overland and groundwater flows from the foothills.
- **Refinement of Consumptive Use**
  - Variability of potential evapotranspiration - The current version of the IDC used for estimation of the consumptive use of crops in the Model uses monthly potential ET values that are the same for all simulation years. Given the annual variability of this data, and potential effects on the annual estimation of crop water demand, it is recommended to use more detailed data from the CIMIS stations to develop annual ETp values for use in the Model.
  - Drought Year ET Representation - The current set of ET maps used for calibration of the IDC ends in 2009. It is recommended to develop similar ET maps for the drought period of 2011-2015 and use the data to calibrate the performance of the IDC during the drought.
- **Implementation of updated datasets**
  - Land use and cropping patterns - The primary source of land use data in the model is the USDA's CropScape, available on the USDA's website. This data has been verified using the local land use and cropping pattern data from the local entities. Additionally, the DWR has recently published a detailed land use and cropping pattern map as developed based on the remote sensing, and verified at the field level, by LandIQ. This data represents the 2014 land use coverage. It is recommended to use this data in the next version of the model and continue using this data as it becomes available by LandIQ and the DWR for next updates to the Model.
  - Review and analysis of private well construction data
- **Linkage to Surface Model-** In order to be able to assess and evaluate effects of changes in operation of surface water resources and groundwater conditions in a dynamic and direct way, it is recommended to link the operations of the Merced River and Exchequer system to the Merced Water Resources Model.
- **C2VSimFG Update Based on MercedWRM for GSP Application-** C2VSimFG is developed to evaluate the integrated surface water and groundwater conditions at a regional scale, whereas, the MercedWRM is capable of evaluation of that integrated system at the local scale. As C2VsimFG may be used by the neighboring basins to evaluate the water resources conditions, and possibly the interbasin flows, it is recommended to work with the DWR to refine and update C2VSimFGto

reflect the local data in the Merced Region, so that the evaluations performed by the neighboring basins reflect the Merced operations properly.

- **Model update schedule-** In order to keep the Model up-to-date and current for analysis of the water resources in the area, it is recommended to update the model every 3-5 years and keep the Model current for evaluation of the GSP progress on path towards groundwater sustainability.

Model Figures

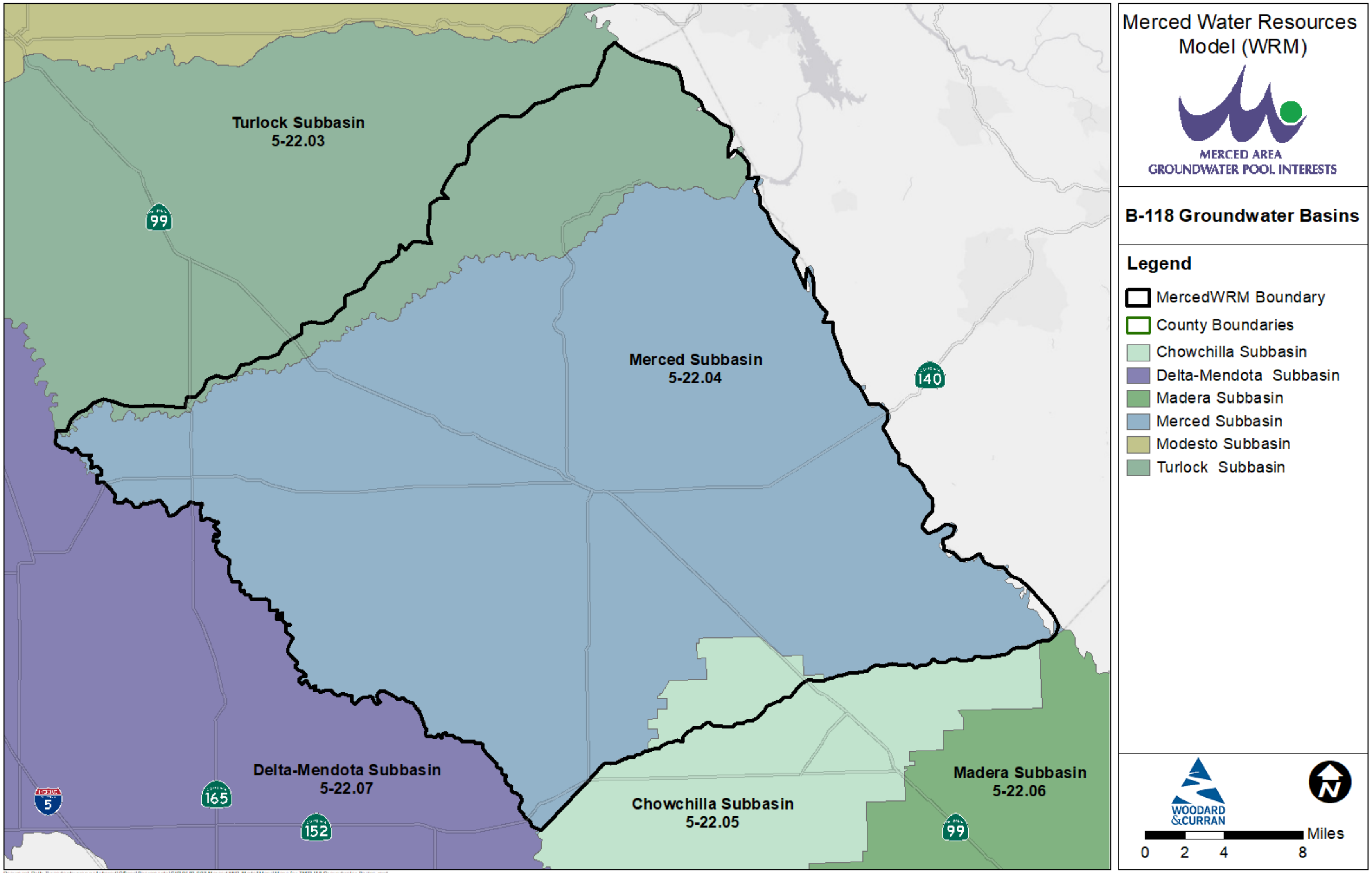


Figure 1: Bulletin 118 Groundwater Basins

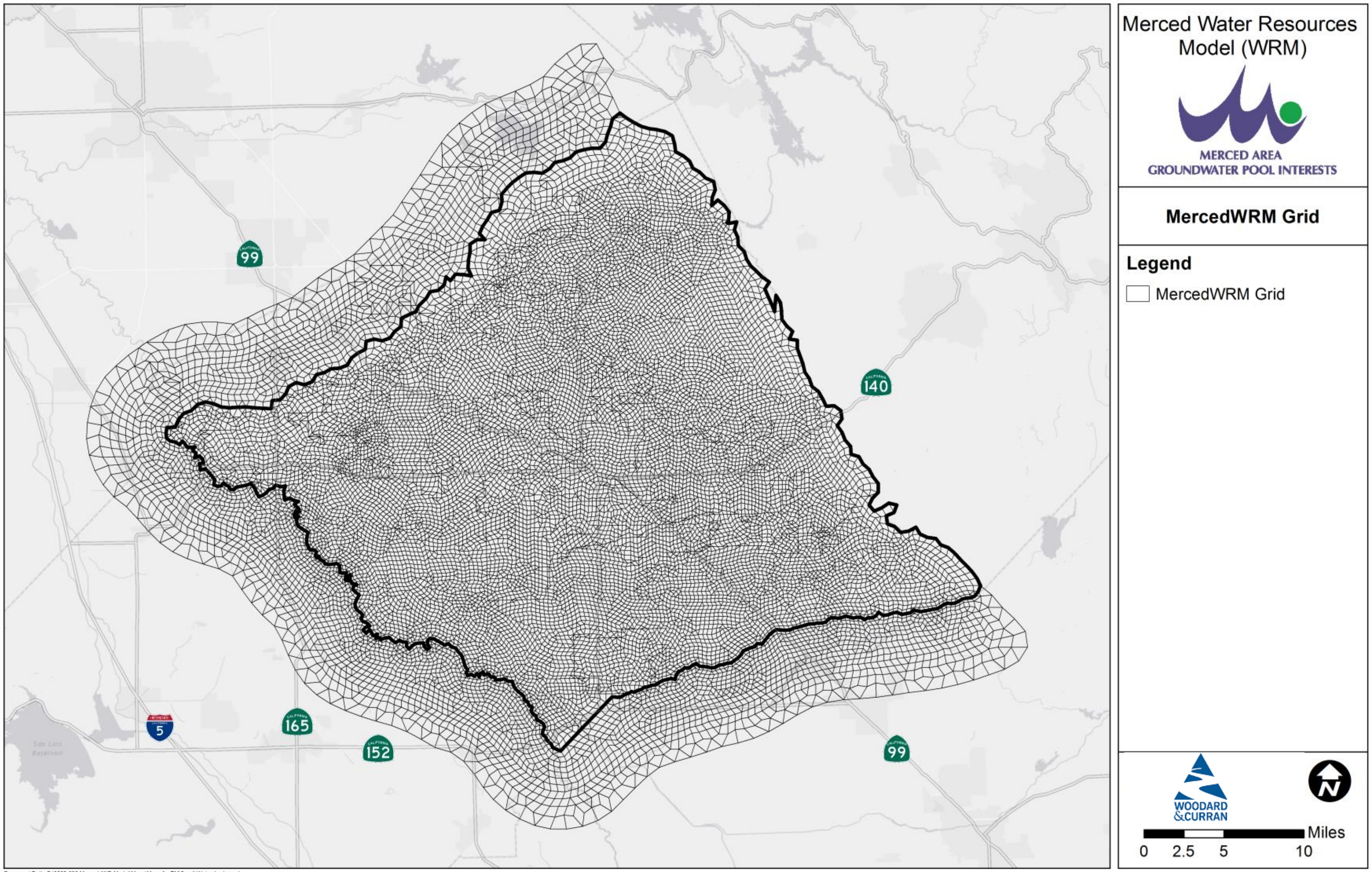


Figure 2: The Merced Water Resources Model Grid

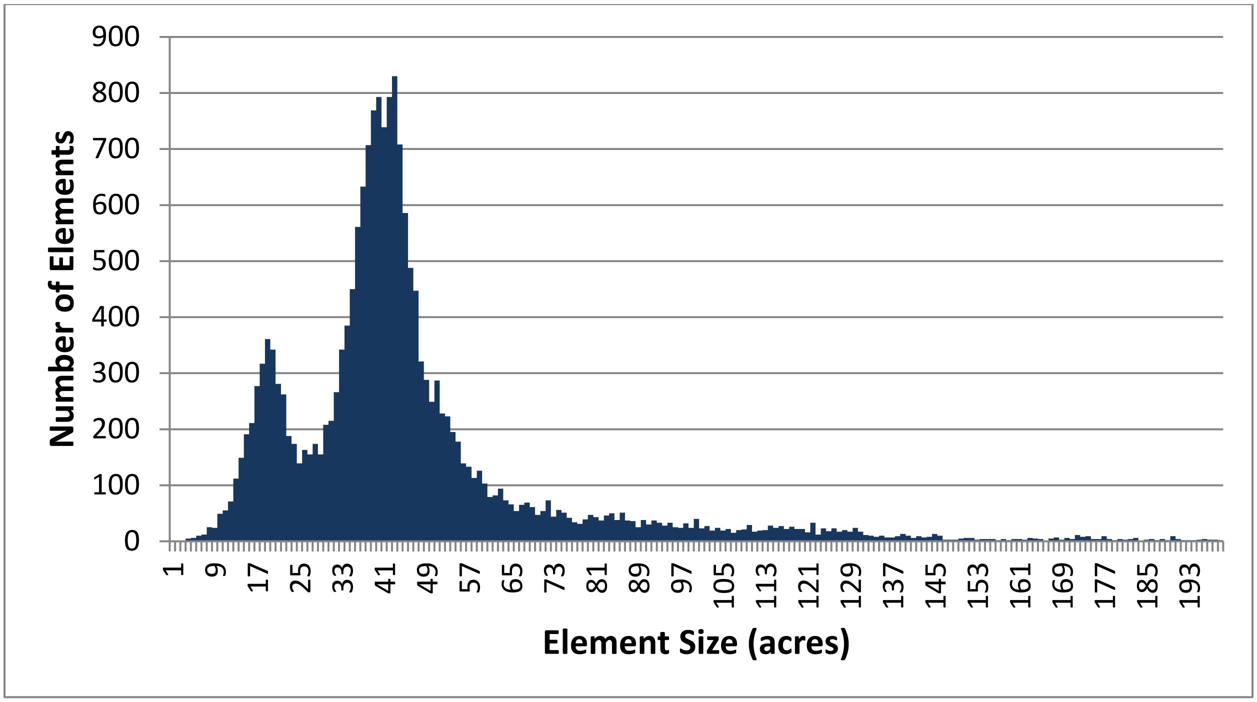


Figure 3: MercedWRM Element Size Distribution

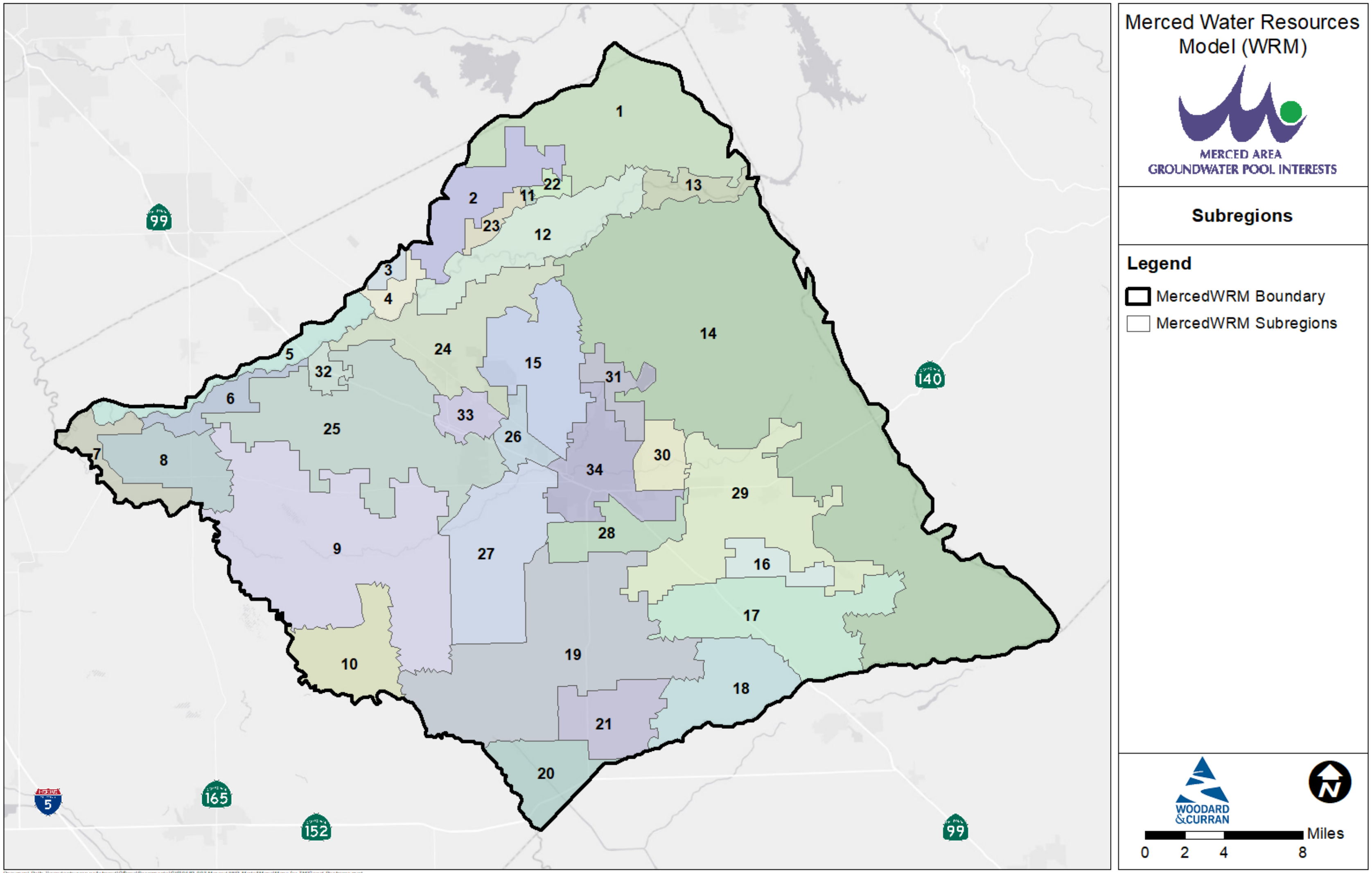


Figure 4: Merced Water Resources Model Subregions

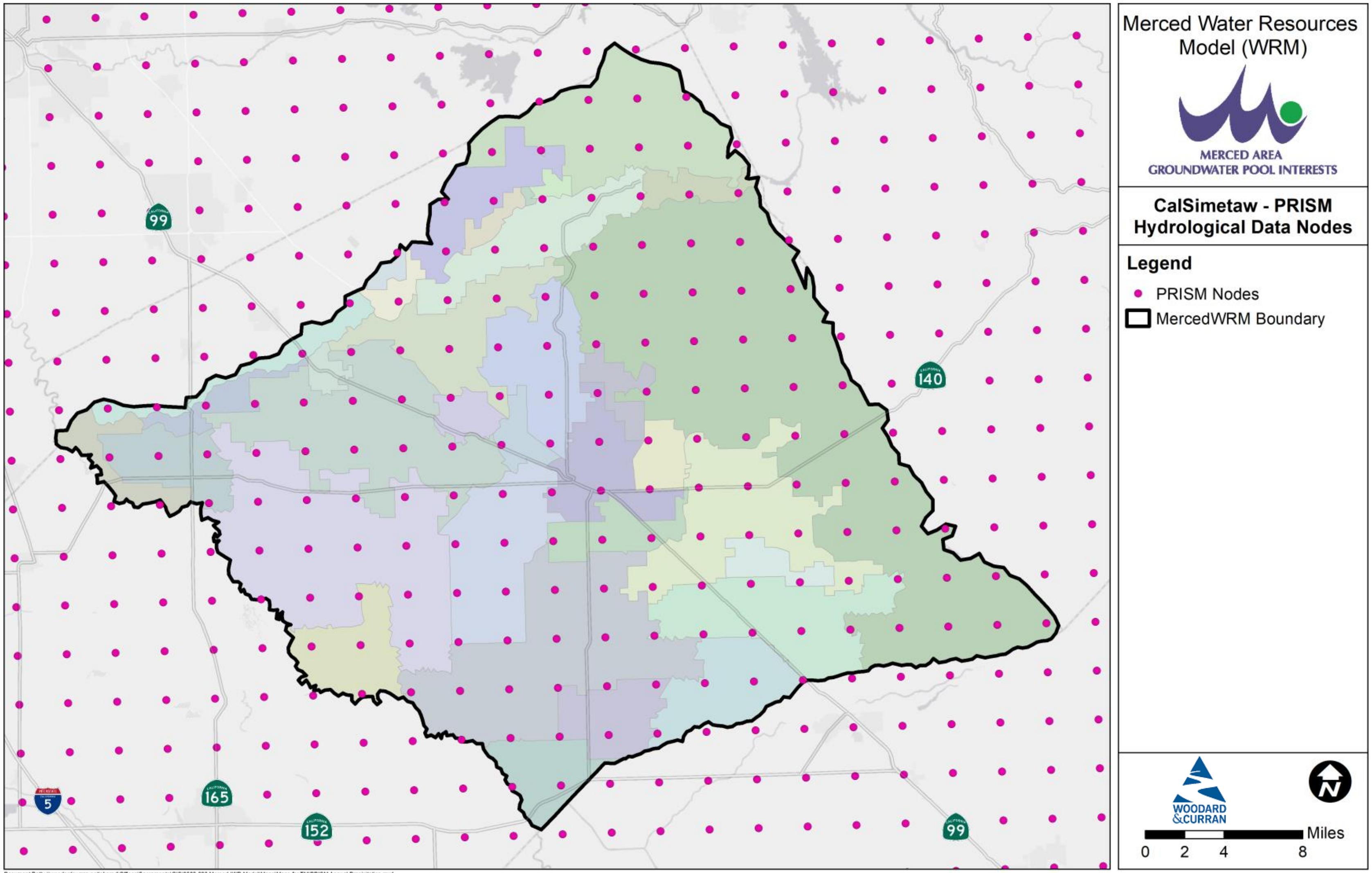


Figure 5: PRISM Grid

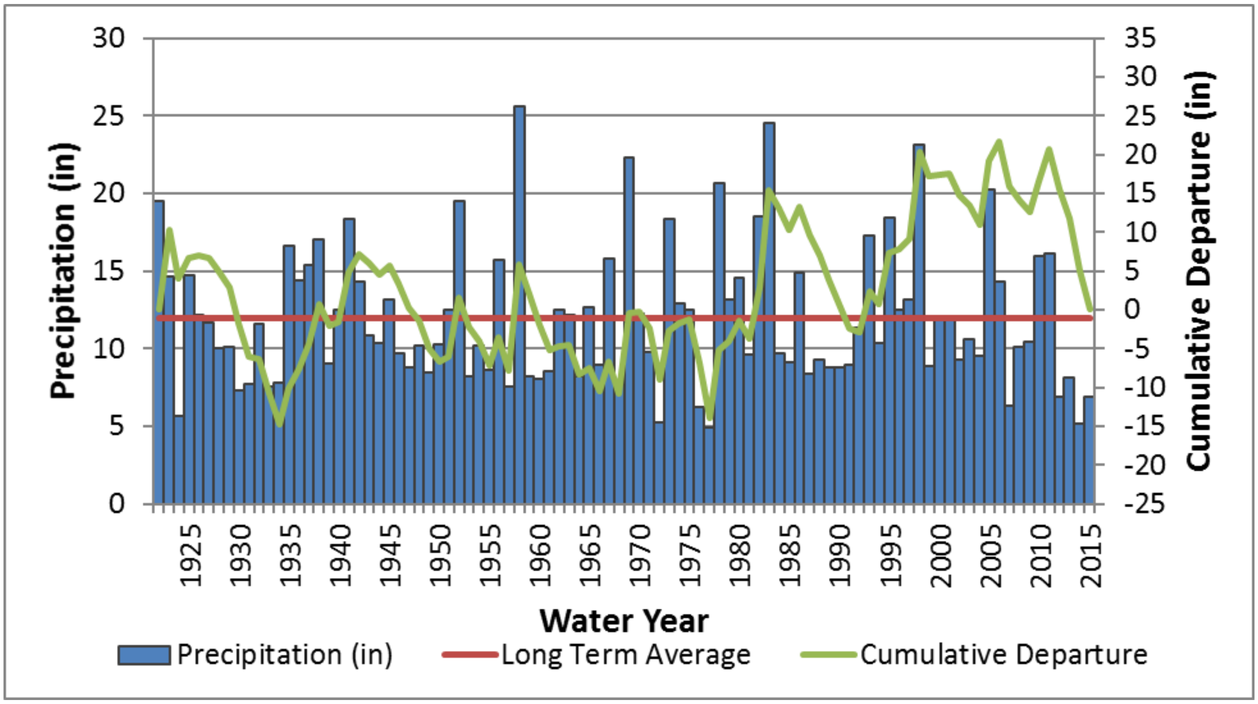


Figure 6: Monthly Precipitation and Cumulative Departure (Long Term: 1922-2015)

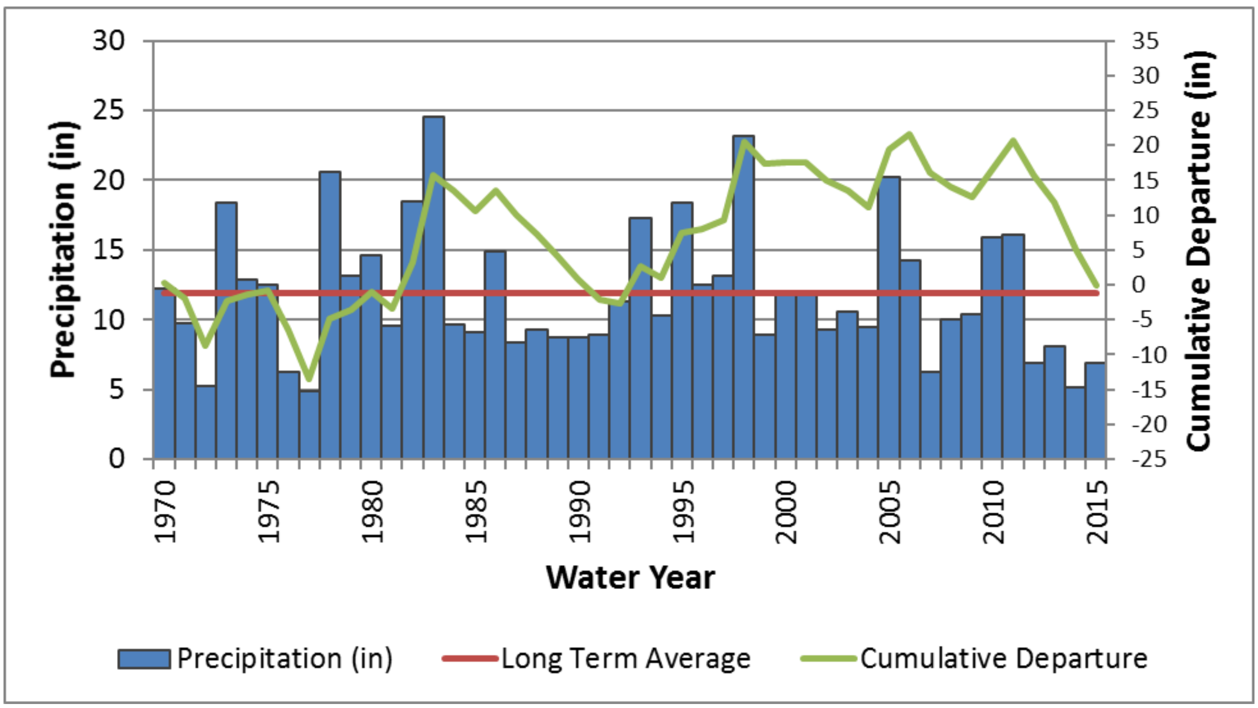


Figure 7: Monthly Precipitation and Cumulative Departure (Hydrologic Period: 1970-2015)

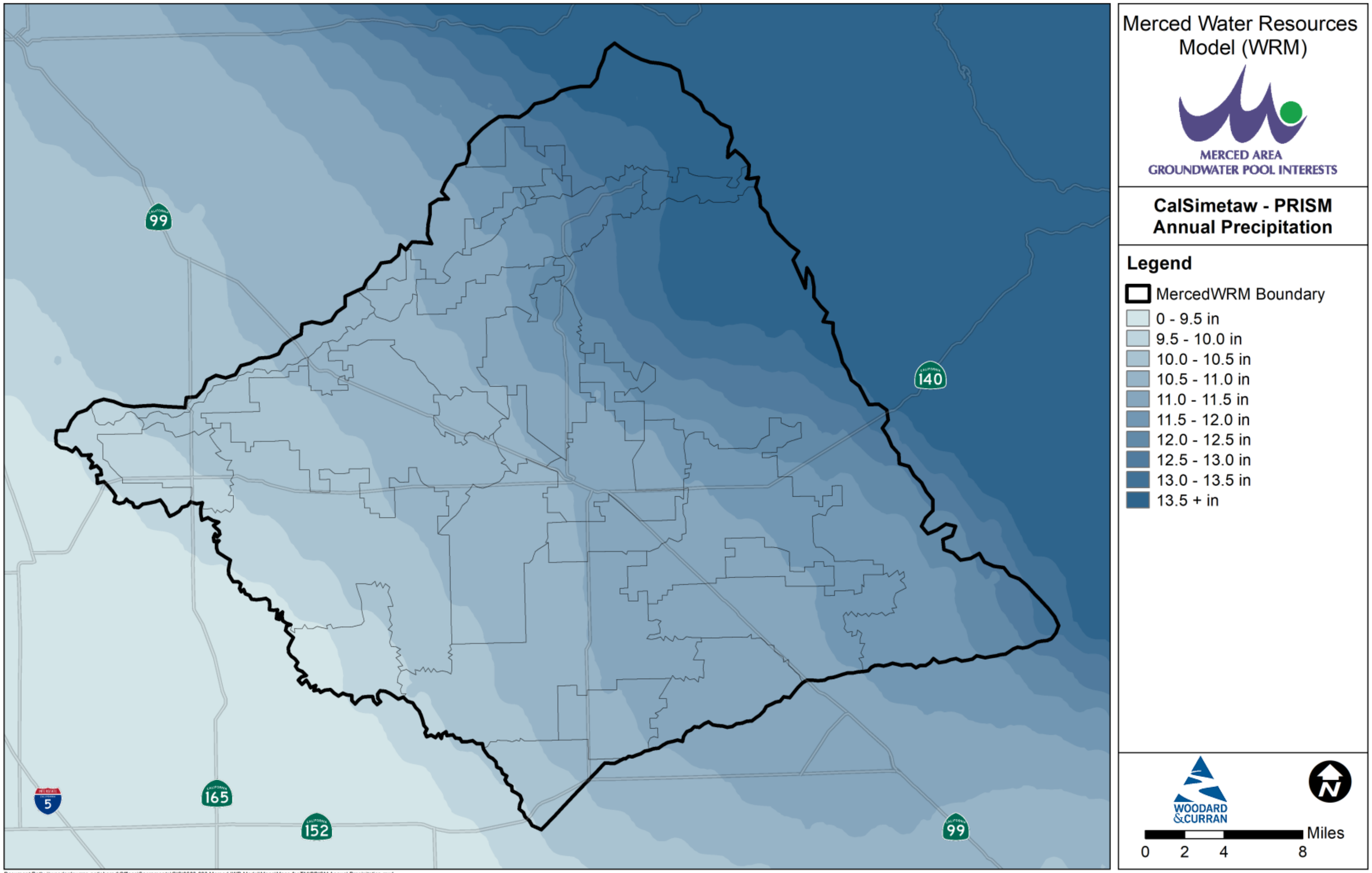


Figure 8: PRISM - Average Annual Rainfall (1970-2015)

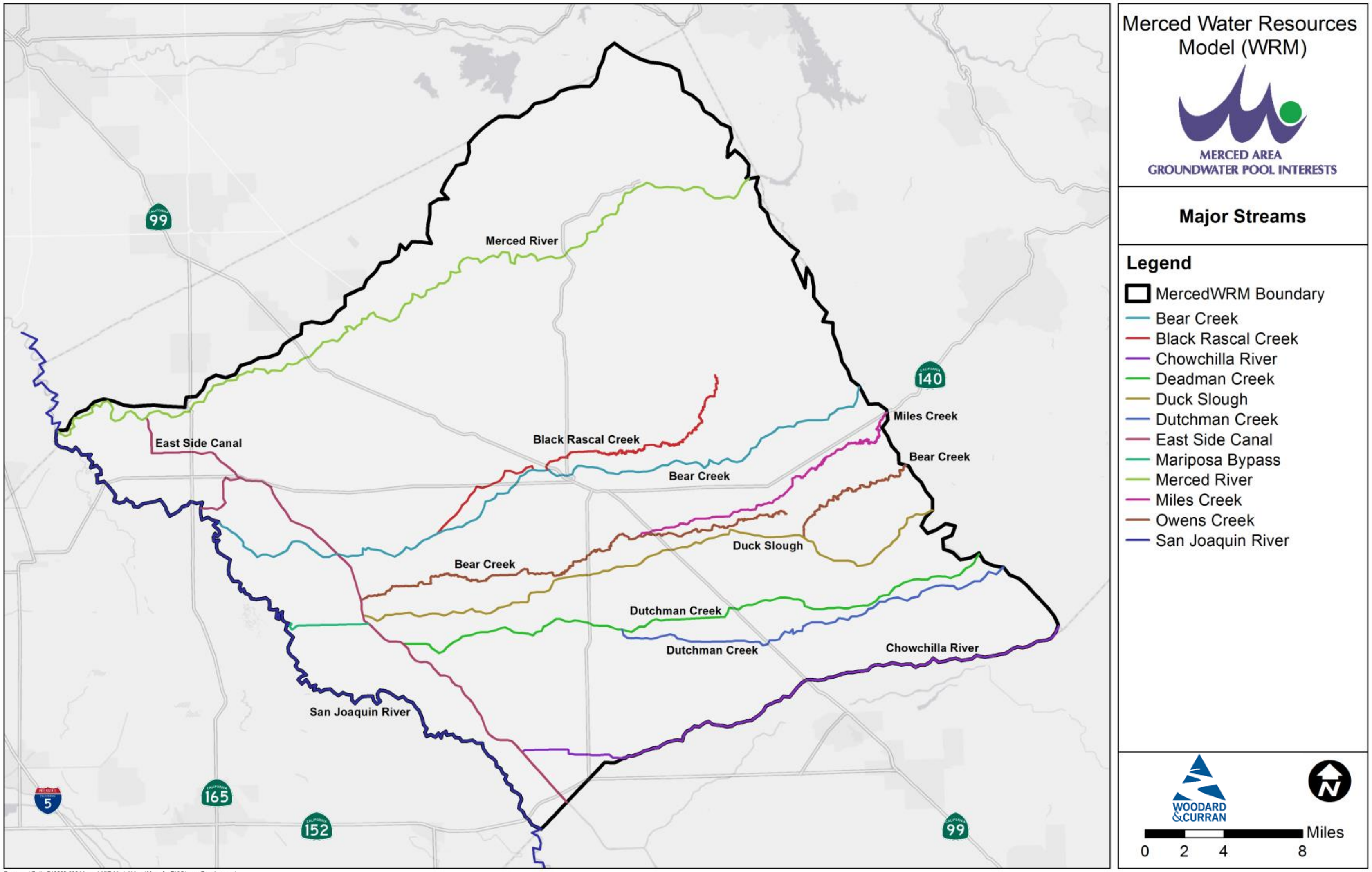


Figure 9: MercedWRM Stream Network

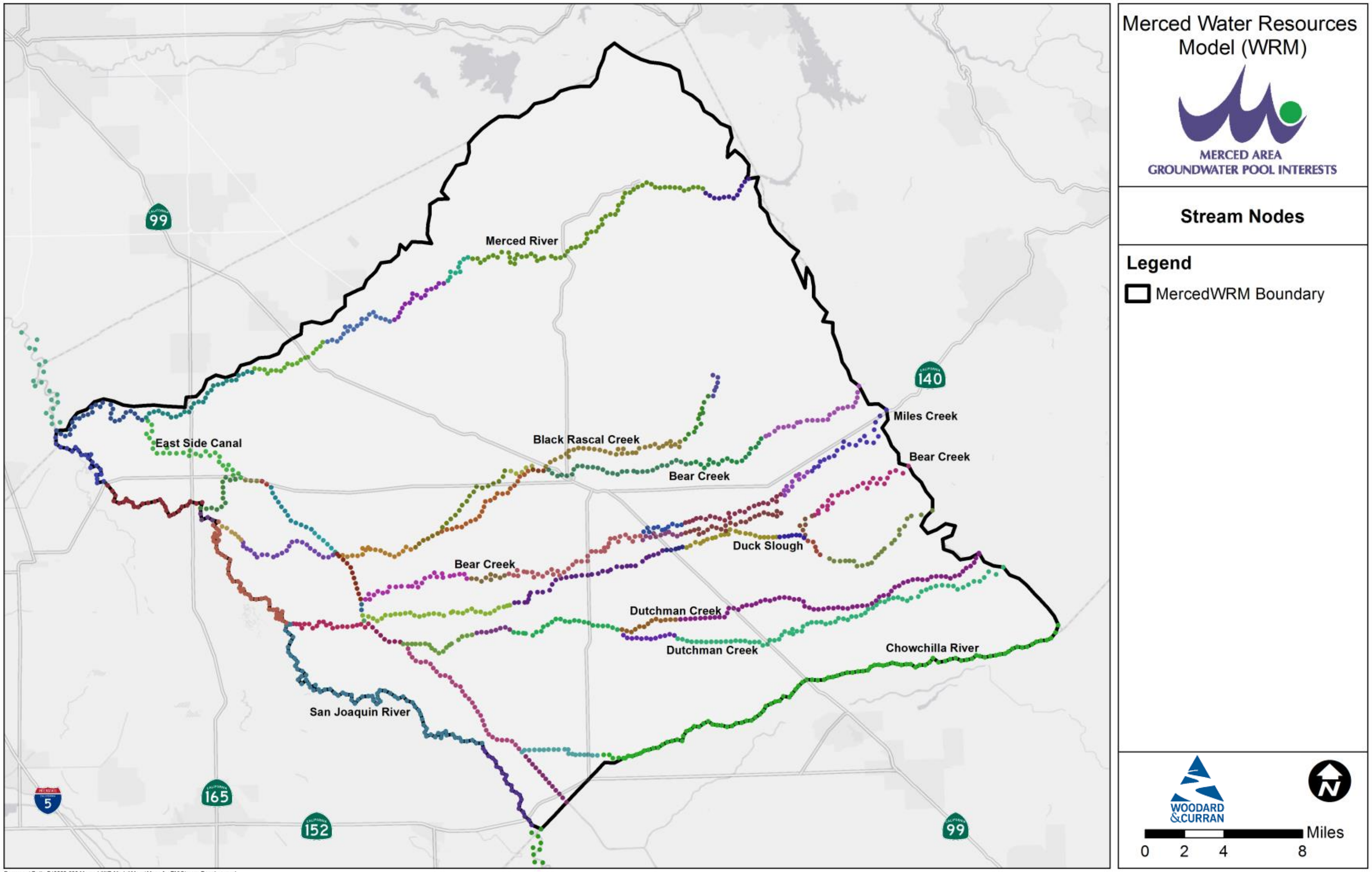


Figure 10: MercedWRM Stream Nodes and Stream Reach Configuration

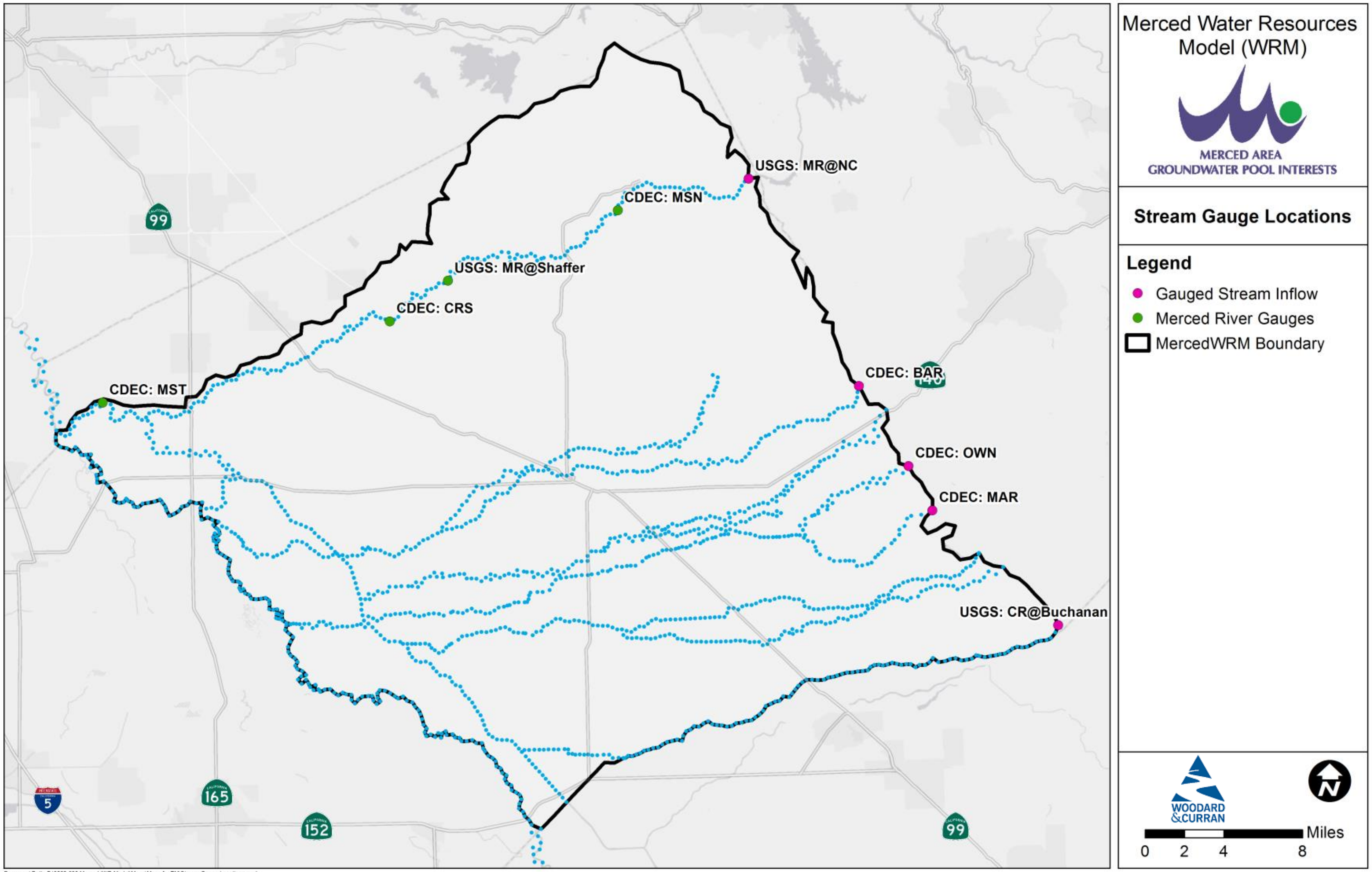


Figure 11: MercedWRM Stream Gauge Locations

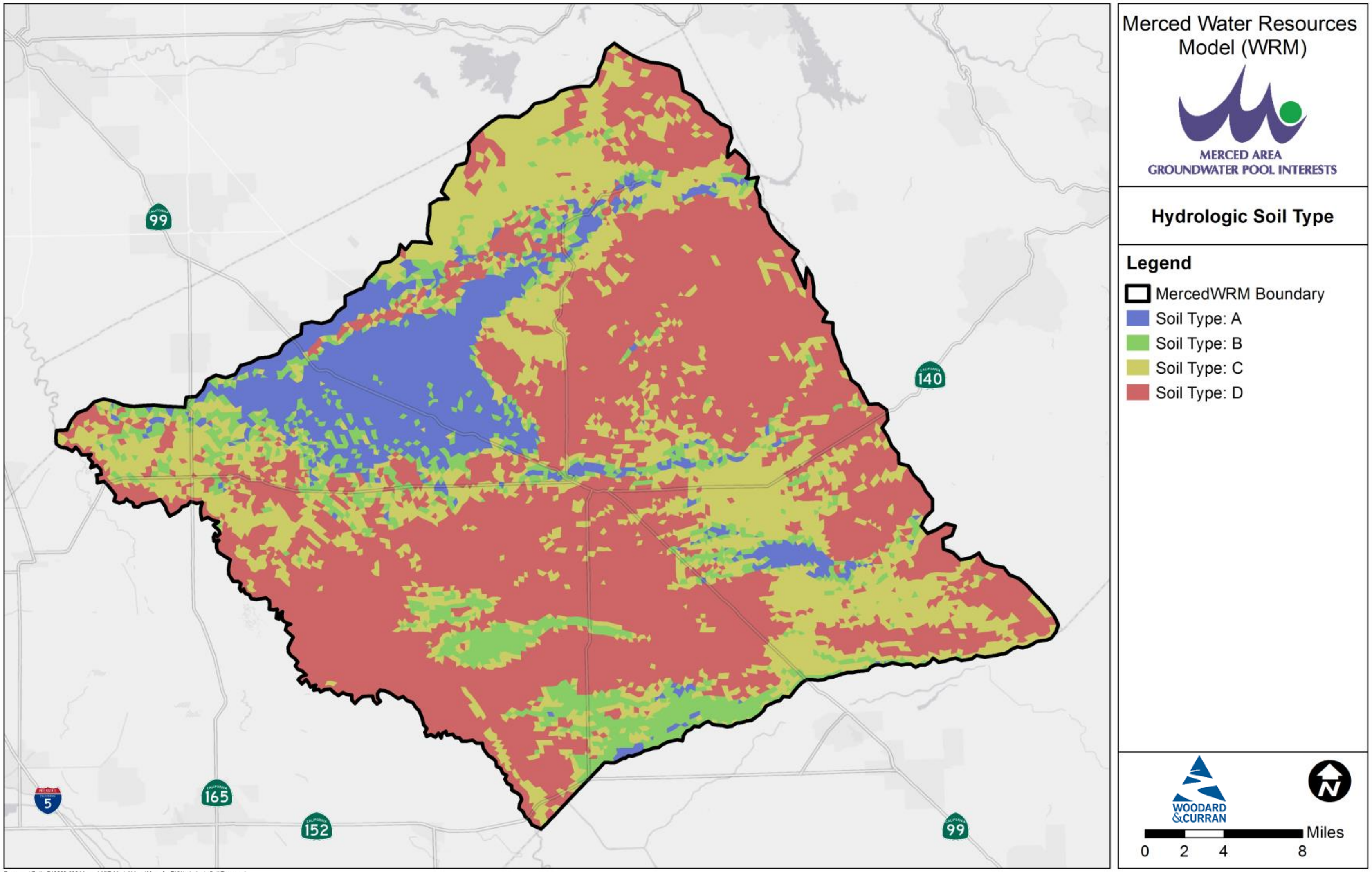


Figure 12: Soil Classifications

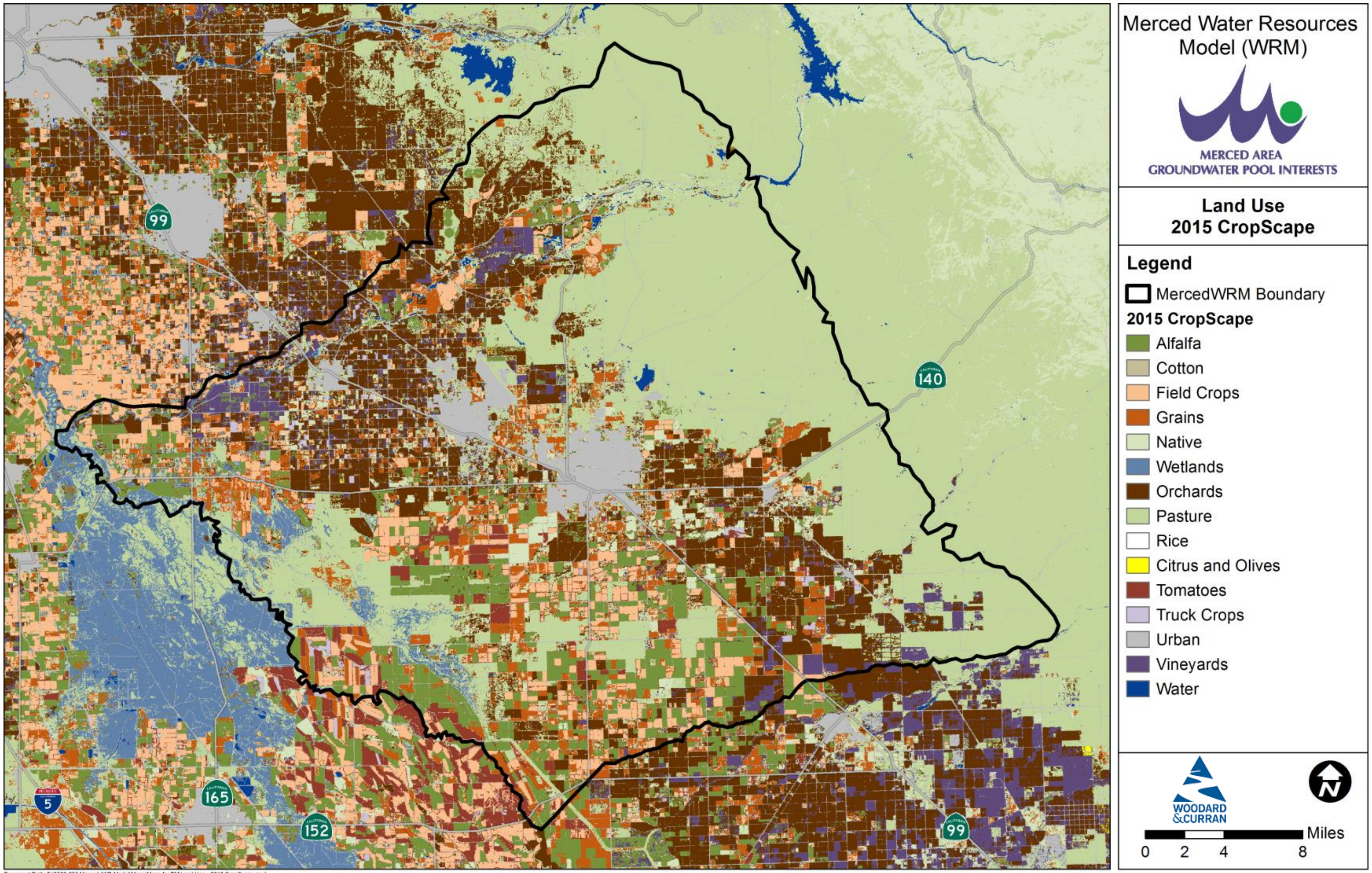


Figure 13: 2015 CropScape Land Use Data

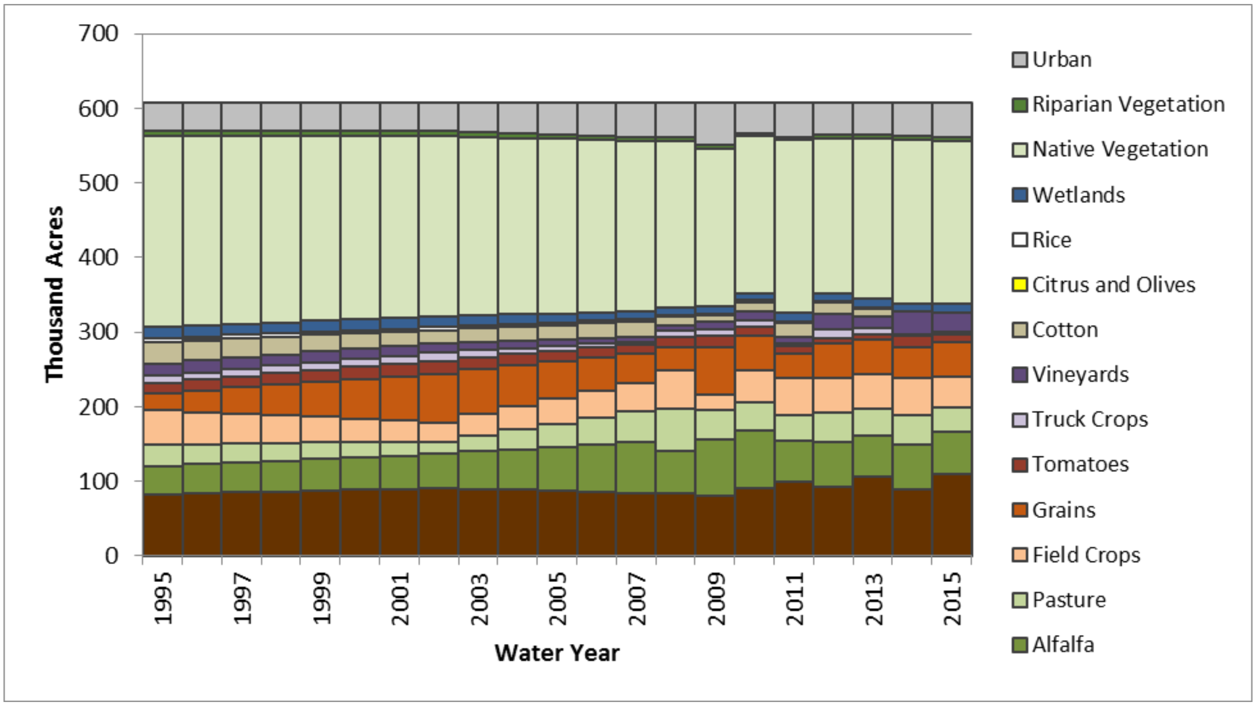


Figure 14: Merced Groundwater Region Annual Land Use Distribution

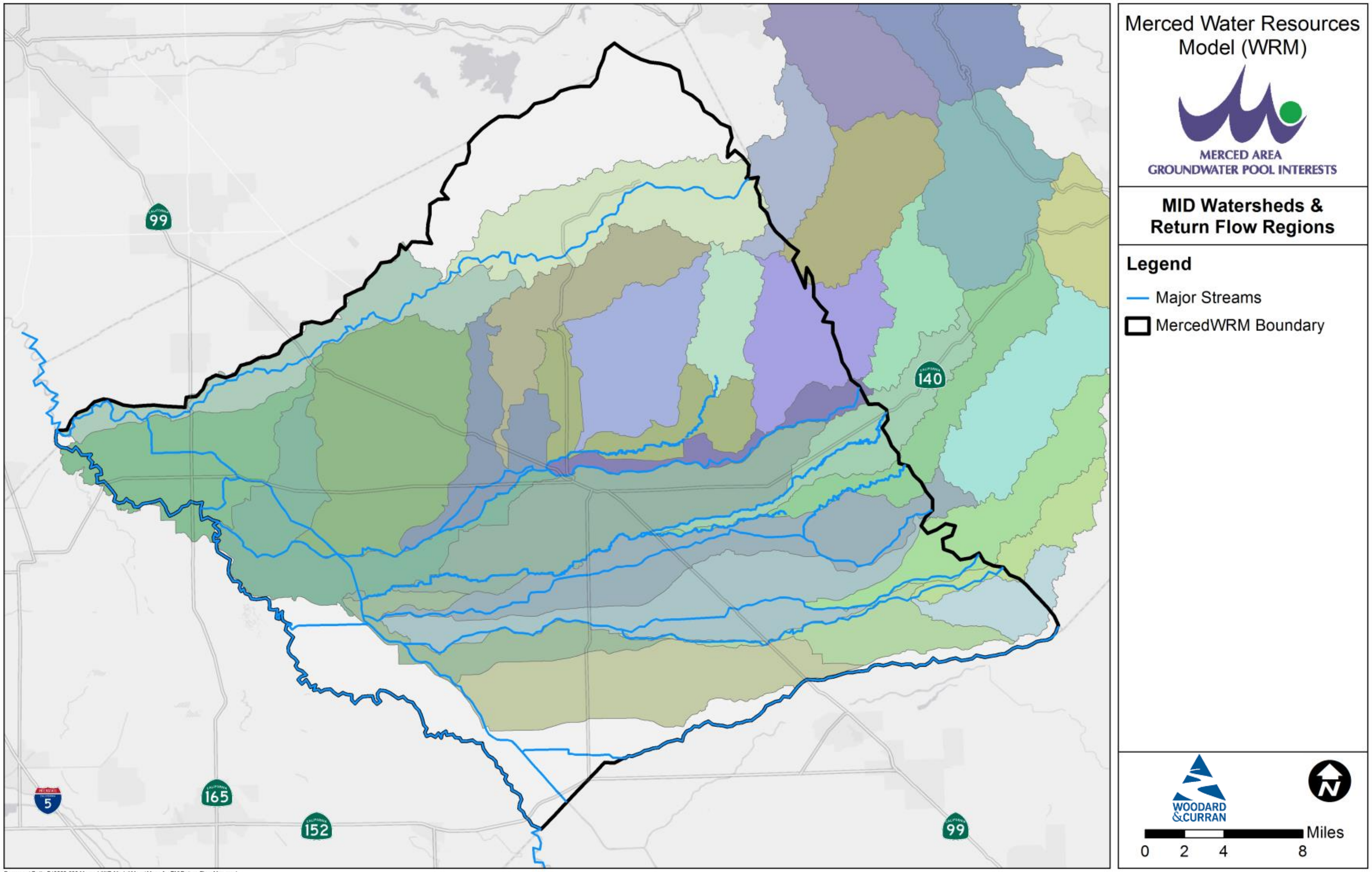


Figure 15: Merced Groundwater Basin Drainage Watersheds

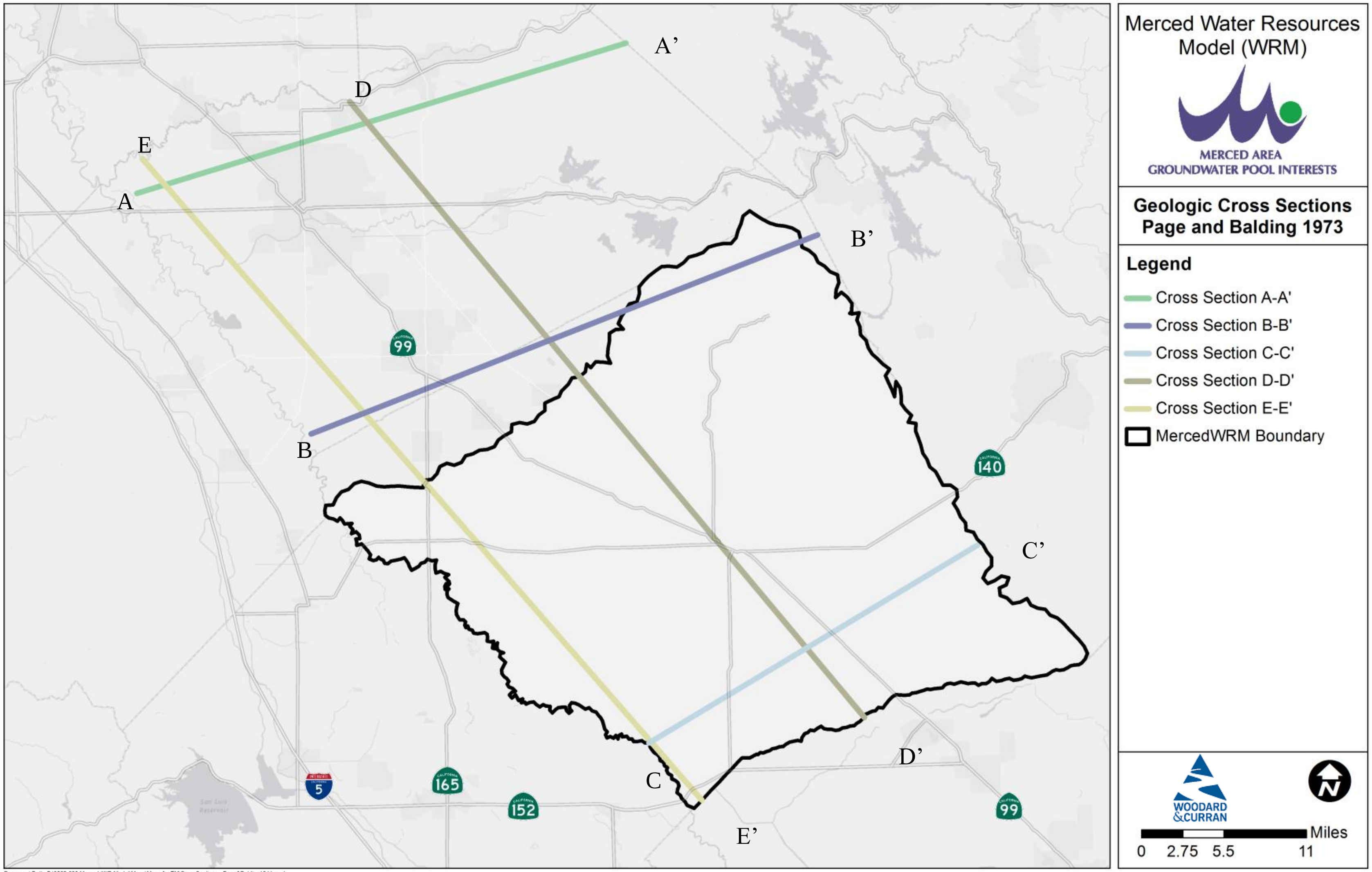


Figure 16: Location of Geologic Cross Sections - Page and Balding 1973

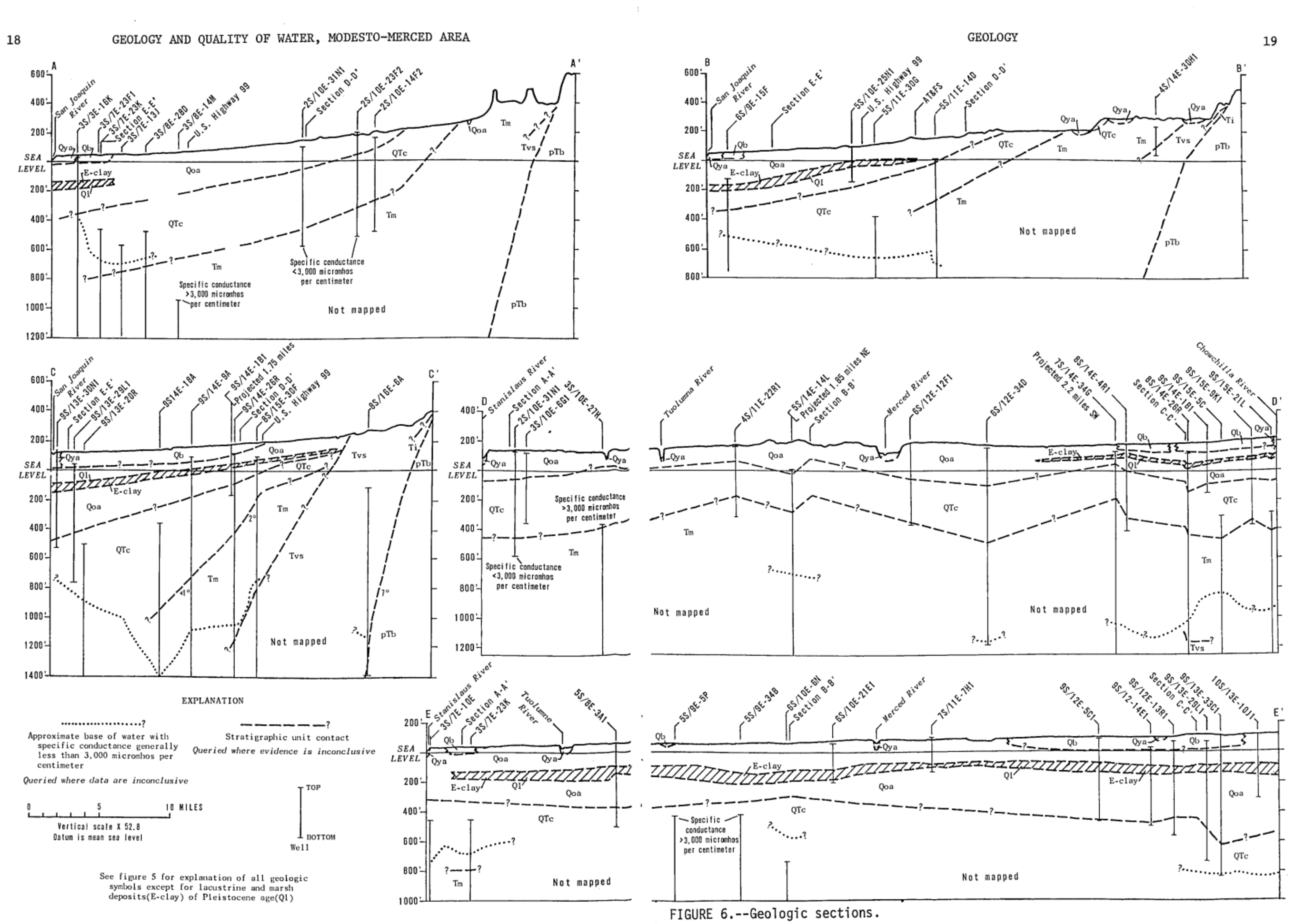


Figure 17: Referenced Cross Sections from Page and Balding 1973

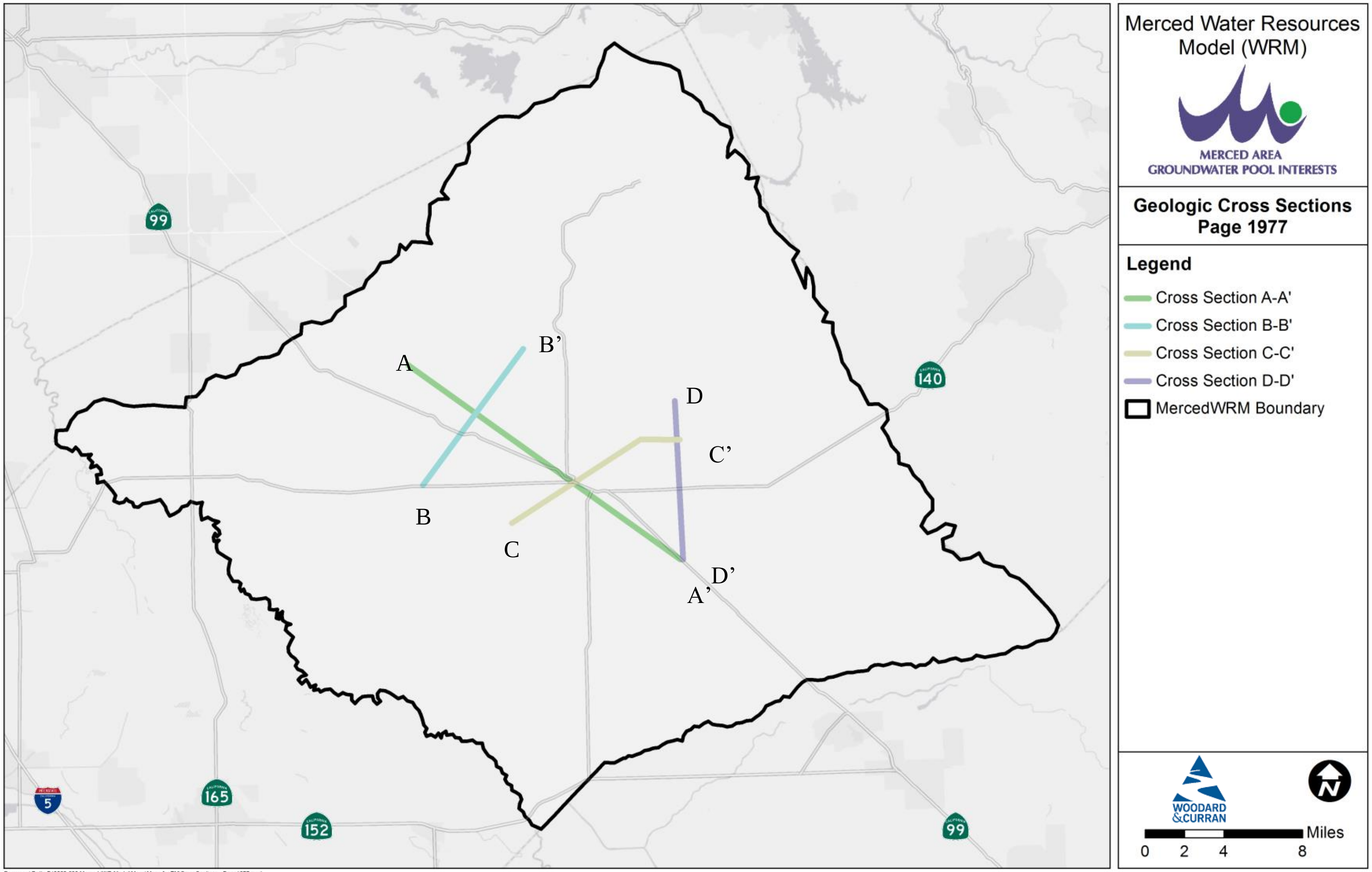


Figure 18: Location of Geologic Cross Sections - Page 1977

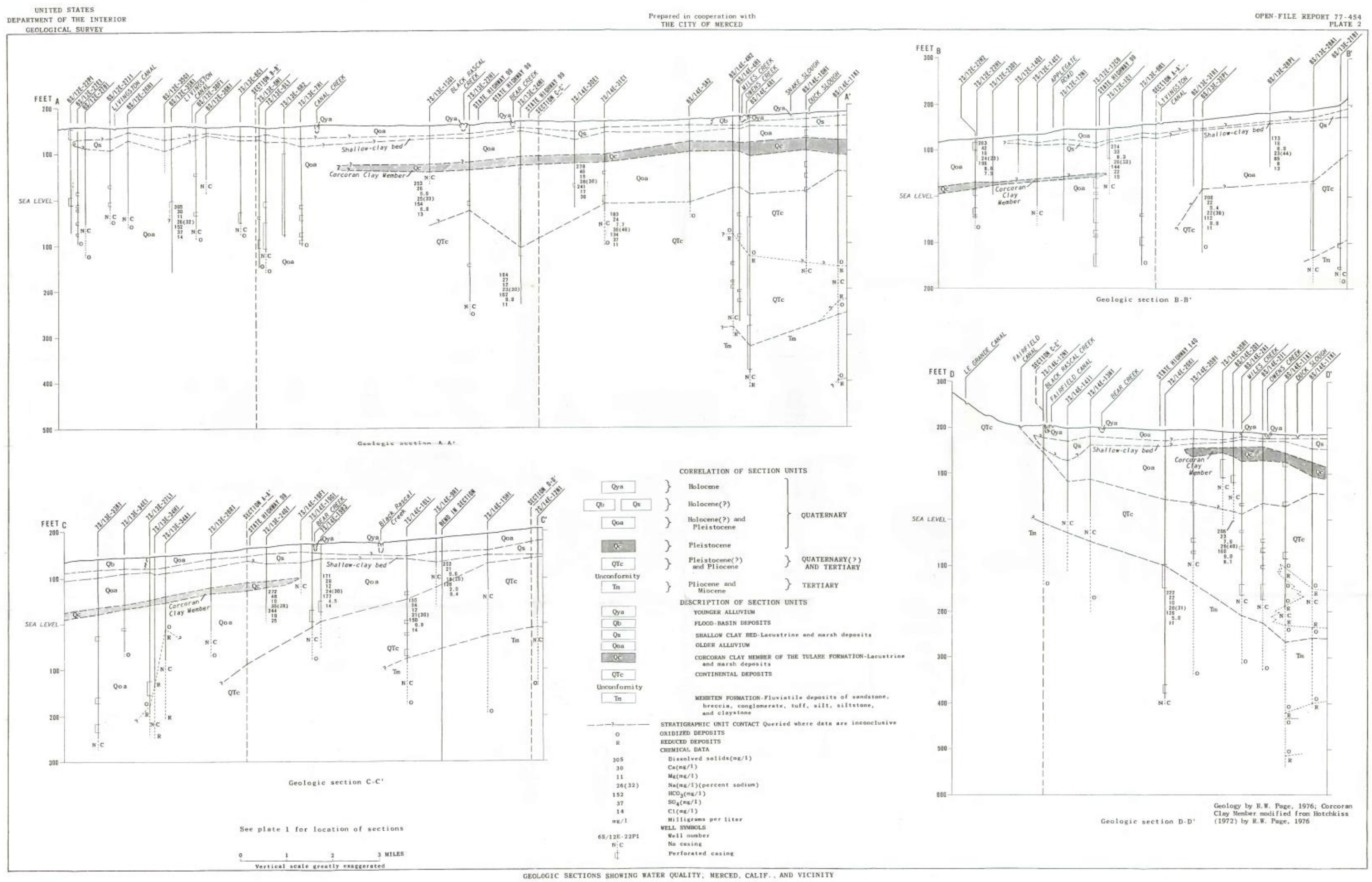


Figure 19: Referenced Cross Sections from Page 1977

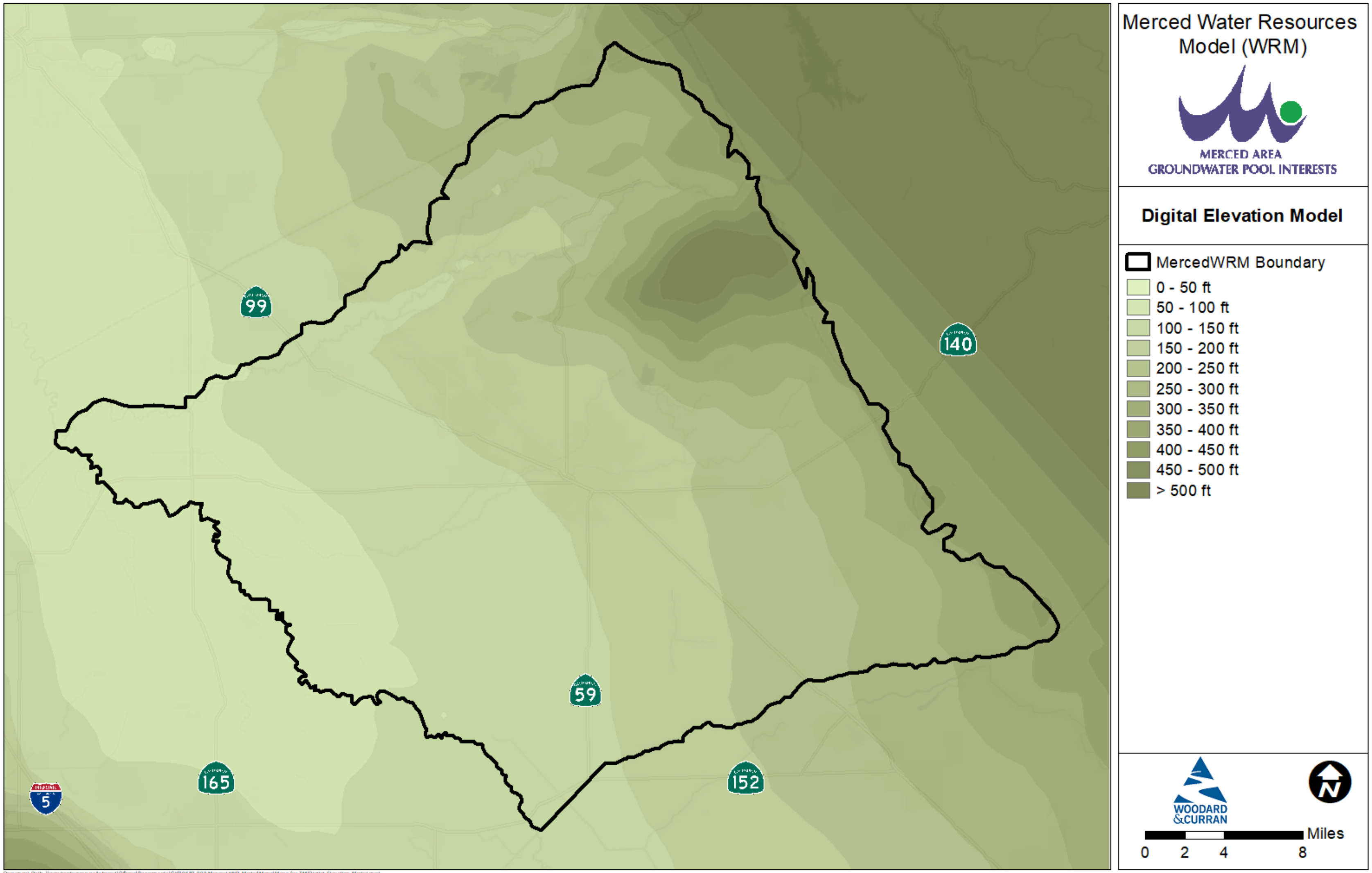


Figure 20: USGS Digital Elevation Model

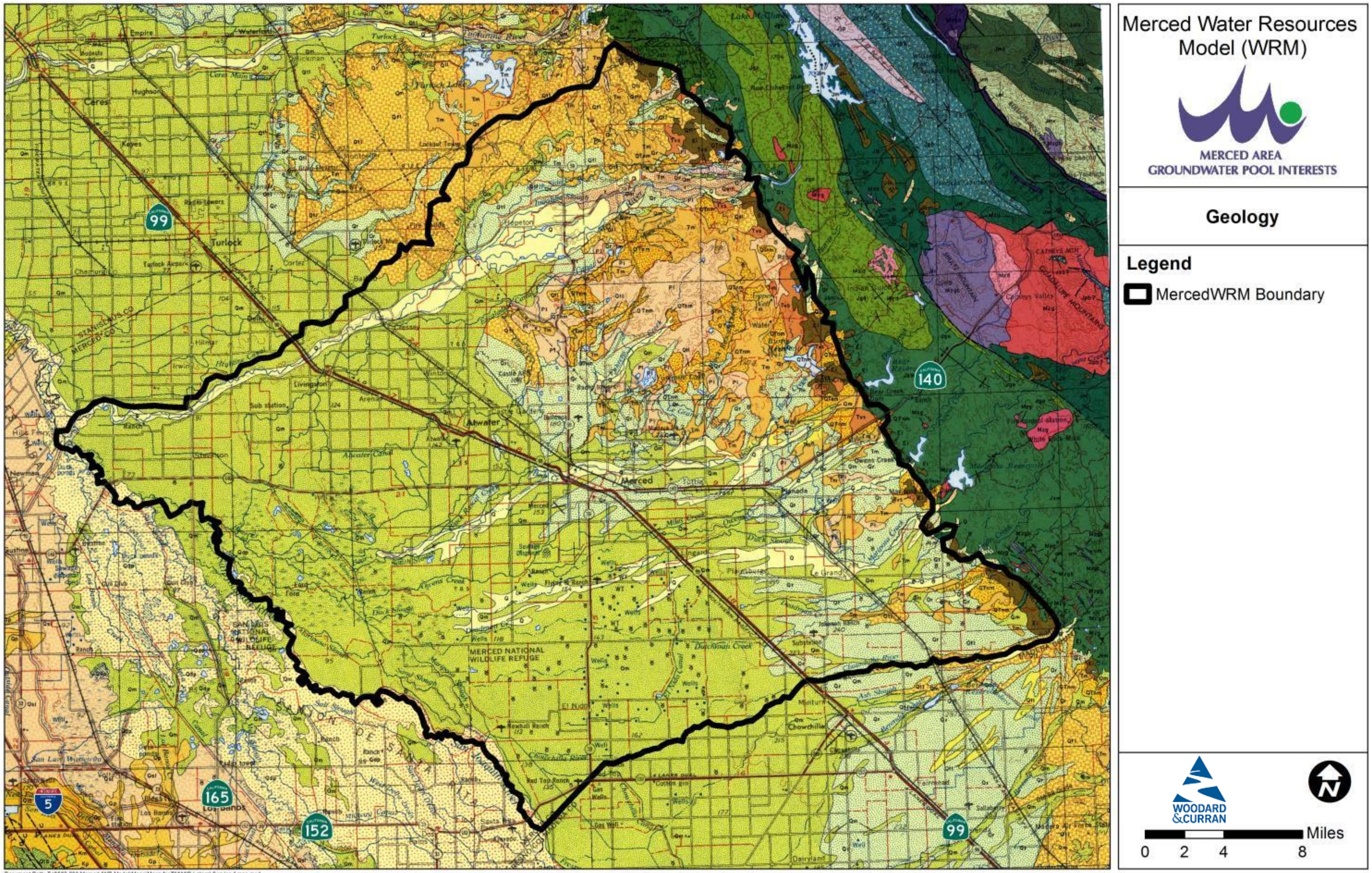


Figure 21: Surficial Geology - Wagner, Bortugno, and McJunkin (1991)

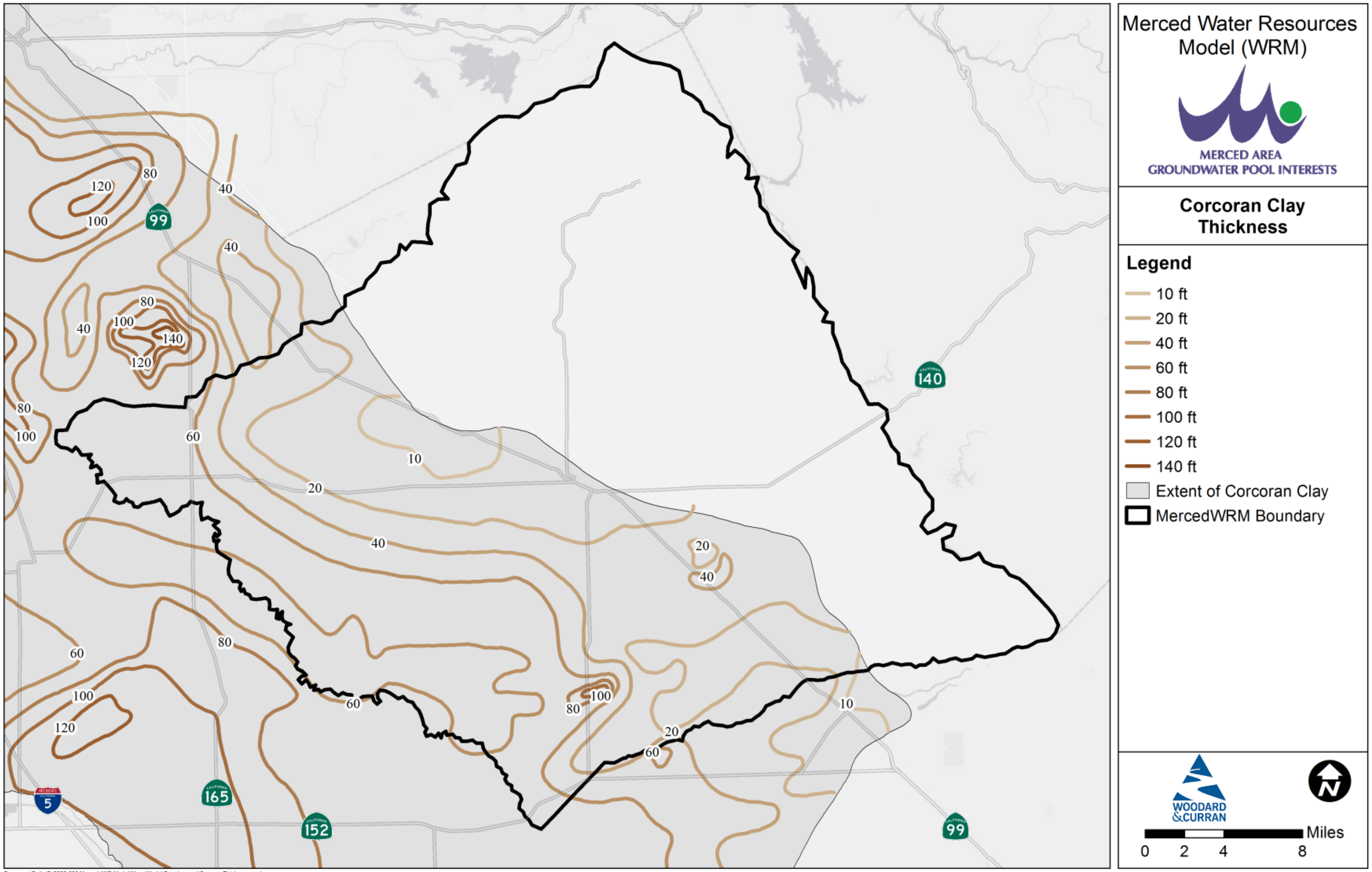


Figure 22: Corcoran Clay Thickness

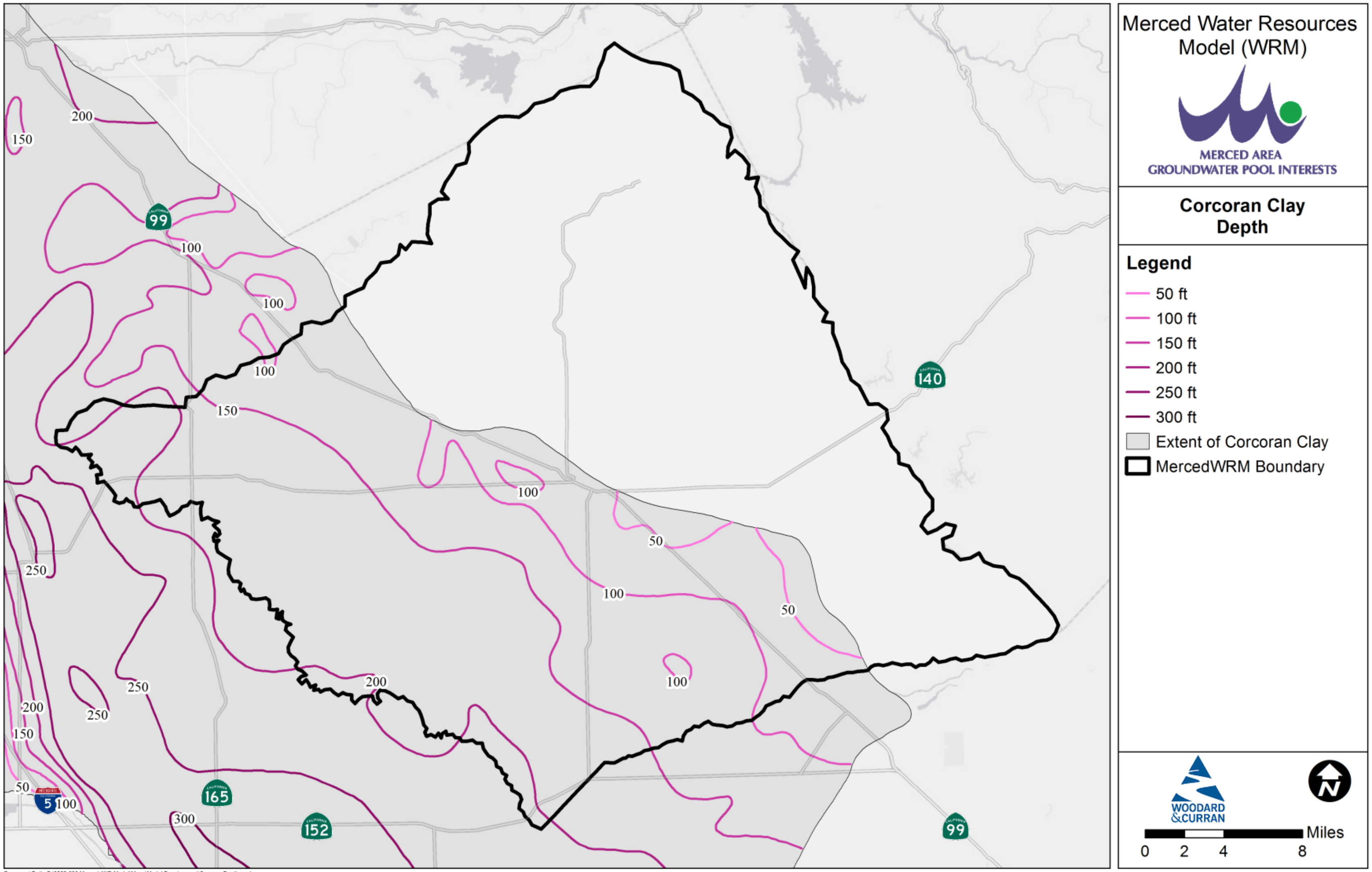


Figure 23: Corcoran Clay Depth

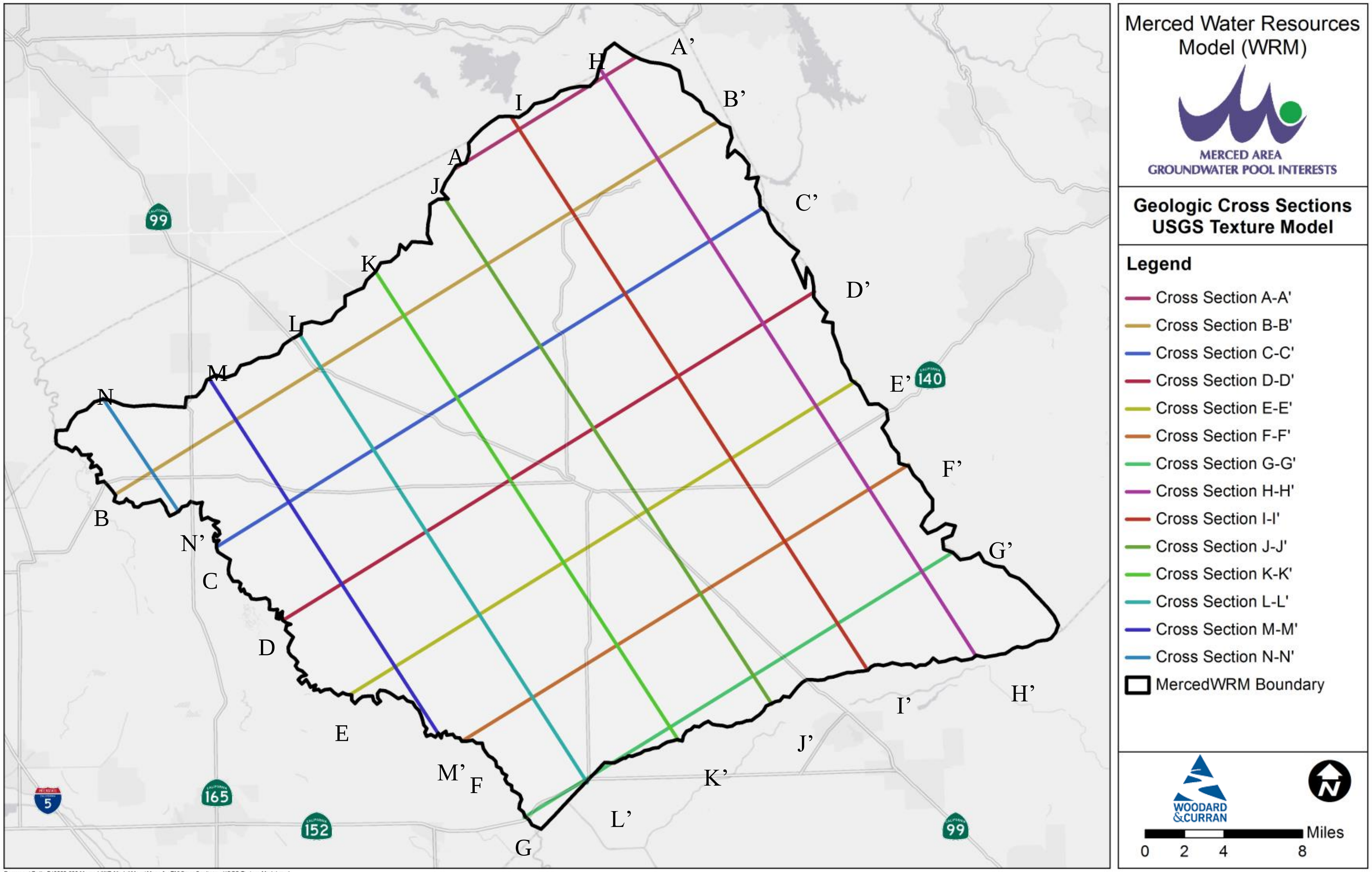


Figure 24: Location of Finalized Geologic Cross Sections

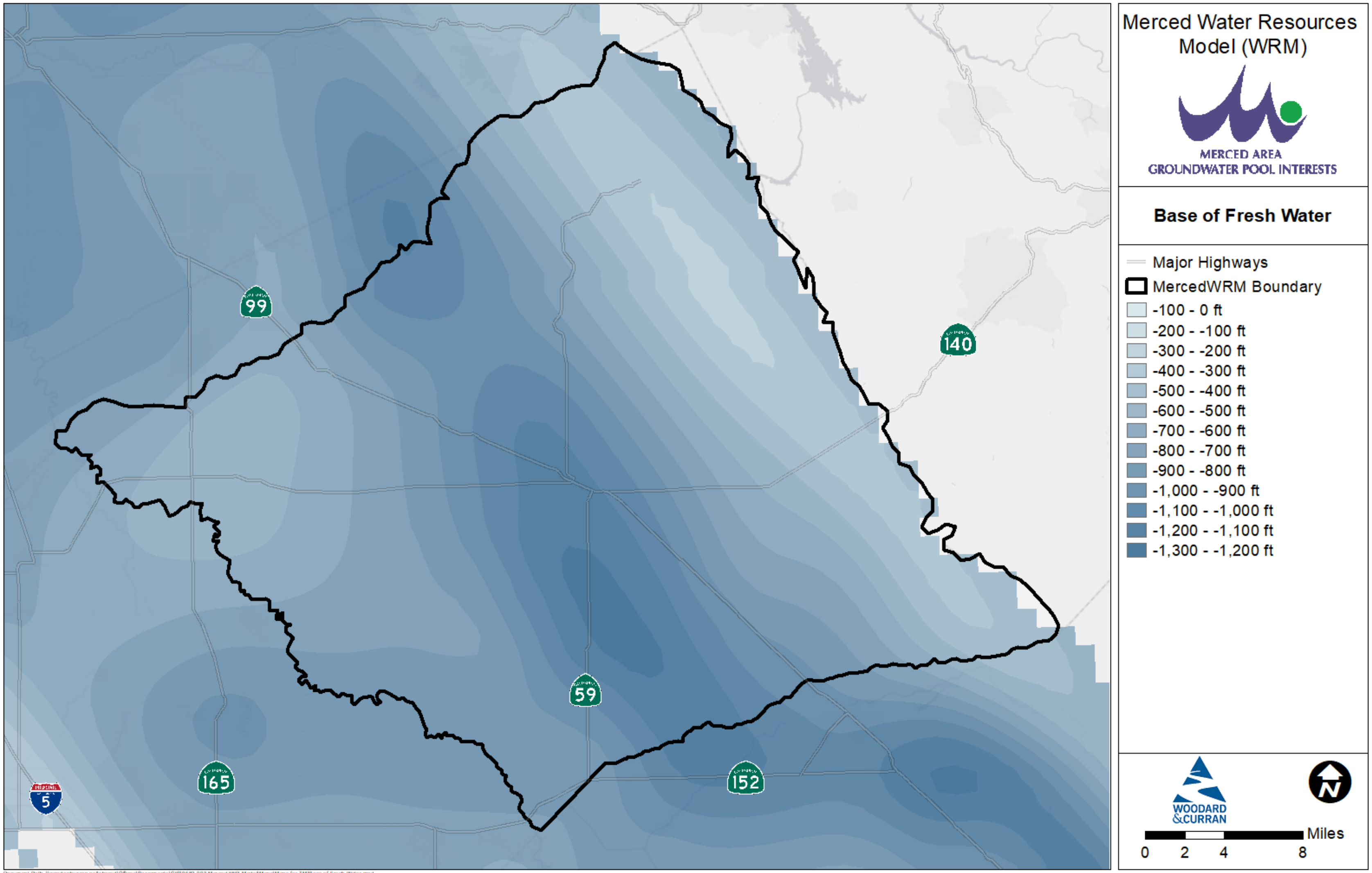


Figure 25: C2VSim Base of Fresh Water

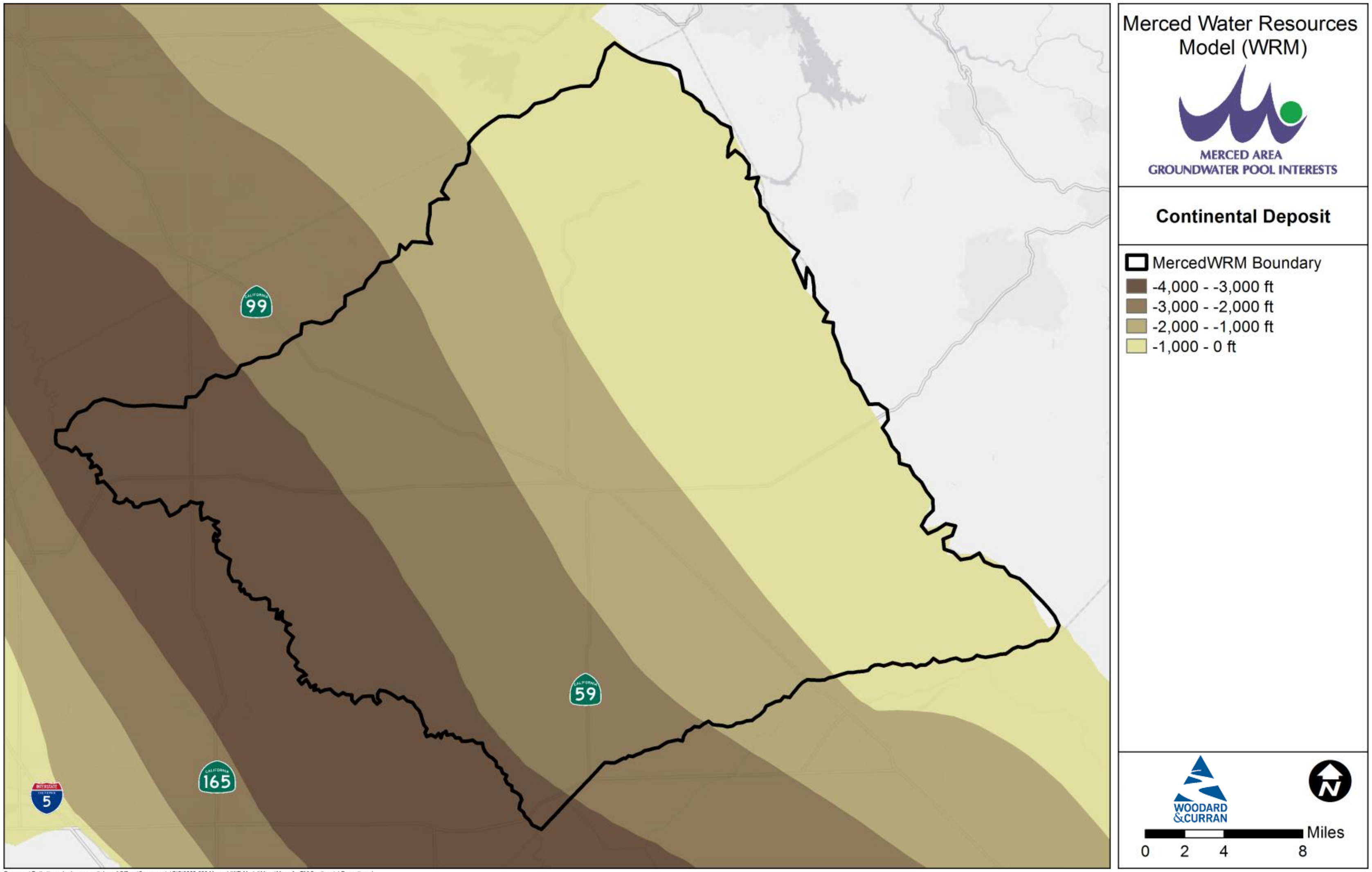


Figure 26: Continental Deposit

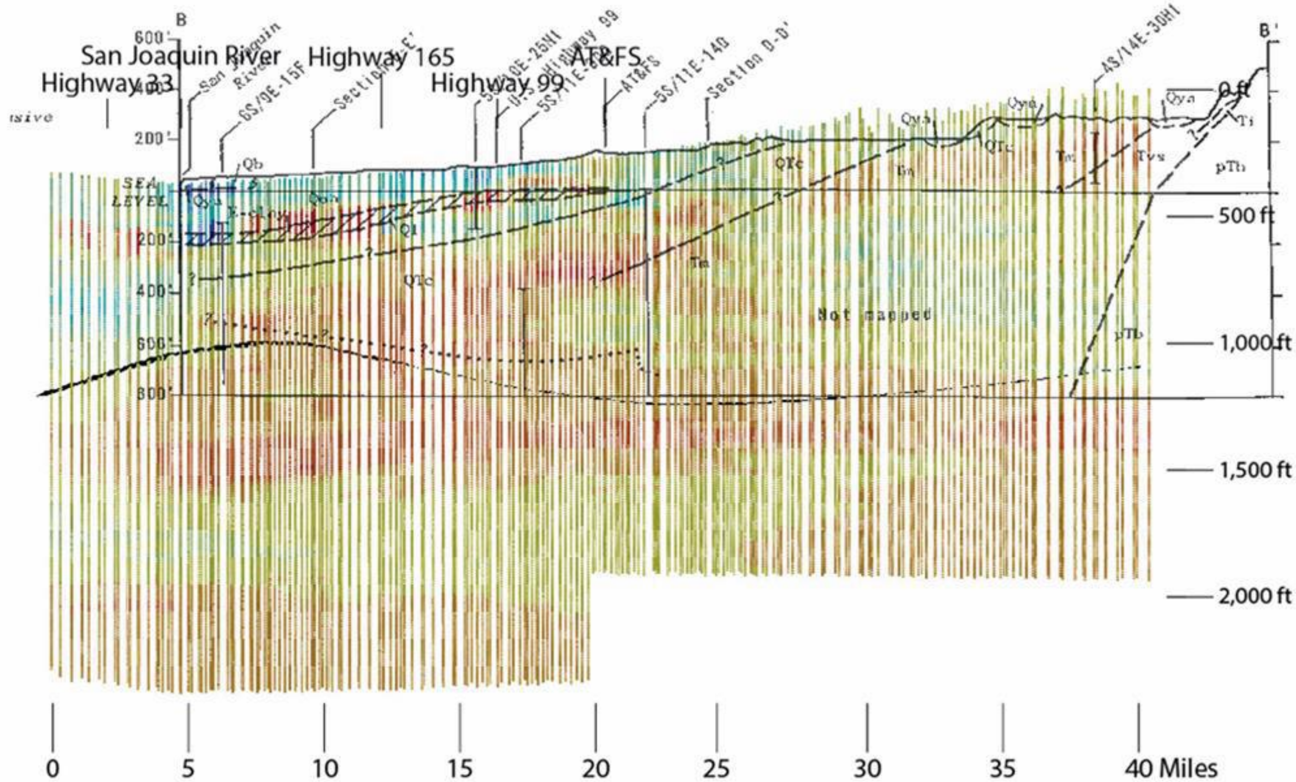


Figure 27: Page and Balding Cross Section B-B' Overlaying the USGS Texture Model Cross Section A-A'

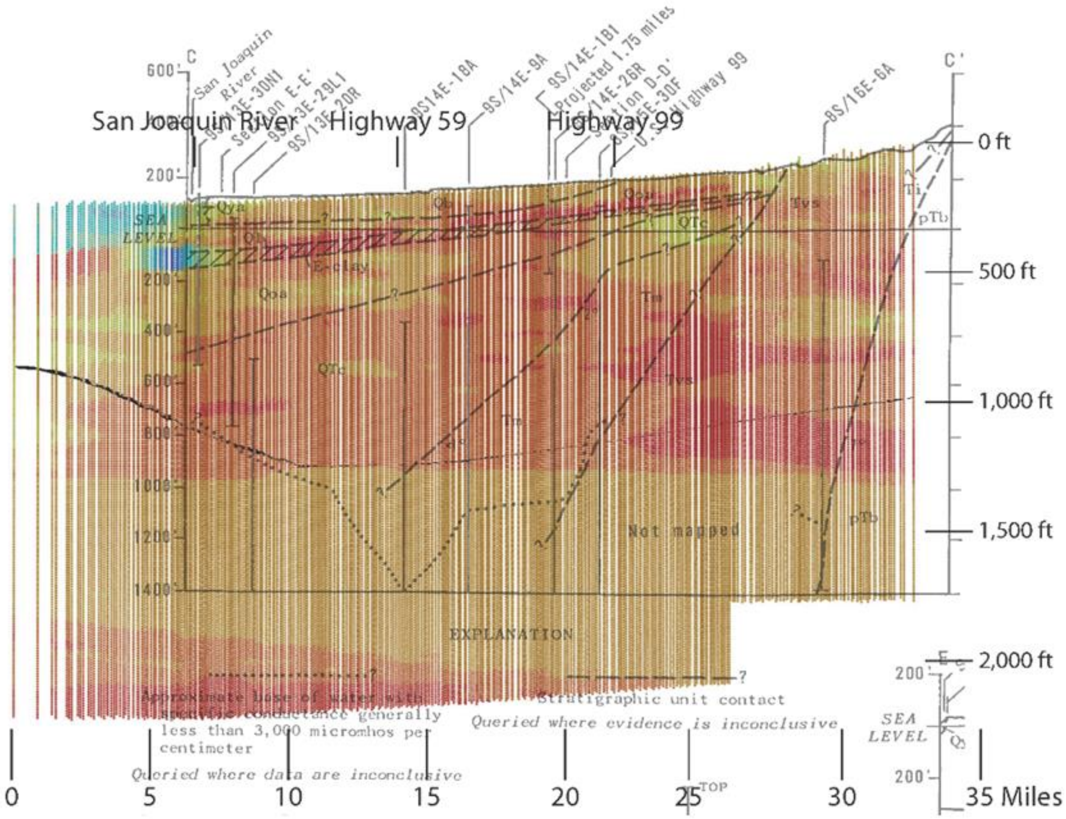


Figure 28: Page and Balding Cross Section C-C' Overlaying the USGS Texture Model Cross Section F-F'

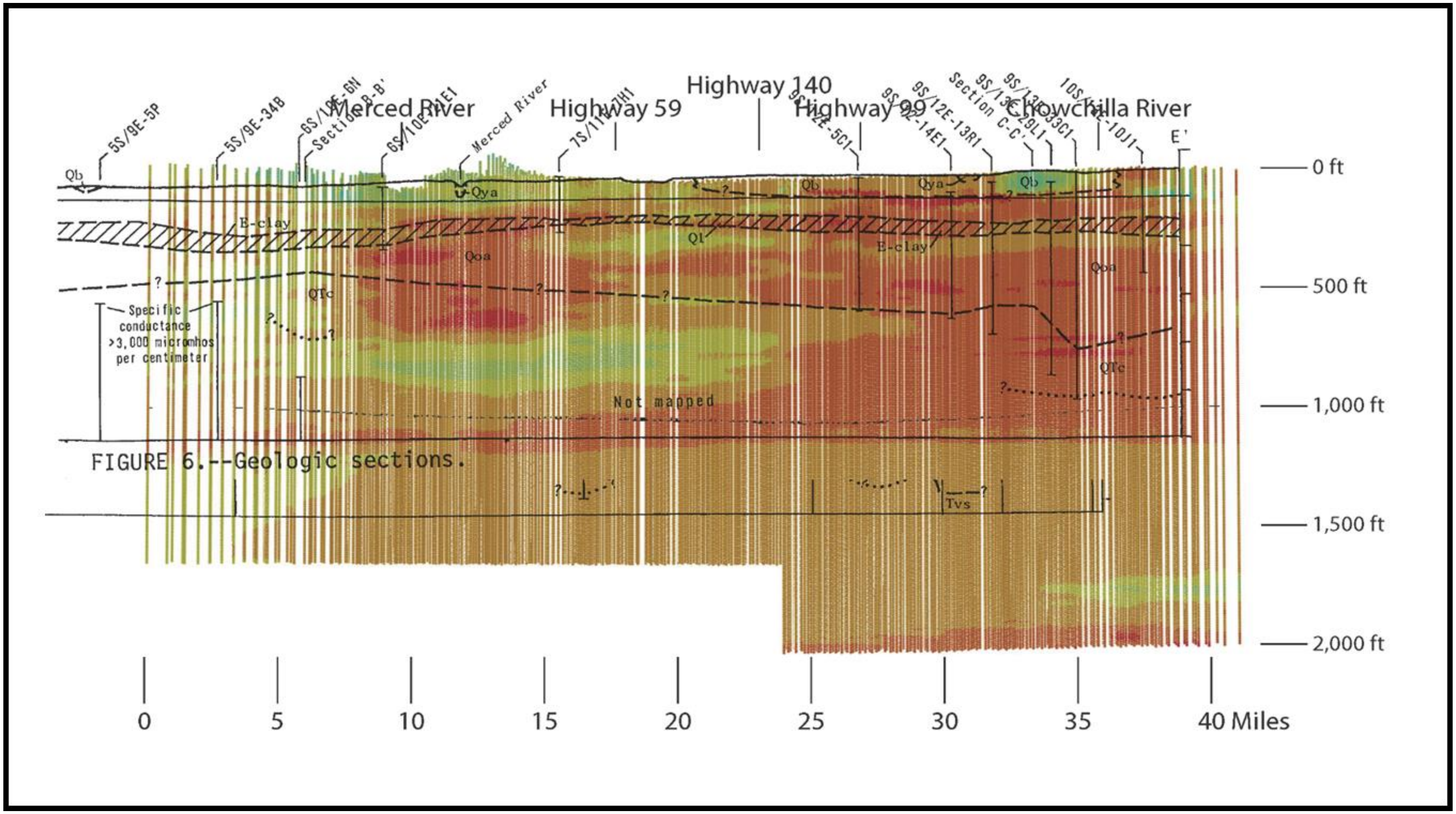


Figure 29: Page and Balding Cross Section D-D' Overlaying the USGS Texture Model Cross Section J-J'

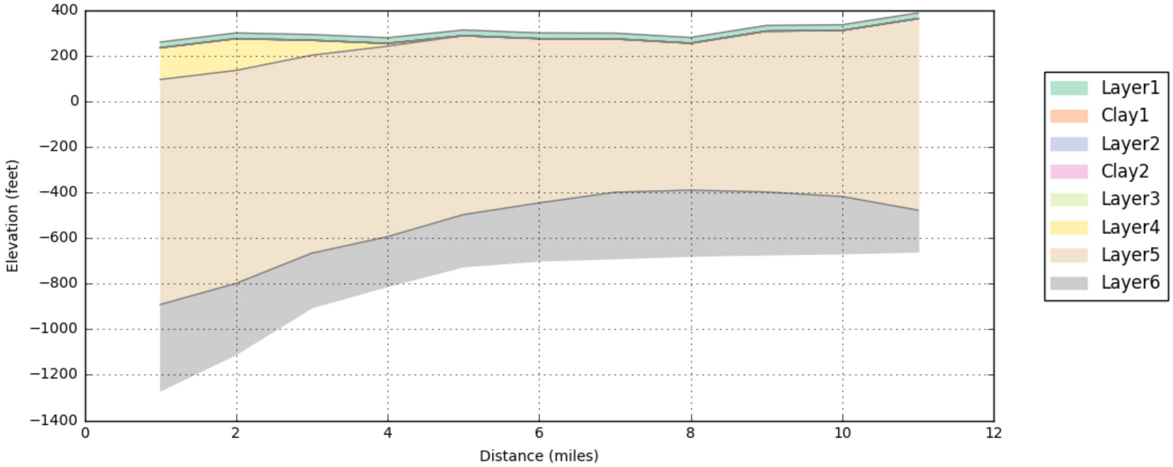


Figure 30: MercedWRM Geologic Cross Section A-A'

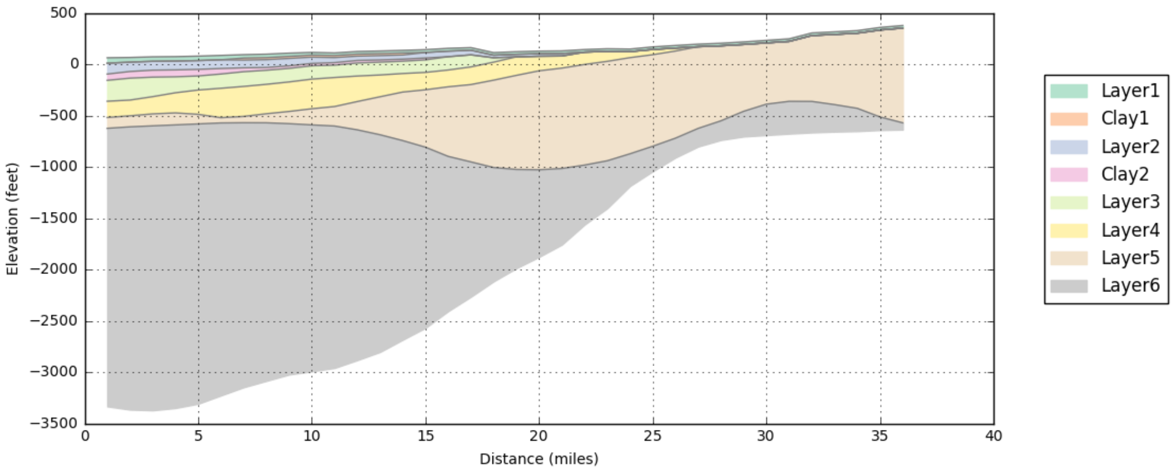


Figure 31: MercedWRM Geologic Cross Section B-B'

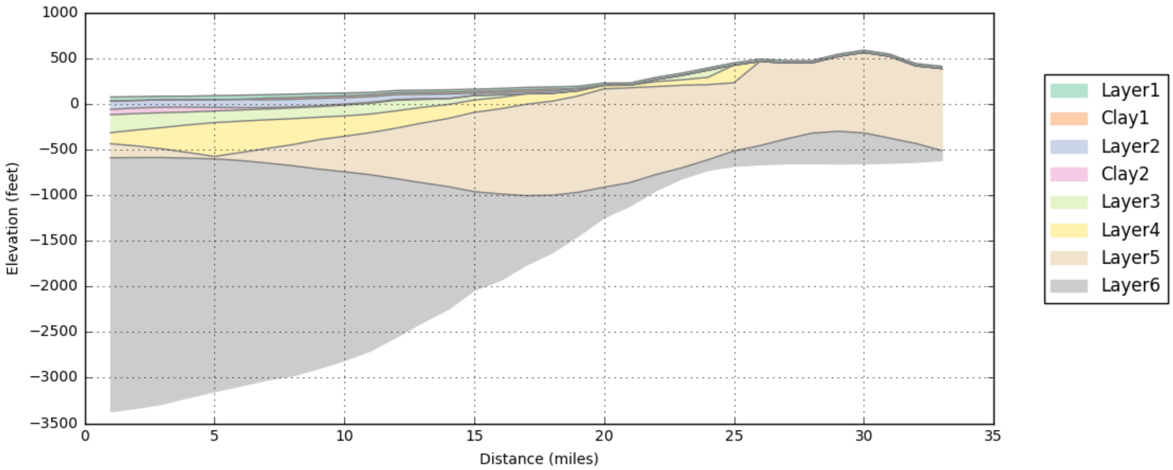


Figure 32: MercedWRM Geologic Cross Section C-C'

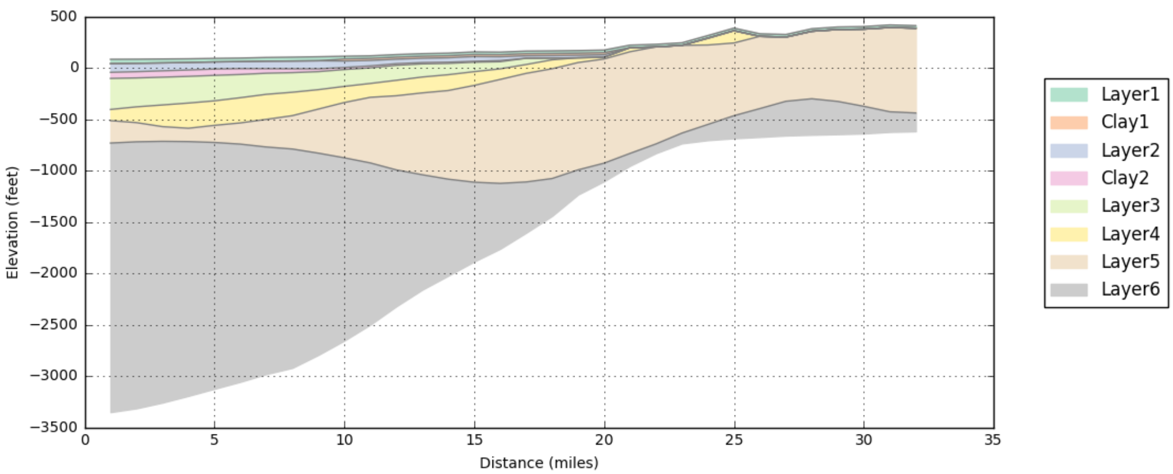


Figure 33: MercedWRM Geologic Cross Section D-D'

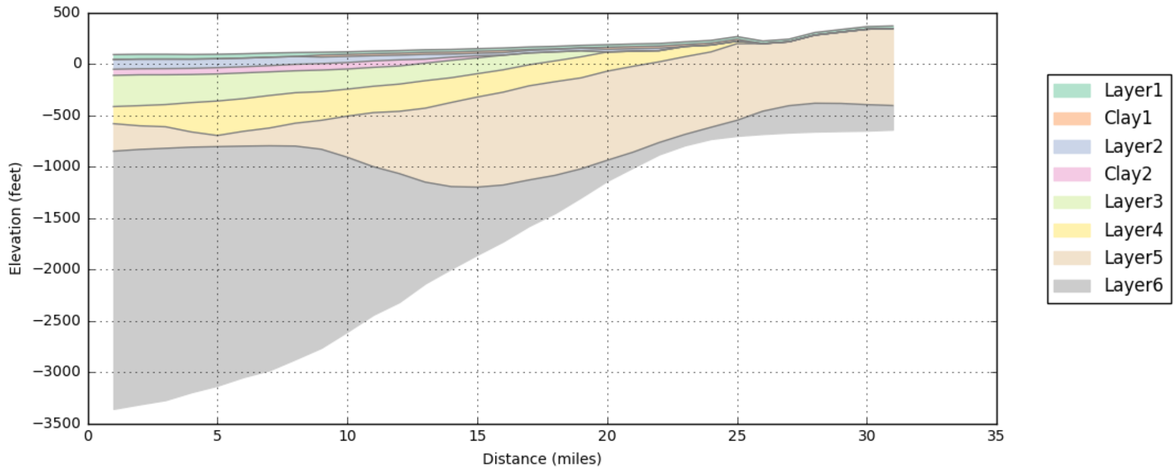


Figure 34: MercedWRM Geologic Cross Section E-E'

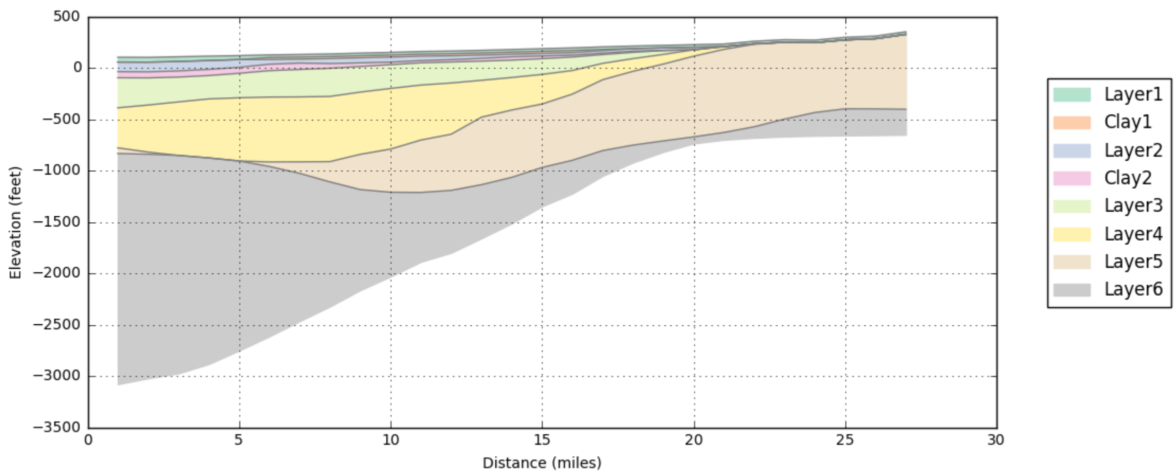


Figure 35: MercedWRM Geologic Cross Section F-F'

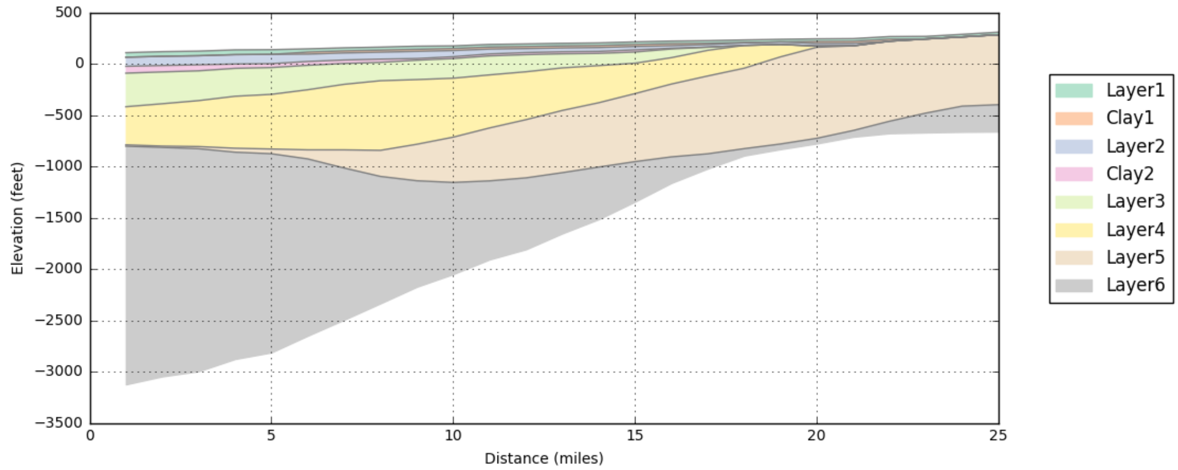


Figure 36: MercedWRM Geologic Cross Section G-G'

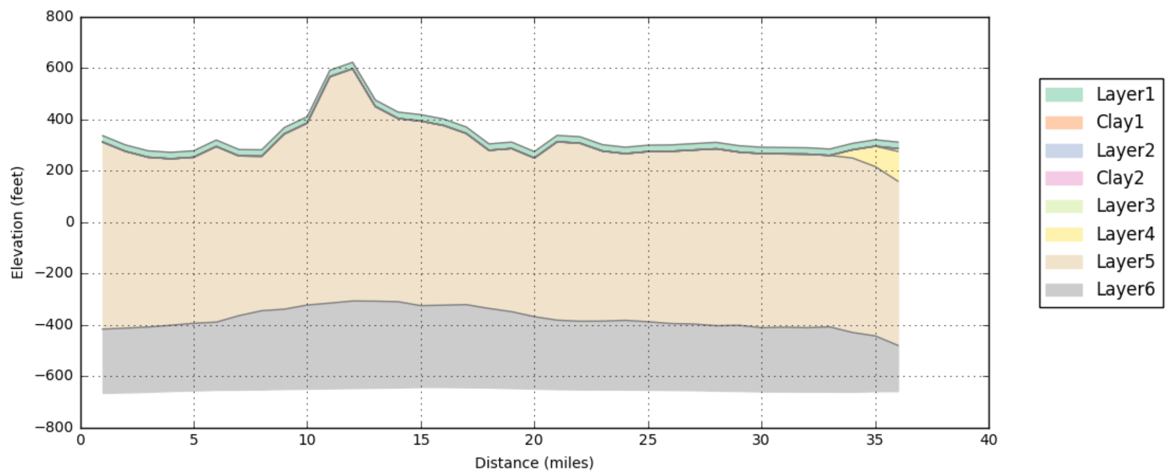


Figure 37: MercedWRM Geologic Cross Section H-H'

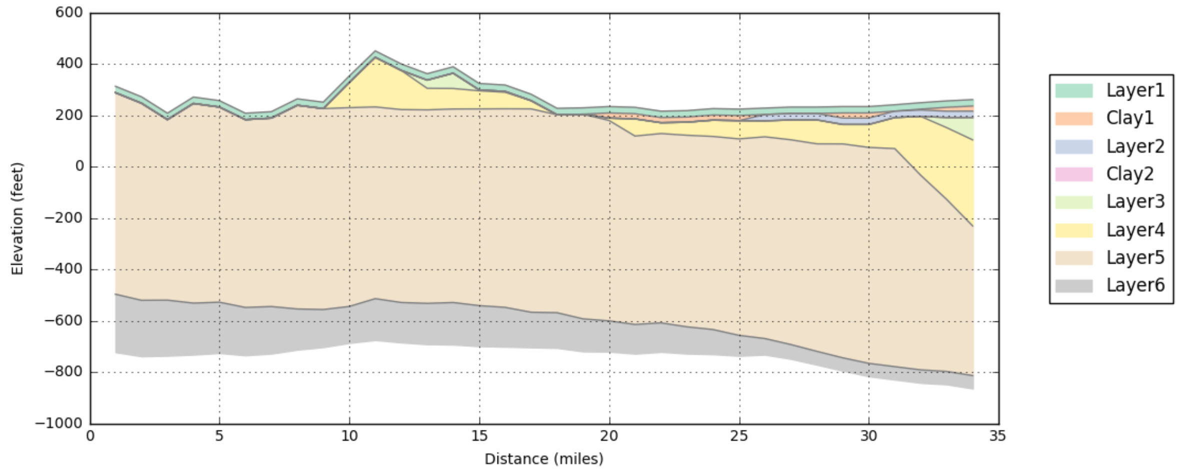


Figure 38: MercedWRM Geologic Cross Section I-I’

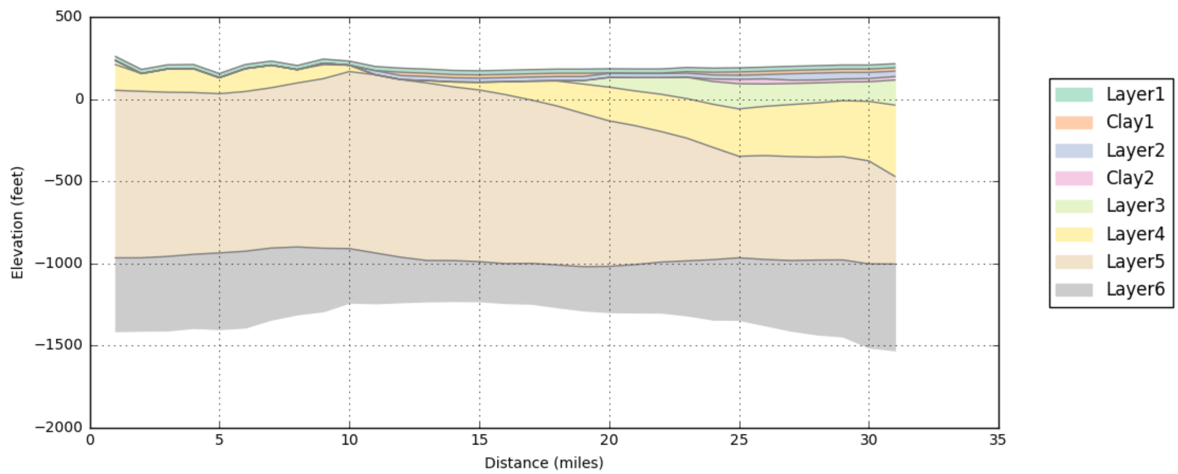


Figure 39: MercedWRM Geologic Cross Section J-J’

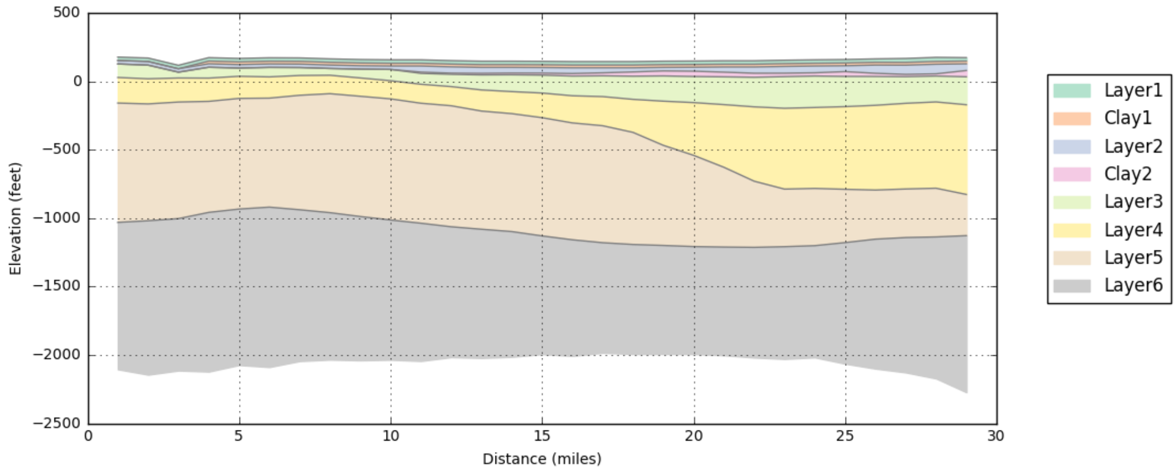


Figure 40: MercedWRM Geologic Cross Section K-K'

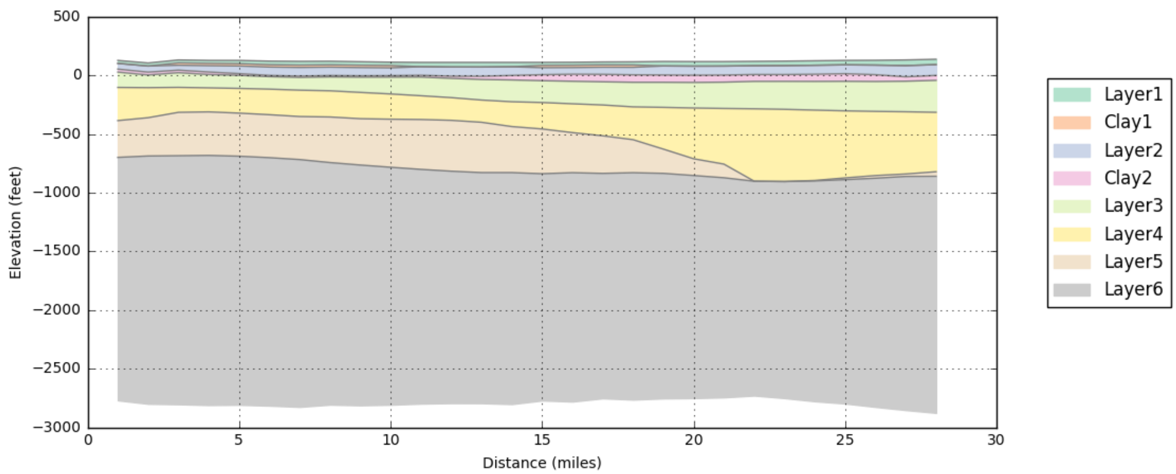


Figure 41: MercedWRM Geologic Cross Section L-L'

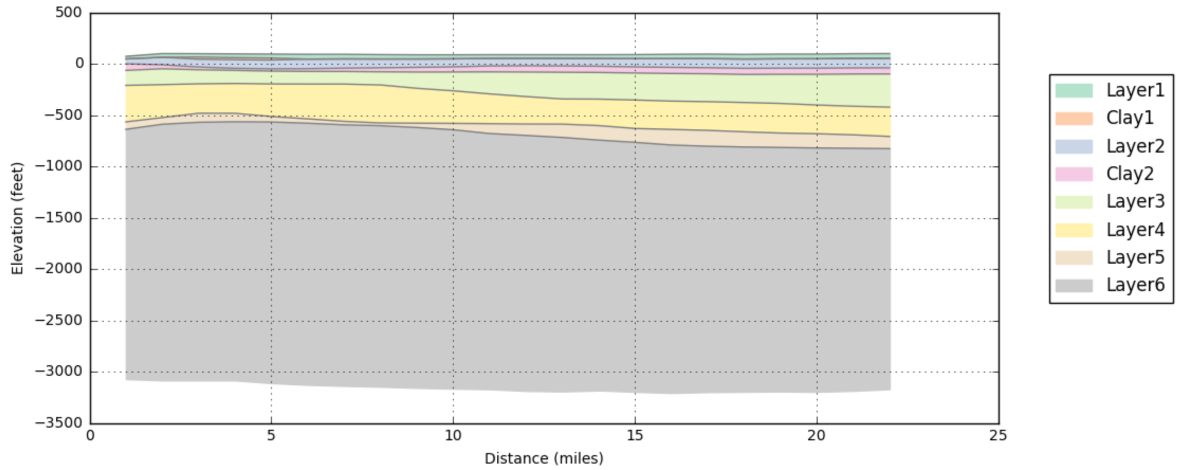


Figure 42: MercedWRM Geologic Cross Section M-M'

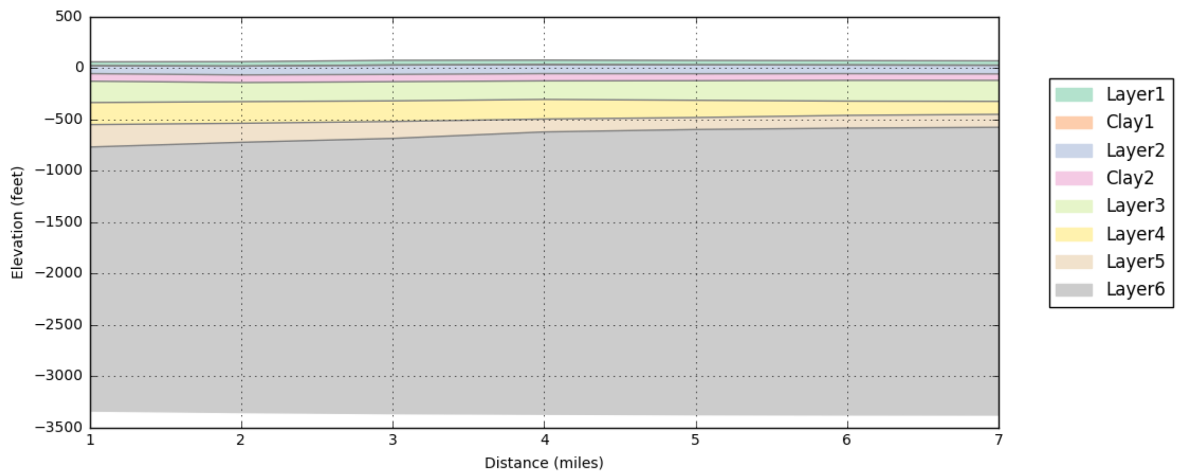


Figure 43: MercedWRM Geologic Cross Section N-N

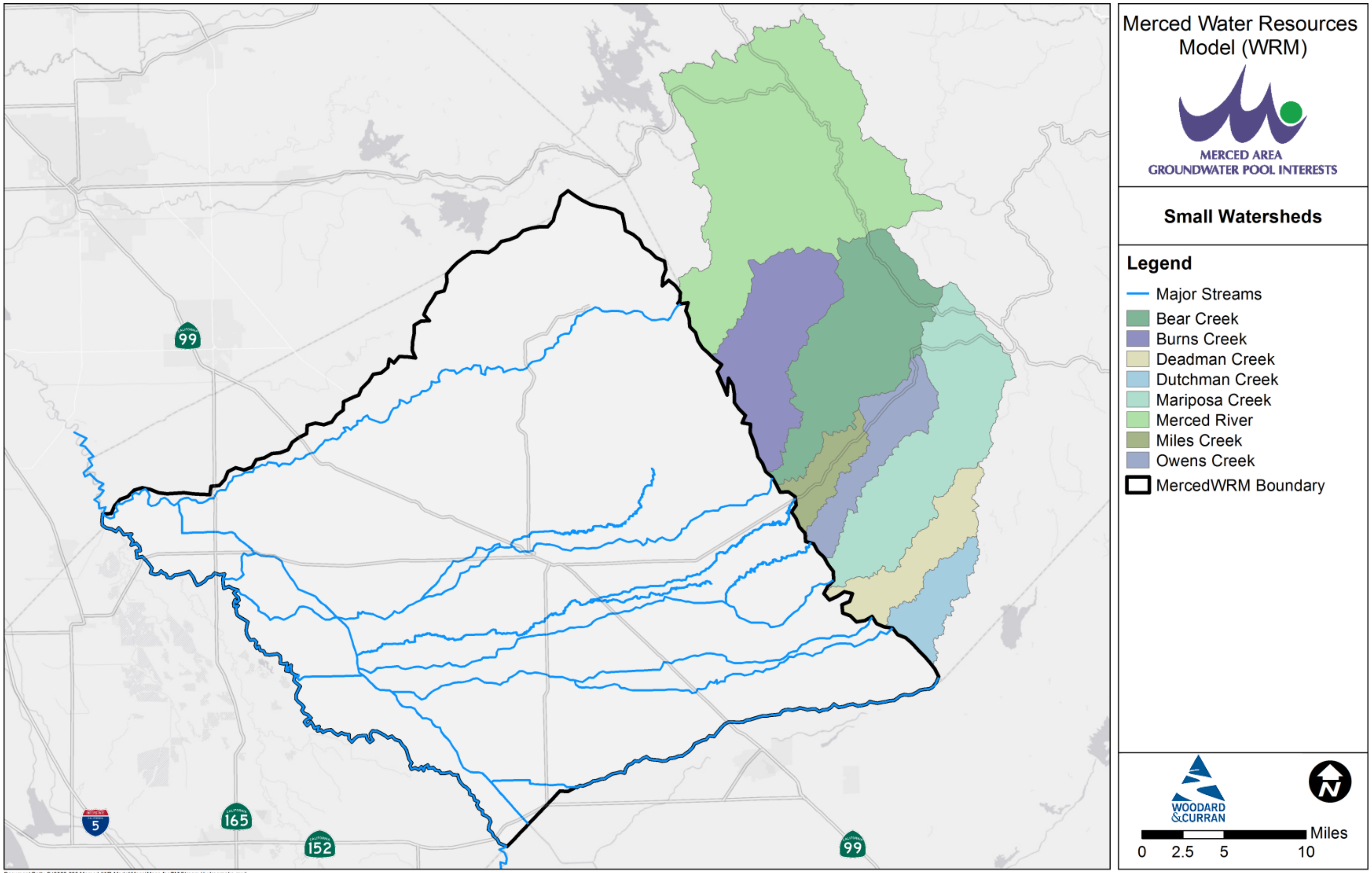


Figure 44: MercedWRM Small Watersheds

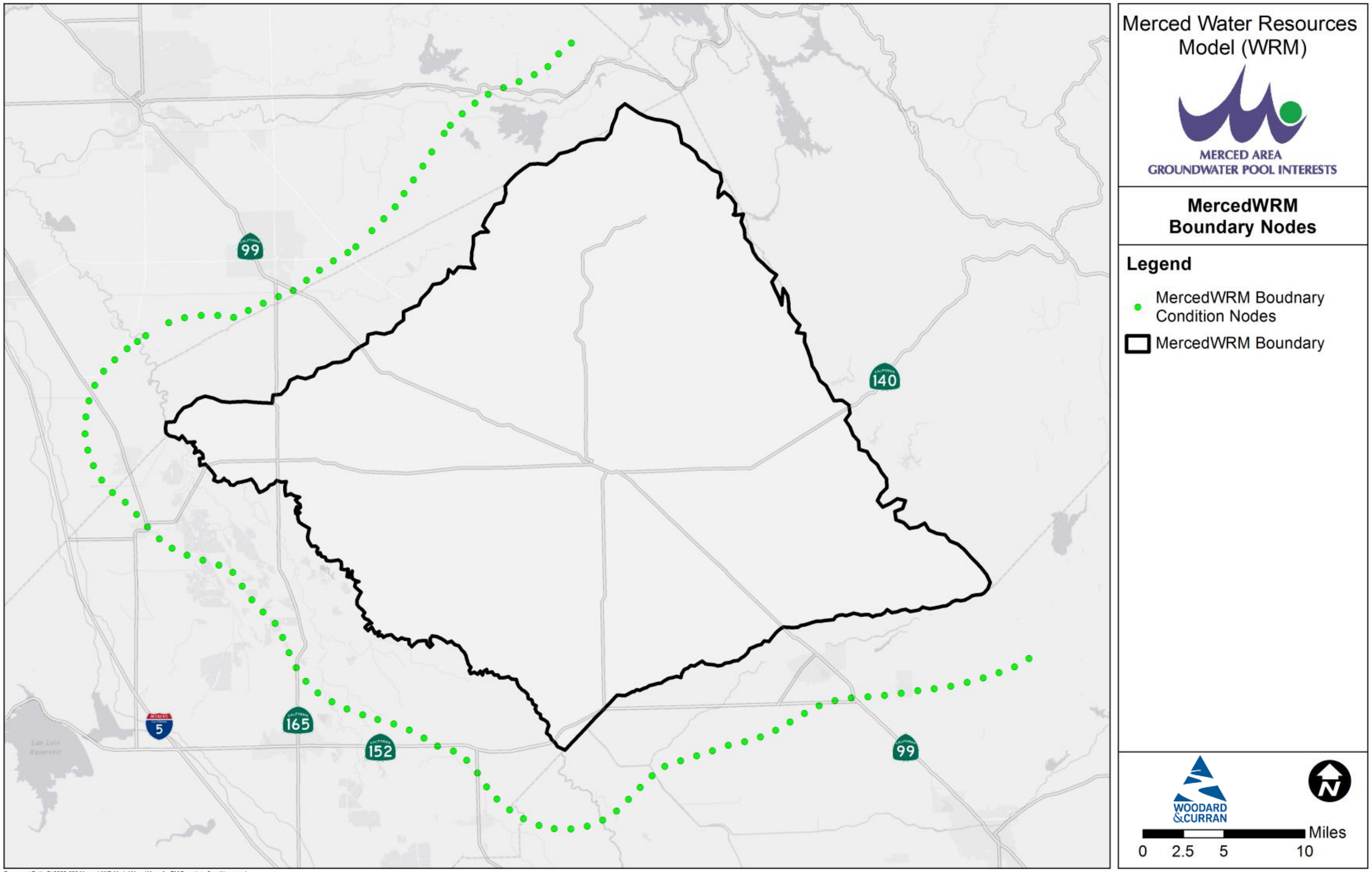


Figure 45: MercedWRM Boundary Nodes

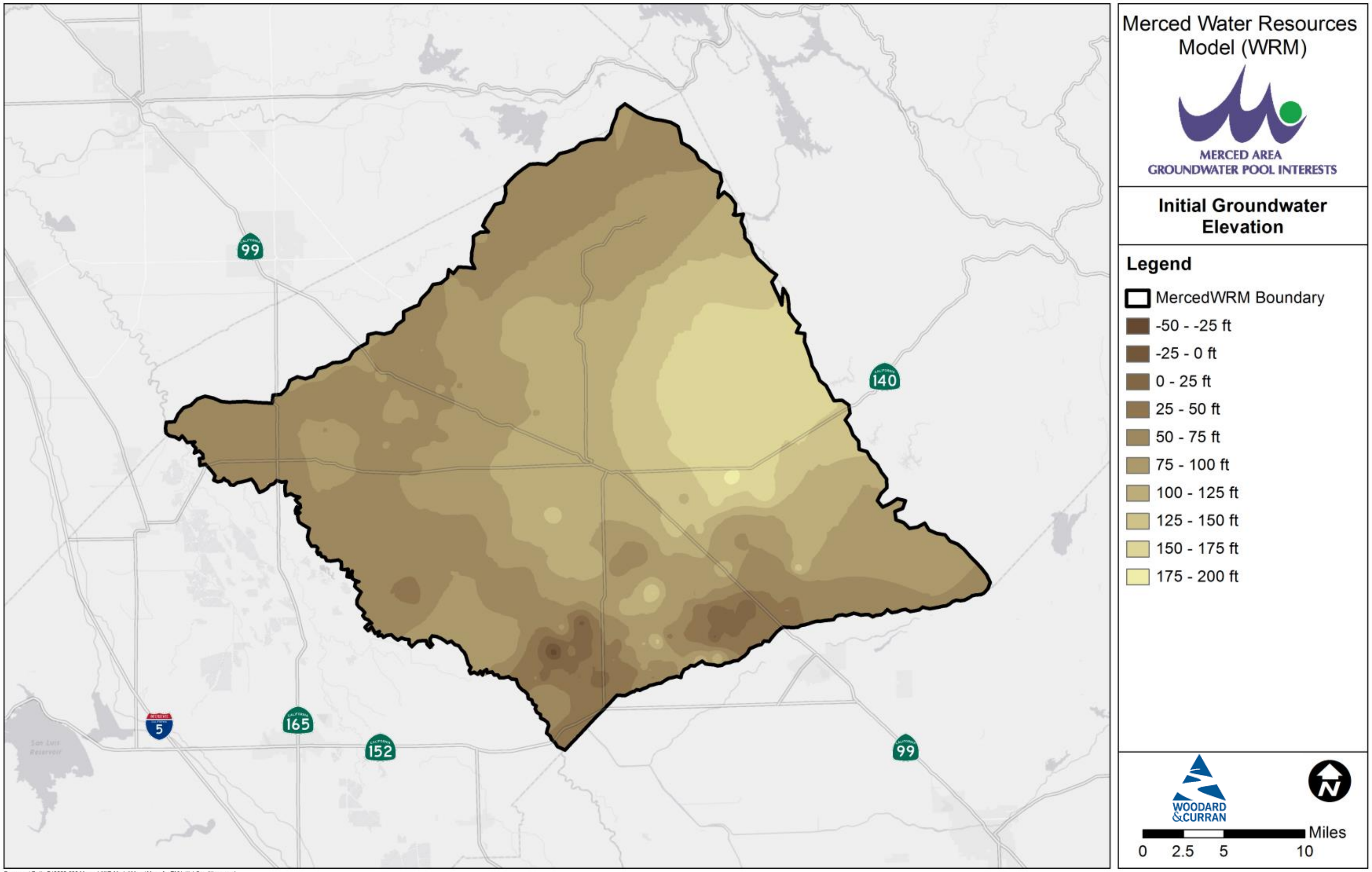


Figure 46: MercedWRM Initial Condition Groundwater Heads

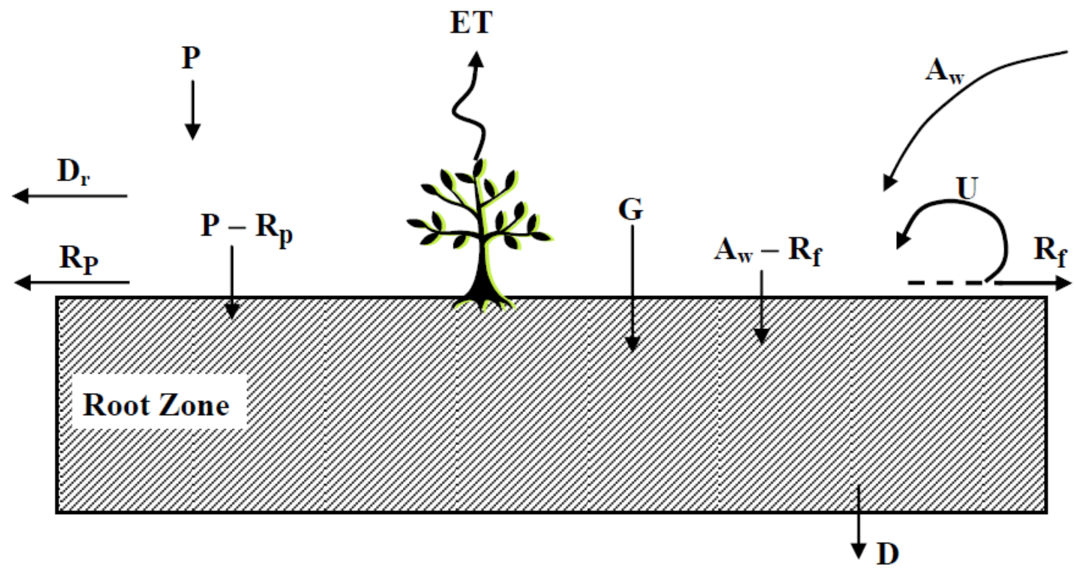


Figure 47: Schematic representation of root zone flow processes simulated by the IDC

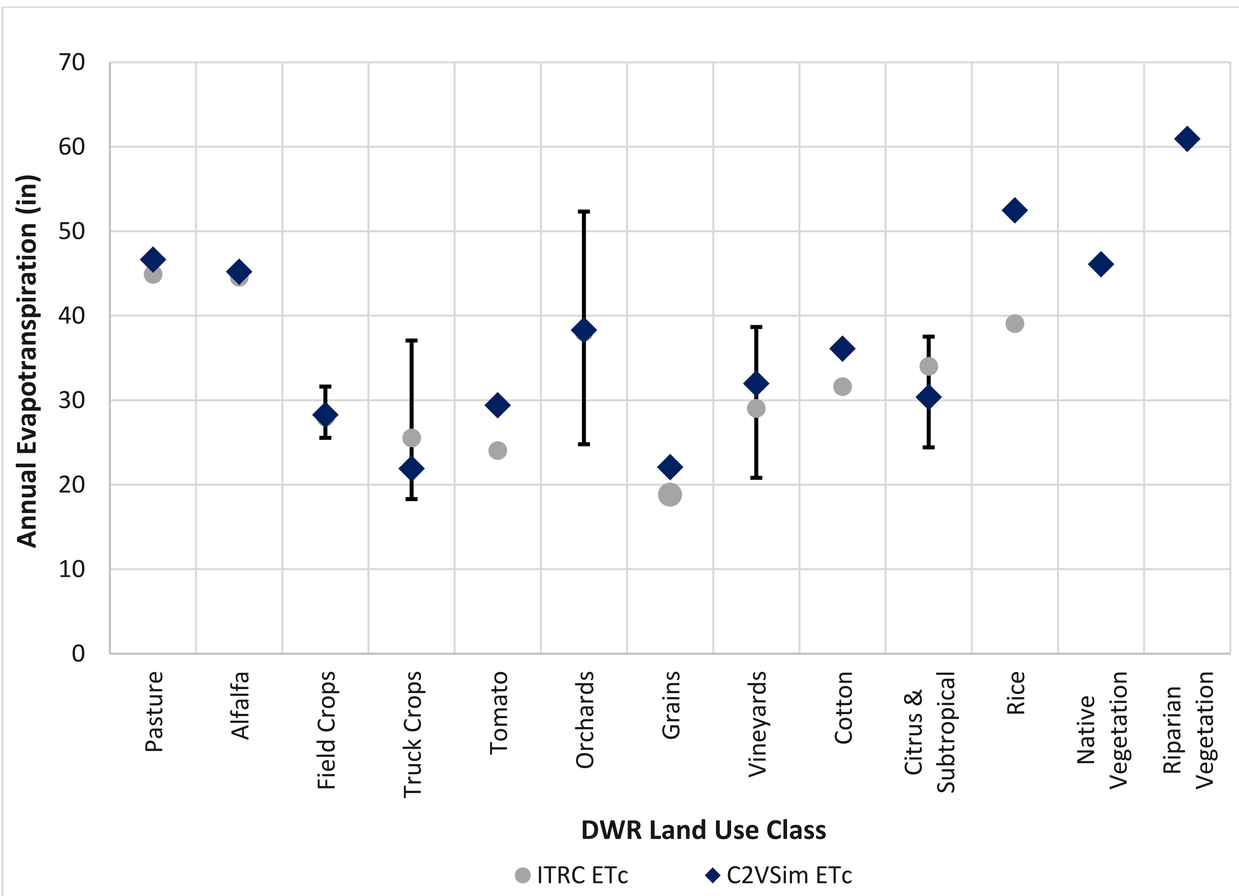


Figure 48: IWFM Demand Calculator Reference Potential Evapotranspiration

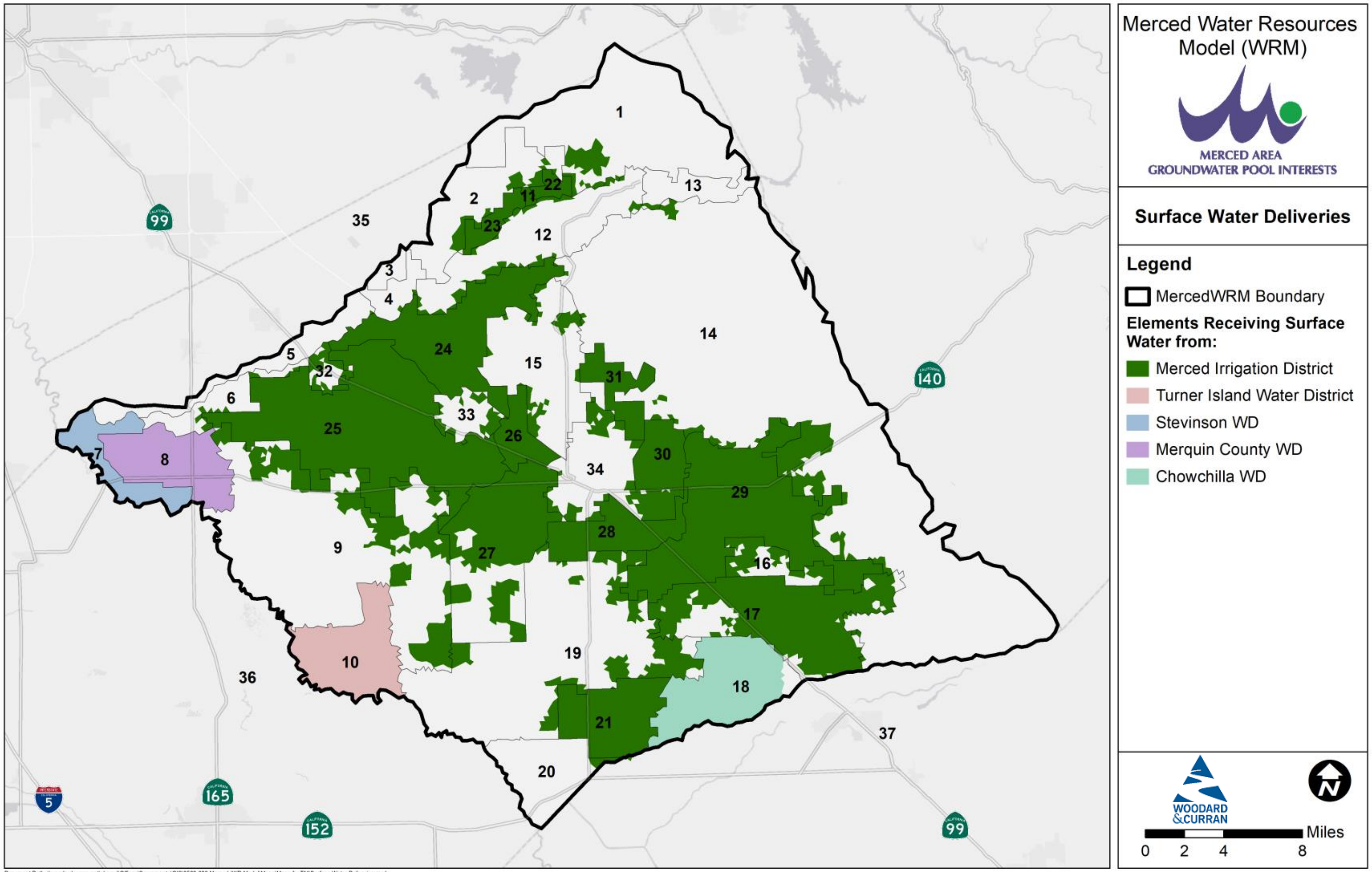


Figure 49: MercedWRM Surface Water Delivery Zones

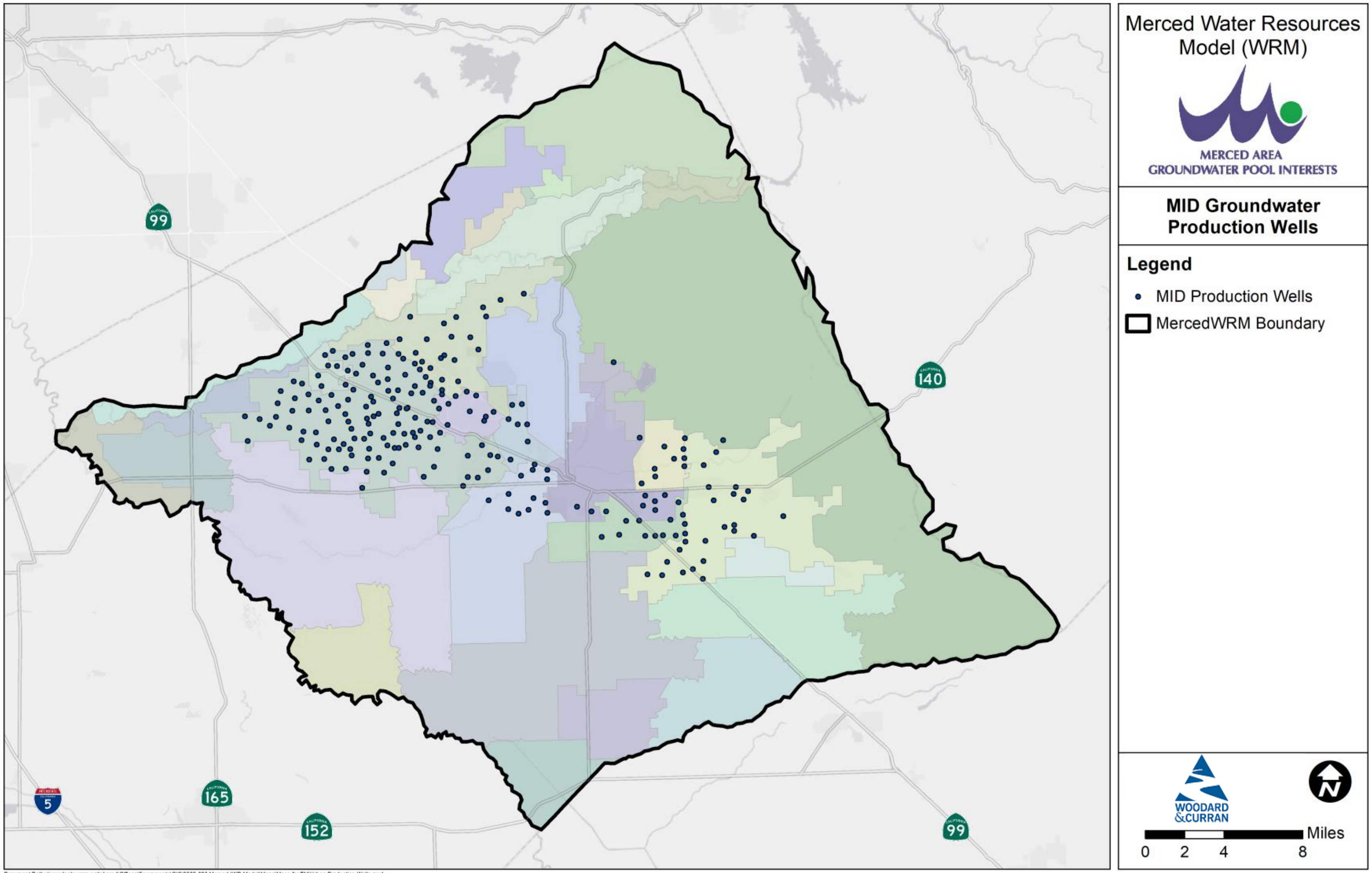


Figure 50: MID Groundwater Production Wells

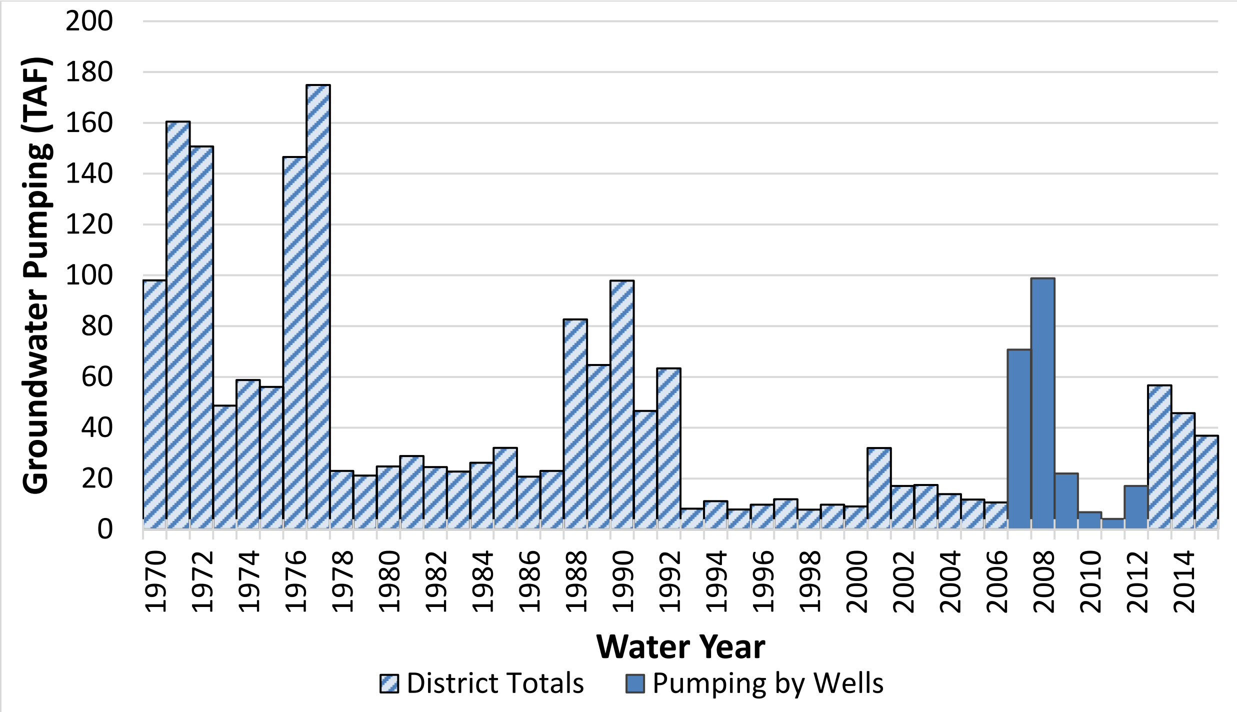


Figure 51: Merced Irrigation District Annual Groundwater Pumping

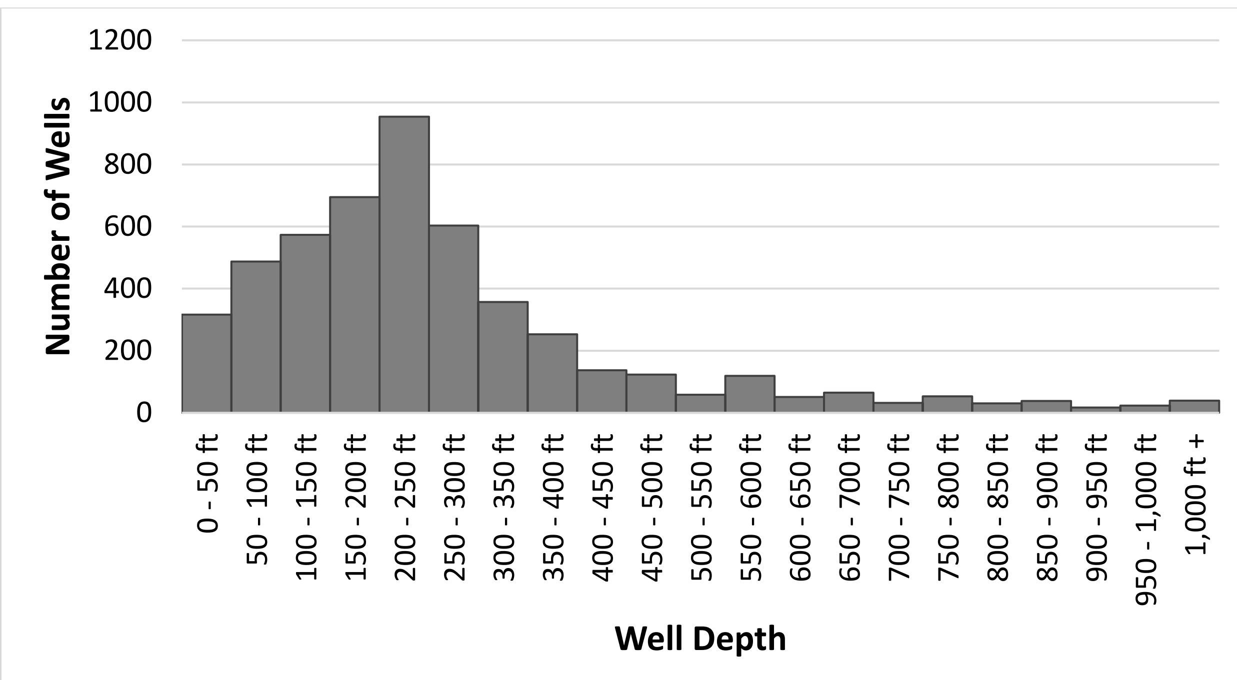


Figure 52: Merced County Database Groundwater Well Depth

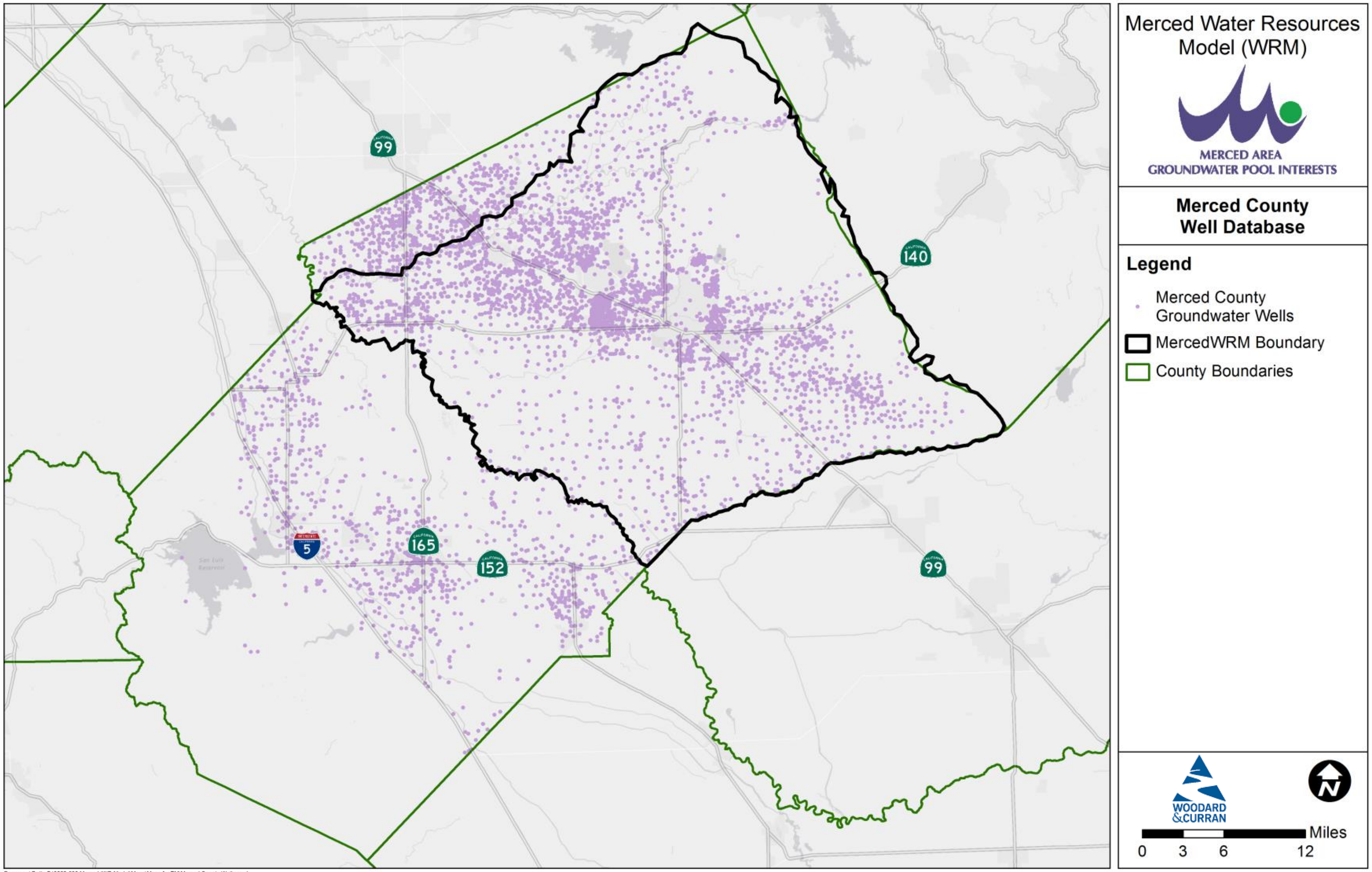


Figure 53: Merced County Groundwater Well Database

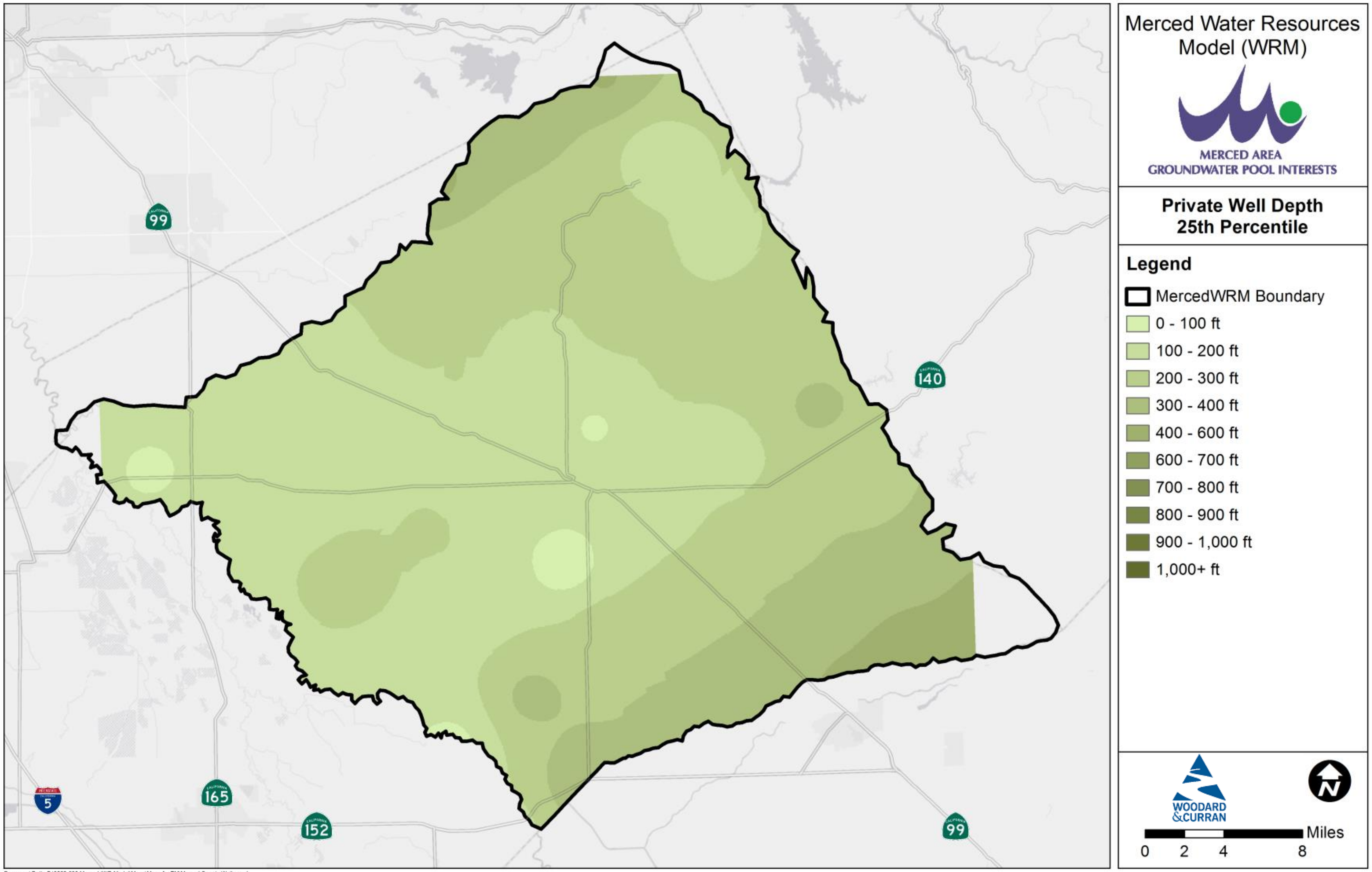


Figure 54: Private Well Depths - 25th Percentile

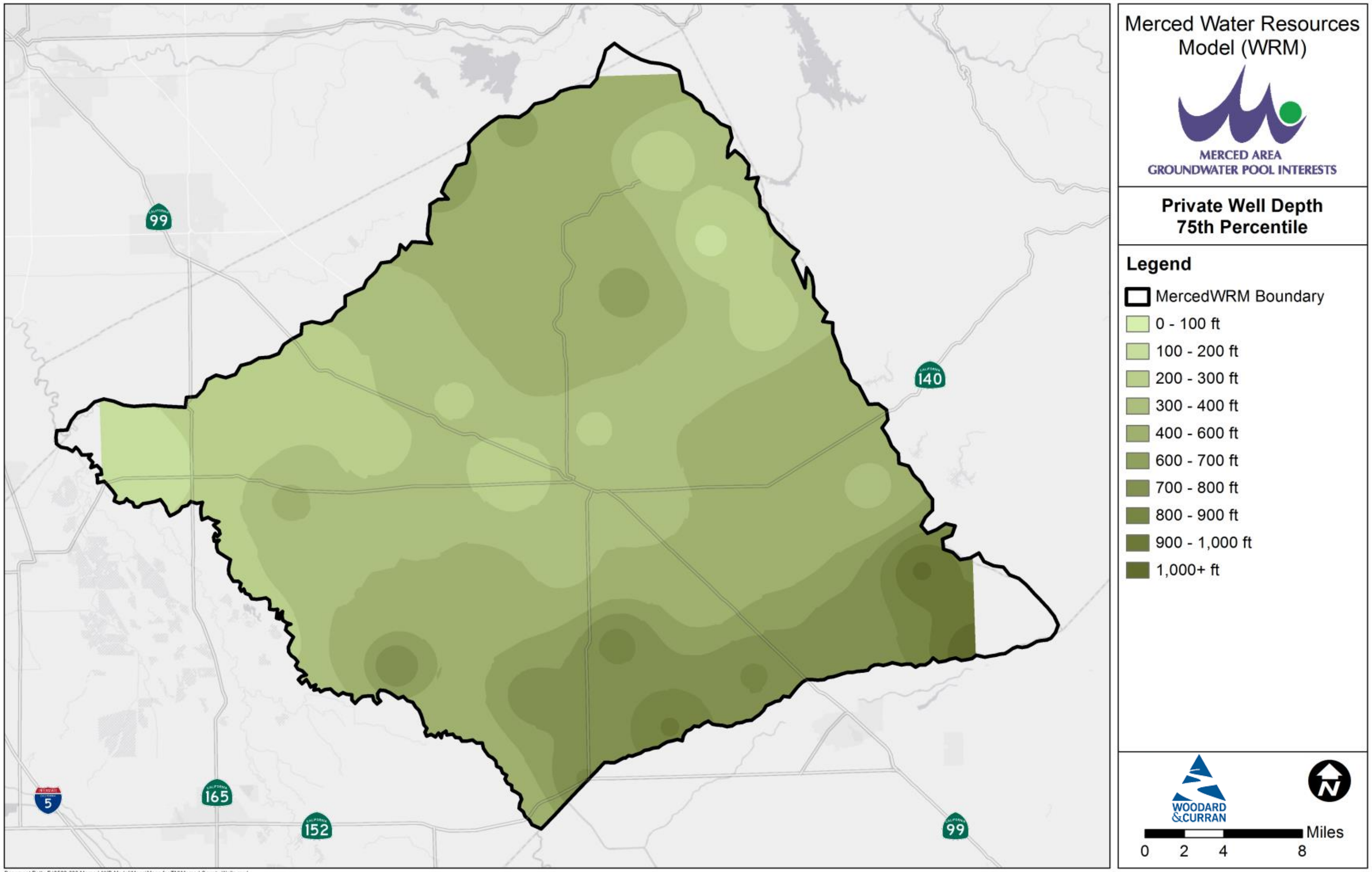


Figure 55: Private Well Depths - 75th Percentile

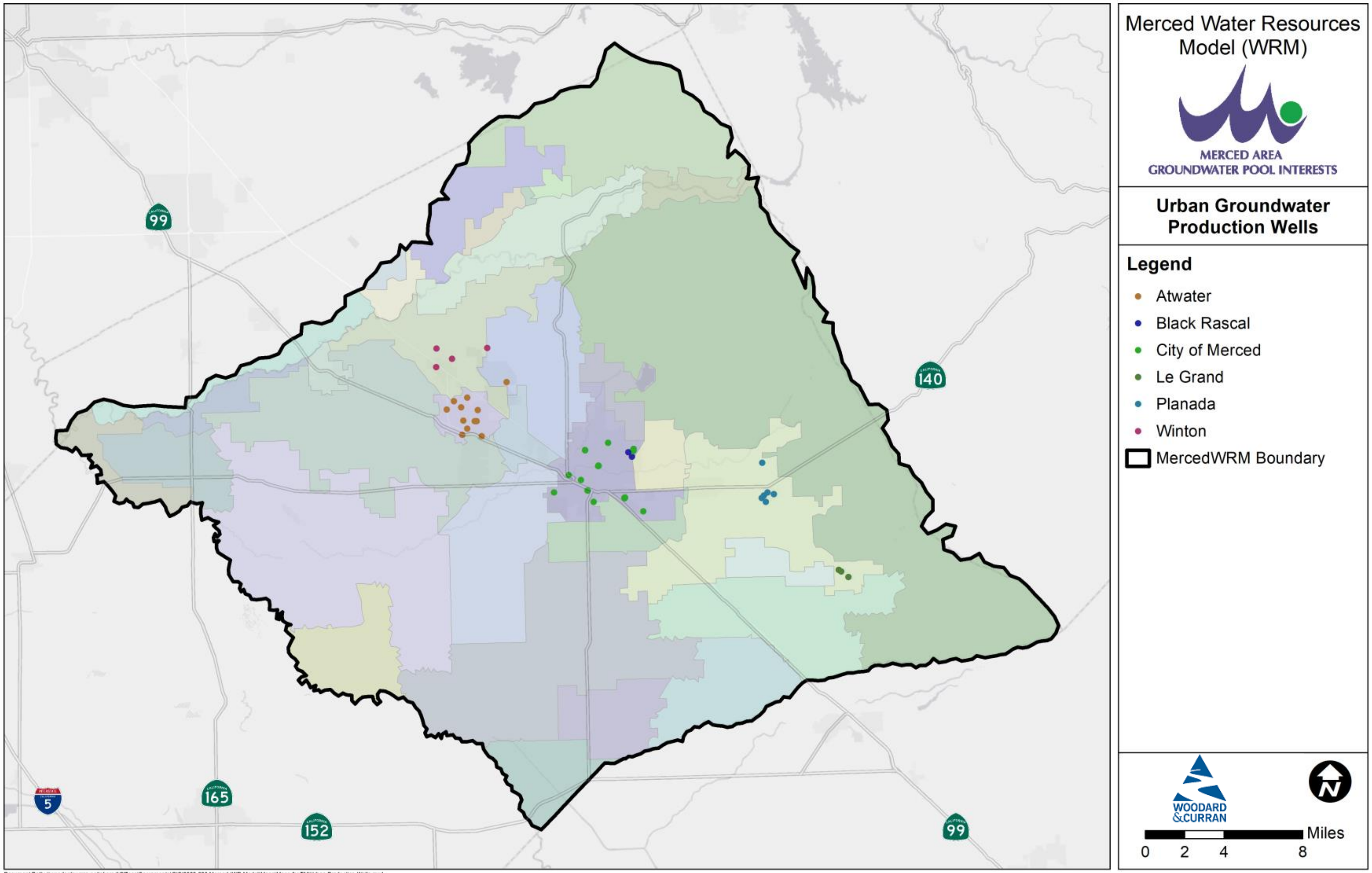
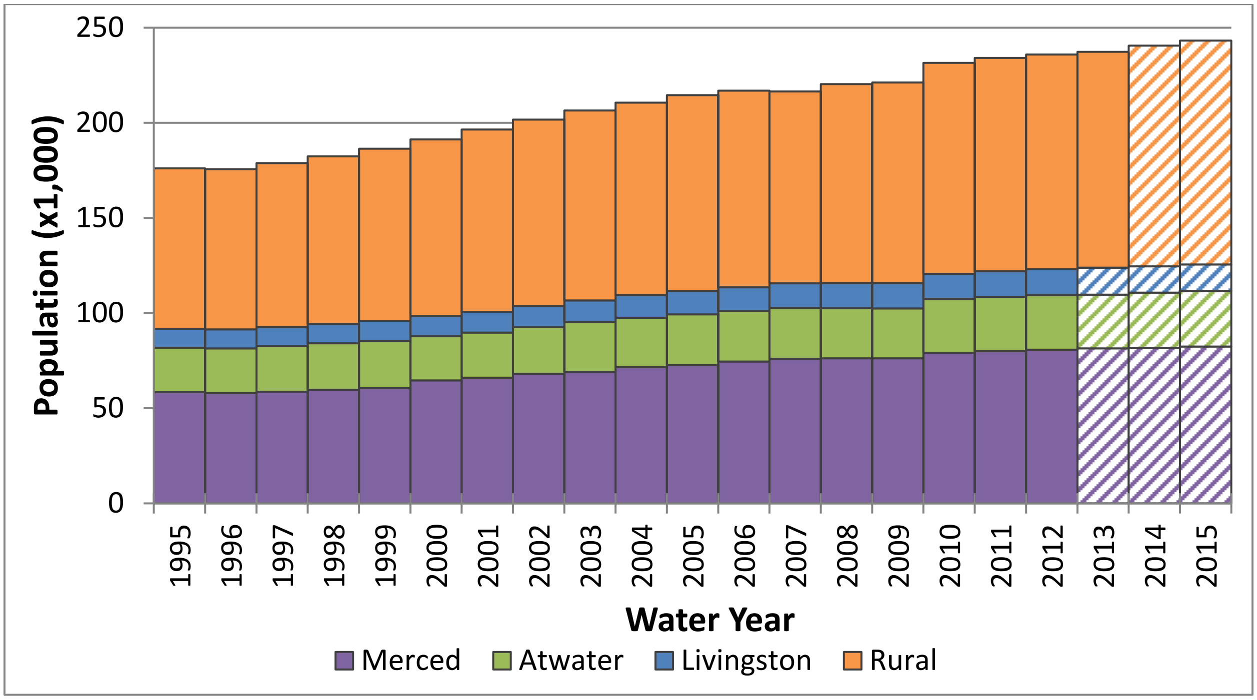
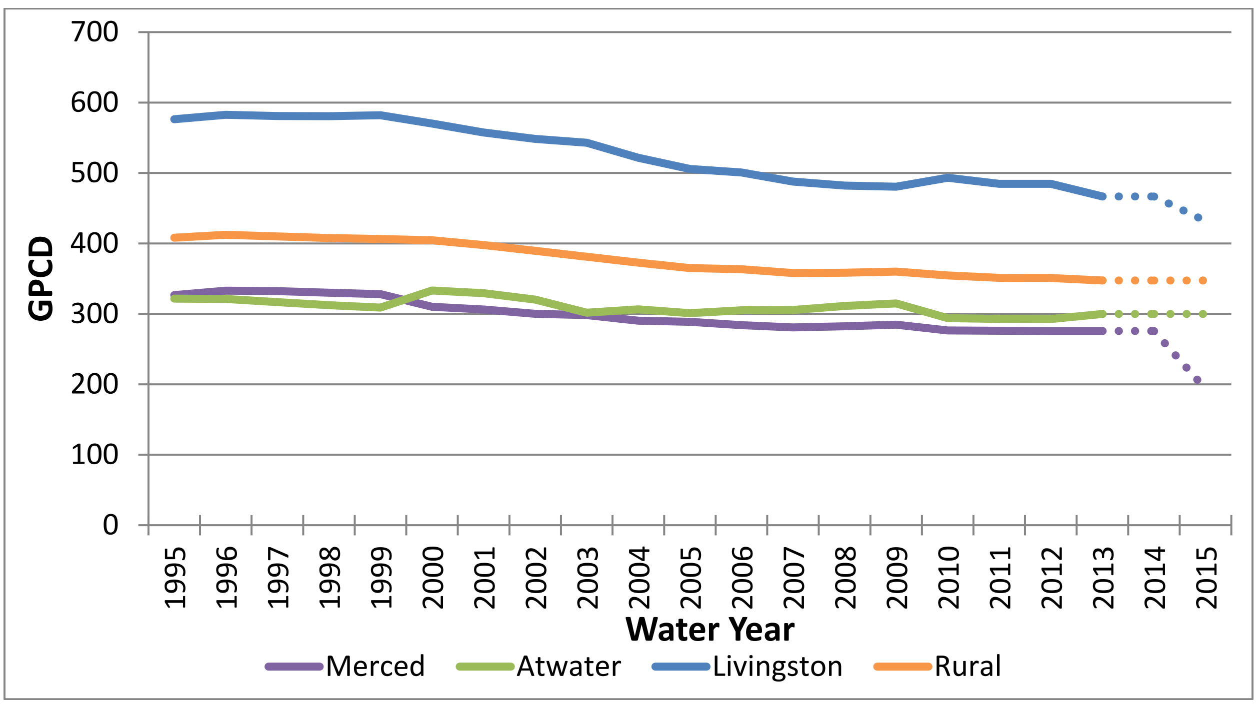


Figure 56: Location of Municipal Groundwater Production Well



*Hatched fill indicates estimated values

Figure 57: Merced Groundwater Region Urban Population Growth



*Dotted line indicates estimated values

Figure 58: Annual Average Urban Consumptive Use (Gallons per Capita per Day)

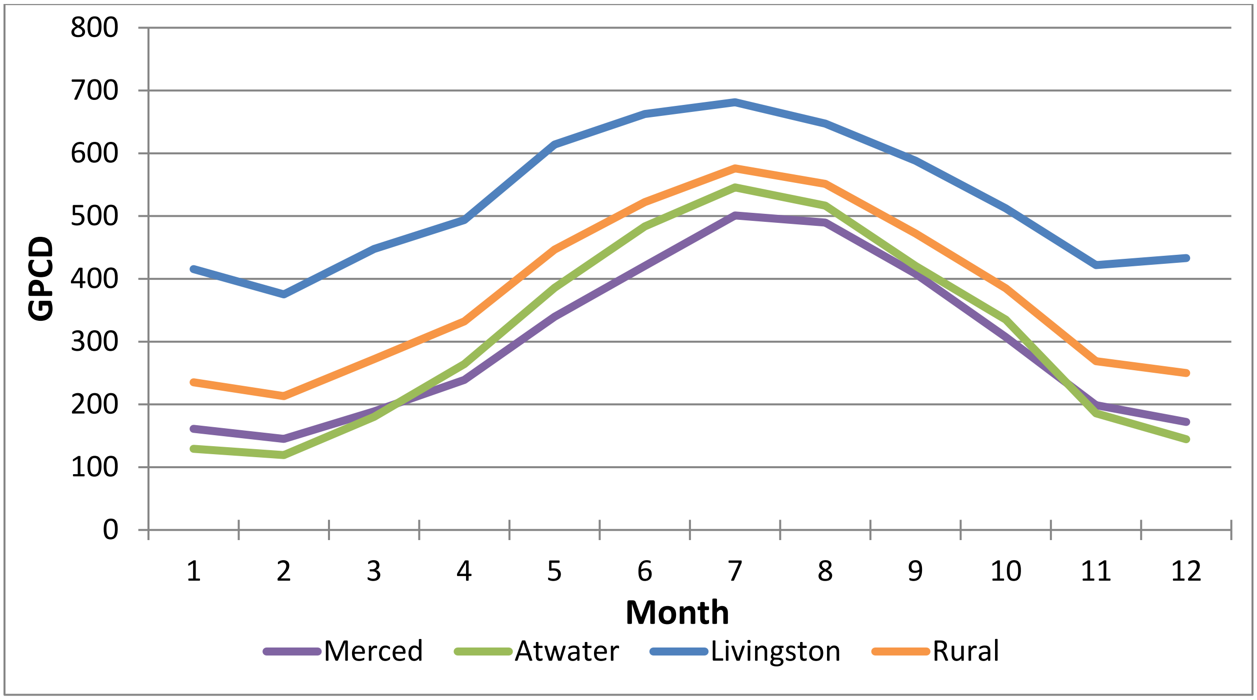
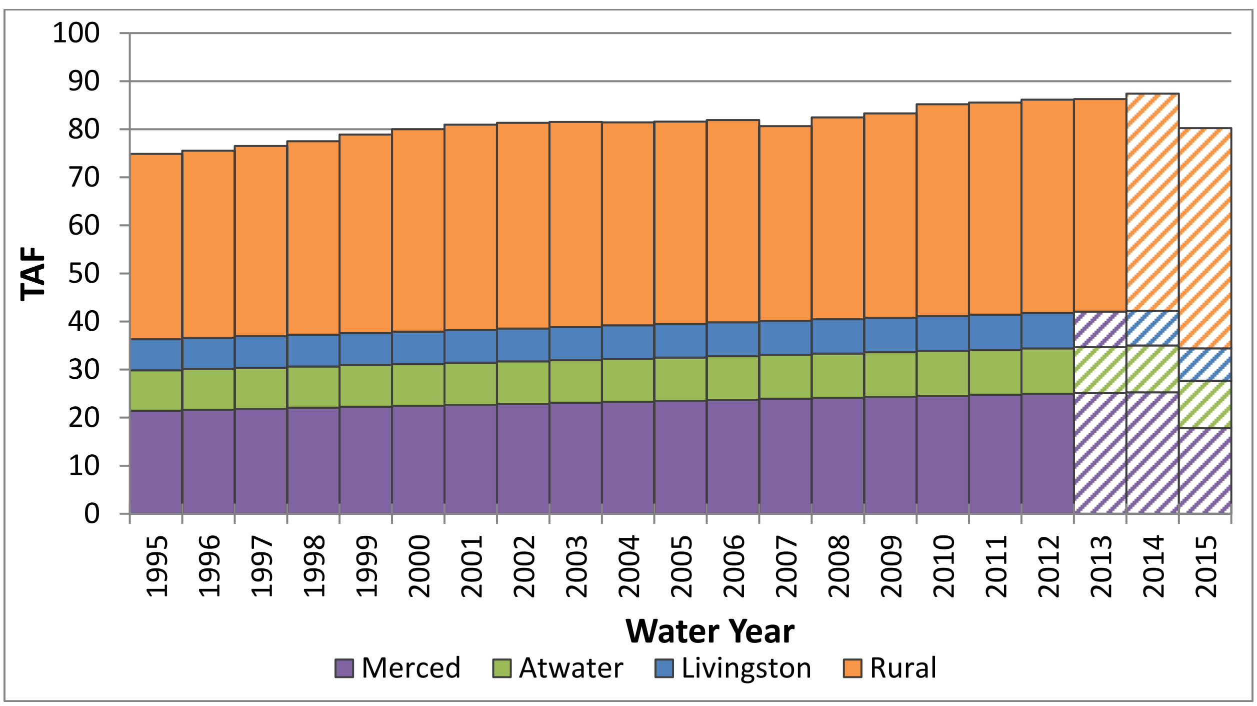


Figure 59: Monthly Average Urban Consumptive Use (Gallons per Capita per Day)



*Hatched fill indicates estimated values

Figure 60: Annual Urban Consumptive Use

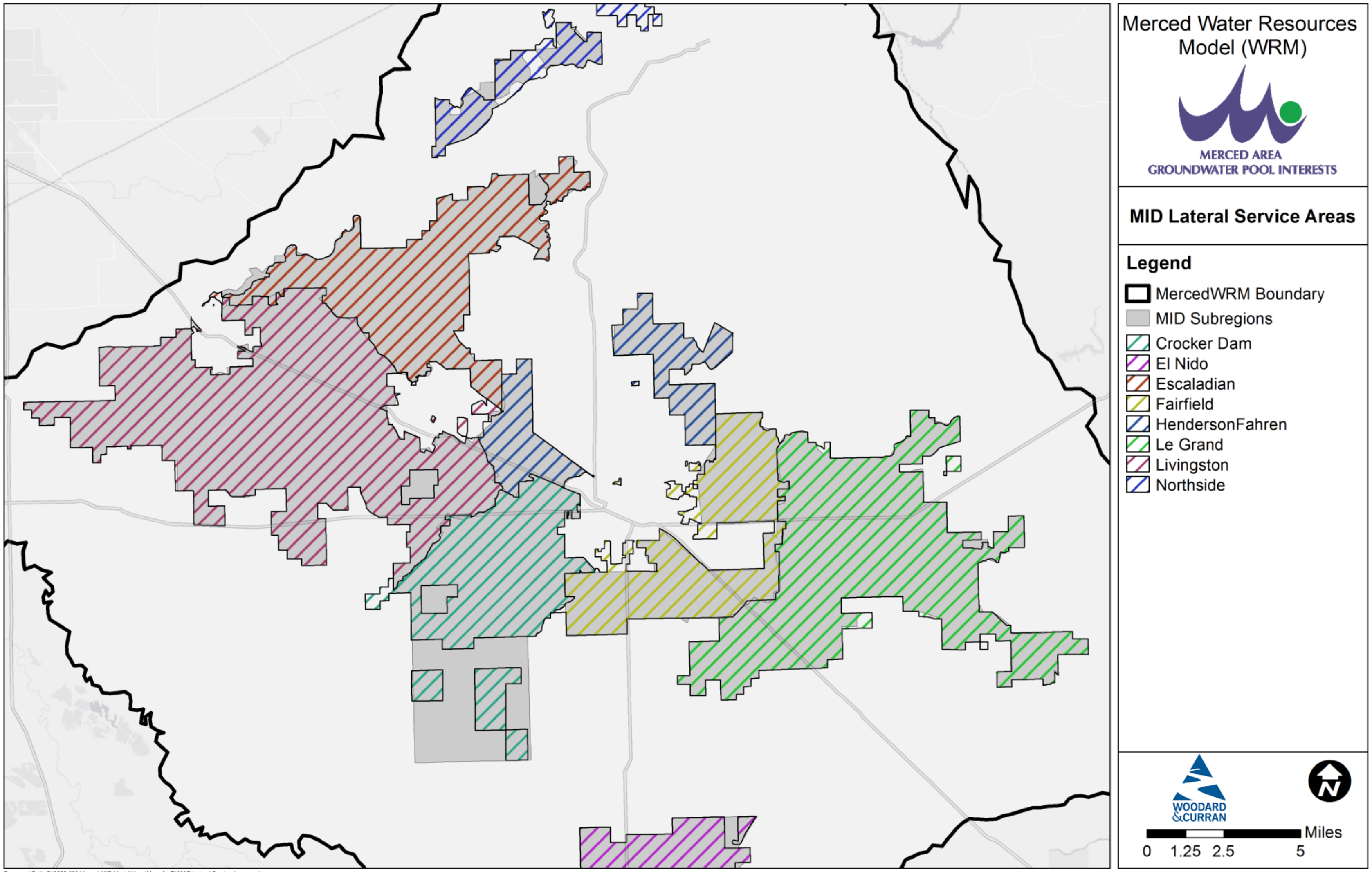


Figure 61: MercedWRM v MID-WBM Surface Budget Areas

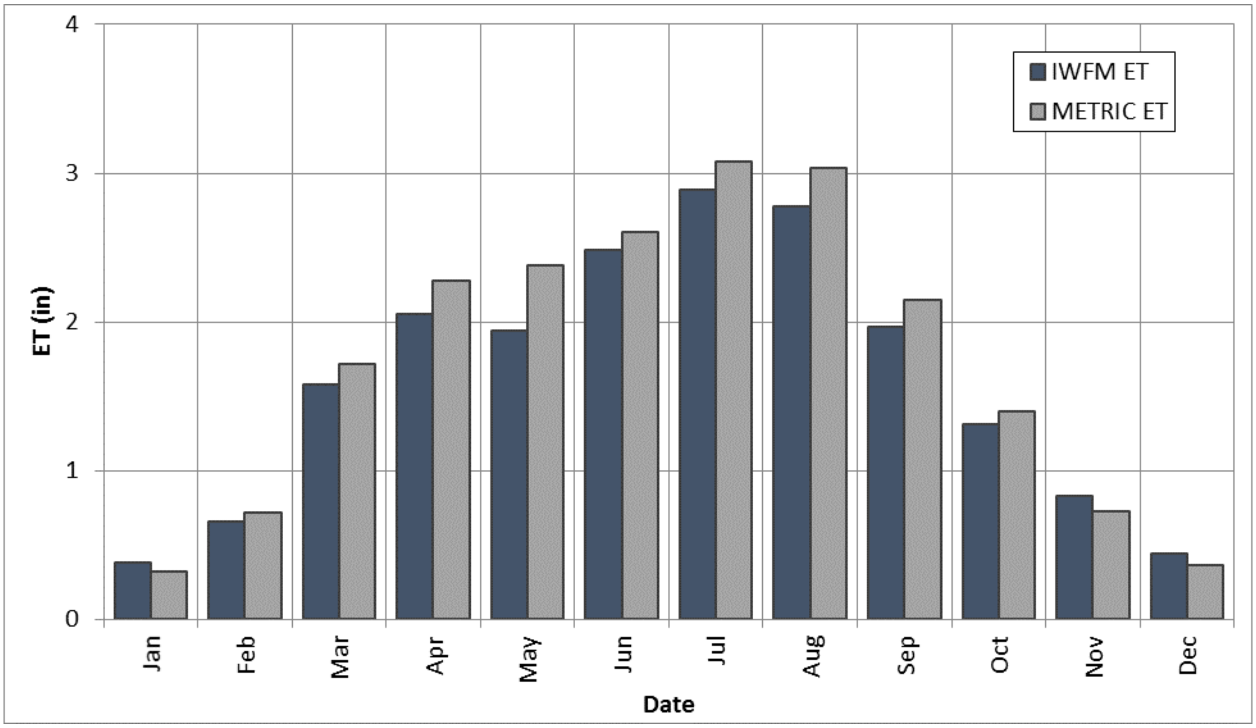


Figure 62: Monthly IWFM-METRIC ET of MercedWRM area during the calibration period

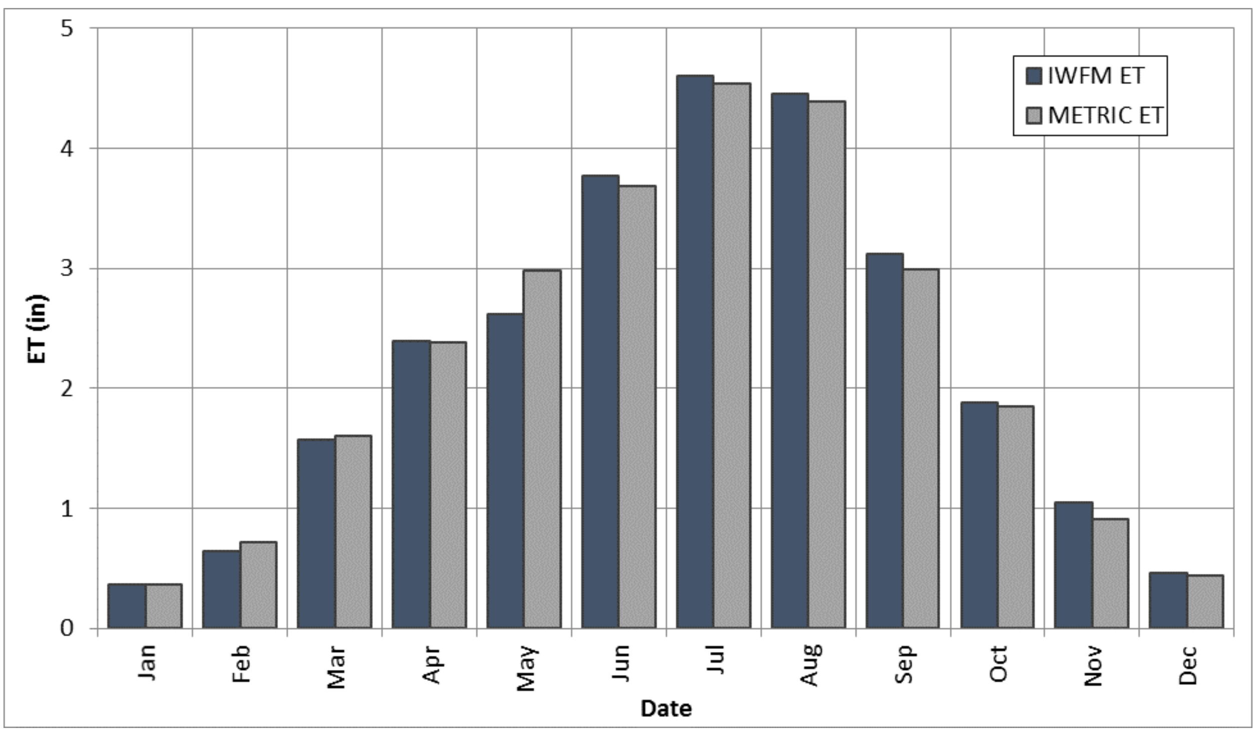


Figure 63: Monthly IWFM-METRIC ET of MID Subregions during the calibration period

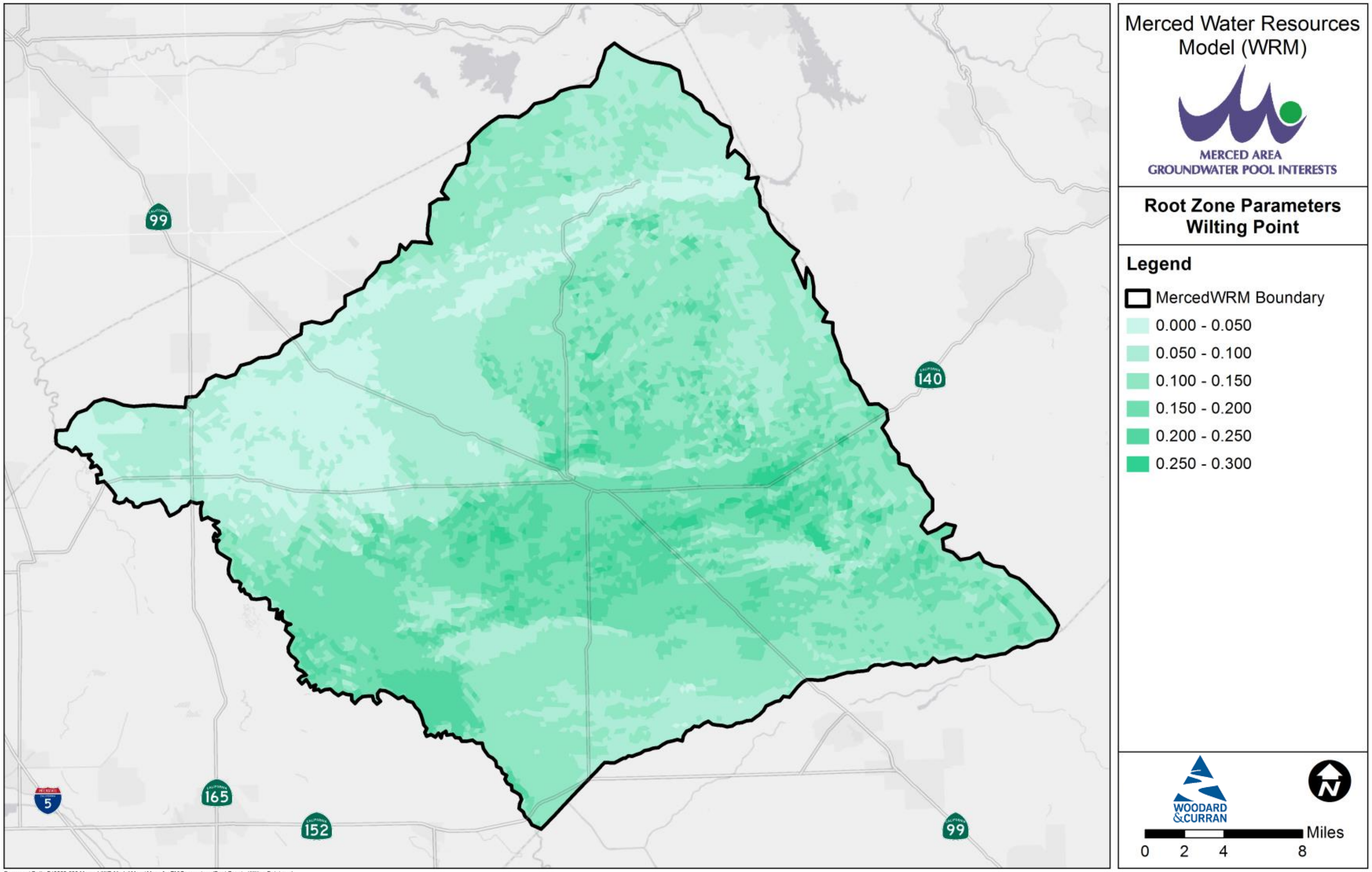


Figure 64: MercedWRM Root Zone Parameters - Wilting Point

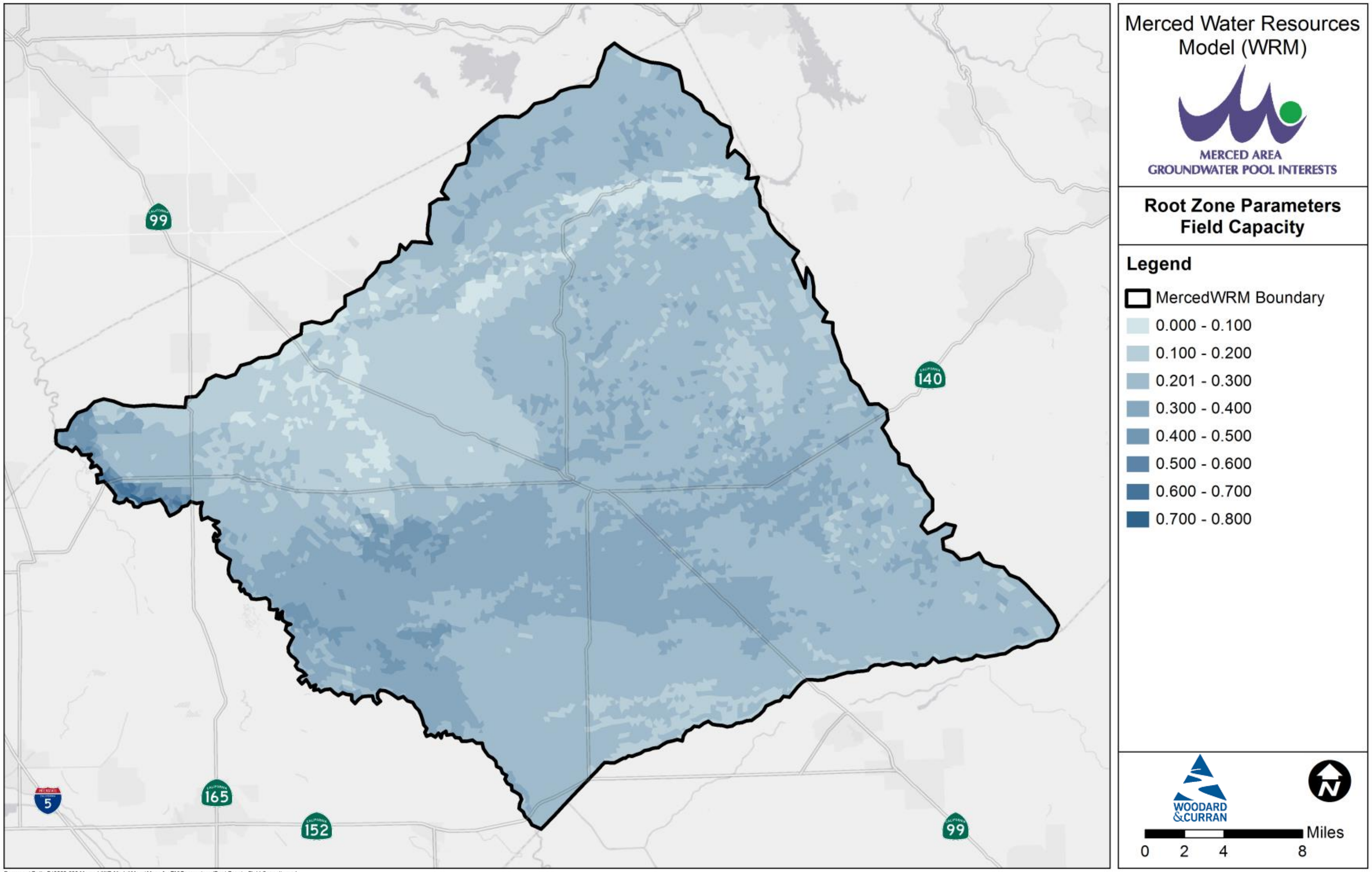


Figure 65: MercedWRM Root Zone Parameters - Field Capacity

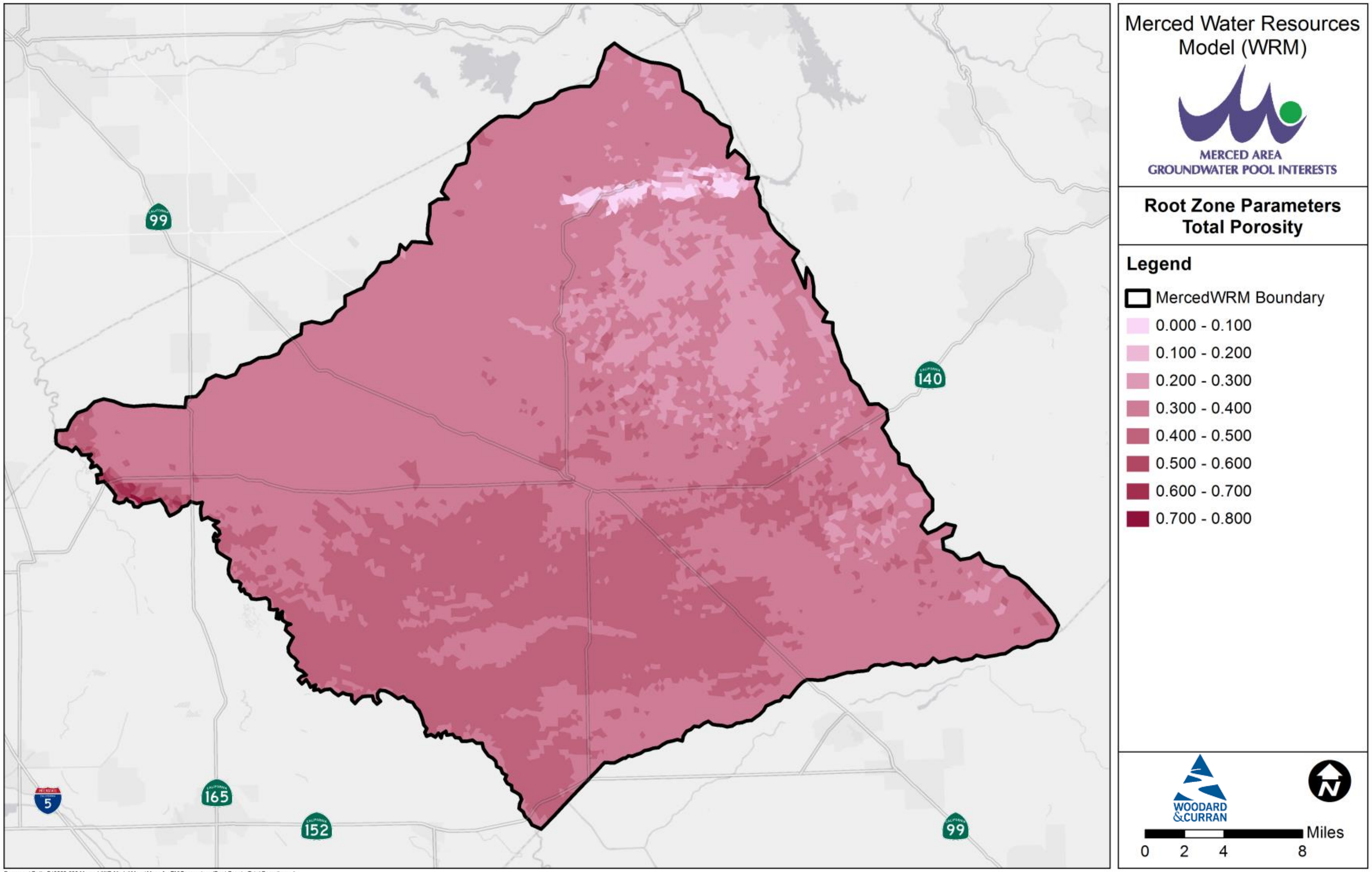


Figure 66: MercedWRM Root Zone Parameters - Total Porosity

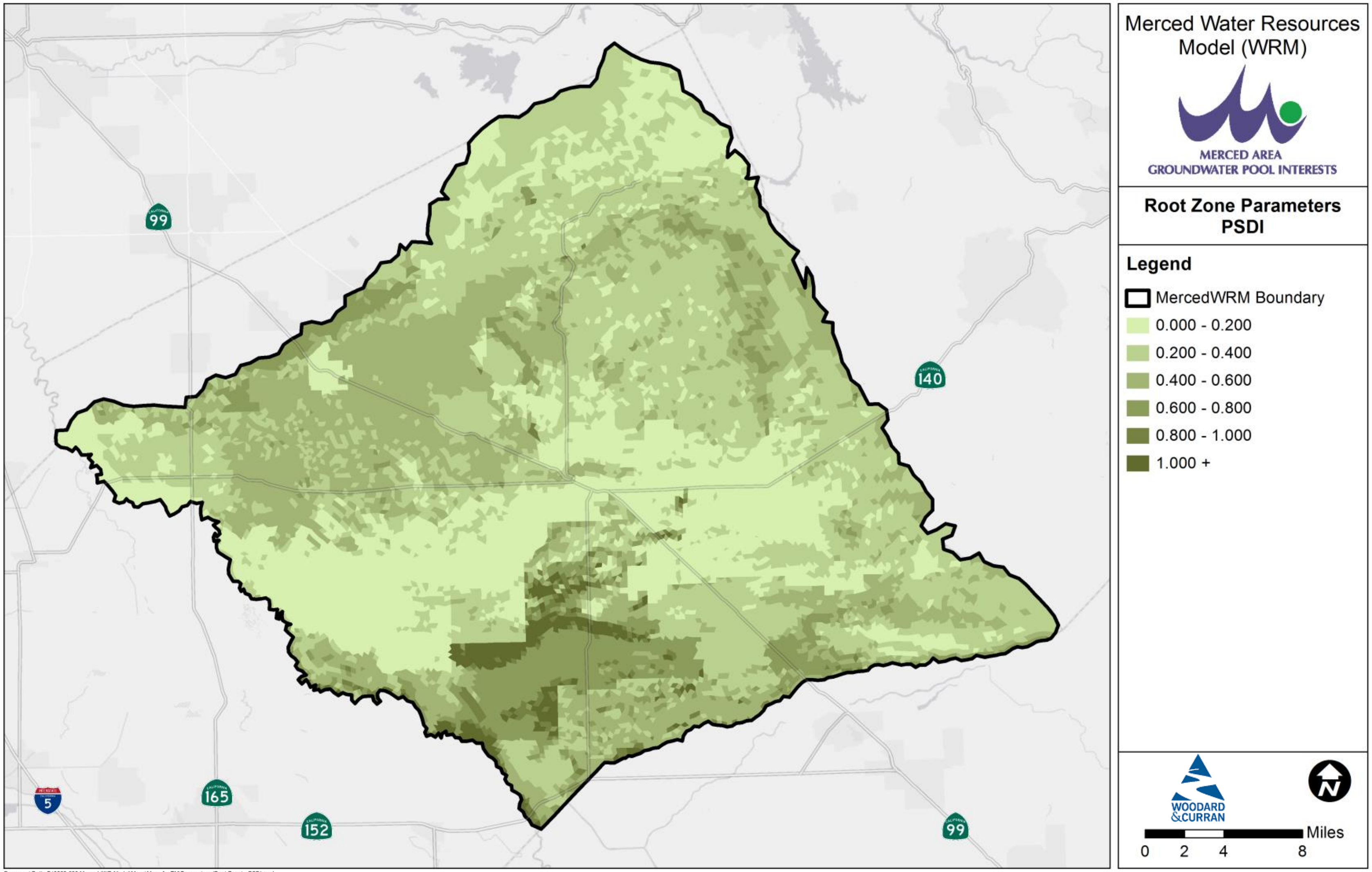


Figure 67: MercedWRM Root Zone Parameters - Pore Size Distribution Index

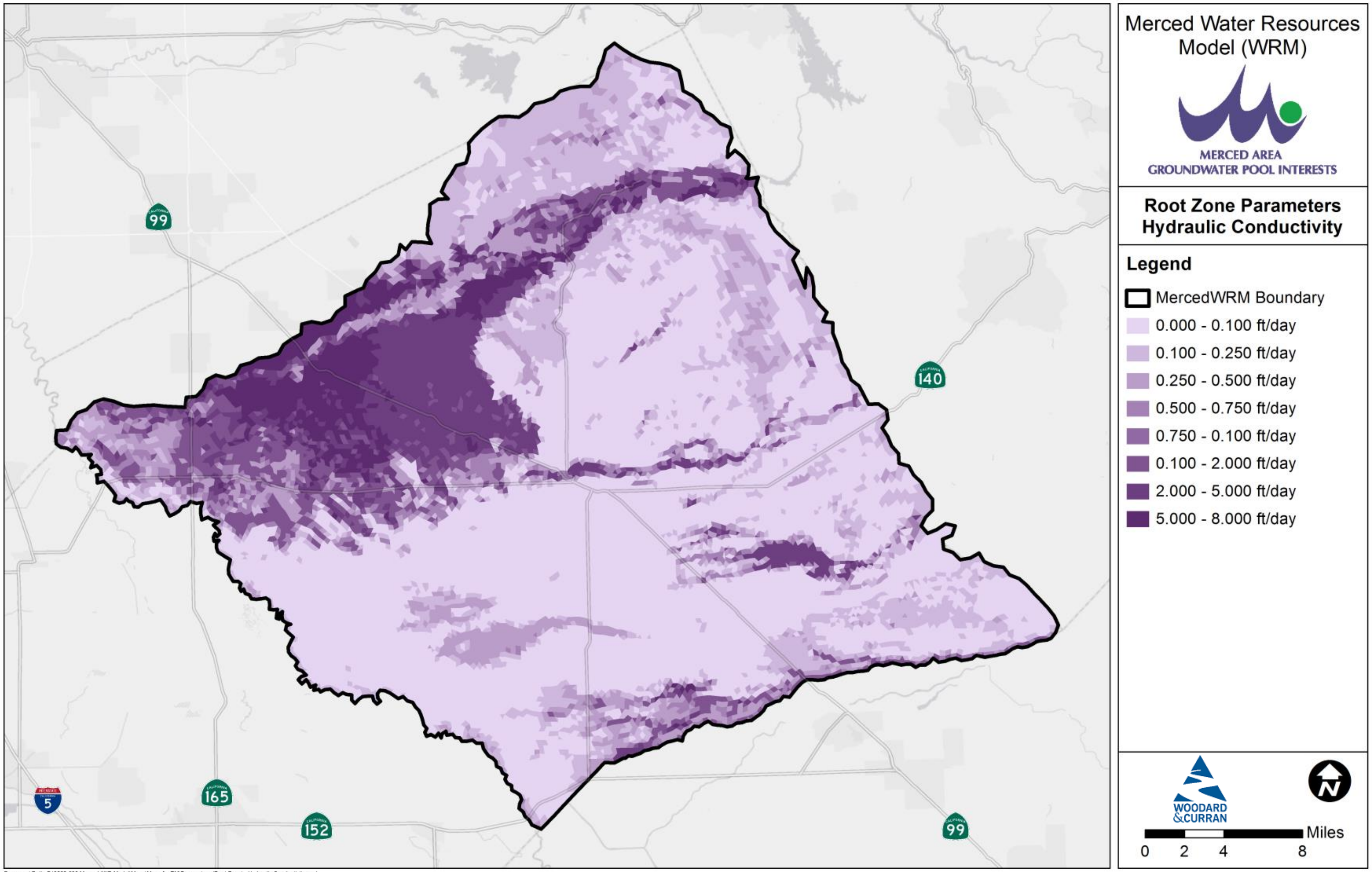


Figure 68: MercedWRM Root Zone Parameters - Hydraulic Conductivity

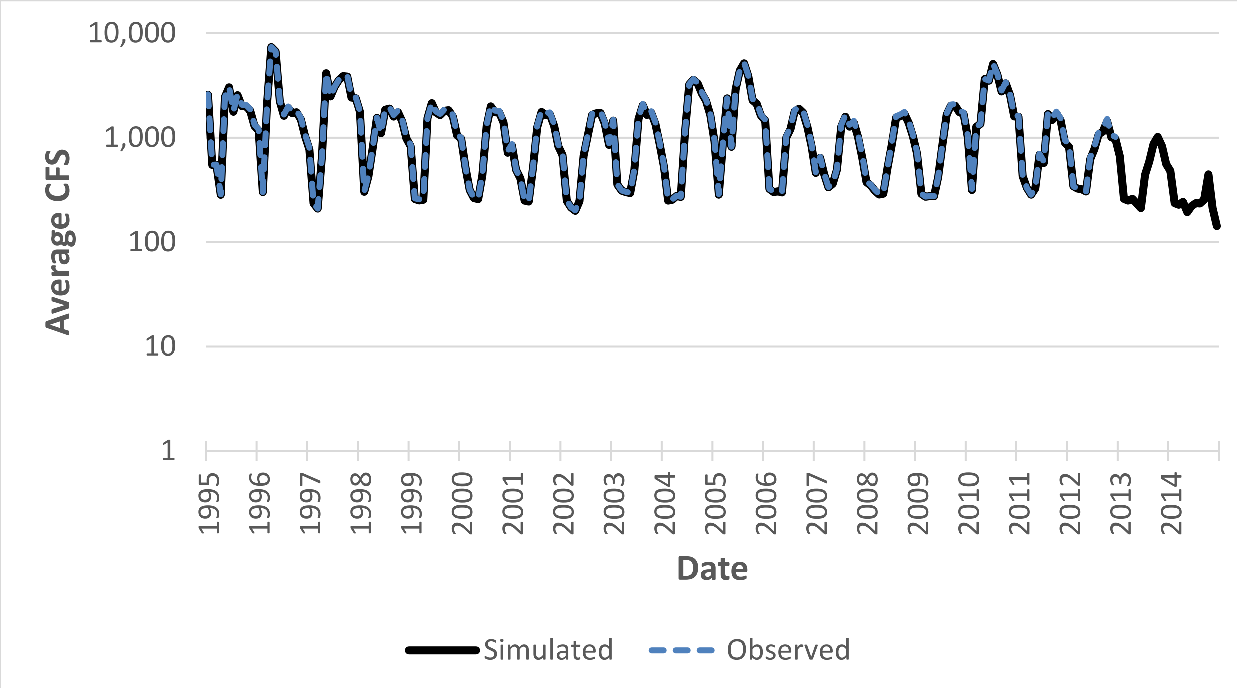


Figure 69: Observed vs Simulated Stream Flow (Merced Falls near the Northside Canal)

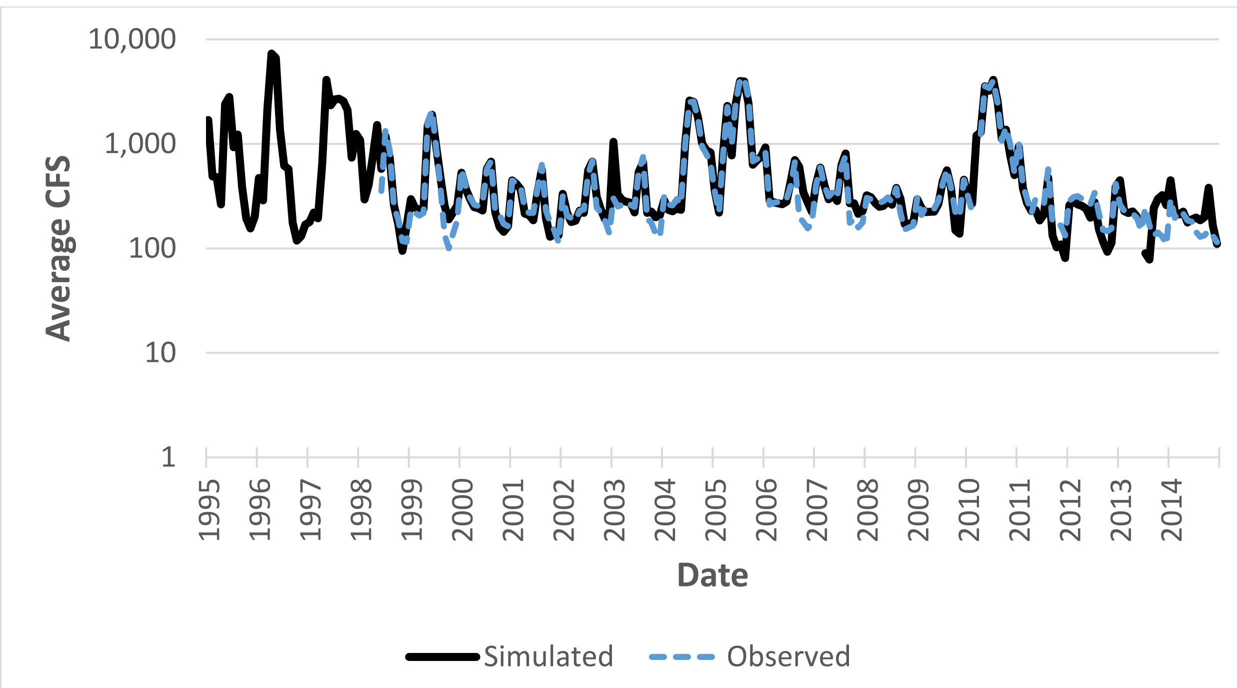


Figure 70: Observed vs Simulated Stream Flow (Merced River near Snelling)

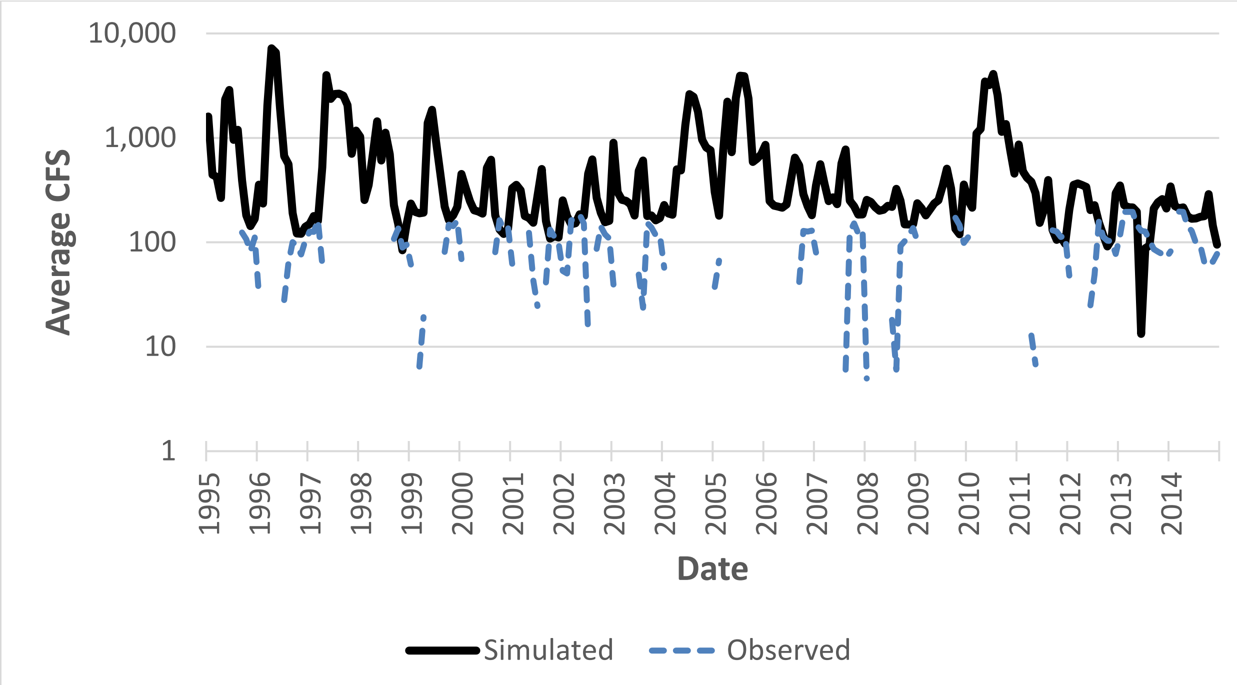


Figure 71: Observed vs Simulated Stream Flow (Merced River at Shaffer Bridge)

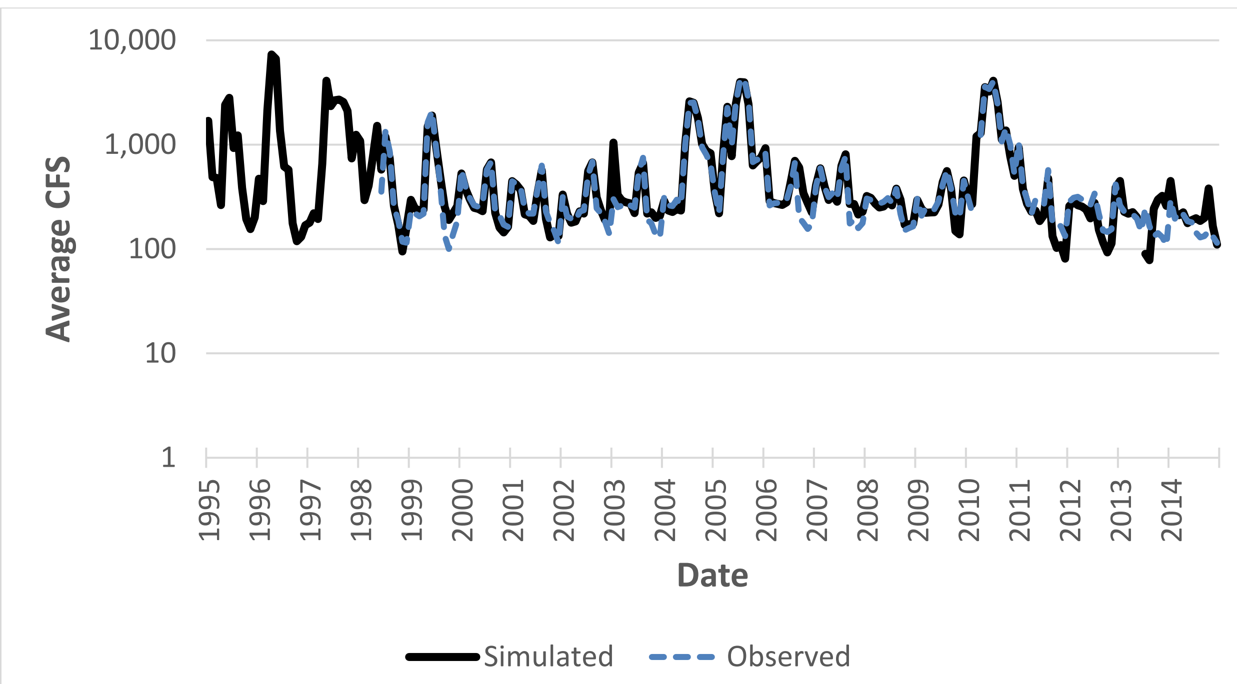


Figure 72: Observed vs Simulated Stream Flow (Merced River near Cressey)

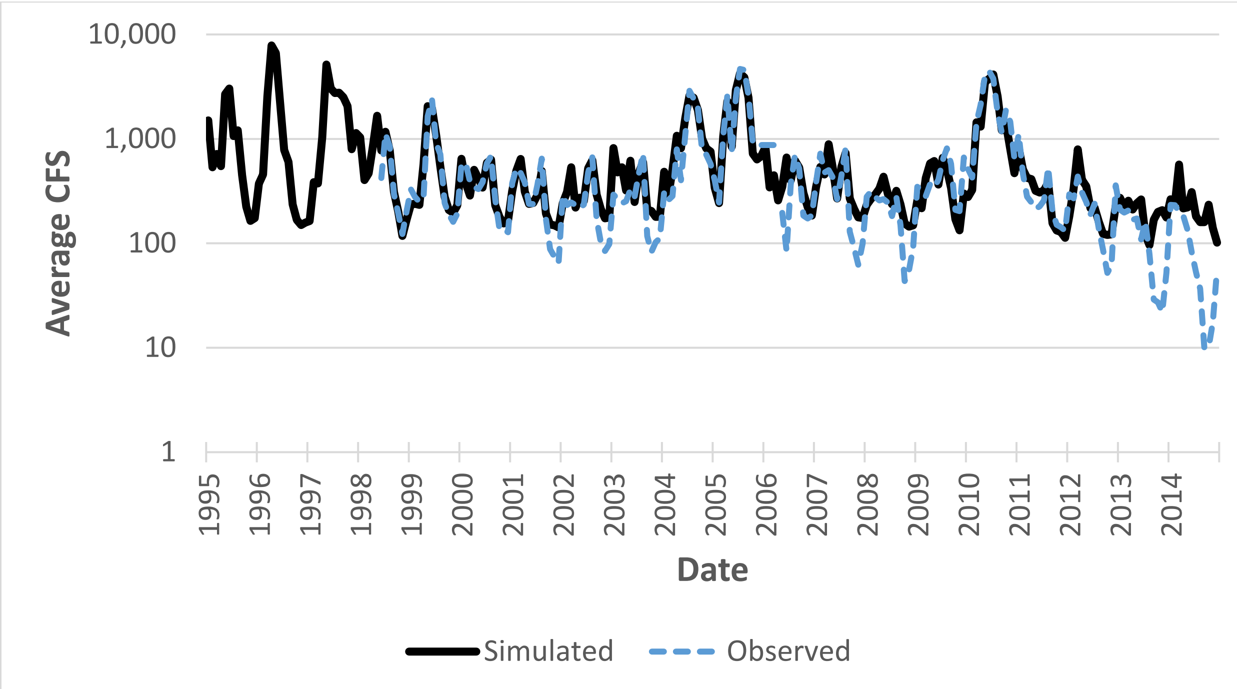


Figure 73: Observed vs Simulated Stream Flow (Merced River near Stevinson

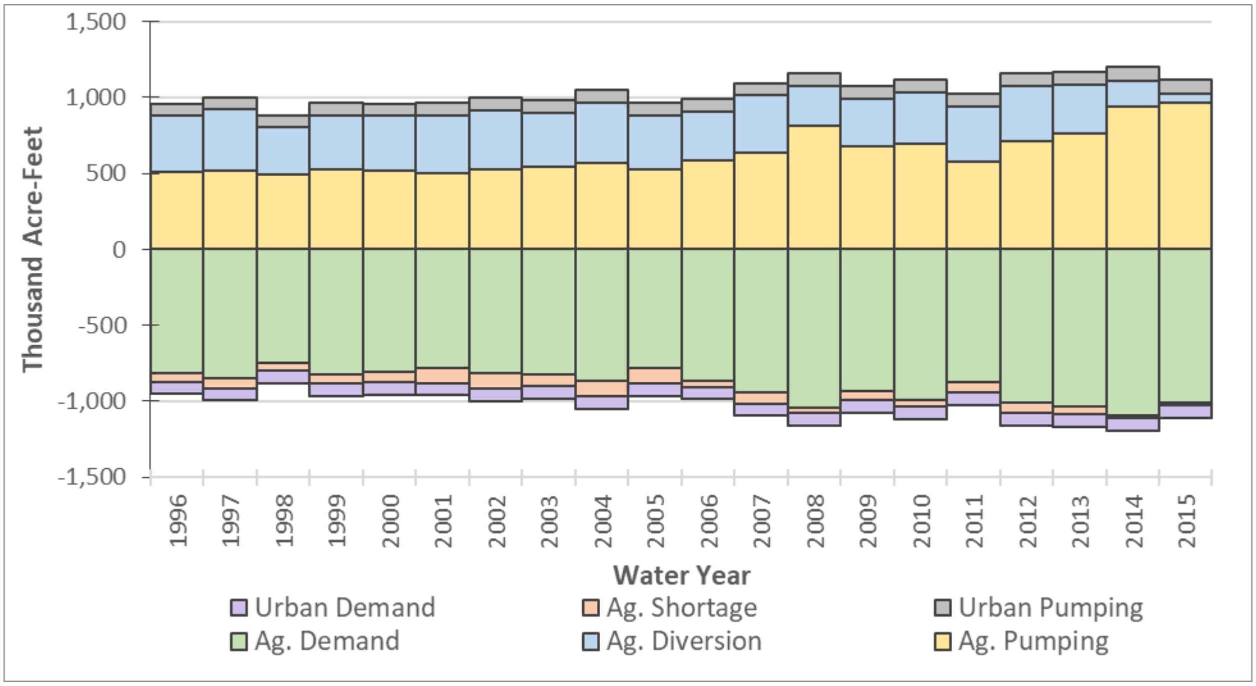


Figure 74: Land and Water Use - Merced Region

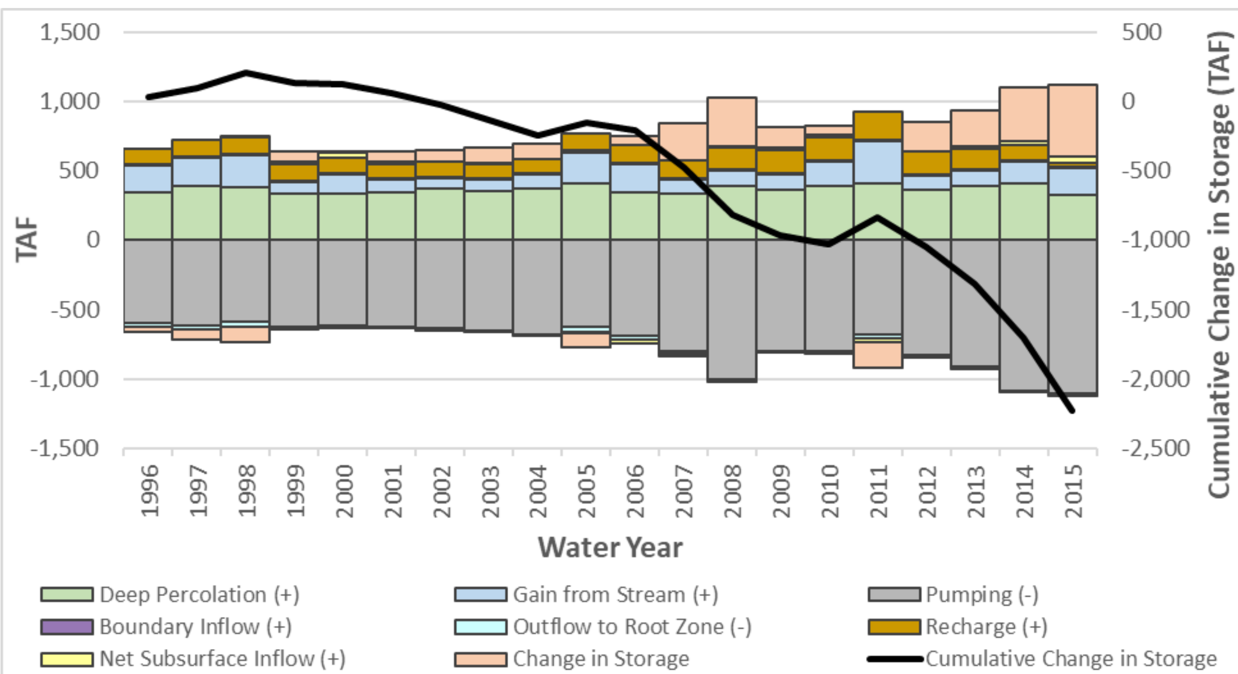


Figure 75: Groundwater Budget - Merced Region

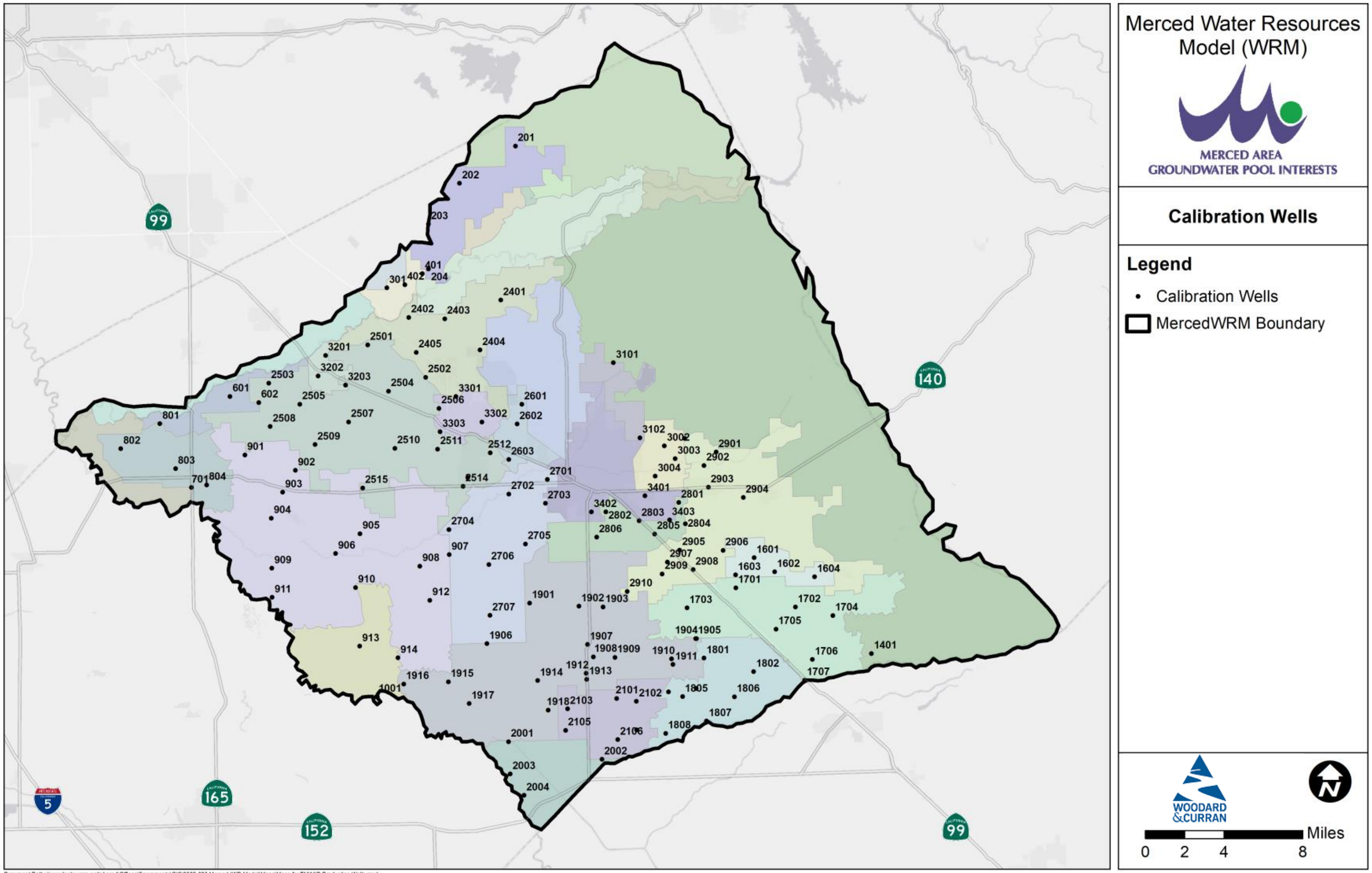


Figure 76: MercedWRM Groundwater Observation Wells

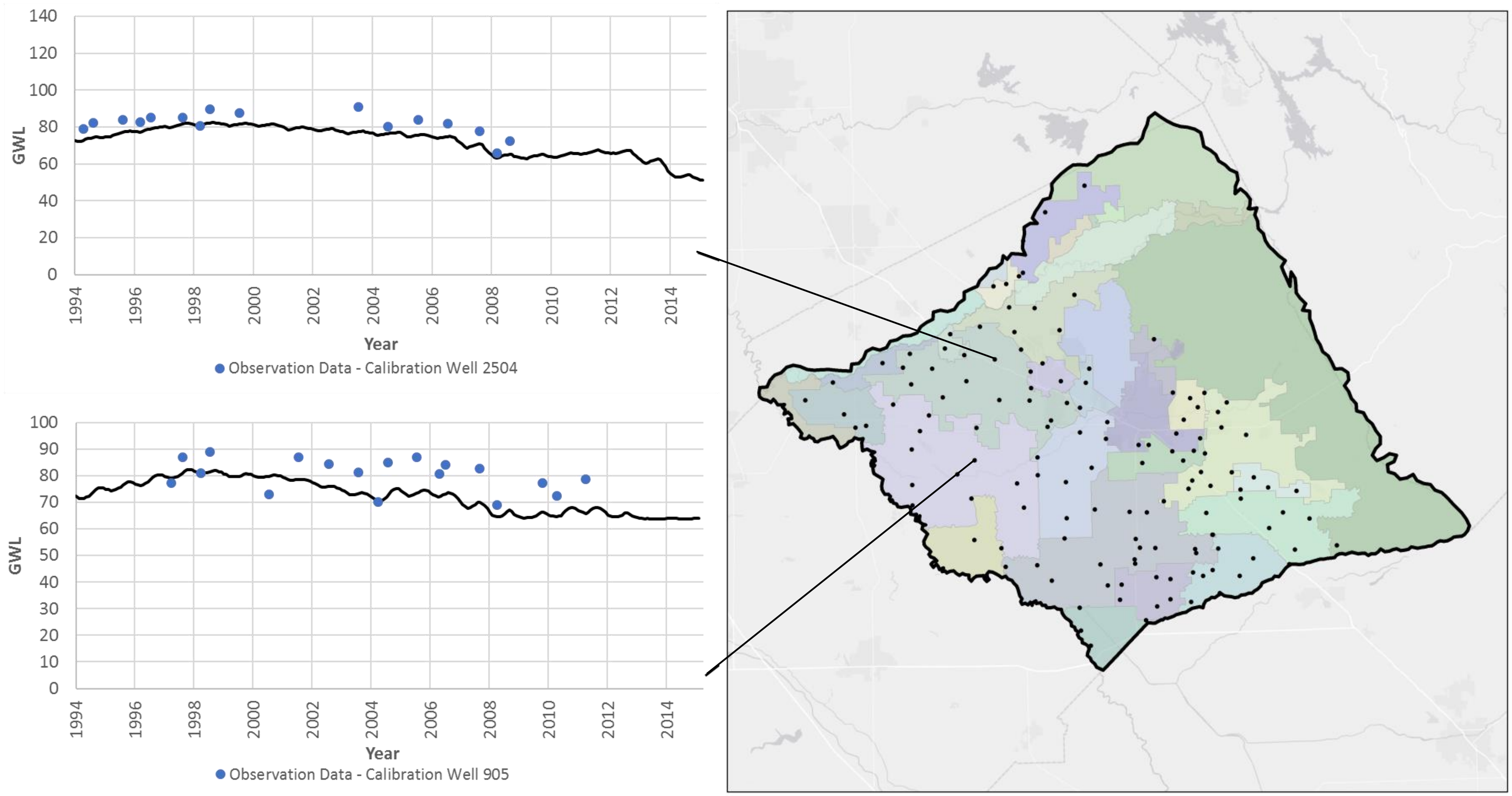


Figure 77: Sample Groundwater Calibration Hydrographs

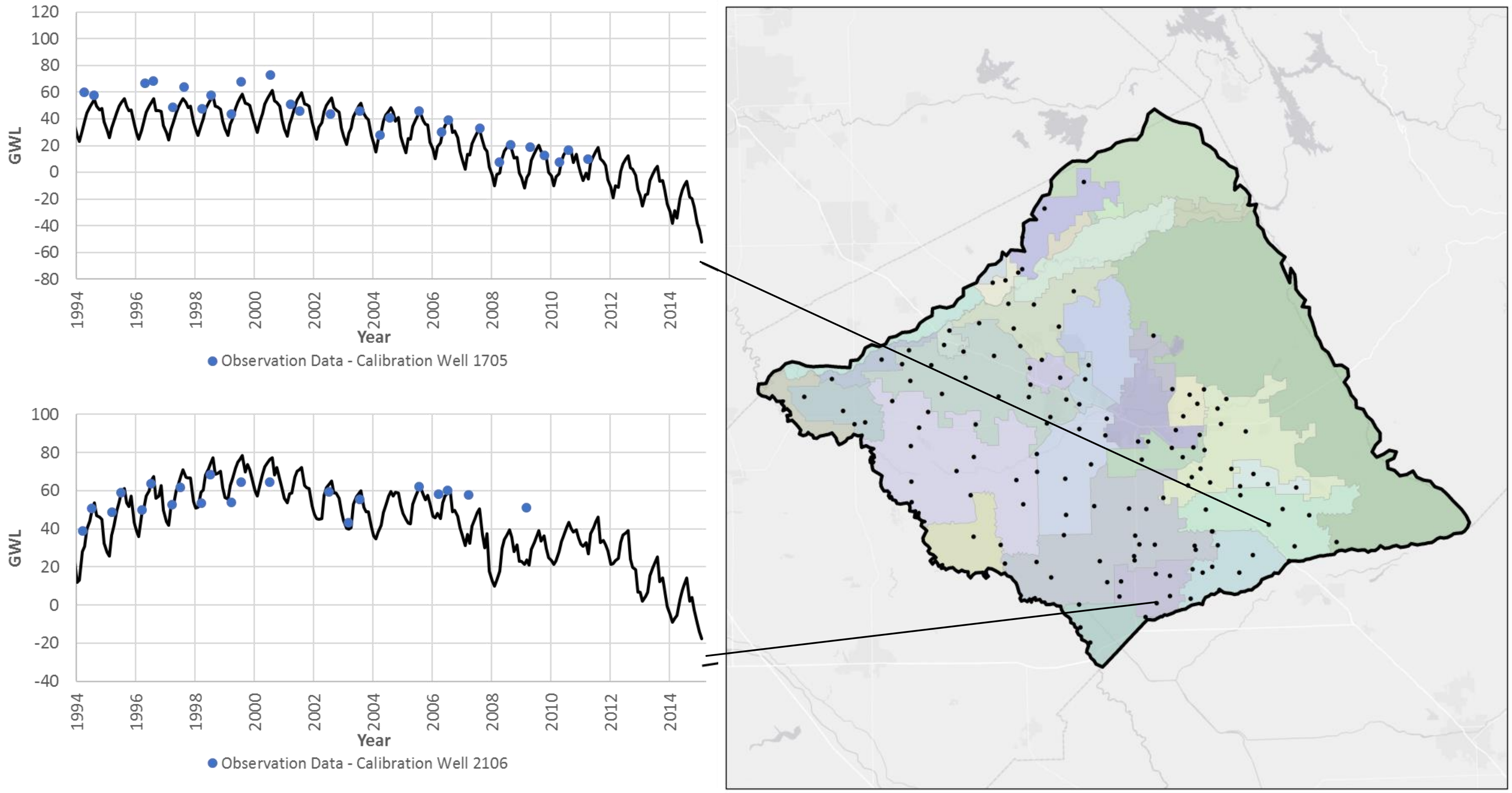


Figure 78: Sample Groundwater Calibration Hydrographs

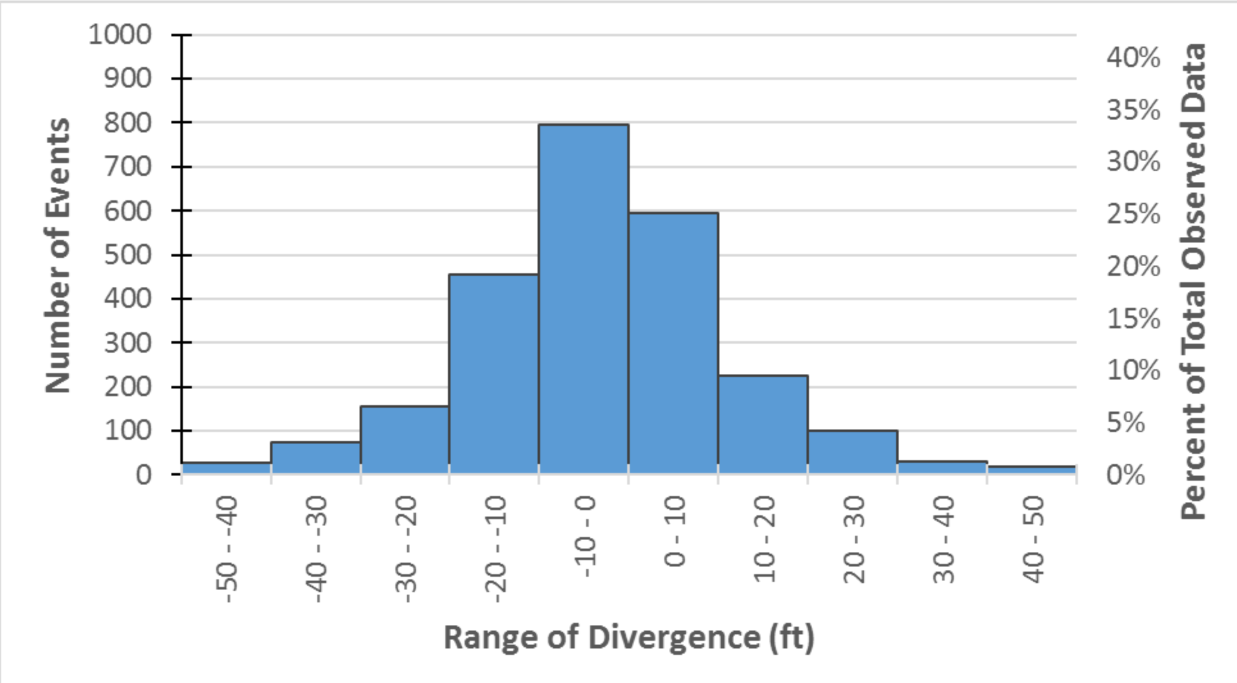


Figure 79: Residual Histogram - Merced Region

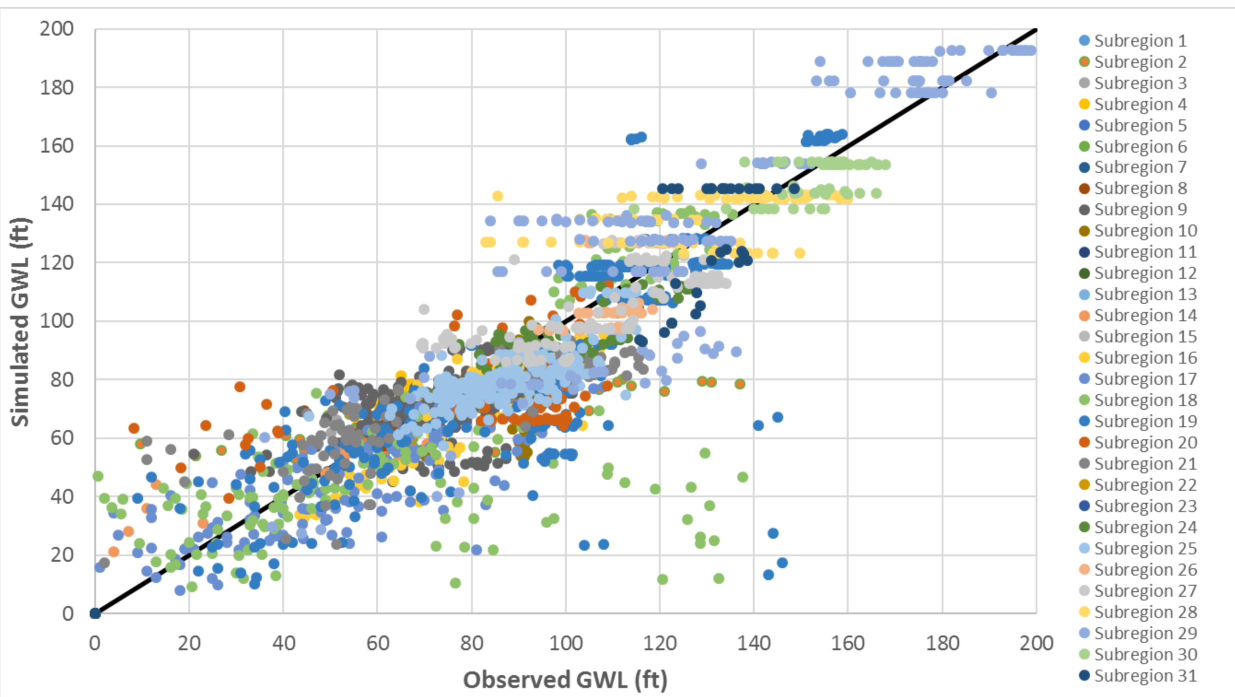


Figure 80: Simulated vs Observed Groundwater Levels By Subregion - Merced Region

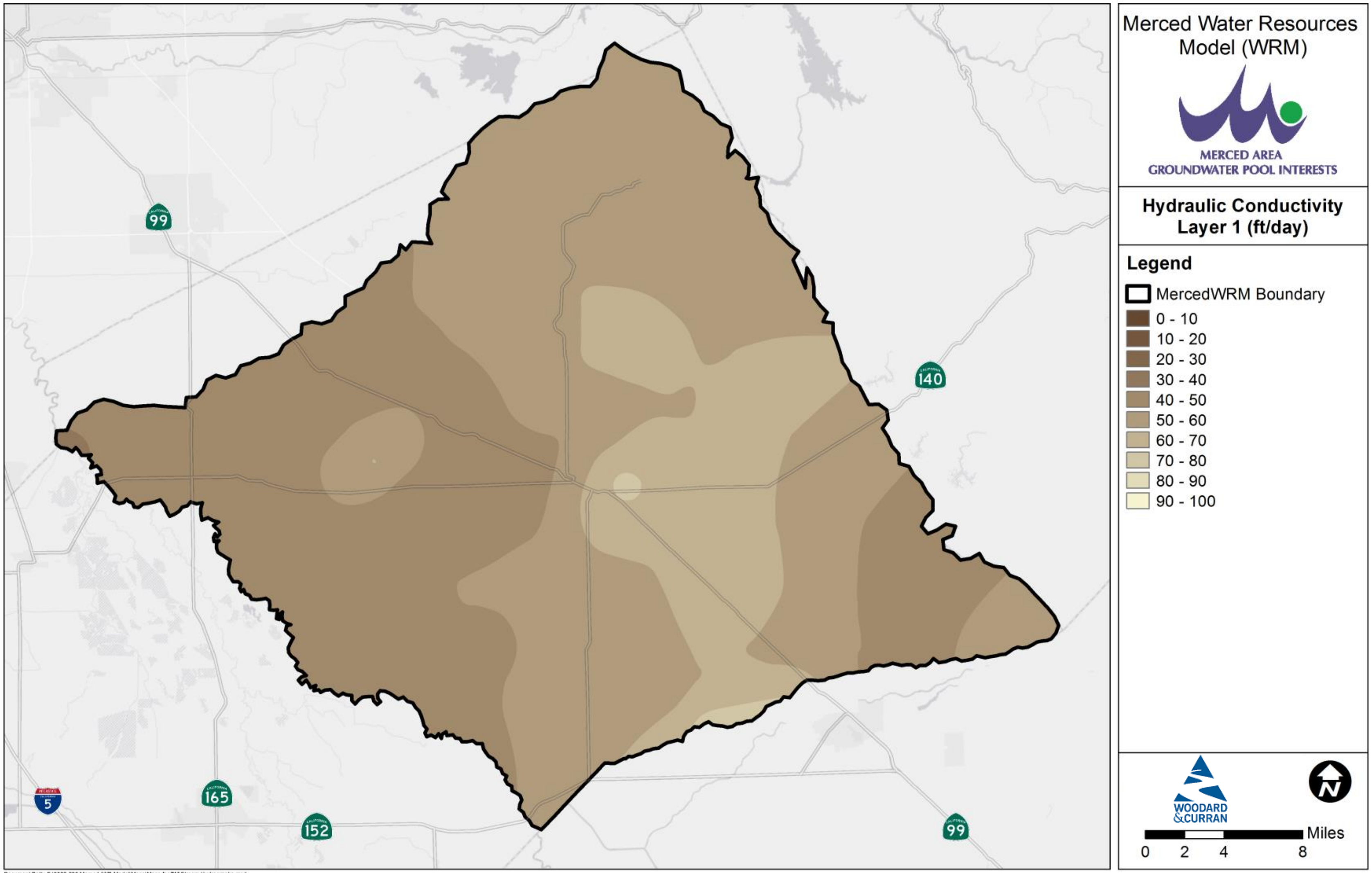


Figure 81: Aquifer Parameters - Hydraulic Conductivity (Layer 1)

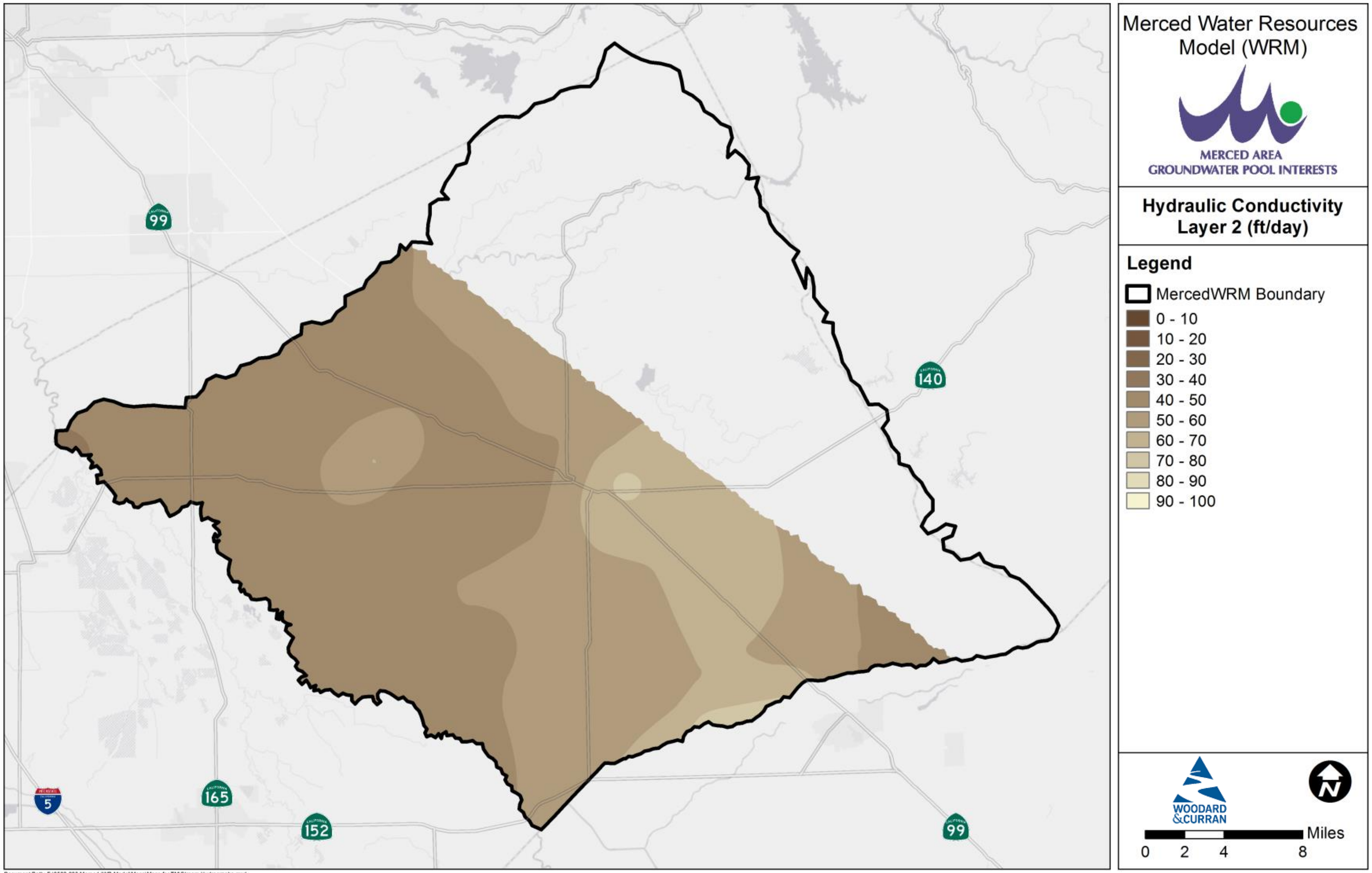


Figure 82: Aquifer Parameters - Hydraulic Conductivity (Layer 2)

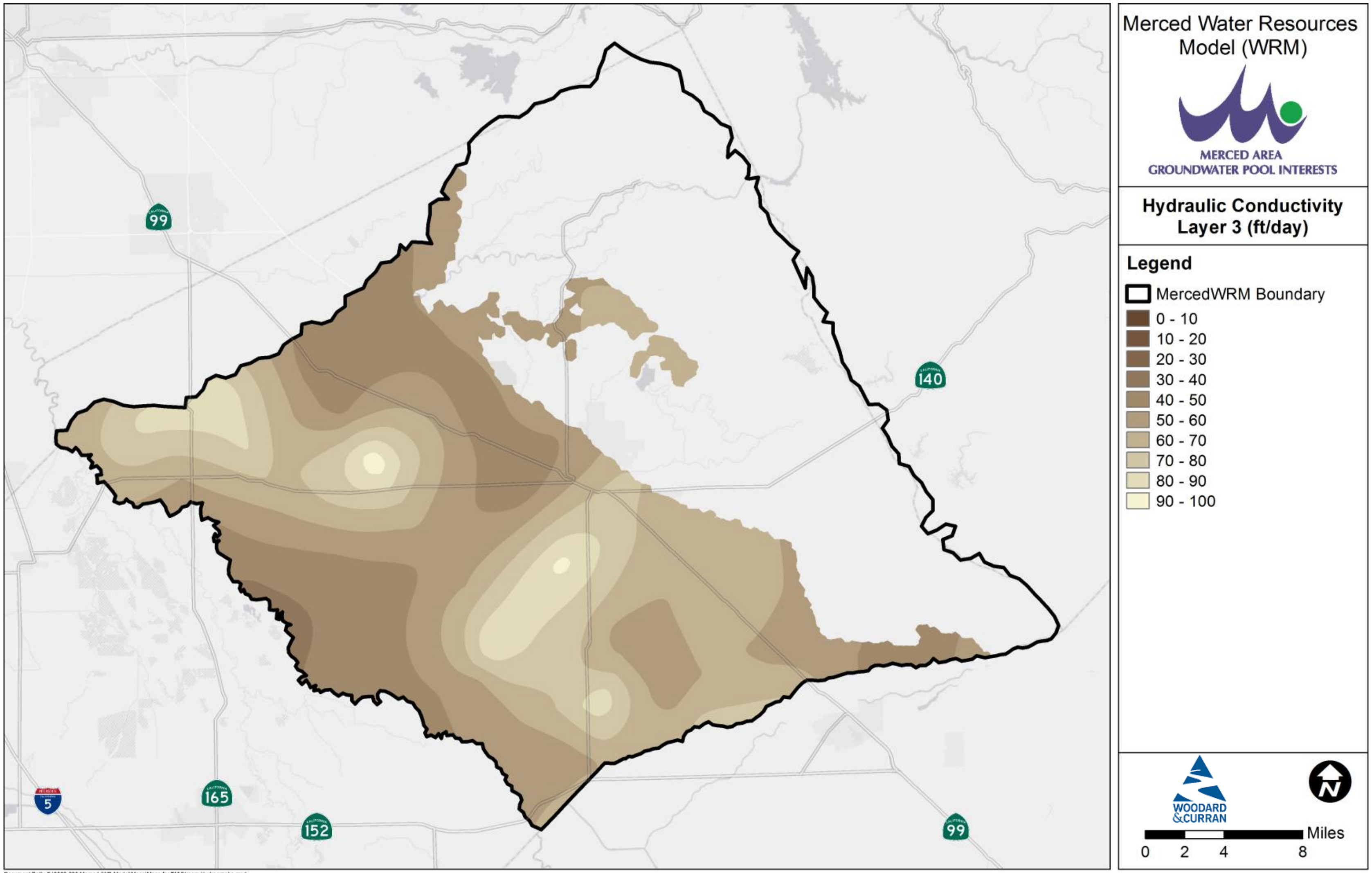


Figure 83: Aquifer Parameters - Hydraulic Conductivity (Layer 3)

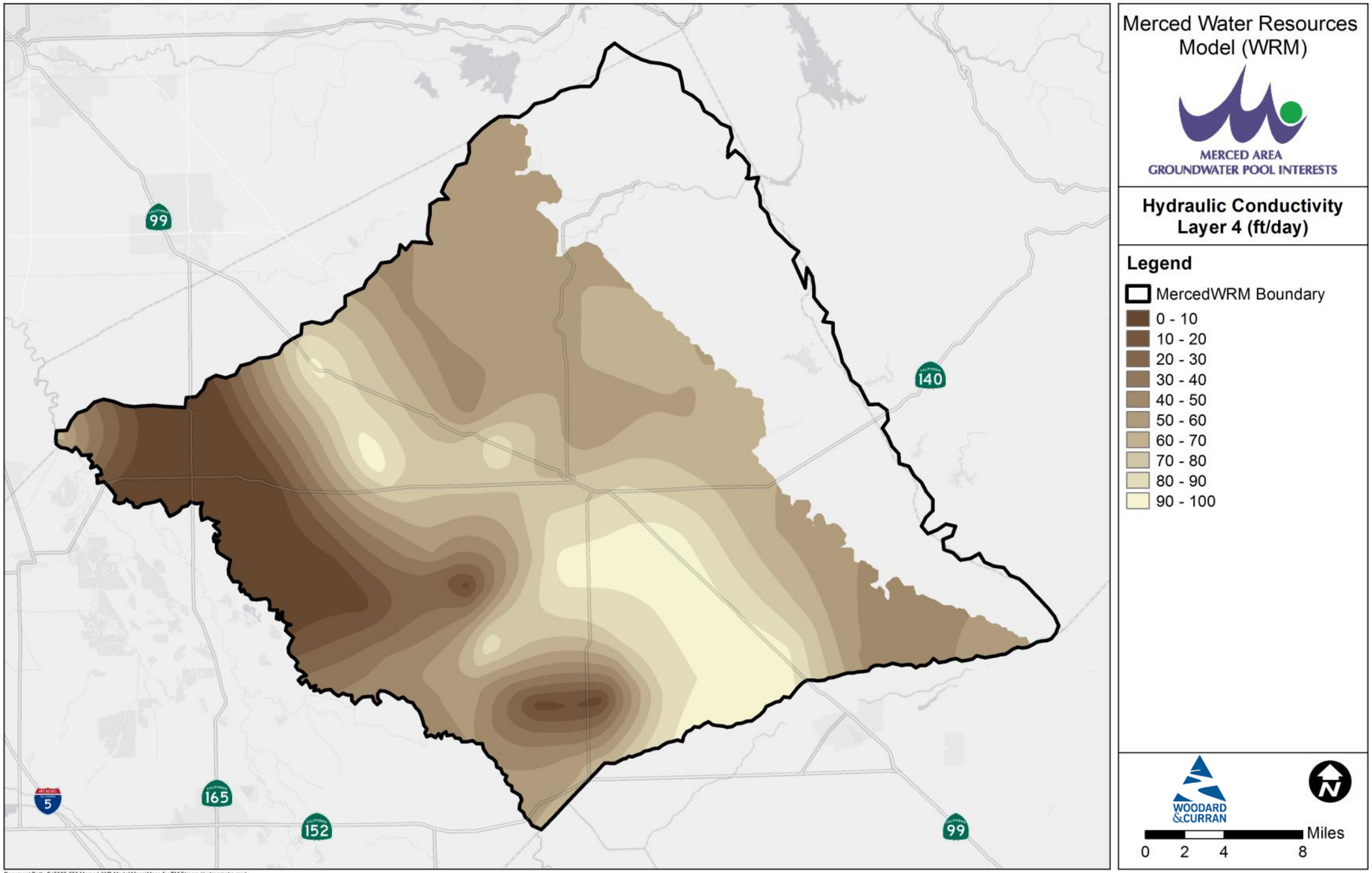


Figure 84: Aquifer Parameters - Hydraulic Conductivity (Layer 4)

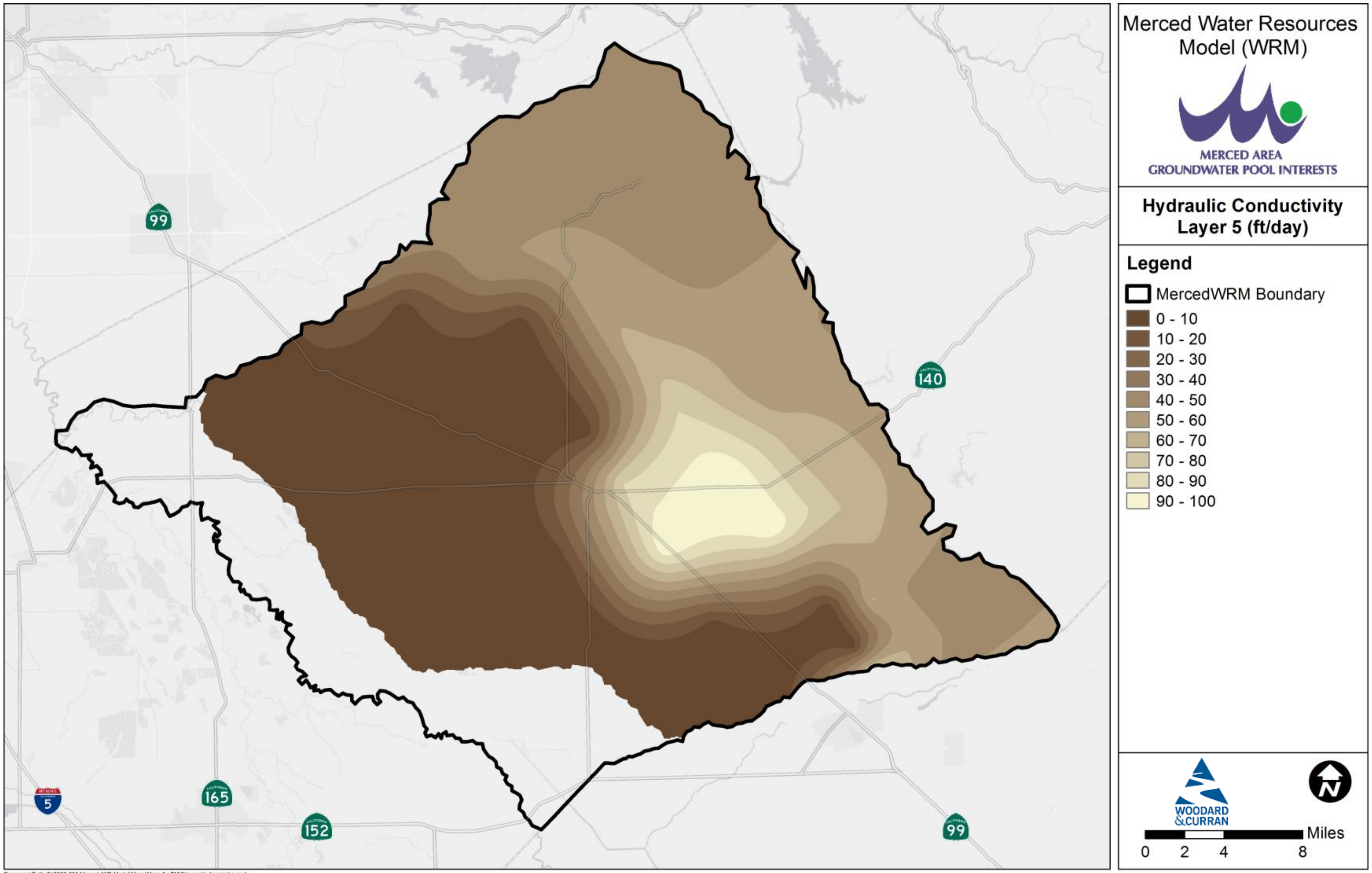


Figure 85: Aquifer Parameters - Hydraulic Conductivity (Layer 5)

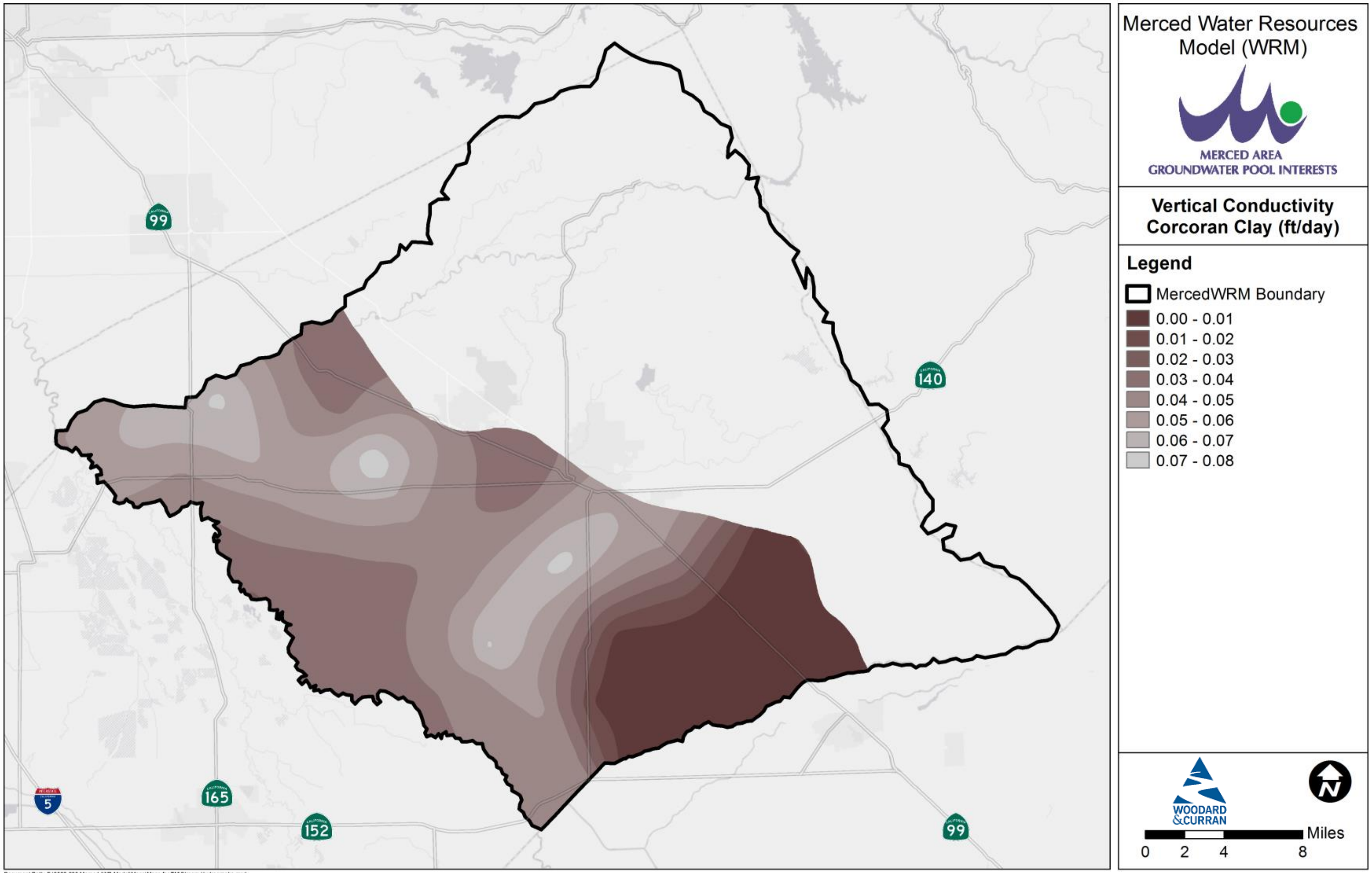


Figure 86: Aquifer Parameters - Vertical Hydraulic Conductivity of the Corcoran Clay

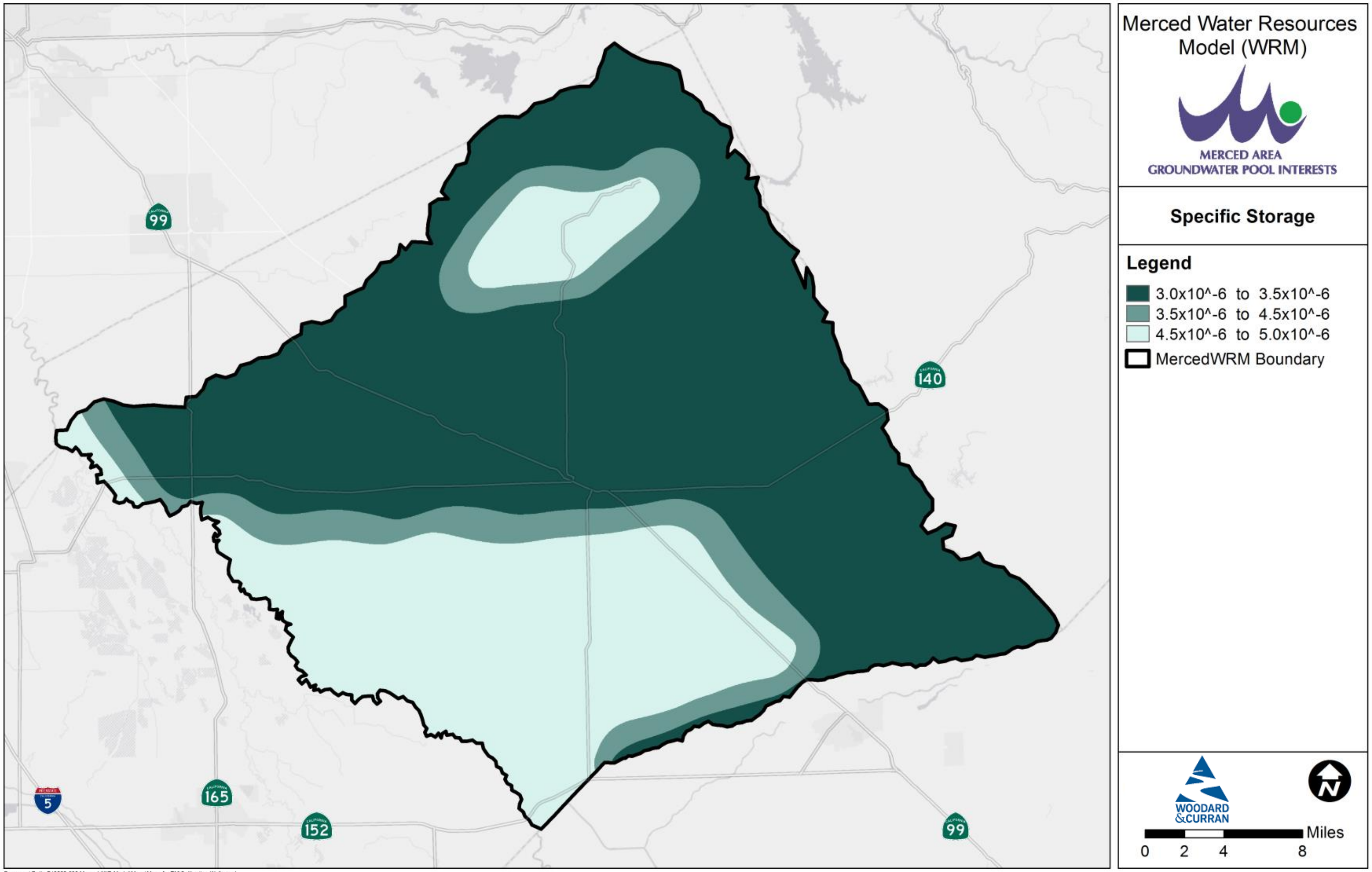


Figure 87: Aquifer Parameters - Specific Storage

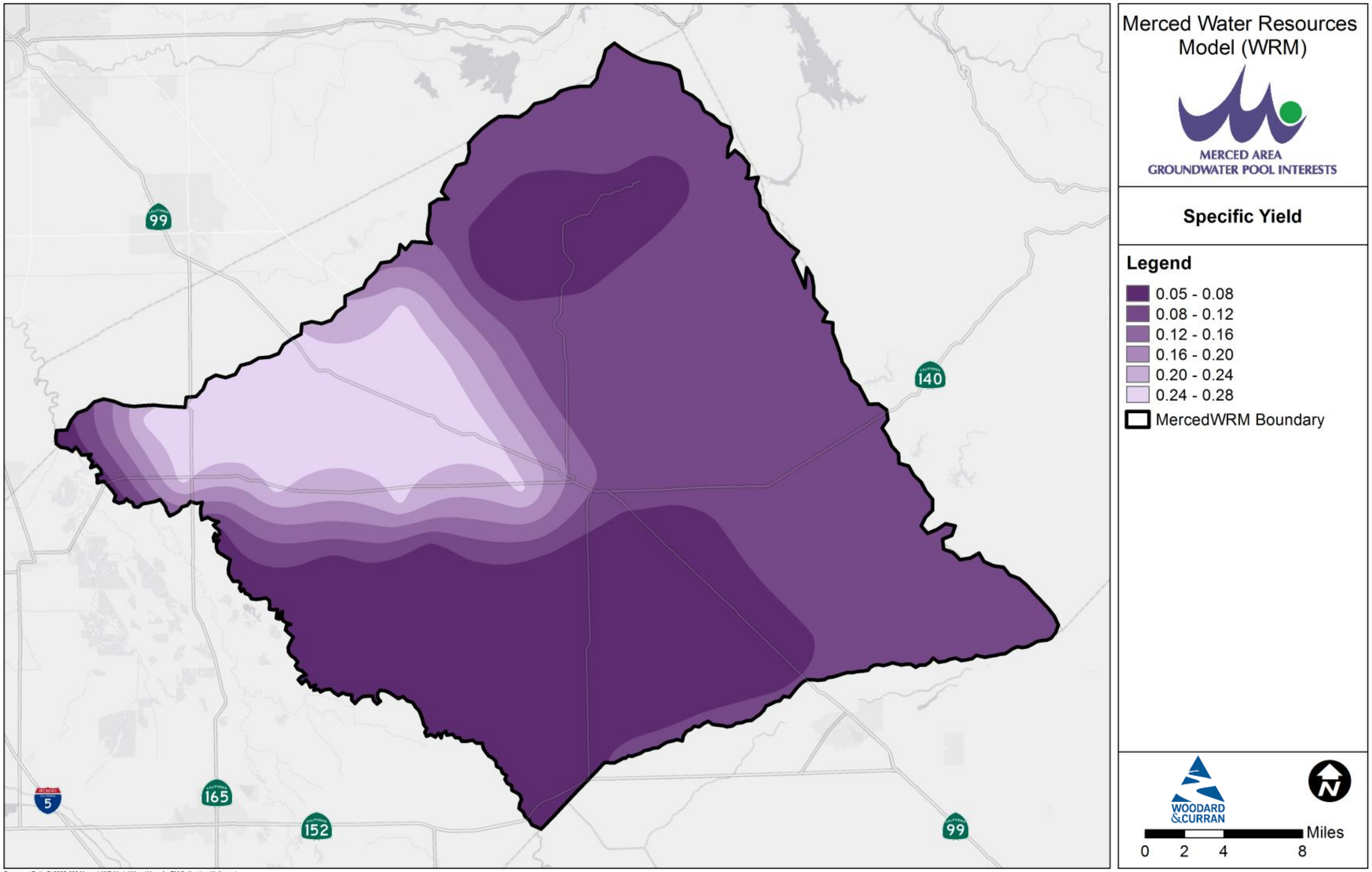


Figure 88: Aquifer Parameters - Specific Yield

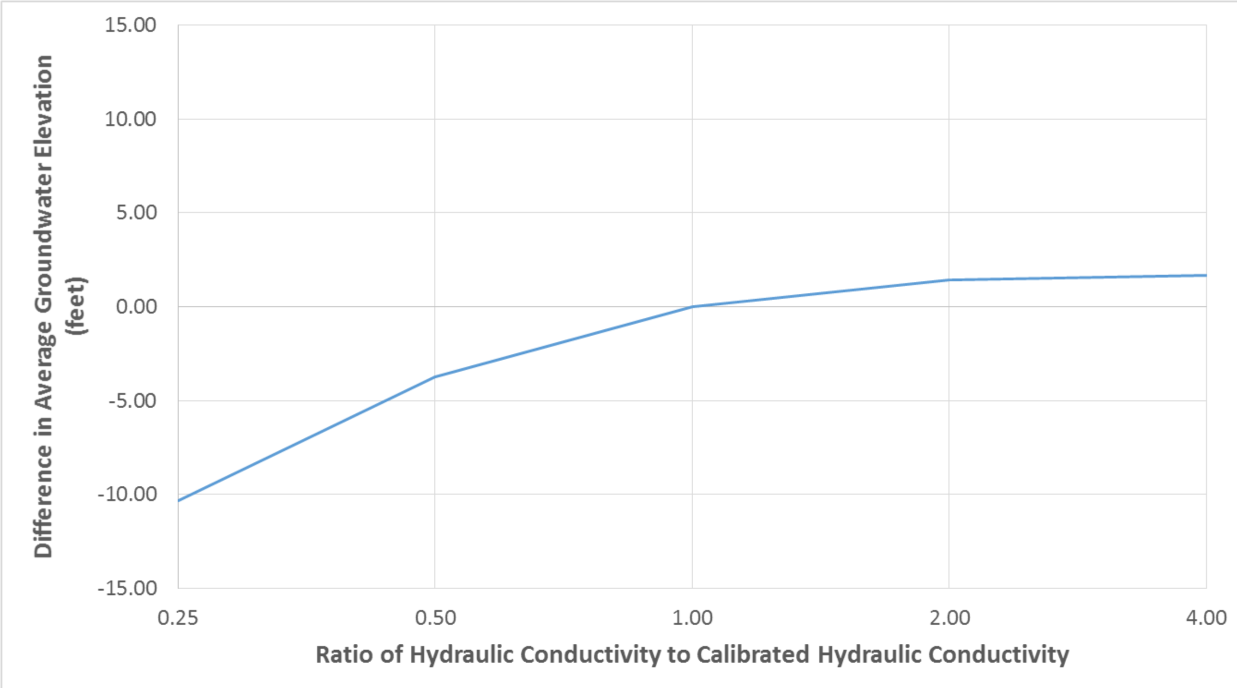


Figure 89: Sensitivity Analysis of Hydraulic Conductivity - Difference in Average Groundwater Elevation (feet)

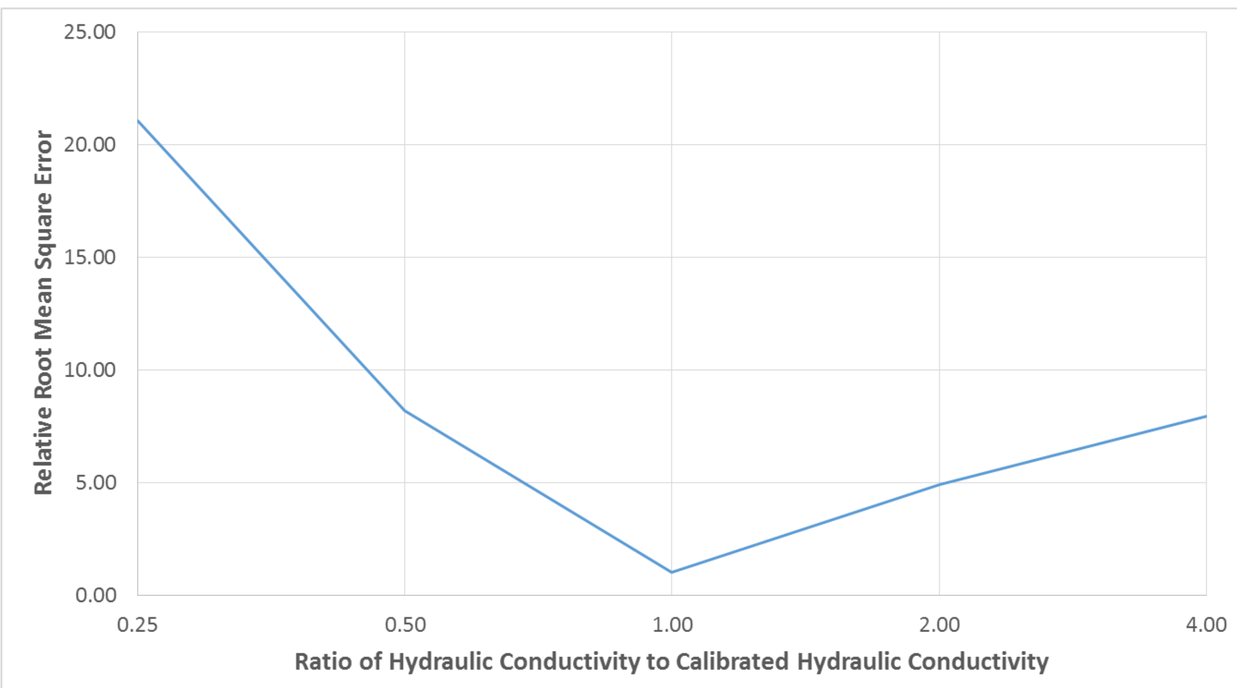


Figure 90: Sensitivity Analysis of Hydraulic Conductivity - Relative Root Mean Square Error

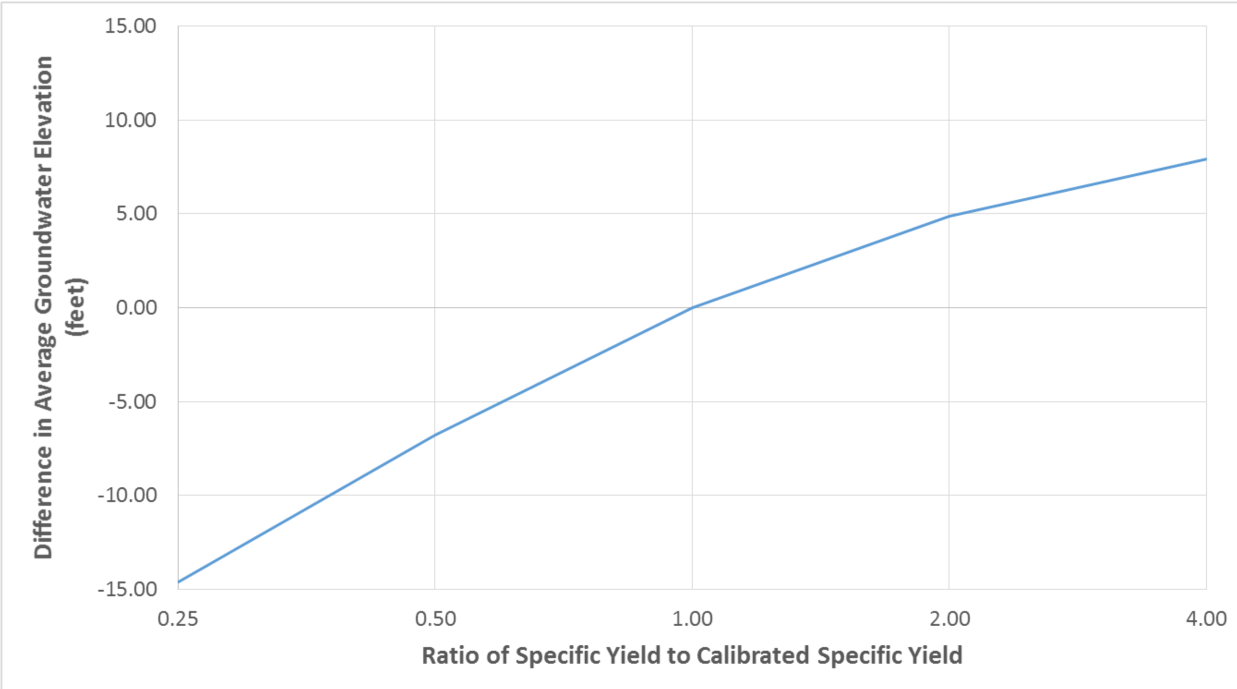


Figure 91: Sensitivity Analysis of Specific Yield - Difference in Average Groundwater Elevation (feet)

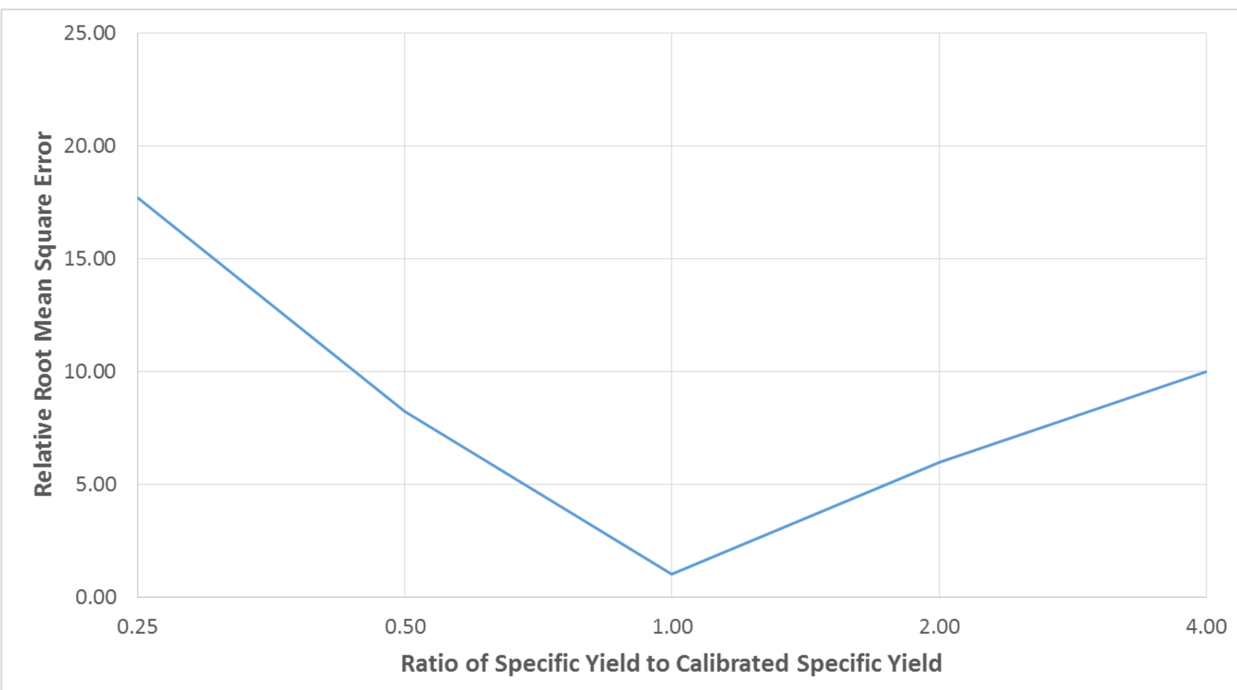


Figure 92: Sensitivity Analysis of Specific Yield - Relative Root Mean Square Error

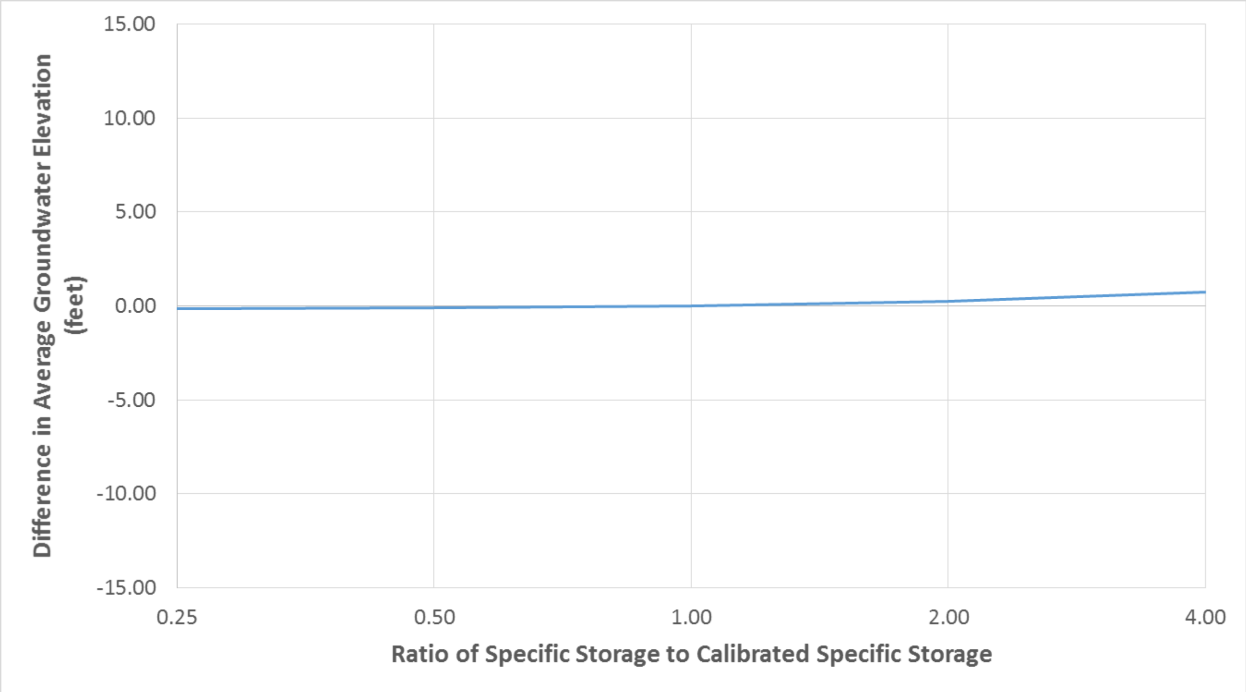


Figure 93: Sensitivity Analysis of Specific Storage - Difference in Average Groundwater Elevation (feet)

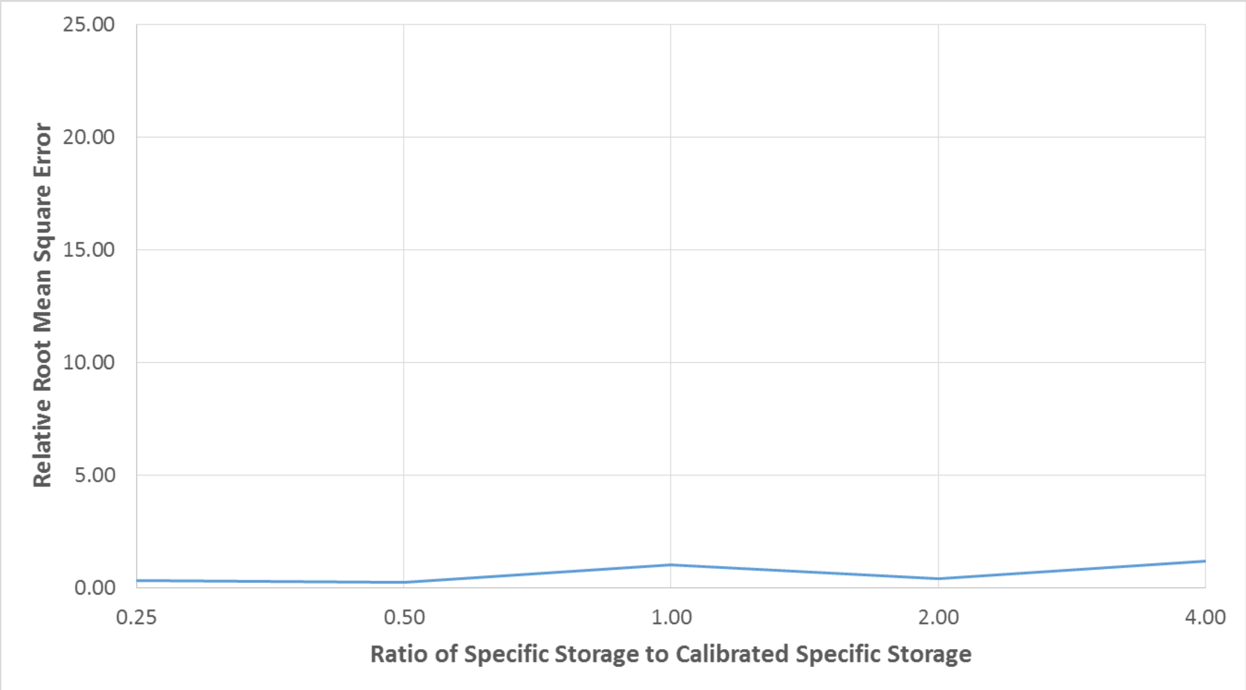


Figure 94: Sensitivity Analysis of Specific Storage - Relative Root Mean Square Error

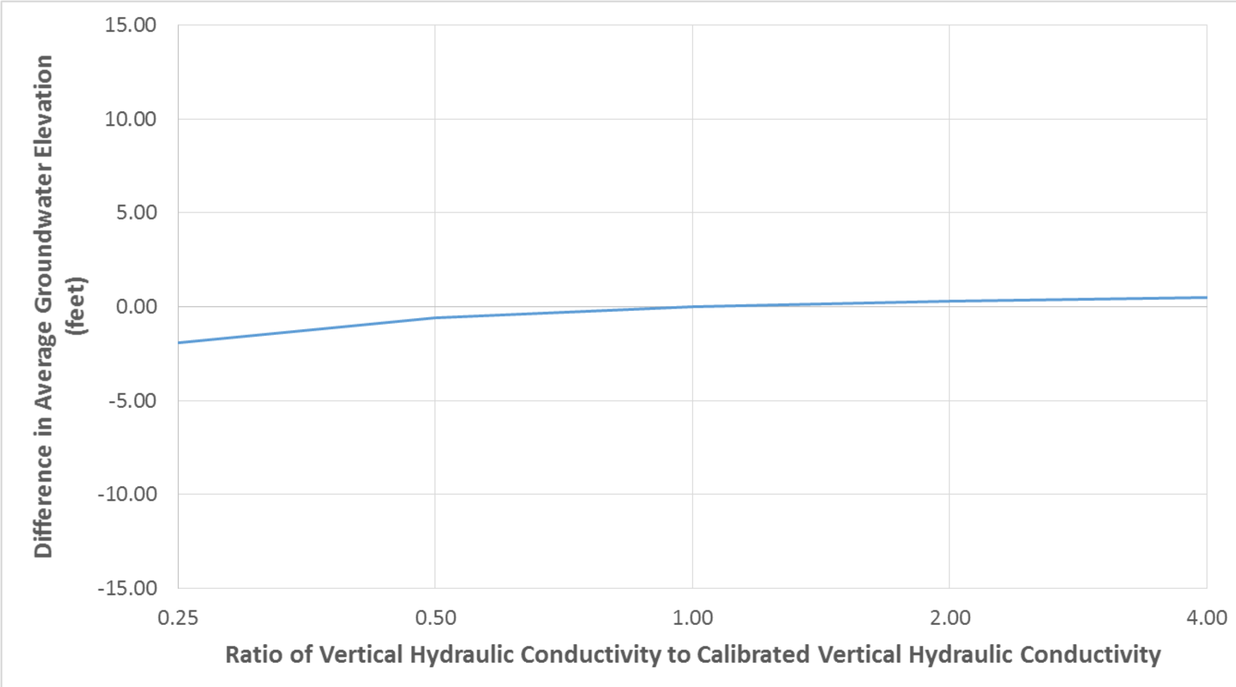


Figure 95: Sensitivity Analysis of Vertical Hydraulic Conductivity of the Corcoran Clay - Difference in Average Groundwater Elevation (feet)

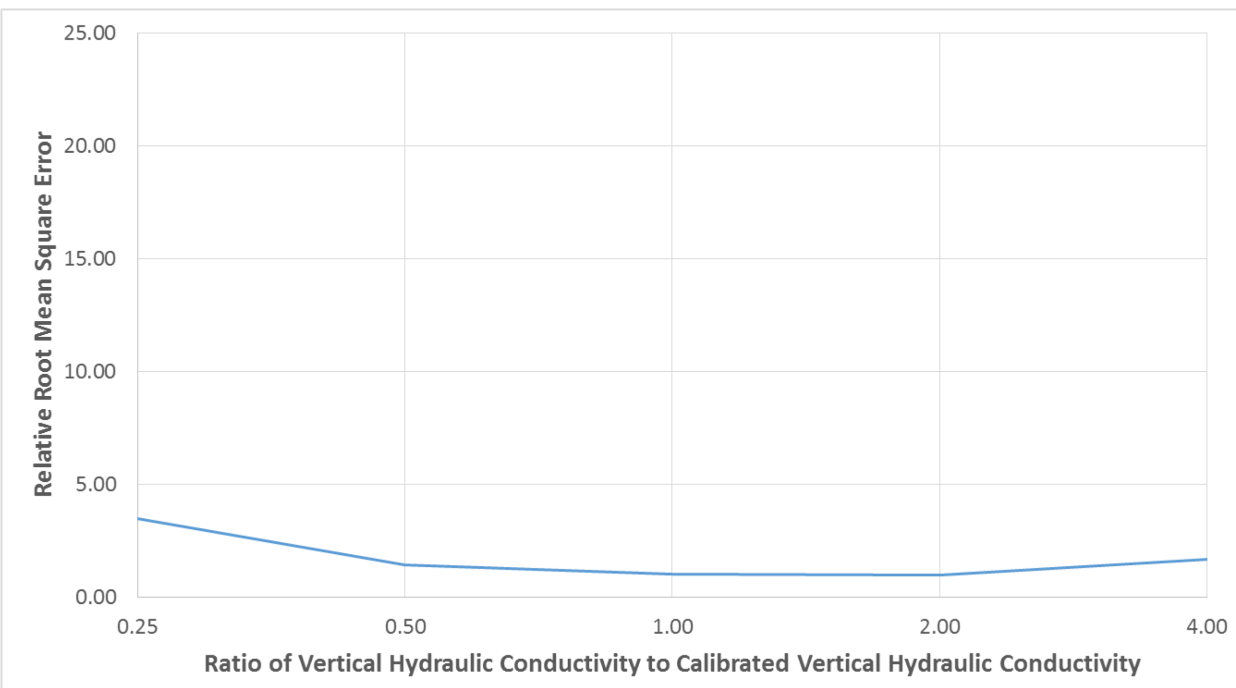


Figure 96: Sensitivity Analysis Vertical Hydraulic Conductivity of the Corcoran Clay - Relative Root Mean Square Error

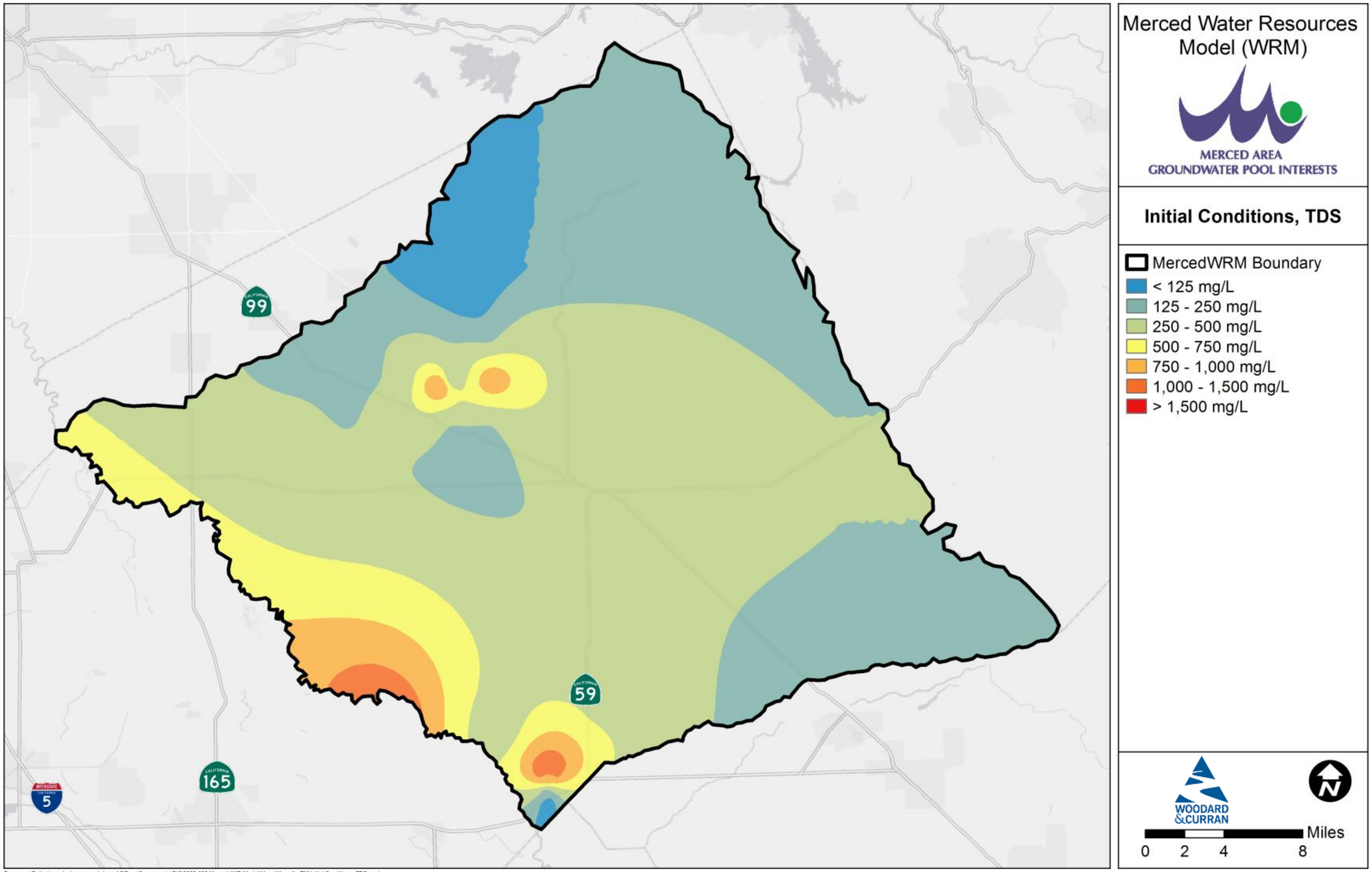


Figure 97: Initial Conditions, TDS

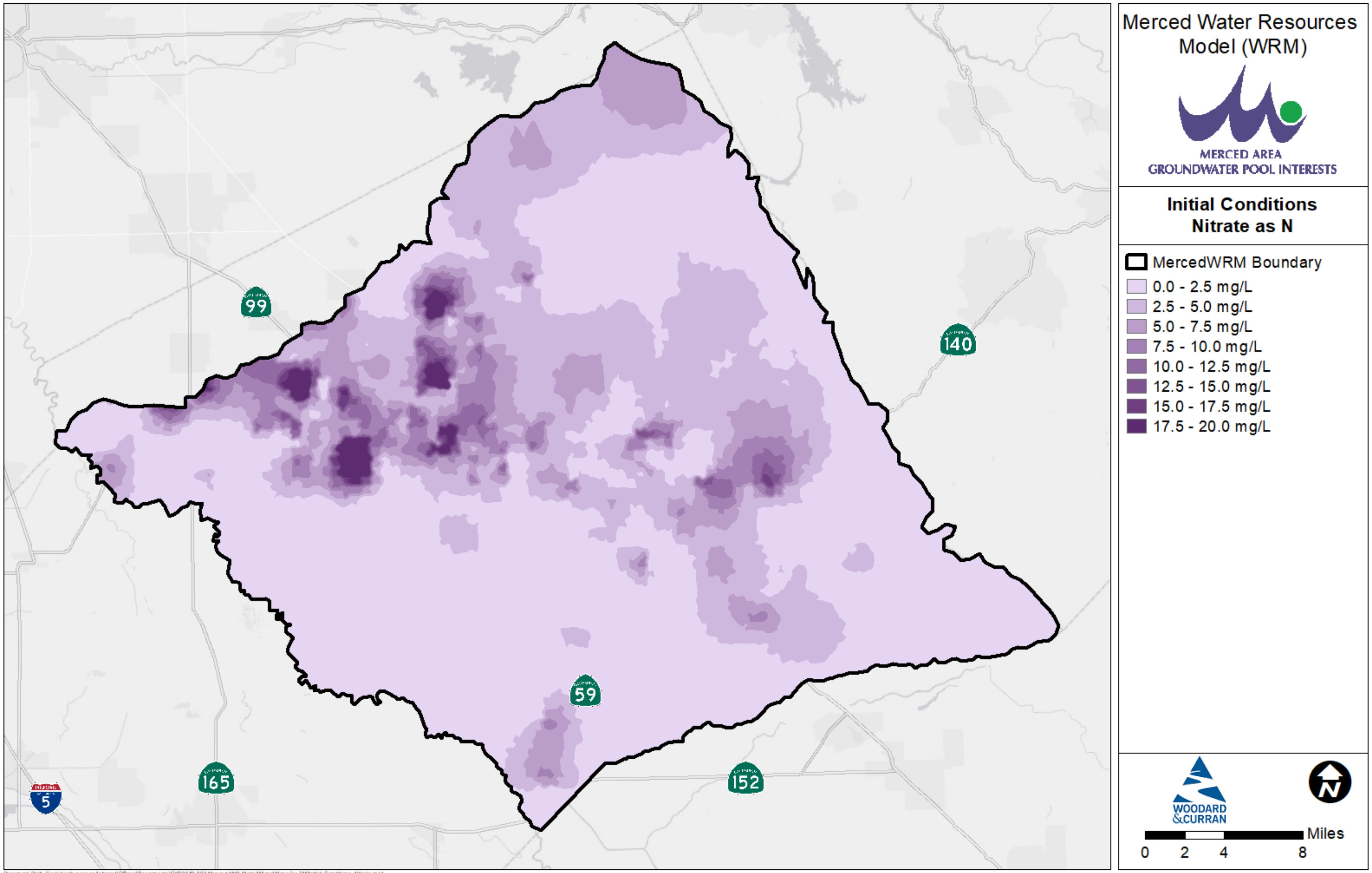


Figure 98: Initial Conditions, Nitrate as N

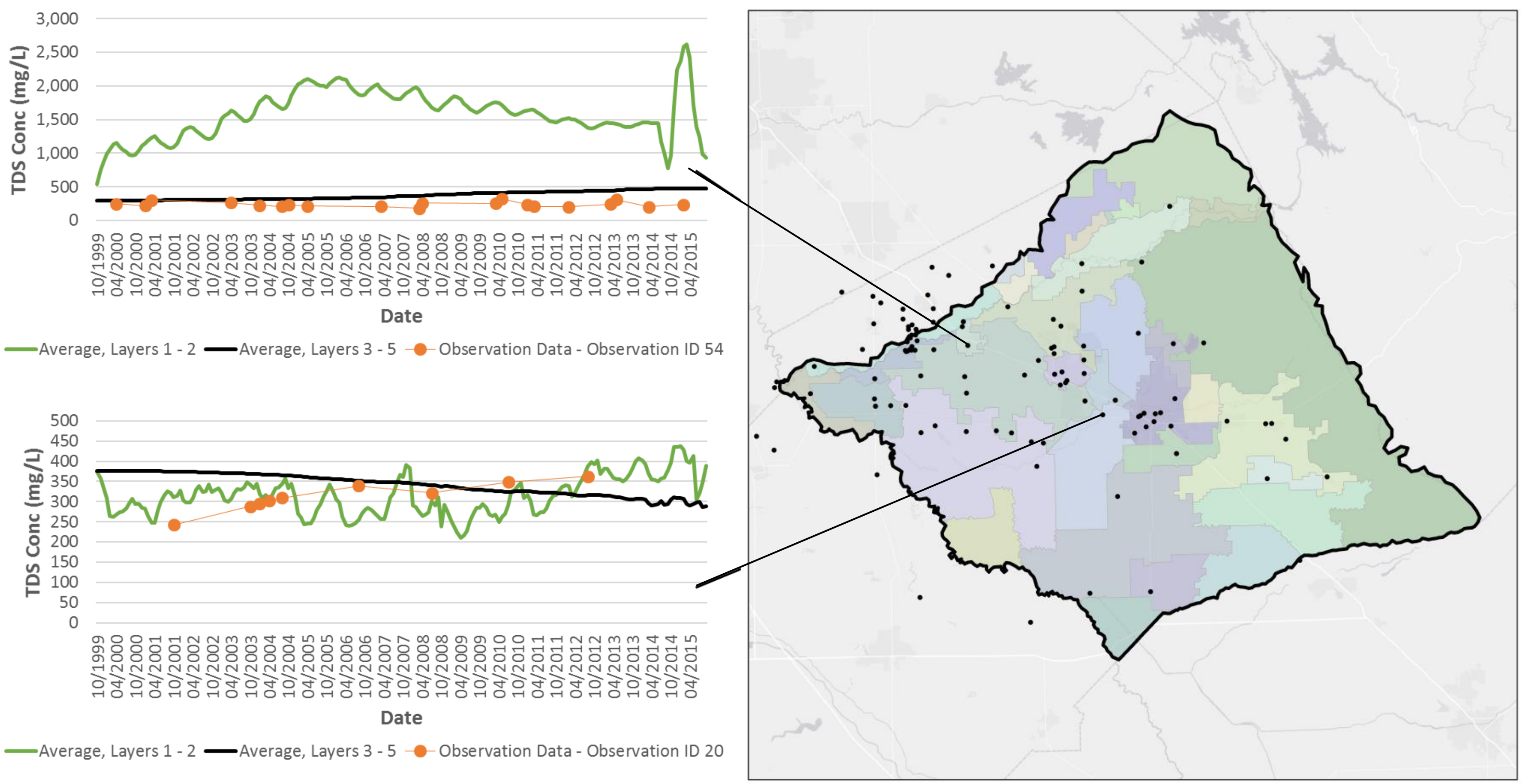


Figure 99: Sample TDS Concentration

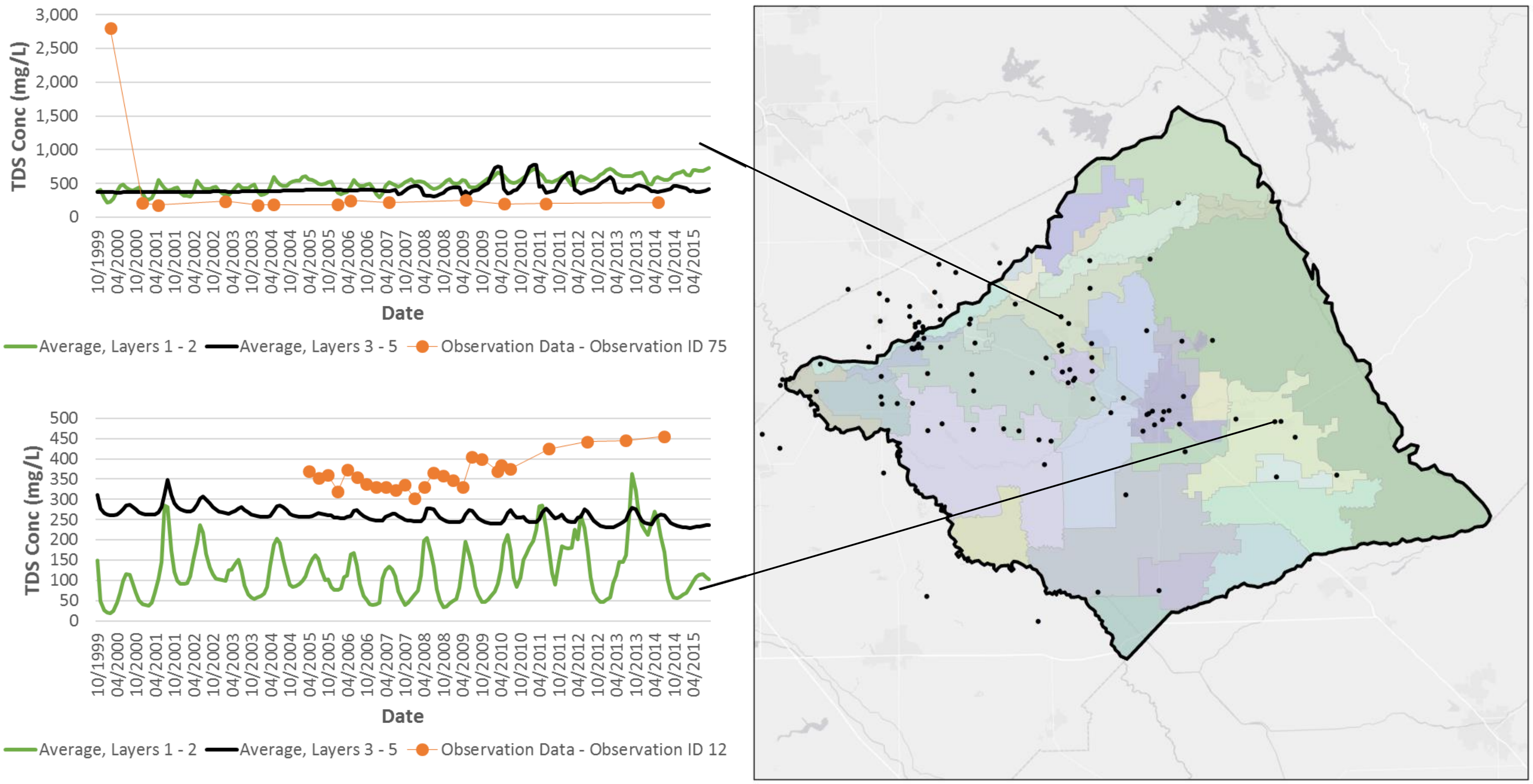


Figure 100: Sample TDS Concentration

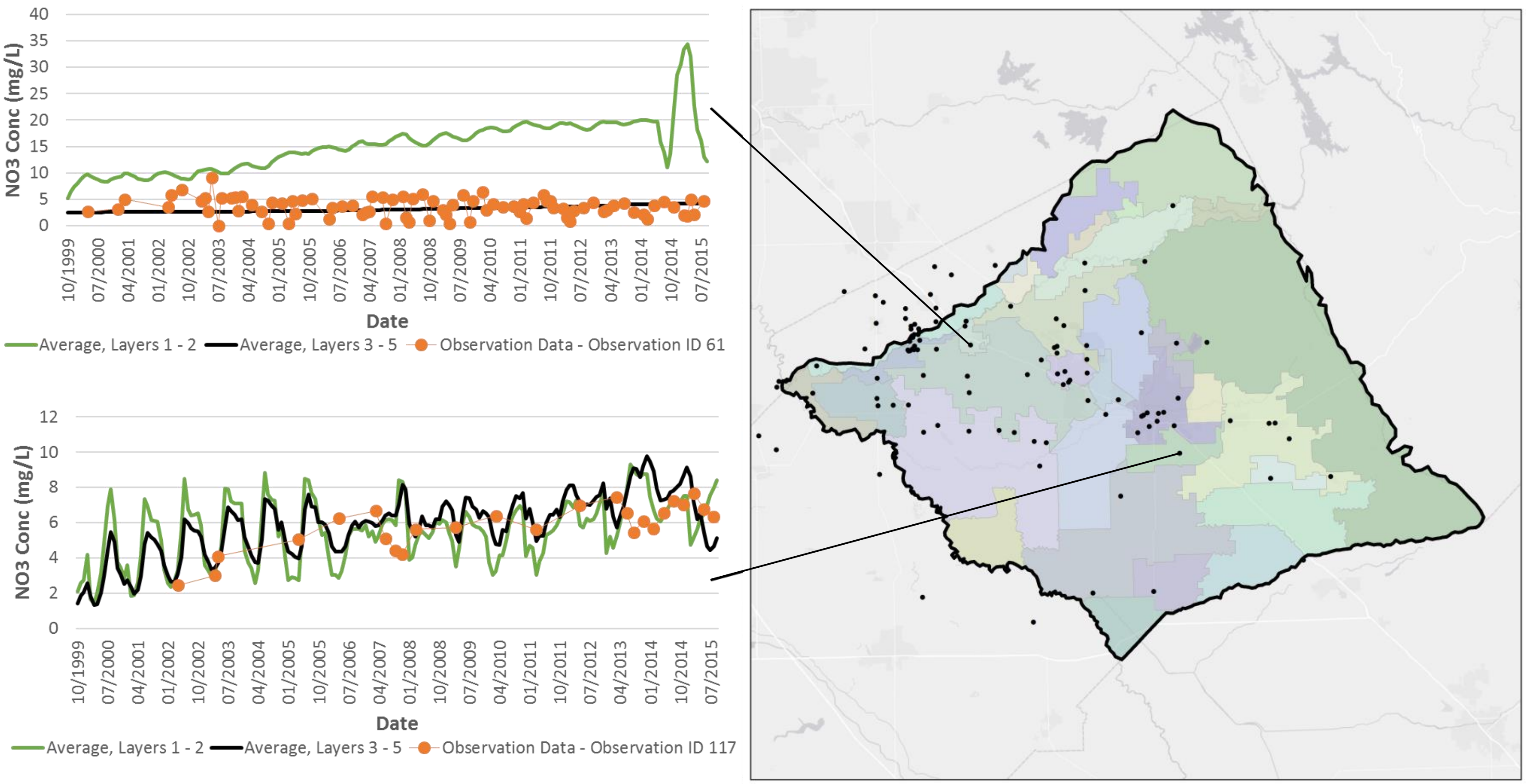


Figure 101: Sample Nitrate Concentration

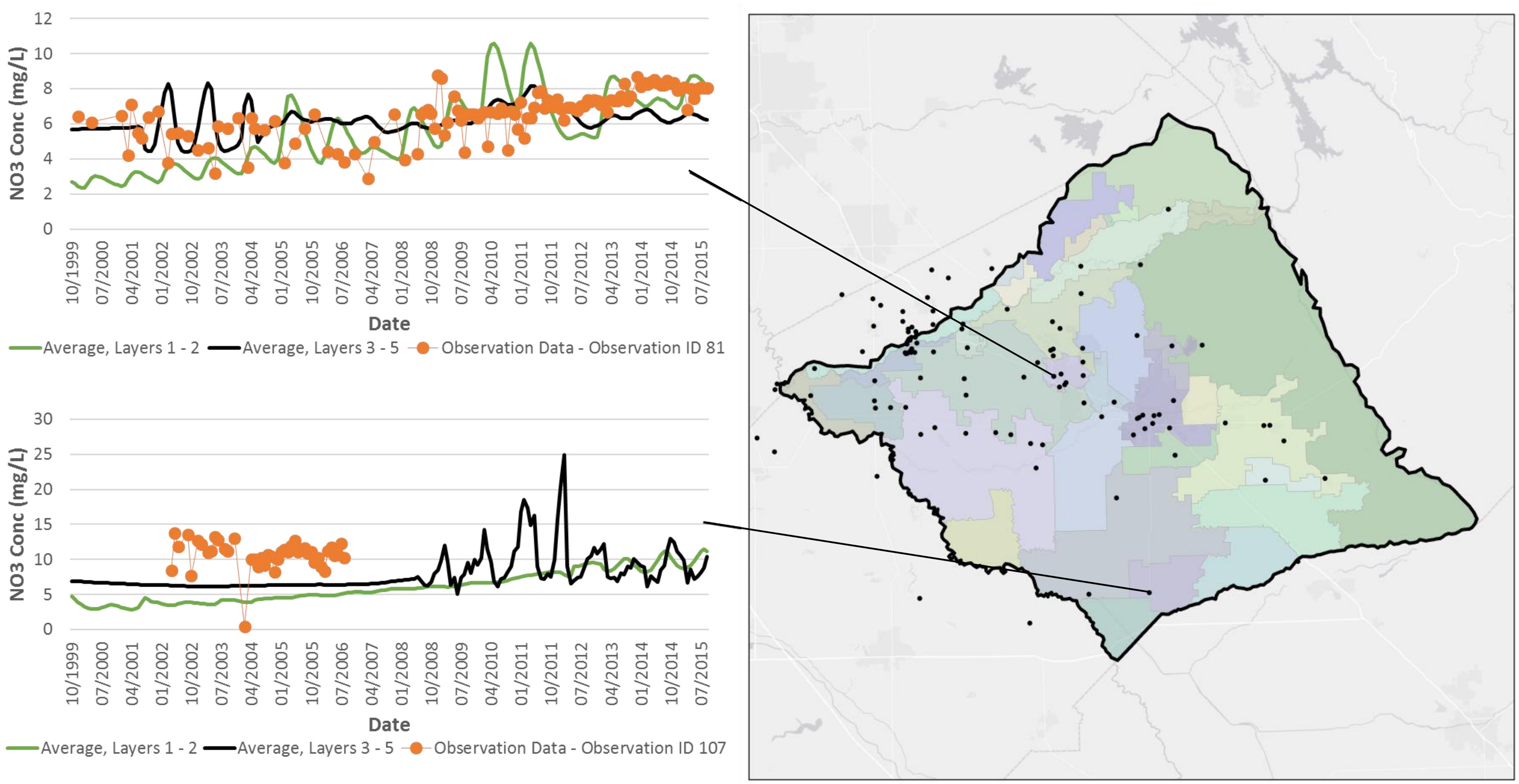
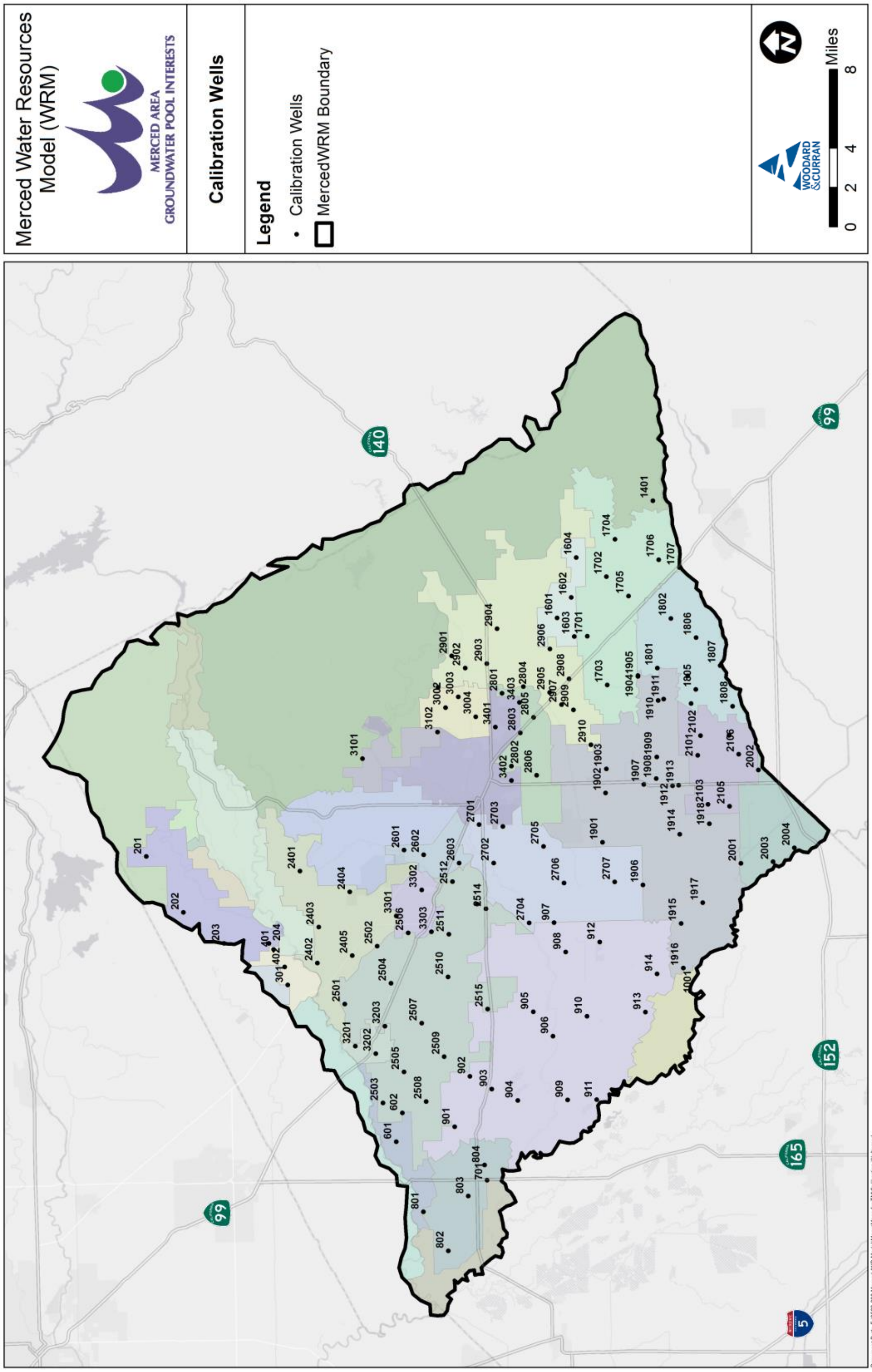


Figure 102: Sample Nitrate Concentration

Appendix A - Groundwater Hydrographs


Merced Water Resources Model (WRM)
MERCED AREA GROUNDWATER POOL INTERESTS
Calibration Wells
Legend
Calibration Wells
MercedWRM Boundary
WOODARD & CURRAN
0 2 4 8
Miles

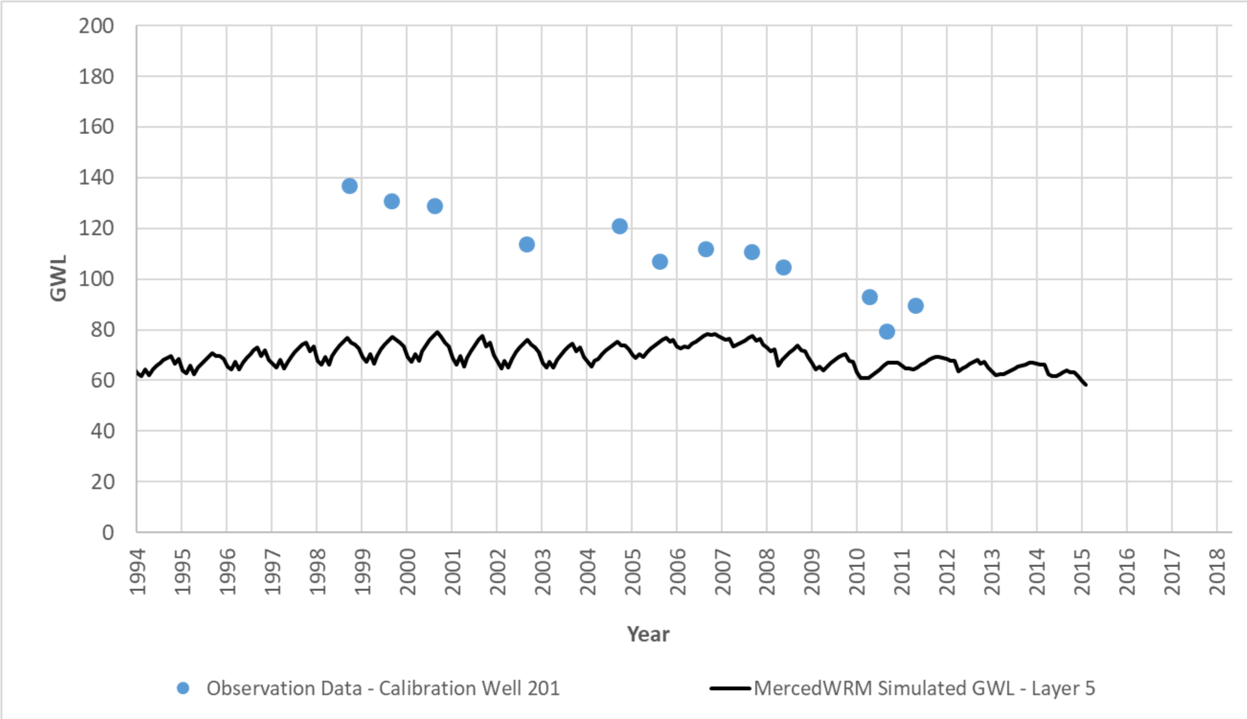


Figure A1: Calibration Well 201

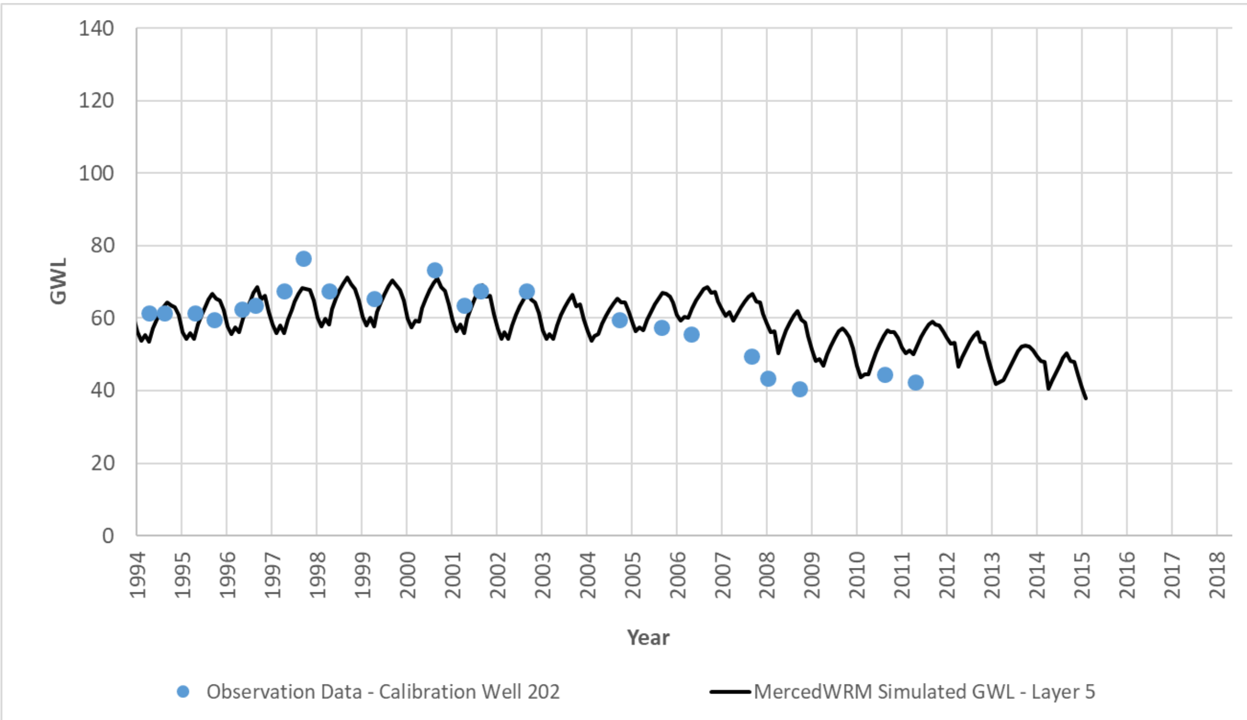


Figure A2: Calibration Well 202

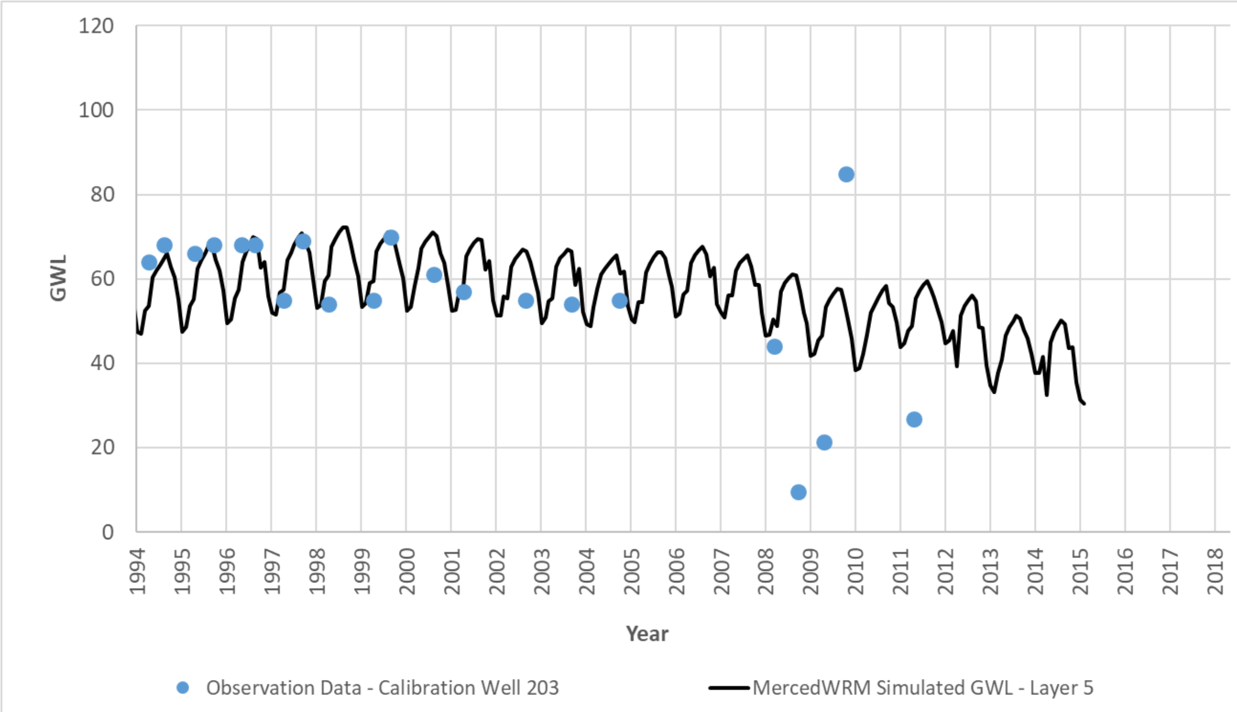


Figure A3: Calibration Well 203

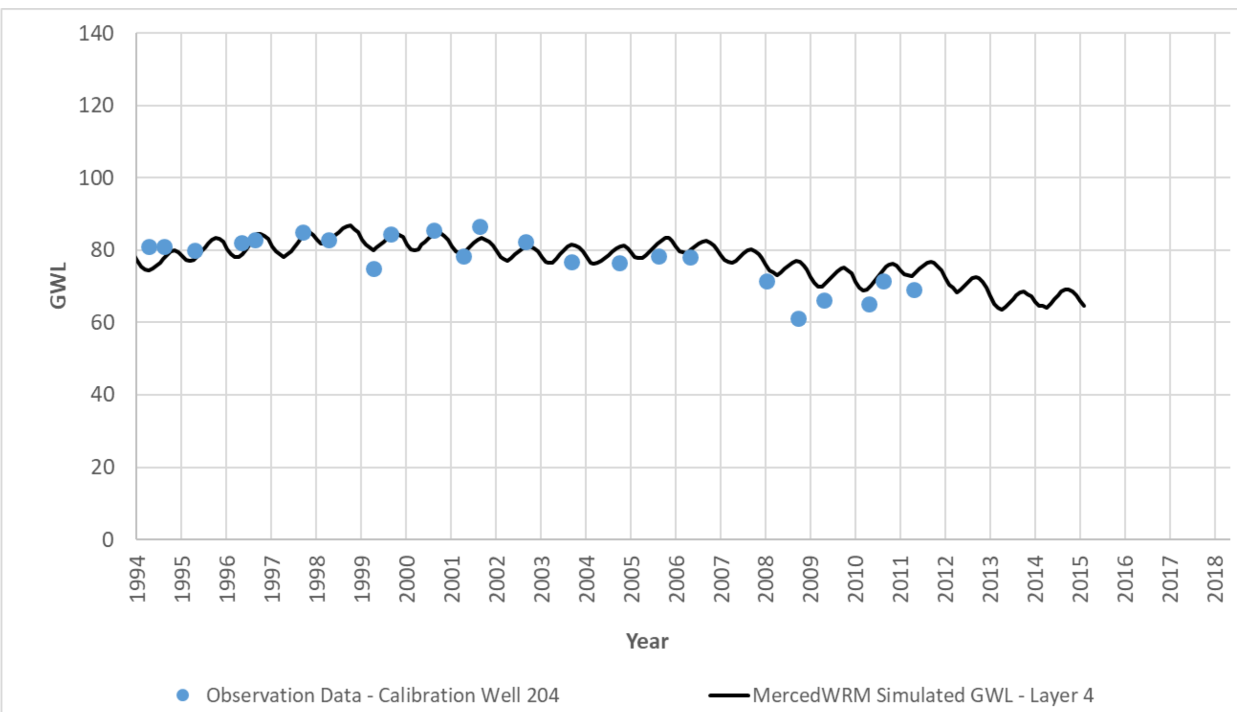


Figure A4: Calibration Well 204

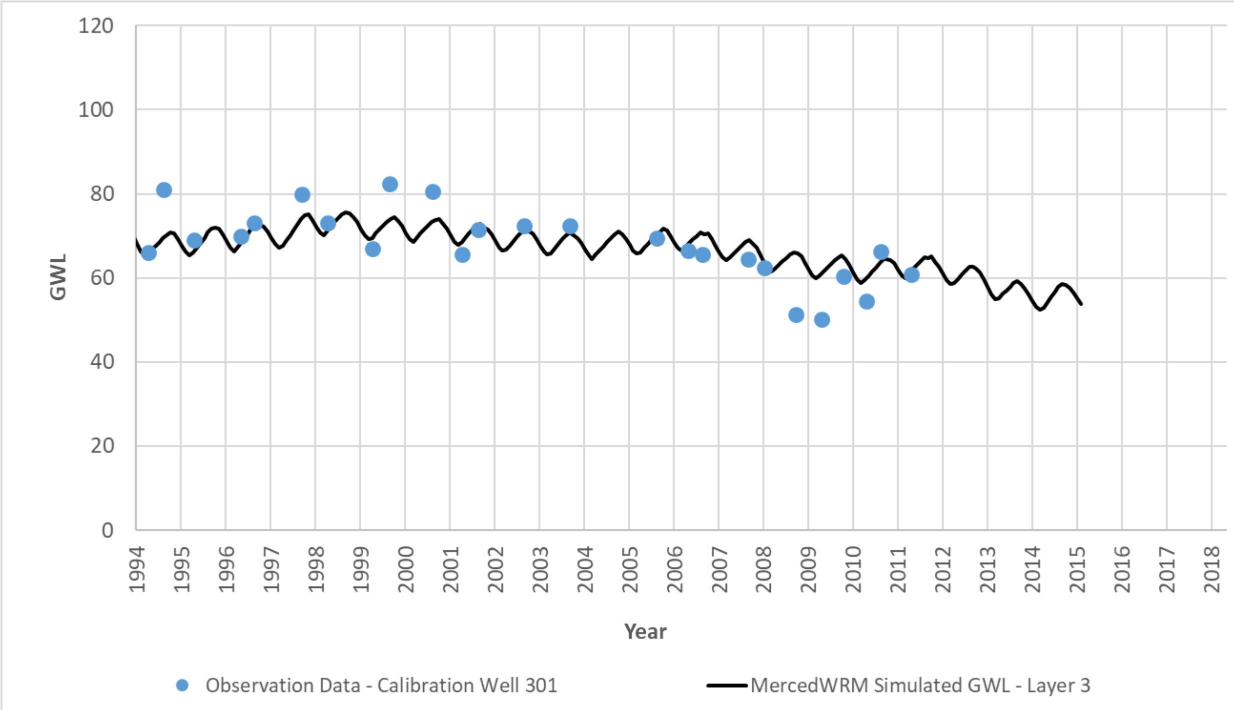


Figure A5: Calibration Well 301

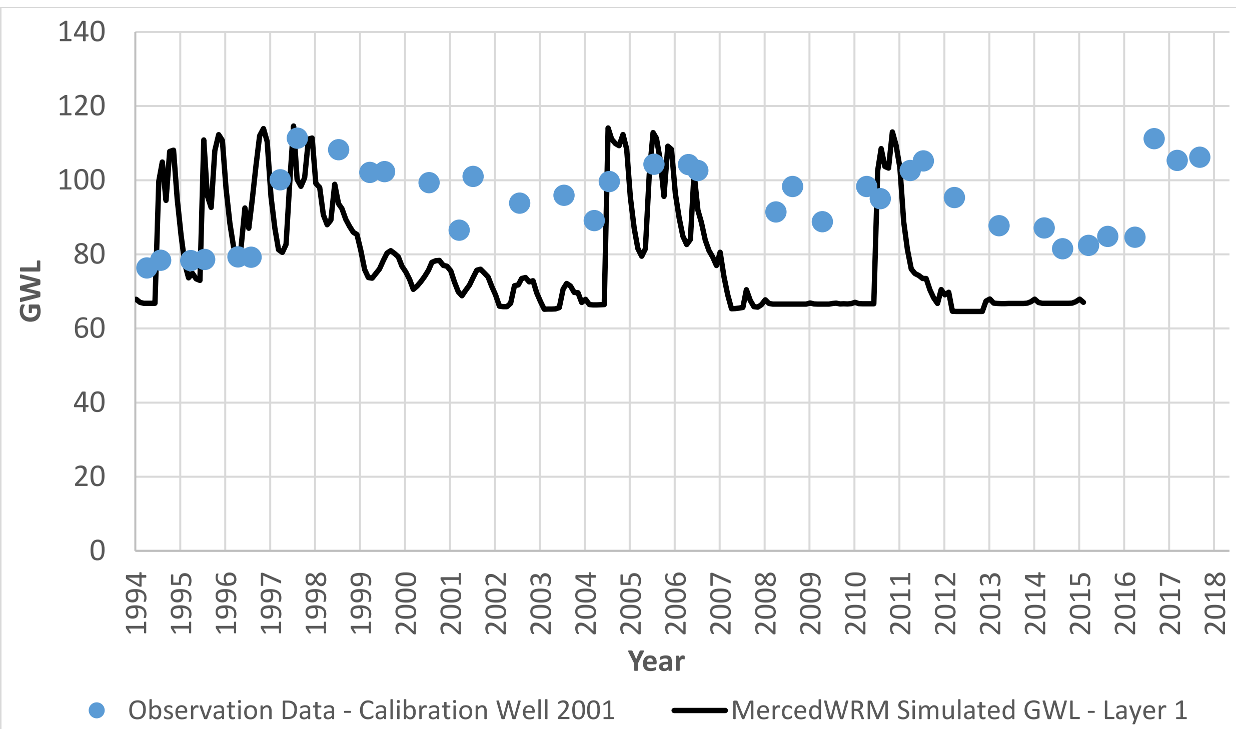


Figure A 6: Calibration Well 401

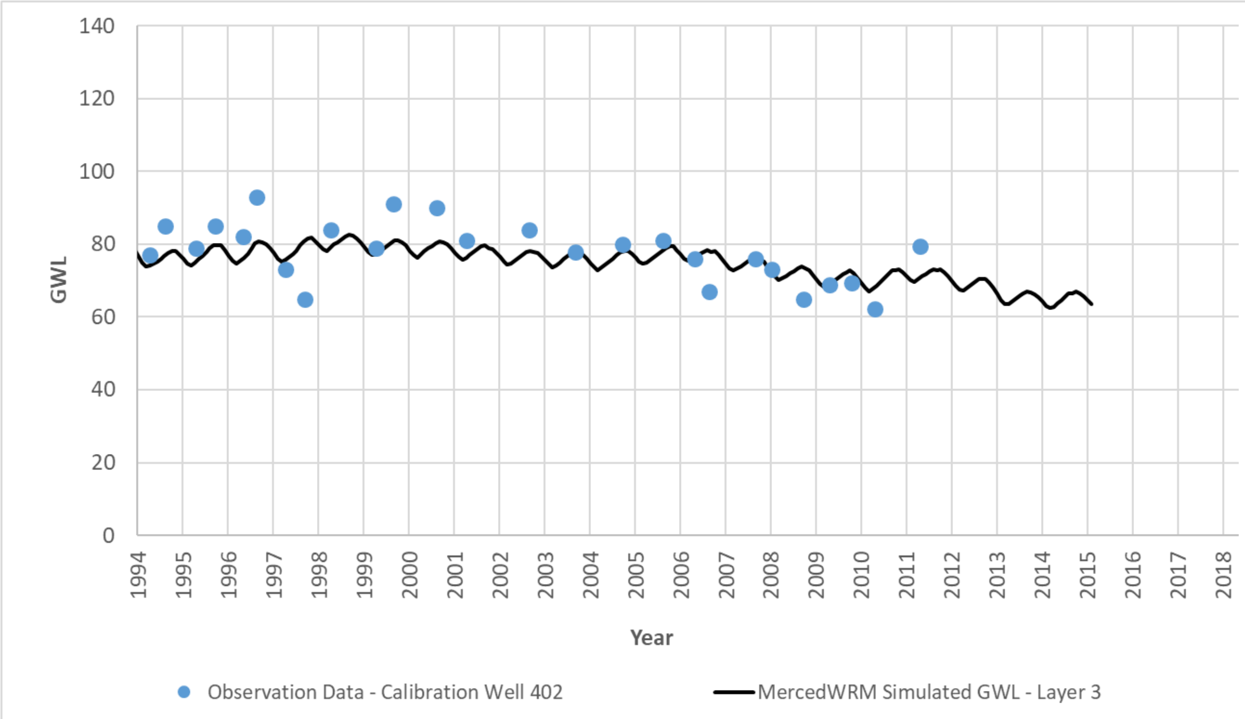


Figure A 7: Calibration Well 402

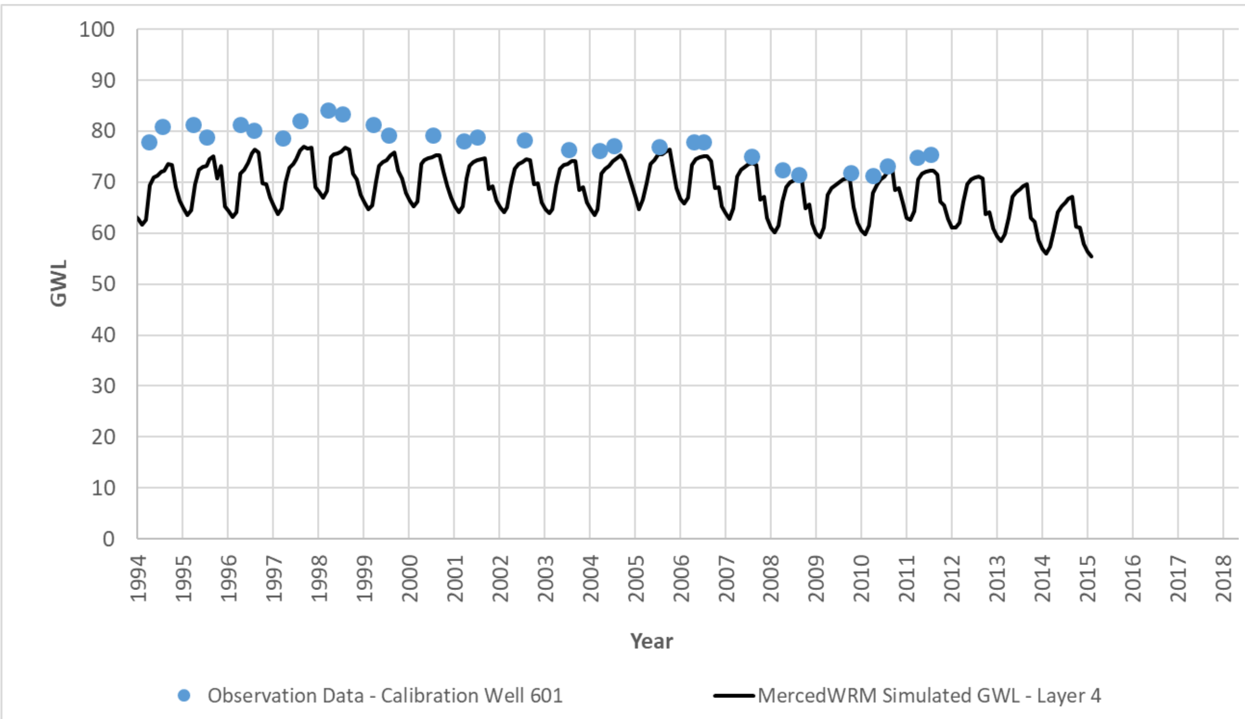


Figure A 8: Calibration Well 601

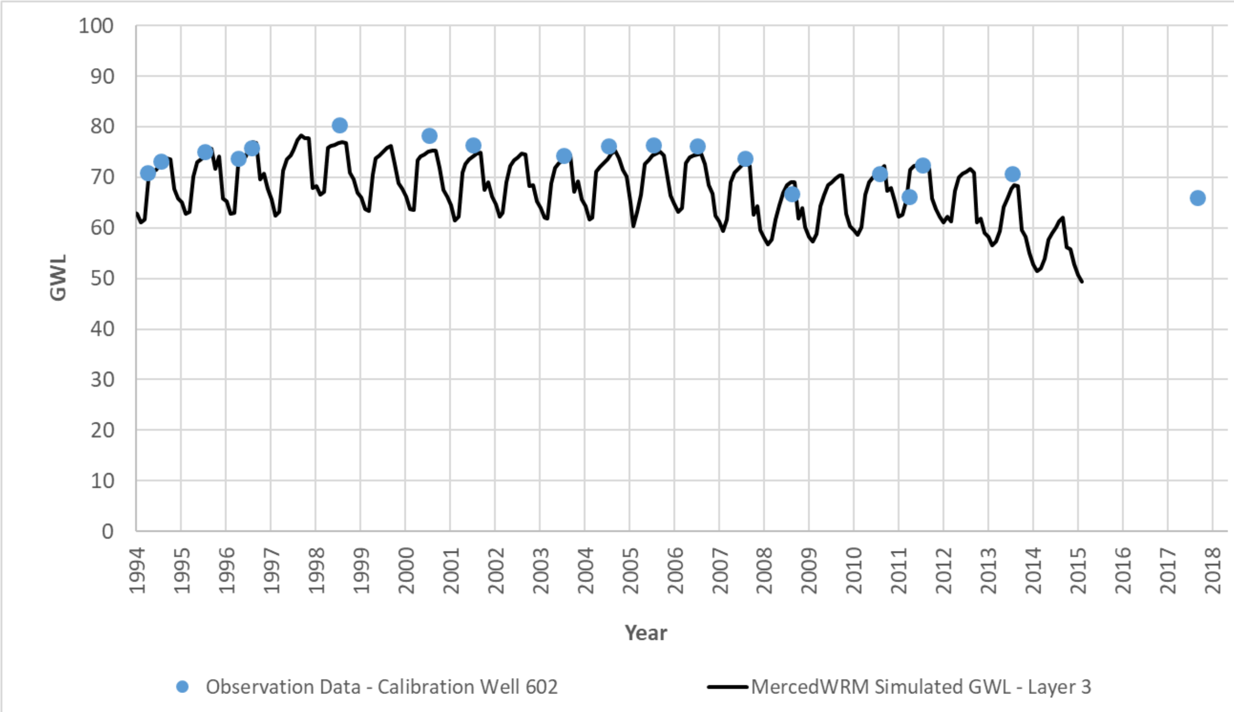


Figure A 9: Calibration Well 602

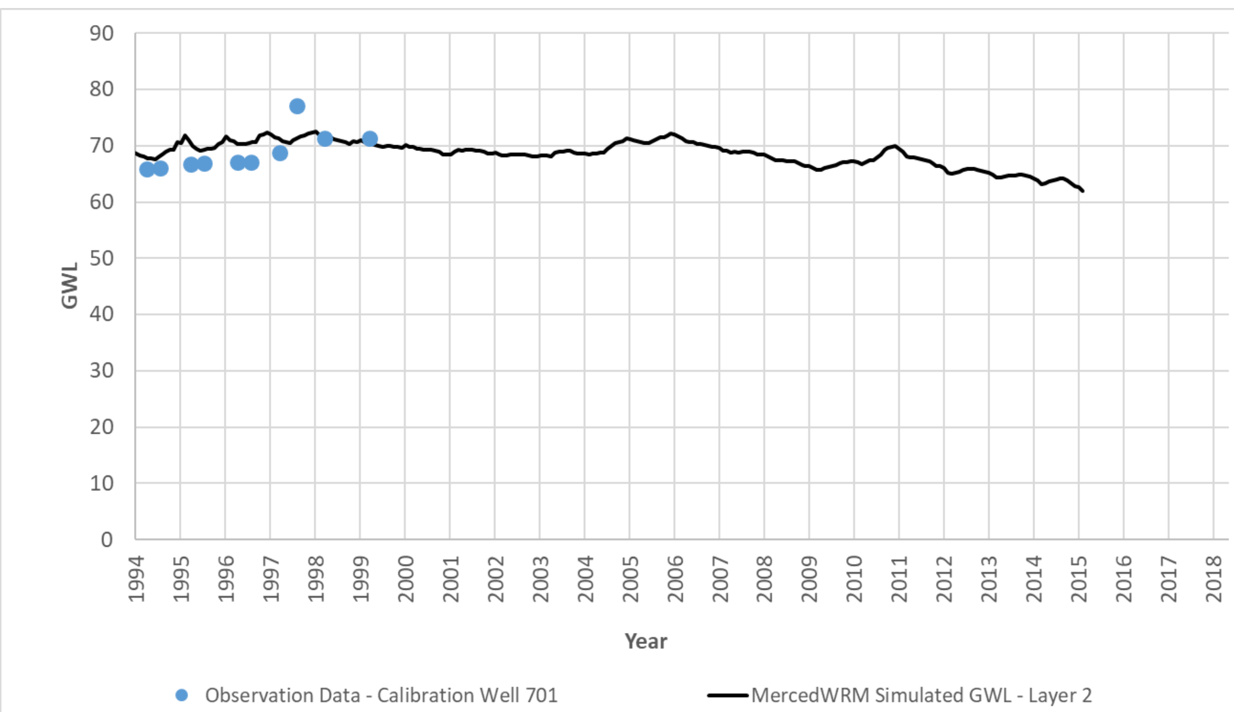


Figure A 10: Calibration Well 701

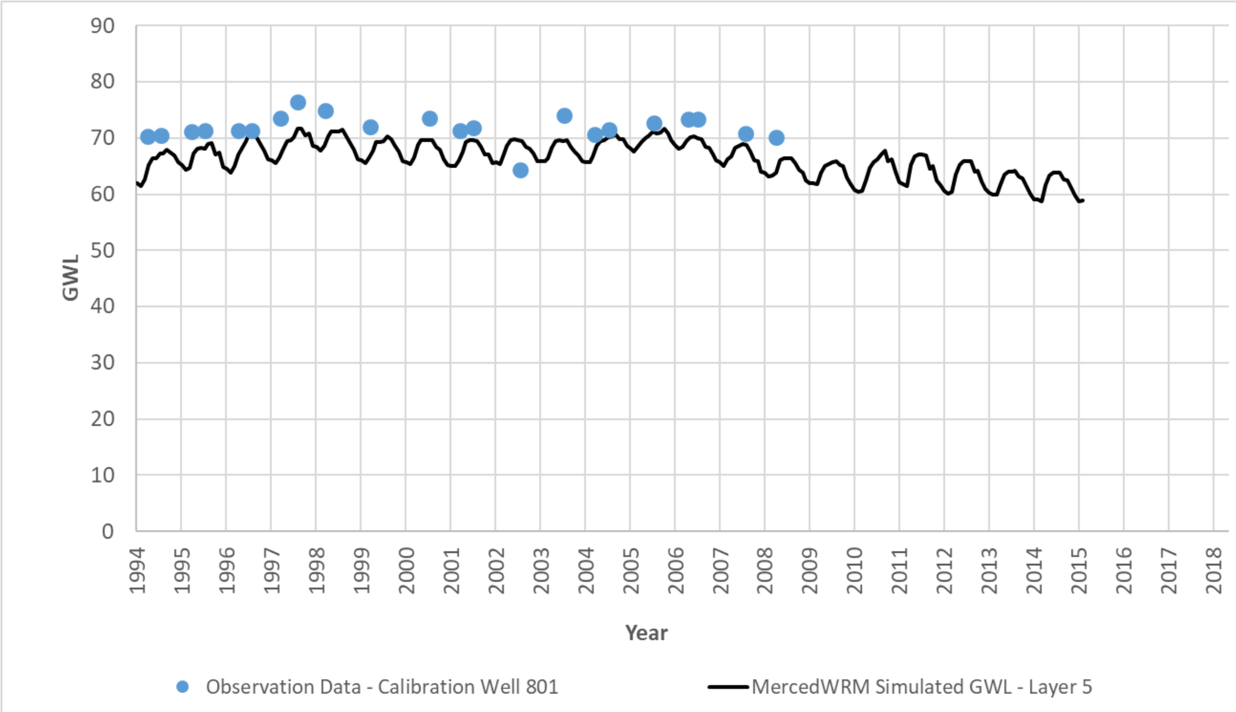


Figure A 11: Calibration Well 801

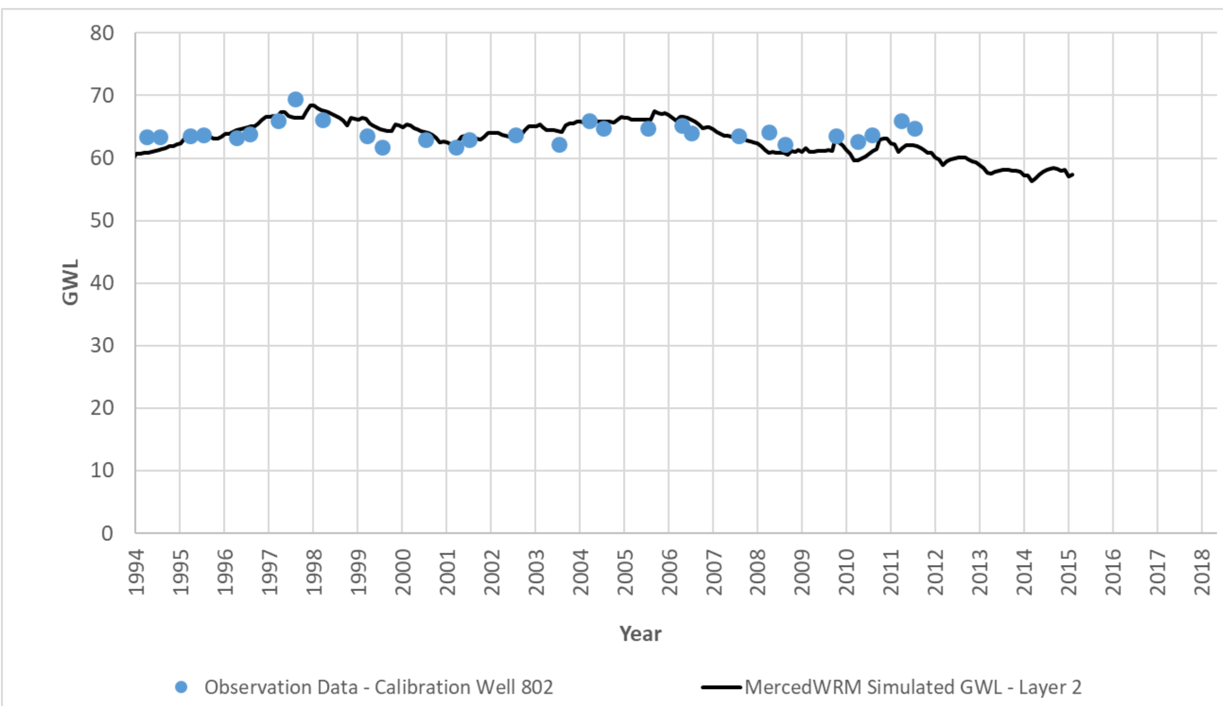


Figure A 12: Calibration Well 802

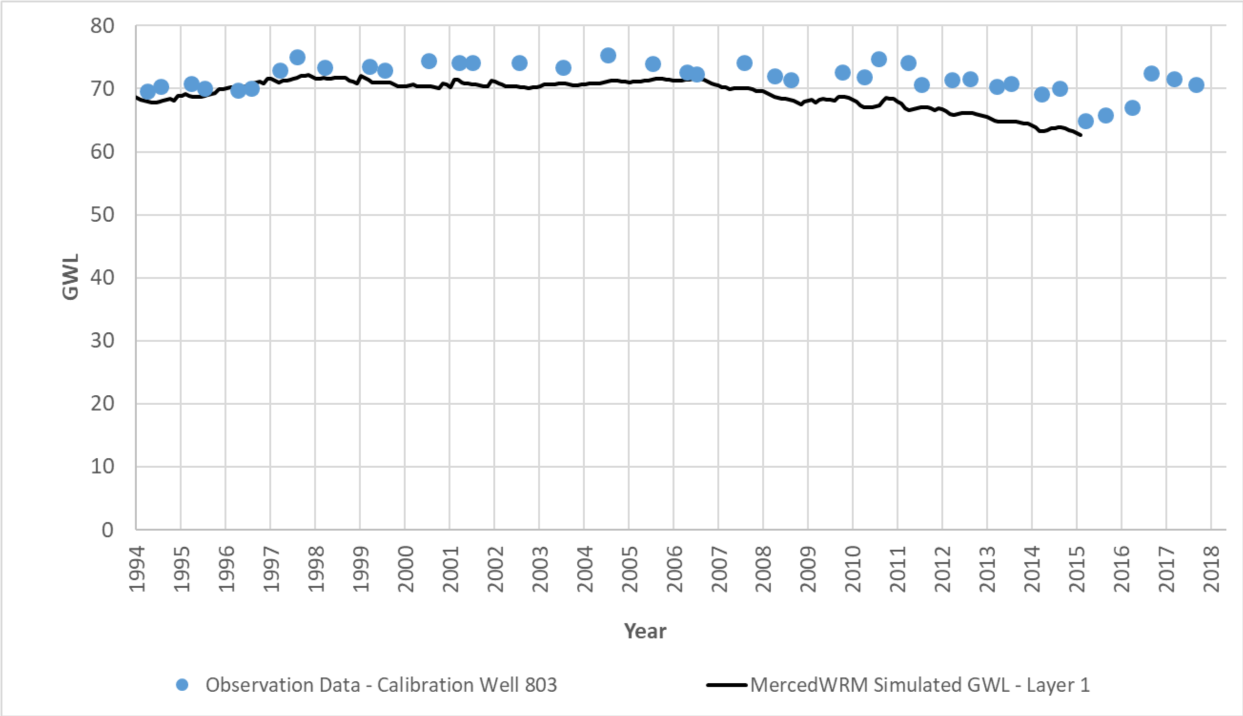


Figure A 13: Calibration Well 803

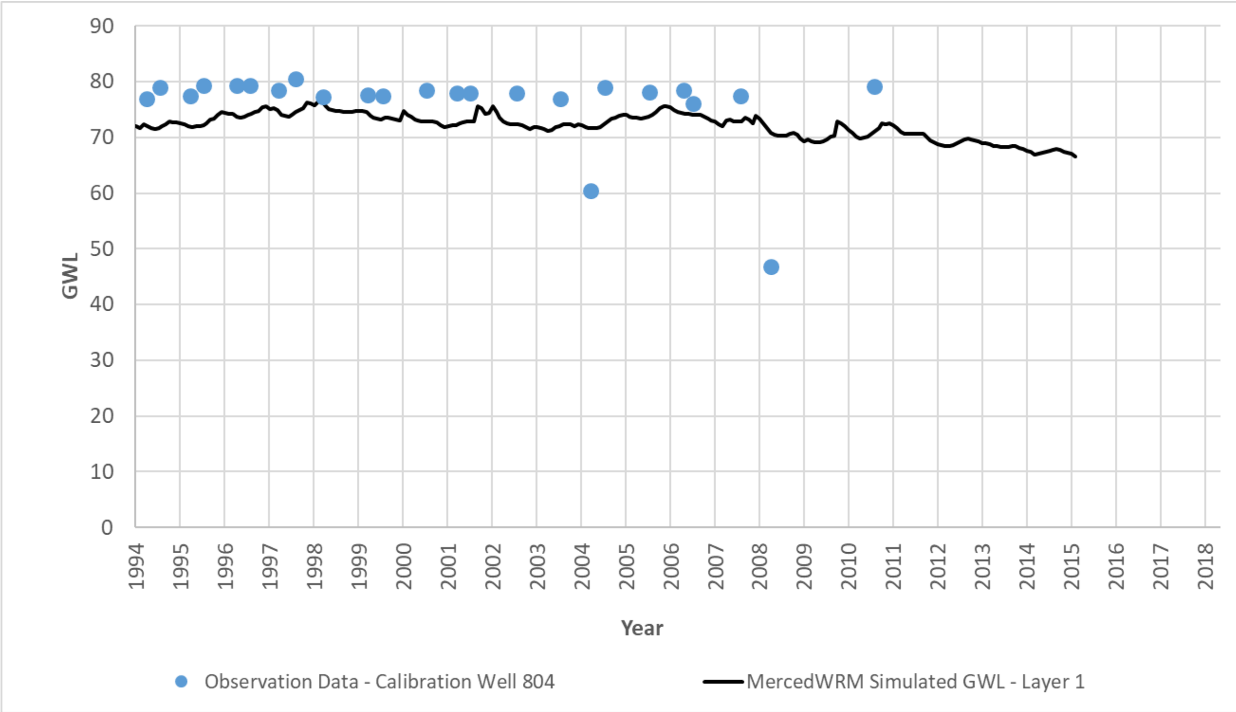


Figure A 14: Calibration Well 804

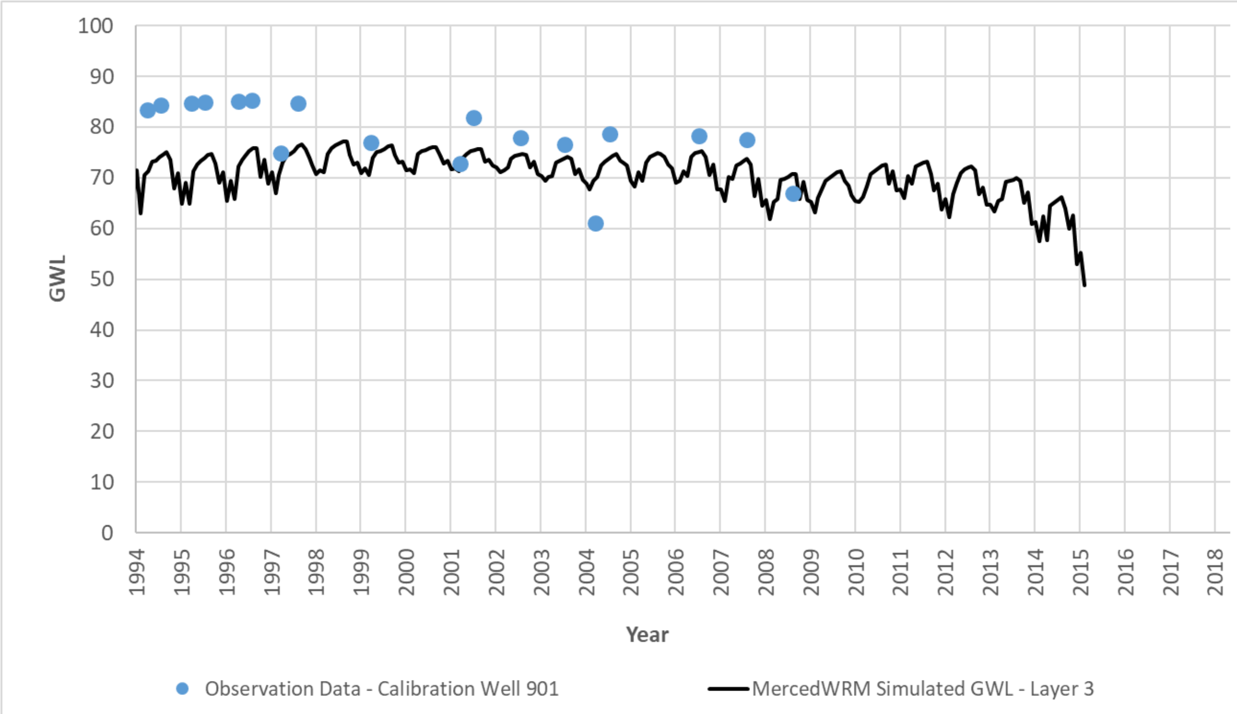


Figure A 15: Calibration Well 901

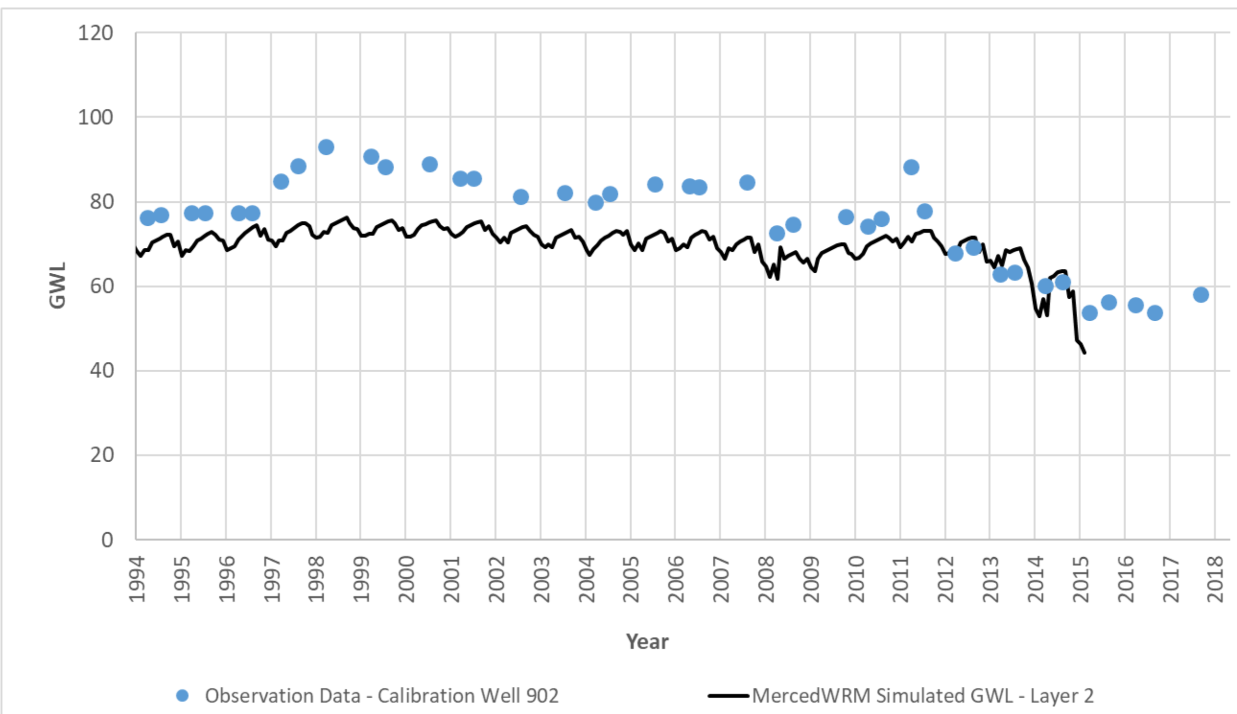


Figure A 16: Calibration Well 902

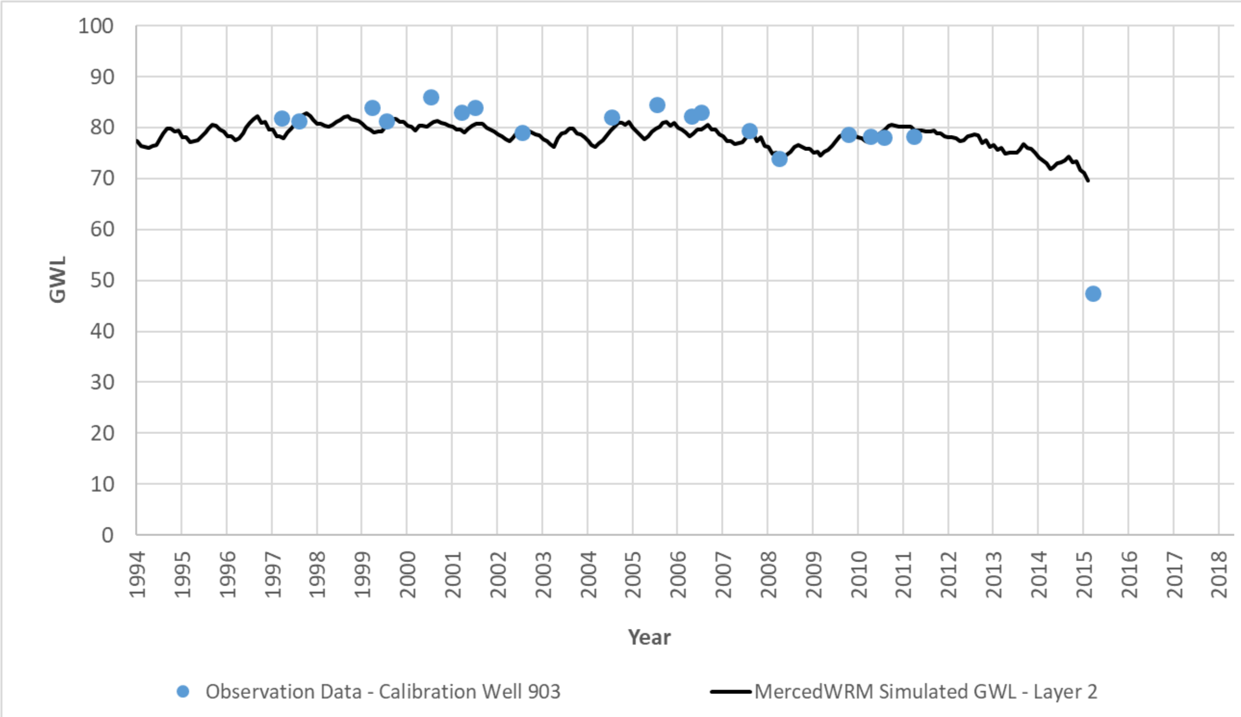


Figure A 17: Calibration Well 903

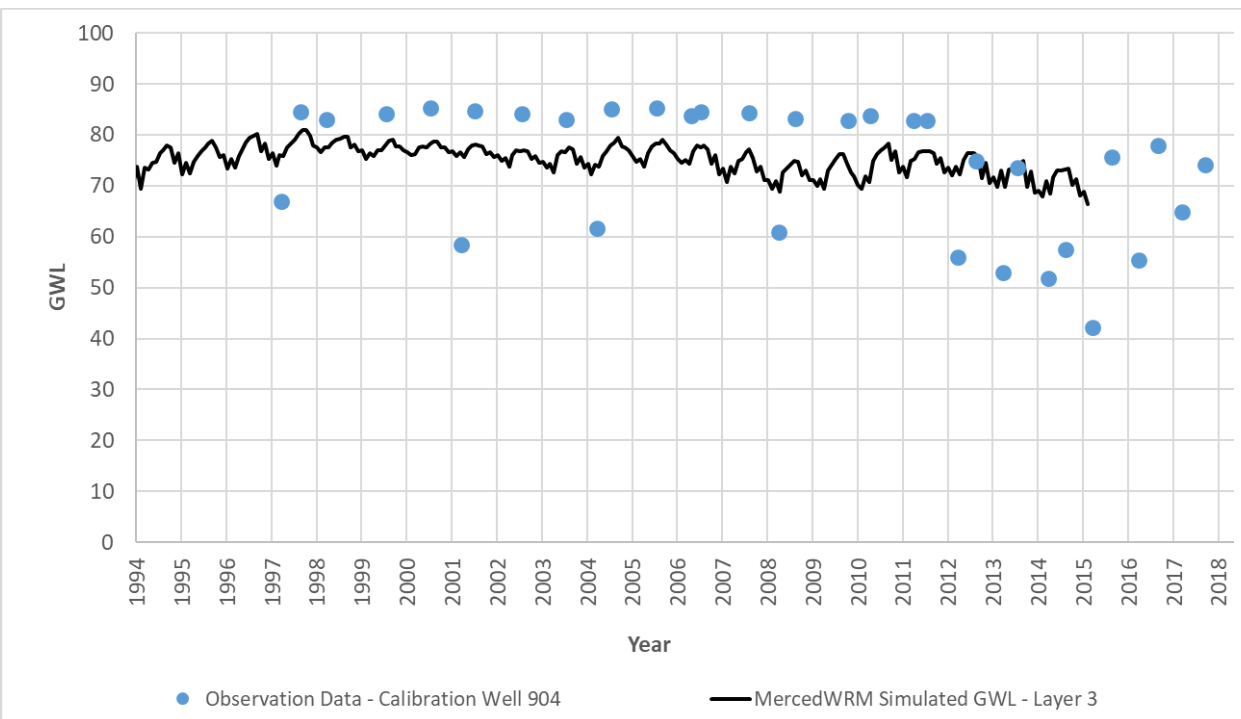


Figure A 18: Calibration Well 904

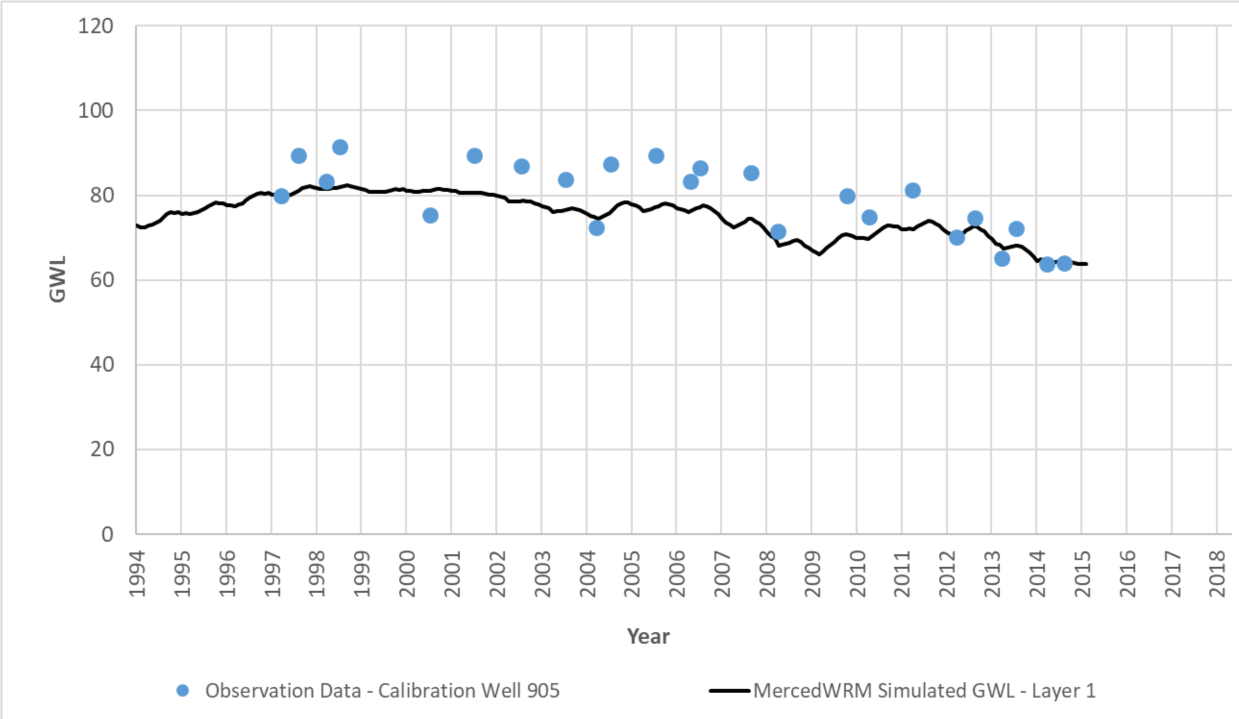


Figure A 19: Calibration Well 905

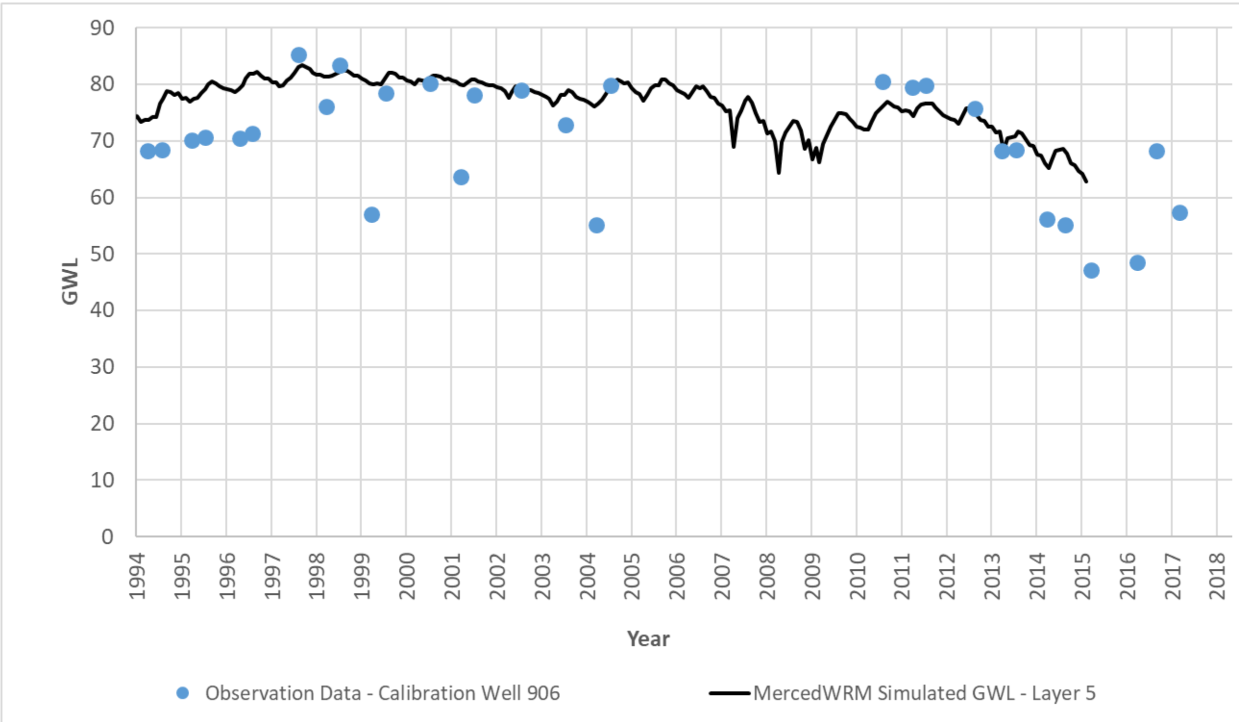


Figure A 20: Calibration Well 906

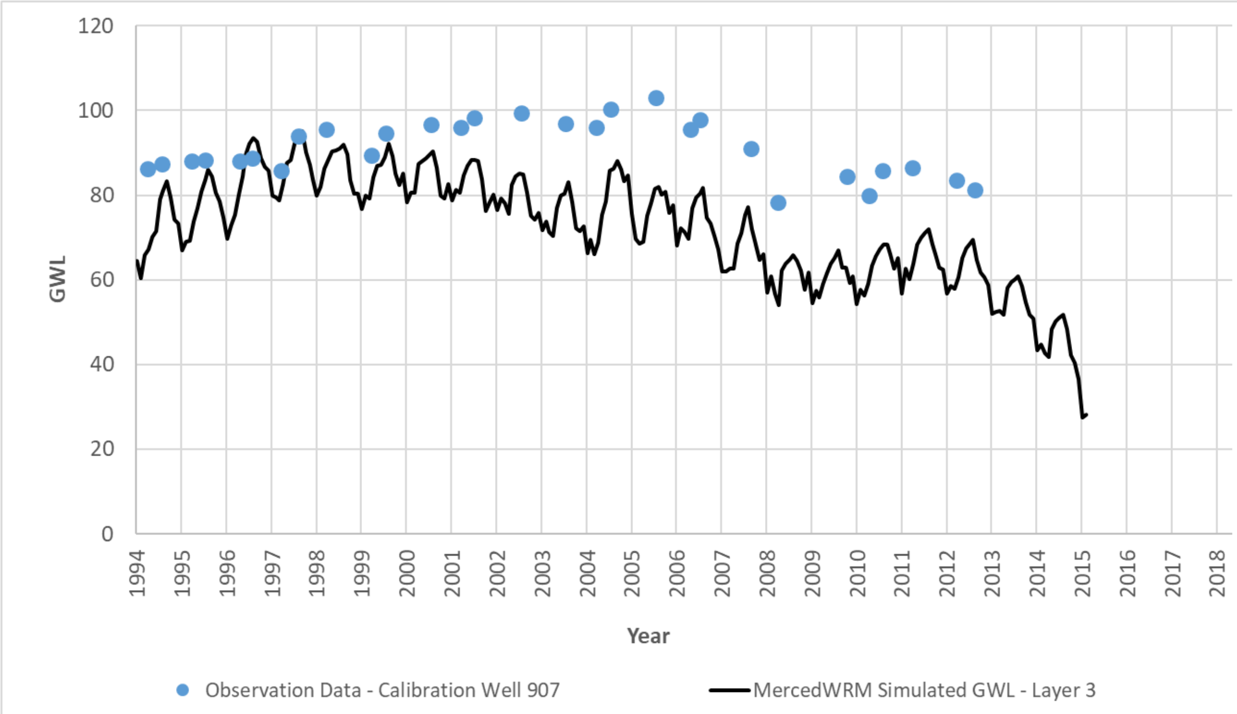


Figure A 21: Calibration Well 907

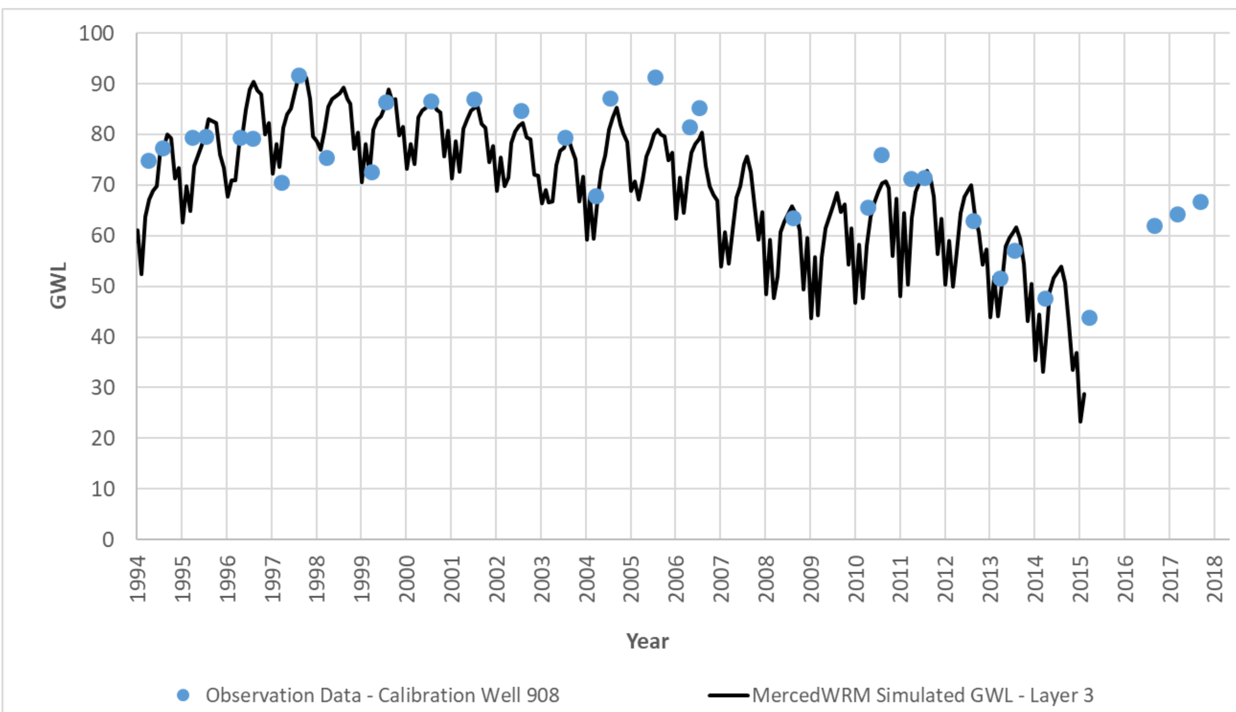


Figure A 22: Calibration Well 908

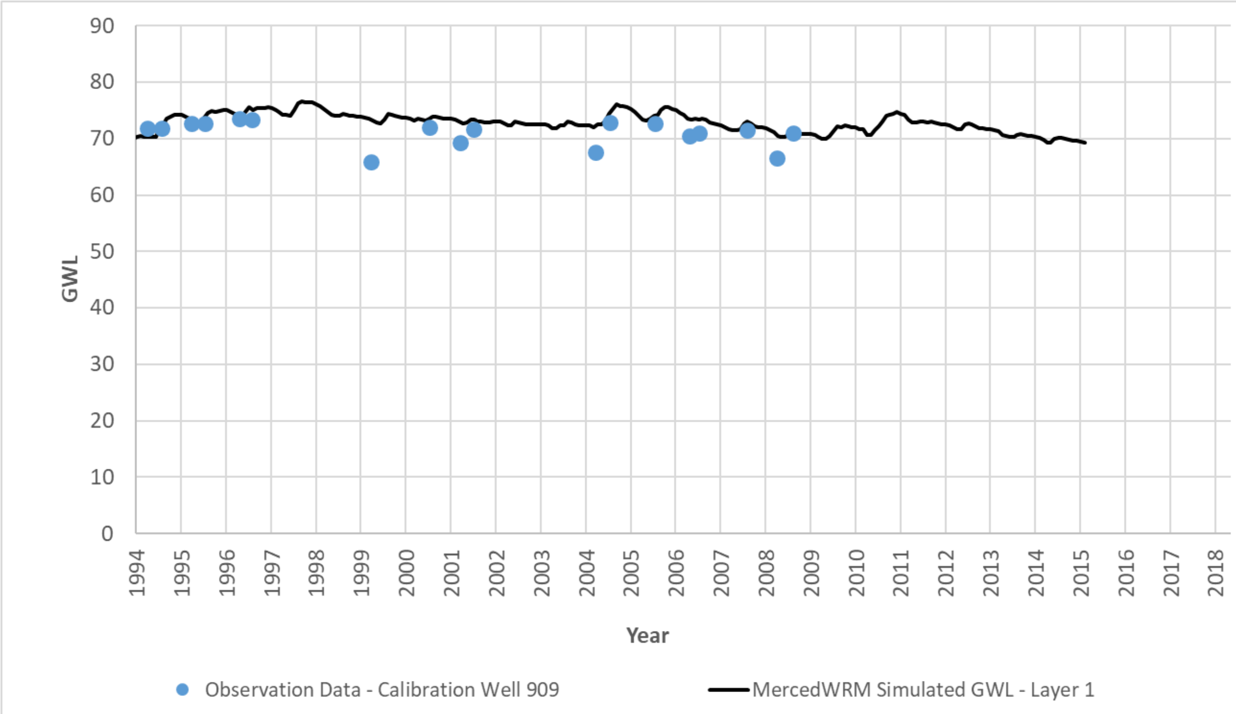


Figure A 23: Calibration Well 909

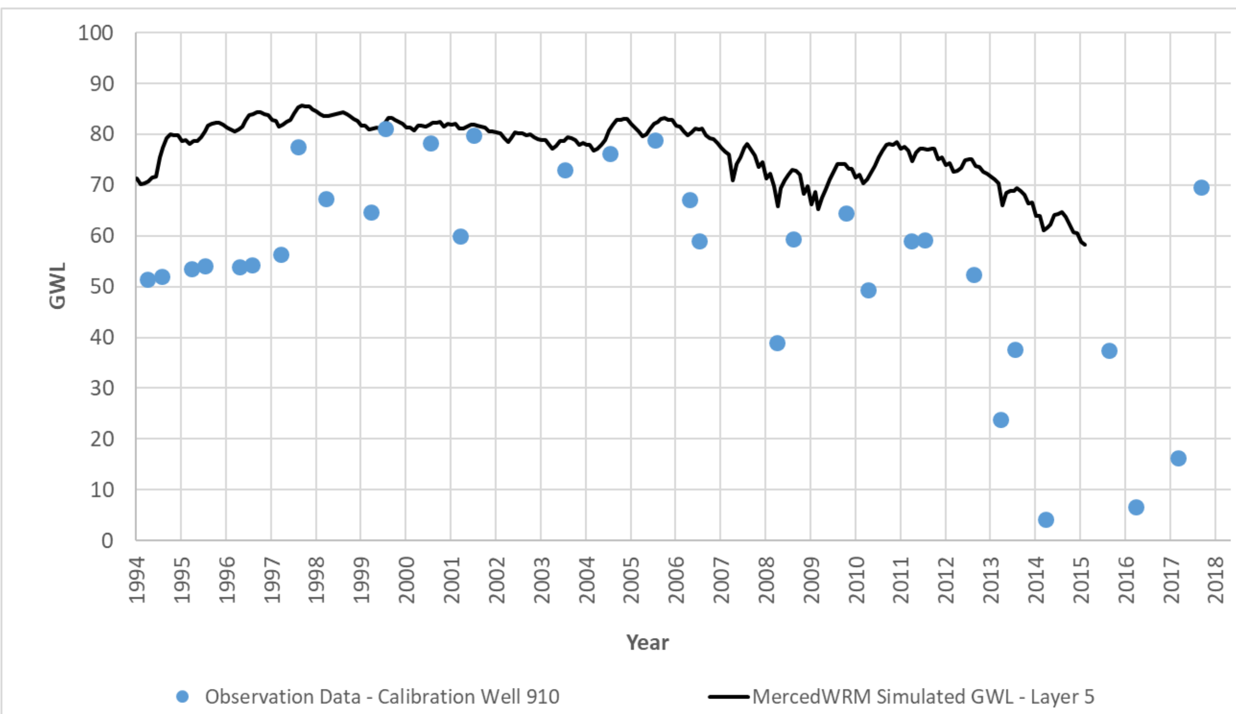


Figure A 24: Calibration Well 910

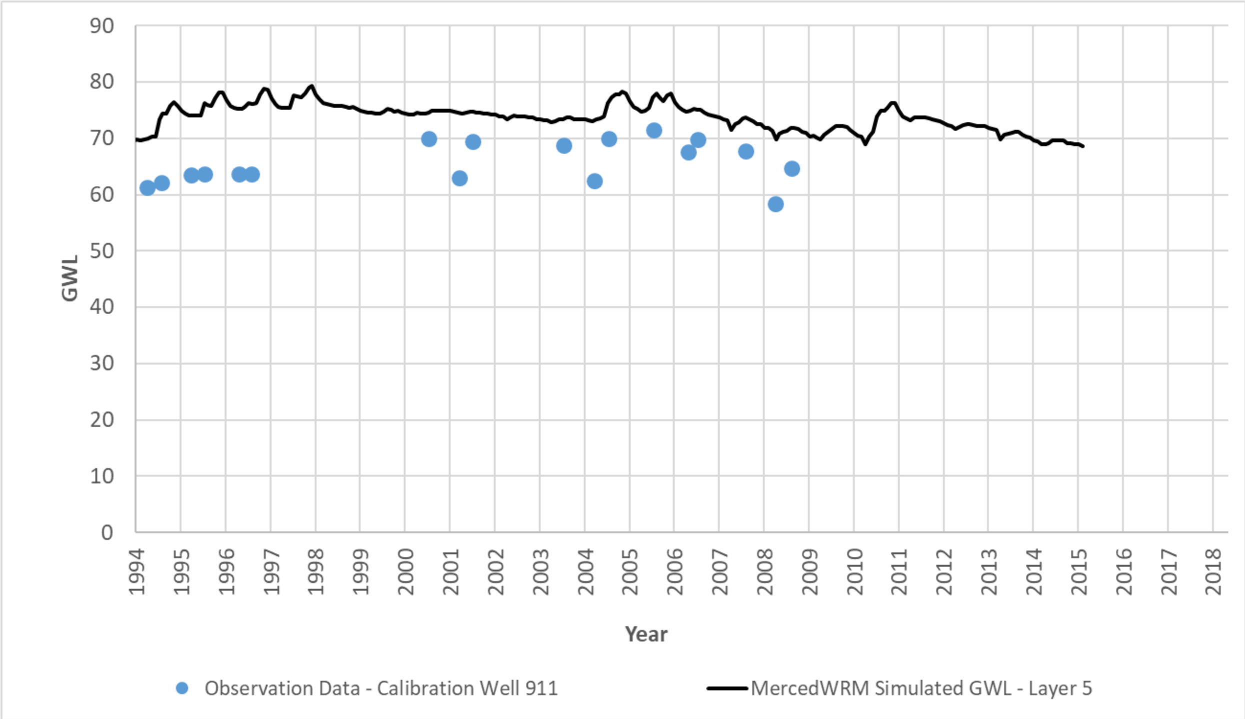


Figure A 25: Calibration Well 911

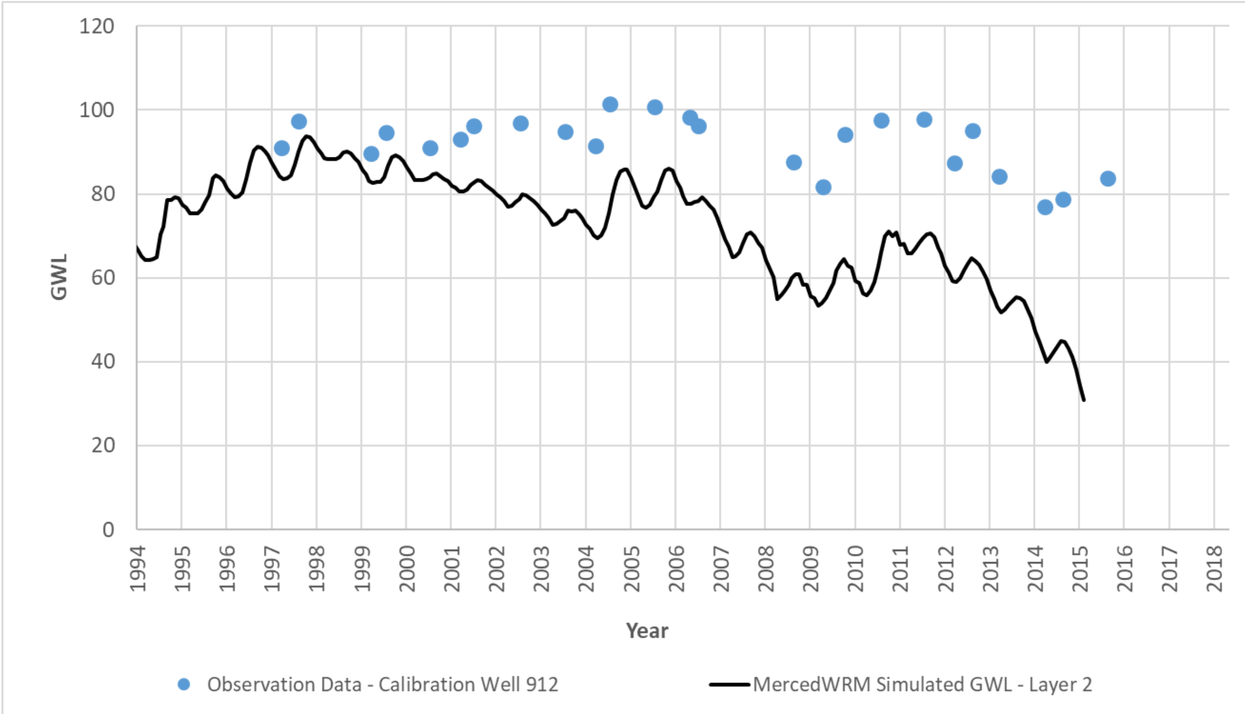


Figure A 26: Calibration Well 912

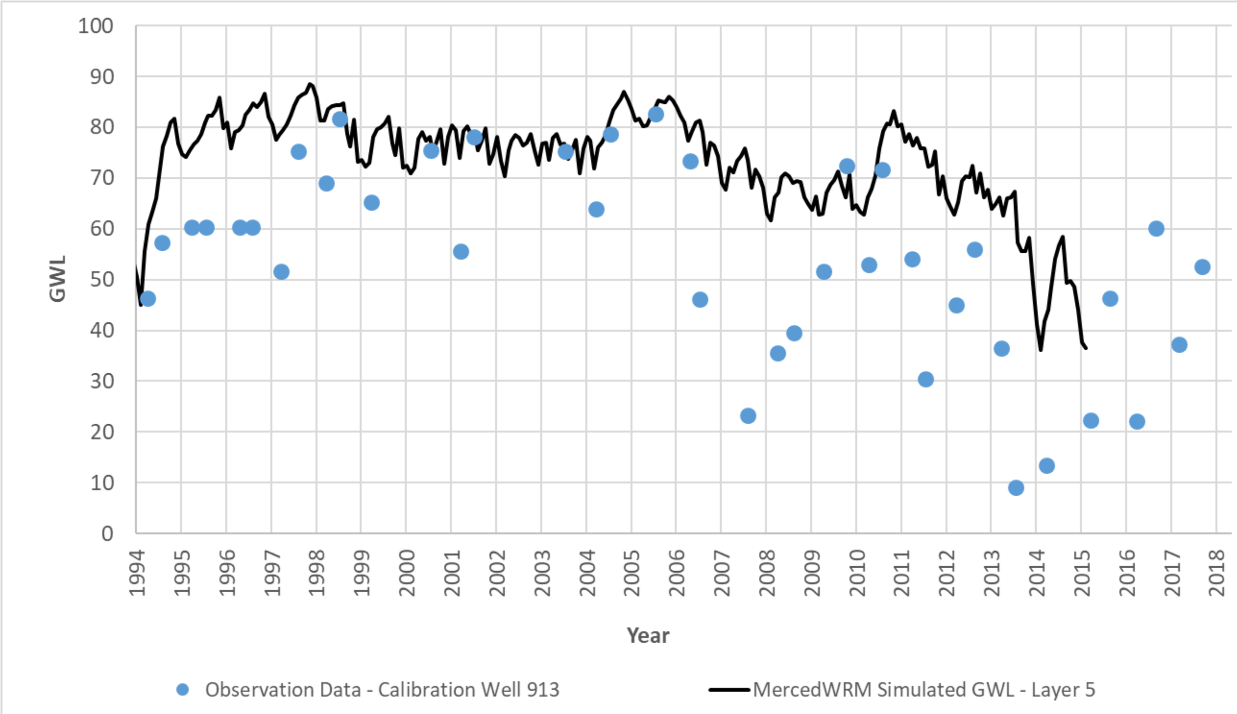


Figure A 27: Calibration Well 913

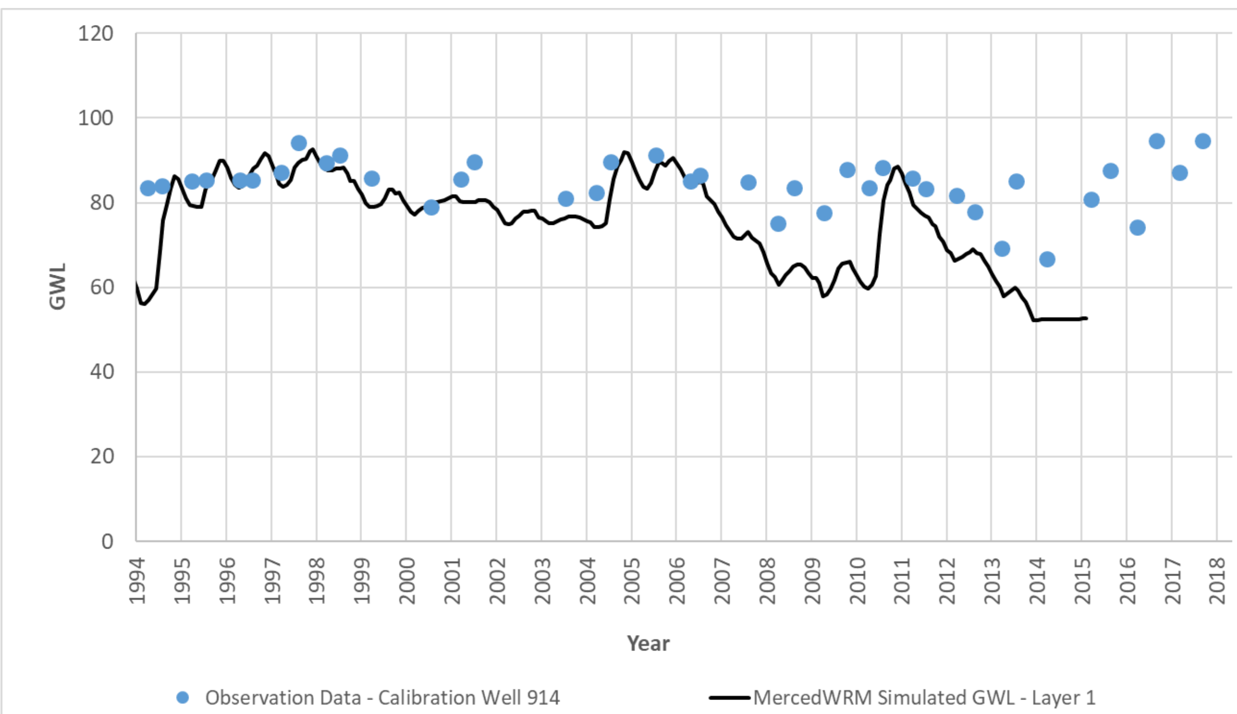


Figure A 28: Calibration Well 914

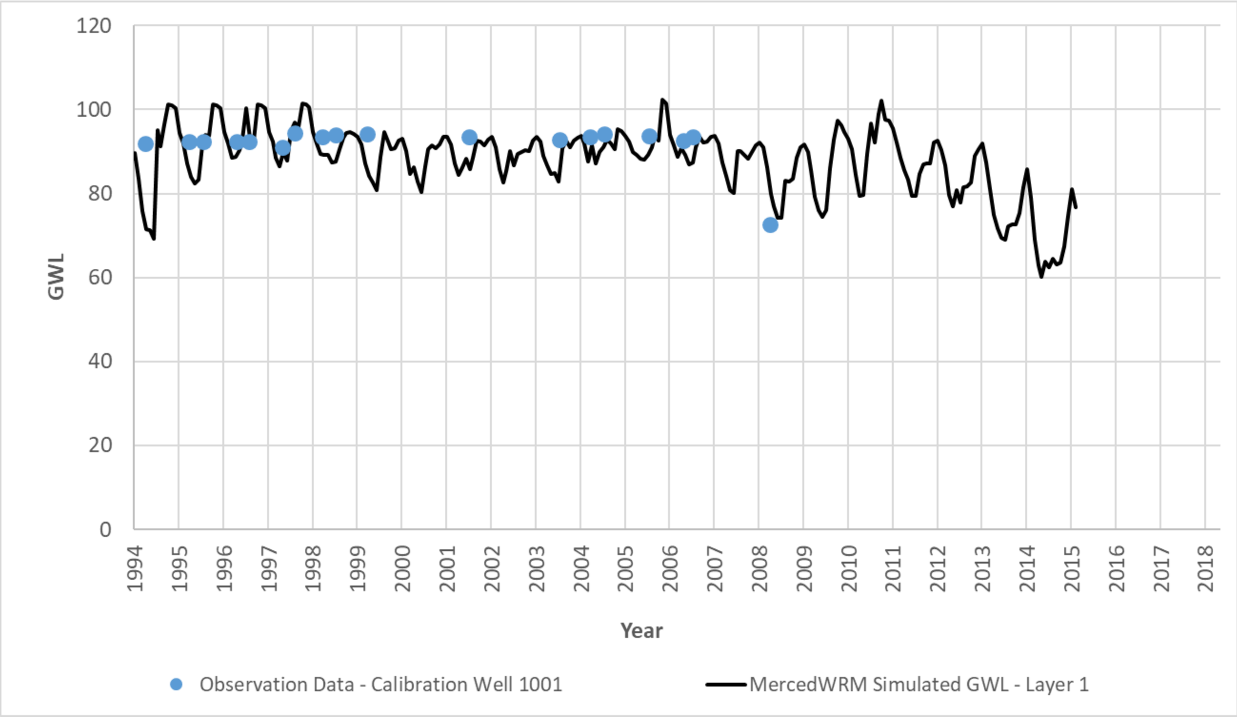


Figure A 29: Calibration Well 1001

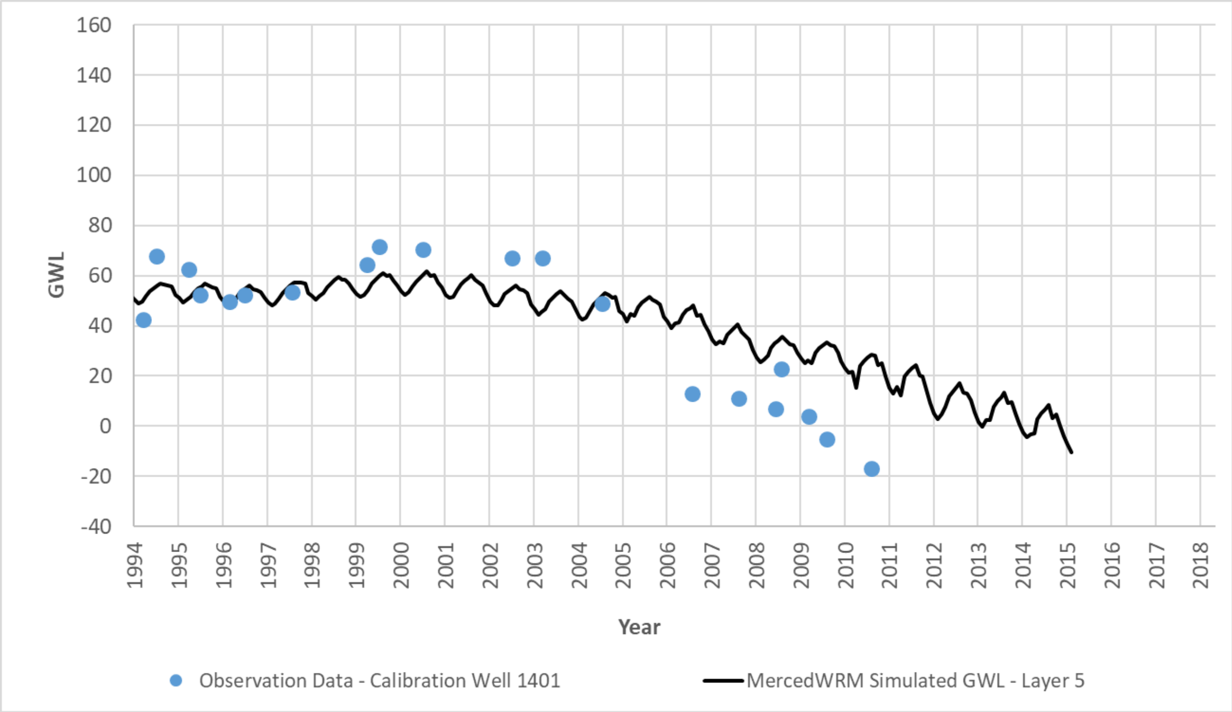


Figure A 30: Calibration Well 1401

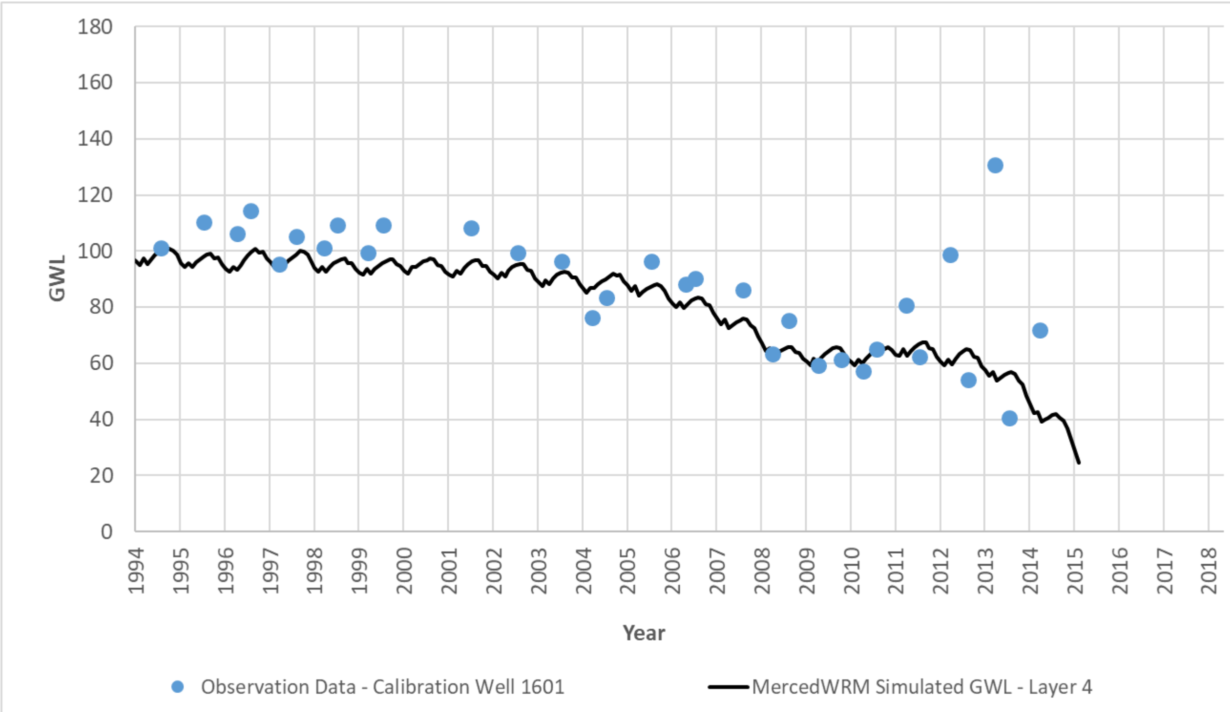


Figure A 31: Calibration Well 1601

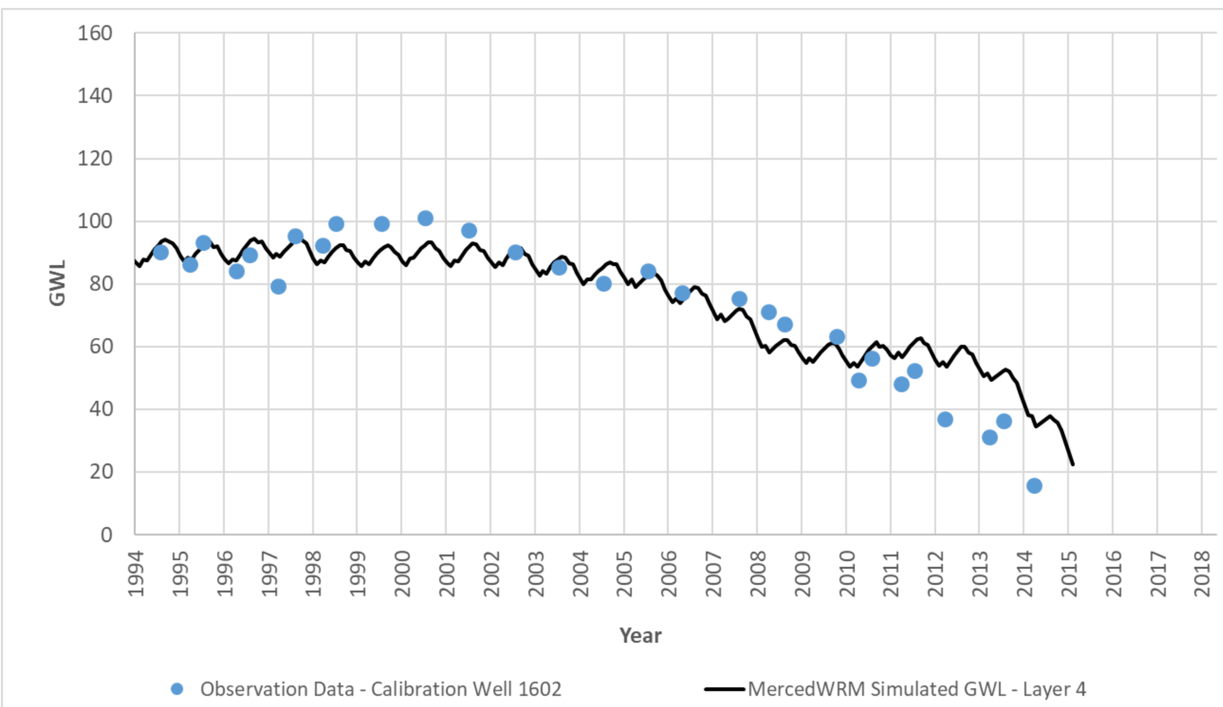


Figure A 32: Calibration Well 1602

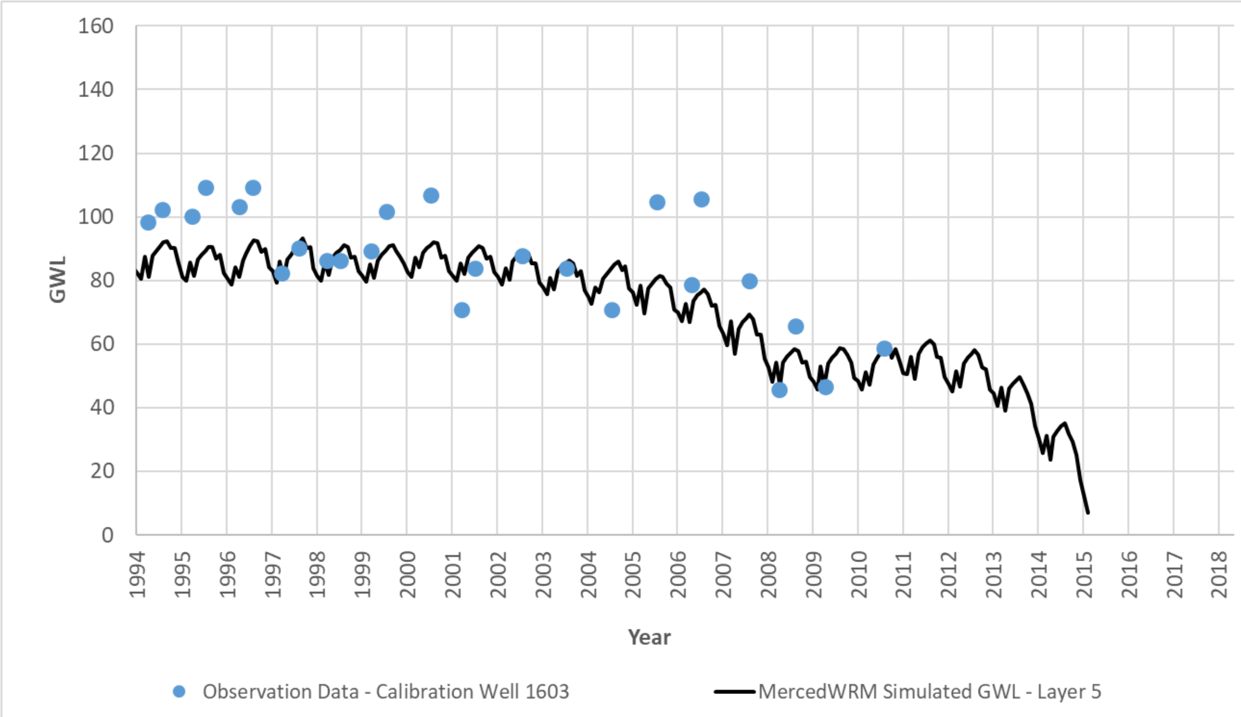


Figure A 33: Calibration Well 1603

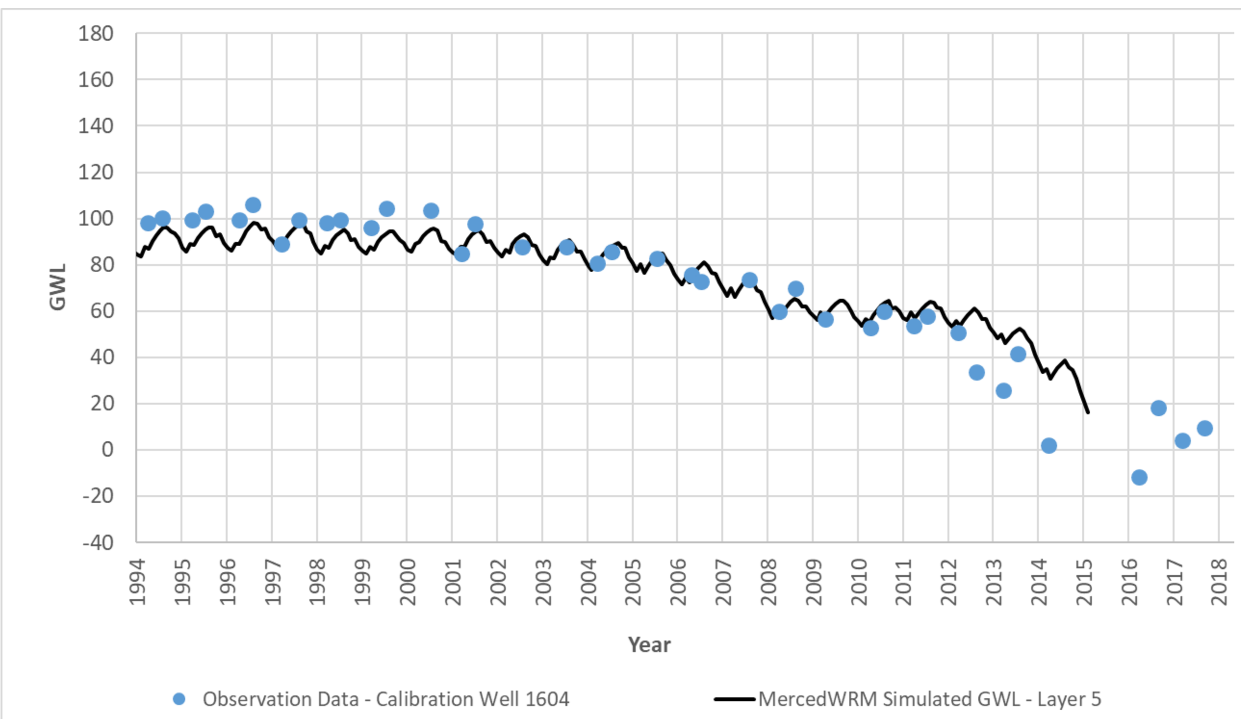


Figure A 34: Calibration Well 1604

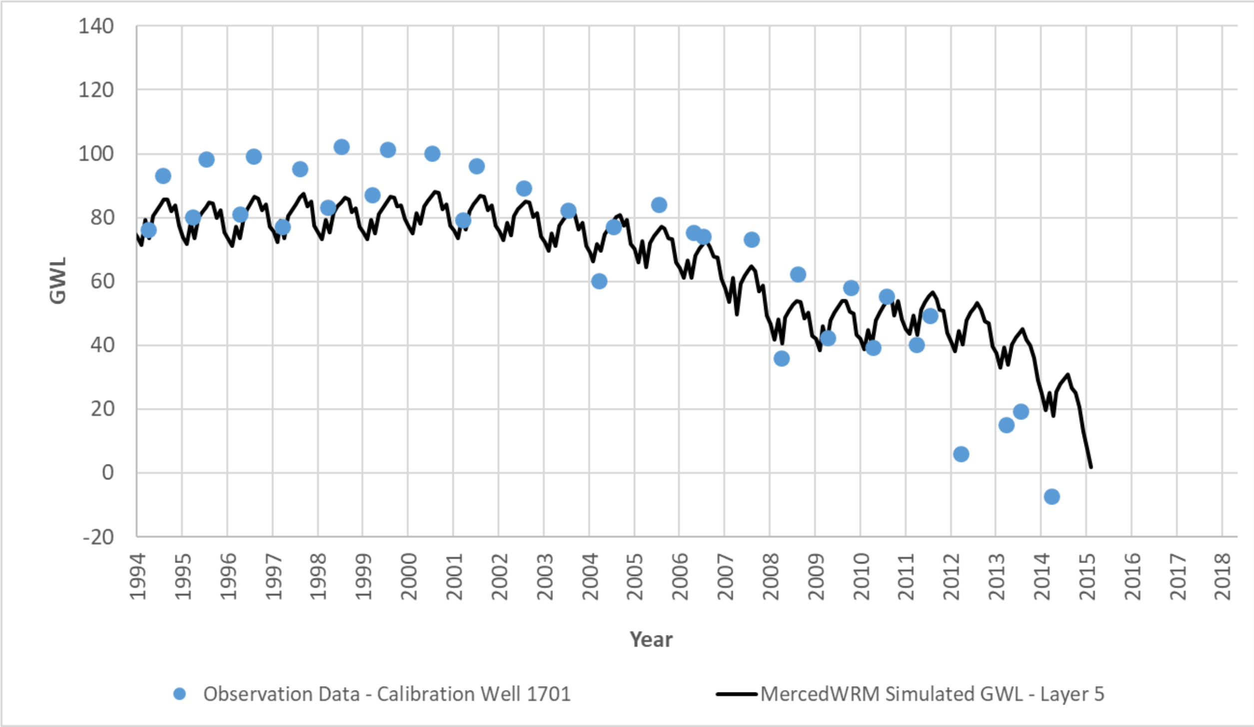


Figure A 35: Calibration Well 1701

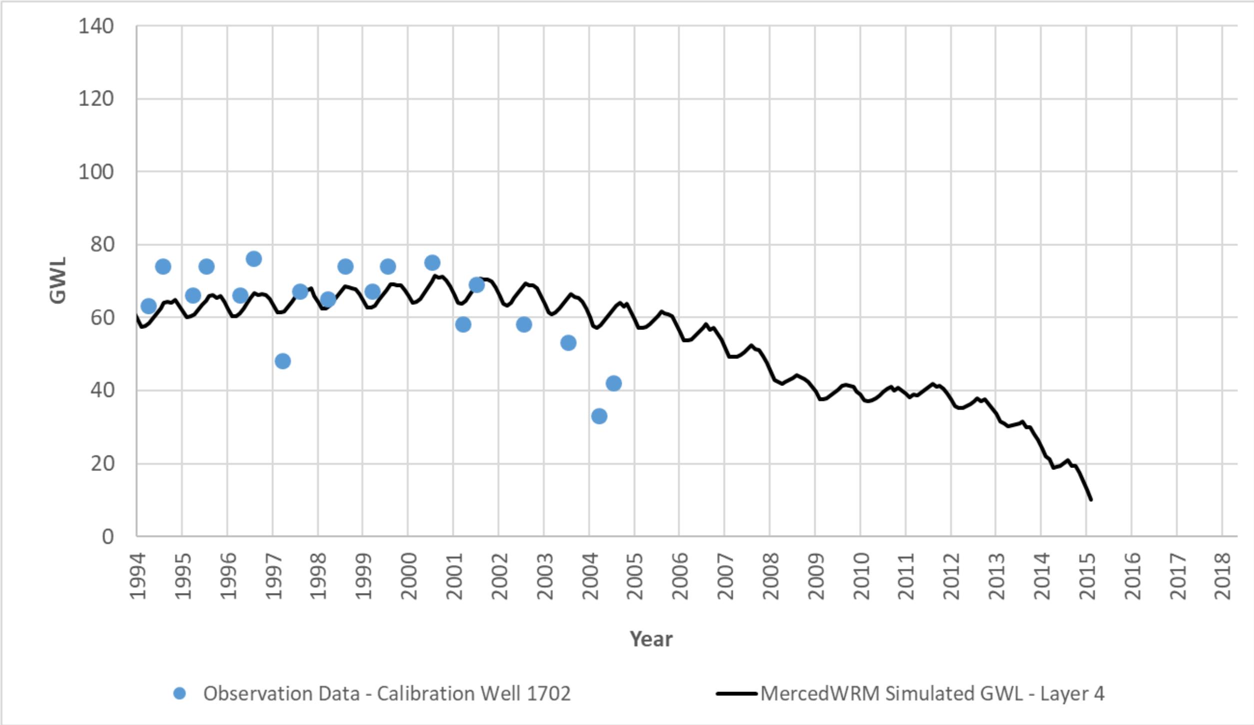


Figure A 36: Calibration Well 1702

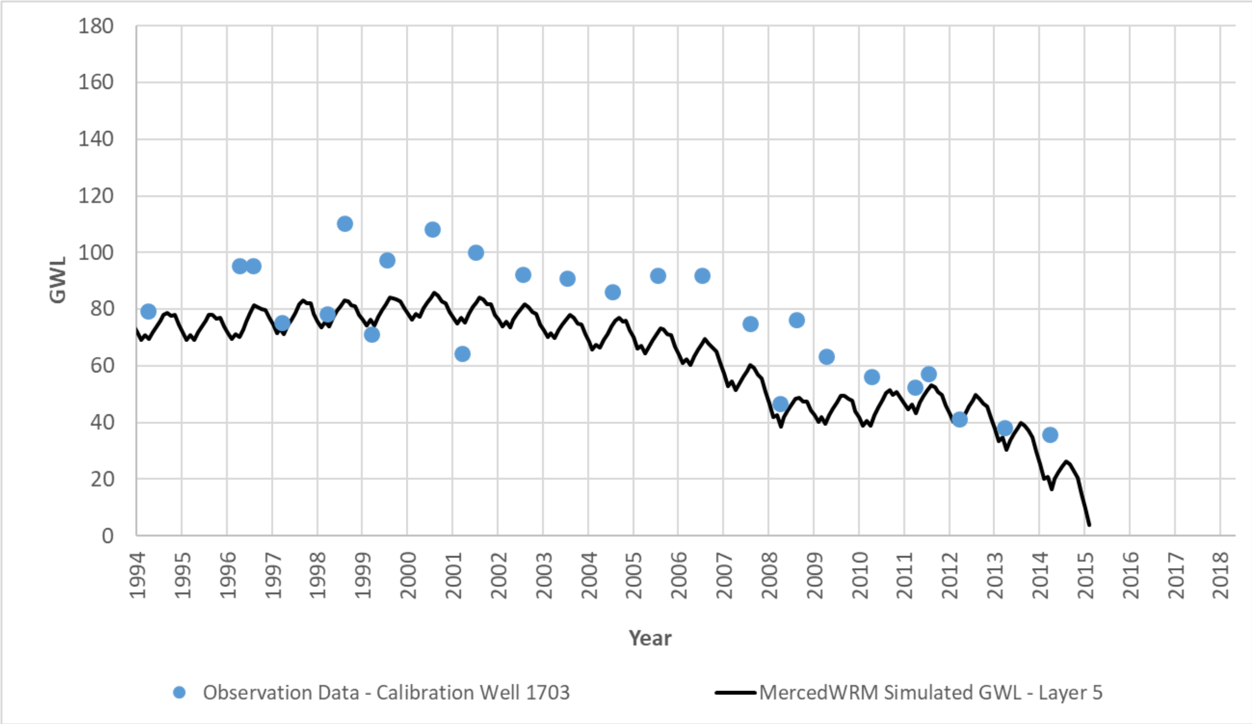


Figure A 37: Calibration Well 1703

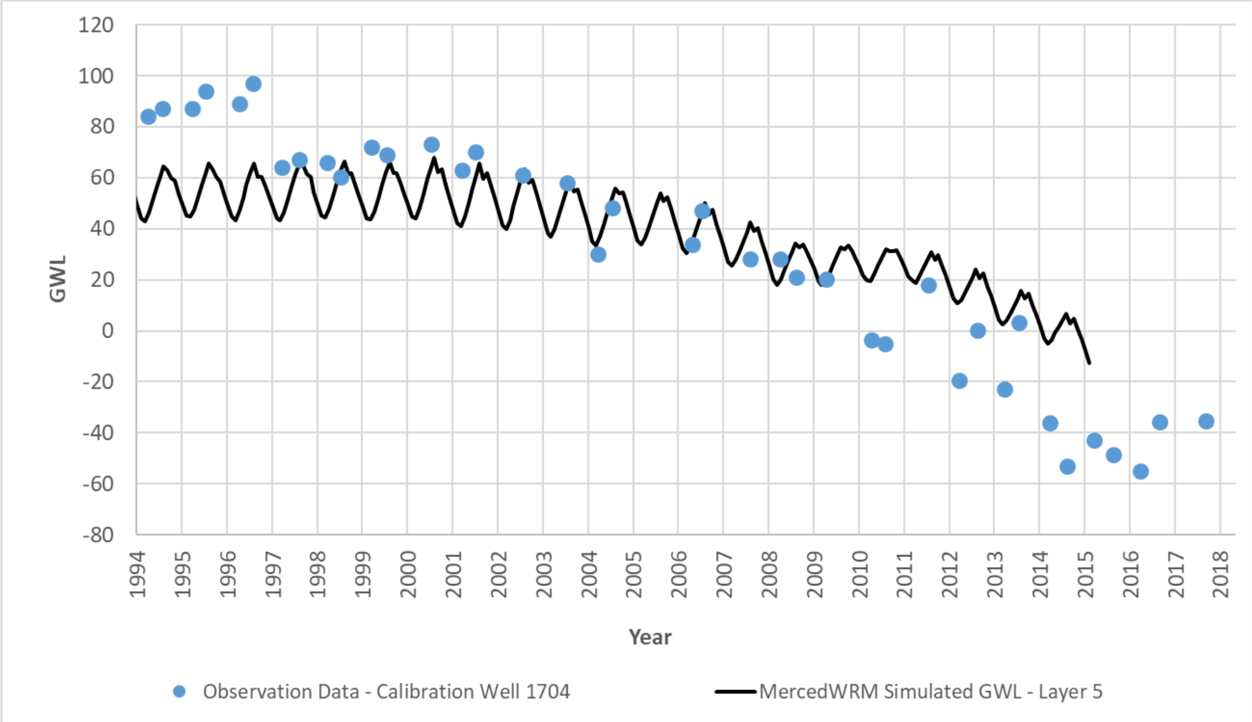


Figure A 38: Calibration Well 1704

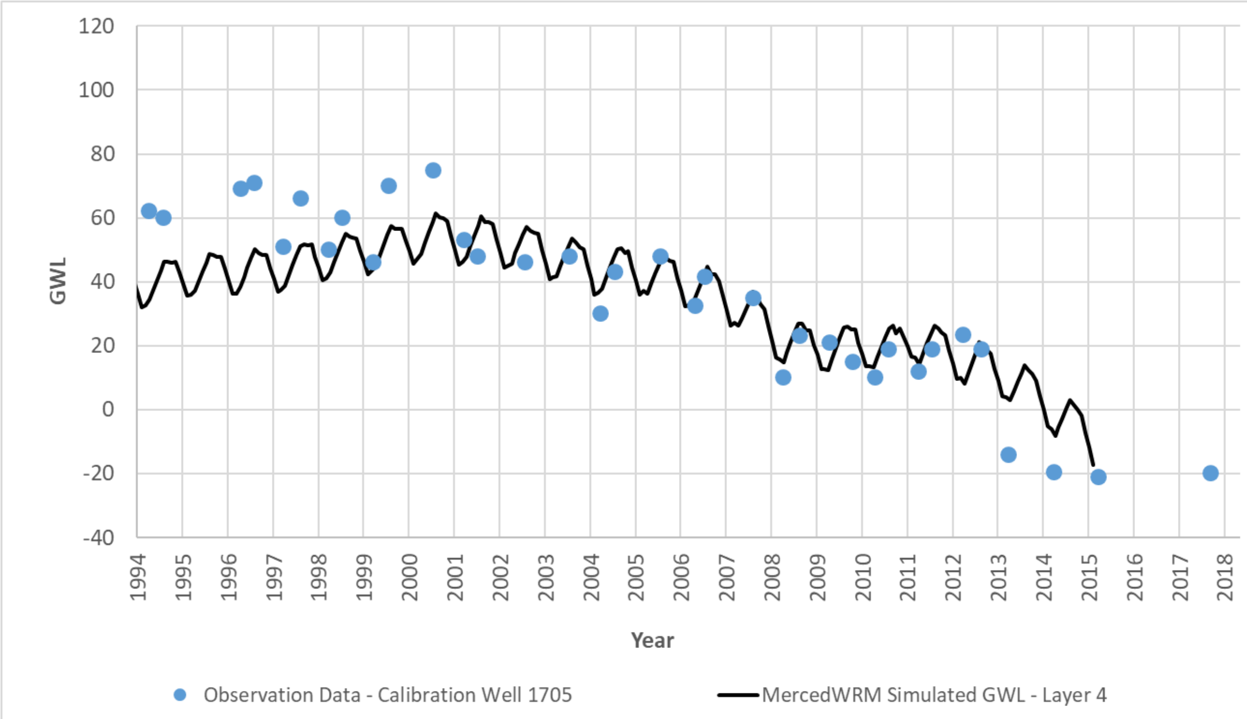


Figure A 39: Calibration Well 1705

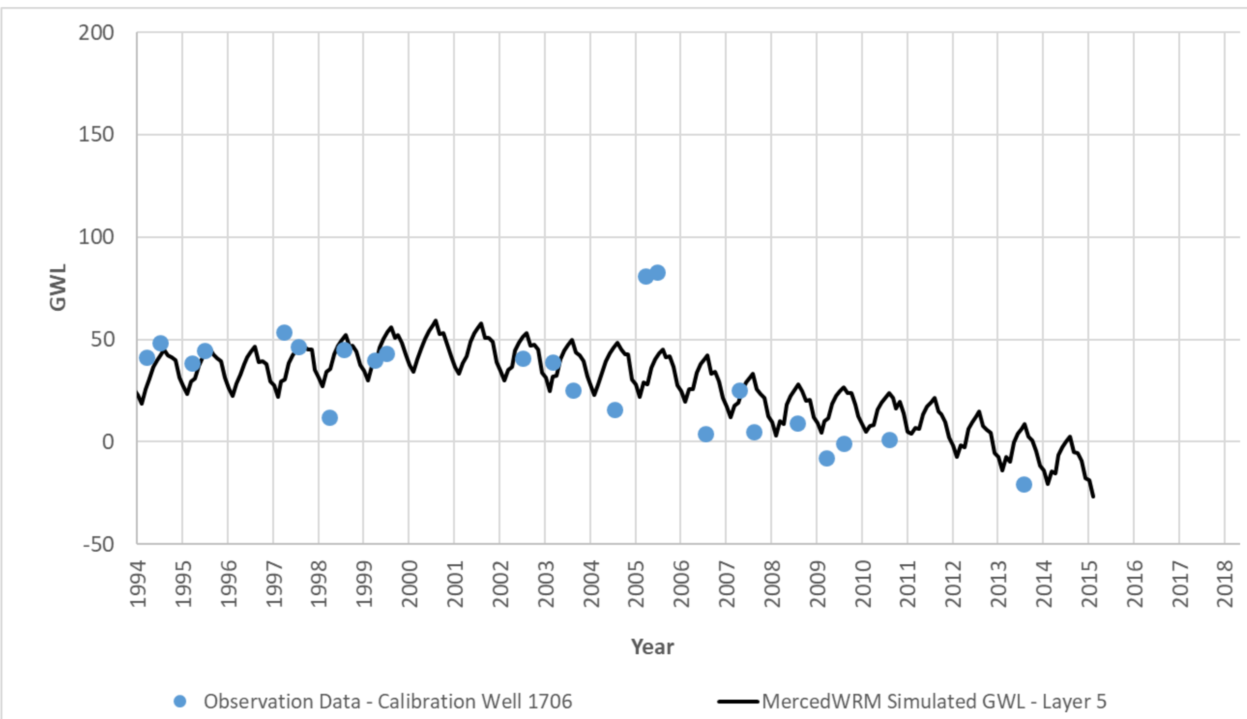


Figure A 40: Calibration Well 1706

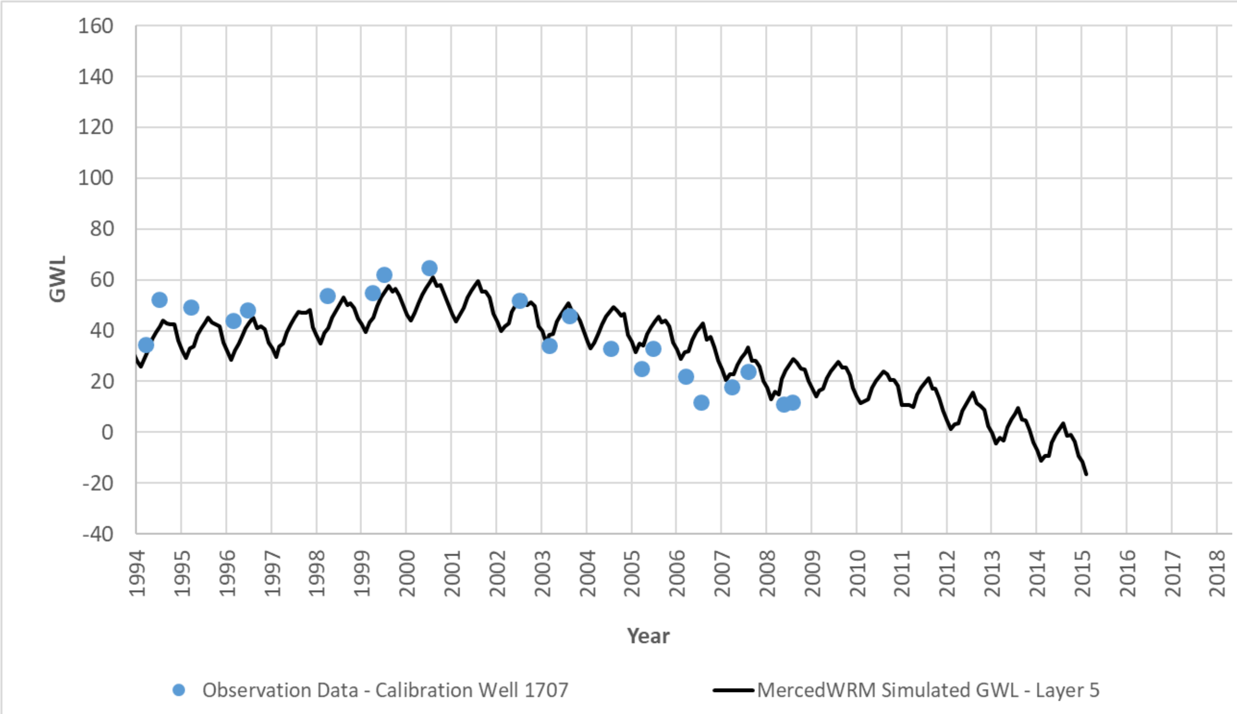


Figure A 41: Calibration Well 1707

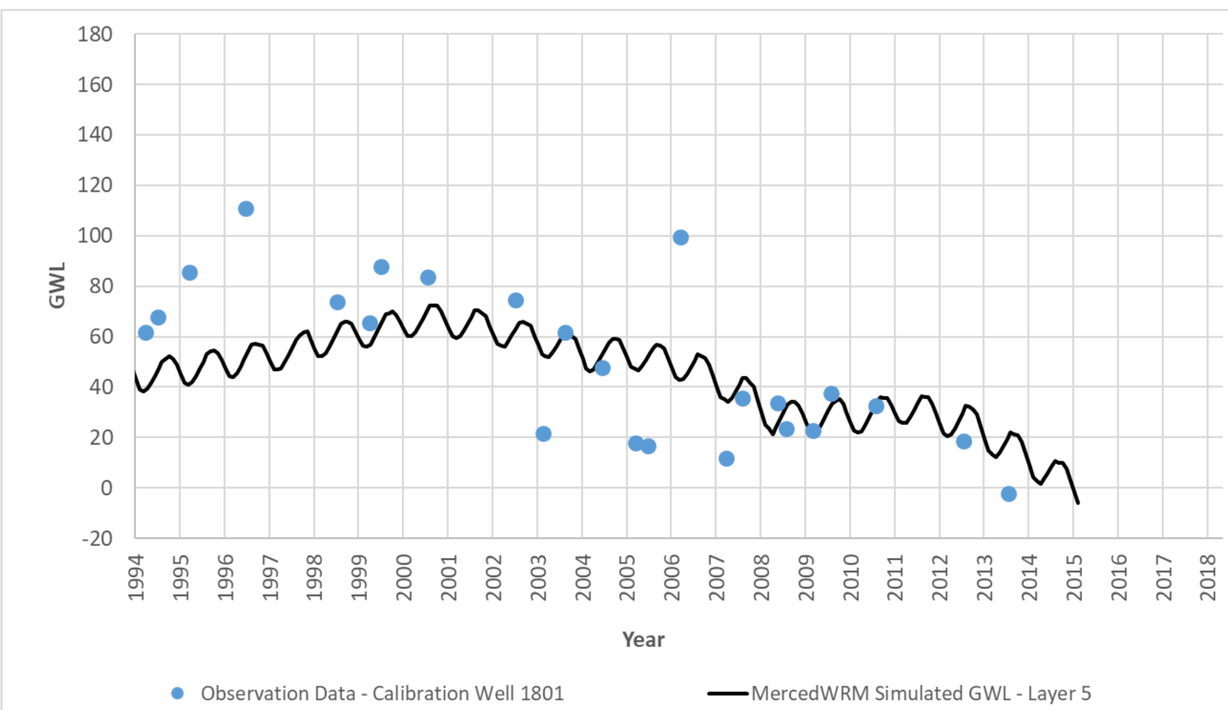


Figure A 42: Calibration Well 1801

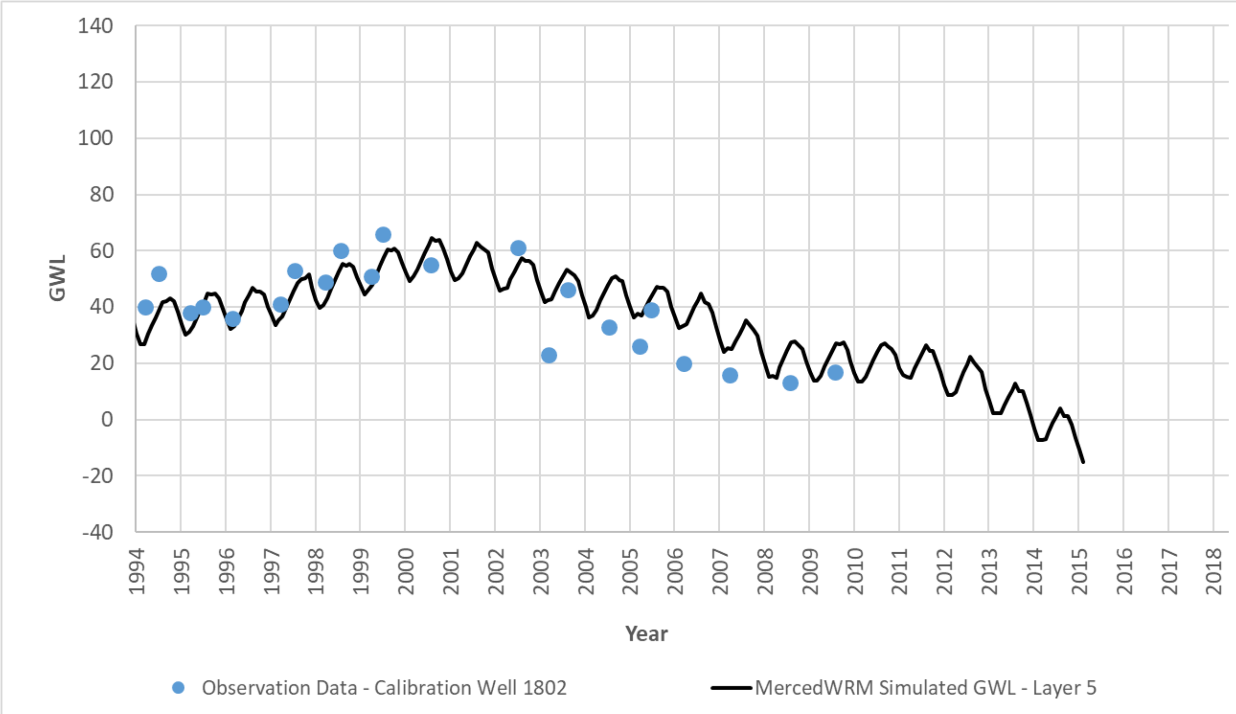


Figure A 43: Calibration Well 1802

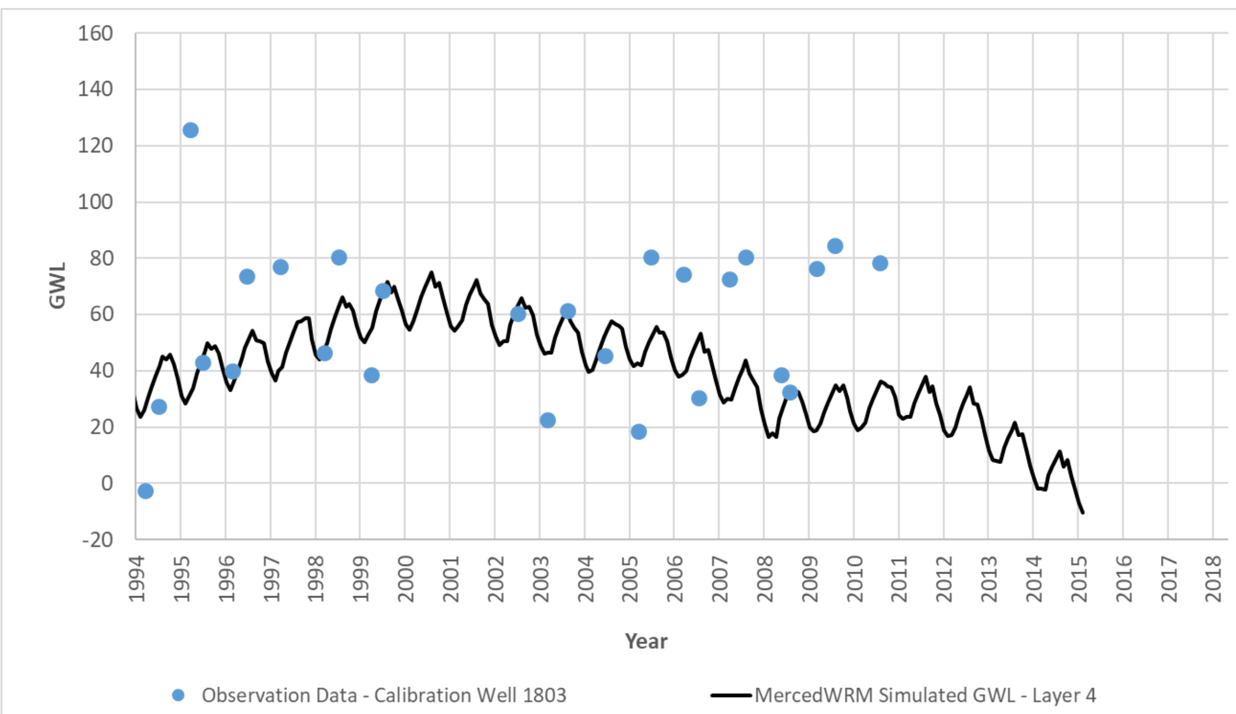


Figure A 44: Calibration Well 1803

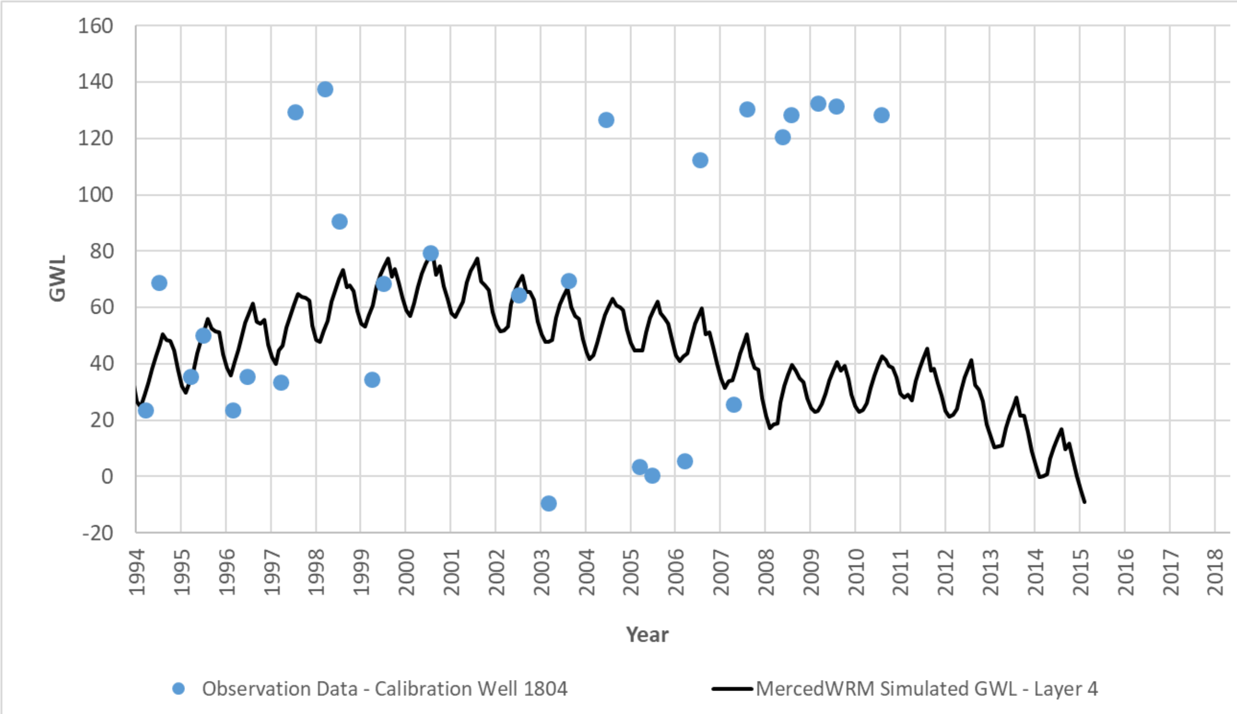


Figure A 45: Calibration Well 1804

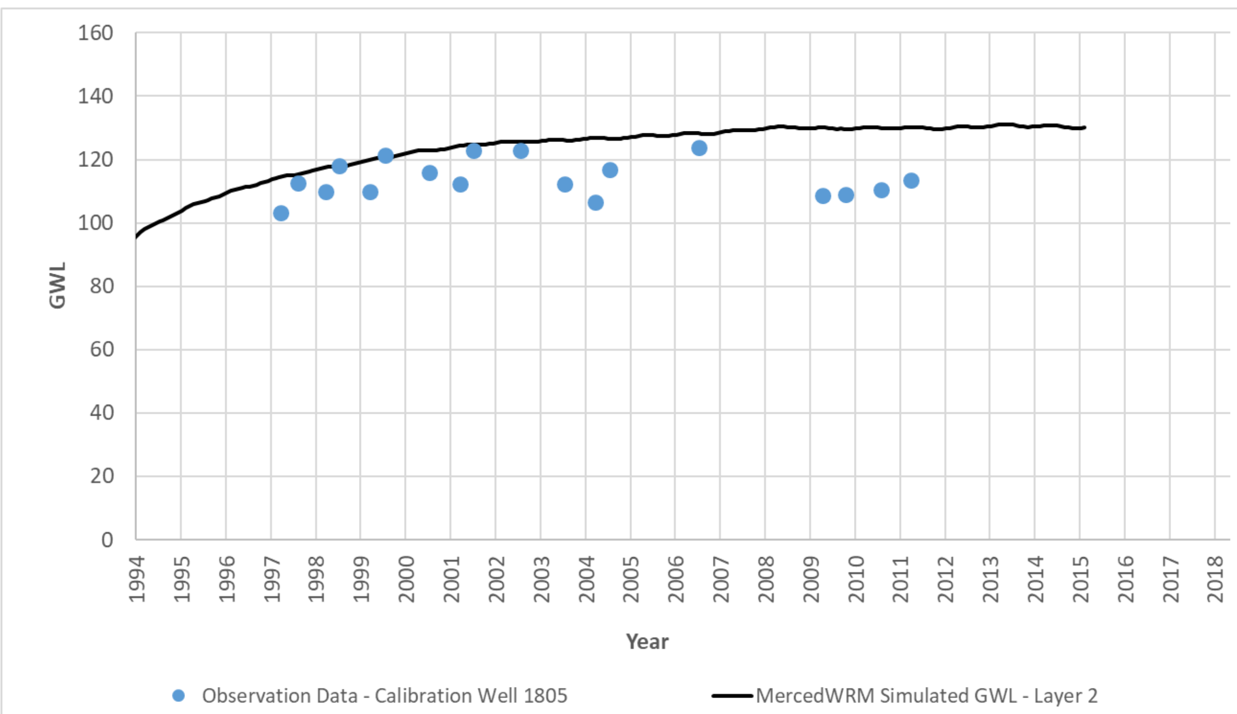


Figure A 46: Calibration Well 1805

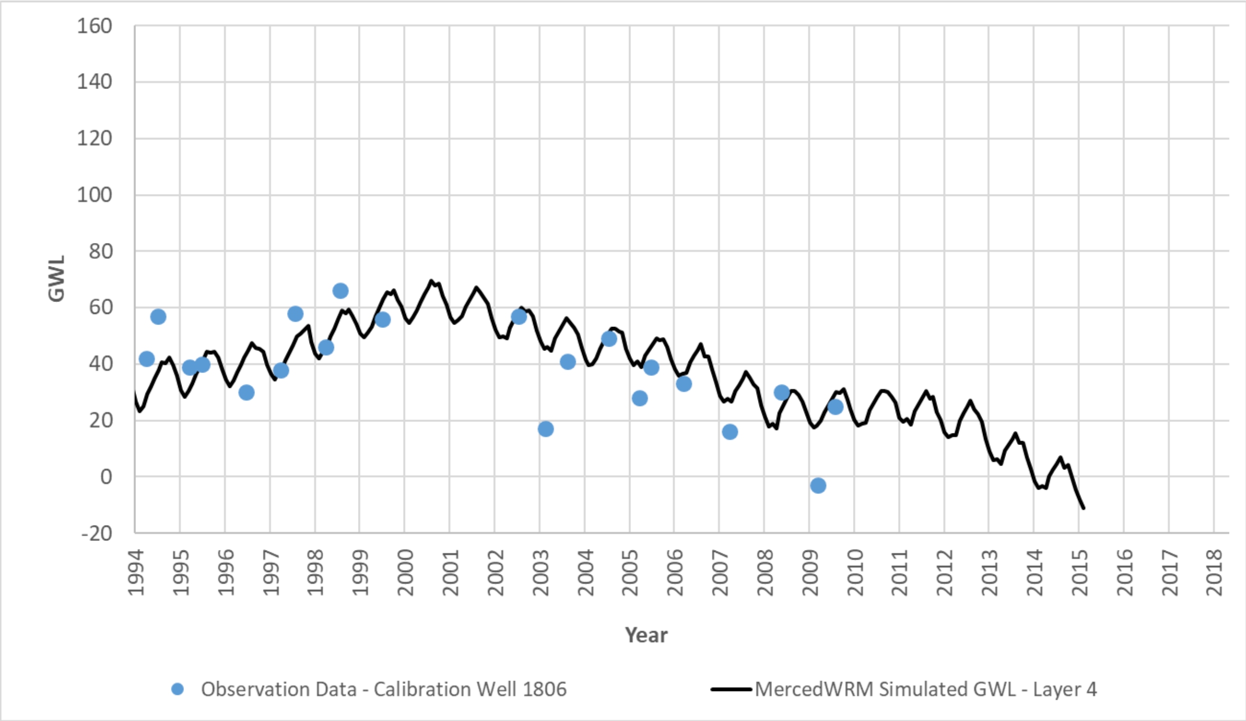


Figure A 47: Calibration Well 1806

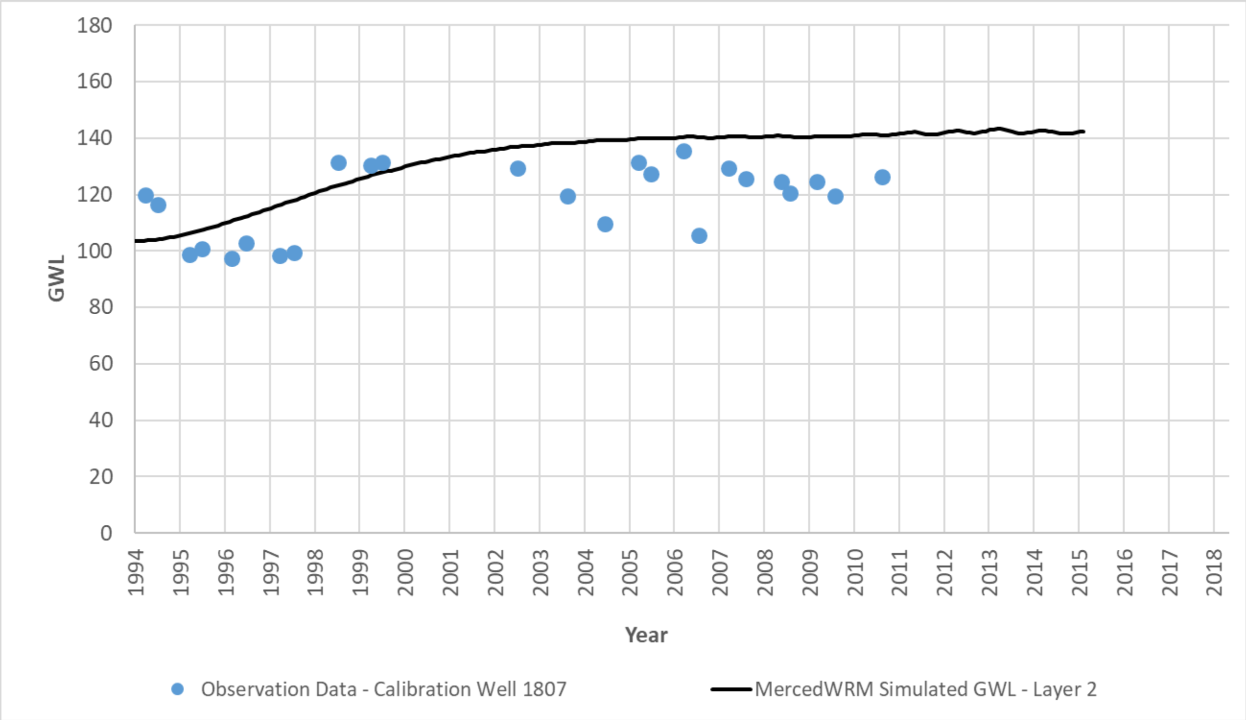


Figure A 48: Calibration Well 1807

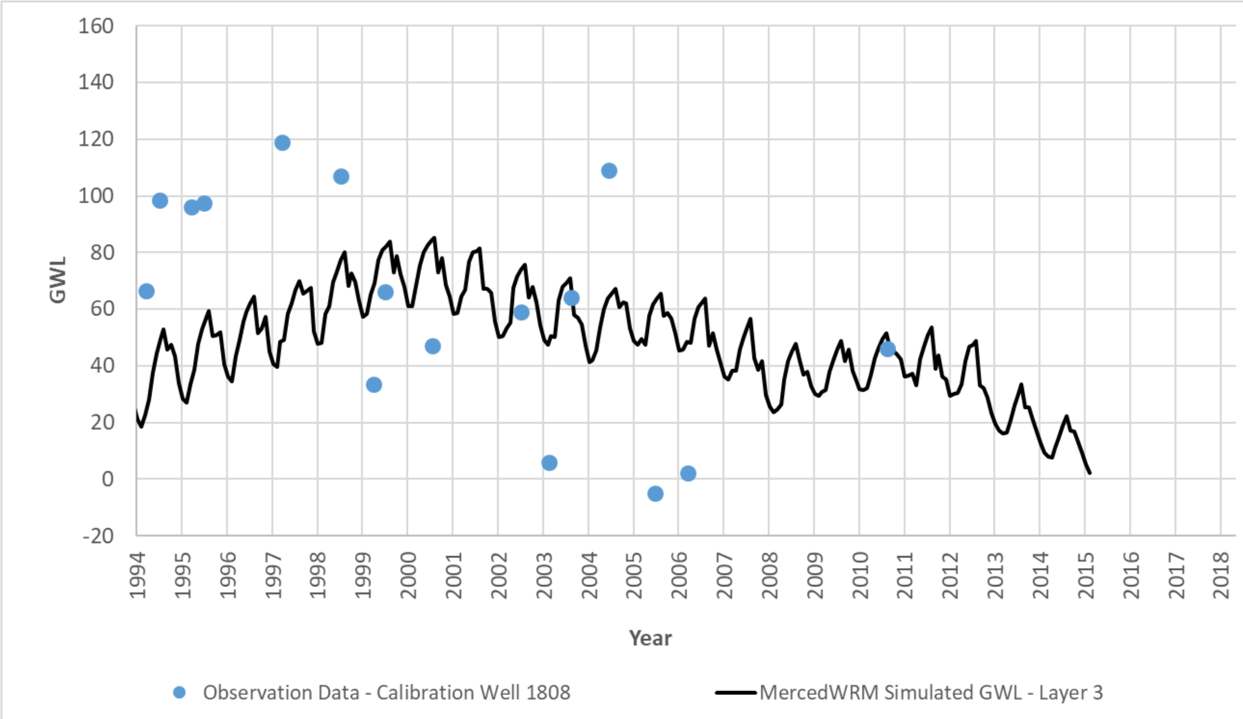


Figure A 49: Calibration Well 1808

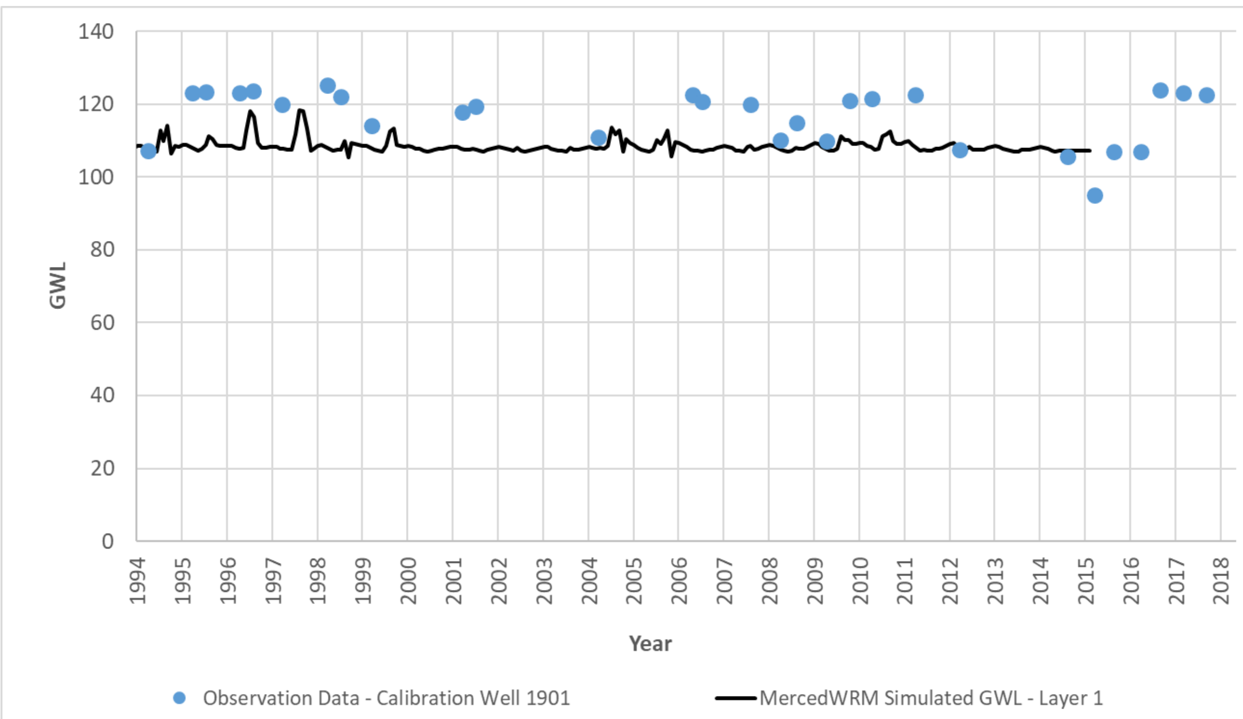


Figure A 50: Calibration Well 1901

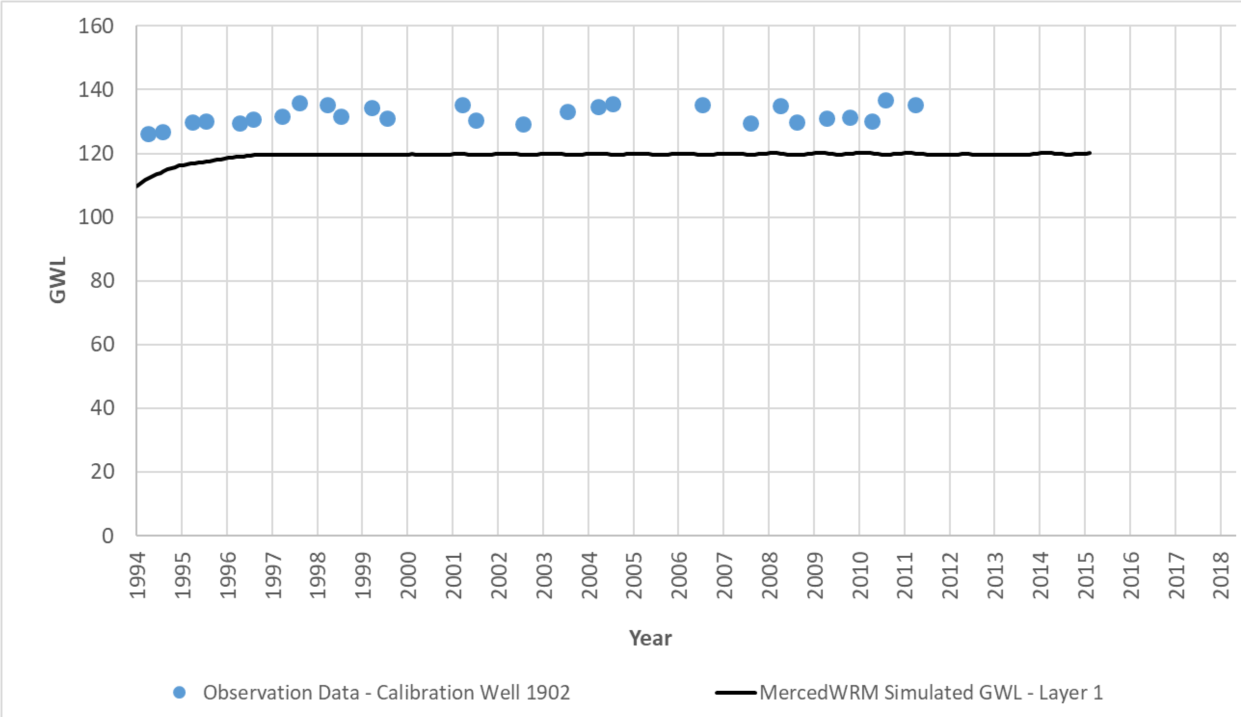


Figure A 51: Calibration Well 1902

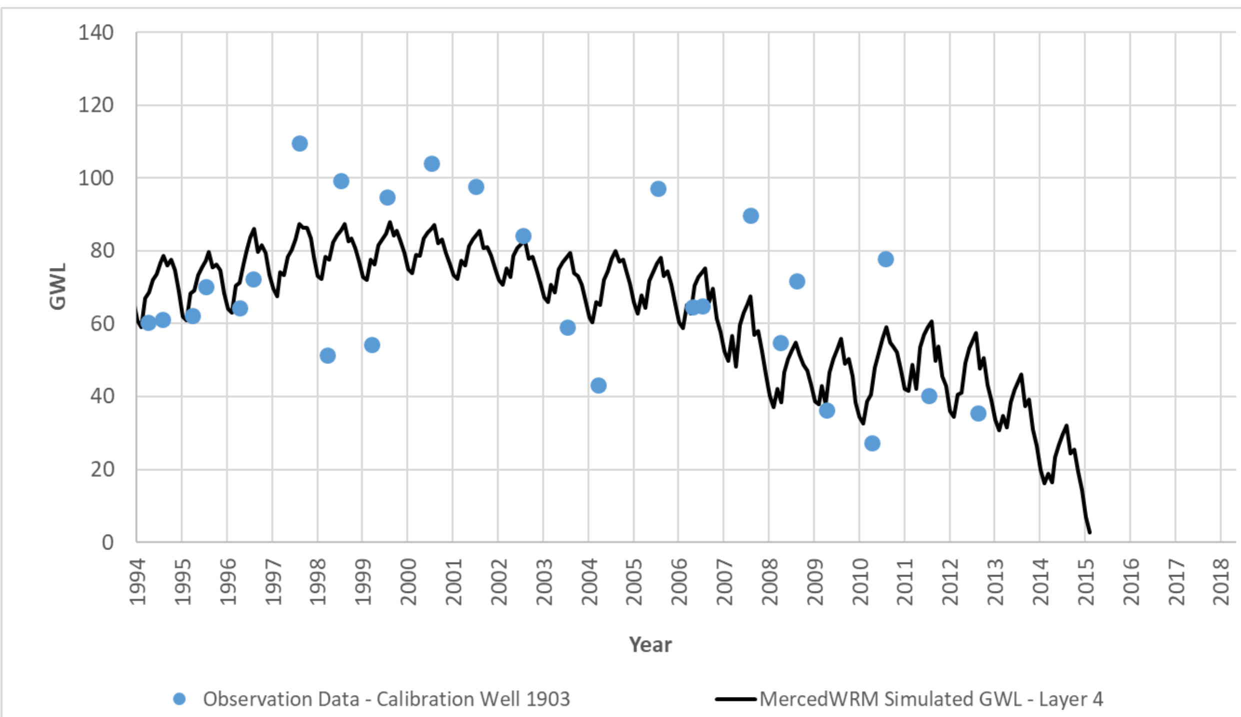


Figure A 52: Calibration Well 1903

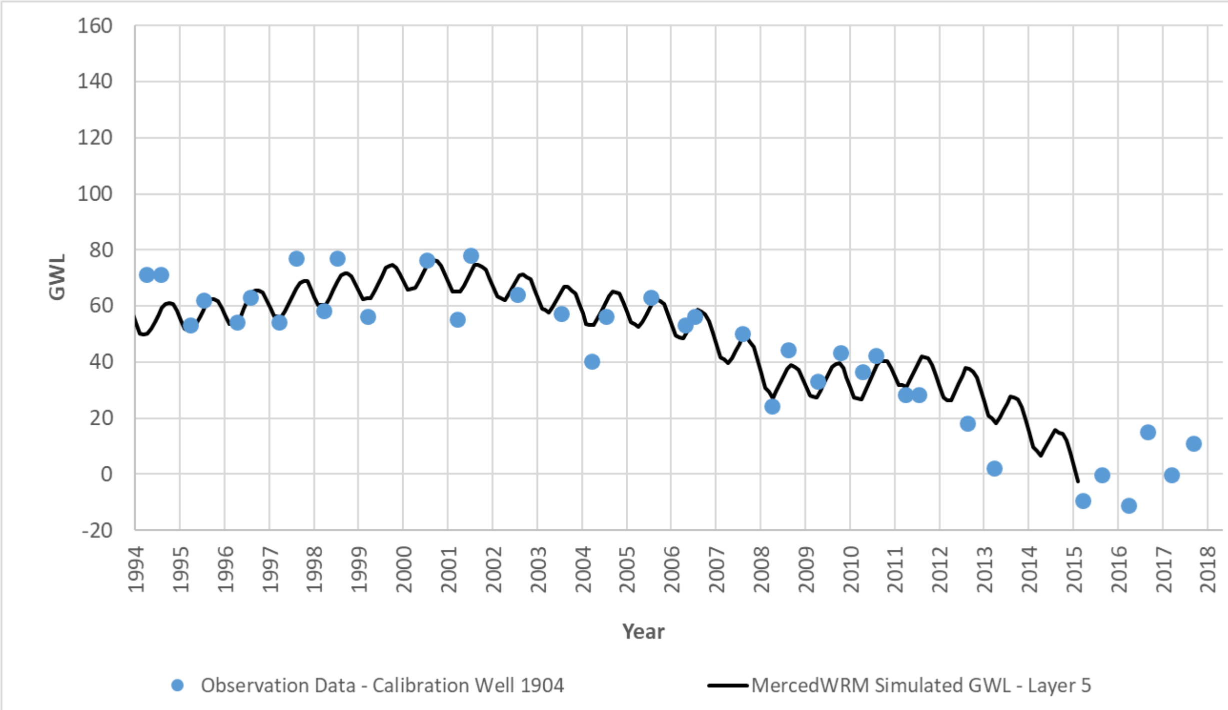


Figure A 53: Calibration Well 1904

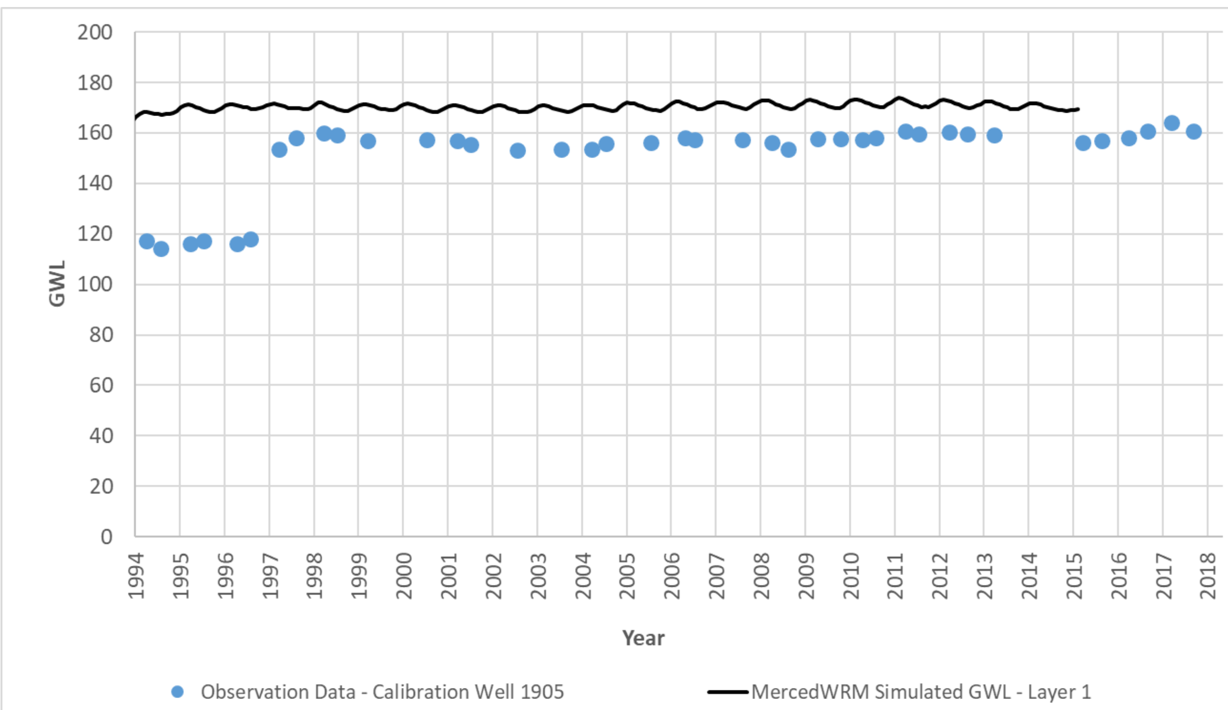


Figure A 54: Calibration Well 1905

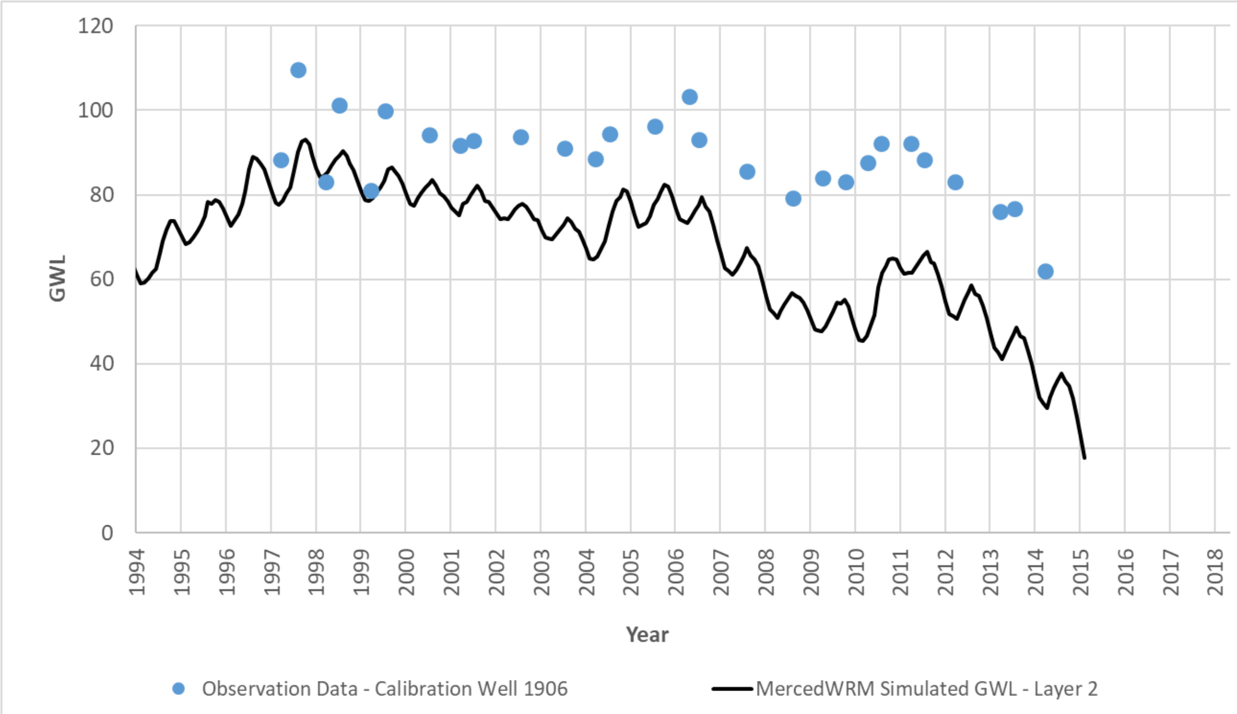


Figure A 55: Calibration Well 1906

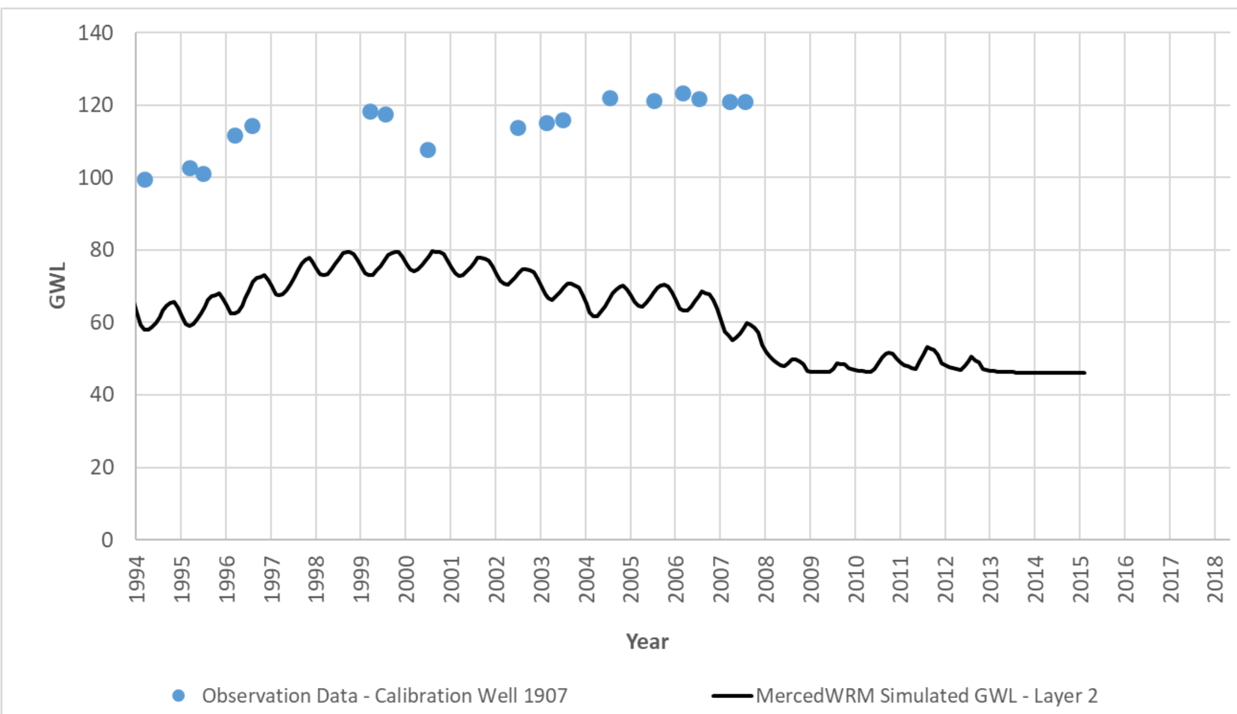


Figure A 56: Calibration Well 1907

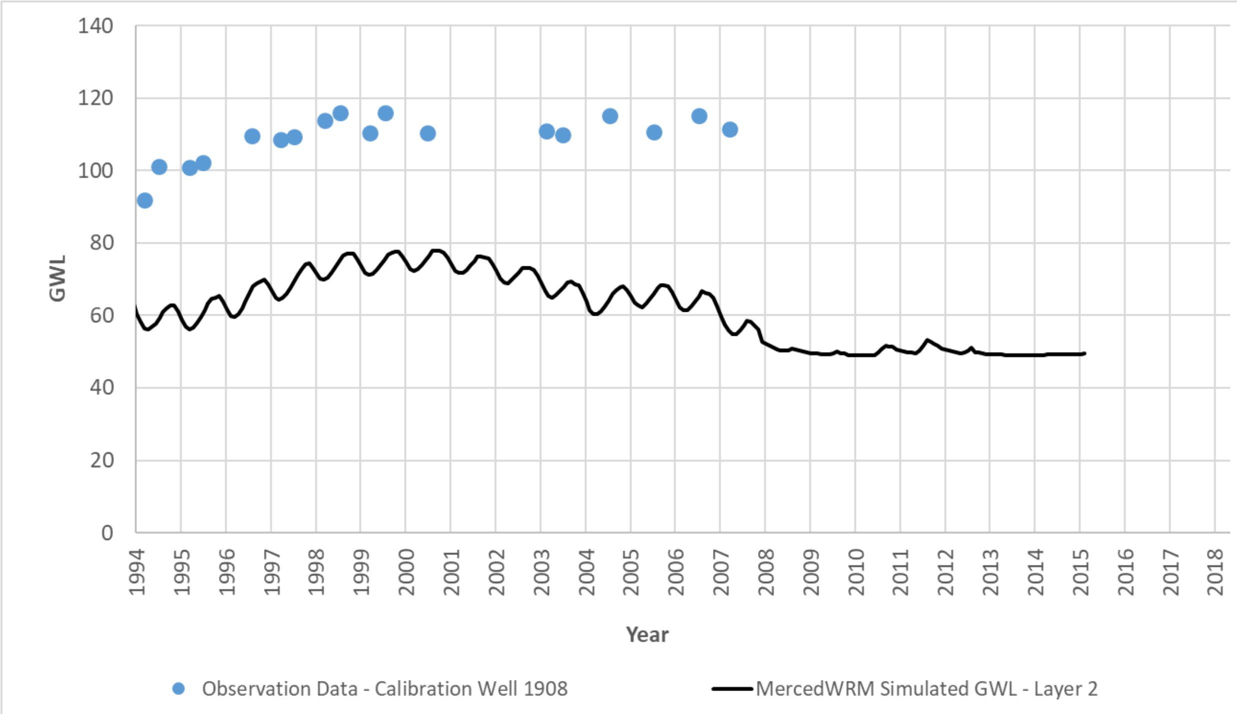


Figure A 57: Calibration Well 1908

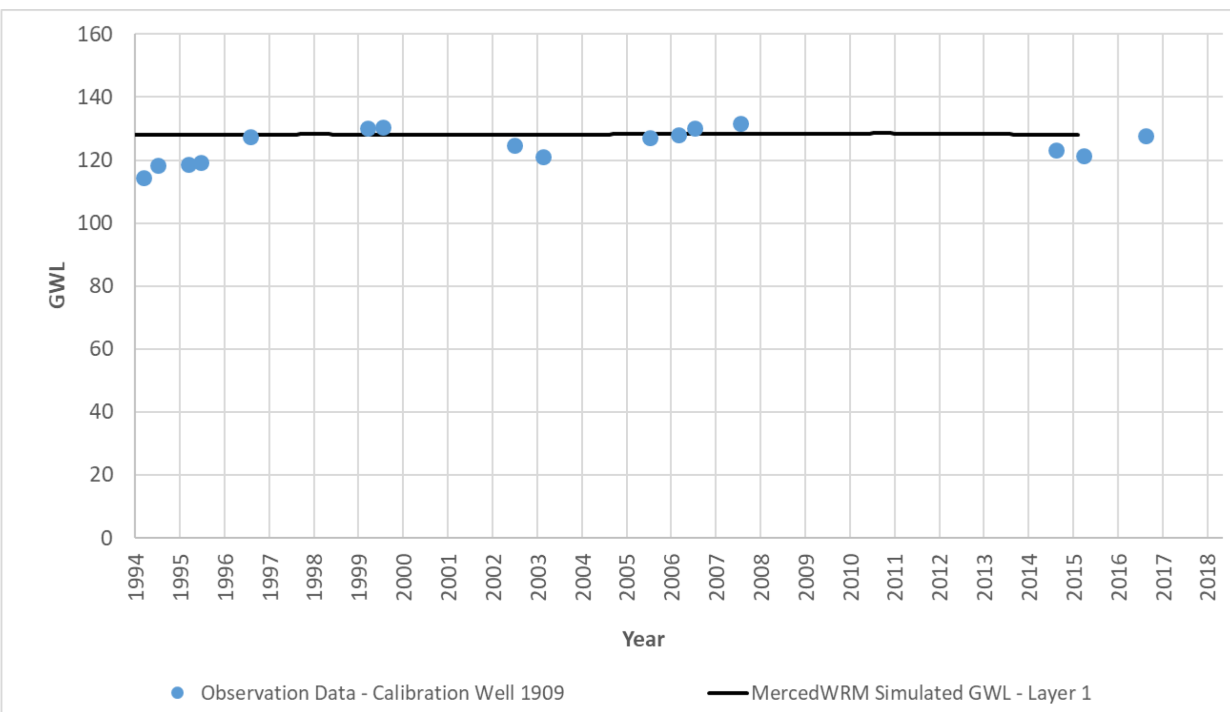


Figure A 58: Calibration Well 1909

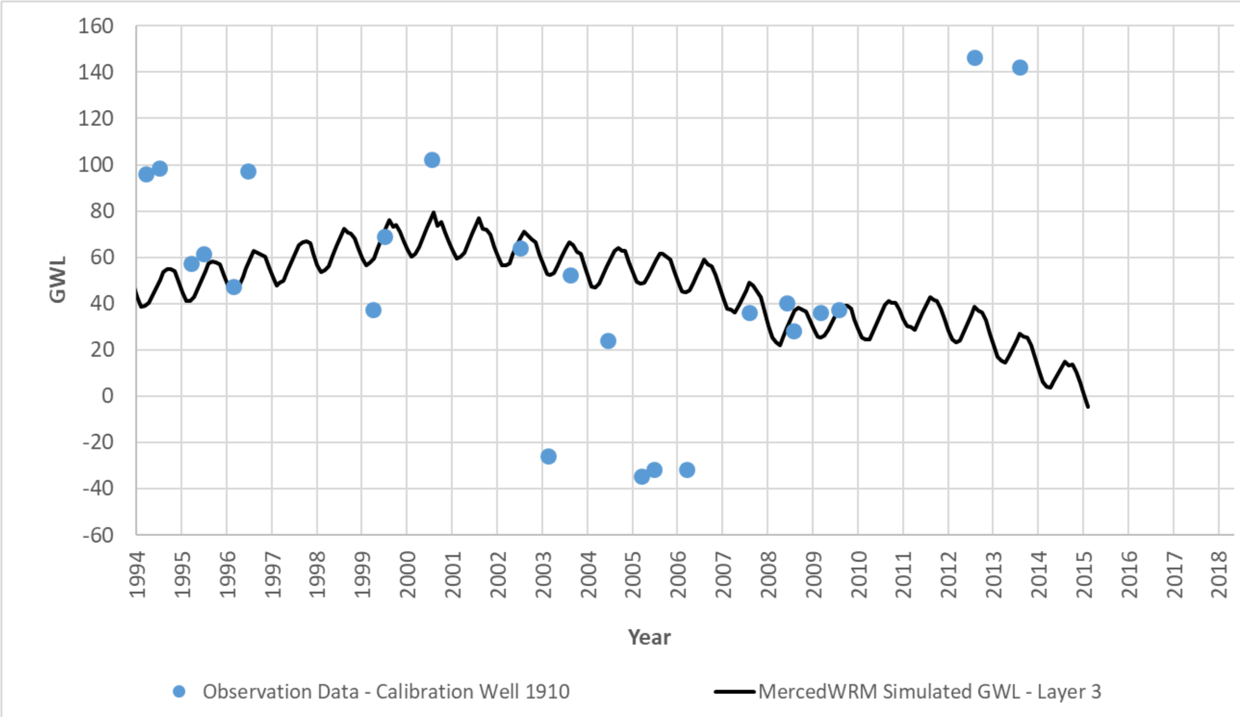


Figure A 59: Calibration Well 1910

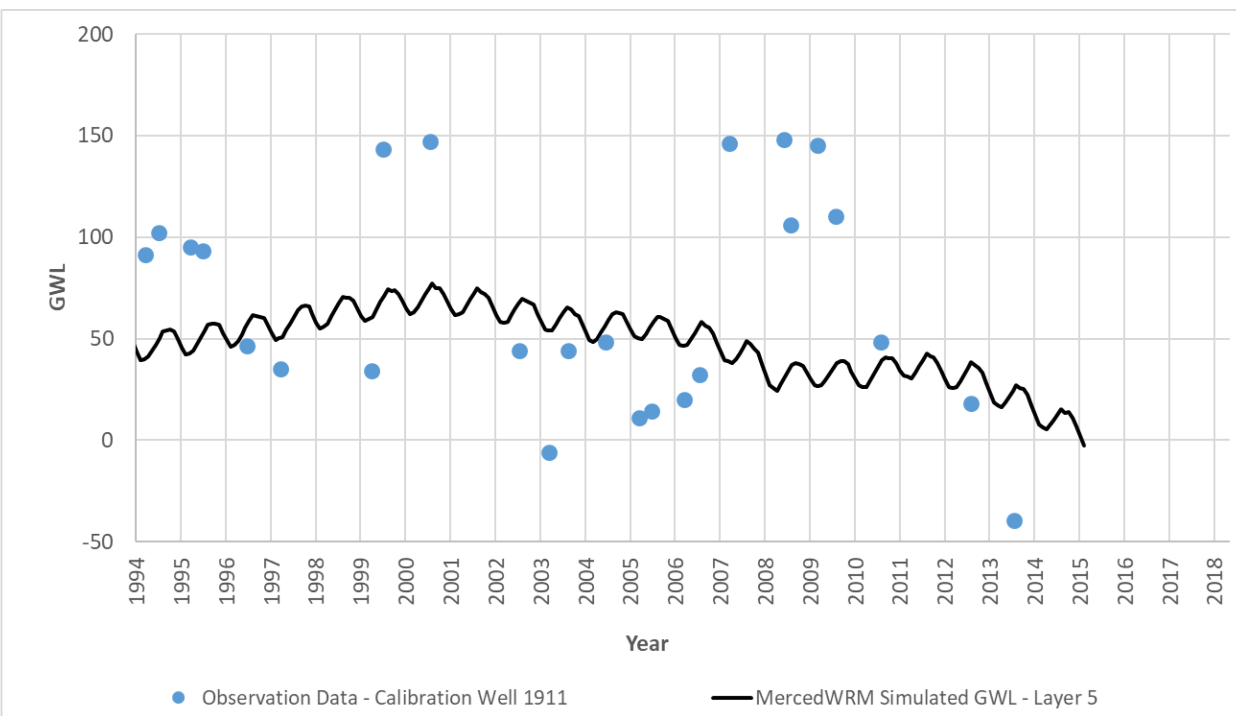


Figure A 60: Calibration Well 1911

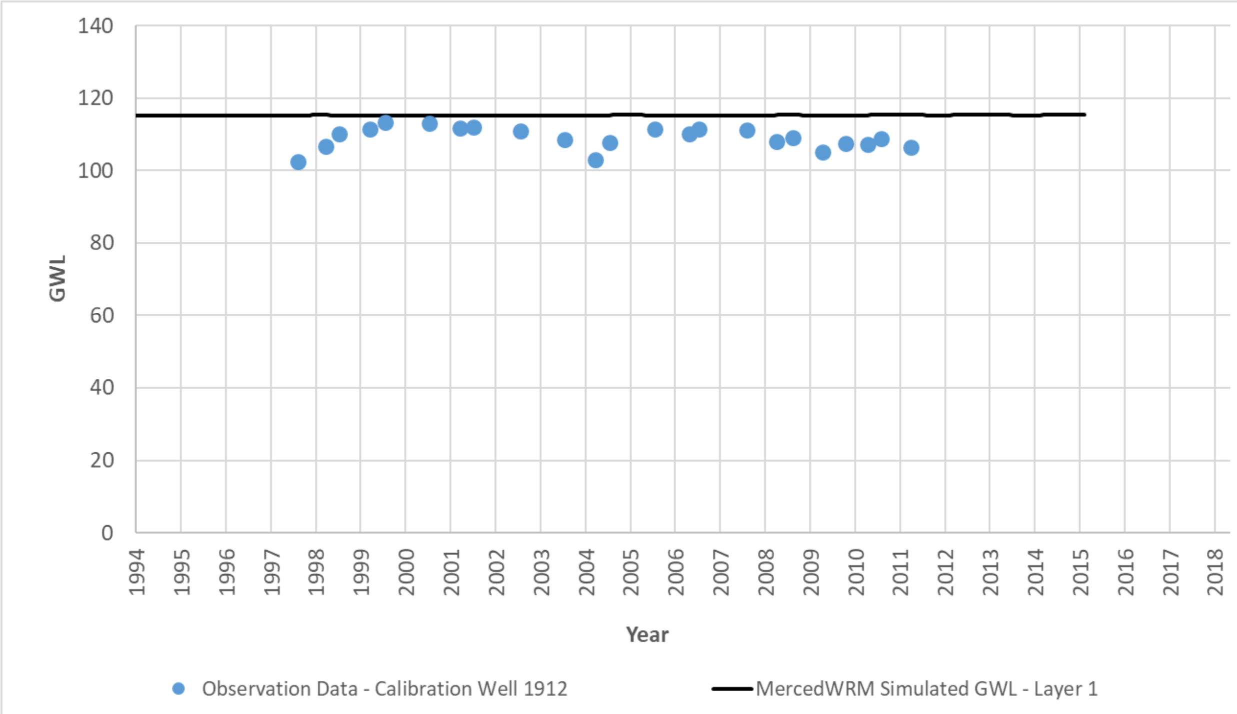


Figure A 61: Calibration Well 1912

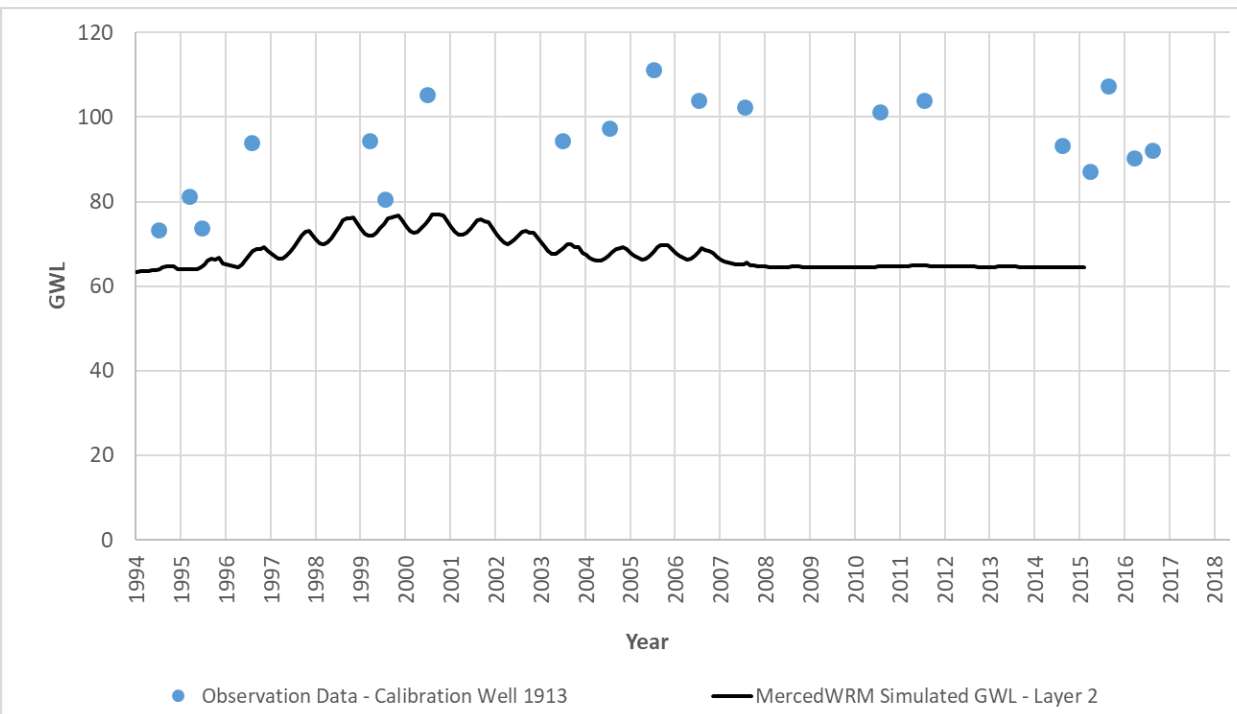


Figure A 62: Calibration Well 1913

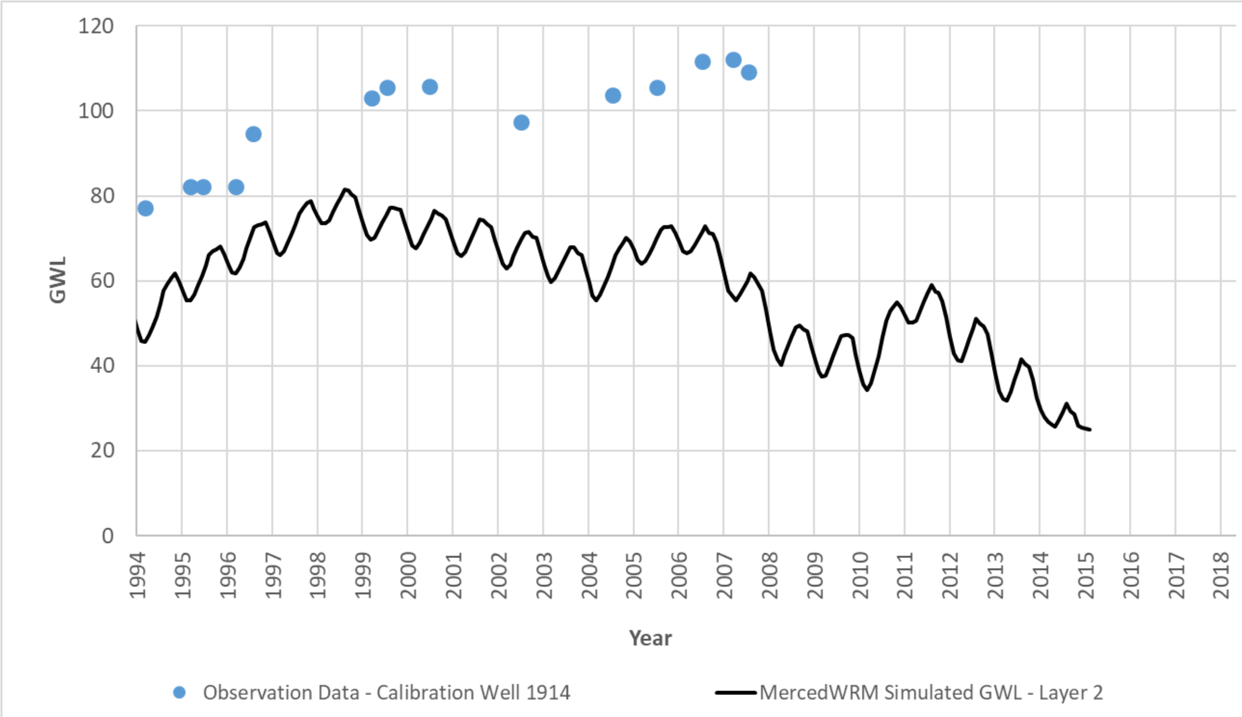


Figure A 63: Calibration Well 1914

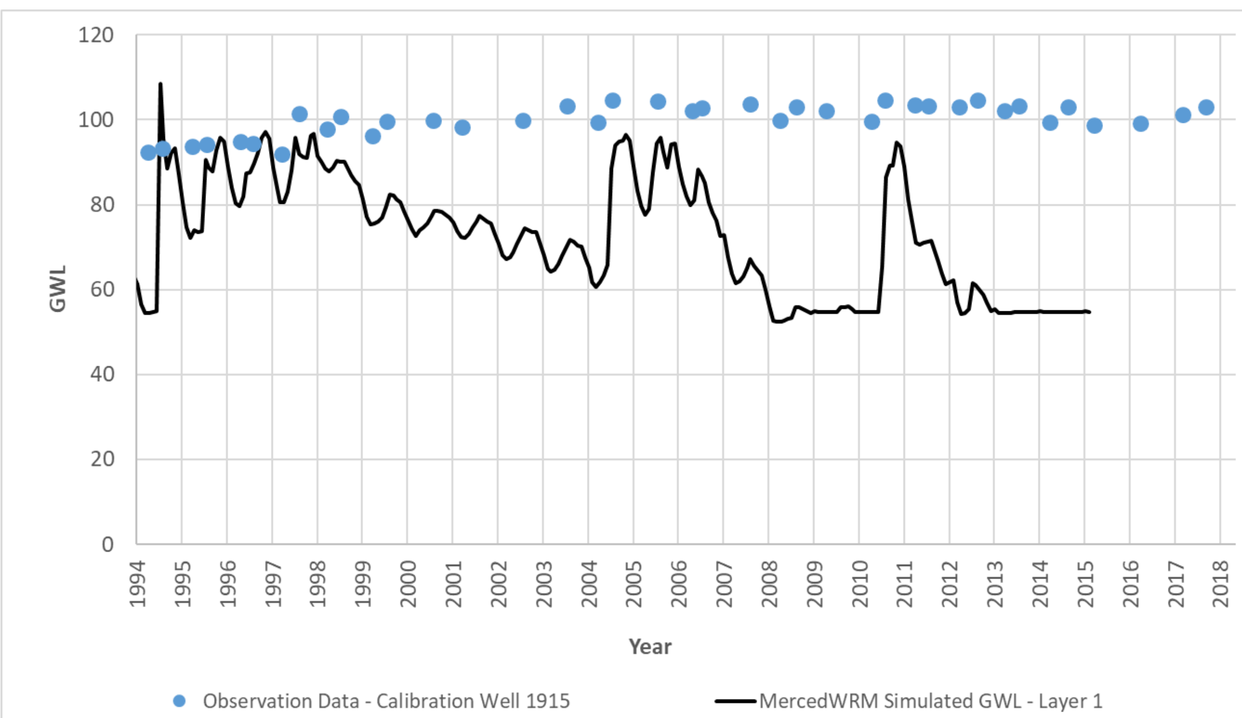


Figure A 64: Calibration Well 1915

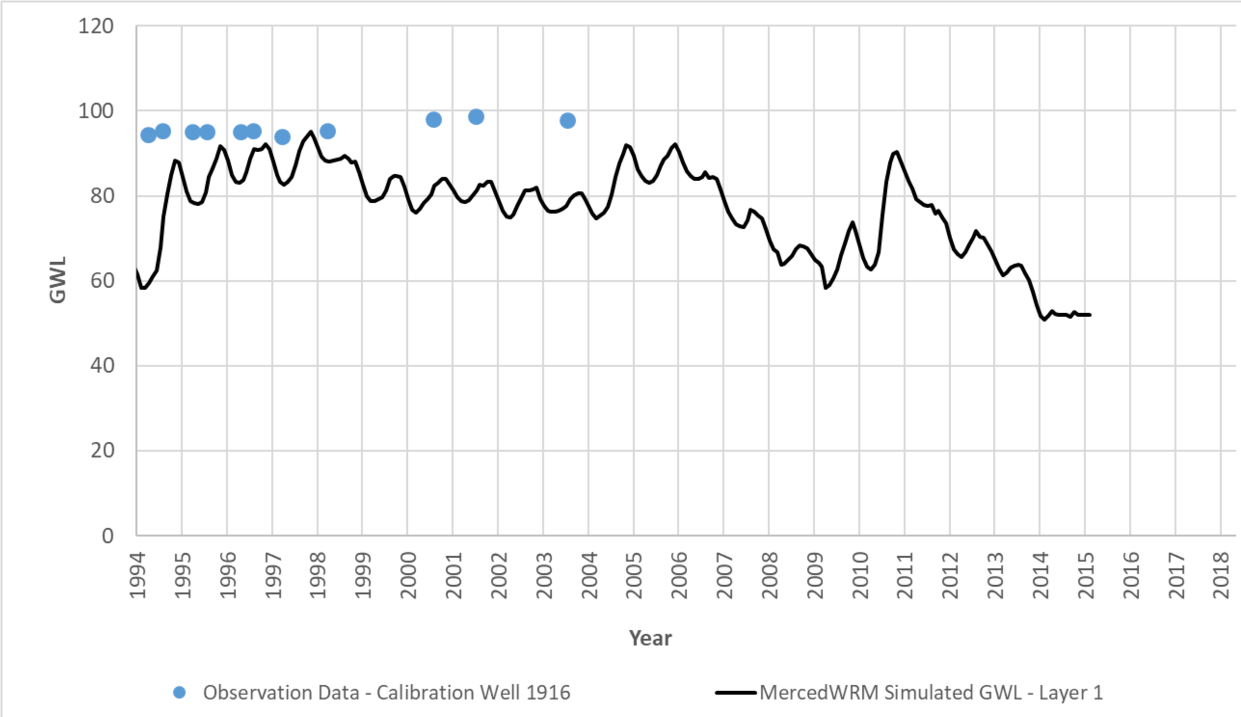


Figure A 65: Calibration Well 1916

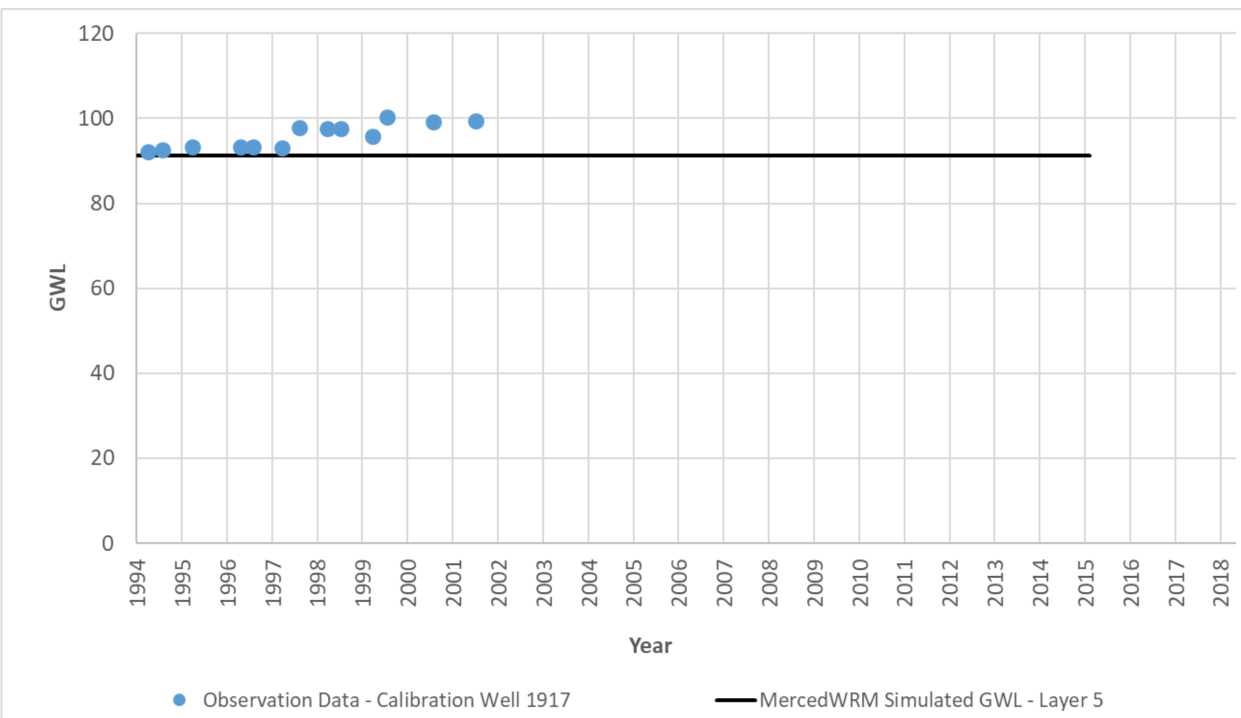


Figure A 66: Calibration Well 1917

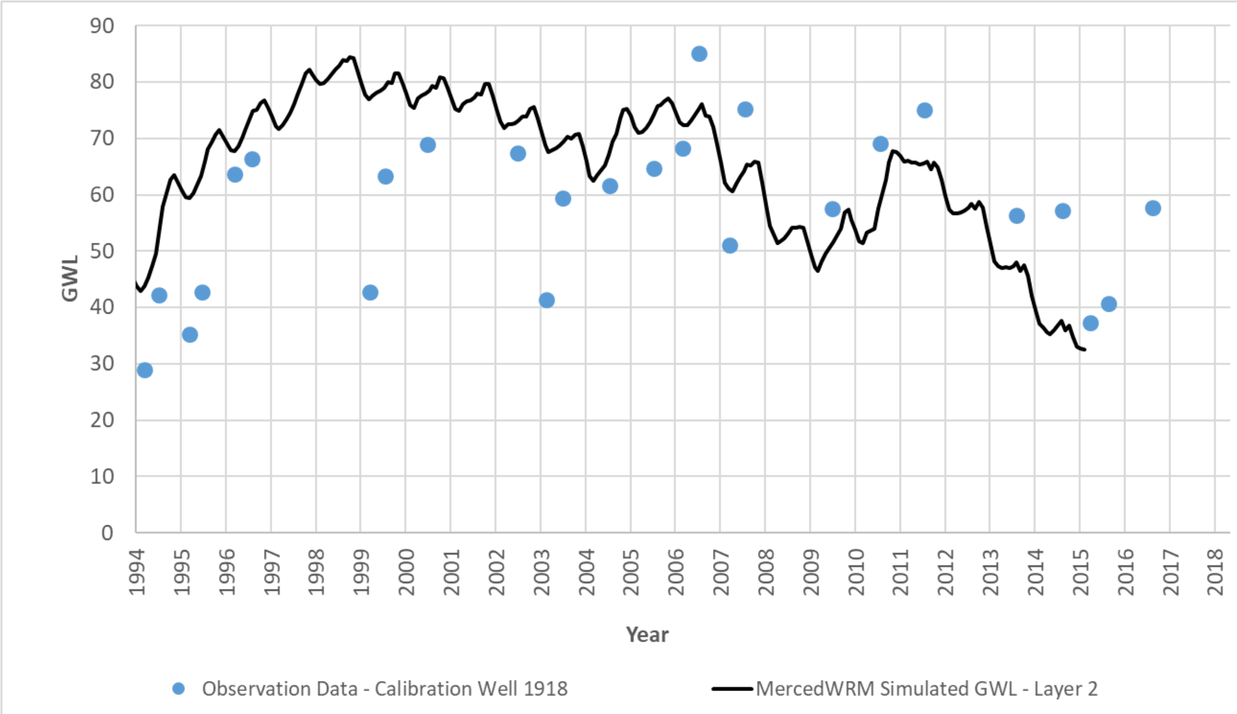


Figure A 67: Calibration Well 1918

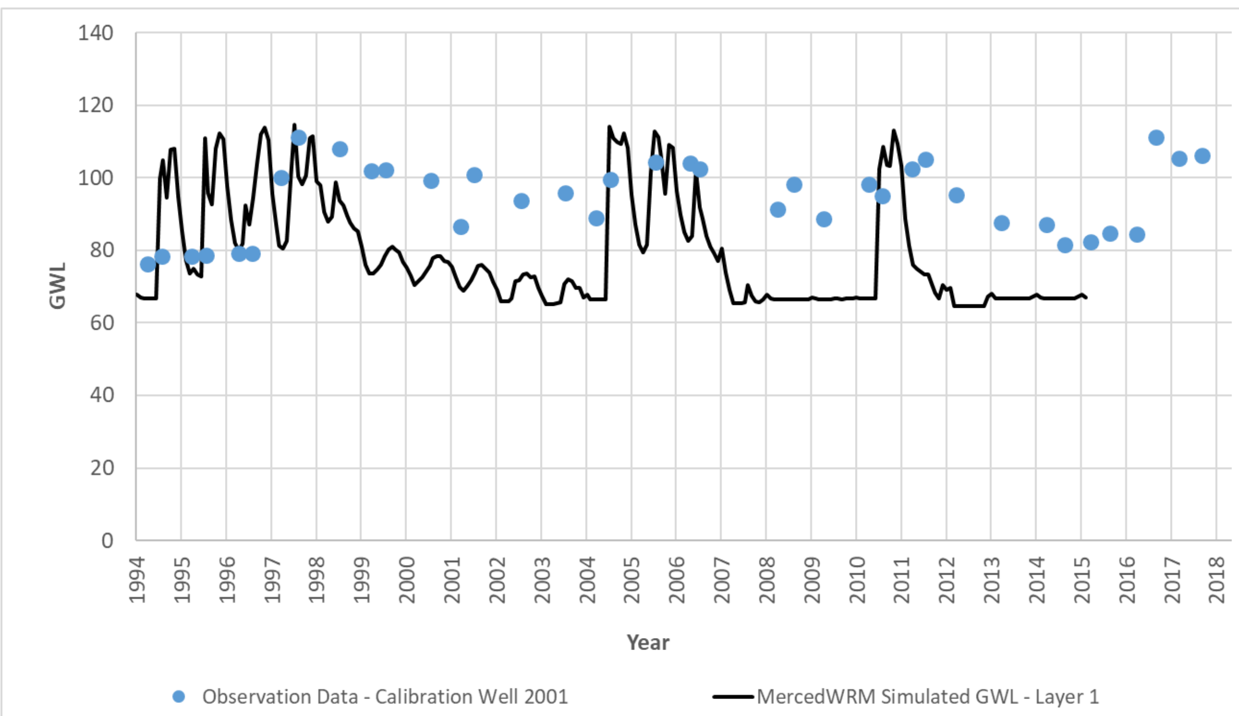


Figure A 68: Calibration Well 2001

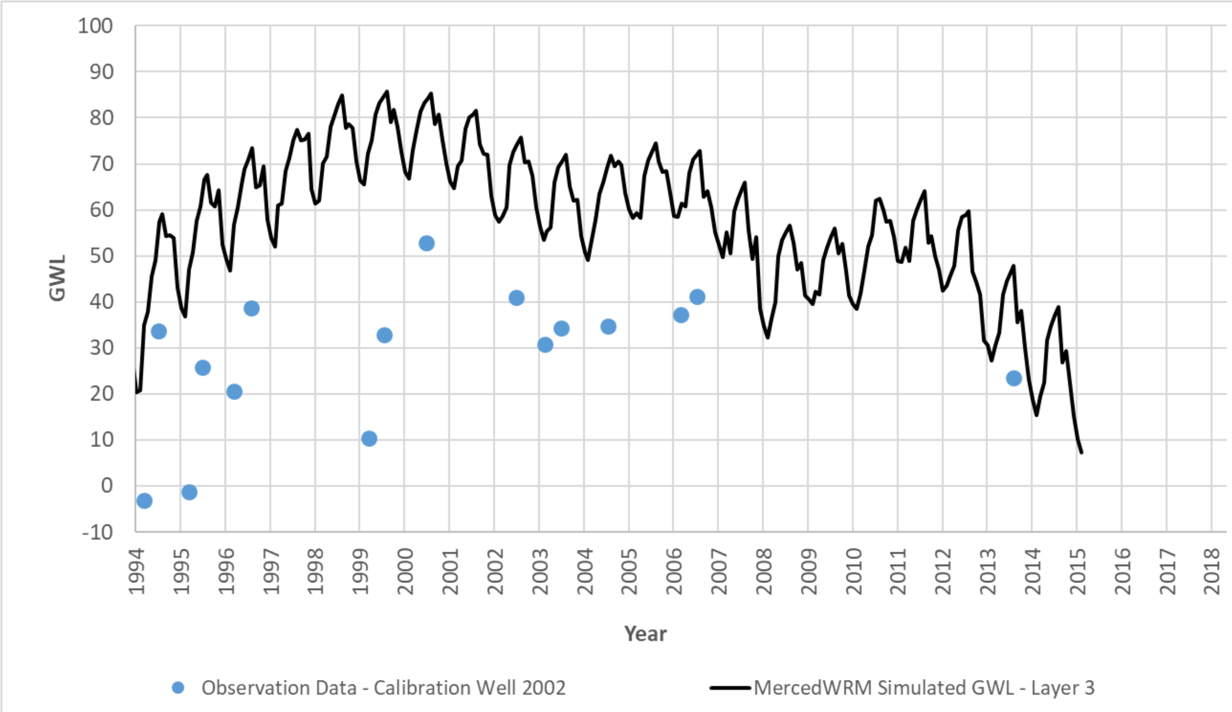


Figure A 69: Calibration Well 2002

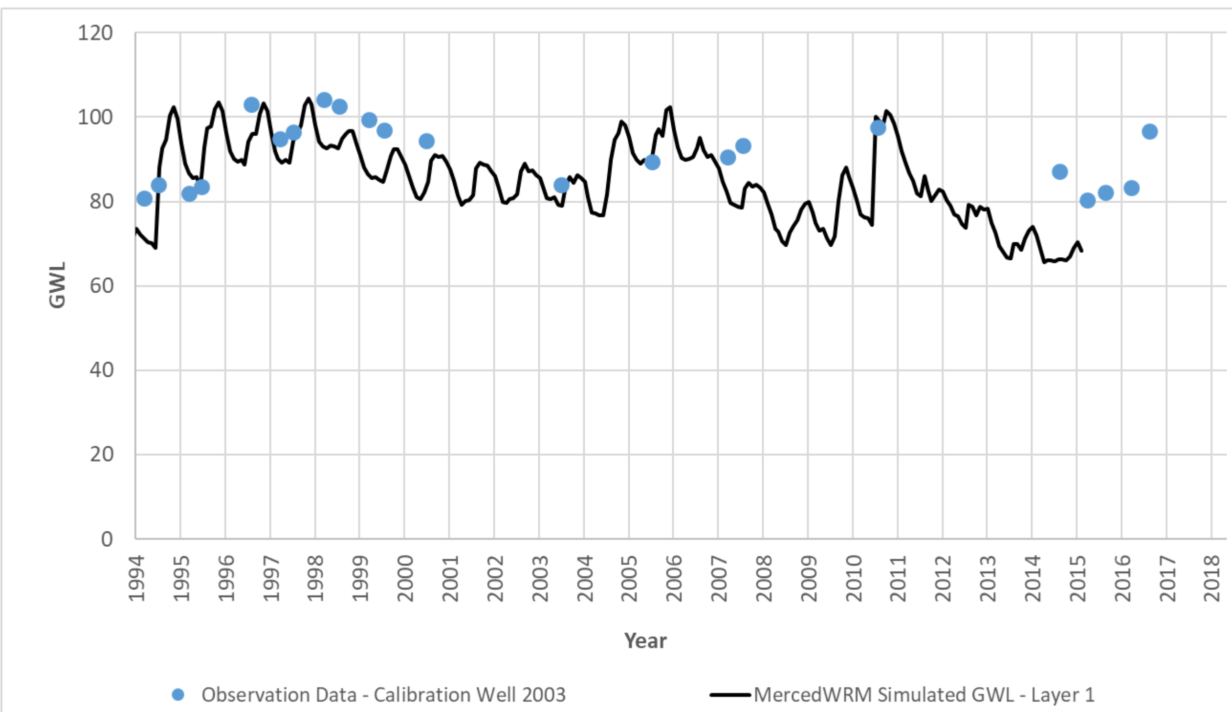


Figure A 70: Calibration Well 2003

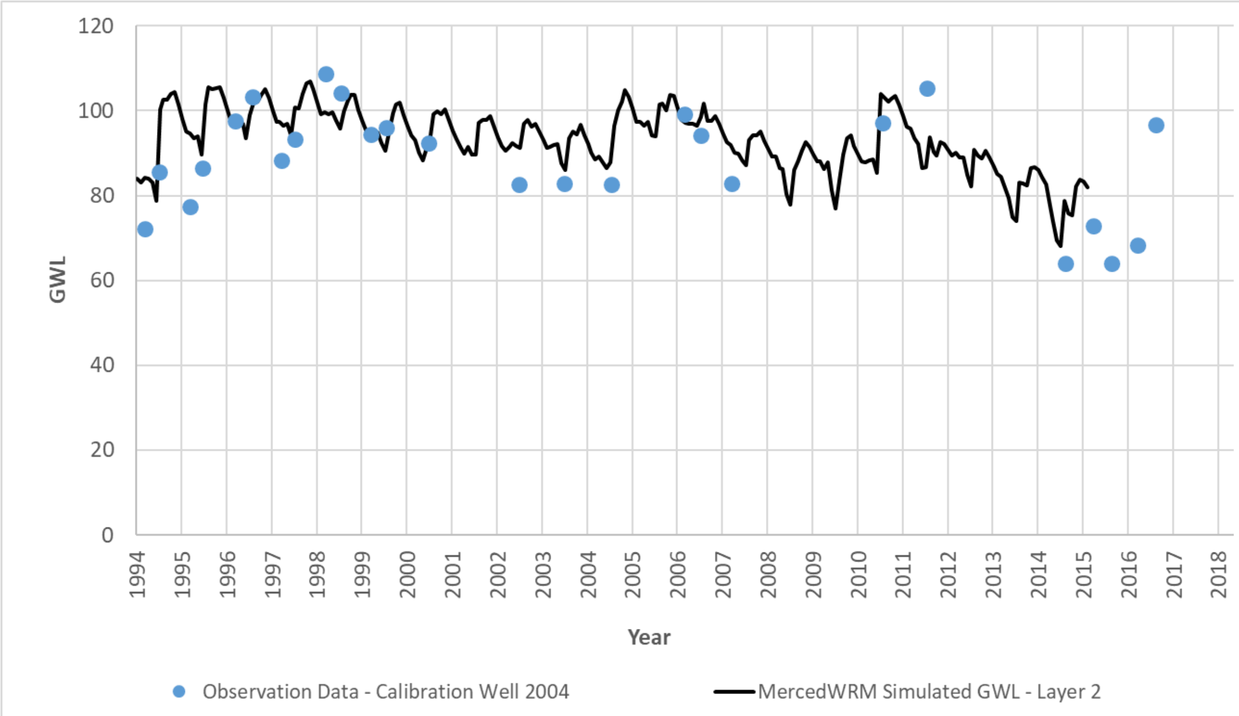


Figure A 71: Calibration Well 2004

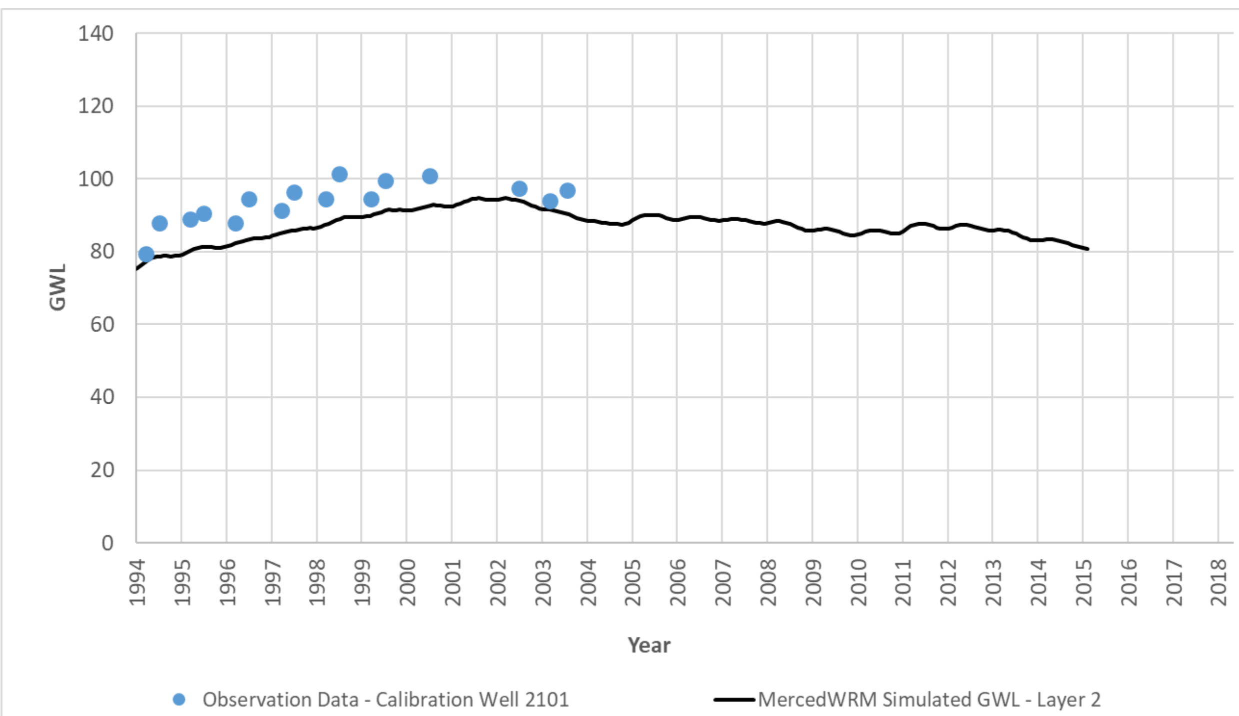


Figure A 72: Calibration Well 2101

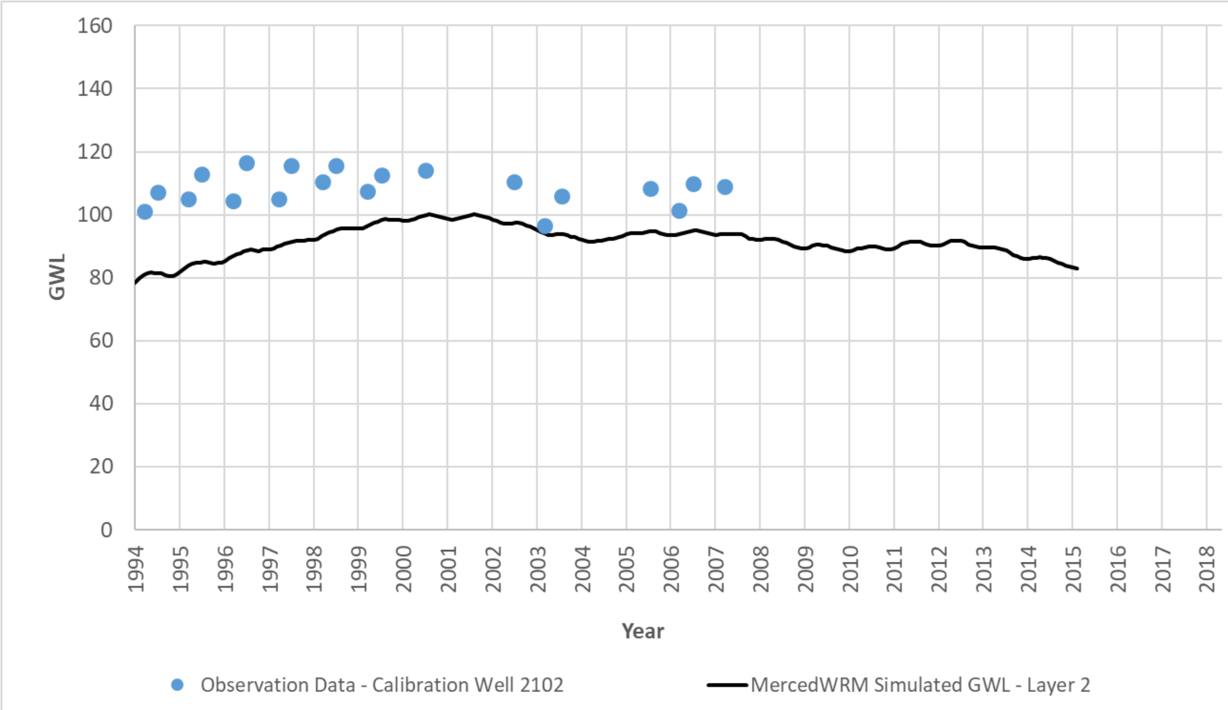


Figure A 73: Calibration Well 2102

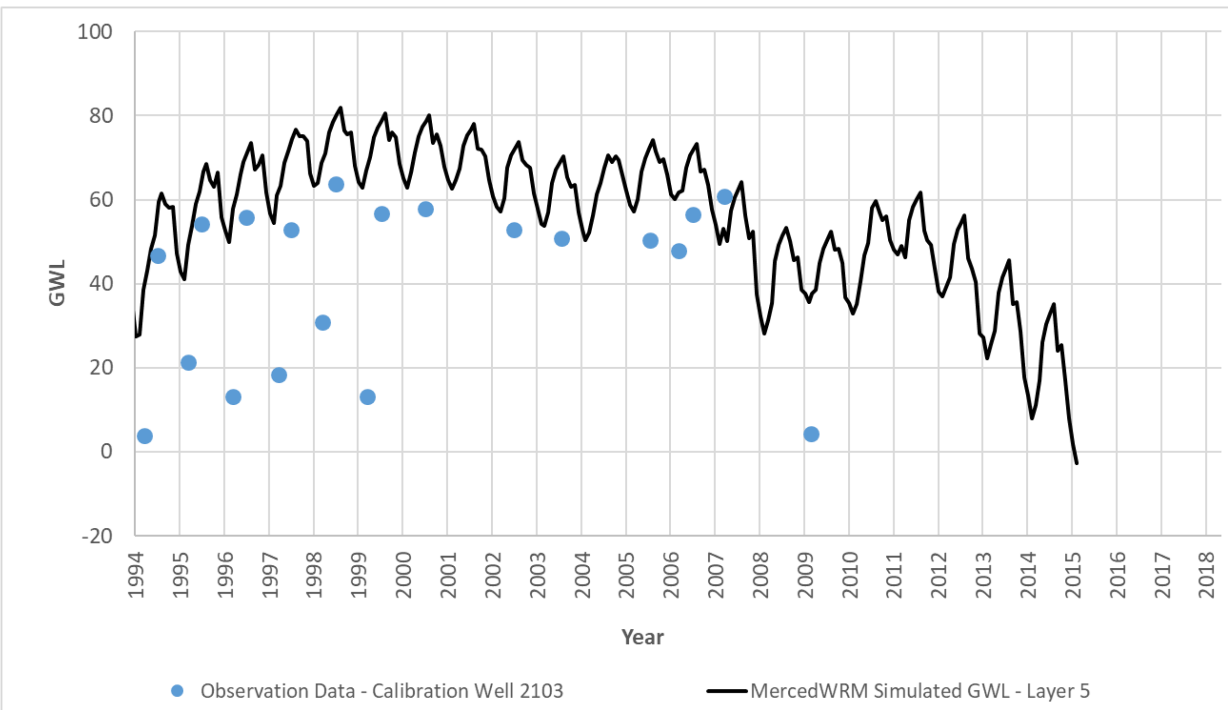


Figure A 74: Calibration Well 2103

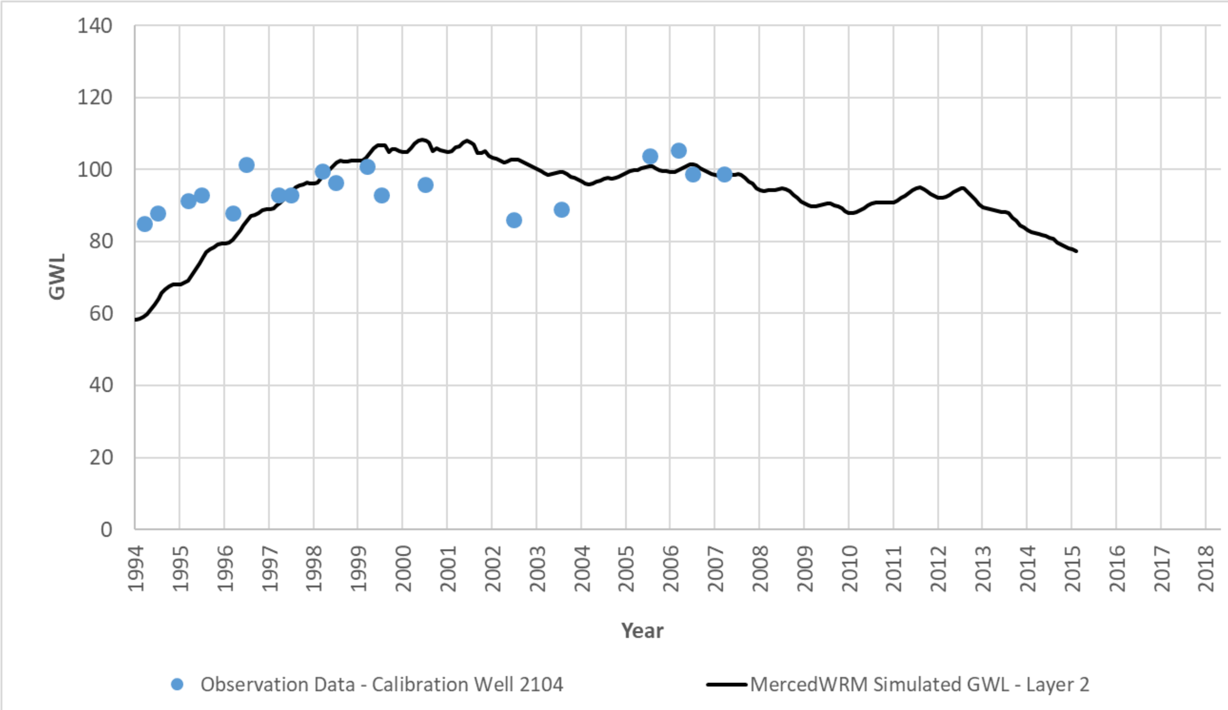


Figure A 75: Calibration Well 2104

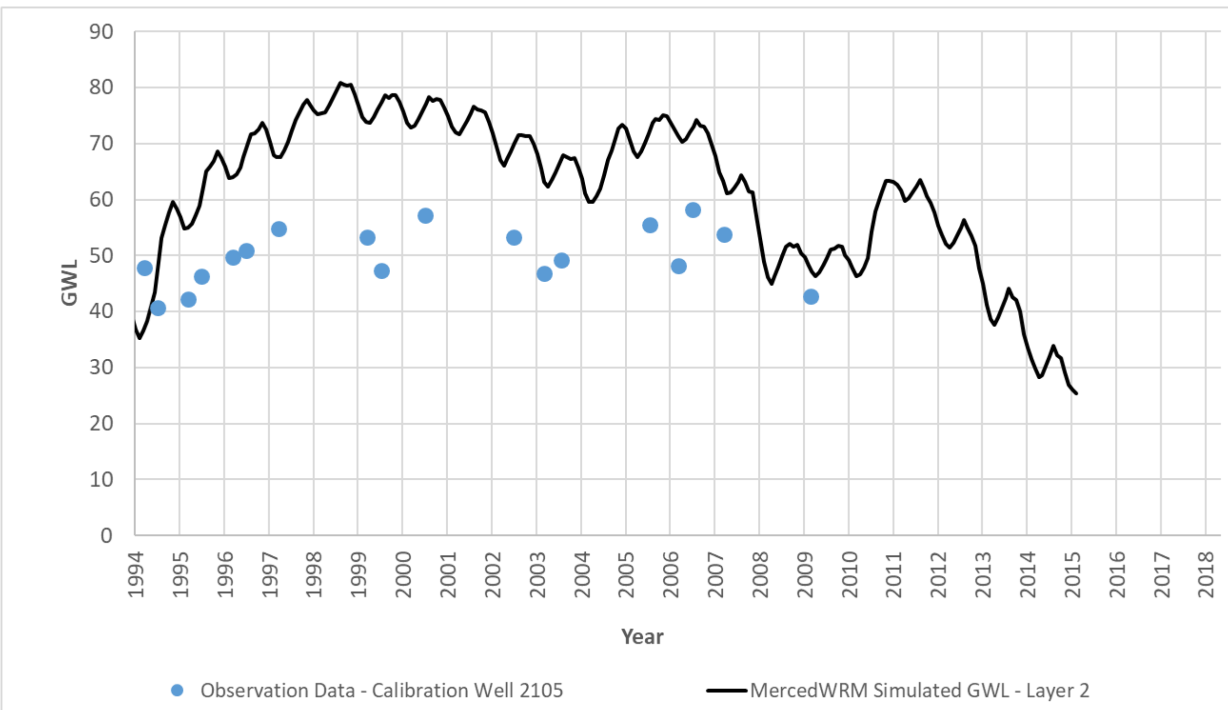


Figure A 76: Calibration Well 2105

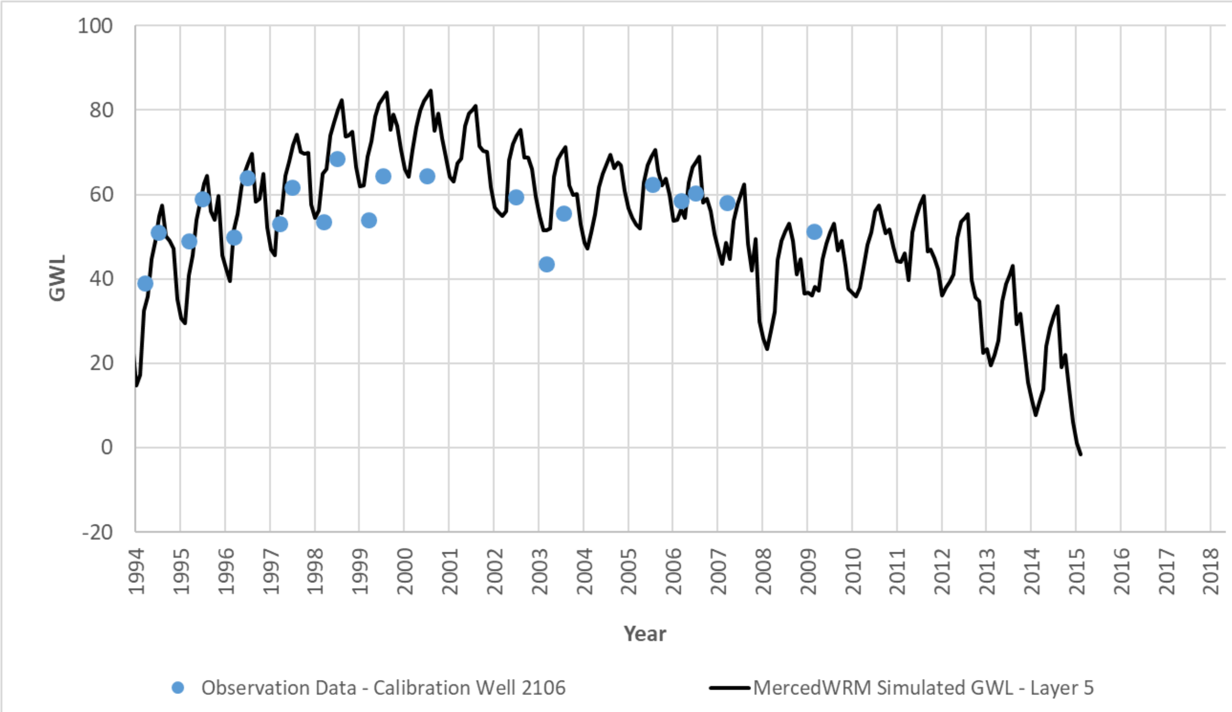


Figure A 77: Calibration Well 2106

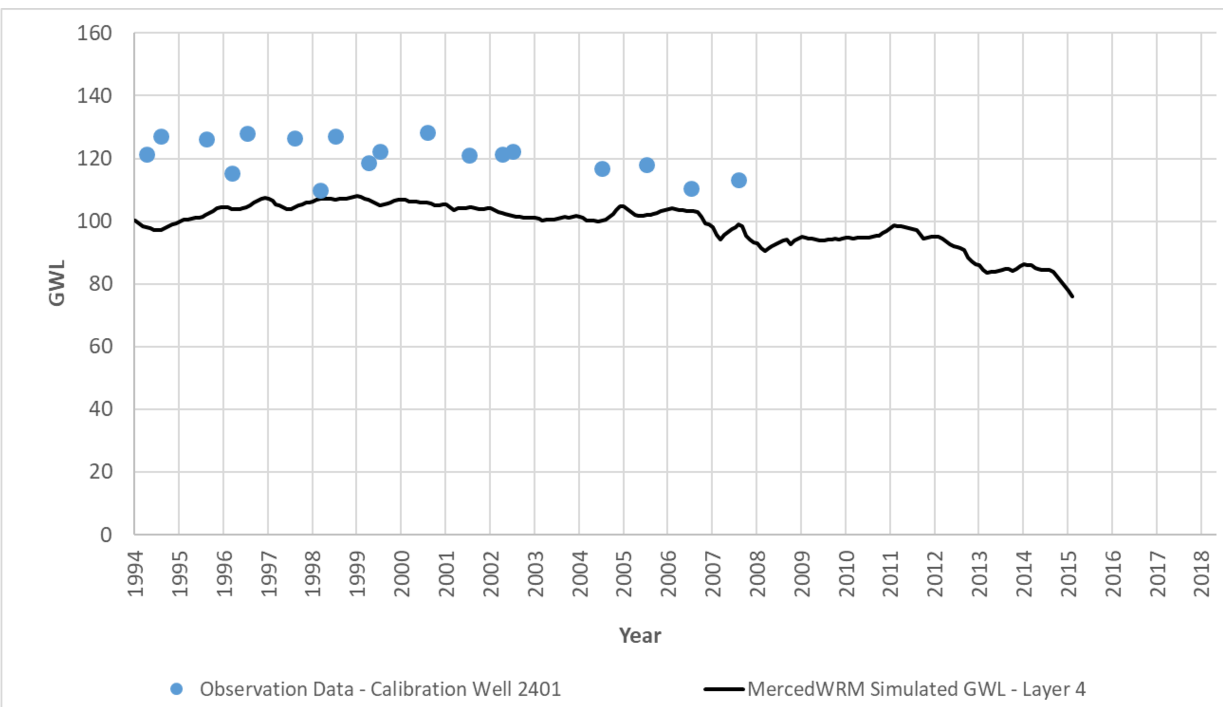


Figure A 78: Calibration Well 2401

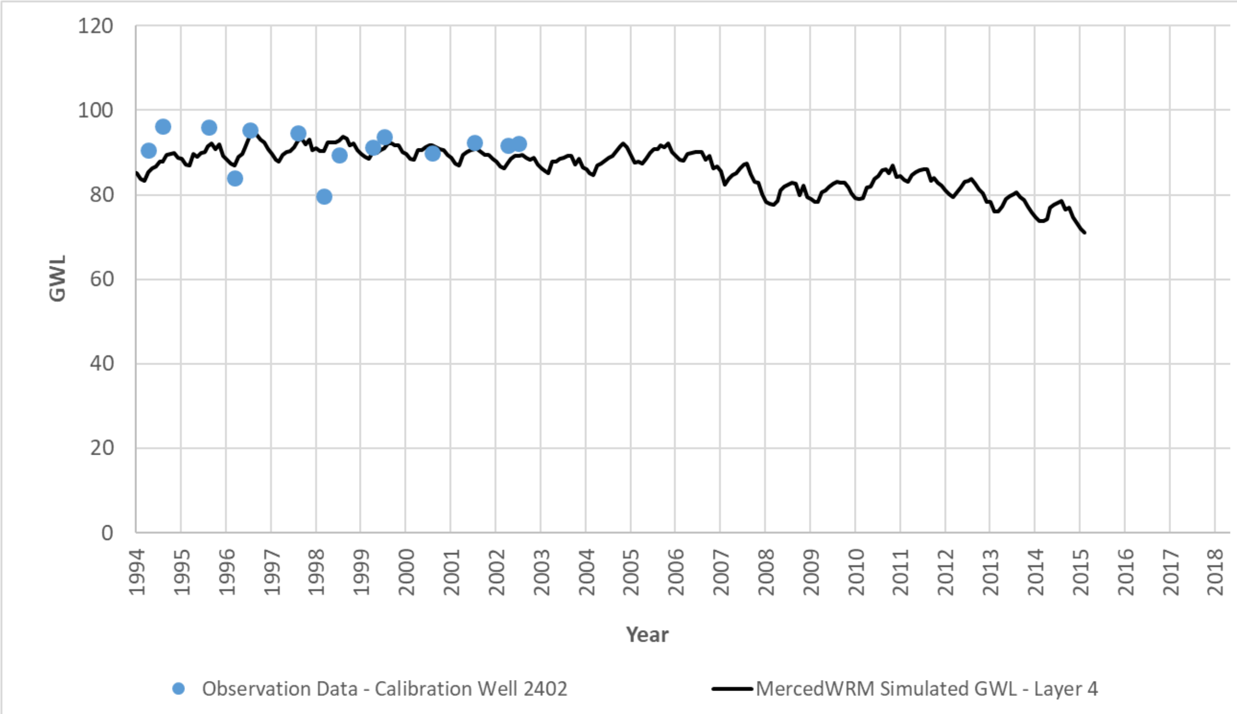


Figure A 79: Calibration Well 2402

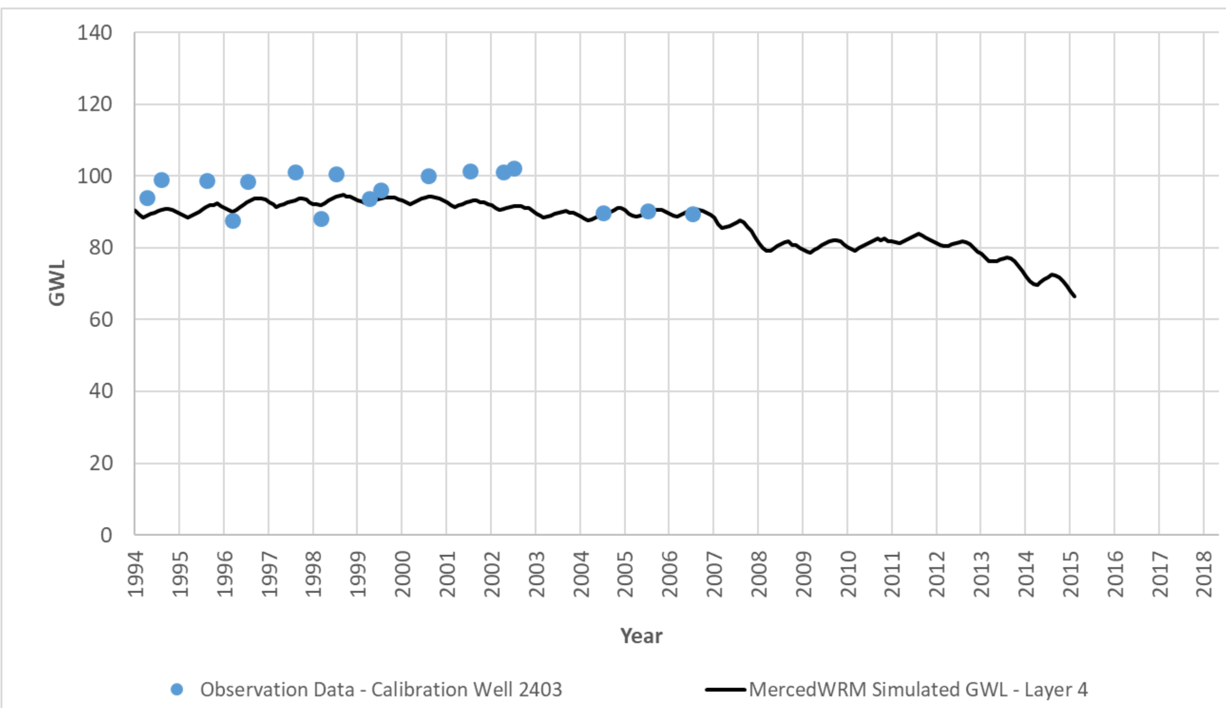


Figure A 80: Calibration Well 2403

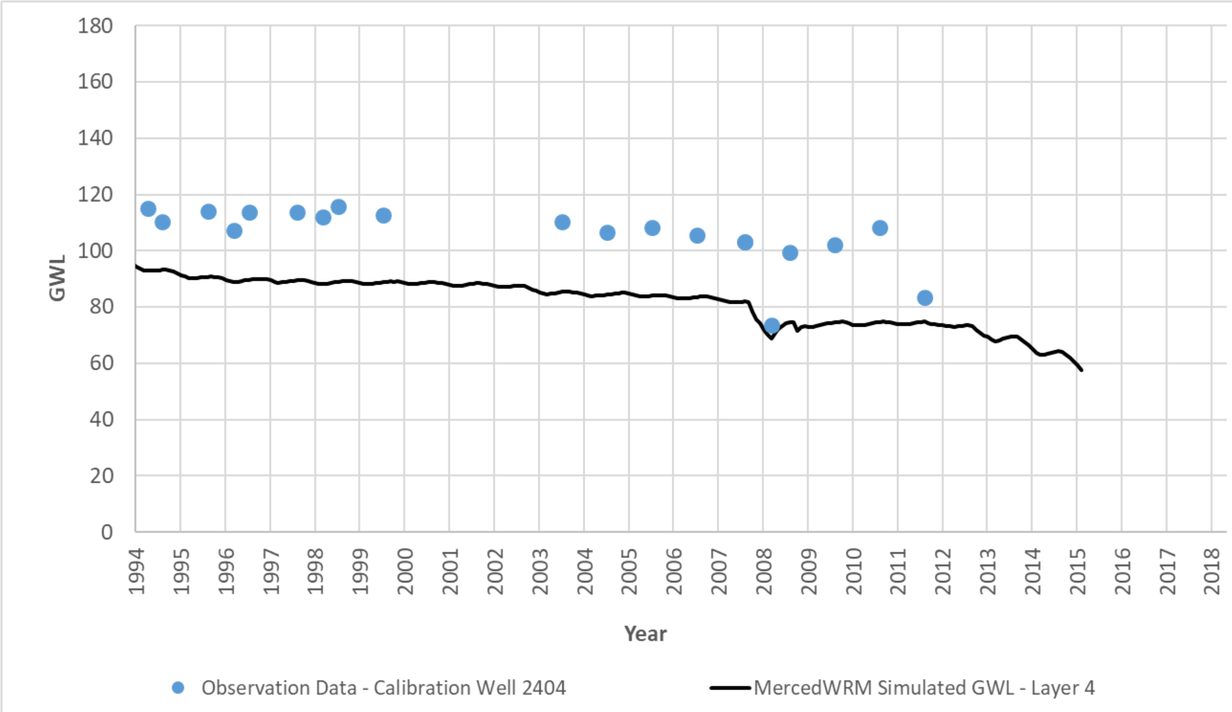


Figure A 81: Calibration Well 2404

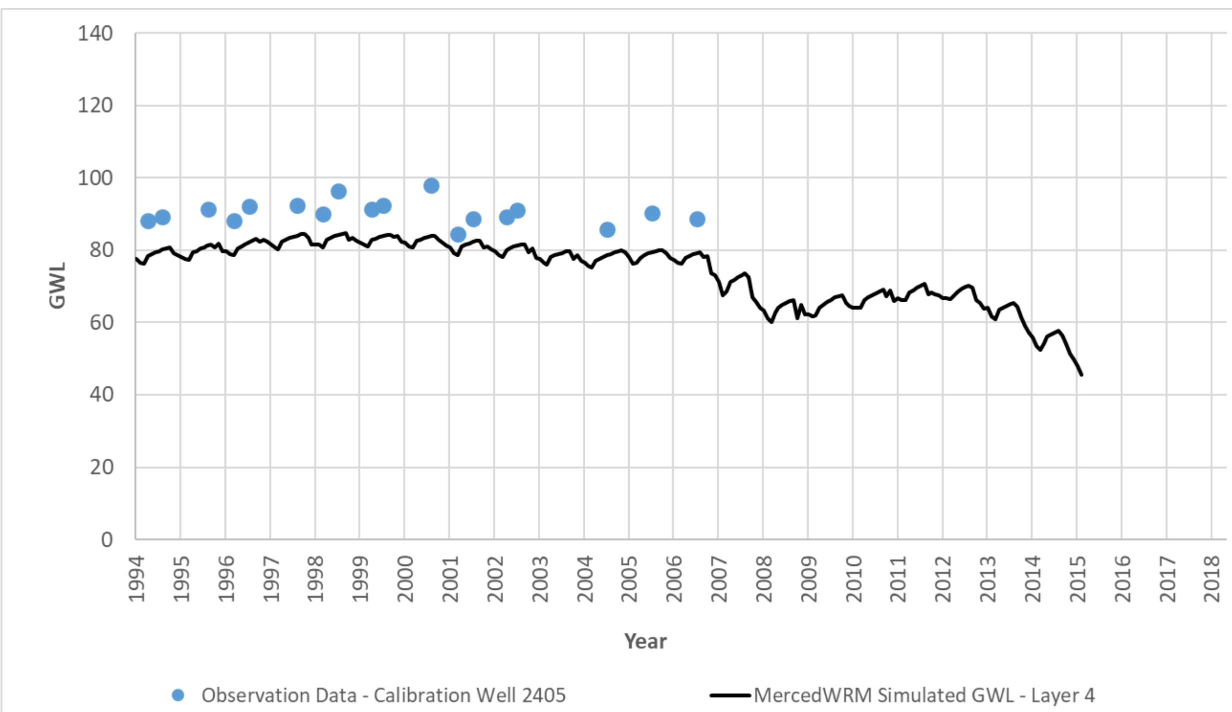


Figure A 82: Calibration Well 2405

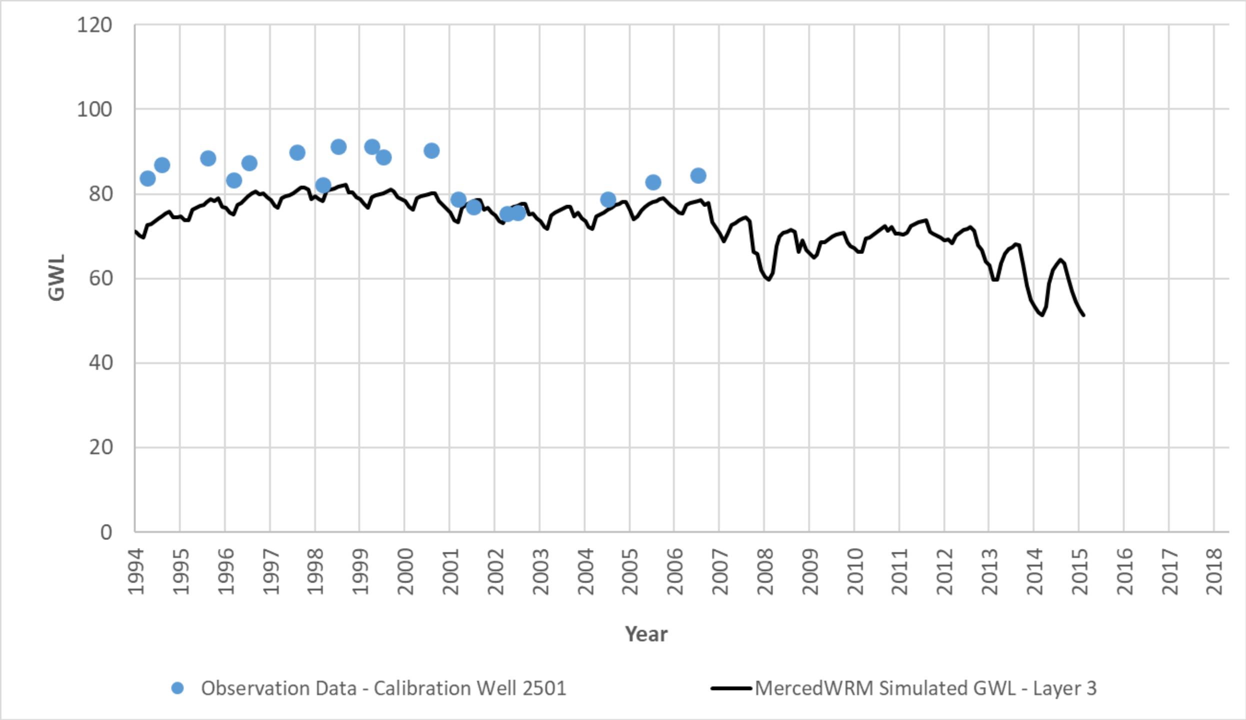


Figure A 83: Calibration Well 2501

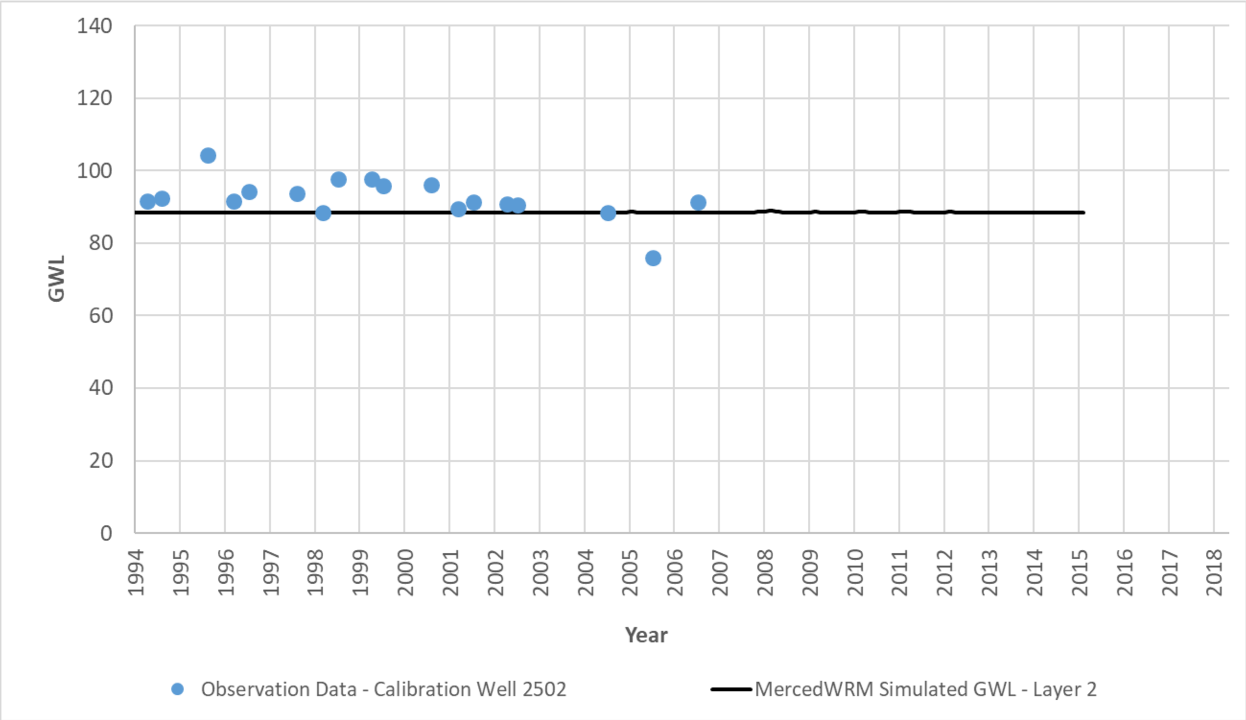


Figure A 84: Calibration Well 2502

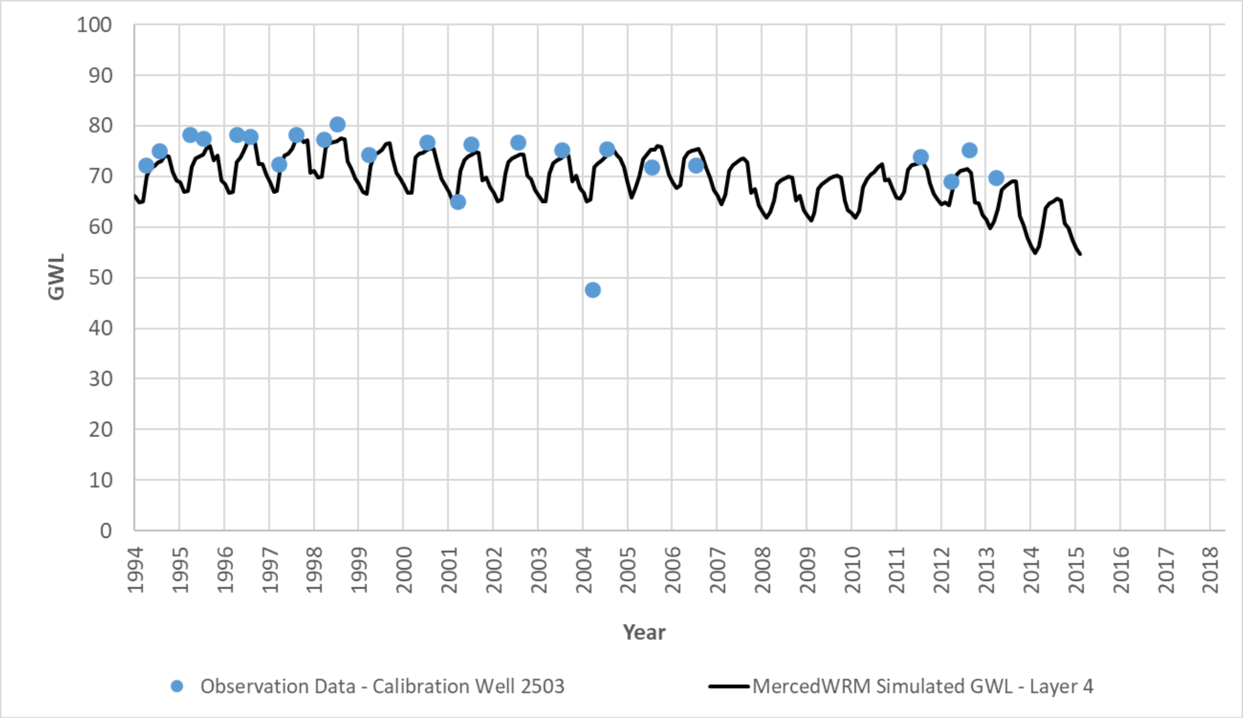


Figure A 85: Calibration Well 2503

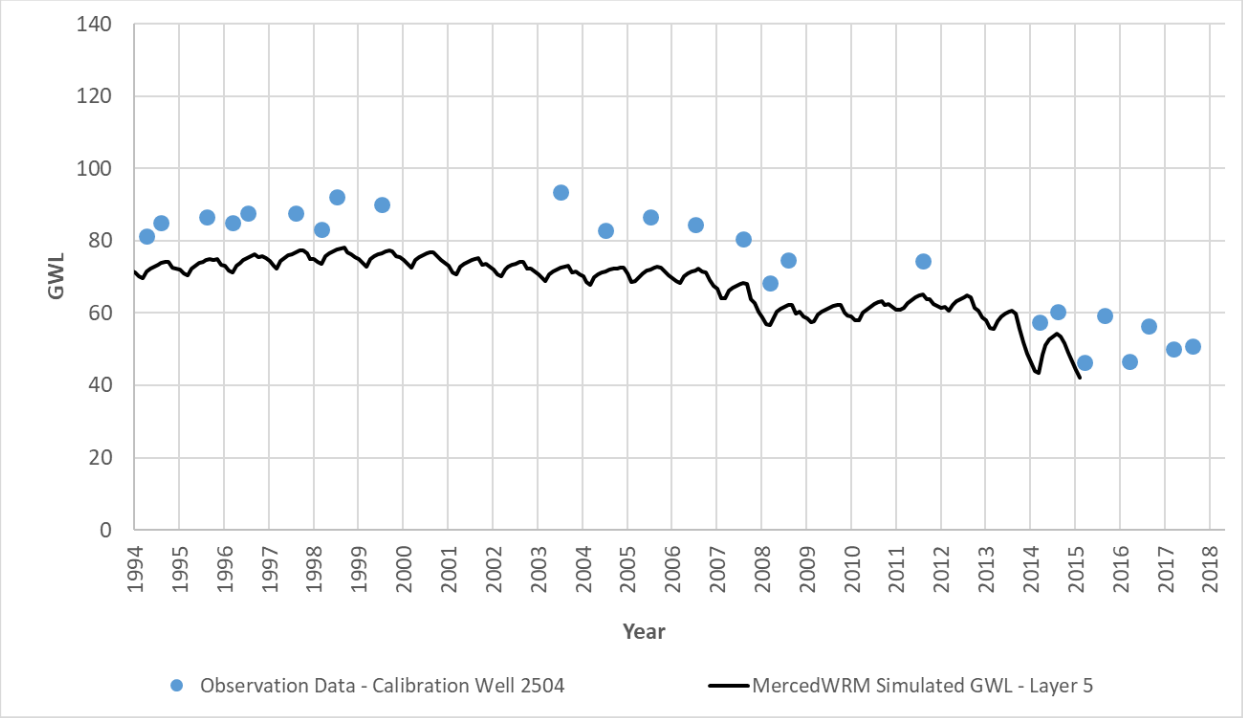


Figure A 86: Calibration Well 2504

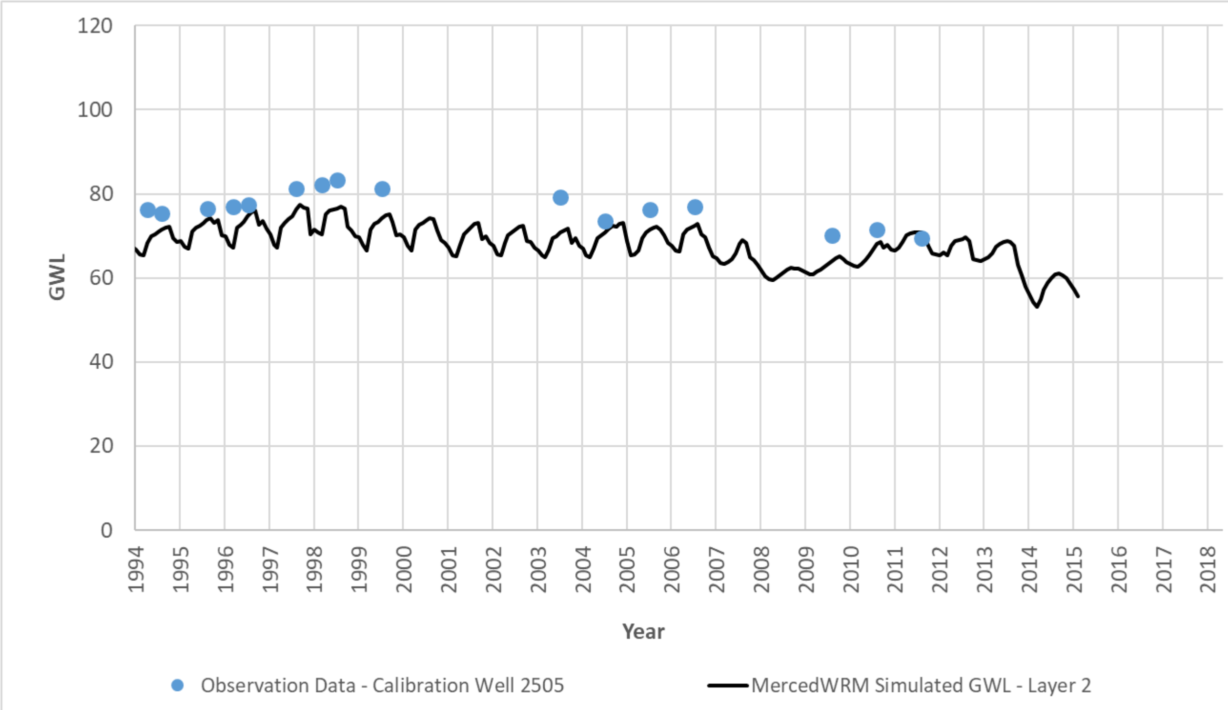


Figure A 87: Calibration Well 2505

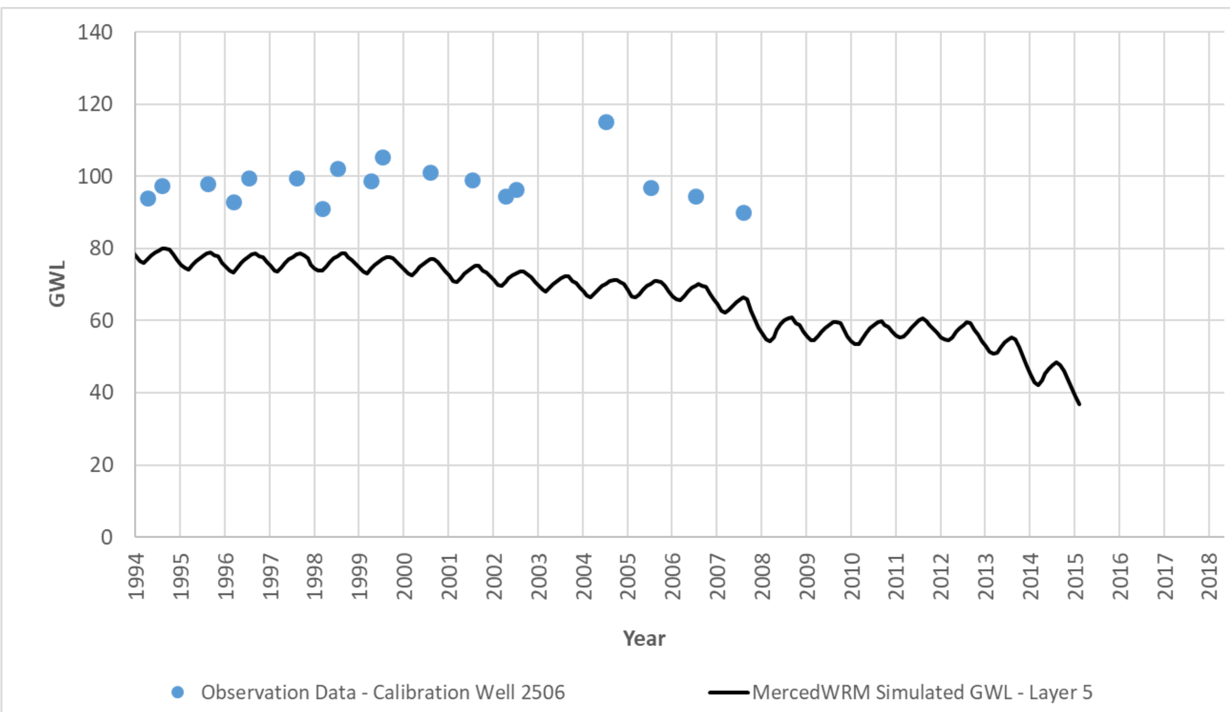


Figure A 88: Calibration Well 2506

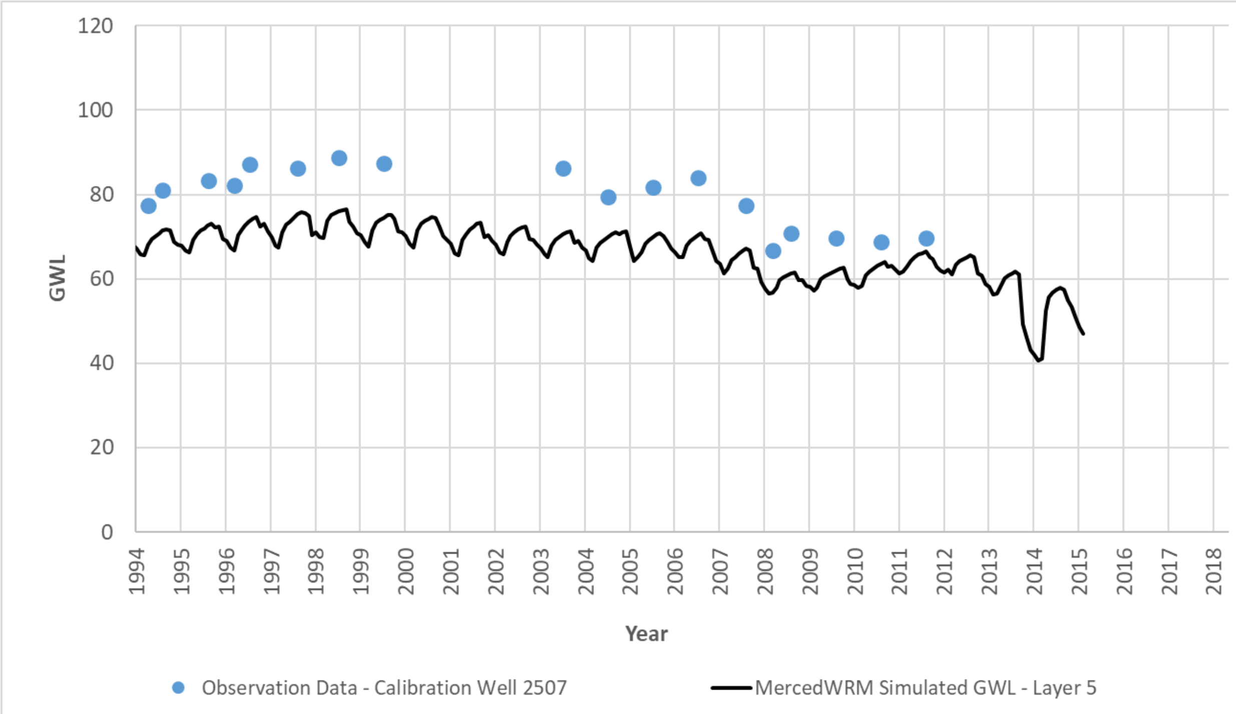


Figure A 89: Calibration Well 2507

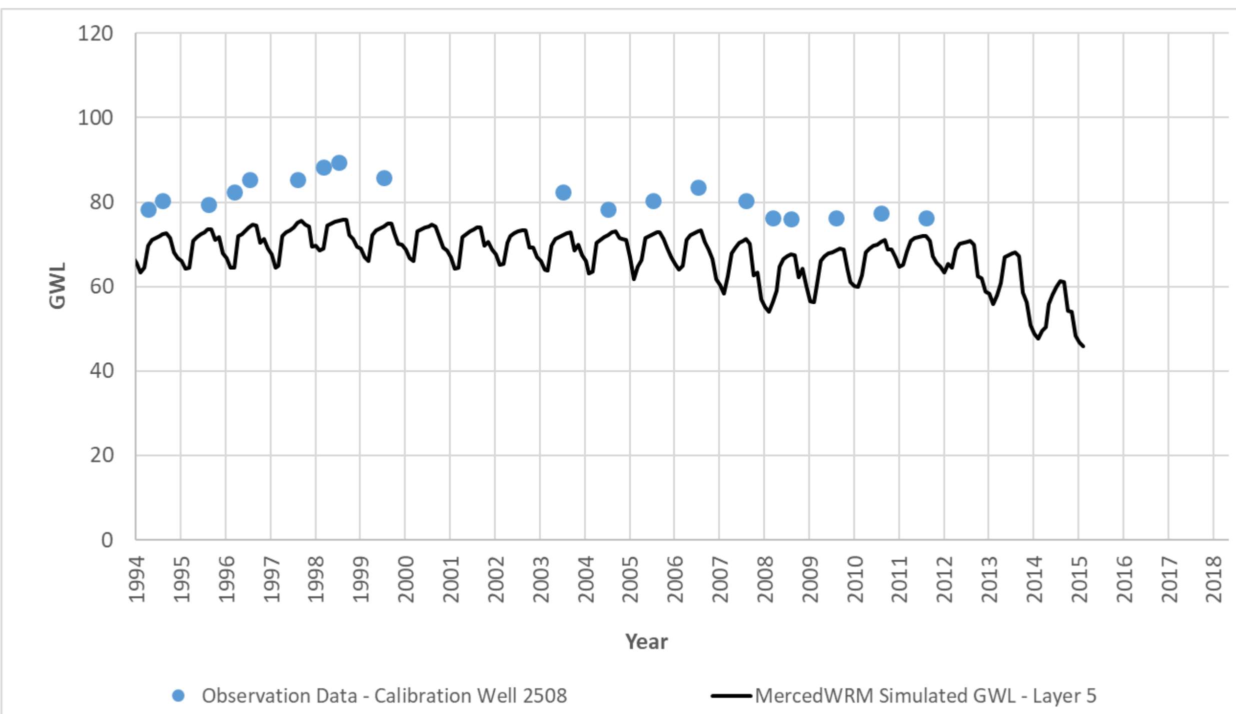


Figure A 90: Calibration Well 2508

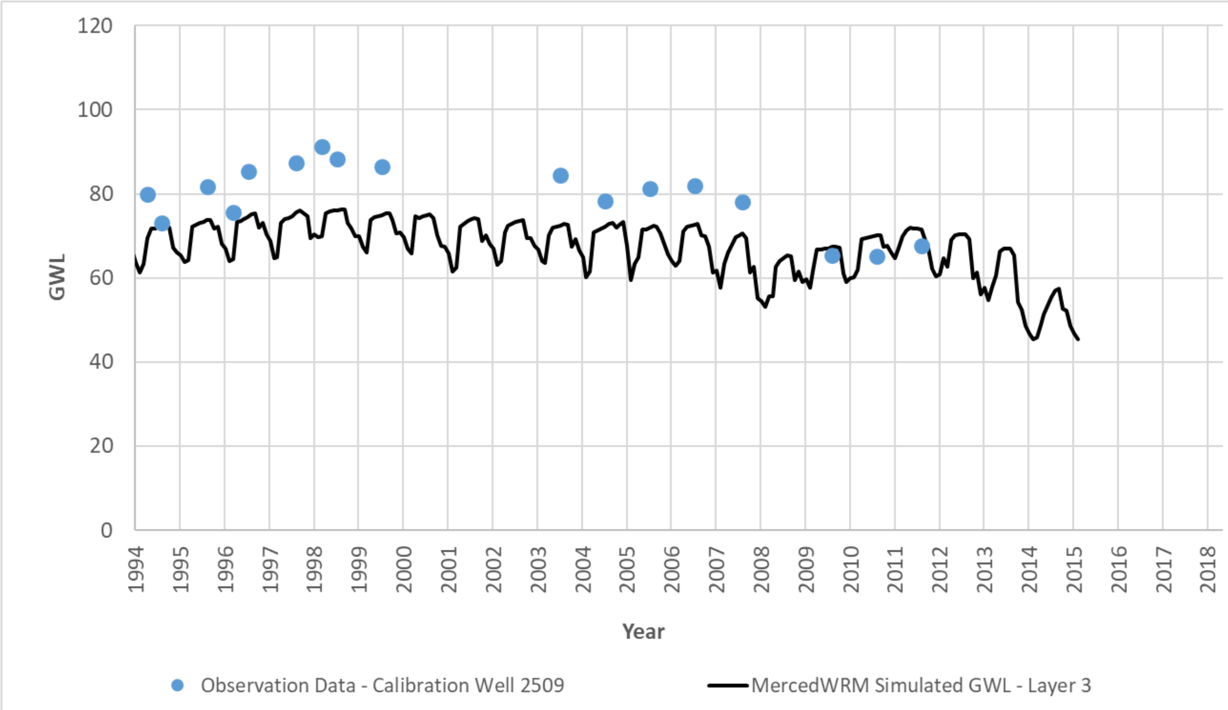


Figure A 91: Calibration Well 2509

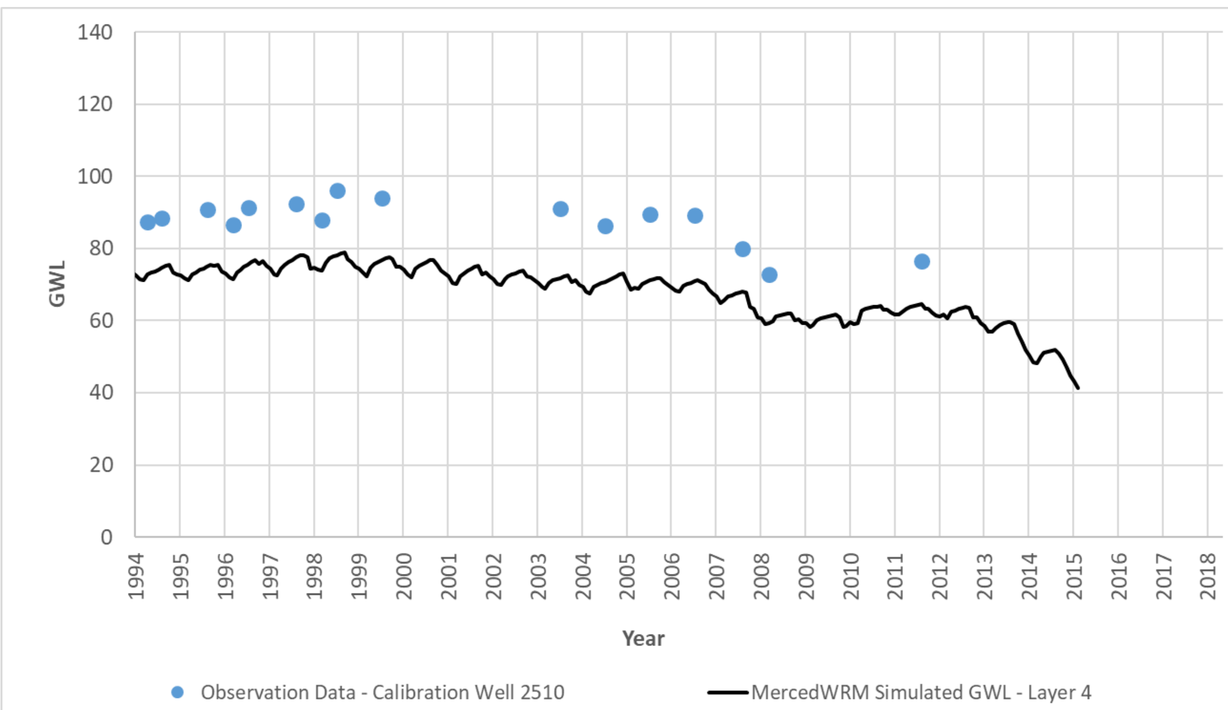


Figure A 92: Calibration Well 2510

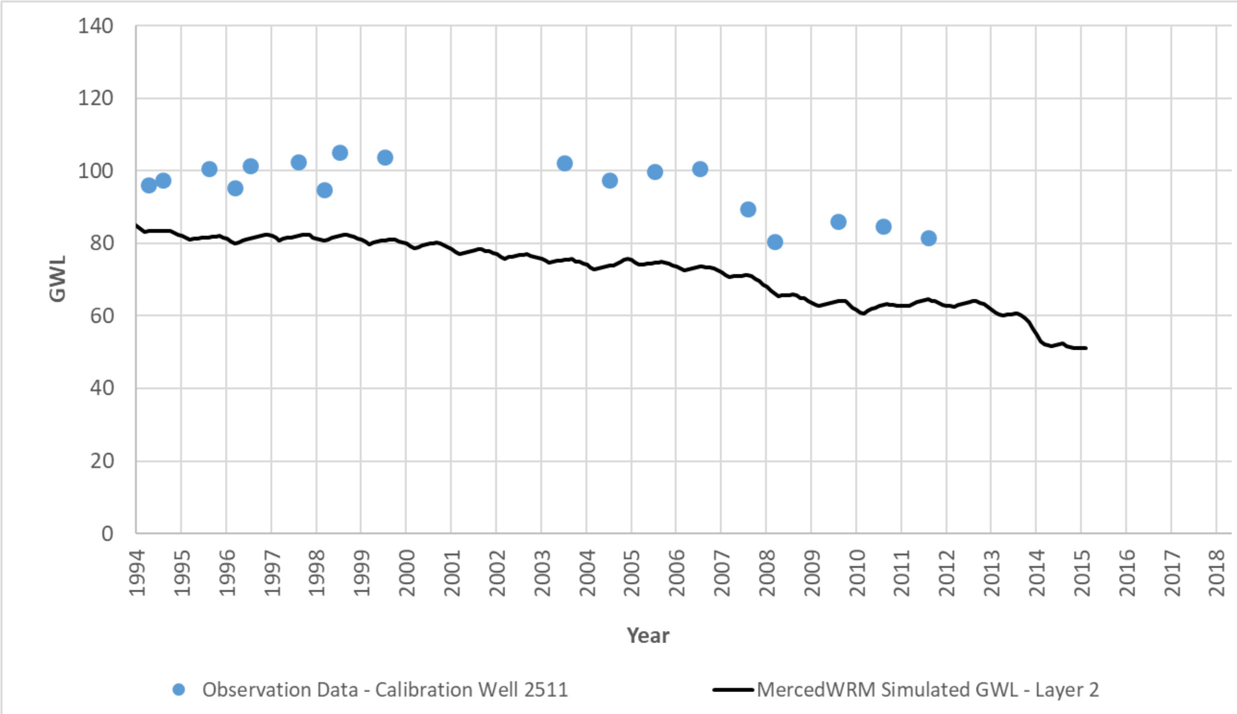


Figure A 93: Calibration Well 2511

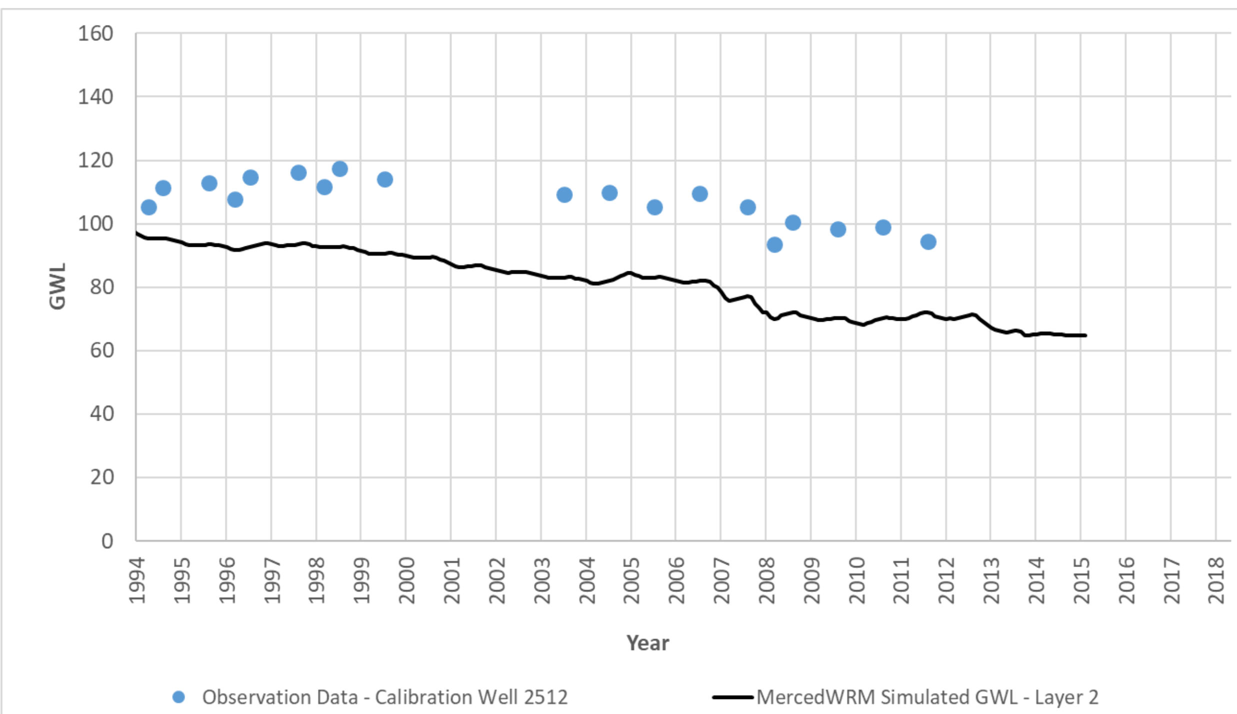


Figure A 94: Calibration Well 2512

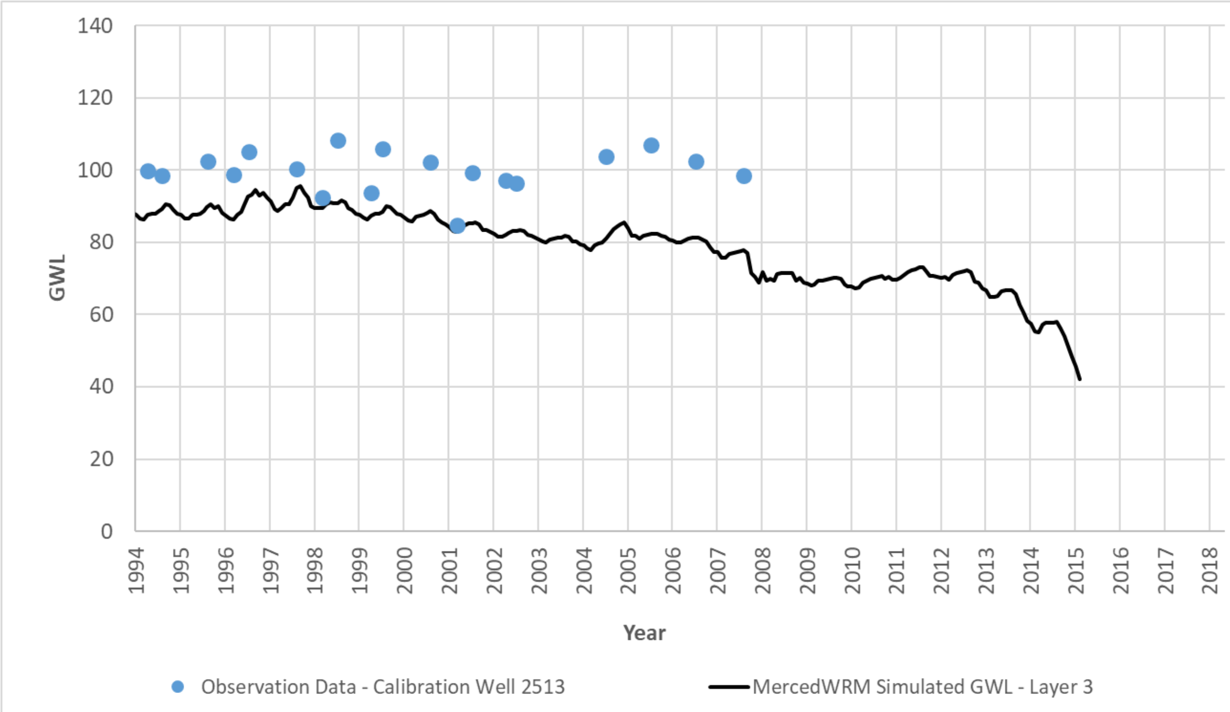


Figure A 95: Calibration Well 2513

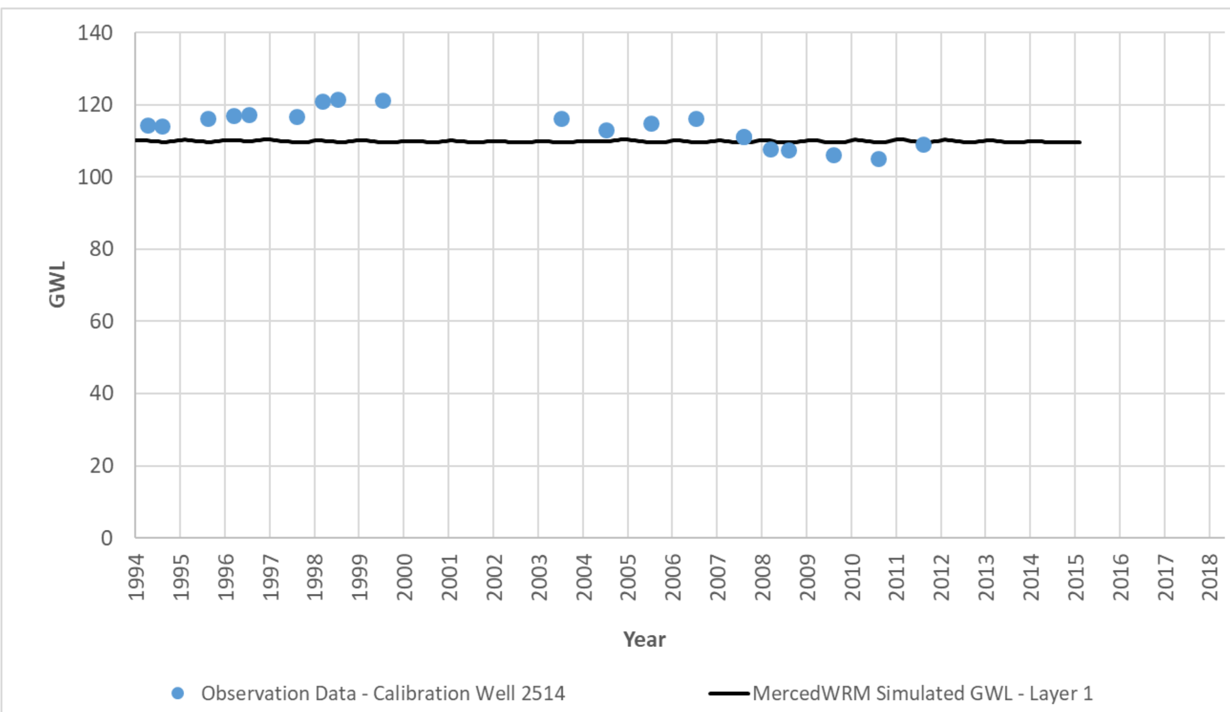


Figure A 96: Calibration Well 2514

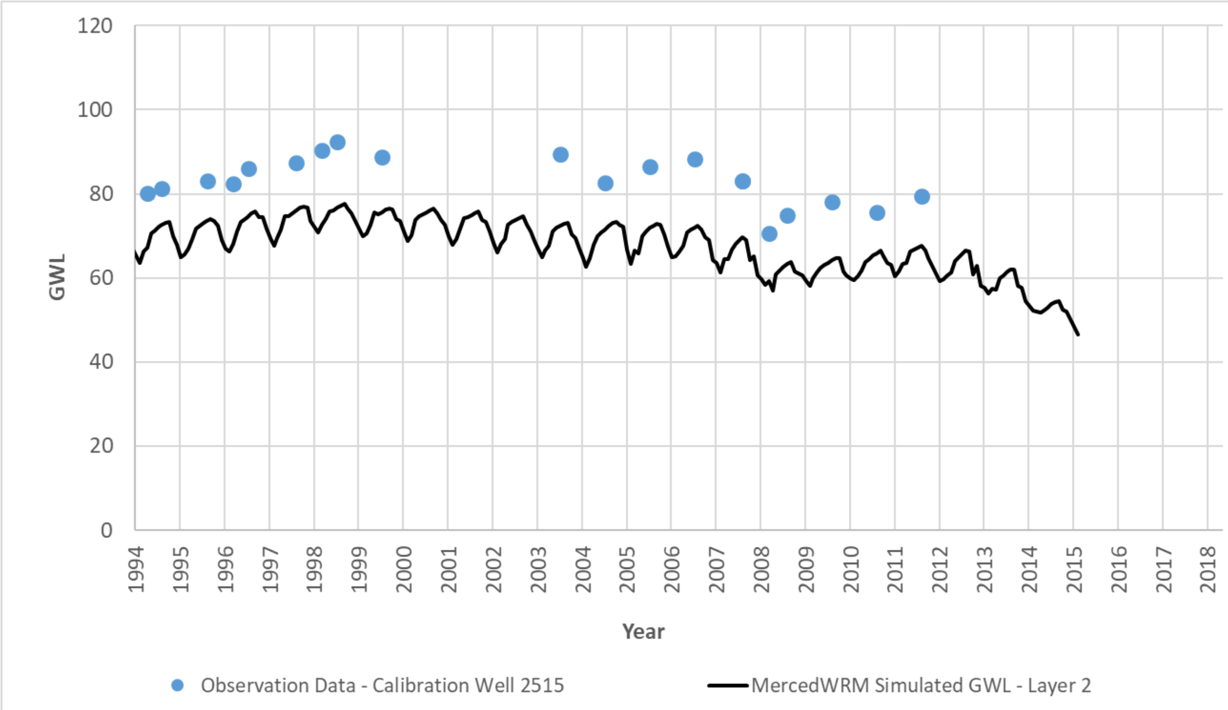


Figure A 97: Calibration Well 2515

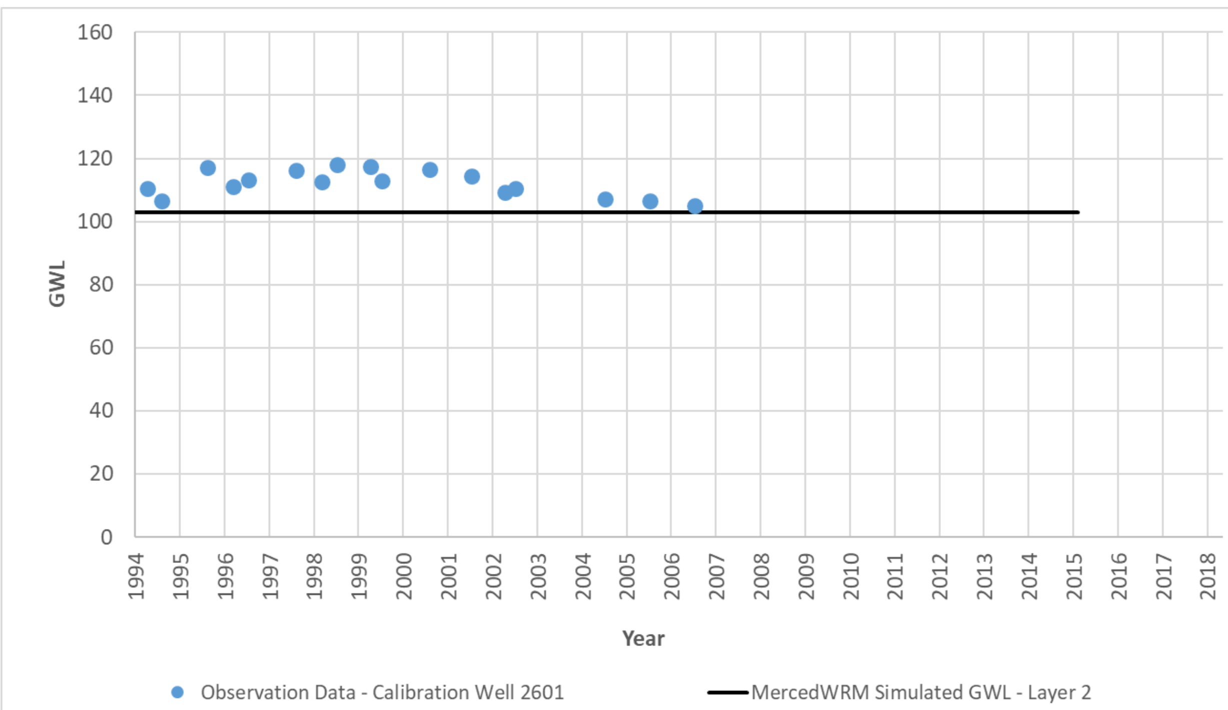


Figure A 98: Calibration Well 2601

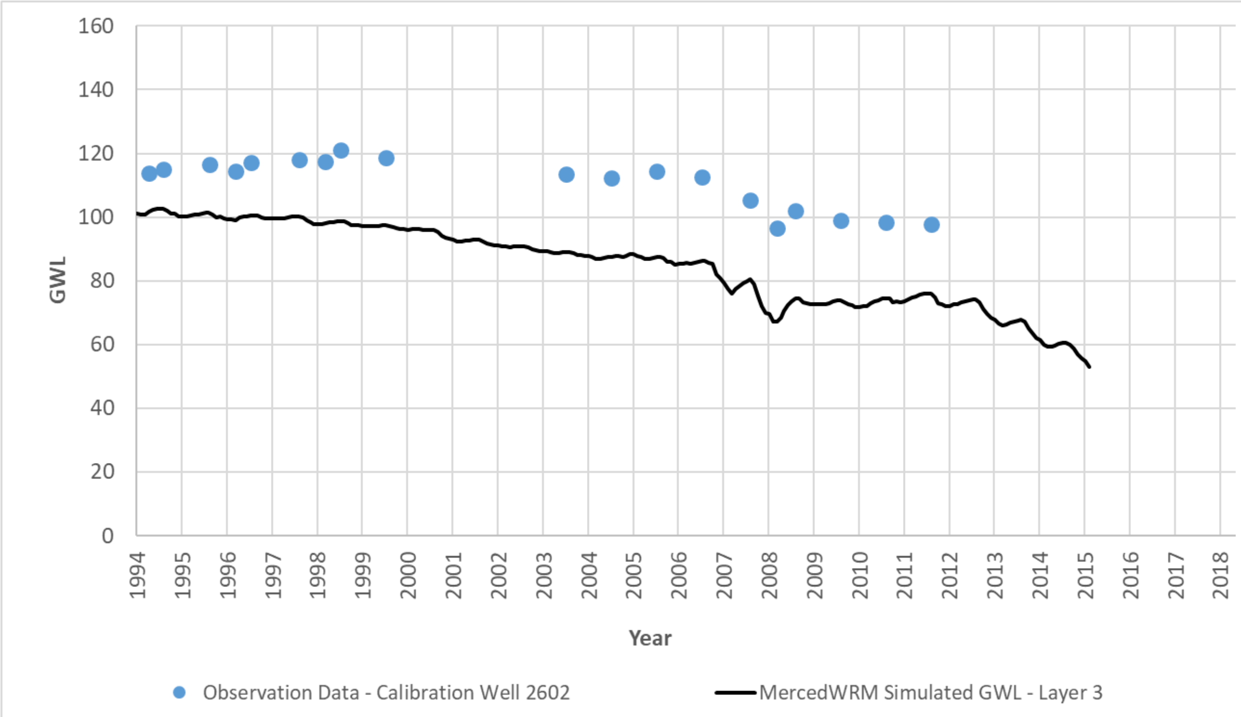


Figure A 99: Calibration Well 2602

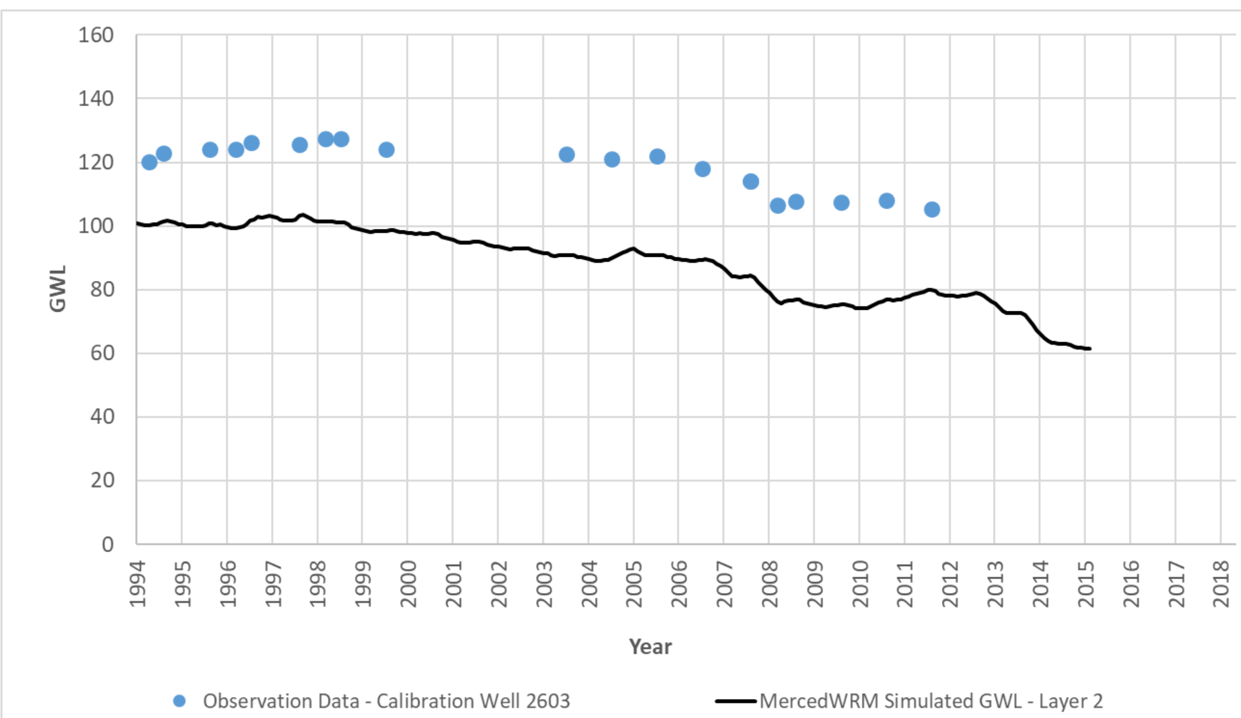


Figure A 100: Calibration Well 2603

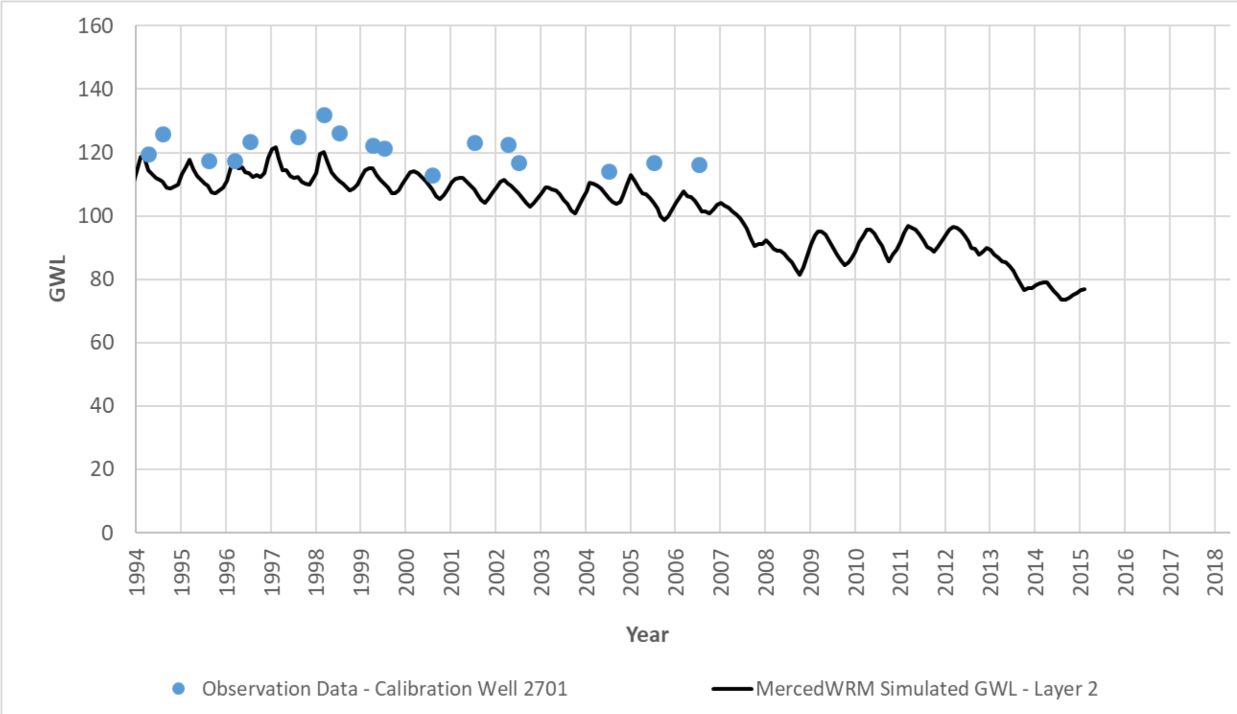


Figure A 101: Calibration Well 2701

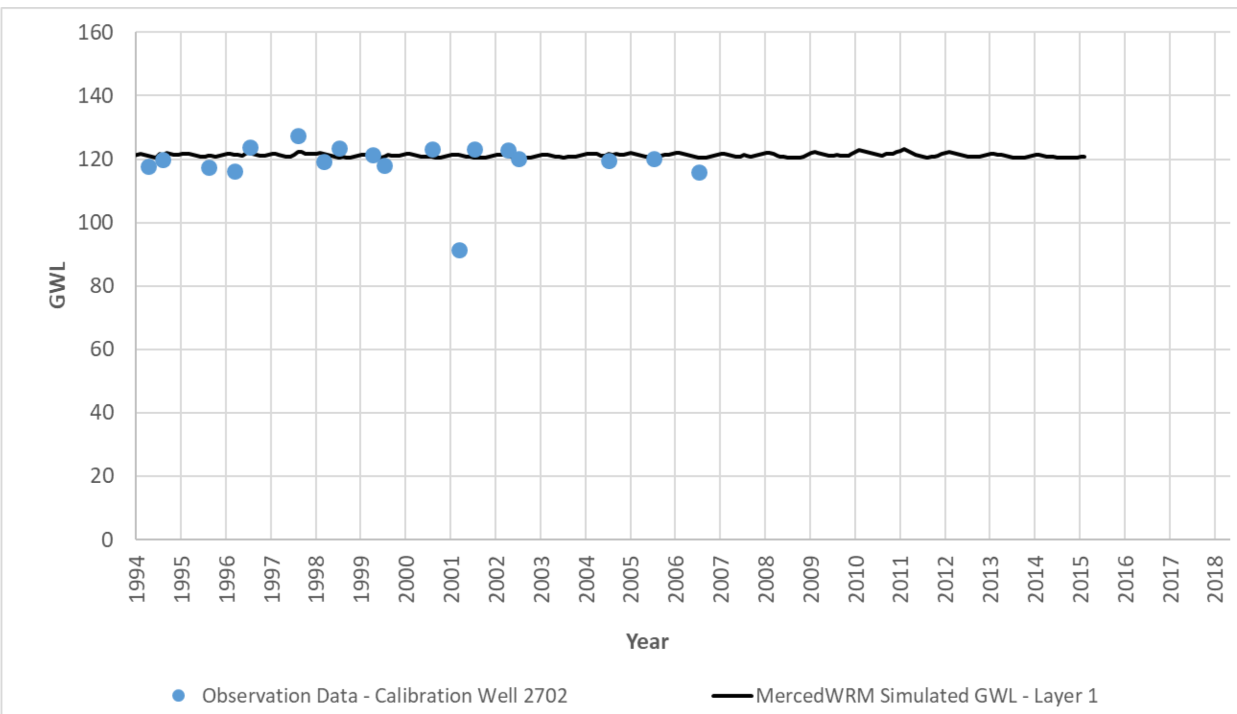


Figure A 102: Calibration Well 2702

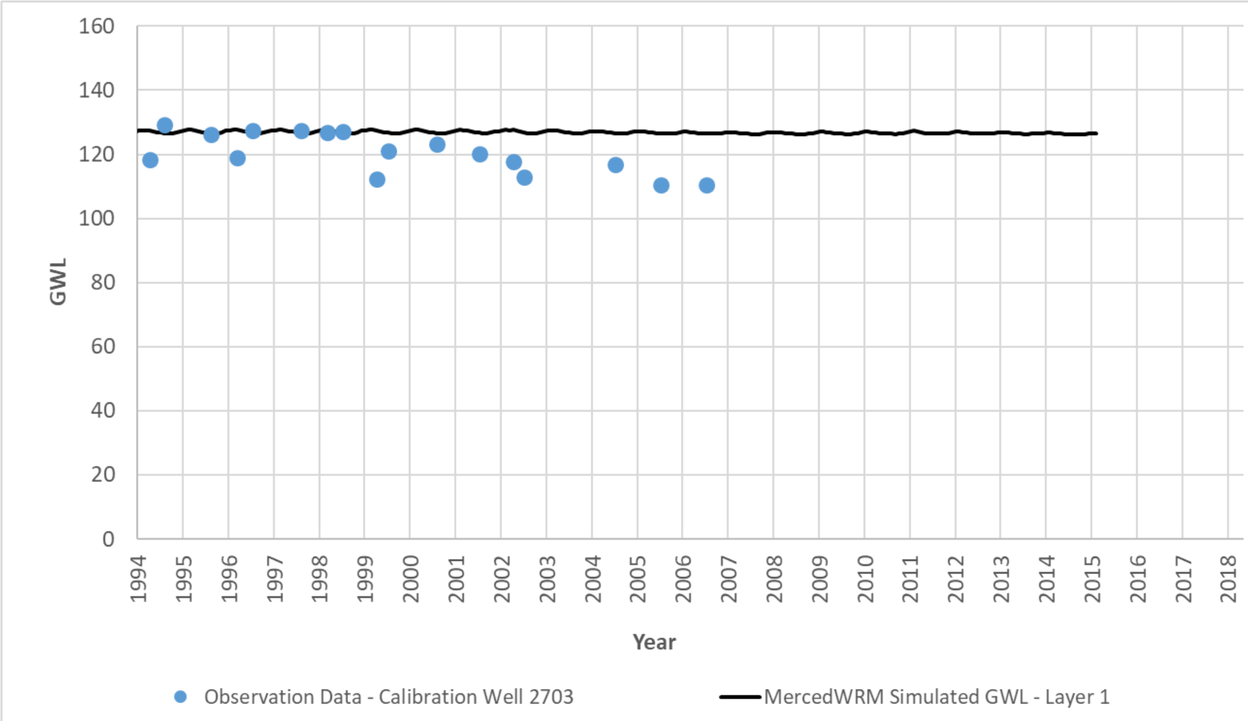


Figure A 103: Calibration Well 2703

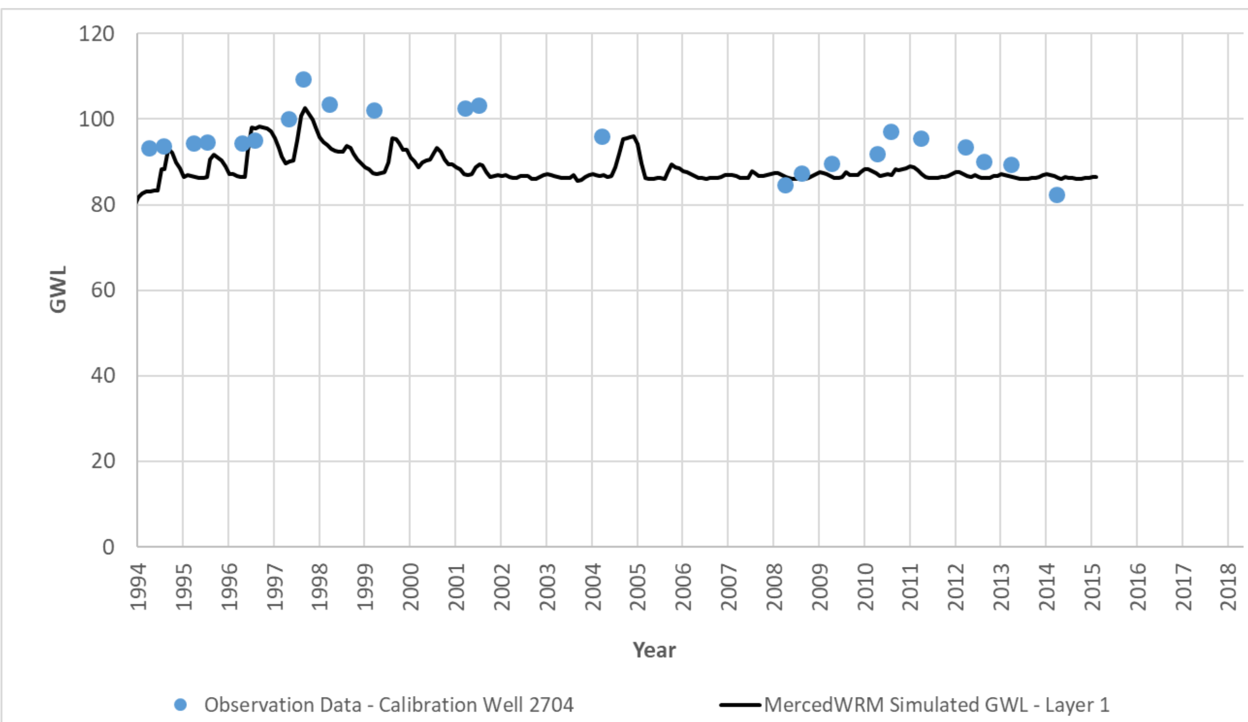


Figure A 104: Calibration Well 2704

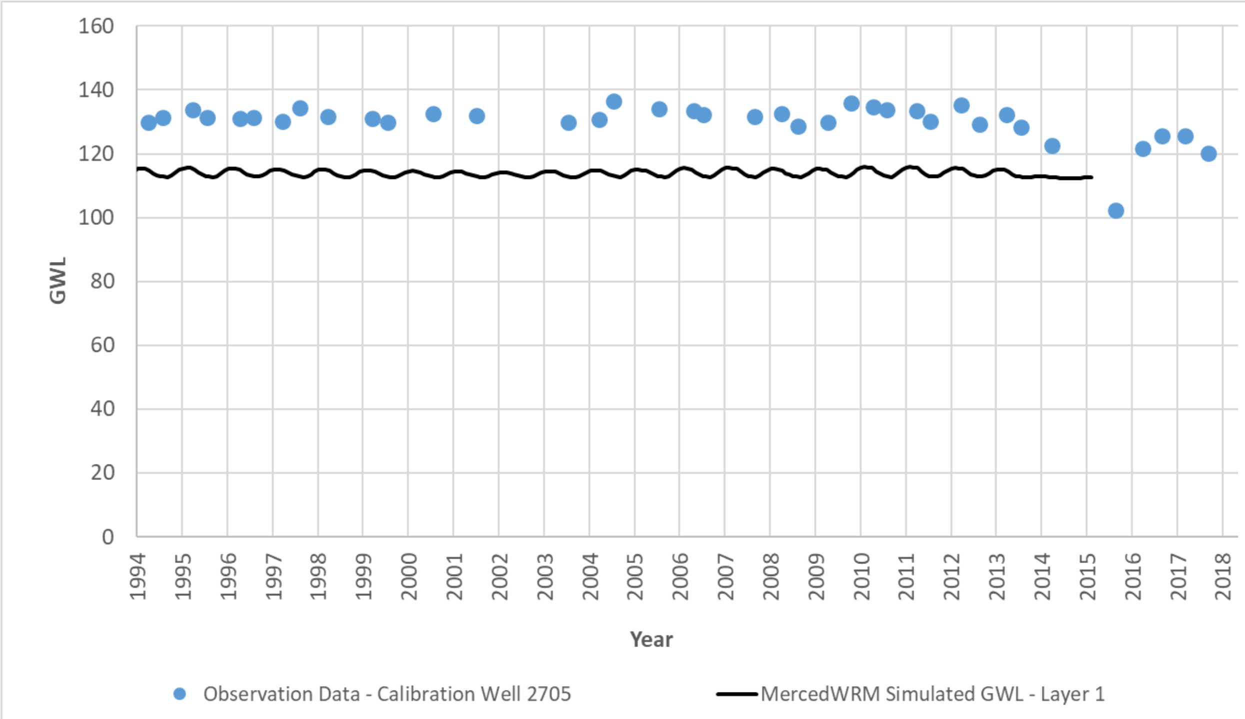


Figure A 105: Calibration Well 2705

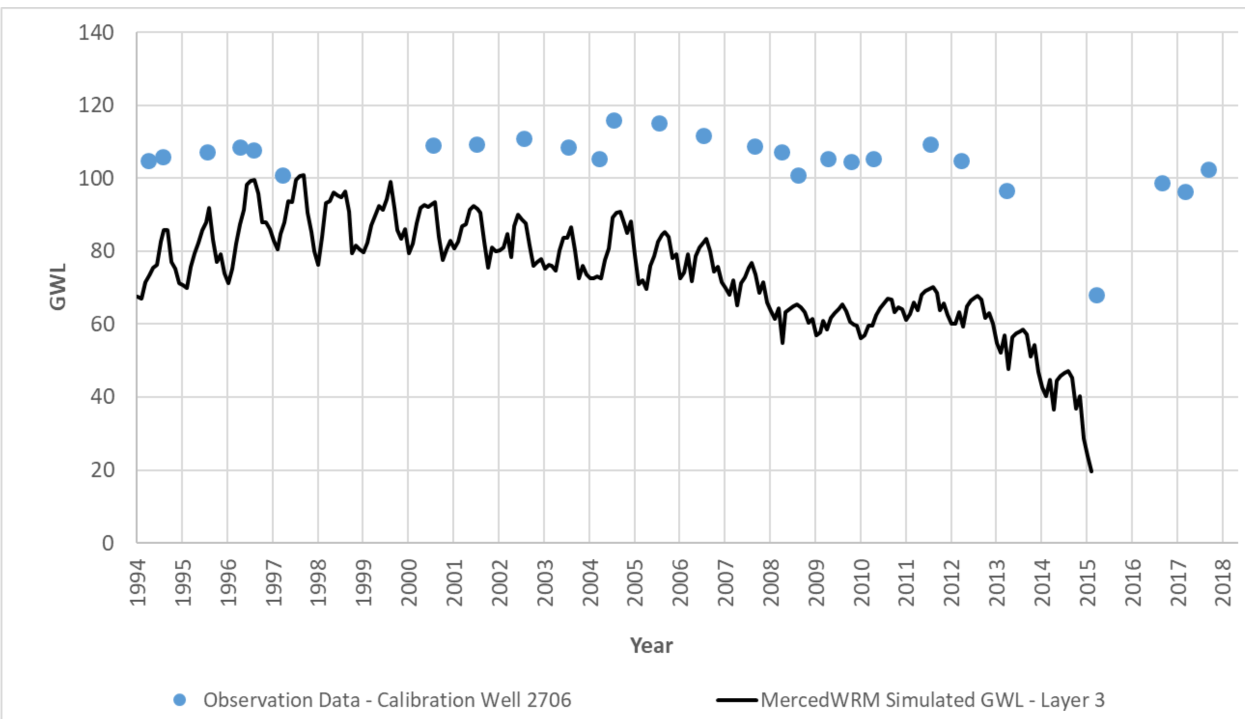


Figure A 106: Calibration Well 2706

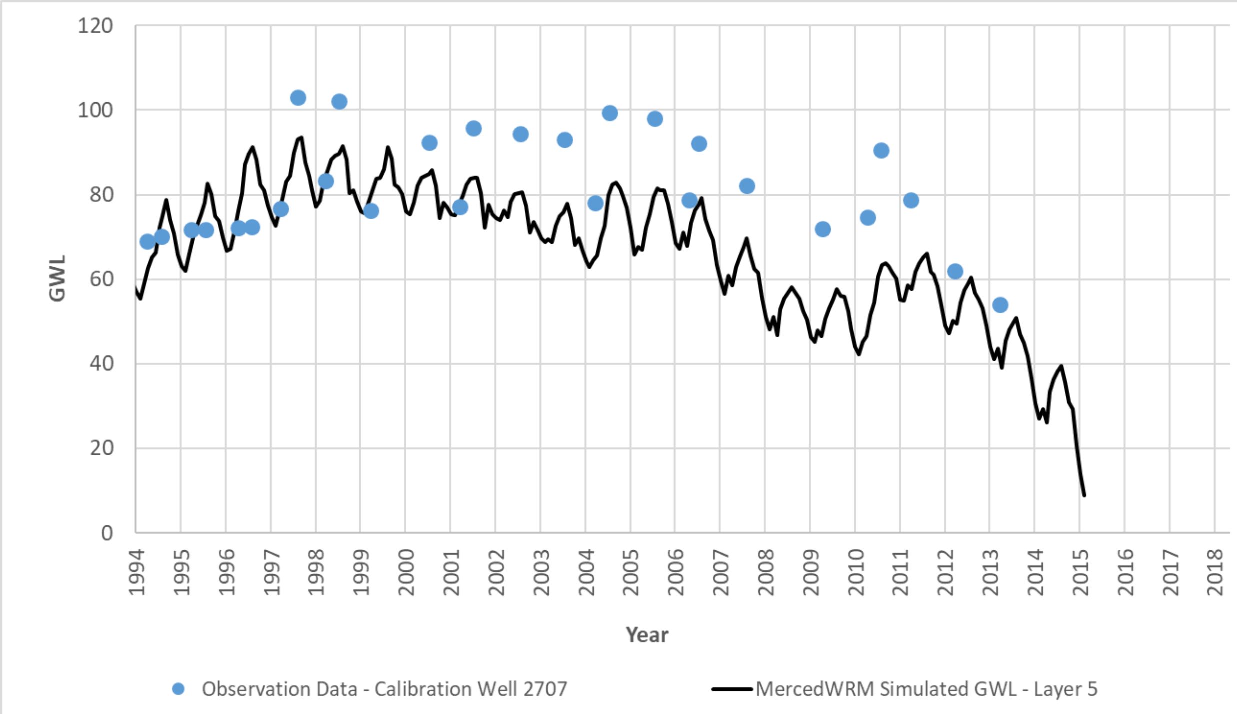


Figure A 107: Calibration Well 2707

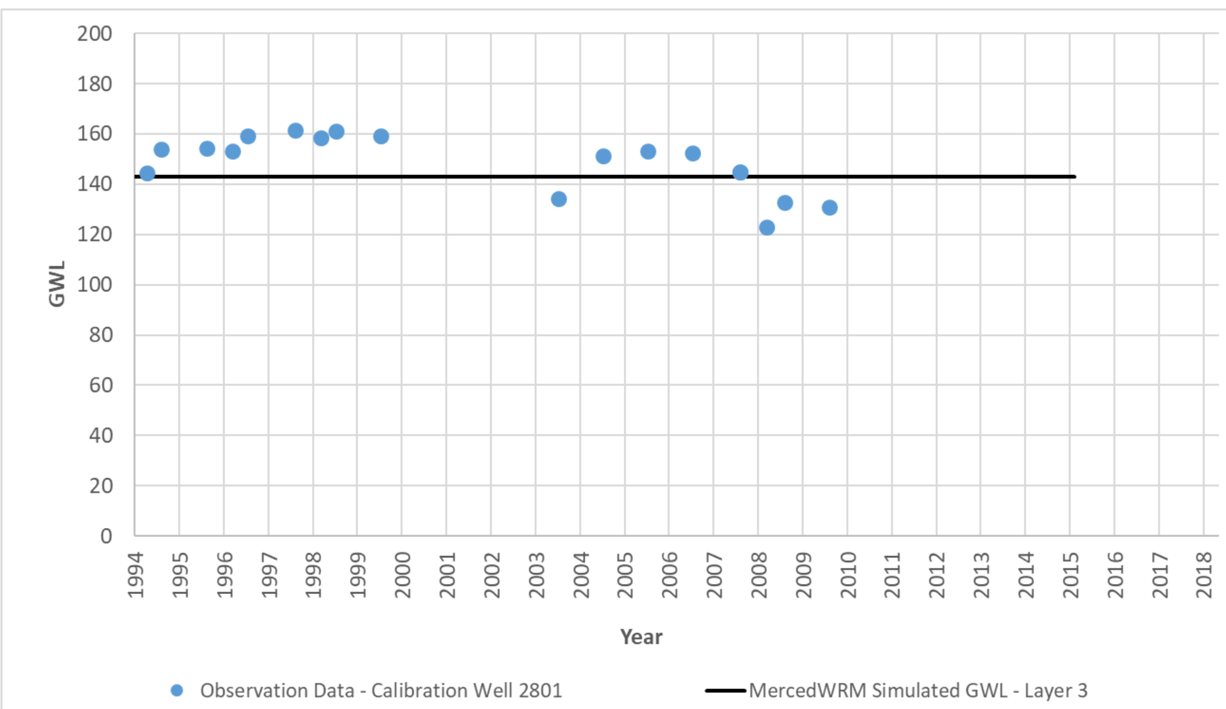


Figure A 108: Calibration Well 2801

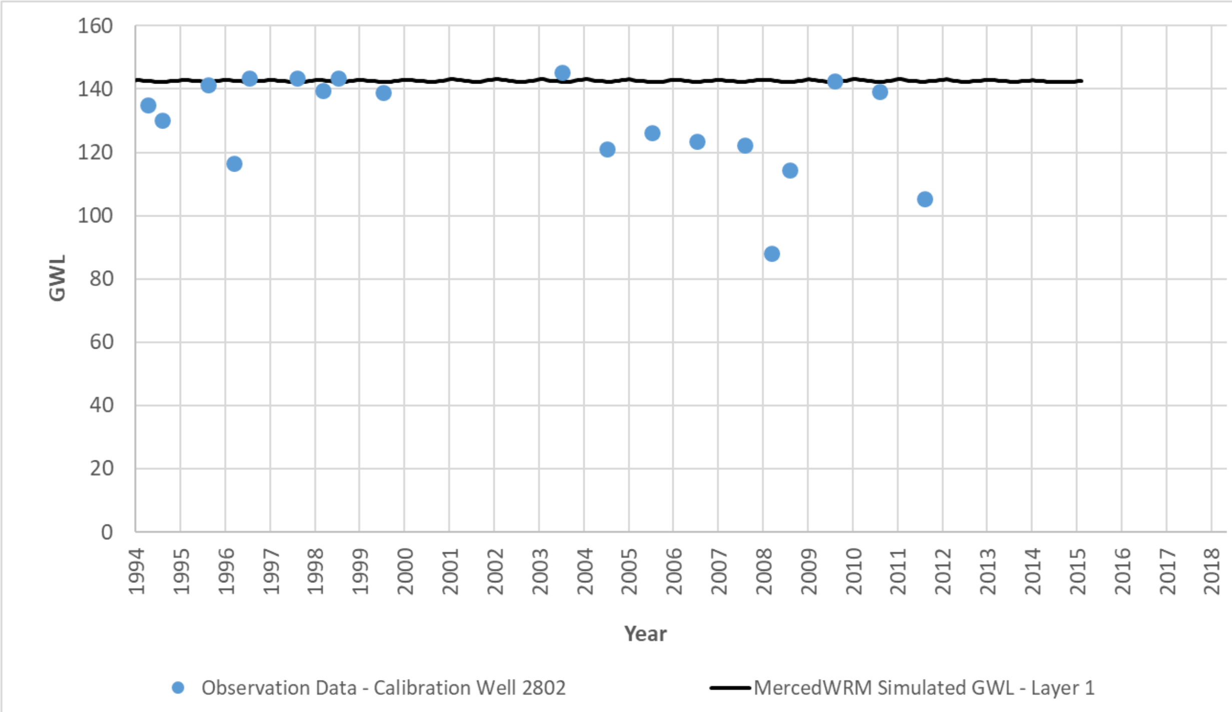


Figure A 109: Calibration Well 2802

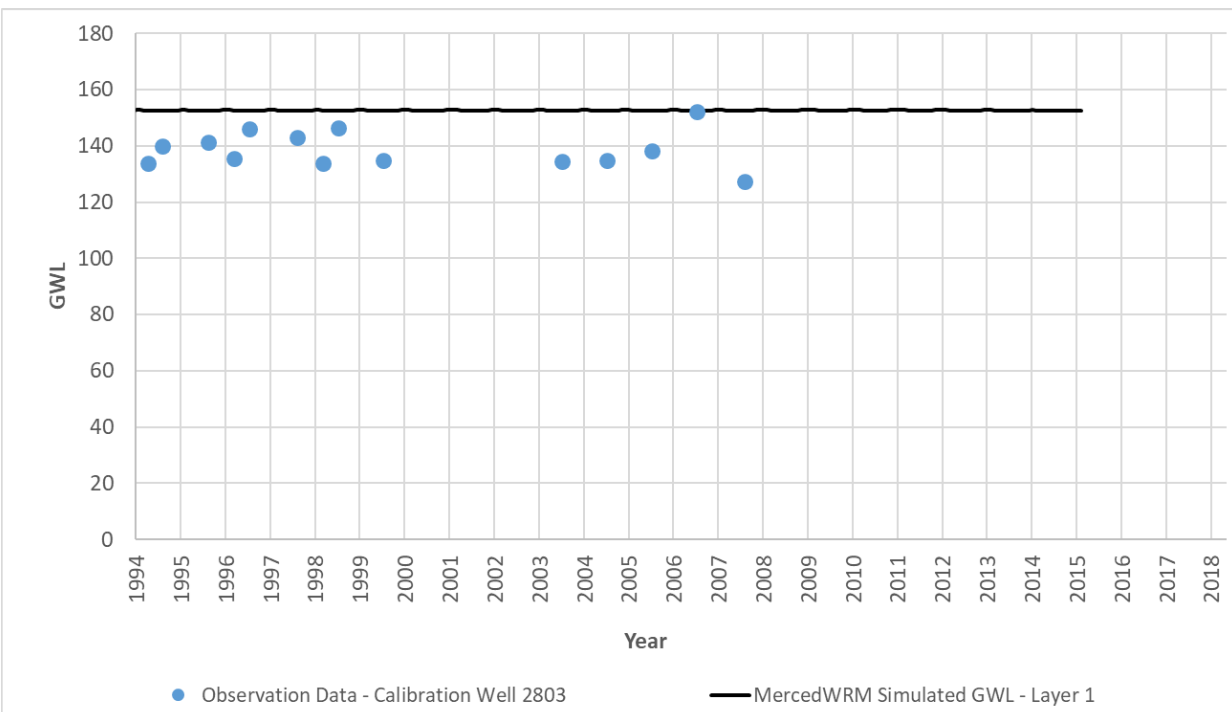


Figure A 110: Calibration Well 2803

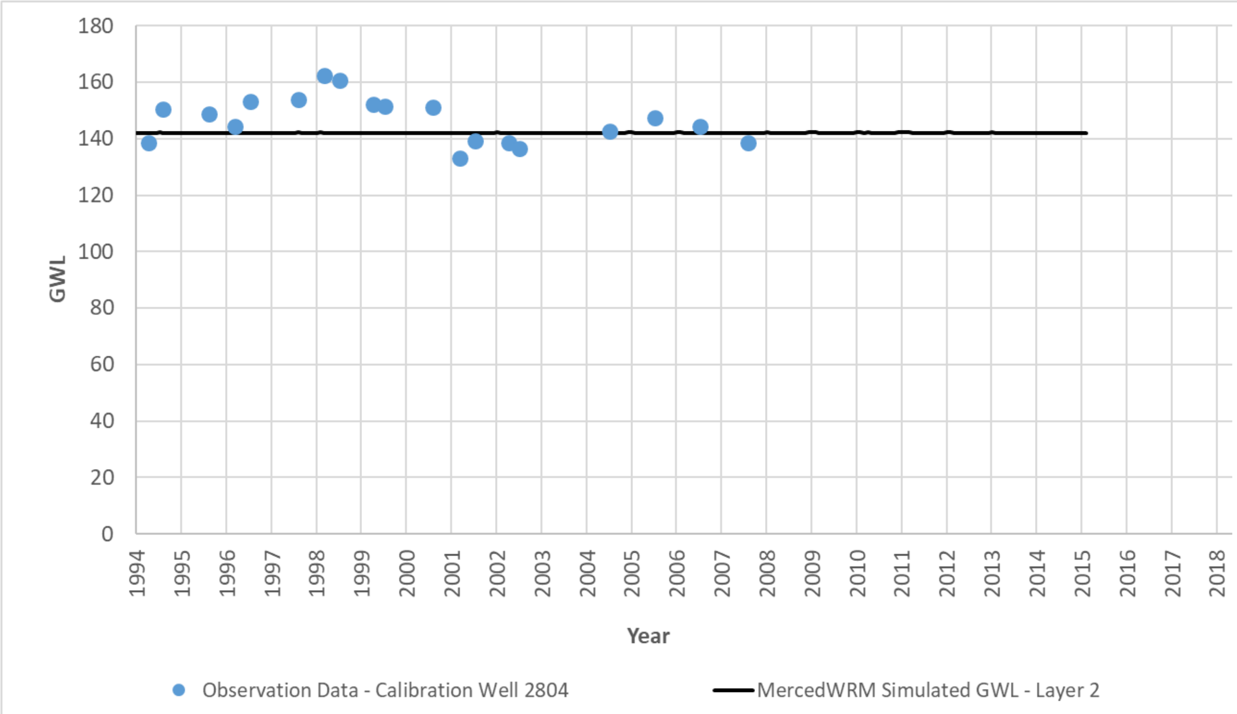


Figure A 111: Calibration Well 2804

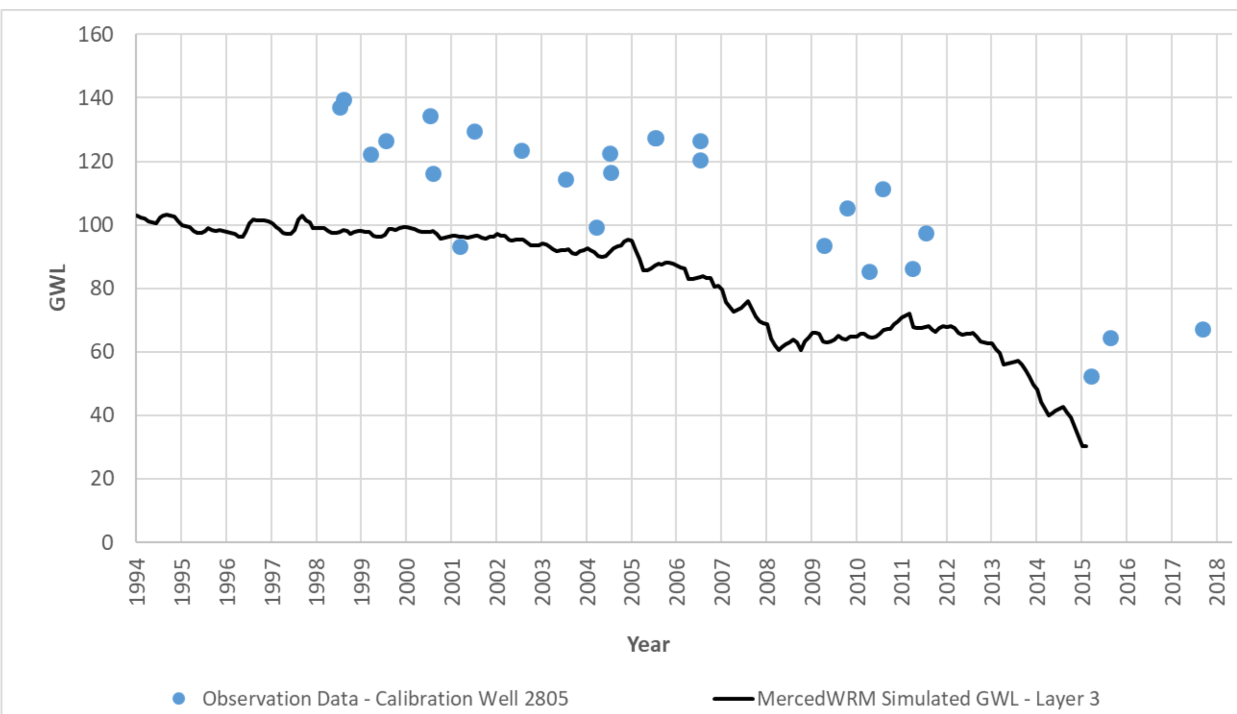


Figure A 112: Calibration Well 2805

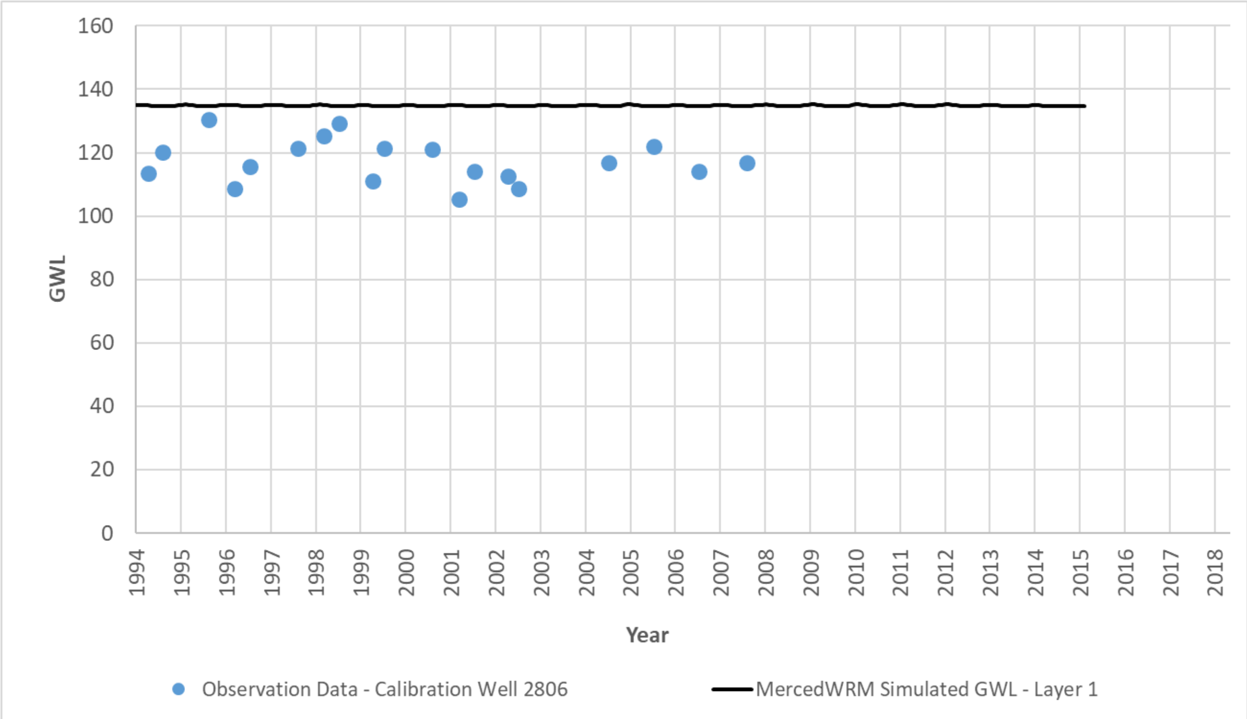


Figure A 113: Calibration Well 2806

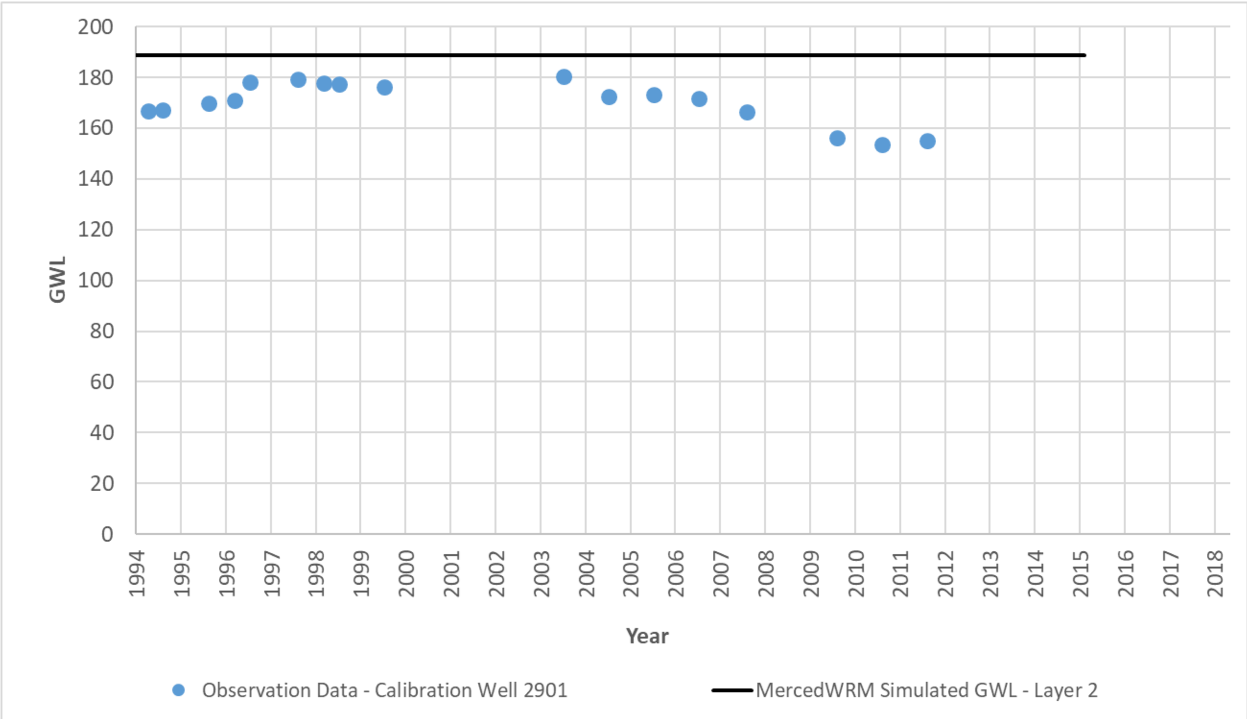


Figure A 114: Calibration Well 2901

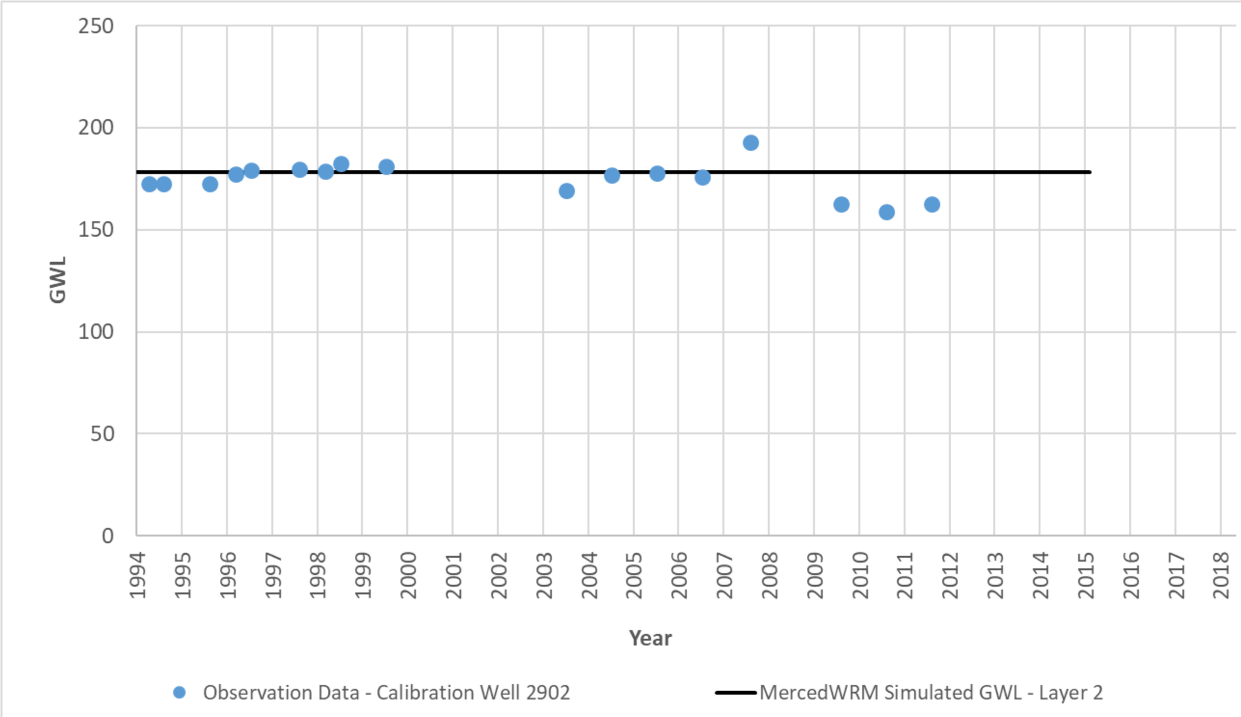


Figure A 115: Calibration Well 2902

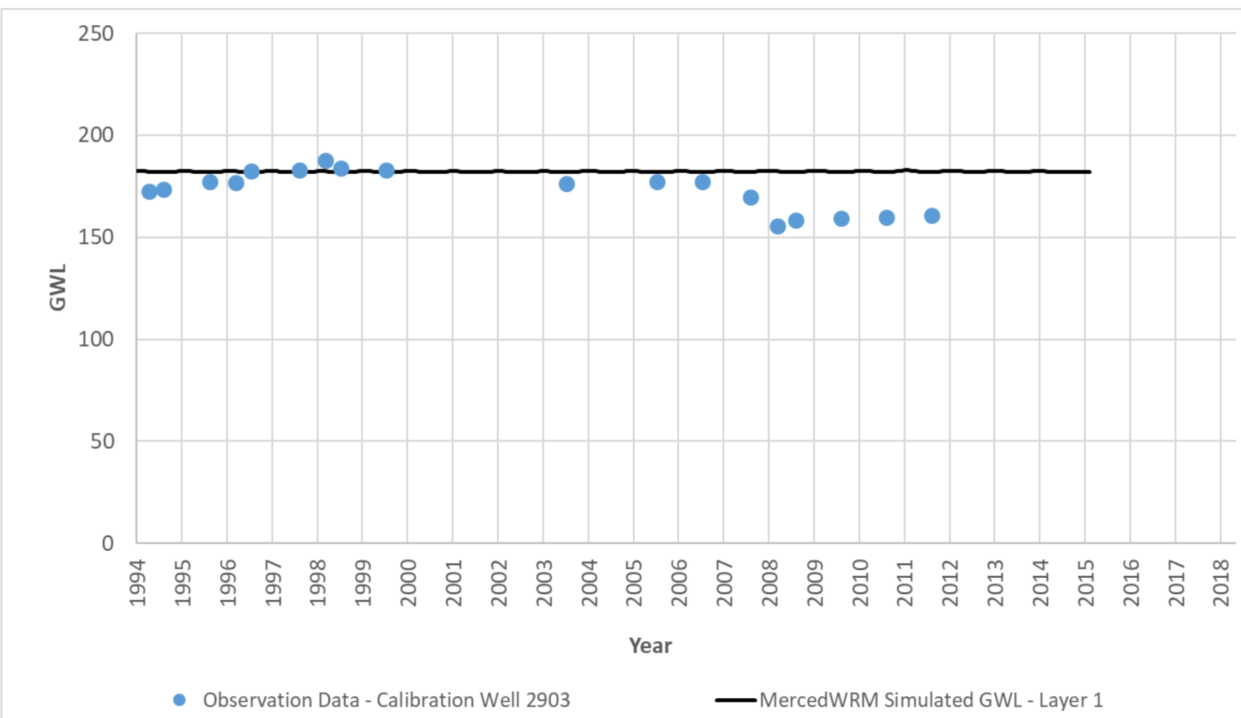


Figure A 116: Calibration Well 2903

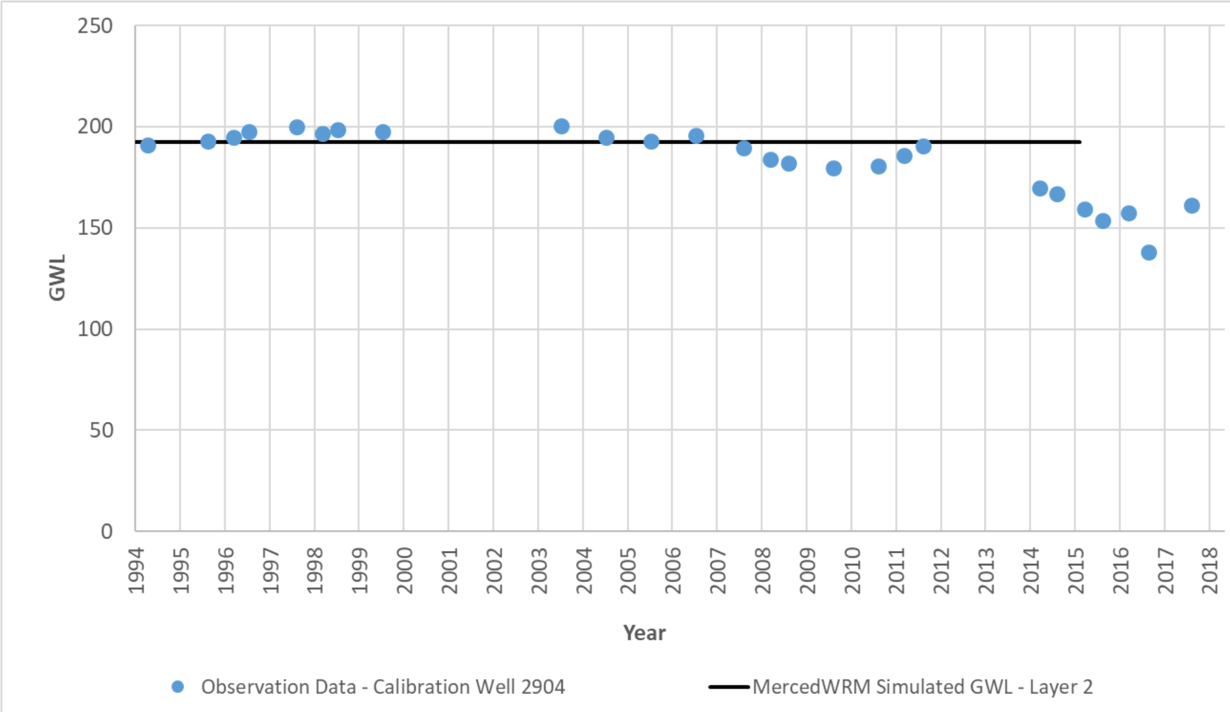


Figure A 117: Calibration Well 2904

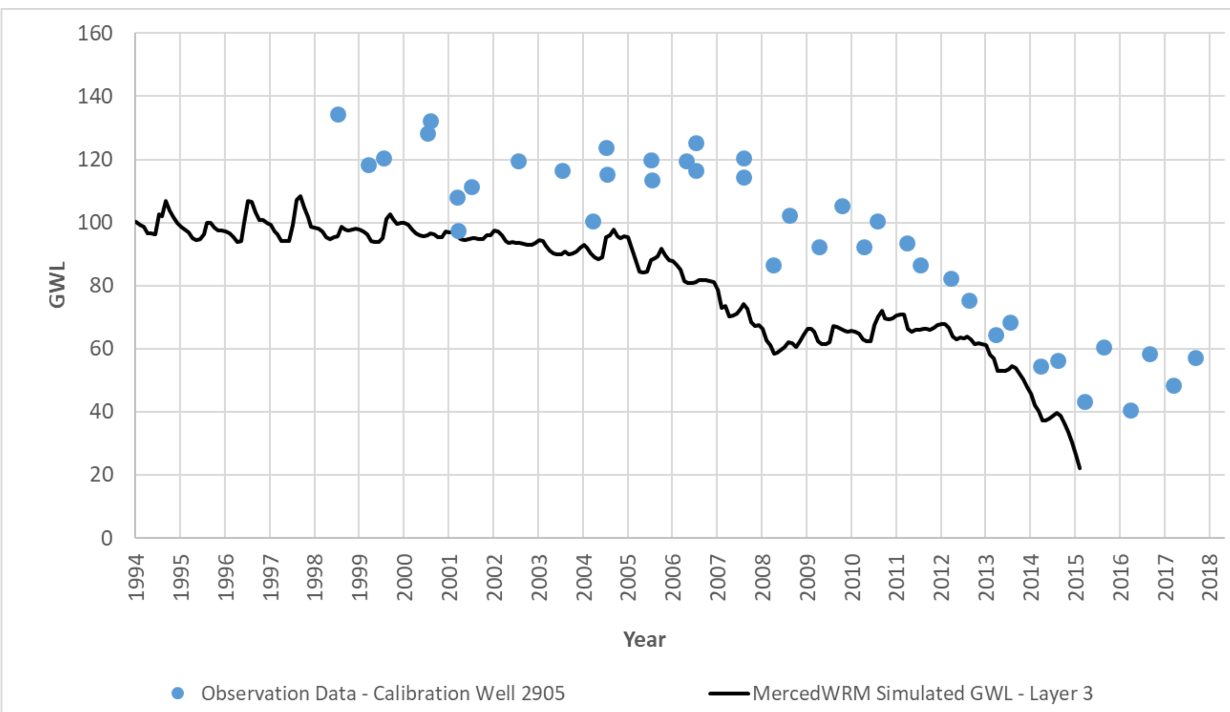


Figure A 118: Calibration Well 2905

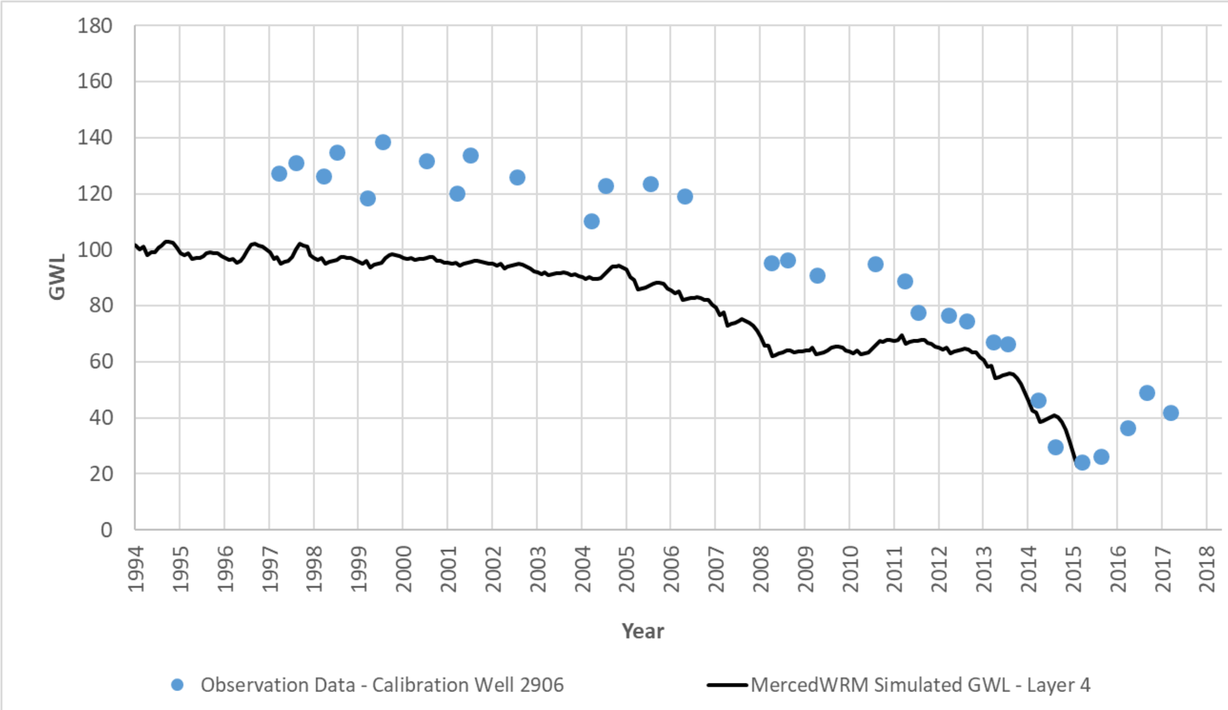


Figure A 119: Calibration Well 2906

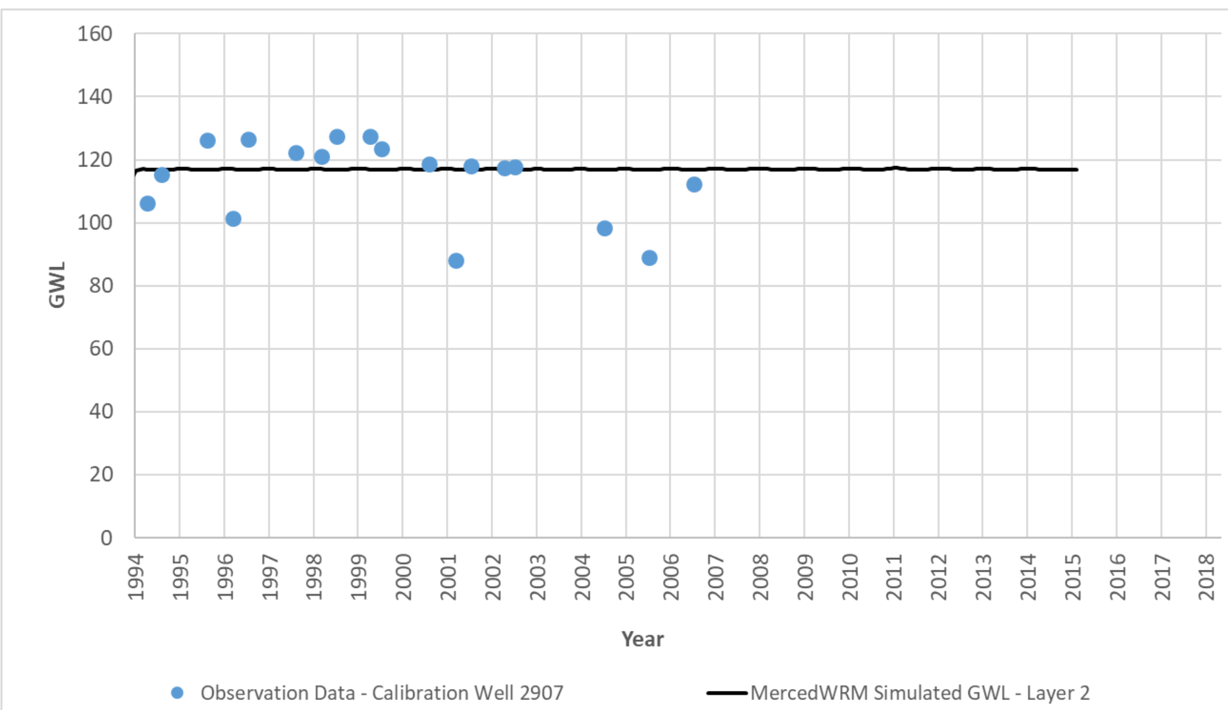


Figure A 120: Calibration Well 2907

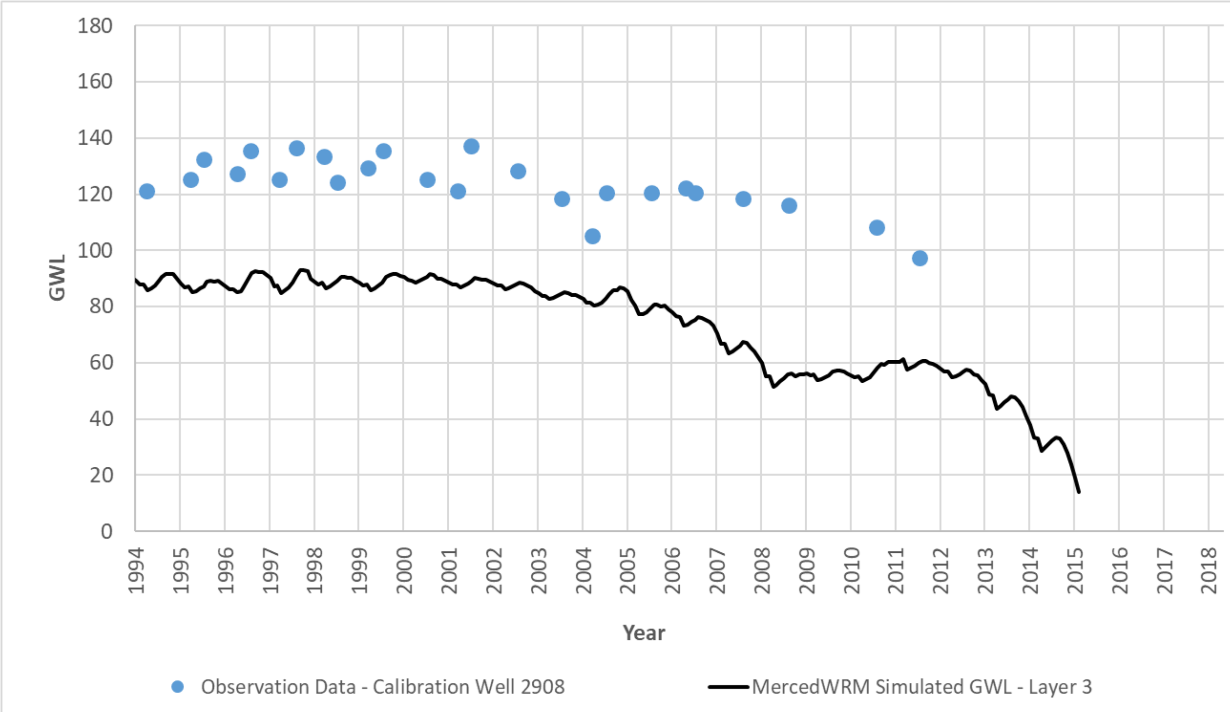


Figure A 121: Calibration Well 2908

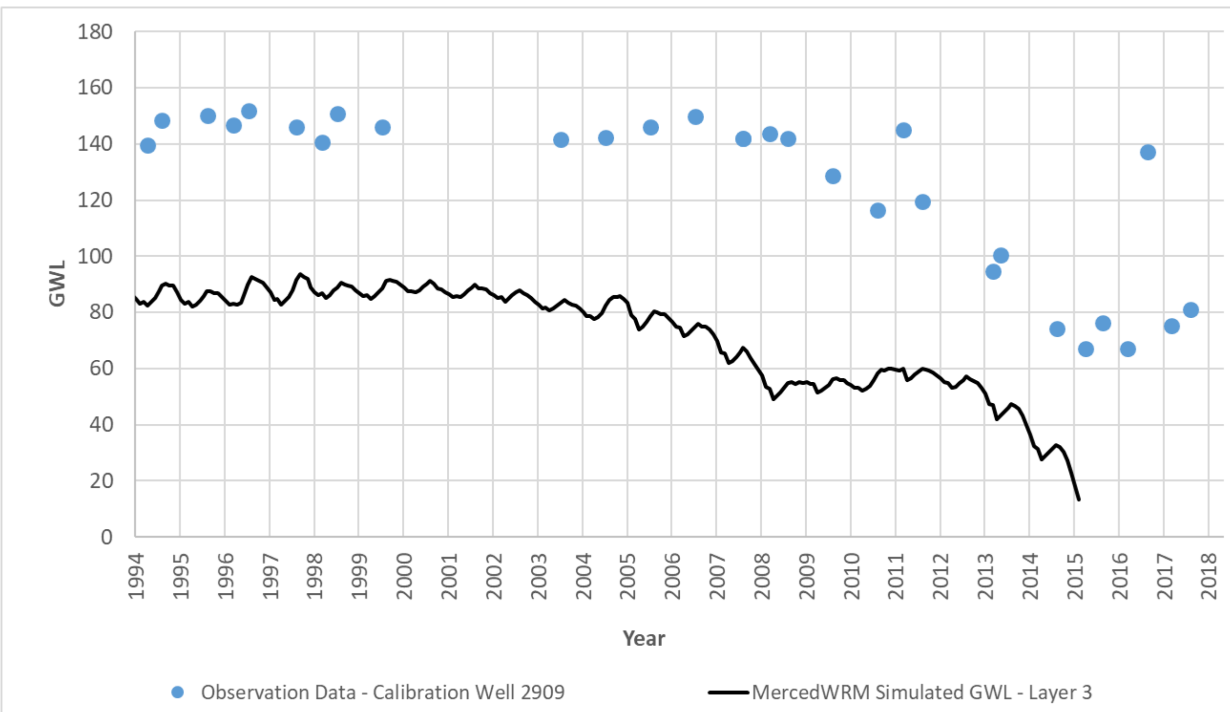


Figure A 122: Calibration Well 2909

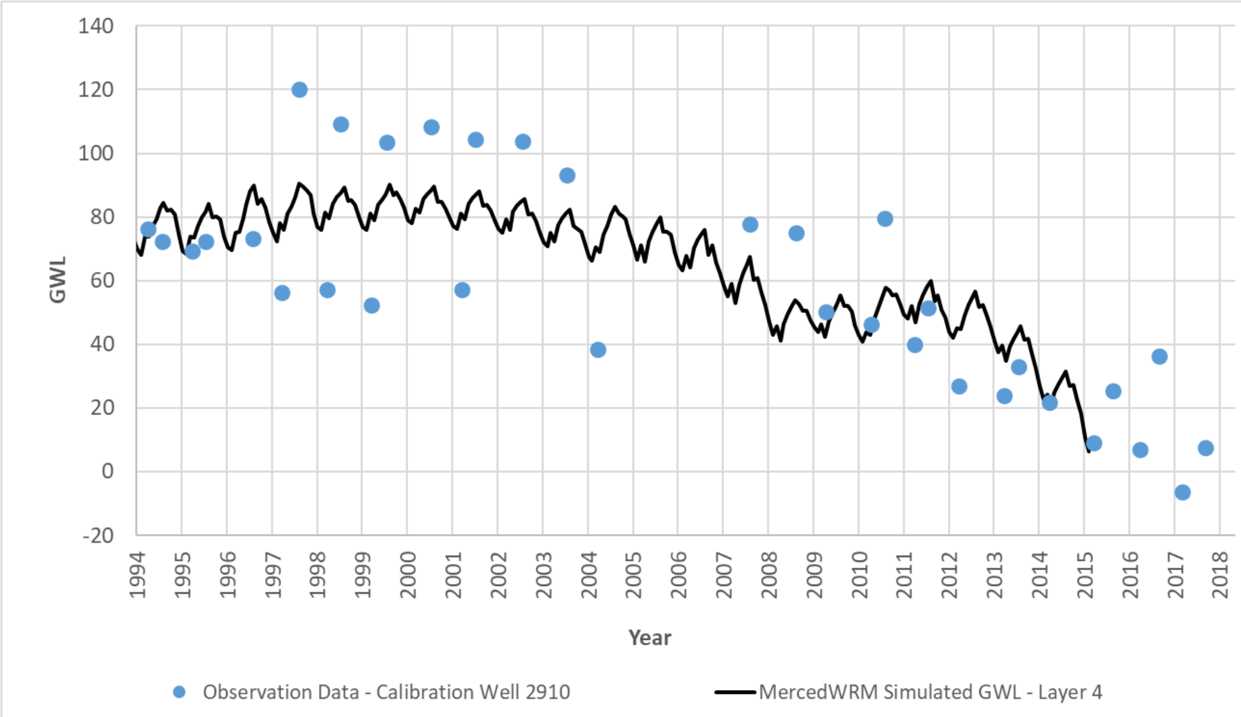


Figure A 123: Calibration Well 2910

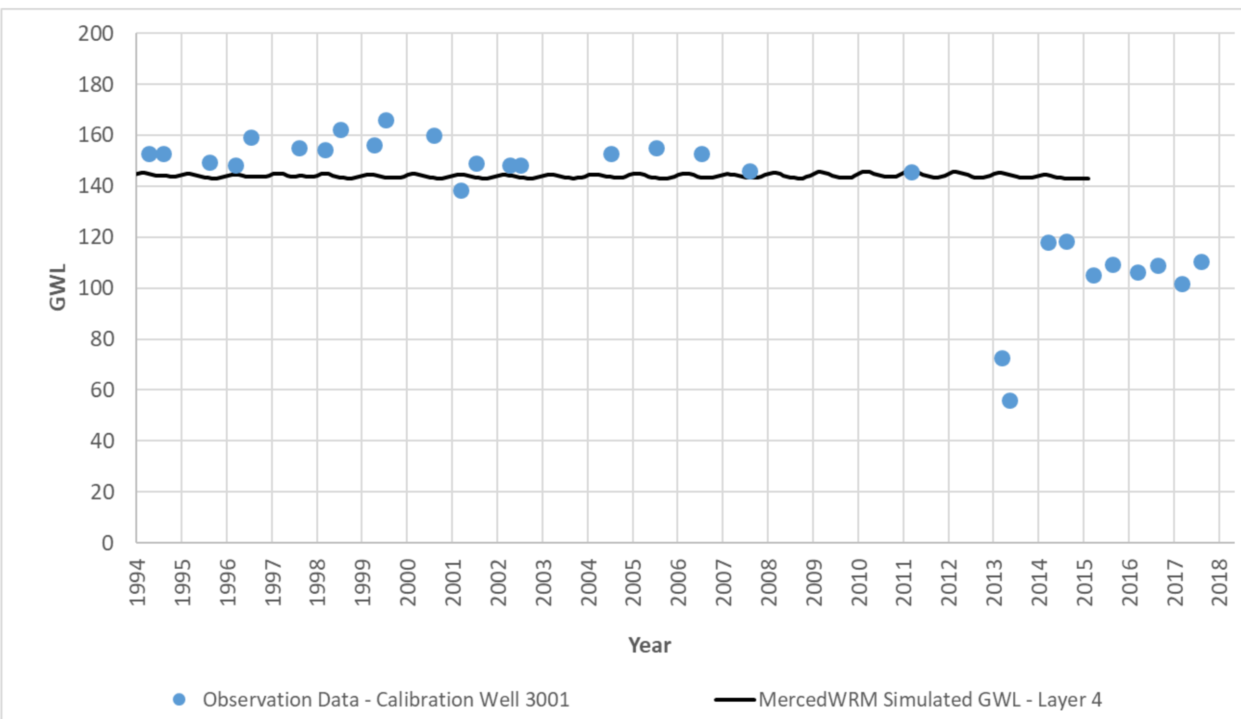


Figure A 124: Calibration Well 3001

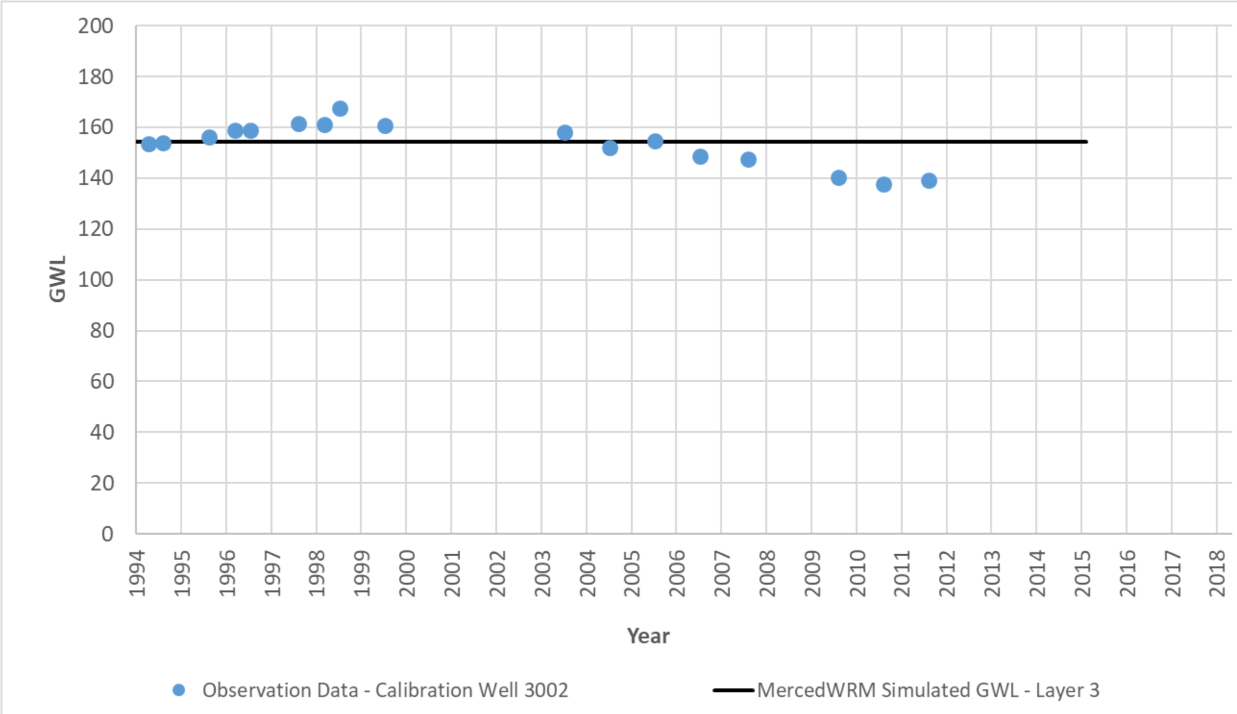


Figure A 125: Calibration Well 3002

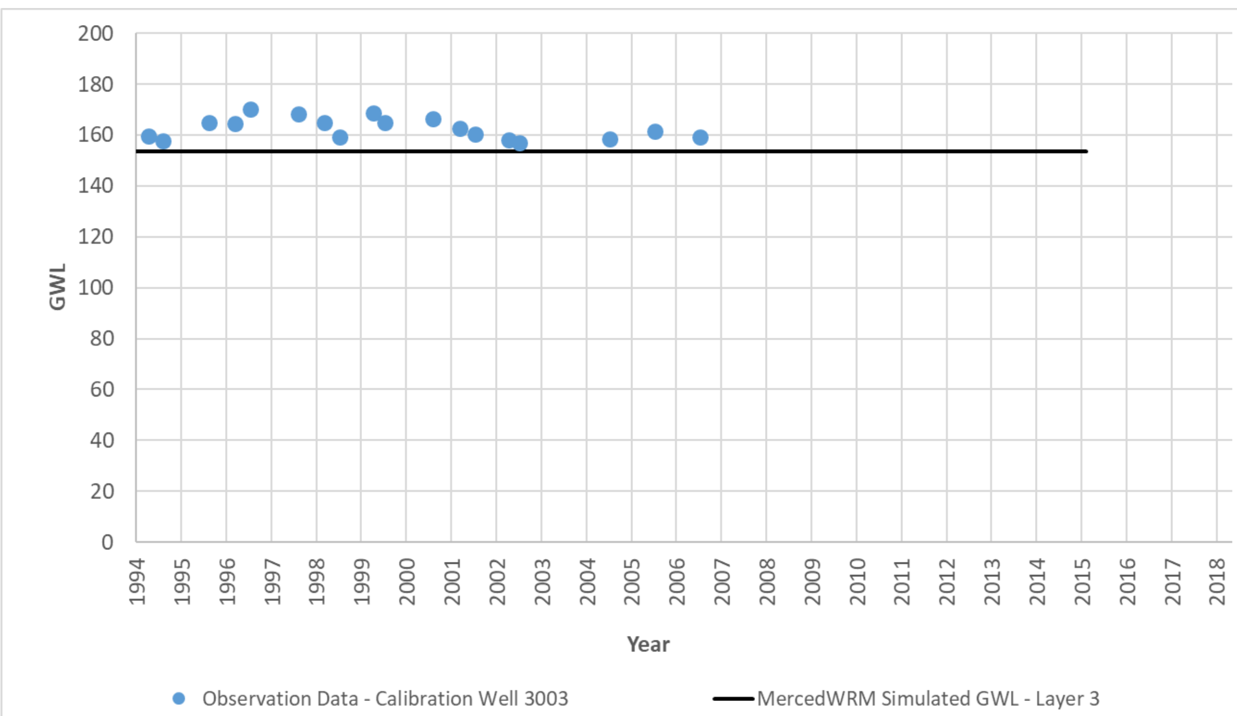


Figure A 126: Calibration Well 3003

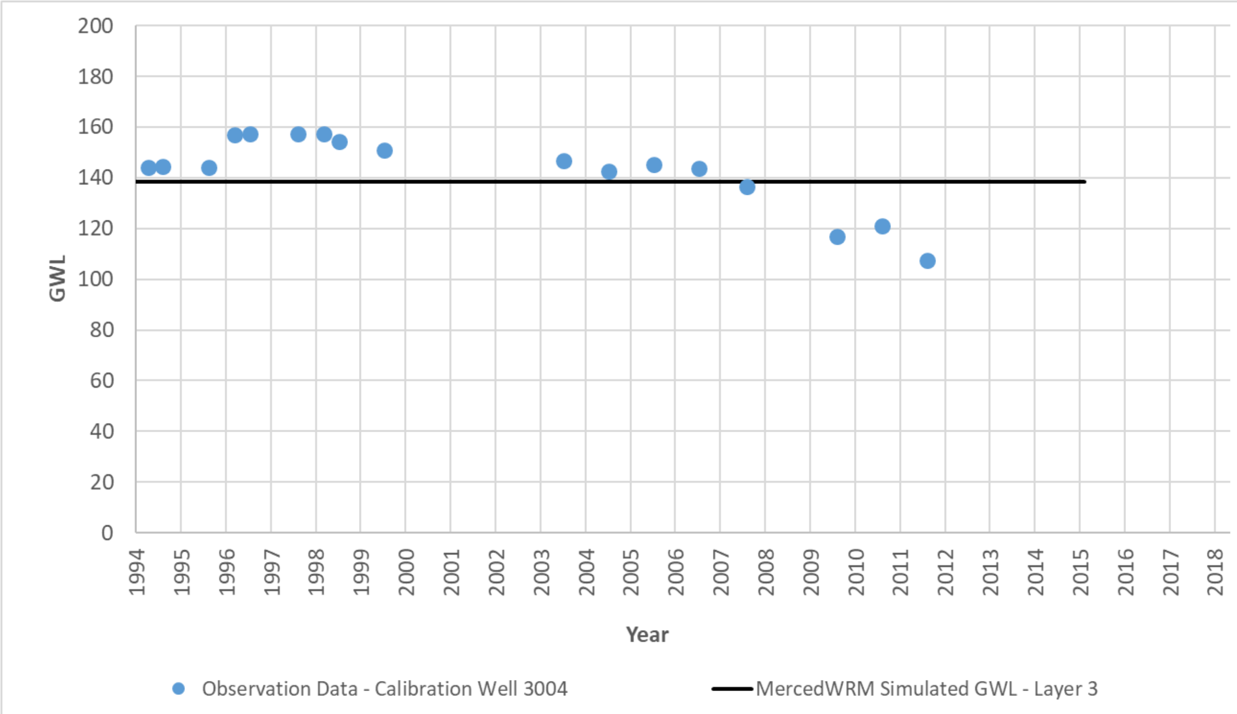


Figure A 127: Calibration Well 3004

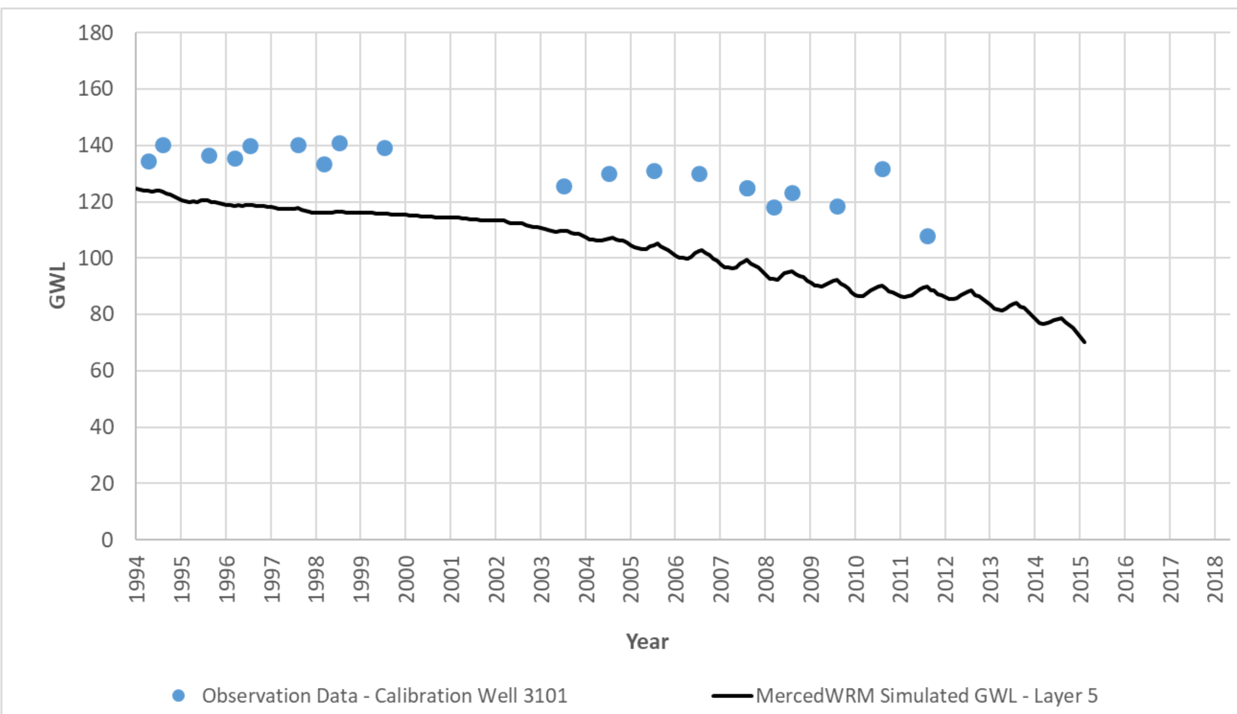


Figure A 128: Calibration Well 3101

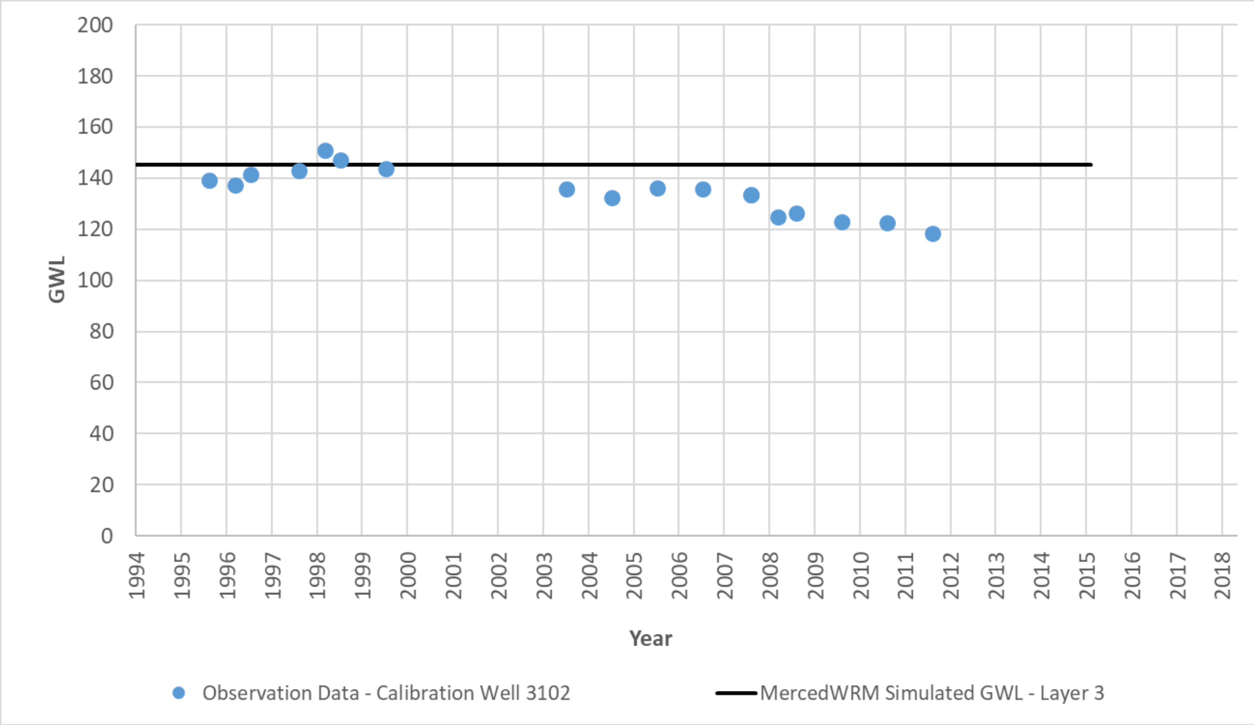
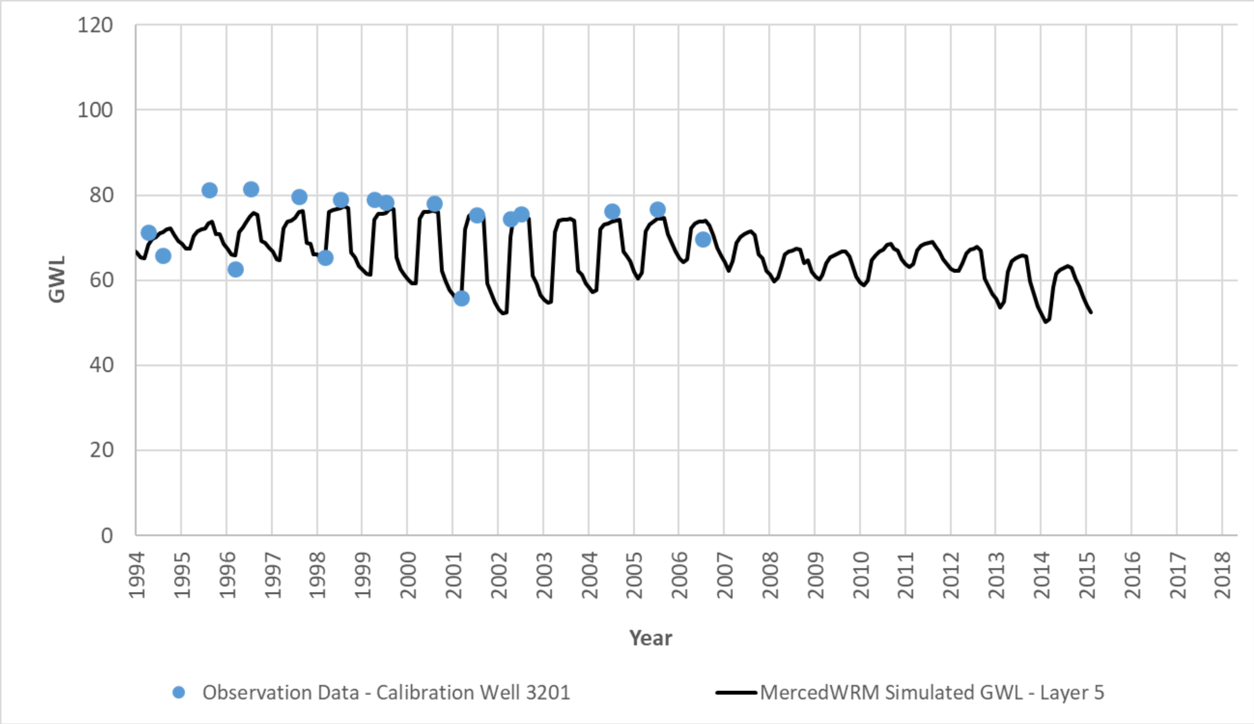


Figure A 129: Calibration Well 3102



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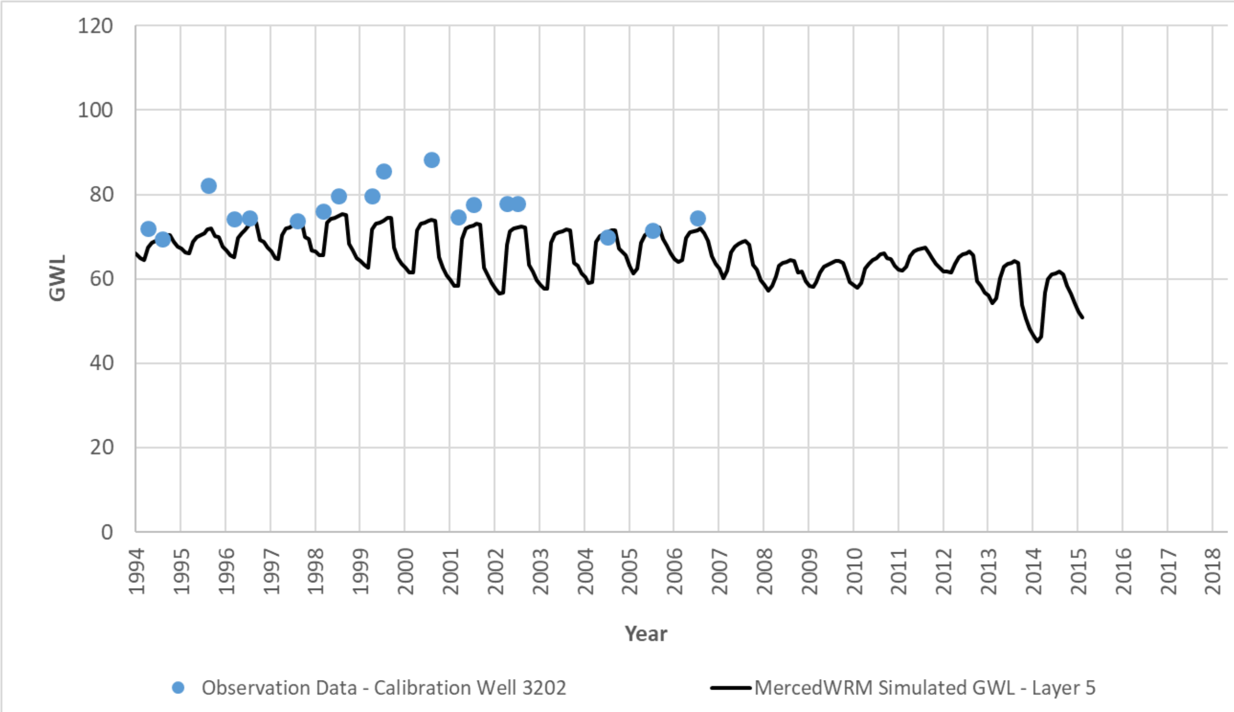

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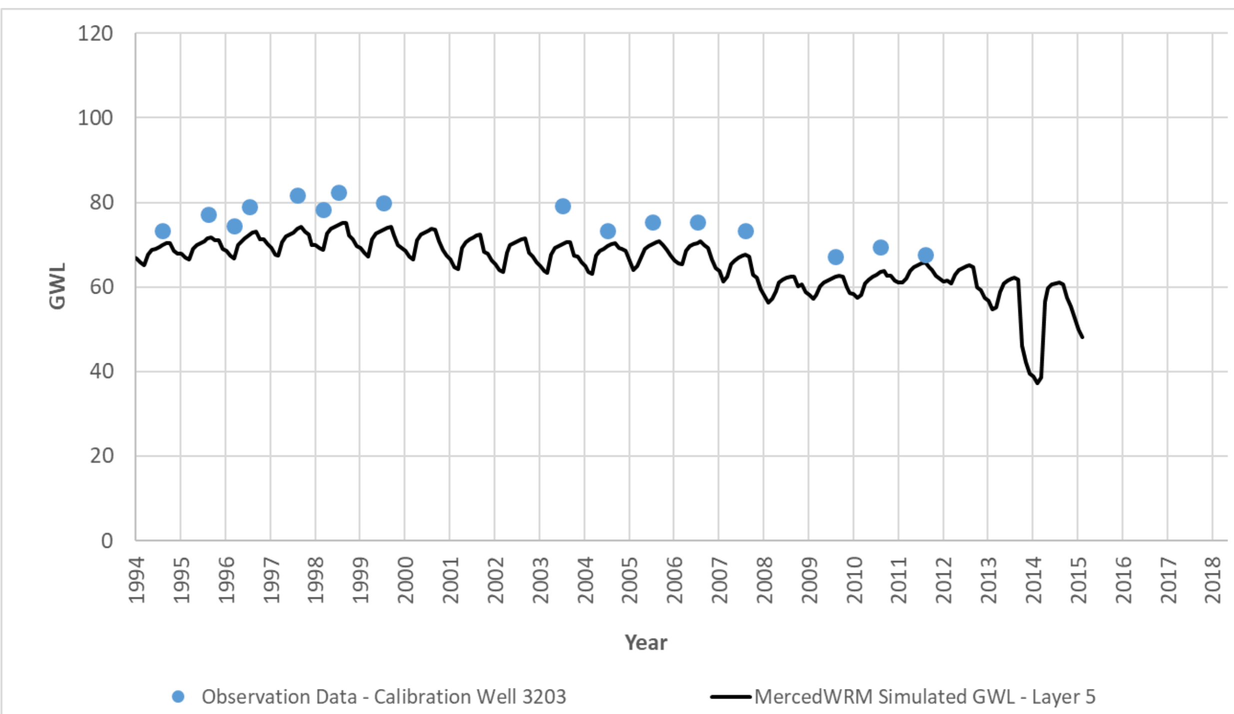


Figure A 132: Calibration Well 3203

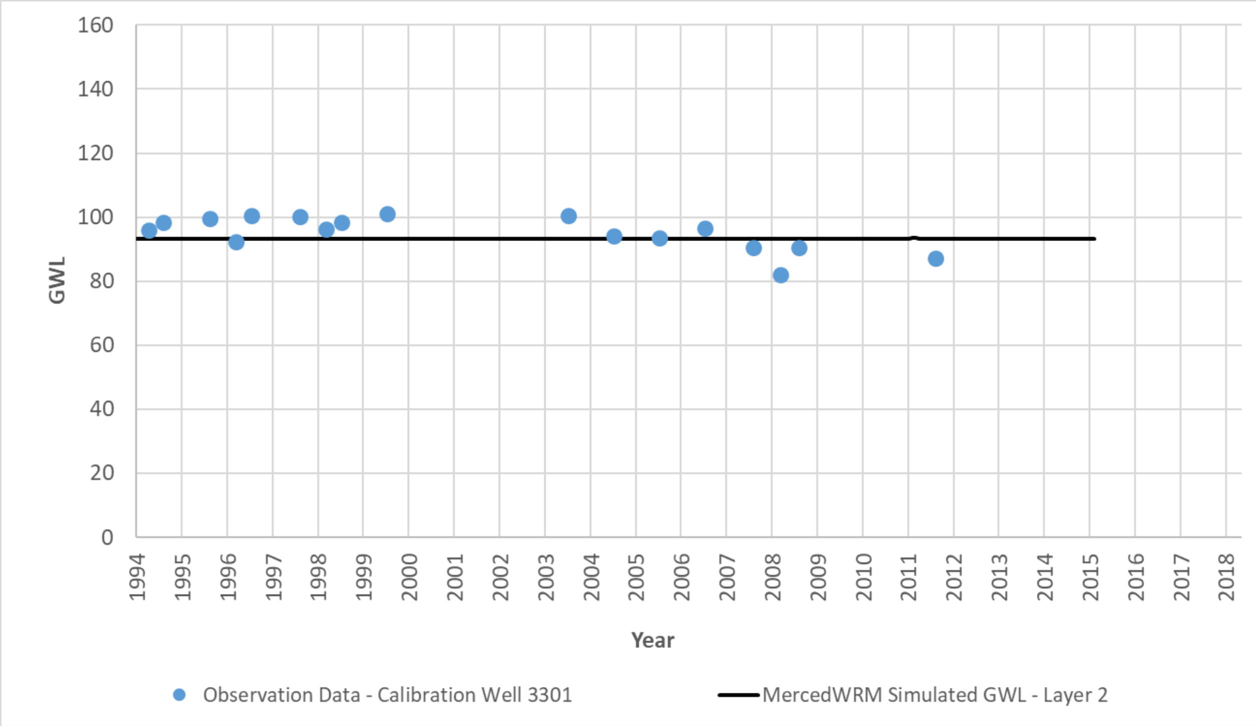
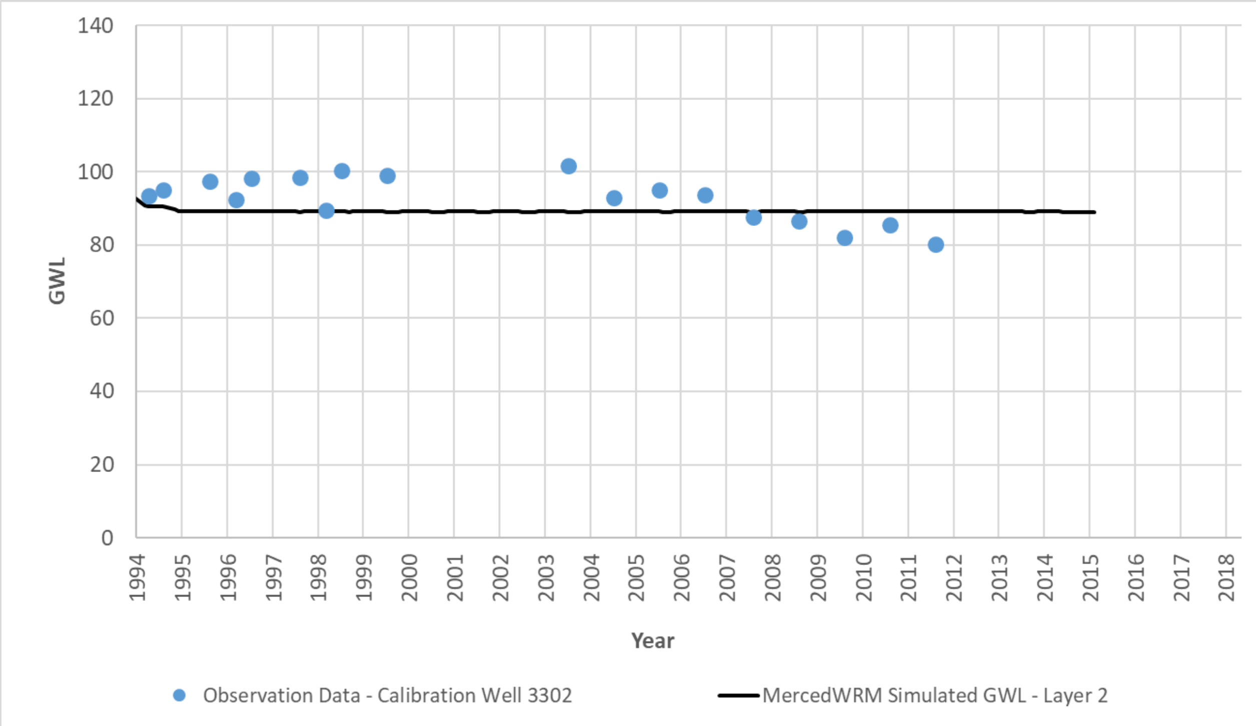


Figure A 133: Calibration Well 3301



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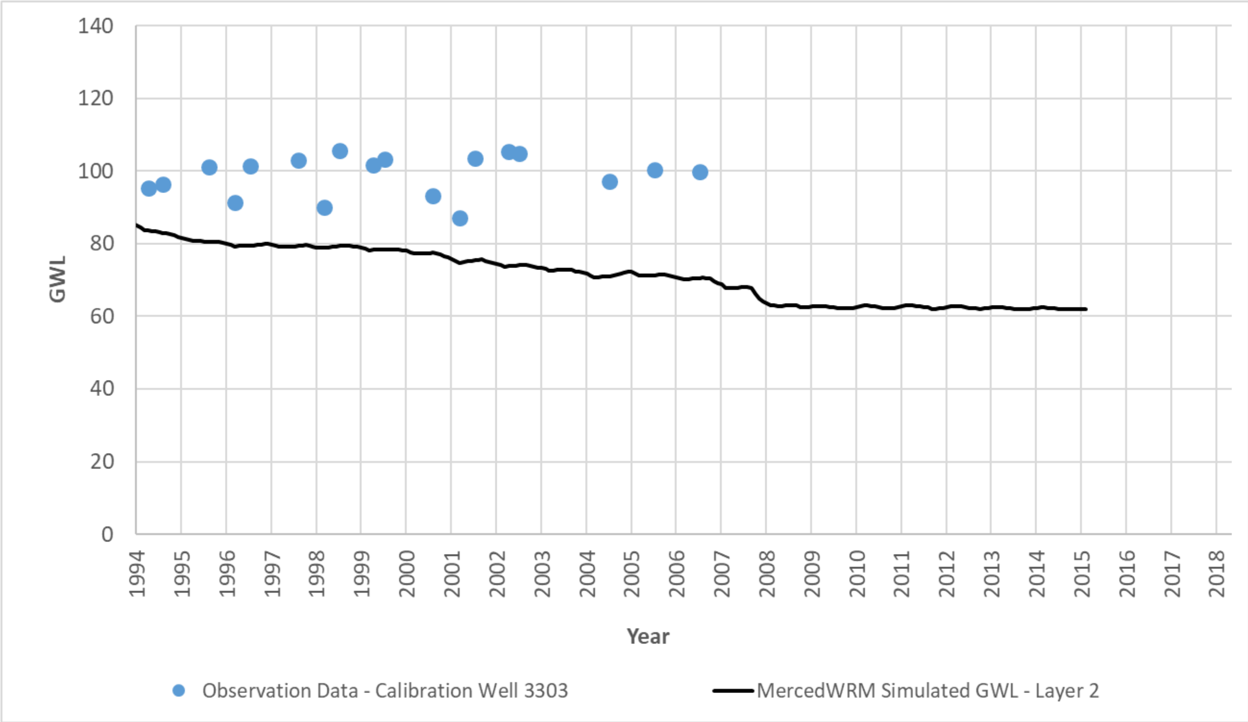

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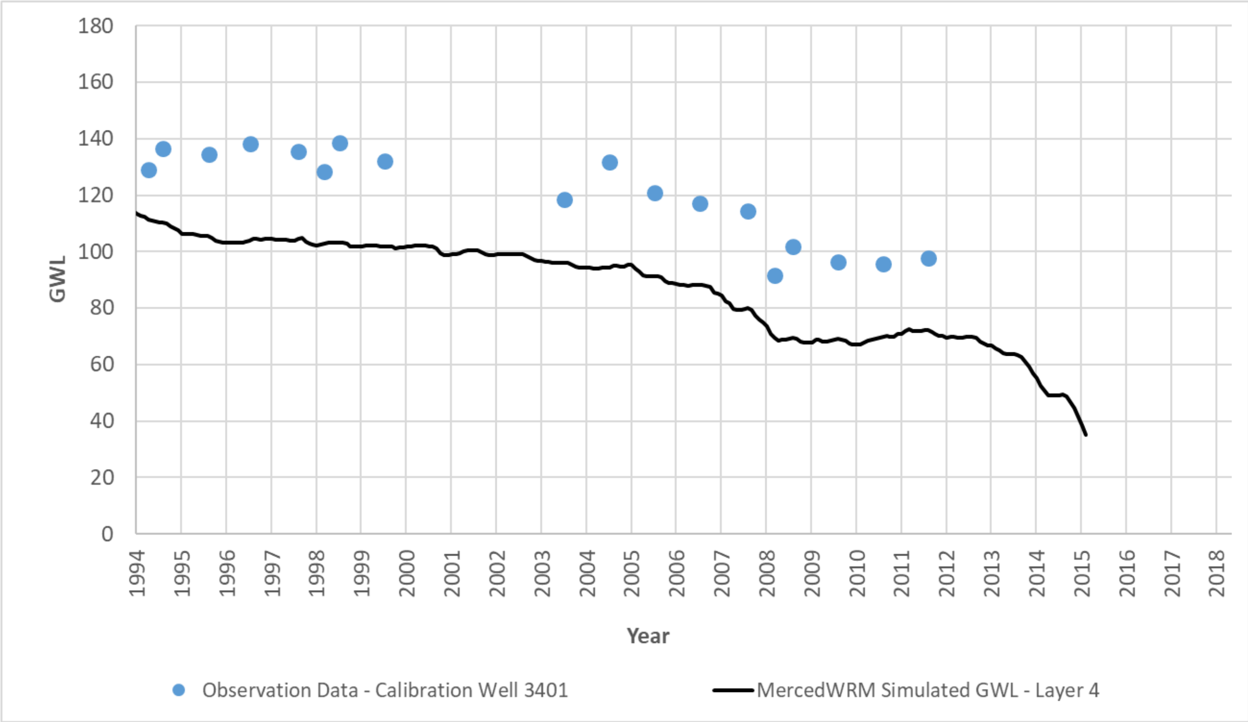
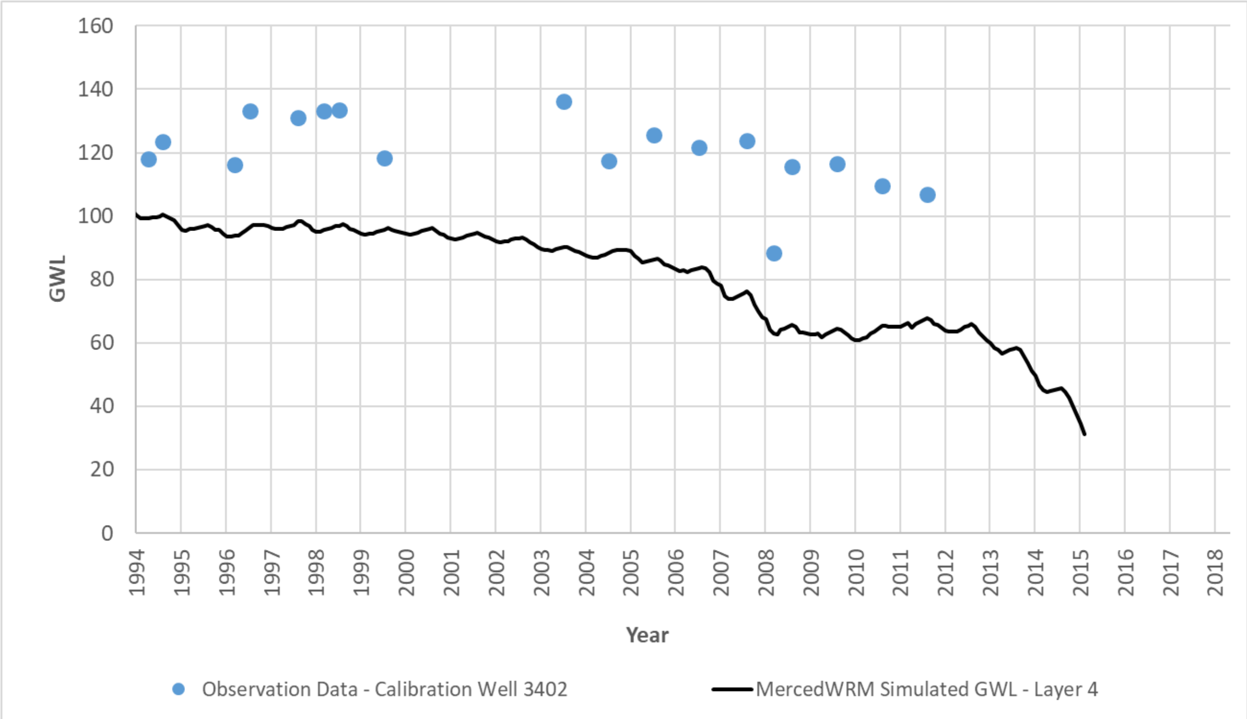


Figure A 136: Calibration Well 3401



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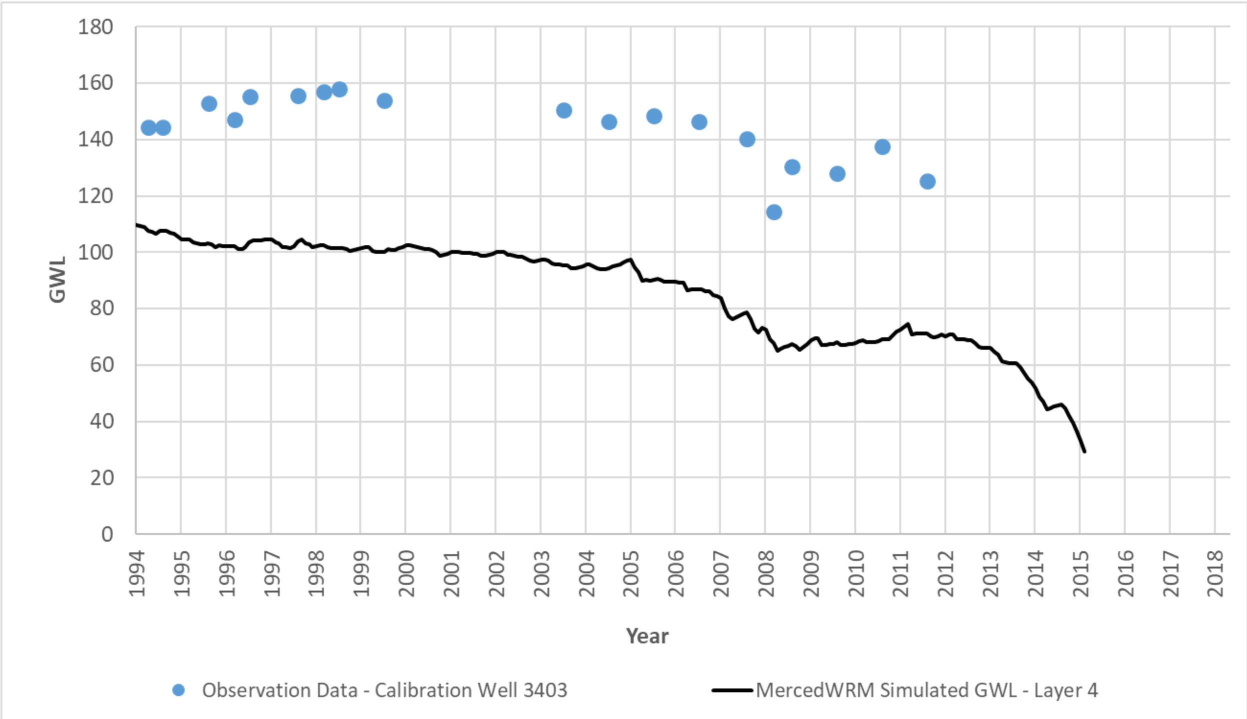

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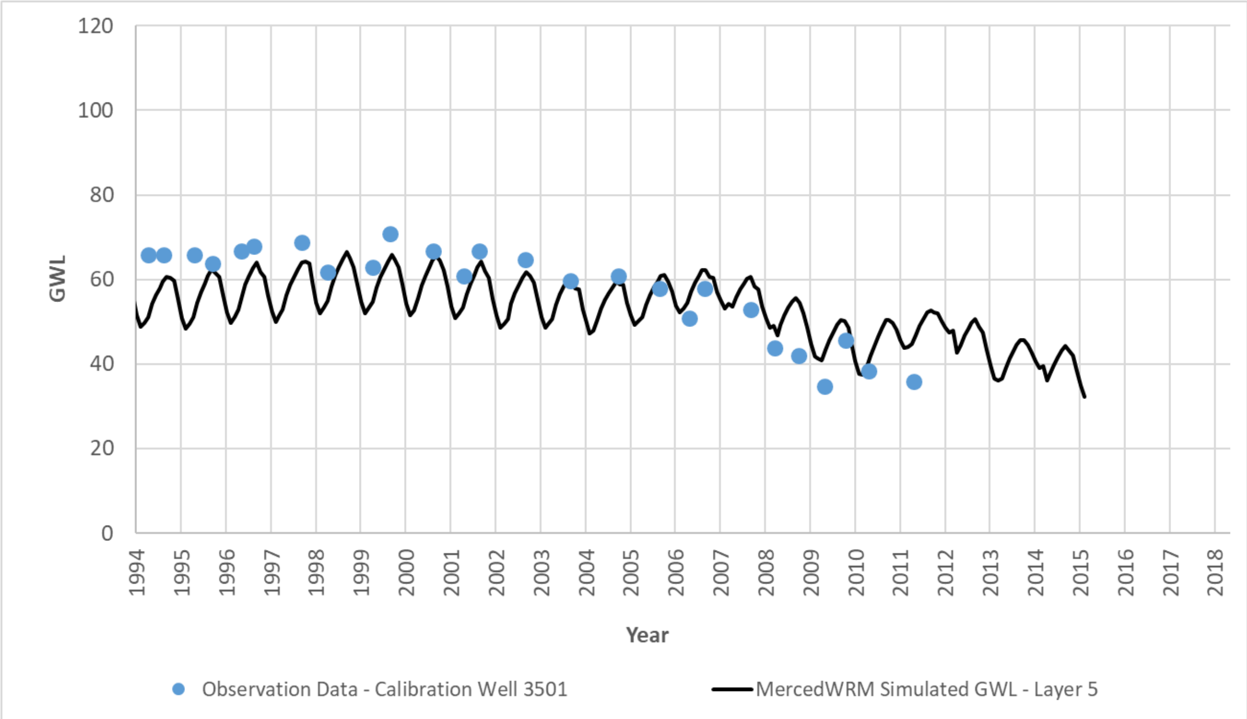
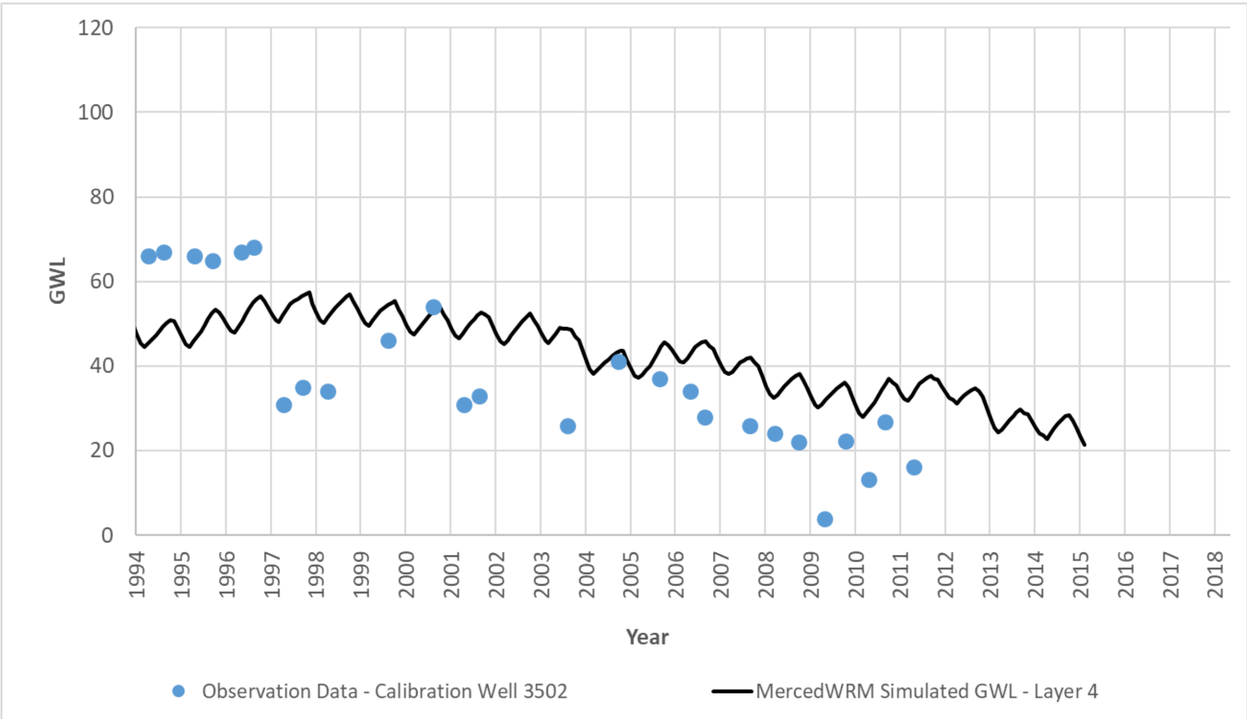


Figure A 139: Calibration Well 3501



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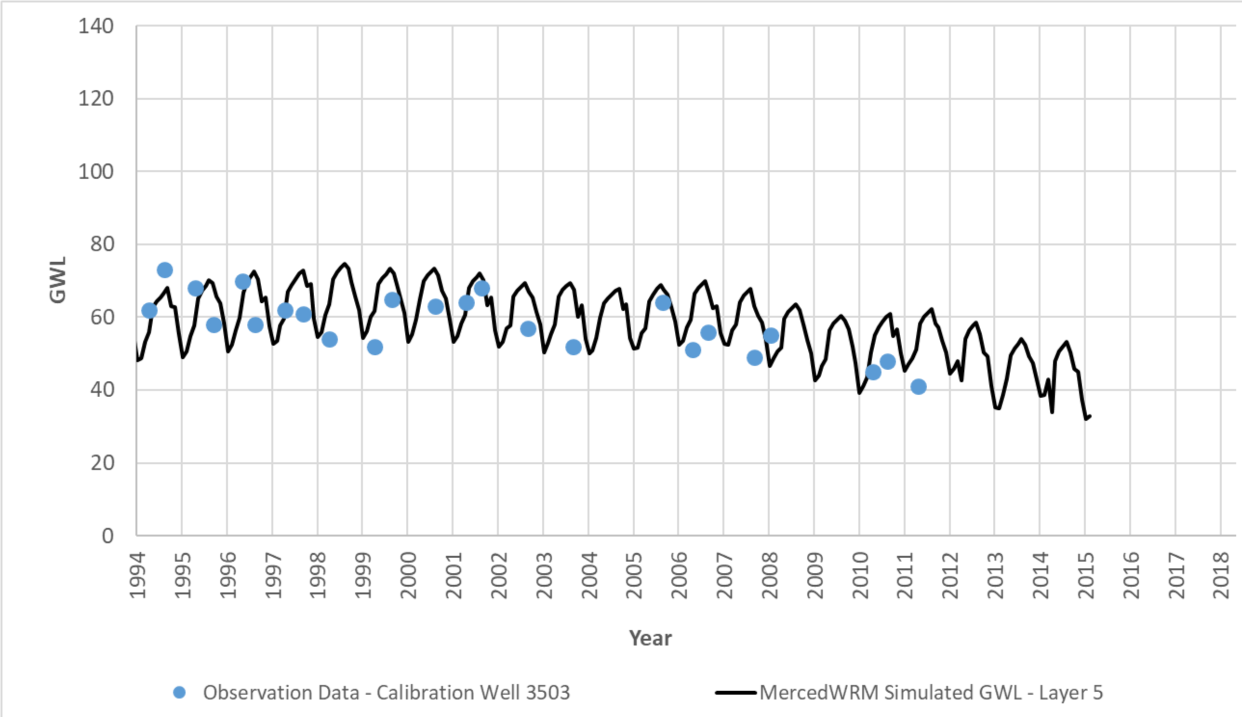

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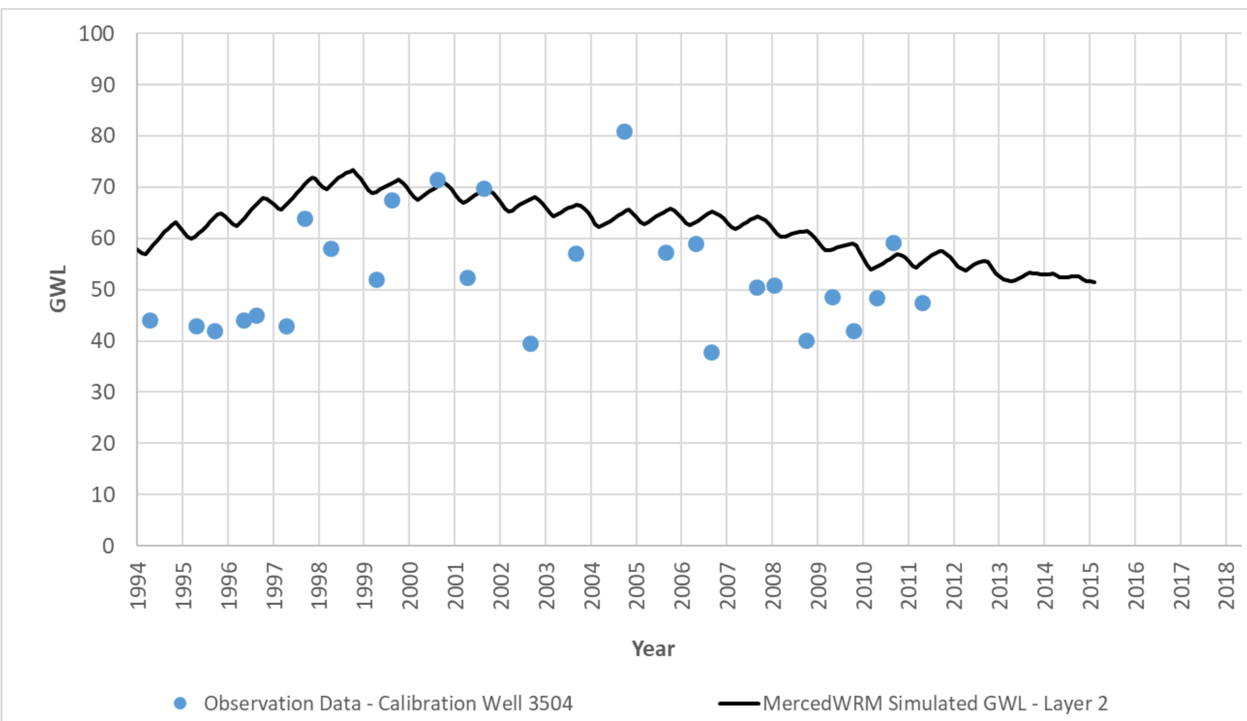
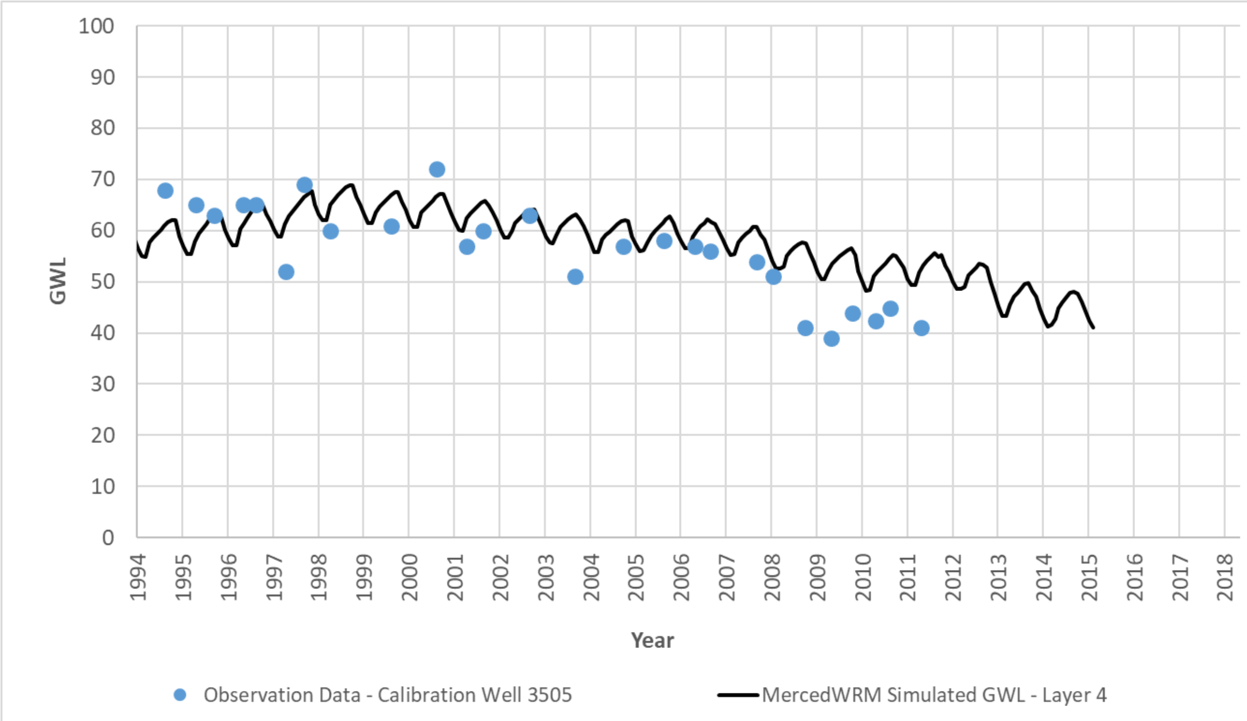


Figure A 142: Calibration Well 3504



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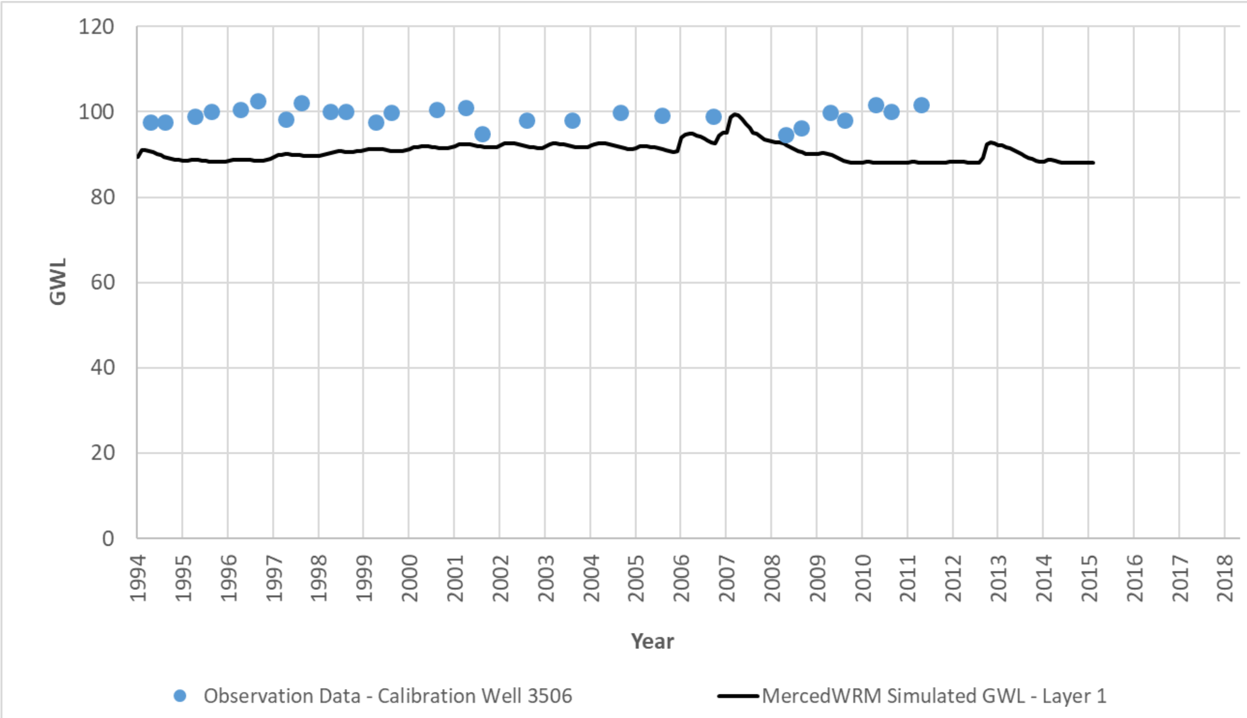

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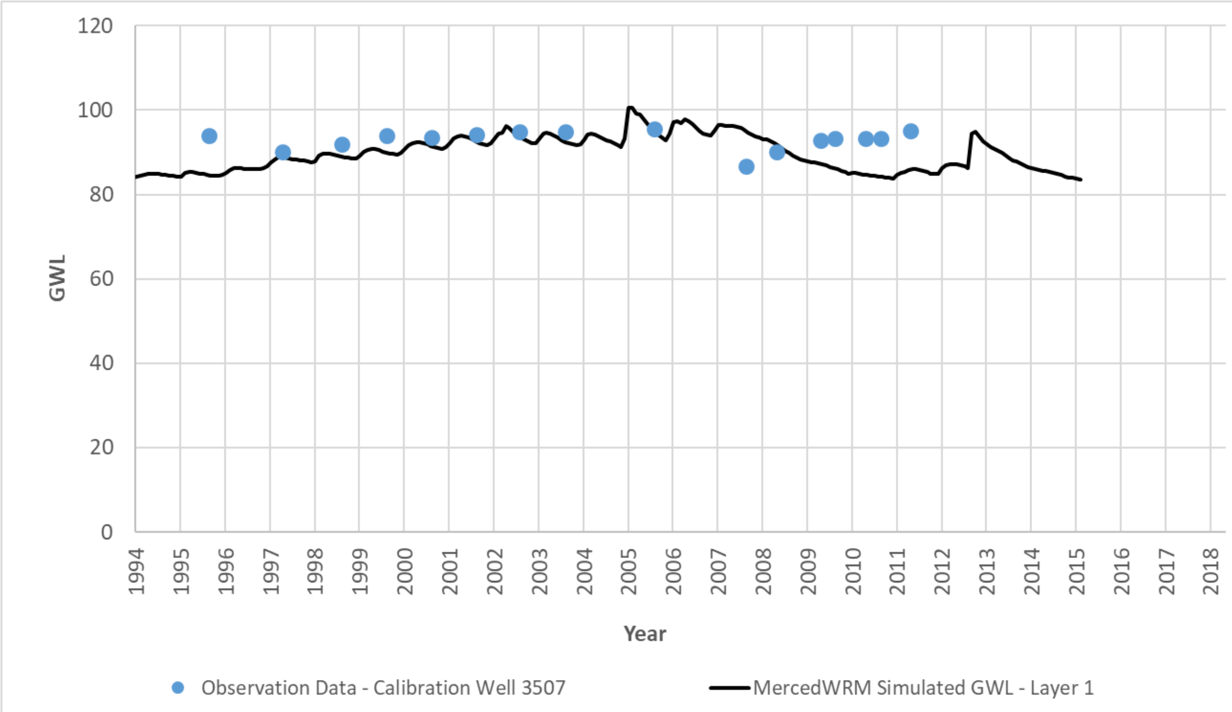

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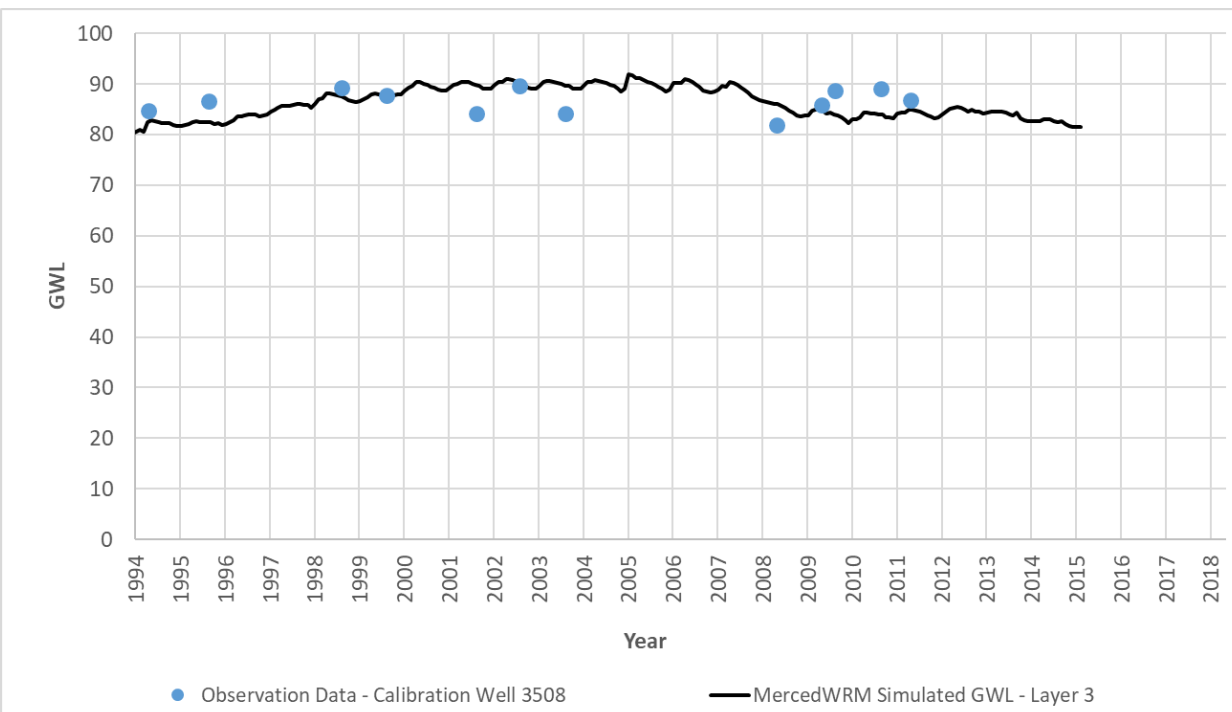
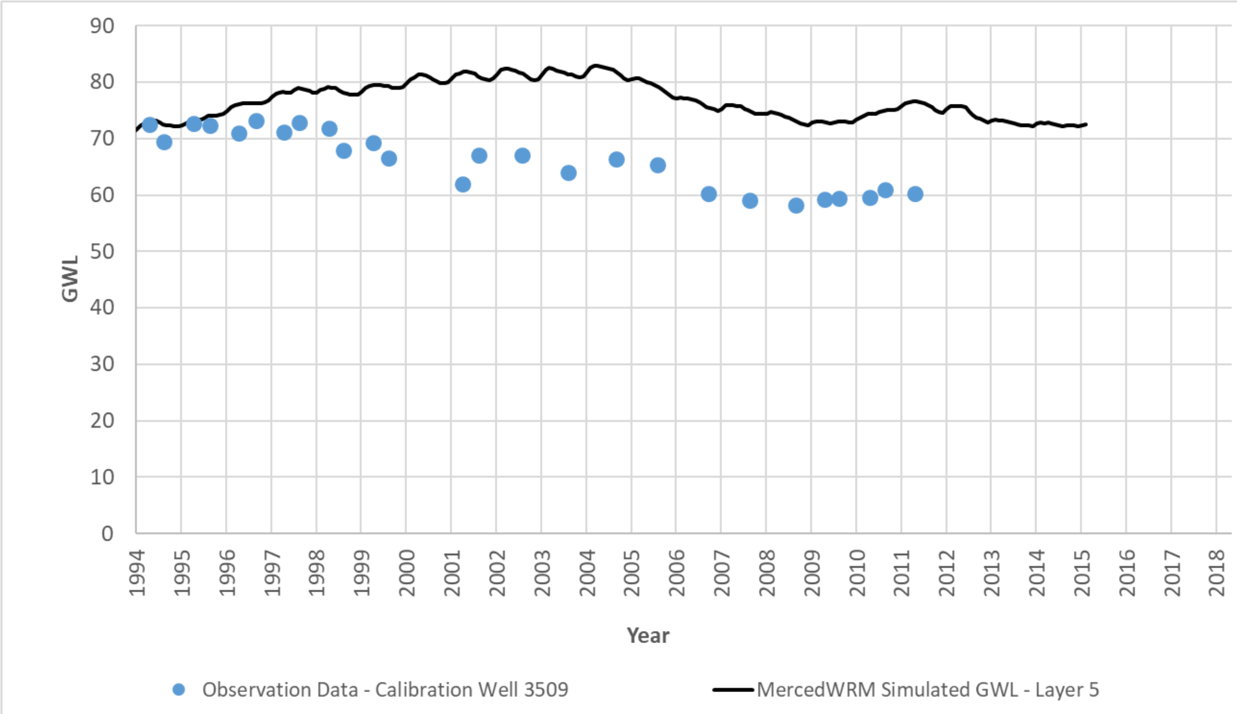


Figure A 146: Calibration Well 3508



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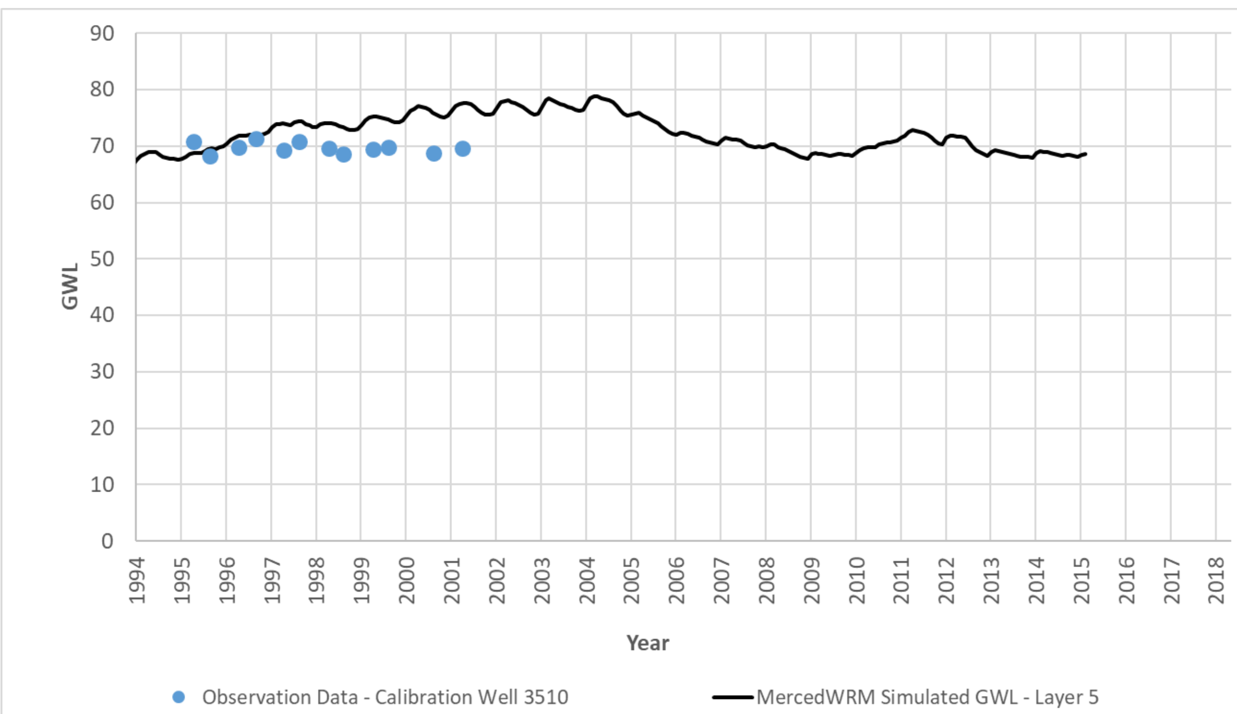


Figure A 148: Calibration Well 3510

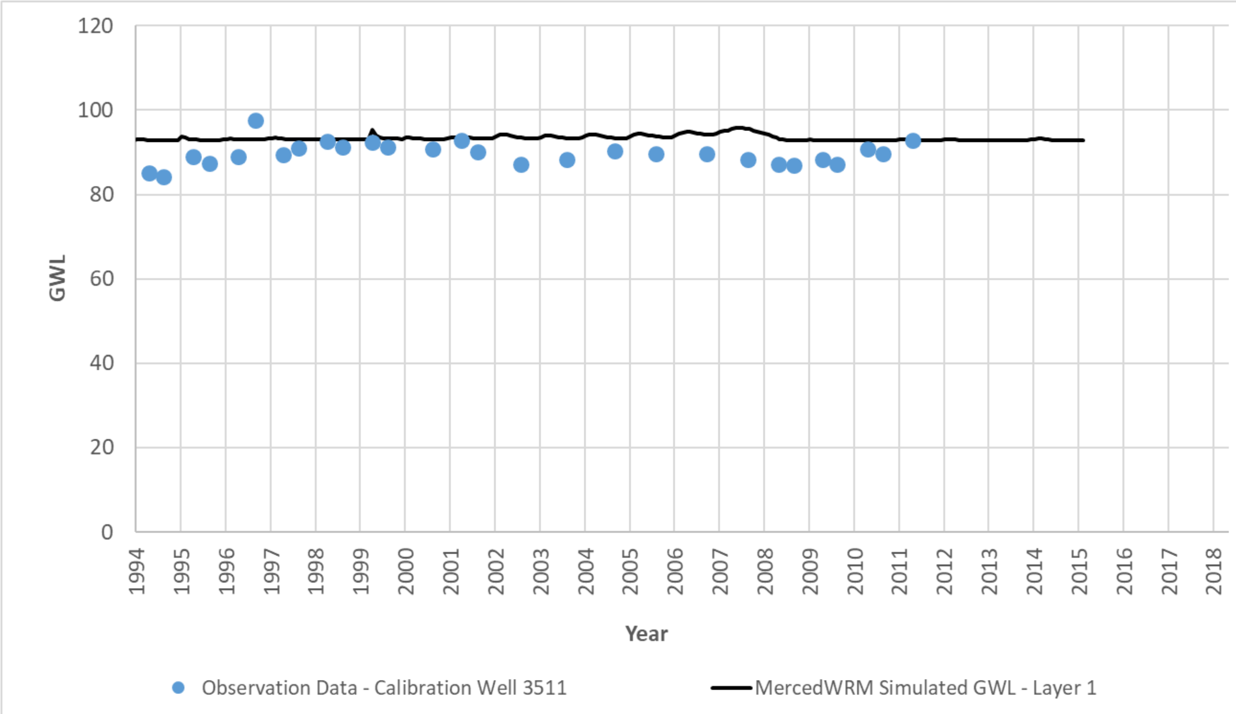
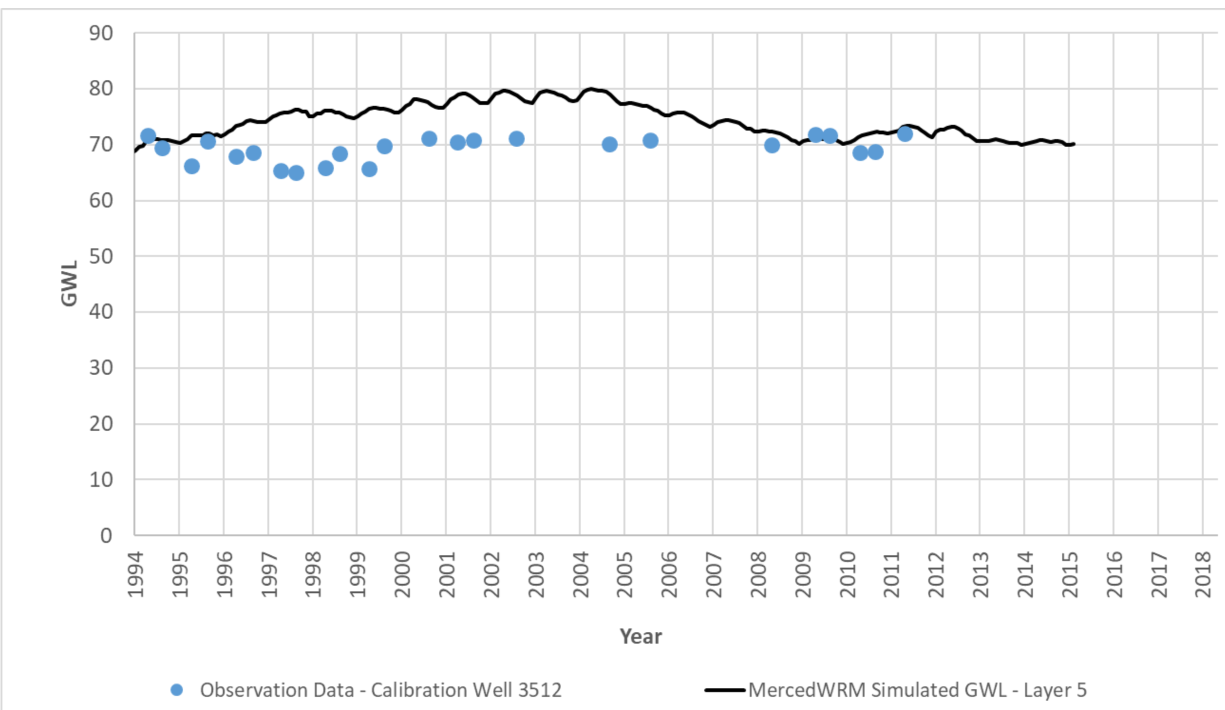


Figure A 149: Calibration Well 3511



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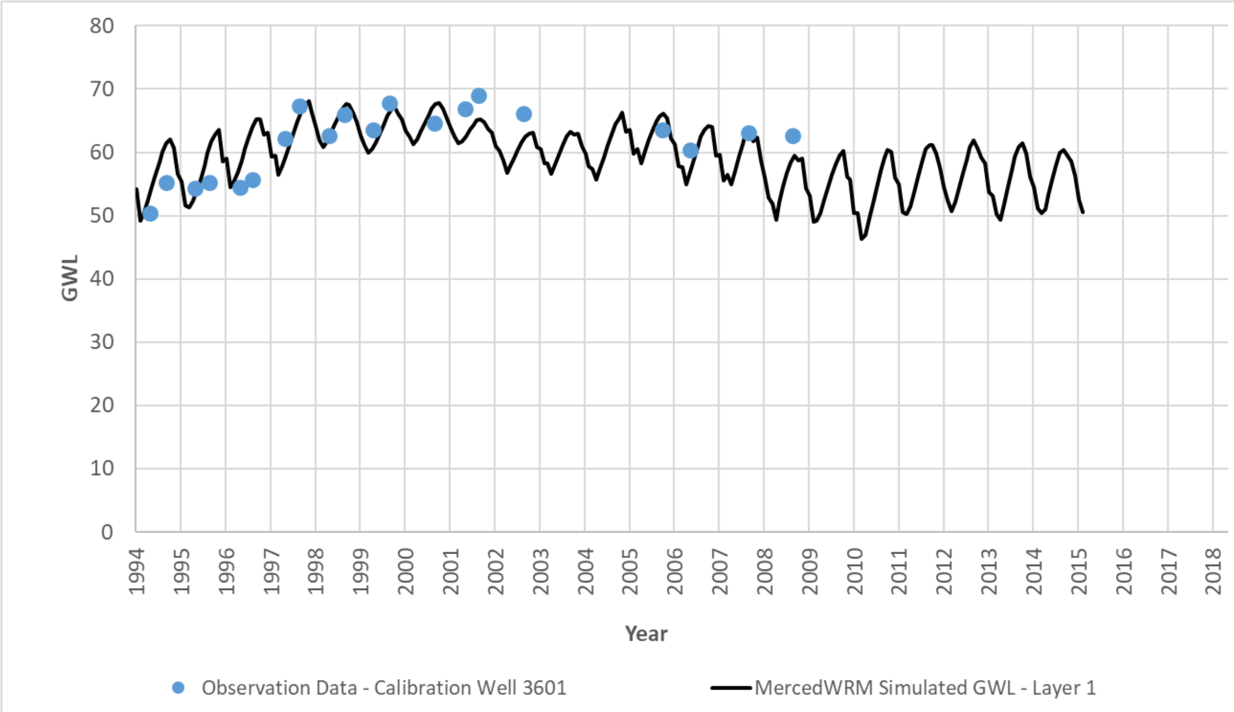


Figure A 151: Calibration Well 3601

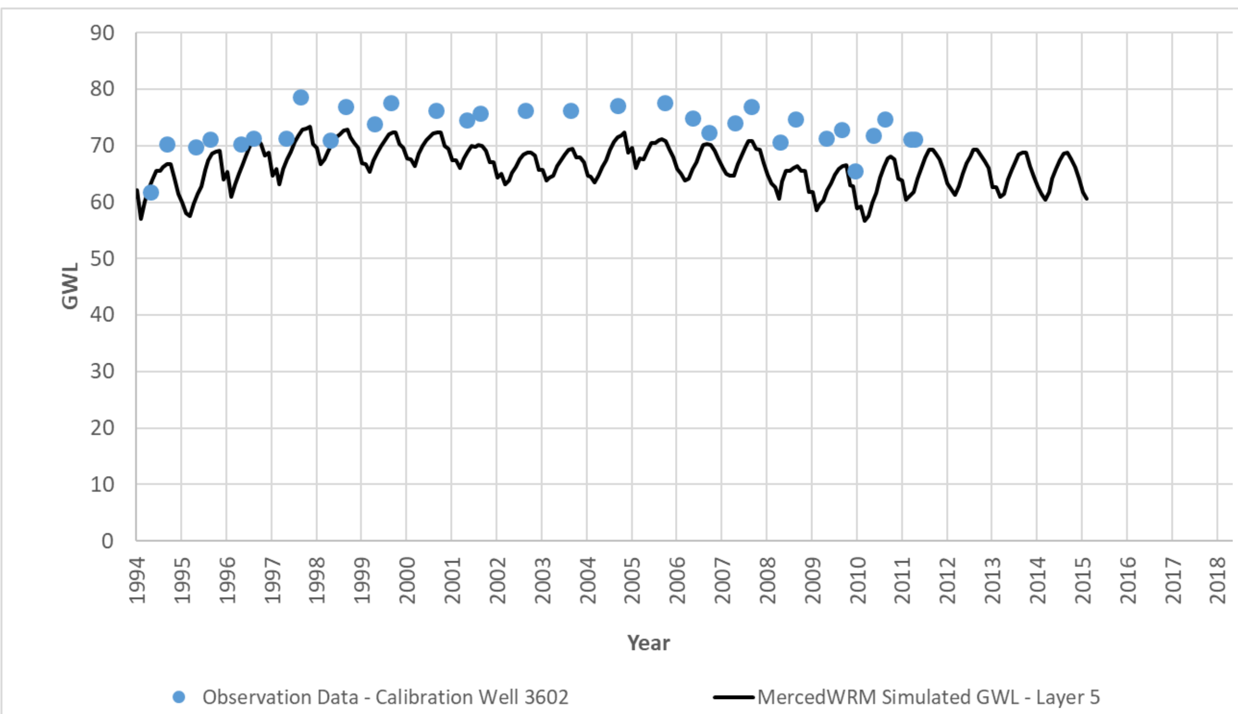


Figure A 152: Calibration Well 3602

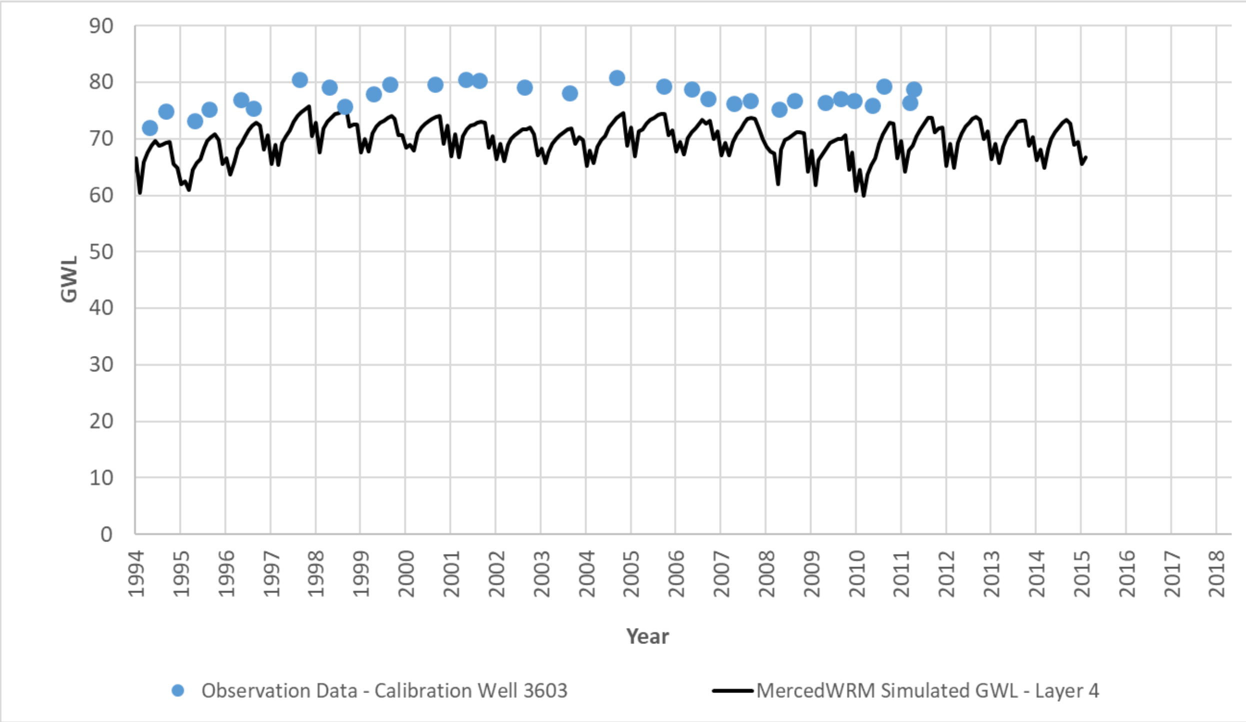


Figure A 153: Calibration Well 3603

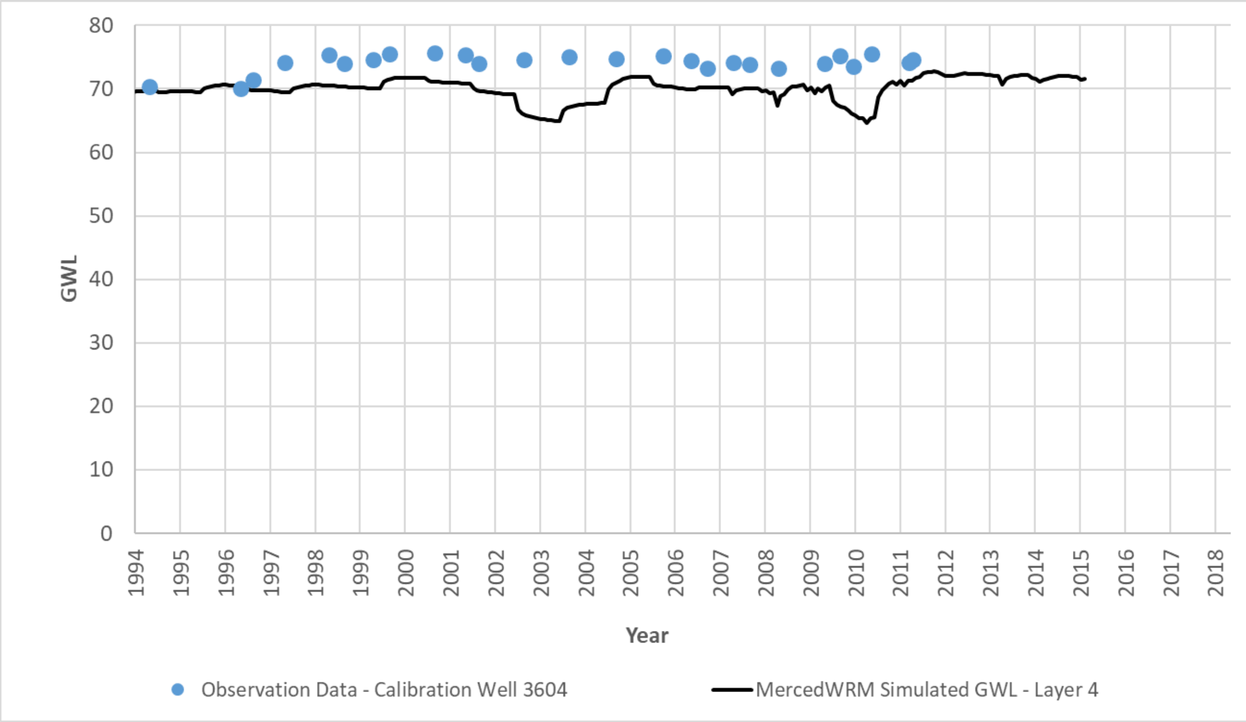


Figure A 154: Calibration Well 3604

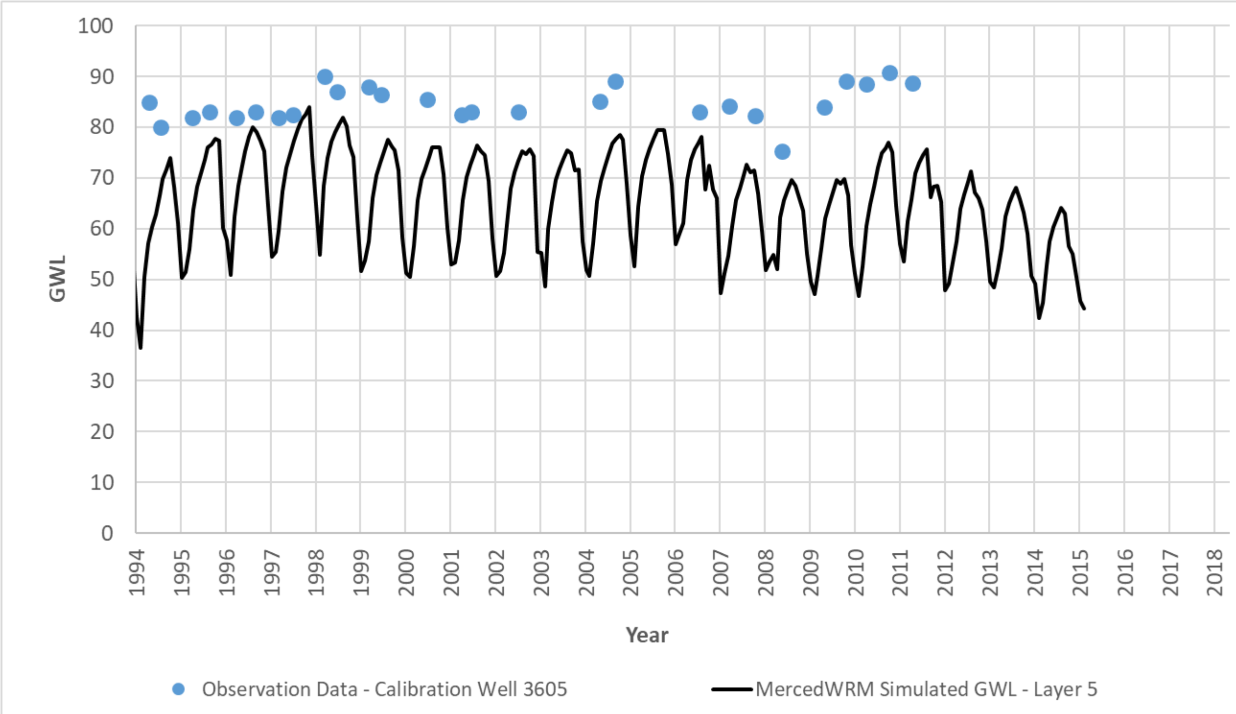


Figure A 155: Calibration Well 3605

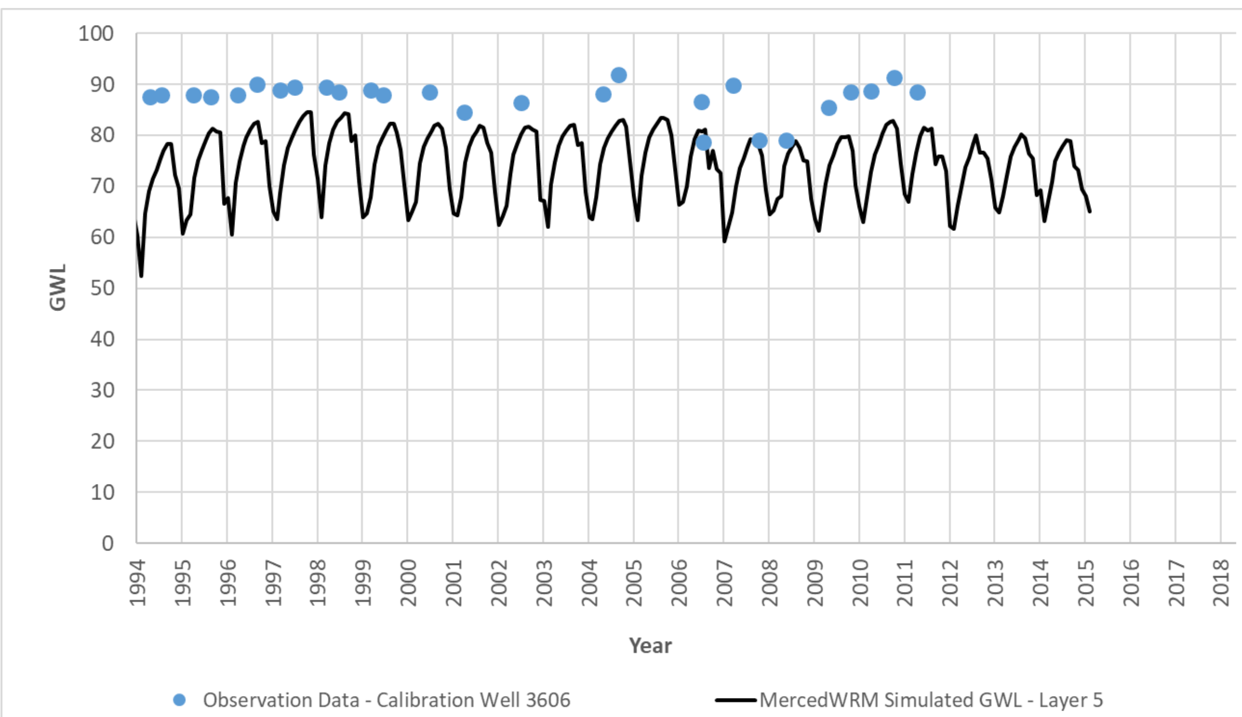


Figure A 156: Calibration Well 3606

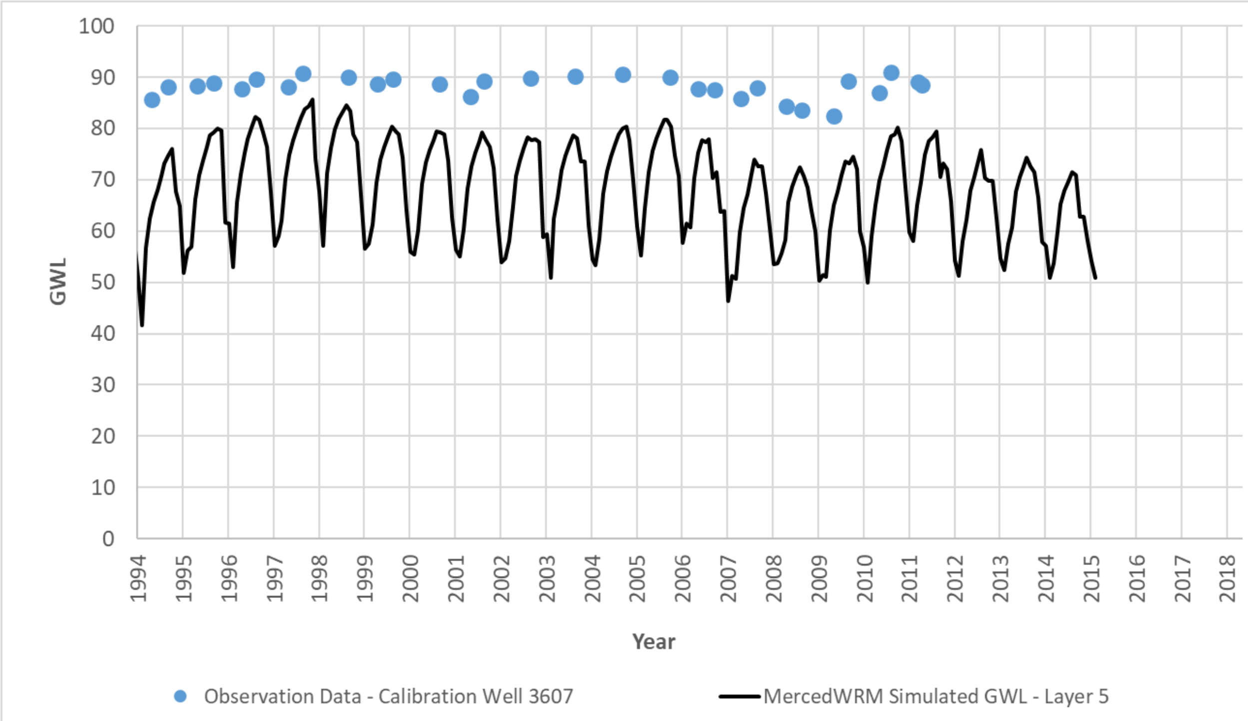


Figure A 157: Calibration Well 3607

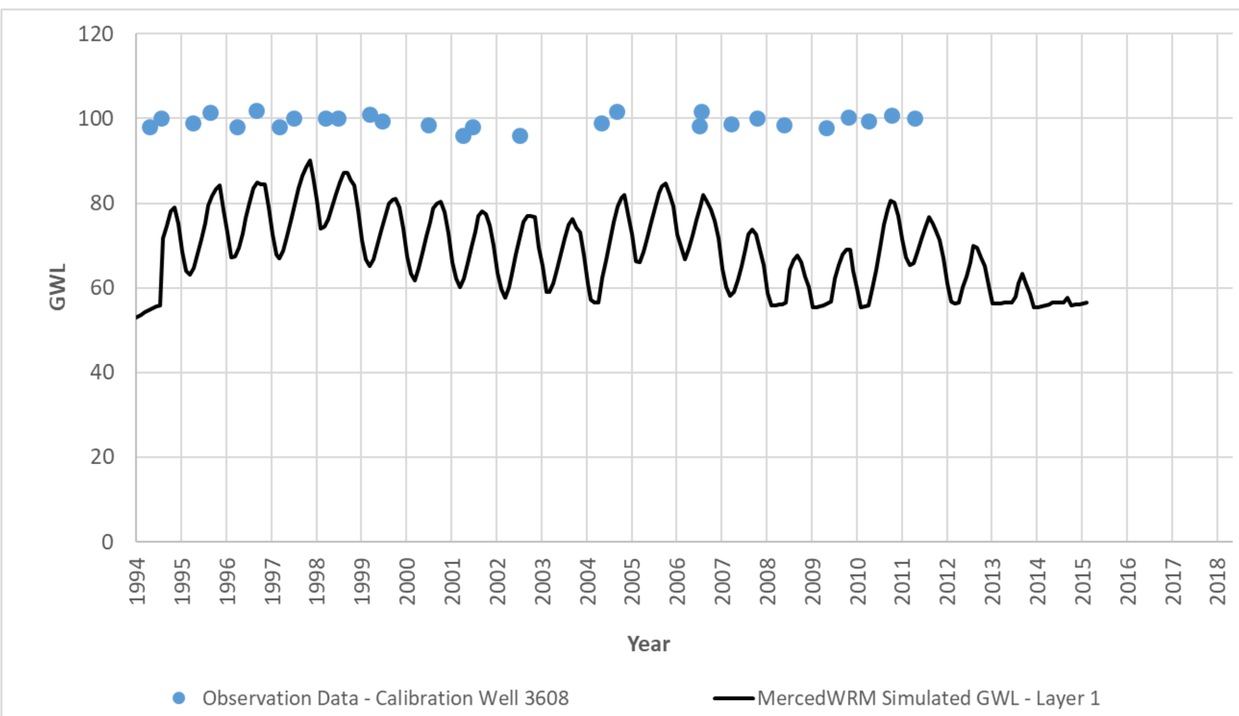
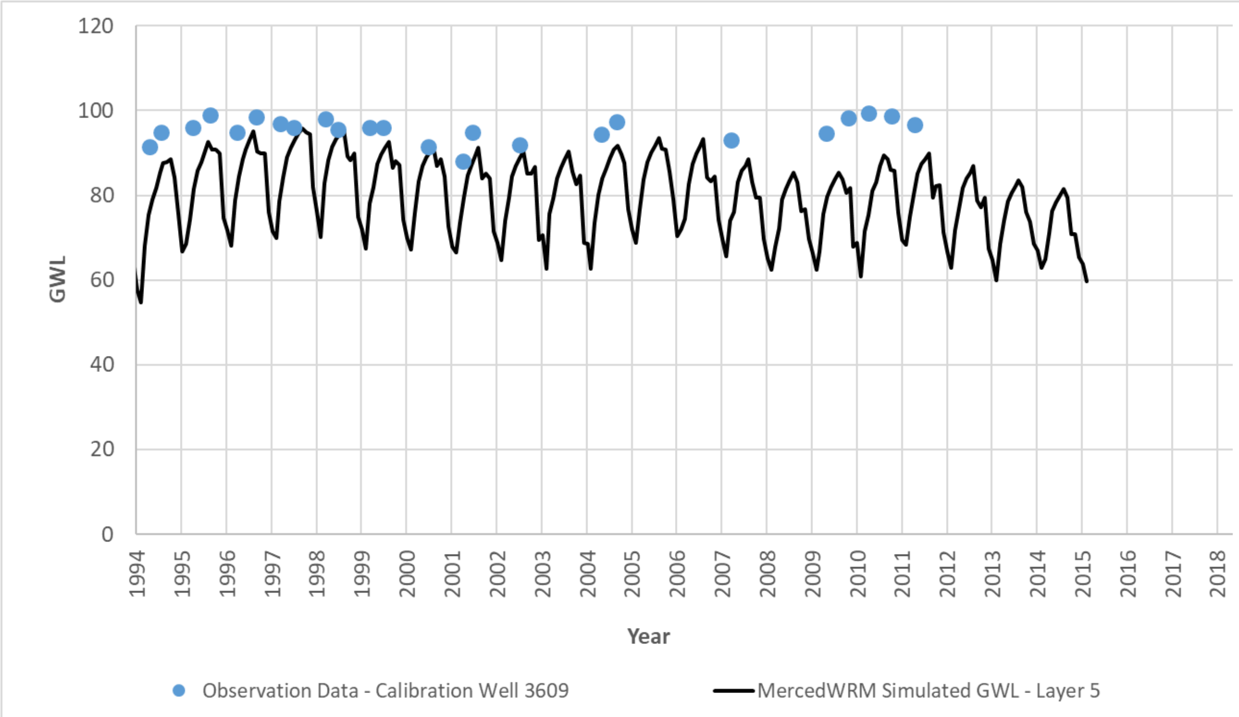


Figure A 158: Calibration Well 3608



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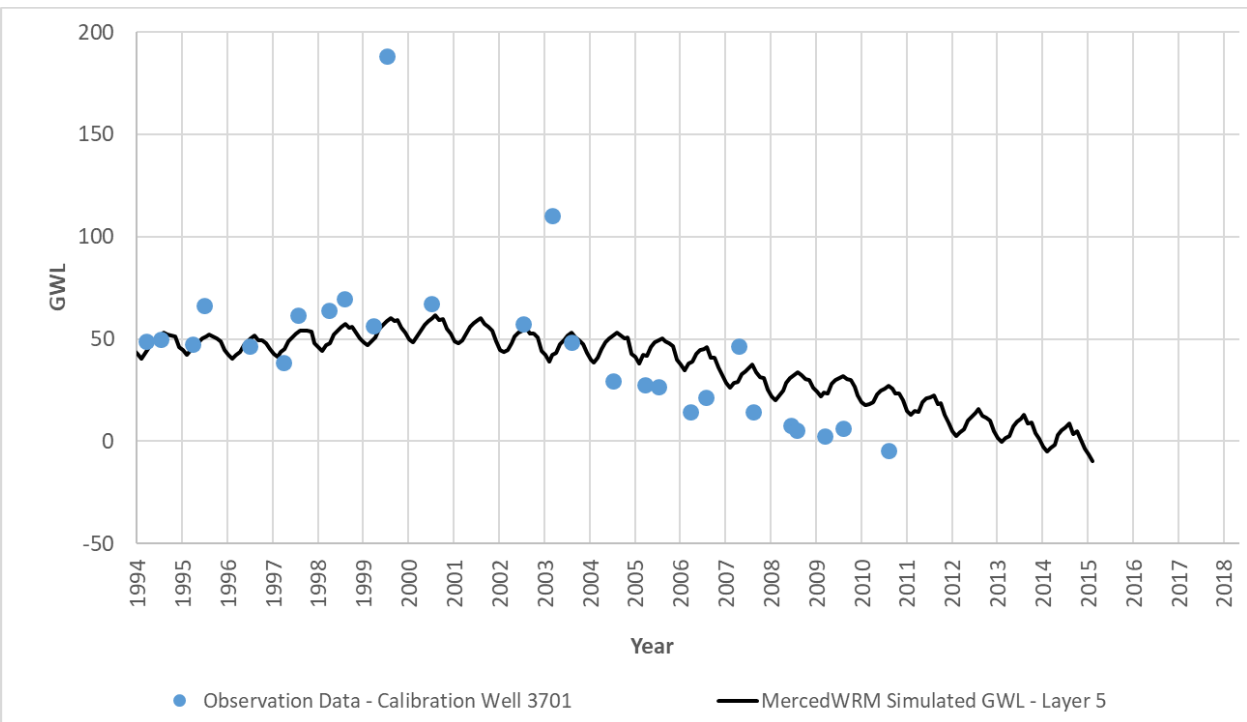


Figure A 160: Calibration Well 3701

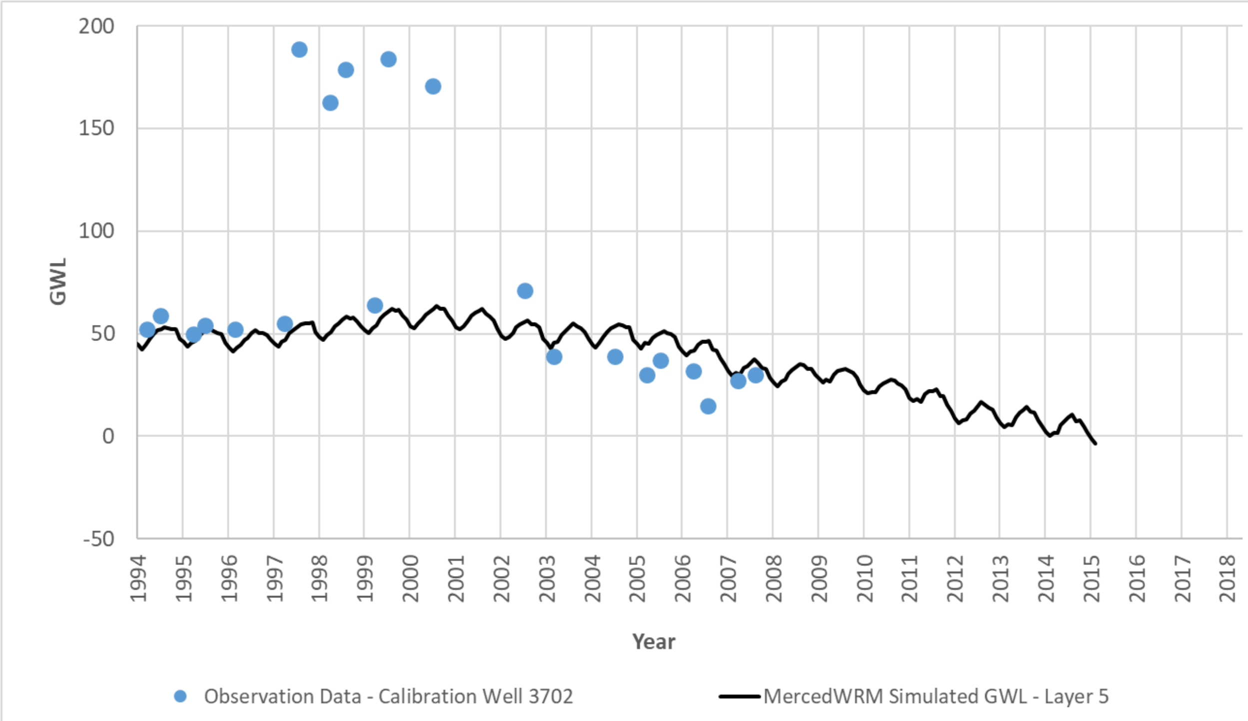


Figure A 161: Calibration Well 3702

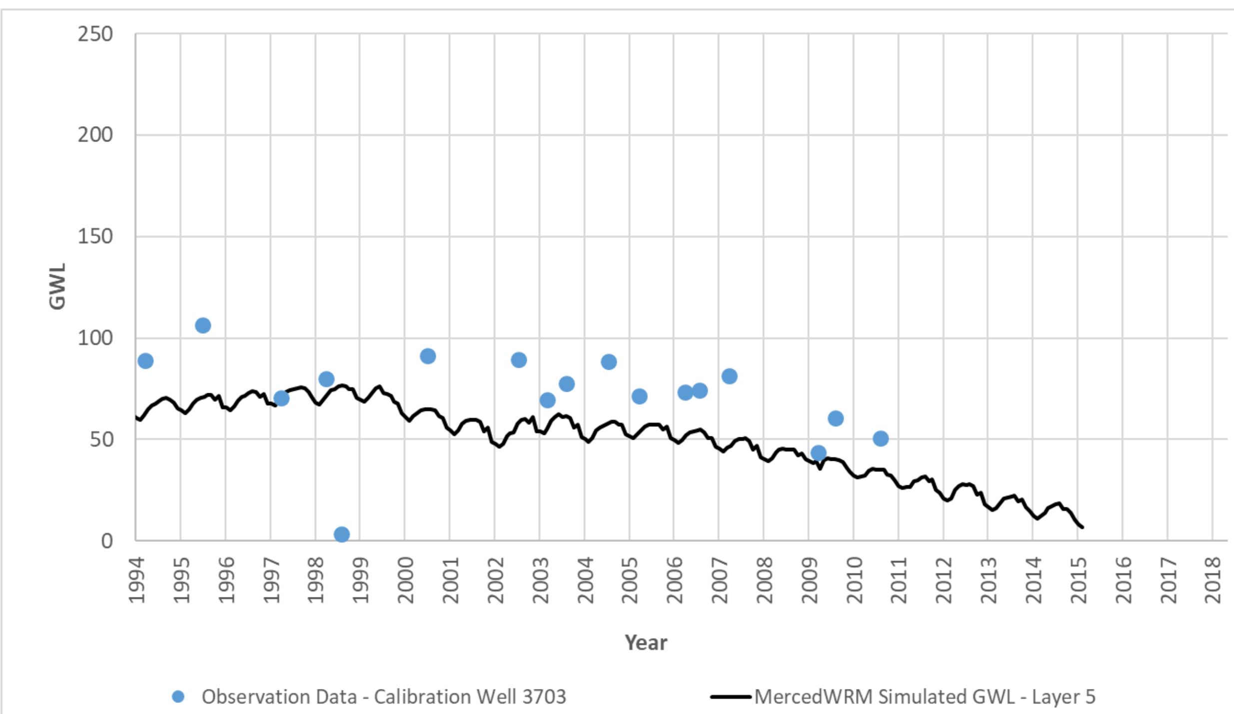


Figure A 162: Calibration Well 3703

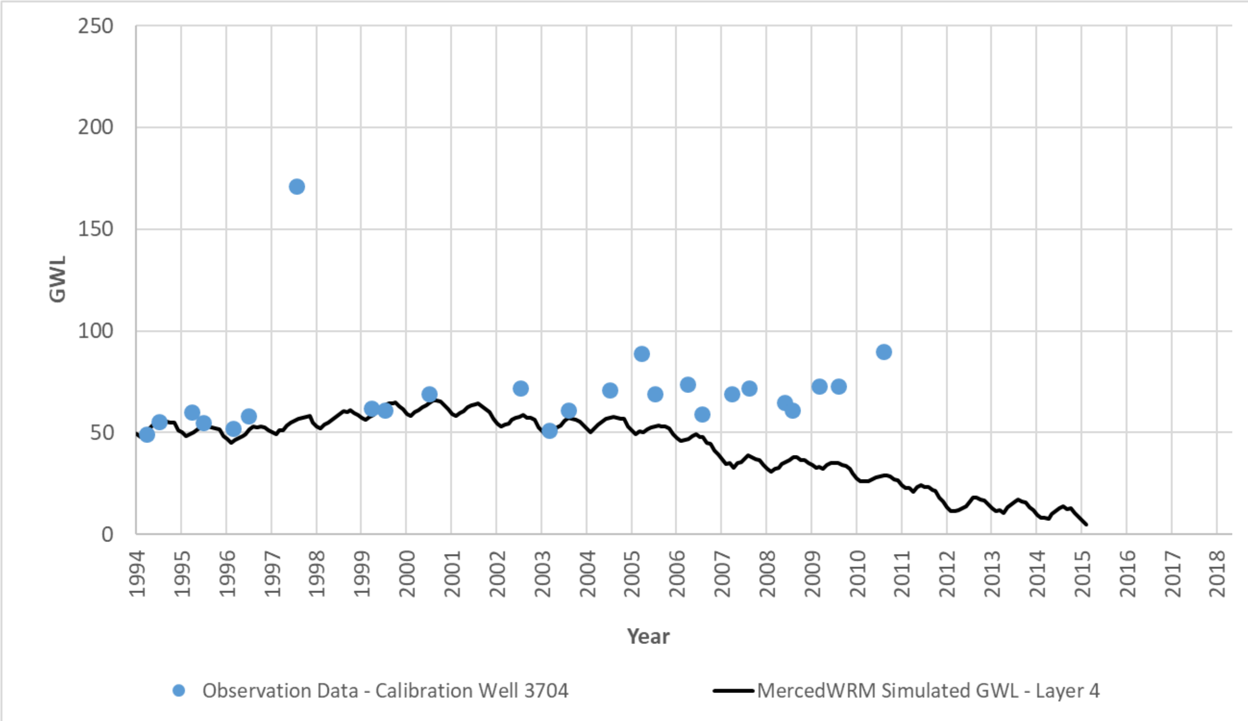


Figure A 163: Calibration Well 3704

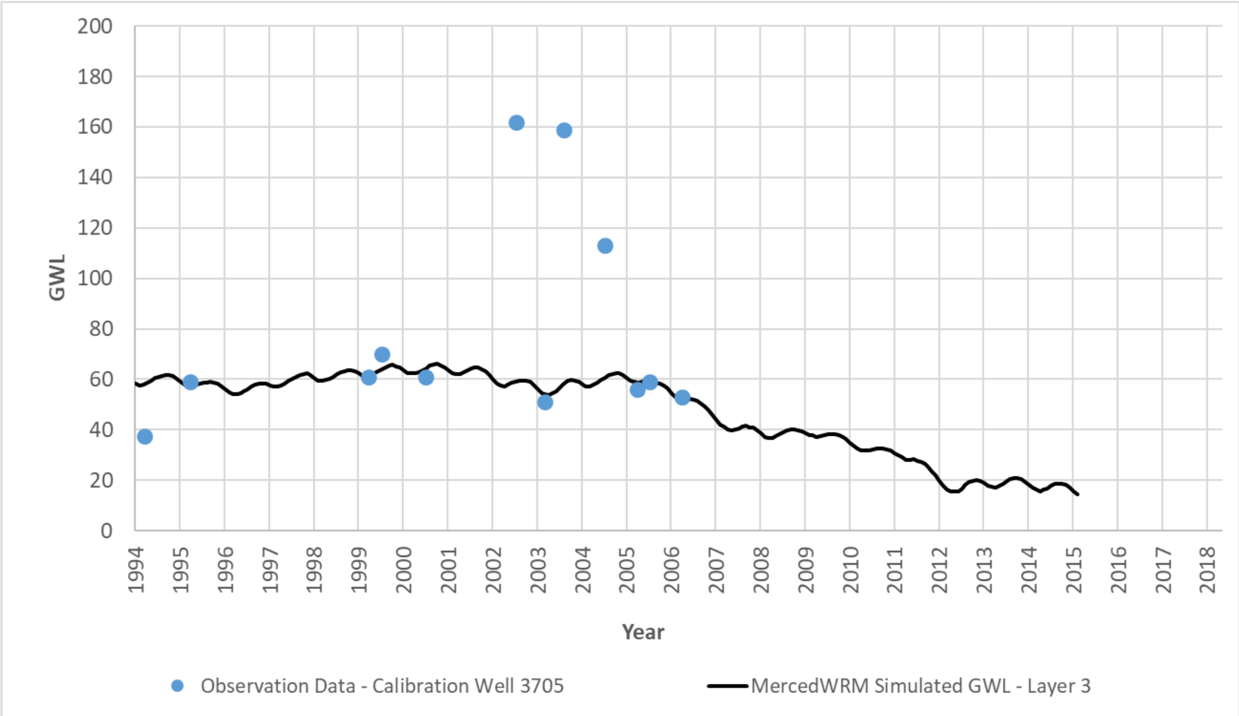
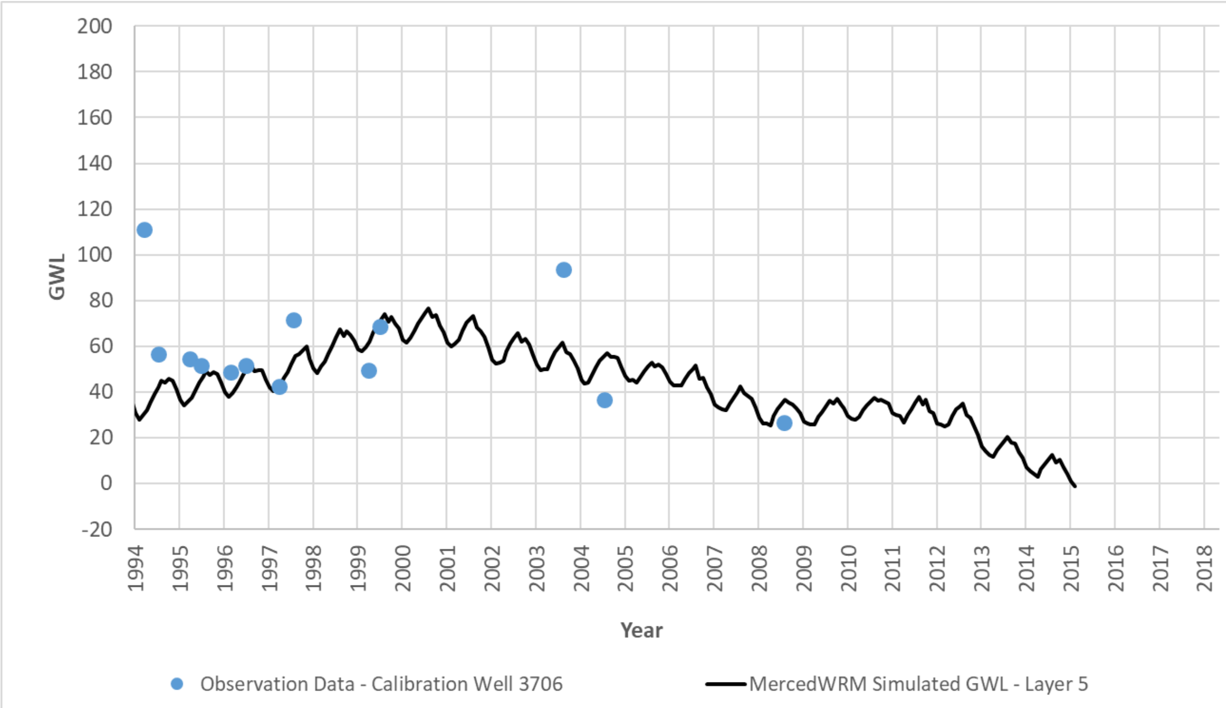


Figure A 164: Calibration Well 3705



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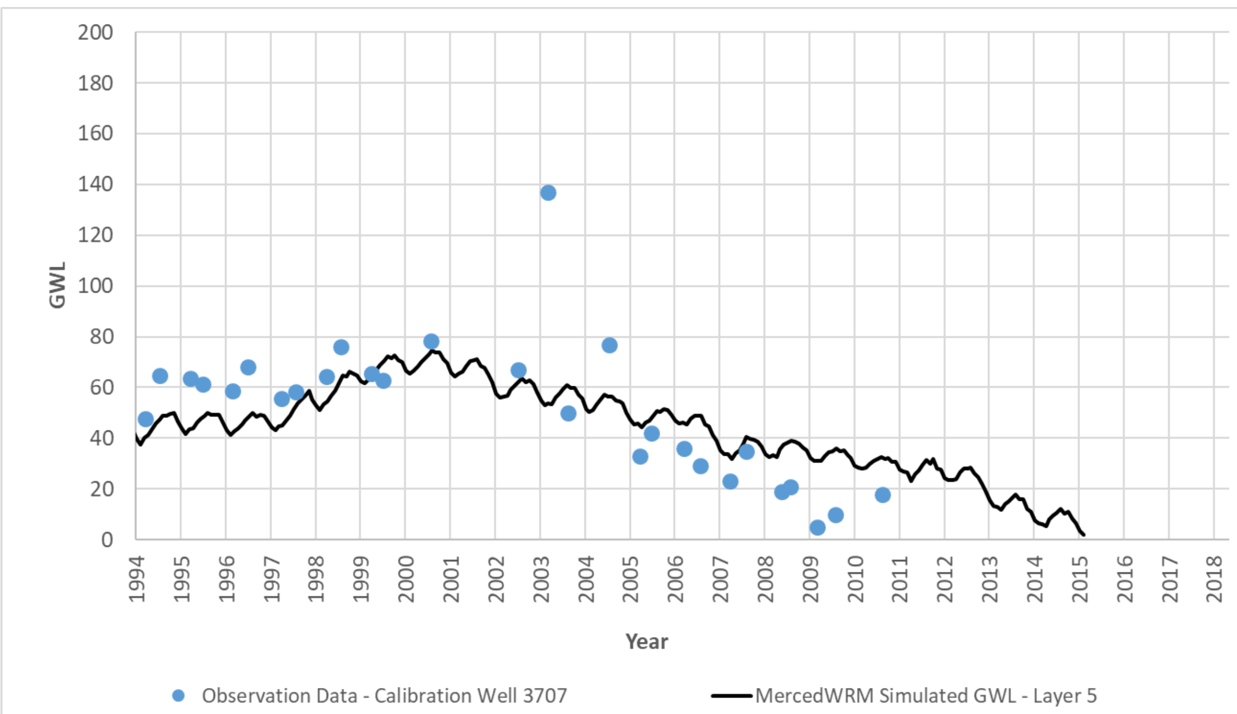


Figure A 166: Calibration Well 3707

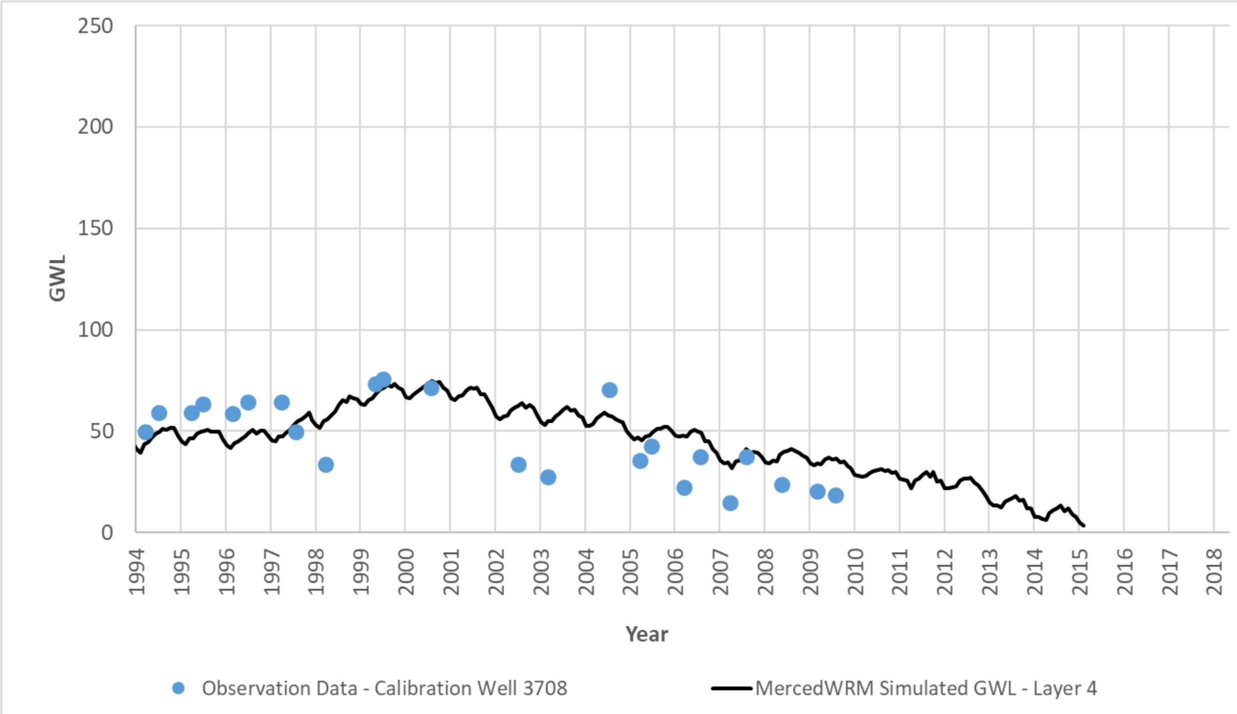


Figure A 167: Calibration Well 3708

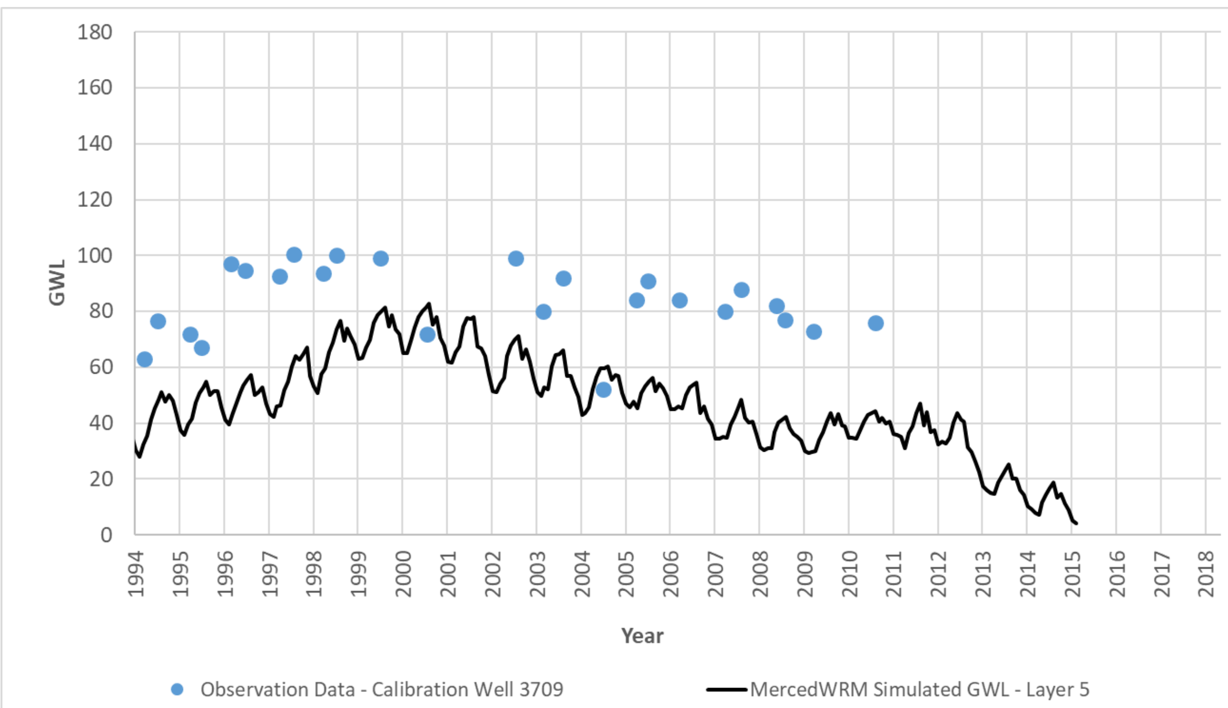


Figure A 168: Calibration Well 3709

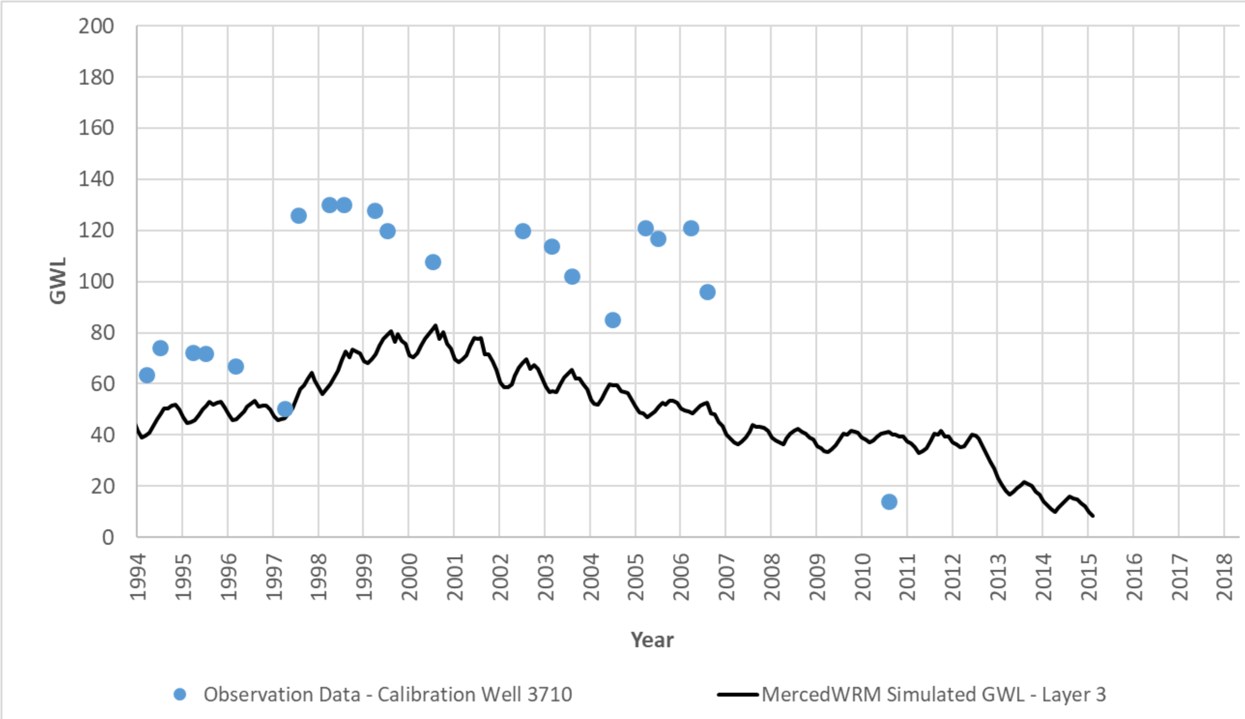


Figure A 169: Calibration Well 3710

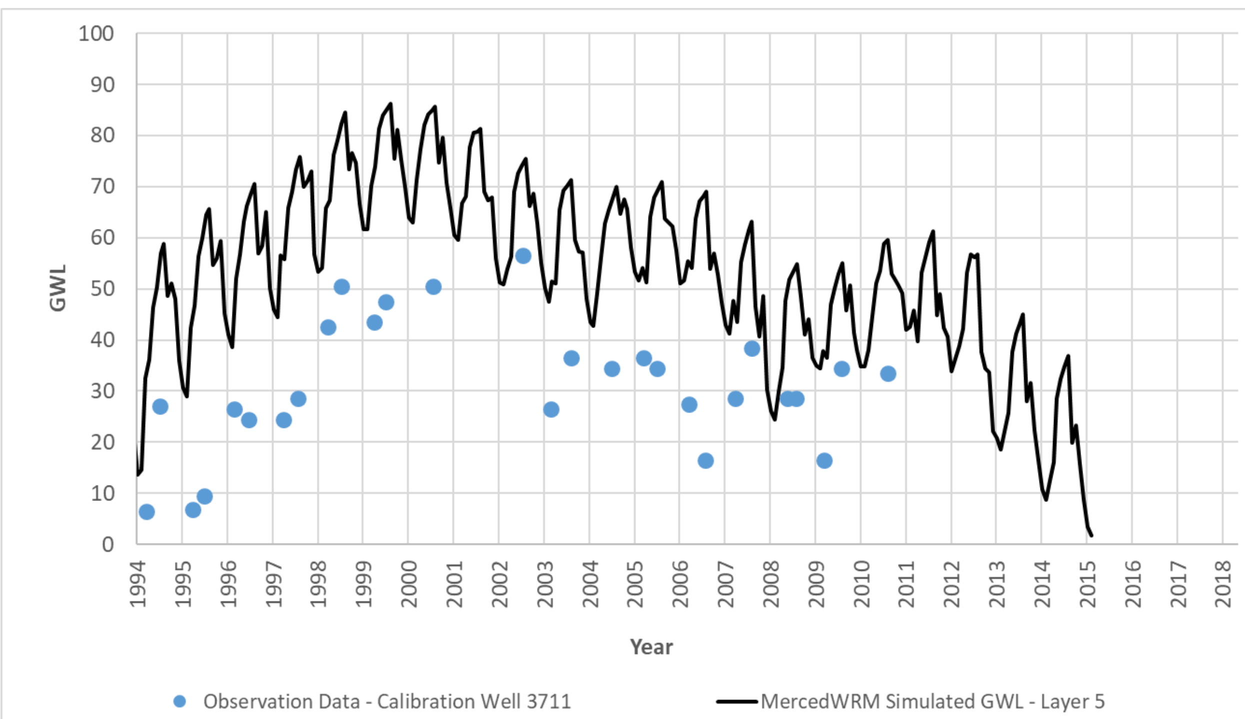


Figure A 170: Calibration Well 3711

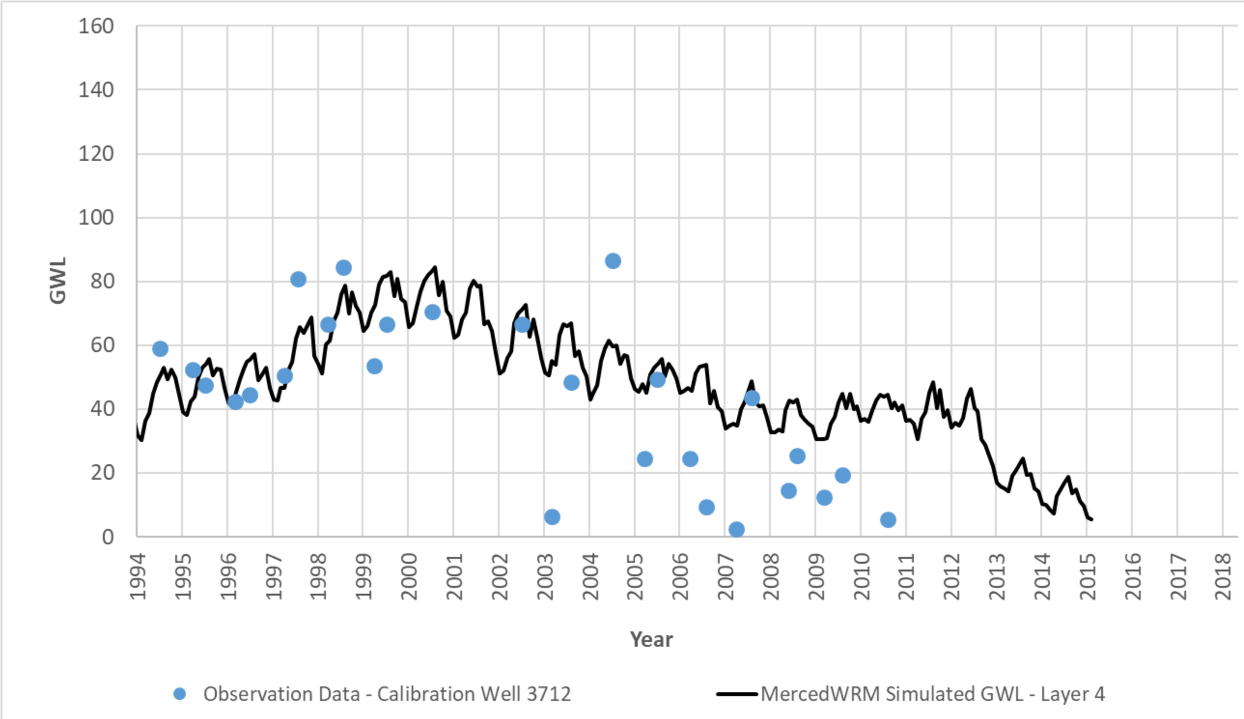


Figure A 171: Calibration Well 3712

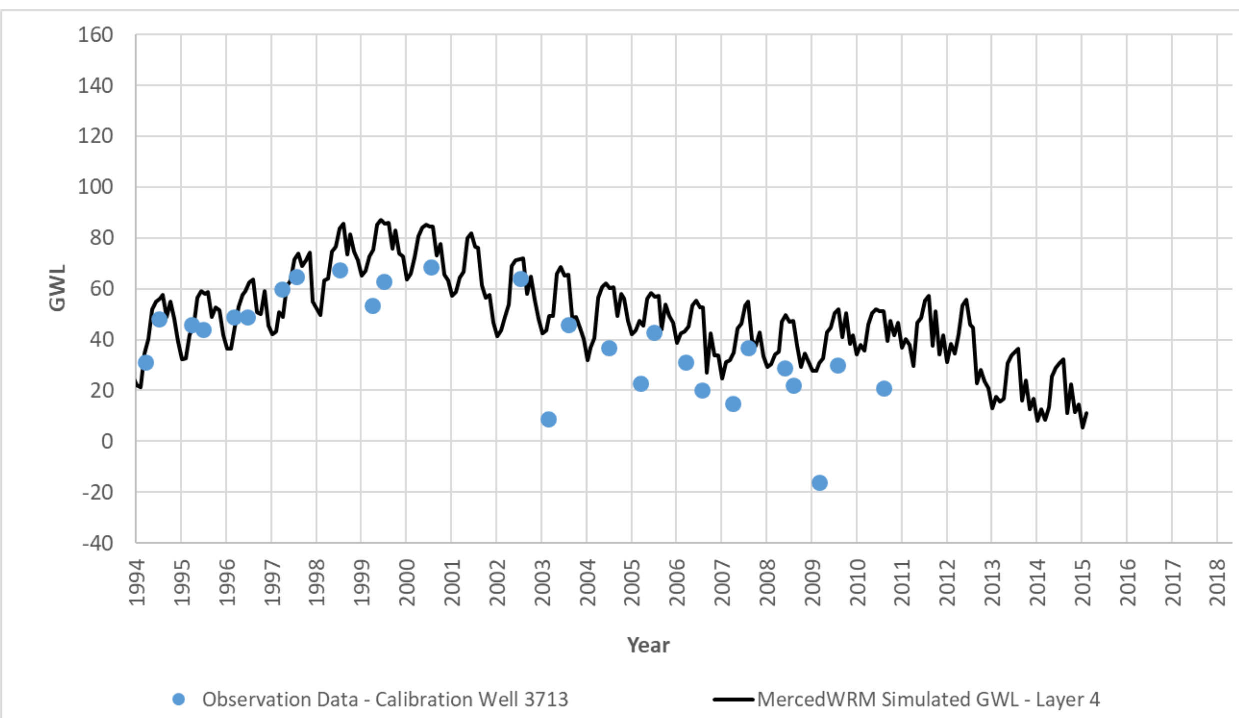


Figure A 172: Calibration Well 3713

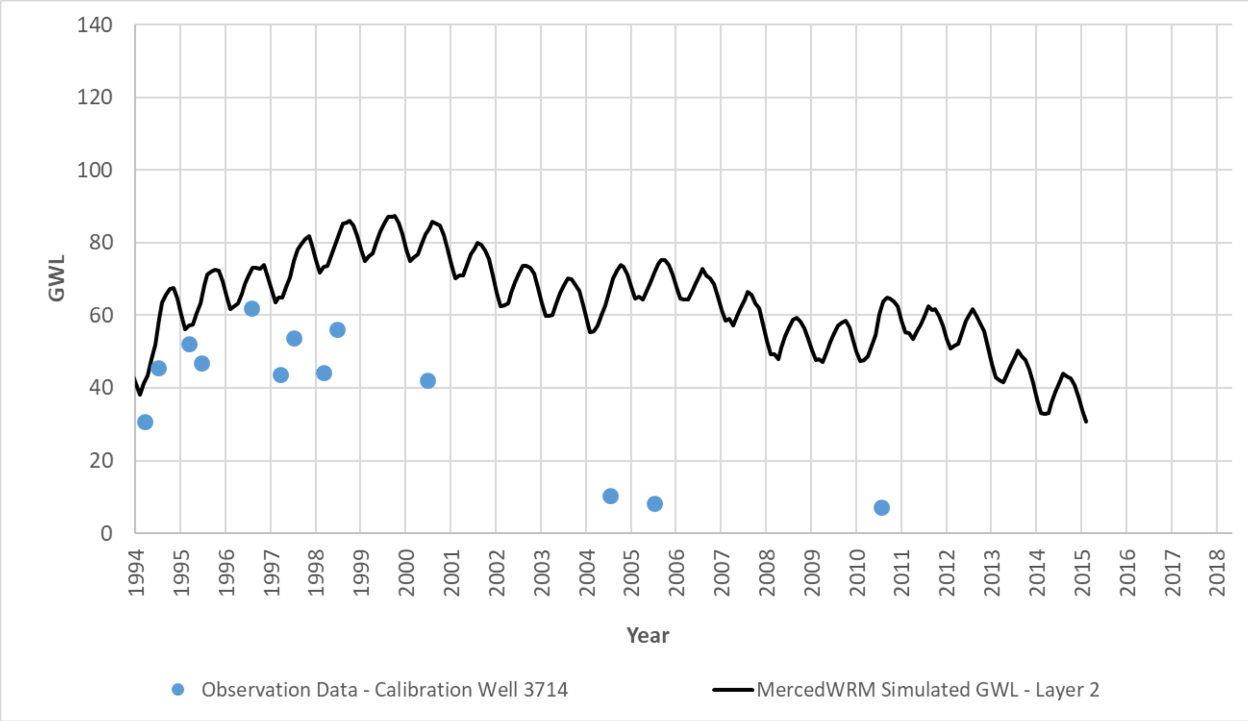


Figure A 173: Calibration Well 3714

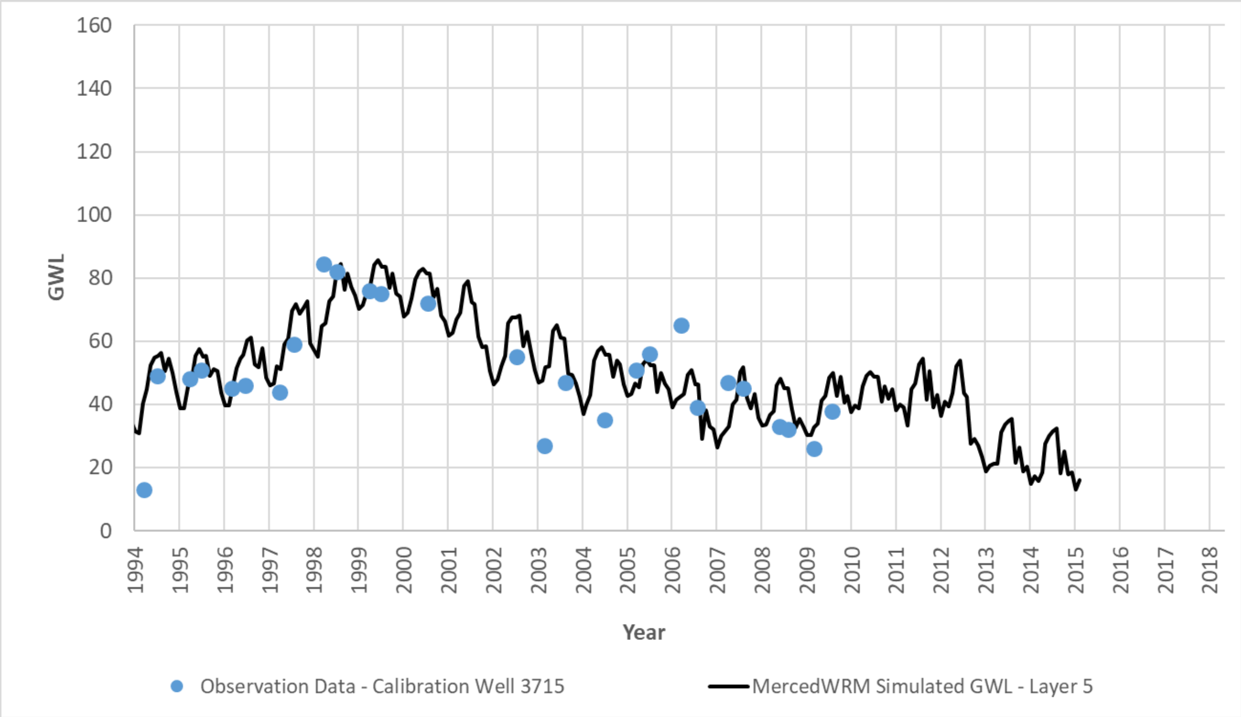


Figure A 174: Calibration Well 3715

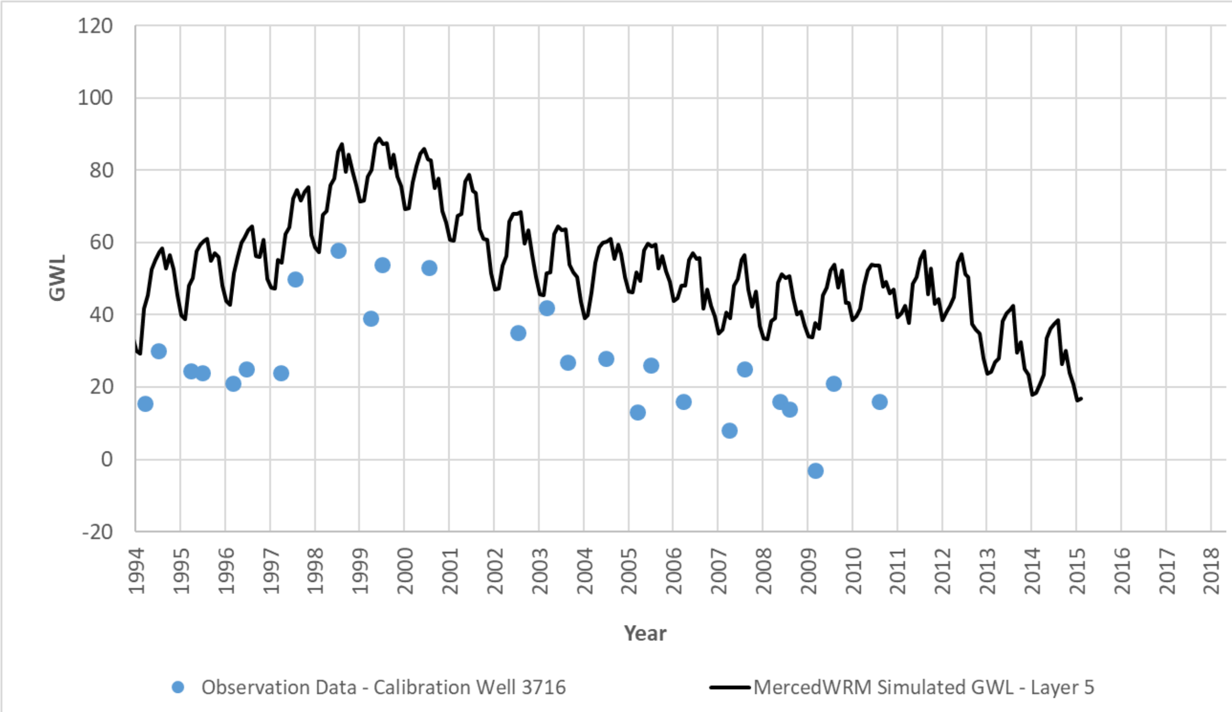


Figure A 175: Calibration Well 3716

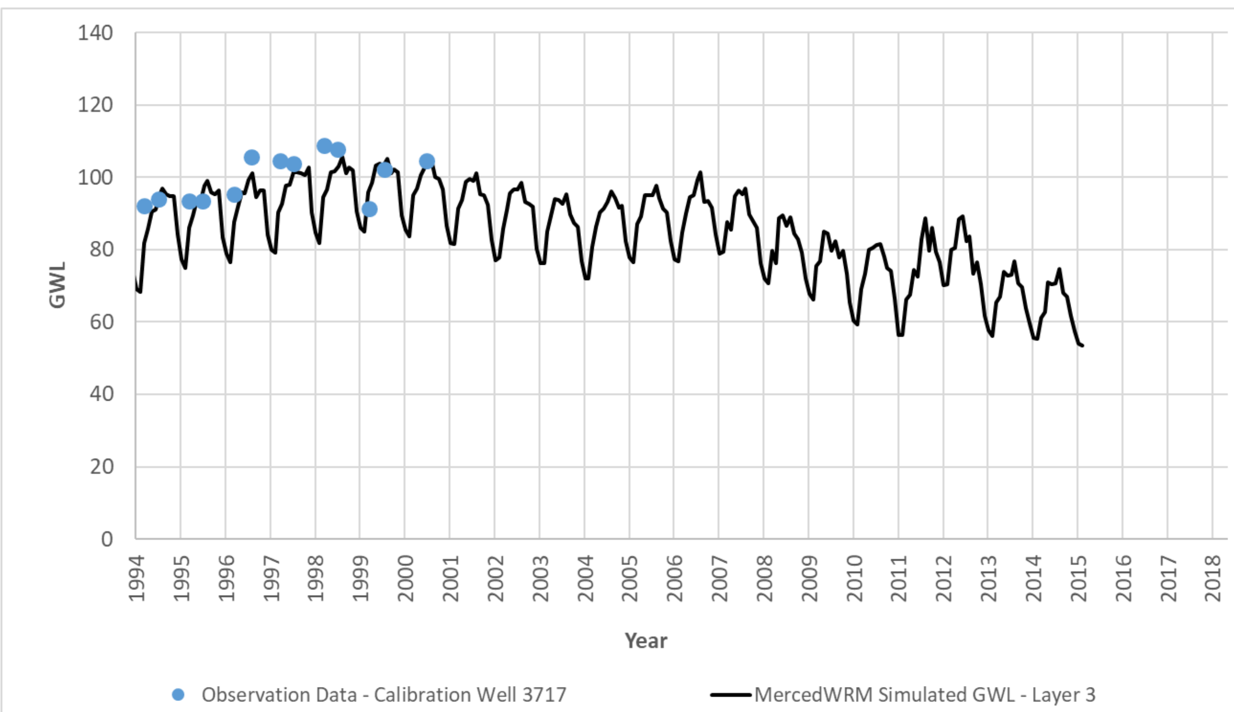


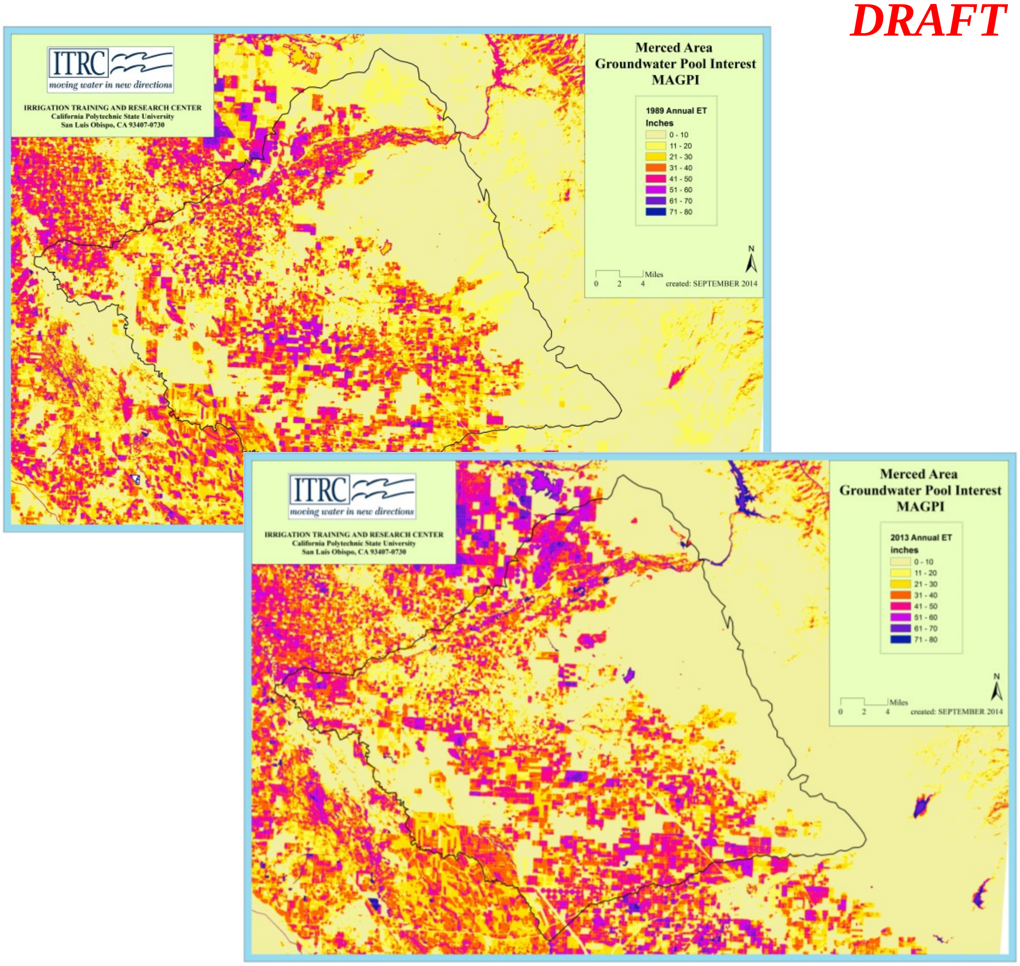
Figure A 176: Calibration Well 3717

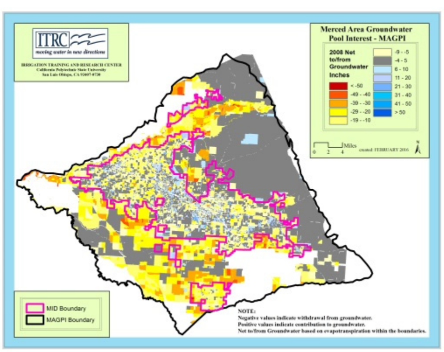
Appendix B - METRIC Project Report

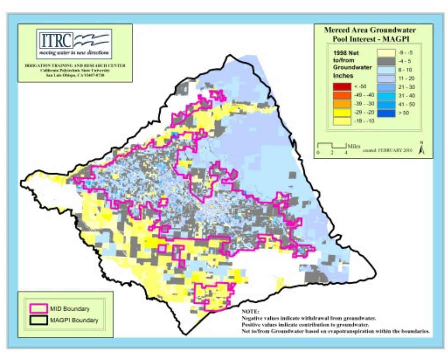
IRRIGATION
TRAINING AND
RESEARCH
CENTER

Remote Sensing of Actual Evapotranspiration and Net To and From Groundwater

DRAFT







DRAFT

Merced Area Groundwater Pool Interests (MAGPI)

Updated
February
2016

IRRIGATION TRAINING AND RESEARCH CENTER

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Irrigation Training and Research Center
Original September 2014
Updated February 2016

EXECUTIVE SUMMARY

This project was conducted by the Irrigation Training and Research Center (ITRC) of California Polytechnic State University, San Luis Obispo, in cooperation with RMC Water & Environmental for the Merced Area Groundwater Pool Interests (MAGPI). The primary objective of this project was to provided actual spatial evapotranspiration information for the MAGPI region to support the groundwater modeling efforts by RMC. ITRC provided monthly ET information for 9 sample years from 1989 through 2013. These years were selected based on different precipitation levels and to account for crop shifts since the late 1980's. The ITRC-METRIC procedure was used to compute the actual evapotranspiration at a 30 meter pixel resolution throughout the study area using LandSAT TM data (LandSATs 5, 7, and 8 were used in this evaluation).

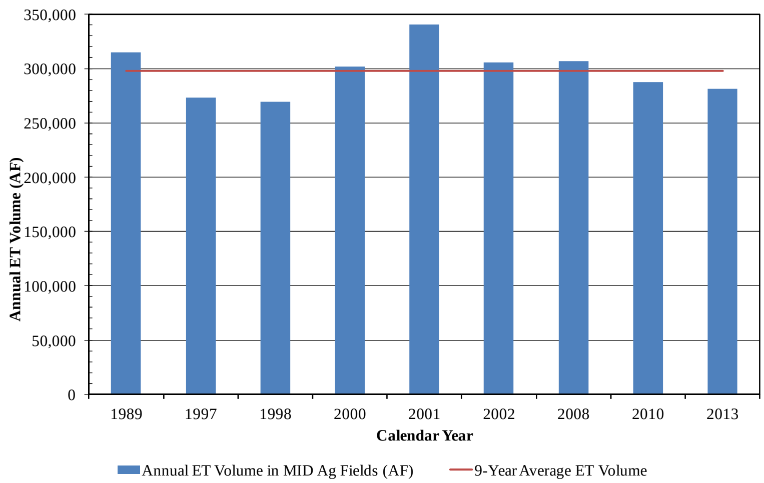


Figure ES-1. Annual volume of crop evapotranspiration within parcels in Merced ID boundaries.

A second objective was to evaluate net amount of water (precipitation and surface irrigation) that taken from or provided to the groundwater from fields throughout the study area. The Net To and From Groundwater (NTFGW) only accounted for water delivered to fields by MID and used in vegetative areas (not canal, drain, river, stream seepage) where surface water delivery information was known. This evaluation required inputs on surface water deliveries, precipitation, evapotranspiration, and estimated runoff (from irrigation and precipitation) spatially throughout the study area. Examples of the results are shown in the following figure for a average (10 inches), wet (19 inches), and a dry (4 inches) precipitation years.

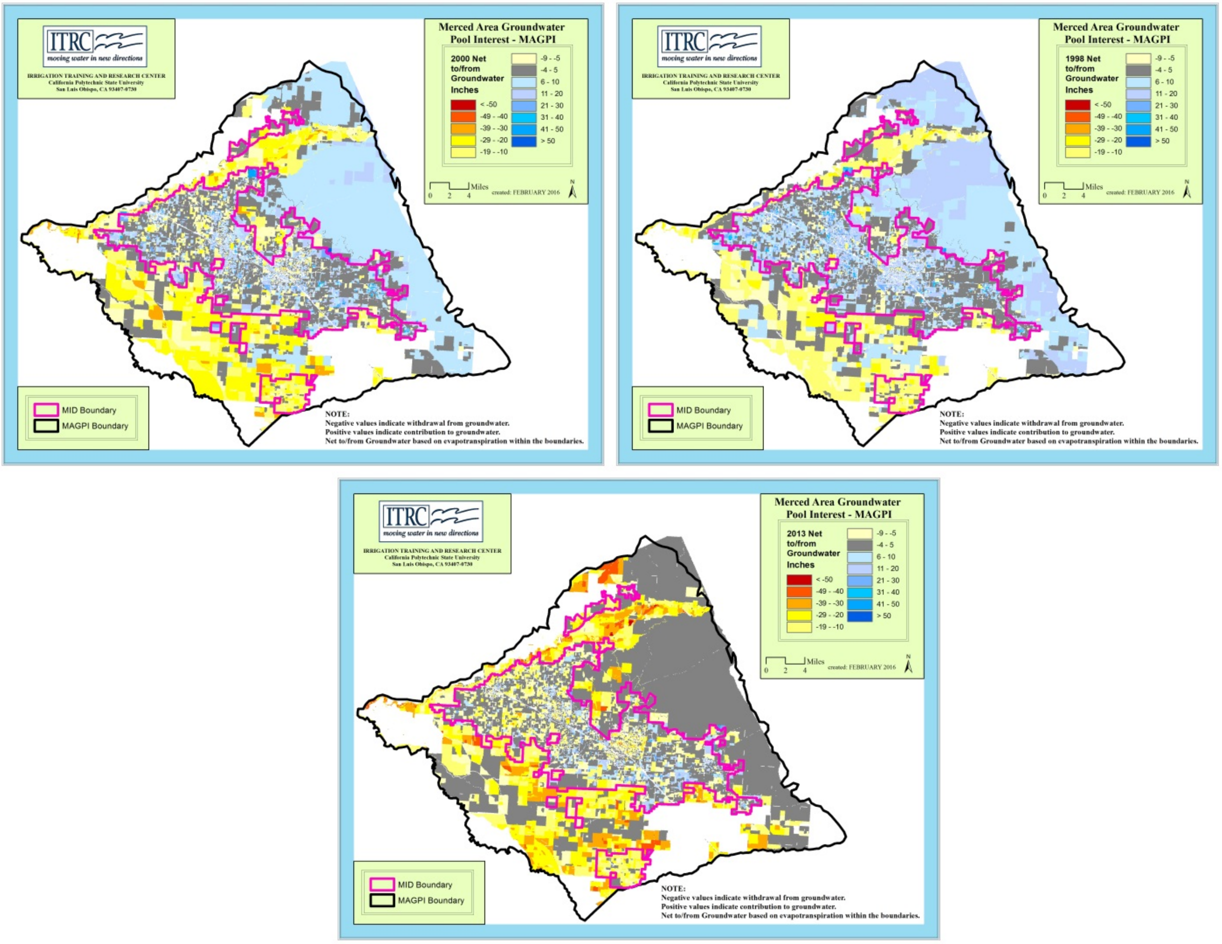


Figure ES-2. Annual net to and from groundwater for vegetative areas in MAGPI area during an AVERAGE (top left), WET (Top right), and DRY (bottom) precipitation year. Negative values (yellow to red) indicate a net from groundwater.

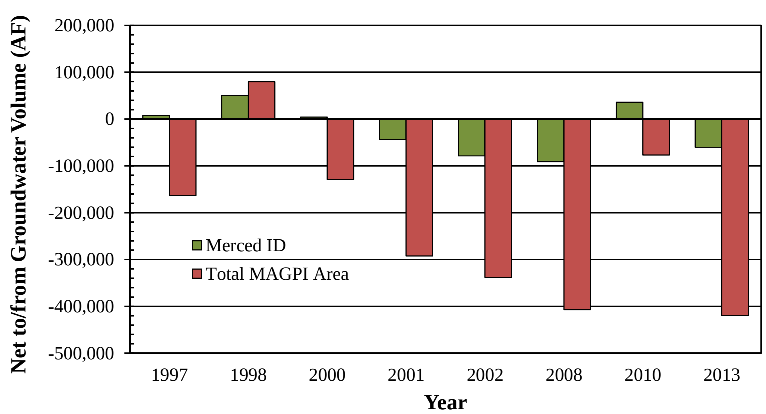


Figure ES-3. Net to/from Groundwater volumes in the Merced ID portion compared to the total MAGPI Area.

Figure ES-3 shows the estimated volume of net to and from groundwater for each year in the study. The volume of groundwater use or recharge is shown within MID boundaries and over the entire MAGPI boundary. It should be noted that surface water deliveries and diversions outside of MID control were requested but not provided as part of this analysis. Therefore the Total MAGPI NTFGW volume is slightly overestimated.

Key Findings

1) Of the years processed, 2001 had the highest ETc in the cropped areas within Merced ID.
2) In normal and wet years, MID users have a net contribution TO the groundwater. This occurs even though most MID users use both surface and groundwater during all years.
3) In dryer years, MID users rely more heavily on groundwater.
4) Except during extremely wet years, the overall MAGPI area has a net FROM (overdraft) which is mitigated by surface water deliveries in MID.

ITRC provided monthly and annual ITRC-METRIC actual ETc images (GIS format) to RMC for the groundwater modeling effort. NTFGW GIS images are also available for RMC to use. The NTFGW should help in the calibrations since one would expect the net groundwater use from the groundwater model to match.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

INTRODUCTION

The Irrigation Training and Research Center (ITRC) at California Polytechnic State University, San Luis Obispo was subcontracted by RMC Water and Environmental to provide actual evapotranspiration (ETc) from vegetation throughout the Merced Area Groundwater Pool Interests (MAGPI) area for a select number of years. This ETc information will be used by RMC as part of a groundwater modeling study for the region that is being funded by MAGPI.

ITRC uses a modified Mapping of EvapoTranspiration with Internal Calibration (METRIC) procedure to compute actual evapotranspiration using LandSAT Thematic Mapper (LandSAT) data. Three LandSAT satellites were used for this study which covered a timeframe starting in 1985-2013 (several years or portions of years were missing in this timeframe). The MAGPI area is shown in Figure 1.

The second objective of this study was to evaluate the net amount of water that was contributed to or taken from the groundwater for crop use in the MAGPI area. ITRC felt that this information would help RMC calibrate the groundwater model for the years examined. This will be discussed in more detail in the body of this report.

ITRC-METRIC MODELING

Satellite Images

LandSAT 5, LandSAT 7, and LandSAT 8 images available from the United States Geological Survey (USGS) on sixteen-day intervals were used for the MAGPI METRIC process. **Table 1** below shows the time frame of available satellite images for each individual satellite.

Table 1. Time frame of available images for LandSAT 5, 7, and 8

LandSAT 5	LandSAT 7**	LandSAT 8
November 1982-October 2011	June 1999-May 2003	April 2013-Present

**After May 2003, LandSAT 7 began producing images with missing data because of a defective sensor

For all three satellites, the LandSAT image that encompassed the area of interest was located in Path 43 and in Row 34. The project area of interest can be seen in **Figure 1** with the July 30th 2013 LandSAT 8 "natural look" image in the background. **Figure 2** shows the infrared background for the same LandSAT 8 image date.

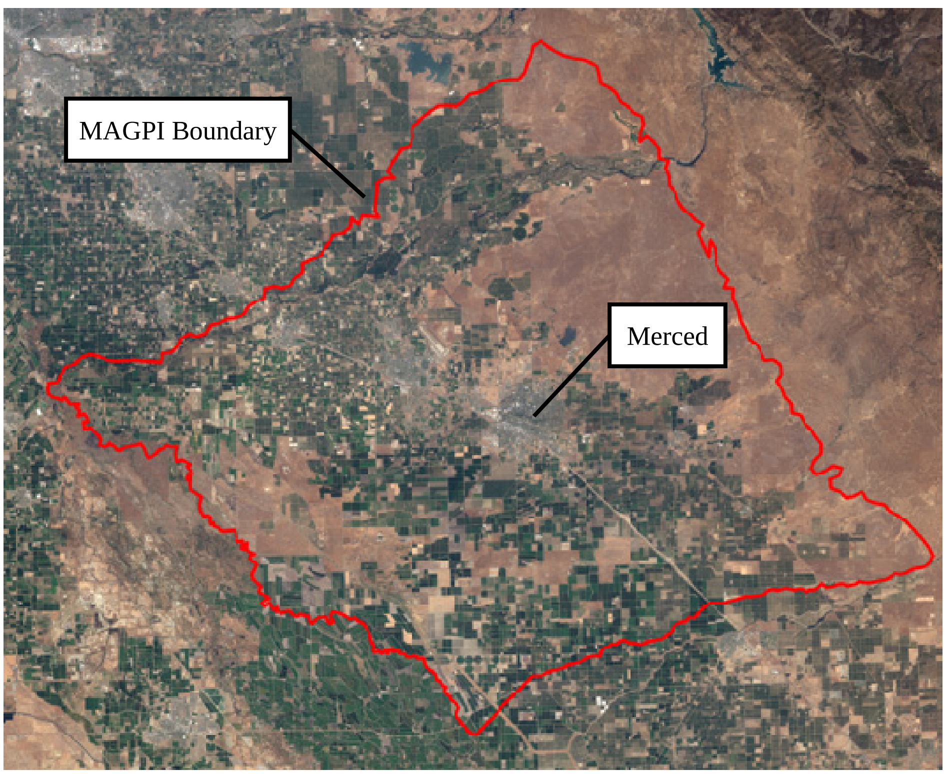


Figure 1. Area of interest with "natural color" image in the background

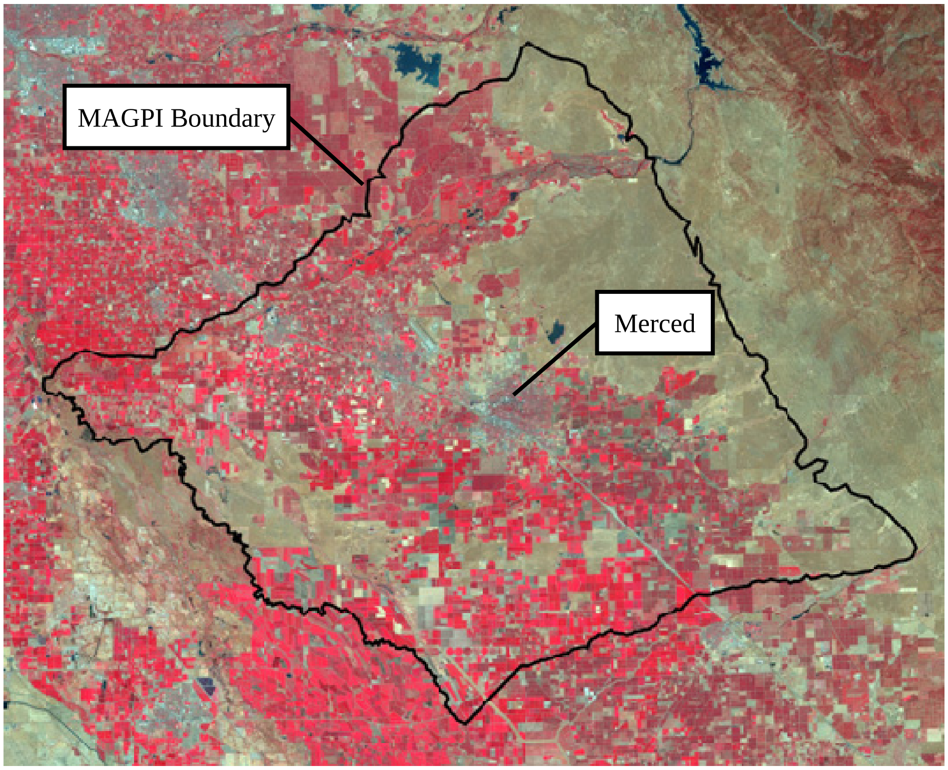


Figure 2. Area of interest with infrared image in the background

A total of nine years were analyzed for the METRIC modeling process. Years were selected so that they covered different precipitation year types (dry, average, or wet water year) and accounted for changes in crop types since the late 1980's. The following years were analyzed for this project:

1. 1989 (Dry water year)
2. 1997 (Average water year)
3. 1998 (Wet water year)
4. 2000 (Average water year)
5. 2001 (Average water year)
6. 2002 (Average/Dry water year)
7. 2008 (Average/Dry water year)
8. 2010 (Wet water year)
9. 2013 (Dry Water Year)

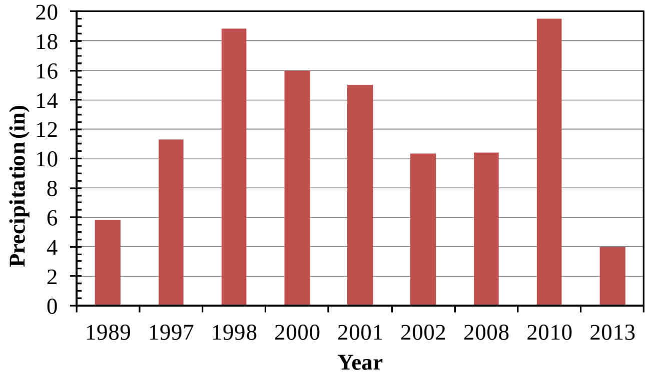


Figure 3. Approximate precipitation amounts in the MAGPI area for the years examined.

In order to obtain reliable results from the METRIC modeling process, daily images need to be free of cloud coverage in the area of interest. **Figure 4** shows the difference between a usable and unusable image for METRIC modeling.

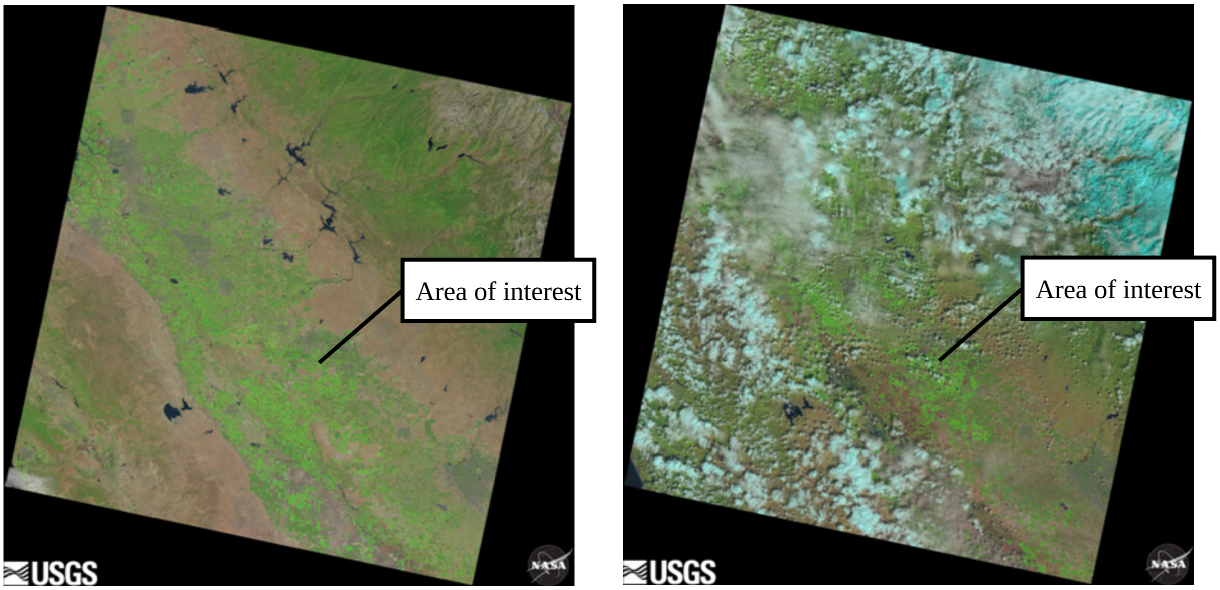


Figure 4. Usable LandSAT image (left image) and an unusable LandSAT image (right image)

All available cloud-free images were used for the modeling process as seen in **Table 2**. A total of 124 images were processed using METRIC.

Table 2. Chosen image dates for MAGPI METRIC Process

Year	1989	1997	1998	2000	2001	2002	2008	2010	2013**
Type	Dry	Average	Wet	Average	Average	Average	Dry	Wet	Dry
Image Dates	1/17 3/22 4/7 5/25 6/10 7/28 8/13 8/29 9/30 10/16 11/1 12/3	1/7 2/24 3/12 3/28 4/13 5/15 5/31 6/16 7/2 7/18 8/3 9/4 9/20 10/22 11/23	2/11 3/15 4/16 5/18 6/19 7/5 7/21 8/6 8/22 9/7 10/9 11/26 12/28	2/1 3/20 4/29* 5/31* 6/16* 6/24 7/2* 7/26 8/11 8/19* 9/20* 9/28 10/14 10/22* 11/17*	1/18 2/3 3/23 4/24 5/10 5/26 6/11 6/19* 7/13 7/29 8/14 8/30 9/15 10/1 11/26* 12/20	3/2* 4/3* 4/19* 5/5* 5/13 6/14 6/30 7/8* 7/24* 8/9* 8/25* 9/10* 9/26* 10/14 10/28*	2/7 3/26 4/11 4/27 5/13 5/29 6/14 6/30 7/16 8/1 8/17 9/2 9/18 10/20	2/12 4/1 5/35 5/19 6/20 7/6 7/22 8/7 8/23 9/24 10/10 11/11	4/25 5/11 6/12 6/28 7/14 7/30 8/15 8/31 9/16 10/18 12/25 12/21
Total	12	15	13	15	16	15	14	12	12

Notes: * indicates LandSAT 7 and ** indicates LandSAT 8

Weather Data

Daily and hourly weather data for the project time frame were collected from the California Irrigation Management Information System (CIMIS) weather stations located near the project area of interest as seen in **Figure 5**.

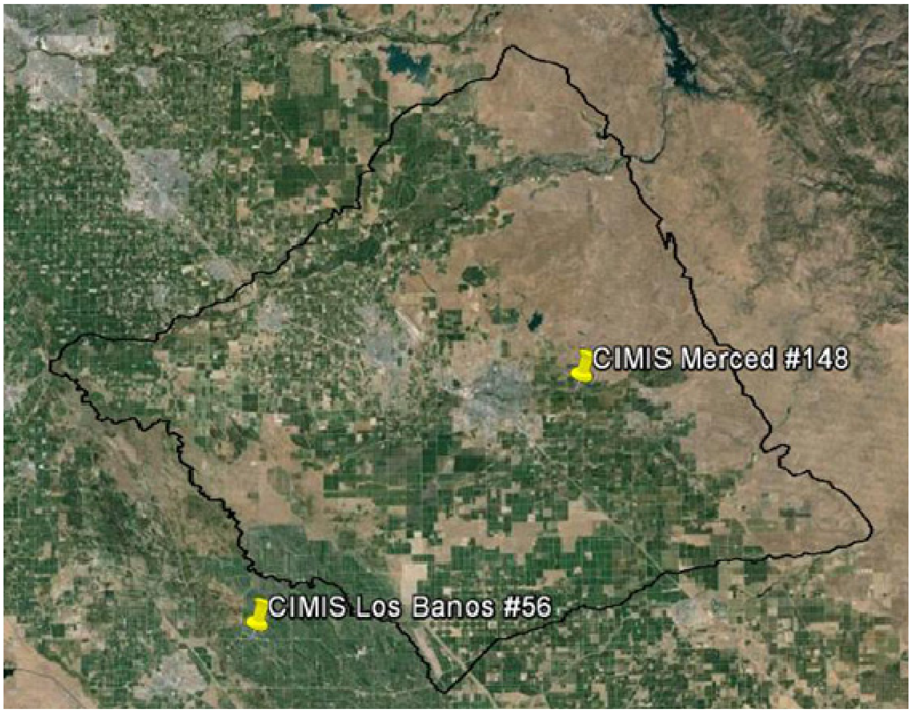


Figure 5. Location of agricultural weather stations considered for historical weather data

Two weather stations were considered for the METRIC modeling process:
1. Merced (Source: CIMIS – Station ID: #148 – Available 1/4/1999 to present)
2. Los Banos (Source: CIMIS – Station ID: #56 – Available 6/28/1988)

The Merced weather station data was used for the modeling years 2000 through 2013 because of its location in respect to the majority of the agricultural area within the MAGPI boundary. The Los Banos weather station data was used for the modeling years prior to the year 2000. The weather component data collected from both weather stations are:
1. Solar radiation (W/m^2)
2. Air temperature (ºC)
3. Wind speed (m/s)
4. Precipitation (mm)
5. Relative humidity (%)
6. Dew point temperature (ºC)

The collected weather data went through a quality control check based FAO procedures. A detailed procedure on the quality control conducted can be found in FAO Irrigation and Drainage paper No. 56 (Allen et al., 1998) along with correction procedures. The main correction needed to compute the hourly *ETo* is to the solar radiation. **Figure 6** contains a graph of the corrected solar radiation over the project time frame.

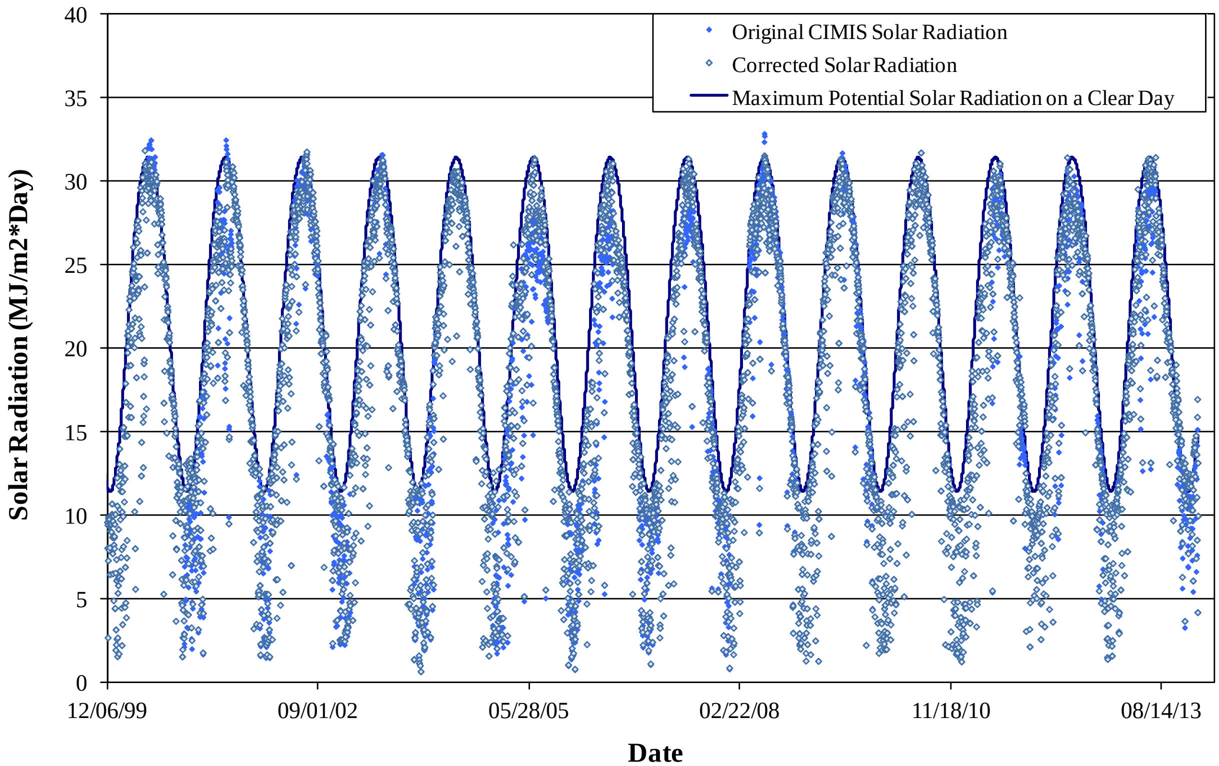


Figure 6. Adjusted solar radiation using FAO 56

Once the solar radiation and any other errors were corrected using the FAO procedures, the *ETo* was computed using the ASCE 2005 Standardized Penman Monteith *ETo* equation. **Figure 7** below shows a monthly comparison of the computed *ETo* for various years of the Merced weather data.

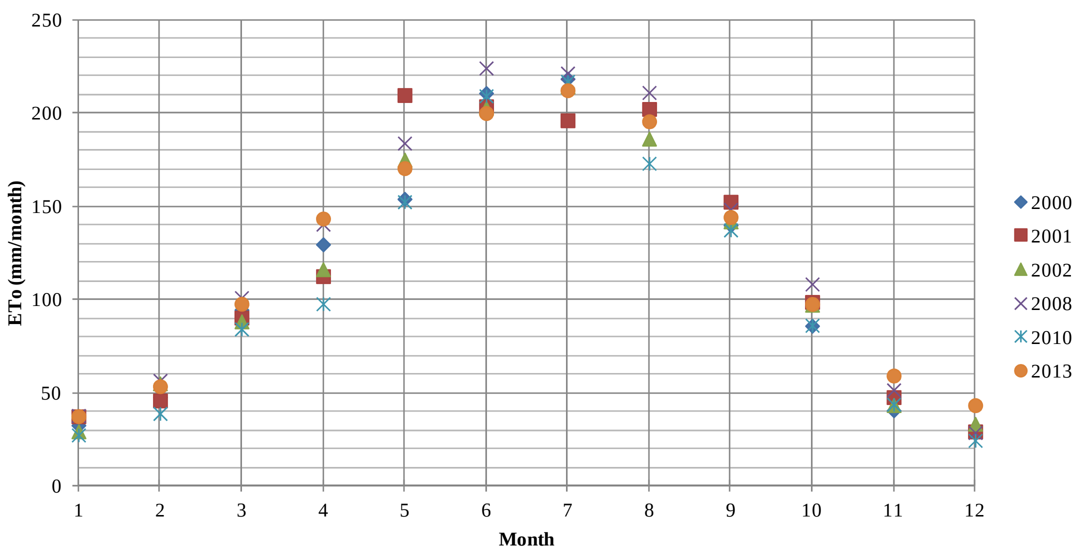


Figure 7. Comparison of monthly ETo computed from the ASCE 2005 Standardized Penman Monteith *ETo* equation using Merced historical weather data

ETo and individual weather data are used within the METRIC process to compute inputs into the software. METRIC computes the instantaneous *ETc* for every pixel within the LandSAT image at the instant the image is taken. Knowing the *ETo* at that instant from the local weather station, a **crop coefficient (*Kc*)** can be computed (*Kc = ETc/ETo*). It has been shown that this instantaneous *Kc* at the time of image acquisition (approximately 11 a.m.) is a very good representation of the *Kc* for that entire day.

Elevation Data

A Digital Elevation Model (DEM) provided by the USGS was used to adjust the model outputs based on the surface elevation through the area of interest. The DEM used had a resolution of 10m (1/3 arc second) which was then re-projected into a 30m x 30m pixel size to match the resolution of the LandSAT images.

Landuse Map

Landuse surveys conducted by the California Department of Water Resources (DWR) on a field by field basis for Merced County in 1995 and 2002 were used as the main source for landuse map in the METRIC modeling process. Additional landuse surveys provided by the DWR for the surrounding counties and annual landuse data provided by the National Agricultural Statistics Service (NASS – an extension of the U.S. Department of Agriculture – USDA) were used to compute the landuse characteristics in the outside areas of Merced County.

All of the landuse maps when through a quality control check to ensure that a single landue value was uniform across an entire field. **Figure 8** shows an example of the Landuse map used for processing the modeling year 2002.

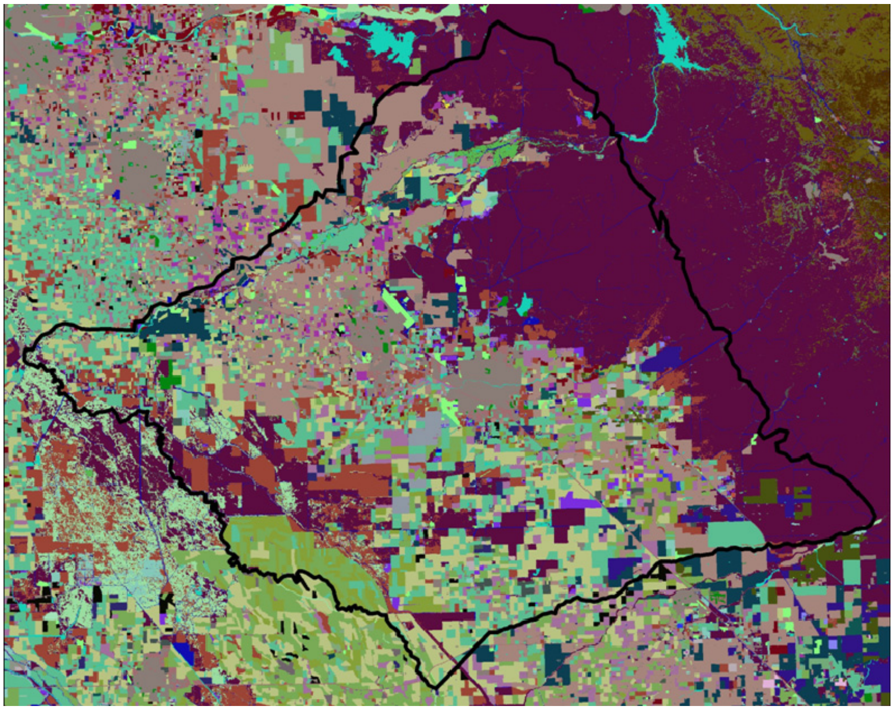


Figure 8. Example of landuse characteristic map used of the METRIC modeling process. Each color identifies a different landuse type (i.e. almonds, alfalfa, developed, etc.)

METRIC Kc Results

Figure 9, **Figure 10**, and **Figure 11** consist of *Kc* results from three different image dates and their ranges of *Kc* values. The lighter the pixel color, such as yellow, the lower the *Kc* value. Conversely, the darker the pixel color, such as blue, the higher the *Kc* value.

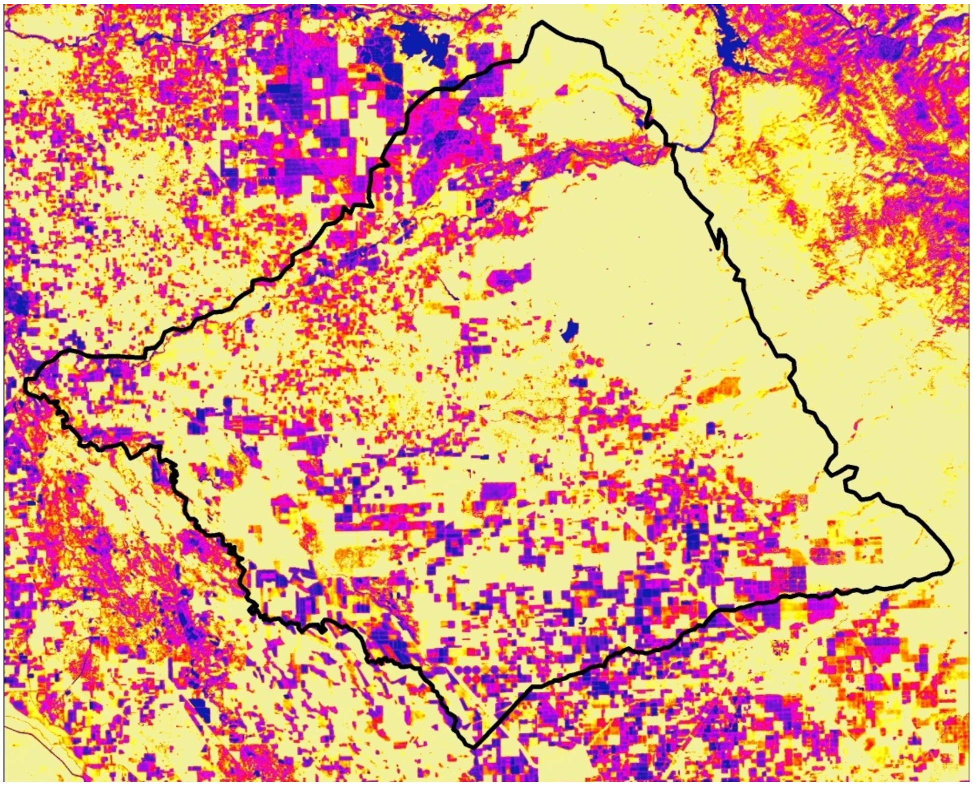


Figure 9. METRIC *Kc* Results for April 25th, 2013

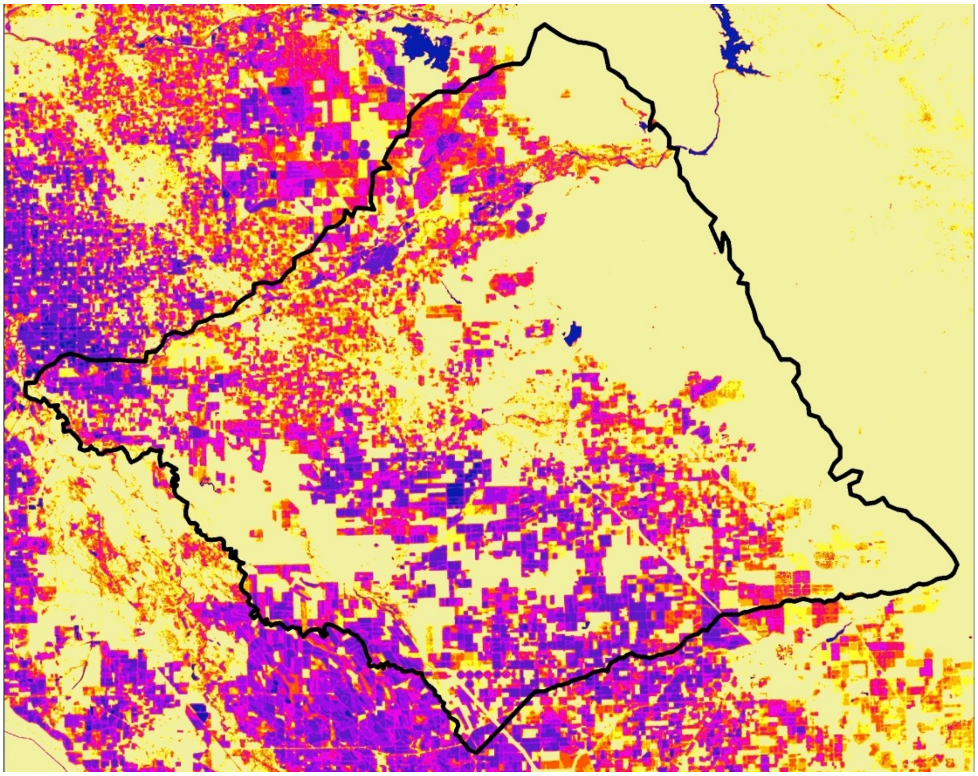


Figure 10. METRIC *Kc* Results for July 30nd, 2013

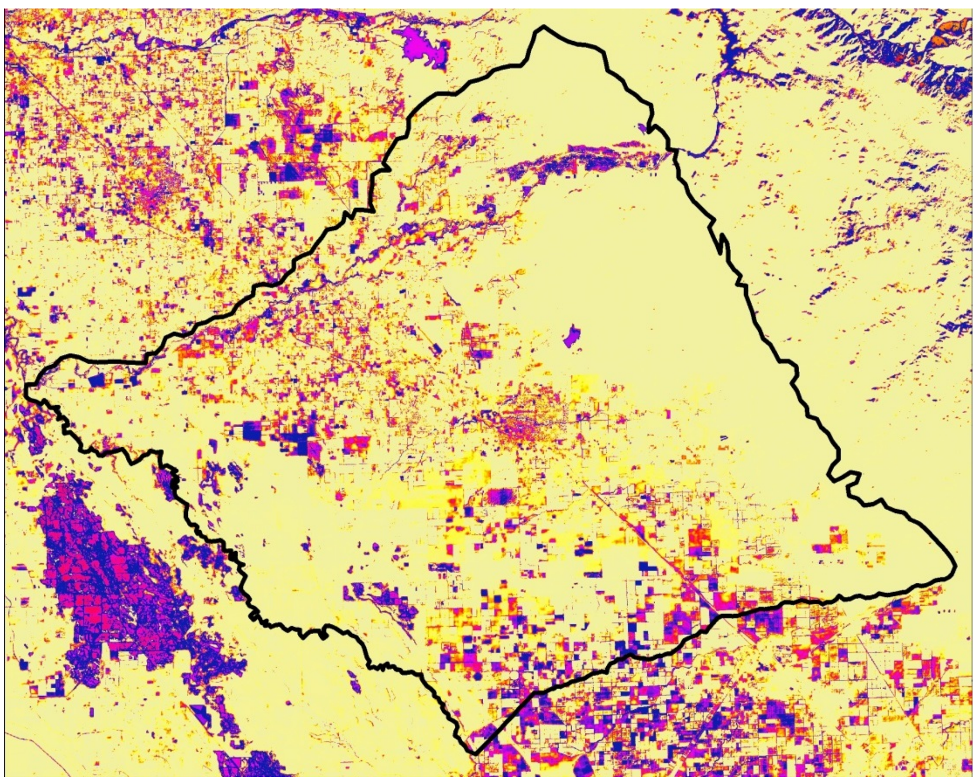


Figure 11. METRIC *Kc* Results for December 21st, 2013

Figure 12 compares the *Kc* values found in individual corn, almond, alfalfa, and peach fields for July 24th, 2002.

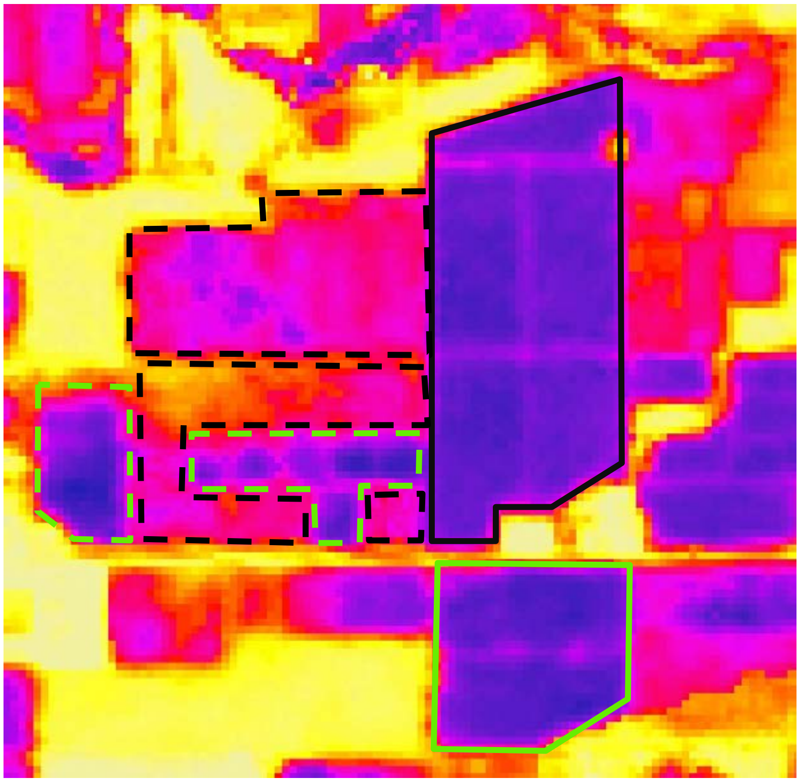


Figure 12. *Kc* color indexing for corn field (solid black border), almond field (dashed black border), alfalfa field (solid green border), and peach field (dashed green boarder) on July 24th, 2002

The *Kc* value ranges for the selected fields in **Figure 12** can be seen in **Table 3** below.

Table 3. Individual Field Kc Values for July 24th, 2002 image (refer to Figure 12)

Individual Field *Kc* Values for July 24th 2002 Image		
Crop	**Border Type/Color**	***Kc* Range**
Corn	Solid Black Line	1.05 – 1.15
Almonds	Dashed Black Line	0.75 – 0.95
Alfalfa	Solid Green Line	1.05 – 1.20
Peaches	Dashed Green Line	1.00 – 1.20

NET TO AND FROM GROUNDWATER MODELING

The other main objective of the ITRC for the MAGPI project besides determining ET for the area of interest was to make monthly estimates of the net amount of water to and from the groundwater for each project year. **Figure 13** shows a simple schematic of the individual components for estimating the *Net To and From Groundwater* (*NTFGW*).

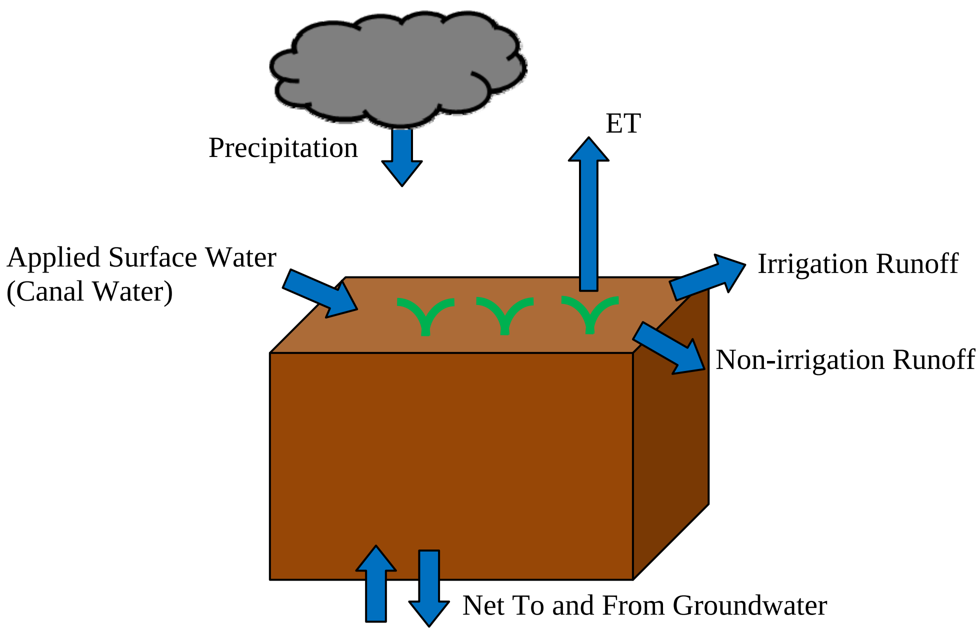


Figure 13. Schematic showing the components for computing the net to and from groundwater

The main components of NTFGW shown in **Figure 13** include:

1. Applied surface water (canal water)
2. Precipitation
3. Evapotranspiration (ET)
4. Irrigation Runoff
5. Non-Irrigation Runoff (precipitation runoff)

The *NTFGW* can be computed using to following equation:

$$NTFGW = Applied\ Water + Precipitation - ET - Irrigation\ Runoff - Non\_Irrigation\ Runoff$$

On a monthly time step, this equation must include the soil moisture depletion (SMD) at the beginning of the month. In order to determine SMD, the soil type and general crop type are needed to determine the soils available water holding capacity in the crops root zone. The initial SMD is estimated based on prior months' (November and December) precipitation amounts. The evaluation of monthly NTFGW requires several checks on Equation 1:

- If Eq. 1NTFGW is positive and is greater than the SMD, the end of the month SMD is assumed to be filled and any additional NTFGW must deep percolate below the root zone (Net to Groundwater).
- If Eq. 1 NTFGW is positive and is less than the SMD, the SMD at the end of the month is equal to the SMD at the beginning plus the Eq 1. NTFGW (no Net to Groundwater).

- If Eq. 1 NTFGW is negative and is less than the water remaining in the soil root zone at the end of the month, SMD at the end of the month is decreased by NTFGW (no Net from Groundwater).
- If Eq. 1 NTFGW is negative and is greater than the water remaining in the soil root zone at the end of the month, the SMD at the end of the month is decreased to the allowable depletion and the remaining NTFGW must be pumped from the groundwater (Net from Groundwater).

The sub-sections below discuss how each parameter of *NTFGW* was computed.

Merced County Parcels

A GIS file containing individual parcel locations in Merced County were obtained from the Merced County website. Output parameters such as ET, applied water, irrigation runoff, etc. were determined on a monthly basis for each individual parcel. **Figure 14** shows all the parcels located in eastern Merced County and within the MAGPI project boundary. **Figure 15** shows an example of an aerial image with individual parcels located just west of Merced.

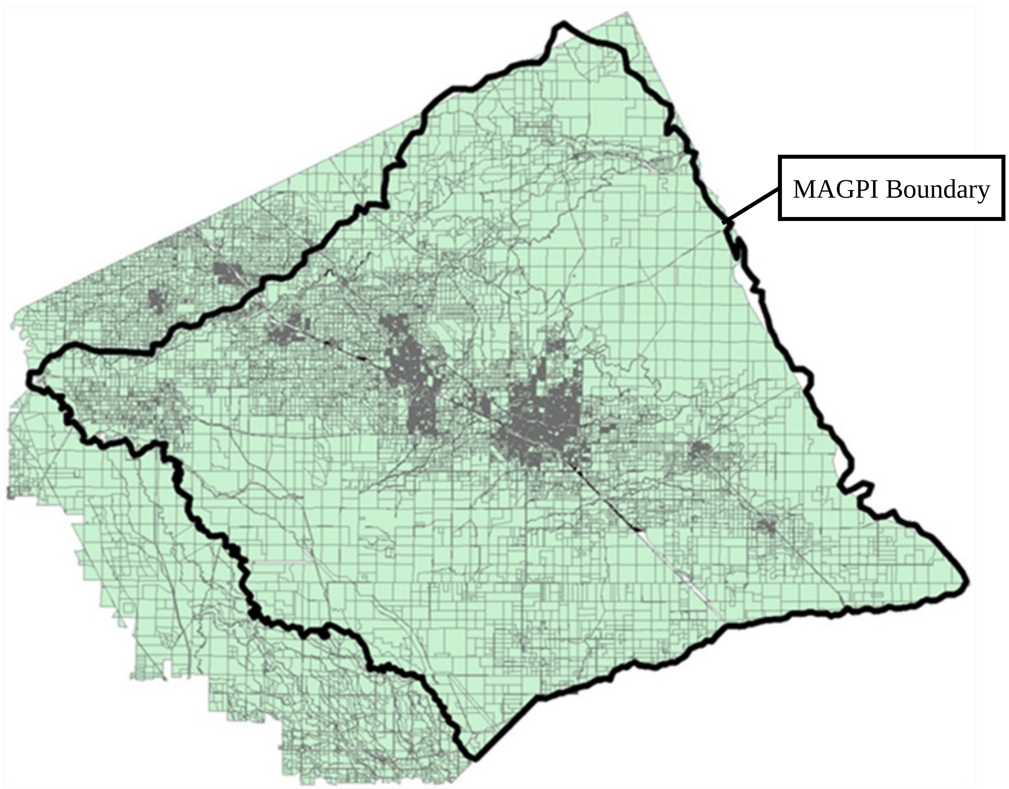


Figure 14. Individual parcels located in eastern Merced County and within the MAGPI project boundary

Figure 15. Aerial image shows individual parcels (outlined with black borders) west of Merced

Applied Surface Water

Surface water delivery events obtained from Merced Irrigation District (MID) from 1992 through 2013 were used to determine the applied water (in acre-feet) for individual water user accounts. The account number for individual surface water users in MID were compared to the known associated parcel numbers. The location of the associated parcel number was compared to the Merced County parcel GIS file to determine the approximate location of the applied water.

With the known approximate acreage of each parcel, the volume of applied water by parcel was converted to applied inches of water on a monthly basis. For simplicity, the applied inches of water were created to be uniform across the entire parcel. Some water accounts had multiple parcels for which the applied water was evenly distributed across all of the parcels under the single account number. A small amount of account numbers did not have an associated parcel number. In this case, the applied water for that account was ignored.

The applied surface water by parcel was averaged over one mile by one mile grid from the Merced County township and sections provided by the Public Land Survey System (PLSS). The reason for averaging the applied water over the quarter mile sub-section was to eliminate field outliers in such cases where small (only a few acres) irrigated fields applying an unrealistic amount of water in a single month. The field outliers were a result of missing parcel numbers for individual accounts that clearly have multiple parcels associated with that account.

An example of the applied water by parcel can be seen in the left image of **Figure 16**. The applied surface water averaged over the one mile grid sections for the same area can be seen in the right image of **Figure 16**. **Figure 17** shows the applied water (one mile resolution) for July 2002 for the entire MAGPI boundary area.

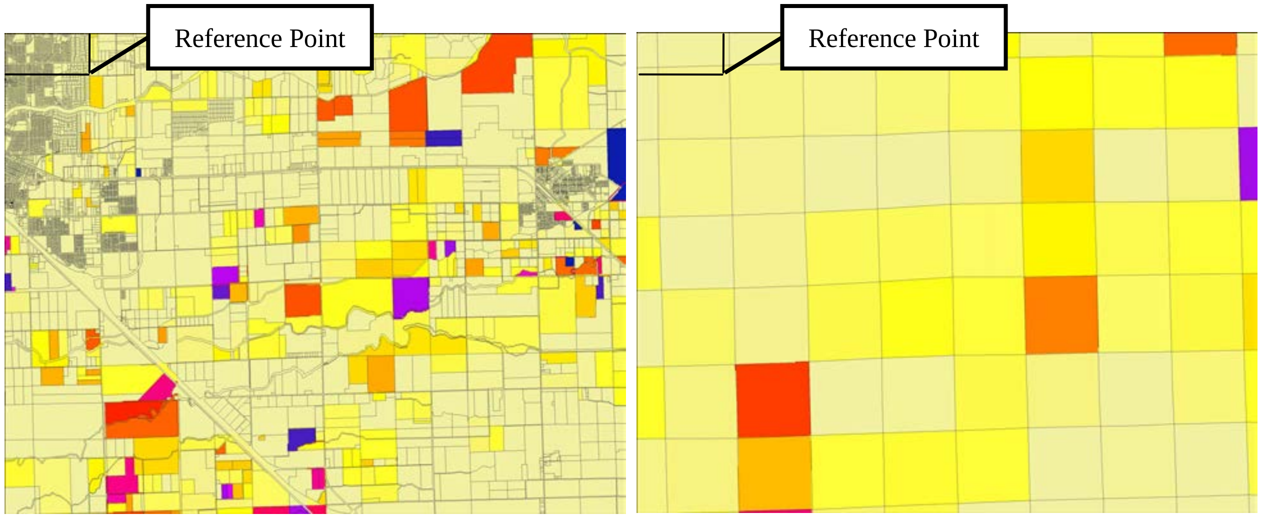


Figure 16. Example of applied water by parcel (left image) compared to applied water over one mile sections (right image) for July 2002. The darker the color the higher the applied surface water.

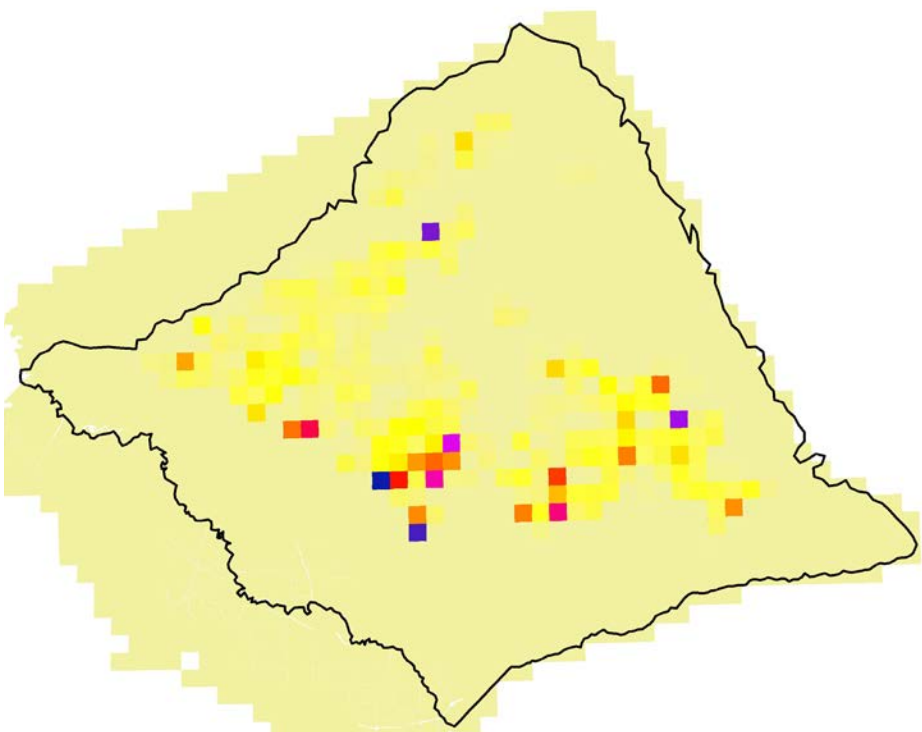


Figure 17. Example of applied surface water on a one mile resolution during July 2002 for the entire MAGPI boundary area

Precipitation

Spatially distributed precipitation maps were downloaded from the PRISM Climate Group of Oregon State University. The raster files displayed monthly precipitation data in millimeters for the entire United States on a 4 km by 4 km resolution.

A sub-set of the original monthly precipitation raster was extracted to be just larger that the project area of interest. The precipitation values of the sub-set precipitation raster were converted from millimeters to inches of precipitation. **Figure 18** shows an example of precipitation raster from PRISM for December 2002. The darker colors indicate a higher monthly total of precipitation.

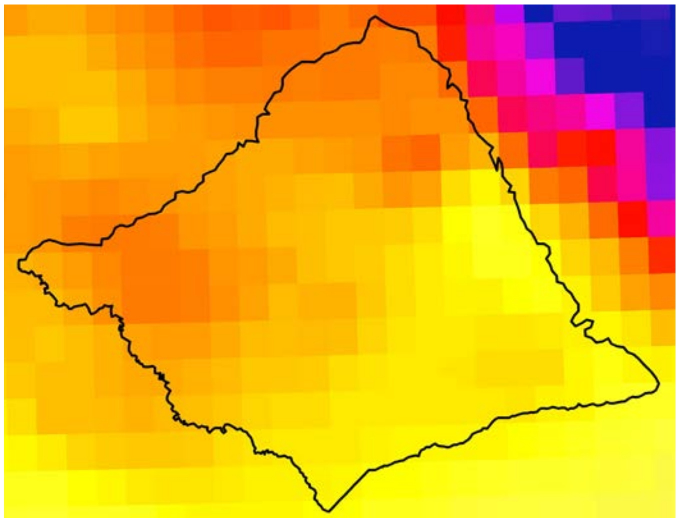


Figure 18. Example of monthly precipitation raster available from PRISM Climate Group for December 2002. The darker colors indicate higher monthly total of precipitation.

ET by Parcel

The average monthly ET per parcel rasters were created from the original 30m by 30 m resolution ET rasters calculated from METRIC. The average monthly ET (in inches) was applied to be uniform across the entire parcel. **Figure 19** shows an example of the average monthly ET by parcel for July 2002 where the dark the colors (blue) indicate a higher the ET value.

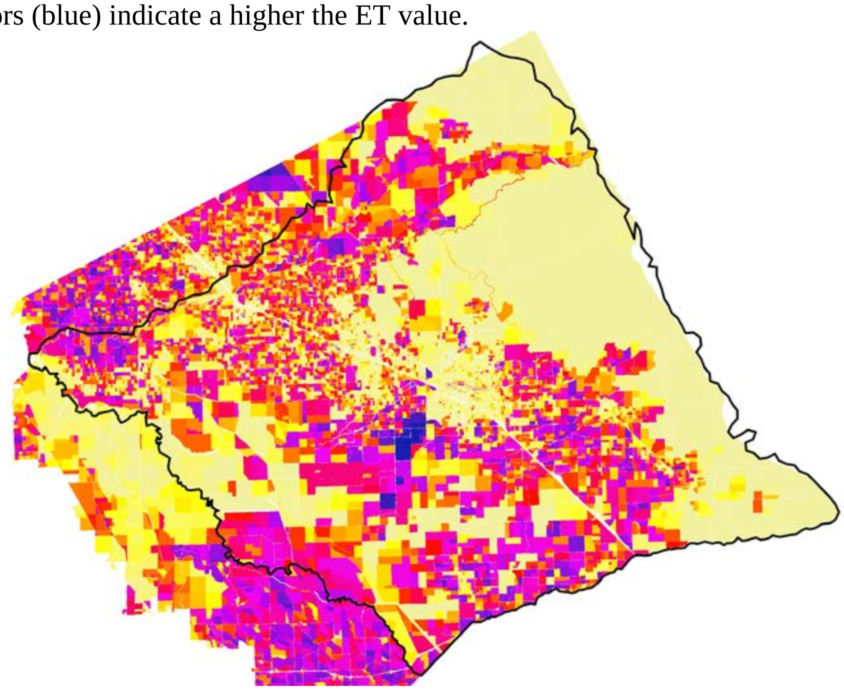


Figure 19. Example of average monthly ET by individual parcel for July 2002. The darker color (blue) indicates a higher ET amount.

Irrigation Runoff

The following process was used to estimate the amount of monthly irrigation runoff from agricultural fields inside the MAGPI project boundary area.

Landuse Type for Determining Irrigation Runoff

Landuse type for each individual parcel was determined using the landuse map created from the DWR land use survey as well as the NASS. Certain crops and landuse types were associated with having no irrigation runoff (refer to **Table 4**). For any orchard or vineyards, it is assumed that drip/microspray irrigation system as used to apply water to the crop and therefore produces no irrigation runoff.

Table 4. Landuse types associated with no irrigation runoff

Landuse Types Associated with No Irrigation Runoff		
Orchards/Vineyards	**Urban**	**Other**
Cherries	Developed – Open Space	Forest
Peaches	Developed – Low Intensity	Shrubland
Apples	Developed – Medium Intensity	Barren
Grapes	Developed – High Intensity	Non-Agriculture
Other Tree Crops		Deciduous Forest
Citrus		Evergreen Forest
Pecans		Mixed Forest
Almonds		Grassland Herbaceous
Walnuts		Fallow/Idle Cropland
Pears		Woody Wetlands
Pistachios		Herbaceous Wetlands
Prunes		
Oranges		
Pomegranates		

Irrigation Method for Determining Irrigation Runoff

The irrigation method for each individual parcel was determined from the DWR land use survey conducted in 2002 for Merced County. The following irrigation methods were assumed to have no irrigation runoff:

- Surface drip irrigation
- Buried drip irrigation (sub-surface drip irrigation)
- Microsprayer irrigation
- Center pivot sprinkler irrigation
- Linear mover sprinkler irrigation
- Non-irrigated fields

Estimated Irrigation Runoff

The following procedure was used to estimate the monthly irrigation runoff for each individual parcel:

1. If a single parcel had either a land use type **or** irrigation method associated with having no irrigation runoff (see previous sections), then it was assumed that no irrigation runoff would occur.

2. If the land use characteristic **<u>or</u>** irrigation method for an individual parcel did not match those stated in the previous sections, then it was assumed that irrigation runoff would occur. For example, a parcel irrigating corn using furrows would be assumed to have some amount of irrigation runoff.
3. For individual parcels assumed to have irrigation runoff occur, the runoff was estimated to be approximately 5% of the average monthly ET computed from METRIC for that specific parcel. For example, if the average monthly ET for a single parcel was 10 inches, the estimated irrigation runoff would be approximately 0.5 inches.

The reasoning behind the 5% of average monthly ET is based on the following reasons:

1. There is not an extensive drainage system throughout the MAGPI boundary to collect tail water runoff.
2. Farmers tend not to have any tail water runoff in their irrigation practices.
3. Some fields throughout the MAGPI boundary utilize tail water recovery systems.

Figure 20 below shows an example of the estimate July 2013 irrigation runoff for each individual parcel. The tan color indicated approximately zero irrigation runoff while the dark colored areas (blue being the darkest) indicating a higher amount of irrigation runoff (up to approximately 0.6 inches for this example).

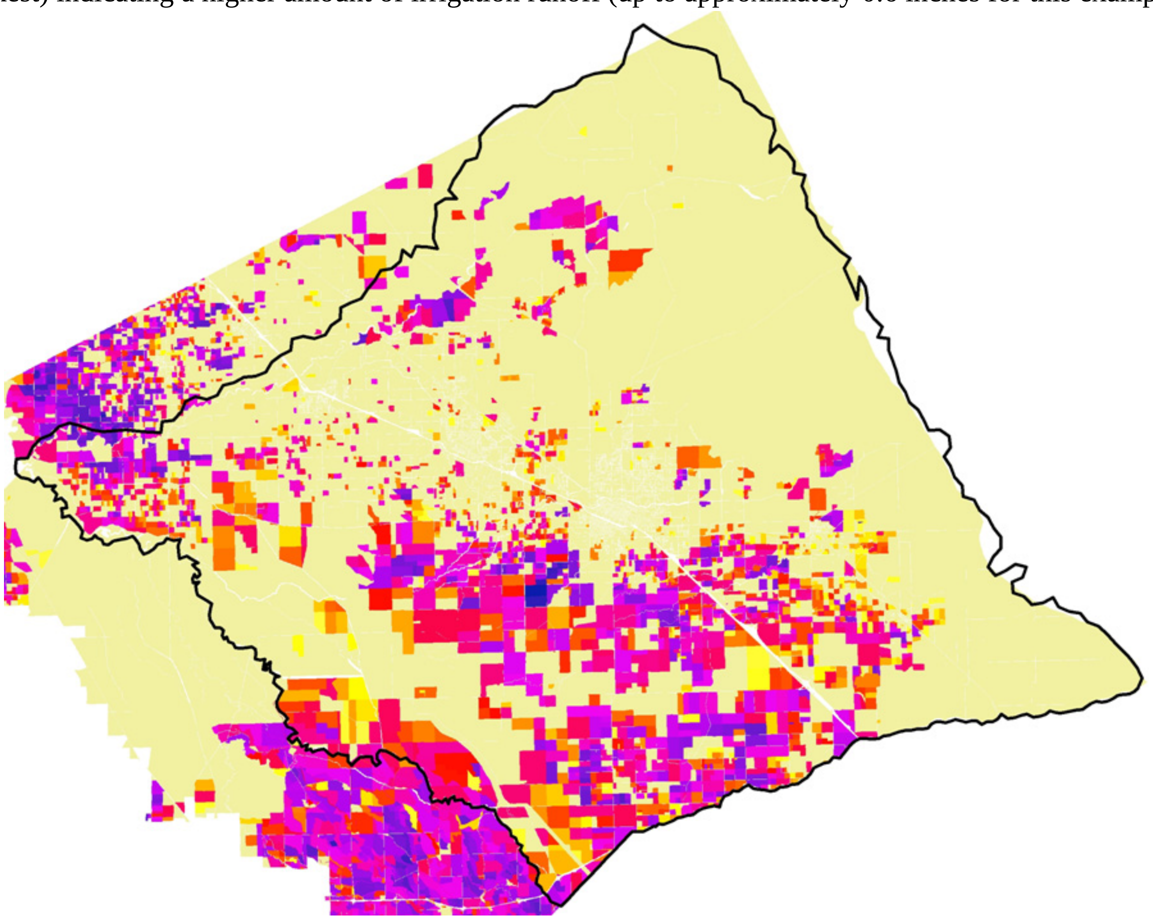


Figure 20. Example of estimate irrigation runoff for individual parcels in July 2013. The darker the color, the higher the irrigation runoff (up to approximately 0.6 inches of irrigation runoff for this example).

Non-Irrigation Runoff

The following procedure was used to estimate the non-irrigation runoff for individual parcels in the agricultural areas within the MAGPI boundary. Precipitation runoff in the urban areas was not considered for this study.

Soil Type Characterization for Individual Parcels

Soil characteristics for Merced County were obtained from the National Resources Conservation Service (NRCS) as seen in **Figure 21**.

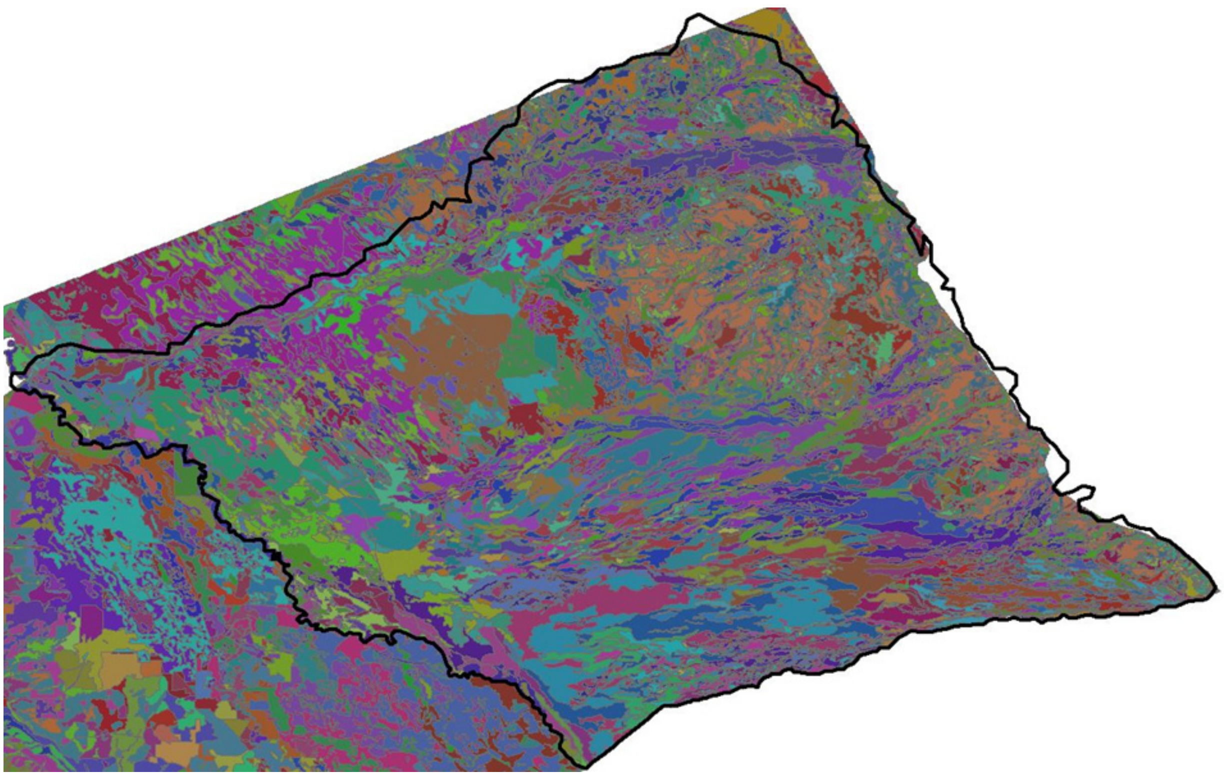


Figure 21. Example of Merced County soil types provided by the NRCS. Each color identifies a separate soil type.

The soil classification provide by the county were assigned a generic soil class types and soil group classification as following:

- Sand – Soil Group A
- Sandy Loam – Soil Group B
- Loam – Soil Group B
- Silt Loam – Soil Group C
- Clay Loam – Soil Group C
- Clay – Soil Group D

The soil types were reclassified for each individual parcel based on the majority of soil type located within each parcel. Each parcel was then assigned a uniform soil type. **Figure 22** shows the uniform soil types reclassified for each parcel to be used for the non-irrigation runoff estimates.

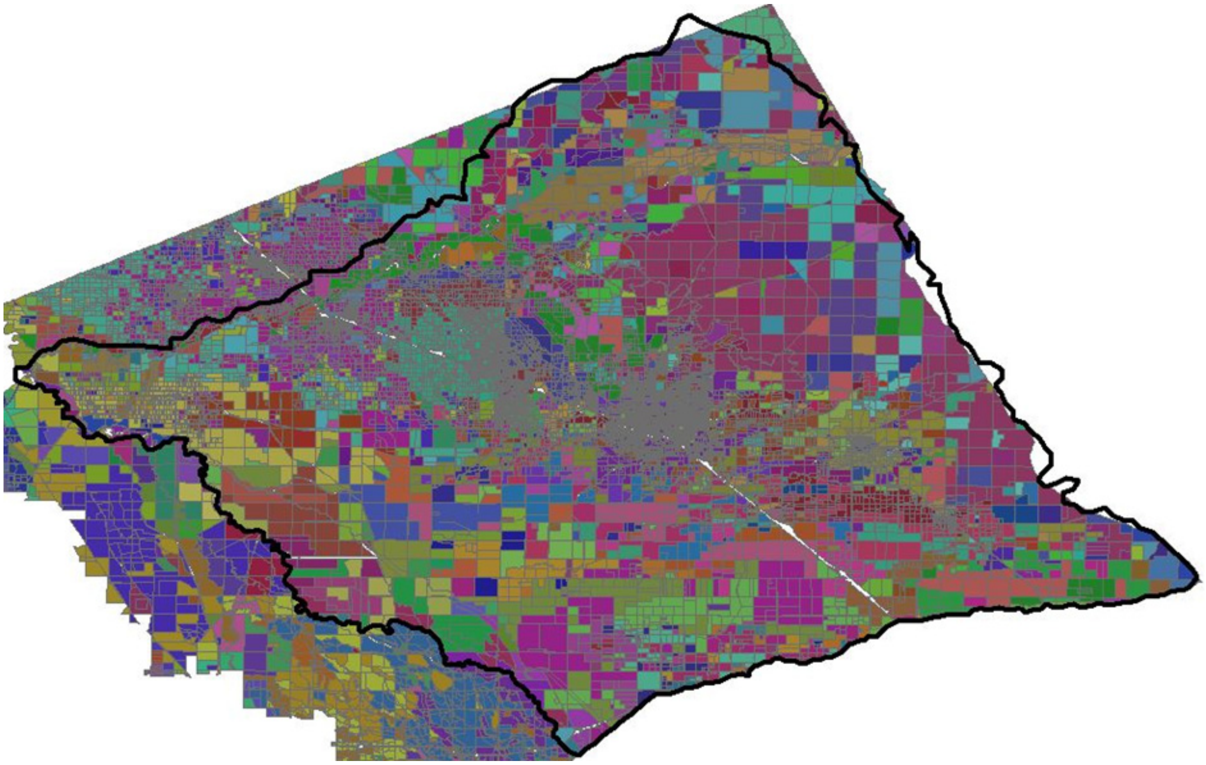


Figure 22. Reclassified soil type by parcel

NRCS (SCS) Rainfall Runoff Procedure for Non-Irrigation Runoff

The NRCS (SCS) rainfall runoff procedure was used to estimate the amount of monthly non-irrigation runoff from agricultural fields inside the MAGPI project boundary area due to precipitation.

Runoff due to precipitation can be estimated using the following equations:

$$P_e = \frac{(P - 0.2S)^2}{(P + 0.8S)}$$

$$S = \frac{1000}{CN} - 10$$

Where: P_e = direct runoff, inches
P = precipitation, inches
S = potential maximum retention
CN = runoff curve number

The precipitation input in the SCS runoff equation was based on daily precipitation totals from the two CIMIS weather stations. It was assumed that the precipitation totals were uniform across the entire project boundary. The curve number for each parcel was determined based on:

1. Assigned land use description (agricultural crop, fallow land, etc).
2. Hydrological soil group.

Table 5 shows the assigned SCS curve numbers used in the estimation of non-irrigation runoff of individual parcels. Runoff from urban areas was not considered in the estimates.

Table 5. Assigned SCS curve numbers for different land use and soil group descriptions

Assigned Curve Numbers for Different Land Use and Soil Group		
Land Use Description**	Soil Group	Curve Number
All agricultural crops – for cultivated agricultural land, row crops, straight rows, in good condition	A	67
	B	78
	C	85
	D	89
Fallow/idle cropland – for non-cultivated agricultural land, pasture or range, no mechanical treatment, in fair condition	A	49
	B	69
	C	79
	D	84
Grassland herbaceous – for non-cultivated agricultural land, forested, grass, in fair condition	A	44
	B	65
	C	76
	D	82
Shrubland – for non-cultivated land, forested, brush, in poor condition	A	48
	B	67
	C	77
	D	83

** Based on SCS Curve Number Descriptions

For small precipitation events, the SCS runoff equation would produce a runoff value greater than the amount of daily precipitation. The reason for this is because of the empirical characteristics for which the SCS runoff equation was produced. Therefore multiple quality control checks were performed on the calculated non-irrigation runoff estimates. The two quality control checks performed were as follows:

1. If the result of $\left[Precipitation - 0.2 \times \left(\frac{1000}{Curve\ No.} - 10\right)\right]$ is negative, then there is no runoff due to precipitation.
2. The amount of computed $Runoff\ must\ be \leq Precipitation.$

Only significant precipitation event with a total daily precipitation of approximately 0.4 inches or greater would produce any runoff amounts. The SCS runoff equation does take into account that a certain amount of precipitation must percolate into the soil before any runoff can occur. That is why only significant precipitation events produce runoff and account for the soil being fully saturated.

The daily runoff estimates were summarized into monthly runoff totals for each model year. **Figure 23** shows an example of the non-irrigation runoff computed for December 2002. The tan color indicated approximately zero non-irrigation runoff while the dark colored areas (blue being the darkest) indicating a higher amount of non-irrigation runoff (up to approximately 0.8 inches for this example).

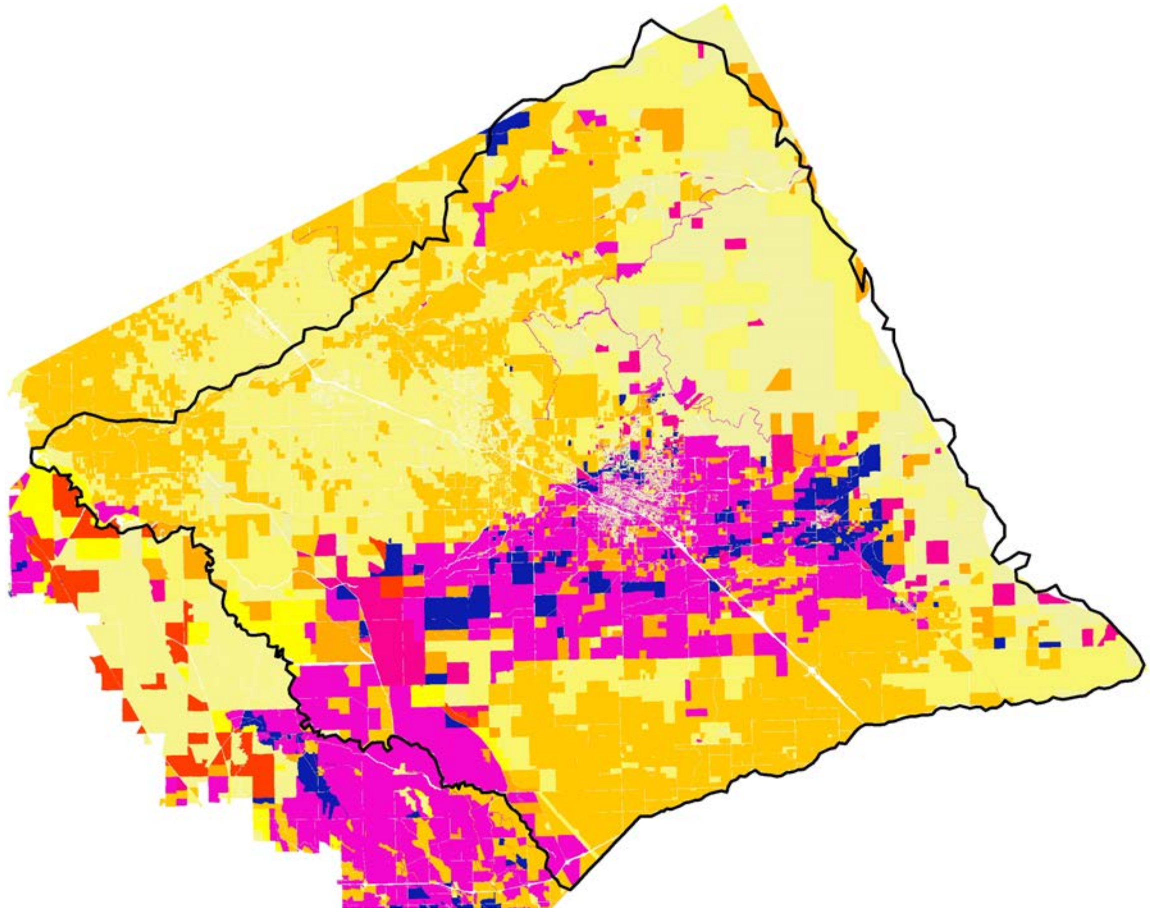


Figure 23. Example of estimate non-irrigation runoff for individual parcels in December 2002. The darker the color, the higher the non-irrigation runoff (up to approximately 0.8 inches of non-irrigation runoff for this example).

Soil Moisture Depletion

The soil's available water holding capacity (AWHC) in the crop root zone is needed to evaluate soil moisture depletion. The NRCS soils map for Merced County provides estimates of AWHC by soil type throughout the area of interest. The AWHC is provided as inches of water held at field capacity per inch of soil (inches/inch) for each soil horizon. A weighted average over the potential root zone was used to determine the root zone AWHC.

Root zones were assumed to be 5 feet for orchards, alfalfa, and vineyards, 3 feet for field crops, and 1.5 feet for natural vegetation. If an orchard or vineyard was irrigated using drip or microspray, the assumed wetted area was 60% of the total area, which reduces the AWHC by 40% for these irrigation methods. There was not a significant amount of buried row crop drip in the region during the analysis period.

The initial soil moisture depletions were estimated based on monthly rainfall in November and December prior to the year being analyzed. ET demand is low during these months and significant precipitation generally occurs in the area between November and February. If there was heavy rainfall during this period the SMD was assumed to be small. If there was little precipitation in the prior month the SMD was assumed to be large (approximately 50%-60% of the root zone AWHC). With average precipitation the SMD was assumed to be 20%-30% of the root zone AWHC.

The soil moisture depletion at the beginning of each month was applied to the procedure for estimating NTFGW as described.

Net To and From Groundwater Results

The resulting monthly *NTFGW* estimates (in inches) were created for each project years. **Figure 24** and **Figure 25** show examples of the computed *NTFGW* for February 2013 and July 2013 respectively.

From summer to fall, the applied water and ET are the driving factors for the *NTFGW* computations. Precipitation, irrigation runoff, and non-irrigation runoff have little to no impact during these months. On the contrary, during late fall through early spring months such as February 2013 (**Figure 24**), the precipitation and non-irrigation runoff become the driving factors. There is very little ET occurring during these months so depending on the monthly precipitation, there should be a slight to a significant contribution to the groundwater.

From the *NTFGW* result for July 2013, there is a apparent withdrawal from the ground water in the outside areas of the MAGPI boundary. No surface water is provided to those outside area and farmers are required to pump groundwater for irrigation. In the same image (**Figure 25**), there also appears to be a slight contribution to the groundwater from agricultural fields located within the MID boundary.

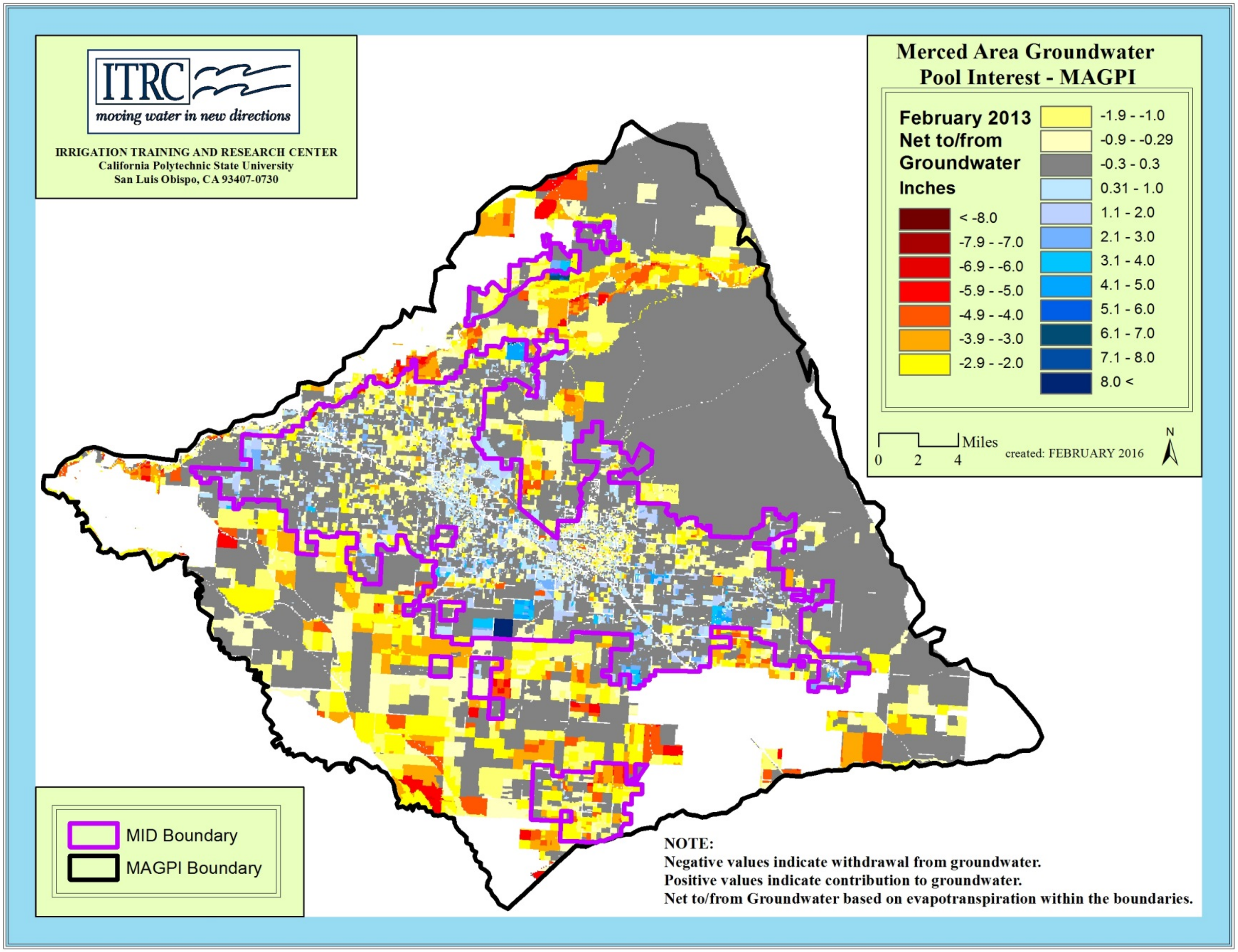


Figure 24. Estimated "Net To and From Groundwater" for February 2013

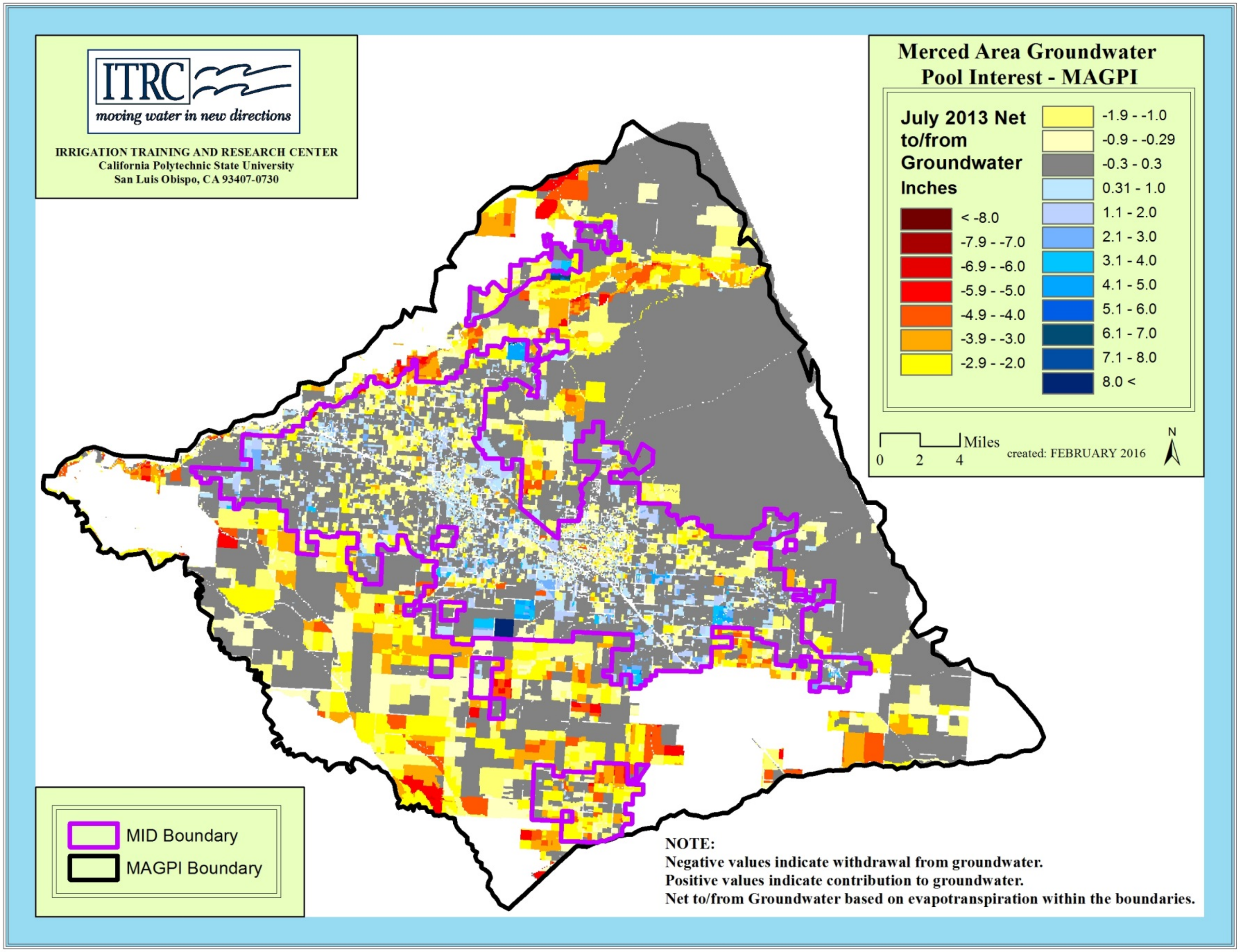


Figure 25. Estimated "Net To and From Groundwater" for July 2013

Missing Surface Water Data for Outside Areas

ITRC was not provided surface water deliveries data made by other irrigation and water districts such as Stevinson Water District or Turner Island Water District. Additionally, ITRC requested but did not receive water diversions from the Merced River north of Merced. Without knowing the amount of applied water in the other water purveyors, the *NTFGW* estimates would be inaccurate. For example, the *NTFGW* estimate would show a significant withdraw in groundwater in those areas when in reality there may only be a small amount of water withdrawn from the groundwater.

Therefore the boundary areas of other water purveyors (see **Figure 26**) were eliminated from the final *NTFGW* estimates.

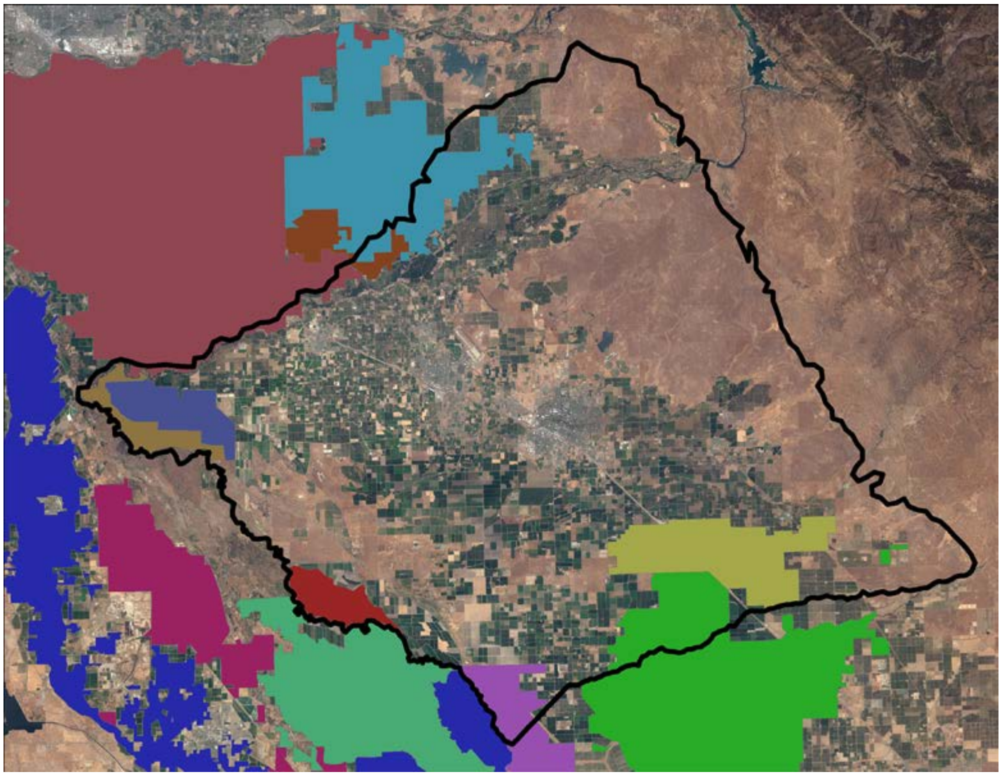
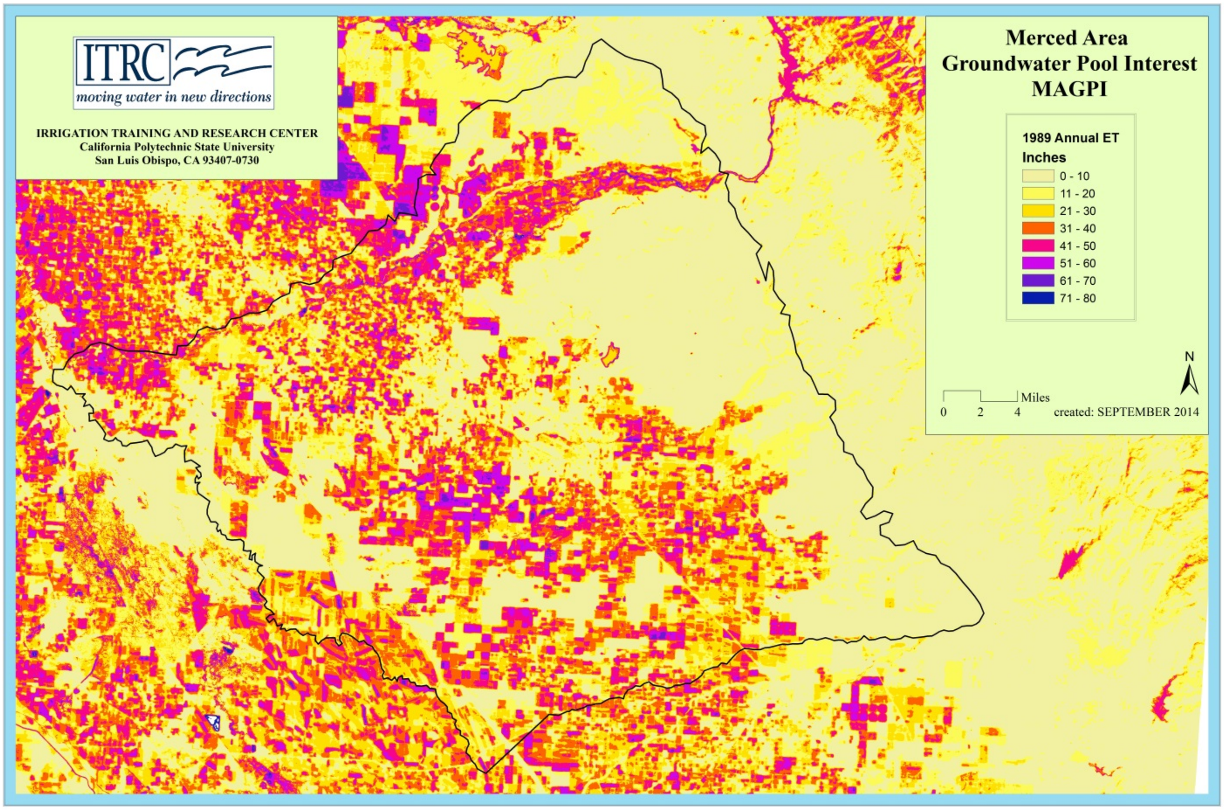
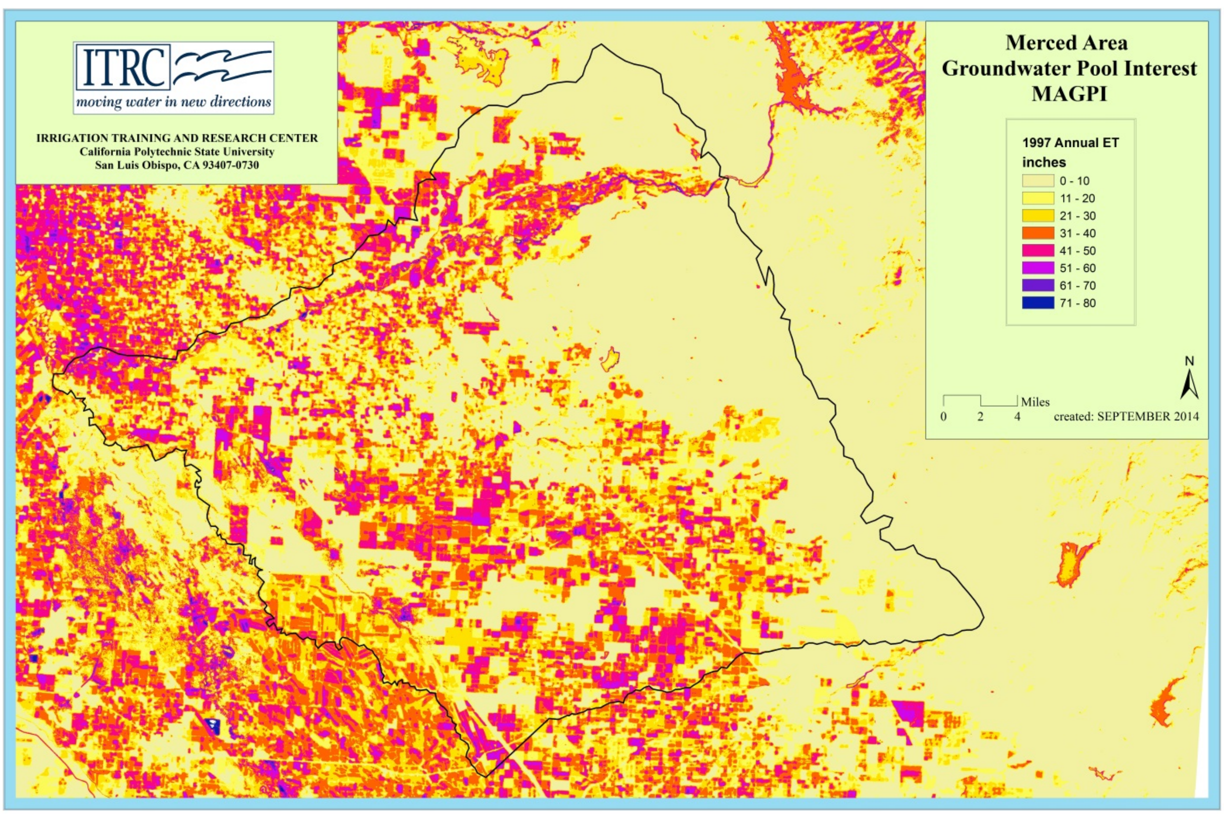
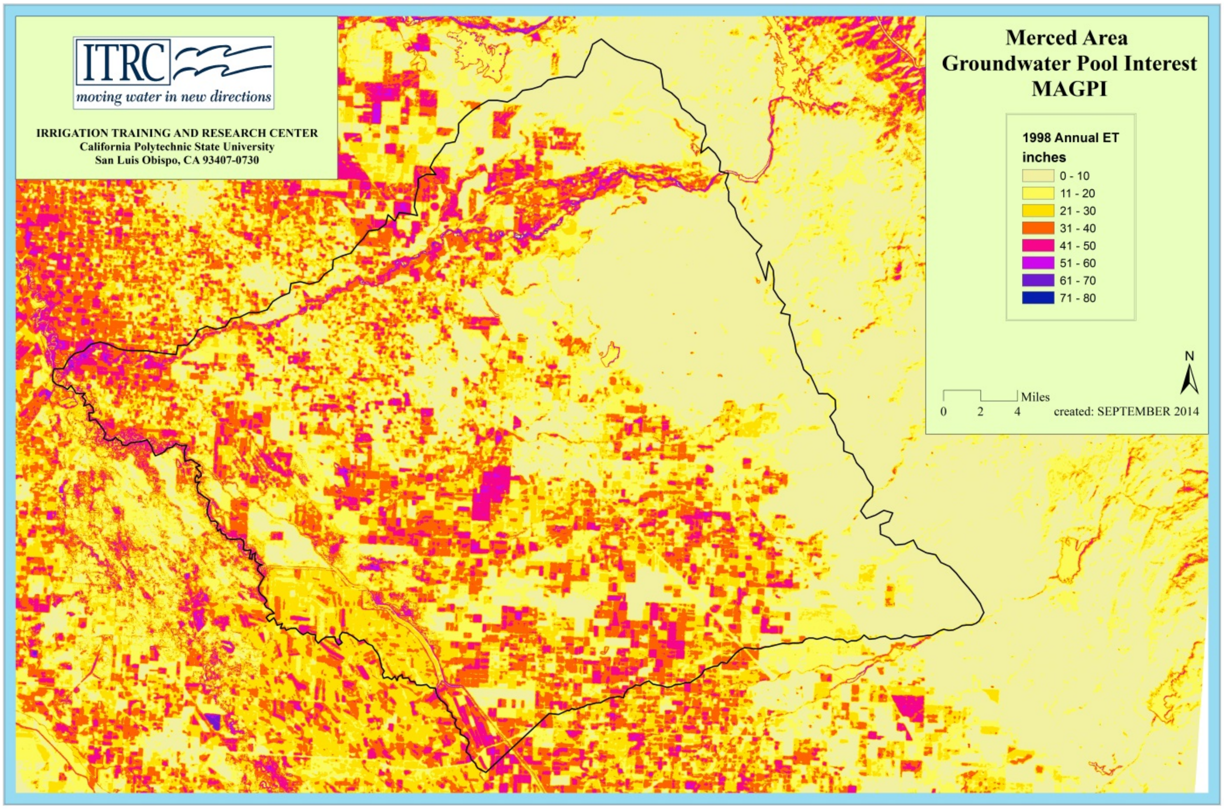


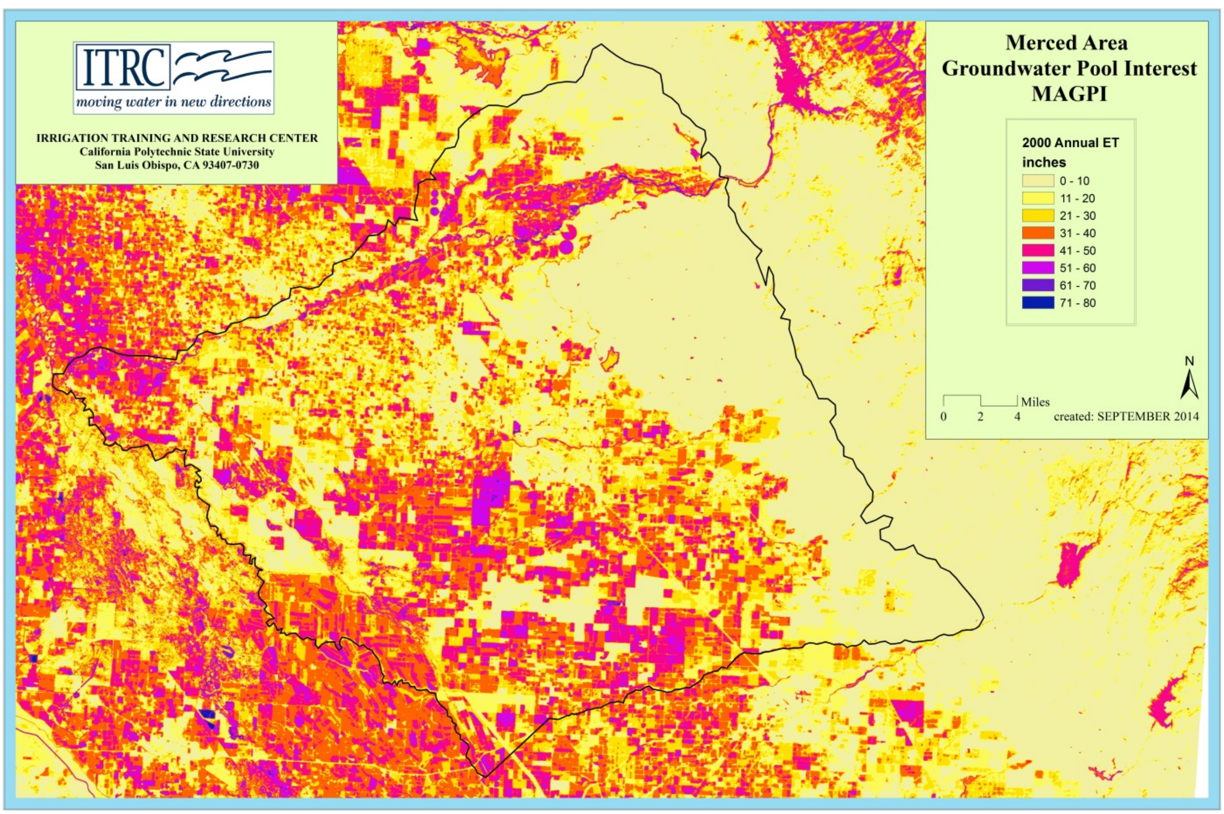
Figure 26. Additional water purveyors in and surrounding the MAGPI boundary for which no surface water data was provided

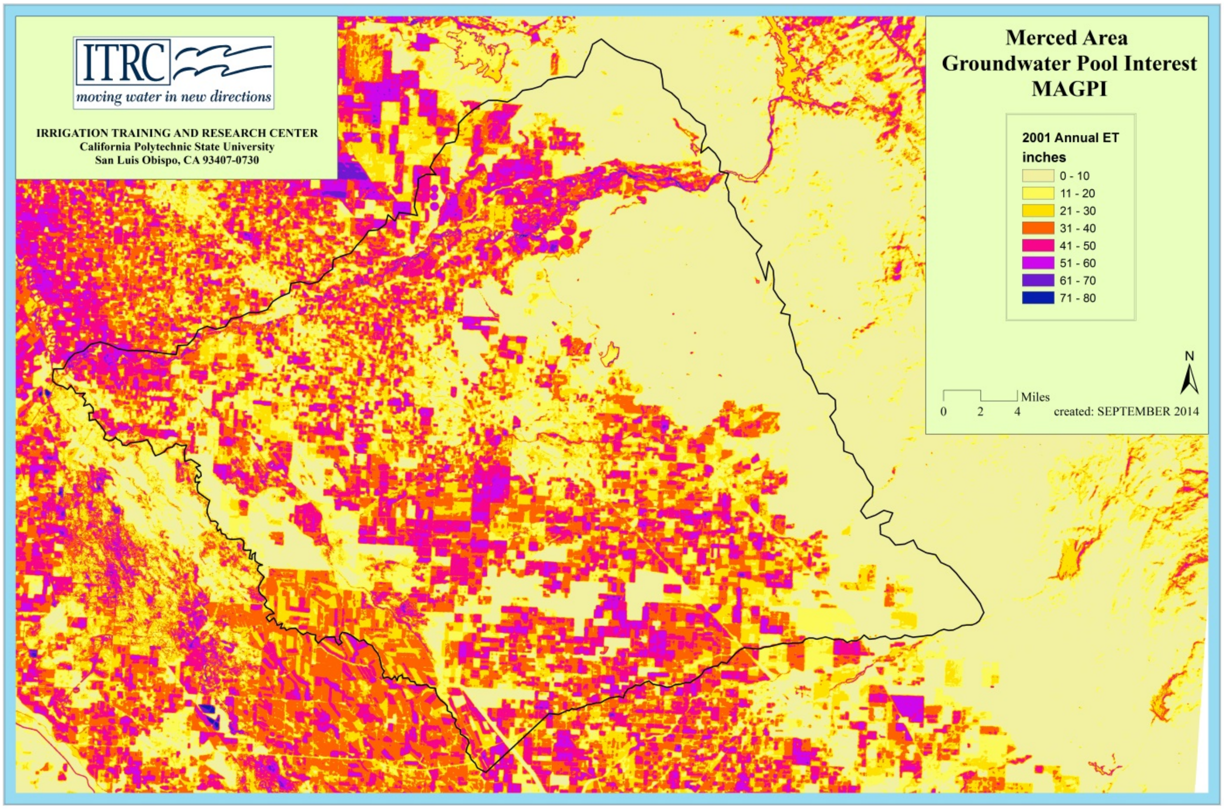
ATTACHMENT A
ITRC-METRIC Annual ETc Images

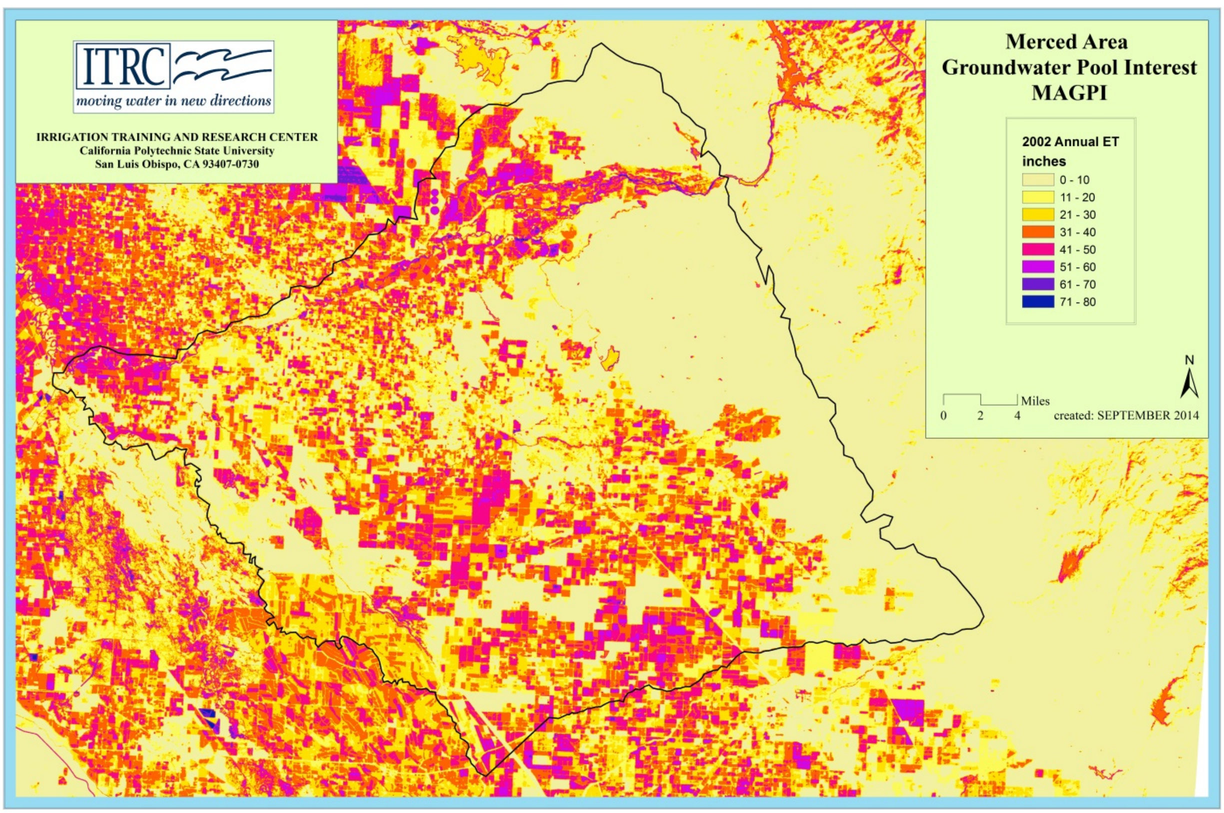

ITRC
moving water in new directions
IRRIGATION TRAINING AND RESEARCH CENTER
California Polytechnic State University
San Luis Obispo, CA 93407-0730
Merced Area
Groundwater Pool Interest
MAGPI
1989 Annual ET
Inches
0 - 10
11 - 20
21 - 30
31 - 40
41 - 50
51 - 60
61 - 70
71 - 80
N
Miles
0 2 4
created: SEPTEMBER 2014

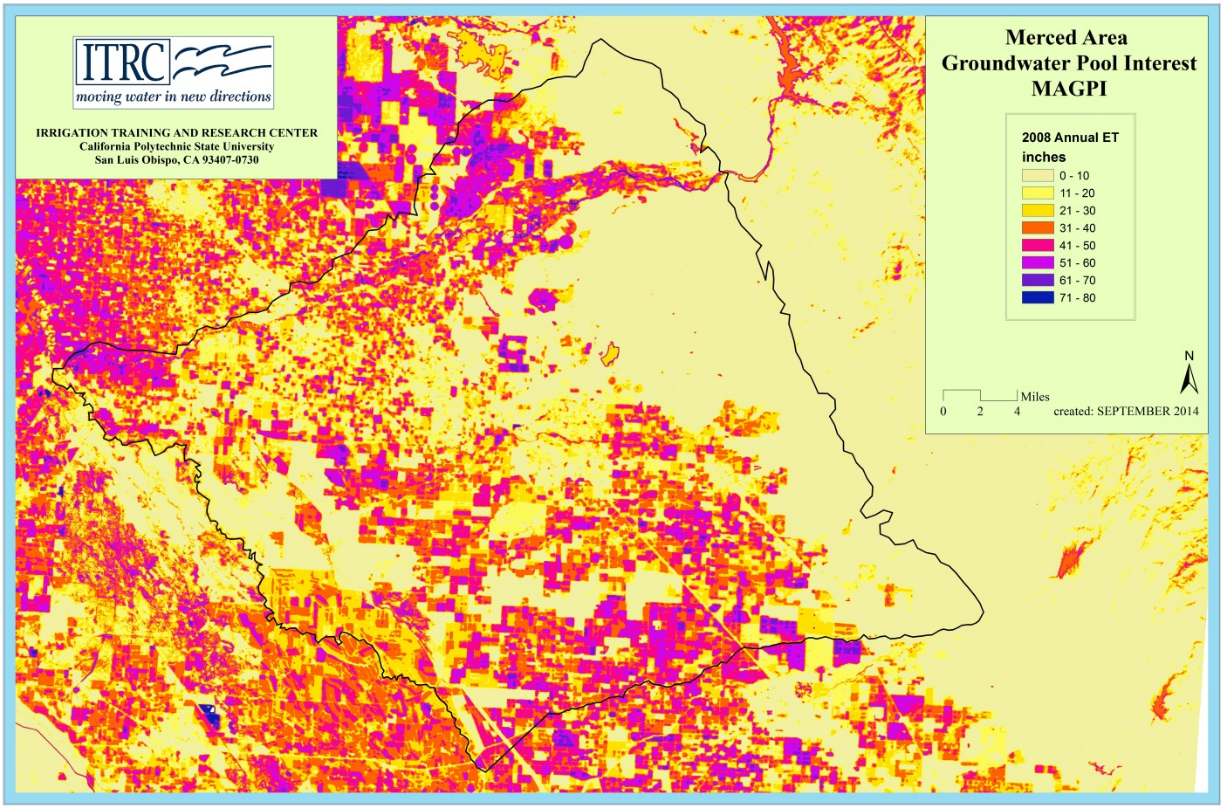

ITRC
moving water in new directions
IRRIGATION TRAINING AND RESEARCH CENTER
California Polytechnic State University
San Luis Obispo, CA 93407-0730
Merced Area
Groundwater Pool Interest
MAGPI
1997 Annual ET
inches
0 - 10
11 - 20
21 - 30
31 - 40
41 - 50
51 - 60
61 - 70
71 - 80
N
Miles
0 2 4
created: SEPTEMBER 2014

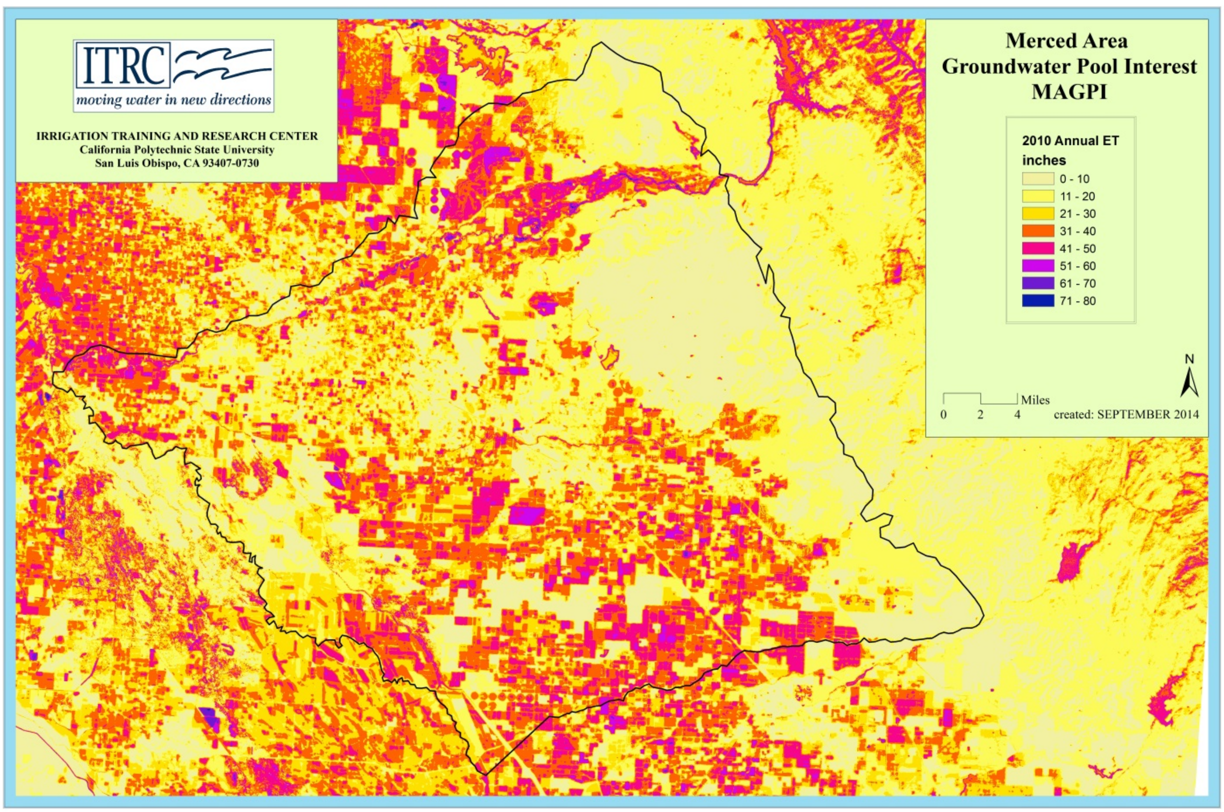

ITRC
moving water in new directions
IRRIGATION TRAINING AND RESEARCH CENTER
California Polytechnic State University
San Luis Obispo, CA 93407-0730
Merced Area
Groundwater Pool Interest
MAGPI
1998 Annual ET
inches
0 - 10
11 - 20
21 - 30
31 - 40
41 - 50
51 - 60
61 - 70
71 - 80
N
Miles
0 2 4
created: SEPTEMBER 2014

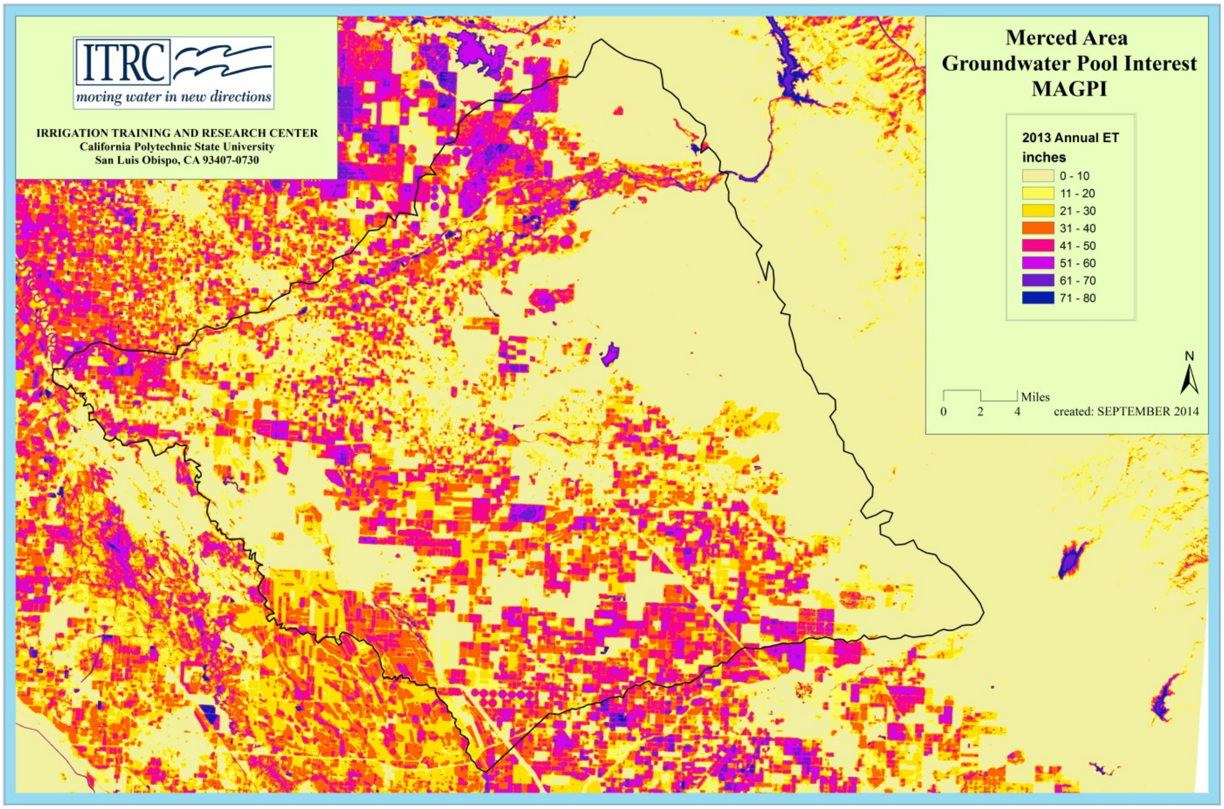

ITRC
moving water in new directions
IRRIGATION TRAINING AND RESEARCH CENTER
California Polytechnic State University
San Luis Obispo, CA 93407-0730
Merced Area
Groundwater Pool Interest
MAGPI
2000 Annual ET
inches
0 - 10
11 - 20
21 - 30
31 - 40
41 - 50
51 - 60
61 - 70
71 - 80
N
Miles
0 2 4
created: SEPTEMBER 2014


ITRC
moving water in new directions
IRRIGATION TRAINING AND RESEARCH CENTER
California Polytechnic State University
San Luis Obispo, CA 93407-0730
Merced Area Groundwater Pool Interest MAGPI
2001 Annual ET
inches
0 - 10
11 - 20
21 - 30
31 - 40
41 - 50
51 - 60
61 - 70
71 - 80
N
Miles
0 2 4
created: SEPTEMBER 2014

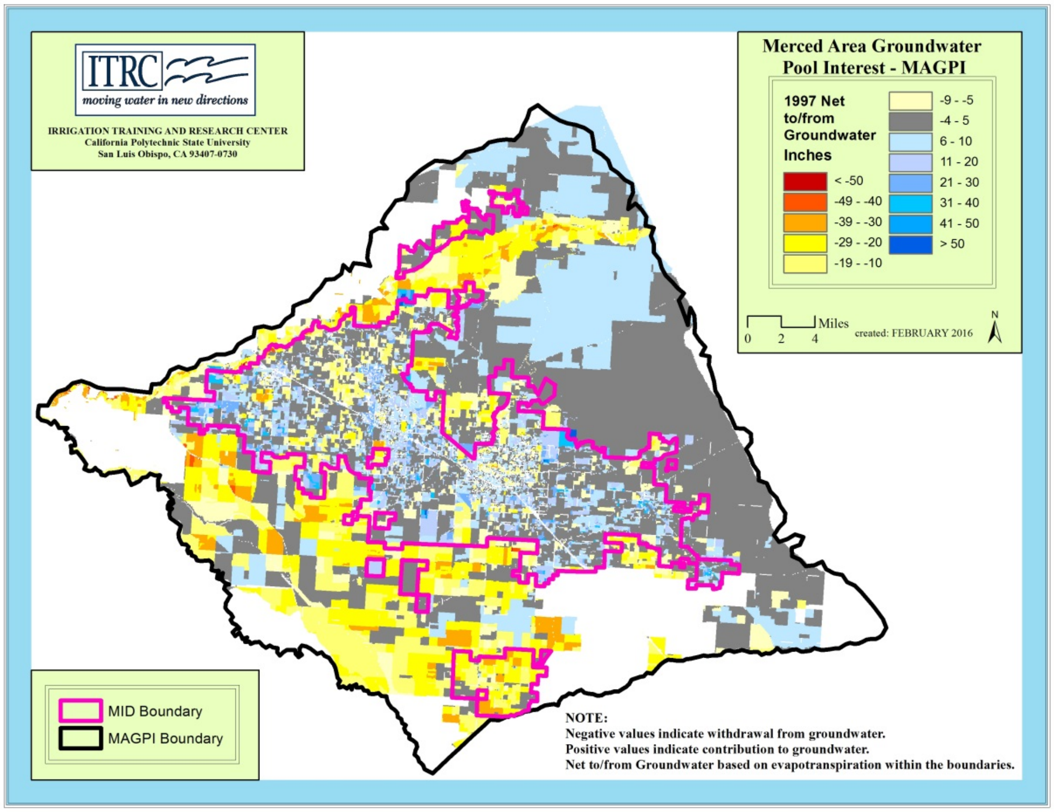

ITRC
moving water in new directions
IRRIGATION TRAINING AND RESEARCH CENTER
California Polytechnic State University
San Luis Obispo, CA 93407-0730
Merced Area Groundwater Pool Interest MAGPI
2002 Annual ET
inches
0 - 10
11 - 20
21 - 30
31 - 40
41 - 50
51 - 60
61 - 70
71 - 80
N
Miles
0 2 4
created: SEPTEMBER 2014

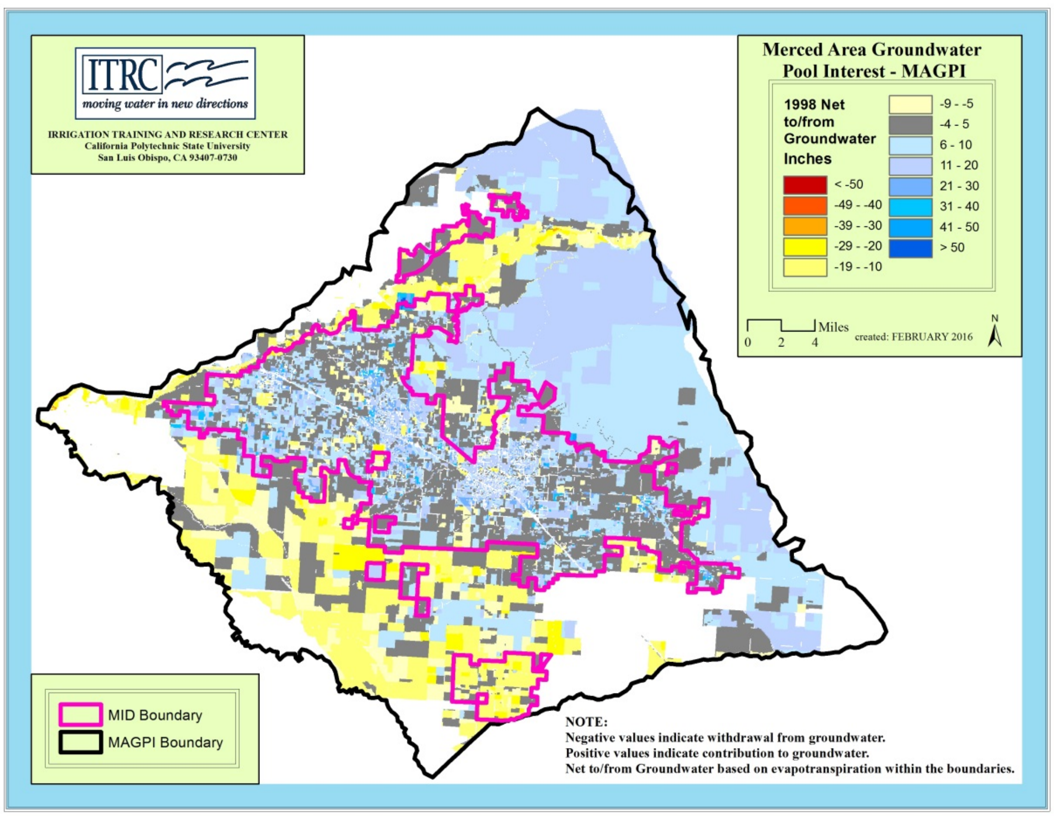

ITRC
moving water in new directions
IRRIGATION TRAINING AND RESEARCH CENTER
California Polytechnic State University
San Luis Obispo, CA 93407-0730
Merced Area
Groundwater Pool Interest
MAGPI
2008 Annual ET
inches
0 - 10
11 - 20
21 - 30
31 - 40
41 - 50
51 - 60
61 - 70
71 - 80
N
0 2 4 Miles
created: SEPTEMBER 2014

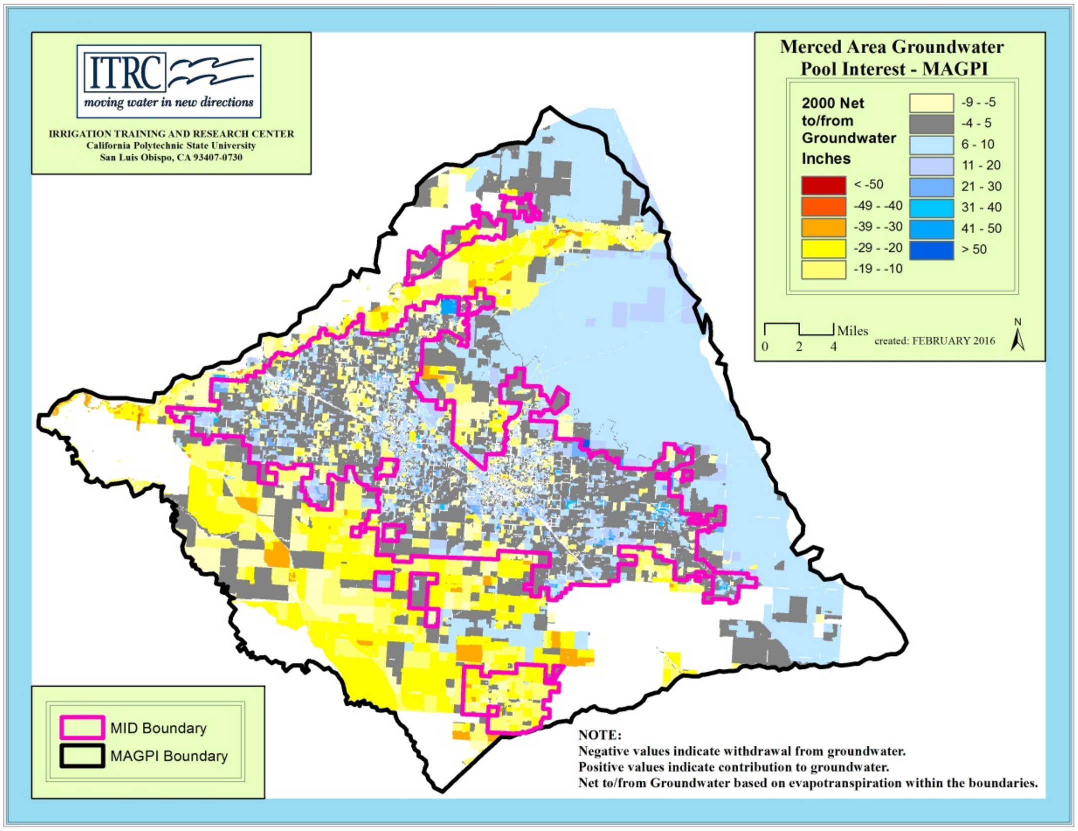

ITRC
moving water in new directions
IRRIGATION TRAINING AND RESEARCH CENTER
California Polytechnic State University
San Luis Obispo, CA 93407-0730
Merced Area
Groundwater Pool Interest
MAGPI
2010 Annual ET
inches
0 - 10
11 - 20
21 - 30
31 - 40
41 - 50
51 - 60
61 - 70
71 - 80
N
0 2 4 Miles
created: SEPTEMBER 2014

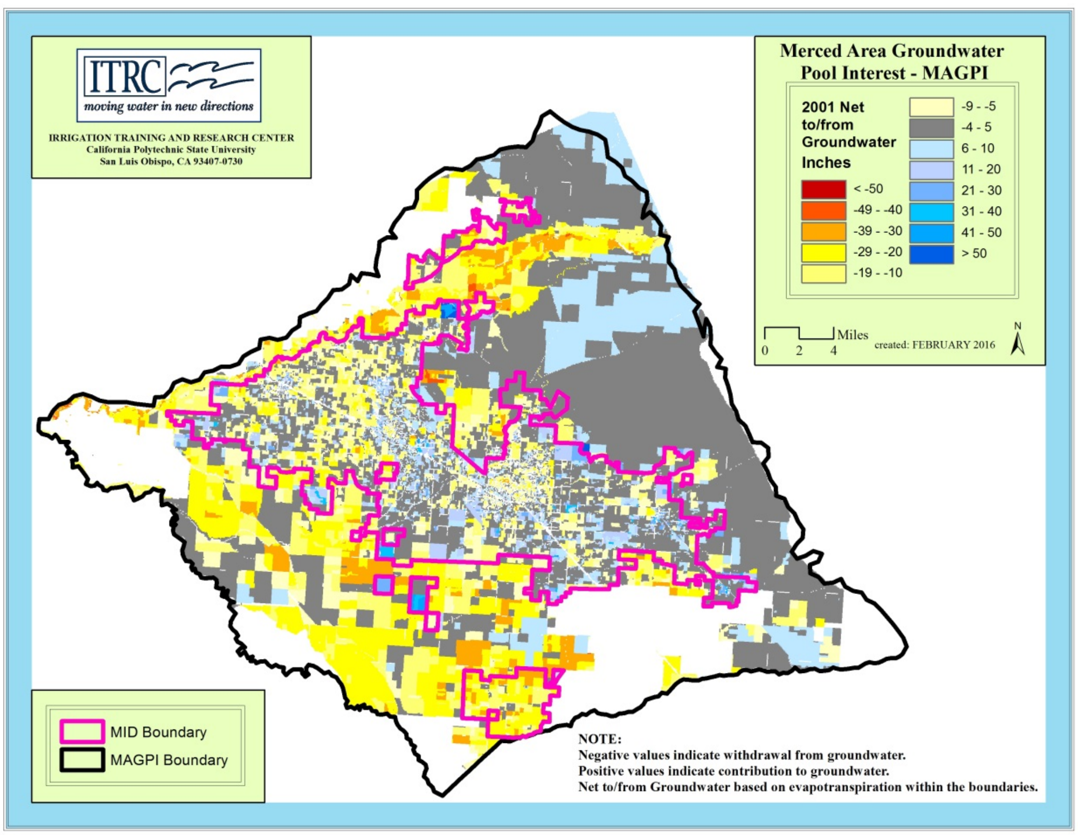

ITRC
moving water in new directions
IRRIGATION TRAINING AND RESEARCH CENTER
California Polytechnic State University
San Luis Obispo, CA 93407-0730
Merced Area
Groundwater Pool Interest
MAGPI
2013 Annual ET
inches
0 - 10
11 - 20
21 - 30
31 - 40
41 - 50
51 - 60
61 - 70
71 - 80
N
Miles
0 2 4
created: SEPTEMBER 2014

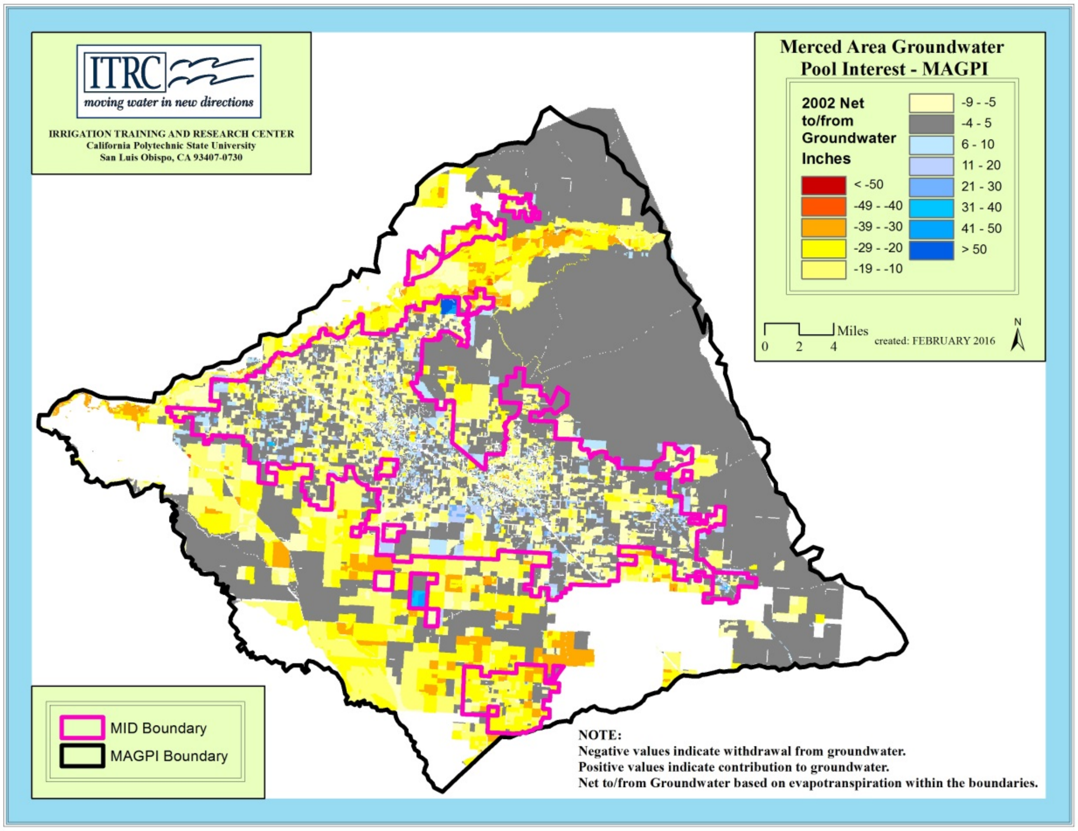
ATTACHMENT B
NTFGW Annual Maps

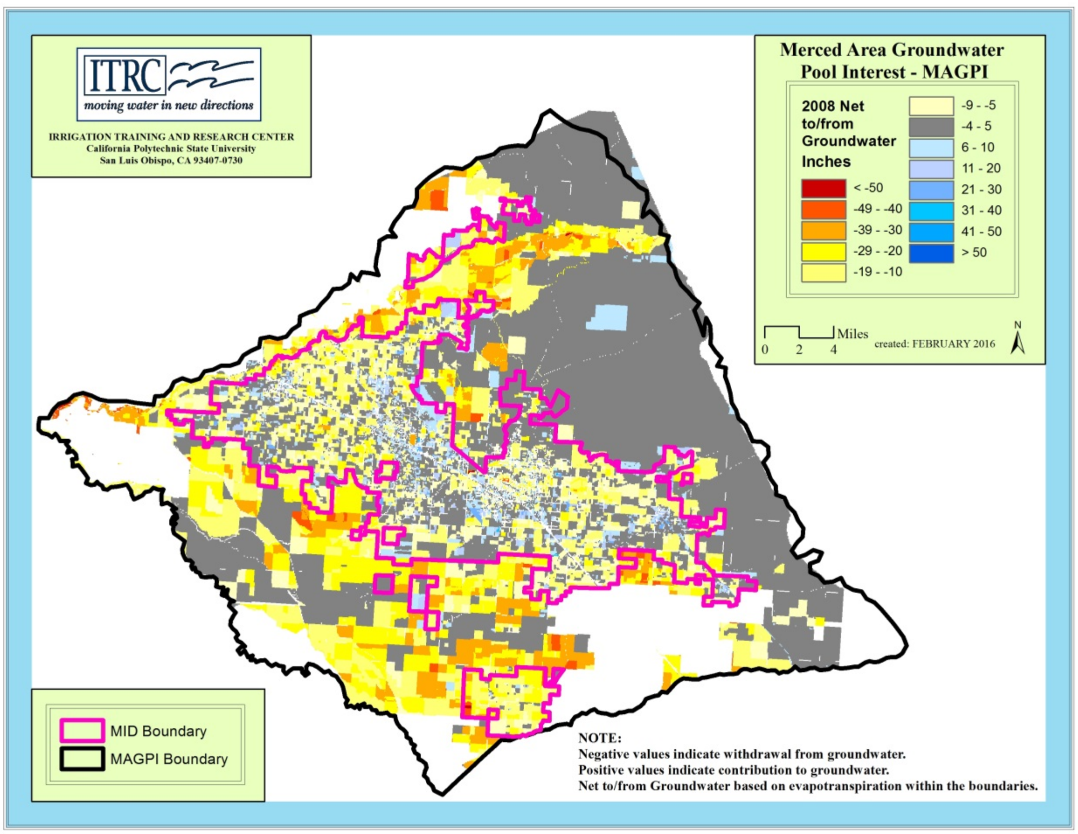

ITRC
moving water in new directions
IRRIGATION TRAINING AND RESEARCH CENTER
California Polytechnic State University
San Luis Obispo, CA 93407-0730
Merced Area Groundwater Pool Interest - MAGPI
1997 Net to/from Groundwater Inches
< -50
-49 - -40
-39 - -30
-29 - -20
-19 - -10
-9 - -5
-4 - 5
6 - 10
11 - 20
21 - 30
31 - 40
41 - 50
> 50
Miles
0 2 4
created: FEBRUARY 2016
N
MID Boundary
MAGPI Boundary
NOTE:
Negative values indicate withdrawal from groundwater.
Positive values indicate contribution to groundwater.
Net to/from Groundwater based on evapotranspiration within the boundaries.

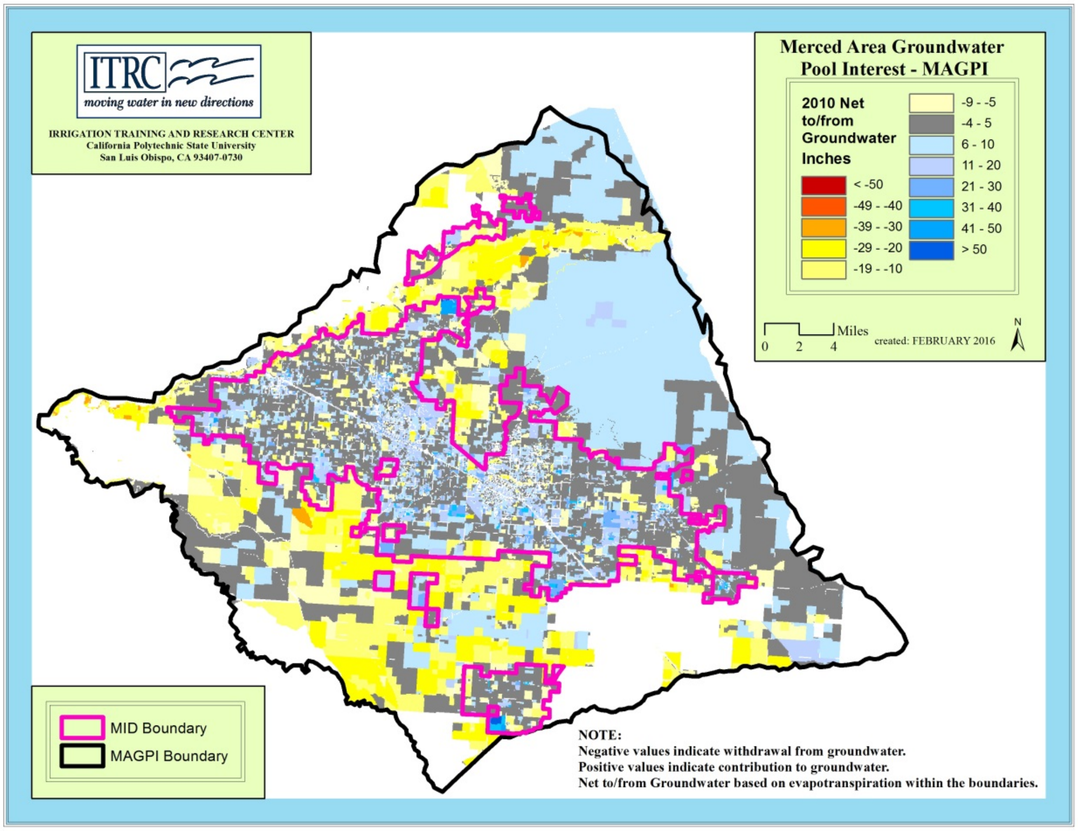

ITRC
moving water in new directions
IRRIGATION TRAINING AND RESEARCH CENTER
California Polytechnic State University
San Luis Obispo, CA 93407-0730
Merced Area Groundwater Pool Interest - MAGPI
1998 Net to/from Groundwater Inches
< -50
-49 - -40
-39 - -30
-29 - -20
-19 - -10
-9 - -5
-4 - 5
6 - 10
11 - 20
21 - 30
31 - 40
41 - 50
> 50
Miles
0 2 4
created: FEBRUARY 2016
N
MID Boundary
MAGPI Boundary
NOTE:
Negative values indicate withdrawal from groundwater.
Positive values indicate contribution to groundwater.
Net to/from Groundwater based on evapotranspiration within the boundaries.

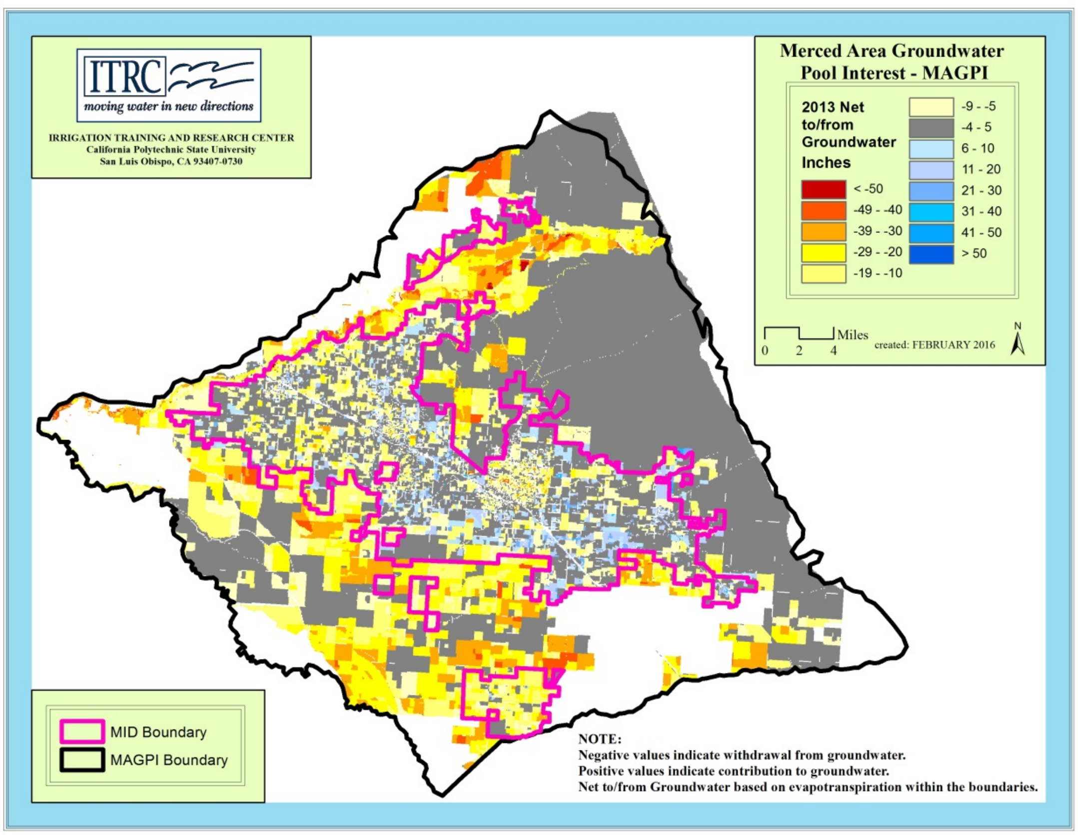

ITRC
moving water in new directions
IRRIGATION TRAINING AND RESEARCH CENTER
California Polytechnic State University
San Luis Obispo, CA 93407-0730
Merced Area Groundwater Pool Interest - MAGPI
2000 Net to/from Groundwater Inches
< -50
-49 - -40
-39 - -30
-29 - -20
-19 - -10
-9 - -5
-4 - 5
6 - 10
11 - 20
21 - 30
31 - 40
41 - 50
> 50
0 2 4 Miles
created: FEBRUARY 2016
N
MID Boundary
MAGPI Boundary
NOTE:
Negative values indicate withdrawal from groundwater.
Positive values indicate contribution to groundwater.
Net to/from Groundwater based on evapotranspiration within the boundaries.


ITRC
moving water in new directions
IRRIGATION TRAINING AND RESEARCH CENTER
California Polytechnic State University
San Luis Obispo, CA 93407-0730
Merced Area Groundwater Pool Interest - MAGPI
2001 Net to/from Groundwater Inches
< -50
-49 - -40
-39 - -30
-29 - -20
-19 - -10
-9 - -5
-4 - 5
6 - 10
11 - 20
21 - 30
31 - 40
41 - 50
> 50
0 2 4 Miles
created: FEBRUARY 2016
N
MID Boundary
MAGPI Boundary
NOTE:
Negative values indicate withdrawal from groundwater.
Positive values indicate contribution to groundwater.
Net to/from Groundwater based on evapotranspiration within the boundaries.


ITRC
moving water in new directions
IRRIGATION TRAINING AND RESEARCH CENTER
California Polytechnic State University
San Luis Obispo, CA 93407-0730
Merced Area Groundwater Pool Interest - MAGPI
2002 Net to/from Groundwater Inches
< -50
-49 - -40
-39 - -30
-29 - -20
-19 - -10
-9 - -5
-4 - 5
6 - 10
11 - 20
21 - 30
31 - 40
41 - 50
> 50
Miles
0 2 4
created: FEBRUARY 2016
N
MID Boundary
MAGPI Boundary
NOTE:
Negative values indicate withdrawal from groundwater.
Positive values indicate contribution to groundwater.
Net to/from Groundwater based on evapotranspiration within the boundaries.


ITRC
moving water in new directions
IRRIGATION TRAINING AND RESEARCH CENTER
California Polytechnic State University
San Luis Obispo, CA 93407-0730
Merced Area Groundwater Pool Interest - MAGPI
2008 Net to/from Groundwater Inches
< -50
-49 - -40
-39 - -30
-29 - -20
-19 - -10
-9 - -5
-4 - 5
6 - 10
11 - 20
21 - 30
31 - 40
41 - 50
> 50
Miles
0 2 4
created: FEBRUARY 2016
N
MID Boundary
MAGPI Boundary
NOTE:
Negative values indicate withdrawal from groundwater.
Positive values indicate contribution to groundwater.
Net to/from Groundwater based on evapotranspiration within the boundaries.


ITRC
moving water in new directions
IRRIGATION TRAINING AND RESEARCH CENTER
California Polytechnic State University
San Luis Obispo, CA 93407-0730
Merced Area Groundwater Pool Interest - MAGPI
2010 Net to/from Groundwater Inches
< -50
-49 - -40
-39 - -30
-29 - -20
-19 - -10
-9 - -5
-4 - 5
6 - 10
11 - 20
21 - 30
31 - 40
41 - 50
> 50
Miles
0 2 4
created: FEBRUARY 2016
N
MID Boundary
MAGPI Boundary
NOTE:
Negative values indicate withdrawal from groundwater.
Positive values indicate contribution to groundwater.
Net to/from Groundwater based on evapotranspiration within the boundaries.

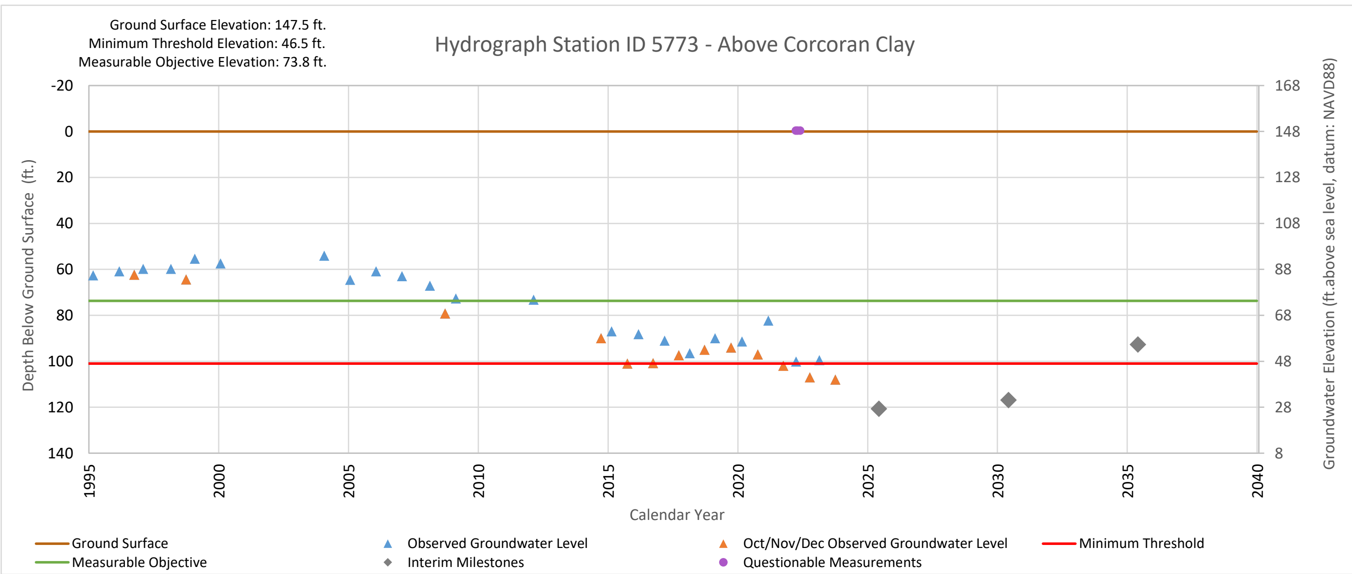

ITRC
moving water in new directions
IRRIGATION TRAINING AND RESEARCH CENTER
California Polytechnic State University
San Luis Obispo, CA 93407-0730
Merced Area Groundwater Pool Interest - MAGPI
2013 Net to/from Groundwater Inches
< -50
-49 - -40
-39 - -30
-29 - -20
-19 - -10
-9 - -5
-4 - 5
6 - 10
11 - 20
21 - 30
31 - 40
41 - 50
> 50
Miles
0 2 4
created: FEBRUARY 2016
N
MID Boundary
MAGPI Boundary
NOTE:
Negative values indicate withdrawal from groundwater.
Positive values indicate contribution to groundwater.
Net to/from Groundwater based on evapotranspiration within the boundaries.

ATTACHMENT C

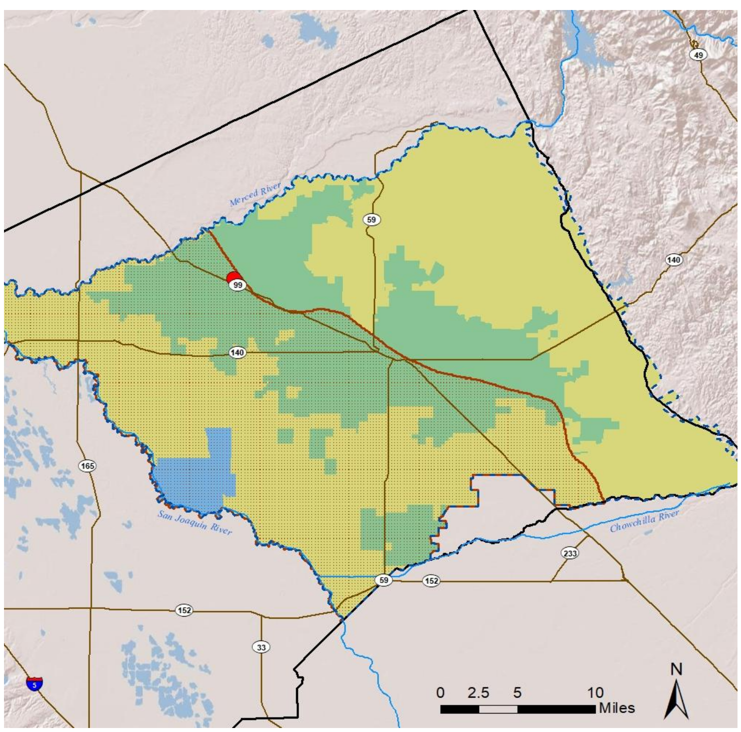
APPENDIX E: PUBLIC COMMENTS AND RESPONSE

No public comments were received.

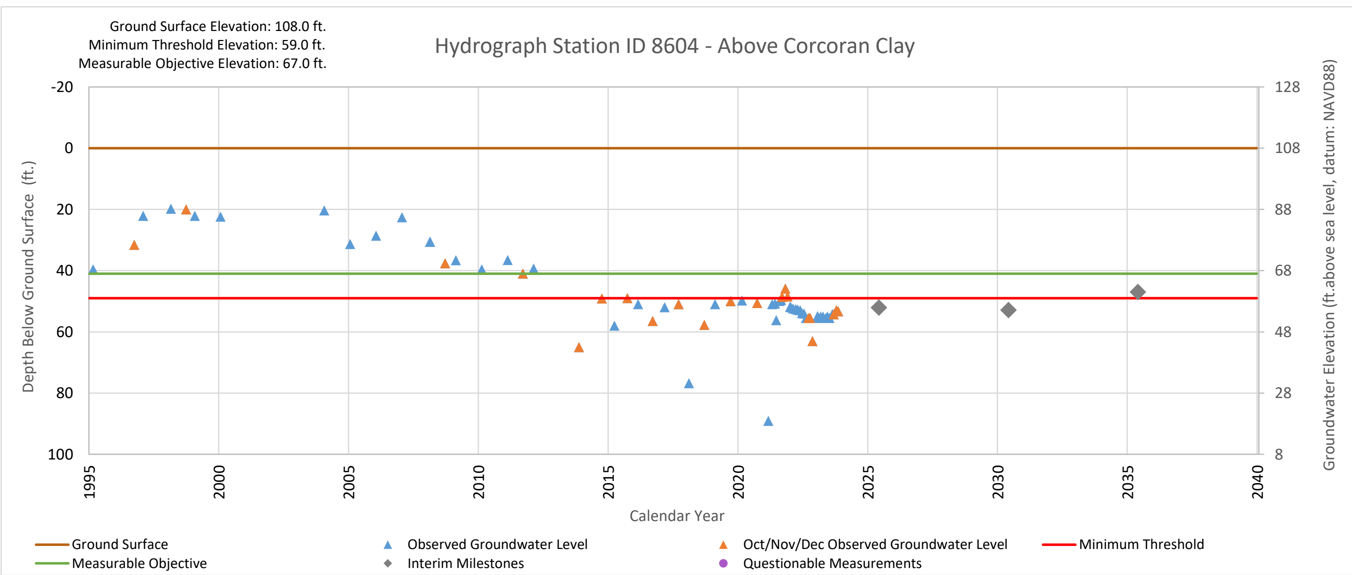
APPENDIX F: SUSTAINABLE MANAGEMENT CRITERIA HYDROGRAPHS FOR DECLINING GROUNDWATER LEVELS



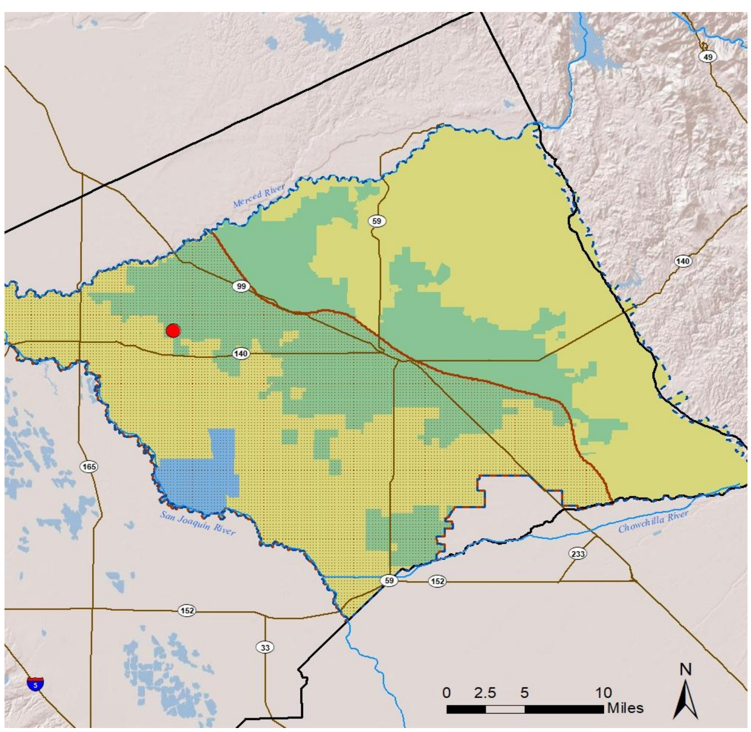
Ground Surface Elevation: 147.5 ft.
Minimum Threshold Elevation: 46.5 ft.
Measurable Objective Elevation: 73.8 ft.
Hydrograph Station ID 5773 - Above Corcoran Clay
Depth Below Ground Surface (ft.)
Groundwater Elevation (ft.above sea level, datum: NAVD88)
Calendar Year
Ground Surface
Measurable Objective
Observed Groundwater Level
Interim Milestones
Oct/Nov/Dec Observed Groundwater Level
Questionable Measurements
Minimum Threshold



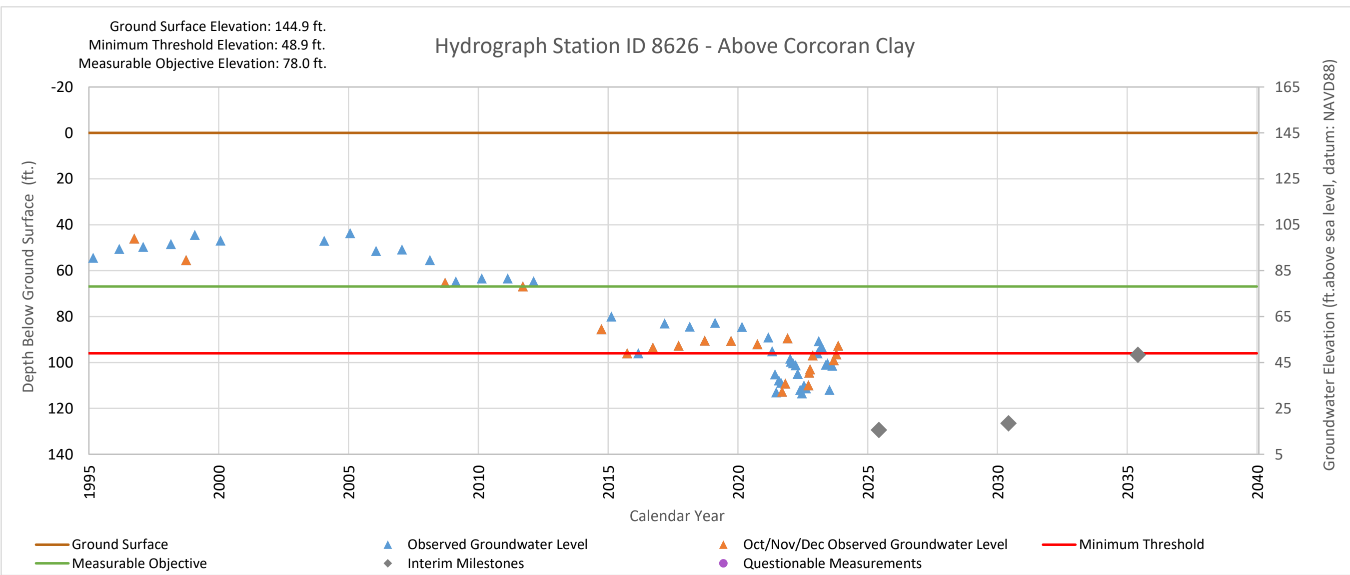
Merced River
San Joaquin River
Chowchilla River
0 2.5 5 10
Miles
N

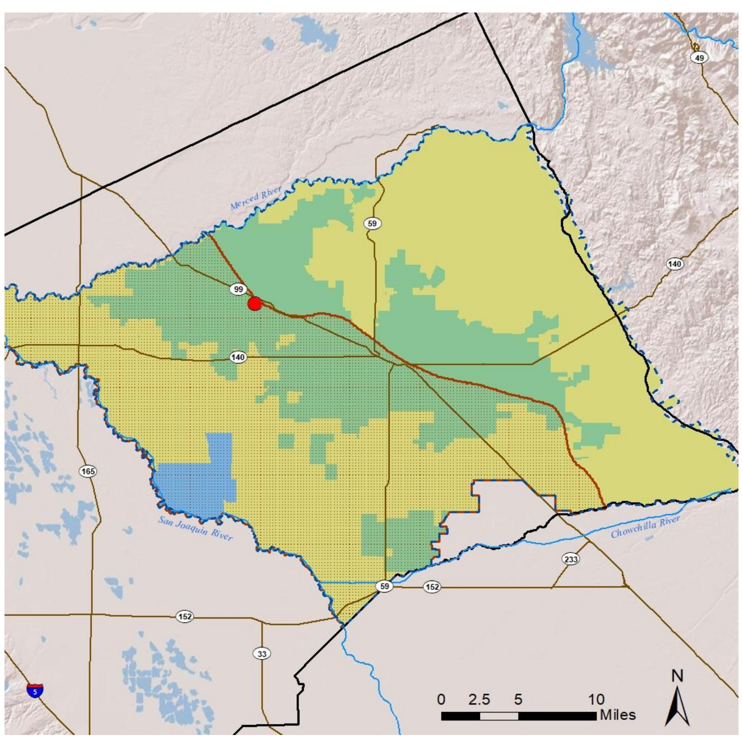


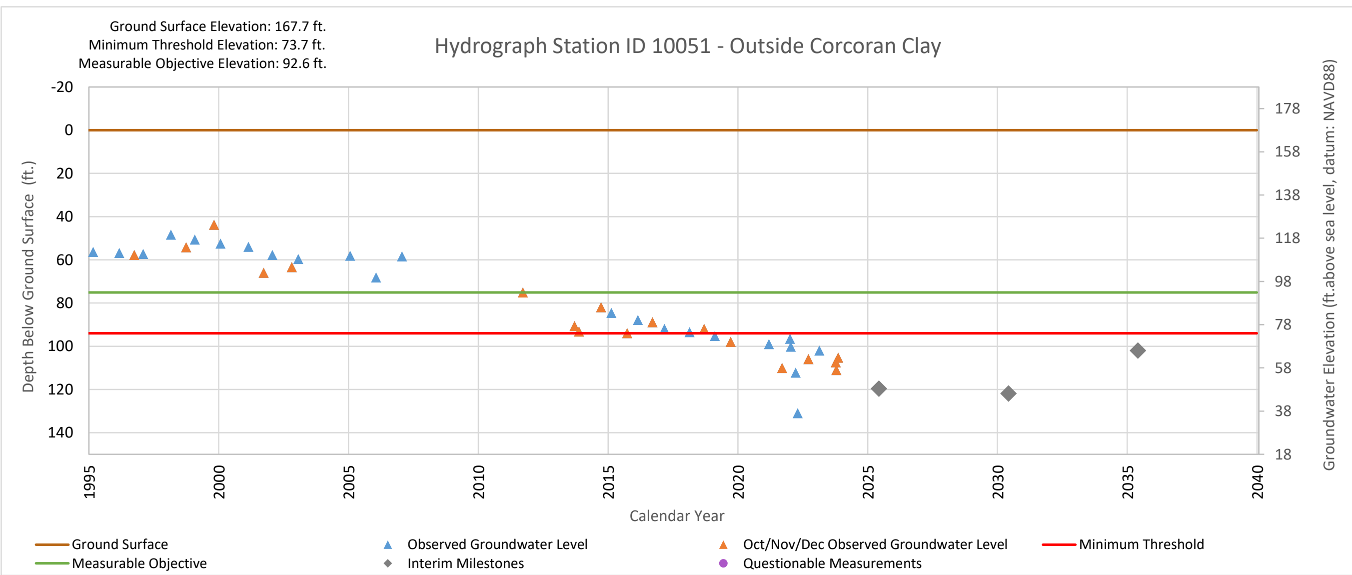
Ground Surface Elevation: 108.0 ft.
Minimum Threshold Elevation: 59.0 ft.
Measurable Objective Elevation: 67.0 ft.
Hydrograph Station ID 8604 - Above Corcoran Clay
Depth Below Ground Surface (ft.)
Groundwater Elevation (ft.above sea level, datum: NAVD88)
Calendar Year
Ground Surface
Measurable Objective
Observed Groundwater Level
Interim Milestones
Oct/Nov/Dec Observed Groundwater Level
Questionable Measurements
Minimum Threshold



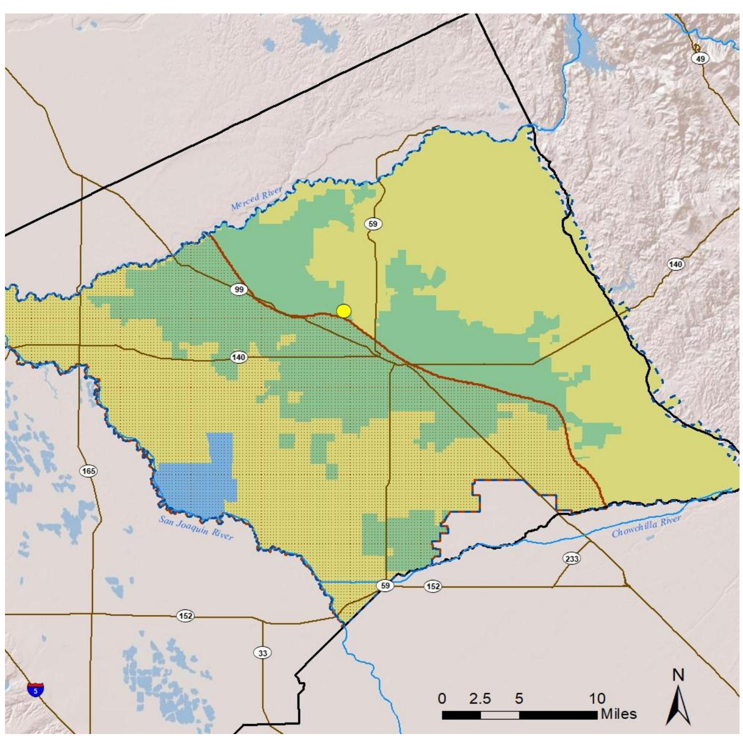
Merced River
San Joaquin River
Chowchilla River
0 2.5 5 10
Miles
N


Ground Surface Elevation: 144.9 ft.
Minimum Threshold Elevation: 48.9 ft.
Measurable Objective Elevation: 78.0 ft.
Hydrograph Station ID 8626 - Above Corcoran Clay
Depth Below Ground Surface (ft.)
Groundwater Elevation (ft.above sea level, datum: NAVD88)
-20
0
20
40
60
80
100
120
140
165
145
125
105
85
65
45
25
5
1995
2000
2005
2010
2015
2020
2025
2030
2035
2040
Calendar Year
Ground Surface
Measurable Objective
Observed Groundwater Level
Interim Milestones
Oct/Nov/Dec Observed Groundwater Level
Questionable Measurements
Minimum Threshold

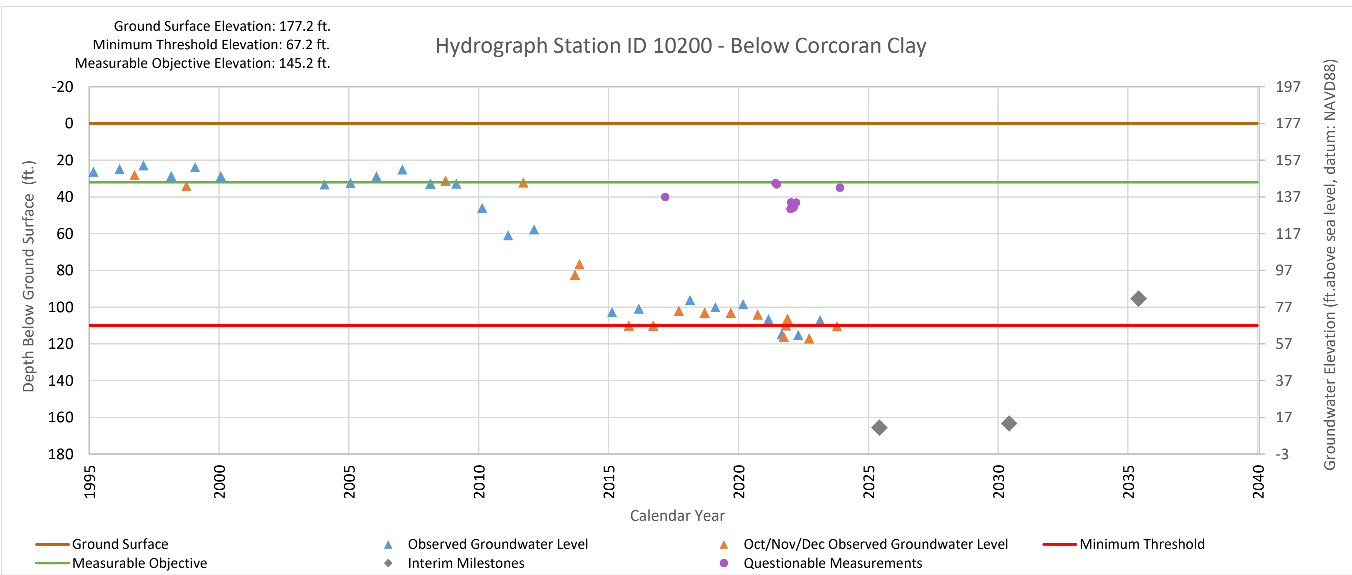

Merced River
San Joaquin River
Chowchilla River
49
59
140
99
165
152
233
33
5
0 2.5 5 10
Miles
N

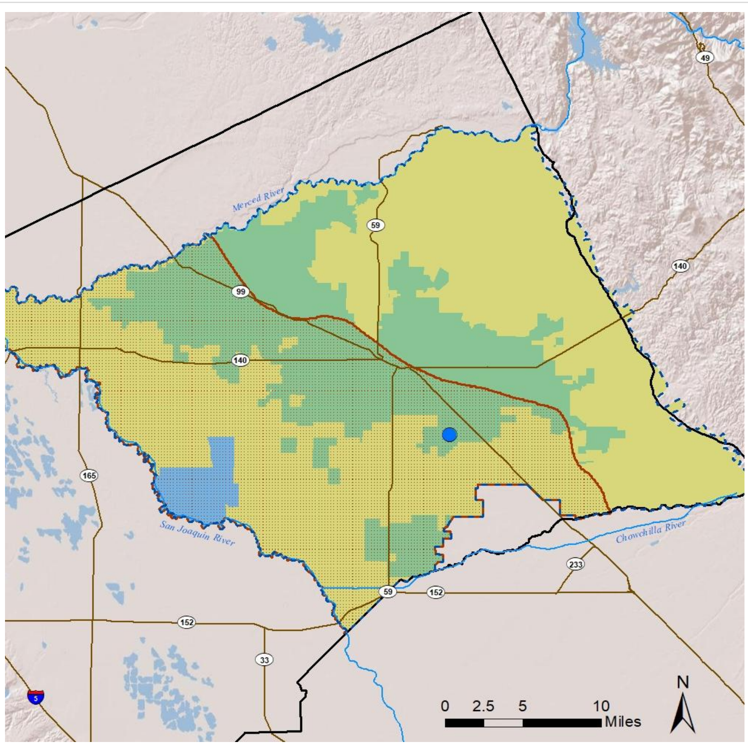


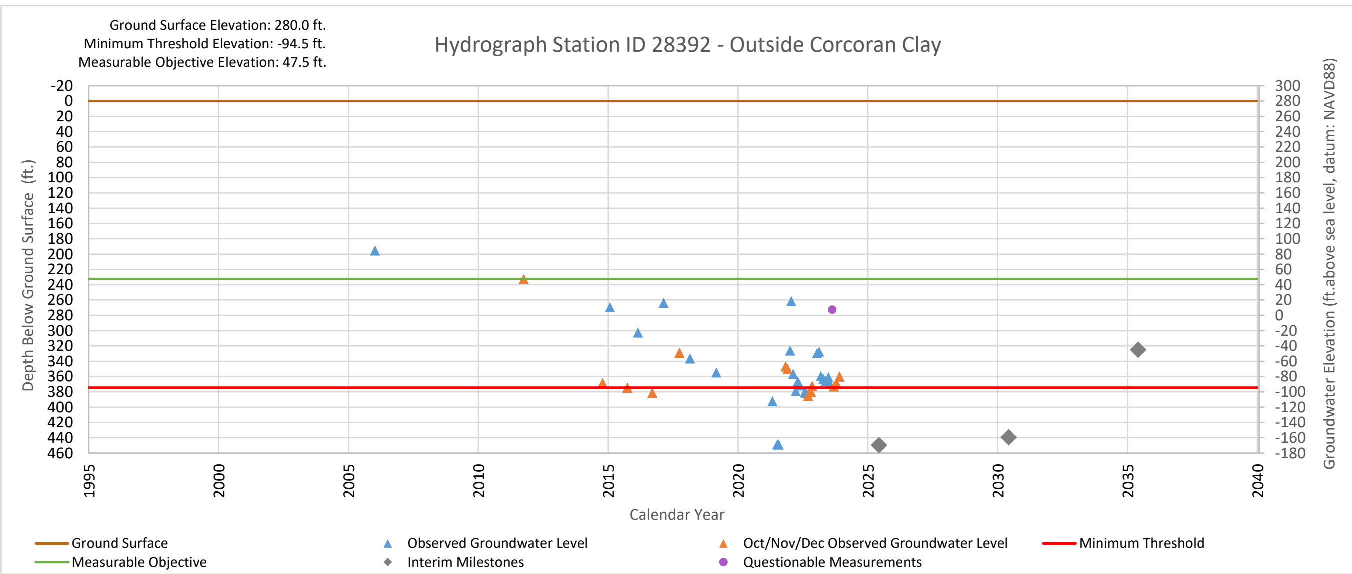
Ground Surface Elevation: 167.7 ft.
Minimum Threshold Elevation: 73.7 ft.
Measurable Objective Elevation: 92.6 ft.
Hydrograph Station ID 10051 - Outside Corcoran Clay
Depth Below Ground Surface (ft.)
Groundwater Elevation (ft.above sea level, datum: NAVD88)
Calendar Year
Ground Surface
Measurable Objective
Observed Groundwater Level
Interim Milestones
Oct/Nov/Dec Observed Groundwater Level
Questionable Measurements
Minimum Threshold



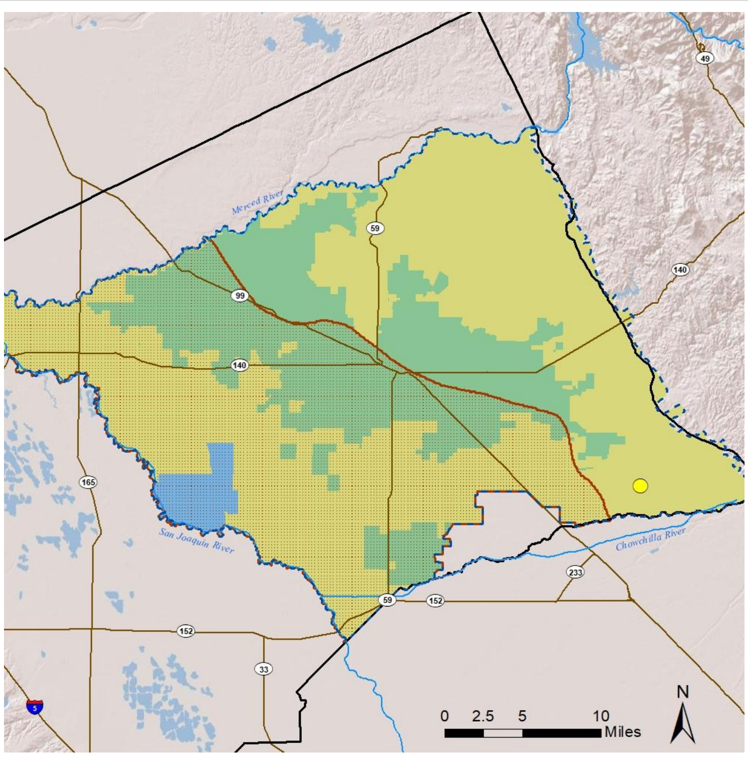
Merced River
San Joaquin River
Chowchilla River
0 2.5 5 10
Miles
N


Ground Surface Elevation: 177.2 ft.
Minimum Threshold Elevation: 67.2 ft.
Measurable Objective Elevation: 145.2 ft.
Hydrograph Station ID 10200 - Below Corcoran Clay
Depth Below Ground Surface (ft.)
Groundwater Elevation (ft.above sea level, datum: NAVD88)
-20
0
20
40
60
80
100
120
140
160
180
197
177
157
137
117
97
77
57
37
17
-3
1995
2000
2005
2010
2015
2020
2025
2030
2035
2040
Calendar Year
Ground Surface
Measurable Objective
Observed Groundwater Level
Interim Milestones
Oct/Nov/Dec Observed Groundwater Level
Questionable Measurements
Minimum Threshold

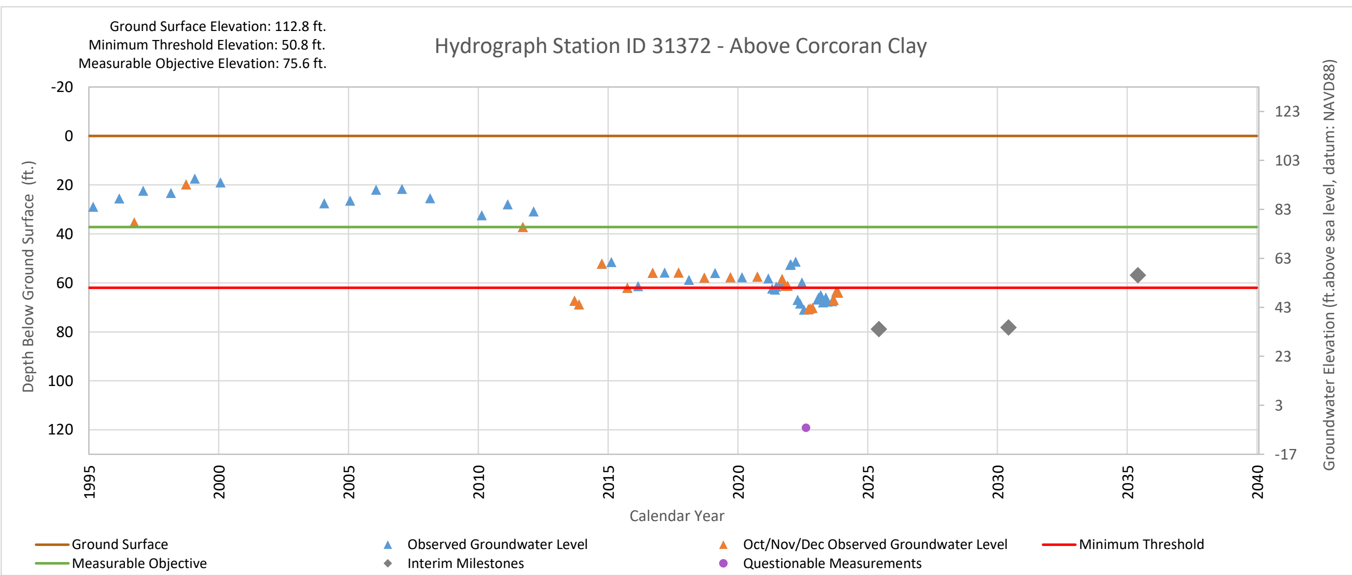

Merced River
San Joaquin River
Chowchilla River
49
59
140
99
165
233
152
33
5
0 2.5 5 10
Miles
N



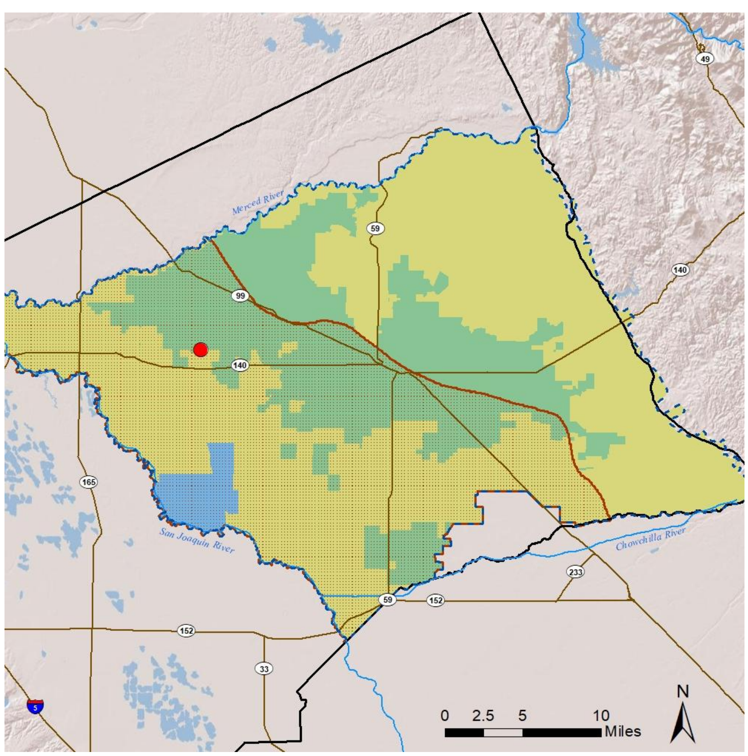
Ground Surface Elevation: 280.0 ft.
Minimum Threshold Elevation: -94.5 ft.
Measurable Objective Elevation: 47.5 ft.
Hydrograph Station ID 28392 - Outside Corcoran Clay
Depth Below Ground Surface (ft.)
Groundwater Elevation (ft.above sea level, datum: NAVD88)
Calendar Year
Ground Surface
Measurable Objective
Observed Groundwater Level
Interim Milestones
Oct/Nov/Dec Observed Groundwater Level
Questionable Measurements
Minimum Threshold



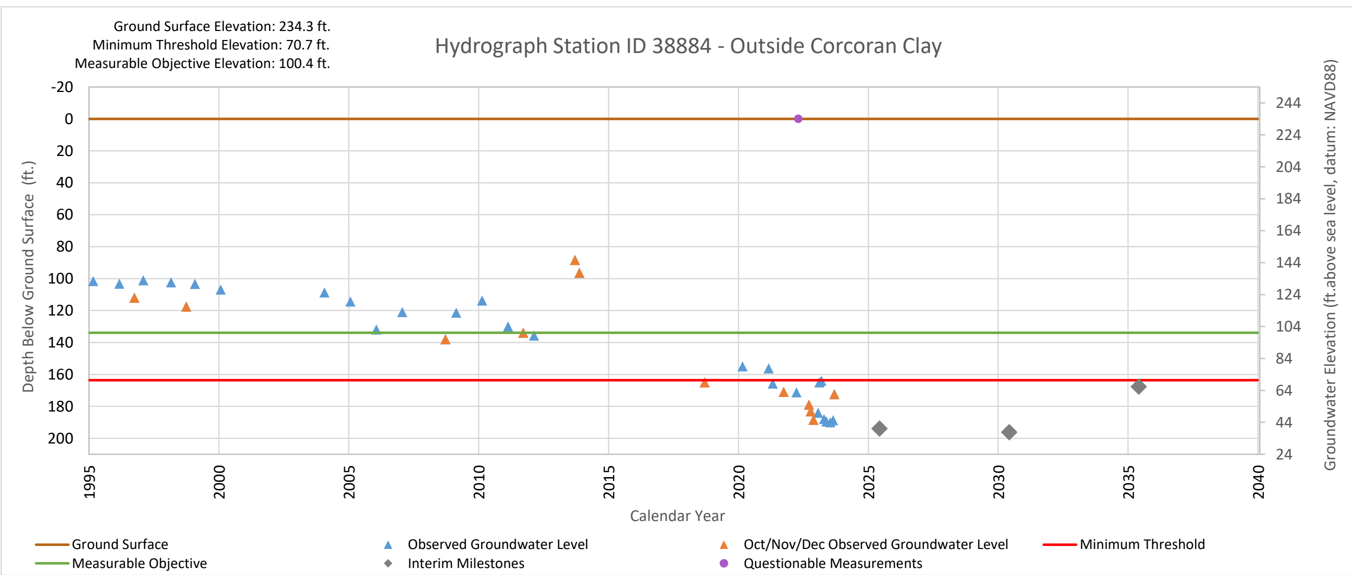
Merced River
San Joaquin River
Chowchilla River
0 2.5 5 10
Miles
N



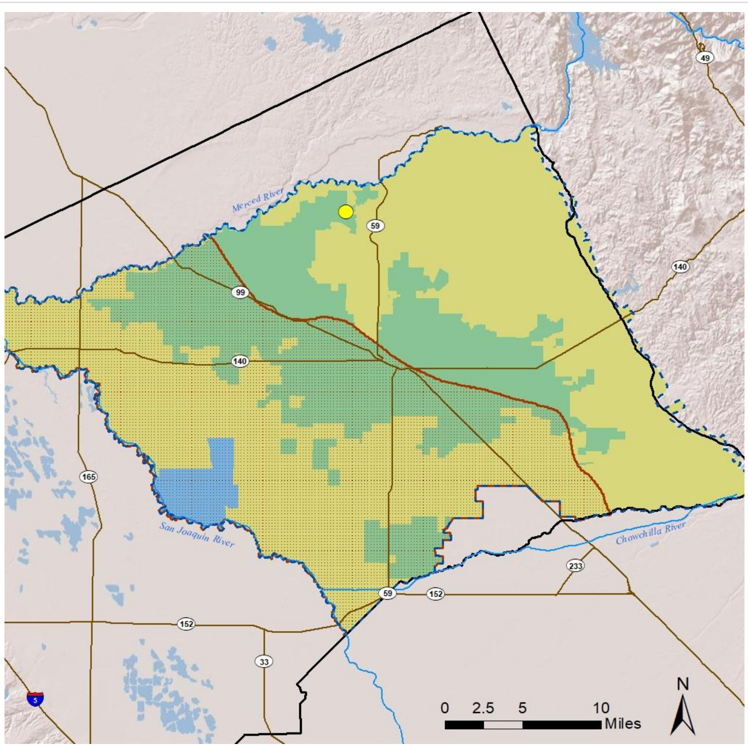
Ground Surface Elevation: 112.8 ft.
Minimum Threshold Elevation: 50.8 ft.
Measurable Objective Elevation: 75.6 ft.
Hydrograph Station ID 31372 - Above Corcoran Clay
Depth Below Ground Surface (ft.)
Groundwater Elevation (ft.above sea level, datum: NAVD88)
Calendar Year
Ground Surface
Measurable Objective
Observed Groundwater Level
Interim Milestones
Oct/Nov/Dec Observed Groundwater Level
Questionable Measurements
Minimum Threshold



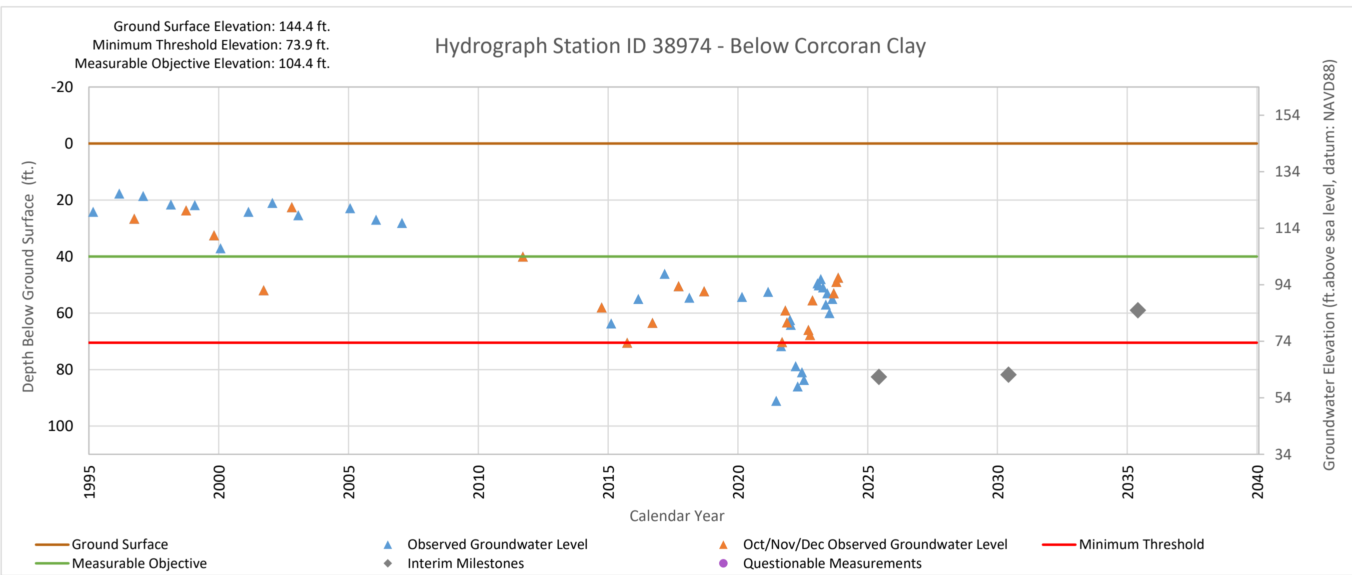
Merced River
San Joaquin River
Chowchilla River
N
0 2.5 5 10
Miles

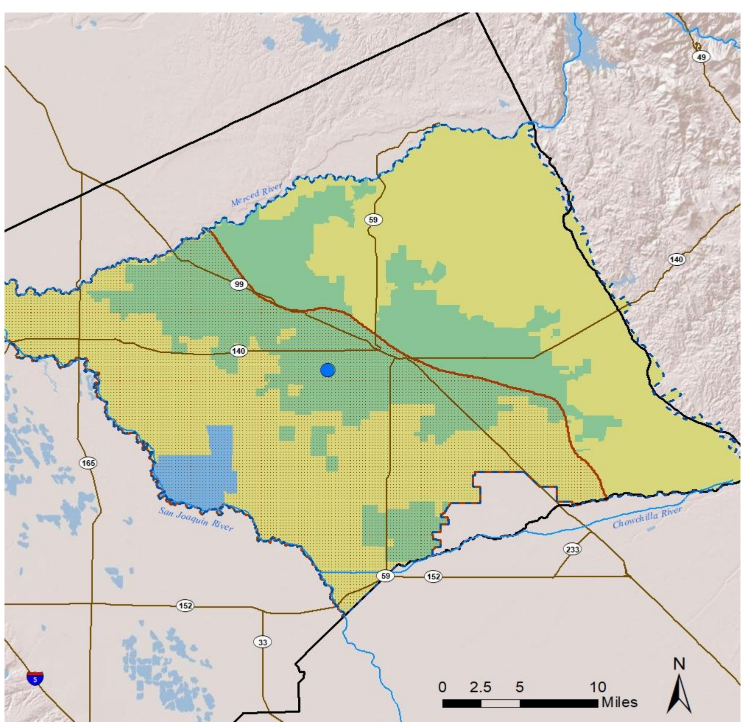


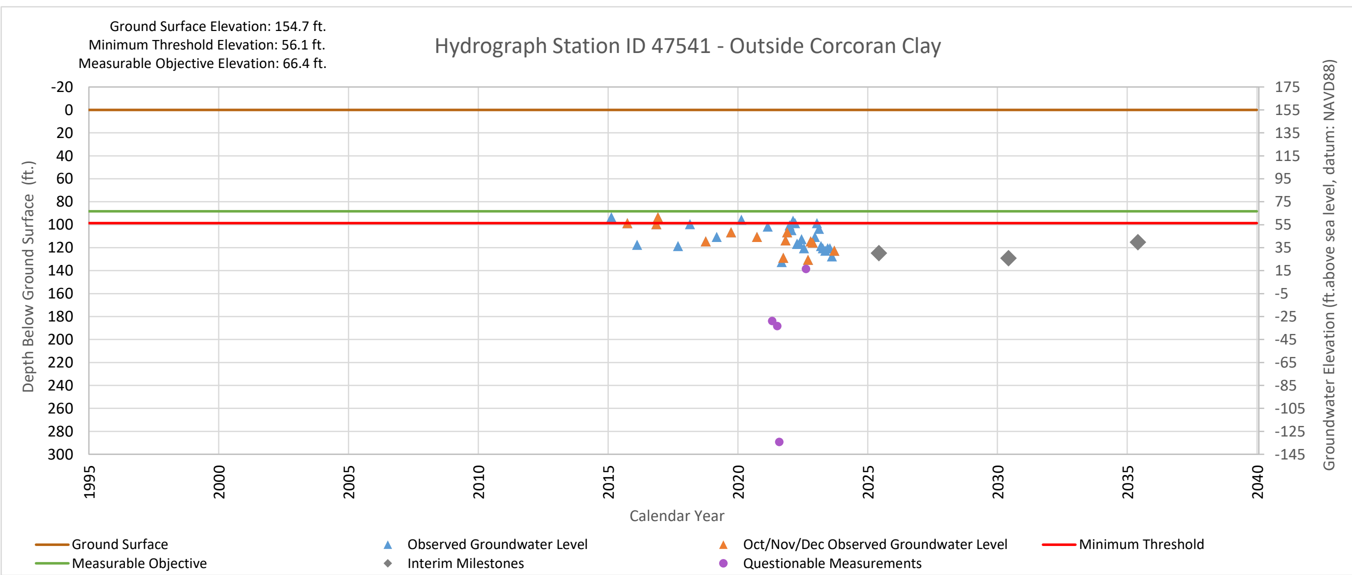
Ground Surface Elevation: 234.3 ft.
Minimum Threshold Elevation: 70.7 ft.
Measurable Objective Elevation: 100.4 ft.
Hydrograph Station ID 38884 - Outside Corcoran Clay
Depth Below Ground Surface (ft.)
-20
0
20
40
60
80
100
120
140
160
180
200
Groundwater Elevation (ft.above sea level, datum: NAVD88)
244
224
204
184
164
144
124
104
84
64
44
24
1995
2000
2005
2010
2015
2020
2025
2030
2035
2040
Calendar Year
Ground Surface
Measurable Objective
Observed Groundwater Level
Interim Milestones
Oct/Nov/Dec Observed Groundwater Level
Questionable Measurements
Minimum Threshold

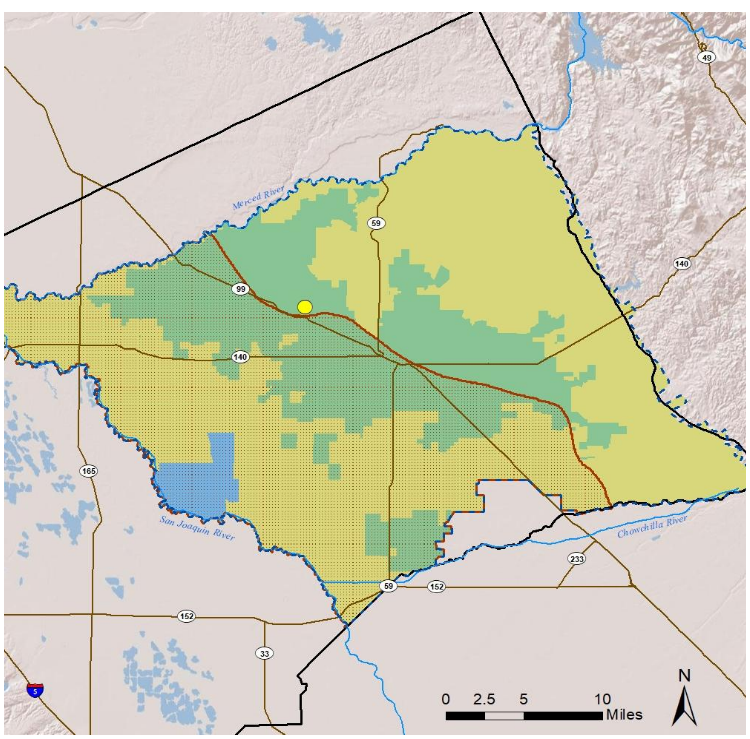


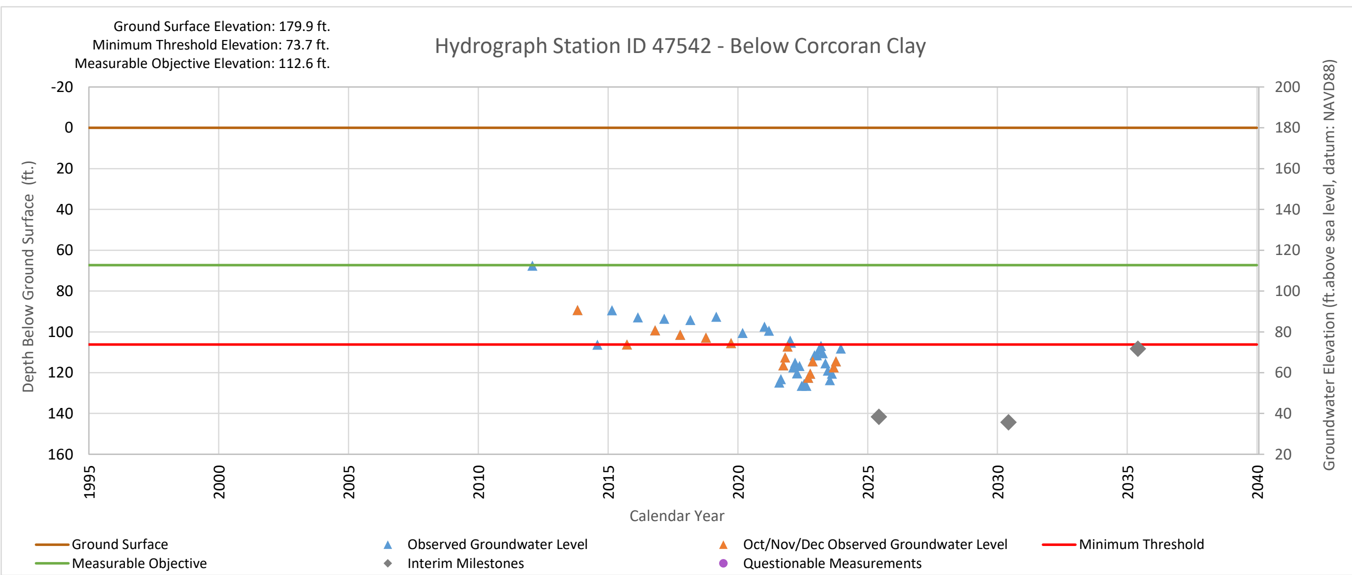
49
Merced River
59
99
140
165
San Joaquin River
Chowchilla River
233
152
33
5
0
2.5
5
10
Miles
N

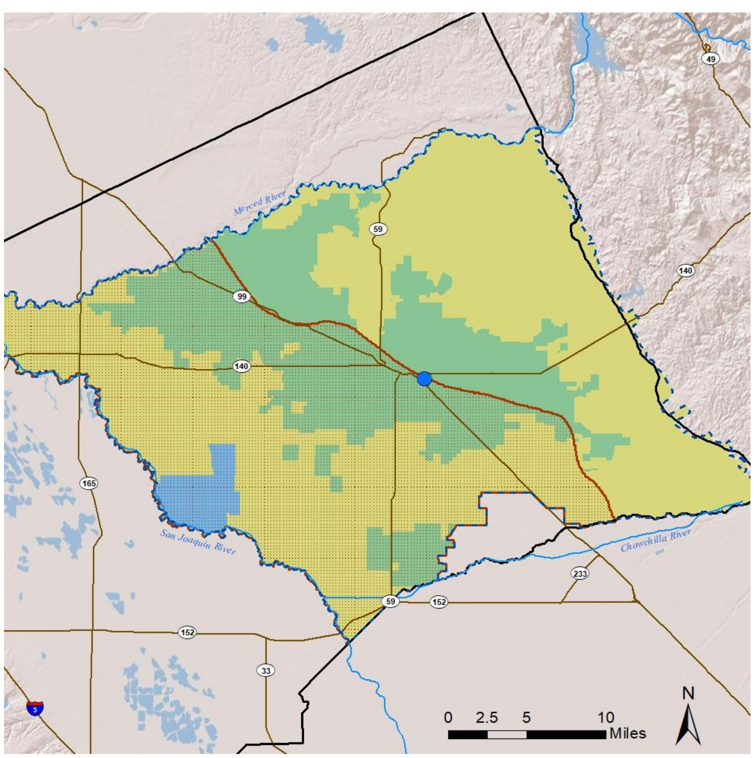

Ground Surface Elevation: 144.4 ft.
Minimum Threshold Elevation: 73.9 ft.
Measurable Objective Elevation: 104.4 ft.
Hydrograph Station ID 38974 - Below Corcoran Clay
Depth Below Ground Surface (ft.)
Groundwater Elevation (ft.above sea level, datum: NAVD88)
Calendar Year
Ground Surface
Measurable Objective
Observed Groundwater Level
Interim Milestones
Oct/Nov/Dec Observed Groundwater Level
Questionable Measurements
Minimum Threshold

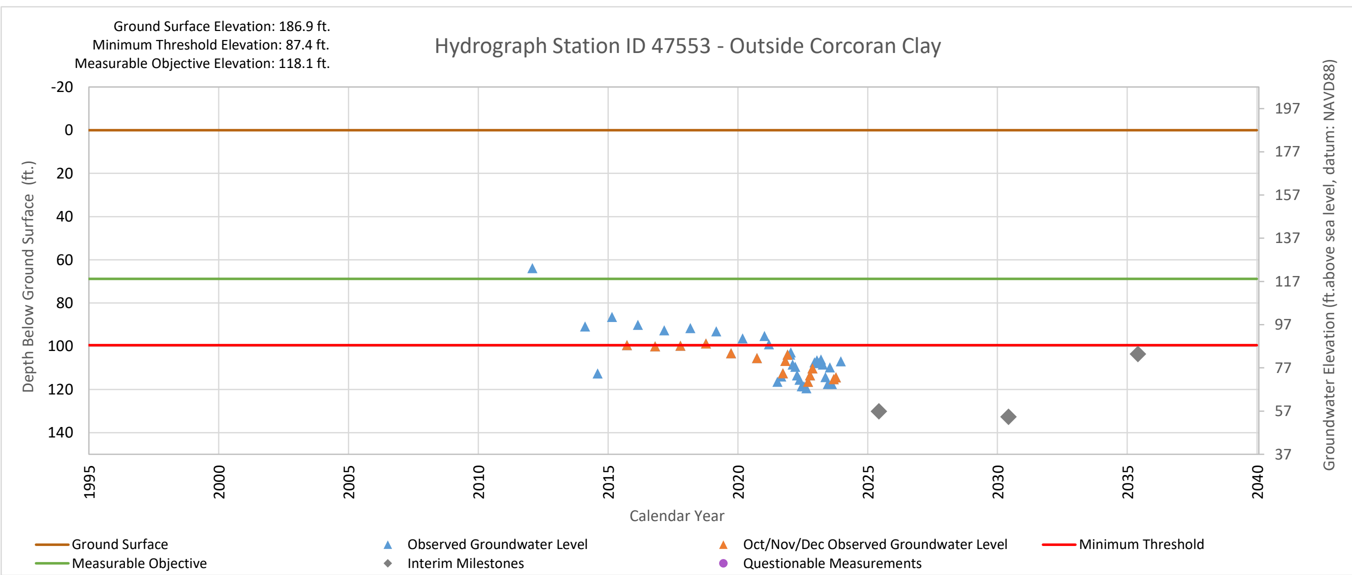

Merced River
San Joaquin River
Chowchilla River
0 2.5 5 10
Miles
N


Ground Surface Elevation: 154.7 ft.
Minimum Threshold Elevation: 56.1 ft.
Measurable Objective Elevation: 66.4 ft.
Hydrograph Station ID 47541 - Outside Corcoran Clay
Depth Below Ground Surface (ft.)
Groundwater Elevation (ft.above sea level, datum: NAVD88)
-20
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
175
155
135
115
95
75
55
35
15
-5
-25
-45
-65
-85
-105
-125
-145
1995
2000
2005
2010
2015
2020
2025
2030
2035
2040
Calendar Year
Ground Surface
Measurable Objective
Observed Groundwater Level
Interim Milestones
Oct/Nov/Dec Observed Groundwater Level
Questionable Measurements
Minimum Threshold

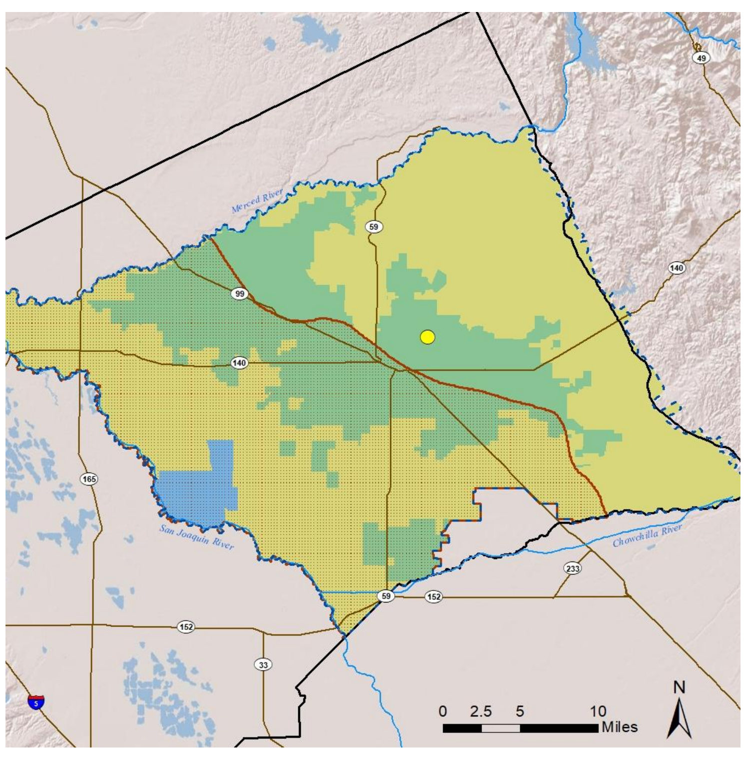

Merced River
San Joaquin River
Chowchilla River
49
59
99
140
165
152
233
33
5
0
2.5
5
10
Miles
N


Ground Surface Elevation: 179.9 ft.
Minimum Threshold Elevation: 73.7 ft.
Measurable Objective Elevation: 112.6 ft.
Hydrograph Station ID 47542 - Below Corcoran Clay
Depth Below Ground Surface (ft.)
Groundwater Elevation (ft.above sea level, datum: NAVD88)
Calendar Year
Ground Surface
Measurable Objective
Observed Groundwater Level
Interim Milestones
Oct/Nov/Dec Observed Groundwater Level
Questionable Measurements
Minimum Threshold

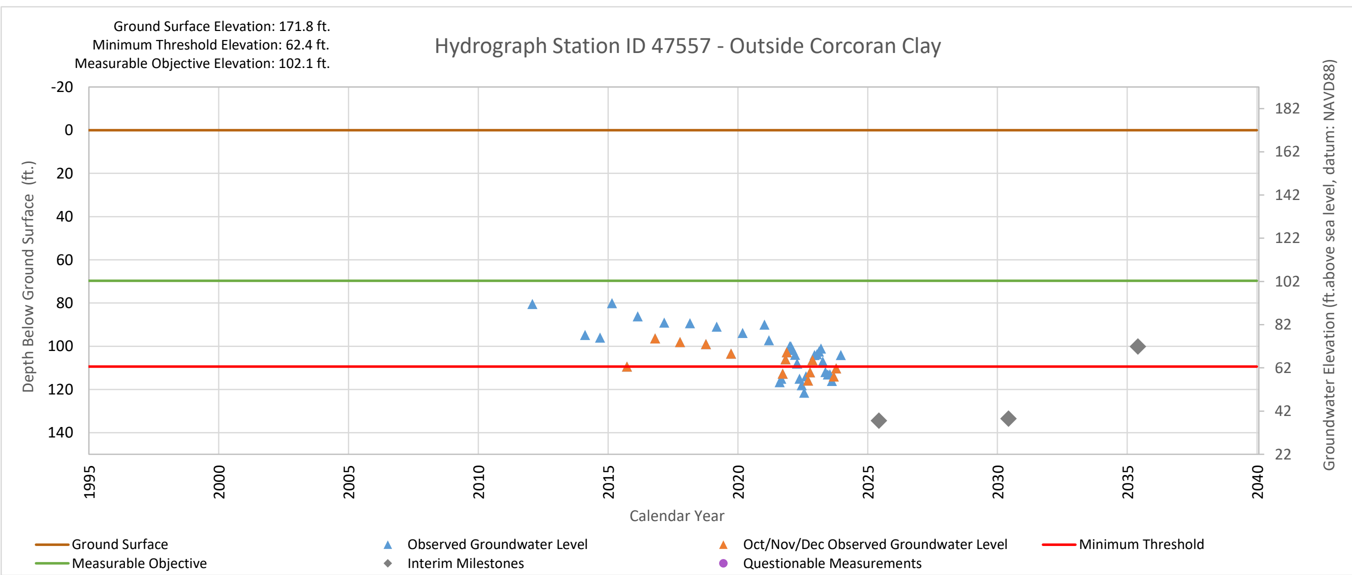

Merced River
San Joaquin River
Chowchilla River
0 2.5 5 10
Miles
N

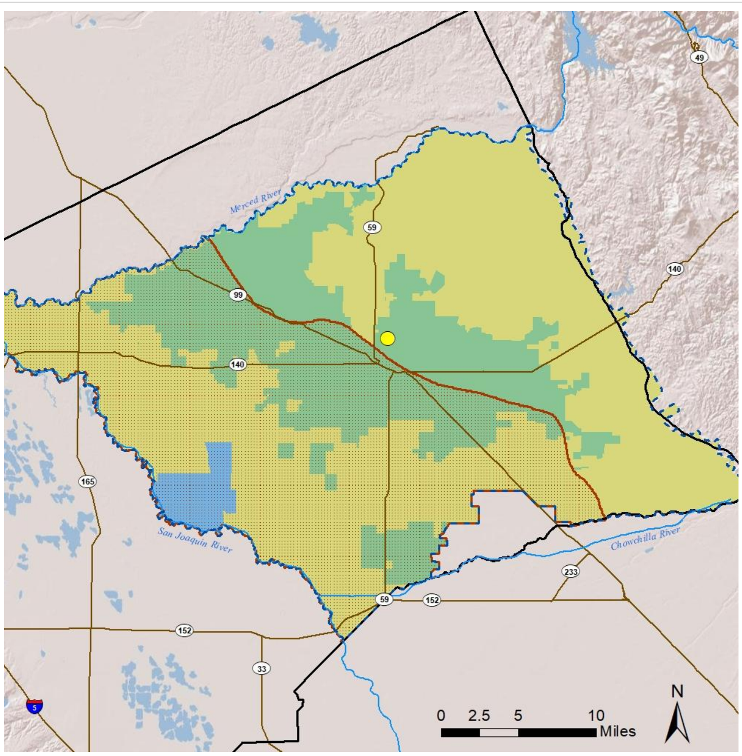


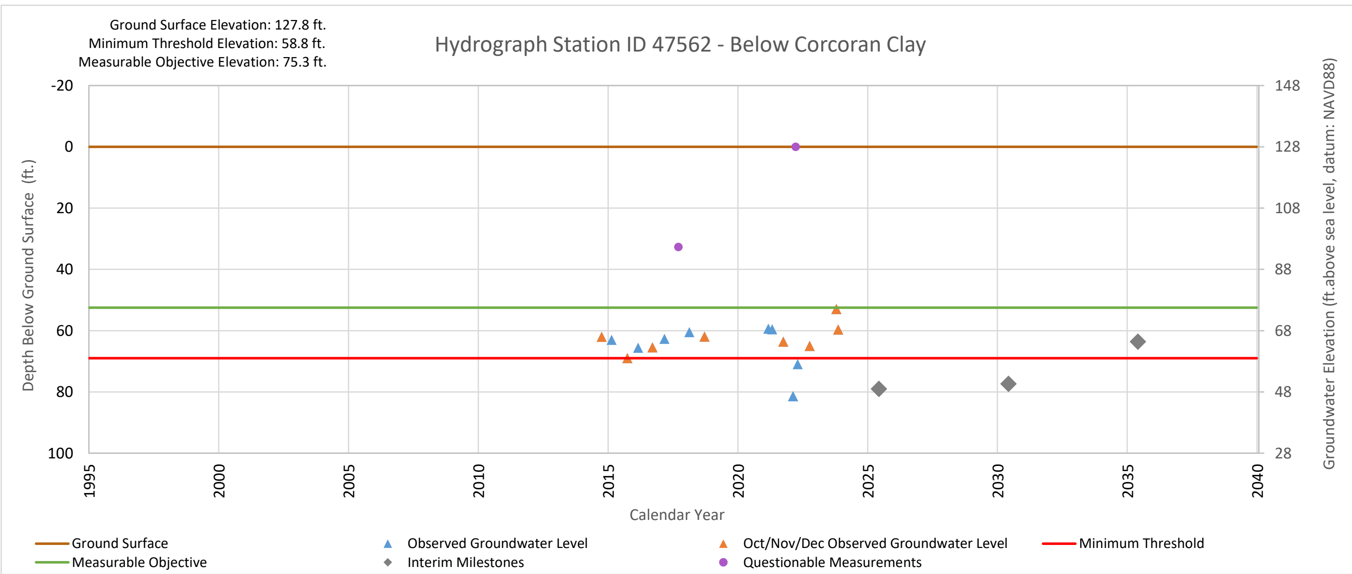
Ground Surface Elevation: 186.9 ft.
Minimum Threshold Elevation: 87.4 ft.
Measurable Objective Elevation: 118.1 ft.
Hydrograph Station ID 47553 - Outside Corcoran Clay
Depth Below Ground Surface (ft.)
Groundwater Elevation (ft.above sea level, datum: NAVD88)
Calendar Year
Ground Surface
Measurable Objective
Observed Groundwater Level
Interim Milestones
Oct/Nov/Dec Observed Groundwater Level
Questionable Measurements
Minimum Threshold



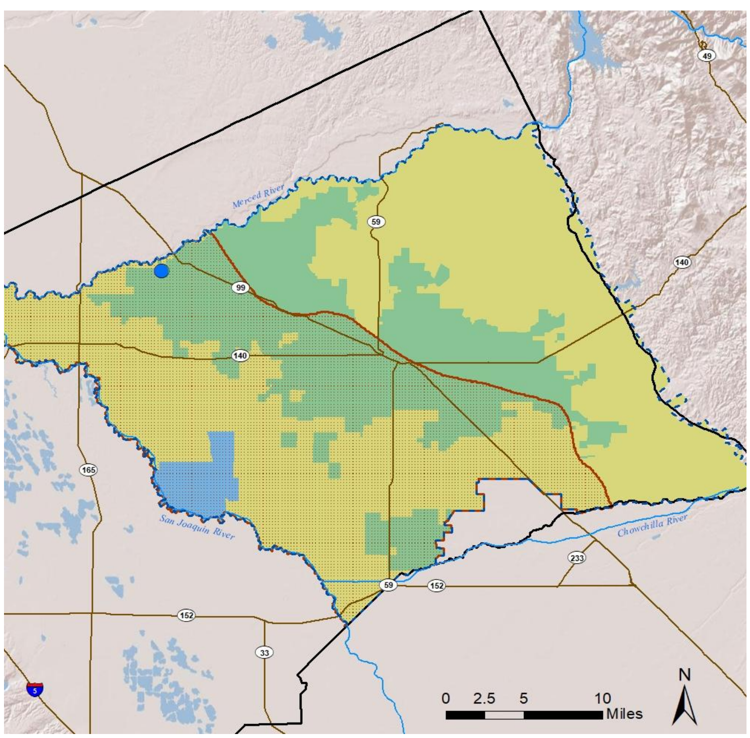
Merced River
San Joaquin River
Chowchilla River
0 2.5 5 10
Miles
N


Ground Surface Elevation: 171.8 ft.
Minimum Threshold Elevation: 62.4 ft.
Measurable Objective Elevation: 102.1 ft.
Hydrograph Station ID 47557 - Outside Corcoran Clay
Depth Below Ground Surface (ft.)
Groundwater Elevation (ft.above sea level, datum: NAVD88)
Calendar Year
-20
0
20
40
60
80
100
120
140
182
162
142
122
102
82
62
42
22
1995
2000
2005
2010
2015
2020
2025
2030
2035
2040
Ground Surface
Measurable Objective
Observed Groundwater Level
Interim Milestones
Oct/Nov/Dec Observed Groundwater Level
Questionable Measurements
Minimum Threshold

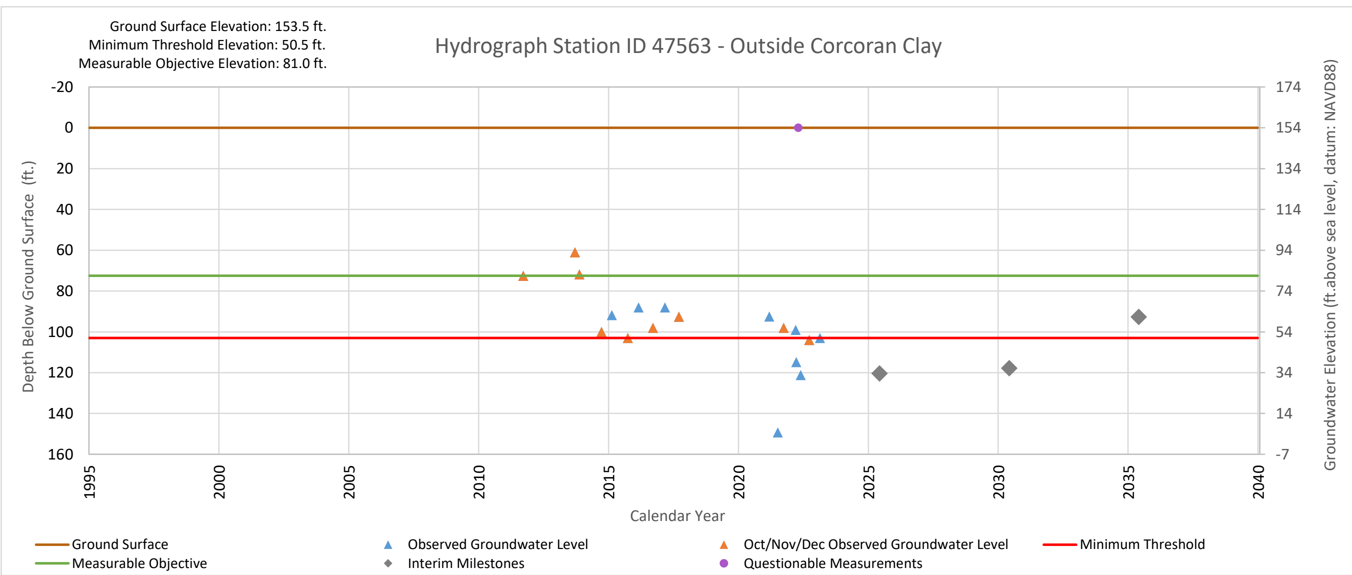

Merced River
San Joaquin River
Chowchilla River
49
59
99
140
165
152
233
33
5
0
2.5
5
10
Miles
N

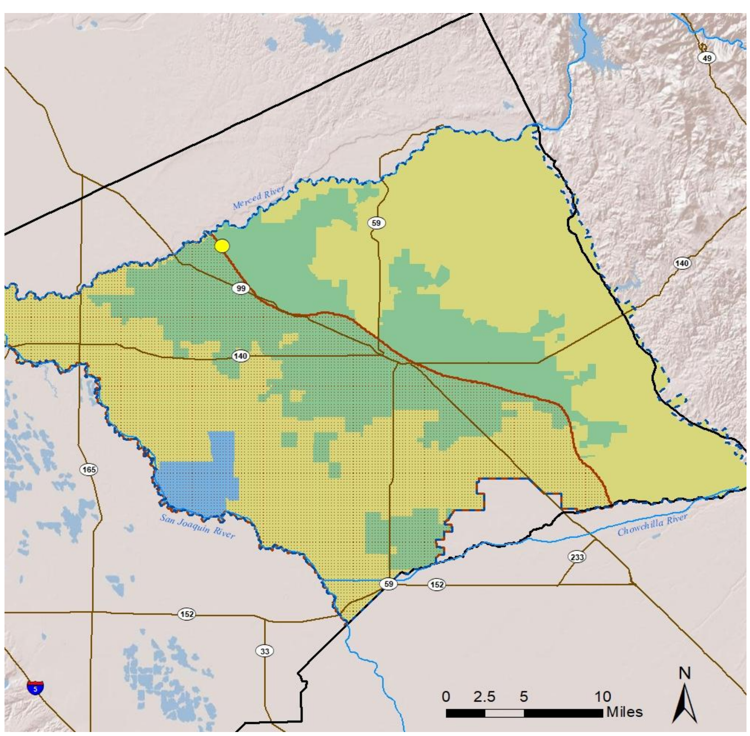


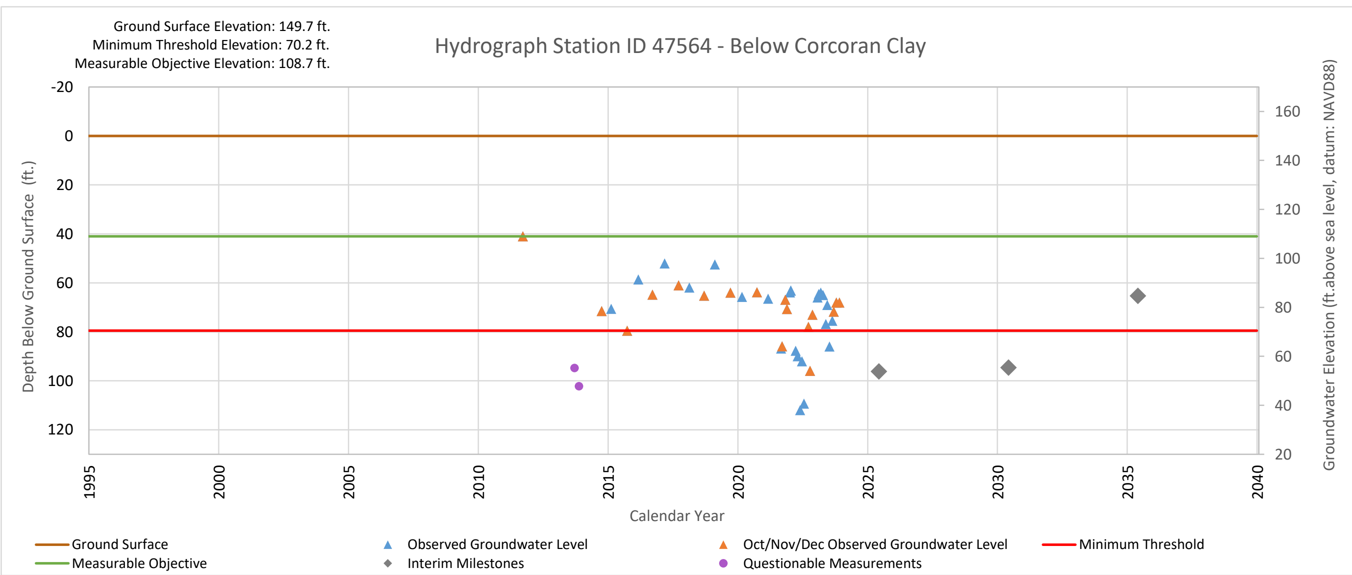
Ground Surface Elevation: 127.8 ft.
Minimum Threshold Elevation: 58.8 ft.
Measurable Objective Elevation: 75.3 ft.
Hydrograph Station ID 47562 - Below Corcoran Clay
Depth Below Ground Surface (ft.)
Groundwater Elevation (ft.above sea level, datum: NAVD88)
Calendar Year
Ground Surface
Measurable Objective
Observed Groundwater Level
Interim Milestones
Oct/Nov/Dec Observed Groundwater Level
Questionable Measurements
Minimum Threshold

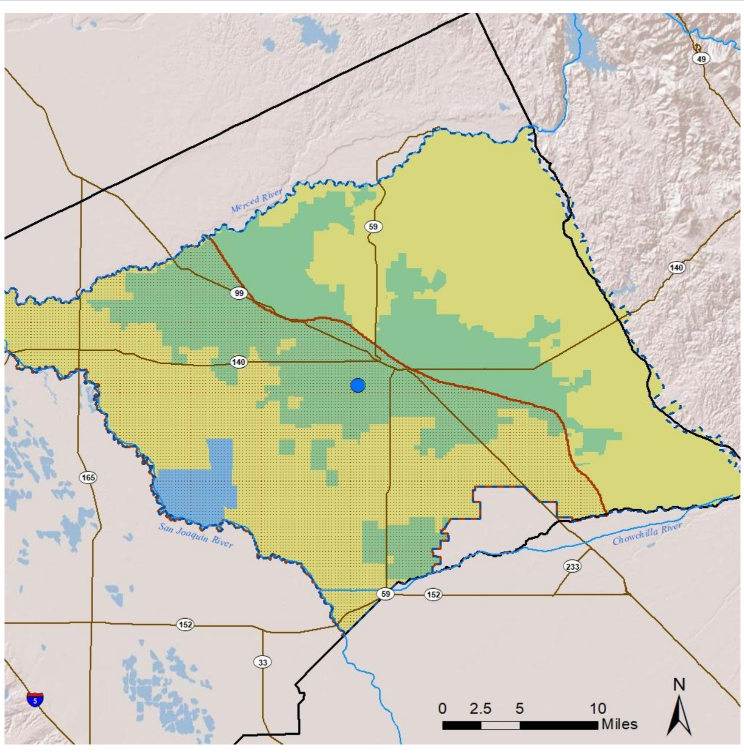


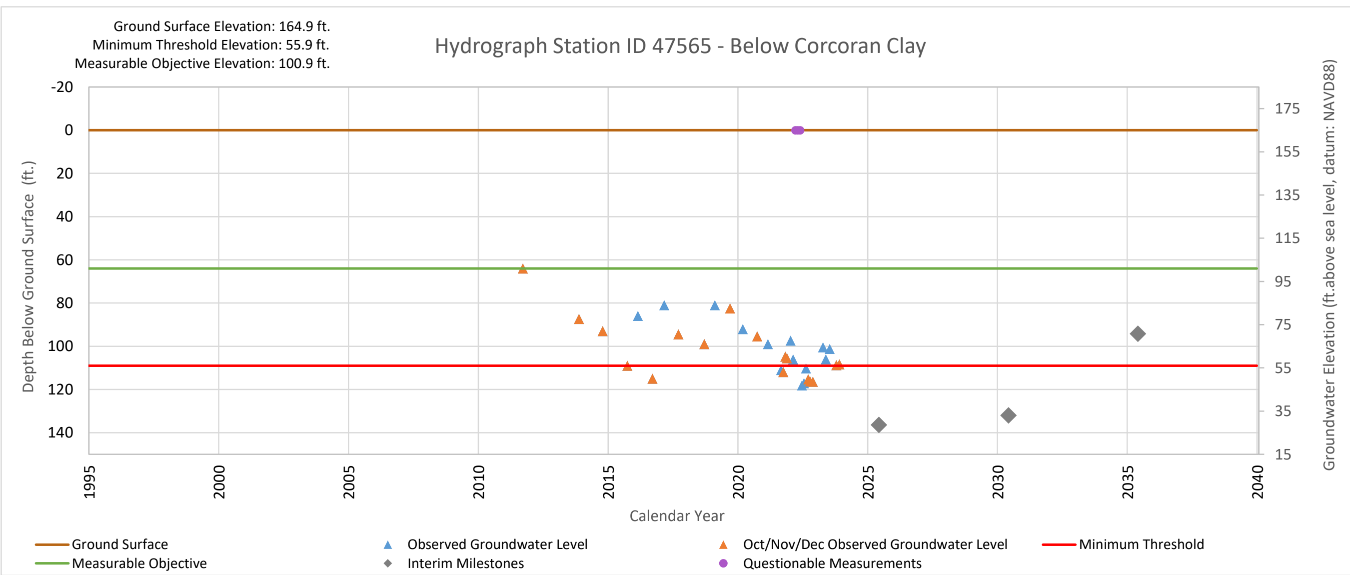
Merced River
San Joaquin River
Chowchilla River
0 2.5 5 10
Miles
N

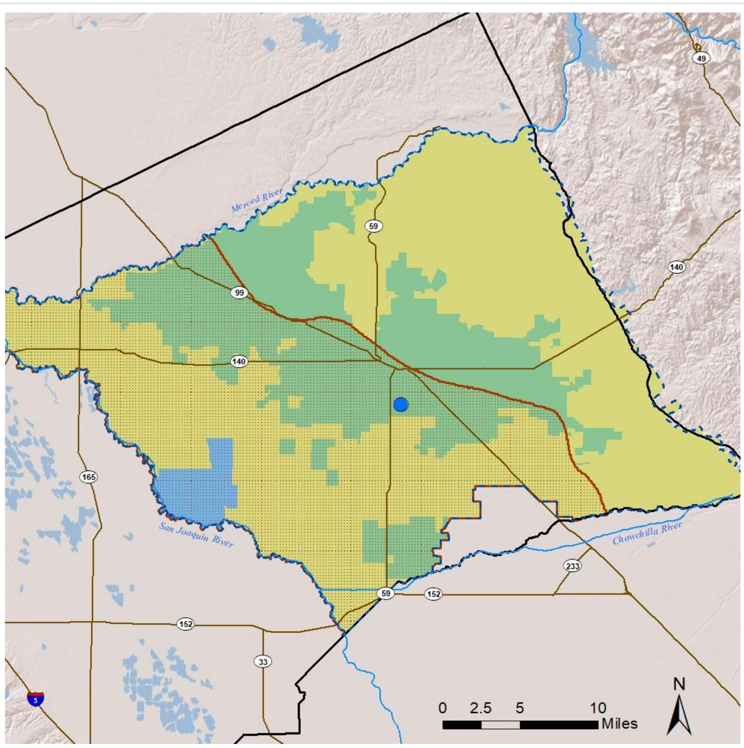

Ground Surface Elevation: 153.5 ft.
Minimum Threshold Elevation: 50.5 ft.
Measurable Objective Elevation: 81.0 ft.
Hydrograph Station ID 47563 - Outside Corcoran Clay
Depth Below Ground Surface (ft.)
Groundwater Elevation (ft.above sea level, datum: NAVD88)
-20
0
20
40
60
80
100
120
140
160
174
154
134
114
94
74
54
34
14
-7
1995
2000
2005
2010
2015
2020
2025
2030
2035
2040
Calendar Year
Ground Surface
Measurable Objective
Observed Groundwater Level
Interim Milestones
Oct/Nov/Dec Observed Groundwater Level
Questionable Measurements
Minimum Threshold

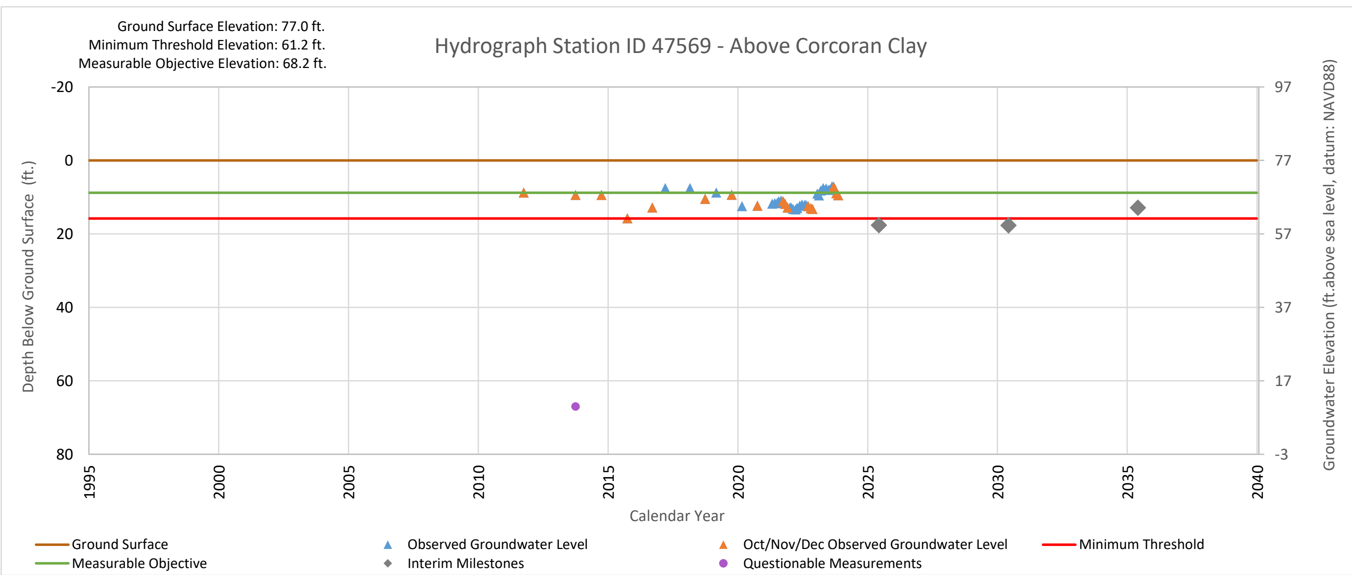

Merced River
San Joaquin River
Chowchilla River
49
59
140
99
165
233
152
33
5
N
0 2.5 5 10
Miles


Ground Surface Elevation: 149.7 ft.
Minimum Threshold Elevation: 70.2 ft.
Measurable Objective Elevation: 108.7 ft.
Hydrograph Station ID 47564 - Below Corcoran Clay
Depth Below Ground Surface (ft.)
Groundwater Elevation (ft.above sea level, datum: NAVD88)
Calendar Year
Ground Surface
Measurable Objective
Observed Groundwater Level
Interim Milestones
Oct/Nov/Dec Observed Groundwater Level
Questionable Measurements
Minimum Threshold

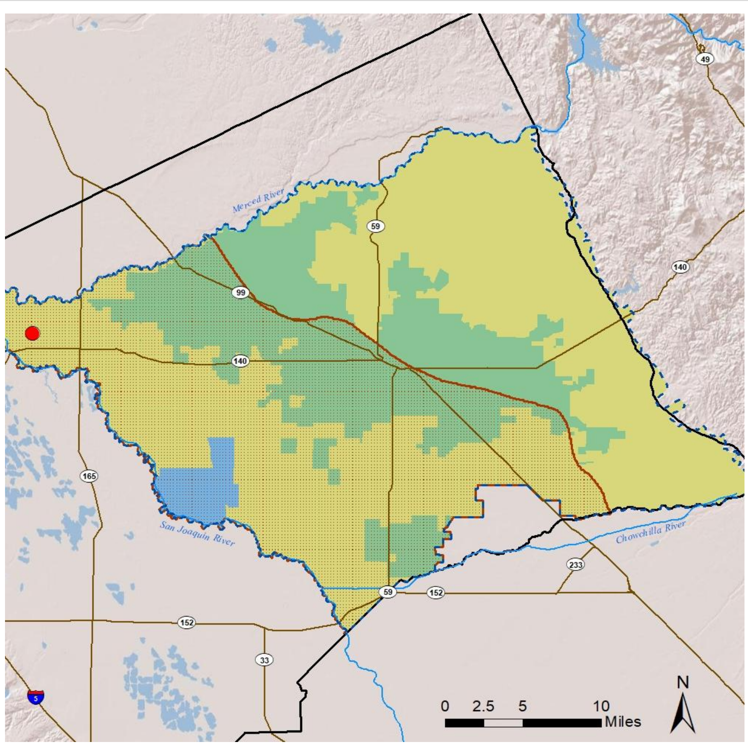

Merced River
San Joaquin River
Chowchilla River
0 2.5 5 10
Miles
N


Ground Surface Elevation: 164.9 ft.
Minimum Threshold Elevation: 55.9 ft.
Measurable Objective Elevation: 100.9 ft.
Hydrograph Station ID 47565 - Below Corcoran Clay
Depth Below Ground Surface (ft.)
Groundwater Elevation (ft.above sea level, datum: NAVD88)
Calendar Year
Ground Surface
Measurable Objective
Observed Groundwater Level
Interim Milestones
Oct/Nov/Dec Observed Groundwater Level
Questionable Measurements
Minimum Threshold

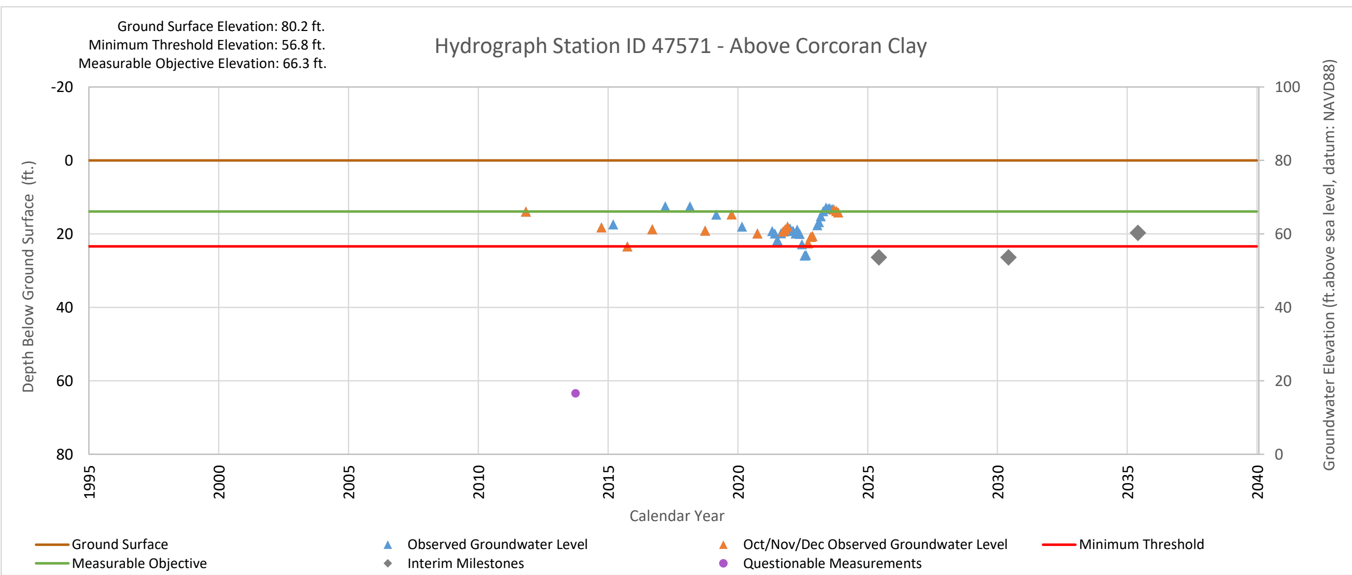

Merced River
San Joaquin River
Chowchilla River
N
0 2.5 5 10
Miles

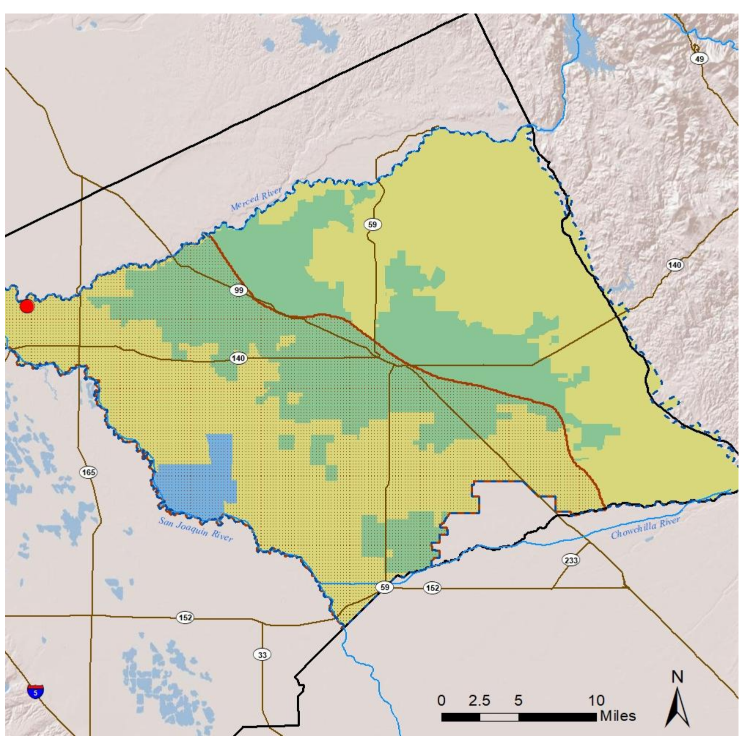


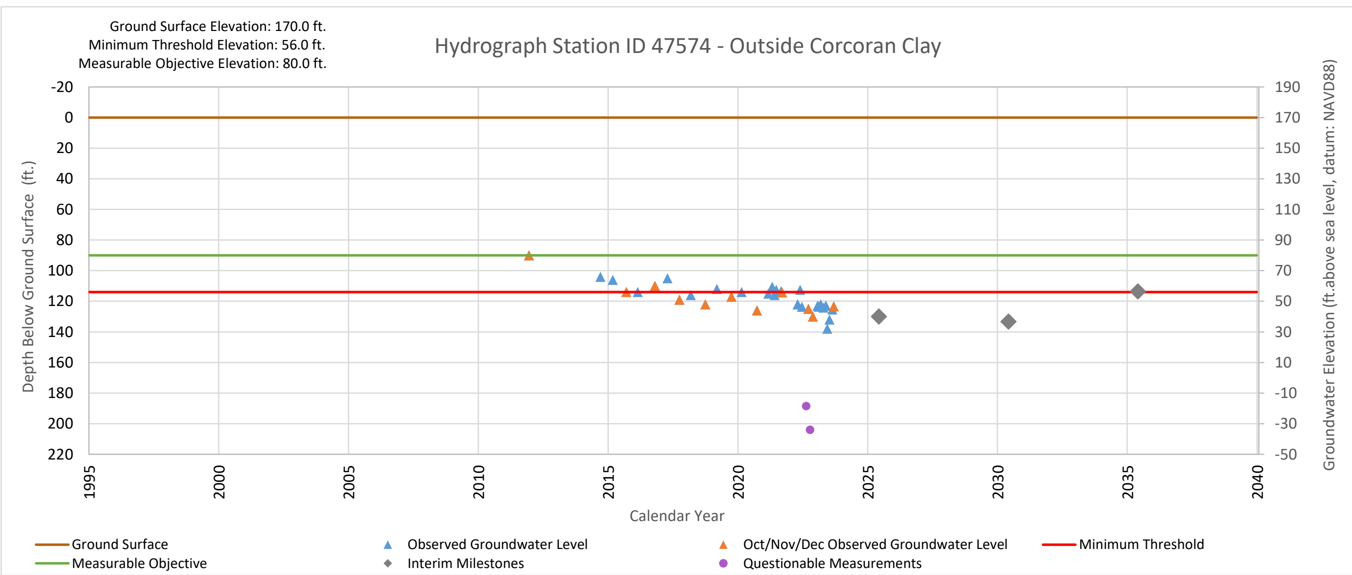
Ground Surface Elevation: 77.0 ft.
Minimum Threshold Elevation: 61.2 ft.
Measurable Objective Elevation: 68.2 ft.
Hydrograph Station ID 47569 - Above Corcoran Clay
Depth Below Ground Surface (ft.)
Groundwater Elevation (ft.above sea level, datum: NAVD88)
Calendar Year
Ground Surface
Measurable Objective
Observed Groundwater Level
Interim Milestones
Oct/Nov/Dec Observed Groundwater Level
Questionable Measurements
Minimum Threshold



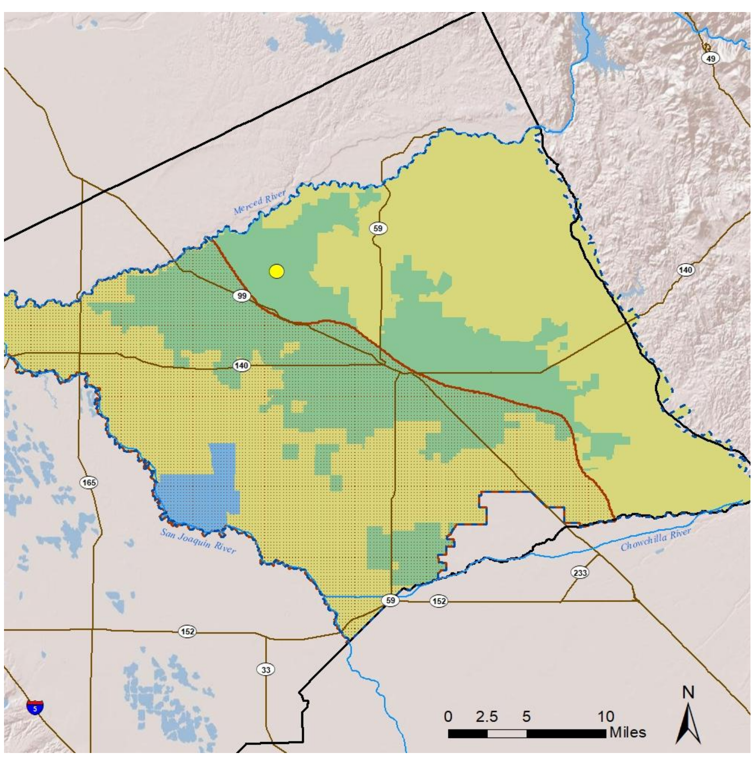
Merced River
San Joaquin River
Chowchilla River
0 2.5 5 10
Miles
N


Ground Surface Elevation: 80.2 ft.
Minimum Threshold Elevation: 56.8 ft.
Measurable Objective Elevation: 66.3 ft.
Hydrograph Station ID 47571 - Above Corcoran Clay
Depth Below Ground Surface (ft.)
Groundwater Elevation (ft.above sea level, datum: NAVD88)
Calendar Year
Ground Surface
Measurable Objective
Observed Groundwater Level
Interim Milestones
Oct/Nov/Dec Observed Groundwater Level
Questionable Measurements
Minimum Threshold

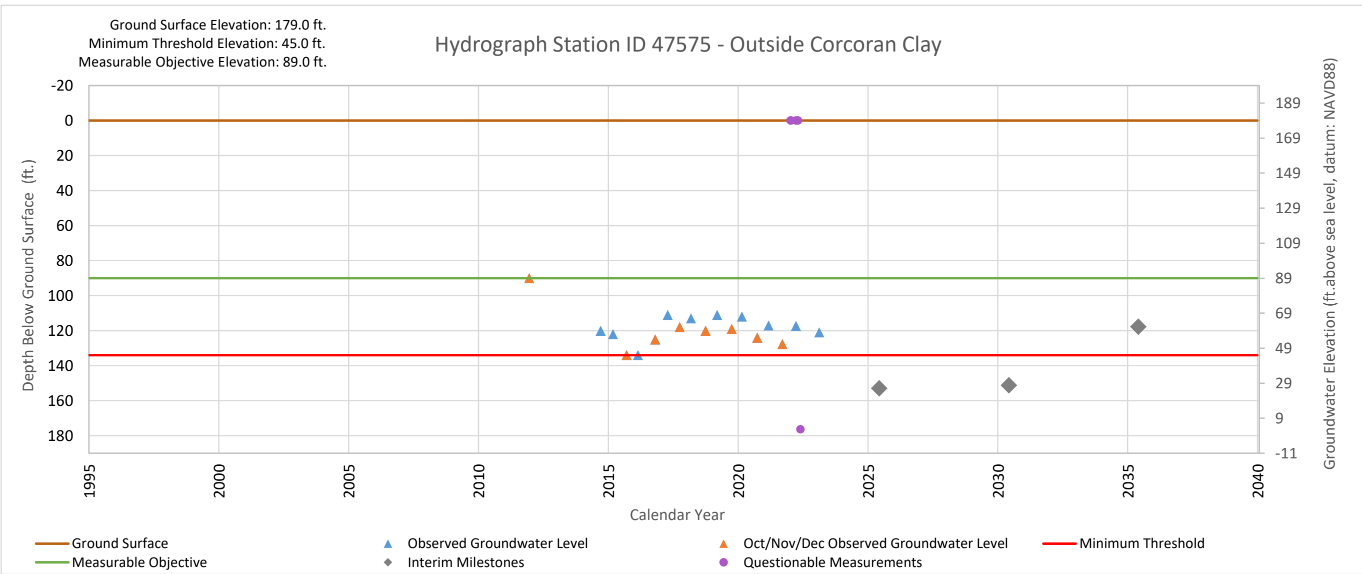

Merced River
San Joaquin River
Chowchilla River
0 2.5 5 10
Miles
N



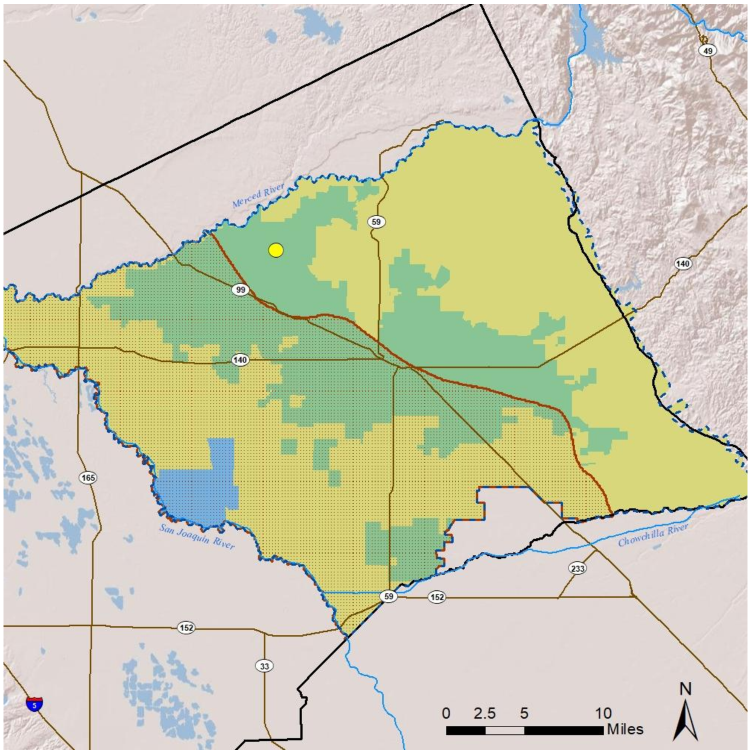
Ground Surface Elevation: 170.0 ft.
Minimum Threshold Elevation: 56.0 ft.
Measurable Objective Elevation: 80.0 ft.
Hydrograph Station ID 47574 - Outside Corcoran Clay
Depth Below Ground Surface (ft.)
Groundwater Elevation (ft.above sea level, datum: NAVD88)
Calendar Year
Ground Surface
Measurable Objective
Observed Groundwater Level
Interim Milestones
Oct/Nov/Dec Observed Groundwater Level
Questionable Measurements
Minimum Threshold



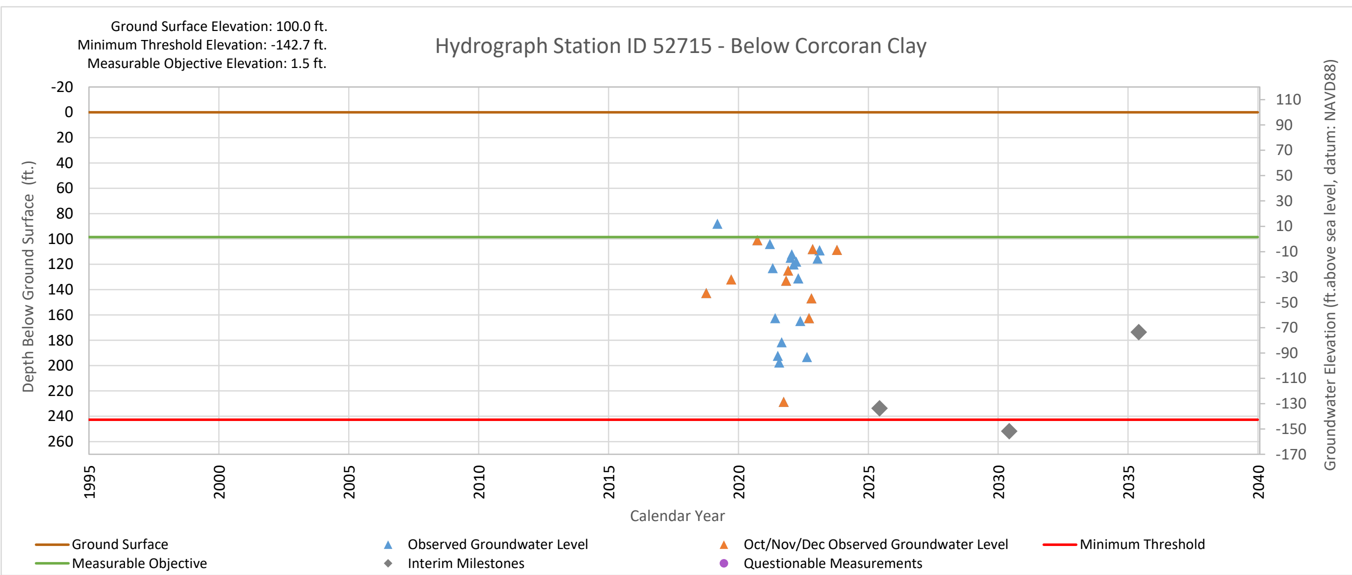
Merced River
San Joaquin River
Chowchilla River
0 2.5 5 10 Miles
N

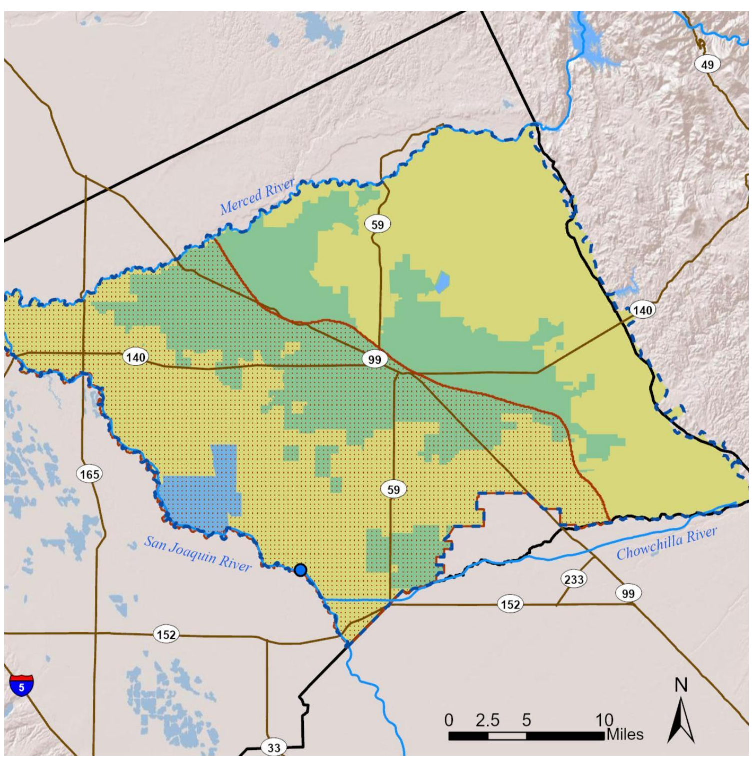


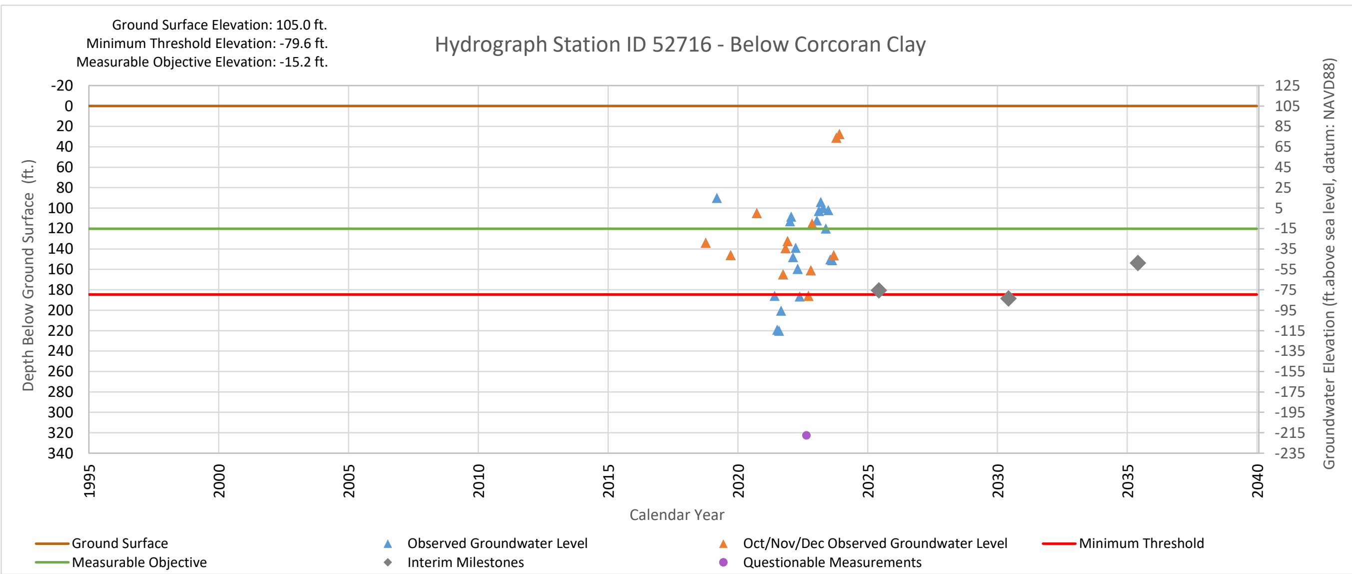
Ground Surface Elevation: 179.0 ft.
Minimum Threshold Elevation: 45.0 ft.
Measurable Objective Elevation: 89.0 ft.
Hydrograph Station ID 47575 - Outside Corcoran Clay
Depth Below Ground Surface (ft.)
Groundwater Elevation (ft.above sea level, datum: NAVD88)
Calendar Year
-20
0
20
40
60
80
100
120
140
160
180
189
169
149
129
109
89
69
49
29
9
-11
1995
2000
2005
2010
2015
2020
2025
2030
2035
2040
Ground Surface
Measurable Objective
Observed Groundwater Level
Interim Milestones
Oct/Nov/Dec Observed Groundwater Level
Questionable Measurements
Minimum Threshold

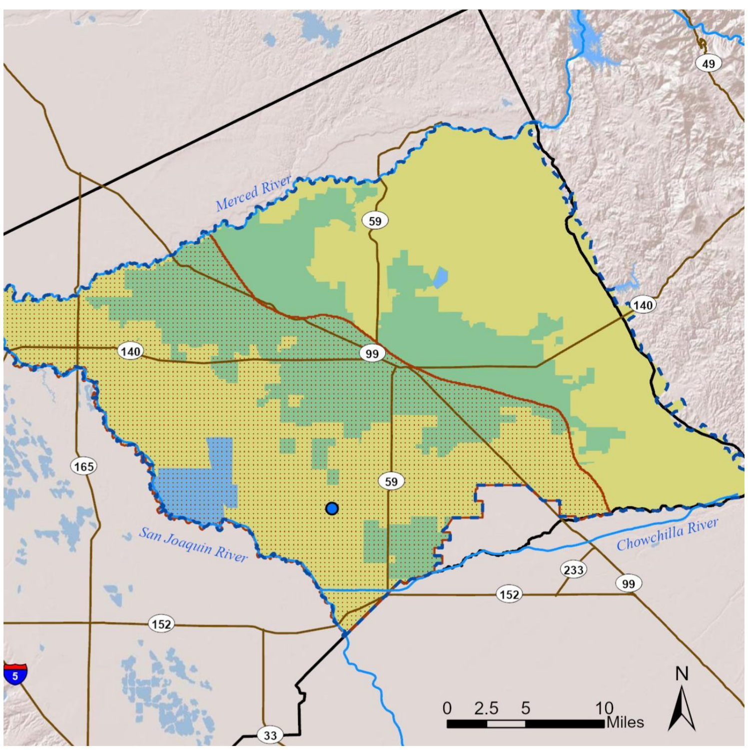


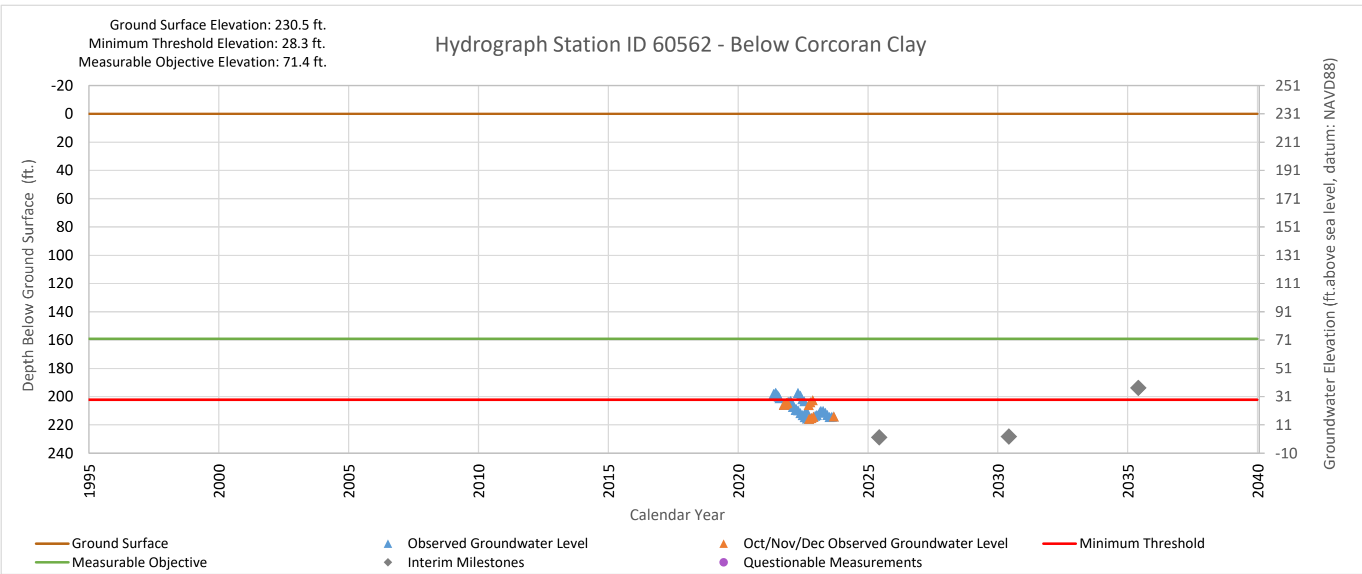
Merced River
San Joaquin River
Chowchilla River
49
59
99
140
165
233
152
33
5
0
2.5
5
10
Miles
N

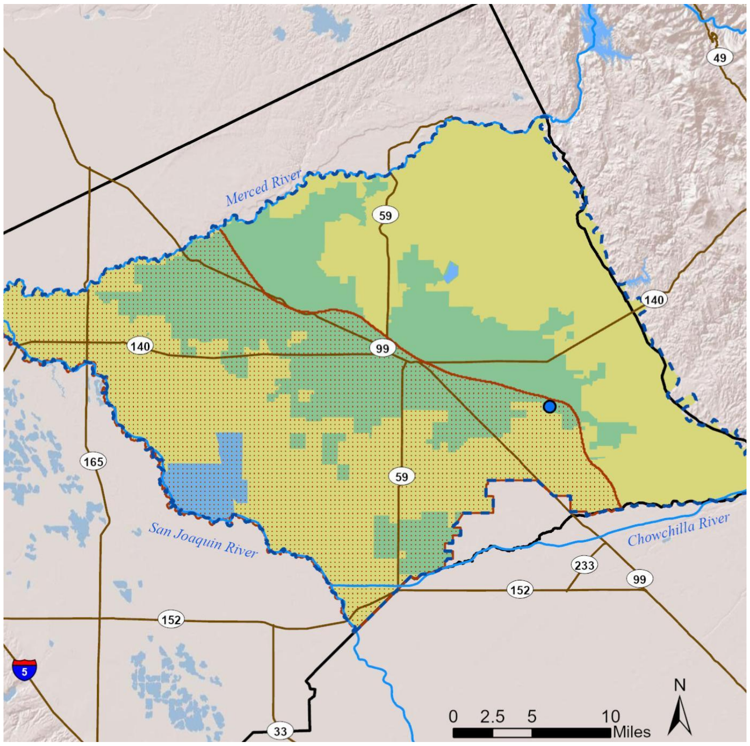

Ground Surface Elevation: 100.0 ft.
Minimum Threshold Elevation: -142.7 ft.
Measurable Objective Elevation: 1.5 ft.
Hydrograph Station ID 52715 - Below Corcoran Clay
Depth Below Ground Surface (ft.)
-20
0
20
40
60
80
100
120
140
160
180
200
220
240
260
Groundwater Elevation (ft.above sea level, datum: NAVD88)
110
90
70
50
30
10
-10
-30
-50
-70
-90
-110
-130
-150
-170
1995
2000
2005
2010
2015
2020
2025
2030
2035
2040
Calendar Year
Ground Surface
Measurable Objective
Observed Groundwater Level
Interim Milestones
Oct/Nov/Dec Observed Groundwater Level
Questionable Measurements
Minimum Threshold

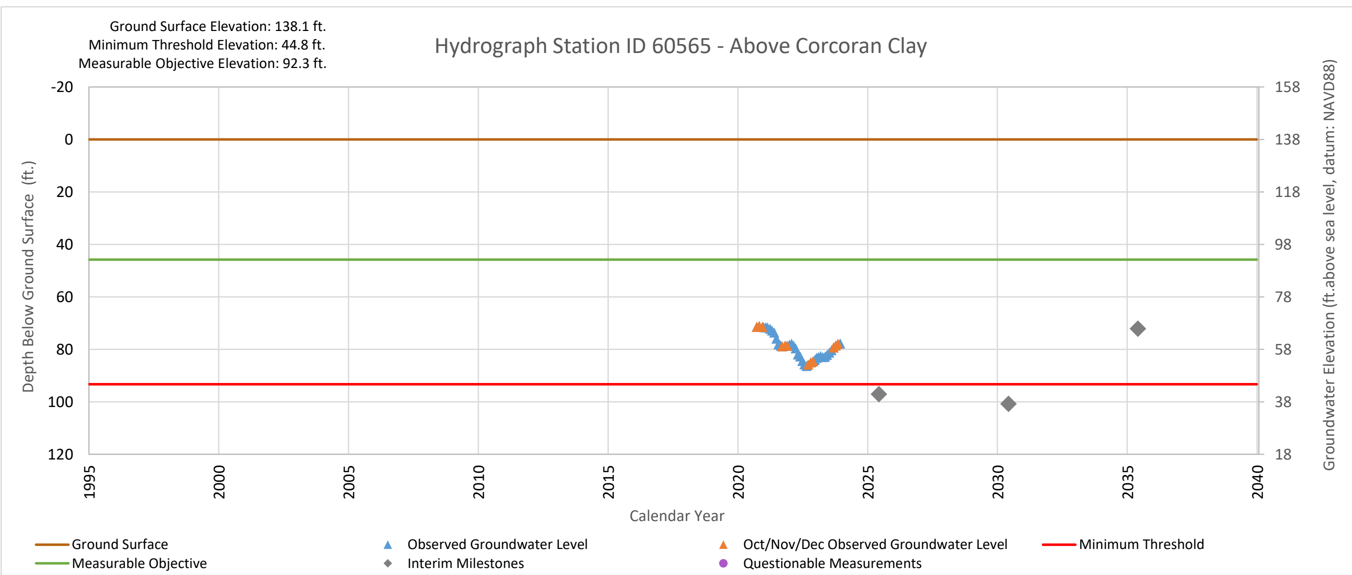

49
Merced River
59
140
99
140
165
59
San Joaquin River
Chowchilla River
233
99
152
152
5
33
N
0 2.5 5 10
Miles

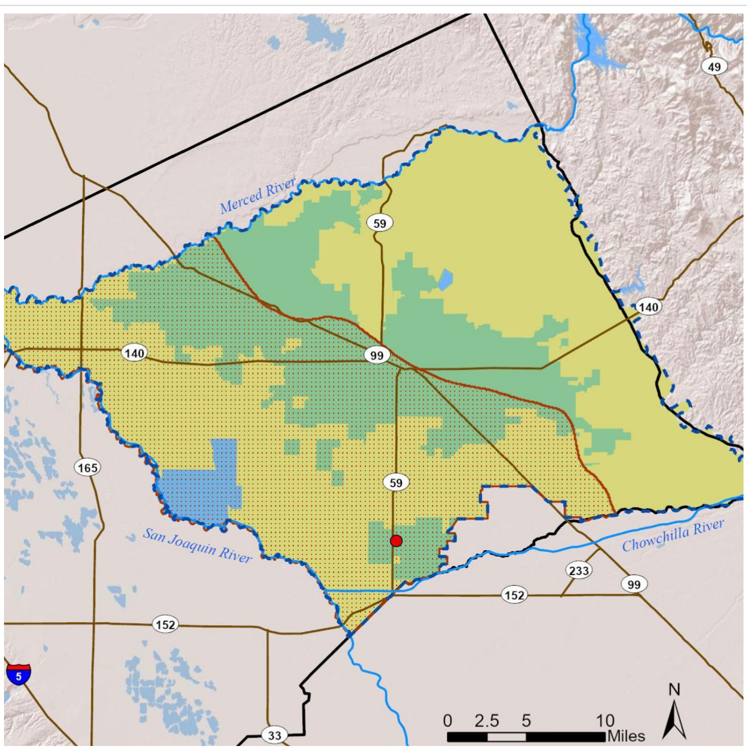

Ground Surface Elevation: 105.0 ft.
Minimum Threshold Elevation: -79.6 ft.
Measurable Objective Elevation: -15.2 ft.
Hydrograph Station ID 52716 - Below Corcoran Clay
Depth Below Ground Surface (ft.)
Groundwater Elevation (ft.above sea level, datum: NAVD88)
Calendar Year
Ground Surface
Measurable Objective
Observed Groundwater Level
Interim Milestones
Oct/Nov/Dec Observed Groundwater Level
Questionable Measurements
Minimum Threshold

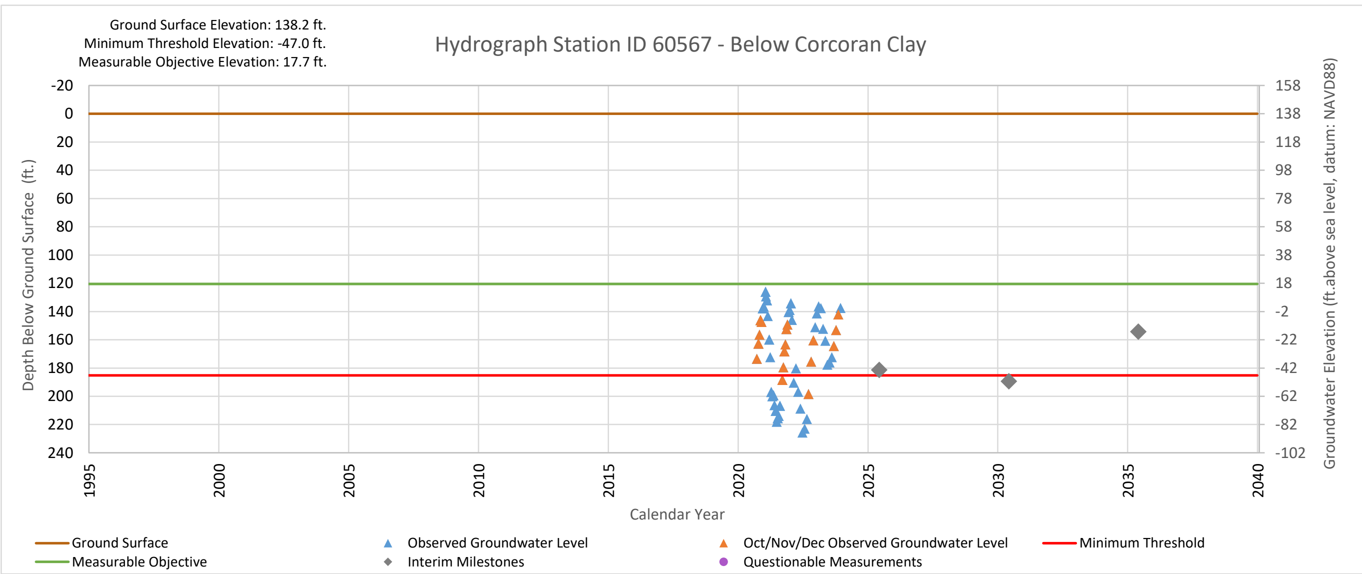

Merced River
San Joaquin River
Chowchilla River
49
59
140
99
165
152
233
33
5
0 2.5 5 10
Miles
N


Ground Surface Elevation: 230.5 ft.
Minimum Threshold Elevation: 28.3 ft.
Measurable Objective Elevation: 71.4 ft.
Hydrograph Station ID 60562 - Below Corcoran Clay
Depth Below Ground Surface (ft.)
Groundwater Elevation (ft.above sea level, datum: NAVD88)
Calendar Year
Ground Surface
Measurable Objective
Observed Groundwater Level
Interim Milestones
Oct/Nov/Dec Observed Groundwater Level
Questionable Measurements
Minimum Threshold

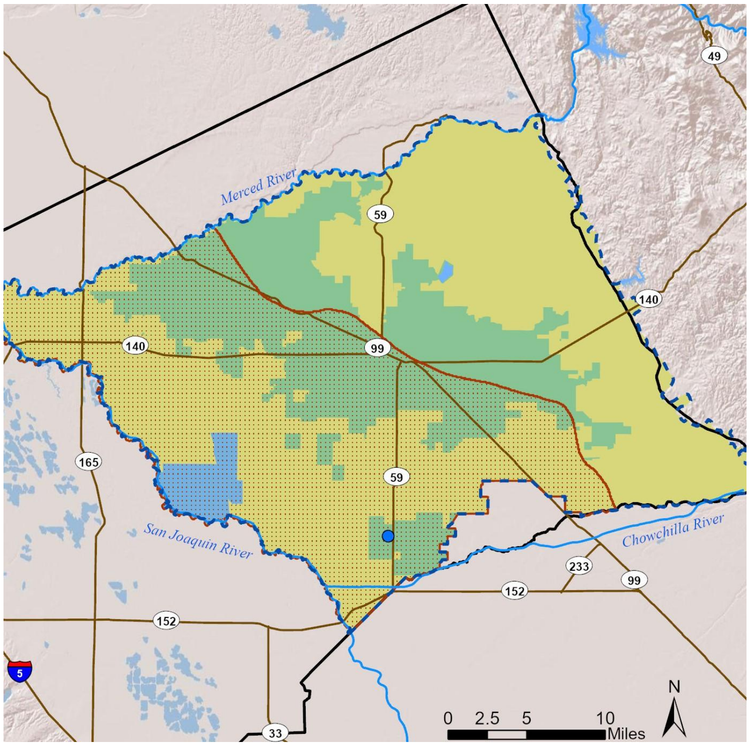

Merced River
San Joaquin River
Chowchilla River
0 2.5 5 10
Miles
N


Ground Surface Elevation: 138.1 ft.
Minimum Threshold Elevation: 44.8 ft.
Measurable Objective Elevation: 92.3 ft.
Hydrograph Station ID 60565 - Above Corcoran Clay
Depth Below Ground Surface (ft.)
Groundwater Elevation (ft.above sea level, datum: NAVD88)
Calendar Year
Ground Surface
Measurable Objective
Observed Groundwater Level
Interim Milestones
Oct/Nov/Dec Observed Groundwater Level
Questionable Measurements
Minimum Threshold

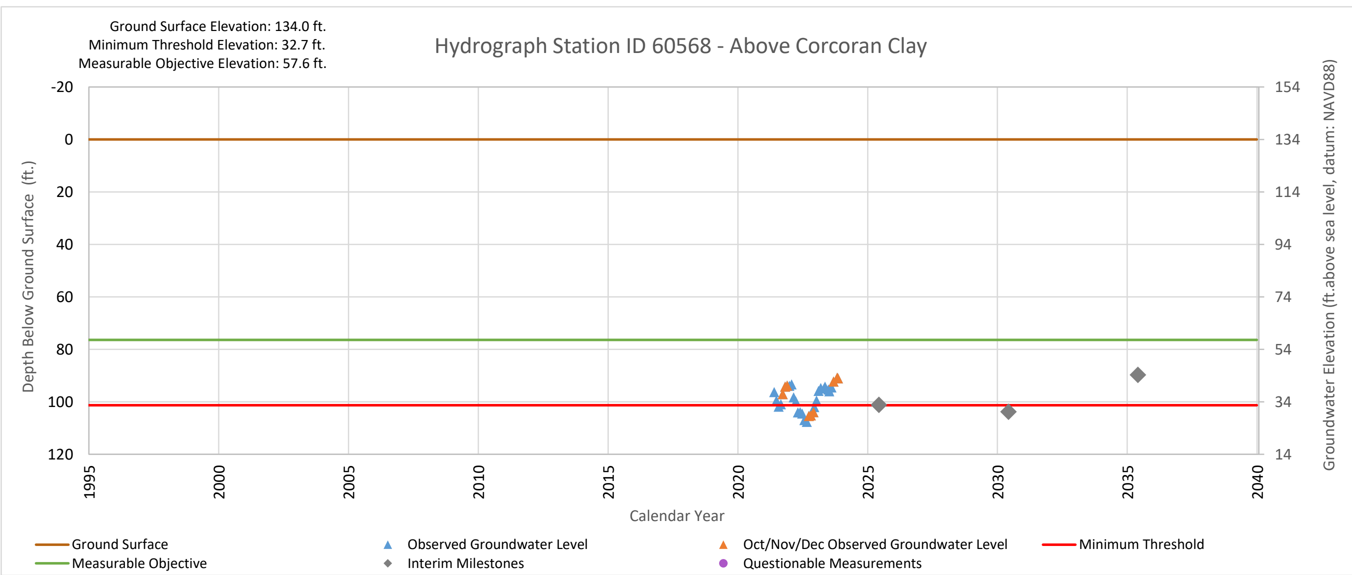

Merced River
San Joaquin River
Chowchilla River
0 2.5 5 10 Miles
N

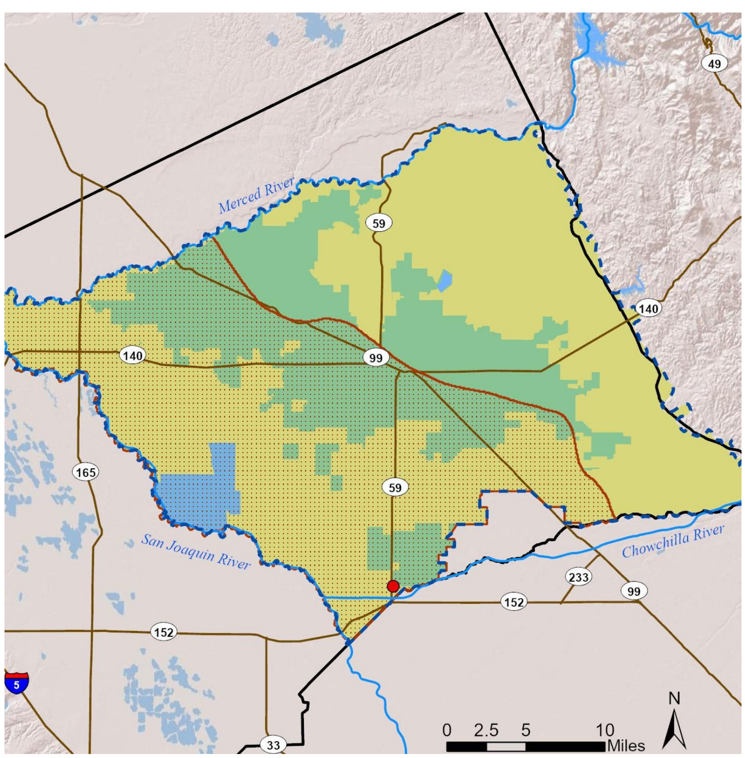


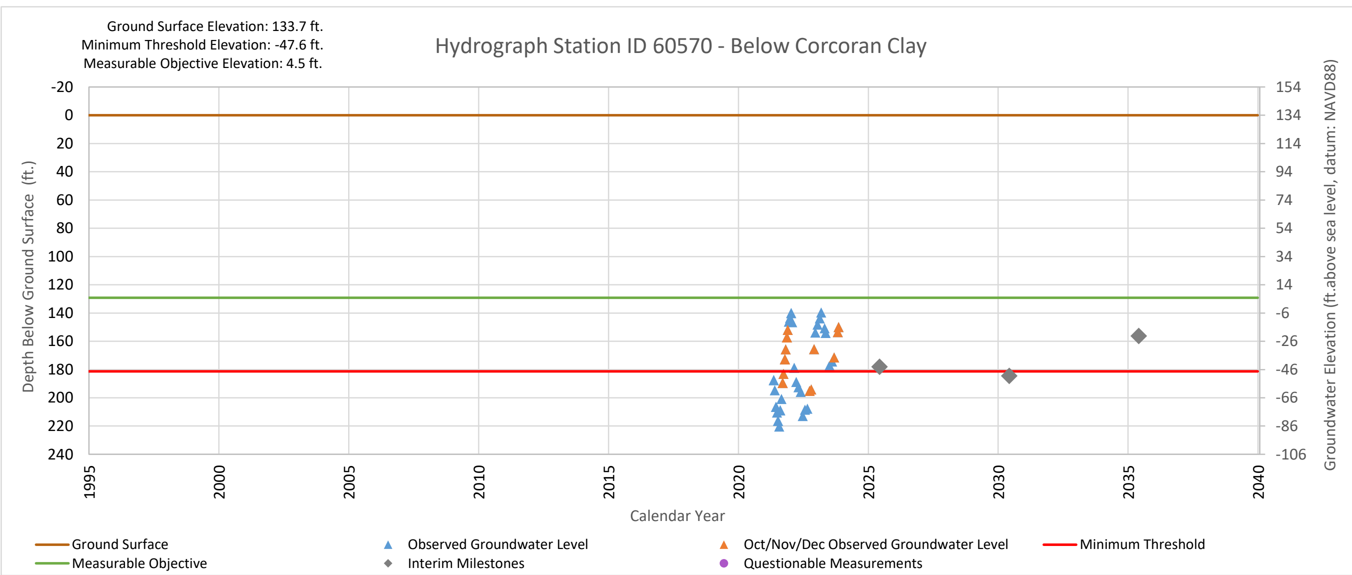
Ground Surface Elevation: 138.2 ft.
Minimum Threshold Elevation: -47.0 ft.
Measurable Objective Elevation: 17.7 ft.
Hydrograph Station ID 60567 - Below Corcoran Clay
Depth Below Ground Surface (ft.)
Groundwater Elevation (ft.above sea level, datum: NAVD88)
Calendar Year
Ground Surface
Measurable Objective
Observed Groundwater Level
Interim Milestones
Oct/Nov/Dec Observed Groundwater Level
Questionable Measurements
Minimum Threshold

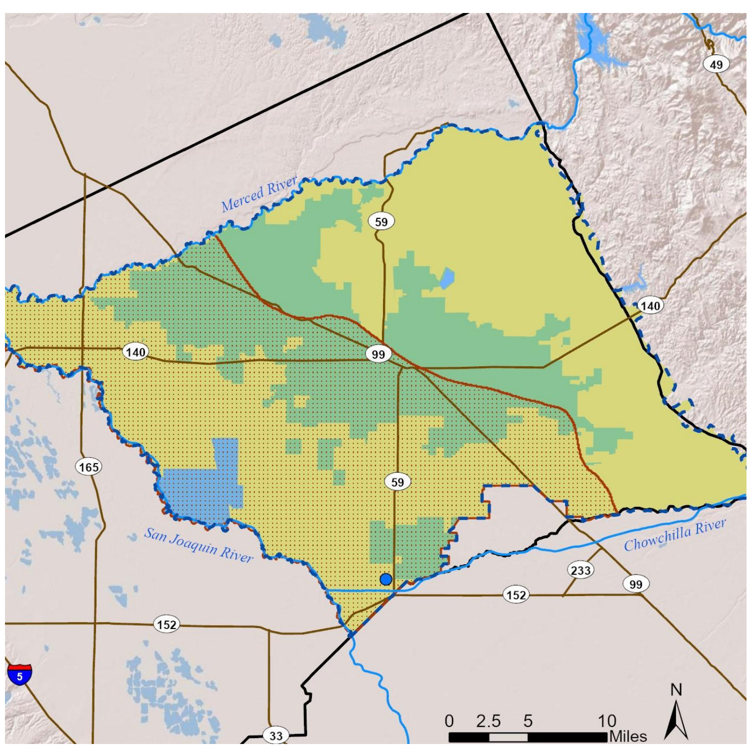


Merced River
San Joaquin River
Chowchilla River
49
59
140
99
165
152
233
5
33
0 2.5 5 10
Miles
N


Ground Surface Elevation: 134.0 ft.
Minimum Threshold Elevation: 32.7 ft.
Measurable Objective Elevation: 57.6 ft.
Hydrograph Station ID 60568 - Above Corcoran Clay
Depth Below Ground Surface (ft.)
Groundwater Elevation (ft.above sea level, datum: NAVD88)
Calendar Year
-20
0
20
40
60
80
100
120
154
134
114
94
74
54
34
14
1995
2000
2005
2010
2015
2020
2025
2030
2035
2040
Ground Surface
Measurable Objective
Observed Groundwater Level
Interim Milestones
Oct/Nov/Dec Observed Groundwater Level
Questionable Measurements
Minimum Threshold


Merced River
San Joaquin River
Chowchilla River
49
59
140
99
165
233
152
5
33
0 2.5 5 10
Miles
N


Ground Surface Elevation: 133.7 ft.
Minimum Threshold Elevation: -47.6 ft.
Measurable Objective Elevation: 4.5 ft.
Hydrograph Station ID 60570 - Below Corcoran Clay
Depth Below Ground Surface (ft.)
Groundwater Elevation (ft.above sea level, datum: NAVD88)
Calendar Year
Ground Surface
Measurable Objective
Observed Groundwater Level
Interim Milestones
Oct/Nov/Dec Observed Groundwater Level
Questionable Measurements
Minimum Threshold


Merced River
San Joaquin River
Chowchilla River
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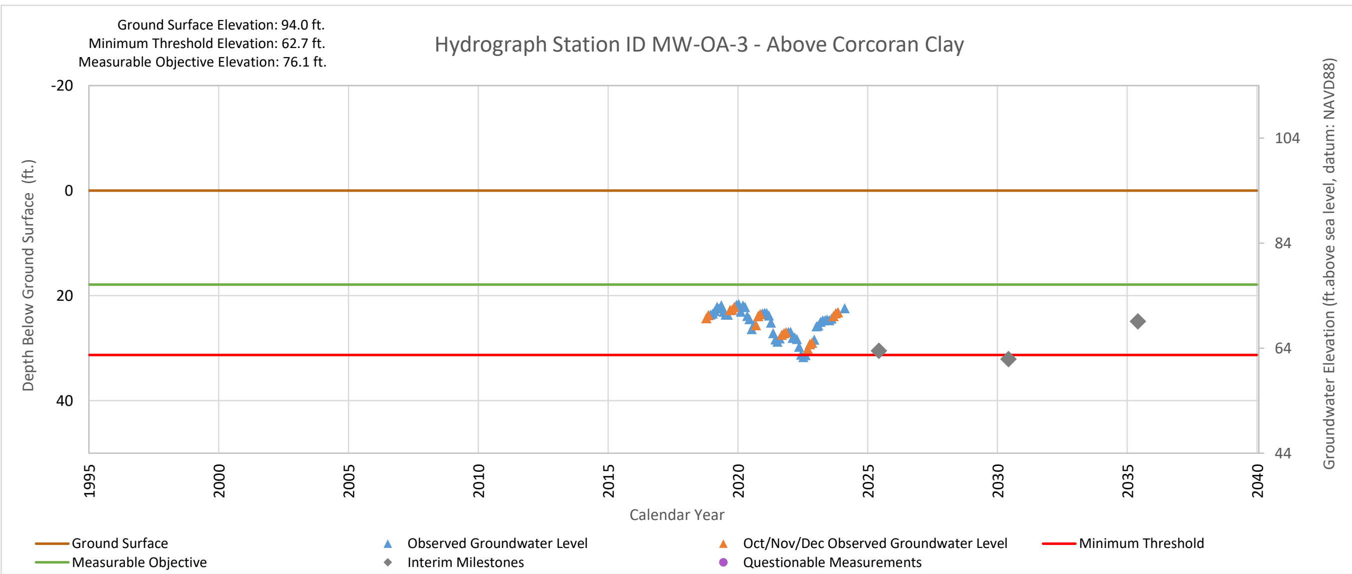
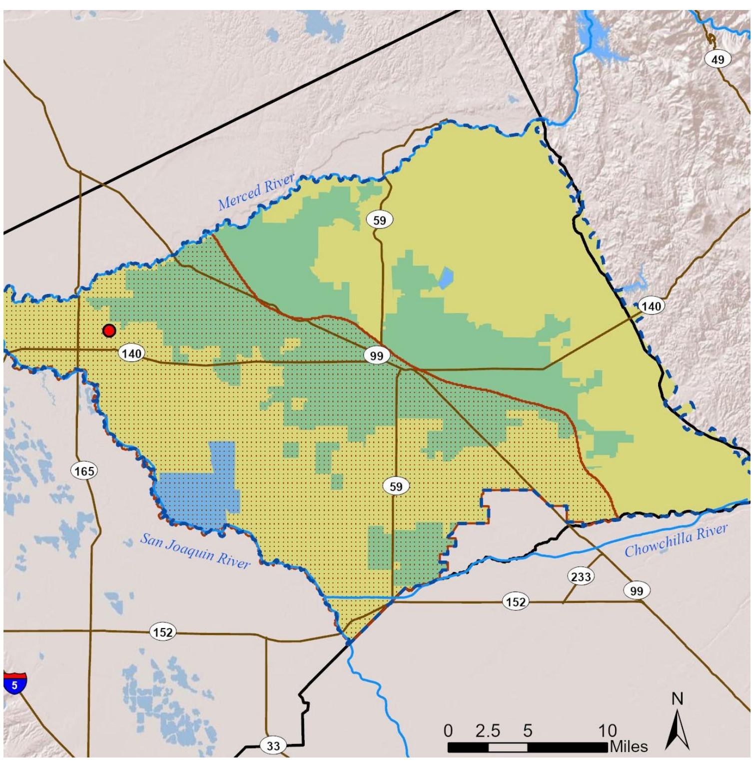
Miles
N



Ground Surface Elevation: 94.0 ft.
Minimum Threshold Elevation: 62.7 ft.
Measurable Objective Elevation: 76.1 ft.
Hydrograph Station ID MW-OA-3 - Above Corcoran Clay
Depth Below Ground Surface (ft.)
Groundwater Elevation (ft.above sea level, datum: NAVD88)
Calendar Year
Ground Surface
Measurable Objective
Observed Groundwater Level
Interim Milestones
Oct/Nov/Dec Observed Groundwater Level
Questionable Measurements
Minimum Threshold



Merced River
San Joaquin River
Chowchilla River
49
59
140
99
165
233
152
5
33
0 2.5 5 10
Miles
N

APPENDIX G: MERCED CHOWCHILLA INTERBASIN AGREEMENT

INTERBASIN AGREEMENT

MERCED-CHOWCHILLA GROUNDWATER SUBBASINS

This Interbasin Agreement for the Merced-Chowchilla Groundwater Subbasins (this "Agreement") is made and effective as of July 31, 2018 ("Effective Date") by and among **Chowchilla Water District Groundwater Sustainability Agency, Merced Irrigation-Urban Groundwater Sustainability Agency, County of Madera Chowchilla Subbasin Groundwater Sustainability Agency, Merced Subbasin Groundwater Sustainability Agency, Triangle T Water District GSA** and **County of Merced Chowchilla Subbasin Groundwater Sustainability Agency**.

This Agreement is made with reference to the following facts and understandings:

A. On August 29, 2014, the California Legislature passed comprehensive groundwater legislation contained in SB 1168, SB 1319, and AB 1739, collectively known as the "Sustainable Groundwater Management Act" ("SGMA"). SGMA was signed into law on September 16, 2014 and it became effective on January 1, 2015. In adopting SGMA, the Legislature intended to provide local groundwater agencies with the authority and technical and financial assistance necessary to sustainably manage groundwater.

B. Under SGMA, each affected groundwater basin or subbasin will be regulated separately by one or more Groundwater Sustainability Agencies (each, a "GSA"). A local agency or combination of local agencies may elect to be the GSA for a basin or subbasin. Each of the parties to this Agreement ("Party(ies)") is a Groundwater Sustainability Agency (each, as "GSA") established by a local government entity with either water supply, water management, or land use responsibilities within the critically overdrafted Merced and Chowchilla groundwater subbasins of the San Joaquin Valley groundwater basin (the "Subbasins").

C. Groundwater sustainability under SGMA is to be achieved through Groundwater Sustainability Plans (each, a "GSP"). A GSP can be a single plan developed by one or more GSAs, or multiple coordinated plans within a basin or subbasin by multiple GSAs. SGMA requires that the GSPs for critically overdrafted subbasins be adopted by January 31, 2020. The regulations interpreting SGMA allow for GSAs with adjoining jurisdictions to enter into interbasin agreements to establish compatible sustainability goals and understanding regarding fundamental elements of the GSPs of each agency, and thereby promote the compatibility of GSPs where the actions in one subbasin may affect the groundwater of an adjoining subbasin.

D. In March of 2016 the Chowchilla Water District submitted a Basin Boundary Modification request to the California Department of Water Resources ("DWR") proposing that the Chowchilla groundwater subbasin boundary be modified under the Jurisdictional Modification criteria in the DWR Basin Boundary Modification Emergency Regulation, which requested changes do not alter the interactive hydrologic nature of the Subbasins. This Basin Boundary Modification resulted in moving a portion of the Chowchilla Subbasin (as defined by Bulletin 118- 2003) that is within the jurisdiction of Merced Irrigation District and Merced County into the Merced Subbasin. This area

MERCED COUNTY CONTRACT NO. 2018175

in Merced County, mainly around the community of El Nido, has experienced significant land subsidence over the recent years.

E. Merced Irrigation District initially submitted to DWR a letter opposing the Basin Boundary Modification due to concerns regarding inter-basin coordination. Merced County submitted a letter of support for the Basin Boundary Modification contingent upon the adoption of an interbasin agreement. Merced Irrigation District subsequently withdrew its opposition to the Basin Boundary Modification request based on agreement from the Chowchilla Subbasin GSAs to enter into this inter-basin agreement as defined in Section 357.2 of the Groundwater Sustainability Plan Emergency Regulations.

F. The Parties are entering into this Agreement to establish compatible sustainability goals and understandings for the Subbasins, with a focus on the areas where the activities occurring within one Party's jurisdiction may affect groundwater within another Party's jurisdiction, to resolve the comments and concerns of Merced Irrigation District and Merced County regarding the boundary modification request of the Chowchilla Water District, and to coordinate preparation of each agency's respective GSP in order to promote the compatibility thereof. The Parties intend that the GSPs will address the level of cooperation and coordination between the Parties.

G. The intent of the Parties under this Agreement is to provide each Party with the sole right and responsibility to implement SGMA within its respective boundaries, as defined herein, in a manner determined by the Party as a GSA. The Parties expressly intend that neither SGMA, nor this Agreement, nor any GSP shall be construed as authorizing another Party, or the other Parties acting together, or any dispute resolution process contained herein, to:

(i) Determine or alter surface water rights or groundwater rights (California Water Code Section 10720.5 (b));

(ii) Make binding determinations of the water rights of any person or entity (California Water Code Section 10726.8 (b)); or

(iii) Supersede the existing land use authority of cities or counties, including the city or county general plan, within the overlying basin (California Water Code Section 10726.8 (f)).

THEREFORE, in consideration of the mutual promises, covenants and provisions herein set forth, it is agreed by and among the Parties as follows:

1. Recitals Incorporated. The recitals set forth above are hereby incorporated into this Agreement as a statement of the intent and purposes of this Agreement.

2. General Information. Within 120 days from execution of this Agreement, each Party shall develop and share with the other Parties general information regarding the portion of the Subbasins in its jurisdiction, including:

a. Description and general information pertaining to groundwater resources;

b. List of public agencies and other entities with groundwater management responsibilities; and

c. List of groundwater management plans and other water resource management plans.

3. Exchange of Information. The Parties shall exchange relevant available technical information and groundwater data to quantify the level of interconnection between the Subbasins and the areas where the activities occurring within one Party's jurisdiction may affect groundwater within another Party's jurisdiction. The Parties will coordinate shared information and work on adjusting values to the same basis for all data and parameters to the best of their abilities, and within reasonable range of acceptable scientific practices to help all Parties reach sustainability within their respective GSA areas. The information exchanged shall include if feasible:

a. Model aquifer parameter values and other model inputs relevant to calculation of inter-basin groundwater flow (e.g. model layering, grid size vertical pumping distribution, etc.);

b. Model outputs including simulated heads (groundwater elevations) by model layer and model water budget components (including model-estimated flows across the Subbasin boundary);

c. Values for groundwater quality (primarily TDS and nitrate), quantity and land subsidence;

d. An estimate of groundwater flow across basin and jurisdictional boundaries, including consistent and coordinated data, methods and assumptions;

e. An estimate of stream-aquifer interactions at boundaries;

f. A common understanding of the hydrogeology and hydrology as it applies to the determination of groundwater flow across basin and jurisdictional boundaries;

g. Sustainable management criteria, including management goals and thresholds, and a monitoring network that would support confirmation that no adverse impacts result from the implementation of the GSPs;

h. Existing and proposed monitoring locations;

i. Plans, programs, and projects anticipated as options and/or alternatives for sustainable management of respective Subbasins;

j. The following parameters:

i. Groundwater elevation data;
ii. Groundwater extraction data or estimates;
iii. Groundwater quality information;
iv. Surface water supply;
v. Reports of cropping patters on parcels adjacent to the subbasin boundaries, with approximately a 5-mile buffer on both sides of the boundary;
vi. Total water use;
vii. Change in groundwater storage;
viii. Water budget for land surface, stream, and groundwater systems;
ix. Sustainable yield; and
x. Agricultural water demands (consumptive use and extraction).

g. The Parties will work in good faith to complete a preliminary exchange of available information set forth above in Section 3(a)-(j) by August 31, 2018, and a complete exchange of information by June 30, 2019. The Parties shall analyze hydrologic and hydrogeologic conditions, based on the detail and local information available within the Merced Water Resources Model and the model to be developed and used for the Chowchilla Subbasin GSP analyses. The Parties will exchange information for the area of model overlap and analyze hydrologic and hydrogeologic conditions in the area of overlap to the extent relevant to interbasin groundwater flow. Information from items "a" through "j" above will be utilized in the analyses. Field verification and results from GSP monitoring programs will generally be used to validate model results during GSP implementation.

4. Planning for the GSPs. The Parties shall develop compatible sustainability goals, minimum thresholds and measurable objectives for their respective GSPs. Compatible sustainability goals would include, but are not limited to, the following:

a. Targeted 2040 groundwater levels;
b. Measurable objectives and interim milestones; and
c. Volumes of groundwater extraction and managed recharge to ensure coordination of any GSP-established or State-recommended/mandated levels.

"Compatible" in the context of this section means that the sustainability goals developed would not impede the other Party's efforts to achieve sustainability

5. Development of the GSPs. Each Party shall be responsible for development of its own GSP for the lands within its GSA jurisdiction, or for joint development of a GSP for the lands within its GSA jurisdiction and the lands of one or more additional GSA. The contents and adoption of each GSP shall be the decision and responsibility of each Party, subject to the criteria set forth in SGMA and its implementing regulations. However, in developing its GSP, each Party shall utilize the information exchanged under this Agreement, and shall incorporate any agreed sustainability goals, minimum thresholds and measurable objectives into each GSP.

6. Implementation. Each Party, in implementing its GSP and managing its affairs, shall avoid actions that materially and adversely impact or impede the ability to achieve the

sustainability goals of each other Party. Disagreements regarding a Party's implementation of its GSP shall be subject to the dispute resolution process outlined in paragraph 9.

7. Meetings. Commencing within 30 days of execution of this Agreement, the Parties shall meet quarterly while the planning activities described in Paragraph 4 are being performed and while the Parties are developing their GSPs. After all GSPs are approved, the Parties shall meet as agreed to discuss implementation and ongoing issues.

8. Costs. Each Party shall bear its own costs for its direct participation in the activities contemplated by this Agreement, including staff time, administrative and overhead costs, office expenses, legal fees, and consultants that report directly and exclusively to that Party. Contracts for any additional studies, reports, and data development for the matters identified in Paragraphs 3 and 4 must be approved by the unanimous vote of the Parties. The Parties shall select one of their members to be the fiscal agent for implementation of this Agreement, which shall calculate the costs being incurred therefor, assess the Parties for contributions to common costs in a timely manner, and pay invoices for such services. No Party shall be bound, financially or otherwise, by any obligation, contract, or activity undertaken by the other Parties unless and except to the extent agreed upon by the Party.

9. Dispute Resolution. The Parties fully intend to comply with this Agreement in good faith. Should, however, any controversy arise among or between the Parties concerning this Agreement, or the rights and duties of any Party under this Agreement, such a controversy shall be addressed as follows:

a. Any Party may trigger the dispute resolution process by delivering, in writing to all Parties, a notification of a dispute or controversy that contains a specific description of the actions alleged to be contrary to this Agreement and a proposed solution. A dispute resolution group, consisting of one member of the elected or appointed governance of each Party, shall be established by the Parties to resolve disputes and/or controversies relating to this Agreement (the "Dispute Resolution Group"). The Dispute Resolution Group shall meet no later than 30 days following notification of the dispute or controversy. The Party alleged to be in violation shall prepare a written response delivered to all Parties prior to the meeting of the Dispute Resolution Group. Thereafter, the Dispute Resolution Group will have 90 days to issue a written, non-binding opinion on the matter in dispute, including a proposed resolution. Any Party, at its sole expense, may retain outside experts to assist in data development or discussion of the dispute. Upon unanimous approval by the Parties, the Dispute Resolution Group may retain independent experts to assist in mediating the dispute. The Parties shall equally share the cost to retain the experts the Dispute Resolution Group selects. The Dispute Resolution Group may also consult with the Department of Water Resources as necessary. Participation in the process established by the Dispute Resolution Group is mandatory and a condition precedent to resorting to litigation, or referring the dispute to the State Water Resources Control Board or Department of Water Resources for formal action.

b. Should the dispute resolution process described above not provide a final resolution to the controversy raised, any Party may pursue any judicial or administrative remedies otherwise available. However, notwithstanding this Paragraph 9, a Party may seek a preliminary injunction or other interlocutory judicial relief if necessary to avoid irreparable damage or to preserve the status quo.

10. General Provisions.

a. Term of Agreement. This Agreement shall expire on December 31, 2030 unless extended by all of the Parties.

b. Amendment. This Agreement may be amended only by a writing executed by all of the Parties.

c. Withdrawal. Any Party may withdraw from this Agreement starting six (6) months after approval of the GSP for all Parties by the DWR, and upon thirty (30) days prior written notice to all other Parties, provided that the withdrawing Party is cooperating through an approved GSP with other Parties and interests in the Basin, where the approved GSP fully meets and incorporates mutual promises, covenants and provisions 2, 3, 4, 5, and 6 of this agreement; and the written notice provided by the withdrawing party documents the basis for withdrawal and the way(s) in which the mutual promises, covenants and provisions 2, 3, 4, 5 have been addressed in the GSP to which it is a party. A withdrawing Party shall not be obligated for any financial obligations incurred after delivery of notice of its withdrawal, but shall remain liable for and shall pay upon demand all obligations of the Parties approved as provided herein prior to written notice of its withdrawal.

d. Severability. Should the participation of any Party to this Agreement, or any part, term or provision of this Agreement, be decided by any court to be illegal, in excess of that Party's authority, in conflict with any law of the State of California, or otherwise rendered unenforceable or ineffectual, the participation of the other Parties or the validity of the remaining portions, terms or provisions of this Agreement shall not be affected thereby and each Party hereby agrees it would have entered into this Agreement upon the remaining terms and provisions.

e. Counterparts and Facsimile. This Agreement may be executed in counterparts, each counterpart being an exact duplicate of all other counterparts, and all counterparts shall be considered as constituting one complete original and may be attached together when executed by the Parties hereto. Facsimile or electronic signatures shall be binding.

f. Notices. Notices authorized or required to be given pursuant to this Agreement shall be in writing and shall be deemed to have been given when mailed, postage prepaid, or delivered during working hours to the principal offices of the other Parties at the address indicated below, attention to the responsible person at each Party as identified, or to such other changed addresses communicated to the other Parties in writing.

Chowchilla Water District GSA
327 S. Chowchilla Blvd.
Chowchilla, CA 93610

County of Madera Chowchilla Subbasin GSA
Department of Water and Natural Resources
200 W. Fourth Street
Madera, CA 93637

Merced Subbasin Groundwater Sustainability Agency
Community and Economic Development Department
County of Merced
2222 M Street
Merced, CA 95340

County of Merced Chowchilla Subbasin GSA
Community and Economic Development Department
County of Merced
2222 M Street
Merced, CA 95340

Merced Irrigation-Urban Groundwater Sustainability Agency
744 West 20th Street
Merced, CA 95340

Triangle T Water District GSA
4400 Hays Drive
Chowchilla, CA 93610

IN WITNESS WHEREOF, the Parties hereto, pursuant to resolutions duly and regularly adopted by their respective Board of Directors or Board of Supervisors, have caused their names to be affixed by their proper and respective officers as of the day and year first above-written.

CHOWCHILLA WATER DISTRICT GSA,
a California water district

By: Kole Upton

Name: Kole Upton

Title: Board President

Merced Subbasin Groundwater Sustainability Agency
Community and Economic Development Department
County of Merced
2222 M Street
Merced, CA 95340

County of Merced Chowchilla Subbasin GSA
Community and Economic Development Department
County of Merced
2222 M Street
Merced, CA 95340

Merced Irrigation-Urban Groundwater Sustainability Agency
744 West 20th Street
Merced, CA 95340

Triangle T Water District GSA
4400 Hays Drive
Chowchilla, CA 93610

IN WITNESS WHEREOF, the Parties hereto, pursuant to resolutions duly and regularly adopted by their respective Board of Directors or Board of Supervisors, have caused their names to be affixed by their proper and respective officers as of the day and year first above-written.

CHOWCHILLA WATER DISTRICT GSA,
a California water district

By:____________________________

Name:__________________________

Title:___________________________

COUNTY OF MADERA CHOWCHILLA SUBBASIN GSA

By: 7-13-18
Michael R. Linden, Deputy County Counsel

COUNTY OF MADERA

Chairman, Board of Supervisors

COUNTY OF MADERA CHOWCHILLA SUBBASIN GSA,

By: ______________________________

Name: ______________________________

Title: ______________________________

COUNTY OF MERCED CHOWCHILLA SUBBASIN GSA,

By: ______________________________ JUL 3 1 2018

Name: Jerald R. O'Banion

Title: Chairman, Board of Supervisors

MERCED SUBBASIN GSA

By: ______________________________

Name: ______________________________

Title: ______________________________

APPROVED AS TO LEGAL FORM

JAMES N. FINCHER
MERCED COUNTY COUNSEL

BY: ______________________________
Jeffrey B. Grant

MERCED IRRIGATION-URBAN GSA

By: ______________________________

Name: ______________________________

Title: ______________________________

COUNTY OF MADERA CHOWCHILLA SUBBASIN GSA,

By: ______________________________

Name: ______________________________

Title: ______________________________

COUNTY OF MERCED CHOWCHILLA SUBBASIN GSA,

By: ______________________________

Name: ______________________________

Title: ______________________________

MERCED SUBBASIN GSA

By: Robert D Kelley

Name: Robert D Kelley

Title: chairman

MERCED IRRIGATION-URBAN GSA

By: ______________________________

Name: ______________________________

Title: ______________________________

COUNTY OF MADERA CHOWCHILLA SUBBASIN GSA,

By: ______________________________

Name: ______________________________

Title: ______________________________

COUNTY OF MERCED CHOWCHILLA SUBBASIN GSA,

By: ______________________________

Name: ______________________________

Title: ______________________________

MERCED SUBBASIN GSA

By: ______________________________

Name: ______________________________

Title: ______________________________

MERCED IRRIGATION-URBAN GSA

By: Hicham Eltal

Name: HICHAM ELTAL

Title: CHAIR

TRIANGLE T WATER DISTRICT GSA

By: ______________________

Name: Mark Hutson

Title: President

APPENDIX H: MERCED TURLOCK INTERBASIN AGREEMENT

MEMORANDUM OF INTENT TO COORDINATE BETWEEN THE MERCED SUBBASIN AND TURLOCK SUBBASIN

WHEREAS, the Turlock Groundwater Subbasin (Subbasin No. 5-22.03) and the Merced Groundwater Subbasin (Subbasin No. 5-22.04) are adjacent subbasins that share a common boundary along the Merced River; and

WHEREAS, the Turlock Subbasin is a high-priority subbasin that is required to submit a Groundwater Sustainability Plan (GSP) to the Department of Water Resources (DWR) by January 31, 2022 and the Merced Subbasin is a high-priority, critically overdraft subbasin that must submit a GSP to DWR by January 31, 2020; and

WHEREAS, the West Turlock Subbasin Groundwater Sustainability Agency (WTSGSA) and the East Turlock Subbasin Groundwater Sustainability Agency (ETSGSA) are working to develop a single GSP in the Turlock Subbasin; and

WHEREAS, the Merced Subbasin Groundwater Sustainability Agency, the Merced Irrigation Urban Groundwater Sustainability Agency, and the Turner Island Water District Groundwater Sustainability Agency-1 are working to develop a single GSP in the Merced Subbasin; and

WHEREAS, the Sustainable Groundwater Management Act (SGMA) prohibits a GSP from adversely affecting an adjacent basin's ability to implement its GSP or impede the ability to achieve its sustainability goal (Water Code, § 10733(c)); and

WHEREAS, the parties to this Memorandum of Intent (MOI) (collectively "Party" or "Parties") desire to establish compatible sustainability goals and understanding regarding fundamental elements of the GSPs of each GSA as they relate to sustainable groundwater management.

NOW, THEREFORE BE IT RESOLVED that the Parties agree to coordinate in the following matter:

1. Each Party desires to comply with SGMA by assuring that its GSP actions do not negatively impact the adjacent GSA in complying with SGMA.

2. To assure this compliance, each Party commits to meeting as necessary to compare GSP development concepts and approaches to identify potential areas of concern that may negatively impact the other.

3. Each Party will commit to sharing data, analysis, methods, results, and any other information that is pertinent to the Parties' compliance with SGMA.

4. The Parties recognize that the development of the respective GSPs have different deadlines and may be developed using different timelines. Coordination is expected to continue, as needed, throughout GSP development and implementation.

5. The Parties recognize there may be data gaps that will need to be filled. Datasets will improve as the Parties develop and implement GSPs over time. The Parties agree to continue to work together to develop and refine understanding of the conditions over time. This common knowledge and understanding will be incorporated into future GSPs as data and information becomes available.

6. The Parties intend to coordinate messaging and outreach along the subbasin borders to maximize stakeholder outreach and understanding between the subbasins.

IN WITNESS WHEREOF, the parties have caused this Memorandum to be executed by and through their respective officers thereunto duly authorized.

WEST TURLOCK SUBBASIN GSA,
a Joint Powers Authority

By: ______________________
Joe Alamo, Chair

Date: 12/18/18

EAST TURLOCK SUBBASIN GSA,
a Joint Powers Authority

By: ______________________
Albert Rossini, Chair

Date: 01-28-19

MERCED IRRIGATION-URBAN GSA

By: ______________________
Chair

Date: 4/19/19

MERCED SUBBASIN GSA,
a Joint Powers Authority

By: ______________________
Chair

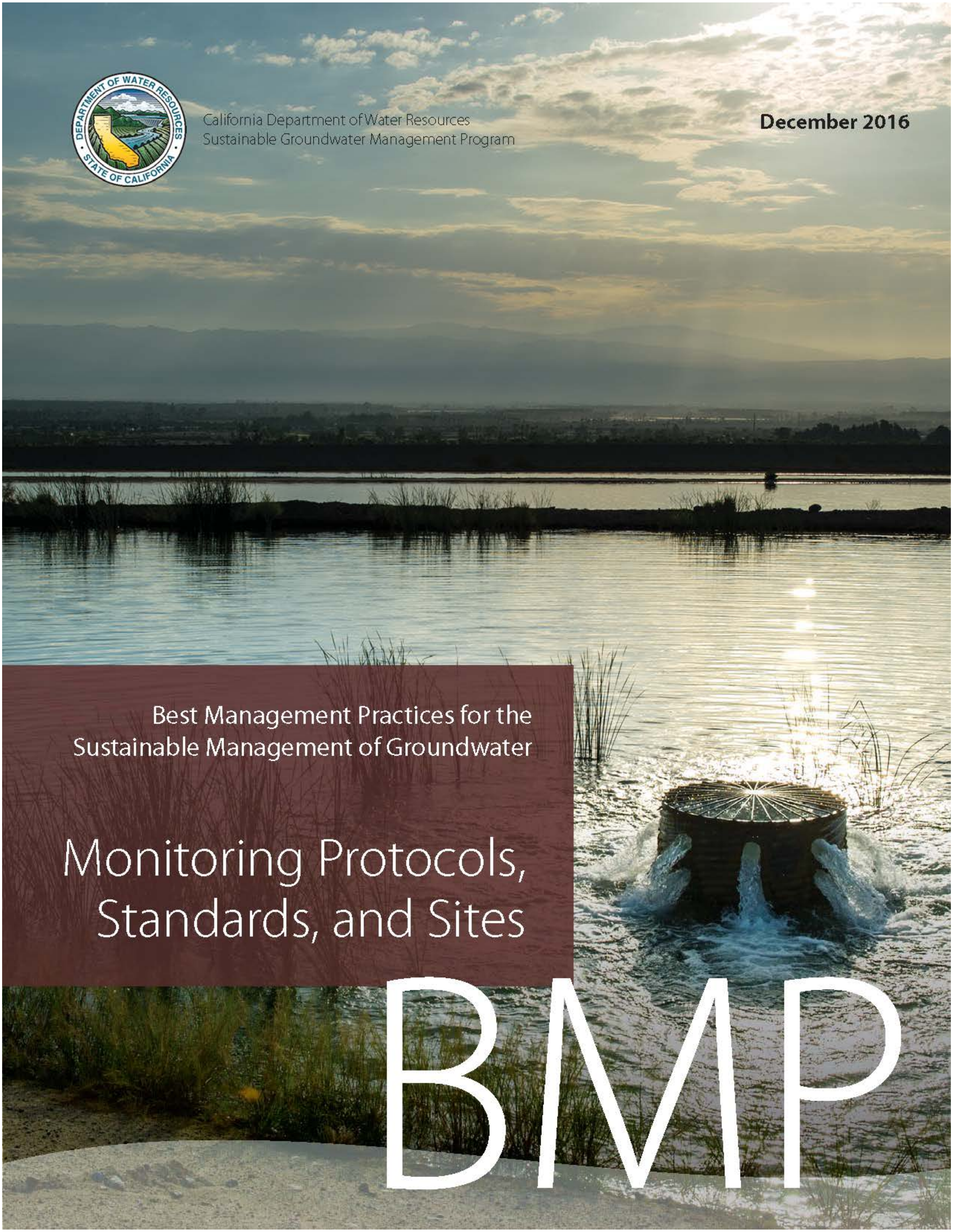
Date: 1/16/19

TURNER ISLAND WATER DISTRICT

By: ______________________
Chair

Date: 2-19-19

APPENDIX I: MONITORING PROTOCOLS – GROUNDWATER LEVELS (DWR BMP)



California Department of Water Resources
Sustainable Groundwater Management Program

December 2016

Best Management Practices for the Sustainable Management of Groundwater

Monitoring Protocols, Standards, and Sites

BMP

State of California
Edmund G. Brown Jr., Governor

California Natural Resources Agency
John Laird, Secretary for Natural Resources

Department of Water Resources
Mark W. Cowin, Director

Carl A. Torgersen, Chief Deputy Director

Office of the Chief Counsel Spencer Kenner	Public Affairs Office Ed Wilson	Government and Community Liaison Anecita S. Agustinez
Office of Workforce Equality Stephanie Varrelman	Policy Advisor Waiman Yip	Legislative Affairs Office Kasey Schimke, Ass't Dir.

Deputy Directors

Gary Bardini	**Integrated Water Management**
William Croyle	**Statewide Emergency Preparedness and Security**
Mark Anderson	**State Water Project**
John Pacheco (Acting)	**California Energy Resources Scheduling**
Kathie Kishaba	**Business Operations**
Taryn Ravazzini	**Special Initiatives**

Division of Integrated Regional Water Management

Arthur Hinojosa Jr., Chief

Prepared under the direction of:

David Gutierrez, Sustainable Groundwater Management Program Manager
Rich Juricich, Sustainable Groundwater Management Branch

Prepared by:

Trevor Joseph, BMP Project Manager

Timothy Godwin
Dan McManus
Mark Nordberg
Heather Shannon
Steven Springhorn

With assistance from:

DWR Region Office Staff

Groundwater Monitoring Protocols, Standards, and Sites Best Management Practice

1. Objective

The objective of this *Best Management Practice* (BMP) is to assist in the development of Monitoring Protocols. The California Department of Water Resources (the Department or DWR) has developed this document as part of the obligation in the Technical Assistance chapter (Chapter 7) of the Sustainable Groundwater Management Act (SGMA) to support the long-term sustainability of California's groundwater *basins*. Information provided in this BMP provides technical assistance to Groundwater Sustainability Agencies (GSAs) and other stakeholders to aid in the establishment of consistent data collection processes and procedures. In addition, this BMP can be used by GSAs to adopt a set of sampling and measuring procedures that will yield similar data regardless of the monitoring personnel. Finally, this BMP identifies available resources to support the development of monitoring protocols.

This BMP includes the following sections:

1. Objective. A brief description of how and where monitoring protocols are required under SGMA and the overall objective of this BMP.
2. Use and Limitations. A brief description of the use and limitations of this BMP.
3. Monitoring Protocol Fundamentals. A description of the general approach and background of groundwater monitoring protocols.
4. Relationship of Monitoring Protocols to other BMPs. A description of how this BMP is connected with other BMPS.
5. Technical Assistance. Technical content providing guidance for regulatory sections.
6. Key Definitions. Descriptions of definitions identified in the GSP Regulations or SGMA.
7. Related Materials. References and other materials that provide supporting information related to the development of Groundwater Monitoring Protocols.

2. USE AND LIMITATIONS

BMPs developed by the Department provide technical guidance to GSAs and other stakeholders. Practices described in these BMPs do not replace the GSP Regulations, nor do they create new requirements or obligations for GSAs or other stakeholders. In addition, using this BMP to develop a GSP does not equate to an approval determination by the Department. All references to GSP Regulations relate to Title 23 of the California Code of Regulations (CCR), Division 2, Chapter 1.5, and Subchapter 2. All references to SGMA relate to California Water Code sections in Division 6, Part 2.74.

3. MONITORING PROTOCOL FUNDAMENTALS

Establishing data collection protocols that are based on best available scientific methods is essential. Protocols that can be applied consistently across all basins will likely yield comparable data. Consistency of data collection methods reduces uncertainty in the comparison of data and facilitates more accurate communication within basins as well as between basins.

Basic minimum technical standards of accuracy lead to quality data that will better support implementation of GSPs.

4. RELATIONSHIP OF MONITORING PROTOCOL TO OTHER BMPS

Groundwater monitoring is a fundamental component of SGMA, as each GSP must include a sufficient network of data that demonstrates measured progress toward the achievement of the sustainability goal for each basin. For this reason, a standard set of protocols need to be developed and utilized.

It is important that data is developed in a manner consistent with the basin setting, planning, and projects/management actions steps identified on **Figure 1** and the GSP Regulations. The inclusion of monitoring protocols in the GSP Regulations also emphasizes the importance of quality empirical data to support GSPs and provide comparable information from basin to basin.

Figure 1 provides a logical progression for the development of a GSP and illustrates how monitoring protocols are linked to other related BMPs. This figure also shows the context of the BMPs as they relate to various steps to sustainability as outlined in the GSP Regulations. The monitoring protocol BMP is part of the Monitoring step identified in **Figure 1**.

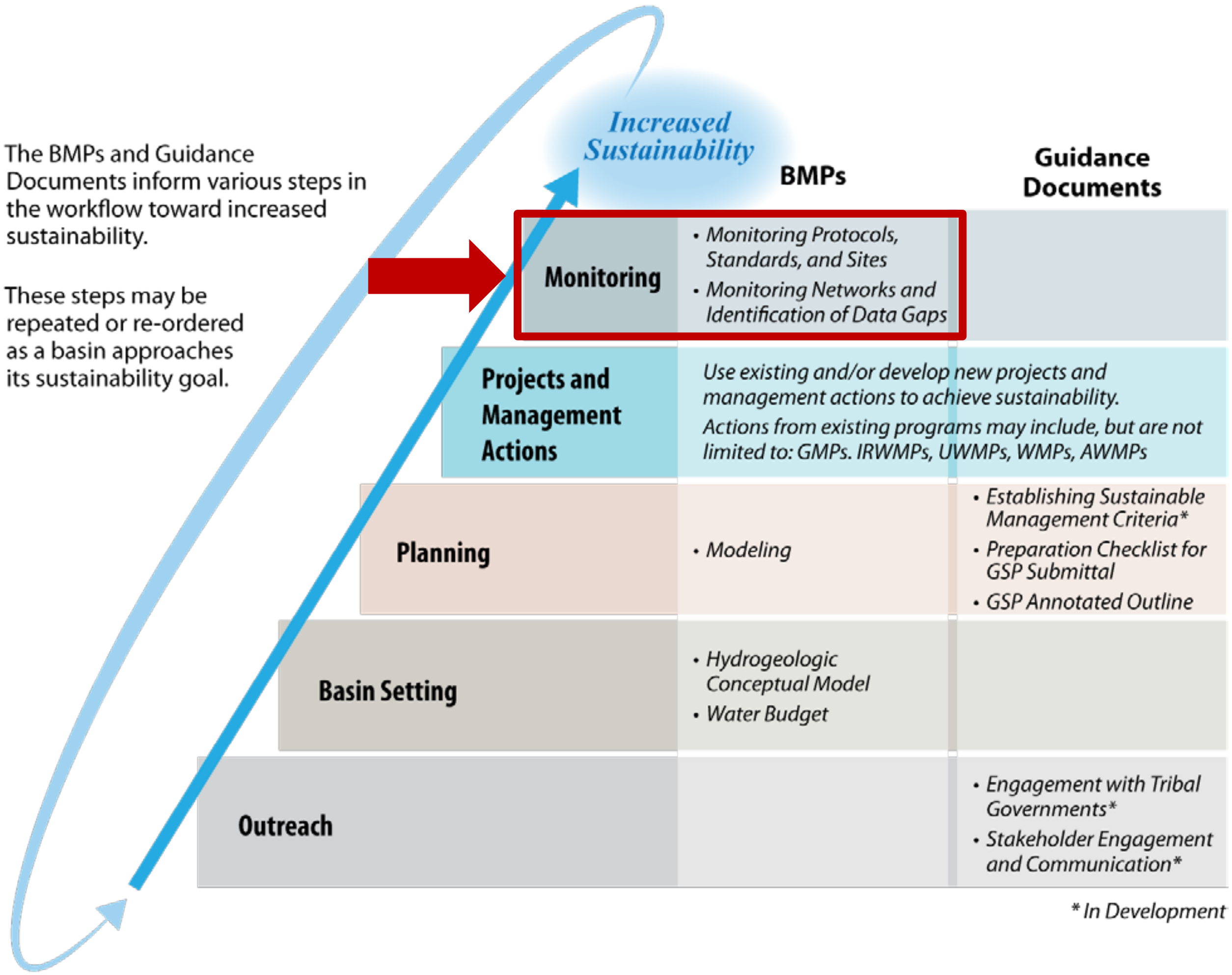


Figure 1 – Logical Progression of Basin Activities Needed to Increase Basin Sustainability

5. TECHNICAL ASSISTANCE

23 CCR §352.2. Monitoring Protocols. Each Plan shall include monitoring protocols adopted by the Agency for data collection and management, as follows:
(a) Monitoring protocols shall be developed according to best management practices.
(b) The Agency may rely on monitoring protocols included as part of the best management practices developed by the Department, or may adopt similar monitoring protocols that will yield comparable data.
(c) Monitoring protocols shall be reviewed at least every five years as part of the periodic evaluation of the Plan, and modified as necessary.

The GSP Regulations specifically call out the need to utilize protocols identified in this BMP, or develop similar protocols. The following technical protocols provide guidance based upon existing professional standards and are commonly adopted in various groundwater-related programs. They provide clear techniques that yield quality data for use in the various components of the GSP. They can be further elaborated on by individual GSAs in the form of standard operating procedures which reflect specific local requirements and conditions. While many methodologies are suggested in this BMP, it should be understood that qualified professional judgment should be used to meet the specific monitoring needs.

The following BMPs may be incorporated into a GSP's monitoring protocols section for collecting groundwater elevation data. A GSP that adopts protocols that deviate from these BMPs must demonstrate that they will yield comparable data.

PROTOCOLS FOR ESTABLISHING A MONITORING PROGRAM

The protocol for establishment of a monitoring program should be evaluated in conjunction with the *Monitoring Network and Identification of Data Gaps* BMP and other BMPs. Monitoring protocols must take into consideration the *Hydrogeologic Conceptual Model, Water Budget, and Modeling* BMPs when considering the data needs to meet GSP objectives and the sustainability goal.

It is suggested that each GSP incorporate the Data Quality Objective (DQO) process following the U.S. EPA *Guidance on Systematic Planning Using the Data Quality Objectives Process* (EPA, 2006). Although strict adherence to this method is not required, it does provide a robust approach to consider and assures that data is collected with a specific purpose in mind, and efforts for monitoring are as efficient as possible to achieve the objectives of the GSP and compliance with the GSP Regulations.

The DQO process presents a method that can be applied directly to the sustainability criteria quantitative requirements through the following steps.

1. State the problem – Define sustainability indicators and planning considerations of the GSP and sustainability goal.
2. Identify the goal – Describe the quantitative measurable objectives and minimum thresholds for each of the sustainability indicators.
3. Identify the inputs – Describe the data necessary to evaluate the sustainability indicators and other GSP requirements (i.e. water budget).
4. Define the boundaries of the study – This is commonly the extent of the Bulletin 118 groundwater basin or subbasin, unless multiple GSPs are prepared for a given basin. In that case, evaluation of the coordination plan and specifically how the monitoring will be comparable and meet the sustainability goals for the entire basin.
5. Develop an analytical approach – Determine how the quantitative sustainability indicators will be evaluated (i.e. are special analytical methods required that have specific data needs).
6. Specify performance or acceptance criteria – Determine what quality the data must have to achieve the objective and provide some assurance that the analysis is accurate and reliable.
7. Develop a plan for obtaining data – Once the objectives are known determine how these data should be collected. Existing data sources should be used to the greatest extent possible.

These steps of the DQO process should be used to guide GSAs to develop the most efficient monitoring process to meet the measurable objectives of the GSP and the sustainability goal. The DQO process is an iterative process and should be evaluated regularly to improve monitoring efficiencies and meet changing planning and project needs. Following the DQO process, GSAs should also include a data quality control and quality assurance plan to guide the collection of data.

Many monitoring programs already exist as part of ongoing groundwater management or other programs. To the extent possible, the use of existing monitoring data and programs should be utilized to meet the needs for characterization, historical record documentation, and continued monitoring for the SGMA program. However, an evaluation of the existing monitoring data should be performed to assure the data being collected meets the DQOs, regulatory requirements, and data collection protocol described in this BMP. While this BMP provides guidance for collection of various regulatory based requirements, there is flexibility among the various methodologies available to meet the DQOs based upon professional judgment (local conditions or project needs).

At a minimum, for each monitoring site, the following information or procedure should be collected and documented:

- Long-term access agreements. Access agreements should include year-round site access to allow for increased monitoring frequency.
- A unique identifier that includes a general written description of the site location, date established, access instructions and point of contact (if necessary), type of information to be collected, latitude, longitude, and elevation. Each monitoring location should also track all modifications to the site in a modification log.

PROTOCOLS FOR MEASURING GROUNDWATER LEVELS

This section presents considerations for the methodology of collection of groundwater level data such that it meets the requirements of the GSP Regulations and the DQOs of the specific GSP. Groundwater levels are a fundamental measure of the status of groundwater conditions within a basin. In many cases, relationships of the sustainability indicators may be able to be correlated with groundwater levels. The quality of this data must consider the specific aquifer being monitored and the methodology for collecting these levels.

The following considerations for groundwater level measuring protocols should ensure the following:

- Groundwater level data are taken from the correct location, well ID, and screen interval depth
- Groundwater level data are accurate and reproducible
- Groundwater level data represent conditions that inform appropriate basin management DQOs
- All salient information is recorded to correct, if necessary, and compare data
- Data are handled in a way that ensures data integrity

General Well Monitoring Information

The following presents considerations for collection of water level data that include regulatory required components as well as those which are recommended.

- Groundwater elevation data will form the basis of basin-wide water-table and piezometric maps, and should approximate conditions at a discrete period in time. Therefore, all groundwater levels in a basin should be collected within as short a time as possible, preferably within a 1 to 2 week period.
- Depth to groundwater must be measured relative to an established Reference Point (RP) on the well casing. The RP is usually identified with a permanent marker, paint spot, or a notch in the lip of the well casing. By convention in open casing monitoring wells, the RP reference point is located on the north side of the well casing. If no mark is apparent, the person performing the measurement should measure the depth to groundwater from the north side of the top of the well casing.
- The elevation of the RP of each well must be surveyed to the North American Vertical Datum of 1988 (NAVD88), or a local datum that can be converted to NAVD88. The elevation of the RP must be accurate to within 0.5 foot. It is preferable for the RP elevation to be accurate to 0.1 foot or less. Survey grade global navigation satellite system (GNSS) global positioning system (GPS) equipment can achieve similar vertical accuracy when corrected. Guidance for use of GPS can be found at USGS http://water.usgs.gov/osw/gps/. Hand-held GPS units likely will not produce reliable vertical elevation measurement accurate enough for the casing elevation consistent with the DQOs and regulatory requirements.
- The sampler should remove the appropriate cap, lid, or plug that covers the monitoring access point listening for pressure release. If a release is observed, the measurement should follow a period of time to allow the water level to equilibrate.
- Depth to groundwater must be measured to an accuracy of 0.1 foot below the RP. It is preferable to measure depth to groundwater to an accuracy of 0.01 foot. Air lines and acoustic sounders may not provide the required accuracy of 0.1 foot.
- The water level meter should be decontaminated after measuring each well.

Where existing wells do not meet the base standard as described in the GSP Regulations or the considerations provided above, new monitoring wells may need to be constructed to meet the DQOs of the GSP. The design, installation, and documentation of new monitoring wells must consider the following:

- Construction consistent with California Well Standards as described in Bulletins 74-81 and 74-90, and local permitting agency standards of practice.
- Logging of borehole cuttings under the supervision of a California Professional Geologist and described consistent with the Unified Soil Classification System methods according to ASTM standard D2487-11.
- Written criteria for logging of borehole cuttings for comparison to known geologic formations, principal aquifers and aquitards/aquicludes, or specific marker beds to aid in consistent stratigraphic correlation within and across basins.
- Geophysical surveys of boreholes to aid in consistency of logging practices. Methodologies should include resistivity, spontaneous potential, spectral gamma, or other methods as appropriate for the conditions. Selection of geophysical methods should be based upon the opinion of a professional geologist or professional engineer, and address the DQOs for the specific borehole and characterization needs.
- Prepare and submit State well completion reports according to the requirements of §13752. Well completion report documentation should include geophysical logs, detailed geologic log, and formation identification as attachments. An example well completion as-built log is illustrated in **Figure 2.** DWR well completion reports can be filed directly at the Online System for Well Completion Reports (OSWCR) http://water.ca.gov/oswcr/index.cfm.

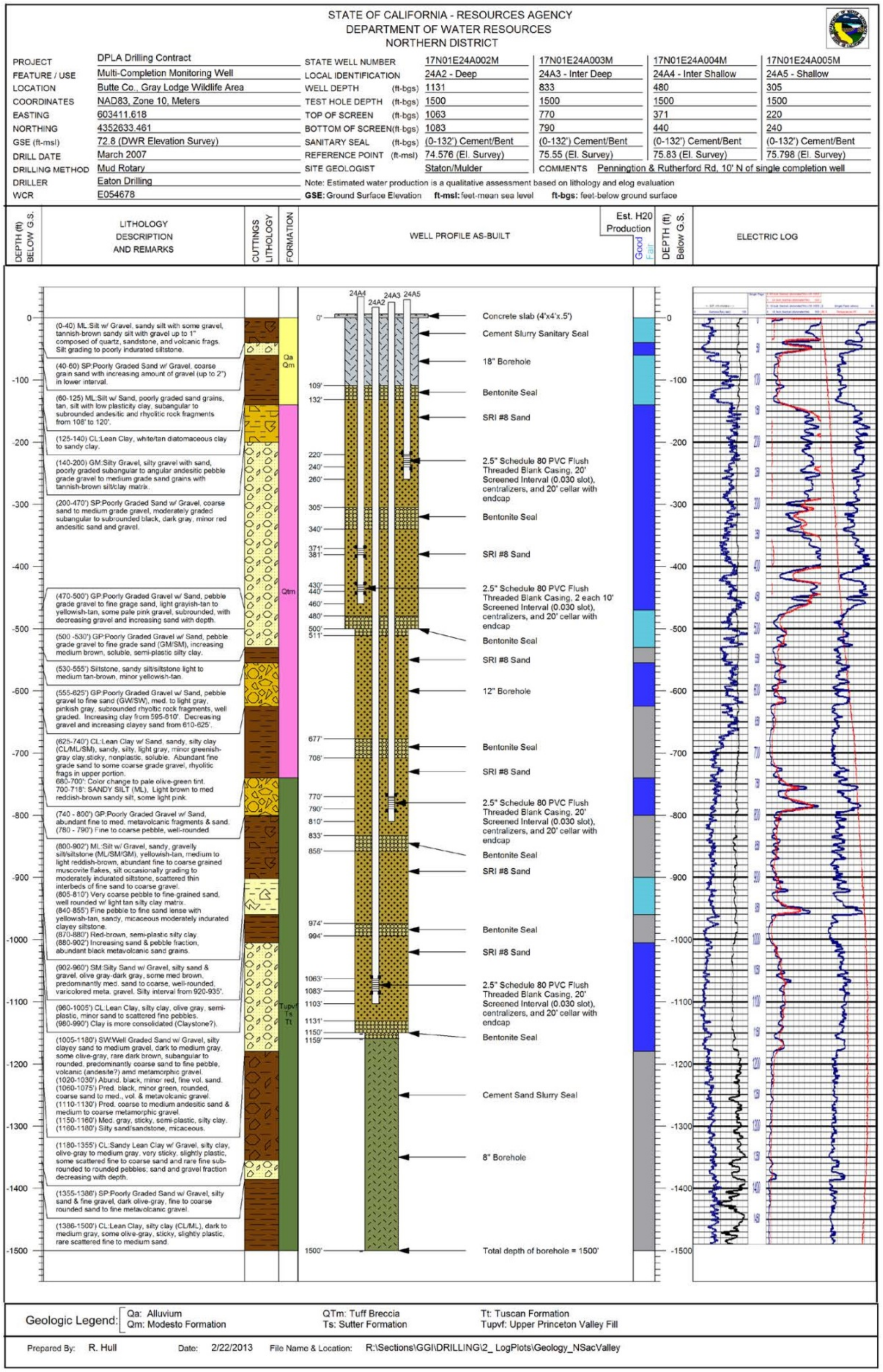


Figure 2 – Example As-Built Multi-Completion Monitoring Well Log

Measuring Groundwater Levels

Well construction, anticipated groundwater level, groundwater level measuring equipment, field conditions, and well operations should be considered prior collection of the groundwater level measurement. The USGS *Groundwater Technical Procedures* (Cunningham and Schalk, 2011) provide a thorough set of procedures which can be used to establish specific Standard Operating Procedures (SOPs) for a local agency. **Figure 3** illustrates a typical groundwater level measuring event and simultaneous pressure transducer download.

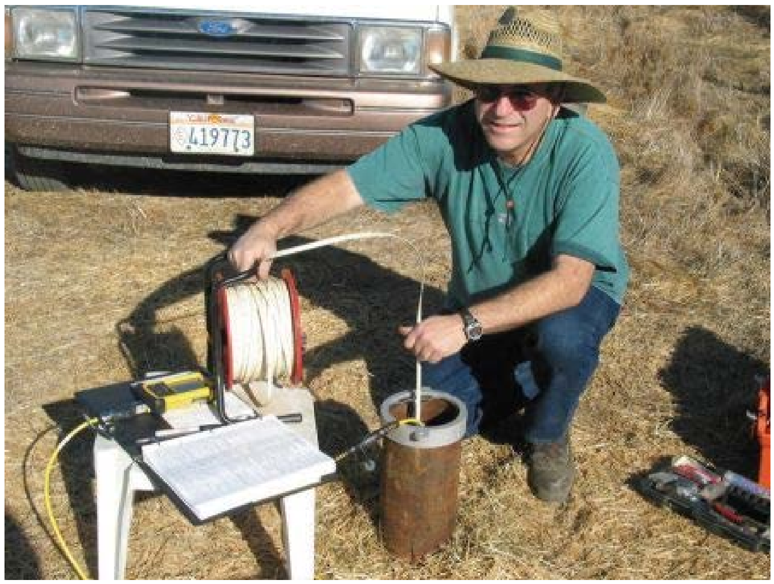


Figure 3 – Collection of Water Level Measurement and Pressure Transducer Download

The following points provide a general approach for collecting groundwater level measurements:

- Measure depth to water in the well using procedures appropriate for the measuring device. Equipment must be operated and maintained in accordance with manufacturer's instructions. Groundwater levels should be measured to the nearest 0.01 foot relative to the RP.
- For measuring wells that are under pressure, allow a period of time for the groundwater levels to stabilize. In these cases, multiple measurements should be collected to ensure the well has reached equilibrium such that no significant changes in water level are observed. Every effort should be made to ensure that a representative stable depth to groundwater is recorded. If a well does not stabilize, the quality of the value should be appropriately qualified as a

questionable measurement. In the event that a well is artesian, site specific procedures should be developed to collect accurate information and be protective of safety conditions associated with a pressurized well. In many cases, an extension pipe may be adequate to stabilize head in the well. Record the dimension of the extension and document measurements and configuration.

- The sampler should calculate the groundwater elevation as:

$$GWE = RPE - DTW$$

Where:

GWE = Groundwater Elevation
RPE = Reference Point Elevation
DTW = Depth to Water

The sampler must ensure that all measurements are in consistent units of feet, tenths of feet, and hundredths of feet. Measurements and RPEs should not be recorded in feet and inches.

Recording Groundwater Levels

- The sampler should record the well identifier, date, time (24-hour format), RPE, height of RP above or below ground surface, DTW, GWE, and comments regarding any factors that may influence the depth to water readings such as weather, nearby irrigation, flooding, potential for tidal influence, or well condition. If there is a questionable measurement or the measurement cannot be obtained, it should be noted. An example of a field sheet with the required information is shown in **Figure 4**. It includes questionable measurement and no measurement codes that should be noted. This field sheet is provided as an example. Standardized field forms should be used for all data collection. The aforementioned USGS *Groundwater Technical Procedures* offers a number of example forms.
- The sampler should replace any well caps or plugs, and lock any well buildings or covers.
- All data should be entered into the GSA data management system (DMS) as soon as possible. Care should be taken to avoid data entry mistakes and the entries should be checked by a second person for compliance with the DQOs.

STATE OF CALIFORNA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

WELL DATA

STATE WELL NUMBER	COUNTY	REFERENCE POINT ELEV.	MEASURING AGENCY
			DWR

NO MEASUREMENT	QUESTIONABLE MEASUREMENT
0. Measurement discontinued	0. Caved or deepened
1. Pumping	1. Pumping
2. Pump house locked	2. Nearby pump operating
3. Tape hung up	3. Casing leaky or wet
4. Can't get tape in casing	4. Pumped recently
5. Unable to locate well	5. Air or pressure gauge measurement
6. Well has been destroyed	6. Other
7. Special	7. Recharge operation at or nearby well
8. Casing leaky or wet	8. Oil in casing
9. Temporarily inaccessible	

DATE	N M	Q M	TAPE AT RP	TAPE AT WS	RP to WS	OBSR VR	COMMENTS

DWR 1213

Figure 4 – Example of Water Level Well Data Field Collection Form

Pressure Transducers

Groundwater levels and/or calculated groundwater elevations may be recorded using pressure transducers equipped with data loggers installed in monitoring wells. When installing pressure transducers, care must be exercised to ensure that the data recorded by the transducers is confirmed with hand measurements.

The following general protocols must be followed when installing a pressure transducer in a monitoring well:

- The sampler must use an electronic sounder or chalked steel tape and follow the protocols listed above to measure the groundwater level and calculate the groundwater elevation in the monitoring well to properly program and reference the installation. It is recommended that transducers record measured groundwater level to conserve data capacity; groundwater elevations can be calculated at a later time after downloading.
- The sampler must note the well identifier, the associated transducer serial number, transducer range, transducer accuracy, and cable serial number.
- Transducers must be able to record groundwater levels with an accuracy of at least 0.1 foot. Professional judgment should be exercised to ensure that the data being collected is meeting the DQO and that the instrument is capable. Consideration of the battery life, data storage capacity, range of groundwater level fluctuations, and natural pressure drift of the transducers should be included in the evaluation.
- The sampler must note whether the pressure transducer uses a vented or non-vented cable for barometric compensation. Vented cables are preferred, but non-vented units provide accurate data if properly corrected for natural barometric pressure changes. This requires the consistent logging of barometric pressures to coincide with measurement intervals.
- Follow manufacturer specifications for installation, calibration, data logging intervals, battery life, correction procedure (if non-vented cables used), and anticipated life expectancy to assure that DQOs are being met for the GSP.
- Secure the cable to the well head with a well dock or another reliable method. Mark the cable at the elevation of the reference point with tape or an indelible marker. This will allow estimates of future cable slippage.
- The transducer data should periodically be checked against hand measured groundwater levels to monitor electronic drift or cable movement. This should happen during routine site visits, at least annually or as necessary to maintain data integrity.

- The data should be downloaded as necessary to ensure no data is lost and entered into the basin's DMS following the QA/QC program established for the GSP. Data collected with non-vented data logger cables should be corrected for atmospheric barometric pressure changes, as appropriate. After the sampler is confident that the transducer data have been safely downloaded and stored, the data should be deleted from the data logger to ensure that adequate data logger memory remains.

PROTOCOLS FOR SAMPLING GROUNDWATER QUALITY

The following protocols can be incorporated into a GSP's monitoring protocols for collecting groundwater quality data. More detailed sampling procedures and protocols are included in the standards and guidance documents listed at the end of this BMP. A GSP that adopts protocols that deviate from these BMPs must demonstrate that the adopted protocols will yield comparable data.

In general, the use of existing water quality data within the basin should be done to the greatest extent possible if it achieves the DQOs for the GSP. In some cases it may be necessary to collect additional water quality data to support monitoring programs or evaluate specific projects. The USGS *National Field Manual for the Collection of Water Quality Data* (Wilde, 2005) should be used to guide the collection of reliable data. **Figure 5** illustrates a typical groundwater quality sampling setup.

Figure 5 – Typical Groundwater Quality Sampling Event

All analyses should be performed by a laboratory certified under the State Environmental Laboratory Accreditation Program. The specific analytical methods are beyond the scope of this BMP, but should be commiserate with other programs evaluating water quality within the basin for comparative purposes.

Groundwater quality sampling protocols should ensure that:

- Groundwater quality data are taken from the correct location
- Groundwater quality data are accurate and reproducible
- Groundwater quality data represent conditions that inform appropriate basin management and are consistent with the DQOs
- All salient information is recorded to normalize, if necessary, and compare data
- Data are handled in a way that ensures data integrity

The following points are general guidance in addition to the techniques presented in the previously mentioned USGS *National Field Manual for the Collection of Water Quality Data.*

Standardized protocols include the following:

- Prior to sampling, the sampler must contact the laboratory to schedule laboratory time, obtain appropriate sample containers, and clarify any sample holding times or sample preservation requirements.
- Each well used for groundwater quality monitoring must have a unique identifier. This identifier must appear on the well housing or the well casing to avoid confusion.
- In the case of wells with dedicated pumps, samples should be collected at or near the wellhead. Samples should not be collected from storage tanks, at the end of long pipe runs, or after any water treatment.
- The sampler should clean the sampling port and/or sampling equipment and the sampling port and/or sampling equipment must be free of any contaminants. The sampler must decontaminate sampling equipment between sampling locations or wells to avoid cross-contamination between samples.
- The groundwater elevation in the well should be measured following appropriate protocols described above in the groundwater level measuring protocols.
- For any well not equipped with low-flow or passive sampling equipment, an adequate volume of water should be purged from the well to ensure that the groundwater sample is representative of ambient groundwater and not stagnant water in the well casing. Purging three well casing volumes is generally

considered adequate. Professional judgment should be used to determine the proper configuration of the sampling equipment with respect to well construction such that a representative ambient groundwater sample is collected. If pumping causes a well to be evacuated (go dry), document the condition and allow well to recover to within 90% of original level prior to sampling. Professional judgment should be exercised as to whether the sample will meet the DQOs and adjusted as necessary.

- Field parameters of pH, electrical conductivity, and temperature should be collected for each sample. Field parameters should be evaluated during the purging of the well and should stabilize prior to sampling. Measurements of pH should only be measured in the field, lab pH analysis are typically unachievable due to short hold times. Other parameters, such as oxidation-reduction potential (ORP), dissolved oxygen (DO) (in situ measurements preferable), or turbidity, may also be useful for meeting DQOs of GSP and assessing purge conditions. All field instruments should be calibrated daily and evaluated for drift throughout the day.
- Sample containers should be labeled prior to sample collection. The sample label must include: sample ID (often well ID), sample date and time, sample personnel, sample location, preservative used, and analytes and analytical method.
- Samples should be collected under laminar flow conditions. This may require reducing pumping rates prior to sample collection.
- Samples should be collected according to appropriate standards such as those listed in the *Standard Methods for the Examination of Water and Wastewater*, USGS *National Field Manual for the Collection of Water Quality Data,* or other appropriate guidance. The specific sample collection procedure should reflect the type of analysis to be performed and DQOs.
- All samples requiring preservation must be preserved as soon as practically possible, ideally at the time of sample collection. Ensure that samples are appropriately filtered as recommended for the specific analyte. Entrained solids can be dissolved by preservative leading to inconsistent results of dissolve analytes. Specifically, samples to be analyzed for metals should be field-filtered prior to preservation; do not collect an unfiltered sample in a preserved container.
- Samples should be chilled and maintained at 4 °C to prevent degradation of the sample. The laboratory's Quality Assurance Management Plan should detail appropriate chilling and shipping requirements.

- Samples must be shipped under chain of custody documentation to the appropriate laboratory promptly to avoid violating holding time restrictions.
- Instruct the laboratory to use reporting limits that are equal to or less than the applicable DQOs or regional water quality objectives/screening levels.

Special protocols for low-flow sampling equipment

In addition to the protocols listed above, sampling using low-flow sample equipment should adopt the following protocols derived from EPA's *Low-flow (minimal drawdown) ground-water sampling procedures* (Puls and Barcelona, 1996). These protocols apply to low-flow sampling equipment that generally pumps between 0.1 and 0.5 liters per minute. These protocols are not intended for bailers.

Special protocols for passive sampling equipment

In addition to the protocols listed above, passive diffusion samplers should follow protocols set forth in USGS Fact Sheet 088-00.

PROTOCOLS FOR MONITORING SEAWATER INTRUSION

Monitoring seawater intrusion requires analysis of the chloride concentrations within groundwater of each principal aquifer subject to seawater intrusion. While no significant standardized approach exists, the methodologies described above for degraded water quality can be applied for the collection of groundwater samples. In addition to the protocol described above, the following protocols should be followed:

- Water quality samples should be collected and analyzed at least semi-annually. Samples will be analyzed for dissolved chloride at a minimum. It may be beneficial to include analyses of iodide and bromide to aid in determination of salinity source. More frequent sampling may be necessary to meet DQOs of GSP. The development of surrogate measures of chloride concentration may facilitate cost-effective means to monitor more frequently to observe the range of conditions and variability of the flow dynamics controlling seawater intrusion.
- Groundwater levels will be collected at a frequency adequate to characterize changes in head in the vicinity of the leading edge of degraded water quality in each principal aquifer. Frequency may need to be increased in areas of known preferential pathways, groundwater pumping, or efficacy evaluation of mitigation projects.
- The use of geophysical surveys, electrical resistivity, or other methods may provide for identification of preferential pathways and optimize monitoring well placement and evaluation of the seawater intrusion front. Professional judgment

should be exercised to determine the appropriate methodology and whether the DQOs for the GSP would be met.

PROTOCOLS FOR MEASURING STREAMFLOW

Monitoring of streamflow is necessary for incorporation into water budget analysis and for use in evaluation of stream depletions associated with groundwater extractions. The use of existing monitoring locations should be incorporated to the greatest extent possible. Many of these streamflow monitoring locations currently follow the protocol described below.

Establishment of new streamflow discharge sites should consider the existing network and the objectives of the new location. Professional judgment should be used to determine the appropriate permitting that may be necessary for the installation of any monitoring locations along surface water bodies. Regular frequent access will be necessary to these sites for the development of ratings curves and maintenance of equipment.

To establish a new streamflow monitoring station special consideration must be made in the field to select an appropriate location for measuring discharge. Once a site is selected, development of a relationship of stream stage to discharge will be necessary to provide continuous estimates of streamflow. Several measurements of discharge at a variety of stream stages will be necessary to develop the ratings curve correlating stage to discharge. The use of Acoustic Doppler Current Profilers (ADCPs) can provide accurate estimates of discharge in the correct settings. Professional judgment must be exercised to determine the appropriate methodology. Following development of the ratings curve a simple stilling well and pressure transducer with data logger can be used to evaluate stage on a frequent basis. A simple stilling well and staff gage is illustrated in **Figure 6**.

Streamflow measurements should be collected, analyzed, and reported in accordance with the procedures outlined in USGS Water Supply Paper 2175, *Volume 1. – Measurement of Stage Discharge* and *Volume 2. – Computation of Discharge.* This methodology is currently being used by both the USGS and DWR for existing streamflow monitoring throughout the State.

Figure 6 – Simple Stilling Well and Staff Gage Setup

PROTOCOLS FOR MEASURING SUBSIDENCE

Evaluating and monitoring inelastic land subsidence can utilize multiple data sources to evaluate the specific conditions and associated causes. To the extent possible, the use of existing data should be utilized. Subsidence can be estimated from numerous techniques, they include: level surveying tied to known stable benchmarks or benchmarks located outside the area being studied for possible subsidence; installing and tracking changes in borehole extensometers; obtaining data from continuous GPS (CGPS) locations, static GPS surveys or Real-Time-Kinematic (RTK) surveys; or analyzing Interferometric Synthetic Aperture Radar (InSAR) data. No standard procedures exist for collecting data from the potential subsidence monitoring approaches. However, an approach may include:

- Identification of land subsidence conditions.
    - Evaluate existing regional long-term leveling surveys of regional infrastructure, i.e. roadways, railroads, canals, and levees.
    - Inspect existing county and State well records where collapse has been noted for well repairs or replacement.
    - Determine if significant fine-grained layers are present such that the potential for collapse of the units could occur should there be significant depressurization of the aquifer system.

    - Inspect geologic logs and the hydrogeologic conceptual model to aid in identification of specific units of concern.
    - Collect regional remote-sensing information such as InSAR, commonly provided by USGS and NASA. Data availability is currently limited, but future resources are being developed.
- Monitor regions of suspected subsidence where potential exists.
    - Establish CGPS network to evaluate changes in land surface elevation.
    - Establish leveling surveys transects to observe changes in land surface elevation.
    - Establish extensometer network to observe land subsidence. An example of a typical extensometer design is illustrated in **Figure 7**. There are a variety of extensometer designs and they should be selected based on the specific DQOs.

Various standards and guidance documents for collecting data include:

- Leveling surveys must follow surveying standards set out in the California Department of Transportation's Caltrans Surveys Manual.
- GPS surveys must follow surveying standards set out in the California Department of Transportation's Caltrans Surveys Manual.
- USGS has been performing subsidence surveys within several areas of California. These studies are sound examples for appropriate methods and should be utilized to the extent possible and where available:
    - http://ca.water.usgs.gov/land_subsidence/california-subsidence-measuring.html
- Instruments installed in borehole extensometers must follow the manufacturer's instructions for installation, care, and calibration.
- Availability of InSAR data is improving and will increase as programs are developed. This method requires expertise in analysis of the raw data and will likely be made available as an interpretative report for specific regions.

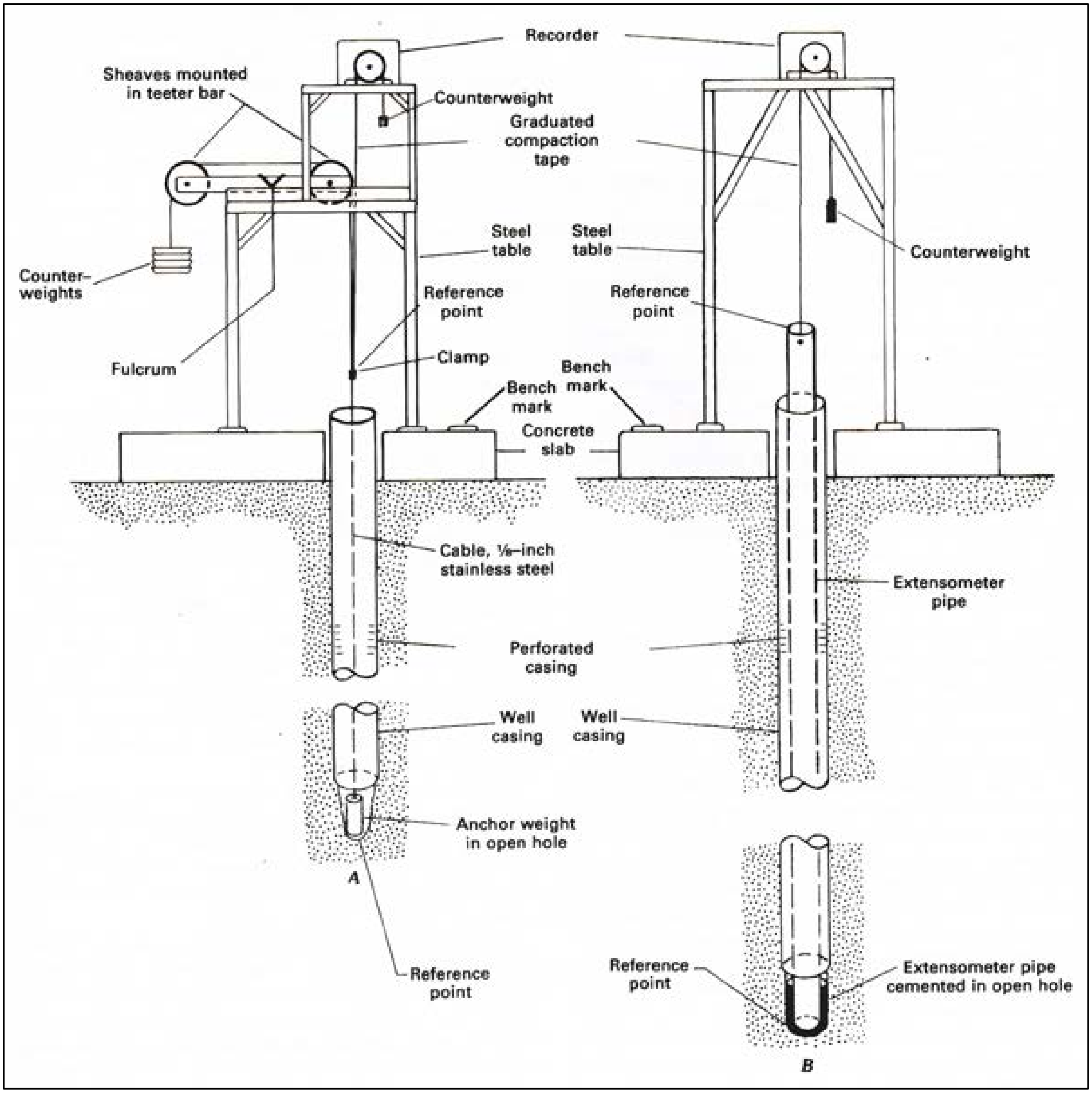


Figure 7 – Simplified Extensometer Diagram

6. Key Definitions

The key definitions and sections related to Groundwater Monitoring Protocols, Standards, and Sites outlined in applicable SGMA code and regulations are provided below for reference.

Groundwater Sustainability Plan Regulations (California Code of Regulations §351)

- §351(h) "Best available science" refers to the use of sufficient and credible information and data, specific to the decision being made and the time frame available for making that decision, that is consistent with scientific and engineering professional standards of practice.
- §351(i) "Best management practice" refers to a practice, or combination of practices, that are designed to achieve sustainable groundwater management and have been determined to be technologically and economically effective, practicable, and based on best available science.

Monitoring Protocols Reference

§352.2. Monitoring Protocols

Each Plan shall include monitoring protocols adopted by the Agency for data collection and management, as follows:

(a) Monitoring protocols shall be developed according to best management practices.

(b) The Agency may rely on monitoring protocols included as part of the best management practices developed by the Department, or may adopt similar monitoring protocols that will yield comparable data.

(c) Monitoring protocols shall be reviewed at least every five years as part of the periodic evaluation of the Plan, and modified as necessary.

SGMA Reference

§10727.2. Required Plan Elements

(f) Monitoring protocols that are designed to detect changes in groundwater levels, groundwater quality, inelastic surface subsidence for basins for which subsidence has been identified as a potential problem, and flow and quality of surface water that directly affect groundwater levels or quality or are caused by groundwater extraction in the basin. The monitoring protocols shall be designed to generate information that promotes efficient and effective groundwater management.

7. RELATED MATERIALS

CASE STUDIES

Luhdorff & Scalmanini Consulting Engineers, J.W. Borchers, M. Carpenter. 2014. *Land Subsidence from Groundwater Use in California*. Full Report of Findings prepared for California Water Foundation. April 2014. 151 p. http://ca.water.usgs.gov/land_subsidence/california-subsidence-cause-effect.html

Faunt, C.C., M. Sneed, J. Traum, and J.T. Brandt, 2015. *Water availability and land subsidence in the Central Valley, California, USA*. Hydrogeol J (2016) 24: 675. doi:10.1007/s10040-015-1339-x.
https://pubs.er.usgs.gov/publication/701605

Poland, J.F., B.E. Lofgren, R.L. Ireland, and R.G. Pugh, 1975. *Land subsidence in the San Joaquin Valley, California, as of 1972*; US Geological Survey Professional Paper 437-H; prepared in cooperation with the California Department of Water Resources, 87 p.
http://pubs.usgs.gov/pp/0437h/report.pdf

Sneed, M., J.T. Brandt, and M. Solt, 2013. *Land subsidence along the Delta-Mendota Canal in the northern part of the San Joaquin Valley, California, 2003-10*; USGS Scientific Investigations Report 2013-5142, prepared in cooperation with U.S. Bureau of Reclamation and the San Luis and Delta-Mendota Water Authority.
https://pubs.er.usgs.gov/publication/sir20135142

Sneed, M., J.T. Brandt, and M. Solt, 2014. *Land subsidence, groundwater levels, and geology in the Coachella Valley, California, 1993–2010*: U.S. Geological Survey, Scientific Investigations Report 2014–5075, 62 p.
http://dx.doi.org/10.3133/sir20145075.

STANDARDS

California Department of Transportation, various dates. *Caltrans Surveys Manual*. http://www.dot.ca.gov/hq/row/landsurveys/SurveysManual/Manual_TOC.html

U.S. Environmental Protection Agency, 2006. Guidance on Systematic Planning Using the Data Quality Objectives Process, EPA QA/G-4 https://www.epa.gov/sites/production/files/documents/guidance_systematic_planning_dqo_process.pdf

Rice, E.W., R.B. Baire, A.D. Eaton, and L.S. Clesceri ed. 2012. *Standard methods for the examination of water and wastewater*. Washington, DC: American Public Health Association, American Water Works Association, and Water Environment Federation.

GUIDANCE

Barcelona, M.J., J.P. Gibb, J.A. Helfrich, and E.E.Graske. 1985. *Practical Guide for Ground-Water Sampling*. Illinois State Water Survey, Champaign, Illinois, 103 pages.
www.orau.org/ptp/PTP%20Library/library/epa/samplings/pracgw.pdf

Buchanan, T.J., and W.P. Somers, 1969. *Discharge measurements at gaging stations; techniques of water-resources investigations of the United States Geologic Survey chapter A8*, Washington D.C. http://pubs.usgs.gov/twri/twri3a8/html/pdf.html

Cunningham, W.L., and Schalk, C.W., comps., 2011, *Groundwater technical procedures of the U.S. Geological Survey*: U.S. Geological Survey Techniques and Methods 1–A1. https://pubs.usgs.gov/tm/1a1/pdf/tm1-a1.pdf

California Department of Water Resources, 2010. *Groundwater elevation monitoring guidelines*.
http://www.water.ca.gov/groundwater/casgem/pdfs/CASGEM%20DWR%20GW%20Guidelines%20Final%20121510.pdf

Holmes, R.R. Jr., P.J. Terrio, M.A. Harris, and P.C. Mills, 2001. *Introduction to field methods for hydrologic and environmental studies*, open-file report 01-50, USGS, Urbana, Illinois, 241 p. https://pubs.er.usgs.gov/publication/ofr0150

Puls, R.W., and Barcelona, M.J., 1996, *Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures*; US EPA, Ground Water Issue EPA/540/S-95/504. https://www.epa.gov/sites/production/files/2015-06/documents/lwflw2a.pdf

Rantz, S.E., and others, 1982. *Measurement and computation of streamflow*; U.S. Geological Survey, Water Supply Paper 2175. http://pubs.usgs.gov/wsp/wsp2175/#table

Subcommittee on Ground Water of the Advisory Committee on Water Information, 2013. *A national framework for ground-water monitoring in the United States*.
http://acwi.gov/sogw/ngwmn_framework_report_july2013.pdf

Vail, J., D. France, and B. Lewis. 2013. *Operating Procedure: Groundwater Sampling SESDPROC-301-R3*.

https://www.epa.gov/sites/production/files/2015-06/documents/Groundwater-Sampling.pdf

Wilde, F.D., January 2005. *Preparations for water sampling (ver. 2.0)*: U.S. Geological Survey Techniques of Water-Resources Investigations, book 9, chap. A1, http://water.usgs.gov/owq/FieldManual/compiled/NFM_complete.pdf

ONLINE RESOURCES

Online System for Well Completion Reports (OSWCR). California Department of Water Resources. http://water.ca.gov/oswcr/index.cfm

Measuring Land Subsidence web page. U.S. Geological Survey. http://ca.water.usgs.gov/land_subsidence/california-subsidence-measuring.html

USGS Global Positioning Application and Practice web page. U.S. Geological Survey. http://water.usgs.gov/osw/gps/

APPENDIX J: MONITORING PROTOCOLS – GROUNDWATER QUALITY (CVGM QAPRP & ESJWQC QAPP)

Quality Assurance Program Plan

For Groundwater Monitoring By The

Central Valley Groundwater Monitoring Collaborative

For The

Irrigated Lands Regulatory Program

Central Valley Regional Water Quality Control Board
11020 Sun Center Drive #200
Rancho Cordova, California 95670-6114

Submitted On

April 1, 2019

Prepared By

LUHDORFF & SCALMANINI CONSULTING ENGINEERS

MLJ ENVIRONMENTAL

PROVOST & PRITCHARD CONSULTING GROUP

GROUP A. PROGRAM MANAGEMENT

1. APPROVAL SIGNATURES

Central Valley Regional Water Quality Control Board

Title:	Name:	Signature:	Date:
Senior Environmental Scientist	Susan Fregien		
Senior Engineering Geologist	David Sholes		
Water Resource Control Engineer	Ashley Peters		

State Water Resources Control Board

Title:	Name:	Signature:	Date:
SWRCB QA Officer	Rene Spears		

CVGMC Program Personnel

Title:	Name:	Signature:	Date:
Program Manager	David Cory		
Senior Hydrogeologist	Vicki Kretsinger		
Program QA Officer	Melisa Turner		

Coalition Project Personnel

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Project Lead, Buena Vista Coalition	Tim Ashlock		
Project Manager, Buena Vista Coalition	Morgan Campbell		
Project QA Officer, Buena Vista Coalition	Sarah Rutherford		
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Project Manager, East San Joaquin Water Quality Coalition	Ally Villalpando		
Project QA Officer, East San Joaquin Water Quality Coalition	Lisa McCrink		
Project Lead, Grassland Drainage Area Coalition	Joe McGahan		
Project Manager, Grassland Drainage Area Coalition	Nick Watterson		
Project QA Officer, Grassland Drainage Area Coalition	Aaron King		
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Project Manager, Kaweah Basin Water Quality Association	Jordan Muell		
Project QA Officer, Kaweah Basin Water Quality Association	Sarah Rutherford		
Project Lead, Kern River Watershed Authority	Nicole Bell		
Project Manager, Kern River Watershed Authority	Morgan Campbell		

Project QA Officer, Kern River Watershed Authority	Sarah Rutherford		
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Project Lead, Westside Water Quality Coalition	Phil Nixon		
Project Manager, Westside Water Quality Coalition	Jill Ghelerter		
Project QA Officer, Westside Water Quality Coalition	Josh Spink		

Analytical Laboratory Personnel

Title/Laboratory:	Name:	Signature:	Date:
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Laboratory Project Manager, BSK (Westside)	Adam Trevarrow		
Laboratory QA Officer, BSK	Michael Ng		
Laboratory Project Manager, Caltest	Eli Greenwald		
Laboratory QA Officer, Caltest	Nell Arguelles		
Laboratory Project Manager, Eurofins	Monica Van Natta		
Laboratory QA Officer, Eurofins	Nilda Cox		
Laboratory Project Manager, FGL	Stephanie Herron		
Laboratory QA Officer, FGL	David Terz		

2. TABLE OF CONTENTS

2.1. List of Tables

2.2. List of Figures

2.3. List of Appendices

Appendix I. Coalition Specific QAPP Forms

Appendix II. Data Management SOP

Appendix III. Field Sampling SOPs

Appendix IV. Laboratory SOPs

Index of Appendices

CVGMC Coalition	QAPP Appendix Reference	Data Management SOP Appendix Reference	Field Sampling SOP Appendix Reference	Laboratory SOPs Appendix Reference
Buena Vista Coalition	Appendix I-A	Appendix II	Appendix III-A	Appendix IV-A
Cawelo Water District Coalition	Appendix I-B	Appendix II	Appendix III-B	Appendix IV-D
East San Joaquin Water Quality Coalition	Appendix I-C	Appendix II	Appendix III-G	Appendix IV-B
Grassland Drainage Area Coalition	Appendix I-D	Appendix II	Appendix III-F	Appendix IV-C
Kaweah Basin Water Quality Association	Appendix I-E	Appendix II	Appendix III-C	Appendix IV-D
Kern River Watershed Coalition Authority	Appendix I-F	Appendix II	Appendix III-D	Appendix IV-A
Kings River Water Quality Coalition	Appendix I-G	Appendix II	Appendix III-E	Appendix IV-A
Westlands Water Quality Coalition	Appendix I-H	Appendix II	Appendix III-G	Appendix IV-B
Westside San Joaquin River Watershed Coalition	Appendix I-I	Appendix II	Appendix III-F	Appendix IV-C
Westside Water Quality Coalition	Appendix I-J	Appendix II	Appendix III-H	Appendix IV-A

2.4. List of Acronyms

AOAC	Association of Official Analytical Chemist	MDL	Method Detection Limit
ASTM	American Society of Testing Materials	MLJ-LLC	Michael L. Johnson, LLC
COC	Chain Of Custody	MOA	Memorandum of Agreement
CRM	Certified Reference Material	MQO	Measurement Quality Objective
CVGMC	Central Valley Groundwater Monitoring Collaborative	MS	Matrix Spike
CVRWQCB	Central Valley Regional Water Quality Control Board	MSD	Matrix Spike Duplicate
DDW	Division of Drinking Water	ORP	Oxidation Reduction Potential
DMS	Data Management System	PR	Percent Recovery
DO	Dissolved Oxygen	QA	Quality Assurance
DQI	Data Quality Indicators	QAPrP	Quality Assurance Project Plan
E	Environmental sample	QC	Quality Control
EC	Specific Conductance	RL	Reporting Limit
FB	Field Blank	RPD	Relative Percent Difference
FD	Field Duplicate	RS	Resample
GAR	Groundwater Quality Assessment Report	SOP	Standard Operating Procedure
GQTM	Groundwater Trend Monitoring	TDS	Total Dissolved Solids
ILRP	Irrigated Land and Regulatory Program	US EPA	United States Environmental Protection Agency
LCS	Laboratory Control Spike	USGS	United States Geological Survey
LCSD	Laboratory Control Spike Duplicate		

2.5. List of Units

cm	centimeter
L	liter
mg	milligram
mV	millivolts
NTU	Nephelometric Turbidity Units
pH	Power of Hydrogen
µg	microgram

3. DISTRIBUTION LIST

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	Laura Satterlee	Project QA Officer	
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	David Sholes	Senior Engineering Geologist	
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Eurofins Eaton	Nilda Cox	Laboratory QA Officer	750 Royal Oaks Drive, Suite 100 Monrovia, CA 91016
Fruit Growers Laboratories	David Terz	Laboratory QA Officer	9415 W. Goshen Avenue Visalia, CA 93291

4. PROGRAM ROLES AND RESPONSIBILITIES

4.1. Involved Parties and Roles

The Central Valley Groundwater Monitoring Collaborative (CVGMC) is a monitoring program developed by various stakeholders across the Central Valley with the goal of characterizing groundwater quality and the potential impact of waste discharges on groundwater quality. The CVGMC has developed a Technical Workplan for long-term trend monitoring that will be implemented by the participating entities.

Ten Central Valley third-party groups comprise the initial group of Irrigated Lands Regulatory Program (ILRP) Coalitions taking part in the Collaborative. The participating agricultural Coalitions are:

- Buena Vista Coalition
- Cawelo Water District Coalition
- East San Joaquin Water Quality Coalition
- Grassland Drainage Area Coalition
- Kaweah Basin Water Quality Association
- Kern River Watershed Coalition Authority
- Kings River Water Quality Coalition
- Westlands Water Quality Coalition
- Westside San Joaquin River Watershed
- Westside Water Quality Coalition

Each of the participating agricultural Coalitions must meet their own groundwater monitoring requirements, outlined in their individual General Orders. However, each Order allows for the Coalitions to collaborate with other Central Valley third parties to monitor and report on groundwater quality trends on a regional basis. The role of the CVGMC is to establish common monitoring and reporting structure as it applies to the individual groundwater trend monitoring requirements established by each third-party group under their individual General Orders. The third-party groups will participate in a regional effort to collect and share groundwater monitoring data to be used for a broad geographical characterization of the potential effects of agricultural lands on groundwater aquifers, for regulatory compliance and decision making throughout the Central Valley.

The Quality Assurance Program Plan (QAPrP) establishes the quality assurance and quality control standards and requirements for useable data for individual projects contributing to this regional collaboration. It also establishes the requirements for a regional data management system, through which all useable data generated under the CVGMC can be stored and accessed by the participants and regulators.

4.2. Program Administration

The CVGMC participating Coalitions work collaboratively under a Memorandum of Agreement (MOA) signed on October 27, 2017. The Memorandum of Agreement outlines the purpose, organization, roles and responsibilities of the member Coalitions, administrative procedures, length of time the terms of the MOA remain in force, termination procedures, and rules of operation. In addition, there is a cost allocation schedule agreed upon by all member Coalitions.

4.3. Project Management and Coordination

The CVGMC activities are managed by a Coordination Committee which consists of a member from each of the Coalitions including a Chair and Vice Chair. The Coordination Committee is responsible for approving scope of work documents for any contractor and provides oversight for any work performed by outside contractors. The Chair serves as the Program Manager for the purpose of this QAPrP and works directly with the Program QA Officer and the Senior Hydrogeologist to assess data received from the individual Coalitions, compile and assess data, and evaluate data for inclusion in CVGMC analysis and reporting.

4.4. Quality Assurance and Data Management

Quality Assurance Officer Role

The Program QA Officer is responsible for developing the programmatic procedures and QA/QC guidelines for field sampling and analytical procedures conducted as part of the CVGMC Technical Workplan. The Program QA Officer will oversee and manage the assessment of accuracy, completeness and precision for samples collected as part of the CVGMC.

Persons Responsible for the Update and Maintenance of QAPrP

The Program QA Officer in coordination with the Program Manager and Senior Hydrogeologist will be responsible for creating, maintaining and updating the QAPrP including the submission of addendums to reflect updates based on project specific QAPP. The Program QA Officer will be responsible for making changes, submitting drafts for review, preparing a final copy and submitting the final version for signature.

4.5. Field, Laboratory, and Technical Services

Well sampling will be conducted by the member Coalitions as described in their project specific QAPP following quality assurance (QA) requirements found in this QAPrP. The individual entities will maintain and store records of data, field sheets, chain of custody (COC) forms, as well as all other forms of documentation.

Programmatic technical services are overseen by the Senior Hydrogeologist, who is responsible for overseeing the implementation of the Programmatic Workplan and development of five-year trend reports to the CVRWQCB. The Senior Hydrogeologist will review updates to the Workplan and assess how changes to workplans meet the technical requirements of the program.

The laboratories contracted to analyze samples collected for the Program studies will provide analytical services for this project in accordance with all method and QA requirements found in this QAPrP. Individual contracts will be maintained by the third-party entities coordinating sampling efforts. All data deliverables generated by contract laboratories will be submitted to the Program Data Management System outlined in this QAPrP in **Section 19.**

All analytical issues will be resolved between the contract entities and covered under individual QAPPs. The laboratories will maintain contact with the individual Project Managers to resolve analytical issues or for notification of laboratory changes.

No individuals outside of the Program Team contribute to the CVGMC in an advisory role.

4.6. Organizational Chart and Responsibilities

Figure 1. Organizational chart - CVGMC.

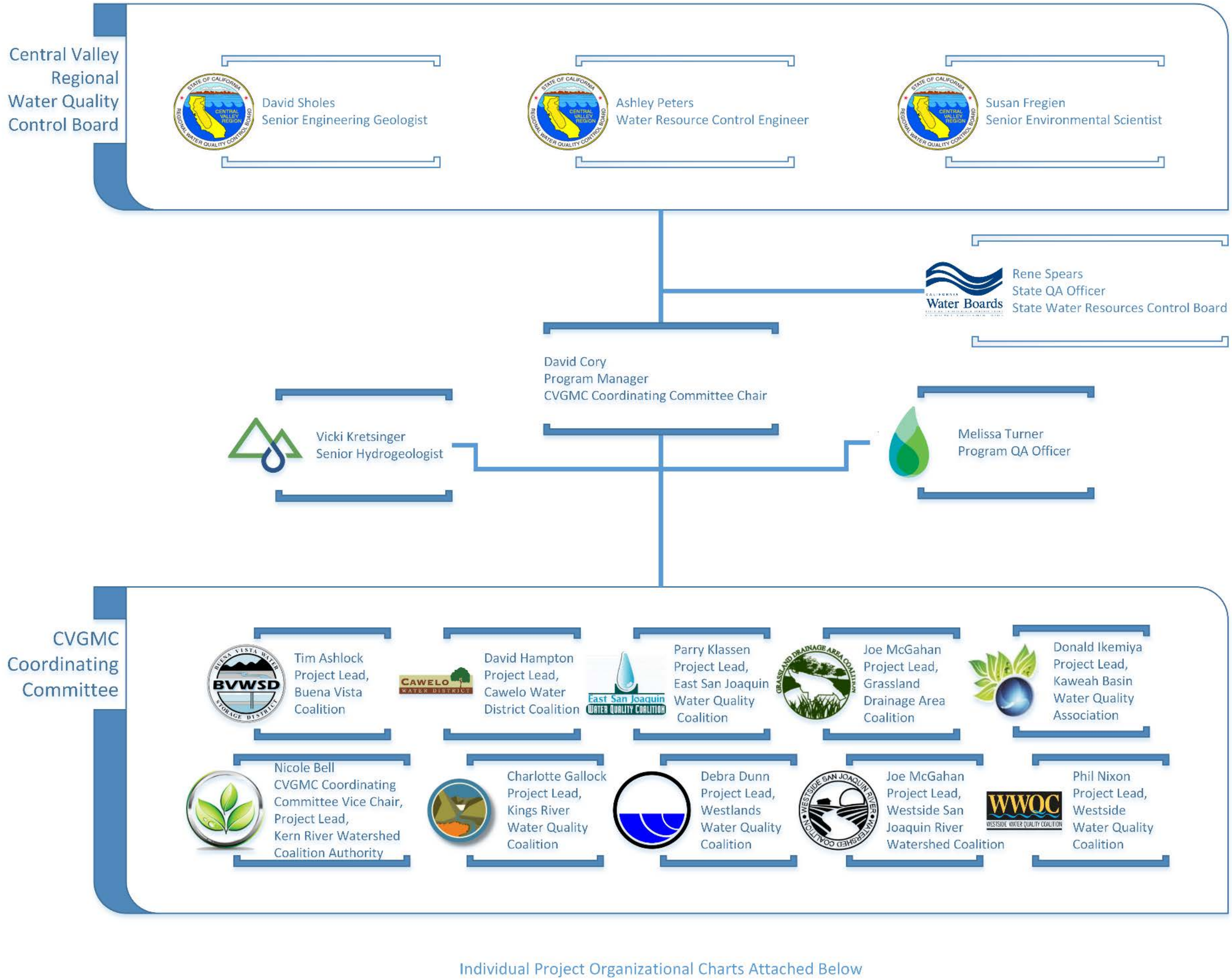


Figure 2. Project Organizational Chart - Buena Vista Coalition.

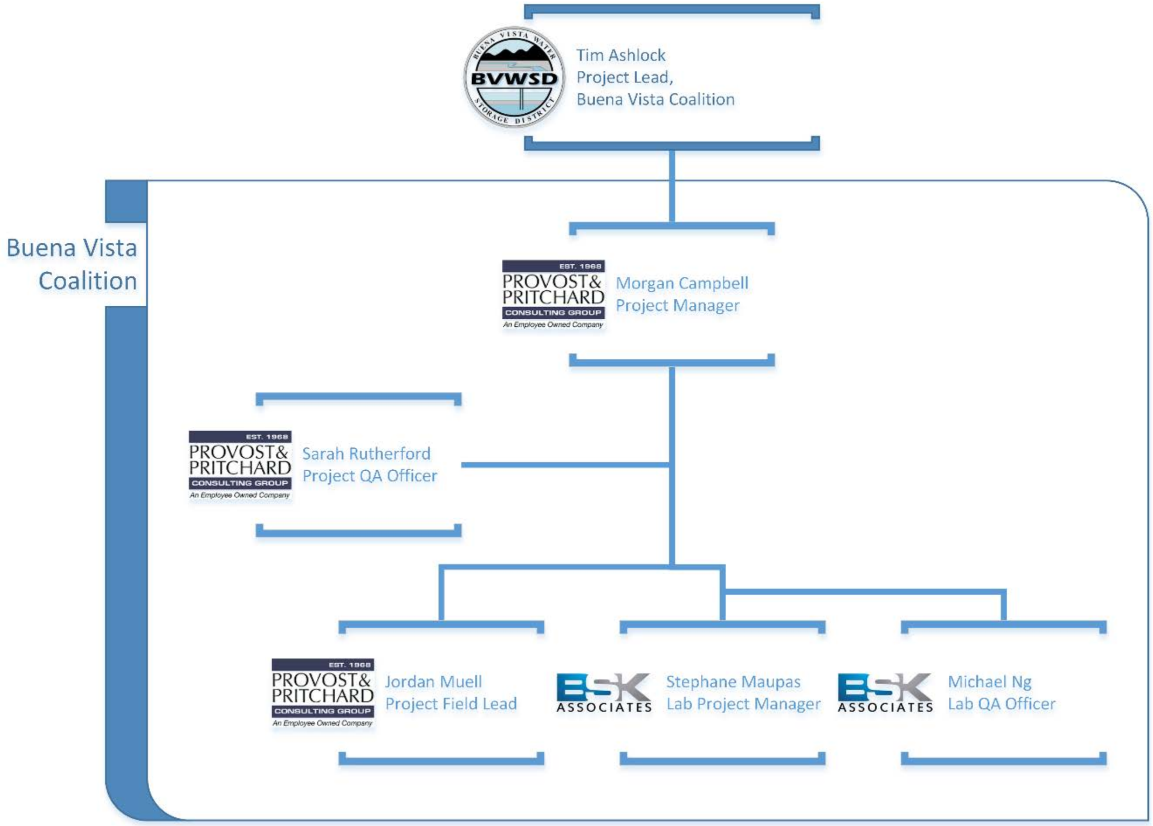


Figure 3. Project Organizational Chart - Cawelo Water District Coalition.

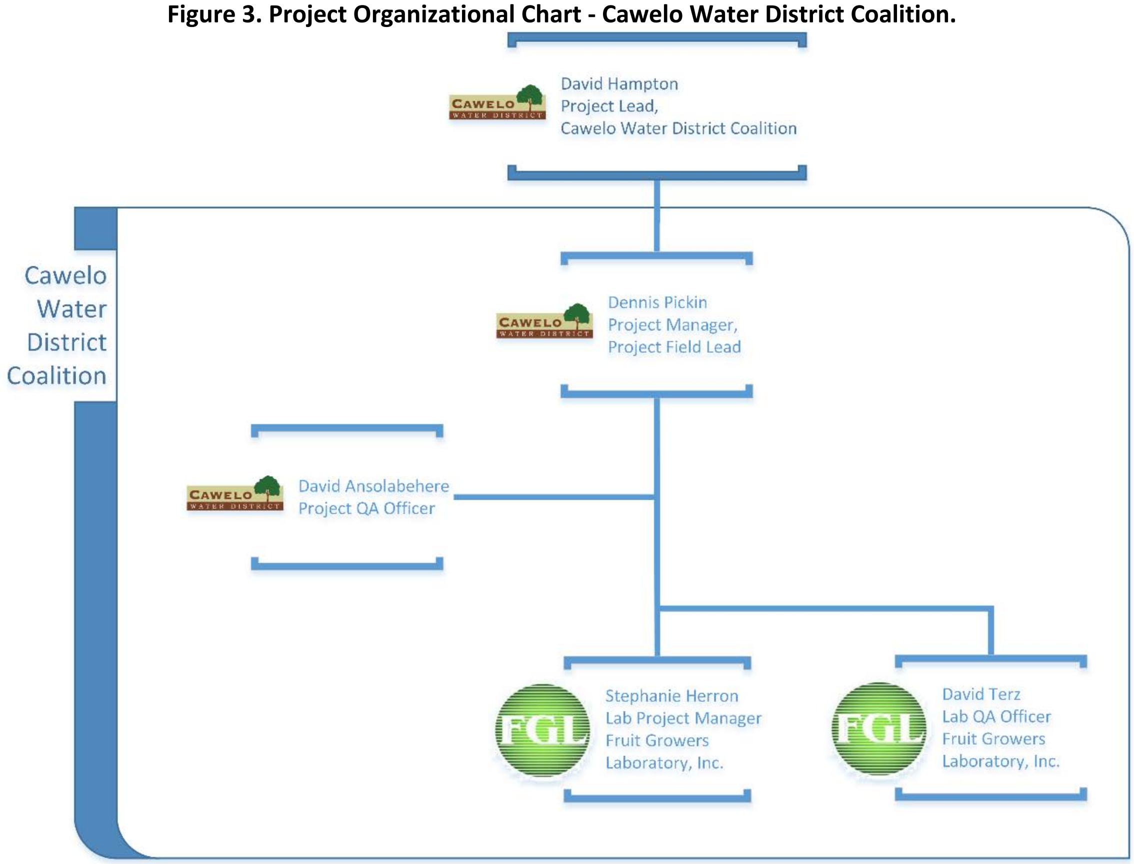


Figure 4. Project Organizational Chart - East San Joaquin Water Quality Coalition.

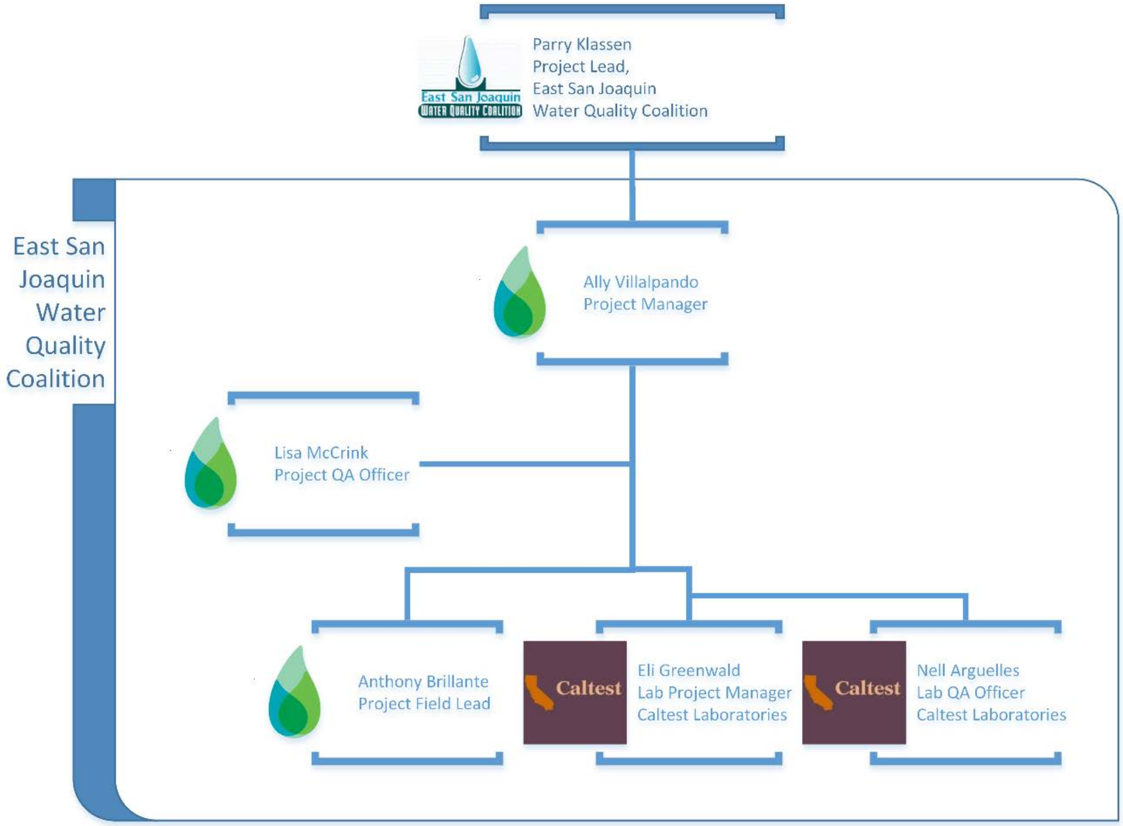


Figure 5. Project Organizational Chart - Grassland Drainage Area Coalition.

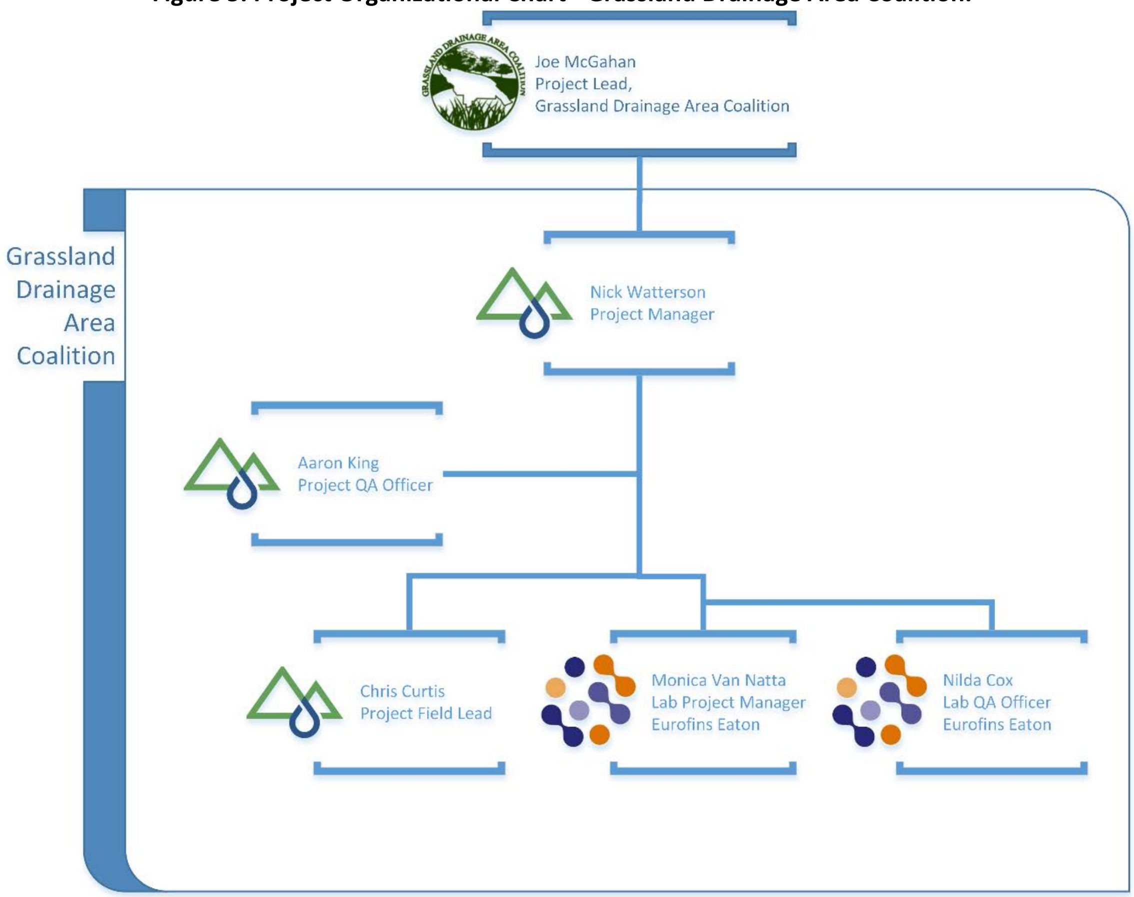


Figure 6. Project Organizational Chart - Kaweah Basin Water Quality Coalition.

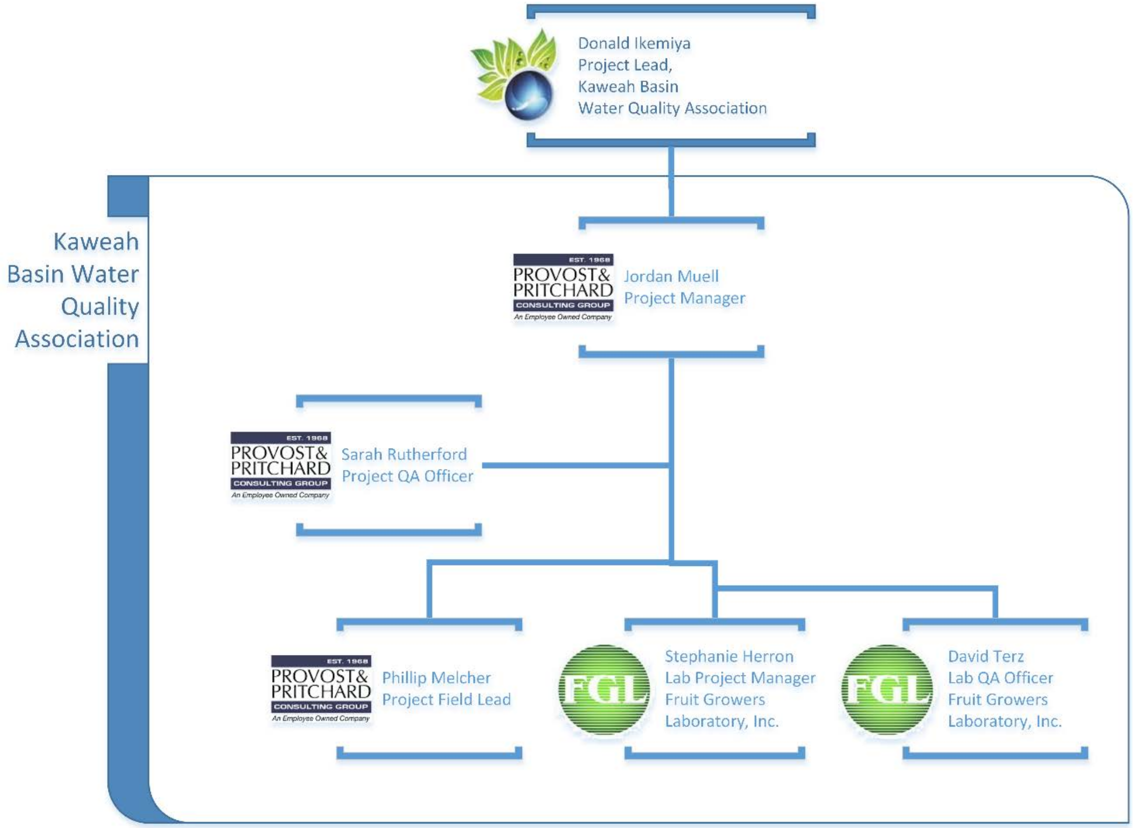


Figure 7. Project Organizational Chart - Kern River Watershed Coalition Authority.

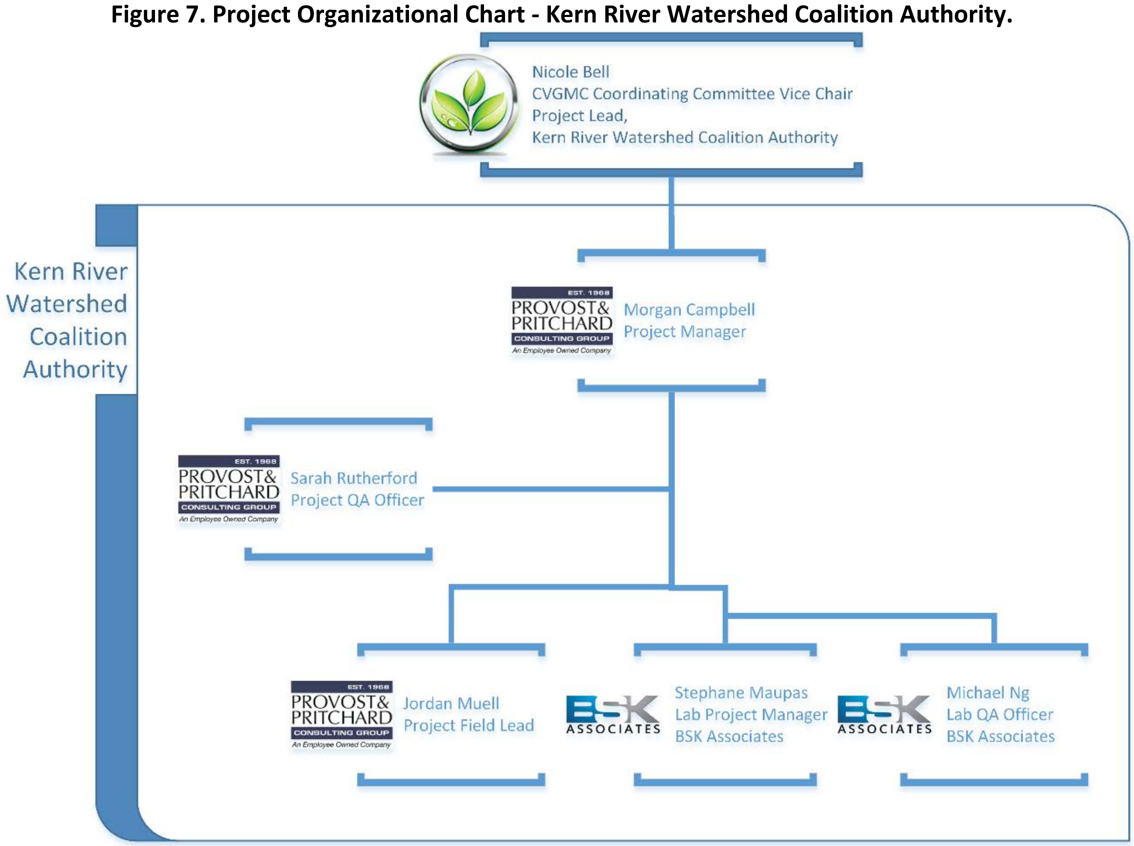


Figure 8. Project Organizational Chart - Kings River Water Quality Coalition.

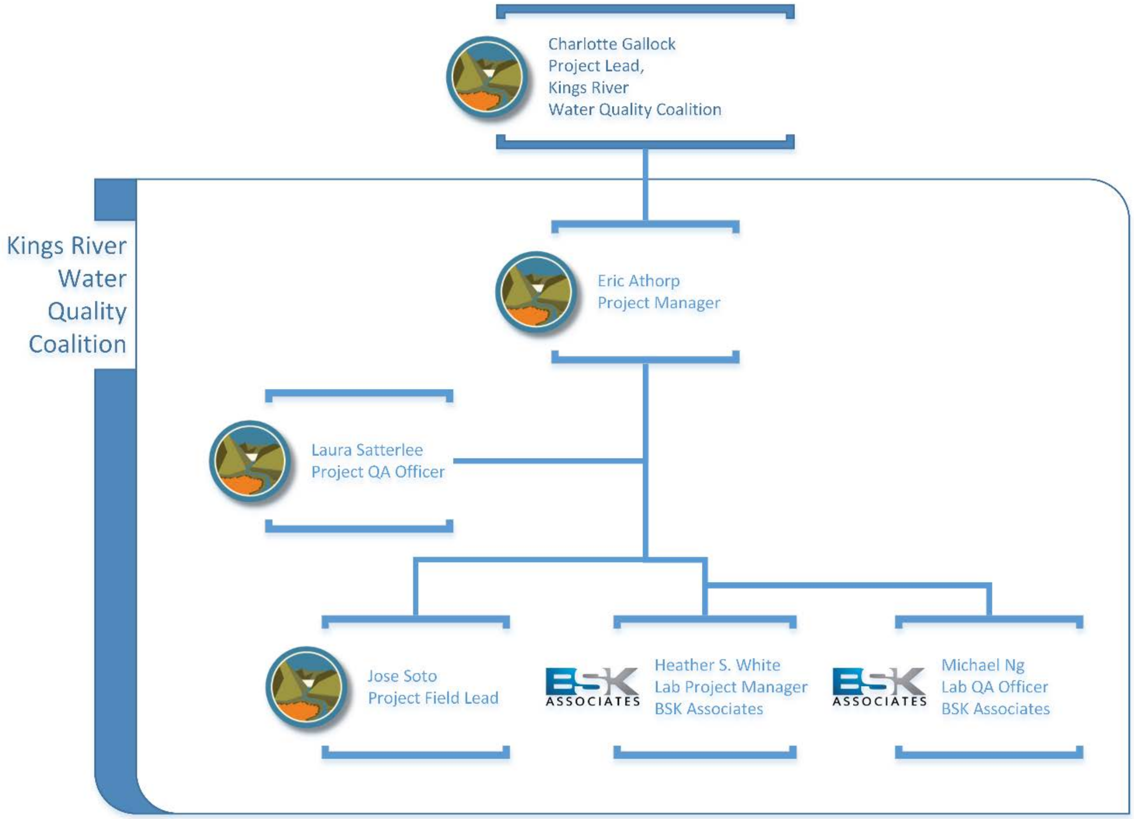


Figure 9. Project Organizational Chart - Westlands Water Quality Coalition.

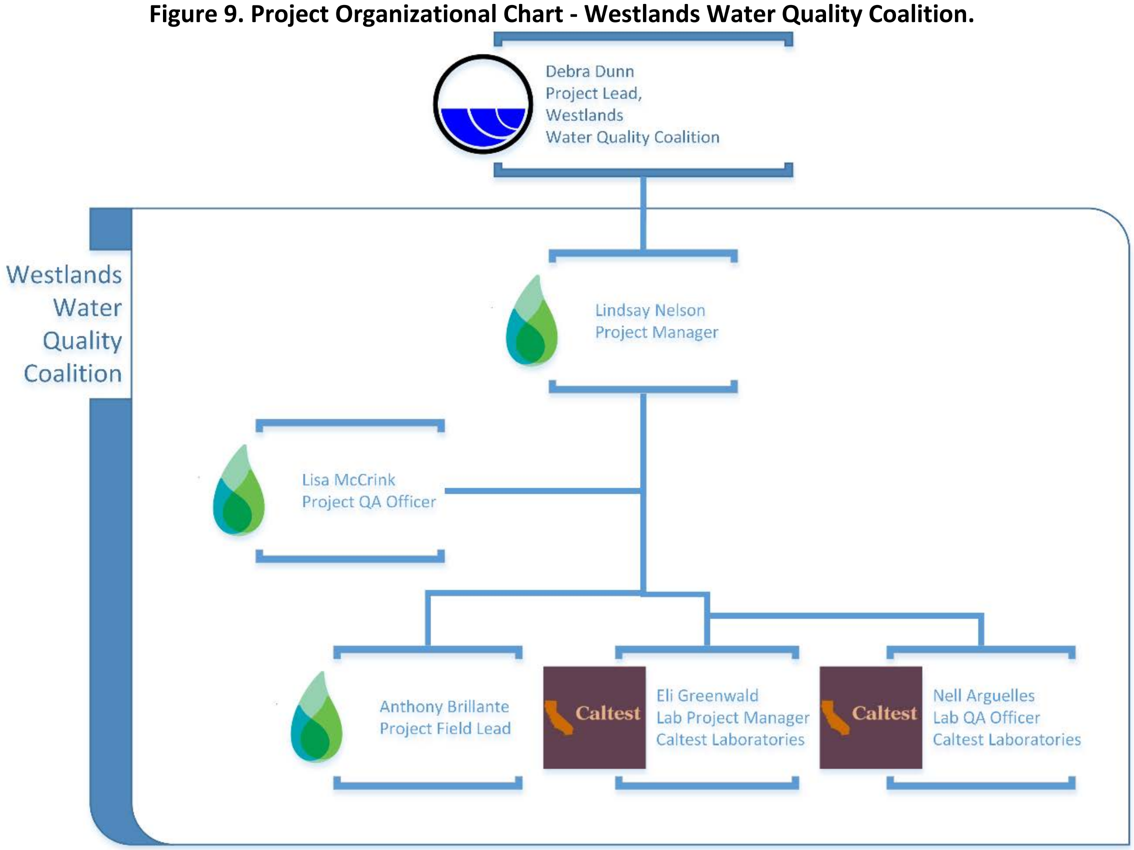


Figure 10. Project Organizational Chart - Westside San Joaquin River Watershed Coalition.

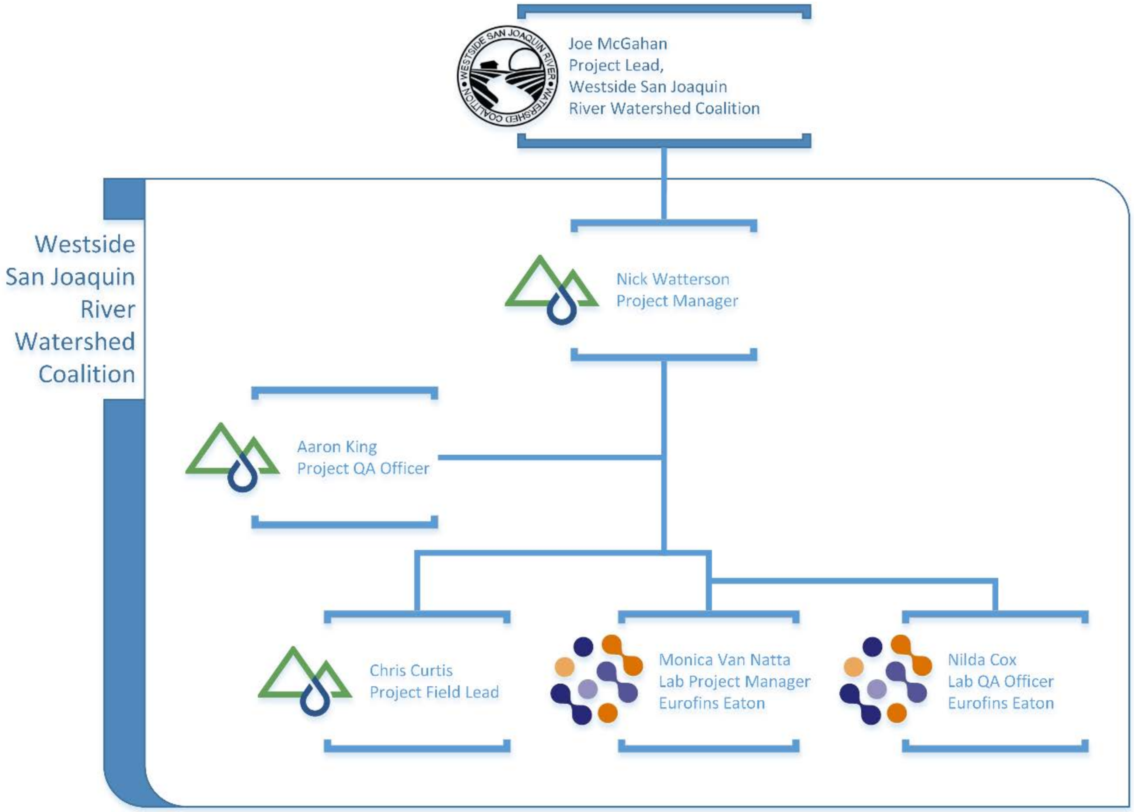
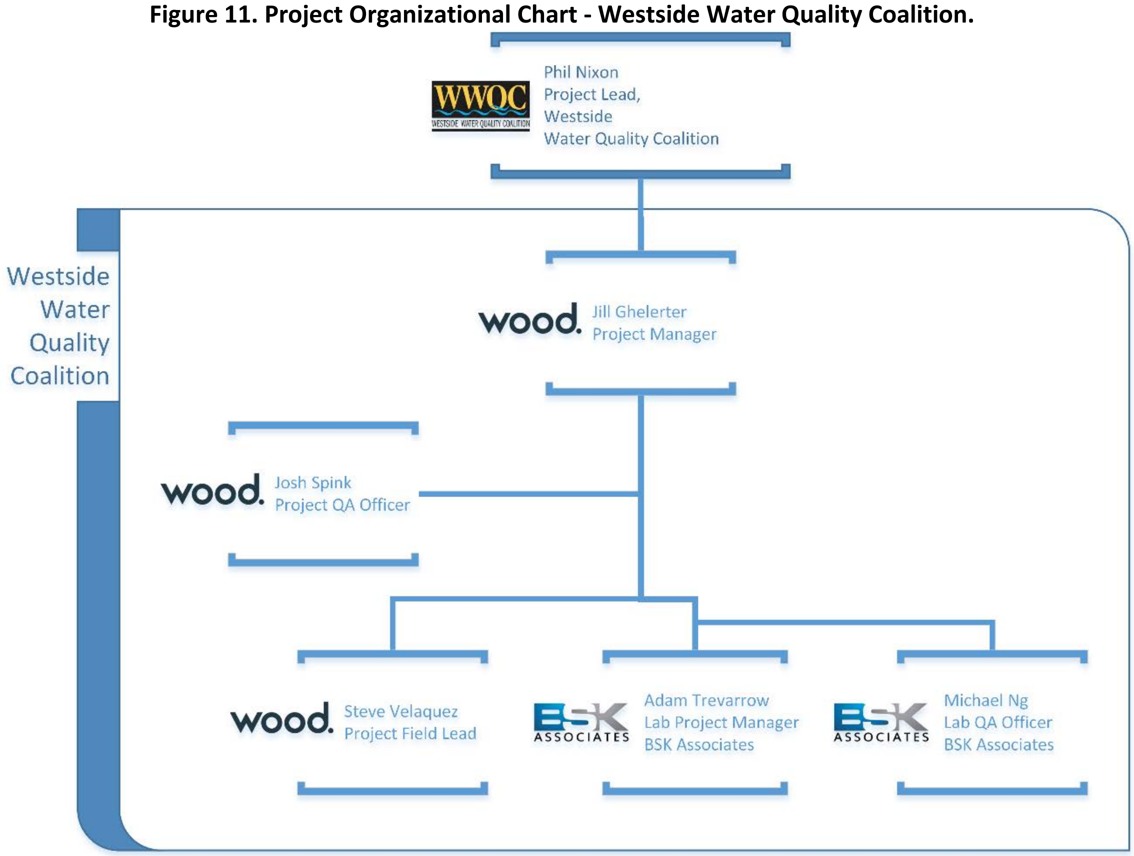


Figure 11. Project Organizational Chart - Westside Water Quality Coalition.



5. PROBLEM DEFINITION/BACKGROUND

The CVGMC was created to comply with the various Waste Discharge Requirements of the participating Central Valley ILRP Coalitions. Given the nature of groundwater trend monitoring and the challenges presented by accurately characterizing groundwater quality on a small geographical scale, groundwater quality trends can be more effectively and efficiently evaluated on a regional level. Furthermore, given the number of state and local regulatory programs with groundwater monitoring requirements, a regional collaboration allows for the individual stakeholders to avoid duplicating costs and effort for the use of the same data.

The Central Valley Regional Water Quality Control Board (CVRWQCB or Regional Board) has allowed the individual Coalitions to opt into a regional effort across the Central Valley to characterize groundwater quality trends and share resources to meet the groundwater monitoring requirements of each third party's individual General Orders. Ten ILRP Coalitions have founded the CVGMC in an effort to meet these requirements. Additionally, the program was created with the understanding that other state and regional programs with groundwater monitoring requirements may also participate in the Collaborative in the future, allowing shared resources across multiple dischargers and stakeholders throughout the Central Valley.

6. PROGRAM DESCRIPTION

6.1. Work Statement and Deliverables

The CVGMC program will be implemented in three phases:

Phase 1. ILRP Technical Workplan;

Phase 2. Coordination Among Existing Groundwater Monitoring Programs;

Phase 3. Future Groundwater Monitoring Coordination

Phase 1 was completed and submitted to the CVRWQCB on May 16, 2018. Upon Executive Officer approval of the Phase 1 Technical Workplan, monitoring of the well network established in the Workplan by the individual participating third parties will begin in Fall 2018.

Individual ILRP Coalitions will report on the data developed in their respective areas annually, in accordance with their individual Orders. All ILRP participants will contribute to a CVGMC 5-Year Report with additional methods to characterize groundwater quality conditions and trends.

Phase 2 and Phase 3 of the program will be implemented once the ILRP Technical Workplan and Data Management System are established.

6.2. Monitoring Projects

Each of the Central Valley ILRP Coalitions have developed a Groundwater Quality Assessment Report (GAR) that characterizes the existing state of groundwater quality within each region. Based on these characterizations, the individual Coalitions have developed, or are currently developing Groundwater

Trend Monitoring Workplans (GQTMs), with the goal of long-term characterization and overall protection and improvement of the groundwater conditions provided by each individual GAR.

By opting into the CVGMC, participating Coalitions will agree to the common approach to monitoring and reporting elements under the Technical Workplan to meet their individual GQTM requirements. The conclusions and existing data developed by each individual GQTM will inform and feed into the regional collaborative Technical Workplan.

Each participating Coalition is responsible for certain Coalition-specific responsibilities. These responsibilities include developing their own individual GQTM to meet specific Order requirements, conducting sampling within their own GQTM network, and preparing Annual Reports in accordance with the CVGMC format.

6.3. Constituents to Be Monitored

Table 1 lists the required constituents associated with CVGMC Technical Workplan and is consistent with the constituents to be monitored by each Coalition. The testing frequency reflects how often a constituent is measured at each well location. The table summarizes the parameter type (whether the result is derived from the field or the laboratory), methods, and analyses used to produce results for each constituent measured at each monitored well.

Table 1. Constituents and parameters.

Constituents and parameters measured are grouped by testing frequency, required or optional and parameter type.

Constituent	Reporting Units	Testing Frequency	Required or Optional	Parameter Type
Nitrate as Nitrogen (NO3-N) or Nitrate + Nitrite as Nitrogen (NO3-N)	mg/L (as N)	Annual	Required	Analytical
Dissolved Oxygen (DO)	mg/L	Annual	Required	Field Measure
Electrical Conductivity (EC) at 25 °C	µS/cm	Annual	Required	Field Measure
pH	pH units	Annual	Required	Field Measure
Temperature	°C	Annual	Required	Field Measure
Depth to standing water (static water level)	ft	Annual	Required[1]	Field Measure
Oxidation-reduction potential (ORP)	mV	Annual	Optional	Field Measure
Turbidity	NTU	Annual	Optional	Field Measure
Anions				
Carbonate	mg/L	Five Years	Required	Analytical
Chloride	mg/L	Five Years	Required	Analytical
Bicarbonate	mg/L	Five Years	Required	Analytical
Sulfate (SO4)	mg/L	Five Years	Required	Analytical
Cations				
Boron	mg/L	Five Years	Required	Analytical
Calcium	mg/L	Five Years	Required	Analytical
Magnesium	mg/L	Five Years	Required	Analytical
Potassium	mg/L	Five Years	Required	Analytical
Sodium	mg/L	Five Years	Required	Analytical
Total Dissolved Solids (TDS)	mg/L	Five Years	Required	Analytical

[1] Collected annually if available/accessible.

6.4. Program Schedule

The program will advance with the deliverable date outlined in **Table 2** below. Wells within the CVGMC network will be monitored starting in Fall 2018, pending Executive Officer approval of the Technical Workplan. Monitoring results will be reported on annually with the expectation that the Workplan will be approved prior to Fall 2018. Annual analysis and reporting of results related to the individual Coalition GQTMs will focus on visual and tabular presentation of data with limited representation of data interpretation. Additional interpretations and conclusions relating to trends and relationships in trends will be conducted as part of reporting every five years.

Table 2. Project deliverable schedule timeline.

Deliverable	Description	Deliverable Due Date
Individual Coalitions Annual Monitoring Reports	Coalition specific analysis and reporting of previous years monitoring results.	November 30, 2019 (Annually)
CVGMC 5-Year Report[1]	Reporting on all CVGMC network monitoring results from the previous 5 years including trends and interpretations.	November 30, 2023 (Every Five Years)

[1]First CVGMC 5-Year Report is shifted to 2023 to have the Coalitions align in their reporting periods coinciding with Groundwater Assessment Reports.

6.5. Geographical Setting

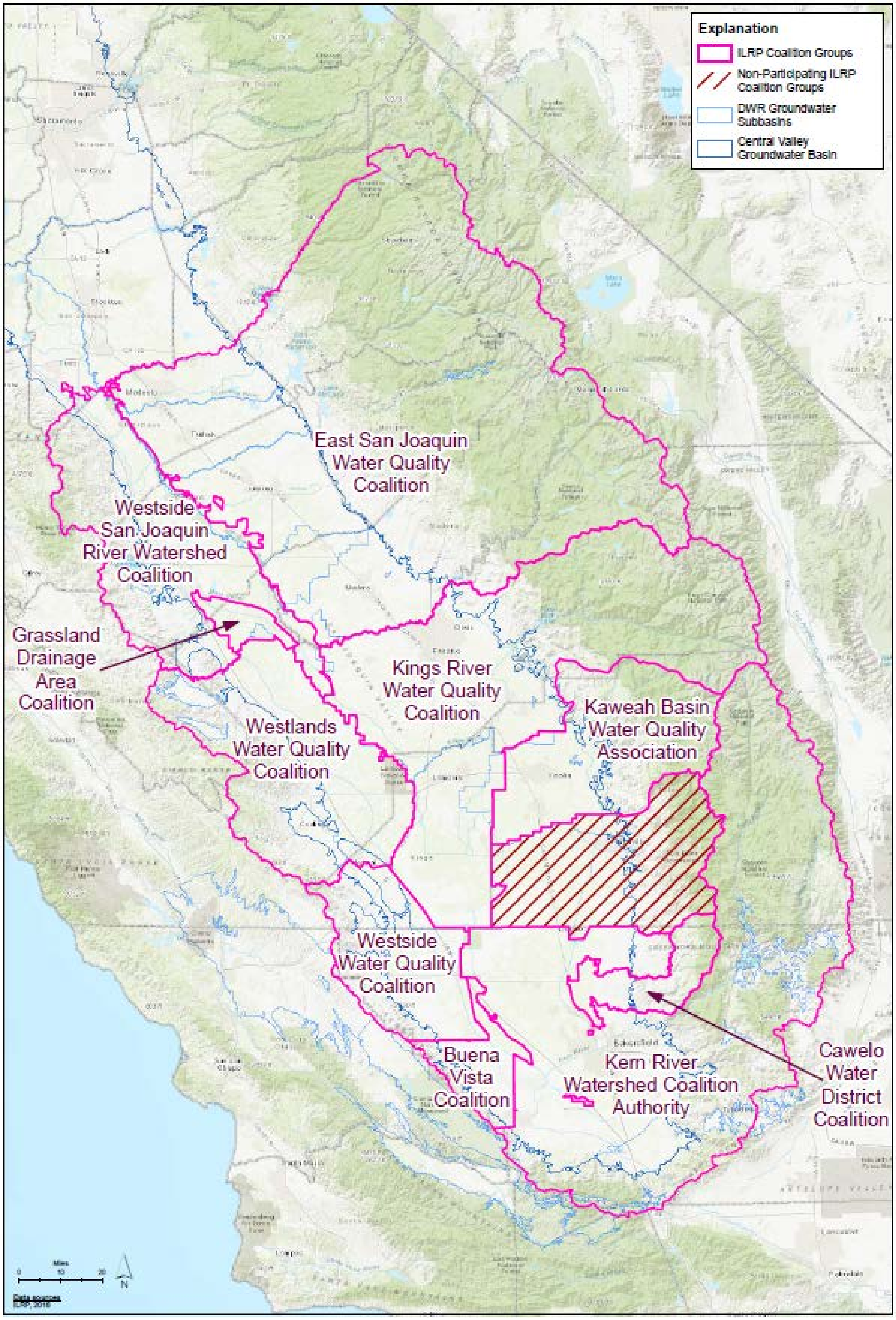
The CVGMC area is made up the groundwater monitoring networks developed by each of the member Coalitions. The area includes the geographic regions of the following Coalitions as part of Phase 1 of the CVGMC: Buena Vista Coalition, Cawelo Water District Coalition, East San Joaquin Water Quality Coalition, Grassland Drainage Area Coalition, Kaweah Basin Water Quality Association, Kern River Watershed Coalition Authority, Kings River Water Quality Coalition, , Westlands Water Quality Coalition, Westside San Joaquin River Watershed Coalition, and Westside Water Quality Coalition (**Figure 12**).

Each Coalition has developed its own network of wells for groundwater quality trend monitoring as described in the individual Coalition GQTMs. These networks include wells spatially distributed across high and low vulnerability areas of each Coalition region in accordance with Coalition-specified prioritization criteria. These well networks will be monitored by the Coalitions and incorporated into the CVGMC network for regional analysis and reporting.

6.6. Constraints

Any constraints that may disrupt the overall goals of the CVGMC are addressed in the Technical Workplan. Constraints associated with individual third-party sampling and data generation should be addressed in individual GQMPs and reported to the CVGMC. It is not anticipated that there will be any constraints that cannot be resolved or which will result in a compliance violation.

Figure 12. Geographical area covered by the CVGMC.



7. PROGRAM QUALITY OBJECTIVES

7.1. Data Quality Indicators

In order to account for the inherent level of uncertainty that can occur from the sampling design process through the result documentation, it is important for the program to have set limits of allowable error to ensure data are useable and supportive of the project goals.

Data Quality Indicators (DQIs) are the quantitative statistics and qualitative descriptors used to interpret the degree of acceptability or utility of data to the user (US EPA QA/G-5, 2002). The principal data quality indicators are precision, accuracy (bias), comparability, completeness, representativeness, and sensitivity.

Limits for error must be established for all applicable DQIs for every measurement conducted under the CVGMC program. Program definitions for each DQI are provided below. For minimum targets associated with each of the following DQIs, see **Section 14.** Project-specific limits for each DQI are provided in Table 5 of the individual QAPP for each participating member of the CVGMC and must at a minimum meet those laid out by this QAPrP.

Precision

Precision measures the agreement among repeated measurements of the same property under identical, or substantially similar, conditions. The closer two values that result from the same measurement under the same conditions are, the higher the degree of precision. The degree of precision can be a result of error and or the limits of the measurement system. A measurement quality objective (MQO) can be set for the allowable amount of variation between multiple measurements to account for limits of the measurement system and the inherent amount of user error associated with the measurement system. Program precision is monitored using duplicate quality control samples, including but not limited to field duplicates, laboratory duplicates, and matrix spike duplicates.

Accuracy (Bias)

Accuracy is a measure of the overall agreement of a measurement to a known value. Accuracy includes a combination of random error (precision) and systematic error (bias) components that are due to sampling and analytical operations.

MQOs can be set to limit bias and to set an amount of error as compared to a true value achieved for a measurement. Contamination, measurement error, and matrix interference are all examples of causes of reduction in accuracy of a measurement.

Contamination that may be introduced during sample handling, preparation, or analysis can be monitored with the use of field blanks and laboratory blanks. If contamination is introduced, blank sample results can provide the degree of bias resulting from the error.

Measurement errors can be monitored through the analysis of a known concentration range and compared to measured results. This can be done using certified reference materials and laboratory control spike samples.

Bias introduced through interfering conditions present in the sample matrix can be monitored by duplicate environmental samples with a known concentration of target analytes prior to analytical process, known as matrix spike samples.

Sensitivity and Resolution

Analytical sensitivity is commonly defined as the lowest value an instrument or method can measure with reasonable degree of certainty. Resolution is the capability of a method or instrument to discriminate between measurement responses representing different levels of a variable of interest. These limits are important to know when evaluating the appropriateness of a method or instrument for the requirements of a given study. Reporting limits represent the level at which a method or instrument can accurately measure a target compound. Reporting limits must be lower than the required project action limit to be appropriate for the project. At a minimum, the data collected under this QAPrP should meet the reporting limits outlined within **Section 13.**

Representativeness

Representativeness is the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. Representativeness addresses the degree to which the samples collected represent the study and address the program objectives. Though not directly measurable, representativeness depends on appropriate study design and adherence to appropriate standard operating procedures. For groundwater sampling, representativeness can be affected by the measurement of stagnant water in well casings, which are not representative of the chemical conditions of the aquifer. As such, sufficient well purging is required to be addressed in all QAPPs and sampling procedures to ensure representativeness is properly addressed for all project data generated.

Various spatial considerations exist in designing the individual Coalition GQTM well networks and the CVGMC network. These considerations focus on where and how to representatively monitor groundwater quality relative to agricultural activities. Spatial factors relating to the CVGMC and GQTM network design include delineation of areas to monitor and specific sites (wells) suitable for use in monitoring. The approaches used in developing the Coalition GQTM well networks are based on consideration of the GQTM requirements in the WDRs and include consideration of agricultural commodities, conditions discussed/identified in the GARs related to vulnerability prioritization, and areas identified in the GAR as contributing significant recharge to urban and rural communities.

Comparability

Comparability is a measure of the confidence with which one data set or method can be compared to another. Project data are comparable when evaluated against similar quality objectives and when utilizing similar methodology and reporting requirements. Given the nature of the CVGMC requiring data generated from a wide geographical region being used in aggregate to make long term trend evaluations and broad regulatory decisions, comparability of contributing projects is crucial to the efficacy of the Collaborative. All projects contributing to the CVGMC Program must maintain comparability by following the provisions outlined in this QAPrP.

Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system. This assessment is typically expressed as a percentage of measurements reported within the prescribed limits associated with the respective DQOs, compared to those initially planned. Completeness evaluations ensure program requirements for data generation and reporting are met by contributing projects. Program completeness is assessed on three levels: field and transport, analytical, and batch completeness. Field and transport completeness is based on the number of samples successfully collected and transported to the appropriate laboratories. Analytical completeness is based on the number of samples successfully analyzed by the laboratory. Batch completeness is based on whether batches were processed with the appropriate QC samples, as prescribed by the method or defined by the laboratory. Minimum QC sample frequency requirements can be found in **Section 13** of this QAPrP.

8. SPECIAL TRAINING/CERTIFICATION

8.1. Specialized Training or Certifications

Field Crews

Specific training and certifications for field crews are the responsibility of the individual Project Managers and are addressed in Table 2 of the individual GQTM QAPPs. All field staff participating in the program must be properly trained on field collection protocols prior to sample collection. Training includes reviewing all sampling Standard Operating Procedures (SOPs), which detail procedures for collecting groundwater samples and associated QC samples. All personnel will be trained in proper calibration and deployment of equipment, sample handling and hold time requirements, and chain of custody procedures. To further safeguard against sampling error, all sampling by recently trained personnel should be done under the supervision of more experienced personnel who accompany sampling crews at least for the first time that they conduct sampling within the study fields. In addition to training for sampling, all sampling personnel should attend a field safety course.

Laboratories

All CVGMC laboratories must have an internal Quality Assurance Manual that is maintained and actively implemented in the day-to-day operations of the laboratory. Laboratory personnel should maintain current training in all relevant aspects of their role in the sample processing and data generation. Training records will be maintained by the laboratory Quality Assurance Officer and be available upon request.

8.2. Laboratory Certification Requirements

All laboratories processing program data will possess and maintain current Environmental Laboratory Accreditation Program (ELAP) certifications.

Participating laboratories will use the methodology specified by the individual QAPP and performed by qualified personnel in accordance with that accreditation.

9. PROGRAM DOCUMENTATION

9.1. CVGMC Planning Documents

ILRP Technical Workplan

The CVGMC has developed a Technical Workplan that identifies consistent approach(es) for monitoring and reporting among the Coalitions to meet requirements of the General Orders. This document outlines how monitoring and reporting will occur, and how quality assurance will be maintained as part of the CVGMC.

9.2. Quality Assurance Program Plan Distribution

Copies of this QAPrP will be distributed to all personnel and/parties involved in the project as outlined in the distribution list. If any parties associated with CVGMC data generation wish to update parts of the QAPrP, an amendment form should be completed to request an update. A signed amendment form must be submitted to the Program QA Officer for review. Once approved, the Project QA Officer will submit the amendment information to the CVRWQCB for final approval. When an amendment is approved, the QAPrP document will be updated and distributed to the all parties and personnel involved with the project.

Each individual QAPP submitted to the CVRWQCB will include details of when, where and how samples will be collected as well as which constituents will be measured. Field sampling and analytical SOPs will be included with each QAPP. These updates will not require an amendment to the QAPrP if the constituents and methods are already listed within **Table 1.** However, if the GQTM Workplan and associated QAPP requires the analysis of a constituent not already included in this QAPrP, a method not already identified, or proposes different DQOs that are less stringent than those listed, an amendment form must be submitted to the Program QA Officer for review once the GQTM is approved.

An alternative to a Coalition developing their own QAPP is to submit Addendum Forms under this QAPrP that will include information specific to their project for the following sections: 10. Sampling Process and Design, 11. Sampling Methods, 12. Sample Handling and Custody, 13. Analytical Methods, 14. Quality Control, 15. Instrument/Equipment Testing, Inspection and Maintenance, 16. Instrument/Equipment Calibration and Frequency, 17. Inspection/Acceptance of Supplies and Consumables.

If the Coalition chooses this option, all information within this QAPrP applies to their project in addition to the specifics outlined in the Addendum Form.

9.3. Standardized Forms

Field Sheets

Each individual QAPP will include the field sheet that will be used when samples are collected. An example field sheet is included in **Figure 13**. At a minimum field sheets must include the following:

- Project name
- Site name

- Site code
- Physical address of property on which well is situated
- State well number (if available)
- Sampling personnel
- GPS coordinates taken with each sampling event
- Sample type
- QC sample type
- Date and time of sample collection
- Results of field measurements
- Depth to standing water (static water level)
- Sampling conditions
- Constituents sampled
- Sample container
- Sample preservation

Chain of Custody

Each individual QAPP will include a Chain of Custody (COC) form that will be used when samples are collected. An example COC is included in **Figure 14**. At a minimum COC forms must include the following:

- Collection agency name and contact information
- Receipt agency name and contact information
- Sample Identification
- Date and time of sample collection
- Analyses requested
- Sample container type
- Number of sample containers
- Preservation
- Relinquished by name(s)
- Relinquished by date(s)
- Relinquished by signature(s)
- Received by name(s)
- Received by date(s)
- Received by signature(s)

Figure 13. Example field sheet.

Well Purging and Sampling

State Well #: ________ Site Code: ________

Site Name: ____________________

Property Address: ____________________

Date: ____________ Target Lat/Long: / ____________ Well Depth: ____________

Weather: ____________ Field Lat.: ____________ Depth to Water: ____________

Personnel: ____________ Field Long.: ____________ MP to LSE: ____________

____________ Acc.: ____________ Casing Dia.: ____________

Unit: ____________

Picture #(s): ____________

QC Site: Yes No
Blank pH: ____________

Sample Point Description:
- At the wellhead
- After pressure tanks
- From a holding tank
- Spigot away from wellhead
- After filter
- Other: ____________

Well Type: Domestic Irrigation Domestic/Irrigation

Meter Calibration Log

	pH	EC	DO	ORP
Standard Used				
Temperature				

Purge start time: **Purge Log**

Time	Volume	Temp	EC	DO	pH	ORP	Comments

Purge Method: submersible turbine pump other: ____________

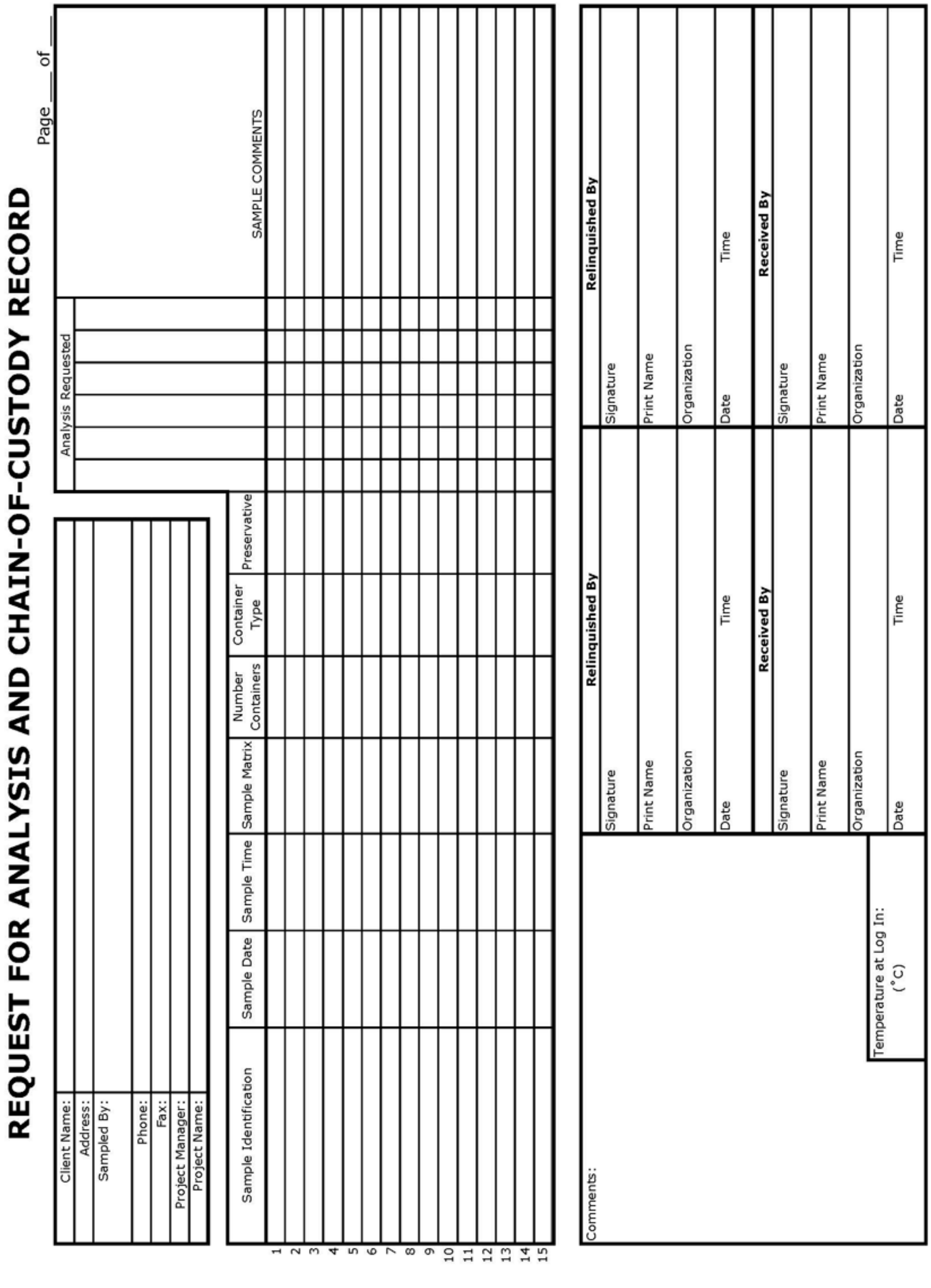
Sampling Method: submersible turbine pump other: ____________

Sample Collection Log **Sample time:**

Analysis	Container	Volume	Quantity	Filtered Y/N	Preservative	Lab

Notes:

Figure 14. Example COC form.



REQUEST FOR ANALYSIS AND CHAIN-OF-CUSTODY RECORD

Page ___ of ___

Client Name:	
Address:	
Sampled By:	
Phone:	
Fax:	
Project Manager:	
Project Name:	

	Sample Identification	Sample Date	Sample Time	Sample Matrix	Number Containers	Container Type	Preservative	Analysis Requested						SAMPLE COMMENTS
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														
11														
12														
13														
14														
15														

Comments:

Temperature at Log In: (°C)

Relinquished By		Relinquished By	
Signature		Signature	
Print Name		Print Name	
Organization		Organization	
Date	Time	Date	Time
Received By		**Received By**	
Signature		Signature	
Print Name		Print Name	
Organization		Organization	
Date	Time	Date	Time

9.4. Data Packages and Storage

All projects conducted as part of the CVGMC must maintain electronic records of field sheets, COCs, and laboratory data for all sampling events. Any original hard copy forms should be filed and kept at the Coalition's main office. Hard copies of laboratory reports may be archived as electronic files such as a PDF. Original GeoTracker EDFs must be saved electronically. GeoTracker EDFs must be uploaded to the GeoTracker and submitted to the CVGMC Data Management System (DMS). The CVGMC DMS will be housed on a third-party server with automatic backups performed nightly, at a minimum. Nightly backups will be replicated to at least one independent server to create redundancy and allow for instant replication if a failure occurs. All electronic files will be maintained for a minimum of 10 years.

A complete description of the data management process is described in this QAPrP in **Section 19.**

9.5. Additional Documents and Records

Additional documents may include photographic documentation, summary reports, meeting notes, presentations, and reports. All forms of documentation must be held on file where they are readily available if ever requested.

9.6. Retention of Documents

All data and/or other products created by the program will be retained by the participating entities and contract laboratories for a minimum of 10 years. The documents may be held for 10 years as electronic copies. Servers where the files reside will be backed up nightly.

9.7. Report Documents

Reporting will be accomplished using a common framework among the participating Coalitions. As required by the ILRP General Orders, each Coalition will provide an Annual Report describing groundwater monitoring in their region. The individual Coalition Annual Reports will be consistently formatted to include basic data tables, time series plots (when sufficient data are available), and figures to display the monitoring results of the current year and variation across years. Upon Executive Officer approval of the Phase 1 Technical Workplan, every five years, a coordinated report will be provided to the CVRWQCB that characterizes groundwater quality across the entire Central Valley (or the portions of the Central Valley participating in the CVGMC).

Annual Reports

Annual analysis and reporting of results related to the individual Coalition GQTMs will focus on visual and tabular presentation of data with limited representation of data interpretation. Annual reports will include a map or maps of the wells sampled and monitored as part of the GQTM network. Results from sampling will be provided in a tabulated format consisting of a summary of the results using statistics such as recent, minimum, maximum, and mean result, in addition to a table providing all field and analytical results.

CVGMC Five-Year Assessment Report

Reporting for the CVGMC will include more extensive analysis at five-year intervals. Every five years, a CVGMC Five-Year Assessment Report will be provided to the CVRWQCB that characterizes groundwater quality across the entire Central Valley (or the portions of the Central Valley participating in the CVGMC). The report will include separate chapters reporting on trends in groundwater quality in each Coalition region as well as a chapter(s) that characterizes groundwater quality across all participating regions. Each chapter will be consistently formatted with common maps, figures, and text to facilitate review by Regional Board staff and other interested parties.

GROUP B. DATA GENERATION AND ACQUISITION

10. SAMPLING DESIGN

10.1. Sampling Process Design Program Policy

An overview of the considerations and criteria for the design of the CVGMC trend monitoring network is detailed in the Technical Workplan focusing on the objectives of the program and requirements of the General Orders, including rationale for appropriate monitoring well distribution, encompassing agricultural regions of the Central Valley.

The primary objectives of the CVGMC GQTM are:

1) *Determine current water quality conditions of groundwater relevant to irrigated agriculture;*
2) *Develop long-term groundwater quality information that can be used to evaluate the regional effects of irrigated agricultural practices and changes in agricultural practices;*
3) *Understand long-term temporal trends in regional groundwater quality, particularly as they relate to effects from irrigated agriculture on potential sources of drinking water for communities;*
4) *Evaluate regional groundwater quality conditions in the CVGMC region, particularly in HVAs, and identify differences in groundwater quality laterally and vertically within the CVGMC region;*
5) *Distinguish groundwater quality changes associated with irrigated agriculture compared to other non-agricultural factors.*

For purposes of characterizing the relatively shallower part of the groundwater system, the CVGMC emphasizes monitoring in the Upper Zone within the upper part of the groundwater system. Wells selected for trend monitoring will be sampled and tested at an annual frequency for water quality parameters including nitrate as nitrogen (as N), electrical conductivity at 25 °C (EC), pH, dissolved oxygen (DO), and temperature. Electrical conductivity, pH, DO, and temperature will be measured in the field whereas nitrate concentration will be analyzed by a certified laboratory. In some Coalition regions, public water supply wells represent additional ongoing monitoring wells that are regularly tested. During the first monitoring event, wells selected for inclusion in the CVGMC GQTM will be sampled and tested for additional water quality constituents, including total dissolved solids (TDS), major anions (carbonate, bicarbonate, chloride, sulfate), and major cations (boron, calcium, sodium, magnesium, potassium). Wells will be tested for these additional constituents every 5 years.

Implementation of the CVGMC Technical Workplan will further the understanding of long-term temporal trends in regional groundwater quality. The regional-scale and long-term trend regional monitoring program involves establishing a system through which the groundwater quality within the CVGMC region will be monitored on a long-term basis to evaluate temporal trends and their relationship with irrigated agriculture. The approach to monitoring for long-term regional groundwater quality trends in the GQTM emphasizes evaluation of trends in wells that are believed to provide a representation of regional trends in areas dominated by irrigated agriculture. The spatial distribution of the monitoring network across the CVGMC region will be variable based on the prioritization of monitoring applied by individual Coalitions. Areas of generally higher priority, most commonly in the HVAs identified in the Coalition GARs, are a greater emphasis for long-term trend monitoring locations than areas of relatively lower priority, especially in lower vulnerability areas because hydrogeologic conditions suggest these areas are less vulnerable to contamination.

10.2. Deferral of Sampling Design Description

This QAPrP does not dictate the exact spatial distribution or prioritization of GQTM wells; the details of prioritization and final well selection are included in each Coalition's GQTM. Specific sample types, matrices, and volumes are outlined in Table 5 of the individual project QAPPs. Project activity schedule and the logistics of submitting samples to contract laboratories are outlined in individual field sampling SOPs. As part of individual Coalition GQTMs, a network of proposed wells exists for each Coalition region recognizing the applied prioritization and any associated delineation of targeted monitoring areas. A variety of factors were considered by individual Coalitions in prioritizing monitoring areas within their respective regions and these are summarized in the CVGMC Technical Workplan including high vulnerability areas, irrigated agriculture and commodities, groundwater quality trends, nitrate MCL exceedances, communities, and recharge areas relative to communities (including non ag sources).

11. SAMPLING METHODS

11.1. Sampling Method Program Policy

All samples collected for inclusion in the CVGMC GQTM analysis will be collected according to detailed SOPs included in the individual QAPPs. The SOPs contain instructions for collecting samples and cleaning equipment between samples. Below is a brief description of the minimal sampling method requirements.

Upon arrival at the well, an attempt will be made to measure the depth to water. Water levels can be measured using an electronic sounder or an air line; air lines have been installed on some agricultural supply wells and can be used to determine depth to water. When possible, it is preferred to use an electronic sounder and record the depth to water to the nearest 0.01 feet. Typically, all depth measurements should be made from the top (the highest point) of the inner well casing. The measuring point location is recorded on the field sheet and used in all subsequent measurements. If there is no measuring point or access to the inside of the well a note will made on the field data sheet.

Field parameters (pH, water temperature, EC, ORP and DO) are measured using field meters specified in the individual QAPPs. The meters will be calibrated for pH, ORP, and DO once in the morning prior to beginning sampling. For pH, a single 3-point calibration with be done using pH 4, 7, and 10 standards; exceptions are if the pH range is known and a calibration is conducted within that range. Conductivity will be calibrated in the morning prior to sampling, and then recalibrated to the nearest calibration solution whenever the conductivity of the well changes substantially. Calibration standards will be maintained at temperatures close to the temperature of the well water.

Except as noted below, purging should be performed for all groundwater monitoring wells prior to sample collection in order to remove stagnant water from within the well casing and ensure that a representative sample is obtained. In general, purging should be done to remove three casing volumes prior to sampling. The field sheet should include details for tracking the amount of volume purged relative to the depth of the well and well casing diameter. It may not be possible to purge three volume casings of water due to the volume of the casing which would result in considerable time and effort. In addition, it may not be necessary to purge three casing volumes for wells that are used daily and are not likely to have stagnant water in the well casing. Other methods for ensuring that the water collected is an adequate representation of the water quality in the groundwater is to monitor field parameters with a flow through system and wait to collect a sample until the measurements are steady, or to use a no-purge sampler such as a Hydrasleeve.

After samples are collected, they must be kept away from sunlight and kept at ≤ 6°C until extraction or analysis. Field personnel collect ten percent of the total samples for quality assurance purposes (5% field duplicate and 5% blank samples). Duplicate field parameter measurements are not necessary. The duplicate samples are submitted to the laboratory as semi-blind samples. Field QC samples are stored at ≤ 6°C alongside environmental samples until extraction or analysis. Field blank samples are processed in the field identically as the other samples using deionized water as sample water. The blank samples are submitted to the laboratory as semi-blind samples.

Any deviation from the written SOP requires notification of the Project QA Officer. All deviations or problems will be noted on the field sheet and corrective actions should be determined by the Project QA Officer. Deviations will also be reviewed by the CVGMC Program QA Officer to determine acceptability of data.

11.2. Deferral of Sampling Method Information

Individual QAPPs include the details for sample collection, including field calibration and sampling SOPs, and purging details. The QAPPs must give enough information to ensure that sampling methods will result in a sample that is void of contamination, representative of the groundwater, and is reproducible. Sample container, volume, and preservative requirements are specified in Table 5 of each individual QAPP. Project-level corrective actions in response to problems that occur during sample collection are the responsibility of the individual Project QA Officers. The Program QA Officer may be included, if necessary.

12. SAMPLE HANDLING AND CUSTODY

12.1. Sample Handling and Custody Program Policy

All sample containers should be clearly labeled with sample ID, collection date and time, collector, and requested analyses. All sampling SOPs must be followed while collecting samples. Custody of all samples is documented and traceable from collection time to submittal for analysis on a Chain of Custody (COC) form. COCs must be with samples during transport to the laboratory. The samples are considered in custody if:

- They are in actual possession;
- They are in view after being in physical possession;
- They are placed in a secure area (accessible by or under the scrutiny of authorized personnel only after in possession).

All samples and accompanying COCs are signed by the sampler in charge and submitted to analyzing laboratories by the samplers, by private overnight courier, or by overnight common parcel service. Once the laboratory has received the samples and COCs, they are responsible for maintaining custody logs sufficient to track each sample submitted and to analyze or preserve each sample within specified holding times.

Enough sample quantity should be collected to permit more than one analysis in case samples need to be re-analyzed. The contract laboratories may recommend sample quantities as well as types of containers for sample collection; most laboratories offer containers to use for analysis. All samples collected for use in the CVGMC GQTM must at a minimum follow program-defined QA requirements for sampling containers, holding time, and sample custody outlined in **Table 3** below. Holding times refer to the maximum time limit at which a laboratory must analyze a sample for the constituent listed. Any sample handling and custody information that deviates from the program sampling handling requirements will be described within the individual GQTMP QAPP and submitted to the CVGMC QA Officer as an amendment to the CVGMC QAPrP.

Table 3. Sample handling and custody.

ANALYTE	RECOMMENDED CONTAINER	INITIAL PRESERVATION/HOLDING REQUIREMENTS	MAXIMUM HOLDING TIME
Nitrate (as N)	Polyethylene	Cool to ≤ 6°C	48 hours
Nitrate + Nitrite (as N)	Polyethylene	Cool to ≤ 6°C; H_2SO_4 to pH ≤ 2	28 days
Carbonate	Polyethylene	Store at ≤ 6°C	14 days
Bicarbonate	Polyethylene	Store at ≤ 6°C	14 days
Chloride	Polyethylene	Store at ≤ 6°C	28 days
Sulfate (SO_4)	Polyethylene	Store at ≤ 6°C	28 days
Boron	Polyethylene	Preserve HNO_3 pH ≤2, store at ≤ 6°C	6 months
Calcium	Polyethylene	Preserve HNO_3 pH ≤2, store at ≤ 6°C	6 months

Analyte	Recommended Container	Initial Preservation/Holding Requirements	Maximum Holding Time
Magnesium	Polyethylene	Preserve HNO_3 pH ≤2, store at ≤ 6°C	6 months
Potassium	Polyethylene	Preserve HNO_3 pH ≤2, store at ≤ 6°C	6 months
Sodium	Polyethylene	Preserve HNO_3 pH ≤2, store at ≤ 6°C	6 months
Total Dissolved Solids	Polyethylene	Store at ≤ 6°C	7 days

13. ANALYTICAL METHODS

13.1. Analytical Methods Policy

Table 5 of the individual GQTM QAPPs identifies the specific analytical methods to be used. All analytical methods employed by a project must be identified within this QAPrP and will be subject to the requirements below.

13.2. QA Program-Defined Analytical Method Requirements

Standard Methodology

For the purposes of this QAPrP, standard methodology is defined as methods that follow a procedure approved by the US EPA or provided in *Standard Methods for the Examination of Water and Wastewater.* Additionally, methods developed or published by the US Geological Survey (USGS), American Society of Testing Materials (ASTM), and Association of Official Analytical Chemist (AOAC) may be used by accredited laboratories.

If a field crew or laboratory uses a method that is not listed in **Table 4**, the Project QA Officer must review the validity and comparability of the data generated following that method. The data validation process should consist of determining the sensitivity level (MDL and RL), accuracy of QC samples and standards, precision of duplicate data, and analytical bias associated with the new method. This information should be compared to the same components associated with the method in this QAPrP. If the Project QA Officer determines the achievability of the new method is comparable to the method listed in this QAPrP, justification for the new method and a copy of the method should be submitted as an amendment to this document and approved by the State Board QA Officer.

The Project QA Officer should be in communication with the Laboratory Project Manager to resolve analytical issues, when they arise. It is the responsibility of the Project QA Officer to determine the most appropriate course of action to resolve any problems and/or accept data. All corrective actions are overseen by the Project QA Officer and should be reported in the annual reports.

Laboratory Turnaround Time

Laboratory reports and electronic deliverables will be submitted to the individual Project Managers within 60 days of samples being submitted to the laboratory. The Program QA Officer will be notified when all samples have been collected and if the laboratory turnaround time has been exceeded.

Table 4. List of acceptable analytical methods for constituents and maximum sensitivity requirements.

Field equipment and laboratories must be able to achieve reporting limits that are equal to or less than those listed.

Constituent	Acceptable Methods	Reporting Limit	Reporting Unit
Field Parameters			
Dissolved Oxygen (DO)	EPA 360.1, EPA 360.2, SM 4500-O	0.1	mg/L
Electrical Conductivity (EC) at 25 °C	EPA 120.1, SM 2510B	2.5	µS/cm
pH	EPA 150.1, EPA 150.2, SM 4500-H+B	0.1	pH units
Temperature	SM 2550	0.1	°C
Turbidity	EPA 180.1, SM 2130B	1	NTU
Nutrients			
Nitrate (as N)	EPA 300.0, EPA 300.1, EPA 351.3, EPA 353.2, SM 4500-NO3, SM 4110 B,	0.1	mg/L (as N)
Nitrate + Nitrite (as N)		0.1	mg/L (as N)
Anions			
Carbonate	EPA 310.1. EPA 310.2, SM 2320B	10	mg/L
Bicarbonate		10	mg/L
Chloride	EPA 300.0, EPA 300.1, EPA 325.2, EPA 325.3, SM 4110B, SM 4110C, SM 4500-Cl	0.25	mg/L
Sulfate (SO4)	EPA 300.0, EPA 300.1, EPA 375.1, EPA 375.2, EPA 375.3, EPA 375.4, SM 4110B, SM 4110C, SM 4500-SO42-C	1	mg/L
Cations			
Boron	EPA 200.5, EPA 200.7, EPA 212.3, SM 3120 B, SM4500-B-B	0.1	mg/L
Calcium	EPA 200.5, EPA 200.7, EPA 215.1, EPA 215.2, SM 3111B, SM 3120 B, SM 3500-Ca B	0.5	mg/L
Magnesium	EPA 200.5, EPA 200.7, EPA 242.1, SM 3111B, SM 3120 B	0.06	mg/L
Potassium	EPA 200.7, EPA 258.1, SM 3111B, SM 3120 B, SM 3500-K B	1	mg/L
Sodium	EPA 200.5, EPA 200.7, EPA 273.1, SM 3111B, SM 3120 B, SM 3500-Na B	0.01	mg/L
Solids			
Total Dissolved Solids	EPA 160.1, SM 2540C	10	mg/L

14. QUALITY CONTROL

14.1. Program Policy

Samples analyzed as part of the CVGMC will be subjected to laboratory and method-specific guidelines to maintain comparability across multiple projects. All projects must utilize the minimum analytical QC outlined below to address the DQIs outlined in this QAPrP within **Section 7.1.**

14.2. CVGMC Programmatic MQOs

Measurement quality objectives are the individual performance or acceptance goals for the individual DQIs. All projects must adhere to the minimum QAPrP MQOs; approved QAPPs may have more stringent MQOs.

Field Quality Control

Field QC results must adhere to the limits of error and frequency requirements detailed in **Table 5**. Field QC frequencies are calculated to ensure that a minimum of 5% of all analyses are for QC purposes (both field duplicate and field blanks).

Table 5. Field Sampling QC.

SAMPLE TYPE	FREQUENCY	ACCEPTABLE LIMITS	CORRECTIVE ACTION
Field Duplicate	5% annual total	RPD ≤ 25%	Determine cause, take appropriate corrective action.
Field Blank	5% annual total	Detectable substance contamination <RL or < sample/5	Determine cause of problem, remove sources of contamination.

Analytical Quality Control

Analytical QC results must adhere to the minimum limits of error and frequency requirements detailed in **Table 6**. All analytical QCs must be analyzed at a frequency of 1 every 20 samples, minimum of 1 per batch.

Table 6. Analytical measurement quality objectives.

Sample Type	Frequency	Acceptable Limits	Corrective Action
Nutrients			
Lab Blanks (method, reagent, instrument)	1 per 20 samples, minimum 1 per batch	Detectable substance contamination <RL	Determine cause of problem, remove sources of contamination, reanalyze suspect samples or flag all suspect data.
Lab Duplicate*	1 per 20 samples, minimum 1 per batch	RPD < 25%	Determine cause, take appropriate corrective action. Recalibrate and reanalyze all suspect samples or flag all suspect data.
Matrix Spike	1 per 20 samples, minimum 1 per batch	80-120%	Determine cause, take appropriate corrective action. Recalibrate and reanalyze all suspect samples or flag all suspect data.
Lab Control Spike, CRM, or SRM	1 per 20 samples, minimum 1 per batch	90-110%	Determine cause, take appropriate corrective action. Recalibrate and reanalyze all suspect samples or flag all suspect data.
Anions			
Lab Blanks (method, reagent, instrument)	1 per 20 samples, minimum 1 per batch	Detectable substance contamination <RL	Determine cause of problem, remove sources of contamination, reanalyze suspect samples or flag all suspect data.
Lab Duplicate*	1 per 20 samples, minimum 1 per batch	RPD < 25%	Determine cause, take appropriate corrective action. Recalibrate and reanalyze all suspect samples or flag all suspect data.
Lab Control Spike, CRM, or SRM	1 per 20 samples, minimum 1 per batch	75-125%	Determine cause, take appropriate corrective action. Recalibrate and reanalyze all suspect samples or flag all suspect data.
Cations			
Lab Blanks (method, reagent, instrument)	1 per 20 samples, minimum 1 per batch	Detectable substance contamination <RL	Determine cause of problem, remove sources of contamination, reanalyze suspect samples or flag all suspect data.
Lab Duplicate*	1 per 20 samples, minimum 1 per batch	RPD < 25%	Determine cause, take appropriate corrective action. Recalibrate and reanalyze all suspect samples or flag all suspect data.
Matrix Spike*	1 per 20 samples, minimum 1 per batch	75-125%	Determine cause, take appropriate corrective action. Recalibrate and reanalyze all suspect samples or flag all suspect data.

Sample Type	Frequency	Acceptable Limits	Corrective Action
Lab Control Spike, CRM, or SRM	1 per 20 samples, minimum 1 per batch	75-125%	Determine cause, take appropriate corrective action. Recalibrate and reanalyze all suspect samples or flag all suspect data.
Total Dissolved Solids			
Lab Blanks (method, reagent, instrument)	1 per 20 samples, minimum 1 per batch	Detectable substance contamination <RL	Determine cause, take appropriate corrective action. Recalibrate and reanalyze all suspect samples or flag all suspect data.
Lab Duplicate*	1 per 20 samples, minimum 1 per batch	RPD < 25%	Determine cause, take appropriate corrective action. Recalibrate and reanalyze all suspect samples or flag all suspect data.
Lab Control Spike, CRM, or SRM	1 per 20 samples, minimum 1 per batch	80-120%	Determine cause, take appropriate corrective action. Recalibrate and reanalyze all suspect samples or flag all suspect data.

*For the purposes of this program it is acceptable for the matrix spike duplicate or the laboratory control duplicate to stand in for the lab duplicate as a measure of the precision of the analytical method.

Precision will be assessed through a combination of field duplicate samples and laboratory duplicate samples. Precision of a pair of samples is measured as the relative percent difference (RPD) between a sample and its duplicate—a laboratory control sample (LCS) and its duplicate (LCSD), a matrix spike (MS) and matrix spike duplicate (MSD), an environmental sample (E) and field duplicate (FD), or an environmental sample and its associated lab duplicate. It is calculated as follows:

$$RPD\ (\%) = \left| \frac{2(V_i - V_D)}{V_i + V_D} \right| \times 100$$

V_i = The measured concentration of the initial sample
V_D = The measured concentration of the sample duplicate

For precision assessment purposes, any lab duplicate, including a matrix spike duplicate or a lab control spike duplicate, may function as the lab duplicate in any batch.

Accuracy is assessed using either an LCS or MS. For an LCS, lab water is spiked with a known concentration of a target analyte and the percent recovery (PR) is reported. PR in an LCS is calculated as follows:

$$\%\ Recovery = \left(\frac{V_{LCS}}{V_{Spike}} \right) \times 100$$

V_{LCS} = The measured concentration of the spiked control sample
V_{Spike} = The expected spike concentration

A MS can also be used to assess accuracy. For a MS, environmental water is spiked with a known concentration of a target analyte and the PR is reported. PR in and MS is calculated as follows:

$$\% \ Recovery = \left(\frac{V_{MS} - V_E}{V_{Spike}} \right) x \ 100$$

V_{MS} = The measured concentration of the spiked matrix sample
V_{Spike} = The concentration of the spike added
V_E = The measured concentration of the original (unspiked) matrix sample

The MS should not be used solely to assess accuracy due to the likelihood of matrix interference; however, if an LCS does not fall within acceptance criteria an MS may be used to validate a batch if the MS is within acceptance criteria. Some constituents are difficult to spike (e.g., Total Dissolved Solids); therefore, a laboratory may choose to analyze a certified reference material (CRM). A CRM analysis may be used in place of an LCS analysis.

14.3. Field and Laboratory Corrective Actions

Batches should be reanalyzed if a single QC sample did not meet an MQO due to an identifiable laboratory error and/or MQOs are not met for more than 50% of analytes analyzed in a QC sample. When batches are reanalyzed, the laboratory should provide both results to the third party. If DQOs fail, but neither of the above scenarios is applicable, the laboratory should follow the corrective actions prescribed in **Table 5** and **Table 6**. Overall, all data failing to meet MQOs should be flagged; re-analysis may occur to confirm improvements in accuracy, precision or contamination measures. The laboratory Project Manager and the Project QA Officer may further discuss additional corrective actions on a case by case basis.

Field crews and contract laboratories are responsible for responding to failures in their measurement systems. If sampling or analytical equipment fails, personnel must record the problem according to their documentation protocols.

15. INSTRUMENT/EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE

15.1. Programmatic Policies

Field Equipment

All field equipment must be inspected and repaired as necessary prior to each sampling event. Routine maintenance and repair of field equipment should follow manufacturer instructions and guidelines. Records of field equipment maintenance and repairs should be maintained for each instrument and are summarized in Table 8 of the individual project QAPPs and outlined in attached sampling SOPs. Project Field Leads are responsible for ensuring that inspection and maintenance activities are completed in accordance with project requirements. Project QA officers oversee all maintenance records generated by project personnel. These records will be available to the Program Manager upon request.

Laboratory Equipment

Routine laboratory instrument testing, inspection, and maintenance should be carried out by a qualified technician. Laboratories are responsible for testing, inspecting, and maintaining all laboratory equipment according to manufacturer specifications. Frequency and procedures for maintenance of analytical equipment used by each laboratory are documented in the Quality Assurance Manual for each laboratory, which will be available to Program Managers from any contract laboratory on request. Laboratory instrument inspection and maintenance activities are outlined in Table 8 of the individual project QAPPs. Any instrument deficiencies that are not resolved prior to data generation will be reviewed by the Project QA Officer. Corrective actions for any deficiencies are the responsibility of the Project QA Officer.

16. INSTRUMENT/EQUIPMENT CALIBRATION AND FREQUENCY

16.1. Programmatic Policies

Field Equipment

Field probes and sensors used to measure field parameters are essential to data generated by the program. Sensors must be calibrated properly prior to any deployment to ensure precision and accuracy of measurement of field parameters. Calibration is performed by measuring the sensors' responses to known conditions and adjusting accordingly to ensure accurate measurements. Calibration procedures should follow manufacturer specifications for the equipment used and are outlined in Table 9 of the individual project QAPPs.

Records of field equipment calibration will be maintained for each instrument. These records will be available to Program Managers upon request.

Laboratory Equipment

Routine laboratory instrument calibration should be carried out by a qualified technician. Laboratories are responsible for calibrating all laboratory equipment according to manufacturer specifications. Frequency and procedures for calibration of analytical equipment used by each laboratory are documented in the Quality Assurance Manual for each laboratory, which will be available to Program Managers from any contract laboratory on request.

17. INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES

17.1. Programmatic Policies

Acceptance criteria for supplies and consumables are outlined in the Laboratory Quality Assurance Manual and in Table 10 of the individual project QAPPs. Laboratory personnel and field crews are responsible for ensuring that all supplies and consumables meet these criteria prior to analysis of sample collection. Inspecting and testing records will be maintained by the laboratories and field crews, and available to Program Managers on request.

18. NON-DIRECT MEASUREMENTS (EXISTING DATA)

Public supply wells may be included in some CVGMC GQTM networks (see description in Technical Workplan); procedures described herein apply to these wells. Continued monitoring of these wells will also be performed by the water supply system operators in accordance with Division of Drinking Water (DDW) requirements. While the annual sampling of the GQTM network wells conducted by each Coalition will include collection of the field parameters identified above, monitoring of additional wells by other monitoring entities may not include testing of all the identified field parameters. Groundwater quality testing in additional wells monitored by others may not align exactly with the frequency of testing for all water quality parameters specified in the WDRs, although coordination efforts with cooperating monitoring entities will focus on establishing a testing program that is consistent and compatible with the monitoring objectives for the GQTM.

All pre-existing data will be assembled within the DMS to facilitate organization, analysis, and display of the acquired data. Well construction information will also be obtained and stored within the database.

Data collected by outside entities will be associated with their individual projects (e.g. PSW_DDS) and clearly identified in any reports or analysis as described in the CVGMC Data Management SOP.

18.1. Existing Data – Meets QAPrP Requirements

If a public supply well is listed as a principal well within the monitoring network, existing data will be reviewed according to the procedures outlined within the CVGMC Data Management SOP and flagged accordingly within the CVGMC DMS. Existing data for principal wells may come directly from the laboratory and/or the agency collecting the samples. The Coalition is responsible for ensuring that these data are loaded to GeoTracker as well as to the CVGMC DMS.

18.2. Existing Data – Does Not Meet QAPrP Requirements

Existing data collected by other entities that do not adhere to the minimum QAPrP requirements may be used for general basin characterization. At a minimum this information must include the location of the well, date of sampling, identification of the agency who collected the sample, original source, method, analyte, concentration, units and reporting limit. Sources of existing data may include GeoTracker and water supply system operators.

19. DATA MANAGEMENT

The CVGMC will use a coordinated data management system that will be centrally maintained for the purpose of implementing the CVGMC. Each Coalition may elect to maintain their own data separately in their own database, if desired, but a coordinated data management system (DMS) will be used to facilitate analyses and reporting of regional groundwater quality data across the CVGMC area and submittal of CVGMC data.

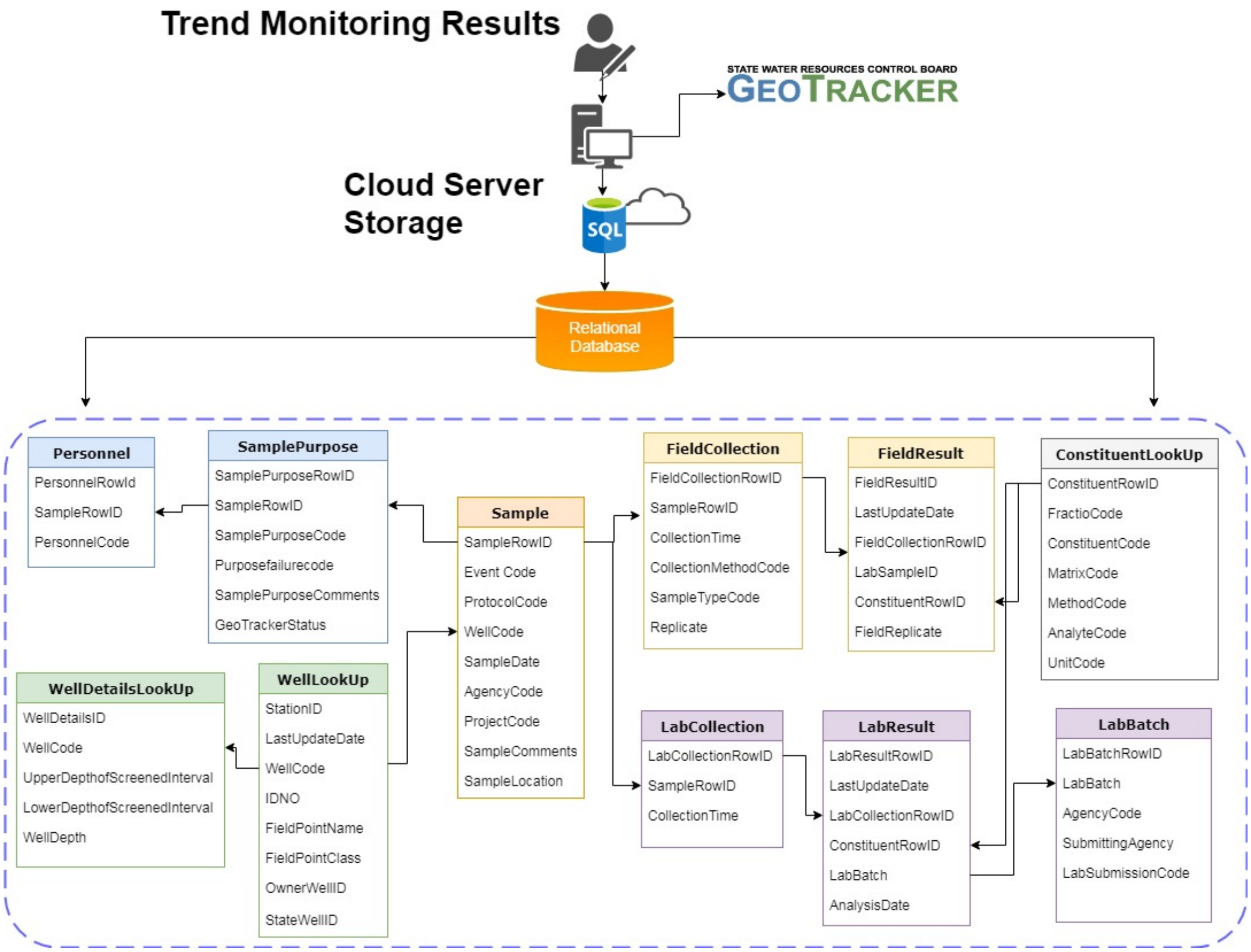
The DMS will be a relational database allowing for efficient storage of well monitoring information, including project information (Coalition-specific project codes and protocols), sample collection information (sample date, time, and location of sample collection), well-related information and monitoring results and associated information. The relational database structure will ensure the integrity of the database with one to many relationships facilitating the analysis of water quality results used for trend analysis, graphing, and visualization. The database will house well location, well construction information, environmental results and quality control data.

Figure 15 includes a conceptual diagram of how data will be collected by individual Coalitions, submitted to GeoTracker and the CVGMC, and stored within the CVGMC DMS. The depiction of the relational database design is not meant to capture all components of the CVGMC DMS but highlights the critical elements of the database and required information. Additional tables not shown include valid value requirements for the various tables to ensure comparability of data sets and assignment of quality assurance codes.

All field data is entered into the CVGMC DMS after it has been reviewed and qualified. All data transcribed or transformed, electronically and otherwise, is double checked for accuracy by project staff; records of this double check are maintained by each Coalition. All field sheets and COCs are scanned and an electronic copy is saved on a secure server which can be accessed by the Program QA Officer upon request.

Transfer of data from laboratories to the Coalitions is done through electronic submittals. Laboratory reports are received as PDFs and in a GeoTracker EDF; both types of files are stored on the Coalition's secure server and can be accessed by the Program QA Officer upon request. EDFs are loaded into the CVGMC DMS as outlined within the Data Management SOP.

Figure 15. CVGMC DMS Relational Database Design Conceptual Diagram.



GROUP C. ASSESSMENT AND OVERSIGHT

20. ASSESSMENTS & RESPONSE ACTIONS

All reviews of QA data will be made by the Project QA Officer according to the data verification and validation procedures outlined in the CVGMC Data Management SOP. Reviews may include the Program QA Officer, if necessary. Contract laboratories are responsible for self-assessment and oversight of finalized data submitted in laboratory reports and GeoTracker files, although data are audited for compliance with each Coalition's QA/QC program. Well data will be loaded directly to GeoTracker by the laboratory. Once data are received by the CVGMC, the data will be reviewed, flagged as necessary and uploaded to the DMS. Individual Project Managers are responsible for notifying the Program QA Officer once data have been reviewed and uploaded into the DMS. The Program QA Officer is responsible for flagging all data that does not meet established QA/QC criteria.

If a discrepancy is discovered during a review, the Program QA Officer will discuss the discrepancy with the Coalition responsible for the activity. The discussion will include the accuracy of the information, potential cause(s) leading to the deviation, how the deviation might impact data quality and the corrective actions that might be considered. Should impacts on data quality be determined to be of substantial concern, the Program QA Officer may issue a stop work order to an individual project, effective until data quality can be assessed and brought within program requirements.

The quality of data will routinely be reviewed as a whole and assessed to determine procedural (field and analytical) changes are necessary for improved data quality. The QA officer may request to visit the laboratory to discuss the review and data quality. Laboratory visits may occur as frequently as once a year or less depending on the need. Other assessments that occur periodically will be oral or electronic via email correspondences; if no discrepancies are noted and corrective action is not required, additional records are neither maintained nor reported. If discrepancies are observed, the details of the discrepancy and any corrective action will be reported in the quarterly and final monitoring report.

Corrective action may correct an unauthorized deviation from the QA/QC procedures or SOPs, or it may remedy a systematic failure in the established QA/QC procedures or SOPs. The Project QA Officer will be responsible for addressing all corrective actions.

21. REPORTS TO MANAGEMENT

The Project Manager is responsible for notifying the Program QA Officer that sampling has been completed and that results are reviewed and loaded into the DMS.

Personnel involved in project tasks may encounter unforeseen issues/concerns at any time. It is important that staff report issues/concerns to managers when they are identified. Individual Project Managers are responsible for project resolutions. If the resolution requires changes to approved workplans or QAPPs, the ILRP CVRQWCB will be contacted and the appropriate actions will be taken to have changes approved.

Project results and an assessment of data quality will be submitted annually to the CVRWQCB. Programmatic data quality assessments will be reported to the CVRWQCB with programmatic trend reports, submitted every five years.

GROUP D. DATA VALIDATION AND USABILITY

22. DATA REVIEW, VERIFICATION, AND VALIDATION REQUIREMENTS

Project QA Officers will review data collected under a Coalition specific GQTM according to the data quality objectives and QA/QC practices outlined within the Data Management SOP. Data utilized by the CVGMC will be reviewed against the data quality objectives cited in **Section 7** of this document, and of each attached individual QAPPs, as well as the QA/QC practices cited in Sections 14 , 15 , 16 , and 17. The Program QA Officer will review any data that fails any stated quality objectives to decide whether to accept or reject the data for use in the CVGMC. The decision to accept or reject the data will be based on an assessment of the impact of the data quality failure. Data collected by other monitoring agencies will go through a more general review as stated within **Section 18.**

23. VERIFICATION AND VALIDATION METHODS

Data will be QC'd by each Coalition according to the data review procedures outlined in the Data Management SOP. The Project's QA Officer or a delegate of the QA Officer will do all reviews of 100% of the reports. Each contract laboratory's QA Officer will perform checks of all of its records at a frequency that the lab determines sufficient. The Program QA Officer is responsible for conducting programmatic reviews of all data for consistency and comparability. Data utilized for the CVGMC will undergo review and checks based on the CVGMC Data Management SOP.

24. RECONCILIATION WITH USER REQUIREMENTS

Procedures to review, verify and validate project data are included in the Data Management SOP. The Program Quality Objectives section describes the role of the DQO process and identifies the program's objectives. Reconciliation with the DQOs involves reviewing the data to determine whether the DQOs have been attained and that the data are adequate for their intended use. At the project level, reconciliation occurs during the data quality assessment.

Limitations in data use will be reported to the CVRWQCB in the Annual Reports and CVGMC Five-Year Assessment Reports.

Quality Assurance Project Plan

For Groundwater Monitoring By The

East San Joaquin Water Quality Coalition

In Compliance With The

Central Vally Groundwater Monitoring Collaborative QAPrP

For The
Irrigated Lands Regulatory Program

Central Valley Regional Water Quality Control Board
11020 Sun Center Drive #200
Rancho Cordova, California 95670-6114

Submitted On

April 1, 2019

Prepared By:

MLJ ENVIRONMENTAL

GROUP A. PROJECT MANAGEMENT

INTRODUCTION

Each of the participating CVGMC agricultural Coalitions must meet their own groundwater monitoring requirements, outlined in their individual General Orders. The role of the CVGMC is to establish common monitoring and reporting structure as it applies to the individual groundwater trend monitoring requirements established by each third-party group under their individual General Orders. The third-party groups will participate in a regional effort to collect and share groundwater monitoring data to be used for a broad geographical characterization of the potential effects of agricultural lands on groundwater aquifers, for and regulatory compliance and decision making throughout the Central Valley.

The Quality Assurance Program Plan (QAPrP) establishes the quality assurance and quality control standards and requirements for useable data for individual projects contributing to this regional collaboration. It also establishes the structure and requirements for a regional data management system, through which all useable data generated under the CVGMC can be stored and accessed by the participants and regulators.

In addition to the programmatic requirements address in the CVGMC QAPrP, the East San Joaquin Water quality Coalition (ESJWQC) will adhere to the following project-specific requirements established in this QAPP.

3. DISTRIBUTION LIST

Table 1. Project Personnel.

Title	Name	Organizational Affiliation	Contact Information (Telephone number, fax number, email address.)
Project Lead	Parry Klassen	ESJWQC	(209) 846-6112 klassenparry@gmail.com
Project Manager	Ally Villalpando	MLJ Environmental	(530) 756-5200 avillalpando@mljenvironmental
Project QA Officer	Lisa McCrink	MLJ Environmental	(530) 756-5200 lmccrink@mljenvironmental
Project Field Lead	Anthony Brillante	MLJ Environmental	(530) 756-5200 abrillante@mljenvironmental.com
Contract Laboratory Project Manager	Eli Greenwald	Caltest Laboraories	(707) 258-4000 eli_greenwald@caltestlabs.com
Contract Laboratory QA Officer	Nell Arguelles	Caltest Laboraories	(707) 258-4000 nell_arguelles@caltestlabs.com

4. PROJECT ROLES AND RESPONSIBILITIES

Project Lead Role

The Project Lead will oversee the project specific groundwater monitoring program and budget. The Project Lead will work with the Project Manager to ensure all protocols as outlined in this QAPP are followed. The Project Lead will be informed regarding any deviations from protocols and/or analytical issues. The Project Lead is responsible for ensuring that the Groundwater Quality Trend Monitoring (GQTM) Workplan is implemented and any deviations to the Workplan are documented.

Project Manager Role

The Project Manager facilitates the implementation of the GQTM Workplan under the guidance of the Project Lead. The Project Manager is responsible for the the coordination of well sampling, laboratory analysis and data reporting. Prior to monitoring, the Project Manager is responsible for ensuring that all parties involved with collecting and analyzing groundwater samples are awre of both field and laboratory roles and responsibilities. The Project Manager is responsible for ensuring communication with Laboratory and Project QA Officers to resolve analytical issues and maintain communication between all parties in regard to laboratory and/or sampling changes.

Project Quality Assurance Officer Role

The Project QA Officer is responsible for establishing QA/QC guidelines for field sampling and analytical procedures conducted as part of the GQTM Workplan. The Project QA Officer will oversee and manage the assessment of accuracy, completeness, and precision for samples collected as part of the GQTM and ensure that project QA/QC guidelines adhere to the QA/QC guidelines set forth in the CVGMC QAPrP.

Project Field Lead

The Project Field Lead is responsible for performing the sample collection and field measurement activities. The Project Field Lead is also responsible for all communications with the analytical laboratory regarding sample shipment, schedule and ensuring that COCs and Field Sheets are completed accurately.

Persons Responsible for the Update and Maintenance of QAPP

The Project QA Officer in coordination with the Project Lead will be responsible for creating, maintaining and updating the QAPP template. The Project QA Officer will be responsible for making changes and submitting the final version to the CVGMC and individuals identified in Section 3 of the QAPP for signature.

5. PROBLEM DEFINITION/BACKGROUND

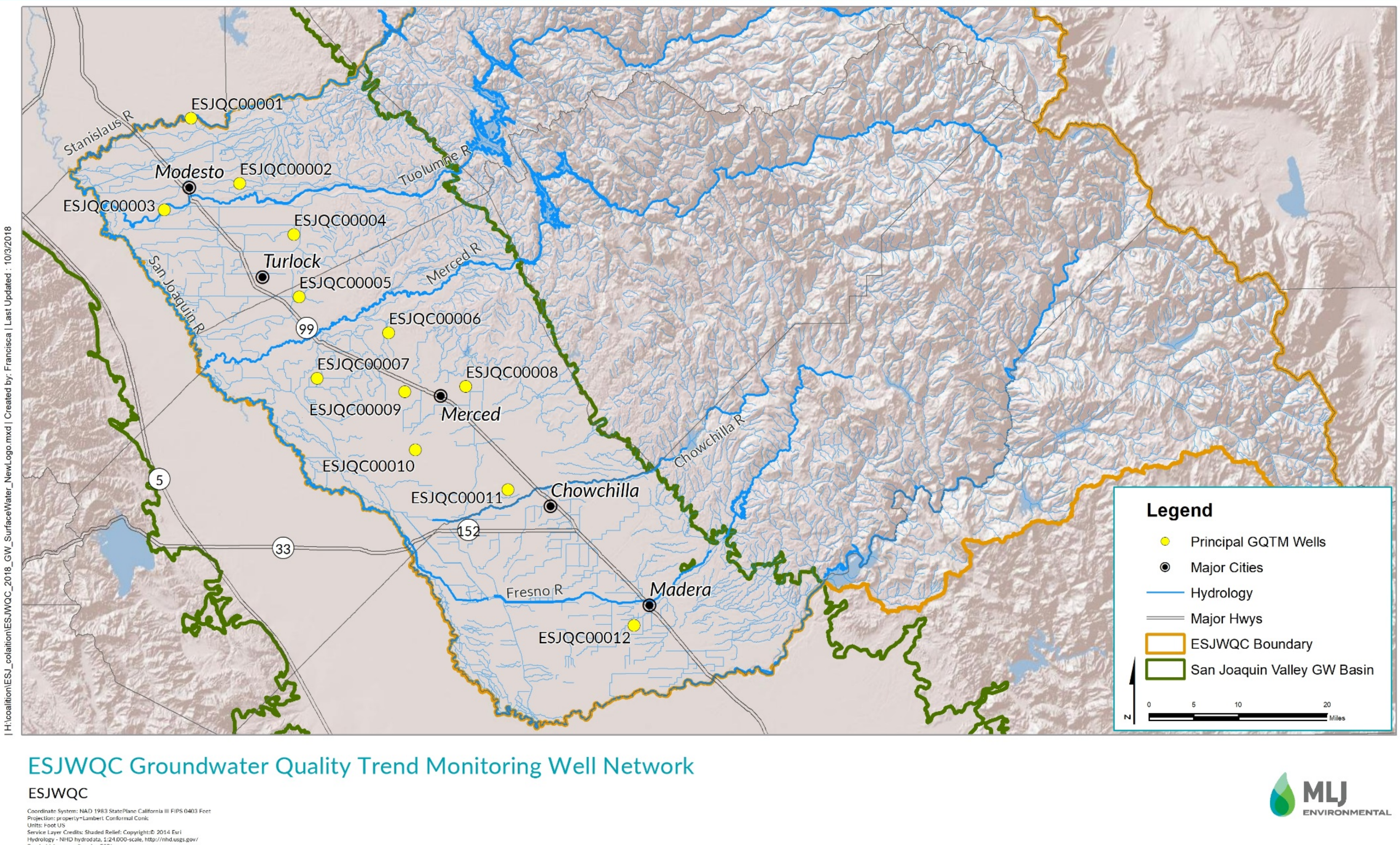
This QAPP includes project-specific information pertaining to the groundwater monitoring to be performed by the ESJWQC as described within the GQTM Workplan submitted on March 1, 2018. The Coalition is a member of the CVGMC and has developed a GQTM Workplan and QAPP in adherence with the CVGMC Technical Workplan and Programmatic QAPP (QAPrP) submitted to the Central Valley Regional Water Quality Control Board on May 16, 2018.

6. PROJECT DESCRIPTION

6.1. Geographical Setting

The Coalition has developed its own network of wells for groundwater quality trend monitoring as described in the GQTM Workplan. These networks include wells spatially distributed across high and low vulnerability areas the Coalition region in accordance with Coalition-specified prioritization criteria. This well network will be monitored and incorporated into the CVGMC network for regional analysis and reporting.

Figure 1. Map of ESJWQC well network.



7. PROJECT QUALITY OBJECTIVES

7.1. Data Quality Indicators

The minimum requirements for Data Quality Indicators (DQIs) (precision, accuracy, comparability, completeness, representativeness and sensitivity) are addressed in the CVGMC QAPrP. Project specific measurement quality objectives (MQOs) are included in **Section 14** are established to ensure that the Coalition is meeting the minimum requirements as outlined in the QAPrP.

8. SPECIAL TRAINING/CERTIFICATION

8.1. Specialized Training or Certifications

The Project Lead is responsible for ensuring that all field crews receive proper training and certifications as outlined in the QAPrP. The Contract Laboratory Project Manager is responsible for ensuring that all laboratory staff maintain current training in all relevant aspects of their role in the sample processing and data generation. Training records must be maintained and available upon request.

Table 2. Specialized training or certifications.

Specializaed Training	Description of Training	Training Provider	Personnel Receiving Training	Location of Records & Certificates
Field Sampling	Procedures and techniques for collecting groundwater samples.	MLJ Environmental	All sampling personnel	MLJ Environmental Offices
Field and Office Safety	Overview of saftey concerns and procedures for field sampling and office work.	MLJ Environmental	All sampling personnel	MLJ Environmental Offices

9. PROJECT DOCUMENTATION

Copies of this QAPP will be distributed to all personnel and/parties involved in the project as outlined in the distribution list. If the Coalition's GQTM and associated QAPP requires the analysis of a constituent not already included in this QAPrP, a method not already identified, or proposes different DQOs that are less stringent than those listed, an amendment form must be submitted to the Program QA Officer for review once the GQTM is approved. The Coalition's GQTM does not required an amendment to the QAPrP.

This Coalition's QAPP Adppendix Form includes project-specific information for the following sections: 10. Sampling Process and Design, 11. Sampling Methods, 12. Sample Handling and Custody, 13. Analytical Methods, 14. Quality Control, 15. Instrument/Equipment Testing, Inspection and Maintenance, 16. Instrument/Equipment Calibration and Frequency, 17. Inspection/Acceptance of Supplies and Consumables.

Field Sheets

The Coalition's field sheet is included in **Figure 2**. At a minimum field sheets must include the following:

- Project name
- Site name
- Site code
- Physical address of property on which well is situated
- State well number (if available)
- Sampling personnel
- GPS coordinates taken with each sampling event
- Sample type
- QC sample type
- Date and time of sample collection
- Results of field measurements
- Depth to standing water (static water level)
- Sampling conditions
- Constituents sampled
- Sample container
- Sample preservation

Chain of Custody

The Coalition's Chain of Custody (COC) form is included in **Figure 3**. At a minimum COC forms must include the following:

- Collection agency name and contact information
- Receipt agency name and contact information
- Sample Identification
- Date and time of sample collection
- Analyses requested
- Sample container type
- Number of sample containers
- Preservation
- Relinquished by name(s)
- Relinquished by date(s)
- Relinquished by signature(s)
- Received by name(s)
- Received by date(s)
- Received by signature(s)

Figure 2. ESJWQC field sheet.

Well Purging and Sampling Log

State Well #: ______ QTMP Well ID: ______ Sample ID: ______ Field Point: ______

Member Name: ____________________

Physical Address: ____________________

Date: ______ Target Lat/Long: ______ Well Depth: ______

Sky Code (Circle one): Field Lat.: ______ Depth to Water: ______

Clear, Cloudy, Partly Cloudy, Rain Field Long.: ______ MP to LSE: ______

Wind: Calm, Light wind, Gusty Accuracy: ______ Casing Dia.: ______

Unit: ______

QC Site: Yes No

Blank pH: ______

Personnel: ______

Picture # (s): ______

Well Type: Domestic Irrigation Public Water Supply

Sampling Point Description:

At the wellhead

After pressure tanks

From a holding tank

Spigot away from wellhead

After Filter

Other: ______

Well Diameter Multiplier			Purge Volume Calculations
Diameter	L	Gal	**DTW (Depth to water); WD (well depth); CV (casing vol)**
2"	0.6	0.16	1CV= (TD-DTW)* Multiplier; 3CV= 1CV*3
4"	2.4	0.65	

Purge start time: **Purge Log** **Purge end time:**

Time	Volume	Temp	EC	DO	pH	ORP	DTW	Turbidity	Comments

Purge Method: Submersible Turbine pump other: ______

Sampling Method: Submersible Turbine pump other: ______

Sample Collection Log **Sample time:**

Analysis	Container	Volume	Quantity	Filtered	Preservative	Lab
Nitrate + Nitrite as N	Poly	500 mL	1	Yes / No	H_2SO_4	
B, Ca, K, Mg, Na	Poly	500 mL	1	Yes / No	HNO_3	
TDS/ Alk/ Cl/ SO_4	Poly	500 mL	1	Yes / No		

Notes:

Figure 3. ESJWQC Chain of Custody form.

MLJ ENVIRONMENTAL

Caltest CHAIN-OF-CUSTODY RECORD

Client Name:	MLJ-LLC
Address:	1480 Drew Ave. Suite #130, Davis, CA 95618
Sampled By:	
Phone:	(530) 756-5200
Fax:	(530) 756-5225
Project Manager:	Michael Johnson
Project Name:	East San Joaquin Water Quality Coalition

	Sample Identification	Field Point Name	Global ID	Sample Date	Sample Time	Number	Type	Total Alkalinity as CaCO3 (SM 2320B)	Total Dissolved Solids (SM2540C)	Chloride, Sulfate SO4 (EPA 300)	Boron, Calcium, Magnesium, Sodium, Potassium	Nitrate as N (EPA300)	Field pH	LAB ID
1						1	500-mL Poly							
						1	500-mL Poly							
						1	500-mL Poly							
2						1	500-mL Poly							
						1	500-mL Poly							
						1	500-mL Poly							
3						1	500-mL Poly							
						1	500-mL Poly							
						1	500-mL Poly							
4						1	500-mL Poly							
						1	500-mL Poly							
						1	500-mL Poly							
5						1	500-mL Poly							
						1	500-mL Poly							
						1	500-mL Poly							
6						1	500-mL Poly							
						1	500-mL Poly							
						1	500-mL Poly							
7						1	500-mL Poly							
						1	500-mL Poly							
						1	500-mL Poly							

Comments:

Please fax signed and completed COC to MLJ LLC: (530) 756-5225, or email to abrillante@mlj-llc.com

If samples are collected for individual monitoring please write the individual Global ID in the sample comments.

Temperature at Log In: (°C)

Relinquished By		Relinquished By	
Signature		Signature	
Print Name		Print Name	
Organization		Organization	
Date	Time	Date	Time
Received By		**Received By**	
Signature		Signature	
Print Name		Print Name	
Organization		Organization	
Date	Time	Date	Time

Full; pg ____ of ____

Sample Matrix: ☐ Sediment ☐ Freshwater ☐ Wastewater ☐ Stormwater ☒ Groundwater

GROUP B. DATA GENERATION AND ACQUISITION

10. SAMPLING DESIGN

For purposes of characterizing the relatively shallower part of the groundwater system, the CVGMC emphasizes monitoring in the Upper Zone within the upper part of the groundwater system. Wells selected for trend monitoring will be sampled and tested at an annual frequency for water quality parameters including nitrate as nitrogen (as N), electrical conductivity at 25 °C (EC), pH, dissolved oxygen (DO), and temperature. Electrical conductivity, pH, DO, and temperature will be measured in the field whereas nitrate concentration will be analyzed by a certified laboratory. In most Coalition regions, public water supply wells represent additional ongoing monitoring wells that are regularly tested. Public water supply wells and any associated external sampling agencies are identified in **Table 4**. Non-direct measurements and analytical data collected by external agencies are processed according to Section 18 of the QAPrP. During the first monitoring event, wells selected for inclusion in the CVGMC GQTM will be sampled and tested for additional water quality constituents, including total dissolved solids (TDS), major anions (carbonate, bicarbonate, chloride, sulfate), and major cations (boron, calcium, sodium, magnesium, potassium). Wells will be tested for these additional constituents every 5 years.

Sample collection will occur during the seasonal window specified in the Workplan. Seasonal sampling reduces variability in groundwater aquifers accross the wet and irrigation seasons. Attempts will be made to sample every well within the network during this time. Inaccesibile wells should be re-sampled whenever possible. If inaccessibility is permanent or resampling cannot occur during the specified sampling period, then the well may need to be removed from the well network. The Project Manager and Project Lead must be notified so that a suitiable replacement well can be located and submitted to Regional Board staff for approval.

All samples collected will be submitted to the contract laboratory with enough time for analysis to occur within the holding times prescribed in **Table 5**. Sample submittals shall occur according to the procedures outlined in the Field Sampling SOP.

Table 3. Well information.

GQTM Well Name	Well ID	GeoTracker Global ID	State Well Number	Well Completion Report Number	Well Type	Well Depth	Well Depth Unit	Year Drilled	Latitude	Longitude	Datum
P01_2a_McHenry	ESJQC00001	AGC100012331		190887	Domestic	135	Feet	1987	37.7522	-120.994	NAD83
P02_1b_Root	ESJQC00002	AGC100012331		290694	Domestic	180	Feet	1988	37.6467	-120.894	NAD83
P03_1q_Vivian	ESJQC00003	AGC100012331		64838	Domestic	105	Feet	1987	37.6031	-121.048	NAD83
P04_1e_Swanson	ESJQC00004	AGC100012331		22701	Domestic	136	Feet	1977	37.5641	-120.783	NAD83
P05_2f_Harding	ESJQC00005	AGC100012331		81-152-D	Domestic	180	Feet	1981	37.4629	-120.772	NAD83
P06_3g_Eucalyptus	ESJQC00006	AGC100012331		465203	Domestic	236	Feet	1993	37.4048	-120.589	NAD83
P07_2g_Atwater	ESJQC00007	AGC100012331	07S11E14	803853	Domestic	230	Feet	2003	37.3308	-120.735	NAD83
P08_1k_East	ESJQC00008	AGC100012331		359701	Domestic	180	Feet	1990	37.3178	-120.432	NAD83
P09_2h_Rodgers	ESJQC00009	AGC100012331		334471	Domestic	180	Feet	1989	37.3092	-120.556	NAD83
P10_2j_Rahilly	ESJQC00010	AGC100012331		Not Found	Domestic	180	Feet	1965	37.2144	-120.535	NAD83
P11_3y_Road11	ESJQC00011	AGC100012331		Not Found	Domestic				37.1497	-120.347	NAD83
P12_1p_Road25	ESJQC00012	AGC100012331		242495	Domestic	276	Feet	1985	36.9287	-120.092	NAD83

Table 4. Well ownership type and sampling agency.

GQTM Well Name	Well ID	Owner Type	Sampling Agency	Sampling SOP
P01_2a_McHenry	ESJQC00001	Member	MLJ Environmental	Standard Operating Procedures for Groundwater Sampling
P02_1b_Root	ESJQC00002	Member	MLJ Environmental	Standard Operating Procedures for Groundwater Sampling
P03_1q_Vivian	ESJQC00003	Member	MLJ Environmental	Standard Operating Procedures for Groundwater Sampling
P04_1e_Swanson	ESJQC00004	Member	MLJ Environmental	Standard Operating Procedures for Groundwater Sampling
P05_2f_Harding	ESJQC00005	Member	MLJ Environmental	Standard Operating Procedures for Groundwater Sampling
P06_3g_Eucalyptus	ESJQC00006	Member	MLJ Environmental	Standard Operating Procedures for Groundwater Sampling
P07_2g_Atwater	ESJQC00007	Member	MLJ Environmental	Standard Operating Procedures for Groundwater Sampling
P08_1k_East	ESJQC00008	Member	MLJ Environmental	Standard Operating Procedures for Groundwater Sampling
P09_2h_Rodgers	ESJQC00009	Member	MLJ Environmental	Standard Operating Procedures for Groundwater Sampling
P10_2j_Rahilly	ESJQC00010	Member	MLJ Environmental	Standard Operating Procedures for Groundwater Sampling
P11_3y_Road11	ESJQC00011	Member	MLJ Environmental	Standard Operating Procedures for Groundwater Sampling
P12_1p_Road25	ESJQC00012	Member	MLJ Environmental	Standard Operating Procedures for Groundwater Sampling

11. SAMPLING METHODS

All samples will be collected according to the attached Standard Opertating Procedures for Groundwater Sampling which includes instructions for collecting samples and cleaning equipment between samples. The field SOP meets the minimal sampling method requirements as described in the QAPrP including details regarding field meter calibration, sampling and purging details. By following the field sampling SOP, samples will be void of contamination, representative of the groundwater, and reproducible.

Any deviation from the written SOP requires notification of the Project QA Officer. All deviation or problems will be noted both on the field sheet and corrective actions should be determined by the Project QA Officer. Deviations will also be reviewed by the CVGMC Program QA Officer to determine acceptability of data.

12. SAMPLE HANDLING AND CUSTODY

All sample containers should be clearly labeled with sample ID, collection date and time, collector, and requested analyses. Chain of Custody forms will be completed and remain with samples during transport to the laboratory as described in the QAPrP. All samples will meet the requirements for sampling containers, holding time, and sample custody outlined in **Table 5** below. Holding times refer to the maximum time limit at which a laboratory must analyze a sample for the constituent listed.

13. ANALYTICAL METHODS

The Project QA Officer should be in communication with the Laboratory Project Manager to resolve analytical issues, when they arise. It is the responsibility of the Project QA Officer to determine the most appropriate course of action to resolve any problems and/or accept data. All corrective actions should be reported in the annual reports.

Table 5. Sample handling and analytical information.

Constituent	Lab-oratory	Analytical Method	Matrix	Fraction	Sample Volume	Sample Container	Preparation	Preservative	Maximum Hold Time	Method Detection Limit (MDL)	Reporting Limit (RL)	Reporting Unit
Field Parameters												
Dissolved Oxygen (DO)	MLJ	SM 4500-O	Groundwater	Unfiltered	NA	NA	None	None	NA	NA	0.01	mg/L
Electrical Conductivity (EC) at 25 °C	MLJ	EPA 120.1	Groundwater	Unfiltered	NA	NA	None	None	NA	NA	2.5	µS/cm
pH	MLJ	EPA 150.1	Groundwater	Unfiltered	NA	NA	None	None	15 minutes	NA	0.1	pH units
Temperature	MLJ	SM 2550	Groundwater	Unfiltered	NA	NA	None	None	NA	NA	0.1	°C
Depth to standing water (static water level)	MLJ	NA	Groundwater	Unfiltered	NA	NA	None	None	NA	NA	NA	ft
Oxidation-reduction potential (ORP)	MLJ	NA	Groundwater	Unfiltered	NA	NA	None	None	NA	NA	NA	mV
Turbidity	MLJ	EPA 180.1	Groundwater	Unfiltered	10 mL	NA	None	None	NA	NA	1	NTU
Nutrients												
Nitrate + Nitrite as N	Caltest	EPA 353.2	Groundwater	Unfiltered*	500 mL	Polyethylene	Field Acidified	H2SO4	28 days	0.07	0.1	mg/L (as N)
Anions												
Bicarbonate	Caltest	SM 2320B	Groundwater	Unfiltered*	500 mL	Polyethylene	None	None	14 days	1.2	10	mg/L
Carbonate	Caltest	SM 2320B	Groundwater	Unfiltered*	500 mL	Polyethylene	None	None	14 days	1.2	10	mg/L
Chloride	Caltest	EPA 300.0	Groundwater	Unfiltered*	500 mL	Polyethylene	None	None	28 days	0.2	1	mg/L
Sulfate (SO4)	Caltest	EPA 300.0	Groundwater	Unfiltered*	500 mL	Polyethylene	None	None	28 days	0.1	0.5	mg/L
Cations												
Boron	Caltest	EPA 200.8	Groundwater	Unfiltered*	500 mL	Polyethylene	Field Acidified	HNO3	6 months	0.002	.01	mg/L
Calcium	Caltest	EPA 200.8	Groundwater	Unfiltered*	500 mL	Polyethylene	Field Acidified	HNO3	6 months	0.02	0.05	mg/L
Magnesium	Caltest	EPA 200.8	Groundwater	Unfiltered*	500 mL	Polyethylene	Field Acidified	HNO3	6 months	0.005	0.05	mg/L
Potassium	Caltest	EPA 200.8	Groundwater	Unfiltered*	500 mL	Polyethylene	Field Acidified	HNO3	6 months	0.02	0.05	mg/L
Sodium	Caltest	EPA 200.8	Groundwater	Unfiltered*	500 mL	Polyethylene	Field Acidified	HNO3	6 months	0.02	0.05	mg/L
Solids												
Total Dissolved Solids (TDS)	Caltest	SM 2540 C	Groundwater	Unfiltered*	500 mL	Polyethylene	None	None	7 days	4	10	mg/L

*Samples with a final turbididty measurement > 10 NTU will be filtered in the field.

14. QUALITY CONTROL

Field Quality Control

Field QC results must adhere to the limits of error and frequency requirements detailed in **Table 6**. Field QC frequencies are calculated to ensure that a minimum of 5% of all analyses are for QC purposes (both field duplicate and field blanks).

Table 6. Field Sampling QC.

Sample Type	Frequency	Acceptable Limits	Corrective Action
Field Duplicate	5% annual total	RPD ≤ 25%	Determine cause, take appropriate corrective action.
Field Blank	5% annual total	Detectable substance contamination <RL or < sample/5	Determine cause of problem, remove sources of contamination.

Analytical Quality Control

Analytical QC results must adhere to the minimum limits of error and frequency requirements detailed in **Table 7**. All analytical QCs must be analyzed at a frequency of 1 every 20 samples, minimum of 1 per batch.

Table 7. Analytical measurement quality objectives.

Sample Type	Frequency	Acceptable Limits	Corrective Action
Nutrients			
Lab Blanks (method, reagent, instrument)	1 per 20 samples, minimum 1 per batch	Detectable substance contamination <RL	Determine cause of problem, remove sources of contamination, reanalyze suspect samples or flag all suspect data.
Lab Duplicate*	1 per 20 samples, minimum 1 per batch	RPD < 25%	Determine cause, take appropriate corrective action. Recalibrate and reanalyze all suspect samples or flag all suspect data.
Matrix Spike	1 per 20 samples, minimum 1 per batch	80-120%	Determine cause, take appropriate corrective action. Recalibrate and reanalyze all suspect samples or flag all suspect data.
Lab Control Spike, CRM, or SRM	1 per 20 samples, minimum 1 per batch	90-110%	Determine cause, take appropriate corrective action. Recalibrate and reanalyze all suspect samples or flag all suspect data.
Anions			
Lab Blanks (method, reagent, instrument)	1 per 20 samples, minimum 1 per batch	Detectable substance contamination <RL	Determine cause of problem, remove sources of contamination, reanalyze suspect samples or flag all suspect data.

Sample Type	Frequency	Acceptable Limits	Corrective Action
Lab Duplicate*	1 per 20 samples, minimum 1 per batch	RPD < 25%	Determine cause, take appropriate corrective action. Recalibrate and reanalyze all suspect samples or flag all suspect data.
Lab Control Spike, CRM, or SRM	1 per 20 samples, minimum 1 per batch	75-125%	Determine cause, take appropriate corrective action. Recalibrate and reanalyze all suspect samples or flag all suspect data.
Cations			
Lab Blanks (method, reagent, instrument)	1 per 20 samples, minimum 1 per batch	Detectable substance contamination <RL	Determine cause of problem, remove sources of contamination, reanalyze suspect samples or flag all suspect data.
Lab Duplicate*	1 per 20 samples, minimum 1 per batch	RPD < 25%	Determine cause, take appropriate corrective action. Recalibrate and reanalyze all suspect samples or flag all suspect data.
Matrix Spike*	1 per 20 samples, minimum 1 per batch	75-125%	Determine cause, take appropriate corrective action. Recalibrate and reanalyze all suspect samples or flag all suspect data.
Lab Control Spike, CRM, or SRM	1 per 20 samples, minimum 1 per batch	75-125%	Determine cause, take appropriate corrective action. Recalibrate and reanalyze all suspect samples or flag all suspect data.
Total Dissolved Solids			
Lab Blanks (method, reagent, instrument)	1 per 20 samples, minimum 1 per batch	Detectable substance contamination <RL	Determine cause, take appropriate corrective action. Recalibrate and reanalyze all suspect samples or flag all suspect data.
Lab Duplicate*	1 per 20 samples, minimum 1 per batch	RPD < 25%	Determine cause, take appropriate corrective action. Recalibrate and reanalyze all suspect samples or flag all suspect data.
Lab Control Spike, CRM, or SRM	1 per 20 samples, minimum 1 per batch	80-120%	Determine cause, take appropriate corrective action. Recalibrate and reanalyze all suspect samples or flag all suspect data.

*For the purposes of this project it is acceptable for the matrix spike duplicate or the laboratory control duplicate to stand in for the lab duplicate as a measure of the precision of the analytical method.

Precision will be assessed through a combination of field duplicate samples and laboratory duplicate samples utilizing the formulas described in the QAPrP. Accuracy is assessed using either an LCS or MS using the formulas described in the QAPrP. Corrective actions shall occur as described in the QAPrP including communication between the laboratory, Project Lead, and Project QA Officer to discuss additional corrective actions on a case by case basis. Field crews and contract laboratories are responsible for responding to failures in their measurement systems. If sampling or analytical equipment fails, personnel must record the problem according to their documentation protocols.

15. INSTRUMENT/EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE

Field equipment and laboratory instruments must be inspected, repaired and maintained as described in the QAPrP. Records of maintenance will be available to the CVGMC Program Manager upon request.

16. INSTRUMENT/EQUIPMENT CALIBRATION AND FREQUENCY

Field calibration procedures will follow manufacturer specifications for the equipment used and are outlined within the attached Standard Operating Procedures for Groundwater Sampling. Records of field equipment calibration should be maintained for each instrument. These records will be available to the CVGMC Program Managers upon request. Calibration of laboratory instruments will be documented in the Quality Assurance Manual for each laboratory which will be available to the CVGMC Program Manager upon request.

Table 8. Instrument/Equipment Testing, Inspection, and Maintenance.

Equipment / Instrument	Maintenance Activity, Testing Activity or Inspection Activity	Frequency	Responsible Person
YSI Pro Plus - Glass Electrode pH Sensor	Clean glass bulb and visually inspect	<24 hours before sampling	Field Lead
YSI Pro Plus - Polarographic DO Sensor	Change membrane and KCl solution	Every 30 days	Field Lead
YSI Pro Plus - Electrode Cell EC and Thermistor Temperature Probe	Clean electrodes	<24 hours before sampling	Field Lead
YSI Pro Plus - Platinum Band ORP Sensor	Clean sensor	<24 hours before sampling	Field Lead
Hanna Instruments Portable Turbidimeter	Battery check; visually inspect and clean samples cuvets	<24 hours before sampling	Field Lead
DGSI Water Level Indicator	Clean cable and check batteries.	<24 hours before sampling	Field Lead
SEAL AQ2 Discrete Analyzer	Clean cells, check all tubing, regenerate cadimum coil	According to manufacturer specifications	Lab QA Officer
Man-Sci Titrasip	Clean titration cup, check tubing	According to manufacturer specifications	Lab QA Officer
Ion Chromatograph (DX 320)	Clean column, check bed supports, replace regenerant, replace suppressor	According to manufacturer specifications	Lab QA Officer
ICP-MS	Check pump tubing, check pump oil, clean cones, clean torch, replace nebulizer, replace torch	According to manufacturer specifications	Lab QA Officer
Balance	Clean pan and check if level, check range of mass used	According to manufacturer specifications	Lab QA Officer

Table 9. Instrument/Equipment Calibration and Frequency.

Equipment / Instrument	Calibration Description and Criteria	Frequency of Calibration	Responsible Person
YSI Pro Plus - Glass Electrode pH Sensor	3 Point calibration at pH 4, 7, and 10; calibration must be accepted by YSI meter	Daily before first measurement	Field Lead
YSI Pro Plus - Polarographic DO Sensor	H20 Saturated air calibration (%O2) at default 760mm Hg	Before each measurement	Field Lead
YSI Pro Plus - Electrode Cell EC and Thermistor Temperature Probe	Calibration to 1413 µS/cm; calibration must be accepted by YSI meter. Temperature calibration is factory set and does not require user calibration	Daily before first measurement and when EC changes substantially between wells	Field Lead
YSI Pro Plus - Platinum Band ORP Sensor	Calibration using ZoBell solution to proper value based on temperature	Daily before first measurement	Field Lead
Hanna Instruments Portable Turbidimeter	2 point calibration at < 0.10 and 15 NTUs	<24 hours before sampling event	Field Lead
SEAL AQ2 Discrete Analyzer	Linear, r≥0.995	Daily, before analysis	Lab QA Officer
Man-Sci Titrasip	pH calibration before use,	Daily, before analysis	Lab QA Officer
Ion Chromatograph (DX 320)	Mixed-standard curve calibration, r≥0.995	Daily, before analysis	Lab QA Officer
ICP-MS	Three calibration standards per linear range, MDL determination, ICV, CCV	When analyst observes calibration is necessary, MDL determined annually, ICV immediately after calibration, CCV after every 10 samples and at end of sample run	Lab QA Officer
Balance	Mass within 0.5%	Daily, before analysis	Lab QA Officer

17. INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES

Acceptance criteria for supplies and consumables are outlined in the Laboratory Quality Assurance Manual and field sampling SOPs. Laboratory personnel and field crews are responsible for ensuring that all supplies and consumables meet these criteria prior to analysis of sample collection. Inspecting and testing records will be maintained by the laboratories and field crews, and available to Program Managers on request.

Table 10. Inspection/Acceptance of Supplies and Consumables.

Consumable	Acceptance Criteria	Frequency	Responsible Person
pH standard calibrating solutions (Fisher Scientific)	Manufacturer's seal intact, measurements within ±0.2 of prior standard measurement	Upon opening a fresh standard solution	Field Lead
EC standard calibrating solutions (Fisher Scientific)	Manufacturer's seal intact, measurements within ±0.5% or 1µS/cm of prior standard measurement	Upon opening a fresh standard solution	Field Lead
Certified pre-cleaned bottles (from laboratory)	Bottles and caps intact	At receipt date of shipment	Field Lead
Pre-preserved containers (from laboratory)	Proper preservative volume present, bottles and caps intact	At receipt date of shipment	Field Lead
Nitrile Gloves (Fisher Scientific)	Carton is intact and gloves within are clean and intact	At receipt date of shipment	Field Lead

18. NON-DIRECT MEASUREMENTS (EXISTING DATA)

Review and assembly of data collected by other entities will follow the procedures described in the QAPrP.

19. DATA MANAGEMENT

The CVGMC will use a coordinated data management system that will be centrally maintained for the purpose of implementing the CVGMC. A coordinated data management system (DMS) will be used to facilitate analyses and reporting of regional groundwater quality data across the CVGMC area and submittal of CVGMC data; the DMS is described in the QAPrP. The Data Management SOP for the CVGMC DMS will be submitted as an amendment to the QAPrP.

GROUP C. ASSESSMENT AND OVERSIGHT

20. ASSESSMENTS & RESPONSE ACTIONS

All reviews of QA data will be made by the Project QA Officer including an assessment of precision, accuracy and completeness as outlined in the Data Management SOP. Reviews may include the Program QA Officer, if necessary. Contract laboratories are responsible for self-assessment and oversight of finalized data submitted in laboratory reports and GeoTracker files, although data are audited for compliance as part of the Coalition's QA/QC program. The Project QA Officer is responsible for ensuring that all data that do not meet the established MQOs are flagged.

If a discrepancy is discovered during the review, the Project QA office will discuss the discrepancy with the personnel responsible for the activity. The discussion will include the accuracy of the information, potentials cause(s) leading to the deviation, how the deviation might impact data quality and the corrective actions that might be considered. If discrepancies are observed, the details of the discrepancy and any corrective action will be reported in the final monitoring report. The Project QA Officer will be responsible for addressing all corrective actions.

21. REPORTS TO MANAGEMENT

Personnel involved in project tasks may encounter unforeseen issues/concerns at any time. It is important that staff report issues/concerns to managers when they are identified. Managers are responsible for project resolutions. If the resolution requires changes to approved documents, the CVRQWCB will be contacted and the appropriate actions will be taken to have changes approved.

GROUP D. DATA VALIDATION AND USABILITY

22. DATA REVIEW, VERIFICATION, AND VALIDATION REQUIREMENTS

The Project QA Officer will review data collected as part of the GQTM according to the data quality objectives and QA/QC practices outlined in the CVGMC Data Management SOP. The decision to accept or reject the data will be based on an assessment of the impact of the data quality failure. Data collected by other monitoring agencies will go through a more general review as stated within **Section 18.**

23. VERIFICATION AND VALIDATION METHODS

The Project's QA Officer or a delegate of the QA Officer will do all reviews of 100% of the reports as outlined in the Data Management SOP. Each contract laboratory's QA Officer will perform checks of all of its records at a frequency that the lab determines sufficient.

24. RECONCILIATION WITH USER REQUIREMENTS

Procedures to review, verify and validate project data is included in the Data Management SOP. The Program Quality Objectives section describes the role of the DQO process and identifies the program's objectives. Reconciliation with the DQOs involves reviewing the data to determine whether the DQOs have been attained and that the data are adequate for their intended use. At the project level, reconciliation occurs during the data quality assessment.

Limitations in data use will be reported to the CVRWQCB in the Annual Reports and CVGMC Five-Year Assessment Reports.

ADDITIONAL REQUIRED DOCUMENTS

The following attached documents are associated with this project.

Table 11. Standard Operating Procedures

Responsible Agency	Method	SOP Title	Revision	Revision Date
MLJ	NA	Standard Operating Procedures for Groundwater Sampling	2.0	Mar-19
Caltest	EPA Method 353.2 / SM 4500NO3F	Nitrate + Nitrite as N	W-NNO3-rev9a	Sep-17
Caltest	SM 2540 C & E / EPA 160.1, 160.4	Total Dissolved Solids, Fixed & Volatile Dissolved Solids	W-TDS-rev10a	Nov-13
Caltest	SM 2320B	TitraSip Automated Water Quality Testing Equipment	W-TitraSip-rev2b	Sep-13
Caltest	EPA 160.1	Total and Volatile Solids, Total and Volatile Solids in Solid Samples	W-RESIDUE-rev9a	Jan-14
Caltest	EPA 300.0	The Determination of Inorganic Anions by Ion Chromatography	W-Dioxex-rev10a	Nov-14
Caltest	EPA 200.8	Determination of Trace Elements in Waters and Wastes by Inductively Coupled Plasma-Mass Spectrometry (3 Modes)	M-2008-3mode-rev3a	Sep-13

APPENDIX K: MONITORING PROTOCOLS – SUBSIDENCE (USBR SJRRP)

RECLAMATION

Managing Water in the West

San Joaquin River Restoration Project – Geodetic Network

GPS Survey Report

U.S. Department of the Interior
Bureau of Reclamation
Mid-Pacific Region
Surveys and Mapping Branch, MP-220

December 2011

GPS SURVEY REPORT

San Joaquin River Restoration Project

Geodetic Network

December 2011

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PROFESSIONAL LAND SURVEYOR
GERALD T. DAVIS
No. 8545
Exp. 12-31-12
STATE OF CALIFORNIA

MAY 4, 2012

I. INTRODUCTION

This report details survey work completed by the Bureau of Reclamation, Mid–Pacific Region, Division of Design and Construction, Surveys and Mapping Branch (MP Surveys) for the San Joaquin River Restoration Project (SJRRP). This survey network was undertaken to provide consistent control on which to base the horizontal and vertical locations of SJRRP maintained staff gages. Recent surveys by RBF Consulting and the California Department of Water Resources (DWR) made us aware of subsidence issues in the project area. Due to these issues, the network was expanded to reach across the entire central valley to allow for the location of stable control stations. Certain control stations from these recent surveys were also selected as a part of our network to provide a direct link to any historic subsidence data. The expanded network also serves as a passive system for future monitoring of subsidence in the San Joaquin River valley. The survey work described in the following report was accomplished with the use of Global Positioning System (GPS), digital optical level and total station technology.

The survey conducted by MP Surveys included:

GPS observation of approximately 63 stations
Least Squares adjustment
Digital Level observation of approximately 195 stations
Digital Level data adjustment
Coordinate Listing
Control Point Data Sheets
Survey Report

The GPS observations incorporated in this survey report were accomplished in November and December 2011. The achieved horizontal accuracy for this network is +\- 1 centimeter based upon the Fully Constrained Network Adjustment – Adjusted Grid Coordinates – Northing Error and Easting Error, which exceeded the horizontal accuracy goal of +\- 2 centimeters. The achieved vertical accuracy for this network is +\- 2.5 centimeters based upon the Fully Constrained Network Adjustment – Adjusted Grid Coordinates – Elevation Error, which exceeded the vertical accuracy goal of +\- 3 centimeters. Ties to the existing control were made to determine the rotational biases. Elevations depicted in this report were determined by static GPS and digital level methods.

MP Surveys provided all GPS, digital level and total station equipment, associated hardware, and all software used during the field phase of the project. MP Surveys was responsible for preparing the final adjustment and this report.

This report details the personnel and equipment used on the project followed by a section detailing the chronology, the method of observing and computational procedures. All pertinent adjustments, coordinate listings and diagrams are included in the attached Appendices.

II. PERSONNEL AND EQUIPMENT

A. Personnel

MP Surveys supplied the following personnel during the field operation:

Gerald Davis, PLS	Project Manager (California PLS #8545)
Mark Morberg, PLS	GPS Supervisor (California PLS #8213)
Adrian VerHagen, LSIT	GPS Observer
John Harrison, LSIT	GPS Observer
Robert Keller	GPS Observer

As Project Manager, Mr. Gerald Davis, PLS was the responsible person in charge of the survey. Mr. Davis reviewed the daily work plans concerning GPS observations and was in direct charge of all the computations, adjustments and the preparation of the final GPS report.

Additional MP Surveys office personnel involved:

Matt Perigny	Graphic/Computer Support
Jillian Baber	Graphic/Computer Support

B. Field Equipment

MP Surveys supplied all computers, printers, software and office products. MP Surveys also supplied the following equipment:

3 – Trimble R8 GNSS GPS receivers

4 – Trimble TSC2 Data Collectors with Trimble Survey Controller software (Ver. 12.43, 12.44, and 12.45)

1 – Trimble 5601 Total Station (1”)

1 – Leica DNA03 Digital Level (0.3mm)

1 – Leica Invar Level Rod (barcode read)

Klamath Basin Area Office supplied the following equipment:

2 – Trimble R8 GNSS GPS receivers

1 – Trimble TSC2 Data Collector with Trimble Survey Controller software (Ver. 12.43)

C. Adjustment Software:

Trimble Business Center: Database and Baseline processing program, (Ver. 2.40.3)

III. CHRONOLOGY

November 28, 2011 (332)
Mobilization and Project Management / Strategy meeting
Begin Static GPS Observation
Session 1 (station observed)
143, 120, 111, 112, 142
Session 2
134, 120, 113, 112, 145

November 29, 2011 (333)
Continue Static GPS Observation
Session 1
134, 142, 165, 141, 140
Session 2
154, 102, 163, 141, 140
Session 3
154, 139, 163, 114, 115
Session 4
104, 105, 114, 115
Session 5
125, 128, 105, 122, 153
Session 6
125, 128, 144, 147

November 30, 2011 (334)
Continue Static GPS Observations
Session 1
157, 146, 144, 147, 137
Session 2
108, 146, 167, 152, 137
Session 3
138, 146, 167, 110, 150
Session 4
138, 109, 119, 110, 166
Session 5
108, 109, 119, 148, 126

November 31, 2011 (335)
Continue Static GPS Observations
Session 1
109, 110, 167, 130
Session 2
108, 106, 107, 155, 126

December 1, 2011 (335), Con't.
<u>Session 3</u>
124, 106, 131, 135, 126
<u>Session 4</u>
157, 106, 162, 156, 133
<u>Session 5</u>
157, 124, 162, 161, 132
<u>Session 6</u>
121, 124, 135, 123, 132

December 2, 2011 (336)
Continue Static GPS Observations
<u>Session 1</u>
121, 147, 101, 123, 129
<u>Session 2</u>
158, 153, 159, 123, 129
<u>Session 3</u>
105, 153, 127, 116, 159
<u>Session 4</u>
114, 163, 127, 160, 103
<u>Session 5</u>
127, 143, 131, 135, 141

December 3, 2011 (337)
Complete Static GPS observations of Primary Control Network
<u>Session 1</u>
128, 139
<u>Session 2</u>
140, 145
<u>Session 3</u>
123, 168
<u>Session 4</u>
137, 155

December 5 – 9, 2011
Begin total station and digital level observations
<u>Gage stations observed</u>
CTK, MIL, LDC, H41, SJF, DNB, SKAGGS, GRF, JBP

December 19 – 23, 2011
Continue total station and digital level observations
<u>Gage stations observed</u>
CBP, SJB, SJN, MEN, SDP, SWA, ELN, EBM, SSH, SJS, MSG, FFB, NEW

January 10 – 11, 2012
Complete total station and digital level observations
Gage stations observed
SMN, NEW

February 2012
Final adjustment of static GPS network, total station, and digital level data completed.

March 2012
GPS report and appendices completed.

April 2012
GPS report and appendices QA/QC'd and peer review completed.

May 2012
Peer review comments incorporated into report. Final report issued.

IV. METHODS

All primary control survey work on the San Joaquin River Restoration Project Geodetic Network was accomplished by static GPS methods. Approximately 61 control points were surveyed as a part of the primary control network. The horizontal datum for this project is the California Coordinate System of 1983, Zone 4, based upon NAD 1983 (epoch 2007), and the vertical datum is NAVD 1988. All coordinates and elevations are reported in U.S. Survey Feet.

<u>Static Survey</u>
GPS observations were made during the daytime hours, with sessions typically averaging 30 minutes in duration. There was an acceptable satellite visibility window from approximately 7 AM to 5 PM. Communication between observers was maintained through the use of cellular phones, which allowed for adjustment of the pre-planned observation schedule due to unforeseen circumstances. Observation start and stop times, antenna height measurements, station descriptions and other pertinent details were recorded on session log sheets. Transportation between control points was achieved through the use of 4 wheel drive government vehicles.

Data processing was performed on a daily basis by the Project Manager and GPS Supervisor. Each evening following the observation sessions, the collected data was downloaded from the internal memory of each data collector and processed using Trimble Business Center (TBC). This processing resulted in a fixed and / or float solution for each baseline. Float solutions were not used in the final constrained adjustment, as fixed solutions represent the most accurate solution. The statistical output generated from the data processing provided the first quality control indicators. These indicators showed acceptable results.

After the baselines were processed and reviewed for statistical integrity, a minimally constrained least squares adjustment was run on a daily basis using TBC. This software adjusts GPS vectors in three dimensions and was designed for network densification using GPS observations. The maximum post processed GPS vector residuals resulting from the least squares adjustment are +\- 1.8 centimeters in the horizontal plane and +\- 6.4 centimeters in the vertical plane. All free adjustments computed in the field were in NAD 83.

<u>RTK GPS and Total Station Surveys</u>
Secondary project control and site features were located in the horizontal dimension using RTK GPS through either the use of a conventional base station setup or Virtual Reference Stations, as dictated by cell coverage, and / or a conventional total station. These features include gage houses, local benchmarks and project monitored staff gages.

Redundant control checks were performed from each base station, virtual or actual, each day to prevent blunders and enable the localization of virtual base collected data. At least two control stations being part of the geodetic network were surveyed at the beginning and completion of each RTK session. This enabled the RTK data to be adjusted to the static control station values, which were held “fixed” for all RTK surveys. This allowed all GPS data to be put on the same datum / epoch and provided “sanity checks” for the data gathered using virtual base stations.

Staff gages and features which were not able to be surveyed using RTK, due to vegetation or proximity to standing water, were surveyed using the Trimble 5601 total station's reflectorless capabilities. All measurements were made in "standard" mode, which averages seven EDM returns for each measured point. Staff gages lying within the waterway of the San Joaquin River were also surveyed for elevations using this same method. A minimum of two individual measurements in both the Direct and Reverse faces were made for each "elevated point" to help prevent blunders, systematic and random errors. The splits of all measured angle sets were verified to be within project tolerances of 5" Horizontal and 10" Vertical maximum.

Digital Level Surveys

NAVD 88 elevations for project monitored staff gages, local benchmarks and secondary control points were established through digital leveling techniques utilizing a Leica DNA03 digital level, rated to .3mm/Km, reading barcodes on Leica Invar Level Rods.

Physical field notes were kept alongside electronic field notes as an independent verification of each digital level observation. All observations were made as a part of closed level loops, with a maximum closure of 0.006' per √Mile.

V. ADJUSTMENTS

Minimally Constrained Adjustment
A primary network was surveyed as part of this project. This network was comprised of existing and new stations and ties into existing National Geodetic Survey (NGS) control stations.

The minimally constrained adjustment computes the network independent of multiple fixed controls and is an indicator of the quality of the GPS measurements. The minimally constrained adjustment held one point (NGS control station K 361) fixed horizontally and vertically, which produced the following results:

Number of Stations	61	Minimum Vector Length	4,821 usft
Degrees of Freedom	501	Maximum Vector Length	176,017 usft
Number of Observations	236	Largest residual (Hz)	0.060 usft
Reference Factor	1.00	Largest residual (Vt)	0.211 usft

*More specific information regarding this adjustment is contained in Appendix 2.

Fully Constrained Adjustment
The constrained adjustment holds the position of specified horizontal and vertical control and scales and rotates the GPS network to fit the control held fixed. For this project the five control stations were held fixed either horizontally or vertically to determine the rotational biases. These five stations were selected based upon their overall agreement with the minimally constrained network adjustment result and their geographic location. Due to the previously mentioned subsidence issues in the San Joaquin River valley we had no confidence in the vertical accuracy of control stations situated within the valley. For this reason, the points selected to constrain the network are spaced around the outside perimeter and are located at the edges of the San Joaquin River valley. These points should provide stable control locations for any future re-observation or network densification. Geoid03 was utilized to achieve orthometric elevations.

Stations held fixed in the primary network constrained adjustment:

Pt	Designation	Northing (usft)	Easting (usft)	Elevation
119	109.28			111.276’
128	F 928			619.257’
138	HPGN CA 10 04	2423374.062	5929562.855	
139	HPGN D CA 06 NF	2099649.706	6250234.978	
145	J 1233	2199134.508	6397420.403	494.094’
146	K 361	2275034.315	5961519.299	285.344’

Network Statistics:

Number of Stations	61	Minimum Baseline Length	4,821 usft
Degrees of Freedom	506	Maximum Baseline Length	176,017 usft
Number of Observations	236	Largest residual (Hz)	0.060 usft
Reference Factor:	1.05	Largest Residual (Vt)	0.211 usft

Deflection in Latitude: 0.107 sec **(95%)** 0.030 sec
Deflection in Longitude: 0.068 sec **(95%)** 0.037 sec
Azimuth Rotation: -0.052 sec **(95%)** 0.010 sec
Scale Factor: 1.00000012**(95%)** 0.00000005

The horizontal datum is NAD 1983 (2007), California Coordinate System of 1983, Zone 4, U. S. Survey Feet.

The vertical datum is NAVD 1988. Geoid model *Geoid03* was selected for use to determine orthometric elevations in the final adjustment. Geoid09 was originally planned for use in the final adjustment. However, after comparing orthometric elevations determined using Geoid09 with the record elevations of our "fixed" control we came to the conclusion that Geoid03 produced elevations more consistent with the record data. As our selected control to be held "fixed" is located in the foothills of the Sierra and Coastal ranges, we have a high degree of confidence that these stations are not subject to the subsidence issues observed in portions of the central valley. The larger elevation differences, as determined by Geoid09, may be caused by stations constrained in the creation of Geoid09 having subsided since their last observation, forcing inaccuracies into the geoid model.

Coordinate differences at known control as reported by the fully constrained adjustment (Negative elevations denote observed elevations lower than record NGS elevations).

Pt. #	PID	Designation	Northing (usft)	Easting (usft)	Elev. Diff.	Yrs since rec. obs.[1]	Comments
101	GU0753	X 989	-0.049	-0.014	-0.98'	4	
119	HS4510	109.28	-83.116	49.791	FIXED	23	NGS Hz Co-ords scaled (+/- 6")
121	GU0762	375 USE	-0.111	-0.122	-1.38'	3	
122	DH6668	ALEX 5	-0.002	0.012	-0.57'	3	
124	HS1103	D 158 RESET	0.004	0.017	-0.76'	3	
125	DH6676	DWIGHT	0.015	-0.059	-0.40'	8	
126	HS4523	E 1420	0.088	-0.012	0.10'	23	
128	GU0588	F 928	0.025	-0.078	FIXED	7	
129	GU4281	FIREPORT	-0.024	-0.054	-0.72'	3	
130	HS1919	FREMONT	0.030	-0.088	-0.15'	2	
131	HS1204	G 706 RESET 1962	-5.578	-4.193	0.21'	46	NGS Hz Co-ords per Hand Held

Pt. #	PID	Designation	Northing (usft)	Easting (usft)	Elev. Diff.	Yrs since rec. obs.[1]	Comments
132	GU0763	G 990 (SDP)	-26.98	775.368	-5.90’	46	NGS Hz Co-ords scaled (+/- 6")[2]
133	AB5019	H 1235 RESET	27.229	111.161	-1.62’	4	NGS Hz Co-ords scaled (+/- 6")
134	DG9695	H1 1941	-0.058	0.066	0.01’	7	
135	HS5409	HPGN CA 06 03	0.011	-0.036	-0.78’	7	
137	HS5410	HPGN CA 10 01	0.042	-0.038	-0.34’	19	
138	HS5412	HPGN CA 10 04	FIXED	FIXED	-0.39’	19	
139	AC6109	HPGN CA 06 NF	FIXED	FIXED	-1.30’	2	
140	AC6102	HPGN CA 06 QF	-0.058	0.095	-0.05’	7	
141	AC6103	HPGN CA 06 RF	-0.044	0.021	-0.19’	7	
142	AC6105	HPGN CA 06 RG	0.000	-0.001	-0.05’	11	
143	AC6106	HPGN CA 06 SG	0.062	-0.041	-0.09’	18	
144	AA4253	HPGN CA 10 BK	0.053	-0.137	-0.17’	7	
145	GT1583	J 1233	FIXED	FIXED	FIXED	3	
146	HS2341	K 361	FIXED	FIXED	FIXED	23	
147	DH6674	KELLIE	0.014	-0.069	-0.69’	8	
148	HS5446	LIVINGSTON RESET	0.043	0.058	0.16’	17	
150	HS2391	NEWMAN NW BASE	0.274	0.300	0.05’	68	
152	HS1827	SALT RM 1	-0.028	0.079	-0.62’	24	
153	DH6679	SHAWN	-0.013	-0.013	-0.43’	8	
154	GU3389	SPEAK AZ MK CADH	-0.010	0.035	-0.31’	18	
155	HS1894	T 987 CADWR	5.147	-375.83	-1.36’	46	NGS Hz Co-ords scaled (+/- 6")
156	HS1953	W 990 CADWR (SWA)	-130.00	-88.276	-6.15’	46	NGS Hz Co-ords scaled (+/- 6")
157	DH6673	WILLIAM 3	-0.010	-0.067	-0.93’	8	

[1]Year of observation for record values is based upon best information available on NGS datasheet; this year has been subtracted from December 2011 to calculate the approximate total elapsed years.
[2]Large differences in Easting value of point 132 exposes a possible datasheet coordinate error, being transcribed numbers in the seconds’ position of the Longitude on the NGS datasheet. Point was recovered as described on NGS datasheet.

The primary network adjustments, both minimal and fully constrained, along with all coordinate listings are included in the following appendices. Please be aware, TBC refers to Ellipsoid Heights as “Height” and Orthometric Elevations as “Elevation”.

VI. SUMMARY

Subsidence is a known issue and our survey has hopefully provided more data for analysis and future monitoring. Our computations show approximately 1.38 feet of subsidence in almost three years at station 375 USE (PID GU0762), affirming subsidence rates noted by RBF Consulting and the U.S. Geological Survey. Additionally, our survey has exposed significant, nearly 6 feet since 1965, subsidence at station G 990 (PID GU0763). While in other areas we show subsidence as low as a couple tenths of a foot over nearly half a century. Furthermore, our survey seems to have exposed a related issue with Geoid09 in this locale. Based upon our observations and data analysis, along with conversations with representatives of the National Geodetic Survey, it appears the validity of Geoid09 in this region has been degraded by subsidence of local passive control stations. The rate of subsidence in areas of the San Joaquin River valley has caused orthometric elevations on known passive control to change more rapidly than published control data can be updated. Due to this, stations were constrained during the creation of Geoid09 which in actuality differed (sometimes greatly) from their published values. In conclusion, this survey provides the start of a stable means for passive monitoring of future subsidence in the San Joaquin River valley.

VII. APPENDICES

Section 1	Control Diagram
Section 2	Minimally Constrained GPS Adjustment
Section 3	Fully Constrained GPS Adjustment
Section 4	Total Station Observation Data
Section 5	Raw Digital Level Data
Section 6	Digital Level Adjustment
Section 7	Adjusted Coordinate Table
Section 8	Control Point Data Sheets

APPENDIX L: MERCED OPTI DATA USER GUIDE

Merced Subbasin Data Management System

optiDATA

Public User Guide

MERCED SGMA

WOODARD & CURRAN

Opti Public User Guide

Opti is a one-stop-shop for transparent data management and analysis that enables integrated performance tracking to support sustainable water management. This Public User Guide has been developed to assist you with navigation and usage of the Merced Subbasin Data Management System (DMS). Please see the Appendix for specific data types and quality codes configured in this implementation.

The DMS may be accessed at: http://opti.woodardcurran.com/merced

Please click on Guest Login to access the DMS as a guest user. If you would like to gain additional access to the DMS for data updates and management, please contact: Tess Sprague (TSprague@woodardcurran.com).

Public usage of the DMS is explained in the following modules:

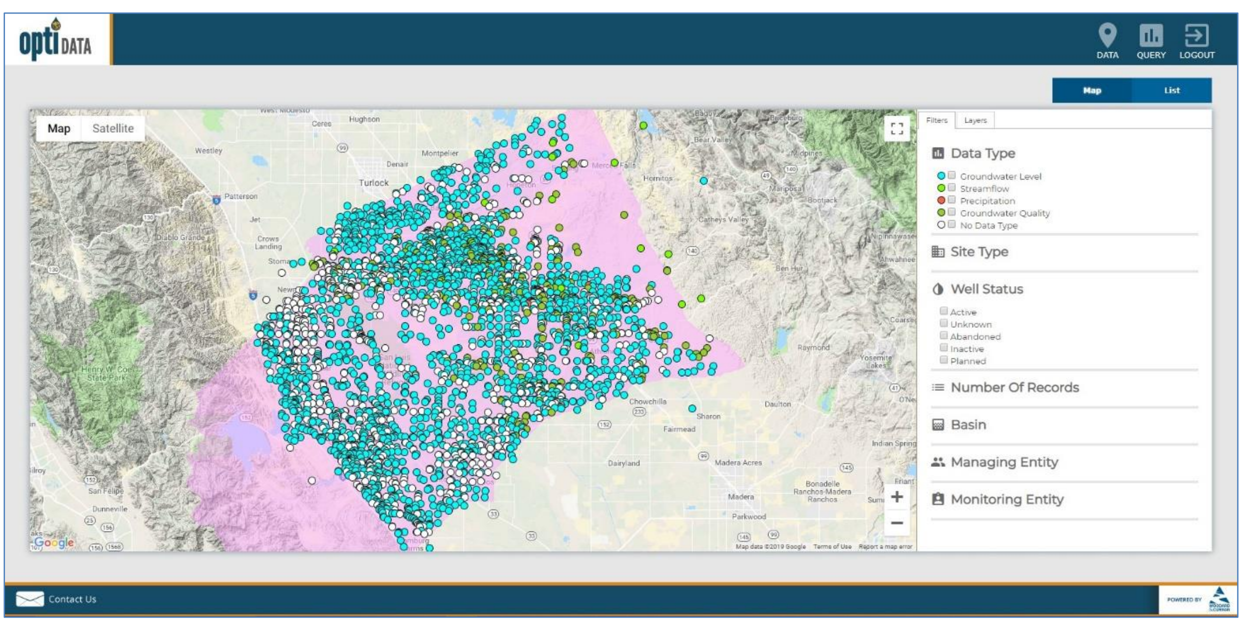
- Data
- Query

Module: Data (Top)

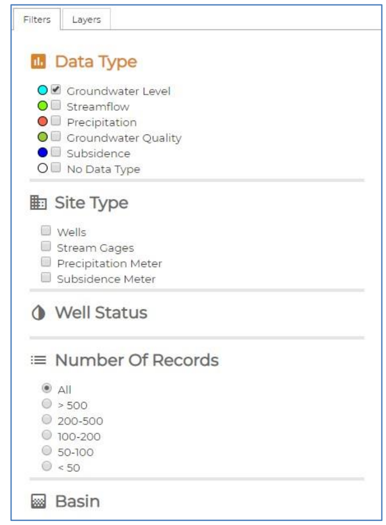
The Data module contains two available submodules that allow you to view water resources data and their associated site information: Map and List.

Submodule: Map

The Map submodule displays the sites (wells, stream gages, facilities, etc.) as point locations on the map.



Feature: Change the Google Map display



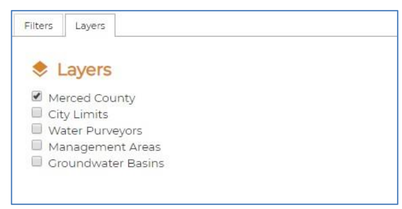
- To move the location or extent of the map display, use the "+" and "-" icons in the lower right-hand corner of the map. You may use the pan tool to move the focal location of the display.
- To change the base layer of the map display, select an option from the upper l eft-hand side of the map display (Map or Satellite).

Feature: Filter the results displayed on the map

- On the Filters tab on the right-hand panel, select the checkboxes for the options for which you would like to filter the results.
- Select sites based on:
    - data type associated with the site,
    - site type,
    - number of data records,
    - entity, or
    - a combination of any filter.

Please note that sites may have more than one data type associated with them, e.g., groundwater level and groundwater quality.

Feature: Change the layers displayed on the map



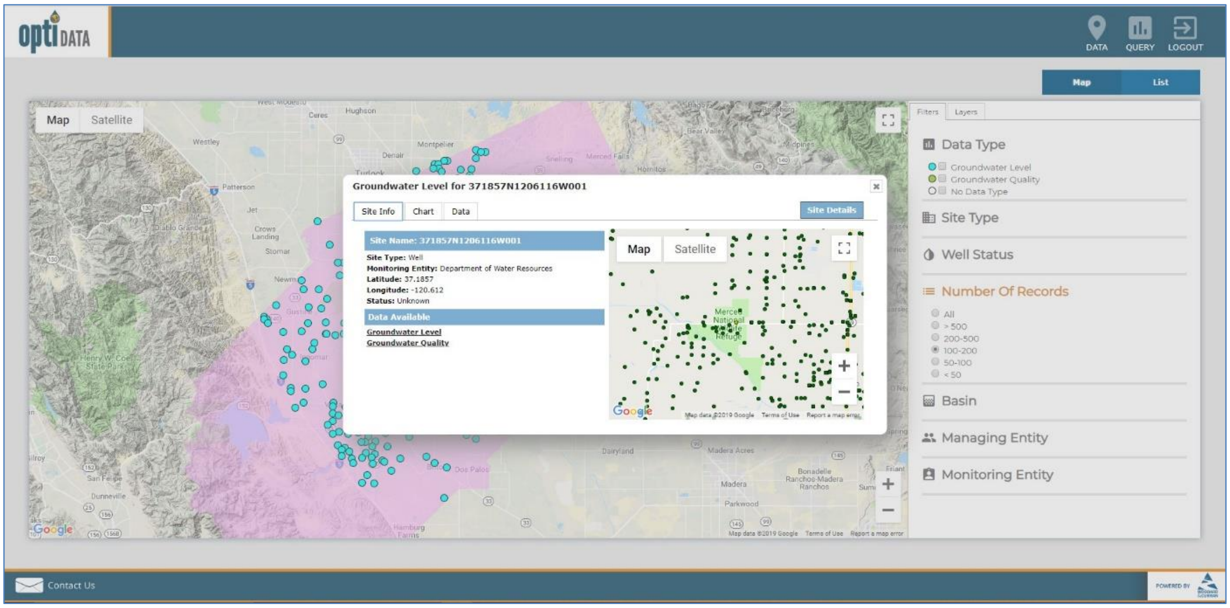
- Click on the Layers tab on the right-hand panel.
- Select the layers that you wish to have displayed. Upon selection, the map will be updated to show the selected layers.
- You may click on features on the layer to view information on that feature.

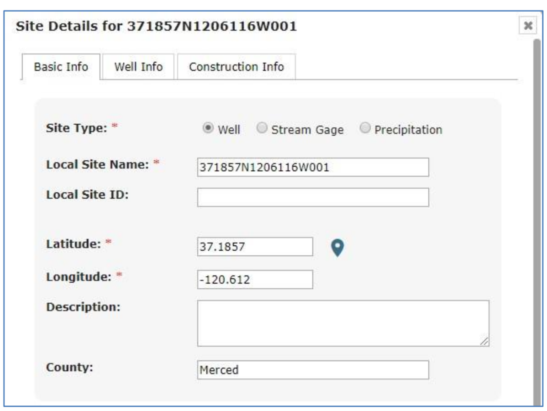
Feature: View site information on the map

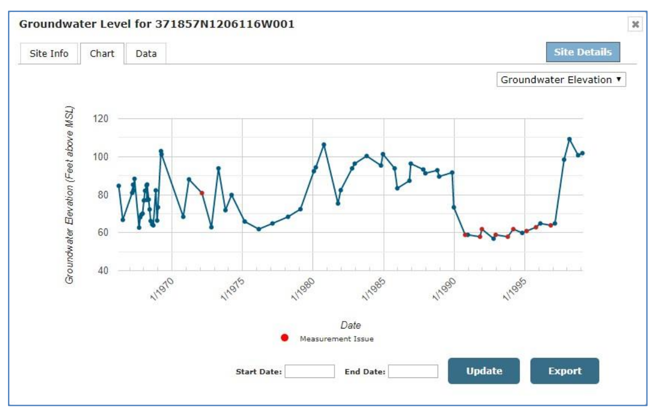
- Click on a site on the map. The site information will be displayed with tabs for Site Info, Chart, and Data.
- To view site detailed information, click on the Details link. The Site Details page will open.
- To view a chart of the data, click on the Chart tab. You may change the parameter by selecting a parameter from the drop-down list in the upper right-hand corner. You may update the chart timeline by selecting the Start Date and End Date and clicking Update. You may export the data to Excel by clicking Export.
- To view a table of the data, click on the Data tab. You may change the parameter by selecting a parameter from the drop-down list in the upper right-hand corner. You may narrow the tabular

list by selecting the Start Date and End Date and clicking Update. You may export the data by clicking Export.

- To select a different data type for the site, click on the data type available under “Data Available” on the Site Info tab.

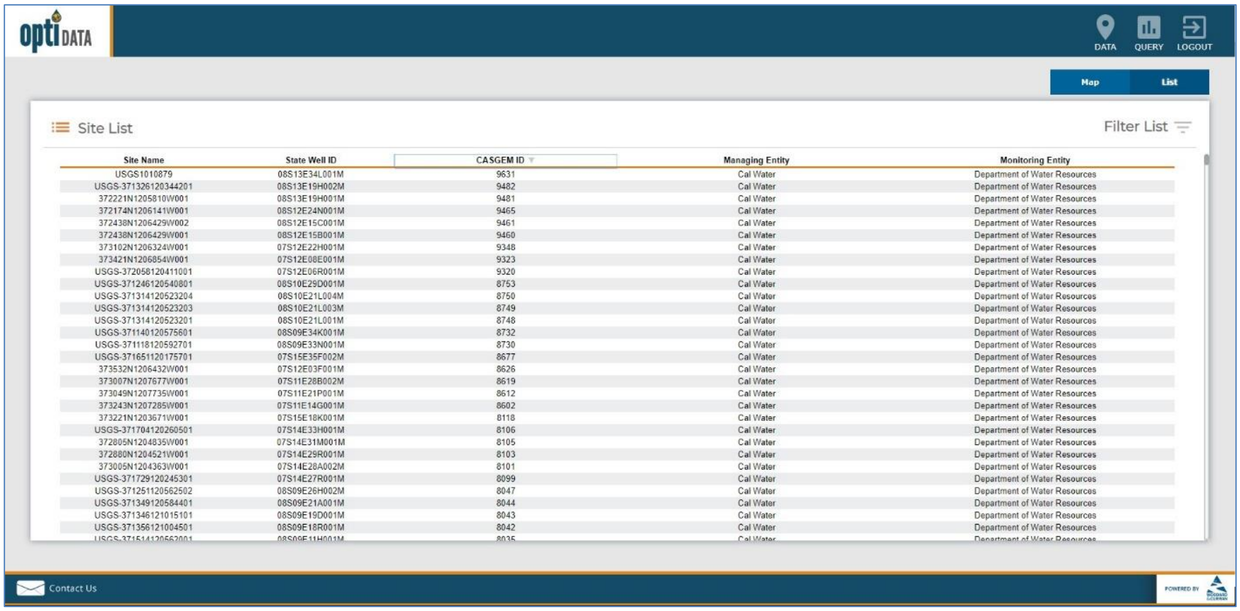






Submodule: List

The List submodule contains a list of sites in a sortable, tabular format.



Feature: Filter and/or sort sites

- Select data type, site type, number of records, or entity from the drop-down menu at the top of the table to filter sites.
- Click on the table headers to alphabetically or numerically sort the selected column.

Feature: View site information from list

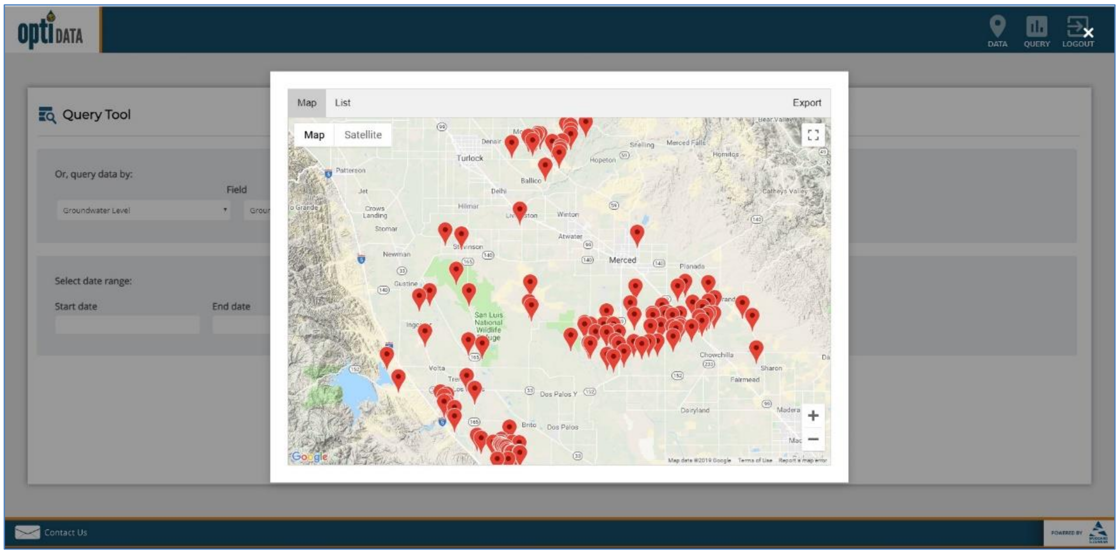
- Click on the selected site name in the list. The site information will be displayed with tabs for Site Info, Chart, and Data. The Site Details page is available through this dialogue box. The following information may be available:

Basic Info	Well Info	Construction Info
Site Type	State Well ID	Total Well Depth
Local Site Name	CASGEM ID	Borehole Depth
Local Site ID	Ground Surface Elevation	Casing Perforations
Latitude/Longitude	Reference Point	Casing Diameter
Description	Reference Point Elevation	Casing Modifications
County	Reference Point Location	Well Capacity
Managing Entity	Reference Point Description	Well Completion Report
Monitoring Entity	Well Use	Number
Type of Monitoring	Well Status	Comments
Type of Measurement	Well Type	
Monitoring Frequency	Aquifers Monitored	

Basic Info	Well Info	Construction Info
	Groundwater Basin Name/Code Comments Upload File	

Module: Query (Top)

The Query module allows users to search for sites and data using different parameters and values.



Feature: Create new query

- Click on the Query icon in the menu.
- To create a new query:
    - Select the following options from the drop-down menu under “Or, query data by:”:
        - Entity
        - Site Name
        - Groundwater Level
        - Streamflow
        - Precipitation
        - Groundwater Quality
        - Surface Water Quality
    - If the selected option has associated parameters, select a parameter in the second drop-down menu.
    - Select an Operator. Please note that for text searches, you may use the “Like” option with wildcards (%).
    - To add additional rows to the query, click on the blue “+” button and complete.
    - To remove rows from the query, click on the red “-“ button.
- To select data within a particular date range, complete the Start date and End date fields.

- Click Run. A window will open with a map view of the results.
    - Click on the site in the map to view the data for the site.
    - Click on the List tab to view the data in a list format. You may click on a site to view the data.
    - Click on Export to export the data to Excel.
- To clear the query, click the Clear button at the bottom of the page.

Appendix – Merced Subbasin Specific Implementation Information

Data Types

The following data types are currently configured in the DMS. Please note that this list may change as more data becomes available.

Data Type	Parameter	Units	Currently Has Data in DMS
Groundwater Elevation	Depth to Groundwater	Feet	Yes
	Groundwater Elevation	Feet above MSL	Yes
Groundwater Quality	1,1,1-Trichloroethane	ug/L	Yes
	1,1,2,2-Tetrachloroethane	ug/L	Yes
	1,1,2-Trichloroethane	ug/L	Yes
	1,1-Dichloroethylene	ug/L	Yes
	1,2-Dibromo-3-chloropropane	ug/L	Yes
	1,2-Dichloroethane	ug/L	Yes
	1,2-Dichloropropane	ug/L	Yes
	Alachlor	ug/L	Yes
	Aluminum	mg/L	Yes
	Antimony	ug/L	Yes
	Arsenic	ug/L	Yes
	Atrazine	ug/L	Yes
	Barium	mg/L	Yes
	Barium	ug/ L	Yes
	Benzene	ug/ L	Yes
	Beryllium	ug/ L	Yes
	Bicarbonate	mg/ L	Yes
	Cadmium	ug/ L	Yes
	Calcium	mg/ L	Yes
	Carbofuran	ug/ L	Yes
	Carbon tetrachloride	ug/ L	Yes
	Chloride	mg/ L	Yes
	Dicamba	ug/ L	Yes
	Dinoseb	ug/ L	Yes
	Endrin	ug/ L	Yes
	Fluoride	mg/ L	Yes
	Glyphosate	ug/ L	Yes
	Heptachlor	ug/ L	Yes
	Heptachlor epoxide	ug/ L	Yes
	Magnesium	mg/ L	Yes

Data Type	Parameter	Units	Currently Has Data in DMS
Groundwater Quality (*continued*)	Manganese	ug/ L	Yes
	MBAS	mg/ L	Yes
	Methoxychlor	ug/ L	Yes
	Molinate	ug/ L	Yes
	Nitrate	mg/ L	Yes
	Pentachlorophenol	ug/ L	Yes
	Picloram	ug/ L	Yes
	Potassium	mg/ L	Yes
	Sodium	mg/ L	Yes
	Sulfate	mg/ L	Yes
	Thiobencarb	ug/ L	Yes
	Toxaphene	ug/ L	Yes
	Dissolved Nitrate	mg/ L as N	Yes
	Dissolved Nitrate	mg/ L as NO3	Yes
	1,1-Dichloroethane	TON	Yes
	1,2,4-Trichlorobenzene	ug/L	Yes
	1,2-Dibromoethane (EDB)	ug/L	Yes
	1,3-Dichloropropene (Total)	mg/L	Yes
	1,4-Dichlorobenzene	ug/L	Yes
	2,4,5-TP (Silvex)	ug/L	Yes
	2,4'-D	ug/L	Yes
	Aluminum - Total	ug/L	Yes
	Antimony - Total	ug/L	Yes
	Apparent Color		Yes
	Arsenic - Total	ug/L	Yes
	Atrazine (Aatrex)	ug/L	Yes
	Barium - Total	ug/L	Yes
	Bentazon	ug/L	Yes
	Benzo(a)pyrene	ug/L	Yes
	Beryllium - Total	ug/L	Yes
	Bicarbonate Alkalinity	ug/L	Yes
	Boron - Total	ug/L	Yes
	Cadmium - Total	ug/L	Yes
	Calcium	NTU	Yes
	Calcium - Total	mg/L	Yes
	Carbonate Alkalinity	ug/L	Yes
	Chloride	ug/L	Yes
	Chromium - Total	ug/L	Yes

Data Type	Parameter	Units	Currently Has Data in DMS
Groundwater Quality (*continued*)	Chromium (Total)	pCi/L	Yes
	Chromium (VI)	ug/L	Yes
	cis-1,2-Dichloroethylene	pCi/L	Yes
	Copper - Total	ug/L	Yes
	Cyanide, Total	ug/L	Yes
	Dalapon	ug/L	Yes
	DBCP	ug/L	Yes
	Di(2-ethylhexyl)adipate	ug/L	Yes
	Di(2-Ethylhexyl)phthalate	ug/L	Yes
	Diquat	ug/L	Yes
	EDB	ug/L	Yes
	Endothall	ug/L	Yes
	gamma-BHC (Lindane)	ug/L	Yes
	Hexachlorobenzene	ug/L	Yes
	Hexachlorocyclopentadiene	ug/L	Yes
	Iron - Total	ug/L	Yes
	Lab Turbidity	NTU	Yes
	Lead - Total	ug/L	Yes
	Magnesium - Total	mg/L	Yes
	Manganese - Total	ug/L	Yes
	Mercury - Total	ug/L	Yes
	Nickel - Total	ug/L	Yes
	Nitrate - N	mg/L	Yes
	Nitrate (as N)	mg/L	Yes
	Nitrate (as N)	ug/L	Yes
	Odor Threshold	TON	Yes
	Oxamyl (Vydate)	ug/L	Yes
	pH		Yes
	Potassium - Total	mg/L	Yes
	Radium 228	mg/L	Yes
	Selenium - Total	ug/L	Yes
	Silica - Total	mg/L	Yes
	Silver - Total	ug/L	Yes
	Simazine (Princep)	ug/L	Yes
	Sodium - Total	mg/L	Yes
	Specific Conductance	umhos/cm	Yes
	Specific Conductance	mg/L	Yes
	Strontium - Total	ug/L	Yes

Data Type	Parameter	Units	Currently Has Data in DMS
Groundwater Quality (*continued*)	TDS	mg/L	Yes
	Technical Chlordane	ug/L	Yes
	Thallium - Total	ug/L	Yes
	Total Alkalinity	mg/L	Yes
	Total Hardness	mg/L	Yes
	Total PCBs	ug/L	Yes
	Uranium - Total	ug/L	Yes
	Vanadium - Total	ug/L	Yes
	Zinc - Total	ug/L	Yes
	TDS	tons/acre-foot	Yes
	NO3N	mg/L	Yes
	NO3-N	mg/L	Yes
	Total Nitrate	mg/L as NO3	Yes
	Total Nitrate	mg/L as N	Yes
	1,2-Dichlorobenzene	ug/L	Yes
	Dissolved Nitrate	mg/L	Yes
	Various Parameters	Various	
Surface Water Quality	Various Parameters	Various	
Streamflow	Streamflow	cfs	Yes
Precipitation	Precipitation	inches	Yes
	Reference Evapotranspiration (ETo)	inches	Yes
	Average Air Temperature	Degrees F	Yes

Quality Flags for Measurement Data

The following quality flags are currently configured in the DMS. Please note that this list may change as more data becomes available.

ID	Quality Flag	Associated Data Type
1	Caved or deepened	Groundwater Level
2	Pumping	Groundwater Level
3	Nearby pump operating	Groundwater Level
4	Casing leaking or wet	Groundwater Level
5	Pumped recently	Groundwater Level
6	Air or pressure gauge measurement	Groundwater Level
7	Other	Groundwater Level
8	Recharge or surface water effects near well	Groundwater Level

ID	Quality Flag	Associated Data Type
9	Oil or foreign substance in casing	Groundwater Level
10	Acoustical sounder	Groundwater Level
11	Recently flowing	Groundwater Level
12	Flowing	Groundwater Level
13	Nearby flowing	Groundwater Level
14	Nearby recently flowing	Groundwater Level
15	Measurement Discontinued	Groundwater Level
16	Pump house locked	Groundwater Level
17	Tape hung up	Groundwater Level
18	Can't get tape in casing	Groundwater Level
19	Unable to locate well	Groundwater Level
20	Well has been destroyed	Groundwater Level
21	Special/Other	Groundwater Level
22	Casing leaking or wet	Groundwater Level
23	Temporarily inaccessible	Groundwater Level
24	Dry well	Groundwater Level
25	Flowing artesian well	Groundwater Level
26	Questionable measurement	Groundwater Level
27	No measurement	Groundwater Level
28	Equal to	Groundwater Quality
29	Less than	Groundwater Quality
30	No data	Groundwater Quality
31	Presence verified but not quantified	Groundwater Quality
32	Analyzed for but not detected	Groundwater Quality
33	Approved for publication	Streamflow
34	Value has been estimated	Streamflow
35	Provisional data subject to revision	Streamflow
36	Unspecified	Streamflow
37	Missing	Precipitation
38	Missing or a comparative sensor is severe or sensor is out of service or data is out of sensor threshold	Precipitation
39	Data is far out of historical limits	Precipitation
40	Quality test pending	Precipitation
41	Data is moderately out of historical limits	Precipitation
42	Historical average	Precipitation
43	Special/other	Precipitation
44	Temporarily inaccessible	Precipitation

APPENDIX M: METERING AND TELEMETRY TECHNICAL MEMORANDUM

TECHNICAL MEMORANDUM

PREPARED BY: Kyle Tracy

REVIEWED BY: Mike Matson and Samantha Salvia

DATE: May 9, 2019

RE: GSP Metering

The intent of this technical memorandum is to provide a data collection and network communications framework that can be applied to GSP projects. GSP metering presents multiple challenges that range from access to private property, meter tampering or bypass to access power and communication utilities; all while implementing a metering program that may have high initial establishment costs and recurring operational and maintenance costs. The metering approach described here will address the common issues that will be associated with most GSP data collection sites. In addition, the alternative approaches presented herein will provide flexibility in implementation, while still achieving the goal of collecting the required data.

1. WELL SITE ALTERNATIVES

1.1 Metering Alternatives

A variety of meters are available to measure water flow. However, the type of meter selected will impact on one or more of the following: cost, pressure loss, rangeability, and accuracy. Installation of the meter must also be considered in the selection process. In many cases the meters will be installed on privately owned wells. Each well will have a unique configuration that will present installation challenges. Well site challenges may include:

- Remote location – many wells are located in farming communities and can be located well away from public roadways
- Limited available straight segments of pipe – In many cases the pipe leaving the well head will almost immediately angle back down into the ground leaving very little straight section of pipe to install a flow meter.
- Pipe diameter different between sites – Well sites will have different pipe diameters, which may impact meter type selection.
- Availability of power – Well sites will of course have power available, but that metered power is paid for by the well owner. Therefore, additional metered power service may be required, or an alternative power source (renewable) may be used.

1.2 Meter Selection

The inconsistency between well sites prevents the establishment of a single standard specification for selecting a meter. Therefore, a set of specifications that provides flexibility in the selection of an appropriate meter for the various well configurations is required. The specification must address the variety of pipe diameters, the variety of piping configurations, turndown (rangeability), calibration requirements, other maintenance requirements, and power demand.

In addition to the meter specifications, the installation requirements must also be considered. The following sections illustrate the installation options, categized as either intrusive or passive.

1.2.1 Invasive Installations

An invasive installation is generally defined as an installation process that requires the pipe be breached. These types of meters require that the pipe be cut, and flanges welded to the pipe. Other meters types require a hole drilled into the pipe with a threaded o-let or hot tap welded onto the pipe. Both types require that the well be shutdown for a period of time while the meter is installed.

Beyond the shutdown time, the downside to this type of installation is the requirement to cut into a pipe that is privately owned. In addition, once the pipe has been cut it may move and cause alignment issues.

1.2.2 Passive Installations

A passive installation is defined as an installation that does not require modification to the existing pipe. These types of meters strap onto the outside of the pipe. The meter uses ultrasonic waves transmitted through the water between sensors to calculate the flow rate. However, since the fluid being measured is clean water, an ultrasonic transit time meter is the only type of meter available

An additional passive method for measuring flow may be achieved by monitoring how long the well pump is running. The pump characteristics must be known along with the pump motor operational characteristics. With the pump curve and motor rpm the flow can be interpolated. The accuracy of this method is low and will continue to deteriorate as the pump & motor ages. Additionally, if the motor is controlled by a VFD, the rpm will need to be measured and recorded in addition to the run state of the pump.

1.2.3 Meter Characteristic Matrix

A variety meters are available to measure clean water flow. The characteristics and installation requirements of each meter have a practical impact on its application. For example, a typical orifice plate requires a long straight run of pipe both upstream and downstream. Other characteristics to consider is the pressure loss and installation orientation – some meters work best mounted vertically. The cost can also vary widely, which is driven by accuracy and the type of material used in its construction.

The following matrix provides a quick look at the various characteristics associated with each meter type. The characteristics included in this table are typical for each type of meter. Actual characteristics vary by manufacturer. The cells highlighted with red text indicate a negative factor that could eliminate the meter type from further consideration.

Table 1: Meter Characteristics Matrix

Meter Type	Installation Type	Rangeability* (typ)	Permanent Pressure Loss **	Pipe Diameter Range (in)	Pipe Diameters (Up / Down)	Calibration / Maintenance ***	Cost$
Orifice	Invasive	4:1	Medium	0.5 - 72	22 / 8	Low	Low
Target	Invasive	10:1	Medium	>= 0.5	1 / 1	High	Low
Venturi	Invasive	4:1	Low	>= 2	Spool	Low	High
Pitot (Annubar)	Invasive	3:1	Very Low	>= 1	8 / 1	Low	Medium
Elbow	Invasive	3:1 (low accuracy)	Very Low	>= 2	N/A	Low	Medium
Magmeter	Invasive	40:1	None	0.1 – 72	5 / 2	Low	High

Meter Type	Installation Type	Rangeability* (typ)	Permanent Pressure Loss **	Pipe Diameter Range (in)	Pipe Diameters (Up / Down)	Calibration / Maintenance ***	Cost$
Insertion Magmeter	Invasive	100:1	Very Low	2 – 120	5 / 2	Low	High
Turbine	Invasive	10:1	High	0.25 - 24	10 / 5	High	Medium
Ultrasonic Time of Flight	Passive	20:1	None	>= 0.5	1 / 1	Low	High
Rotameter	Invasive	10:1	Medium	<= 3	Vertical	Low	Medium
PD Meter	Invasive	10:1	Very High	< 12	1 / 1	High	High
Vortex	Invasive	10:1	Medium	1.5 – 16	15 / 5	Low	Very High
Mass Coriolis	Invasive	10:1	Low	0.25 – 6	Vertical	Low	Very High
Mass Thermal	Invasive	10:1	Low	>= 0.5	N/A	Low	High

Matrix data obtained from multiple sources and is intended to show relative values on a macro level. Actual values will vary by manufacture.
* The Rangeability (or Turndown) value presented is typical for the type of instrument. Actual Rangeability will vary by manufacturer.
** Relative Permanent Pressure can range from very low <0.1 psi to very high >14 psi and can vary by manufacturer
*** Calibration and Maintenance: Low – Requires little to no maintenance and/or infrequent calibration; High – Requires frequent calibration and/or mechanical components may create additional maintenance.
$ Cost: Low – $600 to $2000, Medium – $2,000 to $4,000, High – $5000 to $10,000, Very High – $10,000+

The ideal meter for this type of installation would be the ultrasonic time of flight flow meter. Installation of the meter does not involve breaching the pipe, the meter is highly accurate, and requires relatively short lengths of pipe for installation. In addition, the meter is capable of storing flow data and internally totalizing the flow, and can communicate that information to an external device. It should be noted that older piping with scaling, pitting, or heavy corrosion may create issues for this technology. Additionally, external coatings and internal liners may also be challenging for this technology. However, a handheld meter can be easily strapped onto the pipe and tested during the initial site investigation to aid in making a final meter type selection for the specific installation.

Alternative meter types include the traditional magmeter, insertion magmeter, turbine meter, and target flow meter. However, these meters all require breaching the pipe for installation.

- Like the ultrasonic flow meter, the magmeter has no permanent pressure loss and is highly accurate. The meters require little maintenance, but can be expensive, particularly for larger meters.
- The insertion magmeter is less invasive as its installation involves a hot tap and strap-on components, rather than cutting out a segment the pipe. Like the traditional magmeter it is highly accurate, but does have a mild permanent pressure drop.
- Typical revenue water meters are either turbine or positive displacement meters. Turbine meters are used for larger flows and larger diameter pipes, while positive displacement meters are used on residential applications. Turbine meters are accurate, but will introduce a permanent pressure loss and typically require a long straight run of pipe.

- The target meter is a low-cost alternative that is fairly accurate. However, the meter requires onsite calibration and has an average permanent pressure loss.

1.3 Well site data buffer

The electronics associated with most flow meters are capable of totalizing flow and storing the data internally. The data is shared through various means including: 4-20mA signal, pulse, and bus communication (DNP3, MODBUS, etc.). The amount of data that can be buffered in the meter electronics varies by manufacturer.

If the meter electronics are not capable of buffering the flow data, then a Remote Terminal Unit (RTU) or similar device will be required to collect the flow information and store it for forwarding to centralized data storage.

1.4 Well site data transmitter

The data transmitter implemented at the well site will depend on the Network Communications Architecture selected for the system. The data transmitter may be privately operated licensed frequency or public domain frequency radios, cellular data radio, or a landline connection.

Regardless of the communication medium, the radios will be capable of transmitting data using standard communication protocols. Several open standard and proprietary protocols are available. However, the protocols commonly used in the water industry to transmit data between devices include:

- MODBUS – The most common open standard used in the industry. RTU (Serial Communication) and TCP (Ethernet Communication) variants are available.
- DNP3 – A protocol first adopted by the power industry has become widely recognized as a protocol that operates efficiently over wireless connections.

Proprietary protocols may offer performance improvements or additional levels of security, but selecting a proprietary protocol will also require specific hardware that is typically only available from a single manufacture.

2. NETWORK COMMUNICATIONS

Getting the data from the remote well sites can be achieved through multiple methods, and may involve combinations of methods. The methods of communication include:

- Landline (telephone, cable, fiber optic)
- Cellular WVLAN
- Radio Licensed Frequency
- Radio Public Domain Frequency

In rural areas and farming communities the availability of Landline connections will likely be scarce. The infrastructure may be available close to main roadways, but would be expensive to extend to a well site that is more than 100 yards from the Landline infrastructure. Trenching and conduit are the major contributors to the cost of extending the infrastructure. Likewise, Cellular coverage may also be an issue in these remote areas and communities. However, Landline and Cellular communication methods may still be part of the total communications architecture required to move the data from the wells to central data storage.

Privately operated data radios operate either on a radio frequency licensed for use with the FCC, or on a public domain frequency. In either case the data being transmitted will be encrypted for protection from theft. The primary difference is that in the public domain frequencies there is a risk that another user can broadcast on the same frequency, which will degrade the communication throughput or completely disrupt communications. The same interference is possible with a licensed frequency, but since it is licensed the offender can be ordered to stop communicating on that frequency.

2.1 Architecture Alternatives

While each systems network architecture will be unique, the systems will each use components of two general approaches. The Area Collectors approach collects data from nearby wells at a network node that is still remotely in the overall system, but near to more established infrastructure. That Area Collector Node would then transmit the aggregated data to central data storage. The Peer to Central Host approach has the wells reporting directly back to a centralized host that aggregates the data and forwards it to central data storage.

2.1.1 Area Collectors (Private Radio to Cellular/Landline)

The Area Collectors architecture situates private radios at each well site that communicate with a master radio located within line of site of the well at an Area Node. The Area Node will collect data from multiple well sites and locally buffer the data. The buffered data is then periodically transmitted back to the central host via a cellular or landline connection. The Area Collectors method allows data to be collected from remotely located sites that may not have communication infrastructure available. Additionally, this method allows data transmissions to be managed, thereby reducing costs associated with data usage.

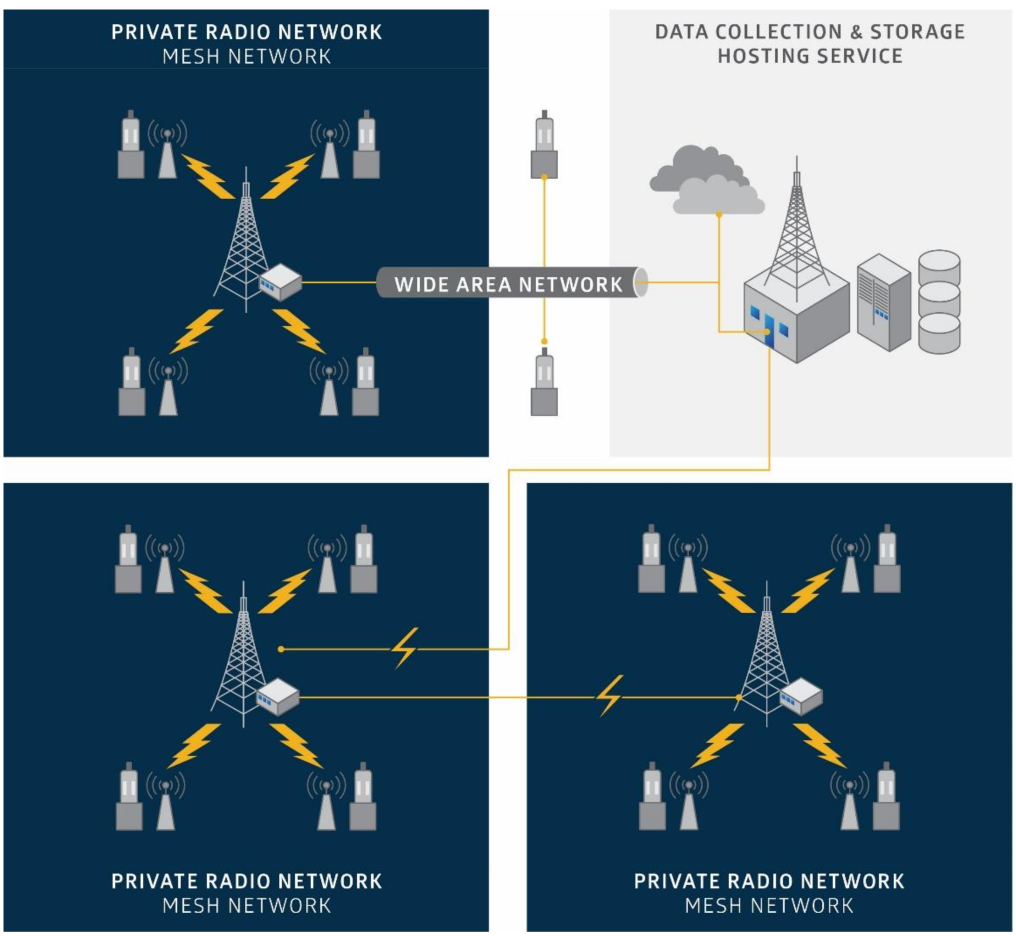


Figure 1 Area Collectors architecture

2.1.2 Peer to Central Host (Private Radio and/or Cellular/Landline to Central Host)

The Peer to Central Host architecture encompasses multiple communication method all reporting to a central host. Since the central host collects data from multiple sources, a more powerful communication processing engine will be required to manage multiple connections. Additionally, data communications will need to be managed at each remote site, and there will be a greater reliance on local data buffering at the remote sites.

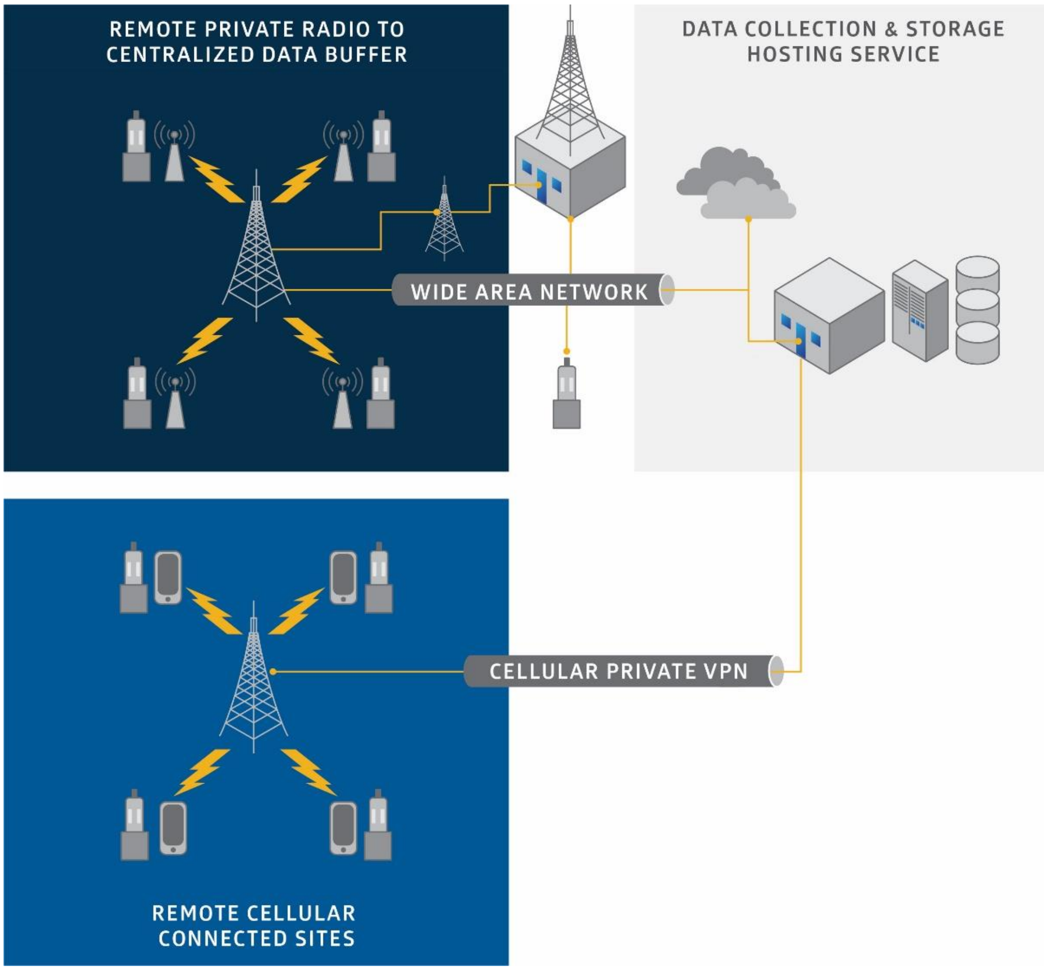


Figure 2 Peer to Central Host architecture

2.1.3 Combined Architecture

The ideal configuration will use a combination of both methods. Geography will be a major factor in the design of the communication architecture, along with the availability of existing communication infrastructure. The selection of a standard communication protocol will also influence the design of the network architecture. MODBUS is a polling communication protocol, which requires sequential managed communication. Whereas DNP3 is capable of both polling and report by exception, which can provide more flexibility in the network architecture, but also requires greater bandwidth.

3. DATA COLLECTION, STORAGE, AND ACCESS

3.1 Central Collection

The data will be received from the remote sites (either directly from the well or from an area node) at a central server. The server, typically a virtual machine with a redundant partner, will translate the received protocol (MODBUS or DNP3) using a software package like Kepware. The Kepware Server is then attached to a SQL server, where the data is collected and stored. At this point the data is available to be moved from the SQL server database to hosted long-term storage where ownership and privacy is managed, while also making the data available for reporting.

The Central Collection may be located either at a District or Interagency headquarters, or may reside in a hosted environment in the cloud. The details of the hosting services are beyond the scope of this technical memo.

4. ESTIMATED COST

A preliminary design will be required in order to establish a reasonable estimate of installation and annual operating costs. Multiple factors contribute to the cost at both the well sites and the overall network communications architecture. The following presents the contributing factors and a range of potential costs:

Well Site Factors:

- Pipe cutting and welding ($800 - $1,600 per well)
- Utility power availability / feasibility of solar or another renewable source
- Access to the well site
- Security, tampering and vandalism prevention
- High-level estimate per well site: $6,000 - $10,000
  - Ultrasonic Time of Travel Flow Meter -- $4,000
  - RTU -- $800
  - Radio -- $1,000
  - Labor -- $1,600

Network Communication Factors:

- Communication infrastructure
- Radio repeater stations
- Cellular data contracts
- Cybersecurity
- High-level network communications estimate (not a hosted service): $3,000 -- $15,000
  - Radio / Network Connectivity -- $3,000
  - Hardware Firewall -- $5,000
  - Labor -- $,5000

Data Collection, Storage, and Access Factors:

- Secure server environment
- Hosting service
- High-level central collection host estimate (not a hosted service): $20,000 -- $27,000
    - Redundant Server Hardware and Virtual Machines -- $10,000
    - Server Software -- $3,000
    - Labor -- $12,000

APPENDIX N: MERCED BASIN GROUNDWATER SUSTAINABILITY STAKEHOLDER ENGAGEMENT STRATEGY

Merced Basin Groundwater Sustainability Stakeholder Engagement Strategy

Prepared for

Merced Irrigation-Urban Groundwater Sustainability Agency

Merced Subbasin Groundwater Sustainability Agency

Turner Island Water District Groundwater Sustainability Agency #1

May 22, 2018 – Updated September 27, 2019

Prepared by

Woodard & Curran

Catalyst

Table of Contents

List of Acronyms

DAC	Disadvantaged Community
DWR	California Department of Water Resources
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
IRWM	Integrated Regional Water Management
MID	Merced Irrigation District
MIUGSA	Merced Irrigation-Urban Groundwater Sustainability Agency
RCD	Resource Conservation District
SDAC	Severely Disadvantaged Community
SGMA	Sustainable Groundwater Management Act
TCP	Trichloropropane
USGS	United States Geological Survey

Merced Subbasin Groundwater Sustainability Stakeholder Engagement Strategy

Overview

California's Groundwater Sustainability Management Act (SGMA) requires that Groundwater Sustainability Plans (GSP) be adopted for the most critical groundwater basins in California. The Merced Groundwater Subbasin was identified by the California Department of Water Resources (DWR) as one of 21 basins in California identified as "critically overdrafted" and one of 48 basins considered high priority.

In accordance with SGMA, water management and land management agencies in Merced Subbasin formed three Groundwater Sustainability Agencies (GSAs):

- Merced Irrigation-Urban Groundwater Sustainability Agency
- Merced Subbasin Groundwater Sustainability Agency
- Turner Island Water District Groundwater Sustainability Agency #1, Turner Island Water District, 1269 W. I Street, Los Banos, CA 93635. (209) 827-7700. GSA Formation Documentation

The GSAs have agreed to develop one GSP for the entire Merced Groundwater Subbasin to be submitted to DWR by January 31, 2020. To develop and implement the GSP, the governing boards of the three GSAs will work together to make decisions necessary to review existing groundwater conditions and develop a plan that supports the long-term sustainability of the Merced Groundwater Subbasin.

Merced Groundwater Subbasin

The Merced Groundwater Subbasin includes the cities of Merced, Atwater, and Livingston, and unincorporated portions of Merced County, including a number of smaller communities, some of which are considered disadvantaged or severely disadvantaged communities (DACs).[1]

The City of Merced serves as the county seat for Merced County and has a population of nearly 80,000. The population is mostly white and Hispanic or Latino, with a mix of African American, Native American, Pacific Islander and an Asian community that includes Hmong, Chinese, Vietnamese, Laotian, Cambodian, Filipino, Thai, Korean, and Asian Indian. The City of Merced is considered a disadvantaged community[2]. Other disadvantaged communities within the Merced Subbasin include Atwater, Bear Creek (Celeste), El Nido, Franklin, Le Grand, Planada, The Grove, Stevinson, Tuttle, and Winton. El Nido, Franklin, and Planada are considered severely disadvantaged.[3]

The Merced Irrigation District (MID) supplies water for agricultural irrigation systems that begin at Lake McClure and divert water to more than 2,000 growers that farm more than 100,000 acres across eastern

[1] DWR developed a DAC mapping tool, which is here: https://gis.water.ca.gov/app/dacs/. The County of Merced has also identified disadvantaged communities in the unincorporated portions on the Merced Subbasin.

[2] Disadvantaged Communities are considered those whose median household income less than 80 percent of the Statewide average

[3] Severely Disadvantaged Communities are considered those whose median household income less than 60 percent of the Statewide average.

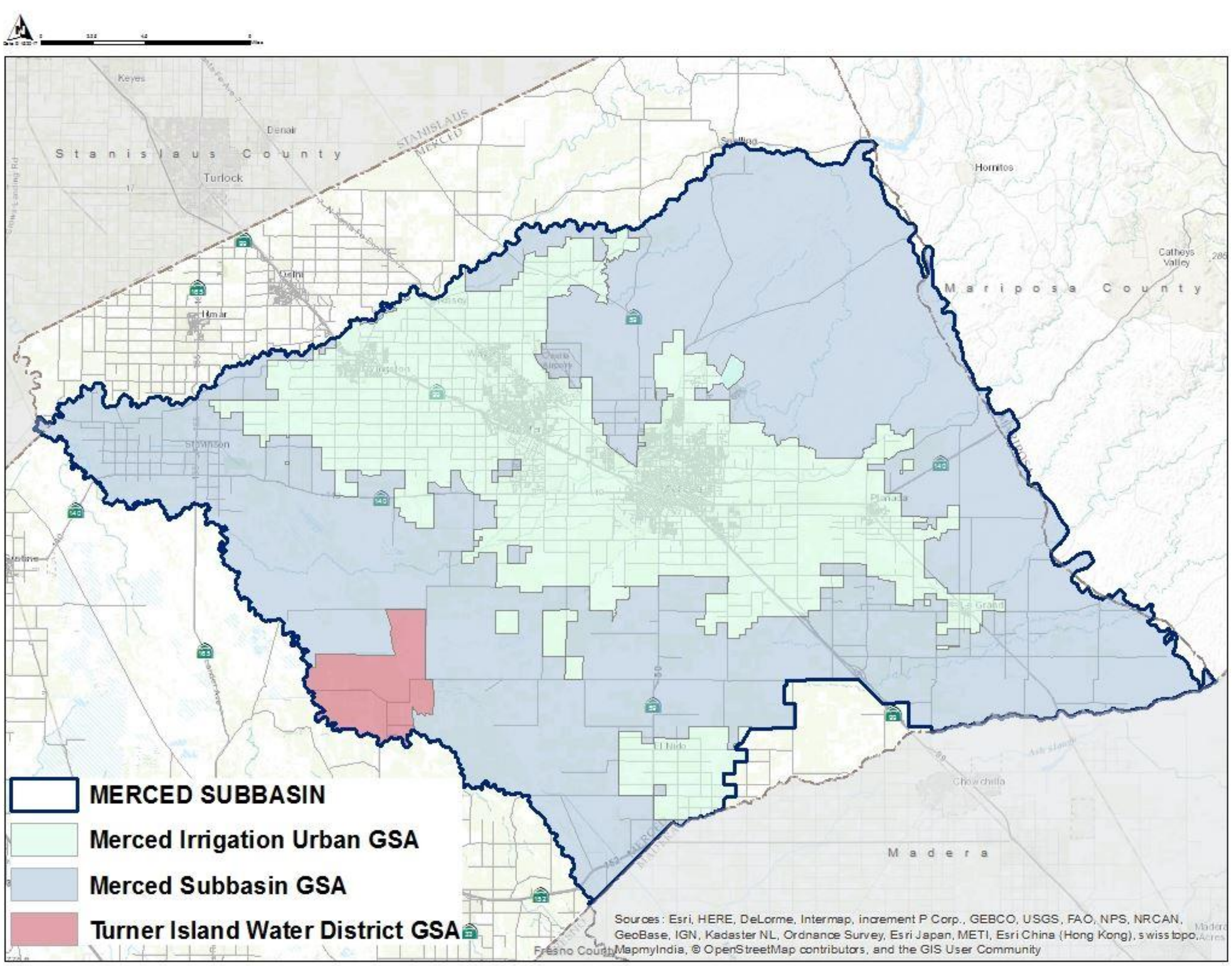
Merced County. The water originates from the Merced River, is stored behind the New Exchequer and McSwain Dams. More than 725 miles of canals and sections of several creeks and sloughs, bring the water to MID customers. MID owns and operates 185 active wells in years of surface water shortage.

The cities of Merced, Livingston, and Atwater pump groundwater and distribute it to residential and business customers in their service areas. Other water districts and companies operating in the Merced Subbasin include:

- Le Grand-Athlone Water District
- Merquin County Water District
- Plainsburg Irrigation District
- Stevinson Water District
- Lone Tree Mutual Water Company
- Sandy Mush Mutual Water Company
- Planada Community Services District
- Le Grande Community Services District

In 2010 in Merced County, U.S. Geological Survey (USGS) data shows that 69% of the water used was surface water and 31% was groundwater. Most of the surface and groundwater was used for agriculture.

Figure 1 Merced Subbasin and Groundwater Sustainability Agencies



Engagement Strategy Goals

The Merced Subbasin Stakeholder Engagement Strategy has been developed to achieve the following goals:

- **Conduct an inclusive outreach and education** process that best supports the success of a well-prepared GSP and that meets SGMA requirements.
- **Offer a comprehensive, transparent outreach and education** process that builds understanding and trust among the various stakeholders.
- **Create a clear, concise, transparent, reliable information flow** with opportunities for public and stakeholder input.
- **Use a *Planning Roadmap*** to align the public engagement opportunities with the development of technical information at key points throughout the project.
- **Evaluate engagement methods** throughout the GSP development and modify as needed.
- **Facilitate effective engagement and communication** to build trust between the various stakeholders and the GSAs.

Key Elements of the Engagement Strategy

Given the importance of groundwater to the continuing economic vitality and public health of the areas served by the Merced Groundwater Subbasin, stakeholder education and input throughout the GSP planning process is essential. This Stakeholder Engagement Strategy has been developed to support the preparation and implementation of a well-informed GSP. The engagement strategy is designed to be flexible and will generally follow the *Planning Roadmap* (See Figure 2, page 8) that aligns public engagement opportunities with the development of technical information throughout the GSP development process.

Roles and Responsibilities

Governing Boards of the Three Groundwater Sustainability Agencies

The governing boards of the three **Groundwater Sustainability Agencies**[4] will work together to oversee the development of the GSP for the entire Merced Subbasin, including overall direction, funding and approval of the GSP. The GSP will be adopted by the governing bodies of the three GSAs. Information about the actions by the governing boards related to the GSP will be posted on the GSP website, at www.mercedsgma.org.

The three GSA governing boards, member agencies, and staff contacts for each of three GSAs are provided in **Appendix A**.

GSP Coordinating Committee

The three GSAs have formed a **Coordinating Committee** comprised of senior staff and governing board members to coordinate GSP planning activities and public outreach. The Coordinating Committee meets the 4th Monday of every month starting at 1:30 pm. Meetings will be noticed at least 48 hours prior to

[4] Merced Irrigation-Urban Groundwater Sustainability Agency, Merced Subbasin Groundwater Sustainability Agency, and Turner Island Water District Groundwater Sustainability Agency #1.

each meeting at www.mercedsgma.org. Meetings are open to the public and include public comment period. Minutes will also be available online.

The Coordinating Committee members are listed in **Appendix A**.

GSP Stakeholder Committee

The **Stakeholder Committee** will be the primary body for providing community input to each of the three GSA Governing Boards and the Coordinating Committee regarding the development of the GSP. The Committee will serve as community representatives to review groundwater conditions, management issues and needs, and projects and management actions to improve groundwater sustainability in the Merced Subbasin. Members also serve as a conduit for engaging stakeholders in the Merced Subbasin and will be invited to participate in GSP outreach activities. The Stakeholder Committee is advisory to the GSA governing boards and is not a decision-making body.

Stakeholder Committee meets the 4th Monday of every month starting at 9:30 am. Meetings will be noticed at www.mercedsgma.org, are open to the public, and include time for public input. Meeting minutes will also be available online.

The Stakeholder Committee members were solicited through a public application process and were approved by the GSA governing boards. The members are listed in **Appendix A**.

Data and Evaluation

The Groundwater Sustainability Plan will be based on data, modeling, and evaluation regarding surface water and groundwater conditions, water uses, and water management options. Public outreach and engagement will be an important element of efforts to collect, review, validate, and refine the data and evaluation that will form the basis of the GSP and future management actions. Throughout the GSP development process, technical information and data will be summarized, simplified, and presented at workshops, online, via email, and in newsletters.

Public Outreach, Education, and Engagement

The GSP planning process includes activities to reach out to organizations and individuals involved in and affected by water management in the Subbasin; to inform and educate them about SGMA, groundwater management, and the GSP planning process; and to solicit and address issues and opportunities to improve groundwater management for the Subbasin.

The three GSA governing bodies will consider stakeholder and public input throughout the GSP development and implementation. The Coordinating Committee will plan and implement the following activities:

- **Develop and maintain notification lists** for the diverse social, cultural, and economic elements of the Merced Subbasin population (see Target Audiences, below). Notification about the GSP process and for public meetings and workshops will be provided through notices (in English and Spanish) available online and emailed to Merced GSP email list, as well as through newspaper display ads and press releases. The notification process will be supported by partner organizations sharing meeting notices with their constituent lists. (see Appendix D).
- **Develop and provide information** regarding SGMA and GSP planning, groundwater management, and Subbasin conditions, and make it available at www.mercedsgma.org
- **Solicit stakeholder and public input** on groundwater analysis and modeling, sustainability goals, project and management actions, and implementation plans.

- **Provide and summarize stakeholder and public input** for the Stakeholder Committee and the three GSA governing bodies throughout the GSP development and implementation.

Project Schedule

The final GSP must be submitted to the California Department of Water Resources in January 31, 2020. The project schedule is designed to solicit, consider, and address public and stakeholder input regarding the important planning elements, including basin conditions, groundwater modeling, sustainability goals, management actions, implementation plan, and draft and final GSP.

Figure 2, page 8, the **GSP Planning Roadmap**, shows a generalized depiction of the schedule for these planning elements and public and stakeholder engagement.

Initial Topics for Stakeholder Input

To support a fair and balanced outreach process and provide inclusive, open pathways for public education and input, it is helpful to identify the key issues of interest to stakeholders as the planning process commences.

Key topics of interest identified to-date include the following:

Planning Process

- With the various involved agencies, including the State, how will surface and groundwater use be accurately depicted for modeling as there are data gaps?
- Identify and plan for the important decision and guidance points in the planning process so that technical analysis, public review comments, and Coordinating Committee recommendations can be provided in timely manner to each of the GSA governing bodies.
- Clarify and plan for how management areas will be defined within the Merced Subbasin, to what degree each management area can define goals and criteria, and how the management areas will be coordinated.
- Establish a common base of understanding about SGMA and the purpose of the GSP.
- Consider how the GSP will relate to, or establish a need to change, the existing county groundwater ordinance.
- How will the GSP address community water supply reliability and quality?
- Consider potential statewide solutions, including improved water trading markets.

Analysis and Evaluation

- There are data gaps regarding groundwater use. Data collection and transparency will be a concern to many landowners. Consider mechanisms for managing private well data.
- Consider and agree on a modeling approach and tool for the Subbasin. There is a lot of variability in groundwater conditions across the Subbasin. The model needs to work for all three GSAs and coordinate with adjacent basins.
- What will the costs (water and financial) for implementation be for communities and farmers?
- How will allocation and management options be developed to reflect differences in surface and ground water access across the Subbasin?

- The monitoring well plan will be important for understanding current conditions and measuring future changes. How will monitoring well locations be identified to be effective for gathering the needed data? How will they be managed?

Education and Outreach

- Contacting and including the interested and affected landowners, groundwater pumpers, and communities in the unincorporated areas outside the boundaries of the Merced Irrigation District will be challenging. The outreach effort should begin immediately to reach out in western, southern, and eastern portions of the Subbasin.
- Use existing forums to inform and engage Municipal Advisory Councils, agriculture and business associations.
- Encourage participation by any persons whose rights may be affected by the GSP development and implementation including but not limited to property rights, surface water and overlying groundwater rights, and the human right to drinking water.
- Translate materials (into languages including but not limited to Spanish) to ensure meaningful participation by stakeholders whose dominant language is not English. Coordinate with Self Help Enterprises to have interpretation services at public meetings.
- Consider informational/educational topics for outreach including:
    - What is SGMA and a GSP?
    - What is a water budget and how does the water modeling work?
    - What is the decision-making process for the GSP?
    - What is the difference between SGMA and IRWM?
    - What is surface water, what is groundwater, how does the subbasin hydrology work?

Outreach Methods

Communication strategies are generally most effective when they are tailored to specific audience-type(s). Targeted materials will be translated into Spanish. Education and outreach will occur throughout the development of the GSP, refer to the **GSP Planning Roadmap** section below.

Here are the general outreach methods and tools envisioned for this project:

1. **Meetings of each of the GSA governing boards** provide an opportunity for formal public comment at decision milestones throughout the GSP planning process.
2. **Coordinating Committee** meetings are also open to the public for questions and input throughout the GSP planning process. Visit http://www.mercedsgma.org for meeting times, agenda, materials, and minutes.
3. Meetings of the **Stakeholder Committee** provide community representatives and other members of the public an opportunity to review and provide input on the elements of the GSP. Meeting are open to the public. Visit http://www.mercedsgma.org for meeting times, agenda, materials, and minutes.
4. **Community Workshops** will provide opportunities for community members and interest groups to learn about, discuss, and comment on the GSP planning process before major decision milestones. Interpretation/translation services at in-person meetings (into languages including but not limited to Spanish) will be provided in communities with substantial non-English speaking populations. Hold workshops in different geographic locations within the Subbasin.

5. The **GSA Website** (www.mercedsgma.org) will house information about SGMA, the GSP process, GSA Governing Boards, Coordinating Committee, Stakeholder Committee, and public meetings, project reports and studies, and groundwater data and information. **Presentation materials** will be posted online. Select Spanish-language information will be included.
6. **Short Articles** will be distributed to local and regional organizations and partners to inform stakeholders about GSP planning, technical issues, and opportunities for participation and review in a simple, clear manner. Organizations may include Merced County Farm Bureau, Merced Chamber of Commerce, and East Merced Resource Conservation District.
7. To share timely information with affected and interested parties, the Coordinating Committee will **engage local and regional organizations and partners** to assist in noticing public meetings and sharing project information. Entities could include Merced County, City of Merced, participating water and irrigation districts, Merced Farm Bureau, Merced Chamber of Commerce, Merced-Mariposa Cattlemen's Association, and others.
8. **Translation of written materials** and interpretation services at in-person meetings (into languages including but not limited to Spanish).
9. Use existing **social media channels** such as Facebook Pages: e.g., Merced County, City of Merced, City of Livingston, and Merced Irrigation District.
10. Engage **news media** representatives at milestones in the GSP process to inform the public and announce opportunities for participation and review.
11. **Key messages** will be developed for use in outreach and education, using compelling, simple, clear **visuals and graphics** to best explain complex technical data.

GSP Planning Roadmap

Using established GSP planning activities, the planning roadmap for stakeholder engagement depicts the relationship of technical studies, decision milestones, and outreach and engagement activities. Figure 2, page 8, the GSP Planning Roadmap shows:

1. Suggested timeline of stakeholder education regarding SGMA and groundwater management issues.
2. Sequencing of education topics and key issues for discussion with GSA Stakeholder Committee, Coordinating Committee, and the three GSA governing boards.

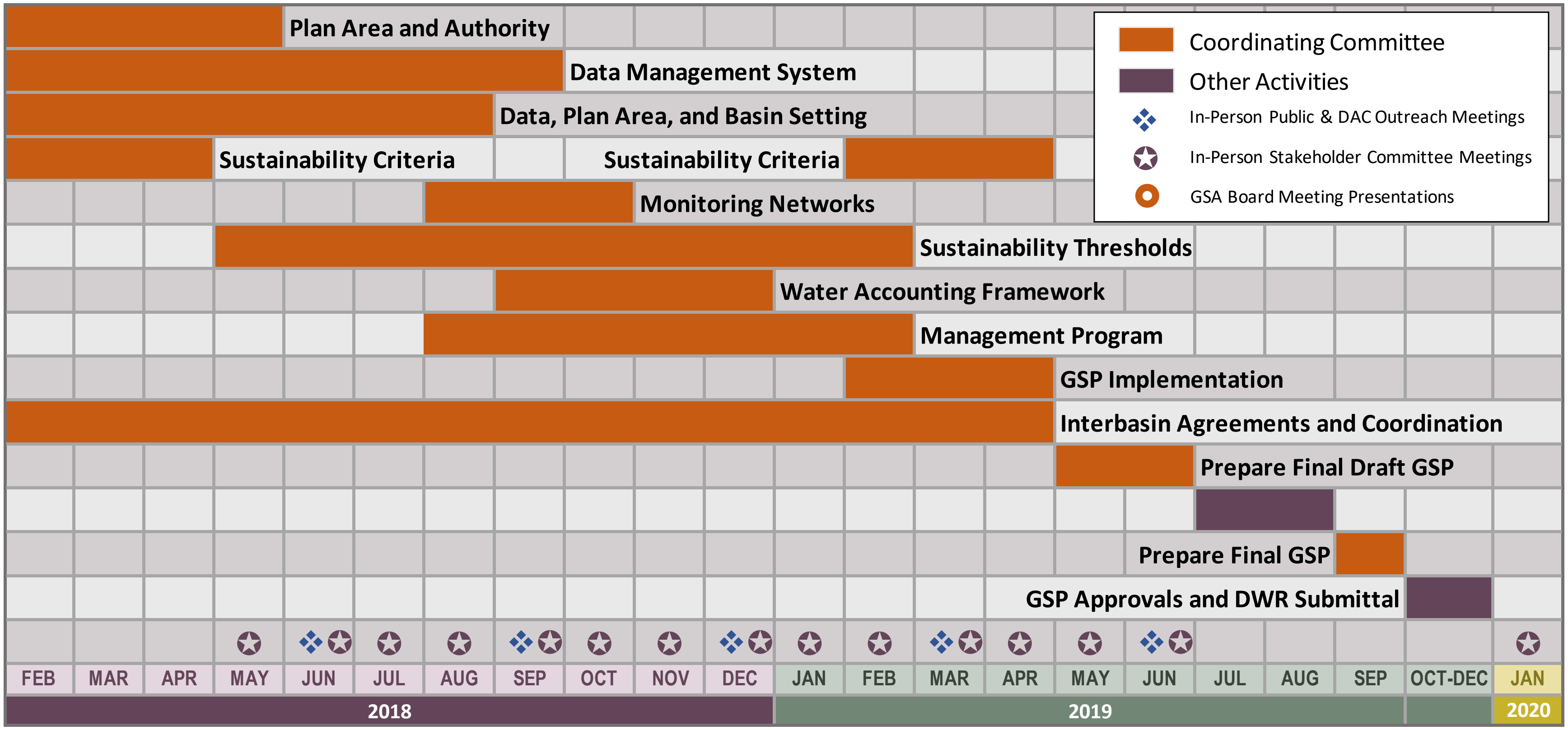
Key Audiences

Knowing the various interested audiences is key to setting a solid course for stakeholder engagement throughout the GSP process. The various interested parties and stakeholders identified to date are listed in **Appendix B**.

According to Water Code section 10723.3, the GSP development process will consider the interests of holders of overlying groundwater rights (including agricultural users and domestic well owners), municipal well operators, public water systems, local land use planning agencies, environmental users of groundwater, surface water users (if there is a connection between surface and groundwater), the federal government, Native American tribes, disadvantaged communities, and other local agencies that were monitoring and managing groundwater usage in the GSP area. Additional relevant stakeholders have also been included.

The Engagement Strategy relies on GSA governing boards, stakeholder committee, and the public to expand the list of interested and affected audiences as the GSP process unfolds.

Figure 2, GSP Planning Roadmap



Attachment A
Merced Subbasin Groundwater Sustainability Agencies

Merced Irrigation-Urban Groundwater Sustainability Agency (MIUGSA)

Member Agencies

- City of Atwater (Municipal)
- City of Livingston (Municipal)
- City of Merced (Municipal)
- Merced Irrigation District (Agriculture and Municipal)
- LeGrand Community Services District (Municipal)
- Planada Community Services District (Municipal)
- Winton Water and Sanitary District (Municipal)

Governing Board

Chair - Hicham Eltal, Merced Irrigation District
Vice Chair – Stephanie Dietz, City of Merced

Staff Contact

Hicham ElTal, heltal@mercedid.org, www.mercedid.org

Merced Subbasin Groundwater Sustainability Agency

Member Agencies

- County of Merced
- County of Mariposa
- Le Grand-Athlone Water District
- Merquin County Water District
- Plainsburg Irrigation District
- Stevinson Water District
- Lone Tree Mutual Water Company
- Sandy Mush Mutual Water Company

Governing Board

- Bob Kelley, Stevinson Water District - Chair
- Nic Marchini, Western White Area Representative - Vice Chair
- Michael Gallo, Eastern White Area Representative
- George Park, Lone Tree Mutual Water Company
- Kole Upton, Le Grand Athlone Water District
- Lloyd Pareira, County of Merced

Staff Contact

Lacey Kiriakou, Merced County, Water Resources Coordinator, lkiriakou@countyofmerced.com.
www.countyofmerced.com/MercedSubbasinGSA

Turner Island Water District Groundwater Sustainability Agency #1

Governing Board

Donald C. Skinner, Chair

Staff Contact

Larry Harris, LHarris@murdoc.com

GSP Coordinating Committee Members

1. Stephanie Dietz, Merced Irrigation-Urban GSA
2. Justin Vinson, Merced Irrigation-Urban GSA
3. Daniel Chavez, Merced Irrigation-Urban GSA
4. Ken Elwin (alternate), Merced Irrigation-Urban GSA
5. Bob Kelley, Merced Subbasin GSA
6. Nic Marchini, Merced Subbasin GSA
7. Mike Gallo, Merced Subbasin GSA
8. George Park (alternate), Merced Subbasin GSA
9. Larry Harris, Turner Island Water District GSA #1
10. Scott Skinner (alternate), Turner Island Water District GSA #1

GSP Stakeholder Committee Members

1. Arlan Thomas, MIDAC
2. Ben Migliazzo, Live Oak Farms
3. Bill Spriggs, City of Merced resident
4. Bob Salles, Leap Carpenter Kemps Insurance
5. Brad Robson, Buchanan Hollow Nut Co. Le Grand-Athlone Water District
6. Breanne Ramos, Executive Director, Merced County Farm Bureau
7. Brian Carter, D&S Farms
8. Carol Bonin, Winton M.A.C.
9. Daniel Machado, Machado Backhoe Inc.
10. Darren Olgwin, McSwain MAC
11. Frenchie Meissonnier, Rice Farmer
12. Galen Miyamoto, Miyamoto Farms
13. Gino Pedretti III, Sandy Mush Mutual Water Company
14. Joe Scoto, Scoto Bros Farms / McSwain Union School District
15. Jean Okuye, East Merced Resource Conservation District
16. Maria Herrera, Self-Help Enterprises
17. Mark Maxwell, University of California, Merced
18. Maxwell Norton, Retired agricultural researcher
19. Parry Klassen, East San Joaquin Water Quality Coalition
20. Rick Drayer, Drayer Ranch
21. Simon Vander Woude, Sandy Mush Mutual Water Company
22. Vacant, City of Livingston resident
23. Vacant, City of Atwater resident

Attachment B - Key Audiences

California Water Code Section 10723.3 Stakeholders

Agricultural Users and Domestic Well Owners

- Groundwater users
- De minimus groundwater users
- Others

Municipal Well Operators and Public Water System Operators

- Le Grand-Athlone Water District
- Merquin County Water District
- Plainsburg Irrigation District
- Stevinson Water District
- Lone Tree Mutual Water Company
- Sandy Mush Mutual Water Company
- California American Water, Meadowbrook District
- Merced Area Groundwater Pool Interests (monitors and reports groundwater elevations in the Merced Subbasin)
- Le Grand Community Services District
- Planada Community Services District

Local Land Use Planning Agencies

- Merced County staff
- Mariposa County staff
- Merced, Atwater, and Livingston town staff
- Neighboring GSA staff

Environmental Groundwater Users

- Merced National Wildlife Refuge, within the San Luis National Wildlife Refuge Complex
- Great Valley Grasslands State Park

Surface Water Users

- Merced Irrigation District (largest agency in the Subbasin with surface water rights)
- Stevinson Water District
- Merquin County Water District

Federal Government Agencies

- U.S. Fish and Wildlife, Merced National Wildlife Refuge
- USDA Natural Resource Conservation Service, Fresno
- USDA, Farm Service Agency
- U.S. Geological Survey, California Water Science Center, Sacramento

Native American Tribes

- None

Disadvantaged and Severely Disadvantaged Communities

- Atwater
- Bear Creek
- Delhi
- El Nido (severely disadvantaged)
- Franklin (severely disadvantaged)
- Hilmar
- Le Grand
- McSwain
- Planada (severely disadvantaged)
- South Merced
- Stevinson
- The Grove
- Tuttle
- Winton

Other State and Local Agencies that Monitor and Manage Groundwater Usage

- Department of Water Resources
- State Water Resources Control Board
- California Department of Fish and Wildlife

Additional Stakeholders

Elected Officials

- Merced County Board of Supervisors
- City Councils: Merced, Atwater, Livingston
- Jim Costa, U.S. Representative, California's Congressional District 16
- Anthony Cannella, California Senate District 12
- Adam Gray, California Assembly District 21

Agricultural Organizations

- Merced County Farm Bureau
- Merced-Mariposa Cattlemen's Association

Municipal Advisory Councils

- McSwain Municipal Advisory Council
- Le Grand Municipal Advisory Council
- Planada Municipal Advisory Council
- Winton Municipal Advisory Council
- Franklin Beachwood Municipal Advisory Council

Colleges and Universities

- University of California Merced

Disadvantaged Community Organizations

- Community Water Center, Laurel Firestone and Debbie Ores
- Clean Water Action, Jennifer Clary
- Leadership Council for Justice and Accountability, Amanda Monaco
- Self Help Enterprises, Maria Herrera and Ilse Lopez-Narvaez
- Neighbors United for a Better South Merced

Business and Community Interests

- Merced Chamber of Commerce
- Merced County Hispanic Chamber of Commerce

Natural Resources Interests/Organizations

- East Merced Resource Conservation District
- Audubon
- River Partners

News Media

- Newspapers: Merced-Sun Star, Atwater Signal,
- Radio: Radio Merced
- TV: Channel 30, Univision based in Fresno

Attachment C
Links to SGMA and Groundwater Information

Department of Water Resources, SGMA: http://www.water.ca.gov/groundwater/sgm/

Department of Water Resources Critically Overdrafted Basins:
http://www.water.ca.gov/groundwater/sgm/cod.cfm

Department of Water Resources, Draft Guidance for GSP Stakeholder Communication and Engagement
http://www.water.ca.gov/groundwater/sgm/pdfs/GD_C&E_Final_2017-06-29.pdf

Department of Water Resources, Stakeholder Communication and Engagement Digital Toolkit
http://www.water.ca.gov/groundwater/sgm/digital_toolkit.cfm

UC Davis Resources re: SGMA: http://groundwater.ucdavis.edu/SGMA/

Union of Concerned Scientists, A Guide to California's Groundwater Sustainability Plans, in English and Spanish: https://www.ucsusa.org/global-warming/ca-and-western-states/groundwater-toolkit#.WnSt5KinFPY

Union of Concerned Scientist, SMGA information: https://www.ucsusa.org/global-warming/regional-information/california-and-western-states/sustainable-groundwater-management-act#.Wne0ga2ZPq0

Community Water Center, Union of Concerned Scientists, Clean Water Fund, Stakeholder Guide for Sustainable Groundwater Management Act Implementation:
https://d3n8a8pro7vhmx.cloudfront.net/communitywatercenter/pages/52/attachments/original/1438102537/SGMA_Stakeholder_Engagement_White_Paper.pdf?1438102537

USGS, California Water Use: https://ca.water.usgs.gov/water_use/2010-california-water-use.html

Attachment D
Partner Opportunities for GSP Outreach

To assist in best leveraging engagement and educational opportunities for interested parties in the Merced Subbasin area, partnering with local organizations can be very effective. By developing a list of activities and opportunities for outreach occurring in the Merced, Livingston, Atwater areas, we can dovetail these with the Merced Subbasin *Planning Roadmap*. Here are some of the partnership opportunities identified to date.

Greater Merced Chamber of Commerce

http://www.mercedchamber.com

Share Public Workshop notices (English and Spanish) for distribution to members.

Merced County Hispanic Chamber of Commerce

http://www.mercedhcc.com

Share Public Workshop notices (English and Spanish) for distribution to members.

Merced Farm Bureau

https://www.mercedfarmbureau.org

- Share articles and Public Workshop notices (English and Spanish) for distribution to members.

Cattlemen's Association – California and Merced/Mariposa

- Share articles and Public Workshop notices (English and Spanish) for distribution to members.

East Merced Resource Conservation District (RCD)

https://www.eastmercedrcd.org

- Share articles and Public Workshop notices (English and Spanish) for distribution to members.

Merced Irrigation District (MID)

http://www.mercedid.com

- Share press releases and Public Workshop notices (English and Spanish) for distribution to news media and members.

County of Merced

https://www.co.merced.ca.us

- Share press releases and Public Workshop notices (English and Spanish) for distribution to news media and interested party list.

City of Merced

https://www.cityofmerced.org

- Share Public Workshop notices (English and Spanish) for distribution to interested party list.

City of Livingston

- Share Public Workshop notices (English and Spanish) for distribution to interested party list.

City of Atwater

- Share Public Workshop notices (English and Spanish) for distribution to interested party list.

Self Help Enterprises & Leadership Counsel for Justice & Accountability

DWR has contracts with these two organizations to assist GSAs with outreach and engagement with disadvantaged communities in the region. The Coordinating Committee will work with both organizations to expand the outreach to disadvantaged communities in the Merced Subbasin for the GSP.

Attachment E
Stakeholder Committee Application

Merced Groundwater Sustainability

Overview

The Merced Groundwater Subbasin is one of 21 basins in the State of California identified by the California Department of Water Resources as critically overdrafted and one of 48 basins considered high priority. Consistent with the requirements of the Sustainable Groundwater Management Act (SGMA), water management and land management agencies in Merced Subbasin have formed three Groundwater Sustainability Agencies (GSAs): the Merced Irrigation-Urban Groundwater Sustainability Agency, the Merced Subbasin Groundwater Sustainability Agency, and the Turner Island Water District Groundwater Sustainability Agency. The three GSAs are collaborating on developing one Groundwater Sustainability Plan for the entire Merced Groundwater Subbasin by January 2020. To develop the Plan, the GSAs will review groundwater conditions and identify means to ensure the long-term sustainability of the Merced Groundwater Subbasin.

Public Outreach and Engagement

As part of developing the Groundwater Sustainability Plan, the Groundwater Sustainability Agencies will inform and involve interested and affected individuals and organizations (stakeholders) and the general public.

- **Groundwater Sustainability Agencies (GSAs)** - Overall direction, funding, and approval for the groundwater sustainability planning process and work products is provided by the governing boards of the three Groundwater Sustainability Agencies. The final Groundwater Sustainability Plan will be adopted by the elected governing bodies of each these organizations. The GSAs have formed a Coordinating Committee of senior staff and board members to coordinate day-to-day project activities and public outreach.
- **Stakeholder Committee** - The GSAs are seeking community representatives to participate in a Stakeholder Committee to review groundwater conditions, management issues and needs, and projects and management actions to improve sustainability of the groundwater basin. The Stakeholder Committee will advise the GSAs and the governing bodies on these topics. Meetings of the Stakeholder Committee will be noticed and open to the public.

- **Members of the Public** - Public outreach and engagement will consist primarily of open Stakeholder Committee meetings, information and updates to the project website, and public workshops held at important stages of the groundwater sustainability planning process. The GSAs will also provide information briefings to elected officials (City Councils, County Board of Supervisors, and Merced Irrigation District Board of Directors), community organizations, neighborhoods, and others as needed to keep them informed and participating.

Appointing the Stakeholder Committee

The GSAs will appoint individuals representing the broad interests and perspectives in the region to participate on the Stakeholder Committee. Candidates who can work together to help the GSAs and staff develop the Groundwater Sustainability Plan (GSP) will be identified through an application process, which will be publicly announced at meetings of the GSA boards and the member agencies. Stakeholder Committee participants are expected to represent the broad interests and geography of the region. The GSP Coordinating Committee will select the members and alternates for the Stakeholder Committee. The intended makeup of the Stakeholder Committee is 10 to 15 members who represent one or more of the following interests:

- **Groundwater Users**
- **Community / Neighborhood Interests**
- **Flood Management Interests**
- **Agricultural Interests**
- **Other Business Interests (non-agriculture)**
- **Environmental Interests**
- **Other Institutional Interests (e.g. UC Merced, Board of Education)**
- **Disadvantaged Community and Environmental Justice Interests**

The GSAs are seeking individuals who have a demonstrated commitment to community service and civic leadership, prior experience participating constructively on similar task forces and advisory committees, and an understanding of water issues.

Participation in the Stakeholder Committee will require a significant commitment of time and attention. The Stakeholder Committee is expected to meet approximately monthly beginning in April 2018 and complete its work in 2019.

The Stakeholder Committee application is attached.

Merced Groundwater Sustainability Plan (GSP)
Stakeholder Committee
Application for Volunteers

The Groundwater Sustainability Agencies for the Merced Groundwater Subbasin are seeking volunteers to participate on the Stakeholder Committee. Ideal candidates will have a demonstrated commitment to community service and civic leadership, prior experience participating constructively on similar task forces or advisory committees, and an understanding of water issues. Volunteers are expected to make a firm commitment to participate in monthly meetings and review groundwater planning documents and other information during groundwater sustainability planning through 2019. The Stakeholder Committee will be appointed from the pool of applications received. Applications are due by **February 12, 2018** and should be submitted via email to the Merced Subbasin GSAs c/o Samantha Salvia, Woodard & Curran, ssalvia@woodardcurran.com, 415-321-3423.

Name: ____

Organization: ____

Mailing Address: ____

Preferred Phone: (Mobile/Work/Home) ____

Email Address: ____

Disciplines/Perspectives: (check all that apply)

☐ Groundwater Users
☐ Community / Neighborhood Interests
☐ Flood Management Interests
☐ Agricultural Interests
☐ Other Business Interests (non-agricultural)
☐ Environmental Interests
☐ Other Institutional Interests
☐ Disadvantaged Community and Environmental Justice Interests

Relevant Prior Experience (Task Forces, Advisory Committees, water issues):

Additional Comments: