Eastern San Joaquin Groundwater Subbasin

Groundwater Sustainability Plan: Complete Appendices

Prepared by:

EASTERN SAN JOAQUIN GROUNDWATER AUTHORITY

November 2019

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APPENDIX 1-A.
EASTERN SAN JOAQUIN GROUNDWATER AUTHORITY JPA AGREEMENT AND BYLAWS

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4/11/2017

JOINT EXERCISE OF POWERS AGREEMENT

ESTABLISHING THE EASTERN SAN JOAQUIN GROUNDWATER AUTHORITY

THIS AGREEMENT is entered into and effective this 8th day of February, 2017 (**"Effective Date"**), pursuant to the Joint Exercise of Powers Act, Cal. Government Code §§ 6500 *et seq*. (**"JPA Act"**) by and among the entities that are signatories to this Agreement.

RECITALS

A. On August 29, 2014, the California Legislature passed comprehensive groundwater legislation contained in SB 1168, SB 1319 and AB 1739. Collectively, those bills, as subsequently amended, enacted the "Sustainable Groundwater Management Act". Governor Brown signed the legislation on September 16, 2014 and it became effective on January 1, 2015.

B. Each of the Members overlie the San Joaquin Valley Groundwater Basin, Eastern San Joaquin Subbasin, California Department of Water Resources Basin No. 5-22.01 as its boundaries may be modified from time to time in accordance with Cal. Water Code Section 10722.2.

C. Each of the Members is either (i) a Groundwater Sustainability Agency (**"GSA"**) duly established in accordance with SGMA, or (ii) a "local agency" as defined in Water Code Section 10721(n) that intends to become a GSA established on or before June 30, 2017.

D. The Members desire, through this Agreement, to form a public entity to be known as the Eastern San Joaquin Groundwater Authority (**"Authority")** for the purpose of coordinating the various GSAs' management of the Basin, in accordance with SGMA. The boundaries of the Authority are depicted on the map attached hereto as **Exhibit A**.

E. The mission of the Authority is to provide a dynamic, cost-effective, flexible and collegial organization to insure initial and ongoing SGMA compliance within the Basin.

F. The Members agree that the Authority itself is not initially intended to be a GSA but the Members may elect GSA status for the Authority in their discretion at a future time as further provided herein.

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

ARTICLE 1: DEFINITIONS

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

a. **"Agreement"** shall mean this Joint Exercise of Powers Agreement Establishing the Eastern San Joaquin Groundwater Authority.

b. **"Authority"** shall mean the Eastern San Joaquin Groundwater Authority formed by this Agreement.

c. **"Basin"** shall mean the San Joaquin Valley Groundwater Basin, Eastern San Joaquin Subbasin, California Department of Water Resources Basin No. 5-22.01 as its boundaries may be modified from time to time in accordance with Cal. Water Code Section 10722.2.

d. **"Board of Directors"** or **"Board"** shall mean the governing body formed to implement this Agreement as established herein.

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

f. **"Dedicated Revenue Stream"** shall mean a revenue stream dedicated to Authority activities that has been adopted by a Member or Members in the form of an assessment or charge in accordance with applicable law.

g. **"DWR"** shall mean the California Department of Water Resources.

h. **"Effective Date"** shall be as set forth in the Preamble.

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

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

k. **"GSA Boundary"** shall mean those lands located within the Members' boundaries.

l. **"JPA Act"** shall mean the Joint Exercise of Powers Act, Cal. Government Code §§ 6500 *et seq.*

m. **"Management Area"** shall mean the area within the boundaries of a Member or group of Members to be managed by that Member or group of Members under any GSP adopted by the Authority.

n. **"Member"** shall mean any of the signatories to this Agreement and "Members" shall mean all of the signatories to this Agreement. Each of the Members shall be either (i) a GSA established on or before the Effective Date in accordance with SGMA, or (ii) a "local agency" as defined in Water Code Section 10721(n) that intends to become a GSA established on or before June 30, 2017.

o. **"Other Basin Agencies"** shall mean all other governmental agencies whose jurisdictions include the land overlying the Basin or whose jurisdictions include some governmental authority over the Basin who are not Members.

p. **"SGMA"** 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 Members intend to work together in mutual cooperation to develop a GSP in compliance with SGMA, for the sustainable management of groundwater for that portion of the Basin underlying the Members of the Authority.

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

2.3 To the extent the Members are not successful at jointly implementing the GSP within the Basin, or to the extent that any Member wishes to implement the GSP within its boundaries, the Authority intends to allow any individual Member to implement the GSP within its boundaries, and to work together with all Members to coordinate such implementation in accordance with the requirements of SGMA.

2.4 The Members intend that the Authority will represent the Members in discussions with Other Basin Agencies, and shall enter into Coordination Agreements with those that form GSAs as required by SGMA to achieve an integrated, comprehensive Basin-wide GSP that satisfies SGMA as to sustainable groundwater management for the entire Basin.

2.5 Each Member will retain the right to determine, in its sole discretion, whether to (i) become a GSA, or (ii) join in a GSA that is a Member of the Authority. However, if a Member fails to take action, on or before June 30, 2017, to (i) become a GSA, or (ii) join in a GSA that is a Member of the Authority, that Member shall be terminated from participation in the Authority and this Agreement in accordance with Article 6.3.

2.6 The Members expressly intend that the Authority will not have the authority to limit or interfere with the respective Member's rights and authorities over their own internal matters, including, but not limited to, a Member's legal rights to surface water supplies and assets, groundwater supplies and assets, facilities, operations, water management and water supply matters. The Members 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.

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

2.8 The Members 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 and funding commitments reasonably anticipated to be necessary for the purposes of this Agreement.

2.9 The Members acknowledge and agree that SGMA is new and complex legislation, with implementing regulations continuing to be developed by DWR. While this Agreement reflects the Members' initial approach to SGMA compliance, a great deal of data needed for implementation is unknown, necessary models are still in development, the Members may have changes in political boundaries or gain experience in the application of SGMA or discover other considerations that may affect the decision of a Member on how to best comply with SGMA within its own and its Management Area boundaries. DWR has acknowledged the need for entities to change their decisions about participating in or becoming a GSA, and it is the intent of the Members to support flexibility in admitting additional Members, accommodating voluntary withdrawals, coordinating with other multi-agency or individual GSAs, changing the form of their organizational documents, for example, or creating an independent agency through a Joint Powers Agreement, and making other types of adjustments required by the Members to achieve efficient compliance with SGMA, consistent with the schedule and requirements of SGMA for coordination throughout the Basin and the provisions of this Agreement.

2.10 Each Member acknowledges that SGMA requires that multiple GSAs within a Bulletin 118 groundwater basin designated as high- or medium-priority must coordinate, and are required to use the same data and consistent methodologies for certain required technical assumptions when developing a GSP, and that the entire subbasin must be managed under one or more GSPs or an alternative in lieu of a GSP for the basin to be deemed in compliance with SGMA.

ARTICLE 3: FORMATION, PURPOSE AND POWERS

3.1 **Recitals:** The foregoing recitals are incorporated by reference.

3.2 **Certification.** Each Member certifies and declares that it is a public agency (as defined in Government Code Section 6500 *et seq.*) that is authorized to be a party to a joint exercise of powers agreement and to contract with each other for the joint exercise of any common power under Article I, Chapter 5, Division 7, Title I of the Government Code, commencing with Section 6500.

3.3 **Formation of Authority.** Pursuant to the JPA Act, the Members hereby form and establish a public entity to be known as the Eastern San Joaquin Groundwater Authority which will function in accordance with this Agreement. The Authority will be a public entity separate from the Members to this Agreement. The Authority shall comply with all provisions of the JPA Act and shall be responsible for administration of this Agreement.

3.4 **Purpose of the Authority.** The purposes of this Authority are to:

a. provide for coordination among the Members to develop and implement a GSP and/or facilitate a coordination agreement, to the extent necessary;

b. provide for the joint exercise of powers common to each of the Members and powers granted pursuant to SGMA (subject to the restrictions contained in this Agreement);

c. cooperatively carry out the purposes of SGMA;

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

e. satisfy the requirements of SGMA for coordination among GSAs.

3.5 **Powers of the Authority.** To the extent authorized by the Members through the Board of Directors, and subject to the limitations set forth in this Agreement and the limitations of all applicable laws, the Authority shall have and may exercise any and all powers commonly held by the Members in pursuit of the Authority's purpose, as described in Article 3.4 of this Agreement, including but not limited to the power:

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

b. To coordinate the exercise of common powers of its Members including, without limitation, powers conferred to the Members by SGMA;

c. To adopt rules, regulations, policies, bylaws and procedures related to the coordination of the Members for purposes of implementation of SGMA;

d. 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; and

e. To borrow funds so long as a Dedicated Revenue Stream is committed by one or more Members for repayment.

3.6 **Powers Reserved to Members**. Notwithstanding anything to the contrary in this Agreement, the Authority shall not undertake any activities within the geographic or service area boundaries of any of its Members pursuant to the GSP developed or adopted hereunder (including, without limitation, the restriction or regulation of groundwater extractions), unless the Member has formally and expressly consented and agreed in writing to the activity proposed pursuant to a special project agreement between the Member and the Authority in accordance with Article 7 of this Agreement. Without limiting the generality of the previous sentence, each of the Members (or groups of Members) will have the sole and absolute right, in its or their sole discretion, to:

a. Become a GSA individually or collectively within the Member's boundaries or the Management Area managed in whole or in part by such Member;

b. Approve any portion, section or chapter of the GSP adopted by the Authority as applicable within the Member's boundaries or the Management Area managed in whole or in part by such Member or GSA of which it is a part;

c. At each individual Member's election, acting through GSAs established by Members, implement SGMA and the GSP adopted by the Authority within the Member's

boundaries or the Management Area managed in whole or in part by such Member; provided that any Member may elect, in its sole discretion, to authorize the Authority to implement SGMA and the GSP or to implement any discrete element or elements of SGMA or the GSP within the Member's boundaries. In the event that a Member elects to authorize the Authority to implement SGMA and the GSP or to implement any discrete element or elements of SGMA or the GSP within the Member's boundaries, such Member and the Authority shall enter into a special project agreement in accordance with Article 7 of this Agreement; and

d. Exercise the powers, without limitation, conferred to a GSA by SGMA.

3.7 **Term.** This Agreement shall be effective as of the Effective Date and shall remain in effect until terminated in accordance with Article 6.5 of this Agreement.

3.8 **Boundaries of the Authority.** The geographic boundaries of the Authority and that portion of the Basin that will be managed by the Authority pursuant to SGMA are depicted in **EXHIBIT A**.

3.9 **Role of Member Agencies.** Each Member 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 each Member is required for the success of the Authority. This support will involve the following types of actions:

a. The Members will provide support to the Board of Directors 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 Members to either approve, or respond quickly to, any recommendations made as to funding shares, operational decisions, fare structures, and other policy areas.

c. Each Member shall contribute its share of capital and operational fund allocations, as established by the Board of Directors in the annual budget, as approved by the Board of Directors.

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

3.10 **Other Officers and Employees.** The Members do not anticipate that the Authority will have any employees. However, the Authority may do the following:

a. Provide that any employee of a Member, with the express approval of that Member, may be an *ex officio* employee of the Authority, and shall perform, unless otherwise provided by the Board, the same various duties for the Authority as for his or her other employer in order to carry out this Agreement.

b. The Board shall have the power to employ competent registered civil engineers and other consultants to investigate and to carefully devise a plan or plans to carry out and fulfill the objects and purposes of SGMA, and complete a GSP.

ARTICLE 4: GOVERNANCE

4.1 **Board of Directors.** The business of the Authority will be conducted by a Board of Directors that is hereby established and that shall be initially composed of one primary representative appointed by each Member; provided, however, that in the event multiple entities establish a single GSA pursuant to a separate agreement, the GSA so established will thereafter have one representative on the Board of Directors and the vote of the GSA will be exercised in accordance with the separate agreement. Without amending this Agreement, the composition of the Board of Directors shall be altered from time to time to reflect the withdrawal of any Member, the admission of a Member or the establishment of a GSA comprised of multiple Members. Members of the Board of Directors are not required to be members of the governing board of the appointing Member; however, it is the strong preference of the Members that members of the Board of Directors be members of the governing board of the appointing Member. Each Member may designate one alternate to serve in the absence of that Member's primary representative on the Board of Directors. Such alternate need not be a member of the governing board of the Member. All primary members of the Board of Directors and all alternates shall file a Statement of Economic Interests (FPPC Form 700). Each Member shall notify the Authority in writing of its designated primary and alternate representatives on the Board of Directors.

4.2 **Term of Directors.** Each member of the Authority Board of Directors will serve until replaced by the appointing Member.

4.3 **Officers.** The Board of Directors shall elect a chairperson and a vice chairperson. The chairperson and vice-chairperson shall be directors of the Board. The chairperson shall preside at all meetings of the Board and the vice-chairperson shall act as the chairperson in the absence of the chairperson elected by the Board. The San Joaquin County Public Works Director or designee shall be the secretary and shall prepare and maintain minutes of all meetings of the Board of Directors. The Treasurer of the County of San Joaquin shall have the duties and obligations of Treasurer of the Authority as set forth in Government Code Sections 6505, 6505.1 and 6505.5.

4.4 **Powers and Limitations.** All the powers and authority of the Authority shall be exercised by the Board, subject, however, to the rights reserved by the Members as set forth in this Agreement.

4.5 **Quorum.** A majority of the members of the Board of Directors will constitute a quorum.

4.6 **Voting.** Except as to actions identified in Article 4.7, the Board of Directors will conduct all business by majority vote. Each member of the Board of Directors will have one (1) vote. Prior to voting, the Members shall endeavor in good faith to reach consensus on the matters to be determined such that any subsequent vote shall be to confirm the consensus of the Members. If any Member strongly objects to a consensus-based decision prior to a vote being cast, the Members shall work in good faith to reasonably resolve such strong objection, and, if the same is

not resolved collaboratively, then the matter will proceed to a vote for final resolution under this Section 4.6 or Section 4.7, below, as applicable.

4.7 **Supermajority Vote Requirement for Certain Actions.** The following actions will require a two-thirds (2/3) vote by the directors present:

a. Approval or modification or amendment of the Authority's annual budget;

b. Decisions related to the levying of taxes, assessments or property-related fees and charges;

c. Decisions related to the expenditure of funds by the Authority beyond expenditures approved in the Authority's annual budget;

d. Adoption of rules, regulations, policies, bylaws and procedures related to the function of the Authority;

e. Decisions related to the establishment of the Members' percentage obligations for payment of the Authority's operating and administrative costs as provided in Article 5.1;

f. Approval of any contracts over $250,000 or contracts for terms that exceed two (2) years;

g. Setting the amounts of any contributions or fees to be paid to the Authority by any Member;

h. Decisions regarding the acquisition by any means and the holding, use, sale, letting and disposal of real and personal property of every kind, including lands, water rights, structures, buildings, rights-of-way, easements, and privileges, and the construction, maintenance, alteration and operation of any and all works or improvements, within or outside the Authority, necessary or proper to carry out any of the purposes of the Authority;

i. Decisions related to the limitation or curtailment of groundwater pumping; and

j. Approval of a GSP.

4.8 **Meetings.** The Board shall provide for regular and special meetings in accordance with Chapter 9, Division 2, Title 5 of Government Code of the State of California (the "Ralph M. Brown Act" commencing at Section 54950), and any subsequent amendments of those provisions.

4.9 **By-Laws.** The Board may adopt by-laws to supplement this Agreement. In the event of conflict between this Agreement and the by-laws, the provisions of this Agreement shall govern.

4.10 **Administrator.** The Members hereby designate the County of San Joaquin to serve as administrator and secretary of, and keeper of records for, the Authority.

4.11 **Advisory Committees.** The Board of Directors may establish one or more advisory committees, technical committees or other committees for any purpose, including but not limited to the GSP purposes in Water Code Section 10727.8.

ARTICLE 5: FINANCIAL PROVISIONS

5.1 **Contributions and Expenses:** Members shall share in the general operating and administrative costs of operating the Authority in accordance with percentages determined by the Authority Board of Directors. Each Member will be assessed no more frequently than quarterly, beginning on July 1 of each year. Members shall pay assessments within ninety (90) days of receiving assessment notice from the secretary of the Authority. Each Member will be solely responsible for raising funds for payment of the Member's share of operating and administrative costs. The obligation of each Member 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 Members. Each Member shall be individually responsible for its own covenants, obligations, and liabilities under this Agreement. No Member shall be under the control of or shall be deemed to control any other Member. No Member shall be precluded from independently pursuing any of the activities contemplated in this Agreement. No Member shall be the agent or have the right or power to bind any other Member without such Member's express written consent, except as expressly provided in this Agreement. Contributions of grant funding, state, federal, or county funding may be provided as funding or a portion of funding on behalf of Members.

5.2 **Initial Contributions.** Upon execution of this Agreement, each of the Members shall contribute Five Thousand Dollars ($5,000.00) to the Authority for initial administrative costs. Such funds may be used in the discretion of the Authority Board of Directors to fund the activities of the Authority including, without limitation, engineering services. The Authority shall provide to the Members quarterly reports detailing how the Initial Contributions are spent.

5.3 **Liability of Board and Officers.** The funds of the Authority may be used to defend, indemnify and hold harmless the Authority, any Director, officer, employee, or agent for actions taken within the scope of the authority of the Authority. Nothing herein shall limit the right of the Authority to purchase insurance including but not limited to directors and officers liability insurance.

5.4 **Repayment of Funds.** No refund or repayment of the initial commitment of funds specified in Article 5.2 will be made to a Member ceasing to be a Member of this Agreement whether pursuant to removal by the Board of Directors or pursuant to a voluntary withdrawal. The refund or repayment of any other contribution shall be made in accordance with the terms and conditions upon which the contribution was made, the terms and conditions of this Agreement or other agreement of the Authority and withdrawing Member.

5.5 **Budget.** The Authority's fiscal year shall run from July 1 through June 30. Each fiscal year, the Board shall adopt a budget for the Authority for the ensuing fiscal year. Within ninety (90) days of the Effective Date of this Agreement, the Board shall adopt a budget. Thereafter, a budget shall be adopted no later than June 30 of the preceding fiscal year. The budget shall be adopted in accordance with Section 4.7 of this Agreement.

5.6 **Alternate Funding Sources.** The Board may obtain State of California or federal grants but shall not create indebtedness without securing a Dedicated Revenue Stream.

5.7 **Depositary.** The Treasurer of the County of San Joaquin shall (i) be the depositary of the Authority, (ii) have custody of all funds of the Authority, and (iii) have the duties and obligations of the Treasurer as set forth in Government Code Sections 6505, 6505.1 and 6505.5. All funds of the Authority shall be held in separate accounts in the name of the Authority and shall not be commingled with funds of any Member or any other person or entity.

5.8 **Accounting.** Full books and accounts shall be maintained for the Authority in accordance with practices established by, or consistent with, those utilized by the Controller of the State of California for like public entities. The books and records of the Authority shall be open to inspection by the Members at all reasonable times, and by bondholders and lenders as and to the extent provided by resolution or indenture.

5.9 **Auditor.** The Auditor of the County of San Joaquin shall have the duties and obligations as Auditor of the Authority as set forth in Government Code Sections 6505 and 6505.5. The Auditor shall ensure strict accountability of all receipts and disbursements of the Authority and shall make arrangements with a qualified firm to perform an annual audit of the accounts and records of the Authority. Copies of such annual audit reports shall be filed with the State Controller and each Member within six months of the end of the fiscal year under examination.

5.10 **Expenditures.** All expenditures within the designations and limitations of the applicable approved budget shall be made upon the approval of any officer so authorized by the Authority Board of Directors. The Treasurer shall draw checks or warrants or make payments by other means for claims or disbursements not within an applicable budget only upon the approval and written order of the Board. The Board shall requisition the payment of funds only upon approval of claims or disbursements and requisition for payment in accordance with policies and procedures adopted by the Board.

5.11 **Initial Staffing Contributions.** The Authority initially intends to contribute to the goals and objectives identified in this Agreement by utilizing the staff of Members at the Members' own cost to pursue those operations, investigations and programs. It is intended that no indebtedness be created unless funding is secured by a Dedicated Revenue Stream.

ARTICLE 6: CHANGES TO MEMBERSHIP, WITHDRAWAL AND TERMINATION

6.1 **Changes to Membership.** The Authority Board of Directors will have the authority to (1) approve the addition of new members to the Authority, and (2) remove a Member involuntarily, in accordance with this Article. In the event of the approval of new Members or the involuntary removal of an existing Member, the Members (and any new Members) shall execute an addendum or amendment to this Agreement describing all changes in Members. In the event of the involuntary removal of a Member the removed Member shall remain fully responsible for its proportionate share of all liabilities incurred by the Authority prior to the effective date of the removal.

6.2 **Noncompliance.** In the event any Member (1) fails to comply with the terms of this Agreement, or (2) undertakes actions that conflict with or undermine the functioning of the Authority or the preparation or implementation of the GSP, such Member shall be subject to the provisions for involuntary removal of a Member set forth in of Section 6.3 of this Agreement. Such actions of a Member shall be as determined by the Board of Directors and 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.

6.3 **Involuntary Termination.** The Members acknowledge that SGMA requires that multiple GSAs within Bulletin 118 groundwater basins designated as high- or medium-priority must coordinate, and are required to use the same data and consistent methodologies for certain required technical assumptions when developing a GSP, and that the entire Basin must be managed under one or more GSPs or an alternative in lieu of a GSP for the Basin to be deemed in compliance with SGMA. As a result, upon the determination by the Board of Directors that the actions of a Member (1) fail to comply with the terms of this Agreement, or (2) conflict with or undermine the functioning of the Authority or the preparation and implementation of the requirements of the GSP, the Board of Directors may terminate that Member's membership in this Authority, provided that prior to any vote to remove a Member involuntarily, all of the Members shall meet and confer regarding all matters related to the proposed removal. The Board of Directors shall terminate the membership in the Authority of any Member that fails, on or before June 30, 2017, to (i) elect to become a GSA duly established in accordance with SGMA, or (ii) participate, through a joint exercise of powers agreement or other legal agreement, in a GSA duly established in accordance with SGMA.

6.4 **Withdrawal of Members.** A Member may, in its sole discretion, unilaterally withdraw from the Authority, effective upon ninety (90) days' prior written notice to the Authority, provided that (a) the withdrawing Member will remain responsible for its proportionate share of any obligation or liability duly incurred by the Authority, in accordance with Article 5.1. A withdrawing Member will not be responsible for any obligation or liability that the Member has voted against at a Board meeting, providing that such Member shall give notice of its withdrawal from the Authority as soon after voting against the proposal as is practicable. Without limiting the generality of the previous sentence, in the event that the Authority levies or adopts any tax, assessment or property-related fee or charge (collectively "Authority Charge") the Authority Charge will not be effective within the jurisdictional boundaries of a Member that votes against the Authority Charge and withdraws in accordance with this Article 6.4. In the event the withdrawing Member has any rights in any property or has incurred obligations to the Authority, the Member 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 Authority. The Authority may not sell, lease, transfer or use any rights of a Member who has withdrawn without first obtaining the written consent of the withdrawing Member. Notwithstanding any other provision of this Agreement, if a Member fails to take action, on or before June 30, 2017, to (i) elect to become a GSA, or (ii) join in a GSA that is a member of the Authority, that Member shall withdraw from the Authority and this Agreement in accordance with this Article 6.4.

6.5 **Termination.** This Agreement and the Authority may be terminated by a majority vote of the Members. However, in the event of termination each of the Members will remain responsible for its proportionate share of any obligation or liability duly incurred by the Authority, in accordance with Article 5.1. Nothing in this Agreement will prevent the Members from withdrawing as provided in this Agreement, or from entering into other joint exercise of power agreements.

6.6 **Disposition of Property Upon Termination.** Upon termination of this Agreement, the assets of the Authority shall be transferred to the Authority's successor, provided that a public entity will succeed the Authority, or in the event that there is no successor public entity, to the Members in proportion to the contributions made by each Member. If the successor public entity will not assume all of the Authority's assets, the Board shall distribute the Authority's assets between the successor entity and the Members in proportion to the any obligation required by Articles 5.1 or 5.6.

6.7 **Rights of Member to Become GSA in Event of Withdrawal or Termination.** Upon withdrawal or involuntary termination of a Member, or termination of this Agreement pursuant to Article 6.5, whether occurring before or after June 30, 2017, the withdrawing or terminated Member will retain all rights and powers to become or otherwise participate in a GSA for the lands within its boundaries. In such event the Authority and its remaining Members (i) shall not object to or interfere with the lands in the withdrawing or terminated Member's boundaries being in a GSA, as designated by the withdrawing or terminated Member or otherwise, (ii) shall facilitate such transition to the extent reasonably necessary, and (iii) shall withdraw from managing that portion of the Basin within the boundaries of the withdrawing or terminating Member and so notify the California Department of Water Resources.

6.8 **Use of Data.** Upon withdrawal, any Member shall be entitled to use any data or other information developed by the Authority during its time as a Member. Further, should a Member withdraw from the Authority after completion of the GSP, it shall be entitled to utilize the GSP for future implementation of SGMA within its boundaries.

ARTICLE 7: SPECIAL PROJECTS

7.1 Fewer than all of the Members may enter into a special project agreement to achieve any of the purposes or activities authorized by this Agreement, and to share in the expenses and costs of such special project, for example, to share in funding infrastructure improvements within the boundaries of only those Members and their Management Areas. Special project agreements must be in writing and documentation must be provided to each of the Members to this Agreement.

7.2 Members that enter into special project agreements agree that any special project expenses incurred for each such special project are the costs of the special project participants, respectively, and not of any other Members to this Agreement not participating in the special project, and the special project expenses shall be paid by the parties to the respective special project agreements.

7.3 Members participating in special project agreements, if conducted by the Authority, shall hold each of the other parties to this Agreement who are not parties to the special project

agreement free and harmless from and indemnify each of them against any and all costs, losses, damages, claims and liabilities arising from the special project agreement. The indemnification obligation of Members participating in special project agreements shall be the same as specified in Article 8.1 for Members in general, except that they shall be limited to liabilities incurred for the special project.

ARTICLE 8: MISCELLANEOUS PROVISIONS

8.1 **Indemnification**. The Authority shall hold harmless, defend and indemnify the Members, 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 Authority, or its agents, officers and employees under this Agreement. These indemnification obligations shall continue beyond the Term of this Agreement as to any acts or omissions occurring before or under this Agreement or any extension of this Agreement.

8.2 **Amendments.** This Agreement may be amended from time to time by a unanimous vote of the Members.

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

8.4 **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. On the signature page of this Agreement, each party shall provide contact information for the purpose of notification.

8.5 **Counterparts.** This Agreement may be executed by the Members 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.

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

8.7 **Severability.** If one or more clauses, sentences, paragraphs or provisions of this Agreement is held to be unlawful, invalid or unenforceable, it is hereby agreed by the Members 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.

8.8 **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 Members to this Agreement.

8.9 **Construction and Interpretation.** This Agreement has been arrived at through negotiation and each Member 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 Member shall not apply in the construction or interpretation of this Agreement.

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

IN WITNESS WHEREOF, the parties hereto have caused Agreement to be executed on the day and year set opposite the name of the parties:

CHARLES WINN, Chair
Board of Supervisors
of the County of San Joaquin,
State of California

MIMI DUZENSKI
Clerk of the Board of Supervisors
of the County of San Joaquin,
State of California

By _____
Clerk

APPROVED AS TO FORM:

By _____
LAWRENCE P. MEYERS
Deputy County Counsel

Eastern San Joaquin Groundwater Authority JPA

ATTEST:

CLERK

SOUTH DELTA WATER AGENCY

John Herrick, March 1, 2017

John Herrick, Counsel & Manager
Printed Name and Title

4255 Pacific Avenue Suite 2
Stockton, CA 95207
Address

jherrlaw@aol.com
E-Mail

Phone: (209) 956-0150

Fax: (209) 956-0154

ATTEST:

CLERK

Stockton East Water District
AGENCY LEGAL NAME

Thomas McGurk 3/7/17
By: Signature Date

Thomas McGurk
Printed Name

President
Title

P.O. Box #5157
Address

Stockton / CA / 95215
City/State/Zip

smoody@sewd.net
Email

(209) 948.0423
Fax

ATTEST:

Joseph Salzman

CLERK

Lockeford Community Services District

AGENCY LEGAL NAME

Gary Gordon 7 Nov. 2017

By: Signature Date

Gary Gordon

Printed Name

Lockeford CSD Board President

Title

17725 Tully Road

Address

Lockeford CA 95237

City/State/Zip

lcsd@softcom.net

Email

n/a

Fax

ATTEST:

CLERK

CSJWCD

AGENCY LEGAL NAME

By: Signature Date 3-9-17

Grant Thompson

Printed Name

President

Title

11 S. San Joaquin St. #306

Address

Stockton, CA 95202

City/State/Zip

Email

209-466-7953

Fax

ATTEST:

CLERK

OAKDALE IRRIGATION DISTRICT
AGENCY LEGAL NAME

By: Signature

3/10/17
Date

Steve Knell, P.E.
Printed Name

General Manager
Title

1205 East F Street
Address

Oakdale, CA 95361
City/State/Zip

srknell@oakdaleirrigation.com
Email

(209) 847-3468
Fax

ATTEST:

CLERK Dante John Nomellini
Manager

CENTRAL DELTA WATER AGENCY
AGENCY LEGAL NAME

By: Signature 3-14-17
Date

George Biagi Jr.
Printed Name

President
Title

P.O.Box 1461
Address

Stockton, CA95201
City/State/Zip

ngmplcs@pacbell.net
Email

209-465-3956
Fax

ATTEST:

CLERK Teresa Vargas

City of Lathrop

AGENCY LEGAL NAME

By: Signature 3-16-17 Date

Stephen J. Salvatore

Printed Name

City Manager

Title

390 Towne Centre Drive

Address

Lathrop, CA 95330

City/State/Zip

ssalvatore@ci.lathrop.ca.us

Email

(209)941-7248

Fax

ATTEST:

CLERK

WOODBRIDGE IRRIGATION DISTRICT GSA
AGENCY LEGAL NAME

4-13-2017
By: Signature Date

ANDERS CHRISTENSEN
Printed Name

MANAGER
Title

18750 N. LOWER SACRAMENTO RD.
Address

WOODBRIDGE, CA. 95258
City/State/Zip

widirrigation@gmail.com
Email

(209) 625-8663
Fax

ATTEST:

Mona Walker
CLERK

Calaveras County Water District
AGENCY LEGAL NAME

4/18/17
By: Signature Date

Jeff Davidson
Printed Name

Board President
Title

PO Box 846
Address

San Andreas, CA 95249
City/State/Zip

administration@ccwd.org
Email

(209)754-1069
Fax

Eastern San Joaquin Groundwater Authority JPA

ATTEST:

JENNIFER M. FERRAIOLO
City Clerk

APPROVED AS TO FORM:

JANICE D. MAGDICH
City Attorney

CITY OF LODI, a municipal corporation

By: STEPHEN SCHWABAUER Date
City Manager

P.O. Box 3006
Lodi, California 95241
sschwabauer@lodi.gov
Fax: (209) 333-6807

Eastern San Joaquin Groundwater Authority JPA

ATTEST:

Barbara Kascht

BARBARA KASCHT
District Secretary

LINDEN COUNTY WATER DISTRICT

Clifford Powell

CLIFFORD POWELL, President
Board of Directors, Linden County Water District

April 20, 2017
Date

Linden County Water District
18243 Highway 26
P.O. Box 595
Linden, California 95236
rmblrmn@aol.com

APPROVED AS TO FORM:

MIA S. BROWN
District Legal Counsel

ATTEST:

CLERK/Secretary

North San Joaquin Water Conservation District
AGENCY LEGAL NAME

By: Signature Date

Joe Valente
Printed Name

President
Title

Address

City/State/Zip

Email

Fax

ATTEST:

CLERK

APPROVED AS TO FORM

By
JOHN BRINTON
City Attorney

City of Manteca
AGENCY LEGAL NAME

By: Signature Date

Stephen F. DeBrum
Printed Name

Mayor
Title

1001 W. Center St., Ste. B
Address

Manteca, CA 95337
City/State/Zip

mayorcounclerk@ci.manteca.ca.us
Email

209-923-8960
Fax

South San Joaquin
Groundwater Sustainability Agency

ATTEST:

AGENCY LEGAL NAME

CLERK

By: Signature Date

Robert A. Holmes
President

Title

11011 E. Highway 120
Manteca CA 95336

rholmes@ssjid.com

Email

209-249-4652

Fax

ATTEST:

Carol Smith

CLERK

CITY OF STOCKTON
AGENCY LEGAL NAME

10/4/17

By: Signature Date

KURT WILSON

Printed Name

Kurt O. Wilson

Title City Manager

425 N. El Dorado

Address

Stockton, CA 95204

City/State/Zip

Email

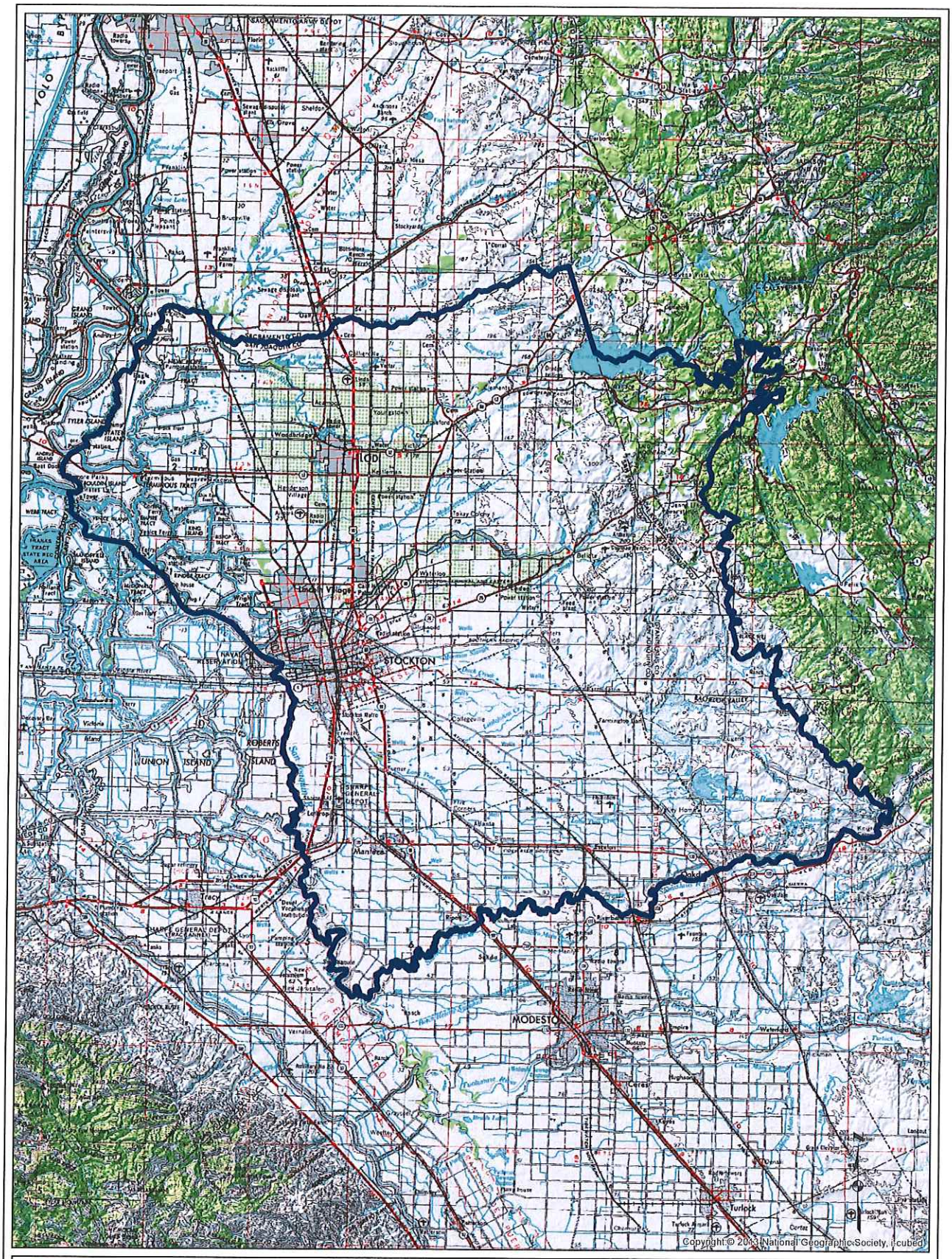
209-937-7149

Fax

APPROVED AS TO FORM AND CONTENT

By

City Attorney



Eastern San Joaquin Groundwater Subbasin

Eastern San Joaquin Groundwater Subbasin

-- Eastern San Joaquin Groundwater Authority "Exhibit A" --

SAN JOAQUIN COUNTY

Department of Public Works, 1810 E. Hazelton Ave., Stockton, CA 95205

The County of San Joaquin does not warrant the accuracy, completeness, or suitability for any particular purpose.
The Information on this map is not intended to replace engineering, financial or primary records research.

Public Works
Working for YOU

Date 3/07/17

EASTERN SAN JOAQUIN GROUNDWATER AUTHORITY BYLAWS

Adopted August 9, 2017

BYLAWS
OF
EASTERN SAN JOAQUIN GROUNDWATER AUTHORITY

ARTICLE I
NAME

This joint powers agency shall be known as the EASTERN SAN JOAQUIN GROUNDWATER AUTHORITY ("Authority") and shall exercise its powers within the geographical area of the Eastern San Joaquin Subbasin as set forth in the joint powers agreement entered into by Calaveras County Water District on behalf of all the members of the Eastside San Joaquin Groundwater Sustainability Agency, Central Delta Water Agency, Central San Joaquin Water Conservation District, City of Lathrop, City of Lodi, City of Manteca, City of Stockton, Linden County Water District, Lockeford Community Services District, North San Joaquin Water Conservation District, Oakdale Irrigation District, San Joaquin County, South Delta Water Agency, South San Joaquin Groundwater Sustainability Agency, Stockton East Water District, and Woodbridge Irrigation District GSA ("Member" or collectively "Members") establishing Authority.

ARTICLE II
PURPOSE

The purposes of Authority as set forth in the joint powers agreement are for the following reasons:

A. Provide for coordination among the Members to develop and implement a Groundwater Sustainability Plan (GSP) and/or facilitate a coordination agreement, to the extent necessary;

B. Provide for the joint exercise of powers common to each of the Members and powers granted to members by the Sustainable Groundwater Management Act (SGMA) (subject to the restrictions contained in the joint powers agreement);

C. Cooperatively carry out the purposes of SGMA;

D. Develop, adopt and implement a legally sufficient GSP covering those portions of the Basin that are within the jurisdictional boundaries of the Members, subject to the limitations set forth in the joint powers agreement; and

E. Satisfy the requirements of SGMA for coordination among Groundwater Sustainability Agencies (GSAs).

F. Allocation of Resources. The Members share common mission and issues, and at the same time, have different needs and priorities and are affected in different ways by these

issues. The resources of Authority should be allocated in a manner so that the needs of any portion of the area within the jurisdictional boundaries of the Authority are not ignored, recognizing, however, that resources are limited and that not all needs can be met, nor all portions of the area assisted equally at any one time.

ARTICLE III
MEMBERSHIP

Section 1. Board. Authority shall be governed by a Board of Directors, herein referred to as the "Authority Board" or "Board", which shall be comprised of:

A. One (1) member appointed from each of the Members. Members of the Board of Directors are not required to be members of the governing board of the appointing Member; however, it is the strong preference that members of the Board of Directors be members of the governing board of the appointing party.

B. In the event Members establish a separate or additional GSA pursuant to a separate agreement with any Member or other entity, the GSA so established will thereafter have one representative on the Board of Directors and the vote of the GSA member will be exercised in accordance with the separate agreement (*e.g., Memorandum of Agreement*).

Section 2. Appointment. Members shall be appointed by the governing body of each Member, or in the event any Member establishes a single GSA with another Member or other entity, pursuant to the separate agreement, and shall serve at the pleasure of their appointing body or bodies or until their respective successors are appointed. If a Member of the Board of Directors is a member of the governing body of the appointing member, termination of that member's mayor, councilperson, supervisor, director or trustee status shall constitute automatic termination of that person's membership on the Authority Board. The appointing body of a Member may appoint a new member or alternate immediately upon any vacancy in the Member's representation.

Section 3. Alternates. The governing body of each Member, or in the event any Member establishes a single GSA with another Member or other entity, pursuant to the separate agreement, shall appoint an alternate member to the Authority Board. The alternate need not be a member of the governing board of the appointing member. During the absence of a regular member from any meeting of the Authority Board, the alternate shall be entitled to participate in all respects as a regular member of the Authority Board.

ARTICLE IV
OFFICERS

Section 1. Elected Officers.

The elected officers shall be chosen by the Board from the members of the Board and shall consist of a Chair and a Vice-Chair.

Section 2. Terms of Elected Officers.

Elected officers of the Board shall be elected by the Board at the June meeting and shall serve for a two (2) year term, said term to commence upon election.

Section 3. Duties of Elected Officers.

A. Chair.

1. The Chair shall preside at all meetings of the Board and such other meetings approved by the Board.

2. The Chair shall serve as official spokesperson for the Board.

3. The Chair shall appoint such committees and other working groups as prescribed by the Board.

4. The Chair shall designate Directors or others to represent the Board at various meetings, hearings, and conferences.

5. The Chair shall perform such other duties as necessary to carry out the work of the Board.

6. The Chair shall perform such duties as prescribed by law.

B. Vice-Chair.

1. The Vice-Chair shall serve in the absence of the Chair.

C. Absences.

1. In the absence of both the Chair and Vice-Chair, a majority of the Board shall select a Director to serve as Chair Pro Tem.

ARTICLE V
MEETINGS

Section 1. Regular and Special Meetings.

A. The Authority Board shall hold a regular meeting on the second Wednesday of each month, at 9:30 a.m., or at a time, specified by the Authority Board. The Authority's Board may designate the location of such regular meetings in a duly adopted Resolution of the Authority Board. Such regular meetings shall be for considering reports of the affairs of Authority and for transacting such other business as may be properly brought before the meeting. Any regular meeting may be rescheduled on an individual basis as to date, time and place, by motion of the Authority Board or at the direction of the Authority Secretary, in the event of a

conflict with holidays, Directors' schedules, or similar matters, or, in the event of a lack of a quorum, as specified below.

B. Special meetings may be called in accordance with the California Ralph M. Brown Act. Special meetings may be called by the Chair, or by any nine Directors.

C. All meetings shall be conducted in accordance with the Ralph M. Brown Act.

Section 2. Closed Sessions.

A. All information presented in closed session shall be confidential.

B. Under Government Code section 54956.96, Authority adopts a joint powers agency limited disclosure policy as follows:

1. All information received by the legislative body of the local agency member in a closed session related to the information presented to Authority in closed session shall be confidential. However, a member of the legislative body of a member local agency may disclose information obtained in a closed session that has direct financial or liability implications for that local agency to the following individuals:

(a). Legal counsel of that member local agency for purposes of obtaining advice on whether the matter has directed financial or liability implications for that member local agency.

(b). Other members of the legislative body of the local agency present in a closed session of that member local agency.

2. Any designated alternate member of the legislative body of the Authority who is also a member of the legislative body of a local agency member and who is attending a properly noticed meeting of the joint powers agency in lieu of a local agency member's regularly appointed member may attend closed sessions of Authority.

Section 3. Quorum.

A. A quorum for conducting all matters of business shall be a majority of the Members.

Section 4. Voting.

A. Voting shall only be conducted at properly noticed meeting where a quorum has been established and members are physically present, except as provided in Government Code section 54953 for teleconferencing.

B. Voting shall be by voice, show of hands, or roll call vote. Any Director may request a roll call vote.

C. In all cases, a vote to "abstain" shall be counted as an "aye" vote unless there is a majority vote to defeat the motion and then the vote to abstain shall be counted as a "no" vote.

D. Supermajority Vote Requirement for Certain Actions. The following actions will require two-thirds (2/3) vote by the directors present:

1. Approval or modification or amendment of the Authority's annual budget;

2. Decision related to the levying of taxes, assessments or property-related fees and charges;

3. Decisions related to the expenditure of funds by the Authority beyond expenditures approved in the Authority's annual budget;

4. Adoption of rules, regulations, policies, bylaws and procedures related to the function of the Authority;

5. Decisions related to the establishment of the Members' percentage obligations for payment of the Authority's operating and administrative costs as provided in Article 5.1 of the joint powers agreement;

6. Approval of any contracts over $250,000 or contracts for terms that exceed two (2) years;

7. Setting the amounts of any contributions or fees to be paid to the Authority by any Member;

8. Decisions regarding the acquisition by any means and the holding, use, sale, letting and disposal of real and personal property of every kind, including lands, water rights, structures, buildings, rights-of-way, easements, and privileges, and the construction, maintenance, alteration and operation of any and all works or improvements, within or outside the Authority, necessary or proper to carry out any of the purposes of the Authority;

9. Decisions related to the limitation or curtailment of groundwater pumping; and

10. Approval of a GSP.

Section 5. Notice of Regular and Special Meetings.

A. Notices of regular meetings shall be sent in writing to each Director at the Director's address at least seventy-two (72) hours prior to such meetings. Directors may choose to receive notices of regular meetings electronically and such electronic notices shall also be sent at least seventy-two (72) hours prior to such meetings. Such notices shall specify the place, the

day, and the hour of the meeting and accompanying the notice shall be a copy of the agenda for that meeting.

B. In the case of special meetings, the written or electronic notice shall specify the specific nature of the business to be transacted.

Section 6. Lack of Quorum.

A. If less than a quorum of the Directors are present at any properly called regular, adjourned regular, special, or adjourned special meeting, the member(s) who are present may adjourn the meeting to a time and place specified in the order of adjournment. A copy of the order or notice of adjournment shall be conspicuously posted on or near the door of the place where the meeting was to have been held within 24 hours after adjournment.

B. If all the members are absent from any regular or adjourned regular meeting, the Administrator of the Authority may so adjourn the meeting and post the order or notice of adjournment as provided, and additionally shall cause a written notice of the adjournment to be given in the same manner as for a notice of a special meeting.

C. If the notice or order of adjournment fails to state the hour at which the adjourned meeting is to be held, it shall be held at the hour specified for the regular meeting of Authority.

Section 7. Agenda.

Any Director or the Administrator may cause an item to be placed on the agenda.

Section 8. Adjournment.

Except as provided in Section 6 above, a meeting may be adjourned by the presiding officer's own action; however, any Director may object to such adjournment by the presiding officer and then a motion and action is required in order to adjourn the meeting in accordance with Rosenberg's Rules of Order.

Section 9. Decorum.

All Directors, and staff, shall conduct themselves in accordance with Rosenberg's Rules of Order and in a civil and polite manner toward other board members, employees, and the public. Using derogatory names, interrupting the speaker having the floor, or being disorderly or disruptive, are prohibited actions. If any meeting is willfully interrupted by any individual so as to render the orderly conduct of that meeting infeasible, that individual may be removed from the meeting. If any group or groups of persons willfully interrupts a meeting so as to render the orderly conduct of that meeting infeasible, the presiding officer, or a majority of the Board, may clear the meeting room in accordance with Government Code section 54957.9.

ARTICLE VI
COMMITTEES

Section 1. Advisory Committee.

A. The Board may establish an Advisory Committee which contains no more than 8 representatives from the Board of the Authority.

B. The members of the Advisory Committee shall elect one (1) of their members to serve as Chairperson.

C. A majority of the Advisory Committee members attending a meeting of the Committee, given notice in writing not less than 72 hours in advance, shall constitute a quorum for discussion and action delegated to the Committee.

D. The Advisory Committee shall conduct the preliminary review of all Federal and State mandates. In conducting such reviews, the Advisory Committee will draw upon the expertise and assistance of any persons, committees, groups, or agencies it deems appropriate.

E. The Advisory Committee shall ensure maximum inter-agency coordination and consistence with adopted comprehensive plans.

F. The Advisory Committee shall carry out any duties as assigned by the Authority Board.

Section 2. Other Committees.

The Authority Board may appoint other committees as necessary. The Chair may appoint ad hoc committees.

ARTICLE VII
REFERRALS

The San Joaquin County may accept by letter or resolution referrals for study and report from any duly constituted advisory or legislative body or their representatives. Reports will be made and returned to the referring body within a reasonable time.

ARTICLE VIII
PARLIAMENTARY AUTHORITY

Rosenberg's Rules of Order, current edition or such other authority as may be subsequently adopted by resolution of the Board is to apply to all questions of procedure and parliamentary law not specified in these Bylaws or otherwise by law.

ARTICLE IX
MISCELLANEOUS

In the case of any inconsistency between the provision of these Bylaws and the Joint Powers Agreement creating the Authority, the provisions of the Joint Powers Agreement shall govern and control. Any capitalized term used in these Bylaws and not defined herein shall have the same meaning as used in the Joint Powers Agreement.

ARTICLE X
AMENDMENTS

The Bylaws may be repealed or amended, or new Bylaws may be proposed, by the affirmative vote of two-thirds of the Board of Directors present on a resolution presented at any regular meeting of the Board, provided notice of such proposal shall have been electronically mailed to each Director at least five (5) calendar days prior to the meeting at which the matter is to be acted upon.

APPENDIX 1-B.
LEGAL AUTHORITY OF EASTERN SAN JOAQUIN GSAS

Central Delta Water Agency – The Central Delta Water Agency (CDWA) was formed by act of the California Legislature (Stats.1973, c. 1133). Among the general purposes is to assure the lands within the agency a dependable supply of water of suitable quality sufficient to meet present and future needs. A portion of the area within the Central Delta Water Agency overlies the San Joaquin Valley Groundwater Basin, Eastern San Joaquin Subbasin DWR Basin No. 5-22.01. Although the CDWA area is primarily served with surface water there are a small number of wells serving mostly domestic use. The CDWA has elected to become a GSA for such area within the Subbasin excepting those portions overlapping the Woodbridge Irrigation District, the Stockton East Water District, the City of Stockton and those San Joaquin County areas intermixed within the City of Stockton. For this GSA area, CDWA has the additional powers and authorities provided in Chapter 5 of Part 2.74 of Division 6 of the California Water Code.

Central San Joaquin Water Conservation District – Central San Joaquin Water Conservation District is a California Water Conservation District formed under Division 21 of the California Water Code with all power and authority set forth therein. CSJWCD has elected to become a GSA as to all the area within its boundary and has all power and authority provided in Chapter 5 of Part 2.74 of Division 6 of the California Water Code.

City of Lodi – The City of Lodi (Lodi) is a California municipal corporation and a local agency as that term is defined by SGMA. As a local agency, Lodi elected to become a GSA for that portion of the Eastern San Joaquin Groundwater Subbasin which overlies the area bounded by the Lodi City limits. Notice of Lodi's GSA election was timely filed with DWR as required by SGMA. As a GSA, Lodi has the additional powers and authorities set forth in Chapter 5 of Part 2.74 of Division 6 of the California Water Code.

City of Manteca – The City of Manteca is an urban water supplier as defined in California Water Code Section 10617. The City of Manteca elected to become a GSA within city limits. As a GSA, the City of Manteca has additional powers and authorities provided in the California Water Code Division 6, Part 2.74, Chapter 5.

City of Stockton – The City of Stockton (City) is a municipal corporation organized under a Charter pursuant to Government Code section 34101. The City has the power to make and enforce all ordinances and regulations in respect to municipal affairs within its jurisdictional area, subject only to the restrictions of and limitations provided in its Charter, the Constitution of the State of California and of the United States.

The City is a local agency as defined by SGMA. The City has water rights, supply, management and land use responsibilities within the Eastern San Joaquin Subbasin (designated as basin number 5-22.01 in the California Department of Water Resources Bulletin 118 basin system) under Water Code section 10721(n). The City's jurisdiction overlies a portion of the Basin that has been designated as a high-priority basin, subject to critical conditions of overdraft which must be managed by a GSP pursuant to Water Code section 10720.7(a)(1) and all other applicable laws.

In addition, Water Code section 10723.6 authorizes a combination of local agencies to form a GSA. The City of Stockton acknowledged its intent to become a GSA and participate in the formation of the Eastern San Joaquin Groundwater Authority (Resolution No. 2015-12-08-1602); approved by the City Council on December 8, 2015.

Eastside GSA – The Eastside San Joaquin Groundwater Sustainability Agency is a multi-agency GSA and includes the County of Calaveras, the County of Stanislaus, Calaveras County Water District, and Rock Creek Water District and was formed by Memorandum of Understanding pursuant to Water Code section 10723.6(a). Separate from the powers conferred to each member agency by their respective enabling acts, the Eastside San Joaquin GSA has the additional powers and authorities provided to GSAs as specified in Part 2.74 of Division 6 of the California Water Code.

Linden County Water District – Linden County Water District (LCWD) is a County Water District established pursuant to and conferred with all powers provided by Division 12 of the California Water Code. LCWD is defined as a local agency within the meaning of the Groundwater Sustainability Management Act, and pursuant to same, has elected to become a GSA for its jurisdictional area.

Lockeford Community Services District – Lockeford Community Services District is a California community services district with all powers and authorities conferred by Government Code sections 61000 to 61250, including the power to supply water for beneficial uses. Lockeford has elected to become a GSA for its service area, and within that area, Lockeford has the additional powers and authorities provided in the California Water Code sections 10725 to 10726.9.

North San Joaquin Water Conservation District – North San Joaquin Water Conservation District is a California Water Conservation District with all powers and authorities conferred through Division 21 of the California Water Code. NSJWCD has elected to become a GSA as to the majority of its jurisdictional area (excluding the portions in the City of Lodi and Lockeford Community Services District). For this GSA area, NSJWCD has the additional powers and authorities provided in Chapter 5 of Part 2.74 of Division 6 of the California Water Code.

San Joaquin County #1 and #2 – The County of San Joaquin (County) is a local public agency as defined under SGMA (Water Code section 10720 et seq.) and is authorized to serve as a GSA and implement the provisions of SGMA. The County elected to become a GSA for those portions within the Eastern San Joaquin and Tracy Subbasin as defined in DWR Bulletin 118 unrepresented by another GSA, and also including the Lincoln Village and Colonial Heights unincorporated islands within the Stockton Metropolitan Area, and the unincorporated portion of the California Water Service Company service area. The County, in addition to the powers and authorities granted pursuant to SGMA, has all of the powers and authorities granted pursuant to Government Code sections 23000–33205, particularly sections 25690–25699 as it pertains to a water system for inhabitants of the County. As it pertains to the County GSA's participation in the Eastern San Joaquin Groundwater Authority, a joint powers authority created pursuant to Government Code section 6500 et seq., the County is authorized to participate in accordance with the terms of the aforementioned statute.

Oakdale Irrigation District – Oakdale Irrigation District (OID) is an Irrigation District formed pursuant to the provisions of Division 11 of the California Water Code. OID has elected to become a GSA for that portion of its jurisdictional area lying north of the Stanislaus River. For this GSA area, OID has the additional powers and authorities provided in Chapter 5 of Part 2.74 of Division 6 of the California Water Code.

Stockton East Water District – Stockton East Water District (SEWD) is a California Water Conservation District formed by special act of the California legislature, holding the powers set forth in that special act as well as all consistent powers and authorities conferred through Division 21 of the California Water Code. SEWD elected to become a GSA as to the majority of its jurisdictional area (excluding the portions in the City of Stockton service area and Linden County Water District). For its GSA area, SEWD has the additional powers and authorities provided in Chapter 5 of Part 2.74 of Division 6 of the California Water Code.

South Delta Water Agency – South Delta Water Agency is a political division of the State of California created by the California Legislature under the South Delta Water Agency Act, chapter 1089 of the statutes of 1973 (Water Code, Appendix, 116-1.1 et.seq.). The South Delta Water Agency has elected to become a GSA as to those areas within its boundaries on the east side of the San Joaquin River (not otherwise in any other GSA). The South Delta Water Agency has the additional powers and authorities provided in Chapter 5 of Part 2.74 of Division 6 of the California Water Code.

South San Joaquin GSA – The South San Joaquin GSA (SSJ GSA) is a multi-agency GSA comprised of the cities of Escalon and Ripon and the South San Joaquin Irrigation District. The cities of Escalon and Ripon are incorporated

cities operating independent municipal drinking water systems primarily served by municipal wells. SSJID is an irrigation district serving irrigation water to approximately 57,000 acres and treated drinking water to the cities of Manteca, Lathrop and Tracy. All three SSJ GSA entities are local public agencies and therefore eligible to independently become GSAs. The three entities have signed a Memorandum of Agreement to establish the multi-agency SSJ GSA. The entities comprising the SSJ GSA are in the process of converting to a Joint Exercise of Powers Agency pursuant to Chapter 5 commencing with Section 6500 of Division 7 of Title 1 of the California Government Code.

Woodbridge Irrigation District – Woodbridge Irrigation District (WID) is an Irrigation District formed pursuant to the provisions of Division 11 of the California Water Code. WID has elected to become a GSA for that portion of its jurisdictional area lying south of South Kile Road, west of City of Lodi, and not including the San Joaquin County areas not part of WID. For this GSA area, WID has the additional powers and authorities provided in Chapter 5 of Part 2.74 of Division 6 of the California Water Code.

APPENDIX 1-C.
AGENCY RESOLUTIONS TO BECOME GSAS

RESOLUTION NO. 2017-3

RESOLUTION OF THE BOARD OF DIRECTORS OF THE CENTRAL DELTA WATER AGENCY ELECTING TO BECOME A GROUNDWATER SUSTAINABILITY AGENCY UNDER THE SUSTAINABLE GROUNDWATER MANAGEMENT ACT WITHIN THE EASTERN SAN JOAQUIN COUNTY SUB-BASIN

WHEREAS, the California Legislature and Governor Jerry Brown signed into law Senate Bills 1168 and 1319 and Assembly Bill 1739, known collectively as the Sustainable Groundwater Management Act (SGMA); and

WHEREAS, the Legislature adopted the Sustainable Groundwater Management Act of 2014, that went into effect on January 1, 2015, which authorizes local agencies to manage groundwater in a sustainable fashion; and

WHEREAS, the SGMA requires all high and medium priority groundwater basins, as designated by the California Department of Water Resources (DWR) Bulletin 118, to be managed by a Groundwater Sustainability Agency (GSA); and

WHEREAS, the Eastern San Joaquin County Groundwater Subbasin (Basin) has been designated by DWR as a high priority Basin; and

WHEREAS, the SGMA authorizes any local agency, or combination of local agencies overlying the Basin, to elect to become a GSA; and

WHEREAS, where more than one local agency overlies a groundwater basin, the SGMA calls on local agencies to cooperate to manage the Basin in a sustainable manner; and

WHEREAS, the Central Delta Water Agency (Agency) is a local agency as defined under the SGMA and is therefore eligible to serve as a GSA within the Basin; and

WHEREAS, Section 10723.2 of the SGMA requires that a GSA consider the interests of all beneficial uses and users of groundwater, as well as those responsible for implementing Groundwater Sustainability Plans (GSP); and

WHEREAS, Section 10723.8 of the SGMA requires that a local agency electing to be a GSA, notify the DWR of its election and intention to undertake sustainable groundwater management within the Basin, and

WHEREAS, it is the intent of the Agency to work cooperatively with other water agencies, the Stockton East Water District, the cities of Lodi and Stockton, the Woodbridge Irrigation District, the California Water Service and the County of San Joaquin, as may be appropriate, to manage the Basin in a sustainable fashion; and

Exhibit "B"

WHEREAS, the Agency has provided informal notice of its interest in serving as the GSA for its boundaries by means of communications with neighboring water agencies, cities and the County of San Joaquin; and

WHEREAS, the District provided public notice, pursuant to Government Code section 6066, of its intention to hold a hearing concerning its establishment of a GSA; and

WHEREAS, the Agency held a public hearing on February 14, 2017, to consider whether it should become the GSA for the portion of the Basin underlying a portion of its boundaries; and

WHEREAS, the Agency wishes to exercise the powers and authorities of a GSA granted by the SGMA.

NOW, THEREFORE, BE IT RESOLVED that the Board of Directors of the Central Delta Water Agency elects that the Central Delta Water Agency become a GSA for the portion of the Eastern San Joaquin Subbasin shown on Exhibit "A"; and

BE IT FURTHER RESOLVED that the boundaries of the GSA for which the Central Delta Water Agency intends to manage is for that area within the Agency's current boundaries as indicated in the map that is attached as Exhibit "A"; and

BE IT FURTHER RESOLVED that Agency staff are hereby directed to provide notice of this election to the DWR in the manner required by law, and

BE IT FURTHER RESOLVED that Agency staff are hereby directed to coordinate with neighboring GSAs that may be established in order to begin the process of developing a GSP for the Basin, as indicated by the SGMA.

PASSED AND ADOPTED by the Board of Directors of the Central Delta Water Agency at a regular meeting on February 14, 2017, by the following vote of the members thereof:

Ayes:	George Biagi, Jr. and Rudy Mussi
Noes:	None
Absent:	Eddie Zuckerman
Abstain:	None

George Biagi, Jr., President, Board of Directors

Attest:

Dante John Nomellini, Sr.
Manager and Co-Counsel

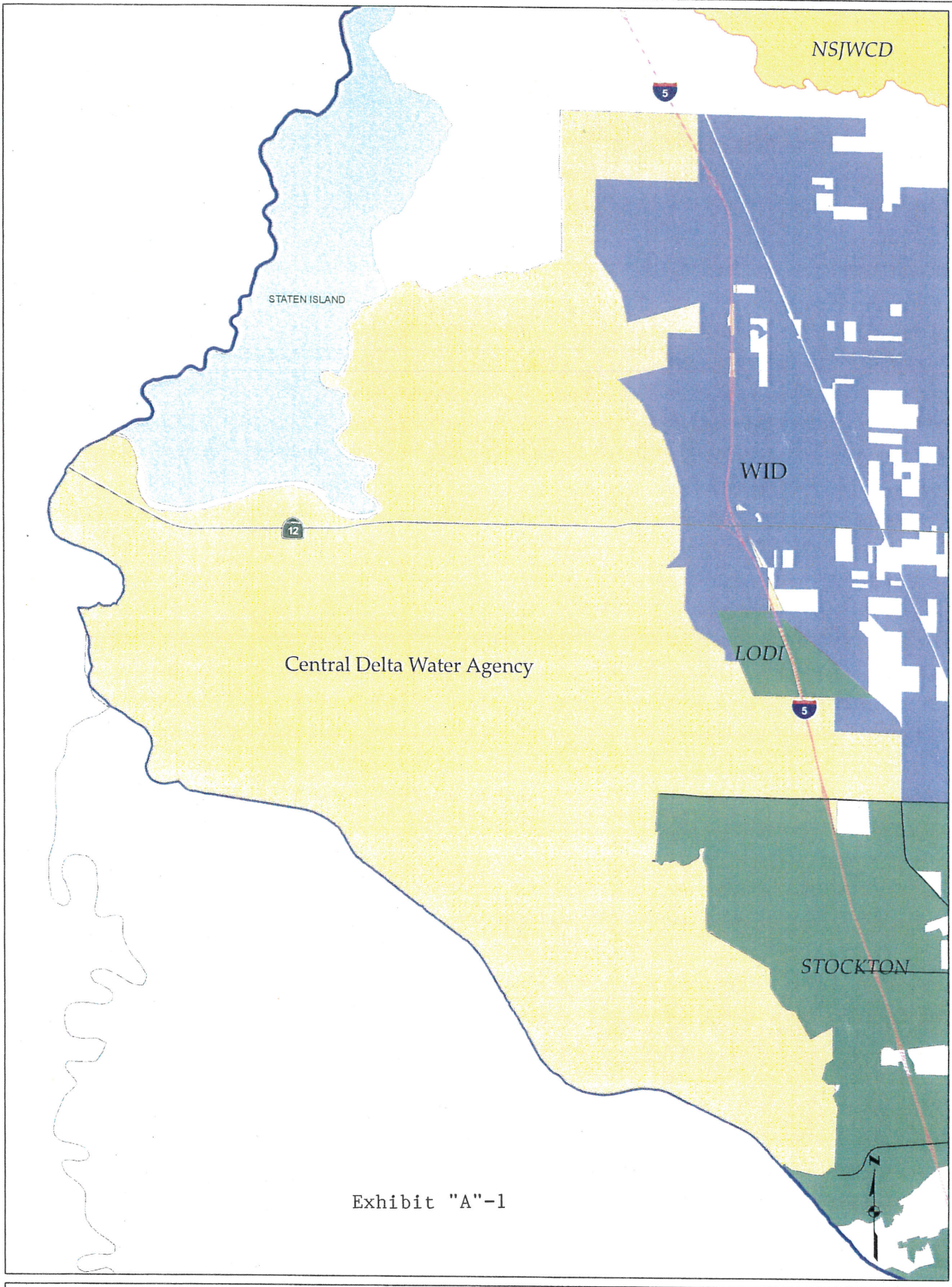
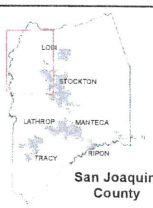


Exhibit "A"-1

CDWA | Eastern San Joaquin Groundwater Subbasin | County Limit

1 " = 7,120.1



Eastern San Joaquin Groundwater Subbasin
(Groundwater Sustainability Agencies)
- - VICINITY MAP - -

SAN JOAQUIN COUNTY
Department of Public Works, 1810 E. Hazelton Ave., Stockton, CA 95205
The County of San Joaquin does not warrant the accuracy, completeness, or suitability for any particular purpose.
The Information on this map is not intended to replace engineering, financial or primary records research.

Public Works
San Joaquin County
Working for YOU

Date: 02/09/2017 GD

RESOLUTION OF THE
CENTRAL SAN JOAQUIN WATER CONSERVATION DISTRICT
ELECTING TO BECOME A GROUNDWATER SUSTAINABILITY AGENCY
UNDER THE SUSTAINABLE GROUNDWATER MANAGEMENT ACT FOR
THE EASTERN SAN JOAQUIN GROUNDWATER BASIN
RESOLUTION 17-1

WHEREAS, the California Legislature and Governor Jerry Brown signed into law Senate Bills 1168 and 1319 and Assembly Bill 1739, known collectively as the Sustainable Groundwater Management Act (SGMA); and

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

WHEREAS, the SGMA requires all high- and medium-priority groundwater basins, as designated by the California Department of Water Resources (DWR) Bulletin 118, to be managed by a Groundwater Sustainability Agency (GSA) or multiple GSAs; and,

WHEREAS, the Eastern San Joaquin Groundwater Sub-basin has been designated by DWR as a high-priority basin and in critical groundwater overdraft; and,

WHEREAS, the SGMA authorizes a local public agency overlying a groundwater sub-basin to elect to become a GSA; and,

WHEREAS, the Central San Joaquin Water Conservation District (District) is a local public agency as defined under the SGMA and overlies a portion of the Eastern San Joaquin Groundwater Sub-basin and is therefore eligible to serve as a GSA; and,

WHEREAS, Section 10723.2 of the SGMA requires that a GSA consider the interests of all beneficial uses and users of groundwater, as well as those responsible for implementing groundwater sustainability plans; and,

WHEREAS, Section 10723.8 of the SGMA requires that a local public agency electing to be a GSA to notify the DWR of its election and intention to undertake sustainable groundwater management within a sub-basin; and,

WHEREAS, the District is committed to sustainable management of its groundwater resources; and,

WHEREAS, pursuant to Government Code Section 6066, notices of a public hearing regarding whether to adopt a Resolution to elect to become a GSA were published on January 10, 2017 and January 17, 2017 in The Record; and,

WHEREAS, the District held a public hearing on January 26, 2017, after publication of notice pursuant to Government Code section 6066 to consider adoption of this Resolution; and,

WHEREAS, the District wishes to exercise the powers and authorities of a GSA granted by the SGMA;

NOW THEREFORE BE IT RESOLVED that:

1. This Board of Directors of Central San Joaquin Water Conservation District hereby elects to become a GSA for those portions of San Joaquin County within the Eastern San Joaquin Groundwater Sub-basin as defined in DWR Bulletin 118, a copy of a map of the proposed management area is attached hereto as Exhibit A; and,
2. The boundaries of the GSA for which Central San Joaquin Water Conservation District intends to manage shall be its service area and the area within its sphere of influence which lie within the Eastern San Joaquin Groundwater Sub-basin; and,
3. The Board of Directors of Central San Joaquin Water Conservation District authorizes the Secretary of the District or his designee to, within 30 days from the date of this Resolution, provide notification of this election to the DWR, including a copy of this Resolution and additional information required by Water Code Section 10723.8, in the manner required by law; and,
4. The Board of Directors of Central San Joaquin Water Conservation District supports resolving boundary overlaps among electing GSAs and also supports exploring the establishment of a coordination agreement to organize electing GSAs; and,
5. The Board of Directors of Central San Joaquin Water Conservation District directs staff to enter into discussions with agencies electing to be GSAs to resolve boundary overlaps and to develop a coordination agreement that recognizes the authority of electing GSAs to implement and enforce a GSP within their respective boundaries.

PASSED AND ADOPTED by the Board of the Central San Joaquin Water Conservation District on the 26th, of January, 2017.

GRANT THOMPSON, President of Board
Of Directors, Central San Joaquin Water
Conservation District

I certify that this is a true copy of Resolution 17-1, as passed by the Board of Directors of the Central San Joaquin Water Conservation District at the regularly scheduled in Collegeville, California, on January 26th, 2017

Dated: January 26, 2017

REID W. ROBERTS, Secretary,
Central San Joaquin Water Conservation
District

Exhibit C

RESOLUTION NO. 2016-03

A RESOLUTION OF THE LODI CITY COUNCIL DECLARING THE FORMATION OF A GROUNDWATER SUSTAINABILITY AGENCY WITHIN LODI CITY LIMITS

==========

WHEREAS, the California legislature has adopted, and the Governor has signed into law, the Sustainable Groundwater Management Act of 2014 ("SGMA"), which authorizes local agencies to manage groundwater in a sustainable fashion; and

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

WHEREAS, in order to exercise the authority granted in SGMA, a local agency or combination of local agencies must elect to become a Groundwater Sustainability Agency ("GSA"); and

WHEREAS, the City of Lodi (the "City") is a local agency, as SGMA defines that term; and

WHEREAS, the City is committed to sustainable management of its groundwater resources, as shown by, among other actions, its conservation efforts and substantial community investment in conjunctive use infrastructure to establish groundwater sustainability; and

WHEREAS, the City overlies the Eastern San Joaquin Groundwater Basin (designated basin number 5-22.01) in the California Department of Water Resources' (DWR) groundwater basin system; and

WHEREAS, the Eastern San Joaquin Groundwater Basin has been designated by DWR as a high-priority basin in critical overdraft; and

WHEREAS, SGMA requires that a GSA be established for all basins designated by the Department of Water Resources by June 30, 2017; and

WHEREAS, it is the intent of the City to work cooperatively with other local GSAs, as may be appropriate, to sustainably manage a portion(s) of the Eastern San Joaquin Groundwater Basin that fall outside the City's jurisdiction; and

WHEREAS, Section 10723.2 of SGMA requires that a GSA consider the interests of all beneficial uses and users of groundwater, as well as those responsible for implementing groundwater sustainability plans; and

WHEREAS, Section 10723.8 of the SGMA requires that a local public agency electing to be a GSA to notify the DWR of its election and intention to undertake sustainable groundwater management within the agency's jurisdictional boundary; and

WHEREAS, pursuant to Government Code 6066, notice of a public hearing on the City's election to become a GSA for the Basin ("Notice") has been published in the Lodi News Sentinel as provided by law; and

WHEREAS, a courtesy copy of the Notice was mailed to the Eastern San Joaquin County Groundwater Basin Authority members; and

WHEREAS, on January 6, 2016, the City held a public hearing to consider adoption of this Resolution; and

WHEREAS, the City wishes to exercise the powers and authorities of a GSA granted by SGMA and to begin the process of cooperatively preparing a groundwater sustainability plan ("Sustainability Plan") with other GSAs as appropriate; and

WHEREAS, adoption of this Resolution does not constitute a "project" under California Environmental Quality Act Guidelines Section 15378(b)(5), including organization and administrative activities of government, because there would be no direct or indirect physical change in the environment.

NOW, THEREFORE, BE IT RESOLVED by the Lodi City Council as follows:

1. The City of Lodi hereby elects to become a GSA for that portion of the Eastern San Joaquin Groundwater Basin which underlies the area bound by the Lodi City limits as shown in Exhibit A; and

2. The Lodi City Council authorizes the City Manager (or his designee) to, within 30 days of the date of this Resolution, provide notice of the City's election to be the GSA for the Basin ("Notice of GSA Election") to the California Department of Water Resources in the manner required by law; and

3. Such notification shall include the boundaries of the areas the City intends to manage, which shall include the lands within the Lodi City limits as shown in Exhibit A, a copy of this Resolution, a list of interested parties developed pursuant to Section 10723.2 of SGMA, and an explanation of how their interests will be considered in the development and operation of the GSA and the development and implementation of the GSAs groundwater sustainability plan; and

4. The City Council hereby directs staff to begin discussions with all interested stakeholders and beneficial users within the Eastern San Joaquin Groundwater Basin, resolve GSA boundary overlaps, and initiate the process of developing a coordinated Groundwater Sustainability Plan in accordance with SGMA.

Dated: January 6, 2016

==========

I hereby certify that Resolution No. 2016-03 was passed and adopted by the City Council of the City of Lodi in a regular meeting held January 6, 2016, by the following vote:

AYES:	COUNCIL MEMBERS –	Johnson, Kuehne, Mounce, Nakanishi, and Mayor Chandler
NOES:	COUNCIL MEMBERS –	None
ABSENT:	COUNCIL MEMBERS –	None
ABSTAIN:	COUNCIL MEMBERS –	None

Jennifer M. Ferraiolo

JENNIFER M. FERRAIOLO
City Clerk

RESOLUTION R2016-236

RESOLUTION OF THE CITY COUNCIL OF THE CITY OF MANTECA, STATE OF CALIFORNIA, DECIDING TO FORM A GROUNDWATER SUSTAINABILITY AGENCY

WHEREAS, the California legislature has adopted, and the Governor has signed into law, the Sustainable Groundwater Management Act of 2014 ("SGMA"), which authorizes local agencies to manage groundwater in a sustainable fashion; and

WHEREAS, the legislative intent is to provide for sustainable management of groundwater basins, to enhance local management of groundwater, to establish minimum standards for sustainable groundwater management; and

WHEREAS, in order to exercise the authority granted in SGMA, a local agency or combination of local agencies must elect to form a Groundwater Sustainability Agency (GSA); and

WHEREAS, the City of Manteca (the City) is a local agency, as SGMA defines that term; and

WHEREAS, the City is committed to sustainable management of its groundwater resources, as shown by, among other actions, its conservation efforts and substantial community investment in conjunctive use infrastructure to establish groundwater sustainability; and

WHEREAS, the City overlies the Eastern San Joaquin Subbasin (designated basin number 5-22.01) in the California Department of Water Resources' (DWR) groundwater basin system; and

WHEREAS, the Eastern San Joaquin Subbasin has been designated by DWR as a high-priority basin in critical overdraft; and

WHEREAS, it is the intent of the City to work cooperatively with other local GSAs, as may be appropriate, to sustainably manage a portion(s) of the Eastern San Joaquin Subbasin that fall outside the City's jurisdiction; and

WHEREAS, Section 10723.2 of SGMA requires that a GSA consider the interests of all beneficial uses and users of groundwater, as well as, those responsible for implementing groundwater sustainability plans; and

WHEREAS, Section 10723.8 of the SGMA requires that a local public agency electing to be a GSA to notify the DWR of its election and intention to undertake sustainable groundwater management within the agency's jurisdictional boundary; and

WHEREAS, pursuant to Government Code 6066, notice of a public hearing on the City's election to form a GSA for the Eastern San Joaquin Subbasin has been published as required by law; and

WHEREAS, on December 6, 2016, the City held a public hearing to consider adoption of this Resolution; and

WHEREAS, the City wishes to exercise the powers and authorities of a GSA granted by SGMA and to begin the process of cooperatively preparing a groundwater sustainability plan (GSP) with other GSAs as appropriate.

NOW, THEREFORE, BE IT RESOLVED, by the City Council of the City of Manteca, as follows:

1. The City Council hereby finds that the facts set forth in the recitals to this Resolution are true and correct, and establish the factual basis for the City Council's adoption of this Resolution.

2. The City Council comes to a final decision to regulate groundwater within City Limits by forming a Groundwater Sustainability Agency.

3. Provides the Public Works Engineering Department authorization, within 30 days of adopting this Resolution, to inform the Department of Water Resources of the City's decision to form a Groundwater Sustainability Agency and take all of the necessary steps to comply with the SGMA and the Department of Water Resources requirements.

4. This Resolution shall take effect immediately upon its adoption.

I HEREBY CERTIFY that the foregoing Resolution was duly adopted by the City Council of the City of Manteca at a public meeting of said City Council held on the sixth day of December 2016, by the following vote:

AYES: Moorhead, Morowit, Silverman, Singh, DeBrum

NOES: None

ABSENT: None

ABSTAIN: None

MAYOR: Steve DeBrum
STEPHEN F. DEBRUM
Mayor

ATTEST: Lisa Blackmon
LISA BLACKMON
City Clerk

Resolution No. 2015-12-08-1602

STOCKTON CITY COUNCIL

==========

RESOLUTION APPROVING THE INTENT OF CITY OF STOCKTON IN COMBINATION WITH CALIFORNIA WATER SERVICE COMPANY TO BECOME A GROUNDWATER SUSTAINABILITY AGENCY UNDER THE SUSTAINABLE GROUNDWATER MANAGEMENT ACT FOR THE EASTERN SAN JOAQUIN COUNTY GROUNDWATER BASIN AND AUTHORIZING THE CITY MANAGER TO SUBMIT NOTICE OF THE INTENT TO THE CALIFORNIA DEPARTMENT OF WATER RESOURCES

The Sustainable Groundwater Management Act of 2014 (SGMA) was signed into law by Governor Jerry Brown on September 16, 2014; and

The City of Stockton (City) is a local agency, as defined under SGMA, and is authorized to serve as a Groundwater Sustainability Agency (GSA); and

Where more than one local agency overlies a groundwater basin, SGMA calls on local agencies to cooperate to manage the groundwater basin in a sustainable manner for the common good; and

The City overlies a basin, the Eastern San Joaquin Sub-Basin (designated basin number 5-22.01 in the California Department of Water Resources Bulletin 118 basin system) (Basin); and

SGMA requires all high and medium priority groundwater basins to be managed by a GSA and the California Department of Water Resources (DWR) designated the Basin as "high priority", therefore requiring a Groundwater Sustainability Plan (GSP); and

Water Code section 10723.6 authorizes a combination of local agencies to form a GSA including a water corporation regulated by the Public Utilities Commission (PUC); and

California Water Service Company (Cal Water) is regulated by the PUC and has a general delegation of authority authorizing officers of the corporation to enter into agreements; and

The City intends to become and participate in the future formation of a GSA in combination with Cal Water for management of the Basin within the boundaries defined as the Urban Service Area until further action redefines those boundaries; and

The City in combination with Cal Water intends to work cooperatively with other

water agencies and the County of San Joaquin (County), as may be appropriate, to manage the Basin in a sustainable fashion and to also explore the possibility of forming a GSA agreement; and

No other GSA is currently operating within the Basin; and

On October 22, 2015, DWR posted a Notice of Intent to Become a GSA for Stockton East Water District (Notice) and if no other Notice is filed by another agency within 90 days, Stockton East Water District will be presumed to be the exclusive GSA within the Basin; and

Pursuant to Government Code section 6066, notice of a public hearing on the City's intent to become a groundwater sustainability agency for the Basin in combination with Cal Water has been published in the Stockton Record Newspaper as provided by law; and

Courtesy copies of the Notice were mailed to the San Joaquin County Board of Supervisors, Cal Water, and Stockton East Water District; and

On this day, the Stockton City Council held a public hearing to consider the decision and intention of the City in combination with Cal Water to become a GSA for management of the Basin; and

It would be in the best interest of the City in combination with Cal Water, to become a GSA for the Basin, and to begin the process of preparing a groundwater sustainability plan in corroboration with other agencies; now, therefore,

BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF STOCKTON, AS FOLLOWS:

1. The City Council hereby approves the decision and intent of the City in combination with Cal Water to become and form a GSA and participate in the future management of the Eastern San Joaquin County Groundwater Sub-Basin.

2. The City Council hereby authorizes within 30 days of the date of this Resolution, the City Manager or his designee to provide notice of the intention, a copy of this Resolution, a map showing the Basin within the Urban Service Area, and a list of beneficial users and users of groundwater, including those responsible for implementing a GSP to DWR in the manner required by SGMA.

3. The Director of Municipal Utilities (Director) is authorized to begin discussions with other local agencies to develop groundwater sustainability plans for the Basin and to ensure that all beneficial users and users of groundwater are included and considered.

4. The Director is also hereby authorized to develop a plan with other groundwater sustainability agencies in which the City might join in coordination with

other local agencies as contemplated by SGMA.

5. The City Manager is hereby authorized and directed to execute all required notices or agreements, and to submit such documents as may be required to provide for the sustainable management of the Basin.

6. The City Manager is hereby authorized and directed to take whatever actions are necessary and appropriate to carry out the purpose and intent of this Resolution.

PASSED, APPROVED, and ADOPTED December 8, 2015.

ANTHONY SILVA, Mayor
of the City of Stockton

ATTEST:

BONNIE PAIGE, City Clerk
of the City of Stockton

RESOLUTION NO. 2016 - 63

A RESOLUTION OF THE BOARD OF DIRECTORS OF THE CALAVERAS COUNTY WATER DISTRICT

DECLARING INTENTION TO BECOME A GROUNDWATER SUSTAINABILITY AGENCY UNDER THE SUSTAINABLE GROUNDWATER MANAGEMENT ACT

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 of 2014 (SGMA); and

WHEREAS, SGMA went into effect on January 1, 2015; and

WHEREAS, SGMA requires all high and medium priority groundwater basins, as designated by the California Department of Water Resources (DWR) Bulletin 118, to be managed by a Groundwater Sustainability Agency (GSA) or group of GSAs; and

WHEREAS, the Eastern San Joaquin Groundwater Subbasin (Basin) has been designated by DWR as a high priority basin; and

WHEREAS, SGMA authorizes specific local agencies overlying the Basin to elect to become a GSA within the Basin; and

WHEREAS, the Calaveras County Water District (District) is a local agency as defined under SGMA that overlies the Basin and is therefore eligible to serve as a GSA within the Basin; and

WHEREAS, Water Code section 10723.2 requires that a GSA consider the interests of all beneficial uses and users of groundwater, as well as those responsible for implementing groundwater sustainability plans; and

WHEREAS, Water Code section 10723.8 requires that a local agency electing to be a GSA to notify the DWR of its election and intention to undertake sustainable groundwater management within a basin; and

WHEREAS, the District held a public hearing on December 14, 2016 after publication of notice pursuant to Water Code section 10723 and Government Code section 6066 to consider the adoption of this Resolution; and

WHEREAS, the District wishes to exercise the powers and authorities of a GSA granted by SGMA.

NOW, THEREFORE, BE IT RESOLVED that the District hereby elects to become a GSA for those portions of the Basin lying within the District's boundaries.

BE IT FURTHER RESOLVED that the District intends to form a multi-agency GSA by Memorandum of Understanding (MOU) to be called the "Eastside San Joaquin Groundwater Sustainability Agency" with other local agencies that overlie the Basin.

BE IT FURTHER RESOLVED that the District and other signatories to the MOU will develop an outreach program to include all stakeholders to ensure that all beneficial uses and users of groundwater are considered.

BE IT FURTHER RESOLVED that the District authorizes the General Manager to enter into a Memorandum of Understanding for formation of the "Eastside San Joaquin Groundwater Sustainability Agency", and to submit to the DWR on behalf of the District and signatories to the MOU a notice of intent to undertake sustainable groundwater management in accordance with the SGMA (Part 2.74 of the Water Code).

BE IT FURTHER RESOLVED that such notification shall include the boundaries of the Basin that the District and Parties to the MOU intend to manage, which shall include the lands within the District boundaries, a copy of this resolution, a list of interested parties developed pursuant to Section 10723.2 of the SGMA, and an explanation of how their interests will be considered in the development and operation of the GSA and the development and implementation of the GSA's groundwater sustainability plan.

PASSED AND ADOPTED this 14th day of December, 2016 by the following vote:

AYES: Directors Mills, Ratterman, Undrhill, Strange and Davidson
NOES: None
ABSTAIN: None
ABSENT: None

CALAVERAS COUNTY WATER DISTRICT

President
Board of Directors

ATTEST:

Mona Walker
Clerk to the Board

THE BOARD OF SUPERVISORS OF THE COUNTY OF STANISLAUS
STATE OF CALIFORNIA

2017-70

Date: February 14, 2017

On motion of Supervisor Withrow Seconded by Supervisor Monteith
and approved by the following vote,
Ayes: Supervisors: Olsen, Withrow, Monteith, DeMartini and Chairman Chiesa
Noes: Supervisors: None
Excused or Absent: Supervisors: None
Abstaining: Supervisor: None

Item # 9:10 a.m.

THE FOLLOWING RESOLUTION WAS ADOPTED:

APPROVAL OF A MEMORANDUM OF UNDERSTANDING FORMING THE EASTSIDE SAN JOAQUIN GROUNDWATER SUSTAINABILITY AGENCY FOR THE EASTERN SAN JOAQUIN GROUNDWATER SUBBASIN

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 of 2014 (SGMA); and

WHEREAS, SGMA went into effect on January 1, 2015; and

WHEREAS, SGMA requires all high and medium priority groundwater basins, as designated by the California Department of Water Resources (DWR) Bulletin 118, to be managed by a Groundwater Sustainability Agency (GSA) or group of GSAs; and

WHEREAS, the Eastern San Joaquin Groundwater Subbasin (Basin) has been designated by DWR as a high priority basin; and

WHEREAS, SGMA authorizes specific local agencies overlying the Basin to elect to become a GSA within the Basin; and

WHEREAS, Stanislaus County (County) is a local public agency as defined under SGMA that overlies the Basin and is therefore eligible to serve as a GSA within the Basin; and

WHEREAS, Water Code section 10723.2 requires that a GSA consider the interests of all beneficial uses and users of groundwater, as well as those responsible for implementing groundwater sustainability plans; and

WHEREAS, Water Code section 10723.8 requires that a local agency electing to be a GSA to notify the DWR of its election and intention to undertake sustainable groundwater management within a basin; and

WHEREAS, on this day, the Board of Supervisors of Stanislaus County ("Board of Supervisors") held a public hearing, after publication of notice pursuant to Water Code Section 10723 and Government Code section 6066 to consider whether it should enter into the Memorandum of Understanding Forming the Eastside San Joaquin Groundwater Sustainability Agency ("GSA MOU") to form the Eastern San Joaquin Groundwater subbasin; and

WHEREAS, the County wishes to exercise the powers and authorities of a GSA granted by SGMA.

NOW, THEREFORE, BE IT RESOLVED that the County hereby elects to become a GSA for those portions of the Basin lying within the County's jurisdictional boundaries.

BE IT FURTHER RESOLVED that the County intends to form a multi-agency GSA by Memorandum of Understanding (MOU) to be called the "Eastside San Joaquin Groundwater Sustainability Agency" with other local agencies that that overlie the Basin.

BE IT FURTHER RESOLVED that the County and other signatories to the MOU will develop an outreach program to include all stakeholders to ensure that all beneficial uses and users of groundwater are considered.

BE IT FURTHER RESOLVED that the County authorizes the Board Chairman to enter into a Memorandum of Understanding for formation of the "Eastside San Joaquin Groundwater Sustainability Agency", and to submit to the DWR on behalf of the County District and Other Parties to the MOU a Notice of Intent to undertake sustainable groundwater management in accordance with the SGMA (Part 2.74 of the Water Code).

BE IT FURTHER RESOLVED that such notification shall include the boundaries of the Basin that the County and Other Parties to the MOU intend to manage, which shall include the lands within the County boundaries, a copy of this resolution, a list of interested parties developed pursuant to Section 10723.2 of the SGMA, and an explanation of how their interests will be considered in the development and operation of the GSA and the development and implementation of a Groundwater Sustainability Plan for the basin.

FEB 14 2017

I hereby certify that the foregoing is a full, true and correct copy of the Original entered in the Minutes of the Board of Supervisors.
ELIZABETH A. KING
Clerk of the Board of Supervisors of the County of Stanislaus, State of California

By Patricia Gonzales

BOARD OF SUPERVISORS STANISLAUS COUNTY CALIF.

ATTEST: ELIZABETH A. KING, Clerk
Stanislaus County Board of Supervisors,
State of California

Elizabeth A King

File No. **GSA-2-1**

THE BOARD OF DIRECTORS OF THE ROCK CREEK WATER DISTRICT

STATE OF CALIFORNIA

Date: April 6, 2017

On motion of Director Orvis Seconded by Director Slicton

Ayes: Orvis, Slicton, McCurly, Orlando, and Harper

Noes: None

THE FOLLOWING RESOLUTION WAS ADOPTED:

APPROVAL OF A MEMORANDUM OF UNDERSTANDING FORMING THE EASTSIDE SAN JOAQUIN GROUNDWATER SUSTAINABILITY AGENCY FOR THE EASTERN SAN JOAQUIN GROUNDWATER SUBBASIN

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

WHEREAS, SGMA went into effect on January 1, 2015; and

WHEREAS, SGMA requires all high and medium priority groundwater basins, as designated by the California Department of Water Resources (DWR) Bulletin 118, to be managed by a Groundwater Sustainability Agency (GSA) or group GSAs; and

WHEREAS, the Eastern San Joaquin Groundwater Subbasin (Basin) has been designated by DWR as a high priority basin; and

WHEREAS, SGMA authorizes specific local agencies overlying the Basin to elect to become a GSA within the basin; and

WHEREAS, Rock Creek Water District (District) is a local agency as defined under SGMA that overlies the Basin and is therefore eligible to serve as a GSA within the Basin; and

WHEREAS, Water Code section 10723.2 requires that a GSA consider the interests of all beneficial uses and users of groundwater, as well as those responsible for implementing groundwater sustainability plans; and

WHEREAS, Water Code section 10723.8 requires that a local agency electing to be a GSA to notify the DWR of its election and intention to undertake sustainable groundwater management within a basin; and

WHEREAS, on this day, the Board of Directors of Rock Creek Water District held a public hearing, after publication of notice pursuant to Water Code Section 10723 and Government Code section 6066 to consider whether it should enter into the Memorandum of Understanding Forming the Eastside San

Joaquin Groundwater Sustainability Agency ("GSA MOU") to form the Eastern San Joaquin Groundwater subbasin; and

WHEREAS, Rock Creek Water District wishes to exercise the powers and authorities of a GSA granted by SGMA.

NOW,THEREFORE, BE IT RESOLVED that Rock Creek Water District herby elects to become a GSA for those portions of the Basin lying within the Districts jurisdictional boundaries.

BE IT FURTHER RESOLVED that the District intends to form a multi-agency GSA by Memorandum of Understanding (MOU) to be called the " Eastside San Joaquin Groundwater Sustainability Agnecy" with the other local agencies that overlie the Basin.

BE IT FURTHER RESOLVED that the District and other signatories to the MOU will develop an outreach program to include all stakeholders to ensure that all beneficial uses and users of the groundwater are considered.

BE IT FURTHER RESOLVED that the District authorizes the Board President to enter into a Memorandum of Understanding for formation of the "Eastside San Joaquin Groundwater Sustainability Agency", and to submit to the DWR on behalf of the District and Other Parties to the MOU a Notice of Intent to undertake sustainable groundwater management in accordance with the SGMA (Part 2.74 of the Water Code).

BE IT FURTHER RESOLVED that such notification shall include the boundaries of the Basin that the District and Other Parties to the MOU intend to manage, which shall include the lands within the District boundaries, a copy of this resolution, a list of interested parties developed pursuant to Section 10723.2 of the SGMA, and an explanation of how their interests will be considered in the development and operation of the GSA and the development and implementation of a Groundwater Sustainability Plan for the basin.

RESOLUTION 16-01

A RESOLUTION OF THE BOARD OF DIRECTORS OF THE LINDEN COUNTY WATER DISTRICT ELECTING TO BECOME A GROUNDWATER SUSTAINABILITY AGENCY UNDER THE SUSTAINABLE GROUNDWATER MANAGEMENT ACT

WHEREAS, the California Legislature enacted the Sustainable Groundwater Management Act (Water Code §§10720-10236.6) ("SGMA"), which became effective January 1, 2015; and

WHEREAS, SGMA requires all high and medium-priority groundwater basins, including the Eastern San Joaquin County Groundwater Subbasin, to be managed by one or more groundwater sustainability agencies ("GSAs"); and

WHEREAS, the Linden County Water District ("LCWD") overlies a portion of the Eastern San Joaquin County Groundwater Subbasin; and

WHEREAS, LCWD furnishes water to members of the public within the area of Linden, pursuant to its powers under the County Water District Law (Water Code §§ 30000-33901); and

WHEREAS, LCWD is a local agency, as defined under SGMA, and is therefore eligible to serve as a groundwater sustainability agency ("GSA") under SGMA; and

WHEREAS, serving as the GSA will allow LCWD to participate in the preparation and implementation of a Groundwater Sustainability Plan ("GSP") within LCWD's jurisdictional boundaries; and

WHEREAS, LCWD posted notice of the requisite public hearing in the Stockton Record on July 28 and August 4, 2016, in conformance with the requirements of Water Code section 10723(b); and

WHEREAS, on August 11, 2016, LCWD held a public hearing and elected to become a GSA for the portion of the Eastern San Joaquin County Groundwater Subbasin that lies within LCWD's jurisdictional boundaries:

NOW, THEREFORE BE IT HEREBY RESOLVED by the Board of Directors of the Linden County Water District as follows:

1. The Board of Directors finds that it is in the best interests of LCWD to become a GSA for that portion of the Eastern San Joaquin County Groundwater Subbasin that lies within the LCWD's jurisdictional boundaries; and

2. The Board of Directors authorizes the Board President, the Board Secretary, and LCWD's Engineer and Legal Counsel to perform all acts necessary and proper for carrying out the intent of this Resolution, to the extent that any such acts are not required to be undertaken by

the Board of Directors, including the preparation and submittal of the Notice of Intention to Form a GSA and all supplementary materials to the California Department of Water Resources.

PASSED AND ADOPTED by the Board of Directors of Linden County Water District at a regular meeting thereof held on the 11th day of August, 2016 by the following vote:

AYES:	Powell, Brennan, Fonzi, Matthews, Fletcher
NOES:	None
ABSTAIN:	None
ABSENT:	None

By: Clifford Powell
Clifford Powell, Board President

ATTEST:

Barbara Kascht
Barbara Kascht, Board Secretary

RESOLUTION NO. 15-02

A RESOLUTION OF THE BOARD OF DIRECTORS OF THE LOCKEFORD COMMUNITY SERVICES DISTRICT ELECTING TO BECOME A GROUNDWATER SUSTAINABILITY AGENCY UNDER THE SUSTAINABLE GROUNDWATER MANAGEMENT ACT

WHEREAS, the Legislature enacted the Sustainable Groundwater Management Act (Water Code §§ 10720-10236.6 ("SGMA")) in 2014 and SGMA took effect on January 1, 2015;

WHEREAS, retaining local jurisdiction over water management and land use is essential to sustainably manage groundwater as a critical resource, and to the vitality of the Lockeford community; and

WHEREAS, Lockeford Community Services District ("District") is authorized under the Community Services District Law (Government Code section 61000 et seq.) to, among other things, supply water for beneficial uses;

WHEREAS, the District overlies portions of the Eastern San Joaquin Subbasin of the San Joaquin Valley Groundwater Basin (designated as basin number 5-22.01 by the California Department of Water Resources) ("Subbasin");

WHEREAS, the District is eligible to be a groundwater sustainability agency under SGMA because it supplies water to the public within the Subbasin (Water Code Sections 10721, subdivision (m), and 10723, subdivision (a));

WHEREAS, groundwater planning for the Subbasin has been initiated by the Sustainable Groundwater Management Act Work Group ("SGMA Work Group") for the Eastern San Joaquin County Groundwater Basin Authority;

WHEREAS, on October 22, 2015, Stockton East Water District elected to be the groundwater sustainability agency for portions of the Subbasin within that agency's boundaries, but that agency's boundaries do not overlap with those of the District;

WHEREAS, similar to Stockton East Water District, the District can advance groundwater management within its boundaries and cooperation with other agencies in the Subbasin by designating itself as a groundwater sustainability agency and coordinating with the SGMA Work Group;

WHEREAS, the District will ensure that diverse water interests are represented in its decision-making processes and development of groundwater management policies;

WHEREAS, the District intends to continue its coordination, cooperation and outreach efforts to ensure that various stakeholder interests are taken into account in its management of the portion of the Subbasin that the District overlies;

WHEREAS, the District has published the notice and conducted the public hearing required by Water Code section 10723.

NOW, THEREFORE, BE IT RESOLVED by the Board of Directors of the District as follows:

1. Pursuant to SGMA, the District elects to be the groundwater sustainability agency for the portions of the Subbasin that the District overlies as shown on Exhibit A attached hereto and incorporated herein by reference.

2. The General Manager or his designee is directed to, within 30 days of the date of this Resolution, provide notification of this election to the Department of Water Resources, including a copy of this Resolution and additional information required by Water Code section 10723.8, in the manner required by law.

3. The District shall establish and maintain a list of persons interested in receiving notices regarding the preparation of any groundwater sustainability plan, meeting announcements and availability of draft groundwater sustainability plans, maps, and other relevant documents pursuant to Water Code section 10723.4. Any person may request, in writing, to be placed on this list of interested persons.

4. The District shall operate as a groundwater sustainability agency under the District's existing rules and be governed by the District's Board of Directors. The Board of Directors of the District reserves the right to consider and adopt operating bylaws, ordinances, and resolutions to facilitate its operation as a groundwater sustainability agency.

PASSED AND ADOPTED by the Board of Directors of the Lockeford Community Services District on the 10th day of December, 2015, by the following vote:

AYES: True, Granlees, Rowe, Stetson, Gordon
NOES:
ABSTAIN:
ABSENT:

By: _____
Mark True, Board President

Attest:

_____
Joe Salzman, Secretary to the Board of Directors

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NORTH SAN JOAQUIN WATER CONSERVATION DISTRICT

RESOLUTION NO. 2016 - 1

ELECTION TO BECOME A GROUNDWATER SUSTAINABILITY AGENCY

WHEREAS, the Legislature adopted the Sustainable Groundwater Management Act (SGMA) in 2014 to, among other things, provide for the sustainable management of groundwater basins.

WHEREAS, SGMA requires all high and medium priority groundwater basins, including the Eastern San Joaquin County Groundwater Subbasin and the Cosumnes Subbasin, to be managed by a Groundwater Sustainability Agency (GSA).

WHEREAS, North San Joaquin Water Conservation District (NSJWCD or District) is a local agency, as defined under SGMA, and is authorized to serve as a GSA for the Eastern San Joaquin County Groundwater Subbasin and the Cosumnes Subbasin.

WHEREAS, NSJWCD's serving as the GSA for the area within its boundaries will allow the District to participate in the preparation and implementation of a Groundwater Sustainability Plan (GSP) that covers the District's territory.

WHEREAS, the District posted notice of public hearing in the Lodi News-Sentinel on January 6 and 13, 2016 relating to the District's intent to become a GSA.

WHEREAS, on January 25, 2016, NSJWCD held a public hearing and elected to become a GSA for those portions of the Eastern San Joaquin County Groundwater Subbasin and the Cosumnes Subbasin that lie within the District's boundaries.

NOW, THEREFORE BE IT HEREBY RESOLVED by the Board of Directors of North San Joaquin Water Conservation District as follows:

1. The Board of Directors finds that it is in the best interests of NSJWCD to become a GSA for those portions of the Eastern San Joaquin County Groundwater Subbasin and the Cosumnes Subbasin that lie within the District's boundaries.

2. The Board of Directors authorizes the Board President to do and cause to be done any and all acts necessary or convenient to carry out the purpose and intent of this resolution to the extent that any such acts do not need to be taken by the Board of Directors, including

providing to the California Department of Water Resources notice of the intention to form a GSA, a copy of this resolution, and a map showing the District and the area it intends to manage under SGMA.

Moved by Director Flinn, seconded by Director Scanlon, that the foregoing resolution be adopted.

Upon roll call the following vote was had:

Ayes: __5_ Directors

Noes: __0_ Directors

Absent: __0_ Directors

Abstain: _0__ Director

The President declared the resolution adopted.

I, David Simpson, Secretary of the Board of Directors of the NORTH SAN JOAQUIN WATER CONSERVATION DISTRICT, do hereby CERTIFY that the foregoing is a full, true and correct copy of a resolution duly adopted at an adjourned regular meeting of said Board of Directors held the 25th day of January 2016.

OAKDALE IRRIGATION DISTRICT
RESOLUTION NO. 2017-33

A RESOLUTION AUTHORIZING AND DIRECTING THE FORMATION OF A GROUNDWATER SUSTAINABILITY AGENCY FOR THE EASTERN SAN JOAQUIN SUB-BASIN

WHEREAS, the California Legislature has adopted, and the Governor has signed into law, the Sustainable Groundwater Management Act of 2014 ("SGMA"), which authorizes local agencies to manage groundwater in a sustainable fashion; and

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

WHEREAS, SGMA requires that a GSA be formed for all basins designated by the Department of Water Resources as a high-priority basin, such as the Eastern San Joaquin Sub-basin (designated basin number 5-22.01 in the California Department of Water Resources' CASGEM groundwater basin system) ("Basin"), by June 30, 2017; and

WHEREAS, SGMA permits a local agency to form a groundwater sustainability agency ("GSA"); and

WHEREAS, the Oakdale Irrigation District (OID) is a local agency, as SGMA defines that term; and

WHEREAS, OID exercises jurisdiction upon lands overlying the Basin and is committed to the sustainable management of the Basin's groundwater resources; and

WHEREAS, OID has determined that the sustainable management of the Basin pursuant to SGMA may best be achieved through the formation of a GSA; and

WHEREAS, notice of a hearing on the OID's decision to form a GSA for its service area within the Basin ("Notice") was published in compliance with Government Code section 6066; and

WHEREAS, on February 21, 2017, OID held a public hearing to consider whether it should form the OID Eastern San Joaquin Sub-basin GSA for the Basin; and

WHEREAS, it would be in the best interests of OID to form the GSA for its service area within the Basin, and to coordinate with other GSAs within the Basin to begin the process of preparing a groundwater sustainability plan ("Sustainability Plan"); and

WHEREAS, adoption of this resolution does not constitute a "project" under California Environmental Quality Act Guidelines Section 15378(b)(5), including organization and administrative activities of government, because there would be no direct or indirect physical change in the environment.

NOW, THEREFORE, BE IT RESOLVED by the Board of Directors of the Oakdale Irrigation District as follows:

1. OID hereby elects to form a GSA and manage groundwater for its service area within the Basin, as reflected in Exhibit "A."

2. Within thirty (30) days of the date of this resolution, the OID Board directs the General Manager to provide notice to California Department of Water Resources that OID intends to form the GSA in the manner required by law.

3. This resolution shall take effect immediately upon passage and adoption.

Upon Motion of Director Santos, seconded by Director Osmundson, and duly submitted to the Board for its Consideration, the above-titled Resolution was adopted this 21st day of February, 2017.

OAKDALE IRRIGATION DISTRICT

Steve Webb, President
Board of Directors

Steve Knell, P.E.
General Manager/Secretary

I HEREBY CERTIFY that the foregoing is a true and correct copy of the original on file with the Oakdale Irrigation District.

OAKDALE IRRIGATION DISTRICT

Steve Knell, P.E.
General Manager/Secretary

BEFORE THE BOARD OF SUPERVISORS OF THE COUNTY OF SAN JOAQUIN
STATE OF CALIFORNIA

RESOLUTION

R-15-185

RESOLUTION ELECTING TO ESTABLISH THE COUNTY OF SAN JOAQUIN AS A GROUNDWATER SUSTAINABILITY AGENCY FOR THOSE PORTIONS OF THE COSUMNES, EASTERN SAN JOAQUIN AND TRACY SUB-BASINS WITHIN SAN JOAQUIN COUNTY

WHEREAS, the California Legislature and Governor Jerry Brown signed into law Senate Bills 1168 and 1319 and Assembly Bill 1739, known collectively as the Sustainable Groundwater Management Act (SGMA); and,

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

WHEREAS, the SGMA requires all high- and medium-priority groundwater basins, as designated by the California Department of Water Resources (DWR) Bulletin 118, to be managed by a Groundwater Sustainability Agency (GSA) or multiple GSAs; and,

WHEREAS, the Eastern San Joaquin Groundwater Sub-basin has been designated by DWR as a high-priority basin and in critical groundwater overdraft; and,

WHEREAS, the Cosumnes and Tracy Sub-basins have been designated by DWR as medium-priority basins; and,

WHEREAS, the SGMA authorizes a local public agency overlying groundwater sub-basin to elect to become a GSA; and,

WHEREAS, the County of San Joaquin (County) is a local public agency as defined under the SGMA and is therefore eligible to serve as a GSA; and,

WHEREAS, Section 10723.2 of the SGMA requires that a GSA consider the interests of all beneficial uses and users of groundwater, as well as those responsible for implementing groundwater sustainability plans; and,

WHEREAS, Section 10723.8 of the SGMA requires that a local public agency electing to be a GSA to notify the DWR of its election and intention to undertake sustainable groundwater management within a sub-basin; and,

WHEREAS, the County is committed to sustainable management of its groundwater resources; and,

WHEREAS, pursuant to Government Code Section 6066, notices of a public hearing regarding whether to adopt a Resolution to elect to become a GSA were published on November 27, 2015 and December 4, 2015 in the Manteca Bulletin, Lodi

News Sentinel, Tracy Press, and on November 27, 2015 and December 8, 2015 in The Record; and,

WHEREAS, the County held a public hearing on December 15, 2015, after publication of notice pursuant to Government Code section 6066 to consider adoption of this Resolution; and,

WHEREAS, the County wishes to exercise the powers and authorities of a GSA granted by the SGMA;

NOW, THEREFORE, BE IT RESOLVED that this Board of Supervisors of San Joaquin County hereby elects to become a GSA for those portions of San Joaquin County within the Cosumnes, Eastern San Joaquin, and Tracy Sub-basin as defined in DWR Bulletin 118, a copy of a map of the proposed management area is attached hereto as Exhibit A; and,

BE IT FURTHER RESOLVED that the San Joaquin County Board of Supervisors authorizes the Director of Public Works or his designee to, within 30 days from the date of this Resolution, provide notification of this election to the DWR, including a copy of this Resolution and additional information required by Water Code Section 10723.8, in the manner required by law; and,

BE IT FURTHER RESOLVED that such notification shall include the boundaries of the areas that the County intends to manage, which shall include the lands within the County boundaries, a copy of this Resolution, a list of interested parties developed pursuant to Section 10723.2 of the SGMA, and an explanation of how their interests will be considered in the development and operation of the GSA and the development and implementation of the GSA's groundwater sustainability plan; and,

BE IT FURTHER RESOLVED that the San Joaquin County Board of Supervisors supports resolving boundary overlaps among electing GSAs and also supports exploring the establishment of a coordination agreement to organize electing GSAs; and,

BE IT FURTHER RESOLVED that the San Joaquin County Board of Supervisors directs staff to enter into discussions with agencies electing to be GSAs to resolve boundary overlaps and to develop a coordination agreement that recognizes the authority of electing GSAs to implement and enforce a GSP within their respective boundaries.

PASSED AND ADOPTED 12/15/2015, by the following vote of the Board of Supervisors, to wit:

AYES: **Winn, Elliott, Villapudua, Miller**

NOES: **None**

ABSENT: **None**

ABSTAIN: **None**

ATTEST:

MIMI DUZENSKI
Clerk of the Board of Supervisors
Of the County of San Joaquin,
State of California

By _____
Clerk

KATHERINE M. MILLER
Chair of the Board
of Supervisors
State of California

WR-15K047-ME4

RESOLUTION NO. 1599

RESOLUTION OF THE BOARD OF DIRECTORS OF THE SOUTH DELTA WATER AGENCY ELECTING TO BECOME A GROUNDWATER SUSTAINABILITY AGENCY UNDER THE SUSTAINABLE GROUNDWATER MANAGEMENT ACT WITHIN THE EASTERN SAN JOAQUIN COUNTY SUB-BASIN

WHEREAS, the California Legislature and Governor Jerry Brown signed into law Senate Bills 1168 and 1319 and Assembly Bill 1739, known collectively as the Sustainable Groundwater Management Act (SGMA); and

WHEREAS, the Legislature adopted the Sustainable Groundwater Management Act of 2014, that went into effect on January 1, 2015, which authorizes local agencies to manage groundwater in a sustainable fashion; and

WHEREAS, the SGMA requires all high and medium priority groundwater basins, as designated by the California Department of Water Resources (DWR) Bulletin 118, to be managed by a Groundwater Sustainability Agency (GSA); and

WHEREAS, the Eastern San Joaquin County Groundwater Subbasin (Basin) has been designated by DWR as a high priority Basin; and

WHEREAS, the SGMA authorizes any local agency, or combination of local agencies overlying the Basin, to elect to become a GSA; and

WHEREAS, where more than one local agency overlies a groundwater basin, the SGMA calls on local agencies to cooperate to manage the Basin in a sustainable manner; and

WHEREAS, the South Delta Water Agency (Agency) is a local agency as defined under the SGMA and is therefore eligible to serve as a GSA within the Basin; and

WHEREAS, Section 10723.2 of the SGMA requires that a GSA consider the interests of all beneficial uses and users of groundwater, as well as those responsible for implementing Groundwater Sustainability Plans (GSP); and

WHEREAS, Section 10723.8 of the SGMA requires that a local agency electing to be a GSA, notify the DWR of its election and intention to undertake sustainable groundwater management within the Basin, and

WHEREAS, it is the intent of the Agency to work cooperatively with the Stockton East Water District, the cities of Lodi and Stockton, the Woodbridge Irrigation District, the California Water Service, the County of San Joaquin, and other involved water agencies or interests as may be appropriate, to manage the Basin in a sustainable fashion; and

WHEREAS, the Agency has provided informal notice of its interest in serving as the GSA for its boundaries by means of communications with neighboring water agencies, cities and the County of San Joaquin; and

WHEREAS, the District provided public notice, pursuant to Government Code section 6066, of its intention to hold a hearing concerning its establishment of a GSA; and

WHEREAS, the Agency held a public hearing on March 1, 2017, to consider whether it should become the GSA for the portion of the Basin underlying a portion of its boundaries; and

WHEREAS, the Agency wishes to exercise the powers and authorities of a GSA granted by the SGMA.

NOW, THEREFORE, BE IT RESOLVED that the Board of Directors of the South Delta Water Agency elects that the South Delta Water Agency become a GSA for the portion of the Eastern San Joaquin Subbasin shown on Exhibit "A"; and

BE IT FURTHER RESOLVED that the boundaries of the GSA for which the South Delta Water Agency intends to manage is for that area within the Agency's current boundaries as indicated in the map that is attached as Exhibit "A"; and

BE IT FURTHER RESOLVED that Agency staff are hereby directed to provide notice of this election to the DWR in the manner required by law, and

BE IT FURTHER RESOLVED that Agency staff are hereby directed to coordinate with neighboring GSAs that may be established in order to begin the process of developing a GSP for the Basin, as indicated by the SGMA.

PASSED AND ADOPTED by the Board of Directors of the South Delta Water Agency at a regular meeting on March 1, 2017, by the following vote of the members thereof:

Ayes:	Jerry Robinson, Nat Bacchetti, Mary Hildebrand, Jack Alvarez
Noes:	None
Absent:	Robert Ferguson
Abstain:	None

Jerry Robinson, President, Board of Directors

Attest:

John Herrick, Esq.
Manager and Co-Counsel

MEMORANDUM OF AGREEMENT BETWEEN SOUTH SAN JOAQUIN IRRIGATION DISTRICT, THE CITY OF RIPON AND THE CITY OF ESCALON TO FORM THE SOUTH SAN JOAQUIN GROUNDWATER SUSTAINABILITY AGENCY

This Memorandum of Agreement ("MOA") dated (enter date) is entered into between the South San Joaquin Irrigation District ("SSJID"), the City of Ripon and the City of Escalon, collectively referred to as the "Parties." The Parties are located in the Eastern San Joaquin Groundwater Subbasin as defined by the Department of Water Resources Bulletin 118 ("Bulletin 118") and are subject to the Sustainable Groundwater Management Act as defined below.

RECITALS

WHEREAS, on September 16, 2014 Governor Jerry Brown signed into law the Sustainable Groundwater Management Act (Senate Bills 1168 and 1319 and Assembly Bill 1739) codified in Part 2.74 of Division 6 of the California Water Code, commencing with section 10720 ("the Act"); and

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

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

WHEREAS, the Parties overlie the southern portion of the Eastern San Joaquin groundwater subbasin (DWR Bulletin 118 No. 5-22.01) ("Basin"), a Bulletin 118 designated high priority basin that is in critical overdraft; and

WHEREAS, the Act requires that basins designated as high priority be managed by one or more Groundwater Sustainability Agencies ("GSA") and that GSAs develop and implement one or more Groundwater Sustainability Plans ("GSP") for such basins; and

WHEREAS, the Act provides that any local agency or combination of agencies overlying a groundwater basin may decide to become or to form a GSA ; and

WHEREAS, the Act defines a local agency as a local public agency that has water supply, water management, or land use responsibilities within a groundwater basin and each of the Parties is a local agency as defined by the Act; and

WHEREAS, the Act provides that a combination of local agencies may form a GSA through a joint powers agreement, a memorandum of agreement or other legal agreement; and

WHEREAS, the Parties share the goal of achieving cost-effective sustainable groundwater management in the Basin that meets the requirements of the Act, as it may be

amended in the future, including considering the interests of all beneficial uses and users of groundwater in the Basin; and

WHEREAS, the Parties intend by this MOA to set forth the framework and agreement under which the Parties will work together to elect to become the South San Joaquin GSA (SSJGSA), in order to collectively develop a GSP for the Managed Area as defined below, whether that is a separate GSP, a regional GSP or a Basin-wide GSP and manage the groundwater in the Managed Area in accordance with the GSP, and to work cooperatively with other GSAs in the Basin as necessary to do so, and

WHEREAS, the Parties intend to negotiate and enter into coordination agreements as required by the Act.

NOW, THEREFORE, it is mutually understood and agreed as follows:

SECTION 1: PURPOSE

The Parties hereby establish the South San Joaquin Groundwater Sustainability Agency to manage the portion of the Eastern San Joaquin Subbasin within the Parties' collective jurisdictions. The purpose of this MOA is to establish a framework to govern the actions of the SSJGSA. These actions include the development and implementation of a GSP for the Managed Area. The Parties intend to collaborate with other local agencies in the potential development of a Basin-wide GSP that is consistent with the goals, interests, authorities and responsibilities of the Parties. The Parties also have discretion under this MOA to form a separate GSP for the Managed Area and to work collaboratively with other GSAs within the Basin to enter into Coordination Agreements as required by the Act. In addition, in the future, the Parties may decide to form a new entity in order to serve as the GSA under a Joint Powers Agreement.

In developing, adopting and implementing a GSP for the Managed Area, or in any coordination with other GSAs and other interests in developing and implementing a Basin-wide GSP that is consistent with the Parties' goals and objectives for the Managed Area, it is each Party's intent, goal and objective to maintain complete control and autonomy over the surface water supplies, water facilities, water operations, groundwater supplies and assets to which each Party and each Party's constituents are legally entitled. Nothing in this MOA requires any contribution or commitment by a Party to share or otherwise contribute that Party's Water Assets as part of the development or implementation of a GSP without that Party's written consent.

SECTION 2: DEFINITIONS

The following terms, whether used in the singular or plural, and when used with initial capitalization, shall have the meanings specified herein.

2.1 **Act**: Refers to the Sustainable Groundwater Management Act as defined in the Recitals, including any amendments to the Act.

2.2 **Governing Body**: Means the legislative body, i.e. governing board, of each Party to this MOA.

2.3 **Governing Board:** Refers to the SSJGSA Board created and described in Section 3.1 of this MOA.

2.4 **Groundwater Sustainability Agency (GSA)**: Is defined in the Recitals and refers to a groundwater sustainability agency as defined in the Act.

2.5 **Groundwater Sustainability Plan (GSP)**: Is defined in the Recitals, and refers to a groundwater plan as defined in the Act, including the groundwater management plan to be developed by the Parties to this MOA pursuant to the Act.

2.6 **Memorandum of Agreement (MOA)**: Refers to this Memorandum of Agreement.

2.7 **GSA Staff**: Refers to any Party's staff, including contracted consultants tasked with carrying out the technical work necessary to implement the Act's provisions.

2.8 **Basin**: Is defined in the Recitals and refers to the Eastern San Joaquin groundwater subbasin.

2.9 **Managed Area**: Is defined as the area reflected in the Map attached as Exhibit A and incorporated herein.

2.10 **Party**: Refers to each agency that is a signatory to this MOA.

2.11. **Water Assets:** Refers to all surface water supplies, water facilities, water operations, groundwater supplies, and any other water-related assets to which each Party and each Party's constituents are legally entitled.

2.12. **Board Member**: Refers to a member of the Governing Board, as defined in Section 2.3.

2.13. **GSP Regulations**: Refers to the Emergency Regulations for Groundwater Sustainability Plans and Alternatives that were adopted by the California Water Commission on May 18, 2016 (Cal. Code Regs., Title 23, Division 2, Chapter 1.5, Subchapter 2. Groundwater Sustainability Plans).

SECTION 3: GOVERNANCE

3.1 **Governing Board**. The GSA shall be governed by a five member Governing Board. Three Board Members will be representatives of SSJID, one Board Member shall be a representative of the City of Ripon, and one Board Member shall be a representative of the City of Escalon. Each Board Member must be appointed by the Governing Body of the Party being

represented. The Members may, but are not required to be, elected members of the Governing Bodies of the Parties. Each Board Member shall certify to the Secretary in writing that he or she has been appointed to be a Board Member by the appointing Party. The Governing Body of each Party shall appoint one Alternate Board Member per Governing Board seat. Alternate Board Members have no vote at Governing Board meetings if the Board Member is present. If the Board Member is not present, the Alternate Board Member shall be entitled to participate in all respects as a regular Board Member. Agency meetings shall comply with the Ralph M. Brown Act required for meetings of the Governing Board.

3.2 **Removal of Board Members**. Board Members and Alternate Board Members shall serve at the pleasure of their appointing Party's Governing Body and may be removed or replaced at any time. Upon removal of a Board Member, the Alternate Board Member shall serve as a Board Member until a new Board Member is appointed by the Party's Governing Body. Parties must submit any changes in Board Member or Alternate Board Member appointments to the Secretary in writing and signed by the Member.

3.3 **Quorum.** Attendance of four Board Members, with at least one Member representing each Party, shall constitute a quorum for the transaction of business. In the absence of a quorum, any meeting of the Governing Board may be adjourned from time to time by a majority present, but no other business may be transacted.

3.4 **Approval.** Action of the Governing Board shall require the affirmative vote of a majority of Board Members voting, except for approvals of the annual budget and cost sharing agreement in Section 4, and any amendments to them, and the addition of additional parties to this MOU in accordance with Section 8.3, which must be approved unanimously by all Board Members. Affirmative action by the Governing Board is binding on each Party.

3.5 **Officers.** The Governing Board shall select a Chair, Vice Chair, Secretary, and any other officers as determined necessary by the Governing Board. The Secretary of the Board is not required to be a member of the Governing Board, but instead, can be a member of the staff of one of the Parties.

3.5.1. The Chair shall preside at all Governing Board Meetings.

3.5.2. The Vice Chair shall act in place of the Chair at meetings should the Chair be absent.

3.5.3. The Secretary shall prepare agendas for meetings in accordance with the Brown Act, keep minutes of all meetings of the Governing Board and shall, as soon as possible after each meeting, forward a copy of the minutes to each Board Member and Alternate Member of the Governing Board. The Secretary shall provide the agendas to each Party for posting in accordance with the Brown Act.

3.5.4. All Officers shall be chosen at the first Governing Board meeting and serve a term of two (2) years. An Officer may serve for multiple consecutive terms. Any Officer may resign at any time upon written notice to the Governing Board.

SECTION 4: FUNDING

Each Party's participation in this MOA is at that Party's sole cost and expense. The Parties shall mutually develop an annual budget and cost sharing agreement for the work to be undertaken by this MOA. Both the budget and cost sharing agreement shall be approved by the Governing Board by unanimous vote, pursuant to Section 3.4 of this Agreement, before any financial expenditures or financial obligations or liabilities may be incurred by the GSA. Expenditures, as well as any income received by the GSA, must be included within the annual budget.

SECTION 5: TECHNICAL COMMITTEE

5.1 Responsibilities of the Technical Committee.

5.1.1 The Governing Board shall establish a Technical Committee made up of GSA Staff. At least one staff member from each Party may serve on the Technical Committee. The Technical Committee shall develop a process to direct and coordinate GSA activities, including the development, planning, financing, environmental review, permitting, implementation, and long-term monitoring of the GSP for the Managed Area, and/or for the portion of a GSP developed and implemented Basin-wide that is applicable to the Managed Area. The Technical Committee may delegate tasks and responsibilities to GSA Staff. The Technical Committee shall keep the Governing Board apprised of its activities, and may from time to time be asked by the Governing Board to attend Governing Board meetings for the purpose of answering questions and providing information. In addition to being responsible for development and implementation of the GSP or portion of a Basin-wide GSP for the Managed Area, the Technical Committee shall have responsibility for the following:

5.1.1.1 Develop and implement a stakeholder participation plan, pursuant to the requirements of the Act and the GSP Regulations, that involves the public and area stakeholders in developing and implementing the GSP.

5.1.1.2 Schedule meetings of the Governing Board through the Secretary as necessary to coordinate development and implementation of the GSP. Attendance at these meetings may be augmented to include staff or consultants of all Parties to ensure that the appropriate expertise is available.

5.1.1.3 Coordinate with other entities within the Basin regarding GSP formation as required by the Act and the GSP Regulations. GSA Staff shall work cooperatively with the Parties to develop agreement on specific positions before communicating the GSA's positions on specific issues with other entities within the Basin, whenever feasible. GSA Staff shall only take positions on issues which may affect the other Parties to this MOA after majority approval of the MOA Parties and ratification by the Governing Board.

5.1.1.4 Establish financial management and review functions, and report regularly to the Governing Board. The purpose of this reporting is to assist the Parties in monitoring and managing invoicing, payments, cash flow, and other financial matters.

SECTION 6: GROUNDWATER SUSTAINABILITY PLAN

6.1 It is the intent of the Parties to develop a GSP that meets the requirements of the Act and the GSP Regulations and can be successfully implemented to achieve groundwater sustainability in the Basin. Notwithstanding the foregoing, and to the maximum extent permitted by law, each Party agrees to implement the GSP in its own service area or cause the implementation of the GSP in its own service area through written agreement, delegation or other means. Further, the Parties shall endeavor to develop a GSP that shall not prohibit or impose conditions upon the drilling or construction of any new groundwater well or operation of the water system within the sphere of influence of any Party. Nothing in this MOA or a future GSP shall be interpreted as superseding the land use authority, police power, or any other authorities of a Party.

6.2 The Parties understand that each of the Parties' respective Governing Bodies will be required to adopt the GSP.

6.3 Each Party to this MOA shall be individually responsible to implement measures to comply with the GSP as necessary in each Party's service area.

SECTION 7: COMMUNICATION

7.1 **Interagency Communication**: To provide for consistent and effective communication between Parties, each Party agrees to designate one staff representative as its central point of contact on matters relating to this MOA. Additional representatives may be appointed to serve as points of contact on specific actions or issues.

7.2 **Providing Proper Notice:** All notices, statements, or payments related to implementing the objectives of this MOA shall be deemed to have been duly given if given in writing and either delivered personally or mailed by first-class, registered, or certified mail as follows to the following individuals or their successors:

South San Joaquin Irrigation District
Peter Rietkerk, General Manager
11011 E. Highway 120
Manteca, California 95366

City of Ripon
Kevin Werner, City Administrator
259 North Wilma Avenue
Ripon, CA 95366

City of Escalon
Tammy Alcantor, City Manager
2060 McHenry Avenue
Escalon, CA 95320

SECTION 8: TERMINATION, WITHDRAWAL AND NEW PARTIES

8.1 **Terminating the Agreement**. This MOA may be terminated upon unanimous written consent of all the Parties.

8.2 **Withdrawal**. A Party may unilaterally withdraw from this MOA without causing or requiring termination of the MOA, effective upon thirty (30) days written notice to the remaining Parties' designated addresses as listed in "Providing Proper Notice" section above. A Party that has withdrawn from this MOA shall remain obligated to pay its share of expenses and obligations as outlined in the budget and cost share agreement incurred or accrued up to the date the Party provided notice of withdrawal. A Party withdrawing from this MOA shall expressly retain the right and responsibility to serve as the GSA for the groundwater basin underlying its boundary or join with other GSA entities in the basin to comply with the groundwater management activities required under the Act.

8.3 **New Parties**. Additional agencies may join this Agreement and become a Party to the Agreement provided that the prospective new Party, (a) is eligible to join a groundwater sustainability agency as provided by the Act, (b) negotiates necessary changes to the structure of the Governing Board with all other Parties, (c) pays all previously incurred costs that the Governing Board determines to have benefited the new Party, (d) agrees in writing to the terms and conditions of this Agreement and (e) is approved by the Parties.

SECTION 9: AMENDMENT; INSURANCE AND INDEMNIFICATION

9.1 **Amendment.** This MOA may be amended only by a subsequent writing, approved and signed by all Parties. Approval from a Party is valid only after that Party's Governing Body approves the amendment at a public meeting. GSA Staff, and individual Governing Board members do not have the authority, express or implied, to amend, modify, waive or in any way alter this MOA of the terms and conditions hereof.

9.2 **Indemnification**. No Party, nor any officer or employee of a Party, shall be responsible for any damage or liability occurring by reason of anything done or omitted to be done by another Party under or in connection with this MOA. The Parties further agree, pursuant to California Government Code section 895.4, that each Party shall fully indemnify and hold harmless the other Parties and their respective agents, officers, employees and contractors from and against all claims, damages, losses, judgments, liabilities, expenses, and other costs, including litigation costs and attorney fees, arising out of, resulting from, or in connection with any work delegated to or action taken or omitted to be taken by the indemnifying Party under this MOA. Each Party shall additionally include within any third party contract entered into in

furtherance of this MOA, provisions requiring the contractor, consultant or vendor to indemnify, defend and hold harmless the other Parties to the same extent as the contracting Party is indemnified.

9.3 Insurance. Each Party shall include within any third party contract entered into in furtherance of this MOA, provisions requiring the contractor, consultant or vendor to provide insurance coverage to the other Parties equivalent to the coverage provided to the contracting Party. Without limiting the foregoing and to extent the following policies are required by the contract, the non-contracting Parties shall: (1) be named as additional insured and provided coverage on a primary and non-contributory basis on the contractor, consultant or vendor's policies of commercial general liability and business automobile liability insurance and (2) be included in any waiver of subrogation endorsements issued on the commercial general liability, business automobile liability and workers' compensation/employer's liability policies.

SECTION 10: MISCELLANEOUS

10.1 Execution in Counterparts. The Parties intend to execute this MOA in counterparts. It is the intent of the Parties to hold one (1) counterpart with single original signatures to evidence the MOA and to thereafter forward (# of Parties to MOA) other original counterparts on a rotating basis for all signatures. Thereafter, each Party shall be delivered an originally executed counterpart with all Party signatures.

10.2 Term of MOA. This MOA shall become operative upon its execution by each of the named Parties. The term of this MOA is indefinite and will cease existence only upon termination by the Parties pursuant to Section 8 of this MOA.

10.3 Choice of Law. This MOA is made in the State of California, under the Constitution and laws of such State and is to be so construed.

10.4 Severability. If any provision of this MOA is determined to be invalid or unenforceable, the remaining provisions will remain in force and unaffected to the fullest extent permitted by law and regulation.

10.5 Entire Agreement. This MOA constitutes the sole, entire, integrated and exclusive agreement between the Parties regarding the contents herein. Any other contracts, agreements, terms, understandings, promises or representations not expressly set forth or referenced in this writing are null and void and of nor force and effect.

10.6 Construction and Interpretation. The Parties agree and acknowledge that this MOA has been developed through negotiation, and that each party has had a full and fair opportunity to revise the terms of this MOA. Consequently, the normal rule of construction that any ambiguities are to be resolved against the drafting party shall not apply in construing or interpreting this MOA.

IN WITNESS WHEREOF, the Parties hereto have executed this Agreement as of the dates set forth below.

SOUTH SAN JOAQUIN IRRIGATION DISTRICT

Dated: 3/23/2017

By: _____
Peter M. Rietkerk, General Manager

CITY OF RIPON

Dated: 3/27/17

By: _____
Kevin Werner, City Administrator

CITY OF ESCALON

Dated: 4-5-17

By: _____
Tammy Alcantor, City Manager

SOUTH SAN JOAQUIN IRRIGATION DISTRICT
RESOLUTION NO. 17-06-W

RESOLUTION ELECTING FORMATION OF THE SOUTH SAN JOAQUIN GROUNDWATER SUSTAINABILITY AGENCY

WHEREAS, the California Legislature has adopted, and the Governor has signed into law, the Sustainable Groundwater Management Act of 2014 ("SGMA"), which requires the sustainable management of groundwater; and

WHEREAS, the legislative intent is to provide for sustainable management of groundwater basins, to enhance local management of groundwater, to establish minimum standards for sustainable groundwater management; and

WHEREAS, in order to exercise the authority granted in SGMA, a local agency or combination of local agencies may elect to form a Groundwater Sustainability Agency (GSA); and

WHEREAS, the South San Joaquin Irrigation District is a local agency, as SGMA defines that term; and.

WHEREAS, the South San Joaquin Irrigation District is committed to sustainable management of its groundwater resources; and

WHEREAS, the South San Joaquin Irrigation District overlies a portion of the Eastern San Joaquin Subbasin (designated basin number 522.01) in the California Department of Water Resources' (DWR) groundwater basin system, which has been designated by DWR as a high-priority basin in critical overdraft; and

WHEREAS, the South San Joaquin Irrigation District elected to become a GSA on October 15, 2015 and previously filed an election with DWR on or about November 12, 2015; and

WHEREAS, the South San Joaquin Irrigation District has begun to work cooperatively with other local agencies that also plan to manage groundwater in compliance with SGMA, including the City of Ripon (Ripon) and the City of Escalon (Escalon); and

WHEREAS, the South San Joaquin Irrigation District, along with its regional partners Ripon and Escalon, intend to work collaboratively to manage their respective service areas under the South San Joaquin Groundwater Sustainability Agency (SSJGSA); and

WHEREAS, Section 10723.8 of the SGMA requires that a local public agency electing to be a GSA to notify the DWR of its election and intention to undertake sustainable groundwater management within the agency's jurisdictional boundary; and

WHEREAS, pursuant to Government Code 6066, notice of a public hearing on the South San Joaquin Irrigation District election to participate in the SSJGSA has been published as required by law; and

WHEREAS, on March 21, 2017, the South San Joaquin Irrigation District held a public hearing to consider adoption of this Resolution; and

WHEREAS, the South San Joaquin Irrigation District wishes to exercise the powers and authorities of a GSA granted by SGMA and to begin the process of cooperatively preparing a Groundwater Sustainability Plan (GSP) with other GSAs as appropriate.

NOW, THEREFORE BE IT RESOLVED THAT:

1. The South San Joaquin Irrigation District hereby finds that the facts set forth in the recitals to this Resolution are true and correct, and establish the factual basis for the South San Joaquin Irrigation District adoption of this Resolution.

2. The South San Joaquin Irrigation District authorizes the General Manager to withdraw the previous election to facilitate its participation in the SSJGSA.

3. The South San Joaquin Irrigation District hereby elects to participate as a member in the SSJGSA to manage groundwater within the boundaries of the South San Joaquin Groundwater Sustainability Agency, including the South San Joaquin Irrigation District boundary.

4. The Board authorizes the General Manager or his designee within 30 days of adopting this Resolution, to inform the Department of Water Resources of the South San Joaquin Irrigation District's decision to participate in the SSJGSA and take such other and further steps as necessary to comply with the SGMA and the Department of Water Resources requirements.

5. This Resolution shall take effect immediately upon its adoption.

PASSED AND ADOPTED at a meeting of the Board of Directors of the South San Joaquin Irrigation District on March 21, 2017, by the following roll call vote:

AYES:	HOLBROOK HOLMES KAMPER KUIL ROOS
NOES:	NONE
ABSTAIN:	NONE
ABSENT:	NONE

ATTEST:

Peter M. Rietkerk, Secretary

RESOLUTION NO. 09-17

RESOLUTION OF THE CITY COUNCIL OF THE CITY OF ESCALON ELECTING FORMATION OF A JOINT GROUNDWATER SUSTAINABILITY AGENCY PURSUANT TO THE SUSTAINABLE GROUNDWATER MANAGEMENT ACT

WHEREAS, the Sustainable Groundwater Management Act of 2014, California Water Code section 10720 et. seq., went into effect on January 1, 2015, and

WHEREAS, the legislative intent of the Act is to provide for the sustainable management of groundwater basins, to enhance local management of groundwater, to establish minimum standards for sustainable groundwater management, and to manage groundwater basins through the actions of local governmental agencies to the greatest extent feasible while minimizing state intervention; and

WHEREAS, the Act requires that California groundwater basins and subbasins designated by the California Department of Water Resources as high priority or medium priority be managed by one or more Groundwater Sustainability Agencies (GSAs) and that such management be accomplished pursuant to one or more approved Groundwater Sustainability Plans (GSPs) for the basin; and

WHEREAS, California Water Code Section 10721(j) defines a GSA as one or more local agencies that implement the provisions of the Act; and

WHEREAS, any local public agency that has water supply, water management or land use responsibilities within a groundwater basin may decide to become a GSA over that basin (California Water Code Sections 10721 and 10723); and

WHEREAS, SGMA provides that a combination of local agencies may form a GSA by a joint powers agreement, a memorandum of agreement, or other legal agreement (Water Code Section 10723.6); and

WHEREAS, the City of Escalon overlies a portion of the San Joaquin Valley Groundwater Basin, Eastern San Joaquin Groundwater Subbasin (defined in the Department of Water Resources' Bulletin 118 as Basin No. 5-22.01), which has been designated by the State of California as a high priority basin that is in a condition of critical overdraft; and

WHEREAS, the City of Escalon is the local agency with exclusive public drinking water supply, water quality and water production responsibilities within and for the City of Escalon; and

WHEREAS, the current exclusive source of the City of Escalon's water supply is groundwater from the Eastern San Joaquin Groundwater Subbasin; and

WHEREAS, it is beneficial to the health, safety and water supply reliability of the City of Escalon to retain local jurisdiction and control over groundwater resources within the City Limits of Escalon; and

WHEREAS, the City of Escalon previously filed notice with California Department of Water Resources (DWR) to become a GSA on February 9, 2017; and

WHEREAS, the City has been working cooperatively with other local agencies that also plan to manage groundwater in compliance with SGMA, including the South San Joaquin Irrigation District (SSJID) and the City of Ripon (Ripon); and

WHEREAS, the City, along with its regional partners SSJID and Ripon intend to jointly form the South San Joaquin Groundwater Sustainability Agency (SSJGSA) through a Memorandum of Agreement to work collaboratively to manage groundwater resources within their respective service areas and to comply with SGMA; and

WHEREAS, prior to adopting a resolution of intent to establish the City of Escalon as a member of the SSJGSA, Water Code Section 10723 requires the City to hold a public hearing, after publication of notice pursuant to California Government Code Section 6066, on whether to become a GSA; and

WHEREAS, pursuant to Government Code Section 6066, notices of a public hearing on whether or not to adopt a resolution to establish the SSJGSA through a Memorandum of Agreement were published on March 15, 2017 and March 22, 2017; and

WHEREAS, adoption of this Resolution does not constitute a project under the California Environmental Quality Act because it does not result in any direct or indirect physical change in the environment;

NOW, THEREFORE, BE IT RESOLVED that the City Council of the City of Escalon does hereby:

1. Elect to participate as a member of the SSJGSA to manage groundwater within the boundaries of the SSJGSA, which includes the portion of the Eastern San Joaquin Groundwater Subbasin underlying the jurisdictions of the City of Escalon, Ripon and SSJID; and

2. Authorize the City Manager or her designee to withdraw the previous GSA election notice to DWR to facilitate the City of Escalon's participation in the SSJGSA;

3. Authorize the City Manager to execute the "Memorandum of Agreement Between South San Joaquin Irrigation District, the City of Ripon and the City of Escalon to Form the South San Joaquin Groundwater Sustainability Agency"; and

4. Authorize the City Manager or her designee to coordinate with the other members of the SSJGSA to provide a copy of this resolution, a Notice of Intent, and all other necessary documentation to DWR within 30 days and to otherwise comply with the requirements of Water Code Section 10723.8; and

4. Authorize the City Manager or her designee to coordinate with the other members of the SSJGSA to maintain a list of interested parties regarding the newly formed SSJGSA pursuant to Water Code Section 10723.4.

PASSED, APPROVED, AND ADOPTED this 3rd day of April 2017, by the following vote:

AYES: Councilmembers Swift, Fox, Alves, Murken, Mayor Laugero
NOES: None
ABSENT: None
ABSTAIN: None

JEFF LAUGERO, Mayor

ATTEST:

ADRI CRIM, Deputy City Clerk

RESOLUTION NO. 17-18

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF RIPON ELECTING FORMATION OF GROUNDWATER SUSTAINABILITY AGENCY

WHEREAS, the California Legislature has adopted, and the Governor has signed into law, the Sustainable Groundwater Management Act of 2014 ("SGMA"), which requires the sustainable management of groundwater; and

WHEREAS, the legislative intent is to provide for sustainable management of groundwater basins, to enhance local management of groundwater, to establish minimum standards for sustainable groundwater management; and

WHEREAS, in order to exercise the authority granted in SGMA, a local agency or combination of local agencies may elect to form a Groundwater Sustainability Agency (GSA); and

WHEREAS, the City of Ripon (the City) is a local agency, as SGMA defines that term; and.

WHEREAS, the City is committed to sustainable management of its groundwater resources; and

WHEREAS, the City overlies a portion of the Eastern San Joaquin Subbasin (designated basin number 522.01) in the California Department of Water Resources' (DWR) groundwater basin system, which has been designated by DWR as a high-priority basin in critical overdraft; and

WHEREAS, the City has begun to work cooperatively with other local agencies that also plan to manage groundwater in compliance with SGMA, including the South San Joaquin Irrigation District (SSJID) and the City of Escalon (Escalon);

WHEREAS, the City, along with its regional partners SSJID and Escalon, intend to work collaboratively to manage their respective service areas under the South San Joaquin Groundwater Sustainability Agency (SSJGSA);

WHEREAS, Section 10723.8 of the SGMA requires that a local public agency electing to be a GSA to notify the DWR of its election and intention to undertake sustainable groundwater management within the agency's jurisdictional boundary; and

WHEREAS, pursuant to Government Code 6066, notice of a public hearing on the City's election to participate in the SSJGSA has been published as required by law; and

WHEREAS, on March 14, 2017, the City held a public hearing to consider adoption of this Resolution; and

WHEREAS, the City wishes to exercise the powers and authorities of a GSA granted by SGMA and to begin the process of cooperatively preparing a Groundwater Sustainability Plan (GSP) with other GSAs as appropriate.

NOW, THEREFORE, the City Council of the City of Ripon does hereby resolve as follows:

1. The City Council hereby finds that the facts set forth in the recitals to this Resolution are true and correct, and establish the factual basis for the City Council's adoption of this Resolution.

2. The City Council hereby elects to participate as a member in the SSJGSA to manage groundwater within the boundaries of the SSJGSA, including the Ripon City Limits.

3. The City Council authorizes the Engineering Department within 30 days of adopting this Resolution, to inform the Department of Water Resources of the City's decision to participate in the SSJGSA and take such other and further steps as necessary to comply with the SGMA and the Department of Water Resources requirements.

4. This Resolution shall take effect immediately upon its adoption.

PASSED AND ADOPTED at a regular meeting of the City Council of the City of Ripon this 14th day of March, 2017, by the following vote:

AYES:	Zuber, Restuccia, de Graaf, Parks, Uecker
NOES:	None
ABSENT:	None
ABSTAINING:	None

The City of Ripon
A Municipal Corporation

By: _____
DEAN UECKER, Mayor

ATTEST:

_____
LISA ROOS, City Clerk

APPENDIX 1-D.
DWR PREPARATION CHECKLIST

GSP Regulations Section	Water Code Section	Requirement	Description	Section(s) in the GSP
Article 3. Technical and Reporting Standards				
352.2		Monitoring Protocols	• Monitoring protocols adopted by the GSA for data collection and management • 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	4.1.3 4.3.3 4.7.4
Article 5. Plan Contents, Subarticle 1. Administrative Information				
354.4		General Information	• Executive Summary • List of references and technical studies	ES Chapter 8: References
354.6		Agency Information	• GSA mailing address • Organization and management structure • Contact information of Plan Manager • Legal authority of GSA • Estimate of implementation costs	1.1.3 1.1.4 1.1.5
354.8(a)	10727.2(a)(4)	Map(s)	• Area covered by GSP • Adjudicated areas, other agencies within the basin, and areas covered by an Alternative • Jurisdictional boundaries of federal or State land • Existing land use designations • Density of wells per square mile	1.1.4 1.2.1
354.8(b)		Description of the Plan Area	• Summary of jurisdictional areas and other features	1.2.1

GSP Regulations Section	Water Code Section	Requirement	Description	Section(s) in the GSP
Article 5. Plan Contents, Subarticle 1. Administrative Information (Continued)				
354.8(f)	10727.2(g)	Land Use Elements or Topic Categories of Applicable General Plans	• Summary of general plans and other land use plans • Description of how implementation of the GSP may change water demands or affect achievement of sustainability and how the GSP addresses those effects • Description of how implementation of the GSP may affect the water supply assumptions of relevant land use plans • Summary of the process for permitting new or replacement wells in the basin • Information regarding the implementation of land use plans outside the basin that could affect the ability of the Agency to achieve sustainable groundwater management	1.2.3.1 1.2.3.2 1.2.3.3 1.2.3.4
354.8(c) 354.8(d) 354.8(e)	10727.2(g)	Water Resource Monitoring and Management Programs	• Description of water resources monitoring and management programs • Description of how the monitoring networks of those plans will be incorporated into the GSP • Description of how those plans may limit operational flexibility in the basin • Description of conjunctive use programs	1.2.2 1.2.3

GSP Regulations Section	Water Code Section	Requirement	Description	Section(s) in the GSP
Article 5. Plan Contents, Subarticle 1. Administrative Information (Continued)				
354.8(g)	10727.4	Additional GSP Contents	**Description of Actions related to:** • Control of saline water intrusion • Wellhead protection • Migration of contaminated groundwater • Well abandonment and well destruction program • Replenishment of groundwater extractions • Conjunctive use and underground storage • Well construction policies • Addressing groundwater contamination cleanup, recharge, diversions to storage, conservation, water recycling, conveyance, and extraction projects • Efficient water management practices • Relationships with State and federal regulatory agencies • Review of land use plans and efforts to coordinate with land use planning agencies to assess activities that potentially create risks to groundwater quality or quantity • Impacts on groundwater dependent ecosystems	1.2.4
354.10		Notice and Communication	• Description of beneficial uses and users • List of public meetings • GSP comments and responses • Decision-making process • Public engagement • Encouraging active involvement • Informing the public on GSP implementation progress	1.3.1 1.3.2 1.3.3 1.3.4 1.3.5 1.3.6
Article 5. Plan Contents, Subarticle 2. Basin Setting				
354.14		Hydrogeologic Conceptual Model	• Description of the Hydrogeologic Conceptual Model • Two scaled cross-sections • Map(s) of physical characteristics: topographic information, surficial geology, soil characteristics, surface water bodies, source and point of delivery for imported water supplies	2.1

GSP Regulations Section	Water Code Section	Requirement	Description	Section(s) in the GSP
Article 5. Plan Contents, Subarticle 2. Basin Setting (Continued)				
354.14(c)(4)	10727.2(a)(5)	Map of Recharge Areas	• Map delineating existing recharge areas that substantially contribute to the replenishment of the basin, potential recharge areas, and discharge areas	2.1.4.5 1.2.2.9
	10727.2(d)(4)	Recharge Areas	• Description of how recharge areas identified in the plan substantially contribute to the replenishment of the basin	2.1.4.5 1.2.2.9
354.16	10727.2(a)(1) 10727.2(a)(2)	Current and Historical Groundwater Conditions	• Groundwater elevation data • Estimate of groundwater storage • Seawater intrusion conditions • Groundwater quality issues • Land subsidence conditions • Identification of interconnected surface water systems • Identification of groundwater-dependent ecosystems	2.2
354.18	10727.2(a)(3)	Water Budget Information	• Description of inflows, outflows, and change in storage • Quantification of overdraft • Estimate of sustainable yield • Quantification of current, historical, and projected water budgets	2.3
	10727.2(d)(5)	Surface Water Supply	• Description of surface water supply used or available for use for groundwater recharge or in-lieu use	2.3.4
354.20		Management Areas	• Reason for creation of each management area • Minimum thresholds and measurable objectives for each management area • Level of monitoring and analysis • Explanation of how management of management areas will not cause undesirable results outside the management area • Description of management areas	Not applicable
Article 5. Plan Contents, Subarticle 3. Sustainable Management Criteria				
354.24		Sustainability Goal	• Description of the sustainability goal	1.1.2
354.26		Undesirable Results	• Description of undesirable results • Cause of groundwater conditions that would lead to undesirable results • Criteria used to define undesirable results for each sustainability indicator • Potential effects of undesirable results on beneficial uses and users of groundwater	3.2.1.1 3.2.2.1 3.2.3.1 3.2.4.1 3.2.5.1 3.2.6.1

GSP Regulations Section	Water Code Section	Requirement	Description	Section(s) in the GSP
Article 5. Plan Contents, Subarticle 3. Sustainable Management Criteria (Continued)				
354.28	10727.2(d)(1) 10727.2(d)(2)	Minimum Thresholds	• Description of each minimum threshold and how they were established for each sustainability indicator • Relationship for each sustainability indicator • Description of how selection of the minimum threshold may affect beneficial uses and users of groundwater • Standards related to sustainability indicators • How each minimum threshold will be quantitatively measured	3.2.1.2 3.2.2.2 3.2.3.2 3.2.4.2 3.2.5.2 3.2.6.2
354.30	10727.2(b)(1) 10727.2(b)(2) 10727.2(d)(1) 10727.2(d)(2)	Measurable Objectives	• Description of establishment of the measurable objectives for each sustainability indicator • Description of how a reasonable margin of safety was established for each measurable objective • Description of a reasonable path to achieve and maintain the sustainability goal, including a description of interim milestones	3.2.1.3 3.2.2.3 3.2.3.3 3.2.4.3 3.2.5.3 3.2.6.3

GSP Regulations Section	Water Code Section	Requirement	Description	Section(s) in the GSP
Article 5. Plan Contents, Subarticle 4. Monitoring Networks				
354.34	10727.2(d)(1) 10727.2(d)(2) 10727.2(e) 10727.2(f)	Monitoring Networks	• Description of monitoring network • Description of monitoring network objectives • Description of how the monitoring network is designed to: demonstrate groundwater occurrence, flow directions, and hydraulic gradients between principal aquifers and surface water features; estimate the change in annual groundwater in storage; monitor seawater intrusion; determine groundwater quality trends; identify the rate and extent of land subsidence; and calculate depletions of surface water caused by groundwater extractions • Description of how the monitoring network provides adequate coverage of Sustainability Indicators • Density of monitoring sites and frequency of measurements required to demonstrate short-term, seasonal, and long-term trends • Scientific rational (or reason) for site selection • Consistency with data and reporting standards • Corresponding sustainability indicator, minimum threshold, measurable objective, and interim milestone • Location and type of each monitoring site within the basin displayed on a map, and reported in tabular format, including information regarding the monitoring site type, frequency of measurement, and the purposes for which the monitoring site is being used • Description of technical standards, data collection methods, and other procedures or protocols to ensure comparable data and methodologies	4.1 4.2 4.3 4.4 4.5 4.6
354.36		Representative Monitoring	• Description of representative sites • Demonstration of adequacy of using groundwater elevations as proxy for other sustainability indicators • Adequate evidence demonstrating site reflects general conditions in the area	4.1.1 4.3.1 4.4 3.2.2.2 3.2.5.2 3.2.6.2

GSP Regulations Section	Water Code Section	Requirement	Description	Section(s) in the GSP
Article 5. Plan Contents, Subarticle 4. Monitoring Networks (Continued)				
354.38		Assessment and Improvement of Monitoring Network	• Review and evaluation of the monitoring network • Identification and description of data gaps • Description of steps to fill data gaps • Description of monitoring frequency and density of sites	4.1.4 4.1.5 4.3.4 4.3.5 4.7 4.7.5
Article 5. Plan Contents, Subarticle 5. Projects and Management Actions				
354.44		Projects and Management Actions	• Description of projects and management actions that will help achieve the basin's sustainability goal • Measurable objective that is expected to benefit from each project and management action • Circumstances for implementation • Public noticing • Permitting and regulatory process • Time-table for initiation and completion, and the accrual of expected benefits • Expected benefits and how they will be evaluated • How the project or management action will be accomplished. If the projects or management actions rely on water from outside the jurisdiction of the Agency, an explanation of the source and reliability of that water shall be included. • Legal authority required • Estimated costs and plans to meet those costs • Management of groundwater extractions and recharge	6.2.1 6.2.2 6.2.3 6.2.4 6.2.5 6.2.6 6.2.7 6.2.8 6.3 6.4 6.5
354.44(b)(2)	10727.2(d)(3)		• Overdraft mitigation projects and management actions	6.2.4 6.2.5 6.2.6 6.3 6.4

GSP Regulations Section	Water Code Section	Requirement	Description	Section(s) in the GSP
Article 8. Interagency Agreements				
357.4	10727.6	Coordination Agreements - Shall be submitted to the Department together with the GSPs for the basin and, if approved, shall become part of the GSP for each participating Agency.	**Coordination Agreements shall describe the following:** • A point of contact • Responsibilities of each Agency • Procedures for the timely exchange of information between Agencies • Procedures for resolving conflicts between Agencies • How the Agencies have used the same data and methodologies to coordinate GSPs • How the GSPs implemented together satisfy the requirements of SGMA • Process for submitting all Plans, Plan amendments, supporting information, all monitoring data and other pertinent information, along with annual reports and periodic evaluation • A coordinated data management system for the basin • Coordination agreements shall identify adjudicated areas within the basin, and any local agencies that have adopted an Alternative that has been accepted by the Department	Not applicable

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APPENDIX 1-E.
RELEVANT GENERAL PLAN GOALS AND POLICIES

San Joaquin County General Plan

The abbreviations following each policy and program refer to the types of tools or actions the County can use to carry out the policies. There are eight types of tools and actions, listed below.

1. *Regulation and Development Review (RDR)*
2. *Plans, Strategies, and Programs (PSP)*
3. *Financing and Budgeting (FB)*
4. *Planning Studies and Reports (PSR)*
5. *County Services and Operations (SO)*
6. *Inter-governmental Coordination (IGC)*
7. *Joint Partnerships with the Private Sector (JP)*
8. *Public Information (PI)*

The following San Joaquin County General Plan Land Use (LU) Element goals and policies related to groundwater use will potentially influence implementation of the GSP.

- Policy LU-1.1 Compact Growth and Development (RDR): The County shall discourage urban sprawl and promote compact development patterns, mixed-use development, and higher-development intensities that conserve agricultural land resources, protect habitat, support transit, reduce vehicle trips, improve air quality, make efficient use of existing infrastructure, encourage healthful, active living, conserve energy and water, and diversify San Joaquin County's housing stock.
- Policy LU-1.7 Farmland Preservation (RDR): The County shall consider information from the State Farmland Mapping and Monitoring Program when designating future growth areas in order to preserve prime farmland and limit the premature conversion of agricultural lands.
- Policy LU-2.17 Delta Primary Zone Amendments (RDR/PSP): The County shall require proposed General Plan amendment or zoning reclassification for areas in the Primary Zone of the Delta to be consistent with the Land Use and Resource Management Plan for the Primary Zone of the Delta, as required by the State Delta Protection Act of 1992 (Public Resources Code 29700 et seq.).
- Policy LU-8.1 Open Space Preservation (PSP): The County shall limit, to the extent feasible, the conversion of open space and agricultural lands to urban uses and place a high priority on preserving open space lands for recreation, habitat protection and enhancement, flood hazard management, public safety, water resource protection, and overall community benefit.

The following San Joaquin County General Plan County Areas and Communities (C) Element goals and policies related to groundwater use will potentially influence implementation of the GSP:

- Policy C-1.2 Character and Quality of Life (RDR): The County shall encourage new development in Urban and Rural communities to be designed to strengthen the desirable characteristics and historical character of the communities, be supported by necessary public facilities and services, and be compatible with historical resources and nearby rural or resource uses.

- Policy C-6.18 New Urban Community Water Supply (RDR/PSP): The County shall require new Urban Communities demonstrate access to adequate water supplies to meet the ultimate buildout of the community, consistent with General Plan policies for reducing further groundwater aquifer overdraft and maintaining sufficient water supplies for agriculture. Applicants for new Urban Communities shall be required to study and guarantee, through a development agreement, that existing and future water supply needs can be met and that existing users' water supplies will not be negatively impacted.

The following San Joaquin County General Plan Economic Development (ED) Element goals and policies related to groundwater use will potentially influence implementation of the GSP:

- Policy ED-3.2 Considerations for New Commercial and Industrial Development (RDR): The County shall consider the following factors when reviewing proposed non-agricultural commercial and industrial development applications, including:
    - Water – New developments must have long-term water supplies to meet the ultimate demand of the development and surrounding area and ensure the continued viability of existing and future development
- Goal ED-4: To support the continued financial growth of the agricultural sector and ag-related businesses.
- Policy ED-4.8 Protect Agricultural Infrastructure (PSP): The County shall recognize and protect agricultural infrastructure, such as farm-to-market routes, water diversion and conveyance structures, airfields, processing facilities, research and development facilities, and farmworker housing.

The following San Joaquin County General Plan Infrastructure and Services (IS) Element goals and policies related to groundwater use will potentially influence implementation of the GSP:

- Goal IS-4: To ensure reliable supplies of water for unincorporated areas to meet the needs of existing and future residents and businesses, while promoting water conservation and the use of sustainable water supply sources.
- Policy IS-4.1 Interagency Cooperation (IGC): The County shall support efforts of local water agencies, special district, and water conservation districts to ensure that adequate high-quality water supplies are available to support existing and future residents and businesses.
- Policy IS-4.2 Interagency Cooperation (IGC): The County shall work with local water agencies to address existing and future water needs for the County.
- Policy IS-4.3 Water Supply Availability (RDR/PSP): The County shall consider the availability of a long-term, reliable potable water supply as a primary factor in the planning of areas for new growth and development.
- Policy IS-4.4 Water Rights Protection (IGC): The County shall support local water agencies in their efforts to protect their water rights and water supply contracts, including working with Federal and State water projects to protect local water rights.
- Policy IS-4.5 Drought Response (PSP/IGC): The County shall encourage all local water agencies to develop and maintain drought contingency and emergency services plans, emergency inter-ties, mutual aid agreements, and related measures to ensure adequate water service during drought or other emergency water shortages.
- Policy IS-4.6 Coordinate Efforts for Adequate Water Supply (PSP/IGC): The County shall support coordinated efforts to obtain adequate water supplies and develop water storage facilities to meet expected water demand.

- Policy IS-4.7 Conjunctive Use (PSP/IGC): The County shall support conjunctive use of groundwater and surface water by local water agencies to improve water supply reliability.

- Policy IS-4.8 Water Conservation Measures (RDR): The County shall require existing and new development to incorporate all feasible water conservation measures to reduce the need for water system improvements.

- Policy IS-4.9 Groundwater Management (IGC): The County shall continue to support cooperative, regional groundwater management planning by local water agencies, water users, and other affected parties to ensure a sustainable, adequate, safe, and economically viable groundwater supply for existing and future uses within the County.

- Policy IS-4.10 Groundwater Monitoring Program (PSR/IGC): The County shall continue to evaluate the quantity and quality of groundwater.

- Policy IS-4.12 Water Supply Planning (PSP/IGC): The County shall encourage local water agencies to develop plans for responding to droughts and the effects of global climate change, including contingency plans, water resource sharing to improve overall water supply reliability, and the allocation of water supply to priority users.

- Policy IS-4.13 Water Quality Standards (RDR): The County shall require that water supplies serving new development meet State water quality standards. If necessary, the County shall require that water be treated to meet State standards and that a water quality monitoring program be in place prior to issuance of building permits.

- Policy IS-4.14 Sufficient Water Supply Assessments (RDR): The County shall require new developments over 500 dwelling units in size to prepare a detailed water source sufficiency study and water supply analysis for use in preparing a Water Supply Assessment, consistent with any Integrated Regional Water Management Plan or similar water management plan. This shall include analyzing the effect of new development on the water supply of existing users.

- Policy IS-4.15 Test Wells (RDR/PSR): Prior to issuing building permits for new development that will rely on groundwater, the County shall require confirmation for existing wells or test wells for new wells to ensure that water quality and quantity are adequate to meet the needs of existing, proposed, and planned future development.

- Policy IS-4.16 Permit for Groundwater Export (RDR): The County shall continue to require a permit for the extraction of groundwater that is intended to be exported outside County boundaries.

- Policy IS-4.17 Advocate Against Water Exports (PSP): The County shall advocate that water should not be exported to other areas of the state unless no other areas in San Joaquin County are impacted and the current and future needs of San Joaquin County can still be met.

- Policy IS-4.19 Water Efficient Landscaping (RDR): The County shall encourage water efficient landscaping and use of native, drought-tolerant plants consistent with the Model Landscape Ordinance.

- Policy IS-4.20 Water Efficient Agricultural Practices (PSP): The County shall encourage farmers to implement irrigation practices, where feasible and practical, to conserve water.

- Goal IS-5: To maintain an adequate level of service in the water systems serving unincorporated areas to meet the needs of existing and future residents and businesses, while improving water system efficiency.

- Policy IS-5.1 Adequate Water Treatment and Distribution Facilities (RDR): The County shall ensure, through the development review process, that adequate water, treatment and distribution facilities are sufficient to

serve new development and are scalable to meet capacity demands when needed. Such needs shall include capacities necessary to comply with water quality and public safety requirements.

- Policy IS-5.2 Water System Standards (RDR): The County shall require the minimum standards for water system improvements provided in Table IS-1 for the approval of tentative maps and zone reclassifications.

- Policy IS-5.3 Water Service in Antiquated Subdivisions (RDR): The County shall require water service through a public water system prior to issuance of building permits for new residences on parcels less than two acres in antiquated subdivisions. Individual wells may be allowed if public water is not available and all well and sewage requirements can be met.

- Policy IS-5.4 Water Infrastructure Fees (RDR): As a condition of approval for new developments, the County shall require verification of payment of fees imposed for water infrastructure capacity per the fee payment schedule from the appropriate local agency prior to the approval of any final subdivision map.

- Policy IS-5.5 Water System Rehabilitation (PSP): The County shall encourage the rehabilitation of irrigation systems and other water delivery systems to reduce water losses and increase the efficient use and availability of water.

- IS-5.6 Consistent Fire Protection Standards for New Development (RDR/IGC): The County, in coordination with local water agencies and fire protection agencies, shall ensure consistent and adequate standards for fire flows and fire protection for new development.

The following San Joaquin County General Plan Resource Conservation and Sustainability (NCR) goals and policies related to groundwater use will potentially influence implementation of the GSP:

- Policy NCR-3.1 Preserve Groundwater Recharge Areas (PSP): The County shall strive to ensure that substantial groundwater recharge areas are maintained as open space.

- Policy NCR-3.2 Groundwater Recharge Projects (PSP): The County shall encourage the development of groundwater recharge projects of all scales within the County and cities to increase groundwater supplies.

- Policy NCR-3.3 Multi-Jurisdictional Groundwater Management Evaluation (IGC): The County shall support multi-jurisdictional groundwater management that involves adjacent groundwater basins.

- Policy NCR-3.4 Eliminate Pollution (PSP): The County shall support efforts to eliminate sources of pollution and clean up the County's waterways and groundwater.

- Policy NCR-3.7 Septic Tank Regulation (RDR): The County shall enforce its septic tank and onsite system regulations consistent with Central Valley Regional Water Quality Control Board policy that recognizes the County as the responsible agency to protect the water quality of surface water and groundwater.

The following San Joaquin County General Plan Delta Element (D) goals and policies related to groundwater use will potentially influence implementation of the GSP:

- Policy D-2.4 Water Rights (RDR/PSP): The County shall protect existing water rights within the Delta, including the “area of origin” laws and anti-degradation policy of the SWRCB for areas in the Delta, such that there is no deprivation of the water needed for present and future reasonable beneficial use in the areas where the water originates.

- Goal D-4: To regulate development within the Delta to ensure the long-term viability of agricultural operations, success of natural ecosystems, and continuation of Delta heritage.

- Goal D-6: To protect Delta water supplies for agricultural uses and ecosystems enhancement and improve overall Delta water quality.
- D-6.5 Water Storage Options (IGC/PSR): The County shall advocate for the study of above- and below-ground storage options as part of a statewide improved flood management and water supply system.

Calaveras County General Plan

The following Calaveras County General Plan Land Use Element goals and policies related to groundwater use will potentially influence implementation of the GSP:

- Policy II-25B: Encourage the development of alternative individual waste disposal systems which minimize pollution and water usage.

The following Calaveras County General Plan Conservation Element goals and policies related to groundwater use will potentially influence implementation of the GSP:

- Goal IV-9: Preserve the County's current water rights and additional water rights necessary to support the County's full development potential.
- Policy IV-9A: Support the development of water projects in the County for domestic and irrigation purposes.
- Goal IV-1: Preserve and encourage the use of land for agriculture purposes.
- Policy IV-1A: Allow resource production lands to remain available for agriculture and rural use.
- Goal IV-2: Protect legally established agriculture from encroachment by incompatible land uses.
- Goal IV-3: Preserve and encourage the expansion of high capability timber lands for timber protection and harvest.
- Policy IV-3A: Allow lands located within high capability timberlands to remain available for timber production.
- Goal IV-4: Maintain and increase timber land productivity.
- Policy IV-4A: Encourage sustained yield timber production and harvest.
- Goal IV-10: Provide for adequate domestic water supplies.
- Policy IV-10A: Encourage continued cooperation among water suppliers in meeting the water needs for the County as a whole.

The following Calaveras County General Plan Open Space Element goals and policies related to groundwater use will potentially influence implementation of the GSP:

- Goal V-2: Protect streams, rivers, and lakes from excessive sedimentation due to development and grading.
- Policy V-2A: Review proposed development projects for potential effects on nearby and adjacent streams, rivers, and lakes.
- Goal V-3: Protect and preserve riparian habitat along streams and rivers in the County.
- Policy V-9A: Balance water resources development with the preservation of streams and rivers in their natural state.

Stanislaus County General Plan

The following Stanislaus County General Plan Land Use Element goals and policies related to groundwater use will potentially influence implementation of the GSP:

- Goal 1: Provide for diverse land use needs by designating patterns which are responsive to the physical characteristics of the land as well as to environmental, economic, and social concerns of the residents of Stanislaus County.

- Policy 2: Land designated Agriculture shall be restricted to uses that are compatible with agricultural practices, including natural resources management, open space, outdoor recreation, and enjoyment of scenic beauty.

- Policy 4: Urban development shall be discouraged in areas with growth-limiting factors such as high water table or poor soil percolation, and prohibited in geological fault and hazard areas, flood plains, riparian areas, and airport and private airstrip hazard areas, unless measures to mitigate the problems are included as part of the application.

- Policy 7: Riparian habitat along the rivers and natural waterways of Stanislaus County shall, to the extent possible, be protected.

- Policy 14: Uses shall not be permitted to intrude into or be located adjacent to an agricultural area if they are detrimental to continued agricultural usage of the surrounding area.

- Policy 17: Agriculture, as the primary industry of the County, shall be promoted and protected.

- Policy 24: Future growth shall not exceed the capabilities/capacity of the provider of services such as sewer, water, public safety, solid waste management, road systems, schools, health care facilities, etc.

- Policy 29: Support the development of a built environment that is responsive to decreasing air and water pollution, reducing the consumption of natural resources and energy, increasing the reliability of local water supplies, and reduces vehicle miles traveled by facilitating alternative modes of transportation, and promoting active living (integration of physical activities, such as biking and walking, into everyday routines) opportunities.

- Goal 7: Provide for direct citizen participation in land use decisions involving the expansion of residential uses into agricultural and open-space areas in order to encourage compact urban form and to preserve agricultural land.

The following Stanislaus County General Plan Conservation/Open Space Element goals and policies related to groundwater use will potentially influence implementation of the GSP:

- Goal 2: Conserve water resources and protect water quality in the County.

- Policy 5: Protect groundwater aquifers and recharge areas, particularly those critical for the replenishment of reservoirs and aquifers.

- Policy 6: Preserve natural vegetation to protect waterways from bank erosion and siltation.

- Policy 7: New development that does not derive domestic water from pre-existing domestic and public water supply systems shall be required to have a documented water supply that does not adversely impact Stanislaus County water resources.

- Policy 8: The County shall support efforts to develop and implement water management strategies.

- Policy 9: The County will investigate additional sources of water for domestic use.

The following Stanislaus County General Plan Agricultural Element goals and policies related to groundwater use will potentially influence implementation of the GSP:

- Goal 1: Strengthen the agricultural sector of our economy.
- Policy 1.1: Efforts to promote the location of new agriculture-related business and industry in Stanislaus County shall be supported.
- Policy 1.10: The County shall protect agricultural operations from conflicts with non-agricultural uses by requiring buffers between proposed non-agricultural uses and adjacent agricultural operations.
- Goal 2: Conserve our agricultural lands for agricultural uses.
- Goal 3: Protect the natural resources that sustain our agricultural industry.
- Policy 3.4: The County shall encourage the conservation of water for both agricultural, rural domestic, and urban uses.
- Policy 3.5: The County will continue to protect the quality of water necessary for crop production and marketing.
- Policy 3.6: The County will continue to protect local groundwater for agricultural, rural domestic, and urban use in Stanislaus County.

City of Stockton General Plan

- Policy SAF-3.2: Protect the availability of clean potable water from groundwater sources.
- Policy SAF-3.2A (PFS-2.11): Continue to cooperate with San Joaquin County, SEWD, and Cal Water to monitor groundwater withdrawals and ensure that they fall within the target yield for the drinking water aquifer.
- Policy SAF-3.3: Encourage use of recycled ("gray") water for landscaping irrigation to reduce demand on potable supplies.
- Policy SAF-3.3A: Require new development to install non-potable water infrastructure for irrigation of large landscaped areas where feasible.
- Policy SAF-3.3B: Investigate and implement Code amendments to allow installation of dual plumbing and/or rainwater capture systems to enable use of recycled water and/or captured rainwater generated on-site.
- Policy SAF-3.4A: Require all new urban development to be served by an adequate wastewater collection system to avoid possible contamination of groundwater from onsite wastewater disposal systems.

City of Lodi General Plan

- Policy C-P7 Agricultural Soil Resources: Adopt an agricultural conservation program (ACP) establishing a mitigation fee to protect and conserve agricultural lands. The ACP shall include the collection of an agricultural mitigation fee for acreage converted from agricultural to urban use, taking into consideration all fees collected for agricultural loss (i.e., AB1600). The mitigation fee collected shall fund agricultural conservation easements, fee title acquisition, and research; the funding of agricultural education and local marketing programs; other capital improvement projects that clearly benefit agriculture (e.g., groundwater recharge projects); and administrative fees through an appropriate entity ("Administrative Entity") pursuant to an administrative

agreement. Goal CO-2: Prevent the creation of new groundwater contamination or the spread of existing contamination.

- Policy C-P13 Biological Resources: Support the protection, restoration, expansion, and management of wetland and riparian plant communities along the Mokelumne River for passive recreation, groundwater recharge, and wildlife habitat.

- Policy C-P27 Hydrology and Water Quality: Monitor the water quality of the Mokelumne River and Lodi Lake, in coordination with San Joaquin County, to determine when the coliform bacterial standard for contact recreation and the maximum concentration levels of priority pollutants, established by the California Department of Health Services, are exceeded. Monitor the presence of pollutants and variables that could cause harm to fish, wildlife, and plant species in the Mokelumne River and Lodi Lake. Post signs at areas used by water recreationists warning users of health risks whenever the coliform bacteria standard for contact recreation is exceeded. Require new industrial development to not adversely affect water quality in the Mokelumne River or in the area's groundwater basin. Control use of potential water contaminants through inventorying hazardous materials used in City and industrial operations.

- Policy C-P34 Hydrology and Water Quality: Protect groundwater resources by working with the county to prevent septic systems in unincorporated portions of the county that are in the General Plan Land Use Diagram on parcels less than two acres.

- Policy GM-P17 Potable Water Supply: Cooperate with Northeastern San Joaquin County Groundwater Banking Authority, other member water agencies, and the WID to retain surface water rights and groundwater supply.

City of Manteca General Plan

- Policy PF-P-5 Public Facilities and Services Element: The City will continue to rely principally on groundwater resources for its municipal water in the near term and will participate in the regional improvements to deliver surface water to augment the City's groundwater supply.

- Policy PF-P-15 Public Facilities and Services Element: The City shall monitor water quality regularly and take necessary measures to prevent contamination.

- Policy PF-P-16 Public Facilities and Services Element: The City shall include a groundwater analysis as a technical analysis of water system capacity in the update of the Public Facilities Implementation Plan (PFIP) and shall prepare an environmental analysis in the PFIP that addresses the quality and availability of groundwater.

- Policy PF-P-17 Public Facilities and Services Element: The City shall consider incremental increases in the demands on groundwater supply and water quality when reviewing development applications.

- Policy RC-P-3 Resource Conservation Element – Water Conservation: The City shall protect the quantity of Manteca's groundwater.

- Policy RC-P-4 Resource Conservation Element – Water Conservation: The City shall require water conservation in both City operations and private development to minimize the need for the development of new water sources.

- Policy RC-P-5 Resource Conservation Element – Water Conservation: Development of private water wells within the city limits shall be allowed only where the City makes a finding that municipal water service is not readily and feasibly available, and such private well systems shall only be allowed to be used until such time as City water service becomes available.

- Policy RC-P-14 Resource Conservation Element – Water Conservation: Encourage participation by the County and surrounding communities in a basin-wide groundwater management study.

- Policy S-P-1 Safety Element: The City shall require preparation of geological reports and/or geological engineering reports for proposed new development located in areas of potentially significant geological hazards, including potential subsidence (collapsible surface soils) due to groundwater extraction.

City of Escalon General Plan

- Objective 3.1 (A) Natural Resources: Protect natural resources including groundwater, soils, and air quality to meet the needs of present and future generations.

- Policy 3.1 (1) Natural Resources: Expand programs that enhance groundwater recharge in order to maintain the groundwater supply, including the installation of retention ponds in new growth areas.

- Policy 3.1 (3) Natural Resources: Policy 3.1 (1) Natural Resources: Expand programs that enhance groundwater recharge in order to maintain the groundwater supply, including the installation of retention ponds in new growth areas.

- Policy 9.1 (12) Public Facility Improvement: To encourage groundwater recharge, ponding basins shall be designed as retention basins. However, pumping facilities shall be included in such facilities to handle peak flows and to provide for disposal of stormwater into irrigation ditches when necessary. Stormwater inflow into irrigation district canals and pipelines shall be subject to existing or future agreements by and between the City and the irrigation districts specifying maximum inflow, maximum service area boundary, and any other limitation thereto.

- Policy 9.1 (14) Public Facility Improvement: New municipal water well sites should be planned which include pump, storage, pressure filtration, and/or treatment equipment. These new wells should be located so that they will not conflict with planned residential neighborhoods. They should have design, screening, landscaping, and architectural improvements which make them compatible with adjacent land uses.

City of Ripon General Plan

- Goal F: Groundwater management pursuant to the City's Urban Water Management Plans to avoid overdraft and maintain drinking water quality.

- Policy F1. Expand City's existing system to regularly monitor and evaluate the physical condition and quality of the groundwater system underlying Ripon, and to identify the need for supplemental water as required.

- Policy F2. Identify and secure available sources of supplemental surface water for replacement or recharge of groundwater as required.

- Policy F3. Manage land use and sewage disposal as required to maintain adequate groundwater quality.

- Goal G: Efficient use of water resources throughout the community pursuant to the City's Groundwater Management and Preservation Plan.

- Policy G1. Promote water conservation through public dissemination of groundwater and municipal water use information.

- Policy G2. Develop a plan, financing mechanism, and target date for installation of water meters on un-metered portions of the water system.

- Policy G3. Promote reclamation and reuse of municipal and industrial wastewaters for irrigation, recharge, or other beneficial uses.

- Policy D5. The City shall implement the Groundwater Management Plan adopted by the City Council. This program includes, but is not necessarily limited to: the ongoing collection and analysis of well quantity and quality data; the identification of recharge areas within the Planning Area; inter-agency coordination and planning to protect and enhance recharge areas; establishment of a well head protection program to ensure well and aquifer testing for new city wells; and the installation of monitoring wells, as required.

- Policy D6. The City shall review design and operation parameters for stormwater detention facilities and make feasible adjustments to these plans, which would promote recharge of stormwater to the groundwater system. For example, siting detention facilities in areas of maximum infiltration capacity, increasing detention time for where necessary storage capacity is not compromised, and adjustment of area/depth ratios to maximize infiltration.

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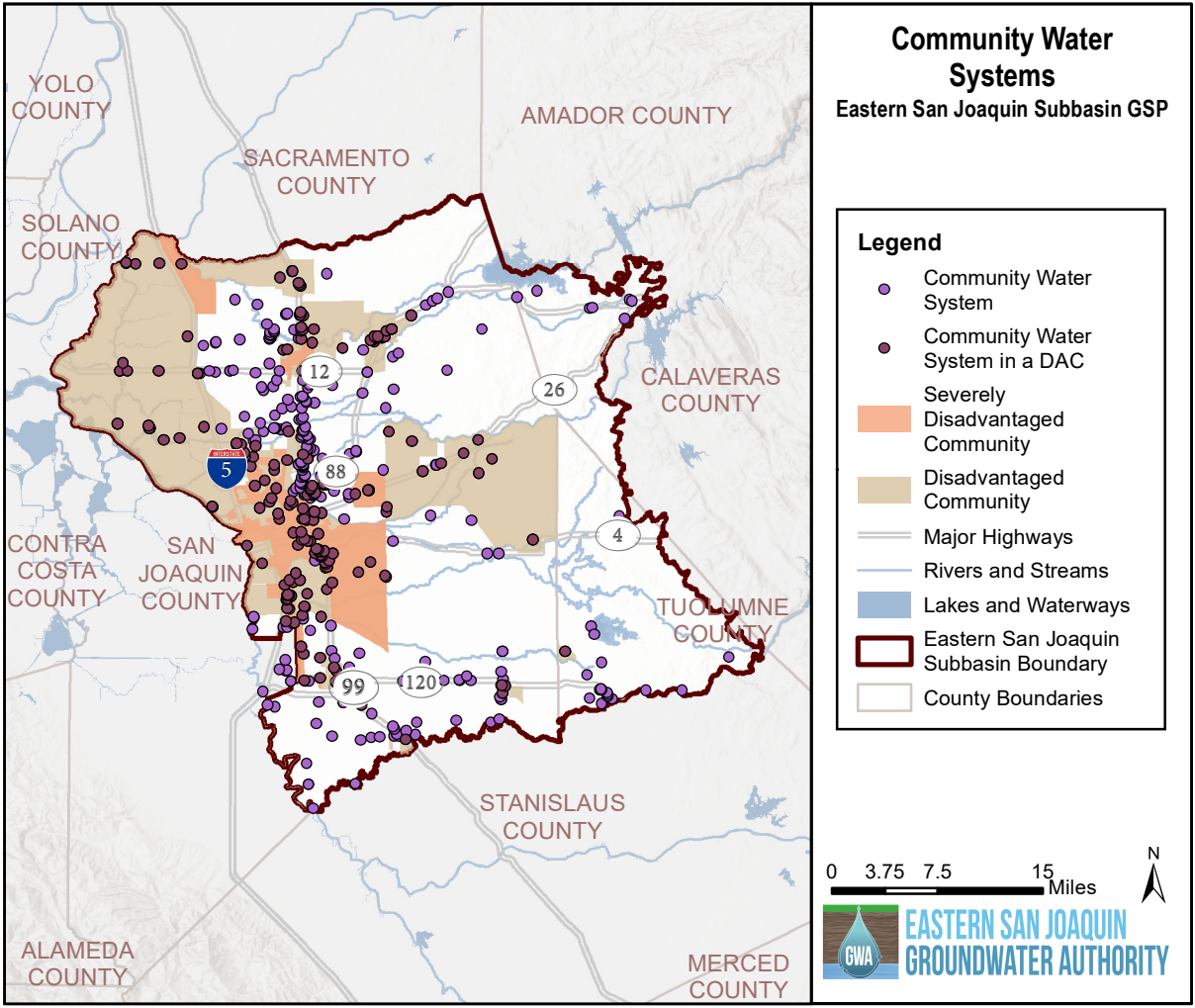
APPENDIX 1-F.
COMMUNITY WATER SYSTEMS


Community Water Systems
Eastern San Joaquin Subbasin GSP
Legend
Community Water System
Community Water System in a DAC
Severely Disadvantaged Community
Disadvantaged Community
Major Highways
Rivers and Streams
Lakes and Waterways
Eastern San Joaquin Subbasin Boundary
County Boundaries
YOLO COUNTY
SACRAMENTO COUNTY
AMADOR COUNTY
SOLANO COUNTY
CALAVERAS COUNTY
CONTRA COSTA COUNTY
SAN JOAQUIN COUNTY
TUOLUMNE COUNTY
STANISLAUS COUNTY
ALAMEDA COUNTY
MERCED COUNTY
12
26
5
88
4
99
120
0 3.75 7.5 15 Miles
N
GWA
EASTERN SAN JOAQUIN GROUNDWATER AUTHORITY

Community Water Systems			
Organization	Water System Population	Water System Connections	Parcel Located in DAC
MERCED OUTBOARD CLUB	125	43	
VALLEY SPRINGS PUD	900	256	
MOKELUMNE BEACH RV PARK	30	1	Yes
ESCALON LIVESTOCK MARKET - INACTIVE	90	1	
LATHROP GAS & FOOD MART*	25	1	
CSP CASWELL STATE PARK	145	9	
TID WOODWARD RESERVOIR	25	1	
TWO RIVERS RV PARK	50	2	
DURHAM FERRY PARK	100	1	
DURHAM FERRY COMMUNITY SCHOOL	30	5	
CARDOZA VILLA CORP	30	16	
FISHER NURSERY	50	1	
FORMER NESTLE USA INC FACILITY	100	1	Yes
GICO MANAGEMENT & WATER SYSTEM	60	1	
WEST KINGDOM HALL OF JEHOVAH WITNES	100	1	
RIPON VFW POST 1051 WATER SYSTEM	25	1	
RIPON, CITY OF	14,915	4,537	
RIPON USD-RIPON HIGH SCHOOL	1,000	1	
RIPON CHRISTIAN SCHOOLS	900	1	
SPRING CREEK ESTATES PWS	90	36	
GIOVANNIS PIZZA	100	2	
JIMCO TRUCK PLAZA WATER SYSTEM	150	5	
MUSD-NILE GARDEN SCHOOL	804	3	
RIPON USD-COLONY OAK SCHOOL	100	1	
MCHENRY AVE RECREATION AREA	25	1	
BIRDS NEST CHILD DEVELPMT CTR INC	25	1	
RIVER ROAD PRODUCE WATER SYSTEM	25	1	
AUSTIN INDUSTRIAL PARK WATER SYSTEM	25	1	
ISLANDER MARINA	150	74	
TURTLE BEACH & WATER SYSTEM	70	1	
NICHOLAS P KUKULICA VFW POST	80	1	Yes
OAKWOOD LAKE WATER DISTRICT-SUBDIVISION	891	252	
OAKWOOD LAKE MOBILE HOME PARK	148	57	

Organization	Water System Population	Water System Connections	Parcel Located in DAC
GURDWARA BURMAT PARKASH MANTECA WS	25	1	
CITY OF OAKDALE TREATMENT PLANT-WATER QU	25	7	
RICH FRUIT PAK CO	100	2	
ECKERT FROZEN FOODS	25	1	
RIVER OAK GRACE-WATER SYSTEM	500	4	
SHADY LAWN FARM (SUMMER CAMP)	150	4	
HOGAN MANUFACTURING CO - INACTIVE	25	1	
BEALL TRAILERS OF CALIF INC	25	1	Yes
RIVER ROAD PLAZA WATER SYSTEM	25	6	
OAKDALE CHEESE & SPECIALTIES	25	1	
FRIENDLY CHEVROLET	30	1	Yes
SJC MOSSDALE CROSSING PARK	25	1	
KINGDOM HALL JEHOVAH WITNESS	100	1	
ORANGE BLOSSOM RECREATION AREA	26	7	
4N MOBILEHOME PARK	65	35	
NORTH OAKS MUTUAL WATER CO	234	61	
O MALLEYS DUCK INN	25	1	
WHISKEY RIVER SALOON	26	2	
SHIVELY S BAR & GRILL	26	1	
ESCALON, CITY OF	7,137	2,390	Yes
OLD WINERY COMPLEX - INACTIVE	250	8	
ESCALON PREMIER BRANDS	300	1	Yes
MUSD-MANTECA HIGH SCHOOL	400	1	Yes
FRANKS ONE/STOP FOOD MART WATER SYS	300	1	
YOSEMITE INN - PWS	50	3	
DELGADO WATER SYSTEM - INACTIVE	25	5	
RAUDEL DELGADO WATER SYSTEM	50	1	
JIMMYS MARKET WATER SYSTEM	25	1	Yes
OLDE TOWNE	35	13	
MUSD-CALLA HIGH SCHOOL	100	1	Yes
JIMMYS LIQUORS WATER SYSTEM	25	1	Yes
SOUTH SAN JOAQUIN IRR DIST	55	2	
MANTECA INDUSTRIAL PRK CSA-30	50	17	
SOUTH SAN JOAQUIN EDUCATION CENTER	25	1	
GUBARY S LIQUOR	25	1	

Organization	Water System Population	Water System Connections	Parcel Located in DAC
OLD FIREHOUSE BBQ & DELI	26	1	
PG&E: Manteca Service Center	25	1	
COUNTRY BAR (WATER)	100	1	
ST PATRICK CATHOLIC CHURCH WTR SYS	25	1	
EUSD-VAN ALLEN SCHOOL	200	1	
GICO VALLEY FARMS	25	1	
EUSD-HEAD START CHILD DEV SERVICES INC	25	1	
MANTECA, CITY OF	75,748	19,759	Yes
ESCALON USD-ESCALON HIGH SCH	800	5	
BTQC-ESCALON	110	1	
PIONEER EQUINE HOSPITAL WATER SYSTEM	25	1	
JR SIMPLOT CO	300	1	
MARSHALL LEHR - INACTIVE	25	15	Yes
ESCALON GOLF COURSE WS	100	1	
CITY OF LATHROP	12,427	3,675	
PILKINGTON NORTH AMERICA INC PLANT 10	25	1	
LOUISE AVE CO-OP	33	11	Yes
MUSD-DISTRICT OFFICE	105	5	
DAN R COSTA INC (WS)	50	1	
CASA DE AMIGOS MOBILE HOME PARK	220	73	
STOCKTON LIVESTOCK AUCTION	50	1	
SOUTHLAND MOBILE HOME PARK	240	87	
MUSD-EAST UNION HIGH SCHOOL	500	4	Yes
TWIN CYPRESS MOBILE HOME PARK	112	45	
FLAGSTONE APARTMENTS	25	8	Yes
MUSD-NEW HAVEN SCHOOL	300	3	
ESCALON LIVESTOCK MKT	100	1	
VALLEY HOME COMMUNITY CENTER	25	1	Yes
C DEGROOT & SONS	25	1	Yes
WOODWARD RESERVOIR WATER SYSTEM	26	1	
LOVELACE TRANSFER STATION	25	1	
HAVEN ACRES RIVER CLUB INC	100	51	
LATHROP SANDS TRAILER COURT	105	35	
BORAL ROOFING	30	1	Yes
DELICATO VINEYARDS	25	5	

Organization	Water System Population	Water System Connections	Parcel Located in DAC
TSI TRANS SYSTEM INC	25	1	Yes
ROBINSON TRUCKING	30	4	Yes
BENETO WATER SYSTEM	30	2	Yes
CENTRAL VALLEY BAPTIST CHURCH WS	25	1	
CHANGING TIDES	30	6	
RIVER MILL, THE	25	1	
TULARE FARMS LLLP WATER SYSTEM	39	1	Yes
FINLEYS	25	2	Yes
MARTINEZ APARTMENTS	40	8	Yes
BORAL ROOFING	35	1	Yes
OASIS MARKET & PRODUCE	25	1	
DELRIO MARKET & DELI	25	1	Yes
J & L DELI	50	3	Yes
SIDHU MOBILE PARK WATER SYSTEM	75	23	Yes
MUSD-FRENCH CAMP SCHOOL	650	1	Yes
POLY PROCESSING CO/WESTERN REG	25	1	Yes
DICKS CORNER	25	1	Yes
HAVEN OF PEACE	25	1	Yes
SJ CO MOSQUITO & VECTOR CTRL*	25	1	Yes
SJC SPORTS COMPLEX	100	1	Yes
FRENCH CAMP GOLF COURSE	25	1	Yes
AVALOS, SILVIA	30	15	Yes
VALIMET INC	60	3	Yes
SIERRA ORGANICS WATER SYSTEM	25	3	Yes
J M EAGLE (WS)	100	15	Yes
COLLEGEVILLE MARKET & CAFE	150	1	
ESCALON USD- COLLEGEVILLE SCH	100	1	Yes
VALLEY TOMATO PRODUCTS	150	1	Yes
BURLINGTON NORTHERN SANTA FE	25	1	Yes
ARCHIES CAFE	36	13	Yes
MAPACHE TRAILER PARK	275	99	Yes
VALLEY 99 DRIVE INN	50	1	Yes
INVESTORS OF KING ISLAND WATER SYS	25	1	Yes
EL RIO MOBILE HOME PARK	60	28	Yes
LARSEN RANCH 39-40/WATER SYSTEM	30	10	Yes

Organization	Water System Population	Water System Connections	Parcel Located in DAC
CARPENTER GUEST HOME #2	30	1	
PICK N PULL AUTO DISMANTLERS	25	1	Yes
FARMINGTON FRESH SALES LLC	25	1	Yes
A1 WINSTONS MOBILE HOME PARK	75	30	Yes
MIDSTATE BARRIER INC	100	1	Yes
V & P TRAILER COURT WATER SYSTEM	35	15	Yes
ENVIROPLEX, INC	25	1	Yes
J B HUNT TRANSPORT INC	25	1	Yes
J B GOLF	75	1	
FARMINGTON WATER COMPANY	270	82	
CALIFORNIA CONCRETE PIPE CORP	25	1	Yes
ROADWAY EXPRESS WATER SYSTEM	25	1	Yes
TUFF SHED WATER SYSTEM	30	1	Yes
LEISURE MANOR	100	42	Yes
MIKE S RAPID SERVICE - INACTIVE	40	1	Yes
BJJ COMPANY LLC	40	1	Yes
CITY OF STOCKTON	358,493	47,501	Yes
SAN JOAQUIN FAIR - 2ND DISTRICT	19	48	Yes
RANCH COFFEE SHOP	100	1	Yes
RANCH SALES	25	1	Yes
S M S BRINERS INC	30	1	
CHARTER WAY MOBILE HOME PARK	150	60	Yes
EL RANCHO INN	50	1	Yes
VALLEY CREST TREE COMPANY	25	3	Yes
CENTURY MOBILE HOME PARK	50	16	Yes
FAIROAKS PWS #44	50	20	Yes
BENTLEY TRAILER COURT	84	28	Yes
DEL MONTE CORP	240	6	Yes
FMC TECHNOLOGIES INC	35	1	Yes
STOCKTON DEVELOPMENTAL CENTER	0	400	Yes
CALIFORNIA CEDAR PRODUCTS - INACTIVE	70	1	Yes
SJ RIFLE RANGE	100	1	
STOCKTON EAST WATER DISTRICT	50	4	
SAN JUAN VISTA	100	73	Yes
BLACK HILLS VALLEY RESORT	25	1	

Organization	Water System Population	Water System Connections	Parcel Located in DAC
ST JOSEPHS HOSPITAL	150	1	Yes
PANELLA TRUCKING LLC	50	1	Yes
BIG WHEEL MOBILE HOME PARK	120	55	Yes
HESKETT, JOE WATER SYSTEM	39	15	Yes
LINDEN USD-CHARTVILLE SCHOOL	40	1	Yes
GIANONE PARK	30	1	Yes
UNIVERSITY OF THE PACIFIC	4,975	202	Yes
STOCKTON SAILING CLUB	25	3	Yes
LADDS STOCKTON MARINA WS	600	1	Yes
MORADA PRODUCE	25	1	Yes
CONNELL MOTOR TRUCK CO PWS	25	1	Yes
SAHARA MOBILE COURT	300	175	Yes
FIRST BAPTIST CHURCH OF STKN	200	1	Yes
FRONTIER MOTEL	42	2	Yes
ST LUKES CHURCH	300	6	Yes
CALIFORNIA INN	40	1	
SHOP N BUY MARKET WATER SYSTEM	50	1	
O-G PACKING CO	25	0	
MARLOWE PROPERTY	50	10	
OMELETTE HOUSE	350	1	
DISPLAY TECHNOLOGIES	100	1	Yes
WATERLOO CHIROPRACTIC CENTER	25	2	Yes
GLENWOOD MOBILE HOME PARK	100	50	Yes
LINDEN USD-GLENWOOD SCHOOL	100	1	
F & H CONSTRUCTION WATER SYSTEM	25	1	Yes
COZAD WATER SYSTEM	29	1	Yes
CHEROKEE FREIGHT LINES WATER SYSTEM	50	1	
MOORE WATER SYSTEM	30	1	
CALIFORNIA FRUIT PROCESSORS	150	1	
CHERRY LANE TRAILER PARK	100	43	Yes
SHADY REST TRAILER COURT	120	53	Yes
CARIBOU MOBILE PARK PWS	180	72	Yes
COUNTRY SQUIRE MOBILE ESTATES & WATER SY	64	47	Yes
IN SHAPE HEALTH CLUB - WEST LANE	5,000	3	Yes
ITALIAN ATHLETIC CLUB	50	1	Yes

Organization	Water System Population	Water System Connections	Parcel Located in DAC
NEW 99 SPEEDWAY WATER SYSTEM	100	3	
AT&T UER47 (NEWTON)	30	1	
KIRK S - INACTIVE	25	9	Yes
WALNUT ACRES	100	30	Yes
LINDEN USD-WAVERLY SCHOOL	240	1	Yes
HAFOKA ELECTRIC INC	25	1	
BETHANY TEMPLE WATER SYSTEM	65	1	
OAKMOORE CONGRE OF JEHOVAH WIT	100	1	
GAF MATERIALS CO	30	1	
SPEERS FABRICATION	25	1	
SJ COUNTY-REDWOOD SCHOOL	83	1	Yes
INTERNATIONAL PAPER	40	1	
MARAGLIANOS INN	40	1	
VIEJO LTD	163	2	
MOBILE VILLAS TRAILER PARK	130	32	
ST MARYS HIGH SCHOOL	950	11	Yes
DOWN RIVER AN ITW COMPANY	25	1	
SPEEDY FOOD STORE WATER SYS	100	1	
STOCKTON VERDE MOBILE HOME PARK	571	293	
BEL AIR MOBILE ESTATE	150	116	
WATERLOO GUN & BOCCE CLUB	50	1	
SHADOW LAKE MOBILE HOME COMMUN	0	256	
OM SCOTT & SONS/HYPONEX CORP	50	5	Yes
FIRST BAPTIST CHURCH OF LINDEN	25	1	Yes
STOCKTON BAPTIST CHURCH	25	1	
BUFFET PARADISE	500	1	Yes
CHINCHIOLO, ROBERT	40	1	
TOWN & COUNTRY INN	55	1	
FIVE MILE HOUSE APARTMENTS	80	42	Yes
EL RANCHO MOTEL	76	1	
GOLFLAND WATER SYSTEM	1,000	1	Yes
DENNY BOYS WATER SYSTEM	300	2	
99 SHELL*	1,000	1	
HAMMER LANE WATER SYSTEM	100	1	
WIENERSCHNITZEL	400	1	

Organization	Water System Population	Water System Connections	Parcel Located in DAC
LINDEN COUNTY WATER DISTRICT	3,234	609	
KNIGHTS INN	600	1	
BAY VALLEY ESTATES PWS	50	13	Yes
ALBERTS RESTAURANT	1,500	1	
STOCKTON STEEL CO	250	6	Yes
ST MICHAELS WATER SYSTEM	25	2	
GAYLA MANOR PWS	146	54	Yes
SHADED TERRACE PWS	161	72	
NORMANS NURSERY	25	1	Yes
SUNNYSIDE ESTATES WATER SYSTEM	76	21	Yes
GIGOLO S	25	1	Yes
HOT AUGUST NIGHTS	1,000	1	Yes
HILDRETH WATER SYSTEM	25	1	Yes
LINDEN USD-WATERLOO ELEMENTARY	225	1	
KINGDOM HALL - INACTIVE	25	1	Yes
STOCKTON MOOSE LODGE	300	2	Yes
MORADA ACRES WATER SYSTEM	105	32	
SOLARIS INN	100	2	Yes
GIANNECCHINI WATER SYSTEM	25	1	
MARTINIS BAIT & TACKLE	1,000	3	
WATERLOO CALIFORNIA RESTAURANT	25	1	
ALMOND PARK WATER SYSTEM	60	20	
LODI USD-DAVIS SCHOOL	630	7	
MORADA OAKS SCHOOL PWS	30	2	
MORADA MANOR WATER SYSTEM	109	32	
ALPINE MEATS INC	270	1	Yes
STOCKTON BALLROOM	1,000	1	Yes
LONE TREE DRIVE IN	25	1	Yes
RANCHO SAN JOAQUIN WATER SYS	141	51	Yes
DELTA WETLANDS CAMP #3	25	5	Yes
VICTORIAN PARK WATER SERVICE	30	6	
PRIMA FRUTTA PACKING	25	1	Yes
LOWER SAC PLAZA	200	2	
MORADA ESTATES N PWS #46	180	82	
PARADISE POINT MARINA	200	15	Yes

Organization	Water System Population	Water System Connections	Parcel Located in DAC
LODI USD-MORADA MIDDLE SCHOOL	435	5	
PODESTA PACKING WATER SYSTEM	25	1	Yes
KOES BAR	25	1	
FINNLEES TRAILER PARK	55	26	
KOREAN PRESBYTERIAN CHURCH	25	1	
BEREA BAPTIST CHURCH STOCKTON CA	100	3	
ELKHORN ESTATES WATER SYSTEM	200	70	
HORIZON CHRISTIAN FELLOWSHIP	1,000	1	
SIGNATURE FRUIT CO, PLANT #4	150	1	Yes
A SAMBADO & SON 39-321	25	1	Yes
MORADA ESTATES PWS	158	86	
WILKINSON MANOR A-ZONE PWS	100	38	
ST FRANCIS MOTEL	40	1	
MORADA SHOPPING CENTER	100	9	
POLLARDVILLE CHICKEN/PIZZA	500	5	
ARCO STATION #595*	100	1	
ROYCE FARMS BBQ	100	1	
MORADA CHEVRON FAST N EASY #60*	200	2	
TAHAMA VILLAGE MOBILE HOME PARK	200	68	
PACIFIC BELL UE17L WATER SYSTEM	150	1	
KING ISLAND TRAILER PARK	200	76	Yes
KING ISLAND MARINA PWS	1,000	11	Yes
SJ OAK GROVE REGIONAL PARK	1,000	9	
E D U CAMP	25	2	
MID-WAY CABINETS INC	25	1	
RESERVE AT SPANOS PARK, THE	1,200	1	Yes
STOCKTON / LODI RV PARK	200	96	
HOLIDAY HARBOR MARINA	100	1	Yes
BROOKSIDE MEADOWS ESTATE	39	15	
HERMAN & HELENS MARINA	30	5	Yes
BEAR CREEK COMMUNITY CHURCH	25	1	
TWIN OAKS MOBILE PARK	255	85	
WAYSIDE MOTEL APARTMENTS WTR SYS	70	22	
LODI USD-ELKHORN SCHOOL	200	1	
TARDITI RENTALS WATER	25	1	

Organization	Water System Population	Water System Connections	Parcel Located in DAC
HOME CHURCH, THE	25	1	
WEST LANE MOBILE HOME PARK	160	83	
CEN CAL WATER SYSTEM	25	1	
LODI USD-TOKAY COLONY SCHOOL	166	2	
SJC MICKE GROVE PARK	1,000	8	
BEAR CREEK WINERY	25	1	
LODI USD-LIVE OAK SCHOOL	100	1	
LODI USD-DOROTHY MAHIN SCHOOL	48	1	
DESHMESH DARBAR LODI/STK WATER SYS	25	1	
DIEDE TRUCKING WATER SYSTEM	25	1	
VILLA CEREZOS	200	82	
MARIONS RANCH HOUSE MOTEL	78	2	
NORTH VALLEY SCHOOL PWS	35	1	
VALLEY LANDSCAPING & MAINT INC	25	1	
SJ COUNTY HOUSING AUTHORITY	500	2	
COLOR SPOT, LODI	30	1	
LODI USD-HENDERSON SCHOOL	200	3	
BACKSPIN GOLF CENTER	1,000	1	
AMOROSA INN & GARDENS LLC	25	1	
WOODBRIDGE GARDENS	30	1	
MERCED LDS CHURCH	257	1	
CHEROKEE MEMORIAL PARK INC WATER SYSTEM	300	6	
FLAG CITY WATER SYSTEM	200	4	
ROCKYS RESTAURANT	3,000	1	Yes
3 BS TRUCK & AUTO PLAZA	1,000	1	Yes
VAN RUITEN FAMILY WINERY	25	1	
PHILLIPS FARMS	100	2	
LITTLE POTATO SLOUGH MUTUAL	350	202	Yes
TOWER PARK VILLAGE HOA	0	200	Yes
CASAS WATER SYSTEM	25	2	Yes
JACOBS TERMINOUS MARKET	25	1	Yes
COUNTRYSIDE LIQUORS & GAS	100	3	
FRANK C ALEGRE TRUCKING INC WS	25	1	
IDLEWILD MOBILE PARK	40	10	
MARTINIS BAIT & TACKLE	25	1	

Organization	Water System Population	Water System Connections	Parcel Located in DAC
LOCKEFORD SPRINGS GOLF COURSE	25	1	
LODI, CITY OF	63,715	25,481	
SUNWEST LIQUORS - INACTIVE	100	1	Yes
MT MORIAH FARMS	500	2	
BOETHING TREELAND FARMS INC	30	1	
WESTGATE LANDING PARK WATER SYSTEM	25	1	Yes
HACIENDA GUANA - INACTIVE	50	18	
HANOT FOUNDATION INC	38	15	
HAYNES BOARD & CARE HOME	41	15	
RAY SCHOOL	200	1	Yes
LOCKEFORD COMMUNITY SERV. DIST.	2,500	819	Yes
COUNTRY MANOR MHP	75	37	
SAN JOAQUIN WATER WORKS #2	293	98	Yes
TURNER RD VINTNERS WEST	25	1	
Turner Road Vintners (East)	100	9	
LODI WINE & BUSINESS CENTER	61	1	Yes
LODI USD-TURNER ACADEMY	120	1	
WOODSIDE INVESTMENTS INC DBA MICHAEL & C	40	1	Yes
STAR BUILDING SYSTEMS	40	1	Yes
WASTEQUIP MANUFACTURING COMPANY LLC	25	1	Yes
JESSIES GROVE WINERY	25	1	
ALBERG WATER SYSTEM	900	7	
FAITH COMMUNITY CHURCH OF THE NAZARENE	25	1	
LODI LAKE MOBILE HOME PARK	104	52	
WOODBRIDGE MOBILE ESTATES	110	37	
SUTTER HOME WINERY INC.	25	1	Yes
TUSCAN WINERY VILLAGE	25	1	Yes
DOUBLE L MOBILE ESTATES	320	150	Yes
SUBWAY SANDWICHES WATER SYS	500	1	Yes
JENSEN PRECAST	25	1	Yes
COUNTRY GARDEN ESTATES	40	13	Yes
KELLOGG GARDEN PRODUCTS	185	2	Yes
WOODBRIDGE INN PWS	50	3	
WOODBRIDGE PIZZA WATER SYSTEM	25	1	
WOODBRIDGE FEED & FUEL	300	1	

Organization	Water System Population	Water System Connections	Parcel Located in DAC
CALVA PRODUCTS CO INC	30	1	
LODI BUILDING ASSOCIATION	25	1	
MOKELUMNE MEADOWS TRAILER PARK	55	27	
WOODBRIDGE COMMUNITY CHURCH	25	1	
LODI HOMES	39	15	Yes
LOCKEFORD MOBILE HOME PARK WTR SYS	100	44	Yes
WINE CUP MOTORCOACH RESORT WTR SYSTEM	25	1	Yes
MOOSE OUTDOOR SPORTSMAN CLUB	25	1	
CBUSO dba Woodbridge Winery	100	11	Yes
COUNTRY CLUB VISTA	75	31	
LAY S RESTAURANT - INACTIVE	250	1	Yes
MUNCH-A-BUNCH - INACTIVE	25	1	Yes
SKS ENTERPRISES	30	1	
ARBOR MOBILE HOME PARK WS	340	173	Yes
FAIRWAY ESTATES PWS CSA-18	68	41	
QUAIL OAKS RANGE	125	1	
LODI USD-HOUSTON SCHOOL	405	4	Yes
A & M MARKET	50	7	Yes
WINE COUNTRY APARTMENTS	40	16	
LODI AIRPORT CAFE	50	1	
BUON GIARDINO	25	1	Yes
ACAMPO WATER SYSTEM	150	61	
MCCORMACK WILLIAMSON	30	1	
ACAMPO INN WATER SYSTEM	35	13	Yes
EL TORERO RESTAURANT	225	1	
BURSON DONUT	25	1	
VIAGGIO WINERY WATER SYSTEM	25	1	
BIGLIERI FARM MARKET	25	1	
KRAMER APARTMENTS - INACTIVE	30	14	
CLEMENTS WATER WORKS #43	120	65	
STONE CORRAL COMMUNITY CHURCH	80	1	
LODI USD-CLEMENTS SCHOOL	116	1	
ROSSETTIS INN	150	1	
CLEMENTS RIDGE PRODUCE	25	1	
WALLACE COMMUNITY SERVICES DISTRICT	340	105	

Organization	Water System Population	Water System Connections	Parcel Located in DAC
SYCAMORE MOBILE HOME PARK	50	22	Yes
K AND D BREW THRU	25	1	Yes
JAHANT FOOD & FUEL	1,000	2	Yes
FOREST LAKE GOLF COURSE	5,000	1	Yes
OAK VIEW UNION ELEMENTARY SCH	350	1	
LAYS ROADHOUSE	100	1	Yes
SMK CHEVRON	1,000	1	Yes
NEW HOPE LANDING GENERAL STORE	125	44	Yes
SIGNATURE FRUIT (TOMATOES)	600	1	Yes
WIMPYS MARINA	70	33	Yes
FOUR CORNERS	600	6	Yes
RIVERSIDE MOBILE HOME PARK	55	28	Yes
COMMUNITY WATER CENTER	Unknown	Unknown	Unknown
NORTH SAN JOAQUIN WATER	Unknown	Unknown	Unknown
SOUTH SAN JOAQUIN WATER TREATMENT	Unknown	Unknown	Unknown

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APPENDIX 1-G.
FRESHWATER SPECIES IN THE EASTERN SAN JOAQUIN SUBBASIN

Freshwater Species in the Eastern San Joaquin Subbasin

Source: The following information was compiled by The Nature Conservancy and included with comments submitted May 31, 2019.

Methodology: ArcGIS was used to select features within the California Freshwater Species Database version 2.0.9 within the GSA's boundary. This database contains information on ~4,000 vertebrates, macroinvertebrates and vascular plants that depend on fresh water for at least one stage of their life cycle. The methods used to compile the California Freshwater Species Database can be found in Howard et al. 2015[1]. The spatial database contains locality observations and/or distribution information from ~400 data sources. The database is housed in the California Department of Fish and Wildlife's BIOS[2] as well as on The Nature Conservancy's science website[3]."

Scientific Name	Common Name	Legal Protected Status		
		Federal	State	Other
BIRDS				
Actitis macularius	Spotted Sandpiper			
Aechmophorus clarkii	Clark's Grebe			
Aechmophorus occidentalis	Western Grebe			
Agelaius tricolor	Tricolored Blackbird	Bird of Conservation Concern	Special Concern	BSSC - First priority
Aix sponsa	Wood Duck			
Anas acuta	Northern Pintail			
Anas americana	American Wigeon			
Anas clypeata	Northern Shoveler			
Anas crecca	Green-winged Teal			
Anas cyanoptera	Cinnamon Teal			
Anas discors	Blue-winged Teal			
Anas platyrhynchos	Mallard			
Anas strepera	Gadwall			
Anser albifrons	Greater White-fronted Goose			
Ardea alba	Great Egret			
Ardea herodias	Great Blue Heron			

[1] Howard, J.K. et al. 2015. Patterns of Freshwater Species Richness, Endemism, and Vulnerability in California. PLoSONE, 11(7). Available at: https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0130710
[2] California Department of Fish and Wildlife BIOS: https://www.wildlife.ca.gov/data/BIOS
[3] Science for Conservation: https://www.scienceforconservation.org/products/california-freshwater-species- database

Scientific Name	Common Name	Legal Protected Status		
		Federal	State	Other
Aythya affinis	Lesser Scaup			
Aythya americana	Redhead		Special Concern	BSSC - Third priority
Aythya collaris	Ring-necked Duck			
Aythya marila	Greater Scaup			
Aythya valisineria	Canvasback		Special	
Botaurus lentiginosus	American Bittern			
Bucephala albeola	Bufflehead			
Bucephala clangula	Common Goldeneye			
Butorides virescens	Green Heron			
Calidris alpina	Dunlin			
Calidris mauri	Western Sandpiper			
Calidris minutilla	Least Sandpiper			
Chen caerulescens	Snow Goose			
Chen rossii	Ross's Goose			
Chlidonias niger	Black Tern		Special Concern	BSSC - Second priority
Chroicocephalus philadelphia	Bonaparte's Gull			
Cinclus mexicanus	American Dipper			
Cistothorus palustris palustris	Marsh Wren			
Cygnus buccinator	Trumpeter Swan			
Cygnus columbianus	Tundra Swan			
Cypseloides niger	Black Swift	Bird of Conservation Concern	Special Concern	BSSC - Third priority
Egretta thula	Snowy Egret			
Empidonax traillii	Willow Flycatcher	Bird of Conservation Concern	Endangered	
Fulica americana	American Coot			
Gallinago delicata	Wilson's Snipe			
Gallinula chloropus	Common Moorhen			
Geothlypis trichas trichas	Common Yellowthroat			

Scientific Name	Common Name	Legal Protected Status		
		Federal	State	Other
Grus canadensis	Sandhill Crane			
Grus canadensis canadensis	Lesser Sandhill Crane		Special Concern	BSSC - Third priority
Haliaeetus leucocephalus	Bald Eagle	Bird of Conservation Concern	Endangered	
Himantopus mexicanus	Black-necked Stilt			
Icteria virens	Yellow-breasted Chat		Special Concern	BSSC - Third priority
Laterallus jamaicensis coturniculus	California Black Rail	Bird of Conservation Concern	Threatened	
Limnodromus scolopaceus	Long-billed Dowitcher			
Lophodytes cucullatus	Hooded Merganser			
Megaceryle alcyon	Belted Kingfisher			
Mergus merganser	Common Merganser			
Mergus serrator	Red-breasted Merganser			
Numenius americanus	Long-billed Curlew			
Numenius phaeopus	Whimbrel			
Nycticorax nycticorax	Black-crowned Night-Heron			
Oreothlypis luciae	Lucy's Warbler		Special Concern	BSSC - Third priority
Oxyura jamaicensis	Ruddy Duck			
Pelecanus erythrorhynchos	American White Pelican		Special Concern	BSSC - First priority
Phalacrocorax auritus	Double-crested Cormorant			
Phalaropus tricolor	Wilson's Phalarope			
Piranga rubra	Summer Tanager		Special Concern	BSSC - First priority
Plegadis chihi	White-faced Ibis		Watch list	
Pluvialis squatarola	Black-bellied Plover			
Podiceps nigricollis	Eared Grebe			
Podilymbus podiceps	Pied-billed Grebe			
Porzana carolina	Sora			

Scientific Name	Common Name	Legal Protected Status		
		Federal	State	Other
Rallus limicola	Virginia Rail			
Recurvirostra americana	American Avocet			
Riparia riparia	Bank Swallow		Threatened	
Setophaga petechia	Yellow Warbler			BSSC - Second priority
Tachycineta bicolor	Tree Swallow			
Tringa melanoleuca	Greater Yellowlegs			
Tringa semipalmata	Willet			
Tringa solitaria	Solitary Sandpiper			
Vireo bellii pusillus	Least Bell's Vireo	Endangered	Endangered	
Xanthocephalus xanthocephalus	Yellow-headed Blackbird		Special Concern	BSSC - Third priority
CRUSTACEANS				
Branchinecta lynchi	Vernal Pool Fairy Shrimp	Threatened	Special	IUCN - Vulnerable
Branchinecta mesovallensis	Midvalley Fairy Shrimp		Special	
Cambaridae fam.	Cambaridae fam.			
Crangonyx spp.	Crangonyx spp.			
Gnorimosphaeroma insulare	An Isopod			
Hyalella spp.	Hyalella spp.			
Lepidurus packardi	Vernal Pool Tadpole Shrimp	Endangered	Special	IUCN - Endangered
Linderiella occidentalis	California Fairy Shrimp		Special	IUCN - Near Threatened
FISH				
Acipenser medirostris ssp. 1	Southern green sturgeon	Threatened	Special Concern	Endangered - Moyle 2013
Mylopharodon conocephalus	Hardhead		Special Concern	Near-Threatened - Moyle 2013
Oncorhynchus mykiss - CV	Central Valley steelhead	Threatened	Special	Vulnerable - Moyle 2013
Oncorhynchus mykiss irideus	Coastal rainbow trout			Least Concern - Moyle 2013

Scientific Name	Common Name	Legal Protected Status		
		Federal	State	Other
Pogonichthys macrolepidotus	Sacramento splittail		Special Concern	Vulnerable - Moyle 2013
Spirinchus thaleichthys	Longfin smelt	Candidate	Threatened	Vulnerable - Moyle 2013
Acipenser medirostris ssp. 1	Southern green sturgeon	Threatened	Special Concern	Endangered - Moyle 2013
Acipenser transmontanus	White sturgeon		Special	Vulnerable - Moyle 2013
Catostomus occidentalis occidentalis	Sacramento sucker			Least Concern - Moyle 2013
Cottus asper ssp. 1	Prickly sculpin			Least Concern - Moyle 2013
Cottus gulosus	Riffle sculpin		Special	Near-Threatened - Moyle 2013
Entosphenus tridentata ssp. 1	Pacific lamprey		Special	Near-Threatened - Moyle 2013
Gasterosteus aculeatus microcephalus	Inland threespine stickleback		Special	Least Concern - Moyle 2013
Hypomesus pacificus	Delta smelt	Threatened	Endangered	Endangered - Moyle 2013
Hysterocarpus traskii traskii	Sacramento tule perch		Special	Near-Threatened - Moyle 2013
Lampetra ayersi	River lamprey		Special Concern	Near-Threatened - Moyle 2013
Lampetra richardsoni	Western brook lamprey			Near-Threatened - Moyle 2013
Lavinia exilicauda exilicauda	Sacramento hitch		Special	Near-Threatened - Moyle 2013
Lavinia symmetricus symmetricus	Central California roach		Special Concern	Near-Threatened - Moyle 2013
Mylopharodon conocephalus	Hardhead		Special Concern	Near-Threatened - Moyle 2013

Scientific Name	Common Name	Legal Protected Status		
		Federal	State	Other
Oncorhynchus gorbuscha	Pink salmon		Special Concern	Endangered - Moyle 2013
Oncorhynchus mykiss - CV	Central Valley steelhead	Threatened	Special	Vulnerable - Moyle 2013
Oncorhynchus mykiss irideus	Coastal rainbow trout			Least Concern - Moyle 2013
Oncorhynchus tshawytscha - CV fall	Central Valley fall Chinook salmon	Species of Special Concern	Special Concern	Vulnerable - Moyle 2013
Oncorhynchus tshawytscha - CV late fall	Central Valley late fall Chinook salmon	Species of Special Concern		Endangered - Moyle 2013
Oncorhynchus tshawytscha - CV spring	Central Valley spring Chinook salmon	Threatened	Threatened	Vulnerable - Moyle 2013
Orthodon microlepidotus	Sacramento blackfish			Least Concern - Moyle 2013
Pogonichthys macrolepidotus	Sacramento splittail		Special Concern	Vulnerable - Moyle 2013
Ptychocheilus grandis	Sacramento pikeminnow			Least Concern - Moyle 2013
Rhinichthys osculus ssp. 1	Sacramento speckled dace			Least Concern - Moyle 2013
Spirinchus thaleichthys	Longfin smelt	Candidate	Threatened	Vulnerable - Moyle 2013
HERPS				
Actinemys marmorata marmorata	Western Pond Turtle		Special Concern	ARSSC
Ambystoma californiense californiense	California Tiger Salamander	Threatened	Threatened	ARSSC
Anaxyrus boreas boreas	Boreal Toad			
Anaxyrus boreas halophilus	California Toad			ARSSC
Rana boylii	Foothill Yellow-legged Frog	Under Review in the Candidate or Petition Process	Special Concern	ARSSC
Rana draytonii	California Red-legged Frog	Threatened	Special Concern	ARSSC
Spea hammondii	Western Spadefoot	Under Review in the Candidate or Petition Process	Special Concern	ARSSC

Scientific Name	Common Name	Legal Protected Status		
		Federal	State	Other
Taricha torosa	Coast Range Newt		Special Concern	ARSSC
Thamnophis couchii	Sierra Gartersnake			
Thamnophis elegans elegans	Mountain Gartersnake			Not on any status lists
Thamnophis elegans terrestris	Coast Gartersnake			Not on any status lists
Thamnophis gigas	Giant Gartersnake	Threatened	Threatened	
Thamnophis sirtalis fitchi	Valley Gartersnake			Not on any status lists
Thamnophis sirtalis sirtalis	Common Gartersnake			
INSECTS & OTHER INVERTEBRATES				
Ablabesmyia annulata				Not on any status lists
Ablabesmyia spp.	Ablabesmyia spp.			
Aeshna spp.	Aeshna spp.			
Anax junius	Common Green Darner			
Apedilum spp.	Apedilum spp.			
Caenis latipennis	A Mayfly			
Centroptilum album	A Mayfly			
Centroptilum spp.	Centroptilum spp.			
Chironomidae fam.	Chironomidae fam.			
Chironomus spp.	Chironomus spp.			
Cladopelma spp.	Cladopelma spp.			
Cladotanytarsus spp.	Cladotanytarsus spp.			
Coenagrionidae fam.	Coenagrionidae fam.			
Corisella spp.	Corisella spp.			
Corixidae fam.	Corixidae fam.			
Cricotopus annulator				Not on any status lists
Cricotopus spp.	Cricotopus spp.			
Cryptochironomus curryi				Not on any status lists
Cryptochironomus spp.	Cryptochironomus spp.			
Cryptotendipes spp.	Cryptotendipes spp.			

Scientific Name	Common Name	Legal Protected Status		
		Federal	State	Other
Dicrotendipes spp.	Dicrotendipes spp.			
Enallagma carunculatum	Tule Bluet			
Enallagma civile	Familiar Bluet			
Endotribelos spp.	Endotribelos spp.			
Fallceon quilleri	A Mayfly			
Fallceon spp.	Fallceon spp.			
Glyptotendipes spp.	Glyptotendipes spp.			
Gomphus spp.	Gomphus spp.			
Hydrophilidae fam.	Hydrophilidae fam.			
Hydropsyche spp.	Hydropsyche spp.			
Hydropsychidae fam.	Hydropsychidae fam.			
Hydroptila spp.	Hydroptila spp.			
Hydroptilidae fam.	Hydroptilidae fam.			
Ischnura cervula	Pacific Forktail			
Ischnura spp.	Ischnura spp.			
Liodessus obscurellus				Not on any status lists
Micrasema arizonica				Not on any status lists
Micrasema spp.	Micrasema spp.			
Microchironomus nigrovittatus				Not on any status lists
Microchironomus spp.	Microchironomus spp.			
Micropsectra spp.	Micropsectra spp.			
Mideopsis spp.	Mideopsis spp.			
Nanocladius spp.	Nanocladius spp.			
Nectopsyche spp.	Nectopsyche spp.			
Oxyethira aculea				Not on any status lists
Oxyethira spp.	Oxyethira spp.			
Pachydiplax longipennis	Blue Dasher			
Pantala flavescens	Wandering Glider			
Pantala hymenaea	Spot-winged Glider			

Scientific Name	Common Name	Legal Protected Status		
		Federal	State	Other
Paracladopelma alphaeus				Not on any status lists
Paracladopelma spp.	Paracladopelma spp.			
Parakiefferiella spp.	Parakiefferiella spp.			
Paratanytarsus grimmii				Not on any status lists
Paratanytarsus spp.	Paratanytarsus spp.			
Peltodytes callosus				Not on any status lists
Peltodytes spp.	Peltodytes spp.			
Pentaneura spp.	Pentaneura spp.			
Phaenopsectra spp.	Phaenopsectra spp.			
Plathemis lydia	Common Whitetail			
Polypedilum albicorne				Not on any status lists
Polypedilum spp.	Polypedilum spp.			
Procladius spp.	Procladius spp.			
Psectrocladius spp.	Psectrocladius spp.			
Pseudosmittia spp.	Pseudosmittia spp.			
Rheotanytarsus spp.	Rheotanytarsus spp.			
Rhionaeschna multicolor	Blue-eyed Darner			
Robackia demeijeri				Not on any status lists
Sigara alternata				Not on any status lists
Sigara mckinstryi	A Water Boatman			Not on any status lists
Sigara spp.	Sigara spp.			
Simulium anduzei				Not on any status lists
Simulium spp.	Simulium spp.			
Sperchon spp.	Sperchon spp.			
Sympetrum corruptum	Variegated Meadowhawk			
Tanypus spp.	Tanypus spp.			

Scientific Name	Common Name	Legal Protected Status		
		Federal	State	Other
Tanytarsus angulatus				Not on any status lists
Tanytarsus spp.	Tanytarsus spp.			
Tramea lacerata	Black Saddlebags			
Trichocorixa calva				Not on any status lists
Tricorythodes spp.	Tricorythodes spp.			
MAMMALS				
Castor canadensis	American Beaver			Not on any status lists
Lontra canadensis canadensis	North American River Otter			Not on any status lists
Neovison vison	American Mink			Not on any status lists
Ondatra zibethicus	Common Muskrat			Not on any status lists
MOLLUSKS				
Anodonta californiensis	California Floater		Special	
Ferrissia spp.	Ferrissia spp.			
Galba spp.	Galba spp.			
Gonidea angulata	Western Ridged Mussel		Special	
Gyraulus spp.	Gyraulus spp.			
Helisoma spp.	Helisoma spp.			
Lymnaea spp.	Lymnaea spp.			
Margaritifera falcata	Western Pearlshell		Special	
Menetus opercularis	Button Sprite			CS
Menetus spp.	Menetus spp.			
Physa acuta	Pewter Physa			Not on any status lists
Physa spp.	Physa spp.			
Pisidium spp.	Pisidium spp.			
Planorbidae fam.	Planorbidae fam.			
Sphaeriidae fam.	Sphaeriidae fam.			
Sphaerium occidentale				Not on any

Scientific Name	Common Name	Legal Protected Status		
		Federal	State	Other
				status lists
Sphaerium spp.	Sphaerium spp.			
PLANTS				
Alnus rhombifolia	White Alder			
Alopecurus saccatus	Pacific Foxtail			
Ammannia coccinea	Scarlet Ammannia			
Ammannia robusta	Grand Redstem			
Anemopsis californica	Yerba Mansa			
Arundo donax	NA			
Azolla filiculoides	NA			
Baccharis salicina				Not on any status lists
Bacopa eisenii	Gila River Water-hyssop			
Bergia texana	Texas Bergia			
Bidens laevis	Smooth Bur-marigold			
Bidens tripartita	NA			
Blennosperma bakeri	Baker's Blennosperma	Endangered	Endangered	CRPR - 1B.1
Boehmeria cylindrica	NA			Not on any status lists
Brodiaea nana				Not on any status lists
Brodiaea pallida	Chinese Camp Brodiaea	Threatened	Endangered	CRPR - 1B.1
Callitriche heterophylla bolanderi	Large Water-starwort			
Callitriche heterophylla heterophylla	Northern Water-starwort			
Callitriche longipedunculata	Longstock Water-starwort			
Callitriche marginata	Winged Water-starwort			
Carex comosa	Bristly Sedge		Special	CRPR - 2B.1
Carex densa	Dense Sedge			
Carex feta	Green-sheath Sedge			
Carex lenticularis	Shore Sedge			
Carex nudata	Torrent Sedge			

Scientific Name	Common Name	Legal Protected Status		
		Federal	State	Other
Carex senta	Western Rough Sedge			
Castilleja campestris succulenta	Fleshy Owl's-clover	Threatened	Endangered	CRPR - 1B.2
Cephalanthus occidentalis	Common Buttonbush			
Ceratophyllum demersum	Common Hornwort			
Cicendia quadrangularis	Oregon Microcala			
Cirsium crassicaule	Slough Thistle		Special	CRPR - 1B.1
Cotula coronopifolia	NA			
Crassula aquatica	Water Pygmyweed			
Crypsis vaginiflora	NA			
Cyperus acuminatus	Short-point Flatsedge			
Cyperus erythrorhizos	Red-root Flatsedge			
Cyperus fuscus	NA			
Cyperus squarrosus	Awned Cyperus			
Damasonium californicum				Not on any status lists
Datisca glomerata	Durango Root			
Downingia bella	Hoover's Downingia			
Downingia bicornuta	NA			
Downingia cuspidata	Toothed Calicoflower			
Downingia elegans	NA			
Downingia insignis	Parti-color Downingia			
Downingia ornatissima	NA			
Downingia pulchella	Flat-face Downingia			
Downingia pusilla	Dwarf Downingia		Special	CRPR - 2B.2
Elatine brachysperma	Shortseed Waterwort			
Elatine californica	California Waterwort			
Elatine rubella	Southwestern Waterwort			
Eleocharis acicularis acicularis	Least Spikerush			
Eleocharis bella	Delicate Spikerush			
Eleocharis bolanderi	Bolander's Spikerush			
Eleocharis engelmannii	Engelmann's Spikerush			Not on any

Scientific Name	Common Name	Legal Protected Status		
		Federal	State	Other
engelmannii				status lists
Eleocharis flavescens flavescens	Pale Spikerush			
Eleocharis macrostachya	Creeping Spikerush			
Eleocharis obtusa	Blunt Spikerush			
Eleocharis parishii	Parish's Spikerush			
Elodea canadensis	Broad Waterweed			
Epilobium campestre	NA			Not on any status lists
Epilobium cleistogamum	Cleistogamous Spike-primrose			
Eragrostis hypnoides	Teal Lovegrass			
Eryngium aristulatum aristulatum	California Eryngo			
Eryngium castrense	Great Valley Eryngo			
Eryngium pinnatisectum	Tuolumne Coyote-thistle		Special	CRPR - 1B.2
Eryngium racemosum	Delta Coyote-thistle		Endangered	CRPR - 1B.1
Eryngium vaseyi vallicola				Not on any status lists
Eryngium vaseyi vaseyi	Vasey's Coyote-thistle			Not on any status lists
Euphorbia hooveri	NA			Not on any status lists
Euthamia occidentalis	Western Fragrant Goldenrod			
Galium trifidum	Small Bedstraw			
Gratiola ebracteate	Bractless Hedge-hyssop			
Gratiola heterosepala	Boggs Lake Hedge-hyssop		Endangered	CRPR - 1B.2
Gratiola neglecta	Clammy Hedge-hyssop			
Helenium bigelovii	Bigelow's Sneezeweed			
Helenium puberulum	Rosilla			
Hibiscus lasiocarpos occidentalis			Special	CRPR - 1B.2
Hippuris vulgaris	Common Mare's-tail			
Hosackia oblongifolia	NA			1.B.3

Scientific Name	Common Name	Legal Protected Status		
		Federal	State	Other
Hydrocotyle ranunculoides	Floating Marsh-pennywort			
Hydrocotyle verticillata verticillata	Whorled Marsh-pennywort			
Isoetes nuttallii	NA			
Isoetes orcuttii	NA			
Isolepis cernua	Low Bulrush			
Juncus acuminatus	Sharp-fruit Rush			
Juncus effusus effusus	NA			
Juncus effusus pacificus				
Juncus phaeocephalus paniculatus	Brownhead Rush			
Juncus uncialis	Inch-high Rush			
Lasthenia ferrisiae	Ferris' Goldfields		Special	CRPR - 4.2
Lasthenia fremontii	Fremont's Goldfields			
Leersia oryzoides	Rice Cutgrass			
Legenere limosa	False Venus'-looking-glass		Special	CRPR - 1B.1
Lemna gibba	Inflated Duckweed			
Lemna minor	Lesser Duckweed			
Lemna minuta	Least Duckweed			
Lemna turionifera	Turion Duckweed			
Lepidium oxycarpum	Sharp-pod Pepper-grass			
Lilaeopsis masonii	Mason's Lilaeopsis		Special	CRPR - 1B.1
Limnanthes alba alba	White Meadowfoam			
Limnanthes alba versicolor	White Meadowfoam			
Limnanthes douglasii douglasii	Douglas' Meadowfoam			
Limnanthes douglasii rosea	Douglas' Meadowfoam			
Limosella acaulis	Southern Mudwort			
Limosella aquatica	Northern Mudwort			
Limosella australis	NA		Special	CRPR - 2B.1
Lindernia dubia	Yellowseed False Pimpernel			
Lipocarpha micrantha	Dwarf Bulrush			

Scientific Name	Common Name	Legal Protected Status		
		Federal	State	Other
Ludwigia grandiflora	NA			
Ludwigia peploides montevidensis	NA			Not on any status lists
Ludwigia peploides peploides	NA			Not on any status lists
Lycopus americanus	American Bugleweed			
Lythrum californicum	California Loosestrife			
Lythrum portula	NA			
Marsilea vestita vestita	NA			Not on any status lists
Mimulus cardinalis	Scarlet Monkeyflower			
Mimulus guttatus	Common Large Monkeyflower			
Mimulus latidens	Broad-tooth Monkeyflower			
Mimulus tricolor	Tricolor Monkeyflower			
Myosurus minimus	NA			
Myosurus sessilis	Sessile Mousetail			
Myriophyllum aquaticum	NA			
Najas guadalupensis guadalupensis	Southern Naiad			
Navarretia intertexta	Needleleaf Navarretia			
Navarretia leucocephala leucocephala	White-flower Navarretia			
Navarretia leucocephala minima	Least Navarretia			
Navarretia myersii myersii	Pincushion Navarretia		Special	CRPR - 1B.1
Neostapfia colusana	Colusa Grass	Threatened	Endangered	CRPR - 1B.1
Oenanthe sarmentosa	Water-parsley			
Orcuttia inaequalis	San Joaquin Valley Orcutt Grass	Threatened	Endangered	CRPR - 1B.1
Orcuttia pilosa	Hairy Orcutt Grass	Endangered	Endangered	CRPR - 1B.1
Orcuttia tenuis	Slender Orcutt Grass	Threatened	Endangered	CRPR - 1B.1
Orcuttia viscida	Sacramento Orcutt Grass	Endangered	Endangered	CRPR - 1B.1
Panicum acuminatum acuminatum				Not on any status lists

Scientific Name	Common Name	Legal Protected Status		
		Federal	State	Other
Panicum dichotomiflorum	NA			
Paspalum distichum	Joint Paspalum			
Perideridia bacigalupii	Bacigalupi's Perideridia		Special	CRPR - 4.2
Perideridia bolanderi bolanderi	Bolander's Yampah			
Perideridia bolanderi involucrata	Bolander's Yampah			
Perideridia kelloggii	Kellogg's Yampah			
Perideridia lemmonii	Lemmon's Yampah			
Persicaria amphibia				Not on any status lists
Persicaria hydropiper	NA			Not on any status lists
Persicaria hydropiperoides				Not on any status lists
Persicaria lapathifolia				Not on any status lists
Persicaria maculosa	NA			Not on any status lists
Persicaria pensylvanica	NA			Not on any status lists
Persicaria punctata	NA			Not on any status lists
Phacelia distans	NA			
Phyla lanceolata	Fog-fruit			
Phyla nodiflora	Common Frog-fruit			
Pilularia americana	NA			
Plagiobothrys acanthocarpus	Adobe Popcorn-flower			
Plagiobothrys austiniae	Austin's Popcorn-flower			
Plagiobothrys distantiflorus	California Popcorn-flower			
Plagiobothrys greenei	Greene's Popcorn-flower			
Plagiobothrys humistratus	Dwarf Popcorn-flower			
Plagiobothrys leptocladus	Alkali Popcorn-flower			
Plagiobothrys reticulatus				Not on any

Scientific Name	Common Name	Legal Protected Status		
		Federal	State	Other
reticulatus				status lists
Plagiobothrys undulatus	NA			Not on any status lists
Plantago elongata elongata	Slender Plantain			
Platanus racemosa	California Sycamore			
Pleuropogon californicus californicus				Not on any status lists
Pluchea odorata odorata	Scented Conyza			
Pogogyne douglasii	NA			
Pogogyne zizyphoroides				Not on any status lists
Potamogeton diversifolius	Water-thread Pondweed			
Potamogeton foliosus foliosus	Leafy Pondweed			
Potamogeton illinoensis	Illinois Pondweed			
Potamogeton nodosus	Longleaf Pondweed			
Primula subalpina				Not on any status lists
Psilocarphus brevissimus brevissimus	Dwarf Woolly-heads			
Psilocarphus brevissimus multiflorus	Delta Woolly Marbles		Special	CRPR - 4.2
Psilocarphus oregonus	Oregon Woolly-heads			
Psilocarphus tenellus	NA			
Ranunculus aquatilis aquatilis	White Water Buttercup			
Ranunculus bonariensis	NA			
Ranunculus hystriculus				Not on any status lists
Ranunculus lobbii	Lobb's Water Buttercup		Special	CRPR - 4.2
Ranunculus pusillus pusillus	Pursh's Buttercup			
Rorippa curvisiliqua curvisiliqua	Curve-pod Yellowcress			
Rorippa palustris palustris	Bog Yellowcress			
Rotala ramosior	Toothcup			

Scientific Name	Common Name	Legal Protected Status		
		Federal	State	Other
Rumex conglomeratus	NA			
Rumex occidentalis				Not on any status lists
Rumex salicifolius salicifolius	Willow Dock			
Sagittaria latifolia latifolia	Broadleaf Arrowhead			
Sagittaria montevidensis calycina				Not on any status lists
Sagittaria sanfordii	Sanford's Arrowhead		Special	CRPR - 1B.2
Salix exigua exigua	Narrowleaf Willow			
Salix exigua hindsiana				Not on any status lists
Salix gooddingii	Goodding's Willow			
Salix laevigata	Polished Willow			
Salix lasiolepis lasiolepis	Arroyo Willow			
Salix melanopsis	Dusky Willow			
Schoenoplectus acutus occidentalis	Hardstem Bulrush			
Schoenoplectus californicus	California Bulrush			
Scirpus microcarpus	Small-fruit Bulrush			
Sidalcea calycosa calycosa	Annual Checker-mallow			
Sidalcea hirsuta	Hairy Checker-mallow			
Sium suave	Hemlock Water-parsnip			
Spirodela polyrhiza	NA			
Stachys ajugoides	Bugle Hedge-nettle			
Stachys albens	White-stem Hedge-nettle			
Stachys pycnantha	Short-spike Hedge-nettle			
Stachys stricta	Sonoma Hedge-nettle			
Symphyotrichum lentum	Suisun Marsh Aster		Special	CRPR - 1B.2
Taxus brevifolia				
Toxicoscordion venenosum venenosum				Not on any status lists

Scientific Name	Common Name	Legal Protected Status		
		Federal	State	Other
Tuctoria greenei	Green's Awnless Orcutt Grass	Endangered	Rare	CRPR - 1B.1
Typha domingensis	Southern Cattail			
Typha latifolia	Broadleaf Cattail			
Utricularia gibba	Humped Bladderwort			
Veronica americana	American Speedwell			
Veronica anagallis-aquatica	NA			
Wolffia globosa	Asian Watermeal			
Wolffiella lingulata	Tongue Bogmat			

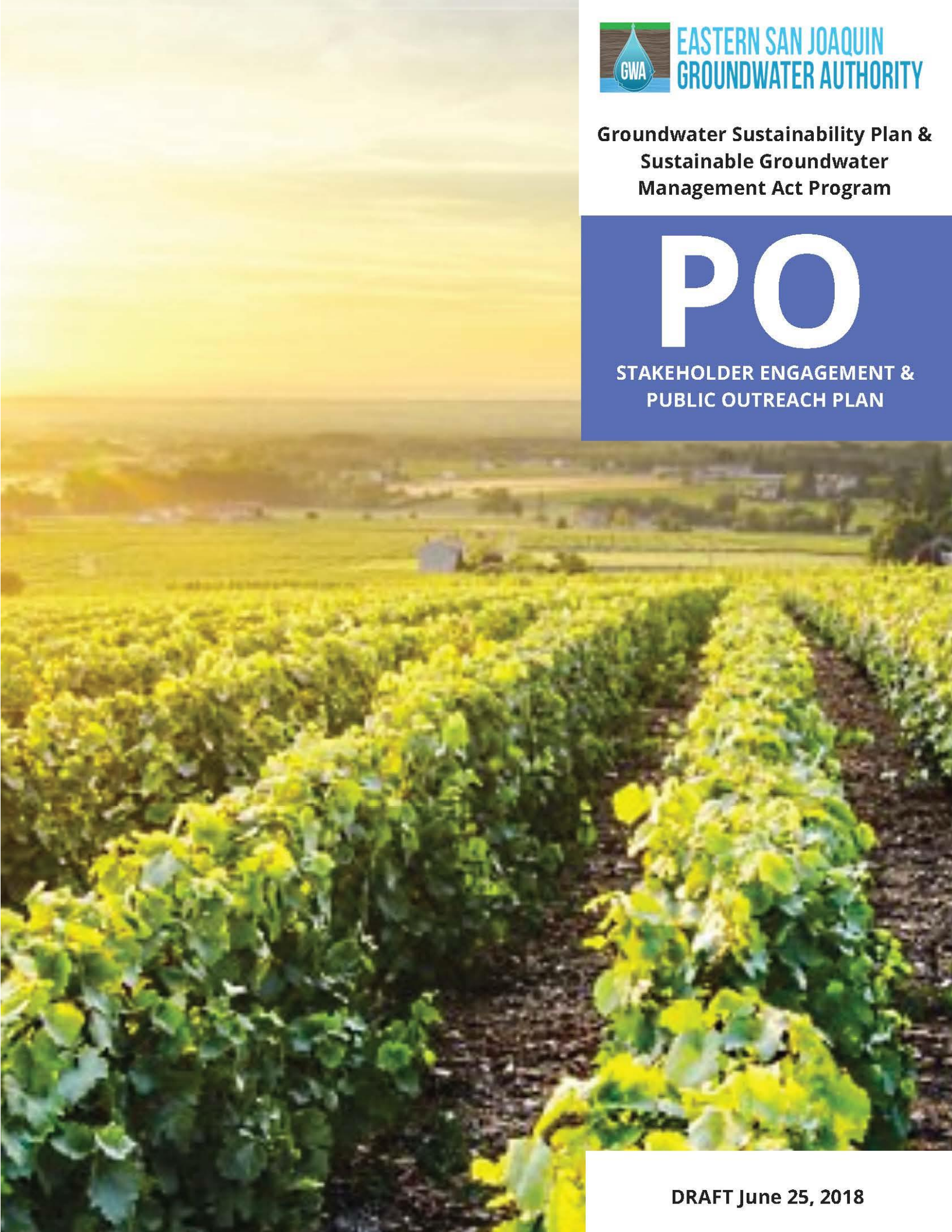
APPENDIX 1-H.
STAKEHOLDER ENGAGEMENT AND PUBLIC OUTREACH PLAN

EASTERN SAN JOAQUIN GROUNDWATER AUTHORITY

Groundwater Sustainability Plan & Sustainable Groundwater Management Act Program

PO

STAKEHOLDER ENGAGEMENT & PUBLIC OUTREACH PLAN



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List of Acronyms

Acronym	Description
DWR	California Department of Water Resources
GWA	Eastern San Joaquin Groundwater Authority
GSA	Groundwater Sustainability Agency
JPA	Joint Powers Authority
SGMA	Sustainable Groundwater Management Act
ESJ GSP	Eastern San Joaquin Groundwater Sustainability Plan

Introduction and Background

Groundwater is a critical and integral component of California's overall water supply, serving residents, businesses, farms, industries and the environment. For many areas of the state, groundwater is the only water supply available year-round. Yet unlike surface water, groundwater has historically not been regulated on a statewide basis. This contributes to serious impacts to water supply and quality including declines in groundwater levels and storage, irreversible land subsidence and impacts to natural ecosystems.

The Central Valley is the state's most productive agricultural region and source of over half the fruits, vegetables and nuts grown nationwide. The Eastern San Joaquin Groundwater Basin, which underlies a portion of California's Central Valley, has historically been over-pumped and has seen areas of declining groundwater levels. Without a reliable source of groundwater, agricultural productivity in the Central Valley and California's economy will suffer.

A new era for California's groundwater began in September 2014 with the passage of the Sustainable Groundwater Management Act (SGMA). SGMA establishes a path for the sustainable management of groundwater through the formation of locally organized Groundwater Sustainability Agencies (GSAs). As part of SGMA, the California Department of Water Resources (DWR) designated groundwater basins as low, medium or high priority. The cornerstone of SGMA is to develop and implement basin-specific GSPs that outline plans to achieve long-term groundwater sustainability.

For the first time in California's history, SGMA has provided a framework for sustainable groundwater management. SGMA mandates that each Subbasin GSA must develop and implement a Groundwater Sustainability Plan (GSP) that details how Subbasin users will balance groundwater Subbasin levels within 20 years of the GSP's adoption. GSAs have the option to do this individually or in collaboration with other GSAs in the region.

The Eastern San Joaquin Groundwater Subbasin has been identified as a critically over-drafted and high priority basin. Given this status it must submit a GSP by January 31, 2020 and be compliant by 2040. Low priority Subbasins must adopt a GSP by 2022 and be compliant by 2042.

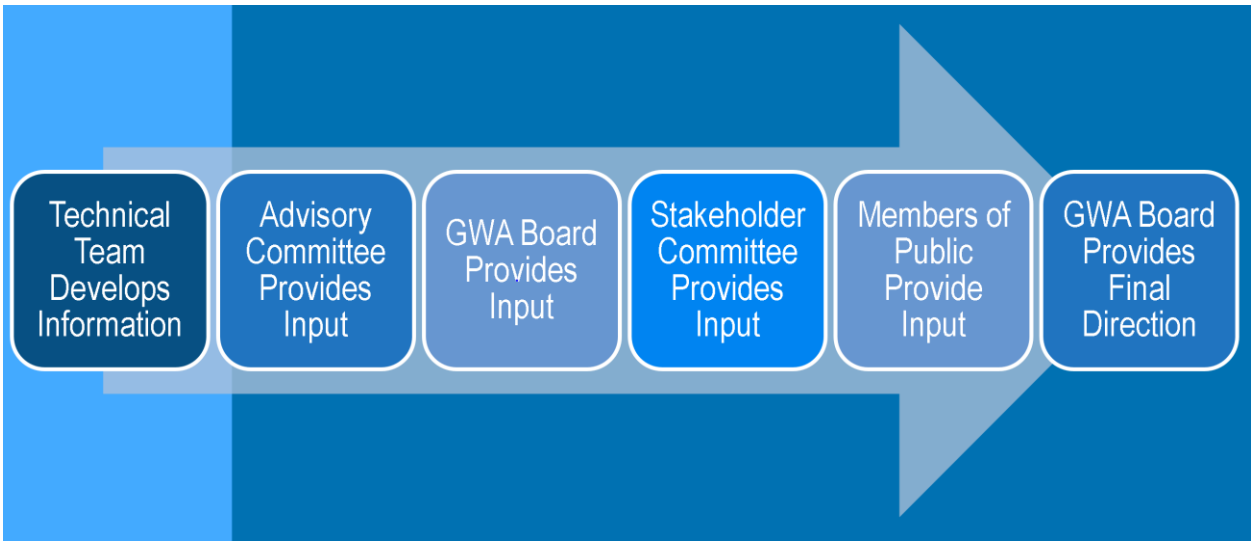
The purpose of the Eastern San Joaquin Groundwater Sustainability Plan (ESJ GSP) is to develop a cost-effective plan for groundwater management that reflects the local needs and conditions and prioritizes and preserves local control over water resources with a secondary goal of meeting the SGMA regulatory requirements for DWR by the January 31, 2020 deadline. The ESJ GSP will provide a path to achieve and document sustainable groundwater management within 20 years following GSP adoption. It will ensure the long-term sustainability of locally-managed groundwater resources in the Subbasin now and into the future.

There are 17 GSAs participating in the joint development and implementation of a single GSP for the Subbasin. Of these participating GSAs, some are comprised of multiple agencies that have established partnerships for the purpose of GSP development and implementation. Below is a list of the GWA Members involved in the planning and implementation process.

1. Eastside San Joaquin GSA
2. San Joaquin County No. 2 (Cal Water)
3. Central Delta Water Agency
4. Central San Joaquin Water Conservation District
5. City of Lathrop
6. City of Lodi
7. City of Manteca
8. City of Stockton
9. Linden County Water District
10. Lockeford Community Services District
11. North San Joaquin Water Conservation District
12. Oakdale Irrigation District
13. San Joaquin County
14. South Delta Water Agency
15. South San Joaquin GSA
16. Stockton East Water District
17. Woodbridge Irrigation District GSA

EASTERN SAN JOAQUIN GROUNDWATER SUBBASIN

Information flow in GSP decision-making process



STRUCTURE

Board and Committee Roles and Responsibilities

Groundwater Authority

The GWA's members include representatives from 17 groundwater sustainability agencies and San Joaquin County No. 2 (Cal Water). The GWA Board of Directors consists of one GSA representative and an alternate to serve during the appointed member's absence. The Board's chairperson presides at all meetings while the vice-chairperson acts as the chairperson during an absence. The GWA will adhere to the decision-making protocol defined in its JPA.

Overall, the GWA Board has final decision-making authority on matters affecting the JPA and the GSP's adoption. The Board will:

- Provide for coordination among the GSA members to develop and implement the GSP
- Provide for the joint exercise of powers common to each of the members and powers granted pursuant to SGMA
- Develop, adopt and implement a legally sufficient GSP covering those portions of the basin that are within the member's jurisdictional boundaries
- Satisfy SGMA requirements for coordination among GSAs

The GWA Board meets on the second Wednesday of each month from 9:30 a.m. to 12 p.m. at the Robert J. Cabral Agricultural Center. The Board will hear updates on the GSP development, share input and provide guidance to the planning process. They will also make decisions at various milestones.

Together the GSAs will implement a single GSP to cover the entire geographic extent encompassed by the boundaries of the Subbasin. The members are:

Advisory Committee

The Advisory Committee consists of staff from various GSAs. The committee meets monthly to provide input on technical and policy-related aspects of the GSP.

Draft sections of the GSP will be drafted by the Advisory Committee prior to presentation to the GWA Board for input. The draft chapters are then presented to and commented on by the Stakeholder Committee and at public meetings. The comments will go back to the GWA Board who formally approves the chapters. Agendas and meeting materials for the Advisory Committee meetings will be posted to the website for public review.

Stakeholder Committee

The Stakeholder Committee includes representatives from organizations that cover the range of interests outside the GWA and GSAs. The Committee will meet on an approximately monthly basis to learn about the GSP, provide comments, feedback and input. Stakeholder Committee meetings shall allow for public comment. Public Comment will generally be limited to three minutes but the time may be adjusted based upon meeting circumstances. Special and emergency meetings do need to provide for non-agenda public comment but may be allowed at the facilitator's discretion.

The Stakeholder Committee will review and/or provide input to the consulting team who is developing the GSP about groundwater-related issues that may include:

- Annual work plans and reports (including mandatory 5-year milestone reports)
- Community outreach
- Development, adoption or amendment of the Groundwater Sustainability Plan
- Fee proposals
- General advisory
- Inter-basin coordination activities
- Local regulations to implement Sustainable Groundwater Management Act ("SGMA")
- Modeling scenarios
- Monitoring programs
- Projects and management actions to achieve sustainability
- Sustainability goals and objectives
- Confirmation of community values

Since stakeholders on the committee represent important interest groups in the basin, they will also be called on to ensure two-way communication with their groups. They will be asked to share information with their interest groups and report back their group's comments accordingly.

The Stakeholder Committee was formed through an open application process. Twenty-two people submitted applications and all were confirmed as members. The members represent a wide range of interests and affiliations. Occasionally, a new member may be added.

Stakeholder Engagement and Public Outreach Plan Purpose

SGMA requires that GSAs identify and engage stakeholders and the public while developing their Groundwater Sustainability Plans. The GWA is committed to active stakeholder engagement and public outreach in the development of the ESJ GSP.

This is a work plan to ensure stakeholders and the public throughout the Subbasin have the opportunity to participate in the process. This is a regional effort supported by state grant funding. It is a requirement for each individual member agency to conduct its own outreach efforts so there will also be 17 other localized outreach efforts throughout the basin by the GWA member agencies.

The GWA members strive to coordinate, integrate and mutually benefit from coordinated groundwater management efforts among stakeholders and the public and those interested in the social, economic and environmental viability of Eastern San Joaquin County.

SGMA Requirements for Stakeholder Engagement*

- Consider the interests of all beneficial uses of water and users of groundwater (Section 10723.2)
- Encourage the active involvement of diverse social, cultural and economic elements of the population within the groundwater basin (Section 10727.8)
- Establish and maintain a list of persons interested in receiving notices regarding plan preparation, meeting announcements and availability of draft plans, maps and other relevant documents (Section 10723.4)
- Make available to the public and DWR a written statement describing the manner in which interested parties may participate in the development and implementation of the GSP (Section 10723.2)

**Guidance Document for Groundwater Sustainability Plan, Stakeholder Communication and Engagement, California Department of Water Resources Sustainable Groundwater Management Program, January 2018*

The Stakeholder Engagement and Public Outreach Plan is a fluid document that will be refined and updated as situations suggest or planning evolves. Its purpose is to serve as a roadmap for effective SGMA outreach that involves:

- Stakeholder identification and assessment
- Targeted communication and broad outreach
- Input methods to reinforce stakeholder understanding and trust
- Opportunities for reflection, feedback and adjustments
- Evaluation metrics

Engagement and Outreach Goal

Inform stakeholders and the public about Eastern San Joaquin's groundwater sustainability planning and offer opportunities for involvement.

Engagement and Outreach Objective

SGMA requires GSAs to consider the interests of the beneficial uses and users of groundwater in the basin (Section 355.4). During the GSP review and approval process, DWR will take into account outreach activities and public comments to determine if GWA considers interests within the basin throughout the development of its GSP (Section 353.8).

Communication and Outreach Objectives

The following are the communications and outreach objectives:

Expand Audience Reach

- Maintain a robust stakeholder list of interested individuals, groups and/or organizations.
- Secure a balanced level of participants who represent the interests of beneficial uses and users of groundwater in the Subbasin through the formation of and participation in a Stakeholder Committee.

Increase Engagement

- Keep interested list of stakeholders informed and aware of opportunities for involvement through email communications and/or their preferred communications.
- Engage DWR for facilitated support to aid in the development of the GSP.
- Open GWA JPA planning efforts to the public with agendas and meeting minutes published on the GWA website (http://esjgroundwater.org/).
- Inform and obtain comments from the general public through public meetings held on an approximately quarterly basis.
- Facilitate productive dialogues among participants at advisory committee, stakeholder and public meetings through the use of qualified facilitators to obtain, consider and integrate feedback accordingly throughout the planning process.
- Seek the input of interest groups during the implementation of the GSP and any future planning efforts.
- Obtain input from the stakeholder committee about preferred locations to conduct public meetings to reach diverse audiences and disadvantaged communities.

Increase GSP Awareness

- Provide timely and accurate public reporting of planning milestones through the distribution of outreach materials and posting of materials on the GWA website for the GSP.
- Secure quality media coverage that is accurate, complete and fair.

Track Efforts

- Maintain an active communications tracking tool to capture stakeholder engagement and public outreach activities and to demonstrate the reporting of GSP outreach activities.

Target Audiences

There are a variety of audiences targeted within the Subbasin whose SGMA knowledge varies from high to little or none. Given this variance, the efforts will be broad and all-inclusive. Target audiences include:

- GWA Board of Directors and staff

- GSAs and their respective elected officials, directors, leadership, management, staff and customers
- Beneficial uses and users of groundwater
- Diverse social, cultural and economic segments of the population within the Subbasin
- Public

In addition to the Stakeholder Committee's regional efforts, the 17 GSAs and San Joaquin County No. 2 (Cal Water) are also focused on outreach efforts to their member audiences.

Stakeholder Engagement and Public Outreach

Stakeholder involvement and public outreach is critical to the GSP development because it helps promote the plan development based on input and broad support. The following activities summarize involvement opportunities and outreach methods to inform GSA boards, broader groups of stakeholders and the public.

It is important to note that levels of interest will evolve and shift according to the GSP's development stage. The consulting team will continue to monitor changing interests and customize outreach to meet those interests.

Stakeholder and Public Involvement: Tactical Activities

GWA Board Meetings, Advisory Committee Meetings and Stakeholder Committee Meetings

All interested stakeholders and public members will have the opportunity to attend GWA Board meetings, Advisory Committee meetings and Stakeholder Committee meetings. The website, communications materials and news releases will include that these meetings are open forums where interested parties may attend to learn more about the GSP and planning underway.

Public Meetings

Public meetings on an approximate quarterly basis will provide a forum to engage diverse social, cultural and economic segments of the population within the Subbasin. In an effort to reach disadvantaged communities, the meetings will be held in venues located in these locations to the extent possible. The Stakeholder Committee will provide input about the best locations for the public meetings to occur at their first meeting planned for June 2018. The plan will be updated to reflect these recommendations. The public meetings will provide an opportunity to:

- Provide participants with information about need/requirement to develop and implement a GSP
- Provide comments about the GSP's components, development and implementation
- Address questions in a transparent, proactive manner

Stakeholder and Public Outreach: Tactical Activities

GSA Boards/Stakeholder Outreach

The consulting team will share information and resources with GSA members and Stakeholder Committee members for their use in internal and external communications. The goal is to equip GSA and Stakeholder Committee members with resources to share with their elected officials, boards of directors, management teams, staff, stakeholders and customers. This will reinforce the

GWA's commitment for broader outreach and help the GWA members communicate information to their boards in an easy-to-understand, efficient manner.

Anticipated resources include:

- Branded PowerPoint presentations for customization and sharing on an approximately monthly basis
- Brief website copy with a link to the GWA site to post on their websites
- Brief, easy-to-understand updates and communications
- Social media content

Stakeholder Database/Communications Tracking Tool

A stakeholder database will be created of anticipated persons of interest. The database will include stakeholders that represent the region's broad interests, perspectives and geography. It will be developed by leveraging existing stakeholder lists and databases from prior GWA engagement efforts, referrals from key stakeholders and stakeholder groups and by conducting research of potential stakeholders that may be interested in one or all of the following categories: groundwater users, community/neighborhood, agricultural, environmental, flood management, Native American Tribes, disadvantaged communities, institutional and business.

The consulting team will continue to build on the list by adding additional interested parties including participants at public meetings and members who sign up on the website and removing anyone who requests to be removed. The database will serve as a foundation for targeted outreach and communication with the diverse target audiences in the basin.

Additionally, the database will be used to:

- Provide a single repository to collect, store and organize contact information about basin stakeholders
- Plan meetings and send notices to stakeholders based upon their identified interests and documents those notices
- Identify the interests and concerns of organizations and individual stakeholders
- Allow individuals to self-identify their interests in SGMA when they sign up as an interested stakeholder
- Document all stakeholders invited to GSP development meetings and their participation at those meetings
- Document agendas for the meetings and post the meeting minutes following the meetings
- Produce summary reports of communication and engagement activities to meet SGMA requirements

Key Messages

Throughout the GSP's development, key messages will serve as the foundation to communications materials. Preliminary draft messages include:

- DWR identified Eastern San Joaquin's Subbasin as one of the State's 21 critically over-drafted basins. Per SGMA, GSAs in critically over-drafted Subbasins are required to develop groundwater sustainability plans and submit the GSPs to DWR by January 31, 2020.
- The GWA JPA was formed to work with locally governed groundwater sustainability agencies to develop a single groundwater sustainability plan for the region's Subbasin.

- The GWA will conduct a locally driven planning process in an open, transparent manner to allow for active stakeholder involvement and public information opportunities.
- The GWA encourages and welcomes the involvement of diverse groundwater users to develop a broadly accepted plan to achieve sustainable groundwater management by 2040 and avoid negative regulatory consequences.

Website

The GWA website (esjgroundwater.org) is active and continues to be maintained on a regular basis. It contains an introduction of the Mission, Member Agencies and GWA Board with links and meeting information. There are sections for projects, educational materials and meeting notices with the accompanying minutes.

The purpose of creating accessible information online, there are sections where interested stakeholders or members of the public can access background/planning materials, presentations, meeting information, news releases, newsletters, public notices and other major announcements and accomplishments.

As distribution of public information and interested parties is important, there is also an area to access the complete project reports relative to the JPA and its member agencies. The website also has areas where interested individuals can request to receive frequent updates and information through email communications. Contact information is readily available for interested parties to communicate with GWA Board members and staff.

The GWA website will serve as the central hub for all information about the GWA. It will be continually updated to keep stakeholders and the public informed and engaged.

Announcement Flyers

In conjunction with the public meetings, announcements will be mailed and disseminated through e-blasts, social media, GSAs, the news media and on the website.

- Invite members of the public to attend the public meetings
- Provide periodic updates to stakeholders and members of the public about the GSP planning process

The flyers will also be provided to the GSAs and stakeholder groups with a message to encourage their organizations to share with their customers/members, stakeholders and other target audiences to help extend reach.

Electronic Communications

Outreach will also occur through e-mail communications to alert interested parties about the meeting notices, meeting summaries and updates to share information with interested parties in with accordance with SGMA. The e-blasts will include brief copy that directs recipients to the GWA website to access these materials for their reference and sharing as desired.

Social Media

Although the GWA does not maintain social media platforms, many of the member GSAs have Twitter and Facebook platforms. The GSAs will receive quarterly social media calendars with compelling, consumer-friendly content for use on their platforms. The posts will help inform diverse audiences about the need for the groundwater sustainability plan, updates on the planning process and public meetings with links to the GWA website and applicable materials.

Media Relations

Engaging and informing the local media about the process will reinforce efforts to reach broader audiences. Media relations activities will include news releases to announce the GSP planning launch, other key milestones and public meetings.

Measure and Evaluate

The GWA's stakeholder engagement and public outreach success will be evaluated against several of DWR's guidelines as described in *Guidance Document for Groundwater Sustainability Plan, Communications and Stakeholder Engagement* and *Collaborating for Success: Stakeholder Engagement for Sustainable Groundwater Management Act Implementation,* a White Paper authored by the Clean Water Fund, Community Water Center and Union of Concerned Scientists. Supporting materials to measure and evaluate stakeholder engagement and public outreach include the following:

- Robust stakeholder list of interested parties that includes representatives from all beneficial uses/users as well as other diverse stakeholders and is continually updated and employed.
- Description of the beneficial uses and users of groundwater in the Subbasin, including the land uses and property interests and other types of parties potentially affected by the GSP and the nature of consultation with those parties.
- Documentation showing local GSAs within the region were informed of and invited to participate in the GSP development effort.
- List of public meetings, planning meetings and stakeholder committee meetings held to discuss the GSP along with meeting notifications and agendas.
- Identification of opportunities for public engagement and discussion of how public input and response will be used.
- Meeting summaries and correspondence to show information-sharing occurred through open, multi-stakeholder dialogues between stakeholder groups for shared understanding of concerns, interests and needs.
- Summary of the advisory and stakeholder committee process to demonstrate the execution of formal mechanisms for the participation of stakeholders in a manner that reasonably addresses their needs.
- Planning documentation showing the flexibility to change and actively revise and/or update the stakeholder engagement plan as the needs of existing stakeholders evolved or as new stakeholders are identified.
- Documentation showing formal procedures exist to solicit and incorporate stakeholder feedback throughout the plan development and implementation.

APPENDIX

Statutory Requirements for Outreach by Phase

The following table summarizes the SGMA's statutory outreach requirements by phase for the GSP development process as provided on the DWR website. The final measurement and outreach report will demonstrate the GWA's achievements to meeting the following activities through a comprehensive stakeholder engagement and public outreach program.

Timeframe	Item
Prior to initiating plan development	Statement of how interested parties may contact the GSA and participate in development and implementation of the plan submitted to DWR. (Sec. 353.6) Post same information on the website
Prior to GSP development	Establish and maintain an interested persons list. (Sec. 10723.4) Prepare a written statement describing the manner in which interested parties may participate in GSP development and implementation. Statement must be provided to: • Legislative body of any city and/or county within the geographic area of the plan • Public Utilities Commission if the geographic area includes a regulated public water system regulated by that Commission • DWR • Interested parties (Sec. 10723.4) • The public
Prior to and with GSP submission	• Record statements of issues and interests of beneficial users of basin groundwater including types of parties representing the interests and consultation process • Lists of public meetings • Inventory of comments and summary of responses • Communication section in GSP (Sec. 354.10) that includes: • Agency decision-making process • Identification of public engagement opportunities and response process • Description of process for inclusion • Method for public information related to progress in implementing the plan (status, projects, actions)

90 days prior to GSP Adoption Hearing(s)	Prior to Public Hearings for adoption or amendment of the GSP, the GWA must notify cities and/or counties of geographic area of the intent to adopt the plan 90 days in advance of adoption. Each GSA will need to individually adopt the GSP. (Sec. 10728.4)
90 days or less prior to GSP Adoption Hearings (Sec. 10728.4)	Prior to Public Hearings for adoption or amendment of the GSP, the GSP entities must: • Consider and review comments • Conduct consultation within 30 days of receipt with cities or counties so requesting
GSP Adoption or Amendment	GSP must be adopted or amended at Public Hearing(s).
60 days after plan submission	60-day comment period for plans under submission to DWR. Comments will be used to evaluate the submission. (Sec. 353.8)
Prior to adoption of fees	Public meeting required prior to adoption of or an increase to fees. Oral or written presentations may be made as part of the meeting. (Sec. 10730). Public notice shall include: • Time and place of meeting • General explanation of matter to be considered • Statement of availability for data required to initiate or amend such fees • Public posting on Agency Website and provision by mail to interested parties of supporting data (at least 20 days in advance) Mailing lists for interested parties are valid for 1 year from date of request and may be renewed by written request of the parties on or before April 1 of each year • Includes procedural requirements per Government Code, Section 6066
Prior to conducting a fee adoption hearing	Must publish notices in a newspaper of general circulation as prescribed • Publication shall be once a week for two successive weeks. Two publications in a newspaper published once a week or more often, with at least five days intervening between the respective publication dates not counting such publication dates, are sufficient • The period of notice begins the first day of publication and terminates at the end of the 14th day, (which includes the first day)

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APPENDIX 1-I.
PUBLIC COMMENTS RECEIVED

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Public Comments Received on the Draft Groundwater Sustainability Plan

- California Department of Fish and Wildlife, North Central Region
- California Poultry Federation
- California Sportfishing Protection Alliance, including comments by Greg Kamman (Kamman Hydrology & Engineering, Inc.)
- Collective comments by The Nature Conservancy, Audubon California, Clean Water Action, Clean Water Fund, American Rivers, and Union of Concerned Scientists
- Collective comments by The League of Women Voters of San Joaquin County; Environmental Justice Coalition for Water; Sierra Club, Delta Sierra Group; Puentes; and Restore the Delta
- Cosumnes Subbasin
- East Bay Municipal Utility District (EBMUD)
- Jane Wagner-Tyack (Communication Consultant)
- Larry Walker Associates, on behalf of agricultural interests
- North San Joaquin Water Conservation District
- Restore the Delta
- Sierra Club, Delta-Sierra Group
- South San Joaquin GSA
- Stockton East Water District
- Terra Land Group, LLC
- The Freshwater Trust, on behalf of Northern Delta GSA and associate member Staten Island-Conservation farms and ranches
- The Nature Conservancy
- The Wine Group
- Tracy Subbasin

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State of California – Natural Resources Agency
DEPARTMENT OF FISH AND WILDLIFE
North Central Region
1701 Nimbus Road,
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GAVIN NEWSOM, Governor
CHARLTON H. BONHAM, Director

August 23, 2019

Brandon Nakagawa
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Subject: COMMENTS ON THE EASTERN SAN JOAQUIN SUBBASIN DRAFT GROUNDWATER SUSTAINABILITY PLAN

Dear Mr. Nakagawa:

The California Department of Fish and Wildlife (Department) North Central Region is providing comments on the Eastern San Joaquin (ESJ) Subbasin Draft Groundwater Sustainability Plan (GSP) prepared by the Eastern San Joaquin Groundwater Authority (ESJGA)[1] pursuant to the Sustainable Groundwater Management Act (SGMA). As trustee agency for the State's fish and wildlife resources, the Department has jurisdiction over the conservation, protection, and management of fish, wildlife, native plants, and the habitat necessary for biologically sustainable populations of such species (Fish & Game Code §§ 711.7 and 1802).

Development and implementation of GSPs under SGMA represents a new era of California groundwater management. The Department has an interest in the sustainable management of groundwater, as many sensitive ecosystems and species depend on groundwater and interconnected surface waters, including ecosystems on Department-owned and -managed lands within SGMA-regulated basins. SGMA and its implementing regulations afford ecosystems and species specific statutory and regulatory consideration, including the following as pertinent to Groundwater Sustainability Plans:

[1] The Eastern San Joaquin Groundwater Authority comprises 17 Groundwater Sustainability Agencies (GSAs): Calaveras County Water District / Stanislaus County, California Water Service Company, Central Delta Water Agency, Central San Joaquin Water Conservation District, City of Lathrop, City of Lodi, City of Manteca, City of Stockton, Linden County Water District, Lockeford Community Services District, North San Joaquin Water Conservation District, Oakdale Irrigation District, San Joaquin County, South Delta Water Agency, South San Joaquin Groundwater Sustainability Agency, Stockton East Water District, Woodbridge Irrigation District GSA.

- Groundwater Sustainability Plans must **identify and consider impacts to groundwater dependent ecosystems** [23 CCR § 354.16(g) and Water Code § 10727.4(l)];
- Groundwater Sustainability Agencies must **consider all beneficial uses and users of groundwater**, including environmental users of groundwater [Water Code §10723.2 (e)]; and Groundwater Sustainability Plans must **identify and consider potential effects on all beneficial uses and users of groundwater** [23 CCR §§ 354.10(a), 354.26(b)(3), 354.28(b)(4), 354.34(b)(2), and 354.34(f)(3)];
- Groundwater Sustainability Plans must **establish sustainable management criteria that avoid undesirable results** within 20 years of the applicable statutory deadline, including depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water [23 CCR § 354.22 *et seq.* and Water Code §§ 10721(x)(6) and 10727.2(b)] and describe monitoring networks that can identify adverse impacts to beneficial uses of interconnected surface waters [23 CCR § 354.34(c)(6)(D)]; and
- Groundwater Sustainability Plans must **account for groundwater extraction for all Water Use Sectors** including managed wetlands, managed recharge, and native vegetation [23 CCR §§ 351(al) and 354.18(b)(3)].

Accordingly, the Department values SGMA groundwater planning that carefully considers and protects groundwater dependent ecosystems (GDE), fish and wildlife beneficial uses, and users of groundwater and interconnected surface waters.

COMMENT OVERVIEW

The Department is writing to support ecosystem preservation in compliance with SGMA and its implementing regulations based on Department expertise and best available information and science.

The Department believes the GSP does not adequately demonstrate consideration of environmental beneficial uses and users of groundwater in its sustainability management criteria nor does it adequately characterize or consider surface water-groundwater connectivity. Accordingly, the Department recommends that ESJGA address these deficiencies before submitting the GSP to the Department of Water Resources (DWR).

COMMENTS AND RECOMMENDATIONS

The Department comments are as follows:

1. **Comment #1** (Plan Area, 1.2.1.1 Summary of Jurisdictional Areas and Other Features, pp. 1-18): Department lands are excluded from 'Summary of Jurisdictional Areas' narrative as well as from Figure 1-11, which maps other federal and state lands.

a. *Issue*: The GSP does not identify the jurisdictional boundaries of Department-owned and -managed lands as required by 23 CCR § 354.8(a)(3).
b. *Recommendation*: Include in Figure 1-11 and the accompanying narrative White Slough Wildlife Area, Woodbridge Ecological Reserve, and Vernalis Ecological Reserve Department lands.

2. **Comment #2** (Basin Setting, 2.2.6 Interconnected Surface Water Systems, starting pp 2-97): The narrative describing the basin's interconnected surface water conditions lacks specifics and contains inconsistencies in mapped surface water-groundwater interconnectivity.
   a. *Issue*:
      i. The interconnected surface water conditions narrative lacks estimations of the quantity and timing of streamflow depletions as specified in 23 CCR § 354.16(f).
      ii. Figure 2-65 portrays modeled 'losing,' 'gaining,' and 'mixed' stream reaches, and Figure 2-66 portrays modeled 'interconnected and 'disconnected' streams. Figure 2-66 shows modeled stream reaches as 'disconnected,' whereas Figure 2-65 identifies those same reaches as switching between 'losing,' 'gaining,' and 'mixed.' Accompanying narrative suggests that streams are only mapped as 'interconnected' in Figure 2-66 when they are interconnected at least 75% of the time. This 75% threshold for displaying interconnected surface waters excludes reaches of stream that are intermittently connected to groundwater and that may depend on groundwater contributions to meet the needs of instream or riparian beneficial uses and users of interconnected surface waters.
   b. *Recommendation*:
      i. Identify the estimated quality and timing of streamflow depletions in the ESJ Subbasin. If this information is not available, identify an expeditious path to estimating these values.
      ii. Update Figure 2-66 to show all interconnected stream reaches, even if they are interconnected less than 25% of the time.
3. **Comment #3** (Basin Setting, 2.2.7 Groundwater-Dependent Ecosystems, starting pp 2-100): GDE identification, required by 23 CCR § 354.16(g), is based on methods that risk exclusion of ecosystems that may depend on groundwater.
   a. *Issue*: Methods applied to the Natural Communities Commonly Associated with Groundwater (NCCAG) dataset to eliminate potential GDEs are fallible.

i. Depth to Groundwater: The removal of potential GDEs with a depth to groundwater greater than 30 feet during (an unspecified season) of 2015 relies on a single-point-in-time baseline hydrology. Specifically, this 2015 baseline falls several years into a historic drought when groundwater levels throughout the San Joaquin Valley were trending dramatically lower than usual due to reduced surface water availability. Exclusion of potential GDEs based on a snapshot of groundwater elevations during a historic drought is invalid; because this approach does not consider representative climate conditions or account for GDEs that can survive a finite period of time without groundwater access (Naumburg 2005), but that rely on groundwater table recovery for long term survival.

ii. Adjacent to Alternate Water Supplies: The GSP notes that "to be dependent on groundwater there must not be other available water supplies" (GSP pp 2-104). This statement disregard's a GDE's adaptability and opportunistic approach to accessing water in which vegetation may vary reliance on surface water and groundwater between seasons and water years.[2] Therefore, the removal of potential GDEs that are within 50 feet of irrigated lands, 150 feet of managed wetlands, and 150 feet of perennial surface water does not consider the potential for GDEs shifting reliance between surface and groundwater. Additionally, vegetation near *interconnected* perennial surface waters may depend on sustained groundwater elevations to stabilize the gradient or rate of loss of surface water; meaning ecosystems near interconnected surface waters likely depend on sustainable groundwater elevations and constitute GDEs. Therefore, it is possible that any of these potential GDEs proximate to 'alternate water supplies' rely on groundwater during specific seasons or water years.

b. *Recommendations*:

i. Depth to Groundwater: Develop a hydrologically robust baseline from which to remove 'areas with a depth to groundwater greater than 30 feet' that relies on multiple, climatically representative years of groundwater elevation and that accounts for the inter-seasonal and inter-annual variability of GDE water demand.

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[2] The Department assumes that potential GDEs removed under this step overlie shallow groundwater, otherwise they would have already been removed during the step of excluding potential GDEs that overlie a depth to groundwater of 30+ feet.

ii. Adjacent to Alternate Water Supplies: Reevaluate potential GDEs previously removed due to proximity to irrigated lands, managed wetlands, and perennial surface waters. Err on the side of inclusivity until there is evidence that the overlying ecosystem has no significant dependence on groundwater across seasons and water year types. Ensure that riparian GDE beneficial users of groundwater and interconnected surface water are carefully considered in the analysis of undesirable results and minimum thresholds for depletions of interconnected surface waters.

4. **Comment #4** (Basin Setting, 2.3.5.4 Projected Water Budget, starting pp 2-130): Projected water budget assumptions may risk overestimating surface water availability and sustainable yield by not relying on best available information [23 CCR § 354.18(e)].
   a. *Issue*: Projected surface water budget assumptions may risk overestimating water availability. Overestimation of water availability can result in the overallocation of both surface and groundwater water resources, unnecessarily jeopardizing environmental beneficial users. Two water budget assumptions that do not rely on best available information and that underscore current sustainable yield estimations are as follows: 1) the climate change analysis predicting a net depletion of aquifer storage is not reflected in the projected water budget or estimated sustainable yield, rather it is presented as a separate analysis; and 2) projected surface water deliveries need to be updated to reflect any new regulatory reductions of surface water deliveries such as those that may be codified in the State Water Resources Control Board Water Quality Control Plan for the Bay Delta: San Joaquin River Flows and Southern Delta Water Quality.
   b. *Recommendation*: Amend the water budget and sustainable yield: 1) apply climate change estimates to the projected water budget and scale the sustainable yield accordingly; and 2) adjust surface water delivery estimates to reflect any new regulatory compliance.
5. **Comment #5** (Sustainable Management Criteria, 3.2.1 Groundwater Levels and 3.2.6 Depletions of Interconnected Surface Water, starting pp 3-1): Groundwater Level and Interconnected Surface Water sustainable management criteria do not protect against undesirable results for fish and wildlife beneficial uses and users of groundwater and interconnected surface waters.
   a. *Issues*:
      i. Proxy Metric: Before addressing the individual sustainability criteria for both Groundwater Levels and Depletions of Interconnected

Surface Water, the Department challenges the use of groundwater elevations as a proxy metric for Depletions of Interconnected Surface Water. The GSP does not provide evidence that a "significant correlation exists between groundwater elevations" and Depletions of Interconnected Surface Water [23 CCR § 354.36(b)(1)]. Instead, the GSP backs into the proxy metric by associating the proposed Groundwater Level minimum thresholds with the absence of significant and unreasonable surface water depletions, claiming that historical depletions of interconnected surface water had no associated undesirable results (GSP pp 3-19). The GSP offers few details to substantiate this claim that historical surface water depletions did not lead to undesirable results, and the GSP does not specify the modeling exercise used to determine the insignificance of historical surface water depletions. Provided the status of surface water allocations and aquatic ecosystems on rivers in the ESJ basin, the Department contests that any surface water depletions attributable to groundwater pumping are likely to be significant and unreasonable, particularly in the benchmark year of 2015 when groundwater pumping and surface water temperatures were critically high. Depleted flows in the lower San Joaquin River, many reaches of which are identified as interconnected in the GSP, contribute to increased in-river water temperatures. Groundwater extraction from interconnected aquifers contributes to depletion of instream flow (Barlow and Leake, 2012). Low flows and increased water temperatures in the lower San Joaquin River have been documented to negatively impact Chinook salmon (*Oncorhynchus tshawytscha*) and steelhead (*Oncorhynchus mykiss*) (Hallock 1970, Marston 2012). Acknowledging that fish and wildlife beneficial uses and users of groundwater likely experienced undesirable results during historical pumping regimes, especially during critically dry years, the GSP cannot rely on groundwater elevation as a proxy metric for Depletions of Interconnected Surface Water. If a significant correlation is lacking between groundwater elevations and Depletions of Interconnected Surface Water, particularly at the representative monitoring well locations used to track groundwater elevations in the ESJ Subbasin, then groundwater elevations used as a proxy for surface water depletions may misinform groundwater management activities and poorly predict instream habitat

conditions for fish and wildlife species. Accordingly, the application of Groundwater Level sustainable management criteria to Depletions of Interconnected Surface Water is inappropriate, as it is not grounded in a quantifiable and site-specific understanding of surface water-groundwater connectivity as required by 23 CCR § 354.28 (c)(6)(A).

ii. Undesirable Results: Groundwater Level 'undesirable results' and 'effects of undesirable results' do not specify impacts to environmental beneficial users such as terrestrial GDEs (GSP pp 3-3, 3-4). Additionally, the method used to identify undesirable results for Groundwater Levels (i.e., minimum threshold exceedances in groundwater elevation) is applied to the identification of undesirable results for the Depletions of Interconnected Surface Water without a reasonable justification. The indicator of undesirable results for Groundwater Levels is the measure of 25% of monitoring wells falling below their minimum thresholds for two consecutive (non-dry) years, yet the GSP does not prove a relationship between the Groundwater Level identification of undesirable results and the presence of undesirable results for Depletions of Interconnected Surface Water (see Comment #5.a.i). Effectively, the GSP does not connect identification of undesirable results for Depletions of Interconnected Surface Water to effects on interconnected surface water beneficial users per 23 CCR § 354.26 (b)(3). Finally, the GSP notes that groundwater levels that fall below the minimum threshold during hydrologically dry or critically dry years are not considered to be an indicator of undesirable results (GSP pp 3-3). This means proposed indicators of undesirable results for Groundwater Levels and Depletions of Interconnected Surface Water do not exist for dry water years. This absence of undesirable results indicators for certain water years means beneficial users of groundwater and interconnected surface water may experience significant and unreasonable effects throughout the duration of dry or critical water years before the undesirable results are 'identified' and managed. Accordingly, there is no groundwater management accountability during the most challenging of years for water resource managers and fish and wildlife beneficial users alike.

iii. Minimum Thresholds and Measurable Objectives: Minimum thresholds and measurable objectives for Groundwater Levels, and by proxy, for Depletions of Interconnected Surface Water, are not

protective of environmental beneficial uses and users of groundwater and interconnected surface water. Minimum thresholds allow for a decrease of groundwater elevation from 2015, or a comparable historic low, for all representative monitoring sites (3-7); and measurable objectives are set at historically low groundwater elevations (GSP 3-8). These sustainability criteria suggest that groundwater elevations at all representative wells in the ESJ Subbasin can continue to decrease for the next 20 years, dropping further from historically low groundwater elevations during drought years, without witnessing undesirable results.

The ESJ Subbasin is characterized by DWR as 'Critically Overdrafted,' meaning "continuation of present water management practices [in the basin] would probably result in significant adverse overdraft-related environmental, social, or economic impacts" ("Critically"). However, according to the GSP, there are no areas within the basin that are considered to have 'significant and unreasonable existing issues' (GSP pp 3-4), therefore minimum thresholds allow for continued groundwater depletions.

Conceptually, there is a disconnect between the ESJ's 'Critically Overdrafted' designation and the GSP's claim that the basin has not experienced undesirable results, nor will it if groundwater levels continue to decrease. More specifically, the Department believes historical declines in terrestrial and aquatic groundwater dependent ecosystem viability, exacerbated by recent drought years, are evidence of undesirable results and further groundwater decline will undoubtedly lead to significant and unreasonable effects on fish and wildlife beneficial uses and users of groundwater and interconnected surface waters under the proposed sustainable management criteria. For example, further streamflow depletion attributable to groundwater pumping that lowers groundwater levels to meet minimum thresholds or even measurable objective may further compromise in-stream temperature targets in the lower San Joaquin River, adversely impacting in-stream species (see Comment #5.a.i). Accordingly, the Department does not believe groundwater levels above the proposed minimum thresholds and below the proposed measurable objectives (in the margin of operational flexibility) will allow the basin to achieve sustainability, particularly with respect to avoiding undesirable results for fish and

wildlife beneficial uses and users of groundwater and interconnected surface water.

b. *Recommendation*:

i. Proxy Metrics: To justify use of groundwater elevations as a proxy metric for Depletions of Interconnected Surface Water, the GSP should either specify how groundwater elevations are significantly correlated to surface water depletions; or define an expeditious path to identifying the location, quantity, and timing of surface water depletions caused by groundwater use, per 23 CCR § 354.28(c)(6)(A), to better inform sustainability criteria for Depletions of Interconnected Surface Water.

ii. Undesirable Results: Specify Groundwater Level 'undesirable results' and 'effects of undesirable results' for environmental beneficial users of groundwater and interconnected surface water. Specify undesirable result indicators for Depletions of Interconnected Surface Water that are relevant to beneficial users of surface waters. Identify undesirable results indicators for dry and critically dry water years for all sustainability indicators.

iii. Minimum Thresholds and Measurable Objectives: Reconsider minimum thresholds and measurable objectives, accounting for undesirable results for fish and wildlife beneficial uses and users of groundwater and interconnected surface water. Design sustainable management criteria that reflect a 'Critically Overdrafted' subbasin designation by seeking to improve current groundwater conditions rather than allowing for continued aquifer depletions over the next two decades. For example, historical groundwater pumping has likely contributed to stream disconnection illustrated in figure 2-66 (GSP 2-99); resulting in depleted stream flows and reduced baseflows in ESJ Subbasin tributaries, and exacerbated high water temperatures in the lower San Joaquin River that negatively impact listed species such as the Chinook Salmon. Minimum thresholds and measurable objectives should reflect an effort to prevent further degradation to interconnected surface waters and to avoid undesirable results, rather than risk magnifying historical undesirable results through lowered groundwater elevations.

6. **Comment #6** (Sustainable Management Criteria, 3.6 Degraded Water Quality, starting pp 3-10): The GSP wrongly abdicates responsibility for specific constituents by implying there is no nexus between specific groundwater contaminants and groundwater pumping (GSP pp 3-11).

a. *Issue*: The GSP identifies two primary water quality constituents of concern in the ESJ Subbasin: salinity and arsenic (GSP pp 2-76). The GSP only specifies sustainability management criteria for salinity. The GSP explains that other constituents, including arsenic, are managed through other regulatory programs, and suggests that because GSAs do not have land use authority, they lack an ability to manage for such constituents as arsenic (GSP pp 3-11). Science suggests that over-pumping of aquifers can cause clay layers to compress and release dissolved arsenic, resulting in an increase of arsenic in extracted water ("Groundwater"). Thus, groundwater pumping actions can affect the presence, movement, and concentration of naturally occurring arsenic in groundwater, potentially increasing anthropogenic and ecosystem exposure to arsenic contamination. According to SGMA statue, GSAs have the authority to establish groundwater extraction allocations, among other relevant authorities [WC § 10726.4]. Because arsenic contamination can be impacted by groundwater pumping, and because GSAs have the authority to manage groundwater pumping, the ESJGA has a viable management lever over arsenic contamination in the ESJ Subbasin.
b. *Recommendation*: Draft a plan to investigate the relationship between groundwater pumping and the presence, movement, and concentration of arsenic in the ESJ Subbasin and include the plan in the GSP submitted to DWR by January 2020. Develop sustainability criteria for arsenic accordingly and in partnership with existing regulatory programs by the first 5-year GSP update due in January 2025.

7. **Comment #7** (Monitoring Networks, starting pp 4-1): Number and distribution of groundwater monitoring wells are insufficient for analysis.
   a. *Issue*: The current monitoring network lacks a sufficient number and representative distribution of shallow groundwater monitoring wells to monitor impacts to environmental beneficial uses and users of groundwater and interconnected surface waters [23 CCR § 354.34(2)]. Few wells are near interconnected surface waters or concentrations of GDEs; and therefore, there are few data points on shallow groundwater level trends. These data are critical to understanding groundwater management impacts on fish and wildlife beneficial uses and users of groundwater, including GDEs and interconnected surface water habitats, that are impacted disproportionately by shallow groundwater trends.
   b. *Recommendation*: Install additional shallow groundwater monitoring wells near GDEs and interconnected surface waters, potentially pairing multiple-

completion wells with streamflow gauges for improved understanding of surface water-groundwater interconnectivity.

8. **Comment #8** (Project and Management Actions; 6.1 Projects, Management Actions, and Adaptive Management Strategies; starting pp 6-1): Demand reduction management actions lack emphasis and specificity critical to ESJ Subbasin sustainability goal achievement.
    a. *Issue*: The GSP project and management actions focus on supply augmentation, with only three projects intended to conserve groundwater through metering and systems optimization. Though the GSP reserves the flexibility to implement demand-side management in the future (GSP pp 6-1), there are no specifics as to how the ESJGA would implement demand management. This lack of specificity on how demand will be managed may lead to deprioritization or delayed implementation of demand management actions, which can undermine a basin's ability to achieve sustainability goals. Considering the ESJ Subbasins' current unsustainable rate of groundwater consumption and considering the cost and timing challenges associated with supply augmentation projects, a balanced portfolio approach to achieve groundwater sustainability should include demand-management strategies.
    b. *Recommendation*: Add specific measures for initiating demand reduction on an earlier timeline in the ESJ Subbasin to account for groundwater pumping lag impacts, supply-augmentation project implementation challenges, and a scaled ramping-down of groundwater use that is a necessary ingredient in San Joaquin Valley long-term groundwater sustainability. Be specific about triggers, timing, and expected outcomes of demand-management actions.

CONCLUSION

In conclusion, the ESJ Subbasin Draft GSP does not comply with all aspects of SGMA statutes and regulations. The Department deems the GSP insufficient in its consideration of fish and wildlife beneficial uses and users of groundwater and interconnected surface waters. The Department recommends that ESJGA address the above comments before GSP submission to DWR. If these comments are not integrated, the Department may recommend to DWR an 'incomplete' or 'inadequate' plan determination based on the following regulatory criteria for plan evaluations:

1. The assumptions, criteria, findings, and objectives, including the sustainability goal, undesirable results, minimum thresholds, measurable objectives, and interim milestones are not reasonable and/or not supported by the best available information and best available science. [23 CCR § 355.4(b)(1)] (See Comment #2, 3, 4, 5, 7)

2. The GSP does not identify reasonable measures and schedules to eliminate data gaps. [23 CCR § 355.4(b)(2)] (See Comment #7)
3. The sustainable management criteria and projects and management actions are not commensurate with the level of understanding of the basin setting, based on the level of uncertainty, as reflected in the GSP. [23 CCR § 355.4(b)(3)] (See Comment #5, 6, 8)
4. The interests of the beneficial uses and users of groundwater in the basin, and the land uses and property interests potentially affected by the use of groundwater in the basin, have not been considered. [23 CCR § 355.4(b)(4)] (See Comment #1, 2, 3, 4, 5, 7)
5. The projects and management actions are not feasible and/or not likely to prevent undesirable results and ensure that the basin is operated within its sustainable yield. [23 CCR § 355.4(b)(5)] (See Comment #8)
6. The GSP does not include a reasonable assessment of overdraft conditions and/or does not include reasonable means to mitigate overdraft, if present. [23 CCR § 355.4(b)(6)] (See Comment #4, 8)

The Department appreciates the opportunity to provide comments on the ESJ Subbasin Draft GSP. Please contact Lauren Mulloy by email at Lauren.Mulloy@wildlife.ca.gov with any questions.

Sincerely,

Kevin Thomas
Regional Manager, North Central Region

Enclosures (Literature Cited)

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August 22, 2019

Eastern San Joaquin Groundwater Authority
1810 E. Hazelton Avenue
P.O. Box 1810
Stockton, California 95201
c/o info@esjgroundwater.org

Ladies and Gentlemen:

The California Poultry Federation ("CPF") is pleased to submit these comments on the Eastern San Joaquin Groundwater Subbasin draft Groundwater Sustainability Plan (hereinafter the "Draft GSP"). CPF represents all parts of the poultry industry, including growers, hatchers, breeders, and processors working with chickens, turkeys, ducks, and game birds. For all those segments, water is essential for nutrition as well as maintaining safe and sanitary conditions. CPF therefore supports effective measures to assure reliable water supplies.

In this regard, CPF commends the Draft GSP for emphasizing projects to augment yield and increase recharge. Such measures are essential for "maintain[ing] an economically-viable groundwater resource for the beneficial use of the people of the Eastern San Joaquin Subbasin." We encourage the Eastern San Joaquin Groundwater Authority to continue identifying and implementing additional measures to increase water supplies.

CPF appreciates your consideration of these comments. Please contact me if you need any additional information.

Very truly yours,

Bill Mattos

BILL MATTOS
President

Executive Committee Members and Officers
Tom Bower, Foster Farms - Chairman | Matt Junkel, Petaluma Poultry - Vice Chairman
Dalton Rasmussen, Squab Producers of California - Secretary/Treasurer | David Pitman, Pitman Family Farms - Past Chairman
Bill Mattos, California Poultry Federation - President

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August 21, 2019

Eastern San Joaquin Groundwater Authority
1810 E. Hazelton Avenue
P. O. Box 1810
Stockton, CA 95201
By email to info@esjgroundwater.org

Re: California Sportfishing Protection Alliance Comments on the Eastern San Joaquin Draft Groundwater Sustainability Plan.

Dear Sir of Madam:

This office represents the California Sportfishing Protection Alliance (CSPA) regarding your review and adoption of the Eastern San Joaquin Draft Groundwater Sustainability Plan (Plan).

CSPA objects to your adoption of the Plan because it does not meet the requirements of the Sustainable Groundwater Management Act or the GSP Emergency Regulations at Title 23, Cal. Code Regs. section 350 et seq. (GSP Rules), as more fully explained in comments that will be submitted by geologist Greg Kamman under separate cover by August 25, 2019.

The Plan does not satisfy GSP Rule 355.4(b)(1) because the Plan's description of the sustainability goal, undesirable results, minimum thresholds, measurable objectives, and interim milestones are not reasonable or supported by the best available information and best available science.

The Plan does not satisfy GSP Rule 355.4(b)(3) because the sustainable management criteria and projects and management actions identified in the plan are not commensurate with the level of understanding of the basin setting, based on the level of uncertainty, as reflected in the Plan.

The Plan does not satisfy GSP Rule 355.4(b)(5) because the Plan does not contain or present substantial evidence to conclude that the projects and management actions identified to achieve sustainable yield are effective or feasible or not likely to prevent undesirable results or to ensure that the basin is operated within its sustainable yield.

These deficiencies are described in more detail in Mr. Kamman's comments.

CSPA urges the Authority to not adopt the Plan in its current form; to revise the draft Plan

to remedy these informational deficiencies; and to recirculate the revised Plan for public comment.

Thank you for your attention to this matter.

Very Truly Yours,

Tom Lippe

Thomas N. Lippe

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Eastern San Joaquin Subbasin GSP Public Draft
Summary of Public Comments and Responses

Comment #	Commenter	Commenter Organization	Page Number	Section, Figure, or Table Number	Sentence Starts with, "...	Comment
1	Tom Lippe	California Sportfishing Protection Alliance				CSPA objects to your adoption of the Plan because it does not meet the requirements of the Sustainable Groundwater Management Act or the GSP Emergency Regulations at Title 23, Cal. Code Regs. section 350 et seq. (GSP Rules), as more fully explained in comments that will be submitted by geologist Greg Kamman under separate cover by August 25, 2019
2	Tom Lippe	California Sportfishing Protection Alliance				The Plan does not satisfy GSP Rule 355.4(b)(1) because the Plan's description of the sustainability goal, undesirable results, minimum thresholds, measurable objectives, and interim milestones are not reasonable or supported by the best available information and best available science.
3	Tom Lippe	California Sportfishing Protection Alliance				The Plan does not satisfy GSP Rule 355.4(b)(3) because the sustainable management criteria and projects and management actions identified in the plan are not commensurate with the level of understanding of the basin setting, based on the level of uncertainty, as reflected in the Plan.
4	Tom Lippe	California Sportfishing Protection Alliance				The Plan does not satisfy GSP Rule 355.4(b)(5) because the Plan does not contain or present substantial evidence to conclude that the projects and management actions identified to achieve sustainable yield are effective or feasible or not likely to prevent undesirable results or to ensure that the basin is operated within its sustainable yield.

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August 23, 2019

Eastern San Joaquin Groundwater Authority
1810 E. Hazelton Avenue
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Stockton, CA 95201
Via email: info@esjgroundwater.org

Subject: Review of on Draft Groundwater Sustainability Plan
Eastern San Joaquin Groundwater Subbasin

Dear Sir/Madame:

I am a hydrologist with over thirty years of technical and consulting experience in the fields of geology, hydrology, and hydrogeology. I have been providing professional hydrology and geomorphology services throughout California since 1989 and routinely manage and lead projects in the areas of surface- and groundwater hydrology, water supply, water quality assessments, water resources management, and geomorphology. A copy of my resume is attached.

On behalf of the California Sportfishing Protection Alliance, I have been retained by the Law Offices of Thomas N. Lippe, APC to review and evaluate the Draft Groundwater Sustainability Plan (GSP) for the Eastern San Joaquin Groundwater Subbasin (ESJGB), especially as it pertains to groundwater interaction with the Stanislaus River. Based on my review, it is my opinion that the GSP is deficient in many areas. The rationale for this opinion is based on the findings presented below.

1. Section 2.1.9.2.2 of the GSP (page 2-49) is entitled, Regional Historic Groundwater Flow and Surface Water Interaction. There is no presentation or reference to historic groundwater interaction with surface water in this section of the GSP.

2. Section 354.16 of the GSP Regulations stipulates that each plan describe current and historic groundwater conditions in the basin based on the best available information. With regard to Section 2.2.6 of the GSP (Interconnected Surface Water Systems), I would like you to be aware of a study completed by Kamman Hydrology & Engineering, Inc.[1], which delineates subterranean streams and Potential Stream Depletion Areas (PSDA) along the Stanislaus River bordering the south side of the ESJGB. PSDA's are areas where groundwater pumping

[1] Kamman Hydrology & Engineering, Inc., 2018, Delineating subterranean streams and Potential Stream Depletion Areas, Lower Stanislaus and Tuolumne River Watershed. Draft Technical Memorandum prepared for: Law Offices of Thomas N. Lippe, APC, July 23, 9p. and 15 sheets.

could potentially cause stream depletion. This report and associated maps are attached for reference and integration into Section 2.2.6 of the GSP.

3. Section 2.2.6 of the GSP (page 2-97 to 2-99) also introduces Figure 2-65 (attached as Exhibit A), which shows gaining streams in blue where groundwater discharges to rivers, losing streams in red where streams lose water to the groundwater system, and mixed streams (gaining or losing less than 75 percent of the time) in orange. This analysis was based on modeling results from the historical calibration of the East San Joaquin Water Resources Model (ESJWRM) for approximately 900 stream nodes in the Eastern San Joaquin Subbasin. The historical model calibration period covers the water years 1996-2015. Based on the Cumulative Departure from Mean Precipitation curve presented in Figure 2-71 (pg. 2-109 of GSP), the years 1996-2015 reflect a dry period, as there is a net decrease in approximately 17-inches of precipitation (i.e., change from +7 [1996] to -10 inches [2015] in the cumulative departure curve). This section of the GSP only presents a description of historical (and dry) interconnected surface water conditions. Section 354.16 of the California Code of Regulations (Regulations) stipulates that each Plan shall provide a description of current and historical groundwater conditions in the basin. The GSP fails to describe the current conditions of the interconnected surface water system in the basin.

4. Section 2.2.6 of the GSP (Interconnected Surface Water Systems; page 2-97 to 2-99) also presents Figure 2-66 (attached as Exhibit B), which is entitled, Interconnected and Disconnected Streams. The GSP states that Stream connectivity was analyzed by comparing monthly groundwater elevations from the historical calibration of the ESJWRM to streambed elevations along the streams represented in the ESJWRM. Exhibit B shows the locations where streams are interconnected at least 75 percent of the time (shown in blue) or disconnected (shown in green). Section 351 of the Regulations defines "interconnected surface water" as surface water that is hydraulically connected at any point by a continuous saturated zone to the underlying aquifer and the overlying surface water is not completely depleted. The GSP (pg. 2-97) states that interconnected surface waters may be either gaining or losing, wherein the surface water feature itself is either gaining water from the aquifer system or losing water to the aquifer system. Exhibit C (attached) is taken from DWR's water budget BMP guidance document[2] and illustrates the relationship between surface water and groundwater for gaining, losing and disconnected streams. Per this diagram, for a stream to be gaining, it must be hydraulically connected to the aquifer. In many instances, a losing stream may also be in hydraulic connection to the aquifer. Losing streams may become disconnected seasonally or during drought periods in response to a falling water table. There are inconsistencies between the results presented in Exhibits A and B where areas delineated as gaining streams are also identified as being disconnected. A good example of this

[2] California Department of Water Resources, 2016, Best Management Practices for the Sustainable Management of Groundwater, Water Budget BMP. December, 53p.

is the upstream portion of the Stanislaus River located in the southeast corner of the basin. These inconsistencies should be corrected or explained. In addition, the stream connectivity presented in Exhibit B is for historic conditions – the current conditions should also be presented per Regulations.

5. The GSP Regulations define "groundwater dependent ecosystem" (GDE) as ecological communities or species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface. Section 354.16 of the Regulations stipulate that Plans identify (current and historic) GDEs within the basin, utilizing data available from the Department, as specified in Section 353.2, or the best available information. As stated on page 2-100, the GSP identifies GDEs within the Subbasin based on determining the areas where vegetation is dependent on groundwater. The GSP presents a methodology where the Natural Communities Commonly Associated with Groundwater (NCCAG) database, developed by DWR, CDFW and The Nature Conservancy (TNC), is used to identify vegetation communities and wetlands that are dependent on groundwater. Figure 2-67 of the GSP (attached as Exhibit D) presents the NCCAG within the basin. The GSP then describes a methodology by which NCCAG's with alternate water supplies are excluded from consideration as GDEs based on the following criteria:

    a. Depth to groundwater greater than 30 feet;
    b. areas within 150 feet of managed wetlands that receive supplemental water;
    c. areas within 50 feet of irrigated agriculture;
    d. areas within 150 feet of perennial surface water bodies, and
    e. areas removed based on stakeholder comment.

    The resulting areas identified as GDEs within the basin based on these criteria are shown in Figure 2-69 of the GSP (attached as Exhibit E).

    There are two major problems with the GSP's method for delineation of GDEs. First, the GSP method only considers the presence of vegetation communities and wetlands in the determination. GSP Regulations stipulate that "species" dependent on groundwater should also be considered. Thus, the analysis should also take into consideration the presence of fish and wildlife species that rely on riparian wetlands and/or flow in rivers influenced by gaining reaches. The Nature Conservancy refers to these species as Environmental Surface Water Beneficial Users and has prepared a list of freshwater species located within each groundwater basin in California. These lists are posted at their website[3] specifically for GSAs and others to better evaluate the impacts of groundwater management on environmental beneficial users of surface water in GSPs. This best available science should be integrated into the determination of GDEs.

[3] https://groundwaterresourcehub.org/sgma-tools/environmental-surface-water-beneficiaries/

The second problem I see in the GSP methodology is the failure to acknowledge that GDEs may depend on shallow groundwater regardless of the presence of alternative water sources. For example, wetlands within or adjacent to irrigated agriculture may not rely on that irrigation for survival; if they did, we would expect to find wetlands growing in all irrigated lands. In addition, the presence and sustainability of perennial surface water in Central Valley Rivers is controlled by many factors (e.g., groundwater inflow, reservoir operations, irrigation drainage, etc.). Modeling results presented in the GSP indicate significant contributions of groundwater flow to "gaining" reaches of the Stanislaus River (see Exhibit A). The riparian and wetland vegetation bordering these gaining reaches are surely sustained to some degree by this groundwater inflow to the river and the shallow groundwater conditions that likely accompany gaining reaches. The interconnected condition is also likely influenced significantly by seasonal and long-term wet and dry cycles. However, the GSP does not quantify the relative spatial or temporal contributions of groundwater supply to riparian habitats. Instead, the GPS simply dismisses these habitats as GDE's under the assumption that perennial flow is sustained through the summer by agricultural deliveries or tailwater. Therefore, it is my opinion that the process of elimination of GDEs as presented in the GSP is seriously flawed and does not correctly recognize or delineate GDEs in the basin.

6. One of the most important outcomes of the GSP is the determination of sustainable yield (sustainability goal) for the basin. Section 2.3.6 (pg. 2-133) of the GSP states that, "The sustainable conditions scenario is based on the projected conditions scenario modified by lowering groundwater production across the model domain." This section of the GSP then provides some qualitative statements about future supplies, demands and uncertainties in water budget assumptions and numerical modeling. Although the sustainable yield of the basin is determined to be 715,000 AF/yr +/- 10 percent, and a 78,000 AF/yr reduction in groundwater use is needed to achieve sustainability, there is no detailed explanation on how these numbers were determined. Per Section 354.24 of the GSP Regulations, "The Plan shall include a description of the sustainability goal, including information from the basin setting used to establish the sustainability goal, etc." As written, the GSP does not provide the reader with a clear and detailed explanation on how the sustainable yield figure was derived and if climate change predictions were factored into the quantification. This omission makes it impossible to review and comment on the reliability of the sustainable yield or required reduction figures for the basin under existing or future conditions. Therefore, the draft GSP should be revised to include this information and recirculated for public comment.

7. Because the Subbasin is in overdraft, the GSP has identified 23 projects to reduce overdraft conditions and meet long-term water demands and sustainability goals. There are some projects focused on conservation and reuse of reclaimed water, but the majority simply reduce local groundwater demand by providing access to surface water supplies. These projects are limited in geographic area and are

intended to provide local solutions. However, from the perspective of a full basin water budget, shifting the reliance from groundwater to surface water supplies may not generate the full benefits anticipated as provided in the project descriptions. This is because diverting and reducing stream flows will lead to reductions in groundwater recharge in other areas within or beyond the basin, via reduced water available for stream infiltration or other uses of stream diversions that contribute to recharge. As required in Section 354.44 of the Regulations, the GSP does not provide a full and comprehensive quantification of demand reduction in response to project implementation – this would require deriving a basin-scale water budget accounting that incorporates project actions. This analysis would also inform the evaluation, as required under Section 355.4 of the GSP Regulations, of Plan/project feasibility and undesireable results (e.g., ecological impacts) associated with increased diversion and use of surface water supplies.

Stated another way, I'm concerned that the GSP has not demonstrated that the Project Actions will be effective in achieving stated reductions in groundwater use and avoiding undesirable results. For example, Project 2, the SEWD Surface Water Implementation Expansion Project (SEWD), would require landowners adjacent to surface water conveyance systems (rivers or pipelines) to utilize surface water as part of the SGMA implementation. This would increase surface water usage by about 18,000 to 20,000 AF/year with in-lieu groundwater recharge benefits. This project relies on water from New Hogan Reservoir (Calaveras River water) and New Melones Reservoir (Stanislaus River water). Although the project could reduce groundwater use, there is no analysis provided on how the project would affect surface and ground water resources downstream of the two reservoirs. If this project reduced downstream flows, it could result in depleted surface water supplies, reduced groundwater recharge from the rivers as well as adverse impacts to riparian vegetation and environmental surface water beneficial users.

Similarly, I'm concerned about the assumed feasibility of some projects achieving the desired goal. For example, the groundwater recharge Projects 11 and 12 are anticipated to each recharge 8,000 AF/yr through the construction and operation of independent 10-acre recharge ponds. This equates to recharging 800 feet of water at each pond site between December 1 and June 30th of each year or 3.78 feet daily for the 212 day period. I am skeptical about achieving this level of recharge given the uncertainties in water availability during dry years, operations that would be required to maintain ponding of sufficient depth and duration, and maintaining basin infiltration rates given the likely accumulation of fine grained material that reduces basin permeability. This example demonstrates how the GSP fails to demonstrate how these project can be accomplished in a successful manner under a variety of rainfall and runoff conditions.

Please feel free to contact me with any questions regarding the material and conclusions contained in this letter.

Sincerely,

Greg Kamman, PG, CHG
Principal Hydrologist

Eastern San Joaquin Subbasin GSP Public Draft

Summary of Public Comments and Responses

Comment #	Commenter	Commenter Organization	Page Number	Section, Figure, or Table Number	Sentence Starts with, "...	Comment
1	Greg Kamman	California Sportfishing Protection Alliance	2-49	Section 2.1.9.2.2		Section 2.1.9.2.2 of the GSP (page 2-49) is entitled, Regional Historic Groundwater Flow and Surface Water Interaction. There is no presentation or reference to historic groundwater interaction with surface water in this section of the GSP.
2	Greg Kamman	California Sportfishing Protection Alliance	2-97	Section 2.2.6		Section 354.16 of the GSP Regulations stipulates that each plan describe current and historic groundwater conditions in the basin based on the best available information. With regard to Section 2.2.6 of the GSP.(Interconnected Surface Water Systems), I would like you to be aware of a study completed by Kamman Hydrology & Engineering, Inc. in 2018 , which delineates subterranean streams and Potential Stream Depletion Areas (PSDA) along the Stanislaus River bordering the south side of the ESJGB. PSDA's are areas where groundwater pumping could potentially cause stream depletion. This report and associated maps are attached for reference and integration into Section 2.2.6 of the GSP. Access KHE's 2018 report at this link: https://www.dropbox.com/s/zzqnn6ifsbahx5p/PSDA-mapping-Tech-Memorandum_v1%2Bquads.pdf?dl=0
3	Greg Kamman	California Sportfishing Protection Alliance	2-97	Section 2.2.6		Section 2.2.6 of the GSP (page 2-97 to 2-99) also introduces Figure 2-65 (attached as Exhibit A), which shows gaining streams in blue where groundwater discharges to rivers, losing streams in red where streams lose water to the groundwater system, and mixed streams (gaining or losing less than 75 percent of the time) in orange. This analysis was based on modeling results from the historical calibration of the East San Joaquin Water Resources Model (ESJWRM) for approximately 900 stream nodes in the Eastern San Joaquin Subbasin. The historical model calibration period covers the water years 1996-2015. Based on the Cumulative Departure from Mean Precipitation curve presented in Figure 2-71 (pg. 2-109 of GSP), the years 1996-2015 reflect a dry period, as there is a net decrease in approximately 17-inches of precipitation (i.e., change from +7 [1996] to -10 inches [2015] in the cumulative departure curve). This section of the GSP only presents a description of historical (and dry) interconnected surface water conditions. Section 354.16 of the California Code of Regulations (Regulations) stipulates that each Plan shall provide a description of current and historical groundwater conditions in the basin. The GSP fails to describe the current conditions of the interconnected surface water system in the basin.

Eastern San Joaquin Subbasin GSP Public Draft

Summary of Public Comments and Responses

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4	Greg Kamman	California Sportfishing Protection Alliance	2-97	Section 2.2.6		Section 2.2.6 of the GSP (Interconnected Surface Water Systems; page 2-97 to 2-99) also presents Figure 2-66 (attached as Exhibit B), which is entitled, Interconnected and Disconnected Streams. The GSP states that Stream connectivity was analyzed by comparing monthly groundwater elevations from the historical calibration of the ESJWRM to streambed elevations along the streams represented in the ESJWRM. Exhibit B shows the locations where streams are interconnected at least 75 percent of the time (shown in blue) or disconnected (shown in green). Section 351 of the Regulations defines "interconnected surface water" as surface water that is hydraulically connected at any point by a continuous saturated zone to the underlying aquifer and the overlying surface water is not completely depleted. The GSP (pg. 2-97) states that interconnected surface waters may be either gaining or losing, wherein the surface water feature itself is either gaining water from the aquifer system or losing water to the aquifer system. Exhibit C (attached) is taken from DWR's water budget BMP guidance document and illustrates the relationship between surface water and groundwater for gaining, losing and disconnected streams. Per this diagram, for a stream to be gaining, it must be hydraulically connected to the aquifer. In many instances, a losing stream may also be in hydraulic connection to the aquifer. Losing streams may become disconnected seasonally or during drought periods in response to a falling water table. There are inconsistencies between the results presented in Exhibits A and B where areas delineated as gaining streams are also identified as being disconnected. A good example of this is the upstream portion of the Stanislaus River located in the southeast corner of the basin. These inconsistencies should be corrected or explained. In addition, the stream connectivity presented in Exhibit B is for historic conditions – the current conditions should also be presented per Regulations.
5	Greg Kamman	California Sportfishing Protection Alliance	2-100	Sections 2.2.7, 2.2.8, and 2.2.9		The GSP Regulations define "groundwater dependent ecosystem" (GDE) as ecological communities or species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface. Section 354.16 of the Regulations stipulate that Plans identify (current and historic) GDEs within the basin, utilizing data available from the Department, as specified in Section 353.2, or the best available information. As stated on page 2-100, the GSP identifies GDEs within the Subbasin based on determining the areas where

Eastern San Joaquin Subbasin GSP Public Draft

Summary of Public Comments and Responses

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						vegetation is dependent on groundwater. The GSP presents a methodology where the Natural Communities Commonly Associated with Groundwater (NCCAG) database, developed by DWR, CDFW and The Nature Conservancy (TNC), is used to identify vegetation communities and wetlands that are dependent on groundwater. Figure 2-67 of the GSP (attached as Exhibit D) presents the NCCAG within the basin. The GSP then describes a methodology by which NCCAG's with alternate water supplies are excluded from consideration as GDEs based on the following criteria: a. Depth to groundwater greater than 30 feet; b. areas within 150 feet of managed wetlands that receive supplemental water; c. areas within 50 feet of irrigated agriculture; d. areas within 150 feet of perennial surface water bodies, and e. areas removed based on stakeholder comment. The resulting areas identified as GDEs within the basin based on these criteria are shown in Figure 2-69 of the GSP (attached as Exhibit E). There are two major problems with the GSP's method for delineation of GDEs. First, the GSP method only considers the presence of vegetation communities and wetlands in the determination. GSP Regulations stipulate that "species" dependent on groundwater should also be considered. Thus, the analysis should also take into consideration the presence of fish and wildlife species that rely on riparian wetlands and/or flow in rivers influenced by gaining reaches. The Nature Conservancy refers to these species as Environmental Surface Water Beneficial Users and has prepared a list of freshwater species located within each groundwater basin in California. These lists are posted at their website specifically for GSAs and others to better evaluate the impacts of groundwater management on environmental beneficial users of surface water in GSPs. This best available science should be integrated into the determination of GDEs. The second problem I see in the GSP methodology is the failure to acknowledge that GDEs may depend on shallow groundwater regardless of the presence of alternative water sources. For example, wetlands within or adjacent to irrigated agriculture may not rely on that irrigation for survival; if they did, we would

Comment #	Commenter	Commenter Organization	Page Number	Section, Figure, or Table Number	Sentence Starts with, "...	Comment
						expect to find wetlands growing in all irrigated lands. In addition, the presence and sustainability of perennial surface water in Central Valley Rivers is controlled by many factors (e.g., groundwater inflow, reservoir operations, irrigation drainage, etc.). Modeling results presented in the GSP indicate significant contributions of groundwater flow to "gaining" reaches of the Stanislaus River (see Exhibit A). The riparian and wetland vegetation bordering these gaining reaches are surely sustained to some degree by this groundwater inflow to the river and the shallow groundwater conditions that likely accompany gaining reaches. The interconnected condition is also likely influenced significantly by seasonal and long-term wet and dry cycles. However, the GSP does not quantify the relative spatial or temporal contributions of groundwater supply to riparian habitats. Instead, the GPS simply dismisses these habitats as GDE's under the assumption that perennial flow is sustained through the summer by agricultural deliveries or tailwater. Therefore, it is my opinion that the process of elimination of GDEs as presented in the GSP is seriously flawed and does not correctly recognize or delineate GDEs in the basin.
6	Greg Kamman	California Sportfishing Protection Alliance	2-133	Section 2.3.6		One of the most important outcomes of the GSP is the determination of sustainable yield (sustainability goal) for the basin. Section 2.3.6 (pg. 2-133) of the GSP states that, "The sustainable conditions scenario is based on the projected conditions scenario modified by lowering groundwater production across the model domain." This section of the GSP then provides some qualitative statements about future supplies, demands and uncertainties in water budget assumptions and numerical modeling. Although the sustainable yield of the basin is determined to be 715,000 AF/yr +/- 10 percent, and a 78,000 AF/yr reduction in groundwater use is needed to achieve sustainability, there is no detailed explanation on how these numbers were determined. Per Section 354.24 of the GSP Regulations, "The Plan shall include a description of the sustainability goal, including information from the basin setting used to establish the sustainability goal, etc." As written, the GSP does not provide the reader with a clear and detailed explanation on how the sustainable yield figure was derived and if climate change predictions were factored into the quantification. This omission makes it impossible to review and comment on the reliability of the sustainable yield or required reduction figures for the basin

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						under existing or future conditions. Therefore, the draft GSP should be revised to include this information and recirculated for public comment.
7	Greg Kamman	California Sportfishing Protection Alliance	6-2	Section 6.2.3		Because the Subbasin is in overdraft, the GSP has identified 23 projects to reduce overdraft conditions and meet long-term water demands and sustainability goals. There are some projects focused on conservation and reuse of reclaimed water, but the majority simply reduce local groundwater demand by providing access to surface water supplies. These projects are limited in geographic area and are intended to provide local solutions. However, from the perspective of a full basin water budget, shifting the reliance from groundwater to surface water supplies may not generate the full benefits anticipated as provided in the project descriptions. This is because diverting and reducing stream flows will lead to reductions in groundwater recharge in other areas within or beyond the basin, via reduced water available for stream infiltration or other uses of stream diversions that contribute to recharge. As required in Section 354.44 of the Regulations, the GSP does not provide a full and comprehensive quantification of demand reduction in response to project implementation – this would require deriving a basin-scale water budget accounting that incorporates project actions. This analysis would also inform the evaluation, as required under Section 355.4 of the GSP Regulations, of Plan/project feasibility and undesireable results (e.g., ecological impacts) associated with increased diversion and use of surface water supplies. Stated another way, I'm concerned that the GSP has not demonstrated that the Project Actions will be effective in achieving stated reductions in groundwater use and avoiding undesirable results. For example, Project 2, the SEWD Surface Water Implementation Expansion Project (SEWD), would require landowners adjacent to surface water conveyance systems (rivers or pipelines) to utilize surface water as part of the SGMA implementation. This would increase surface water usage by about 18,000 to 20,000 AF/year with in-lieu groundwater recharge benefits. This project relies on water from New Hogan Reservoir (Calaveras River water) and New Melones Reservoir (Stanislaus River water). Although the project could reduce groundwater use, there is no analysis provided on how the project would affect surface and ground water resources downstream of the two reservoirs. If this project reduced downstream flows, it

Eastern San Joaquin Subbasin GSP Public Draft

Summary of Public Comments and Responses

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						could result in depleted surface water supplies, reduced groundwater recharge from the rivers as well as adverse impacts to riparian vegetation and environmental surface water beneficial users. Similarly, I'm concerned about the assumed feasibility of some projects achieving the desired goal. For example, the groundwater recharge Projects 11 and 12 are anticipated to each recharge 8,000 AF/yr through the construction and operation of independent 10-acre recharge ponds. This equates to recharging 800 feet of water at each pond site between December 1 and June 30th of each year or 3.78 feet daily for the 212 day period. I am skeptical about achieving this level of recharge given the uncertainties in water availability during dry years, operations that would be required to maintain ponding of sufficient depth and duration, and maintaining basin infiltration rates given the likely accumulation of fine grained material that reduces basin permeability. This example demonstrates how the GSP fails to demonstrate how these project can be accomplished in a successful manner under a variety of rainfall and runoff conditions.

ATTACHMENTS

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Exhibit A

Figure 2-65: Losing and Gaining Streams

Exhibit B

Figure 2-66: Interconnected and Disconnected Streams

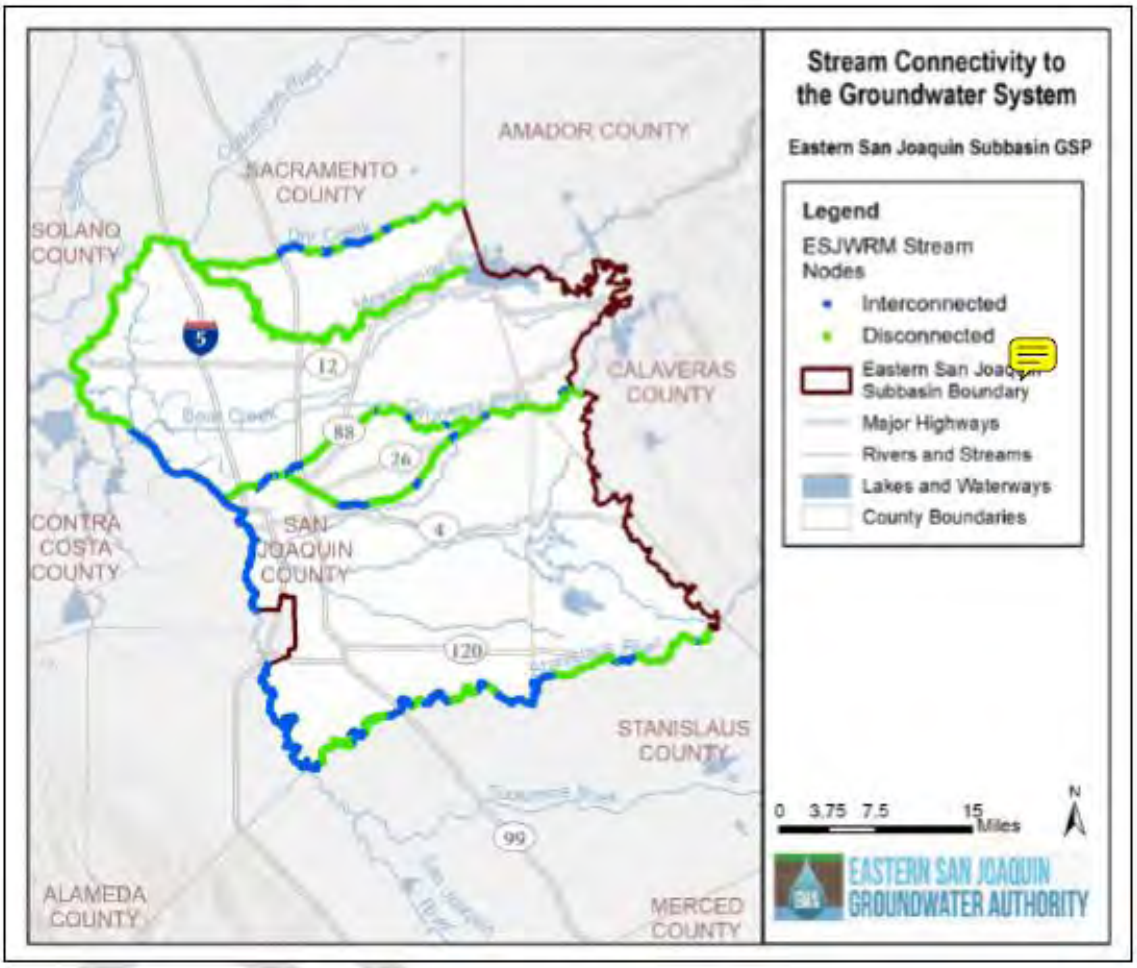


Exhibit C

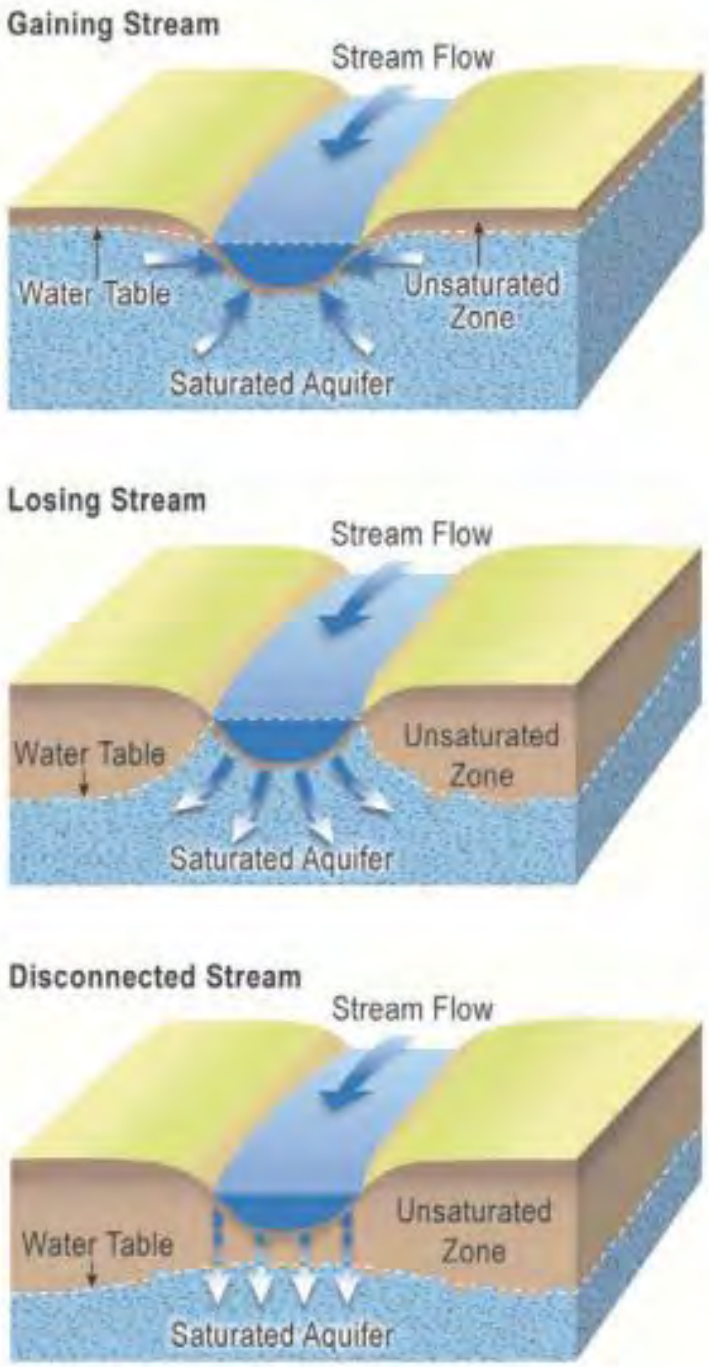


Figure 2 – Gaining, Losing, and Disconnected Streams

Exhibit D

Figure 2-67: Natural Communities Commonly Associated with Groundwater (NCCAG)

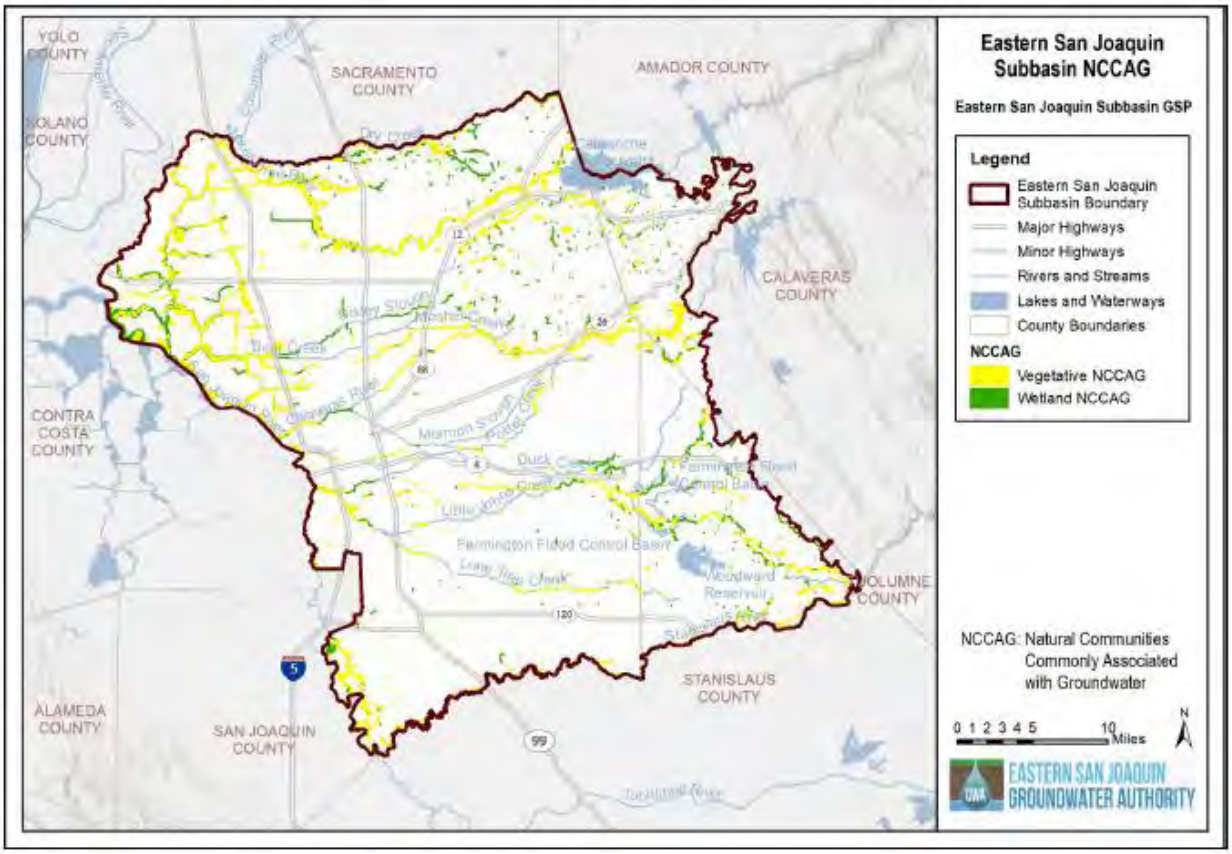
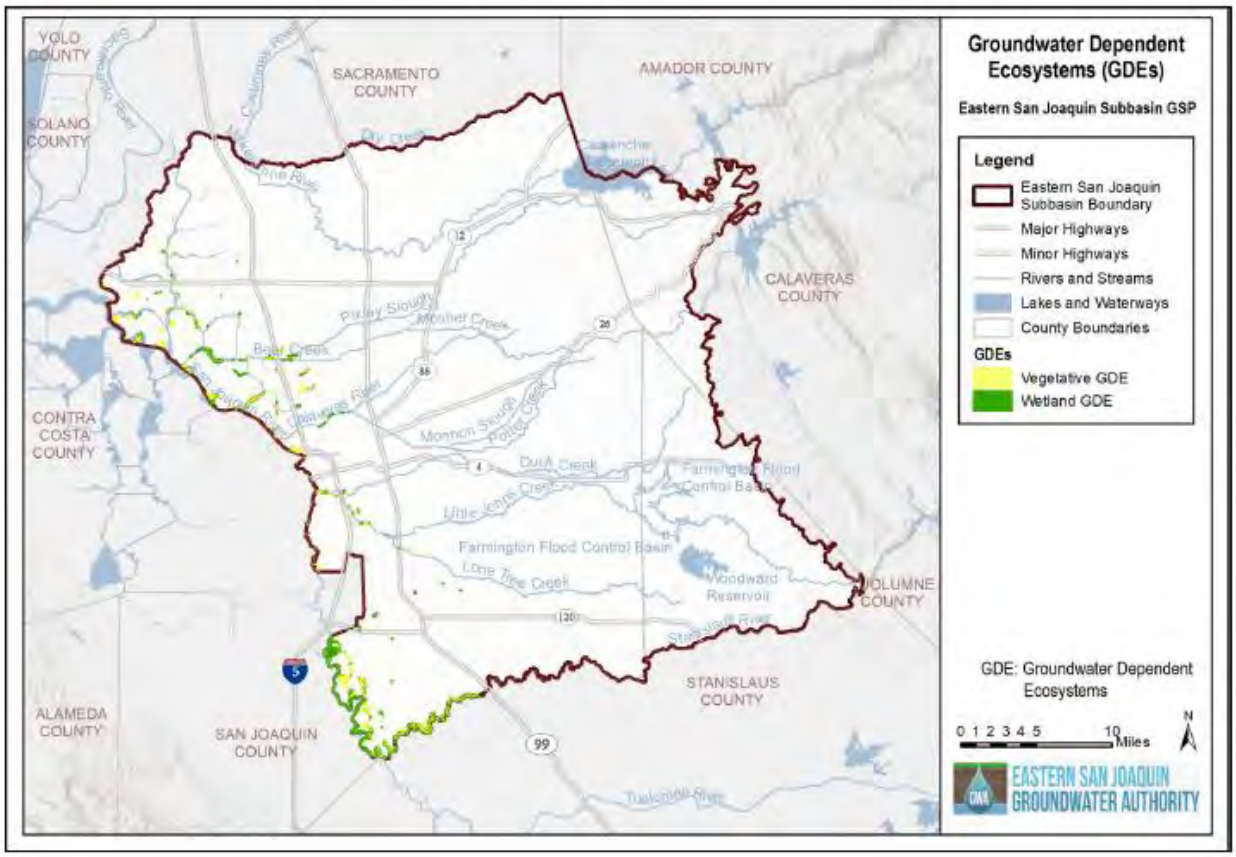


Exhibit E

Figure 2-69: Areas Identified as GDEs



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Kamman Resume

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Greg Kamman, PG, CHG

Principal Hydrologist

EDUCATION	1989	M.S. Geology - Sedimentology and Hydrogeology Miami University, Oxford, OH
	1985	A.B. Geology Miami University, Oxford, OH
REGISTRATION	No. 360 No. 5737	Certified Hydrogeologist (CHG.), CA Professional Geologist (PG), CA
PROFESSIONAL HISTORY	1997 - Present	Principal Hydrologist/Vice President Kamman Hydrology & Engineering, Inc. San Rafael, CA
	1994 - 1997	Senior Hydrologist/Vice President Balance Hydrologics, Inc., Berkeley, CA
	1991 - 1994	Project Geologist/Hydrogeologist Geomatrix Consultants, Inc., San Francisco, CA
	1989 - 1991	Senior Staff Geologist/Hydrogeologist Environ International Corporation, Princeton, NJ
	1986 - 1989	Instructor and Research/Teaching Assistant Miami University, Oxford, OH

SKILLS AND EXPERIENCE

As a Principal Hydrologist with 30 years of technical and consulting experience in the fields of geology, hydrology, and hydrogeology, Mr. Kamman routinely manages projects in the areas of surface- and ground-water hydrology, stream and wetland habitat restoration, water supply, water quality assessments, water resources management, and geomorphology. Areas of expertise include: stream and wetland habitat restoration; characterizing and modeling basin-scale hydrologic and geologic processes; assessing hydraulic and geomorphic responses to land-use changes in watersheds and causes of stream channel instability; evaluating surface- and ground-water resources and their interaction; and designing and implementing field investigations characterizing surface and subsurface conditions; and stream and wetland habitat restoration feasibility assessments and design. In addition, Mr. Kamman commonly works on projects that revolve around sensitive fishery, wetland, wildlife and/or riparian habitat enhancement. Mr. Kamman performs many of these projects in response to local, state (CEQA) and federal statutes (NEPA, ESA), and other regulatory frameworks. Thus, Mr. Kamman is accustomed to working within a multi-disciplined team and maintains close collaborative relationships with biologists, engineers, planners, architects, lawyers, and resource and regulatory agency staff. Mr. Kamman is a prime or contributing author to over 80 technical publications and reports in the discipline of hydrology – the majority pertaining to ecological restoration. Mr. Kamman routinely teaches courses on stream and wetland restoration through U.C. Berkeley Extension and San Francisco State University's Romberg Tiburon Center.

PROFESSIONAL SOCIETIES & AFFILIATIONS	Groundwater Resources Association of California Society for Ecological Restoration International California Native Plant Society

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2018 Report by KHE

Delineating Subterranean Streams and Potential Stream Depletion Areas,

Lower Stanislaus and Tuolumne River Watershed

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DRAFT TECHNICAL MEMORANDUM

Kamman Hydrology & Engineering, Inc.
7 Mt. Lassen Dr., Suite C122, San Rafael, CA 94903
Telephone: (415) 491-9600
Facsimile: (415) 680-1538
E-mail: greg@khe-inc.com

Date: July 23, 2018

To: Tom Lippe, Law Offices of Thomas N. Lippe, APC

From: Greg Kamman

Subject: Delineating Subterranean Streams and Potential Stream Depletion Areas Lower Stanislaus and Tuolumne River Watersheds

This memorandum presents the results of Kamman Hydrology & Engineering, Inc.'s (KHE) study to delineate and map subterranean streams and PSDAs in the Lower Stanislaus and Tuolumne River Watersheds within Stanislaus County. This work was completed pursuant to the approach and methods described in the February and March 2008 Stetson Engineering Inc. reports (Stetson 2008a and 2008b). Copies of these reports are attached. The mapped area includes: a) the mainstem Stanislaus River watershed between Goodwin Dam and confluence with San Joaquin River; and b) the mainstem Tuolumne River watershed between La Grange Dam/Reservoir and the San Joaquin River (hereafter referred to as Study Area). Mapping was completed on USGS 7.5-minute topographic quadrangle sheets (quad sheets) containing the mainstem river channels. Figure 1 depicts the 15 quad sheets that contain the study/mapping area.

BACKGROUND AND OBJECTIVES

Groundwater pumping can deplete stream flows if there is a hydraulic connection between groundwater aquifer and stream bed. Groundwater diversions that reduce stream flows can have a negative effect on anadromous fish habitat. The following excerpt from Stetson 2008a (pages 1-3) summarizes groundwater extraction that is subject to California laws governing surface water rights.

> *Pursuant to Water Code 1200, the State Water Board has permitting authority over subterranean streams flowing in known and definite channels. Groundwater classified as percolating groundwater is not subject to the State Water Board's permitting authority. Thus, when considering an appropriation of groundwater, the State Water Board may have to evaluate the legal classification of the groundwater and determine whether it is a subterranean stream subject to the State Water Board's permitting authority. In doing so, the State Water Board applies a four-part test, which was uphold by the appellate court in North*

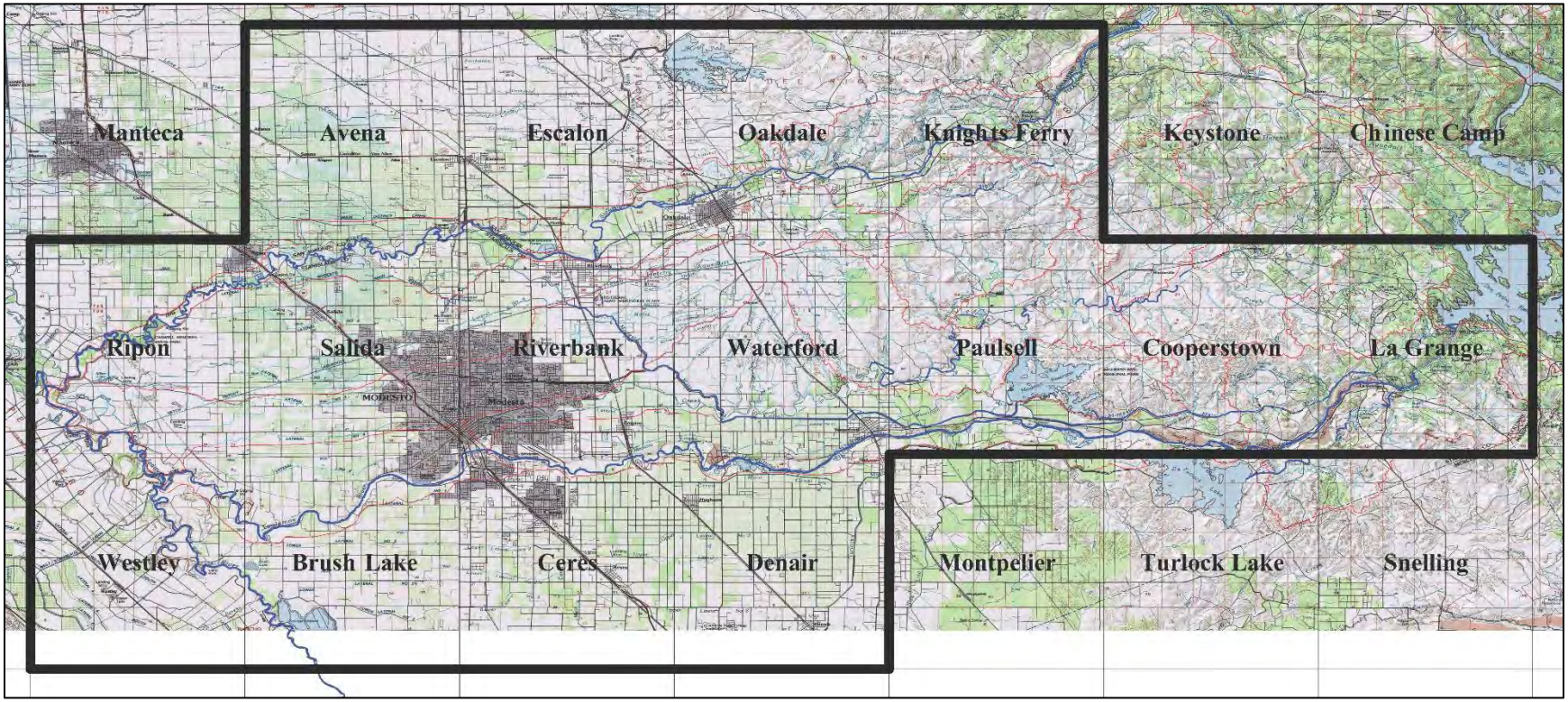

FIGURE 1: Study and mapping area (outlined in black), including: river alignments and USGS 7.5-minute quadrangle sheet boundaries.

Gualala Water Co. v. State Water Resources Control Bd. (North Gualala) (2006) 139 Cal.App.4th 1577 [43 Cal.Rptr.3d 821]. The State Water Board also has continuing authority to protect public trust uses and to prevent the waste, unreasonable use, unreasonable method of use, or unreasonable method of diversion of water, regardless of basis of right.

In determining the legal classification of groundwater, the following physical conditions must exist for the State Water Board to classify groundwater as a subterranean stream flowing through a known and definite channel:

(1) A subsurface channel must be present;

(2) The channel must have a relatively impermeable bed and banks;

(3) The course of the channel must be known or capable of being determined by reasonable inference; and

(4) Groundwater must be flowing in the channel.

Following the methods and guidelines provided by Stetson (2008a and 2008b), the objectives of this study are to: a) delineates subterranean streams within the Study Area in accordance with the State Water Board's four-part test; and b) delineates Potential Stream Depletion Areas (PSDA) where groundwater pumping could potentially cause stream depletion.

METHODOLOGY

To complete this mapping study, KHE obtained and reviewed numerous sources of information including: available topographic maps; geology reports and maps; soil survey maps and reports; and aerial imagery. All information was integrated into GIS work platform for synthesis and review. In many instances, older geologic maps were manually georeferenced[1] in order to import and overlay with other maps in GIS. Based on synthesis and review of this information, estimates of subterranean stream and PSDA boundaries were mapped on the most recent USGS 7.5-minute quadrangle maps identified in Figure 1.

Subterranean stream, channel alluvium and PSDA boundaries were mapped based on geology and soil map data. Sources of geology and soil information reviewed are presented in Tables 1 and 2. Considerable detailed mapping of alluvial deposits within the Study Area has been

[1] Georeferencing means to associate something with locations in physical space. The term is used in the geographic information systems (GIS) field to describe the process of associating a physical map or raster image of a map with spatial locations.

completed within the Study Area. In addition to the sources listed in Tables 1 and 2, studies by Marchand (1976), Marchand and Allwardt (1981), Page and Balding (1973) and Page (1986) were helpful in describing and distinguishing the relative age/position of geologic units as they relate to surface water interaction. Mapped units were identified and defined as follows.

- Subterranean Stream: geologic contract between relatively impermeable bedrock and recent Holocene alluvium (or equivalent deposits) clearly associated with and in reasonable proximity of a stream. Subterranean streams represent areas where groundwater flow is through a known and definite channel and subject to State Water Board permitting authority.

- Potential Stream Depletion Area (PSDA): Alluvial deposits that serve as aquifers that can be hydraulically connected to adjacent stream and where groundwater pumping can deplete stream flow or reduce groundwater flow to the stream[2]. However, PSDAs lack a clear delineation of "bed and banks" (i.e., lack of impermeable deposits hosting stream) and therefore are not subject to State Water Board permitting authority. PSDAs may include one or more of the geologic units identified in Table 3.

- Mapped Channel Alluvium: recently deposited (young) alluvial channel deposits located within the PSDA, including the geologic and soil units identified in Table 3. This unit is associated with alluvial deposits that will display greater or more immediate stream depletion by a pumping well screened within the unit.

Subterranean stream and PSDA boundaries based on mapped geology and soil units were further adjusted based upon topographic expression and aerial imagery (NAIP, 2014). For quadrangles where only soil and regional geologic maps were available (Oakdale, Escalon, Paulsell, Waterford and Riverbank), map unit boundaries relied more on topographic expression. No field inspection of mapped unit boundaries was conducted.

[2] For the stream to be influenced by a pumping well, the well is typically screened within a zone of material that is hydraulically connected to the stream. A well does not have the potential to deplete a stream if the well is sealed throughout the alluvial deposits that are in hydraulic connection with the stream and if the well is pumping water from an aquifer that is hydraulically disconnected from the natural channel or subterranean stream.

TABLE 1: Sources of Geology and Soil Information: Lower Stanislaus River

USGS Quadrangle	Source of Information
Knights Valley	• Preliminary Geologic Map of Copperopolis Quadrangle (Bartow et al., 1981) • Geologic map of the San Francisco-San Jose quadrangle (Wagner et al., 1991) • Soil Survey of Stanislaus County, California, Northern part (USDA NRCS, 2007) • Soil Survey, Eastern Stanislaus Area, California (Arkley, 1964)
Oakdale	• Geologic map of the San Francisco-San Jose quadrangle (Wagner et al., 1991) • Soil Survey of Stanislaus County, California, Northern part (USDA NRCS, 2007) • Soil Survey, Eastern Stanislaus Area, California (Arkley, 1964)
Escalon	• Geologic map of the San Francisco-San Jose quadrangle (Wagner et al., 1991) • Soil Survey of Stanislaus County, California, Northern part (USDA NRCS, 2007) • Soil Survey, Eastern Stanislaus Area, California (Arkley, 1964)
Avena	• Geologic map of the San Francisco-San Jose quadrangle (Wagner et al., 1991) • Soil Survey, Eastern Stanislaus Area, California (Arkley, 1964)
Salida	• Preliminary geologic map showing Quaternary deposits of the lower Tuolumne and Stanislaus alluvial fans and along the lower San Joaquin River (Marchand and Harden, 1978) • Geologic map of the San Francisco-San Jose quadrangle (Wagner et al., 1991) • Soil Survey, Eastern Stanislaus Area, California (Arkley, 1964)
Ripon	• Preliminary geologic map showing Quaternary deposits of the lower Tuolumne and Stanislaus alluvial fans and along the lower San Joaquin River (Marchand and Harden, 1978) • Geologic map of the San Francisco-San Jose quadrangle (Wagner et al., 1991) • Soil Survey, Eastern Stanislaus Area, California (Arkley, 1964)

TABLE 2: Sources of Geology and Soil Information: Lower Tuolumne River

USGS Quadrangle	Source of Information
La Grange	• Preliminary geologic maps showing Cenozoic deposits of the Cooperstown and La Grange quadrangles (Marchand et al., 1981) • Geologic map of the San Francisco-San Jose quadrangle (Wagner et al., 1991) • Soil Survey, Eastern Stanislaus Area, California (Arkley, 1964)
Cooperstown	• Preliminary geologic maps showing Cenozoic deposits of the Cooperstown and La Grange quadrangles (Marchand et al., 1981) • Geologic map of the San Francisco-San Jose quadrangle (Wagner et al., 1991) • Soil Survey, Eastern Stanislaus Area, California (Arkley, 1964)
Paulsell	• Geologic map of the San Francisco-San Jose quadrangle (Wagner et al., 1991) • Soil Survey, Eastern Stanislaus Area, California (Arkley, 1964)
Waterford	• Geologic map of the San Francisco-San Jose quadrangle (Wagner et al., 1991) • Soil Survey, Eastern Stanislaus Area, California (Arkley, 1964)
Riverbank	• Geologic map of the San Francisco-San Jose quadrangle (Wagner et al., 1991) • Soil Survey, Eastern Stanislaus Area, California (Arkley, 1964)
Denair	• Preliminary geologic maps showing Quaternary deposits of the Ceres, Denair and Montpellier 7 ½ quadrangles (Marchand, 1980) • Geologic map of the San Francisco-San Jose quadrangle (Wagner et al., 1991) • Soil Survey, Eastern Stanislaus Area, California (Arkley, 1964)
Ceres	• Preliminary geologic maps showing Quaternary deposits of the Ceres, Denair and Montpellier 7 ½ quadrangles (Marchand, 1980) • Geologic map of the San Francisco-San Jose quadrangle (Wagner et al., 1991) • Soil Survey, Eastern Stanislaus Area, California (Arkley, 1964)
Brush Lake	• Preliminary geologic map showing Quaternary deposits of the lower Tuolumne and Stanislaus alluvial fans and along the lower San Joaquin River (Marchand and Harden, 1978) • Geologic map of the San Francisco-San Jose quadrangle (Wagner et al., 1991) • Soil Survey, Eastern Stanislaus Area, California (Arkley, 1964)

TABLE 2: Sources of Geology and Soil Information: Lower Tuolumne River (continued)

USGS Quadrangle	Source of Information
Westley	• Preliminary geologic map showing Quaternary deposits of the lower Tuolumne and Stanislaus alluvial fans and along the lower San Joaquin River (Marchand and Harden, 1978) • Geologic map of the San Francisco-San Jose quadrangle (Wagner et al., 1991) • Soil Survey, Eastern Stanislaus Area, California (Arkley, 1964)

TABLE 3: Geologic units associated with Potential Stream Depletion Areas (PSDA)

Age		Geologic Map Units				PSDA Map Unit
Holocene	Modern	Post Modesto Formation	pmf	hal – undifferentiated alluvium; af- artificial fill; t – dredge tailings; pm4		Mapped Channel Alluvium
	Historic			pm3		Potential Stream Depletion Area (PSDA)
	Prehistoric			pm2		
	Early Holocene			pm1		
Pleistocene		Modesto Formation	m2 /m2f (upper unit)	m2-4		
				m2-3		
				m2-2		
				m2-1		
			m1 /m1f (lower unit)			
		Riverbank Formation	r3 / r3f (upper unit)			
			r2 /r2f (middle unit)			Not Within PSDA
			r1 /r1f (lower unit)			
		Turlock Lake Formation	t2 (upper unit)		t2u	
					t2l	
			t1 (lower unit)			

RESULTS AND DISCUSSION

The quadrangles with mapped subterranean streams and PSDAs are included at the end of this memorandum. It is important to note that the vast majority of PSDAs are bounded by older alluvial and floodplain deposits which could potentially be in hydraulic connection with adjacent PSDAs. Thus, further analysis of potential streamflow depletion is necessary for wells completed in Holocene or Pleistocene aged material outside of a mapped PSDA and lying within ½-mile of the mainstem Stanislaus and Tuolumne Rivers.

Because the delineation of areas on the accompanying maps were, a) based on information readily available at the time they were developed, and b) only assess potential stream flow depletion from the mainstem Stanislaus and Tuolumne Rivers (i.e., not their tributaries), the maps do not represent all of the subterranean streams or PSDAs that exist in the area. Site specific investigations will be needed to verify the existence (or absence) of subterranean streams and PSDAs.

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AVENA QUADRANGLE
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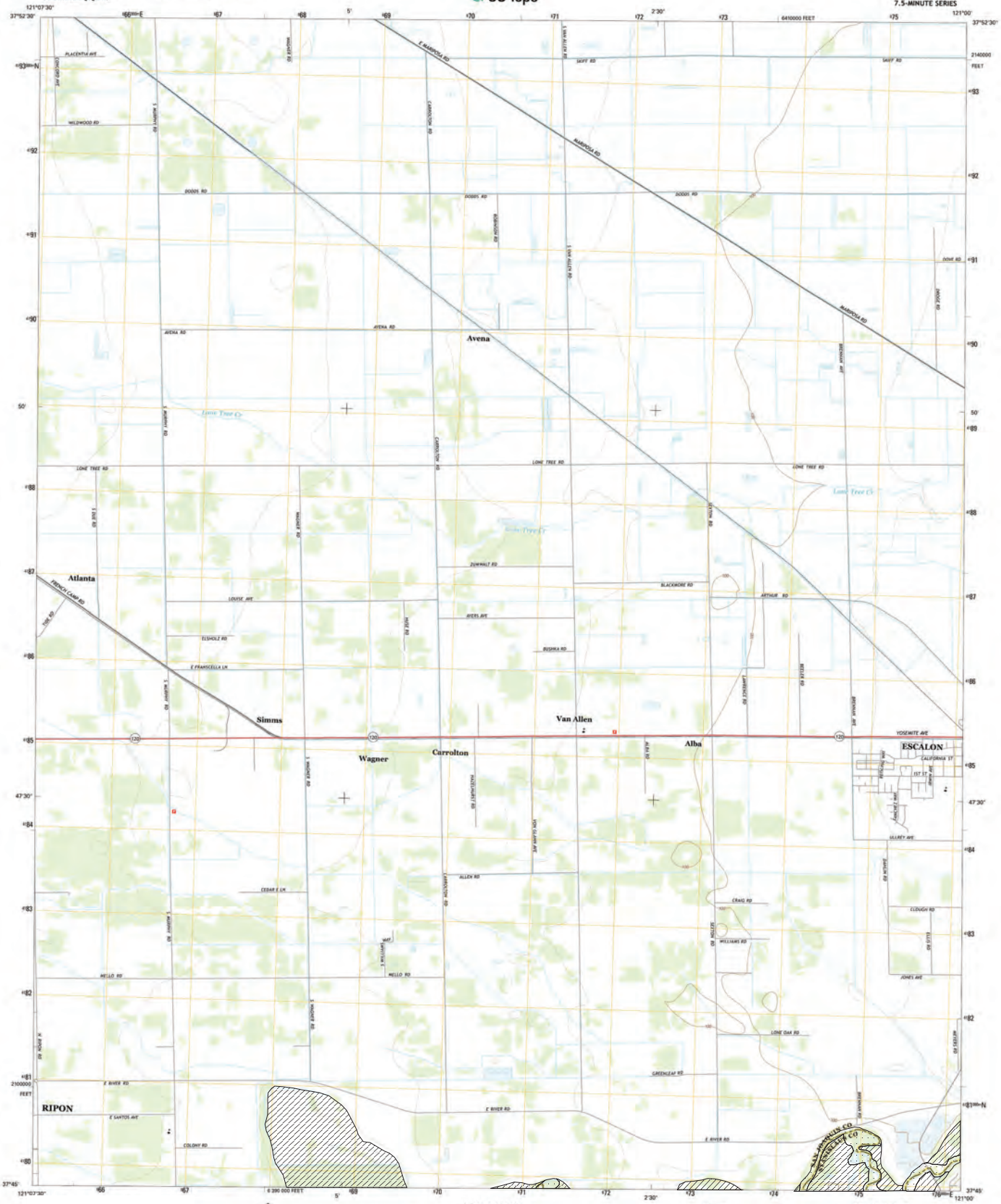

DELINEATION OF SUBTERRANEAN STREAMS AND POTENTIAL STREAM DEPLETION AREAS WITHIN AND ADJACENT TO THE STANISLAUS AND TUOLUMNE RIVERS

Avena Quadrangle Legend
- Mapped Channel Alluvium
- Potential Stream Depletion Area

UTM GRID AND 2015 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24 000

KILOMETERS 0 0.5 1 2
METERS 1000 0 1000 2000
MILES 0 0.5 1
FEET 1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000

CONTOUR INTERVAL 10 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the National Geospatial Program US Topo Product Standard, 2011. A metadata file associated with this product is draft version 0.6.18

ROAD CLASSIFICATION
Expressway — Local Connector
Secondary Hwy — Local Road
Ramp — 4WD
Interstate Route — US Route — State Route

1 Stockton East
2 Peters
3 Farmington
4 Manteca
5 Escalon
6 Ripon
7 Salida
8 Riverbank

AVENA, CA
2015

MSN
NGA REF NO. USGS X24K1940

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ESCALON QUADRANGLE
CALIFORNIA
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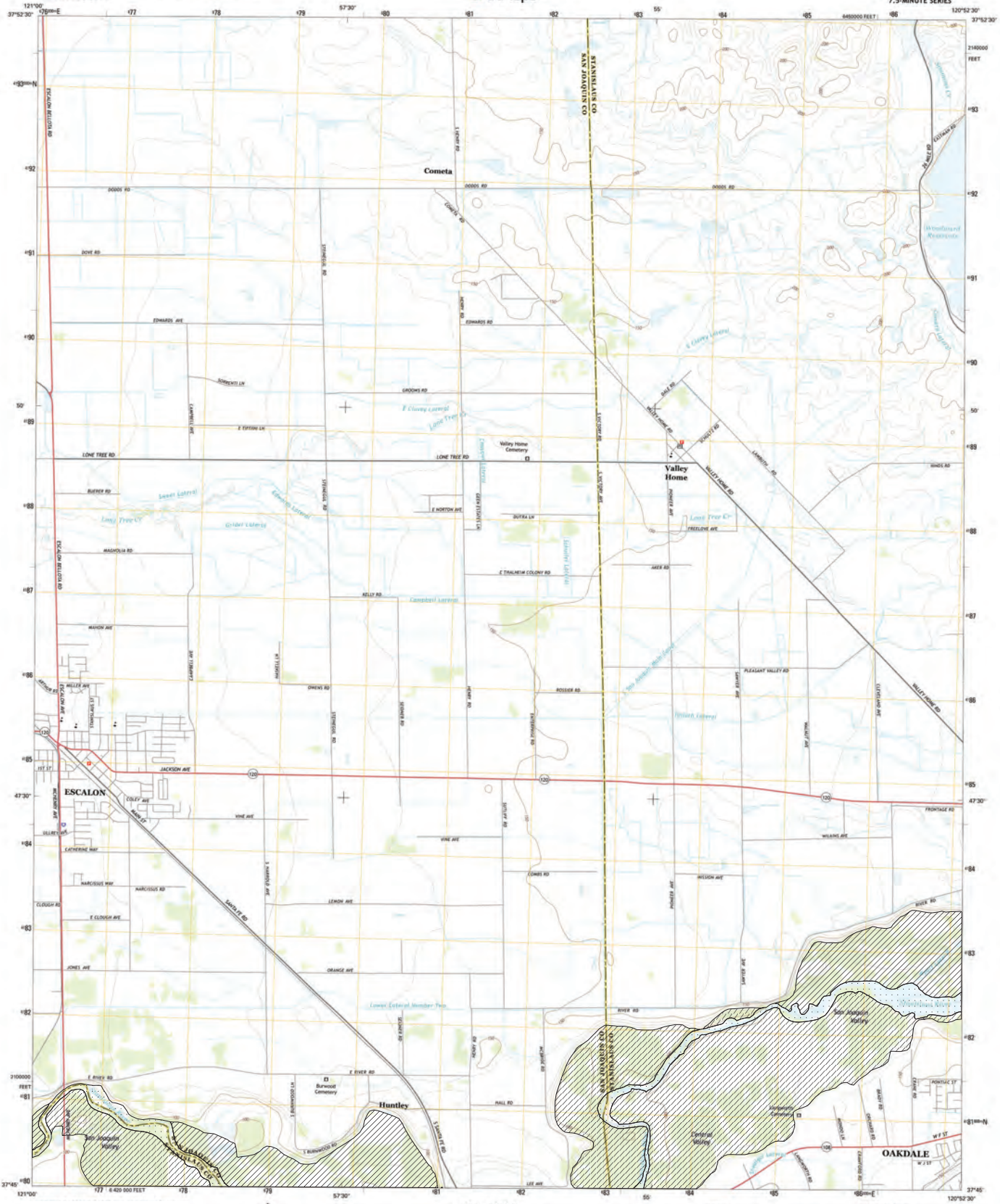

DELINEATION OF SUBTERRANEAN STREAMS AND POTENTIAL STREAM DEPLETION AREAS WITHIN AND ADJACENT TO THE STANISLAUS AND TUOLUMNE RIVERS

Escalon Quadrangle Legend
- Mapped Channel Alluvium
- Potential Stream Depletion Area

SCALE 1:24 000

KILOMETERS 1 0.5 0 1 2
METERS 1000 500 0 1000 2000
MILES 1 0.5 0 1
FEET 1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000

UTM GRID AND 2015 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

CONTOUR INTERVAL 10 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the National Geospatial Program US Topo Product Standard, 2011. A metadata file associated with this product is draft version 0.6.18

ROAD CLASSIFICATION
Expressway — Local Connector
Secondary Hwy — Local Road
Ramp — 4WD
Interstate Route — US Route — State Route

ADJOINING QUADRANGLES
1 Pelsers
2 Farmington
3 Bachelor Valley
4 Avena
5 Oakdale
6 Salida
7 Riverbank
8 Waterford

ESCALON, CA
2015

NGA REF NO. USGSX4414527

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OAKDALE QUADRANGLE
CALIFORNIA-STANISLAUS CO.
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DELINEATION OF SUBTERRANEAN STREAMS AND POTENTIAL STREAM DEPLETION AREAS WITHIN AND ADJACENT TO THE STANISLAUS AND TUOLUMNE RIVERS

Oakdale Quadrangle Legend
- Mapped Channel Alluvium
- Potential Stream Depletion Area

Mn
GN
13° 32'
241 MILS
1° 20'
24 MILS

UTM GRID AND 2015 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

U.S. National Grid
100,000-m Square ID
PG
Grid Zone Designation
10S

SCALE 1:24 000

KILOMETERS 1 0.5 0 1 2
METERS 1000 500 0 1000 2000
MILES 1 0.5 0 1
FEET 1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000

CONTOUR INTERVAL 10 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the National Geospatial Program US Topo Product Standard, 2011. A metadata file associated with this product is draft version 0.6.18

CALIFORNIA
QUADRANGLE LOCATION

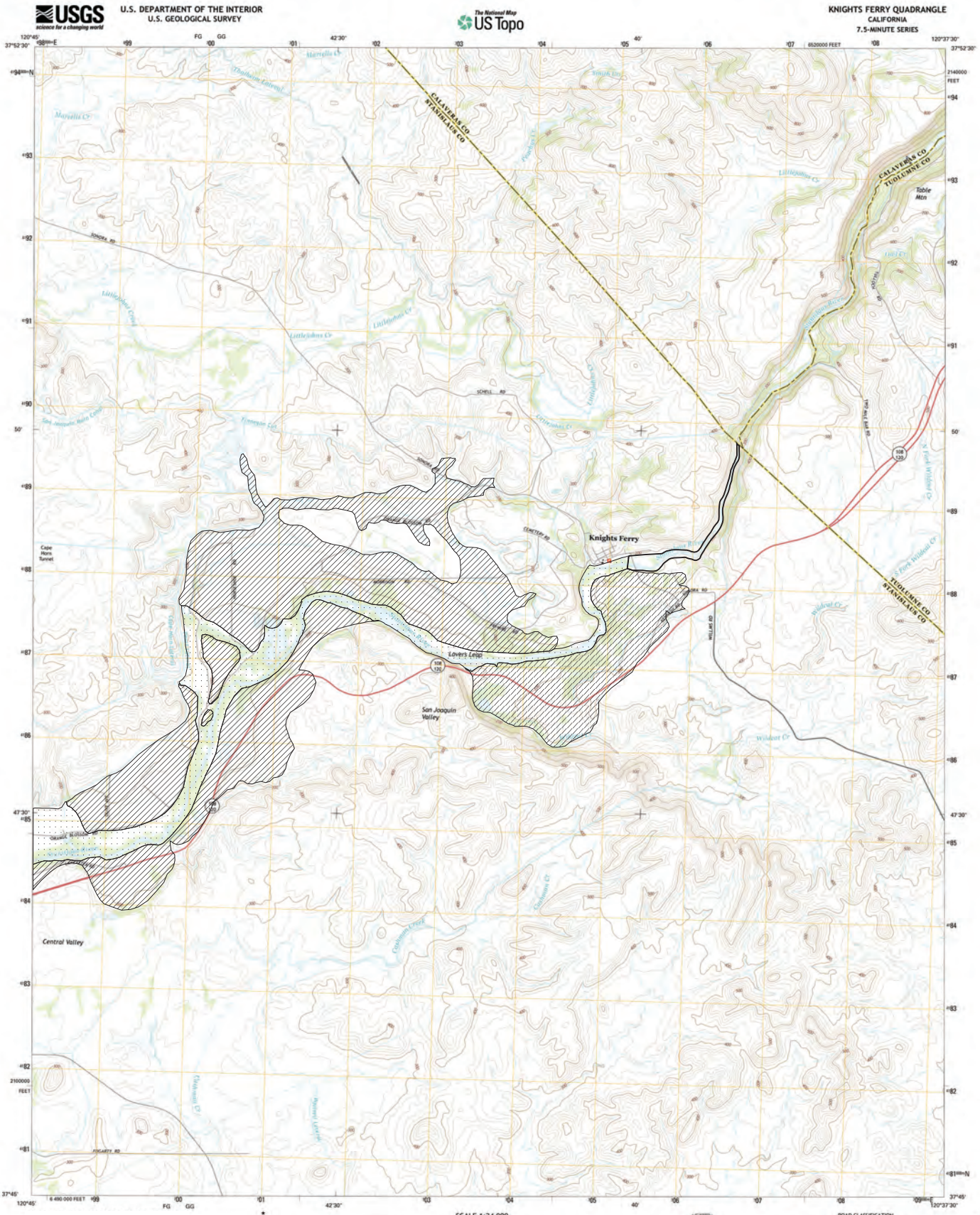
1	2	3
4		5
6	7	8

SURROUNDING QUADRANGLES
1 Farmington
2 Bachelor Valley
3 Copperopolis
4 Escalon
5 Knights Ferry
6 Riverbank
7 Waterford
8 Paulsell

ROAD CLASSIFICATION
Expressway
Secondary Hwy
Ramp
Local Connector
Local Road
4WD
Interstate Route
US Route
State Route

OAKDALE, CA
2015

HCA REF NO. US05XAS327FT



DELINEATION OF SUBTERRANEAN STREAMS AND POTENTIAL STREAM DEPLETION AREAS WITHIN AND ADJACENT TO THE STANISLAUS AND TUOLUMNE RIVERS

Knights Ferry Quadrangle Legend

- Subterranean Flow
- Mapped Channel Alluvium
- Potential Stream Depletion Area

SCALE 1:24 000

KILOMETERS 0.5 0 1 2

METERS 1000 500 0 1000 2000

MILES 1 0.5 0 1

FEET 1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000

UTM GRID AND 2015 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

CONTOUR INTERVAL 20 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the National Geospatial Program US Topo Product Standard, 2011. A metadata file associated with this product is draft version 0.6.18

ROAD CLASSIFICATION

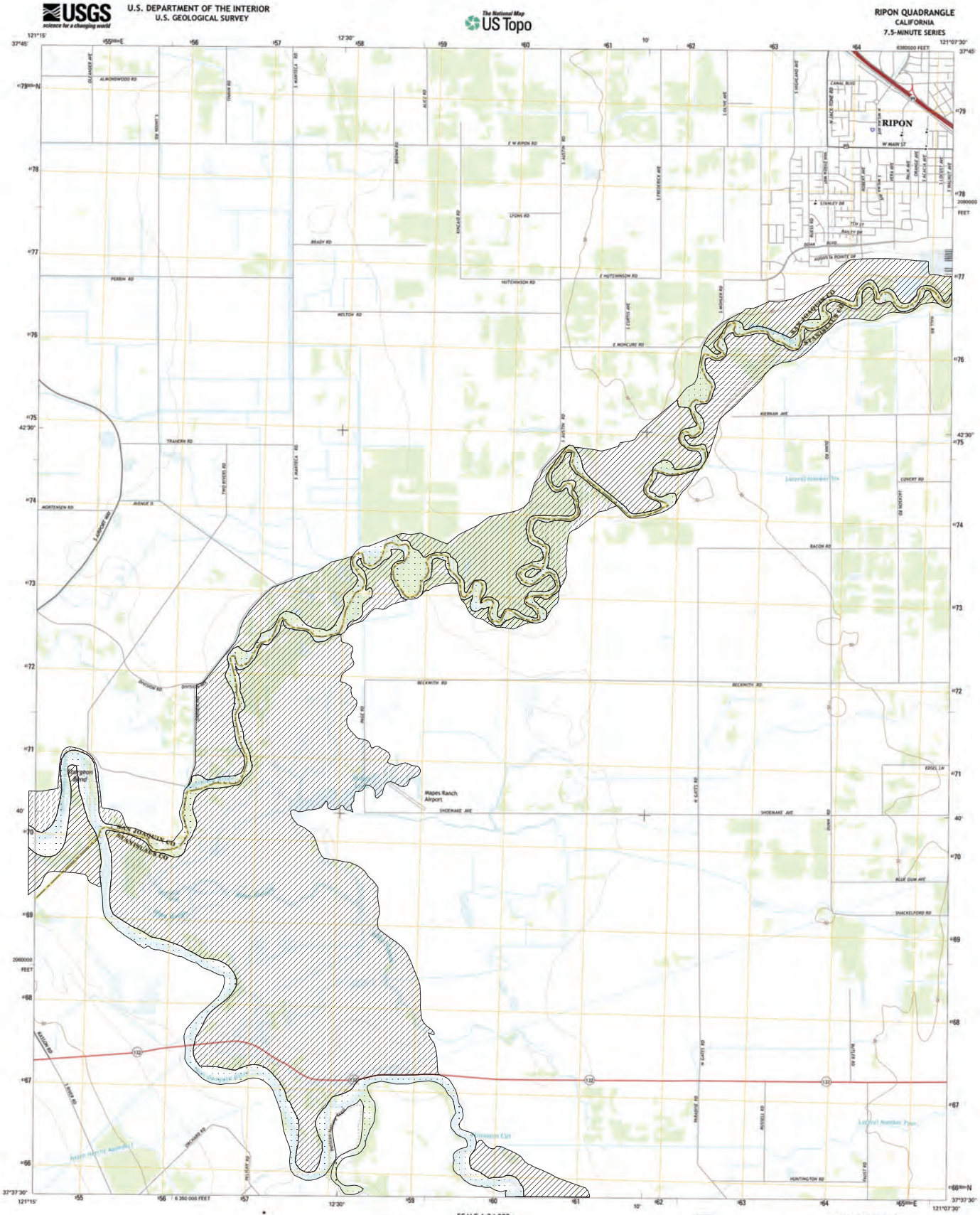
Expressway — Local Connector
Secondary Hwy — Local Road
Ramp — 4WD
Interstate Route — US Route — State Route

ADJOINING QUADRANGLES

1 Bachelor Valley
2 Coppenapolis
3 New Melones Dam
4 Oakdale
5 Keystone
6 Waterford
7 Paulsell
8 Cooperstown

KNIGHTS FERRY, CA
2015

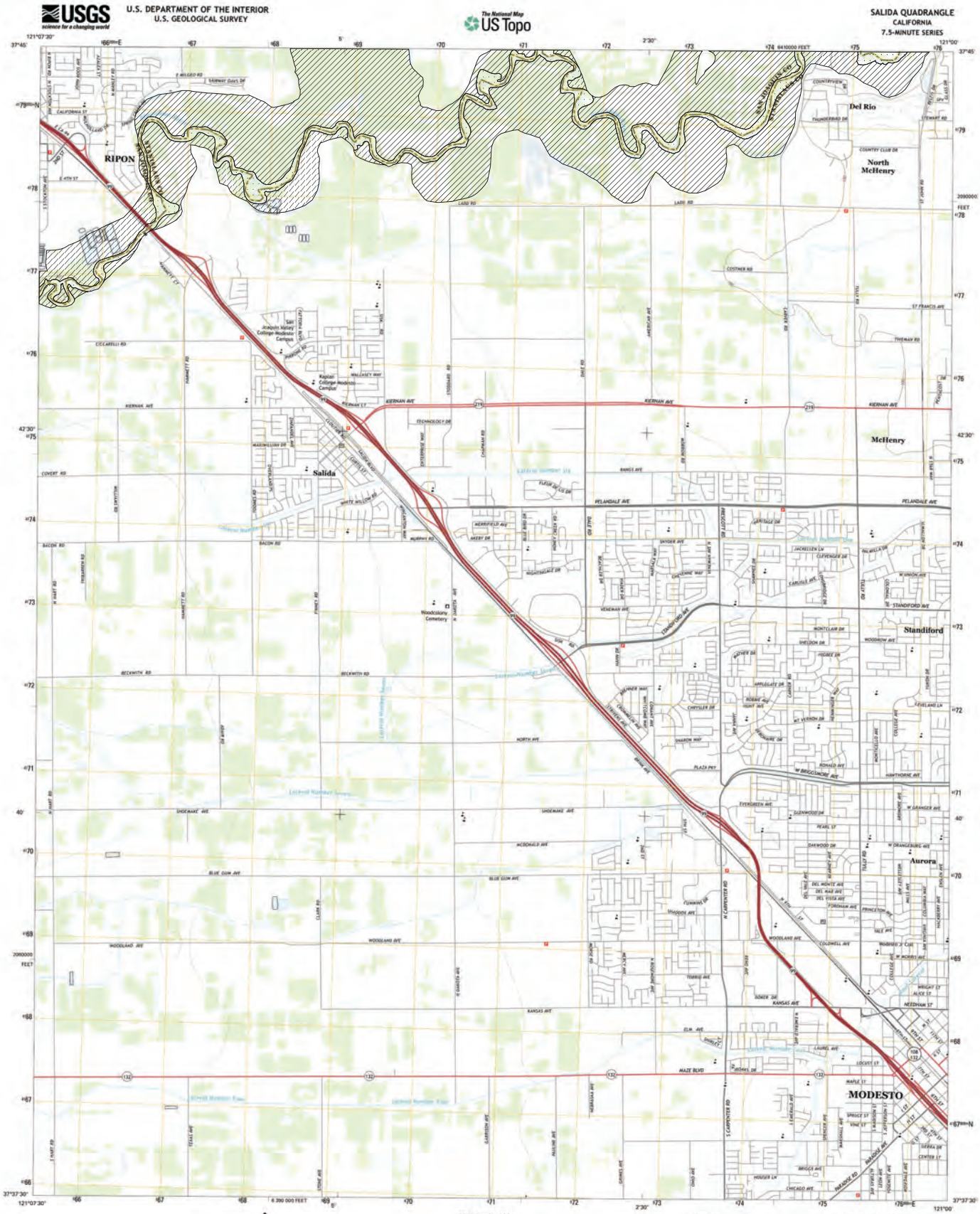
NGA REF NO. USGX24K23853



DELINEATION OF SUBTERRANEAN STREAMS AND POTENTIAL STREAM DEPLETION AREAS WITHIN AND ADJACENT TO THE STANISLAUS AND TUOLUMNE RIVERS

Ripon Quadrangle Legend

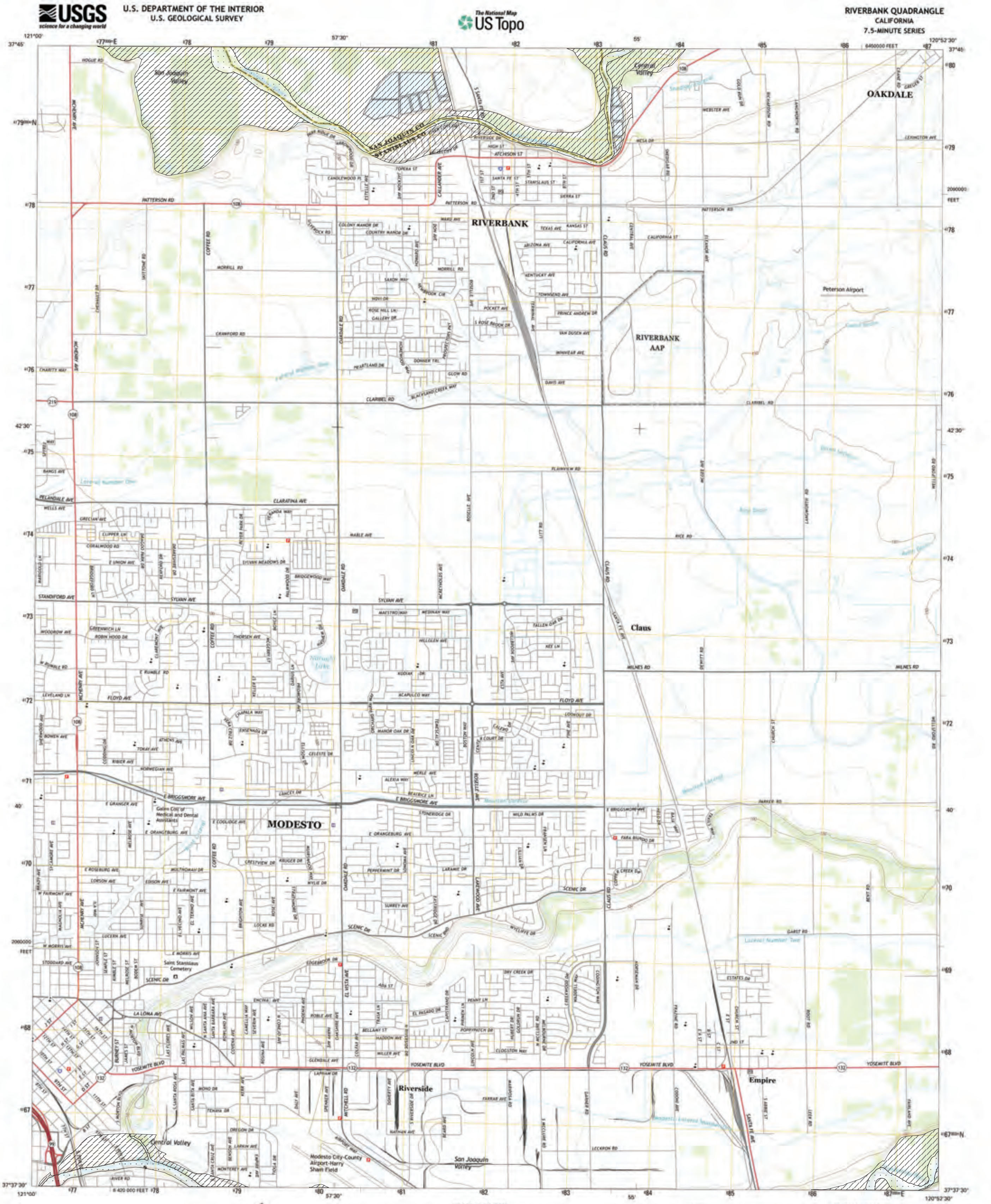
- Mapped Channel Alluvium
- Potential Stream Depletion Area



DELINEATION OF SUBTERRANEAN STREAMS AND POTENTIAL STREAM DEPLETION AREAS WITHIN AND ADJACENT TO THE STANISLAUS AND TUOLUMNE RIVERS

Salida Quadrangle Legend

- Mapped Channel Alluvium
- Potential Stream Depletion Area



SCALE 1:24 000

CONTOUR INTERVAL 10 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

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UTM GRID AND 2015 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

ROAD CLASSIFICATION

Expressway — Local Connector
Secondary Hwy — Local Road
Ramp — 4WD
Interstate Route — US Route — State Route

1 Avena
2 Escalon
3 Oakdale
4 Salida
5 Waterford
6 Brush Lake
7 Ceres
8 Denair

ADJOINING QUADRANGLES

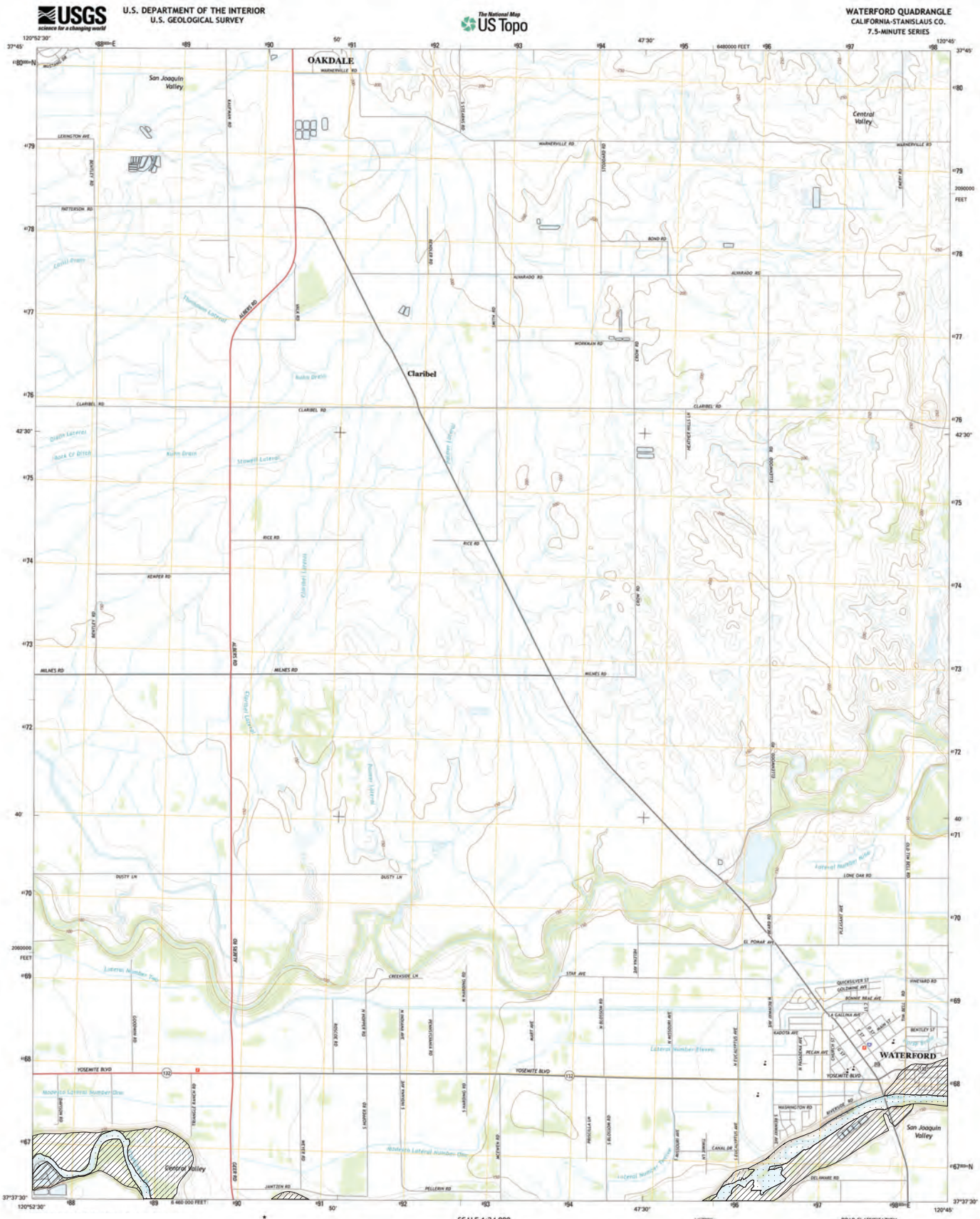
RIVERBANK, CA
2015

NSN. 7643016357537
NGA REF NO. USGSX24K38033

DELINEATION OF SUBTERRANEAN STREAMS AND POTENTIAL STREAM DEPLETION AREAS WITHIN AND ADJACENT TO THE STANISLAUS AND TUOLUMNE RIVERS

Riverbank Quadrangle Legend

- Mapped Channel Alluvium
- Potential Stream Depletion Area



DELINEATION OF SUBTERRANEAN STREAMS AND POTENTIAL STREAM DEPLETION AREAS WITHIN AND ADJACENT TO THE STANISLAUS AND TUOLUMNE RIVERS

Waterford Quadrangle Legend

- Mapped Channel Alluvium
- Potential Stream Depletion Area

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DELINEATION OF SUBTERRANEAN STREAMS AND POTENTIAL STREAM DEPLETION AREAS WITHIN AND ADJACENT TO THE STANISLAUS AND TUOLUMNE RIVERS

Paulsell Quadrangle Legend
- Mapped Channel Alluvium
- Potential Stream Depletion Area

Pm 13° 29'
GN 240 MILS
1° 25'
25 MILS

UTM GRID AND 2015 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

U.S. National Grid
100,000-m Square ID
Up
FG GG
Grid Zone Designation
10S

SCALE 1:24 000

KILOMETERS 1 0.5 0 1 2
METERS 1000 500 0 1000 2000
MILES 1 0.5 0 1
FEET 1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000

CONTOUR INTERVAL 10 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the National Geospatial Program US Topo Product Standard, 2011. A metadata file associated with this product is draft version 0.6.18

CALIFORNIA
QUADRANGLE LOCATION

1	2	3
4		5
6	7	8

ADJOINING QUADRANGLES
1 Oakdale
2 Knights Ferry
3 Keystone
4 Waterford
5 Cooperstown
6 Denair
7 Montpelier
8 Turlock Lake

ROAD CLASSIFICATION
Expressway
Secondary Hwy
Ramp
Local Connector
Local Road
4WD
Interstate Route
US Route
State Route

PAULSELL, CA
2015

NSA REF NO. USGX25234445

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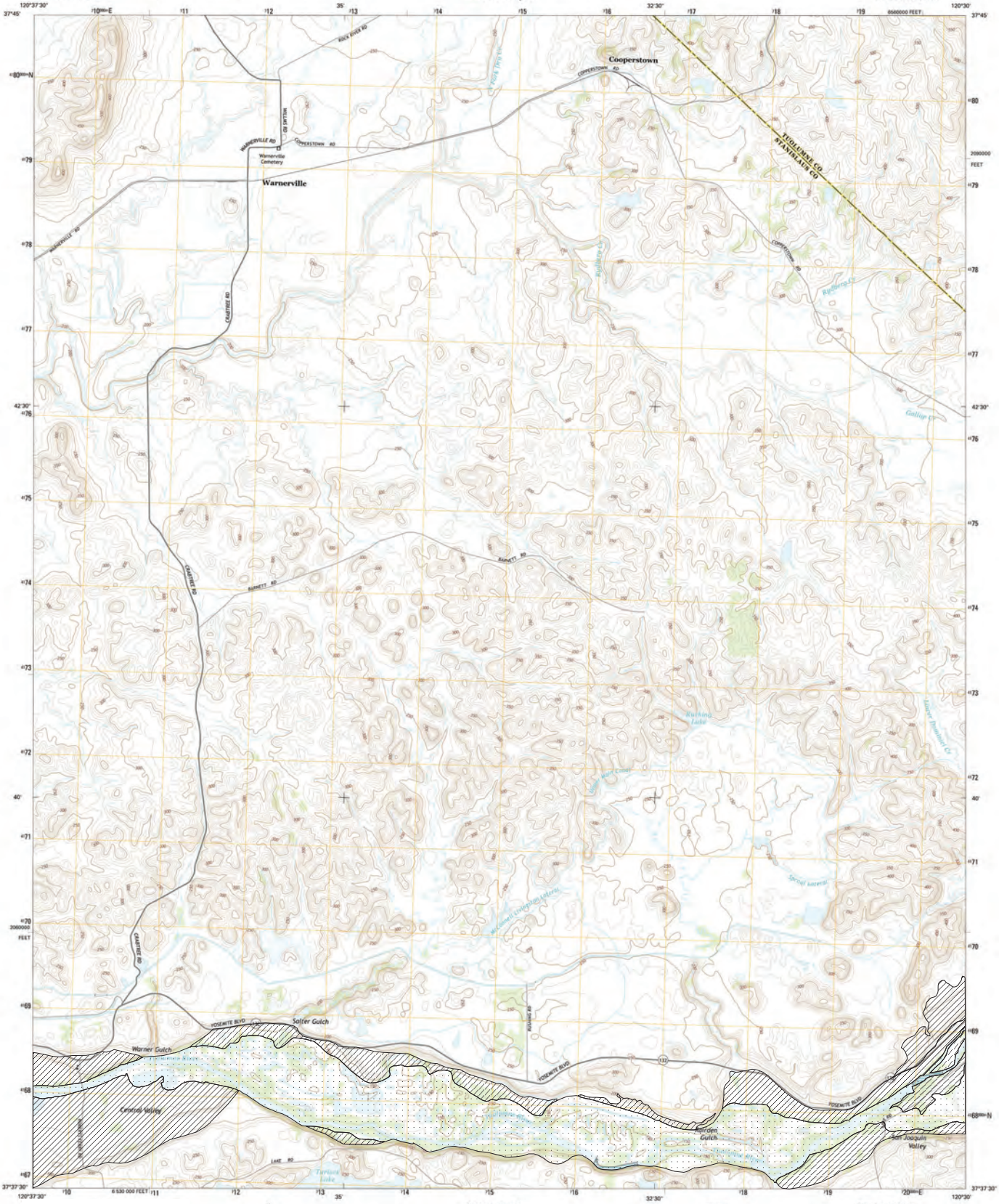
COOPERSTOWN QUADRANGLE
CALIFORNIA
7.5-MINUTE SERIES



DELINEATION OF SUBTERRANEAN STREAMS AND POTENTIAL STREAM DEPLETION AREAS WITHIN AND ADJACENT TO THE STANISLAUS AND TUOLUMNE RIVERS

Cooperstown Quadrangle Legend
- Mapped Channel Alluvium
- Potential Stream Depletion Area

Map
N 13° 28'
GN 239 MILS
1° 24'
26 MILS

UTM GRID AND 2015 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

U.S. National Grid
100,000-m Square ID
GG
Grid Zone Designation
10S

SCALE 1:24 000

KILOMETERS 1 0.5 0 1 2
METERS 1000 500 0 1000 2000
MILES 1 0.5 0 1
FEET 1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000

CONTOUR INTERVAL 10 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

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CALIFORNIA
QUADRANGLE LOCATION

1	2	3
4		5
6	7	8

ADJOINING QUADRANGLES
1 Knights Ferry
2 Keystone
3 Chinese Camp
4 Paulsell
5 La Grange
6 Montpelier
7 Turlock Lake
8 Snelling

ROAD CLASSIFICATION

Expressway	Local Connector
Secondary Hwy	Local Road
Ramp	4WD

Interstate Route — US Route — State Route

COOPERSTOWN, CA
2015

NGA PRINTED IN U.S.A.
NGA MAP NO. 1 USGS 2 X 1 0 1 0

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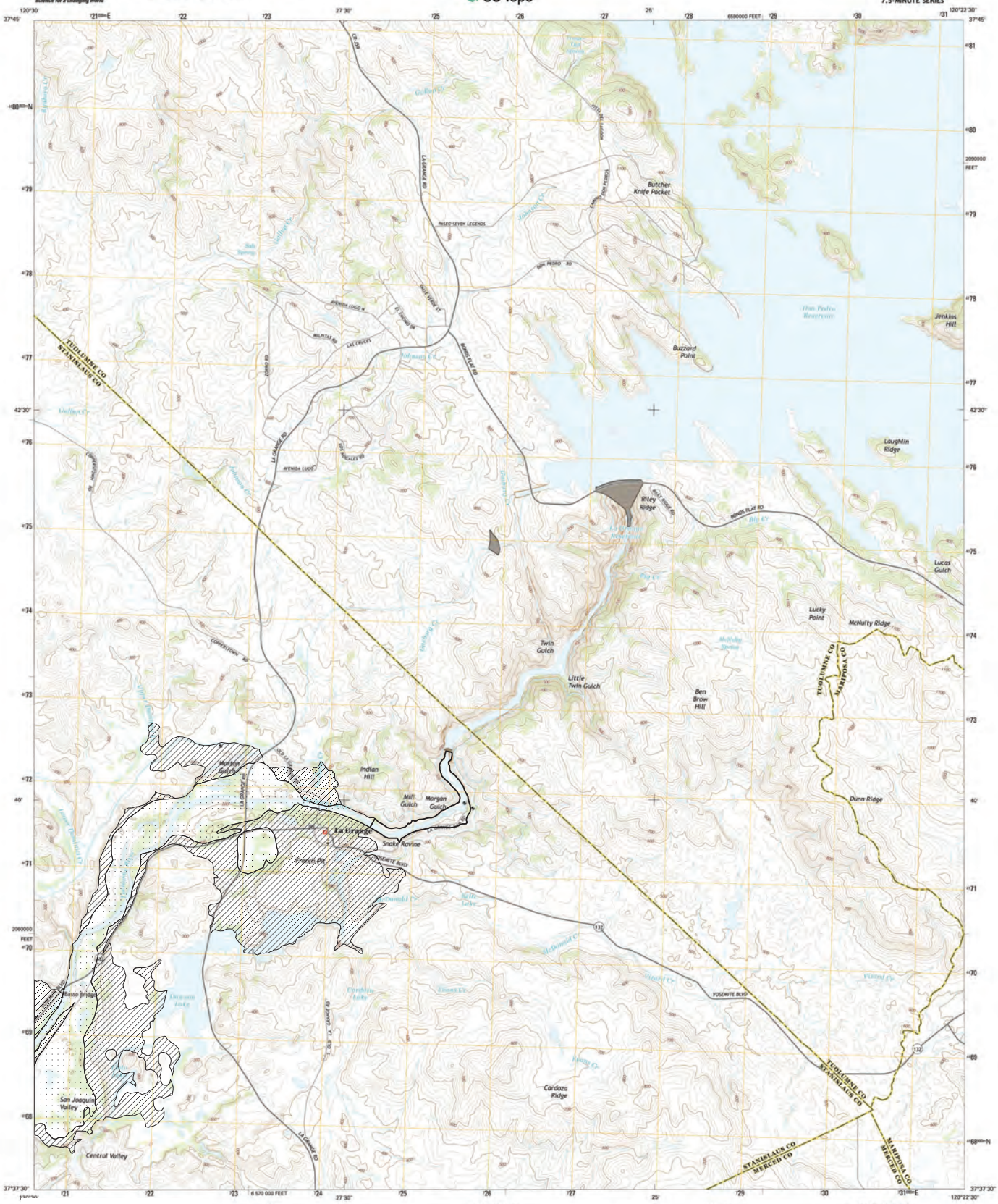
LA GRANGE QUADRANGLE
CALIFORNIA
7.5-MINUTE SERIES



DELINEATION OF SUBTERRANEAN STREAMS AND POTENTIAL STREAM DEPLETION AREAS WITHIN AND ADJACENT TO THE STANISLAUS AND TUOLUMNE RIVERS

La Grange Quadrangle Legend
- Subterranean Flow
- Mapped Channel Alluvium
- Potential Stream Depletion Area

UTM GRID AND 2015 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24 000

CONTOUR INTERVAL 20 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

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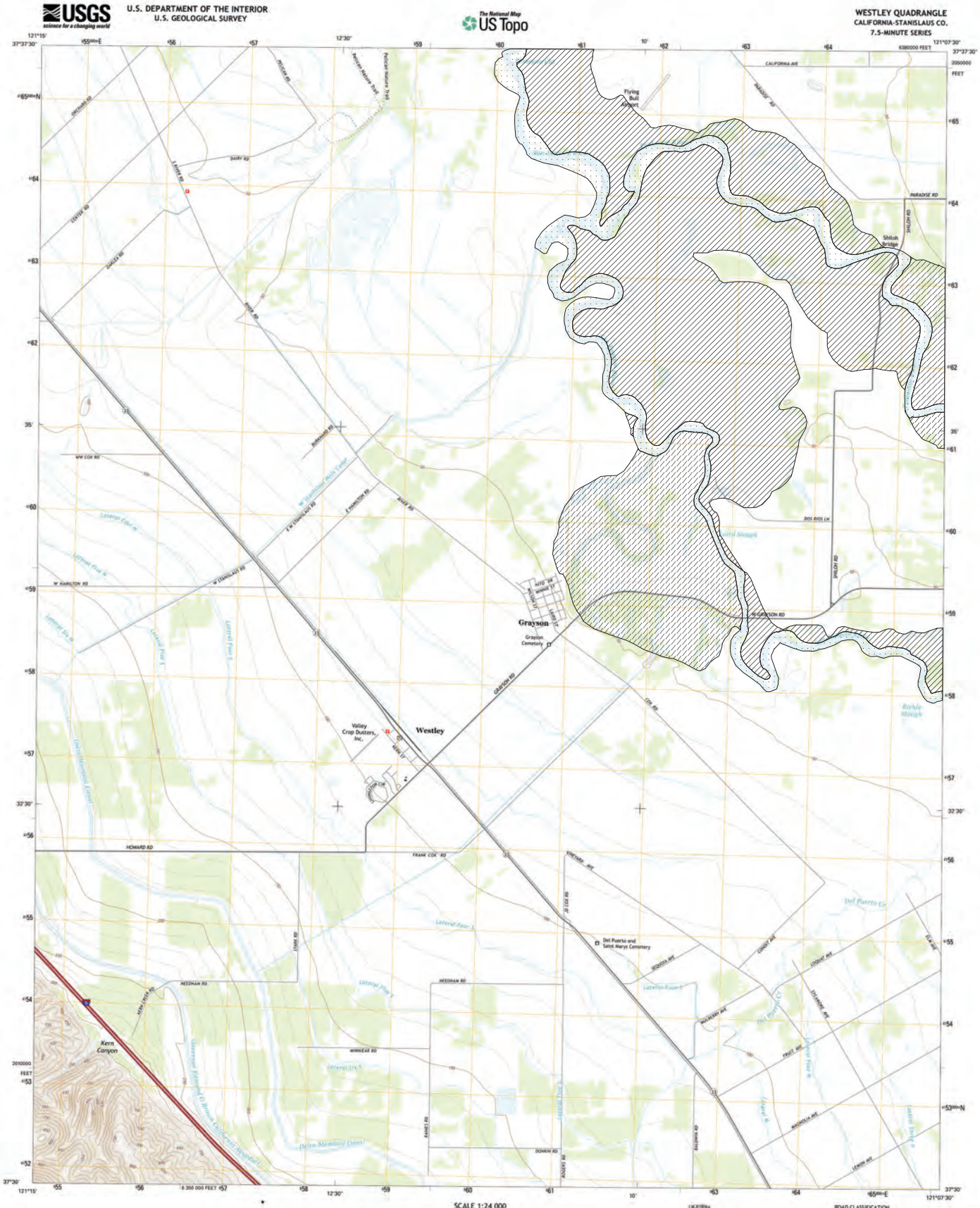
ROAD CLASSIFICATION

ADJOINING QUADRANGLES
1 Keystone
2 Chinese Camp
3 Moccasin
4 Cooperstown
5 Penon Blanco Peak
6 Turlock Lake
7 Snelling
8 Merced Falls

LA GRANGE, CA
2015



DELINEATION OF SUBTERRANEAN STREAMS AND POTENTIAL STREAM DEPLETION AREAS WITHIN AND ADJACENT TO THE STANISLAUS AND TUOLUMNE RIVERS

Westley Quadrangle Legend

- Mapped Channel Alluvium
- Potential Stream Depletion Area

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BRUSH LAKE QUADRANGLE
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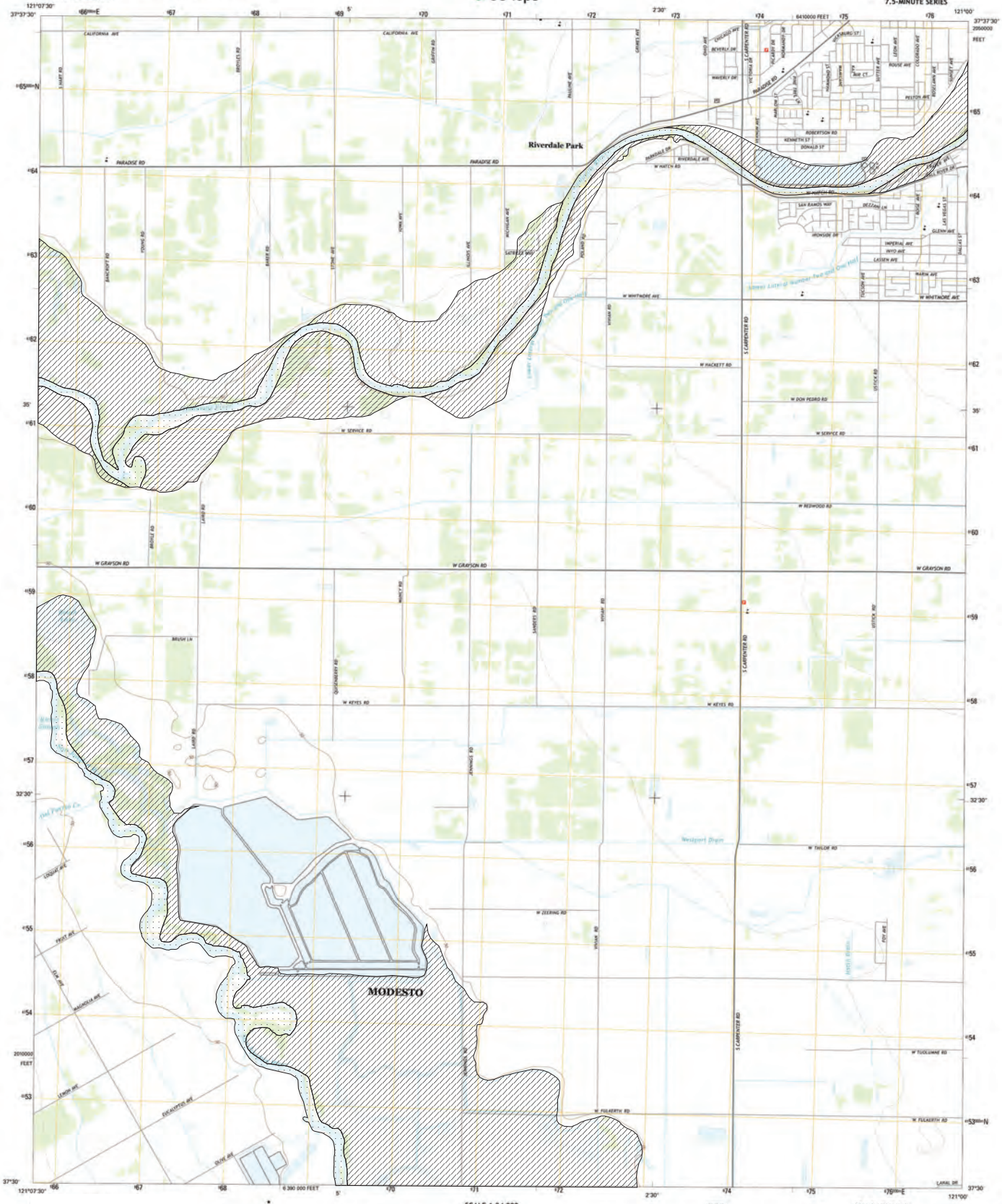


DELINEATION OF SUBTERRANEAN STREAMS AND POTENTIAL STREAM DEPLETION AREAS WITHIN AND ADJACENT TO THE STANISLAUS AND TUOLUMNE RIVERS

Brush Lake Quadrangle Legend
- Mapped Channel Alluvium
- Potential Stream Depletion Area

SCALE 1:24 000

KILOMETERS 1 0.5 0 1 2
METERS 1000 500 0 1000 2000
MILES 1 0.5 0 1
FEET 1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000

CONTOUR INTERVAL 10 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the National Geospatial Program US Topo Product Standard, 2011. A metadata file associated with this product is draft version 0.6.18

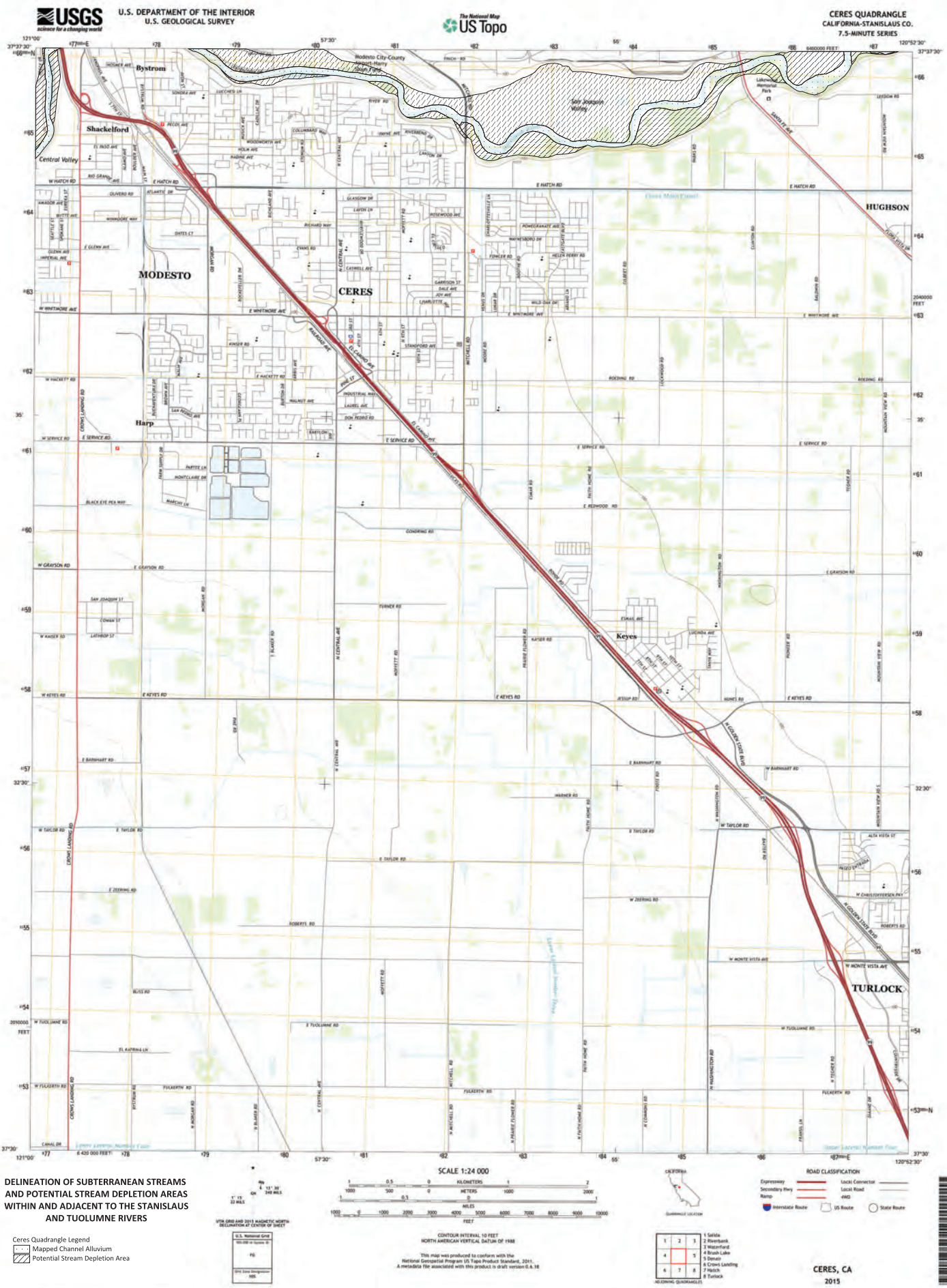
ROAD CLASSIFICATION
Expressway — Local Connector
Secondary Hwy — Local Road
Ramp — 4WD
Interstate Route — US Route — State Route

1 Ripon
2 Salida
3 Riverbank
4 Westley
5 Ceres
6 Patterson
7 Crows Landing
8 Hatch

ADJOINING QUADRANGLES

BRUSH LAKE, CA
2015

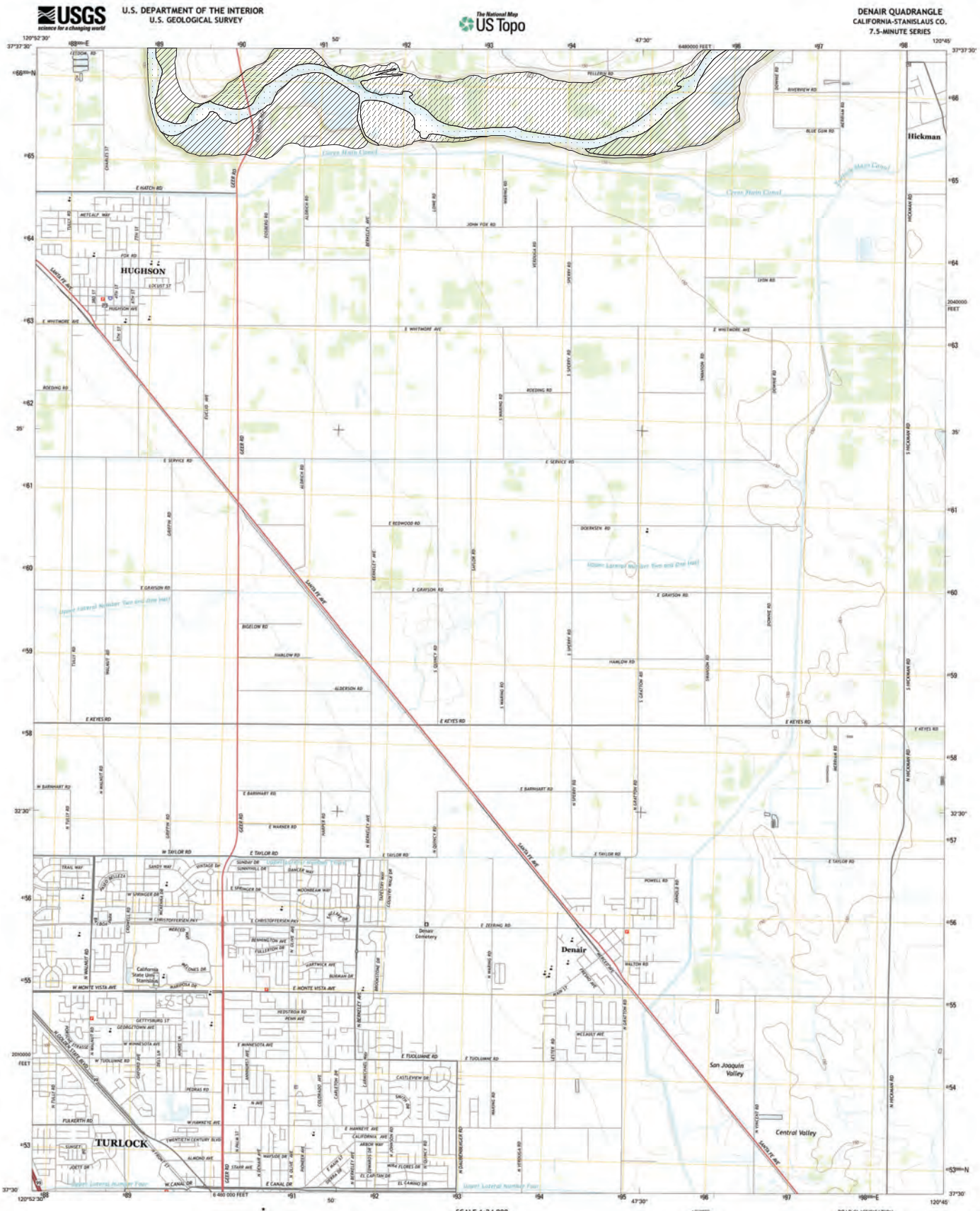
NGMDB
NGGA REF NO. USGSX24B5613



DELINEATION OF SUBTERRANEAN STREAMS AND POTENTIAL STREAM DEPLETION AREAS WITHIN AND ADJACENT TO THE STANISLAUS AND TUOLUMNE RIVERS

Ceres Quadrangle Legend

- Mapped Channel Alluvium
- Potential Stream Depletion Area



DELINEATION OF SUBTERRANEAN STREAMS AND POTENTIAL STREAM DEPLETION AREAS WITHIN AND ADJACENT TO THE STANISLAUS AND TUOLUMNE RIVERS

Denair Quadrangle Legend

- Mapped Channel Alluvium
- Potential Stream Depletion Area

August 25, 2019

Sent via email to info@esjgroundwater.org

Re: Comments on Draft Groundwater Sustainability Plan for Eastern San Joaquin Subbasin

To whom it may concern,

On behalf of the above-listed organizations, we would like to offer the attached comments on the draft Groundwater Sustainability Plan for the Eastern San Joaquin Subbasin. Our organizations are deeply engaged in and committed to the successful implementation of the Sustainable Groundwater Management Act (SGMA) because we understand that groundwater is a critical piece of a resilient California water portfolio, particularly in light of our changing climate. Because California's water and economy are interconnected, the sustainable management of each basin is of interest to both local communities and the state as a whole.

Our organizations have significant expertise in the environmental needs of groundwater and the needs of disadvantaged communities.

- The Nature Conservancy, in collaboration with state agencies, has developed several tools[1] for identifying groundwater dependent ecosystems in every SGMA groundwater basin and has made that tool available to each Groundwater Sustainability Agency.
- Audubon California is an expert in understanding wetlands and their role in groundwater recharge and applying conservation science to develop multiple-benefit solutions for sustainable groundwater management.
- Clean Water Action and Clean Water Fund are sister organizations that have deep expertise in the provision of safe drinking water, particularly in California's small disadvantaged communities, and co-authored a report on public and stakeholder engagement in SGMA[2].

[1] https://groundwaterresourcehub.org/

[2] https://www.cleanwater.org/publications/collaborating-success-stakeholder-engagement-sustainable-groundwater-management-act

- The Union of Concerned Scientists has been working to ensure that future water supply meets demand and withstands climate change impacts by supporting stakeholder education and integration, and the creation and implementation of science-based Groundwater Sustainability Plans.
- American Rivers is committed to restoring damaged rivers and conserving clean water for people and nature.

Because of the number of draft plans being released and our interest in reviewing every plan, we have identified key plan elements that are necessary to ensure that each plan adequately addresses essential requirements of SGMA. A summary review of your plan using our evaluation framework is attached to this letter as Appendix A. Appendix B provides a more detailed evaluation of the water quality and drinking water elements of the Plan. Our hope is that you can use our feedback to improve your plan before it is submitted in January 2020.

This review does not look at data quality but instead looks at how data was presented and used to identify and address the needs of disadvantaged communities (DACs), drinking water and the environment. In addition to informing individual groundwater sustainability agencies of our analysis, we plan to aggregate the results of our reviews to identify trends in GSP development, compare plans and determine which basins may require greater attention from our organizations.

Key Indicators

Appendix A provides a list of the questions we posed, how the draft plan responds to those questions and an evaluation by element of major issues with the plan. Below is a summary by element of the questions used to evaluate the plan.

1. Identification of Beneficial Users. This element is meant to ascertain whether and how DACs and groundwater-dependent ecosystems (GDEs) were identified, what standards and guidance were used to determine groundwater quality conditions and establish minimum thresholds for groundwater quality, and how environmental beneficial users and stakeholders were engaged through the development of the draft plan.
2. Communications plan. This element looks at the sufficiency of the communications plan in identifying ongoing stakeholder engagement during plan implementation, explicit information about how DACs were engaged in the planning process and how stakeholder input was incorporated into the GSP process and decision-making.
3. Maps related to Key Beneficial Uses. This element looks for maps related to drinking water users, including the density, location and depths of public supply and domestic wells; maps of GDE and interconnected surface waters with gaining and losing reaches; and monitoring networks.
4. Water Budgets. This element looks at how climate change is explicitly incorporated into current and future water budgets; how demands from urban and domestic water users were incorporated; and whether the historic, current and future water demands of native vegetation and wetlands are included in the budget.
5. Management areas and Monitoring Network. This element looks at where, why and how management areas are established, as well what data gaps have been identified and how the plan addresses those gaps.
6. Measurable Objectives and Undesirable Results. This element evaluates whether the plan explicitly considers the impacts on DACs, GDEs and environmental beneficial users in the

development of Undesirable Results and Measurable Objectives. In addition, it examines whether stakeholder input was solicited from these beneficial users during the development of those metrics.

7. Management Actions and Costs. This element looks at how identified management actions impact DACs, GDEs and interconnected surface water bodies; whether mitigation for impacts to DACs is discussed or funded; and what efforts will be made to fill identified data gaps in the first five years of the plan. Additionally, this element asks whether any changes to local ordinances or land use plans are included as management actions.

Conclusion

We know that SGMA plan development and implementation is a major undertaking, and we want every basin to be successful. We would be happy to meet with you to discuss our evaluation as you finalize your Plan for submittal to DWR. Feel free to contact Suzannah Sosman at suzannah@aginnovations.org for more information or to schedule a conversation.

Sincerely,

Jennifer Clary
Water Program Manager
Clean Water Action/Clean Water Fund

Lisa Hunt, Ph.D.
Director of California River Restoration Science
American Rivers

Samantha Arthur
Working Lands Program Director
Audubon California

J. Pablo Ortiz-Partida, Ph.D.
Western States Climate and Water Scientist
Union of Concerned Scientists

Sandi Matsumoto
Associate Director, California Water Program
The Nature Conservancy

Groundwater Basin/Subbasin: Eastern San Joaquin Groundwater Subbasin (DWR #5-022.01)
GSA: Eastern San Joaquin Groundwater Authority (Comprising 15 GSAs)
GSP Date: July 2019 Public Review Draft

1. Identification of Beneficial Users

Were key beneficial users identified and engaged?

Selected relevant requirements and guidance:
GSP Element 2.1.5, "Notice & Communication" (§354.10):
(a) A description of the beneficial uses and users of groundwater in the basin, including the land uses and property interests potentially affected by the use of groundwater in the basin, the types of parties representing those interests, and the nature of consultation with those parties.
GSP Element 2.2.2, "Groundwater Conditions" (§354.16):
(d) Groundwater quality issues that may affect the supply and beneficial uses of groundwater, including a description and map of the location of known groundwater contamination sites and plumes.
(f) Identification of interconnected surface water systems within the basin and an estimate of the quantity and timing of depletions of those systems, utilizing data available from the Department, as specified in Section 353.2, or the best available information.
(g) Identification of groundwater dependent ecosystems within the basin, utilizing data available from the Department, as specified in Section 353.2, or the best available information.
GSP Element 3.3, "Minimum Thresholds" (§354.28):
(4) How minimum thresholds may affect the interests of beneficial uses and users of groundwater or land uses and property interests.

Review Criteria		Yes	No	N/A	Relevant Info per GSP	Location (Section, Page[1])
1. Do identified beneficial users (BUs) include:	a. Disadvantaged Communities (DACs)	X			"DACs and SDACs are mapped in Figure 1-8: Disadvantaged Communities (DACs)Figure 1-8 and are primarily in the western portions of the Subbasin. Approximately 33 percent of the Subbasin area is considered Disadvantaged and 7 percent is considered severely disadvantaged. Disadvantaged communities include the following census designated places (CDPs): Stockton City CDP, Collierville CDP, Lockeford CDP, Terminous CDP, and Valley Home CDP. Severely disadvantaged communities include: Kennedy CDP, August CDP, French Camp CDP, Taft Mosswood CDP, and Thornton CDP." GSP does not clearly identify and discuss what sources are used for drinking water supplies by DACs (e.g., primarily domestic wells, small community water systems depend on only groundwater, etc.).	Section 1.2.1, Page 42 Section 1.3.1, Page 67
	b. Tribes		X		"Of the potential beneficial uses and users of groundwater in the Subbasin listed in CWC Section 10723.2, those not included are the following: • California Native American tribes"	Section 1.3.1, Page 68
	c. Small community public water systems (<3,300 connections)		X			

[1] Page numbers refer to the page of the PDF.

2.	What data were used to identify presence or absence of DACs?	a. DWR DAC Mapping Tool[2]	X			"For this GSP, the 2012-2016 ACS dataset was used, establishing statewide MHI as $63,783 (CA DWR, Mapping Tools)."	Section 1.2.1, Page 42
		i. Census Places	X				
		ii. Census Block Groups		X			
		iii. Census Tracts		X			
		b. Other data source		X			
3.	Groundwater Conditions section includes discussion of:	a. Drinking Water Quality	X			Information on the historical and current groundwater quality conditions for salinity, nitrate, arsenic, and point-source contamination is provided. "Water quality is not known to have adversely affected beneficial [drinking water] uses of groundwater in the Eastern San Joaquin Subbasin, generally."	Section 2.2.4, Page 154-174
		b. California Maximum Contaminant Levels (CA MCLs)[3] (or Public Health Goals where MCL does not exist, e.g. Chromium VI)	X			"For the purposes of this GSP, comparing parameter concentrations to their MCL or SMCL is used as the basis for describing groundwater quality concerns in the Eastern San Joaquin Subbasin. Comparisons to the MCL or SMCL must be considered in context as the measured concentrations represent raw water, which may be treated or blended prior to delivery to meet the standard or may not be used for potable uses. Water quality is not known to have adversely affected beneficial uses of groundwater in the Eastern San Joaquin Subbasin, generally." "The EPA's MCL of 10 mg/L for Nitrate as N delimits high levels of nitrate for drinking water use. Many measured concentrations are above this value, both historically and recently. Comparisons to the MCL must be considered in context as the measured concentrations represent raw water, which may be treated or blended prior to delivery to meet the standard or may not be used for potable uses." "Public health concerns about arsenic in drinking water related to its potential to cause adverse health effects are addressed through EPA's MCL, established at 10 micrograms per liter (µg/L). Figure 2-60 shows the spatial distribution of arsenic concentrations contained in the GAMA database. From the 1970s to present, the total number and percentage of arsenic values above 10 µg/L has increased (see Table 2-9)."	Section 2.2.4, Page 154-174 Section 2.2.4.2 Page 165 Section 2.2.4.3, Page 167
4.	What local, state, and federal standards or plans were used to assess drinking water BUs in the development of Minimum Thresholds (MTs)?	a. Office of Environmental Health Hazard Assessment Public Health Goal (OEHHA PHGs)[4]		X			
		b. CA MCLs[3]	X			"In the development of minimum thresholds, beneficial uses of groundwater as a drinking water supply and as an agricultural supply were considered. For drinking water, the TDS secondary maximum contaminant level (SMCL) was considered. As noted in the Current and Historical Conditions section of this GSP (Section 2.2), the SWRCB Division of Drinking Water (DDW) has	Section 3.2.3, Page 240-242

[2] DWR DAC Mapping Tool: https://gis.water.ca.gov/app/dacs/

[3] CA MCLs: https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/MCLsandPHGs.html

[4] OEHHA PHGs: https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/MCLsandPHGs.html

					established SMCLs for TDS in drinking water supplies. SMCLs are established for aesthetic reasons such as taste, odor, and color and are not based on public health concerns. For TDS, the SMCL is 500 mg/L (recommended) and the upper SMCL is 1,000 mg/L (SWRCB, 2017). The SWRCB has set a short-term standard of 1,500 mg/L, which is a temporary concentration generally allowed only under rare circumstances (SWRCB, 2017)." "Salinity is the only water quality constituent for which minimum thresholds are established in the Eastern San Joaquin Subbasin. Although other constituents, including arsenic, nitrogen, and sulfate, are evaluated in the Current and Historical Groundwater Conditions section of this GSP (Section 2.2), these constituents are managed through existing management and regulatory programs within the Subbasin."	
	c. Data Quality Objectives (DQOs) in Regional Water Quality Control Plans		X			
	d. Sustainable Communities Strategies/ Regional Transportation Plans[5]		X			
	e. County and/or City General Plans, Zoning Codes and Ordinances[6]		X			
5. Does the GSP identify how environmental BUs and environmental stakeholders were engaged throughout the development of the GSP?			X		Caswell Memorial State Park is incorrectly referred to as being located outside the Eastern San Joaquin Subbasin. The following additional protected lands are located near surface waters within the Subbasin that may be interconnected with groundwater, and/or may rely at least partly on groundwater to support vegetation and sensitive natural communities. These protected lands represent potential beneficial users of groundwater: Durham Ferry State Recreational Area, a small portion (approximately 200 acres) of San Joaquin River National Wildlife Refuge, Army Corps Park, Vernalis Riparian Habitat (Public Conservation Lands), Seegers Preserve, Cabral Island Preserve, Machado Preserve, Hansen Preserve, Micke Grove Park and Zoo, Oak Grove Regional Park, Nakagawa Preserve, El Rio Farms Preserve, Lodi Lake Nature Area, Woodbridge Regional Park, Woodbridge Ecological Preserve, White Slough WA, Nuss Farms, Beck Preserve, Hilder Preserve, Staten Island Ranch, Burchel Preserve, and Ishizuka Preserve. The authors referred to the San Joaquin County General Plan documents, including background reports, for information regarding these important resources. Section 2.2.8 includes a geospatial analysis that removes managed wetlands from consideration as GDEs.	Section 1.3.1, Page 67 Section 2.2.8, Page 178-184

[5] CARB: https://ww2.arb.ca.gov/resources/documents/scs-evaluation-resources

[6] OPR General Plan Guidelines: http://www.opr.ca.gov/planning/general-plan/

Summary / Comments

The GSP does not currently provide clear information on how and to what extent DAC members rely on groundwater. For example: how much of the population relies on private domestic wells for drinking water? How much of the population relies on small community water systems and where are those systems located? Are those community water systems solely depending on groundwater? How many connections do the small water systems serve? This information is valuable for the reader to understand the scale of the vulnerable population dependent on groundwater for drinking water.

Although the GSP identifies declining water quality trends for arsenic and nitrate in the basin, which meet the GSP's definition of undesirable results for water quality, no MOs or MTs are set for these constituents. The concentration of these constituents can be impacted by management actions.

The GSP notes plans to coordinate and share data with other regulatory monitoring programs, but does not explain how this coordination will improve sustainability with respect to water quality within the basin. The GSP should identify a clear plan for addressing all groundwater constituents that are contributing to the undesirable results of degraded groundwater quality, including those for drinking water users.

Caswell Memorial State Park is incorrectly referred to as being located outside the Eastern San Joaquin Subbasin.

The authors referred to the San Joaquin County General Plan documents, including background reports, for information regarding these important resources. These potential beneficial groundwater users should be described in the text on pp. 1-18 and shown in Figure 1-11. Please include a description recognizing all of the protected areas in the Subbasin and their beneficial groundwater uses.

Section 2.2.8 includes a geospatial analysis that removes managed wetlands from consideration as GDEs. The managed wetlands in the Subbasin should be identified in this section.

2. Communications Plan

How were key beneficial users engaged, and how was their input incorporated into the GSP process and decisions?

Selected relevant requirements and guidance:
GSP Element 2.1.5, "Notice & Communication" (§354.10):

Each Plan shall include a summary of information relating to notification and communication by the Agency with other agencies and interested parties including the following:

(c) Comments regarding the Plan received by the Agency and a summary of any responses by the Agency.

(d) A communication section of the Plan that includes the following:

(1) An explanation of the Agency's decision-making process.

(2) Identification of opportunities for public engagement and a discussion of how public input and response will be used.

(3) A description of how the Agency encourages the active involvement of diverse social, cultural, and economic elements of the population within the basin.

(4) The method the Agency shall follow to inform the public about progress implementing the Plan, including the status of projects and actions.

DWR Guidance Document for GSP Stakeholder Communication and Engagement[7]

Review Criteria	Yes	No	N/A	Relevant Info per GSP	Location (Section, Page)
1. Is a Stakeholder Communication and Engagement Plan (SCEP) included?	X			Stakeholder Engagement & Public Outreach Plan, dated June 25, 2018	App. 1-G, Page 138
2. Does the SCEP identify that ongoing engagement will be conducted during GSP implementation?	X			"The GSAs intend to continue public outreach and provide opportunities for engagement during GSP implementation. This will include providing opportunities for public participation, at public meetings, providing access to GSP information online, and continued coordination with entities conducting outreach to diverse communities in the Subbasin. Announcements will continue to be distributed via email prior to public meetings. Emails will also be distributed as specific deliverables are finalized, when opportunities are available for stakeholder input and when this input is requested, or when items of interest to the stakeholder group arise, such as relevant funding opportunities. The Eastern San Joaquin SGMA website, managed as part of GSP administration, will be updated a minimum of monthly, and will house meeting agendas and materials, reports, and other program information. The website may be updated to add new pages as the program continues and additional activities are implemented. Additionally, public workshops will be held semi-annually to provide an opportunity for stakeholders and members of the public to learn about, discuss, and provide input on GSP activities, progress toward meeting the sustainability goal of this GSP, and the SGMA program."	Section 7.7, Page 318

[7] DWR Guidance Document for GSP Stakeholder Communication and Engagement https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Sustainable-Groundwater-Management/Best-Management-Practices-and-Guidance-Documents/Files/Guidance-Document-for-Groundwater-Sustainability-Plan---Stakeholder-Communication-and-Engagement.pdf

3. Does the SCEP specifically identify how DAC beneficial users were engaged in the planning process?	X			Workgroup members identified as representing DAC interests: Agricultural Business – Farmer Representative, Calaveras County Resource Conservation District, Catholic Charities of the Diocese of Stockton, Environmental Justice Coalition for Water, Restore the Delta, Sierra Club - Delta-Sierra Group "Spanish translation was provided at informational open house events, creating an opportunity for local Spanish-speaking individuals to engage in the GSP development process."	Section 1.3.4, Page 70-73 Section ES, Page 17
4. Does the GSP explicitly describe how stakeholder input was incorporated into the GSP process and decisions?	X			"Ideas generated at the Workgroup meetings were directed to decision makers at the GWA Board meetings. Input was captured in monthly meeting summaries, which were reviewed by Workgroup members prior to being presented to the GWA Board in meeting agenda packets and posted to the GWA website. In addition, summaries of prior month Workgroup meetings, as well as highlights and key takeaways from those meetings, were presented regularly as a standing agenda item at GWA Board meetings. In addition to influencing GSP development and decisions related to groundwater management, feedback from stakeholders played a key role in enhancing education and outreach efforts, and the stakeholder involvement process more broadly. Changes were made to the Open House format following stakeholder comment, and outreach events with community groups (as referenced in Section 1.3.4.5 above) were added based on feedback to further spread the word about SGMA and local GSP development efforts. Additionally, changes to the Workgroup meeting structure and process were made based on findings of the Situation Assessment." Workgroup recommendations are cited throughout the sustainable management criteria sections.	Section 1.3.4, Page 78

Summary / Comments

Ongoing stakeholder engagement and inclusion throughout the GSP implementation process will be crucial to ensuring that the needs of the most vulnerable beneficial users in the basin are met.

The Communications plan does not specify how the DACs identified in Figure 1-8 were specifically engaged. The failure to identify small community water systems calls into question how and whether adequate outreach to DACs was conducted.

The "stakeholder feedback" mechanism for removal of NCCAGs from consideration as GDEs is not explained or documented in the GSP. Please provide details that support removing potential GDEs based on stakeholder feedback.

3. Maps Related to Key Beneficial Uses

Were best available data sources used for information related to key beneficial users?

Selected relevant requirements and guidance:
GSP Element 2.1.4 "Additional GSP Elements" (§354.8):

Each Plan shall include a description of the geographic areas covered, including the following information:

(a) One or more maps of the basin that depict the following, as applicable:

(5) The density of wells per square mile, by dasymetric or similar mapping techniques, showing the general distribution of agricultural, industrial, and domestic water supply wells in the basin, including de minimis extractors, and the location and extent of communities dependent upon groundwater, utilizing data provided by the Department, as specified in Section 353.2, or the best available information.

GSP Element 3.5 Monitoring Network (§354.34)

(b) Each Plan shall include a description of the monitoring network objectives for the basin, including an explanation of how the network will be developed and implemented to monitor
groundwater and related surface conditions, and the interconnection of surface water and groundwater, with sufficient temporal frequency and spatial density to evaluate the affects and effectiveness of Plan implementation. The monitoring network objectives shall be implemented to accomplish the following:

(c) Each monitoring network shall be designed to accomplish the following for each sustainability indicator:

(1) Chronic Lowering of Groundwater Levels. Demonstrate groundwater occurrence, flow directions, and hydraulic gradients between principal aquifers and surface water features by the following methods:

(A) A sufficient density of monitoring wells to collect representative measurements through depth-discrete perforated intervals to characterize the groundwater table or potentiometric surface for each principal aquifer.

(4) Degraded Water Quality. Collect sufficient spatial and temporal data from each applicable principal aquifer to determine groundwater quality trends for water quality indicators, as determined by the Agency, to address known water quality issues.

(6) Depletions of Interconnected Surface Water. Monitor surface water and groundwater, where interconnected surface water conditions exist, to characterize the spatial and temporal exchanges between surface water and groundwater, and to calibrate and apply the tools and methods necessary to calculate depletions of surface water caused by groundwater extractions. The monitoring network shall be able to characterize the following:

(A) Flow conditions including surface water discharge, surface water head, and baseflow contribution.

(B) Identifying the approximate date and location where ephemeral or intermittent flowing streams and rivers cease to flow, if applicable.

(C) Temporal change in conditions due to variations in stream discharge and regional groundwater extraction.

(D) Other factors that may be necessary to identify adverse impacts on beneficial uses of the surface water.

(f) The Agency shall determine the density of monitoring sites and frequency of measurements required to demonstrate short-term, seasonal, and long-term trends based upon the following factors:

(3) Impacts to beneficial uses and users of groundwater and land uses and property interests affected by groundwater production, and adjacent basins that could affect the ability of that basin to meet the sustainability goal.

Review Criteria		Yes	No	N/A	Relevant Info per GSP	Location (Section, Page)
1. Does the GSP Include Maps Related to Drinking Water Users?	a. Well Density	X			Maps provided.	Section 1.2.1, Page 46-48
	b. Domestic and Public Supply Well Locations & Depths		X		No map provided, other than density maps. Domestic and public supply well depths are not clearly identified and presented, although they are reportedly used as a basis for determining water level MTs. "There are as many as 2 million domestic, irrigation, and monitoring water	Section 1.2.2, Page 52

					wells in California included in this dataset, including approximately 10,000 domestic wells located in the Eastern San Joaquin Subbasin."	
	i. Based on DWR Well Completion Report Map Application[8]?	X			"OSWCR is used as a data source for wells identified for monitoring. In this GSP, the OSWCR database was used to evaluate Plan Area and identify sustainable management criteria." "Domestic well data was retrieved from Online System for Well Completion Reports (OSCWR), and information on casing, screening, and age of well is not available in most locations."	Section 1.2.2, Page 52 Section 3.2.1, Page 234
	ii. Based on Other Source(s)?		X			
2. Does the GSP include maps related to Groundwater Dependent Ecosystem (GDE) locations?	a. Map of GDE Locations	X			The GSP takes the approach of removing NCCAGs with "access to alternate water supplies" from consideration as GDEs, and states that in order to be considered GDEs, "there must not be alternate water supplies". Alternate water supplies are assumed to include various potential sources of surface water including managed wetlands, irrigated agricultural fields, perennial surface water sources, and other unspecified sources determined by stakeholders on a case-specific basis. Ecosystems often rely both on groundwater and surface water to meet their water needs. The availability of alternate water supplies to provide some portion of a GDE's or wetland's water demand does not necessarily mean all of its water needs can be met through alternate supplies (i.e., without reliance on groundwater). Groundwater pumping depletes ISWs under both gaining or losing conditions, and GDEs may rely on the interactions of surface water to meet their water requirements. A strictly binary approach, designating all NCCAGs as either 100 percent reliant on groundwater or 100 percent reliant on alternate water supplies is therefore inconsistent with the available science. Very little description is provided regarding the nature and function of the identified GDEs, their potential sensitivity to groundwater and surface water supply changes, their relative habitat value, or the current and historical groundwater conditions and variability near the GDEs. Given that monitoring of groundwater levels near ISWs has been identified as a data gap and limited resources are available to expand monitoring efforts in these areas, additional assessment would be helpful to identify and prioritize potential data gaps.	Section 2.2.9, Page 183
	b. Map of Interconnected Surface Waters (ISWs)	X			In Section 2.2.6, please describe the technical basis for selecting a 25 percent interconnection threshold, and how it will adequately protect the environmental beneficial uses of surface water in potentially interconnected surface waters from significant and unreasonable impacts related to groundwater extraction. Shallow groundwater monitoring data near surface waters and NCCAGs are identified as a data gap in Section 2.1.10, and the use of the Eastern San Joaquin Water Resources Model (ESJWRM) to determine the percentage of time that stream reaches are groundwater connected entails inherent	Section 2.2.6, Page 175-177
	i. Does it identify which reaches are gaining and which are losing?	X				Section 2.2.6, Page 176-177
	ii. Depletions to ISWs are quantified by stream segments.		X			
	iii. Depletions to ISWs are quantified seasonally.		X			

[8] DWR Well Completion Report Map Application: https://www.arcgis.com/apps/webappviewer/index.html?id=181078580a214c0986e2da28f8623b37

					uncertainty. The potential presence of shallow or perched aquifers near the rivers is not assessed or discussed in the GSP. Groundwater modeling conducted by the United States Geological Survey (USGS), DWR and others (e.g., JJ&A, 2018) has considered some river reaches shown as disconnected in Figure 2-66 (pp. 2-99) to be groundwater-connected. No data or discussion is presented regarding the potential groundwater connection of other streams associated with significant wetland and riparian resources, including Pixley Slough, Mormon Slough, Littlejohns Creek, Bear Creek, Potter Creek, Duck Creek and Lone Tree Creek. As such, there is considerable uncertainty regarding the designation of interconnected and disconnected surface water resources in Figure 2-66. The uncertainty regarding the groundwater interconnection of streams in the Subbasin should be identified as a data gap. Section 2.1.4.2 Major Hydraulic Features should discuss (or reference the sections discussing) the following: Specific ISWs, including the extent of both gaining and losing reaches; In-stream flow requirements in each of the interconnected rivers/streams including the amount, time of year when the flow minimum is specified, the duration, the freshwater fish species for which it applies, associated permits that set forth the requirements, and the regulating agency setting forth the compliance requirements; Areas of critical habitat that exist within rivers and streams. Section 2.1.5 Geologic Formations and Stratigraphy Table 2-2 states that Holocene Stream Channel Deposits are generally not saturated except by the San Joaquin River. Based on the available data, it would be expected that the stream channel deposits associated with the other ISWs in the Subbasin would be saturated near those streams and rivers. Section 2.1.9.2.2 Regional Historic Groundwater Flow and Surface Water Interaction should include a discussion of historic groundwater-surface water interaction.	
3. Does the GSP include maps of monitoring networks?	a. Existing Monitoring Wells	X			Maps provided.	Section 2.1.1, Page 80, 83 Section 3.2, Page 235, 242
	b. Data sources:					
	i. California Statewide Groundwater Elevation Monitoring (CASGEM)	X			"The California Statewide Groundwater Elevation Monitoring (CASGEM) and San Joaquin County (SJC) monitoring well networks provide the basis for determining groundwater levels across the Eastern San Joaquin Subbasin."	Section 2.1.1, Page 79
	ii. Water Board Regulated monitoring sites	X			"GAMA data for the Eastern San Joaquin Subbasin contains water quality results collected by the SWRCB-DDW (formerly DHS-DDW), DPR, DWR, LLNL, and USGS from the 1940s to present."	Section 1.2.2, Page 52
	iii. Department of Pesticide Regulation (DPR) monitoring wells	X			"GAMA data for the Eastern San Joaquin Subbasin contains water quality results collected by the SWRCB-DDW (formerly DHS-DDW), DPR, DWR, LLNL, and USGS from the 1940s to present."	Section 1.2.2, Page 52
	c. Future SGMA Monitoring Well Network	X			Maps provided.	Section 4, Page

Groundwater Basin/Subbasin: Eastern San Joaquin Groundwater Subbasin (DWR #5-022.01)
GSA: Eastern San Joaquin Groundwater Authority (Comprising 15 GSAs)
GSP Date: July 2019 Public Review Draft

1. Identification of Beneficial Users

Were key beneficial users identified and engaged?

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(4) How minimum thresholds may affect the interests of beneficial uses and users of groundwater or land uses and property interests.

Review Criteria		Yes	No	N/A	Relevant Info per GSP	Location (Section, Page[1])
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	b. Tribes		X		"Of the potential beneficial uses and users of groundwater in the Subbasin listed in CWC Section 10723.2, those not included are the following: • California Native American tribes"	Section 1.3.1, Page 68
	c. Small community public water systems (<3,300 connections)		X			

[1] Page numbers refer to the page of the PDF.

2.	What data were used to identify presence or absence of DACs?	a. DWR DAC Mapping Tool[2]	X			"For this GSP, the 2012-2016 ACS dataset was used, establishing statewide MHI as $63,783 (CA DWR, Mapping Tools)."	Section 1.2.1, Page 42
		i. Census Places	X				
		ii. Census Block Groups		X			
		iii. Census Tracts		X			
		b. Other data source		X			
3.	Groundwater Conditions section includes discussion of:	a. Drinking Water Quality	X			Information on the historical and current groundwater quality conditions for salinity, nitrate, arsenic, and point-source contamination is provided. "Water quality is not known to have adversely affected beneficial [drinking water] uses of groundwater in the Eastern San Joaquin Subbasin, generally."	Section 2.2.4, Page 154-174
		b. California Maximum Contaminant Levels (CA MCLs)[3] (or Public Health Goals where MCL does not exist, e.g. Chromium VI)	X			"For the purposes of this GSP, comparing parameter concentrations to their MCL or SMCL is used as the basis for describing groundwater quality concerns in the Eastern San Joaquin Subbasin. Comparisons to the MCL or SMCL must be considered in context as the measured concentrations represent raw water, which may be treated or blended prior to delivery to meet the standard or may not be used for potable uses. Water quality is not known to have adversely affected beneficial uses of groundwater in the Eastern San Joaquin Subbasin, generally." "The EPA's MCL of 10 mg/L for Nitrate as N delimits high levels of nitrate for drinking water use. Many measured concentrations are above this value, both historically and recently. Comparisons to the MCL must be considered in context as the measured concentrations represent raw water, which may be treated or blended prior to delivery to meet the standard or may not be used for potable uses." "Public health concerns about arsenic in drinking water related to its potential to cause adverse health effects are addressed through EPA's MCL, established at 10 micrograms per liter (µg/L). Figure 2-60 shows the spatial distribution of arsenic concentrations contained in the GAMA database. From the 1970s to present, the total number and percentage of arsenic values above 10 µg/L has increased (see Table 2-9)."	Section 2.2.4, Page 154-174 Section 2.2.4.2 Page 165 Section 2.2.4.3, Page 167
4.	What local, state, and federal standards or plans were used to assess drinking water BUs in the development of Minimum Thresholds (MTs)?	a. Office of Environmental Health Hazard Assessment Public Health Goal (OEHHA PHGs)[4]		X			
		b. CA MCLs[3]	X			"In the development of minimum thresholds, beneficial uses of groundwater as a drinking water supply and as an agricultural supply were considered. For drinking water, the TDS secondary maximum contaminant level (SMCL) was considered. As noted in the Current and Historical Conditions section of this GSP (Section 2.2), the SWRCB Division of Drinking Water (DDW) has	Section 3.2.3, Page 240-242

[2] DWR DAC Mapping Tool: https://gis.water.ca.gov/app/dacs/

[3] CA MCLs: https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/MCLsandPHGs.html

[4] OEHHA PHGs: https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/MCLsandPHGs.html

					established SMCLs for TDS in drinking water supplies. SMCLs are established for aesthetic reasons such as taste, odor, and color and are not based on public health concerns. For TDS, the SMCL is 500 mg/L (recommended) and the upper SMCL is 1,000 mg/L (SWRCB, 2017). The SWRCB has set a short-term standard of 1,500 mg/L, which is a temporary concentration generally allowed only under rare circumstances (SWRCB, 2017)." "Salinity is the only water quality constituent for which minimum thresholds are established in the Eastern San Joaquin Subbasin. Although other constituents, including arsenic, nitrogen, and sulfate, are evaluated in the Current and Historical Groundwater Conditions section of this GSP (Section 2.2), these constituents are managed through existing management and regulatory programs within the Subbasin."	
	c. Data Quality Objectives (DQOs) in Regional Water Quality Control Plans		X			
	d. Sustainable Communities Strategies/ Regional Transportation Plans[5]		X			
	e. County and/or City General Plans, Zoning Codes and Ordinances[6]		X			
5. Does the GSP identify how environmental BUs and environmental stakeholders were engaged throughout the development of the GSP?			X		Caswell Memorial State Park is incorrectly referred to as being located outside the Eastern San Joaquin Subbasin. The following additional protected lands are located near surface waters within the Subbasin that may be interconnected with groundwater, and/or may rely at least partly on groundwater to support vegetation and sensitive natural communities. These protected lands represent potential beneficial users of groundwater: Durham Ferry State Recreational Area, a small portion (approximately 200 acres) of San Joaquin River National Wildlife Refuge, Army Corps Park, Vernalis Riparian Habitat (Public Conservation Lands), Seegers Preserve, Cabral Island Preserve, Machado Preserve, Hansen Preserve, Micke Grove Park and Zoo, Oak Grove Regional Park, Nakagawa Preserve, El Rio Farms Preserve, Lodi Lake Nature Area, Woodbridge Regional Park, Woodbridge Ecological Preserve, White Slough WA, Nuss Farms, Beck Preserve, Hilder Preserve, Staten Island Ranch, Burchel Preserve, and Ishizuka Preserve. The authors referred to the San Joaquin County General Plan documents, including background reports, for information regarding these important resources. Section 2.2.8 includes a geospatial analysis that removes managed wetlands from consideration as GDEs.	Section 1.3.1, Page 67 Section 2.2.8, Page 178-184

[5] CARB: https://ww2.arb.ca.gov/resources/documents/scs-evaluation-resources

[6] OPR General Plan Guidelines: http://www.opr.ca.gov/planning/general-plan/

Summary / Comments

The GSP does not currently provide clear information on how and to what extent DAC members rely on groundwater. For example: how much of the population relies on private domestic wells for drinking water? How much of the population relies on small community water systems and where are those systems located? Are those community water systems solely depending on groundwater? How many connections do the small water systems serve? This information is valuable for the reader to understand the scale of the vulnerable population dependent on groundwater for drinking water.

Although the GSP identifies declining water quality trends for arsenic and nitrate in the basin, which meet the GSP's definition of undesirable results for water quality, no MOs or MTs are set for these constituents. The concentration of these constituents can be impacted by management actions.

The GSP notes plans to coordinate and share data with other regulatory monitoring programs, but does not explain how this coordination will improve sustainability with respect to water quality within the basin. The GSP should identify a clear plan for addressing all groundwater constituents that are contributing to the undesirable results of degraded groundwater quality, including those for drinking water users.

Caswell Memorial State Park is incorrectly referred to as being located outside the Eastern San Joaquin Subbasin.

The authors referred to the San Joaquin County General Plan documents, including background reports, for information regarding these important resources. These potential beneficial groundwater users should be described in the text on pp. 1-18 and shown in Figure 1-11. Please include a description recognizing all of the protected areas in the Subbasin and their beneficial groundwater uses.

Section 2.2.8 includes a geospatial analysis that removes managed wetlands from consideration as GDEs. The managed wetlands in the Subbasin should be identified in this section.

2. Communications Plan

How were key beneficial users engaged, and how was their input incorporated into the GSP process and decisions?

Selected relevant requirements and guidance:
GSP Element 2.1.5, "Notice & Communication" (§354.10):

Each Plan shall include a summary of information relating to notification and communication by the Agency with other agencies and interested parties including the following:

(c) Comments regarding the Plan received by the Agency and a summary of any responses by the Agency.

(d) A communication section of the Plan that includes the following:

(1) An explanation of the Agency's decision-making process.

(2) Identification of opportunities for public engagement and a discussion of how public input and response will be used.

(3) A description of how the Agency encourages the active involvement of diverse social, cultural, and economic elements of the population within the basin.

(4) The method the Agency shall follow to inform the public about progress implementing the Plan, including the status of projects and actions.

DWR Guidance Document for GSP Stakeholder Communication and Engagement[7]

Review Criteria	Yes	No	N/A	Relevant Info per GSP	Location (Section, Page)
1. Is a Stakeholder Communication and Engagement Plan (SCEP) included?	X			Stakeholder Engagement & Public Outreach Plan, dated June 25, 2018	App. 1-G, Page 138
2. Does the SCEP identify that ongoing engagement will be conducted during GSP implementation?	X			"The GSAs intend to continue public outreach and provide opportunities for engagement during GSP implementation. This will include providing opportunities for public participation, at public meetings, providing access to GSP information online, and continued coordination with entities conducting outreach to diverse communities in the Subbasin. Announcements will continue to be distributed via email prior to public meetings. Emails will also be distributed as specific deliverables are finalized, when opportunities are available for stakeholder input and when this input is requested, or when items of interest to the stakeholder group arise, such as relevant funding opportunities. The Eastern San Joaquin SGMA website, managed as part of GSP administration, will be updated a minimum of monthly, and will house meeting agendas and materials, reports, and other program information. The website may be updated to add new pages as the program continues and additional activities are implemented. Additionally, public workshops will be held semi-annually to provide an opportunity for stakeholders and members of the public to learn about, discuss, and provide input on GSP activities, progress toward meeting the sustainability goal of this GSP, and the SGMA program."	Section 7.7, Page 318

[7] DWR Guidance Document for GSP Stakeholder Communication and Engagement https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Sustainable-Groundwater-Management/Best-Management-Practices-and-Guidance-Documents/Files/Guidance-Document-for-Groundwater-Sustainability-Plan---Stakeholder-Communication-and-Engagement.pdf

3. Does the SCEP specifically identify how DAC beneficial users were engaged in the planning process?	X			Workgroup members identified as representing DAC interests: Agricultural Business – Farmer Representative, Calaveras County Resource Conservation District, Catholic Charities of the Diocese of Stockton, Environmental Justice Coalition for Water, Restore the Delta, Sierra Club - Delta-Sierra Group "Spanish translation was provided at informational open house events, creating an opportunity for local Spanish-speaking individuals to engage in the GSP development process."	Section 1.3.4, Page 70-73 Section ES, Page 17
4. Does the GSP explicitly describe how stakeholder input was incorporated into the GSP process and decisions?	X			"Ideas generated at the Workgroup meetings were directed to decision makers at the GWA Board meetings. Input was captured in monthly meeting summaries, which were reviewed by Workgroup members prior to being presented to the GWA Board in meeting agenda packets and posted to the GWA website. In addition, summaries of prior month Workgroup meetings, as well as highlights and key takeaways from those meetings, were presented regularly as a standing agenda item at GWA Board meetings. In addition to influencing GSP development and decisions related to groundwater management, feedback from stakeholders played a key role in enhancing education and outreach efforts, and the stakeholder involvement process more broadly. Changes were made to the Open House format following stakeholder comment, and outreach events with community groups (as referenced in Section 1.3.4.5 above) were added based on feedback to further spread the word about SGMA and local GSP development efforts. Additionally, changes to the Workgroup meeting structure and process were made based on findings of the Situation Assessment." Workgroup recommendations are cited throughout the sustainable management criteria sections.	Section 1.3.4, Page 78

Summary / Comments

Ongoing stakeholder engagement and inclusion throughout the GSP implementation process will be crucial to ensuring that the needs of the most vulnerable beneficial users in the basin are met.

The Communications plan does not specify how the DACs identified in Figure 1-8 were specifically engaged. The failure to identify small community water systems calls into question how and whether adequate outreach to DACs was conducted.

The "stakeholder feedback" mechanism for removal of NCCAGs from consideration as GDEs is not explained or documented in the GSP. Please provide details that support removing potential GDEs based on stakeholder feedback.

3. Maps Related to Key Beneficial Uses

Were best available data sources used for information related to key beneficial users?

Selected relevant requirements and guidance:
GSP Element 2.1.4 "Additional GSP Elements" (§354.8):

Each Plan shall include a description of the geographic areas covered, including the following information:

(a) One or more maps of the basin that depict the following, as applicable:

(5) The density of wells per square mile, by dasymetric or similar mapping techniques, showing the general distribution of agricultural, industrial, and domestic water supply wells in the basin, including de minimis extractors, and the location and extent of communities dependent upon groundwater, utilizing data provided by the Department, as specified in Section 353.2, or the best available information.

GSP Element 3.5 Monitoring Network (§354.34)

(b) Each Plan shall include a description of the monitoring network objectives for the basin, including an explanation of how the network will be developed and implemented to monitor
groundwater and related surface conditions, and the interconnection of surface water and groundwater, with sufficient temporal frequency and spatial density to evaluate the affects and effectiveness of Plan implementation. The monitoring network objectives shall be implemented to accomplish the following:

(c) Each monitoring network shall be designed to accomplish the following for each sustainability indicator:

(1) Chronic Lowering of Groundwater Levels. Demonstrate groundwater occurrence, flow directions, and hydraulic gradients between principal aquifers and surface water features by the following methods:

(A) A sufficient density of monitoring wells to collect representative measurements through depth-discrete perforated intervals to characterize the groundwater table or potentiometric surface for each principal aquifer.

(4) Degraded Water Quality. Collect sufficient spatial and temporal data from each applicable principal aquifer to determine groundwater quality trends for water quality indicators, as determined by the Agency, to address known water quality issues.

(6) Depletions of Interconnected Surface Water. Monitor surface water and groundwater, where interconnected surface water conditions exist, to characterize the spatial and temporal exchanges between surface water and groundwater, and to calibrate and apply the tools and methods necessary to calculate depletions of surface water caused by groundwater extractions. The monitoring network shall be able to characterize the following:

(A) Flow conditions including surface water discharge, surface water head, and baseflow contribution.

(B) Identifying the approximate date and location where ephemeral or intermittent flowing streams and rivers cease to flow, if applicable.

(C) Temporal change in conditions due to variations in stream discharge and regional groundwater extraction.

(D) Other factors that may be necessary to identify adverse impacts on beneficial uses of the surface water.

(f) The Agency shall determine the density of monitoring sites and frequency of measurements required to demonstrate short-term, seasonal, and long-term trends based upon the following factors:

(3) Impacts to beneficial uses and users of groundwater and land uses and property interests affected by groundwater production, and adjacent basins that could affect the ability of that basin to meet the sustainability goal.

Review Criteria		Yes	No	N/A	Relevant Info per GSP	Location (Section, Page)
1. Does the GSP Include Maps Related to Drinking Water Users?	a. Well Density	X			Maps provided.	Section 1.2.1, Page 46-48
	b. Domestic and Public Supply Well Locations & Depths		X		No map provided, other than density maps. Domestic and public supply well depths are not clearly identified and presented, although they are reportedly used as a basis for determining water level MTs. "There are as many as 2 million domestic, irrigation, and monitoring water	Section 1.2.2, Page 52

					wells in California included in this dataset, including approximately 10,000 domestic wells located in the Eastern San Joaquin Subbasin."	
	i. Based on DWR Well Completion Report Map Application[8]?	X			"OSWCR is used as a data source for wells identified for monitoring. In this GSP, the OSWCR database was used to evaluate Plan Area and identify sustainable management criteria." "Domestic well data was retrieved from Online System for Well Completion Reports (OSCWR), and information on casing, screening, and age of well is not available in most locations."	Section 1.2.2, Page 52 Section 3.2.1, Page 234
	ii. Based on Other Source(s)?		X			
2. Does the GSP include maps related to Groundwater Dependent Ecosystem (GDE) locations?	a. Map of GDE Locations	X			The GSP takes the approach of removing NCCAGs with "access to alternate water supplies" from consideration as GDEs, and states that in order to be considered GDEs, "there must not be alternate water supplies". Alternate water supplies are assumed to include various potential sources of surface water including managed wetlands, irrigated agricultural fields, perennial surface water sources, and other unspecified sources determined by stakeholders on a case-specific basis. Ecosystems often rely both on groundwater and surface water to meet their water needs. The availability of alternate water supplies to provide some portion of a GDE's or wetland's water demand does not necessarily mean all of its water needs can be met through alternate supplies (i.e., without reliance on groundwater). Groundwater pumping depletes ISWs under both gaining or losing conditions, and GDEs may rely on the interactions of surface water to meet their water requirements. A strictly binary approach, designating all NCCAGs as either 100 percent reliant on groundwater or 100 percent reliant on alternate water supplies is therefore inconsistent with the available science. Very little description is provided regarding the nature and function of the identified GDEs, their potential sensitivity to groundwater and surface water supply changes, their relative habitat value, or the current and historical groundwater conditions and variability near the GDEs. Given that monitoring of groundwater levels near ISWs has been identified as a data gap and limited resources are available to expand monitoring efforts in these areas, additional assessment would be helpful to identify and prioritize potential data gaps.	Section 2.2.9, Page 183
	b. Map of Interconnected Surface Waters (ISWs)	X			In Section 2.2.6, please describe the technical basis for selecting a 25 percent interconnection threshold, and how it will adequately protect the environmental beneficial uses of surface water in potentially interconnected surface waters from significant and unreasonable impacts related to groundwater extraction. Shallow groundwater monitoring data near surface waters and NCCAGs are identified as a data gap in Section 2.1.10, and the use of the Eastern San Joaquin Water Resources Model (ESJWRM) to determine the percentage of time that stream reaches are groundwater connected entails inherent	Section 2.2.6, Page 175-177
	i. Does it identify which reaches are gaining and which are losing?	X				Section 2.2.6, Page 176-177
	ii. Depletions to ISWs are quantified by stream segments.		X			
	iii. Depletions to ISWs are quantified seasonally.		X			

[8] DWR Well Completion Report Map Application: https://www.arcgis.com/apps/webappviewer/index.html?id=181078580a214c0986e2da28f8623b37

					uncertainty. The potential presence of shallow or perched aquifers near the rivers is not assessed or discussed in the GSP. Groundwater modeling conducted by the United States Geological Survey (USGS), DWR and others (e.g., JJ&A, 2018) has considered some river reaches shown as disconnected in Figure 2-66 (pp. 2-99) to be groundwater-connected. No data or discussion is presented regarding the potential groundwater connection of other streams associated with significant wetland and riparian resources, including Pixley Slough, Mormon Slough, Littlejohns Creek, Bear Creek, Potter Creek, Duck Creek and Lone Tree Creek. As such, there is considerable uncertainty regarding the designation of interconnected and disconnected surface water resources in Figure 2-66. The uncertainty regarding the groundwater interconnection of streams in the Subbasin should be identified as a data gap. Section 2.1.4.2 Major Hydraulic Features should discuss (or reference the sections discussing) the following: Specific ISWs, including the extent of both gaining and losing reaches; In-stream flow requirements in each of the interconnected rivers/streams including the amount, time of year when the flow minimum is specified, the duration, the freshwater fish species for which it applies, associated permits that set forth the requirements, and the regulating agency setting forth the compliance requirements; Areas of critical habitat that exist within rivers and streams. Section 2.1.5 Geologic Formations and Stratigraphy Table 2-2 states that Holocene Stream Channel Deposits are generally not saturated except by the San Joaquin River. Based on the available data, it would be expected that the stream channel deposits associated with the other ISWs in the Subbasin would be saturated near those streams and rivers. Section 2.1.9.2.2 Regional Historic Groundwater Flow and Surface Water Interaction should include a discussion of historic groundwater-surface water interaction.	
3. Does the GSP include maps of monitoring networks?	a. Existing Monitoring Wells	X			Maps provided.	Section 2.1.1, Page 80, 83 Section 3.2, Page 235, 242
	b. Data sources:					
	i. California Statewide Groundwater Elevation Monitoring (CASGEM)	X			"The California Statewide Groundwater Elevation Monitoring (CASGEM) and San Joaquin County (SJC) monitoring well networks provide the basis for determining groundwater levels across the Eastern San Joaquin Subbasin."	Section 2.1.1, Page 79
	ii. Water Board Regulated monitoring sites	X			"GAMA data for the Eastern San Joaquin Subbasin contains water quality results collected by the SWRCB-DDW (formerly DHS-DDW), DPR, DWR, LLNL, and USGS from the 1940s to present."	Section 1.2.2, Page 52
	iii. Department of Pesticide Regulation (DPR) monitoring wells	X			"GAMA data for the Eastern San Joaquin Subbasin contains water quality results collected by the SWRCB-DDW (formerly DHS-DDW), DPR, DWR, LLNL, and USGS from the 1940s to present."	Section 1.2.2, Page 52
	c. Future SGMA Monitoring Well Network	X			Maps provided.	Section 4, Page

						265
	i. SGMA Monitoring Well Network map includes identified DACs?		X			
	ii. SGMA Monitoring Well Network map includes identified GDEs?		X			

Summary / Comments

The GSP uses domestic well depths as a basis for determining water level MTs, but does not present the domestic well depth data in the document. A map or maps showing domestic and public supply well depths would provide more transparency.

The GSP identifies that information on domestic well construction including screen interval depths, are not available. However, the GSP does not identify a plan to fill this data gap, even though this information is critical to the GSA's establishment of their water level MTs.

Providing maps of the monitoring network overlaid with location of DACs, GDEs, and any other sensitive beneficial users will allow the reader to evaluate the adequacy of the network to monitor conditions near these beneficial users.

The scientific rationale for removing areas with access to alternate water sources from the identified GDEs should be better explained. Specifically, the results of any supporting habitat assessments should be provided. If no habitat assessments were conducted or reviewed, this should be identified as a data gap.

In the case of managed wetlands, the water sources used by the managed wetlands, the type of managed wetlands, the relationship of the wetlands to groundwater, and the wetland manager should be specified. In addition, these managed wetlands should be identified in Section 1.3.1.

The approach used to identify and exclude GDEs should be supported by actual hydrologic and habitat assessment data. If such data and assessments are not available, the need for supporting studies to validate the approach should be identified as a data gap.

Shallow groundwater data near streams are identified as a significant data gap, and the application of a 30-foot depth to water criterion in light of the identified data gaps needs to be explained and supported.

We recommend that depth to groundwater contour maps are used to verify whether a connection to groundwater exists for polygons in the NC Dataset, instead of relying on inferences based on the presence of surface water features in the Basin.

It is highly advised that seasonal and interannual fluctuations in the groundwater regime are taken into consideration in the evaluation of root zones, particularly for oak trees. Utilizing groundwater data from one point in time or contoured with too few shallow monitoring wells can misrepresent groundwater levels required by GDEs, and inadvertently result in adverse impacts to the GDEs.

We recommend that a discussion regarding the nature and characteristics of the identified GDEs be included.

4. Water Budgets

How were climate change projections incorporated into projected/future water budget and how were key beneficial users addressed?

						265
	i. SGMA Monitoring Well Network map includes identified DACs?		X			
	ii. SGMA Monitoring Well Network map includes identified GDEs?		X			

Summary / Comments

The GSP uses domestic well depths as a basis for determining water level MTs, but does not present the domestic well depth data in the document. A map or maps showing domestic and public supply well depths would provide more transparency.

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It is highly advised that seasonal and interannual fluctuations in the groundwater regime are taken into consideration in the evaluation of root zones, particularly for oak trees. Utilizing groundwater data from one point in time or contoured with too few shallow monitoring wells can misrepresent groundwater levels required by GDEs, and inadvertently result in adverse impacts to the GDEs.

We recommend that a discussion regarding the nature and characteristics of the identified GDEs be included.

4. Water Budgets

How were climate change projections incorporated into projected/future water budget and how were key beneficial users addressed?

Selected relevant requirements and guidance:
GSP Element 2.2.3 "Water Budget Information" (Reg. § 354.18)

Each Plan shall include a water budget for the basin that provides an accounting and assessment of the total annual volume of groundwater and surface water entering and leaving the basin, including historical, current and projected water budget conditions, and the change in the volume of water stored. Water budget information shall be reported in tabular and graphical form.

*Projected water budgets shall be used to estimate future baseline conditions of supply, **demand**, and aquifer response to Plan implementation, and to identify the uncertainties of these projected water budget components. The projected water budget shall utilize the following methodologies and assumptions to estimate future baseline conditions concerning hydrology, water demand and surface water supply availability or reliability over the planning and implementation horizon:*

(b) The water budget shall quantify the following, either through direct measurements or estimates based on data:

(5) If overdraft conditions occur, as defined in Bulletin 118, the water budget shall include a quantification of overdraft over a period of years during which water year and water supply conditions approximate average conditions.

(6) The water year type associated with the annual supply, demand, and change in groundwater stored.

(c) Each Plan shall quantify the current, historical, and projected water budget for the basin as follows:

*(1) Current water budget information shall quantify current inflows and outflows for the basin using the most recent hydrology, water supply, **water demand**, and land use information.*

DWR Water Budget BMP[9]
DWR Guidance for Climate Change Data Use During GSP Development and Resource Guide[10]

Review Criteria	Yes	No	N/A	Relevant Info per GSP	Location (Section, Page)
1. Are climate change projections explicitly incorporated in future/ projected water budget scenario(s)?	X			"Consistent with Section 354.18(d)(3) and Section 354.18(e) of the GSP Regulations, analyses for the Eastern San Joaquin Subbasin GSP evaluated the projected water budget with and without climate change conditions."	Section 2.3.7, Page 212-229
2. Is there a description of the methodology used to include climate change?	X			"Accepted methods for estimating climate change impacts on groundwater are based on the assessment of impacts on the individual water resource system elements that directly link to groundwater. These elements include precipitation, streamflow, evapotranspiration and, for coastal aquifers, sea level rise as a boundary condition. For the Eastern San Joaquin Subbasin, sea level rise was not included. The method for perturbing the streamflow, precipitation, and evapotranspiration input files is described in the following sections. A future scenario of 2070 climate forecasts was evaluated in this analysis, consistent with DWR guidance (CA DWR, 2018b). DWR combined 10 global climate models (GCMs) for two different representative climate pathways (RCPs) to generate the central tendency scenarios in the datasets used in this analysis. The "local analogs" method (LOCA) was used to downscale these 20 different climate projections to a scale usable for California (CA	Section 2.3.7, Page 214

[9] DWR BMP for the Sustainable <management of Groundwater Water Budget: https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Sustainable-Groundwater-Management/Best-Management-Practices-and-Guidance-Documents/Files/BMP-4-Water-Budget.pdf

[10] DWR Guidance Document for the Sustainable Management of Groundwater Guidance for Climate Change Data Use During GSP Development: https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Sustainable-Groundwater-Management/Best-Management-Practices-and-Guidance-Documents/Files/Climate-Change-Guidance_Final.pdf

					DWR, 2018b). The 2070 central tendency among these projections serves to assess impacts of climate change over the long-term planning and implementation period."	
3. What is used as the basis for climate change assumptions?	a. DWR-Provided Climate Change Data and Guidance[11]	X			"The approach developed for this GSP is based on the methodology in DWR's guidance document (CA DWR, 2018b)."	Section 2.3.7, Page 213
	b. Other	X			"The following resources from DWR were used in the climate change analysis: • SGMA Data Viewer • Guidance for Climate Change Data Use During Sustainability Plan Development and Appendices (Guidance Document) • Water Budget BMP • Climate Change Desktop IWFM Tools. The SGMA Data Viewer is where the climate change forecast datasets are available for download (CA DWR, 2018c). The guidance document details the approach, development, applications, and limitations of the datasets available from the SGMA Data Viewer (CA DWR, 2018c). The Water Budget BMP describes in greater detail how DWR recommends projected water budgets be computed (CA DWR, 2016). The Desktop IWFM Tools are available to calculate the projected precipitation and evapotranspiration inputs under climate change conditions (CA DWR, 2018b)."	Section 2.3.7, Page 213
4. Does the GSP use multiple climate scenarios?			X		Includes a baseline and a 2070 climate conditions scenario.	
5. Does the GSP quantitatively incorporate climate change projections?		X			"Under the climate change scenario, the average annual precipitation is 11 percent higher than the projected conditions scenario, increasing from 984,000 AF/year to 1,090,000 AF/year. Similarly, the average annual volume of evapotranspiration is 6 percent higher than the projected conditions scenario, increasing to 1,476,000 AF/year from 1,394,000 AF/year. Despite there being higher flows in streams, the monthly timing of the flows meant that surface water diversions were not expected to change due to both availability of water in the stream and water rights agreements limiting diversion months. With a similar surface water supply and increased water demands under the climate change scenario, private groundwater production is simulated to increase approximately 11 percent, from 801,000 AF/year to 887,000 AF/year. Under climate change conditions, the depletion in aquifer storage is expected to increase by about 68 percent to an average annual storage change of 57,000 AF/year, from 34,000 AF/year in the projected conditions scenario."	Section 2.3.7, Page 226
6. Does the GSP explicitly account for climate change in the following elements of the water budget?	a. Inflows: i. Precipitation	X			"2.3.7.3.2 Precipitation and Evapotranspiration under Climate Change"	Section 2.3.7, Page 222-226
	ii. Surface Water	X			"2.3.7.3.1 Streamflow under Climate Change"	Section 2.3.7, Page 214-221
	iii. Imported Water			X	No imported supplies in the basin.	
	iv. Subsurface Inflow	X			Included in Figure 2-102.	Section 2.3.7, Page 229

[11] DWR Guidance Document for the Sustainable Management of Groundwater Guidance for Climate Change Data Use During GSP Development: https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Sustainable-Groundwater-Management/Best-Management-Practices-and-Guidance-Documents/Files/Climate-Change-Guidance_Final.pdf
DWR Resource Guide DWR-Provided Climate Change Data and Guidance for Use During GSP Development: https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Sustainable-Groundwater-Management/Best-Management-Practices-and-Guidance-Documents/Files/Resource-Guide-Climate-Change-Guidance_v8.pdf

	b. Outflows:	i. Evapotranspiration	X			"2.3.7.3.2 Precipitation and Evapotranspiration under Climate Change"	Section 2.3.7, Page 222-226
		ii. Surface Water Outflows (incl. Exports)	X			"2.3.7.3.1 Streamflow under Climate Change"	Section 2.3.7, Page 214-221
		iii. Groundwater Outflows (incl. Exports)	X			"With a similar surface water supply and increased water demands under the climate change scenario, private groundwater production is simulated to increase approximately 11 percent, from 801,000 AF/year to 887,000 AF/year. Under climate change conditions, the depletion in aquifer storage is expected to increase by about 68 percent to an average annual storage change of 57,000 AF/year, from 34,000 AF/year in the projected conditions scenario. A graphical representation of simulated changes to precipitation, evapotranspiration, and groundwater pumping are presented in Figure 2-98 though Figure 2-100, and complete water budgets for the climate change scenario are shown in Figure 2-101 and Figure 2-102."	Section 2.3.7, Page 226
7. Are demands by these sectors explicitly included in the future/projected water budget?	a. Domestic Well users (<5 connections)			X			Expected to be in Section 2.3.5, Page 208
	b. State Small Water systems (5-14 connections)			X			
	c. Small community water systems (<3,300 connections)			X			
	d. Medium and Large community water systems (> 3,300 connections)			X			
	e. Non-community water systems			X			
8. Are water uses for native vegetation and/or wetlands explicitly included in the current and historical water budgets?				X		The following items related to GDEs, wetlands and riparian areas should be clarified or considered: "Riparian intake from streams" is identified as a stream system water budget component and is defined as the portion of riparian evapotranspiration (ET) met by streamflows. Please include an explanation of the approach to determining the amount of riparian ET demand met by streamflow vs. groundwater evapotranspiration. Groundwater outflow to ET does not appear to be identified as a groundwater budget component (for example see Figure 2-74, p. 2-125). In addition, the ET demand of natural vegetation does not appear to be considered in water supply and demand calculations (for example see Table 2-16, p. 2-126). Since wetlands, GDEs and riparian vegetation are recognized as beneficial users of groundwater in the Subbasin, it is appropriate to include them in these calculations.	Section 2.3.5, Page 193-211
9. Are water uses for native vegetation and/or wetlands explicitly included in the projected/future water budget?				X			Expected to be in Section 2.3.5, Page 208

Summary / Comments
It is not clear how climate change is anticipated to change the demands of domestic users and small public water systems or how these demands were accounted for in the projected water budget.

Please include an explanation of the approach to determining the amount of riparian ET demand met by streamflow vs. groundwater evapotranspiration.

Groundwater outflow to ET does not appear to be identified as a groundwater budget component. In addition, the ET demand of natural vegetation does not appear to be considered in water supply and demand calculations. Since wetlands, GDEs and riparian vegetation are recognized as beneficial users of groundwater in the Subbasin, it is appropriate to include them in these calculations.

5. Management Areas and Monitoring Network

How were key beneficial users considered in the selection and monitoring of Management Areas and was the monitoring network designed appropriately to identify impacts on DACs and GDEs?

Selected relevant requirements and guidance:
GSP Element 3.3, "Management Areas" (§354.20):

(b) A basin that includes one or more management areas shall describe the following in the Plan:
(2) The minimum thresholds and measurable objectives established for each management area, and an explanation of the rationale for selecting those values, if different from the basin at large.
(3) The level of monitoring and analysis appropriate for each management area.
(4) An explanation of how the management area can operate under different minimum thresholds and measurable objectives without causing undesirable results outside the management area, if applicable.
(c) If a Plan includes one or more management areas, the Plan shall include descriptions, maps, and other information required by this Subarticle sufficient to describe conditions in those areas.

CWC Guide to Protecting Drinking Water Quality under the SGMA[12]
TNC's Groundwater Dependent Ecosystems under the SGMA, Guidance for Preparing GSPs[13]

Review Criteria	Yes	No	N/A	Relevant Info per GSP	Location (Section, Page)
1. Does the GSP define one or more Management Area?		X		The GWA encompasses 15 GSAs, without designated management areas.	Section 1.1.4, Page 31
2. Were the management areas defined specifically to manage GDEs?			X		
3. Were the management areas defined specifically to manage DACs?			X		
a. If yes, are the Measurable Objectives (MOs) and MTs for GDE/DAC management areas more restrictive than for the basin as a whole?			X		
b. If yes, are the proposed management actions for GDE/DAC management areas more restrictive/ aggressive than for the basin as a whole?			X		
4. Does the GSP include maps or descriptions indicating what DACs are located in each Management Area(s)?			X		
5. Does the GSP include maps or descriptions indicating what GDEs are located in each Management Area(s)?			X		

[12] CWC Guide to Protecting Drinking Water Quality under the SGMA: https://d3n8a8pro7vhmx.cloudfront.net/communitywatercenter/pages/293/attachments/original/1559328858/Guide_to_Protecting_Drinking_Water_Quality_Under_the_Sustainable_Groundwater_Management_Act.pdf?1559328858

[13] TNC's Groundwater Dependent Ecosystems under the SGMA, Guidance for Preparing GSPs: https://www.scienceforconservation.org/assets/downloads/GDEsUnderSGMA.pdf

6. Does the plan identify gaps in the monitoring network for DACs and/or GDEs?	X			"Groundwater level monitoring data gaps exist in areas where data is limited. Specifically, areas of high data needs include monitoring near streams, Subbasin boundaries, and the central area of groundwater depression." Groundwater quality monitoring data gaps have three components: **1. Spatial Distribution:** Monitoring wells are mainly focused in the western portion of the Subbasin, as this area has historically had the highest concentrations of TDS. Additional sampling performed within these identified areas will provide more information about salinity in the indicated locations. 2. **Well construction data:** The majority of groundwater quality monitoring wells are screened in intervals between 100 to 300 feet bgs. Only one well is screened below this interval, to a depth of 467 feet bgs. Both deeper and shallower groundwater quality monitoring wells are needed to better understand the spatial distribution of salinity concentrations in the Subbasin. 3. **Monitoring Frequency:** Temporally, groundwater quality monitoring occurs at different frequencies across the Subbasin, dependent on the monitoring agency responsible (summarized in Table 4-7). The groundwater quality monitoring network under the GSP will utilize a standardized, quarterly monitoring schedule to ensure all wells are sampled regularly."	Section 4.7 Pages 263-264
a. If yes, are plans included to address the identified deficiencies?	X			"Data gaps will be filled by leveraging existing wells and by constructing new wells through Technical Support Services (TSS) funding, future grant funding, and GSA funding. In total, there are 12 proposed new monitoring well sites (shown in Figure 4-3 in orange); these wells will also be measured for groundwater levels and groundwater quality." "The new wells are distributed throughout the Subbasin and increase coverage near streams, Subbasin boundaries, and in the central area of groundwater depression. Two recommended monitoring locations are adjacent to Dry Creek, to provide data relevant to potential surface water depletions and subsurface flows across the Subbasin boundary to the Cosumnes Subbasin to the north. Relevant data from these and other wells will be shared with Cosumnes Subbasin GSAs and parallel efforts will be coordinated." The areas identified as potential GDEs in the GSP are located near the western boundary of the Subbasin. Only one of the representative monitoring wells appears to be located near those areas (Figure 4-1 on p. 4-5). Very few of the remaining monitoring wells are located near potential ISWs and GDEs. Per the GSP Regulations (23 CCR §354.34 (a) and (b)), monitoring must address trends in groundwater and related surface conditions. Groundwater level monitoring alone may be insufficient to establish a linkage between	Section 4.7.1 Page 264

				groundwater extraction and potentially resulting impacts to environmental resources associated with GDEs and ISWs. The cause-effect relationship between groundwater levels and the biological responses that could result in significant and unreasonable impacts to ISWs and GDEs depends on a number of complicated factors, and this relationship is not characterized or discussed. As such, it is not possible to determine whether the proposed monitoring, minimum thresholds and measurable objectives are sufficiently protective to ensure significant and unreasonable impacts to GDEs and ISWs will be prevented. Well sites near ISWs should be selected at varying distances from streams and completed as vertically-nested clusters to capture the lateral and vertical gradients between the pumped depths in the aquifer system and the shallow groundwater aquifers that are in communication with ISWs or GDEs. There is a need to enhance monitoring of stream flow and vertical groundwater gradients by installing more stream gauges and clustered/nested wells near streams, rivers or wetlands. Ideally, co-locating stream gauges with clustered wells would enhance understanding about where ISWs exist in the basin and whether pumping is causing depletions of surface water or impacts on beneficial users of surface water and groundwater. Section 5.3 Table 5.3 indicates that data regarding streamflow and GDEs is not currently included in the proposed Data Management System.	

Summary / Comments

The GSP clearly identifies plans to address data gaps in the monitoring network near streams, but does not clearly identify whether data gaps exist near DACs/drinking water users. A map illustrating the location of current and proposed monitoring well locations and depths relative to domestic and small public water systems wells and depths would allow the reader to assess the adequacy of the proposed network for monitoring impacts to these beneficial users.

Very few of the remaining monitoring wells are located near potential ISWs and GDEs. Specific monitoring of GDEs and ISWs should be described to further evaluate, monitor, manage and protect these areas.

It is not possible to determine whether the proposed monitoring, minimum thresholds and measurable objectives are sufficiently protective to ensure significant and unreasonable impacts to GDEs and ISWs will be prevented. The GDE Pulse interactive mapping application[14] provides an example of a linkage between groundwater level data and GDE health that could be used to incorporate remote sensing into an efficient and incisive monitoring program. Please provide an explanation how groundwater levels will specifically be used to assess adverse impacts to GDEs and ISWs, and identify any data gaps and how they will be addressed.

Monitoring well locations should be prioritized near high value or sensitive resources (GDEs) that are vulnerable to significant and unreasonable impacts, such as near the protected lands identified in our comments on Section 1.3.1 or the GDEs identified in the Subbasin. In addition to the major streams and rivers in the subbasin, impacts to smaller creeks and wetland areas should be considered, as these may be the most vulnerable resources. Please discuss the results of a resource assessment or consultations

[14] **GDE Pulse can be accessed here: https://groundwaterresourcehub.org/sgma-tools/gde-pulse/**

with resource managers that demonstrates a sufficient number of wells is proposed to address data gaps near GDEs and ISWs, and that they are being sited where they will provide the most benefit. Alternatively, please outline the process by which this will be accomplished. Please address how the need to link and correlate groundwater level declines to biological responses, and significant and adverse impacts to GDEs and ISWs will be addressed. Addressing data gaps is typically iterative and it is not reasonable to expect it will be a one-time process. Please describe the process by which data gaps will be identified and addressed on an ongoing basis. Section 5.3 Table 5.3 indicates that data regarding streamflow and GDEs is not currently included in the proposed Data Management System. Please discuss which monitoring data for "related surface conditions" will be gathered and incorporated in the DMS to assess potential significant and unreasonable impacts to environmental beneficial uses and users. In Section 7.3.1, please clarify the potential use of imagery as a monitoring tool, and expand it to monitoring surface indicators of ISW and GDE ecosystem health. In Section 7.3.2.2, please specifically address ecosystem health of GDEs and ISWs as a surface indicator to subsurface conditions. This can be done using GDEPulse, remote sensing, imagery or other feasible methods.

6. Measurable Objectives and Undesirable Results

How were DAC and GDE beneficial uses and users considered in the establishment of Sustainable Management Criteria?

Selected relevant requirements and guidance:
GSP Element 3.4 "Undesirable Results" (§ 354.26):
(b) The description of undesirable results shall include the following:
(3) Potential effects on the beneficial uses and users of groundwater, on land uses and property interests, and other potential effects that may occur or are occurring from undesirable results
GSP Element 3.2 "Measurable Objectives" (§ 354.30)
(a) Each Agency shall establish measurable objectives, including interim milestones in increments of five years, to achieve the sustainability goal for the basin within 20 years of Plan implementation and to continue to sustainably manage the groundwater basin over the planning and implementation horizon.

Review Criteria	Yes	No	N/A	Relevant Info per GSP	Location (Section, Page)
1. Are DAC impacts considered in the development of Undesirable Results (URs) and MOs for groundwater levels and groundwater quality?		X		DACs are not explicitly addressed, but domestic well users are considered under URs. WL URs: "If groundwater levels were to cause undesirable results, effects could include de-watering of a subset of the existing groundwater infrastructure, starting with the shallowest wells, which are generally domestic wells; and adverse effects on groundwater-dependent ecosystems, to the extent connected with the production aquifer." WQ URs: "If groundwater quality were degraded resulting in undesirable results, the effect would potentially include: reduction in usable supply of groundwater, domestic wells being dewatered, increased treatment costs, and required access to alternate supplies can be unaffordable for small users. Some water quality issues could potentially cause more impact to agricultural uses than municipal or domestic uses, depending on the impact of the contaminant to these water use sectors." WL MTs: "The minimum thresholds for chronic lowering of groundwater levels are the shallower of 1992 and 2015-2016 historical groundwater levels with a buffer of 100 percent of historical range applied, *or* the 10th percentile domestic well total depth of wells within a 3-mile radius of the monitoring well, whichever is shallower at each representative monitoring well site." WQ MTs: "The minimum threshold of 1,000 mg/L was defined by considering two primary beneficial uses as risk of undesirable results related to salinity: drinking water quality and agriculture uses. The minimum threshold was defined by the GWA Board and reflects input from agricultural and municipal stakeholders, including local drinking water purveyors and the	Section 3.2.1, Page 232 Section 3.2.3, Page 241

				local agricultural community."	
2. Does the GSP explicitly discuss how stakeholder input from DAC community members was considered in the development of URs and MOs?		X		"Potential impacts and the extent to which they are considered significant and unreasonable are determined by the GWA Board and with input by the Advisory Committee, Workgroup, and members of the public. During development of the GSP, potential undesirable results identified by stakeholders included a significant and unreasonable: • Number of wells going dry • Reduction of in the pumping capacity of existing wells • Increase in pumping costs due to greater lift • Need for deeper well installations or lowering of pumps" "Salinity is the only water quality constituent for which minimum thresholds are established in the Eastern San Joaquin Subbasin. Although other constituents, including arsenic, nitrogen, and sulfate, are evaluated in the Current and Historical Groundwater Conditions section of this GSP (Section 2.2), these constituents are managed through existing management and regulatory programs within the Subbasin…. TDS was selected for the evaluation of sustainable management criteria for salinity under this sustainability indicator, as historical data for TDS are more widely available in the Eastern San Joaquin Subbasin than other constituents used to measure salinity, such as electrical conductivity (EC) or chloride. This decision was made by the GWA Board based on the greater availability of TDS data in the Subbasin." Stakeholder input from DAC community members does not appear to have been considered in establishment of water quality URs, based on the information presented in the GSP.	Section 3.2.1.1.1 Page 232 Section 3.2.3.1.1 Pages 240-241
3. Does the GSP explicitly consider impacts to GDEs and environmental BUs of surface water in the development of MOs for groundwater levels and depletions of ISWs?		X		Section 2.2.7 includes the incorrect statement that SGMA does not require sustainable management criteria to be established for the management of GDEs. Section 1.3.1 of the GSP states that beneficial users of groundwater and ISWs include "environmental users of groundwater, including species and habitat reliant on instream flows, as well as wetlands and GDEs." Undesirable results under SGMA include chronic lowering of groundwater levels resulting in significant and unreasonable depletion of supply for beneficial groundwater users, including GDEs. Undesirable results also include depletion of ISWs resulting in significant and unreasonable adverse impacts on beneficial users of surface water, including wetlands and GDEs. The incorrect statement that SGMA does not require the establishment of sustainable management criteria for GDEs should be removed. Per the GSP Regulations (23 CCR §354.34 (a) and (b)), monitoring must address trends in groundwater and related surface conditions (emphasis added). Groundwater level monitoring alone may be insufficient to establish a linkage between groundwater extraction and potentially resulting impacts to environmental resources associated with GDEs and ISWs. The cause-effect	

				relationship between groundwater levels and the biological responses that could result in significant and unreasonable impacts to ISWs and GDEs depends on a number of complicated factors, and this relationship is not characterized or discussed. As such, it is not possible to determine whether the proposed monitoring, minimum thresholds and measurable objectives are sufficiently protective to ensure significant and unreasonable impacts to GDEs and ISWs will be prevented. The GDEpulse interactive mapping application provides an example of a linkage between groundwater level data and GDE health that could be used to incorporate remote sensing into an efficient and incisive monitoring program. Please provide an explanation how groundwater levels will specifically be used to assess adverse impacts to GDEs and ISWs, and identify any data gaps and how they will be addressed.	
4. Does the GSP explicitly consider impacts GDEs and environmental BUs of surface water and recreational lands in the discussion and development of Undesirable Results?		X		Section 3.2.1.1.1 Description of Undesirable Results (for chronic lowering of groundwater levels only describes undesirable results relating to human beneficial uses of groundwater and neglects environmental beneficial uses that could be adversely affected by chronic groundwater level decline. Section 3.2.6.1.1 Description of Undesirable Results (for ISWs) states that undesirable results related to surface water depletion were defined and evaluated only for major streams and rivers including the Calaveras River, Dry Creek, Mokelumne River, San Joaquin River, and Stanislaus River. The section goes on to state that many of the smaller creeks and streams are solely used for the conveyance of irrigation water and these systems have not been considered in the analysis of depletions. Contrary to these statements, surface water resources in these creeks County support significant recognized aquatic habitat, wetlands and riparian zones that represent potential environmental beneficial uses and users of groundwater. A number of these streams are associated with designated protected lands. The analysis for potential depletion of ISWs in Section 3.2.6 does not include all beneficial users of surface water that could be affected by groundwater withdrawals, including environmental beneficial users along creeks. Section 3.2.6.1.2 Identification of Undesirable Results (for ISWs) states that "undesirable results would occur if groundwater extractions depleted interconnected streams and there was not sufficient surface water to supply … fish and wildlife demands." This definition of undesirable results is overly narrow and recognizes only a limited subset of the environmental beneficial users of ISWs. In Section 3.2.6.1.3 Potential Effects of Undesirable Results (for ISWs), the potential effects of undesirable results on environmental beneficial users are not described.	

Summary / Comments

Stakeholder input from DAC community members does not appear to have been considered in establishment of water quality URs, based on the information presented in the GSP.

Based on the presented information, domestic well uses are considered under URs and for the development of water level MOS and MTs, but DAC members are not explicitly considered. More detail and specifics regarding DAC members, including those that rely on smaller community drinking water systems, not only domestic wells, is necessary to demonstrate that these beneficial users were adequately considered.

The incorrect statement that SGMA does not require the establishment of sustainable management criteria for GDEs should be removed.

Please add “potential adverse impacts to GDEs” to the list of potential undesirable results presented in Section 3.2.1.1.1.

The analysis for potential depletion of ISWs in Section 3.2.6 should include all beneficial users of surface water that could be affected by groundwater withdrawals, including environmental beneficial users along creeks, even if the creeks are interconnected less than 75% of the time.

The definition of undesirable results for ISWs is overly narrow and recognizes only a limited subset of the environmental beneficial users of ISWs. A more complete definition would be that undesirable results would occur if groundwater extraction resulted in a depletion of surface water that caused significant impacts to aquatic species or wildlife, or degradation of wetlands, riparian habitats and GDEs. Please expand the definition of undesirable results to include all of the environmental beneficial uses and users of ISWs, and expand the analysis in Section 3.2.6, as appropriate.

Please expand Section 3.2.6.1.3 to describe the potential effects of undesirable results on all beneficial uses and users of ISWs, including environmental uses and users.

7. Management Actions and Costs

What does the GSP identify as specific actions to achieve the MOs, particularly those that affect the key BUs, including actions triggered by failure to meet MOs? What funding mechanisms and processes are identified that will ensure that the proposed projects and management actions are achievable and implementable?

Selected relevant requirements and guidance

GSP Element 4.0 Projects and Management Actions to Achieve Sustainability Goal (§ 354.44)

(a) Each Plan shall include a description of the projects and management actions the Agency has determined will achieve the sustainability goal for the basin, including projects and management actions to respond to changing conditions in the basin.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(1) A list of projects and management actions proposed in the Plan with a description of the measurable objective that is expected to benefit from the project or management action.

Review Criteria	Yes	No	N/A	Relevant Info per GSP	Location (Section, Page)
1. Does the GSP identify benefits or impacts to DACs as a result of identified management actions?		X		"Project addresses Disadvantaged Communities (DACs) and/or Severely Disadvantaged Communities (SDACs)" was a criterion for project prioritization, but, project benefits and impacts are not explicitly discussed in terms of DACs.	Section 6.2.1, Page 275
2. If yes: b. Is a plan to mitigate impacts on DAC drinking water users included in the proposed Projects and Management Actions?		X			
c. Does the GSP identify costs to fund a mitigation program?		X			
d. Does the GSP include a funding mechanism to support the mitigation program?		X			
2. Does the GSP identify specific management actions and funding mechanisms to meet the identified MOs for groundwater quality and groundwater levels?	X			23 projects that are expected to benefit groundwater levels are summarized in Tables 6-1 (benefits and costs) and 7-3 (funding mechanisms). Table 6-1 lists potential projects and the Measurable Objective that is expected to benefit. Only water level benefits are listed, but maintenance or recovery of groundwater levels, or construction of recharge facilities, also will have environmental benefits in many cases. From the table, it is not possible to distinguish the full range of project benefits or how the projects will be prioritized. It would be advantageous to demonstrate multiple benefits from a funding and prioritization perspective.	Section 6.2.3, Page 277 Section 7.8, Page 319
3. Does the GSP include plans to fill identified data gaps by the first five-year report?	X			"A description of the monitoring network will be provided in the 5-year report. Data gaps, or areas of the Subbasin that are not monitored in a manner consistent with the requirements of the regulations, will be identified or re-assessed if previously identified. An assessment of the monitoring networks' function will be provided, along with an analysis of data collected to-date. If data gaps are identified, the GSP will be revised to include a program for addressing these data gaps, along with an implemented schedule for addressing data gaps and how the GSAs will incorporate updated data into	Section 7.6.4, Page 317

				the GSP."	
4. Do proposed management actions include any changes to local ordinances or land use planning?		X			
5. Does the GSP identify additional/contingent actions and funding mechanisms in the event that MOs are not met by the identified actions?		X			Expected in Section 6 or 7
6. Does the GSP provide a plan to study the interconnectedness of surface water bodies?		X		"In the Eastern San Joaquin Subbasin, groundwater discharge from the aquifer is primarily through groundwater pumping. However, groundwater also discharges to streams where groundwater elevations are higher than the streambed. Figure 2-65 shows gaining streams in blue where groundwater discharges to rivers, losing streams in red where streams lose water to the groundwater system, and mixed streams (gaining or losing less than 75 percent of the time) in orange. This analysis was based on modeling results from the historical calibration of the ESJWRM for approximately 900 stream nodes in the Eastern San Joaquin Subbasin." No plan for further study.	Section 2, Page 175-177
7. If yes: a. Does the GSP identify costs to study the interconnectedness of surface water bodies?			X		
b. Does the GSP include a funding mechanism to support the study of interconnectedness surface water bodies?			X		
8. Does the GSP explicitly evaluate potential impacts of projects and management actions on groundwater levels near surface water bodies?		X		Potential impacts of projects and management actions on groundwater levels near surface water bodies are not evaluated.	

Summary / Comments

The likely benefits and impacts to DAC members by the proposed projects and management actions are not clearly identified in the GSP. A discussion should be added for each project or management action to clearly identify the benefits to DAC drinking water users and potential impacts to the water supply. For all potential impacts, the project/management action should include a clear plan to monitor for, prevent, and/or mitigate against such impacts.

The GSP does not appear to include any plans to address impacts to domestic well users if domestic wells do go dry in the future. Based on the water level MTs, at least 10% of domestic wells would be expected to be dewatered if MT levels are reached. While the identified projects are intended to keep water levels above the MTs, no program is provided as a contingency in case 1) groundwater conditions decline before the projects are fully implemented, or 2) implementation of such projects does not have the desired effects. A plan to mitigate impacts to DAC drinking water users could include a program to replace wells, connect well users to a public water system, establishment of a tanked water program, etc. The GSP should also identify a mechanism to fund such a program.

From Table 6-1 it is not possible to distinguish the full range of project benefits or how the projects will be prioritized. It would be advantageous to demonstrate multiple benefits from a funding and prioritization perspective.

Potential impacts of projects and management actions on groundwater levels near surface water bodies should be evaluated as part of the GSP.

Focused Technical Review:
July 2019 Eastern San Joaquin Subbasin Public Draft Groundwater Sustainability Plan (GSP)

Water Levels

The draft GSP sets the minimum thresholds (MTs) for groundwater levels at representative monitoring well sites as the shallower of either: (1) the shallower of 1992 or 2015-2016 historical groundwater levels with a buffer of 100 percent of historical range applied, or (2) the 10th percentile of total depth of domestic wells within a 3-mile radius of a representative monitoring well site[1]. This approach to setting water level MTs and the selected representative monitoring network leaves key beneficial users in the subbasin, specifically domestic well users and in particular members of disadvantaged communities (DACs), potentially vulnerable to impacts.

- The draft GSP specifies that the total depth of domestic wells were used as a basis for determining water level undesirable results and MTs. However, a water supply well becomes unusable or subject to decreased performance and longevity as water levels fall within the screened interval, which will occur before water levels reach the bottom of the well. Given this consideration, **the draft GSP should consider that using the total well depth or bottom of the screen interval would result in more wells being impacted than assumed by the 10th percentile calculation.**
- According to the draft GSP, "an average of 400 domestic wells were captured within a 3-mile radius of each representative monitoring well, covering approximately 76 percent [%] of the domestic wells in the Subbasin" (Section 3.2.1.2). **Figure 1** shows the location of the representative monitoring network wells (RMWs) for water levels and the domestic wells within the subbasin, based on research conducted for development of the Community Water Center (CWC) Vulnerability Tool.[2] Each dot is scaled to represent the number of wells located within a given PLSS Section (i.e., approximately a 1-square mile grid cell). The CWC Vulnerability Tool uses domestic well data from the Online System for Well Completion Reports (OSCWR), which was then processed to remove wells identified as abandoned or destroyed. Therefore, the assessment shown in **Figure 1** uses the same dataset that is cited in the draft GSP for this analysis. However, based on the assessment presented in **Figure 1**, approximately 4,800 domestic wells out of approximately 9,600 domestic wells located in the subbasin are located within the buffer radius. **This represents one-half of the domestic wells in the subbasin, rather than the approximately 76%, as described in the draft GSP (Section 3.2.1.2).** Therefore, based on the available data, it appears that substantially fewer domestic wells were considered for the purposes of developing water level MTs than is described by the draft GSP. **It is therefore recommended that the data and methodology used to develop water level MTs in the draft GSP be made more clear and transparent, and include a clear set of figures and tables illustrating the process and results of this analysis.**
- As illustrated on **Figure 1**, the water level RMW network included in the draft GSP provides a high density of coverage in the center and southern parts of the subbasin, but does not provide adequate coverage to allow for monitoring and protection of domestic well users (through establishment of and compliance with Measurable Objectives [MOs] and MTs) that are located

[1] For well 03N07E21L003 a two-mile radius is used.
[2] The domestic well data layer used for this analysis was developed by the Water Equity Science Shop (WESS) as part of Community Water Center's Drinking Water Vulnerability Tool, which will be publicly released in winter 2019.

outside of these areas. Based on the assessment described above, this amounts to approximately 50% of the domestic wells within the subbasin, including domestic well users: (1) in and around the DACs of Terminous and Thorton, (2) immediately south of the DAC of Stockton, and (3) in the northwestern portion of the subbasin near Valley Springs. The draft GSP's discussion of representative groundwater level site selection (Section 4.1.1) does not describe how the selected wells were demonstrated to be "representative", nor is there an explanation as to why certain portions of the subbasin were left out of the RMW network. Based on the broad monitoring network shown in Figure 4-1, existing wells that could serve as RMWs are available in these areas. **It is therefore recommended, that in order to improve the water level monitoring network, that additional *RMWs* (with MOs/MTs) be established to be protective of domestic water users in the areas identified above.**

- **Figure 1** also shows the location of community water systems in the subbasin. As identified above, the limited spatial distribution of the water level monitoring network does not provide equal coverage across the subbasin. In particular, the RMW network does not provide coverage: (1) in the northwestern portion of the subbasin, which includes the community water systems of the Kings Island Trailer Park Water System, Little Potato Slough Mutual, the Riverside Mobile Home Park, and the San Joaquin County Thornton water system, which collectively serve over 2,000 people; (2) the northeastern portion of the subbasin which includes the Wallace and Jenny Lind areas of the Calaveras County Water District, which serve nearly 10,000 people; or (3) in the southeast portion of the subbasin, which includes the Knights Ferry Community Services District and the Twin Cypress Mobile Home Park systems, which serve approximately 280 people. **It is therefore recommended, that in order to improve the water level monitoring network, that additional *RMWs* (with MOs/MTs) be established to be protective of community water systems in these areas.**

- **Figure 2** shows the approximate elevations of the domestic well depths (as feet below ground surface; ft bgs) along with the proposed water level MTs from the draft GSP. MTs and domestic well depths are shown with red representing the shallowest wells/water levels and blue representing the deepest wells/water levels. Based on this assessment, it appears that many domestic wells are completed to deeper depths than the proximate water level MTs. However, the domestic wells that are located farther from the current monitoring locations tend to be among the shallowest wells in the subbasin. In particular, wells surrounding the DACs of Terminous and Thorton, as well as those in the central and southern portions of the DAC of Stockton appear to be particularly shallow and thus more vulnerable to decreasing water levels. As described above, it is recommended that the monitoring well network be expanded to include consideration of these vulnerable communities. However even if the RMW network is not expanded, **it is recommended that contours of water levels across the subbasin be provided for two scenarios: 1) if MOs are reached at each RMW, and 2) if MTs are reached at each RMW. In order to evaluate the potential impacts to domestic well users located further than 3 miles from a RMW, it is recommended that the domestic well depths across the subbasin be compared to the contoured scenarios, and that the results be presented in the GSP. Per 23 CCR § 354.28, these assessments should be included in the GSP in order for the public and DWR to able to fully evaluate the ability of the proposed sustainable management criteria and monitoring program to protect beneficial users within the subbasin.**

- As illustrated in **Figure 2**, there appear to be quite a few domestic wells located near RMWs 04N07E20H003M, 02N07E03D001, 02N07E29B001, and Lodi City Well #2 that are significantly more shallow than the MTs. **It is recommended that a more detailed assessment be provided in the GSP to provide a more transparent assessment of the number and locations of domestic wells expected to go dry at the proposed MTs.**

Water Quality

The draft GSP includes limited analysis of water quality constituents and defines undesirable results (URs) for water quality relative to "impacts to the long-term viability of domestic, agricultural, municipal, environmental, or other beneficial uses over the planning and implementation horizon of this GSP" (Section 3.2.1.1). For the reasons identified below, the water quality monitoring network and analysis presented in the draft GSP does not clearly illustrate how the sustainable management criteria will be sufficient to ensure that the stated water quality UR of impacting the long-term viability of the groundwater resource, particularly for domestic water users including DACs, will be avoided.

- The draft GSP states that "An undesirable result for degraded water quality in the Eastern San Joaquin Subbasin is experienced if groundwater management activities cause significant and unreasonable impacts to the long-term viability of domestic, agricultural, municipal, environmental, or other beneficial uses over the planning and implementation horizon of this GSP" (Section 3.2.3.1.1). However, the draft GSP only defines MOs/MTs for salinity, and states that "Although other constituents, including arsenic, nitrogen, and sulfate, are evaluated in the Current and Historical Groundwater Conditions section of this GSP (Section 2.2), these constituents are managed through existing management and regulatory programs within the Subbasin. … Through monitoring, the GSP will document these constituents and identify opportunities for coordination with existing programs" (Section 3.2.3.1.1). Per 23 CCR § 354.28, **the draft GSP should provide a detailed explanation as to how this approach will result in protection of groundwater for DACs and other drinking water beneficial users in the subbasin.**

- The draft GSP sets MOs/MTs for groundwater quality for ten RMWs within the subbasin; however, given that several wells are located very near each other, based on the spatial distribution, the network effectively consists of only eight locations within the subbasin.[3] This represents only one well for approximately 150 square miles of groundwater subbasin, or 0.67 wells per 100 square miles. This monitoring well density is just barely within the established DWR guidance for monitoring well densities of between 0.2 and 10 wells per 100 square miles.[4] Further, the DWR guidance provides a range of recommended monitoring density and notes that the frequency of monitoring wells depends on local geology, extent of groundwater use, and how the GSP defines undesirable results. The draft GSP notes that "Historically, high TDS concentrations have occurred in the western portion of the Subbasin, near the San Joaquin River and urban areas; as such, the majority of representative monitoring wells are located in the western half of the Subbasin. Monitoring wells are located both within areas of high TDS concentrations, to observe and monitor TDS trends, and adjacent to high TDS areas, to observe potential TDS movement" (Section 4.3.1). However, the goal of measuring avoiding the degradation of water quality in the

[3] It is noted that the GSP acknowledges that water quality data from additional wells will be included for annual reporting purposes, but not compliance purposes under SGMA.
[4] DWR, 2016. *Best Management Practices for the Sustainable Management of Groundwater, Monitoring Networks and Identification of Data Gaps (BMP #2),* December 2018.

subbasin should not be limited to areas where this impact has already occurred. **Given the complexity of this subbasin and the geographic distribution of sensitive beneficial users, this proposed network of water quality RMWs appears to be insufficient to monitor impacts to groundwater for drinking water beneficial users, particularly domestic well users and DACs.**

- **Figure 3** shows the location of domestic wells within the subbasin. Each dot is scaled to represent the number of wells located within a given PLSS Section (i.e., approximately a 1-square mile grid cell). **Figure 3** also shows the location of the ten water quality RMWs. All water quality RMWs are located in the western one-third of the subbasin. However, **roughly 80% of the domestic wells in the subbasin are located east of the area being monitored for water quality pursuant to the draft GSP**. In addition, numerous community water systems, including those serving schools, mobile home communities, and small mutual water company and community service districts are located north and east of the RWM network. **A substantial portion of domestic well users and those that rely on small community water systems are located in areas far outside of the water quality RMW network, including those in the DACs of Thornton, Collierville, Lockeford, and Valley Home. The draft GSP should describe how the proposed RMWs will ensure that the groundwater used by these domestic well users and community water systems will be managed to avoid significant and unreasonable negative water quality impacts to these beneficial users.**
- According to the draft GSP, the current proposed RMW network is limited to locations on the west side of the subbasin in and near areas that have had historically high concentrations of TDS. However, as identified above, a significant proportion of drinking water users are located outside of this area. In order to improve the monitoring network for water quality, we recommend that additional *representative* monitoring wells (with MTs) be established to be protective of the DACs of **Thornton, Collierville, Lockeford, and Valley Home**, and throughout the eastern portion of the subbasin.
- The draft GSP states that "increased arsenic concentrations have not been found to be related to groundwater management activities in the Subbasin" (Section 2.2.4.3). However, the draft GSP does not provide any additional information or to support this statement. Arsenic concentrations have been shown in some areas of the Central Valley to have a relationship to the dewatering of the Corcoran Clay.[5] **The spatial relationship between the presence of the Corcoran Clay and arsenic concentrations should be evaluated and presented in the GSP.** [5,6]
- The draft GSP does not include an analysis of the change in water quality constituents relative to the change in water levels. Such an analysis would further support or disprove the statement that "increased arsenic concentrations have not been found to be related to groundwater management activities in the Subbasin" (Section 2.2.4.3).[7] **Therefore, change in water quality constituent concentrations should be analyzed relative to change in water levels, particularly over drought periods, to evaluate the potential relationship between water quality and groundwater management activities for arsenic and other constituents.**

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[5] Smith, Ryan et al. "Overpumping leads to California groundwater arsenic threat." *Nature communications* vol. 9,1 2089. 5 Jun. 2018, doi:10.1038/s41467-018-04475-3. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5988660/

[6] DWR, 2017. *Best Management Practices for the Sustainable Management of Groundwater, Sustainable Management Criteria (BMP #6),* Draft November 2017.

[7] Stanford, 2019. *A Guide to Water Quality Requirements Under the Sustainable Groundwater Management Act,* Spring 2019.

Water Budget

- The draft GSP estimates conditions using 2070 climate forecast. Based on this, the draft GSP estimates that "Under climate change conditions, the depletion in aquifer storage is expected to increase by about 68 percent to an average annual storage change of 57,000 AF/year, from 34,000 AF/year in the projected conditions scenario" (Section 2.3.7.4). However, the results of the climate change scenario modeling were not used as the basis for development of Project and Management Actions. Therefore, while climate change is evaluated in terms of future water budget conditions, the draft GSP does not actually include a substantive plan to address the increased deficit anticipated to result from climate change.
- The draft GSP notes that because there are no available data on local private groundwater pumping, "groundwater pumping to meet agricultural and rural residential needs is calculated by the model based on meeting remaining demands after appropriate surface water delivery is made to respective areas. Demand in areas with no access to surface water is completely met by groundwater pumping" (Section 2.3.4.2). However, based on our review of the draft GSP the model-calculated rural residential demands are not presented in the document. **This water demand information should be transparently presented for the historical, current, and future water budgets so that the public can review the drinking water demand estimates for domestic users and community water systems, and make an assessment as to the appropriateness of the demands considered in the historical, current, or future water budgets.**
- The draft GSP notes that the future water budget demands for domestic areas outside of those covered by Urban Water Management Plans "are estimated based on rural population" and that "To estimate the urban water demand of rural domestic water areas, the average major urban area GPCD was combined with estimated rural population" (Section 3.2 of Appendix 2-1). However, the draft GSP does not present the population values associated with the rural population or a clear presentation of the results of this method. **In order for the public to be able to evaluate the appropriateness of these assumptions, the applied values and resultant demands should be clearly identified in the document.**

Projects and Management Actions

- The proposed projects and management actions include twenty separate direct and in-lieu recharge projects. Recharge projects have the potential to mobilize contaminants, including by mobilizing surface and shallow soil contaminants through percolation, spreading existing contaminant plumes by altering the groundwater flow gradient, and mobilizing naturally occurring compounds through changes in geochemistry due to the introduction of a different water type, among other mechanisms. As recommended in the 2019 Stanford *A Guide to Water Quality Requirements Under the Sustainable Groundwater Management Act,* "In addition to complying with any regulatory requirements, GSAs undertaking recharge or other active management actions should consider developing a sufficient understanding of the interactions between subsurface geology, geochemistry and GSP projects in their basin. The development of sufficient monitoring networks, capable of detecting changes in groundwater quality conditions related to active management, will be critical to understanding these interactions."[7] **Therefore, the GSP should explicitly describe how such risks will be evaluated and monitored as a part of each identified project.**

Well Mitigation Program

Based on our assessment of the water levels, a significant proportion of domestic wells have the potential to be partially or fully dewatered if water levels reach the proposed MT levels. However, the draft GSP does not include or describe any plans to develop a well impact mitigation program. Such a program could include a combination of replacing impacted wells with new, deeper wells and/or connecting domestic users to a public water system. A plan to establish an emergency tanked water program, as was done in some areas of California during the last drought, may be an appropriate short-term solution, but would not be a good long-term solution for community members. Key considerations for establishing such a program should include:

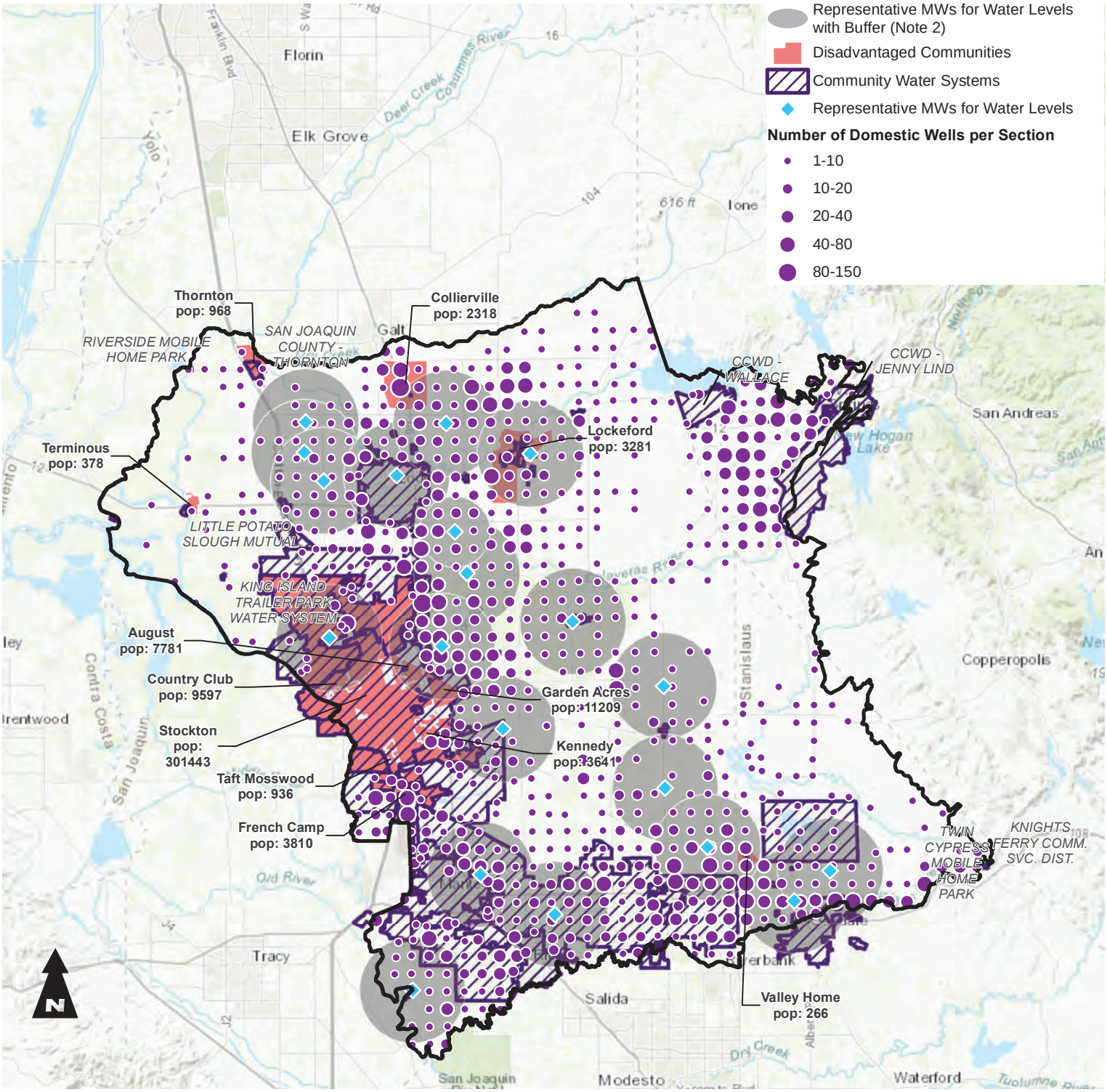
- A strong preference for connecting current domestic well users to a public water system, whenever possible. Public water systems have an obligation to test water quality for water served, and although the public water systems in this area typically have limited resources, they do have a greater ability to install treatment systems to address water quality impacts, recoup funds for litigated contamination such as 1,2,3-TCP, and apply for and receive grant funding for beneficial projects. Because of this, public water systems, including small community water systems, provide a more reliable drinking water source than privately-owned domestic wells.
- A secure and reliable funding source and mechanism for implementation of such a mitigation program needs to be identified. While grant or emergency funding could potentially be available for such a program when needed, the availability of these funds is not certain. A more secure funding mechanism could be the establishment of a reserve fund that is paid into on an annual basis and accrues funds that would then available as water levels drop in the future.
- The implementation of a mitigation program should be triggered before wells begin to become unusable, so that funding will be available, and the necessary planning and contracting will be completed such that the necessary construction will be implemented without unnecessarily leaving community members without access to drinking water. Thus, the program should be designed to be proactive, rather than reactive.
- A well mitigation program should not be established only in case of emergency. Droughts are said to be becoming more and more frequent and severe, and as such should be included as part of the long-term sustainability planning for the subbasin.

Attachments

Figure 1 - Representative Monitoring Network for GW Levels Relative to Domestic Wells, DACs, and Community Water Systems
Figure 2 - Water Level MTs and Domestic Wells
Figure 3 - Representative Monitoring Network for Water Quality Relative to Domestic Wells, DACs, and Community Water Systems

Figure 1 - Representative Monitoring Network for GW Levels Relative to Domestic Wells, DACs, and Community Water Systems

Eastern San Joaquin Subbasin



Notes

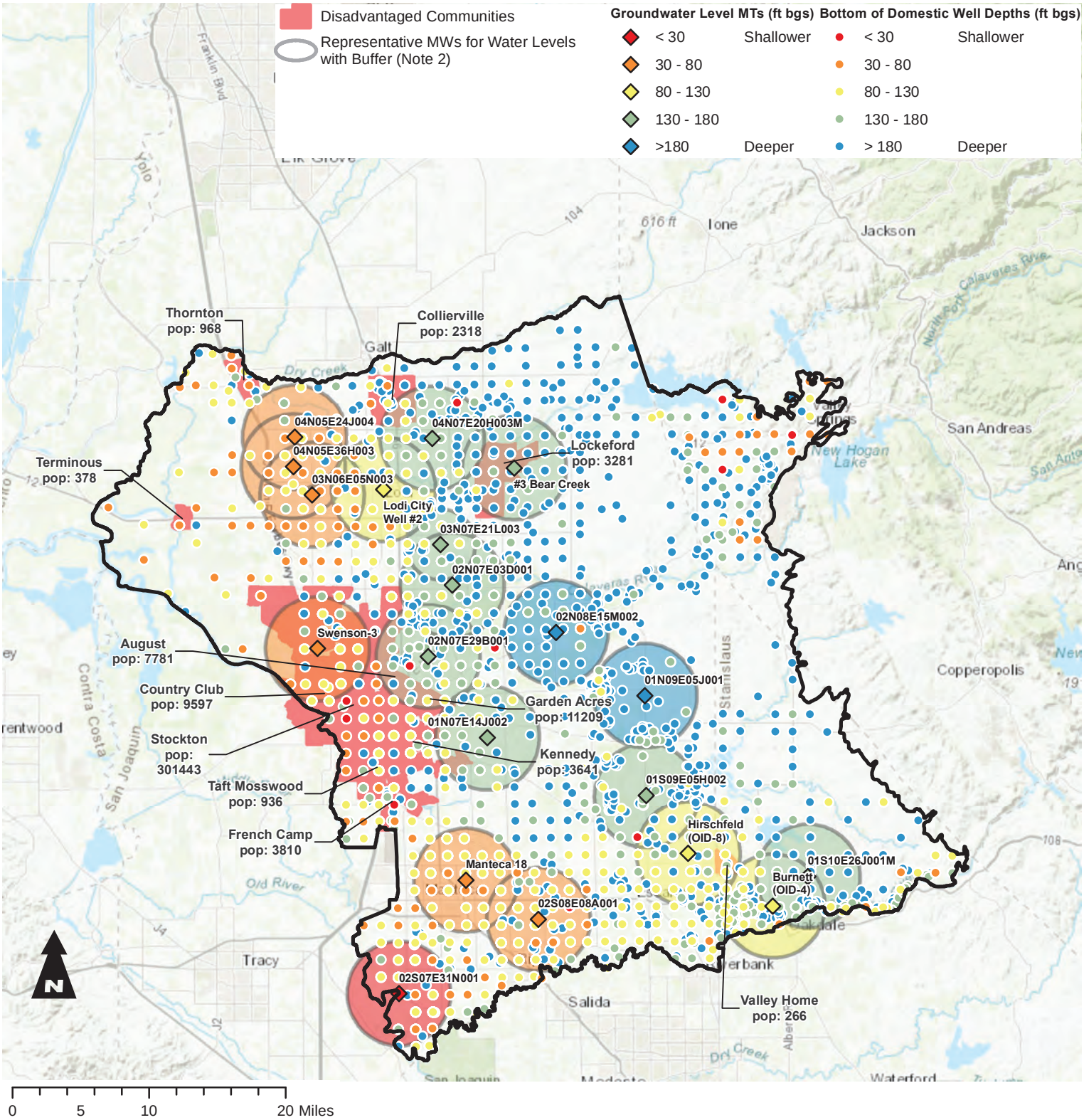
1. All locations are approximate.
2. For purposes of this assessment, buffer with a radius of 3 miles is created around the representative monitoring wells except for well 03N07E21L003 with a 2-mile radius buffer "due to variations in local well depth due to proximity to the Mokelumne River".

References

1. Domestic Well Densities: Research to develop the CWC Vulnerability Tool draft as of August 6, 2019.
2. Disadvantaged community data: downloaded on August 6, 2019 from the DAC Mapping Tool: https://gis.water.ca.gov/app/dacs/.
3. Community Water System data: downloaded on August 6, 2019 from Tracking California: https://trackingcalifornia.org/water/map-viewer.
3. Groundwater level monitoring well information are from Draft Eastern San Joaquin Groundwater Subbasin GSP dated July 2019.

Figure 2 - Water Level Minimum Thresholds and Domestic Wells

Eastern San Joaquin Subbasin



Notes

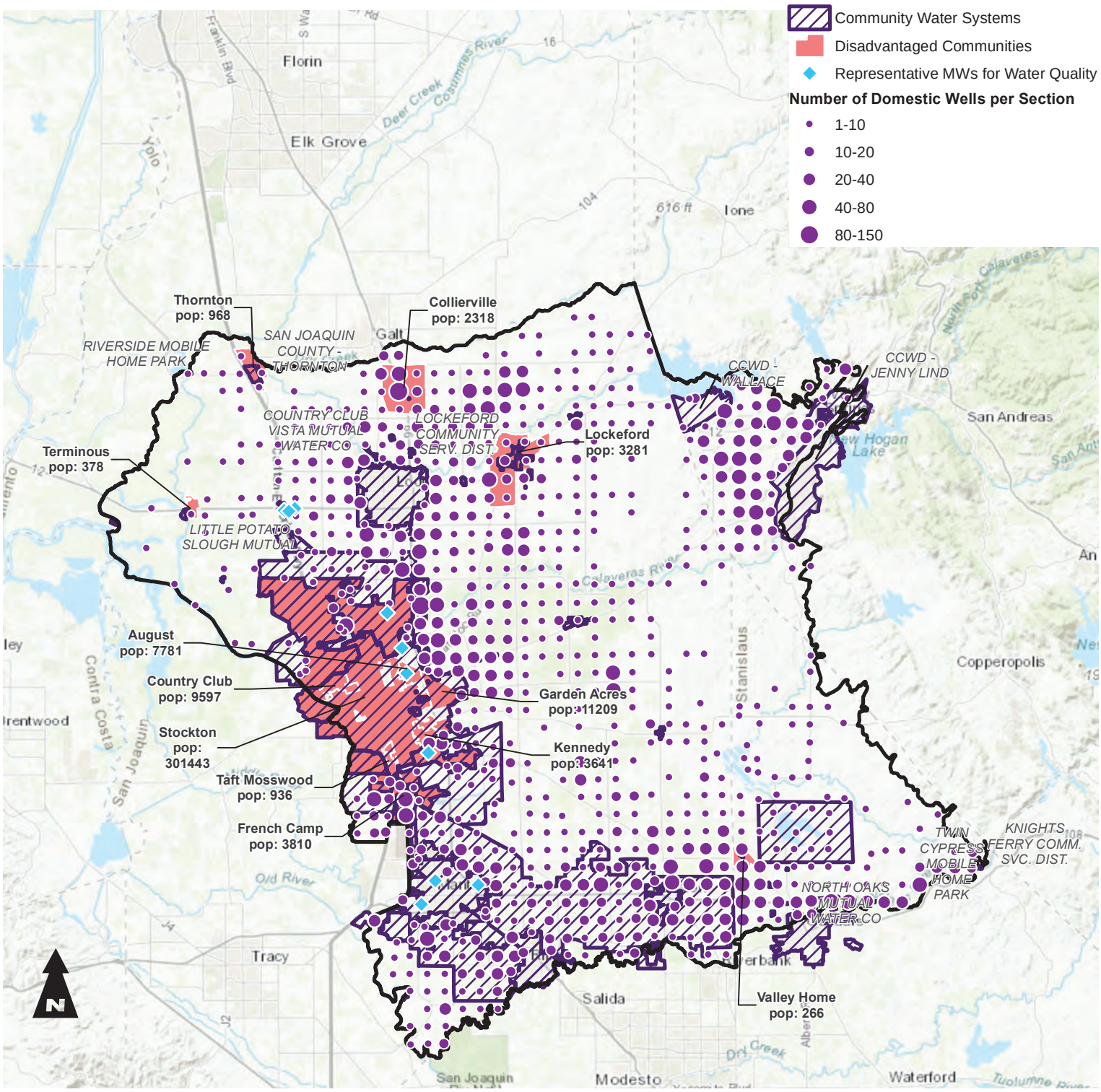
1. All locations are approximate.
2. Buffer with a radius of 3 miles is shown around all representative monitoring wells, except for well 03N07E21L003 for which a 2-mile radius buffer is used "due to variations in local well depth due to proximity to the Mokelumne River", per the draft GSP.
3. For this assessment, the proposed MTs in ft above sea level presented in APPENDIX 3-A of the draft GSP were converted to depth below ground surface values, based on the historical water levels presented in the same table. Where available, bottom of screen interval of a domestic well was used for this assessment, and bottom of well depth was used for the remaining domestic wells.

References

1. Domestic Well Densities: Research to develop the CWC Vulnerability Tool draft as of May 16, 2019.
2. Disadvantaged community data: downloaded on August 6, 2019 from the DAC Mapping Tool: https://gis.water.ca.gov/app/dacs/. Last updated in 2016.
3. Groundwater level monitoring well information are collected from the Draft Eastern San Joaquin GSP, dated July 2019. MT values are from APPENDIX 3-A Table of the Draft GSP.

Figure 3 - Representative Monitoring Network for GW Quality Relative to Domestic Wells, DACs, and Community Water Systems

Eastern San Joaquin Subbasin



Notes

1. All locations are approximate.

References

1. Domestic Well Densities: Research to develop the CWC Vulnerability Tool draft as of August 6, 2019.
2. Disadvantaged community data: downloaded on August 6, 2019 from the DAC Mapping Tool: https://gis.water.ca.gov/app/dacs/.
3. Community Water System data: downloaded on August 6, 2019 from Tracking California: https://trackingcalifornia.org/water/map-viewer.
3. Groundwater quality monitoring well information are from Figure 3-3, Draft Eastern San Joaquin Groundwater Subbasin GSP dated July 2019.

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July 17, 2019

Eastern San Joaquin Groundwater Authority
P. O. Box 1810
Stockton, CA 95201
Via email: info@esjgroundwater.org

Re: Public Outreach within the Eastern San Joaquin Subbasin

We are writing this letter to comment on public outreach related to the development of the Groundwater Sustainability Plan (GSP) for the Eastern San Joaquin Subbasin by the Eastern San Joaquin Groundwater Authority (ESJGA) and Groundwater Sustainability Agencies (GSAs) and to suggest changes to increase involvement of the diverse stakeholders that reside in the Subbasin.

The following general observations are explored in further detail below.

- Public outreach has not been well-coordinated or effective because of the nature of GSAs formed in this Subbasin, because of assumptions underlying Sustainable Groundwater Management Act (SGMA) outreach guidelines, and because technical issues and funding challenges have not been widely discussed nor presented in language that will engage those impacted.
- Outreach summaries produced and distributed by the GSP consultant team (see Appendix A) do not provide useful information because they allow for reporting on only certain kinds of outreach, and because even GSAs that do perform outreach are not always reporting it.
- Focusing outreach requirements on individual GSAs has created a situation in which it appears that no outreach has been done to an important and impacted category of users: people on domestic wells.

We conclude with recommendations for improving outreach and increasing transparency as the GSP process moves from planning into implementation.

Background

The Water Code includes these directions with reference to public outreach for SGMA required of GSAs:

> 10727.8 (a) [. . .] The groundwater sustainability agency shall encourage the active involvement of diverse social, cultural, and economic elements of the population within the groundwater basin prior to and during the development and implementation of the groundwater sustainability plan. [. . .].

Submitting public notices to the newspaper, notices of items on an isolated agenda, or a notice on a website fulfills a minimum outreach requirement for some governmental actions but not for SGMA. Groundwater sustainability plan regulations require that GSAs document in a communication section of the GSP the opportunities for public engagement and active involvement of diverse social, cultural, and economic elements of the population within the basin[1] These types of public notices do not encourage active involvement of diverse members of our Eastern San Joaquin Subbasin. These minimum public noticing techniques were used when the GSAs were formed and are documented on the SGMA Portal website: https://sgma.water.ca.gov/portal/gsa/all (search for GSA of interest). A single initial notification of GSP preparation was made on behalf of all the GSAs within the Eastern San Joaquin Subbasin and can be found here: https://sgma.water.ca.gov/portal/gsp/init/preview/82. Since the initial notification dated March 16, 2018, development of the GSP has been ongoing, but consistent public outreach has not.

A 2017 Department of Water Resources (DWR) grant for Facilitation and Support Services included a stakeholder identification and engagement component, but stakeholder engagement efforts trailed facilitation activities under that agreement by about six months. A situation assessment produced by consultants in December 2018, after the end of the contract period, summarized feedback from one group of stakeholders. That assessment references a separate document with recommendations for adjustment to the stakeholder process, but the separate document is not available online.

Public outreach has not been well-coordinated or effective because of the nature of GSAs formed in this Subbasin, because of assumptions underlying SGMA outreach guidelines, and because technical issues and funding challenges have not been widely discussed nor presented in language that will engage those impacted.

Agencies in the Eastern San Joaquin Subbasin formed GSAs primarily to protect their autonomy, not necessarily because they were considering the effect of the GSP on the users they serve or residents within the GSA boundaries. Some GSAs have names that would not be recognized even by water users that they serve. Examples include the Eastside GSA (Calaveras County Water District, Rock Creek Water District, and Stanislaus County), and South San Joaquin GSA (South San Joaquin Irrigation District). Nevertheless, SGMA assigns GSAs outreach responsibilities.

[1] DWR Guidance Document of Groundwater Sustainability Plan, Stakeholder Communication and Engagement; California Code of Regulations, Title 23 Waters, Division 2 Department of Water Resources; Chapter 1.5 Groundwater Management; Subchapter 2 Groundwater Sustainability Plan; Article 5 Plan Contents; §354.10

SGMA defines stakeholders broadly and beneficial users specifically including:

> (a) Holders of overlying groundwater rights, including: (1) Agricultural users. (2) Domestic well owners. (b) Municipal well operators. (c) Public water systems. (d) Local land use planning agencies. (e) Environmental users of groundwater. (f) Surface water users, if there is a hydrologic connection between surface and groundwater bodies. (g) The federal government, including, but not limited to, the military and managers of federal lands. (h) California Native American Tribes. (i) disadvantaged communities (DAC), including, but not limited to, those served by private domestic wells or small community water systems. (j) Entities listed in Section 10927 that are monitoring and reporting groundwater elevations in all or a part of a groundwater basin managed by the groundwater sustainability agency.[2]

Not all of the 15 GSAs in the Eastern San Joaquin Subbasin represent the full range of stakeholders identified in the legislation. Specifically, municipal water purveyor GSAs will contain few of the types of stakeholders that were likely intended to be reached, such as people on domestic wells or small community water systems.

An example of the variability of circumstances with respect to one stakeholder group, DACs, is shown in the following table.

Table 1. Distribution of DACs within the Eastern San Joaquin Subbasin[3]

Groundwater Sustainability Agency	Percent DAC	Percent not DAC
City of Lodi	75%	25%
Lockeford Community Service District	67%	33%
San Joaquin County No. 2 (Calwater)	60%	40%
City of Stockton	58%	42%
Central Delta Water Agency	50%	50%
Central San Joaquin Water Conservation District	50%	50%
Linden County Water District	50%	50%
Stockton East Water District	45%	55%
San Joaquin County No. 1	43%	57%
North San Joaquin Water Conservation District	40%	60%
City of Manteca	33%	67%
Oakdale Irrigation District	33%	67%
South Delta Water Agency	33%	67%
South San Joaquin GSA	30%	70%
Eastside San Joaquin GSA	17%	83%

Seventy-five percent of the City of Lodi falls into the disadvantaged communities (DAC) or severely disadvantaged communities (SDAC) categories. However, a single public water system serves all Lodi residents regardless of income level. It integrates groundwater and surface water using a system in which the city invested millions of dollars and which it operates on a not-for-profit basis.

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[2] Collaborating for Success: Stakeholder Engagement for Sustainable Groundwater Management Act Implementation, https://www.cleanwateraction.org/files/publications/ca/SGMA_Stakeholder_Engagement_White_Paper.pdf

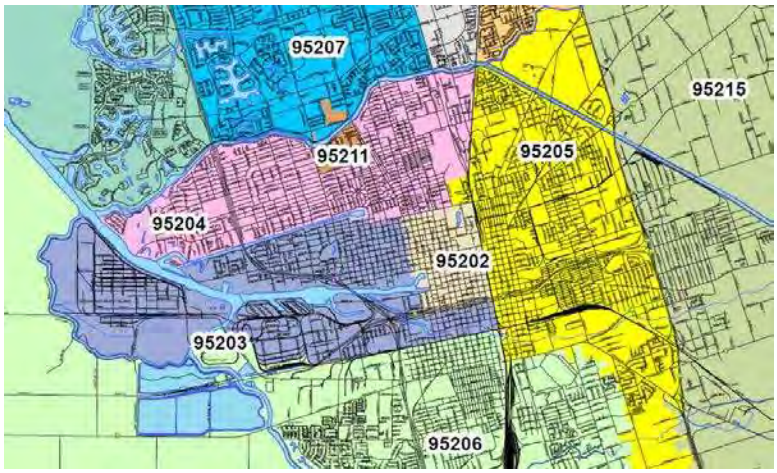
[3] http://www.esjgroundwater.org/Portals/0/assets/docs/agendas/2018/ESJ-GSP-GS-Workgroup-Slides-13Nov2018.pdf downloaded 06.21.19

By contrast, two different urban water purveyors operate within the geographical boundaries of the City of Stockton's GSA: the City of Stockton Municipal Utilities Department, and California Water Service Company (Calwater). Calwater has a separate agreement with San Joaquin County to form San Joaquin County GSA No. 2, which consists of boundary areas outside of the City of Stockton limits which are served by Calwater. The City of Stockton GSA encompasses all areas within the City of Stockton limits regardless of whether or not the City of Stockton is the water purveyor. This situation increases the possibility of customer confusion and of outreach inequities. Calwater has held one public outreach meeting which was not noticed to Calwater customers other than the posting on the Eastern San Joaquin Groundwater Authority website. The City of Stockton has not notified all customers of the City of Stockton Municipal Utilities Department or those within city limits that are served by Calwater. The City of Stockton representative recently announced that it is illegal to drill or operate a private well in Stockton (June 13, 2019 and July 3, 2019), and the City's position is that if there is a problem with an existing well, the well user should hook up to City services. Neither urban customers nor domestic and irrigation well owners have been notified specifically.

There is a greater distribution of DACs within the City of Stockton GSA boundary that are served by the for-profit Calwater and whose water rates are significantly higher than rates paid by the other residents of the City of Stockton GSA. An analysis published by CalMatters, an independent news organization, shows the income disparities within the city. (See Table 2.)

Calwater Stockton Service Boundary -

https://www.calwater.com/docs/rates/maps/STK_SAM_2016.pdf



City of Stockton ZipCode Map http://www.stocktongov.com/files/ZipcodeMap.pdf

Table 2. CalMatters Taxes and Income by Zip Code in Areas Served by Calwater

District	Zip Code	Number of Tax Returns	Average Tax Liability	Average Income	Calwater Only or Partially
Stockton	95207	20234	1357	46353	Partially
	95206	26837	638	38537	Mostly(urban)
	95205	14584	367	31969	Mostly(urban)
	95215	8722	1111	43779	Partially
	95204	12662	1646	51250	Partially
	95203	5999	866	38193	Only
	95202	1715	724	30928	Only
	https://calmatters.org/articles/how-much-do-you-neighbors-pay-california-state-taxes/				

An outreach challenge arises from the fact that for purposes of the SGMA process, DACs and SDACs are identified only in terms of income relative to the state median household income (MHI). However, not everyone who is economically disadvantaged will be impacted by changes in groundwater management in this Subbasin, and not everyone who will be impacted is economically disadvantaged. Lodi, which has the highest DAC percentage (75 percent) of any GSA in the Subbasin, also has the highest MHI of any community place in the Subbasin.[4] There are 358 small public water systems in San Joaquin County[5] in areas that do not necessarily have less than MHIs but have difficulties with affordability.

Other indexes for measuring disadvantage or vulnerability include the ICARP (Integrated Climate Adaptation and Resiliency Program) of the California Office of Planning and Research; the ROI (Regional Opportunity Index) developed by UC Davis; CalBRACE (California Building Resilience Against Climate Effects) developed by the California Department of Public Health; and CalEnviroScreen, developed by the California Office of Environmental Health and Hazard Assessment. Indexes that define disadvantaged communities in terms of socioeconomic, public health, and environmental hazard as well as in terms of income may provide a more nuanced picture of whether members of a community are likely to have access to the information and political influence they need in order to be fairly represented.

Another outreach challenge arises from the fact that for social justice groups organized around issues not directly related to water, SGMA-related issues may not seem urgent, and may not at this point be urgent absent specific information relating to quality, or cost impacts.

Engagement of DACs requires an emphasis on plain language and multiple opportunities to engage during times convenient to these residents that struggle to make a living. The three evening meetings that have occurred were not widely publicized. Broader outreach could be achieved using factsheets, which lend themselves to focused information conveyance and can be tailored to reach this population and distributed in mailed bills or linked to billing information sent by email. Factsheets have not been released for characterizations of each GSA within the Subbasin or to describe specific aspects of the GSP during its development.

Furthermore, according to the US Census[6], 41.2% of persons age 5 years+, 2013-2017 have languages spoken at home other than English. The only outreach material that has been translated into Spanish are flyers about public outreach meetings. An example of the timing of availability to distribute information is given for the ESJGA July 18, 2019 Public Informational Meeting: On July 5, 2019 the Spanish version was sent out to the email list while on June 26, 2019 the English version was sent out. Problems with timing here: 1) the flyers were available less than a month before the event and 2) the lag between the distribution of the flyers created added work for organizations to get that second Spanish flyer out.

Funding discussions have not widely occurred in the Eastern San Joaquin Subbasin. At the June 12, 2019 Sustainability Workgroup meeting the issue of funding was brought up and a member also following another basin's GSP process stated that discussions there have been primarily

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[4] https://water.ca.gov/LegacyFiles/irwm/grants/sgwp/sgwp_docs/2017_Solicitation/Applications/Eastern San Joaquin Groundwater Authority/Att7_2017SGWPC2_DAC_1of2.pdf accessed 7.9.19.
[5] https://www.sjgov.org/department/envhealth/programs/default?id=26243 accessed 7.8.19.
[6] https://www.census.gov/quickfacts/fact/table/sanjoaquincountycalifornia/PST045218 accessed 7.8.19

about funding. Until parties to this process know how much implementation will cost, obligation levels cannot be determined. At the June 12, 2019 Groundwater Authority meeting, the Board members voted to adopt the 2019-2020 Annual budget which included no funding sources identified for any implementation other than plan submittal to DWR.

Outreach summaries produced and distributed by the GSP consultant team do not provide useful information because they allow for reporting on only certain kinds of outreach, and because even GSAs that perform outreach are not always reporting it.

According to the ESJGA GSA Outreach Activities summary (Appendix A), some GSAs have reported no outreach activities at all. This may indicate that no outreach activity occurred or that GSA staff is unwilling or unable to report GSA outreach activities, or that the summary provides data only on electronic outreach. A major theme raised by a member of the ESJ Groundwater Advisory Committee at its June 12, 2019 meeting is that there must be balance between autonomy and accountability. This documentation of SGMA-required outreach activities to encourage active involvement suggests that perhaps too much autonomy has been applied without clearly needed accountability. Also, not all agencies that want autonomy have the capacity or resources to do the required outreach for which they may be held accountable.

These updates on GSA Outreach Activities summarize communication media without describing specifics of face-to-face contact efforts, much less the likely effectiveness of outreach, or even numbers of people reached.

For example, all the GSAs are credited with outreach for the February 12, 2019 informational meeting in Lockeford, but as was noted at the June 12, 2019 ESJ Sustainability Workgroup meeting, Lockeford itself promoted that meeting vigorously with individual notices sent to each ratepayer, and the February 12, 2019 was by far the best attended of the informational meetings so far. However, it is unlikely, that it was attended by members of the public throughout the Subbasin, as this Outreach Activities summary suggests.

The GSA Outreach Activities summary shows no outreach by the Central Delta Water Agency or the South Delta Water Agency. However, neither of these GSAs has a website or uses social media. That does not necessarily mean that water users within those GSAs are uninformed about SGMA. Recently, a farmer with land in both the Central Delta Water Agency area and North San Joaquin Water Conservation District was asked whether he was planning to take a look at the GSP draft (which he did know about), and he said that he was leaving that to the attorneys that represent property owners within the GSAs.

On the GSA Outreach Activities summary, the City of Lodi notes that its website is "still current" with regard to SGMA. Appendix B summarizes the challenge of finding SGMA information on Lodi's website. Is this outreach adequate? Perhaps it is, given the fact that the great majority of Lodi's residents are not currently affected by what is happening with SGMA. On the other hand, not all outreach done in Lodi appears on the GSA Outreach Activities summary. In March, a representative of the League of Women Voters of San Joaquin County made a presentation as part of a special meeting in Lodi that was attended by about a dozen members of the public. That meeting is not on the summary list.

On the GSA Outreach Activities summary, the City of Stockton does not have any outreach listed. The following request to the City of Stockton was made on June 13, 2019 and again on July 5, 2019 to increase visibility of the next public outreach and the draft GSP comment period. Yet, as of July 8, 2019 there was no reply from City representatives regarding the request nor has there been any posting made on the City of Stockton website of community events.

- The draft Groundwater Sustainability Plan will be out for Public Review July 10 – August 25.
- The next Groundwater Authority Public Outreach event is July 18, 2019 from 5-8 pm at the Agricultural Commissioner's Office Assembly Room #1 located at 2101 E Earhart Ave Ste 100, Stockton, CA 95206.
- Please post notice on the City of Stockton community events website and send out information about the public review of the Groundwater Sustainability Plan in utilities bills between June and August to notify the residents located within the boundary of the City of Stockton Groundwater Sustainability Agency.

Yet, as of July 17, 2019 there was no reply from City representatives regarding the request nor has there been any posting made on the City of Stockton website of community events.

Outreach that relies heavily on websites, email, and social media risks missing members of the public who prefer not to use or do not have reliable access to electronic media. San Joaquin County Census Data[7] estimates from 2017 show that while 86.4% of households report having a computer only 77.5% have an internet subscription. In addition, internet connectivity can be unreliable in rural areas. Residents of the Sacramento-San Joaquin Delta face major challenges with broadband access.

The consultants have periodically provided outreach material posted on the Eastern San Joaquin Groundwater Authority website: http://www.esjgroundwater.org/Agendas . The use of this outreach material is not documented.

An evaluation of GSA websites as a minimum means to perform outreach was performed in late June and early July, 2019 and is summarized in Appendix B. This evaluation illustrated variability in ease to find information and breadth of information provided with a specific emphasis on whether or not the July 18, 2019 Public Outreach event was included.

Focusing outreach requirements on individual GSAs has created a situation in which it appears that no outreach has been done to an important and impacted category of users: people on domestic wells.

It appears that landowners with agricultural wells are being reached with information about SGMA, probably through the Farm Bureau. Many municipal water customers may not be as affected as those residents on small water systems. The big gap in outreach is with people relying on individual domestic wells, which DWR and the GSP consultant team estimates to include over 10,000 property owners with domestic wells. Those individuals, who are likely

[7] https://www.census.gov/quickfacts/fact/table/sanjoaquincountycalifornia/PST045218

very vulnerable to impacts of the GSP, are not being directly noticed. Of most concern are the residents with wells less than 200 feet below ground surface[8]

Table 3. Characterization of Residents with Domestic Wells

DAC Characteristics	Average Domestic Well Depth (ft)	Domestic well count
Basin-wide	230.2	10034
Outside of DAC areas	235.4	7829
Within DAC areas	211.6	2205

With the exception of San Joaquin County GSA No.1, GSAs in this Subbasin are either public agencies or a private agency (San Joaquin County GSA No.2 – Calwater) created to provide surface and/or groundwater. These GSAs therefore have some kind of constituency or customer base. People on domestic wells are not part of that base, and responsibility for SGMA outreach to them has not been addressed.

RECOMMENDATIONS

- GSAs in the Eastern San Joaquin Subbasin should increase outreach by print with informational inserts in utility bills, property tax bills, and any other regular correspondence that is sent to households. Notices of the plan commenting period should be posted at each GSA headquarters, along with information about where to find GSA specific information.
- Principal and sub-contract consultants who are developing the GSP can develop posters that can be widely distributed, and can provide flyers to the Agricultural Commissioner's Office, Environmental Health Department, and Community Development Department within Calaveras, San Joaquin, and Stanislaus Counties.
- The Eastern San Joaquin Groundwater Authority (ESJGA) website, esjgroundwater.org , should provide GSA website addresses where stakeholders can find GSA and ESJGA level information, GSA contact email addresses, telephone numbers, and GSA staff contact names. Currently only mailing addresses are available for contacting GSAs. A number of non-governmental organizations (NGOs) representatives including the Sierra Club, League of Woman Voters, and Catholic Charities requested back in November 2018 that this information be updated, but that has not been done[9].
- The ESJGA website should provide information about how people can determine the GSA jurisdiction within which they live.
- Email inquiries to "Contact Us" on the ESJGA website currently go through a San Joaquin County government subcontractor, who redirects them. Responses to email inquiries, tabulating, and documenting of contacts and responses, should be included on regular outreach summaries.

[8] http://www.esjgroundwater.org/Portals/0/assets/docs/agendas/2018/ESJ-GSP-GS-Workgroup-Slides-13Nov2018.pdf downloaded 06.21.19
[9] http://www.esjgroundwater.org/About-Us/Members accessed 7.8.19.

- As part of GSP implementation, the ESJGA governance body should consider assessing GSAs a fee to provide funding for an outreach coordinator to perform tasks that GSAs do not have the staff or expertise to perform.
- As recommended by the Facilitation and Support Services consultants, a stakeholder or advisory board should be convened when the GSP is submitted, to review and inform implementation.

Each GSA should provide a written explanation of why the outreach they have done so far is adequate to meet the intent of SGMA outreach, and if it has not been adequate, what strategies each GSA proposes for doing adequate outreach during implementation of the plan.
This information should be included in the GSP.

A preliminary list of GSP implementation elements includes a task called "Public Outreach and Website Maintenance." Providing for public outreach and website maintenance only at the level of the Eastern San Joaquin Groundwater Authority website will not be adequate to cover the outreach obligations of all the GSAs.

Sincerely,

Kathy Casenave
President
League of Women Voters of
San Joaquin County

Mary Elizabeth
Conservation Chair
Delta-Sierra Group, Sierra Club

Barbara Barrigan-Parrilla
Executive Director
Restore the Delta

Esperanza Vielma
Board Chair
Environmental Justice Coalition for Water

Kenda Templeton
Executive Director
P.U.E.N.T.E.S.

Attachments: Appendix A. Groundwater Sustainability Agency Outreach
Appendix B. Finding SGMA References on GSA Websites

cc: DWR SGMA Portal for individual GSA distribution

San Joaquin County No. 1 and No.2
City of Lodi
Lockeford Community Service District
City of Stockton
Central Delta Water Agency
Central San Joaquin Water Conservation District
Linden County Water District
Stockton East Water District
North San Joaquin Water Conservation District
City of Manteca
Oakdale Irrigation District
South Delta Water Agency
South San Joaquin GSA
Eastside San Joaquin GS

Eastern San Joaquin Groundwater Authroity
GSA Outreach Activities - October 2018

Agency Name	Update Website	Use Outreach Slides	Post to Social Media	Other
Cal Water	Post Notice of SGMA Public Outreach Meeting 11/14			
Central Delta Water Agency				
Central San Joaquin Water Conservation District				
City of Lathrop	Post Notice of ESJ Outreach Meeting in Manteca on 11/7/18			
City of Lodi				
City of Manteca			Facebook Posts on Informational Meeting, 10/19, 10/24, 10/30	
City of Stockton				
Eastside San Joaquin GSA		California Board of Realtors Marketing Meeting, Oakdale, CA		
Linden County Water District		Public meeting, 7pm Oct. 25 - at Linden County Water District Offices		
Lockeford Community Services District				Advertized Public Hearing on Oct.24 Via Local Newspaper
North San Joaquin Water Conservation District				
Oakdale Irrigation District				Posted ESJ Info Mtg Flyers in front office & incorporated them into OID's 10/16/18 Board agenda packet
San Joaquin County				
South Delta Water Agency				
South San Joaquin GSA				
Stockton East Water District				
Woodbridge Irrigation District GSA				Standing Agenda Item at the Monthly WID Board Meeting

Please indicate which of the above outreach activities your GSA has planned for the upcoming month. Please approximate date of completion.

Eastern San Joaquin Groundwater Authroity
GSA Outreach Activities - November 2018

Agency Name	Update Website	Use Outreach Slides	Post to Social Media	Other
Cal Water				SGMA Outreach Meeting 11/14
Central Delta Water Agency				
Central San Joaquin Water Conservation District				
City of Lathrop	Post Notice of ESJ Outreach Meeting in Manteca on 11/7/18			Attend ESJ Outreach Mtg. in Manteca on 11/7
City of Lodi				
City of Manteca			Facebook Post on Informational Meeting, 11/7	Manteca Council Agenda Item 11/20
City of Stockton				
Eastside San Joaquin GSA				
Linden County Water District				
Lockeford Community Services District				
North San Joaquin Water Conservation District				
Oakdale Irrigation District	Updated 11/1/18	Added to OID's Website 11/1/18		Posted ESJ Info Mtg Flyers in front office
San Joaquin County				Ag Commission Pesticide Application Meetings
South Delta Water Agency				
South San Joaquin GSA				
Stockton East Water District				
Woodbridge Irrigation District GSA				

Please indicate which of the above outreach activities your GSA has planned for the upcoming month. Please approximate date of completion.

Eastern San Joaquin Groundwater Authority
GSA Outreach Activities - December 2018

Agency Name	Update Website	Use Outreach Slides	Post to Social Media	Other
Cal Water				
Central Delta Water Agency				
Central San Joaquin Water Conservation District				
City of Lathrop				
City of Lodi				
City of Manteca				
City of Stockton				
Eastside San Joaquin GSA				
Linden County Water District				
Lockeford Community Services District				
North San Joaquin Water Conservation District				12/17 SGMA JPA Standing agenda item
Oakdale Irrigation District				
San Joaquin County				
South Delta Water Agency				
South San Joaquin GSA				
Stockton East Water District				
Woodbridge Irrigation District GSA				

Please indicate which of the above outreach activities your GSA has planned for the upcoming month. Please approximate date of completion.

Eastern San Joaquin Groundwater Authority GSA Outreach Activities - January 2019

Agency Name	Update Website	Use Outreach Slides	Post to Social Media	Other
Cal Water				
Central Delta Water Agency				
Central San Joaquin Water Conservation District				
City of Lathrop				
City of Lodi	1/17/2019 added flyers			
City of Manteca			Posted Information Meeting date/time/location on City's Facebook Page	
City of Stockton				
Eastside San Joaquin GSA				
Linden County Water District				
Lockeford Community Services District				
North San Joaquin Water Conservation District	1/29 Posted February 12 ESJ Info Mtg Flyers on the NSJWCD website, and emailed to monthly agenda recipients			1/28 SGMA JPA Standing agenda item
Oakdale Irrigation District	Posted February 12th ESJ Info Mtg Flyers on the OID website			Posted February 12th ESJ Info Mtg Flyers in front office and incorporated it into the 2/5/19 board agenda packet
San Joaquin County				SJ County Advisory Water Commission SGMA standing agenda item 1/16/19
South Delta Water Agency				
South San Joaquin Groundwater Sustainability Agency				
Stockton East Water District		Added to website		
Woodbridge Irrigation District GSA				

Please indicate which of the above outreach activities your GSA has planned for the upcoming month. Please approximate date of completion.

Eastern San Joaquin Groundwater Authority GSA Outreach Activities - February 2019

Agency Name	Update Website	Use Outreach Slides	Post to Social Media	Other
Cal Water				Public informational meeting 2/12/19
Central Delta Water Agency				Public informational meeting 2/12/19
Central San Joaquin Water Conservation District				Public informational meeting 2/12/19
City of Lathrop				Public informational meeting 2/12/19
City of Lodi				Public informational meeting 2/12/19
City of Manteca				Public informational meeting 2/12/19
City of Stockton				Public informational meeting 2/12/19
Eastside San Joaquin GSA				Public informational meeting 2/12/19
Linden County Water District		Joint outreach with Stockton East Water District 2/18/19		Public informational meeting 2/12/19
Lockeford Community Services District				Public informational meeting 2/12/19
North San Joaquin Water Conservation District				Public informational meeting 2/12/19
Oakdale Irrigation District				Public informational meeting 2/12/19
San Joaquin County				SJ County Advisory Water Commission SGMA standing agenda item 2/20/19; Public informational meeting 2/12/19
South Delta Water Agency				Public informational meeting 2/12/19
South San Joaquin Groundwater Sustainability Agency				Public informational meeting 2/12/19
Stockton East Water District				Joint outreach with Linden County Water District 2/18/19; Public informational meeting 2/12/19
Woodbridge Irrigation District GSA				Public informational meeting 2/12/19

Please indicate which of the above outreach activities your GSA has planned for the upcoming month. Please approximate date of completion.

Eastern San Joaquin Groundwater AuthorityGSA Outreach Activities - March 2019

Agency Name	Update Website	Use Outreach Slides	Post to Social Media	Other
Cal Water				
Central Delta Water Agency				
Central San Joaquin Water Conservation District				
City of Lathrop				
City of Lodi				
City of Manteca				
City of Stockton				
Eastside San Joaquin GSA				
Linden County Water District				
Lockeford Community Services District				Monthly bill and SGMA info
North San Joaquin Water Conservation District				
Oakdale Irrigation District	Updated for March	Added to website		
San Joaquin County				
South Delta Water Agency				
South San Joaquin Groundwater Sustainability Agency				
Stockton East Water District				
Woodbridge Irrigation District GSA				

Please indicate which of the above outreach activities your GSA has planned for the upcoming month. Please approximate date of completion.

Eastern San Joaquin Groundwater AuthorityGSA Outreach Activities - April 2019

Agency Name	Update Website	Use Outreach Slides	Post to Social Media	Other
Cal Water				
Central Delta Water Agency				
Central San Joaquin Water Conservation District				
City of Lathrop				
City of Lodi				
City of Manteca				
City of Stockton				
Eastside San Joaquin GSA				
Linden County Water District				
Lockeford Community Services District				Monthly bill and SGMA info
North San Joaquin Water Conservation District				
Oakdale Irrigation District				
San Joaquin County				Advisory Water Commission meeting 4/17/19
South Delta Water Agency				
South San Joaquin Groundwater Sustainability Agency				
Stockton East Water District				
Woodbridge Irrigation District GSA				

Please indicate which of the above outreach activities your GSA has planned for the upcoming month. Please approximate date of completion.

From June 12 , 2019 GWA Agenda Packet

Eastern San Joaquin Groundwater Authority
GSA Outreach Activities - May 2019

Agency Name	Update Website	Use Outreach Slides	Post to Social Media	Other
Cal Water				
Central Delta Water Agency				
Central San Joaquin Water Conservation District				
City of Lathrop				
City of Lodi	Still current			
City of Manteca				
City of Stockton				
Eastside San Joaquin GSA		CCWD Board Meeting - 5/29		
Linden County Water District				
Lockeford Community Services District				Monthly billing statement & info
North San Joaquin Water Conservation District		Updated to website		5/5/19 - Outreach call with: Jennifer Rohde, Groundwater Scientist, The Nature Conservancy
Oakdale Irrigation District	Updated for May	Added to website		
San Joaquin County				SJ County Advisory Water Commission SGMA standing agenda item
South Delta Water Agency				
South San Joaquin Groundwater Sustainability Agency		SSJGSA Special Board Meeting - 5/22		
Stockton East Water District				
Woodbridge Irrigation District GSA				

Please indicate which of the above outreach activities your GSA has planned for the upcoming month. Please approximate date of completion.

From June 12 , 2019 GWA Agenda Packet

Eastern San Joaquin Groundwater Authority
GSA Outreach Activities - June 2019

Agency Name	Update Website	Use Outreach Slides	Post to Social Media	Other
Cal Water				
Central Delta Water Agency				
Central San Joaquin Water Conservation District				
City of Lathrop				
City of Lodi	Still current			
City of Manteca				
City of Stockton				
Eastside San Joaquin GSA	CCWD Website Update	CCWD Board Meeting 6/26		
Linden County Water District				
Lockeford Community Services District				
North San Joaquin Water Conservation District				
Oakdale Irrigation District	Updated for June	Added to website		
San Joaquin County				
South Delta Water Agency				GSA Public Meeting - 6/13
South San Joaquin Groundwater Sustainability Agency		SSJGSA Board Meeting - 6/19		
Stockton East Water District				
Woodbridge Irrigation District GSA				

Please indicate which of the above outreach activities your GSA has planned for the upcoming month. Please approximate date of completion.

Appendix B. Finding SGMA References on GSA Websites: Easy, challenging, or impossible?

GSA	Difficulty	Details	Outreach material ?
San Joaquin County No. 2 (CalWater) https://www.calwater.com/about/district-information/stk/	Challenging	From the Cal Water main page, the searcher must select "Stockton District." Once there, the only SGMA posting is for the 11/14/18 SGMA public outreach meeting that CalWater itself held	No
Central Delta Water Agency	Impossible	CDWA doesn't have a website.	
Central San Joaquin Water Conservation District http://csjwcd.com/district-services/surface-water/groundwater-sustainabilty-act/	Challenging	From the home page, there is a drop-down menu for "Groundwater Sustainability Act." There is some information about the formation of the GSA; the most recent posting is the JPA agreement.	No
City of Lodi http://www.lodi.gov/525/Water	Challenging	Under Your Government, the searcher must click Public Works then click Water. The first item is a link to the ESJGA website, and there is a link to the flyer for the July 18 informational meeting in English.	No
City of Manteca https://www.ci.manteca.ca.us/PublicWorks/Pages/Utility-Services.aspx	Impossible	If the searcher goes to Department/Public Works/Water Division, she/he will find no drop-down reference to SGMA.	No
City of Stockton http://www.stocktongov.com/government/departments/municipalUtilities/utilWater.html	Challenging	Departments/Public Works—Water is not here. It is under Municipal Utilities Department. But there is no reference to SGMA there; instead the searcher must click Utility Services, then click Water to find only the Resolution forming the JPA and a link to the Eastern San Joaquin Groundwater Authority website: http://www.esjgroundwater.org/	No
Eastside San Joaquin GSA https://ccwd.org/water-resources/sgma/#eastside	Easy	The searcher must know to look for the Calaveras County Water District. Under Departments/Water Resources there are entries for both SGMA and Eastside GSA. There is a 30-minute YouTube video in which Peter Martin, CCWD Water Resources Manager, discusses CCWD's Role in SGMA. The page includes an explanation of the area covered by the Eastside GSA, a partnership of CCWD and Stanislaus County, Calaveras County and Rock Creek Water District.	Yes
Linden County Water District http://www.lindencwd.com/	Impossible	No mention of SGMA, but see Stockton East Water District. There is no mention here of a reported public meeting on 10/25/18.	No
Lockeford Community Services District https://www.facebook.com/LockefordCommunityServicesDistrict/	Easy	The home page is a Facebook page. The searcher can click on the flyer for the February 12, 2019 meeting. There is nothing more recent.	No
North San Joaquin Water Conservation District https://nsjgroundwater.org/sgma/	Easy	There is a SGMA drop-down item on the home page. April and May 2019 ESJGA PowerPoint slides are posted for outreach, and there are links to the SGMA portal, SGMA legislation, the timeline, State Intervention, and a link to a flyer specifically targeting domestic well users.	Yes
Oakdale Irrigation District https://www.oakdaleirrigation.com	Challenging	The menu does not mention SGMA. There is a menu entry for General Manager Newsletters, and the newsletter for March 2018 includes an article about SGMA in connection with a crop report.	No
San Joaquin County https://www.sjgov.org/department/pwk/aboutus?category=divisions&division=Water%20Resources	Impossible	If the searcher knows to go to the Public Works page, she/he can click on "What divisions are in the Department of Public Works" to find Water Resources. There, the contact information still directs to Brandon Nakagawa, who is no longer with the County. Documents posted are from the early 2000s, and SGMA is not mentioned.	No
South Delta Water Agency	Impossible	SDWA doesn't have a website.	
South San Joaquin GSA https://www.ssjid.com	Easy	The searcher must know to go to the SSJID webpage. There, two relevant postings are obvious immediately: the flyer for the July 18, 2019 informational meeting, and a California Farm Bureau Federation brochure on SGMA with SSJID contact information.	Yes
Stockton East Water District https://sewd.net/	Easy	The opening page has a link to January 3, 2019 ESJGA outreach materials along with other SGMA materials and a flyer about a joint presentation with Linden County Water District to the Linden-Peters Chamber of Commerce held February 18, 2019.	Yes

Data as of 7/1/19

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Eastern San Joaquin Subbasin GSP Public Draft July 2019
Cosumnes Subbasin Public Comments submitted via e-mail to info@esjgroundwater.org

Comment #	Commenter	Commenter Organization	Section & Page Number	Section, Figure, or Table Number or Topic	Sentence Starts with, "...	Comment
1	John Fio jfio@ekiconsult.com 650-292-9110	EKI on behalf of Cosumnes Subbasin GSA Working Group	1- 36	1.2.3.3 Land Use Plans Outside the Plan Area	"The City of Galt, located in Sacramento County, is on the southern edge..."	The section heading indicates it will discuss land use plans outside the ESJ Subbasin, but no specific land use planning information is provided for the adjacent Cosumnes Subbasin aside from referencing the existence of the City of Galt General Plan (2009).
2	Linda Dorn dornl@saccounty.net 916-874-1085	Sacramento County Groundwater Sustainability Agency (GSA) - Cosumnes Subbasin	1- 36	1.2.3.4 Well Permitting	N/A	As an adjacent basin please add Sacramento County well permitting. For well standards visit: http://www.emd.saccounty.net/EC/Pages/Wells.aspx
3	John Fio	EKI on behalf of Cosumnes Subbasin GSA Working Group	1- 51	1.3.5 Inter-basin Coordination	"As part of the SGMA process, stakeholder outreach..."	Only provides date of inter-basin meeting. No explanation of topics discussed or outcome from effort.
4	John Fio	EKI on behalf of Cosumnes Subbasin GSA Working Group	2- 39	2.1.9 Principal Aquifer	"The Eastern San Joaquin Subbasin HCM has one Principal Aquifer that provides..."	The northern boundary of the ESJ Subbasin is shared with the Cosumnes Subbasin, however, there seems to be very little information described in writing about subsurface conditions and groundwater flow conditions at that boundary. This appears to be a deficit in the HCM.
5	Linda Dorn	Sacramento County Groundwater Sustainability Agency (GSA) - Cosumnes Subbasin	2- 57	2.1.10 HCM Data Gaps	"Groundwater Level Data	Sacramento County GSA is adjacent to the northwest data gap area and we encourage coordination with Sacramento County GSA for filling this data gap.
6	Linda Dorn	Sacramento County Groundwater Sustainability Agency (GSA) - Cosumnes Subbasin	2- 59	2.2.1.1 Historical Groundwater Elevations	"The northeast corner of the subbasin...	Amador County Groundwater Sustainability Authority may have information to help fill this data gap in the northeast corner of the subbasin. https://amadorwater.org/tag/amador-county-groundwater-management-authority/
7	John Fio	EKI on behalf of Cosumnes Subbasin GSA Working Group	2- 66	Figure 2-38		It would be helpful for neighboring basins if the groundwater elevation map displayed data points and posted values, especially at the basin boundaries where the contours help assess cross boundary flows.
8	Linda Dorn	Sacramento County Groundwater Sustainability Agency (GSA) - Cosumnes Subbasin	2- 108	2.3.1 Water Budget Background Information	"Because this process in new....	Since the Eastern San Joaquin subbasins water budget relies on adjacent subbasins inflow, the water budget inflow information for the Cosumnes subbasin maybe different than what has been calculated. A sentence should be added that reflects how the water budget will handle discrepancies between adjacent subbasins water budgets .
9	Linda Dorn	Sacramento County Groundwater Sustainability Agency (GSA) - Cosumnes Subbasin	2- 111	2.3.4.1 Assumptions Used in the Historical Water Budget	"The historical calibration includes the following: second bullet, first sub bullet Dry Creek	Sacramento County flood gauge information may provide data on flows in Dry Creek that would be more accurate than extracting Dry Creek flow from CalSIMII. Please see the website below for more information on flow for Dry Creek. https://www.sacflood.org/level.php?view=253d63a6-69ea-4c28-bd90-539059aa5fd8&view_group=99a123be-5de5-3678-7140-d7bb445af1b3&group=7c53d59d-d00d-707c-d514-fc1327f3c4e9 Also Amador County produced a 2006 Dry Creek Watershed Management Plan **(attached)** that is attached to the e-mail submitting these comments. Amador County has additional information on Cosumnes River flows too.

Comment #	Commenter	Commenter Organization	Section & Page Number	Section, Figure, or Table Number or Topic	Sentence Starts with, "...	Comment
10	John Fio	EKI on behalf of Cosumnes Subbasin GSA Working Group	2- 121	Table 2-15		Historical conditions indicate that, on average, net groundwater flow is from the Cosumnes Subbasin into the ESJ Subbasin at a rate of 14,000 acre-feet per year (AF/year). However, inflows from the Cosumnes Subbasin to the ESJ Subbasin increase to 23,000 AF/yr under current conditions (more than 60%) and will be 19,000 AF/yr under projected conditions (more than 30%). These changes in cross-boundary flows are potentially significant, and groundwater level monitoring and protective SMCs are needed near the subbasin boundary to ensure that: (1) undesirable results do not occur across the shared subbasin boundary , and (2) these projected increased levels of inflow to the ESJ subbasin from the Cosumnes Subbasin do not impact the ability of the Cosumnes Subbasin to achieve sustainability.
11	Linda Dorn	Sacramento County Groundwater Sustainability Agency (GSA) - Cosumnes Subbasin	2- 134	2.3.6 Sustainable Yield Estimate	"Under sustainable conditions....	Assuming groundwater pumping under sustainable conditions will not create changes in groundwater inflow from neighboring basins should include a caveat referencing future GSPs of the neighboring basins will help determine if pumping under sustainable conditions will affect inflows at the basin boundaries.
12	John Fio	EKI on behalf of Cosumnes Subbasin GSA Working Group	2- 134	2.3.6 Sustainable Yield Estimate	"In order to achieve a net-zero change in groundwater storage..."	The projected water budget shows greater outflows than inflows, resulting in an average annual deficit in groundwater storage of 34,000 AF/year in the ESJ Subbasin. To achieve sustainability, approximately 78,000 AF/year of direct or in lieu groundwater recharge and/or reduction in agricultural and urban groundwater pumping is reportedly needed in the ESJ Subbasin. However, there is no explanation or discussion for how and where these reductions will be achieved. Moreover, the lack of certainty in implementing projects and/or management actions to achieve sustainability create uncertainty in their potential effects on the Cosumnes Subbasin.
13	John Fio	EKI on behalf of Cosumnes Subbasin GSA Working Group	2- 148	2.3.7.4 Eastern San Joaquin Water Budget Under Climate Change	"A climate change scenario was developed for the ESJWRM to evaluate the hydrological impacts under these climate change conditions."	Tabulated water budget results like those in Table 2-15 need to be included for the climate change scenario results.
14	John Fio	EKI on behalf of Cosumnes Subbasin GSA Working Group	3- 4	3.2.1.2 Minimum Thresholds	"The minimum thresholds for chronic lowering of groundwater levels..."	The Minimum Thresholds(MT) for groundwater levels protect against Undesirable Results in the ESJ Subbasin and were specified for 19 wells based on minimum water levels measured in 1992 or 2015-2016, whichever are lowest, plus an operational buffer. These groundwater level MTs are utilized as proxy for groundwater storage, subsidence, and interconnected surface water sustainability indicators for the ESJ Subbasin. The MTs for the ESJ Subbasin should also ensure that they are not creating changes in groundwater inflow that could impede sustainability plans and implementation in the Cosumnes Subbasin. This includes groundwater level monitoring near the subbasin boundary and projected changes under historical, current, projected, and climate change.
15	John Fio	EKI on behalf of Cosumnes Subbasin GSA Working Group	3- 18	3.2.6 Depletion of Interconnected Surface Water	"Depletion of interconnected surface water is a reduction..."	"Depletion of Interconnected Surface Water" states that depletions are considered an Undesirable Result (UR) if the depletions significantly and unreasonably reduce surface water flow or levels and adversely impact beneficial uses of the surface water within the ESJ Subbasin. However, the contribution of these reductions to the cumulative depletion in downstream flows and potential impacts to Cosumnes Subbasin recharge should also be considered, given the important nature of this boundary condition.

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16	Rodney Frickerfricke @geiconsultants.com 916-341-9138	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	1- 10	1.2.1.1	2nd to last line in 1st paragraph	~~Sacramento~~ Solano Subbasin (Bulletin 118 Basin Number 5-021.66)
17	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	1- 14		Sentence does not seem correct.	..., while ~~eastern~~ western portions of San Joaquin County and City of Stockton, and ~~western portions of Calaveras and~~ much of Stanislaus County ~~ies,~~ lie in neighboring subbasins.
18	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	1- 19	Well Density	"DWR recommends a suggested well density of 0.2 to 10 monitoring wells per 100 square miles."	Statement is out of context. Paragraph is talking about density of supply wells and the DWR criteria is not applicable to locations chosen by well owners. Monitoring wells are subject to the DWR criteria, which is a different topic.
19	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	1- 19	Figure 1-12 to -14	Density of ... Wells per Square Mile	The download of data for these maps should have included data tables, including number of wells per section, depths, and other information. How were these data addressed in the GSP?
20	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	1- 22	1.2.2 Water Resources Monitoring and Management Programs	Eighth primary bullet	Online System for Well Completion Reports (OSWCR) seems to be oriented to licensed well drillers but has a link to: *Well Completion Report Map Application* which provides links to PDFs. In addition, the *SGMA Data Viewer* application provides links to PDFs of well completion reports.
21	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	1- 25	1.2.2.1.5	Data Received Directly from GSAs	See above.
22	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	1- 27	1.2.2.4 Land Subsidence Monitoring	1st paragraph	The paragraph should acknowledge that DWR (2014) listed the Eastern San Joaquin Subbasin as having a medium to high potential for subsidence due to long-term declining groundwater levels. (*Summary of Recent, Historical, and Estimated Potential for Future Land Subsidence in California*)
23	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	1- 27	1.2.2.4 Land Subsidence Monitoring	**United State Geological Survey**	The paragraph starts with a USGS heading, which only applies to the subsequent paragraph. The paragraph refers to Plate Boundary Observatory (PBO) GPS stations, which are operated by UNAVCO, and refers to station (P781), which was removed from the program in 2014. The text does not acknowledge other PBO stations in the vicinity of the subbasin, including P256 – Brentwood, P257 – Tracy, P273 – Lodi, P274 – Elk Grove, P275 – Galt, and P309 – Linden. The USGS study area may have utilized the PBO stations but the study addressed much of the San Joaquin Valley further south.
24	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	1- 27	1.2.2.4 Land Subsidence Monitoring	**Other** - last sentence	The NASA JPL processed dataset spans from May ~~Spring of~~ 2015 to April ~~Summer of~~ 2017 (CA, DWR, 2019).

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25	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	1- 40	1.3.1 Beneficial Uses and Users in the Basin	First bullet	Text says "…. approximately 1,000 unique domestic, public, and production wells in the Subbasin." but Figure 2-4 shows 6,800 GAMA sites and DWR (2014) says 19,176 wells total.
26	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	1- 51	1.3.5 Inter-basin Coordination	First paragraph	To date, there has been at least one meeting between representatives of the GWA and the neighboring ~~basins of~~ Cosumnes, Modesto, ~~Subbasin~~ and Tracy Subbasins to initiate this process.
27	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 8	2.1.2 Regional Geologic and Structural Setting		The Sierra Nevada Mountain Range, east of the Central Valley, is comprised of pre-Tertiary igneous and metamorphic ~~continental~~ rocks.
28	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 9	2.1.3 Geologic History	Marine conditions persisted through the middle to late Tertiary period (~3-30 million years ago) …	Middle to late Tertiary would be more like 23 to 60 or 65 million years
29	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 12	2.1.4.2 Major Hydraulic Features	Four paragraphs	Acre-feet per day and cubic feet per second are flow rates, not volumes
30	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 23	2.1.5 Geologic Formation and Stratigraphy		Generally, eastside formation material originates as ~~from~~ continental deposits from the Sierra Nevada and westside formation material originates as ~~from the~~ continental deposits from the Coastal Ranges (marine).
31	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 25	Figure 2-16 Geologic Map		The Tulare Formation is listed in the legend but is not present on the map. The Sacramento Regional Geology Map (RGM) does not include the Tulare Formation in its Explanation and the dark orange shading on the San Francisco-San Jose RGM is labeled Tvs for the Valley Springs Formation. The Tulare Formation originates from the Coast Range and would not crop out within the ESJ Subbasin.
32	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 26	Table 2-2 Generalized Stratigraphic Column	Fourth row of information: Turlock Lake is listed in the Formation column (4th) but the Rock column (6th) references Laguna, Tulare and younger formations.	See comment above. The explanation summary for the San Francisco-San Jose RGM shows that the Tulare Formation is older than the Turlock Lake Formation. The Geologic Map Explanation indicates the upper Tulare Formation and lower Turlock Lake Formation could be interbedded at depth within the center of the Central Valley.
33	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 27	2.1.5.1.2 Ione Formation	Last sentence, first paragraph: "This ~~kaolinite~~ sand is commonly called Ione sand."	The Ione Formation is an important source of both sand and clay but these products are separate. "Kaolinite sand" is not possibly since kaolinite is a clay mineral and not durable enough to be sand.
34	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 29	2.1.5.1.5 Laguna Formation	Last paragraph: "Some studies suggest that an extensive aquitard, namely the Corcoran Clay member of the Tulare Formation, extends into the Laguna Formation or separates the Laguna and Mehrten Formations."	Which studies suggest that the Pliocene-Pleistocene Tulare Formation (younger) could be part of the middle Pliocene Laguna Formation (older) or occur between the Laguna Formation and the Miocene-early Pliocene Mehrten Formation (older still)?

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35	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 29	2.1.5.1.6 Turlock Lake Formation	Second paragraph: "The Turlock Lake Formation is differentiated from the west to east by its Corcoran Clay member that is present in the southwest corner of the Subbasin ..."	According to the USGS (Faunt, 2009), "... the western San Joaquin Valley generally is finer-grained and is underlain by the **Corcoran Clay Member of the Tulare Formation** (hereafter referred to as the Corcoran Clay)." and "This confining unit is a stratigraphic unit, the **Corcoran Clay Member of the Tulare Formation** (referred to in this report as the Corcoran Clay." Bold added for emphasis. A search of the report (Faunt, 2009) did not find any reference to the Turlock Lake Formation.
36	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 32	Figure 2-18: Base of Fresh Groundwater ~~Elevation~~ Contours and Stockton Fault		Only a single sentence for the figure. Additional text should be added to explain the significance of the information.
37	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 35	Figure 2-20: Hydrogeologic Cross-sections A-A' and B-B'		Cross sections are too small, even printed on 11 x 17" paper, as the well labels are not legible. Scale of 0.36 to 0.45 inch per 1000 feet is not reasonable. The Stockton Fault is not depicted or located on Sections D-D' and E-E'. Page 2-38, first paragraph refers to "well screen interval (shown in red)." but the interval is not shown and likely could not be seen due to the small size of the cross section. Cross sections don't show the three zones within the principal aquifer, except by association with the formations. Model Section D-D' is equivalent to GSP Section C-C' and D-D' shows the Corcoran Clay. The Corcoran Clay is shown on southern end (7 miles) of Section E-E' but not at the southern end of Section D-D'. According to DWR (1981/2008), the top of the Corcoran Clay cannot be delineated to the east of Highway 99 at Manteca, but Section E-E' is located further east of Highway 99 and would not encounter the clay until several miles further south of the subbasin boundary. Moreover, the depth to the top might be 200 feet on the west side of Manteca, south of Highway 120, which is within the southernmost alignment of Section D-D'. The presence of the Corcoran Clay appears to be more related to the DWR model of the Central Valley than to well logs.
38	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 36	Figure 2-21: Hydrogeologic Cross-sections C-C' and D-D'		
39	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 37	Figure 2-22: Hydrogeologic Cross-section E-E'		
40	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 35	Figure 2-20: Hydrogeologic Cross-section B-B'		The eastern side of the sections show 1,500 feet and nearly 2,100 feet, respectively, of sedimentary formations without presenting an explanation. Section A-A' shows these formations thinning eastward on top of bedrock. Sections B-B' and C-C' suggest a substantial aquifer further east and the model sections show similar conditions. This thick eastern boundary is not discussed in the text and will produce a high-end bias for the estimate of groundwater storage which could lead to the false sense of sustainability.
41	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 36	Figure 2-21: Hydrogeologic Cross-section C-C'		
42	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 39	2.1.9.1 Zones within Principal Aquifer	Stratigraphy of the Deep Zone aquifer materials	What about the stratigraphy of the Shallow and Intermediate Zones? Why are is the stratigraphy of the deeper than Deep Zone referenced when few wells are deeper than 500 feet?
43	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 41	2.1.9.1.1 Shallow Zone	The cross-sections also depict the aquifer thickness from 30 feet to greater than 300 feet.	For the 11 x 17" print, that's 0.01 to 0.12 inches,

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44	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 42	2.1.9.1.3 Deep Zone	As depicted on the hydrogeologic cross-sections A-A' through E-E' (refer to Figure 2-20, Figure 2-21, and Figure 2-22), boring logs indicate a significant 30-foot thick gravel encountered at a depth from 140 to 170 feet.	and 0.01 inches at 0.06 to 0.07 inches below the land surface, and is not shown on the sections. What about a bullet for hydraulic conductivity values for each zone to match the other aquifer parameters?
45	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 43	2.1.9.1.4 Limited Aquitards	The Corcoran Clay member of the ~~Turlock Lake~~ Tulare Formation and other interbedded clay/silts are aquitards that inhibit groundwater flow. The Corcoran Clay ~~(found at the base of the upper unit of the Turlock Formation)~~ is present at a depth of about 200 feet bgs.	See comments above. Text on page 2-29 says Corcoran Clay is associated with the Laguna Formation and/or occurs between the Laguna and Mehrten Formations. As shown on Section E-E', the top of Corcoran Clay is ~140 feet and the thickness is ~70 feet at the basin boundary.
46	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 43	2.1.9.1.4 Limited Aquitards	The cross-sections (Figure 2-20, Figure 2-21, and Figure 2-22) show both the clay and silt horizons range in thickness from less than 10 feet to over 150 feet.	For the 11 x 17" print, that's 0.004 to 0.06 inches
47	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 45	2.1.9.2 Aquifer Characteristics and Groundwater Quality	The thickest sand and gravel sequences ranged from 500 to 700 feet in the foothills located near the Stanislaus River ~~Dry Creek~~, south of Woodward ~~Camanche~~ Reservoir and Northeast of Oakdale.	Camanche Reservoir is located at the northeastern corner of the subbasin and Oakdale is located at the southeastern corner, ~30 miles apart.
48	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 45	2.1.9.2.1 Aquifer Parameters and Production Zone Well Capacities		Production Zone is new subdivision to the Principal Aquifer. How does it relate to the Shallow, Intermediate and Deep Zones?
49	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 48		SY values range from 4 to 10 percent.	Page 2-42 said "Storage coefficients up to 17 percent" for the shallow zone, which should have referred to the specific yield.
50	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 48	Table 2-4 Wells within Water-Bearing Zones		Why was Intermediate and Deep Zones combined?
51	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 50	2.1.9.2.3.1 Geologic Formation Water Quality	The Ione formation, for instance, is known to have high sulfate levels in groundwater related to the pH influence on pyrite-sulfide rich coal deposits..	The oxidation of pyrite and other sulfide minerals would produce sulfuric acid which would manifest as a lower pH.
52	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 50		Sources of arsenic include weathering of minerals containing arsenic, desorption of arsenic under certain pH values, and release of arsenic in redox conditions	What type of conditions since redox is an abbreviation for reduced versus oxidized conditions - oxygen absent versus oxygen present?

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53	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 50		Another element of great importance is nitrogen, as it is included in many compounds that are by-products of agriculture ...	The focus of this paragraph is odd. The atmosphere is comprised of 78% nitrogen and the soils and underlying rock in the upland watersheds appears to absorb and store nitrogen. The real important issue is the occurrence of nitrate in the subbasin. How much nitrate occurs in the Mokelumne River (and other rivers) as that surface water enters the subbasin? Why is nitrate omitted from the list of anions in the next paragraph? Why wasn't a box-and-whisker diagram prepared for nitrate to show its variations between 2005 and 2017?
54	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 56	2.1.10 HCM Data Gaps	• Water quality of three zones in principal aquifer~~s~~	
55	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 57	Groundwater Level Data	• Additional groundwater level data near major creeks and rivers such as the Mokelumne River to improve quantification and understanding of subsurface flows between subbasins and for surface water-groundwater interactions	
56	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 57	Subsurface Conditions	• Further definition of aquifer characteristics (e.g., hydraulic conductivity, transmissivity, and storage parameters) within and near Subbasin boundary areas to the east, southeast, north and northwest, including aquifer tests	Why east side of basin, which is bedrock in the foothills of the Sierra Nevada mountains? More attention is needed along the boundary with the Cosumnes and South American Subbasins to the north.
57	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 60	Figure 2-34: Hydrographs of Selected Wells		SGMA requires the same datum and scaling for hydrographs (to the extent possible). The 10 hydrographs use different horizontal and vertical scales. The horizontal scales varied from starting years between 1950 and 1973 and the ending years between 2014 and 2017 which produced a span of 43 to 67 years. The span of the vertical scales varied between 18 and 180 years. What are the depths of these 10 wells? What zones do these wells represent? Why weren't wells 04N08E06C002 and 04N05E10K001 identified as representative monitoring wells, given their proximal location to the northern boundary of the subbasin?
58	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 62	Figure 2-35: Groundwater Elevations 1940-2018, (a) Box-and Whisker Plot with Precipitation		Difficult plot due to overlapping lines. Change to scale of the second vertical axis to shift the precipitation line above the box-and-whiskers. Average annual precipitation line is not provided, as stated in third note. What about showing the water year type?
59	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 64	2.2.1.2 Current Groundwater Elevations		Why are 2016 data omitted from current conditions? Historical data are 1996 to 2015. Current data are only 2017?
60	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 67	2.2.1.2.1 Vertical Gradients	A downward gradient is one where groundwater ~~is moving downward~~ could move deeper through the subsurface if the vertical hydraulic conductivity allows the movement.	Vertical gradients only show potential for groundwater flow. An aquitard would prevent that vertical flow

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						vertical flow.
61	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 67		At present, USGS nested monitoring wells confirm downward vertical ~~flows~~ gradient (Williamson, 1989).	
62	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 69	Figures 2-40 to 2-49: Nested Well Hydrographs		SGMA requires the same datum and scaling for hydrographs (to the extent possible). The 10 hydrographs use different horizontal and vertical scales. Use of the scales would allow the magnitude of the gradients to be evident between locations and allow comparison of the record of data.
63	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 74	2.2.2 Groundwater Storage	In 2015, the total fresh groundwater storage was estimated as 53.0 MAF and the cumulative change in storage over 1995-2015 was estimated as -0.91 MAF (-0.09%), or -0.05 MAF/yr.	Figure 2-50 is not effective at showing anything - just a big blue rectangle with a slightly irregularly top '-0.91 / 53 *100 = -1.7% Reduction in storage really only began in 2008 when the value became negative and stay negative thereafter. The average change in storage would be -0.11 MAF/yr for that 8-year period.
64	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 80	Table 2-5: Summary of Chloride Data by Decade	Table 2-5 shows occurrence of chloride measurements ~~greater than 250 mg/L~~ by decade.	The table shows that minimum, average, and median values are all less than 250 mg/L. How do the depth intervals relate to the zones in the principal aquifer?
65	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 80	Table 2-6: Summary of Chloride Data by Depth (1940s-2010s)	Table 2-6 shows occurrence of chloride measurements ~~greater than 250 mg/L~~ by well depth.	
66	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 82	Chloride data	Approximately 4,600 of the almost 13,000 chloride measurements in the Eastern San Joaquin Subbasin are from wells lacking any construction or screen depth information. Roughly half of the measurements ~~above 250 mg/L~~ occur in the wells lacking depth data, which also show the highest range in values occurring above 250 mg/L.	Table 2.6 shows that 3,566 samples out of a total of 6,931 samples lack depth data but these data are not limited to only concentrations greater than 250 mg/L. The no-depth well group does have the highest range but the 100-foot well group has a much higher median value, a higher minimum, and a comparable average relative to the no-depth well group.
67	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 82	2.2.4.1.2 Total Dissolved Solids	TDS, which is a measure of all inorganic ~~and organic~~ substances present in a liquid in molecular, ionized, or colloidal suspended form, is commonly used to measure salinity.	According to the USGS (Hem, 1985), "Organic matter, if present, may be partly volatile, but it is not completely removed unless the residue is strongly ignited."
68	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 85	Figure 2-57: Maximum TDS Concentrations in Shallow Wells 2015-2018		Figure explanation says shallow wells are less than 200 feet but Table 2.7 show depth ranges of 0-100', 100-250', 250-500', and >500', which is not consistent. How do the depth intervals relate to the zones in the principal aquifer?
69	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 85	Figure 2-58: Maximum TDS Concentrations in Deep Wells 2015-2018		Figure explanation says deep wells are greater than 200 feet. What about intermediate wells?

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70	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 95	Table 2-10: MCLs for Common Petroleum Hydrocarbons and MTBE		Why are the units for xylene mg/L when the other organics are ug/L? The change seems disingenuous.
71	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 96	Table 2-11: MCLs for Common Synthetic Organic Constituents	**TCE**: Used as a solvent in manufacturing facilities and dry cleaners **PCE**: Used as a solvent ~~in~~ at dry cleaners, manufacturing facilities, printing shops, and auto repair facilities	TCE may have been used early in the dry cleaning industry but dry cleaners seem to be the dominant source for PCE plumes.
72	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 101	Figure 2-67: Natural Communities Commonly Associated with Groundwater (NCCAG)		Dark subbasin boundary line obscures the color-coded lines
73	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 109	2.3.3 Use of the ESJWRM and Associated Data in Water Budget Development		Historical Water Budget was established for 20 years (WY 1996 to 2015). Projected Water Budget was produced for the implementation period, starting in 2020, based on a 50-year previous hydrology (1969 to 2018). Why is Current Water Budget based on a 50-year period (1969 to 2018) when SGMA requires the use of "the most recent hydrology, water supply, water demand, and land use information."? I'm thinking a Current Water Budget would be for 2016 and 2017 (maybe 2018) to be consistent with Section 2.2.1.2 - Current Groundwater Elevations.
74	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 110	Table 2-12: Summary of Water Budget Assumptions (Historical, Current, and Projected Periods)		Hydrologic Years: 50-year period for Current Water Budget is not consistent with SGMA requirement. All other entries say current and refer to recent information - no the past 50 years. Note 3 refers to "pre-drought level (assumed water year 2013)". WY 2013 was a critical WY.
75	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 112	2.3.4.2 Assumptions Used in the Current Water Budget		The 50-year period is not consistent with SGMA requirement.
76	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 115	2.3.5 Water Budget Estimates	Land Surface System, Inflows: Riparian intake from streams	Riparian intake from streams is evapotranspiration outflow from the stream system. How can it also be an inflow?
77	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 121	Table 2-15: Average Annual Water Budget – Groundwater System		The proportions of water in the budgets don't vary more than a few percentage point which is likely due to the long-term overlapping periods of data. See previous comments on the use of a 50-year period for current conditions. Totals for main categories of inflow and outflow don't match table totals (due to rounding [?]). Tables 2-13 and 2-14 may exhibit similar discrepancies.
78	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin		Figures 2-72 to 2-80		Magnitude of average annual volumes would be more easily perceived if the vertical scale was the same for each plot.

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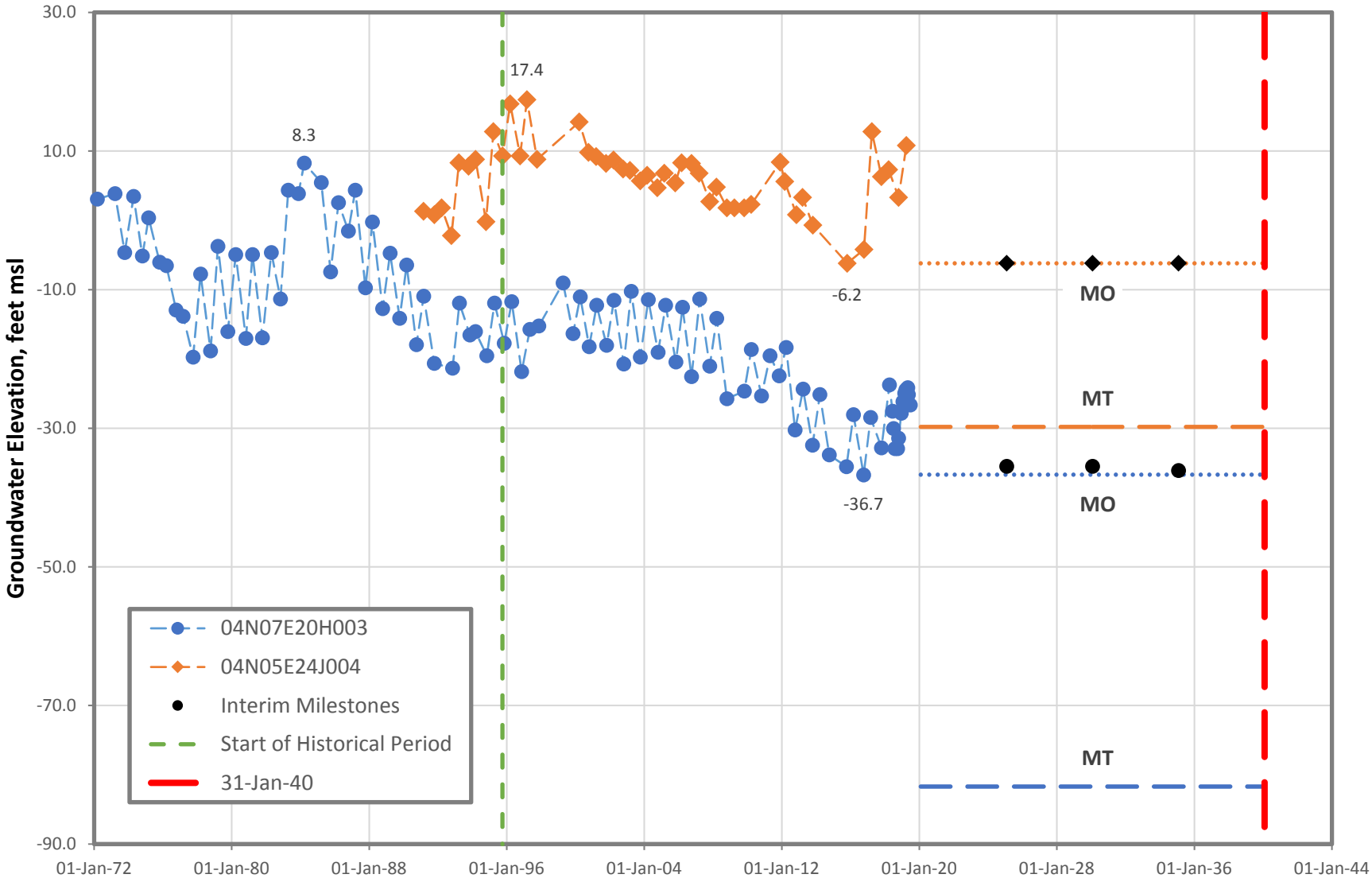
79	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 126	Table 2-16: Average Annual Values for Key Components of Historical Water Budget by Year Type	Above Normal (AN) and Below Normal (BN) columns	How can the average of three AN years be less than one BN year? Is math correct?
80	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 130	2.3.5.4 Projected Water Budget Estimates		Section needs a figure for projected groundwater budget similar to the historical conditions of 1996 to 2015 (Figure 2-51) and for climate change (Figure 2-102). What about groundwater budget information for Wys 2016, 2017, and 2018?
81	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 133	2.3.6 Sustainable Yield Estimate	In order to account for the challenges of implementing the GSP, this Plan assumes future operations would remain consistent for a 25-year period and groundwater levels would continue to decline until 2040.	This statement actually implies that groundwater levels will decline until 2045 (2020 + 25 = 2045), which would not be consistent with SGMA's prohibition of "chronic lowering of groundwater levels" which would continue to cause groundwater to flow from the adjacent subbasins and limit their ability to achieve sustainable management, unless ESJ successfully implements all of their projects and management actions.
82	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 134		The sustainable conditions scenario results in groundwater outflows almost equal to groundwater inflows, bringing the long-term (50-year) average change in groundwater storage to close to zero. Based on this analysis, the sustainable yield of the basin is **715,000 AF/year** ± 10 percent.	Does this 50-year average approach really support operations within this sustainable yield within the 20-year planning and implementation horizon? The sustainable yield would appear to range from 643,000 AF/yr to **715,000 AF/yr** to 787,000 AF/yr. Table 2-17 says the 50-year total groundwater supply is 801,000 AF/yr, which is 86,000 AF/yr greater than the sustainable yield. Text on page 2-148 also refers to 801,000 AF/yr as private groundwater production.
83	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 134		In order to achieve a net-zero change in groundwater storage over a 50-year planning period, approximately 78,000 AF/year of direct or in lieu groundwater recharge and/or reduction in agricultural and urban groundwater pumping would need to be implemented in the Eastern San Joaquin Subbasin.	
84	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 138	Figure 2-82: Dry Creek Hydrograph		Why is a 54-year period (1964 to 2018) used in the projection when the previous text referred to a 50-year period (1696 to 2018)? Shouldn't the time scale be 2020 to 2070 or Year 1 to 50, beginning in 2020? Same questions for Figures 2-84, 2-86, 2-88, and 2-90.
85	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 148	2.3.7.4 Eastern San Joaquin Water Budget Under Climate Change	With a similar surface water supply and increased water demands under the climate change scenario, private groundwater production is simulated to increase approximately 11 percent, from 801,000 AF/year to 887,000 AF/year.	Does municipal groundwater pumping increase to total?

Comment #	Commenter	Commenter Organization	Section & Page Number	Section, Figure, or Table Number or Topic	Sentence Starts with, "...	Comment
86	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2- 151	Figure 2-102: Groundwater Budget – Climate Change Scenario		Cumulative change in groundwater storage continues to decline for the 50-year period which is not consistent with the SGMA prohibition of reduction in groundwater storage.
87	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	3- 6	Figure 3-2: Location of Representative Monitoring Wells for Groundwater Levels		Groundwater along the northern boundary are monitored by two shallow CASGEM wells (Wells 04N07E20H003 and 04N05E24J003) that are 3.3 to 4.2 miles south of the Cosumnes Subbasin. These wells are located ~8 miles apart along the 26-mile E-W subbasin boundary (excludes 4-mile N-S boundary with Amador County). Additional monitoring wells should be installed along to the boundary to cover the entire length, including deeper wells, to better define cross boundary flow, vertical gradients, and the surface water-groundwater interaction.
88 89	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	3- 7	Table 3-1: Minimum Thresholds for Chronic Lowering of Groundwater Levels		The MT for well 04N07E20H003 was confirmed at -81.7 feet MSL by the GSP methodology, but the MT (-31.2 feet MSL) for well 04N05E24J003 was found to be lower by 1.4 feet or -29.8 feet MSL. Appendix 3-A shows a 25-foot buffer compared to the 23.6-foot buffer derived from the difference between the highest and lowest values. The MOs were confirmed for the two wells (Table 3-2). Use of these management criteria will further reduce groundwater levels and storage along the northern boundary of the subbasin and cause groundwater from the Cosumnes Subbasin to flow into the ESJ Subbasin due to this generous management criteria. Recent groundwater levels (Mar/Apr-19) are 13 and 17 feet above their respective MOs and 58 and 41 feet above their respective MTs (Wells 04N07E20H003 and 04N05E24J003). Use of this criteria will allow the further lowering of groundwater levels and the reduction in storage, which will cause additional groundwater flow from the Cosumnes Subbasin, especially during a long-term period of drought. Note that the method for establishing the MT buffer is somewhat different for each well, which adds a bias to values. For well 04N07E20H003, the buffer was based on the difference between the highest groundwater level (WL), which occurred during Mar-84 (during an above normal [AN] WY, following the wettest WY on record and a wetter AN WY), and the lowest WL during Oct-16. For well 04N05E24J004, the highest and lowest WLs occurred during Mar-97 and Oct-15, respectively. The historical water budget period was established for 1996 to 2015, so the highest and lowest WLs should be restricted to that period (**See attached Figures 1 & 2)**. In addition, Appendix 3-B provides hydrographs with MT and MO lines for a date range beginning in 1990. This uniform criteria should be applied to all representative WL monitoring wells.

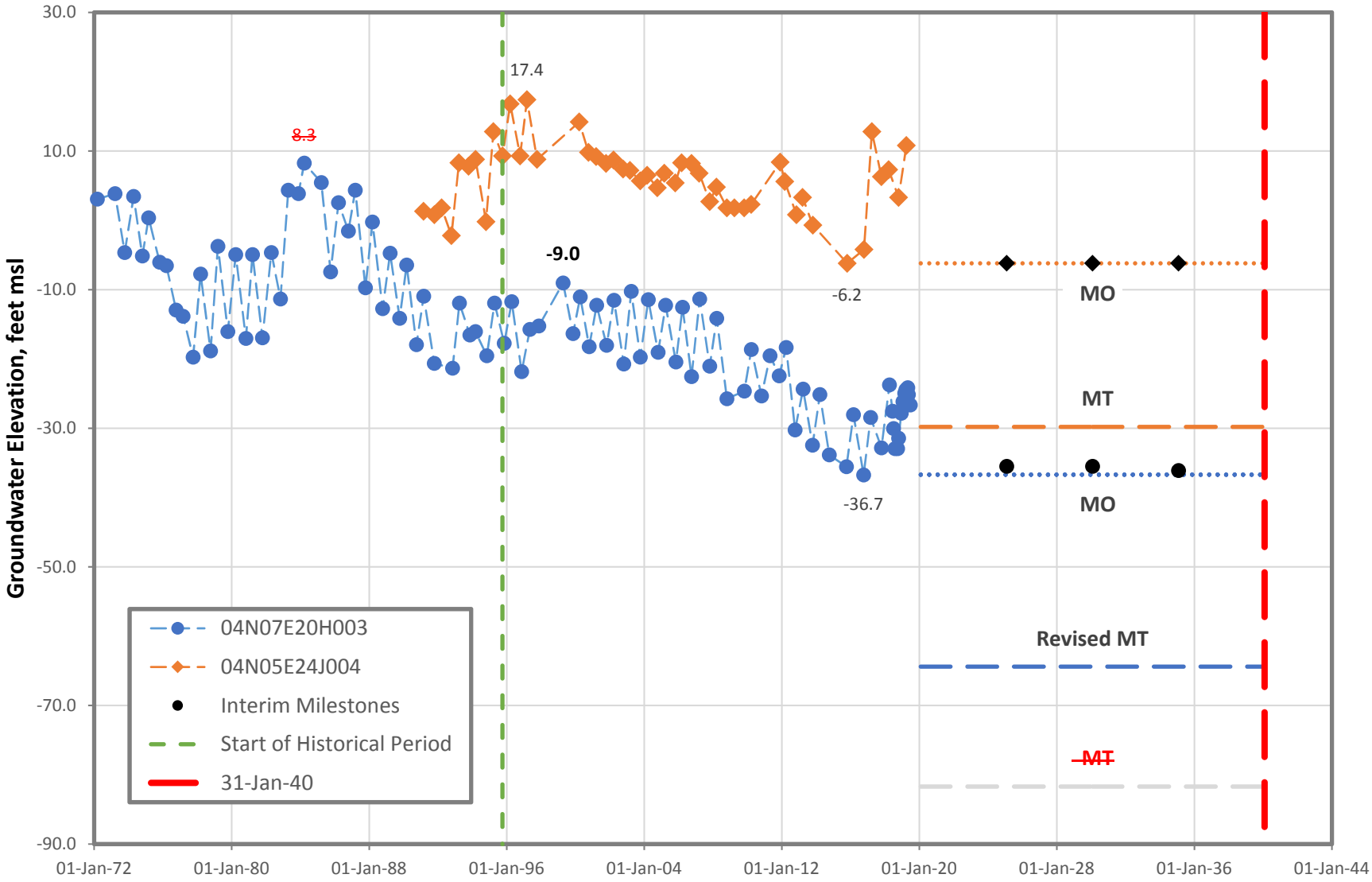
Comment #	Commenter	Commenter Organization	Section & Page Number	Section, Figure, or Table Number or Topic	Sentence Starts with, "...	Comment
90	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	3- 9	Table 3-3: Interim Milestones for Chronic Lowering of Groundwater Levels		Current groundwater levels (WL) are set at values for Fall 2015. For well 04N05E24J004, the "current" WL, MO, and all interim milestones are -6.2 feet MSL. The WL declined further in fall 2016 to -4.2 feet MSL and then varied from 6.3 feet MSL in fall 2017 and 3.3 feet MSL in fall 2018. For well 04N07E20H003, the "current" WL was -35.5 feet MSL, just above the MO of -36.7 feet MSL, and the first two interim milestones equal -35.5 feet MSL ("current WL") and the third milestone allowed a WL decline to -36.1 feet MSL. The WLs declined during the fall 2016 to -36.7 feet MSL (MO) and then rose thereafter to -32.8 feet MSL during fall 2017 and -31.4 feet MSL during fall 2018.
91	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	3- 10	3.2.2 Reduction in Groundwater Storage	3.2.2.1.1 Description of Undesirable Results	DWR has classified the ESJ Subbasin as overdrafted. The text does not provide a direct rebuttal to this classification or address the contributions of groundwater from the adjacent subbasins which should be an undesirable result of overpumping.
92	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	3- 11		3.2.2.2 Minimum Thresholds	The text does not address the contributions of groundwater from the adjacent subbasins which should be an undesirable result of overpumping. How much groundwater would move into the ESJ Subbasin from adjacent subbasins if the storage were reduced by 1.2 MAF to down to 30 MAF?
93	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	3- 14	Table 3-4: Interim Milestones for Degraded Water Quality		The measurable objective for TDS is 600 mg/L - the recommended secondary MCL plus a 100-mg/L buffer. TDS currently ranges from 280 to 510 mg/L (average: 370 mg/L) at the 10 representative monitoring wells. The interim milestones allow incremental increases of TDS over the 20-year period, ranging from 5 to 29 percent (average: 15%), where lower-TDS wells have greater increments and higher-TDS wells have lower increments. This approach appears to encourage the degradation of water quality as an objective.
94	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	3- 18	3.2.5 Land Subsidence	3.2.5.2 Minimum Thresholds Further, the use of groundwater levels as a proxy is necessary, given the lack of direct monitoring for land subsidence in the Subbasin.	The text fails to acknowledge the continuous GPS station (P309 - Linden) in the subbasin and the 5 other stations in adjacent subbasins, which be used to interpolate subsidence within the subbasin. Additional GSP stations could be installed in the subbasin.
95	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	4- 8	4.3 MONITORING NETWORKS FOR DEGRADED WATER QUALITY	Monitoring networks monitoring for water quality will test for total dissolved solids (TDS), cations and anions, arsenic, and field parameters including pH, electrical conductivity (EC), and temperature.	Anions should <u>include nitrate</u> as well as bicarbonate & carbonate, chloride, and sulfate.
96	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	4- 14	4.3.5 Spatial Density of Groundwater Quality Monitoring Wells	DWR's Monitoring Networks and Identification of Data Gaps BMP states "The spatial distribution must be adequate to map or supplement mapping of known contaminants" (CA DWR, 2016~~10b~~).	Make appropriate revision in Section 8, page 8-6
97	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	6- 1	6.2.1 Project Identification	• Project is affordable and cost~~e~~-effective (~~highest~~ lowest unit cost per volume water savings)	

Comment #	Commenter	Commenter Organization	Section & Page Number	Section, Figure, or Table Number or Topic	Sentence Starts with, "...	Comment
98	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	6- 34	6.3 MANAGEMENT ACTIONS	Additional management activities are discussed in Chapter 7: Plan Implementation, including:	All of these activities are required by SGMA so they aren't really management actions (reduced pumping, fallowing, ...) as intended by SGMA
99	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	7- 4	Table 7-2: Costs to GSAs and GSP Implementation Costs	Developing 5-Year Evaluation Reports: $800,000 - $2,000,000 every 5 years	$0.8M to $2.0M is quite excessive, as if the GSP will be done over. Annual reports will provide a significant foundation for the 5-year evaluation and the cost might be only $200K to $300K - hopefully a lot less. Other costs should be reviewed closely to ensure reasonableness.
100	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	7- 7	7.6 DEVELOPING 5-YEAR EVALUATION REPORTS		
101	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	7- 5	7.3.1 Monitoring	Components of the annual monitoring program costs include:	Won't the field crew and their equipment be used for sampling ($57K to $60K) and ~~sampling~~ costs are really laboratory costs ($24K to $30K)? Will CASGEM continue to exist after full implementation of SGMA?
102	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	7- 8	7.6.3 Reconsideration of GSP Elements	The water year types from the San Joaquin Valley Water Year Hydrologic Classification used in this Plan are based on stream inflows from a variety of streams in the San Joaquin Valley. In the future, a more locally-relevant index may be developed that would be more representative of conditions specific to the Subbasin.	Why waste resources on a new index when a 118-year index is already available for the San Joaquin Valley? (Sacramento Valley index is 113 years long and is mostly consistent with the San Joaquin Valley index.)
103	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	ES- 3	ES-5. EXISTING GROUNDWATER CONDITIONS	California has three secondary maximum contaminant level (SMCL) standards for TDS, all based on aesthetic considerations such as taste and odor, not public health concerns. These are 500 mg/L (recommended limit), 1,000 mg/L (upper limit), and 1,500 ~~2,500~~ mg/L (short-term limit).	
104	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	ES- 3	ES-5. EXISTING GROUNDWATER CONDITIONS	Interconnected surface waters are surface water features that are hydraulically connected by a saturated zone to the groundwater system. If the water table adjacent to a river or stream goes down as a result of groundwater pumping, the river or stream may "lose" water to the underlying aquifer.	Replace with: Surface waters can be hydraulically interconnected to the groundwater system, where the baseflow is derived from the aquifer (gaining stream) or the stream can lose surface water to the aquifer. If the water table beneath the stream goes down excessively as a result of groundwater pumping, the stream may disconnect from the underlying aquifer.
105	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	ES- 9	ES-10. PROJECTS AND MANAGEMENT ACTIONS	Additional management activities included in the Draft GSP include the following:	All of these activities are required by SGMA so they aren't really management actions (reduced pumping, fallowing, ...) as intended by SGMA

Comment #	Commenter	Commenter Organization	Section & Page Number	Section, Figure, or Table Number or Topic	Sentence Starts with, "...	Comment
106	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	ES- 11	ES-11. GSP IMPLEMENTATION	The GWA Board adopted a preliminary schedule for project implementation. Project implementation is scheduled to begin in 2020, with full sustainability ~~implementation~~ by 2040.	
107	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	ES- 12	ES-12. FUNDING		Some costs need a closer look, especially the 5-year updates.
108	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	Model ES-4	Cross Section B-B'		Elevation scale is shown to vary from 2500' to 0' [msl]. The correct elevation range should be 900' msl, based on Figure 22, to a deep negative elevation.
109	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	Model Report	Figures 29a to 29f: Cross Sections		The upper limits of the elevation scale vary from 1800' to 3000'. The correct elevation range should be 900' msl, based on Figure 22, to a deep negative elevation.
110	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	Model Report	Figures 29a: Cross Section		Section A-A' is located somewhat north of GSP Section A-A'. The GSP section shows the sedimentary formations thinning eastward on top of bedrock. Whereas, the model section shows over 1000 feet of sediments along the eastern boundary of the model. This extra thickness in the model provides additional groundwater storage which could contribute to a false sense of sustainability.
111	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	Model Report 2-12	2.9 Model Layering		Layer 1 thickness ranges from 34 to 966 feet and Layer 2 thickness ranges from 50 to 540 feet. Layer 1 is thickest within the north-central and along the eastern boundary, and the latter condition seems unusual and is not explained by the report. Layer 2 is thickest within the south-central area and this condition seems reasonable.
112	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	Model Report	Figure 23: Layer 1 Thickness & Figure 24: Layer 2 Thickness		The thickness of Layer 1 is divided into five categories but the range of the first and last categories are significantly different from the middle 3 categories. The span of the first category is 196 feet and the last category is 520 feet, compared to the 60-foot spans of the middle categories. For comparison, the thickness of Layer 2 is divided into six categories with spans between 60 and 90 feet (average: 73 feet). These large differences within Layer 1 contribute to the uncertainty in the model output.
113	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	Model Report 3-6	3.3.2 Groundwater Pumping	Table 8: Summary of ESJWRM Well Pumping	City of Galt is located along the northern boundary of the subbasin and produces groundwater for its customers. The model should acknowledge and include the City's groundwater production.
114	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	Model Report 4-6	4.7 Final Calibration Parameters	Table 10: Range of Aquifer Parameter Values	Why does the Corcoran Clay vertical K values apply to Layers 3 and 4 when the aquitard is situated between Layers 1 and 2?



Comments on ESJ Draft GSP	GEI Consultants	Sustainable Management Criteria for Groundwater Levels along the Northern Boundary of the Eastern San Joaquin Subbasin
Sacramento County GSA in the Cosumnes Subbasin		Aug-19 Figure 1



Comments on ESJ Draft GSP	GEI Consultants	Sustainable Management Criteria for Groundwater Levels along the Northern Boundary of the Eastern San Joaquin Subbasin
Sacramento County GSA in the Cosumnes Subbasin		Aug-19 Figure 2

ROD

DRY CREEK WATERSHED MANAGEMENT PLAN

A CASE STUDY EXERCISE: WATERSHED PARTNERSHIPS SEMINAR

February 27 – March 9, 2006
Folsom, CA

Prepared By:

TEAM #1

John Brodie
Jeannie Habben
Jan Lopez
Sara Martin
Leandro Ramos
Pam Sturner
Diane Zarate

Section 1

Mission Statement and Watershed Background

Mission Statement

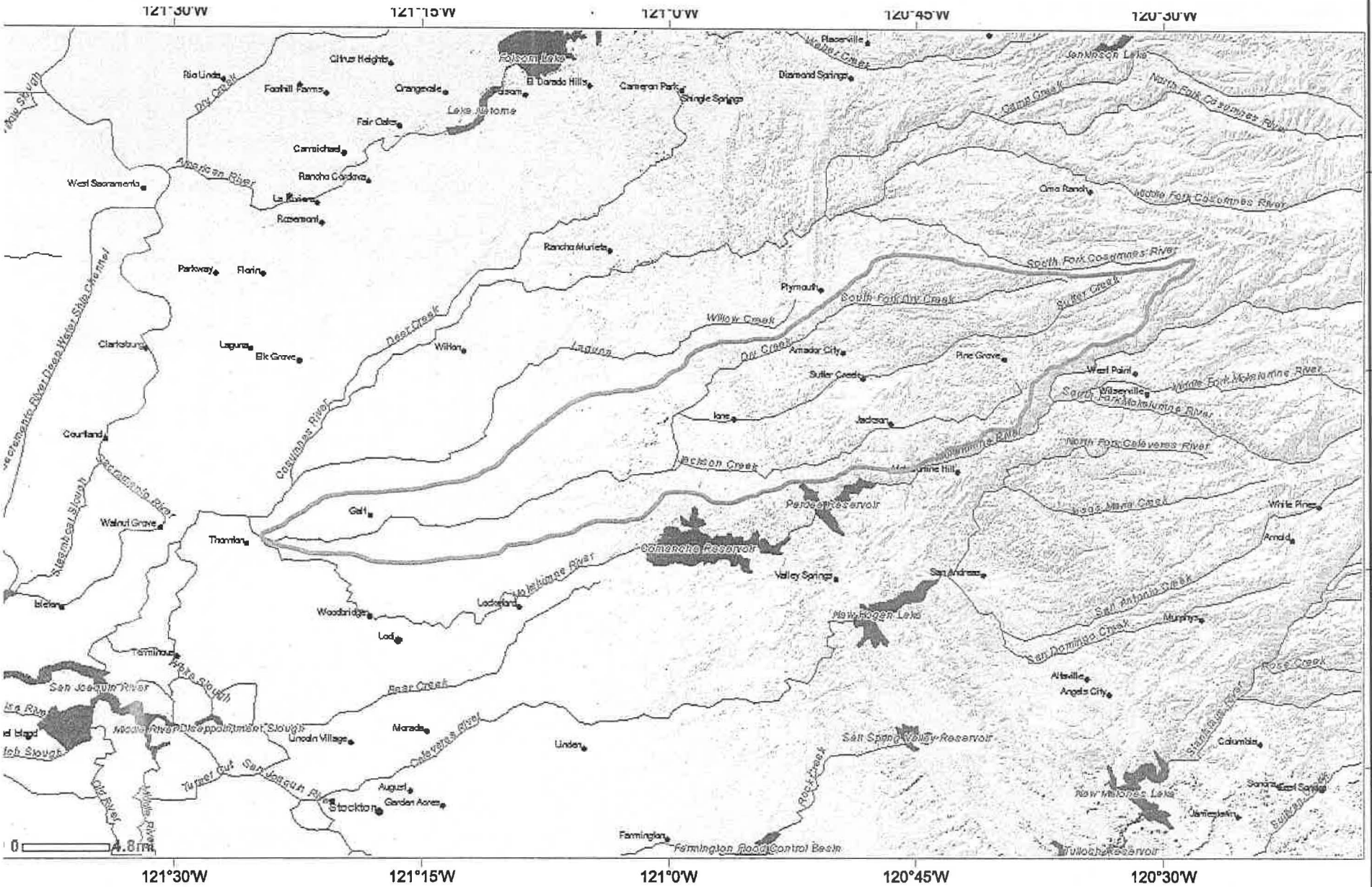
The mission of the Amador Dry Creek Watershed Council (ADCWC) is to preserve the quality of life in our watershed by engaging stakeholders and the community, managing growth and fire hazards, and protecting natural resources, while respecting private property rights.

Background Information

The Dry Creek watershed is located in central California, and drains the portion of the Sierra Nevada foothills between the Cosumnes River and the Mokelumne River. As shown in Figure 1, the creek flows west/southwest through the western slope of the foothills, joining with its two major tributaries, Sutter Creek and Jackson Creek, on the way. It then flows to the floor of the Central Valley, where it empties into the Cosumnes River. The Cosumnes River empties into the Mokelumne River, which then enters the complex network of tidally-influenced rivers and sloughs of the Sacramento-San Joaquin Delta. The delta waters eventually empty into the San Francisco Bay.

The watershed area encompasses approximately 388 square miles, with over 150 miles of streams and over 900 miles of roads. The majority of the watershed is located in Amador County, but the lower-elevation, western end of the watershed is split between Sacramento County in the north and San Joaquin County in the south. Incorporated cities within the watershed include Jackson, Sutter Creek, Amador City and Ione in Amador county, and Galt in Sacramento County. State Route 49, which connects Sierra Nevada foothill towns, is the major north/south transportation corridor in the watershed, and State Route 88 is the main east/west transportation corridor (see Figure 2).

Streams in the Dry Creek watershed are almost completely unregulated. Lake Amador, located on Jackson Creek near Ione, is the only dammed reservoir in the watershed.



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38°44'26"N

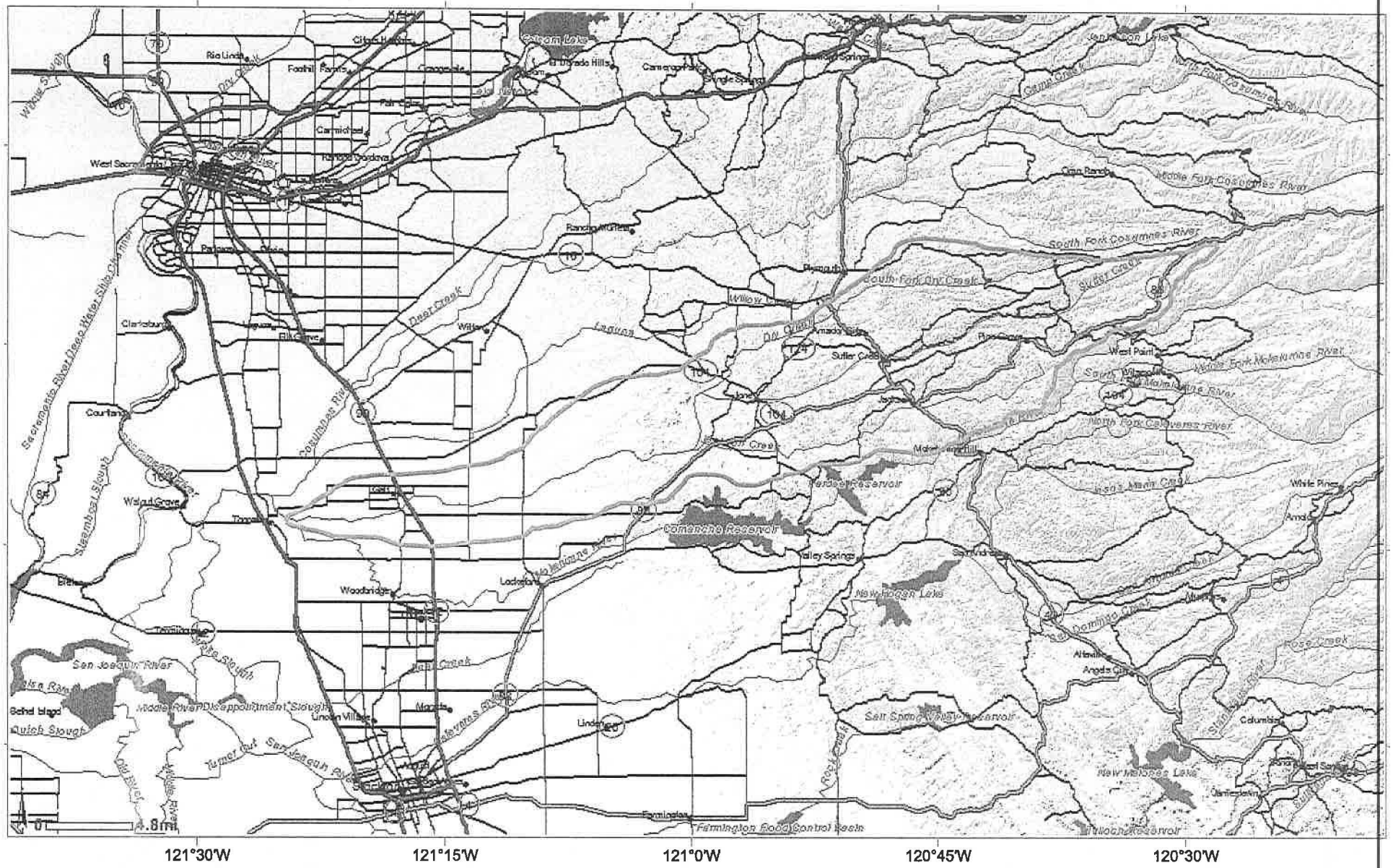
121°41'23"W | Map Extent | 120°17'59"W

37°54'49"N

The National Map
http://nationalmap.gov/

Geographic Coordinate System (WGS84)

Figure 1—Dry Creek Watershed



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38°44'26"N

121°41'23"W Map Extent 120°17'59"W

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Figure 2—Major Roads in the Dry Creek Watershed

Hydrology

Elevations within the Dry Creek watershed range between 4,000 feet at the upper end of the watershed to approximately 7 feet at the confluence of Dry Creek with the Cosumnes River. The main stem Dry Creek channel has a length of 112 miles with an elevation drop of approximately 950 feet. By comparison, the main stem of the neighboring Cosumnes River channel travels a length of 133 miles with an elevation drop of 625 feet. The downstream end of the watershed is tidally influenced—the daily tide range at Dry Creek's confluence with the Cosumnes River is approximately 1.5 to 2 feet.

As mentioned above, streams in the Dry Creek Watershed are largely unregulated. The unregulated nature of the streams, as well as the relatively steep channel profile, mean that Dry Creek is a relatively "flashy" system, with floods peaking over a few hours and lasting just a few days.

The climate of the watershed is Mediterranean, where summers are hot and dry, and the bulk of the rainfall occurs in the winter, mostly during the months of December through mid-March. Thus, winter rain events are the primary source of annual peak flows in the watershed. Estimated peak flows in Dry Creek are shown below in Table 1.

Table 1. Peak Flows for Dry Creek at Galt

Storm Event (Recurrence Interval)	Peak Flow Discharge (cfs)
2-Year	4,230
5-Year	11,200
10-Year	17,800
20-Year	25,400
50-Year	37,000
100-Year	46,900

Source: David Ford Consulting Engineers 2004

Dry Creek is no longer a perennial stream. Flows typically cease in the lower watershed during the late summer and fall due to upstream water use and groundwater overdraft in the lower watershed. Additionally, manipulation of the landscape by humans over the past 200 years has disconnected Dry Creek from many of its historical floodplains around Galt. Because of this, farms and pastures in the lower watershed are often flooded during high flow events.

Geology

Amador County lies almost entirely in the Sierra Nevada geomorphic province; only the extreme portion lies in the Central Valley. From the Central Valley

eastward, the range gradually rises to the glaciated crest in the vicinity of Mokelumne and Thimble Peaks, both of which lie above 9000 feet.

The older rocks of the Sierra Nevada, commonly called the "Bedrock series" consist of isoclinally folded complexly faulted metamorphic rocks of Paleozic and Mesozoic ages, intruded by several types of igneous rocks, chiefly granites. Unconformably overlying these rocks in the Western portion of Amador County are much younger, nearly flat-lying Tertiary sediments. These nearly flat-lying sediments are commonly called "superadjacent series"

The older metamorphic rocks are divided into the Calaveras and Amador groups and Mariposa formation. The Calaveras group includes all of the pre-Mesozoic rocks in this country while the Amador group and Mariposa formation are Jurassic.

Biological Resources

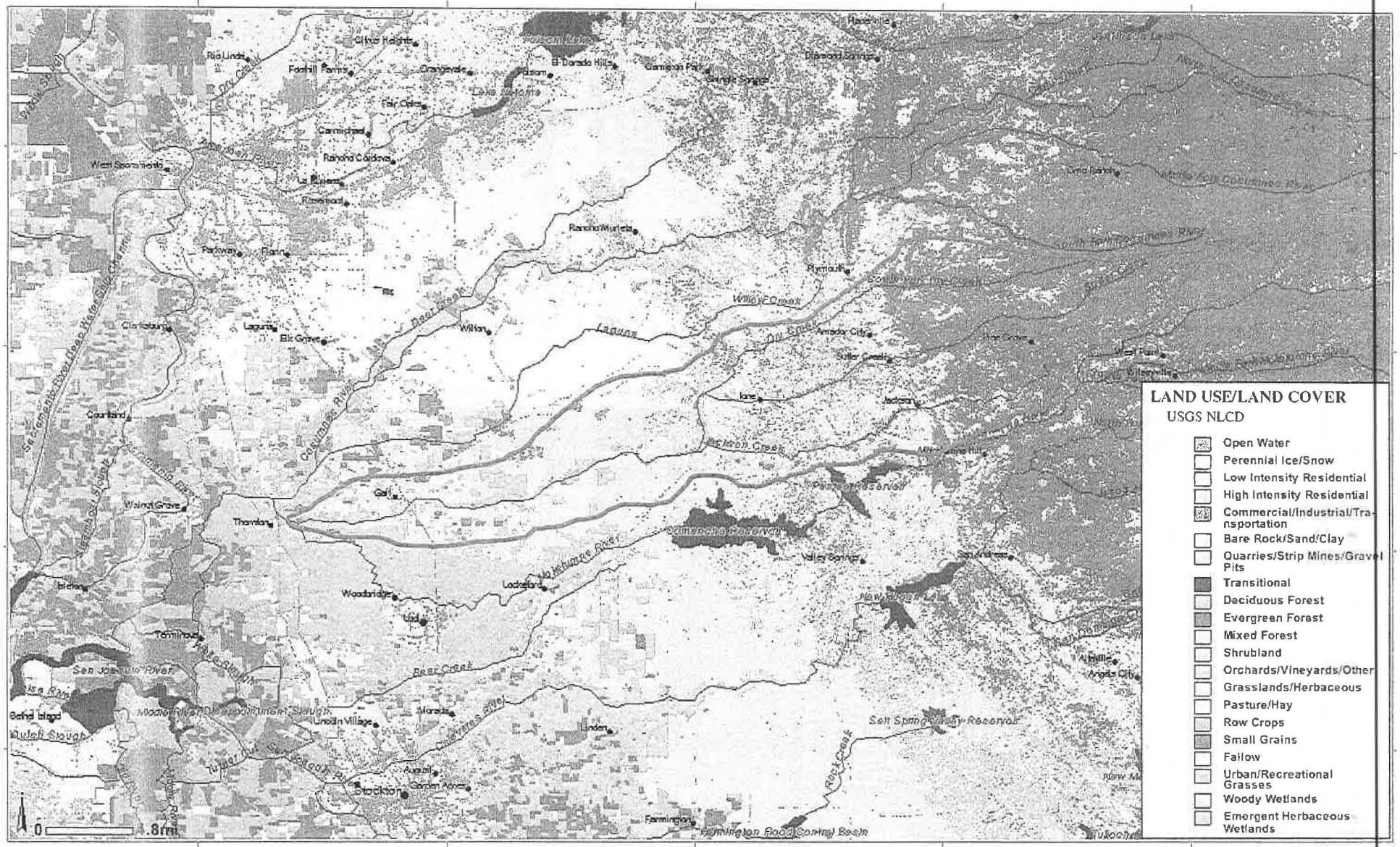
More information is needed to make a thorough characterization of the biological resources in the Dry Creek watershed. As shown in Figure 3, the upper third of the watershed is primarily vegetated with evergreen forest, the central third of the watershed is comprised of mixed coniferous/deciduous forest and grassland, and the lower third of the watershed is mainly grasslands.

Natural communities, as designated by the California Department of Fish and Game, that are present in watershed include Ione Chaparral in the upper portion of the watershed and Coastal and Valley Freshwater Marsh, Great Valley Mixed Riparian Forest, Great Valley Valley Oak Riparian Forest, Ione Chaparral, Northern Hardpan Vernal Pool, and Valley Oak Woodland in the lower portion of the watershed. Lists of special-status species in the upper and lower watersheds from the California Natural Diversity Database are included as Attachments A and B.

A number of species have attracted stakeholders' attention, many because of their implications for land management issues. Manzanita in the understory of the upper watershed forest has been known to fuel wildfires. Several invasive species have become established, among them Arundo donax, Himalayan blackberry, yellow star thistle, knapweed, skeleton weed, tree of heaven, and pepperweed. The federally listed and protected valley elderberry longhorn beetle has also been observed in the lower watershed.

Community Information

Census data for the exact area of the watershed are not readily available, as watershed overlays do not yet figure among the data sets of the U.S. Census Bureau. However, data from the 2000 census do exist for the five cities of the watershed. Those figures indicate that while most of the watershed's communities lie in Amador County, its largest population center is the city of



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Geographic Coordinate System (WGS84)

Figure 3—Land Cover in the Dry Creek Watershed

Galt, which lies in Sacramento County. In 2000 Galt had a population of 19,472. The second-largest city was Ione, which houses the Mule Creek State Prison and had a population of 7,129; Jackson was the third-largest, with 3,989 residents; Sutter Creek, the fourth-largest, with 2,303, and Amador City the smallest, with 196. Together, the cities in Amador County – Amador City, Ione, Jackson, and Sutter Creek – account for approximately 39% of the county's population of 35,100. An unknown number of people live in the unincorporated areas. On the whole, Amador County's population is older than that of California, with 18.0% being older than 65, as opposed to 10.6% for the state. A table with the census data is attached (Attachment C).

Given the amount of development that has taken place since the 2000 census, the numbers and relationships described above may have changed.

There are a number of other community institutions and characteristics that the Amador Dry Creek Watershed Council may wish to take into account as it plans for its future. One is the presence of groups with varying experience on the land. Members of an indigenous Native American tribe, the Miwok, continue to practice the old ways; traditional ceremonies are held in the round-house at Chaw'se State Park, and tribal elders practice traditional crafts, among them basketry using local natural materials. Families of some of the county's farmers, ranchers, and vintners have worked the same ground for several generations. Others who may have ongoing direct experience of the resource include hunters, agricultural workers, skiers, and hikers.

Over the past several years, development and land management have appeared prominently in community interactions. Several collaborative efforts have been undertaken. Homeowners in the KC Ranchettes subdivision, the Amador Fire Safe Council, and the Jackson Rancheria Casino worked together to fund and implement a brush-clearing project to create a fire break. The Sonoma Ecology Center, which has worked with the Amador County Wine Grape Growers Association, held watershed education workshops for local elementary school students and residents of Amador County. The Sutter Creek City Council is studying possibilities for adaptive reuse of Knight Foundry and the Central Eureka Mine; one proposal involves preserving the stamp mill and adding trails with a self-guided interpretive tour. In January 2006 Amador County announced interest in attracting the headquarters of the state Sierra Nevada Conservancy to a property in Martell formerly owned by Georgia-Pacific. Other interactions on land management include several recent lawsuits: one by the group Protect the Historic Amador Waterways to halt construction of a cross-county pipeline that would dry up the Amador Canal; one by the Earth Island Institute and the Center for Biological Diversity to halt timber harvesting near the Bear Creek Reservoir; and one by Amador County to halt the construction of a casino by the Buena Vista Band.

Known civic organizations operating in the watershed include the Lyons Club, which runs an Adopt-a-Highway project; the Rotary Club; Sons in Retirement (SIRS), the League of Women Voters of Amador County, and the Amador County Community Foundation.

Given the initial survey of community information, a list of stakeholders in the watershed could include the following:

Landowners • Ranchers • Farmers • Homeowners – new and existing **Native American Tribes** **State, Federal, and Regulatory Agencies** • CA Department of Fish & Game • CA State Water Resources Control Board • Central Valley Regional Water Quality Control Board • CA Department of Water Resources • CA Bay-Delta Authority • CA Department of Conservation • CA Department of Health Services • CA State Parks • National Oceanic and Atmospheric Administration – Fisheries • United States Fish & Wildlife Service • US Department of Agriculture/Natural Resources Conservation Services • Bureau of Land Management • US Army Corps of Engineers • US Bureau of Indian Affairs • US Geological Survey • US Environmental Protection Agency	**Business and Manufacturing** • Golf Course owner/operator • Developers • Tourism • Casino Owner/operators • Commercial manufacturing • Timber Industry • Mining **Utilities** • Pacific Gas & Electric • Amador Water Agency • Jackson Irrigation District • Municipal wastewater agencies **Non-Governmental Organizations** • Amador/Dry Creek Watershed Council • Amador Fire Safe Council • Dry Creek Conservation • PHAW – Protect the Historic Amador Waterways group • Foothill Conservancy • Amador County • Sacramento County • San Joaquin County • Local cities (incorporated or unincorporated)

Water and Wastewater Management

Water use in the watershed includes municipal, domestic and industrial water supply; agricultural irrigation; stock watering, recreation, warm water fish habitat and wildlife habitat.

A significant portion of the watershed is not served by municipal water or wastewater treatment facilities, and septic systems and wells dominate, particularly in the upper reaches. The upper watershed, located in Amador County, has characteristics distinctly different from the lower watershed. Information for the lower watershed is limited to the City of Galt in this report.

Amador County

In 1959, the Amador Water Agency was formed for the purpose of providing water and wastewater services to the residents of Amador County. The Agency is governed by a board of five directors who are elected to four year terms. The Agency offices are located in Sutter Creek, California.

Water Sources

The North Fork of the Mokelumne River, located on the California Sierra Nevada Mountains, is the primary source for the Central Amador Water Project system, the Amador Water System and the PG&E Tiger Creek Powerhouse system. Water supplied from rainfall and snowmelt is stored in the Tiger Creek After bay and gravity feeds to the PG&E Powerhouse Memcor Plant where it is treated. Water from the Tiger Creek After bay is also pumped to the Buckhorn Water Treatment Plant where it is treated and ready for use by customers of Pine Grove, Pioneer, and several smaller communities. Water from the Mokelumne River is also stored in Lake Tabeaud and conveyed by the Amador Canal to the Tanner Water Treatment Plant where it is treated for use by the customers of Jackson, Sutter Creek, Amador City and Drytown. The Ione Pipeline transports raw water from the Tanner Reservoir to the Ione Water Treatment Plant where customers are served ~~by well water~~.

The Amador Canal is a flume-like ditch that runs 23 miles from Lake Tabeaud to Tanner Reservoir. It was built in the Gold Rush era and the first water flowed through the canal as motive power for the mills and mines of the county. Later it supplied water for agricultural and domestic purposes to Sutter Creek, Jackson and Amador City (and still does today). It also helps to power Knight Foundry in Sutter Creek, the only remaining and longest continuously operated water-powered iron works in the United States.

Over many years, leaks in the canal have existed and have been allowed to continue; a valuable ecosystem of plant and animal life has become dependent on the water, as have Amador County citizens through their ground water wells, businesses along the creeks and tourism. The seepage also provides valuable fire protection and helps to cool the air in surrounding areas.

Wastewater Treatment/Disposal

There are six small wastewater treatment plants located in the watershed: Amador City, Sutter Creek, Martell, Ione, and Jackson. Amador City, Sutter Creek and Martell have secondary treatment and pump their effluent to Ione. Ione has settling ponds and percolation ponds to process much of what it receives. A portion of the effluent is advanced treated and pumped for land

application and golf course irrigation. The plant at Jackson also provides secondary treatment of its influent and then discharges its effluent into Lake Amador. Lake Amador provides water for domestic supply downstream and the Health Department would prefer that the Jackson Plant cease discharging to the lake because of water quality concerns.

Most of the population is on septic systems, which are located throughout the watershed. Many systems are very old and there is concern about the potential for failure. It is unknown if the leach fields from existing septic systems are impacting groundwater or stream water quality.

City of Galt

The City of Galt Public Works Department is responsible for the production of potable water and the operation and maintenance of the wastewater treatment plant for the residents of Galt.

Water Sources

The City of Galt relies upon groundwater from the Cosumnes Sub basin of the San Joaquin Valley Groundwater Basin as its sole source of domestic potable water. The Cosumnes Sub basin is an unadjudicated basin that supports both municipal and agricultural users. Basin inflows include natural and applied water recharge. Subsurface inflow and outflow are not known specifically. Based upon a water balance provided in a 2003 Department of Water Resources Bulletin, groundwater outflows exceed groundwater inflows by approximately 4300 acre-feet per year, suggesting a basin overdraft situation may exist.

The current system is comprised of two three-million gallon storage tanks with pump stations, seven wells, 62 miles of piping and valves and 5,800 lateral connections. The City currently averages production of over four million gallons per day of domestic water.

Treated Surface Water

Treated surface water is only viable as a future water supply if the City is successful in negotiating the purchase of imported water supply. The City has researched the availability of surface water rights for the Cosumnes River as well as from the intermittent creeks in the vicinity of the City.

Wastewater Treatment/Disposal

The City operates and maintains the wastewater treatment plant and is currently processing approximately 2.0-2.2 MGD with a plant capacity of 3.0 MGD. In 1991, Galt's Wastewater Treatment Plant was upgraded to full secondary treatment and treatment capacity was increased to 3.0 million gallons per day (MGD). At the time of the expansion, the City did not have sufficient disposal capacity during the summer to handle 3.0 MGD. At the present, the City has disposal capacity for approximately 2.2 MGD with an additional 0.3 MGD

capacity available in 2006. The City owns 180 acres of land and leases an additional 180 acres for disposal of effluent by irrigation and injection of solids.

Land Use

Historically, land use and development in Amador County has been shaped by mining, timber, agriculture, and grazing. Current land use and development is still shaped by those same forces, with the addition of tourism, manufacturing, and the in-migration of retired residents and residents who commute to the relatively distant economic centers of Sacramento and the Bay Area.

The major development trend is toward greater densities of homes where development is permitted. Amador County remained almost untouched as neighboring El Dorado, Sacramento, and San Joaquin Counties experienced explosive population growth and residential development through the late 1990s. However, rising real estate prices in neighboring counties and Amador County's desirable climate, rural ambiance, and proximity to major job markets are starting to attract unheard-of amounts of development pressure.

Table 2. General Land Use Categories in Amador County

Land Use	Acres	Percent of County
Urban and Suburban (Residential, Commercial, and Manufacturing)	108,619	29%
Federal Lands (USFS, BLM & Mokelumne Wilderness)	100,328	27%
General Agriculture (Williamson Act)	94,028	25%
Other Agriculture (EBMUD, JVID, Non-Williamson Act)	43,582	11%
Timber Production (Non-USFS/BLM)	29,524	8%
Total County	**376,081**	**100%**

Source: Amador County Fire Hazard Reduction Plan, 2004

Urban and suburban land uses continues to be the highest use of land in Amador County. As shown in the previous table, approximately 25% of agricultural lands remain under Williamson Act conservation contracts, limiting non-agricultural development in the future (Attachment D). Non-renewal of these contracts requires a ten year restricted withdrawal period, with penalties for non-compliance. However, non-irrigated lands currently reflect the fastest growing conversion of land use in an attempt to meet perceived residential needs. Unincorporated communities developing within the county (and watershed) include Jackson Valley, Martell, and Volcano.

Planning Efforts

Amador County adopted its first general plan in 1973, and has conducted updates as needed, on a 10-year review schedule. In November, 2005, the Amador County Board of Supervisors implemented a moratorium on all developments requesting general plan or zoning changes, and began steps to complete an update of its General Plan.

Amador County, and the Dry Creek Watershed area in particular, has experienced significant growth over the past 10 years. The Amador County Development Policy states that future residential development will be encouraged to take place in the form of farms, ranches, and estates throughout the county or through expansion of existing towns and villages. The increasing density of residences in the intermix zone is particularly important due to the extreme wildfire hazard in this area.

These intermix zones, otherwise know as the Wildland Urban Interface (WUI) zones, have been identified to help local agencies, organizations, and landowners focus on management of the inherent fire hazards occurring when populations encroach upon wildland areas.

The following four communities in the Dry Creek watershed are identified in the CERES database as having general plans and zoning ordinances. Table 3 shows population density for those communities.

Table 3. Amador County, California Census Subdivisions (CERES)

			Area in square miles			Density per square mile of Land Area	
Community Name Type	**Population**	**Housing Units**	**Land**	**Water**	**Total**	**Population**	**Housing Units**
Ione CCD	10,391	2,573	127.24	6.25	133.49	81.66	20.22
Jackson CCD	6,997	3,211	75.96	2.28	78.23	92.12	42.27
Pine Grove-Silver Lake CCD	9,784	5,548	218.86	3.10	221.96	44.70	25.35
Sutter Creek-Plymouth CCD	7,928	3,703	170.91	0.10	171.01	46.39	21.67

No information was immediately available for subdivision development within the cities of the watershed. Within the unincorporated areas of the watershed areas, the following subdivision maps were processed as noted in 2006:

Table 4. Processed Subdivision Maps in the Dry Creek Watershed (Amador County)

Community	Subdivision Name	No. of Units	Acres	Approved	Application
Ione	Vintage Estates	9	371	X	
Jackson Area	Clinton Oaks	4	20.6		X
Pine Grove	Petersen Ranch	58	141.22	X	
"	Pine Grove Bluffs—Phase 1	109	23.87	X	
"	Quail Ridge	81	82	X	
"	Mokelumne Bluffs	95	137.86		X
"	Pine Acres North	106	44.2		X
Sutter Creek Area	Sherrill	4	97	X	
"	LaMel Grand Estates	7	38	X	
"	Aparicio	4	31.03		X
	Total	**477**	**986.66**	**6**	**4**

Source: Amador County Subdivision records

The Amador Fire Safe Council has written the Amador County Fire Hazard Reduction Plan, finalized in May 2004. The objective of this plan is to provide the Amador Fire Safe Council a foundation to identify, prioritize, and link fuel modification treatment areas in order to create a fire safe community.

Other area plans include the Fire Resource Assessment Program of 2003 by the California Department of Forestry and Fire Protection, Lower Mokelumne River Watershed Stewardship Plan by San Joaquin County Resource Conservation District and The Lower Mokelumne River Watershed Stewardship Planning Committee.

Since the lower watershed is located in both Sacramento and San Joaquin counties, there are also references in code in the 1993 County of Sacramento General Plan Adopted on December 15, 1993 and the San Joaquin County General Plan 2010 (San Joaquin County Community Development Department, 1992. The Foothill Conservancy developed the Foothill Conservancy Land Use and Development Principles, which were developed in 2003 and adopted by the Amador Association of Realtors and the West Point Business Council in 2005.

Section 2
Issue Identification

Based on the information gathered to date, the following issues of concern were prioritized for the watershed.

Stakeholder Development and Engagement—The ADCWC is a fledgling watershed group and its first priorities should be to engage as many stakeholders as possible in its process and to raise awareness of the relevance of watershed issues to the everyday life of the residents. Building local capacity will allow the ADCWC to leverage the substantial amount of historical knowledge of the watershed among residents, foster support for its actions, and draw from a large pool for volunteer efforts.

Watershed Assessment/Monitoring Efforts—Relatively little is known about the Dry Creek watershed and its resources. In order to provide a starting point for strategic watershed planning and management, baseline information about the watershed and reliable monitoring efforts are needed. This information will allow stakeholders to create an inventory of important issues and goals based on good science, as well as allow the ADCWC to assess the success of its future efforts and adaptively manage those efforts in light of any changes that may occur.

Growth Management—As described in the Land Use section above, lands in the Dry Creek watershed are experiencing tremendous development pressure. Effects of unregulated growth on quality of life, water quality, water supply, and natural resources in the watershed were the most often articulated concern of members of the ADCWC and other stakeholders. A key role of the ADCWC over the coming years will be to form partnerships with local agencies and developers to ensure that the development occurs in a manner complementary to the current quality of life, and in harmony with existing natural resources. Additionally, Amador County is currently in the process of updating its general plan, which presents the ADCWC with a real opportunity to influence development policy in a positive way.

Protect Natural Resources—Sustainability of human life, agricultural production, quality of life, healthy ecosystems, and species diversity in and downstream of the Dry Creek Watershed all depend upon the protection and careful stewardship of natural resources in the watershed. One of the chief roles of a watershed group is to allow community stakeholders to drive the decision-making process about how to approach stewardship of these resources.

Manage Fire Hazards—Fire hazard in the eastern portion of the watershed was also expressed as a main concern of stakeholders in the Dry Creek watershed. A Fire Safe Council has already been established in Amador County to address these concerns. Partnering with the Amador Fire Safe Council would be a great opportunity for information sharing, as well as for the ADCWC to introduce themselves and their mission to a large group of potential stakeholders.

Respect Private Property Rights—Because most of the watershed is privately owned, the cooperation and goodwill of private landowners is necessary for the success of Watershed Plan implementation. Respecting private property rights is the key to receiving that cooperation and is incorporated into the goals and objectives of other priority issues.

Section 3

Goals and Objectives for Priority Issues

3.2 Stakeholder Development and Engagement

The Amador Dry Creek Watershed Council is a new organization within the community. Composition of the Council should reflect as many interests in the watershed, especially those of private landowners. Members should develop a broad understanding of all conditions and issues in the watershed that impact the quality of life.

3.2.1 Goal: Expand Participation in the ADC Watershed Council

Objective: Include as many stakeholders as possible in the development of the watershed management plan.

Action Steps (to be completed within 1 year of initiation):

- Survey stakeholders with pre-paid postcard response for meeting dates, times, etc.
- Establish a "neutral" site for meetings or rotate sites and/or locations.
- Get already established groups involved and ask for participation from their members (i.e., Fire Safe Council, RCD Boards, Tribal leaders, Cattlemen's Association, Farm Bureau, PHAW, other NGOs, local/state/federal governments.
- Identify education and outreach needs and opportunities.
- Identify key issues and develop strategies to address them.
- Identify activities to actively engage Council members and others in the community

Performance Measure: Encourage stakeholders participation regularly in plan formulation; completion of a watershed action plan.

Funding Strategies:

- In-kind donations (paper, printing, postage, meeting space, etc.)

- Community foundation capacity building grants (i.e. Chico database)

3.2.2

Goal: Educate the community on watershed issues

Objective: Develop and implement an education and outreach program.

Action Steps:

- Gather available stakeholder education materials already completed by local agencies
- Collaborate with private, state and government stakeholders to compile existing resource materials on resource concerns, policy items, and best management practices.
- Work closely with governmental agencies to eliminate duplication of watershed education efforts.
- Develop ways in which research data and information materials are understandable and available for direct use in decision making and implementation by as many stakeholders as possible
- Partner with local volunteer organizations to assist with education and management efforts
- Host public workshops to demonstrate watershed improvements due to activities implemented by watershed projects
- Develop a school classroom outreach presentation

Performance Measure: Variety of materials available; number of workshops and presentations given; partnerships with schools for watershed education

Funding Strategies:

- Identify grants and other funding opportunities for planning, implementation, and monitoring project. (Refer to Additional Resources at the end of this report)
- Funding from DFG, USFWS, NOAA Fisheries, National Fish and Wildlife Foundation, CALFED.
- Funding from community foundations, Jackson Rancheria Casino, and School Districts

3.3

Watershed Assessment/Monitoring Efforts

Relatively little is known about the Dry Creek Watershed and its resources. In order to provide a starting point for strategic watershed planning and management, baseline information about the watershed and reliable monitoring efforts should be established. This information will allow stakeholders to create an inventory of important issues and goals reinforced by data, as well as allow

the Council to assess the success of its efforts and adaptively manage those efforts in light of any changes that may occur.

3.3.1 **Goal: Establish reliable baseline information about the watershed.**

a) **Objective: Identify data gaps and strategies for gathering needed data**

b) **Objective: Perform a comprehensive watershed assessment and update it every five years.** The assessment should incorporate information on biological resources, invasive species, stream morphology, water management, land use, demographics, economics, and potential partners.

Action Steps:

- Assemble existing available resource materials, including:
- County Soil map (NRCS)
- Vegetation species inventory (CNPS, RHJV, EBMUD, PG&E)
- Mammalian species inventory (DFG, Sierra Club, USFWS, EBMUD, PG&E)
- Avian species inventory (Audubon, Sierra Club, PRBO, EBMUD, PG&E)
- Fish species inventory (NOAA Fisheries, DFG, USFWS, Amador Water Agency, EBMUD, PG&E
- Baseline Water Quality data (RWQCB, water agencies)
- Map of land uses (County Planning)
- Maps of Williamson act land (DOC, NRCS)
- Conduct riparian habitat assessment
- Identify education and outreach needs and opportunities

Performance Measures: maps of each condition (perhaps as GIS layers); ranking of species for preservation, ranking of areas for preservation, ranking target areas for restoration, enhancement, and protection.

Funding Strategy: Funding from DFG, USFWS, NOAA Fisheries, National Fish and Wildlife Foundation, CALFED. In-kind help from other agencies, especially stakeholder agencies.

c) **Objective: Establish a credible water flow and velocity gauging system on Dry Creek and its tributaries.**

The most useful distribution of gauges would require installing eight gauges. However, with limited funding, installing gauges below each major tributary

confluence could provide useful data, as could reactivating the gauge on Dry Creek at Galt.

Action Steps:

- Install an 8-gauge configuration, including the following:
- North Fork Dry Creek above confluence with South Fork Dry Creek,
- South Fork Dry Creek above confluence with North Fork Dry Creek,
- Below confluence of North and South Fork Dry Creeks,
- Sutter Creek above confluence with Dry Creek,
- Below confluence of Sutter Creek and Dry Creek,
- Jackson Creek above confluence with Dry Creek,
- Below confluence of Jackson Creek and Dry Creek, and
- Dry Creek at Galt.

Performance Measure:

- Produce baseline flow report
- Establish maintenance plan
- Respect private property rights in producing data

Funding Strategy:

- Respect private property rights and produce measures to ensure interests are comfortable with funding source, perhaps pursue private support for this effort
- Homeland Security grants

Objective: Develop a stakeholder water quality monitoring program.

This effort will function to collect valuable data that can be used in ranking priorities and measuring success of actions, as well as to engage local residents in an activity that will put them on the ground in their watershed, learning how their watershed works and how certain activities affect their watershed, and fostering a personal connection with their local streams.

Action Steps:

- Identify sites for monitoring activities
- Recruit volunteers interested and available for monitoring activities
- Develop ~~or~~ sampling protocol
- Provide training for volunteers on sampling protocol

Performance Measure:

- Basline report is produced

- Sampling protocol in compliance with EPA standards and/or State Regulation standards.
- Monitoring schedule is established

Funding Strategy:

- Collaborate with established watershed groups and local governments to identify and promote integration among watershed efforts
- Pursue funding fro private sources to assist in the assurance that private property rights and concerns can be respected.

3.4

Growth Management

Amador County is experiencing accelerated growth, which may adversely impact the availability of water, water quality, traffic and the rural character of the watershed. An effort to update the County General Plan has begun and will take approximately 3-4 years to complete.

3.4.1

Goal: Encourage water use efficiency to ensure an adequate supply for current and projected domestic and agricultural uses, and to support the needs of natural habitats.

Objective: Participate in outreach and education efforts to increase public understanding of the current sources, uses and limitations of water supply in the watershed.

Action Steps:

- Plan approach in collaboration with AWA
- Convene meetings with community groups
- Distribute literature and BMPs for water use efficiency strategies

Performance Measure: Pre and post campaign surveys of public understanding of water issues and conservation practices; increased level of understanding and use of conservation measures

Funding Strategy: Partner with local public agencies that might be able to leverage statewide funding sources for water use efficiency.

b) **Objective: Initiate collaborative among wastewater management agencies, agricultural producers and interested stakeholders to develop a plan for reuse of secondary and advanced secondary treated wastewater for additional farm and vineyard irrigation.**

Action Steps:

- Plan with AWA and convene meeting of key stakeholders.
- Gather and provide information of similar efforts in other communities.
- Educate the community and farmers on current sources and uses of water, including the viability of using recycled water for additional farm and vineyard irrigation.

Performance Measure: Completed plan for increased agricultural reuse of wastewater; zero discharge to Lake Amador

Funding Strategy: In-kind services; SWRCB loans/grants

3.4.2 **Goal: Balance land use decisions with the need to maintain a healthy environment and to protect natural resources**

a) **Objective: Integrate Watershed Plan priorities into the revised Amador County General Plan.**

Action Steps:

- Participate in the General Plan update meetings (Task Force?) to represent the interests of the watershed in proposed GP amendments.
- Propose language for integration into the General Plan update, which reflects the values and priorities of the community and the health of the watershed.

Performance Measure: Updated Amador County General Plan is consistent with the values and priorities of the community and the health of the watershed.

Funding Strategy: In-kind services

b) **Objective: Assist in establishing guidelines for "Smart Growth" in the counties, the cities, and/or the towns in the watershed, including in the Amador County General Plan, which is currently being updated.**

Action Steps:

- Complete a watershed assessment including water use, well clustering, water draw down, and recharge and riparian areas to address the reduction of corridor habitat as a result of development in the watershed.

- Assess any established water systems in the watershed checking for water supplies, wastewater disposal, and water quality
- Attend and participate any Board of Supervisor's meetings addressing growth and land use
- Form a sub-committee of the watershed to assist in the Area Plan to include water issues, building locations in respect to riparian areas of the creek, and smart growth policy
- Address as an issue of growth the reduction and prevention of sedimentation from entering the creek.

Performance Measure: Completed assessment; Smart Growth guidelines established

Funding Strategy: In-kind services; local agency funding/partnership

3.5 Protect Natural Resources

The many rich natural resources in the Dry Creek Watershed need care and protection to maintain the current quality of life. Efforts to improve and sustain these resources will help ensure adequate supplies of drinking water, wildlife to observe and enjoy, healthy ecosystems with native plants, fire safe communities, and an appreciation for both public land and personal property.

3.5.1 Goal: Preserve Natural Resources of Amador Dry Creek Watershed

a) Objective: Identify areas for habitat protection, enhancement, and restoration

Action Steps:

- Conduct an analysis of baseline assessment information, as detailed above
- Identify data gaps
- Identify current land protections (Williamson act, easements, encoded setbacks, etc.)
- Identify funding sources for protection/enhancement/restoration (p/e/r)
- Identify companies/NGO's, or non-profits that perform p/e/r design and construction
- Identify permitting needs and problems
- Identify Education and Outreach needs and opportunities

Performance Measures:

- Map of T/E species habitat protection areas (not specific properties)
- Safe harbor agreement for landowners w t/e species concerns

- Completed list of alternatives for watershed-wide p/e/r actions.
- Agreement from stakeholders on target areas for p/e/r actions
- Protection and p/e/r priorities are included in the updated county general plan

Funding Strategy: CALFED ERP, DFG, USFWS, EPA, RWQCB.

3.5.2

Goal: Reduce and prevent contaminants from entering the watershed (improve and protect water quality).

a)

Objective: Implement clean water programs to improve identified problem areas.

Some specific examples include: replace failing septic systems, remove old mine tailings, improve and or install new storm drainage, replace undersized culverts, develop ways to reduce and prevent contaminants from entering the streams.

Action Steps:

- Seek grant funding to support a monitoring program of the Dry Creek watershed to determine the type of pollutants and their effect on water quality.
- Determine the major drainage problems, including those from old mines, old logging camps/mills, housing developments, commercial operations, vineyards, and septic system runoff that are entering the watershed.
- Evaluate old mine and old logging residue to determine constituents and assess water quality impacts.
- Develop a monitoring program
- Develop restoration plans, including best management practices for implementation.

Performance Measures: List of priority pollutants; completed water quality impact report; Monitoring program in place; BMPS developed or under development

Funding Strategy: CALFED ERP, DFG, USFWS, EPA, RWQCB.

3.5.3

Goal: Educate and involve the community in reducing the impacts of invasive plants

a)

Objective: Eliminate all noxious weeds or invasive plant species in the watershed.

Action Steps:

- Complete a Noxious Weed/Invasive species assessment in the Dry Creek Watershed
- Educate Stakeholders utilizing materials already completed by local agencies

- Create brochures and hand-outs specific to the invasive species in the Dry Creek Watershed
- Develop methods to eliminate Noxious Weeds/Invasive species in a manner that does not degrade the watershed
- Reestablish native plant species to enhance riparian corridors and to sustain threatened and endangered species
- Host public workshops and tours to demonstrate watershed improvements due to activities implemented by watershed projects
- Recruit volunteers to identify areas of concern and eradicate those areas

Performance Measures: Completed assessment and map of priority areas; acres reestablished with native plant species; number of workshops/tours and attendance at those event; number of volunteers/volunteer work days

Funding Strategy: CALFED ERP, DFG, USFWS, EPA, RWQCB.

3.6 Manage Fire Hazards

According to the California, Fire Plan, the risk of wild fires is increasing, area population is increasing, and the topography of the area adds to the potential for wildfire. These factors, when combined, place the watershed and its assets at high risk. The threat of a large, damaging wildfire is high, as is the potential for loss of valuable natural resources, personal property and human life.

3.6.1 Goal: Protect the watershed through support for and implementation of additional fire safety strategies.

a) Objective: In cooperation with the Fire Safe Council and the community, survey the properties east of Hwy 49 to determine areas of high fire risk.

Action Steps:

- Map areas to be surveyed
- Recruit volunteers and landowners to complete assessment
- Develop strategies for reducing fire risk.

Performance Measures: Completed assessment and map of priority areas; Number of volunteers/landowners participating; completed list of strategies and plan for implementation

Funding Strategy: In-kind services

b) **Objective: Reduce excessive fuel loads on public and private lands and increase public safety**

Action Steps:

- Recruit public agencies and volunteers to support efforts
- Construct defensible fuel breaks in most vulnerable areas;
- Evaluating fire-fighting access; and
- Develop evacuation plan for the watershed

Performance Measures: Number of public agencies and volunteers participating in effort; Completed defensible fuel breaks; completed evacuation plan.

Funding Strategy: In-kind services; CDF; local fire agencies

3.6.2 **Goal: Educate and involve landowners in the watershed to keep their property fire safe**

a) **Objective: Provide fire safety guidelines to prevent the threat of a large damaging wildfire or the potential loss of valuable natural resources, personal property, and human life.**

Action Steps:

- Educate property owners on the "Lean, Clean, and Green" approach
- Reduce excessive fuel loads on public and private lands.
- Identify areas with excessive fuel loads
- Assist landowners in constructing defensible fuel breaks, evaluating fire-fighting access, and developing an evacuation plan.

Performance Measures: Number of landowners participating in educational efforts; vulnerable areas identified; completed defensible fuel breaks; completed evacuation plans.

Funding Strategy: In-kind services; CDF; local fire agencies.

Section 4

Additional Resources

Mokelumne River Watershed Owner's Manual: Based on the Home*A*Syst model, the Mokelumne River Watershed Owner's Manual is a voluntary, stewardship-based workbook to guide homeowners in reducing non-point source pollution. The workbook was prepared by the San Joaquin County Resource Conservation District in partnership with the Lower Mokelumne River Watershed Stewardship Planning Committee. The manual provides guidelines for evaluating property and formulating action plans to reduce or eliminate non-point source pollution for homeowners and other residents of the watershed. Topics addressed include: storm water management, reducing pollutants in runoff, landscaping and property management to reduce runoff, drinking water well management, well location and maintenance, household wastewater and septic/sewer systems, managing hazardous household products, product disposal, managing swimming pools and similar topics.

Central Valley Waste Services: CVWS offers educational programs promoting a clean environment. Specifically, CVWS emphasizes educational programs for: a) second graders regarding how recycling preserves natural resources and b) fourth graders discussing source reduction of trash. Thousands of children benefit from these programs annually.

U.C. Cooperative Extension: This agency provides extensive education program addressing watershed management. A few of the most recently developed programs include homeowner education programs targeting the use of residential pesticides (currently funded by CALFED and targeting Diazinon and Dursban) and a new curriculum targeting grades 3-6 emphasizing water and pesticide education. The agency also holds regular farm commodity meetings (e.g., tomato, corn, asparagus, etc.) which emphasize best management practices related to water use and pollution.

Leadership Institute's Adopt-A-Watershed: Adopt-A-Watershed is a K-12 school-community learning experience which uses local watersheds as living

laboratories where students engage in hands-on activities. The program is sponsored by the Leadership Institute. Five primary elements are emphasized: 1) applying science concepts directly to the local watershed, 2) monitoring local watersheds through field study, 3) restoring watersheds through community need-based projects, 4) educating through community action projects and 5) reflecting upon concepts learned while making contributions to the community. The program addresses plants, wildlife, aquatics, ecosystems, soils, geology, vegetation management, and cultures with a curriculum consistent with state requirements. Training for teachers is included in the program. Approximately 120 teachers in San Joaquin County are currently involved in the program.

Learning Under Creative Concepts (LUCC): This organization provides stewardship-related programs for young first-offenders and other at-risk youths which help to foster responsibility and self-esteem. Undertaken primarily on LUCC-owned property, these stewardship-based programs include agriculture, riparian restoration, horse rehabilitation, and similar programs.

Lodi-Woodbridge Winegrape Commission (LWWC): LWWC has produced the Lodi Winegrowers Workbook . This self-assessment guide to integrated farming practices addresses viticulture, soil management, water management, pest management, habitat management, management of human resources and evaluation of wine quality.

CA Dairy Quality Assurance Program (CDQAP): The San Joaquin County U.C. Cooperative Extension office assists in implementation of this voluntary program to encourage management practices promoting resource conservation in dairy operations. Additional program details may be found at CDQA.org.

California Cattleman's Association (CCA) CA Rangeland Water Quality Management Plan Riparian Grazing Project, Beef Quality Assurance Program: The California Rangeland Water Quality Management Program (CRWQMP) was developed by the CCA, U.S. Cooperative Extension, environmental agencies and interest groups to improve water quality on private rangeland under a voluntary program officially adopted in 1995 and including rangeland water quality management strategies, policies and coordination mechanisms as well as sample plants and sources of assistance.

The Riparian Grazing Projects is a joint effort of the CCA and U.S. Cooperative Extension to determine correct and incorrect methods for grazing to ensure riparian success. The project is a statewide study of rangeland riparian areas in which riparian area health, specific site watershed conditions and site specific management are simultaneously examined and address both past and present grazing methods. Program assistance is being provided by the CA Department of Forestry and fire Protection, the U.S. EPA, the CA Department of Fish and Game, the U.S. Department of Forestry, the U.S. Bureau of Land Management, UC Davis and others.

Much like the CA Dairy Quality Assurance Program, this program was begun in 1986 as an industry effort to encourage cattlemen to follow certain quality control measures exceeding those of the U.S. Department of Agriculture and the Food and Drug Administration. The California Cattleman's Association Quality

Assurance Program grew from this effort in 1992 and emphasizes a partnership with the U.C. Cooperative Extension. Surveys and workshops are used to evaluate multiple activities, including animal handling and sanitation activities that may affect the watershed.

Biologically Integrated Orchard Systems (BIOS): Founded in 1993 by the Community Alliance with Family Farmers (CAFF), BIOS is a technical assistance program whose primary purpose is to "build a community of farmers, other agricultural professionals, and public institutions dedicated to the voluntary adoption of whole-systems approaches to farm management that are flexible, maintain long-term profitability, and rely less on chemical inputs."

The BIOS program for almonds and walnuts has been underway for nearly seven years in the Central Valley where a small, but growing number of farmers have successfully reduced their insecticide, herbicide and fertilizer inputs without affecting yield or quality. The BIOS program is actively working to refine these techniques and extend them to other nut growers using the experiences of the participating growers, their independent pest control advisors and UC researchers.

BIOS programs are active in Merced, Stanislaus, Madera, San Joaquin Colusa, Yolo, Solano and Merced counties. Program cooperators include the University of California Sustainable Agriculture Research and Education Program, UC Statewide Integrated Pest Management Program, UC Cooperative Extension, the USDA's Farm Service Agency, and the USDA's Natural Resources Conservation Service (NRCS).

Biologically Integrated Farming Systems (BIFS): As a result of the success of the BIOS program (see above), the California Legislature created BIFS to extend the BIOS project to include crops and other farming systems. The University of California Sustainable Agriculture Research and Education Program (SAREP), and the U.S. Environmental Protection Agency support this competitive grant program. The goal of BIFS is to demonstrate and expand the use of integrated farming systems that have been proven to economically reduce the use of farm chemicals. Farmers involved in the BIFS project are:

- Integrating biological and cultural control of pests into their production systems;
- Using pest monitoring and economic action thresholds to advise the timing of chemical applications;
- Emphasizing soil-building practices such as the use of cover crops to provide all or part of the nitrogen needed by crops, increase water infiltration of the soil and decrease erosion and flooding;
- Using manure to provide nutrients for cover crops;
- Creating an on-farm habitat and restoring riparian areas to encourage beneficial insect populations and improve habitat for fish, migrant birds and game species; and
- Improving livestock management while protecting natural resources.

Central Valley Project Improvement Act/Anadromous Fish Restoration Plan: The Central Valley Project Improvement Act (CVPIA) of 1992 [Section 3405(b)(1)] directed the Secretary of the Interior to develop and implement a program which makes all reasonable efforts to double natural production of anadromous fish in Central Valley rivers and streams by 2002. In response, the U.S. Fish and Wildlife Service prepared the Anadromous Fish Restoration Program Plan (AFRP). The plan identifies multiple anadromous fish habitat deficiencies in each tributary of the Central Valley of California.

Alternative Roofing plans: www.roofmeadow.com

California Conservation Dept.-Recycling Division (916)-323-3836 www.consrv.ca.gov

California EPA-Toxics Help Desk (916)-327-1848 www.calepa.ca.gov

California Health Services Dept.-Drinking Water and Environmental Management

(916)-322-2308 www.dhs.ca.gov/ps/ddwem/

California Pesticide Regulation Department-Environmental Monitoring and Pest Management (916)-324-4100 www.cdpr.ca.gov

California Toxic Substances Control-Public Assistance (916)-322-0476 www.dtsc.ca.gov

California Water Resources Control Board (SWRCB) (916)-341-5250 www.swrcb.ca.gov

SWRCB-Nonpoint Section (916)-341-5494 www.swrcb.ca.gov

SWRCB-Stormwater Programs (916)-341-5529 www.swrcb.ca.gov

California Native Grass Association www.cgna.org

California Native Plant Society (916)-447-2677 www.cnps.org

Motor oil and filter recycling (800)-253-2687

United States Department of Agriculture-Natural Resource Conservation Service www.nrcs.usda.gov

A few of the potential funding sources for some of the LMSP programs include:

American Sport fishing Association Fish American Foundation (FAF) and the

National Oceanic and Atmospheric Administration (NOAA) – offers funding for community based restoration programs for on-the-ground habitat restoration in marine, estuarine and anadromous fish habitats. $5,000-$30,000. NOAA

Fisheries Restoration Center, HC-3, RM 15322; 1315 East West Highway; Silver Spring, MD 20910 (301) 713-0174 Ext. 200.
www.nmfs.noaa.gov/habitat/restoration/community/index.htm.

California Resources Agency - California Department of Parks and Recreation , Planning and Local Services Section - Habitat Conservation Fund. P.O. Box 942896; 1416 Ninth St., Sacramento, CA 94296-0001; (916) 653-7423 or visit http://parks.ca.gov/grants/hcf/hcf.htm

California Resources Agency - California Department of Parks and Recreation Recreational Trails Program Grants. Contact (916) 651-8572 or http://parks.ca.gov/grants/rtp/rtp00.htm

California Resources Agency – Environmental Enhancement and Mitigation Fund Program (EEM) Grants for acq1uisition, restoration or enhancement of watersheds, wildlife habitat, wetlands and forests. Grants generally limited to $250,000. Contact (916) 653-5656 or http://ceres.ca.gov/cra/eemp_new.html

California Department of Conservation Division of Land Resource Protection - California Farmland Conservancy Program (CFCP). Contact (916) 322-9721 or be e-mail at CFCP@consrv.ca.gov.

California Department of Conservation Resource Conservation District Assistance Grant Program. Contact the Division of Land Resource Protection. (916) 324-0774

CALFED – Various, including the CALFED Ecosystem Restoration Program and Watershed Program. See www.calfed.ca.gov for details and deadlines.

National Association of Conservation Districts – Conservation Incentives Program (CIP) – visit www.nacd.org

National Fish and Wildlife Foundation – extensive list of grants for resource conservation activities. Contact (415) 778-0999 or visit www.nfwf.org/programs/guidelines.htm

Northwest Water Law and Policy Project. Video to assist communities in securing funding for restoration projects in local streams and watersheds. Call (503) 768-6761 or e-mail water@lclark.edu

United States Department of Agriculture Natural Resources Conservation Service – Conservation Programs. Extensive list of funding sources and assistance programs: Conservation Technical Assistance, Environmental Quality Incentives Program (EQIP), Wetlands Reserve Program (WRP), Wildlife Habitat Incentives Program (WHIP), Forestry Incentives Program (FIP), Farmland Protection Program (FPP), and many more.
www.nhq.nrcs.usda.gov/PROGRMAS/cpindex.htm

United States Fish and Wildlife Service Small Wetlands Grants, under $50,000. Contact (703) 358-1784 or visit
http://northamerican.fws.gov/NAWCA/smgrants.htrml

National Resource Projects Inventory – NRPI – www.ice.ucdavis.edu/nrpi

California Watershed Funding Database – www.calwatershedfunds.org

California Watershed Network – www.watershednetwork.org

Section 5
References

David Ford Consulting Engineers, 2004. *Cosumnes and Mokelumne River watersheds – Design storm runoff analysis*, prepared for Sacramento County Department of Water Resources, February.

City of Galt Urban Water Management Plan, 2005.

City of Galt website.

CALFED Watershed Partnership Seminar Dry Creek Watershed handout.

Attachment A. Special-Status Species in the Upper Dry Creek Watershed[a]

Common Name	Scientific Name	Federal Status		California Status		DFG Species of Concern	CNPS Listing[b]
		Threatened	Endangered	Threatened	Endangered		
Natural Communities							
Ione Chaparral							
Birds							
Tricolored blackbird	*Agelaius tricolor*					✓	
Reptiles/Amphibians							
Northwestern pond turtle	*Emys (=Clemmys) marmorata marmorata*					✓	
Invertebrates							
Grady's Cave amphipod	*Stygobromus gradyi*						
Valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*	✓					
Plants							
Bisbee Peak rush-rose	*Helianthemum suffrutescens*						3
Ione buckwheat	*Eriogonum apricum var. apricum*		✓		✓		1B
Ione manzanita	*Arctostaphylos myrtifolia*	✓					1B
Irish Hill buckwheat	*Eriogonum apricum var. prostratum*		✓		✓		1B
Parry's horkelia	*Horkelia parryi*						1B
Pincushion navarretia	*Navarretia myersii ssp. myersii*						1B
Prairie wedge grass	*Sphenopholis obtusata*						2
Red Hills soaproot	*Chlorogalum grandiflorum*						1B
Tuolumne button-celery	*Eryngium pinnatisectum*						1B

[a]Data gathered using the California Department of Fish and Game's California Natural Diversity Database Quick Viewer for the following USGS quadrangles: Amador City, Aukum, Fiddletown, Irish Hill, Ione, Jackson, Pine Grove, and West Point. This is not an official CNDDB report.

[b] California Native Plant Society (CNPS) "1B" Listing—Rare or Endangered in California and elsewhere
CNPS "2" Listing—Rare and Endangered in California, more common elsewhere
CNPS "3" Listing—Need more information

Attachment B. Special-Status Species in the Lower Dry Creek Watershed[a]

Common Name	Scientific Name	Federal Status		California Status		DFG Species of Concern	CNPS Listing[b]
		Threatened	Endangered	Threatened	Endangered		
Natural Communities							
Coastal and Valley Freshwater Marsh							
Great Valley Mixed Riparian Forest							
Great Valley Valley Oak Riparian Forest							
Ione Chaparral							
Northern Hardpan Vernal Pool							
Valley Oak Woodland							
Mammals							
American badger	*Taxidea taxus*					✓	
Birds							
Bank swallow	*Riparia riparia*			✓			
Burrowing owl	*Athene cunicularia*					✓	
Golden eagle	*Aquila chrysaetos*					✓	
Great blue heron	*Ardea herodias*						
Great egret	*Ardea alba*						
Swainson's hawk	*Buteo swainsoni*			✓			
Tricolored blackbird	*Agelaius tricolor*					✓	
White-tailed kite	*Elanus leucurus*						
Reptiles/Amphibians							
California tiger salamander	*Ambystoma californiense*	✓				✓	
Foothill yellow-legged frog	*Rana boylii*					✓	
Giant garter snake	*Thamnophis gigas*	✓		✓			
Northwestern pond turtle	*Emys (=Clemmys) marmorata marmorata*					✓	
Western pond turtle	*Emys (=Clemmys) marmorata*					✓	
Western spadefoot	*Spea (=Scaphiopus) hammondii*					✓	
Fish							
Sacramento splittail	*Pogonichthys macrolepidotus*					✓	
Invertebrates							
Midvalley fairy shrimp	*Branchinecta mesovallensis*						
Ricksecker's water scavenger beetle	*Hydrochara rickseckeri*						
Valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*	✓					
Vernal pool fairy shrimp	*Branchinecta lynchi*	✓					

Common Name	Scientific Name	Federal Status		California Status		DFG Species of Concern	CNPS Listing[b]
		Threatened	Endangered	Threatened	Endangered		
Vernal pool tadpole shrimp	*Lepidurus packardi*		✓				
Plants							
Bisbee Peak rush-rose	*Helianthemum suffrutescens*						3
Blue skullcap	*Scutellaria lateriflora*						2
Boggs Lake hedge-hyssop	*Gratiola heterosepala*				✓		1B
California linderiella	*Linderiella occidentalis*						
Delta mudwort	*Limosella subulata*						2
Delta tule pea	*Lathyrus jepsonii var. jepsonii*						1B
Dwarf downingia	*Downingia pusilla*						2
Ione buckwheat	*Eriogonum apricum var. apricum*		✓		✓		1B
Ione manzanita	*Arctostaphylos myrtifolia*	✓					1B
Irish Hill buckwheat	*Eriogonum apricum var. prostratum*		✓		✓		1B
Legenere	*Legenere limosa*						1B
Mason's lilaeopsis	*Lilaeopsis masonii*						1B
Parry's horkelia	*Horkelia parryi*						1B
Pincushion navarretia	*Navarretia myersii ssp. myersii*						1B
Rose-mallow	*Hibiscus lasiocarpus*						2
Sacramento orcutt grass	*Orcuttia viscida*		✓		✓		1B
Sanford's arrowhead	*Sagittaria sanfordii*						1B
Tuolumne button-celery	*Eryngium pinnatisectum*						1B

[a]Data gathered using the California Department of Fish and Game's California Natural Diversity Database Quick Viewer for the following USGS quadrangles: Bruceville, Carbondale, Clay, Galt, Goose Creek, Lodi North, and Thornton. This is not an official CNDDB report.

[b]California Native Plant Society (CNPS) "1B" Listing—Rare or Endangered in California and elsewhere
CNPS "2" Listing—Rare and Endangered in California, more common elsewhere
CNPS "3" Listing—Need more information

Attachment C. 2000 census data for Amador County and Dry Creek watershed communities

Geographic area	% of Amador County populatio n	Total populatio n	White	Black or African-America n	American Indian and Alaska Native	Asian	Native Hawaiian and Other Pacific	Other race	Two or more races	Hispani c or Latino (of any race)
I. Census count: members of ethnic groups										
Amador City	0.56%	196	178	0	2	0	0	8	8	18
Galt, Sacramento County	NA	19,472	13,726	225	204	553	31	3616	1117	6465
Ione city, Amador County	20.31%	7,129	4,128	1,271	164	120	12	1,292	142	1,437
Jackson city, Amador County	11.36%	3,989	3,731	20	55	23	3	74	83	258
Sutter Creek city, Amador County	6.56%	2,303	2,106	5	30	24	7	49	82	134
Amador County	**100.00%**	**35,100**	**30,113**	**1,359**	**626**	**350**	**36**	**1,769**	**847**	**3,126**
II. Ethnic groups as % of total										
Amador City		100.0%	90.8%	0.0%	1.0%	0.0%	0.0%	4.1%	4.1%	9.2%
Galt		100.0%	70.5%	1.2%	1.0%	2.8%	0.2%	18.6%	5.7%	33.2%
Ione city, Amador County		100.0%	57.9%	17.8%	2.3%	1.7%	0.2%	18.1%	2.0%	20.2%
Jackson city, Amador County		100.0%	93.5%	0.5%	1.4%	0.6%	0.1%	1.9%	2.1%	6.5%
Sutter Creek city, Amador County		100.0%	91.4%	0.2%	1.3%	1.0%	0.3%	2.1%	3.6%	5.8%
Amador County		**100.0%**	**85.8%**	**3.9%**	**1.8%**	**1.0%**	**0.1%**	**5.0%**	**2.4%**	**8.9%**

STATE OF CALIFORNIA
Arnold Schwarzenegger, Governor

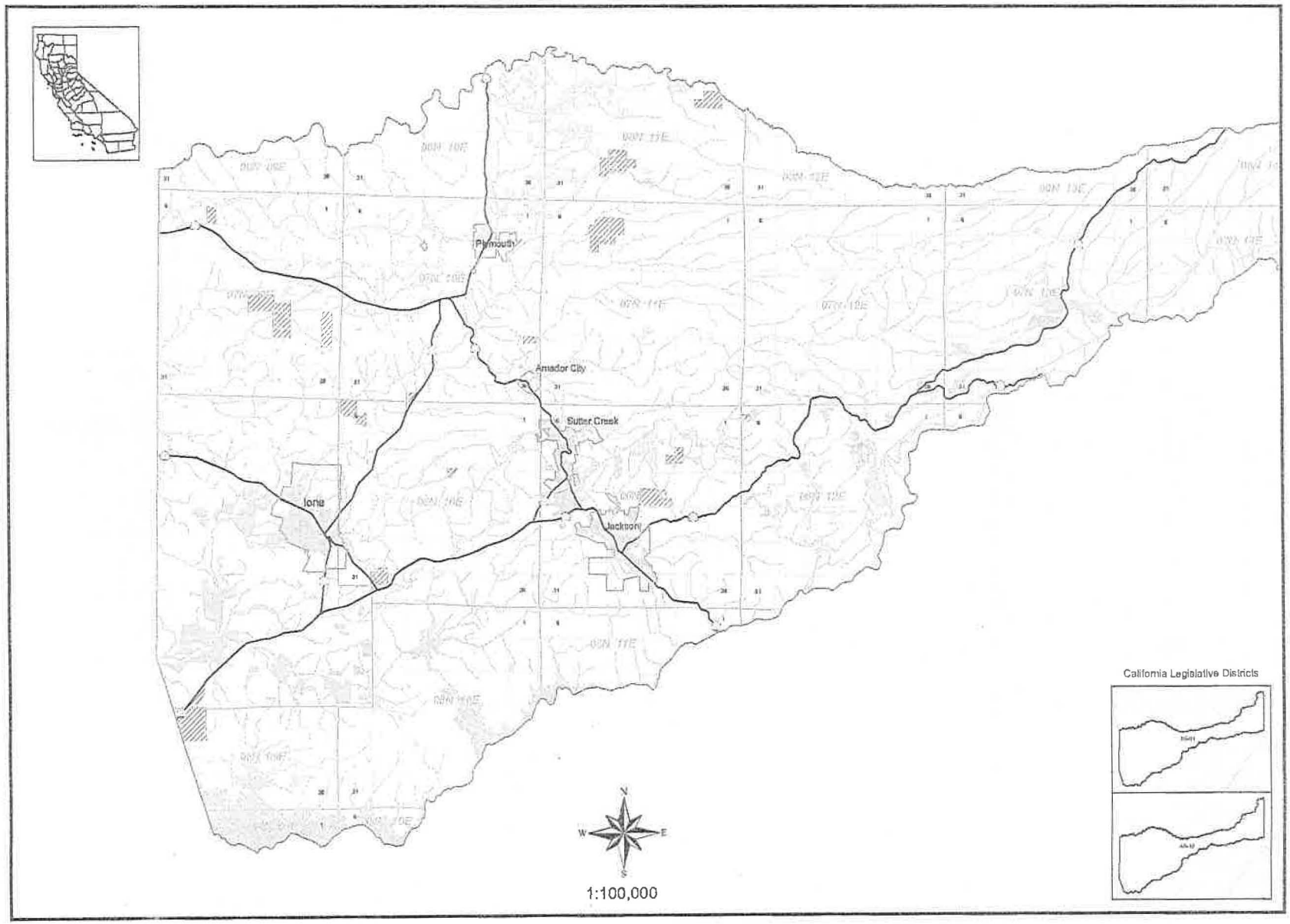
THE RESOURCES AGENCY
Michael Chrisman, Secretary for Resources

DEPARTMENT OF CONSERVATION
Debbie Sareeram, Interim Director

Amador County Williamson Act Lands 2004

Land Enrolled in Williamson Act and Farmland Security Zone Contracts as of 01-01-2004

Department of Conservation
Division of Land Resource Protection



Williamson Act - Prime Agricultural Land

Williamson Act - Non-Prime Agricultural Land

Williamson Act - Non-Prime Land in Non-Renewal

Non-Enrolled Land

Urban and Built-up Land

Water

City Limits or City Boundary

Public Land Survey System

Highways

Williamson Act - Prime Agricultural Land
Land which is enrolled under California Land Conservation Act contract and meets one of the following criteria (as set forth under California Government Code Section 51201):
1. Land which qualifies for rating as class I or class II in the Natural Resources Conservation Service land use capability classification;
2. Land which qualifies for rating 80 to 100 in the Storie Index Rating;
3. Land which supports livestock used for the production of food and fiber and which has an annual carrying capacity equivalent to at least one animal unit per acre, as defined by the United States Department of Agriculture;
4. Land planted with fruit or nut-bearing trees, vines, bushes or crops which have a non-bearing period of less than five years and which normally return during the commercial bearing period on an average basis from the production of unprocessed agricultural plant production not less than two hundred dollars per acre;
5. Land which has returned from the production of unprocessed agricultural plant production and has an annual gross value of less than two hundred dollars per acre for three of the previous five years.

Williamson Act - Non-Prime Agricultural Land
Land which is enrolled under California Land Conservation Act contract and does not meet one of the criteria for classification as Prime Agricultural Land. Non-Prime Land is defined as Open Space Land of statewide significance under the California Open Space Subvention Act (see California Government Code Section 16143), and may be identified as such in other documents. Most Non-Prime Land is in agricultural use whether grazing or non-irrigated crops. However, Non-Prime Land may also include open space uses which are compatible with agriculture and contained within local general plans.

Williamson Act - Agricultural Land in Non-Renewal
During the Non-Renewal process, the annual tax assessment gradually increases. At the end of the 9-year Non-Renewal period, the contract is terminated.

Non-Enrolled Land
County land not included in the Williamson Act Program

Urban and Built-up Land
Land occupied by structures with a build density of at least one unit to one and one-half acres. The actual extent of Developed Land was provided by the Department of Conservation's Farmland Mapping and Monitoring Program.

The California Land Conservation Act of 1965 - commonly referred to as the Williamson Act - is the State's primary program for the conservation of private land in agricultural and open space use. It is a voluntary, locally administered program that offers participating property owners in lands with agricultural, open space, or their use are contracts between individual landowners and local governments. For more information on the Williamson Act please contact the Department of Conservation, 801 K Street, MS 18-11, Sacramento, CA 95814, Phone: (916) 324-0850, Email: bmp@conmail.ca.gov, web page: www.consrv.ca.gov/DLRP

Maps depicting Williamson Act enrollment are produced in cooperation with the participating counties and the California Department of Conservation's Division of Land Resource Protection using Natural Resources Conservation Service and Geographic Information Systems. The Department of Conservation cannot guarantee the accuracy, completeness and current status regarding areas enrolled under Williamson Act contracts.

The information necessary to accurately depict parcels that are enrolled under contract has been derived from various sources for county planning purposes and for Assessor's Office. This map is intended for internal review and analysis only and should not be used within the limits of this purpose. All questions regarding the accuracy/status of results should be directed to the county assessor or planning agency office.

The Department of Conservation makes no warranties as to suitability of this map for any particular purpose.

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Printed on 12-1-2004
by DLRP Staff James Mondalson 916-324-0782

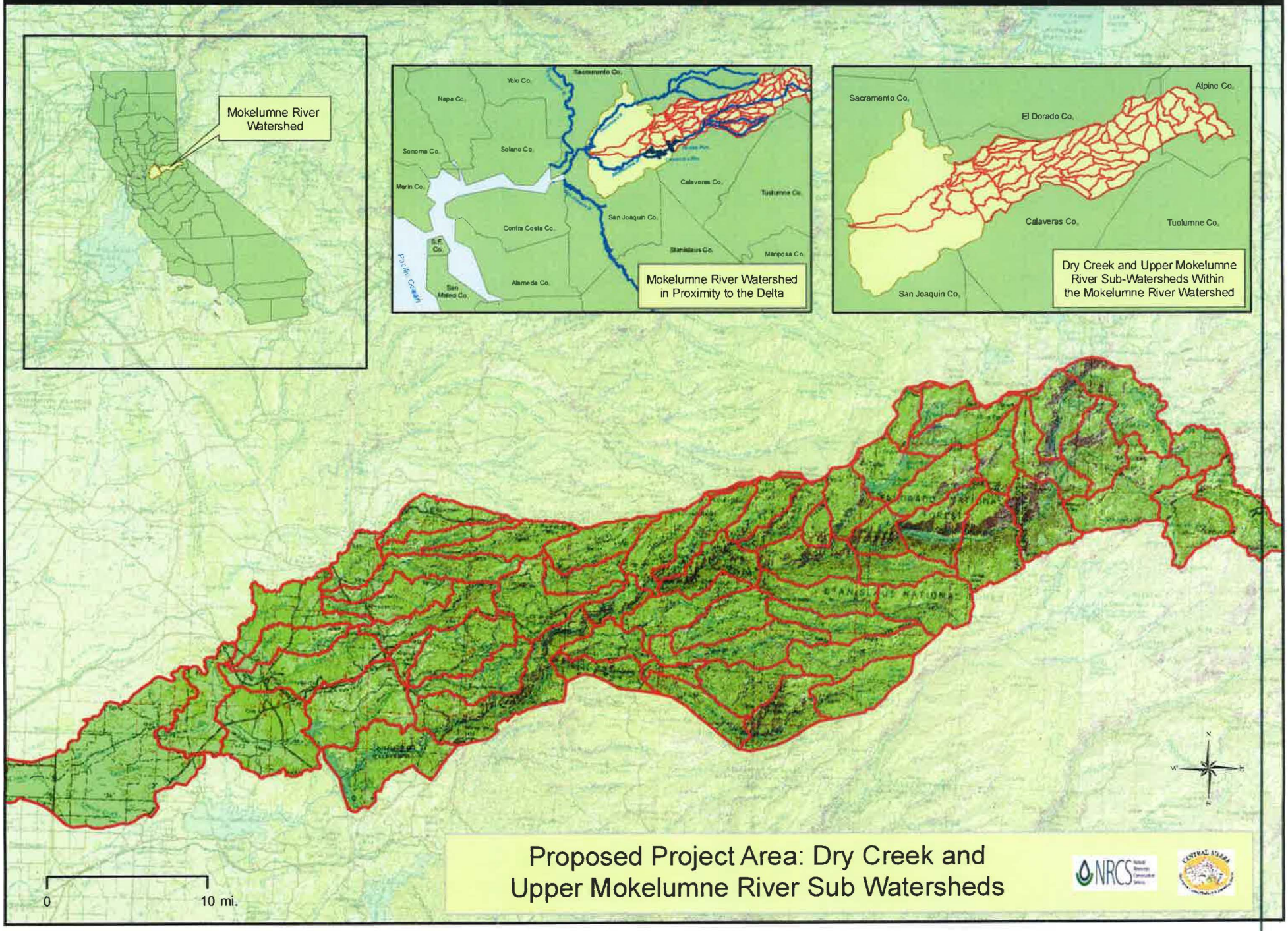
Attachment A. Special-Status Species in the Upper Dry Creek Watershed[a]

Common Name	Scientific Name	Federal Status		California Status		DFG Species of Concern	CNPS Listing[b]
		Threatened	Endangered	Threatened	Endangered		
Natural Communities							
Ione Chaparral							
Birds							
Tricolored blackbird	*Agelaius tricolor*					✓	
Reptiles/Amphibians							
Northwestern pond turtle	*Emys (=Clemmys) marmorata marmorata*					✓	
Invertebrates							
Grady's Cave amphipod	*Stygobromus gradyi*						
Valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*	✓					
Plants							
Bisbee Peak rush-rose	*Helianthemum suffrutescens*						3
Ione buckwheat	*Eriogonum apricum var. apricum*		✓		✓		1B
Ione manzanita	*Arctostaphylos myrtifolia*	✓					1B
Irish Hill buckwheat	*Eriogonum apricum var. prostratum*		✓		✓		1B
Parry's horkelia	*Horkelia parryi*						1B
Pincushion navarretia	*Navarretia myersii ssp. myersii*						1B
Prairie wedge grass	*Sphenopholis obtusata*						2
Red Hills soaproot	*Chlorogalum grandiflorum*						1B
Tuolumne button-celery	*Eryngium pinnatisectum*						1B

[a]Data gathered using the California Department of Fish and Game's California Natural Diversity Database Quick Viewer for the following USGS quadrangles: Amador City, Aukum, Fiddletown, Irish Hill, Ione, Jackson, Pine Grove, and West Point. This is not an official CNDDB report.

[b] California Native Plant Society (CNPS) "1B" Listing—Rare or Endangered in California and elsewhere
CNPS "2" Listing—Rare and Endangered in California, more common elsewhere
CNPS "3" Listing—Need more information

Upper Mokelumne River Watershed Development and Planning Project



3/17/10

MOKELUMNE RIVER
WATER ENTITIES
03/17/10

NAME	CREATED	GOVNCE TYPE	PUPOSE & MISSION	MEMBERS
OTHER ENTITIES				
CABY				
MRA			Mokelumne River Authority	
MRA			Mokelumne River Association.	
MRWS			Mokelumne River Watershed Council	
MWF		MOU	Mokelumne Water Forum - http://www.ebmud.com/about_ebmud/publications/project_factsheets/mokelumne_water_forum_web_3-07.pdf	
DCW			Dry Creek Watershed	
UMRWA	Created 2000		Upper Mokelumne River Water Authority	
MRWPA			Mokelumne River Water and Power Authority	

3/17/10

MOKELUMNE RIVER
WATER ENTITIES
03/17/10

NAME	CREATED	GOVNCE TYPE	PUPOSE & MISSION	MEMBERS
CAMWRA MEMBERS				
AWA	Legislation 1959	Specl Dist	Amador Water Agency - http://www.amadorwa.com/ Provide treated water & waste water services countywide	5 supervisorial dist 5 elected directors
Amador County	Incorp. 1854	County	Part of CA 3rd congressional district. State assembly 10th district. State senate 1st district. http://www.co.amador.ca.us/	5 elected supervisors
CPUD	Established 1934	Specl Dist	Calaveras Public Utilities District - http://www.goldrush.com/~cpud/ Provides water to San Andreas and Mokelumne Hill	5 member board
CCWD	Formed 1946	Specl Dist	Calaveras County Water District - http://www.ccwd.org/ Provide treated water to district members	5 elected directors 5 supervisorial dist
Calaveras County	Incorp. 1850	County	Part of CA 3rd congressional district. State assembly 25th district. State senate 1st district. http://co.calaveras.ca.us/cc/	5 elected supervisors
JVID	1956		Jackson Valley Irrigation District	5 member board?

Water Supply Improvements Division
375 11th Street - MS 407
Oakland, CA 94607

TRANSMITTAL MEMORANDUM

DATE: August 23, 2019

TO: Eastern San Joaquin Groundwater Authority
1810 E. Hazelton Avenue
P.O. Box 1810
Stockton, CA 95201

FROM: Linda Hu, Manager LHU
Water Supply Improvements Division

Sent via email to info@esjgroundwater.org

SUBJECT: Comments on the Eastern San Joaquin Draft Groundwater Sustainability Plan

Thank you for the opportunity to review the Eastern San Joaquin Draft Groundwater Sustainability Plan (GSP). It represents a significant work effort by the Eastern San Joaquin Groundwater Authority and your consultant. Comments from EBMUD on the Draft GSP are attached and have been compiled using the submittal template.

EBMUD appreciates being able to provide feedback on the Draft GSP. If you have any questions, you can reach Grace Su at 510-287-7013.

Attachment

Eastern San Joaquin Subbasin GSP Public Draft
Summary of Public Comments and Responses

Comment #	Commenter	Commenter Organization	Page Number	Section, Figure, or Table Number	Sentence Starts with, "...	Comment
1		EBMUD	p. 2-3	2.1.1.1	"Figure 2-2 shows the distribution..."	The text says that a large number of wells do not have construction depth or screen interval information. Were only the wells with construction information used to prepare the GW elevation contour maps for each principal aquifer?
2		EBMUD	p. 2-12	2.1.4.2	4th paragraph of Sec 2.1.4.2, 3rd sentence "Flow in the Mokelumne River below the Camanche Reservoir varies seasonally..."	Please modify the discharge values from Camanche Reservoir discussed in the third and fourth sentence of this paragraph. Releases from the Camanche Reservoir could be as low as 100 cfs during critically dry years and up to 5,000 cfs during the wet season. Since the Camanche Dam was completed in 1964, the maximum daily release from the Camanche Reservoir has not exceeded 5,000 cfs. The Mokelumne River flows recorded below Camanche Dam prior to 1964 are not representative of flows observed after the dam was built.
3		EBMUD	p. 2-48	2.1.9.2.1	"The horizontal hydraulic conductivity varies..."	What is the basis for the statement that the horizontal hydraulic conductivity values in the model are considered low? If the conductivities are higher, what implications would that have on the results?
4		EBMUD	p. 6-19	6.2.5.3	Second paragraph of Sec 6.2.5.3, second sentence "The longer term banking project..."	Please change "will" to "may" in this sentence: The longer term project <u>may</u> use the same concept...
5		EBMUD	p. 6-19	6.2.5.3	Third paragraph of Sec 6.2.5.3, "As part of both the pilot and longer-term projects..."	EBMUD is requesting that this sentence be removed as it does not accurately reflect the terms of the existing Agreement.
6		EBMUD	p. 7-6	7.4.1		EBMUD would like to be informed as the Mokelumne River Loss Study Project moves forward and is interested in being a participant and in providing technical input.

JANE WAGNER-TYACK

COMMUNICATION CONSULTANT

145 South Rose Street, Lodi, CA 95240 ◆ 209-642-5105 ◆ JaneTyack@mac.com

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August 25, 2019

VIA E-mail

Eastern San Joaquin Groundwater Authority
1810 E. Hazelton Avenue
P. O. Box 1810
Stockton, CA 95201
info@esjgroundwater.org

SUBJECT: Comments on the Groundwater Sustainability Plan

Following are comments on elements of the GSP that I think need to be strengthened, based on concerns I have heard expressed in the community, including the wider environmental and social justice community.

While the database of interested parties may have been robust, as the GSP asserts (1.3.4.4), actual outreach to two important groups—people reliant on domestic or community water system wells, and disadvantaged communities—has *not* been robust. This is a consequence of a variety of factors, including the nature and jurisdictions of the GSAs in this subbasin; the way DWR has defined disadvantaged communities for SGMA purposes; and the lack of projects to which outreach can be tied at this stage in the process.

It is therefore in the best interests of the GWA to ensure that the GSP adequately covers the kinds of social and environmental justice concerns that might be voiced during robust outreach.

A note regarding style: Credibility of the entire GSP will benefit from greater use of the active voice rather than the passive voice. For example, the statement "Water Quality **is not known** to have adversely affected beneficial uses of groundwater in the Eastern San Joaquin Subbasin, generally" (2.2.4) is in the passive voice, which allows the writer to avoid mentioning any parties responsible for making this determination or the bases on which they have made that determination. Use of the passive voice can make a statement seem both vague and subtly evasive. That will be the case even if, as in this situation, other evidence in the document shows the statement to be literally true: we do not have enough data to know.

Water Quality

The case for setting minimum thresholds only for salinity based on the fact that other constituents of concern are managed through existing management and regulatory programs is not persuasively supported in the GSP.

Nitrate

2.2.4.2 says, "Increased nitrate concentrations have not been found to be related to groundwater management activities in the Subbasin." This statement does not define "groundwater management activities" and does not identify those responsible for the finding of no relationship. Meanwhile, other evidence appears to contradict the assertions.

Prior to the assertion above, in the same paragraph, is the statement that "recent nitrate measurements above the MCL correspond to the overall historical trends and highlight areas with elevated Nitrate concentrations in more recent years." What is the evidence that these elevated concentrations are unrelated to groundwater management?

The superficial treatment of dairies in the GSP is notable given the fact that milk was San Joaquin County's second top commodity in 2017. This is relevant to the discussion of nitrates as well as point source contamination (see below). Dairies are confined animal feeding operations (CAFOs), and CAFOs are linked to nitrates in water.

The Environmental Working Group's Farm Subsidy Database lists 347 dairies in San Joaquin County that received Dairy Program subsidies between 1995 and 2019. (https://farm.ewg.org/top_recips.php?fips=06077&progcode=dairy&page=0) Not all of these are in the ESJ Subbasin. However, some are in Stockton, Ripon, Farmington, and west of Lodi, areas the GSP notes have higher nitrate concentrations. Was any effort made to track nitrate relative to dairy operations?

According to 1.2.2.2.6, Irrigated Land Regulatory Program and CV-SALTS, The ILRP monitors for "nutrients (such as TDS and nitrates) in surface and groundwater." "…[There] are several representative monitoring sites [in the Eastern San Joaquin River Watershed] for the monitoring of dairies. The ILRP is in the process of developing a comprehensive monitoring network for future use to address ILRP data objectives. The San Joaquin County and Delta Water Quality Coalition members also monitor domestic wells for nitrate in high vulnerability areas." However, this requirement only began January 1, 2019. So there is not a lot of data yet.

(Note: The effectiveness of any monitoring network depends on actual participation, which even fines will not necessarily ensure.)

At 2.2.4.4.5, Emerging Contaminants, the GSP says, "Several studies, such as by Watanabe et al. in 2010, have recently been published or are underway regarding the potential link between dairies and the occurrence of pharmaceuticals in shallow groundwater in San Joaquin County." If pharmaceuticals from dairies may be linked to groundwater, it cannot be plausibly argued that nitrate from dairies may not be similarly linked.

Arsenic

2.2.4.3 says, "Increased arsenic concentrations have not been found to be related to groundwater management activities in the Subbasin." Again, the statement does not define "groundwater management activities" and does not identify those responsible for the finding of no relationship. Meanwhile, 4.3 says "Arsenic will be monitored for information purposes and to track trends in arsenic concentrations. The Groundwater Sustainability Plan (GSP) does not include sustainability

goals, measurable objectives, or minimum thresholds for arsenic." Why does the GWA plan to monitor arsenic if it is unrelated to groundwater management? Is it likely that goals, objectives, and minimum thresholds will be set later on the basis of monitoring?

(Note: For Figures 2-59, 2-60, and 2-61—why are these showing uniform grids underlying the data points? It suggests that monitoring occurs on a uniform grid.)

The rationale for not setting minimum thresholds for arsenic, nitrogen, and sulfate (at 3.2.3.1.1 Description of Undesirable Results) is that "these constituents are managed through existing management and regulatory programs within the Subbasin." For example, the GSP mentions monitoring through the Central Valley Regional Water Quality Control Board Waste Discharge Requirement (WDR) Dairy program. The GWA will rely on "coordination with existing agencies" to ensure that regulations are being met. "Additionally, SGMA does not give GSAs land use authority, so a nexus must be present between groundwater conditions and groundwater pumping activities." We need to explain what "nexus" refers to in this context. Also, how will the GSA coordinate with existing agencies?

<u>Point Sources</u>

As with nitrate and arsenic, the GSP provides no convincing support for the statement at 2.2.4.4 that "Point source contamination has not been found to be related to groundwater management activities in the Subbasin." In fact, there is considerable evidence to the contrary.

Section 1.2.2.2.4, Division of Drinking Water, says, "DDW data was used in the development of this GSP to identify point-source contamination areas." However, the use of that data appears to have been restricted in the GSP, which notes (2.2.4.4) that "point sources include leaking underground storage tanks, landfills, historical dry cleaners, **and others**" (emphasis added). CAFOs are point sources under NPDES regulations. Figure 2-62 accompanying the point source discussion shows only Active Investigation and Remediation Sites, not all point-source contamination areas, and the discussion focuses on fuel sites.

The GSP does not provide enough information to demonstrate either that CAFOs do not have any effect on groundwater in the Subbasin or that existing monitoring and regulatory programs will address the situation if there is an effect on groundwater.

The claim that "Point source contamination has not been found to be related to groundwater management activities in the Subbasin" is clearly contradicted by 2.2.4.4.1, which discusses plumes that have been publicized. (It would be better not to introduce this section with the word "publicized," which suggests that the plumes are included in the GSP primarily because people already know about them.)

In the case of the City of Lodi, it is true that "cleanup [of the Busy Bee plume] [is] moving toward completion under CVRWQCB oversite" (should be "oversight"). However, Section 1.2.3.1.5 says that "…the [Lodi] General Plan recognizes that groundwater contamination and overdraft in the Eastern San Joaquin Subbasin can threaten the City's ability to meet current water demands and limit future development…." This may or may not refer to the Busy Bee plume, but the City of Lodi clearly would not agree that in general, there is no connection between contamination and groundwater management in the Subbasin.

Similarly, Section 1.2.3.1.8 says that "The [Ripon] General Plan predicts that the City of Ripon may have to abandon a large number of wells as sources of potable water due to contamination…." The source of contamination is not mentioned in the GSP, but again, this concern reflects a connection between contaminated water quality and groundwater management.

2.1.1.2, Groundwater Quality Data, says, "The GAMA [groundwater ambient monitoring and assessment] database contains approximately 6,800 well sites through the Eastern San Joaquin Subbasin with over 1.6 million water quality measurements." However, "significant data gaps remain." For chloride, for example, ". . . out of the over 6,800 wells listed in GAMA for the Eastern San Joaquin Subbasin, no more than 700 chloride measurements were taken during any year since 2005." Having such limited data adds to the implausibility of the claim that water quality is not known to have adversely affected beneficial uses of groundwater in the Eastern San Joaquin Subbasin.

Wells and Well Permitting

Information relative to wells is not robust in the GSP, a situation that is not entirely justified by data gaps. Also, the GSP takes a hands-off approach to well permitting. It is natural for people who learn that the Eastern San Joaquin Subbasin is in a condition of overdraft to expect well permitting to be coordinated with the GSP to achieve sustainability goals.

Section 1.2.1.1 (page 1-19) says that "Though there are overlaps and discrepancies in the designation of wells, domestic wells are largely private residential wells, public wells are municipal-operated wells, and production wells are for irrigation or industrial purposes." These distinctions appear to overlook, or perhaps categorize as a "discrepancy," the fact that San Joaquin County has 358 small public water systems, defined as having between 5 and 14 service connections.
https://www.sjgov.org/department/envhealth/programs/default?id=26243
Some of these will be in the Eastern San Joaquin Subbasin. None of the figures showing well density appears to include these.

The present system of well permitting apparently does not provide the kind of information that it is supposed to provide. 1.2.2.1.5., Data Received Directly from GSAs, describes the Online System for Well Completion Reports (OSWCR), a DWR program that includes about 10,000 domestic wells in the ESJ Subbasin. ". . .[Drilling contractors] are required to submit a Well Completion Report to DWR for upload to the interactive OSWCR web site." According to 1.2.3.4.1, San Joaquin County has established well standards that require "installing monitoring device(s) for groundwater extraction, elevation, and/or water quality." So theoretically, extraction information is available. But 2.1.1.1 says "Vertical data gaps are . . . pronounced, as lack of construction data is an obstacle."

In San Joaquin County, well owners can opt out of groundwater monitoring, which is apparently a major reason for data limitations. Section 1.2.2.1.1 says that for the CASGEM network monitored by CCWD, "additional wells may need to be added in the future if owners opt out of the monitoring network." In San Joaquin County, a large portion of the wells in the CASGEM monitoring network are privately owned, and when SJCFCWCD sent consent forms, "about 40 were signed and returned." Is it known how many wells are in this network, and what percentage of consent this represents? By contrast, in Stanislaus County, 17 wells in the Eastern San Joaquin Subbasin alone are in the CASGEM plan to be measured semi-annually.

Section 1.2.3.4, Well Permitting, makes it clear that in San Joaquin County and Calaveras County, the purpose of permitting is to prevent groundwater contamination. By contrast, permitting in Stanislaus County has a much broader objective. "In 2014, the DER adopted a Groundwater Ordinance to prohibit unsustainable extraction of groundwater in unincorporated areas of the County." The GSP should address the question of why the whole Subbasin should not meet this standard. Anecdotal reports of new well drilling in eastern San Joaquin County express a belief that new agricultural wells are adversely affecting existing well owners and exacerbating overdraft in the area, a belief that the GSP does nothing to allay. In the absence of any resource management system with parameters that all groundwater users understand, civil actions will continue to be the only way to resolve disputes between competing users.

Dismissing concerns about the well-permitting process by saying that it is "ministerial" is no longer a convincing argument for the status quo in light of the rejection of Siskiyou County's argument in the Scott Valley decision that the Public Trust Doctrine does not apply to the county's issuance of ministerial well construction permits in Scott Valley. Although this decision applies to public uses in navigable waters, it is only a matter of time before the practice of giving a well permit to every property owner who asks for one, without regard to the impact on neighboring groundwater users and the shared aquifer, is subjected to similar scrutiny.

Recommendations

- Prefer the active voice to the passive voice to make clear who is responsible for the content of assertions.
- Reconsider the decision not to set minimum thresholds for nitrate, arsenic, and point sources, or strengthen the case for not doing so.
- Include more information about public water systems.
- Propose a Subbasin-wide well permitting standard that will address sustainability goals, or provide a justification for not doing so.

Jane Wagner-Tyack

cc: Glenn Prasad
Alicia Connelly

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Comment #	Commenter	Commenter Organization	Page Number	Section, Figure, or Table Number	Sentence Starts with, "...	Comment
1	Jane Wagner-Tyack	San Joaquin County Public Works	ES-1	Introduction, Paragraph 2	"A Joint Exercise of Powers Agreement...	"Is comprised of" misrepresents the meaning of "comprise." Preferable: "The GWA is composed of 15 Groundwater Sustainability Agencies" or the "The GWA comprises 15 Groundwater Sustainability Agencies." The same is true for the other two uses of "comprise" in this paragraph.
2	JWT	"	ES-1	Introduction, Paragraph 2		SGMA wanted to see an advisory group that included a wide range of stakeholders. This was not supposed to be just outreach to stakeholders to tell them what was being decided. Maybe you want to mention at the end of this paragraph that "Some input from the Sustainability Workgroup (described below) has also been incorporated into the GSP."
3	JWT	"	ES-1	ES-2	"The GWA's jurisdictional area...	Bulletin 118 and updated--Do you mean "as" updated?
4	JWT	"	ES-2	ES-3	"A stakeholder engagement strategy...	Please delete "all" in the first sentence. The stakeholder engagement strategy is far from inclusive. Also, mention that this is a 24-member Workgroup.
5	JWT	"	ES-2	ES-4	"The Subbasin is located...	On the third line, please insert "the" before "San Joaquin River."
6	JWT	"	ES-3	ES-5	"The western and southern portions...	The last sentence in this paragraph seems unnecessarily vague. What effects has the Sacramento-San Joaquin Delta (note correct name for the Delta) had on groundwater levels in the Subbasin? What surface water has been imported for in-lieu use?
7	JWT	"	ES-3	ES-5	Paragraph beginning with "Groundwater quality...	"Concerns" and "maximum" misspelled. Also, in the last sentence, "have not been able to be tied"--SOMEONE's analysis has not tied elevated concentrations of other constitutents to groundwater management activities. I think the water quality argument will be vulnerable here, and it would be best to mention from the beginning whatever data or prior analysis you have to support this assertion.
8	JWT	"	ES-3	ES-5	"As such...	Need to correct spelling of "volume" and "concern" in the last sentence of the paragraph.
9	JWT	"	ES-3	ES-5	"While the San Joaquin Delta...	The Delta is properly referred to as "the Sacramento-San Joaquin Delta." (Do a search of this for the whole document.) Also, third line, "alternations to," do you mean "alterations to"?
10	JWT	"	ES-4	ES-6	"The method prescribed...	The prior bulleted list is preceded by a statement with a colon. The bulleted item here isn't part of a list. This statement could be made part of the paragraph.
11	JWT	"	ES-6	ES-7	"Under the intermediate climate change scenario...	Reading that the annual groundwater overdraft is projected to increase to approximately 57,000 AF/year with climate change is likely to send the reader back to find out what the current overdraft is, but I don't see that number above, only a statement that the Subbasin has been overdraft for many years. For comparison purposes, provide an average or range of current overdraft. Also, briefly, what is it about climate change that will lead to greater overdraft?
12	JWT	"	ES-7	ES-8, next to Figure ES-6	"The monitoring networks...	Line 5, delete "from" before "participating GSA." It isn't necessary.
13	JWT	"	ES-7	Figure ES-6		This map needs a legend for what kinds of wells the different shapes represent.

14	JWT	"	ES-8	ES-9	"The DMS can be accessed…	After the link, you might tell the reader to use the Guest login.
15	JWT	"	ES-9	ES-10	"These additional evaluations…	"modification of levels of pumping reduction" is confusing. You could just say, "These additional evaluations may lead to pumping modifications associated with the attainment of reliability."
16	JWT	"	ES-9	ES-10	"Several projects…	Delete "several," which suggests a small number.
17	JWT	"	ES-9	ES-10	"The initial set of projects…	"The initial set of projects WAS reviewed" or "The projects WERE reviewed"
18	JWT	"	ES-9	ES-10	"The projected supply of projects. . .	"Planned projects are anticipated to provide enough water to offset the projected 2040 supply imbalance of _____ AFY."
19	JWT	"	ES-12	ES-12	"The GSAs will evaluation options…	It isn't clear how the two bulleted points ("Developing" and "Evaluation") relate to the paragraph that introduces them. Also, "Evaluating" would be the correct parallel to "Developing."

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Comment #	Commenter	Commenter Organization	Page Number	Section, Figure, or Table Number	Sentence Starts with, "...	Comment
1	Jane Wagner-Tyack	San Joaquin County Public Works	Page 1-1	1.1.1	Last paragraph: "The Eastern San Joaquin GSP. . ."	Introduce the earlier GBA here to distinguish it from the GSA. There was initial confusion; also, the GBA was responsible for much of the prior planning effort, and you will reference it at 1.1.4.3. ". . . fits in with these prior planning efforts, including the Eastern San Joaquin Groundwater Basin Authority (GBA), building on existing local management. . . ."
2	JWT	"	Page 1-3	1.1.4	"The Eastern San Joaquin GSP. . ."	Change 15 to 16 for number of GSAs and add back in Woodbridge Irrigation District (WID).
3	JWT	"	Page 1-8		"Lockeford Community Services District..."	In the second sentence, the references to "currently" and "in 2010" in the same sentence are confusing. "The District provides water and wastewater service to approximately 3,200 residents (as of 2010) in the unincorporated..."
4	JWT	"	Page 1-9		"The City of Escalon..."	"to meet domestic and industrial needs in the City"--which City? Both the City of Escalon and the City of Tracy are named in this sentence.
5	JWT	"	"		"Stockton East Water District..."	Delete "with" before "overlaps." "The SEWD GSA covers 101,000 acres of the District"--meaning unclear. Is this 101,000 acres that are not part of another GSA? Insert "is" between "and" and "provided" at the end of the third line. Last line--"...two efforts preceding the current GWA that focused..."
6	JWT	"	"			Add back Woodbridge Irrigation District.
7	JWT	"	Page 1-14		"The Eastern San Joaquin Subbasin encompasses..."	I believe that Thornton should be added as an unincorporated community.
8	JWT	"	Page 1-18	1.2.1.1	"Figure 1-11 shows..."	"...within **the region that includes** the Eastern San Joaquin Subbasin." (Only one of these state parks is actually in the Subbasin.)
9	JWT	"	Page 1-25	1.2.2.1.5	"These data were provided..."	On the first reference to the ESJWRM, write out "Eastern San Joaquin Water Resources Model" so that the reader doesn't have to refer to the list of acronyms. This is a fairly important model not mentioned earlier.
10	JWT	"	Page 1-30	1.2.2.7.4	"Measure the volume of water..."	"with sufficient accuracy"--sufficient for what? This is extremely vague. If you can without misrepresentation, stop this point after "customers". Otherwise, clarify.
11	JWT	"	Page 1-31	1.2.2.8	"All the major irrigation districts..."	No pipelines? At the top of the next page, we learn that OID has over time replaced unlined laterals with PVC pipelines.
12	JWT	"	Page 1-31	1.2.2.8	"While this entire lateral system..."	"105 miles are inconsistent"--meaning unclear. Please clarify.
13	JWT	"	Page 1-32	1.2.2.9	"The observed recharge amount..."	"...for a total recharge volume of about 65,000 AF since the inception of the project."
14	JWT	"	Page 1-34	1.2.3.1.1		Sources are provided for all the other plan information in this section. What is the source of information for the San Joaquin County General Plan? Would it be appropriate to move "(SJC, 2016b)" to the end of this sections as "(San Joaquin County, 2016b)"? And what does "b" refer to?
15	JWT	"	Page 1-35	1.2.3.1.8	"The General Plan predicts..."	"may have to abandon a large number of wells as sources of potable water due to contamination,..."--What kind of contamination? This is relevant to the Water Quality Sustainability Indicator.
16	JWT	"	Page 1-51	1.3.5	"To date..."	This sentence says that there has been "at least one meeting". The next sentence refers to "these meetings." These statements need to be consistent.

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1	Jane Wagner-Tyack	San Joaquin County Public Works	Page 1-3	1.1.4	Para. 1, "The Eastern San Joaquin GSP...	End of 7th line, change "comprised" to "consisting."
2	JWT	"	"	"	Para. 4, "The county is presumed..."	Delete. This sentence is redundant.
3	JWT	"	Page 1-5	1.1.4.2	"Each of the 15 GSAs..."	Change "15" to "16" and change "have" to "has"--"Each. . .has a voice. . .and **has** appointed". Correct parallelism of bulleted list: **Approving** budgets, Proposing guidance, **Adopting** rules, **Approving** any contracts, Reporting to, **Approving and implementing** a GSP. For second bulleted list, **Recommending** for both bullets.
4	JWT	"	Page 1-6	1.1.4.3	"Central Delta Water Agency..."	Add (CDWA) after the agency name to conform to the style for the other agencies.
5	JWT	"	Page 1-7		"Eastside San Joaquin GSA..."	Delete "comprised of"--"Eastside San Joaquin GSA is a partnership...."
6	JWT	"	"		"Calaveras County Water District..."	Second to last line, insert "the" before "Calaveras River".
7	JWT	"	"		"Stanislaus County..."	First line, substitute "and" for "that"--"and extends..."
8	JWT	"	Page 1-8		"San Joaquin County..."	Change "is comprised of" to "consists of" or "comprises." For a correct usage of "comprise," see the OID description directly above this entry.
9	JWT	"	"		"San Joaquin County No.2..."	"Almost 7,000 acres of San Joaquin County plus Cal Water are combined in San Joaquin County No. 2 GSA."
10	JWT	"	Page 1-9		"South San Joaquin GSA..."	Substitute "encompass" (as in the SDWA description) for "is comprised of." "Comprise" is not the most accurate word to use in the first bulleted paragraph below. Better: "The cities of Manteca, Ripon, and Escalon account for approximately 20,000 acres of the District area."
11	JWT	"	Page 1-10		"Exercise the powers..."	Substitute "on" for "to"--"Exercise the powers conferred on GSAs by SGMA."
12	JWT	"	Page 1-22	1.2.2	"Statewide Monitoring Programs..."	For consistency: add (DWR) after Department of Water Resources; insert Water Data Library before (WDL), add (CV-SALTS) after Central Valley Salinity Alternatives for Long-Term Sustainability. Also, for Dairy CARES--Cares is apparently not an acronym. The correct term is Dairy Cares.
13	JWT	"	Page 1-26	1.2.2.2.3	"However, differences..."	Remove the "s" from "creates." The subject/verb agreement is "differences...create".
14	JWT	"	Page 1-26	1.2.2.2.6	"The 2017 SNMP..."	Change "off" to "on"--"was developed based on a detailed water quality analysis..."
15	JWT	"	Page 1-31	1.2.2.8	"While this entire lateral system..."	Ssubstitute "the entire lateral system historically consisted of open, unlined ditches"
16	JWT	"	Page 1-32	1.2.2.8	"SEWD also uses..."	Second paragraph on the page, 3rd line, substitute "estimated" for "considered."
17	JWT	"	Page 1-32	1.2.2.9	"Direct recharge projects..."	Delete the second "Figure 1-16" in the first sentence, at the end.
18	JWT	"	Page 1-32	1.2.2.9	"Since 2003..."	Add" has"--"Since 2003, SEWD **has** operated..."
19	JWT	"	Page 1-34	1.2.3.1.1	"Stakeholders informed..."	Change this to "Stakeholder **input** informed..."
20	JWT	"	Page 1-34	1.2.3.1.5	"The 2010 General Plan Update..."	Insert "input from"--"...the 1991 General Plan was informed by input from community members..."

21	JWT	"	Page 1-35	1.2.3.1.5	"As the primary source…"	Dangling modifier--the General Plan is not the primary source of water supply. But also, groundwater is no longer the primary source of water supply for Lodi, which now gets about 50% of its water most of the time from surface supplies through an agreement with WID. Delete the phrase "As the primary source of water supply for the City of Lodi" and begin the sentence with "The General Plan..."
22	JWT	"	Page 1-40	1.3.1	"Agricultural users…"	Delete "of" after "hold."
23	JWT	"	Page 1-42	1.3.4.2	"The GWA developed…"	Delete "relied" and insert "the Workgroup"--"…to promote stakeholder input and relied upon the Workgroup when developing…"
24	JWT	"	Page 1-42	1.3.4.2	"The Workgroup included members…"	Delete "and"--"members from a variety of organizations who represent one or more…"
25	JWT	"	Page 1-47	1.3.4.3	"With the support…"	Two sentences have been telescoped here. Change to "detailing **a** stakeholder engagement strategy developed to achieve…"
26	JWT	"	Page 1-47	1.3.4.4	"The database was developed…"	There were no prior GWA engagement efforts (because there was no prior GWA). For "GWA", substitute "Eastern San Joaquin Subbasin engagement efforts…"
27	JWT	"	Page 1-49	1.2.3.4	"Targeted outreach presentations…"	Delete the apostrophe in "Manufacturers." They don't use it. The name style in Table 1-4 is correct.

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Comment #	Commenter	Commenter Organization	Page Number	Section, Figure, or Table Number	Sentence Starts with, "...	Comment
1	Jane Wagner-Tyack	San Joaquin County Public Works	Page 2-16	2.1.4.3	"These soils tend..."	"...restricted to metamorphic or pre-Tertiary sedimentary material and that, whereas..." Something is missing here; "that" doesn't make sense in this context.
2	JWT	"	Page 2-16	2.1.4.3	"Hardpan....However, in other areas..."	"Pre-Modesto formations" are mentioned here, but I didn't see those defined earlier, and the Geologic Time Scale in Figure 2-5 appears not to be designed to include them. They are referenced again in Section 2.1.4.5.1. "During the Pleistocene Epoch when the Modesto and Riverbank formations were deposited..." Can you provide a second Time Scale showing more detail for the Pleistocene?
3	JWT	"	Page 2-23	2.1.5	"The Eastern San Joaquin Subbasin..."	This paragraph refers the reader to Figure 2-15 and also refers to "the Central Valley geomorphic province and the granitic Sierra Nevada Geomorphic province." However, neither of these provinces is identified in Figure 2-15. Also, it would be helpful to have Figure 2-15 on the same page as this discussion.
4	JWT	"	Page 2-23	2.1.5	"The most important fresh water-bearing..."	The sentence refers to the Mehrten and Laguna formations, but these have not been introduced earlier, so the reader has no context in which to place them. As with the Pre-Modesto and Riverbank formations mentioned in 2.1.4.3 and 2.1.4.5.1, a geologic time scale should be provided.
5	JWT	"	Page 2-27	Table 2-2	Footnote	This footnote says that "Figure 2-5 contains time scales corresponding to formations." It does not. As noted above, the time scale needs more detail for local formations for the Tertiary and Quaternary periods.
6	JWT	"	Page 2-27	Table 2-2	Water-Bearing Properties	The table says that the Eocene is "Unimportant to fresh water basin except as possible contaminant source." Is saline water the only contaminant, or are there other possible contaminants? Any mention of contaminants is likely to be a red flag relative to groundwater quality discussions.
7	JWT	"	Page 2-27	2.1.5.1.1 and 2.1.5.1.2	"The pre-Ione Eocene rocks..."	Again, if a figure like 2-5 is going to be provided, it should include all the formations referenced in the text.
8	JWT	"	Page 2-28	2.1.5.1.3	"The Oligocene-Age Valley Springs Formation..."	It appears that these local formations are spatial rather than (or in addition to) temporal. Figure 2-16 is intended to show these formations, but it is VERY hard to read, with excessive grid detail that doesn't appear to be relevant to showing the major formations.
9	JWT	"	Page 2-28	2.1.5.1.4	"Overlying the Valley Springs Formation..."	Need different visuals for all formations listed under 2.1.5.1
10	JWT	"	Page 2-32	2.1.6	"Uplift of the Sierra Nevada..."	This sentence concludes with "for the east side of the Great Valley." "Great Valley" is not a term that has been used in this document previously, and it is not a commonly used term in this state. In fact, it isn't clear what it means. Does it refer to California's Central Valley? To the San Joaquin Valley?
11	JWT	"	Page 2-38	2.1.7	"The analysis for this GSP..."	This sentence, at the top of page 2-38, says that water wells and oil and gas wells are "indicated by an asterisk on the cross-sections." The asterisks are completely illegible. In fact, the cross-sections are impossible to read.
12	JWT	"	Page 2-38	2.1.7	"The analysis inferred..."	The sentence at the bottom of the second paragraph on page 2-38 says, "The analysis inferred formation contracts in place where this data was limited..." Can you explain what "formation contracts" are? Or do you mean that the formation contracts (decreases in size)?

Comment #	Commenter	Commenter Organization	Page Number	Section, Figure, or Table Number	Sentence Starts with, "…	Comment
13	JWT	"	Page 2-42	2.1.9.1.4	"The clay is typically…"	The sentence refers to the condition of the Corcoran Clay "as depicted on Figure 2-22", but it is very hard to discern anything in Figure 2-22.
14	JWT	"	Page 2-47	Table 2-3		Since there is no list of definitions, define "Aquifer Field" in the text or in a footnote to this table.
15	JWT	"	Page 2-49	2.1.9.2.3.1	"The natural geochemical effects…"	"The natural geochemical effects on water quality result to mobilize the elemental makeup of sediments"--meaning unclear. Please rephrase to clarify.
16	JWT	"	Page 2-50	2.1.9.2.3.1	"Per 23 CCR…"	This sentence sounds awkward and unncessarily legalistic, and it doesn't clearly apply to the rest of the section. That is, it isn't clear that the two lists that follow are intended to summarize the general water quality of principal aquifers; that seems to be covered in the next sections. Can you say this? "General water quality of principal aquifers is summarized in the following sections, as required by 23 CCR ...."
17	JWT	"	Page 2-50	2.1.9.2.3.1	"Nitrogen, most commonly occurring as Nitrate…"	The sentence says that nitrate (should be lower case) "is well understood as a result of fertilizer application". Actually, nitrate is well understood as a result of studies of the consequences of its agricultural use in fertilizer application. The following sentence says that "Naturally occurring nitrogen must also be discussed to have a complete understanding of the natural conditions" in the Subbasin. A better transition: "Nitrogen also occurs naturally in the Eastern San Joaquin Subbasin. Extensive work..."
18	JWT	"	Page 2-50	2.1.9.2.3.2	"Evaluating the historical trends…"	Suggested rewrite for easier reading: "Evaluating the historical trends of these parameters is not straightforward. GAMA records include some groundwater quality results for the Eastern San Joaquin Subbasin going back to the 1940s. However, a thorough analysis requires a large amount of data on all the major cations and anions mentioned above. A large number of measurements of this kind were taken from 2005 to 2017, as shown in Figure 2-27. Data from 2018 are not included because at the time of writing, that data was incomplete."
19	JWT	"	Page 2-52	2.1.9.2.3.2	"Evaluating the years…"	Delete "a better idea" and just say "an idea," since there is not actually any other idea for "better" to refer to. Regarding the Trilinear Diagrams, is it customary to present these without a legend for the symbols?

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Comment #	Commenter	Commenter Organization	Page Number	Section, Figure, or Table Number	Sentence Starts with, "...	Comment
1	Jane Wagner-Tyack	San Joaquin County Public Works	Page 2-1	2	"Current and Historical..."	"e" in "The" should not be boldfaced.
2	JWT	"	Page 2-8	2.1.2	"The Sierra Nevada..."	Delete "is comprised of" and substitute "consists of".
3	JWT	"	Page 2-8	2.1.2	"The material source..."	Add "s" to "source" for correct subject/verb agreement, and add "the" before Sierra Nevada"--"The material sources...are the Coastal Ranges and the Sierra Nevada..."
4	JWT	"	Page 2-9	2.1.3	"The origin..."	Changes "vary" to "varies" for correct subject/verb agreement--"The origin...varies in geologic time..."
5	JWT	"	Page 2-9	2.1.4.1	"Ground surface..."	Change "and" to "to"--"Ground surface elevations vary...from almost 1,000 feet...to around sea level..."
6	JWT	"	Page 2-12	2.1.4.2	"Two major westerly flowing..."	Add "the" before both "Stanislaus River" and "Mokelumne River".
7	JWT	"	Page 2-12	2.1.4.2	"In additiion to the Stanislaus..."	Delete "the" before "10 watersheds".
8	JWT	"	Page 2-15	2.1.4.3	"Alluvial fan..."	Change "Figure 3-9" to "Figure 2-9".
9	JWT	"	Page 2-19	2.1.4.4	"Several districts receive..."	Add "the" before "Stanislaus River".
10	JWT	"	Page 2-23	2.1.5	"The most important fresh water-bearing..."	Lower case "f" in "Mehrten and Laguna formations" and "Riverbank and Modesto formations."
11	JWT	"	Page 2-29	2.1.5.1.6	"The Turlock Lake Formation..."	Substitute "consists" for "as consisting."
12	JWT	"	Page 2-32	Figure 2-18		Add "Water" to title--"Base of Fresh Water Elevation Contours and Stockton Fault"
13	JWT	"	Page 2-39	2.1.9	"The zones are..."	First bullet--"Shallow Zone that consists of" (replace "is comprised of"); Second bullet--"Intermediate Zone that consists of" (replace "is comprised of"). The third bullet is already correct.
14	JWT	"	Page 2-39	2.1.9.1	Third and fourth bullets	Insert "of" after "depth" in each case--"Depth of discrete layers..."
15	JWT	"	Page 2-41	2.1.9.1.1	"The shallow water-bearing..."	Insert "and" after "geologic formations"--"...are present west of the older geologic formations **and** extend across..."
16	JWT	"	Page 2-42	2.1.9.1.1	"Transmissivities..."	"gpd/ft"--gallons per day per foot? "gpd" is not on the list of acronyms.
17	JWT	"	Page 2-43	2.1.9.1.4	"As depicted on the cross-sectiions..."	Substitute "have" for "has"--"...thickest sequences...and overbank fines...**have** been observed."
18	JWT	"	Page 2-45	2.1.9.2	"Recognition of..."	Change "Recognition of" to "Recognizing" so that this bullet point reads like a sentence, as the others to.
19	JWT	"	Page 2-45	2.1.9.2.1	"For depiction purposes..."	Replace "comprised of" with "encompassing."
20	JWT	"	Page 2-47	2.1.9.2.1	"The distribution of production wells..."	Change "are" to "is"--"The distribution...is provided..."
21	JWT	"	Page 2-49	2.1.9.2.3.1	"The USGS..."	Replace "which encompasses" with "which includes." In the next sentence, change "is" to "are" for correct subject/verb agreement--"natural geomechanical effects" is the subject of this clause.
22	JWT	"	Page 2-49	2.1.9.2.3.1	"Rivers draining areas..."	Delete "also" between "rocks" and "have". There is no other condition to which this cleaarly refers.
23	JWT	"	Page 2-49	2.1.9.2.3.1	"Groundwater quality..."	"...is characterized by Metzger and others in a 2012 study, *Test Drilling* ..."

Comment #	Commenter	Commenter Organization	Page Number	Section, Figure, or Table Number	Sentence Starts with, "…	Comment
24	JWT	"	Page 2-50	2.1.9.2.3.1	"Arsenic is of particular concern…"	Insert "is" between "and" and "hazardous"--"…is naturally occuring..and is hazardous…"
25	JWT	"	Page 2-50	2.1.9.2.3.1	"Arsenic was detected…"	Write out San Joaquin County instead of using SJC. (It is nice not to expect the reader to refer to the acronym list for everything.)
26	JWT	"	Page 2-57	2.1.10	"Aquifer characteristics…"	"actions" should be plural--"…"a significant impact on how projects and management **actions** in one part of the basin…"

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Comment #	Commenter	Commenter Organization	Page Number	Section, Figure, or Table Number	Sentence Starts with, "...	Comment
1	JWT	San Joaquin County Public Works	Page 2-76	2.2.3	"While the Delta..."	This section misrepresesents the situation in the Delta by suggesting that barriers have been installed to prevent seawater intrusion. No barriers prevent the inland movement of seawater into the Delta; it does occur, and managing it is an ongoing challenge. If you need a reference, I can provide one. Correction: "While the Delta ecosystem evolved with a natural salinity cycle that brought brackish tidal water in from San Francisco Bay, levees installed to allow development of agriculture, followed by development and operation of the Central Valley Project and the State Water Project, have altered the inward movement of seawater through the Delta. Current management practices endeavor to maintain freshwater flows through a combination of hydraulic and physical barriers, and alterations to existing channels." Change "alternations" to "**alterations** of existing channels". I don't see the Water Education Foundation listed under References. Also, in the last sentence in this paragraph, delete "sources" and change "are" to "is"--"...salinity in the Subbasin is due to other factors..."
2	JWT	"	Page 2-77	2.2.4.1.1	"As shown in Fgure 2-52..."	The sentence says that additional measurements above 250 mg/L are scatterred throughout SJC (I would just write out San Joaquin County), but the figure does not show any measurements outside the Subbasin.
3	JWT	"	Page 2-95	2.2.4.4.1	"Since the discovery..."	This sentence says that groundwater monitoring and evaluation has resulted in removal of contaminant sources and implementation of remedial activities. That isn't something that just monitoring can do. When groundwater monitoring and evaluation identified point source locations for contamination, the City of Lodi initiated remedial activities.
4	JWT	"	Page 2-94 to 2-95	2.2.4.4.1		This entire section appears to contradict the claim in 2.2.4.4 that point source contamination has not been found to be related to groundwater management activities in the Subbasin. Broadly, for ALL similar statements (for example at 2.2.4.2 and 2.2.4.3), there needs to be a clear explanation of what "related to groundwater management activities" actually means.
5	JWT	"	Page 2-95	2.2.4.4.2	"Approximately 134 sites..."	This sentence says that sites are doing investigation and remediation. The same statement is made in 2.2.4.4.3 and 2.2.4.4.4 . What is meant by sites? WHO is doing the investigation and remediation? Is this the responsibility of site owners? The RWQCB? Please name an agent or agents for these activities.

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Comment #	Commenter	Commenter Organization	Page Number	Section, Figure, or Table Number	Sentence Starts with, "...	Comment
1	JWT	San Joaquin County Public Works	Page 2-58	2.2.1.1	"To visually show..."	Replace "with" with "that have"--"10 wells **that have** periods...and that are relatively..."
2	JWT	"	Page 2-62	Figure 2-35	Footnote 3	Delete comma after "line".
3	JWT	"	Page 2-64	2.2.1.2	"Along the eastern side..."	Substitute "to" for "and" in this clause--"...the lateral gradient ranges from approximately 21 ft/mi...**to** 16 ft/mi..." A range is always "from x...to y" (or "is between x and y").
4	JWT	"	Page 2-76	2.2.4	"The primary naturally occurring..."	Constituents "are related to..." or "relate to..."
5	JWT	"	Page 2-76	2.2.4.1	"San Joaquin Delta Sediments..."	IMPORTANT: There is no San Joaquin Delta, at least not in California. The San Joaquin River and the Sacramento River meet to form the **Sacramento-San Joaquin Delta**. That is the correct name. I recommend doing Find for the whole GSP document to be sure that all of these uses of the name are correct.
6	JWT	"	Page 2-76	2.2.4.1	"San Joaquin Delta Sediments..."	"Emplace" means to put into position. Suggested revision: "Evaporation of groundwater in discharge areas introduces naturally occurring soluble salts into Sacramento-San Joaquin Delta sediments."
7	JWT	"	Page 2-77	2.2.4.1	"Deep Deposits...This results..."	Comma after second "aquifer"--"This results in a saline aquifer underlying the freshwater aquifer, and well pumping can result..."
8	JWT	"	Page 2-77	2.2.4.1.1	"As shown..."	Change "have" to "has" in the last line--"...the number of measurements...has decreased..." (It is the number, not the measurements, that has decreased.)
9	JWT	"	Page 2-87	2.2.4.2	"Under the ILRP..."	Write out "San Joaquin County" here, since it is part of the name of the Coalition. Otherwise, it sounds like SJC and the Delta Water Quality Coalition are two separate entities.
10	JWT	"	Page 2-94	2.2.4.4.1	""The Busy Bee Plume..."	Delete "and" after "closure" and insert a comma--"...now has regulatory closure, with cleanup moving..."
11	JWT	"	Page 2-95	2.2.4.4.2	"Of these sites..."	Substitute "At" for "Of"--"At these sites, petroleum hydrocarbon constitutents..."
12	JWT	"	Page 2-95	2.2.4.4.3	"Of these sites..."	Substitute "At" for "Of"--"At these sites, pesticides..."
13	JWT	"	Page 2-96	2.2.4.4.4	"Of these sites..."	Substitute "At" for "Of"--"At these sites, the most common constitutents..."
14	JWT	"	Page 2-96	2.2.5	"Subsidence has not been..."	Revise this sentence as follows: "There are no historical records of significant and unreasonable impacts from subsidence in the Eastern San Joaquin Subbasin."
15	JWT	"	Page 2-100	2.2.8	"The NCCAG database..."	Revise this sentence as follows: "A working group consisting of DWR, California Department of Fish and Wildlife (CDFW), and the Nature Conservancy (TNC) developed the NCCAG database by reviewing publicly available state and federal agency datatsets..."
16	JWT	"	Page 2-104	2.2.8	"The Plan identifies..."	Typo: Should be "The Plan identifies GDEs as NCCAG-identified areas **that** meet all of the criteria below."
17	JWT	"	Page 2-104	2.2.8	"Areas with a depth..."	Comma needed after "region" to prevent misreading, plus "s" on "plant"--"Oak trees are considered the deepest-rooted plants in the region, with a root zone..."
18	JWT	"	Page 2-104	2.2.8	"Areas at least 150 feet from..."	Add "to be"--"...are assumed to be unable to access...and **to be** dependent on..."

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Comment #	Commenter	Commenter Organization	Page Number	Section, Figure, or Table Number	Sentence Starts with, "...	Comment
1						
2	Jane Wagner-Tyack	San Joaquin County Public Works	2-108	2.3.1	"Because this process is new..."	The relationship between these two ideas is not causal but coordinate. Revision: "This process is new and has been developed under time constraints; the water budget assumptions will be refined in the future..."
3	JWT	"	2-113	2.3.4.2	"As private groundwater pumping was estimated..."	"Therefore, groundwater pumping to meet agricultural and rural residential needs is calculated by the model based on meeting remaining demands after appropriate surface water delivery is made to respective areas." Please explain what is meant by "appropriate surface water delivery" and which areas are "respective" (and of what they are respective).
4	JWT	"	2-115	2.3.5	"Inflows..."	Do you want to add "including urban runoff" to the third bullet? Urban runoff is discussed in detail in Footnote 5 of Table 2-13.
5	JWT	"	2-117 to 2-118	Table 2-13		To begin with, please put the table and the footnotes on facing pages. The Hydrologic Period row should show parallel information: For Historical: Water Years 1996-2015 (20-Year Period); for Current: Water Years 1969-2018 (50-Year Period); for Projected, Water Years 1969-2018 (50-Year Period). Without this information, it is hard to fairly evaluate the table in general and Footnote 1 in particular. In Footnote 5, "The historical calibration, with both less precipitation and smaller urban areas..."--since this represents a yearly average, explain why there is less precipitation. Finally, if surface water is diverted from one part of the Subbasin and delivered to another part of the Subbasin, does that show up somewhere here? Does that warrant a footnote?
6	JWT	"	2-119 to 2-120	Table 2-14		Same comments as for Table 2-13 with respect to headings and footnotes.
7	JWT	"	2-121 to 2-122	Table 2-15		Same comments as for Table 2-13 with respect to headings and footnotes. Also, footnote 1 says that differences in scenarios are related partly to "differences in the infiltration parameters related to land use." This need to be explained. Also, please provide a footnote explaining why no South American Subbasin outflows are shown.
8	JWT	"	2-122	Table 2-15		Footnote 4 refers to MAR projects. I'm pretty sure those weren't mentioned earlier in the document. Section 2.3.4.3 would be a logical place to do that.
9	JWT	"	2-123	Figure 2-72		Labels on the bar graph should correspond to the discussion in the text above the graph. Thus, the right-hand bar, for Inflow (and these are actually Surface Water Inflows), would show "Upstream Reservoir Releases" or "Reservoir Releases" rather than "Stream Inflows" for the green section (the source of the majority of inflows). The orange section of the bar would be "Runoff of Precipitation." The yellow section would be "Return Flow of Applied Water." Another color needs to be used for "Stream Gains from Groundwater," as this is MUCH too dark to read. For the Outflow bar, the gray section should be labeled "Downstream Outflows," or better, "San Joaquin River and Mokelumne River Outflows," as in Figure 2-78. The light blue section is "Stream Seepage to Groundwater." **Where are "Surface Water Diversions"?**

Comment #	Commenter	Commenter Organization	Page Number	Section, Figure, or Table Number	Sentence Starts with, "…	Comment
10	JWT	"	2-123ff	2.3.5.1, 2.3.5.2, 2.3.5.4		(Should 2.3.5.4 actually be 2.3.5.3?) For ALL the water budget figures, I encourage using a scale for Average Annual Volume that is the same for all hydrologic periods and all systems. This will be inconvenient in terms of document spacing, but it will convey much more clearly the water budget situation across scenarios and will improve the credibility of the document. It is not usually the intention to mislead with this kind of graphic presentation, but that is frequently the effect.
11	JWT	"	2-124	Figure 2-73		Inflow categories in the bar graph correspond to the descriptions in the text except that "Total" is not necessary for either Surface or Groundwater Supply. The dark blue background, both here and in subsequent Land Surface System figures, makes the text too hard to read and should be lightened. For Outflow, the orange area should be "Surface Runoff of Precipitation," and the yellow area should be "Return Flow of Applied Water."
12	JWT	"	2-125	Figure 2-74		Inflow categories in the bar graph correspond to descriptions, except that "Change in Groundwater Storage" is misleading. This is actually a deficit and should be identified that way, and a number could be put on it in the text , which just says "…the inflows do not meet the entire groundwater demand." The amount of the deficit is listed in the text for the current average (on page 2-129) and for the projected average (on page 2-132). Alternatively, you could omit that category from the bar graph and show that the Inflow bar is actually lower than the outflow bar. This would be an honest representation of the situation. Tucking the gray bar in the middle appears deceptive. For the Outflow bar, the orange section should be "subsurface Outflow to Neighboring Basins."
13	JWT	"	2-127	Figure 2-75		See Comment #9 for Figure 2-72. Labels should be consistent between text and graph and across graphs. Also, keep Inflow discussion first, as in the prior discussion and to align with the fact that Inflows are shown in the left-hand bar. This will mean deleting "These" from the beginning of the paragraph directly above.
14	JWT	"	2-129	Figure 2-77		Again, don't bury "Change in Groundwater Storage" in the middle. Call it a deficit, and show it at the top of the bar. It is already identified in the text as 48,000 AF/year. Also, in the text, refer to groundwater use as "Groundwater pumping," as is done in the bar graph and also in the discussion on page 2-124. Using the word "production" looks like an attempt to disguise what is actually going on.
15	JWT	"	2-130	Figure 2-78		As in Figure 2-72, the Inflo categories are "Reservoir Releases," "Runoff of Precipitation," "Return Flow of Applied Water", and "Stream Gains From Groundwater." Outflow categories are "San Joaquin River and Mokelumne River Outflows", "Stream Seepage to Groundwater", and "Riparian Intake from Streams." But again, surface water diversions are missing from the Outflow bar. The text mentions distribution to local growers of 370,000 AF/year. **What about urban diversions?**
16	JWT	"	2-131	Figure 2-79		See Comment #11 on Figure 2-73 for both Figure 2-76 and Figure 2-79.
17	JWT	"	2-132	Figure 2-80 and accompanying text		Again, don't bury "Change in Groundwater Storage" in the middle, and do call it a Deficit. In the text, (first paragraph) use "groundwater pumping" instead of "groundwater production."

Comment #	Commenter	Commenter Organization	Page Number	Section, Figure, or Table Number	Sentence Starts with, "…	Comment
18	JWT	"	2-133	Table 2-17		Where do the numbers for the last row, "Change in Groundwater Storage" come from? They don't appear to arise from anything else in the table, where everything is in balance. Should that row be separated from the rest of the table?
19	JWT	"	2-135	2.3.7.2	"The methods suggested by DWR…"	"…to ensure the resolution would be reasonable…"--What is meant by "resolution" in this context?
20	JWT	"	2-150	Figure 2-100		This title is misleading. Climate change will not produce more groundwater. The title should be "Simulated Changes in Groundwater Pumping due to Climate Change." Delete "production" from the Note.

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1						
2	Jane Wagner-Tyack	San Joaquin County Public Works	2-110	Table 2-12	Footnote 2	"Future evapotranspiration rates are assumed to remain the same as historical." Do you want to add any qualifiying statement here about climate change?
3	JWT	"	2-110	Table 2-12	Footnote 5	Note that there's an error here for Reference source not found.
4	JWT	"	2-111	2.3.4.1	"Dry creek..."	Change "was" to "were"--"...flow estimates...were used..."
5	JWT	"	2-111	2.3.4.1	"Deliveries to agricultural areas..."	To be consistent, write out all district names, or don't write out any of them. Also, "including" implies that not all entities are listed. If they are all listed, delete "including" and use a colon after "Subbasin." If you include acronyms after names (which is actually a good idea), put them in parentheses rather than brackets. Brackets are correctly used in the section above for parenthetical references **within** parentheses.
6	JWT	"	2-114	2.3.4.3	"Surface water delivery projections..."	Change "was" to "were"--"...projections...**were** estimated..." (The noun with which a verb grammatically agrees is frequently not the closest noun.)
7	JWT	"	2-115	2.3.5	"The primary components of..."	Fourth bullet, add "the" between "to" and "stream".
8	JWT	"	2-116	2.3.5	"The estimated water budgets..."	"are provided herein" sounds stiff and formal, which is not the tone of the document overall. Suggestion: "...scenarios are provided below, with results summarized in Table 2-13 and Table 2-15."
9	JWT	"	2-123	2.3.5.1	"Because of these circumstances..."	"...the water budget presented in Table 2-12..." Table 2-12 is a summary of water budget assumptions. It doesn't appear to be a water budget. Also, delete "of" between "estimates" and "contributions"--"...the water budget...not only quantifies...but also estimates..."
10	JWT	"	2-124	2.3.5.1	"A groundwater overdraft estimate..."	Delete "formerly" from this sentence. It is already clear that previous efforts have given a different estimate.
11	JWT	"	2-124 to 2-125	2.3.5.1	"Such previous efforts..."	NSJCGBA is not on the list of acronyms, and I am not aware of such an entity. Does this refer to a groundwater management plan by the Eastern San Joaquin County Groundwater Basin Authority? ESJCGBA should be on the list of acronyms, as well as GBA.
12	JWT	"	2-125	2.3.5.1	"When these changes occurred..."	Sentence is awkward. Suggested revision: "The timing of these changes was often independent of hydrologic conditions..."
13	JWT	"	2-126	Table 2-16		Footnote 6: Substitute "are" for "is"--"Differences...are more related..."
14	JWT	"	2-126	Table 2-16		Footnote 3: Revise: "...averaging of the resulting agricultural demand is less a function of water year type than of the time in the simulation when that water year fell."
15	JWT	"	2-131	2.3.5.2	"Inflows are comprised of precipitation..."	Substitute "consist of" for "are comprised of."
16	JWT	"	2-132	2.3.5.4	"As expected, in wet years..."	(This section should probably be 2.3.5.3.) Change "meets" to "meet" and delete the second "more of"--"...there is more precipitation and surface water to meet the water demand..."
17	JWT	"	2-132	2.3.5.4	"Unlike the historical calibration..."	Insert a comma between "averages" and "and"--"...to calculate meaningful averages, and the supplies and demands are..."
18	JWT	"	2-134	2.3.6	"Therefore, to account for these uncertainties..."	Delete "use of"--"...a range of assumptions (from high-end estimates to low-end estimates)..."

Comment #	Commenter	Commenter Organization	Page Number	Section, Figure, or Table Number	Sentence Starts with, "…	Comment
19	JWT	"	2-136	Table 2-18		"Reference ET"--Use "Eto" as provided in the list of acronyms.
20	JWT	"	2-136	2.3.7.3.1	"The resolution of these perturbation factors…"	HUC is not on the list of acronyms. Write out "Hydrologic Unit Code" here or include that in the acronyms.
21	JWT	"	2-137	2.3.7.3.1.1	"DWR change factors…"	WY is not on the list of acronyms. Write out "Water Year" here orinclude that in the acronyms.
22	JWT	"	2-138	2.3.7.3.1.1	"The exceedance curves…"	This sentence is hard to read, but I think what is meant is "…the projected condition scenario and the with-climate-change scenario." Add the hyphens.
23	JWT	"	2-140	2.3.7.3.1.2	"Streamflow simulated…"	Should be "Streamflows" (plural) to agree with "and those derived using…"
24	JWT	"	2-144	2.3.7.3.2	"Change factors are available…"	Insert "are" between "and" and "spatially"--"…are available on a monthly time step and are spatially defined…"
25	JWT	"	2-144	2.3.7.3.2.1	"Months with no precipitation…"	Words appear to be missing. "…were assumed **to have** a monthly precipitation…"
26	JWT	"	2-146	2.3.7.3.2.2	"Refinement to the simulated…"	Change "are" to "is"--"Refinement…is shown…"

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1	JWT	San Joaquin County Public Works	Page 3-1	3.1	"The California Water Code (CWC) defines..."	Define "planning and implementation horizon."
2	JWT	"	Page 3-1	3.1	"Groundwater levels in the Subbasin..."	Define "implementation period."
3	JWT	"	Page 3-10	3.2.2.1.2	"It is roughly estimated..."	Avoid using the passive voice to disguise a source of responsibility. WHO has estimated groundwater demand, and HOW? This information is central to the case we are making.
4	JWT	"	Page 3-11	3.2.3.1.1	"Additionally, SGMA does not give..."	"...so a nexus must be present between groundwater conditions and groundwater pumping activities." In plain English, what does this mean?
5	JWT	"	Page 3-12	3.2.3.1.2	"Undesirable results occur..."	"...and where these concentrations are the result of groundwater management activities." What kind of activities? How will we know?
6	JWT	"	Page 3-19	3.2.6.2	"Current or historical issues..."	To avoid obscurity associated with use of the passive voice: "In discussions of interconnected surface water, the GWA Board, Advisory Committee, Workgroup members, and GSA staff did not indicate signficant and unreasonable depletions, either currently or historically. Based on this input, this GSP assumes that historical conditions are protective of beneficial uses...." I suggest adding "however" at the beginning of the last sentence: "However, if groundwater levels were to fall lower than historical levels..." Regarding "qualified below", where? In the next paragraph?
7	JWT	"	Page 4-3	4.1.1	"2. Robust and Extensive Historical Data..."	It is worth providing some representative dates for historical data available in this Subbasin, especially since it is noted later that CASGEM data goes back to 2009. Let's not miss any opportunity to note that groundwater conditions have been monitored in this Subbasin for quite a long time.
8	JWT	"	Page 4-9	4.3.1	"3. A Range of TDS Concentrations..."	"Wells with historically "low" TDS concentrations..." What does this mean? Why is "low" in quotation marks? Quotations marks are sometimes used this way when the writer wants to put distance between the implied meaning and the actual situation. That would be unwise in this case.
9	JWT	"	Pages 4-9 and 4-13	4.3.1 and 4.3.4		Section 4.3.1 lists the City of Lodi as one of the agencies monitoring and managing wells for groundwater quality, but the City of Lodi is not shown in Table 4-5. The text should explain why not. Meanwhile, City of Lodi is listed in Table 4-7, but there is a footnote that TDS has not been regularly monitored at White Slough sites. Should this footnoted information appear in Section 4.3.1 as well?
10	JWT	"	Page 4-15	4.7.1	"The DWR's USGS..."	Do you mean "guide for **selection** of wells" rather than "guide for collection of wells"?

Eastern San Joaquin Subbasin GSP Public Draft
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Comment #	Commenter	Commenter Organization	Page Number	Section, Figure, or Table Number	Sentence Starts with, "...	Comment
1	JWT	San Joaquin County Public Works	Page 3-1	Section 3 Introduction	"The sustainable management criteria..."	Delete "meetings" after "Workgroup".
2	JWT	"	Page 3-3	3.2.1.1.1	Second bullet	Delete "of" after "Reduction".
3	JWT	"	Page 3-3	3.2.1.1.3	"Potential causes..."	Sentence is awkward and hard to read. Revision: "Undesirable results due to future chronic lowering of groundwater levels could result from the following: insufficient pumping offset/reduction in the basin that results in localized or basin-wide groundwater level lowering; or delays in implementation of GSP programs or projects due to increased demand or regulatory, permitting, or funding obstacles."
4	JWT	"	Page 3-4	3.2.1.2	"This examination evidenced..."	Substitute "showed" for "evidenced."
5	JWT	"	Page 3-5	3.2.1.2	"The GWA Board determined..."	"...dewatering of domestic wells is a potential undesirable result that could be used to confirm the adequacy..."
6	JWT	"	Page 3-5	3.2.1.2	"The 10th percentile..."	"...to account for **the fact that** domestic wells may have been drilled..."
7	JWT	"	Page 3-8	3.2.1.3	"The Margin is defined..."	"...the difference between the minimum threshold and **the** measurable objective."
8	JWT	"	Page 3-10	3.2.2.1.4	"If groundwater levels were to reach..."	Make this all one sentence--no period after "years", and separate with semi-colons--"...effects could include running out of fresh groundwater to access in drought years; increased cost of access; reduction in beneficial uses, such as domestic supply; and changes to agriculture."
9	JWT	"	Page 3-11	3.2.2.3	"As chronic lowering of groundwater levels..."	This refers the reader to Section 3.2.5.3, but that section just sends the reader somewhere else. It should probably refer to Section 3.2.1.3, where measurable objectives and interim milestones for lowering of groundwater levels are discussed. Also, insert "as" between "milestones" and "for".
10	JWT	"	Page 3-12	3.2.3.1.4	"If groundwater quality..."	Add "s" after "effect" and insert a comma and "which" after "supplies"--"...the effects would potentially include...to access alternate supplies, which can be unaffordable..."
11	JWT	"	Page 3-12	3.2.3.1.4	"Water quality degradation..."	Add "or" after "practices"--"...changes in irrigation practices or crops grown,..."
12	JWT	"	Page 3-14	3.2.3.3	"600 mg/L..."	Delete "are" after "uses" in the last line--"...will protect landscape uses against impacts..."
13	JWT	"	Page 3-15	3.2.4.1.1	"There is the possibility..."	Use the correct name for the Delta: "the Sacramento-San Joaquin Delta".
13	JWT	"	Page 3-15	3.2.4.1.3	"If seawater intrusion..."	Use the correct name for the Delta: "the Sacramento-San Joaquin Delta".
14	JWT	"	Page 3-15	3.2.4.1.4	"Water quality degradation..."	Add "or" after "practices"--"...changes in irrigation practices or crops grown,..."
15	JWT	"	Page 3-18	3.2.5.2	"Historical declines in groundwater levels..."	Add "in the Eastern San Joaquin Subbasin"--"...declines in groundwater levels in the Eastern San Joaquin Subbasin have not resulted..."
16	JWT	"	Page 3-18	3.2.5.3	"As chronic lowering..."	The last line refers the reader to Section 2.2, Current and Historical Groundwater Conditions. It should probably refer to Section 3.2.1.3.
17	JWT	"	Page 3-19	3.2.6.1.2	"An undesirable result..."	Add "in" to clarify parallelism, and use semicolons to make this sentence easier to follow--"...if depletions resulted in the release of stored surface water...; in the decrease of acreage...; in the reduction in availability...; or in the elimination...."

Comment #	Commenter	Commenter Organization	Page Number	Section, Figure, or Table Number	Sentence Starts with, "…	Comment
18	JWT	"	Page 3-19	3.2.6.1.4	"If depletions…"	Correct parallelism: "…insufficient surface water would be available to support diversions for agricultural or urban uses or to support regulatory environmental requirements."
19	JWT	"	Page 3-19	3.2.6.1.4	"This could result…"	Substitute "pumping" for "production" and correct the parallelism: "This could result in increased groundwater pumping, changes in irrigation practices and crops grown, and adverse effects to property values and the regional economy."
20	JWT	"	Page 4-1	4.1.1	"Representative monitoring…"	Add "the" between "in" and "production"--"…represent overall conditions in the production zone…"
21	JWT	"	Page 4-3	4.1.1	"4. Increased Density…"	Substitute "insight into" for "insightful information about"--"…may provide insight into groundwater dynamics…"
22	JWT	"	Pages 4-3 and 4-4	4.1.2	"The 76 wells…"	Correct the parallelism of the numbered items: "1. They use an existing data source…2. They provide reliable…3. They are in many cases new, having been constructed…" Also correct the parallelism for the second numbered list, on page 4-4, by making the first item a sentence, as the others are: "1. They use an existing data source and have a historical data record;"
23	JWT	"	Page 4-4	4.1.2	"The broad monitoring network…"	Make this two sentences: "…San Joaquin County's Flag City wells). These will be monitored…"
24	JWT	"	Page 4-6	4.1.3	"Taken using a CASGEM-approved…"	Correct agreement: "using a CASGEM-approved … method…" or "using CASGEM-approved…methods…"
24	JWT	"	Page 4-6	4.1.3	"Typical groundwater level measurement…"	Add an "s" to "include"--"…measurement equipment…includes…"
25	JWT	"	Page 4-7	4.1.4	"The spatial location…"	Change "were" to "was" for correct subject/verb agreement: "…spatial location…was based…"
26	JWT	"	Page 4-8	4.3	"The representative monitoring network…"	Change "are" to "is"--"the representative monitoring network is used…"
27	JWT	"	Page 4-10	4.3.1	"5. Current TDS Monitoring…"	Add comma, and "they" in the second sentence: "These wells are equipped…consistent measurements, and they represent…"
28	JWT	"	Page 4-14	4.3.5	"A total of 10 monitoring wells…"	Revision: "The representative monitoring network consists of a total of 10 monitoring wells, a density of 0.8 wells per 100 square miles."
29	JWT	"	Page 4-14	4.3.5	"The total number of wells…"	Add "s" to "meet"--"The total number…meets DWR's recommendations…"
30	JWT	"	Page 4-14	4.7	"Additionally, areas…"	Insert "a" between "present" and "limitation"--"…wells present a limitation…"

Eastern San Joaquin Subbasin GSP Public Draft
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Comment #	Commenter	Commenter Organization	Page Number	Section, Figure, or Table Number	Sentence Starts with, "...	Comment
1	Jane Wagner-Tyack	San Joaquin County Public Works	Page 6-1	6.1	"The Eastern San Joaquin Subbasin..."	Correct spelling of "offest" to "offset."
2	JWT	"	Page 6-1	6.2.1	Bulleted list	Third bullet: correct spelling to "cost-effective."
3	JWT	"	Page 6-2	6.2.3	"The initial set of projects..."	For correct subject/verb agreement, change "were" to "was"--"The initial set...was reviewed..." Next sentence, change "are" to "is"--"A final list...is included..."
4	JWT	"	Page 6-2			PLEASE PROVIDE A MAP SHOWING THE LOCATIONS OF THE PROJECTS.
5	JWT	"	Page 6-3	Table 6-1		Suggest footnoting the annual cost of Project 4 to explain why it is so much higher than the others. (Mostly annual cost of water purchase.)
6	JWT	"	Page 6-4	Table 6-1		For Project 11, Current Status, change "partied" to "parties."
7	JWT	"	Page 6-8ff	Various	"Estimated Costs and Plans to Meet Costs..."	In most of the project descriptions that follow, subject/verb agreement needs to be corrected in one of these ways: "The estimated cost for this project includes..." or "The estimated costs for this project include..."
8	JWT	"	Page 6-11	6.2.4.3	"Installation of other components..."	"Installation" is the subject of the sentence. Everything between that and the verb is part of a modifying phrase. So the verb must be "is", not "are"--"Installation...is in the planning stage."
9	JWT	"	Page 6-12	6.2.4.4	"Trigger for Implementation...The availability..."	Suggest inserting "reduced" before "availability" to better reflect the meaning of the sentence--"The reduced availability...would be the only potential cause for a reduction in SWFT production."
10	JWT	"	Page 6-12	6.2.4.5	"Project status..."	Insert "been" between "has" and "completed"--"...project has been completed..."
11	JWT	"	Page 6-13	6.2.4.5	"Time-Table..."	Insert "been" between "has" and "completed"--"...project has been completed..."
12	JWT	"	Page 6-13	6.2.4.5	"Circumstances..."	Insert "been"--"Construction for this project has been completed" (or "is complete").
13	JWT	"	Page 6-13	6.2.4.6	"As water is diverted..."	Change "has" to "have"--"until 7 years...have elapsed."
14	JWT	"	Page 6-13	6.2.4.6	"However, individual applicants..."	Delete "s" on "on permits", or delete "a."
15	JWT	"	Page 6-15	6.2.4.7	"Project Status"	Delete "at"--"Design for this project is 60 percent complete..."
16	JWT	"	Page 6-15ff	Various		For most of the Time-Table statements that follow, insert "was" before "initiated" or substitute "began."
17	JWT	"	Page 6-15	6.2.4.8	"SEWD and CSJWCD..."	Substitute "overlie" for "overly. Insert "subject to" between "and" and "historical"--"...dependent on groundwater and subject to historical overdraft..."
18	JWT	"	Page 6-16	6.2.4.8	"Project Status...Environmental review..."	For "implemented," substitute "done," or say that a review "may be required."
19	JWT	"	Page 6-17	6.2.4.8	"Circumstances for Implementation..."	Last line, insert hyphen between "as" and "needed"--"...on an as-needed basis..."
20	JWT	"	Page 6-17	6.2.5.1	"How Project...The contract is long-term..."	Correct punctuation: "The contract project is long-term; however, water availability..."
21	JWT	"	Page 6-18	6.2.5.1	"Circumstances for Implementation...As scenarios change..."	Add "the" between "with" and "landowner."

Comment #	Commenter	Commenter Organization	Page Number	Section, Figure, or Table Number	Sentence Starts with, "…	Comment
22	JWT	"	Page 6-19	6.2.5.3	"NSJWCD will control…"	Change "withdraw" to "withdrawal" and change the second "pumping" to "pumped"--"NSJWCD will control the withdrawal of the banked water…and then conveying the pumped groundwater…."

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Comment #	Commenter	Commenter Organization	Page Number	Section, Figure, or Table Number	Sentence Starts with, "...	Comment
1	JWT	San Joaquin County Public Works	Page 4-16	Figure 4-3		Praise up front: Some of the graphics in this document are very good, and could serve as a model for others that are not so good. Figure 4-3 is sharp, and the colors and shapes can be adequately differentiated. It is worth bearing in mind that fairly or not, every unclear graphic is likely to be perceived as intentionally deceptive.
2	JWT	"	Page 1-4	Figure 1-3		Colors, especially in the legend, are hard to distinguish, and of course Woodbridge Irrigation District will need to be added back. Also, not every area has a corresponding number. Would broadening the color scale from blue/green help?
3	JWT	"	Page 1-11	Figure 1-4		Legend and logo are fuzzy. Sacrifice the second frame?
4	JWT	"	Page 1-12	Figure 1-5		Colors for East Contra Costa and Tracy subbasins are hard to differentiate, and Tracy and Cosumnes are too similar. I-5 symbol is fuzzy.
5	JWT	"	Page 1-14	Figure 1-7		County boundaries are not adequately distinguishable from other lines. Sacrifice the second f
6	JWT	"	Page 1-15	Figure 1-8		Fuzzy. Also, the colors make it hard to distinguish SDACs from DACs at this scale. Make it bigger if possible.
7	JWT	"	Page 1-16	Figure 1-9		Sacrifice the second frame to gain a little size? The map on the facing page doesn't have it. Here and afterward, favor a slightly larger map over a second frame for the figure.
8	JWT	"	Page 1-17	Figure 1-10		Numbers for roads and highways are fuzzy.
9	JWT	"	Page 1-18	Figure 1-11		Fuzzy. Also, Lakes and Waterways are too similar in color to Carnegie SVRA, even though the latter has a border.
10	JWT	"	Page 2-5	Figure 2-3		Highway symbols could be sharper. Landscape orientation is good.
11	JWT	"	Page 2-10	Figure 2-6		Really nice.
12	JWT	"	Page 2-11	Figure 2-7		Identify Bear Creek, as in Figure 1-5.
13	JWT	"	Page 2-14	Figure 2-8		Some colors are too similar for adjacent watersheds, and blue is always problematic if it is also used for Lakes and Waterways.
14	JWT	"	Page 2-15	Figure 2-9		Too small; it is very difficult to read city names. Given general layout issues on this and the following page, there probably isn't much that can be done about this.
15	JWT	"	Page 2-17	Figure 2-10		A bit fuzzy. Especially since there is room, show this with a landscape orientation.
16	JWT	"	Page 2-18	Figure 2-11		A lot of place and feature names on this map are virtually illegible, and the legend is too small. Figure 2-12 is only slightly better. Maybe nothing can be done about this.
17	JWT	"	Page 2-22	Figure 2-13		Fuzzy.
18	JWT	"	Page 2-25	Figure 2-16		The underlying grid distracts from the formations this figure is intended to show, which are hard to distinguish at best. Some colors in the legend are too similar--how is Valley Springs distinguished from Tulare? The letters on the color blocks are illegible, and they are important because they are referred to in the Table that follows. Road and highway designations on the map are fuzzy. Why is the word "Flood" floating on the right in Calaveras County?

Comment #	Commenter	Commenter Organization	Page Number	Section, Figure, or Table Number	Sentence Starts with, "...	Comment
19	JWT	"	Page 2-31	Figure 2-17		It looks like most of the map units shown in the legend are not features of this subbasin, so maybe this could be simplified by including only those that are. Letters on the color blocks are illegible. It is hard to tell where the Stockton Arch is. Part of the name of "Bear" on the right is missing. Would it be possible to lay the map unit colors and detail over a map with less fuzzy place-name detail and just major roads and water features?
20	JWT	"	Pages 2-35 to 2-37	Figures 2-20 to 2-22		Most of the detail in these cross-sections is completely illegible. Of course most readers will not care about the individual well identifiers, but if this information is important enough to include in the GSP (and it is referred to several times in the text-for example, some of these well identifiers apparently have asterisks), then it is important enough to be legible. Using the full page instead of allowing large margins might help a bit, as would putting each cross-section on its own page. Could the legends go underneath instead of beside the cross-sections?
21	JWT	"	Pages 2-40 to 2-41	Figures 2-23 and 2-24		Well depth colors are indistinguishable, and identifiers could be sharper. Bigger might be better. Landscape orientation would help.
22	JWT	"	Page 2-46	Figure 2-26		There is certainly room here for a landscape orientation, which has just been used for Figure 2-25.
23	JWT	"	Page 2-51	Figure 2-27		Should definitely be shown in landscape. There is room.
24	JWT	"	Page 2-52	Figure 2-28		Why no legend? Is everyone supposed to know what these symbols represent?
25	JWT	"	Page 2-54	Figure 2-31		Different chloride concentrations are impossible to distinguish. I'm working from a hard copy, and just to be sure that I wasn't quibbling about something that would be visible in a different medium, I downloaded this figure and expanded it to fill my desktop computer screen. I still can't tell the difference in concentrations. Don't use a graded color scale?
26	JWT	"	Page 2-55	Figure 2-32		See comments for Figure 2-31. There is room for landscape orientation for both these figures, but that alone won't solve the problem.
27	JWT	"	Page 2-60	Figure 2-34		This figure is remarkably legible, given the detail it has to convey. The legend is nice and sharp.
28	JWT	"	Pages 2-65 and 2-70	Figures 2-37 and 2-38		Use landscape orientation. Maybe we'll be lucky and they will end up on facing pages.
29	JWT	"	Page 2-68	Figure 2-39		Correct name of Swenson Gold Course well. It is Swenson **Golf** Course. Landscape?
30	JWT	"	Page 2-74	Figure 2-50		This figure is misleading in an important way. The subbasin has a large enough change in groundwater elevation that DWR has put us in the critical overdraft category, but all that shows here is a faintly wavy line at the top of the graph. A separate graph showing everything above 50 MAF at a different scale would more honestly illustrate the situation.
31	JWT	"	Page 2-75	Figure 2-51		In the legend, green and blue, and brown and pink, are too difficult to distinguish, although they work OK in the chart itself. Make the boxes bigger? Landscape orient this figure?
32	JWT	"	Pages 2-78 and 2-79	Figures 2-52 and 2-53		Landscape for both?
33	JWT	"	Page 2-81	Figure 2-54		Yellow hard to see, orange impossible, especially if it is in a city. Landscape?
34	JWT	"	Pages 2-83 through 2-86	Figures 2-55 through 2-58		Symbols for different levels of maximum TDS are indistinguishable. (Figure 2-58 is slightly sharper than the others.) Compare to Figure 4-3. Landscape?

Comment #	Commenter	Commenter Organization	Page Number	Section, Figure, or Table Number	Sentence Starts with, "…	Comment
35	JWT	"	Page 2-97	Figure 2-64		Road identifiers are REALLY fuzzy, and county names and other features are almost illegible. Numbers in the legend are fuzzy. Is this partly the result of merging the regular subbasin map with InSAR data?
36	JWT	"	Pages 2-98 and 2-99	Figures 2-65 and 2-66		Landscape?
37	JWT	"	Pages 2-101, 2-103, and 2-105	Figures 2-67, 2-68, and 2-69		Yellow is too hard to see. Figure 2-68 is also fuzzier than the other two.
38	JWT	"	Page 2-150	Figure 2-101		This figure warrants its own page, with larger boxes to make the colors in the legend distinguishable. Add labels on the right side of the graph above and below the middle line for Demand and Supply, and split the legend identifiers accordingly to help the reader match them to the colors on the graph.
39	JWT	"	Page 2-151	Figure 2-102		Again, the colors in the legend are hard to differentiate, although they work reasonably well in the graph itself.
40	JWT	"	Page 3-6	Figure 3-2		Colors for Select Unincorporated Communities and Cities are too hard to differentiate.
41	JWT	"	Pages 4-5 and 4-11	Figures 4-1 and 4-2		Fuzzy. Compare to Figure 4-3.

Eastern San Joaquin Subbasin GSP Public Draft
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Comment #	Commenter	Commenter Organization	Page Number	Section, Figure, or Table Number	Sentence Starts with, "...	Comment
1	JWT	San Joaquin County Public Works	Page 2-32	Figure 2-18		In earlier comments, I suggested adding "Water" to the title between "Fresh" and "Elevation." If you do that, add "Water" in the legend also.

Memorandum

DATE: August 26, 2019

TO: Eastern San Joaquin Groundwater Authority (info@esjgroundwater.org)

SUBJECT: Groundwater Conditions and Management in the Eastern San Joaquin Subbasin/Comments on Groundwater Sustainability Plan Draft Chapters

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1. INTRODUCTION

The Eastern San Joaquin Groundwater Authority (ESJGA), which is a joint power authority, must complete a GSP by January 31, 2020 for the critically overdrafted Eastern San Joaquin Subbasin (ESJ Subbasin, or Subbasin). Larry Walker Associates was asked to review and provide comments on the draft Groundwater Sustainability Plan (GSP) by agricultural interests within the Subbasin. These agricultural interests wish to ensure that the GSP accurately reflects conditions within the Subbasin and effectively addresses overdraft conditions in compliance with the Sustainable Groundwater Management Act (SGMA). This memorandum provides initial comments on the analysis of the groundwater conditions and proposed management in the ESJ GSP, as described in publicly released draft chapters.[1]

2. COMMENTS ON EASTERN SAN JOAQUIN GSP DRAFT CHAPTERS

Draft chapters of the ESJ Subbasin GSP were released in three Bundles in May and June 2019. The complete GSP draft was released for public comment on July 10th.

This memorandum provides comments on: (1) the Eastern San Joaquin Subbasin water budget; (2) the draft GSP's characterization of current groundwater conditions; and (3) opportunities for local recharge with surface water to address overdraft conditions.

[1] Available at: http://www.esjgroundwater.org/. Although the comment deadline is listed as August 25, 2019, Civil Code 12a extends the deadline to the following business day. We suggest setting future deadlines on business days to avoid confusion.

Topic 1. Eastern San Joaquin Subbasin Water Budget

Water budgets were developed for the draft GSP to provide a quantitative account of water entering and leaving the Subbasin. Water enters and leaves due to natural conditions, such as precipitation and streamflow, and/or through human activities, such as groundwater pumping or recharge from applied water. Interconnection between the groundwater system and river/streams accounts for other exchanges. Quantities presented for the water budget components of the Subbasin provide information on historical, current, and projected conditions as they relate to hydrology, water demand, water supply, land use, population, climate variability, groundwater and surface water interaction, and groundwater flow.

Water budget quantities presented in the GSP are based on simulation results from the Eastern San Joaquin Water Resources Model (ESJWRM). The ESJWRM simulates the major hydrologic processes that affect the land surface, stream, and groundwater systems in the Subbasin. The major hydrologic processes can be represented by separate water budgets which detail inflows and outflows occurring at the stream level, land surface level, and groundwater. Estimated water budgets are prepared for historical conditions, current conditions, and projected conditions scenarios. This examination focuses on the groundwater water budget.

The primary components of the groundwater system are:

- Inflows
    - Deep percolation from precipitation, applied water (surface water and groundwater) for agricultural lands, and applied water (surface water and groundwater) for outdoor use in the urban areas
    - Stream seepage (stream losses to groundwater)
    - Other recharge (including unlined canals/reservoir seepage, local tributaries seepage, and Managed Aquifer Recharge projects)
    - Subsurface inflow
- Outflows
    - Stream gain from the groundwater system
    - Groundwater pumping
    - Subsurface outflow
- Change in groundwater storage: This reflects average annual change in groundwater storage

The average annual water budget for the groundwater system as presented in the GSP is presented in **Table 1**. As shown, the historical groundwater budget has greater outflows than inflows, leading to an estimated average annual decrease in groundwater storage of approximately 41,000 AF/year, or roughly 5% of the total inflow for this period. This overdraft estimate represents a refinement over previous efforts, which formerly estimated levels of overdraft to be between 70,000 AF and 150,000 AF annually. The current conditions scenario estimates average annual inflows of 959,000 AF/year and average aquifer outflows of 1,007,000 AF/year, resulting in an average annual deficit in groundwater storage of 48,000 AF/year, or roughly 5% of the total inflow for this period. Under projected conditions, the groundwater system experiences an average of 939,000 AF/year of inflow each year, and total discharges of 973,000 AF/year, resulting in an annual deficit in groundwater storage of 34,000 AF/year, or roughly 4% of the total inflow for this period (GSP, Table 3-4).

Table 1. GSP Average Annual Water Budget – Groundwater System (AF/year)

Component	Historical Calibration (AF/year)	Current Conditions (AF/year)	Projected Conditions (AF/year)
Hydrologic Period	*Water Years 1996 – 2015*	*50-Year Period*	*50-Year Period*
Total Inflow	811,000	959,000	939,000
Total Outflow	852,000	1,007,000	973,000
Outflow due to Groundwater Pumping	692,000	851,000	801,000
Change in Groundwater Storage	41,000	48,000	34,000

As presented in the draft GSP, the groundwater water budget is approximately in balance. In all three scenarios, groundwater pumping represents the largest groundwater system outflow, representing 81%, 85%, and 82% of total outflow for the historical calibration, current conditions, and projected conditions, respectively. Groundwater pumping for all three scenarios is estimated by the ESJWRM based on the need for additional water to meet remaining demands after surface water deliveries occur. Differences in demand largely drive the amount of groundwater pumped, and sustainability cannot be met if the largest outflow of the water budget, groundwater pumping, is estimated solely based on consumptive use methodology as closure to the groundwater water balance. If this information is available, it should be used. A water budget should also be developed to address reasonably foreseeable drought conditions.

In contrast to the draft GSP's analysis presenting the groundwater water budget as relatively in balance, the GSP also acknowledges the large groundwater depression in the central portion of the Subbasin (GSP Figures 3-37 and 3-38). Long-term trends from 10 wells distributed across the Subbasin with periods of record greater than 40 years show that groundwater elevations have declined over time throughout most of the Subbasin. The average groundwater decline was quantified as -0.5 ft/yr for the period 1996-2015. However, due to the fact that this analysis only includes two wells near the cone of depression, the investigation should be expanded to focus on additional wells located within the sphere of influence of the problem area. This is also true for the Vertical Gradient analysis provided in draft GSP Section 3.4.1.2.1, which lacks any wells located in the southern portion of the Subbasin (GSP Figure 3-39). Groundwater conditions in additional wells should be depicted in the GSP and monitored in order to track the occurrence of undesirable groundwater effects. Additional wells would also assist in tracking the benefits of recharge (discussed below).

The GSP presents analysis on interconnected surface water systems (GSP Section 3.4.6). This section includes figures showing the Subbasin's losing and gaining streams (GSP Figure 3-65), as well as the interconnected and disconnected streams (Figure 3-66). Interconnected surface waters are surface water features that are hydraulically connected by a saturated zone to the groundwater system. GSP Figure 3-65 and 3-66 shows rivers at the center of the Subbasin as always losing and disconnected, demonstrating that the general trend is for groundwater not to be able to provide any baseflow to the rivers and with groundwater levels always declining.

Furthermore, draft GSP Figures 3-37 and 3-38 lack districts and landmarks, making it difficult to interpret the location and detail of the groundwater depression, including the overlying water

agencies. In addition, indicating groundwater levels below ground surface (BGS), rather than above mean sea level (MSL) would be helpful to better understand groundwater conditions.

Topic 2. GSP Unduly Minimizes Overdraft Conditions

The California Department of Water Resources (DWR) lists the ESJ Subbasin as critically overdrafted. As defined by SGMA, a critically overdrafted groundwater basin is "[a] basin is subject to critical overdraft when continuation of present water management practices would probably result in significant adverse overdraft-related environmental, social, or economic impacts."[2]

Groundwater levels in the ESJ Subbasin have been monitored since at least the 1950s. A drop of groundwater levels to deeper depths indicates groundwater depletion, while a rise of groundwater levels to shallower depths indicates groundwater recharge. Changes in groundwater levels can arise from seasonal variation and increased groundwater pumping during droughts.

Analysis provided by the Department of Water Resources (DWR) Groundwater Information Center Interactive Map Application[3] (**Figure 1**) shows the change in groundwater elevation for three time periods (B: Spring 2004-2014, C: Fall 2006-2016, D: Spring 2008-2018; dark red represents 40 feet of decline, orange represents 20 feet of decline, green represents 10 feet of increase). As shown, during the period spring 2004-2014 (Map B) groundwater levels declined 20 feet in the south-central portion of the Subbasin, while during the period spring 2008-2018 (Map D), groundwater levels declined up to 40 feet in the southern portion of the Subbasin.

Changes for the period Fall 2006-2016 are increasingly pronounced throughout the Subbasin as fall is the lowest period for groundwater elevations due to lack of seasonal recharge, and increased reliance on pumping due to decreased surface water availability during the peak of the irrigation season. It is noted that groundwater elevation changes are impacted year to year by water year type and available surface water deliveries. Although the three time periods do not present a spatially consistent change in groundwater elevation (with the exception of the depression in the south-central portion of the Subbasin), they do depict the overall trend of a persistent decrease in groundwater elevation throughout the Subbasin. While these changes in groundwater elevation are measured by DWR, the GSP presents minimal historical modeled change in storage (GSP Figure 3-50).

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[2] Available at: https://water.ca.gov/Programs/Groundwater-Management/Bulletin-118/Critically-Overdrafted-Basins

[3] Available at: https://gis.water.ca.gov/app/gicima/

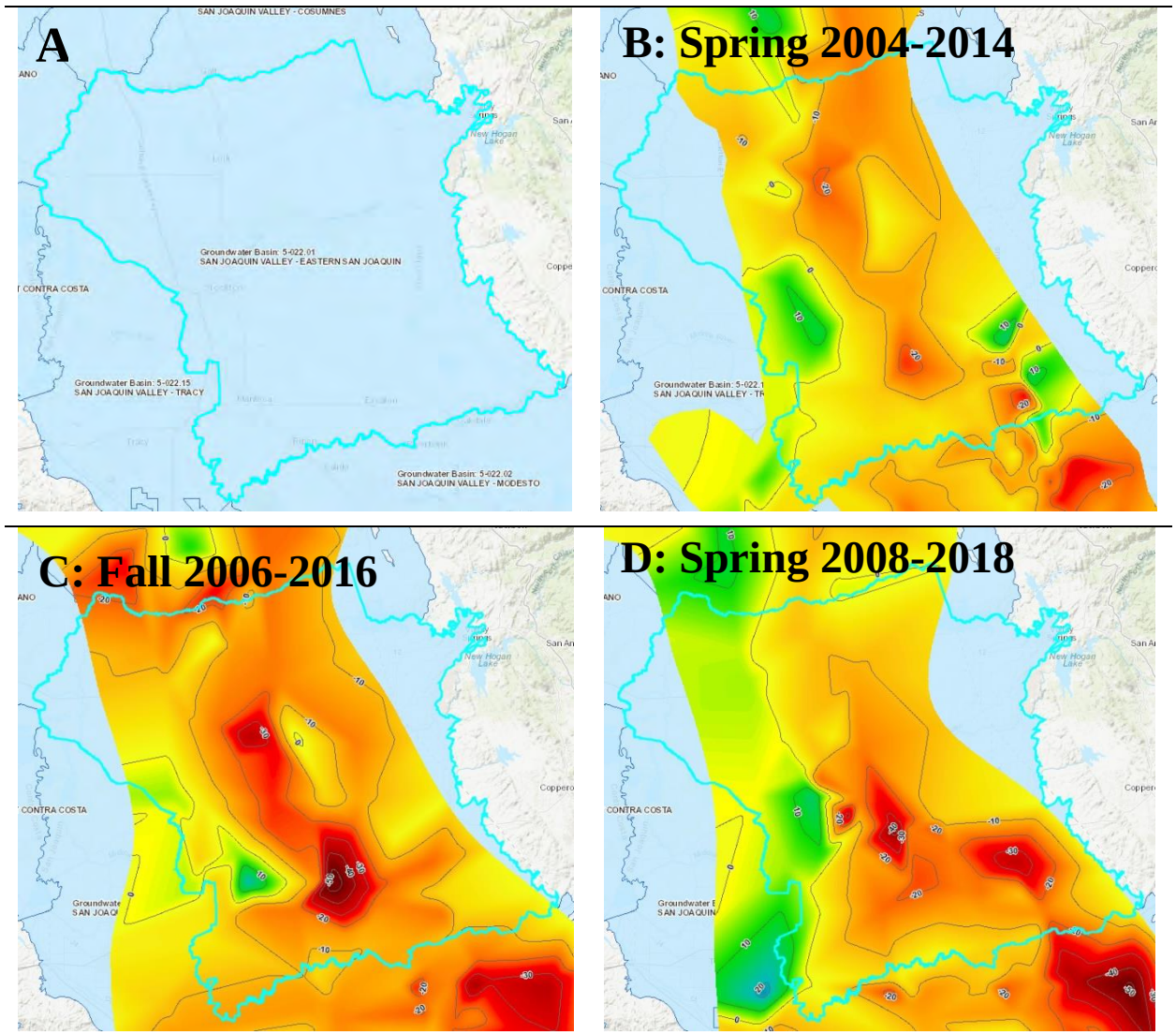

Figure 1. Change in Groundwater Elevation, Eastern San Joaquin Subbasin: Department of Water Resources Groundwater Information Center Interactive Map Application (A: ESJ Boundary; B: Change Spring 2004 – 2014; C: Change Fall 2006 – 2016; D: Change Spring 2008 – 2018)[4]

Draft ESJ GSP Figure 3-34 shows ten groundwater wells spread evenly through the basin. Overall most of the Subbasin shows a long-term decline in groundwater elevations, with an average decline of -0.5 ft/year during the period 1996-2015. Groundwater elevation maps from First Quarter and Fourth Quarter 2017 show a large cone of depression in the center of the basin, with a groundwater elevation deeper than 50 feet below mean sea level (Figures 3-37 and 3-38).

The draft ESJ GSP unduly minimizes Subbasin challenges related to groundwater storage and overdraft. Three examples are provided below.

[4] Dark red represents 40 feet of decline, orange represents 20 feet of decline, light green represents 10 feet of increase.

Section 3.4.2 states:

> *Figure 3-50 shows annual total storage for the combined ESJWRM fresh groundwater layers (not including the deep saline layer). Figure 3-51 shows the cumulative change in storage against annual storage change and water year type. In 2015, the total fresh groundwater storage was estimated as 53.0 MAF and the cumulative change in storage over 1995-2015 was estimated as -0.91 MAF (-0.09%), or -0.05 MAF/year.*

Section 4.2.2.1.1 states the following:

> *Undesirable results related to groundwater storage in the Subbasin have not occurred historically, are not currently occurring, and are not likely to occur in the future. As discussed in the current and historical groundwater conditions section of this GSP (Section 3.4.2), there is a large volume (approximately 53 million acre-feet [MAF]) of freshwater in storage. Previous analysis of groundwater storage using the ESJWRM showed a range of fluctuation from 1996 to 2015 of approximately 0.001 percent per year.*

Section 4.2.2.1.3 states:

> *Although the Subbasin has enough fresh groundwater in storage to sustain groundwater pumping in conditions of overdraft for centuries, dramatic increases in reliance on groundwater, severe drought, or other major changes in groundwater management over time could cause the volume of freshwater in groundwater storage to decline to a significant and unreasonable level.*

Thus, while DWR has listed the ESJ Subbasin as critically overdrafted, the ESJ GSP appears to claim that the Subbasin has a nearly balanced water budget and there are minimal problems with groundwater overdraft.

The ESJ Draft GSP also quotes a series of different groundwater overdraft values, leading to unnecessary confusion regarding conditions in the Subbasin. The Annual Water Budget in Table 2-15 is averaged over the entire basin, with a change in groundwater storage of 41,000 AF/year (1996-2015), 48,000 AF/year (past 50 years) and 34,000 AF/year (future 50 years). However, under DWR's intermediate climate change scenario, the annual groundwater overdraft will increase to 57,000 AF/year, from the previous estimate of 34,000 AF/year. Without climate change, the GSP Executive Summary states that, to reach sustainability, the basin must offset and/or recharge approximately 78,000 AF/year:

> *This number is larger than the estimated annual overdraft of the projected conditions scenario due to the integrated nature of the groundwater subbasin. As efforts are made to reach sustainability in the Subbasin, flows to and from neighboring basins and flows to and from streams may be impacted, creating the need for additional recharge or pumping reduction greater than the overdrafted amount.*

The ESJ Draft GSP should acknowledge the reality of climate change scenarios prescribed by DWR, and highlight the fact that the estimated groundwater pumping offsets and/or recharge of 78,000 AF/year is a conservative estimate that may in reality be closer to 101,000 AF/year (calculated by increasing the change in groundwater storage from 34,000 AF/year (projected conditions for 50-year period) to 57,000 AF/year (climate change scenario).

As explained below, projects that make additional surface water supplies available within the Subbasin would help address these overdraft conditions.

Topic 3. Local Groundwater Recharge Opportunities Should be Expanded

For groundwater recharge, additional surface water supplies can and should be used to offset groundwater pumping or should be directly discharged into the aquifer through groundwater banking. Water districts within the ESJ Subbasin, including the Oakdale Irrigation District (OID) and the South San Joaquin Irrigation District (SSJID) sell and/or transfer surplus surface water to water users outside the Subbasin. Since 2007, for instance, OID has reported that it sold surplus water and raised $58 million ($5.8 million per year) in revenue over the last ten years.[5] SSJID has also transferred/sold a significant amount of water.

Selling surface water to water users within the Subbasin (rather than selling and transferring water out of the Subbasin) would reduce reliance on groundwater sources and encourage groundwater recharge and sustainability. Stanislaus County has conducted groundwater model scenarios investigating the impact of additional surface water deliveries on groundwater elevations. The Stanislaus County Hydrologic Model released a scenario where the Cities of Ceres and Turlock decreased groundwater pumping due to increased surface water delivery of 5,700 and 11,100 AFY, respectively. The scenario also assumes increased agricultural pumping. **Figure 2** compares two released scenarios: Scenario 2 – Reasonable Upper Bound Potential Demand Increase and Scenario 5 – Additional Surface Water Delivery.[6] By replacing groundwater pumping with surface water delivery, the model found moderate groundwater recharge (shown by warm colors).

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[5] *Evaluation of San Joaquin River Flow and Southern Delta Water Quality Objectives and Implementation – Comment Letter 1000-1031*. Comment #62. July 2018.

[6] Stanislaus County. 2017. *Stanislaus County Hydrologic Model: Development and Forecast Modeling*. Prepared by Mike Tietze. December 20, 2017. Available at: http://www.stancounty.com/er/pdf/groundwater/draft-tech-memo-schm.pdf

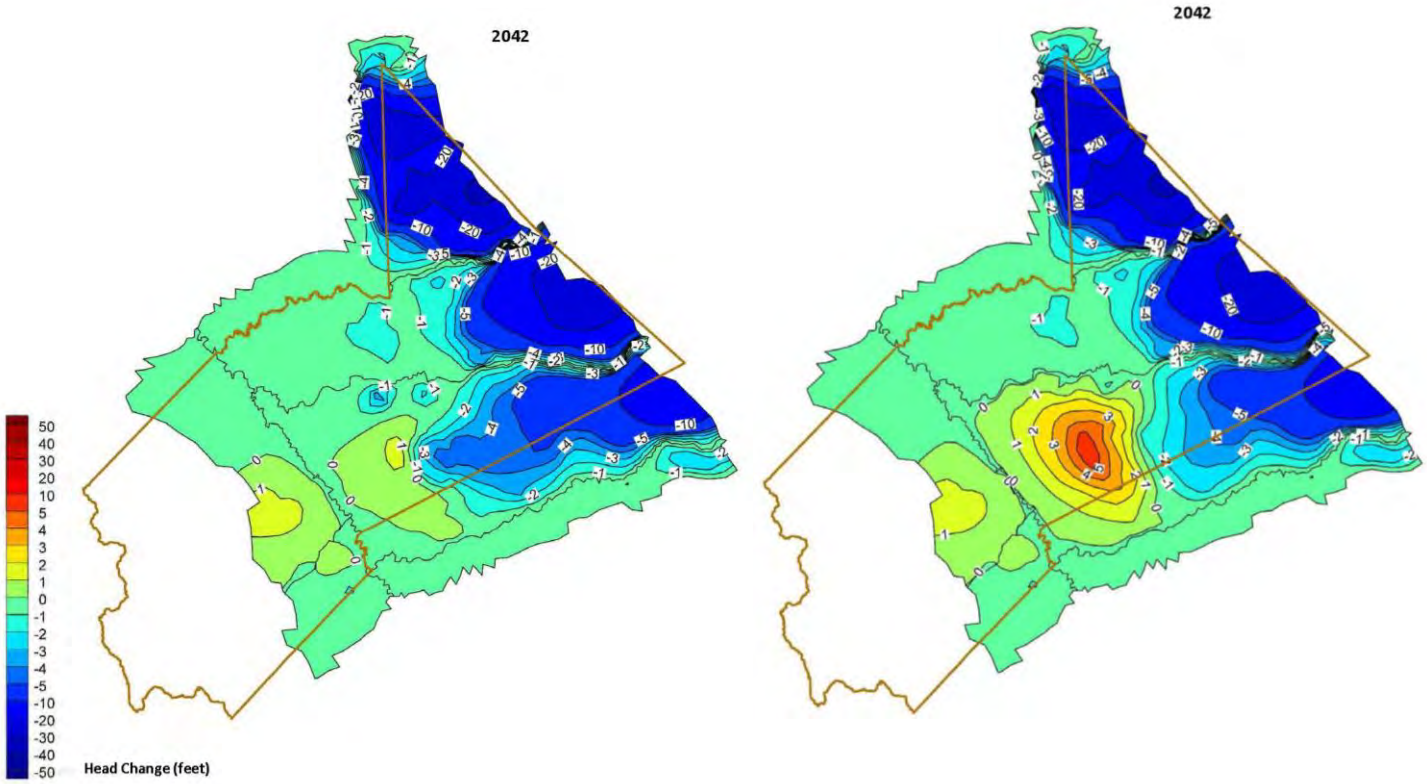

Figure 2. Head Change from the Stanislaus County Hydrologic Model - Scenario 2 (Increased Groundwater Pumping) (left) and Scenario 5 (Replace Groundwater with Surface Water) (right)

Chapter 6 of the ESJ Draft GSP lists 23 potential projects to offset the 78,000 AF/year groundwater overdraft, which include direct and in-lieu recharge, intra-basin water transfers, demand conservation, water recycling, and stormwater reuse. Project 8 proposes in-lieu recharge through long-term water transfers to the Stockton East Water District (SEWD) and Central San Joaquin Water Conservation District (CSJWCD) from OID and SSJID. SEWD and CSJWCD have historical groundwater overdraft conditions and water transfers from OID and SSJID could encourage groundwater recharge (GSP, pp. 6-15 to 6-17). Project 8 is projected to offset 45,000 AF/year in groundwater pumping, with a projected annual cost of $9 million at $200 per acre-foot. Due to historical water transfers from OID and SSJID to entities within the ESJ basin, existing infrastructure is adequate for Project 8 to move forward, as stated on pp. 6-16 of the Draft GSP:

> *Expected project time-table is 2019-2021. A new long-term transfer could begin immediately upon agreement among the parties. Transfers from OID/SSJID to SEWD/CSJWCD have historically been agreed to, with historical transfer amounts varying from 0 to 40,000 AF/year.*

According to the 2015 OID Agricultural Water Management Plan (2015 AWMP), transfers from OID to areas outside the Subbasin totaled 325,294 acre-feet between 2005 and 2014 (2015 AWMP Table 5-9.).[7] OID also reported that its surplus water sales since 2007 raised $58 million

[7] Available at: https://www.oakdaleirrigation.com/2015-ag-water-management-plan

($5.8 million per year) in revenue in the succeeding ten years[8]. These figures (which relate to only one water district) indicate that there is a greater potential for surface water transfers to recharge the overdrafted ESJ Subbasin than acknowledged in the draft GSP.

The ESJ GSP should expand Project 8 to include additional water transfers within the Subbasin for recharge. In addition, Project 8 should not be limited to transfers solely from OID and SSJID to the SEWD and CSJWCD service areas. Instead, all lands subject to declining groundwater levels (GSP Figures 3-37 and 3-38) and with at least Moderately Good recharge potential (GSP, Figure 2-14) should be included. For instance, lands within the Eastside GSA (a cooperative GSA formed by the Calaveras County Water District, Stanislaus County, Calaveras County, and Rock Creek Water District) also have some existing infrastructure to receive transferred water and, according to the draft GSP, these areas also include potential recharge areas (See GSP, Figure 2-14). In addition, if the rate for purchase of surface water was lower, additional purchases may occur voluntarily, potentially increasing recharge. With the expansion of Project 8, overdrafted conditions in the Subbasin would be more readily addressed. To the extent new infrastructure would be needed for an expansion of Project 8, additional Potential Project could be included in GSP section 6.2.5, and could include any necessary improvements to water distribution systems.

The GSP should also promote smaller recharge projects whereby water users may divert surplus surface water supplies for recharge on their own lands. This could be accomplished, for instance, by the creation of a program within the GSP that landowners could join if specified criteria are met. Creation of such a program would assist smaller recharge projects with completion of complex permitting and review requirements.

The efficacy of these projects in their potential to recharge the aquifer should be analyzed using a model scenario with the GSP Eastern San Joaquin Water Resources Model (ESJWRM).

3. CONCLUSION

We hope these comments are helpful in completing a draft GSP that effectively meets the requirements of SGMA. Please contact us if you have any questions.

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[8] *Evaluation of San Joaquin River Flow and Southern Delta Water Quality Objectives and Implementation – Comment Letter 1000-1031*. Comment #62. July 2018.

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Eastern San Joaquin Subbasin GSP Public Draft
Summary of Public Comments and Responses

Comment #	Commenter	Commenter Organization	Page Number	Section, Figure, or Table Number	Sentence Starts with, "...	Comment
1	David Simpson	NSJWCD	NA	NA	NA	Woodbridge ID and recharge projects within the District need to be included in the Final GSP.
2	David Simpson	NSJWCD	NA	NA	NA	The GSP should contain a statement of concern relating to SWRCB plans to reduce flows available for use by 40-60%. The GSP references climate change yet a far greater threat to sustainability in the basin is the reallocation of surface water flows currently being undertaken by the SWRCB. The Draft GSP assumes constant or increased availability of surface water yet the SWRCB has threatened to take 40-60% of the currently available flow in several key rivers. With reduced availability of surface water for existing uses and groundwater recharge, there is little to no hope of achieving groundwater sustainability without massive new infrastructure, draconian pumping restriction and increased regulation.
...						
3	David Simpson	NSJWCD	ES-10, others?	Potential Projects	NSJWCD and Manaserro	Lasko should be spelled Lakso Manaserro should be spelled Manassero

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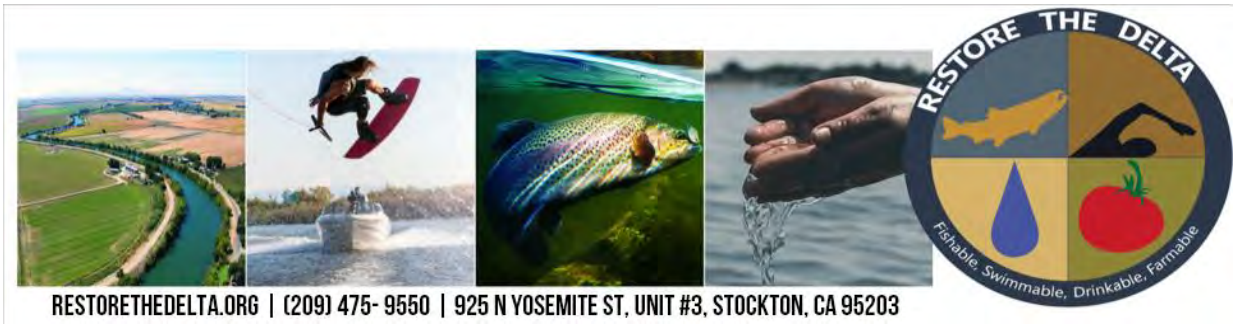

September 4, 2019

Eastern San Joaquin Groundwater Authority
1810 E. Hazelton Avenue
PO Box 1810
Stockton, CA 95201
info@esjgroundwater.org

Re: Comments Regarding the Eastern San Joaquin Draft Groundwater Sustainability Plan

To Whom It May Concern:

Restore the Delta works in the areas of public education and outreach so that all Californians recognize the Sacramento-San Joaquin Bay Delta as part of California's natural heritage, deserving of restoration.

We fight for a Delta with waters that are fishable, swimmable, drinkable, and farmable, able to support the health of the estuary, San Francisco Bay, and the ocean beyond. A coalition of California residents, business leaders, civic organizations, community groups, faith-based communities, union locals, farmers, fishermen, and environmentalists, Restore the Delta envisions the Sacramento-San Joaquin Delta as a place where a vibrant local economy, tourism, recreation, farming, wildlife, and fisheries thrive as a result of resident efforts to protect our waterway commons.

To that end, we are writing to offer comments regarding the Eastern San Joaquin Draft Groundwater Sustainability Plan. We acknowledge that we missed the comment deadline. This happened in part because we were busy completing a climate change analysis of the San Francisco Bay-Delta Estuary, which needed to be completed in order for us to offer thoughtful comments on the relationship between climate change impacts on the Delta and the Eastern San Joaquin Groundwater Basin. If our late comments cannot be accepted, can you please let us know how and where we can engage with the process again to share our findings? We believe you will find our findings worth of consideration and inclusion.

Climate Change Analysis

Restore the Delta observes in Table 2-17 (p. 2-133) of the Draft GSP Chapter 2 finds that in wet years groundwater storage is projected to increase by an annual average of 52 TAF; 23 TAF in above normal years; and decrease by 7 TAF in below normal years, 44 TAF in dry years, and 39 TAF in critically dry years. Overall, over the 50-year planning horizon of the Draft GSP, groundwater storage in the Subbasin is projected to decrease an average of 34 TAF. Over 50 years, this is a cumulative loss of stored freshwater of about 1.7 MAF. This is a much smaller amount than other groundwater sustainability agencies are contemplating elsewhere in California, but it still represents a cumulative loss to storage in our Subbasin. This is about 3.2 percent of the total subsurface freshwater storage of 53 MAF cited elsewhere in the Draft GSP.

Elsewhere, the Draft GSP states that "to achieve a net-zero change in groundwater storage over a 50-year planning period, approximately 78,000 AF/year of direct or in lieu groundwater recharge and/or reduction in agricultural and urban groundwater pumping would need to be implemented the Eastern San Joaquin Subbasin. This number is larger than the estimated annual overdraft of the projected conditions scenario due to the integrated nature of the groundwater sub basin." (p. 2-134) If neighboring subbasins do less to recharge their underground supplies hypothetically it would mean that the GWA would have to do more, and vice-versa, to avoid undesirable results. Restore the Delta urges the GWA to recognize this interrelationship more explicitly and to adopt a policy of encouraging neighbors to do their fair share of net recharge (combining "additional recharge or pumping reduction") activities as they implement their GSPs. We recommend also that the Final GSP incorporate reviews of what neighboring GSAs and their GSPs are contemplating in this regard so that readers of the GWA's GSP understand what this "neighborhood baseline" consists of when it comes to assessing undesirable results indicators and evaluating the success or failure of neighbors' implementation projects.

Restore the Delta is by and large disappointed with the Draft GSP's climate change analysis. The Draft GSP provides no broad overview of what effects climate change is likely to have on Subbasin groundwater resources. There is not even a summary of the California Fourth Climate Change Assessment commentary on what effects are expected in California as we step-by-step enter that climate future. Instead, the Draft GSP presents only a turgid, technical description of its use of DWR climate-change models and the results of those models. This should have been limited to an appendix, and the results simply summarized in the Draft GSP. Instead, the modeling results are presented with little context. The state has presented a comprehensive, region-by-region analysis of climate change effects, and the Draft GSP needs to apply it—both to educate the Subbasin publics (including disadvantaged communities) and to place DWR-based climate change analytic results in context. As drafted, the climate change analysis has been done; GSA staff can check the box for providing a minimally adequate GSP to the state. The water users of the Subbasin deserve more, however. They deserve a Final GSP that tells them what the

analysis means for the future of Subbasin groundwater resources and communities, and how it plays out relative to each of the sustainability indicators the Draft GSP puts forward.

Draft GSP Sustainable Indicators/Policies

SGMA's "undesirable results" include:

- chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply if continued over the planning and implementation horizon;
- significant and unreasonable reduction of groundwater storage;
- significant and unreasonable seawater intrusion;
- significant and unreasonable degraded water quality, including the migration of contaminant plumes that impair water supplies;
- significant and unreasonable land subsidence that substantially interferes with surface land uses; and
- depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of surface water.

In our testimony to the State Water Board on California WaterFix in 2016, we noted there was a cone of depression in the central part of the Eastern San Joaquin groundwater basin and that salt water intrusion was a risk, especially if freshwater was withdrawn via diversions at the WaterFix north Delta intakes. This condition persists, according to the Draft GSP. We note from Figures 2-37 and 2-38 (pp. 2-65 and 2-66 of the Draft GSP) that as of 2017 the cone of depression is still very much present. This existing condition has undesirable results ***now***. There are extensive losing stream reaches in the Eastern San Joaquin groundwater basin: Dry Creek along the north boundary, the Mokelumne River below Camanche Reservoir, and Calaveras River and Mormon Slough for nearly their full lengths across the basin. When compared with the groundwater elevation maps that show the cones of depression (Figures 2-37 and 2-38), it is evident that the cones of depression are located directly beneath the Calaveras River and Mormon Slough, which are losing streams—their flows are now disconnected from the groundwater system, as shown in Figure 2-66 (p. 2-99). There also appears to be a portion of a cone of depression beneath Dry Creek near to the Mokelumne River as well, though this is not labeled with the same color as the cone of depression in the Eastern San Joaquin basin. This means that there is great potential for saltwater intrusion, which the draft GSP gently acknowledges. Net subsurface flow is from the west to the east. But the draft GSP is silent about the ecological consequences of having losing streams spanning the groundwater basin. It means that to the extent these streams have riparian vegetation corridors along them, the trees and shrubs that comprise them are stressed, and to the extent stream reaches are devoid of riparian vegetation, river biota are starved of nutrients and shade.

Restore the Delta considers such conditions to be undesirable results of existing conditions along the basin's most significant losing streams and should be an object of policy for restoration and recovery.

Disadvantaged communities (also known as "environmental justice communities" and "climate justice communities") are located along the western edge of the Eastern San Joaquin groundwater basin—portions off the central and eastern Delta in the northeastern portion of the basin, the Stockton area, parts of Lodi and eastern Lodi, as well as the central basin (Figure 1-8, p. 1-15). This latter central basin DAC area directly coincides with the location of the losing stream reaches of Calaveras River and Mormon Slough, both of which overlie the cone of depression, which is caused by over-drafting of local aquifers largely by agricultural pumping activities. Disadvantaged communities are forced to live with existing disadvantaged streams—losing streams. The Draft GSP appears to do little to rectify these existing undesirable conditions—undesirable at least from the standpoint of the disadvantaged communities forced to live without healthy riverine ecosystems and recreational and angling beneficial uses of them in their midst.

The Draft GSP tracks the SGMA-defined "undesirable results" in its Sustainability Indicators (Section 3.2).

It defines an undesirable result of "chronic lowering of groundwater levels" as "experienced if sustained groundwater levels are too low to satisfy beneficial uses within the Subbasin over the planning and implementation horizon of this GSP." Indicators of this undesirable result include number of wells "going dry," reduction of pumping capacity of existing wells, increased pumping costs due to greater lift, and need for deeper well installations or lowering of pumps. The Draft GSP sets a threshold of 25 percent of representative monitoring wells (5 of 20 such wells in the Subbasin) have their elevations fall below their minimum level thresholds for two consecutive years that are non-dry (that is, below-normal, above-normal, or wet years). In other words, a SGMA-undesirable result would occur when groundwater levels fall for two consecutive years when there should be instead a net recharging of Subbasin aquifers during non-dry years.

This particular indicator lacks any recognition of the differential impact of falling groundwater elevations on disadvantaged communities relative to other groundwater pumpers like cities and agricultural enterprises. While the plan identifies disadvantaged communities (which we note above), it does not correlate explicitly the degree to which disadvantaged communities in the Subbasin are predominantly reliant on municipal/public or private water systems, or whether they are predominantly reliant on private wells. The Draft GSP provides no policies or program recommendations and needs that would address the question: if these conditions develop where disadvantaged residents lose their pumped groundwater supplies, what steps will the GWA take

to mitigate such events and recover the utility of their public/private systems or wells? The Draft GSP would, it appears, wait until impacts on disadvantaged and other communities occur before any actions to prevent such occurrences would be taken. For example, if one year of non-dry groundwater elevation decline results in 5 of the 20 monitoring wells happens, the Draft GSP would appear to require that the GWA wait a full year before any kind of action might be taken. Moreover, what actions should be taken if such dramatic events occur are not specified (pumping restrictions/moratoria? pump taxes to discourage excessive pumping? revolving loan funds for drilling deeper wells?).

The cost indicator is indeed relevant here. The Draft GSP recognizes just "increase in pumping costs due to greater lift" as an undesirable result relating to lowered groundwater elevations. The Draft GSP fails to provide any cost threshold beyond which point the GWA would presumably act on this triggered indicator. What level of cost increase is reasonable due to greater lift needs? Do public and private well systems need to be treated differently from a cost standpoint than single private wells? Will increased costs for wells operated by members of disadvantaged communities be treated the same or differently than other systems? Restore the Delta recommends that they should be treated differently so that ability to pay is taken into account. Just as important, what remedial action does the GWA commit to in order to stem impacts to disadvantaged community groundwater users when pumping costs rise? ***In short, whose groundwater pumping costs are going to be the GWA's yardstick for determining undesirable results, and what actions will the GWA commit to in redressing undesirable results?***

For the lowering of groundwater elevation and reduction in groundwater storage indicators, the definitions in the Draft GSP are too vague about which beneficial uses have to be affected by the undesirable result. There needs to be more clear specification of undesirable results in relation to specific beneficial uses. If the GWA means "all beneficial uses" for these indicators, then state "all beneficial uses." As worded, these indicators give the GWA license to pick favored beneficial uses over others. The cost issue just discussed is an example of this.

The matter of groundwater storage reduction presents different problems. The Draft GSP confidently states that "there is a large volume (approximately 53 million acre-feet [MAF] of freshwater in storage" in the Subbasin, and there appears to be very little fluctuation historically in this volume on a percentage basis. The Draft GSP states that "it is roughly estimated that groundwater demand for beneficial use occurs within the top 23 MAF of the Subbasin." (p. 3-10) No geographic description of where this 23 MAF occurs is provided. The "threshold" for undesirable result in the Draft GSP on the storage indicator then becomes "when storage is insufficient to satisfy beneficial uses within the Subbasin. Therefore, undesirable results would occur if groundwater storage were reduced to less than 30 MAF." (Ibid.)

Here the Draft GSP fails to connect the already existing undesirable results noted above with this level of groundwater storage in the Subbasin (that is, the cone of depression with the presence of losing streams immediately overlying them, for example, and their occurrence immediately beneath and down-gradient of disadvantaged communities in the Subbasin). The Draft GSP takes current groundwater storage at 53 MAF as an acceptable baseline when it actually represents a storage level that is undesirable given existing surface and subsurface conditions. Restore the Delta urges the GWA to rethink, redefine, and redraft this particular indicator discussion so that existing undesirable conditions can experience recovery and restoration to sustainable conditions as the GSP planning and implementation horizon plays out.

We appreciate that the Draft GSP specifies beneficial uses to be addressed in its "degraded water quality" discussion (beginning p. 3-11). We recommend, however, that this indicator go beyond salinity to factor in any and all surface impaired water ways identified by the Central Valley Regional Water Quality Control Board and the State Water Resources Control Board, connected or disconnected from groundwater systems. This will ensure that no water quality or toxic constituent "falls through the cracks" between SGMA implementation and Clean Water Act enforcement. This will help GWA staff stay abreast of 303d affairs carried out by the water regulators, especially where losing streams or percolation and recharge areas may become contaminated.

The Draft GSP sets a threshold of 3 of 10 water quality monitoring well sites exceeding minimum thresholds for two consecutive years and where these concentrations are the result of groundwater management activities. We ask a similar question as above of the GWA: if a toxic plume suddenly spikes at three or more of the ten water quality monitoring wells, is the Draft GSP to be interpreted as meaning that the GWA would wait up to two years before taking any kind of action to protect public health and safety and address the contamination? Why does this indicator even have a time/duration threshold before enabling the GWA to identify, prevent, or mitigate an undesirable result? As with the cost discussion, what actions does the GWA commit to in order to stem the breaching of the minimum water quality thresholds it has put forward? Would it really allow saltwater intrusion, for example, to proceed for two years before acting to push back the isohaline toward the Delta? That would cost a lot more in water injections and scarce dollars, for example, than if authority for action contained in the Draft GSP allowed more prompt assessment and prevention of saltwater intrusion.

The remaining three indicators in the Draft GSP address sea water intrusion, land subsidence, and depletion of interconnected surface water. Restore the Delta feels that these three indicators in the Draft GSP would all benefit from similar critical review and treatment (including redefinition to include existing undesirable baseline conditions) that we have outlined above for the first three indicators; indeed, our specific comments on reconnecting losing streams to groundwater systems apply to Section 3.2.6 on depletion of interconnected surface water,

including our comments about the relationships of disadvantaged communities to these natural hydrologic systems.

In closing, California Water and the City of Stockton Municipal Utility District depend, in part, on groundwater wells to provide safe and affordable drinking water supplies to residents of environmental justice communities within the City of Stockton. Residents from our environmental justice communities, made it clear during the recent California EPA Environmental Justice Initiative for Stockton, that they do not have confidence in our local drinking water supply due to issues of taste and discoloration. Furthermore, small urban businesses and farms which provide affordable local produce to residents living within Stockton's food deserts are also dependent on the health of our region's groundwater system and deserve to be protected from future impacts of saltwater intrusion and pollution plumes. We believe, consequently, that the GWA has a responsibility toward helping ensure that water quality and quantity is protected, and even improved, for the Subbasin, requiring further analysis of climate change impacts as described above.

Thank you for the opportunity to comment.

Sincerely yours,

Barbara Barrigan-Parrilla
Executive Director

Tim Stroshane
Policy Analyst

Cc: Mayor Michael Tubbs, City of Stockton
Mel Lytle, City of Stockton
Gordon MacKay, City of Stockton
Supervisor Kathy Miller, San Joaquin County
Supervisor Chuck Winn, San Joaquin County
Supervisor Tom Patti, San Joaquin County
Supervisor Bob Elliott, San Joaquin County
Supervisor Miguel Villapudua, San Joaquin County
Fritz Buchman, San Joaquin County
Kris Bilaji, San Joaquin County

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Delta-Sierra Group
Mother Lode Chapter
P.O. Box 9258
Stockton CA 95208

Eastern San Joaquin Groundwater Authority 25 August 2019
P. O. Box 1810, Stockton CA 95205
Via email: info@esjgroundwater.org and ESJgroundwater@sjgov.org

Re: Eastern Joaquin Groundwater Sustainability Plan – Public Draft July 2019

The Sierra Club has adopted a water policy to promote proper management for a healthful and aesthetically pleasing natural environment. The policy calls for thorough water inventories including historic water yields and uses, with priority where substantial demands are anticipated. The Eastern San Joaquin (ESJ) Subbasin is a high priority basin which is critically overdrafted requiring that managers of the resource comprised of 15 Groundwater Sustainability Agencies (GSAs) develop a groundwater sustainability plan (GSP) by January 2020.

The Draft GSP was released in July 2019 and the Delta-Sierra Group has prepared generalized comments regarding the following topics:

1. Initial Notification of GSP Preparation
2. GSP Funding
3. Beneficial Users Outreach
4. Wells
5. Recharge Areas
6. Interconnected surface waters
7. Groundwater dependent Ecosystems
8. Water Quality
9. Data Management System
10. Monitoring
11. Modeling
12. Notice of Intent to Adopt GSP

Initial Notification of GSP Preparation

The 15 GSAs along with 2 now former Eastern San Joaquin GSAs agreed to develop one GSP for the Eastern San Joaquin Groundwater Subbasin. The basis for this cooperation is outlined in the Joint Powers Agreement[1] which established the Eastern San Joaquin Groundwater Authority (GWA) to oversee the GSP development. According to the Notice of GSP Plan Development submitted to DWR: "The agreement specifies that the 17 GSAs will coordinate via the GWA to develop and implement a single GSP."[2]

The GSP must contain four main components:

1. A description of the plan area and groundwater basin setting (including an assessment of current and future groundwater conditions) and a water budget.
2. Sustainability goals which must avoid all six undesirable results
3. Projects and management actions that will achieve the community's sustainability goal, and
4. A monitoring plan that will measure progress over time.

The Eastern San Joaquin groundwater basin is characterized as an alluvial basin because most all the underlying sediments were deposited by flowing water and that have been allowed to accumulate over a million years or more[3]. The area overlying the basin is located in three counties: San Joaquin, Calaveras, and Stanislaus. Most of the basin lies within San Joaquin County.

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[1] https://www.sierraclub.org/sites/www.sierraclub.org/files/sce-authors/u14441/Fully%20Executed%20Eastern%20San%20Joaquin%20Groundwater%20Authority%20JPA_02082017.pdf. Fully authorized by signatories October 2017.

[2] https://sgma.water.ca.gov/portal/gsp/init/preview/82 Accessed 8.24.19.

[3] PAGE R.W., Geology of the Fresh Ground-Water Basin of the Central Valley, California, with Texture Maps and Sections REGIONAL AQUIFER-SYSTEM ANALYSIS; U.S. GEOLOGICAL SURVEY PROFESSIONAL PAPER 1401-C; 1986.

GSP Funding

To develop the GSP a contract was signed with Woodard & Curran for $2,176,420 that is in effect through the submittal of final GSP to DWR in January 2020. To fund the contractual obligation there was a uniform distribution of the local share costs between the then 17 GSAs. The Disadvantaged Community Grant, supported by Sierra Club, reduced the local cost share associated with the $1,500,000 Proposition 1 grant that was awarded to the GWA. Additionally, San Joaquin County Zone 2 Groundwater Investigation Assessment funds were distributed to 16 of the GSAs to further lower local cost shares to approximately $28,000/GSA within San Joaquin County. There was a much more robust discussion about funding the development of the GSP than for implementing the GSP. Table 1 below provides a summary of the GSA's areas and composition, both factors with groundwater extraction volumes should be considered when determining GSP implementation contributions.

Table 1. GSA's Area and Primary Land Use

Groundwater Sustainability Agency	Area (Acres)	Primary Land Use
Central Delta Water Agency GSA	52,000	Agricultural
Central San Joaquin Water Conservation District GSA	73,000	Agricultural
City of Lodi GSA	8,710[4]	Urban 4,565 population density/mile[4]
City of Manteca GSA	13,000	Urban 3,784 population density/mile[4]
City of Stockton	39,000	Urban 4,730 population density/mile[4]
Eastside San Joaquin GSA	126,000	Agricultural: Calaveras County Water District, Stanislaus County, and Rock Creek Water District (1,800 acres).
Linden County Water District	3,000	Urban 1,800 residents
Lockeford Community Services District	800	Urban 3,200 residents
North San Joaquin Water Conservation District GSA	149,000	Agricultural: Approximately 50% is irrigated land
Oakdale Irrigation District	31,000	Agricultural – supplier of surface water to Urban and Agricultural
County of San Joaquin GSA - Eastern San Joaquin 1	51,000	Agricultural with unincorporated community service districts
County of San Joaquin GSA - Eastern San Joaquin 2- Calwater	7,000	Urban – 42,000 connections – County MOA[5] with California Water Service, an investor owned utility
South Delta Water Agency GSA	18,000	Agricultural surface water users, groundwater unusable due to high salinity
South San Joaquin GSA	64,000	Agricultural and Urban: South San Joaquin Irrigation District distributes water for agricultural and urban users; City of Ripon 14,700 residents, and City of Escalon 7,400 residents.
Stockton East Water District GSA	101,000	Agricultural

In June 2019, an Ad Hoc Committee was established by the GWA to evaluate the role of the GWA going forward because many members believed that the JPA was only a coordinating agreement so that a

[4] https://www.census.gov/quickfacts/fact/table/mantecacitycalifornia,stocktoncitycalifornia,lodicitycalifornia/LND110210 data not included in the draft GSP.

[5] https://www.sierraclub.org/sites/www.sierraclub.org/files/sce-authors/u14441/Cal%20Water%20MOA_A-17-146_06052017_0.pdf.

single plan could be prepared covering the entire Eastern San Joaquin Groundwater Subbasin rather individual GSAs preparing their own plans.

The uncertainty related to ongoing governance exists in part because the Ad Hoc Committee was created especially so that Brown Act notifications to the public were not required. Whether or not coordination between the 15 GSAs continues during implementation will be in large part determined by what this Ad Hoc Committee reports to the GWA for their consideration. It is expected that this report will be made available either in September 2019 GWA agenda materials or at the September 2019 GWA meeting. In either case long after comments on the draft GSP are due in August 2019. The postponing of these important governance and funding discussions creates a situation of urgency which will likely preclude widespread public outreach and consideration of beneficial users' comments. The deficiencies related to individual GSA water budgets casts serious doubts about how funding allocations will be made so that basin-wide monitoring and implementation activities are accomplished. A frequent comment has been, why should we fund someone else's misuse and lack of planning when we have been funding efficiency improvements all along.

Beneficial Users Outreach

To satisfy the requirement to consider all beneficial users when developing the GSP, the Stakeholder Workgroup was formed in June 2018 to convey to the Groundwater Authority the perspectives of beneficial users in the basin. The approach to create a stakeholder committee for outreach to all beneficial user types was presented at the March 2018 GWA meeting. The presentation included the role of the Stakeholder Committee and the flow of information: staff Advisory Committee to Groundwater Authority Board then to Stakeholder Committee, and after the Groundwater Authority Board is "comfortable with everything, the topics will be ready for public presentations".

The goals of the Stakeholder Workgroup are outlined in the June 2018 *Draft Eastern San Joaquin Groundwater Authority Groundwater Sustainability Plan and Sustainable Groundwater Management Program Stakeholder Engagement and Public Outreach Plan.* The Workgroup may provide to the consulting team developing the GSP, input regarding the following groundwater-related issues:

- Annual work plans and reports (including mandatory 5-year milestone reports)
- Community outreach
- Development, adoption or amendment of the Groundwater Sustainability Plan
- Fee proposals
- General advisory
- Inter-basin coordination activities
- Local regulations to implement Sustainable Groundwater Management Act ("SGMA")
- Modeling scenarios
- Monitoring programs
- Projects and management actions to achieve sustainability
- Sustainability goals and objectives
- Confirmation of community values

Early on Stakeholder Workgroup members expressed frustration that specific technical information was not available for review in advance of meetings; that during meetings new information was made available on PowerPoint slides only; that meetings were rushed because there was an emphasis on presenting information rather than engaging in meaningful dialogue that could be communicated to the GWA. These issues and others are included in the results of the DWR Facilitation Grant situational assessment completed in December 2018. *The Eastern San Joaquin Groundwater Sustainability Work*

Group Stakeholder Assessment Highlights Report and *Highlights presentation*[6] were available in December 2018 and satisfied the requirements of the Department of Water Resources (DWR) Public Outreach Facilitation Agreement signed in September 2017. Since the GWA did not meet in December 2018 or January 2019 a video[7] was prepared for GWA review.

Frequently, information was requested by Workgroup Members so that meaningful comments could be prepared. These requests were:

- For more complete descriptions of management projects before final selection included in the GSP.
- For how responsibilities for funding the implementation of the GSP were to be allocated between the GSAs.

While Stakeholder Workgroup members were apprised of these two major aspects of the GSP, the members had too little detailed information to develop comments to convey their ideas to the GWA. Because information flow was limited, it is questionable about how robust engagement was during the GSP development.

Members expressed frustration that there were no demand management options to curtail continued development of the groundwater resource in areas were overdraft have been identified. Wells of any size can be drilled in San Joaquin County and Calaveras County with no requirement for metering to verify that permit application estimates of groundwater demand are valid. Stanislaus County, on the other hand has taken a discretionary approach so that new wells installed do not further impact aquifer overdrafted conditions. This discretionary approach as well as the ministerial approach to groundwater well permitting are currently under consideration by the California State Supreme Court Case No. S251709.

Many of the problems related to outreach that were discussed in 2018 continued and are in part summarized in a July 2019 letter submitted by multiple organizations including the League of Women Voters – San Joaquin County, the Delta-Sierra Group of the Sierra Club, Restore the Delta, Environmental Justice Coalition for Water, and Puentes[8].

On August 12, 2019 the members of the Stakeholder Workgroup were notified that scheduling for the final 1.5-hour meeting was underway and would be held in September 2019 to discuss responses to comments received on the Draft GSP, and "conclude with a small thank you ceremony." Likely, rather than a discussion, this meeting will include a presentation of a few comments or the GSP adoption process. This statement is based on the fact that the Stakeholder Workgroup was informed at the May 2019 that the June 2019 meeting was to include a discussion of Bundle 1 draft GSP comments and only a brief comment was made regarding one stakeholder group's comments – the Nature Conservancy regarding groundwater dependent ecosystem identification. Instead of a discussion of comments there was an overview presentation of draft GSP Bundles 2 and 3.

Wells, Recharge Areas, Interconnected Surface Waters, and Groundwater Dependent Ecosystems

Wells

The GSP Wellhead protection areas and recharge areas Section 1.2.3.4, addresses wellhead protection programs in San Joaquin County, Calaveras County, and Stanislaus County. The discussion regarding wellhead protection areas seemed to be restricted to annular seals on wells which do prevent surficial contamination from entering the aquifer. No analysis was offered as to the variation of well construction

[6] https://www.sierraclub.org/sites/www.sierraclub.org/files/sce-authors/u14441/Eastern%20San%20Joaquin%20%20Groundwater%20Sustainability%20Work%20Group%20Stakeholder%20Assessment%20Highlights%20Report.pdf and https://www.sierraclub.org/sites/www.sierraclub.org/files/sce-authors/u14441/ESJ-Assessment-DRAFT.pdf

[7] https://www.youtube.com/watch?v=JKIHfbvTmPs&t=178s not distributed to GWA based on available public records.

[8] https://www.sierraclub.org/sites/www.sierraclub.org/files/sce-authors/u14441/Collective%20Comments%20on%20GSA%20outreach%20activities%20%20071719%20final.pdf

standards and location requirements that might relate to wellhead protection areas. A brief summary of well construction standards and location requirements for the three counties is included in Table 2. With the exception of Stanislaus County, there are no restrictions on pumping or new well installations, of any size and depth due to the ministerial approach adopted by San Joaquin and Calaveras Counties. Continued issuance of well permits of any size occurs including in areas where cones of depression have been identified due to historic groundwater extraction exceeding groundwater recharge.

Despite the fact that GSAs are able require water management devices on non-de minimis water wells no metering of wells of any size was proposed in the draft GSP. De minimis wells produce less than two acre-feet per year for domestic purposes. Reporting of extraction volumes and meters on all wells not de minimis is required should the State Water Resource Control Board have to regulate a basin. There are several thousand or more wells that are not de minimis that extract groundwater within the Eastern San Joaquin Groundwater Subbasin. The Delta-Sierra Group recommends that the largest non-de minimis extraction wells be metered with an annual reporting requirement. Requiring the metering of the largest extraction wells is a good step towards validating the results of modeling based on acreage and crop types.

Table 2. County Regulation for Well Installation

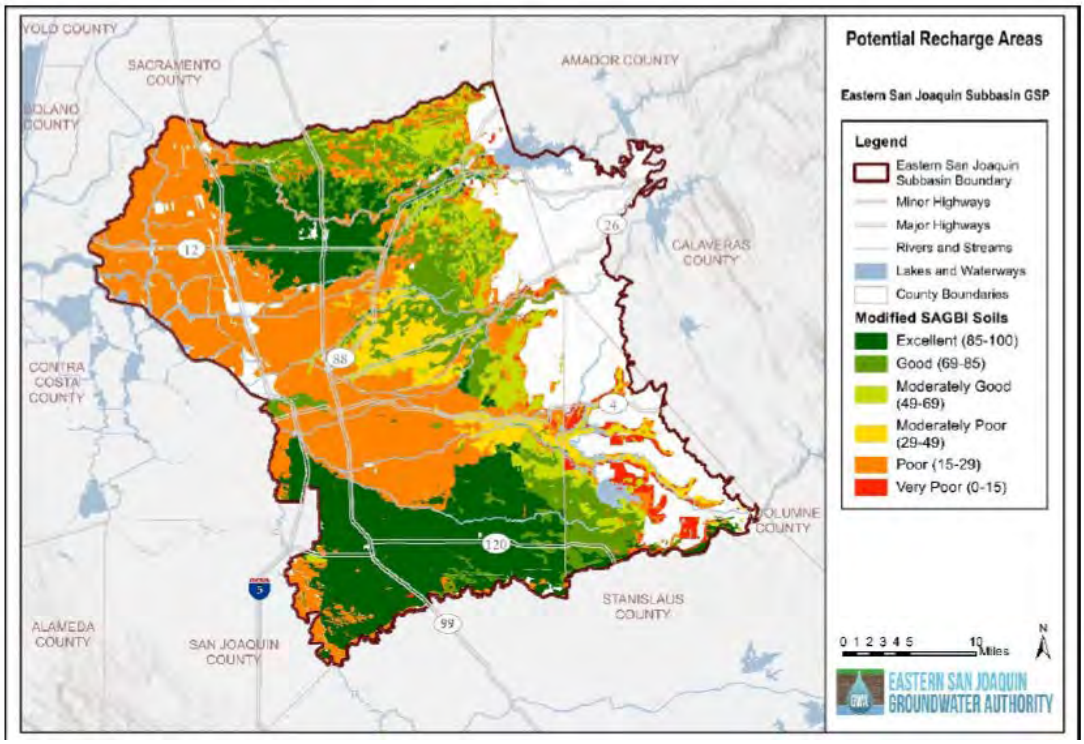
San Joaquin County[9]	Stanislaus County[10]	Calaveras County
San Joaquin County Environmental Health Department oversees a well permitting program	Stanislaus County Department of Environmental Resources oversees a well permitting program	Calaveras County Environmental Health Department oversees a well permitting program
Setbacks for Public Water System Wells (Lots recorded after 1972): Property Line 25 ft (10 ft) Septic Tank 100 ft (50 ft) disposal 100 ft (100 ft) Sewer Line 50 ft (50 ft) Stream, Creek, 50 ft (50 ft) River, Canal	In 2014, the DER adopted a Groundwater Ordinance to prohibit unsustainable extraction of groundwater in unincorporated areas of the County. The DER reviews each Well Permit Application and determines whether the well is subject to, or exempt from, the prohibitions in the Groundwater Ordinance. Permit Applications for wells intended to extract 2 AF/year of groundwater or less are exempt from the prohibitions in the Groundwater Ordinance	Setbacks[11] Property line <5 acres 10ft Property line >5 acres 50 ft Septic Tank 100ft Disposal 100ft Sewer Line 50 ft Surface Water 25 ft
The minimum depth of the annular seal for wells in San Joaquin County: Public Water Supplies 100 ft Individual Domestic Well 100 ft Industrial Wells 100 ft Agricultural Wells 50 ft	All wells shall have an annual seal except for Agricultural wells located 300 feet or more from a domestic well[12]: Minimum seals as set forth in Chapter II of the Department of Water Resources Bulletin No. 74, "Water Well Standards" (February 1968), or as subsequently revised or supplemented, which are incorporated in this chapter and made a part of this chapter. (Prior code §3-313)[13] Community water supply 50 ft Industrial 50 ft Individual domestic 20 ft Agricultural well 20 ft	The minimum dept of the annular seal for wells in Calaveras County[14]: Public drinking water well 50 ft Commercial well 50 ft Industrial well 50 ft Individual domestic well 20 ft Agricultural well 20 ft Vertical geothermal exchange wells 20 ft Wells within twenty-five (25) feet of a water way 20 ft below the bed of the water way.

[9] https://www.sjgov.org/uploadedfiles/sjc/departments/ehd/forms/well%20standards.pdf
[10] http://www.stancounty.com/er/pdf/application-packet.pdf
[11] http://ema.calaverasgov.us/Portals/EMA/Documents/EH/Wells/Minimum_Well_Setbacks.pdf
[12] https://qcode.us/codes/stanislauscounty/view.php?version=beta&view=mobile&topic=9-9_36-9_36_070
[13] http://wdl.water.ca.gov/waterdatalibrary/docs/historic/Bulletins/Bulletin_74/Bulletin_74-90__1991.pdf
[14] http://ema.calaverasgov.us/Portals/EMA/Documents/EH/Wells/Well_Ordinance.pdf

Recharge Areas

Groundwater recharge areas were not specifically addressed in GSP Section 1.2.3.4 but instead were discussed in 2.1.4.5.3: Description of Potential Recharge Areas. Modified SAGBI data was used to categorize 310,098 acres out of 610,890 acres (51 percent) of agricultural and grazing land within the Subbasin as moderately good, good, or excellent for groundwater recharge. The Modified SAGBI data show higher potential for recharge than unmodified SAGBI data because the modified data assume that the soils have been or will be ripped to a depth of 6 feet, which can break up fine grained materials at the surface to improve percolation. A generalized map was provided of potential recharge areas as shown below, but a map identifying existing recharge areas that substantially contribute to the replenishment of the groundwater basin was not found in the draft GSP.

Figure 2-14 Potential Recharge Areas



SGMA requires that a map identifying existing and potential recharge, and specifically identifying the existing recharge areas that substantially contribute to the replenishment of the groundwater basin. This map shall be provided to the appropriate local planning agencies so that appropriate protection measures may be considered for adoption. In order to enhance recharge opportunities, land use planning that restrict paving and build over in an important mechanism. Good land use policies are necessary components to achieve the sustainability goals for the basin; so that existing recharge can continue and that development of additional regional recharge areas can become part of local water resource and community development plans.

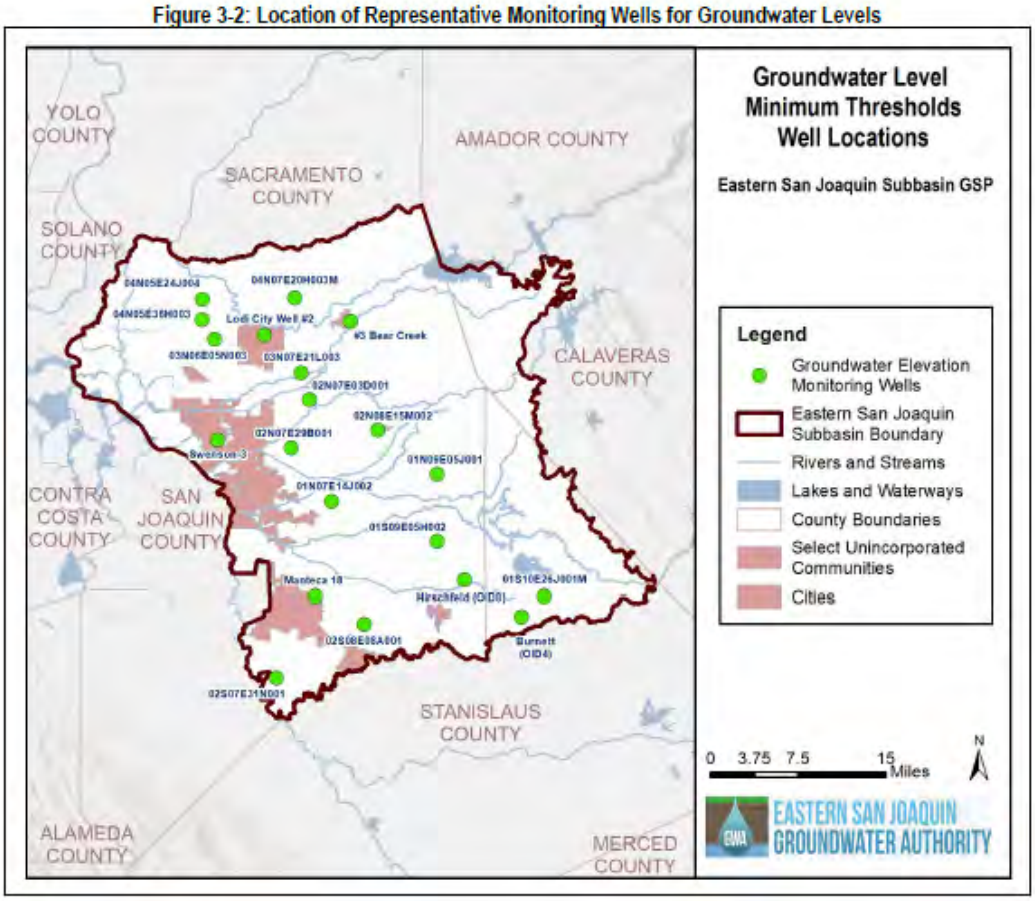
Interconnected Surface Waters

Depletion of interconnected surface waters is an undesirable effect and the minimum threshold is the rate or volume of surface water depletions caused by groundwater use that has adverse impacts on beneficial uses of the surface water. Surface water supplies are available to many beneficial users including those with water rights granted by the State Water Resources Control Board directly or based on historical rights and environmental users including wildlife with and without narrow temperature ranges, and recreational users. When wells of any size are allowed to be drilled as near as 25 feet to 50 feet of a surface water source, it is likely that those wells are influenced to a large degree by surface water flows and contribute to surface water depletions in most circumstances.

The GSP noted in section 3.2.6 Depletion of Interconnected Surface Water that "quantification of depletions is relatively challenging and requires significant data on both groundwater levels near streams and stage information supported by groundwater modeling." Without restricting the installation of wells within areas of influence that intersect surface waterways, further depletion of interconnected surface waters will continue.

The draft GSP uses groundwater level minimum thresholds as a proxy for the depletion of interconnected surface water sustainability indicator. As such, the minimum thresholds for the interconnected surface water sustainability indicator are the same as the minimum thresholds for the chronic lowering of groundwater levels sustainability indicator. The use of the existing representative groundwater level monitoring wells is inadequate to assess whether or not surface waters are depleted by groundwater extraction wells near surface waterways. Figure 3-2 from the draft GSP shows the minimum threshold compliance well locations. Based on the scale of the legend the nearest well to a surface waterway is Bear Creek #3 which may be up to approximately 1 mile away from Bear Creek (0.5/2*3.75 miles) and operated by the Lockeford Community Services District which also operates wastewater infiltration ponds in the vicinity as shown in the snapshot from the 2007 Central Valley Regional Water Quality Control Board Waste Discharge Requirements[15]

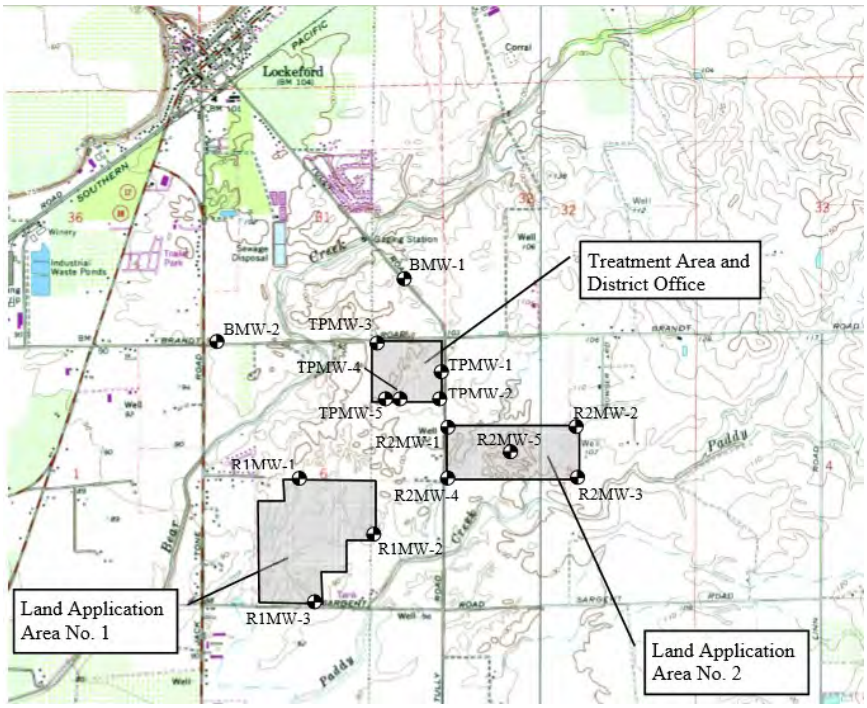
Figure 3-2: Location of Representative Monitoring Wells for Groundwater Levels



The CVRWQCB permitted the Lockeford Community Services District in 2007, a monthly average land application flow rate not to exceed 300,000 gallons per day, and upon approval of the Recycled Water Expansion Report by the Executive Officer, the monthly average flow rate may be increased to a maximum of 400,000 gallons per day. The location of Bear Creek #3 is not specified on the CVRWCB map shown below.

[15] https://www.waterboards.ca.gov/centralvalley/board_decisions/adopted_orders/san_joaquin/r5-2007-0179.pdf accessed 8.25.19

Snapshot from CVRWCD WDR for Lockeford Community Services District



The draft GSP included Bear Creek #3 well construction details (780 feet total depth with screened intervals from ground surface to depth or 96 feet to -684 feet mean sea level [msl]), The well could possibly be influenced by land application recharge as well as nearby Bear Creek. The current groundwater level for Bear Creek #3 is -49.3 ft msl with an objective of -50.3 ft msl or approximately 150 feet below ground surface. The minimum threshold for groundwater lowering which is being proposed as a basis for assessing depletion of groundwater is -72.3 ft msl. The minimum threshold is the quantitative threshold for each sustainability indicator used to define the point at which undesirable results may begin to occur. Reduction of groundwater levels approximately 20 feet while possibly causing some domestic or agricultural wells to go dry is not adequate to determine that surface water depletions are or are not occurring. The use of groundwater level reductions is inadequate to assess interconnected surface water impacts.

Groundwater Dependent Ecosystems

Groundwater-dependent ecosystems (GDEs) are defined in the GSP regulations as "ecological communities or species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface." SGMA requires the identification of GDEs but does not require that sustainable management criteria be established to manage these areas. GDEs exist where vegetation accesses shallow groundwater for survival; without the access to shallow groundwater, these plants would die. Thus, this Plan identifies GDEs within the Eastern San Joaquin Subbasin based on determining the areas where vegetation is dependent on groundwater as a reduced subset of potential GDEs identified in the Natural Communities Commonly Associated with Groundwater (NCCAG) database. The significant reduction of GDEs as compared to the NCCAG database was related to co-occurrence of surface water sources including irrigation canals. The Delta-Sierra Group objected in February 2019 to the disqualification of local ecosystems as GDEs if sources other than groundwater are available. Specifically, the criteria to not have other sources of water is defined as being at least 50 feet from irrigated land or 150 feet from either managed wetlands or from perennial surface water bodies. These water sources if not receiving water from groundwater will be discharging to groundwater. In either case freshwater species that are critical for ecosystem sustainability benefit: either the in-stream and riparian ecosystems or groundwater dependent ecosystems. The criteria used when removing GDE from the NCCAG database reduced the importance that these areas represent in the Subbasin. This reduction of designated GDE areas may

negatively affect future consideration and management actions and result in negative impacts to GDEs within the Eastern San Joaquin Subbasin. As no sustainable management criteria are required for GDEs, the Delta-Sierra Group recommends that a less restrictive method be used if reductions to the NCCAG are desired, and that the Nature Conservancy and California Department of Fish and Wildlife be consulted.

Water Quality, Data Management System, and Monitoring

Water Quality

The Eastern San Joaquin Subbasin groundwater quality is negatively impacted by contaminates not currently proposed for monitoring or inclusion in the Data Management System. Recent reports of a school using a contaminated well creates a reminder of the many contaminant plumes in the Subbasin including petroleum hydrocarbons, solvents, and emerging contaminants. Additionally, monitoring for nitrates in groundwater samples collected from monitoring wells and on-site domestic wells is now a requirement of the Irrigated Lands General Permit[16] with results submitted in the State of California GeoTracker database. Nitrate contamination is a significant problem in agricultural areas related to the handling of wastes and applications of fertilizers.

Data Management System

An important part of the initial steps of implementation will be to have several workshops for beneficial users that are interested in accessing the database and creating reports or accessing pre-made report formats. Probably those staff that will be inputting data will also require training. Ideally, as work continues with the database, methods to incorporate contaminant data stored by the State of California in various databases can be explored. Another possibility is that GSAs exercise their powers and authorities to require that other groundwater management data be included in an expanded database. Fees could be charged of those with reportable results to submit to the database. The fees could offset time required by staff to input the data. Perhaps, San Joaquin Environmental Health could administer the database because they already have access to small water system monitoring data under permit. Those using groundwater and those making important planning decisions would benefit from a centralized location for groundwater quality.

Monitoring

Descriptions of monitoring frequencies need to be revised to consistently described the planned semi-annual monitoring. Staff involved with the California Statewide Groundwater Elevation Monitoring (CASGEM) well monitoring suggested that conditions could exist that more frequent monitoring may be necessary to capture valid seasonal fluctuations. Consideration should be given to the sampling of representative groundwater level compliance wells quarterly, a reduction of the DWR monthly monitoring suggestion. Semi-annual monitoring may miss transient changes in response to unseasonable conditions. Understanding these transient changes may help refine the conceptual model.

The monitoring protocols described in *The DWR Best Management Practices for the Sustainable Management of Groundwater Monitoring Protocols, Standards, and Sites* are used within the existing CASGEM program. The statement that "these protocols and existing resources will be used when possible in data monitoring and collection in support of this GSP" suggests that some wells being monitored by agencies not using these protocols may elect to continue to use their current protocol. A clear commitment that all representative groundwater wells will have well construction details and have data collected consistently using DWR's best management practices.

Modeling

The Delta-Sierra Group began asking for model specifics in 2017 and submitted correspondence in June 2018 summarizing those requests followed up with November 2018 and January 2019 correspondence.

[16] https://www.waterboards.ca.gov/centralvalley/board_decisions/adopted_orders/general_orders/ilrp_wdrs_res_final_web.pdf accessed 8.25.19

Public information requests with the DWR and San Joaquin County Counsel resulted in the report being made available in March 2019, six months after the report publication date and one year after it was due to DWR. Efforts are still underway to understand the complexities of the model and evaluate baseline conditions parameters used for model validation. The August 2018 Model Report included a reference to an April 25,2018 Eastern San Joaquin Water Resources Model IDC Workshop that was not noticed or advertised despite stakeholder collaboration being the first topic discussed. Going forward as the model is refined under contract, the Delta-Sierra Group suggests that model refinement include multiple opportunities for interested parties that are stakeholders to become more familiar with the model.

The sustainable conditions scenario for the water budget results in groundwater outflows almost equal to groundwater inflows with a basin sustainable yield estimated to be 715,000 AF/year ± 10 percent. The water budget that was used to identify the 78,000 AF/year of offset needed to balance the groundwater budget over 50 years, is based on model results. This statement is confusing especially given the description of the model results under climate change, as it is unclear which number is being referred to:

> This number is larger than the estimated annual overdraft of the projected conditions scenario due to the integrated nature of the groundwater subbasin.

Examples of offsets that could satisfy the groundwater deficit include direct or in lieu groundwater recharge and/or reduction in agricultural and urban groundwater pumping. Projects that reduce projected groundwater pumping and/or increase recharge will help the Subbasin reach sustainability.

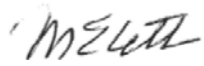
Under the intermediate climate change scenario prescribed by DWR, the depletion in aquifer storage is expected to increase by about 68 percent to an average annual storage change of 57,000 AF/year, from 34,000 AF/year in the projected conditions scenario. If the 68 percent is applied to 78,000 AF/year, deficient an additional 53,000 AF/year will be needed and the planned projects projected to achieve sustainability included in the GSP will be insufficient.

Notice of Intent to Adopt GSP

Between 8.20.19 and 8.25.19, the esjgroundwater.org website was updated with the Notice of Intent to Adopted GSP. The website indicated that the Notice was posted on 8.16.19 and sent by mail and email. The Notice stated that no sooner than 90 days public hearings will be held to consider adoption of the GSP. The GSAs that were listed included Woodbridge Irrigation District which has withdrawn GSA standing with the Eastern San Joaquin Subbasin GWA and the Department of Water Resources. As of 8.25.19, the Notice of Intent to Adopt GSP was not forwarded to the ESJ interested parties list although interested parties were directed to the esjgroundwater.org website for meeting information and public hearing dates. The Notice of Intent to Adopt GSP did include email addresses of GSA representatives in addition to mailing addresses and FAX numbers.

Thank you for the 45 day comment period for the Eastern San Joaquin Groundwater Subbasin Draft Groundwater Sustainability Plan. If any questions arise regarding these comments, please contact me at mebeth@outlook.com.

Sincerely,



Mary Elizabeth M.S., R.E.H.S.
Delta-Sierra Group Conservation Chair
Sierra Club

Eastern San Joaquin Subbasin GSP Public Draft
Summary of Public Comments and Responses

Comment #	Commenter	Commenter Organization	Page Number	Section, Figure, or Table Number	Sentence Starts with, "...	Comment
1	BN	SSJGSA	1-1	1.1.1	The following figure (Figure 1-1) shows flagship reports from these efforts	Add Ag Water Mangement Plans and General Plans to the list.
2	BN	SSJGSA	1-3	1.1.4		Suggest mentioning that Lathrop signed on to the JPA then voluntarly withdrew citing the Basin Boundary modification approved by DWR.
3	BN	SSJGSA	1-3	1.1.4	California Water Service	Suggest referencing Memorandum of Agreemnt between Calwater and County
4	BN		1-3	1.1.4	WID	WID reinstatement as a GSA
5	BN	SSJGSA	All	Throughout		Replace GWA with ESJGWA
6	BN	SSJGSA	1-6	1.1.4.2	Decisions of the GWA...	Should also reference the JPA document posted to www.esjgroundwater.org
7	BN	SSJGSA	1-9	1.1.4.3	South San Joaquin Irrigation District	Escalon is contracted to receive treated surface water ffrom SSJID but has yet to install infrastructure to connect to the system.
8	BN	SSJGSA	1-9	1.1.4.4	The GWA's JPA ...	Sentaence should read: The ESJGWA's JPA calls out the following powers granted to GSA's by SGMA.
9	BN	SSJGSA	1-11	Figure 1-4		Include DWR Subbasin Basin Numbers for San Joaquin Basin and 5-22.01
10	BN	SSJGSA	1-12	Figure 1-5		Include DWR Subbasin Basin Numbers for San Joaquin Basin and all adjacent basins.
11	BN	SSJGSA	1-13	Figure 1-6		Sac Co. ans San Joaquin Co/ shades are too similar.
12	BN	SSJGSA	1-17	Figure 1-10		Call out USDA CropScape 2015 as Data source.
13	BN	SSJGSA	1-19 and 20	Figures 1-11 and 1-12		Call out DWR WDL as data source.
14	BN	SSJGSA	1-23	1.2.2.1.1		Might want to call out that the Board of Supervisors of San Joaquin County also act as the Board of Suerpvisors of the SJCFCWCD. The SJC Public Works Department also staffs the SJCFCWCD.
15	BN	SSJGSA	1-24	1.2.2.1.1		Technically, the SJCFCWCD should be called out, not SJC.
16	BN	SSJGSA	1-25	1.2.2.1.5		Not a Technical Review Committee. Participants possessed technical expertise sch as staff and consultants represeting many of the GSAs forming the ESJGWA.
17	BN	SSJGSA	1-32	1.2.2.8	concrete linbed and replaced with	replace "PVC" with "buried"
18	BN	SSJGSA	1-35	1.2.3.1.8		Checking with Ripon on GP descrption
19	BN	SSJGSA	1-36	1.2.3.4.1		Confirm and insert that Municipal codes prohibit private supply wells.
20	BN	SSJGSA	1-39	1.2.4	Current opportunities to participate in plan...	The GP Update is complete so the opportunity to comment is actually through the discretionary approval process which includes CEQA, Planning Commission, appeals, etc.
21	BN	SSJGSA	1-40	1.3.1	Agricultural users and domestic well	Delete "of"
22	BN	SSJGSA	1-47	1.3.4.3	Keep interested list of stakeholders	Suggested Edit: and/or their preferred mode of communication
23	BN	SSJGSA	2-1	2.2.1.1	The California Statewide Groundwater Elevation Monitoring (CASGEM)	Conssitency: SJCFCWCD is the CASEGEM Entity and the SJC Public Work staffs the SJCFCWCD which is a separate legal entity.
24	BN	SSJGSA	2-4 and 2-6	Figure 2-6		Suggest deleting figure 2-4 amd reference on page 2-4.

Comment #	Commenter	Commenter Organization	Page Number	Section, Figure, or Table Number	Sentence Starts with, "…	Comment
25	BN	SSJGSA	2-13	Table 2-1		Suggest clarifying the nu,mbers as the drainage area or sub-watershed area vs. watershed area. There may be some confusion as to watershed area vs sub-watershed area .
26	BN	SSJGSA	2-14	Figure 2-8		Same comment above.
27	BN	SSJGSA	2-16	2.1.4.3	The Farmington Groundwater Recharge/Seasonal Habitat Study	"MWD" should be "MWH"
28	BN	SSJGSA	2-64	2.2.1.2	Current groundwater elevation conditions	Suggest describing measurements as Spring and Fall rather than by quarter.
29	BN	SSJGSA	2-104	2.2.9		See attacehd spreadsheet of polygons that have been investigated by staff and determined to be non-GDE's. The attached sreadsheet lists the reason for the determination.
30	BN	SSJGSA	2-110	Table 2-12		See Table note 5: Referrence error
31	BN	SSJGSA	2-115	2.3.4.3	As private groundwater pumping	Suggest referencing IDC in Model Report.
32	BN	SSJGSA	2-123	2.3.5.1	The Joint Powers Agreement (JPA) selected	Replace with "The ESJGWA selected"
33	BN	SSJGSA	2-123	2.3.5.1	When analyzing the water budget for the stream system	Rplace "…potentiall significant effects…" with "… a calculated increase…"
34	BN	SSJGSA	2-125	2.3.5.1	Additionally, a portion of the reduction seen in the overdraft estimate	Replace "…may be due to a shift to…" with "… are the result of converting from groundwater use to surface water supplies…"
35	BN	SSJGSA	2-126	Table 2-16	3 Agricultural demand is based on	Replace 2nd sentance in footnote 3 with : As agricultural land use continually evolves through changes in crop types and urbanization over the historical calibration, averaging of the resulting agricultural demand is less a function of water year type and rather dependent more on when in the simulation that year type fell.
36	BN	SSJGSA	2-126	Table 2-16	4 Urban demand evolves	Replace footnote 4 with: "Urbn demands in the Historic Water Budget are reported values from cited sources. Averaging urban demands by year type may not explicitly depict urban growth patterns during the historical model period"
37	BN	SSJGSA	2-127	2.3.5.2	The current water budget quantifies inflows	Replace "basin" with "Subbasin"
38	BN	SSJGSA	2-128	2.3.5.2	Based on 2014 cropping patterns and	Ad to beginning of sentence: The analysis fixes the l;anduse to current conditions and is based on…
39	BN	SSJGSA	2-128	2.3.5.2	The almost 2.4 MAF/year of	Replace "The almost" with "Approximately"
40	BN	SSJGSA	2-129	2.3.5.2	The current conditions scenario simulates	I'm not sure what this sentence means if you've defined the current condition as 2014 land use and 2015 population

Comment #	Commenter	Commenter Organization	Page Number	Section, Figure, or Table Number	Sentence Starts with, "…	Comment
41	BN	SSJGSA	2-130	2.3.5.4	Due to the expansion of urban area in all the major municipalities, agricultural acreage is reduced by less than 40,000 acres.	Replace two sentances with: An important assumption made in the project water balance analysis that due to projected urban growth, agricultural acreage is xpected to decrease by approximately 40,000 acres. While there is agricultural growth anticipated in the eastern areas of the Subbasin and potential conversion of existing agricultural land to permanent irrigated crops, no reliable projections were available to include in the simulation; therefore, no additional agricultural land growth was added to the projected conditions scenario.
42	BN	SSJGSA	2-134	2.3.6	As efforts are made to reach sustainability in the Subbasin	Replace "be impacted" with "vary due to a number of proposed mangement actions resulting in increased groundwater levels...". Impacted only sounds negative.
43	BN	SSJGSA	2-134	2.3.7.1	Consistent with Section 354.18(d)(3) and	an analysis was performed for the Subbain evaluating the projected water budget with and …
44	BN	SSJGSA	3-4	3.2.1.2	Each of the three conditions scenarios	Delete "scenarios"
45	BN	SSJGSA	3-4	3.2.1.2	The GSP authors reviewed prior groundwater-related planning documents	Suggested re-write: Previously adopted groundwater-related panning documents were reviewed including the … These documents provided a starting point for setting minimum thresholds.
46	BN	SSJGSA	3-4	3.2.1.2	The 2014 IRWMP indicates Fall 1992	The reference to Fall 1992 actually was developed as part of the 2007 IRWMP and was used as the basis for comparison in a subsequent Programatic EIR..
47	BN	SSJGSA	3-5	3.2.1.2	The GWA Board determined that dewatering of domestic wells may be a potential undesirable result that could potentially be used to confirm the adequacy of the minimum threshold methodology.	Proposed re-write: The GWA Board determined that dewatering of domestic wells ~~may be a potential~~ is undesirable ~~result that~~ and could ~~potentially~~ be used to confirm the adequacy of the minimum threshold methodology.

Comment #	Commenter	Commenter Organization	Page Number	Section, Figure, or Table Number	Sentence Starts with, "…	Comment
48	BN	SSJGSA	3-5	3.2.1.2	The 10th percentile domestic well depth (i.e., the depth of the top 10th percent most shallow well) wasexamined within a radius around the monitoring well representative of local conditions. A radius of 3 miles around therepresentative monitoring well was used in all cases except for well 03N07E21L003, where a 2-mile radius was useddue to variations in local well depth due to proximity to the Mokelumne River. An average of 400 domestic wells werecaptured within a 3-mile radius of each representative monitoring well, covering approximately 76 percent of thedomestic wells in the Subbasin.	Suggest replacing with: A radius of 3 miles around each representative monitoring well was used to idetify the 10th percentile domestic well construction depth. For representative monitoring well 03N07E21L003, a 2-mile radius was used due to variations in groundwater levels due to its proximity to the Mokelumne River. The 3-mile radiii (including the 2-mile radius of monitoring well 03N07E21L003) of each representative monitoring well, includes an average of 400 domestic wells each capturing approximately 76 percent of the domestic wells in the OSWCR dataset..
49	BN	SSJGSA	3-5	3.2.1.2	Domestic well data was retrieved from Online System for Well Completion Reports (OSCWR), and information on casing, screening, and age of well is not available in most locations. The 10th	Consider re-write: Domestic well data obtained from the OSCWR dataset is sparsely populated with information on total casing depth, screening intervals, and the age of the well. The 10th percentile well depthwas choosen due to the uncertainty in the database and to account for domestic wells that may have been drilled to a very shallow depth prior to the current well drilling standards enforced by local jurisdictionsand/or have reached the end of their lifecycle. The10th percentile domestic well depth for groundwater levels is protective of 90 percent of the domestic wells in the OSCWR dataset and is used as the minimum threshold for
50	BN	SSJGSA	3-5	3.2.1.2		Cosider adding the OSCWR domestic well depth dataset to the Appendix.
51	BN	SSJGSA	3-10	3.2.2.1.1	The undesirable result...	Delete: "The undesirable result related to reduction in groundwater storage is defined in SGMA as: Significant and unreasonable reduction in groundwater storage."

Comment #	Commenter	Commenter Organization	Page Number	Section, Figure, or Table Number	Sentence Starts with, "…	Comment
52	BN	SSJGSA	3-10	3.2.2.1.1	An undesirable result for reduction in groundwater storage in the Eastern San Joaquin Subbasin is experienced if sustained groundwater storage volumes are too low to satisfy beneficial uses within the Subbasin over the planning and implementation horizon of this GSP.	Consider replacing with "The ESJGWA has determined that an undesirable result for the reduction of groundwater storage is experienced if sustained groundwater storage volumes are too low to satisfy beneficial uses within the Subbasin over the planning and implementation horizon of this GSP."
53	BN	SSJGSA	3-10	3.2.2.1.2	It is roughly estimated that groundwater…	It is estimated that overlying pumpers have limited access equating to approximately the shallowest 23 MAF of groundwater storage in the Subbasin; therefore an undesirable result would occur if groundwater storage levels were depleted by 23 MAF.
54	BN	SSJGSA	3-10	3.2.2.1.3	Although the Subbasin has enough fresh groundwater in storage to sustain	Suggested edit: Depletion of 23 MAF within the SGMA panning horizon of 2040 is highly unlikely. There would need to be an event of a catastrophic nature or proonged and exgerated increases in the mining of groundwater, extreme and severe drought, or other major changes in groundwater management over time could to cause a depletion of groundwater storage to a significant and unreasonable level.
55	BN	SSJGSA	3-10	3.2.2.1.4	If groundwater levels were to reach	Suggest adding degredation of produced water quality from groundwaeer sources
56	BN	SSJGSA	3-11	3.2.2.2	As noted above, the amount of groundwater	Suggest replacing "… until storage reached 30 MAF..." with "...until storate was depleted by 23 MAF…"
57	BN	SSJGSA	3-12	3.2.3.1.1	GSA members and their affiliates	"cities" should be Cities and add SJCFCWCD
58	BN	SSJGSA	3-12	3.2.3.1.2		Give examples of groundwater or water management activities that causes groundwater quality degredation.
59	BN	SSJGSA	3-12	3.2.3.1.3		Suggest adding that increases in salinity only occurred in parts of the Subbasin
60	BN	SSJGSA	3-12	3.2.3.1.4	If groundwater quality were degraded resulting in undesirable results, the effect would potentially include	Replace fisrt part of first sentence with: The potential effects of degraded groundwater quality would include:

Comment #	Commenter	Commenter Organization	Page Number	Section, Figure, or Table Number	Sentence Starts with, "…	Comment
61	BN	SSJGSA	3-12	3.2.3.2	The minimum threshold of 1,000 mg/L was	Suggested edits: A minimum threshold of 1,000 mg/L was selected based on stakeholder concerns for drinking water and agricultual benefical uses. The minimum threshold selected by the GWA Board was also informed by stakeholder input. There was a meeting held in Fall 2018 with GSA representatives from San Joaquin County, City of Lodi, City of Manteca, City of Stockton, and Cal Water and an addiitonal meeting with agribusiness members of the Stakeholder Workgroup.
62	BN	SSJGSA	3-17	3.2.5.1.4		Replace unrecoverable with irecoverable
63	BN	SSJGSA	3-19	3.2.6.1.2		Proposed re-write: An undesirable result will have been deemed to occur if depletions resulted in an impact to a senior water right holder such as if the release of stored surface water occurred in higher frequencxy and volume to meet fish and wildlife requirements or a decrease in the amout of supply avaiablle for a senior water right holder including riparian diverters, or a potential reduction in acreage of groundwater dependent ecosystems.
64	BN	SSJGSA	4-1	4.	Whole Chapter	Replace "GWA" with "ESJGWA"
65	BN	SSJGSA	4-3	4.1.2	The 76 wells included in the broad monitoring network	Sugggested edit: Of the 107 wells in the broad monitoring network, 76 wells included are wells used in CASGEM…
66	BN	SSJGSA	4-13	4.3.3		SJc also has a monitoring protocol and safety manual which could be refereenced in the GSP and also update at a later date possibley to include data hadleing and database management..
67	BN	SSJGSA	4-15	4.7.3	Monitoring Frequency	Suggest reiterating the monitoring frequecy for all well catagories. Quarterly for representative wellls for levels; semi-anually for broad network for levels, and both represenative and broad network for water quality.
68	BN	SSJGSA	4-15	4.7.1	The DWR's USGS National Field Manual for the Collection of Water Quality Data…	Reference also Calaveras, Stanislaus ans San Joaquin Counties applicable monitoring well drilling standards.
69	BN	SSJGSA	5-1	5.	Whole Chapter	Replace "GWA" with "ESJGWA"
70	BN	SSJGSA	5-8	Table 5-4		San Joaquin County should be San Joaquin County Flood Control and Water Conservation District
71	BN	SSJGSA	6-1	6.	Whole Chapter	Replace "GWA" with "ESJGWA"
72	BN	SSJGSA	6-31	6.2.6.5	SSJID currently operates a 3,800-acre pilot…	The project is called the Division 9 Project
73	BN	SSJGSA	6-35	Table 6-2		Table needs an update of upcoming Important Dates
74	BN	SSJGSA	7-1	7.	Whole Chapter	Replace "GWA" with "ESJGWA"
75	BN	SSJGSA	7-4	Table 7-2		Some costs appear low. Dicussions are ongoing as to governance, costs, and sacountability measures. Costs should be re-estimated higher to avoid sticker shock later during implementation.
76	BN	SSJGSA	7-6	7.4.1	**Mokelumne River Loss Study Project**	Suggest lumping the study in with Model Refinements in section 7.4.2. Also suggest study ciould be expanded to include other rivers.
77	BN	SSJGSA	7-12	7.9		GSP Implementation funding lacks specifics. The ESJGWA Board may wish to bolseter and afirm the funding commitment in the resoution when adopting/afirming the GSP.

FID	Land Use Description Based on	Location	
0	School Sports Field	APN	224-490-11
1	Grazing Pasture	APN	200-140-36
2	Grazing Pasture	APN	200-140-18 and 200-14-05
3	Golf Course Drain	APN	200-130-04
4	Grazing Pasture	APN	206-110-08
5	French Camp Outlet Canal (SSJID Drain)	APN	241-310-32
6	French Camp Outlet Canal (SSJID Drain)	APN	241-310-32
7	School Sports Field	APN	224-490-11
8	Grazing Pasture	APN	218-060-14
9	Grazing Pasture	APN	218-060-04
10	Grazing Pasture	APN	218-060-03
11	Grazing Pasture	APN	218-060-10

		Location	
0	State Highway Intersection	NE Corner HWY 120 and Airport Way	
1	State Highway Intersection	NW Corner HWY 120 and Airport Way	
2	Golf Course	Riparian	Stanislaus River - Jack Tone Golf Course
3	State Highway Intersection	NE Corner HWY 120 and Union Road	
4	Willows	APN	257-300-07
5	Wastewater Plant	APN	241-310-58
6	Golf Course	Riparian	Stanislaus River - Jack Tone Golf Course
7	Wastewater Plant	APN	259-110-07
8	Golf Course	Riparian	Stanislaus River - Jack Tone Golf Course

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Eastern San Joaquin Subbasin GSP Public Draft
Summary of Public Comments and Responses

Comment #	Commenter	Commenter Organization	Page Number	Section, Figure, or Table Number	Sentence Starts with, "...	Comment
1	Stockton East Water District	Stockton East Water District GSA	Page 1 - 27	Section 1.2.2.4	"Periodic subsidence reporting within the Eastern San Joaquin Subbasin is not known to occur.	This sentence does not make sense. Suggest revision to: "There has been no documented subsidence reported within the Eastern San Joaquin Subbasin."
2	Stockton East Water District	Stockton East Water District GSA	Page 1 - 36	Section 1.2.3.4.1`	"San Joaquin County has established water well standards. . . "	A more accurate statement would be "San Joaquin County has established water well standards for new wells that define property line setbacks . . . ETC." as these requirements apply only to new wells.
3	Stockton East Water District	Stockton East Water District GSA	Page 2 - 111	Section 2.3.4.1	"Streamflows entering the Subbasin are regulated releases from respective reservoirs."	This is not entirely accurate, streamflows entering the subbasin do induce regulated releases from respective reservoirs, but also include inflow from unregulated streams downstream of regulating reservoirs. This should be noted.
4	Stockton East Water District	Stockton East Water District GSA	Page 2 - 112	Section 2.3.4.1	Riparian Diversions	Stockton East Water District should be included in the list of districts with riparian diversions off major streams.
5	Stockton East Water District	Stockton East Water District GSA	Page 2 - 112	Section 2.3.4.1	"Data on private pumping was not available. . . "	Data on private pumping is available from Stockton East Water District, was provided to the consultant, and is more accurate that that calculated by the consumptive use methodology.
6	Stockton East Water District	Stockton East Water District GSA	Page 2 - 112	Section 2.3.4.2	Calaveras River	The cited stream flow data does not include inflow into the Calaveras River below New Hogan Dam, including Cosgrove Creek and others. Similarly, the data list does not include flow for other nonregulated reservoirs in the watershed.
7	Stockton East Water District	Stockton East Water District GSA	Page 2 - 113	Section 2.3.4.2	Riparian	Stockton East Water District should be included in the list of districts with riparian diversions off major streams.
8	Stockton East Water District	Stockton East Water District GSA	Page 2 - 113	Section 2.3.4.2	"As private groundwater pumping was estimated. . ."	Data on private pumping is available from Stockton East Water District, was provided to the consultant, and is more accurate that that calculated by the consumptive use methodology.
9	Stockton East Water District	Stockton East Water District GSA	Page 2 - 115	Section 2.3.4.3	Riparian	Stockton East Water District should be included in the list of districts with riparian diversions off major streams.
10	Stockton East Water District	Stockton East Water District GSA	Page 2 - 115	Section 2.3.4.3	"As private groundwater pumping was estimated. . ."	Data on private pumping is available from Stockton East Water District, was provided to the consultant, and is more accurate that that calculated by the consumptive use methodology.
11	Stockton East Water District	Stockton East Water District GSA	Page 6 - 9	Section 6.2.4.2	"This is an existing surface water right."	More accurately, these are existing surface water entitlements under contract.
12	Stockton East Water District	Stockton East Water District GSA	Page 6 - 13	Section 6.2.4.6	"However, individual applicants. . ."	Grammatical correction - the word "a" should be deleted before the word "streambed."
13	Stockton East Water District	Stockton East Water District GSA	Page 7 - 12	Section 7.9	"Prior to implementing. . ."	The sentence should be rewritten to state: "Prior to implementing any fee or assessment program, the GSAs would complete a rate assessment study or other analysis if required by ~~consistent with the~~ regulatory requirements."

Comment #	Commenter	Commenter Organization	Page Number	Section, Figure, or Table Number	Sentence Starts with, "…	Comment
14	Stockton East Water District	Stockton East Water District GSA	Page 7 - 12	Table 7-4		In the first and third boxes under "Certainty" the Proposition 218 process should be qualified with "if applicable."

August 21, 2019

VIA EMAIL

Eastern San Joaquin Groundwater Authority
1810 E. Hazelton Avenue
P. O. Box 1810
Stockton, CA 95201
(info@esjgroundwater.org)

Re: Public Comments Concerning the Public Draft of the July 2019 Eastern San Joaquin Groundwater Subbasin Groundwater Sustainability Plan.

Dear Board Members,

My name is Martin Harris and I am an authorized representative for Terra Land Group, LLC ("TLG").

In July 2019, the Eastern San Joaquin Groundwater Authority ("ESJGA") released a Draft July 2019 Eastern San Joaquin Groundwater Subbasin Groundwater Sustainability Plan ("GSP") for public review and comment. TLG reviewed the public comment submittal template as provided through the website, but we feel the scope of the project involved merits a longer response than the template provides for. Therefore, we are submitting this formal letter with enclosures attached to do justice to the full environmental impact report.

Section ES-1 of the GSP provides an introduction that details twenty-three potential projects and other actions being considered to meet the requirements of the California Sustainable Groundwater Management Act.

Section ES-7 details water budgeting related to projected groundwater pumping and offsets required to achieve sustainability.

Page 1-16 of the GSP states that *"crop type varies by region, with orchards and vine crops comprising the majority of agriculture in the Sub-basin…alfalfa and irrigated pasture were the next most dominant crop."*

COMMENT: TLG believes that due to a growing number of economic and other environmental factors affecting the ability of farmers to profitably grow crops and operate dairies in the San Joaquin Valley, any water sustainability plan to be considered must take into consideration that many farmers are abandoning lower-priced crops like alfalfa and silage corn to seek higher-priced food crops that may be less tolerant to the salinity levels typical of recycled water (See Project 19/Manteca Recycled Water Project as described on pages 6-28 and 6-29 of the GSP)

Page 1-31 of the GSP discusses the recharge benefits relating to *"canal seepage, generally considered a loss to Districts in the short term, has played and will continue to play a crucial role in the long-term sustainability of groundwater resources in the Eastern San Joaquin Sub-basin."*

COMMENT: TLG agrees with this comment on page 1-31, but also believes that open canals currently being utilized in the sandy areas of the sub-basin must be properly managed and maintained to offset the potential effects of sedimentation and erosion.

Page 2-12 of the GSP states that *"the San Joaquin River is the principal drainage outlet of the Northern San Joaquin Valley, flowing northward on the west margin of the Eastern San Joaquin Sub-basin to its confluence with the Sacramento River in the San Joaquin-Sacramento Delta."*

COMMENT: TLG believes that channel flow deficiencies and back-water effects in and along the South Delta need to be fully considered and mitigated as part of any GSP to be considered. (**See Enclosures 1-18**)

Page 2-134 of the GSP states: *"There are uncertainties associated with projections in the ESJWRM (Eastern San Joaquin Water Resources Model) scenarios due to the sequence of the hydrologic period, population projections, future cropping patterns, and irrigation practices and technologies, as well as uncertainties inherent in the representation of the physical groundwater and surface water system by the model."*

Page 2-151 of the GSP states: *"The approach developed for this GSP is based on the methodology in DWR's guidance document (DWR, 2018 b) and uses "best available information" related to climate changes in the Eastern San Joaquin Sub-basin. There are limitations and uncertainties associated with this analysis. One important limitation is that Cal Sim II does not fully simulate local surface water operations. Thus, the analysis conducted for this GSP may not fully reflect how surface and groundwater basin operations would respond to changes in water demand and availability caused by climate change."*

COMMENT: The uncertainties as detailed on pages 2-134 and 2-151 of the GSP appear to be especially important when considering Section 6.2.6.6 of the GSP describes project #23 (SSJID Storm Water Reuse) which may find it difficult to drain any and all potential storm water drainage flows to be created along and through the South San Joaquin Irrigation District ("SSJID") distribution system to the San Joaquin River via the French Camp Outlet Canal. (See page 6-32 of the GSP)

TLG also believes that SSJID drainage into the San Joaquin River may also prove problematic at other San Joaquin River outlet locations currently being considered.

Other GSP Projects to consider:

(i) GSP Section 6.2.6.2 describes Project #19 (Recycled Water Transfer to Agriculture) (See GSP Pages 6-28 and 6-29); and
(ii) GSP Section 6.2.6.5 describes Project #22 (Pressurization of SSJID Facilities) (See GSP pages 6-31 and 6-32)

QUESTION: What drainage and backwater effects may be created in conjunction with GSP Projects #19, 22, and 23?

With a number of unresolved hydrology and other environmental issues that may significantly affect drainage in and along the South Delta, TLG presents the following additional comments for the project staff's consideration.

As you may be aware, the South Delta-Lower San Joaquin River Basin, including the areas south of Manteca and Lathrop, is a recognized floodplain. The area narrowly escaped the impacts of flooding when a levee breach occurred on February 20, 2017 in South Manteca on the San Joaquin River, thanks to the efforts of several quick-thinking farmers who risked their lives to repair it. The breach occurred when the river channel was flowing at approximately 40,000 cubic feet per second ("cfs"). This flow rate was well below the design capacity of 66,080 cfs that the San Joaquin River levees called for in the 2014 draft copy of the Lower San Joaquin and Delta South Regional Flood Management Plan. TLG believes this breach could be a warning sign of a more disastrous flood to come, and TLG has been urging local and state authorities to take action to protect the region before a more devastating flood occurs.

TLG believes there appears to be an unsustainable level of development growth and changes to land uses affecting the areas in and along the South Delta-Lower San Joaquin River Basin. TLG believes that this growth may create and/or increase flood risks to the urban and rural residents, businesses, and property owners located in the areas to be affected. As the area continues to grow, more residents and businesses will move in, creating more people and valuable property to be affected. The potential damages and impending liability will only increase over time.

TLG is not necessarily opposed to development growth, provided however, that the urban and urbanizing areas already approved or to be considered for development growth must fully identify, allow for, and provide for timely mitigation measures. These measures should fully offset any and all upstream and downstream flood water, storm water, waste water, potable and agricultural/irrigation water delivery, back water, and other hydrology-related short-term as well as long-range impacts that may be created.

TLG believes that this can only be accomplished by putting an end to the continuing delays and immediately performing a full and comprehensive environmental review. This should be performed in conjunction with an updated general plan and related environmental justice element that fully considers and mitigates for the growing storm water, waste water, potable water, irrigation water, transportation, and transit needs affecting the areas in and along the South Delta.

This review should also consider any and all development-related flood and other hydrology-related impacts as affected by the federally-approved Lower San Joaquin River Flood Management Project (100-year level of protection) in association with California Senate Bill No. 5 ("SB5") (200-year level of protection) requirements as well as any Stanislaus River Basin Drainage Plan (sponsored by the South San Joaquin Irrigation District and Oakdale Irrigation District Tri-Dam Project), or Ripon/South Manteca Stanislaus River Right Bank Levee Breach Flood Fight Action Plan to be considered.

Over the last few years, TLG has presented hundreds of letters, documents, engineering and survey data, and other forms of evidence to the authorities involved to support our concerns. TLG has also attended dozens of council, commission, and board meetings and has spoken to various authorities both publicly and privately to seek answers regarding federal, state, and local involvement related to water management decisions and potential impacts to our community. These letters and documents are available on request. The enclosures attached to this letter explain our concerns in detail, linking them to evidence as presented in the previously-released environmental impact reports and feasibility studies. Please review the enclosures attached to understand the full potential for impacts involved.

In summary, TLG is concerned regarding the following points:

1. Backwater effects and changes to drainage patterns, in conjunction with anticipated 200-year flood protection improvements as affected by a San Joaquin River and/or Stanislaus River right bank levee breach, could have a devastating effect on the urbanizing and non-urbanizing areas in and along the South Delta/Lower San Joaquin River Basin. (**See Enclosures 1-15**)

2. The City of Manteca has been experiencing exponential development growth and urban expansion. Many of the involved projects appear to have been approved with no apparent meaningful consideration for their individual contribution to total cumulative drainage impacts. The accompanying changes to grade, land elevations, and drainage patterns may be creating irreversible impacts to the surrounding community, and could increase flood risk to those affected. (**See Enclosures 1-4 and 6-15**)

3. TLG believes that these continued project approvals (and associated impacts) directly conflict with the goals and policies stated in the Manteca General Plan 2023 (enacted on October 6, 2003) and fail to adequately address public risk due to recently-discovered San Joaquin River channel flow deficiencies in conjunction with unresolved sedimentation and climate change issues affecting the areas in and along the South Delta.

4. The Paradise Cut Expansion project, in the form presented in the "Conceptual Design Technical Memo/Paradise Cut Expansion Project/April 9, 2019," may or may not prove adequate in offsetting the full range of development and other hydrology-related impacts that may be created. Also, TLG believes that the Paradise Cut Expansion Stage reductions called for between the Paradise Weir and the Airport Way (Vernalis Bridge) may not fully address the potential for additional drainage impacts to be created. (**See Enclosures 1-15**)

   This is especially concerning when considering pages 4 and 5 of the Mossdale Tract Program: 2019 Annual Adequate Progress Report Update for Urban Level of Protection-Final Report (included as Attachment 2 to the 8/20/2019 MCC Meeting Agenda Item B.3), which states that, "the Urban Flood Risk Reduction Study remains incomplete and the Climate Adoption Policy is underway. As such, a new determination that the project meets the appropriate Standard of Protection will need to be made in conjunction with the 2020 Annual Report."

QUESTION: How will what appears to be a very real potential for unresolved and continuing sedimentation and climate change issues in and along the South Delta be considered and allowed for in the final Mossdale Tract Drainage Plan? (**See Enclosures 1-15 & 18**)

5. The San Joaquin River may be unable to handle any and all potential combinations of storm water or waste water flows that may be drained into or along the river channel.

6. With all of the various development and infrastructure projects being approved and considered by the different agencies in and around Manteca and the South Delta region, TLG is concerned that there is a lack of integration and cohesion between the agencies related to the projects. Without a single oversight agency in charge of the "big picture," or all the hydraulic decisions being made, there may be a potential for the various projects to cause conflicting hydraulic effects and impacts to the upstream and downstream communities that may be affected. A list of forty-one such currently ongoing and planned projects can be found in **Enclosure 1**. (Also **See Enclosures 2-15**)

   QUESTION: How can local, regional, state, and federal authorities work closer together to create an updated water plan that provides water deliveries at the local, regional, and state level while protecting the urban and rural areas along the South Delta from any increases to flood water, storm water, waste water, and other hydrology-related impacts that may be created?

7. Projects appear to continue to be approved by various agencies without the agencies fully understanding the total potential for flood water, storm water, and waste water impacts involved. Agencies, city councils, and districts appear to be more interested in supporting development and in avoiding liability than they are in safeguarding the residents and businesses that may be affected.

   QUESTION: What effect will the Daniels Street extension have on stormwater drainage flows currently being drained in and along the French Camp Outlet Canal? (See the July 16, 2019 Manteca City Council meeting agenda item B.4. Also **See Enclosure 3**)

   QUESTION: What effect will the proposed formation of the San Joaquin County Flood Control & Water Conservation District ("SJCFCWCD") Zone 9 Flood Conveyance and Levee Maintenance Benefit Assessment District (and related projects) have on changing drainage patterns and associated outfall locations currently existing and relied upon by the South San Joaquin Irrigation District and its members? (See July 18, 2019 SJAFCA meeting agenda item 5.1. Also **See Enclosures 1-15**)

8. The Manteca General Plan 2023 states several goals and policies which appear to indicate that Manteca is committed to protecting the community from flooding related to existing and projected development. (**See Enclosure 1**) It appears that both the cities of Manteca and Lathrop plan on redirecting storm water drainage and/or effluent wastewater flows along and through the urbanizing and non-urbanizing areas in and along the South Delta-Lower San Joaquin River Basin. However, no meaningful solution has been clearly presented to identify City of Manteca effluent waste water spray field discharge facilities

to replace those to be abandoned due to planned construction of several new development projects.

QUESTION: What effect will filing and/or extending an Exclusive Negotiating Agreement for the Recycled Water Project have on sustaining total potable and irrigation water (ie. groundwater and surface water) volumes available to the urban and rural areas in and around Lathrop and Manteca? (See the July 16, 2019 Manteca City Council meeting agenda item B.8. (**See Enclosure 3**; Also within **Enclosure 1**, see its own Enclosure 4)

9. Further, TLG believes that the San Joaquin County (and other local community) general plan(s) have failed to meet the public safety and environmental impact disclosure and mitigation requirements as called for in California Senate Bill No. 1000 ("SB 1000") (environmental justice) and CEQA. San Joaquin County, as well as the various other non-federal sponsors involved, should be acting in a good-faith manner to fully identify and mitigate the potential for flood and other hydrology related impacts and health risks to the disadvantaged communities that may be affected.

10. The City of Manteca General Plan 2023 indicates that the French Camp Outlet Channel "*is the limiting factor that sets the flow rates for drainage systems in the City of Manteca.*" TLG believes that due to SB5 200-year flood protection requirements, various flood drainage impacts and back-water effects may be created affecting the hydraulic capacity of the system. TLG also believes this may be particularly true for certain outfall locations that may be proposed in areas not currently protected by a 200-year flood protection levee. **(See Enclosure 1)**

11. The effect of 200-year flood protection and related potential for underestimating drainage and back water effects associated with the location of the Raymus Expressway as depicted in the proposed Land Use Map Alternatives "A" and "B" to be considered by the Manteca City Council in association with the Manteca City Council 7/30/2019 meeting agenda item C.1. (**See Enclosures 10 & 11**)

    QUESTION: What short term and/or long range changes to flood water, storm water, waste water, potable and irrigation water delivery, and other hydrology related drainage and conveyance patterns may be irreversibly altered due to approval of the proposed Raymus Expressway roadway alignment as detailed in the 5/22/19 Manteca General Plan Land Use Alternative Maps "A" or "B"? (See 7/30/2019 Manteca City Council meeting agenda item C.1 (19-360) Attachments 1 and 2)

12. Undetermined back water and other potential drainage effects associated with the Upper Jones Tract (RD 2029) and Lower Jones Tract (RD 2038) consolidation. (**See Enclosures 12 & 13**)

    QUESTION: Will drainage impacts in and along the South Delta be reduced or adversely affected due to any future improvements to be considered in association with the Upper Jones Tract (RD 2039)/Lower Jones Tract (RD 2038) consolidation?

13. What appears to be a potential for system-wide ESJGA drainage modeling deficiencies and unmitigated impacts due to apparent ground surface grade and elevation level variations associated with the growing number of collaborative watershed and agricultural landscape easements being acquired on properties located in and along the South Delta. (**See Enclosure 19**)

14. Changing climate and increasing flood risks across the country. Levees are only one solution to flood control; they have their limits. (**See Enclosure 5**)

On August 5, 2019, the City of Manteca issued a Request for Proposal for Storm Drain Zones 36 & 39 Engineering, Environmental and Permitting (CIP 20004). ("Request for Proposal")

(i) Section 2.1 of the Request for Proposal states: *"With the exception of Drain #II near the southern boundary of Zone 39, there are no regional drainage facilities in the study area."*

However, TLG believes that it is important to mention that a second drain (SSJID drain #10) exists with a location beginning at a point situated adjacent to Airport Way (just north of the Airport Way/Fig Avenue public roadway intersection); and extending in a direction approximately west to the City of Manteca Storm Drainage Zone 39 eastern boundary; and thence turning and continuing in a generally southern direction along the Zone 39 eastern boundary until meeting and connecting with SSJID Drain #11 near the southern boundary of the current City of Manteca city limits.

In addition, a growing number of South Manteca land owners and residents are starting to consider the potential for various changes in drainage patterns, flow volumes and other environmental effects that may significantly impact SSJID drains #10 and #11 as those drains merge together and continue through Drain #11 along the southern boundary of the City of Manteca and into Walthall Slough.

QUESTION: Are local authorities aware that SSJID Drain #11, in its present form, has deviated from a course that appears to be called for in **Enclosure 16**?

QUESTION: Will any and all flow impedances and back water effects be considered as part of any drainage analysis to be performed? (**See Enclosures 14 & 15**)

QUESTION: For what purpose are San Joaquin County land use and/or zoning reclassifications in and along the South Delta being considered? (**See Enclosure 17**)

(ii) In addition, the Request for Proposal does not appear to consider City of Manteca storm drainage Zone 34.

QUESTION: If the French Camp Outlet Canal (FCOC) is abandoned or no longer able to accept drainage flows from the developing areas of Zone 34, where will Zone 34 storm water be drained to? (**See Enclosures 14 & 15**)

QUESTION: What effect will any public facility/infrastructure rehabilitation or improvement projects in and along Little Johns Creek have on the continued

operation of the FCOC as well as other upstream and downstream areas to be affected?

(iii) The Request for Proposal further states:

4.1 Drainage

Planning and design of storm water collection, conveyance, and storage systems are predicated on the following assumptions:

1. *Runoff is attenuated through detention basins prior to discharge to regional Facilities. Detention basins will be sized to store a 10-yr, 48-hr event. Detention basins will empty by gravity or pumps, over a 96-hr period. The bottom elevation of the detention basin will be a minimum of 2 ft above the groundwater elevation.*
2. *The high-water level in the storage system will be a minimum of 1 ft below the lowest grade elevation of the property served.*
3. *Minimum pipe diameter of storm drains will be 12-inches. Pipe velocities will range from 2.5 to 10.0 ft per second (ft/sec). Storm drains will have a minimum cover of 30-inches.*
4. *Manholes will be located at junction points, changes in alignment, and changes in pipe size. Manholes will be spaced every 300 ft for pipe diameters less than 21-inches and 500 ft for pipe diameters greater that 21-inches.*
5. *Detention basin pump stations will be designed to discharge the 10-yr, 48-hr storm volume from the basin during a period of not less than 96 hours. Pump stations will be equipped with a minimum of one standby unit. Pump stations will be designed with trash racks sediment dams.*
6. *Drainage channels will be designed to confine the peak 100-yr discharge with 2 ft of freeboard.*
7. *Water surface elevation (WSEL) in the San Joaquin River at the railroad bridge crossing near the OLWD storm drain outfall is: (a) 20.6 ft for 10-yr event; (b) 28.0 ft for 100-yr event; and (c) 29.0 ft for 200-yr event. All elevations reference NAVD88 datum.*

QUESTION: Are the effects of climate change and unresolved sedimentation issues along the South Delta being fully considered while making the assumption that the water surface elevation in the San Joaquin River at the railroad bridge crossing near the Oakwood Lake Water District storm drain outfall is: (a) 20.6 feet for a 10-year event; (b) 28.0 feet for a 100-year event; (c) 29.0 feet for a 200-year event. (**See Enclosures 1-15**)

QUESTION: In the event of a right bank San Joaquin River or Stanislaus River levee breach, how will flood waters be drained from the urbanizing and non-urbanizing areas south of Manteca?

QUESTION: When considering the magnitude of 100-year, 200-year, or other periodic levels of flood events that are expected to occur, isn't it likely that water elevations (NAV D88 datum) on the land side (east of the San Joaquin River in the areas south of Manteca) could exceed the 29'-0" elevation as forecasted in the Request for Proposal?

QUESTION: What facilities and other actions are planned to safeguard and protect our local urban and rural communities against the unplanned release of right bank San Joaquin

River levee breach flood waters that historically accumulate and rise in height against the South Manteca portion of the RD 17 dryland cross levee?

In closing, TLG urges authorities and project team members involved to stop the delays and recommend and support a full and comprehensive environmental review in conjunction with any and all previously-approved and reasonably-foreseeable projects to determine the total cumulative drainage impacts and backwater effects. This should be done before approving or recommending any ESJGA Groundwater Sustainability Plan or related project to move forward that does not fully identify and mitigate any and all drainage and other impacts to be expected. (**See Enclosures 1-19**)

Thank you for your attention to this very important matter.

Respectfully,

Martin Harris
for Terra Land Group, LLC.

MH/cm

Enclosures:

Enclosures with hyperlinks can be accessed and downloaded via Dropbox.

1. 2019-07-08 letter from TLG to the Manteca Planning Commission (https://www.dropbox.com/s/gb5m4idk7w968wr/2019-07-22_LTR_MPC_AgIt6.1.pdf?dl=0)
2. 2019-07-10 letter from TLG to the Tri-Valley San Joaquin Regional Rail Authority (https://www.dropbox.com/s/av5zp60u1f2pyw7/2019-07-10_LTR_TVSJVRRA_ValleyLink.pdf?dl=0)
3. 2019-07-15 letter from TLG to the Manteca City Council (https://www.dropbox.com/s/6suvyxweqb8wo0i/2019-07-15_LTR_MCC_AgItsB.4.pdf?dl=0)
4. 2019-07-16 letter from TLG to the San Joaquin Area Flood Control Agency (https://www.dropbox.com/s/rwumj9hlh8qfyws/2019-07-16_LTR_SJAFCA_AgIts5.1.pdf?dl=0)
5. 2019-07-19 Manteca Bulletin article "As flood risks increase across USA it's time to recognize limits of levees"
6. 2019-07-22 letter from TLG to the Central Valley Flood Protection Board (https://www.dropbox.com/s/nzqls8yeelwxk6q/2019-07-22_LTR_CVFPB_AgIts5F.pdf?dl=0)

7. 2019-07-08 letter from TLG to the San Joaquin County Local Agency Formation Commission (https://www.dropbox.com/s/kt4dteou08jt7zp/2019-07-08_LTR_LAFCo_AgIt3.pdf?dl=0)
8. 2019-06-10 letter from TLG to the San Joaquin County Local Agency Formation Commission (https://www.dropbox.com/s/mj03mzwpu3hb24g/2019-06-10_LTR_LAFCo_AgIts3-5.pdf?dl=0)
9. 2019-06-17 letter from TLG to the American Rivers and San Joaquin County Resource Conservation District (https://www.dropbox.com/s/q24qx0vu98nokdr/2019-06-17_LTR_AmRivers_ParadiseCut.pdf?dl=0)
10. Attachments 1 and 2 from the 07-30-2019 Manteca City Council Special Meeting, agenda item C.1 (19-360)
11. 2019-07-29 letter from TLG to the Manteca City Council (https://www.dropbox.com/s/w7cu83tzs7io9ll/2019-07-29_LTR_MCC_AgItC.1.pdf?dl=0)
12. 2018-09-10 letter from TLG to the San Joaquin County Local Agency Formation Commission (https://www.dropbox.com/s/p43d2hsn9kbiow7/2018-09-10_LTR_LAFCo_AgIt4.pdf?dl=0)
13. 2018-12-12 letter #2 from TLG to the San Joaquin County Local Agency Formation Commission (https://www.dropbox.com/s/krkzs9w7vpwguo3/2018-12-12_LTR2_LAFCo_AgItPubComm.pdf?dl=0)
14. 2018-05-14 letter from TLG to Greg Showerman (https://www.dropbox.com/s/8oao37q42u7u4e5/2018-05-14_LTR_GShowerman_TM2.2.pdf?dl=0)
15. 2018-11-28 letter from TLG to Greg Showerman (https://www.dropbox.com/s/hftxivtlgnfupdw/2018-11-28_LTR_Showerman_Drainage.pdf?dl=0)
16. South Manteca assessor's map showing Dredger Cut
17. San Joaquin County Zone Classification application No. PA-1700172 of San Joaquin County: December 7, 2017 Notice of Public Hearing--Item Rescheduled, documentation and supporting maps
18. 08-14-2019 Reservoir storage and release data (as published by the CA Department of Water Resources on the California Data Exchange Center website)
19. American Rivers/CDFW property easement at the Kisst Dairy property as included on the San Joaquin County Habitat Conservation and Open Space Plan (included as Agenda Item 4Q in the August 22, 2019 Joint Meeting of the Board of Directors for the San Joaquin Council of Governments and SJCOG Inc.)

cc:

San Joaquin Flood Control and Water Conservation District, % Fritz Buchman

San Joaquin Area Flood Control Agency, Attn: Marlo Duncan, Project Manager
Manteca City Council, % Lisa Blackmon, City Clerk
City of Manteca Community Development Director, Greg Showerman
Central Valley Flood Protection Board, Attn: Ryan Jones
Central Valley Flood Protection Board, Attn: Leslie Gallagher, Executive Officer
South San Joaquin Irrigation District Board of Directors, % Danielle Barney, Executive Secretary/Clerk of the Board
San Joaquin Council of Governments, % Diane Nguyen
San Joaquin Local Agency Formation Commission, Attn: James Glaser
South San Joaquin Groundwater Sustainability Agency, % Danielle Barney
Reclamation District No. 17, % Nomellini, Grilli & McDaniel PLC
Reclamation District No. 2075, Attn: Pam Forbus
Reclamation District No. 2094, Attn: Pam Forbus
Tri-Dam Project Board of Directors
Eric Thorburn, Oakdale Irrigation District, Water Operations Manager / District Engineer
American Rivers, Attn: Aysha Massell, Associate Director
Lathrop City Council, % Teresa Vargas, City Clerk
Diane Lazard, City of Lathrop
Michael Mierzwa, Lead Flood Management Planner, California Department of Water Resources
Jon Ericson, Hydrology and Flood Operations Officer, California Department of Water Resources
California Department of Water Resources, Attn: Mary Jimenez

Enclosure 5

2019-07-19 Manteca Bulletin article "As flood risks increase across USA it's time to recognize limits of levees"

As flood risks increase across USA it's time to recognize limits of levees

P E RS P E CT I V E

New Orleans averted disaster this month when tropical storm Barry delivered less rain in the Crescent City than forecasters originally feared. But Barry's slog through Louisiana, Arkansas, Tennessee and Missouri is just the latest event in a year that has tested levees across the central U.S.

Many U.S. cities rely on levees for protection from floods. There are more than 100,000 miles of levees nationwide, in all 50 states and one of every five counties. Most of them seriously need repair: Levees received a D on the American Society of Civil Engineers' 2018 national infrastructure report card.

Levees shield farms and towns from flooding, but they also create risk. When rivers rise, they can't naturally spread out in the floodplain as they did in the pre-flood control era. Instead, they flow harder and faster and send more water downstream.

And climate models show that flood risks are increasing. During this year's unusually wet winter and spring, dozens of levees on the Missouri, Mississippi and Arkansas rivers were overtopped or breached by floodwaters. Across the central U.S., rivers are becoming increasingly hard to control.

Remaking the Missouri In my book, "A River in the City of Fountains," I describe the complexities of flood control in Kansas City, which sits at the junction of the Missouri and Kansas rivers.

The Missouri, the larger of these two, is America's longest river, rising in Montana's Rocky Mountains and flowing east and south for 2,341 miles until it joins the Mississippi River north of St. Louis. Historically it was wide and shallow, full of sand bars and snags that created challenges for steamboats.

In the late 19th and early 20th centuries, Kansas City business leaders began lobbying for federal navigation subsidies to counter the influence of the railroads. Until the river could be narrowed and deepened, navigation was unreliable. And without levees, industry in the floodplain was at risk.

Major floods inundated Kansas City in 1903, 1908, 1943 and 1951, leaving thousands homeless and causing heavy economic damage. These disasters in damages, showed the limitations of this strategy. Floodwaters rose to unprecedented levels, eventually breaching or overtopping more than 1,000 levees.

After the waters ebbed, federal and state officials paid to move some homes and communities off floodplains to higher ground. However, this trend quickly reversed. By 2008, Missouri had authorized more than $2 billion of new development in zones that were flooded in 1993.

Many Kansas City residents still believe that higher, stronger levees will hold back future floods, and Congress has authorized millions of dollars to build them. But experienced engineers like retired Army Brigadier General Gerald Galloway, who coauthored a federal government assessment of the 1993 floods, warn that "there's no such thing as absolute protection."

For their part, many scientists and engineers have found that levees can exacerbate floods by pushing river waters to new heights. One 2018 study estimated that about 75% of increases in the magnitude of 100year floods on the lower Mississippi River over the past 500 years could be attributed to river engineering.

What about commercial benefits from channeling rivers? Kansas City is still an economic hub, but railroads and highways have been more important than barges. The Missouri carries only a fraction of the tonnage shipped on other navigable rivers, such as the Mississippi, even though its channel has been expensively built and maintained for over 100 years.

Rethinking river control Levees also constrain cities' relationships with rivers, walling off any connections for purposes other than commerce. Author William Least Heat-Moon captured this paradox when he traveled across the U.S. by boat in the late 1990s and observed that "Kansas City, born of the Missouri, has turned away from its great genetrix more than almost any other river city in America."

More recently, however, Kansas City has begun to remember its interest and love for the Missouri. Riverside development and public spaces are fostering new physical and cultural interfaces with the river.

convinced civic leaders that more than piecemeal navigation and flood control projects along the lower Missouri were needed.

In 1944 they got their wish when Congress passed the Flood Control Act, which authorized construction of dozens of dams nationwide. One section of the bill, the Missouri Basin Plan, sought to convert the entire Missouri into what historian Donald Worster calls an "ornate hydraulic regime," with five upstream dams for hydroelectric power, irrigation and recreation, as well as levees and a navigable barge channel from Sioux City to St. Louis.

Over the next decade engineers built levees and straightened and dredged the river channel. Upstream dams curbed the Missouri's spring rise. In August 1955, Life Magazine reported that "U.S. engineers have finally clinched their victory over the rampaging Missouri River. Flood control … is already bringing prosperity to the valley it drains."

The limits of levees Today Kansas City and many other U.S. river towns are fortified behind levees and floodwalls, but faith in the idea of engineered flood control is starting to erode.

Disastrous Midwest flooding in the summer of 1993, which killed 50 people and caused US$15 billion

In my view, this year's floods should lead to more of this kind of rethinking. River towns can start by restricting floodplain development so that people and property will not be in harm's way. This will create space for rivers to spill over in flood season, reducing risks downstream. Proposals to raise and improve levees should be required to take climate change and related flooding risks into account.

Davenport, Iowa has embraced this approach. With a population of over 102,000, it is the largest U.S. river city without levees or a permanent floodwall. Instead Davenport has emphasized adapting to flooding by increasing public green spaces in the flood zone and elevating buildings that flank the Mississippi River.

Kansas City and other towns could advance this discussion by moving beyond strictly commercial visions of their waterways and considering this question: What does a healthy river of the future look like?

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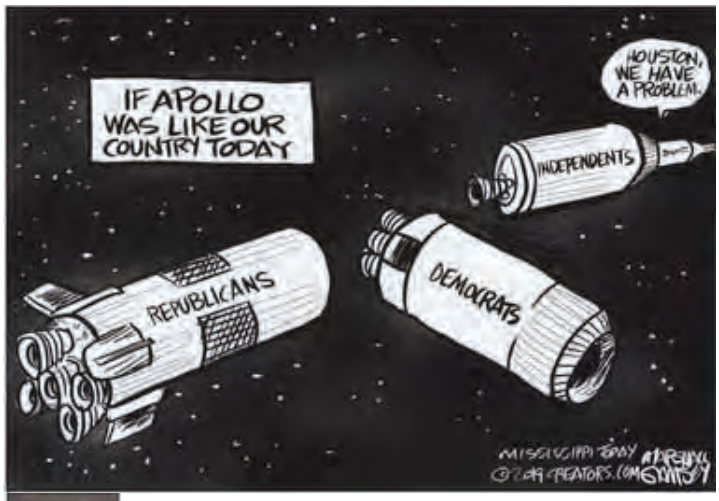

AMAHIA MALLEA

Drake University

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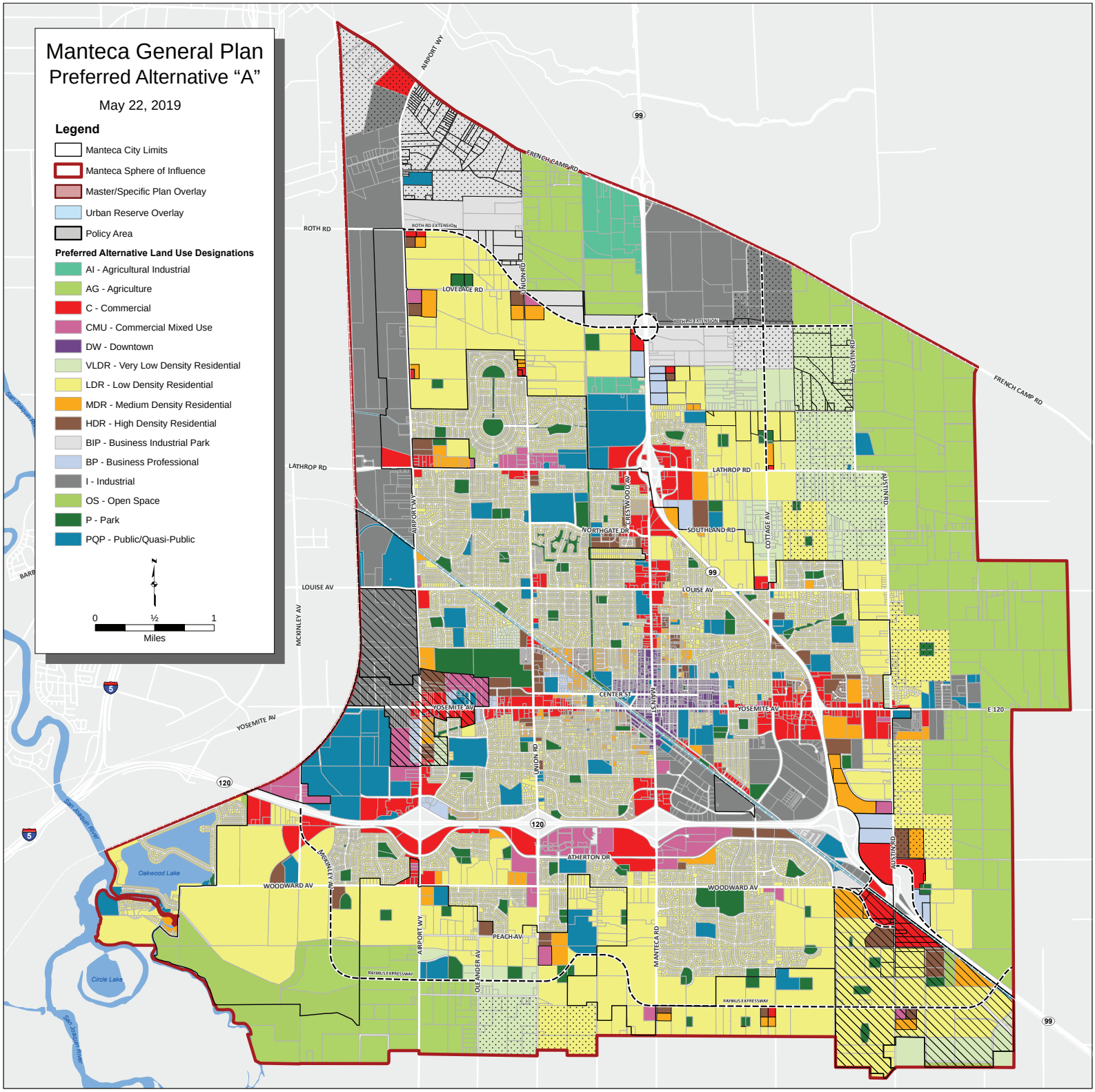
Enclosure 10

Attachments 1 and 2 from the 07-30-2019 Manteca City Council Special Meeting, agenda item C.1 (19-360)


Manteca General Plan
Preferred Alternative "A"
May 22, 2019
Legend
Manteca City Limits
Manteca Sphere of Influence
Master/Specific Plan Overlay
Urban Reserve Overlay
Policy Area
Preferred Alternative Land Use Designations
AI - Agricultural Industrial
AG - Agriculture
C - Commercial
CMU - Commercial Mixed Use
DW - Downtown
VLDR - Very Low Density Residential
LDR - Low Density Residential
MDR - Medium Density Residential
HDR - High Density Residential
BIP - Business Industrial Park
BP - Business Professional
I - Industrial
OS - Open Space
P - Park
PQP - Public/Quasi-Public
N
0
½
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AIRPORT WY
FRENCH CAMP RD
ROTH RD
ROTH RD EXTENSION
LOVELACE RD
UNION RD
AUSTIN RD
LATHROP RD
NORTHGATE DR
CRESTWOOD AV
SOUTHLAND RD
COTTAGE AV
LOUISE AV
MCKINLEY AV
CENTER ST
MAIN ST
YOSEMITE AV
E 120
ATHERTON DR
WOODWARD AV
PEACH AV
OLEANDER AV
MANTECA RD
RAYMUS EXPRESSWAY
Oakwood Lake
Circle Lake
San Joaquin River
99
120
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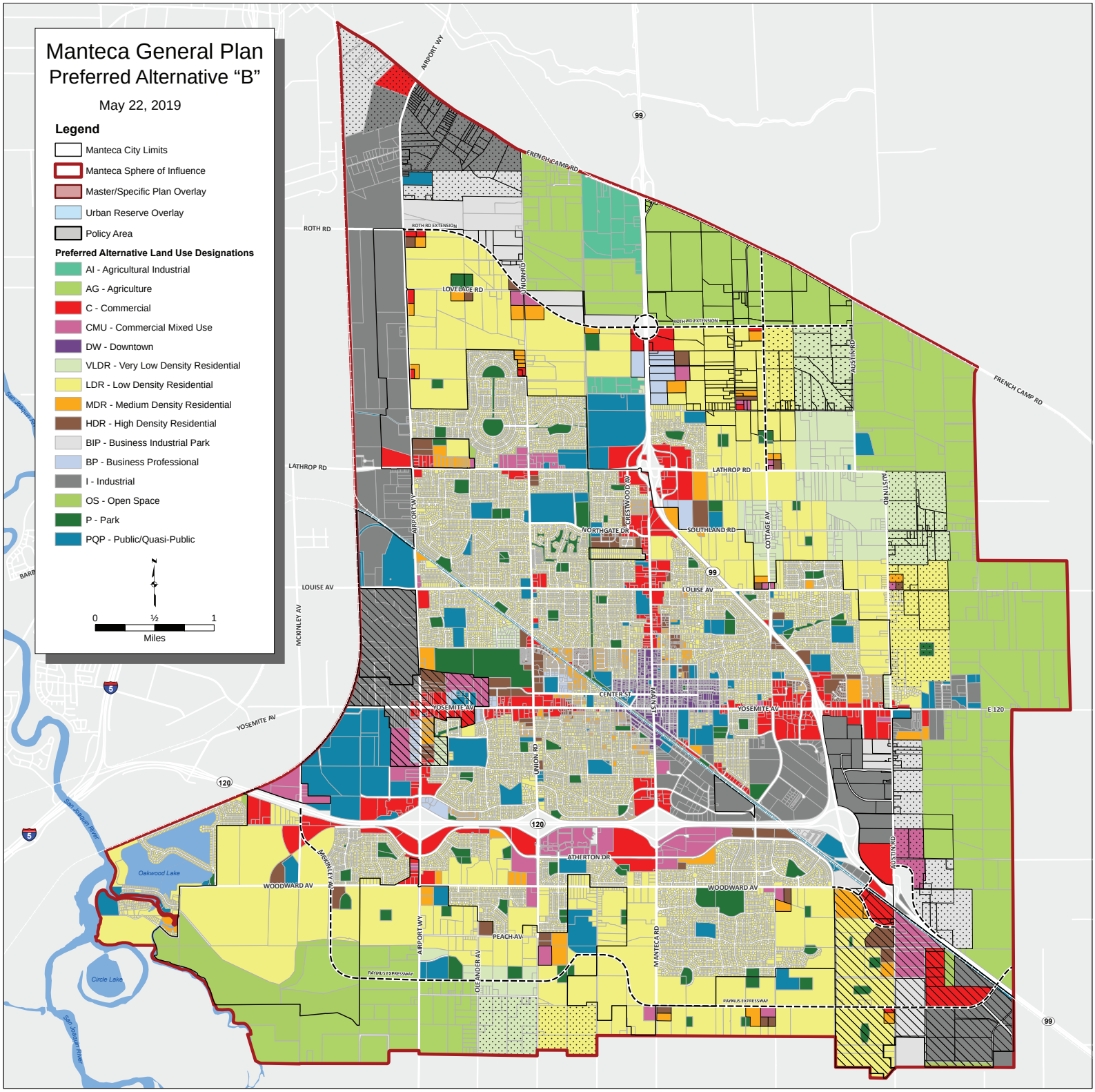
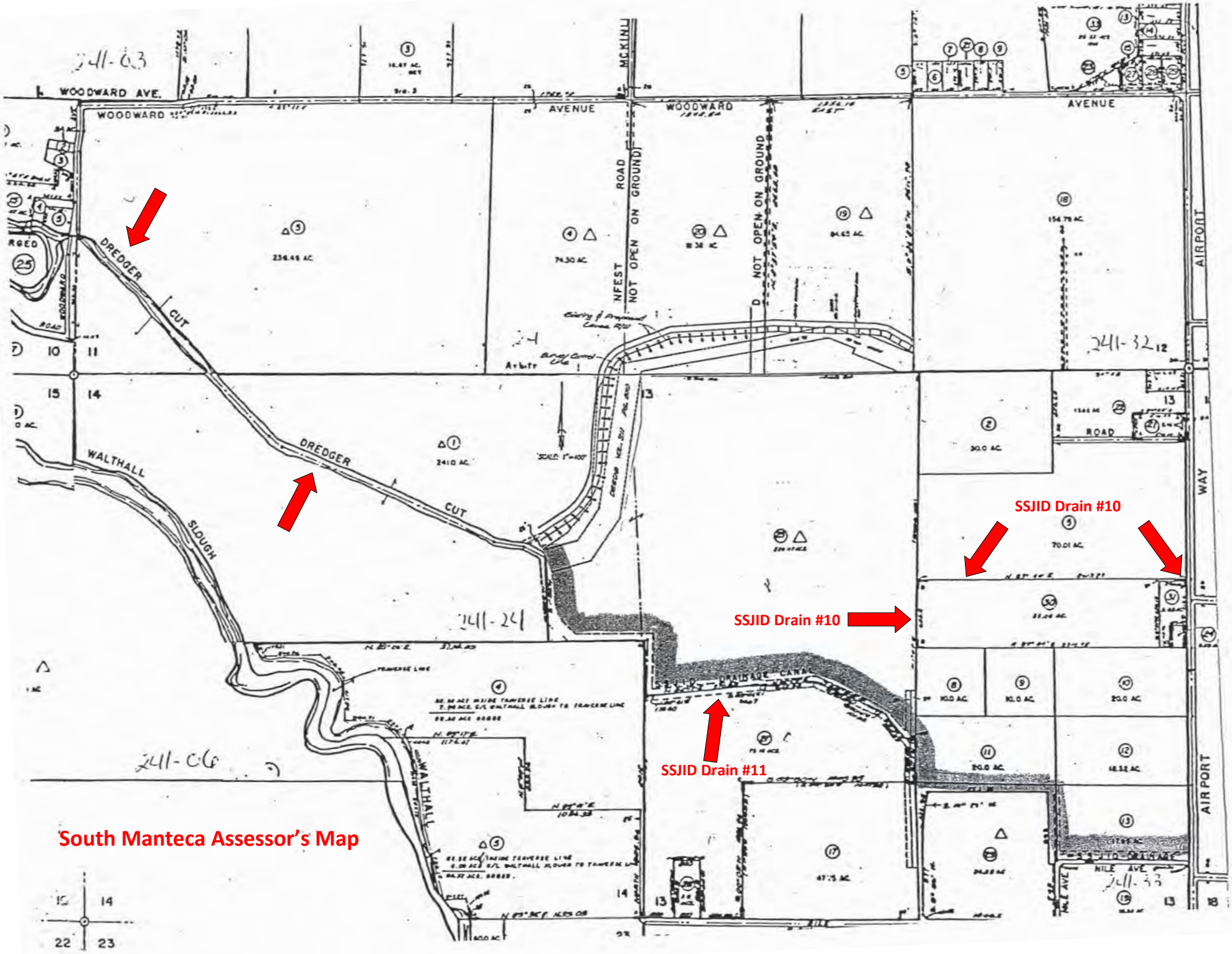

Manteca General Plan
Preferred Alternative "B"
May 22, 2019
Legend
Manteca City Limits
Manteca Sphere of Influence
Master/Specific Plan Overlay
Urban Reserve Overlay
Policy Area
Preferred Alternative Land Use Designations
AI - Agricultural Industrial
AG - Agriculture
C - Commercial
CMU - Commercial Mixed Use
DW - Downtown
VLDR - Very Low Density Residential
LDR - Low Density Residential
MDR - Medium Density Residential
HDR - High Density Residential
BIP - Business Industrial Park
BP - Business Professional
I - Industrial
OS - Open Space
P - Park
PQP - Public/Quasi-Public
0
½
1
Miles
AIRPORT WY
FRENCH CAMP RD
ROTH RD
ROTH RD EXTENSION
LOVELACE RD
UNION RD
AUSTIN RD
LATHROP RD
NORTHGATE DR
CRESTWOOD AV
SOUTHLAND RD
COTTAGE AV
LOUISE AV
MCKINLEY AV
CENTER ST
MAIN ST
YOSEMITE AV
E 120
ATHERTON DR
WOODWARD AV
PEACH AV
OLEANDER AV
MANTECA RD
RAYMUS EXPRESSWAY
Oakwood Lake
Circle Lake
San Joaquin River
99
120
5

Enclosure 16

South Manteca assessor's map showing Dredger Cut and SSJID Drains; Figure 5-1 showing future drainage improvements as published in the City of Manteca 2013 Storm Drain Master Plan


WOODWARD AVE.
WOODWARD
AVENUE
MCKINLEY ROAD
NOT OPEN ON GROUND
NOT OPEN ON GROUND
AIRPORT
WAY
DREDGER CUT
DREDGER CUT
WALTHALL SLOUGH
WALTHALL
ROAD
NILE AVE
SSJID DRAINAGE CANAL
SSJID Drain #10
SSJID Drain #10
SSJID Drain #11
241-03
241-32
241-24
241-06
241-33
South Manteca Assessor's Map

CITY OF MANTECA

PUBLIC WORKS DEPARTMENT

N

Figure 5-1

Future Drainage Improvements

Legend:

- CITY DRAIN (IN USE)
- CITY DRAIN (NOT IN USE)
- SSJID DRAIN
- SSJID LATERAL
- EXISTING SSJID/CITY DUAL USE LATERAL
- PROPOSED SSJID/CITY DUAL USE LATERAL BY DEVELOPER
- PROPOSED LATERAL (DEVELOPER)
- PROPOSED DRAIN BY CITY
- PROPOSED LATERAL (CITY/SSJID)
- CITY TELEMETRY
- MONITORING STATION
- PRIVATE TELEMETRY
- PRIVATE PUMP STATION
- DIRECT DISCHARGE AREA
- PARCELS
- STORM DRAIN IMPROVEMENT
- NON_RESIDENTIAL AREA FOR INFILTRATION BASIN
- REGIONAL PIPELINE FOR DEVELOPABLE AREA
- REGIONAL PUMP STATION FOR DEVELOPABLE AREA

0 0.5 1 2 Miles

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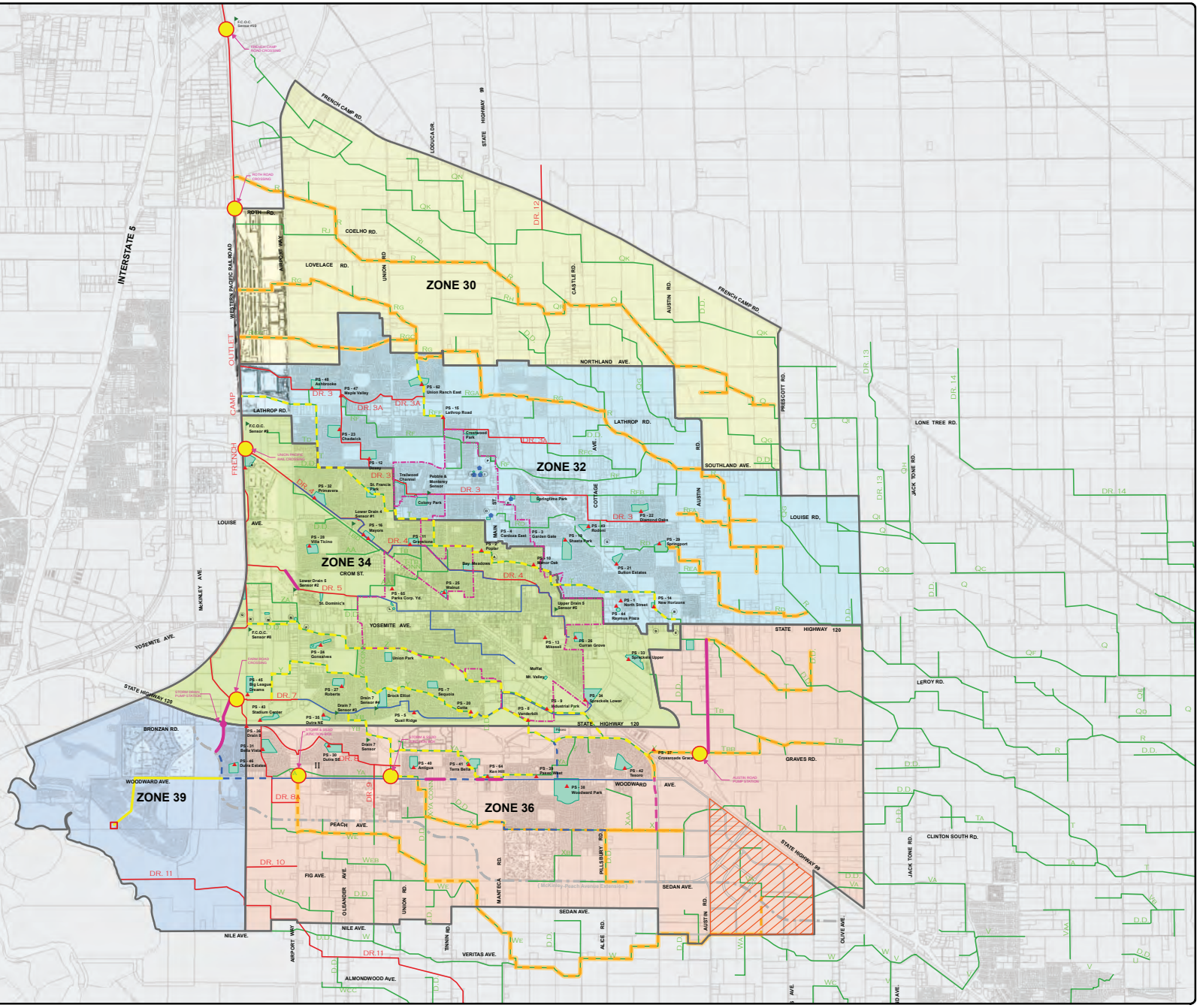


Enclosure 17

San Joaquin County Zone Classification application No. PA-1700172 of San Joaquin County: December 7, 2017 Notice of Public Hearing - Item Rescheduled, documentation and supporting maps

RECEIVED NOV 30 2017

SAN JOAQUIN COUNTY
COMMUNITY DEVELOPMENT DEPARTMENT

1810 E. HAZELTON AVE., STOCKTON, CA 95205-6232
PHONE: 209/468-3121 FAX: 209/468-3163

November 21, 2017

RE: December 7, 2017 Notice of Public Hearing – Item Rescheduled

To Whom It May Concern:

Please note Zone Classification application No. PA-1700172 of San Joaquin County to process the zone reclassifications for the Landowner Requests of the 2035 General Plan Update has been removed from the December 7, 2017 San Joaquin County Planning Commission hearing agenda and the item is now scheduled for the December 21, 2017 San Joaquin County Planning Commission hearing. You will receive an updated Notice of Public Hearing for the rescheduled item at a future date.

If you have any questions please feel free to contact me at (209) 468-0222 or alisa.goulart@sjgov.org

Sincerely,

Alisa Goulart
Associate Planner

RECEIVED NOV 22 2017

NOTICE OF PUBLIC HEARING
Before the
SAN JOAQUIN COUNTY PLANNING COMMISSION

On Thursday, December 7, 2017, at 6:30 p.m., or as soon as possible thereafter, in the Auditorium of the San Joaquin County Department of Public Health Services, 1601 East Hazelton Avenue, Stockton, California, the Planning Commission will hold a public hearing to consider:

PROJECT:

ZONE RECLASSIFICATION APPLICATION NO. PA-1700172 OF SAN JOAQUIN COUNTY to process the zone reclassifications for the Landowner Requests of the 2035 General Plan Update that were approved and adopted by the Board of Supervisors. The adopted Landowner Requests changed the General Plan designation of the subject parcels. Adoption of these Zone Reclassifications will assign zoning to the subject parcels that is consistent with the General Plan. The project site is located Countywide (Supervisorial District: All).

ENVIRONMENTAL REVIEW OF PROJECT:

Based on the Initial Study, which indicates that this project will not have a significant effect on the environment, and a Negative Declaration has been prepared.

PUBLIC HEARING PROCEDURE:

Following is a brief explanation of Planning Commission hearings. For meetings with large agendas, or if an item is particularly controversial, the time limits noted below may be applied by the Chairman:

- Staff report and recommendation are presented.
- Primary project proponents give their testimony (limited to 20 minutes). Other project proponents give their testimony (limited to 5 minutes).
- Primary project opponents give their testimony (limited to 20 minutes if there is an agreed upon spokesperson). Other project opponents give their testimony (limited to 5 minutes).
- Applicant may rebut the opponents' testimony (limited to 10 minutes).
- Time limits do not apply to responses to questions from Planning Commissioners or staff.
- Chairman will close the public hearing and bring the matter back to the Planning Commission for discussion and decision.

All persons interested in this matter are invited to be present at this hearing and submit oral statements regarding either the project or the Environmental Determination. Any written materials or statements you want to be considered at the hearing must be submitted to the Community Development Department no later than noon on the Friday before the public hearing. Only those persons who attend the hearing or participate by making oral or written comments may appeal any Planning Commission actions to the Board of Supervisors. If you challenge the nature of any proposed actions in court, you may be limited to raising only those issues you or someone else raised at the public hearing described in this notice, or in written correspondence delivered to the Community Development Department prior to the public hearing. If you have any questions about this matter, please contact San Joaquin County Community Development Department, 1810 East Hazelton Avenue, Stockton, CA 95205. Phone: 209-468-3120.

Kerry Sullivan, Director
San Joaquin County
Community Development Department

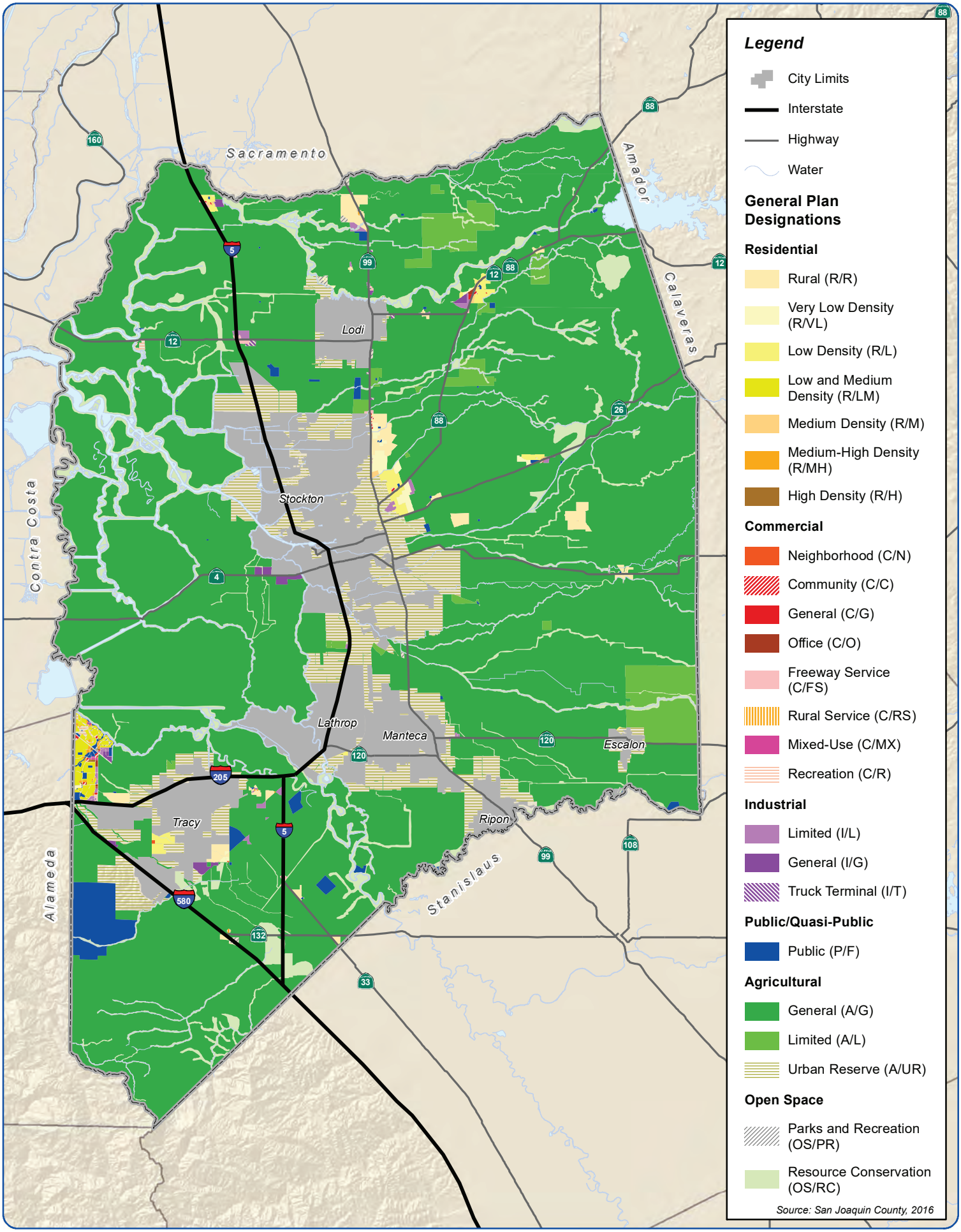
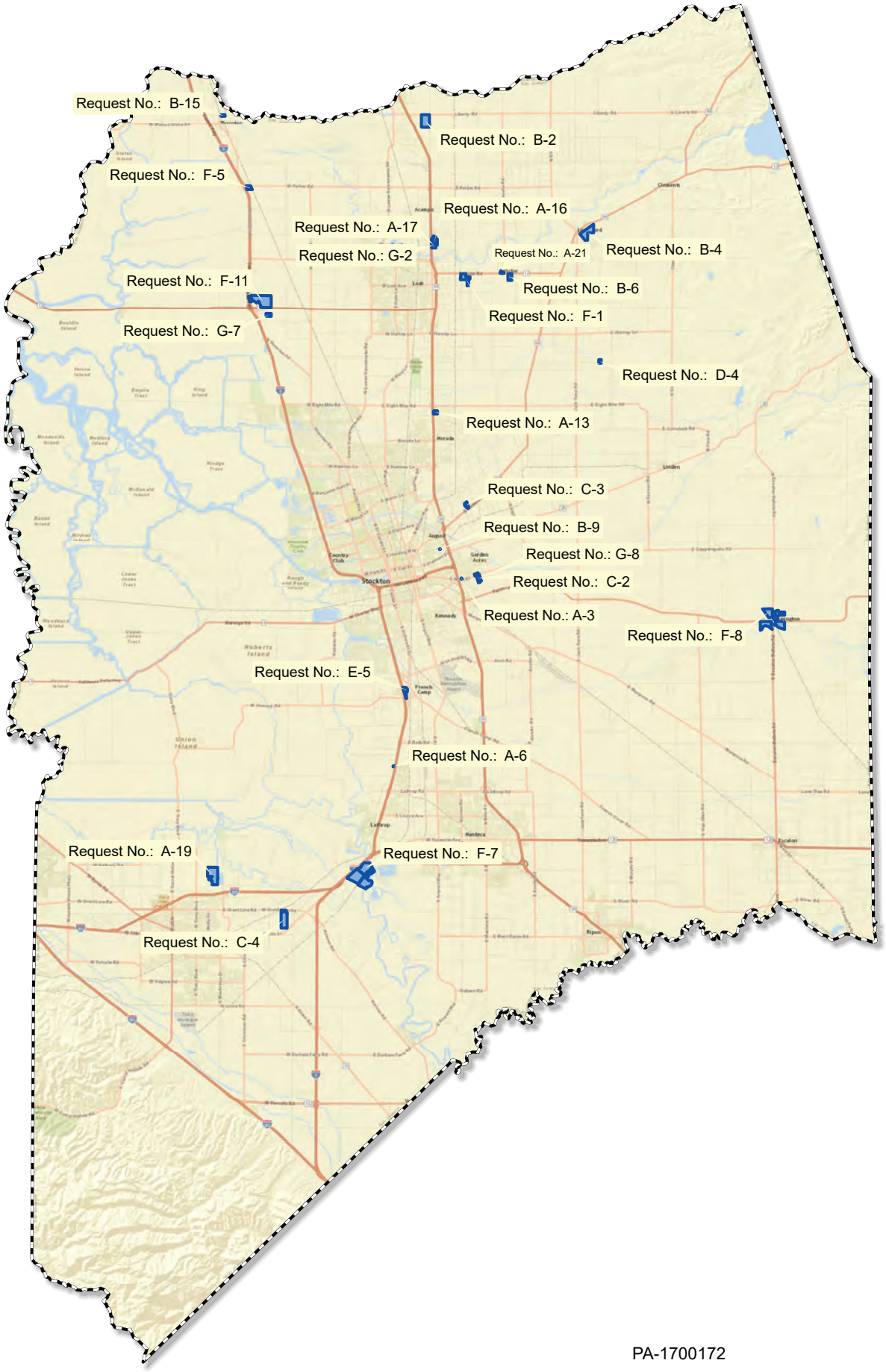


Figure LU-1
General Plan Land Use Diagram



PA-1700172

REQUEST LOCATOR

Sources: Esri, HERE, DeLorme, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, © OpenStreetMap contributors, and the GIS User Community

Google Maps

Imagery ©2017 Google, Map data ©2017 Google 2000 ft

Enclosure 18

2019-08-14 Reservoir Data from the CA Department of Water Resources

5151 E. ALMONDWOOD DRIVE MANTECA, CA 95337

Archived Report Products: 2019-08-14

Daily Reservoir Storage Summary

ENDING AT MIDNIGHT - 08/13/2019

FOR SELECTED RESERVOIRS IN NORTHERN AND SOUTHERN CALIFORNIA

Report generated: August 14, 2019 13:05

WATER STORAGE

Reservoir Name	StaID	Capacity (AF)	Elevation (FT)	Storage (AF)	Storage Change	% of Capacity	Average Storage	% of Average	Outflow (CFS)	Inflow (CFS)	Storage-Year Ago This Date
TRINITY RIVER											
TRINITY LAKE	CLE	2,447,650	2,352.28	2,168,353	-2,125	89	1,890,588	115	1,587	587	1,617,834
WHISKEYTOWN	WHI	241,100	1,208.51	236,338	-381	98	237,572	99	1,292	1,124	236,528
LEWISTON	LEW	14,660	1,900.92	13,852	132	94	13,872	100	1,539	1,609	14,360
RUSSIAN RIVER											
SONOMA(WARM SPRINGS)	WRS	381,000	445.53	230,741	-229	61	210,555	110	97	1	207,978
MENDOCINO (COYOTE)	COY	122,400	748.36	87,000	-209	71	64,516	135	205	117	70,078
SACRAMENTO RIVER											
SHASTA	SHA	4,552,000	1,042.92	3,870,252	-13,956	85	3,084,934	125	9,396	2,597	2,926,205
KESWICK	KES	23,772	585.15	22,601	-76	95	22,359	101	11,091	11,059	21,732
FEATHER RIVER											
OROVILLE	ORO	3,537,577	856.78	2,900,331	-15,257	82	2,469,415	117	10,199	2,698	1,786,780
ANTELOPE	ANT	22,566	5,000.09	20,832	-53	92	19,273	108	---	---	19,457
FRENCHMAN	FRD	55,477	5,584.85	50,640	-119	91	35,377	143	---	---	48,928
LAKE DAVIS	DAV	83,000	5,772.04	72,907	-110	88	61,806	118	---	---	72,647
YUBA RIVER											
BULLARDS BAR	BUL	966,000	1,916.25	787,867	-5,091	82	709,510	111	2,934	373	691,836
ENGLEBRIGHT	ENG	70,000	522.36	66,258	1,080	95	65,398	101	---	3,132	66,187
AMERICAN RIVER											
FOLSOM	FOL	977,000	449.76	803,085	-2,348	82	657,192	122	3,760	2,684	554,002
UNION VALLEY	UNV	266,369	4,861.62	242,695	-1,865	91	202,353	120	---	---	220,764
LOON LAKE	LON	69,306	6,398.36	53,911	-74	78	55,111	98	---	---	54,122
ICE HOUSE	ICH	43,496	5,442.13	38,345	-242	88	36,771	104	---	11	32,937
NIMBUS	NAT	9,000	123.93	8,228	37	91	8,318	99	3,365	3,388	7,965
CACHE CREEK											
INDIAN VALLEY	INV	300,000	1,473.70	256,960	---	86	154,420	166	240	10	139,832
PUTAH CREEK											
BERRYESSA	BER	1,602,000	435.06	1,459,594	-1,104	91	---	---	---	---	1,311,493
STONY CREEK											
BLACK BUTTE	BLB	143,700	458.42	78,515	-994	55	60,280	130	484	14	41,507
CALAVERAS RIVER											
NEW HOGAN	NHG	317,000	672.40	170,242	-569	54	142,370	120	302	51	179,297
MOKELUMNE RIVER											
CAMANCHE	CMN	417,120	229.39	372,520	-575	89	280,603	133	850	620	356,800
PARDEE	PAR	203,795	566.32	200,844	-321	99	187,245	107	883	---	199,643
STANISLAUS RIVER											
DONNELL'S	DON	64,320	---	58,589	-632	91	48,483	121	596	---	54,342
BEARDSLEY	BRD	97,800	---	91,628	-105	94	79,668	115	668	---	60,935
TULLOCH	TUL	67,000	508.95	65,658	480	98	65,162	101	3,419	3,675	65,511
NEW MELONES	NML	2,400,000	1,060.20	2,088,923	-5,117	87	1,433,546	146	3,622	1,174	1,855,253
TUOLUMNE RIVER											
DON PEDRO	DNP	2,030,000	821.31	1,919,682	-1,368	95	1,500,805	128	3,232	726	1,650,103
HETCH HETCHY	HTH	360,000	---	356,224	---	99	310,812	115	542	---	333,322
CHERRY VALLEY	CHV	273,500	---	248,143	---	91	179,365	138	254	---	230,067
MERCED RIVER											
MC CLURE (EXCHEQUER)	EXC	1,024,600	853.49	931,897	-2,322	91	600,476	155	1,958	285	743,657
CHOWCHILLA RIVER											

WATER STORAGE											
Reservoir Name	StaID	Capacity (AF)	Elevation (FT)	Storage (AF)	Storage Change	% of Capacity	Average Storage	% of Average	Outflow (CFS)	Inflow (CFS)	Storage-Year Ago This Date
EASTMAN (BUCHANAN)	BUC	150,000	552.27	95,236	-468	63	62,505	152	200	-21	64,368
FRESNO RIVER											
HENSLEY (HIDDEN)	HID	90,000	509.14	48,111	-431	53	30,017	160	220	17	16,760
SAN JOAQUIN RIVER											
MILLERTON (FRIANT)	MIL	520,500	564.37	456,106	-3,601	88	289,073	158	4,452	2,712	309,769
SAN LUIS CREEK											
SAN LUIS	SNL	2,041,000	479.89	1,283,037	-17,425	63	938,416	137	---	---	911,255
KINGS RIVER											
PINE FLAT	PNF	1,000,000	913.15	787,866	-7,629	79	454,000	174	6,019	2,223	363,787
KAWEAH RIVER											
KAWEAH (TERMINUS)	TRM	185,600	645.30	63,941	-2,697	34	37,943	169	1,656	311	19,251
TULE RIVER											
SUCCESS	SCC	82,300	635.98	49,685	-1,164	60	27,935	178	626	55	10,737
KERN RIVER											
ISABELLA	ISB	568,000	2,576.54	283,667	-2,030	50	249,532	114	1,774	863	125,898
TRUCKEE RIVER											
STAMPEDE	STP	226,500	5,946.76	220,104	-673	97	142,154	155	80	-5	210,430
INDEPENDENCE LAKE	INP	17,295	6,948.53	16,969	-21	98	16,349	104	---	---	16,753
DONNER LAKE	DNN	9,700	5,935.19	8,995	-34	93	8,523	106	---	---	8,366
SANTA YNEZ RIVER											
CACHUMA LAKE	CCH	193,305	737.90	150,247	-104	78	158,657	95	38	17	68,802
SOUTH COAST											
PYRAMID	PYM	180,000	2,576.62	168,126	1,279	93	160,255	105	---	---	164,687
CASTAIC	CAS	325,000	1,501.81	295,002	-699	91	270,202	109	---	---	281,537
LAKE PERRIS	PRR	131,452	1,583.42	116,509	-178	89	101,961	114	---	---	101,879

AF - Acre Feet CFS - Cubic Feet per Second

Note: Reservoir Flows are daily averages.

| Back

SAN JOAQUIN RIVER NEAR VERNALIS *(VNS)*

Elevation: 35.0' · SAN JOAQUIN R basin · Operator: USGS and DWR

Query executed Wednesday at 13:57:38

Provisional data, subject to change.
Select a sensor type for a plot of data.

DAILY DATA

DATE / TIME (PST)	*M FLOW* CFS
07/15/2019	3,023
07/16/2019	3,023
07/17/2019	3,559
07/18/2019	3,742
07/19/2019	3,725
07/20/2019	3,572
07/21/2019	3,227
07/22/2019	3,015
07/23/2019	3,068
07/24/2019	3,543
07/25/2019	3,664
07/26/2019	3,687
07/27/2019	3,512
07/28/2019	3,091
07/29/2019	2,736
07/30/2019	2,651
07/31/2019	3,155
08/01/2019	3,302
08/02/2019	3,402
08/03/2019	3,309
08/04/2019	2,845
08/05/2019	2,499
08/06/2019	2,528
08/07/2019	3,165
08/08/2019	3,541
08/09/2019	3,716
08/10/2019	3,668
08/11/2019	3,208
08/12/2019	2,780
08/13/2019	2,506
08/14/2019	--

Showing 1 to 31 of 31 entries

BRT and *ART* signify discharge at stage below or above available rating table
Warning! This data is preliminary and subject to revision.

Show VNS Map | Plot all VNS Sensors | 2 Month VNS Data | Real-Time VNS Data | VNS Info

Enclosure 19

American Rivers/CDFW property easement at the Kisst Dairy property as included on the San Joaquin County Habitat Conservation and Open Space Plan (included as Agenda Item 4Q in the August 22, 2019 Joint Meeting of the Board of Directors for the San Joaquin Council of Governments and SJCOG Inc.

August 2019
SJCOG, Inc.

STAFF REPORT

SUBJECT: American Rivers / California Department of Fish and Wildlife Easement Holding Request

RECOMMENDED ACTION: Motion to (1) Approve the Conservation Easement Holding Request and (2) Approve the Treasurer to Negotiate the Terms of the Easement Holding with the Requesting Parties

DISCUSSION:

SUMMARY:

American Rivers, a nation-wide conservation entity for collaborative watershed and agricultural landscapes, is working with the California Department of Fish and Wildlife (CDFW) to acquire a habitat conservation on a property in San Joaquin County through the Wildlife Conservation Board (WCB) grant program. Because SJCOG, Inc. is the non-profit 501c3 administrators of the San Joaquin County Habitat Conservation and Open Space Plan (SJMSCP), American Rivers and CDFW approached SJCOG, Inc. staff as the best option for both agencies to serve as the holding entity for the acquired land. While the habitat land easement will not provide any mitigation credit for the SJMSCP, it would require the SJCOG, Inc. to take responsibility for accepting, monitor and reporting on the mitigation land to the parties for which it would be compensated.

RECOMMENDATION:

A motion to (1) approve the conservation easement holding request and (2) approve the SJCOG, Inc. Treasurer to negotiate the terms of the easement holding with the requesting parties.

FISCAL IMPACT:

If approved, SJCOG, Inc. will receive the easement through a recorded grant deed and will be provided an endowment for the future costs of land management, monitoring, and reporting. SJCOG, Inc. will establish an endowment account for this preserve in the amount of roughly **$90,023.00** (109.55+/- acres x $821.75 per acre for 2019 endowment amount) for these activities

BACKGROUND:

The American Rivers/CDFW property easement at the Kisst Dairy Property is being purchased with grant funds in the Old River Paradise Cut area where many existing SJMSCP easement lands exist. The easement will be a Swainson's hawk easement for active row cropland. The

property is in the Central Zone along Paradise Cut and Alder Avenue as shown in attachment 1 and 2.

The grant easement purchase will have a Preserve Management Plan (PMP) recorded with the grant deed of conservation drafted by American Rivers and CDFW with input by SJCOG, Inc. staff and ICF as land managers for the SJMSCP. The PMP will follow the overall premise of existing SJMSCP management plans for the near-by preserve to allow better management and monitoring as a Row and Field Crop Preserve.

CDFW and American Rivers have drafted a Monitoring Protocol (attachment 3) for consideration by the SJCOG, Inc. Board. The final details of the agreement, compensation, and scope will be completed through negotiations before recording and accepting.

COMMITTEE ACTIONS:

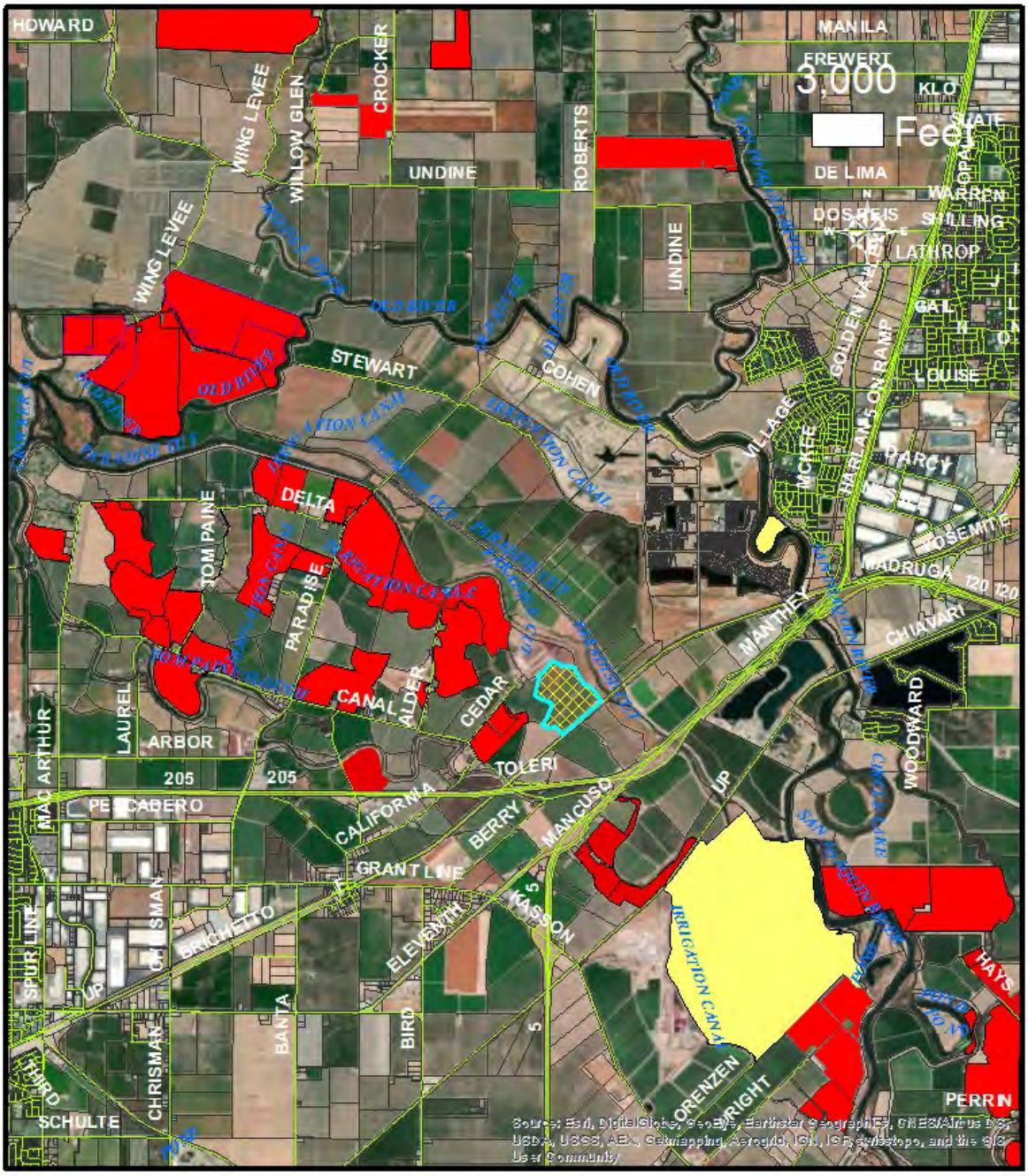
- Habitat Technical Advisory Committee: Information
- SJCOG, Inc. Board – Action Required

ATTACHMENTS:

1. Overview Preserve Location Map
2. Preserve Location Map
3. Monitoring Protocol

Prepared by: Steven Mayo, Program Manager

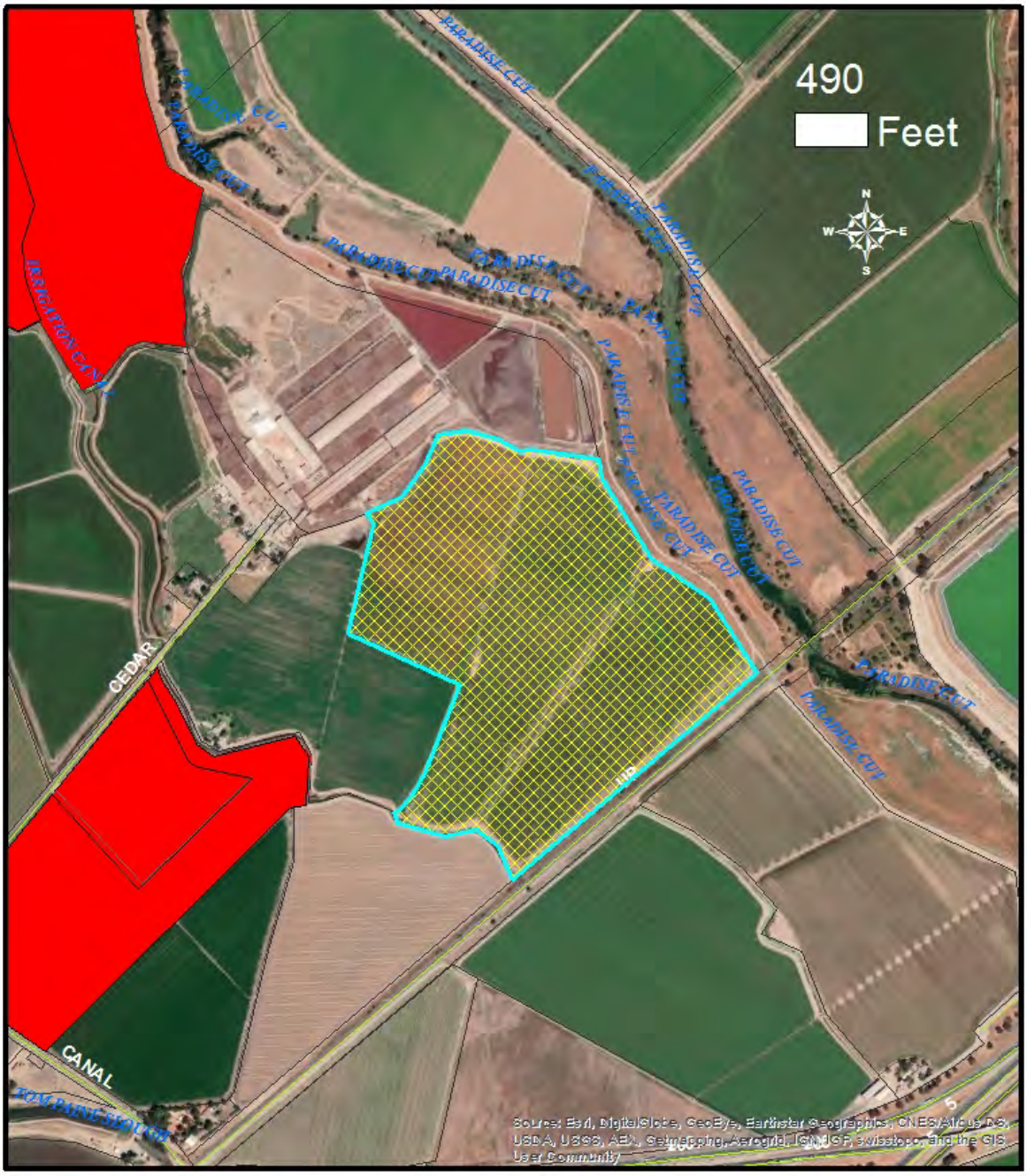
ATTACHMENT 1



Legend

- AR CDFW WCB Kisst Easement
- SJCOG_Preserves
- Unknown/Other Easement

ATTACHMENT 2



Legend

- AR CDFW WCB Kisst Easement
- SJCOG_Preserves
- Unknown/Other Easement

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Eastern San Joaquin Subbasin GSP Public Draft						
Summary of Public Comments and Responses						
Comment #	**Commenter**	**Commenter Organization**	**Page Number**	**Section, Figure, or Table Number**	**Sentence Starts with, "…**	**Comment**
1	Chris Thomas cthomas@thefreshwatertrust.org /northerndeltagsa@gmail.com	Northern Delta Susatinability Agency/NDGSA Associate Member Staten Island-Conservation Farms and Ranches	N/A	Public and Agency Comment Disposition/Coordination		The Groundwater Sustainability Plan ("GSP") development process could be improved with greater integration of public comments into the GSP. Specifically, there should be a disposition process for both oral and written comments. In addition, engagement and coordination with adjacent agencies/ subbasins should be clearly documented. The subbasin planning processes in our region will benefit from greater coordination, and doing so will be essential to completing successful GSPs.
2			pp. 2-56 to 2-57	2.1.10 HCM Data Gaps	Basin Setting	The draft GSP has significant and critical gaps in understanding of conditions, which contributes to inadequate modeling.
						The data gaps identified in the draft GSP include the following:
						—Water quality of principal aquifers
						—Aquifer characteristics
						—Groundwater Level Data
						—Groundwater Quality Data
						—Subsurface Conditions
						This extensive list of missing data indicates that the technical fundamentals of the subbasin's hydrologic and water quality are absent, that the ongoing lack of data collection and analysis is problematic, and calls into question the basis for establishing reliable and defensible thresholds.

Comment #	Commenter	Commenter Organization	Page Number	Section, Figure, or Table Number	Sentence Starts with, "…	Comment
4		3		Proposed Monitoring Well Network	Basin Setting	To rectify data gaps, a concerted program to resolve data gaps should be developed, funded and implemented. Further, these data gaps preclude the ability to track consistency with the GSP, and ultimately to ensure sustainability. furthermore, there are significant defects in the GSPs proposed monitoring approach. Sampling frequency was reduced to 2 events a year for 'representative' monitoring wells. This seems far too infrequent, given the DWR documented 'critically over-drafted' basin condition, existing cones of depression, and the limited number of monitoring wells proposed . (Discussed at July 10, 2019 GWA Board Meeting.) DWR has identified that the well sampling frequency should be based on groundwater conditions and hydrogeologic understanding. https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Sustainable-Groundwater-Management/Best-Management-Practices-and-Guidance-Documents/Files/BMP-2-Monitoring-Networks-and-Identification-of-Data-Gaps.pdf
						The draft GSP approach in number, location and frequency of sampling of wells appears to be inconsistent with the DWR BMPs. Generally, there are too few wells, and they are spatially dispersed outside of the cone(s) of depression over a very large subbasin, and limited sampling frequency will make it difficult to track the sustainability criteria and associated thresholds, the effectiveness of the GSP, and to begin to detect impacts to Groundwater Dependent Ecosystems (GDEs).
11		h	p. 2-65	Figure 2-37		Only one large cone of depression, an area of significantly reduced water table elevation, is identified in the GSP. This singular feature differs from previous analyses in the Cosumnes and South American subbasins; and, the degree of resolution of the data presented makes it difficult to tell if there are one or more distinct cones in the central part of the subbasin, but in any case the model shows depletion along Staten Island.

Comment #	Commenter	Commenter Organization	Page Number	Section, Figure, or Table Number	Sentence Starts with, "…	Comment
5			pp. 2-65 to 2-66	Figure 2-37 Figure 2-38,	Groundwater Modelin	The model(s) appear to show groundwater elevation declines in the Delta, including Staten Island. These data need further investigation since that condition seems unlikely and not supported by DWR and other groundwater elevation analyses. ESJ consultants were asked to explain why there were so many apparent discontinuities from the adjacent subbasin documented depressions, and the apparent errors in reporting of groundwater elevations in the Delta. For example, there are inexplicably irregular patterns of groundwater elevations shown for the Delta. The response was that the model itself had some challenges in development and that stakeholders could ignore those results. There is apparently limited quality control in the modeling effort, and erroneous results were not identified in the draft GSP. To the extent the GSP continues to rely on this modeling, it should identify where and how the data is not considered accurate. Or, if there are significant caveats, how and where those apply.
6				Sections 3.4-9	Groundwater Dependent Ecosystems and Interconnected Surface Waters	At the July 10, 2019 GWA Board Meeting, the consultants discussed use of The Nature Conservancy-initiated GDE assessment approach, “somewhat,” but that in any case that their analysis was “consistent.” The approach to GDEs should be clearly disclosed in the GSP.
7				Figure 3-64 Figure 3-65		Similarly, Interconnected Surface Waters (ISW) analysis in the draft GSP shows portions the sloughs as being variously ‘always losing’ and ‘always gaining’ around the perimeter of Staten Island.Yet, these gaining sections (all at or below sea level) are further identified ‘disconnected’ from the groundwater system.
						When asked about this obvious error in groundwater depletion modeling below sea level for several streams and Delta sloughs, the staff response was that it appears to be a modeling calibration error. It seems unlikely that these data were reviewed before publication. If they were reviewed, it would be expected that the text of the draft GSP would explain why it was incorrect or uncertain and how that was being resolved. This discrepancy raises concerns about the quality and the reliability of the GDE and ISW analyses.

Comment #	Commenter	Commenter Organization	Page Number	Section, Figure, or Table Number	Sentence Starts with, "…	Comment
8					Sea Water Intrusion	The draft GSP has set water quality standards for salinity intrusion that appear inconsistent with meeting environmental and agricultural beneficial uses, and protecting crops from yield losses associated with cumulative impacts of salinity. The GSP sets the isocontour line for reporting at 500 mg/L, ostensibly "same as Secondary Maximum Contaminant Level (SMCL) for chloride." (P. 12 July 10, 2019 GWA Board Meeting.) The Chloride SMCL set by the USEPA is 250 mg/L: https://www.epa.gov/dwregdev/drinking-water-regulations-and-contaminants https://www.epa.gov/sites/production/files/2018-03/documents/dwtable2018.pdf
						The SMCL for Total Dissolved Solids (TDS) set by the USEPA is 500 mg/L: https://www.epa.gov/sites/production/files/2019-03/documents/cfr-2011-title40-vol23-part143.pdf
9			p. 3-14 p. 3-12		Drinking Water Supplies and Agricultrual Uses Not Protected	However, the GSP set the measurable objective at 600 mg/L for TDS and the minimum threshold for TDS at 1,000 mg/L., double the SMCL. This measurable objective is above the SMCL, and the maximum threshold is not protective of drinking water supplies and agricultural uses. By the time water quality has reached the measurable objective it is unlikely to be used for potable water, and places agriculture at risk from yield losses.
10					Chloride Threshold Too High	The subbasin's GSP defined minimum threshold for chloride has been set at 2,000 mg/L, well above the limits for harm for many agricultural crops. http://lawr.ucdavis.edu/cooperative-extension/irrigation/drought-tips/water-quality-guidelines-trees-and-vines https://catalog.extension.oregonstate.edu/sites/catalog/files/project/pdf/pnw597.pdf
11			p. 3-12		TDS Threshold Too High	The minimum threshold is set at 1,000 mg/L for TDS, also at or above the level of impact to agricultural most agricultural crops. https://www.usbr.gov/lc/phoenix/programs/cass/pdf/Phase1/ATechapdxTDS.pdf

Comment #	Commenter	Commenter Organization	Page Number	Section, Figure, or Table Number	Sentence Starts with, "…	Comment
12						The monitoring triggers in the draft GSP for chloride and TDS are too high to avoid undesireable effects, and do consider leaching fractions or soil salinity accumulation rates in its asumptions that further chronic reductions in crop productivity and other negative impacts would be avoided. The analysis in the draft GSP does not appear to follow a best available science (BAS) approach. For instance, the draft GSP fails to dislcose that the levels of TDS identified as acceptable are associated with levels found to have a 50% yield loss of crops.
13			p. 3-15			The trigger at 400% SMCL woudl clearly cause negative impacts to domestic well users drinking water quality. The threshold for chloride is impermissibly high and would cause degradation of existing water quality, and potentially institutionalize unsustainable and undesirable water quality.
14			p. 2-54	Figure 2-31	Inadequate Baseline and Monitoring	The well network and associated chloride concentrations used in the analysis do not adequately represent Delta locations or the potential for associated sea/brackish water intrusion into shallow groundwater. Significantly more wells at various depths are required to show current conditions, and to detect future impacts within the Delta.
15			p. 2-78 to 2-79	Figure 2-52 Figure 2-53		Where chloride concentrations are described, there are a disproportionate amount of observations above 250 mg/L. in the Delta. If this threshold were approved it is possible that agricultural groundwater users would not be able to use this water for crops without reductions in productivity, and that continued irrigation with this water could reduce the ability to continue farming current crops. This standard is entirely inappropriate for drinking water quality.
20			p. 3-12	Section 3.2.3.1.2		Whatever the particular standard, protection from seawater intrusion is reliant on the ability of the subbasin to detect undesirable effects. For the entire ESJ subbasin, the draft GSP provides: “Undesirable results occur during GSP implementation when more than 25 percent of representative monitoring wells (3 of 10 sites) exceed the minimum thresholds for water quality for two consecutive years and where these concentrations are the result of groundwater management activities.”

Comment #	Commenter	Commenter Organization	Page Number	Section, Figure, or Table Number	Sentence Starts with, "…	Comment
16						Given the limited number of monitoring wells over a vast area, this standard is inadequate for the detection of a groundwater impact. The standard would require the source of the exceedance to be known, and that source to be the 'result of groundwater management activities'; that there is a monitoring well in proximity, that the exceedance in detected in the twice a year sampling; that two additional wells are located in the proximity and have similar detections with similar identified causes; and, moreover that those detections happen over two years. Those conditions are obviously unlikely to ever be met; the proposed well monitoring network appears to be so dispersed to ensure that exceedances could only be met at one well at the most.
17					Conculsion	The draft GSP is lacking in available data and an adequate proposed monitoring approach. The draft GSP should be modified and updated to include reasonable, scientifically supported thresholds, better track sustainability, and meet SGMA statutory requirements. The draftf GSP should also be updated to clarify where the data and the visualizations are not accurate and what process will be applied to improve them. The salinity and TDS limits are not likely to meet sustainability and could allow significant degradation of water quality if applied.
						We look forward to working with the ESJ group to ensure a complete GSP that meets all requriements and can be approved by DWR in the coming months.

The Nature Conservancy
Protecting nature. Preserving life.

CALIFORNIA WATER | GROUNDWATER

555 Capitol Mall, Suite 1290
Sacramento, California 95814
[916] 449-2850

nature.org
GroundwaterResourceHub.org

August 24, 2019

Eastern San Joaquin Groundwater Authority
1810 E. Hazelton Avenue
P.O. Box 1810
Stockton, CA 95201

Submitted online via: http://www.esjgroundwater.org/

Re: Eastern San Joaquin Subbasin Groundwater Sustainability Plan Public Draft

Dear Basin Representatives,

The Nature Conservancy (TNC) appreciates the opportunity to comment on the Eastern San Joaquin Subbasin Groundwater Sustainability Plan Public Draft prepared by the Eastern San Joaquin Groundwater Authority under the Sustainable Groundwater Management Act (SGMA) and dated July 2019. TNC provided comments on the Eastern San Joaquin Subbasin Groundwater Sustainability Plan Draft Deliverable 1, which included portions of Chapters 1, 2, 3 and 5, on May 31, 2019. For your convenience, we have included the several attachments (discussed below) to this letter that were also provided in the previous letter.

TNC as a Stakeholder Representative for the Environment

TNC is a global, nonprofit organization dedicated to conserving the lands and waters on which all life depends. We seek to achieve our mission through science-based planning and implementation of conservation strategies. For decades, we have dedicated resources to establishing diverse partnerships and developing foundational science products for achieving positive outcomes for people and nature in California. TNC was part of a stakeholder group formed by the Water Foundation in early 2014 to develop recommendations for groundwater reform and actively worked to shape and pass SGMA.

Our reason for engaging is simple: California's freshwater biodiversity is highly imperiled. We have lost more than 90 percent of our native wetland and river habitats, leading to precipitous declines in native plants and the populations of animals that call these places home. These natural resources are intricately connected to California's economy providing direct benefits through industries such as fisheries, timber and hunting, as well as indirect benefits such as clean water supplies. SGMA must be successful for us to achieve a sustainable future, in which people and nature can thrive within Eastern San Joaquin Groundwater Authority region and California.

We believe that the success of SGMA depends on bringing the best available science to the table, engaging all stakeholders in robust dialog, providing strong incentives for beneficial outcomes and rigorous enforcement by the State of California.

Given our mission, we are particularly concerned about the inclusion of nature, as required, in GSPs. The Nature Conservancy has developed a suite of tools based on best available science to help GSAs, consultants, and stakeholders efficiently incorporate nature into GSPs.

These tools and resources are available online at GroundwaterResourceHub.org. The Nature Conservancy's tools and resources are intended to reduce costs, shorten timelines, and increase benefits for both people and nature.

*Ad**dressing Nature's Water Needs** in GSPs*

SGMA requires that all beneficial uses and users, including environmental users of groundwater, be considered in the development and implementation of GSPs (Water Code § 10723.2).

The GSP Regulations include specific requirements to identify and consider groundwater dependent ecosystems (23 CCR §354.16(g)) when determining whether groundwater conditions are having potential effects on beneficial uses and users. GSAs must also assess whether sustainable management criteria may cause adverse impacts to beneficial uses, which include environmental uses, such as plants and animals. In addition, monitoring networks should be designed to detect potential adverse impacts to beneficial uses due to groundwater. Adaptive management is embedded within SGMA and provides a process to work toward sustainability over time by beginning with the best available information to make initial decisions, monitoring the results of those decision, and using data collected through monitoring to revise decisions in the future. Over time, GSPs should improve as data gaps are reduced and uncertainties addressed.

To help ensure that GSPs adequately address nature as required under SGMA, The Nature Conservancy has prepared a checklist (Attachment A) for GSAs and their consultants to use. The attached version of this checklist was revised in July 2019. The Nature Conservancy believes the following elements are foundational for 2020 GSP submittals. For detailed guidance on how to address the checklist items, please also see our publication, *GDEs under SGMA: Guidance for Preparing GSPs*[1].

1. Environmental Representation

SGMA requires that groundwater sustainability agencies (GSAs) consider the interests of all beneficial uses and users of groundwater. To meet this requirement, we recommend actively engaging environmental stakeholders by including environmental representation on the GSA board, technical advisory group, and/or working groups. This could include local staff from state and federal resource agencies, nonprofit organizations and other environmental interests. By engaging these stakeholders, GSAs will benefit from access to additional data and resources, as well as a more robust and inclusive GSP.

2. Basin GDE and ISW Maps

SGMA requires that groundwater dependent ecosystems (GDEs) and interconnected surface waters (ISWs) be identified in the GSP. We recommend using the Natural Communities Commonly Associated with Groundwater Dataset (NC Dataset) provided online[2] by the Department of Water Resources (DWR) as a starting point for the GDE map. The NC Dataset was developed through a collaboration between DWR, the Department of Fish and Wildlife and TNC.

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[1] GDEs under SGMA: Guidance for Preparing GSPs is available at: https://groundwaterresourcehub.org/public/uploads/pdfs/GWR_Hub_GDE_Guidance_Doc_2-1-18.pdf

[2] The Department of Water Resoruces' Natural Communities Commonly Associated with Groundwater dataset is available at: *https://gis.water.ca.gov/app/NCDatasetViewer/*

3. Potential Effects on Environmental Beneficial Users

SGMA requires that potential effects on GDEs and environmental surface water users be described when defining undesirable results. In addition to identifying GDEs in the basin, The Nature Conservancy recommends identifying beneficial users of surface water, which include environmental users. This is a critical step, as it is impossible to define "significant and unreasonable adverse impacts" without knowing *what* is being impacted. Since the Public Draft GSP includes the Freshwater Species List for the Subbasin provided in our earlier comment letter as Appendix 1-F of the Public Draft, we did not include it as an attachment to this letter. We recommend that after identifying which freshwater species exist in your basin, especially federal and state-listed species, that you contact staff at the California Department of Fish and Wildlife (CDFW), United States Fish and Wildlife Service (USFWS) and/or National Marine Fisheries Services (NMFS) to obtain their input on the groundwater and surface water needs of the organisms on the GSA's freshwater species list. Because effects to plants and animals are difficult and sometimes impossible to reverse, we recommend erring on the side of caution to preserve sufficient groundwater conditions to sustain GDEs and ISWs.

4. Biological and Hydrological Monitoring

If sufficient hydrological and biological data in and around GDEs is not available in time for the 2020/2022 plan, data gaps should be identified along with actions to reconcile the gaps in the monitoring network.

The Nature Conservancy has thoroughly reviewed the Eastern San Joaquin Subbasin Draft GSP. We appreciate the work that has gone into the preparation of this plan. However, we consider it to be inadequate under SGMA because the basis for removing the majority of the potential GDEs identified in the NC Dataset from further consideration and management as GDEs is not scientifically supported, and could lead to significant and unreasonable impacts. Based on the available data, the removed polygons should be retained and managed as potential GDEs in the plan. If further analysis were to provide substantial evidence that groundwater level declines would not result in an adverse impact to the species in these ecosystems, then consideration could be given to removing them at that time; however, no such evidence has been presented in the draft GSP.

Our specific comments related to the Eastern San Joaquin Subbasin Groundwater Sustainability Plan, Draft Deliverable 1 of the Draft GSP are provided in detail in Attachment B and are in reference to the numbered items in the revised checklist in Attachment A. Attachment C describes six best practices that GSAs and their consultants can apply when using local groundwater data to confirm a connection to groundwater for DWR's Natural Communities Commonly Associated with Groundwater Dataset[2]. Attachment D provides an overview of a new, free online tool that allows GSAs to assess changes in groundwater-dependent ecosystem (GDE) health using satellite, rainfall, and groundwater data.

Thank you for fully considering our comments as you develop your GSP.

Best Regards,

Sandi Matsumoto
Associate Director, California Water Program
The Nature Conservancy

Attachment A
Considering Nature under SGMA: A Checklist

The Nature Conservancy is neither dispensing legal advice nor warranting any outcome that could result from the use of this checklist. Following this checklist does not guarantee approval of a GSP or compliance with SGMA, both of which will be determined by DWR and the State Water Resources Control Board.

Environmental User Checklist

The Nature Conservancy is neither dispensing legal advice nor warranting any outcome that could result from the use of this checklist. Following this checklist does not guarantee approval of a GSP or compliance with SGMA, both of which will be determined by DWR and the State Water Resources Control Board.

GSP Plan Element*		GDE Inclusion in GSPs: Identification and Consideration Elements	Check Box
Admin Info	2.1.5 Notice & Communication *23 CCR §354.10*	Description of the types of environmental beneficial uses of groundwater that exist within GDEs and a description of how environmental stakeholders were engaged throughout the development of the GSP.	1
Planning Framework	2.1.2 to 2.1.4 Description of Plan Area *23 CCR §354.8*	Description of jurisdictional boundaries, existing land use designations, water use management and monitoring programs; general plans and other land use plans relevant to GDEs and their relationship to the GSP.	2
		Description of instream flow requirements, threatened and endangered species habitat, critical habitat, and protected areas.	3
		Summary of process for permitting new or replacement wells for the basin, and how the process incorporates any protection of GDEs	4
Basin Setting	2.2.1 Hydrogeologic Conceptual Model *23 CCR §354.14*	Basin Bottom Boundary: Is the bottom of the basin defined as at least as deep as the deepest groundwater extractions?	5
		Principal aquifers and aquitards: Are shallow aquifers adequately described, so that interconnections with surface water and vertical groundwater gradients with other aquifers can be characterized?	6
		Basin cross sections: Do cross-sections illustrate the relationships between GDEs, surface waters and principal aquifers?	7
	2.2.2	Interconnected surface waters:	8

	Current & Historical Groundwater Conditions *23 CCR §354.16*	Interconnected surface water maps for the basin with gaining and losing reaches defined (included as a figure in GSP & submitted as a shapefile on SGMA portal).		9
		Estimates of current and historical surface water depletions for interconnected surface waters quantified and described by reach, season, and water year type.		10
		Basin GDE map included (as figure in text & submitted as a shapefile on SGMA Portal).		11
		If NC Dataset *was* used:	Basin GDE map denotes which polygons were kept, removed, and added from NC Dataset (Worksheet 1, can be attached in GSP section 6.0).	12
			The basin's GDE shapefile, which is submitted via the SGMA Portal, includes two new fields in its attribute table denoting: 1) which polygons were kept/removed/added, and 2) the change reason (e.g., why polygons were removed).	13
			GDEs polygons are consolidated into larger units and named for easier identification throughout GSP.	14
		If NC Dataset *was not* used:	Description of why NC dataset was not used, and how an alternative dataset and/or mapping approach used is best available information.	15
		Description of GDEs included:		16
		Historical and current groundwater conditions and variability are described in each GDE unit.		17
		Historical and current ecological conditions and variability are described in each GDE unit.		18
		Each GDE unit has been characterized as having high, moderate, or low ecological value.		19
		Inventory of species, habitats, and protected lands for each GDE unit with ecological importance (Worksheet 2, can be attached in GSP section 6.0).		20
	2.2.3 Water Budget *23 CCR §354.18*	Groundwater inputs and outputs (e.g., evapotranspiration) of native vegetation and managed wetlands are included in the basin's historical and current water budget.		21
		Potential impacts to groundwater conditions due to land use changes, climate change, and population growth to GDEs and aquatic ecosystems are considered in the projected water budget.		22
Sustainable Management Criteria	3.1 Sustainability Goal *23 CCR §354.24*	Environmental stakeholders/representatives were consulted.		23
		Sustainability goal mentions GDEs or species and habitats that are of particular concern or interest.		24
		Sustainability goal mentions whether the intention is to address pre-SGMA impacts, maintain or improve conditions within GDEs or species and habitats that are of particular concern or interest.		25
	3.2 Measurable Objectives *23 CCR §354.30*	Description of how GDEs were considered and whether the measurable objectives and interim milestones will help achieve the sustainability goal as it pertains to the environment.		26
	3.3 Minimum Thresholds *23 CCR §354.28*	Description of how GDEs and environmental uses of surface water were considered when setting minimum thresholds for relevant sustainability indicators:		27
		Will adverse impacts to GDEs and/or aquatic ecosystems dependent on interconnected surface waters (beneficial user of surface water) be avoided with the selected minimum thresholds?		28

		Are there any differences between the selected minimum threshold and state, federal, or local standards relevant to the species or habitats residing in GDEs or aquatic ecosystems dependent on interconnected surface waters?		29
	3.4 Undesirable Results *23 CCR §354.26*	For GDEs, hydrological data are compiled and synthesized for each GDE unit:		30
		If hydrological data *are available* within/nearby the GDE	Hydrological datasets are plotted and provided for each GDE unit (Worksheet 3, can be attached in GSP Section 6.0).	31
			Baseline period in the hydrologic data is defined.	32
			GDE unit is classified as having high, moderate, or low susceptibility to changes in groundwater.	33
			Cause-and-effect relationships between groundwater changes and GDEs are explored.	34
		If hydrological data *are not available* within/nearby the GDE	Data gaps/insufficiencies are described.	35
			Plans to reconcile data gaps in the monitoring network are stated.	36
		For GDEs, biological data are compiled and synthesized for each GDE unit:		37
		Biological datasets are plotted and provided for each GDE unit, and when possible provide baseline conditions for assessment of trends and variability.		38
		Data gaps/insufficiencies are described.		39
		Plans to reconcile data gaps in the monitoring network are stated.		40
		Description of potential effects on GDEs, land uses and property interests:		41
		Cause-and-effect relationships between GDE and groundwater conditions are described.		42
		Impacts to GDEs that are considered to be "significant and unreasonable" are described.		43
		Known hydrological thresholds or triggers (e.g., instream flow criteria, groundwater depths, water quality parameters) for significant impacts to relevant species or ecological communities are reported.		44
		Land uses include and consider recreational uses (e.g., fishing/hunting, hiking, boating).		45
		Property interests include and consider privately and publicly protected conservation lands and opens spaces, including wildlife refuges, parks, and natural preserves.		46
Sustainable Management Criteria	3.5 Monitoring Network *23 CCR §354.34*	Description of whether hydrological data are spatially and temporally sufficient to monitor groundwater conditions for each GDE unit.		47
		Description of how hydrological data gaps and insufficiencies will be reconciled in the monitoring network.		48
		Description of how impacts to GDEs and environmental surface water users, as detected by biological responses, will be monitored and which GDE monitoring methods will be used in conjunction with hydrologic data to evaluate cause-and-effect relationships with groundwater conditions.		49

Projects & Mgmt Actions	4.0. Projects & Mgmt Actions to Achieve Sustainability Goal *23 CCR §354.44*	Description of how GDEs will benefit from relevant project or management actions.	50
		Description of how projects and management actions will be evaluated to assess whether adverse impacts to the GDE will be mitigated or prevented.	51

* In reference to DWR's GSP annotated outline guidance document, available at:
https://water.ca.gov/LegacyFiles/groundwater/sgm/pdfs/GD_GSP_Outline_Final_2016-12-23.pdf

Attachment B

TNC Evaluation of the Eastern San Joaquin Subbasin Groundwater Sustainability Plan, Public Draft Complete Executive Summary and Main Report

A complete draft of the Eastern San Joaquin GSP has been provided for public review. On May 31, 2019, TNC provided comments on the Eastern San Joaquin Subbasin GSP Draft Deliverable 1, which included portions of Chapters 1, 2, 3 and 5. This attachment summarizes our comments on the complete public draft GSP dated July 2019, and includes any initial review comments from our May 31, 2019 that have not yet been addressed. Since the GSP does not follow the DWR Annotated GSP Outline, we have organized our comments below in accordance with the item numbers in the checklist included as Attachment A.

Checklist Item 1 – Notice & Communication (23 CCR §354.10).

- [Section 1.3.1 Beneficial Uses and Users in the Subbasin (pp. 1-40)] [Checklist item 1]
    - Caswell Memorial State Park is incorrectly referred to as being located outside the Eastern San Joaquin Subbasin. The following additional protected lands are located near surface waters within the Subbasin that may be interconnected with groundwater, and/or may rely at least partly on groundwater to support vegetation and sensitive natural communities. These protected lands represent potential beneficial users of groundwater: Durham Ferry State Recreational Area, a small portion (approximately 200 acres) of San Joaquin River National Wildlife Refuge, Army Corps Park, Vernalis Riparian Habitat (Public Conservation Lands), Seegers Preserve, Cabral Island Preserve, Machado Preserve, Hansen Preserve, Micke Grove Park and Zoo, Oak Grove Regional Park, Nakagawa Preserve, El Rio Farms Preserve, Lodi Lake Nature Area, Woodbridge Regional Park, Woodbridge Ecological Preserve, White Slough WA, Nuss Farms, Beck Preserve, Hilder Preserve, Staten Island Ranch, Burchel Preserve, and Ishizuka Preserve. The authors referred to the San Joaquin County General Plan documents, including background reports, for information regarding these important resources. These potential beneficial groundwater users should be described in the text on pp. 1-18 and shown in Figure 1-11. Please include a description recognizing all of the protected areas in the Subbasin and their beneficial groundwater uses.
    - Section 2.2.8 includes a geospatial analysis that removes managed wetlands from consideration as GDEs. The managed wetlands in the Subbasin should be identified in this section.

Checklist Item 2 to 4 - Description of general plans and other land use plans relevant to GDEs and their relationship to the GSP (23 CCR §354.8).

- [Section 1.2.1 Description of Plan Area (1-10 to 1-21)] Critical habitat is known to exist for protected aquatic species, such as California Tiger Salamander, Steelhead, Delta Smelt, Giant Gartersnake and California Red-Legged Frog in and around the Subbasin (https://fws.maps.arcgis.com/home/webmap/viewer.html?webmap=9d8de5e265ad4fe09893cf75b8dbfb77). There are likely ongoing monitoring programs associated with critical habitat areas and the protected lands. Please include a description of these habitat areas, and associated programs and requirements pertinent to ISWs, GDEs and wetlands. Identify areas where critical habitat exists and overlaps with ISWs and GDEs.
- [Section 1.2.2 Water Resources Monitoring and Management Programs (pp. 1-21 to 1-32)] Per the GSP Regulations (23 CCR §354.34 (a) and (b)), monitoring must address trends in groundwater *and related surface conditions* (emphasis added). In order for this section to provide the appropriate context and help assure integration of GSP implementation with other ongoing regulatory programs, this section should describe the following:
    - Monitoring activities and responsibilities by State, Federal and local agencies and jurisdictions related to aquatic resources and GDEs that could be affected by groundwater withdrawals should be discussed. Section 1.2.2.6 states that there are no agencies that do monitoring specific to surface-groundwater interconnection. While this may be technically correct insofar as it relates to hydrogeologic monitoring, it ignores ongoing monitoring programs related to the state of aquatic resources and GDEs that could be affected by groundwater withdrawals, and that are a direct indicator of potential undesirable results. For example, there are likely ongoing monitoring programs associated with the protected lands listed in our comments to Section 1.3.1, and other open space or preserve areas that may be monitored by public, private or nonprofit entities. A discussion of monitoring programs related to GDEs and ISWs should be included.
    - The lack of existing hydrologic monitoring of surface-groundwater interconnection is a significant data gap as it relates to classification and management of GDEs and should be identified as such and further discussed and addressed in the appropriate subsequent sections of the GSP.
    - Monitoring activities and responsibilities related to instream flow and water quality requirements under applicable Federal Energy Regulatory Commission licenses, Biological Opinions and other regulations or programs are relevant and should be identified. Please include a discussion of water flow and quality monitoring requirements pertinent to ISWs.

- [Section 1.2.3 Land Use Elements or Topic Categories of Applicable General Plans (pp. 1-33 to 1-36 and Appendix 1-E)]
    - This section should include a discussion of General Plan goals and policies related to the protection and management of GDEs and aquatic resources that could be affected by groundwater withdrawals, rather than being limited to goals and policies directly related to groundwater resources alone. Section

1.3.1 correctly identifies environmental uses of groundwater as including "…species and habitat reliant on instream flows, as well as wetlands and GDEs," and yet Section 1.2.3 and Appendix 1-E do not identify any General Plan policies related to these resources. Section 1.2.3 should identify if there are any Habitat Conservation Plans (HCPs) or Natural Community Conservation Plans (NCCPs) within the Subbasin and if they are associated with critical, GDE and/or ISW habitats. Appendix 1-E should identify General Plan policies related to wetlands, riparian habitat, streams, aquatic habitat, and related threatened and endangered species. Section 1.2.3.2 should include a discussion of the relationship of GSP implementation to General Plan goals and policies related to GDEs and aquatic habitat; and also address how GSP implementation will coordinate with the goals of any HCPs or NCCPs.

- [Section 1.2.3.4 Well Permitting (pp. 1-36 to 1-38)] This section should include a discussion of the following:
    - Future well permitting must be coordinated with the GSP to assure achievement of the Plan's sustainability goals.
    - The State Third Appellate District recently found that Counties have a responsibility to consider the potential impacts of groundwater withdrawals on public trust resources when permitting new wells near streams with public trust uses (ELF v. SWRCB and Siskiyou County, No. C083239). The need for well permitting programs to comply with this requirement should be stated.
    - Section 2.3.3.3 discusses potential exemptions from the Stanislaus County Groundwater Ordinance but does not mention the fact that applicants who are not exempt are required to provide substantial evidence that their proposed extraction will not result in undesirable results, including significant and unreasonable impacts to GDEs and surface waters.

Checklist Items 6 and 7 – Hydrogeologic Conceptual Model (23 CCR §354.14)

- [Section 2.1.7 Geologic Cross Sections (pp. 2-35 to 2-37)] Please clearly state whether localized perched aquifers are present in the basin. Include example near-surface cross section details that depict the conceptual understanding of shallow groundwater and stream interactions at different locations, including perched and regional aquifers.
- [Section 2.1.8.2 Definable Bottom of the Basin (p. 2-39)] The Bottom of the Basin Boundary was defined by the base of freshwater, which was mapped 45 years ago and pumping since then has very likely resulted in shift in the isohaline contouring in the basin. Defining the bottom of the Subbasin based on geochemical properties is a suitable approach for defining the base of freshwater, however, as noted on page 9 of DWR's Hydrogeologic Conceptual Model BMP (https://water.ca.gov/LegacyFiles/groundwater/sgm/pdfs/BMP_HCM_Final_2016-12-23.pdf) "the definable bottom of the basin should be at least as deep as the deepest groundwater extractions". Thus, groundwater extraction well depth data should also be included in the determination of the basin bottom. This will

prevent the possibility of extractors with wells deeper than the basin boundary from claiming exemption of SGMA due to their well residing outside the vertical extent of the basin boundary. Also, pumping saline groundwater and desalinating it will become increasingly economical under SGMA due to pumping restrictions in the basin.

- [Section 2.1.10 HCM Data Gaps (pp. 2-56 and 2-57)] The Hydrologic Conceptual Model identified several data gaps including the following for groundwater level data:
    - Depth- or zone-specific water levels to assess vertical interconnection, including zones within the Principal Aquifer. Nested monitoring wells would be helpful near surface water to show how pumping is impacting surface water flows and GDEs.
    - Additional shallow groundwater data near surface waters and NCCAGs.
    - Additional groundwater level data in the east and northwest areas of the Subbasin.
    - Additional groundwater level data near the Mokelumne River to improve quantification and understanding of subsurface flows.

  Of these, the second data gap is the information that is most critical to identifying GDEs or potential GDEs and understanding their characteristics.

Checklist Items 8, 9 and 10 – Interconnected Surface Waters (23 CCR §354.16)

- [Section 2.1.4.2 Major Hydraulic Features (pp. 2-9 to 2-14)] This section should discuss (or reference the sections discussing) the following:
    - Specific ISWs, including the extent of both gaining and losing reaches.
    - In-stream flow requirements in each of the interconnected rivers/streams including the amount, time of year when the flow minimum is specified, the duration, the freshwater fish species for which it applies, associated permits that set forth the requirements, and the regulating agency setting forth the compliance requirements.
    - Areas of critical habitat that exist within rivers and streams.
- [Section 2.1.5 Geologic Formations and Stratigraphy (pp. 2-23 to 2-27)] Table 2-2 states that Holocene Stream Channel Deposits are generally not saturated except by the San Joaquin River. Based on the available data, it would be expected that the stream channel deposits associated with the other ISWs in the Subbasin would be saturated near those streams and rivers.
- [Section 2.1.9.2.2 Regional Historic Groundwater Flow and Surface Water Interaction (p. 2-49)] This section focuses on groundwater flow direction and defers further discussion of groundwater conditions to Section 2.2, which does not provide information on historical groundwater-surface water interaction. This section should include a discussion of historic groundwater-surface water interaction.
- Section 2.2.6 Interconnected Surface Water Systems (pp. 2-97 to 2-99)]
    - The determination as to whether or not a stream reach is interconnected or disconnected was made based on whether modeling conducted for the GSP

indicated that it is interconnected more than 25 percent of the time. Even if the stream is only connected 25% of the time, it is still connected, and that short period of connectivity may be during critical times for select species or provide a cooling or biogeochemical effect during a critical period. Please describe the technical basis for selecting a 25 percent interconnection threshold, and how it will adequately protect the environmental beneficial uses of surface water in potentially interconnected surface waters from significant and unreasonable impacts related to groundwater extraction.

- Shallow groundwater monitoring data near surface waters and NCCAGs are identified as a data gap in Section 2.1.10, and the use of the Eastern San Joaquin Water Resources Model (ESJWRM) to determine the percentage of time that stream reaches are groundwater connected entails inherent uncertainty. The potential presence of shallow or perched aquifers near the rivers is not assessed or discussed in the GSP. Groundwater modeling conducted by the United States Geological Survey (USGS), DWR and others (e.g., JJ&A, 2018) has considered some river reaches shown as disconnected in Figure 2-66 (pp. 2-99) to be groundwater-connected. No data or discussion is presented regarding the potential groundwater connection of other streams associated with significant wetland and riparian resources, including Pixley Slough, Mormon Slough, Littlejohns Creek, Bear Creek, Potter Creek, Duck Creek and Lone Tree Creek. As such, there is considerable uncertainty regarding the designation of interconnected and disconnected surface water resources in Figure 2-66. The uncertainty regarding the groundwater interconnection of streams in the Subbasin should be identified as a data gap.

Checklist Items 11 through 20 – Groundwater Dependent Ecosystems (23 CCR §354.16)

- [Section 2.2.7 Groundwater-Dependent Ecosystems (p. 2-100)] This section includes the incorrect statement that SGMA does not require sustainable management criteria to be established for the management of GDEs. Section 1.3.1 of the GSP states that beneficial users of groundwater and ISWs include "environmental users of groundwater, including species and habitat reliant on instream flows, as well as wetlands and GDEs." Undesirable results under SGMA include chronic lowering of groundwater levels resulting in significant and unreasonable depletion of supply for beneficial groundwater users, *including* GDEs. Undesirable results also include depletion of ISWs resulting in significant and unreasonable adverse impacts on beneficial users of surface water, including wetlands and GDEs. The incorrect statement that SGMA does not require the establishment of sustainable management criteria for GDEs should be removed.
- [Section 2.2.8 Methodology for GDE Identification (p. 2-100 to 2-106)] The GSP relies on the NCCAG database developed by TNC for the DWR to identify potential GDEs, and then provides a framework for removing most of these areas from further consideration. It appears that the preliminary desktop analysis documented in the draft GSP resulted an excessive elimination of the NC dataset

polygons mapped in the Eastern San Joaquin Subbasin. In particular, the methods used to confirm whether or not polygons in the NC Dataset are connected to groundwater in the Eastern San Joaquin Subbasin are highly flawed. We have the following comments on the proposed approach:

- The GSP takes the approach of removing NCCAGs with "access to alternate water supplies" from consideration as GDEs, and states that in order to be considered GDEs, "there must not be alternate water supplies". Alternate water supplies are assumed to include potential sources of surface water including managed wetlands, irrigated agricultural fields, perennial surface water sources, and other unspecified sources determined by stakeholders on a case-specific basis. This approach is inappropriate and deficient for several important reasons:
    - There is no hydrologic analysis or empirical data provided as a basis for the proposed buffer zones. The hydrologic connectivity between a GDE and a nearby alternative water source is highly dependent on local conditions and can vary seasonally and by year type. In the case of managed wetlands, no consideration is given to the nature of the wetland and surrounding area, the source and frequency of inundation, the soil types, and other features that would be needed to understand the hydrologic connectivity between the wetland and the surrounding area, or even whether the wetland itself it groundwater dependent for a portion of the year. Similarly, no information is given to the topography and hydrology surrounding irrigated agricultural fields, the soil types involved, irrigation practices, whether irrigation is likely to be curtailed during dry years or during certain crop rotations, and other relevant factors. The hydrologic connectivity of perennial surface water sources cannot be assessed without specific knowledge of the water source, topography and soil conditions. In summary, the adequacy of generic buffer zones to assure GDE access to surface water is unsubstantiated.
    - No information is provided regarding the species residing in the GDEs, their sensitivity to groundwater level declines, or the extent of their reliance on groundwater vs. the proposed "alternate water supplies."
    - There is no evidence of consultation with the regulatory agencies responsible for the protection and management of these resources in the establishment of the proposed framework. It does not appear that any habitat assessments have been conducted.
    - Ecosystems often rely both on groundwater and surface water to meet their water needs (see Best Management Practice #3 in Attachment C of this letter). The availability of "alternate water supplies" to provide some portion of a GDE's water demand does not mean all of its water needs can be met through alternate supplies (i.e., without reliance on groundwater).
    - Groundwater pumping depletes ISWs under both gaining or losing conditions, and GDEs may rely on the interactions of surface water to meet their water requirements.

Simply put, the approach proposes to manage GDEs without consideration to understanding the nature and needs of the resource being managed. A strictly binary approach, designating all NCCAGs as either 100 percent reliant on groundwater or 100 percent reliant on alternate water supplies is inconsistent with the available science and is not supportable. A scientific rationale for removing areas with access to assumed alternate water sources has not been provided. The deleted potential GDEs should be retained in the GSP and managed as potential GDEs. If further study and consultation with the appropriate regulatory agencies indicates that some areas would not be affected by groundwater withdrawals, consideration could be given to removing them at that time.

- We have the following additional comments regarding the potential use of buffer zones to exclude NC-Dataset polygons from further consideration as GDEs:
  - In the case of managed wetlands, the water sources used by the managed wetlands, the type of managed wetlands, the relationship of the wetlands to groundwater, and the wetland manager should be specified. In addition, these managed wetlands should be identified in Section 1.3.1.
  - Please refer to Attachment C of this letter for best practices in using groundwater data to verify whether NCCAGs are GDEs. The GSP identifies monitoring data for shallow groundwater near ISWs as a data gap. Please discuss what temporal and spatial data were **used to identify "shallow groundwa**ter**,"** and identify any data gaps.
  - A scientifically defensible rationale and data for applying the proposed buffer zones used to remove NCCAGs areas proximal to alternate water sources from consideration as GDEs has not been provided. In the absence of specific information regarding groundwater levels near these features, which is identified as a data gap in the GSP, it is possible that they are connected to a shallow groundwater table, at least seasonally. This is true of both gaining and losing reaches. Such a connection means they meet the definition of a GDE, regardless of whether the groundwater is replenished by a surface water source (see Best Management Practice #3 in Attachment C of this letter). In addition, the extent of groundwater reliance, and the ability of species to adapt to seasonal and long-term changes in hydrologic conditions, varies from species to species. We acknowledge that proximity to surface water sources and establishment of buffer zones may be an important consideration in GDE management; however, groundwater extraction can still result in drawdown near these areas, especially at the outer fringes of GDEs that are more vulnerable to drawdown. Buffer zones, if used, must be supported by actual hydrologic and habitat assessment data. If such data and assessments are not available, the areas should not be deleted from consideration and management as GDEs. The need for

supporting studies to validate the approach may be identified as a data gap and undertaken in the future.

- The "stakeholder feedback" mechanism for removal of NCCAGs from consideration as GDEs is not explained or documented in the GSP. Please provide details that support removing potential GDEs based on stakeholder feedback. Stakeholder feedback, in the absence of scientifically supportable data and/or agency consultation, may be insufficient to exclude areas from consideration as GDEs.
-

- We have the following comments about the proposed use of a 30-foot depth to water criterion to exclude NC-Dataset polygons from further consideration as GDEs:
  - SGMA defines GDEs as "ecological communities and species that depend on *groundwater emerging from aquifers or on groundwater occurring near the ground surface*". We recommend that depth to groundwater contour maps are used, where they can be reliably substantiated, to verify whether a connection to groundwater exists for polygons in the NC Dataset. This is preferable to relying on inferences based on the presence of surface water features in the Basin. However, it is important to note that where depth to water is uncertain in proximity to streams, a depth to water criterion for assessing which polygons are GDEs is inappropriate. Please refer to Appendix C of this letter for best practices for using groundwater data to verify a connection to groundwater.
  - Please provide more details on how depth to groundwater contour maps were developed:
    - Are the wells used for interpolating depth to groundwater sufficiently close (<5km) to NC Dataset polygons to reflect local conditions relevant to ecosystems?
    - Are the wells used for interpolating depth to groundwater screened within the surficial unconfined aquifer and capable of measuring the true water table?
    - Is depth to groundwater contoured using groundwater elevations at monitoring wells to get groundwater elevation contours across the landscape? This layer can then be subtracted from land surface elevations from a Digital Elevation Model (DEM)[3] to estimate depth-to-groundwater contours across the landscape. This will provide much more accurate contours of depth-to-groundwater along streams and other land surface depressions where GDEs are commonly found. Depth to groundwater contours developed from depth to groundwater measurements

[3] USGS Digital Elevation Model data products are described at: https://www.usgs.gov/core-science-systems/ngp/3dep/about-3dep-products-services and can be downloaded at: https://iewer.nationalmap.gov/basic/

at wells assumes that the land surface is constant, which is a poor assumption to make. It is better to assume that water surface elevations are constant in between wells, and then calculate depth to groundwater using a DEM of the land surface to contour depth to groundwater.

- The 30-foot depth to water criterion used to exclude riparian areas near streams east of the San Joaquin River from further consideration as GDEs is very broadly applied and poorly supported. Based on our understanding of the regional hydrogeology, we would expect riparian vegetation and wetlands near the major surface drainages to be connected to water tables associated with the regional aquifer system from a point where the streams exit the foothill uplands westward, except in areas of significant, pumping-induced drawdown. Shallow groundwater data near streams are identified as a significant data gap, and the available groundwater level data come from wells screened at a variety of depths. The application of a 30-foot depth to water criterion is inadequately supported in light of the identified data gaps, and should not be used exclude potential GDEs from further consideration without additional study.
- While depth to groundwater levels within 30 feet are generally accepted as being a proxy for confirming that polygons in the NC dataset are connected to groundwater, the variable needs of plant species and their dependence on seasonal and inter-annual groundwater level fluctuations should be considered when applying this criterion. The GSP cites a maximum rooting depth of 25 feet for oak trees as a basis for the 30-foot criterion, yet studies have found the roots of oaks can extend deeper than 70 feet to extract water from the capillary fringe immediately above the water table during the summer and fall, and that groundwater reserves provide a buffer to rapid changes in their hydroclimate, as long as groundwater reserves are not depleted by drought or human consumption.[4] It is highly advised that seasonal and interannual fluctuations in the groundwater regime are taken into consideration. Utilizing groundwater data from one point in time or contoured with too few shallow monitoring wells can misrepresent groundwater levels required by GDEs, and inadvertently result in adverse impacts to the GDEs. Based on a study we recently submitted to Frontiers in Environmental Science Journal, we've observed riparian forests along the Cosumnes River to experience a range in groundwater levels between 1.5 and 75 feet over seasonal and interannual timescales. Seasonal fluctuations in the regional water table can support perched groundwater near an intermittent river that seasonally runs dry due to large seasonal fluctuations in the regional water table. While perched groundwater itself cannot directly be

[4] *Miller and others. 2009. Groundwater Uptake by Woody Vegetation in a Semi-Arid Oak Savannah. Water Resources Research. Volume 46. November.*

managed due to its position in the vadose zone, the water table position within the regional aquifer (via pumping rate restrictions, restricted pumping at certain depths, restricted pumping around GDEs, well density rules) and its interactions with surface water (e.g., timing and duration) can be managed to prevent adverse impacts to ecosystems due to changes in groundwater quality and quantity under SGMA.

- Very little description is provided regarding the nature and function of the identified GDEs, their potential sensitivity to groundwater and surface water supply changes, their relative habitat value, or the current and historical groundwater conditions and variability near the GDEs. Given that monitoring of groundwater levels near ISWs has been identified as a data gap and limited resources are available to expand monitoring efforts in these areas, additional assessment would be helpful to identify and prioritize potential data gaps. We recommend that a discussion regarding the nature and characteristics of the identified GDEs be included.

Checklist Items 21 and 22 – Water Budget (23 CCR §354.18)

- [Section 2.3.5 Water Budget Estimates (pp. 2-115 to 2-133)] The following items related to GDEs, wetlands and riparian areas should be clarified or considered:
    - "Riparian intake from streams" is identified as a stream system water budget component and is defined as the portion of riparian evapotranspiration (ET) met by streamflows. Please include an explanation of the approach to determining the amount of riparian ET demand met by streamflow vs. groundwater evapotranspiration.
    - Groundwater outflow to ET does not appear to be identified as a groundwater budget component (for example see Figure 2-74, p. 2-125). In addition, the ET demand of natural vegetation does not appear to be considered in water supply and demand calculations (for example see Table 2-16, p. 2-126). Since GDEs (including wetlands,riparian vegetation, phreatophytes and other communities) are recognized as beneficial users of groundwater in the Subbasin, it is appropriate to include them in these calculations.

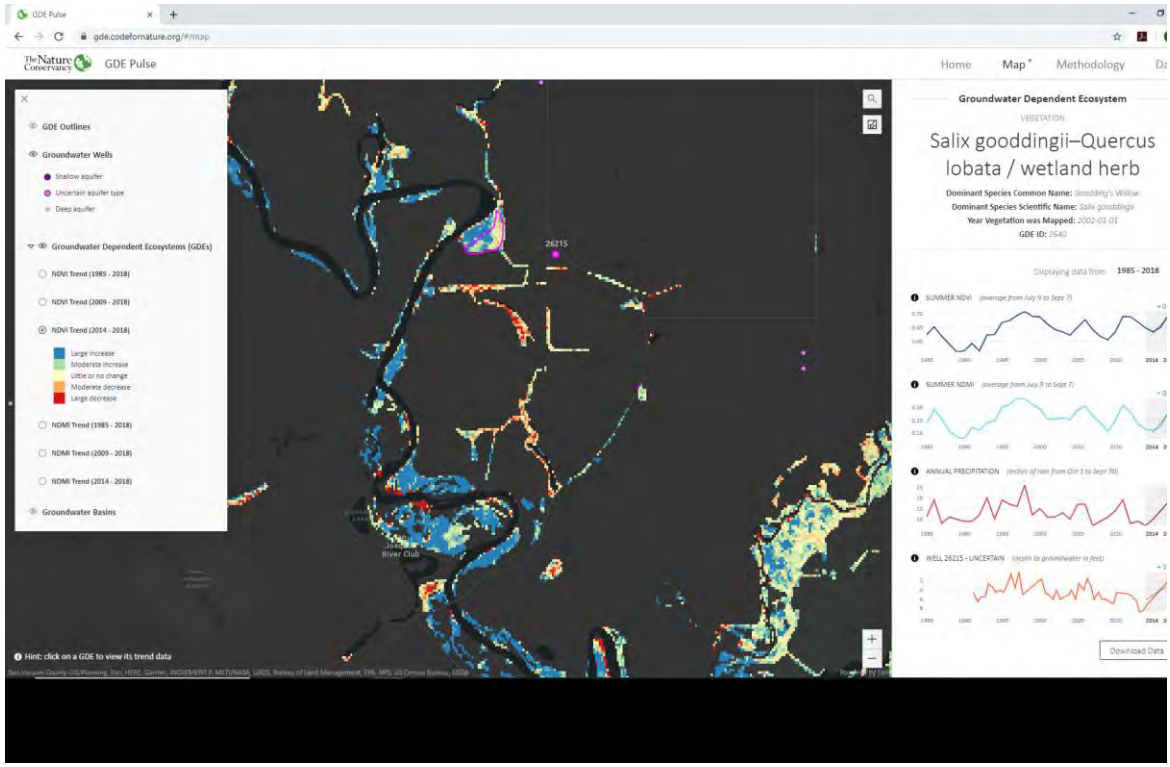
Checklist Items 23 and 25 – Sustainability Goal (23 CCR §354.24)

- [Section 3.1 Sustainability Goal (p. 3-1)] The Sustainability Goal is defined as being " … to maintain an economically-viable groundwater resource for the beneficial use of the people of the Eastern San Joaquin Subbasin … ." Since GDEs, are recognized as beneficial users of groundwater in the Subbasin, they should be mentioned in the Sustainability Goal.

<u>Checklist Item 26 – Measurable Objectives (23 CCR §354.30</u>) and Checklist Items 30 to 33 – Undesirable Results (<u>23 CCR §354.26)</u>

- [Section 3.2.1.1.1 Description of Undesirable Results (for chronic lowering of groundwater levels (p. 3-3)] This section only describes undesirable results relating to human beneficial uses of groundwater and neglects environmental beneficial uses that could be adversely affected by chronic groundwater level decline. On page 3-5 in Section 3.2.1.2, impacts to GDEs are correctly identified as an undesirable result potentially associated with chronic groundwater level decline. Please add **"potential adverse** impacts to GDEs" to the list of potential undesirable results presented in Section 3.2.1.1.1.
- [Section 3.2.3.1.1 Description of Undesirable Results (for degraded water quality (p. 3-11)] This section only describes undesirable results in terms of total dissolved solids concentrations and related impacts. The section should be modified to state that overpumping and dewatering of aquitards has been identified as a potential source of elevated arsenic concentrations above drinking water standards in San Joaquin Valley aquifers. The following is a link to a paper by Smith, Knight and Fendorf (2018) titled "Overpumping leads to California groundwater arsenic threat": (https://www.nature.com/articles/s41467-018-04475-3).
- [Section 3.2.6.1.1 Description of Undesirable Results (for ISWs (p. 3-11)] This section states that undesirable results related to surface water depletion were defined and evaluated only for major streams and rivers including the Calaveras River, Dry Creek, Mokelumne River, San Joaquin River, and Stanislaus River. The section goes on to state that many of the smaller creeks and streams are solely used for the conveyance of irrigation water and these systems have not been considered in the analysis of depletions. Contrary to these statements, surface water resources in these creeks support significant recognized aquatic habitat, wetlands and riparian zones that represent potential environmental beneficial uses and users of groundwater. A number of these streams are associated with designated protected lands. The analysis for potential depletion of ISWs in Section 3.2.6 should include all beneficial users of surface water that could be affected by groundwater withdrawals, including environmental beneficial users along creeks, even if the creeks are interconnected less than 75% of the time.
- [Section 3.2.6.1.2 Identification of Undesirable Results (for ISWs (p. 3-12)] The section states that "undesirable results would occur if groundwater extractions depleted interconnected streams and there was not sufficient surface water to supply … fish and wildlife demands." This definition of undesirable results is overly narrow and recognizes only a limited subset of the environmental beneficial users of ISWs. A more complete definition would be that undesirable results would occur if groundwater extraction resulted in a depletion of surface water that caused significant impacts to aquatic species or wildlife, or degradation of GDEs. Please expand the definition of undesirable results to include all of the environmental beneficial uses and users of ISWs, and expand the analysis in Section 3.2.6, as appropriate.
- [Section 3.2.6.1.3 Potential Effects of Undesirable Results (for ISWs (p. 3-12)] The potential effects of undesirable results on environmental beneficial users are not described. Please expand the section to describe the potential effects of

undesirable results on all beneficial uses and users of ISWs, including environmental uses and users.

- The GDE Pulse web application developed by The Nature Conservancy provides easy access to 35 years of satellite data to view trends of vegetation metrics, groundwater depth (where available), and precipitation data. This satellite imagery can be used to observe trends for NC dataset polygons within the Subbasin. Over the past 10 years (2009-2018), some NC dataset vegetation polygons have experienced adverse impacts to vegetation growth and moisture in the western portion of the Subbasin. An example screen shot from the GDE Pulse tool is presented below. Please review these spatial patterns and, where possible, correlate them with water level trends. Any indications of adverse trends and any data gaps should be identified.
- 

Checklist Items 27 to 29 – Minimum Thresholds (23 CCR §354.28).

- [Section 3.2.6.2 Minimum Thresholds (for ISWs (pp. 3-19 and 3-20)] The GSP proposes to use the Minimum Thresholds and Measurable Objectives associated with Chronic Decline in Groundwater Levels as a proxy for management of depletion of ISWs, and concludes that these criteria will be protective of the depletion of ISWs and prevent significant and unreasonable impacts to beneficial surface water uses and users. This conclusion is not adequately supported by data and/or consultation with the agencies that are responsible for the regulation of GDE habitats. We have the following comments:
    - The section states that current or historical issues associated with depletion of ISWs were not indicated to be significant and unreasonable based on discussions at GWA Board, Advisory Committee, and Workgroup meetings and

through input from GSA staff, and that it was therefore assumed that historical conditions are protective of beneficial uses. It does not appear that any consultation occurred with the Federal, State and local agencies responsible for management and regulation of environmental beneficial uses of ISWs, or with the private parties, agencies and NGOs involved in managing the protected lands listed in our response to Section 1.3.1. In addition, no reference is made to the review of supporting documents for General Plan Conservation or Land Use Elements, or to the review of environmental management studies and documents such as Biological Assessments, Biological Opinions, HCPs or other studies regarding the current and historical conditions of the beneficial uses being evaluated. Please provide a more thorough explanation of the basis for the assumption that current and historical groundwater level conditions are protective of beneficial uses related to ISWs. Data gaps should be acknowledged.

- The GDE Pulse web application developed by The Nature Conservancy provides easy access to 35 years of satellite data to view trends of vegetation metrics, groundwater depth (where available), and precipitation data. This satellite imagery can be used to observe trends for NC dataset polygons within the Subbasin. Over the past 10 years (2009-2018), some NC dataset vegetation polygons have experienced adverse impacts to vegetation growth and moisture in the western portion of the Subbasin. Please review these spatial patterns and, where possible, correlate them with water level trends. Any indications of adverse trends and any data gaps should be identified.
- The section discusses future use scenarios, associated groundwater level declines and ISW depletions on a broad level. The potential effects of these declines on environmental beneficial uses, including GDEs, are not discussed. In addition to discussion of potential adverse effects at a general level, a conclusion that significant adverse impacts are unlikely generally requires more site- and resource-specific analysis. Please include a discussion of the potential for adverse effects of surface water depletions on environmental resources, as well as a reasoned analysis of the likelihood of their occurrence under future scenarios. The lack of site-specific data to draw conclusions about specific environmental beneficial users should be recognized as a data gap.
- Please expand the analysis of potential undesirable results to include all environmental beneficial uses and users, including those associated with more local streams and creeks.
- The statement that an additional depletion of the surface water due to groundwater pumping of 50,000 acre-feet per year is not significant and unreasonable needs to be further analyzed. The conclusion is based on analyzing the estimated depletion as a percentage of total surface water discharge. The significance of such a depletion relative to specific beneficial uses and users will depend on its distribution throughout the surface water system. Even a modest amount of depletion may have a significant local adverse effect. The limitations of broad conclusions regarding basin-

wide surface water flow depletions should be recognized and any data gaps identified.

Checklist Items 47, 48 and 49 – Monitoring Network (23 CCR §354.34)

- [Section 4.1 Monitoring Network for Chronic Groundwater Level Decline (pp. 4-1 to 4-8) and Section 4.6 Monitoring Network for Depletion of Interconnected Surface Water (p. 4-14)] The GSP proposes to use groundwater level monitoring for chronic groundwater level decline as a surrogate for monitoring the depletion of ISWs. We have the following comments.
    - The areas identified as potential GDEs in the GSP are located near the western boundary of the Subbasin. Only one of the representative monitoring wells appears to be located near those areas (Figure 4-1 on p. 4-5). Very few of the remaining monitoring wells are located near potential ISWs and GDEs. Specific monitoring should be described to further evaluate, monitor, manage and protect areas with ISWs and GDEs.
    - Per the GSP Regulations (23 CCR §354.34 (a) and (b)), monitoring must address trends in groundwater *and related surface conditions* (emphasis added). Groundwater level monitoring alone may be insufficient to establish a linkage between groundwater extraction and potentially resulting impacts to environmental resources associated with GDEs and ISWs. The cause-effect relationship between groundwater levels and the biological responses that could result in significant and unreasonable impacts to ISWs and GDEs depends on a number of complicated factors, and this relationship is not characterized or discussed. As such, it is not possible to determine whether the proposed monitoring, minimum thresholds and measurable objectives are sufficiently protective to ensure significant and unreasonable impacts to GDEs and ISWs will be prevented. The GDE Pulse interactive mapping application provides an example of a linkage between groundwater level data and GDE health that could be used to incorporate remote sensing into an efficient and incisive monitoring program. Please provide an explanation how groundwater levels will specifically be used to assess adverse impacts to GDEs and ISWs, and identify any data gaps and how they will be addressed.
- [Section 4.7 Data Gaps (pp. 4-14 to 4-17)] Twelve new monitoring wells are proposed to measure groundwater levels and quality in critical areas where data are sparse. These include increased coverage near streams, Subbasin boundaries, and in the central area of groundwater depression. We have the following comments.
    - Locations should be prioritized near high value or sensitive resources that are vulnerable to significant and unreasonable impacts, such as near the protected lands identified in our comments on Section 1.3.1 or the GDEs identified in the Subbasin. In addition to the major streams and rivers in the subbasin, impacts to smaller creeks and wetland areas should be considered, as these may be the most vulnerable resources. Please discuss the results of a resource assessment or consultations with resource managers that demonstrates a sufficient number of wells is proposed to address data gaps near GDEs and ISWs, and that they are being sited where

they will provide the most benefit. Alternatively, please outline the process by which this will be accomplished.
    - As discussed in our comments above, please address how the need to link and correlate groundwater level declines to biological responses, and significant and adverse impacts to GDEs and ISWs will be addressed.
    - Well sites near ISWs should be selected at varying distances from streams and completed as vertically-nested clusters to capture the lateral and vertical gradients between the pumped depths in the aquifer system and the shallow groundwater aquifers that are in communication with ISWs or GDEs. There is a need to enhance monitoring of stream flow and vertical groundwater gradients by installing more stream gauges and clustered/nested wells near streams, rivers or wetlands. Ideally, co-locating stream gauges with clustered wells would enhance understanding about where ISWs exist in the basin and whether pumping is causing depletions of surface water or impacts on beneficial users of surface water and groundwater.
    - Addressing data gaps is typically iterative and it is not reasonable to expect it will be a one-time process. Please describe the process by which data gaps will be identified and addressed on an ongoing basis.
- [Section 5.3 Data Included in the Management System (pp. 5-6 to 5-8)] Table 5.3 indicates that data regarding streamflow and GDEs is not currently included in the proposed Data Management System. Per the GSP Regulations (23 CCR §354.34 (a) and (b)), monitoring must address trends in groundwater *and related surface conditions* (emphasis added). You cannot manage what you do not measure. **Please discuss which monitoring data for "related surface conditions" will** be gathered and incorporated in the DMS to assess potential significant and unreasonable impacts to environmental beneficial uses and users.
- [Section 7.3.1 Monitoring (p. 7-5)] This section lists the key components involved in implementation of the monitoring network. Groundwater levels and monitoring will occur semi-annually, but no other information is given. Section 6.3 states that "additional management activities are discussed in Chapter 7: Plan Implementation", and would include monitoring groundwater use through use of satellite imagery. However, Chapter 7 does not discuss using imagery or any remote sensing, which is a great tool for monitoring ecosystem health of GDEs and ISWs. Please clarify the potential use of imagery as a monitoring tool, and expand it to monitoring surface indicators of ISW and GDE ecosystem health.
- [Section 7.3.2.2 Basin Conditions (pp. 7-5 and 7-6)] This section describes what current groundwater conditions and monitoring results will be included in the annual monitoring report. Please specifically address ecosystem health of GDEs and ISWs as a surface indictor to subsurface conditions. This can be done using GDE Pulse, remote sensing, imagery or other feasible methods.

Checklist Items 50 and 51 – Project and Management Actions (23 CCR §354.44)

- [Section 6.2.1 Project Identification (p. 6-1)] The Subbasin includes many GDEs and ISWs which represent beneficial uses and users of groundwater, and which include potentially sensitive resources and protected lands. Environmental resource

protection needs should be considered in establishing project priorities. In addition, consistent with existing grant and funding guidelines for SGMA-related work, priority should be given to multi-benefit projects that can address water quantity as well as providing environmental benefits or benefits to disadvantaged communities. Please include environmental benefits and multiple benefits as criteria for assessing project priorities.

- Table 6-1 (pp. 6-2 to 6-7) lists potential projects and the Measurable Objective that is expected to benefit. Only water level benefits are listed, but maintenance or recovery of groundwater levels, or construction of recharge facilities, also will have environmental benefits in many cases. From the table, it is not possible to distinguish the full range of project benefits or how the projects will be prioritized. It would be advantageous to demonstrate multiple benefits from a funding and prioritization perspective.
- [Section 6.2.4 Planned Projects (pp. 6-8 to 6-33)]
    - For the projects already identified, please consider stating how ISWs and GDEs will benefit or be protected, or what other environmental benefits will accrue.
    - If ISWs will not be adequately protected by those listed, please include and describe additional management actions and projects targeted for protecting ISWs.
    - Recharge ponds, reservoirs and facilities for managed stormwater recharge can be designed to include elements that act functionally as wetlands and provide a benefit for wildlife and aquatic species. In some cases, such facilities have been incorporated into local HCPs, more fully recognizing the value of the habitat that they provide and the species they support. For projects that will be constructing recharge ponds, please consider identifying if there will be habitat value incorporated into the design and how the recharge ponds will be managed to benefit environmental users.
    - Specific examples of how project descriptions may be refined to incorporate environmental benefits include the following:
        - Project 21: Winery Recycled Water will recycle winery wastewater and reuse it for irrigation and in-lieu recharge, or the water will be put into ponds. Please consider identifying what proportion of water will be put into ponds for direct recharge that could also provide a benefit for wildlife and aquatic species.
        - Project 23: SSJID Stormwater Reuse will capture stormwater for reuse and recharge. Project 18: Farmington Dam Repurpose Project proposes to more than double storage in Farmington Basin for water supply. Please consider assessing ways in which these projects could also provide enhanced wildlife and aquatic species benefits.
        - For examples of case studies on how to incorporate environmental benefits into groundwater projects, please visit our website: https://groundwaterresourcehub.org/case-studies/recharge-case-studies/
- [Section 6.3 Management Actions (p. 6-34)] This section lists only administrative actions the GSA will undertake to implement the GSP, and does not identify the management actions to be taken if to assure SGMA compliance if monitoring data

indicate that measurable objectives or interim milestones are not being achieved. An adaptive management approach, where monitoring data are used to assess results and inform refinement of the management approach is typically specified. Please identify what management actions will be taken if monitoring data indicate that Measurable Objectives or Interim Milestones are not being achieved, or undesirable results are imminent.

Eastern San Joaquin Subbasin GSP Public Draft
Summary of Public Comments and Responses

Comment #	Commenter	Commenter Organization	Page Number	Section, Figure, or Table Number	Sentence Starts with, "...	Comment
Attachment A (see comment letter)	Sandi Matsumoto	The Nature Conservancy	N/A	N/A	N/A	Considering Nature under SGMA: A Checklist "Environmental User Checklist"
Attachment B (see comment letter)	Sandi Matsumoto	The Nature Conservancy	N/A	N/A	N/A	This attachment (also detailed below) summarizes our comments on the complete public draft GSP dated July 2019, and includes any initial review comments from our May 31, 2019 that have not yet been addressed.
1	Sandi Matsumoto	The Nature Conservancy	pp. 1-40	Section 1.3.1	N/A	Caswell Memorial State Park is incorrectly referred to as being located outside the Eastern San Joaquin Subbasin. The following additional protected lands are located near surface waters within the Subbasin that may be interconnected with groundwater, and/or may rely at least partly on groundwater to support vegetation and sensitive natural communities. These protected lands represent potential beneficial users of groundwater: Durham Ferry State Recreational Area, a small portion (approximately 200 acres) of San Joaquin River National Wildlife Refuge, Army Corps Park, Vernalis Riparian Habitat (Public Conservation Lands), Seegers Preserve, Cabral Island Preserve, Machado Preserve, Hansen Preserve, Micke Grove Park and Zoo, Oak Grove Regional Park, Nakagawa Preserve, El Rio Farms Preserve, Lodi Lake Nature Area, Woodbridge Regional Park, Woodbridge Ecological Preserve, White Slough WA, Nuss Farms, Beck Preserve, Hilder Preserve, Staten Island Ranch, Burchel Preserve, and Ishizuka Preserve. The authors referred to the San Joaquin County General Plan documents, including background reports, for information regarding these important resources. These potential beneficial groundwater users should be described in the text on pp. 1-18 and shown in Figure 1-11. Please include a description recognizing all of the protected areas in the Subbasin and their beneficial groundwater uses. Section 2.2.8 includes a geospatial analysis that removes managed wetlands from consideration as GDEs. The managed wetlands in the Subbasin should be identified in this section.
2	Sandi Matsumoto	The Nature Conservancy	pp. 1-10 to 1-21	Section 1.2.1	N/A	Critical habitat is known to exist for protected aquatic species, such as California Tiger Salamander, Steelhead, Delta Smelt, Giant Gartersnake and California Red-Legged Frog in and around the Subbasin (https://fws.maps.arcgis.com/home/webmap/viewer.html?webmap=9d8de5e265ad4fe09893cf75b8dbfb77). There are likely ongoing monitoring programs associated with critical habitat areas and the protected lands. **Please include a description of these habitat areas, and associated programs and requirements pertinent to ISWs, GDEs and wetlands. Identify areas where critical habitat exists and overlaps with ISWs and GDEs.**
3	Sandi Matsumoto	The Nature Conservancy	pp. 1-21 to 1-32	Section 1.2.2	N/A	Per the GSP Regulations (23 CCR §354.34 (a) and (b)), monitoring must address trends in groundwater *and related surface conditions* (emphasis added). In order for this section to provide the appropriate context and help assure integration of GSP implementation with other ongoing regulatory programs, this section should describe the following: o Monitoring activities and responsibilities by State, Federal and local agencies and jurisdictions related to aquatic resources and GDEs that could be affected by groundwater withdrawals should be discussed. Section 1.2.2.6 states that there are no agencies that do monitoring specific to surface-groundwater interconnection. While this may be technically correct insofar as it relates to hydrogeologic monitoring, it ignores ongoing monitoring programs related to the state of aquatic resources and GDEs that could be affected by groundwater withdrawals, and that are a direct indicator of potential undesirable results. For example, there are likely ongoing monitoring programs associated with the protected lands listed in our comments to Section 1.3.1, and other open space or preserve areas that may be monitored by public, private or nonprofit entities. A discussion of monitoring programs related to GDEs and ISWs should be included. o The lack of existing hydrologic monitoring of surface-groundwater interconnection is a significant data gap as it relates to classification and management of GDEs and should be identified as such and further discussed and addressed in the appropriate subsequent sections of the GSP. o Monitoring activities and responsibilities related to instream flow and water quality requirements under applicable Federal Energy Regulatory Commission licenses, Biological Opinions and other regulations or programs are relevant and should be identified. Please include a discussion of water flow and quality monitoring requirements pertinent to ISWs.

Comment #	Commenter	Commenter Organization	Page Number	Section, Figure, or Table Number	Sentence Starts with, "...	Comment
4	Sandi Matsumoto	The Nature Conservancy	pp. 1-33 to 1-36 and Appendix 1-E)	Section 1.2.3	N/A	This section should include a discussion of General Plan goals and policies related to the protection and management of GDEs and aquatic resources that could be affected by groundwater withdrawals, rather than being limited to goals and policies directly related to groundwater resources alone. Section 1.3.1 correctly identifies environmental uses of groundwater as including "…species and habitat reliant on instream flows, as well as wetlands and GDEs," and yet Section 1.2.3 and Appendix 1-E do not identify any General Plan policies related to these resources. Section 1.2.3 should identify if there are any Habitat Conservation Plans (HCPs) or Natural Community Conservation Plans (NCCPs) within the Subbasin and if they are associated with critical, GDE and/or ISW habitats. Appendix 1-E should identify General Plan policies related to wetlands, riparian habitat, streams, aquatic habitat, and related threatened and endangered species. Section 1.2.3.2 should include a discussion of the relationship of GSP implementation to General Plan goals and policies related to GDEs and aquatic habitat; and also address how GSP implementation will coordinate with the goals of any HCPs or NCCPs.
5	Sandi Matsumoto	The Nature Conservancy	pp. 1-36 to 1-38	Section 1.2.3.4	N/A	This section should include a discussion of the following: o Future well permitting must be coordinated with the GSP to assure achievement of the Plan's sustainability goals. o The State Third Appellate District recently found that Counties have a responsibility to consider the potential impacts of groundwater withdrawals on public trust resources when permitting new wells near streams with public trust uses (ELF v. SWRCB and Siskiyou County, No. C083239). The need for well permitting programs to comply with this requirement should be stated. o Section 2.3.3.3 discusses potential exemptions from the Stanislaus County Groundwater Ordinance but does not mention the fact that applicants who are not exempt are required to provide substantial evidence that their proposed extraction will not result in undesirable results, including significant and unreasonable impacts to GDEs and surface waters.
6	Sandi Matsumoto	The Nature Conservancy	pp. 2-35 to 2-37	Section 2.1.7	N/A	Please clearly state whether localized perched aquifers are present in the basin. Include example near-surface cross section details that depict the conceptual understanding of shallow groundwater and stream interactions at different locations, including perched and regional aquifers.
7	Sandi Matsumoto	The Nature Conservancy	p. 2-39	Section 2.1.8.2	N/A	The Bottom of the Basin Boundary was defined by the base of freshwater, which was mapped 45 years ago and pumping since then has very likely resulted in shift in the isohaline contouring in the basin. Defining the bottom of the Subbasin based on geochemical properties is a suitable approach for defining the base of freshwater, however, as noted on page 9 of DWR's Hydrogeologic Conceptual Model BMP (https://water.ca.gov/LegacyFiles/groundwater/sgm/pdfs/BMP_HCM_Final_2016-12-23.pdf) "the definable bottom of the basin should be at least as deep as the deepest groundwater extractions". Thus, groundwater extraction well depth data should also be included in the determination of the basin bottom. This will prevent the possibility of extractors with wells deeper than the basin boundary from claiming exemption of SGMA due to their well residing outside the vertical extent of the basin boundary. Also, pumping saline groundwater and desalinating it will become increasingly economical under SGMA due to pumping restrictions in the basin.
8	Sandi Matsumoto	The Nature Conservancy	pp. 2-56 and 2-57	Section 2.1.10	N/A	The Hydrologic Conceptual Model identified several data gaps including the following for groundwater level data: o Depth- or zone-specific water levels to assess vertical interconnection, including zones within the Principal Aquifer. Nested monitoring wells would be helpful near surface water to show how pumping is impacting surface water flows and GDEs. o Additional shallow groundwater data near surface waters and NCCAGs. o Additional groundwater level data in the east and northwest areas of the Subbasin. o Additional groundwater level data near the Mokelumne River to improve quantification and understanding of subsurface flows. Of these, the second data gap is the information that is most critical to identifying GDEs or potential GDEs and understanding their characteristics.
9	Sandi Matsumoto	The Nature Conservancy	pp. 2-9 to 2-14	Section 2.1.4.2	N/A	This section should discuss (or reference the sections discussing) the following: o Specific ISWs, including the extent of both gaining and losing reaches. o In-stream flow requirements in each of the interconnected rivers/streams including the amount, time of year when the flow minimum is specified, the duration, the freshwater fish species for which it applies, associated permits that set forth the requirements, and the regulating agency setting forth the compliance requirements. o Areas of critical habitat that exist within rivers and streams.
10	Sandi Matsumoto	The Nature Conservancy	pp. 2-23 to 2-27	Section 2.1.5	N/A	Table 2-2 states that Holocene Stream Channel Deposits are generally not saturated except by the San Joaquin River. Based on the available data, it would be expected that the stream channel deposits associated with the other ISWs in the Subbasin would be saturated near those streams and rivers.
11	Sandi Matsumoto	The Nature Conservancy	p. 2-49	Section 2.1.9.2.2	N/A	This section focuses on groundwater flow direction and defers further discussion of groundwater conditions to Section 2.2, which does not provide information on historical groundwater-surface water interaction. **This section should include a discussion of historic groundwater-surface water interaction.**

Comment #	Commenter	Commenter Organization	Page Number	Section, Figure, or Table Number	Sentence Starts with, "...	Comment
12	Sandi Matsumoto	The Nature Conservancy	pp. 2-97 to 2-99	Section 2.2.6	N/A	o The determination as to whether or not a stream reach is interconnected or disconnected was made based on whether modeling conducted for the GSP indicated that it is interconnected more than 25 percent of the time. Even if the stream is only connected 25% of the time, it is still connected, and that short period of connectivity may be during critical times for select species or provide a cooling or biogeochemical effect during a critical period. **Please describe the technical basis for selecting a 25 percent interconnection threshold, and how it will adequately protect the environmental beneficial uses of surface water in potentially interconnected surface waters from significant and unreasonable impacts related to groundwater extraction.** o Shallow groundwater monitoring data near surface waters and NCCAGs are identified as a data gap in Section 2.1.10, and the use of the Eastern San Joaquin Water Resources Model (ESJWRM) to determine the percentage of time that stream reaches are groundwater connected entails inherent uncertainty. The potential presence of shallow or perched aquifers near the rivers is not assessed or discussed in the GSP. Groundwater modeling conducted by the United States Geological Survey (USGS), DWR and others (e.g., JJ&A, 2018) has considered some river reaches shown as disconnected in Figure 2-66 (pp. 2-99) to be groundwater-connected. No data or discussion is presented regarding the potential groundwater connection of other streams associated with significant wetland and riparian resources, including Pixley Slough, Mormon Slough, Littlejohns Creek, Bear Creek, Potter Creek, Duck Creek and Lone Tree Creek. As such, there is considerable uncertainty regarding the designation of interconnected and disconnected surface water resources in Figure 2-66. The uncertainty regarding the groundwater interconnection of streams in the Subbasin should be identified as a data gap.
13	Sandi Matsumoto	The Nature Conservancy	p. 2-100	Section 2.2.7	N/A	This section includes the incorrect statement that SGMA does not require sustainable management criteria to be established for the management of GDEs. Section 1.3.1 of the GSP states that beneficial users of groundwater and ISWs include "environmental users of groundwater, including species and habitat reliant on instream flows, as well as wetlands and GDEs." Undesirable results under SGMA include chronic lowering of groundwater levels resulting in significant and unreasonable depletion of supply for beneficial groundwater users, including GDEs. Undesirable results also include depletion of ISWs resulting in significant and unreasonable adverse impacts on beneficial users of surface water, including wetlands and GDEs. The incorrect statement that SGMA does not require the establishment of sustainable management criteria for GDEs should be removed.

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14	Sandi Matsumoto	The Nature Conservancy	p. 2-100 to 2-106	Section 2.2.8	N/A	The GSP relies on the NCCAG database developed by TNC for the DWR to identify potential GDEs, and then provides a framework for removing most of these areas from further consideration. It appears that the preliminary desktop analysis documented in the draft GSP resulted an excessive elimination of the NC dataset polygons mapped in the Eastern San Joaquin Subbasin. In particular, the methods used to confirm whether or not polygons in the NC Dataset are connected to groundwater in the Eastern San Joaquin Subbasin are highly flawed. We have the following comments on the proposed approach: oThe GSP takes the approach of removing NCCAGs with "access to alternate water supplies" from consideration as GDEs, and states that in order to be considered GDEs, "there must not be alternate water supplies". Alternate water supplies are assumed to include potential sources of surface water including managed wetlands, irrigated agricultural fields, perennial surface water sources, and other unspecified sources determined by stakeholders on a case-specific basis. This approach is inappropriate and deficient for several important reasons: •There is no hydrologic analysis or empirical data provided as a basis for the proposed buffer zones. The hydrologic connectivity between a GDE and a nearby alternative water source is highly dependent on local conditions and can vary seasonally and by year type. In the case of managed wetlands, no consideration is given to the nature of the wetland and surrounding area, the source and frequency of inundation, the soil types, and other features that would be needed to understand the hydrologic connectivity between the wetland and the surrounding area, or even whether the wetland itself it groundwater dependent for a portion of the year. Similarly, no information is given to the topography and hydrology surrounding irrigated agricultural fields, the soil types involved, irrigation practices, whether irrigation is likely to be curtailed during dry years or during certain crop rotations, and other relevant factors. The hydrologic connectivity of perennial surface water sources cannot be assessed without specific knowledge of the water source, topography and soil conditions. In summary, the adequacy of generic buffer zones to assure GDE access to surface water is unsubstantiated. •No information is provided regarding the species residing in the GDEs, their sensitivity to groundwater level declines, or the extent of their reliance on groundwater vs. the proposed "alternate water supplies." •There is no evidence of consultation with the regulatory agencies responsible for the protection and management of these resources in the establishment of the proposed framework. It does not appear that any habitat assessments have been conducted. •Ecosystems often rely both on groundwater and surface water to meet their water needs (see Best Management Practice #3 in Attachment C of this letter). The availability of "alternate water supplies" to provide some portion of a GDE's water demand does not mean all of its water needs can be met through alternate supplies (i.e., without reliance on groundwater). •Groundwater pumping depletes ISWs under both gaining or losing conditions, and GDEs may rely on the interactions of surface water to meet their water requirements. Simply put, the approach proposes to manage GDEs without consideration to understanding the nature and needs of the resource being managed. A strictly binary approach, designating all NCCAGs as either 100 percent reliant on groundwater or 100 percent reliant on alternate water supplies is inconsistent with
15	Sandi Matsumoto	The Nature Conservancy	pp. 2-115 to 2-133	Section 2.3.5	N/A	The following items related to GDEs, wetlands and riparian areas should be clarified or considered: o"Riparian intake from streams" is identified as a stream system water budget component and is defined as the portion of riparian evapotranspiration (ET) met by streamflows. Please include an explanation of the approach to determining the amount of riparian ET demand met by streamflow vs. groundwater evapotranspiration. oGroundwater outflow to ET does not appear to be identified as a groundwater budget component (for example see Figure 2-74, p. 2-125). In addition, the ET demand of natural vegetation does not appear to be considered in water supply and demand calculations (for example see Table 2-16, p. 2-126). Since GDEs (including wetlands,riparian vegetation, phreatophytes and other communities) are recognized as beneficial users of groundwater in the Subbasin, it is appropriate to include them in these calculations.
16	Sandi Matsumoto	The Nature Conservancy	p. 3-1	Section 3.1	N/A	The Sustainability Goal is defined as being " … to maintain an economically-viable groundwater resource for the beneficial use of the people of the Eastern San Joaquin Subbasin … ." **Since GDEs, are recognized as beneficial users of groundwater in the Subbasin, they should be mentioned in the Sustainability Goal.**
17	Sandi Matsumoto	The Nature Conservancy	p. 3-3	Section 3.2.1.1.1	N/A	This section only describes undesirable results relating to human beneficial uses of groundwater and neglects environmental beneficial uses that could be adversely affected by chronic groundwater level decline. On page 3-5 in Section 3.2.1.2, impacts to GDEs are correctly identified as an undesirable result potentially associated with chronic groundwater level decline. Please add "potential adverse impacts to GDEs" to the list of potential undesirable results presented in Section 3.2.1.1.1.
18	Sandi Matsumoto	The Nature Conservancy	p. 3-11	Section 3.2.3.1.1	Degraded Water Quality	This section only describes undesirable results in terms of total dissolved solids concentrations and related impacts. The section should be modified to state that overpumping and dewatering of aquitards has been identified as a potential source of elevated arsenic concentrations above drinking water standards in San Joaquin Valley aquifers. The following is a link to a paper by Smith, Knight and Fendorf (2018) titled "Overpumping leads to California groundwater arsenic threat": (https://www.nature.com/articles/s41467-018-04475-3).

Comment #	Commenter	Commenter Organization	Page Number	Section, Figure, or Table Number	Sentence Starts with, "…	Comment
19	Sandi Matsumoto	The Nature Conservancy	p. 3-11	Section 3.2.6.1.1	ISWs	This section states that undesirable results related to surface water depletion were defined and evaluated only for major streams and rivers including the Calaveras River, Dry Creek, Mokelumne River, San Joaquin River, and Stanislaus River. The section goes on to state that many of the smaller creeks and streams are solely used for the conveyance of irrigation water and these systems have not been considered in the analysis of depletions. Contrary to these statements, surface water resources in these creeks support significant recognized aquatic habitat, wetlands and riparian zones that represent potential environmental beneficial uses and users of groundwater. A number of these streams are associated with designated protected lands. The analysis for potential depletion of ISWs in Section 3.2.6 should include all beneficial users of surface water that could be affected by groundwater withdrawals, including environmental beneficial users along creeks, even if the creeks are interconnected less than 75% of the time.
20	Sandi Matsumoto	The Nature Conservancy	p. 3-12	Section 3.2.6.1.2	N/A	The section states that "undesirable results would occur if groundwater extractions depleted interconnected streams and there was not sufficient surface water to supply … fish and wildlife demands." This definition of undesirable results is overly narrow and recognizes only a limited subset of the environmental beneficial users of ISWs. A more complete definition would be that undesirable results would occur if groundwater extraction resulted in a depletion of surface water that caused significant impacts to aquatic species or wildlife, or degradation of GDEs. Please expand the definition of undesirable results to include all of the environmental beneficial uses and users of ISWs, and expand the analysis in Section 3.2.6, as appropriate.
21	Sandi Matsumoto	The Nature Conservancy	p. 3-12	Section 3.2.6.1.3	N/A	The potential effects of undesirable results on environmental beneficial users are not described. Please expand the section to describe the potential effects of undesirable results on all beneficial uses and users of ISWs, including environmental uses and users. •The GDE Pulse web application developed by The Nature Conservancy provides easy access to 35 years of satellite data to view trends of vegetation metrics, groundwater depth (where available), and precipitation data. This satellite imagery can be used to observe trends for NC dataset polygons within the Subbasin. Over the past 10 years (2009-2018), some NC dataset vegetation polygons have experienced adverse impacts to vegetation growth and moisture in the western portion of the Subbasin. An example screen shot from the GDE Pulse tool is presented below. Please review these spatial patterns and, where possible, correlate them with water level trends. Any indications of adverse trends and any data gaps should be identified.

Comment #	Commenter	Commenter Organization	Page Number	Section, Figure, or Table Number	Sentence Starts with, "...	Comment
22	Sandi Matsumoto	The Nature Conservancy	pp. 3-19 and 3-20	Section 3.2.6.2	N/A	The GSP proposes to use the Minimum Thresholds and Measurable Objectives associated with Chronic Decline in Groundwater Levels as a proxy for management of depletion of ISWs, and concludes that these criteria will be protective of the depletion of ISWs and prevent significant and unreasonable impacts to beneficial surface water uses and users. This conclusion is not adequately supported by data and/or consultation with the agencies that are responsible for the regulation of GDE habitats. We have the following comments: oThe section states that current or historical issues associated with depletion of ISWs were not indicated to be significant and unreasonable based on discussions at GWA Board, Advisory Committee, and Workgroup meetings and through input from GSA staff, and that it was therefore assumed that historical conditions are protective of beneficial uses. It does not appear that any consultation occurred with the Federal, State and local agencies responsible for management and regulation of environmental beneficial uses of ISWs, or with the private parties, agencies and NGOs involved in managing the protected lands listed in our response to Section 1.3.1. In addition, no reference is made to the review of supporting documents for General Plan Conservation or Land Use Elements, or to the review of environmental management studies and documents such as Biological Assessments, Biological Opinions, HCPs or other studies regarding the current and historical conditions of the beneficial uses being evaluated. Please provide a more thorough explanation of the basis for the assumption that current and historical groundwater level conditions are protective of beneficial uses related to ISWs. Data gaps should be acknowledged. oThe GDE Pulse web application developed by The Nature Conservancy provides easy access to 35 years of satellite data to view trends of vegetation metrics, groundwater depth (where available), and precipitation data. This satellite imagery can be used to observe trends for NC dataset polygons within the Subbasin. Over the past 10 years (2009-2018), some NC dataset vegetation polygons have experienced adverse impacts to vegetation growth and moisture in the western portion of the Subbasin. Please review these spatial patterns and, where possible, correlate them with water level trends. Any indications of adverse trends and any data gaps should be identified. oThe section discusses future use scenarios, associated groundwater level declines and ISW depletions on a broad level. The potential effects of these declines on environmental beneficial uses, including GDEs, are not discussed. In addition to discussion of potential adverse effects at a general level, a conclusion that significant adverse impacts are unlikely generally requires more site- and resource-specific analysis. Please include a discussion of the potential for adverse effects of surface water depletions on environmental resources, as well as a reasoned analysis of the likelihood of their occurrence under future scenarios. The lack of site-specific data to draw conclusions about specific environmental beneficial users should be recognized as a data gap. oPlease expand the analysis of potential undesirable results to include all environmental beneficial uses and users, including those associated with more local streams and creeks. oThe statement that an additional depletion of the surface water due to groundwater pumping of 50,000 acre-feet per year is not significant and unreasonable needs to be further analyzed. The conclusion is based on analyzing the estimated depletion as a percentage of total surface water discharge.
23	Sandi Matsumoto	The Nature Conservancy	pp. 4-1 to 4-8 and p. 4-14	Section 4.1 and Section 4.6	N/A	The GSP proposes to use groundwater level monitoring for chronic groundwater level decline as a surrogate for monitoring the depletion of ISWs. We have the following comments. oThe areas identified as potential GDEs in the GSP are located near the western boundary of the Subbasin. Only one of the representative monitoring wells appears to be located near those areas (Figure 4-1 on p. 4-5). Very few of the remaining monitoring wells are located near potential ISWs and GDEs. Specific monitoring should be described to further evaluate, monitor, manage and protect areas with ISWs and GDEs. oPer the GSP Regulations (23 CCR §354.34 (a) and (b)), monitoring must address trends in groundwater and related surface conditions (emphasis added). Groundwater level monitoring alone may be insufficient to establish a linkage between groundwater extraction and potentially resulting impacts to environmental resources associated with GDEs and ISWs. The cause-effect relationship between groundwater levels and the biological responses that could result in significant and unreasonable impacts to ISWs and GDEs depends on a number of complicated factors, and this relationship is not characterized or discussed. As such, it is not possible to determine whether the proposed monitoring, minimum thresholds and measurable objectives are sufficiently protective to ensure significant and unreasonable impacts to GDEs and ISWs will be prevented. The GDE Pulse interactive mapping application provides an example of a linkage between groundwater level data and GDE health that could be used to incorporate remote sensing into an efficient and incisive monitoring program. Please provide an explanation how groundwater levels will specifically be used to assess adverse impacts to GDEs and ISWs, and identify any data gaps and how they will be addressed.

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24	Sandi Matsumoto	The Nature Conservancy	pp. 4-14 to 4-17	Section 4.7	N/A	Twelve new monitoring wells are proposed to measure groundwater levels and quality in critical areas where data are sparse. These include increased coverage near streams, Subbasin boundaries, and in the central area of groundwater depression. We have the following comments. oLocations should be prioritized near high value or sensitive resources that are vulnerable to significant and unreasonable impacts, such as near the protected lands identified in our comments on Section 1.3.1 or the GDEs identified in the Subbasin. In addition to the major streams and rivers in the subbasin, impacts to smaller creeks and wetland areas should be considered, as these may be the most vulnerable resources. Please discuss the results of a resource assessment or consultations with resource managers that demonstrates a sufficient number of wells is proposed to address data gaps near GDEs and ISWs, and that they are being sited where they will provide the most benefit. Alternatively, please outline the process by which this will be accomplished. oAs discussed in our comments above, please address how the need to link and correlate groundwater level declines to biological responses, and significant and adverse impacts to GDEs and ISWs will be addressed. oWell sites near ISWs should be selected at varying distances from streams and completed as vertically-nested clusters to capture the lateral and vertical gradients between the pumped depths in the aquifer system and the shallow groundwater aquifers that are in communication with ISWs or GDEs. There is a need to enhance monitoring of stream flow and vertical groundwater gradients by installing more stream gauges and clustered/nested wells near streams, rivers or wetlands. Ideally, co-locating stream gauges with clustered wells would enhance understanding about where ISWs exist in the basin and whether pumping is causing depletions of surface water or impacts on beneficial users of surface water and groundwater. oAddressing data gaps is typically iterative and it is not reasonable to expect it will be a one-time process. Please describe the process by which data gaps will be identified and addressed on an ongoing basis.
25	Sandi Matsumoto	The Nature Conservancy	pp. 5-6 to 5-8	Section 5.3, Table 5.3	N/A	Table 5.3 indicates that data regarding streamflow and GDEs is not currently included in the proposed Data Management System. Per the GSP Regulations (23 CCR §354.34 (a) and (b)), monitoring must address trends in groundwater and related surface conditions (emphasis added). You cannot manage what you do not measure. Please discuss which monitoring data for "related surface conditions" will be gathered and incorporated in the DMS to assess potential significant and unreasonable impacts to environmental beneficial uses and users.
26	Sandi Matsumoto	The Nature Conservancy	p. 7-5	Section 7.3.1	N/A	This section lists the key components involved in implementation of the monitoring network. Groundwater levels and monitoring will occur semi-annually, but no other information is given. Section 6.3 states that "additional management activities are discussed in Chapter 7: Plan Implementation", and would include monitoring groundwater use through use of satellite imagery. However, Chapter 7 does not discuss using imagery or any remote sensing, which is a great tool for monitoring ecosystem health of GDEs and ISWs. Please clarify the potential use of imagery as a monitoring tool, and expand it to monitoring surface indicators of ISW and GDE ecosystem health.
27	Sandi Matsumoto	The Nature Conservancy	pp. 7-5 and 7-6	Section 7.3.2.2	N/A	This section describes what current groundwater conditions and monitoring results will be included in the annual monitoring report. Please specifically address ecosystem health of GDEs and ISWs as a surface indictor to subsurface conditions. This can be done using GDE Pulse, remote sensing, imagery or other feasible methods.
28	Sandi Matsumoto	The Nature Conservancy	p. 6-1	Section 6.2.1	N/A	The Subbasin includes many GDEs and ISWs which represent beneficial uses and users of groundwater, and which include potentially sensitive resources and protected lands. Environmental resource protection needs should be considered in establishing project priorities. In addition, consistent with existing grant and funding guidelines for SGMA-related work, priority should be given to multi-benefit projects that can address water quantity as well as providing environmental benefits or benefits to disadvantaged communities. Please include environmental benefits and multiple benefits as criteria for assessing project priorities.
29	Sandi Matsumoto	The Nature Conservancy	pp. 6-2 to 6-7	Table 6.1	N/A	Table 6-1 lists potential projects and the Measurable Objective that is expected to benefit. Only water level benefits are listed, but maintenance or recovery of groundwater levels, or construction of recharge facilities, also will have environmental benefits in many cases. From the table, it is not possible to distinguish the full range of project benefits or how the projects will be prioritized. It would be advantageous to demonstrate multiple benefits from a funding and prioritization perspective.

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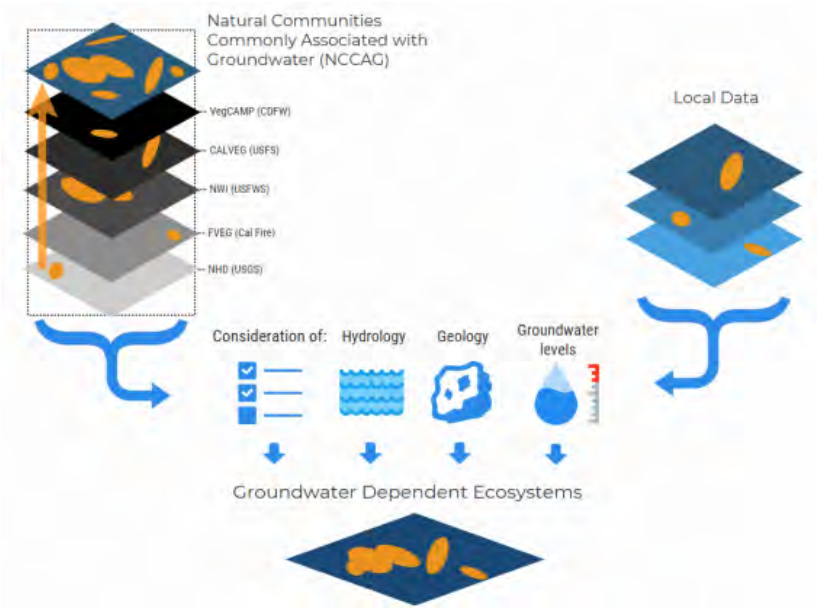
30	Sandi Matsumoto	The Nature Conservancy	pp. 6-8 to 6-33	Section 6.2.4	N/A	oFor the projects already identified, please consider stating how ISWs and GDEs will benefit or be protected, or what other environmental benefits will accrue. oIf ISWs will not be adequately protected by those listed, please include and describe additional management actions and projects targeted for protecting ISWs. oRecharge ponds, reservoirs and facilities for managed stormwater recharge can be designed to include elements that act functionally as wetlands and provide a benefit for wildlife and aquatic species. In some cases, such facilities have been incorporated into local HCPs, more fully recognizing the value of the habitat that they provide and the species they support. For projects that will be constructing recharge ponds, please consider identifying if there will be habitat value incorporated into the design and how the recharge ponds will be managed to benefit environmental users. oSpecific examples of how project descriptions may be refined to incorporate environmental benefits include the following: ・Project 21: Winery Recycled Water will recycle winery wastewater and reuse it for irrigation and in-lieu recharge, or the water will be put into ponds. Please consider identifying what proportion of water will be put into ponds for direct recharge that could also provide a benefit for wildlife and aquatic species. ・Project 23: SSJID Stormwater Reuse will capture stormwater for reuse and recharge. Project 18: Farmington Dam Repurpose Project proposes to more than double storage in Farmington Basin for water supply. Please consider assessing ways in which these projects could also provide enhanced wildlife and aquatic species benefits. ・For examples of case studies on how to incorporate environmental benefits into groundwater projects, please visit our website: https://groundwaterresourcehub.org/case-studies/recharge-case-studies/
31	Sandi Matsumoto	The Nature Conservancy	p. 6-34	Section 6.3	N/A	This section lists only administrative actions the GSA will undertake to implement the GSP, and does not identify the management actions to be taken if to assure SGMA compliance if monitoring data indicate that measurable objectives or interim milestones are not being achieved. An adaptive management approach, where monitoring data are used to assess results and inform refinement of the management approach is typically specified. Please identify what management actions will be taken if monitoring data indicate that Measurable Objectives or Interim Milestones are not being achieved, or undesirable results are imminent.
Attachment C (see comment letter)	Sandi Matsumoto	The Nature Conservancy	N/A	N/A	N/A	IDENTIFYING GDEs UNDER SGMA Best Practices for using the NC Dataset
Attachment D (see comment letter)	Sandi Matsumoto	The Nature Conservancy	N/A	N/A	N/A	GDE Pulse A new, free online tool that allows Groundwater Sustainability Agencies to assess changes in groundwater dependent ecosystem (GDE) health using satellite, rainfall, and groundwater data.

Attachment C

July 2019

IDENTIFYING GDEs UNDER SGMA
Best Practices for using the NC Dataset

The Sustainable Groundwater Management Act (SGMA) requires that groundwater dependent ecosystems (GDEs) be identified in Groundwater Sustainability Plans (GSPs). As a starting point, the Department of Water Resources (DWR) is providing the Natural Communities Commonly Associated with Groundwater Dataset (NC Dataset) online[5] to help Groundwater Sustainability Agencies (GSAs), consultants, and stakeholders identify GDEs within individual groundwater basins. To apply information from the NC Dataset to local areas, GSAs should combine it with the best available science on local hydrology, geology, and groundwater levels to verify whether polygons in the NC dataset are likely supported by groundwater in an aquifer (Figure 1)[6]. This document highlights six best practices for using local groundwater data to confirm whether mapped features in the NC dataset are supported by groundwater.



The NC Dataset identifies vegetation and wetland features that are good indicators of a GDE. The dataset is comprised of 48 publicly available state and federal datasets that map vegetation, wetlands,

[5] *NC Dataset Online Viewer: https://gis.water.ca.gov/app/NCDatasetViewer/*
[6] California Department of Water Resources (DWR). 2018. Summary of the "Natural Communities Commonly Associated with Groundwater" Dataset and Online Web Viewer. Available at: https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Data-and-Tools/Files/Statewide-Reports/Natural-Communities-Dataset-Summary-Document.pdf

springs, and seeps commonly associated with groundwater in California[7]. It was developed through a collaboration between DWR, the Department of Fish and Wildlife, and The Nature Conservancy (TNC). TNC has also provided detailed guidance on identifying GDEs from the NC dataset[8] on the Groundwater Resource Hub[9], a website dedicated to GDEs.

BEST PRACTICE #1. Establishing a Connection to Groundwater

Groundwater basins can be comprised of one continuous aquifer (Figure 2a) or multiple aquifers stacked on top of each other (Figure 2b). In unconfined aquifers (Figure 2a), using the depth-to-groundwater and the rooting depth of the vegetation is a reasonable method to infer groundwater dependence for GDEs. If groundwater is well below the rooting (and capillary) zone of the plants and any wetland features, the ecosystem is considered disconnected and groundwater management is not likely to affect the ecosystem (Figure 2d). However, it is important to consider local conditions (e.g., soil type, groundwater flow gradients, and aquifer parameters) and to review groundwater depth data from multiple seasons and water year types (wet and dry) because intermittent periods of high groundwater levels can replenish perched clay lenses that serve as the water source for GDEs (Figure 2c). Maintaining these natural groundwater fluctuations are important to sustaining GDE health.

Basins with a stacked series of aquifers (Figure 2b) may have varying levels of pumping across aquifers in the basin, depending on the production capacity or water quality associated with each aquifer. If pumping is concentrated in deeper aquifers, SGMA still requires GSAs to sustainably manage groundwater resources in shallow aquifers, such as perched aquifers, that support springs, surface water, domestic wells, and GDEs (Figure 2). This is because vertical groundwater gradients across aquifers may result in pumping from deeper aquifers to cause adverse impacts onto beneficial users reliant on shallow aquifers or interconnected surface water. The goal of SGMA is to sustainably manage groundwater resources for current and future social, economic, and environmental benefits. While groundwater pumping may not be currently occurring in a shallower aquifer, use of this water may become more appealing and economically viable in future years as pumping restrictions are placed on the deeper production aquifers in the basin to meet the sustainable yield and criteria. Thus, identifying GDEs in the basin should done irrespective to the amount of current pumping occurring in a particular aquifer, so that future impacts on GDEs due to new production can be avoided. A good rule of thumb to follow is: *if groundwater can be pumped from a well - it's an aquifer*.

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[7] *For more details on the mapping methods, refer to: Klausmeyer, K., J. Howard, T. Keeler-Wolf, K. Davis-Fadtke, R. Hull, A. Lyons. 2018. Mapping Indicators of Groundwater Dependent Ecosystems in California: Methods Report. San Francisco, California. Available at: https://groundwaterresourcehub.org/public/uploads/pdfs/iGDE_data_paper_20180423.pdf*

[8] "Groundwater Dependent Ecosystems under the Sustainable Groundwater Management Act: Guidance for Preparing Groundwater Sustainability Plans" is available at: https://groundwaterresourcehub.org/gde-tools/gsp-guidance-document/

[9] *The Groundwater Resource Hub: www.GroundwaterResourceHub.org*

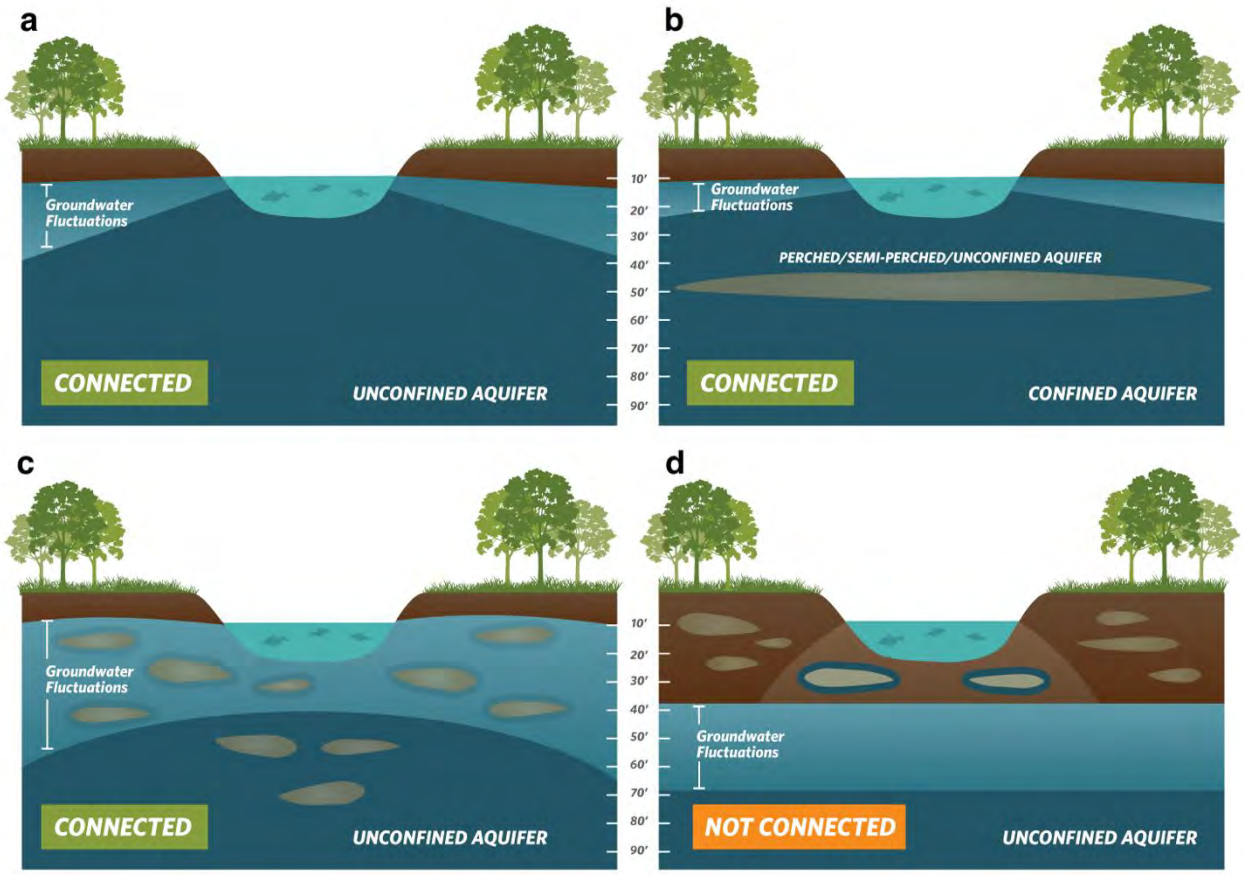


Figure 2. Confirming whether an ecosystem is connected to groundwater. Top: (a) Under the ecosystem is an unconfined aquifer with depth-to-groundwater fluctuating seasonally and interannually within 30 feet from land surface. (b) Depth-to-groundwater in the shallow aquifer is connected to overlying ecosystem. Pumping predominately occurs in the confined aquifer, but pumping is possible in the shallow aquifer. Bottom: (c) Depth-to-groundwater fluctuations are seasonally and interannually large, however, clay layers in the near surface prolong the ecosystem's connection to groundwater. (d) Groundwater is disconnected from surface water, and any water in the vadose (unsaturated) zone is due to direct recharge from precipitation and indirect recharge under the surface water feature. These areas are not connected to groundwater and typically support species that do not require access to groundwater to survive.

BEST PRACTICE #2. Characterize Seasonal and Interannual Groundwater Conditions

SGMA requires GSAs to describe current and historical groundwater conditions when identifying GDEs [23 CCR §354.16(g)]. Relying solely on the SGMA benchmark date (January 1, 2015) or any other single point in time to characterize groundwater conditions (e.g., depth-to-groundwater) is inadequate because managing groundwater conditions with data from one time point fails to capture the seasonal and interannual variability typical of California's climate. DWR's Best Management Practices document on water budgets[10] recommends using 10 years of water supply and water budget information to describe how historical conditions have impacted the operation of the basin within sustainable yield, implying that a baseline[11] could be determined based on data between 2005 and 2015. Using this or a similar time period, depending on data availability, is recommended for determining the depth-to-groundwater.

GDEs depend on groundwater levels being close enough to the land surface to interconnect with surface water systems or plant rooting networks. The most practical approach[12] for a GSA to assess whether polygons in the NC dataset are connected to groundwater is to rely on groundwater elevation data. As detailed in TNC's GDE guidance document[4], one of the key factors to consider when mapping GDEs is to contour depth-to-groundwater in the aquifer that is supporting the ecosystem (see Best Practice #5).

Groundwater levels fluctuate over time and space due to California's Mediterranean climate (dry summers and wet winters), climate change (flood and drought years), and subsurface heterogeneity in the subsurface (Figure 3). Many of California's GDEs have adapted to dealing with intermittent periods of water stress, however if these groundwater conditions are prolonged, adverse impacts to GDEs can result. While depth-to-groundwater levels within 30 feet[4] of the land surface are generally accepted as being a proxy for confirming that polygons in the NC dataset are supported by groundwater, it is highly advised that fluctuations in the groundwater regime be characterized to understand the seasonal and interannual groundwater variability in GDEs. Utilizing groundwater data from one point in time can misrepresent groundwater levels required by GDEs, and inadvertently result in adverse impacts to the GDEs. Time series data on groundwater elevations and depths are available on the SGMA Data Viewer[13]. However, if insufficient data are available to describe groundwater conditions within or near polygons from the NC dataset, include those polygons in the GSP until data gaps are reconciled in the monitoring network (see Best Practice #6).

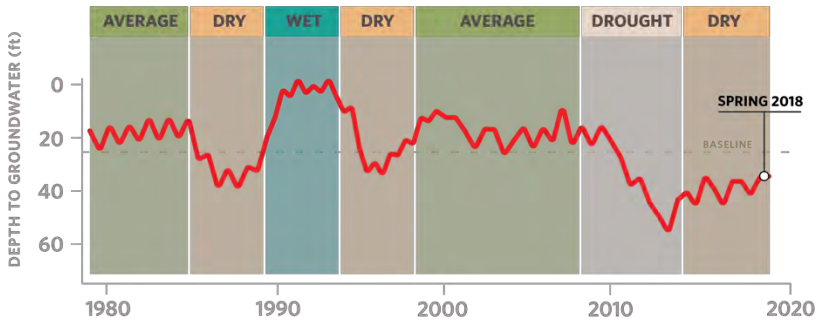


Figure 3. Example seasonality and interannual variability in depth-to-groundwater over time. Selecting one point in time, such as Spring 2018, to characterize groundwater conditions in GDEs fails to capture what groundwater conditions are necessary to maintain the ecosystem status into the future so adverse impacts are avoided.

[10] DWR. 2016. Water Budget Best Management Practice. Available at: https://water.ca.gov/LegacyFiles/groundwater/sgm/pdfs/BMP_Water_Budget_Final_2016-12-23.pdf

[11] *Baseline is defined under the GSP regulations as "historic information used to project future conditions for hydrology, water demand, and availability of surface water and to evaluate potential sustainable management practices of a basin." [23 CCR §351(e)]*

[12] Groundwater reliance can also be confirmed via stable isotope analysis and geophysical surveys. For more information see The GDE Assessment Toolbox (Appendix IV, GDE Guidance Document for GSPs[4]).

[13] *SGMA Data Viewer: https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer*

BEST PRACTICE #3. Ecosystems Often Rely on Both Groundwater and Surface Water

GDEs are plants and animals that rely on groundwater for all or some of its water needs, and thus can be supported by multiple water sources. The presence of non-groundwater sources (e.g., surface water, soil moisture in the vadose zone, applied water, treated wastewater effluent, urban stormwater, irrigated return flow) within and around a GDE does not preclude the possibility that it is supported by groundwater, too. SGMA defines GDEs as "ecological communities and species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface" [23 CCR §351(m)]. Hence, depth-to-groundwater data should be used to identify whether NC polygons are supported by groundwater and should be considered GDEs. In addition, SGMA requires that significant and undesirable adverse impacts to beneficial users of surface water be avoided. Beneficial users of surface water include environmental users such as plants or animals[14], which therefore must be considered when developing minimum thresholds for depletions of interconnected surface water.

GSAs are only responsible for impacts to GDEs resulting from groundwater conditions in the basin, so if adverse impacts to GDEs result from the diversion of applied water, treated wastewater, or irrigation return flow away from the GDE, then those impacts will be evaluated by other permitting requirements (e.g., CEQA) and may not be the responsibility of the GSA. However, if adverse impacts occur to the GDE due to changing groundwater conditions resulting from pumping or groundwater management activities, then the GSA would be responsible (Figure 4).

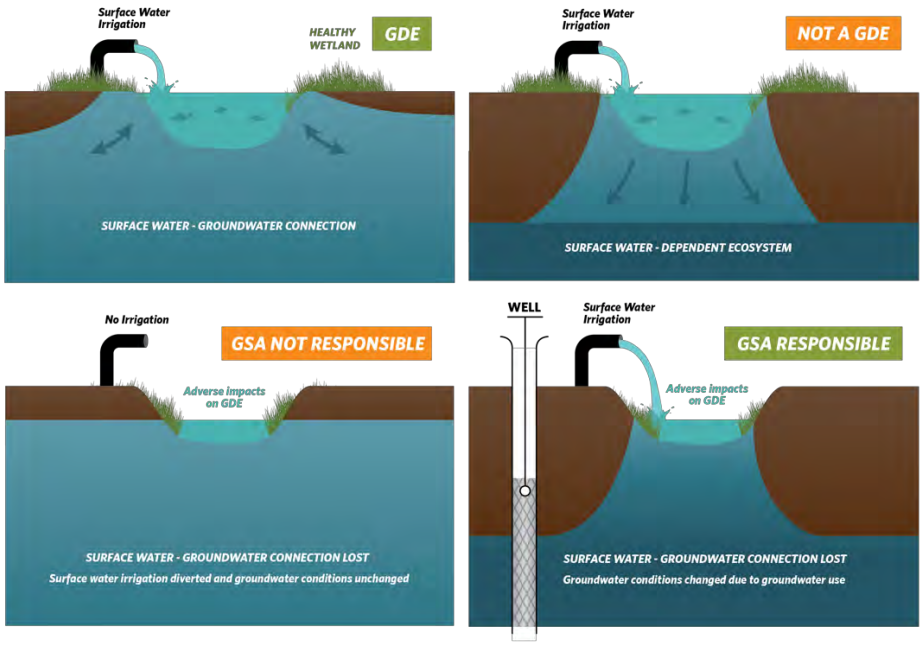


Figure 4. Ecosystems often depend on multiple sources of water. Top: (Left) Surface water and groundwater are interconnected, meaning that the GDE is supported by both groundwater and surface water. (Right) Ecosystems that are only reliant on non-groundwater sources are not groundwater-dependent. Bottom: (Left) An ecosystem that was once dependent on an interconnected surface water, but loses access to groundwater solely due to surface water diversions may not be the GSA's responsibility. (Right) Groundwater dependent ecosystems once dependent on an interconnected surface water system, but loses that access due to groundwater pumping is the GSA's responsibility.

[14] *For a list of environmental beneficial users of surface water by basin, visit: https://groundwaterresourcehub.org/gde-tools/environmental-surface-water-beneficiaries/*

BEST PRACTICE #4. Select Representative Groundwater Wells

Identifying GDEs in a basin requires that groundwater conditions are characterized to confirm whether polygons in the NC dataset are supported by the underlying aquifer. To do this, proximate groundwater wells should be identified to characterize groundwater conditions (Figure 5). When selecting representative wells, it is particularly important to consider the subsurface heterogeneity around NC polygons, especially near surface water features where groundwater and surface water interactions occur around heterogeneous stratigraphic units or aquitards formed by fluvial deposits. The following selection criteria can help ensure groundwater levels are representative of conditions within the GDE area:

- Choose wells that are within 5 kilometers (3.1 miles) of each NC Dataset polygons because they are more likely to reflect the local conditions relevant to the ecosystem. If there are no wells within 5km of the center of a NC dataset polygon, then there is insufficient information to remove the polygon based on groundwater depth. Instead, it should be retained as a potential GDE until there are sufficient data to determine whether or not the NC Dataset polygon is supported by groundwater.

- Choose wells that are screened within the surficial unconfined aquifer and capable of measuring the true water table.

- Avoid relying on wells that have insufficient information on the screened well depth interval for excluding GDEs because they could be providing data on the wrong aquifer. This type of well data should not be used to remove any NC polygons.

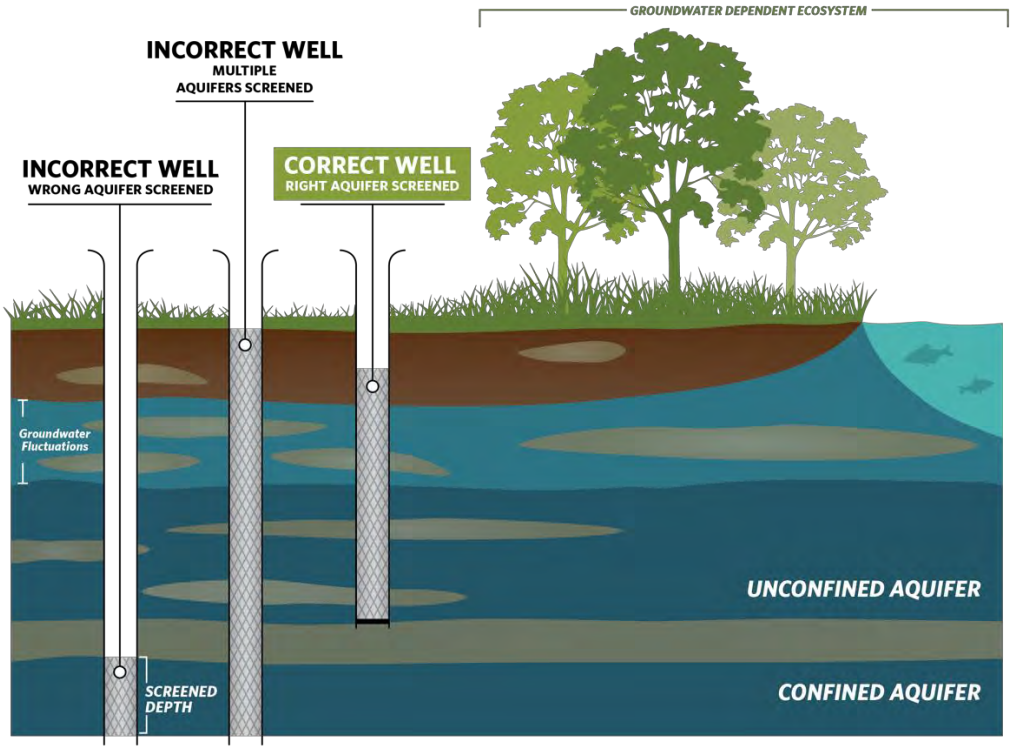


Figure 5. Selecting representative wells to characterize groundwater conditions near GDEs.

BEST PRACTICE #5. Contouring Groundwater Elevations

The common practice to contour depth-to-groundwater over a large area by interpolating measurements at monitoring wells is unsuitable for assessing whether an ecosystem is supported by groundwater. This practice causes errors when the land surface contains features like stream and wetland depressions because it assumes the land surface is constant across the landscape and depth-to-groundwater is constant below these low-lying areas (Figure 6a). A more accurate approach is to interpolate groundwater elevations at monitoring wells to get groundwater elevation contours across the landscape. This layer can then be subtracted from land surface elevations from a Digital Elevation Model (DEM)[15] to estimate depth-to-groundwater contours across the landscape (Figure b; Figure 7). This will provide a much more accurate contours of depth-to-groundwater along streams and other land surface depressions where GDEs are commonly found.

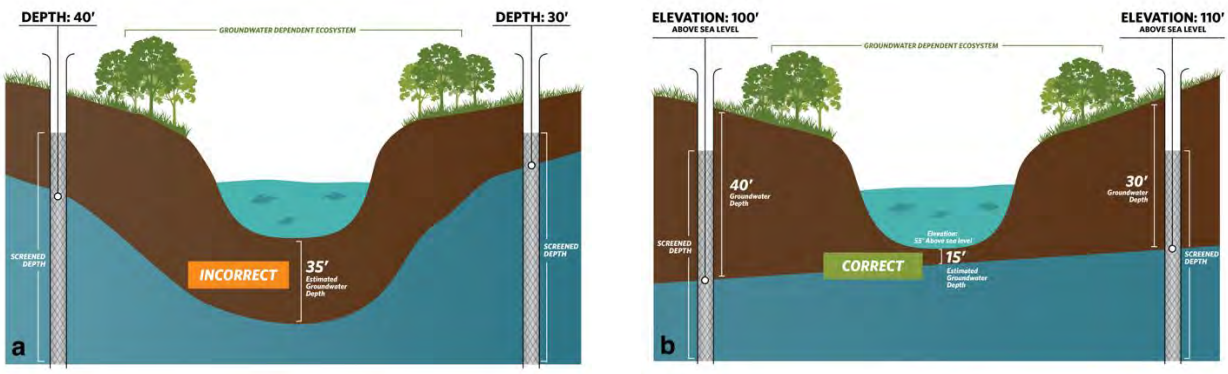


Figure 6. Contouring depth-to-groundwater around surface water features and GDEs. (a) Groundwater level interpolation using depth-to-groundwater data from monitoring wells. (b) Groundwater level interpolation using groundwater elevation data from monitoring wells and DEM data.

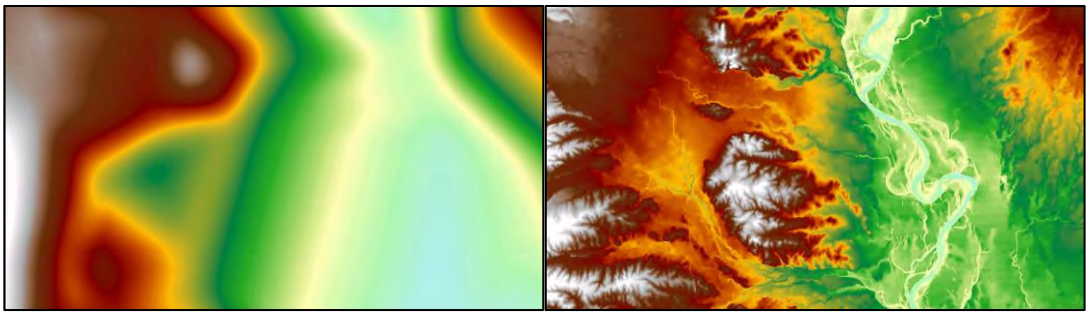


Figure 7. Depth-to-groundwater contours in Northern California. (Left) Contours were interpolated using depth-to-groundwater measurements determined at each well. (Right) Contours were determined by interpolating groundwater elevation measurements at each well and superimposing ground surface elevation from DEM spatial data to generate depth-to-groundwater contours. The image on the right shows a more accurate depth-to-groundwater estimate because it takes the local topography and elevation changes into account.

[15] USGS Digital Elevation Model data products are described at: https://www.usgs.gov/core-science-systems/ngp/3dep/about-3dep-products-services and can be downloaded at: https://iewer.nationalmap.gov/basic/

BEST PRACTICE #6. Best Available Science

Adaptive management is embedded within SGMA and provides a process to work toward sustainability over time by beginning with the best available information to make initial decisions, monitoring the results of those decisions, and using the data collected through monitoring programs to revise decisions in the future. In many situations, the hydrologic connection of NC dataset polygons will not initially be clearly understood if site-specific groundwater monitoring data are not available. If sufficient data are not available in time for the 2020/2022 plan, The Nature Conservancy strongly advises that questionable polygons from the NC dataset be included in the GSP until data gaps are reconciled in the monitoring network. Erring on the side of caution will help minimize inadvertent impacts to GDEs as a result of groundwater use and management actions during SGMA implementation.

KEY DEFINITIONS

Groundwater basin is an aquifer or stacked series of aquifers with reasonably well-defined boundaries in a lateral direction, based on features that significantly impede groundwater flow, and a definable bottom. *23 CCR §341(g)(1)*

Groundwater dependent ecosystem (GDE) are ecological communities or species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface. *23 CCR §351(m)*

Interconnected surface water (ISW) surface water that is hydraulically connected at any point by a continuous saturated zone to the underlying aquifer and the overlying surface water is not completely depleted. *23 CCR §351(o)*

Principal aquifers are aquifers or aquifer systems that store, transmit, and yield significant or economic quantities of groundwater to wells, springs, or surface water systems. *23 CCR §351(aa)*

ABOUT US

The Nature Conservancy is a science-based nonprofit organization whose mission is *to conserve the lands and waters on which all life depends*. To support successful SGMA implementation that meets the future needs of people, the economy, and the environment, TNC has developed tools and resources (www.groundwaterresourcehub.org) intended to reduce costs, shorten timelines, and increase benefits for both people and nature.

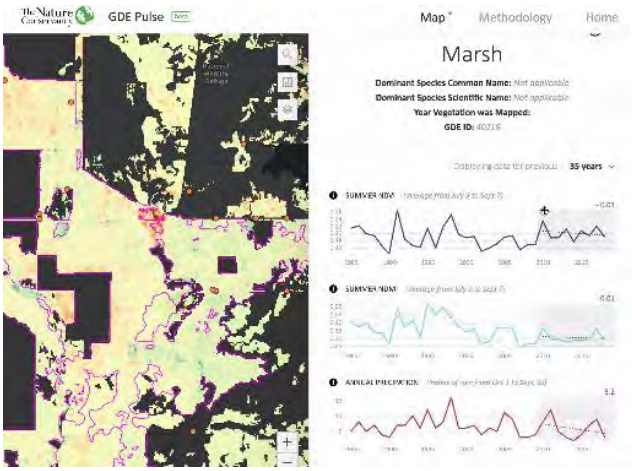
Attachment D

GDE Pulse

A new, free online tool that allows Groundwater Sustainability Agencies to assess changes in groundwater dependent ecosystem (GDE) health using satellite, rainfall, and groundwater data.

The Nature Conservancy
Protecting nature. Preserving life.

Visit
https://gde.codefornature.org/



Remote sensing data from satellites has been used to monitor the health of vegetation all over the planet. GDE pulse has compiled 35 years of satellite imagery from NASA's Landsat mission for every polygon in the Natural Communities Commonly Associated with Groundwater Dataset[16]. The following datasets are included:

Normalized Difference Vegetation Index (NDVI) is a satellite-derived index that represents the greenness of vegetation. Healthy green vegetation tends to have a higher NDVI, while dead leaves have a lower NDVI. We calculated the average NDVI during the driest part of the year (July - Sept) to estimate vegetation health when the plants are most likely dependent on groundwater.

Normalized Difference Moisture Index (NDMI) is a satellite-derived index that represents water content in vegetation. NDMI is derived from the Near-Infrared (NIR) and Short-Wave Infrared (SWIR) channels. Vegetation with adequate access to water tends to have higher NDMI, while vegetation that is water stressed tends to have lower NDMI. We calculated the average NDVI during the driest part of the year (July–September) to estimate vegetation health when the plants are most likely dependent on groundwater.

Annual Precipitation is the total precipitation for the water year (October 1st – September 30th) from the PRISM dataset[17]. The amount of local precipitation can affect vegetation with more precipitation generally leading to higher NDVI and NDMI.

Depth to Groundwater measurements provide an indication of the groundwater levels and changes over time for the surrounding area. We used groundwater well measurements from nearby (<1km) wells to estimate the depth to groundwater below the GDE based on the average elevation of the GDE (using a digital elevation model) minus the measured groundwater surface elevation.

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[16] *The Natural Communities Commonly Associated with Groundwater Dataset is hosted on the California Department of Water Resources' website: https://gis.water.ca.gov/app/NCDatasetViewer/#*

[17] The PRISM dataset is hosted on Oregon State University's website: http://www.prism.oregonstate.edu/

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Eastern San Joaquin Subbasin GSP Public Draft
Summary of Public Comments and Responses

Comment #	Commenter	Commenter Organization	Page Number	Section, Figure, or Table Number	Sentence Starts with, "...	Comment
1	Joey Giordano	The Wine Group	ES-6	Figure ES-6		On Figure ES-6, I would recommend adding the total for each column/section of the bar graph below the text for each section (i.e. "Pumping under Projected Conditions XX,XXX AF". The figure has less value when you have to rely on the units on the y-axis rather than having the totals for each section explicitly marked.

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August 21, 2019

Eastern San Joaquin Groundwater Authority
Post Office Box 1810
Stockton, CA 95201
info@esjgroundwater.org

RE: Comments on the Eastern San Joaquin Draft Groundwater Sustainability Plan (GSP)

This letter provides comments on the July 2019 Public Draft of the Eastern San Joaquin Draft Groundwater Sustainability Plan on behalf of the GSAs participating in preparation of the Tracy Subbasin Groundwater Sustainability Plan.

While interbasin coordination is not legally required under the Sustainable Groundwater Management Act, it is essential to avoid problematic disagreements after key GSP elements have already been prepared for each basin

Table 2-15 on page 2-121 of the Draft GSP indicates that the Tracy Subbasin has historically contributed 35,000 acre-feet while it is projected to increase to 41,000 acre-feet of subsurface inflow annually to the Eastern San Joaquin Groundwater Basin. These figures have not been documented or confirmed by those GSAs participating in preparation of the Tracy Subbasin Groundwater Sustainability Plan (GSP). This line should be footnoted to indicate that these figures will be further refined upon completion of the Tracy Subbasin GSP in January of 2022, and coordination of these figures with the Tracy Subbasin GSAs.

Please direct any questions to District Manager David Weisenberger at (209) 835-4670.

Very truly yours,

David Weisenberger

DAVID WEISENBERGER
General Manager

cc: Steve Bayley
Jeanne M. Zolezzi, Esq.

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APPENDIX 1-J.
RESPONSE TO PUBLIC COMMENTS

Eastern San Joaquin Groundwater Sustainability Plan
Response to Comments – Master Responses

Master Response 1 -- Groundwater Dependent Ecosystems

1) Section 2.2.7 (Groundwater-Dependent Ecosystems) was revised to classify NCCAG areas that access co-occurring surface water as data gap areas requiring further refinement. Section 2.2.7.1 (Methodology for GDE Identification) was updated to better articulate the methodology used and the describe data gaps within the NCCAG dataset. A footnote was added indicating referencing the use of 2015 groundwater levels in the GDE analysis as follows: This analysis uses 2015 groundwater levels (winter, spring, summer, and fall), which may be deeper than representative levels due to drought conditions, a factor which will be considered in future GDEs analyses. Figure 2-74 was updated to show removed NCCAG areas as data gaps.

2) Language was added to Section 4.7 (Data Gaps) to identify NCCAG areas removed through the GDE analysis are data gaps ideas requiring further refinement (NCCAGs that either access co-occurring surface water or were identified as located in an area with groundwater levels deeper than 30 feet bgs). The purpose of this is to identify potential existing GDEs that may have been incorrectly eliminated through this screening process.

3) Language was added to Section 4.7 (Data Gaps) to indicate that the ESJGWA would evaluate using the GDE Pulse Tool and other tools to monitor GDEs.

4) The GSP includes the list of freshwater species provided by The Nature Conservancy as Appendix 1-G: Freshwater Species in the Eastern San Joaquin Subbasin as beneficial users of groundwater. Language was added to Section 2.2.7 (Groundwater-Dependent Ecosystems) and Section 4.7 (Data Gaps) to indicate that fish and wildlife species associated with GDEs are a data gap area.

Master Response 2 -- Interconnected Surface Water

1) The ESJGWA recognizes that depletions of interconnected surface water are a data gap area and supports the use of groundwater levels as a proxy, as this represents the best information currently available. The ESJGWA has identified a need for future study and refinement of interconnected surface water and will continue coordination efforts to better inform basin conditions.

2) Language has been added to Section 4.7 (Data Gaps) identifying interconnected surface water as a data gap area for future study and refinement. The section has also been updated to clarify and better articulate the ESJGWA's focus on installing additional monitoring wells near streams, which can be evaluated for use as representative monitoring wells in the future.

3) The GSP identifies areas in the Subbasin that the ESJGWA believes to be interconnected based on the best available information but recognizes that these areas may require additional analysis and will be updated with future model verification and validation efforts. Figures 2-71 and 2-72 were reviewed for consistency based on comments received and the section was reorganized for clarification. Language in Section 2.2.6 (Interconnected Surface Water Systems) was updated to describe gaining and losing streams as “gaining greater than 75% of the time” and “losing greater than 75% of the time” and Figure 2-72 was updated accordingly. Figure 2-71 was updated to display stream nodes gaining most of the time as interconnected and the language was updated to “interconnected greater than 75% of the time” and “interconnected less than 25% of the time.” Language was added to clarify Figures 2-71 and 2-72 in the GSP are showing model results and are not intended for regulatory purposes. A footnote was added to Figures 2-71 and 2-72 stating: Analysis is based on limited data recognized to have significant gaps. Interconnected surface water is a recognized data gap in the GSP as discussed in Section 4.7. Stream nodes in areas with poor model calibration were removed from Figures 2-71 and 2-72 and text was added to clarify that this data gap will be resolved in future updates to the GSP.

4) Language was added to Section 2.2.6 (Interconnected Surface Water Systems) clarifying that the ESJWRM historical calibration model results represents the best available information for both current and historical conditions related to interconnectivity between surface water and the groundwater system as follows: This analysis was based on modeling results from the historical calibration of the ESJWRM for approximately 900 stream nodes in the Eastern San Joaquin Subbasin, which represents that best available information for current and historical conditions related to interconnected surface water systems.

5) The GSP includes the list of freshwater species provided by The Nature Conservancy as Appendix 1-G: Freshwater Species in the Eastern San Joaquin Subbasin as beneficial users of groundwater.

6) Language was added to Section 4.7 (Data Gaps) to indicate that the ESJGWA would evaluate using the GDE Pulse Tool and other tools to monitor GDEs.

7) The ESJGWA considers current minimum thresholds and measurable objectives to be protective of beneficial uses and users in the subbasin, and to be protective of existing in-stream flow requirements for fish and wildlife.

Master Response 3 -- Water Quality

1) A new subsection has been added to Section 3.2.3 (Section 3.2.3.4: Monitoring for Additional Constituents), which states that additional monitoring is needed to identify water quality conditions and trends related to additional constituents including arsenic and nitrate. This new subsection references Chapter 4 (Monitoring Networks) and describes the informational monitoring efforts that will take place as part of the broad monitoring network for water quality, and specifically, the monitoring for arsenic and for cations/anions, which includes nitrate. The subsection also references the existing regulations through existing water resources monitoring and management programs (described in Section 1.2.2). Language has been added to indicate that if existing regulations are violated, or if monitoring efforts indicate concerning trends, the ESJGWA will evaluate developing minimum thresholds and measurable objectives for additional constituents, as well as to take steps to coordinate with regulatory agencies. Additionally, language has been added stating that the ESJGWA may require GSAs that are drinking water suppliers to report to the ESJGWA if constituents of concern exceed their MCL. While these reports do not reflect the water quality of private well owners, it would provide a useful basin-wide screen to better inform basin groundwater quality.

2) Language has been added to Section 3.2.3.2 (Minimum Thresholds) referencing Section 3.2.3.4 and indicating the monitoring efforts for additional constituents, including nitrate and arsenic.

3) Language was modified in Section 3.2.3.1.1 (Description of Undesirable Results) to indicate new monitoring efforts in the Subbasin that will occur as part of the broad monitoring network for water quality and to highlight coordination efforts with existing regulatory agencies to determine if existing regulatory requirements are met. Language stating no nexus was removed and replaced with language stating that new monitoring efforts and coordination with existing regulatory agencies will allow the GSAs to determine if groundwater pumping activities are contributing to undesirable effects related to degraded water quality.

Master Response 4 -- Groundwater Storage

1) Given the existing subsurface conditions and large volume for groundwater in storage, the historical undesirable effects in the Eastern San Joaquin Subbasin groundwater have been related to accessibility, not storage volume. Thus, the issues associate with groundwater overdraft are more appropriately addressed through the Chronic Lowering of Groundwater Levels Sustainability Indicator.

2) Language was added to Section 3.2.2 (Reduction in Groundwater Storage) to better articulate the model analysis used to determine no undesirable results for Reduction in Groundwater Storage and to show how using groundwater levels as a proxy is protective as follows: An undesirable result occurs when groundwater storage volumes are insufficient to satisfy beneficial uses within the Subbasin. To identify a volume associated with undesirable results, the ESJWRM was run to estimate the volume of groundwater storage needed to meet beneficial uses. The analysis determined that groundwater demand for beneficial use occurs within the shallowest 23 MAF of the Subbasin, as this is roughly the zone corresponding to the depth at which pumping occurs and is reasonably expected to occur in the future. Based on this analysis, it is estimated that overlying pumpers have limited access equating to approximately the shallowest 23 MAF of groundwater storage in the Subbasin; therefore, an undesirable result would occur if groundwater storage levels were depleted by 23 MAF. Therefore, undesirable results would occur if groundwater storage were reduced by 23 MAF, to a total volume of 30 MAF…Minimum thresholds for groundwater levels will effectively avoid undesirable results for reduction of groundwater storage. As noted above, the amount of groundwater in storage in the Subbasin is approximately 53 MAF and the undesirable results of reducing beneficial uses would not occur until storage is reduced by 23 MAF, to a total of 30 MAF. The ESJWRM was run to estimate the reduction in groundwater storage that would occur if every representative monitoring well in the Subbasin were to operate at the minimum threshold for the chronic lowering of groundwater levels sustainability indicator. The results of this analysis showed that this scenario would result in a reduction of approximately 1.2 MAF of storage.3 Because undesirable results are anticipated to occur following a reduction of 23 MAF, the minimum thresholds for groundwater levels are protective of beneficial uses. Minimum thresholds and measurable objectives for groundwater levels can therefore be used as a proxy for reduction in groundwater storage, as groundwater levels are sufficiently protective against occurrences of significant and unreasonable reduction in groundwater storage.

3) The ESJGWA acknowledges conditions of overdraft and in response has identified projects that will recharge and/or offset up to 78,000 AFY to meet the Subbasin's sustainable yield. The groundwater storage estimate of 53 MAF is based on current groundwater conditions calculated for years 1996-2015; this estimate does not include future projects implemented as part of this GSP. Sustainable yield is defined in the GSP as “the maximum quantity of water, calculated over a base period representative of long-term conditions in the basin and including any temporary surplus, that can be withdrawn annually from a groundwater supply without causing an undesirable result” (per CWC §10721(w)). Sustainable yield for the Eastern San Joaquin Subbasin was calculated through development of an ESJWRM sustainable conditions scenario (model run) in which the goal was to generate a long-term (50-year) change in Subbasin groundwater storage of zero, a conservative approach, as a change in storage of greater than zero could occur without causing undesirable results.

Master Response 5 -- Projects

1) The ESJGWA acknowledges that many of the projects are in preliminary planning stages. The ESJGWA has a 20-year planning timeframe to bring the projects online, and will continue to evaluate project benefits, impacts, and costs. The ESJWRM was used to calculate basin-scale planning targets based on projected future water demands. There is uncertainty in these estimates, which will be refined in coming years through model updates and verification studies. Further, this GSP is an adaptive plan, driven by annual monitoring reports. The data in these reports, as well as individual GSA-level water budgets, will provide a means of project evaluation, and will assess potential for undesirable results. The three tiers of projects have been developed to respond to the uncertainty in planning targets and provide greater flexibility in how sustainability will be achieved. The Subbasin may need to recharge and/or offset more or less water than the estimated 78,000 AFY to reach sustainability and can pull from the highest benefit and most feasible projects to do so.

2) GSP projects have been proposed by individual GSAs and will be implemented at the GSA level. The ESJGWA's role in project implementation will be to oversee essential coordination and evaluation activities, but the ESJGWA does not have authority to direct project design, timeline, or initiation.

3) A subsection was added to GSP Chapter 6 (Projects and Management Actions) that outlines a process for management actions if the identified projects do not progress, or if monitoring activities demonstrate that the projects are not effective in achieving stated recharge and/or offset targets: Although the ESJGWA does not provide direct authority to require GSAs to implement projects, the ESJGWA will be working on GSA-level water budgets and will be requesting annual or biannual progress reports to evaluate progress. If the projects do not progress, or if monitoring efforts demonstrate that the projects are not effective in achieving stated recharge and/or offset targets, the ESJGWA will convene a working group to evaluate supply-side and demand-side management actions such as the implementation of groundwater pumping curtailments, land fallowing, etc.

4) The ESJGWA acknowledges that there are many factors that could affect the availability of surface water, and that has to be evaluated by GSAs in the implementation of projects. The process of GSAs providing biannual reports will allow for the ESJGWA to update the Plan and adjust the implementation course as needed based on conditions.

5) Language was added to the GSP referencing existing conservation management actions (including Urban Water Management Plans and Agriculture Water Management Plans). Additionally, language was added to Section 6.2.2 (Project Implementation) to emphasize the pathway toward sustainability: Projects will be administered by the GSA project proponents. GSAs may elect to implement projects individually or jointly with one or more GSAs or with the ESJGWA. As the ESJGWA develops GSA-level water budgets, the GSAs will have a better understanding of how projects will be implemented at the GSA-level and can better evaluate progress toward completion.

ESJ Public Comments Response

Comment #	Commenter	Commenter Organization	Section, Figure, or Table Number	Comment	Category	Response to Comment
1	Kevin Thomas	CA Department of Fish and Wildlife, North Central Region		The Department believes the GSP does not adequately demonstrate consideration of environmental beneficial uses and users of groundwater in its sustainability management criteria nor does It adequately characterize or consider surface water-groundwater connectivity. Accordingly, the Department recommends that ESJ address these deficiencies before submitting the GSP to the Department of Water Resources (DWR).	Interconnected Surface Water	The GSP as written includes the list of freshwater species provided by The Nature Conservancy as Appendix 1-G: Freshwater Species in the Eastern San Joaquin Subbasin as beneficial users of groundwater.
2	Kevin Thomas	CA Department of Fish and Wildlife, North Central Region	1.2.1.1	Department lands are excluded from 'Summary of Jurisdictional Areas' narrative as well as from Figure 1-11, which maps other federal and state lands. a. Issue: The GSP does not identify the jurisdictional boundaries of Department-owned and -managed lands as required by 23 CCR §354.8(a)(3). b. Recommendation: Include in Figure 1-11 and the accompanying narrative White Slough Wildlife Area, Woodbridge Ecological Reserve, and Vernalis Ecological Reserve Department lands.	Plan Area	Edits made to Figure 1-11 to include White Slough Wildlife Area, Woodbridge Ecological Reserve, and Vernalis Ecological Reserve Department lands. Added text to Section 1.2.1 (Description of Plan Area) to describe these areas: The California Department of Fish and Wildlife (CDFW) owns 880 acres of man-made ditches, canals, and marshes with both grassland and riparian habitat, recognized as the White Slough Wildlife Area. The property was designated by the Fish and Game Commission in 1980 and provides recreational opportunities such as fishing, hunting, and hiking (CDFW, 2019a). CDFW also maintains the 353-acre Woodbridge Ecological Reserve to protect primarily the sandhill crane population, but also other migratory waterfowl. The sandhill crane was listed as a threatened species in 1983. Woodbridge Ecological Reserve and the greater Stockton Delta wetlands make up the largest freshwater marsh in California (CDFW, 2019b). Lastly, Vernalis Ecological Reserve is also shown in Figure 1-11. It serves as a public access area owned by CDFW for hunting and wildlife viewing (CDFW, 2019c).
3	Kevin Thomas	CA Department of Fish and Wildlife, North Central Region	2.2.6	The narrative describing the basin's interconnected surface water conditions lacks specifics and contains inconsistencies in mapped surface water-groundwater interconnectivity. a. Issue: i. The interconnected surface water conditions narrative lacks estimations of the quantity and timing of streamflow depletions as specified in 23 CCR § 354.16(f). ii. Figure 2-65 portrays modeled 'losing,' 'gaining,' and 'mixed' stream reaches, and Figure 2-66 portrays modeled 'interconnected and 'disconnected' streams. Figure 2-66 shows modeled stream reaches as 'disconnected,' whereas Figure 2-65 identifies those same reaches as switching between 'losing,' 'gaining,' and 'mixed.' Accompanying narrative suggests that streams are only mapped as 'interconnected' in Figure 2-66 when they are interconnected at least 75% of the time. This 75% threshold for displaying interconnected surface waters excludes reaches of stream that are intermittently connected to groundwater and that may depend on groundwater contributions to meet the needs of instream or riparian beneficial uses and users of interconnected surface waters. b. Recommendation: i. Identify the estimated quality and timing of streamflow depletions in the ESJ Subbasin. If this information is not available, identify an expeditious path to estimating these values. ii. Update Figure 2-66 to show all interconnected stream reaches, even if they are interconnected less than 25% of the time.	Interconnected Surface Water	See Master Response 2 - ISW.
4	Kevin Thomas	CA Department of Fish and Wildlife, North Central Region	2.2.7	GDE identification, required by 23 CCR § 354.16(g), is based on methods that risk exclusion of ecosystems that may depend on groundwater. a. Issue: Methods applied to the Natural Communities Commonly Associated with Groundwater (NCCAG) dataset to eliminate potential GDEs are fallible. i. Depth to Groundwater: The removal of potential GDEs with a depth to groundwater greater than 30 feet during (an unspecified season) of 2015 relies on a single-point-in-time baseline hydrology. Specifically, this 2015 baseline falls several years into a historic drought when groundwater levels throughout the San Joaquin Valley were trending dramatically lower than usual due to reduced surface water availability. Exclusion of potential GDEs based on a snapshot of groundwater elevations during a historic drought is invalid; because this approach does not consider representative climate conditions or account for GDEs that can survive a finite period of time without groundwater access (Naumburg 2005), but that rely on groundwater table recovery for long term survival. ii. Adjacent to Alternate Water Supplies: The GSP notes that "to be dependent on groundwater there must not be other available water supplies" (GSP pp 2-104). This statement disregard's a GDE's adaptability and opportunistic approach to accessing water in which vegetation may vary reliance on surface water and groundwater between seasons and water years. Therefore, the removal of potential GDEs that are within 50 feet of irrigated lands, 150 feet of managed wetlands, and 150 feet of perennial surface water does not consider the potential for GDEs shifting reliance between surface and groundwater. Additionally, vegetation near interconnected perennial surface waters may depend on sustained groundwater elevations to stabilize the gradient or rate of loss of surface water; meaning ecosystems near interconnected surface waters likely depend on sustainable groundwater elevations and constitute GDEs. Therefore, it is possible that any of these potential GDEs proximate to 'alternate water supplies' rely on groundwater during specific seasons or water years. b. Recommendations: i. Depth to Groundwater: Develop a hydrologically robust baseline from which to remove areas with a depth to groundwater greater than 30 feet' that relies on multiple, climatically representative years of groundwater elevation and that accounts for the inter-seasonal and inter-annual variability of GDE water demand. ii. Adjacent to Alternate Water Supplies: Reevaluate potential GDEs previously removed due to proximity to irrigated lands, managed wetlands, and perennial surface waters. Err on the side of inclusivity until there is evidence that the overlying ecosystem has no significant dependence on groundwater across seasons and water year types. Ensure that riparian GDE beneficial users of groundwater and interconnected surface water are carefully considered in the analysis of undesirable results and minimum thresholds for depletions of interconnected surface waters.	GDEs	See Master Response 1 - GDEs.
5	Kevin Thomas	CA Department of Fish and Wildlife, North Central Region	2.3.5.4	Projected water budget assumptions may risk overestimating surface water availability and sustainable yield by not relying on best available information [23 COR § 354.18(e)]. a. Issue: Projected surface water budget assumptions may risk overestimating water availability. Overestimation of water availability can result in the overallocation of both surface and groundwater water resources, unnecessarily jeopardizing environmental beneficial users. Two water budget assumptions that do not rely on best available information and that underscore current sustainable yield estimations are as follows: 1) the climate change analysis predicting a net depletion of aquifer storage is not reflected in the projected water budget or estimated sustainable yield, rather it is presented as a separate analysis; and 2) projected surface water deliveries need to be updated to reflect any new regulatory reductions of surface water deliveries such as those that may be codified in the State Water Resources Control Board Water Quality Control Plan for the Bay Delta: San Joaquin River Flows and Southern Delta Water Quality. b. Recommendation: Amend the water budget and sustainable yield: 1) apply climate change estimates to the projected water budget and scale the sustainable yield accordingly; and 2) adjust surface water delivery estimates to reflect any new regulatory compliance.	Water Budget	1) Consistent with regulations, the 2070 climate change sensitivity analysis on the projected conditions scenario was used to better understand trends and inform planning. Due to the uncertainty around climate projections in the 2070 timeframe, the ESJGWA Board determined the projected conditions scenario was most appropriate for analyzing sustainable yield in the GSP implementation time period beginning in 2040. Therefore, the sustainable yield analysis did not include climate change. Comment noted for follow up in next round of model refinements and updates to analyses. 2) Added text to Section 2.3.5 (Water Budget Estimates) clarifying that climate change was a separate scenario: "Hydrology under climate change projections was evaluated in a separate ESJWRM scenario and results are discussed separately in Section 2.3.7.4." 3) Added text to Section 2.3.6 (Sustainable Yield Estimate) clarifying that climate change was not part of the analysis: "The sustainable conditions scenario, building off the projected conditions scenario, does not include climate change discussed in Section 2.3.7. Due to the uncertainty around DWR's climate projections for a 2070 timeframe, the ESJGWA Board determined the projected conditions scenario was most appropriate for analyzing sustainable yield in the GSP implementation time period beginning in 2040." 4) The SWRCB did adopt the water quality control plan for the Bay-Delta, which has an impact on the Subbasin and will be addressed in future updates to the GSP. Given the timeframe of the GSP being adopted, it was not possible to include the new regulations in the analysis in this GSP and they will be included in future iterations.

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Comment #	Commenter	Commenter Organization	Section, Figure, or Table Number	Comment	Category	Response to Comment
6	Kevin Thomas	CA Department of Fish and Wildlife, North Central Region	3.2.1	Groundwater Level and Interconnected Surface Water sustainable management criteria do not protect against undesirable results for fish and wildlife beneficial uses and users of groundwater and interconnected surface waters. a. Issues: i. Proxy Metric: Before addressing the individual sustainability criteria for both Groundwater Levels and Depletions of Interconnected Surface Water, the Department challenges the use of groundwater elevations as a proxy metric for Depletions of Interconnected Surface Water. The GSP does not provide evidence that a "significant correlation exists between groundwater elevations" and Depletions of Interconnected Surface Water [23 OCR §354.36(b)(1)]. Instead, the GSP backs into the proxy metric by associating the proposed Groundwater Level minimum thresholds with the absence of significant and unreasonable surface water depletions, claiming that historical depletions of interconnected surface water had no associated undesirable results (GSP pp 3-19). The GSP offers few details to substantiate this claim that historical surface water depletions did not lead to undesirable results, and the GSP does not specify the modeling exercise used to detennine the insignificance of historical surface water depletions. Provided the status of surface water allocations and aquatic ecosystems on rivers in the ESJ basin, the Department contests that any surface water depletions attributable to groundwater pumping are likely to be significant and unreasonable, particularly in the benchmark year of 2015 when groundwater pumping and surface water temperatures were critically high. Depleted flows in the lower San Joaquin River, many reaches of which are identified as interconnected in the GSP, contribute to increased in-river water temperatures. Groundwater extraction from interconnected aquifers contributes to depletion of instream flow(Barlow and Leake, 2012). Low flows and increased water temperatures in the lower San Joaquin River have been documented to negatively impact Chinook salmon {Oncorhynchustshawytscha) and steelhead {Oncorhynchus mykiss) (Hallock 1970,Marston 2012). Acknowledging that fish and wildlife beneficial uses and users of groundwater likely experienced undesirable results during historical pumping regimes, especially during critically dry years, the GSP cannot rely on groundwater elevation as a proxy metric for Depletions of Interconnected Surface Water. If a significant correlation is lacking between groundwater elevations and Depletions of Interconnected Surface Water, particularly at the representative monitoring well locations used to track groundwater elevations in the ESJ Subbasin, then groundwater elevations used as a proxy for surface water depletions may misinform groundwater management activities and poorly predict instream habitat conditions for fish and wildlife species. Accordingly, the application of Groundwater Level sustainable management criteria to Depletions of Interconnected Surface Water is inappropriate, as it is not grounded in a quantifiable and site-specific understanding of surface water-groundwater connectivity as required by 23 CCR § 354.28 (c)(6)(A). ii. Undesirable Results: Groundwater Level 'undesirable results' and 'effects of undesirable results' do not specify impacts to environmental beneficial users such as terrestrial GDEs (GSP pp 3-3, 3-4). Additionally, the method used to identify undesirable results for Groundwater Levels (i.e., minimum threshold exceedances in groundwater elevation) is applied to the identification of undesirable results for the Depletions of Interconnected Surface Water without a reasonable justification. The indicator of undesirable results for Groundwater Levels is the measure of 25% of monitoring wells falling below their minimum thresholds for two consecutive (non-dry) years, yet the GSP does not prove a relationship between the Groundwater Level identification of undesirable results and the presence of undesirable results for Depletions of Interconnected Surface Water (see Comment #5.a.i). Effectively, the GSP does not connect identification of undesirable results for Depletions of Interconnected Surface Water to effects on interconnected surface water beneficial users per 23 CCR § 354.26 (b)(3). Finally, the GSPnotes that groundwater levels that fall below the minimum threshold during hydrologically dry or critically dry years are not considered to be an indicator of undesirable results (GSP pp 3-3). This means proposed Indicators of undesirable results for Groundwater Levels and Depletions of Interconnected Surface Water do not exist for dry water years. This absence of undesirable results indicators for certain water years means beneficial users of groundwater and interconnected surface water may experience significant and unreasonable effects throughout the duration of dry or critical water years before the undesirable results are 'identified' and managed. Accordingly, there is no groundwater management accountability during the most challenging of years for water resource managers and fish and wildlife beneficial users alike. iii. Minimum Thresholds and Measurable Objectives: Minimum thresholds and measurable objectives for Groundwater Levels, and by proxy, for Depletions of Interconnected Surface Water, are not protective of environmental beneficial uses and users of groundwater and interconnected surface water. Minimum thresholds allow for a decrease of groundwater elevation from 2015, or a comparable historic low, for all representative monitoring sites (3-7); and measurable objectives are set at historically low groundwater elevations (GSP 3-8). These sustainability criteria suggest that groundwater elevations at all representative wells in the ESJ Subbasin can continue to decrease for the next 20 years, dropping further from historically low groundwater elevations during drought years, without witnessing undesirable results. The ESJ Subbasin is characterized by DWR as 'Critically Overdrafted,' meaning "continuation of present water management practices [in the basin] would probably result in significant adverse overdraft-related environmental, social, or economic impacts" ("Critically"). However, according to the GSP, there are no areas within the basin that are considered to have 'significant and unreasonable existing issues' (GSP pp 3-4), therefore minimum thresholds allow for continued groundwater depletions. Conceptually, there is a disconnect between the ESJ's 'Critically Overdrafted' designation and the GSP's claim that the basin has not experienced undesirable results, nor will it if groundwater levels continue to decrease. More specifically, the Department believes historical declines in terrestrial and aquatic groundwater dependent ecosystem viability, exacerbated by recent drought years, are evidence of undesirable results and further groundwater decline will undoubtedly lead to significant and unreasonable effects on fish and wildlife beneficial uses and users of groundwater and interconnected surface waters under the proposed sustainable management criteria. For example, further streamflow depletion attributable to groundwater pumping that lowers groundwater levels to meet minimum thresholds or even measurable objective may further compromise in-stream temperature targets in the lower San Joaquin River, adversely impacting in-stream species (see Comment #5.a.i). Accordingly, the Department does not believe groundwater levels above the proposed minimum thresholds and below the proposed measurable objectives (in the margin of operational flexibility) will allow the basin to achieve sustainability, particularly with respect to avoiding undesirable results for fish and wildlife beneficial uses and users of groundwater and Interconnected surface water. b. Recommendation: i. Proxy Metrics: To justify use of groundwater elevations as a proxy metric for Depletions of Interconnected Surface Water, the GSP should either specify how groundwater elevations are significantly correlated to surface water depletions; or define an expeditious path to identifying the location, quantity, and timing of surface water depletions caused by groundwater use, per 23 CCR §354.28(c)(6)(A), to better inform sustainability criteria for Depletions of Interconnected Surface Water. ii. Undesirable Results: Specify Groundwater Level 'undesirable results' and 'effects of undesirable results' for environmental beneficial users of groundwater and interconnected surface water. Specify undesirable result indicators for Depletions of Interconnected Surface Water that are relevant to beneficial users of surface waters. Identify undesirable results indicators for dry and critically dry water years for all sustainability indicators. iii. Minimum Thresholds and Measurable Objectives: Reconsider minimum thresholds and measurable objectives, accounting for undesirable results for fish and wildlife beneficial uses and users of groundwater and interconnected surface water. Design sustainable management criteria that reflect a 'Critically Overdrafted' subbasin designation by seeking to improve current groundwater conditions rather than allowing for continued aquifer depletions over the next two decades. For example, historical groundwater pumping has likely contributed to stream disconnection illustrated in figure 2-66 (GSP 2-99); resulting in depleted stream flows and reduced baseflows in ESJ Subbasin tributaries, and exacerbated high water temperatures in the lower San Joaquin River that negatively impact listed species such as the Chinook Salmon. Minimum thresholds and measurable objectives should reflect an effort to prevent further degradation to interconnected surface waters and to avoid undesirable results, rather than risk magnifying historical undesirable results through lowered groundwater elevations.	Interconnected Surface Water	See Master Response 2 - ISW.

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7	Kevin Thomas	CA Department of Fish and Wildlife, North Central Region	3.6	The GSP wrongly abdicates responsibility for specific constituents by implying there is no nexus between specific groundwater contaminants and groundwater pumping (GSP pp 3-11). a. Issue. The GSP identifies two primary water quality constituents of concern in the ESJ Subbasin: salinity and arsenic (GSP pp 2-76). The GSP only specifies sustainability management criteria for salinity. The GSP explains that other constituents, including arsenic, are managed through other regulatory programs, and suggests that because GSAs do not have land use authority, they lack an ability to manage for such constituents as arsenic (GSP pp 3-11). Science suggests that over-pumping of aquifers can cause clay layers to compress and release dissolved arsenic, resulting in an increase of arsenic in extracted water ("Groundwater"). Thus, groundwater pumping actions can affect the presence, movement, and concentration of naturally oncoming arsenic in groundwater, potentially increasing anthropogenic and ecosystem exposure to arsenic contamination. According to SGMA statue, GSAs have the authority to establish groundwater extraction allocations, among other relevant authorities [WC § 10726.4]. Because arsenic contamination can be impacted by groundwater pumping, and because GSAs have the authority to manage groundwater pumping, the ESJGWA has a viable management lever over arsenic contamination in the ESJ Subbasin. b. Recommendation: Draft a plan to investigate the relationship between groundwater pumping and the presence, movement, and concentration of arsenic in the ESJ Subbasin and include the plan in the GSP submitted to DWR by January 2020. Develop sustainability criteria for arsenic accordingly and in partnership with existing regulatory programs by the first 5-year GSP update due in January 2025.	Groundwater Quality	See Master Response 3 -- Water Quality.
8	Kevin Thomas	CA Department of Fish and Wildlife, North Central Region	Monitoring Networks	Number and distribution of groundwater monitoring wells are insufficient for analysis. a. Issue: The current monitoring network lacks a sufficient number and representative distribution of shallow groundwater monitoring wells to monitor impacts to environmental beneficial uses and users of groundwater and interconnected surface waters [23 CCR § 354.34(2)], Few wells are near interconnected surface waters or concentrations of] GDEs; and therefore, there are few data points on shallow groundwater level trends. These data are critical to understanding groundwater management impacts on fish and wildlife beneficial uses and users of groundwater, including GDEs and interconnected surface water habitats, that are impacted disproportionately by shallow groundwater trends. b. Recommendation: Install additional shallow groundwater monitoring wells near GDEs and interconnected surface waters, potentially pairing multiple-completion wells with streamflow gauges for improved understanding of surface water-groundwater interconnectivity.	Monitoring Network	Data gaps are discussed in Section 4.7 (Data Gaps) and include identified gaps in the monitoring and analysis of interconnected surface waters and GDEs. The GSP includes a plan for the drilling of up to 12 proposed wells to help resolve identified gaps and enhance future analysis of interconnected surface waters and GDEs. These proposed wells would all measure for both groundwater quality and groundwater levels and include 2 deep, nested wells funded under the TSS application and up to 10 shallow wells drilled by the ESJGWA. If a need for more detail is recognized, the monitoring network will be reevaluated as updates to the GSP occur. Frequency of groundwater level monitoring is cited in the Draft Monitoring Networks and Identification of Data Gaps Best Management Practice. While semi-annual monitoring is required for groundwater levels, DWR guidance recommends monthly sampling of groundwater levels for the Subbasin based on aquifer type, volume of long-term aquifer withdrawals, and recharge potential. The ESJGWA Board determined semi-annual sampling was appropriate as it will capture seasonal highs and lows and that additional monitoring would not necessarily provide additional information on trends.
9	Kevin Thomas	CA Department of Fish and Wildlife, North Central Region	6.1	Demand reduction management actions lack emphasis and specificity critical to ESJ Subbasin sustainability goal achievement. a. Issue: The GSP project and management actions focus on supply augmentation, with only three projects intended to conserve groundwater through metering and systems optimization. Though the GSP reserves the flexibility to implement demand-side management In the future (GSP pp 6-1), there are no specifics as to how the ESJGA would implement demand management. This lack of specificity on how demand will be managed may lead to deprioritization or delayed implementation of demand management actions, which can undermine a basin's ability to achieve sustainability goals. Considering the ESJ Subbasins' current unsustainable rate of groundwater consumption and considering the cost and timing challenges associated with supply augmentation projects, a balanced portfolio approach to achieve groundwater sustainability should Include demand-management strategies. b. Recommendation: Add specific measures for initiating demand reduction on an earlier timeline in the ESJ Subbasin to account for groundwater pumping lag Impacts, supply-augmentation project implementation challenges, and a scaled ramping-down of groundwater use that is a necessary ingredient in San Joaquin Valley long-ten groundwater sustainability. Be specific about triggers, timing, and expected outcomes of demand-management actions.	Projects and Management Actions	See Master Response 5 - Projects.
10	Bill Mattos	California Poultry Federation		CFP commends the Draft GSP for emphasizing projects to augment yield and increase recharge.	Projects and Management Actions	See Master Response 5 - Projects.
11	Tom Lippe	California Sportfishing Protection Alliance	n/a	The Plan does not satisfy GSP Rule 355.4(b)(1) because the Plan's description of the sustainability goal, undesirable results, minimum thresholds, measurable objectives, and interim milestones are not reasonable or supported by the best available information and best available science.	Sustainable Management Criteria	The ESJGWA has determined that the plan is supported by the best available data and science with extensive input from stakeholders, GSAs, and agencies.
12	Tom Lippe	California Sportfishing Protection Alliance	n/a	The Plan does not satisfy GSP Rule 355.4(b)(3) because the sustainable management criteria and projects and management actions identified in the plan are not commensurate with the level of understanding of the basin setting, based on the level of uncertainty, as reflected in the Plan.	Sustainable Management Criteria	The ESJGWA has determined that the plan is supported by the best available data and science with extensive input from stakeholders, GSAs, and agencies.
13	Tom Lippe	California Sportfishing Protection Alliance	n/a	The Plan does not satisfy GSP Rule 355.4(b)(5) because the Plan does not contain or present substantial evidence to conclude that the projects and management actions identified to achieve sustainable yield are effective or feasible or not likely to prevent undesirable results or to ensure that the basin is operated within its sustainable yield.	Projects and Management Actions	See Master Response 5 - Projects.
14	Greg Kamman	California Sportfishing Protection Alliance	Section 2.1.9.2.2	Section 2.1.9.2.2 of the GSP (page 2-49) is entitled, Regional Historic Groundwater Flow and Surface Water Interaction. There is no presentation or reference to historic groundwater interaction with surface water in this section of the GSP.	Basin Setting	Added text to Section 2.1.9.2.2 (Regional Historic Groundwater Flow and Surface Water Interaction) referring to where historic groundwater-surface water interaction is discussed: Historical groundwater-surface water interaction in the context of the twenty years of the historical model (ESJWRM) is discussed in Section 2.2.6.
15	Greg Kamman	California Sportfishing Protection Alliance	Section 2.2.6	Section 354.16 of the GSP Regulations stipulates that each plan describe current and historic groundwater conditions in the basin based on the best available information. With regard to Section 2.2.6 of the GSP.(Interconnected Surface Water Systems), I would like you to be aware of a study completed by Kamman Hydrology & Engineering, Inc. in 2018 , which delineates subterranean streams and Potential Stream Depletion Areas (PSDA) along the Stanislaus River bordering the south side of the ESJGB. PSDA's are areas where groundwater pumping could potentially cause stream depletion. This report and associated maps are attached for reference and integration into Section 2.2.6 of the GSP. Access KHE's 2018 report at this link: https://www.dropbox.com/s/zzqnn6ifsbahx5p/PSDA-mapping-Tech-Memorandum_v1%2Bquads.pdf?dl=0	Basin Setting	Thank you for providing the report. Interconnected surface water was discussed at the scale of the Eastern San Joaquin Subbasin in Section 2.2.6, though the figures show more individual stream results. Comment noted for follow up and comparison as analysis of stream-aquifer interaction continues in future GSP updates.
16	Greg Kamman	California Sportfishing Protection Alliance	Section 2.2.6	Section 2.2.6 of the GSP (page 2-97 to 2-99) also introduces Figure 2-65 (attached as Exhibit A), which shows gaining streams in blue where groundwater discharges to rivers, losing streams in red where streams lose water to the groundwater system, and mixed streams (gaining or losing less than 75 percent of the time) in orange. This analysis was based on modeling results from the historical calibration of the East San Joaquin Water Resources Model (ESJWRM) for approximately 900 stream nodes in the Eastern San Joaquin Subbasin. The historical model calibration period covers the water years 1996-2015. Based on the Cumulative Departure from Mean Precipitation curve presented in Figure 2-71 (pg. 2-109 of GSP), the years 1996-2015 reflect a dry period, as there is a net decrease in approximately 17-inches of precipitation (i.e., change from +7 [1996] to -10 inches [2015] in the cumulative departure curve). This section of the GSP only presents a description of historical (and dry) interconnected surface water conditions. Section 354.16 of the California Code of Regulations (Regulations) stipulates that each Plan shall provide a description of current and historical groundwater conditions in the basin. The GSP fails to describe the current conditions of the interconnected surface water system in the basin.	Interconnected Surface Water	See Master Response 2 - ISW.

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17	Greg Kamman	California Sportfishing Protection Alliance	Section 2.2.6	Section 2.2.6 of the GSP (Interconnected Surface Water Systems; page 2-97 to 2-99) also presents Figure 2-66 (attached as Exhibit B), which is entitled, Interconnected and Disconnected Streams. The GSP states that Stream connectivity was analyzed by comparing monthly groundwater elevations from the historical calibration of the ESJWRM to streambed elevations along the streams represented in the ESJWRM. Exhibit B shows the locations where streams are interconnected at least 75 percent of the time (shown in blue) or disconnected (shown in green). Section 351 of the Regulations defines "interconnected surface water" as surface water that is hydraulically connected at any point by a continuous saturated zone to the underlying aquifer and the overlying surface water is not completely depleted. The GSP (pg. 2-97) states that interconnected surface waters may be either gaining or losing, wherein the surface water feature itself is either gaining water from the aquifer system or losing water to the aquifer system. Exhibit C (attached) is taken from DWR's water budget BMP guidance document and illustrates the relationship between surface water and groundwater for gaining, losing and disconnected streams. Per this diagram, for a stream to be gaining, it must be hydraulically connected to the aquifer. In many instances, a losing stream may also be in hydraulic connection to the aquifer. Losing streams may become disconnected seasonally or during drought periods in response to a falling water table. There are inconsistencies between the results presented in Exhibits A and B where areas delineated as gaining streams are also identified as being disconnected. A good example of this is the upstream portion of the Stanislaus River located in the southeast corner of the basin. These inconsistencies should be corrected or explained. In addition, the stream connectivity presented in Exhibit B is for historic conditions – the current conditions should also be presented per Regulations.	Interconnected Surface Water	See Master Response 2 - ISW.
18	Greg Kamman	California Sportfishing Protection Alliance	Sections 2.2.7, 2.2.8, and 2.2.9	The GSP Regulations define "groundwater dependent ecosystem" (GDE) as ecological communities or species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface. Section 354.16 of the Regulations stipulate that Plans identify (current and historic) GDEs within the basin, utilizing data available from the Department, as specified in Section 353.2, or the best available information. As stated on page 2-100, the GSP identifies GDEs within the Subbasin based on determining the areas where vegetation is dependent on groundwater. The GSP presents a methodology where the Natural Communities Commonly Associated with Groundwater (NCCAG) database, developed by DWR, CDFW and The Nature Conservancy (TNC), is used to identify vegetation communities and wetlands that are dependent on groundwater. Figure 2-67 of the GSP (attached as Exhibit D) presents the NCCAG within the basin. The GSP then describes a methodology by which NCCAG's with alternate water supplies are excluded from consideration as GDEs based on the following criteria: a. Depth to groundwater greater than 30 feet; b. areas within 150 feet of managed wetlands that receive supplemental water; c. areas within 50 feet of irrigated agriculture; d. areas within 150 feet of perennial surface water bodies, and e. areas removed based on stakeholder comment. The resulting areas identified as GDEs within the basin based on these criteria are shown in Figure 2-69 of the GSP (attached as Exhibit E). There are two major problems with the GSP's method for delineation of GDEs. First, the GSP method only considers the presence of vegetation communities and wetlands in the determination. GSP Regulations stipulate that "species" dependent on groundwater should also be considered. Thus, the analysis should also take into consideration the presence of fish and wildlife species that rely on riparian wetlands and/or flow in rivers influenced by gaining reaches. The Nature Conservancy refers to these species as Environmental Surface Water Beneficial Users and has prepared a list of freshwater species located within each groundwater basin in California. These lists are posted at their website specifically for GSAs and others to better evaluate the impacts of groundwater management on environmental beneficial users of surface water in GSPs. This best available science should be integrated into the determination of GDEs. The second problem I see in the GSP methodology is the failure to acknowledge that GDEs may depend on shallow groundwater regardless of the presence of alternative water sources. For example, wetlands within or adjacent to irrigated agriculture may not rely on that irrigation for survival; if they did, we would expect to find wetlands growing in all irrigated lands. In addition, the presence and sustainability of perennial surface water in Central Valley Rivers is controlled by many factors (e.g., groundwater inflow, reservoir operations, irrigation drainage, etc.). Modeling results presented in the GSP indicate significant contributions of groundwater flow to "gaining" reaches of the Stanislaus River (see Exhibit A). The riparian and wetland vegetation bordering these gaining reaches are surely sustained to some degree by this groundwater inflow to the river and the shallow groundwater conditions that likely accompany gaining reaches. The interconnected condition is also likely influenced significantly by seasonal and long-term wet and dry cycles. However, the GSP does not quantify the relative spatial or temporal contributions of groundwater supply to riparian habitats. Instead, the GPS simply dismisses these habitats as GDE's under the assumption that perennial flow is sustained through the summer by agricultural deliveries or tailwater. Therefore, it is my opinion that the process of elimination of GDEs as presented in the GSP is seriously flawed and does not correctly recognize or delineate GDEs in the basin.	GDEs	See Master Response 1 - GDEs.
19	Greg Kamman	California Sportfishing Protection Alliance	Section 2.3.6	One of the most important outcomes of the GSP is the determination of sustainable yield (sustainability goal) for the basin. Section 2.3.6 (pg. 2-133) of the GSP states that, "The sustainable conditions scenario is based on the projected conditions scenario modified by lowering groundwater production across the model domain." This section of the GSP then provides some qualitative statements about future supplies, demands and uncertainties in water budget assumptions and numerical modeling. Although the sustainable yield of the basin is determined to be 715,000 AF/yr +/- 10 percent, and a 78,000 AF/yr reduction in groundwater use is needed to achieve sustainability, there is no detailed explanation on how these numbers were determined. Per Section 354.24 of the GSP Regulations, "The Plan shall include a description of the sustainability goal, including information from the basin setting used to establish the sustainability goal, etc." As written, the GSP does not provide the reader with a clear and detailed explanation on how the sustainable yield figure was derived and if climate change predictions were factored into the quantification. This omission makes it impossible to review and comment on the reliability of the sustainable yield or required reduction figures for the basin under existing or future conditions. Therefore, the draft GSP should be revised to include this information and recirculated for public comment.	Water Budget	1) The text in 2.3.6 (Sustainable Yield Estimate) includes a description of how sustainable yield was estimated using ESJWRM. The analysis of sustainable yield involved simulations on the projected conditions scenario lowering groundwater production across the model domain to achieve a long-term change in storage of, or very close to, zero. 2) The ESJGWA Board determined the projected conditions scenario was most appropriate for analyzing sustainable yield in the GSP implementation time period beginning in 2040. Consistent with regulations, the 2070 climate change sensitivity analysis on the projected conditions scenario was used to better understand trends and inform planning. Therefore, the sustainable yield analysis did not include climate change. Comment noted for follow up in next round of model refinements and updates to analyses.

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Comment #	Commenter	Commenter Organization	Section, Figure, or Table Number	Comment	Category	Response to Comment
20	Greg Kamman	California Sportfishing Protection Alliance	Section 6.2.3	Because the Subbasin is in overdraft, the GSP has identified 23 projects to reduce overdraft conditions and meet long-term water demands and sustainability goals. There are some projects focused on conservation and reuse of reclaimed water, but the majority simply reduce local groundwater demand by providing access to surface water supplies. These projects are limited in geographic area and are intended to provide local solutions. However, from the perspective of a full basin water budget, shifting the reliance from groundwater to surface water supplies may not generate the full benefits anticipated as provided in the project descriptions. This is because diverting and reducing stream flows will lead to reductions in groundwater recharge in other areas within or beyond the basin, via reduced water available for stream infiltration or other uses of stream diversions that contribute to recharge. As required in Section 354.44 of the Regulations, the GSP does not provide a full and comprehensive quantification of demand reduction in response to project implementation – this would require deriving a basin-scale water budget accounting that incorporates project actions. This analysis would also inform the evaluation, as required under Section 355.4 of the GSP Regulations, of Plan/project feasibility and undesirable results (e.g., ecological impacts) associated with increased diversion and use of surface water supplies. Stated another way, I'm concerned that the GSP has not demonstrated that the Project Actions will be effective in achieving stated reductions in groundwater use and avoiding undesirable results. For example, Project 2, the SEWD Surface Water Implementation Expansion Project (SEWD), would require landowners adjacent to surface water conveyance systems (rivers or pipelines) to utilize surface water as part of the SGMA implementation. This would increase surface water usage by about 18,000 to 20,000 AF/year with in-lieu groundwater recharge benefits. This project relies on water from New Hogan Reservoir (Calaveras River water) and New Melones Reservoir (Stanislaus River water). Although the project could reduce groundwater use, there is no analysis provided on how the project would affect surface and ground water resources downstream of the two reservoirs. If this project reduced downstream flows, it could result in depleted surface water supplies, reduced groundwater recharge from the rivers as well as adverse impacts to riparian vegetation and environmental surface water beneficial users. Similarly, I'm concerned about the assumed feasibility of some projects achieving the desired goal. For example, the groundwater recharge Projects 11 and 12 are anticipated to each recharge 8,000 AF/yr through the construction and operation of independent 10-acre recharge ponds. This equates to recharging 800 feet of water at each pond site between December 1 and June 30th of each year or 3.78 feet daily for the 212 day period. I am skeptical about achieving this level of recharge given the uncertainties in water availability during dry years, operations that would be required to maintain ponding of sufficient depth and duration, and maintaining basin infiltration rates given the likely accumulation of fine grained material that reduces basin permeability. This example demonstrates how the GSP fails to demonstrate how these project can be accomplished in a successful manner under a variety of rainfall and runoff conditions.	Projects and Management Actions	See Master Response 5 - Projects. The ESJWRM will be updated to incorporate and evaluate GSP projects in future model refinement efforts.
21		Collective Comments: TNC, Audubon California, CWA, CWF, American Rivers, Union of Concerned Scientists		The GSP does not currently provide clear information on how and to what extent DAC members rely on groundwater. For example: how much of the population relies on private domestic wells for drinking water? How much of the population relies on small community water systems and where are those systems located? Are those community water systems solely depending on groundwater? How many connections do the small water systems serve? This information is valuable for the reader to understand the scale of the vulnerable population dependent on groundwater for drinking water. [SEE MORE SPECIFICS IN COMMENT LETTER]	DACs	1) DAC areas are mapped in Figure 1-8 in Section 1.2.1. The density of domestic wells are mapped in Figure 1-12. 2) An appendix has been added to the GSP which documents the 432 community water systems that received hard copy outreach materials throughout the GSP development process. Section 1.3.4.4 (Stakeholder Database) was updated to list the dates that outreach materials were mailed to community water systems. An analysis was performed to map community water systems that are DAC or SDAC areas, and the results of this analysis are presented in the added appendix. The appendix lists the number of connections served by each system. 3) Section 1.3.1 (Beneficial Uses and Users in the Subbasin) was updated to include community water systems and reference the added appendix. 4) Language was added to Section 1.3.4.5 (Stakeholder Education and Outreach) indicating that many GSAs conducted local outreach within their jurisdiction, including direct mailings to parcels served as part of a small water system.
22		Collective Comments: TNC, Audubon California, CWA, CWF, American Rivers, Union of Concerned Scientists		Although the GSP identifies declining water quality trends for arsenic and nitrate in the basin, which meet the GSP's definition of undesirable results for water quality, no MOs or MTs are set for these constituents. The concentration of these constituents can be impacted by management actions. [SEE MORE SPECIFICS IN COMMENT LETTER]	Groundwater Quality	See Master Response 3 -- Water Quality.
23		Collective Comments: TNC, Audubon California, CWA, CWF, American Rivers, Union of Concerned Scientists		The GSP notes plans to coordinate and share data with other regulatory monitoring programs, but does not explain how this coordination will improve sustainability with respect to water quality within the basin. The GSP should identify a clear plan for addressing all groundwater constituents that are contributing to the undesirable results of degraded groundwater quality, including those for drinking water users. [SEE MORE SPECIFICS IN COMMENT LETTER]	Groundwater Quality	See Master Response 3 -- Water Quality.
24		Collective Comments: TNC, Audubon California, CWA, CWF, American Rivers, Union of Concerned Scientists		Caswell Memorial State Park is incorrectly referred to as being located outside the Eastern San Joaquin Subbasin. [SEE MORE SPECIFICS IN COMMENT LETTER]	Clarifying Edit	Caswell Memorial State Park is within the Subbasin. Section 1.2.1 (Description of Plan Area) includes text that it is the only state park within the Eastern San Joaquin Subbasin boundary.
25		Collective Comments: TNC, Audubon California, CWA, CWF, American Rivers, Union of Concerned Scientists	Figure 1-11	The authors referred to the San Joaquin County General Plan documents, including background reports, for information regarding these important resources. These potential beneficial groundwater users should be described in the text on pp. 1-18 and shown in Figure 1-11. Please include a description recognizing all of the protected areas in the Subbasin and their beneficial groundwater uses. [SEE MORE SPECIFICS IN COMMENT LETTER]	Plan Area	Comment noted. This information is beyond the scope of the GSP. Consider for inclusion in future updates to the GSP.
26		Collective Comments: TNC, Audubon California, CWA, CWF, American Rivers, Union of Concerned Scientists	2.2.8	Section 2.2.8 includes a geospatial analysis that removes managed wetlands from consideration as GDEs. The managed wetlands in the Subbasin should be identified in this section. [SEE MORE SPECIFICS IN COMMENT LETTER]	GDEs	Comment noted for potential inclusion in future update to the GSP. Figure 2-68 was updated to show removed NCCAG areas (including managed wetlands in pink) as data gaps. These identified wetlands were reviewed with local water managers to verify supplemental water deliveries.
27		Collective Comments: TNC, Audubon California, CWA, CWF, American Rivers, Union of Concerned Scientists		Ongoing stakeholder engagement and inclusion throughout the GSP implementation process will be crucial to ensuring that the needs of the most vulnerable beneficial users in the basin are met. [SEE MORE SPECIFICS IN COMMENT LETTER]	Outreach	This has been noted as a future item for consideration as the GSAs move into GSP implementation.

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28		Collective Comments: TNC, Audubon California, CWA, CWF, American Rivers, Union of Concerned Scientists	Figure 1-8	The Communications plan does not specify how the DACs identified in Figure 1-8 were specifically engaged. The failure to identify small community water systems calls into question how and whether adequate outreach to DACs was conducted. [SEE MORE SPECIFICS IN COMMENT LETTER]	Outreach	1) An appendix has been added to the GSP which documents the 432 community water systems that received hard copy outreach materials throughout the GSP development process. Section 1.3.4.4 (Stakeholder Database) was updated to list the dates that outreach materials were mailed to community water systems. An analysis was performed to map community water systems that are DAC or SDAC areas, and the results of this analysis are presented in the added appendix. 2) Section 1.3.1 (Beneficial Uses and Users int he Subbasin) was updated to include community water systems and reference the added appendix. 3) Language was added to Section 1.3.4.5 (Stakeholder Education and Outreach) indicating that many GSAs conducted local outreach within their jurisdiction, including direct mailings to parcels served as part of a small water system.
29		Collective Comments: TNC, Audubon California, CWA, CWF, American Rivers, Union of Concerned Scientists		The "stakeholder feedback" mechanism for removal of NCCAGs from consideration as GDEs is not explained or documented in the GSP. Please provide details that support removing potential GDEs based on stakeholder feedback. [SEE MORE SPECIFICS IN COMMENT LETTER]	GDEs	Text in Section 2.2.7 (Groundwater-Dependent Ecosystems) was edited to clarify what comprised stakeholder feedback: Next, areas identified as GDEs were ground-truthed with GSA staff and Groundwater Sustainability Workgroup (Workgroup) members. Through this process, areas identified GDEs were investigated, and areas identified as known irrigated parcels such as parks were reclassified. These areas are labels on Figure 2-74 as "Stakeholder Comment."
30		Collective Comments: TNC, Audubon California, CWA, CWF, American Rivers, Union of Concerned Scientists		The GSP uses domestic well depths as a basis for determining water level MTs, but does not present the domestic well depth data in the document. A map or maps showing domestic and public supply well depths would provide more transparency. [SEE MORE SPECIFICS IN COMMENT LETTER]	Groundwater Levels	Appendix 3-A (Supplemental Data for Groundwater Level Minimum Thresholds) shows the tabulated data for the wells in the representative monitoring network for groundwater levels. The table has been updated to include municipal well depths for Stockton, Manteca, and Lodi.
31		Collective Comments: TNC, Audubon California, CWA, CWF, American Rivers, Union of Concerned Scientists		The GSP identifies that information on domestic well construction including screen interval depths, are not available. However, the GSP does not identify a plan to fill this data gap, even though this information is critical to the GSA's establishment of their water level MTs. [SEE MORE SPECIFICS IN COMMENT LETTER]	Monitoring Network	Though the ESJGWA is not currently planning to collect construction information about domestic wells, any information that is shared or becomes publicly available will be reviewed for use in updates to the GSP.
32		Collective Comments: TNC, Audubon California, CWA, CWF, American Rivers, Union of Concerned Scientists		Providing maps of the monitoring network overlaid with location of DACs, GDEs, and any other sensitive beneficial users will allow the reader to evaluate the adequacy of the network to monitor conditions near these beneficial users. [SEE MORE SPECIFICS IN COMMENT LETTER]	Monitoring Network	The plan is supported by the best available data and science and meets the requirements of SGMA. The ESJGWA Board supports the inclusion of the monitoring network as presented and approved it in July 2019.
33		Collective Comments: TNC, Audubon California, CWA, CWF, American Rivers, Union of Concerned Scientists		The scientific rationale for removing areas with access to alternate water sources from the identified GDEs should be better explained. Specifically, the results of any supporting habitat assessments should be provided. If no habitat assessments were conducted or reviewed, this should be identified as a data gap. [SEE MORE SPECIFICS IN COMMENT LETTER]	GDEs	See Master Response 1 - GDEs.
34		Collective Comments: TNC, Audubon California, CWA, CWF, American Rivers, Union of Concerned Scientists		In the case of managed wetlands, the water sources used by the managed wetlands, the type of managed wetlands, the relationship of the wetlands to groundwater, and the wetland manager should be specified. In addition, these managed wetlands should be identified in Section 1.3.1. [SEE MORE SPECIFICS IN COMMENT LETTER]	GDEs	Comment noted. The managed wetlands and surrounding areas are mapped in Figure 2-68. SGMA does note require identification of managed wetlands or further classification.
35		Collective Comments: TNC, Audubon California, CWA, CWF, American Rivers, Union of Concerned Scientists		The approach used to identify and exclude GDEs should be supported by actual hydrologic and habitat assessment data. If such data and assessments are not available, the need for supporting studies to validate the approach should be identified as a data gap. [SEE MORE SPECIFICS IN COMMENT LETTER]	GDEs	GDEs have been identified as data gap areas requiring further refinement. Section 4.7 (Data Gaps) has been updated to reflect this change and to identify plans to collection additional data in areas of shallow groundwater.
36		Collective Comments: TNC, Audubon California, CWA, CWF, American Rivers, Union of Concerned Scientists		Shallow groundwater data near streams are identified as a significant data gap, and the application of a 30-foot depth to water criterion in light of the identified data gaps needs to be explained and supported. [SEE MORE SPECIFICS IN COMMENT LETTER]	Monitoring Network	Section 2.2.7 (Groundwater-Dependent Ecosystems) was expanded to better describe the analysis: To identify NCCAG areas that are GDEs, the analysis identified communities in areas where groundwater levels are shallower than 30 feet bgs, as these areas are thought to be reachable by the root zone of vegetation. Oak trees are considered the deepest-rooted plant in the region with a root zone of roughly 25 feet. This value is considered conservative, as this depth is unlikely to support recruitment of new oak seedlings. NCCAG-identified communities in areas with groundwater shallower than 30 feet were considered as potential GDEs. Communities in areas deeper than 30 feet were identified as data gap areas for future refinement and are labeled on Figure 2-68 as "Depth to Water > 30 ft". These areas will be refined in future analyses to identify potential existing GDEs that may have been misclassified through this screening process. Additional information regarding plans to fill GDE-related data gaps can be found in Section 4.7.4.
37		Collective Comments: TNC, Audubon California, CWA, CWF, American Rivers, Union of Concerned Scientists		We recommend that depth to groundwater contour maps are used to verify whether a connection to groundwater exists for polygons in the NC Dataset, instead of relying on inferences based on the presence of surface water features in the Basin. [SEE MORE SPECIFICS IN COMMENT LETTER]	GDEs	Comment noted. This GSP uses a depth to groundwater contour map to evaluate whether a connection to groundwater exists with the Natural Communities Commonly Associated with Groundwater database (collectively developed by TNC, DWR, and CDFW).
38		Collective Comments: TNC, Audubon California, CWA, CWF, American Rivers, Union of Concerned Scientists		It is highly advised that seasonal and interannual fluctuations in the groundwater regime are taken into consideration in the evaluation of root zones, particularly for oak trees. Utilizing groundwater data from one point in time or contoured with too few shallow monitoring wells can misrepresent groundwater levels required by GDEs, and inadvertently result in adverse impacts to the GDEs. [SEE MORE SPECIFICS IN COMMENT LETTER]	GDEs	See Master Response 1 - GDEs.
39		Collective Comments: TNC, Audubon California, CWA, CWF, American Rivers, Union of Concerned Scientists		We recommend that a discussion regarding the nature and characteristics of the identified GDEs be included. [SEE MORE SPECIFICS IN COMMENT LETTER]	GDEs	Comment noted. Consider for inclusion in future updates to the GSP. As GDEs are a recognized data gap in the GSP, the list of identified GDEs will continue to be refined. Language was added to Section 4.7 (Data Gaps) to identify NCCAG areas removed through the GDE analysis are data gaps areas requiring further refinement. The purpose of this is to identify potential existing GDEs that may have been incorrectly eliminated through this screening process.

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40		Collective Comments: TNC, Audubon California, CWA, CWF, American Rivers, Union of Concerned Scientists		It is not clear how climate change is anticipated to change the demands of domestic users and small public water systems or how these demands were accounted for in the projected water budget. [SEE MORE SPECIFICS IN COMMENT LETTER]	Climate Change	There was no specific analysis done on the impact of climate change on domestic users and small public water systems apart from the simulation of both in the climate change model scenario as a part of the broader urban classification including all cities, private domestic users, and public water systems. Climate change will continue to be evaluated with every update to the GSP. Comment noted for follow up in next round of model refinements and updates to analyses.
41		Collective Comments: TNC, Audubon California, CWA, CWF, American Rivers, Union of Concerned Scientists		Please include an explanation of the approach to determining the amount of riparian ET demand met by streamflow vs. groundwater evapotranspiration. [SEE MORE SPECIFICS IN COMMENT LETTER]	Water Budget	Riparian evapotranspiration is included in the water budget (part of "Refuge, Native, and Riparian Evapotranspiration" in Table 2-14) and simulated in the model. Both streamflow and groundwater can contribute to meeting riparian evapotranspiration demand and the amount of demand met by each component is estimated directly by the model. "Riparian Intake from Streams" in Tables 2-13 and 2-14 includes all surface water and groundwater contributing to riparian demand through stream-aquifer interaction. The ESJWRM model does not have the level of detail to determine how much groundwater is consumed by riparian demand.
42		Collective Comments: TNC, Audubon California, CWA, CWF, American Rivers, Union of Concerned Scientists		Groundwater outflow to ET does not appear to be identified as a groundwater budget component. In addition, the ET demand of natural vegetation does not appear to be considered in water supply and demand calculations. Since wetlands, GDEs and riparian vegetation are recognized as beneficial users of groundwater in the Subbasin, it is appropriate to include them in these calculations. [SEE MORE SPECIFICS IN COMMENT LETTER]	Water Budget	1) Groundwater outflow to evapotranspiration is not directly included as a water budget component and is simulated indirectly in ESJWRM through stream-aquifer interaction and seepage of pumped groundwater. 2) Wetlands, GDEs, riparian vegetation, and native (or natural) vegetation are recognized as beneficial users and are included in the water budget, though not separated out and are part of "Refuge, Native, and Riparian Evapotranspiration". There is not enough information at this time to determine how much groundwater is consumed by each of these demands. 3) This GSP recognized GDEs as a data gap in both the determination of GDEs in the Subbasin as well as the simulation of GDEs in the model. In the model, GDEs are broadly assumed to be represented as native vegetation as they are not specifically included in land use surveys. This representation removes the realistic variation of rooting depths across GDEs and we will consider the specific simulation of GDEs in future updates to the model. Comment noted for follow up in next round of model refinements and updates.
43		Collective Comments: TNC, Audubon California, CWA, CWF, American Rivers, Union of Concerned Scientists		The GSP clearly identifies plans to address data gaps in the monitoring network near streams, but does not clearly identify whether data gaps exist near DACs/drinking water users. A map illustrating the location of current and proposed monitoring well locations and depths relative to domestic and small public water systems wells and depths would allow the reader to assess the adequacy of the proposed network for monitoring impacts to these beneficial users. [SEE MORE SPECIFICS IN COMMENT LETTER]	Monitoring Network	The ESJGWA Board supports the inclusion of the monitoring network as presented and approved it in July 2019. Data gaps are discussed in Section 4.7 (Data Gaps) and include identified gaps in the monitoring and analysis of interconnected surface waters and GDEs. The GSP includes a plan for the drilling of up to 12 proposed wells to help resolve identified gaps and enhance future analysis of interconnected surface waters and GDEs. These proposed wells would all measure for both groundwater quality and groundwater levels and include 2 deep, nested wells funded under the TSS application and up to 10 shallow wells drilled by the ESJGWA. The plan meets the requirements of SGMA and does not require an additional figure at this time.
44		Collective Comments: TNC, Audubon California, CWA, CWF, American Rivers, Union of Concerned Scientists		Very few of the remaining monitoring wells are located near potential ISWs and GDEs. Specific monitoring of GDEs and ISWs should be described to further evaluate, monitor, manage and protect these areas. [SEE MORE SPECIFICS IN COMMENT LETTER]	Monitoring Network	The ESJGWA Board determined the monitoring network is consistent with SGMA regulations. If a need for more detail recognized, the monitoring network will be reevaluated as updates to the GSP occur. Data gaps are discussed in Section 4.7 (Data Gaps) and include identified gaps in the monitoring and analysis of interconnected surface waters and GDEs. The GSP includes a plan for the drilling of up to 12 proposed wells to help resolve identified gaps and enhance future analysis of interconnected surface waters and GDEs. These proposed wells would all measure for both groundwater quality and groundwater levels and include 2 deep, nested wells funded under the TSS application and up to 10 shallow wells drilled by the ESJGWA.
45		Collective Comments: TNC, Audubon California, CWA, CWF, American Rivers, Union of Concerned Scientists		It is not possible to determine whether the proposed monitoring, minimum thresholds and measurable objectives are sufficiently protective to ensure significant and unreasonable impacts to GDEs and ISWs will be prevented. The GDE Pulse interactive mapping application14 provides an example of a linkage between groundwater level data and GDE health that could be used to incorporate remote sensing into an efficient and incisive monitoring program. Please provide an explanation how groundwater levels will specifically be used to assess adverse impacts to GDEs and ISWs, and identify any data gaps and how they will be addressed. [SEE MORE SPECIFICS IN COMMENT LETTER]	Monitoring Network	The ESJGWA Board determined the monitoring network is consistent with SGMA regulations. If a need for more detail recognized, the monitoring network will be reevaluated as updates to the GSP occur. Data gaps are discussed in Section 4.7 (Data Gaps) and include identified gaps in the monitoring and analysis of interconnected surface waters and GDEs. The GSP includes a plan for the drilling of up to 12 proposed wells to help resolve identified gaps and enhance future analysis of interconnected surface waters and GDEs. These proposed wells would all measure for both groundwater quality and groundwater levels and include 2 deep, nested wells funded under the TSS application and up to 10 shallow wells drilled by the ESJGWA. GDE Pulse will be evaluated for use in the next round of GSP updates.
46		Collective Comments: TNC, Audubon California, CWA, CWF, American Rivers, Union of Concerned Scientists		Monitoring well locations should be prioritized near high value or sensitive resources (GDEs) that are vulnerable to significant and unreasonable impacts, such as near the protected lands identified in our comments on Section 1.3.1 or the GDEs identified in the Subbasin. In addition to the major streams and rivers in the subbasin, impacts to smaller creeks and wetland areas should be considered, as these may be the most vulnerable resources. Please discuss the results of a resource assessment or consultations with resource managers that demonstrates a sufficient number of wells is proposed to address data gaps near GDEs and ISWs, and that they are being sited where they will provide the most benefit. Alternatively, please outline the process by which this will be accomplished. [SEE MORE SPECIFICS IN COMMENT LETTER]	Monitoring Network	The ESJGWA Board determined the monitoring network is consistent with SGMA regulations. If a need for more detail recognized, the monitoring network will be reevaluated as updates to the GSP occur. Data gaps are discussed in Section 4.7 (Data Gaps) and include identified gaps in the monitoring and analysis of interconnected surface waters and GDEs. The GSP includes a plan for the drilling of up to 12 proposed wells to help resolve identified gaps and enhance future analysis of interconnected surface waters and GDEs. These proposed wells would all measure for both groundwater quality and groundwater levels and include 2 deep, nested wells funded under the TSS application and up to 10 shallow wells drilled by the ESJGWA.
47		Collective Comments: TNC, Audubon California, CWA, CWF, American Rivers, Union of Concerned Scientists		Please address how the need to link and correlate groundwater level declines to biological responses, and significant and adverse impacts to GDEs and ISWs will be addressed. [SEE MORE SPECIFICS IN COMMENT LETTER]	GDEs	The GSP considers environmental users of groundwater, including species and habitat reliant on instream flows, as well as wetlands and GDEs as beneficial uses and users. See Section 1.3.1 (Beneficial Uses and Users in the Basin). Beneficial uses and users are considered in identifying undesirable results for each of the sustainability indicators.
48		Collective Comments: TNC, Audubon California, CWA, CWF, American Rivers, Union of Concerned Scientists		Addressing data gaps is typically iterative and it is not reasonable to expect it will be a one-time process. Please describe the process by which data gaps will be identified and addressed on an ongoing basis. [SEE MORE SPECIFICS IN COMMENT LETTER]	Monitoring Network	The ESJGWA is committed to resolving the data gaps identified during the GSP development process. As discussed in Section 7.6.4 (Monitoring Network Description), a program may be developed for the GSP update to help fill new or remaining data gaps.
49		Collective Comments: TNC, Audubon California, CWA, CWF, American Rivers, Union of Concerned Scientists	5.3	Section 5.3 Table 5.3 indicates that data regarding streamflow and GDEs is not currently included in the proposed Data Management System. Please discuss which monitoring data for "related surface conditions" will be gathered and incorporated in the DMS to assess potential significant and unreasonable impacts to environmental beneficial uses and users. [SEE MORE SPECIFICS IN COMMENT LETTER]	DMS	Surface water data, including streamflow and water quality, is readily and publicly available online and has not be separately added to the DMS, though the system is set up to store streamflow and many other different types of data. Streamflow and surface water gage data was used both to build and calibrate the model, as well as in various analyses for the GSP. All groundwater level monitoring data will be evaluated for analysis of groundwater-surface water interaction and other surface conditions. As GDEs are a recognized data gap in the GSP, additional data may be collected that will be considered for addition to the DMS.
50		Collective Comments: TNC, Audubon California, CWA, CWF, American Rivers, Union of Concerned Scientists	7.3.1	In Section 7.3.1, please clarify the potential use of imagery as a monitoring tool, and expand it to monitoring surface indicators of ISW and GDE ecosystem health. [SEE MORE SPECIFICS IN COMMENT LETTER]	Monitoring Network	While there are currently no specific plans regarding the use of imagery is a monitoring tool, any publicly available tools will be evaluated for use in updates to the GSP.
51		Collective Comments: TNC, Audubon California, CWA, CWF, American Rivers, Union of Concerned Scientists	7.3.2.2	In Section 7.3.2.2, please specifically address ecosystem health of GDEs and ISWs as a surface indicator to subsurface conditions. This can be done using GDEPulse, remote sensing, imagery or other feasible methods [SEE MORE SPECIFICS IN COMMENT LETTER]	Monitoring Network	While there are currently no specific plans regarding the use of imagery is a monitoring tool, any publicly available tools will be evaluated for use in updates to the GSP.

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52		Collective Comments: TNC, Audubon California, CWA, CWF, American Rivers, Union of Concerned Scientists		Stakeholder input from DAC community members does not appear to have been considered in establishment of water quality URs, based on the information presented in the GSP. [SEE MORE SPECIFICS IN COMMENT LETTER]	Outreach	1) An appendix has been added to the GSP which documents the 432 community water systems that received hard copy outreach materials throughout the GSP development process. Section 1.3.4.4 (Stakeholder Database) was updated to list the dates that outreach materials were mailed to community water systems. An analysis was performed to map community water systems that are DAC or SDAC areas, and the results of this analysis are presented in the added appendix. 2) Section 1.3.1 (Beneficial Uses and Users in the Subbasin) was updated to include community water systems and reference the added appendix. 3) Language was added to Section 1.3.4.5 (Stakeholder Education and Outreach) indicating that many GSAs conducted local outreach within their jurisdiction, including direct mailings to parcels served as part of a small water system.
53		Collective Comments: TNC, Audubon California, CWA, CWF, American Rivers, Union of Concerned Scientists		Based on the presented information, domestic well uses are considered under URs and for the development of water level MOS and MTs, but DAC members are not explicitly considered. More detail and specifics regarding DAC members, including those that rely on smaller community drinking water systems, not only domestic wells, is necessary to demonstrate that these beneficial users were adequately considered. [SEE MORE SPECIFICS IN COMMENT LETTER]	Sustainable Management Criteria	Groundwater level minimum thresholds considered domestic wells in the analysis to determine the thresholds with the intent of being protective of 90% of domestic wells. In the Subbasin, 22 percent of domestic wells are located within DACs. An appendix has been added to the GSP which documents the 432 community water systems that received hard copy outreach materials throughout the GSP development process. Section 1.3.4.4 (Stakeholder Database) was updated to list the dates that outreach materials were mailed to community water systems. An analysis was performed to map community water systems that are DAC or SDAC areas, and the results of this analysis are presented in the added appendix.
54		Collective Comments: TNC, Audubon California, CWA, CWF, American Rivers, Union of Concerned Scientists		The incorrect statement that SGMA does not require the establishment of sustainable management criteria for GDEs should be removed. [SEE MORE SPECIFICS IN COMMENT LETTER]	Clarifying Edit	Clarified text in Section 2.2.7 (Groundwater-Dependent Ecosystems): SGMA requires the identification of GDEs. SGMA does not require that additional sustainable management criteria be established to specifically manage these areas, but rather includes GDEs as a beneficial user of water to be considered when developing other sustainable management criteria.
55		Collective Comments: TNC, Audubon California, CWA, CWF, American Rivers, Union of Concerned Scientists	3.2.1.1.1	Please add "potential adverse impacts to GDEs" to the list of potential undesirable results presented in Section 3.2.1.1.1. [SEE MORE SPECIFICS IN COMMENT LETTER]	Clarifying Edit	Added text to Section 3.2.1.1.1 (Description of Undesirable Results) to list GDEs as having potential undesirable results due to the chronic lowering of groundwater: Adverse impacts to environmental uses and users, including interconnected surface waters and groundwater-dependent ecosystems (GDEs).
56		Collective Comments: TNC, Audubon California, CWA, CWF, American Rivers, Union of Concerned Scientists	3.2.6	The analysis for potential depletion of ISWs in Section 3.2.6 should include all beneficial users of surface water that could be affected by groundwater withdrawals, including environmental beneficial users along creeks, even if the creeks are interconnected less than 75% of the time. [SEE MORE SPECIFICS IN COMMENT LETTER]	Interconnected Surface Water	Comment noted. The ESJGWA supports the definition of undesirable results provided in the GSP, which identifies GDEs and freshwater fish and wildlife species as beneficial users. The ESJGWA will continue to collect data to better inform connectivity conditions in the Subbasin.
57		Collective Comments: TNC, Audubon California, CWA, CWF, American Rivers, Union of Concerned Scientists		The definition of undesirable results for ISWs is overly narrow and recognizes only a limited subset of the environmental beneficial users of ISWs. A more complete definition would be that undesirable results would occur if groundwater extraction resulted in a depletion of surface water that caused significant impacts to aquatic species or wildlife, or degradation of wetlands, riparian habitats and GDEs. Please expand the definition of undesirable results to include all of the environmental beneficial uses and users of ISWs, and expand the analysis in Section 3.2.6, as appropriate. [SEE MORE SPECIFICS IN COMMENT LETTER]	GDEs	Comment noted. The ESJGWA supports the definition of undesirable results provided in the GSP, which identifies GDEs and freshwater fish and wildlife species as beneficial users. The ESJGWA will continue to collect data to better inform connectivity conditions in the Subbasin.
58		Collective Comments: TNC, Audubon California, CWA, CWF, American Rivers, Union of Concerned Scientists	3.2.6.1.3	Please expand Section 3.2.6.1.3 to describe the potential effects of undesirable results on all beneficial uses and users of ISWs, including environmental uses and users. [SEE MORE SPECIFICS IN COMMENT LETTER]	Interconnected Surface Water	The ESJGWA considers the discussion in Section 3.2.6 (Depletions of Interconnected Surface Water) to be descriptive of beneficial uses and users in the subbasin, and to be protective of existing in-stream flow requirements for fish and wildlife.
59		Collective Comments: TNC, Audubon California, CWA, CWF, American Rivers, Union of Concerned Scientists		The likely benefits and impacts to DAC members by the proposed projects and management actions are not clearly identified in the GSP. A discussion should be added for each project or management action to clearly identify the benefits to DAC drinking water users and potential impacts to the water supply. For all potential impacts, the project/management action should include a clear plan to monitor for, prevent, and/or mitigate against such impacts. [SEE MORE SPECIFICS IN COMMENT LETTER]	Projects and Management Actions	Comment noted. The ESJGWA has a twenty year planning timeframe to bring the projects online, and will continue to evaluate project benefits, impacts, and costs. DAC benefits and impacts will be addressed at the GSA level by the project proponents, as determined to be appropriate by the project proponents. SGMA looks at the basin-scale. Project impacts will be evaluated; it is the GSA's responsibility to meet project-level environmental regulations. CEQA compliance will be done at the GSA level.
60		Collective Comments: TNC, Audubon California, CWA, CWF, American Rivers, Union of Concerned Scientists		The GSP does not appear to include any plans to address impacts to domestic well users if domestic wells do go dry in the future. Based on the water level MTs, at least 10% of domestic wells would be expected to be dewatered if MT levels are reached. While the identified projects are intended to keep water levels above the MTs, no program is provided as a contingency in case 1) groundwater conditions decline before the projects are fully implemented, or 2) implementation of such projects does not have the desired effects. A plan to mitigate impacts to DAC drinking water users could include a program to replace wells, connect well users to a public water system, establishment of a tanked water program, etc. The GSP should also identify a mechanism to fund such a program. [SEE MORE SPECIFICS IN COMMENT LETTER]	Groundwater Levels	The ESJGWA supports using the minimum thresholds, measurable objectives, and interim milestones for the chronic lowering of groundwater levels sustainability indicator as written. SGMA does not require zero impact, and the ESJGWA has determined that it is not considered significant and unreasonable for wells belonging to the shallowest 10 percent of domestic wells to be dewatered, as the wells that are likely to be dewatered are those that are 50 years or older, have reached the end of their usable life, and would need to be replaced anyway. Data collected on Stanislaus County rural domestic wells that were dewatered in years 2014-2016, showed that the average depth of wells reported as dewatered was 91 ft bgs, and that 60 percent were shallower than 100 ft bgs. Additionally, the average well age for wells reported as dewatered was 55 years, and 52 percent were older than 50 years old. There are various well impact mitigation programs in place, therefore there were no changes were made to the GSP.
61		Collective Comments: TNC, Audubon California, CWA, CWF, American Rivers, Union of Concerned Scientists	Table 6-1	From Table 6-1 it is not possible to distinguish the full range of project benefits or how the projects will be prioritized. It would be advantageous to demonstrate multiple benefits from a funding and prioritization perspective. [SEE MORE SPECIFICS IN COMMENT LETTER]	Projects and Management Actions	Comment noted. The text in Chapter 6 (Projects and Management Actions) provides summaries of all potential SGMA projects, including expected project benefits.
62		Collective Comments: TNC, Audubon California, CWA, CWF, American Rivers, Union of Concerned Scientists		Potential impacts of projects and management actions on groundwater levels near surface water bodies should be evaluated as part of the GSP. [SEE MORE SPECIFICS IN COMMENT LETTER]	Projects and Management Actions	Comment noted. The ESJGWA has a twenty year planning timeframe to bring the projects online, and will continue to evaluate project benefits, impacts, and costs. SGMA looks at the basin-scale. Project impacts will be evaluated; it is the GSA's responsibility to meet project-level environmental regulations. CEQA compliance will be done at the GSA level.
63		Collective Comments: TNC, Audubon California, CWA, CWF, American Rivers, Union of Concerned Scientists		The draft GSP sets the minimum thresholds (MTs) for groundwater levels at representative monitoring well sites as the shallower of either: (1) the shallower of 1992 or 2015-2016 historical groundwater levels with a buffer of 100 percent of historical range applied, or (2) the 10th percentile of total depth of domestic wells within a 3-mile radius of a representative monitoring well site1. This approach to setting water level MTs and the selected representative monitoring network leaves key beneficial users in the subbasin, specifically domestic well users and in particular members of disadvantaged communities (DACs), potentially vulnerable to impacts. [SEE MORE SPECIFICS IN COMMENT LETTER, APPENDIX B: FOCUSED TECHNICAL REVIEW]	Groundwater Levels	The ESJGWA supports using the minimum thresholds, measurable objectives, and interim milestones for the chronic lowering of groundwater levels sustainability indicator as written. SGMA does not require zero impact, and the ESJGWA has determined that it is not considered significant and unreasonable for wells belonging to the shallowest 10 percent of domestic wells to be dewatered, as the wells that are likely to be dewatered are those that are 50 years or older, have reached the end of their usable life, and would need to be replaced anyway. Data collected on Stanislaus County rural domestic wells that were dewatered in years 2014-2016, showed that the average depth of wells reported as dewatered was 91 ft bgs, and that 60 percent were shallower than 100 ft bgs. Additionally, the average well age for wells reported as dewatered was 55 years, and 52 percent were older than 50 years old. There are various well impact mitigation programs in place, therefore there were no changes were made to the GSP.

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64		Collective Comments: TNC, Audubon California, CWA, CWF, American Rivers, Union of Concerned Scientists		The draft GSP includes limited analysis of water quality constituents and defines undesirable results (URs) for water quality relative to "impacts to the long-term viability of domestic, agricultural, municipal, environmental, or other beneficial uses over the planning and implementation horizon of this GSP" (Section 3.2.1.1). For the reasons identified below, the water quality monitoring network and analysis presented in the draft GSP does not clearly illustrate how the sustainable management criteria will be sufficient to ensure that the stated water quality UR of impacting the long-term viability of the groundwater resource, particularly for domestic water users including DACs, will be avoided. [SEE MORE SPECIFICS IN COMMENT LETTER, APPENDIX B: FOCUSED TECHNICAL REVIEW]	Groundwater Quality	See Master Response 3 -- Water Quality.
65		Collective Comments: TNC, Audubon California, CWA, CWF, American Rivers, Union of Concerned Scientists		The draft GSP estimates conditions using 2070 climate forecast. Based on this, the draft GSP estimates that "Under climate change conditions, the depletion in aquifer storage is expected to increase by about 68 percent to an average annual storage change of 57,000 AF/year, from 34,000 AF/year in the projected conditions scenario" (Section 2.3.7.4). However, the results of the climate change scenario modeling were not used as the basis for development of Project and Management Actions. Therefore, while climate change is evaluated in terms of future water budget conditions, the draft GSP does not actually include a substantive plan to address the increased deficit anticipated to result from climate change.	Water Budget	Consistent with regulations, the 2070 climate change sensitivity analysis on the projected conditions scenario was used to better understand trends and inform planning. Due to the uncertainty around climate projections in the 2070 timeframe, the ESJGWA Board determined the projected conditions scenario was most appropriate for analyzing sustainable yield in the GSP implementation time period beginning in 2040. Therefore, climate change was not included in the sustainable yield analysis or the estimated amount of direct or in lieu recharge and/or reduction in pumping needed for the Subbasin to reach sustainability. Climate change will continue to be evaluated with every update to the GSP and estimates of projects and management actions will continue to evolve with refinements to the model. Comment noted for follow up in next round of model refinements and updates to analyses.
66		Collective Comments: TNC, Audubon California, CWA, CWF, American Rivers, Union of Concerned Scientists		The draft GSP notes that because there are no available data on local private groundwater pumping, "groundwater pumping to meet agricultural and rural residential needs is calculated by the model based on meeting remaining demands after appropriate surface water delivery is made to respective areas. Demand in areas with no access to surface water is completely met by groundwater pumping" (Section 2.3.4.2). However, based on our review of the draft GSP the model-calculated rural residential demands are not presented in the document. This water demand information should be transparently presented for the historical, current, and future water budgets so that the public can review the drinking water demand estimates for domestic users and community water systems, and make an assessment as to the appropriateness of the demands considered in the historical, current, or future water budgets.	Water Budget	Specifying urban demand at the level of rural residential demand goes above and beyond the requirements of SGMA. The current text, tables, and figures for the water budget meet the requirements of the GSP.
67		Collective Comments: TNC, Audubon California, CWA, CWF, American Rivers, Union of Concerned Scientists		The draft GSP notes that the future water budget demands for domestic areas outside of those covered by Urban Water Management Plans "are estimated based on rural population" and that "To estimate the urban water demand of rural domestic water areas, the average major urban area GPCD was combined with estimated rural population" (Section 3.2 of Appendix 2-1). However, the draft GSP does not present the population values associated with the rural population or a clear presentation of the results of this method. In order for the public to be able to evaluate the appropriateness of these assumptions, the applied values and resultant demands should be clearly identified in the document.	Water Budget	The model report was finalized in August 2018 and was included as an appendix in the GSP to provide an explanation of the development and calibration of the historical model. The model documentation will be updated as updates to the model are made in the future. Comment noted for follow up in next round of model refinements and updates to analyses.
68		Collective Comments: TNC, Audubon California, CWA, CWF, American Rivers, Union of Concerned Scientists		The proposed projects and management actions include twenty separate direct and in-lieu recharge projects. Recharge projects have the potential to mobilize contaminants, including by mobilizing surface and shallow soil contaminants through percolation, spreading existing contaminant plumes by altering the groundwater flow gradient, and mobilizing naturally occurring compounds through changes in geochemistry due to the introduction of a different water type, among other mechanisms. As recommended in the 2019 Stanford A Guide to Water Quality Requirements Under the Sustainable Groundwater Management Act, "In addition to complying with any regulatory requirements, GSAs undertaking recharge or other active management actions should consider developing a sufficient understanding of the interactions between subsurface geology, geochemistry and GSP projects in their basin. The development of sufficient monitoring networks, capable of detecting changes in groundwater quality conditions related to active management, will be critical to understanding these interactions."7 Therefore, the GSP should explicitly describe how such risks will be evaluated and monitored as a part of each identified project.	Projects and Management Actions	1) CEQA compliance will be conducted at the GSA level. Language was added to Section 2.2.4.4 (Point Sources) stating that new projects undertaken by GSAs as part of GSP implementation will evaluate contaminant plume movement in a CEQA document, and management through existing regulatory agencies was highlighted. 2) Recharge projects were preliminarily screened for the potential to contribution to the migration of a potential contaminant plume during the GSP project proposal process. Projects with the potential to contribute to the migration of a potential contaminant plume were eliminated from consideration and removed from the GSP list of projects. (See GSP Section 6.2.1 (Project Identification)).
69		Collective Comments: TNC, Audubon California, CWA, CWF, American Rivers, Union of Concerned Scientists		Based on our assessment of the water levels, a significant proportion of domestic wells have the potential to be partially or fully dewatered if water levels reach the proposed MT levels. However, the draft GSP does not include or describe any plans to develop a well impact mitigation program. Such a program could include a combination of replacing impacted wells with new, deeper wells and/or connecting domestic users to a public water system. A plan to establish an emergency tanked water program, as was done in some areas of California during the last drought, may be an appropriate short-term solution, but would not be a good long-term solution for community members. Key considerations for establishing such a program should include: - A strong preference for connecting current domestic well users to a public water system, whenever possible. Public water systems have an obligation to test water quality for water served, and although the public water systems in this area typically have limited resources, they do have a greater ability to install treatment systems to address water quality impacts, recoup funds for litigated contamination such as 1,2,3-TCP, and apply for and receive grant funding for beneficial projects. Because of this, public water systems, including small community water systems, provide a more reliable drinking water source than privately-owned domestic wells. - A secure and reliable funding source and mechanism for implementation of such a mitigation program needs to be identified. While grant or emergency funding could potentially be available for such a program when needed, the availability of these funds is not certain. A more secure funding mechanism could be the establishment of a reserve fund that is paid into on an annual basis and accrues funds that would then available as water levels drop in the future. - The implementation of a mitigation program should be triggered before wells begin to become unusable, so that funding will be available, and the necessary planning and contracting will be completed such that the necessary construction will be implemented without unnecessarily leaving community members without access to drinking water. Thus, the program should be designed to be proactive, rather than reactive. - A well mitigation program should not be established only in case of emergency. Droughts are said to be becoming more and more frequent and severe, and as such should be included as part of the long-term sustainability planning for the subbasin.	Groundwater Levels	The ESJGWA supports using the minimum thresholds, measurable objectives, and interim milestones for the chronic lowering of groundwater levels sustainability indicator as written. SGMA does not require zero impact, and the ESJGWA has determined that it is not considered significant and unreasonable for wells belonging to the shallowest 10 percent of domestic wells to be dewatered, as the wells that are likely to be dewatered are those that are 50 years or older, have reached the end of their usable life, and would need to be replaced anyway. Data collected on Stanislaus County rural domestic wells that were dewatered in years 2014-2016, showed that the average depth of wells reported as dewatered was 91 ft bgs, and that 60 percent were shallower than 100 ft bgs. Additionally, the average well age for wells reported as dewatered was 55 years, and 52 percent were older than 50 years old. There are various well impact mitigation programs in place, therefore there were no changes were made to the GSP.
70		Collective Comments: TNC, Audubon California, CWA, CWF, American Rivers, Union of Concerned Scientists		The following figures are included in the joint comments document: Figure 1 - Representative Monitoring Network for GW Levels Relative to Domestic Wells, DACs, and Community Water Systems Figure 2 - Water Level MTs and Domestic Wells Figure 3 - Representative Monitoring Network for Water Quality Relative to Domestic Wells, DACs, and Community Water Systems [SEE MORE SPECIFICS IN COMMENT LETTER]	Monitoring Network	No specific comment to respond to.
71		Collective Comments: The League of Women Voters of SJC, EJCW, Sierra Club Delta-Sierra Group, Puentes, Restore the Delta		Submitting public notices to the newspaper, notices of items on an isolated agenda, or a notice on a website fulfills a minimum outreach requirement for some governmental actions but not for SGMA. Groundwater sustainability plan regulations require that GSAs document in a communication section of the GSP the opportunities for public engagement and active involvement of diverse social, cultural, and economic elements of the population within the basin. These types of public notices do not encourage active involvement of diverse members of our Eastern San Joaquin Subbasin. These minimum public noticing techniques were used when the GSAs were formed and are documented on the SGMA Portal website: https://sgma.water.ca.gov/portal/gsa/all (search for GSA of interest). A single initial notification of GSP preparation was made on behalf of all the GSAs within the Eastern San Joaquin Subbasin and can be found her: https://sgma.water.ca.gov/portal/gsp/init/preview/82. Since the initial notification dated March 16, 2018, development of the GSP has been ongoing, but consistent public outreach has not. A 2017 Department of Water Resources (DWR) grant for Facilitation and Support Services included a stakeholder identification and engagement component, but stakeholder engagement efforts trailed facilitation activities under that agreement by about six months. A situation assessment produced by consultants in December 2018, after the end of the contract period, summarized feedback from one group of stakeholders. That assessment references a separate document with recommendations for adjustment to the stakeholder process, but the separate document is not available online.	Outreach	Outreach efforts conducted as part of GSP development are described in Chapter 1.3 (Notice and Communication). Outreach efforts done by the ESJGWA have gone above and beyond the requirements of SGMA. However, the ESJGWA recognizes there is always room for improvement. The ESJGWA has appointed an Ad Hoc Committee for the purposes of refining implementation and funding next steps. The Ad Hoc Committee has met weekly to bi-weekly since July 2019. Recommendations on outreach efforts moving forward are being identified by the Ad Hoc Committee for ESJGWA action. The Ad Hoc Committee has reviewed the suggestions put forth in this letter and have identified these future actions for consideration moving forward.

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72		Collective Comments: The League of Women Voters of SJC, EJCW, Sierra Club Delta-Sierra Group, Puentes, Restore the Delta		Public outreach has not been well-coordinated or effective because of the nature of GSAs formed in this Subbasin, because of assumptions underlying SGMA outreach guidelines, and because technical issues and funding challenges have not been widely discussed nor presented in language that will engage those impacted. Agencies in the Eastern San Joaquin Subbasin formed GSAs primarily to protect their autonomy, not necessarily because they were considering the effect of the GSP on the users they serve or residents within the GSA Boundaries. Some GSAs have names that would not be recognized even by water users that they serve. Examples include the Eastside GSA (Calaveras County Water District, Rock Creek Water District, and Stanislaus County), and South San Joaquin GSA (South San Joaquin Irrigation District). Nevertheless, SGMA assigns GSAs outreach responsibilities. [SEE MORE SPECIFICS IN COMMENT LETTER]	Outreach	Outreach efforts conducted as part of GSP development are described in Chapter 1.3 (Notice and Communication). Outreach efforts done by the ESJGWA have gone above and beyond the requirements of SGMA. However, the ESJGWA recognizes there is always room for improvement. The ESJGWA has appointed an Ad Hoc Committee for the purposes of refining implementation and funding next steps. The Ad Hoc Committee has met weekly to bi-weekly since July 2019. Recommendations on outreach efforts moving forward are being identified by the Ad Hoc Committee for ESJGWA action. The Ad Hoc Committee has reviewed the suggestions put forth in this letter and have identified these future actions for consideration moving forward.
73		Collective Comments: The League of Women Voters of SJC, EJCW, Sierra Club Delta-Sierra Group, Puentes, Restore the Delta		Outreach summaries produced and distributed by the GSP consultant team do not provide useful information because they allow for reporting on only certain kinds of outreach, and because even GSAs that perform outreach are not always reporting it. According to the ESJGA GSA Outreach Activities summary (Appendix A), some GSAs have reported no outreach activities at all. This may indicate that no outreach activity occurred or that GSA staff is unwilling or unable to report GSA outreach activities, or that the summary provides data only on electronic outreach. A major theme raised by a member of the ESJ Groundwater Advisory Committee at its June 12, 2019 meeting is that there must be balance between autonomy and accountability. This documentation of SGMA-required outreach activities to encourage active involvement suggests that perhaps too much autonomy has been applied without clearly needed accountability. Also, not all agencies that want autonomy have the capacity or resources to do the required outreach for which they may be held accountable. [SEE MORE SPECIFICS IN COMMENT LETTER]	Outreach	Outreach efforts conducted as part of GSP development are described in Chapter 1.3 (Notice and Communication). Outreach efforts done by the ESJGWA have gone above and beyond the requirements of SGMA. However, the ESJGWA recognizes there is always room for improvement. The ESJGWA has appointed an Ad Hoc Committee for the purposes of refining implementation and funding next steps. The Ad Hoc Committee has met weekly to bi-weekly since July 2019. Recommendations on outreach efforts moving forward are being identified by the Ad Hoc Committee for ESJGWA action. The Ad Hoc Committee has reviewed the suggestions put forth in this letter and have identified these future actions for consideration moving forward.
74		Collective Comments: The League of Women Voters of SJC, EJCW, Sierra Club Delta-Sierra Group, Puentes, Restore the Delta		Focusing outreach requirements on individual GSAs has created a situation in which it appears that no outreach has been done to an important and impacted category of users: people on domestic wells. …Those individuals, who are likely very vulnerable to impacts of the GSP, are not being directly noticed. Of most concern are the residents with wells less than 200 feet below ground surface… With the exception of San Joaquin County GSA No.1, GSAs in this Subbasin are either public agencies or a private agency (San Joaquin County GSA No.2 – Calwater) created to provide surface and/or groundwater. These GSAs therefore have some kind of constituency or customer base. People on domestic wells are not part of that base, and responsibility for SGMA outreach to them has not been addressed. [SEE MORE SPECIFICS IN COMMENT LETTER]	Outreach	Outreach efforts conducted as part of GSP development are described in Chapter 1.3 (Notice and Communication). Outreach efforts done by the ESJGWA have gone above and beyond the requirements of SGMA. However, the ESJGWA recognizes there is always room for improvement. The ESJGWA has appointed an Ad Hoc Committee for the purposes of refining implementation and funding next steps. The Ad Hoc Committee has met weekly to bi-weekly since July 2019. Recommendations on outreach efforts moving forward are being identified by the Ad Hoc Committee for ESJGWA action. The Ad Hoc Committee has reviewed the suggestions put forth in this letter and have identified these future actions for consideration moving forward.
75		Collective Comments: The League of Women Voters of SJC, EJCW, Sierra Club Delta-Sierra Group, Puentes, Restore the Delta		Recommendations - GSAs in the Eastern San Joaquin Subbasin should increase outreach by print with informational inserts in utility bills, property tax bills, and any other regular correspondence that is sent to households. Notices of the plan commenting period should be posted at each GSA headquarters, along with information about where to find GSA specific information. - Principal and sub-contract consultants who are developing the GSP can develop posters that can be widely distributed, and can provide flyers to the Agricultural Commissioner's Office, Environmental Health Department, and Community Development Department within Calaveras, San Joaquin, and Stanislaus Counties. - The Eastern San Joaquin Groundwater Authority (ESJGA) website, esjgroundwater.org, should provide GSA website addresses where stakeholders can find GSA and ESJGA level information, GSA contact email addresses, telephone numbers, and GSA staff contact names. Currently only mailing addresses are available for contacting GSAs. A number of non-governmental organizations (NGOs) representatives including the Sierra Club, League of Woman Voters, and Catholic Charities requested back in November 2018 that this information be updated, but that has not been done. - The ESJGA website should provide information about how people can determine the GSA jurisdiction within which they live. - Email inquiries to "Contact Us" on the ESJGA website currently go through a San Joaquin County government subcontractor, who redirects them. Responses to email inquiries, tabulating, and documenting of contacts and responses, should be included on regular outreach summaries. - GSAs a fee to provide funding for an outreach coordinator to perform tasks that GSAs do not have the staff or expertise to perform. - As recommended by the Facilitation and Support Services consultants, a stakeholder or advisory board should be convened when the GSP is submitted, to review and inform implementation.	Outreach	Outreach efforts conducted as part of GSP development are described in Chapter 1.3 (Notice and Communication). Outreach efforts done by the ESJGWA have gone above and beyond the requirements of SGMA. However, the ESJGWA recognizes there is always room for improvement. The ESJGWA has appointed an Ad Hoc Committee for the purposes of refining implementation and funding next steps. The Ad Hoc Committee has met weekly to bi-weekly since July 2019. Recommendations on outreach efforts moving forward are being identified by the Ad Hoc Committee for ESJGWA action. The Ad Hoc Committee has reviewed the suggestions put forth in this letter and have identified these future actions for consideration moving forward.
76		Collective Comments: The League of Women Voters of SJC, EJCW, Sierra Club Delta-Sierra Group, Puentes, Restore the Delta		Each GSA should provide a written explanation of why the outreach they have done so far is adequate to meet the intent of SGMA outreach, and if it has not been adequate, what strategies each GSA proposes for doing adequate outreach during implementation of the plan. This information should be included in the GSP.	Outreach	Outreach efforts conducted as part of GSP development are described in Chapter 1.3 (Notice and Communication). Outreach efforts done by the ESJGWA have gone above and beyond the requirements of SGMA. However, the ESJGWA recognizes there is always room for improvement. The ESJGWA has appointed an Ad Hoc Committee for the purposes of refining implementation and funding next steps. The Ad Hoc Committee has met weekly to bi-weekly since July 2019. Recommendations on outreach efforts moving forward are being identified by the Ad Hoc Committee for ESJGWA action. The Ad Hoc Committee has reviewed the suggestions put forth in this letter and have identified these future actions for consideration moving forward.
77		Collective Comments: The League of Women Voters of SJC, EJCW, Sierra Club Delta-Sierra Group, Puentes, Restore the Delta		A preliminary list of GSP implementation elements includes a task called "Public Outreach and Website Maintenance." Providing for public outreach and website maintenance only at the level of the Eastern San Joaquin Groundwater Authority website will not be adequate to cover the outreach obligations of all the GSAs.	Outreach	Outreach efforts conducted as part of GSP development are described in Chapter 1.3 (Notice and Communication). Outreach efforts done by the ESJGWA have gone above and beyond the requirements of SGMA. However, the ESJGWA recognizes there is always room for improvement. The ESJGWA has appointed an Ad Hoc Committee for the purposes of refining implementation and funding next steps. The Ad Hoc Committee has met weekly to bi-weekly since July 2019. Recommendations on outreach efforts moving forward are being identified by the Ad Hoc Committee for ESJGWA action. The Ad Hoc Committee has reviewed the suggestions put forth in this letter and have identified these future actions for consideration moving forward.
78	John Fio jfio@ekiconsult.com 650-292-9110	EKI on behalf of Cosumnes Subbasin GSA Working Group	1.2.3.3 Land Use Plans Outside the Plan Area	The section heading indicates it will discuss land use plans outside the ESJ Subbasin, but no specific land use planning information is provided for the adjacent Cosumnes Subbasin aside from referencing the existence of the City of Galt General Plan (2009).	Plan Area	As the surrounding groundwater subbasins are not designated as critically overdrafted, their GSPs are on a slower timeline. ESJ Subbasin will continue to coordinate with Cosumnes Subbasin and other neighboring subbasins on land use planning in the two subbasins as their GSP work progresses. Text added to 1.2.3.3 discussing continued coordination with neighboring subbasins: Ongoing coordination with neighboring groundwater subbasins will include updates on major land use planning that may impact the groundwater system.
79	Linda Dorn dornl@saccounty.net 916-874-1085	Sacramento County Groundwater Sustainability Agency (GSA) - Cosumnes Subbasin	1.2.3.4 Well Permitting	As an adjacent basin please add Sacramento County well permitting. For well standards visit: http://www.emd.saccounty.net/EC/Pages/Wells.aspx	Well Permitting	A new subsection has been added to the GSP under section 1.2.3.4 (Well Permitting) to add Sacramento well permitting information in response to this comment.
80	John Fio	EKI on behalf of Cosumnes Subbasin GSA Working Group	1.3.5 Inter-basin Coordination	Only provides date of inter-basin meeting. No explanation of topics discussed or outcome from effort.	Clarifying Edit	Comment noted. As the surrounding subbasins are on a slower timeline than the Subbasin, inter-basin coordination is just beginning and the description in the text is indicative of discussions so far.
81	John Fio	EKI on behalf of Cosumnes Subbasin GSA Working Group	2.1.9 Principal Aquifer	The northern boundary of the ESJ Subbasin is shared with the Cosumnes Subbasin, however, there seems to be very little information described in writing about subsurface conditions and groundwater flow conditions at that boundary. This appears to be a deficit in the HCM.	Basin Setting	The ESJGWA determined that the HCM meets the requirements of the Water Code. Subsurface conditions are discussed for the entire Subbasin. Groundwater flow is discussed broadly in Section 2.1.9.2.2 (Regional Historical Groundwater Flow and Surface Water Interaction) with more discussion and figures in Section 2.2.1.2 (Current Groundwater Elevations).

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82	Linda Dorn	Sacramento County Groundwater Sustainability Agency (GSA) - Cosumnes Subbasin	2.1.10 HCM Data Gaps	Sacramento County GSA is adjacent to the northwest data gap area and we encourage coordination with Sacramento County GSA for filling this data gap.	Current Groundwater Conditions	This has been noted as a future item for consideration as the GSAs move into GSP implementation.
83	Linda Dorn	Sacramento County Groundwater Sustainability Agency (GSA) - Cosumnes Subbasin	2.2.1.1 Historical Groundwater Elevations	Amador County Groundwater Sustainability Authority may have information to help fill this data gap in the northeast corner of the subbasin. https://amadorwater.org/tag/amador-county-groundwater-management-authority/	Basin Setting	This has been noted as a future item for consideration as the GSAs move into GSP implementation.
84	John Fio	EKI on behalf of Cosumnes Subbasin GSA Working Group	Figure 2-38	It would be helpful for neighboring basins if the groundwater elevation map displayed data points and posted values, especially at the basin boundaries where the contours help assess cross boundary flows.	Mechanics - Graphics	The ESJGWA will continue to coordinate with neighboring subbasins as they develop their plans and establish sustainable management criteria, such that no subbasin is preventing another from achieving sustainability.
85	Linda Dorn	Sacramento County Groundwater Sustainability Agency (GSA) - Cosumnes Subbasin	2.3.1 Water Budget Background Information	Since the Eastern San Joaquin subbasins water budget relies on adjacent subbasins inflow, the water budget inflow information for the Cosumnes subbasin maybe different than what has been calculated. A sentence should be added that reflects how the water budget will handle discrepancies between adjacent subbasins water budgets .	Water Budget	As the Cosumnes Subbasin is not designated as a critically overdrafted, groundwater basin, their GSP is on a slower timeline so analysis was not available for direct comparison during initial inter-basin coordination discussions. ESJ Subbasin will continue to coordinate with Cosumnes Subbasin on boundary flows across Dry Creek as well as sustainable management criteria developed in the two subbasins as their GSP work progresses.
86	Linda Dorn	Sacramento County Groundwater Sustainability Agency (GSA) - Cosumnes Subbasin	2.3.4.1 Assumptions Used in the Historical Water Budget	Sacramento County flood gauge information may provide data on flows in Dry Creek that would be more accurate than extracting Dry Creek flow from CalSIMII. Please see the website below for more information on flow for Dry Creek. https://www.sacflood.org/level.php?view=253d63a6-69ea-4c28-bd90-539059aa5fd8&view_group=99a123be-5de5-3678-7140-d7bb445af1b3&group=7c53d59d-d00d-707c-d514-fc1327f3c4e9 Also Amador County produced a 2006 Dry Creek Watershed Management Plan (attached) that is attached to the e-mail submitting these comments. Amador County has additional information on Cosumnes River flows too.	Basin Setting	This has been noted as a future item for consideration as the GSAs move into GSP implementation.
87	John Fio	EKI on behalf of Cosumnes Subbasin GSA Working Group	Table 2-15	Historical conditions indicate that, on average, net groundwater flow is from the Cosumnes Subbasin into the ESJ Subbasin at a rate of 14,000 acre-feet per year (AF/year). However, inflows from the Cosumnes Subbasin to the ESJ Subbasin increase to 23,000 AF/yr under current conditions (more than 60%) and will be 19,000 AF/yr under projected conditions (more than 30%). These changes in cross-boundary flows are potentially significant, and groundwater level monitoring and protective SMCs are needed near the subbasin boundary to ensure that: (1) undesirable results do not occur across the shared subbasin boundary , and (2) these projected increased levels of inflow to the ESJ subbasin from the Cosumnes Subbasin do not impact the ability of the Cosumnes Subbasin to achieve sustainability.	Water Budget	As the Cosumnes Subbasin is not designated as a critically overdrafted, groundwater basin, their GSP is on a slower timeline so analysis was not available for direct comparison during initial inter-basin coordination discussions. ESJ Subbasin will continue to coordinate with Cosumnes Subbasin on boundary flows across Dry Creek as well as sustainable management criteria developed in the two subbasins as their GSP work progresses.
88	Linda Dorn	Sacramento County Groundwater Sustainability Agency (GSA) - Cosumnes Subbasin	2.3.6 Sustainable Yield Estimate	Assuming groundwater pumping under sustainable conditions will not create changes in groundwater inflow from neighboring basins should include a caveat referencing future GSPs of the neighboring basins will help determine if pumping under sustainable conditions will affect inflows at the basin boundaries.	Water Budget	As the neighboring subbasins are not designated as critically overdrafted groundwater basins, their GSPs are on a later timeline so analyses were not available for direct comparison during initial inter-basin coordination discussions. ESJ Subbasin will continue to coordinate with neighboring subbasins on boundary flows as well as sustainable management criteria as GSP work progresses. The ESJGWA will continue to coordinate with neighboring subbasins as they develop their plans and establish sustainable management criteria, such that no subbasin is preventing another from achieving sustainability.
89	John Fio	EKI on behalf of Cosumnes Subbasin GSA Working Group	2.3.6 Sustainable Yield Estimate	The projected water budget shows greater outflows than inflows, resulting in an average annual deficit in groundwater storage of 34,000 AF/year in the ESJ Subbasin. To achieve sustainability, approximately 78,000 AF/year of direct or in lieu groundwater recharge and/or reduction in agricultural and urban groundwater pumping is reportedly needed in the ESJ Subbasin. However, there is no explanation or discussion for how and where these reductions will be achieved. Moreover, the lack of certainty in implementing projects and/or management actions to achieve sustainability create uncertainty in their potential effects on the Cosumnes Subbasin.	Water Budget	See Master Response 5 - Projects.
90	John Fio	EKI on behalf of Cosumnes Subbasin GSA Working Group	2.3.7.4 Eastern San Joaquin Water Budget Under Climate Change	Tabulated water budget results like those in Table 2-15 need to be included for the climate change scenario results.	Climate Change	The current text, tables, and figures for climate change meet the requirements of the GSP. Future updates to the GSP may include more detailed analysis of climate change scenario results.
91	John Fio	EKI on behalf of Cosumnes Subbasin GSA Working Group	3.2.1.2 Minimum Thresholds	The Minimum Thresholds(MT) for groundwater levels protect against Undesirable Results in the ESJ Subbasin and were specified for 19 wells based on minimum water levels measured in 1992 or 2015-2016, whichever are lowest, plus an operational buffer. These groundwater level MTs are utilized as proxy for groundwater storage, subsidence, and interconnected surface water sustainability indicators for the ESJ Subbasin. The MTs for the ESJ Subbasin should also ensure that they are not creating changes in groundwater inflow that could impede sustainability plans and implementation in the Cosumnes Subbasin. This includes groundwater level monitoring near the subbasin boundary and projected changes under historical, current, projected, and climate change.	Monitoring Network	As the Cosumnes Subbasin is not designated as a critically overdrafted, groundwater basin, their GSP is on a slower timeline so analysis was not available for direct comparison during initial inter-basin coordination discussions. As described in Section 4.7 (Data Gaps) and shown in Figure 4-3, additional groundwater monitoring wells are planned for more groundwater monitoring along the boundary with Cosumnes Subbasin to support future GSP updates. ESJ Subbasin will continue to coordinate with Cosumnes Subbasin on boundary flows across Dry Creek as well as sustainable management criteria developed in the two subbasins as their GSP work progresses.
92	John Fio	EKI on behalf of Cosumnes Subbasin GSA Working Group	3.2.6 Depletion of Interconnected Surface Water	"Depletion of Interconnected Surface Water" states that depletions are considered an Undesirable Result (UR) if the depletions significantly and unreasonably reduce surface water flow or levels and adversely impact beneficial uses of the surface water within the ESJ Subbasin. However, the contribution of these reductions to the cumulative depletion in downstream flows and potential impacts to Cosumnes Subbasin recharge should also be considered, given the important nature of this boundary condition.	Interconnected Surface Water	See Master Response 2 - ISW.
93	Rodney Frickerfricke@geiconsultants.com 916-341-9138	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	1.2.1.1	Sacramento Solano Subbasin (Bulletin 118 Basin Number 5-021.66)	Mechanics - Text	Comment addressed in text.
94	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin		..., while eastern western portions of San Joaquin County and City of Stockton, and western portions of Calaveras and much of Stanislaus County ies, lie in neighboring subbasins.	Mechanics - Text	Edited text in Section 1.2.1.1: The cities of Lodi, Escalon, Manteca, and Ripon are contained entirely within the Subbasin, while western portions of San Joaquin County and the City of Stockton, and eastern portions of Calaveras and Stanislaus counties, lie in neighboring subbasins or outside of groundwater subbasins altogether.
95	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	Well Density	Statement is out of context. Paragraph is talking about density of supply wells and the DWR criteria is not applicable to locations chosen by well owners. Monitoring wells are subject to the DWR criteria, which is a different topic.	Mechanics - Text	Edited text in Section 1.2.1.1 to remove sentence related to monitoring well density.
96	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	Figure 1-12 to -14	The download of data for these maps should have included data tables, including number of wells per section, depths, and other information. How were these data addressed in the GSP?	Mechanics - Graphics	Comment noted. This information is beyond the scope of the GSP. Data used in the figures can be obtained through DWR's Well Completion Report Map Application.

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Comment #	Commenter	Commenter Organization	Section, Figure, or Table Number	Comment	Category	Response to Comment
97	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	1.2.2 Water Resources Monitoring and Management Programs	Online System for Well Completion Reports (OSWCR) seems to be oriented to licensed well drillers but has a link to: Well Completion Report Map Application which provides links to PDFs. In addition, the SGMA Data Viewer application provides links to PDFs of well completion reports.	Clarifying Edit	Comment noted. OSWCR is DWR's database of well completion reports. DWR's SGMA data viewer uses records from OSWCR to display wells with downloadable completion report PDFs.
98	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	1.2.2.4 Land Subsidence Monitoring	The paragraph should acknowledge that DWR (2014) listed the Eastern San Joaquin Subbasin as having a medium to high potential for subsidence due to long-term declining groundwater levels. (Summary of Recent, Historical, and Estimated Potential for Future Land Subsidence in California)	Subsidence	Comment noted. Continued lowering of groundwater levels may cause subsidence, though there are no historical records of impacts in the Subbasin.
99	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	1.2.2.4 Land Subsidence Monitoring	The paragraph starts with a USGS heading, which only applies to the subsequent paragraph. The paragraph refers to Plate Boundary Observatory (PBO) GPS stations, which are operated by UNAVCO, and refers to station (P781), which was removed from the program in 2014. The text does not acknowledge other PBO stations in the vicinity of the subbasin, including P256 – Brentwood, P257 – Tracy, P273 – Lodi, P274 – Elk Grove, P275 – Galt, and P309 – Linden. The USGS study area may have utilized the PBO stations but the study addressed much of the San Joaquin Valley further south.	Subsidence	1) The ESJGWA supports the use of existing monitoring stations and InSAR data currently referenced in the GSP for the evaluation of subsidence, and believe the conditions of the subbasin do warrant the creation of new subsidence stations at this time. The GSP has been updated to reference the UNAVCO continuous GPS stations in Section 1.2.2.4 (Land Subsidence Monitoring): Reporting since 2004, the UNAVCO (formerly University Navigation Satellite Timing and Ranging or NAVSTAR Consortium) Plate Boundary Observatory network consists of a network of about 1,100 continuous global positioning system (CGPS) and meteorology stations in the western United States to measure deformation resulting from the constant motion of the Pacific and North American tectonic plates in the western United States. Stations located within the Subbasin contain data from at least 2006 to current and include station P309 located east of Linden and station P273 located west of Lodi. Other stations are also available in nearby Subbasins. Subsidence analyses have also been conducted using satellite-based methods over limited time periods, as described below. 2) The paragraph under the USGS heading referring to the nonoperational station P781 was deleted with the expansion of the description of the UNAVCO data.
100	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	1.2.2.4 Land Subsidence Monitoring	The NASA JPL processed dataset spans from May Spring of 2015 to April Summer of 2017 (CA, DWR, 2019).	Subsidence	Comment noted. Multiple sources refer to the NASA JPL dataset spanning Spring 2015 to Summer 2017.
101	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	1.3.1 Beneficial Uses and Users in the Basin	Text says "…. approximately 1,000 unique domestic, public, and production wells in the Subbasin." but Figure 2-4 shows 6,800 GAMA sites and DWR (2014) says 19,176 wells total.	Clarifying Edit	The total number of production wells in the Subbasin is not known. Edited Section 1.3.1 (Beneficial Uses and Users in the Basin) to delete sentence mentioning 1,000 wells.
102	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	1.3.5 Inter-basin Coordination	To date, there has been at least one meeting between representatives of the GWA and the neighboring basins of Cosumnes, Modesto, Subbasin and Tracy Subbasins to initiate this process.	Clarifying Edit	Edited text in Section 1.3.5 (Inter-basin Coordination): To date, there have been initial meetings between representatives of the ESJGWA and the neighboring subbasins to initiate this process.
103	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2.1.2 Regional Geologic and Structural Setting	The Sierra Nevada Mountain Range, east of the Central Valley, is comprised of pre-Tertiary igneous and metamorphic continental rocks.	Clarifying Edit	Edited text in Section 2.1.2 (Regional Geologic and Structural Setting): The Sierra Nevada Mountain Range, east of the Central Valley, consists of pre-Tertiary igneous and metamorphic continental rocks.
104	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2.1.3 Geologic History	Middle to late Tertiary would be more like 23 to 60 or 65 million years	Clarifying Edit	Text is correct. The middle to late tertiary period is closer in time to now than the earlier portion of the tertiary period, so the ~3-30 million years ago in the text is correct.
105	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2.1.4.2 Major Hydraulic Features	Acre-feet per day and cubic feet per second are flow rates, not volumes	Clarifying Edit	Edited text in Section 2.1.4.2 (Major Hydraulic Features) on Page 2-12 from "volumes" to "flows".
106	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2.1.5 Geologic Formation and Stratigraphy	Generally, eastside formation material originates as from continental deposits from the Sierra Nevada and westside formation material originates as from the continental deposits from the Coastal Ranges (marine).	Clarifying Edit	Edited text in Section 2.1.5 (Geologic Formations and Stratigraphy).
107	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	Figure 2-16 Geologic Map	The Tulare Formation is listed in the legend but is not present on the map. The Sacramento Regional Geology Map (RGM) does not include the Tulare Formation in its Explanation and the dark orange shading on the San Francisco-San Jose RGM is labeled Tvs for the Valley Springs Formation. The Tulare Formation originates from the Coast Range and would not crop out within the ESJ Subbasin.	Mechanics - Graphics	The Tulare Formation was taken out of the legend. This is confirmed by both of the RGMs the commenter cited.
108	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	Table 2-2 Generalized Stratigraphic Column	See comment above. The explanation summary for the San Francisco-San Jose RGM shows that the Tulare Formation is older than the Turlock Lake Formation. The Geologic Map Explanation indicates the upper Tulare Formation and lower Turlock Lake Formation could be interbedded at depth within the center of the Central Valley.	Clarifying Edit	According to the San Francisco-San Jose RGM, the Tulare Fm is generally older than the Turlock Lake Fm and likely interbedded in the San Joaquin Valley, as the commenter noted. The Rock Characteristics and Environment column describes the continental basinal equivalent formations from recent to Plio-Pleistocene. These descriptions can be revised and clarified in future iterations of the GSP.
109	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2.1.5.1.2 Ione Formation	The Ione Formation is an important source of both sand and clay but these products are separate. "Kaolinite sand" is not possibly since kaolinite is a clay mineral and not durable enough to be sand.	Clarifying Edit	Deleted sentence in Section 2.1.5.1.2 (Ione Formation) referring to Ione sand.
110	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2.1.5.1.5 Laguna Formation	Which studies suggest that the Pliocene-Pleistocene Tulare Formation (younger) could be part of the middle Pliocene Laguna Formation (older) or occur between the Laguna Formation and the Miocene-early Pliocene Mehrten Formation (older still)?	Clarifying Edit	Removed in response to comment.
111	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2.1.5.1.6 Turlock Lake Formation	According to the USGS (Faunt, 2009), "… the western San Joaquin Valley generally is finer-grained and is underlain by the Corcoran Clay Member of the Tulare Formation (hereafter referred to as the Corcoran Clay)." and "This confining unit is a stratigraphic unit, the Corcoran Clay Member of the Tulare Formation (referred to in this report as the Corcoran Clay." Bold added for emphasis. A search of the report (Faunt, 2009) did not find any reference to the Turlock Lake Formation.	Clarifying Edit	Faunt 2009 is not cited in Chapter 2 in reference to the Turlock Lake Formation.
112	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	Figure 2-18: Base of Fresh Groundwater Elevation Contours and Stockton Fault	Only a single sentence for the figure. Additional text should be added to explain the significance of the information.	Basin Setting	Added text to reference other sections for discussion of base of fresh water: This feature also influences the location, depth, and thickness of the "base of the fresh water", as shown below in Figure 2 18. The base of fresh water is discussed further in Sections 2.1.7 and 2.1.8.2.

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Comment #	Commenter	Commenter Organization	Section, Figure, or Table Number	Comment	Category	Response to Comment
113	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	Figure 2-20: Hydrogeologic Cross-sections A-A' and B-B'	- Cross sections are too small, even printed on 11 x 17" paper, as the well labels are not legible. Scale of 0.36 to 0.45 inch per 1000 feet is not reasonable. The Stockton Fault is not depicted or located on Sections D-D' and E-E'. - Page 2-38, first paragraph refers to "well screen interval (shown in red)." but the interval is not shown and likely could not be seen due to the small size of the cross section. Cross sections don't show the three zones within the principal aquifer, except by association with the formations. Model Section D-D' is equivalent to GSP Section C-C' and D-D' shows the Corcoran Clay. - The Corcoran Clay is shown on southern end (7 miles) of Section E-E' but not at the southern end of Section D-D'. According to DWR (1981/2008), the top of the Corcoran Clay cannot be delineated to the east of Highway 99 at Manteca, but Section E-E' is located further east of Highway 99 and would not encounter the clay until several miles further south of the subbasin boundary. Moreover, the depth to the top might be 200 feet on the west side of Manteca, south of Highway 120, which is within the southernmost alignment of Section D-D'. - The presence of the Corcoran Clay appears to be more related to the DWR model of the Central Valley than to well logs.	Basin Setting	The level of detail in the GSP is appropriate for a conceptual model of the Subbasin, and the number of cross-sections already exceeds SGMA requirements. Additionally, the well logs for wells shown in the cross-sections are public for detailed review. The representation of Corcoran Clay cross-sections is based on previous work from DWR and is consistent with the latest released version of C2VSim. The image resolution was increased to help with zooming in on small areas.
114	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	Figure 2-21: Hydrogeologic Cross-sections C-C' and D-D'	- Cross sections are too small, even printed on 11 x 17" paper, as the well labels are not legible. Scale of 0.36 to 0.45 inch per 1000 feet is not reasonable. The Stockton Fault is not depicted or located on Sections D-D' and E-E'. - Page 2-38, first paragraph refers to "well screen interval (shown in red)." but the interval is not shown and likely could not be seen due to the small size of the cross section. Cross sections don't show the three zones within the principal aquifer, except by association with the formations. Model Section D-D' is equivalent to GSP Section C-C' and D-D' shows the Corcoran Clay. - The Corcoran Clay is shown on southern end (7 miles) of Section E-E' but not at the southern end of Section D-D'. According to DWR (1981/2008), the top of the Corcoran Clay cannot be delineated to the east of Highway 99 at Manteca, but Section E-E' is located further east of Highway 99 and would not encounter the clay until several miles further south of the subbasin boundary. Moreover, the depth to the top might be 200 feet on the west side of Manteca, south of Highway 120, which is within the southernmost alignment of Section D-D'. - The presence of the Corcoran Clay appears to be more related to the DWR model of the Central Valley than to well logs.	Basin Setting	The level of detail in the GSP is appropriate for a conceptual model of the Subbasin, and the number of cross-sections already exceeds SGMA requirements. Additionally, the well logs for wells shown in the cross-sections are public for detailed review. The representation of Corcoran Clay cross-sections is based on previous work from DWR and is consistent with the latest released version of C2VSim. The image resolution was increased to help with zooming in on small areas.
115	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	Figure 2-22: Hydrogeologic Cross-section E-E'	- Cross sections are too small, even printed on 11 x 17" paper, as the well labels are not legible. Scale of 0.36 to 0.45 inch per 1000 feet is not reasonable. The Stockton Fault is not depicted or located on Sections D-D' and E-E'. - Page 2-38, first paragraph refers to "well screen interval (shown in red)." but the interval is not shown and likely could not be seen due to the small size of the cross section. Cross sections don't show the three zones within the principal aquifer, except by association with the formations. Model Section D-D' is equivalent to GSP Section C-C' and D-D' shows the Corcoran Clay. - The Corcoran Clay is shown on southern end (7 miles) of Section E-E' but not at the southern end of Section D-D'. According to DWR (1981/2008), the top of the Corcoran Clay cannot be delineated to the east of Highway 99 at Manteca, but Section E-E' is located further east of Highway 99 and would not encounter the clay until several miles further south of the subbasin boundary. Moreover, the depth to the top might be 200 feet on the west side of Manteca, south of Highway 120, which is within the southernmost alignment of Section D-D'. - The presence of the Corcoran Clay appears to be more related to the DWR model of the Central Valley than to well logs.	Basin Setting	The level of detail in the GSP is appropriate for a conceptual model of the Subbasin, and the number of cross-sections already exceeds SGMA requirements. Additionally, the well logs for wells shown in the cross-sections are public for detailed review. The representation of Corcoran Clay cross-sections is based on previous work from DWR and is consistent with the latest released version of C2VSim. The image resolution was increased to help with zooming in on small areas.
116	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	Figure 2-20: Hydrogeologic Cross-section B-B'	The eastern side of the sections show 1,500 feet and nearly 2,100 feet, respectively, of sedimentary formations without presenting an explanation. Section A-A' shows these formations thinning eastward on top of bedrock. Sections B-B' and C-C' suggest a substantial aquifer further east and the model sections show similar conditions. This thick eastern boundary is not discussed in the text and will produce a high-end bias for the estimate of groundwater storage which could lead to the false sense of sustainability.	Basin Setting	The current model thickness is consistent with the DWR's C2VSim model and is an area for enhancement in model refinements. New monitoring wells shown in Figure 4-3 will help refine the model thickness through new information about the aquifer on the eastern side of the Subbasin. Comment noted for follow up in next round of model refinements and updates.
117	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	Figure 2-21: Hydrogeologic Cross-section C-C'	The eastern side of the sections show 1,500 feet and nearly 2,100 feet, respectively, of sedimentary formations without presenting an explanation. Section A-A' shows these formations thinning eastward on top of bedrock. Sections B-B' and C-C' suggest a substantial aquifer further east and the model sections show similar conditions. This thick eastern boundary is not discussed in the text and will produce a high-end bias for the estimate of groundwater storage which could lead to the false sense of sustainability.	Basin Setting	The current model thickness is consistent with the DWR's C2VSim model and is an area for enhancement in model refinements. New monitoring wells shown in Figure 4-3 will help refine the model thickness through new information about the aquifer on the eastern side of the Subbasin. Comment noted for follow up in next round of model refinements and updates.
118	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2.1.9.1 Zones within Principal Aquifer	What about the stratigraphy of the Shallow and Intermediate Zones? Why are is the stratigraphy of the deeper than Deep Zone referenced when few wells are deeper than 500 feet?	Basin Setting	The level of detail in the GSP is appropriate for a conceptual model of the Subbasin.
119	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2.1.9.1.1 Shallow Zone	For the 11 x 17" print, that's 0.01 to 0.12 inches, and 0.01 inches at 0.06 to 0.07 inches below the land surface, and is not shown on the sections. What about a bullet for hydraulic conductivity values for each zone to match the other aquifer parameters?	Clarifying Edit	The level of detail in the GSP is appropriate for a conceptual model of the Subbasin. The image resolution of the cross-sections was increased to help with zooming in on small areas.
120	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2.1.9.1.3 Deep Zone	For the 11 x 17" print, that's 0.01 to 0.12 inches, and 0.01 inches at 0.06 to 0.07 inches below the land surface, and is not shown on the sections. What about a bullet for hydraulic conductivity values for each zone to match the other aquifer parameters?	Clarifying Edit	The level of detail in the GSP is appropriate for a conceptual model of the Subbasin. The image resolution of the cross-sections was increased to help with zooming in on small areas.
121	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2.1.9.1.4 Limited Aquitards	See comments above. Text on page 2-29 says Corcoran Clay is associated with the Laguna Formation and/or occurs between the Laguna and Mehrten Formations. As shown on Section E-E', the top of Corcoran Clay is ~140 feet and the thickness is ~70 feet at the basin boundary.	Clarifying Edit	Comment noted. Discussion in Section 2.1.9.1.4 is discussing the northern portion of the Corcoran Clay in general (not specific to the Subbasin), while Cross-Section E-E' only shows one small area of the Subbasin.
122	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2.1.9.1.4 Limited Aquitards	For the 11 x 17" print, that's 0.004 to 0.06 inches	Clarifying Edit	The level of detail in the GSP is appropriate for a conceptual model of the Subbasin. The image resolution of the cross-sections was increased to help with zooming in on small areas.
123	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2.1.9.2 Aquifer Characteristics and Groundwater Quality	Camanche Reservoir is located at the northeastern corner of the subbasin and Oakdale is located at the southeastern corner, ~30 miles apart.	Clarifying Edit	Edited text in Section 2.1.9.2 (Aquifer Characteristics and Groundwater Quality): The thickest sand and gravel sequences ranged from 500 to 700 feet near the Stanislaus River, south of Woodward Reservoir and northeast of Oakdale.
124	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2.1.9.2.1 Aquifer Parameters and Production Zone Well Capacities	Production Zone is new subdivision to the Principal Aquifer. How does it relate to the Shallow, Intermediate and Deep Zones?	Clarifying Edit	The production zone is not a new subdivision of the principal aquifer. As described in Section 2.1.9 (Principal Aquifer): The Eastern San Joaquin Subbasin HCM has one principal aquifer that provides water for domestic, irrigation, and municipal water supply and that is composed of three water production zones. These three water production zones are the Shallow, Intermediate, and Deep Zones.
125	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin		Page 2-42 said "Storage coefficients up to 17 percent" for the shallow zone, which should have referred to the specific yield.	Clarifying Edit	Edited text in Section 2.1.9.1.1 (Shallow Zone) to change storage coefficients to specific yield.
126	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	Table 2-4 Wells within Water-Bearing Zones	Why was Intermediate and Deep Zones combined?	Clarifying Edit	Intermediate and deep zones were combined in Table 2-4 due to trends in the data. Consider for further definition in future updates to the GSP.
127	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2.1.9.2.3.1 Geologic Formation Water Quality	The oxidation of pyrite and other sulfide minerals would produce sulfuric acid which would manifest as a lower pH.	Clarifying Edit	Comment noted.

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128	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin		What type of conditions since redox is an abbreviation for reduced versus oxidized conditions - oxygen absent versus oxygen present?	Clarifying Edit	Comment noted. Source (Izbicki et al., 2008) indicates arsenic release in the absence of oxygen.
129	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin		The focus of this paragraph is odd. The atmosphere is comprised of 78% nitrogen and the soils and underlying rock in the upland watersheds appears to absorb and store nitrogen. The real important issue is the occurrence of nitrate in the subbasin. How much nitrate occurs in the Mokelumne River (and other rivers) as that surface water enters the subbasin? Why is nitrate omitted from the list of anions in the next paragraph? Why wasn't a box-and-whisker diagram prepared for nitrate to show its variations between 2005 and 2017?	Basin Setting	Comment noted. Additional data on nitrate in the Subbasin is included in Section 2.2.4.2 (Nitrate). Nitrate was left off the list of water quality parameters in Section 2.1.9.2.3.1 (Geologic Formation Water Quality) as it is covered by separate monitoring and regulation programs.
130	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2.1.10 HCM Data Gaps	Water quality of three zones in principal aquifers	Clarifying Edit	Edited text in Section 2.1.10 (HCM Data Gaps): Water quality of three zones in principal aquifer.
131	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	Groundwater Level Data	Additional groundwater level data near major creeks and rivers such as the Mokelumne River to improve quantification and understanding of subsurface flows between subbasins and for surface water-groundwater interactions	Clarifying Edit	Edited text in Section 2.1.10 (HCM Data Gaps): Additional groundwater level data near major creeks and rivers to improve quantification and understanding of subsurface flows between groundwater subbasins and surface water-groundwater interaction.
132	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	Subsurface Conditions	Why east side of basin, which is bedrock in the foothills of the Sierra Nevada mountains? More attention is needed along the boundary with the Cosumnes and South American Subbasins to the north.	Clarifying Edit	Comment noted. The eastern area, though largely bedrock, lacks monitoring wells, as discussed in Chapter 4 (Monitoring Network), and data.
133	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	Figure 2-34: Hydrographs of Selected Wells	SGMA requires the same datum and scaling for hydrographs (to the extent possible). The 10 hydrographs use different horizontal and vertical scales. The horizontal scales varied from starting years between 1950 and 1973 and the ending years between 2014 and 2017 which produced a span of 43 to 67 years. The span of the vertical scales varied between 18 and 180 years. What are the depths of these 10 wells? What zones do these wells represent? Why weren't wells 04N08E06C002 and 04N05E10K001 identified as representative monitoring wells, given their proximal location to the northern boundary of the subbasin?	Mechanics - Graphics	Comment noted for consideration in updates to the GSP. It is beyond the scope of the GSP to include this information.
134	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	Figure 2-35: Groundwater Elevations 1940-2018, (a) Box-and Whisker Plot with Precipitation	Difficult plot due to overlapping lines. Change to scale of the second vertical axis to shift the precipitation line above the box-and-whiskers. Average annual precipitation line is not provided, as stated in third note. What about showing the water year type?	Mechanics - Graphics	Comment noted. Scales on the plot were updated. Water year types and annual total precipitation can be found in Figure 2-71.
135	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2.2.1.2 Current Groundwater Elevations	Why are 2016 data omitted from current conditions? Historical data are 1996 to 2015. Current data are only 2017?	Clarifying Edit	Groundwater level data represented the latest complete records available at the time of the analysis for the GSP. The DMS will ensure that data is kept up-to-date for future analyses and updates to the GSP.
136	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2.2.1.2.1 Vertical Gradients	Vertical gradients only show potential for groundwater flow. An aquitard would prevent that vertical flow.	Clarifying Edit	Comment noted. Aquitards would prevent vertical flow, but are not common in Eastern San Joaquin Subbasin.
137	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2.2.1.2.1 Vertical Gradients	Vertical gradients only show potential for groundwater flow. An aquitard would prevent that vertical flow.	Clarifying Edit	Comment noted. Aquitards would prevent vertical flow, but are not common in Eastern San Joaquin Subbasin.
138	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	Figures 2-40 to 2-49: Nested Well Hydrographs	SGMA requires the same datum and scaling for hydrographs (to the extent possible). The 10 hydrographs use different horizontal and vertical scales. Use of the scales would allow the magnitude of the gradients to be evident between locations and allow comparison of the record of data.	Mechanics - Graphics	Scales on the hydrographs were standardized for consistency.
139	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2.2.2 Groundwater Storage	Figure 2-50 is not effective at showing anything - just a big blue rectangle with a slightly irregularly top '-0.91 / 53 *100 = -1.7% Reduction in storage really only began in 2008 when the value became negative and stay negative thereafter. The average change in storage would be -0.11 MAF/yr for that 8-year period.	Mechanics - Graphics	The figure has been developed to show the impact of groundwater extraction on overall amount of fresh groundwater in storage. The potential for undesirable results associated with groundwater accessibility are addressed through the Chronic Lowering of Groundwater Levels Sustainability Indicator.
140	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	Table 2-5: Summary of Chloride Data by Decade	The table shows that minimum, average, and median values are all less than 250 mg/L. How do the depth intervals relate to the zones in the principal aquifer?	Clarifying Edit	Comment noted. Table 2-5 shows chloride measurements by decade, but has no component related specifically to well depth.
141	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	Table 2-6: Summary of Chloride Data by Depth (1940s-2010s)	The table shows that minimum, average, and median values are all less than 250 mg/L. How do the depth intervals relate to the zones in the principal aquifer?	Clarifying Edit	Comment noted. Table 2-5 shows chloride measurements by well depth, with depths ranging from 0 to over 500 feet deep. These wells may be from any of the principal aquifer zones, depending where in the Subbasin they are located. From Figure 2-54, as most of the wells with depth data are in the City of Stockton area, the wells are likely in the intermediate or deep zones according to cross-section B-B' in Figure 2-20.
142	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	Chloride data	Table 2.6 shows that 3,566 samples out of a total of 6,931 samples lack depth data but these data are not limited to only concentrations greater than 250 mg/L. The no-depth well group does have the highest range but the 100-foot well group has a much higher median value, a higher minimum, and a comparable average relative to the no-depth well group.	Clarifying Edit	Comment noted. Consider for analysis in future updates to the GSP.
143	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2.2.4.1.2 Total Dissolved Solids	According to the USGS (Hem, 1985), "Organic matter, if present, may be partly volatile, but it is not completely removed unless the residue is strongly ignited."	Clarifying Edit	Comment noted. Consider for analysis in future updates to the GSP.

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Comment #	Commenter	Commenter Organization	Section, Figure, or Table Number	Comment	Category	Response to Comment
144	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	Figure 2-57: Maximum TDS Concentrations in Shallow Wells 2015-2018	Figure explanation says shallow wells are less than 200 feet but Table 2.7 show depth ranges of 0-100', 100-250', 250-500', and >500', which is not consistent. How do the depth intervals relate to the zones in the principal aquifer?	Clarifying Edit	Figure 2-57 shows TDS concentrations in shallow wells (wells shallower than 200 feet), while Figure 2-58 shows concentrations in deep wells (wells deeper than 200 feet). Table 2-7 is the tabulated date behind the two figures (2-57 and 2-58). The well depths are likely in the shallow or intermediate zones of the principal aquifer, based on the depths presented in cross-section C-C' in Figure 2-21.
145	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	Figure 2-58: Maximum TDS Concentrations in Deep Wells 2015-2018	Figure explanation says deep wells are greater than 200 feet. What about intermediate wells?	Mechanics - Graphics	The analysis only differentiates between deep wells (greater than 200 feet) and shallow wells (less than 200 feet).
146	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	Table 2-10: MCLs for Common Petroleum Hydrocarbons and MTBE	Why are the units for xylene mg/L when the other organics are ug/L? The change seems disingenuous.	Clarifying Edit	Confirmed MCLs in California Regulations Related to Drinking Water from the SWRCB. Units in table are correct.
147	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	Table 2-11: MCLs for Common Synthetic Organic Constituents	TCE may have been used early in the dry cleaning industry but dry cleaners seem to be the dominant source for PCE plumes.	Clarifying Edit	Edited sources for PCE in Table 2-11 (MCLs for Common Synthetic Organic Constituents): Used as a solvent in manufacturing facilities, dry cleaners, printing shops, and auto repair facilities.
148	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	Figure 2-67: Natural Communities Commonly Associated with Groundwater (NCCAG)	Dark subbasin boundary line obscures the color-coded lines	Mechanics - Graphics	Changed the order of the layering so that the subbasin boundary does not obscure the NCCAG indications.
149	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2.3.3 Use of the ESJWRM and Associated Data in Water Budget Development	Historical Water Budget was established for 20 years (WY 1996 to 2015). Projected Water Budget was produced for the implementation period, starting in 2020, based on a 50-year previous hydrology (1969 to 2018). Why is Current Water Budget based on a 50-year period (1969 to 2018) when SGMA requires the use of "the most recent hydrology, water supply, water demand, and land use information."? I'm thinking a Current Water Budget would be for 2016 and 2017 (maybe 2018) to be consistent with Section 2.2.1.2 - Current Groundwater Elevations.	Water Budget	The current text, tables, and figures for the water budget meet the requirements of the GSP. As described in Section 2.3.4.2 (Assumptions Used in the Current Water Budget), the current conditions scenario uses current estimates of water demand and supplies along with 50 years of historical hydrology to see the long-term impact of current demand and supply on the Subbasin.
150	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	Table 2-12: Summary of Water Budget Assumptions (Historical, Current, and Projected Periods)	Hydrologic Years: 50-year period for Current Water Budget is not consistent with SGMA requirement. All other entries say current and refer to recent information - no the past 50 years. Note 3 refers to "pre-drought level (assumed water year 2013)". WY 2013 was a critical WY.	Water Budget	1) The current text, tables, and figures for the water budget meet the requirements of the GSP. As described in Section 2.3.4.2 (Assumptions Used in the Current Water Budget), the current conditions scenario uses current estimates of water demand and supplies along with 50 years of historical hydrology to see the long-term impact of current demand and supply on the Subbasin. 2) Even though water year 2013 was designated a critical water year in terms of hydrology, the drought regulations had not largely impacted urban water users yet, so 2013 urban demand (per capita water use) was assumed to represent normal/pre-drought urban demand conditions.
151	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2.3.4.2 Assumptions Used in the Current Water Budget	The 50-year period is not consistent with SGMA requirement.	Water Budget	The current text, tables, and figures for the water budget meet the requirements of the GSP. As described in Section 2.3.4.2 (Assumptions Used in the Current Water Budget), the current conditions scenario uses current estimates of water demand and supplies along with 50 years of historical hydrology to see the long-term impact of current demand and supply on the Subbasin.
152	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2.3.5 Water Budget Estimates	Riparian intake from streams is evapotranspiration outflow from the stream system. How can it also be an inflow?	Clarifying Edit	The stream water budget is a balance on water in streams and the land surface water budget is a balance on water used on lands. Water comes from the stream system to meet the riparian demand occurring in the land surface system, so is an outflow from the stream system and an inflow to the land surface system.
153	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	Table 2-15: Average Annual Water Budget – Groundwater System	The proportions of water in the budgets don't vary more than a few percentage point which is likely due to the long-term overlapping periods of data. See previous comments on the use of a 50-year period for current conditions. Totals for main categories of inflow and outflow don't match table totals (due to rounding [?]). Tables 2-13 and 2-14 may exhibit similar discrepancies.	Water Budget	Added a footnote to Tables 2-13 to 2-17 clarifying that: Summations in table may not match the numbers in the table. This is due to the rounding of model results.
154	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	Figures 2-72 to 2-80	Magnitude of average annual volumes would be more easily perceived if the vertical scale was the same for each plot.	Mechanics - Graphics	Scales have been changed to be consistent within scenarios for each of the stream, land surface, and groundwater system figures.
155	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	Table 2-16: Average Annual Values for Key Components of Historical Water Budget by Year Type	How can the average of three AN years be less than one BN year? Is math correct?	Mechanics - Graphics	Footnote on Table 2-16 addresses this comment: There was only one below normal year in the historical calibration, so averages are just based on model results for that single water year. Since there wasn't any more below normal years to use in the average, results the below normal water year type do not follow expected trends.
156	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2.3.5.4 Projected Water Budget Estimates	Section needs a figure for projected groundwater budget similar to the historical conditions of 1996 to 2015 (Figure 2-51) and for climate change (Figure 2-102). What about groundwater budget information for Wys 2016, 2017, and 2018?	Water Budget	The current text, tables, and figures for the water budget meet the requirements of the GSP. The current version of the model includes data through water year 2015 (September 2015). Future refinements to the model will include data updates to include 2016 through 2018.
157	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2.3.6 Sustainable Yield Estimate	This statement actually implies that groundwater levels will decline until 2045 (2020 + 25 = 2045), which would not be consistent with SGMA's prohibition of "chronic lowering of groundwater levels" which would continue to cause groundwater to flow from the adjacent subbasins and limit their ability to achieve sustainable management, unless ESJ successfully implements all of their projects and management actions.	Clarifying Edit	25 years was edited to 20 years in the text in Section 2.3.6 (Sustainable Yield Estimate).

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Comment #	Commenter	Commenter Organization	Section, Figure, or Table Number	Comment	Category	Response to Comment
158	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin		Does this 50-year average approach really support operations within this sustainable yield within the 20-year planning and implementation horizon? The sustainable yield would appear to range from 643,000 AF/yr to 715,000 AF/yr to 787,000 AF/yr. Table 2-17 says the 50-year total groundwater supply is 801,000 AF/yr, which is 86,000 AF/yr greater than the sustainable yield. Text on page 2-148 also refers to 801,000 AF/yr as private groundwater production.	Water Budget	The sustainable yield scenario of the ESJWRM tests if a simulated demand reduction is sustainable over 50 years of varying hydrologic data. The 20-year implementation period was included to allow for changes to occur in the Subbasin before 2040 and for groundwater levels to continue to drop. The text in Section 2.3.6 (Sustainable Yield Estimate) was edited to clarify that demand reductions slowly ramp up over the 20-year period: In order to account for the challenges of implementing the GSP, this Plan assumes future operations include a ramping up of demand reduction actions (e.g., projects that reduce groundwater pumping or increase recharge) for a 20-year period and groundwater levels will continue to decline until 2040.
159	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin		Does this 50-year average approach really support operations within this sustainable yield within the 20-year planning and implementation horizon? The sustainable yield would appear to range from 643,000 AF/yr to 715,000 AF/yr to 787,000 AF/yr. Table 2-17 says the 50-year total groundwater supply is 801,000 AF/yr, which is 86,000 AF/yr greater than the sustainable yield. Text on page 2-148 also refers to 801,000 AF/yr as private groundwater production.	Water Budget	The sustainable yield scenario of the ESJWRM tests if a simulated demand reduction is sustainable over 50 years of varying hydrologic data. The 20-year implementation period was included to allow for changes to occur in the Subbasin before 2040 and for groundwater levels to continue to drop. The text in Section 2.3.6 (Sustainable Yield Estimate) was edited to clarify that demand reductions slowly ramp up over the 20-year period: In order to account for the challenges of implementing the GSP, this Plan assumes future operations include a ramping up of demand reduction actions (e.g., projects that reduce groundwater pumping or increase recharge) for a 20-year period and groundwater levels will continue to decline until 2040.
160	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	Figure 2-82: Dry Creek Hydrograph	Why is a 54-year period (1964 to 2018) used in the projection when the previous text referred to a 50-year period (1696 to 2018)? Shouldn't the time scale be 2020 to 2070 or Year 1 to 50, beginning in 2020? Same questions for Figures 2-84, 2-86, 2-88, and 2-90.	Climate Change	Edits made to Figures 2-82, 2-84, 2-86, 2-88, and 2-90 so time scale shows the 50-year period of the simulation period.
161	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2.3.7.4 Eastern San Joaquin Water Budget Under Climate Change	Does municipal groundwater pumping increase to total?	Climate Change	In the climate change scenario, groundwater pumping to meet agricultural and residential needs is calculated by the model based on meeting remaining demands after appropriate surface water delivery is made to respective areas. Demand in areas with no access to surface water is completely met by groundwater pumping. Pumping occurring within city limits may need to increase to meet the urban demands not met through surface water.
162	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	Figure 2-102: Groundwater Budget – Climate Change Scenario	Cumulative change in groundwater storage continues to decline for the 50-year period which is not consistent with the SGMA prohibition of reduction in groundwater storage.	Climate Change	Consistent with regulations, the 2070 climate change sensitivity analysis on the projected conditions scenario was used to better understand trends and inform planning. Due to the uncertainty around climate projections in the 2070 timeframe, the ESJGWA Board determined the projected conditions scenario was most appropriate for analyzing sustainable yield and a zero change in storage in the GSP implementation time period beginning in 2040. Climate change will continue to be evaluated with every update to the GSP and estimates of projects and management actions will continue to evolve with refinements to the model. Comment noted for follow up in next round of model refinements and updates to analyses.
163	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	Figure 3-2: Location of Representative Monitoring Wells for Groundwater Levels	Groundwater along the northern boundary are monitored by two shallow CASGEM wells (Wells 04N07E20H003 and 04N05E24J003) that are 3.3 to 4.2 miles south of the Cosumnes Subbasin. These wells are located ~8 miles apart along the 26-mile E-W subbasin boundary (excludes 4-mile N-S boundary with Amador County). Additional monitoring wells should be installed along to the boundary to cover the entire length, including deeper wells, to better define cross boundary flow, vertical gradients, and the surface water-groundwater interaction.	Monitoring Network	As described in Section 4.7 (Data Gaps) and shown in Figure 4-3, additional groundwater monitoring wells are planned for the Subbasin to fill recognized data gaps. Two of these wells are adjacent to Dry Creek and will provide data relevant to stream-aquifer interaction, as well as subsurface flows across the groundwater subbasin boundary shared with Cosumnes Subbasin. One of the wells, a deep nested well, was included in the TSS funding application and is located along the boundary shared with Cosumnes Subbasin (about midway along the portion of Dry Creek bordering the Subbasin). The second well along Dry Creek is shallow and will be funded by the ESJGWA. Additional information will be provided by wells installed and maintained along the boundary by the GSAs within the Cosumnes Subbasin, which will also be incorporated into future GSP updates. The text in Section 4.7 (Data Gaps) was updated to reflect additional details about the proposed new monitoring wells and locations of the TSS wells.
164	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	Table 3-1: Minimum Thresholds for Chronic Lowering of Groundwater Levels	The MT for well 04N07E20H003 was confirmed at -81.7 feet MSL by the GSP methodology, but the MT (-31.2 feet MSL) for well 04N05E24J003 was found to be lower by 1.4 feet or -29.8 feet MSL. Appendix 3-A shows a 25-foot buffer compared to the 23.6-foot buffer derived from the difference between the highest and lowest values. The MOs were confirmed for the two wells (Table 3-2). Use of these management criteria will further reduce groundwater levels and storage along the northern boundary of the subbasin and cause groundwater from the Cosumnes Subbasin to flow into the ESJ Subbasin due to this generous management criteria. Recent groundwater levels (Mar/Apr-19) are 13 and 17 feet above their respective MOs and 58 and 41 feet above their respective MTs (Wells 04N07E20H003 and 04N05E24J003). Use of this criteria will allow the further lowering of groundwater levels and the reduction in storage, which will cause additional groundwater flow from the Cosumnes Subbasin, especially during a long-term period of drought. Note that the method for establishing the MT buffer is somewhat different for each well, which adds a bias to values. For well 04N07E20H003, the buffer was based on the difference between the highest groundwater level (WL), which occurred during Mar-84 (during an above normal [AN] WY, following the wettest WY on record and a wetter AN WY), and the lowest WL during Oct-16. For well 04N05E24J004, the highest and lowest WLs occurred during Mar-97 and Oct-15, respectively. The historical water budget period was established for 1996 to 2015, so the highest and lowest WLs should be restricted to that period (See attached Figures 1 & 2). In addition, Appendix 3-B provides hydrographs with MT and MO lines for a date range beginning in 1990. This uniform criteria should be applied to all representative WL monitoring wells.	Groundwater Levels	1) This response assumes the commenter to have confirmed the minimum threshold and measurable objective for well 04N07E20H003. For well 04N05E24J003, the commenter notes the measurable objective is confirmed correct, but the minimum threshold is not. It is assumed the commenter is referring to well 04N05E24J004 because well 04N05E24J003 is not used. The discrepancy noted in the comment is in the source of data from which the calculations are made. Local San Joaquin County well data was used to calculate the buffer and a minimum threshold of -31.2 ft MSL for 04N05E24J004. The measurable objective of -6.2 ft MSL was calculated from CASGEM data for well 04N05E24J004. Where available, CASGEM data was consistently used to calculate measurable objectives and local agency data was consistently used to determine the historical range buffer, as the local datasets typically had a longer monitoring record. 2) The ESJGWA supports using the minimum thresholds, measurable objectives, and interim milestones for the chronic lowering of groundwater levels sustainability indicator as written. The current approach was developed recognizing that the aquifer is heterogeneous, and the criteria as written accounts for the varying responses to hydrology that occur in different locations across the Subbasin. The intent of adding a buffer of 100 percent of the historical range to the historical drought low is to reflect this varying hydrology, as areas far from surface water will respond/fluctuate differently than areas close to surface water. It is recognized that the monitoring wells have different periods of record. The methodology uses available data from 1990 to 2019 to set these criteria. 3) In evaluating flow gradient changes between subbasins, the ESJGWA's focus is on long-term change in groundwater elevation, rather than temporary fluctuation in periods of drought. The ESJGWA will continue to coordinate with neighboring subbasins as they develop their plans and establish sustainable management criteria, such that no subbasin is preventing another from achieving sustainability. Because neighboring subbasins are largely on the 2022 timeline for GSP development, it is too speculative at this time to determine how inter-basin flows will be affected.
165	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	Table 3-3: Interim Milestones for Chronic Lowering of Groundwater Levels	Current groundwater levels (WL) are set at values for Fall 2015. For well 04N05E24J004, the "current" WL, MO, and all interim milestones are -6.2 feet MSL. The WL declined further in fall 2016 to -4.2 feet MSL and then varied from 6.3 feet MSL in fall 2017 and 3.3 feet MSL in fall 2018. For well 04N07E20H003, the "current" WL was -35.5 feet MSL, just above the MO of -36.7 feet MSL, and the first two interim milestones equal -35.5 feet MSL ("current WL") and the third milestone allowed a WL decline to -36.1 feet MSL. The WLs declined during the fall 2016 to -36.7 feet MSL (MO) and then rose thereafter to -32.8 feet MSL during fall 2017 and -31.4 feet MSL during fall 2018.	Groundwater Levels	Correct, the current groundwater levels are set at values for Fall 2015 for almost all wells. This is noted in a footnote in Table 3-3. The four wells using an average groundwater level for current are indicated with "**".
166	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	3.2.2 Reduction in Groundwater Storage	DWR has classified the ESJ Subbasin as overdrafted. The text does not provide a direct rebuttal to this classification or address the contributions of groundwater from the adjacent subbasins which should be an undesirable result of overpumping.	Groundwater Storage	See Master Response 4 - GW Storage.
167	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin		The text does not address the contributions of groundwater from the adjacent subbasins which should be an undesirable result of overpumping. How much groundwater would move into the ESJ Subbasin from adjacent subbasins if the storage were reduced by 1.2 MAF to down to 30 MAF?	Groundwater Storage	See Master Response 4 - GW Storage.
168	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	Table 3-4: Interim Milestones for Degraded Water Quality	The measurable objective for TDS is 600 mg/L - the recommended secondary MCL plus a 100-mg/L buffer. TDS currently ranges from 280 to 510 mg/L (average: 370 mg/L) at the 10 representative monitoring wells. The interim milestones allow incremental increases of TDS over the 20-year period, ranging from 5 to 29 percent (average: 15%), where lower-TDS wells have greater increments and higher-TDS wells have lower increments. This approach appears to encourage the degradation of water quality as an objective.	Groundwater Quality	The measurable objective is close to the SMCL of 500 mg/L and significantly below the upper limit SMCL of 1000 mg/L and is considered protective of beneficial uses. Having measurable objectives somewhat above current conditions provides the GSAs with flexibility through the implementation horizon, while being protective of drinking water and agricultural water supplies.

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169	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	3.2.5 Land Subsidence	The text fails to acknowledge the continuous GPS station (P309 - Linden) in the subbasin and the 5 other stations in adjacent subbasins, which be used to interpolate subsidence within the subbasin. Additional GSP stations could be installed in the subbasin.	Subsidence	The ESJGWA supports the use of existing monitoring stations and InSAR data currently referenced in the GSP for the evaluation of subsidence, and believe the conditions of the subbasin do warrant the creation of new subsidence stations at this time. The GSP has been updated to reference the UNAVCO continuous GPS stations in Section 1.2.2.4 (Land Subsidence Monitoring): UNAVCO's Plate Boundary Observatory Program – Reporting since 2004, the UNAVCO (formerly University Navigation Satellite Timing and Ranging or NAVSTAR Consortium) Plate Boundary Observatory network consists of a network of about 1,100 continuous global positioning system (CGPS) and meteorology stations in the western United States to measure deformation resulting from the constant motion of the Pacific and North American tectonic plates in the western United States. Stations located within the Subbasin contain data from at least 2006 to current and include station P309 located east of Linden and station P273 located west of Lodi. Other stations are also available in nearby Subbasins. GSP subsidence analyses have been conducted using satellite-based methods over limited time periods, as described below.
170	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	4.3 MONITORING NETWORKS FOR DEGRADED WATER QUALITY	Anions should include nitrate as well as bicarbonate & carbonate, chloride, and sulfate.	Clarifying Edit	Comment noted. Water quality monitoring will test for a variety of contaminants.
171	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	4.3.5 Spatial Density of Groundwater Quality Monitoring Wells	Make appropriate revision in Section 8, page 8-6	Clarifying Edit	Edited References to delete 2010b (2016b is the correct reference to the monitoring network BMP), make formerly 2010c references into 2010b, and edit references in Section 4.3.5 (Spatial Density of Groundwater Quality Monitoring Wells) to 2016b.
172	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	6.2.1 Project Identification	Project is affordable and coste-effective (highest lowest unit cost per volume water savings)	Mechanics - Text	Comment addressed in text.
173	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	6.3 MANAGEMENT ACTIONS	All of these activities are required by SGMA so they aren't really management actions (reduced pumping, fallowing, …) as intended by SGMA	Plan Implementation	The ESJGWA treats management actions as generally administrative, locally implemented actions that the GSAs could take that affect groundwater sustainability. Language was added to the GSP (Section 6.3 Management Actions) referencing existing conservation management actions occurring in the Subbasin (including Urban Water Management Plans and Agriculture Water Management Plans). More information on management actions will be added if the ESJGWA determines pumping reductions or others are needed to achieve sustainability in the Subbasin.
174	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	Table 7-2: Costs to GSAs and GSP Implementation Costs	$0.8M to $2.0M is quite excessive, as if the GSP will be done over. Annual reports will provide a significant foundation for the 5-year evaluation and the cost might be only $200K to $300K - hopefully a lot less. Other costs should be reviewed closely to ensure reasonableness.	Plan Implementation	The cost estimates for implementation actions are conservative planning-level estimates that will be refined once additional specifics have been determined. The ESJ ESJGWA Plan Implementation Ad-Hoc Committee has been convened for this purpose and is meeting on an approximately weekly basis to actively identify next steps and form recommendations that will allow for refinement in GSP implementation cost estimates.
175	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	7.6 DEVELOPING 5-YEAR EVALUATION REPORTS	$0.8M to $2.0M is quite excessive, as if the GSP will be done over. Annual reports will provide a significant foundation for the 5-year evaluation and the cost might be only $200K to $300K - hopefully a lot less. Other costs should be reviewed closely to ensure reasonableness.	Plan Implementation	The cost estimates for implementation actions are conservative planning-level estimates that will be refined once additional specifics have been determined. The ESJ ESJGWA Plan Implementation Ad-Hoc Committee has been convened for this purpose and is meeting on an approximately weekly basis to actively identify next steps and form recommendations that will allow for refinement in GSP implementation cost estimates.
176	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	7.3.1 Monitoring	Won't the field crew and their equipment be used for sampling ($57K to $60K) and sampling costs are really laboratory costs ($24K to $30K)? Will CASGEM continue to exist after full implementation of SGMA?	Plan Implementation	Section 7.3.1 (Monitoring) has been updated to change the line item previous identified "Sampling costs" to "Laboratory costs". The form that the future CASGEM program will take after SGMA implementation is unknown at this time.
177	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	7.6.3 Reconsideration of GSP Elements	Why waste resources on a new index when a 118-year index is already available for the San Joaquin Valley? (Sacramento Valley index is 113 years long and is mostly consistent with the San Joaquin Valley index.)	Clarifying Edit	The San Joaquin Valley index is not based only on data local to the Subbasin. The ESJGWA Board will evaluate available indices' methodologies and determine whether or not to develop a new water year index.
178	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	ES-5. EXISTING GROUNDWATER CONDITIONS	California has three secondary maximum contaminant level (SMCL) standards for TDS, all based on aesthetic considerations such as taste and odor, not public health concerns. These are 500 mg/L (recommended limit), 1,000 mg/L (upper limit), and 1,500 2,500 mg/L (short-term limit).	Clarifying Edit	Edited Section ES-5 (Existing Groundwater Conditions) to correct the short-term SMCL for TDS and clarify the text: These are 500 mg/L (recommended limit), 1,000 mg/L (upper limit), and 1,500 mg/L (short-term limit).
179	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	ES-5. EXISTING GROUNDWATER CONDITIONS	Replace with: Surface waters can be hydraulically interconnected to the groundwater system, where the baseflow is derived from the aquifer (gaining stream) or the stream can lose surface water to the aquifer. If the water table beneath the stream goes down excessively as a result of groundwater pumping, the stream may disconnect from the underlying aquifer.	Clarifying Edit	Edited text in Section ES-5 (Existing Groundwater Conditions): Surface waters can be hydraulically interconnected with the groundwater system, where the stream baseflow is either derived from the aquifer (gaining stream) or recharged to the aquifer (losing stream). If the water table beneath the stream lowers as a result of groundwater pumping, the stream may disconnect entirely from the underlying aquifer. Major river systems in the Subbasin are highly managed to meet instream flow requirements for fisheries, water quality standards, and water rights of users downstream.
180	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	ES-10. PROJECTS AND MANAGEMENT ACTIONS	All of these activities are required by SGMA so they aren't really management actions (reduced pumping, fallowing, …) as intended by SGMA	Plan Implementation	The ESJGWA treats management actions as generally administrative, locally implemented actions that the GSAs could take that affect groundwater sustainability. Language was added to the GSP (Section 6.3 Management Actions) referencing existing conservation management actions occurring in the Subbasin (including Urban Water Management Plans and Agriculture Water Management Plans). More information on management actions will be added if the ESJGWA determines pumping reductions or others are needed to achieve sustainability in the Subbasin.
181	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	ES-12. FUNDING	Some costs need a closer look, especially the 5-year updates.	Plan Implementation	The cost estimates for implementation actions are conservative planning-level estimates that will be refined once additional specifics have been determined. The ESJGWA Plan Implementation Ad-Hoc Committee has been convened for this purpose and is meeting on an approximately weekly basis to actively identify next steps and form recommendations that will allow for refinement in GSP implementation cost estimates.
182	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	Cross Section B-B'	Elevation scale is shown to vary from 2500' to 0' [msl]. The correct elevation range should be 900' msl, based on Figure 22, to a deep negative elevation.	Mechanics - Graphics	The level of detail in the GSP is appropriate for a conceptual model of the Subbasin. The image resolution of the cross-sections was increased to help with zooming in on small areas.
183	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	Figures 29a to 29f: Cross Sections	The upper limits of the elevation scale vary from 1800' to 3000'. The correct elevation range should be 900' msl, based on Figure 22, to a deep negative elevation.	Mechanics - Graphics	Comment noted. The model report was finalized in August 2018 and was included as an appendix in the GSP to provide an explanation of the development and calibration of the historical model. The model documentation will be updated as updates to the model are made in the future.

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184	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	Figures 29a: Cross Section	Section A-A' is located somewhat north of GSP Section A-A'. The GSP section shows the sedimentary formations thinning eastward on top of bedrock. Whereas, the model section shows over 1000 feet of sediments along the eastern boundary of the model. This extra thickness in the model provides additional groundwater storage which could contribute to a false sense of sustainability.	Model Uncertainties	Sustainability is measured through field monitoring and comparison with minimum thresholds, allowing for identification of sustainable conditions. The current model thickness is consistent with the DWR's C2VSim model and is an area for enhancement in model refinements. New monitoring wells shown in Figure 4-3 in Section 4.71 (Plan to Fill Data Gaps) will help refine the model thickness through new information about the aquifer on the eastern side of the Subbasin. Comment noted for follow up in next round of model refinements and updates.
185	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	2.9 Model Layering	Layer 1 thickness ranges from 34 to 966 feet and Layer 2 thickness ranges from 50 to 540 feet. Layer 1 is thickest within the north-central and along the eastern boundary, and the latter condition seems unusual and is not explained by the report. Layer 2 is thickest within the south-central area and this condition seems reasonable.	Clarifying Edit	Comment noted. The model report was finalized in August 2018 and was included as an appendix in the GSP to provide an explanation of the development and calibration of the historical model. The model documentation will be updated as updates to the model are made in the future.
186	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	Figure 23: Layer 1 Thickness & Figure 24: Layer 2 Thickness	The thickness of Layer 1 is divided into five categories but the range of the first and last categories are significantly different from the middle 3 categories. The span of the first category is 196 feet and the last category is 520 feet, compared to the 60-foot spans of the middle categories. For comparison, the thickness of Layer 2 is divided into six categories with spans between 60 and 90 feet (average: 73 feet). These large differences within Layer 1 contribute to the uncertainty in the model output.	Clarifying Edit	Comment noted. The model report was finalized in August 2018 and was included as an appendix in the GSP to provide an explanation of the development and calibration of the historical model. The model documentation will be updated as updates to the model are made in the future.
187	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	3.3.2 Groundwater Pumping	City of Galt is located along the northern boundary of the subbasin and produces groundwater for its customers. The model should acknowledge and include the City's groundwater production.	Clarifying Edit	Comment noted. The model report was finalized in August 2018 and was included as an appendix in the GSP to provide an explanation of the development and calibration of the historical model. The model documentation will be updated as updates to the model are made in the future.
188	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin	4.7 Final Calibration Parameters	Why does the Corcoran Clay vertical K values apply to Layers 3 and 4 when the aquitard is situated between Layers 1 and 2?	Clarifying Edit	Comment noted. The model report was finalized in August 2018 and was included as an appendix in the GSP to provide an explanation of the development and calibration of the historical model. The model documentation will be updated as updates to the model are made in the future.
189	Rodney Fricke	GEI on behalf of Sacramento County GSA - Cosumnes Subbasin		The GWA Board adopted a preliminary schedule for project implementation. Project implementation is scheduled to begin in 2020, with full sustainability implementation by 2040.	Mechanics - Text	Comment noted. Sentence is discussing that full project implementation will be by 2040 (also when sustainability will be achieved).
190	Grace Su	EBMUD	2.1.1.1	The text says that a large number of wells do not have construction depth or screen interval information. Were only the wells with construction information used to prepare the GW elevation contour maps for each principal aquifer?	Clarifying Edit	Comment noted. It is unclear what maps the commenter is referring to. The contour maps in Chapter 2 (Basin Setting) only relate to groundwater elevation information, which was available at wells even if construction information was not available.
191	Grace Su	EBMUD	2.1.4.2	Please modify the discharge values from Camanche Reservoir discussed in the third and fourth sentence of this paragraph. Releases from the Camanche Reservoir could be as low as 100 cfs during critically dry years and up to 5,000 cfs during the wet season. Since the Camanche Dam was completed in 1964, the maximum daily release from the Camanche Reservoir has not exceeded 5,000 cfs. The Mokelumne River flows recorded below Camanche Dam prior to 1964 are not representative of flows observed after the dam was built.	Clarifying Edit	Edited text in Section 2.1.4.2 (Major Hydraulic Features) to correct maximum and minimum Camache Reservoir releases: Flow in the Mokelumne River below the Camanche Reservoir varies seasonally and is dependent on discharges from the on-stream reservoir, from less than 200 AF/day during the dry season to 9,900 AF/day during the wet season. These flows correlate to discharges from as low as 100 to no more than 5,000 cfs collected by the USGS below the Camanche Dam.
192	Grace Su	EBMUD	2.1.9.2.1	What is the basis for the statement that the horizontal hydraulic conductivity values in the model are considered low? If the conductivities are higher, what implications would that have on the results?	Clarifying Edit	Higher hydraulic conductivities in ESJWRM would have significant impact on the movement of groundwater in the Subbasin. Hydraulic conductivities will be further evaluated as the model is updated in the future. Edited text in Section 2.1.9.2.1 (Aquifer Parameters and Production Zone Well Capacities) to remove portion of sentence with the comment that horizontal hydraulic conductivity in the model is considered low.
193	Grace Su	EBMUD	6.2.5.3	Please change "will" to "may" in this sentence: The longer term project may use the same concept…	Mechanics - Text	Comment addressed in text.
194	Grace Su	EBMUD	6.2.5.3	EBMUD is requesting that this sentence be removed as it does not accurately reflect the terms of the existing Agreement.	Clarifying Edit	Comment addressed in text.
195	Grace Su	EBMUD	7.4.1	EBMUD would like to be informed as the Mokelumne River Loss Study Project moves forward and is interested in being a participant and in providing technical input.	Projects and Management Actions	This has been noted as a future item for consideration as the GSAs move into GSP implementation.
196	Jane Wagner-Tyack	Communication Consultant	Introduction, Paragraph 2	"Is comprised of" misrepresents the meaning of "comprise." Preferable: "The GWA is composed of 15 Groundwater Sustainability Agencies" or the "The GWA comprises 15 Groundwater Sustainability Agencies." The same is true for the other two uses of "comprise" in this paragraph.	Mechanics - Text	Comment addressed in text.
197	Jane Wagner-Tyack	Communication Consultant	Introduction, Paragraph 2	SGMA wanted to see an advisory group that included a wide range of stakeholders. This was not supposed to be just outreach to stakeholders to tell them what was being decided. Maybe you want to mention at the end of this paragraph that "Some input from the Sustainability Workgroup (described below) has also been incorporated into the GSP."	Outreach	Added to ES-3 (Outreach Efforts): from the Workgroup was presented to the ESJGWA Board and has also been incorporated into the GSP.
198	Jane Wagner-Tyack	Communication Consultant	ES-2	Bulletin 118 and updated--Do you mean "as" updated?	Mechanics - Text	Comment addressed in text.
199	Jane Wagner-Tyack	Communication Consultant	ES-3	Please delete "all" in the first sentence. The stakeholder engagement strategy is far from inclusive. Also, mention that this is a 24-member Workgroup.	Clarifying Edit	Edits made. Groundwater Sustainability Workgroup is 23 members.
200	Jane Wagner-Tyack	Communication Consultant	ES-4	On the third line, please insert "the" before "San Joaquin River."	Mechanics - Text	Comment addressed in text.
201	Jane Wagner-Tyack	Communication Consultant	ES-5	The last sentence in this paragraph seems unnecessarily vague. What effects has the Sacramento-San Joaquin Delta (note correct name for the Delta) had on groundwater levels in the Subbasin? What surface water has been imported for in-lieu use?	Clarifying Edit	Edited text in ES-5 (Existing Groundwater Conditions): The western and southern portions of the Subbasin have experienced less change in groundwater levels, in part due to the minimal groundwater pumping in the Delta area to the west and the import of surface water for agricultural and urban uses.
202	Jane Wagner-Tyack	Communication Consultant	ES-5	"Concerns" and "maximum" misspelled.	Mechanics - Text	Comment addressed in text.
203	Jane Wagner-Tyack	Communication Consultant	ES-5	In the last sentence, "have not been able to be tied"--SOMEONE's analysis has not tied elevated concentrations of other constituents to groundwater management activities. I think the water quality argument will be vulnerable here, and it would be best to mention from the beginning whatever data or prior analysis you have to support this assertion.	Groundwater Quality	Language was added to ES-5: Existing Groundwater Conditions stating: The GSP establishes ongoing monitoring of salinity, arsenic, nitrate, and a number of other common water quality constituents to fill data gaps and identify potential trends of concern.
204	Jane Wagner-Tyack	Communication Consultant	ES-5	Need to correct spelling of "volume" and "concern" in the last sentence of the paragraph.	Mechanics - Text	Comment addressed in text.
205	Jane Wagner-Tyack	Communication Consultant	ES-5	The Delta is properly referred to as "the Sacramento-San Joaquin Delta." (Do a search of this for the whole document.) Also, third line, "alternations to," do you mean "alterations to"?	Mechanics - Text	Comment addressed in text.
206	Jane Wagner-Tyack	Communication Consultant	ES-6	The prior bulleted list is preceded by a statement with a colon. The bulleted item here isn't part of a list. This statement could be made part of the paragraph.	Mechanics - Text	Comment addressed in text.
207	Jane Wagner-Tyack	Communication Consultant	ES-7	Reading that the annual groundwater overdraft is projected to increase to approximately 57,000 AF/year with climate change is likely to send the reader back to find out what the current overdraft is, but I don't see that number above, only a statement that the Subbasin has been overdraft for many years. For comparison purposes, provide an average or range of current overdraft. Also, briefly, what is it about climate change that will lead to greater overdraft?	Clarifying Edit	Edited text in ES-7 (Water Budgets) to clarify climate change analysis: The projected Subbasin water budget was also evaluated under climate change conditions, which simulate higher demand requiring increased groundwater pumping despite more precipitation and streamflows. The climate change scenario used for the analysis was the 2070 central tendency climate change scenario prescribed by DWR. The overdraft modeled under climate change conditions is simulated to increase above projected conditions without climate change.
208	Jane Wagner-Tyack	Communication Consultant	ES-8, next to Figure ES-6	Line 5, delete "from" before "participating GSA." It isn't necessary.	Mechanics - Text	Comment addressed in text.
209	Jane Wagner-Tyack	Communication Consultant	Figure ES-6	This map needs a legend for what kinds of wells the different shapes represent.	Mechanics - Graphics	Figure represents total pumping by all types of wells. Comment addressed in text.

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210	Jane Wagner-Tyack	Communication Consultant	ES-9	After the link, you might tell the reader to use the Guest login.	Clarifying Edit	Comment noted. There is a "Guest Login" button at the DMS link.
211	Jane Wagner-Tyack	Communication Consultant	ES-10	"modification of levels of pumping reduction" is confusing. You could just say, "These additional evaluations may lead to pumping modifications associated with the attainment of reliability."	Mechanics - Text	Comment addressed in text.
212	Jane Wagner-Tyack	Communication Consultant	ES-10	Delete "several," which suggests a small number.	Mechanics - Text	Comment addressed in text.
213	Jane Wagner-Tyack	Communication Consultant	ES-10	"The initial set of projects WAS reviewed" or "The projects WERE reviewed"	Mechanics - Text	Comment addressed in text.
214	Jane Wagner-Tyack	Communication Consultant	ES-10	"Planned projects are anticipated to provide enough water to offset the projected 2040 supply imbalance of _____ AFY."	Mechanics - Text	Comment addressed in text.
215	Jane Wagner-Tyack	Communication Consultant	ES-12	It isn't clear how the two bulleted points ("Developing" and "Evaluation") relate to the paragraph that introduces them. Also, "Evaluating" would be the correct parallel to "Developing."	Clarifying Edit	Deleted bulleted points as not relevant to the surrounding text.
216	Jane Wagner-Tyack	Communication Consultant	1.1.1	Introduce the earlier GBA here to distinguish it from the GSA. There was initial confusion; also, the GBA was responsible for much of the prior planning effort, and you will reference it at 1.1.4.3. ". . . fits in with these prior planning efforts, including the Eastern San Joaquin Groundwater Basin Authority (GBA), building on existing local management. . . ."	Clarifying Edit	Comment noted.
217	Jane Wagner-Tyack	Communication Consultant	1.1.4	Change 15 to 16 for number of GSAs and add back in Woodbridge Irrigation District (WID).	Mechanics - Text	Comment addressed in text.
218	Jane Wagner-Tyack	Communication Consultant		In the second sentence, the references to "currently" and "in 2010" in the same sentence are confusing. "The District provides water and wastewater service to approximately 3,200 residents (as of 2010) in the unincorporated…"	Mechanics - Text	Comment addressed in text.
219	Jane Wagner-Tyack	Communication Consultant		"to meet domestic and industrial needs in the City"--which City? Both the City of Escalon and the City of Tracy are named in this sentence.	Clarifying Edit	Edited text in Section 1.1.4.3 (Description of Participating Agencies): The City of Escalon is selling its allotment of treated water to the City of Tracy but intends to construct a pipeline to convey SSJID water to meet domestic and industrial needs in the City of Escalon (SSJID, 2015b).
220	Jane Wagner-Tyack	Communication Consultant		Delete "with" before "overlaps." "The SEWD GSA covers 101,000 acres of the District"--meaning unclear. Is this 101,000 acres that are not part of another GSA? Insert "is" between "and" and "provided" at the end of the third line. Last line--"...two efforts preceding the current GWA that focused..."	Mechanics - Text	Edits made to text to clarify SEWD acreage.
221	Jane Wagner-Tyack	Communication Consultant		Add back Woodbridge Irrigation District.	Mechanics - Text	Comment addressed in text.
222	Jane Wagner-Tyack	Communication Consultant		I believe that Thornton should be added as an unincorporated community.	Mechanics - Text	Comment addressed in text.
223	Jane Wagner-Tyack	Communication Consultant	1.2.1.1	"…within the region that includes the Eastern San Joaquin Subbasin." (Only one of these state parks is actually in the Subbasin.)	Mechanics - Text	Comment addressed in text.
224	Jane Wagner-Tyack	Communication Consultant	1.2.2.1.5	On the first reference to the ESJWRM, write out "Eastern San Joaquin Water Resources Model" so that the reader doesn't have to refer to the list of acronyms. This is a fairly important model not mentioned earlier.	Mechanics - Text	Comment addressed in text.
225	Jane Wagner-Tyack	Communication Consultant	1.2.2.7.4	"with sufficient accuracy"--sufficient for what? This is extremely vague. If you can without misrepresentation, stop this point after "customers". Otherwise, clarify.	Clarifying Edit	Language of "with sufficient accuracy" came from California Water Code §10608.48(b). Edited text in Section 1.2.2.7.4 (Agricultural Water Management Plans) to clarify: Measure the volume of water delivered to customers with sufficient accuracy to comply with requirements of the California Water Code (CWC).
226	Jane Wagner-Tyack	Communication Consultant	1.2.2.8	No pipelines? At the top of the next page, we learn that OID has over time replaced unlined laterals with PVC pipelines.	Clarifying Edit	Edited text in Section 1.2.2.8 (Canal Diversions and Seepage): All of the major irrigation districts utilize a combination of natural watercourses, canals, and pipelines to distribute surface water diversions to their customers.
227	Jane Wagner-Tyack	Communication Consultant	1.2.2.8	"105 miles are inconsistent"--meaning unclear. Please clarify.	Clarifying Edit	Edited text in Section 1.2.2.8 (Canal Diversions and Seepage): While the entire lateral system historically consisted of open, unlined ditches, 100 miles of the laterals have been converted to pipelines; 105 miles are open, concrete-lined ditches; and the rest remain unlined.
228	Jane Wagner-Tyack	Communication Consultant	1.2.2.9	"…for a total recharge volume of about 65,000 AF since the inception of the project."	Mechanics - Text	Comment addressed in text.
229	Jane Wagner-Tyack	Communication Consultant	1.2.3.1.1	Sources are provided for all the other plan information in this section. What is the source of information for the San Joaquin County General Plan? Would it be appropriate to move "(SJC, 2016b)" to the end of this sections as "(San Joaquin County, 2016b)"? And what does "b" refer to?	Mechanics - Text	Moved reference to San Joaquin County General Plan (SJC, 2016b) to end of section as commenter suggested.
230	Jane Wagner-Tyack	Communication Consultant	1.2.3.1.8	"may have to abandon a large number of wells as sources of potable water due to contamination,…"--What kind of contamination? This is relevant to the Water Quality Sustainability Indicator.	Groundwater Quality	Language was added to indicate that this is a result of localized contamination.
231	Jane Wagner-Tyack	Communication Consultant	1.3.5	This sentence says that there has been "at least one meeting". The next sentence refers to "these meetings." These statements need to be consistent.	Mechanics - Text	Edits made to text to clarify inter-basin coordination meetings.
232	Jane Wagner-Tyack	Communication Consultant	1.1.4	End of 7th line, change "comprised" to "consisting."	Mechanics - Text	Comment addressed in text.
233	Jane Wagner-Tyack	Communication Consultant	"	Delete. This sentence is redundant.	Mechanics - Text	Comment addressed in text.
234	Jane Wagner-Tyack	Communication Consultant	1.1.4.2	Change "15" to "16" and change "have" to "has"--"Each. . .has a voice. . .and has appointed". Correct parallelism of bulleted list: Approving budgets, Proposing guidance, Adopting rules, Approving any contracts, Reporting to, Approving and implementing a GSP. For second bulleted list, Recommending for both bullets.	Mechanics - Text	Comment addressed in text.
235	Jane Wagner-Tyack	Communication Consultant	1.1.4.3	Add (CDWA) after the agency name to conform to the style for the other agencies.	Mechanics - Text	Comment addressed in text.
236	Jane Wagner-Tyack	Communication Consultant		Delete "comprised of"--"Eastside San Joaquin GSA is a partnership...."	Mechanics - Text	Comment addressed in text.
237	Jane Wagner-Tyack	Communication Consultant		Second to last line, insert "the" before "Calaveras River".	Mechanics - Text	Comment addressed in text.
238	Jane Wagner-Tyack	Communication Consultant		First line, substitute "and" for "that"--"and extends…"	Mechanics - Text	Comment addressed in text.
239	Jane Wagner-Tyack	Communication Consultant		Change "is comprised of" to "consists of" or "comprises." For a correct usage of "comprise," see the OID description directly above this entry.	Mechanics - Text	Comment addressed in text.
240	Jane Wagner-Tyack	Communication Consultant		"Almost 7,000 acres of San Joaquin County plus Cal Water are combined in San Joaquin County No. 2 GSA."	Mechanics - Text	Comment addressed in text.
241	Jane Wagner-Tyack	Communication Consultant		Substitute "encompass" (as in the SDWA description) for "is comprised of." "Comprise" is not the most accurate word to use in the first bulleted paragraph below. Better: "The cities of Manteca, Ripon, and Escalon account for approximately 20,000 acres of the District area."	Mechanics - Text	Comment addressed in text.
242	Jane Wagner-Tyack	Communication Consultant		Substitute "on" for "to"--"Exercise the powers conferred on GSAs by SGMA."	Mechanics - Text	Comment addressed in text.
243	Jane Wagner-Tyack	Communication Consultant	1.2.2	For consistency: add (DWR) after Department of Water Resources; insert Water Data Library before (WDL), add (CV-SALTS) after Central Valley Salinity Alternatives for Long-Term Sustainability. Also, for Dairy CARES--Cares is apparently not an acronym. The correct term is Dairy Cares.	Mechanics - Text	Comment addressed in text.
244	Jane Wagner-Tyack	Communication Consultant	1.2.2.2.3	Remove the "s" from "creates." The subject/verb agreement is "differences…create".	Mechanics - Text	Comment addressed in text.
245	Jane Wagner-Tyack	Communication Consultant	1.2.2.2.6	Change "off" to "on"--"was developed based on a detailed water quality analysis…"	Mechanics - Text	Comment addressed in text.
246	Jane Wagner-Tyack	Communication Consultant	1.2.2.8	Substitute "the entire lateral system historically consisted of open, unlined ditches"	Mechanics - Text	Comment addressed in text.
247	Jane Wagner-Tyack	Communication Consultant	1.2.2.8	Second paragraph on the page, 3rd line, substitute "estimated" for "considered."	Mechanics - Text	Comment addressed in text.

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248	Jane Wagner-Tyack	Communication Consultant	1.2.2.9	Delete the second "Figure 1-16" in the first sentence, at the end.	Mechanics - Text	Comment addressed in text.
249	Jane Wagner-Tyack	Communication Consultant	1.2.2.9	Add" has"--"Since 2003, SEWD has operated..."	Mechanics - Text	Comment addressed in text.
250	Jane Wagner-Tyack	Communication Consultant	1.2.3.1.1	Change this to "Stakeholder input informed..."	Mechanics - Text	Comment addressed in text.
251	Jane Wagner-Tyack	Communication Consultant	1.2.3.1.5	Insert "input from"--"...the 1991 General Plan was informed by input from community members..."	Mechanics - Text	Comment addressed in text.
252	Jane Wagner-Tyack	Communication Consultant	1.2.3.1.5	Dangling modifier--the General Plan is not the primary source of water supply. But also, groundwater is no longer the primary source of water supply for Lodi, which now gets about 50% of its water most of the time from surface supplies through an agreement with WID. Delete the phrase "As the primary source of water supply for the City of Lodi" and begin the sentence with "The General Plan..."	Mechanics - Text	Comment addressed in text.
253	Jane Wagner-Tyack	Communication Consultant	1.3.1	Delete "of" after "hold."	Mechanics - Text	Comment addressed in text.
254	Jane Wagner-Tyack	Communication Consultant	1.3.4.2	Delete "relied" and insert "the Workgroup"--"...to promote stakeholder input and relied upon the Workgroup when developing..."	Mechanics - Text	Comment addressed in text.
255	Jane Wagner-Tyack	Communication Consultant	1.3.4.2	Delete "and"--"members from a variety of organizations who represent one or more..."	Mechanics - Text	Comment addressed in text.
256	Jane Wagner-Tyack	Communication Consultant	1.3.4.3	Two sentences have been telescoped here. Change to "detailing a stakeholder engagement strategy developed to achieve..."	Mechanics - Text	Comment addressed in text.
257	Jane Wagner-Tyack	Communication Consultant	1.3.4.4	There were no prior GWA engagement efforts (because there was no prior GWA). For "GWA", substitute "Eastern San Joaquin Subbasin engagement efforts..."	Mechanics - Text	Comment addressed in text.
258	Jane Wagner-Tyack	Communication Consultant	1.3.4.5	Delete the apostrophe in "Manufacturers." They don't use it. The name style in Table 1-4 is correct.	Mechanics - Text	Comment addressed in text.
259	Jane Wagner-Tyack	Communication Consultant	2.1.4.3	"...restricted to metamorphic or pre-Tertiary sedimentary material and that, whereas..." Something is missing here; "that" doesn't make sense in this context.	Clarifying Edit	Removed "that, whereas" from sentence in Section 2.1.4.3: These soils tend to be darker and heavier than the Stanislaus and Mokelumne River fan soils likely due to the source area being restricted to metamorphic or pre-Tertiary sedimentary material and the Mokelumne and Stanislaus Rivers received large contributions from a granitic source (CA DWR 1967).
260	Jane Wagner-Tyack	Communication Consultant	2.1.4.3	"Pre-Modesto formations" are mentioned here, but I didn't see those defined earlier, and the Geologic Time Scale in Figure 2-5 appears not to be designed to include them. They are referenced again in Section 2.1.4.5.1. "During the Pleistocene Epoch when the Modesto and Riverbank formations were deposited..." Can you provide a second Time Scale showing more detail for the Pleistocene?	Basin Setting	The pre-Modesto formation is earlier in the Pliocene era, as seen in Table 2-2. The geologic time scale in Figure 2-5 is sufficient for the purposes of the discussion in the GSP.
261	Jane Wagner-Tyack	Communication Consultant	2.1.5	This paragraph refers the reader to Figure 2-15 and also refers to "the Central Valley geomorphic province and the granitic Sierra Nevada Geomorphic province." However, neither of these provinces is identified in Figure 2-15. Also, it would be helpful to have Figure 2-15 on the same page as this discussion.	Mechanics - Graphics	Comment addressed in text.
262	Jane Wagner-Tyack	Communication Consultant	2.1.5	The sentence refers to the Mehrten and Laguna formations, but these have not been introduced earlier, so the reader has no context in which to place them. As with the Pre-Modesto and Riverbank formations mentioned in 2.1.4.3 and 2.1.4.5.1, a geologic time scale should be provided.	Clarifying Edit	A geologic time scale is included as Figure 2-5. A stratigraphic column is included that associates the time scale with the names and characteristics of each formation, as Table 2-2. Figure 2-5 and Table 2-2 are introduced in Section 2.1.2.
263	Jane Wagner-Tyack	Communication Consultant	Table 2-2	This footnote says that "Figure 2-5 contains time scales corresponding to formations." It does not. As noted above, the time scale needs more detail for local formations for the Tertiary and Quaternary periods.	Mechanics - Text	Comment noted. The level of detail in Figure 2-5, along with the text descriptions of the formations is sufficient.
264	Jane Wagner-Tyack	Communication Consultant	Table 2-2	The table says that the Eocene is "Unimportant to fresh water basin except as possible contaminant source." Is saline water the only contaminant, or are there other possible contaminants? Any mention of contaminants is likely to be a red flag relative to groundwater quality discussions.	Clarifying Edit	Removed in response to comment.
265	Jane Wagner-Tyack	Communication Consultant	2.1.5.1.1 and 2.1.5.1.2	Again, if a figure like 2-5 is going to be provided, it should include all the formations referenced in the text.	Mechanics - Graphics	This figure is a geologic timescale meant to serve as a reference for the reader. Only those time periods relevant to the formations in the subbasin are referenced in the text.
266	Jane Wagner-Tyack	Communication Consultant	2.1.5.1.3	It appears that these local formations are spatial rather than (or in addition to) temporal. Figure 2-16 is intended to show these formations, but it is VERY hard to read, with excessive grid detail that doesn't appear to be relevant to showing the major formations.	Mechanics - Graphics	This figure is a geologic map that is georeferenced from the references noted at the bottom. The figure was reimported into the document at a higher resolution.
267	Jane Wagner-Tyack	Communication Consultant	2.1.5.1.4	Need different visuals for all formations listed under 2.1.5.1	Mechanics - Graphics	Comment noted for consideration in updates to the GSP. It is beyond the scope of the GSP required by SGMA.
268	Jane Wagner-Tyack	Communication Consultant	2.1.6	This sentence concludes with "for the east side of the Great Valley." "Great Valley" is not a term that has been used in this document previously, and it is not a commonly used term in this state. In fact, it isn't clear what it means. Does it refer to California's Central Valley? To the San Joaquin Valley?	Clarifying Edit	Term was clarified in the text.
269	Jane Wagner-Tyack	Communication Consultant	2.1.7	This sentence, at the top of page 2-38, says that water wells and oil and gas wells are "indicated by an asterisk on the cross-sections." The asterisks are completely illegible. In fact, the cross-sections are impossible to read.	Mechanics - Graphics	Figures were reimported at a higher resolution.
270	Jane Wagner-Tyack	Communication Consultant	2.1.7	The sentence at the bottom of the second paragraph on page 2-38 says, "The analysis inferred formation contracts in place where this data was limited..." Can you explain what "formation contracts" are? Or do you mean that the formation contracts (decreases in size)?	Clarifying Edit	This comment points out a typo in the text as written. Comment addressed in text.
271	Jane Wagner-Tyack	Communication Consultant	2.1.9.1.4	The sentence refers to the condition of the Corcoran Clay "as depicted on Figure 2-22", but it is very hard to discern anything in Figure 2-22.	Mechanics - Graphics	This figure was reimported into the document at a higher resolution. Cross-sections were developed to represent the basin scale and not intended to provide specific information on individual well level stratigraphy.
272	Jane Wagner-Tyack	Communication Consultant	Table 2-3	Since there is no list of definitions, define "Aquifer Field" in the text or in a footnote to this table.	Mechanics - Text	Edited heading for Table 2-3 to remove reference to aquifer field.
273	Jane Wagner-Tyack	Communication Consultant	2.1.9.2.3.1	"The natural geochemical effects on water quality result to mobilize the elemental makeup of sediments"--meaning unclear. Please rephrase to clarify.	Mechanics - Text	Edited text to clarify: The natural geochemical effects on water quality release the elemental makeup of sediments (i.e., metals and other ions).
274	Jane Wagner-Tyack	Communication Consultant	2.1.9.2.3.1	This sentence sounds awkward and unnecessarily legalistic, and it doesn't clearly apply to the rest of the section. That is, it isn't clear that the two lists that follow are intended to summarize the general water quality of principal aquifers; that seems to be covered in the next sections. Can you say this? "General water quality of principal aquifers is summarized in the following sections, as required by 23 CCR ...."	Mechanics - Text	Comment addressed in text.
275	Jane Wagner-Tyack	Communication Consultant	2.1.9.2.3.1	The sentence says that nitrate (should be lower case) "is well understood as a result of fertilizer application". Actually, nitrate is well understood as a result of studies of the consequences of its agricultural use in fertilizer application. The following sentence says that "Naturally occurring nitrogen must also be discussed to have a complete understanding of the natural conditions" in the Subbasin. A better transition: "Nitrogen also occurs naturally in the Eastern San Joaquin Subbasin. Extensive work..."	Mechanics - Text	Comment addressed in text.
276	Jane Wagner-Tyack	Communication Consultant	2.1.9.2.3.2	Suggested rewrite for easier reading: "Evaluating the historical trends of these parameters is not straightforward. GAMA records include some groundwater quality results for the Eastern San Joaquin Subbasin going back to the 1940s. However, a thorough analysis requires a large amount of data on all the major cations and anions mentioned above. A large number of measurements of this kind were taken from 2005 to 2017, as shown in Figure 2-27. Data from 2018 are not included because at the time of writing, that data was incomplete."	Mechanics - Text	Comment addressed in text.
277	Jane Wagner-Tyack	Communication Consultant	2.1.9.2.3.2	Delete "a better idea" and just say "an idea," since there is not actually any other idea for "better" to refer to.	Mechanics - Text	Comment addressed in text.
278	Jane Wagner-Tyack	Communication Consultant	2.1.9.2.3.2	Regarding the Trilinear Diagrams, is it customary to present these without a legend for the symbols?	Mechanics - Graphics	Comment addressed in text.
279	Jane Wagner-Tyack	Communication Consultant	2	"e" in "The" should not be boldfaced.	Mechanics - Text	Comment addressed in text.
280	Jane Wagner-Tyack	Communication Consultant	2.1.2	Delete "is comprised of" and substitute "consists of".	Mechanics - Text	Comment addressed in text.
281	Jane Wagner-Tyack	Communication Consultant	2.1.2	Add "s" to "source" for correct subject/verb agreement, and add "the" before Sierra Nevada"--"The material sources...are the Coastal Ranges and the Sierra Nevada..."	Mechanics - Text	Comment addressed in text.
282	Jane Wagner-Tyack	Communication Consultant	2.1.3	Changes "vary" to "varies" for correct subject/verb agreement--"The origin...varies in geologic time..."	Mechanics - Text	Comment addressed in text.
283	Jane Wagner-Tyack	Communication Consultant	2.1.4.1	Change "and" to "to"--"Ground surface elevations vary...from almost 1,000 feet...to around sea level..."	Mechanics - Text	Comment addressed in text.

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Comment #	Commenter	Commenter Organization	Section, Figure, or Table Number	Comment	Category	Response to Comment
284	Jane Wagner-Tyack	Communication Consultant	2.1.4.2	Add "the" before both "Stanislaus River" and "Mokelumne River".	Mechanics - Text	Comment addressed in text.
285	Jane Wagner-Tyack	Communication Consultant	2.1.4.2	Delete "the" before "10 watersheds".	Mechanics - Text	Comment addressed in text.
286	Jane Wagner-Tyack	Communication Consultant	2.1.4.3	Change "Figure 3-9" to "Figure 2-9".	Mechanics - Text	Comment addressed in text.
287	Jane Wagner-Tyack	Communication Consultant	2.1.4.4	Add "the" before "Stanislaus River".	Mechanics - Text	Comment addressed in text.
288	Jane Wagner-Tyack	Communication Consultant	2.1.5	Lower case "f" in "Mehrten and Laguna formations" and "Riverbank and Modesto formations."	Mechanics - Text	Comment addressed in text.
289	Jane Wagner-Tyack	Communication Consultant	2.1.5.1.6	Substitute "consists" for "as consisting."	Mechanics - Text	Comment addressed in text.
290	Jane Wagner-Tyack	Communication Consultant	Figure 2-18	Add "Water" to title--"Base of Fresh Water Elevation Contours and Stockton Fault"	Mechanics - Text	Comment addressed in text.
291	Jane Wagner-Tyack	Communication Consultant	2.1.9	First bullet--"Shallow Zone that consists of" (replace "is comprised of"); Second bullet--"Intermediate Zone that consists of" (replace "is comprised of"). The third bullet is already correct.	Mechanics - Text	Comment addressed in text.
292	Jane Wagner-Tyack	Communication Consultant	2.1.9.1	Insert "of" after "depth" in each case--"Depth of discrete layers..."	Mechanics - Text	Comment addressed in text.
293	Jane Wagner-Tyack	Communication Consultant	2.1.9.1.1	Insert "and" after "geologic formations"--"...are present west of the older geologic formations and extend across..."	Mechanics - Text	Comment addressed in text.
294	Jane Wagner-Tyack	Communication Consultant	2.1.9.1.1	"gpd/ft"--gallons per day per foot? "gpd" is not on the list of acronyms.	Mechanics - Text	Comment addressed in text.
295	Jane Wagner-Tyack	Communication Consultant	2.1.9.1.4	Substitute "have" for "has"--"...thickest sequences...and overbank fines...have been observed."	Mechanics - Text	Comment addressed in text.
296	Jane Wagner-Tyack	Communication Consultant	2.1.9.2	Change "Recognition of" to "Recognizing" so that this bullet point reads like a sentence, as the others to.	Mechanics - Text	Comment addressed in text.
297	Jane Wagner-Tyack	Communication Consultant	2.1.9.2.1	Replace "comprised of" with "encompassing."	Mechanics - Text	Comment addressed in text.
298	Jane Wagner-Tyack	Communication Consultant	2.1.9.2.1	Change "are" to "is"--"The distribution...is provided..."	Mechanics - Text	Comment addressed in text.
299	Jane Wagner-Tyack	Communication Consultant	2.1.9.2.3.1	Replace "which encompasses" with "which includes." In the next sentence, change "is" to "are" for correct subject/verb agreement--"natural geochemical effects" is the subject of this clause.	Mechanics - Text	Comment addressed in text.
300	Jane Wagner-Tyack	Communication Consultant	2.1.9.2.3.1	Delete "also" between "rocks" and "have". There is no other condition to which this clearly refers.	Mechanics - Text	Comment addressed in text.
301	Jane Wagner-Tyack	Communication Consultant	2.1.9.2.3.1	"...is characterized by Metzger and others in a 2012 study, Test Drilling..."	Mechanics - Text	Comment addressed in text.
302	Jane Wagner-Tyack	Communication Consultant	2.1.9.2.3.1	Insert "is" between "and" and "hazardous"--"...is naturally occurring..and is hazardous..."	Mechanics - Text	Comment addressed in text.
303	Jane Wagner-Tyack	Communication Consultant	2.1.9.2.3.1	Write out San Joaquin County instead of using SJC. (It is nice not to expect the reader to refer to the acronym list for everything.)	Mechanics - Text	Comment addressed in text.
304	Jane Wagner-Tyack	Communication Consultant	2.1.10	"actions" should be plural--"..."a significant impact on how projects and management actions in one part of the basin..."	Mechanics - Text	Comment addressed in text.
305	Jane Wagner-Tyack	Communication Consultant	2.2.3	This section misrepresents the situation in the Delta by suggesting that barriers have been installed to prevent seawater intrusion. No barriers prevent the inland movement of seawater into the Delta; it does occur, and managing it is an ongoing challenge. If you need a reference, I can provide one. Correction: "While the Delta ecosystem evolved with a natural salinity cycle that brought brackish tidal water in from San Francisco Bay, levees installed to allow development of agriculture, followed by development and operation of the Central Valley Project and the State Water Project, have altered the inward movement of seawater through the Delta. Current management practices endeavor to maintain freshwater flows through a combination of hydraulic and physical barriers, and alterations to existing channels." Change "alternations" to "alterations of existing channels". I don't see the Water Education Foundation listed under References. Also, in the last sentence in this paragraph, delete "sources" and change "are" to "is"--"...salinity in the Subbasin is due to other factors..."	Clarifying Edit	Edited text in Section 2.2.3 (Seawater Intrusion) to remove reference to barriers in the Delta preventing seawater intrusion and based on other commenter suggestions: While the Delta ecosystem evolved with a natural salinity cycle that brought brackish tidal water in from the San Francisco Bay, levees installed to allow development of agriculture, followed by development and operation of the Central Valley Project and the State Water Project, have altered the inward movement of seawater through the Delta. Current management practices endeavor to maintain freshwater flows through a combination of hydraulic and physical barriers and alterations to existing channels (Water Education Foundation). Portions of the Subbasin do, however, experience water quality issues related to salinity, which are addressed under the water quality section (Section 2.2.4.1). As described in Section 2.2.4.1, salinity in the Subbasin is due to other factors and are not the result of seawater intrusion. Citation for Water Education Foundation reference added in the text.
306	Jane Wagner-Tyack	Communication Consultant	2.2.4.1.1	The sentence says that additional measurements above 250 mg/L are scattered throughout SJC (I would just write out San Joaquin County), but the figure does not show any measurements outside the Subbasin.	Mechanics - Text	To be consistent with the extent of data shown Figure 2-52, deleted portion of sentence mentioning measurements in the remainder of San Joaquin County.
307	Jane Wagner-Tyack	Communication Consultant	2.2.4.4.1	This sentence says that groundwater monitoring and evaluation has resulted in removal of contaminant sources and implementation of remedial activities. That isn't something that just monitoring can do. When groundwater monitoring and evaluation identified point source locations for contamination, the City of Lodi initiated remedial activities.	Mechanics - Text	Edited text to clarify meaning: Since the discovery of these plumes in the 1980s, groundwater monitoring and evaluation at point source locations has led to the implementation of remedial activities such as the installation of groundwater extraction and remedial systems, implementation of a Salinity Reduction Plan, and mandated WDRs (RWQCB, 2012).
308	Jane Wagner-Tyack	Communication Consultant	2.2.4.4.1	This entire section appears to contradict the claim in 2.2.4.4 that point source contamination has not been found to be related to groundwater management activities in the Subbasin. Broadly, for ALL similar statements (for example at 2.2.4.2 and 2.2.4.3), there needs to be a clear explanation of what "related to groundwater management activities" actually means.	Groundwater Quality	See Master Response 3 - WQ.
309	Jane Wagner-Tyack	Communication Consultant	2.2.4.4.2	This sentence says that sites are doing investigation and remediation. The same statement is made in 2.2.4.4.3 and 2.2.4.4.4 . What is meant by sites? WHO is doing the investigation and remediation? Is this the responsibility of site owners? The RWQCB? Please name an agent or agents for these activities.	Clarifying Edit	Sites include individual areas with active, potential, or past contamination issues found in the RWQCB's GeoTracker or DTSC's EnviroStor databases. The responsible party for the site is usually the owner or operator who may be responsible for cleanup of the site. More information is available online regarding GeoTracker and EnviroStor
310	Jane Wagner-Tyack	Communication Consultant	2.2.1.1	Replace "with" with "that have"--"10 wells that have periods...and that are relatively..."	Mechanics - Text	Comment addressed in text.
311	Jane Wagner-Tyack	Communication Consultant	Figure 2-35	Delete comma after "line".	Mechanics - Text	Comment addressed in text.
312	Jane Wagner-Tyack	Communication Consultant	2.2.1.2	Substitute "to" for "and" in this clause--"...the lateral gradient ranges from approximately 21 ft/mi...to 16 ft/mi..." A range is always "from x...to y" (or "is between x and y").	Mechanics - Text	Comment addressed in text.
313	Jane Wagner-Tyack	Communication Consultant	2.2.4	Constituents "are related to..." or "relate to..."	Mechanics - Text	Comment addressed in text.
314	Jane Wagner-Tyack	Communication Consultant	2.2.4.1	IMPORTANT: There is no San Joaquin Delta, at least not in California. The San Joaquin River and the Sacramento River meet to form the Sacramento-San Joaquin Delta. That is the correct name. I recommend doing Find for the whole GSP document to be sure that all of these uses of the name are correct.	Mechanics - Text	Comment addressed in text.
315	Jane Wagner-Tyack	Communication Consultant	2.2.4.1	"Emplace" means to put into position. Suggested revision: "Evaporation of groundwater in discharge areas introduces naturally occurring soluble salts into Sacramento-San Joaquin Delta sediments."	Mechanics - Text	Comment addressed in text.
316	Jane Wagner-Tyack	Communication Consultant	2.2.4.1	Comma after second "aquifer"--"This results in a saline aquifer underlying the freshwater aquifer, and well pumping can result..."	Mechanics - Text	Comment addressed in text.
317	Jane Wagner-Tyack	Communication Consultant	2.2.4.1.1	Change "have" to "has" in the last line--"...the number of measurements...has decreased..." (It is the number, not the measurements, that has decreased.)	Mechanics - Text	Comment addressed in text.
318	Jane Wagner-Tyack	Communication Consultant	2.2.4.2	Write out "San Joaquin County" here, since it is part of the name of the Coalition. Otherwise, it sounds like SJC and the Delta Water Quality Coalition are two separate entities.	Mechanics - Text	Comment addressed in text.

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Comment #	Commenter	Commenter Organization	Section, Figure, or Table Number	Comment	Category	Response to Comment
319	Jane Wagner-Tyack	Communication Consultant	2.2.4.4.1	Delete "and" after "closure" and insert a comma--"…now has regulatory closure, with cleanup moving…"	Mechanics - Text	Comment addressed in text.
320	Jane Wagner-Tyack	Communication Consultant	2.2.4.4.2	Substitute "At" for "Of"--"At these sites, petroleum hydrocarbon constituents…"	Mechanics - Text	Comment addressed in text.
321	Jane Wagner-Tyack	Communication Consultant	2.2.4.4.3	Substitute "At" for "Of"--"At these sites, pesticides…"	Mechanics - Text	Comment addressed in text.
322	Jane Wagner-Tyack	Communication Consultant	2.2.4.4.4	Substitute "At" for "Of"--"At these sites, the most common constituents…"	Mechanics - Text	Comment addressed in text.
323	Jane Wagner-Tyack	Communication Consultant	2.2.5	Revise this sentence as follows: "There are no historical records of significant and unreasonable impacts from subsidence in the Eastern San Joaquin Subbasin."	Mechanics - Text	Comment addressed in text.
324	Jane Wagner-Tyack	Communication Consultant	2.2.8	Revise this sentence as follows: "A working group consisting of DWR, California Department of Fish and Wildlife (CDFW), and the Nature Conservancy (TNC) developed the NCCAG database by reviewing publicly available state and federal agency datasets…"	Mechanics - Text	Comment addressed in text.
325	Jane Wagner-Tyack	Communication Consultant	2.2.8	Typo: Should be "The Plan identifies GDEs as NCCAG-identified areas that meet all of the criteria below."	Mechanics - Text	Comment addressed in text.
326	Jane Wagner-Tyack	Communication Consultant	2.2.8	Comma needed after "region" to prevent misreading, plus "s" on "plant"--"Oak trees are considered the deepest-rooted plants in the region, with a root zone…"	Mechanics - Text	Comment addressed in text.
327	Jane Wagner-Tyack	Communication Consultant	2.2.8	Add "to be"--"…are assumed to be unable to access…and to be dependent on…"	Mechanics - Text	Comment addressed in text.
328	Jane Wagner-Tyack	Communication Consultant	2.3.1	The relationship between these two ideas is not causal but coordinate. Revision: "This process is new and has been developed under time constraints; the water budget assumptions will be refined in the future…"	Mechanics - Text	Comment addressed in text.
329	Jane Wagner-Tyack	Communication Consultant	2.3.4.2	"Therefore, groundwater pumping to meet agricultural and rural residential needs is calculated by the model based on meeting remaining demands after appropriate surface water delivery is made to respective areas." Please explain what is meant by "appropriate surface water delivery" and which areas are "respective" (and of what they are respective).	Clarifying Edit	Edited text in 2.3.4.2 and 2.3.4.2: Therefore, groundwater pumping to meet agricultural and rural residential needs is calculated by the model based on meeting remaining demands after surface water deliveries are made.
330	Jane Wagner-Tyack	Communication Consultant	2.3.5	Do you want to add "including urban runoff" to the third bullet? Urban runoff is discussed in detail in Footnote 5 of Table 2-13.	Clarifying Edit	Runoff to the stream system is only due to precipitation. The note in Table 2-13 focuses on urban areas, they are the largest contributor to runoff as there is more rainwater runoff from paved areas as opposed to areas with soil. Clarified this in note 5 on Table 2-13.
331	Jane Wagner-Tyack	Communication Consultant	Table 2-13	To begin with, please put the table and the footnotes on facing pages. The Hydrologic Period row should show parallel information: For Historical: Water Years 1996-2015 (20-Year Period); for Current: Water Years 1969-2018 (50-Year Period); for Projected, Water Years 1969-2018 (50-Year Period). Without this information, it is hard to fairly evaluate the table in general and Footnote 1 in particular. In Footnote 5, "The historical calibration, with both less precipitation and smaller urban areas..."--since this represents a yearly average, explain why there is less precipitation. Finally, if surface water is diverted from one part of the Subbasin and delivered to another part of the Subbasin, does that show up somewhere here? Does that warrant a footnote?	Mechanics - Graphics	1) Edited hydrologic period rows as suggested by commenter. 2) Clarified note 5 in Table 2-13 to describe why the historical simulation has less average rainfall: The historical calibration, with both less precipitation (due to more dry years than wet in the 20-year period) and smaller urban areas, has a corresponding smaller runoff. 3) For a subbasin-wide water budget, there is no distinction in where surface water is diverted from versus delivered to. For the purposes of the stream system balance, the only concern is how much surface water was taken off of streams within the Subbasin.
332	Jane Wagner-Tyack	Communication Consultant	Table 2-14	Same comments as for Table 2-13 with respect to headings and footnotes.	Mechanics - Graphics	Edited hydrologic period rows as suggested by commenter.
333	Jane Wagner-Tyack	Communication Consultant	Table 2-15	Same comments as for Table 2-13 with respect to headings and footnotes. Also, footnote 1 says that differences in scenarios are related partly to "differences in the infiltration parameters related to land use." This need to be explained. Also, please provide a footnote explaining why no South American Subbasin outflows are shown.	Mechanics - Graphics	1) Edited hydrologic period rows as suggested by commenter. 2) Clarified description of deep percolation in note 1 in Table 2-15: Deep percolation is the amount of infiltrated water ultimately reaching the groundwater aquifer. The source of the water may be from precipitation, as well as either applied surface water or groundwater used for agricultural or urban and industrial purposes. Differences between scenarios are related to differences between these sources of water and differences in urban versus agricultural land use totals. 3) Added note 8 to Table 2-13 and note 11 to Table 2-15: Values smaller than 500 AF/year are represented by a dash (-).
334	Jane Wagner-Tyack	Communication Consultant	Table 2-15	Footnote 4 refers to MAR projects. I'm pretty sure those weren't mentioned earlier in the document. Section 2.3.4.3 would be a logical place to do that.	Mechanics - Text	A section was added to Chapter 6 to discuss Flood-MAR.
335	Jane Wagner-Tyack	Communication Consultant	Figure 2-72	Labels on the bar graph should correspond to the discussion in the text above the graph. Thus, the right-hand bar, for Inflow (and these are actually Surface Water Inflows), would show "Upstream Reservoir Releases" or "Reservoir Releases" rather than "Stream Inflows" for the green section (the source of the majority of inflows). The orange section of the bar would be "Runoff of Precipitation." The yellow section would be "Return Flow of Applied Water." Another color needs to be used for "Stream Gains from Groundwater," as this is MUCH too dark to read. For the Outflow bar, the gray section should be labeled "Downstream Outflows," or better, "San Joaquin River and Mokelumne River Outflows," as in Figure 2-78. The light blue section is "Stream Seepage to Groundwater." Where are "Surface Water Diversions"?	Mechanics - Graphics	Dark colors were made lighter. Labeling is consistent with DWR's Water Budget Best Management Practice.
336	Jane Wagner-Tyack	Communication Consultant	2.3.5.1, 2.3.5.2, 2.3.5.4	(Should 2.3.5.4 actually be 2.3.5.3?) For ALL the water budget figures, I encourage using a scale for Average Annual Volume that is the same for all hydrologic periods and all systems. This will be inconvenient in terms of document spacing, but it will convey much more clearly the water budget situation across scenarios and will improve the credibility of the document. It is not usually the intention to mislead with this kind of graphic presentation, but that is frequently the effect.	Mechanics - Graphics	Scales have been changed to be consistent within scenarios for each of the stream, land surface, and groundwater system figures.
337	Jane Wagner-Tyack	Communication Consultant	Figure 2-73	Inflow categories in the bar graph correspond to the descriptions in the text except that "Total" is not necessary for either Surface or Groundwater Supply. The dark blue background, both here and in subsequent Land Surface System figures, makes the text too hard to read and should be lightened. For Outflow, the orange area should be "Surface Runoff of Precipitation," and the yellow area should be "Return Flow of Applied Water."	Mechanics - Graphics	Dark background was made lighter. Labeling is consistent with DWR's Water Budget Best Management Practice.
338	Jane Wagner-Tyack	Communication Consultant	Figure 2-74	Inflow categories in the bar graph correspond to descriptions, except that "Change in Groundwater Storage" is misleading. This is actually a deficit and should be identified that way, and a number could be put on it in the text , which just says "…the inflows do not meet the entire groundwater demand." The amount of the deficit is listed in the text for the current average (on page 2-129) and for the projected average (on page 2-132). Alternatively, you could omit that category from the bar graph and show that the Inflow bar is actually lower than the outflow bar. This would be an honest representation of the situation. Tucking the gray bar in the middle appears deceptive. For the Outflow bar, the orange section should be "subsurface Outflow to Neighboring Basins."	Mechanics - Graphics	The description of "change in groundwater storage" is consistent with DWR's Water Budget Best Management Practice.
339	Jane Wagner-Tyack	Communication Consultant	Figure 2-75	See Comment #9 for Figure 2-72. Labels should be consistent between text and graph and across graphs. Also, keep Inflow discussion first, as in the prior discussion and to align with the fact that Inflows are shown in the left-hand bar. This will mean deleting "These" from the beginning of the paragraph directly above.	Mechanics - Graphics	Labeling is consistent with DWR's Water Budget Best Management Practice.
340	Jane Wagner-Tyack	Communication Consultant	Figure 2-77	Again, don't bury "Change in Groundwater Storage" in the middle. Call it a deficit, and show it at the top of the bar. It is already identified in the text as 48,000 AF/year. Also, in the text, refer to groundwater use as "Groundwater pumping," as is done in the bar graph and also in the discussion on page 2-124. Using the word "production" looks like an attempt to disguise what is actually going on.	Mechanics - Graphics	The description of "change in groundwater storage" is consistent with DWR's Water Budget Best Management Practice.
341	Jane Wagner-Tyack	Communication Consultant	Figure 2-78	As in Figure 2-72, the Inflow categories are "Reservoir Releases," "Runoff of Precipitation," "Return Flow of Applied Water", and "Stream Gains From Groundwater." Outflow categories are "San Joaquin River and Mokelumne River Outflows", "Stream Seepage to Groundwater", and "Riparian Intake from Streams." But again, surface water diversions are missing from the Outflow bar. The text mentions distribution to local growers of 370,000 AF/year. What about urban diversions?	Mechanics - Graphics	Labeling is consistent with DWR's Water Budget Best Management Practice.
342	Jane Wagner-Tyack	Communication Consultant	Figure 2-79	See Comment #11 on Figure 2-73 for both Figure 2-76 and Figure 2-79.	Mechanics - Graphics	Dark background was made lighter. Labeling is consistent with DWR's Water Budget Best Management Practice.
343	Jane Wagner-Tyack	Communication Consultant	Figure 2-80 and accompanying text	Again, don't bury "Change in Groundwater Storage" in the middle, and do call it a Deficit. In the text, (first paragraph) use "groundwater pumping" instead of "groundwater production."	Mechanics - Graphics	The description of "change in groundwater storage" is consistent with DWR's Water Budget Best Management Practice.
344	Jane Wagner-Tyack	Communication Consultant	Table 2-17	Where do the numbers for the last row, "Change in Groundwater Storage" come from? They don't appear to arise from anything else in the table, where everything is in balance. Should that row be separated from the rest of the table?	Clarifying Edit	The change in groundwater storage is the difference between groundwater system inflows and outflows. It is a separate category and necessary to balance the groundwater water budget. In Table 2-17, added heading above row for "Change in Groundwater Storage" specifying a separate section for "Inflows Minus Outflows".
345	Jane Wagner-Tyack	Communication Consultant	2.3.7.2	"…to ensure the resolution would be reasonable…"--What is meant by "resolution" in this context?	Clarifying Edit	Replaced "resolution" with "results" in text in Section 2.3.7.2 (DWR Guidance).
346	Jane Wagner-Tyack	Communication Consultant	Figure 2-100	This title is misleading. Climate change will not produce more groundwater. The title should be "Simulated Changes in Groundwater Pumping due to Climate Change." Delete "production" from the Note.	Mechanics - Text	Comment addressed in text.
347	Jane Wagner-Tyack	Communication Consultant	Table 2-12	"Future evapotranspiration rates are assumed to remain the same as historical." Do you want to add any qualifying statement here about climate change?	Clarifying Edit	Added text to note 2 of Table 2-12: For the current and projected water budgets, future evapotranspiration rates are assumed to remain the same as historical. The impact of climate change on evapotranspiration is evaluated separately in Section 2.3.7.

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Comment #	Commenter	Commenter Organization	Section, Figure, or Table Number	Comment	Category	Response to Comment
348	Jane Wagner-Tyack	Communication Consultant	Table 2-12	Note that there's an error here for Reference source not found.	Mechanics - Text	Removed unlinked reference from text.
349	Jane Wagner-Tyack	Communication Consultant	2.3.4.1	Change "was" to "were"--"...flow estimates...were used..."	Mechanics - Text	Comment addressed in text.
350	Jane Wagner-Tyack	Communication Consultant	2.3.4.1	To be consistent, write out all district names, or don't write out any of them. Also, "including" implies that not all entities are listed. If they are all listed, delete "including" and use a colon after "Subbasin." If you include acronyms after names (which is actually a good idea), put them in parentheses rather than brackets. Brackets are correctly used in the section above for parenthetical references within parentheses.	Mechanics - Text	Comment addressed in text.
351	Jane Wagner-Tyack	Communication Consultant	2.3.4.3	Change "was" to "were"--"...projections...were estimated..." (The noun with which a verb grammatically agrees is frequently not the closest noun.)	Mechanics - Text	Comment addressed in text.
352	Jane Wagner-Tyack	Communication Consultant	2.3.5	Fourth bullet, add "the" between "to" and "stream".	Mechanics - Text	Comment addressed in text.
353	Jane Wagner-Tyack	Communication Consultant	2.3.5	"are provided herein" sounds stiff and formal, which is not the tone of the document overall. Suggestion: "...scenarios are provided below, with results summarized in Table 2-13 and Table 2-15."	Mechanics - Text	Comment addressed in text.
354	Jane Wagner-Tyack	Communication Consultant	2.3.5.1	"...the water budget presented in Table 2-12..." Table 2-12 is a summary of water budget assumptions. It doesn't appear to be a water budget. Also, delete "of" between "estimates" and "contributions"--"...the water budget...not only quantifies...but also estimates..."	Mechanics - Text	Comment addressed in text.
355	Jane Wagner-Tyack	Communication Consultant	2.3.5.1	Delete "formerly" from this sentence. It is already clear that previous efforts have given a different estimate.	Mechanics - Text	Comment addressed in text.
356	Jane Wagner-Tyack	Communication Consultant	2.3.5.1	NSJCGBA is not on the list of acronyms, and I am not aware of such an entity. Does this refer to a groundwater management plan by the Eastern San Joaquin County Groundwater Basin Authority? ESJCGBA should be on the list of acronyms, as well as GBA.	Mechanics - Text	NSJCGBA stands for Northeastern San Joaquin County Groundwater Banking Authority, which is a previous groundwater management effort.
357	Jane Wagner-Tyack	Communication Consultant	2.3.5.1	Sentence is awkward. Suggested revision: "The timing of these changes was often independent of hydrologic conditions..."	Mechanics - Text	Comment addressed in text.
358	Jane Wagner-Tyack	Communication Consultant	Table 2-16	Footnote 6: Substitute "are" for "is"--"Differences...are more related..."	Mechanics - Text	Comment addressed in text.
359	Jane Wagner-Tyack	Communication Consultant	Table 2-16	Footnote 3: Revise: "...averaging of the resulting agricultural demand is less a function of water year type than of the time in the simulation when that water year fell."	Mechanics - Text	Comment addressed in text.
360	Jane Wagner-Tyack	Communication Consultant	2.3.5.2	Substitute "consist of" for "are comprised of."	Mechanics - Text	Comment addressed in text.
361	Jane Wagner-Tyack	Communication Consultant	2.3.5.4	(This section should probably be 2.3.5.3.) Change "meets" to "meet" and delete the second "more of"--"...there is more precipitation and surface water to meet the water demand..."	Mechanics - Text	Comment addressed in text.
362	Jane Wagner-Tyack	Communication Consultant	2.3.5.4	Insert a comma between "averages" and "and"--"...to calculate meaningful averages, and the supplies and demands are..."	Mechanics - Text	Comment addressed in text.
363	Jane Wagner-Tyack	Communication Consultant	2.3.6	Delete "use of"--"...a range of assumptions (from high-end estimates to low-end estimates)..."	Mechanics - Text	Comment addressed in text.
364	Jane Wagner-Tyack	Communication Consultant	Table 2-18	"Reference ET"--Use "Eto" as provided in the list of acronyms.	Mechanics - Text	Comment addressed in text.
365	Jane Wagner-Tyack	Communication Consultant	2.3.7.3.1	HUC is not on the list of acronyms. Write out "Hydrologic Unit Code" here or include that in the acronyms.	Mechanics - Text	Comment addressed in text.
366	Jane Wagner-Tyack	Communication Consultant	2.3.7.3.1.1	WY is not on the list of acronyms. Write out "Water Year" here or include that in the acronyms.	Mechanics - Text	Comment addressed in text.
367	Jane Wagner-Tyack	Communication Consultant	2.3.7.3.1.1	This sentence is hard to read, but I think what is meant is "...the projected condition scenario and the with-climate-change scenario." Add the hyphens.	Mechanics - Text	Comment addressed in text.
368	Jane Wagner-Tyack	Communication Consultant	2.3.7.3.1.2	Should be "Streamflows" (plural) to agree with "and those derived using..."	Mechanics - Text	Comment addressed in text.
369	Jane Wagner-Tyack	Communication Consultant	2.3.7.3.2	Insert "are" between "and" and "spatially"--"...are available on a monthly time step and are spatially defined..."	Mechanics - Text	Comment addressed in text.
370	Jane Wagner-Tyack	Communication Consultant	2.3.7.3.2.1	Words appear to be missing. "...were assumed to have a monthly precipitation..."	Mechanics - Text	Comment addressed in text.
371	Jane Wagner-Tyack	Communication Consultant	2.3.7.3.2.2	Change "are" to "is"--"Refinement...is shown..."	Mechanics - Text	Comment addressed in text.
372	Jane Wagner-Tyack	Communication Consultant	3.1	Define "planning and implementation horizon."	Clarifying Edit	Added text to Section 3.1 (Sustainability Goal) to define the planning and implementation horizon: The planning and implementation horizon includes a 20-year implementation period until 2040 where sustainability is achieved and a 50-year planning period where pumping is maintained within the sustainable yield.
373	Jane Wagner-Tyack	Communication Consultant	3.1	Define "implementation period."	Clarifying Edit	Added text to Section 3.1 (Sustainability Goal) to define the planning and implementation horizon: The planning and implementation horizon includes a 20-year implementation period until 2040 where sustainability is achieved and a 50-year planning period where pumping is maintained within the sustainable yield.
374	Jane Wagner-Tyack	Communication Consultant	3.2.2.1.2	Avoid using the passive voice to disguise a source of responsibility. WHO has estimated groundwater demand, and HOW? This information is central to the case we are making.	Mechanics - Text	Comment addressed through edits to text in response to another comment.
375	Jane Wagner-Tyack	Communication Consultant	3.2.3.1.1	"...so a nexus must be present between groundwater conditions and groundwater pumping activities." In plain English, what does this mean?	Clarifying Edit	Language was modified in Section 3.2.3.1.1 (Description of Undesirable Results (Degraded Water Quality) to indicate new monitoring efforts in the Subbasin that will occur as part of the Broad monitoring network for Water Quality) and to highlight coordination efforts with existing regulatory agencies to determine if existing regulatory requirements are met. Language stating no nexus was removed and replaced with language stating that new monitoring efforts and coordination with existing regulatory agencies will allow the GSAs to determine if groundwater pumping activities are contributing to undesirable effects related to degraded water quality.
376	Jane Wagner-Tyack	Communication Consultant	3.2.3.1.2	"...and where these concentrations are the result of groundwater management activities." What kind of activities? How will we know?	Clarifying Edit	The ESJGWA supports the sustainable management criteria for degraded water quality. Groundwater management activities refer to non-natural sources of salinity, such as irrigation return water or movement of groundwater if due to groundwater pumping.
377	Jane Wagner-Tyack	Communication Consultant	3.2.6.2	To avoid obscurity associated with use of the passive voice: "In discussions of interconnected surface water, the GWA Board, Advisory Committee, Workgroup members, and GSA staff did not indicate significant and unreasonable depletions, either currently or historically. Based on this input, this GSP assumes that historical conditions are protective of beneficial uses...." I suggest adding "however" at the beginning of the last sentence: "However, if groundwater levels were to fall lower than historical levels..." Regarding "qualified below", where? In the next paragraph?	Mechanics - Text	Comment addressed in text.
378	Jane Wagner-Tyack	Communication Consultant	4.1.1	It is worth providing some representative dates for historical data available in this Subbasin, especially since it is noted later that CASGEM data goes back to 2009. Let's not miss any opportunity to note that groundwater conditions have been monitored in this Subbasin for quite a long time.	Clarifying Edit	1) Comment noted. Groundwater level data discussed in Chapter 2 (Basin Setting). 2) Removed "since 2009" from Section 4.1.2 (Broad Monitoring Network for Groundwater Levels) as it was misleading and indicated that CASGEM only included measurements more recent than 2009: Of the 107 wells in the broad monitoring network, 76 wells included are wells used in CASGEM, a monitoring program that has tracked seasonal long-term groundwater elevation trends in the Subbasin.
379	Jane Wagner-Tyack	Communication Consultant	4.3.1	"Wells with historically "low" TDS concentrations..." What does this mean? Why is "low" in quotation marks? Quotations marks are sometimes used this way when the writer wants to put distance between the implied meaning and the actual situation. That would be unwise in this case.	Clarifying Edit	Removed quotes around "low" in Section 4.3.1 (Representative Monitoring Network for Groundwater Quality).
380	Jane Wagner-Tyack	Communication Consultant	4.3.1 and 4.3.4	Section 4.3.1 lists the City of Lodi as one of the agencies monitoring and managing wells for groundwater quality, but the City of Lodi is not shown in Table 4-5. The text should explain why not. Meanwhile, City of Lodi is listed in Table 4-7, but there is a footnote that TDS has not been regularly monitored at White Slough sites. Should this footnoted information appear in Section 4.3.1 as well?	Mechanics - Text	Comment noted. City of Lodi is not mentioned in Section 4.3.1 and is not included in Table 4-5. The City of Lodi has wells in the broad monitoring network for groundwater quality, discussed in Section 4.3.2.
381	Jane Wagner-Tyack	Communication Consultant	4.7.1	Do you mean "guide for selection of wells" rather than "guide for collection of wells"?	Mechanics - Text	Comment addressed in text.
382	Jane Wagner-Tyack	Communication Consultant	Section 3 Introduction	Delete "meetings" after "Workgroup".	Mechanics - Text	Comment addressed in text.

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Comment #	Commenter	Commenter Organization	Section, Figure, or Table Number	Comment	Category	Response to Comment
383	Jane Wagner-Tyack	Communication Consultant	3.2.1.1.1	Delete "of" after "Reduction".	Mechanics - Text	Comment addressed in text.
384	Jane Wagner-Tyack	Communication Consultant	3.2.1.1.3	Sentence is awkward and hard to read. Revision: "Undesirable results due to future chronic lowering of groundwater levels could result from the following: insufficient pumping offset/reduction in the basin that results in localized or basin-wide groundwater level lowering; or delays in implementation of GSP programs or projects due to increased demand or regulatory, permitting, or funding obstacles."	Mechanics - Text	Comment addressed in text.
385	Jane Wagner-Tyack	Communication Consultant	3.2.1.2	Substitute "showed" for "evidenced."	Mechanics - Text	Comment addressed in text.
386	Jane Wagner-Tyack	Communication Consultant	3.2.1.2	"...dewatering of domestic wells is a potential undesirable result that could be used to confirm the adequacy..."	Mechanics - Text	Comment addressed in text.
387	Jane Wagner-Tyack	Communication Consultant	3.2.1.2	"...to account for the fact that domestic wells may have been drilled..."	Mechanics - Text	Comment addressed in text.
388	Jane Wagner-Tyack	Communication Consultant	3.2.1.3	"...the difference between the minimum threshold and the measurable objective."	Mechanics - Text	Comment addressed in text.
389	Jane Wagner-Tyack	Communication Consultant	3.2.2.1.4	Make this all one sentence--no period after "years", and separate with semi-colons--"...effects could include running out of fresh groundwater to access in drought years; increased cost of access; reduction in beneficial uses, such as domestic supply; and changes to agriculture."	Mechanics - Text	Comment addressed in text.
390	Jane Wagner-Tyack	Communication Consultant	3.2.2.3	This refers the reader to Section 3.2.5.3, but that section just sends the reader somewhere else. It should probably refer to Section 3.2.1.3, where measurable objectives and interim milestones for lowering of groundwater levels are discussed. Also, insert "as" between "milestones" and "for".	Mechanics - Text	Comment addressed in text.
391	Jane Wagner-Tyack	Communication Consultant	3.2.3.1.4	Add "s" after "effect" and insert a comma and "which" after "supplies"--"...the effects would potentially include...to access alternate supplies, which can be unaffordable..."	Mechanics - Text	Comment addressed in text.
392	Jane Wagner-Tyack	Communication Consultant	3.2.3.1.4	Add "or" after "practices"--"...changes in irrigation practices or crops grown,..."	Mechanics - Text	Comment addressed in text.
393	Jane Wagner-Tyack	Communication Consultant	3.2.3.3	Delete "are" after "uses" in the last line--"...will protect landscape uses against impacts..."	Mechanics - Text	Comment addressed in text.
394	Jane Wagner-Tyack	Communication Consultant	3.2.4.1.1	Use the correct name for the Delta: "the Sacramento-San Joaquin Delta".	Mechanics - Text	Comment addressed in text.
395	Jane Wagner-Tyack	Communication Consultant	3.2.4.1.3	Use the correct name for the Delta: "the Sacramento-San Joaquin Delta".	Mechanics - Text	Comment addressed in text.
396	Jane Wagner-Tyack	Communication Consultant	3.2.4.1.4	Add "or" after "practices"--"...changes in irrigation practices or crops grown,..."	Mechanics - Text	Comment addressed in text.
397	Jane Wagner-Tyack	Communication Consultant	3.2.5.2	Add "in the Eastern San Joaquin Subbasin"--"...declines in groundwater levels in the Eastern San Joaquin Subbasin have not resulted..."	Mechanics - Text	Comment addressed in text.
398	Jane Wagner-Tyack	Communication Consultant	3.2.5.3	The last line refers the reader to Section 2.2, Current and Historical Groundwater Conditions. It should probably refer to Section 3.2.1.3.	Mechanics - Text	Comment addressed in text.
399	Jane Wagner-Tyack	Communication Consultant	3.2.6.1.2	Add "in" to clarify parallelism, and use semicolons to make this sentence easier to follow--"...if depletions resulted in the release of stored surface water...; in the decrease of acreage...; in the reduction in availability...; or in the elimination...."	Mechanics - Text	Comment addressed in text.
400	Jane Wagner-Tyack	Communication Consultant	3.2.6.1.4	Correct parallelism: "...insufficient surface water would be available to support diversions for agricultural or urban uses or to support regulatory environmental requirements."	Mechanics - Text	Comment addressed in text.
401	Jane Wagner-Tyack	Communication Consultant	3.2.6.1.4	Substitute "pumping" for "production" and correct the parallelism: "This could result in increased groundwater pumping, changes in irrigation practices and crops grown, and adverse effects to property values and the regional economy."	Mechanics - Text	Comment addressed in text.
402	Jane Wagner-Tyack	Communication Consultant	4.1.1	Add "the" between "in" and "production"--"...represent overall conditions in the production zone..."	Mechanics - Text	Comment addressed in text.
403	Jane Wagner-Tyack	Communication Consultant	4.1.1	Substitute "insight into" for "insightful information about"--"...may provide insight into groundwater dynamics..."	Mechanics - Text	Comment addressed in text.
404	Jane Wagner-Tyack	Communication Consultant	4.1.2	Correct the parallelism of the numbered items: "1. They use an existing data source...2. They provide reliable...3. They are in many cases new, having been constructed..." Also correct the parallelism for the second numbered list, on page 4-4, by making the first item a sentence, as the others are: "1. They use an existing data source and have a historical data record;"	Mechanics - Text	Comment addressed in text.
405	Jane Wagner-Tyack	Communication Consultant	4.1.2	Make this two sentences: "...San Joaquin County's Flag City wells). These will be monitored..."	Mechanics - Text	Comment addressed in text.
406	Jane Wagner-Tyack	Communication Consultant	4.1.3	Correct agreement: "using a CASGEM-approved ... method..." or "using CASGEM-approved...methods..."	Mechanics - Text	Comment addressed in text.
407	Jane Wagner-Tyack	Communication Consultant	4.1.3	Add an "s" to "include"--"...measurement equipment...includes..."	Mechanics - Text	Comment addressed in text.
408	Jane Wagner-Tyack	Communication Consultant	4.1.5	Change "were" to "was" for correct subject/verb agreement: "...spatial location...was based..."	Mechanics - Text	Comment addressed in text.
409	Jane Wagner-Tyack	Communication Consultant	4.3	Change "are" to "is"--"the representative monitoring network is used..."	Mechanics - Text	Comment addressed in text.
410	Jane Wagner-Tyack	Communication Consultant	4.3.1	Add comma, and "they" in the second sentence: "These wells are equipped...consistent measurements, and they represent..."	Mechanics - Text	Comment addressed in text.
411	Jane Wagner-Tyack	Communication Consultant	4.3.5	Revision: "The representative monitoring network consists of a total of 10 monitoring wells, a density of 0.8 wells per 100 square miles."	Mechanics - Text	Comment addressed in text.
412	Jane Wagner-Tyack	Communication Consultant	4.3.5	Add "s" to "meet"--"The total number...meets DWR's recommendations..."	Mechanics - Text	Comment addressed in text.
413	Jane Wagner-Tyack	Communication Consultant	4.7	Insert "a" between "present" and "limitation"--"...wells present a limitation..."	Mechanics - Text	Comment addressed in text.
414	Jane Wagner-Tyack	Communication Consultant	6.1	Correct spelling of "offset" to "offset."	Mechanics - Text	Comment addressed in text.
415	Jane Wagner-Tyack	Communication Consultant	6.2.1	Third bullet: correct spelling to "cost-effective."	Mechanics - Text	Comment addressed in text.
416	Jane Wagner-Tyack	Communication Consultant	6.2.3	For correct subject/verb agreement, change "were" to "was"--"The initial set...was reviewed..." Next sentence, change "are" to "is"--"A final list...is included..."	Mechanics - Text	Comment addressed in text.
417	Jane Wagner-Tyack	Communication Consultant		PLEASE PROVIDE A MAP SHOWING THE LOCATIONS OF THE PROJECTS.	Projects and Management Actions	A map of project locations has been added to Section 6.1.2 (Projects).
418	Jane Wagner-Tyack	Communication Consultant	Table 6-1	Suggest footnoting the annual cost of Project 4 to explain why it is so much higher than the others. (Mostly annual cost of water purchase.)	Mechanics - Text	Description in text in Section 6.2.4.4 for Project 4 clarifies the estimated costs for this project.
419	Jane Wagner-Tyack	Communication Consultant	Table 6-1	For Project 11, Current Status, change "partied" to "parties."	Mechanics - Text	Comment addressed in text.
420	Jane Wagner-Tyack	Communication Consultant	Various	In most of the project descriptions that follow, subject/verb agreement needs to be corrected in one of these ways: "The estimated cost for this project includes..." or "The estimated costs for this project include..."	Mechanics - Text	Comment addressed in text.
421	Jane Wagner-Tyack	Communication Consultant	6.2.4.3	"Installation" is the subject of the sentence. Everything between that and the verb is part of a modifying phrase. So the verb must be "is", not "are"--"Installation...is in the planning stage."	Mechanics - Text	Comment addressed in text.

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422	Jane Wagner-Tyack	Communication Consultant	6.2.4.4	Suggest inserting "reduced" before "availability" to better reflect the meaning of the sentence--"The reduced availability…would be the only potential cause for a reduction in SWFT production."	Mechanics - Text	Comment addressed in text.
423	Jane Wagner-Tyack	Communication Consultant	6.2.4.5	Insert "been" between "has" and "completed"--"…project has been completed…"	Mechanics - Text	Comment addressed in text.
424	Jane Wagner-Tyack	Communication Consultant	6.2.4.5	Insert "been" between "has" and "completed"--"…project has been completed…"	Mechanics - Text	Comment addressed in text.
425	Jane Wagner-Tyack	Communication Consultant	6.2.4.5	Insert "been"--"Construction for this project has been completed" (or "is complete").	Mechanics - Text	Comment addressed in text.
426	Jane Wagner-Tyack	Communication Consultant	6.2.4.6	Change "has" to "have"--"until 7 years…have elapsed."	Mechanics - Text	Comment addressed in text.
427	Jane Wagner-Tyack	Communication Consultant	6.2.4.6	Delete "s" on "on permits", or delete "a."	Mechanics - Text	Comment addressed in text.
428	Jane Wagner-Tyack	Communication Consultant	6.2.4.7	Delete "at"--"Design for this project is 60 percent complete…"	Mechanics - Text	Comment addressed in text.
429	Jane Wagner-Tyack	Communication Consultant	Various	For most of the Time-Table statements that follow, insert "was" before "initiated" or substitute "began."	Mechanics - Text	Comment addressed in text.
430	Jane Wagner-Tyack	Communication Consultant	6.2.4.8	Substitute "overlie" for "overly. Insert "subject to" between "and" and "historical"--"…dependent on groundwater and subject to historical overdraft…"	Mechanics - Text	Comment addressed in text.
431	Jane Wagner-Tyack	Communication Consultant	6.2.4.8	For "implemented," substitute "done," or say that a review "may be required."	Mechanics - Text	Comment addressed in text.
432	Jane Wagner-Tyack	Communication Consultant	6.2.4.8	Last line, insert hyphen between "as" and "needed"--"…on an as-needed basis…"	Mechanics - Text	Comment addressed in text.
433	Jane Wagner-Tyack	Communication Consultant	6.2.5.1	Correct punctuation: "The contract project is long-term; however, water availability…"	Mechanics - Text	Comment addressed in text.
434	Jane Wagner-Tyack	Communication Consultant	6.2.5.1	Add "the" between "with" and "landowner."	Mechanics - Text	Comment addressed in text.
435	Jane Wagner-Tyack	Communication Consultant	6.2.5.3	Change "withdraw" to "withdrawal" and change the second "pumping" to "pumped"--"NSJWCD will control the withdrawal of the banked water…and then conveying the pumped groundwater…."	Mechanics - Text	Comment addressed in text.
436	Jane Wagner-Tyack	Communication Consultant	Figure 4-3	Praise up front: Some of the graphics in this document are very good, and could serve as a model for others that are not so good. Figure 4-3 is sharp, and the colors and shapes can be adequately differentiated. It is worth bearing in mind that fairly or not, every unclear graphic is likely to be perceived as intentionally deceptive.	Mechanics - Graphics	Comment noted. No edits made to text.
437	Jane Wagner-Tyack	Communication Consultant	Figure 1-3	Colors, especially in the legend, are hard to distinguish, and of course Woodbridge Irrigation District will need to be added back. Also, not every area has a corresponding number. Would broadening the color scale from blue/green help?	Mechanics - Graphics	Woodbridge Irrigation District was added back into the figure. All areas have corresponding numbers. Blue/Green color scale is intentional to accommodate for color blindness.
438	Jane Wagner-Tyack	Communication Consultant	Figure 1-4	Legend and logo are fuzzy. Sacrifice the second frame?	Mechanics - Graphics	This figure was reimported into the document at a higher resolution.
439	Jane Wagner-Tyack	Communication Consultant	Figure 1-5	Colors for East Contra Costa and Tracy subbasins are hard to differentiate, and Tracy and Cosumnes are too similar. I-5 symbol is fuzzy.	Mechanics - Graphics	Darkened the borders around neighboring groundwater subbasins. Reimported the map at a higher resolution.
440	Jane Wagner-Tyack	Communication Consultant	Figure 1-7	County boundaries are not adequately distinguishable from other lines. Sacrifice the second frame?	Mechanics - Graphics	Reimported at higher resolution. As there is no inset map, it is unclear which second frame is being referred to in the comment.
441	Jane Wagner-Tyack	Communication Consultant	Figure 1-8	Fuzzy. Also, the colors make it hard to distinguish SDACs from DACs at this scale. Make it bigger if possible.	Mechanics - Graphics	Added darkened outlines to the DAC and SDAC polygons. Reimported into document at higher resolution.
442	Jane Wagner-Tyack	Communication Consultant	Figure 1-9	Sacrifice the second frame to gain a little size? The map on the facing page doesn't have it. Here and afterward, favor a slightly larger map over a second frame for the figure.	Mechanics - Graphics	This map does not have a second frame. Unclear what this comment is referring to.
443	Jane Wagner-Tyack	Communication Consultant	Figure 1-10	Numbers for roads and highways are fuzzy.	Mechanics - Graphics	This figure was reimported into the document at a higher resolution.
444	Jane Wagner-Tyack	Communication Consultant	Figure 1-11	Fuzzy. Also, Lakes and Waterways are too similar in color to Carnegie SVRA, even though the latter has a border.	Mechanics - Graphics	This figure was reimported into the document at a higher resolution.
445	Jane Wagner-Tyack	Communication Consultant	Figure 2-3	Highway symbols could be sharper. Landscape orientation is good.	Mechanics - Graphics	This figure was reimported into the document at a higher resolution.
446	Jane Wagner-Tyack	Communication Consultant	Figure 2-6	Really nice.	Mechanics - Graphics	Comment noted. No edits made to text.
447	Jane Wagner-Tyack	Communication Consultant	Figure 2-7	Identify Bear Creek, as in Figure 1-5.	Mechanics - Graphics	Bear Creek was labeled like in Figure 1-5.
448	Jane Wagner-Tyack	Communication Consultant	Figure 2-8	Some colors are too similar for adjacent watersheds, and blue is always problematic if it is also used for Lakes and Waterways.	Mechanics - Graphics	Colors that were similar were changed in adjacent watersheds.
449	Jane Wagner-Tyack	Communication Consultant	Figure 2-9	Too small; it is very difficult to read city names. Given general layout issues on this and the following page, there probably isn't much that can be done about this.	Mechanics - Graphics	Comment noted. No edits made to text.
450	Jane Wagner-Tyack	Communication Consultant	Figure 2-10	A bit fuzzy. Especially since there is room, show this with a landscape orientation.	Mechanics - Graphics	This figure was reimported into the document at a higher resolution.
451	Jane Wagner-Tyack	Communication Consultant	Figure 2-11	A lot of place and feature names on this map are virtually illegible, and the legend is too small. Figure 2-12 is only slightly better. Maybe nothing can be done about this.	Mechanics - Graphics	Comment noted for consideration in updates to the GSP. This figure cannot be edited to improve legibility.
452	Jane Wagner-Tyack	Communication Consultant	Figure 2-13	Fuzzy.	Mechanics - Graphics	This figure was reimported into the document at a higher resolution.
453	Jane Wagner-Tyack	Communication Consultant	Figure 2-16	The underlying grid distracts from the formations this figure is intended to show, which are hard to distinguish at best. Some colors in the legend are too similar--how is Valley Springs distinguished from Tulare? The letters on the color blocks are illegible, and they are important because they are referred to in the Table that follows. Road and highway designations on the map are fuzzy. Why is the word "Flood" floating on the right in Calaveras County?	Mechanics - Graphics	Removed unnecessary labels. Reimported into document at a higher resolution. The geology map is georeferenced from the original source and cannot be edited.
454	Jane Wagner-Tyack	Communication Consultant	Figure 2-17	It looks like most of the map units shown in the legend are not features of this subbasin, so maybe this could be simplified by including only those that are. Letters on the color blocks are illegible. It is hard to tell where the Stockton Arch is. Part of the name of "Bear" on the right is missing. Would it be possible to lay the map unit colors and detail over a map with less fuzzy place-name detail and just major roads and water features?	Mechanics - Graphics	Comment noted. This map is georeferenced from it's original source and cannot be edited.
455	Jane Wagner-Tyack	Communication Consultant	Figures 2-20 to 2-22	Most of the detail in these cross-sections is completely illegible. Of course most readers will not care about the individual well identifiers, but if this information is important enough to include in the GSP (and it is referred to several times in the text--for example, some of these well identifiers apparently have asterisks), then it is important enough to be legible. Using the full page instead of allowing large margins might help a bit, as would putting each cross-section on its own page. Could the legends go underneath instead of beside the cross-sections?	Mechanics - Graphics	Figures reimported at a higher resolution into the document.
456	Jane Wagner-Tyack	Communication Consultant	Figures 2-23 and 2-24	Well depth colors are indistinguishable, and identifiers could be sharper. Bigger might be better. Landscape orientation would help.	Mechanics - Graphics	Changed well depth color ramp to be more distinguishable and increased size of symbol. Also changed color ramp of the aquifer elevations so that symbols are easier to distinguish.
457	Jane Wagner-Tyack	Communication Consultant	Figure 2-26	There is certainly room here for a landscape orientation, which has just been used for Figure 2-25.	Mechanics - Graphics	If there is no issue with reading the map, the orientation of the map was not changed.

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458	Jane Wagner-Tyack	Communication Consultant	Figure 2-27	Should definitely be shown in landscape. There is room.	Mechanics - Graphics	Figure placed in landscape.
459	Jane Wagner-Tyack	Communication Consultant	Figure 2-28	Why no legend? Is everyone supposed to know what these symbols represent?	Mechanics - Graphics	Clarifying text was added to Section 2.1.9.2.3.2 (Ion Composition).
460	Jane Wagner-Tyack	Communication Consultant	Figure 2-31	Different chloride concentrations are impossible to distinguish. I'm working from a hard copy, and just to be sure that I wasn't quibbling about something that would be visible in a different medium, I downloaded this figure and expanded it to fill my desktop computer screen. I still can't tell the difference in concentrations. Don't use a graded color scale?	Mechanics - Graphics	The color ramp of the concentrations was changed and the size of the points was increased for clarity.
461	Jane Wagner-Tyack	Communication Consultant	Figure 2-32	See comments for Figure 2-31. There is room for landscape orientation for both these figures, but that alone won't solve the problem.	Mechanics - Graphics	The color ramp of the concentrations was changed and the size of the points was increased for clarity.
462	Jane Wagner-Tyack	Communication Consultant	Figure 2-34	This figure is remarkably legible, given the detail it has to convey. The legend is nice and sharp.	Mechanics - Graphics	Comment noted. No edits made to text.
463	Jane Wagner-Tyack	Communication Consultant	Figures 2-37 and 2-38	Use landscape orientation. Maybe we'll be lucky and they will end up on facing pages.	Mechanics - Graphics	If there is no issue with reading the map, the orientation of the map was not changed.
464	Jane Wagner-Tyack	Communication Consultant	Figure 2-39	Correct name of Swenson Gold Course well. It is Swenson Golf Course. Landscape?	Mechanics - Graphics	Spelling error fixed.
465	Jane Wagner-Tyack	Communication Consultant	Figure 2-50	This figure is misleading in an important way. The subbasin has a large enough change in groundwater elevation that DWR has put us in the critical overdraft category, but all that shows here is a faintly wavy line at the top of the graph. A separate graph showing everything above 50 MAF at a different scale would more honestly illustrate the situation.	Mechanics - Graphics	The figure has been developed to show the impact of groundwater extraction on overall amount of fresh groundwater in storage. The potential for undesirable results associated with groundwater accessibility are addressed through the Chronic Lowering of Groundwater Levels Sustainability Indicator.
466	Jane Wagner-Tyack	Communication Consultant	Figure 2-51	In the legend, green and blue, and brown and pink, are too difficult to distinguish, although they work OK in the chart itself. Make the boxes bigger? Landscape orient this figure?	Mechanics - Graphics	Figure placed in landscape.
467	Jane Wagner-Tyack	Communication Consultant	Figures 2-52 and 2-53	Landscape for both?	Mechanics - Graphics	Placed in landscape. Reimported Figure 2-53 at a higher resolution.
468	Jane Wagner-Tyack	Communication Consultant	Figure 2-54	Yellow hard to see, orange impossible, especially if it is in a city. Landscape?	Mechanics - Graphics	Changed color ramp in the figure to be more visible. Also enlarged the size of the points.
469	Jane Wagner-Tyack	Communication Consultant	Figures 2-55 through 2-58	Symbols for different levels of maximum TDS are indistinguishable. (Figure 2-58 is slightly sharper than the others.) Compare to Figure 4-3. Landscape?	Mechanics - Graphics	These 4 figures were reimported into the document at a higher resolution to help distinguish between the different levels.
470	Jane Wagner-Tyack	Communication Consultant	Figure 2-64	Road identifiers are REALLY fuzzy, and county names and other features are almost illegible. Numbers in the legend are fuzzy. Is this partly the result of merging the regular subbasin map with InSAR data?	Mechanics - Graphics	This figure was reimported into the document at a higher resolution to help distinguish between the different levels.
471	Jane Wagner-Tyack	Communication Consultant	Figures 2-65 and 2-66	Landscape?	Mechanics - Graphics	Figures were reimported at a higher resolution.
472	Jane Wagner-Tyack	Communication Consultant	Figures 2-67, 2-68, and 2-69	Yellow is too hard to see. Figure 2-68 is also fuzzier than the other two.	Mechanics - Graphics	The two figures with yellow indicating Vegetative areas were changed to orange (2-67 and 2-69). Figure 2-68 was reimported into the document at a higher resolution.
473	Jane Wagner-Tyack	Communication Consultant	Figure 2-101	This figure warrants its own page, with larger boxes to make the colors in the legend distinguishable. Add labels on the right side of the graph above and below the middle line for Demand and Supply, and split the legend identifiers accordingly to help the reader match them to the colors on the graph.	Mechanics - Graphics	Figure was placed on its own page and made larger in response to this comment.
474	Jane Wagner-Tyack	Communication Consultant	Figure 2-102	Again, the colors in the legend are hard to differentiate, although they work reasonably well in the graph itself.	Mechanics - Graphics	Put this figure on its own page and made the page landscape.
475	Jane Wagner-Tyack	Communication Consultant	Figure 3-2	Colors for Select Unincorporated Communities and Cities are too hard to differentiate.	Mechanics - Graphics	Select Unincorporated Communities was in the legend in error.
476	Jane Wagner-Tyack	Communication Consultant	Figures 4-1 and 4-2	Fuzzy. Compare to Figure 4-3.	Mechanics - Graphics	Figures were reimported at a higher resolution.
477	Jane Wagner-Tyack	Communication Consultant	Figure 2-18	In earlier comments, I suggested adding "Water" to the title between "Fresh" and "Elevation." If you do that, add "Water" in the legend also.	Mechanics - Graphics	Comment addressed in figure.
478	Jane Wagner-Tyack	Communication Consultant		The case for setting minimum thresholds only for salinity based on the fact that other constituents of concern are managed through existing management and regulatory programs is not persuasively supported in the GSP. [SEE MORE SPECIFICS IN COMMENT LETTER]	Groundwater Quality	See Master Response 3 -- Water Quality.
479	Jane Wagner-Tyack	Communication Consultant		Prefer the active voice to the passive voice to make clear who is responsible for the content of assertions. [SEE MORE SPECIFICS IN COMMENT LETTER]	Clarifying Edit	Edits made throughout GSP to remove passive voice.
480	Jane Wagner-Tyack	Communication Consultant		Include more information about public water systems. [SEE MORE SPECIFICS IN COMMENT LETTER]	Basin Setting	1) An appendix has been added to the GSP which documents the 432 community water systems that received hard copy outreach materials throughout the GSP development process. Section 1.3.4.4 (Stakeholder Database) was updated to list the dates that outreach materials were mailed to community water systems. An analysis was performed to map community water systems that are DAC or SDAC areas, and the results of this analysis are presented in the added appendix. 2) Section 1.3.1 (Beneficial Uses and Users in the Subbasin) was updated to include community water systems and reference the added appendix.
481	Jane Wagner-Tyack	Communication Consultant		Propose a Subbasin-wide well permitting standard that will address sustainability goals, or provide a justification for not doing so. [SEE MORE SPECIFICS IN COMMENT LETTER]	Well Permitting	Well permitting requirements for San Joaquin, Calaveras, and Stanislaus counties are identified in Section 1.2.3.4 (Well Permitting) of the GSP. An additional subsection has been added to include Sacramento County well permitting requirements. GSAs do not have well permitting authority, unless as authorized by the respective county. SGMA does not provide a GSA with the authority to issue or regulate permits for the construction, modification, or abandonment of groundwater wells, but maintains the authority for well permitting activities with the county. (Water Code, § 10726.4(b).) A GSA may request the county provide the GSA with notice of any permit applications (10726.4(b)) and a GSA may impose spacing requirements on new well construction (10726.4(a)(1)). The ESJGWA will continue to coordinate with its member GSAs that are well permitting agencies. Language has been added to Section 4.7.1 (Plan to Fill Data Gaps) referencing applicable Calaveras County, Stanislaus County, and San Joaquin County monitoring well drilling standards.
482	Jane Wagner-Tyack	Communication Consultant		Nitrates: 2.2.4.2 says, "Increased nitrate concentrations have not been found to be related to groundwater management activities in the Subbasin." This statement does not define "groundwater management activities" and does not identify those responsible for the finding of no relationship. Meanwhile, other evidence appears to contradict the assertions. Prior to the assertion above, in the same paragraph, is the statement that "recent nitrate measurements above the MCL correspond to the overall historical trends and highlight areas with elevated Nitrate concentrations in more recent years." What is the evidence that these elevated concentrations are unrelated to groundwater management? The superficial treatment of dairies in the GSP is notable given the fact that milk was San Joaquin County's second top commodity in 2017. This is relevant to the discussion of nitrates as well as point source contamination (see below). Dairies are confined animal feeding operations (CAFOs), and CAFOs are linked to nitrates in water. Was any effort made to track nitrate relative to dairy operations? [SEE MORE SPECIFICS IN COMMENT LETTER]	Groundwater Quality	See Master Response 3 -- Water Quality.

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483	Jane Wagner-Tyack	Communication Consultant		Arsenic: 2.2.4.3 says, "Increased arsenic concentrations have not been found to be related to groundwater management activities in the Subbasin." Again, the statement does not define "groundwater management activities" and does not identify those responsible for the finding of no relationship. Meanwhile, 4.3 says "Arsenic will be monitored for information purposes and to track trends in arsenic concentrations. The Groundwater Sustainability Plan (GSP) does not include sustainability goals, measurable objectives, or minimum thresholds for arsenic." Why does the GWA plan to monitor arsenic if it is unrelated to groundwater management? Is it likely that goals, objectives, and minimum thresholds will be set later on the basis of monitoring? The rationale for not setting minimum thresholds for arsenic, nitrogen, and sulfate (at 3.2.3.1.1 Description of Undesirable Results) is that "these constituents are managed through existing management and regulatory programs within the Subbasin." For example, the GSP mentions monitoring through the Central Valley Regional Water Quality Control Board Waste Discharge Requirement (WDR) Dairy program. The GWA will rely on "coordination with existing agencies" to ensure that regulations are being met. "Additionally, SGMA does not give GSAs land use authority, so a nexus must be present between groundwater conditions and groundwater pumping activities." We need to explain what "nexus" refers to in this context. Also, how will the GSA coordinate with existing agencies? [SEE MORE SPECIFICS IN COMMENT LETTER]	Groundwater Quality	See Master Response 3 -- Water Quality.
484	Jane Wagner-Tyack	Communication Consultant		Point Sources: As with nitrate and arsenic, the GSP provides no convincing support for the statement at 2.2.4.4 that "Point source contamination has not been found to be related to groundwater management activities in the Subbasin." In fact, there is considerable evidence to the contrary. Section 1.2.2.2.4, Division of Drinking Water, says, "DDW data was used in the development of this GSP to identify point-source contamination areas." However, the use of that data appears to have been restricted in the GSP, which notes (2.2.4.4) that "point sources include leaking underground storage tanks, landfills, historical dry cleaners, and others" (emphasis added). CAFOs are point sources under NPDES regulations. Figure 2-62 accompanying the point source discussion shows only Active Investigation and Remediation Sites, not all point-source contamination areas, and the discussion focuses on fuel sites. The claim that "Point source contamination has not been found to be related to groundwater management activities in the Subbasin" is clearly contradicted by 2.2.4.4.1, which discusses plumes that have been publicized. (It would be better not to introduce this section with the word "publicized," which suggests that the plumes are included in the GSP primarily because people already know about them.)	Groundwater Quality	Language was added to Section 2.2.4.4 (Point Sources) stating that new projects undertaken by GSAs as part of GSP implementation will evaluate contaminant plume movement in a CEQA document, and management through existing regulatory agencies was highlighted. The sentence: "Point source contamination has not been found to be related to groundwater management activities in the Subbasin" was deleted. The description of plumes as "publicized" was retained, as this language was developed in coordination with City of Lodi representatives to best reflect water quality conditions in the GSA.
485	Laura Folglia, Katrina Arredondo, Olin Applegate	Larry Walker Associates	2.3	Differences in demand largely drive the amount of groundwater pumped, and sustainability cannot be met if the largest outflow of the water budget, groundwater pumping, is estimated solely based on consumptive use methodology as closure to the groundwater water balance. If this information is available, it should be used. [SEE MORE SPECIFICS IN COMMENT LETTER]	Water Budget	This has been noted as a future item for consideration as the GSAs move into GSP implementation.
486	Laura Folglia, Katrina Arredondo, Olin Applegate	Larry Walker Associates	2.3	A water budget should also be developed to address reasonably foreseeable drought conditions.	Water Budget	All of the model scenarios include a broad range of different hydrologic years, discussed in 2.3.2 (Identification of Hydrologic Periods). Several major drought events were included as part of the 50-year hydrologic period from water year 1969 through 2018 and in the historical simulation period from water year 1996 through 2015. Tables 2-16 and 2-17 summarize some of the water budget components (including precipitation) by San Joaquin River Index water year type for the historical and projected conditions model simulations.
487	Laura Folglia, Katrina Arredondo, Olin Applegate	Larry Walker Associates	Figures 2-37 and 2-38	In contrast to the draft GSP's analysis presenting the groundwater water budget as relatively in balance, the GSP also acknowledges the large groundwater depression in the central portion of the Subbasin (GSP Figures 3-37 and 3-38). Long-term trends from 10 wells distributed across the Subbasin with periods of record greater than 40 years show that groundwater elevations have declined over time throughout most of the Subbasin. The average groundwater decline was quantified as -0.5 ft/yr for the period 1996-2015. However, due to the fact that this analysis only includes two wells near the cone of depression, the investigation should be expanded to focus on additional wells located within the sphere of influence of the problem area. However, due to the fact that this analysis only includes two wells near the cone of depression, the investigation should be expanded to focus on additional wells located within the sphere of influence of the problem area. [SEE MORE SPECIFICS IN COMMENT LETTER]	Basin Setting	The two wells near the cone of depression are from Figure 2-34, which shows hydrographs from select representative wells distributed across the Subbasin. These wells are just a small subset of those used to create Figures 3-37 and 3-38, which show the groundwater elevations in First Quarter 2017 and Fourth Quarter 2017, respectively. These maps were created using groundwater elevations from all available wells with data for those time periods.
488	Laura Folglia, Katrina Arredondo, Olin Applegate	Larry Walker Associates	Figure 2-39	This is also true for the Vertical Gradient analysis provided in draft GSP Section 3.4.1.2.1, which lacks any wells located in the southern portion of the Subbasin (GSP Figure 3-39). Groundwater conditions in additional wells should be depicted in the GSP and monitored in order to track the occurrence of undesirable groundwater effects. Additional wells would also assist in tracking the benefits of recharge [SEE MORE SPECIFICS IN COMMENT LETTER]	Basin Setting	Figure 2-39 shows the current multiple completion wells in the Subbasin. The vertical gradient analysis lacks wells in the southern portion of the Subbasin because there weren't nested wells in that area with sufficient historical data. If a need for more nested and/or clustered monitoring wells is recognized, the monitoring network will be reevaluated as updates to the GSP occur.
489	Laura Folglia, Katrina Arredondo, Olin Applegate	Larry Walker Associates	Figures 2-37 and 2-38	Furthermore, draft GSP Figures 3-37 and 3-38 lack districts and landmarks, making it difficult to interpret the location and detail of the groundwater depression, including the overlying water agencies. In addition, indicating groundwater levels below ground surface (BGS), rather than above mean sea level (MSL) would be helpful to better understand groundwater conditions.	Mechanics - Graphics	City boundaries and labels were added to address the comment. Redoing the analysis for DTW in addition to GWE is beyond the scope required in the GSP.
490	Laura Folglia, Katrina Arredondo, Olin Applegate	Larry Walker Associates	Multiple	The draft ESJ GSP unduly minimizes Subbasin challenges related to groundwater storage and overdraft... Thus, while DWR has listed the ESJ Subbasin as critically overdrafted, the ESJ GSP appears to claim that the Subbasin has a nearly balanced water budget and there are minimal problems with groundwater overdraft. [SEE MORE SPECIFICS IN COMMENT LETTER]	Groundwater Storage	See Master Response 4 - GW Storage.
491	Laura Folglia, Katrina Arredondo, Olin Applegate	Larry Walker Associates	2.3	The ESJ Draft GSP also quotes a series of different groundwater overdraft values, leading to unnecessary confusion regarding conditions in the Subbasin. The Annual Water Budget in Table 2-15 is averaged over the entire basin, with a change in groundwater storage of 41,000 AF/year (1996-2015), 48,000 AF/year (past 50 years) and 34,000 AF/year (future 50 years). However, under DWR's intermediate climate change scenario, the annual groundwater overdraft will increase to 57,000 AF/year, from the previous estimate of 34,000 AF/year. Without climate change, the GSP Executive Summary states that, to reach sustainability, the basin must offset and/or recharge approximately 78,000 AF/year [SEE MORE SPECIFICS IN COMMENT LETTER]	Water Budget	The multiple overdraft values are for the different modeling scenarios required by SGMA regulations. The ESJGWA supports the description of the Subbasin water budget in the GSP.
492	Laura Folglia, Katrina Arredondo, Olin Applegate	Larry Walker Associates	2.3.7	The ESJ Draft GSP should acknowledge the reality of climate change scenarios prescribed by DWR, and highlight the fact that the estimated groundwater pumping offsets and/or recharge of 78,000 AF/year is a conservative estimate that may in reality be closer to 101,000 AF/year (calculated by increasing the change in groundwater storage from 34,000 AF/year (projected conditions for 50-year period) to 57,000 AF/year (climate change scenario).	Climate Change	Consistent with regulations, the 2070 climate change sensitivity analysis on the projected conditions scenario was used to better understand trends and inform planning. Due to the uncertainty around climate projections in the 2070 timeframe, the ESJGWA Board determined the projected conditions scenario was most appropriate for analyzing sustainable yield in the GSP implementation time period beginning in 2040. Therefore, climate change was not included in the sustainable yield analysis or the estimated amount of direct or in lieu recharge and/or reduction in pumping needed for the Subbasin to reach sustainability. Climate change will continue to be evaluated with every update to the GSP and estimates of projects and management actions will continue to evolve with refinements to the model. Comment noted for follow up in next round of model refinements and updates to analyses.
493	Laura Folglia, Katrina Arredondo, Olin Applegate	Larry Walker Associates	6.2.4.8	The ESJ GSP should expand Project 8 to include additional water transfers within the Subbasin for recharge. The ESJ GSP should expand Project 8 to include additional water transfers within the Subbasin for recharge. In addition, Project 8 should not be limited to transfers solely from OID and SSJID to the SEWD and CSJWCD service areas. Instead, all lands subject to declining groundwater levels (GSP Figures 3-37 and 3-38) and with at least Moderately Good recharge potential (GSP, Figure 2-14) should be included. [SEE MORE SPECIFICS IN COMMENT LETTER]	Projects and Management Actions	See Master Response 5 - Projects.
494	Laura Folglia, Katrina Arredondo, Olin Applegate	Larry Walker Associates	6.2	The GSP should also promote smaller recharge projects whereby water users may divert surplus surface water supplies for recharge on their own lands. This could be accomplished, for instance, by the creation of a program within the GSP that landowners could join if specified criteria are met. Creation of such a program would assist smaller recharge projects with completion of complex permitting and review requirements. [SEE MORE SPECIFICS IN COMMENT LETTER]	Projects and Management Actions	1) GSP projects have been proposed by individual GSAs and will be implemented at the GSA level. Although the ESJGWA does not have authority to direct project design or implementation, the ESJGWA's role will be to oversee essential project coordination by identifying where projects would be beneficial, synthesize how GSAs are doing projects, and make sure that GSA projects are getting the Subbasin to sustainability. 2) Flood-Managed Aquifer Recharge (Flood-MAR) opportunities will be considered through ongoing coordination with existing agencies. Flood-MAR is an integrated and voluntary resource management strategy that uses flood water resulting from, or in anticipation of, rainfall or snow melt for managed aquifer recharge (MAR) on agricultural lands and working landscapes, including but not limited to refuges, floodplains, and flood bypasses. Flood-MAR can be implemented at multiple scales, from individual landowners diverting flood water with existing infrastructure, to using extensive detention/recharge areas and modernizing flood management infrastructure/operations (Source: https://water.ca.gov/Programs/All-Programs/Flood-MAR). 3) See also: Master Response 5 - Projects.

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495	Laura Folglia, Katrina Arredondo, Olin Applegate	Larry Walker Associates	6.2	The efficacy of these projects in their potential to recharge the aquifer should be analyzed using a model scenario with the GSP Eastern San Joaquin Water Resources Model (ESJWRM).	Projects and Management Actions	This has been noted as a future item for consideration as the GSAs move into GSP implementation.
496	David Simpson	NSJWCD	NA	Woodbridge ID and recharge projects within the District need to be included in the Final GSP.	Projects and Management Actions	Woodbridge Irrigation District (WID) was part of the ESJGWA when projects were solicited, and WID did not propose any GSP projects at that time. WID's existing projects are captured in the Water Budget.
497	David Simpson	NSJWCD	NA	The GSP should contain a statement of concern relating to SWRCB plans to reduce flows available for use by 40-60%. The GSP references climate change yet a far greater threat to sustainability in the basin is the reallocation of surface water flows currently being undertaken by the SWRCB. The Draft GSP assumes constant or increased availability of surface water yet the SWRCB has threatened to take 40-60% of the currently available flow in several key rivers. With reduced availability of surface water for existing uses and groundwater recharge, there is little to no hope of achieving groundwater sustainability without massive new infrastructure, draconian pumping restriction and increased regulation.	Plan Implementation	1) The ESJGWA acknowledges that there are many factors that could affect the availability of surface water and that has to be evaluated by GSAs in the implementation of projects. The process of providing annual reports to DWR and of GSAs self-reporting to the ESJGWA will allow the ESJGWA to update the Plan and adjust the implementation course as needed based on conditions. The GSP allows project implementation to be updated as needed, and it is currently too speculative to say what the impact will be from the proposed SWRCB regulation, as the SWRCB has not yet determined how the regulation will be been implemented. 2) A data gaps and uncertainties subsection was added to Chapter 7 (Plan Implementation): The ESJGWA acknowledges that there are many factors that could affect the availability of surface water, including the SWRCB plans to reduce flows available for use by 40-60% as part of the Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (Bay-Delta Plan Update). Such regulations will need to be evaluated by GSAs in the implementation of projects. The process of GSAs providing biannual reports will allow for the ESJGWA to update the Plan and adjust the implementation course as needed based on conditions. The GSP allows project implementation to be updated as needed, and it is currently too speculative to say what the impact will be from the Bay-Delta Plan Update regulation, as the SWRCB has not yet determined how the regulation will be been implemented.
498	David Simpson	NSJWCD	Potential Projects	Lakso should be spelled Lakso. Manaserro should be spelled Manassero.	Clarifying Edit	Comment addressed in text.
499	Barbara Barrigan-Parrilla	Restore the Delta		Restore the Delta observes in Table 2-17 (p. 2-133) of the Draft GSP Chapter 2 finds that in wet years groundwater storage is projected to increase by an annual average of 52 TAF; 23 TAF in above normal years; and decrease by 7 TAF in below normal years, 44 TAF in dry years, and 39 TAF in critically dry years. Overall, over the 50-year planning horizon of the Draft GSP, groundwater storage in the Subbasin is projected to decrease an average of 34 TAF. Over 50 years, this is a cumulative loss of stored freshwater of about 1.7 MAF. This is a much smaller amount than other groundwater sustainability agencies are contemplating elsewhere in California, but it still represents a cumulative loss to storage in our Subbasin. This is about 3.2 percent of the total subsurface freshwater storage of 53 MAF cited elsewhere in the Draft GSP.	Groundwater Storage	See Master Response 4 - GW Storage.
500	Barbara Barrigan-Parrilla	Restore the Delta		If neighboring subbasins do less to recharge their underground supplies hypothetically it would mean that the GWA would have to do more, and vice-versa, to avoid undesirable results. Restore the Delta urges the GWA to recognize this interrelationship more explicitly and to adopt a policy of encouraging neighbors to do their fair share of net recharge (combining "additional recharge or pumping reduction") activities as they implement their GSPs.	Plan Implementation	As neighboring plans are developed, the ESJGWA will be reviewing and providing input. The ESJGWA will review and will provide comment on neighboring Subbasins' GSPs if their plans adversely affect our ability to achieve sustainability.
501	Barbara Barrigan-Parrilla	Restore the Delta		We recommend also that the Final GSP incorporate reviews of what neighboring GSAs and their GSPs are contemplating in this regard so that readers of the GWA's GSP understand what this "neighborhood baseline" consists of when it comes to assessing undesirable results indicators and evaluating the success or failure of neighbors' implementation projects.	Interbasin Coordination	As the neighboring groundwater subbasins are not designated as critically overdrafted, their GSPs are on a later timeline, so analyses are not available for direct comparison. The ESJGWA will continue to coordinate with neighboring basins as more information is available.
502	Barbara Barrigan-Parrilla	Restore the Delta		Restore the Delta is by and large disappointed with the Draft GSP's climate change analysis. The Draft GSP provides no broad overview of what effects climate change is likely to have on Subbasin groundwater resources. There is not even a summary of the California Fourth Climate Change Assessment commentary on what effects are expected in California as we step-by-step enter that climate future. Instead, the Draft GSP presents only a turgid, technical description of its use of DWR climate-change models and the results of those models. This should have been limited to an appendix, and the results simply summarized in the Draft GSP. Instead, the modeling results are presented with little context. The state has presented a comprehensive, region-by-region analysis of climate change effects, and the Draft GSP needs to apply it—both to educate the Subbasin publics (including disadvantaged communities) and to place DWR-based climate change analytic results in context. As drafted, the climate change analysis has been done; GSA staff can check the box for providing a minimally adequate GSP to the state. The water users of the Subbasin deserve more, however. They deserve a Final GSP that tells them what the analysis means for the future of Subbasin groundwater resources and communities, and how it plays out relative to each of the sustainability indicators the Draft GSP puts forward.	Climate Change	The ESJGWA has noted the resource provided and has determined that it is not necessary to include a summary of the California Fourth Climate Change Assessment. The climate change analysis meets the requirements of the GSP. Climate change will continue to be evaluated with every update to the GSP.
503	Barbara Barrigan-Parrilla	Restore the Delta	Figure 2-37 and 2-38	When compared with the groundwater elevation maps that show the cones of depression (Figures 2-37 and 2-38), it is evident that the cones of depression are located directly beneath the Calaveras River and Mormon Slough, which are losing streams—their flows are now disconnected from the groundwater system, as shown in Figure 2-66 (p. 2-99). There also appears to be a portion of a cone of depression beneath Dry Creek near to the Mokelumne River as well, though this is not labeled with the same color as the cone of depression in the Eastern San Joaquin basin. This means that there is great potential for saltwater intrusion, which the draft GSP gently acknowledges. Net subsurface flow is from the west to the east. But the draft GSP is silent about the ecological consequences of having losing streams spanning the groundwater basin. [SEE MORE SPECIFICS IN COMMENT LETTER]	Interconnected Surface Water	Comment noted. As stated in the GSP, seawater intrusion is not present in the Subbasin and is not anticipated to occur; however, minimum thresholds and measurable objectives have been established to be protective in the event that sea level rise ever does occur. The ecological consequences of losing streams is the Subbasin requires further study. Groundwater provides benefits to gaining streams through additional baseflow and through influences on water chemistry and temperature.
504	Barbara Barrigan-Parrilla	Restore the Delta	Figure 1-8	Disadvantaged communities are forced to live with existing disadvantaged streams—losing streams. The Draft GSP appears to do little to rectify these existing undesirable conditions—undesirable at least from the standpoint of the disadvantaged communities forced to live without healthy riverine ecosystems and recreational and angling beneficial uses of them in their midst.	Projects and Management Actions	The ESJGWA acknowledges conditions of overdraft and in response has identified projects that will recharge and/or offset up to 78,000 AFY to meet the Subbasin's sustainable yield. As groundwater levels stabilize, the gradient pulling water from losing streams will decrease when compared to conditions without such actions. The ESJGWA has not identified losing streams as a significant and unreasonable negative impact. See Master Response 2 - ISW.
505	Barbara Barrigan-Parrilla	Restore the Delta		This particular indicator lacks any recognition of the differential impact of falling groundwater elevations on disadvantaged communities relative to other groundwater pumpers like cities and agricultural enterprises. While the plan identifies disadvantaged communities (which we note above), it does not correlate explicitly the degree to which disadvantaged communities in the Subbasin are predominantly reliant on municipal/public or private water systems, or whether they are predominantly reliant on private wells. The Draft GSP provides no policies or program recommendations and needs that would address the question: if these conditions develop where disadvantaged residents lose their pumped groundwater supplies, what steps will the GWA take to mitigate such events and recover the utility of their public/private systems or wells? The Draft GSP would, it appears, wait until impacts on disadvantaged and other communities occur before any actions to prevent such occurrences would be taken. [SEE MORE SPECIFICS IN COMMENT LETTER]	Projects and Management Actions	The ESJGWA supports using the minimum thresholds, measurable objectives, and interim milestones for the chronic lowering of groundwater levels sustainability indicator as written. SGMA does not require zero impact, and the ESJGWA has determined that it is not considered significant and unreasonable for wells belonging to the shallowest 10 percent of domestic wells to be dewatered, as the wells that are likely to be dewatered are those that are 50 years or older, have reached the end of their usable life, and would need to be replaced anyway. Data collected on Stanislaus County rural domestic wells that were dewatered in years 2014-2016, showed that the average depth of wells reported as dewatered was 91 ft bgs, and that 60 percent were shallower than 100 ft bgs. Additionally, the average well age for wells reported as dewatered was 55 years, and 52 percent were older than 50 years old. There are various well impact mitigation programs in place, therefore there were no changes were made to the GSP.
506	Barbara Barrigan-Parrilla	Restore the Delta		The Draft GSP recognizes just "increase in pumping costs due to greater lift" as an undesirable result relating to lowered groundwater elevations. The Draft GSP fails to provide any cost threshold beyond which point the GWA would presumably act on this triggered indicator. What level of cost increase is reasonable due to greater lift needs? Do public and private well systems need to be treated differently from a cost standpoint than single private wells? Will increased costs for wells operated by members of disadvantaged communities be treated the same or differently than other systems? Restore the Delta recommends that they should be treated differently so that ability to pay is taken into account. Just as important, what remedial action does the GWA commit to in order to stem impacts to disadvantaged community groundwater users when pumping costs rise? In short, whose groundwater pumping costs are going to be the GWA's yardstick for determining undesirable results, and what actions will the GWA commit to in redressing undesirable results? [SEE MORE SPECIFICS IN COMMENT LETTER]	Plan Implementation	Given the high number of variables involved, a cost threshold for was not developed for increases in pumping costs due to greater lift as part of the Chronic Lowering of Groundwater Levels sustainability indicator undesirable result. The ESJGWA will continue to coordinate with its GSA members that are well permitting agencies.
507	Barbara Barrigan-Parrilla	Restore the Delta		For the lowering of groundwater elevation and reduction in groundwater storage indicators, the definitions in the Draft GSP are too vague about which beneficial uses have to be affected by the undesirable result. There needs to be more clear specification of undesirable results in relation to specific beneficial uses. If the GWA means "all beneficial uses" for these indicators, then state "all beneficial uses." As worded, these indicators give the GWA license to pick favored beneficial uses over others.	Groundwater Levels	1) Language was added to Section 3.2.1.1.1 (Chronic Lowering of Groundwater Levels, Description of Undesirable Results) referencing GSP Section 1.3.1 (Beneficial Uses and Users in the Subbasin). A bullet was added to identify impacts to environmental uses and users, including interconnected surface waters and GDEs, as a potential undesirable result identified by stakeholders during GSP development. Additionally, language was added to Section 3.2.1.1.4 (Chronic Lowering of Groundwater Levels, Potential Effects of Undesirable Results) to identify potential effects of undesirable results related to GDEs as a data gap. Text was added to refence the new shallow monitoring program in Section 4.7 (Plan to Fill Data Gaps) as a plan to obtain additional information. 2) Language was added to Section 3.2.2.1.1 (Reduction in Groundwater Storage, Description of Undesirable Results) referencing GSP Section 1.3.1 (Beneficial Uses and Users in the Subbasin).

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Comment #	Commenter	Commenter Organization	Section, Figure, or Table Number	Comment	Category	Response to Comment
508	Barbara Barrigan-Parrilla	Restore the Delta		The Draft GSP confidently states that "there is a large volume (approximately 53 million acre-feet [MAF] of freshwater in storage" in the Subbasin, and there appears to be very little fluctuation historically in this volume on a percentage basis. The Draft GSP states that "it is roughly estimated that groundwater demand for beneficial use occurs within the top 23 MAF of the Subbasin." (p. 3-10) No geographic description of where this 23 MAF occurs is provided. The "threshold" for undesirable result in the Draft GSP on the storage indicator then becomes "when storage is insufficient to satisfy beneficial uses within the Subbasin. Therefore, undesirable results would occur if groundwater storage were reduced to less than 30 MAF." (Ibid.) Here the Draft GSP fails to connect the already existing undesirable results noted above with this level of groundwater storage in the Subbasin (that is, the cone of depression with the presence of losing streams immediately overlying them, for example, and their occurrence immediately beneath and down-gradient of disadvantaged communities in the Subbasin). The Draft GSP takes current groundwater storage at 53 MAF as an acceptable baseline when it actually represents a storage level that is undesirable given existing surface and subsurface conditions. Restore the Delta urges the GWA to rethink, redefine, and redraft this particular indicator discussion so that existing undesirable conditions can experience recovery and restoration to sustainable conditions as the GSP planning and implementation horizon plays out.	Groundwater Storage	See Master Response 4 - GW Storage. The cone of depression is evaluated and discussed in the Section 2.2 (Current and Historical Groundwater Conditions) of the GSP. Groundwater storage is evaluated at a subbasin scale.
509	Barbara Barrigan-Parrilla	Restore the Delta		We ask a similar question as above of the GWA: if a toxic plume suddenly spikes at three or more of the ten water quality monitoring wells, is the Draft GSP to be interpreted as meaning that the GWA would wait up to two years before taking any kind of action to protect public health and safety and address the contamination? Why does this indicator even have a time/duration threshold before enabling the GWA to identify, prevent, or mitigate an undesirable result? As with the cost discussion, what actions does the GWA commit to in order to stem the breaching of the minimum water quality thresholds it has put forward? Would it really allow saltwater intrusion, for example, to proceed for two years before acting to push back the isohaline toward the Delta? That would cost a lot more in water injections and scarce dollars, for example, than if authority for action contained in the Draft GSP allowed more prompt assessment and prevention of saltwater intrusion. [SEE MORE SPECIFCS IN COMMENT LETTER]	Sustainable Management Criteria	Sustainable management criteria and the choosing of minimum thresholds are meant to be representative of not only one point in time, but of long-term conditions in the Subbasin. By looking at two consecutive years, rather than a single year, we can remove short-term/outlier measurements and determine if conditions are reflective of longer-term trends. Furthermore, the nature of the definition of undesirable results do not preclude early action if deemed warranted by the GSAs.
510	Barbara Barrigan-Parrilla	Restore the Delta		The remaining three indicators in the Draft GSP address sea water intrusion, land subsidence, and depletion of interconnected surface water. Restore the Delta feels that these three indicators in the Draft GSP would all benefit from similar critical review and treatment (including redefinition to include existing undesirable baseline conditions) that we have outlined above for the first three indicators; indeed, our specific comments on reconnecting losing streams to groundwater systems apply to Section 3.2.6 on depletion of interconnected surface water, including our comments about the relationships of disadvantaged communities to these natural hydrologic systems.	Sustainable Management Criteria	The ESJGWA supports the sustainable management criteria as written. The purpose of the criteria is to identify what is significant and unreasonable with a focus on long-term conditions in the Subbasin. The GSAs of the ESJGWA can decide to take action at any point when established thresholds are violated.
511	Mary Elizabeth	Sierra Club, Delta-Sierra Group	7.2	There was a much more robust discussion about funding the development of the GSP than for implementing the GSP. Table 1 below provides a summary of the GSA's areas and composition, both factors with groundwater extraction volumes should be considered when determining GSP implementation contributions. [SEE MORE SPECIFICS IN COMMENT LETTER]	Plan Implementation	This has been noted as a future item for consideration as the GSAs move into GSP implementation.
512	Mary Elizabeth	Sierra Club, Delta-Sierra Group	7.5	Whether or not coordination between the 15 GSAs continues during implementation will be in large part determined by what this Ad Hoc Committee reports to the GWA for their consideration. It is expected that this report will be made available either in September 2019 GWA agenda materials or at the September 2019 GWA meeting. In either case long after comments on the draft GSP are due in August 2019. The postponing of these important governance and funding discussions creates a situation of urgency which will likely preclude widespread public outreach and consideration of beneficial users' comments. The deficiencies related to individual GSA water budgets casts serious doubts about how funding allocations will be made so that basin-wide monitoring and implementation activities are accomplished. A frequent comment has been, why should we fund someone else's misuse and lack of planning when we have been funding efficiency improvements all along. [SEE MORE SPECIFICS IN COMMENT LETTER]	Plan Implementation	This has been noted as a future item for consideration as the GSAs move into GSP implementation.
513	Mary Elizabeth	Sierra Club, Delta-Sierra Group	n/a	Early on Stakeholder Workgroup members expressed frustration that specific technical information was not available for review in advance of meetings; that during meetings new information was made available on PowerPoint slides only; that meetings were rushed because there was an emphasis on presenting information rather than engaging in meaningful dialogue that could be communicated to the GWA. [SEE MORE SPECIFICS IN COMMENT LETTER]	Plan Implementation	This has been noted as a future item for consideration as the GSAs move into GSP implementation.
514	Mary Elizabeth	Sierra Club, Delta-Sierra Group	1.2.3.4	The GSP Wellhead protection areas and recharge areas Section 1.2.3.4, addresses wellhead protection programs in San Joaquin County, Calaveras County, and Stanislaus County. The discussion regarding wellhead protection areas seemed to be restricted to annular seals on wells which do prevent surficial contamination from entering the aquifer. No analysis was offered as to the variation of well construction standards and location requirements that might relate to wellhead protection areas. [SEE MORE SPECIFICS IN COMMENT LETTER]	Basin Setting	Section 1.2.4 (Additional GSP Elements) provides GSAs an opportunity to discuss additional Plan areas, including wellhead protection areas and well construction policies. The ESJGWA identified these topics as relevant and important to the Subbasin as addressed in Section 1.2.3.4 (Well Permitting). Analysis on variation of well construction standards and location requirements relating to wellhead protection areas can be considered in future updates to the GSP.
515	Mary Elizabeth	Sierra Club, Delta-Sierra Group	n/a	Despite the fact that GSAs are able require water management devices on non-de minimis water wells no metering of wells of any size was proposed in the draft GSP… The Delta-Sierra Group recommends that the largest non-de minimis extraction wells be metered with an annual reporting requirement. [SEE MORE SPECIFICS IN COMMENT LETTER]	Plan Implementation	This has been noted as a future item for consideration as the GSAs move into GSP implementation.
516	Mary Elizabeth	Sierra Club, Delta-Sierra Group	2.1.4.5.3	A generalized map was provided of potential recharge areas as shown below, but a map identifying existing recharge areas that substantially contribute to the replenishment of the groundwater basin was not found in the draft GSP... SGMA requires that a map identifying existing and potential recharge, and specifically identifying the existing recharge areas that substantially contribute to the replenishment of the groundwater basin. [SEE MORE SPECIFICS IN COMMENT LETTER]	Basin Setting	A map of existing groundwater recharge areas is presented in Figure 2-13 and a map of potential groundwater recharge areas is presented in Figure 2-14. Added to text to Section 2.1.4.5.1 (Description of Recharge Areas) clarifying that higher percolation indicates more recharge and referencing the existing conjunctive use programs (including direct recharge) described in Section 1.2.2.9: The higher percolation areas are those that substantially contribute to the replenishment and recharge of the Subbasin. Section 1.2.2.9 includes text and a figure (Figure 1-16) of existing conjunctive use programs, including current direct recharge occurring in the Subbasin.
517	Mary Elizabeth	Sierra Club, Delta-Sierra Group	3.2.6	The GSP noted in section 3.2.6 Depletion of Interconnected Surface Water that "quantification of depletions is relatively challenging and requires significant data on both groundwater levels near streams and stage information supported by groundwater modeling. "Without restricting the installation of wells within areas of influence that intersect surface waterways, further depletion of interconnected surface waters will continue. [SEE MORE SPECIFICS IN COMMENT LETTER]	Well Permitting	Well permitting requirements for San Joaquin, Calaveras, and Stanislaus counties are identified in Section 1.2.3.4 (Well Permitting) of the GSP. An additional subsection has been added to include Sacramento County well permitting requirements. GSAs do not have well permitting authority, unless as authorized by the respective county. SGMA does not provide a GSA with the authority to issue or regulate permits for the construction, modification, or abandonment of groundwater wells, but maintains the authority for well permitting activities with the county. (Water Code, § 10726.4(b).) A GSA may request the county provide the GSA with notice of any permit applications (10726.4(b)) and a GSA may impose spacing requirements on new well construction (10726.4(a)(1)). The ESJGWA will continue to coordinate with its member GSAs that are well permitting agencies. Language has been added to Section 4.7.1 (Plan to Fill Data Gaps) referencing applicable Calaveras County, Stanislaus County, and San Joaquin County monitoring well drilling standards.
518	Mary Elizabeth	Sierra Club, Delta-Sierra Group	3.2.1	The draft GSP uses groundwater level minimum thresholds as a proxy for the depletion of interconnected surface water sustainability indicator. As such, the minimum thresholds for the interconnected surface water sustainability indicator are the same as the minimum thresholds for the chronic lowering of groundwater levels sustainability indicator. The use of the existing representative groundwater level monitoring wells is inadequate to assess whether or not surface waters are depleted by groundwater extraction wells near surface waterways. [SEE MORE SPECIFICS IN COMMENT LETTER]	Interconnected Surface Water	See Master Response 2 - ISW.
519	Mary Elizabeth	Sierra Club, Delta-Sierra Group	2.2.7	The significant reduction of GDEs as compared to the NCCAG database was related to co-occurrence of surface water sources including irrigation canals. The Delta-Sierra Group objected in February 2019 to the disqualification of local ecosystems as GDEs if sources other than groundwater are available... As no sustainable management criteria are required for GDEs, the Delta-Sierra Group recommends that a less restrictive method be used if reductions to the NCCAG are desired, and that the Nature Conservancy and California Department of Fish and Wildlife be consulted. [SEE MORE SPECIFICS IN COMMENT LETTER]	GDEs	See Master Response 1 - GDEs.
520	Mary Elizabeth	Sierra Club, Delta-Sierra Group	2.2.4	The Eastern San Joaquin Subbasin groundwater quality is negatively impacted by contaminates not currently proposed for monitoring or inclusion in the Data Management System. Nitrate contamination is a significant problem in agricultural areas related to the handling of wastes and applications of fertilizers. [SEE MORE SPECIFICS IN COMMENT LETTER]	Groundwater Quality	See Master Response 3 -- Water Quality.

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521	Mary Elizabeth	Sierra Club, Delta-Sierra Group	n/a	An important part of the initial steps of implementation will be to have several workshops for beneficial users that are interested in accessing the database and creating reports or accessing pre-made report formats. Probably those staff that will be inputting data will also require training. Ideally, as work continues with the database, methods to incorporate contaminant data stored by the State of California in various databases can be explored. Another possibility is that GSAs exercise their powers and authorities to require that other groundwater management data be included in an expanded database. Fees could be charged of those with reportable results to submit to the database. The fees could offset time required by staff to input the data. Perhaps, San Joaquin Environmental Health could administer the database because they already have access to small water system monitoring data under permit. Those using groundwater and those making important planning decisions would benefit from a centralized location for groundwater quality. [SEE MORE SPECIFICS IN COMMENT LETTER]	DMS	This has been noted as a future item for consideration as the GSAs move into GSP implementation.
522	Mary Elizabeth	Sierra Club, Delta-Sierra Group	n/a	Staff involved with the California Statewide Groundwater Elevation Monitoring (CASGEM) well monitoring suggested that conditions could exist that more frequent monitoring may be necessary to capture valid seasonal fluctuations. Consideration should be given to the sampling of representative groundwater level compliance wells quarterly, a reduction of the DWR monthly monitoring suggestion. Semi-annual monitoring may miss transient changes in response to unseasonable conditions. Understanding these transient changes may help refine the conceptual model. [SEE MORE SPECIFICS IN COMMENT LETTER]	Monitoring Network	The ESJGWA Board determined semi-annual sampling was appropriate as it will capture seasonal highs and lows. If a need for more frequent monitoring is recognized, the monitoring frequency will be reevaluated as updates to the GSP occur.
523	Mary Elizabeth	Sierra Club, Delta-Sierra Group	n/a	The August 2018 Model Report included a reference to an April 25,2018 Eastern San Joaquin Water Resources Model IDC Workshop that was not noticed or advertised despite stakeholder collaboration being the first topic discussed. Going forward as the model is refined under contract, the Delta-Sierra Group suggests that model refinement include multiple opportunities for interested parties that are stakeholders to become more familiar with the model. [SEE MORE SPECIFICS IN COMMENT LETTER]	Model Refinements	This has been noted as a future item for consideration as the GSAs move into GSP implementation.
524	Mary Elizabeth	Sierra Club, Delta-Sierra Group	2.3	This statement is confusing especially given the description of the model results under climate change, as it is unclear which number is being referred to: "This number is larger than the estimated annual overdraft of the projected conditions scenario due to the integrated nature of the groundwater subbasin." [SEE MORE SPECIFICS IN COMMENT LETTER]	Water Budget	1) Consistent with regulations, the 2070 climate change sensitivity analysis on the projected conditions scenario was used to better understand trends and inform planning. Due to the uncertainty around climate projections in the 2070 timeframe, the ESJGWA Board determined the projected conditions scenario was most appropriate for analyzing sustainable yield in the GSP implementation time period beginning in 2040. Therefore, climate change was not included in the sustainable yield analysis or the estimated amount of direct or in lieu recharge and/or reduction in pumping needed for the Subbasin to reach sustainability. Comment noted for follow up in next round of model refinements and updates to analyses. 2) Added text to Section 2.3.6 (Sustainable Yield Estimate) clarifying which numbers are being discussed: This number (78,000 AF/year) is larger than the estimated annual overdraft of the projected conditions scenario (34,000 AF/year) due to the integrated nature of a groundwater subbasin.
525	Mary Elizabeth	Sierra Club, Delta-Sierra Group	2.3	Under the intermediate climate change scenario prescribed by DWR, the depletion in aquifer storage is expected to increase by about 68 percent to an average annual storage change of 57,000 AF/year, from 34,000 AF/year in the projected conditions scenario. If the 68 percent is applied to 78,000 AF/year, deficient an additional 53,000 AF/year will be needed and the planned projects projected to achieve sustainability included in the GSP will be insufficient. [SEE MORE SPECIFICS IN COMMENT LETTER]	Projects and Management Actions	Consistent with regulations, the 2070 climate change sensitivity analysis on the projected conditions scenario was used to better understand trends and inform planning. Due to the uncertainty around climate projections in the 2070 timeframe, the ESJGWA Board determined the projected conditions scenario was most appropriate for analyzing sustainable yield in the GSP implementation time period beginning in 2040. Therefore, climate change was not included in the sustainable yield analysis or the estimated amount of direct or in lieu recharge and/or reduction in pumping needed for the Subbasin to reach sustainability. Climate change will continue to be evaluated with every update to the GSP and estimates of projects and management actions will continue to evolve with refinements to the model. Comment noted for follow up in next round of model refinements and updates to analyses.
526	Mary Elizabeth	Sierra Club, Delta-Sierra Group	n/a	As of 8.25.19, the Notice of Intent to Adopt GSP was not forwarded to the ESJ interested parties list although interested parties were directed to the esjgroundwater.org website for meeting information and public hearing dates. The Notice of Intent to Adopt GSP did include email addresses of GSA representatives in addition to mailing addresses and FAX numbers. [SEE MORE SPECIFICS IN COMMENT LETTER]	Outreach	This has been noted as a future item for consideration as the GSAs move into GSP implementation.
527	Brandon Nakagawa	SSJGSA	1.1.1	Add Ag Water Management Plans and General Plans to the list.	Mechanics - Text	Comment addressed in text.
528	Brandon Nakagawa	SSJGSA	1.1.4	Suggest mentioning that Lathrop signed on to the JPA then voluntarily withdrew citing the Basin Boundary modification approved by DWR.	Clarifying Edit	Text added to Section 1.1.4 (Agency Information).
529	Brandon Nakagawa	SSJGSA	1.1.4	Suggest referencing Memorandum of Agreement between Cal Water and County	Clarifying Edit	Comment noted. Consider for inclusion in future updates to the GSP.
530	Brandon Nakagawa	SSJGSA	1.1.4	WID reinstatement as a GSA	Mechanics - Text	Comment addressed in text.
531	Brandon Nakagawa	SSJGSA	Throughout	Replace GWA with ESJGWA	Mechanics - Text	Comment addressed in text.
532	Brandon Nakagawa	SSJGSA	1.1.4.2	Should also reference the JPA document posted to www.esjgroundwater.org	Clarifying Edit	Comment noted. Future is ESJGWA is currently unknown. Consider for future updates to the GSP.
533	Brandon Nakagawa	SSJGSA	1.1.4.3	Escalon is contracted to receive treated surface water from SSJID but has yet to install infrastructure to connect to the system.	Clarifying Edit	Edited text for SSJID in Section 1.1.4.3 (Description of Participating Agencies): SSJID in 2005 began the delivery of up to 32,000 AF/year currently (and up to 43,000 AF/year in Phase II) of treated surface water from Woodward Reservoir to the cities of Manteca, Lathrop, and Tracy for the SCWSP with Escalon to receive water in the future (Eastern San Joaquin County GBA, 2014).
534	Brandon Nakagawa	SSJGSA	1.1.4.4	Sentence should read: The ESJGWA's JPA calls out the following powers granted to GSA's by SGMA.	Mechanics - Text	Comment addressed in text.
535	Brandon Nakagawa	SSJGSA	Figure 1-4	Include DWR Subbasin Basin Numbers for San Joaquin Basin and 5-22.01	Mechanics - Text	Comment noted. DWR subbasin numbers already included in the text in Section 1.2.1.1 (Summary of Jurisdictional Areas and Other Features).
536	Brandon Nakagawa	SSJGSA	Figure 1-5	Include DWR Subbasin Basin Numbers for San Joaquin Basin and all adjacent basins.	Clarifying Edit	Comment noted. DWR subbasin numbers already included in the text in Section 1.2.1.1 (Summary of Jurisdictional Areas and Other Features).
537	Brandon Nakagawa	SSJGSA	Figure 1-6	Sac Co. and San Joaquin Co/ shades are too similar.	Clarifying Edit	Edited county colors in figure.
538	Brandon Nakagawa	SSJGSA	Figure 1-10	Call out USDA CropScape 2015 as Data source.	Clarifying Edit	Comment noted. USDA CropScape 2015 discussed in text in Section 1.2.1.1 (Summary of Jurisdictional Areas and Other Features): In the 2015 CropScape dataset, fruit and nut trees comprised 37 percent, and vineyards comprised 24 percent, of the irrigated crops in the Subbasin. Alfalfa and irrigated pasture were the next most dominant crop type, comprising 11 percent of irrigated crops in the Subbasin (USDA, 2015).
539	Brandon Nakagawa	SSJGSA	Figures 1-11 and 1-12	Call out DWR WDL as data source.	Clarifying Edit	Comment noted. DWR's WDL discussed in text in Section 1.2.1.1 (Summary of Jurisdictional Areas and Other Features).
540	Brandon Nakagawa	SSJGSA	1.2.2.1.1	Might want to call out that the Board of Supervisors of San Joaquin County also act as the Board of Supervisors of the SJCFCWCD. The SJC Public Works Department also staffs the SJCFCWCD.	Clarifying Edit	Comment noted. Consider for inclusion in future updates to the GSP.
541	Brandon Nakagawa	SSJGSA	1.2.2.1.1	Technically, the SJCFCWCD should be called out, not SJC.	Mechanics - Text	Comment noted. Change heading for Section 1.2.2.1.2 to San Joaquin County Flood Control and Water Conservation District and edited text to reflect the change.
542	Brandon Nakagawa	SSJGSA	1.2.2.1.5	Not a Technical Review Committee. Participants possessed technical expertise sch as staff and consultants representing many of the GSAs forming the ESJGWA.	Clarifying Edit	Comment noted. Edited text in Section 1.2.2.1.5 (Data Received Directly from GSAs) to remove mention of the GBA's Technical Review Committee.
543	Brandon Nakagawa	SSJGSA	1.2.2.8	replace "PVC" with "buried"	Mechanics - Text	Comment addressed in text.
544	Brandon Nakagawa	SSJGSA	1.2.3.1.8	Checking with Ripon on GP description	Clarifying Edit	Comment noted.
545	Brandon Nakagawa	SSJGSA	1.2.3.4.1	Confirm and insert that Municipal codes prohibit private supply wells.	Clarifying Edit	Comment noted. Consider for inclusion in future updates to the GSP.
546	Brandon Nakagawa	SSJGSA	1.2.4	The GP Update is complete so the opportunity to comment is actually through the discretionary approval process which includes CEQA, Planning Commission, appeals, etc.	Clarifying Edit	As the 2016 San Joaquin County General Plan update is complete, deleted the sentence from Section 1.2.4 (Additional GSP Elements) discussing it as an opportunity to comment on land use planning.
547	Brandon Nakagawa	SSJGSA	1.3.1	Delete "of"	Mechanics - Text	Comment addressed in text.

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548	Brandon Nakagawa	SSJGSA	1.3.4.3	Suggested Edit: and/or their preferred mode of communication	Mechanics - Text	Comment addressed in text.
549	Brandon Nakagawa	SSJGSA	2.2.1.1	Consistency: SJCFCWCD is the CASEGEM Entity and the SJC Public Work staffs the SJCFCWCD which is a separate legal entity.	Mechanics - Text	Edited text for consistency: SJC's monitoring well data comes from the San Joaquin County Flood Control and Water Conservation District (SJCFCWCD).
550	Brandon Nakagawa	SSJGSA	Figure 2-6	Suggest deleting figure 2-4 and reference on page 2-4.	Mechanics - Graphics	Comment noted. This figure provides the number of chloride measurements at GAMA Monitoring Sites.
551	Brandon Nakagawa	SSJGSA	Table 2-1	Suggest clarifying the numbers as the drainage area or sub-watershed area vs. watershed area. There may be some confusion as to watershed area vs sub-watershed area .	Clarifying Edit	Comment noted. Text considered clear enough in the distinction between watershed areas and the larger Subbasin.
552	Brandon Nakagawa	SSJGSA	Figure 2-8	Same comment above.	Clarifying Edit	Comment noted. Text considered clear enough in the distinction between watershed areas and the larger Subbasin.
553	Brandon Nakagawa	SSJGSA	2.1.4.3	"MWD" should be "MWH"	Mechanics - Text	Comment addressed in text.
554	Brandon Nakagawa	SSJGSA	2.2.1.2	Suggest describing measurements as Spring and Fall rather than by quarter.	Mechanics - Text	Edited text: Current groundwater elevation conditions, for the purposes of this Plan, have been characterized as First Quarter 2017 (recent seasonal high, measured in Spring 2017) and Fourth Quarter 2017 (recent seasonal low, measured in Fall 2017) groundwater elevation measurements.
555	Brandon Nakagawa	SSJGSA	2.2.9	See attached spreadsheet of polygons that have been investigated by staff and determined to be non-GDE's. The attached spreadsheet lists the reason for the determination.	Mechanics - Graphics	Commenter indicated that comment was addressed in other changes made to GDE section.
556	Brandon Nakagawa	SSJGSA	Table 2-12	See Table note 5: Reference error	Mechanics - Text	Removed unlinked reference from text.
557	Brandon Nakagawa	SSJGSA	2.3.4.3	Suggest referencing IDC in Model Report.	Clarifying Edit	Add references to Sections 2.3.4.2 and 2.3.4.3 to the model report for more detail of ESJWRM private groundwater pumping estimation: Additional details on the estimation of private groundwater pumping in ESJWRM can be found in the published model report (Appendix 2-A).
558	Brandon Nakagawa	SSJGSA	2.3.5.1	Replace with "The ESJGWA selected"	Mechanics - Text	Comment addressed in text.
559	Brandon Nakagawa	SSJGSA	2.3.5.1	Replace "…potential significant effects…" with "… a calculated increase…"	Mechanics - Text	Comment addressed in text.
560	Brandon Nakagawa	SSJGSA	2.3.5.1	Replace "…may be due to a shift to…" with "… are the result of converting from groundwater use to surface water supplies…"	Mechanics - Text	Comment addressed in text.
561	Brandon Nakagawa	SSJGSA	Table 2-16	Replace 2nd sentence in footnote 3 with : As agricultural land use continually evolves through changes in crop types and urbanization over the historical calibration, averaging of the resulting agricultural demand is less a function of water year type and rather dependent more on when in the simulation that year type fell.	Mechanics - Text	Comment addressed in text.
562	Brandon Nakagawa	SSJGSA	Table 2-16	Replace footnote 4 with: "Urban demands in the Historic Water Budget are reported values from cited sources. Averaging urban demands by year type may not explicitly depict urban growth patterns during the historical model period"	Mechanics - Text	Comment addressed in text.
563	Brandon Nakagawa	SSJGSA	2.3.5.2	Replace "basin" with "Subbasin"	Mechanics - Text	Comment addressed in text.
564	Brandon Nakagawa	SSJGSA	2.3.5.2	Ad to beginning of sentence: The analysis fixes the land use to current conditions and is based on…	Mechanics - Text	Comment addressed in text.
565	Brandon Nakagawa	SSJGSA	2.3.5.2	Replace "The almost" with "Approximately"	Mechanics - Text	Comment addressed in text.
566	Brandon Nakagawa	SSJGSA	2.3.5.2	I'm not sure what this sentence means if you've defined the current condition as 2014 land use and 2015 population	Mechanics - Text	Edited text to clarify: The current conditions scenario simulates 50 years of hydrology with conditions approximately reflective of current Subbasin management and activities.
567	Brandon Nakagawa	SSJGSA	2.3.5.4	Replace two sentences with: An important assumption made in the project water balance analysis that due to projected urban growth, agricultural acreage is expected to decrease by approximately 40,000 acres. While there is agricultural growth anticipated in the eastern areas of the Subbasin and potential conversion of existing agricultural land to permanent irrigated crops, no reliable projections were available to include in the simulation; therefore, no additional agricultural land growth was added to the projected conditions scenario.	Mechanics - Text	Comment addressed in text.
568	Brandon Nakagawa	SSJGSA	2.3.6	Replace "be impacted" with "vary due to a number of proposed management actions resulting in increased groundwater levels...". Impacted only sounds negative.	Mechanics - Text	Comment addressed in text.
569	Brandon Nakagawa	SSJGSA	2.3.7.1	an analysis was performed for the Subbasin evaluating the projected water budget with and …	Mechanics - Text	Comment addressed in text.
570	Brandon Nakagawa	SSJGSA	3.2.1.2	Delete "scenarios"	Mechanics - Text	Comment addressed in text.
571	Brandon Nakagawa	SSJGSA	3.2.1.2	Suggested re-write: Previously adopted groundwater-related panning documents were reviewed including the … These documents provided a starting point for setting minimum thresholds.	Mechanics - Text	Comment addressed in text.
572	Brandon Nakagawa	SSJGSA	3.2.1.2	The reference to Fall 1992 actually was developed as part of the 2007 IRWMP and was used as the basis for comparison in a subsequent Programmatic EIR..	Mechanics - Text	Comment noted. Though Fall 1992 was initially identified in the 2007 IRWMP as having the lowest elevations in the subbasin at that time, it was used again in the more recent 2014 IRWMP update.
573	Brandon Nakagawa	SSJGSA	3.2.1.2	Proposed re-write: The GWA Board determined that dewatering of domestic wells may be a potential is undesirable result that and could potentially be used to confirm the adequacy of the minimum threshold methodology.	Mechanics - Text	Comment addressed in text.
574	Brandon Nakagawa	SSJGSA	3.2.1.2	Suggest replacing with: A radius of 3 miles around each representative monitoring well was used to identify the 10th percentile domestic well construction depth. For representative monitoring well 03N07E21L003, a 2-mile radius was used due to variations in groundwater levels due to its proximity to the Mokelumne River. The 3-mile radii (including the 2-mile radius of monitoring well 03N07E21L003) of each representative monitoring well, includes an average of 400 domestic wells each capturing approximately 76 percent of the domestic wells in the OSWCR dataset.	Mechanics - Text	Comment addressed in text.
575	Brandon Nakagawa	SSJGSA	3.2.1.2	Consider re-write: Domestic well data obtained from the OSCWR dataset is sparsely populated with information on total casing depth, screening intervals, and the age of the well. The 10th percentile well depth was chosen due to the uncertainty in the database and to account for domestic wells that may have been drilled to a very shallow depth prior to the current well drilling standards enforced by local jurisdictions and/or have reached the end of their lifecycle. The10th percentile domestic well depth for groundwater levels is protective of 90 percent of the domestic wells in the OSCWR dataset and is used as the minimum threshold for determining if a decline in groundwater levels is significant and unreasonable under SGMA.	Mechanics - Text	Comment addressed in text.
576	Brandon Nakagawa	SSJGSA	3.2.1.2	Consider adding the OSCWR domestic well depth dataset to the Appendix.	Clarifying Edit	Comment noted. Consider for inclusion in future updates to the GSP.
577	Brandon Nakagawa	SSJGSA	3.2.2.1.1	Delete: "The undesirable result related to reduction in groundwater storage is defined in SGMA as: Significant and unreasonable reduction in groundwater storage."	Mechanics - Text	Comment addressed in text.
578	Brandon Nakagawa	SSJGSA	3.2.2.1.1	Consider replacing with "The ESJGWA has determined that an undesirable result for the reduction of groundwater storage is experienced if sustained groundwater storage volumes are too low to satisfy beneficial uses within the Subbasin over the planning and implementation horizon of this GSP."	Mechanics - Text	Comment addressed in text.
579	Brandon Nakagawa	SSJGSA	3.2.2.1.2	It is estimated that overlying pumpers have limited access equating to approximately the shallowest 23 MAF of groundwater storage in the Subbasin; therefore an undesirable result would occur if groundwater storage levels were depleted by 23 MAF.	Groundwater Storage	Language updated in the GSP to indicate 23MAF reduction as definition of undesirable result for the Reduction in Groundwater Storage sustainability indicator, rather than the subbasin having reached 30MAF remaining.

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Comment #	Commenter	Commenter Organization	Section, Figure, or Table Number	Comment	Category	Response to Comment
580	Brandon Nakagawa	SSJGSA	3.2.2.1.3	Suggested edit: Depletion of 23 MAF within the SGMA panning horizon of 2040 is highly unlikely. There would need to be an event of a catastrophic nature or prolonged and exaggerated increases in the mining of groundwater, extreme and severe drought, or other major changes in groundwater management over time could to cause a depletion of groundwater storage to a significant and unreasonable level.	Mechanics - Text	Comment addressed in text.
581	Brandon Nakagawa	SSJGSA	3.2.2.1.4	Suggest adding degradation of produced water quality from groundwater sources	Clarifying Edit	Edited text in Section 3.2.2.1.4 (Potential Effects of Undesirable Results): If groundwater levels were to reach levels causing significant and unreasonable undesirable results, effects could include degradation of produced water quality from groundwater sources; running out of fresh groundwater to access in drought years; increased cost of access; and reduction in beneficial uses, such as domestic supply and changes to agriculture.
582	Brandon Nakagawa	SSJGSA	3.2.2.2	Suggest replacing "… until storage reached 30 MAF..." with "...until storage was depleted by 23 MAF…"	Mechanics - Text	Comment addressed in text.
583	Brandon Nakagawa	SSJGSA	3.2.3.1.1	"cities" should be Cities and add SJCFCWCD	Mechanics - Text	Comment noted. No edits made to text.
584	Brandon Nakagawa	SSJGSA	3.2.3.1.2	Give examples of groundwater or water management activities that causes groundwater quality degradation.	Clarifying Edit	The ESJGWA supports the sustainable management criteria for degraded water quality. Groundwater management activities refer to non-natural sources of salinity, such as irrigation return water or movement of groundwater if due to groundwater pumping.
585	Brandon Nakagawa	SSJGSA	3.2.3.1.3	Suggest adding that increases in salinity only occurred in parts of the Subbasin	Clarifying Edit	Edited text in Section 3.2.3.1.3 (Potential Causes of Undesirable Results) to indicate that salinity is only a concern in part of the Subbasin: Within the Subbasin, there are localized concerns related to salinity along with three primary sources of salinity, as discussed in Section 2.2.4 of this GSP.
586	Brandon Nakagawa	SSJGSA	3.2.3.1.4	Replace first part of first sentence with: The potential effects of degraded groundwater quality would include:	Mechanics - Text	Comment addressed in text.
587	Brandon Nakagawa	SSJGSA	3.2.3.2	Suggested edits: A minimum threshold of 1,000 mg/L was selected based on stakeholder concerns for drinking water and agricultural beneficial uses. The minimum threshold selected by the GWA Board was also informed by stakeholder input. There was a meeting held in Fall 2018 with GSA representatives from San Joaquin County, City of Lodi, City of Manteca, City of Stockton, and Cal Water and an additional meeting with agribusiness members of the Stakeholder Workgroup.	Mechanics - Text	Comment addressed in text.
588	Brandon Nakagawa	SSJGSA	3.2.5.1.4	Replace unrecoverable with irrecoverable	Mechanics - Text	Comment addressed in text.
589	Brandon Nakagawa	SSJGSA	3.2.6.1.2	Proposed re-write: An undesirable result will have been deemed to occur if depletions resulted in an impact to a senior water right holder such as if the release of stored surface water occurred in higher frequency and volume to meet fish and wildlife requirements or a decrease in the amount of supply available for a senior water right holder including riparian diverters, or a potential reduction in acreage of groundwater dependent ecosystems.	Mechanics - Text	Comment addressed in text.
590	Brandon Nakagawa	SSJGSA	4.	Replace "GWA" with "ESJGWA"	Mechanics - Text	Comment addressed in text.
591	Brandon Nakagawa	SSJGSA	4.1.2	Suggested edit: Of the 107 wells in the broad monitoring network, 76 wells included are wells used in CASGEM…	Mechanics - Text	Comment addressed in text.
592	Brandon Nakagawa	SSJGSA	4.3.3	SJc also has a monitoring protocol and safety manual which could be referenced in the GSP and also update at a later date possibly to include data handling and database management..	Monitoring Network	Comment noted. The current monitoring protocols meet the requirements of SGMA.
593	Brandon Nakagawa	SSJGSA	4.7.3	Suggest reiterating the monitoring frequency for all well categories. Quarterly for representative wells for levels; semi-annually for broad network for levels, and both representative and broad network for water quality.	Clarifying Edit	Comment noted. Consider for inclusion in future updates to the GSP.
594	Brandon Nakagawa	SSJGSA	4.7.1	Reference also Calaveras, Stanislaus and San Joaquin Counties applicable monitoring well drilling standards.	Well Permitting	Language has been added to Section 4.7.1 (Plan to Fill Data Gaps) referencing applicable Calaveras County, Stanislaus County, and San Joaquin County monitoring well drilling standards.
595	Brandon Nakagawa	SSJGSA	5.	Replace "GWA" with "ESJGWA"	Mechanics - Text	Comment addressed in text.
596	Brandon Nakagawa	SSJGSA	Table 5-4	San Joaquin County should be San Joaquin County Flood Control and Water Conservation District	Mechanics - Text	Comment addressed in text.
597	Brandon Nakagawa	SSJGSA	6.	Replace "GWA" with "ESJGWA"	Mechanics - Text	Comment addressed in text.
598	Brandon Nakagawa	SSJGSA	6.2.6.5	The project is called the Division 9 Project	Mechanics - Text	Comment noted.
599	Brandon Nakagawa	SSJGSA	Table 6-2	Table needs an update of upcoming Important Dates	Clarifying Edit	Updated Table 6-2 with more recent dates for the various funding mechanisms.
600	Brandon Nakagawa	SSJGSA	7.	Replace "GWA" with "ESJGWA"	Mechanics - Text	Comment addressed in text.
601	Brandon Nakagawa	SSJGSA	Table 7-2	Some costs appear low. Discussions are ongoing as to governance, costs, and accountability measures. Costs should be re-estimated higher to avoid sticker shock later during implementation.	Projects and Management Actions	The cost estimates for implementation actions are conservative planning-level estimates that will be refined once additional specifics have been determined. The ESJ ESJGWA Plan Implementation Ad-Hoc Committee has been convened for this purpose and is meeting on an approximately weekly basis to actively identify next steps and form recommendations that will allow for refinement in GSP implementation cost estimates.
602	Brandon Nakagawa	SSJGSA	7.4.1	Suggest lumping the study in with Model Refinements in section 7.4.2. Also suggest study could be expanded to include other rivers.	Projects and Management Actions	The Mokelumne River Loss Project description text has been moved to Chapter 6 (Projects and Management Actions) based on direction from the ESJGWA Board provided at the September 11, 2019 Board meeting. At this time, no projects have been proposed to study other rivers in the Subbasin. However, further model refinement efforts will verify and validate model calibration at points across the subbasin.
603	Brandon Nakagawa	SSJGSA	7.9	GSP Implementation funding lacks specifics. The ESJGWA Board may wish to bolseter and affirm the funding commitment in the resolution when adopting/affirming the GSP.	Plan Implementation	The cost estimates for implementation actions are conservative planning-level estimates that will be refined once additional specifics have been determined. The ESJ ESJGWA Plan Implementation Ad-Hoc Committee has been convened for this purpose and is meeting on an approximately weekly basis to actively identify next steps and form recommendations that will allow for refinement in GSP implementation cost estimates.
604	Stockton East Water District	Stockton East Water District GSA	Section 1.2.2.4	This sentence does not make sense. Suggest revision to: "There has been no documented subsidence reported within the Eastern San Joaquin Subbasin."	Mechanics - Text	Comment addressed through edits to text in response to another comment.
605	Stockton East Water District	Stockton East Water District GSA	Section 1.2.3.4.1`	A more accurate statement would be "San Joaquin County has established water well standards for new wells that define property line setbacks . . . ETC." as these requirements apply only to new wells.	Mechanics - Text	Comment addressed in text.
606	Stockton East Water District	Stockton East Water District GSA	Section 2.3.4.1	This is not entirely accurate, streamflows entering the subbasin do induce regulated releases from respective reservoirs, but also include inflow from unregulated streams downstream of regulating reservoirs. This should be noted.	Clarifying Edit	Deleted sentence in Section 2.3.4.1 (Assumptions Used in the Historical Water Budget) to remove confusion and clarified text: Upstream reservoirs regulating streamflows into the Subbasin include Pardee and Camanche on the Mokelumne River; New Hogan on the Calaveras River; and New Melones, Tulloch, and Goodwin on the Stanislaus River. As reservoir releases are regulated, no changes to the historical operations of the reservoirs are assumed.
607	Stockton East Water District	Stockton East Water District GSA	Section 2.3.4.1	Stockton East Water District should be included in the list of districts with riparian diversions off major streams.	Clarifying Edit	Data from C2VSim for Calaveras River riparian diversions includes those diversions going to SEWD.
608	Stockton East Water District	Stockton East Water District GSA	Section 2.3.4.1	Data on private pumping is available from Stockton East Water District, was provided to the consultant, and is more accurate that that calculated by the consumptive use methodology.	Water Budget	Comment noted for follow up in next round of model refinements. Added text to Section 2.3.4.1 to clarify that private groundwater pumping was estimated the same way across the subbasin for consistency: Data on private pumping was not available on a consistent basis across the model, so private pumping was estimated as that which would be required to meet agricultural and rural residential water needs as calculated by the ESJWRM model based on consumptive use methodology (Refer to the ESJWRM documentation for details).

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609	Stockton East Water District	Stockton East Water District GSA	Section 2.3.4.2	The cited stream flow data does not include inflow into the Calaveras River below New Hogan Dam, including Cosgrove Creek and others. Similarly, the data list does not include flow for other nonregulated reservoirs in the watershed.	Water Budget	Streams simulated directly in ESJWRM include Dry Creek, Mokelumne River, Calaveras River, Stanislaus River, and San Joaquin River. All other stream flows, including tributaries to these streams, are estimated in the model. If any of these tributaries have long-term flow data available, they may be considered for direct simulation in future updates to the model.
610	Stockton East Water District	Stockton East Water District GSA	Section 2.3.4.2	Stockton East Water District should be included in the list of districts with riparian diversions off major streams.	Clarifying Edit	Data from C2VSim for Calaveras River riparian diversions includes those diversions going to SEWD.
611	Stockton East Water District	Stockton East Water District GSA	Section 2.3.4.2	Data on private pumping is available from Stockton East Water District, was provided to the consultant, and is more accurate that that calculated by the consumptive use methodology.	Water Budget	Comment noted for follow up in next round of model refinements. Added text to Section 2.3.4.2 to clarify that private groundwater pumping was estimated the same way across the subbasin for consistency: As private groundwater pumping was estimated by ESJWRM in the historical calibration, there is no local estimate of current private groundwater pumping available on a consistent basis across the model.
612	Stockton East Water District	Stockton East Water District GSA	Section 2.3.4.3	Stockton East Water District should be included in the list of districts with riparian diversions off major streams.	Clarifying Edit	Data from C2VSim for Calaveras River riparian diversions includes those diversions going to SEWD.
613	Stockton East Water District	Stockton East Water District GSA	Section 2.3.4.3	Data on private pumping is available from Stockton East Water District, was provided to the consultant, and is more accurate that that calculated by the consumptive use methodology.	Water Budget	Comment noted for follow up in next round of model refinements. Added text to Section 2.3.4.2 to clarify that private groundwater pumping was estimated the same way across the subbasin for consistency: As private groundwater pumping was estimated by ESJWRM in the historical calibration, there is no local estimate of projected private groundwater pumping available on a consistent basis across the model.
614	Stockton East Water District	Stockton East Water District GSA	Section 6.2.4.2	More accurately, these are existing surface water entitlements under contract.	Clarifying Edit	Comment noted.
615	Stockton East Water District	Stockton East Water District GSA	Section 6.2.4.6	Grammatical correction - the word "a" should be deleted before the word "streambed."	Mechanics - Text	Comment addressed in text.
616	Stockton East Water District	Stockton East Water District GSA	Section 7.9	The sentence should be rewritten to state: "Prior to implementing any fee or assessment program, the GSAs would complete a rate assessment study or other analysis if required by consistent with the regulatory requirements."	Clarifying Edit	Edited text in Section 7.9 (GSP Implementation Funding): Prior to implementing any fee or assessment program, the GSAs would complete a rate assessment study or other analysis if required by the regulatory requirements.
617	Stockton East Water District	Stockton East Water District GSA	Table 7-4	In the first and third boxes under "Certainty" the Proposition 218 process should be qualified with "if applicable."	Clarifying Edit	Comment addressed in text.
618	Martin Harris	Terra Land Group, LLC		Any water sustainability plan to be considered must take into consideration that many farmers are abandoning lower-priced crops like alfalfa and silage corn to seek higher-priced food crops that may be less tolerant to the salinity levels typical of recycled water (See Project 19/Manteca Recycled Water Project as described on pages 6-28 and 6-29 of the GSP) [SEE MORE SPECIFICS IN COMMENT LETTER]	Groundwater Quality	The ESJGWA considers minimum thresholds and measurable objectives for groundwater quality to be protective of agricultural uses. During GSP development, GSAs provided anticipated future crop type information for assessment with a general consensus that uncertainty in market demands is too high to consider future crop types into land use estimates. Language was added in Section 3.2.3.2 (Degraded Water Quality Minimum Thresholds) to include information on salinity tolerances of Subbasin crops.
619	Martin Harris	Terra Land Group, LLC		Open canals currently being utilized in the sandy area of the sub-basin must by properly managed and maintained to offset the potential effects of sedimentation and erosion. [SEE MORE SPECIFICS IN COMMENT LETTER]	Flood Risk	This has been noted as a future item for consideration as the GSAs move into GSP implementation.
620	Martin Harris	Terra Land Group, LLC		TLG believes that channel flow deficiencies and back-water effects in and along the South Delta need to be fully considered and mitigated as part of any GSP to be considered. [SEE MORE SPECIFICS IN COMMENT LETTER]	Flood Risk	There are several ongoing efforts in the Subbasin for stormwater and flood work, including through regional flood control agencies as well as planning and implementation activities. The San Joaquin Area Flood Control Agency (SJAFCA) covers San Joaquin County with the exception of a few select city areas and aims to address flood protection in the area it covers. Projects SJAFCA has worked on include flood walls, levees, detention basins, and other flood control improvements. SB 985 (Water Code section 10563, subdivision (c)(1)), requires a Storm Water Resource Plan as a condition of receiving funds for storm water and dry weather runoff capture projects from any bond approved by voters after January 2014. SWRPs are intended to develop multiple benefit projects for upcoming funding opportunities. SWRP projects can include benefits such as improved storm drainage, reduced impervious surfaces, flood protection, etc. Areas in the Subbasin have developed stormwater management plans and programs, including the City of Stockton and City of Manteca.
621	Martin Harris	Terra Land Group, LLC		The uncertainties as detailed on pages 2-134 and 2-151 of the GSP appear to be especially important when considering Section 6.2.6.6 of the GSP describes project #23 (SSJID Storm Water Reuse) which may find it difficult to drain any and all potential storm water drainage flows to be created along and through the South San Joaquin Irrigation District ("SSJID") distribution system to the San Joaquin River via the French Camp Outlet Canal. (See page 6-32 of the GSP). TLG also believes that SSJID drainage into the San Joaquin River may also prove problematic at other San Joaquin River outlet locations currently being considered. [SEE MORE SPECIFICS IN COMMENT LETTER]	Flood Risk	There are several ongoing efforts in the Subbasin for stormwater and flood work, including through regional flood control agencies as well as planning and implementation activities. The San Joaquin Area Flood Control Agency (SJAFCA) covers San Joaquin County with the exception of a few select city areas and aims to address flood protection in the area it covers. Projects SJAFCA has worked on include flood walls, levees, detention basins, and other flood control improvements. SB 985 (Water Code section 10563, subdivision (c)(1)), requires a Storm Water Resource Plan as a condition of receiving funds for storm water and dry weather runoff capture projects from any bond approved by voters after January 2014. SWRPs are intended to develop multiple benefit projects for upcoming funding opportunities. SWRP projects can include benefits such as improved storm drainage, reduced impervious surfaces, flood protection, etc. Areas in the Subbasin have developed stormwater management plans and programs, including the City of Stockton and City of Manteca.
622	Martin Harris	Terra Land Group, LLC		What drainage and backwater effects may be created in conjunction with GSP Projects #19, 22, and 23? …. TLG believes that this can only be accomplished by putting an end to the continuing delays and immediately performing a full and comprehensive environmental review. This should be performed in conjunction with an updated general plan and related environmental justice element that fully considers and mitigates for the growing storm water, waste water, potable water, irrigation water, transportation, and transit needs affecting the areas in and along the South Delta. [SEE MORE SPECIFICS IN COMMENT LETTER]	Flood Risk	There are several ongoing efforts in the Subbasin for stormwater and flood work, including through regional flood control agencies as well as planning and implementation activities. The San Joaquin Area Flood Control Agency (SJAFCA) covers San Joaquin County with the exception of a few select city areas and aims to address flood protection in the area it covers. Projects SJAFCA has worked on include flood walls, levees, detention basins, and other flood control improvements. SB 985 (Water Code section 10563, subdivision (c)(1)), requires a Storm Water Resource Plan as a condition of receiving funds for storm water and dry weather runoff capture projects from any bond approved by voters after January 2014. SWRPs are intended to develop multiple benefit projects for upcoming funding opportunities. SWRP projects can include benefits such as improved storm drainage, reduced impervious surfaces, flood protection, etc. Areas in the Subbasin have developed stormwater management plans and programs, including the City of Stockton and City of Manteca.
623	Martin Harris	Terra Land Group, LLC		How will what appears to be a very real potential for unresolved and continuing sedimentation and climate change issues in and along the South Delta be considered and allowed for in the final Mossdale Tract Drainage Plan? [SEE MORE SPECIFICS IN COMMENT LETTER]	Flood Risk	There are several ongoing efforts in the Subbasin for stormwater and flood work, including through regional flood control agencies as well as planning and implementation activities. The San Joaquin Area Flood Control Agency (SJAFCA) covers San Joaquin County with the exception of a few select city areas and aims to address flood protection in the area it covers. Projects SJAFCA has worked on include flood walls, levees, detention basins, and other flood control improvements. SB 985 (Water Code section 10563, subdivision (c)(1)), requires a Storm Water Resource Plan as a condition of receiving funds for storm water and dry weather runoff capture projects from any bond approved by voters after January 2014. SWRPs are intended to develop multiple benefit projects for upcoming funding opportunities. SWRP projects can include benefits such as improved storm drainage, reduced impervious surfaces, flood protection, etc. Areas in the Subbasin have developed stormwater management plans and programs, including the City of Stockton and City of Manteca.
624	Martin Harris	Terra Land Group, LLC		How can local, regional, state, and federal authorities work closer together to create an updated water plan that provides water deliveries at the local, regional, and state level while protecting the urban and rural areas along the South Delta from any increases to flood water, storm water, waste water, and other hydrology-related impacts that may be created? [SEE MORE SPECIFICS IN COMMENT LETTER]	Flood Risk	There are several ongoing efforts in the Subbasin for stormwater and flood work, including through regional flood control agencies as well as planning and implementation activities. The San Joaquin Area Flood Control Agency (SJAFCA) covers San Joaquin County with the exception of a few select city areas and aims to address flood protection in the area it covers. Projects SJAFCA has worked on include flood walls, levees, detention basins, and other flood control improvements. SB 985 (Water Code section 10563, subdivision (c)(1)), requires a Storm Water Resource Plan as a condition of receiving funds for storm water and dry weather runoff capture projects from any bond approved by voters after January 2014. SWRPs are intended to develop multiple benefit projects for upcoming funding opportunities. SWRP projects can include benefits such as improved storm drainage, reduced impervious surfaces, flood protection, etc. Areas in the Subbasin have developed stormwater management plans and programs, including the City of Stockton and City of Manteca.

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625	Martin Harris	Terra Land Group, LLC		What effect will the Daniels Street extension have on stormwater drainage flows currently being drained in and along the French Camp Outlet Canal? [SEE MORE SPECIFICS IN COMMENT LETTER]	Flood Risk	There are several ongoing efforts in the Subbasin for stormwater and flood work, including through regional flood control agencies as well as planning and implementation activities. The San Joaquin Area Flood Control Agency (SJAFCA) covers San Joaquin County with the exception of a few select city areas and aims to address flood protection in the area it covers. Projects SJAFCA has worked on include flood walls, levees, detention basins, and other flood control improvements. SB 985 (Water Code section 10563, subdivision (c)(1)), requires a Storm Water Resource Plan as a condition of receiving funds for storm water and dry weather runoff capture projects from any bond approved by voters after January 2014. SWRPs are intended to develop multiple benefit projects for upcoming funding opportunities. SWRP projects can include benefits such as improved storm drainage, reduced impervious surfaces, flood protection, etc. Areas in the Subbasin have developed stormwater management plans and programs, including the City of Stockton and City of Manteca.
626	Martin Harris	Terra Land Group, LLC		What effect will the proposed formation of the San Joaquin County Flood Control & Water Conservation District ("SJCFCWCD") Zone 9 Flood Conveyance and Levee Maintenance Benefit Assessment District (and related projects) have on changing drainage patterns and associated outfall locations currently existing and relied upon by the South San Joaquin Irrigation District and its members? [SEE MORE SPECIFICS IN COMMENT LETTER]	Flood Risk	There are several ongoing efforts in the Subbasin for stormwater and flood work, including through regional flood control agencies as well as planning and implementation activities. The San Joaquin Area Flood Control Agency (SJAFCA) covers San Joaquin County with the exception of a few select city areas and aims to address flood protection in the area it covers. Projects SJAFCA has worked on include flood walls, levees, detention basins, and other flood control improvements. SB 985 (Water Code section 10563, subdivision (c)(1)), requires a Storm Water Resource Plan as a condition of receiving funds for storm water and dry weather runoff capture projects from any bond approved by voters after January 2014. SWRPs are intended to develop multiple benefit projects for upcoming funding opportunities. SWRP projects can include benefits such as improved storm drainage, reduced impervious surfaces, flood protection, etc. Areas in the Subbasin have developed stormwater management plans and programs, including the City of Stockton and City of Manteca.
627	Martin Harris	Terra Land Group, LLC		What effect will filing and/or extending an Exclusive Negotiating Agreement for the Recycled Water Project have on sustaining total potable and irrigation water (i.e.. groundwater and surface water) volumes available to the urban and rural areas in and around Lathrop and Manteca? [SEE MORE SPECIFICS IN COMMENT LETTER]	Projects and Management Actions	SGMA looks at the basin-scale. Project impacts will be evaluated; it is the GSA's responsibility to meet project-level environmental regulations. CEQA compliance will be done at the GSA level.
628	Martin Harris	Terra Land Group, LLC		What short term and/or long range changes to flood water, storm water, waste water, potable and irrigation water delivery, and other hydrology related drainage and conveyance patterns may be irreversibly altered due to approval of the proposed Raymus Expressway roadway alignment as detailed in the 5/22/19 Manteca General Plan Land Use Alternative Maps "A" or "B"? [SEE MORE SPECIFICS IN COMMENT LETTER]	Flood Risk	There are several ongoing efforts in the Subbasin for stormwater and flood work, including through regional flood control agencies as well as planning and implementation activities. The San Joaquin Area Flood Control Agency (SJAFCA) covers San Joaquin County with the exception of a few select city areas and aims to address flood protection in the area it covers. Projects SJAFCA has worked on include flood walls, levees, detention basins, and other flood control improvements. SB 985 (Water Code section 10563, subdivision (c)(1)), requires a Storm Water Resource Plan as a condition of receiving funds for storm water and dry weather runoff capture projects from any bond approved by voters after January 2014. SWRPs are intended to develop multiple benefit projects for upcoming funding opportunities. SWRP projects can include benefits such as improved storm drainage, reduced impervious surfaces, flood protection, etc. Areas in the Subbasin have developed stormwater management plans and programs, including the City of Stockton and City of Manteca.
629	Martin Harris	Terra Land Group, LLC		Will drainage impacts in and along the South Delta be reduced or adversely affected due to any future improvements to be considered in association with the Upper Jones Tract (RD 2039)/Lower Jones Tract (RD 2038) consolidation? [SEE MORE SPECIFICS IN COMMENT LETTER]	Flood Risk	There are several ongoing efforts in the Subbasin for stormwater and flood work, including through regional flood control agencies as well as planning and implementation activities. The San Joaquin Area Flood Control Agency (SJAFCA) covers San Joaquin County with the exception of a few select city areas and aims to address flood protection in the area it covers. Projects SJAFCA has worked on include flood walls, levees, detention basins, and other flood control improvements. SB 985 (Water Code section 10563, subdivision (c)(1)), requires a Storm Water Resource Plan as a condition of receiving funds for storm water and dry weather runoff capture projects from any bond approved by voters after January 2014. SWRPs are intended to develop multiple benefit projects for upcoming funding opportunities. SWRP projects can include benefits such as improved storm drainage, reduced impervious surfaces, flood protection, etc. Areas in the Subbasin have developed stormwater management plans and programs, including the City of Stockton and City of Manteca.
630	Martin Harris	Terra Land Group, LLC		Are local authorities aware that SSJID Drain #11, in its present form, has deviated from a course that appears to be called for in Enclosure 16? [SEE MORE SPECIFICS IN COMMENT LETTER]	Flood Risk	There are several ongoing efforts in the Subbasin for stormwater and flood work, including through regional flood control agencies as well as planning and implementation activities. The San Joaquin Area Flood Control Agency (SJAFCA) covers San Joaquin County with the exception of a few select city areas and aims to address flood protection in the area it covers. Projects SJAFCA has worked on include flood walls, levees, detention basins, and other flood control improvements. SB 985 (Water Code section 10563, subdivision (c)(1)), requires a Storm Water Resource Plan as a condition of receiving funds for storm water and dry weather runoff capture projects from any bond approved by voters after January 2014. SWRPs are intended to develop multiple benefit projects for upcoming funding opportunities. SWRP projects can include benefits such as improved storm drainage, reduced impervious surfaces, flood protection, etc. Areas in the Subbasin have developed stormwater management plans and programs, including the City of Stockton and City of Manteca.
631	Martin Harris	Terra Land Group, LLC		Will any and all flow impedances and back water effects be considered as part of any drainage analysis to be performed? (See Enclosures 14 & 15) [SEE MORE SPECIFICS IN COMMENT LETTER]	Flood Risk	There are several ongoing efforts in the Subbasin for stormwater and flood work, including through regional flood control agencies as well as planning and implementation activities. The San Joaquin Area Flood Control Agency (SJAFCA) covers San Joaquin County with the exception of a few select city areas and aims to address flood protection in the area it covers. Projects SJAFCA has worked on include flood walls, levees, detention basins, and other flood control improvements. SB 985 (Water Code section 10563, subdivision (c)(1)), requires a Storm Water Resource Plan as a condition of receiving funds for storm water and dry weather runoff capture projects from any bond approved by voters after January 2014. SWRPs are intended to develop multiple benefit projects for upcoming funding opportunities. SWRP projects can include benefits such as improved storm drainage, reduced impervious surfaces, flood protection, etc. Areas in the Subbasin have developed stormwater management plans and programs, including the City of Stockton and City of Manteca.
632	Martin Harris	Terra Land Group, LLC		For what purpose are San Joaquin County land use and/or zoning reclassifications in and along the South Delta being considered? (See Enclosure 17) [SEE MORE SPECIFICS IN COMMENT LETTER]	Projects and Management Actions	Some of the more specific processes can be addressed through land use decision making processes. There is a SGMA requirement to coordinate in land use policy development, and GSAs will comply with the requirement to coordinate with land use development partners.
633	Martin Harris	Terra Land Group, LLC		If the French Camp Outlet Canal (FCOC) is abandoned or no longer able to accept drainage flows from the developing areas of Zone 34, where will Zone 34 storm water be drained to? [SEE MORE SPECIFICS IN COMMENT LETTER]	Flood Risk	There are several ongoing efforts in the Subbasin for stormwater and flood work, including through regional flood control agencies as well as planning and implementation activities. The San Joaquin Area Flood Control Agency (SJAFCA) covers San Joaquin County with the exception of a few select city areas and aims to address flood protection in the area it covers. Projects SJAFCA has worked on include flood walls, levees, detention basins, and other flood control improvements. SB 985 (Water Code section 10563, subdivision (c)(1)), requires a Storm Water Resource Plan as a condition of receiving funds for storm water and dry weather runoff capture projects from any bond approved by voters after January 2014. SWRPs are intended to develop multiple benefit projects for upcoming funding opportunities. SWRP projects can include benefits such as improved storm drainage, reduced impervious surfaces, flood protection, etc. Areas in the Subbasin have developed stormwater management plans and programs, including the City of Stockton and City of Manteca.
634	Martin Harris	Terra Land Group, LLC		What effect will any public facility/infrastructure rehabilitation or improvement projects in and along Little Johns Creek have on the continued operation of the FCOC as well as other upstream and downstream areas to be affected? [SEE MORE SPECIFICS IN COMMENT LETTER]	Projects and Management Actions	SGMA looks at the basin-scale. Project impacts will be evaluated; it is the GSA's responsibility to meet project-level environmental regulations. CEQA compliance will be done at the GSA level.

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Comment #	Commenter	Commenter Organization	Section, Figure, or Table Number	Comment	Category	Response to Comment
635	Martin Harris	Terra Land Group, LLC		Are the effects of climate change and unresolved sedimentation issues along the South Delta being fully considered while making the assumption that the water surface elevation in the San Joaquin River at the railroad bridge crossing near the Oakwood Lake Water District storm drain outfall is: (a) 20.6 feet for a 10-year event; (b) 28.0 feet for a 100-year event; (c) 29.0 feet for a 200-year event. [SEE MORE SPECIFICS IN COMMENT LETTER]	Flood Risk	SGMA looks at the basin-scale. Project impacts will be evaluated; it is the GSA's responsibility to meet project-level environmental regulations. CEQA compliance will be done at the GSA level.
636	Martin Harris	Terra Land Group, LLC		In the event of a right bank San Joaquin River or Stanislaus River levee breach, how will flood waters be drained from the urbanizing and non-urbanizing areas south of Manteca? [SEE MORE SPECIFICS IN COMMENT LETTER]	Flood Risk	There are several ongoing efforts in the Subbasin for stormwater and flood work, including through regional flood control agencies as well as planning and implementation activities. The San Joaquin Area Flood Control Agency (SJAFCA) covers San Joaquin County with the exception of a few select city areas and aims to address flood protection in the area it covers. Projects SJAFCA has worked on include flood walls, levees, detention basins, and other flood control improvements. SB 985 (Water Code section 10563, subdivision (c)(1)), requires a Storm Water Resource Plan as a condition of receiving funds for storm water and dry weather runoff capture projects from any bond approved by voters after January 2014. SWRPs are intended to develop multiple benefit projects for upcoming funding opportunities. SWRP projects can include benefits such as improved storm drainage, reduced impervious surfaces, flood protection, etc. Areas in the Subbasin have developed stormwater management plans and programs, including the City of Stockton and City of Manteca.
637	Martin Harris	Terra Land Group, LLC		When considering the magnitude of 100-year, 200-year, or other periodic levels of flood events that are expected to occur, isn't it likely that water elevations (NAV D88 datum) on the land side (east of the San Joaquin River in the areas south of Manteca) could exceed the 29'-0" elevation as forecasted in the Request for Proposal? [SEE MORE SPECIFICS IN COMMENT LETTER]	Flood Risk	There are several ongoing efforts in the Subbasin for stormwater and flood work, including through regional flood control agencies as well as planning and implementation activities. The San Joaquin Area Flood Control Agency (SJAFCA) covers San Joaquin County with the exception of a few select city areas and aims to address flood protection in the area it covers. Projects SJAFCA has worked on include flood walls, levees, detention basins, and other flood control improvements. SB 985 (Water Code section 10563, subdivision (c)(1)), requires a Storm Water Resource Plan as a condition of receiving funds for storm water and dry weather runoff capture projects from any bond approved by voters after January 2014. SWRPs are intended to develop multiple benefit projects for upcoming funding opportunities. SWRP projects can include benefits such as improved storm drainage, reduced impervious surfaces, flood protection, etc. Areas in the Subbasin have developed stormwater management plans and programs, including the City of Stockton and City of Manteca.
638	Martin Harris	Terra Land Group, LLC		What facilities and other actions are planned to safeguard and protect our local urban and rural communities against the unplanned release of right bank San Joaquin River levee breach flood waters that historically accumulate and rise in height against the South Manteca portion of the RD 17 dryland cross levee? [SEE MORE SPECIFICS IN COMMENT LETTER]	Flood Risk	There are several ongoing efforts in the Subbasin for stormwater and flood work, including through regional flood control agencies as well as planning and implementation activities. The San Joaquin Area Flood Control Agency (SJAFCA) covers San Joaquin County with the exception of a few select city areas and aims to address flood protection in the area it covers. Projects SJAFCA has worked on include flood walls, levees, detention basins, and other flood control improvements. SB 985 (Water Code section 10563, subdivision (c)(1)), requires a Storm Water Resource Plan as a condition of receiving funds for storm water and dry weather runoff capture projects from any bond approved by voters after January 2014. SWRPs are intended to develop multiple benefit projects for upcoming funding opportunities. SWRP projects can include benefits such as improved storm drainage, reduced impervious surfaces, flood protection, etc. Areas in the Subbasin have developed stormwater management plans and programs, including the City of Stockton and City of Manteca.
639	Chris Thomas cthomas@thefreshwatertrust.org /northerndeltagsa@gmail.com	Northern Delta Sustainability Agency/NDGSA Associate Member Staten Island-Conservation Farms and Ranches	Public and Agency Comment Disposition/Coordination	The Groundwater Sustainability Plan ("GSP") development process could be improved with greater integration of public comments into the GSP. Specifically, there should be a disposition process for both oral and written comments. In addition, engagement and coordination with adjacent agencies/ subbasins should be clearly documented. The subbasin planning processes in our region will benefit from greater coordination, and doing so will be essential to completing successful GSPs.	Outreach	This has been noted as a future item for consideration as the GSAs move into GSP implementation.
640	Chris Thomas cthomas@thefreshwatertrust.org /northerndeltagsa@gmail.com	Northern Delta Sustainability Agency/NDGSA Associate Member Staten Island-Conservation Farms and Ranches	2.1.10 HCM Data Gaps	The draft GSP has significant and critical gaps in understanding of conditions, which contributes to inadequate modeling. The data gaps identified in the draft GSP include the following: —Water quality of principal aquifers —Aquifer characteristics —Groundwater Level Data —Groundwater Quality Data —Subsurface Conditions This extensive list of missing data indicates that the technical fundamentals of the subbasin's hydrologic and water quality are absent, that the ongoing lack of data collection and analysis is problematic, and calls into question the basis for establishing reliable and defensible thresholds.	Model Uncertainties	The HCM data gaps identified in the GSP are areas where sufficient data was either unavailable or nonexistent at the time the GSP was put together and the model was calibrated. The model will continue to be refined with every update to the GSP and as data becomes available to fill in any data gaps.
641	Chris Thomas cthomas@thefreshwatertrust.org /northerndeltagsa@gmail.com	Northern Delta Sustainability Agency/NDGSA Associate Member Staten Island-Conservation Farms and Ranches	Proposed Monitoring Well Network	To rectify data gaps, a concerted program to resolve data gaps should be developed, funded and implemented. Further, these data gaps preclude the ability to track consistency with the GSP, and ultimately to ensure sustainability. furthermore, there are significant defects in the GSPs proposed monitoring approach.	Monitoring Network	The ESJGWA is committed to resolving the data gaps identified during the GSP development process. The Prop 68 funds are designed to help address identified data gaps and the current application focuses on groundwater flow in the northwestern portion of the Subbasin with plans for additional monitoring wells in that area. As discussed in Section 7.6.4 (Monitoring Network Description), a program may be developed for the GSP update to help fill new or remaining data gaps.
642	Chris Thomas cthomas@thefreshwatertrust.org /northerndeltagsa@gmail.com	Northern Delta Sustainability Agency/NDGSA Associate Member Staten Island-Conservation Farms and Ranches		Sampling frequency was reduced to 2 events a year for 'representative' monitoring wells. This seems far too infrequent, given the DWR documented 'critically over-drafted' basin condition, existing cones of depression, and the limited number of monitoring wells proposed . (Discussed at July 10, 2019 GWA Board Meeting.) DWR has identified that the well sampling frequency should be based on groundwater conditions and hydrogeologic understanding. https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Sustainable-Groundwater-Management/Best-Management-Practices-and-Guidance-Documents/Files/BMP-2-Monitoring-Networks-and-Identification-of-Data-Gaps.pdf	Monitoring Network	Frequency of groundwater level monitoring is cited in the Draft Monitoring Networks and Identification of Data Gaps Best Management Practice. While semi-annual monitoring is required for groundwater levels, DWR guidance recommends monthly sampling of groundwater levels for the Subbasin based on aquifer type, volume of long-term aquifer withdrawals, and recharge potential. The ESJGWA Board determined semi-annual sampling was appropriate as it will capture seasonal highs and lows and that additional monitoring would not necessarily provide additional information on trends. If a need for more frequent monitoring is recognized, the monitoring frequency will be reevaluated as updates to the GSP occur.
643	Chris Thomas cthomas@thefreshwatertrust.org /northerndeltagsa@gmail.com	Northern Delta Sustainability Agency/NDGSA Associate Member Staten Island-Conservation Farms and Ranches		The draft GSP approach in number, location and frequency of sampling of wells appears to be inconsistent with the DWR BMPs. Generally, there are too few wells, and they are spatially dispersed outside of the cone(s) of depression over a very large subbasin, and limited sampling frequency will make it difficult to track the sustainability criteria and associated thresholds, the effectiveness of the GSP, and to begin to detect impacts to Groundwater Dependent Ecosystems (GDEs).	Monitoring Network	The ESJGWA Board supports the inclusion of the monitoring network as presented and approved it in July 2019. If a need for more detail is recognized, the monitoring network will be reevaluated as updates to the GSP occur. Data gaps are discussed in Section 4.7 (Data Gaps) and include a plan for the drilling of up to 12 additional monitoring wells to help resolve identified gaps in well locations. Frequency of groundwater level monitoring is cited in the Draft Monitoring Networks and Identification of Data Gaps Best Management Practice. While semi-annual monitoring is required for groundwater levels, DWR guidance recommends monthly sampling of groundwater levels for the Subbasin based on aquifer type, volume of long-term aquifer withdrawals, and recharge potential. The ESJGWA Board determined semi-annual sampling was appropriate as it will capture seasonal highs and lows and that additional monitoring would not necessarily provide additional information on trends.
644	Chris Thomas cthomas@thefreshwatertrust.org /northerndeltagsa@gmail.com	Northern Delta Sustainability Agency/NDGSA Associate Member Staten Island-Conservation Farms and Ranches	Figure 2-37	Only one large cone of depression, an area of significantly reduced water table elevation, is identified in the GSP. This singular feature differs from previous analyses in the Cosumnes and South American subbasins; and, the degree of resolution of the data presented makes it difficult to tell if there are one or more distinct cones in the central part of the subbasin, but in any case the model shows depletion along Staten Island.	Basin Setting	Added text to Section 2.2.1.2 (Current Groundwater Conditions) referencing the localized depression forming across the Cosumnes-Eastern San Joaquin Subbasin boundary and clarifying that the central depression in the Subbasin is most significant to achieving sustainability in the Subbasin: A localized depression area is shown expanding from Cosumnes Subbasin across Dry Creek to Eastern San Joaquin Subbasin in Fourth Quarter 2017. However, from the perspective of the entire Eastern San Joaquin Subbasin, the central pumping depression east of the City of Stockton is most significant to achieving sustainability in the Subbasin.

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645	Chris Thomas cthomas@thefreshwatertrust.org /northerndeltagsa@gmail.com	Northern Delta Sustainability Agency/NDGSA Associate Member Staten Island-Conservation Farms and Ranches	Figure 2-37 Figure 2-38,	The model(s) appear to show groundwater elevation declines in the Delta, including Staten Island. These data need further investigation since that condition seems unlikely and not supported by DWR and other groundwater elevation analyses. ESJ consultants were asked to explain why there were so many apparent discontinuities from the adjacent subbasin documented depressions, and the apparent errors in reporting of groundwater elevations in the Delta. For example, there are inexplicably irregular patterns of groundwater elevations shown for the Delta. The response was that the model itself had some challenges in development and that stakeholders could ignore those results. There is apparently limited quality control in the modeling effort, and erroneous results were not identified in the draft GSP. To the extent the GSP continues to rely on this modeling, it should identify where and how the data is not considered accurate. Or, if there are significant caveats, how and where those apply.	Model Uncertainties	Groundwater conditions in the Delta area are not depressed and are not contributing to the overall groundwater issues in the Subbasin. During the development of the model there was not sufficient data in terms of groundwater usage and/or long-term trends in groundwater levels that would support detailed calibration of the model in the Delta area. Therefore, in consultation with the stakeholders representing the Delta area, the level of effort in calibrating the model for that area was minimized and more effort was put into the calibration of the central portion of the Subbasin. Depending on the quality of additional data that could become available, further refinements in calibration could be performed during the next round of model refinements.
646	Chris Thomas cthomas@thefreshwatertrust.org /northerndeltagsa@gmail.com	Northern Delta Sustainability Agency/NDGSA Associate Member Staten Island-Conservation Farms and Ranches	Sections 3.4-9	At the July 10, 2019 GWA Board Meeting, the consultants discussed use of The Nature Conservancy-initiated GDE assessment approach, "somewhat," but that in any case that their analysis was "consistent." The approach to GDEs should be clearly disclosed in the GSP.	GDEs	Section 2.2.7.1 (Methodology for GDE Identification) was updated to better articulate the methodology used and the describe data gaps within the NCCAG dataset.
647	Chris Thomas cthomas@thefreshwatertrust.org /northerndeltagsa@gmail.com	Northern Delta Sustainability Agency/NDGSA Associate Member Staten Island-Conservation Farms and Ranches	Figure 3-64 Figure 3-65	Similarly, Interconnected Surface Waters (ISW) analysis in the draft GSP shows portions the sloughs as being variously 'always losing' and 'always gaining' around the perimeter of Staten Island. Yet, these gaining sections (all at or below sea level) are further identified 'disconnected' from the groundwater system. When asked about this obvious error in groundwater depletion modeling below sea level for several streams and Delta sloughs, the staff response was that it appears to be a modeling calibration error. It seems unlikely that these data were reviewed before publication. If they were reviewed, it would be expected that the text of the draft GSP would explain why it was incorrect or uncertain and how that was being resolved. This discrepancy raises concerns about the quality and the reliability of the GDE and ISW analyses.	Model Uncertainties	See Master Response 2 - ISW.
648	Chris Thomas cthomas@thefreshwatertrust.org /northerndeltagsa@gmail.com	Northern Delta Sustainability Agency/NDGSA Associate Member Staten Island-Conservation Farms and Ranches		The draft GSP has set water quality standards for salinity intrusion that appear inconsistent with meeting environmental and agricultural beneficial uses, and protecting crops from yield losses associated with cumulative impacts of salinity. The GSP sets the isocontour line for reporting at 500 mg/L, ostensibly "same as Secondary Maximum Contaminant Level (SMCL) for chloride." (P. 12 July 10, 2019 GWA Board Meeting.) The Chloride SMCL set by the USEPA is 250 mg/L: https://www.epa.gov/dwregdev/drinking-water-regulations-and-contaminants https://www.epa.gov/sites/production/files/2018-03/documents/dwtable2018.pdf	Seawater Intrusion	The seawater intrusion chloride isocontour is intended to monitor for a seawater intrusion front. Harm related to agricultural crops, as well as drinking water supplies is address through the Degraded Water Quality Sustainability Indicator.
649	Chris Thomas cthomas@thefreshwatertrust.org /northerndeltagsa@gmail.com	Northern Delta Sustainability Agency/NDGSA Associate Member Staten Island-Conservation Farms and Ranches		The SMCL for Total Dissolved Solids (TDS) set by the USEPA is 500 mg/L: https://www.epa.gov/sites/production/files/2019-03/documents/cfr-2011-title40-vol23-part143.pdf However, the GSP set the measurable objective at 600 mg/L for TDS and the minimum threshold for TDS at 1,000 mg/L., double the SMCL. This measurable objective is above the SMCL, and the maximum threshold is not protective of drinking water supplies and agricultural uses. By the time water quality has reached the measurable objective it is unlikely to be used for potable water, and places agriculture at risk from yield losses.	Groundwater Quality	The ESJGWA considers minimum thresholds and measurable objectives for groundwater quality to be protective of drinking water supplies and agricultural uses, as secondary maximum contaminant levels (SMCL) are established for aesthetic reasons such as taste, odor, and color and are not based on public health concerns. The three levels of SMCLs for TDS are: Recommended (500 mg/L), Upper (1,000 mg/L), and Short Term (1,500 mg/L). Language was added in Section 3.2.3.2 (Degraded Water Quality Minimum Thresholds) to include information on salinity tolerances of Subbasin crops.
650	Chris Thomas cthomas@thefreshwatertrust.org /northerndeltagsa@gmail.com	Northern Delta Sustainability Agency/NDGSA Associate Member Staten Island-Conservation Farms and Ranches		The subbasin's GSP defined minimum threshold for chloride has been set at 2,000 mg/L, well above the limits for harm for many agricultural crops. http://lawr.ucdavis.edu/cooperative-extension/irrigation/drought-tips/water-quality-guidelines-trees-and-vines https://catalog.extension.oregonstate.edu/sites/catalog/files/project/pdf/pnw597.pdf	Seawater Intrusion	The seawater intrusion chloride isocontour is intended to monitor for a seawater intrusion front. Harm related to agricultural crops, as well as drinking water supplies is address through the Degraded Water Quality Sustainability Indicator.
651	Chris Thomas cthomas@thefreshwatertrust.org /northerndeltagsa@gmail.com	Northern Delta Sustainability Agency/NDGSA Associate Member Staten Island-Conservation Farms and Ranches		The minimum threshold is set at 1,000 mg/L for TDS, also at or above the level of impact to agricultural most agricultural crops. https://www.usbr.gov/lc/phoenix/programs/cass/pdf/Phase1/ATechapdxTDS.pdf	Groundwater Quality	The minimum thresholds are intended to define levels that are significant and unreasonable and are not the desired state of the subbasin. The ESJGWA considers minimum thresholds and measurable objectives for groundwater quality to be protective of agricultural uses. Language was added in Section 3.2.3.2 (Degraded Water Quality Minimum Thresholds) to include information on salinity tolerances of Subbasin crops.
652	Chris Thomas cthomas@thefreshwatertrust.org /northerndeltagsa@gmail.com	Northern Delta Sustainability Agency/NDGSA Associate Member Staten Island-Conservation Farms and Ranches		The monitoring triggers in the draft GSP for chloride and TDS are too high to avoid undesirable effects, and do consider leaching fractions or soil salinity accumulation rates in its assumptions that further chronic reductions in crop productivity and other negative impacts would be avoided. The analysis in the draft GSP does not appear to follow a best available science (BAS) approach. For instance, the draft GSP fails to disclose that the levels of TDS identified as acceptable are associated with levels found to have a 50% yield loss of crops.	Groundwater Quality	The minimum thresholds are intended to define levels that are significant and unreasonable, and are not the desired state of the subbasin. The ESJGWA considers minimum thresholds and measurable objectives for groundwater quality to be protective of agricultural uses. Language was added in Section 3.2.3.2 (Degraded Water Quality Minimum Thresholds) to include information on salinity tolerances of Subbasin crops.
653	Chris Thomas cthomas@thefreshwatertrust.org /northerndeltagsa@gmail.com	Northern Delta Sustainability Agency/NDGSA Associate Member Staten Island-Conservation Farms and Ranches		The trigger at 400% SMCL would clearly cause negative impacts to domestic well users drinking water quality. The threshold for chloride is impermissibly high and would cause degradation of existing water quality, and potentially institutionalize unsustainable and undesirable water quality.	Seawater Intrusion	The seawater intrusion chloride isocontour is intended to monitor for a seawater intrusion front. Harm related to agricultural crops, as well as drinking water supplies is address through the Degraded Water Quality Sustainability Indicator.
654	Chris Thomas cthomas@thefreshwatertrust.org /northerndeltagsa@gmail.com	Northern Delta Sustainability Agency/NDGSA Associate Member Staten Island-Conservation Farms and Ranches	Figure 2-31	The well network and associated chloride concentrations used in the analysis do not adequately represent Delta locations or the potential for associated sea/brackish water intrusion into shallow groundwater. Significantly more wells at various depths are required to show current conditions, and to detect future impacts within the Delta.	Monitoring Network	Data gaps are discussed in Section 4.7 (Data Gaps) and include a plan for the drilling of up to 12 additional monitoring wells to help resolve identified gaps. Two of these wells are shallow and planned for locations along San Joaquin River in the Delta and, if constructed, would provide more data on both water quality and groundwater levels in the Delta.
655	Chris Thomas cthomas@thefreshwatertrust.org /northerndeltagsa@gmail.com	Northern Delta Sustainability Agency/NDGSA Associate Member Staten Island-Conservation Farms and Ranches	Figure 2-52 Figure 2-53	Where chloride concentrations are described, there are a disproportionate amount of observations above 250 mg/L. in the Delta. If this threshold were approved it is possible that agricultural groundwater users would not be able to use this water for crops without reductions in productivity, and that continued irrigation with this water could reduce the ability to continue farming current crops. This standard is entirely inappropriate for drinking water quality.	Seawater Intrusion	The seawater intrusion chloride isocontour is intended to monitor for a seawater intrusion front. Harm related to agricultural crops, as well as drinking water supplies is address through the Degraded Water Quality Sustainability Indicator.

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656	Chris Thomas cthomas@thefreshwatertrust.org /northerndeltagsa@gmail.com	Northern Delta Sustainability Agency/NDGSA Associate Member Staten Island-Conservation Farms and Ranches	Section 3.2.3.1.2	Whatever the particular standard, protection from seawater intrusion is reliant on the ability of the subbasin to detect undesirable effects. For the entire ESJ subbasin, the draft GSP provides: "Undesirable results occur during GSP implementation when more than 25 percent of representative monitoring wells (3 of 10 sites) exceed the minimum thresholds for water quality for two consecutive years and where these concentrations are the result of groundwater management activities."	Seawater Intrusion	The ESJGWA has determined this to be protective as representative monitoring locations as SGMA is intended to manage at the basin scale.
657	Chris Thomas cthomas@thefreshwatertrust.org /northerndeltagsa@gmail.com	Northern Delta Sustainability Agency/NDGSA Associate Member Staten Island-Conservation Farms and Ranches		Given the limited number of monitoring wells over a vast area, this standard is inadequate for the detection of a groundwater impact. The standard would require the source of the exceedance to be known, and that source to be the 'result of groundwater management activities'; that there is a monitoring well in proximity, that the exceedance in detected in the twice a year sampling; that two additional wells are located in the proximity and have similar detections with similar identified causes; and, moreover that those detections happen over two years. Those conditions are obviously unlikely to ever be met; the proposed well monitoring network appears to be so dispersed to ensure that exceedances could only be met at one well at the most.	Monitoring Network	The ESJGWA Board supports the inclusion of the monitoring network as presented and approved it in July 2019. If a need for more frequent monitoring or more monitoring wells is recognized, the monitoring program and groundwater quality sustainable management criteria will be reevaluated as updates to the GSP occur. The broad monitoring network for groundwater quality will also be evaluated to test for the extent of exceedances and will help indicate if the monitoring program should be reexamined in future updates to the GSP.
658	Chris Thomas cthomas@thefreshwatertrust.org /northerndeltagsa@gmail.com	Northern Delta Sustainability Agency/NDGSA Associate Member Staten Island-Conservation Farms and Ranches		The draft GSP is lacking in available data and an adequate proposed monitoring approach. The draft GSP should be modified and updated to include reasonable, scientifically supported thresholds, better track sustainability, and meet SGMA statutory requirements. The draft GSP should also be updated to clarify where the data and the visualizations are not accurate and what process will be applied to improve them.	Monitoring Network	The ESJGWA recognizes a number of data gap areas related to GDEs, interconnected surface waters, and overall monitoring network coverage, as discussed in Section 4.7 (Data Gaps). The plan is supported by the best available data and science and meets the requirements of SGMA. The ESJGWA Board supports the inclusion of the monitoring network as presented and approved it in July 2019.
659	Chris Thomas cthomas@thefreshwatertrust.org /northerndeltagsa@gmail.com	Northern Delta Sustainability Agency/NDGSA Associate Member Staten Island-Conservation Farms and Ranches		The salinity and TDS limits are not likely to meet sustainability and could allow significant degradation of water quality if applied.	Groundwater Quality	The ESJGWA considers minimum thresholds and measurable objectives for groundwater quality to be protective of agricultural uses. Language was added in Section 3.2.3.2 (Degraded Water Quality Minimum Thresholds) to include information on salinity tolerances of Subbasin crops.
660	Sandi Matsumoto	The Nature Conservancy		The Nature Conservancy has thoroughly reviewed the Eastern San Joaquin Subbasin Draft GSP. We appreciate the work that has gone into the preparation of this plan. However, we consider it to be inadequate under SGMA because the basis for removing the majority of the potential GDEs identified in the NC Dataset from further consideration and management as GDEs is not scientifically supported, and could lead to significant and unreasonable impacts. Based on the available data, the removed polygons should be retained and managed as potential GDEs in the plan. If further analysis were to provide substantial evidence that groundwater level declines would not result in an adverse impact to the species in these ecosystems, then consideration could be given to removing them at that time; however, no such evidence has been presented in the draft GSP.	GDEs	See Master Response 1 - GDEs.
661	Sandi Matsumoto	The Nature Conservancy	N/A	Considering Nature under SGMA: A Checklist "Environmental User Checklist" [SEE MORE SPECIFICS IN ATTACHMENT A IN COMMENT LETTER]	GDEs	The methodology presented in the Environmental User Checklist goes above and beyond the requirements of SGMA and can be evaluated in future iterations of the GSP as determined by the ESJGWA. The ESJGWA considers the methodology used in the GSP to be appropriate at this time given the existing data gap limitations, and can be refined further in future GSP updates.
662	Sandi Matsumoto	The Nature Conservancy	Section 1.3.1	Caswell Memorial State Park is incorrectly referred to as being located outside the Eastern San Joaquin Subbasin. The following additional protected lands are located near surface waters within the Subbasin that may be interconnected with groundwater, and/or may rely at least partly on groundwater to support vegetation and sensitive natural communities. These protected lands represent potential beneficial users of groundwater: Durham Ferry State Recreational Area, a small portion (approximately 200 acres) of San Joaquin River National Wildlife Refuge, Army Corps Park, Vernalis Riparian Habitat (Public Conservation Lands), Seegers Preserve, Cabral Island Preserve, Machado Preserve, Hansen Preserve, Micke Grove Park and Zoo, Oak Grove Regional Park, Nakagawa Preserve, El Rio Farms Preserve, Lodi Lake Nature Area, Woodbridge Regional Park, Woodbridge Ecological Preserve, White Slough WA, Nuss Farms, Beck Preserve, Hilder Preserve, Staten Island Ranch, Burchel Preserve, and Ishizuka Preserve. The authors referred to the San Joaquin County General Plan documents, including background reports, for information regarding these important resources. These potential beneficial groundwater users should be described in the text on pp. 1-18 and shown in Figure 1-11. Please include a description recognizing all of the protected areas in the Subbasin and their beneficial groundwater uses. Section 2.2.8 includes a geospatial analysis that removes managed wetlands from consideration as GDEs. The managed wetlands in the Subbasin should be identified in this section.	Clarifying Edit	1) Caswell Memorial State Park is within the Subbasin. Section 1.2.1 (Description of Plan Area) includes text that it is the only State Park within the Eastern San Joaquin Subbasin boundary. 2) Comment noted. This information (potential beneficial groundwater users) is beyond the scope of the GSP. Consider for inclusion in future updates to the GSP.
663	Sandi Matsumoto	The Nature Conservancy	Section 1.2.1	Critical habitat is known to exist for protected aquatic species, such as California Tiger Salamander, Steelhead, Delta Smelt, Giant Gartersnake and California Red-Legged Frog in and around the Subbasin (https://fws.maps.arcgis.com/home/webmap/viewer.html?webmap=9d8de5e265ad4fe09893cf75b8dfb77). There are likely ongoing monitoring programs associated with critical habitat areas and the protected lands. Please include a description of these habitat areas, and associated programs and requirements pertinent to ISWs, GDEs and wetlands. Identify areas where critical habitat exists and overlaps with ISWs and GDEs.	GDEs	The comment request goes above and beyond the requirements of SGMA and can be evaluated in future iterations of the GSP as determined by the ESJGWA.
664	Sandi Matsumoto	The Nature Conservancy	Section 1.2.2	Per the GSP Regulations (23 CCR §354.34 (a) and (b)), monitoring must address trends in groundwater and related surface conditions (emphasis added). In order for this section to provide the appropriate context and help assure integration of GSP implementation with other ongoing regulatory programs, this section should describe the following: - Monitoring activities and responsibilities by State, Federal and local agencies and jurisdictions related to aquatic resources and GDEs that could be affected by groundwater withdrawals should be discussed. Section 1.2.2.6 states that there are no agencies that do monitoring specific to surface-groundwater interconnection. While this may be technically correct insofar as it relates to hydrogeologic monitoring, it ignores ongoing monitoring programs related to the state of aquatic resources and GDEs that could be affected by groundwater withdrawals, and that are a direct indicator of potential undesirable results. For example, there are likely ongoing monitoring programs associated with the protected lands listed in our comments to Section 1.3.1, and other open space or preserve areas that may be monitored by public, private or nonprofit entities. A discussion of monitoring programs related to GDEs and ISWs should be included. - The lack of existing hydrologic monitoring of surface-groundwater interconnection is a significant data gap as it relates to classification and management of GDEs and should be identified as such and further discussed and addressed in the appropriate subsequent sections of the GSP. - Monitoring activities and responsibilities related to instream flow and water quality requirements under applicable Federal Energy Regulatory Commission licenses, Biological Opinions and other regulations or programs are relevant and should be identified. Please include a discussion of water flow and quality monitoring requirements pertinent to ISWs.	Monitoring Network	1) The GSP monitoring network section meets the requirements of SGMA regulations. Publicly available data through other monitoring programs was reviewed for the GSP and will be utilized in future updates. 2) Section 4.7 (Data Gaps) was updated to specifically include interconnected surface water as a data gap. Many of the 12 proposed monitoring wells discussed in Section 4.7 are specifically located near streams with the intent of enhancing the monitoring and analysis of interconnected surface water.
665	Sandi Matsumoto	The Nature Conservancy	Section 1.2.3	This section should include a discussion of General Plan goals and policies related to the protection and management of GDEs and aquatic resources that could be affected by groundwater withdrawals, rather than being limited to goals and policies directly related to groundwater resources alone. Section 1.3.1 correctly identifies environmental uses of groundwater as including "…species and habitat reliant on instream flows, as well as wetlands and GDEs," and yet Section 1.2.3 and Appendix 1-E do not identify any General Plan policies related to these resources. Section 1.2.3 should identify if there are any Habitat Conservation Plans (HCPs) or Natural Community Conservation Plans (NCCPs) within the Subbasin and if they are associated with critical, GDE and/or ISW habitats. Appendix 1-E should identify General Plan policies related to wetlands, riparian habitat, streams, aquatic habitat, and related threatened and endangered species. Section 1.2.3.2 should include a discussion of the relationship of GSP implementation to General Plan goals and policies related to GDEs and aquatic habitat; and also address how GSP implementation will coordinate with the goals of any HCPs or NCCPs.	GDEs	The GSP includes General Plan goals and policies the ESJGWA has determined to be relevant to the GSP. This plan identifies GDEs as a beneficial use and there will be additional coordination and refinement of GDE data gap areas as the plan is refined.

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666	Sandi Matsumoto	The Nature Conservancy	Section 1.2.3.4	This section should include a discussion of the following: - Future well permitting must be coordinated with the GSP to assure achievement of the Plan's sustainability goals. - The State Third Appellate District recently found that Counties have a responsibility to consider the potential impacts of groundwater withdrawals on public trust resources when permitting new wells near streams with public trust uses (ELF v. SWRCB and Siskiyou County, No. C083239). The need for well permitting programs to comply with this requirement should be stated. - Section 2.3.3.3 discusses potential exemptions from the Stanislaus County Groundwater Ordinance but does not mention the fact that applicants who are not exempt are required to provide substantial evidence that their proposed extraction will not result in undesirable results, including significant and unreasonable impacts to GDEs and surface waters.	Well Permitting	1) Well permitting requirements for San Joaquin, Calaveras, and Stanislaus counties are identified in Section 1.2.3.4 (Well Permitting) of the GSP. An additional subsection has been added to include Sacramento County well permitting requirements. GSAs do not have well permitting authority, unless as authorized by the respective county. SGMA does not provide a GSA with the authority to issue or regulate permits for the construction, modification, or abandonment of groundwater wells, but maintains the authority for well permitting activities with the county. (Water Code, § 10726.4(b).) A GSA may request the county provide the GSA with notice of any permit applications (10726.4(b)) and a GSA may impose spacing requirements on new well construction (10726.4(a)(1)). The ESJGWA will continue to coordinate with its member GSAs that are well permitting agencies. Language has been added to Section 4.7.1 (Plan to Fill Data Gaps) referencing applicable Calaveras County, Stanislaus County, and San Joaquin County monitoring well drilling standards. 2) Section 1.2.3.4.3 (Well Permitting, Stanislaus County) has been updated to include language on procedures for applicants not exempt from the Stanislaus County Groundwater Ordinance.
667	Sandi Matsumoto	The Nature Conservancy	Section 2.1.7	Please clearly state whether localized perched aquifers are present in the basin. Include example near-surface cross section details that depict the conceptual understanding of shallow groundwater and stream interactions at different locations, including perched and regional aquifers.	Basin Setting	The level of detail in the GSP is appropriate for a conceptual model of the Subbasin.
668	Sandi Matsumoto	The Nature Conservancy	Section 2.1.8.2	The Bottom of the Basin Boundary was defined by the base of freshwater, which was mapped 45 years ago and pumping since then has very likely resulted in shift in the isohaline contouring in the basin. Defining the bottom of the Subbasin based on geochemical properties is a suitable approach for defining the base of freshwater, however, as noted on page 9 of DWR's Hydrogeologic Conceptual Model BMP (https://water.ca.gov/LegacyFiles/groundwater/sgm/pdfs/BMP_HCM_Final_2016-12-23.pdf) "the definable bottom of the basin should be at least as deep as the deepest groundwater extractions". Thus, groundwater extraction well depth data should also be included in the determination of the basin bottom. This will prevent the possibility of extractors with wells deeper than the basin boundary from claiming exemption of SGMA due to their well residing outside the vertical extent of the basin boundary. Also, pumping saline groundwater and desalinating it will become increasingly economical under SGMA due to pumping restrictions in the basin.	Basin Setting	The location and depth of the base of freshwater was confirmed by the values presented in the California Department of Conversation DOGGR wells. Comment noted for follow up in next round of GSP refinements and updates.
669	Sandi Matsumoto	The Nature Conservancy	Section 2.1.10	The Hydrologic Conceptual Model identified several data gaps including the following for groundwater level data: - Depth- or zone-specific water levels to assess vertical interconnection, including zones within the Principal Aquifer. Nested monitoring wells would be helpful near surface water to show how pumping is impacting surface water flows and GDEs. - Additional shallow groundwater data near surface waters and NCCAGs. - Additional groundwater level data in the east and northwest areas of the Subbasin. - Additional groundwater level data near the Mokelumne River to improve quantification and understanding of subsurface flows. Of these, the second data gap is the information that is most critical to identifying GDEs or potential GDEs and understanding their characteristics.	GDEs	Comment noted. As GDEs are a recognized data gap in the GSP, the list of identified GDEs will continue to be refined. Language was added to Section 4.7 (Data Gaps) to identify NCCAG areas removed through the GDE analysis are data gaps areas requiring further refinement. The purpose of this is to identify potential existing GDEs that may have been incorrectly eliminated through this screening process.
670	Sandi Matsumoto	The Nature Conservancy	Section 2.1.4.2	This section should discuss (or reference the sections discussing) the following: - Specific ISWs, including the extent of both gaining and losing reaches. - In-stream flow requirements in each of the interconnected rivers/streams including the amount, time of year when the flow minimum is specified, the duration, the freshwater fish species for which it applies, associated permits that set forth the requirements, and the regulating agency setting forth the compliance requirements. - Areas of critical habitat that exist within rivers and streams.	Interconnected Surface Water	See Master Response 2 - ISW.
671	Sandi Matsumoto	The Nature Conservancy	Section 2.1.5	Table 2-2 states that Holocene Stream Channel Deposits are generally not saturated except by the San Joaquin River. Based on the available data, it would be expected that the stream channel deposits associated with the other ISWs in the Subbasin would be saturated near those streams and rivers.	Clarifying Edit	Removed in response to comment.
672	Sandi Matsumoto	The Nature Conservancy	Section 2.1.9.2.2	This section focuses on groundwater flow direction and defers further discussion of groundwater conditions to Section 2.2, which does not provide information on historical groundwater-surface water interaction. This section should include a discussion of historic groundwater-surface water interaction.	Interconnected Surface Water	See Master Response 2 - ISW
673	Sandi Matsumoto	The Nature Conservancy	Section 2.2.6	- The determination as to whether or not a stream reach is interconnected or disconnected was made based on whether modeling conducted for the GSP indicated that it is interconnected more than 25 percent of the time. Even if the stream is only connected 25% of the time, it is still connected, and that short period of connectivity may be during critical times for select species or provide a cooling or biogeochemical effect during a critical period. Please describe the technical basis for selecting a 25 percent interconnection threshold, and how it will adequately protect the environmental beneficial uses of surface water in potentially interconnected surface waters from significant and unreasonable impacts related to groundwater extraction. - Shallow groundwater monitoring data near surface waters and NCCAGs are identified as a data gap in Section 2.1.10, and the use of the Eastern San Joaquin Water Resources Model (ESJWRM) to determine the percentage of time that stream reaches are groundwater connected entails inherent uncertainty. The potential presence of shallow or perched aquifers near the rivers is not assessed or discussed in the GSP. Groundwater modeling conducted by the United States Geological Survey (USGS), DWR and others (e.g., JJ&A, 2018) has considered some river reaches shown as disconnected in Figure 2-66 (pp. 2-99) to be groundwater-connected. No data or discussion is presented regarding the potential groundwater connection of other streams associated with significant wetland and riparian resources, including Pixley Slough, Mormon Slough, Littlejohns Creek, Bear Creek, Potter Creek, Duck Creek and Lone Tree Creek. As such, there is considerable uncertainty regarding the designation of interconnected and disconnected surface water resources in Figure 2-66. The uncertainty regarding the groundwater interconnection of streams in the Subbasin should be identified as a data gap.	Interconnected Surface Water	See Master Response 2 - ISW.
674	Sandi Matsumoto	The Nature Conservancy	Section 2.2.7	This section includes the incorrect statement that SGMA does not require sustainable management criteria to be established for the management of GDEs. Section 1.3.1 of the GSP states that beneficial users of groundwater and ISWs include "environmental users of groundwater, including species and habitat reliant on instream flows, as well as wetlands and GDEs." Undesirable results under SGMA include chronic lowering of groundwater levels resulting in significant and unreasonable depletion of supply for beneficial groundwater users, including GDEs. Undesirable results also include depletion of ISWs resulting in significant and unreasonable adverse impacts on beneficial users of surface water, including wetlands and GDEs. The incorrect statement that SGMA does not require the establishment of sustainable management criteria for GDEs should be removed.	Clarifying Edit	Clarified text in Section 2.2.7 (Groundwater-Dependent Ecosystems): SGMA requires the identification of GDEs. SGMA does not require that additional sustainable management criteria be established to specifically manage these areas, but rather includes GDEs as a beneficial user of water to be considered when developing other sustainable management criteria.

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675	Sandi Matsumoto	The Nature Conservancy	Section 2.2.8	The GSP relies on the NCCAG database developed by TNC for the DWR to identify potential GDEs, and then provides a framework for removing most of these areas from further consideration. It appears that the preliminary desktop analysis documented in the draft GSP resulted an excessive elimination of the NC dataset polygons mapped in the Eastern San Joaquin Subbasin. In particular, the methods used to confirm whether or not polygons in the NC Dataset are connected to groundwater in the Eastern San Joaquin Subbasin are highly flawed. We have the following comments on the proposed approach: The GSP takes the approach of removing NCCAGs with "access to alternate water supplies" from consideration as GDEs, and states that in order to be considered GDEs, "there must not be alternate water supplies". Alternate water supplies are assumed to include potential sources of surface water including managed wetlands, irrigated agricultural fields, perennial surface water sources, and other unspecified sources determined by stakeholders on a case-specific basis. This approach is inappropriate and deficient for several important reasons: - There is no hydrologic analysis or empirical data provided as a basis for the proposed buffer zones. The hydrologic connectivity between a GDE and a nearby alternative water source is highly dependent on local conditions and can vary seasonally and by year type. In the case of managed wetlands, no consideration is given to the nature of the wetland and surrounding area, the source and frequency of inundation, the soil types, and other features that would be needed to understand the hydrologic connectivity between the wetland and the surrounding area, or even whether the wetland itself it groundwater dependent for a portion of the year. Similarly, no information is given to the topography and hydrology surrounding irrigated agricultural fields, the soil types involved, irrigation practices, whether irrigation is likely to be curtailed during dry years or during certain crop rotations, and other relevant factors. The hydrologic connectivity of perennial surface water sources cannot be assessed without specific knowledge of the water source, topography and soil conditions. In summary, the adequacy of generic buffer zones to assure GDE access to surface water is unsubstantiated. - No information is provided regarding the species residing in the GDEs, their sensitivity to groundwater level declines, or the extent of their reliance on groundwater vs. the proposed "alternate water supplies." - There is no evidence of consultation with the regulatory agencies responsible for the protection and management of these resources in the establishment of the proposed framework. It does not appear that any habitat assessments have been conducted. - Ecosystems often rely both on groundwater and surface water to meet their water needs (see Best Management Practice #3 in Attachment C of this letter). The availability of "alternate water supplies" to provide some portion of a GDE's water demand does not mean all of its water needs can be met through alternate supplies (i.e., without reliance on groundwater). - Groundwater pumping depletes ISWs under both gaining or losing conditions, and GDEs may rely on the interactions of surface water to [SEE MORE SPECIFICS IN COMMENT LETTER]	GDEs	See Master Response 1 - GDEs.
676	Sandi Matsumoto	The Nature Conservancy	Section 2.3.5	The following items related to GDEs, wetlands and riparian areas should be clarified or considered: - "Riparian intake from streams" is identified as a stream system water budget component and is defined as the portion of riparian evapotranspiration (ET) met by streamflows. Please include an explanation of the approach to determining the amount of riparian ET demand met by streamflow vs. groundwater evapotranspiration. - Groundwater outflow to ET does not appear to be identified as a groundwater budget component (for example see Figure 2-74, p. 2-125). In addition, the ET demand of natural vegetation does not appear to be considered in water supply and demand calculations (for example see Table 2-16, p. 2-126). Since GDEs (including wetlands, riparian vegetation, phreatophytes and other communities) are recognized as beneficial users of groundwater in the Subbasin, it is appropriate to include them in these calculations.	Water Budget	1) Riparian evapotranspiration is included in the water budget (part of "Refuge, Native, and Riparian Evapotranspiration" in Table 2-14) and simulated in the model. Both streamflow and groundwater can contribute to meeting riparian evapotranspiration demand and the amount of demand met by each component is estimated directly by the model. "Riparian Intake from Streams" in Tables 2-13 and 2-14 includes all surface water and groundwater contributing to riparian demand through stream-aquifer interaction. The ESJWRM model does not have the level of detail to determine how much groundwater is consumed by riparian demand. 2) Groundwater outflow to evapotranspiration is not directly included as a water budget component and is simulated indirectly in ESJWRM through stream-aquifer interaction and seepage of pumped groundwater. 3) Wetlands, GDEs, riparian vegetation, and native (or natural) vegetation are recognized as beneficial users and are included in the water budget, though not separated out and are part of "Refuge, Native, and Riparian Evapotranspiration". There is not enough information at this time to determine how much groundwater is consumed by each of these demands. 4) This GSP recognized GDEs as a data gap in both the determination of GDEs in the Subbasin as well as the simulation of GDEs in the model. In the model, GDEs are broadly assumed to be represented as native vegetation as they are not specifically included in land use surveys. This representation removes the realistic variation of rooting depths across GDEs and we will consider the specific simulation of GDEs in future updates to the model. Comment noted for follow up in next round of model refinements and updates.
677	Sandi Matsumoto	The Nature Conservancy	Section 3.1	The Sustainability Goal is defined as being " … to maintain an economically-viable groundwater resource for the beneficial use of the people of the Eastern San Joaquin Subbasin … ." Since GDEs, are recognized as beneficial users of groundwater in the Subbasin, they should be mentioned in the Sustainability Goal.	Sustainable Management Criteria	The ESJGWA Board determined the sustainability goal meets the requirements of SGMA. GDEs are included in Section 1.3.1 (Beneficial Uses and Users in the Subbasin) and considered as an undesirable result in the Chronic Lowering of Groundwater Levels sustainability indicator in Section 3.2.1. As groundwater levels are a key indicator in achieving the Subbasin's sustainability goal, the sustainability criteria should help prevent adverse effects on GDEs.
678	Sandi Matsumoto	The Nature Conservancy	Section 3.2.1.1.1	This section only describes undesirable results relating to human beneficial uses of groundwater and neglects environmental beneficial uses that could be adversely affected by chronic groundwater level decline. On page 3-5 in Section 3.2.1.2, impacts to GDEs are correctly identified as an undesirable result potentially associated with chronic groundwater level decline. Please add "potential adverse impacts to GDEs" to the list of potential undesirable results presented in Section 3.2.1.1.1.	GDEs	Language was added to Section 3.2.1.1.1 to include: Adverse impacts to environmental uses and users, including interconnected surface waters and groundwater-dependent ecosystems (GDEs).
679	Sandi Matsumoto	The Nature Conservancy	Section 3.2.3.1.1	This section only describes undesirable results in terms of total dissolved solids concentrations and related impacts. The section should be modified to state that overpumping and dewatering of aquitards has been identified as a potential source of elevated arsenic concentrations above drinking water standards in San Joaquin Valley aquifers. The following is a link to a paper by Smith, Knight and Fendorf (2018) titled "Overpumping leads to California groundwater arsenic threat": (https://www.nature.com/articles/s41467-018-04475-3).	Groundwater Quality	Comment noted. Thank your providing a link to the arsenic paper. Text was added to Section 3.2.3.1.1 (Description of Undesirable Results) to discuss management of arsenic and nitrate.
680	Sandi Matsumoto	The Nature Conservancy	Section 3.2.6.1.1	This section states that undesirable results related to surface water depletion were defined and evaluated only for major streams and rivers including the Calaveras River, Dry Creek, Mokelumne River, San Joaquin River, and Stanislaus River. The section goes on to state that many of the smaller creeks and streams are solely used for the conveyance of irrigation water and these systems have not been considered in the analysis of depletions. Contrary to these statements, surface water resources in these creeks support significant recognized aquatic habitat, wetlands and riparian zones that represent potential environmental beneficial uses and users of groundwater. A number of these streams are associated with designated protected lands. The analysis for potential depletion of ISWs in Section 3.2.6 should include all beneficial users of surface water that could be affected by groundwater withdrawals, including environmental beneficial users along creeks, even if the creeks are interconnected less than 75% of the time.	Interconnected Surface Water	1) The ESJGWA recognizes that interconnected surface water is a data gap area and supports the use of groundwater levels as a proxy as the best information currently available. The ESJGWA has identified a need for future study and refinement will continue coordination efforts to better inform conditions. 2) Language has been added to Section 4.7 (Data Gaps) identifying interconnected surface water as a data gap area for future study and refinement. It also has been updated to clarify and better articulate the ESJGWA's focus on installing additional monitoring wells near streams, which can be evaluated for use as representative monitoring wells in the future.
681	Sandi Matsumoto	The Nature Conservancy	Section 3.2.6.1.2	The section states that "undesirable results would occur if groundwater extractions depleted interconnected streams and there was not sufficient surface water to supply … fish and wildlife demands." This definition of undesirable results is overly narrow and recognizes only a limited subset of the environmental beneficial users of ISWs. A more complete definition would be that undesirable results would occur if groundwater extraction resulted in a depletion of surface water that caused significant impacts to aquatic species or wildlife, or degradation of GDEs. Please expand the definition of undesirable results to include all of the environmental beneficial uses and users of ISWs, and expand the analysis in Section 3.2.6, as appropriate.	Interconnected Surface Water	Comment noted, the ESJGWA supports the definition of undesirable results provided in the GSP, which identifies GDEs and freshwater fish and wildlife species as beneficial users. The ESJGWA will continue to collect data to better inform connectivity conditions in the Subbasin.
682	Sandi Matsumoto	The Nature Conservancy	Section 3.2.6.1.3	The potential effects of undesirable results on environmental beneficial users are not described. Please expand the section to describe the potential effects of undesirable results on all beneficial uses and users of ISWs, including environmental uses and users. The GDE Pulse web application developed by The Nature Conservancy provides easy access to 35 years of satellite data to view trends of vegetation metrics, groundwater depth (where available), and precipitation data. This satellite imagery can be used to observe trends for NC dataset polygons within the Subbasin. Over the past 10 years (2009-2018), some NC dataset vegetation polygons have experienced adverse impacts to vegetation growth and moisture in the western portion of the Subbasin. An example screen shot from the GDE Pulse tool is presented below. Please review these spatial patterns and, where possible, correlate them with water level trends. Any indications of adverse trends and any data gaps should be identified. [SEE MORE SPECIFICS IN COMMENT LETTER]	GDEs	1) Language was added to Section 3.2.6.1.1 to reference Section 1.3.1 (Beneficial Uses and Users in the Basin). 2) Language was added to Section 4.7 (Data Gaps) to indicate that the ESJGWA would evaluate using the GDE Pulse Tool and other tools to monitor GDEs.

Comment #	Commenter	Commenter Organization	Section, Figure, or Table Number	Comment	Category	Response to Comment
683	Sandi Matsumoto	The Nature Conservancy	Section 3.2.6.2	The GSP proposes to use the Minimum Thresholds and Measurable Objectives associated with Chronic Decline in Groundwater Levels as a proxy for management of depletion of ISWs, and concludes that these criteria will be protective of the depletion of ISWs and prevent significant and unreasonable impacts to beneficial surface water uses and users. This conclusion is not adequately supported by data and/or consultation with the agencies that are responsible for the regulation of GDE habitats. We have the following comments: - The section states that current or historical issues associated with depletion of ISWs were not indicated to be significant and unreasonable based on discussions at GWA Board, Advisory Committee, and Workgroup meetings and through input from GSA staff, and that it was therefore assumed that historical conditions are protective of beneficial uses. It does not appear that any consultation occurred with the Federal, State and local agencies responsible for management and regulation of environmental beneficial uses of ISWs, or with the private parties, agencies and NGOs involved in managing the protected lands listed in our response to Section 1.3.1. In addition, no reference is made to the review of supporting documents for General Plan Conservation or Land Use Elements, or to the review of environmental management studies and documents such as Biological Assessments, Biological Opinions, HCPs or other studies regarding the current and historical conditions of the beneficial uses being evaluated. Please provide a more thorough explanation of the basis for the assumption that current and historical groundwater level conditions are protective of beneficial uses related to ISWs. Data gaps should be acknowledged. - The GDE Pulse web application developed by The Nature Conservancy provides easy access to 35 years of satellite data to view trends of vegetation metrics, groundwater depth (where available), and precipitation data. This satellite imagery can be used to observe trends for NC dataset polygons within the Subbasin. Over the past 10 years (2009-2018), some NC dataset vegetation polygons have experienced adverse impacts to vegetation growth and moisture in the western portion of the Subbasin. Please review these spatial patterns and, where possible, correlate them with water level trends. Any indications of adverse trends and any data gaps should be identified. - The section discusses future use scenarios, associated groundwater level declines and ISW depletions on a broad level. The potential effects of these declines on environmental beneficial uses, including GDEs, are not discussed. In addition to discussion of potential adverse effects at a general level, a conclusion that significant adverse impacts are unlikely generally requires more site- and resource-specific analysis. Please include a discussion of the potential for adverse effects of surface water depletions on environmental resources, as well as a reasoned analysis of the likelihood of their occurrence under future scenarios. The lack of site-specific data to draw conclusions about specific environmental beneficial users should be recognized as a data gap. - Please expand the analysis of potential undesirable results to include all environmental beneficial uses and users, including those associated with more local streams and creeks. - The statement that an additional depletion of the surface water due to groundwater pumping of 50,000 acre-feet per year is not significant and unreasonable needs to be further analyzed. The conclusion is based on analyzing the estimated depletion as a percentage of total surface water discharge. The significance of such a depletion relative to specific beneficial uses and users will depend on its distribution throughout the surface water system. Even a modest amount of depletion may have a significant local adverse effect. The limitations of broad conclusions regarding basin-wide surface water flow depletions should be recognized and any data gaps identified.	Interconnected Surface Water	See Master Response 2 - ISW.
684	Sandi Matsumoto	The Nature Conservancy	Section 4.1 and Section 4.6	The GSP proposes to use groundwater level monitoring for chronic groundwater level decline as a surrogate for monitoring the depletion of ISWs. We have the following comments. - The areas identified as potential GDEs in the GSP are located near the western boundary of the Subbasin. Only one of the representative monitoring wells appears to be located near those areas (Figure 4-1 on p. 4-5). Very few of the remaining monitoring wells are located near potential ISWs and GDEs. Specific monitoring should be described to further evaluate, monitor, manage and protect areas with ISWs and GDEs. - Per the GSP Regulations (23 CCR §354.34 (a) and (b)), monitoring must address trends in groundwater and related surface conditions (emphasis added). Groundwater level monitoring alone may be insufficient to establish a linkage between groundwater extraction and potentially resulting impacts to environmental resources associated with GDEs and ISWs. The cause-effect relationship between groundwater levels and the biological responses that could result in significant and unreasonable impacts to ISWs and GDEs depends on a number of complicated factors, and this relationship is not characterized or discussed. As such, it is not possible to determine whether the proposed monitoring, minimum thresholds and measurable objectives are sufficiently protective to ensure significant and unreasonable impacts to GDEs and ISWs will be prevented. The GDE Pulse interactive mapping application provides an example of a linkage between groundwater level data and GDE health that could be used to incorporate remote sensing into an efficient and incisive monitoring program. Please provide an explanation how groundwater levels will specifically be used to assess adverse impacts to GDEs and ISWs, and identify any data gaps and how they will be addressed.	Interconnected Surface Water	See Master Response 2 - ISW.
685	Sandi Matsumoto	The Nature Conservancy	Section 4.7	Twelve new monitoring wells are proposed to measure groundwater levels and quality in critical areas where data are sparse. These include increased coverage near streams, Subbasin boundaries, and in the central area of groundwater depression. We have the following comments. oLocations should be prioritized near high value or sensitive resources that are vulnerable to significant and unreasonable impacts, such as near the protected lands identified in our comments on Section 1.3.1 or the GDEs identified in the Subbasin. In addition to the major streams and rivers in the subbasin, impacts to smaller creeks and wetland areas should be considered, as these may be the most vulnerable resources. Please discuss the results of a resource assessment or consultations with resource managers that demonstrates a sufficient number of wells is proposed to address data gaps near GDEs and ISWs, and that they are being sited where they will provide the most benefit. Alternatively, please outline the process by which this will be accomplished. - As discussed in our comments above, please address how the need to link and correlate groundwater level declines to biological responses, and significant and adverse impacts to GDEs and ISWs will be addressed. - Well sites near ISWs should be selected at varying distances from streams and completed as vertically-nested clusters to capture the lateral and vertical gradients between the pumped depths in the aquifer system and the shallow groundwater aquifers that are in communication with ISWs or GDEs. There is a need to enhance monitoring of stream flow and vertical groundwater gradients by installing more stream gauges and clustered/nested wells near streams, rivers or wetlands. Ideally, co-locating stream gauges with clustered wells would enhance understanding about where ISWs exist in the basin and whether pumping is causing depletions of surface water or impacts on beneficial users of surface water and groundwater. - Addressing data gaps is typically iterative and it is not reasonable to expect it will be a one-time process. Please describe the process by which data gaps will be identified and addressed on an ongoing basis.	Monitoring Network	1) Comment noted for consideration as proposed monitoring well locations are finalized and future updates to the monitoring network is considered. Interconnected surface water was a major consideration in the placement of the proposed wells and almost all of the locations are very close to either major or minor streams. The two wells included in the TSS application are both deep, nested wells located near streams (Dry Creek and Calaveras River) and are anticipated to be drilled within a year. 2) The impact of groundwater level declines to beneficial users, as well as the effect of interconnected surface water and GDEs, will be considered in updates to the GSP and in the annual reports. 3) Comment noted for consideration as proposed monitoring well locations are finalized and future updates to the monitoring network (including evaluating the need for the installation of stream gauges) is considered. 4) The ESJGWA is committed to resolving the data gaps identified during the GSP development process. As discussed in Section 7.6.4 (Monitoring Network Description), a program may be developed for the GSP update to help fill any new or remaining data gaps. Data gaps will be continually reevaluated and addressed in updates to the GSP and in annual reports.
686	Sandi Matsumoto	The Nature Conservancy	Section 5.3, Table 5.3	Table 5.3 indicates that data regarding streamflow and GDEs is not currently included in the proposed Data Management System. Per the GSP Regulations (23 CCR §354.34 (a) and (b)), monitoring must address trends in groundwater and related surface conditions (emphasis added). You cannot manage what you do not measure. Please discuss which monitoring data for "related surface conditions" will be gathered and incorporated in the DMS to assess potential significant and unreasonable impacts to environmental beneficial uses and users.	DMS	Surface water data, including streamflow and water quality, is readily and publicly available online and has not be separately added to the DMS, though the system is set up to store streamflow and many other different types of data. Streamflow and surface water gage data was used both to build and calibrate the model, as well as in various analyses for the GSP. All groundwater level monitoring data will be evaluated for analysis of groundwater-surface water interaction and other surface conditions. As GDEs are a recognized data gap in the GSP, additional data may be collected that will be considered for addition to the DMS.
687	Sandi Matsumoto	The Nature Conservancy	Section 7.3.1	This section lists the key components involved in implementation of the monitoring network. Groundwater levels and monitoring will occur semi-annually, but no other information is given. Section 6.3 states that "additional management activities are discussed in Chapter 7: Plan Implementation", and would include monitoring groundwater use through use of satellite imagery. However, Chapter 7 does not discuss using imagery or any remote sensing, which is a great tool for monitoring ecosystem health of GDEs and ISWs. Please clarify the potential use of imagery as a monitoring tool, and expand it to monitoring surface indicators of ISW and GDE ecosystem health.	Monitoring Network	While there are currently no specific plans regarding the use of imagery is a monitoring tool, any publicly available tools will be evaluated for use in updates to the GSP. The text in Section 6.3 was edited to remove a mention of satellite imagery.
688	Sandi Matsumoto	The Nature Conservancy	Section 7.3.2.2	This section describes what current groundwater conditions and monitoring results will be included in the annual monitoring report. Please specifically address ecosystem health of GDEs and ISWs as a surface indictor to subsurface conditions. This can be done using GDE Pulse, remote sensing, imagery or other feasible methods.	Monitoring Network	While there are currently no specific plans regarding the use of imagery is a monitoring tool, any publicly available tools, including GDE Pulse, will be evaluated for use in updates to the GSP.

ESJ Public Comments Response

Comment #	Commenter	Commenter Organization	Section, Figure, or Table Number	Comment	Category	Response to Comment
689	Sandi Matsumoto	The Nature Conservancy	Section 6.2.1	The Subbasin includes many GDEs and ISWs which represent beneficial uses and users of groundwater, and which include potentially sensitive resources and protected lands. Environmental resource protection needs should be considered in establishing project priorities. In addition, consistent with existing grant and funding guidelines for SGMA-related work, priority should be given to multi-benefit projects that can address water quantity as well as providing environmental benefits or benefits to disadvantaged communities. Please include environmental benefits and multiple benefits as criteria for assessing project priorities.	Projects and Management Actions	See Master Response 5 - Projects. Multi-benefit projects will be pursued when feasible.
690	Sandi Matsumoto	The Nature Conservancy	Table 6.1	Table 6-1 lists potential projects and the Measurable Objective that is expected to benefit. Only water level benefits are listed, but maintenance or recovery of groundwater levels, or construction of recharge facilities, also will have environmental benefits in many cases. From the table, it is not possible to distinguish the full range of project benefits or how the projects will be prioritized. It would be advantageous to demonstrate multiple benefits from a funding and prioritization perspective.	Projects and Management Actions	Comment noted. The text in Chapter 6 (Projects and Management Actions) provides summaries of all potential SGMA projects, including expected project benefits.
691	Sandi Matsumoto	The Nature Conservancy	Section 6.2.4	- For the projects already identified, please consider stating how ISWs and GDEs will benefit or be protected, or what other environmental benefits will accrue. - If ISWs will not be adequately protected by those listed, please include and describe additional management actions and projects targeted for protecting ISWs. - Recharge ponds, reservoirs and facilities for managed stormwater recharge can be designed to include elements that act functionally as wetlands and provide a benefit for wildlife and aquatic species. In some cases, such facilities have been incorporated into local HCPs, more fully recognizing the value of the habitat that they provide and the species they support. For projects that will be constructing recharge ponds, please consider identifying if there will be habitat value incorporated into the design and how the recharge ponds will be managed to benefit environmental users. - Specific examples of how project descriptions may be refined to incorporate environmental benefits include the following: - Project 21: Winery Recycled Water will recycle winery wastewater and reuse it for irrigation and in-lieu recharge, or the water will be put into ponds. Please consider identifying what proportion of water will be put into ponds for direct recharge that could also provide a benefit for wildlife and aquatic species. - Project 23: SSJID Stormwater Reuse will capture stormwater for reuse and recharge. Project 18: Farmington Dam Repurpose Project proposes to more than double storage in Farmington Basin for water supply. Please consider assessing ways in which these projects could also provide enhanced wildlife and aquatic species benefits. - For examples of case studies on how to incorporate environmental benefits into groundwater projects, please visit our website: https://groundwaterresourcehub.org/case-studies/recharge-case-studies/E698	Projects and Management Actions	1) GSP projects have been proposed by individual GSAs and will be implemented at the GSA level. Although the ESJGWA does not have authority to direct project design or implementation, the ESJGWA's role will be to oversee essential project coordination by identifying where projects would be beneficial, synthesize how GSAs are doing projects, and make sure that GSA projects are getting the Subbasin to sustainability. Multi-benefit projects will be pursued when feasible. 2) Flood-Managed Aquifer Recharge (Flood-MAR) is an integrated and voluntary resource management strategy that uses flood water resulting from, or in anticipation of, rainfall or snow melt for managed aquifer recharge (MAR) on agricultural lands and working landscapes, including but not limited to refuges, floodplains, and flood bypasses. Flood-MAR can be implemented at multiple scales, from individual landowners diverting flood water with existing infrastructure, to using extensive detention/recharge areas and modernizing flood management infrastructure/operations (Source: https://water.ca.gov/Programs/All-Programs/Flood-MAR). 3) See also: Master Response 5 - Projects.
692	Sandi Matsumoto	The Nature Conservancy	Section 6.3	This section lists only administrative actions the GSA will undertake to implement the GSP, and does not identify the management actions to be taken if to assure SGMA compliance if monitoring data indicate that measurable objectives or interim milestones are not being achieved. An adaptive management approach, where monitoring data are used to assess results and inform refinement of the management approach is typically specified. Please identify what management actions will be taken if monitoring data indicate that Measurable Objectives or Interim Milestones are not being achieved, or undesirable results are imminent.	Projects and Management Actions	See Master Response 5 - Projects.
693	Sandi Matsumoto	The Nature Conservancy	N/A	IDENTIFYING GDEs UNDER SGMA Best Practices for using the NC Dataset [SEE MORE SPECIFICS IN ATTACHMENT C IN COMMENT LETTER]	GDEs	Comment noted, this is not a requirement of SGMA and can be evaluated in future iterations of the GSP as determined by the ESJGWA. Language was added to Section 4.7 (Data Gaps) to indicate that the ESJGWA would evaluate using the GDE Pulse Tool and other tools to monitor GDEs.
694	Sandi Matsumoto	The Nature Conservancy	N/A	GDE Pulse A new, free online tool that allows Groundwater Sustainability Agencies to assess changes in groundwater dependent ecosystem (GDE) health using satellite, rainfall, and groundwater data. [SEE SPECIFICS IN ATTACHMENT D IN COMMENT LETTER]	GDEs	Language was added to Section 4.7 (Data Gaps) to indicate that the ESJGWA would evaluate using the GDE Pulse Tool and other tools to monitor GDEs.
695	Joey Giordano	The Wine Group	Figure ES-6	On Figure ES-6, I would recommend adding the total for each column/section of the bar graph below the text for each section (i.e. "Pumping under Projected Conditions XX,XXX AF". The figure has less value when you have to rely on the units on the y-axis rather than having the totals for each section explicitly marked.	Mechanics - Graphics	Comment noted. This is beyond the scope of the GSP.
696	David Weisenberger	Banta-Carbona Irrigation District on behalf of Tracy Subbasin GSAs	Table 2-15	Table 2-15 on page 2-121 of the Draft GSP indicates that the Tracy Subbasin has historically contributed 35,000 acre-feet while it is projected to increase to 41,000 acre-feet of subsurface inflow annually to the Eastern San Joaquin Groundwater Basin. These figures have not been documented or confirmed by those GSAs participating in preparation of the Tracy Subbasin Groundwater Sustainability Plan (GSP). This line should be footnoted to indicate that these figures will be further refined upon completion of the Tracy Subbasin GSP in January of 2022, and coordination of these figures with the Tracy Subbasin GSAs.	Clarifying Edit	Added to note 6 on Table 2-15 to clarify that subsurface flows are an important component of continuing inter-basin coordination: Continuing inter-basin coordination may refine these numbers.

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APPENDIX 1-K.
NOTICE OF INTENT TO ADOPT A GSP

NOTICE OF INTENT TO ADOPT A GROUNDWATER SUSTAINABILITY PLAN

EASTERN SAN JOAQUIN GROUNDWATER AUTHORITY

1810 E. Hazelton Avenue
P. O. Box 1810
Stockton, CA 95201

(209) 468-3089
ESJgroundwater@sjgov.org
esjgroundwater.org

August 16, 2019

Via email and U.S. mail

To Whom it May Concern:

SUBJECT: NOTICE OF INTENT TO ADOPT A GROUNDWATER SUSTAINABILITY PLAN

On behalf of the Groundwater Sustainability Agencies (GSAs) comprising the Eastern San Joaquin Groundwater Authority (referred to herein as the ESJ GWA and as listed below), pursuant to California Water Code Section 10728.4, the ESJ GWA, on behalf of its member agencies, hereby gives notice to the legislative body of any City, County, or Public Utilities Commission-regulated company within the geographic area covered by the pending Eastern San Joaquin Groundwater Subbasin Groundwater Sustainability Plan (GSP) that its member GSAs intend to adopt the GSP for the Eastern San Joaquin Groundwater Subbasin (Basin No. 5-022.01). A map of the GSP area is included herein.

Interested parties may provide comments on the Public Draft GSP during the scheduled public comment period, July 10 through August 25, 2019. Information regarding the Draft GSP has been posted on the ESJ GWA website at www.esjgroundwater.org. The Draft Plan can be viewed on the website homepage. According to Water Code Section §10728.4: "A groundwater sustainability agency may adopt or amend a groundwater sustainability plan after a public hearing, held at least 90 days after providing notice to a city or county within the area of the proposed plan or amendment. The groundwater sustainability agency shall review and consider comments from any city or county that receives notice pursuant to this section and shall consult with a city or county that requests consultation within 30 days of receipt of the notice."

No sooner than 90 days from the date of this Notice, each of the GSAs identified below will hold a public hearing and consider adopting the GSP. For meeting information and public hearing dates, please refer to the ESJ GWA website.

Should you have any questions about this notice, please contact me by email at kbalaji@sjgov.org or by phone at (209) 468-3100.

Sincerely,

KRIS BALAJI, PMP, P.E.
Eastern San Joaquin Subbasin Plan Manager

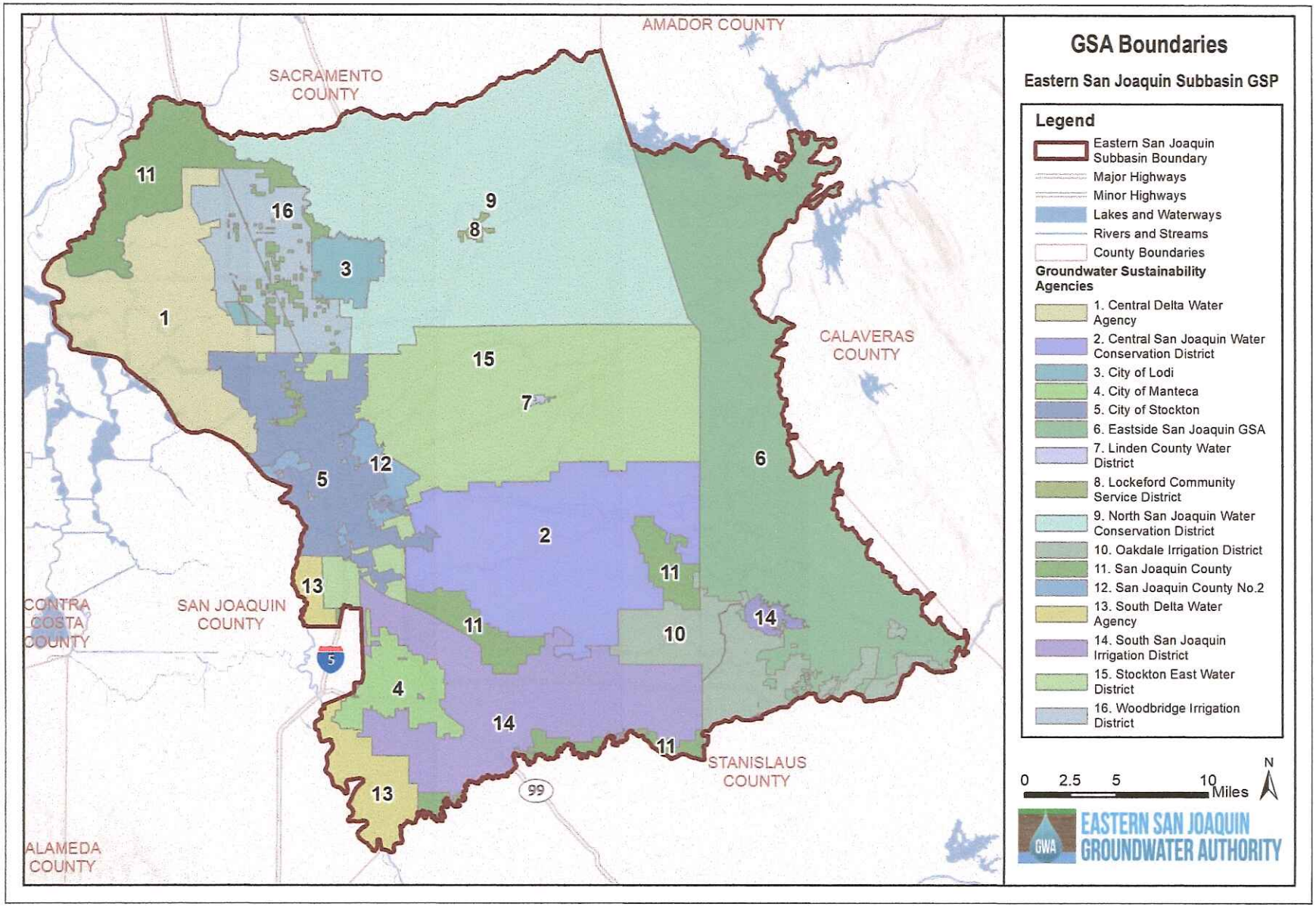
NOTICE OF INTENT TO ADOPT A GROUNDWATER SUSTAINABILITY PLAN

Eastern San Joaquin Region Plan Manager: Kris Balaji, San Joaquin County

GSAs:

- Central Delta Water Agency
- Central San Joaquin Water Conservation District
- City of Lodi
- City of Manteca
- City of Stockton
- Eastside San Joaquin GSA
- Linden County Water District
- Lockeford Community Services District
- North San Joaquin Water Conservation District
- Oakdale Irrigation District
- County of San Joaquin GSA – Eastern San Joaquin 1
- County of San Joaquin GSA – Eastern San Joaquin 2
- South Delta Water Agency
- South San Joaquin GSA
- Stockton East Water District
- Woodbridge Irrigation District

NOTICE OF INTENT TO ADOPT A GROUNDWATER SUSTAINABILITY PLAN



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NOTICE OF INTENT TO ADOPT A GROUNDWATER SUSTAINABILITY PLAN

ATTEST:

Jeanne Urbani
CLERK

CENTRAL DELTA WATER AGENCY
AGENCY LEGAL NAME

By: Signature 8-15-19 Date

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NOTICE OF INTENT TO ADOPT A GROUNDWATER SUSTAINABILITY PLAN

ATTEST:

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NOTICE OF INTENT TO ADOPT A GROUNDWATER SUSTAINABILITY PLAN

ATTEST:

for Pamela M. Farris
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Approved as to Form:

JANICE D. MAGDICH
City Attorney

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8/15/2019
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NOTICE OF INTENT TO ADOPT A GROUNDWATER SUSTAINABILITY PLAN

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CLERK

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NOTICE OF INTENT TO ADOPT A GROUNDWATER SUSTAINABILITY PLAN

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CLERK

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NOTICE OF INTENT TO ADOPT A GROUNDWATER SUSTAINABILITY PLAN

ATTEST:

Rebecca Hitrock

CLERK

Eastside San Joaquin Groundwater Sustainability Agency

AGENCY LEGAL NAME

8/16/2019

By: Signature Date

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NOTICE OF INTENT TO ADOPT A GROUNDWATER SUSTAINABILITY PLAN

ATTEST:

CLERK

LINDEN COUNTY WATER DISTRICT
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ATTEST:

CLERK

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NOTICE OF INTENT TO ADOPT A GROUNDWATER SUSTAINABILITY PLAN

ATTEST:

CLERK

North San Joaquin Water Conservation District.
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8/15/19
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NOTICE OF INTENT TO ADOPT A GROUNDWATER SUSTAINABILITY PLAN

ATTEST:

CLERK

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08/15/19
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NOTICE OF INTENT TO ADOPT A GROUNDWATER SUSTAINABILITY PLAN

ATTEST:

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NOTICE OF INTENT TO ADOPT A GROUNDWATER SUSTAINABILITY PLAN

ATTEST:

CLERK

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8/15/19

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NOTICE OF INTENT TO ADOPT A GROUNDWATER SUSTAINABILITY PLAN

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By: Signature Date

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NOTICE OF INTENT TO ADOPT A GROUNDWATER SUSTAINABILITY PLAN

ATTEST:

Jessica Librado
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Woodbridge Irrigation District
AGENCY LEGAL NAME

Anders Christensen 8-16-2019
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APPENDIX 2-A.
EASTERN SAN JOAQUIN WATER RESOURCES MODEL (ESJWRM) REPORT

Eastern San Joaquin Water Resources Model (ESJWRM)

AUGUST 2018

WOODARD & CURRAN

EASTERN SAN JOAQUIN WATER RESOURCES MODEL (ESJWRM)

Final Report

August 2018

Prepared by

WOODARD & CURRAN

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APPENDICES

Appendix A: Presentations to Technical Review Committee
Appendix B: ESJWRM IDC Technical Memorandum
Appendix C: ESJWRM Calibration Wells

LIST OF ABBREVIATIONS

AF and AFY	Acre-Feet and Acre-Feet Per Year
ASTM	American Standard Testing Method
AWMP	Agricultural Water Management Plan
C2VSim	California Central Valley Groundwater-Surface Water Simulation Model
Cal Water	California Water Service Company Stockton District
CALSIMETAW	California Simulation of Evapotranspiration of Applied Water
CASGEM	California Statewide Groundwater Elevation Monitoring
CCWD	Calaveras County Water District
CDEC	California Data Exchange Center
CFS	Cubic Feet per Second
CIMIS	California Irrigation Management Information System
County	San Joaquin County
CSJWCD	Central San Joaquin Water Conservation District
CVHM	Central Valley Hydrologic Model
DEM	Digital Elevation Model
DWR	California Department of Water Resources
ESJ Subbasin	Eastern San Joaquin Groundwater Subbasin
ESJWRM	Eastern San Joaquin Water Resources Model
ET	Evapotranspiration
ETAW	Evapotranspiration of Applied Water
GBA	Eastern San Joaquin County Groundwater Basin Authority
GMS	Aquaveo Groundwater Modeling System
GPCD	Gallons Per Capita Per Day
GSA	Groundwater Sustainability Agency
GSE	Ground Surface Elevation
GSP	Groundwater Sustainability Plan
GWA	Eastern San Joaquin Groundwater Authority
IDC	IWFM Demand Calculator
IGSM	Integrated Groundwater and Surface Water Model
IRWMP	Integrated Regional Water Management Plan
IWFM	Integrated Water Flow Model
KH	Aquifer Hydraulic Conductivity
KV	Aquifer or Aquitard Vertical Hydraulic Conductivity
LCSD	Lockeford Community Services District
LCWD	Linden County Water District
MAF and MAFY	Million Acre-Feet and Million Acre-Feet Per Year
METRIC	Mapping Evapotranspiration at High Resolution with Internalized Calibration
NASS	National Agricultural Statistics Service
NRCS	Natural Resource Conservation Service
NSJWCD	North San Joaquin Water Conservation District
OID	Oakdale Irrigation District
OSWCR	Online System for Well Completion Reports
PRISM	Precipitation-Elevation Regressions on Independent Slopes Model

PSDI	Pore Size Distribution Index
RMS	Root Mean Square
SEWD	Stockton East Water District
SGMA	Sustainable Groundwater Management Act
SS	Aquifer Specific Storage
SSJID	South San Joaquin Irrigation District
SSURGO	Soil Survey Geographic Database
STATSGO2	Digital General Soil Map of the United States
SY	Aquifer Specific Yield
TAF and TAFY	Thousand Acre-Feet and Thousand Acre-Feet Per Year
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USGS	United States Geological Survey
UWMP	Urban Water Management Plan
WDL	Water Data Library
WID	Woodbridge Irrigation District

ACKNOWLEDGEMENTS

In December 2015, San Joaquin County (County) applied for Proposition 1's Counties with Stressed Basins Grant and received approval for $499,900. With a fifty percent cost share with the California Department of Water Resources, the County executed a contract with Woodard & Curran (formerly RMC Water and Environment), on September 13, 2016 to begin work on a hydrologic model for the Eastern San Joaquin Groundwater Subbasin. The purpose of the resulting model, the Eastern San Joaquin Water Resources Model (ESJWRM), is to support activities in long-term management of the Eastern San Joaquin Subbasin at the local scale, specifically focusing on meeting the goals and requirements of the Sustainable Groundwater Management Act.

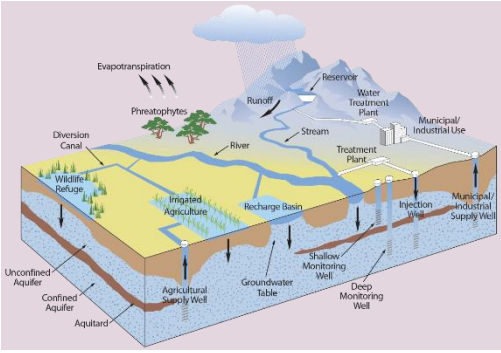
A technical committee provided quality assurance and technical support throughout the project, resulting in a groundwater model widely accepted by local shareholders and public agencies. The committee was an informal group consisting of technical representatives from local agencies, consultants with knowledge of the area, representatives for neighboring groundwater subbasins, Department of Water Resources (DWR) staff, and San Joaquin County personnel. Local agencies with consistent representation included San Joaquin County, Woodbridge Irrigation District, City of Lodi, North San Joaquin Water Conservation District, Lockeford Community Services District, Calaveras County Water District, City of Stockton, California Water Service Company Stockton District, Stockton East Water District, City of Lathrop, City of Manteca, South San Joaquin Irrigation District, City of Escalon, Oakdale Irrigation District, and Stanislaus County.

The Main Project Team included:

- Woodard & Curran (formerly RMC Water and Environment)
    - Alyson Watson, Project Principal
    - Ali Taghavi, Project Manager
    - Sevim Onsoy, Project Support
    - Jeanna Long, Data Management System Lead
    - Sara Miller, Project Engineer
- NV5

EXECUTIVE SUMMARY

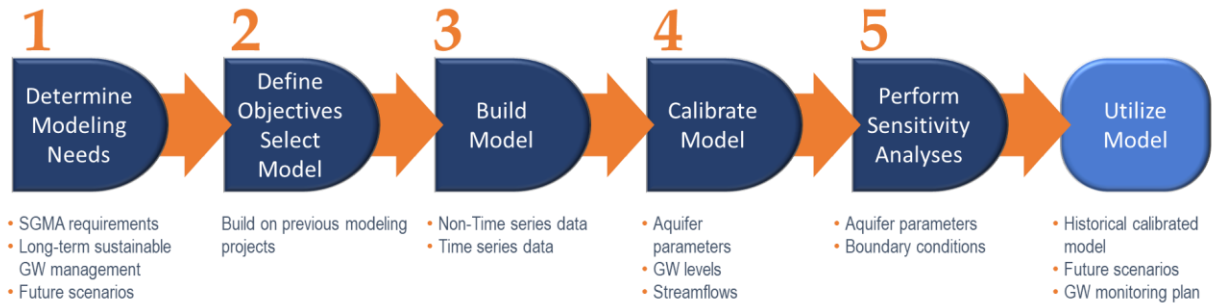
The Eastern San Joaquin Water Resources Model (ESJWRM) was developed to evaluate the surface water and groundwater resources in the Eastern San Joaquin Groundwater Subbasin (ESJ Subbasin) during recent historical hydrologic conditions. This period covers water years 1995 through 2015, and includes several above normal and wet years, as well as the most recent drought conditions. The model is designed to simulate the regional water resources conditions in the ESJ Subbasin, including the land surface processes, groundwater operations, stream and river systems, and the interaction between these resources.



Development of the ESJWRM occurred in an open and transparent process over approximately 24 months, starting in September 2016. Model development was a collaborative process between San Joaquin County staff, local water agencies, and Woodard & Curran, as consultant and developers of the model. The model was developed by partial funding from the Department of Water Resources (DWR), and as such, the DWR staff were engaged and collaborated in development of the model.

A technical committee provided quality assurance and technical support throughout the project, resulting in an integrated water resources model widely accepted by local shareholders and public agencies. The committee was an informal group consisting of technical representatives from local agencies, consultants with knowledge of the area, representatives from neighboring groundwater subbasins, DWR staff, and San Joaquin County personnel. Local agencies with consistent representation included San Joaquin County, Woodbridge Irrigation District, City of Lodi, North San Joaquin Water Conservation District, Lockeford Community Services District, Calaveras County Water District, City of Stockton, California Water Service Company Stockton District, Stockton East Water District, City of Lathrop, City of Manteca, South San Joaquin Irrigation District, City of Escalon, Oakdale Irrigation District, and Stanislaus County.

ESJWRM development followed a robust process as shown below. Modeling needs were established in early 2015, shortly after the passage of the Sustainable Groundwater Management Act (SGMA). Subsequently, modeling goals and objectives were discussed and established, and San Joaquin County was successful in securing funds through Proposition 1 to begin development of the model.

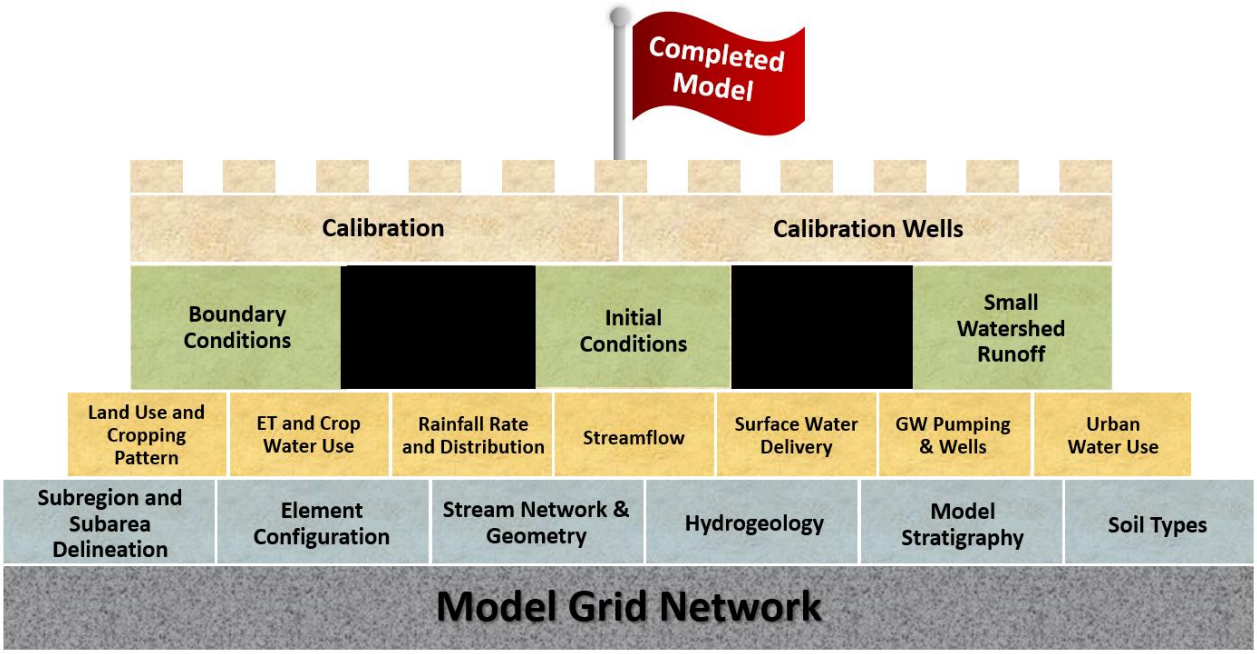


ESJWRM development required a significant amount of data and information, including hydrologic, hydrogeologic, topographic and soil conditions, land use and cropping patterns, urban and agricultural water demand, urban and agricultural water supplies, surface water conveyance and distribution systems, groundwater infrastructure and extraction, and irrigation practices. The following figure shows the type

of data and information needed to develop the model. A collaborative process was followed to collect and analyze, fill data gaps, and develop proper assumptions for the use, context, and accuracy of the data, before analyzing and properly formatting the data for input in the model.

Once the model was constructed, appropriate state-of-the-art scientific and engineering protocols and guidelines were utilized to calibrate the model to ensure that:

- Water budgets generated by the model represent the regional and local understanding of the agricultural and urban entities represented in the model. The model-generated water budgets showing water demand and supply and the groundwater system are prepared and reported on both monthly and annual scales for urban and agricultural entities as well as at the subbasin scale.
- Monthly groundwater levels generated by the model at select observation wells throughout the subbasin closely follow the long-term annual trends and short-term seasonal fluctuations that are recorded and reported at the observation wells.
- Monthly streamflow generated by the model at select gauging stations closely follow the high and low flows as reported.

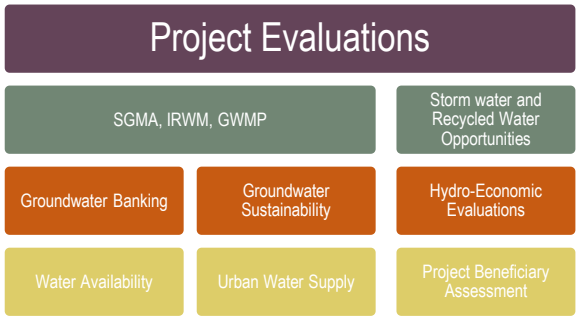


The calibrated ESJWRM provides detailed conditions of the ESJ Subbasin over the calibration period of water years 1996 through 2015. This calibrated model can be used for understanding subbasin characteristics and the effects of historical surface water and groundwater operations as well as irrigation practices or urban operations on the groundwater and surface water resources in the ESJ Subbasin. These include:

- Historical and current levels of development
- Subbasin operations under natural conditions
- Nature, extent, and rates of stream-aquifer interaction

- Effects and benefits of upstream regulation of rivers on the operations of the groundwater subbasin
- Effects of operations of regional water supply projects, including conjunctive use, on subbasin conditions
- Evaluation of water quality conditions in the subbasin

Additionally, the calibrated model can be used to develop baseline conditions representing projections of land use, population growth, water demand, and water supply conditions, as estimated based on local and regional planning activities. The baseline model, as a robust, defensible, and detailed tool, may be used for assessing the current and projected water resources conditions in the basin to support various local and regional planning projects and programs, such as the development and implementation of a Groundwater Sustainability Plan (GSP). ESJWRM may also be used to evaluate the effectiveness of different projects that may be proposed through the GSP development process. The fine scale of the model also provides the opportunity for individual Groundwater Sustainability Agencies (GSAs) to evaluate the effects of ESJ Subbasin conditions on smaller GSA areas.



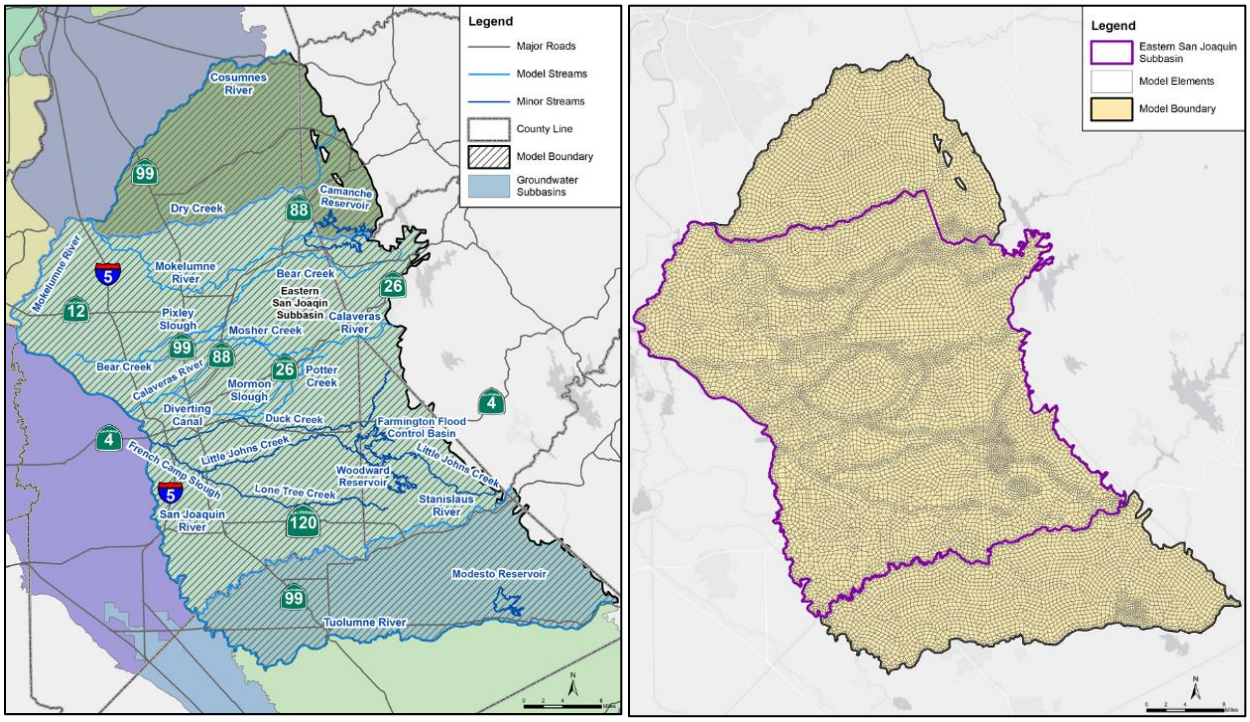
Some of the key features of the ESJWRM are as follows:

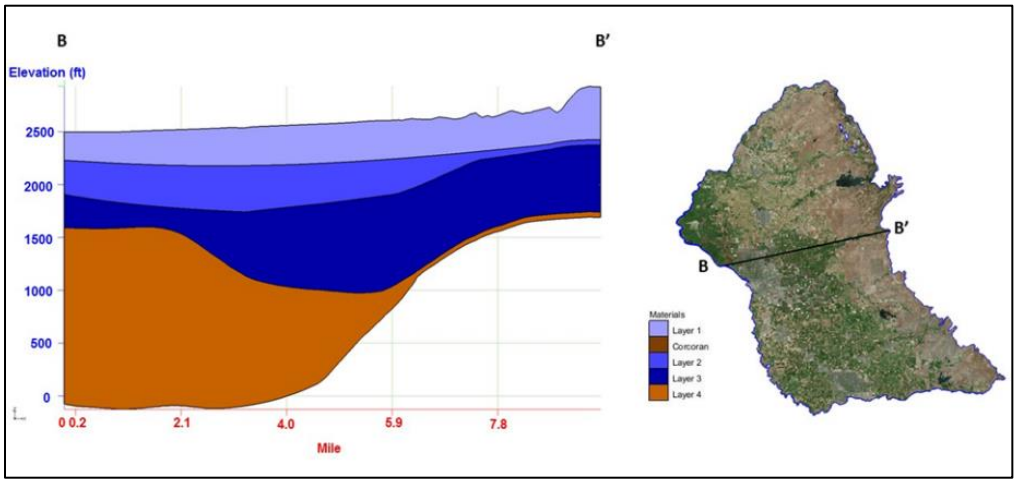
Model Platform

The model code platform is the DWR's Integrated Water Flow Model (IWFM-2015). This code platform was developed by DWR to simulate the integrated hydrologic conditions of a groundwater basin, with interactions between the surface water, groundwater, and stream system. The code platform has specific strengths in the calculation of agricultural water demand in a predominantly agricultural area, such as the Eastern San Joaquin Subbasin. The code platform is supported by the DWR modeling support staff for local and regional applications, including SGMA implementation.

Model Area

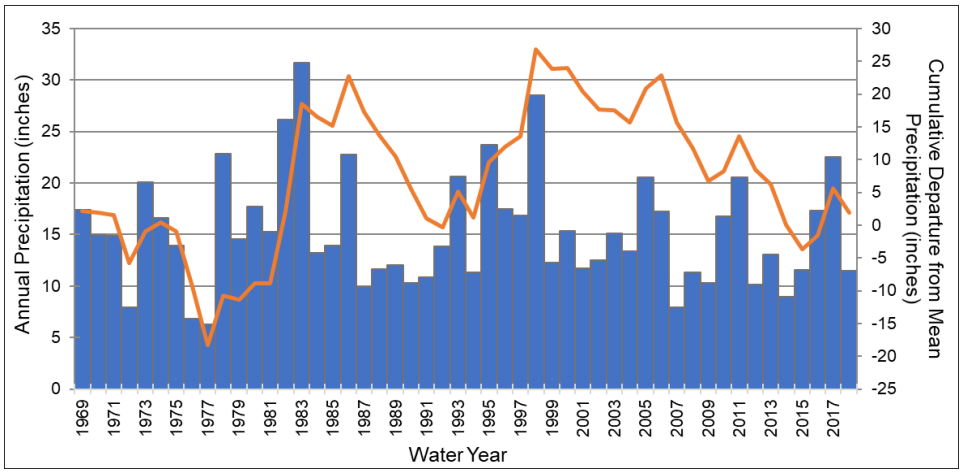
The model covers the entire area of the Eastern San Joaquin Groundwater Subbasin, as defined by DWR Bulletin 118, as well as the areas of the Modesto and Cosumnes Groundwater Subbasins (the basins immediately north and south of the ESJ Subbasin). The model area is subdivided into small units (elements). A comprehensive integrated hydrologic process and analysis is conducted at each model element, and surface water and groundwater flows are calculated and simulated across elements, and throughout the entire model area on a monthly time step, in such a way that mass balance is preserved every month. Additionally, each element represents the geologic and hydrogeologic conditions of the subsurface environment as represented by four model layers in a conceptual context.

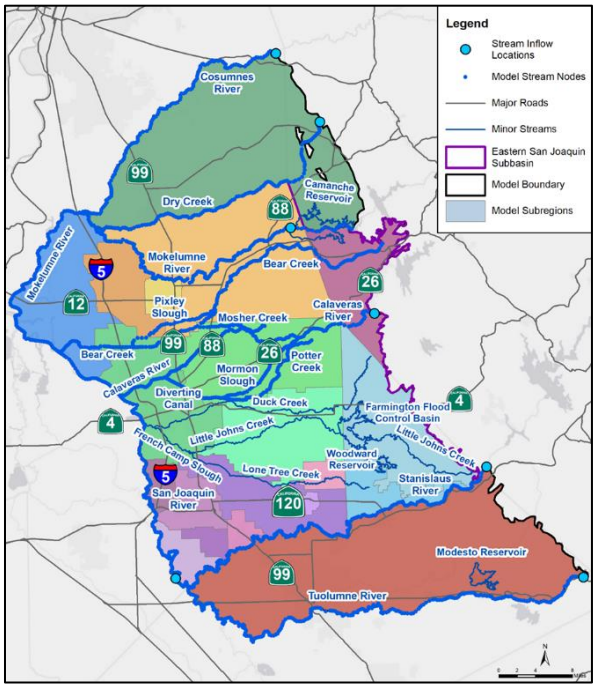




Hydrology

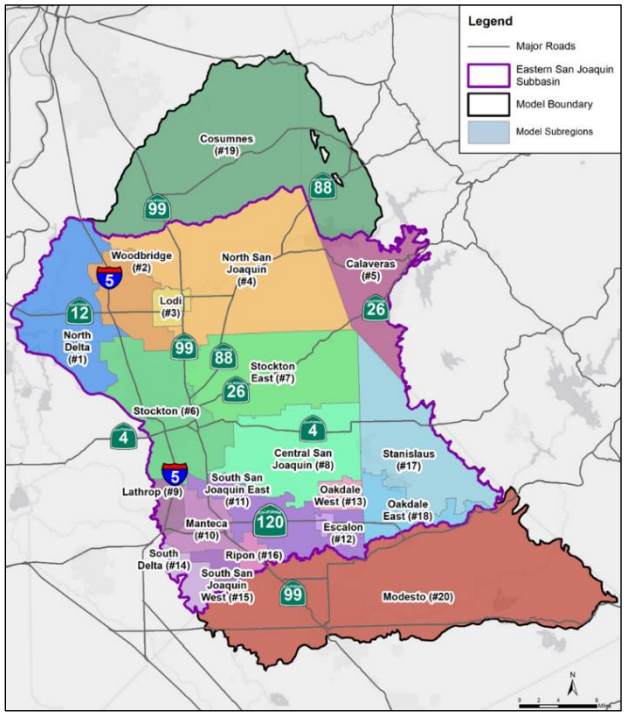
The model contains 50 years of hydrologic period (water years 1969 through 2018), which provides opportunities to assess the basin conditions during above normal, below normal, and drought periods. The model is calibrated during the period of 1996-2015, during which there are more robust and defensible data available for model calibration. In addition, the model includes major and minor rivers and creeks in the area and calculates stream-aquifer interaction along the major rivers and creeks. The minor creeks and canals represented in the model are used for conveyance of irrigation water and drainage.

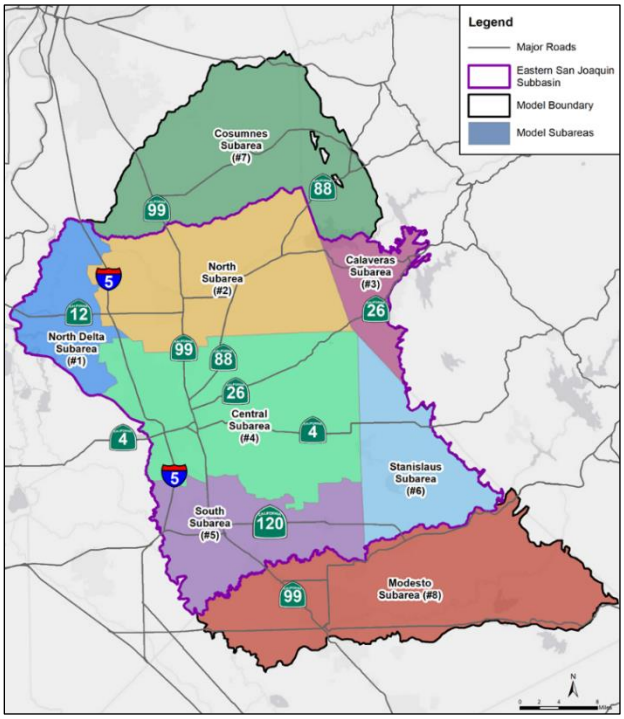




Model Subareas

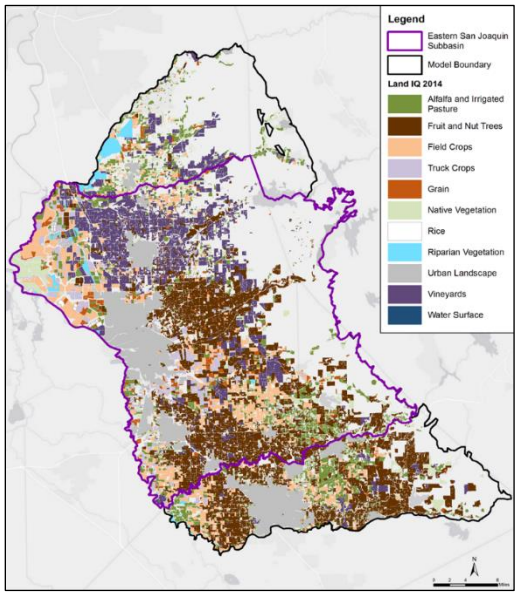
The model elements are aggregated into larger geographic areas, which represent individual agricultural and urban entities (Subregions) and larger planning areas (Subareas). These larger areas can be used to prepare model input data and to analyze model generated water budgets for planning purposes.

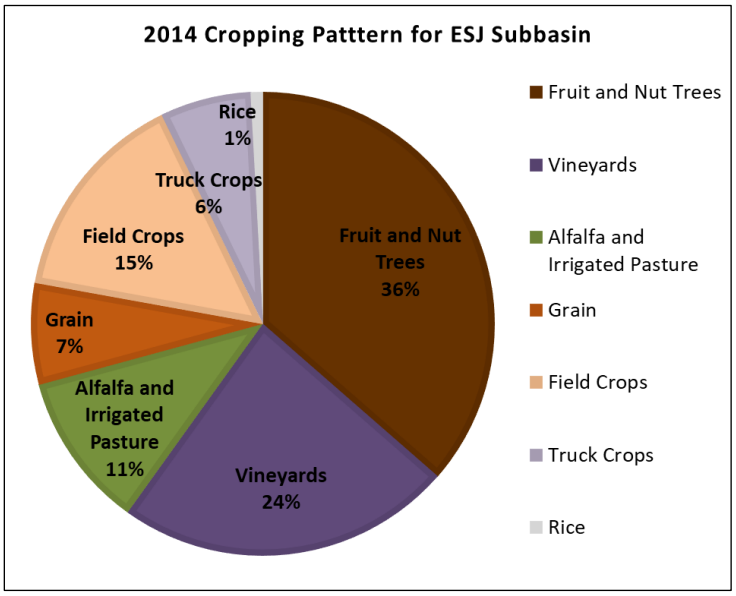




Land Use and Agricultural Cropping Pattern

A key data set used in the model is the distribution of land between agricultural, urban, native, and riparian land use categories, as well as acreages of major crops in the agricultural lands. This information is prepared and processed based on land use surveys prepared and reported by the DWR (DWR, 1993-2000), remote sensing data from the United States Department of Agriculture called CropScape (USDA NASS, 2007-2015), and the DWR Land IQ dataset (DWR, 2014). This information was compiled, analyzed, and evaluated for each model element; compared and cross-checked with data and information from the agricultural entities; and finalized for use in the model.

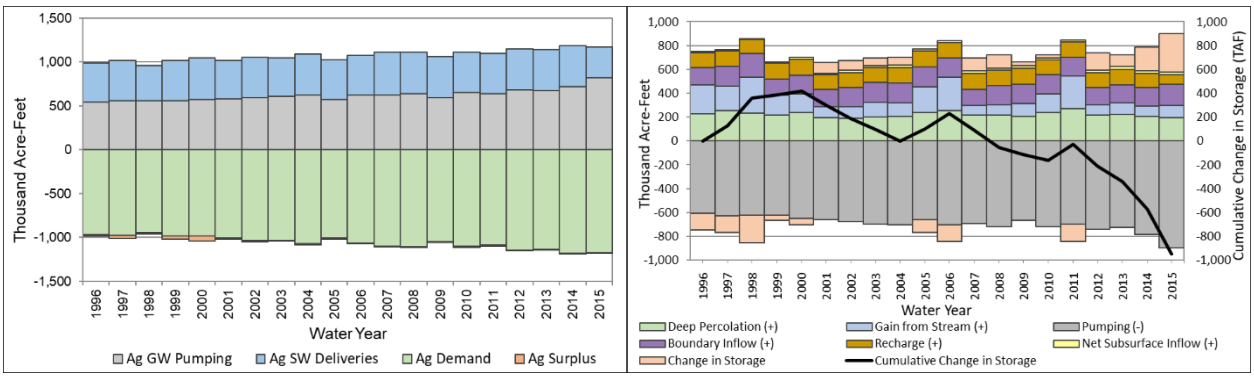




Water Budgets

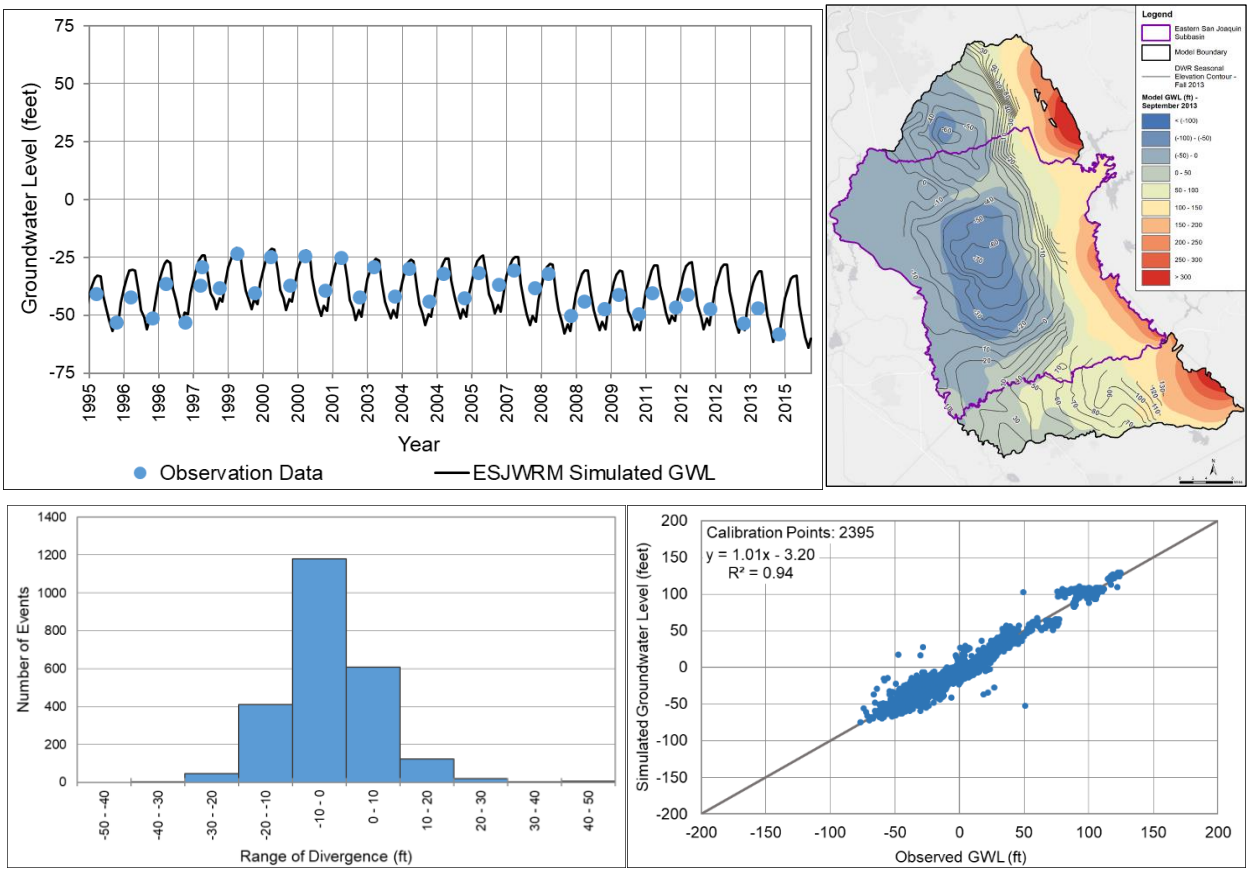
The model produces water budgets for land surface processes, including an estimate of urban and agricultural water demands, and water supplies. In addition, the model produces water budgets for the groundwater system, including groundwater pumping to meet irrigation demand and urban water needs, deep percolation from rainfall and irrigation applied water, subsurface flows from neighboring groundwater subbasins and the Sierra Nevada foothills, seepage from unlined conveyance canals, and flows between the stream and the aquifer system. The model can present this information on both a monthly and annual basis. Local operations data and information was collected from various water users and model parameters were adjusted to calibrate the model outcome to the reported values. Model calibration was conducted in an open and transparent process to ensure that the water budgets and model calibration results are properly representing the conditions of the groundwater basin to the extent that information is available.

An annual representation of the groundwater budget can reveal overall changes in groundwater storage, as depicted in the chart below. Uncertainties are inherent in every data set and calculation. Through a systematic sensitivity analysis, the range of impacts of uncertainties on model calculations was quantified. Knowledge of this range of uncertainties can assist in providing flexibility in decisions that rely on model results. The average annual depletions in groundwater storage for the historical period of 1996-2015 is estimated to be about 24,000 to 70,000 acre-feet per year (AFY), with an average depletion of 47,000 AFY.



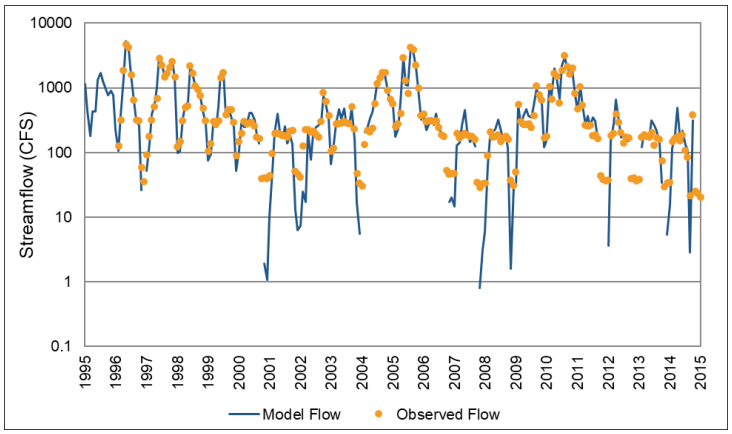
Groundwater Levels

The model-calculated groundwater levels are calibrated to observed groundwater levels at key wells over time. The typical goal of this calibration process is to adjust hydraulic parameters that influence the movement of groundwater such that the groundwater levels calculated by the model at the specific observation wells throughout the model area track short-term seasonal fluctuations and long-term trends as closely as possible. A typical model produced result is shown in the chart below. Once calibrated, the model produces regional groundwater levels for select points in time, as shown in the figure below. Model calibration statistics are represented in the following figures, which indicate that 75% of model calculated groundwater levels are within 10 feet of reported observations, and 97% are within 20 feet of reported observations. Given the uncertainties in the measurement of reported values, as well as uncertainties in model calculations, and expected calibration results for similar models as reported in the scientific communities, this statistic represents a very good model performance.



Streamflows

The model calculates flow of water in the stream system throughout the basin. Streamflows are subject to the diversion of water for beneficial agricultural uses or urban consumption, return flows from irrigation practices, runoff of rainfall, as well as gains and losses due to interaction with the groundwater system. The model stream system is calibrated to reported flows at the downstream gauging stations. The chart below shows the comparison between model calculated streamflow and gauge records on Mokelumne River at Woodbridge. The results indicate that the model is capable of simulating both the low and the high flows reasonably well.



Conclusions and Recommendations

The ESJWRM, in its current state, is a robust, comprehensive, defensible and well-established model for assessing the water resources in the ESJ Subbasin under historical and projected conditions. The following recommendations are to be considered for further refinements and enhancements of the model:

- **Continue engagement with local groundwater users and managers**. Continue working with local agencies and groundwater users in ESJ Subbasin to further understand the local operations of the groundwater system and improve representation of groundwater users in the ESJWRM.
- **Refinement of boundary flows**. The current boundary flows at the northern, western, and southern boundaries of the model area are based on an older version of the C2VSim with adjustments made based on initial groundwater levels assumed for the beginning of the model (October 1994). DWR is currently in the process of updating the C2VSIm model. Once the latest fine grid version (C2VSim-2015) is publicly available, boundary flows for the ESJ model area should be verified and updated, as necessary.
- **Enhance variability of potential evapotranspiration**. The current version of the IDC used for estimation of the consumptive use of crops in the ESJWRM uses monthly potential ET values that are the same for all years during the model period. Given that there may be annual variability in the potential ET data with possible effects on the annual estimation of crop water demand, it is recommended to use more detailed data with temporal variability to develop a full time series of ET values for use in the model.
- **Refine surface water deliveries in Cosumnes and Modesto Subbasins.** The surface water deliveries in the Cosumnes and Modesto Subbasins are currently at the subregion level and do not have the detailed spatial resolution of other areas within the ESJ Subbasin. This data may need to be verified and updated as modeling efforts in those subbasins progress to meet the requirements of SGMA.
- **Update C2VSim based on ESJWRM**. The fine grid version of C2VSim was developed by the DWR to evaluate the integrated surface water and groundwater conditions at a regional scale; whereas, the ESJWRM is capable of evaluation at the local scale. To increase the accuracy of regional groundwater conditions in the fine grid C2VSim, the County is encouraged to work with DWR to provide data and information for further refinement and update of C2VSim in the ESJWRM area.
- **Develop model update schedule**. In order to keep the ESJWRM up-to-date and current for analysis of water resources and especially for supporting SGMA implementation, it is recommended that the model be updated every 3 to 5 years. A possible update schedule can be kept consistent with the GSP updates, with a lead time of 2 to 3 years relative to the GSP update schedule.

1. INTRODUCTION

1.1 Goals of Model Development

The Eastern San Joaquin Water Resources Model (ESJWRM) was developed primarily to evaluate the current and recent historical groundwater conditions of the Eastern San Joaquin Groundwater Subbasin (ESJ Subbasin) and simulate various future condition scenarios as part of the Groundwater Sustainability Plan (GSP) preparation process under the Sustainable Groundwater Management Act (SGMA). ESJWRM will also be used to evaluate the effectiveness of different projects that may be proposed through the GSP development process. The fine scale of the model also provides the opportunity for individual Groundwater Sustainability Agencies (GSAs) to evaluate the effect of changing ESJ Subbasin conditions on smaller GSA areas.

1.2 Eastern San Joaquin Groundwater Subbasin

The ESJ Subbasin underlies portions of San Joaquin, Calaveras, and Stanislaus counties, with the majority of the area in San Joaquin County (Figure 1). San Joaquin County is located in the northeastern San Joaquin Valley and contains portions of the Sacramento-San Joaquin River Delta.

In 2014, the ESJ Subbasin was categorized as a high priority groundwater subbasin under the California Statewide Groundwater Elevation Monitoring (CASGEM) program. The ESJ Subbasin has been identified by the California Department of Water Resources (DWR) as critically overdrafted and is included in the List of Critically Overdrafted Basins finalized in January 2016. As a critically overdrafted subbasin, GSAs in the ESJ Subbasin must develop a GSP by January 31, 2020 that details how the ESJ Subbasin will be managed in a sustainable manner by 2040. The other groundwater subbasins immediately surrounding the ESJ Subbasin are not critically overdrafted except for the Delta-Mendota Subbasin (Figure 2).

The major municipalities in the ESJ Subbasin are the cities of Lodi, Stockton (including California Water Service Company Stockton District or Cal Water), Lathrop, Manteca, Ripon, and Escalon. The major agricultural water providers in the ESJ Subbasin include Woodbridge Irrigation District (WID), North San Joaquin Water Conservation District (NSJWCD), Stockton East Water District (SEWD), Central San Joaquin Water Conservation District (CSJWCD), South San Joaquin Irrigation District (SSJID), and Oakdale Irrigation District (OID). The major municipalities and agricultural water providers are all GSAs. Other agencies which supply water or have land use authority within the ESJ Subbasin and have been designated as GSA's are San Joaquin County, Stanislaus County (in combination with CCWD and Rock Creek Water District), Calaveras County Water District (CCWD), North and South Delta Water Agencies, Lockeford Community Services District (LCSD), and Linden County Water District (LCWD). The 17 GSAs covering ESJ Subbasin and their corresponding member agencies are listed in Table 1. The water purveyors are shown in Figure 3a and the GSAs are shown in Figure 3b.

Table 1: ESJ Subbasin GSAs and Member Agencies

GSA	Member Agency
Central Delta Water Agency	Central Delta Water Agency
Central San Joaquin Water Conservation District	Central San Joaquin Water Conservation District
City of Lathrop	City of Lathrop
City of Lodi	City of Lodi

GSA	Member Agency
City of Manteca	City of Manteca
City of Stockton	City of Stockton
Eastside San Joaquin GSA	Calaveras County Water District Stanislaus County Rock Creek Water District
Linden County Water District	Linden County Water District
Lockeford Community Services District	Lockeford Community Services District
North San Joaquin Water Conservation District	North San Joaquin Water Conservation District
Oakdale Irrigation District ESJ Subbasin GSA	Oakdale Irrigation District
San Joaquin County	San Joaquin County
San Joaquin County No. 2	San Joaquin County Cal Water
South Delta Water Agency	South Delta Water Agency
South San Joaquin GSA	South San Joaquin Irrigation District City of Ripon City of Escalon
Stockton East Water District	Stockton East Water District
Woodbridge Irrigation District	Woodbridge Irrigation District

1.3 Local Coordination

The development of the ESJWRM took place in an open and transparent process. The 17 GSAs of the ESJ Subbasin coordinate SGMA activities through the formation of the Eastern San Joaquin Groundwater Authority (GWA). The Eastern San Joaquin County Groundwater Basin Authority (GBA) was the organizational structure for agency coordination of water resources activities before SGMA regulations and the formation of the GWA. Many of the GBA/GWA agency members participated in a Technical Review Committee, which acted as the forum to review model input data and assumptions, as well as calibration results. The Technical Review Committee helped to facilitate major modeling decisions, provided input data, and reviewed results. The monthly Technical Review Committee meetings were open to all interested parties and generally consisted of technical representatives from local agencies, consultants with knowledge of the area, representatives for neighboring groundwater subbasins, DWR staff, and San Joaquin County personnel. Presentations given to this group are included in Appendix A and highlight major model configuration decisions, data analysis, and draft model results.

Local agencies with consistent representation at the Technical Review Committee meetings included San Joaquin County, WID, City of Lodi, NSJWCD, LCSD, CCWD, City of Stockton, Cal Water, SEWD, City of Lathrop, City of Manteca, SSJID, City of Escalon, OID, and Stanislaus County.

1.4 Model Platform

The ESJ Subbasin has been modeled since the mid-1980s. In 1993, as part of the Bureau of Reclamation's American River Watershed Investigation, an integrated model was developed based on the Integrated

Groundwater and Surface Water Model (IGSM) code. This model was developed in coordination with the San Joaquin County (County) and DWR and was used to analyze several conjunctive use programs and projects. In 2001, the San Joaquin County IGSM model was converted to a DYNFLOW platform (a proprietary finite element groundwater flow model) and was used for the County's Water Management Plan (CDM, 2008). The model originally simulated a period of October 1969 through September 1993 and was updated in 2007 for the Eastern San Joaquin Integrated Regional Water Management Plan (IRWMP) to simulate hydrologic conditions through September 2006. The proprietary nature of DYNFLOW makes the model not suitable to support subbasin analysis as part of GSP development per SGMA requirements.

With the award of Proposition 1's Counties with Stressed Basins Grant, the determination was made to combine data from the older models into a new, local-scale model using DWR's code that updated and replaced IGSM, called Integrated Water Flow Model (IWFM). IWFM is an open-source, finite element simulation code that supports triangular and quadrilateral elements (Dogrul et al., 2017a). It was specifically designated in GSP regulations as being supported by DWR for water budget development and SGMA compliance. It is also the code used for DWR's California Central Valley Groundwater-Surface Water Simulation Model (C2VSim), the fine grid version of which is being refined and enhanced by DWR to support SGMA activities throughout the Central Valley at the regional scale (Brush et al., 2013). C2VSim was developed using the same methodology and source data as were ESJWRM's datasets. To maintain consistency, ESJWRM relies on C2VSim for many of its datasets.

The IWFM Demand Calculator (IDC) is the stand-alone root zone component of IWFM that simulates land surface and root zone flow processes (Dogrul et al., 2017b). It calculates agricultural and urban water demands using inputs including climate conditions, soil parameters, and land use types and distribution. It can be run separately or combined with IWFM. IDC data development and results in this documentation are included as part of all other IWFM datasets and results. The IDC major data pieces and draft results were initially presented in a February 1, 2018 Technical Memorandum (Appendix B).

At the October 26, 2016 Technical Review Committee meeting, the decision was made to keep the model domain the same as for the DYNFLOW model. The County's DYNFLOW model included the ESJ Subbasin, as well as the Cosumnes Subbasin to the north and the Modesto Subbasin to the south. The ESJ Subbasin is the primary model area and the secondary model area includes the Cosumnes and Modesto Subbasins. The physical model boundaries are included in Table 2 and shown in Figure 4.

Table 2: Physical Model Boundaries

Boundary	Entire Model	Primary Model Area (ESJ Subbasin)
North	Cosumnes River	Dry Creek and County Boundary (including Mokelumne River)
East	Sierra Nevada Foothills	Sierra Nevada Foothills
South	Tuolumne River	Stanislaus River
West	San Joaquin River	San Joaquin River

2. MODEL DEVELOPMENT

This section presents the source and analysis of input data used in the development of ESJWRM. This includes spatial and temporal information for hydrologic and hydrogeologic data sets included in the model, as well as physical parameters and assumptions.

2.1 Model Input Data

The historical ESJWRM simulates water years 1995 through 2015 (October 1, 1994 through September 30, 2015). All data and computations are performed on a monthly time step. IWFM model files and corresponding major data sources and report sections are referenced below in Table 3.

Table 3: ESJWRM Major Model Data

Major Data Category	Minor Data Category	Data Source	Report Section
Hydrogeological Data	Geologic Stratification	C2VSim	2.9
	Aquifer Parameters	USGS Texture Model	4.7
Stream Data	Stream Configuration	C2VSim & San Joaquin County	2.3
	Stream Inflow	USGS & USACE Stream Gauges	2.3
	Calibration Gauges	USGS & CDEC Stream Gauges	4.3
Hydrological Data	Precipitation	PRISM & CalSIMETAW	2.4
Agricultural Water Demand	Land Use	DWR CropScape Land IQ Ag Commissioner's Report Local Information	2.6
	Evapotranspiration	C2VSim METRIC Local Information	2.7
	Soil Properties	SSURGO & STATSGO2	2.5
Urban Water Demand	Population	U.S. Census Bureau & Local Information	3.2
	Per Capita Water Use	Local Information (UWMPs)	3.2
Water Supply	Groundwater Pumping	Local Information	3.3.2
	Surface Water Deliveries	Local Information	3.3.1
Other	Boundary Conditions	C2VSim & Local Information	2.11
	Initial Conditions	C2VSim	2.12
	Small Watersheds	C2VSim	2.10
	Calibration Wells	DWR & Local Information	4.5

The hydrologic period used to build the model data files was water years 1969 through 2018 (October 1, 1968 through September 30, 2018). This allows for future work to use a longer model run time using actual historical rainfall and stream inflow records.

2.2 Model Grid and Reporting Units

The finite element grid was developed using Aquaveo's Groundwater Modeling System (GMS) software. The grid includes quadrilateral and triangular elements based on selected input lines and control points. Features included in the development of the model grid are shown in Figure 5 and included:

- Groundwater subbasin boundaries
- Hydrologic and hydrogeologic features (i.e., major and minor streams, reservoirs/lakes, and outcroppings)
- City spheres of influence boundaries
- ESJ Subbasin GSA boundaries
- County boundaries
- Subsurface flow patterns
- Other boundaries

The model grid contains 16,054 elements and 15,302 nodes with an average element area of 76.5 acres (Figure 6). The average node spacing is 0.37 miles overall, ranging from about 0.28 miles near hydrologic features to 0.42 miles in other areas. There was a 0.75-mile buffer included around the streams to transition from the finer to coarser node spacing. Primary objectives during grid development were to maintain a manageable number of elements and nodes, to optimize resolution for data analysis, to contain a finer resolution along rivers to allow for better simulation of stream-aquifer interaction, to optimize the model run time, and to streamline model output.

The model elements are grouped into 20 model subregions that are used to organize input data for the model and report standard model output water budgets (Figure 7). Subregion borders were delineated using boundaries including city spheres of influence, water agencies, subbasin, and county lines. These subregions are aggregated into 8 larger units (model subareas), which are the primary units to present results and are used for basin-scale planning (Figure 8). ESJ Subbasin, the primary model area, is made up of 6 subareas and 18 subregions or a total of 772,377 acres (about 1,207 square miles). The entire ESJWRM area covers 1,228,194 acres (about 1,919 square miles). A description of model subregions, including the subarea they are part of and the number of model elements they contain, is in Table 4.

Table 4: Model Subregions and Subareas

Subregion Number	Subregion Name	Subarea Name and Number	Number of Elements
1	North Delta	North Delta Subarea (#1)	872
2	Woodbridge	North Subarea (#2)	485
3	Lodi		104
4	North San Joaquin		1,969

Subregion Number	Subregion Name	Subarea Name and Number	Number of Elements
5	Calaveras	Calaveras Subarea (#3)	664
6	Stockton	Central Subarea (#4)	1,074
7	Stockton East		1,314
8	Central San Joaquin		929
9	Lathrop	South Subarea (#5)	119
10	Manteca		224
11	South San Joaquin East		632
12	Escalon		33
13	Oakdale West		128
14	South Delta		254
15	South San Joaquin West		74
16	Ripon		86
17	Stanislaus	Stanislaus Subarea (#6)	1,312
18	Oakdale East		332
19	Cosumnes	Cosumnes Subarea (#7)	2,378
20	Modesto	Modesto Subarea (#8)	3,071

2.3 Stream Configuration and Stream Inflow

The model hydrology is represented by 25 model stream reaches, which are largely defined to start and/or end at confluences. Major streams include Cosumnes River, Dry Creek, Mokelumne River, Bear Creek, Calaveras River, Stanislaus River, Tuolumne River, and San Joaquin River (Figure 9). Many of these streams route water along connecting sloughs and canals, including Pixley Slough, Mosher Creek, Potter Creek, Mormon Slough, and Diverting Canal. As described in Section 2.2, the model grid was designed to include other hydrologic features such as major reservoirs or other important streams that may be simulated in ESJWRM in the future. Hydrologic features used during grid development (i.e., reservoirs and minor streams) include Camanche Reservoir, Duck Creek, Farmington Flood Control Basin, French Camp Slough, Little Johns Creek, Lone Tree Creek, Modesto Reservoir, Tracy Lakes, and Woodward Reservoir (Figure 5 and Figure 9). These hydrologic features represent important drainage and conveyance water courses in the model, while the model streams interactively simulate flows and stream-aquifer interaction at every model stream node.

The streams and creeks are represented in the model by 1674 stream nodes on a quarter-mile interval. The number of stream nodes and their refined resolution provide increased accuracy when depicting stream-groundwater interaction. Physical characteristics, including the stream invert elevation, channel width, and a stream flow rating table, were obtained from the closest C2VSim stream nodes and United States Geological Survey (USGS) Digital Elevations Models (DEM).

Time series of stream inflow data is available from 7 USGS and the United States Army Corps of Engineers (USACE) gauging stations. This data is consistent with C2VSim streamflow data (Brush, 2013). A table of stream input data and a map of available stream gauge locations may be found in Table 5 and Figure 9.

There was not sufficient data available for Bear Creek to generate a full time series record and it is only receiving runoff and/or drainage from nearby model elements.

Table 5: Summary of ESJWRM Stream Inflow Data

Stream	Stream Node	Source	Gauge Name	Period of Record	Average Annual Streamflow (acre-feet)
Cosumnes River	1	USGS	USGS 11335000: Cosumnes River at Michigan Bar, CA	October 1907 to present/ongoing	365,000
Dry Creek	140	USGS	Estimated in C2VSim by correlation with USGS 11329500: Dry Creek near Galt, CA	Not continuous October 1926 to December 1997	25,000
		USGS	Estimated in C2VSim by correlation with USGS 11335000: Cosumnes River at Michigan Bar, CA	Used October 1987 to September 1995 and January 1998 to present/ongoing	
Mokelumne River	290	USGS	USGS 11323500: Mokelumne River below Camanche Dam, CA	October 1904 to present/ongoing	525,000
Calaveras River	758	USGS	USGS 11308900: Calaveras River below New Hogan Dam near Valley Springs, CA	February 1961 to September 1990	151,000
		USACE	New Hogan Dam releases	October 1990 to present/ongoing	
Stanislaus River	1033	USGS	USGS 11302000: Stanislaus River below Goodwin Dam near Knights Ferry, CA	February 1957 to present/ongoing	575,000
Tuolumne River	1248	USGS	USGS 11289650: Tuolumne River below Lagrange Dam near Lagrange, CA	October 1970 to present/ongoing	835,000
San Joaquin River	1497	USGS	USGS 11303500: San Joaquin River near Vernalis, CA	October 1923 to present/ongoing	3,089,000

ESJWRM also specifies how water routes at forks in the rivers. Ten percent of Bear Creek flows through Pixley Slough before returning to Bear Creek, while 90% continues in Bear Creek. Eighty percent of Calaveras River flows through Mormon Slough and the Diverting Canal before returning to Calaveras River, while 20% continues in Calaveras River.

2.4 Precipitation

Rainfall data for the model area is derived from the PRISM (Precipitation-Elevation Regressions on Independent Slopes Model) database used in the DWR's CALSIMETAW (California Simulation of Evapotranspiration of Applied Water) model. The database contains daily precipitation data from October 1, 1921 on a 4-kilometer grid throughout the model area. ESJWRM has monthly rainfall data defined for every model element in order to preserve the spatial distribution of the monthly rainfall. Each of the model elements was mapped to the nearest of 364 available PRISM reference nodes, uniformly distributed across the model domain. The resulting average annual precipitation is shown in Figure 10.

Figure 11 shows the annual rainfall in the model area and the cumulative departure from mean, which is an indication of long-term rainfall trends in the area. The minimum precipitation during the simulation period was in water year 2007 with 8.0 inches, while the maximum occurred in water year 1998 with 28.5 inches. The average precipitation was 15.1 inches, with 9 above average and 12 below average simulation years.

2.5 Root Zone Soil Parameters

The soil properties specified in the model are field capacity, wilting point, total porosity, saturated hydraulic conductivity, and pore size distribution index (PSDI). A recent update to IWFM added the capability to specify a separate saturated hydraulic conductivity for areas covered by rice or wetlands, which prevents the overestimation of deep percolation during periods of ponded water. All the soil properties are used to determine the soil types and characteristics of each model element.

DWR's IWFM Soil Data Builder (DWR, 2017) was used in conjunction with the United States Department of Agriculture (USDA) Soil Survey Geographic Database (SSURGO) (USDA, 2017a) soil data to determine the five soil properties for each model element. The IWFM Soil Data Builder extracts the SSURGO data relevant to the model area (in this case, 6 counties) and associates it with each grid element. For ESJWRM elements where SSURGO data was incomplete, USDA's Digital General Soil Map of the United States (STATSGO2) data were used instead (USDA, 2017b). In total, a little over 3,500 elements (about 22% of all elements) used STATSGO2 data for at least one of the parameters. Editing of soil parameters is a standard part of IDC calibration and the final soil parameter values and their spatial distributions are discussed and shown in figures in Section 4.2.

Model elements are associated with the four hydrological soil groups according to their runoff potential and infiltration characteristics. ESJWRM elements with their corresponding hydrologic soil group are shown in Figure 12. The Natural Resource Conservation Service (NRCS) (USDA NRCS, 2009) 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 gravel or sand 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.

2.6 Land Use and Cropping Patterns

For the model to calculate water supply requirements, every model element needs to have land use defined for every year of the simulation. ESJWRM includes 23 irrigated crop categories and 4 general land use categories. All of the irrigated crop categories except for rice are simulated as non-ponded crops, meaning they are grown without standing water. Rice is simulated as both no decomposition (assumed 20% of total rice area) and flooded decomposition (assumed 80% of total rice area) to represent the current understanding of local growing practices. The general land use categories include urban landscape (e.g., residential areas, golf courses, and school fields), water surface (e.g., streams, lakes, and reservoirs), riparian vegetation (e.g., native vegetation located near surface water), and native vegetation. The irrigated crop categories were combined into 6 high-level groupings of crops with similar water use or irrigation practices. Table 6 lists the land use categories.

The crop categories are identical to those in C2VSim, except that ESJWRM breaks out almonds, cherries, pistachios, and walnuts as individual categories. This was done at the request of the Technical Review Committee based on the importance and amount of these crops in the ESJ Subbasin.

Spatial land use data was used to specify land use types and crop acreages for each model element for each year. The three major reference sources include DWR land use surveys, CropScape, and Land IQ. As crop categories were not consistent across all the land use data sources, individual mappings matched up each crop type to model land use category.

DWR conducts periodic land use surveys for each county that include over 70 different crop categories, as well as urban and native vegetation, for each parcel or field (DWR, 1993-2000). DWR land use surveys have high accuracy due to extensive ground truthing. For ESJWRM, the land use surveys by county were merged and assumed to represent water year 1995 in the model. The surveys used include:

1. San Joaquin County (1996)
2. Sacramento County (1993)
3. Amador County (1997)
4. Calaveras County (2000)
5. Stanislaus County (1996)

Data for water years 2007 through 2015 are from the USDA's remote sensing CropScape data (USDA NASS, 2007-2015). CropScape includes 256 land use categories that come from annual satellite imagery collected during the growing season on 30-meter by 30-meter pixels. Based on reports on the CropScape website, the level of accuracy for this data is about 85-97% for crop-specific land cover categories. Although this level of accuracy is relatively high, the accuracy varies depending on many factors, including the time of the satellite image, growing season timing, cloud cover, type of crop, and maturity state of the crop.

DWR retained Land IQ to develop a statewide assessment of agricultural land use in summer 2014. Land IQ used remote sensing methods to collect and process the data at the parcel scale, which was then ground truthed for a reported overall accuracy of 96.6% (DWR, 2014). In ESJWRM, this data was used as verification of CropScape 2014 data and, in some cases, as replacement or enhancement of the CropScape data. Land IQ did not include a native vegetation category, so any blank land was assumed to be native vegetation.

Table 6: Land Use Categories

Land Use Type	Model Category	Grouped Categories
Irrigated Crops	Almonds Cherries Citrus & Subtropical Other Orchard Pistachios Walnuts	Fruit and Nut Trees
	Vineyards	Vineyards
	Alfalfa Pasture	Alfalfa and Irrigated Pasture
	Grain	Grain
	Corn Cotton Dry Beans Field Crops Safflower Sugar Beets	Field Crops
	Cucurbits Onion & Garlic Potatoes Tomato Fresh Tomato Processing Truck Crops	Truck Crops
	Rice	Rice
Other Land Use	Urban Landscape Water Surface Riparian Vegetation Native Vegetation	

Local data and knowledge was also utilized to refine and correct, when necessary, the cropping acreages developed based on the DWR land use surveys and CropScape years. To fill the gap between 1995 and 2007, all land use and crop categories were interpolated at the spatial resolution level of the model element. Thus, the geographic distribution of interpolated land use and cropping patterns are honored.

Consistent mappings were developed to link crop categories from the various data sources to model categories based on previous work done for C2VSim. Adjustments were made, as needed, at the element level to ensure that the land use and cropping pattern trends over time are reflective of local data. These adjustments were mostly based on local knowledge and information received from various entities, including irrigation districts, water districts, and municipalities.

Figure 13 and Figure 14 show the spatial distribution of the major land use categories in the ESJ Subbasin for 1995 and 2015. Figure 15 shows the annual trends of land use categories in the ESJ Subbasin.

Figure 16, Figure 17, and Figure 18 show the spatial distribution of the irrigated crops for 1995, 2014, and 2015. Figure 19a-19g show the annual cropping patterns, by high level categories, for the entire ESJ Subbasin and major model subareas.

Overall, land use trends from 1995 through 2015 show significant increases in total and irrigated agricultural acreage, with about 384,000 irrigated acres in ESJ Subbasin at the beginning of simulation and about 398,000 acres with agricultural 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 conversion to higher water permanent crops, particularly vineyards, almonds, and walnuts. This translates to a higher water requirement, largely provided either by groundwater or surface water, though changes in irrigation methods may mitigate some of the increased water need due to land use changes.

Not all the subareas show an increase in agricultural land; many remain relatively consistent through the entire simulation period. When there was a decrease in agricultural land, there was a compensating increase in urban land, indicating the expansion of urban areas.

2.7 Evapotranspiration

The crop evapotranspiration (ET) requirement is an important factor in agricultural demand estimation. Every ESJWRM land use category (except for water surface) plus small-stream watersheds must have average monthly values used for the entire simulation. To allow for spatial variability within the model, ET rates are also defined by model subregion.

The ET values are based on a variety of sources, including locally-developed data for the SSJID and the OID Agricultural Water Management Plans (AWMPs) (SJJID, 2015; OID, 2016) and averages for DWR's CIMIS (California Irrigation Management Information System) Zone 12 developed using the Mapping Evapotranspiration at High Resolution with Internalized Calibration (METRIC) methodology, which is a remote-sensing based technology to estimate crop actual ET. Based on discussions with locals (pers. comm. Jennifer Spaletta representing NSJWCD and Bryan Thoreson representing SSJID), deficit irrigation of vineyards was simulated in ESJWRM with reference to the growing season ET values in the Lodi area (Prichard).

In IWFM, ET represents the net vertical water flux from the land surface and root zone through the upper model boundary. Figure 20 shows the range in annual evapotranspiration rates from the various sources for the 27 categories. Final model ET depends on the model subregion, with SSJID and OID using their locally-developed ET rates and the remainder of the model using the METRIC data.

2.8 Drainage

Surface water drainage (e.g., runoff from rainfall and excess applied water) for each model element is assigned to a stream node representing where the drainage ultimately flows to. These drainage patterns were delineated using the USGS Watershed Boundary Dataset for 12-digit hydrologic units, also called subwatersheds. Each 12-digit hydrologic unit located within the model boundaries was associated with the model stream node it ultimately drained into through both visual analysis as well as information provided on the subwatersheds. Elements falling within the hydrologic units were assigned to the model stream node indicating the ultimate surface water drainage direction. A total of 94 unique stream nodes receive surface water drainage in ESJWRM from 79 subwatersheds. Figure 21 shows these stream nodes and the subwatersheds mapped to the model elements.

2.9 Model Layering

The subsurface zone is characterized by four model layers (three freshwater aquifers and one saline aquifer) representing the different geology from the ground surface to the bedrock. A small portion of the southwestern part of the subbasin has a confining unit of Corcoran Clay. The layering extents and thicknesses are all consistent with C2VSim. Descriptions of each of the model layers are listed below, from top to bottom.

- Layer 1: Layer 1 represents the top unconfined portion of the aquifer. The ground surface elevation (GSE), or the top of Layer 1, comes from the USGS DEM at a resolution of 10 meters. The bottom of Layer 1 is defined as the top of Corcoran Clay where the confining unit exists or else as the bottom of Layer 1 in C2VSim. The layer thickness is limited by the stream invert elevation and ranges from 34 to 966 feet. The GSE is shown in Figure 22 and thickness of Layer 1 is shown in Figure 23.
- Aquitard 1: Corcoran Clay (i.e., E Clay) separates Layers 1 and 2 in a small portion of the southwest corner of the model. The extent, thickness, and depth of the Corcoran Clay originated from the Central Valley Hydrologic Model (CVHM) Spatial Database. The depth to the Corcoran Clay, ranging from 20 to 280 feet below the GSE, is shown in Figure 24 and the thickness of the Corcoran Clay, ranging from 10 to 160 feet, is in Figure 25.
- Layer 2: Layer 2 represents the primary pumping layer and is beneath the confining layer where Corcoran Clay exists. Layer 2 is principally bounded on the top by the bottom of Layer 1 or the bottom of Corcoran Clay (where it exists) and on the bottom by Layer 2 in C2VSim. The thickness of Layer 2, ranging from 50 to 540 feet, is in Figure 26.
- Layer 3: Layer 3 extends to the base of fresh water. Information used in developing the bottom of Layer 3 includes data from Steven Springhorn of DWR's North Central Regional Office, Christopher Olvera of DWR's South Central Regional Office, and Williamson et al. 1989. The thickness of Layer 3, ranging from 50 to 1,335 feet, is in Figure 27.
- Layer 4: Layer 4 consists of the saline water ranging from the base of fresh water to the base of continental deposits and is a current non-production zone. Information used in developing the bottom of Layer 4 includes Page's 1974 Base and Thickness of the Post Eocene Continental Deposits in the Sacramento Valley and the thickness of the aquifer developed by Williamson et al. 1989. The thickness of Layer 4, ranging from 50 to 2,250 feet, is in Figure 28.

Cross sections of the model layering in various locations across the model extent can be seen in Figure 29a-29f.

2.10 Small-Stream Watersheds

The inflow from the eastern boundary of the model (i.e., Sierra Nevada foothills) originates from both gauged and ungauged watersheds. The simulation of gauged watersheds (i.e., stream inflows into the model) was discussed in Section 2.3 and shown in Figure 9. The simulation of the ungauged watersheds is explained in this section.

Flow from ungauged small watersheds is estimated based on precipitation rates and characteristics assigned to each identified ungauged watershed. A portion of flow from the small watershed enters the model area as surface runoff and flows to simulated streams. The remaining small watershed inflow infiltrates to groundwater.

ESJWRM simulates the ungauged eastern inflow using 39 distinct small watersheds (Figure 30), consistent with those on the eastern boundary of C2VSim. These were delineated originally from the USGS Watershed Boundary Dataset.

All subsurface inflows from these small watersheds are routed to model Layer 1 along specified groundwater nodes (Figure 30), with a user-defined maximum percolation rate at each node. Excess flows that do not infiltrate to groundwater enter the simulated streams at user-specified locations (Figure 30) delineated using a similar methodology to the drainage pattern discussed above in Section 2.8. The hydrologic conditions of these small watersheds used to estimate the subsurface and surface flows are represented using site-specific parameters (e.g., precipitation, surface layer soil parameters, runoff coefficient) based on C2VSim.

2.11 Boundary Conditions

As discussed in the previous section, inflows along the eastern boundary are represented using small watersheds. Boundary conditions define the subsurface inflows from all other boundaries of the model (i.e., northern, western, and southern), as well as areas with known groundwater levels.

Time series general head boundary conditions representing groundwater levels outside of the model area were defined for 596 boundary nodes on the northern, western and southern limits (i.e., along Cosumnes, Mokelumne, San Joaquin, and Tuolumne Rivers). Groundwater flow at the model boundaries was quantified based on the groundwater gradient across the model boundary. The head inside the model area is simulated by ESJWRM and the head outside the model area is based on historical groundwater elevation data from DWR's Water Data Library (WDL).

Additional groundwater boundary conditions were defined to simulate known groundwater elevations for the Sacramento-San Joaquin Delta and lakes or reservoirs (reservoir locations shown in Figure 5). ESJWRM specifies high groundwater levels at or near zero feet for 60 groundwater nodes representing the edges of the Sacramento-San Joaquin Delta. Using data available in C2VSim, seepage from Camanche Reservoir was represented by specifying the full time series of groundwater levels for the 270 groundwater nodes representing the reservoir. The other reservoirs in the model were not included in C2VSim, so did not have boundary conditions available to estimate reservoir seepage. Instead, Woodward Reservoir seepage is included as a stream diversion from Stanislaus River (see Section 3.3.1). Farmington Flood Control Basin is used primarily for flood control purposes. Any recharge is incidental to the operation of the dam and is currently not included in ESJWRM. Modesto Reservoir, as it is located outside of the focus area of ESJ Subbasin, was not simulated.

2.12 Initial Conditions

Groundwater heads for each model node and each layer at the beginning of the simulation (i.e., October 1, 1994) were developed using the DWR's WDL database and San Joaquin County's database of historical groundwater monitoring. Over 1,100 wells with data for Fall 1993, Fall 1994, or Fall 1995 were compiled and interpolated to create a raster representing initial groundwater levels for each model groundwater node. Due to the lack of information on well perforation and even depth for many of the WDL and San Joaquin County monitoring locations, the groundwater heads for each model layer are assumed to all begin at the same value. This assumption means the model needs about a year for groundwater levels to stabilize, so model results focus on water years 1996 through 2015 (a 20-year period). The initial conditions for ESJWRM representing October 1, 1994 are shown in Figure 31.

3. WATER SUPPLY AND DEMAND DATA

The following sections describe the data and methodology for the ESJWRM water demand and supply calculations. Agricultural and urban demand are calculated in the IDC portion of IWFM. Agricultural and urban supply are specified in IWFM's groundwater pumping and surface water diversion data.

3.1 Agricultural Water Demand

Agricultural water demand is the amount of irrigation water that is required to satisfy the crops evapotranspiration requirement. The IWFM Demand Calculator or IDC is designed to estimate the agricultural water demand for each model element through consumptive use methodology. The IDC calculations rely on model input data for historical crop acreage, irrigation practices (e.g., return and reuse fractions, irrigation period), soil moisture requirements, effective rainfall (the portion of rainfall available for crop consumptive use), crop evapotranspiration, and localized soil parameters. This data was compiled, analyzed, synthesized, and processed for input in ESJWRM.

Precipitation, land use, evapotranspiration, and soil properties are discussed in the relevant sections in Chapter 2. Irrigation period, using data from C2VSim, defines irrigation as either on or off for each crop and each month of the model simulation period. These were vetted and revised as necessary by the Technical Review Committee to better represent local practices in the ESJWRM area. Most trees are assumed irrigated from April through October (with almonds and pistachios from February through October), vineyards from May through October, most field crops from May through September, and most truck crops from April through September. Crops with irrigation assumed year-round include citrus and subtropical trees, irrigated pasture, alfalfa, and onions and garlic. Fractions to represent return flow (i.e., irrigation flow following the model drainage pattern discussed in Section 2.8) and reuse (i.e., the fraction of applied irrigation water to be reused for irrigation) are from C2VSim and are defined by subregion. For all ESJWRM, agricultural lands are given a 1% return flow and 1% reuse factor and urban landscape areas are assumed to have 15% return flow and 0% reuse.

3.2 Urban Water Use

IDC calculates urban demand based on per capita water use, population, and the breakdown of indoor versus outdoor water use by month. Figure 32 shows the annual population trends for each urban center. Figure 33 shows the annual per capita water use values of these urban centers used in the calculation of urban water demand.

Population and per capita water use for the major urban areas were largely provided directly by the urban areas or were obtained from the respective Urban Water Management Plans (UWMP). Additional annual population, including an estimate for rural urban areas, came from the United States Census Bureau and the California Department of Finance. Monthly per capita water use, commonly reported in gallons per capita per day (GPCD), was generally estimated for each urban entity using the annual population and monthly urban water use (provided by cities based on water delivery records). To estimate the urban water demand of rural domestic water areas, the average major urban area GPCD was combined with estimated rural population.

It was assumed that an annual average of 60% of urban water was used indoors and 40% was used outdoors. The monthly fractions entered into the model had the majority of urban water demand due to

indoor activities from November through March and up to a maximum of 60% of urban water used outdoors for the remainder of the year.

The indoor/outdoor breakdown received concurrence from the urban water providers who attended the Technical Review Committee meetings. Population and per capita water use data were reviewed by the major urban areas and confirmed at the meetings (pers. comm. Kathryn Garcia from Lodi, Andrew Richle from Lodi, Michael Bolzowski from Cal Water, Greg Gibson from Lathrop, and Elba Mijango from Manteca).

3.3 Water Supply Summary

Both the agricultural and urban demands estimated by IDC are primarily met through the IWFM representation of surface water diversions and groundwater pumping. Other sources of water simulated in IWFM to meet demand include precipitation and existing moisture in the soil.

3.3.1 Surface Water

Historical surface water diversions for the simulation period were compiled from a combination of sources discussed in more detail in Section 3.4, including gauge data, water rights reports, UWMPs, AWMPs, and other sources. Some diversions were estimated based on historical demands. A summary of diversions simulated in the model is provided in Table 7, along with fractions for recoverable loss (i.e., percolation or canal seepage), non-recoverable loss (i.e., evaporation), and delivery (i.e., amount delivered is equal to the total amount minus the recoverable and non-recoverable losses).

The monthly data for all these diversions came from local agencies or C2VSim (Modesto Subbasin diversions and riparian diversions) as discussed in more detail in Section 3.4. Many diversions provide water across model subregions, so deliveries are assigned to a group of elements representing the delivery area. Diversions either are taken out of streams at specified model streams nodes or are imported into the model area (i.e., diversion location occurs upstream of stream inflow gauge). Figure 34 shows the stream nodes where diversions occurred.

Table 7: Summary of ESJWRM Surface Water Deliveries

ID	Description	Diversion Location	Delivery Area	Use	Fraction			Average Annual Diversion*** (acre-feet)	Data Source
					RL*	NL**	Delivery		
1	Mokelumne River to Woodbridge ID for Ag	Mokelumne River at Lodi Lake	Element group representing Woodbridge Irrigation District	Ag	30%	2%	68%	56,700	WID
2	Mokelumne River to City of Lodi (by agreement with Woodbridge ID)	Mokelumne River at Lodi Lake	Lodi Sphere of Influence	Urban	3%	1%	96%	5,000	WID

ID	Description	Diversion Location	Delivery Area	Use	Fraction			Average Annual Diversion*** (acre-feet)	Data Source
					RL*	NL**	Delivery		
3	Mokelumne River to City of Stockton for Delta Water Supply Project (by agreement with Woodbridge ID)	Mokelumne River at Lodi Lake	Element group representing Stockton area minus Cal Water	Urban	3%	1%	96%	5,400	WID
4	Mokelumne River to Contra Costa WD (by agreement with Woodbridge ID)	Mokelumne River at Lodi Lake	Export out of model	Urban	0%	0%	100%	2,000 (one year only)	WID
5	Mokelumne River to North San Joaquin WCD For Ag	Mokelumne River between Camanche Reservoir and Lodi Lake	Element group representing North San Joaquin WCD	Ag	10%	2%	88%	2,200	NSJWCD
6	Calaveras River to Bellota Pipeline to Stockton East WD WTP for M&I	Calaveras River at split with Mormon Slough	Stockton Sphere of Influence	Urban	3%	1%	96%	15,800	SEWD
7	Calaveras River to Calaveras County WD for Ag	Import (outside of ESJWRM)	Calaveras Subregion (Subregion 5)	Ag	9%	1%	90%	1,100	CCWD
8	Calaveras River to Stockton East WD for Ag	Calaveras River at split with Mormon Slough	Element group representing Stockton East Water District agricultural customers	Ag	40%	5%	55%	42,600	SEWD
9	Calaveras River to Farmington Groundwater Recharge Program	Calaveras River at split with Mormon Slough	Element group representing recharge locations	Ag	100%	0%	0%	1,300	SEWD
10	San Joaquin River at Empire Tract to City of Stockton for Delta Water Supply Project	San Joaquin River at Empire Tract just after junction with Bear Creek	Element group representing Stockton area minus Cal Water	Urban	3%	1%	96%	7,800	City of Stockton

ID	Description	Diversion Location	Delivery Area	Use	Fraction			Average Annual Diversion*** (acre-feet)	Data Source
					RL*	NL**	Delivery		
11	San Joaquin River to North Delta	San Joaquin River near North Delta Subregion	Element group representing North Delta	Ag	5%	1%	94%	107,000	Estimated by model
12	San Joaquin River to South Delta	San Joaquin River near South Delta Subregion	Element group representing South Delta	Ag	5%	1%	94%	14,200	Estimated by model
13	Farmington Reservoir via Lower Farmington Canal to Peters Pipeline to Stockton East WD WTP	Import (outside of ESJWRM)	Stockton Sphere of Influence	Urban	3%	1%	96%	33,300	SEWD
14	Farmington Reservoir via Lower Farmington Canal to Stockton East WD for Ag	Import (outside of ESJWRM)	Element group representing Stockton East Water District agricultural customers	Ag	15%	2%	83%	5,300	SEWD
15	Farmington Reservoir via Little Johns Creek and Lower Farmington Canal to Central San Joaquin WCD for Ag	Import (outside of ESJWRM)	Element group representing Central San Joaquin WCD	Ag	28%	2%	70%	38,800	SEWD
16	Stanislaus River to Farmington Groundwater Recharge Program	Import (outside of ESJWRM)	Element group representing recharge locations	Ag	100%	0%	0%	3,000	SEWD
17	Woodward Reservoir to South San Joaquin ID for Ag	Import (outside of ESJWRM)	Element group representing South San Joaquin ID minus Division 6	Ag	21%	6%	74%	195,300	SSJID
18	Stanislaus River at Goodwin Dam to Oakdale ID for Ag	Import (outside of ESJWRM)	Element group representing Oakdale ID	Ag	16%	1%	83%	111,100	OID

ID	Description	Diversion Location	Delivery Area	Use	Fraction			Average Annual Diversion*** (acre-feet)	Data Source
					RL*	NL**	Delivery		
19	Woodward Reservoir Seepage	Import (outside of ESJWRM)	Element group representing Woodward Reservoir	Ag	100%	0%	0%	17,500	SSJID
20	Woodward Reservoir to Nick C. DeGroot WTP to City of Manteca for M&I	Import (outside of ESJWRM)	Manteca Sphere of Influence	Urban	3%	1%	96%	6,300	AWMP/ UWMP
21	Woodward Reservoir to Nick C. DeGroot WTP to City of Escalon for M&I	Import (outside of ESJWRM)	Escalon Sphere of Influence	Urban	3%	1%	96%	0	AWMP/ UWMP
22	Woodward Reservoir to Nick C. DeGroot WTP to City of Lathrop for M&I	Import (outside of ESJWRM)	Lathrop Sphere of Influence	Urban	3%	1%	96%	1,100	AWMP/ UWMP
23	Woodward Reservoir to Nick C. DeGroot WTP to City of Ripon for M&I	Import (outside of ESJWRM)	Ripon Sphere of Influence	Urban	3%	1%	96%	0	AWMP/ UWMP
24	Tuolumne River to Modesto ID	Import (outside of ESJWRM)	Element group representing Modesto ID	Ag	15%	3%	82%	307,600	C2VSim
25	Tuolumne River to City of Modesto (via Modesto ID)	Import (outside of ESJWRM)	Element group representing City of Modesto	Urban	5%	1%	94%	30,600	C2VSim
26	Cosumnes River to Riparian for Ag	Along Cosumnes River near confluence with Mokelumne River	Element group representing riparian diverters	Ag	10%	2%	88%	4,300	C2VSim
27	Dry Creek to Riparian for Ag	Approximately midway along Dry Creek	Element group representing riparian diverters	Ag	10%	2%	88%	6,000	C2VSim

ID	Description	Diversion Location	Delivery Area	Use	Fraction			Average Annual Diversion*** (acre-feet)	Data Source
					RL*	NL**	Delivery		
28	Mokelumne River to Riparian for Ag	Approximately midway along Mokelumne River	Element group representing riparian diverters	Ag	10%	2%	88%	9,700	C2VSim
29	Calaveras River to Riparian for Ag	Calaveras River at split with Mormon Slough	Element group representing riparian diverters	Ag	10%	2%	88%	20,400	C2VSim
30	Stanislaus River to Riparian for Ag	Approximately midway along Stanislaus River	Element group representing riparian diverters	Ag	15%	3%	82%	20,700	C2VSim
31	Tuolumne River to Riparian for Ag	Approximately midway along Tuolumne River	Element group representing riparian diverters	Ag	15%	3%	82%	2,500	C2VSim
32	San Joaquin River to Riparian for Ag	San Joaquin River near confluence with Tuolumne River	Element group representing riparian diverters	Ag	15%	3%	82%	6,200	C2VSim
33	Woodward Reservoir to South San Joaquin ID Division 6 for Ag	Import (outside of ESJWRM)	Element group representing South San Joaquin ID Division 6	Ag	15%	2%	83%	5,200	SSJID

*RL = Recoverable Loss (canal seepage or recharge)
**NL = Non-Recoverable Loss (evaporation)
*** Averages calculated only for years with diversions occurring (i.e., non-zero average)

3.3.2 Groundwater Pumping

Groundwater pumping within ESJWRM is separated into well- or element-based pumping. The former largely includes district-operated wells that feed into the surface water supply network, while the latter includes estimated private groundwater pumping.

District pumping (or well pumping) is specified monthly throughout the simulation period. Data was provided by local agencies and included well locations, depths and perforations, use (agricultural or urban) and historical monthly pumping records. Table 8 lists the number of wells by type and agency included in ESJWRM. Figure 35 shows all the district pumping wells (separated by agricultural and municipal wells) in ESJWRM.

Table 8: Summary of ESJWRM Well Pumping

Agency	Number of Urban Pumping Wells	Number of Agricultural Pumping Wells	Average Annual Urban Pumping (acre-feet)	Average Annual Agricultural Pumping (acre-feet)
Cal Water	56	---	9,600	0
Escalon	4	---	1,400	0
Lathrop	6	---	2,200	0
Linden County WD	4	---	450	0
Lockeford CSD	4	---	530	0
Lodi	29	---	15,200	0
Manteca	15	31	9,500	1,300
Oakdale ID	---	24	0	5,800
Ripon	9	9	3,900	1,100
SEWD	5	---	3,100	0
SSJID	---	28	0	5,200
Stockton	37	---	9,300	0
Total Average Annual Pumping (acre-feet)			55,180	13,400

Private groundwater pumping quantities on an individual well basis are largely unknown, though aggregate estimates for private pumping are often included in planning documents (e.g., AWMPs, UWMPs, groundwater management plans). Therefore, private agricultural pumping in ESJWRM is estimated by IWFM on an element basis by assigning two virtual wells at the centroid of each model element. One well represents private agricultural pumping and one well represents rural residential pumping. These wells are used to calculate any additional pumping necessary to meet the agricultural and urban demand estimated by IDC for an element after district pumping and surface water has been distributed.

The perforation interval, which dictates the layers a simulated well extracts water from, were assigned separately to the agricultural and domestic (i.e., rural residential) wells. All agricultural wells were assumed to pump 40% from Layer 1 and 60% from Layer 2. Rural residential wells used a statistical analysis of perforation interval developed for C2VSim. Perforation interval data was compiled by DWR using data from the CASGEM and Online System for Well Completion Reports (OSWCR) databases. Simulated perforation intervals were assigned as the 5th and 95th percentiles of the well perforation interval data for each township/range block.

3.4 Water Supply Sources

This section provides a detailed description of the sources of water supply (both surface water and pumping) occurring in ESJWRM.

3.4.1 Delta Areas

The North Delta and South Delta Subregions (Subregion 1 and 14) are mostly assumed to cover the portion of the Sacramento-San Joaquin River Delta overlying the ESJ Subbasin. As discussed at the Technical Review Committee meetings, the majority of the agricultural water demand in these areas is known to be entirely served by surface water taken off the San Joaquin River. Therefore, almost all of the agricultural demand is assumed to be supplied by the San Joaquin River (Diversion #11 and #12 for North Delta and

South Delta, respectively). A small portion of the agricultural land is assumed to rely on groundwater via element pumping. All of the urban demand is supplied by small, private residential wells and is estimated in ESJWRM using element pumping.

Though Subregions 1 and 14 are assumed to represent the Delta, elements in Subregions 1 and 14 receive surface water from other diversions unrelated to the assumed riparian Delta diversions. A portion of WID's delivery area extends into Subregion 1 and is supplied by WID's diversion off the Mokelumne River (Diversion #1) as discussed in Section 3.4.2. Portions of other riparian diversions discussed in Section 3.4.19 extend into Subregions 1 and 14, specifically Dry Creek (Diversion #27) in Subregion 1 and San Joaquin River (Diversion #32) in Subregion 14.

3.4.2 Woodbridge Irrigation District

WID receives water from the Mokelumne River, which is provided to its agricultural customers through a distribution canal network or is sold to nearby municipalities. Through agreements, Lodi and Stockton use some of WID's surface water right beginning in water years 2013 and 2012, respectively (Diversion #2 and #3). In water year 2013, WID supplied Contra Costa Water District with a one-time transfer of 2,000 AF (acre-feet), represented by Diversion #4. Diversion #1 delivers water to the element group representing WID's service area, which spans portions of Subregion 1, most of Subregion 2, part of Subregion 3, and a small area of Subregion 6. The scale of the ESJWRM element grid is not refined enough to simulate deliveries on the parcel scale, so model elements may include parcels which do not in actuality receive surface water from WID.

Some of the agricultural demand (largely native landscape) adjacent to streams is met by the riparian diversion from Mokelumne River (Diversion #28) as discussed in Section 3.4.19. All remaining agricultural demand is estimated in ESJWRM as element pumping. All urban demand is likewise element pumping.

3.4.3 City of Lodi

The City of Lodi purchases surface water from WID, which it takes from the Mokelumne River adjacent to the city. Diversion #2 supplies part of the urban demand beginning in water year 2013, with all of the previous demand being met exclusively by groundwater. 29 municipal wells are simulated in the model, with at least 3 becoming inactive during the simulation period. Since Lodi began receiving surface water, its supply mix has steadily decreased its reliance on groundwater, from 100% of the urban demand in water year 2012 to 55% of the demand in water year 2015, with its increase in surface water use.

The agricultural land surrounding the current city boundaries is supplied by either WID on the west or NSJWCD to the east. Though the agricultural demand in these areas is small, WID's Diversion #1 or NSJWCD's Diversion #5, along with the riparian diversion from Mokelumne River (Diversion #28) (see Section 3.4.19), are able to supply some of the agricultural demand adjacent to Lodi. The city's wastewater treatment plant, located to the west of the city in Subregion #1, is surrounded by fields irrigated using recycled water from the treatment plant. Any additional agricultural or urban demand is estimated in ESJWRM as element pumping.

3.4.4 North San Joaquin Water Conservation District

NSJWCD receives water from the Mokelumne River, which is provided to its agricultural customers as Diversion #5. Historically, NSJWCD has not used its entire water right allotment and did not divert any water towards the end of the simulation (starting water year 2013).

Some of the agricultural demand adjacent to water is met by the riparian diversions from Dry Creek (Diversion #27) and Mokelumne River (Diversion #28) (see Section 3.4.19). Any additional agricultural demand is estimated in ESJWRM as element pumping, while small domestic urban demand is met by element pumping.

3.4.5 Lockeford Community Services District

LCSD is located within ESJWRM Subregion 4 and is surrounded by agricultural land under NSJWCD. LCSD has 4 municipal pumping wells used to meet all the urban demand generated by its customers. Some of the agricultural demand is met by the riparian diversion from Mokelumne River (Diversion #28) (see Section 3.4.19), while the remaining is met by element pumping.

3.4.6 Calaveras County

Only a small portion of Calaveras County extends into the ESJ Subbasin and the land is mostly unirrigated or native vegetation with small residential pockets and some irrigated agricultural parcels. CCWD uses a small amount of Calaveras River water for agricultural demand in the ESJ Subbasin (Diversion #7). Additional agricultural demand is met by the riparian diversion from Calaveras River (Diversion #29) (see Section 3.4.19) or element pumping. All the residential demand is met by element pumping.

3.4.7 Stockton Area

The Stockton area includes service areas of both the City of Stockton as well as Cal Water. San Joaquin County also manages water for several unincorporated areas in and around the city.

Both the City of Stockton and Cal Water purchase surface water for urban use from SEWD. The water originates from either the Calaveras or Stanislaus Rivers and is delivered to customers after treatment at the SEWD water treatment plant (Diversion #6 and Diversion #13). Additionally, Stockton began the Delta Water Supply Project in water year 2012 and built a water treatment plant, providing another source of surface water for the area from San Joaquin River at Empire Tract (Diversion #10) and Mokelumne River via agreement with WID (Diversion #3).

Stockton, Cal Water, and San Joaquin County maintain pumping wells for urban water use. Due to the scale of the element grid, many of the San Joaquin County areas were too small to be simulated separately from Stockton or Cal Water. Thus, San Joaquin County groundwater pumping is instead estimated by element pumping in ESJWRM. Stockton itself has 37 municipal wells in the area, though only about 14 are still active at the end of the simulation. Cal Water maintains a separate delivery area and operates 56 wells to meet urban demand, though only about 20 wells are active at the end of ESJWRM's historical simulation. Due to the complexity of the water supply in the area, the supply mix for urban water use in ESJWRM is difficult to separate by agency, though for the entire area is, on average, 70% surface water and 30% groundwater pumping with the reliance on groundwater decreasing toward the end of simulation due to the construction of the Delta Water Supply Project.

One riparian diversion from Calaveras River (Diversion #29) provides water to areas adjacent to the river (see Section 3.4.19). Additional agricultural demand may be met by surface water from WID (Diversion #1) where it extends into the northern part of the Stockton area or SEWD (Diversion #8 and Diversion #14). Any additional agricultural demand occurring in the area is supplied by the estimated element pumping.

3.4.8 Stockton East Water District

SEWD receives water from both Calaveras River (i.e., New Hogan Lake) and Stanislaus River (i.e., New Melones Lake) and sells water to its customers for both agricultural and municipal purposes. Agricultural water is delivered directly to customers scattered across the district area (model Subregions 6 and 7). Municipal water, as discussed in Section 3.4.7, is routed to SEWD's water treatment plant and is sold to the City of Stockton and Cal Water. Beginning in water year 2003, SEWD has operated groundwater recharge projects near its water treatment plant, utilizing water taken from both the Calaveras and Stanislaus Rivers.

In Table 7, SEWD's two urban diversions are Diversion #6 and Diversion #13, the two agricultural diversions are Diversion #8 and Diversion #14, and the two diversions used for recharge are Diversion #9 and Diversion #16. One riparian diversion from Calaveras River (Diversion #29) provides water to areas adjacent to the river (see Section 3.4.19). SEWD operates 5 urban pumping wells in the vicinity of the water treatment plant that are mixed with the surface water for use in the Stockton area and are utilized rarely (only during water year 2015 during the simulation period of ESJWRM). Any additional agricultural or urban demand is met by element pumping.

3.4.9 Linden County Water District

LCWD is located within ESJWRM Subregion 7 and is surrounded by agricultural land under SEWD. Though it receives no surface water, LCWD has 4 municipal pumping wells to meet all the urban demand generated by its customers. By the end of the simulation, only 2 of the wells are still active.

3.4.10 Central San Joaquin Water Conservation District

CSJWCD receives water from Stanislaus River (i.e., New Melones Lake) (Diversion #15) that is used for agricultural demand in model Subregion 8. Any additional agricultural demand is estimated as element pumping by ESJWRM. All the private residential urban demand is likewise calculated as element pumping.

3.4.11 South San Joaquin Irrigation District

SSJID's service area covers the agricultural lands around the cities of Manteca, Ripon, and Escalon. SSJID provides water to agricultural customers within the district using water from the Stanislaus River (taken out at Goodwin Dam) and then stored in Woodward Reservoir just east of the district's area in Stanislaus County. Diversion #17 represents the agricultural diversion from Woodward Reservoir that is delivered to SSJID's customers through its series of canals covering the district. Based on communication with SSJID, one portion of SSJID, Division 6 (formerly Division 9), began receiving more surface water beginning in water year 2011. An increase in surface water to Division 6 (near Ripon in Subregions 15 and 16) is simulated using Diversion #33. Diversion #19 represents the seepage from Woodward Reservoir as SSJID had monthly data estimating the groundwater recharge due to the reservoir. Diversion #30 simulates the riparian diverters along Stanislaus River (see Section 3.4.19).

SSJID maintains 28 agricultural wells located in and around the City of Manteca to augment their surface water supply. Any remaining agricultural demand in the district is met by element pumping estimated by ESJWRM.

The Nick C. DeGroot Water Treatment Plant located at Woodward Reservoir was constructed as part of the South County Water Supply Project through the collaboration of SSJID and the cities of Escalon, Lathrop, Manteca, and Tracy. Beginning in water year 2005, surface water deliveries from the treatment plant began to Lathrop, Manteca, and Tracy with Escalon deliveries to begin in the future (currently

Escalon's allotment is sold to Tracy). Ripon potentially may be added to the project at a later point. These deliveries are simulated in ESJWRM as Diversion #20 (Manteca), #21 (Escalon), #22 (Lathrop), and #23 (Ripon). Urban demand in these areas in discussed further in the relevant sections below. Any private residential demand estimated by ESJWRM in SSJID is met by element pumping.

3.4.12 City of Lathrop

Lathrop has 6 municipal pumping wells, one of which was inactive for the entire simulation period but may come back online for future use. The city began receiving surface water from the South County Water Supply Project in water year 2005 (Diversion #22) and will receive a higher allotment in future phases of the project.

Since Lathrop began receiving surface water and normalized for the drought, its supply mix has steadily decreased its reliance on groundwater, from 100% of the urban demand in water year 2004 to an average of 74% of the demand after the South County Water Supply Project began (ranging from 53% to 92% at the peak of the drought).

The small amount of agricultural demand in the vicinity of Lathrop is supplied by element pumping in ESJWRM. Recycled water is utilized for some fodder crop irrigation and will be incorporated in baseline runs of the model.

3.4.13 City of Manteca

Manteca has 15 active municipal wells that provide water for urban use and 31 active agricultural wells used to irrigate city landscaping. Agricultural land near the city is irrigated by SSJID's diversion from Stanislaus River (Diversion #17). Starting in water year 2005, Manteca began receiving water from the South County Water Supply Project (Diversion #20). Additional agricultural and urban demand not met by the mix of groundwater pumping and surface water supply is estimated in the model as element pumping.

Since Manteca began receiving surface water, its supply mix has steadily decreased its reliance on groundwater, from 100% of the urban demand before water year 2005 to an average of 62% of the demand after.

3.4.14 City of Ripon

Ripon has 9 municipal pumping wells, at least 5 of which remain active at the end of the historical simulation. In addition, Ripon has 3 agricultural wells used for the city's non-potable system and 6 non-potable wells owned by Nestle. The groundwater pumping is augmented by SSJID's diversion from Stanislaus River (Diversion #17) used for agricultural land surrounding the city. The city is currently not receiving surface water for municipal use from the South County Water Supply project, but may pursue that possibility in the future (Diversion #23). Currently, all the urban demand is met by groundwater pumping.

Adjacent to the Stanislaus River, some elements are receiving water for agricultural purposes from the Stanislaus River riparian diversion (Diversion #30) as discussed in Section 3.4.19.

3.4.15 City of Escalon

Escalon has 4 municipal pumping wells, at least 3 of which remain active at the end of the simulation. Starting in water year 2005, the city was eligible to receive water from the South County Water Supply Project (Diversion #21), but has yet to build the pipeline necessary to take advantage of the allotted

surface water. Currently, Escalon sells its allotment to the City of Tracy (located in San Joaquin County but outside of the ESJ Subbasin).

Agricultural land near the city is irrigated by SSJID's diversion from Stanislaus River (Diversion #17) as discussed in Section 3.4.19. Any remaining agricultural demand is supplied using ESJWRM's element pumping estimates.

3.4.16 Oakdale Irrigation District

OID takes surface water from Stanislaus River at Goodwin Dam that splits from SSJID's water to go into OID's distribution system to supply to agricultural users (Diversion #18). The district's delivery area is spread between elements in ESJWRM Subregions 13, 18, and 20. Additional agricultural water comes from OID's 24 wells spread around the district's area.

3.4.17 Cosumnes Subbasin

As it is outside of the model focus area of ESJ Subbasin, the only diversions simulated in the Cosumnes Subbasin in ESJWRM are the riparian diversions from Cosumnes River (Diversion #26) and Dry Creek (Diversion #27) (see Section 3.4.19). Any additional agricultural or urban demands are met in the model by element pumping.

3.4.18 Modesto Subbasin

Three riparian diversions extend to elements in the Modesto Subbasin—Stanislaus River (Diversion #30), Tuolumne River (Diversion #31), and San Joaquin River (Diversion #32) (see Section 3.4.19). Additional agricultural surface water comes from the Tuolumne River to Modesto Irrigation District using data in C2VSim (Diversion #24). OID's delivery area extends into the Modesto Subbasin and receives a portion of OID's diversion off Stanislaus River (Diversion #18). Any remaining agricultural demand is supplied by ESJWRM-calculated element pumping.

Urban demand in the Modesto Subbasin is largely met using element pumping, except in the area of the City of Modesto, which receives surface water from Tuolumne River (via Modesto Irrigation District) in Diversion #25, with data from C2VSim.

3.4.19 Riparian Diverters

C2VSim includes surface water diversions to non-district riparian water users along simulated streams. This information (diversion volumes, locations, and delivery areas) was pulled from C2VSim and used to simulate riparian diversions in ESJWRM. These diversions are from Cosumnes River (Diversion #26), Dry Creek (Diversion #27), Mokelumne River (Diversion #28), Calaveras River (Diversion #29), Stanislaus River (Diversion #30), Tuolumne River (Diversion #31), and San Joaquin River (Diversion #32). The riparian lands receiving these diversions are shown in Figure 36.

4. MODEL CALIBRATION

The goals 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) and (2) to maximize the agreement between simulated and observed groundwater levels at selected well locations and simulated and observed streamflow hydrographs at selected gauging stations. These objectives are achieved through verification of the model input data and adjustment of model parameters.

4.1 Model Calibration

Model calibration begins after data analysis and input data file development is completed. The calibration effort can be broken down into subsets that align with 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
- Conduct additional refinements to model as necessary

ESJWRM was calibrated to local data and knowledge, surface water flows, groundwater hydrographs, and groundwater contours. The sources used to check model results include local knowledge (mainly gathered during Technical Review Committee meetings), AWMPs, UWMPs, other local planning efforts, measured groundwater levels and contours, and observed streamflow data.

Due to uncertainty in the initial conditions, a one year “ramp up” period is included to allow groundwater levels to stabilize. Thus, the model calibration period for the ESJWRM is October 1995 through September 2015 or water years 1996 through 2015 (20 years).

4.2 Calibration of the IDC and Root-Zone Parameters

The goal of the IDC calibration process is to determine reasonable urban and agricultural demand and develop the components of a balanced root zone budget. IDC calibration serves as the foundation of the IWFM calibration as demand estimated translates directly to groundwater pumping, which is the primary stress on the groundwater system. This part of the calibration effort focused primarily on refining individual budget items while maintaining reasonable root zone parameters.

The calibrated IDC was used to estimate monthly agricultural water demand at each model element during the model hydrologic period. To adjust agricultural demand, elemental root zone parameters, particularly the soil hydraulic conductivity and the pore size distribution index, were adjusted in accordance with the hydrologic soil group and subregion. Spatial representation of these calibrated parameters is shown in Figure 37 though Figure 41. The IDC model was calibrated to agricultural water use values reported by irrigation districts in their AWMPs and then checked against local data with input from irrigation district representatives and consultants (pers. comm. Doug Heberle from WID, Jennifer Spaletta representing

NSJWCD, Tom Flinn from NSJWCD, Peter Martin from CCWD, Cathy Lee from SEWD, Manuel Verduzco from SEWD, Sam Bologna from SSJID, Peter Rietkerk from SSJID, Bryan Thoreson representing SSJID, Emily Sheldon from OID, Eric Thorburn from OID, and Byron Clark representing OID). Figure 42a-42n show the agricultural water demand, unit agricultural water use, and unit evapotranspiration of applied water (ETAW) estimates by the total ESJ Subbasin area and major subareas. Differences in the charts between the subregion and subareas is due the differences in cropping patterns and evapotranspiration rates, which drive the estimation of agricultural demand. The difference between the two unit water use columns provide an indication of the efficiency of agricultural practices in the subregion or subarea. Overall, the estimated agricultural demand reflects the same variability seen in irrigation practices and major crops from area to area within the ESJ Subbasin.

Figure 43a-43g show the model estimated annual urban demand for the total ESJ Subbasin area and subareas. Urban demand reflects the population and per capita water use defined for each urban area and estimated for the remaining rural residential areas.

4.3 Calibration of Surface Water Features

The ESJWRM simulates streamflow in 39 small watersheds and several major rivers and creeks across the model domain.

As discussed in Section 2.10, small watersheds are used to simulate inflows into the model from ungauged watersheds. The small watershed contributions are split between surface water runoff that enters the stream system, percolation that occurs during transport to the streams, and baseflow entering the groundwater system at the model boundary. Groundwater level hydrographs along the model boundary selected for groundwater level calibration (Section 4.5) were referenced to confirm and edit, as necessary, the various parameters of the small watersheds.

Streamflow calibration is primarily performed by comparing the simulated streamflow with local data from 11 stream gauges (Table 9 and Figure 44). Data for these gauges came from USGS or the California Data Exchange Center (CDEC). Two of these stream gauges (Mokelumne River below Camanche Dam and San Joaquin River near Vernalis) are duplicates of gauges used to estimate stream inflow into the model area and were not referenced for streamflow calibration and only verification of model setup.

Table 9: Summary of ESJWRM Stream Calibration Gauges

Stream	Stream Node	Agency	Gauge Name	Period of Record
Cosumnes River	98	USGS	USGS 11336000: Cosumnes River at McConnell, CA	October 1941 to October 1982
Dry Creek	222	USGS	USGS 11329500: Dry Creek near Galt, CA	October 1926 to December 1997
Mokelumne River*	290	USGS	USGS 11323500: Mokelumne River below Camanche Dam, CA	October 1904 to present/ongoing
Mokelumne River	382	USGS	USGS 11325500: Mokelumne River at Woodbridge, CA	June 1924 to present/ongoing
Mokelumne River	501	USGS	USGS 11336930: Mokelumne River at Andrus Island near Terminous, CA	July 2006 to present/ongoing

Stream	Stream Node	Agency	Gauge Name	Period of Record
Mormon Slough	876	USACE	CDEC MRS: Mormon Slough at Bellota	December 1997 to present/ongoing
Stanislaus River	1067	DWR	CDEC OBB: Stanislaus River at Orange Blossom Bridge	January 1993 to present/ongoing
Stanislaus River	1186	USGS	USGS 11303000: Stanislaus River at Ripon, CA	October 1940 to present/ongoing
Tuolumne River	1382	USGS	USGS 11290000: Tuolumne River at Modesto, CA	April 1940 to present/ongoing
San Joaquin River*	1497	USGS	USGS 11303500: San Joaquin River near Vernalis, CA	October 1923 to present/ongoing
San Joaquin River	1597	USGS	USGS 11304810: San Joaquin River below Garwood Bridge at Stockton, CA	December 1995 to present/ongoing

*Same as stream inflow gauge, so not used for calibration and included as verification of model setup

Stream flow calibration included refinement of the stream bed hydraulic conductivity originally from C2VSim (Figure 45). Simulated stream flows were compared with observed records and exceedance charts were also used to check the model performance when simulating high and low flows at each gauge location. Calibration results for select stream gauges are included in Figure 46a-46j.

4.4 Calibration of Water Budgets

The aim of the calibration process is to ensure the accurate representation of the hydrologic characteristics of the groundwater basin, confirmed through the analysis of the resulting water budgets. A water budget balances all supplies, demands, and any subsequent change in storage occurring within that specific portion of the hydrologic cycle. IWFM automatically outputs budgets at the subregion scale for processes involving groundwater, the surface layer, streams, the root zone, small watersheds, and the unsaturated zone. IWFM can output select budgets down to a single element or any specific grouping of elements.

During this step of the calibration process, model results are reviewed and summarized into monthly and annual (by water year) budgets. The most important budgets reviewed for calibration are the groundwater budget and the land and water use budget. After extensive budget analysis, key model datasets and parameters are adjusted, particularly groundwater aquifer parameters, to better match local budgets from AWMPs or other planning efforts. The ESJWRM water budget results are summarized in the following sections.

4.4.1 Land and Water Use Budget

The land and water use budget includes two different versions, agricultural and urban, and represents the balance of the IDC-calculated water demands with the water supplied. Both the agricultural and urban versions include the same components that make up the water balance:

- Inflows:
    - Demand (either agricultural or urban)
    - Surplus (if applicable)

- Outflows:
    - Groundwater pumping
    - Surface water deliveries
    - Shortage (if applicable)

The average annual water demand for the subbasin within the calibration period was 1.2 million acre-feet (MAF), consisting of approximately 1.1 MAF agricultural demand and 0.1 MAF urban demand. This demand was met by approximately an average annual of 0.50 MAF of surface water deliveries (0.45 MAF of agricultural and 0.05 MAF of urban deliveries) and was supplemented by approximately 0.69 MAF of groundwater production (0.62 MAF of agricultural and 0.07 MAF of urban pumping). The annual estimated land and water use budgets for the calibration period are presented in Figure 47a-47g and Figure 48a-48g, showing the agricultural and urban, respectively, demands and water supplies in the ESJ Subbasin and its component subareas. Due to uncertainties in the reported and estimated values of agricultural and urban water supplies, as well as respective estimates of the demands, there are some imbalances between the demand and supply values. These imbalances are shown as surplus or shortage and are typically less than 10% of the reported supplies, and within the margin of errors of the analysis.

4.4.2 Groundwater Budget

The primary components of the groundwater budget, corresponding to the major hydrologic processes affecting groundwater flow in the model area, are:

- Inflows:
    - Deep percolation (from rainfall and excess irrigation applied water)
    - Gain from stream (or recharge due to stream seepage)
    - Recharge (from other sources such as irrigation canal seepage and recharge ponds)
    - Boundary inflow (from outside the model area)
    - Subsurface inflow (from adjacent subregions)
- Outflows:
    - Groundwater pumping
    - Loss to stream (or outflow to streams and rivers)
    - Boundary outflow (to outside the model area)
    - Subsurface outflow (to adjacent subregions)
- Change in groundwater storage (either an inflow or outflow)

The groundwater budget consists of inflows to and outflows from the groundwater system. Figure 49a-49g show the annual components of the groundwater budget, including cumulative change in groundwater storage for ESJ Subbasin. Primary components of the groundwater budget are as follows: average annual groundwater pumping is estimated to be 0.70 MAF, which is offset by approximately 0.22 MAF of deep percolation from rainfall and applied water, net gain from stream of 0.15 MAF, recharge from conveyance and unlined canals of approximately 0.12 MAF, and a total net subsurface inflow of

approximately 0.16 MAF from neighboring subbasins and foothills. The cumulative change in groundwater storage is calculated from the change in groundwater storage. Due to inherent uncertainties in data and assumptions used in the model, approximations used in representing physical features in the aquifer system, and uncertainties in the model calibration, all budget components have some degree of uncertainty. A sensitivity analysis was performed to estimate the sensitivity of the model results to the changes in each of the key model parameters. Given the overall range of uncertainties, the long-term average annual depletion in groundwater storage in ESJ Subbasin during the model historical period is estimated to range between 24 to 70 TAF, with an average of approximately 47 TAF per year.

4.5 Groundwater Level Calibration

Like streamflow calibration, the goal of groundwater level calibration is to achieve reasonable agreement between the simulated and observed values (in this case, groundwater levels at calibration wells). Within the ESJWRM, over 3,000 wells were evaluated for developing groundwater observation locations to track ESJWRM's calibration at both a regional and local scale. The records for these wells were obtained from San Joaquin County's monitoring database, DWR's CASGEM program, and local monitoring wells from the City of Lodi and Oakdale Irrigation District. The calibration wells were selected based on their period of record, spatial distribution across the model, representativeness of good indicators of model responses to the various stresses, availability of observation data, and trends of nearby wells. Though a working set of 160 wells was tentatively selected initially, this was narrowed to an ultimate set of 70 wells that are representative of the long-term conditions of groundwater levels both at a local and regional scale in ESJWRM. These 70 calibration wells are shown in Figure 50 with information tabulated in Appendix C.

Simulated groundwater levels are calibrated to observed levels through adjustments to hydrogeologic parameters or aquifer parameters including hydraulic conductivity, specific storage, and specific yield (discussed in Section 4.7). The goal of groundwater level calibration is to achieve the maximum agreement between simulated and observed groundwater elevations at calibration wells while maintaining reasonable values for aquifer parameters. 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 data development and confirm the accuracy of general groundwater flow vectors. During this iteration, simulated groundwater elevation trends, flow directions, and groundwater gradients are compared to measured data. DWR's groundwater level contours for spring and fall many years starting in the 2010s were used to evaluate ESJWRM's groundwater contours from matching time periods. Figure 51a-51d show the resulting ESJWRM groundwater level elevations (average of the top 2 layers of the model where most of the pumping in the subbasin occurs) compared to DWR contours for 4 different seasons and years: Spring 2011, Fall 2013, Spring 2015, and Fall 2015. Fall 2015 also represents the end of simulation groundwater levels.
- 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 70 calibration wells were compared with corresponding observed values for concurrence in long-term trends as well as seasonal fluctuations.

Discussed further in the next section (Section 4.6), the results of the groundwater level calibration indicate that the ESJWRM reasonably simulates the long-term hydrologic responses under various hydrologic conditions. Figure 52a-52r show a selection of calibration wells (1 representing each ESJ Subbasin model

subregion or 18 wells) with their resulting groundwater level hydrographs. All 70 calibration well hydrographs are included in Appendix C.

4.6 Measurement of Calibration Status

The ESJWRM calibration status was measured using two metrics: the groundwater level trend and the relationship between simulated and observed groundwater levels. The statistics were evaluated to meet the American Standard Testing Method (ASTM) standard. In addition to quantifiable metrics, the ESJWRM 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) 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 head. An analysis of all calibration water levels within the model indicated the presence of 200+ feet of water level changes. Using 10 percent as the "small fraction", the acceptable residual level would be 20 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 20 feet.

- 75% of observed groundwater levels are within +/- 10 feet of its respective simulated values
- 97% of observed groundwater levels are within +/- 20 feet of its respective simulated values
- 99% of observed groundwater levels are within +/- 30 feet of its respective simulated values

The residual histogram for the ESJ Subbasin is shown in Figure 53. Additionally, a scatter plot of simulated versus observed values is shown in Figure 54.

4.7 Final Calibration Parameters

The initial aquifer parameters for the ESJWRM came from DWR's texture model values extracted to C2VSim coarse grid nodes. These coarse grid nodes formed a parametric grid covering the model area and reflected the scale at which parameters were adjusted throughout the calibration process. The grid was slightly modified to cover the entire ESJWRM model along the boundaries and additional nodes were added or moved within areas of the model to provide better control (Figure 55). The parameters resulting from the calibration process are listed in Table 10.

Table 10: Range of Aquifer Parameter Values

Stream	Layer 1	Layer 2	Layer 3	Layer 4
Horizontal Hydraulic Conductivity (ft/day)	11.5 – 72.7	6.4 – 44.8	1.1 – 4.6	1.8 – 5.2
Vertical Hydraulic Conductivity (ft/day)	0.005 – 0.14	0.004 – 0.07	0.004 – 0.05	0.004 – 0.15
Corcoran Clay Vertical Hydraulic Conductivity (ft/day)	3.6×10^{-4} – 1.5×10^{-3}	3.6×10^{-4} – 1.5×10^{-3}	3.6×10^{-4} – 1.5×10^{-3}	3.6×10^{-4} – 1.5×10^{-3}
Specific Storage (unitless)	8.55×10^{-5} – 1.57×10^{-4}	4.18×10^{-6} – 1.97×10^{-4}	4.21×10^{-6} – 2.05×10^{-4}	2.53×10^{-5} – 1.75×10^{-4}
Specific Yield (unitless)	0.04 - 0.10	0.04 – 0.09	0.04 – 0.09	0.05 – 0.09

Horizontal Hydraulic Conductivity – The hydraulic conductivity (KH) in the ESJWRM varies across the horizontal direction and across model layers. The fully calibrated values remain descriptive of the initial hydrogeologic analysis, range from 1.1 ft/day to 72.7 ft/day, and the spatial distribution is represented in Figure 56 through Figure 58.

Vertical Hydraulic Conductivity – Primarily a constraining factor across the Corcoran Clay in the small portion of the model underlain by it, the Vertical Hydraulic Conductivity (KV) facilitates the separation between the unconfined and confined aquifers within the ESJWRM. The KV values of the Corcoran aquitard is found to be less than one one-thousandth of the horizontal conductivity of the surrounding aquifer systems. For those parts of ESJWRM without Corcoran Clay, the KV controls the flow of groundwater between the materials making up the different modeled aquifer layers.

Specific Storage – Specific Storage (SS) 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 values range from 4.18×10^{-6} to 2.05×10^{-4}, as shown in Figure 59 through Figure 61.

Specific Yield – Specific Yield (SY) 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 values range from 0.04 to 0.10 and are shown in Figure 62 through Figure 64.

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.

A sensitivity analysis was performed using the ESJWRM 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 ESJWRM. A sensitivity metric is a single number derived from the ESJWRM 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 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 the model layers, model 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.

4.8.1 Sensitivity Analysis Results

Adjustments of aquifer parameters, and the analysis the resulting groundwater head, was performed at all groundwater nodes within the model domain. Similarly, streambed conductance was analyzed at all model stream nodes. Sensitivity analyses were performed for the ESJWRM for the following parameters with results discussed below.

Horizontal Hydraulic Conductivity – The sensitivity of the ESJWRM to changes in hydraulic conductivity are presented in Figure 65 and Figure 66. Reduction of hydraulic conductivity to one-fourth of the calibrated value results in 10.13 feet higher groundwater levels in the model, whereas increases to hydraulic conductivity decrease the average groundwater levels by 2.05 feet. Changes to horizontal hydraulic conductivity have small impacts to RMS values.

Vertical Hydraulic Conductivity – The sensitivity of the ESJWRM to changes in vertical hydraulic conductivity are presented in Figure 67 and Figure 68. Reduction of this parameter to one-fourth of the calibrated value results in 10.34 feet higher groundwater levels in the model, whereas increases to the vertical hydraulic conductivity decrease the average groundwater levels by 4.80 feet. Changes to vertical hydraulic conductivity have very little impact on RMS values.

Specific Storage – The sensitivity of the ESJWRM to changes in specific storage are presented in Figure 69 and Figure 70. Reduction of specific storage to one-fourth of the calibrated value results in approximately 12.64 feet higher groundwater levels in the model, whereas increases to specific storage decrease the average groundwater levels by 1.49 feet. Changes to specific storage have very little impact on RMS values.

Specific Yield – The sensitivity of the ESJWRM to changes in specific yield are presented in Figure 71 and Figure 72. Reduction of specific yield to one-fourth of the calibrated value results in 11.67 feet higher groundwater levels in the model and increases to specific yield increase the average groundwater levels by 1.82 feet. Changes to specific yield have slight impacts to RMS values.

Streambed Conductance – The sensitivity of the ESJWRM to changes in streambed conductance are presented in Figure 73 and Figure 74. Reduction of conductance to one-fourth of the calibrated value results in 8.09 feet higher groundwater levels in the model, whereas increases to conductance decrease the average groundwater levels by 5.09 feet. Changes to streambed conductance have slight impacts to RMS values.

The results of the sensitivity analysis for the ESJWRM indicate that the model is a stable model and the system responds in the expected manner because of changes in aquifer parameters and other input data.

5. CONCLUSIONS AND RECOMMENDATIONS

The ESJWRM, in its current state, is a robust, comprehensive, defensible and well-established model for assessing the water resources in the ESJ Subbasin under historical and projected conditions. The following recommendations are to be considered for further refinements and enhancements of the model:

- **Continue engagement with local groundwater users and managers**. Continue working with local agencies and groundwater users in ESJ Subbasin to further understand the local operations of the groundwater system and improve representation of groundwater users in the ESJWRM.
- **Refinement of boundary flows**. The current boundary flows at the northern, western, and southern boundaries of the model area are based on an older version of the C2VSim with adjustments made based on initial groundwater levels assumed for the beginning of the model (October 1994). DWR is currently in the process of updating the C2VSIm model. Once the latest fine grid version (C2VSim-2015) is publicly available, boundary flows for the ESJ model area should be verified and updated, as necessary.
- **Enhance variability of potential evapotranspiration**. The current version of the IDC used for estimation of the consumptive use of crops in the ESJWRM uses monthly potential ET values that are the same for all years during the model period. Given that there may be annual variability in the potential ET data with possible effects on the annual estimation of crop water demand, it is recommended to use more detailed data with temporal variability to develop a full time series of ET values for use in the model.
- **Refine surface water deliveries in Cosumnes and Modesto Subbasins.** The surface water deliveries in the Cosumnes and Modesto Subbasins are currently at the subregion level and do not have the detailed spatial resolution of other areas within the ESJ Subbasin. This data may need to be verified and updated as modeling efforts in those subbasins progress to meet the requirements of SGMA.
- **Update C2VSim based on ESJWRM**. The fine grid version of C2VSim was developed by the DWR to evaluate the integrated surface water and groundwater conditions at a regional scale; whereas, the ESJWRM is capable of evaluation at the local scale. To increase the accuracy of regional groundwater conditions in the fine grid C2VSim, the County is encouraged to work with DWR to provide data and information for further refinement and update of C2VSim in the ESJWRM area.
- **Develop model update schedule**. In order to keep the ESJWRM up-to-date and current for analysis of water resources and especially for supporting SGMA implementation, it is recommended that the model be updated every 3 to 5 years. A possible update schedule can be kept consistent with the GSP updates, with a lead time of 2 to 3 years relative to the GSP update schedule.

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Williamson, A.K., D.E. Prudic, and L.A. Swain, 1989. Ground-water flow in the Central Valley, California. USGS Professional Paper 1401-D.

FIGURES

Figure 1: ESJ Subbasin with County Lines

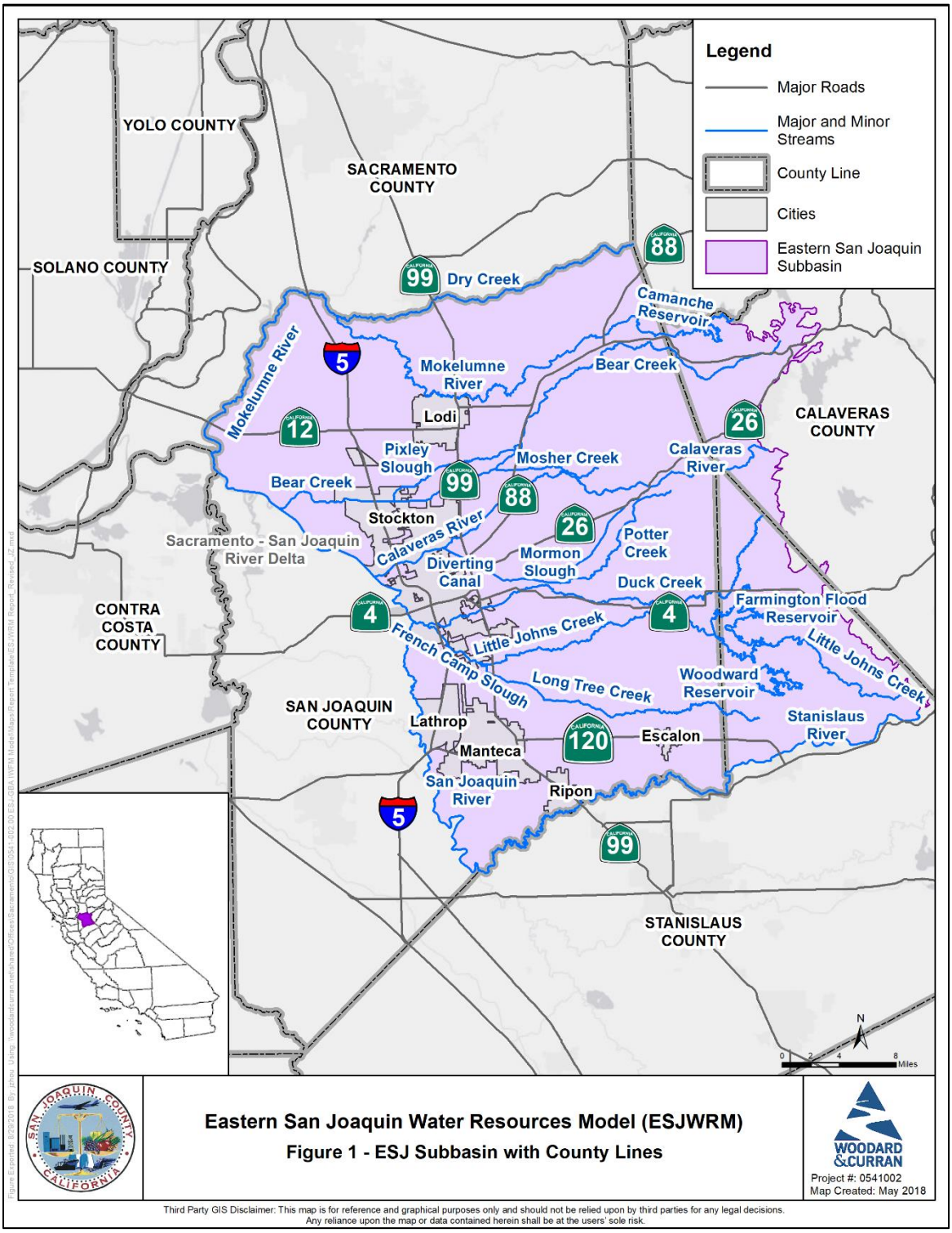


Figure 2: Groundwater Subbasins

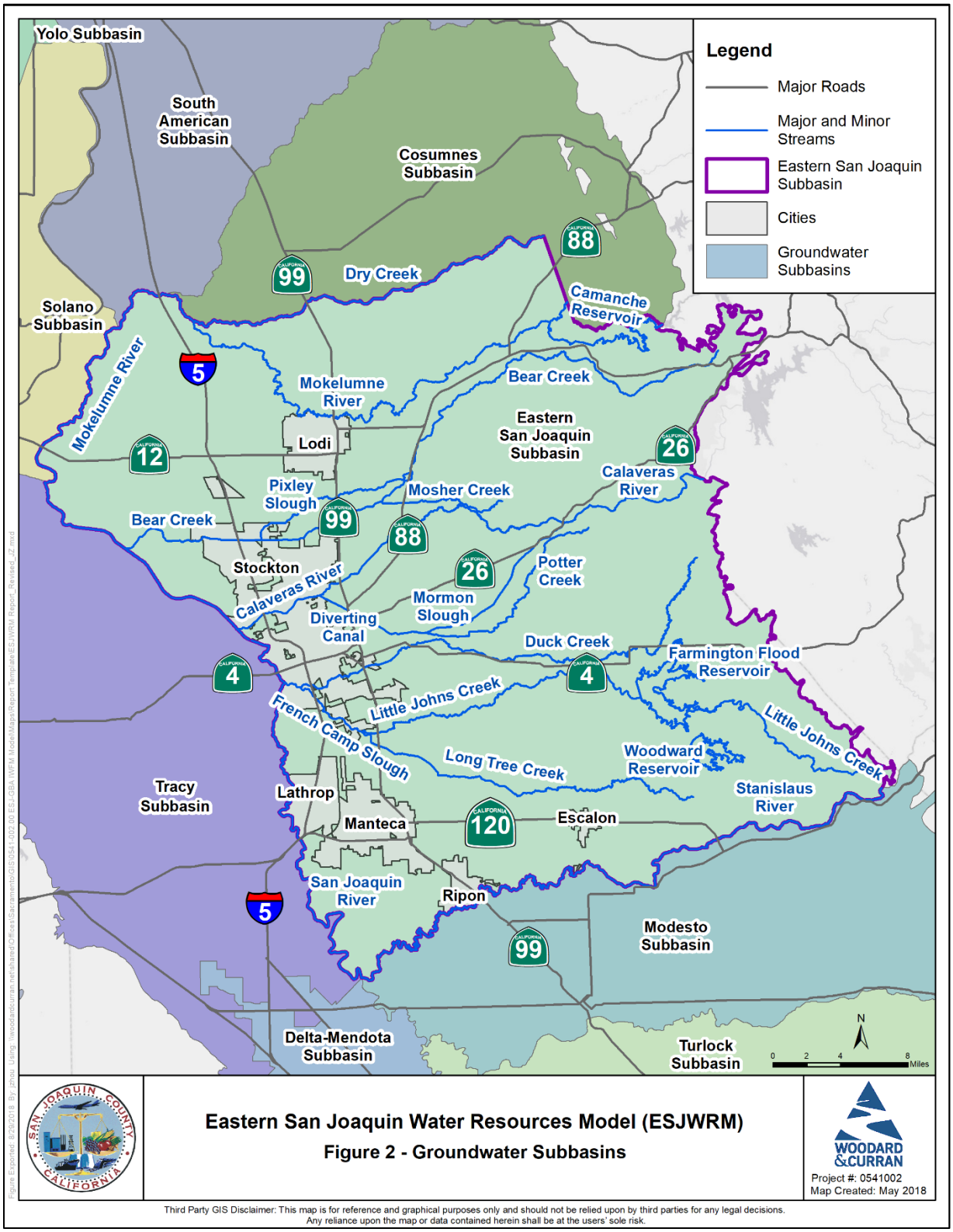


Figure 3a: ESJ Subbasin Major Water Purveyors

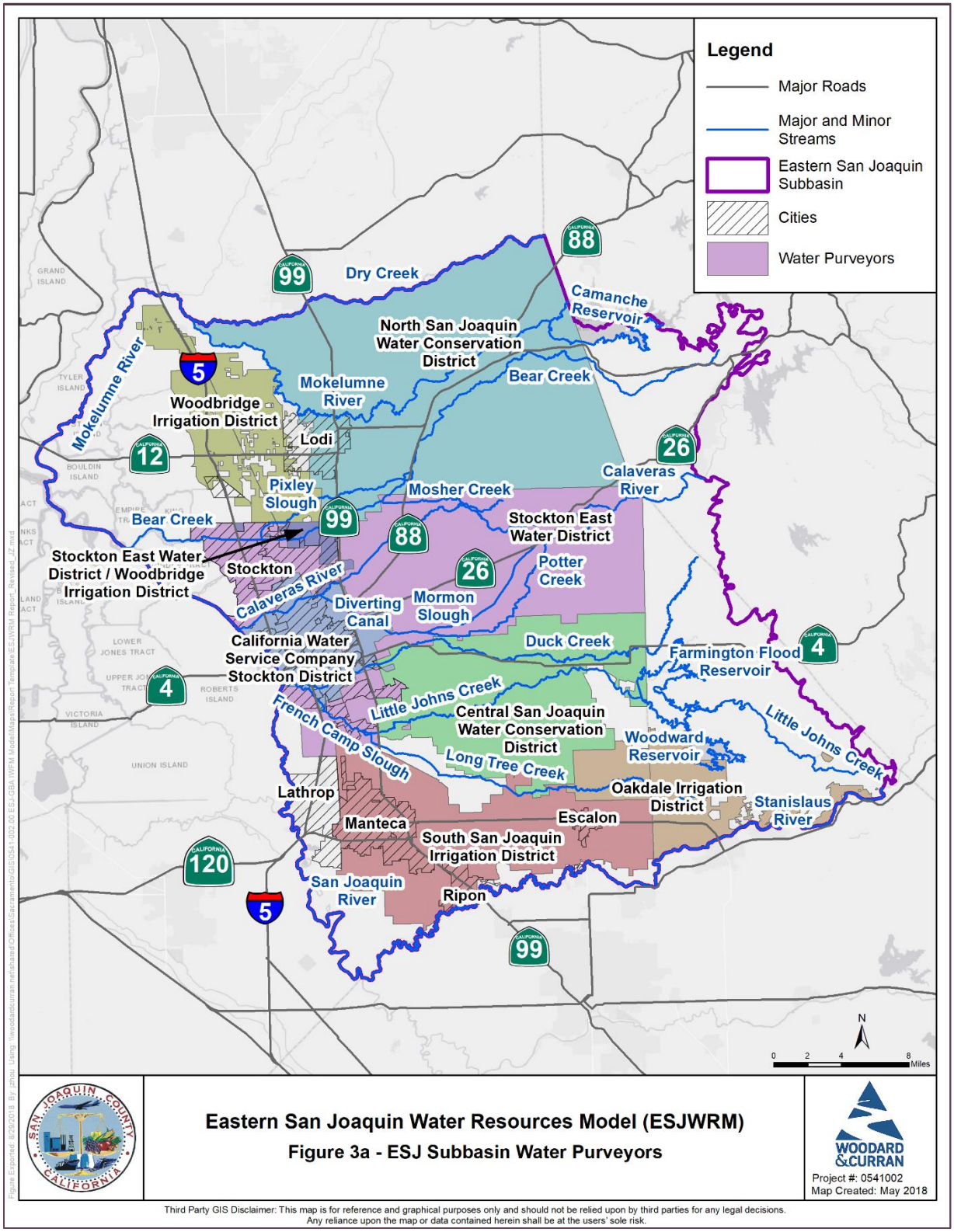


Figure 3b: ESJ Subbasin Groundwater Sustainability Agencies

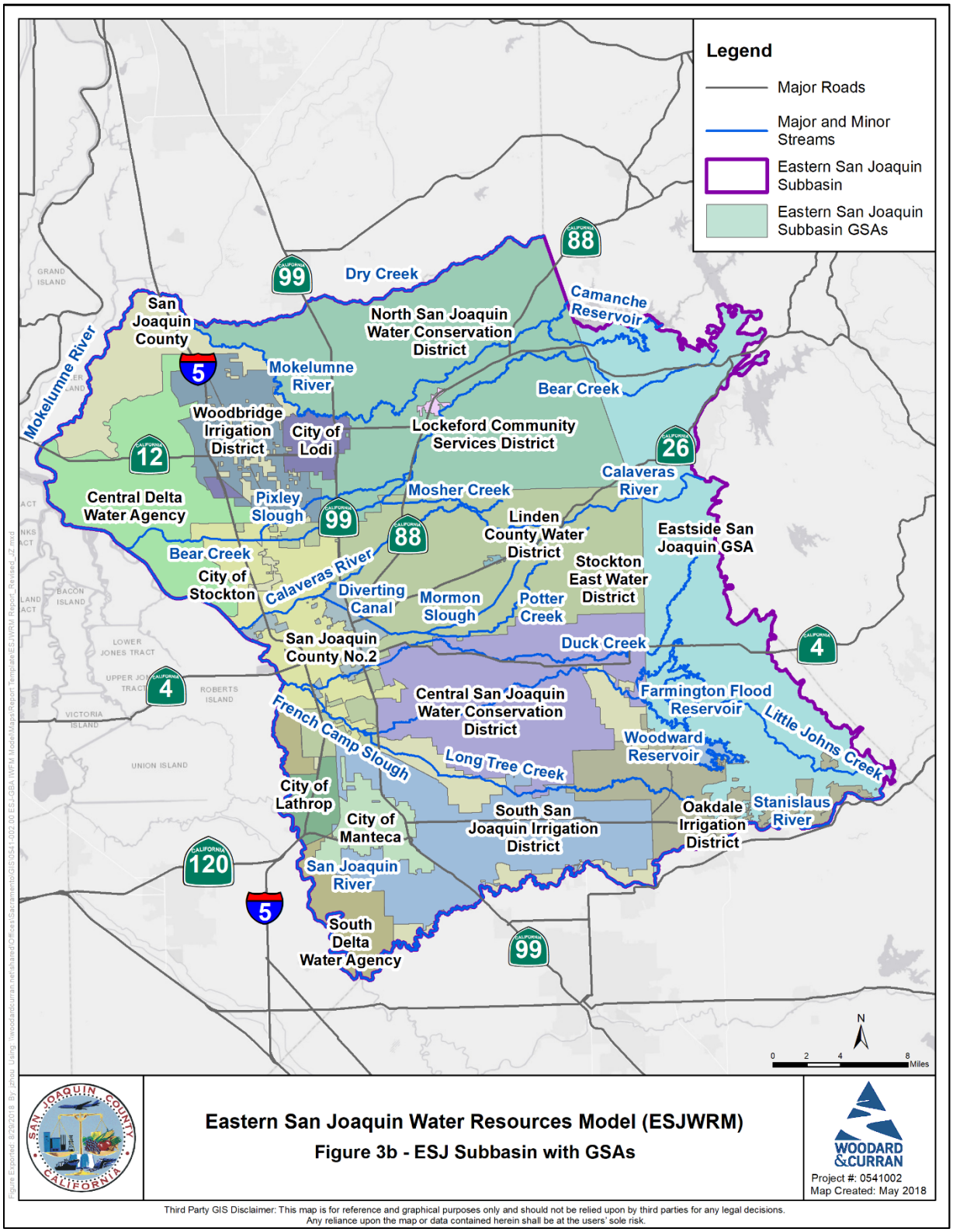


Figure 4: ESJWRM Boundaries

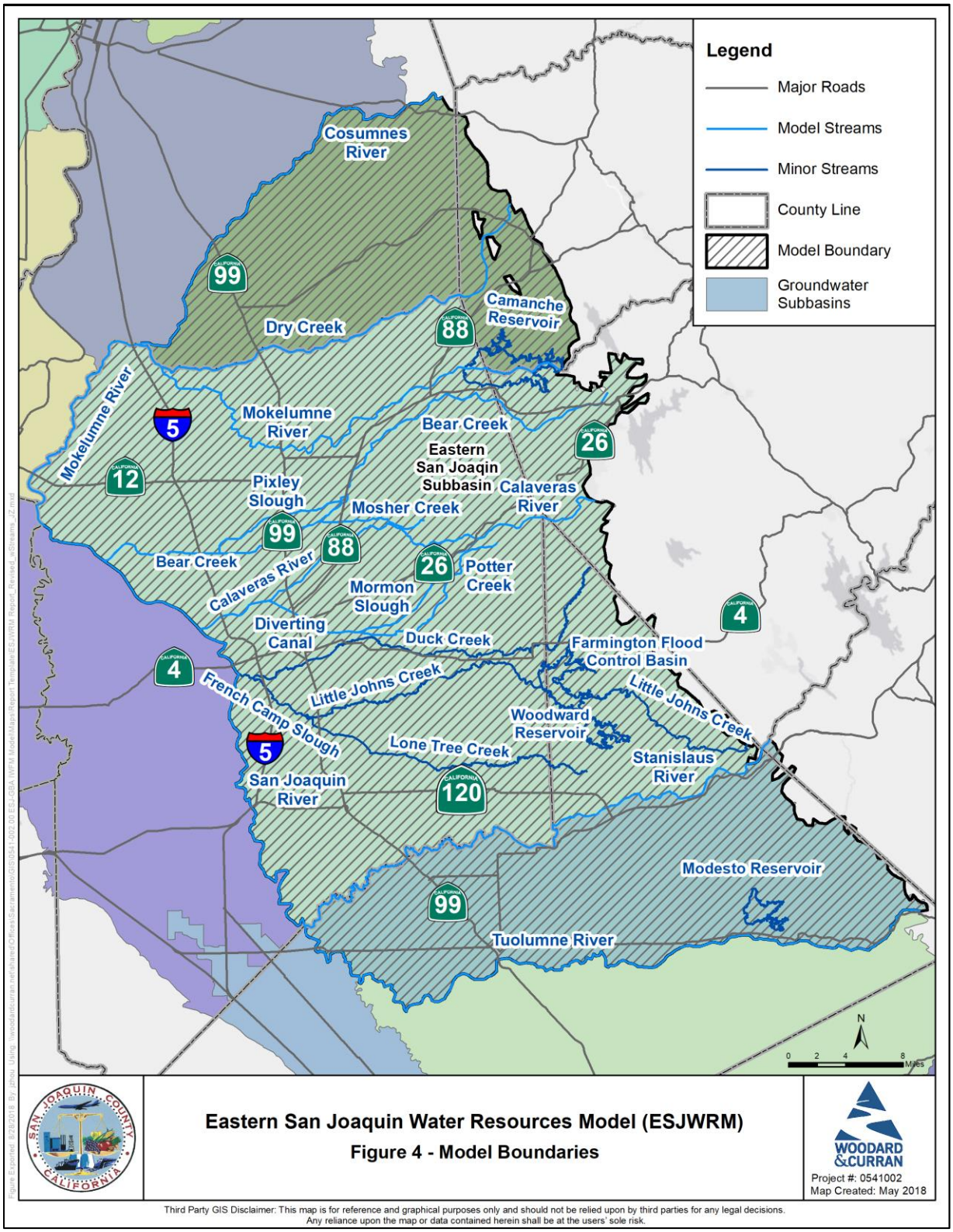


Figure 5: ESJWRM Grid Development Features

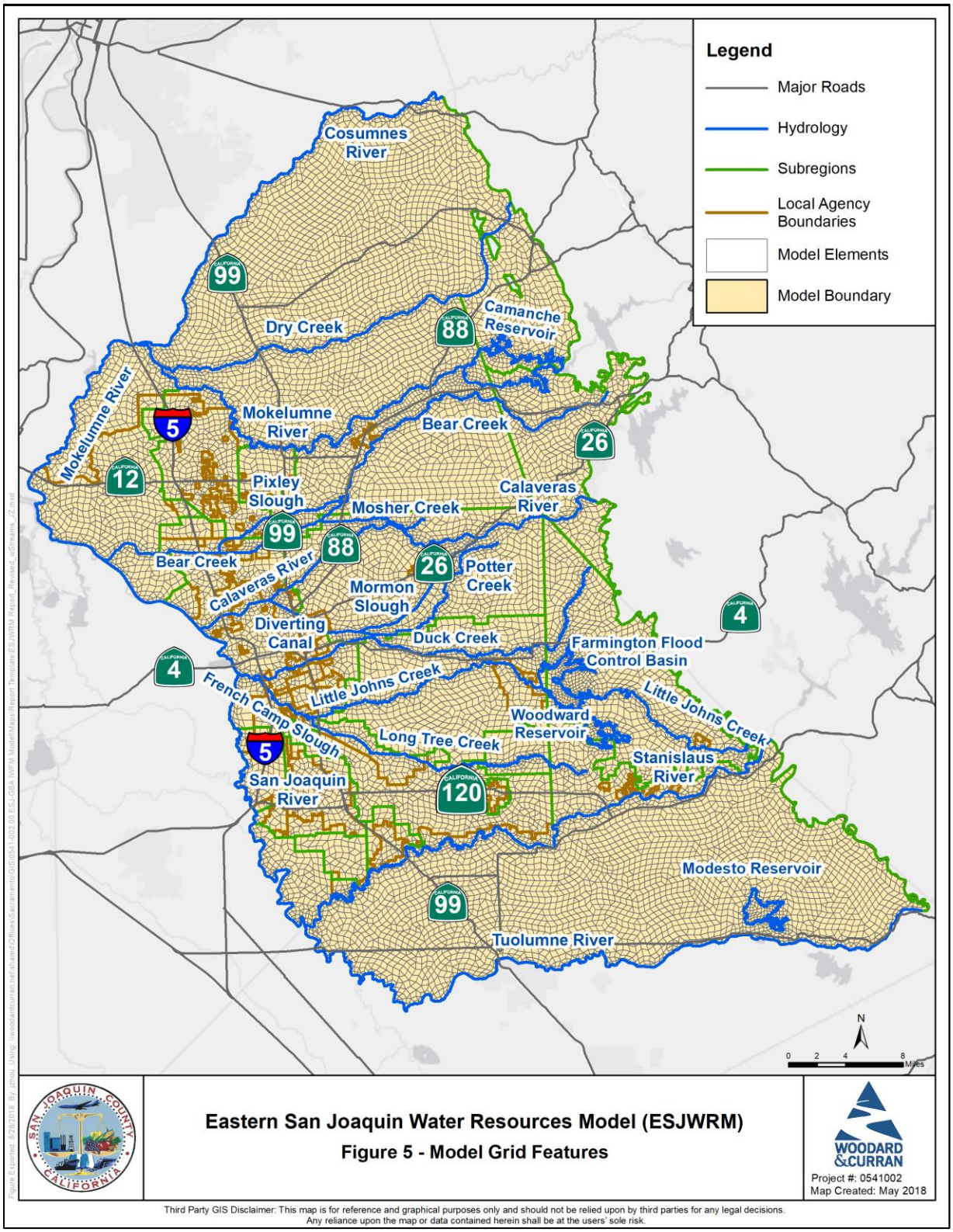


Figure 6: ESJWRM Elements

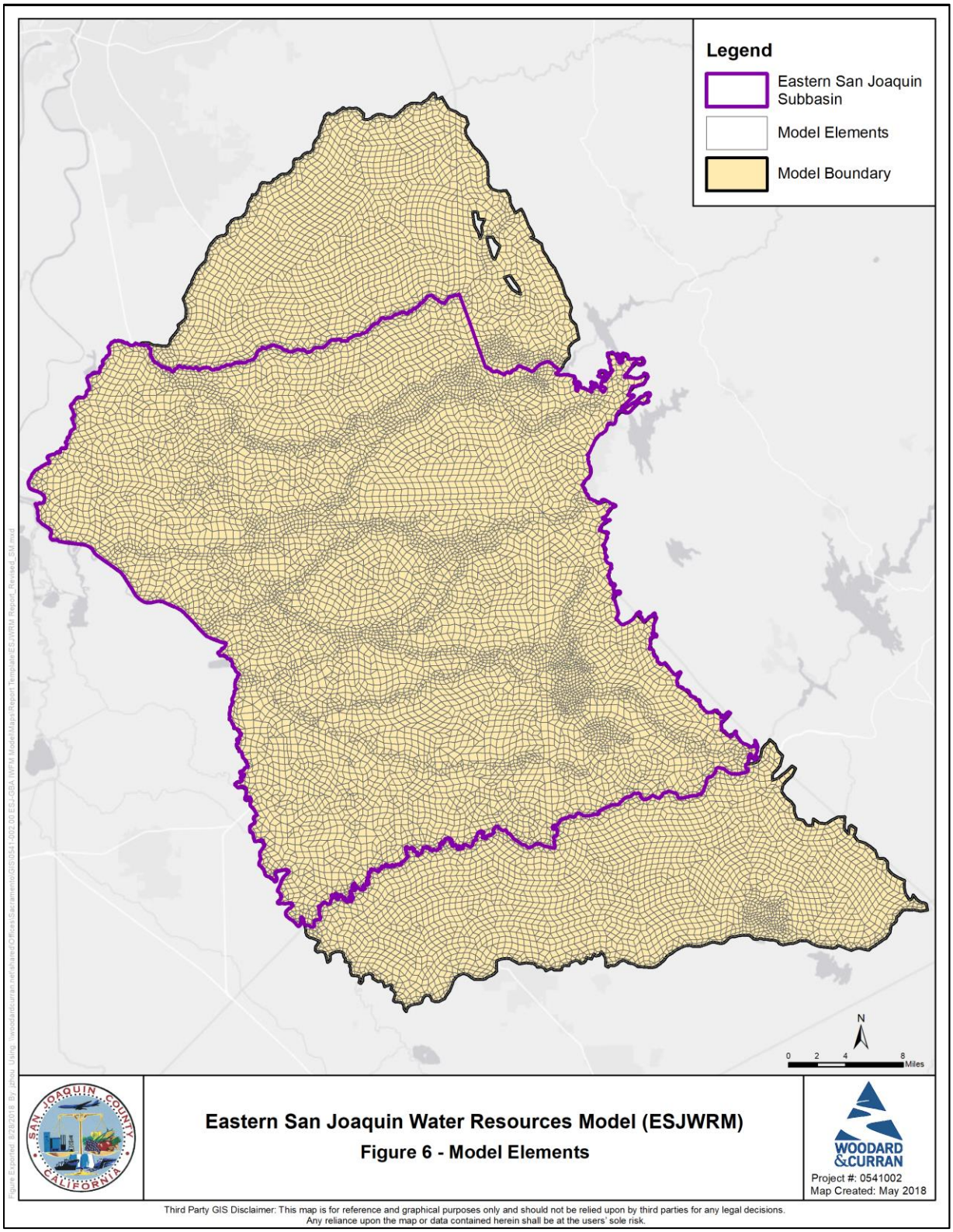


Figure 7: ESJWRM Subregions

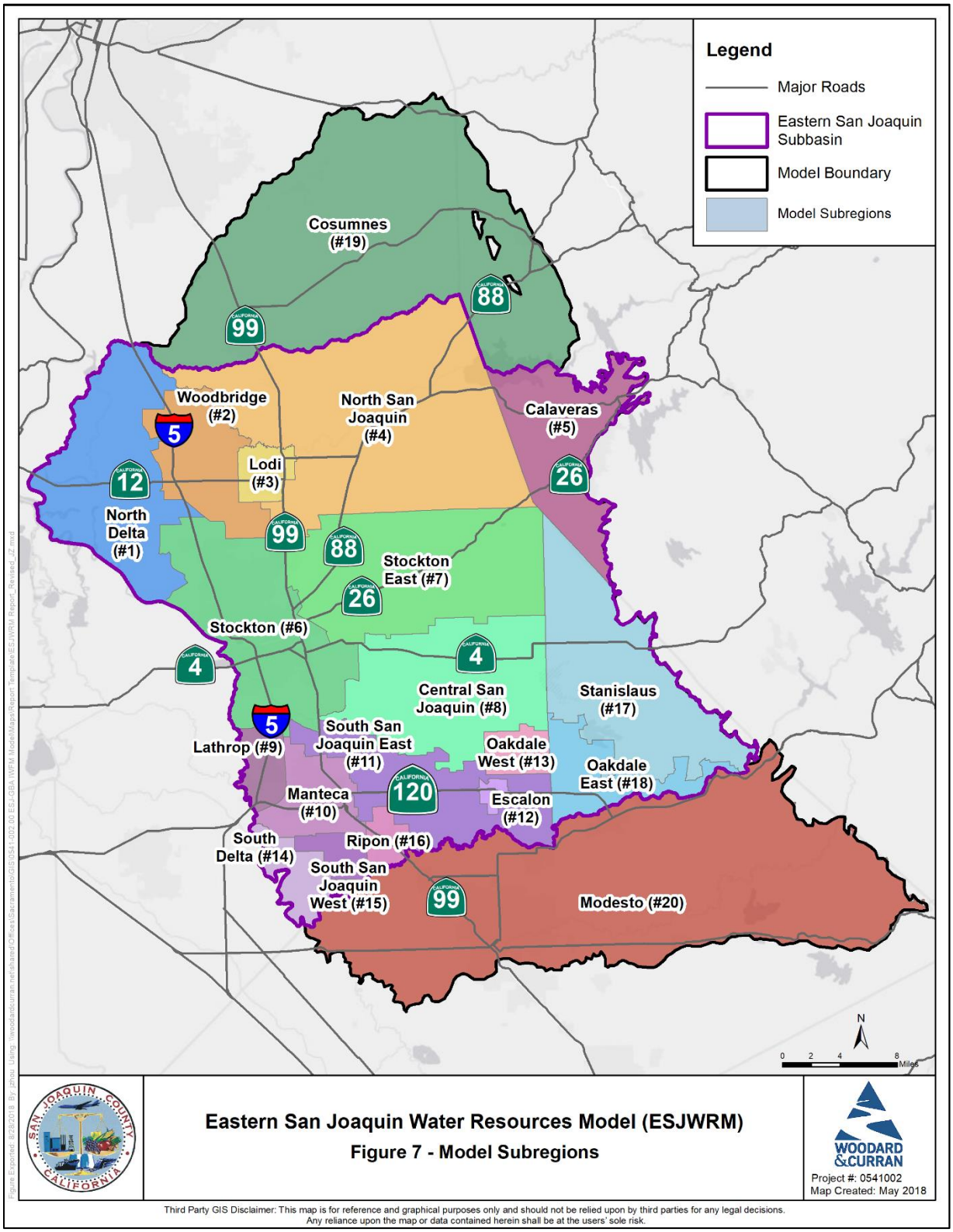


Figure 8: ESJWRM Subareas

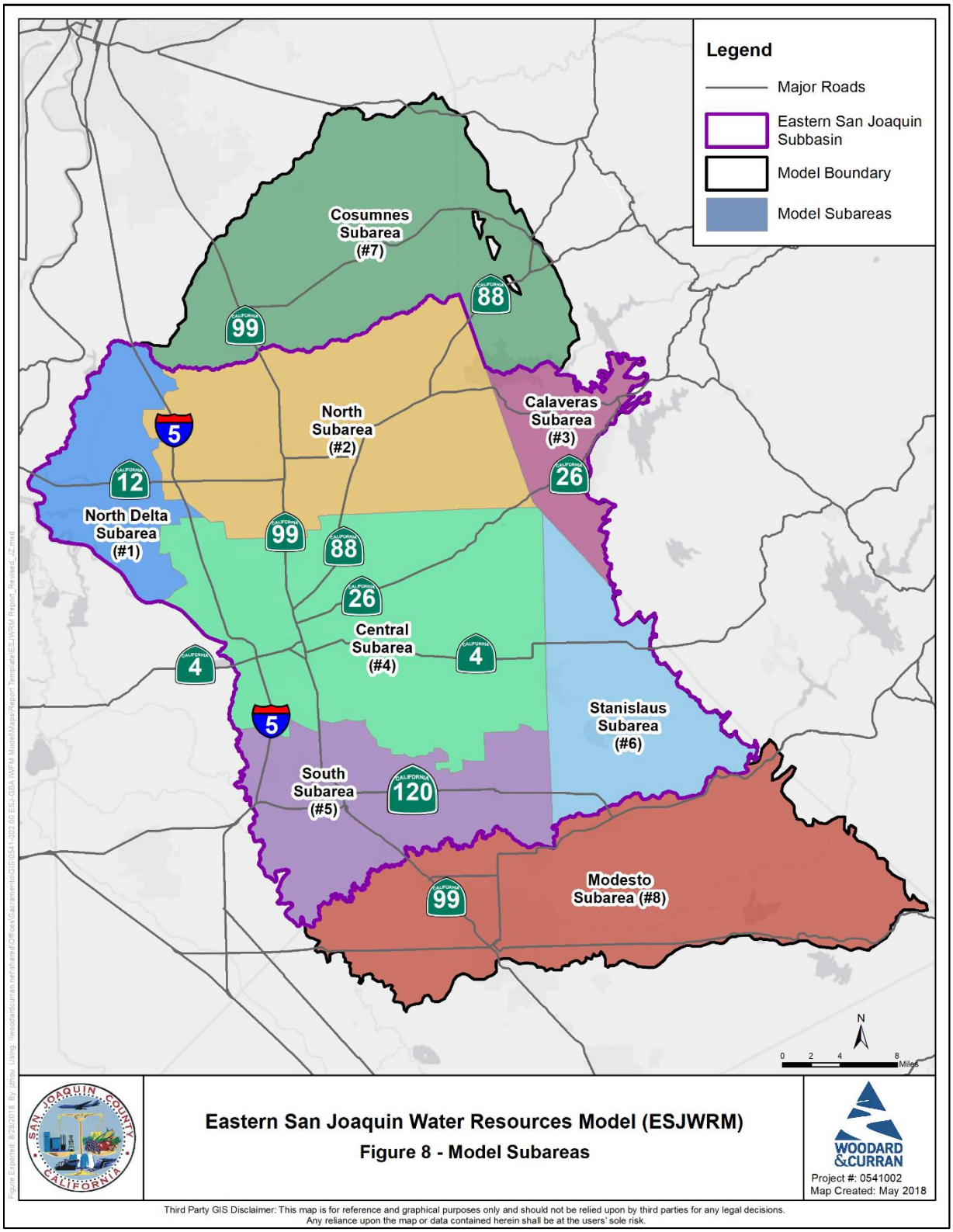


Figure 9: ESJWRM Streams and Stream Inflow Locations

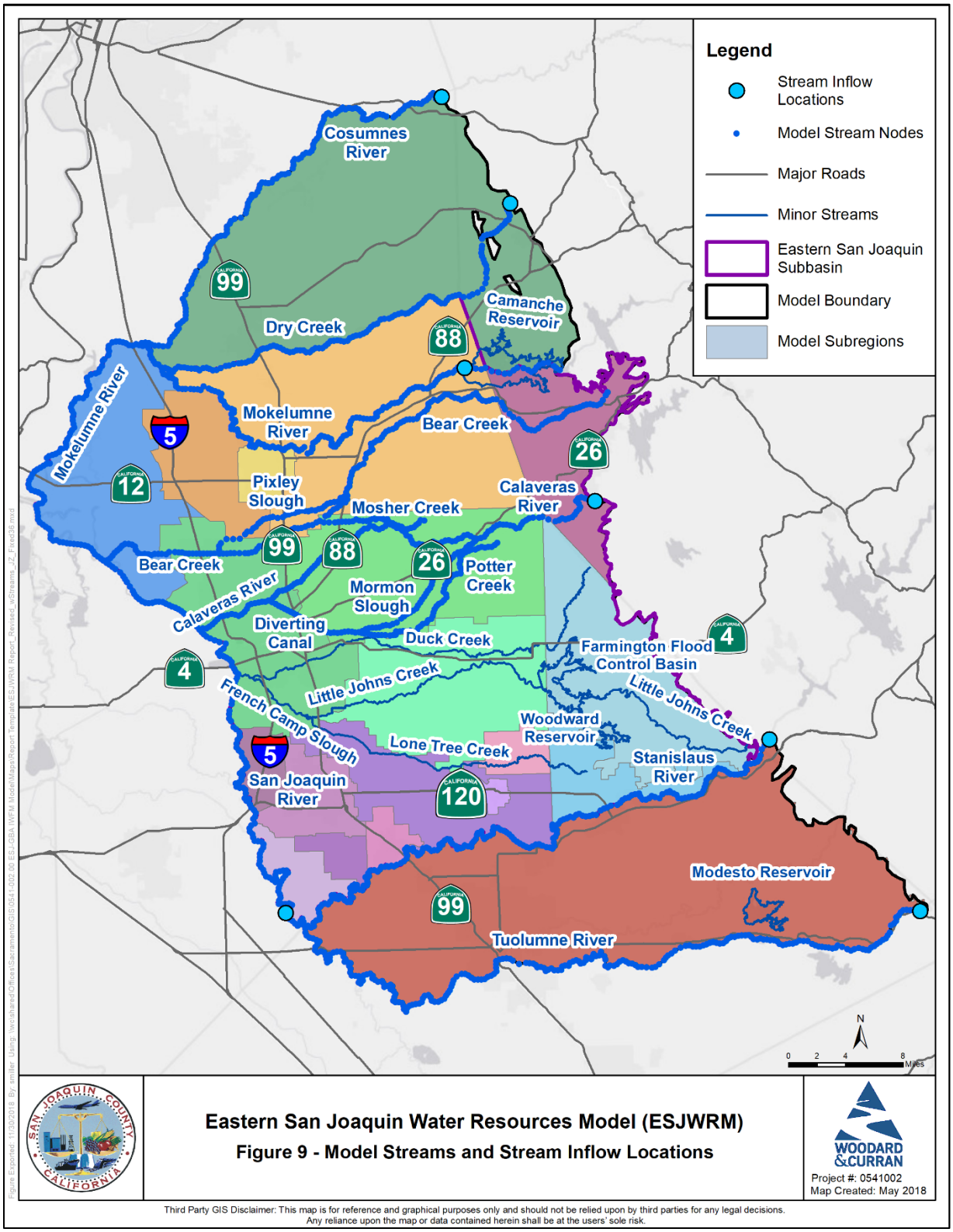


Figure 10: ESJWRM Average Annual Precipitation

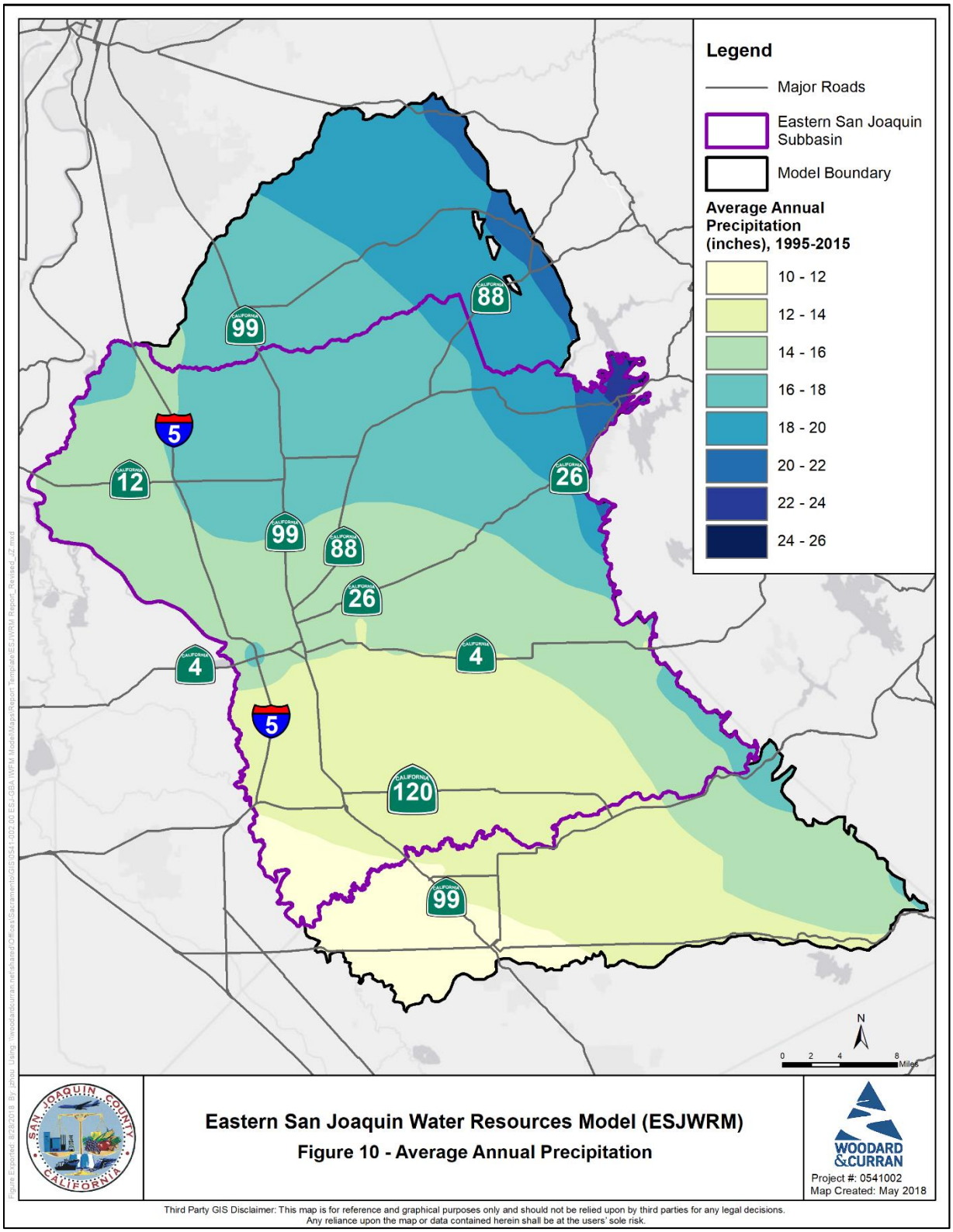


Figure 11: ESJWRM Annual Rainfall

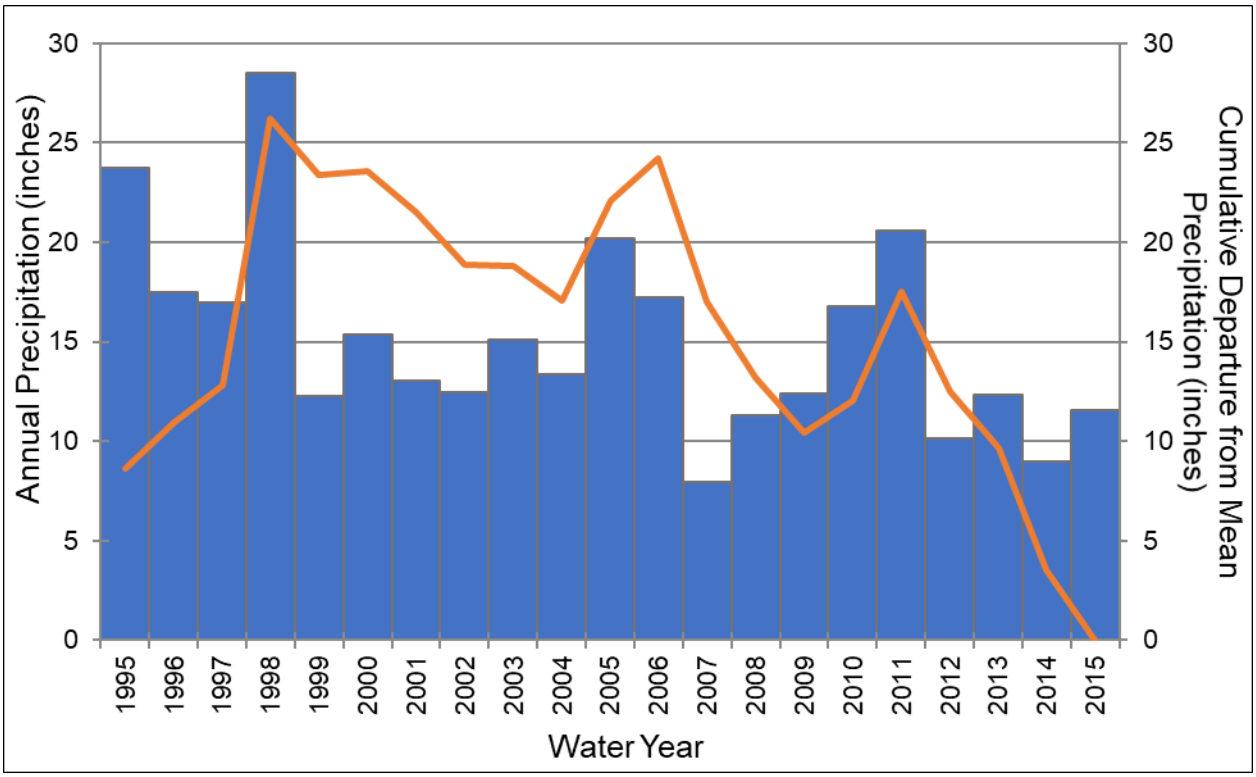


Figure 12: ESJWRM Hydrologic Soil Group

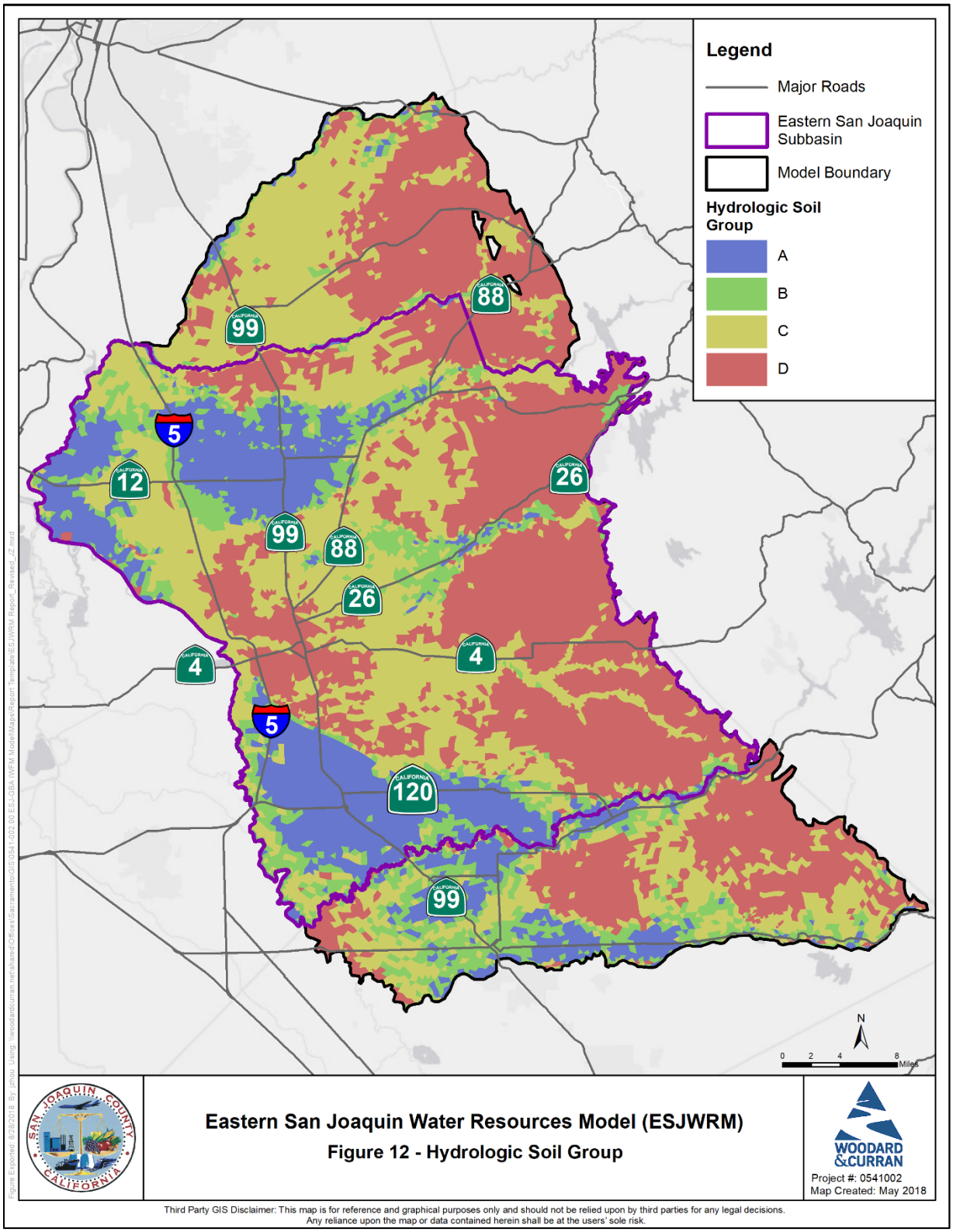


Figure 13: ESJWRM General Land Use in 1995 DWR Land Use Survey

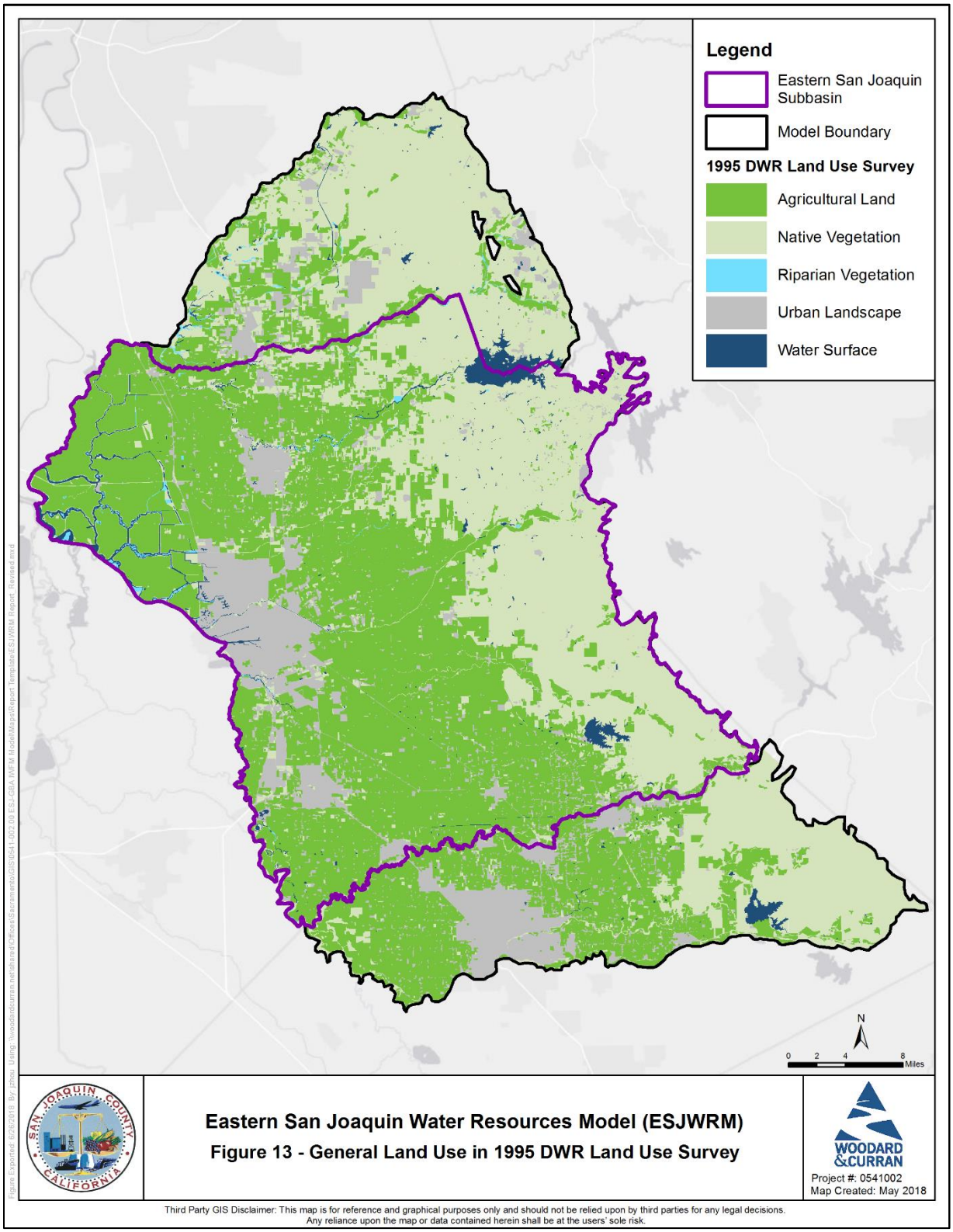


Figure 14: ESJWRM General Land Use in 2015 CropScape

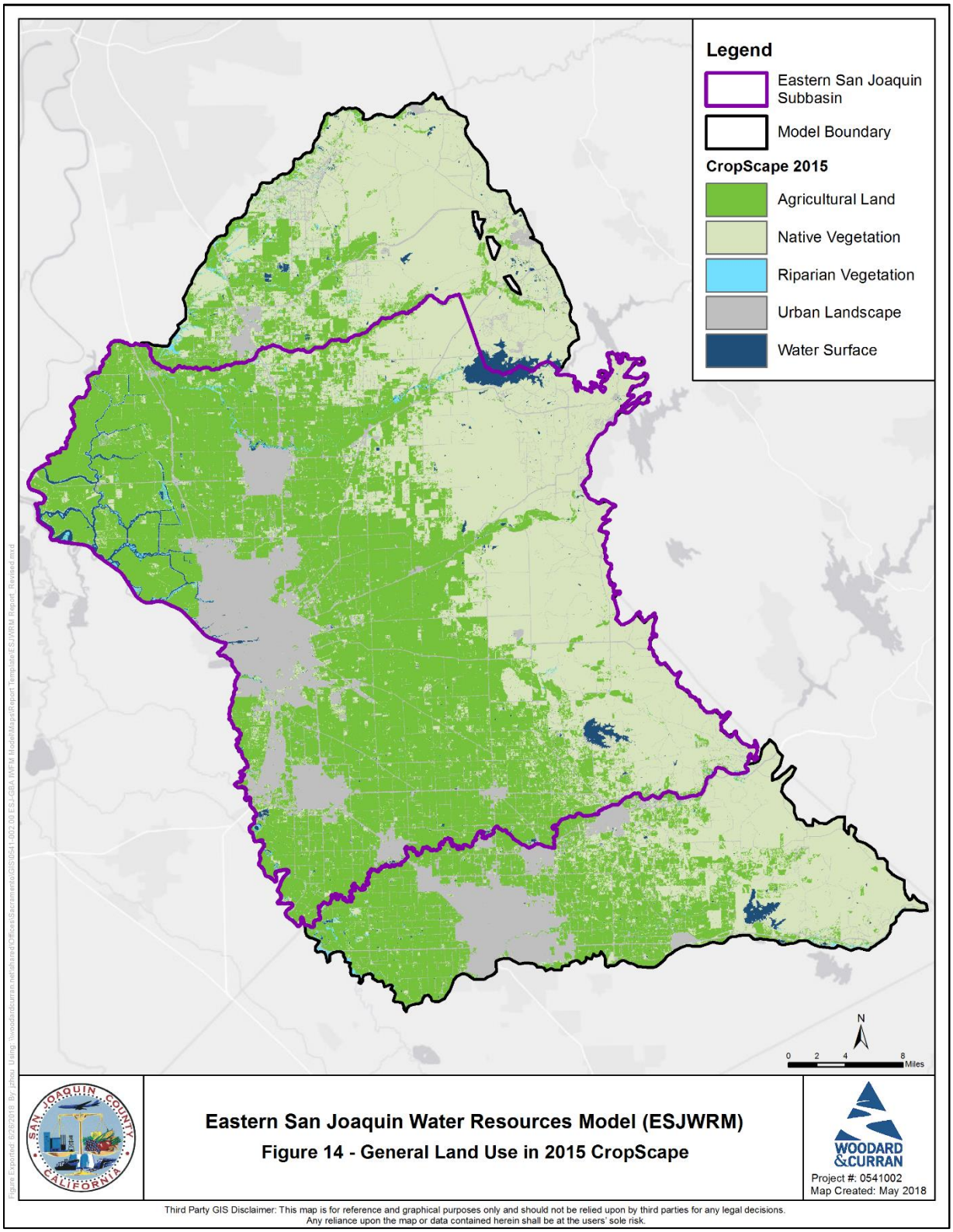


Figure 15: ESJWRM ESJ Subbasin Annual General Land Use

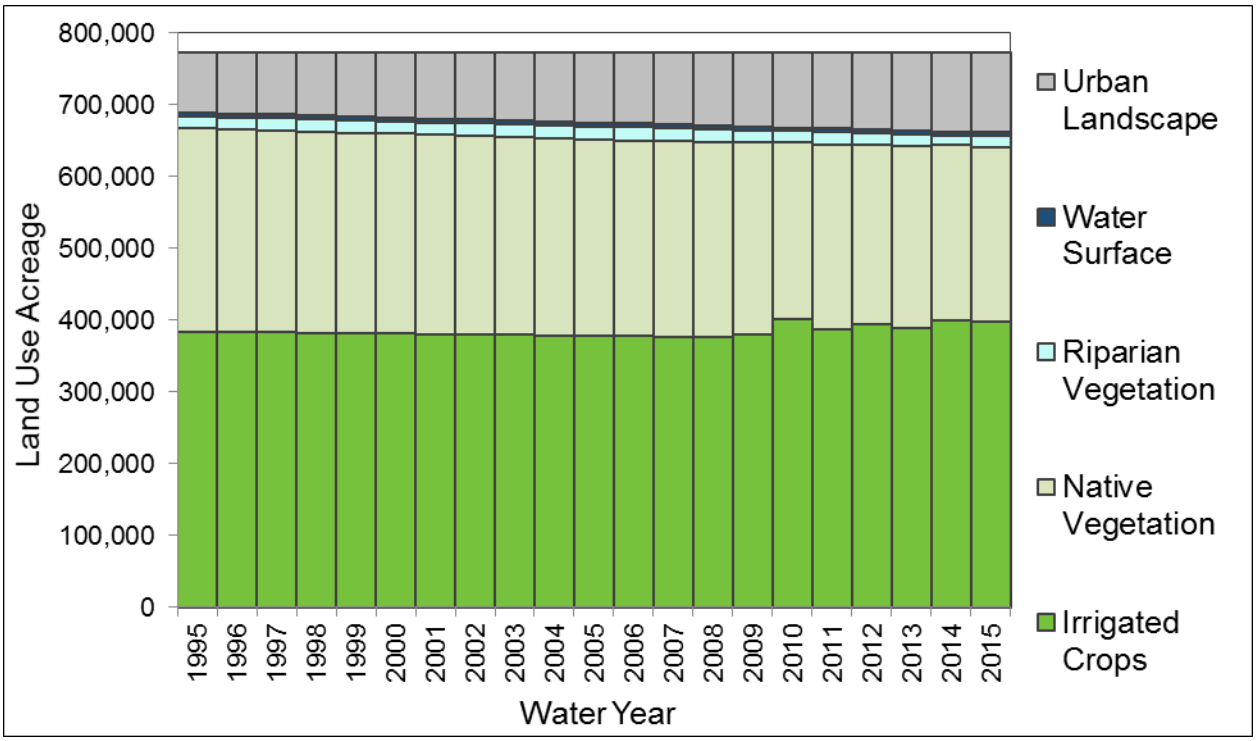


Figure 16: ESJWRM Cropping Pattern in 1995 DWR Land Use Survey

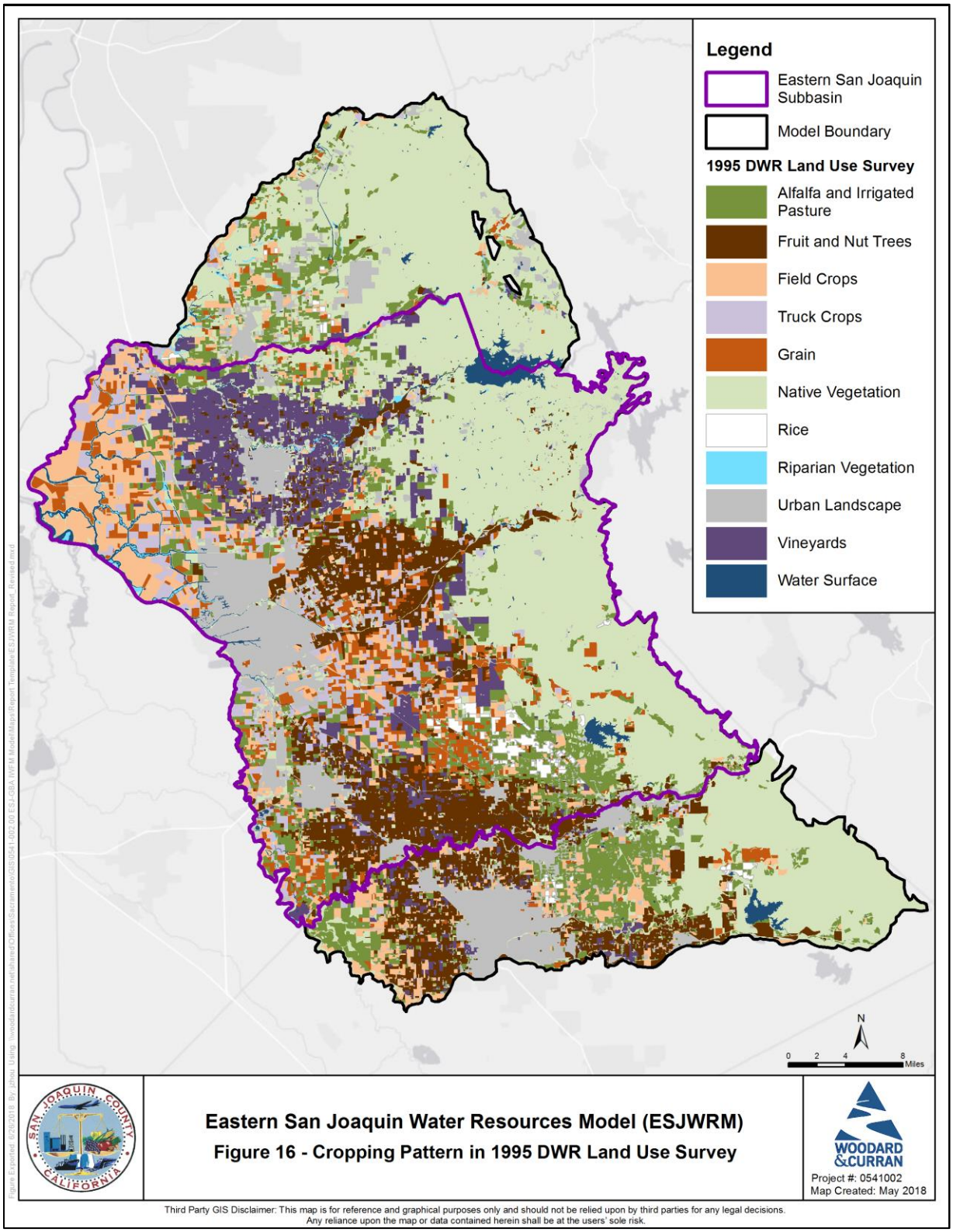


Figure 17: ESJWRM Cropping Pattern in 2014 Land IQ

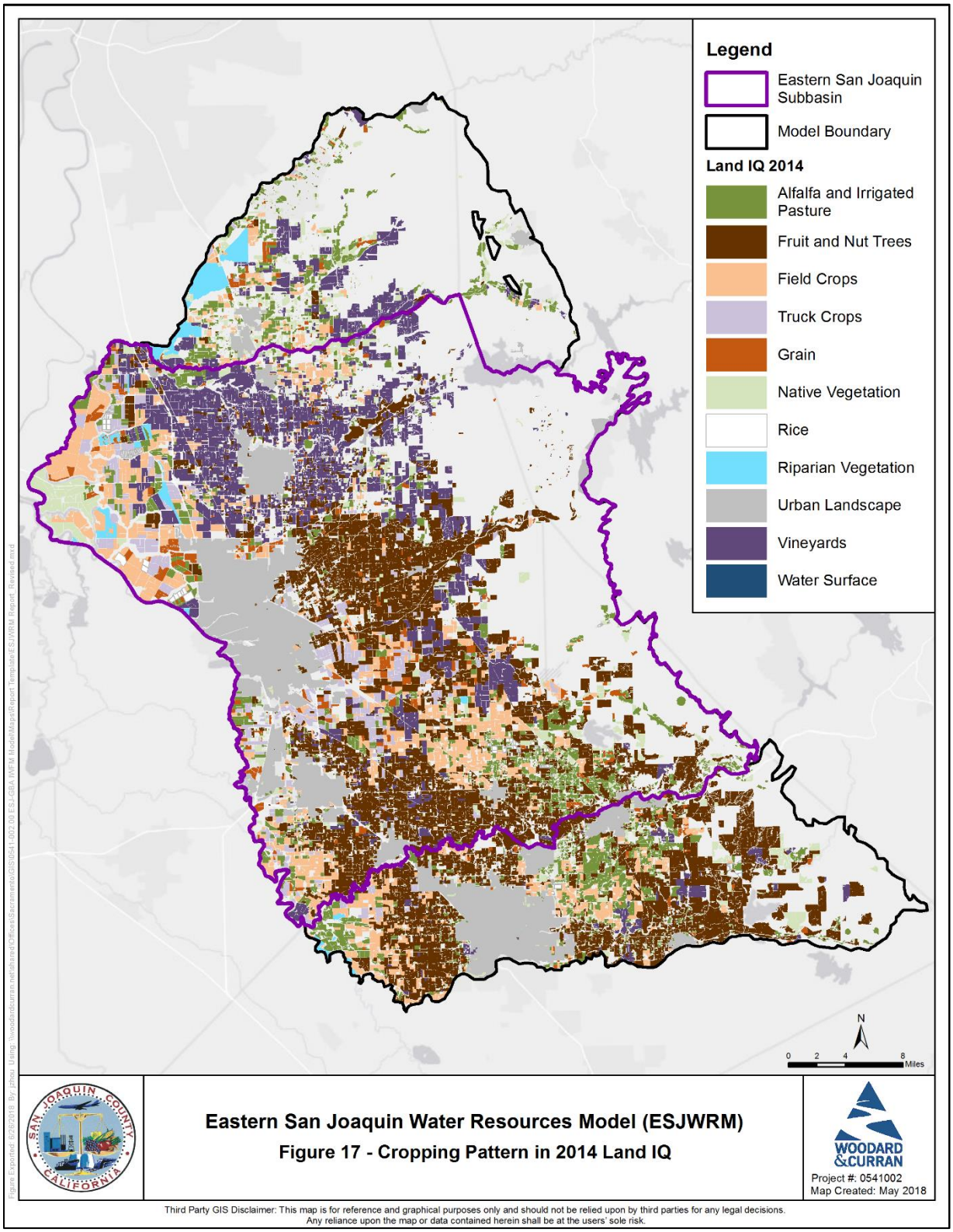


Figure 18: ESJWRM Cropping Pattern in 2015 CropScape

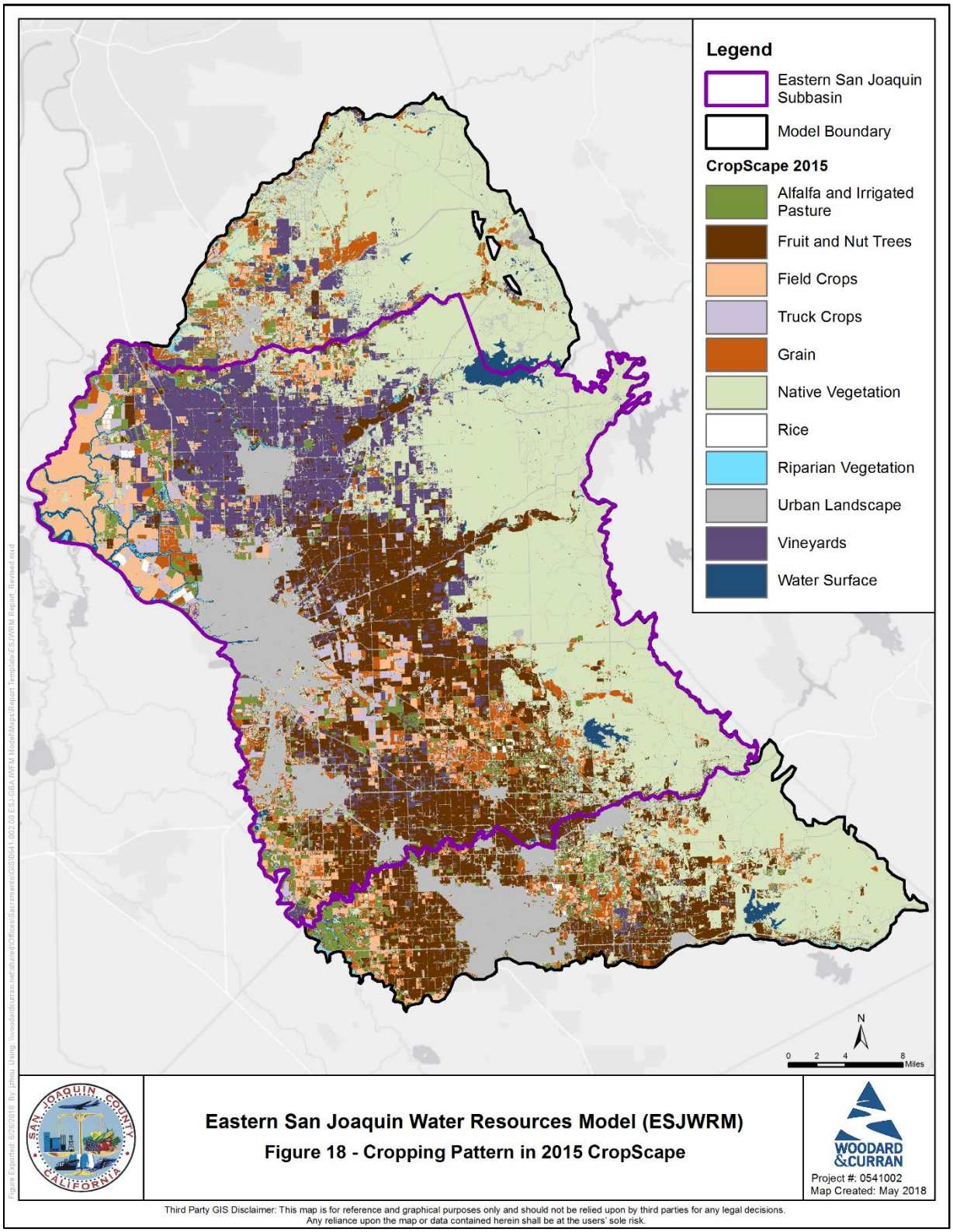


Figure 19a: ESJWRM Annual Cropping Pattern – Eastern San Joaquin Subbasin

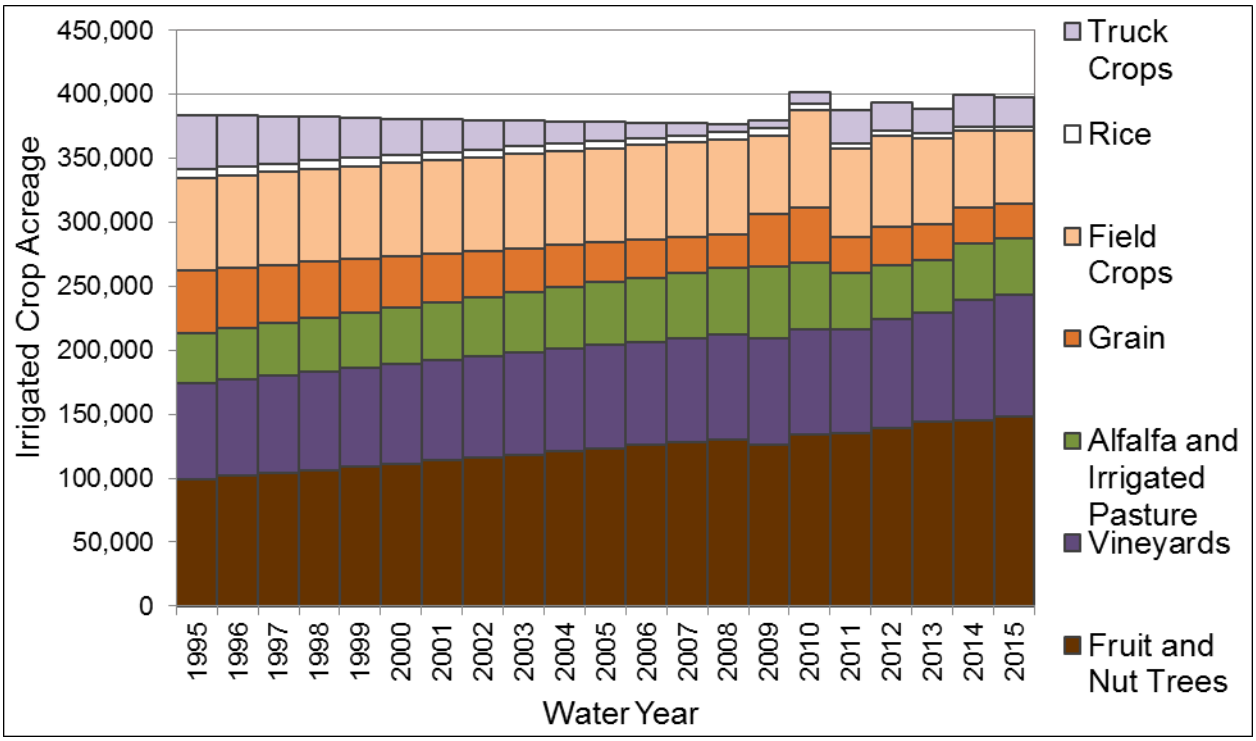


Figure 19b: ESJWRM Annual Cropping Pattern – Subarea 1 (North Delta Subarea)

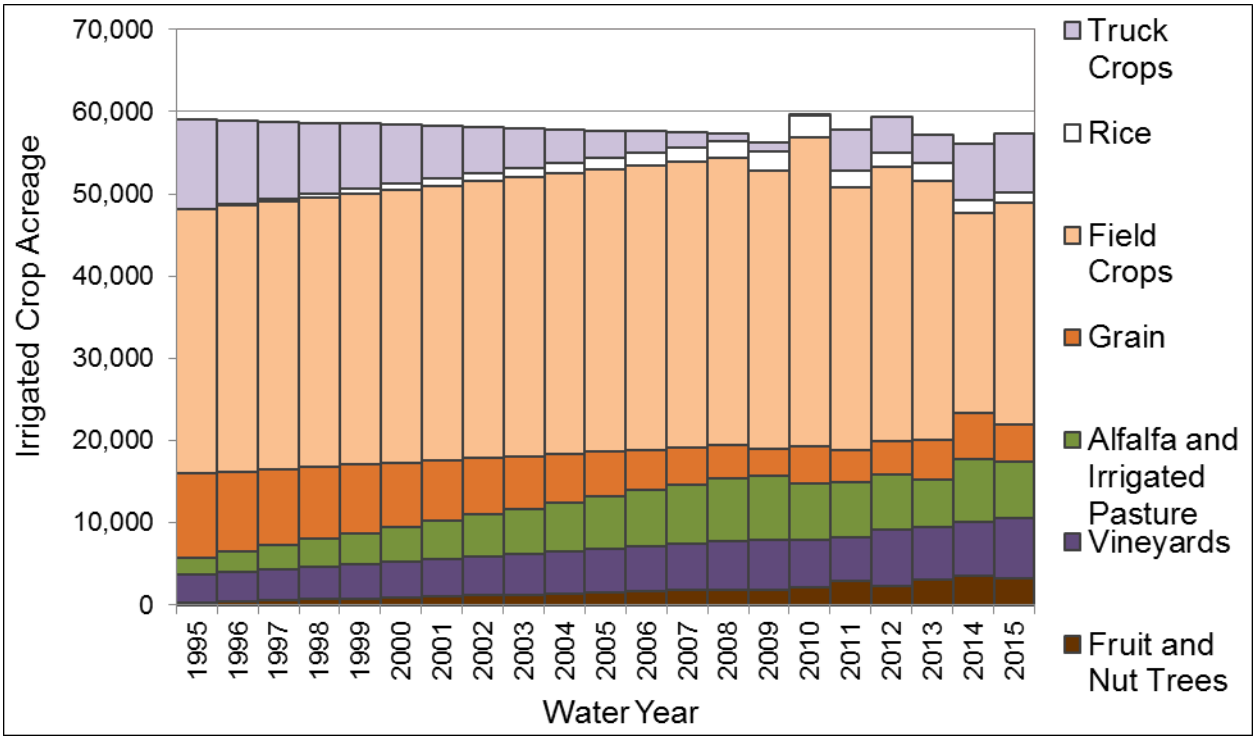


Figure 19c: ESJWRM Annual Cropping Pattern – Subarea 2 (North Subarea)

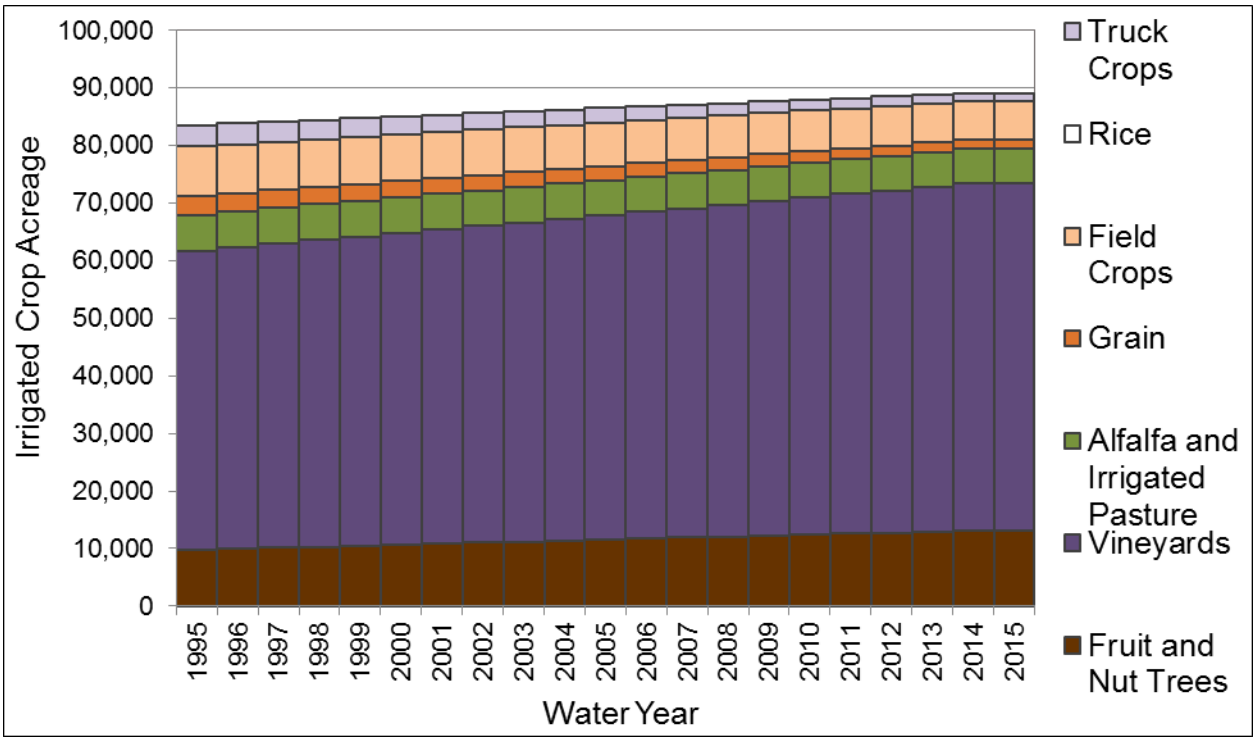


Figure 19d: ESJWRM Annual Cropping Pattern – Subarea 3 (Calaveras Subarea)

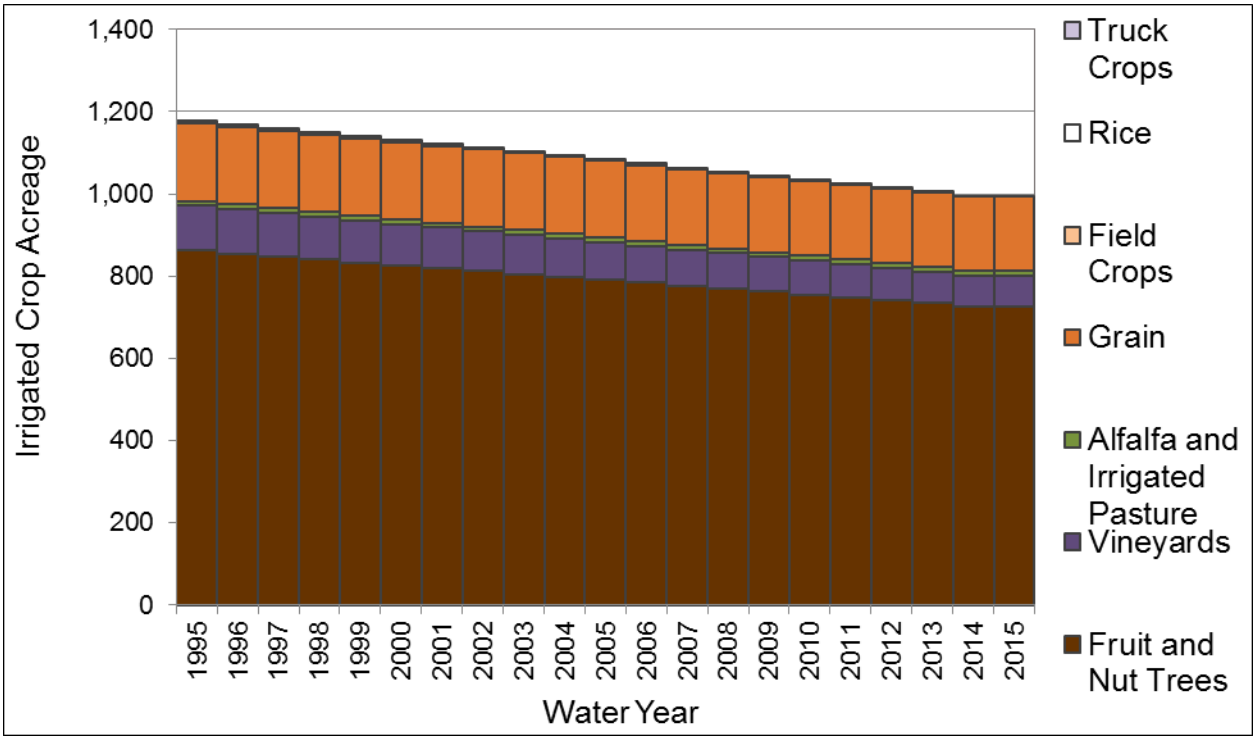


Figure 19e: ESJWRM Annual Cropping Pattern – Subarea 4 (Central Subarea)

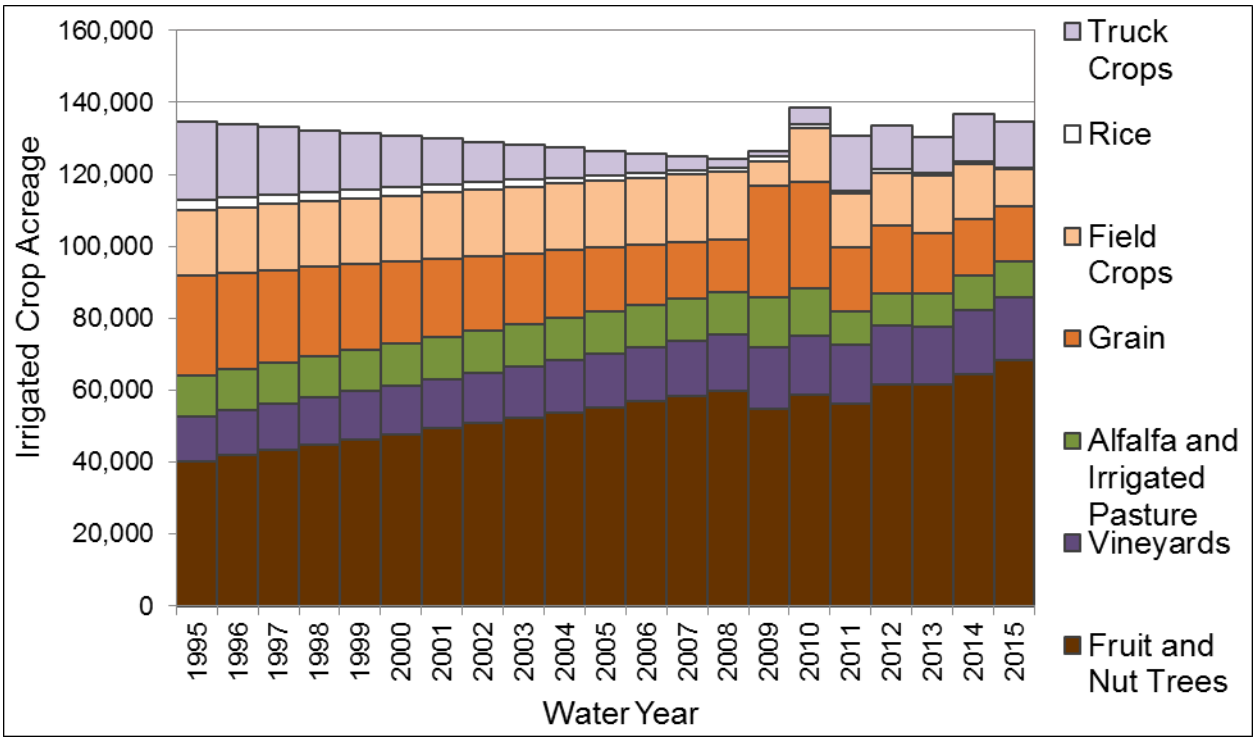


Figure 19f: ESJWRM Annual Cropping Pattern – Subarea 5 (South Subarea)

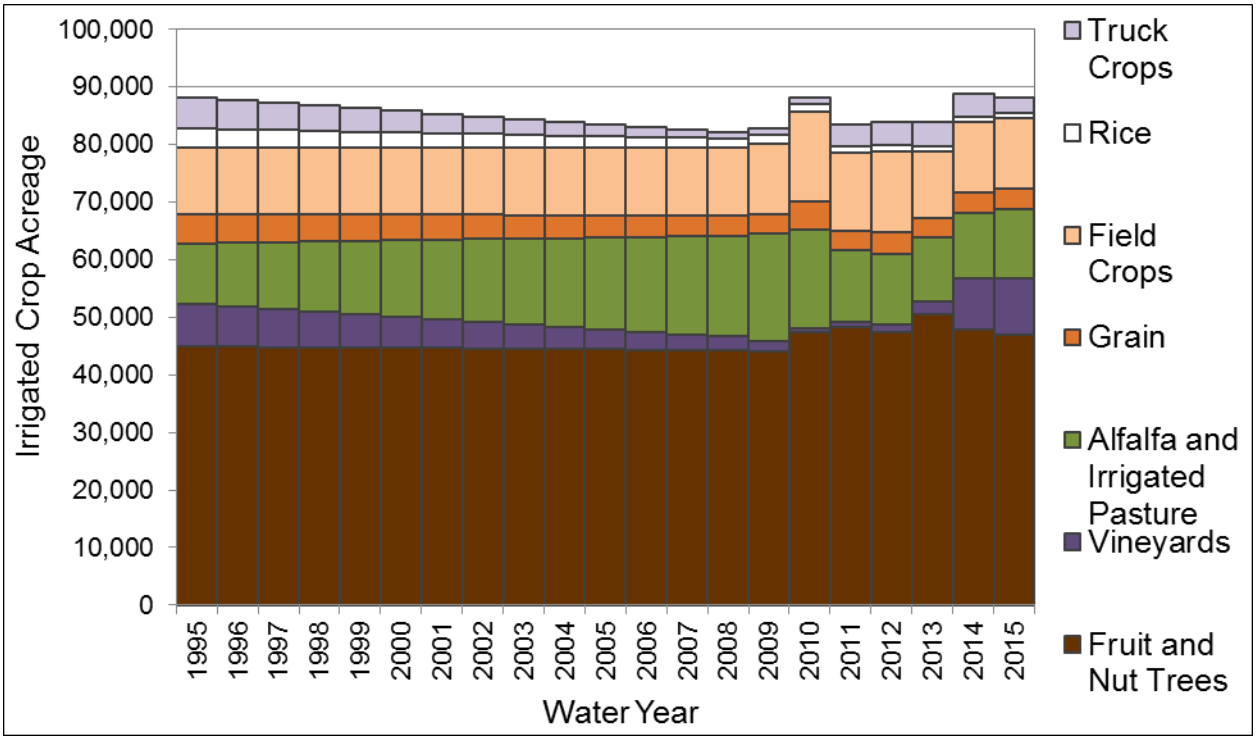


Figure 19g: ESJWRM Annual Cropping Pattern – Subarea 6 (Stanislaus Subarea)

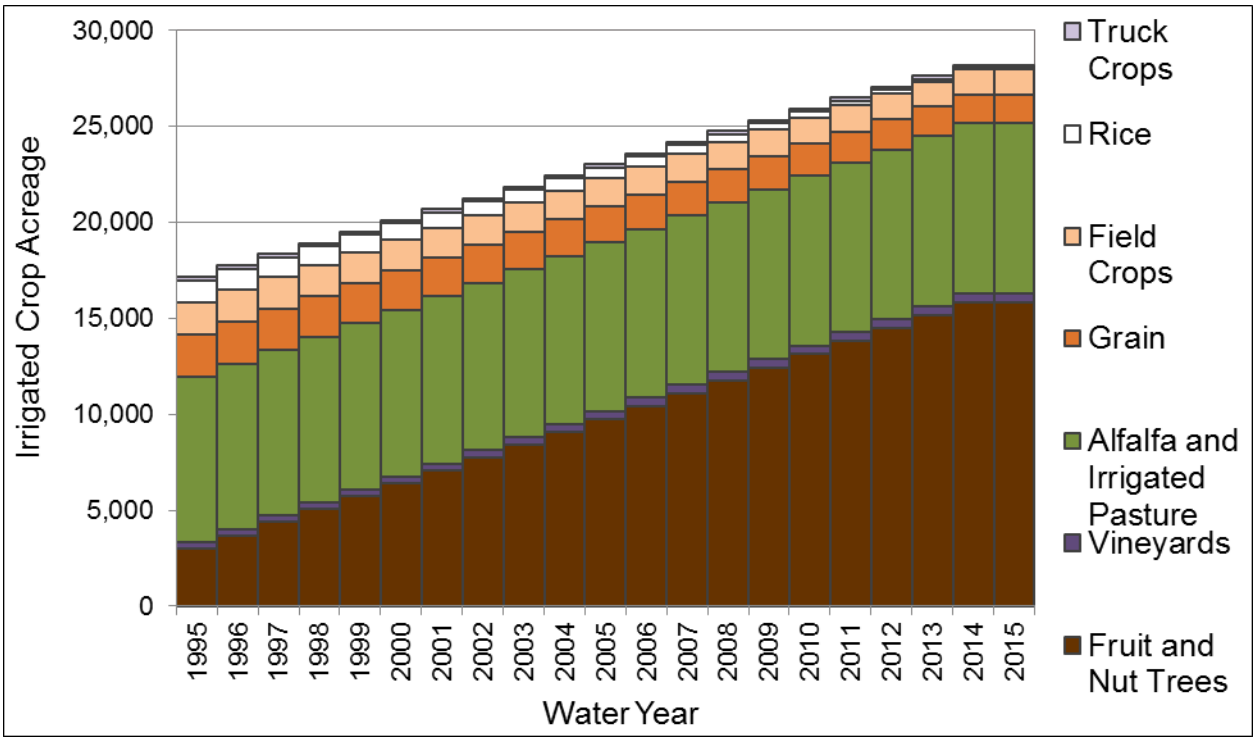


Figure 20: ESJWRM Annual Evapotranspiration

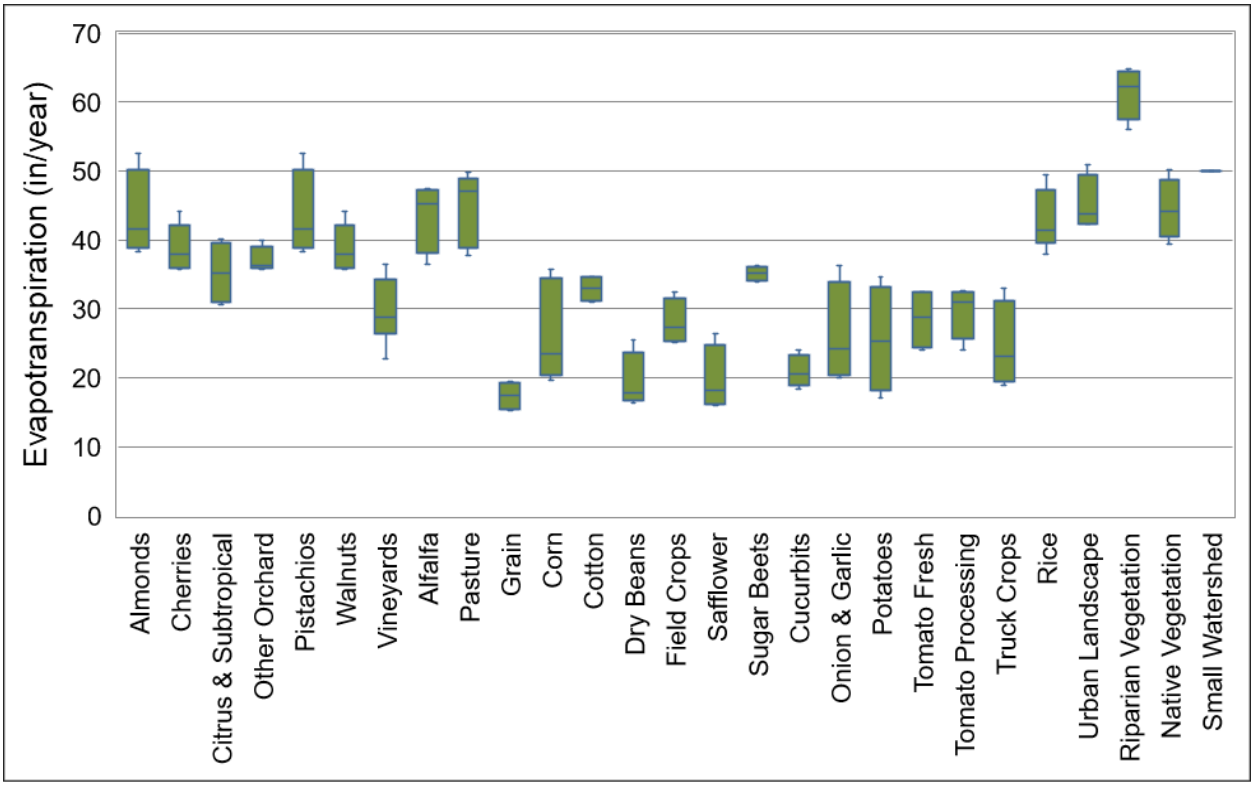


Figure 21: ESJWRM Surface Water Drainage Watersheds

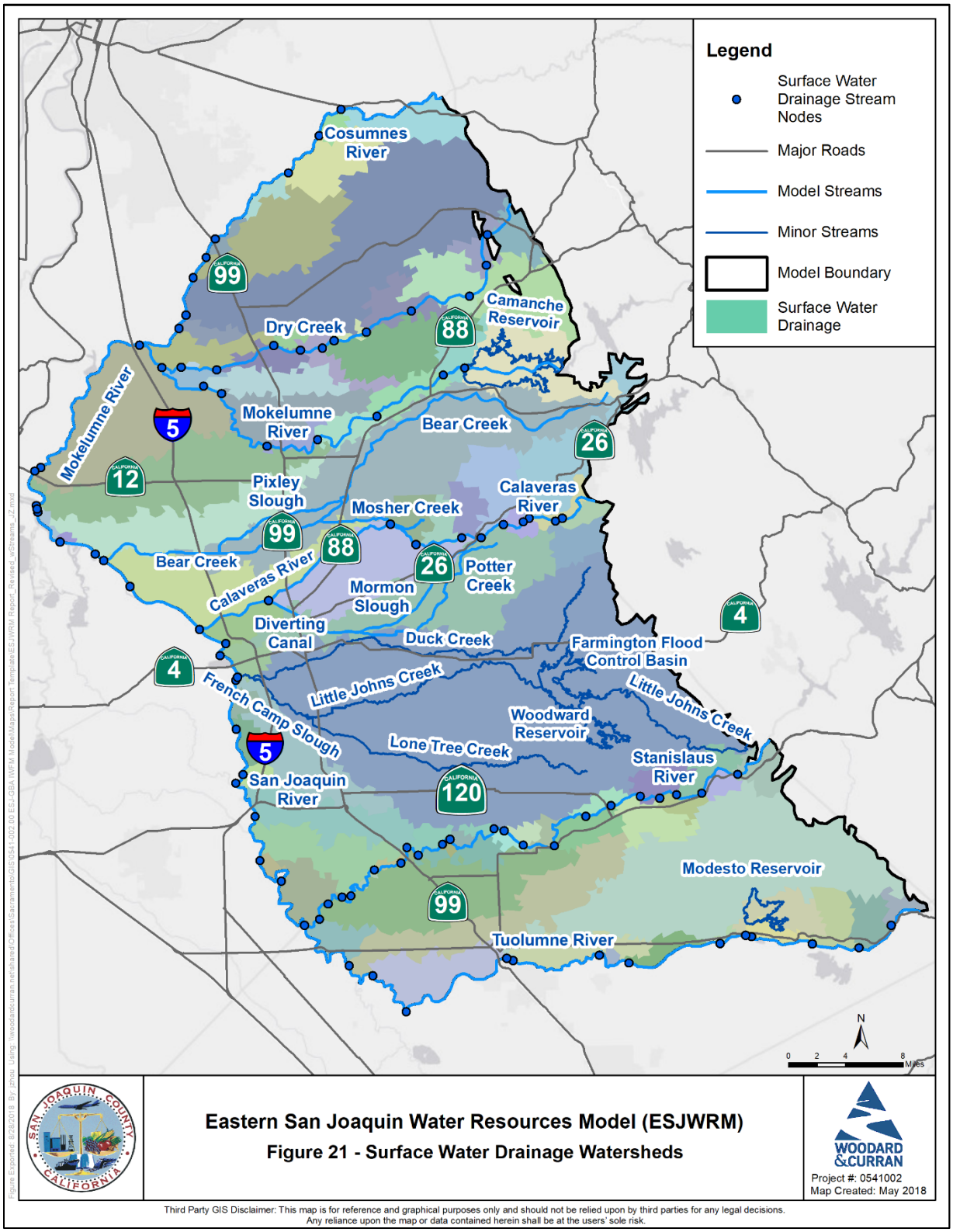


Figure 22: ESJWRM Ground Surface Elevation

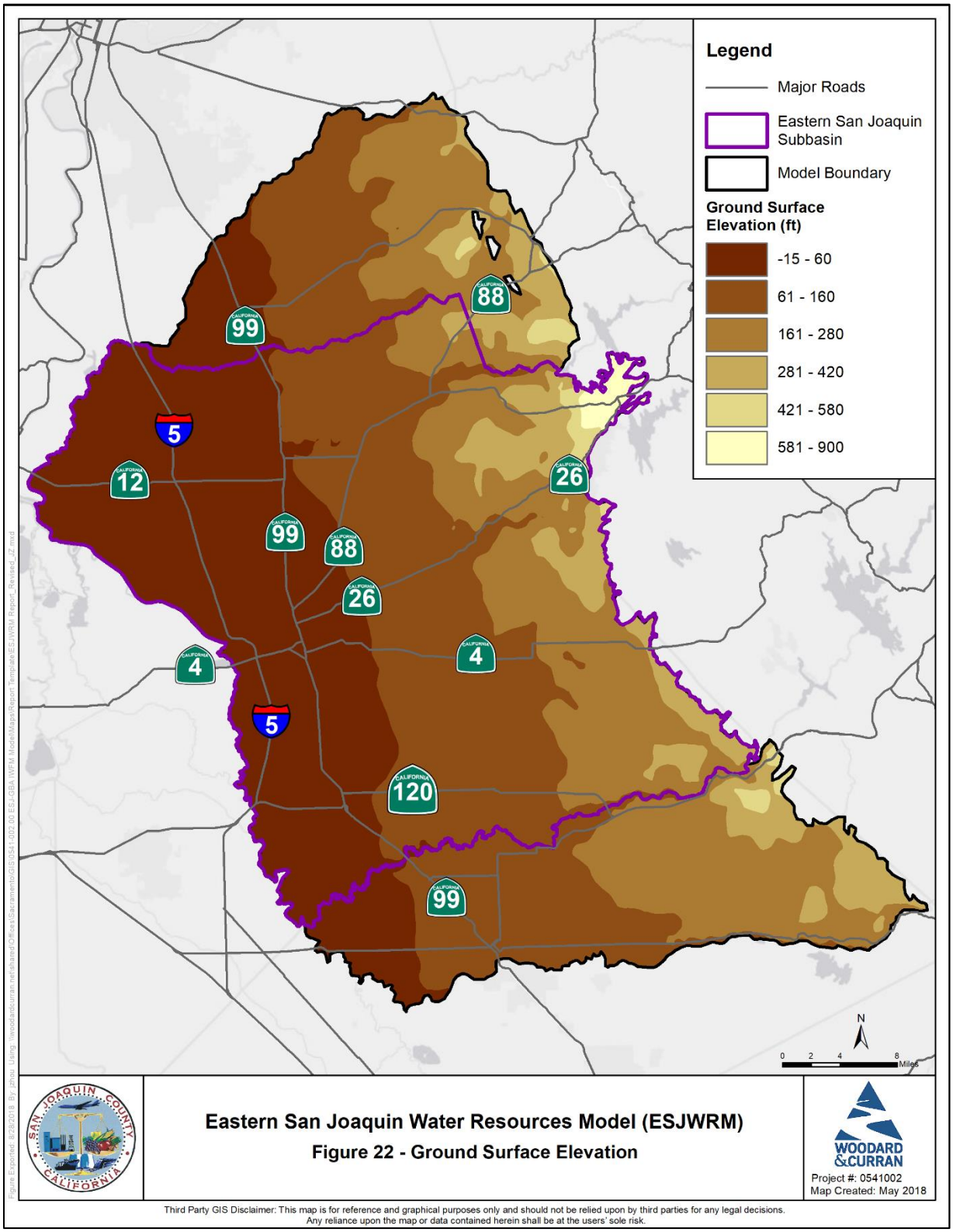


Figure 23: ESJWRM Layer 1 Thickness

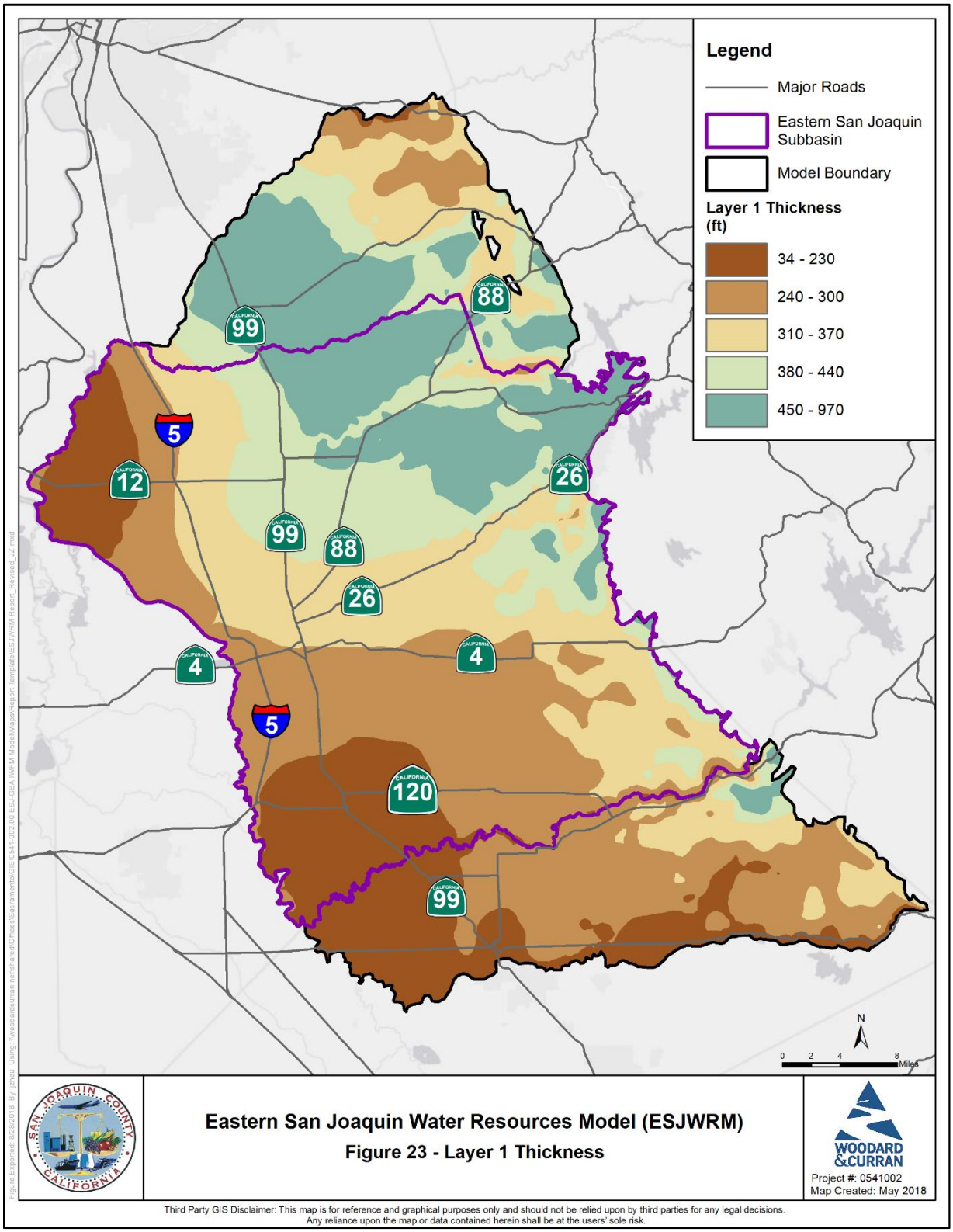


Figure 24: ESJWRM Corcoran Clay Depth to Top

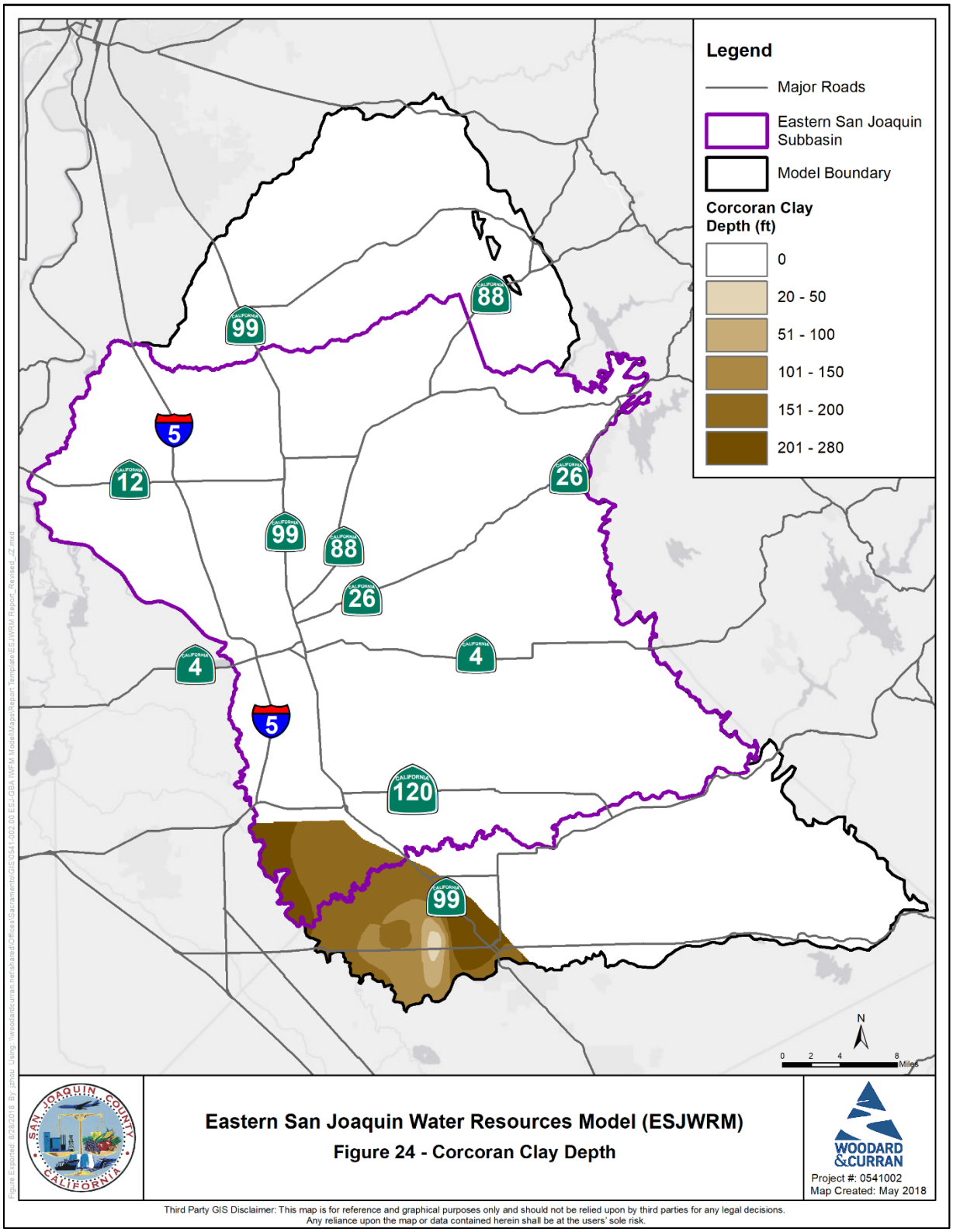


Figure 25: ESJWRM Corcoran Clay Thickness

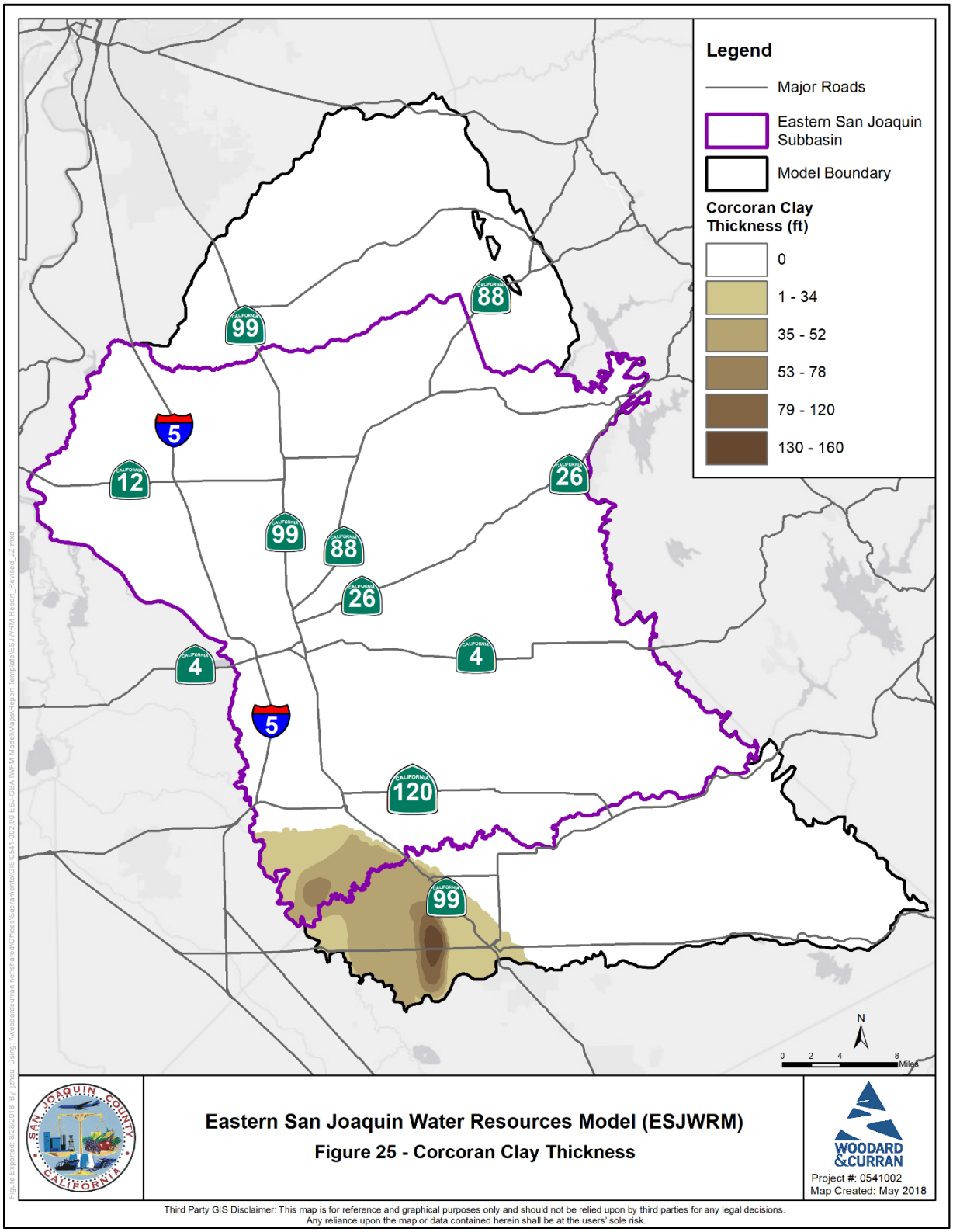


Figure 26: ESJWRM Layer 2 Thickness

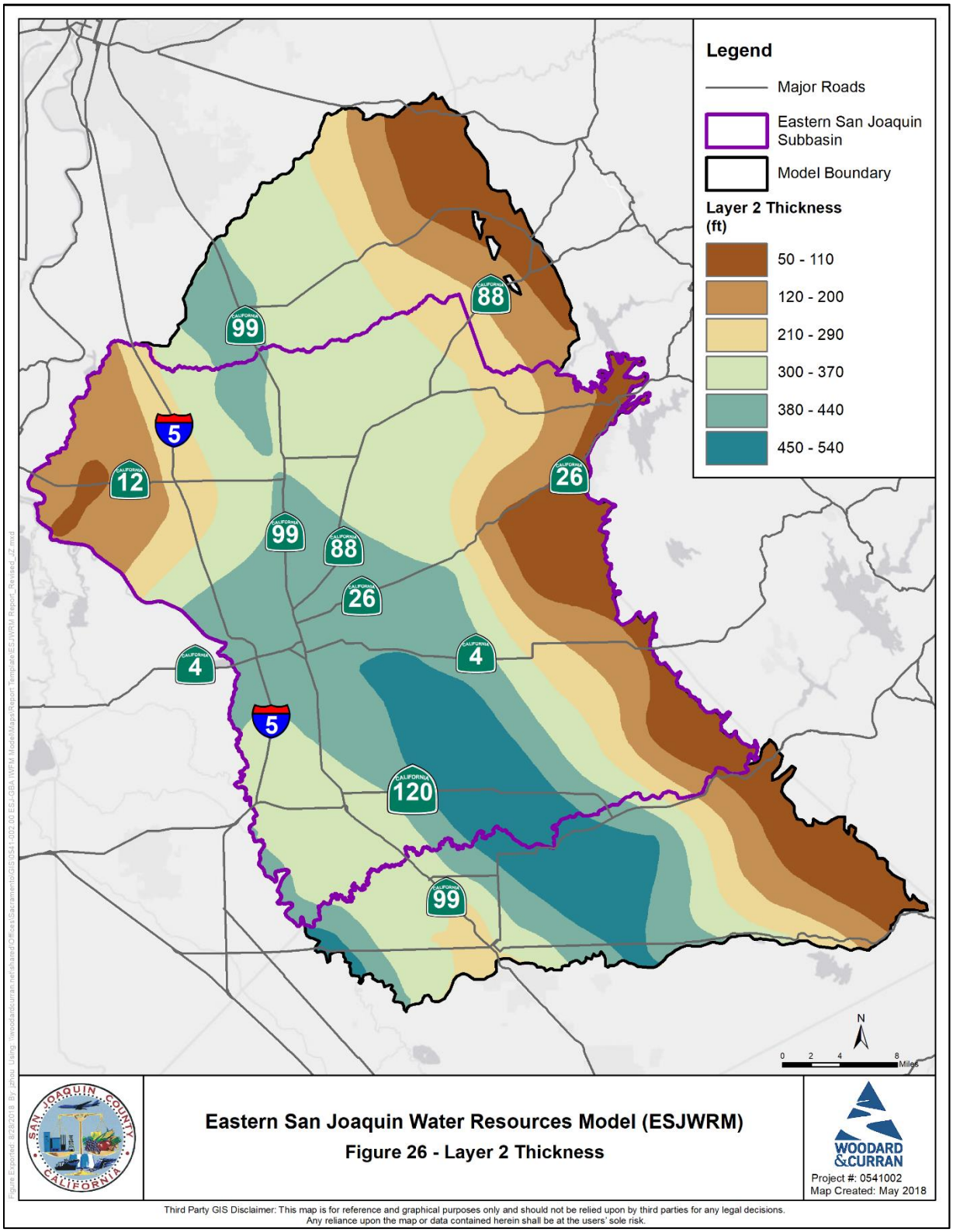


Figure 27: ESJWRM Layer 3 Thickness

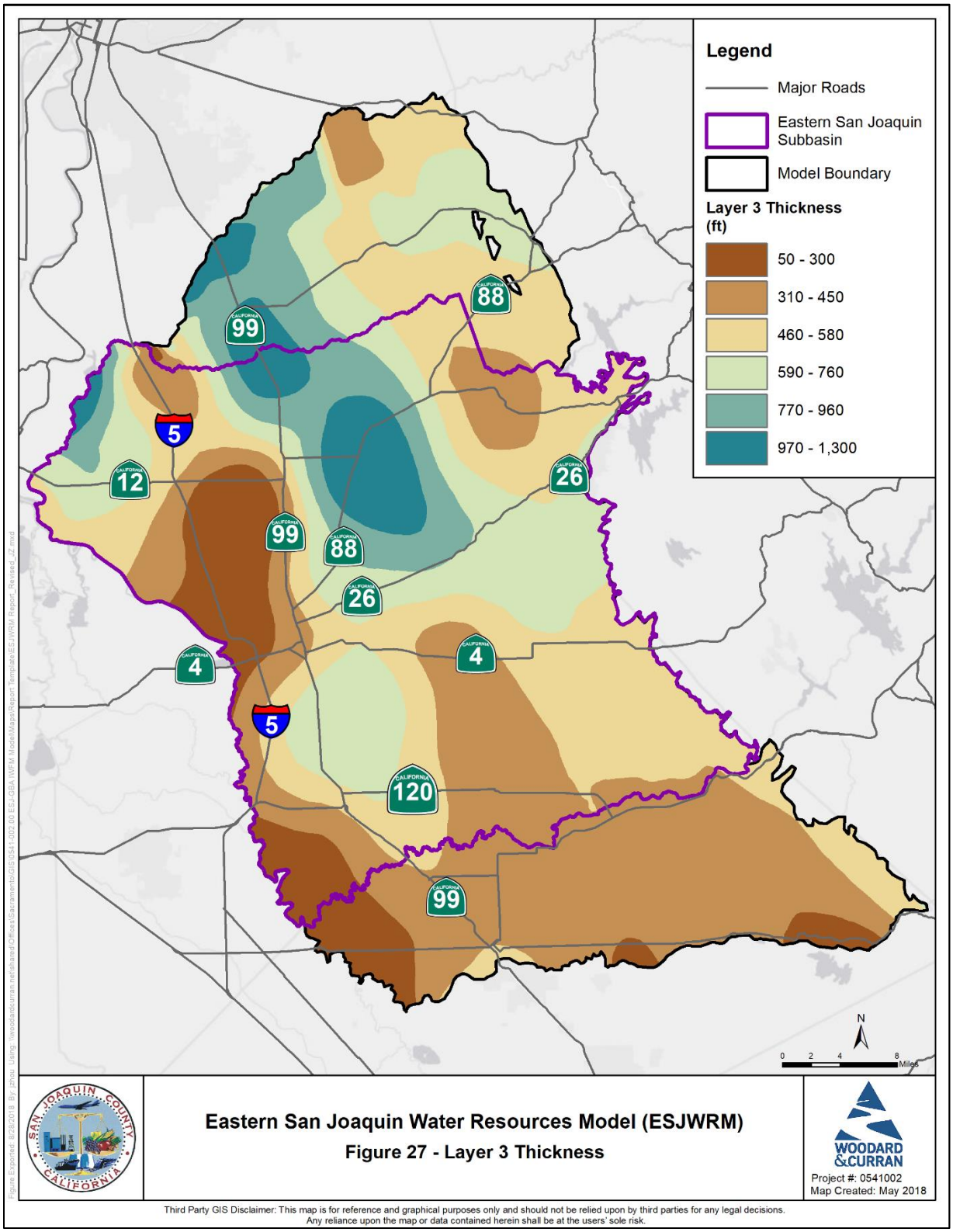


Figure 28: ESJWRM Layer 4 Thickness

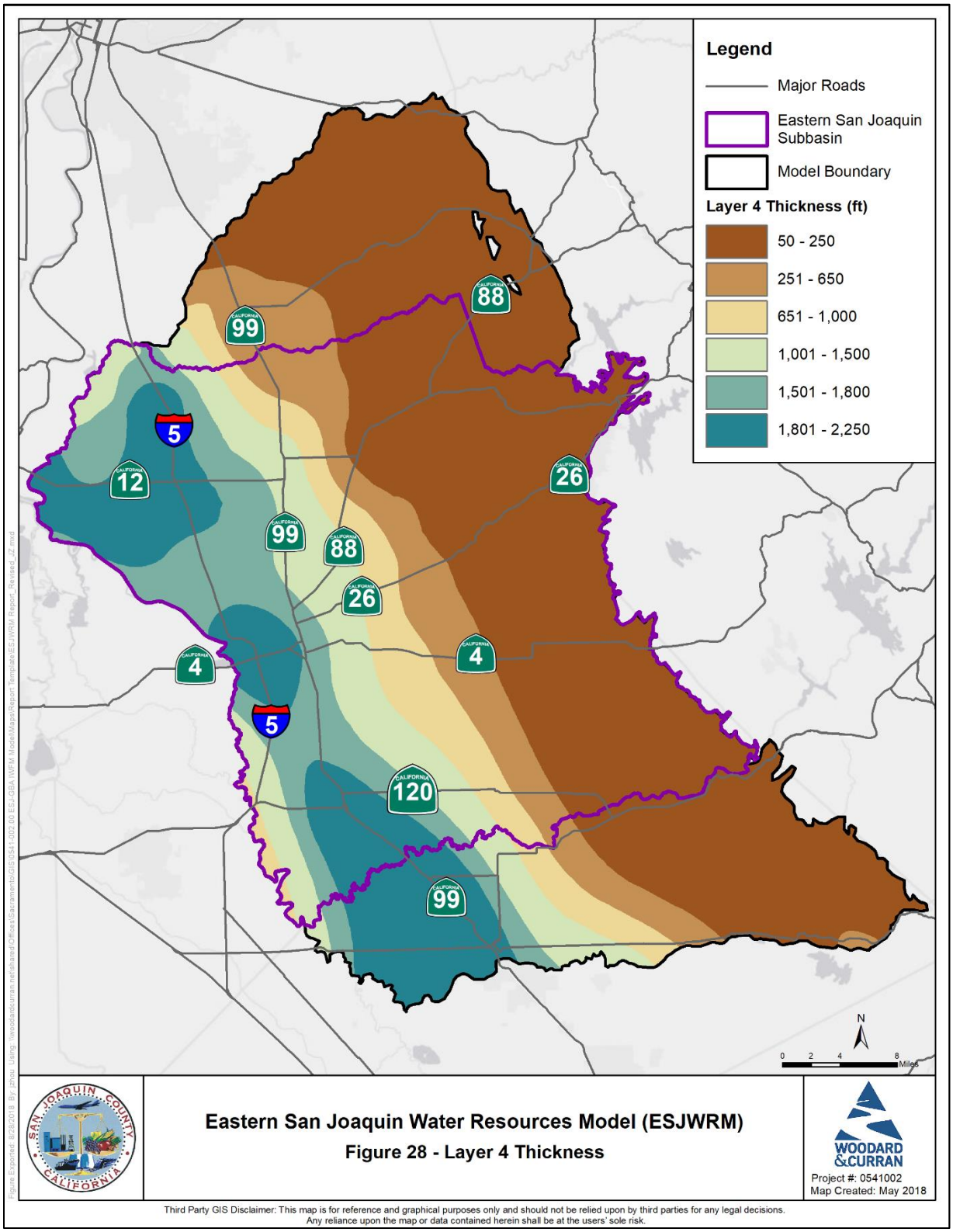


Figure 29a: ESJWRM Cross Section A - A'

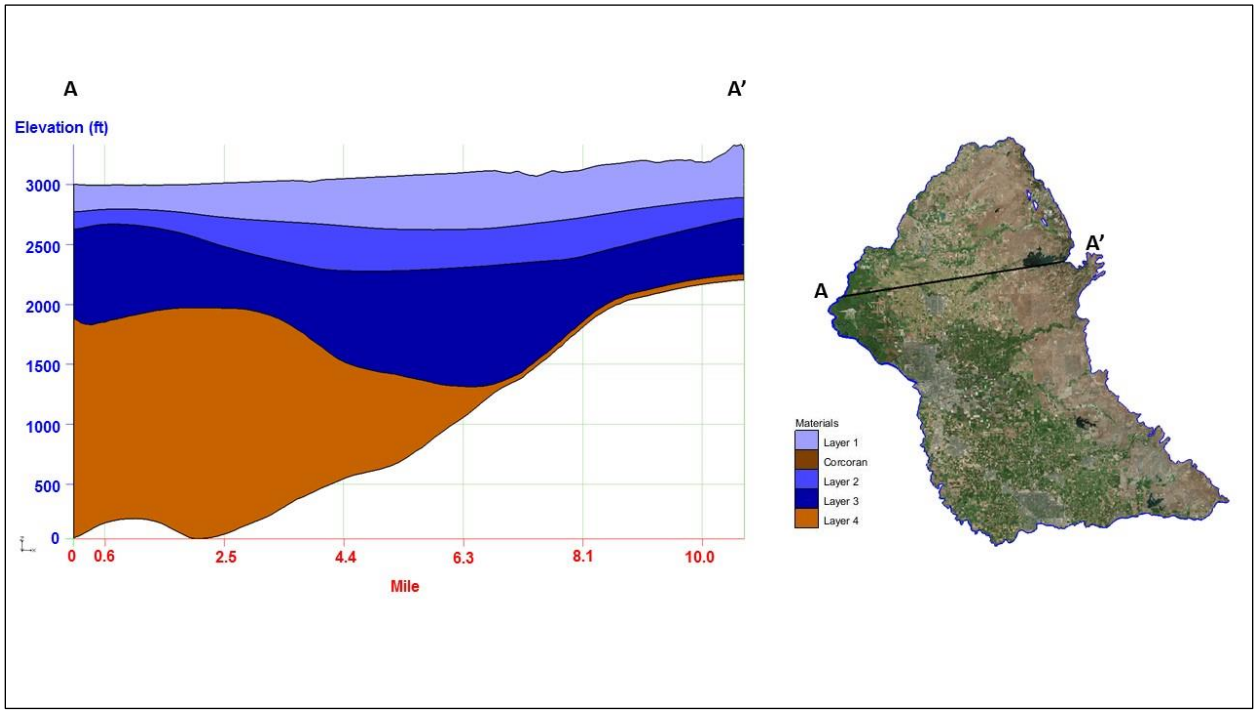


Figure 29b: ESJWRM Cross Section B - B'

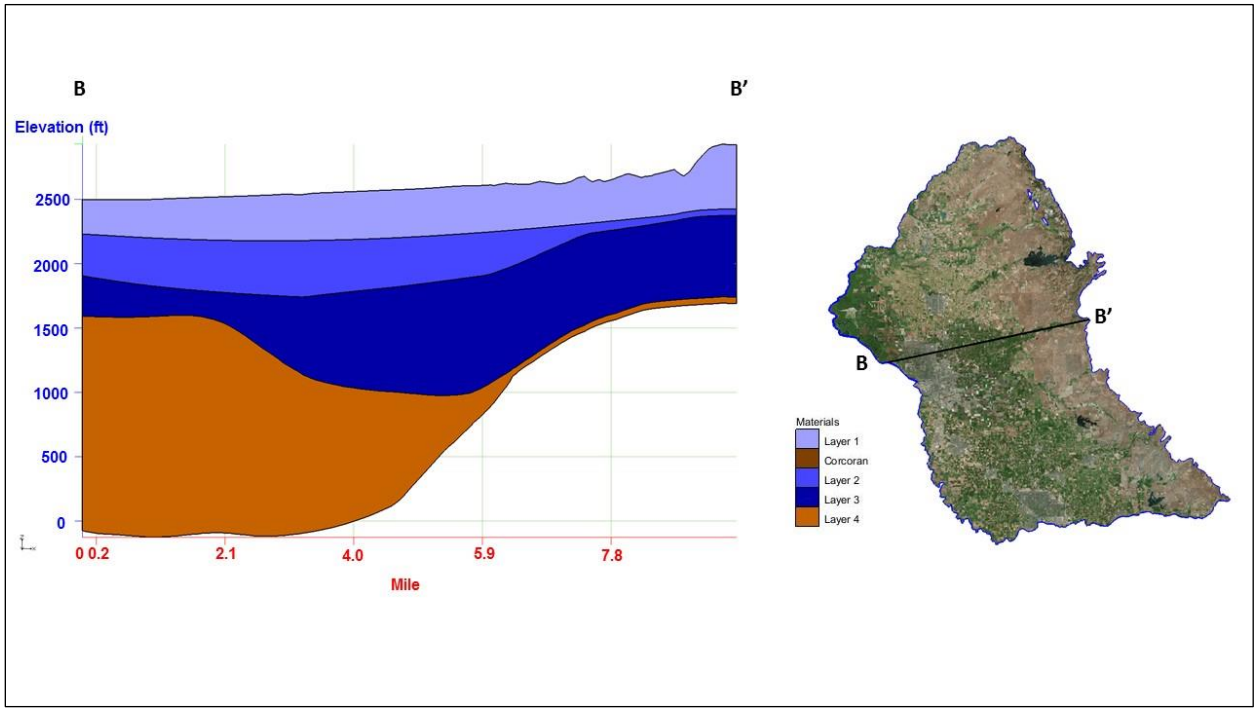


Figure 29c: ESJWRM Cross Section C - C'

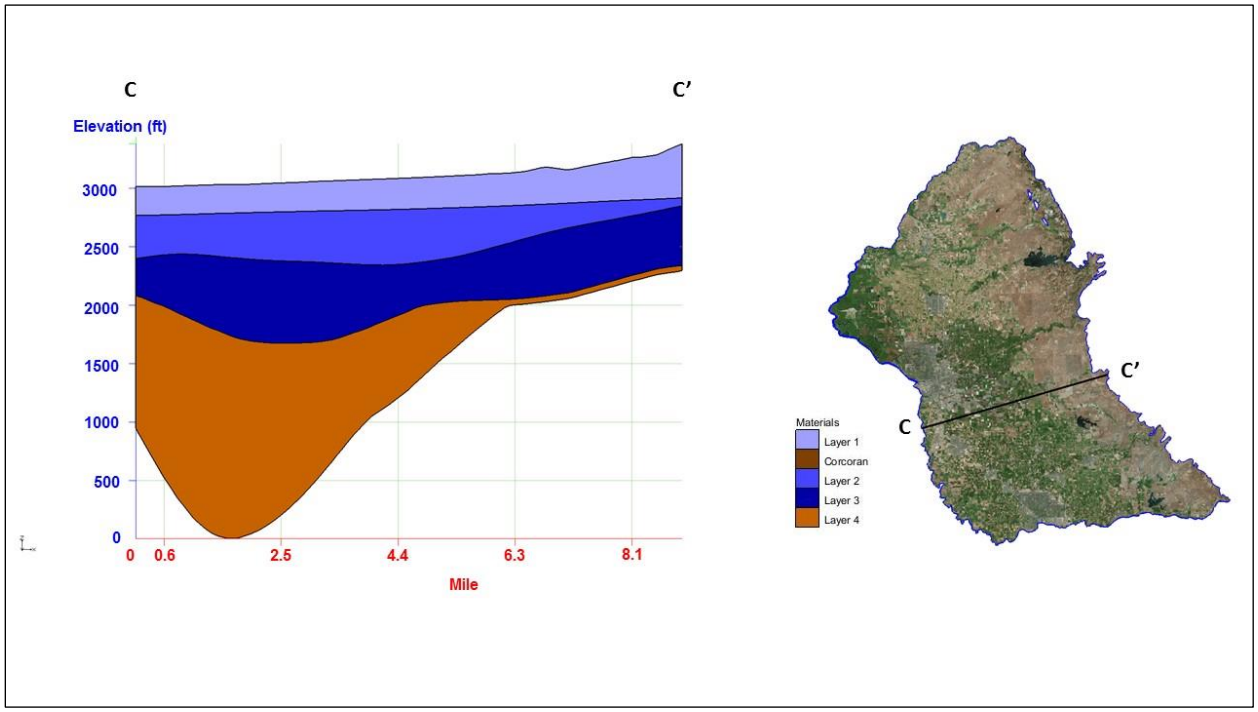


Figure 29d: ESJWRM Cross Section D - D'

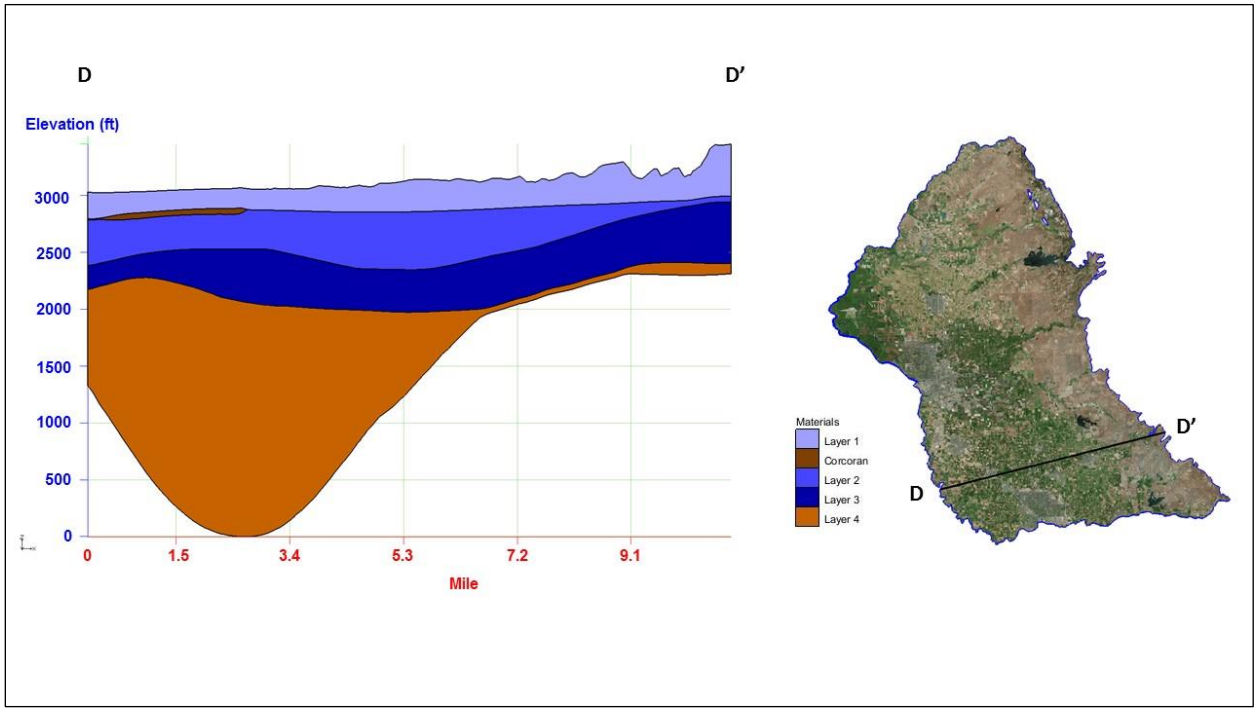


Figure 29e: ESJWRM Cross Section E - E'

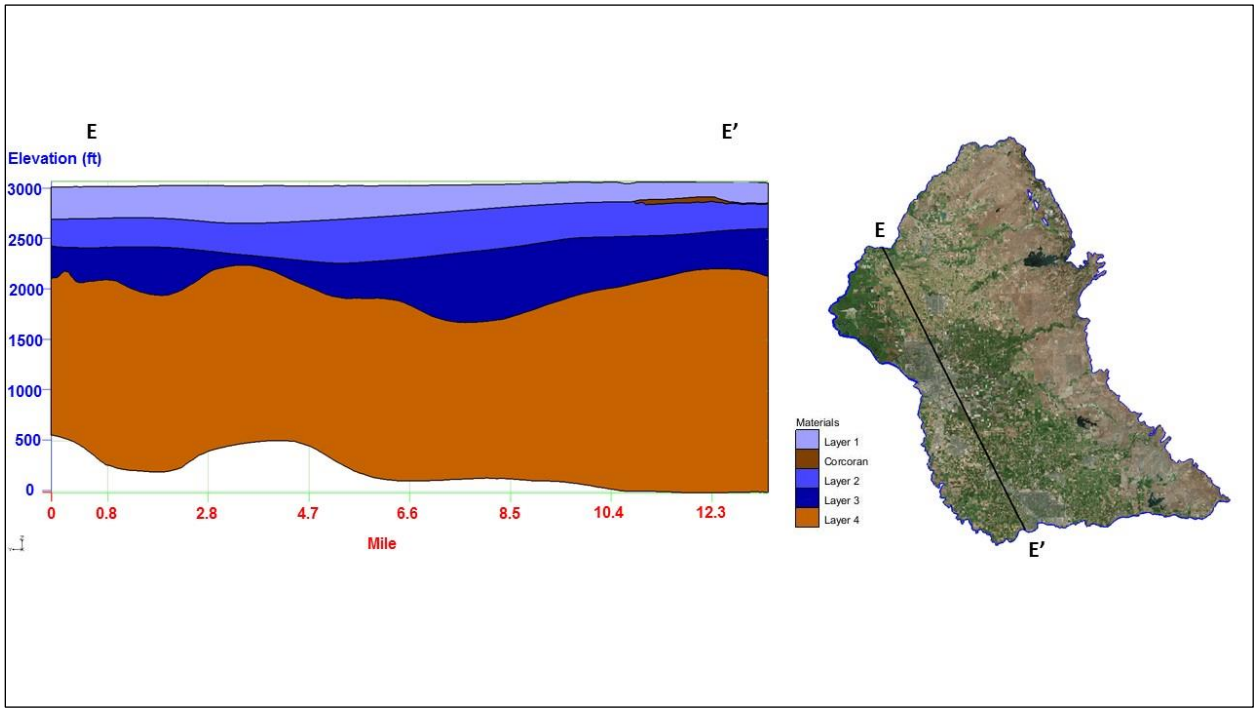


Figure 29f: ESJWRM Cross Section F - F'

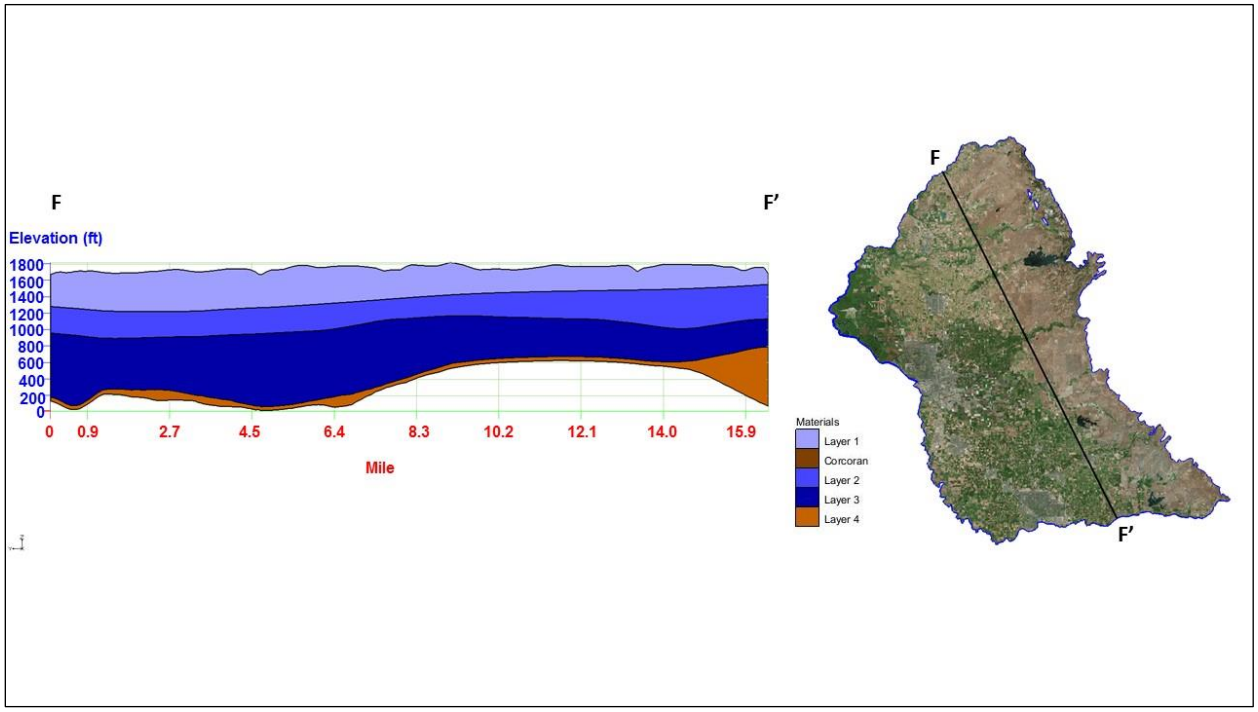


Figure 30: ESJWRM Small Watersheds

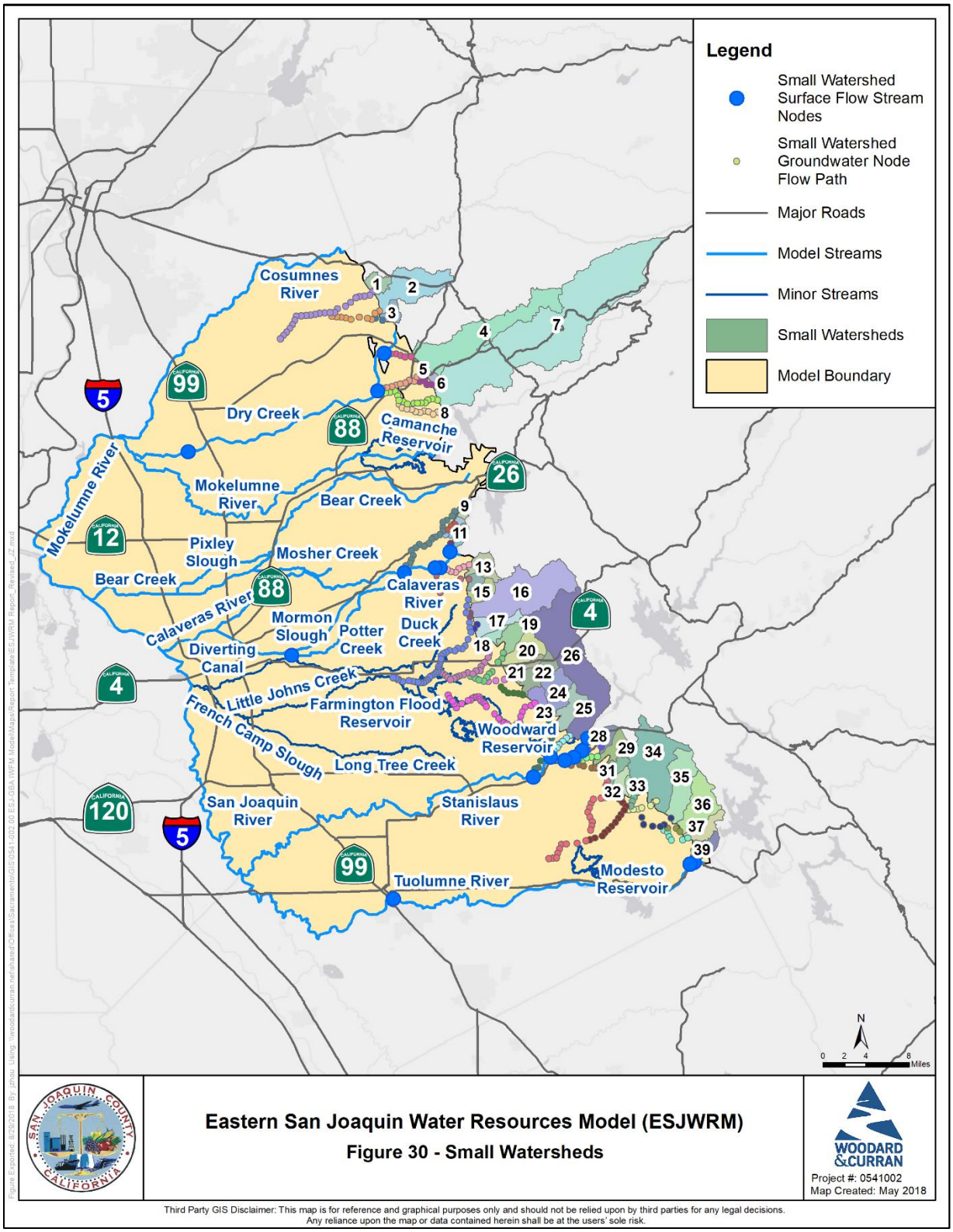


Figure 31: ESJWRM Initial GW Levels (Fall 1994)

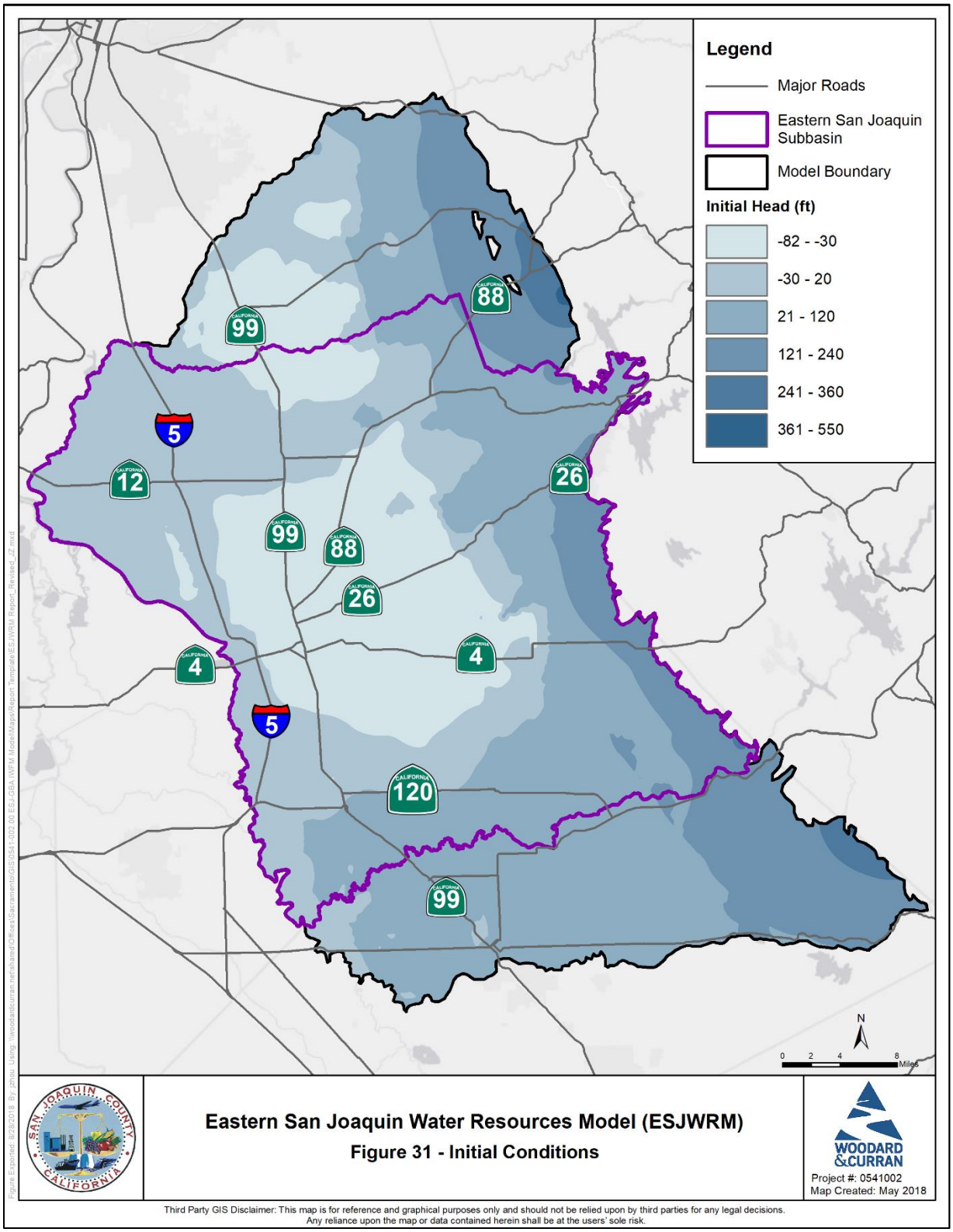


Figure 32: ESJWRM Annual Population by Urban Center

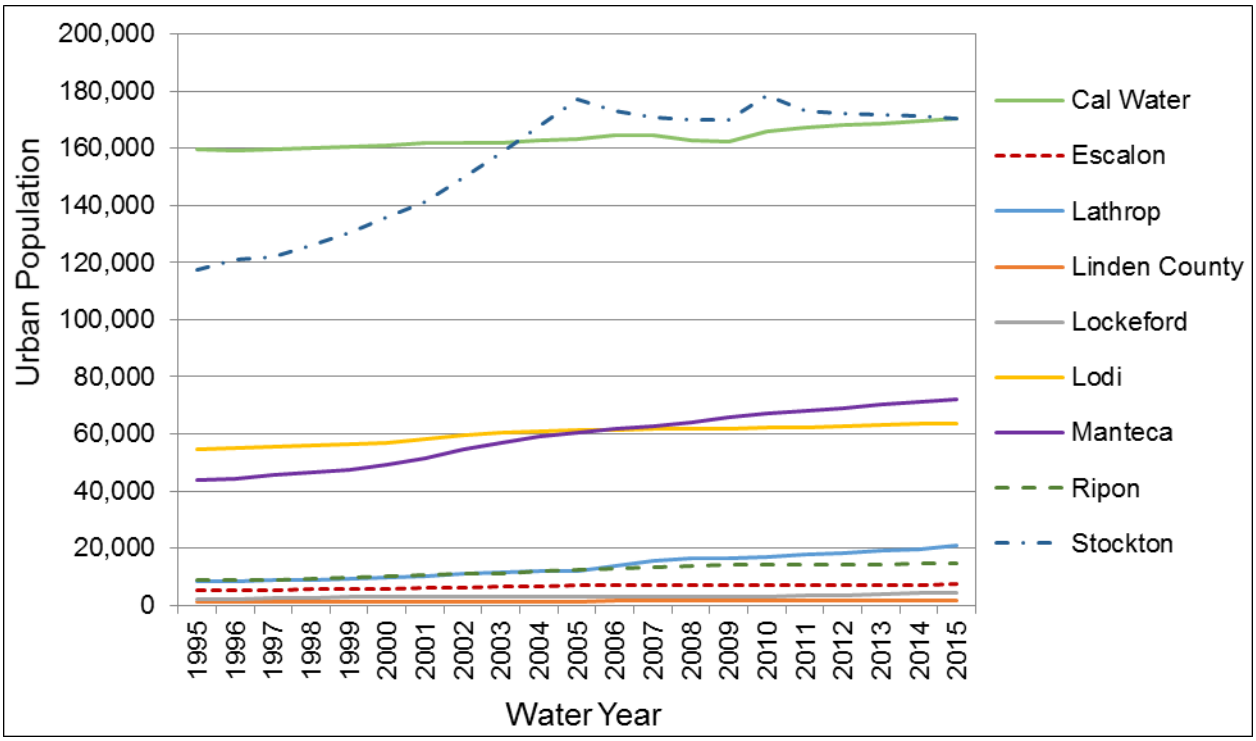


Figure 33: ESJWRM Annual Per Capita Water Use by Urban Center

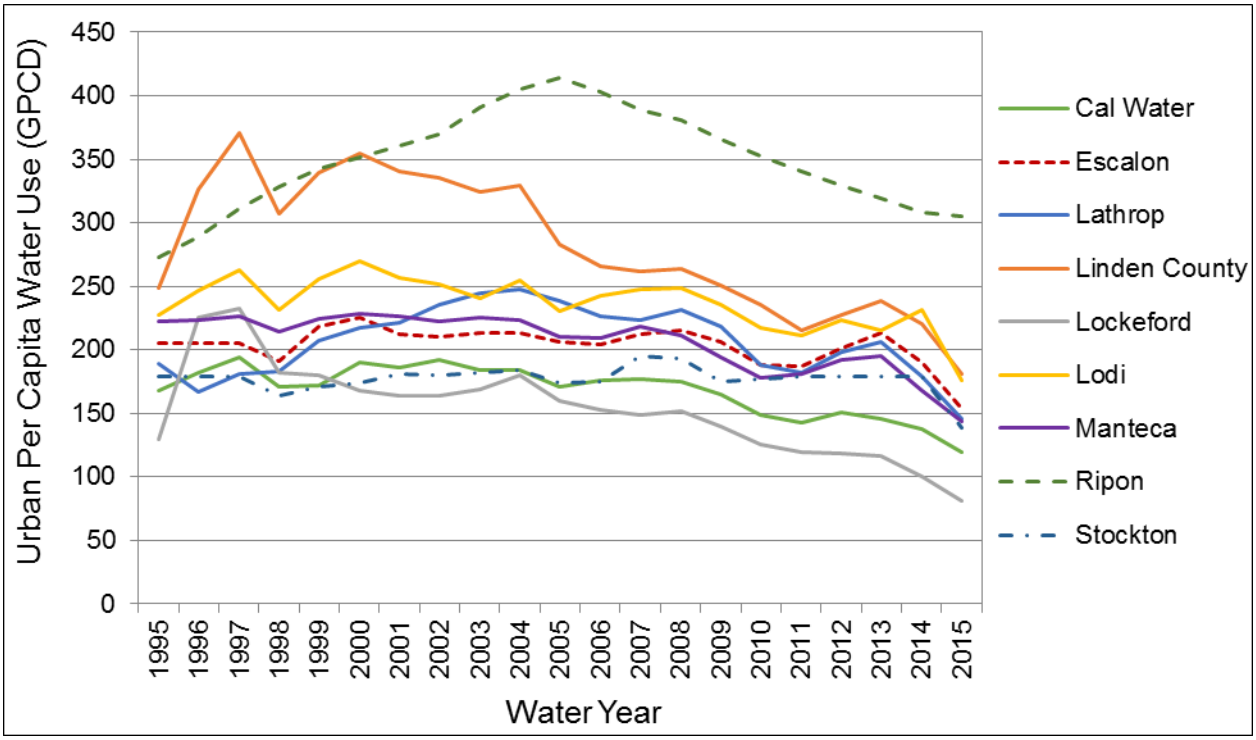


Figure 34: ESJWRM Surface Water Diversion Locations

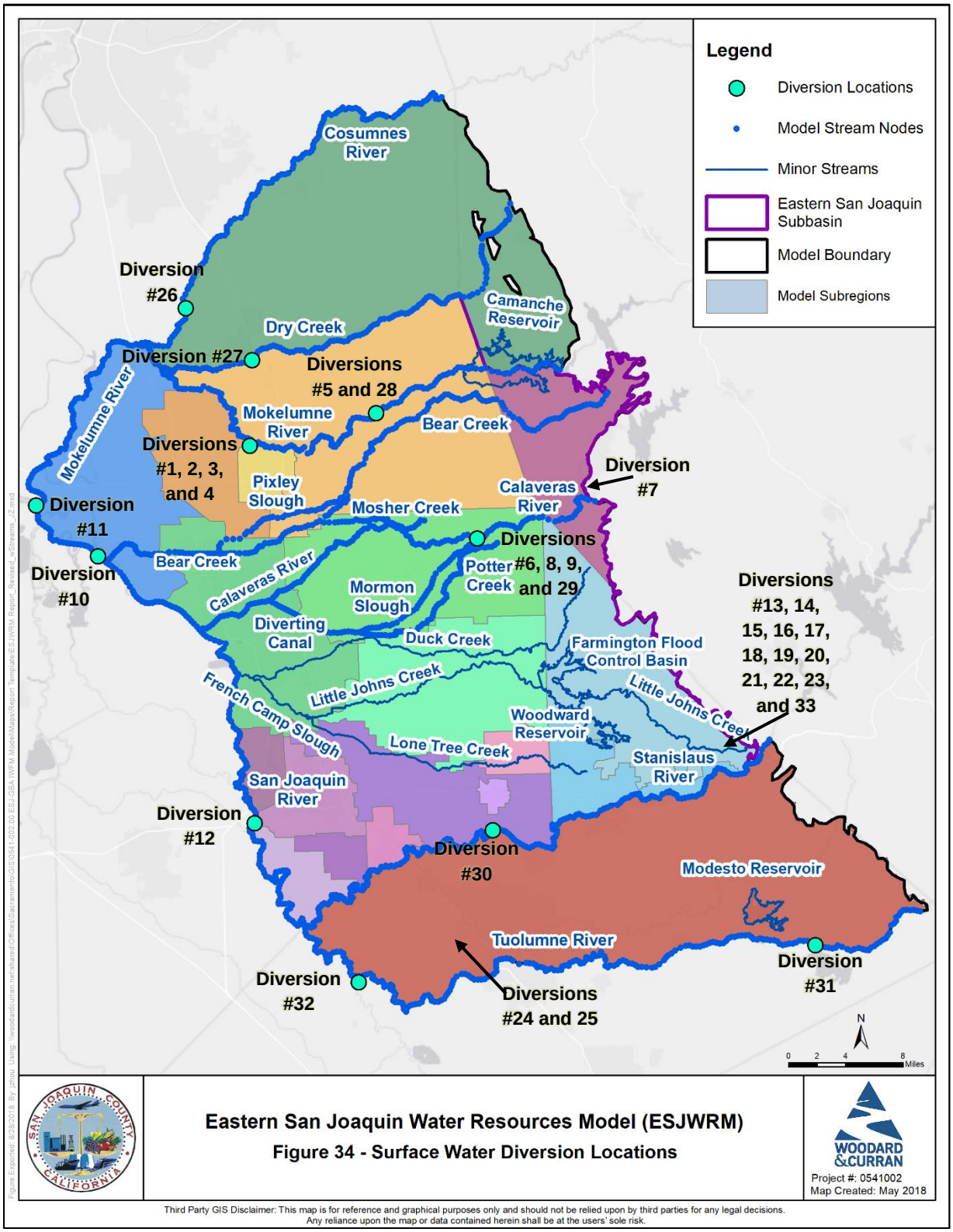


Figure 35: ESJWRM Groundwater Production Wells

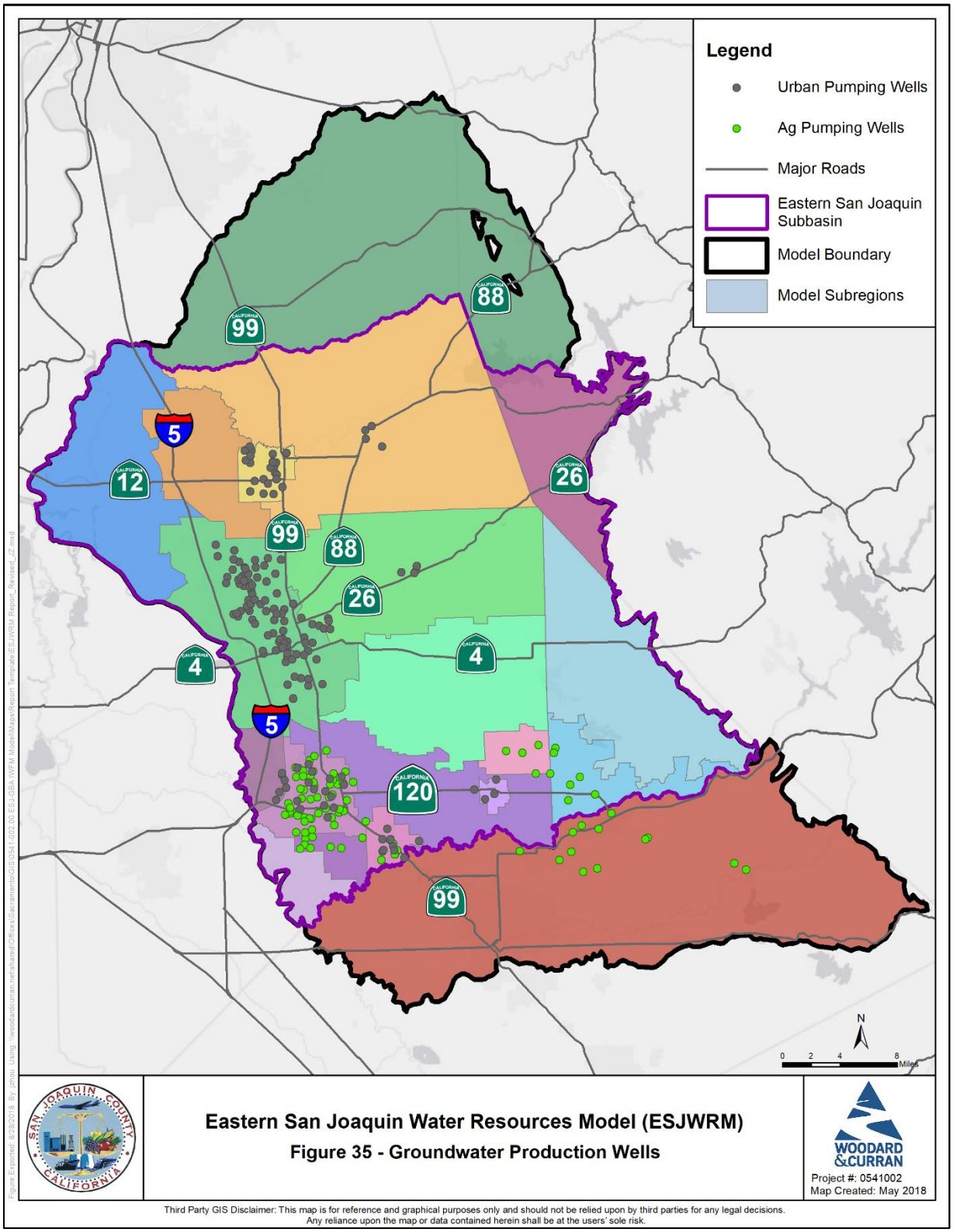


Figure 36: ESJWRM Riparian Surface Water Diversion Areas

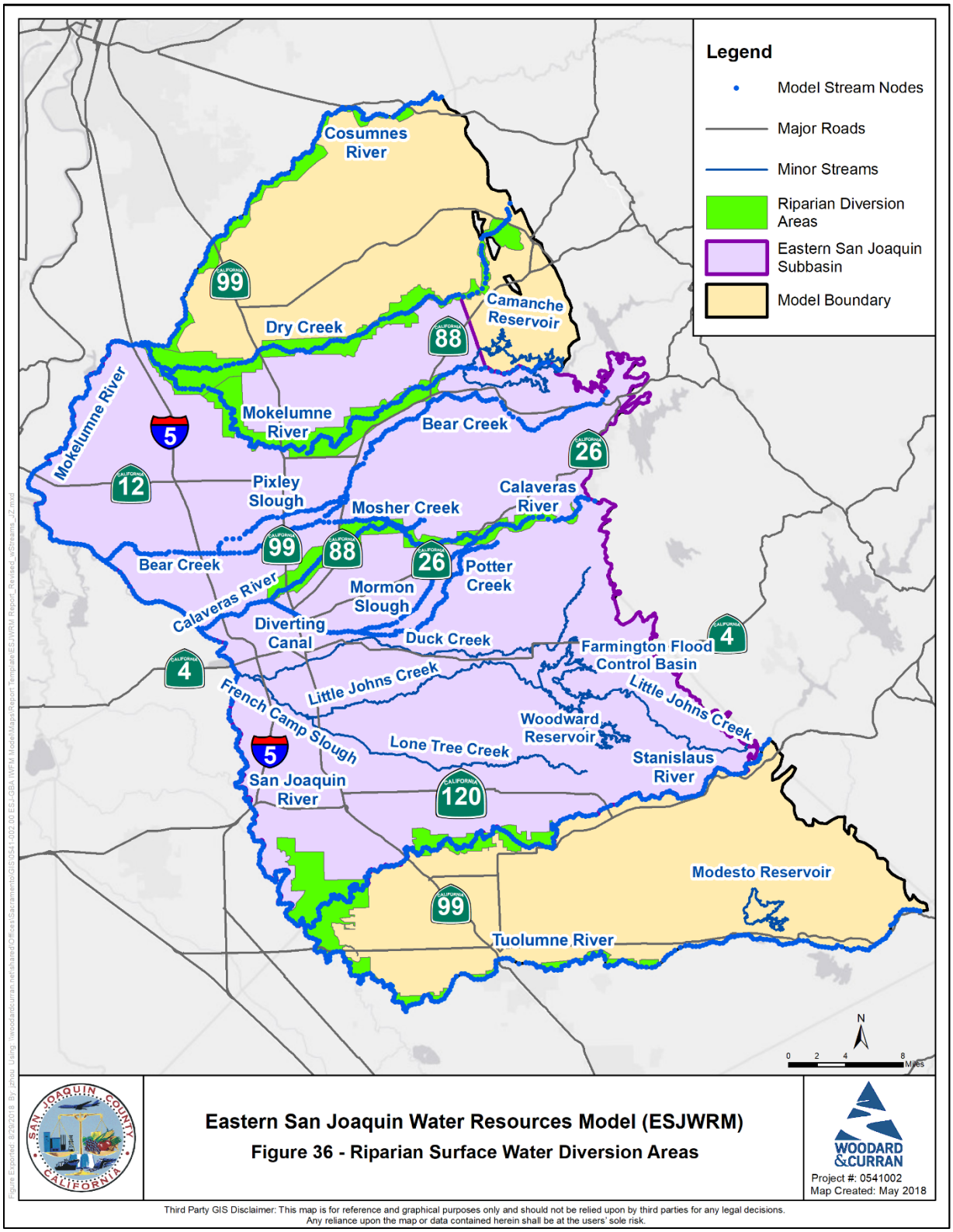


Figure 37: ESJWRM Field Capacity

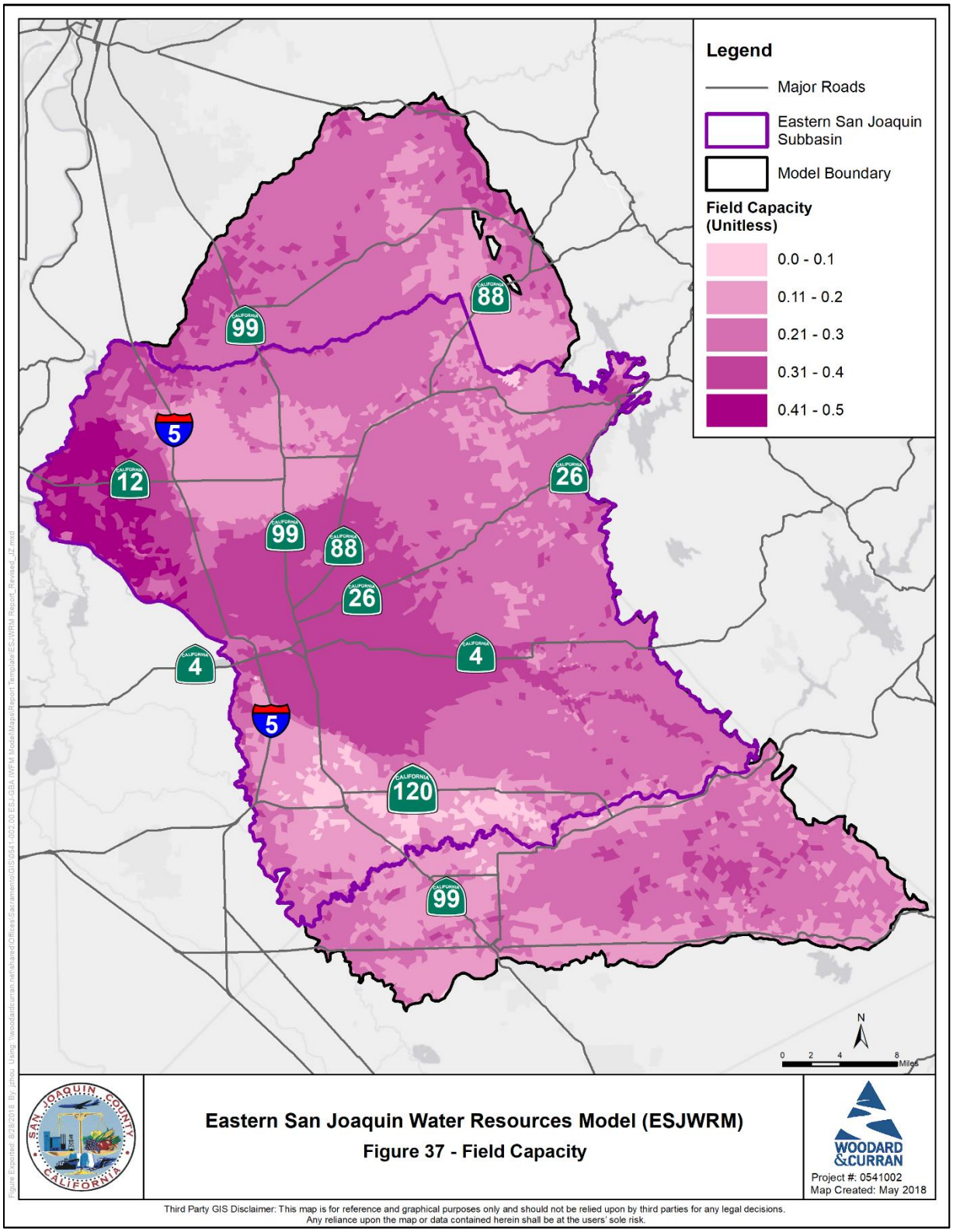


Figure 38: ESJWRM Wilting Point

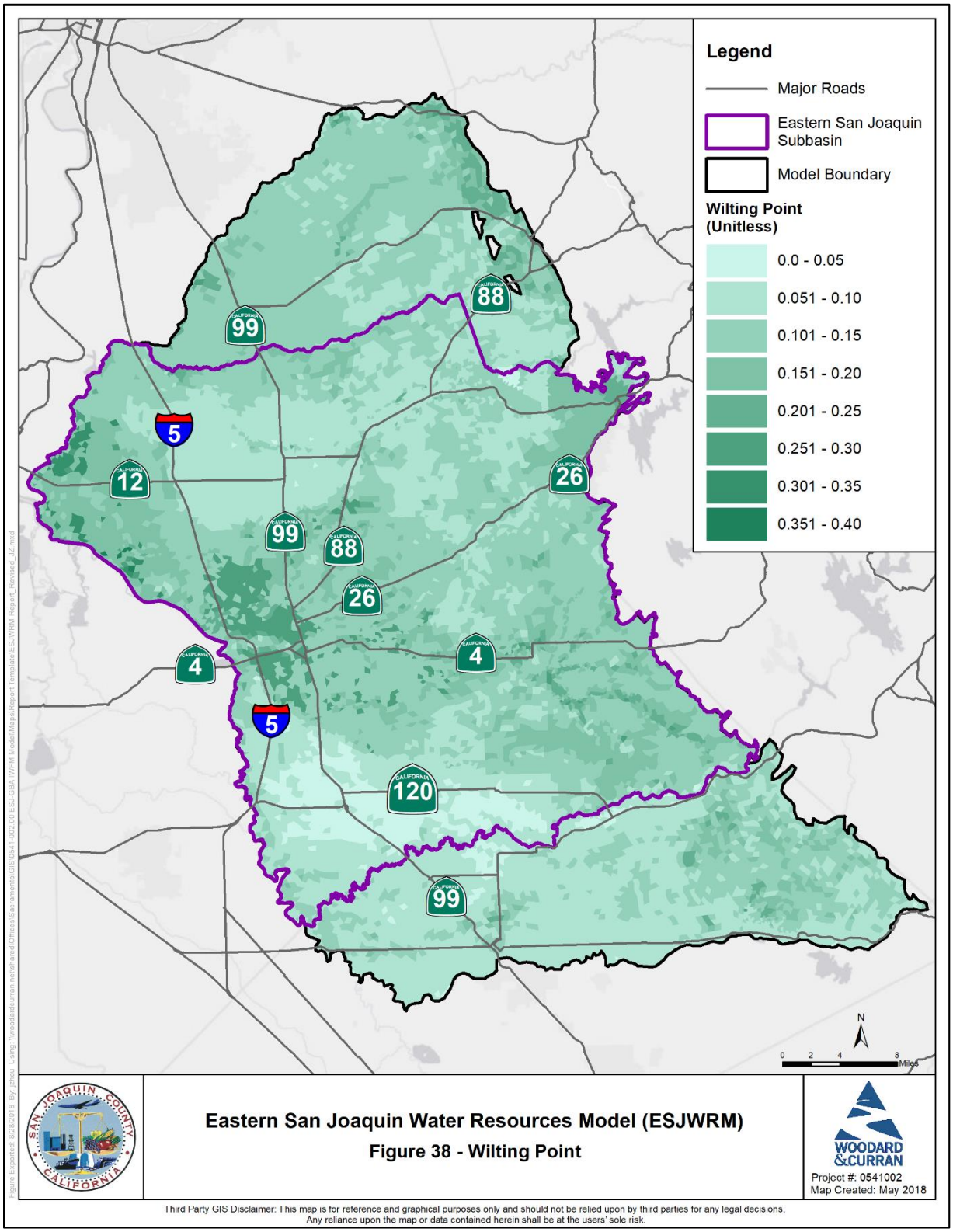


Figure 39: ESJWRM Total Porosity

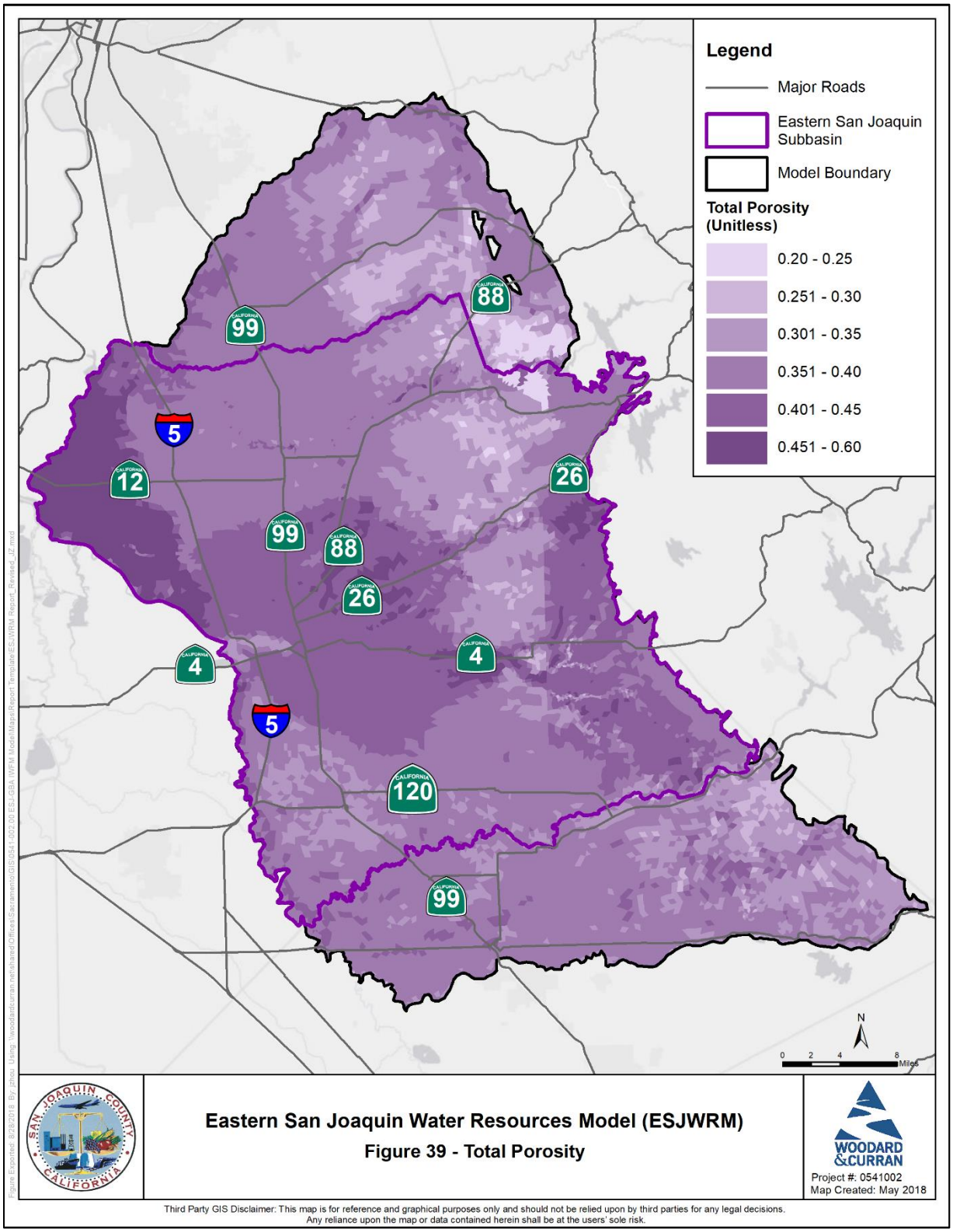


Figure 40: ESJWRM Saturated Hydraulic Conductivity

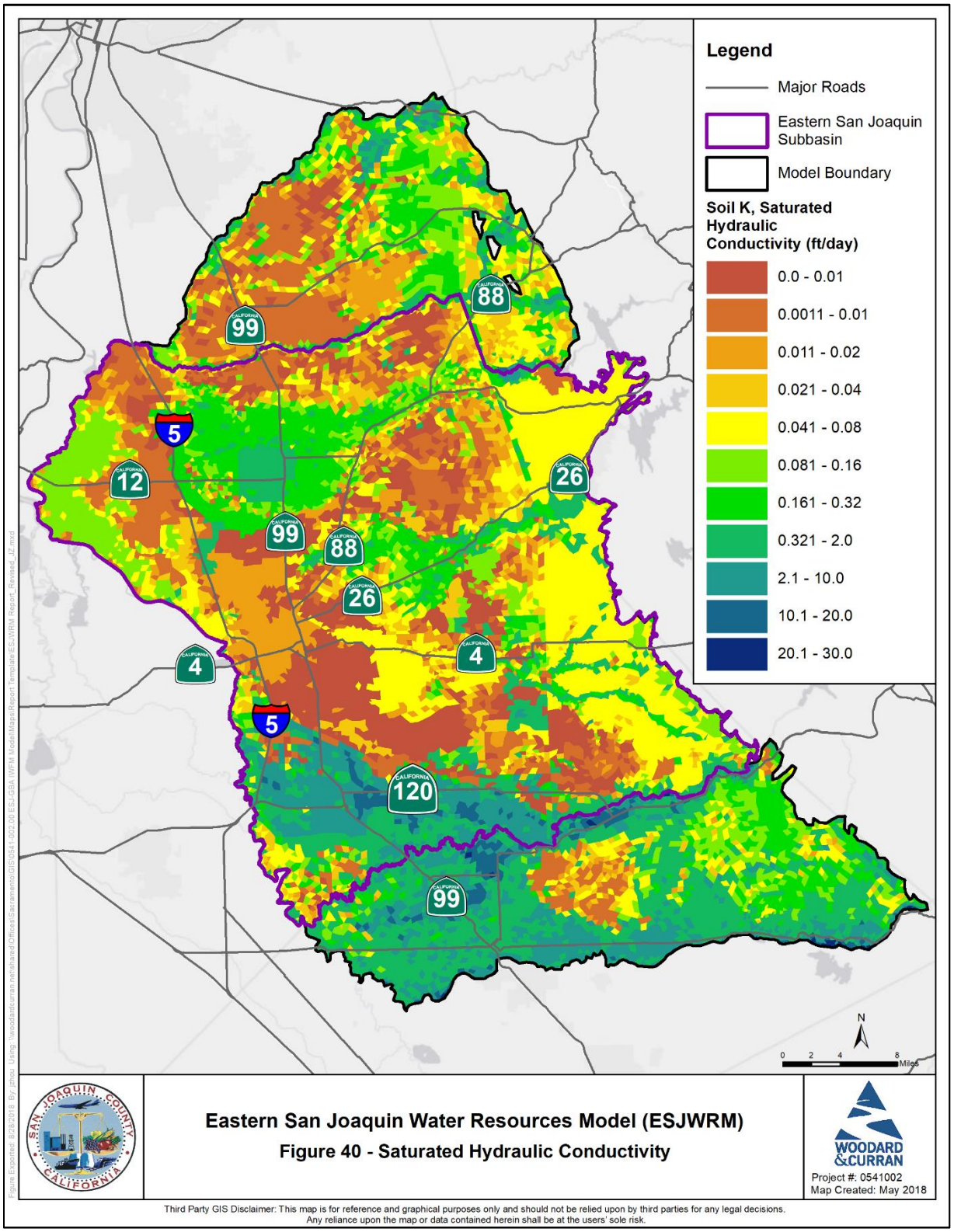


Figure 41: ESJWRM Pore Size Distribution Index

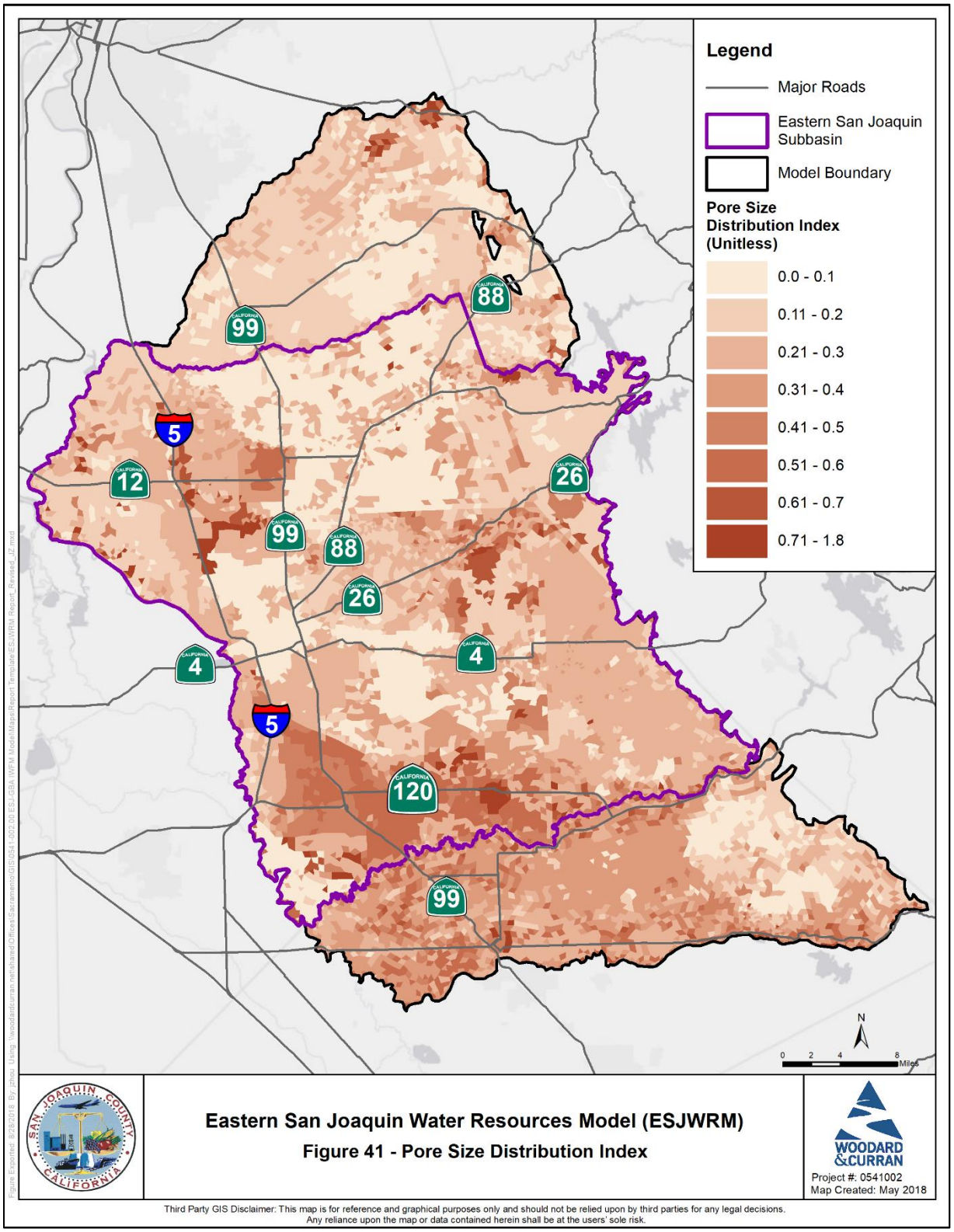


Figure 42a: ESJWRM Agricultural Water Demand – Eastern San Joaquin Subbasin

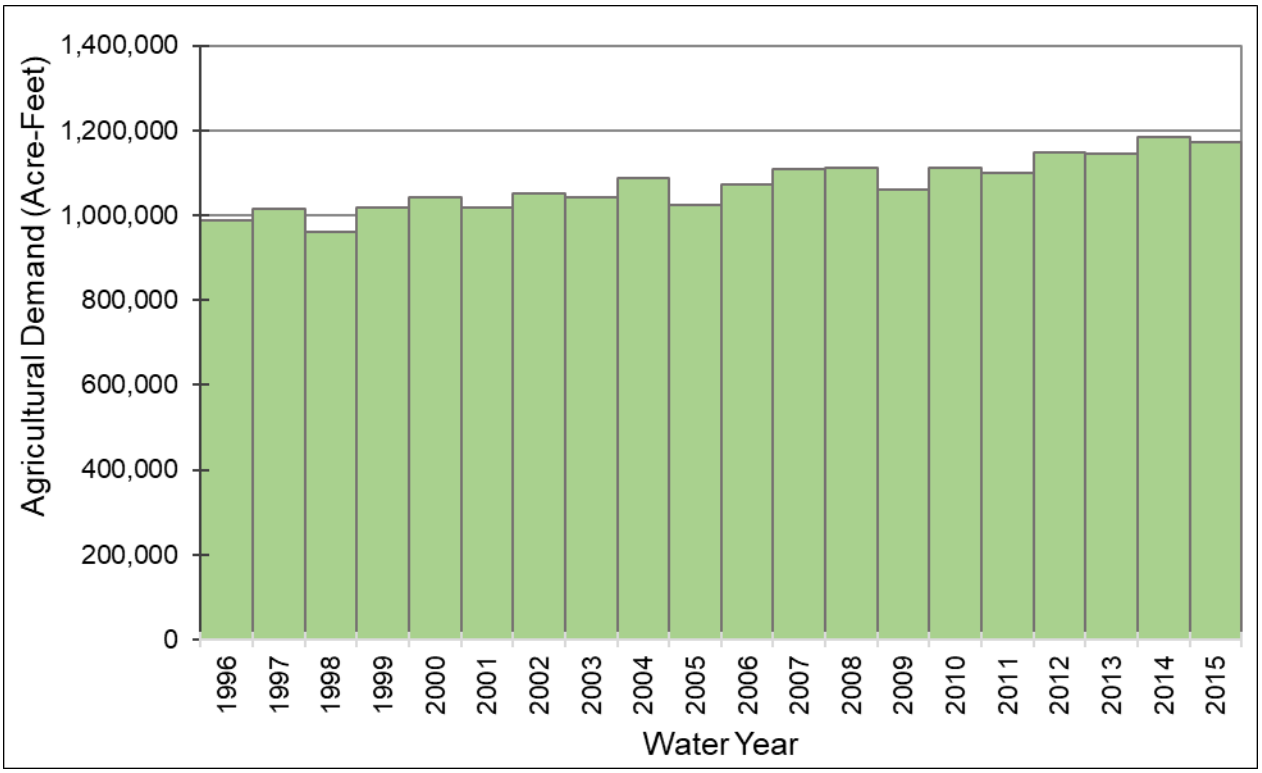


Figure 42b: ESJWRM Unit Agricultural Water Use and ETAW – Eastern San Joaquin Subbasin

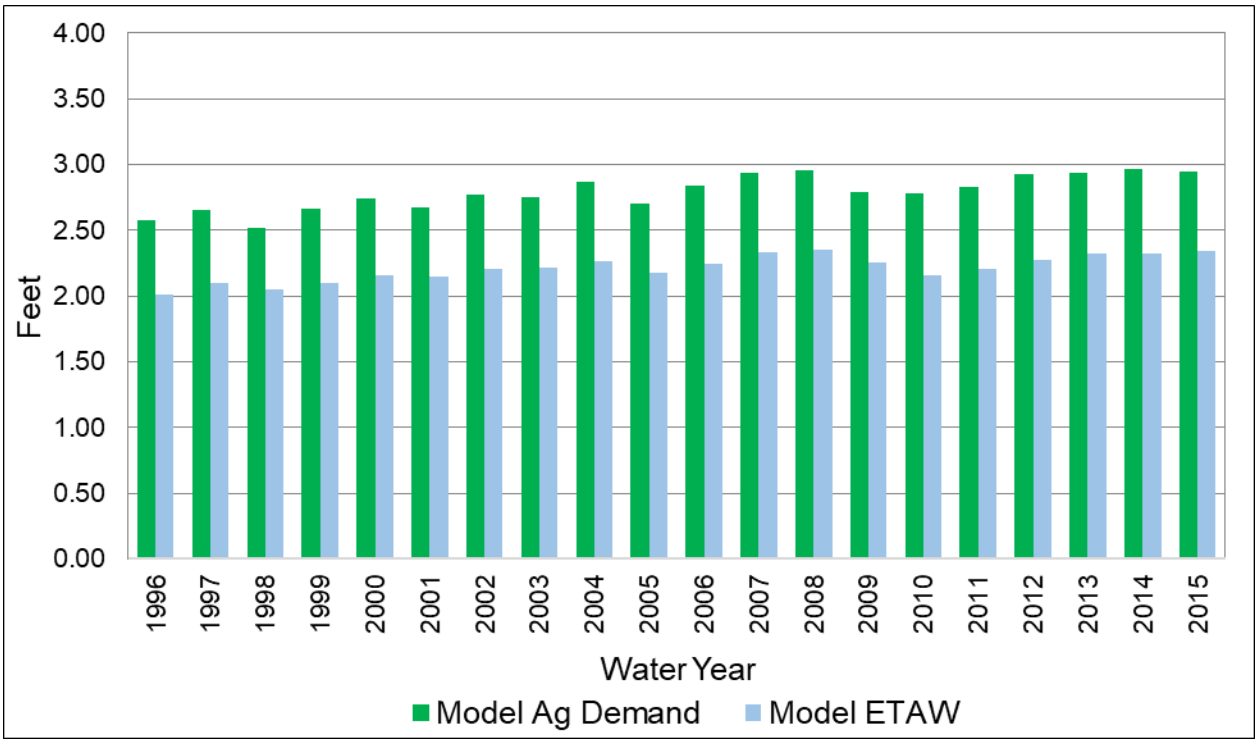


Figure 42c: ESJWRM Agricultural Water Demand – Subarea 1 (North Delta Subarea)

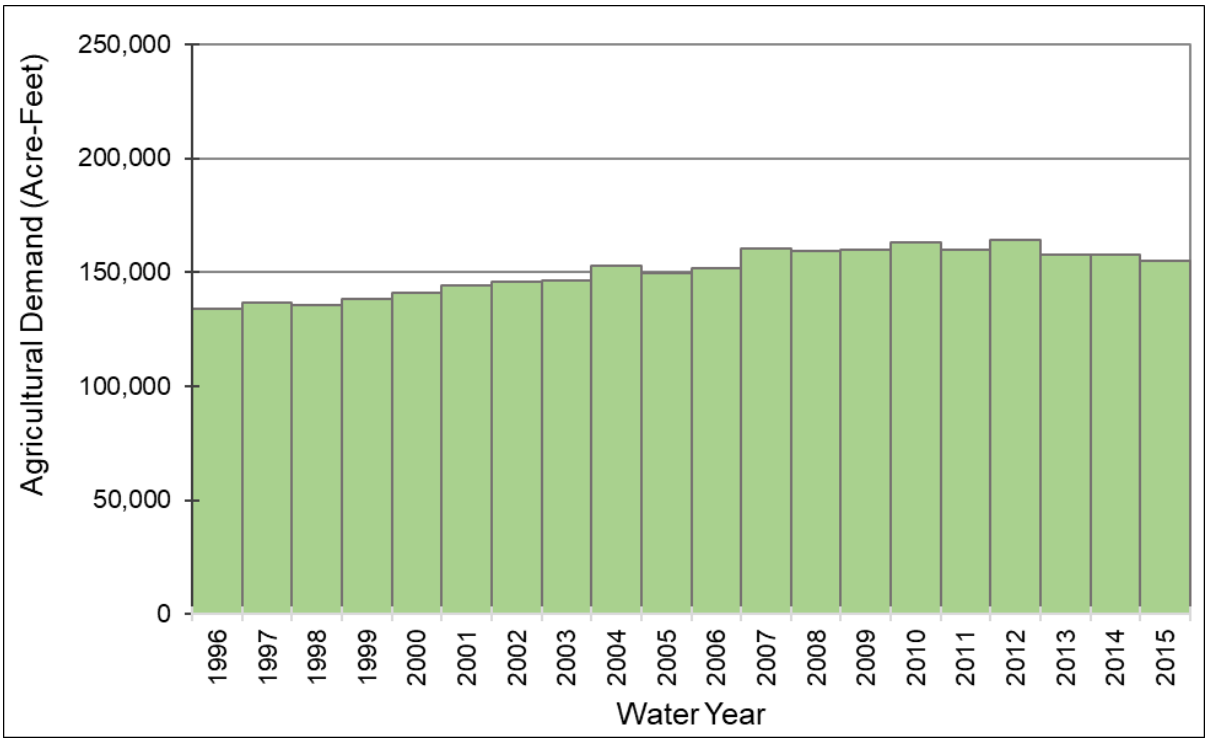


Figure 42d: ESJWRM Unit Agricultural Water Use and ETAW – Subarea 1 (North Delta Subarea)

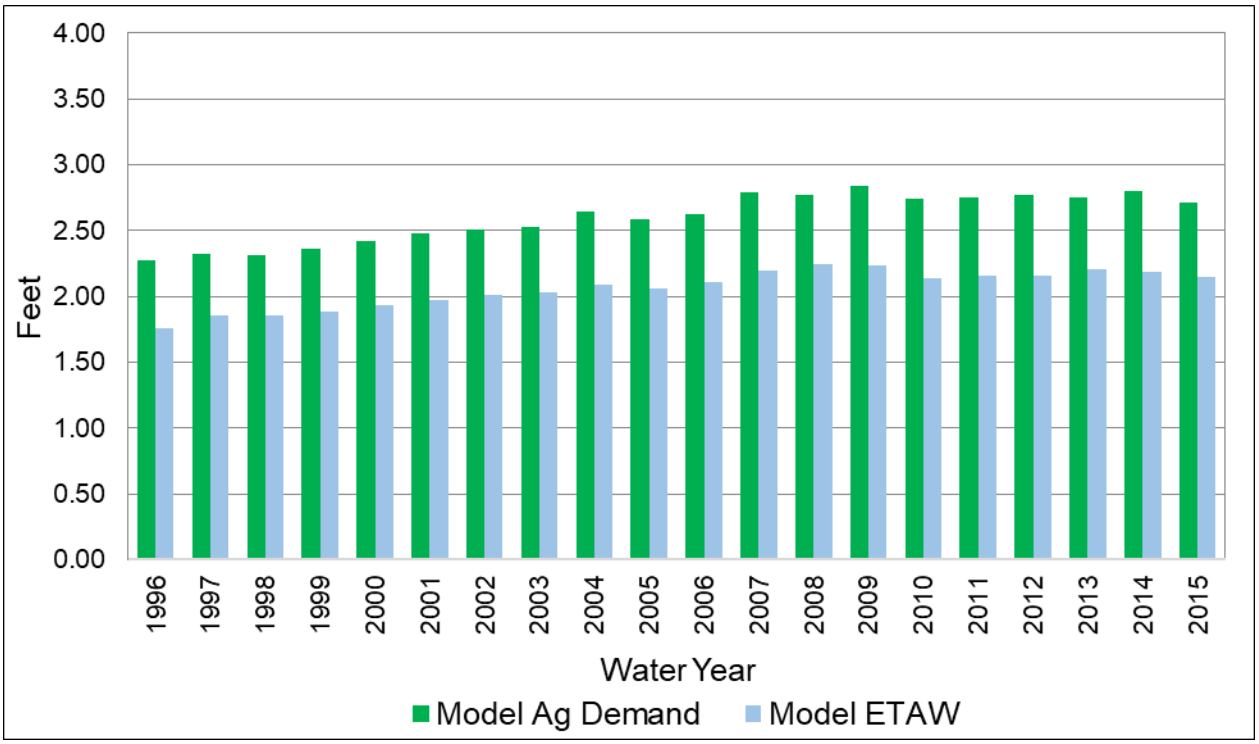


Figure 42e: ESJWRM Agricultural Water Demand – Subarea 2 (North Subarea)

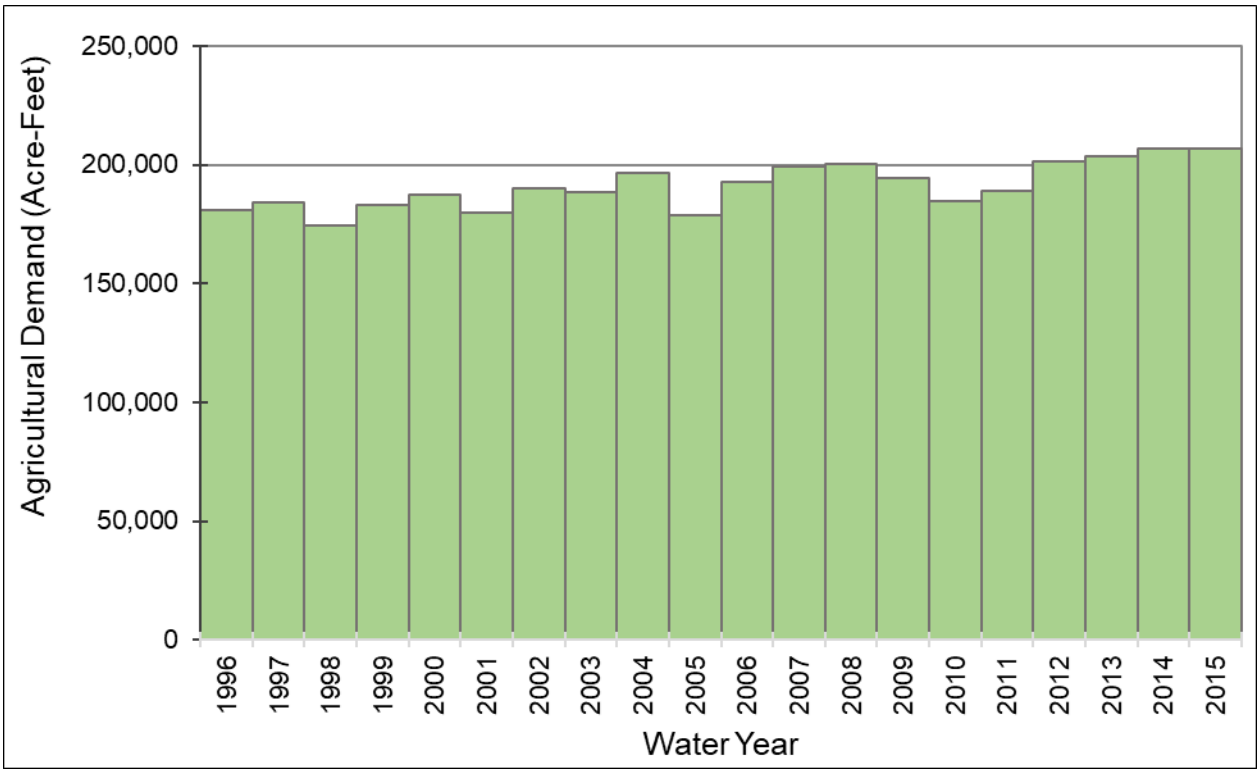


Figure 42f: ESJWRM Unit Agricultural Water Use and ETAW – Subarea 2 (North Subarea)

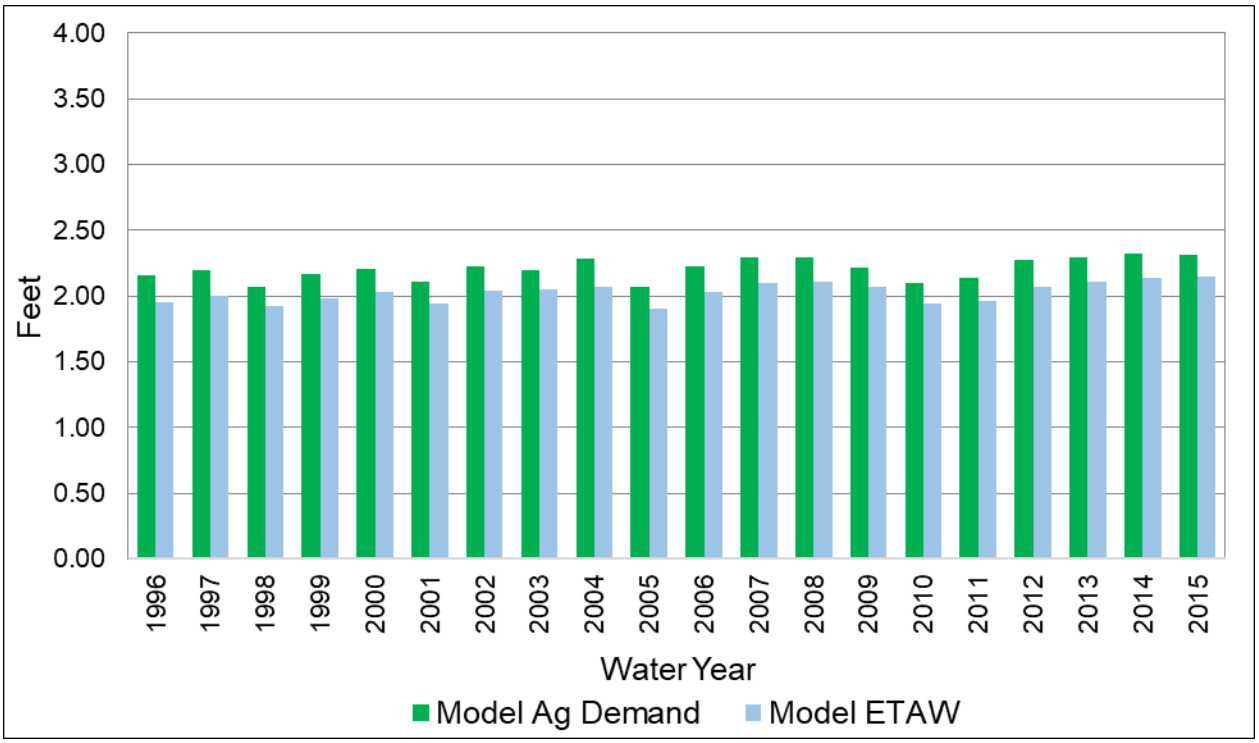


Figure 42g: ESJWRM Agricultural Water Demand – Subarea 3 (Calaveras Subarea)

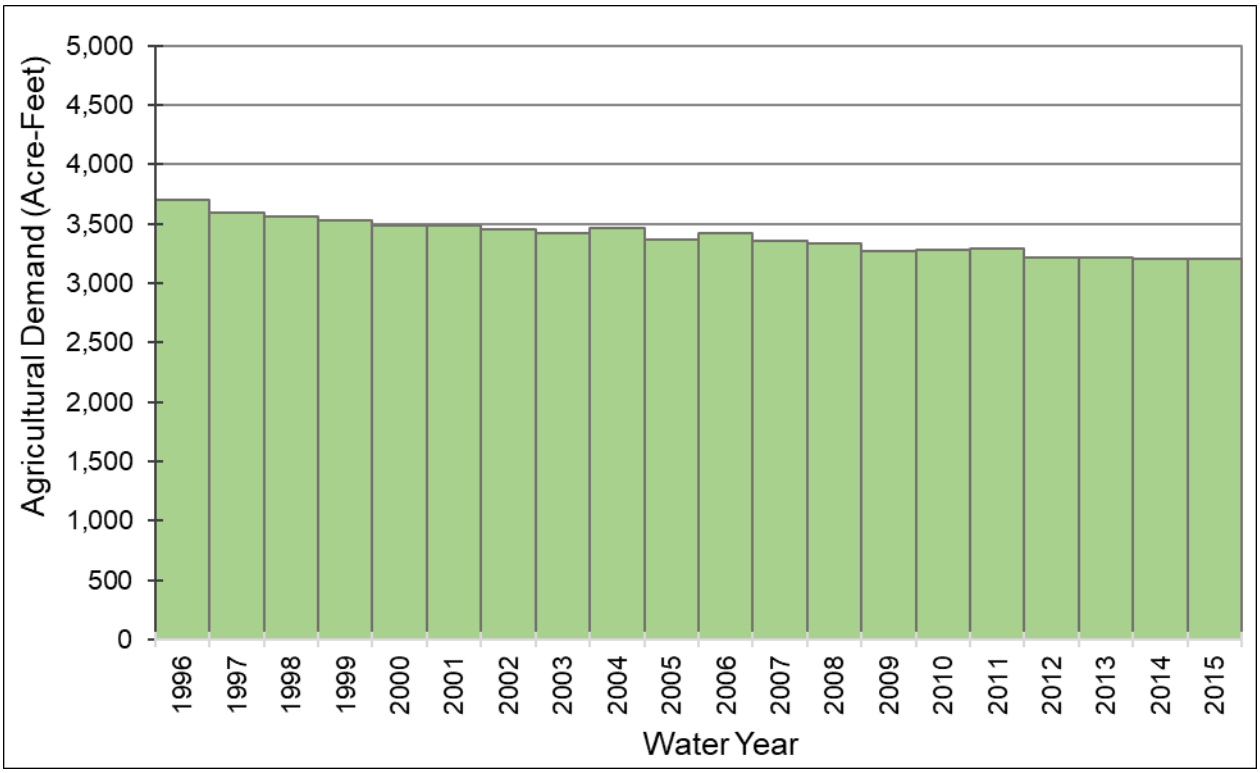


Figure 42h: ESJWRM Unit Agricultural Water Use and ETAW – Subarea 3 (Calaveras Subarea)

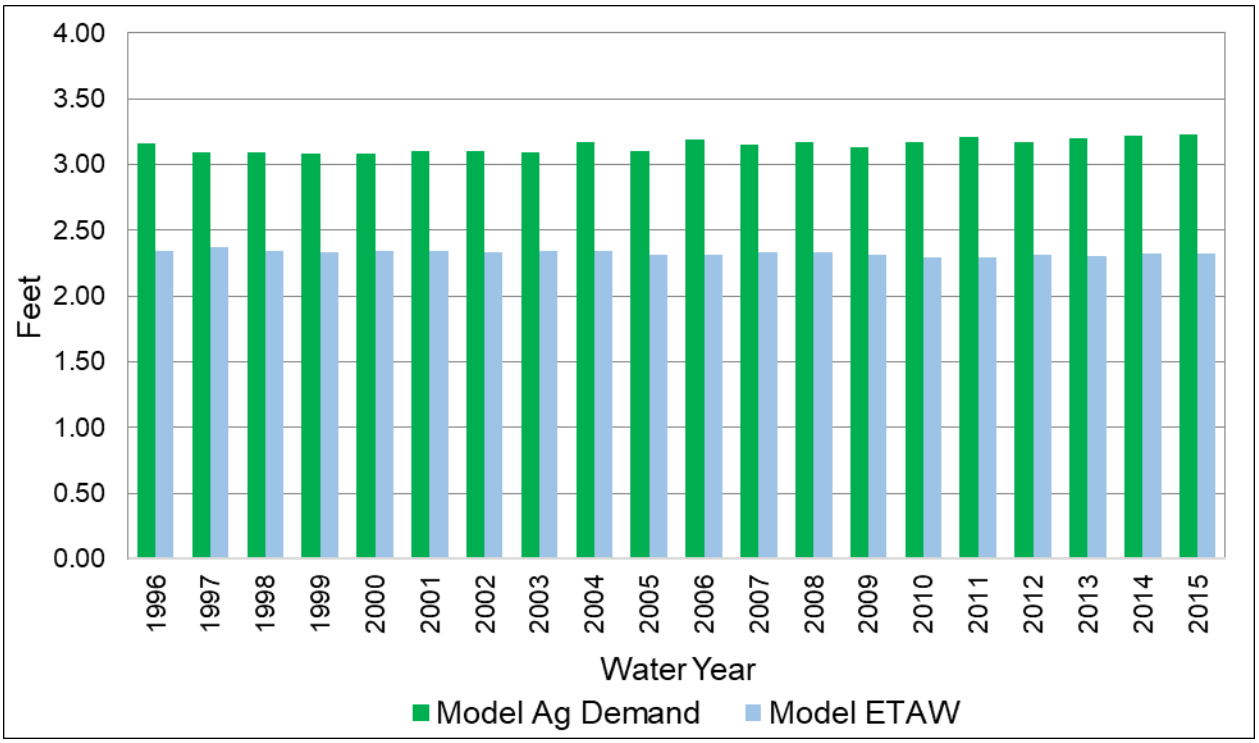


Figure 42i: ESJWRM Agricultural Water Demand – Subarea 4 (Central Subarea)

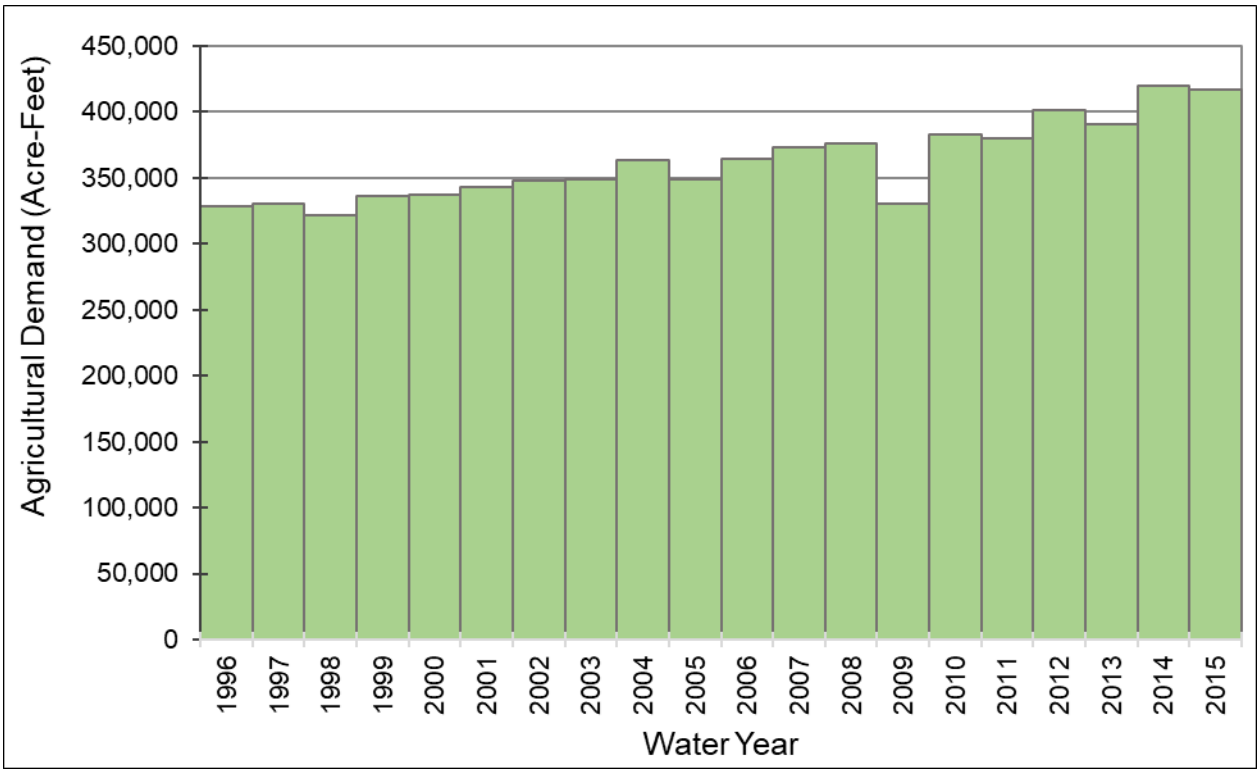


Figure 42j: ESJWRM Unit Agricultural Water Use and ETAW – Subarea 4 (Central Subarea)

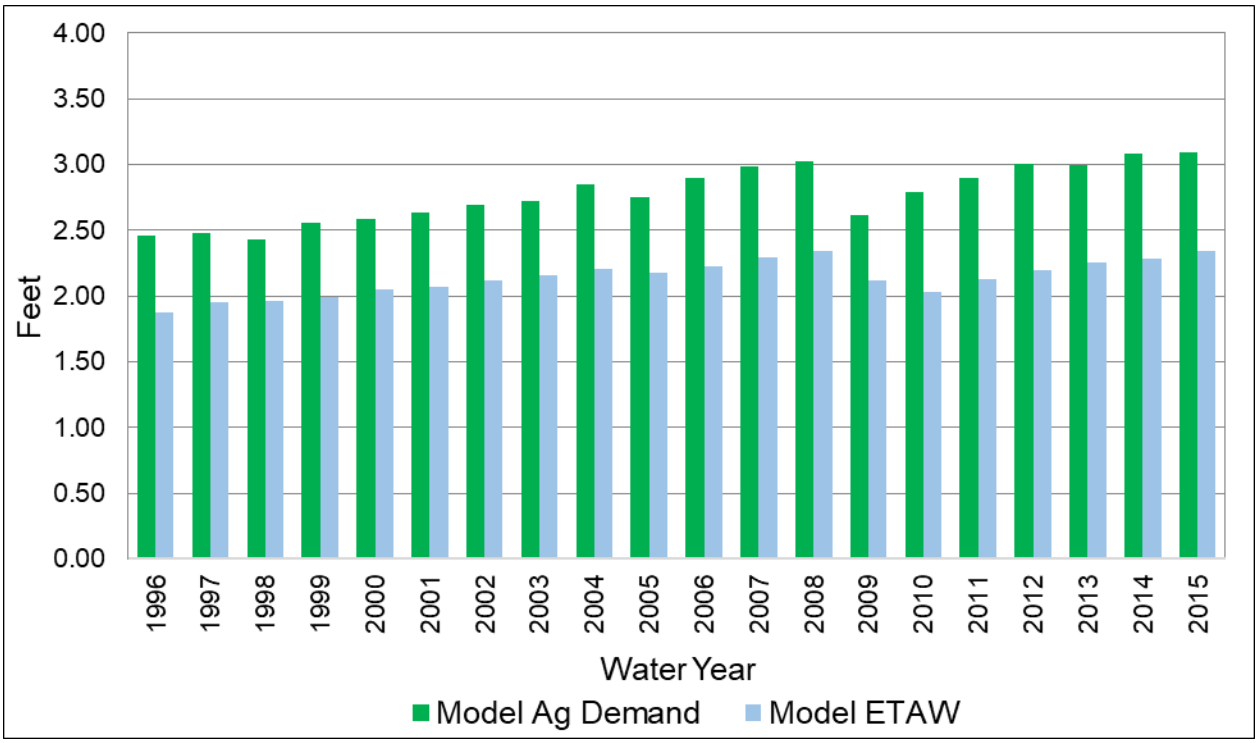


Figure 42k: ESJWRM Agricultural Water Demand – Subarea 5 (South Subarea)

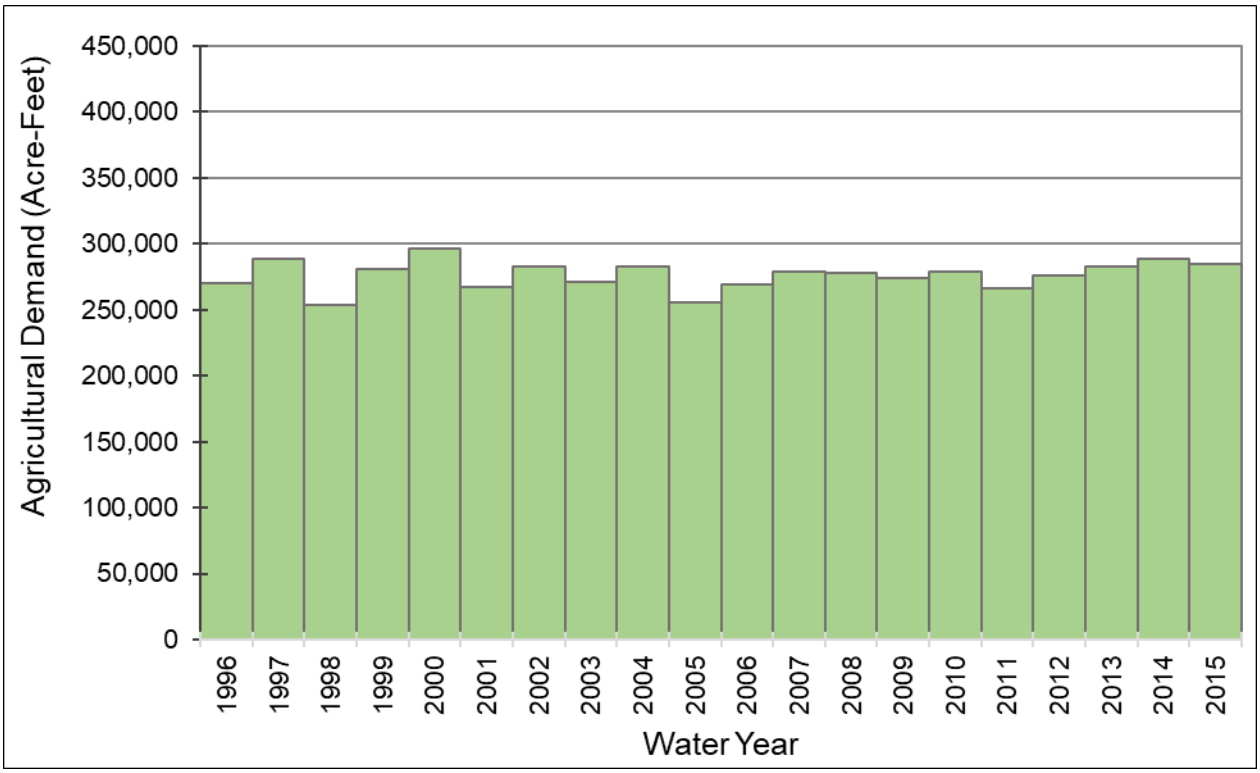


Figure 42l: ESJWRM Unit Agricultural Water Use and ETAW – Subarea 5 (South Subarea)

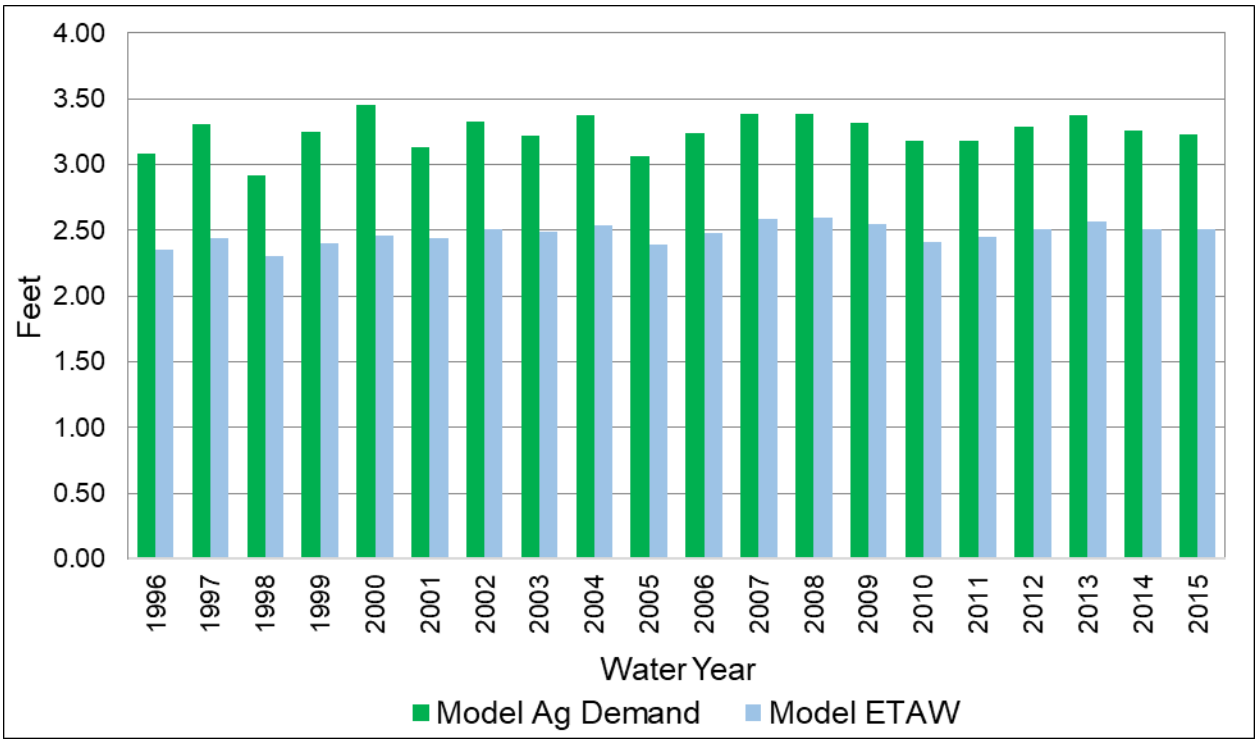


Figure 42m: ESJWRM Agricultural Water Demand – Subarea 6 (Stanislaus Subarea)

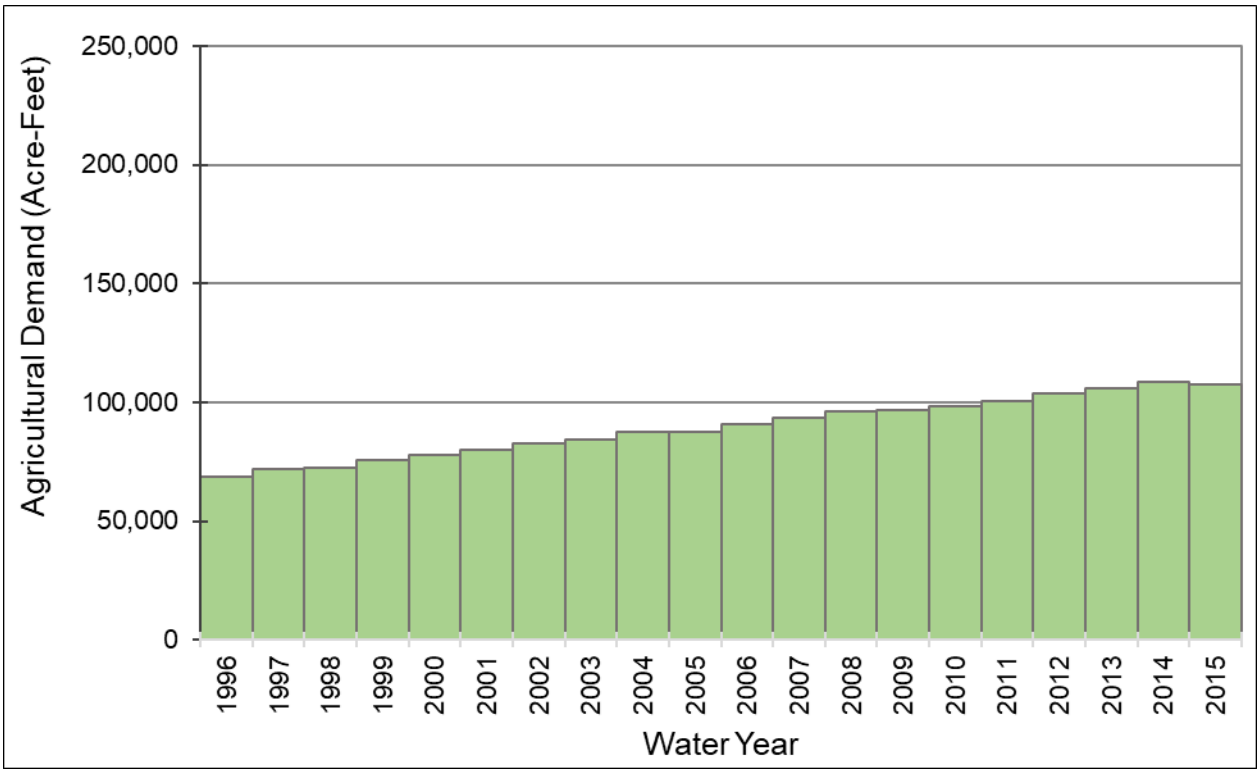


Figure 42n: ESJWRM Unit Agricultural Water Use and ETAW – Subarea 6 (Stanislaus Subarea)

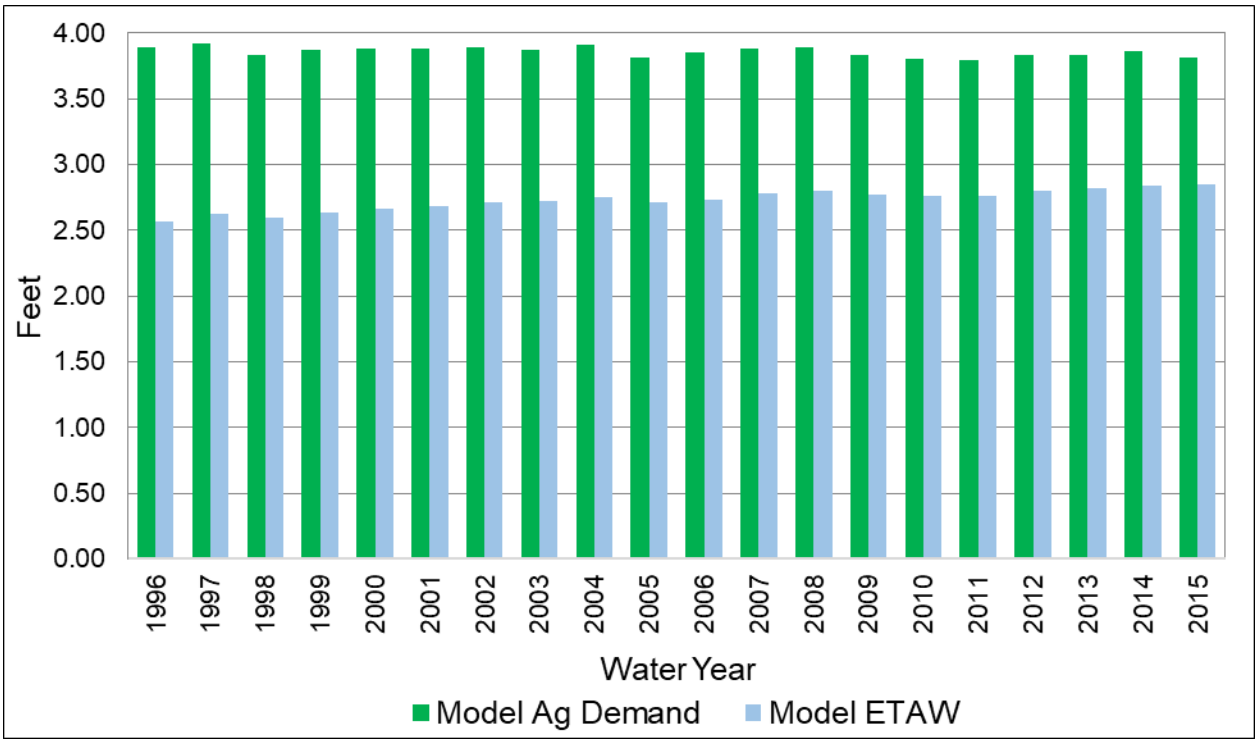


Figure 43a: ESJWRM Urban Water Demand – Eastern San Joaquin Subbasin

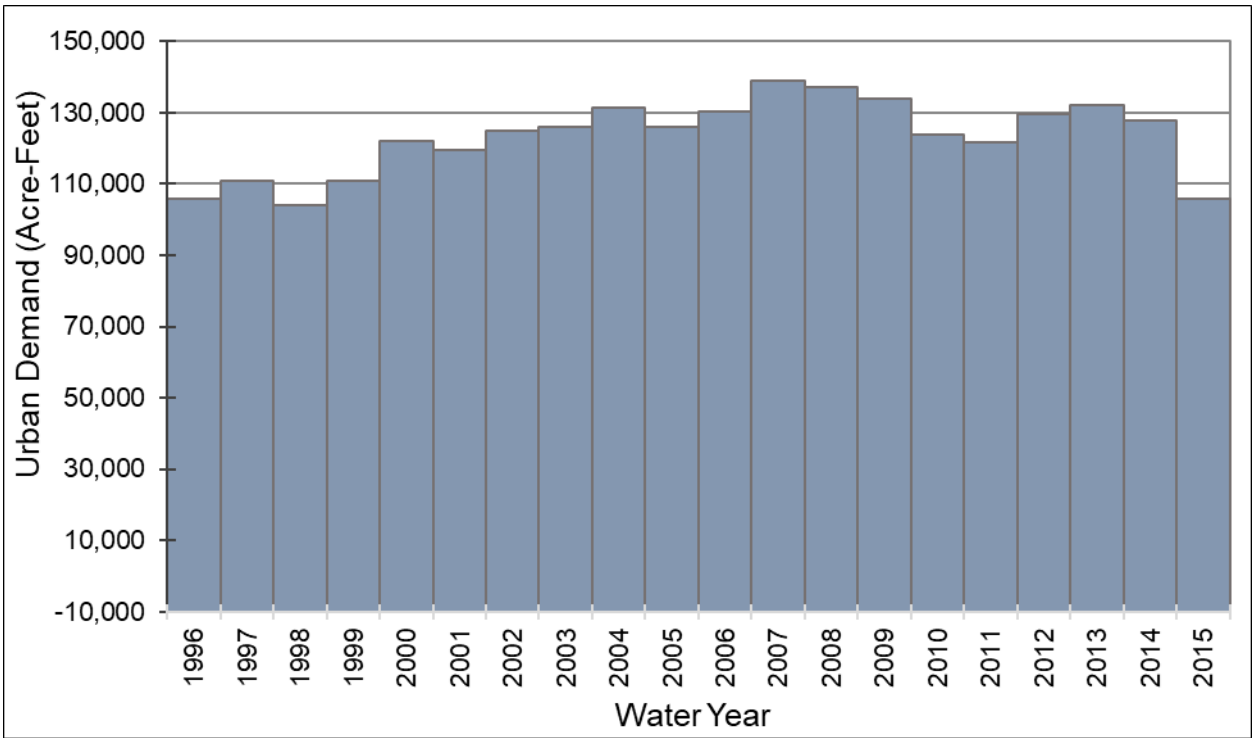


Figure 43b: ESJWRM Urban Water Demand – Subarea 1 (North Delta Subarea)

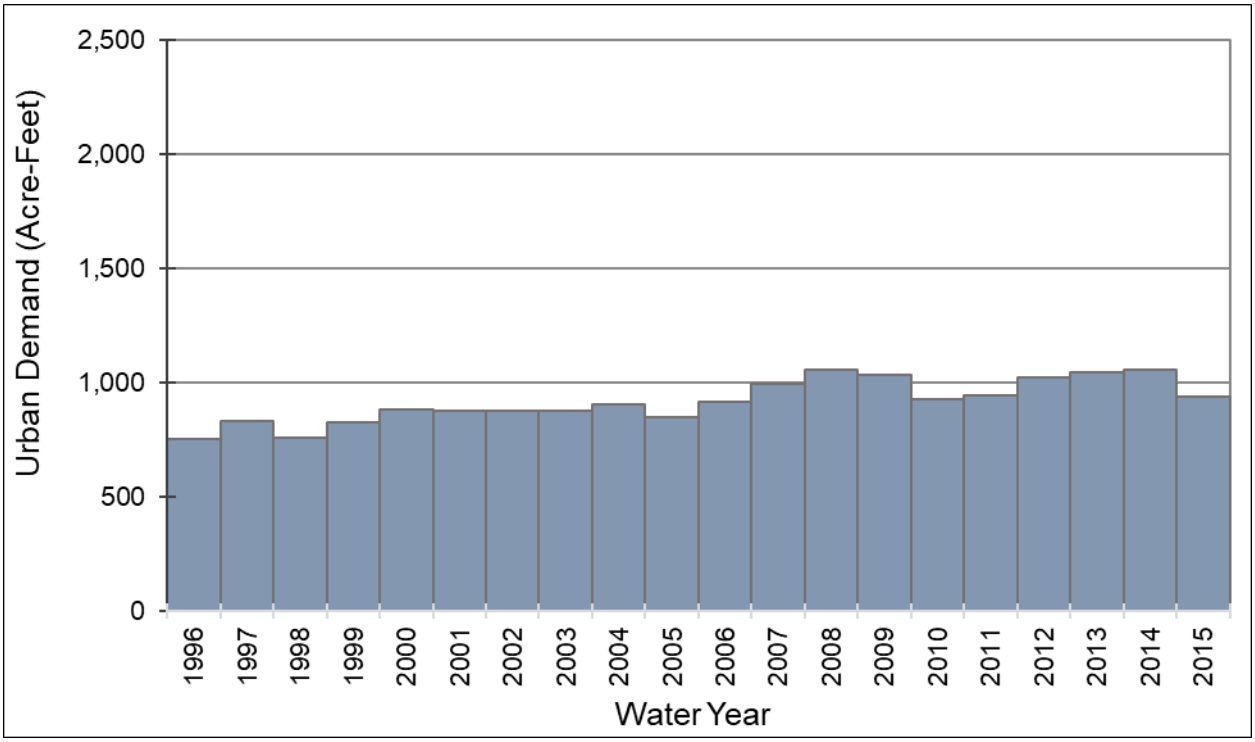


Figure 43c: ESJWRM Urban Water Demand – Subarea 2 (North Subarea)

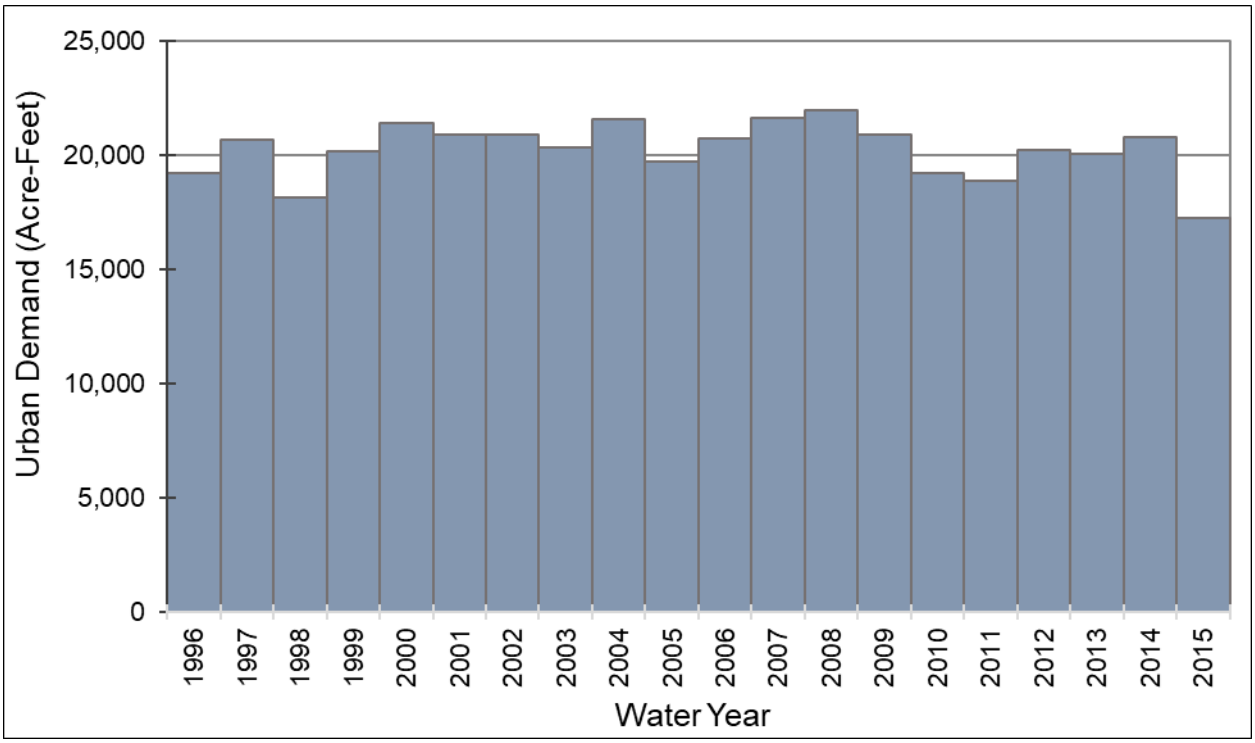


Figure 43d: ESJWRM Urban Water Demand – Subarea 3 (Calaveras Subarea)

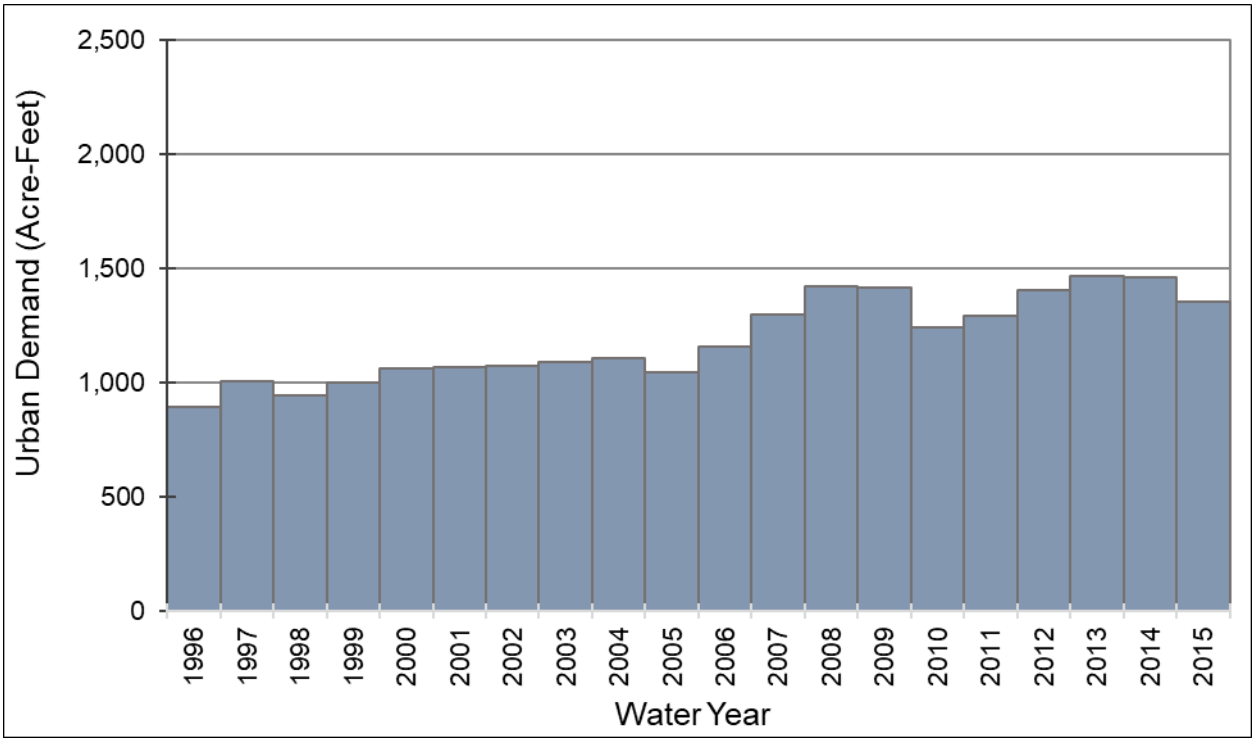


Figure 43e: ESJWRM Urban Water Demand – Subarea 4 (Central Subarea)

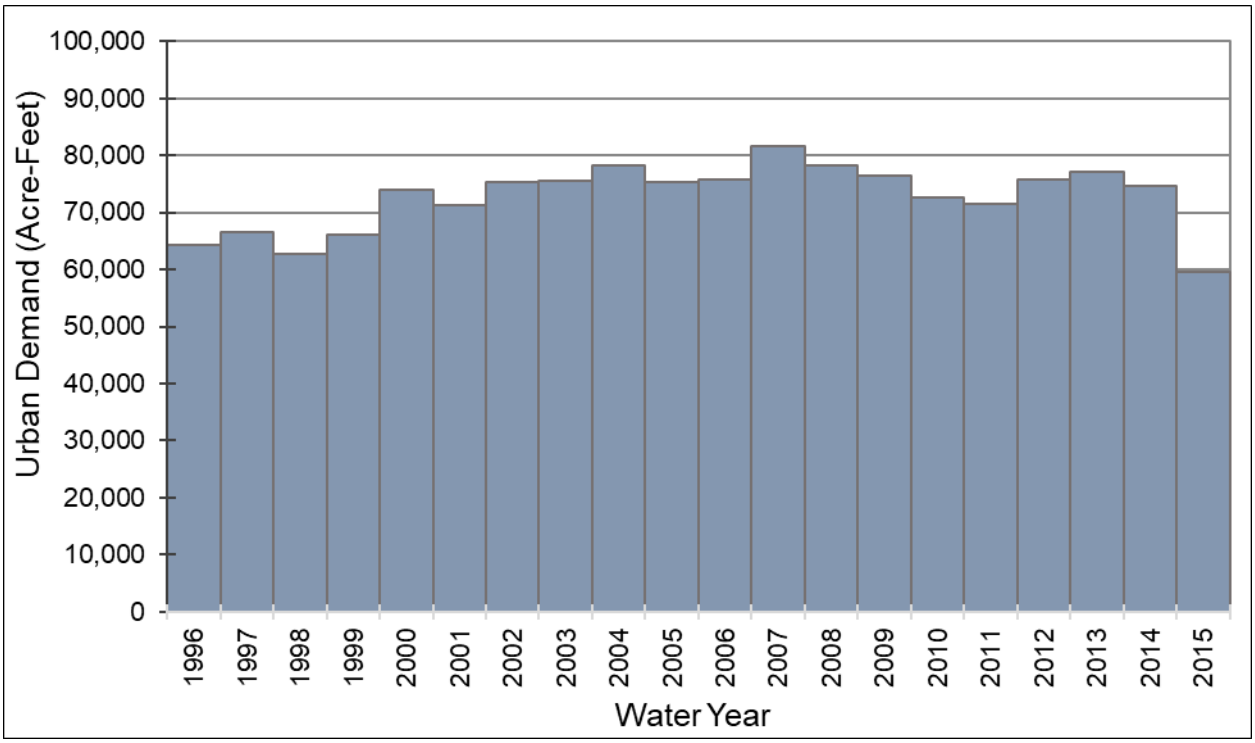


Figure 43f: ESJWRM Urban Water Demand – Subarea 5 (South Subarea)

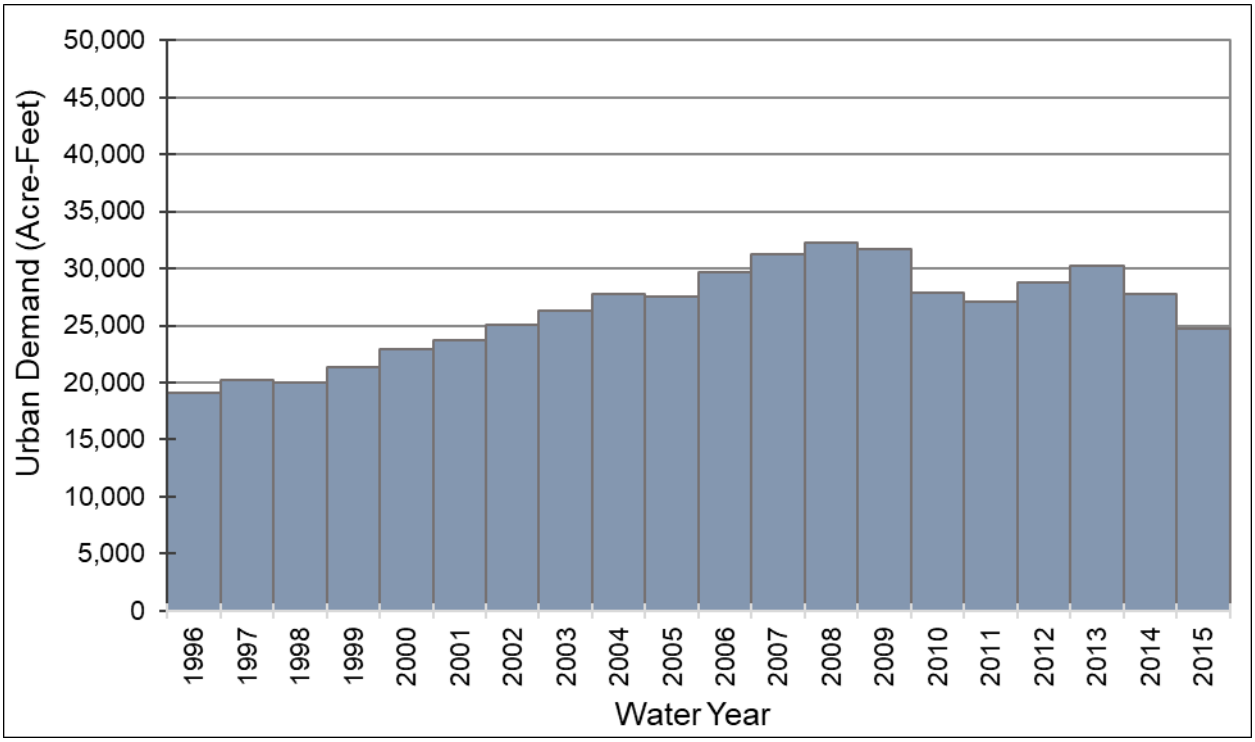


Figure 43g: ESJWRM Urban Water Demand – Subarea 6 (Stanislaus Subarea)

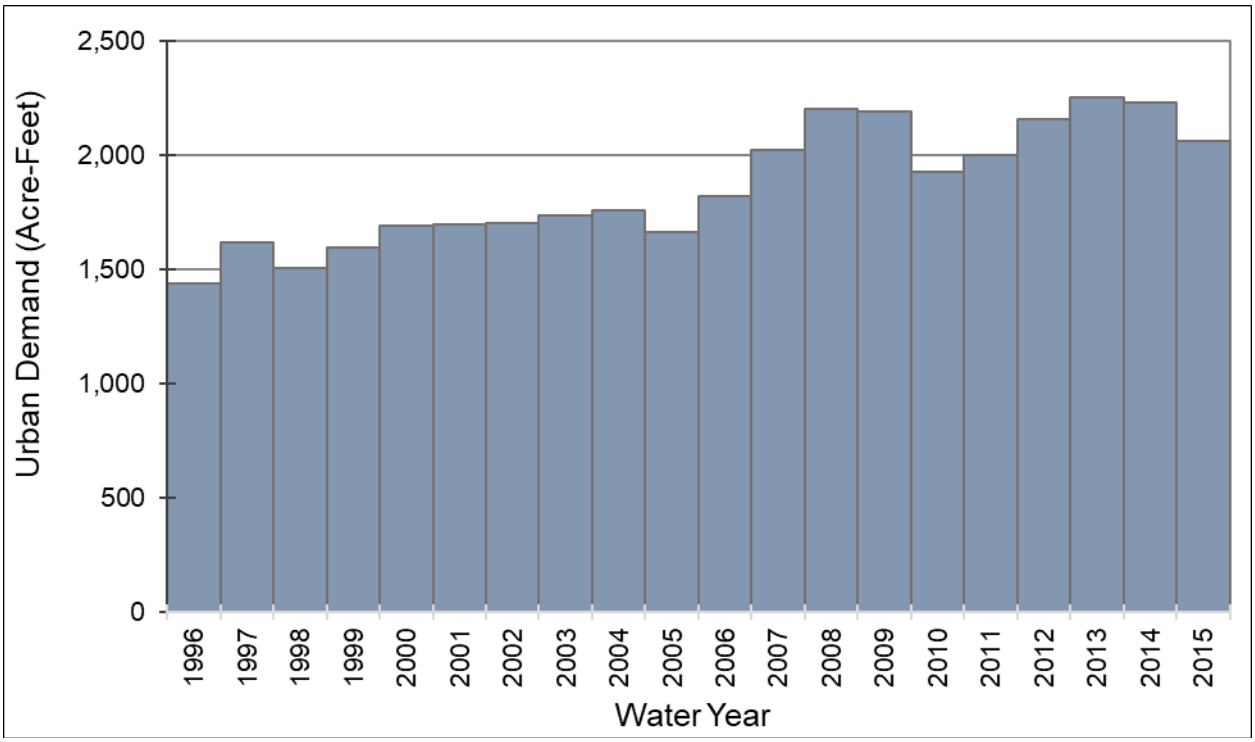


Figure 44: ESJWRM Stream Calibration Gauges

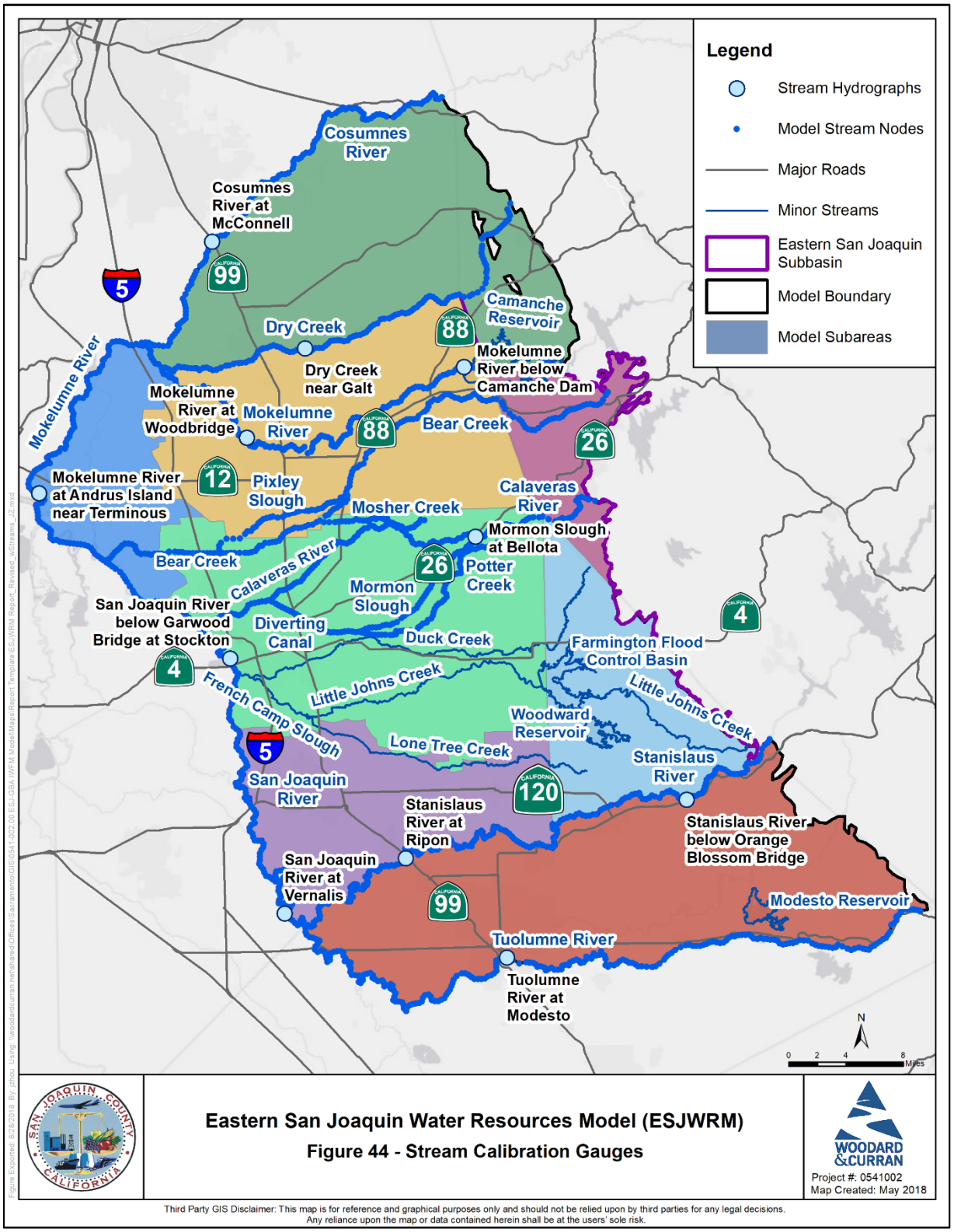


Figure 45: ESJWRM Stream Bed Hydraulic Conductivity

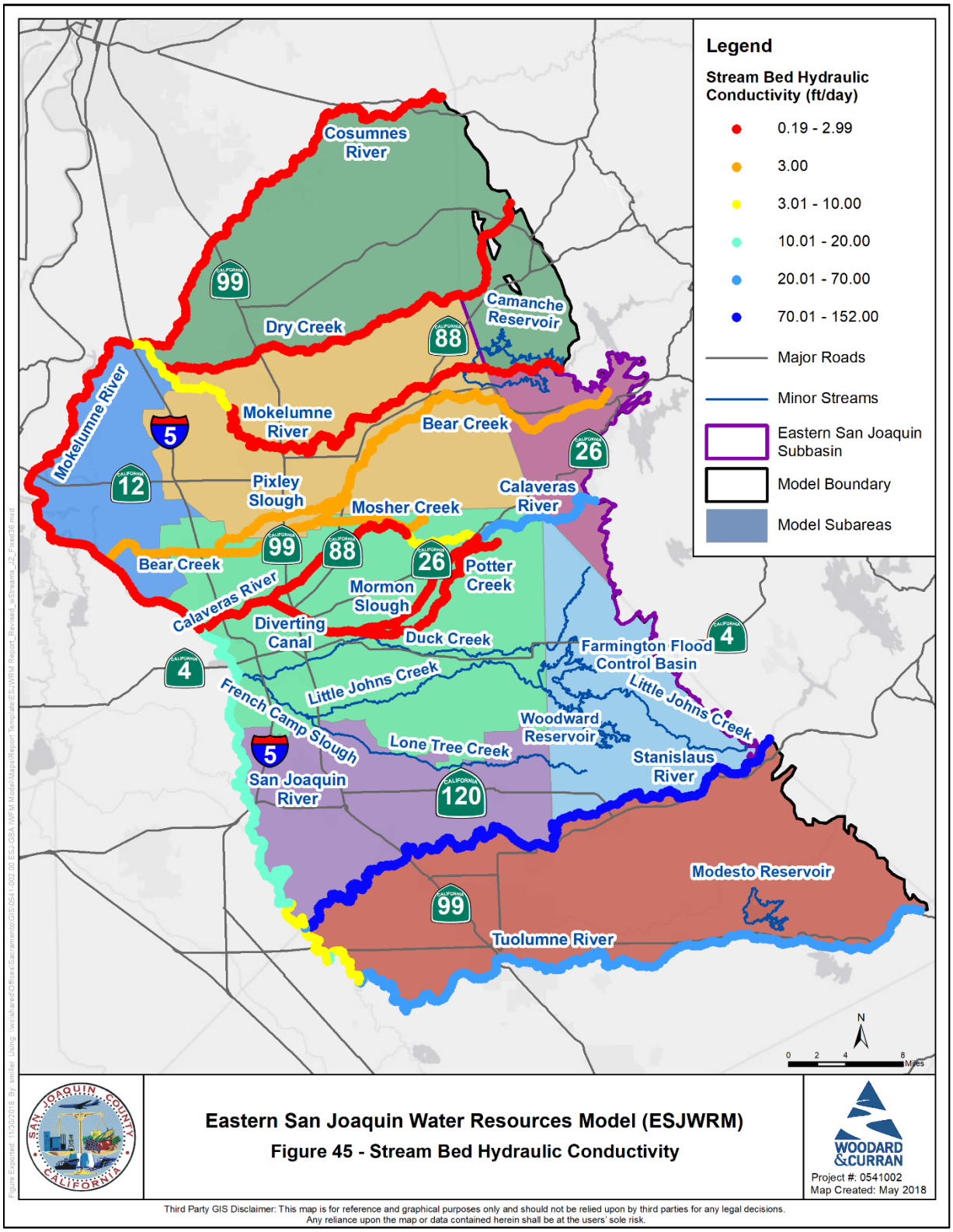


Figure 46a: ESJWRM Stream Calibration Gauges Streamflow – Dry Creek near Galt

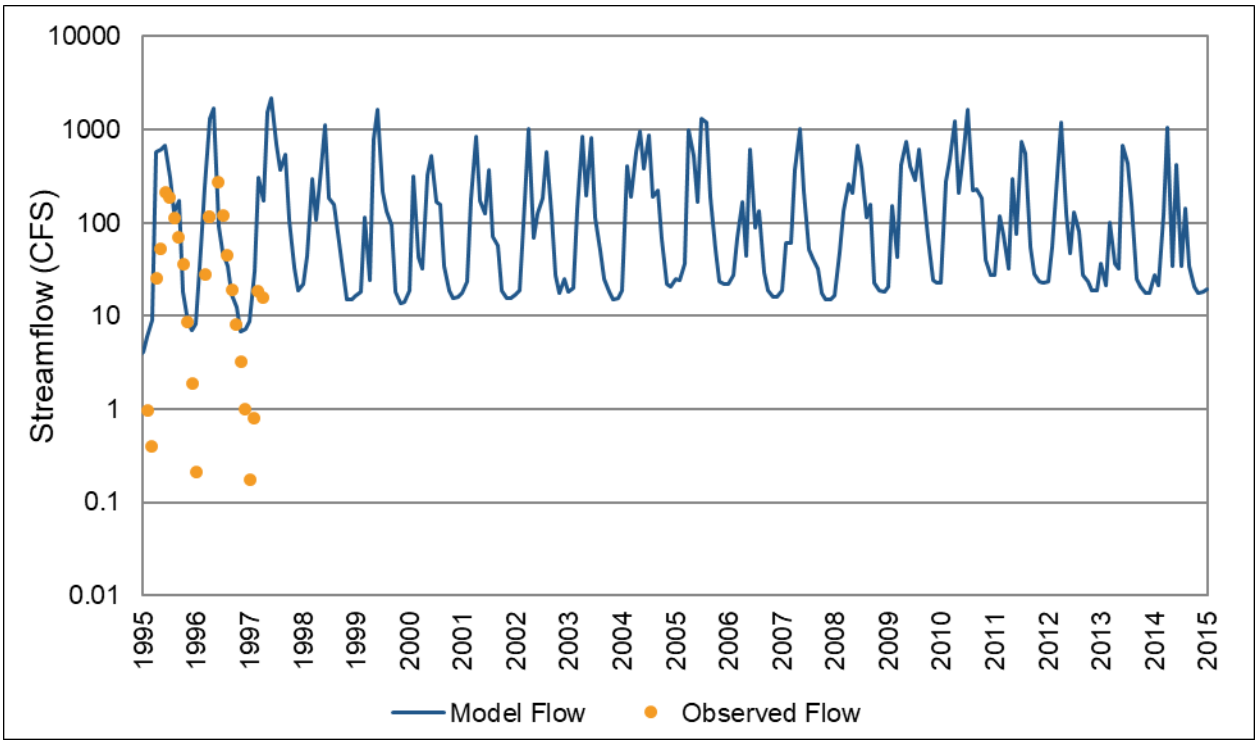


Figure 46b: ESJWRM Stream Calibration Gauges Exceedance – Dry Creek near Galt

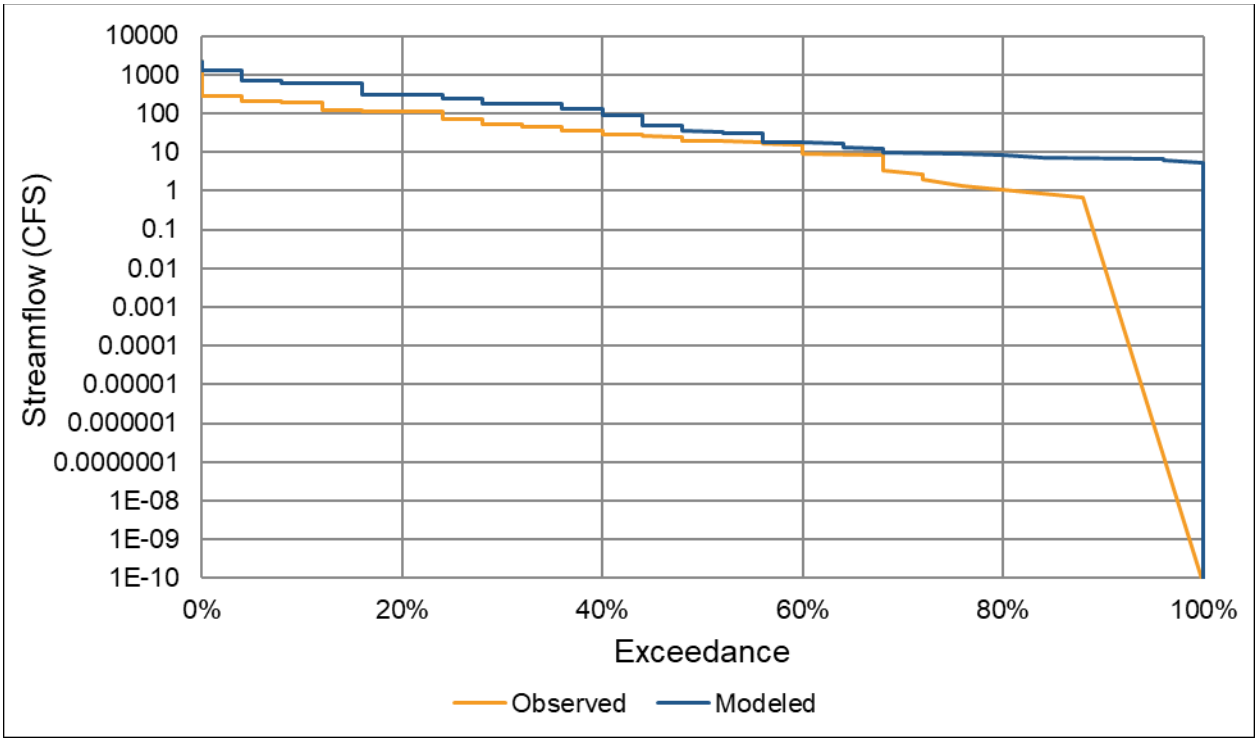


Figure 46c: ESJWRM Stream Calibration Gauges Streamflow – Mokelumne River at Woodbridge

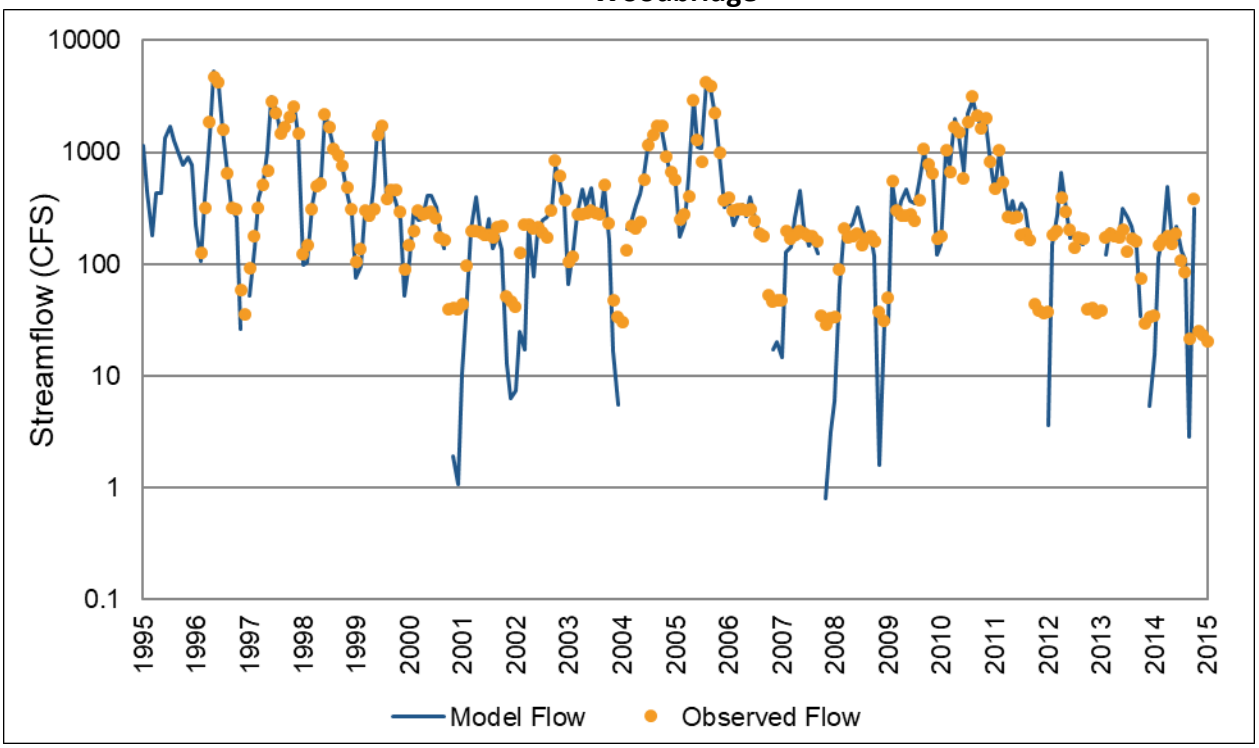


Figure 46d: ESJWRM Stream Calibration Gauges Exceedance – Mokelumne River at Woodbridge

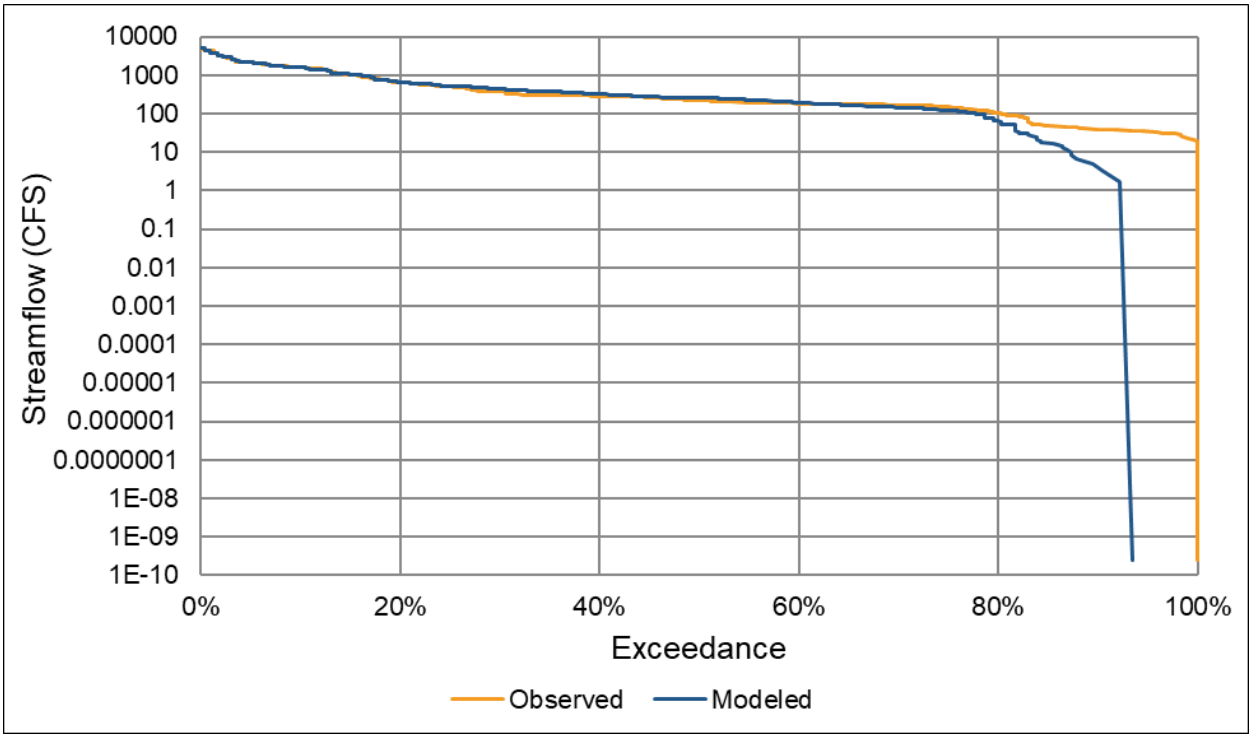


Figure 46e: ESJWRM Stream Calibration Gauges Streamflow – Mormon Slough at Bellota

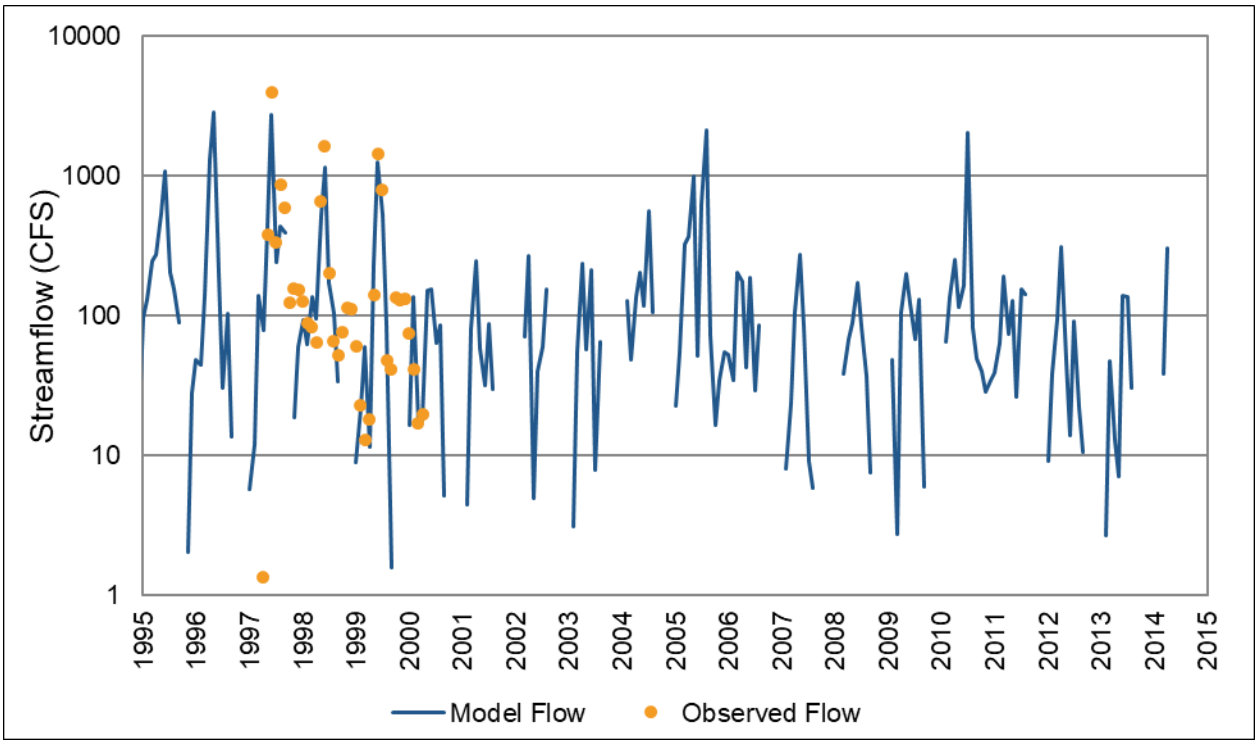


Figure 46f: ESJWRM Stream Calibration Gauges Exceedance – Mormon Slough at Bellota

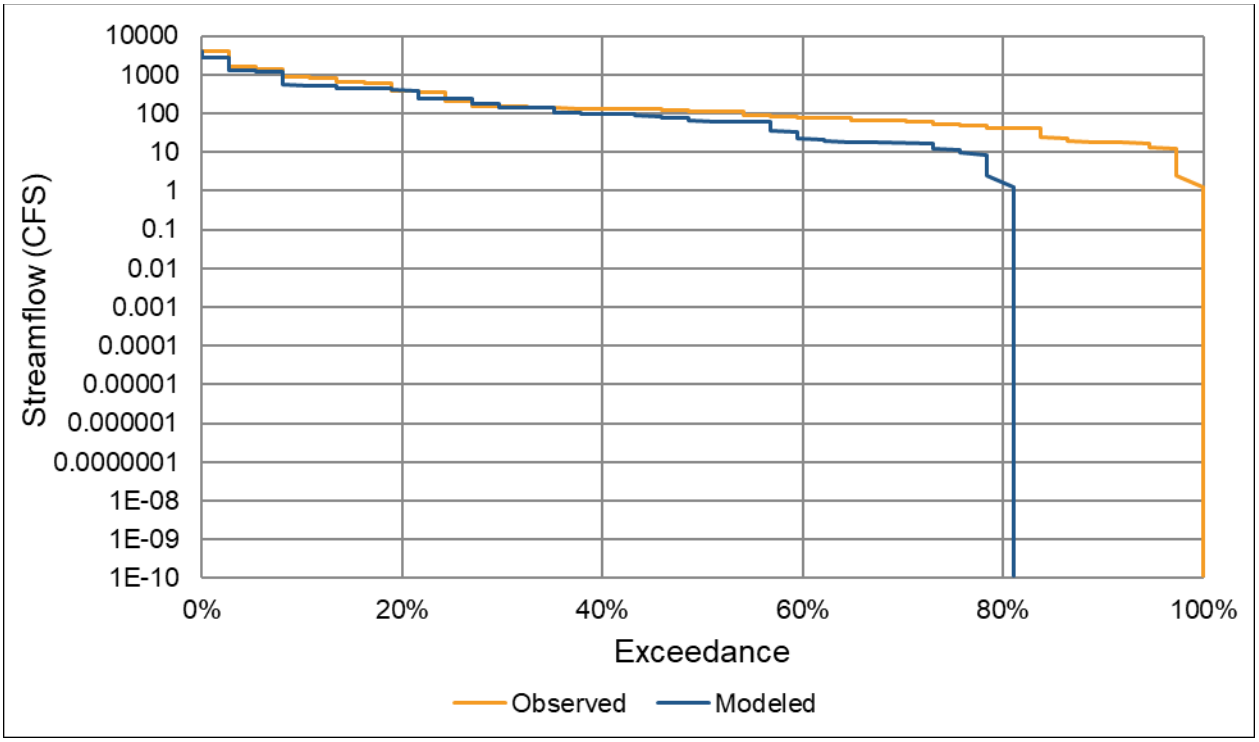


Figure 46g: ESJWRM Stream Calibration Gauges Streamflow – Stanislaus River below Orange Blossom Bridge

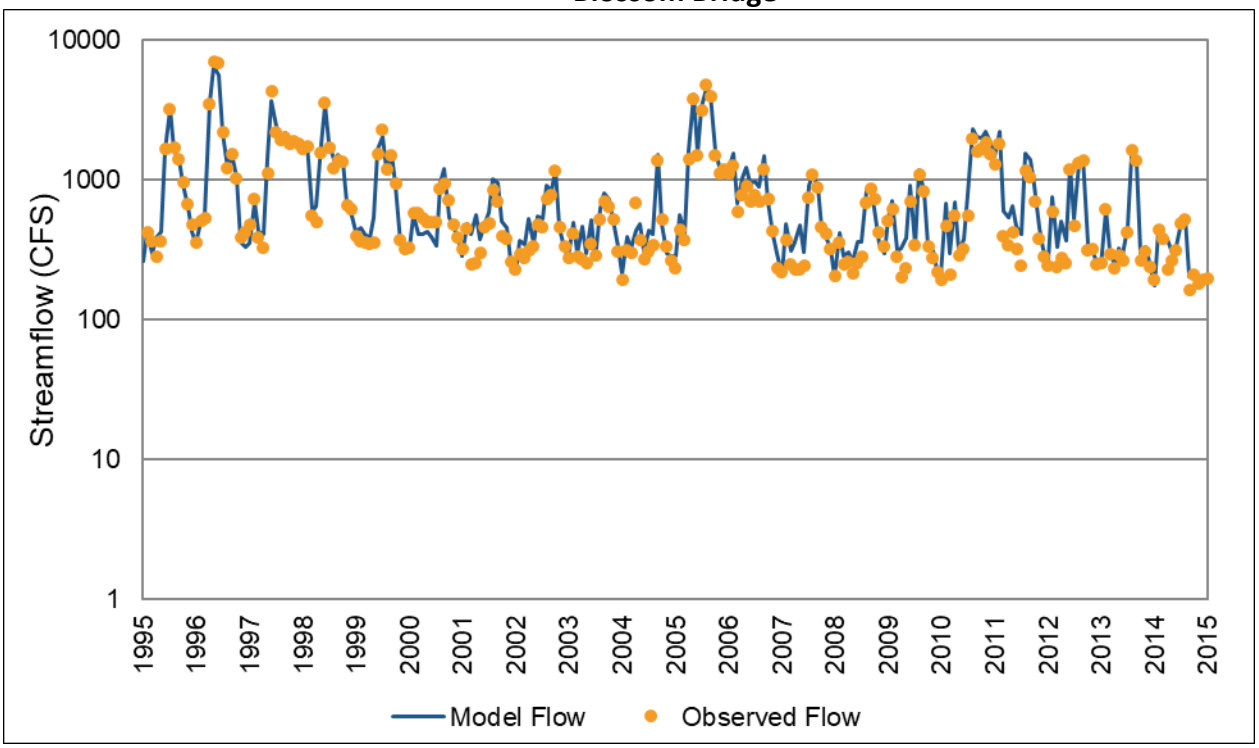


Figure 46h: ESJWRM Stream Calibration Gauges Exceedance – Stanislaus River below Orange Blossom Bridge

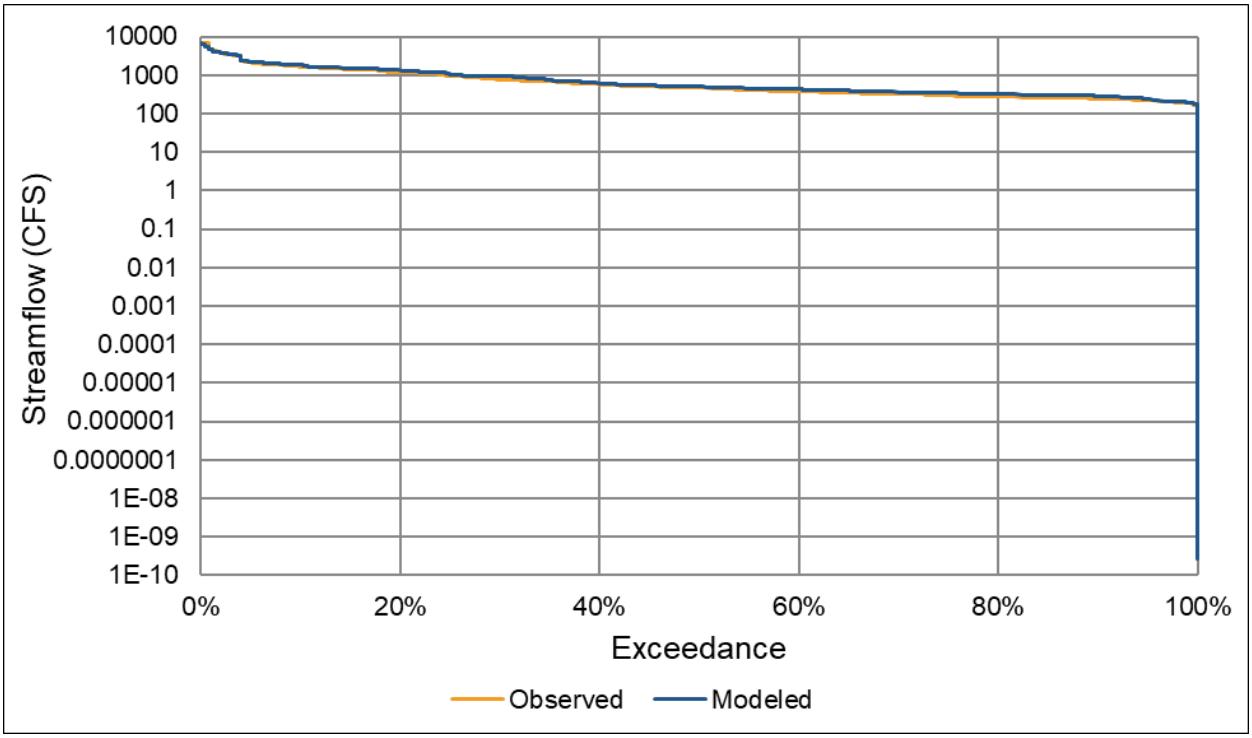


Figure 46i: ESJWRM Stream Calibration Gauges Streamflow – San Joaquin River below Garwood Bridge at Stockton

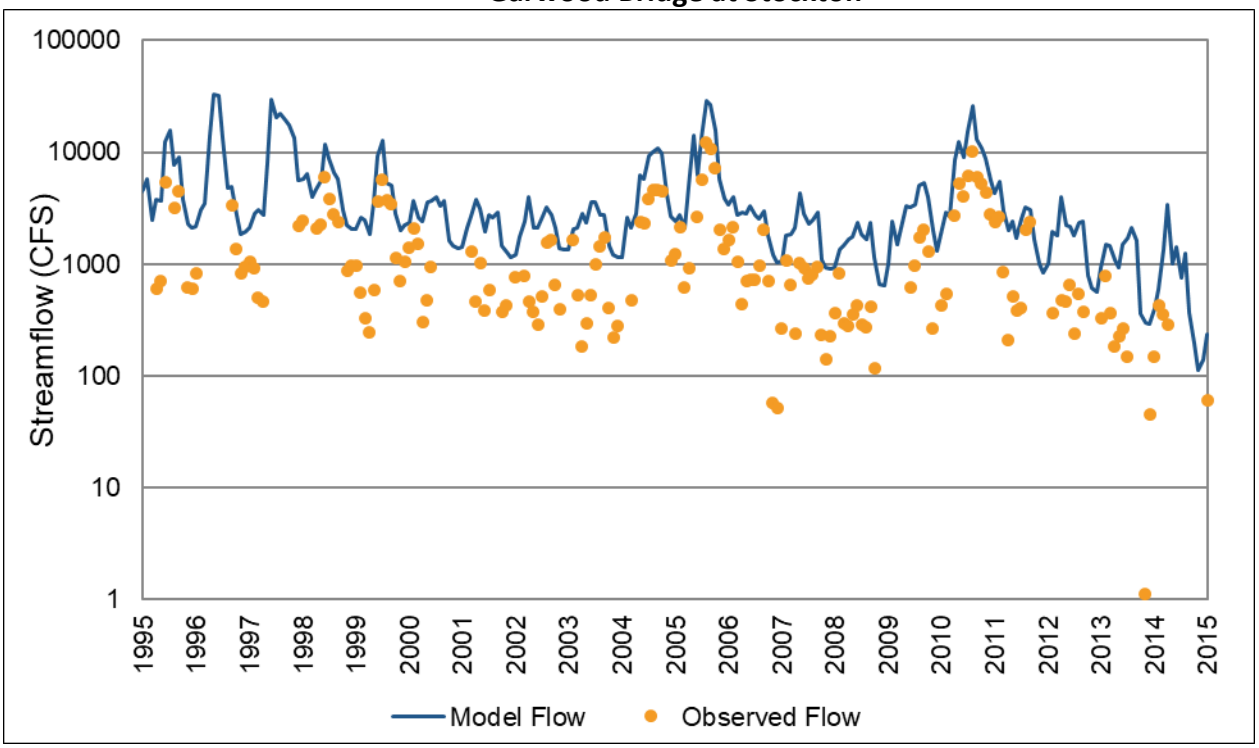


Figure 46j: ESJWRM Stream Calibration Gauges Exceedance – San Joaquin River below Garwood Bridge at Stockton

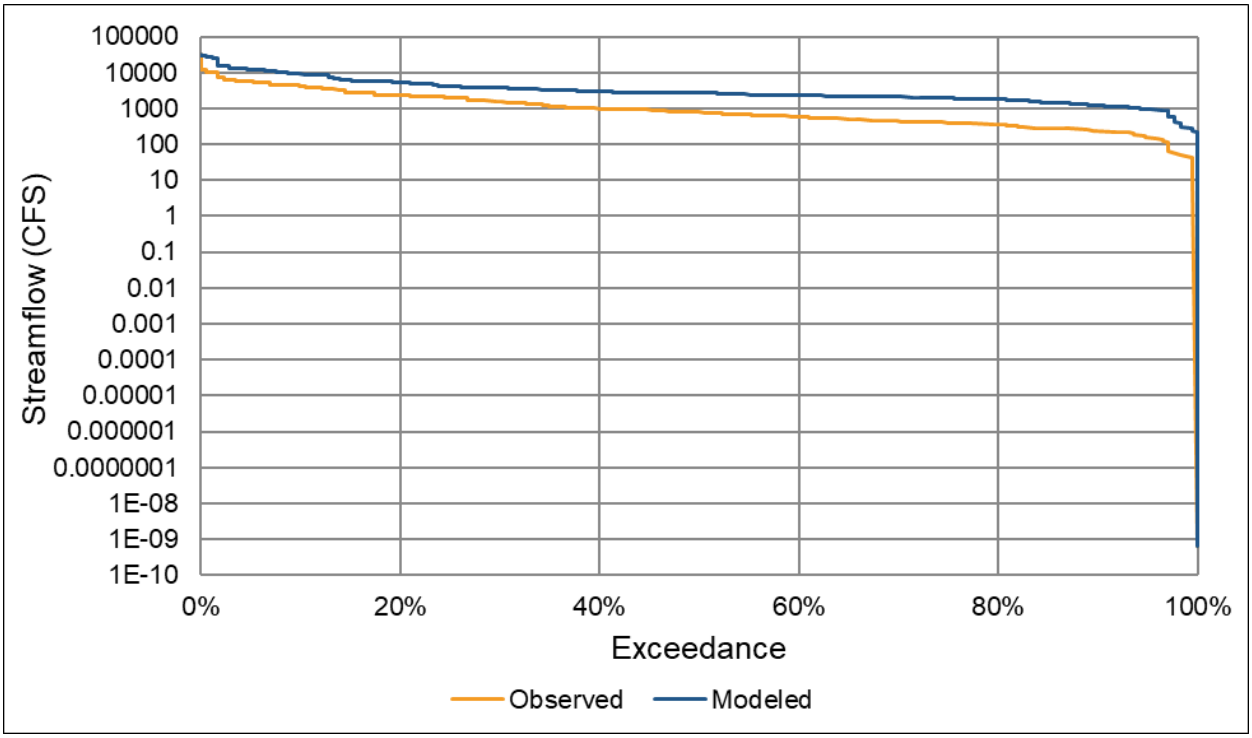


Figure 47a: ESJWRM Agricultural Land and Water Use Budget – Eastern San Joaquin Subbasin

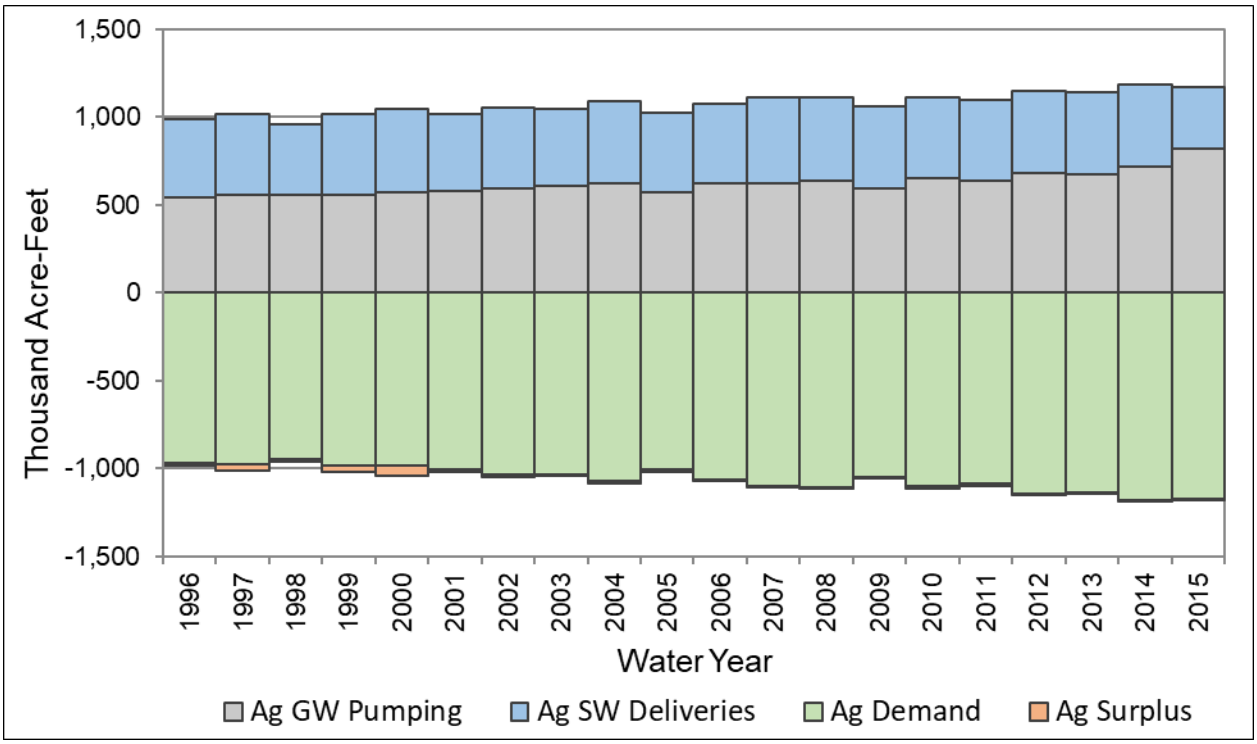


Figure 47b: ESJWRM Agricultural Land and Water Use Budget – Subarea 1 (North Delta Subarea)

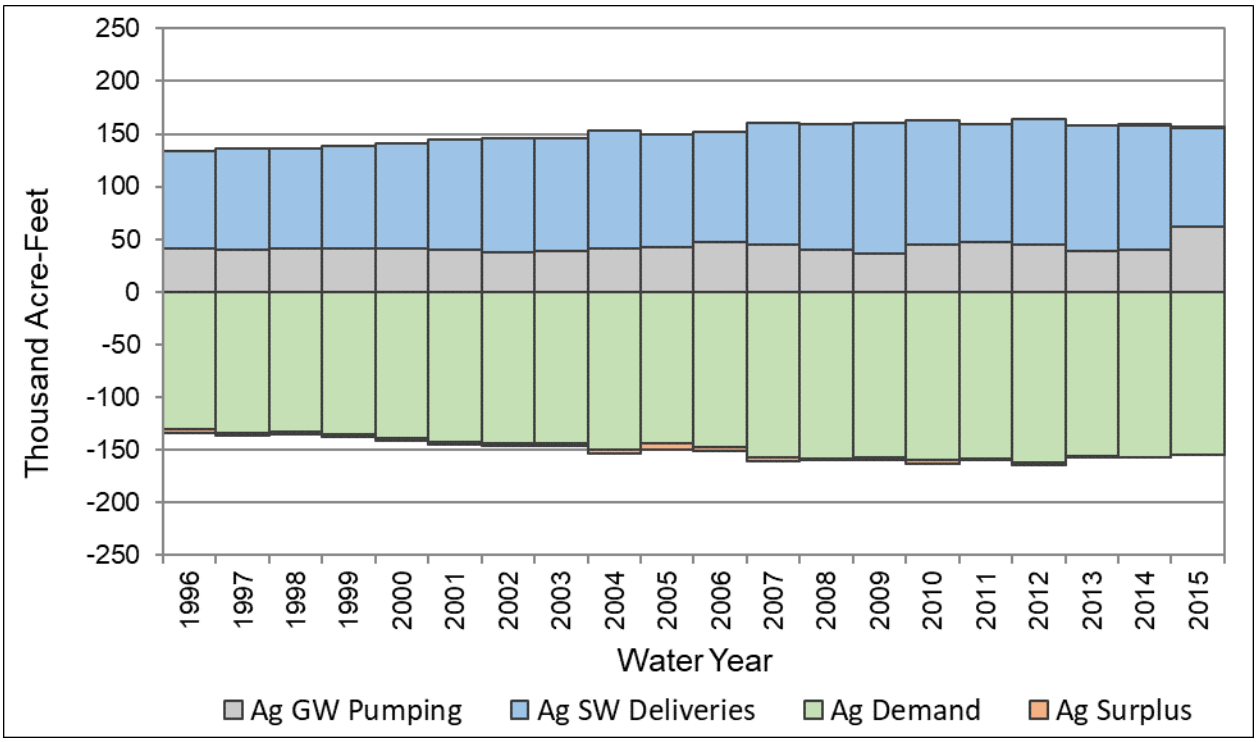


Figure 47c: ESJWRM Agricultural Land and Water Use Budget – Subarea 2 (North Subarea)

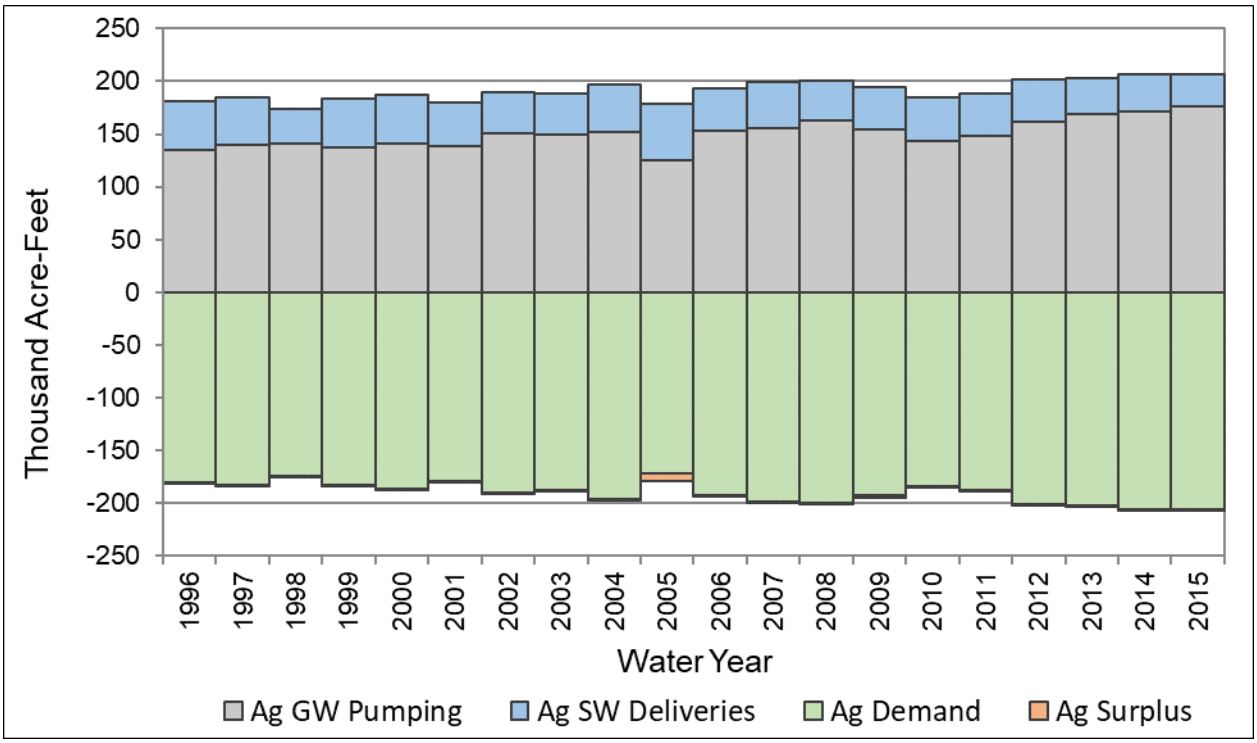


Figure 47d: ESJWRM Agricultural Land and Water Use Budget – Subarea 3 (Calaveras Subarea)

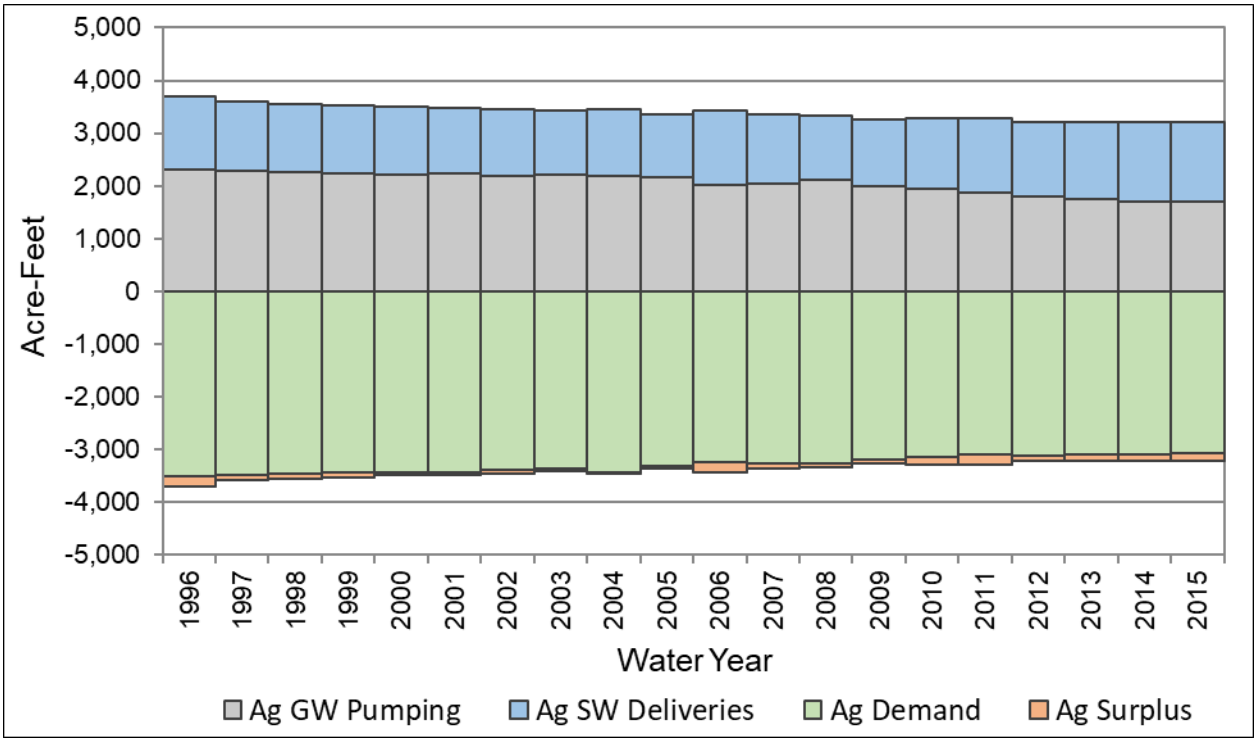


Figure 47e: ESJWRM Agricultural Land and Water Use Budget – Subarea 4 (Central Subarea)

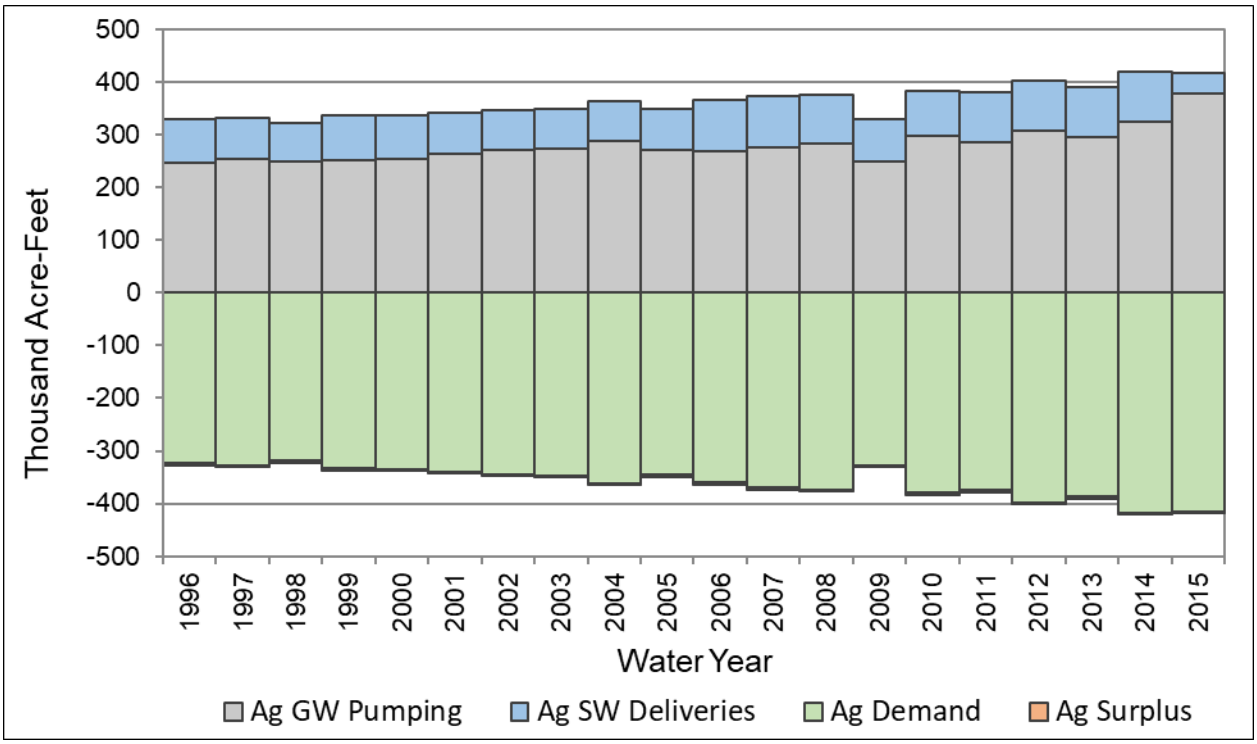


Figure 47f: ESJWRM Agricultural Land and Water Use Budget – Subarea 5 (South Subarea)

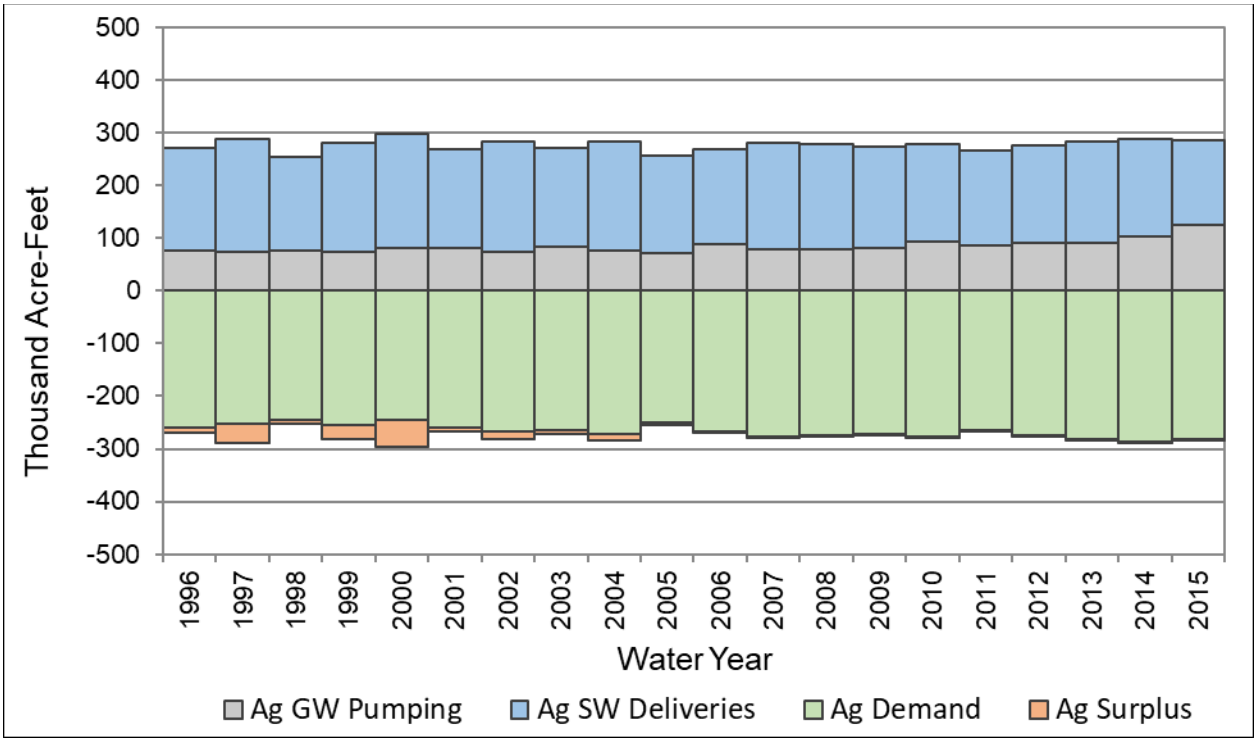


Figure 47g: ESJWRM Agricultural Land and Water Use Budget – Subarea 6 (Stanislaus Subarea)

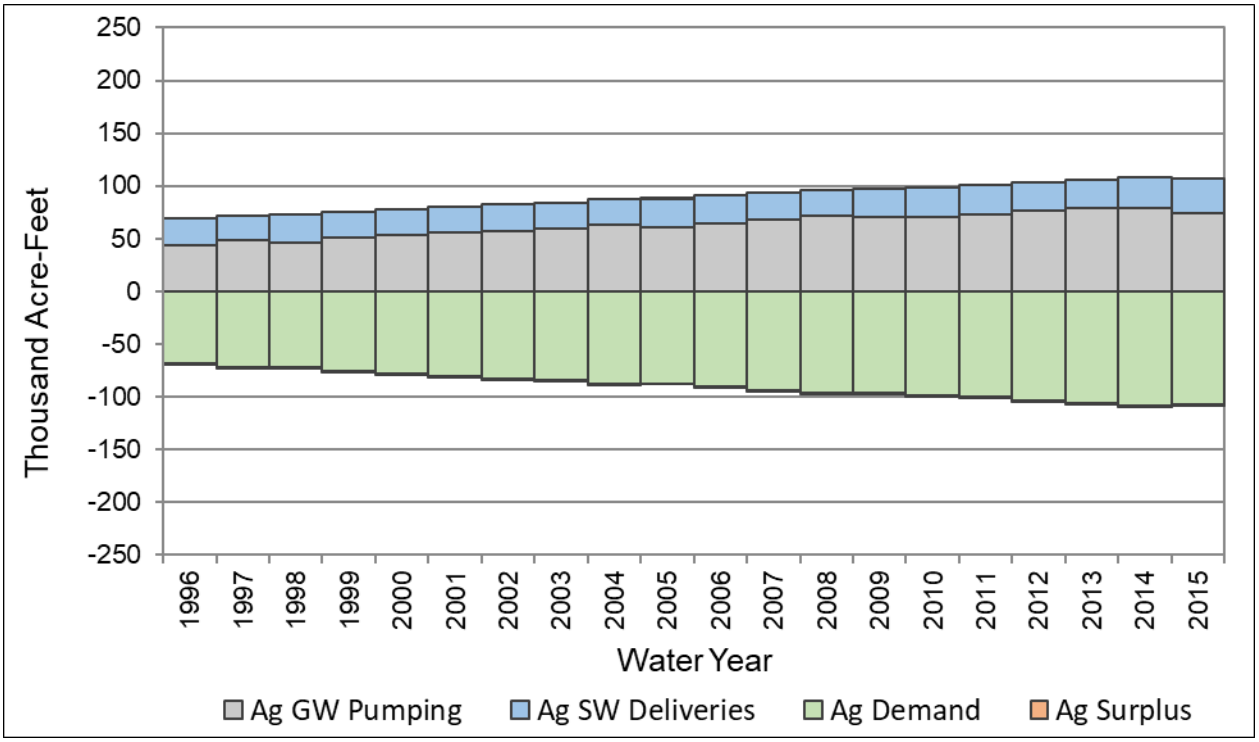


Figure 48a: ESJWRM Urban Land and Water Use Budget – Eastern San Joaquin Subbasin

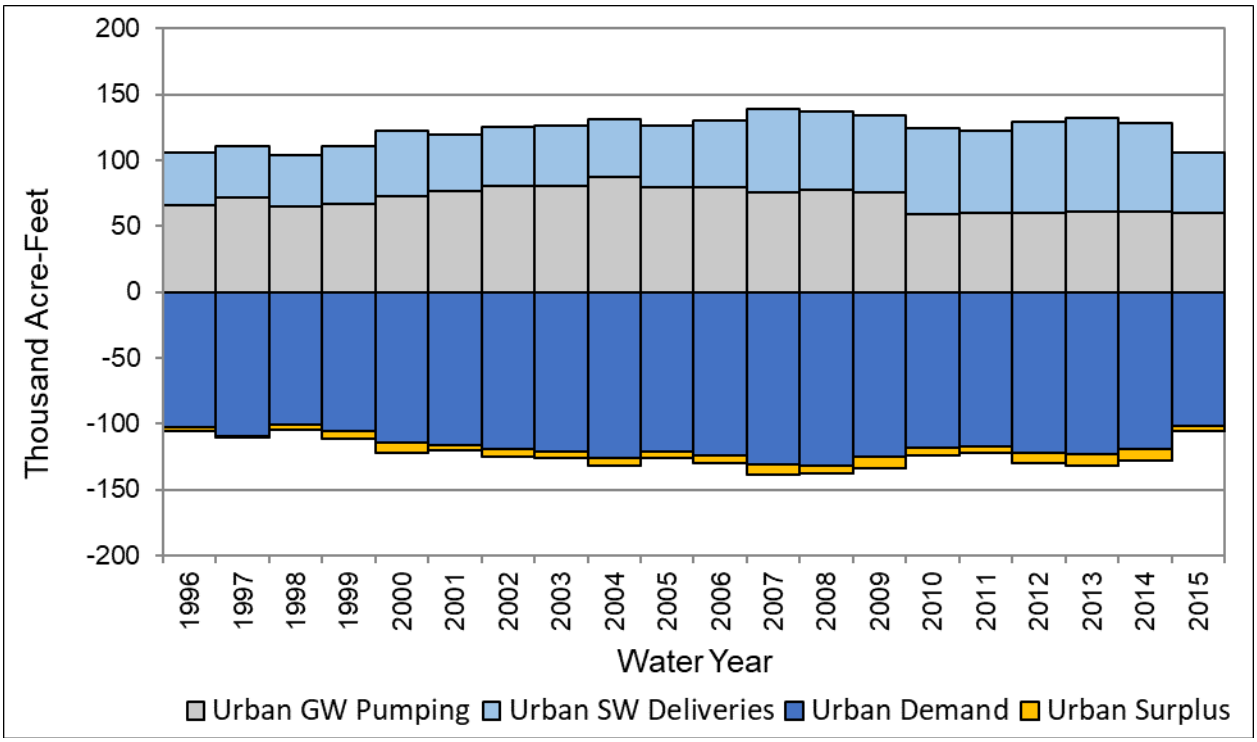


Figure 48b: ESJWRM Urban Land and Water Use Budget – Subarea 1 (North Delta Subarea)

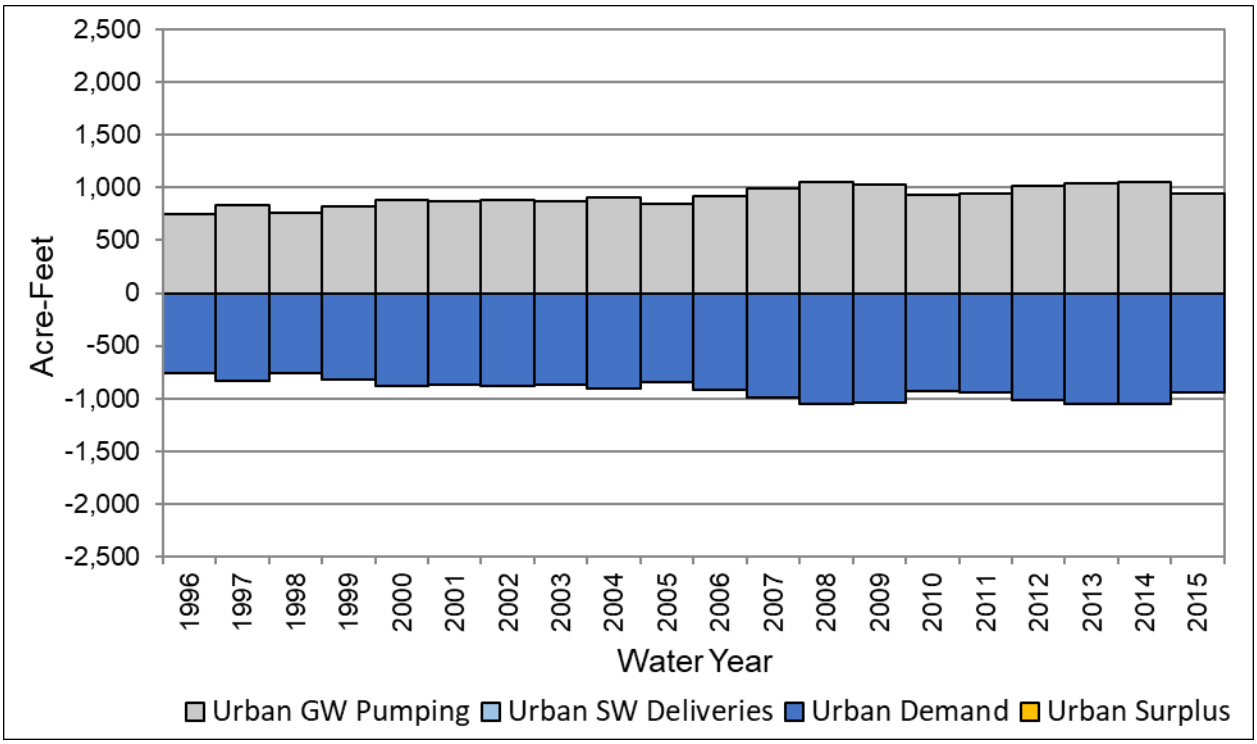


Figure 48c: ESJWRM Urban Land and Water Use Budget – Subarea 2 (North Subarea)

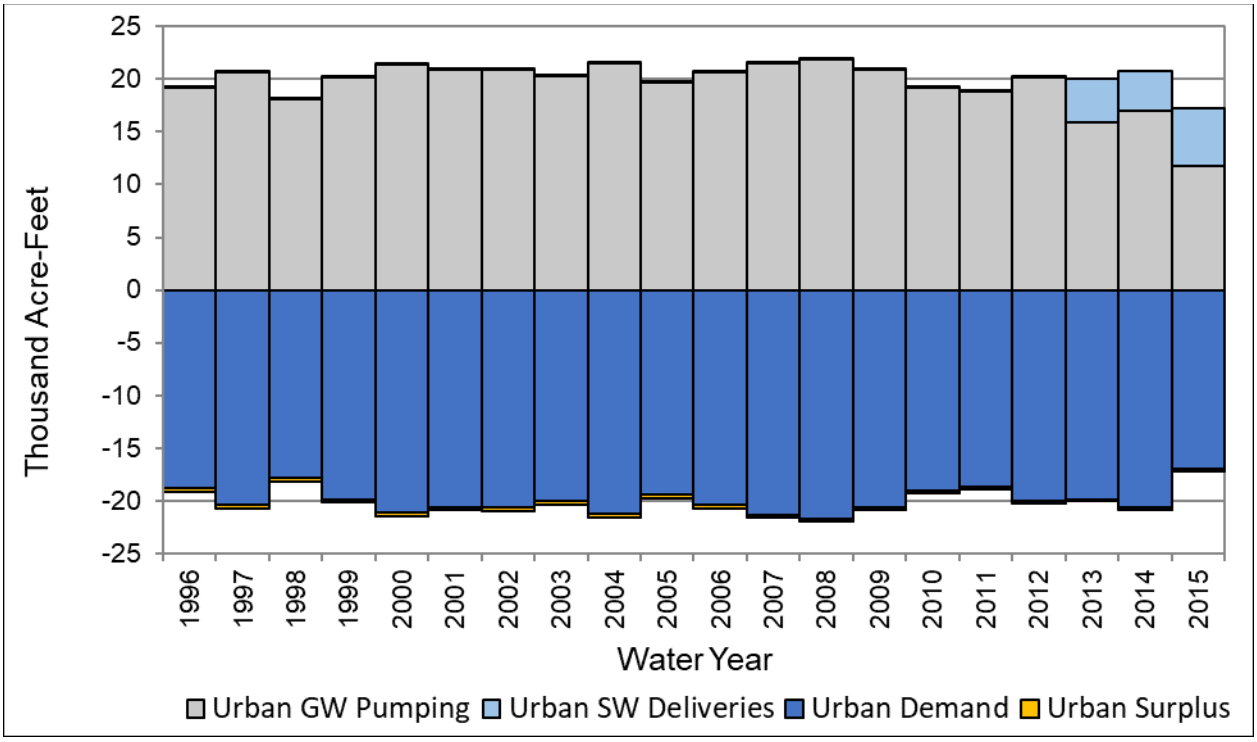


Figure 48d: ESJWRM Urban Land and Water Use Budget – Subarea 3 (Calaveras Subarea)

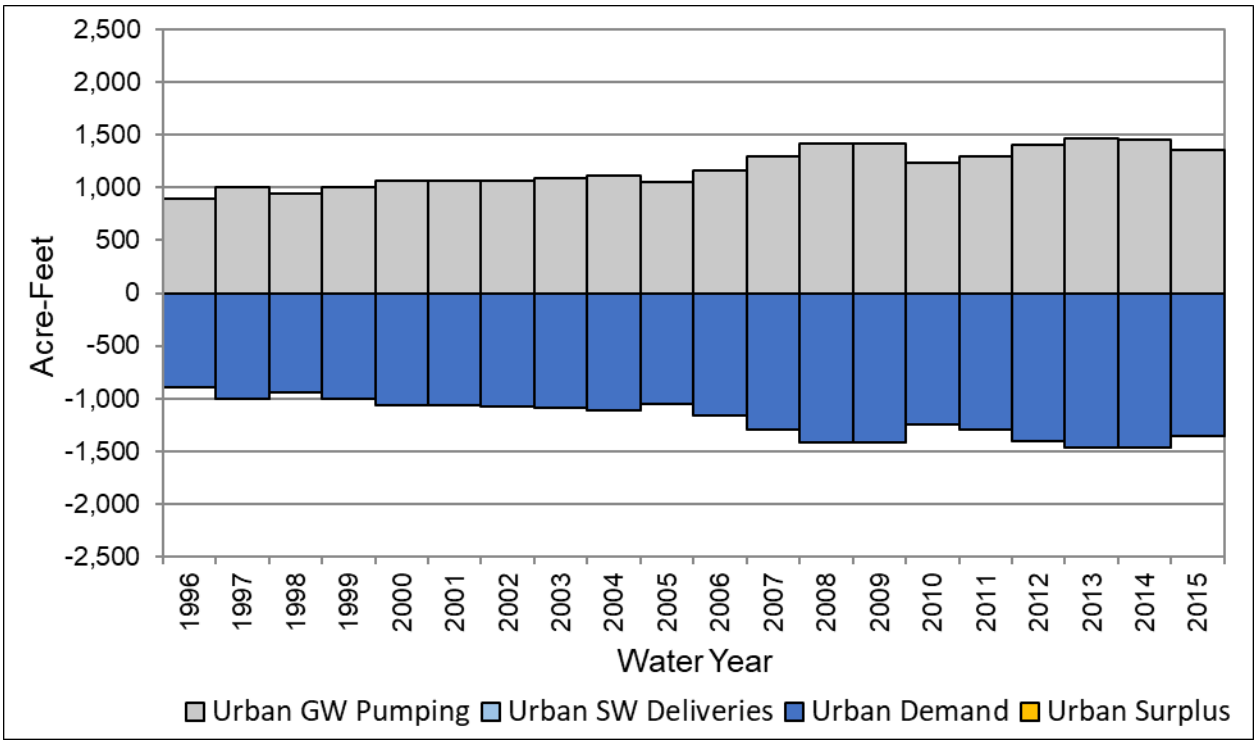


Figure 48e: ESJWRM Urban Land and Water Use Budget – Subarea 4 (Central Subarea)

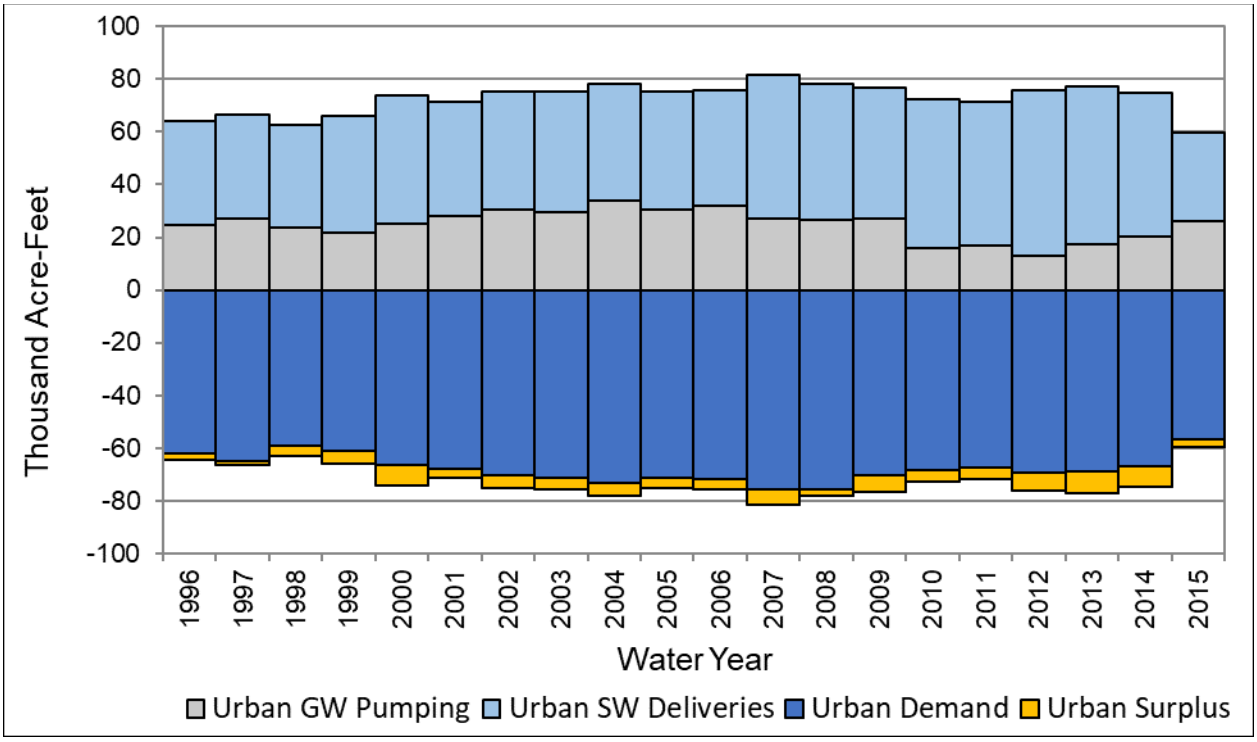


Figure 48f: ESJWRM Urban Land and Water Use Budget – Subarea 5 (South Subarea)

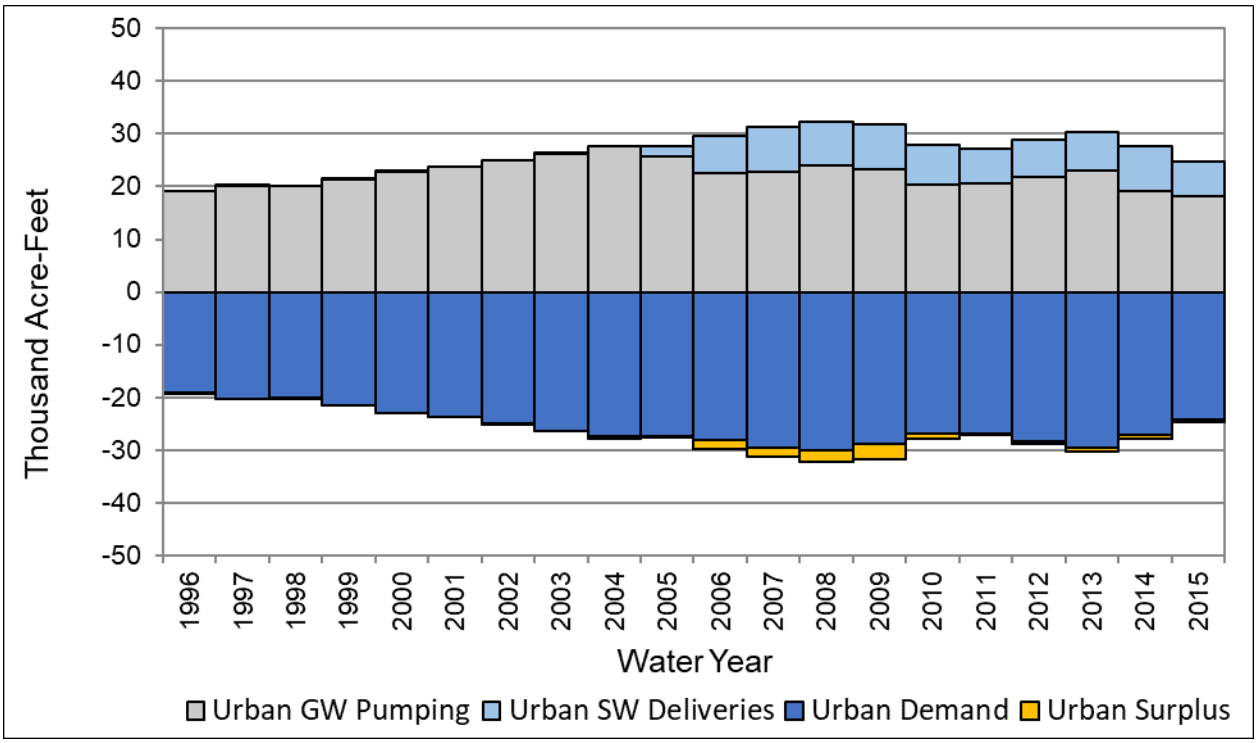


Figure 48g: ESJWRM Urban Land and Water Use Budget – Subarea 6 (Stanislaus Subarea)

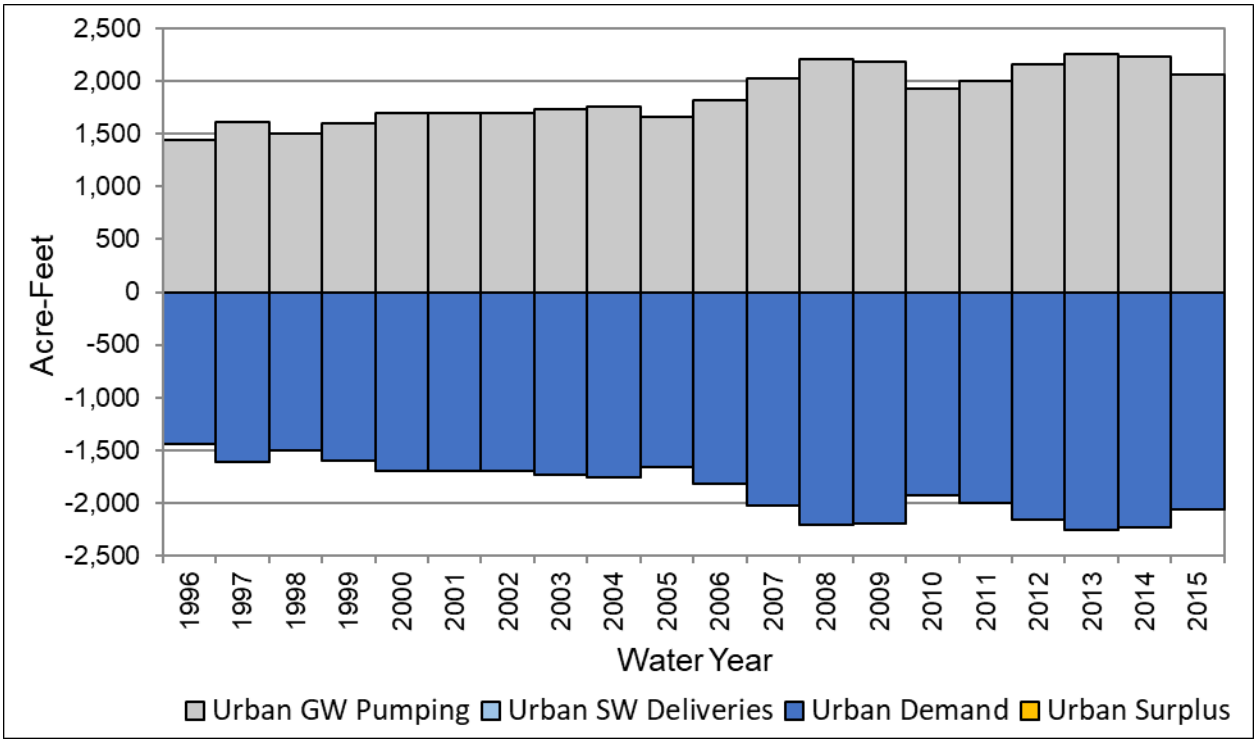


Figure 49a: ESJWRM Groundwater Budget – Eastern San Joaquin Subbasin

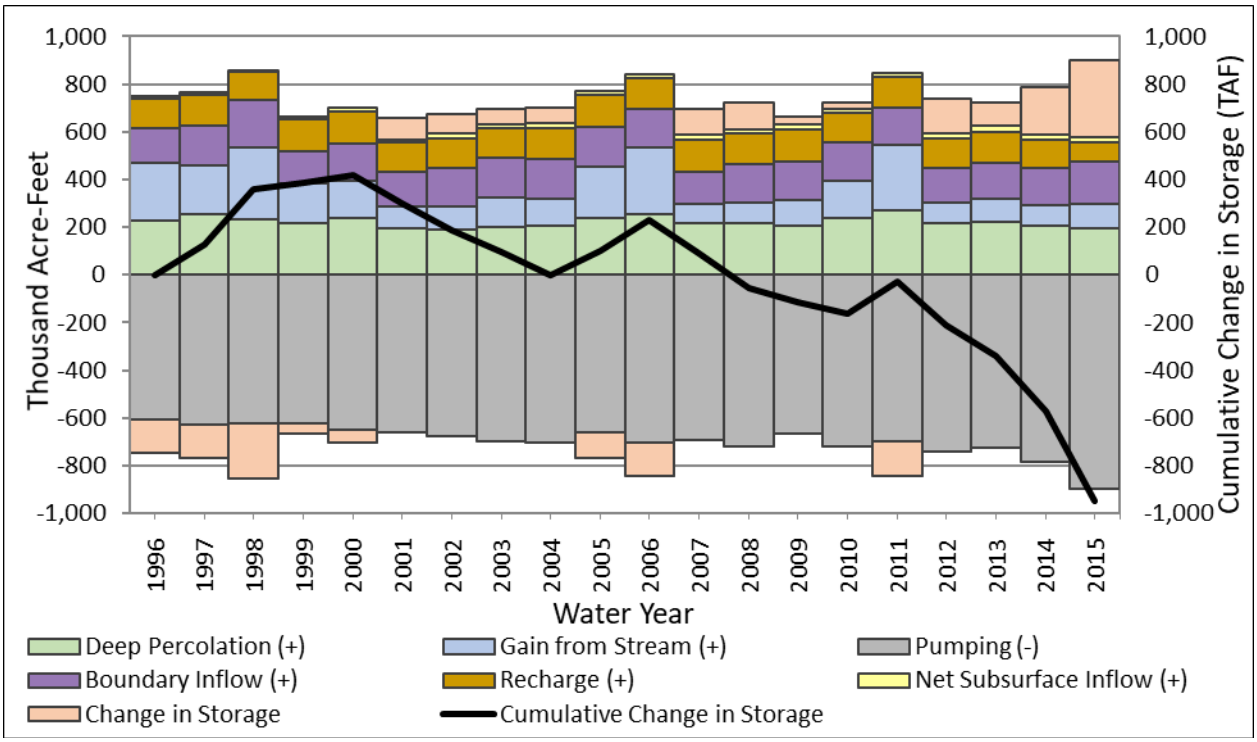


Figure 49b: ESJWRM Groundwater Budget – Subarea 1 (North Delta Subarea)

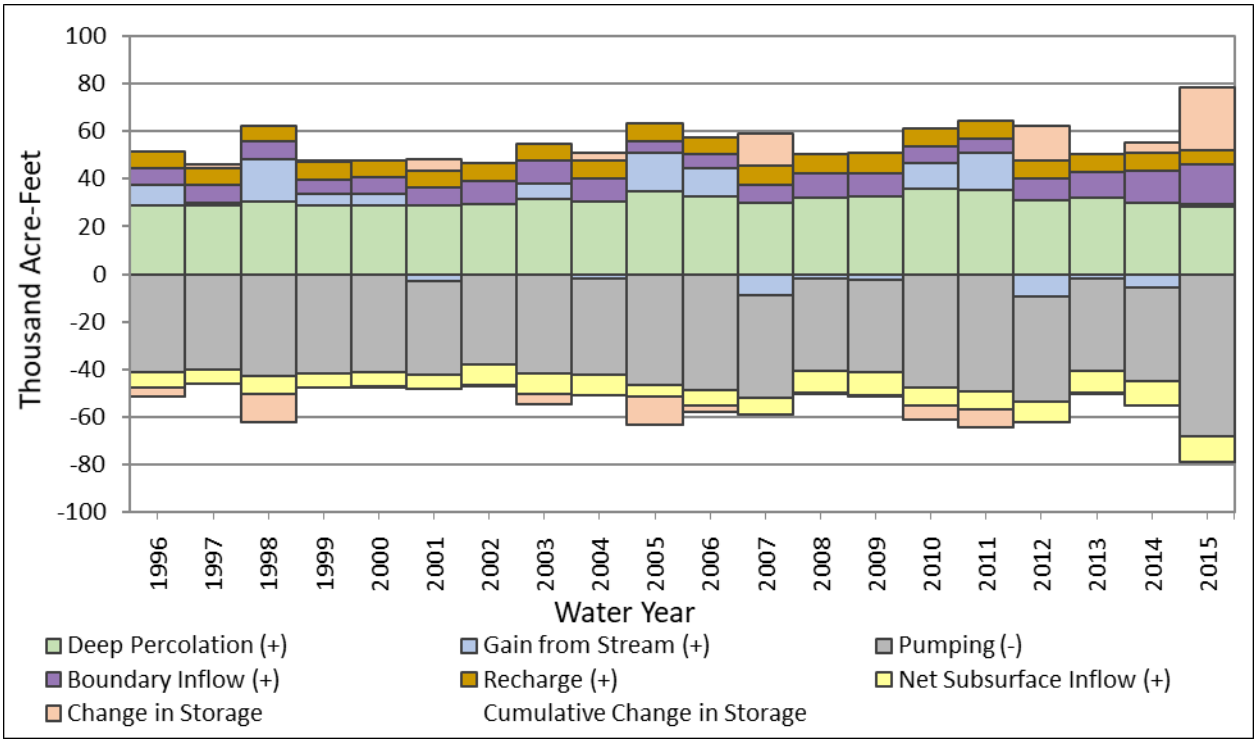


Figure 49c: ESJWRM Groundwater Budget – Subarea 2 (North Subarea)

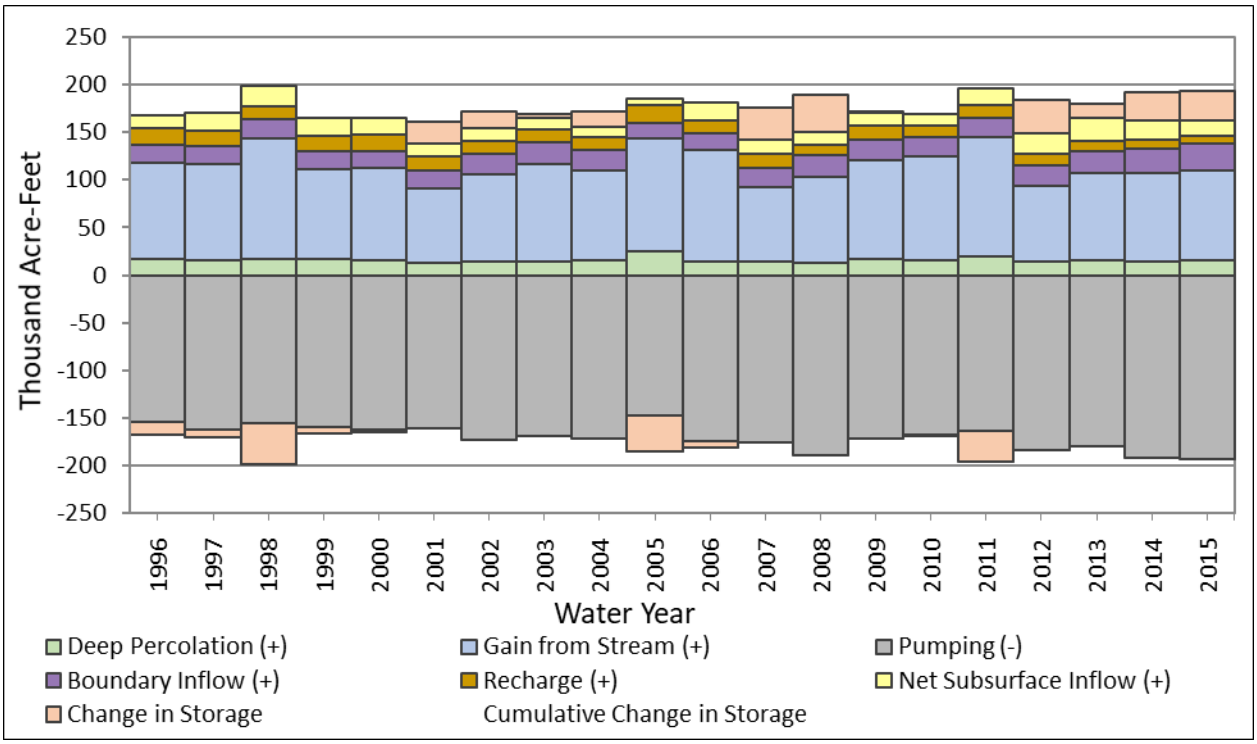


Figure 49d: ESJWRM Groundwater Budget – Subarea 3 (Calaveras Subarea)

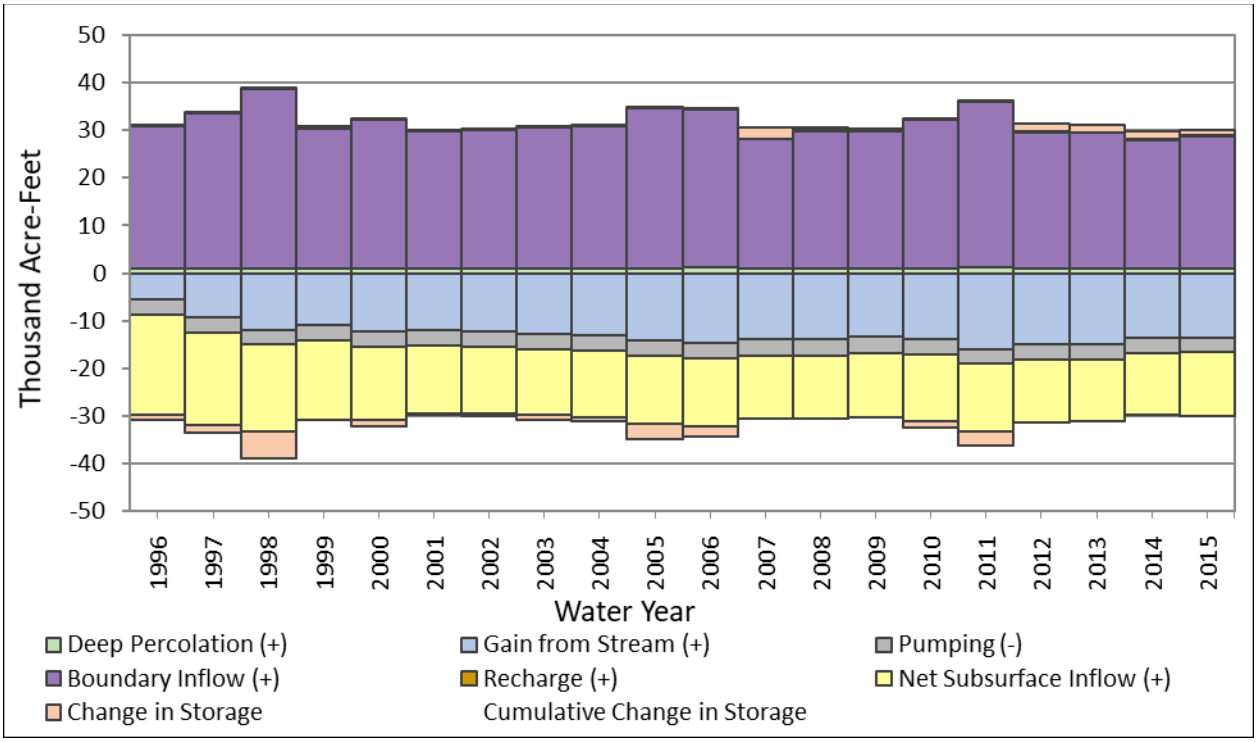


Figure 49e: ESJWRM Groundwater Budget – Subarea 4 (Central Subarea)

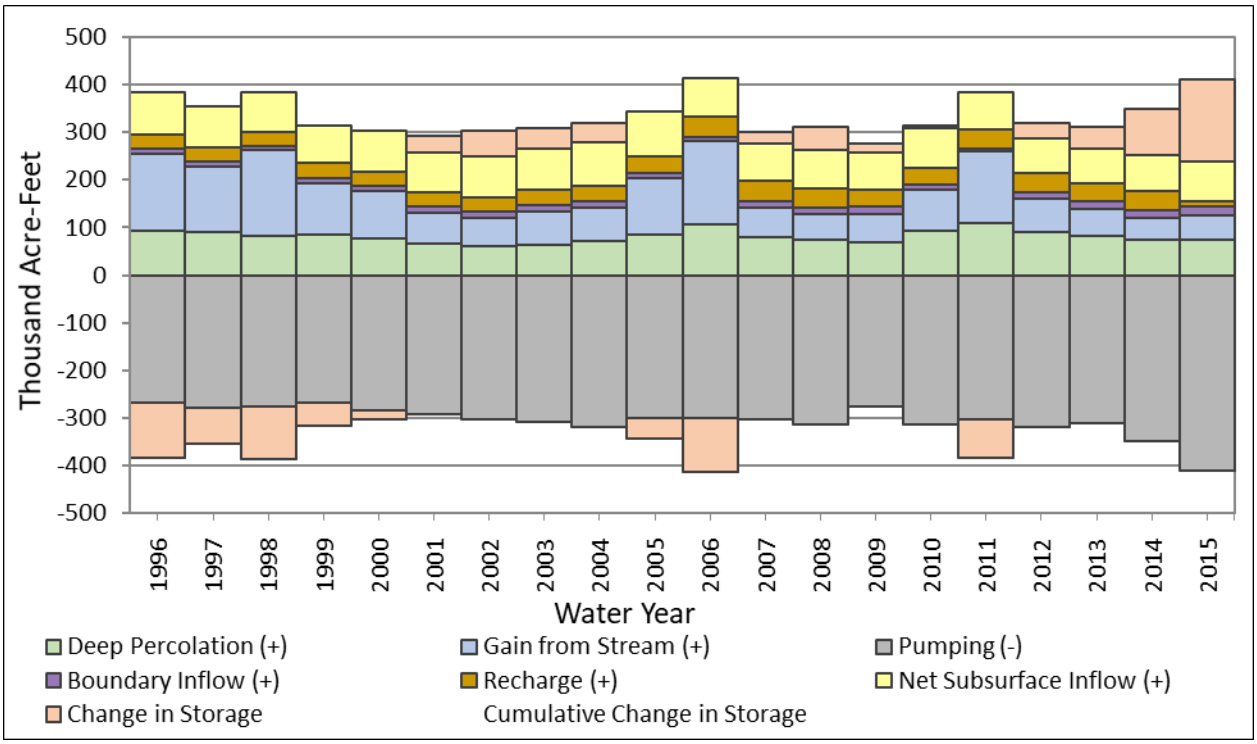


Figure 49f: ESJWRM Groundwater Budget – Subarea 5 (South Subarea)

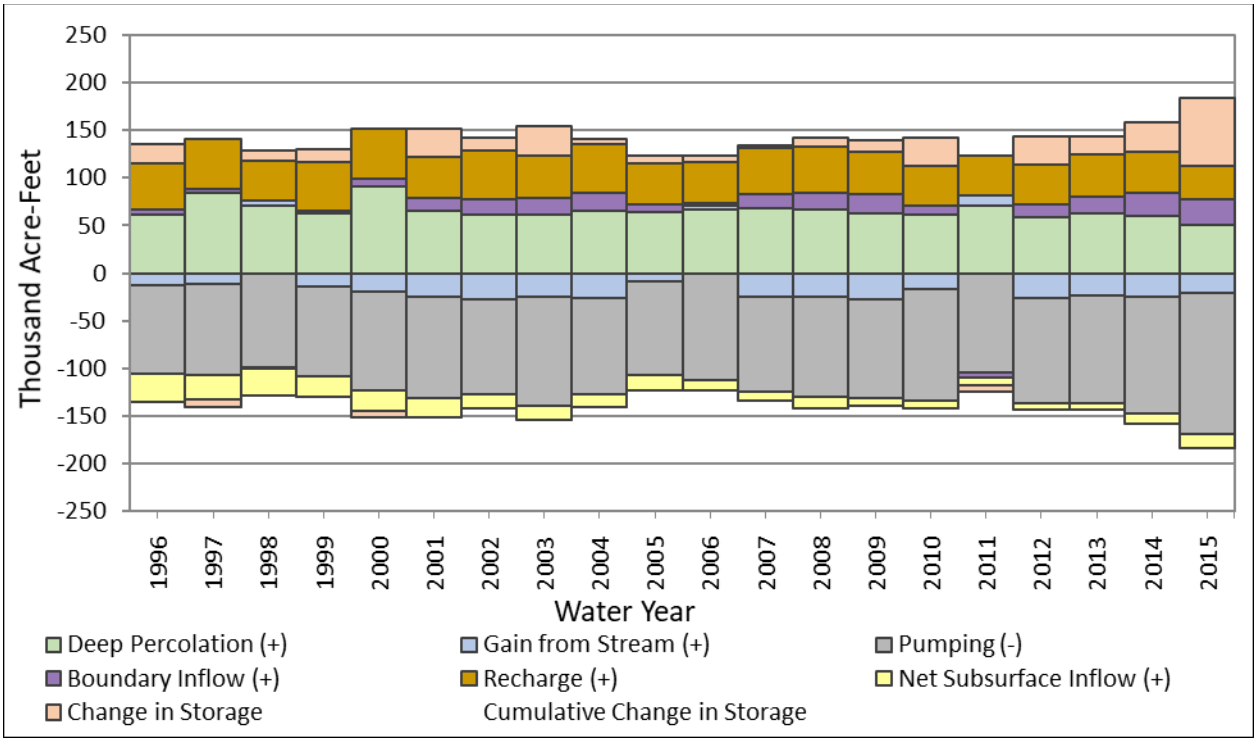


Figure 49g: ESJWRM Groundwater Budget – Subarea 6 (Stanislaus Subarea)

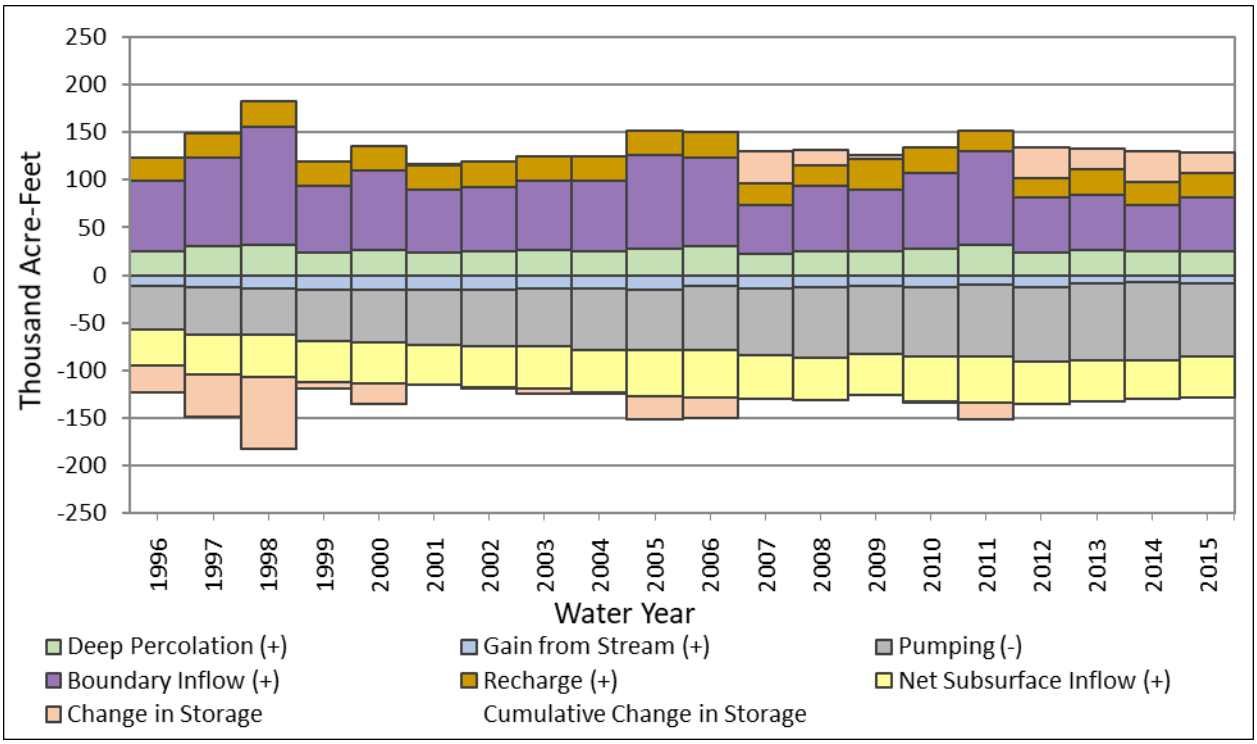


Figure 50: ESJWRM Groundwater Level Calibration Wells

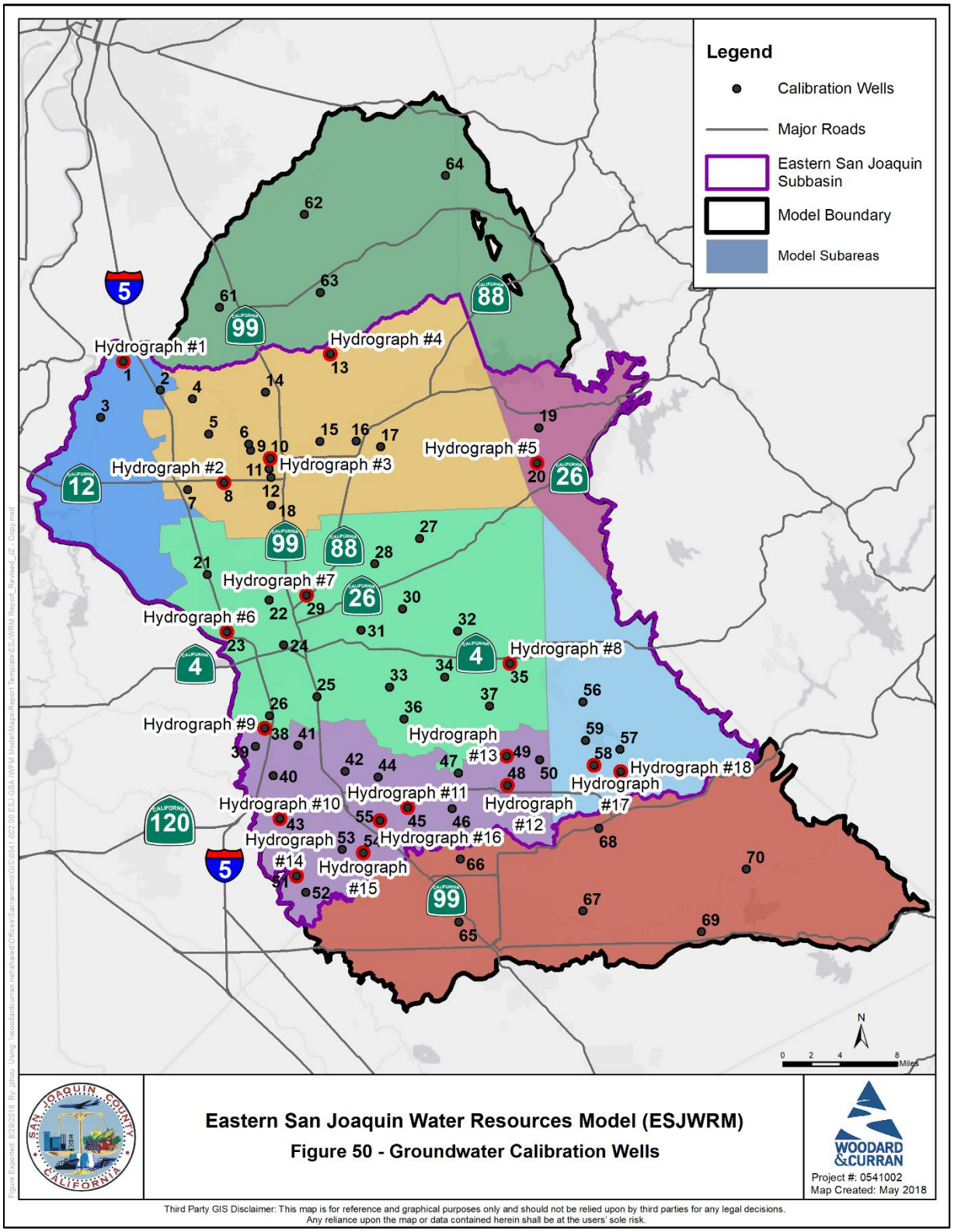


Figure 51a: ESJWRM Groundwater Level Contours (Fall 2015)

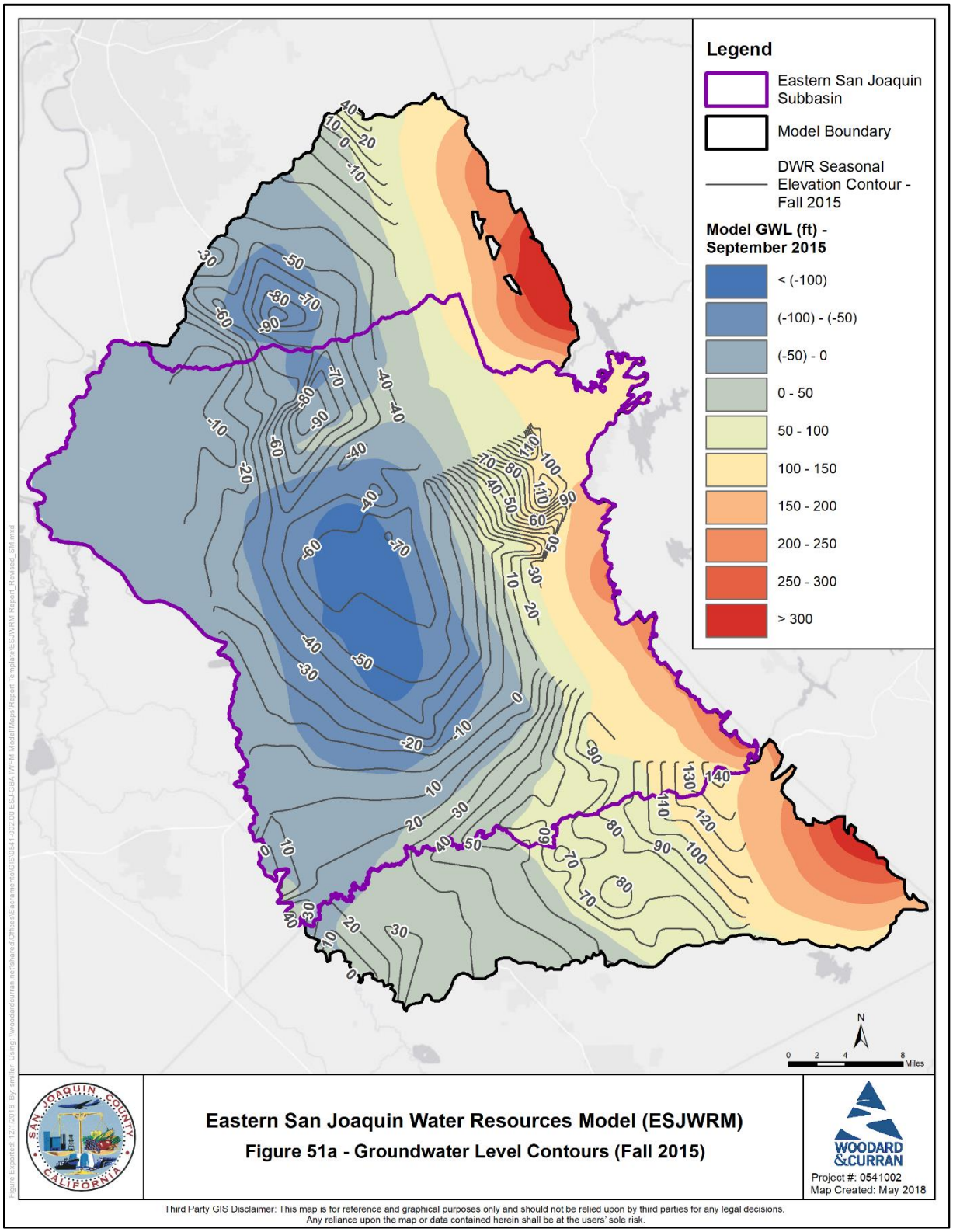


Figure 51b: ESJWRM Groundwater Level Contours (Spring 2015)

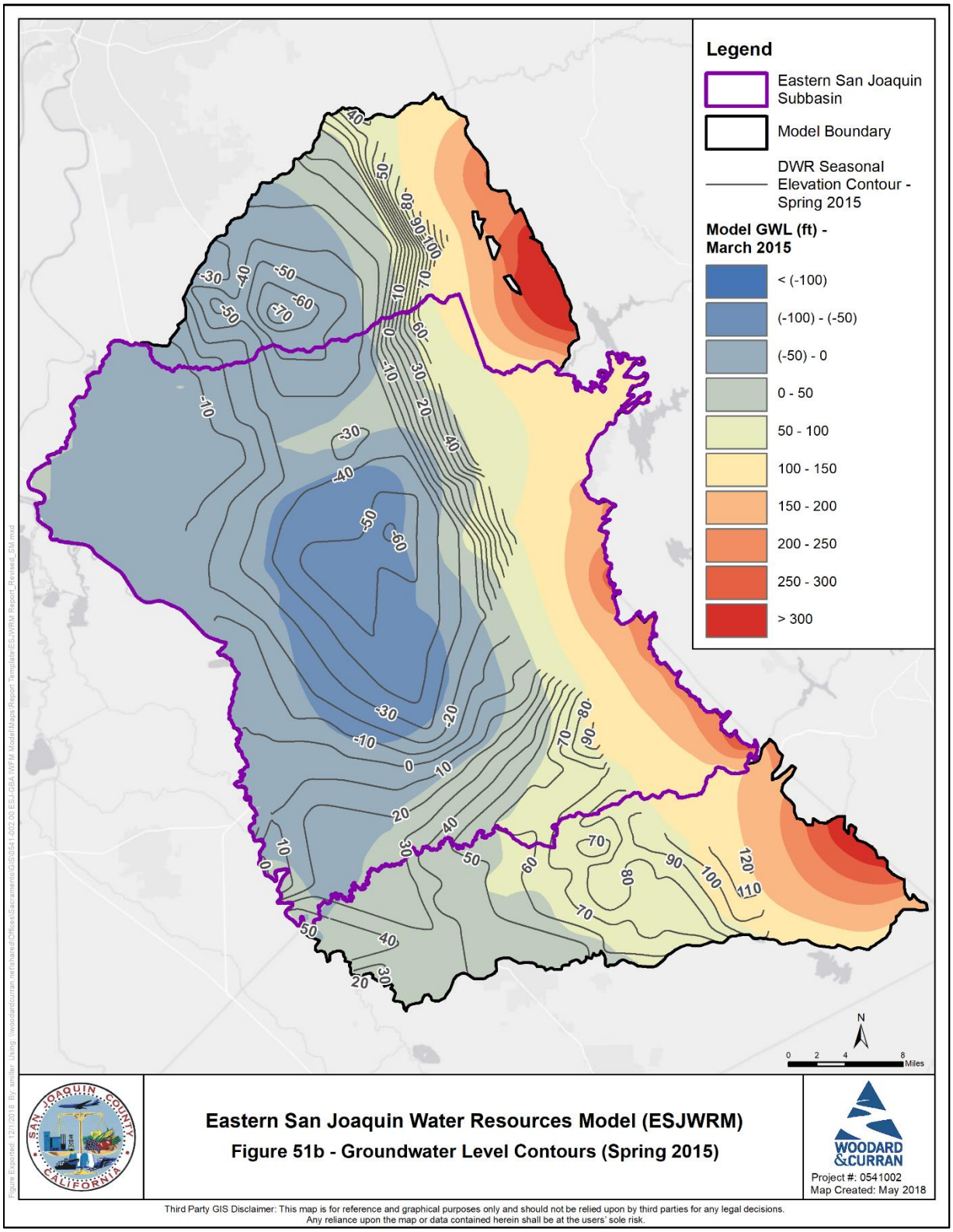


Figure 51c: ESJWRM Groundwater Level Contours (Fall 2013)

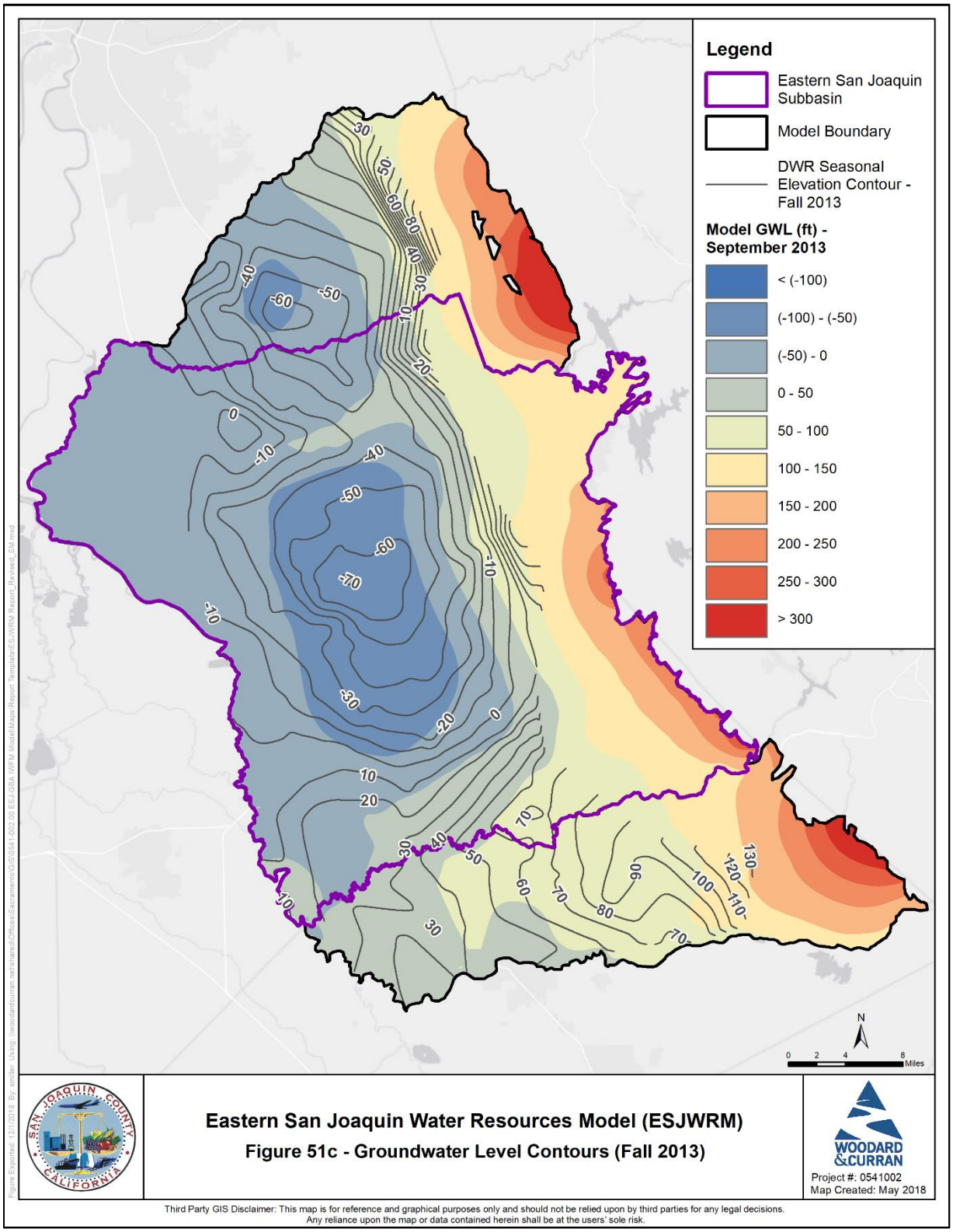


Figure 51d: ESJWRM Groundwater Level Contours (Spring 2011)

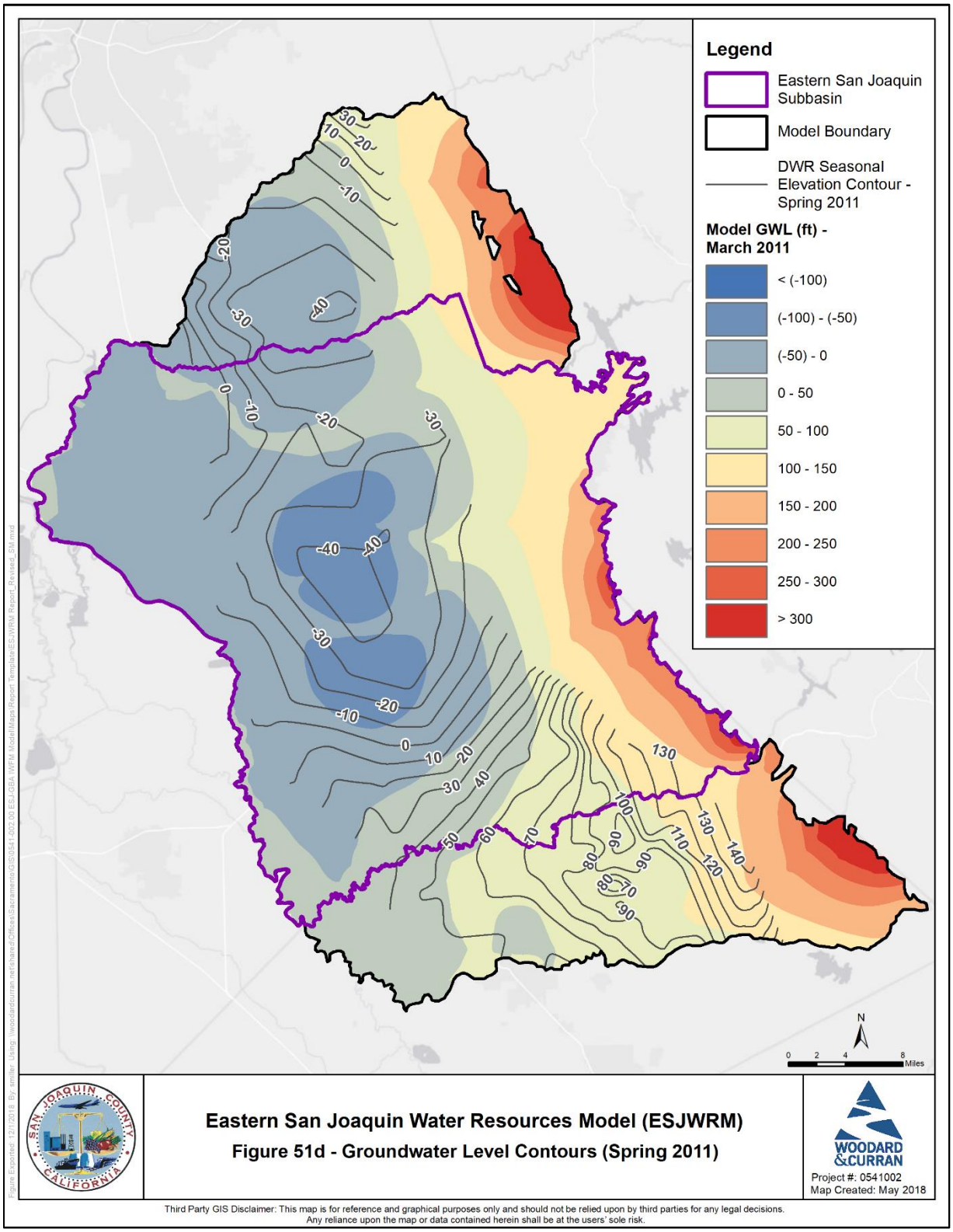


Figure 52a: ESJWRM Groundwater Level Hydrograph – Hydrograph #1

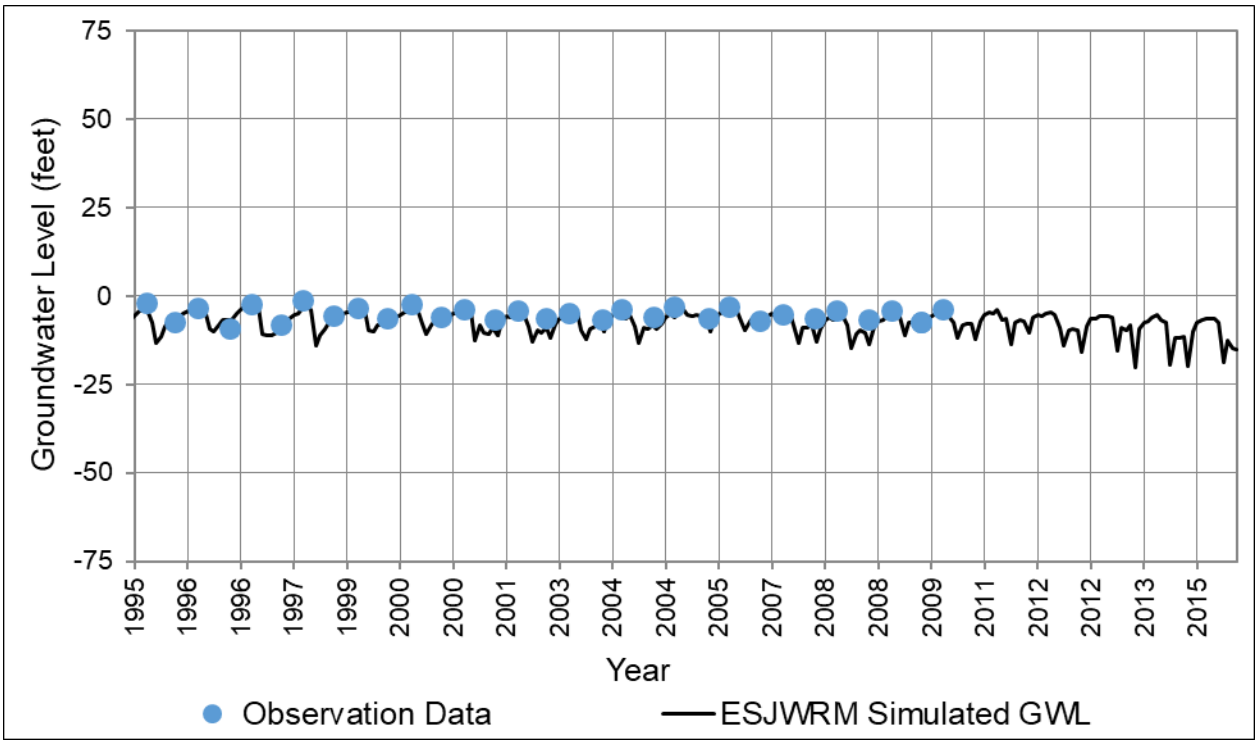


Figure 52b: ESJWRM Groundwater Level Hydrograph – Hydrograph #2

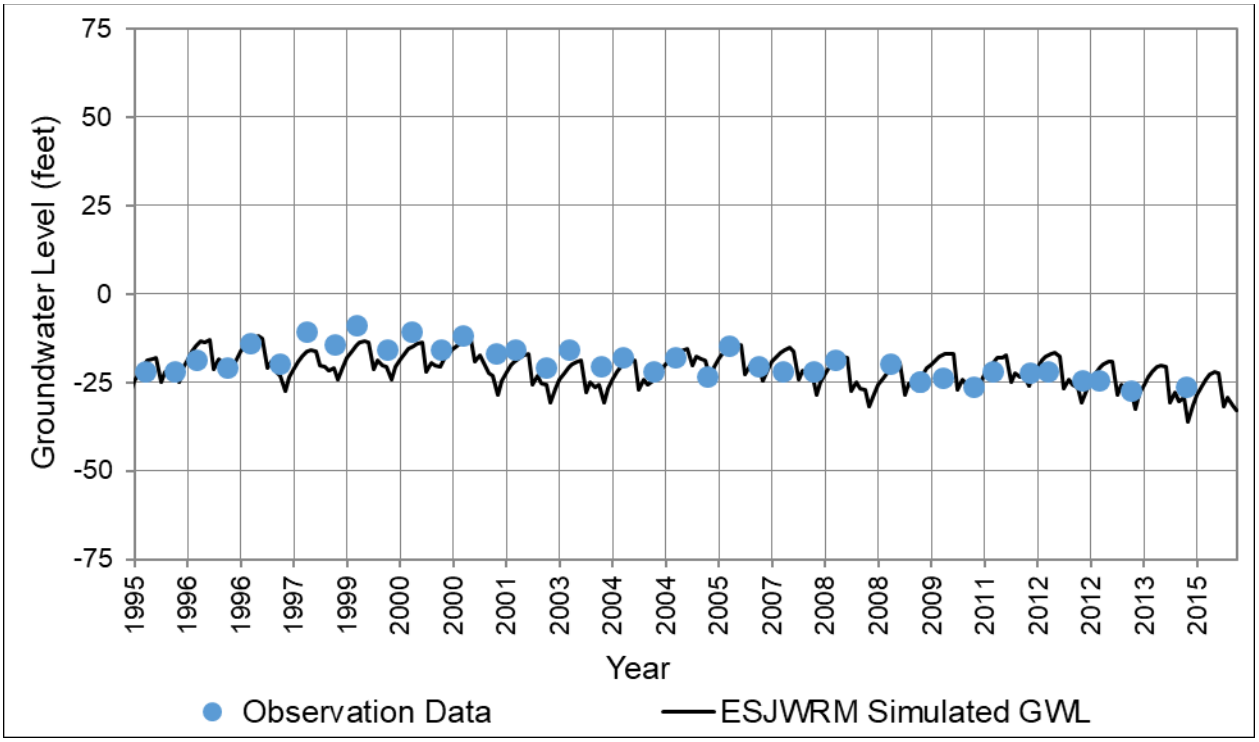


Figure 52c: ESJWRM Groundwater Level Hydrograph – Hydrograph #3

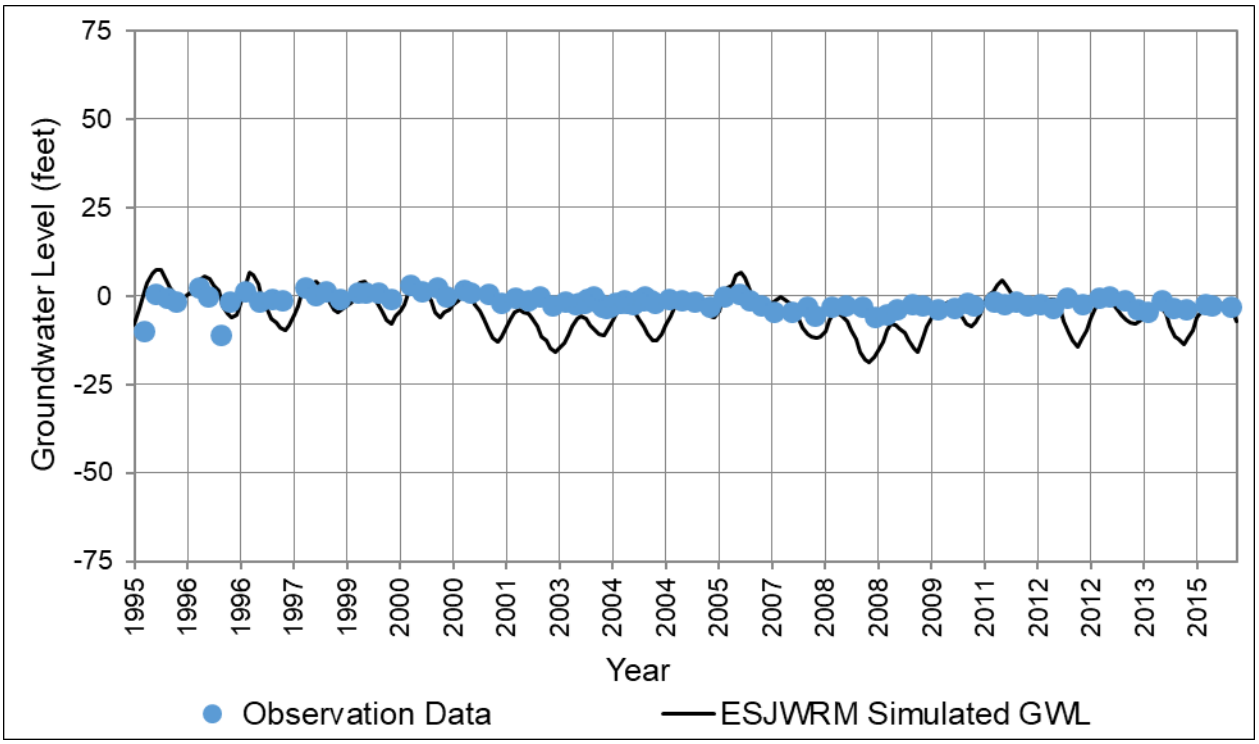


Figure 52d: ESJWRM Groundwater Level Hydrograph – Hydrograph #4

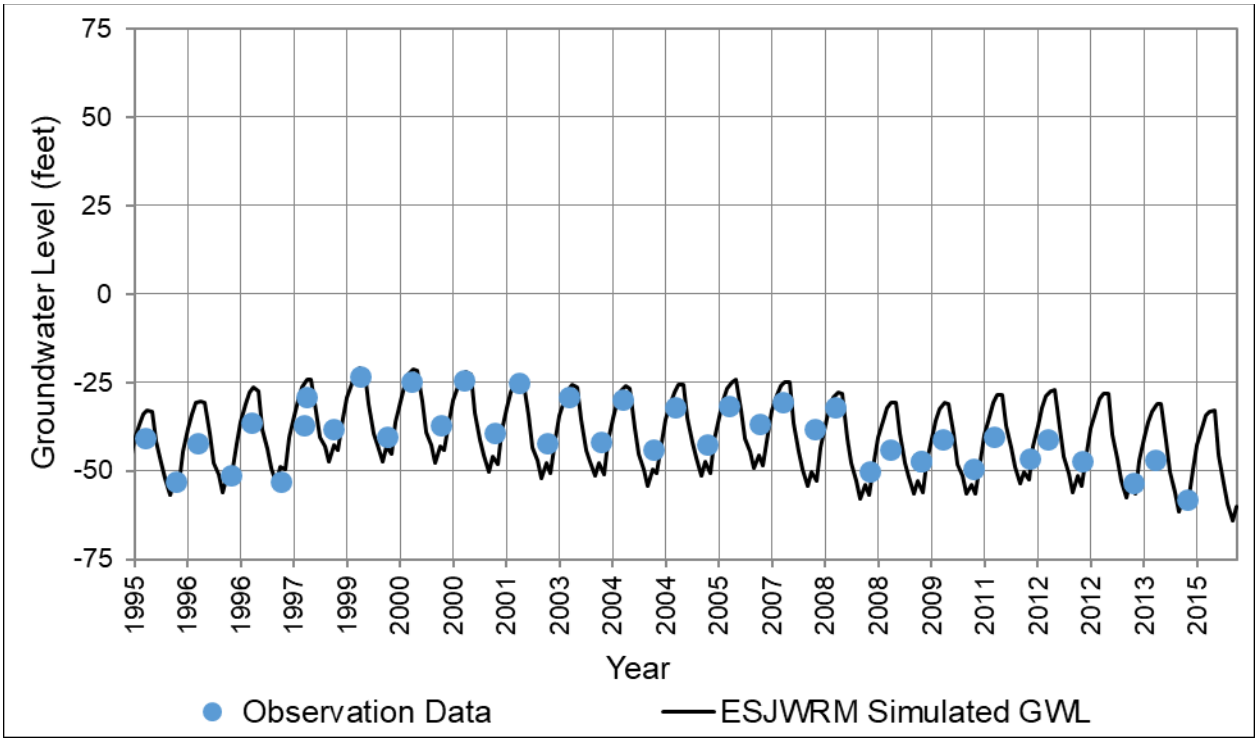


Figure 52e: ESJWRM Groundwater Level Hydrograph – Hydrograph #5

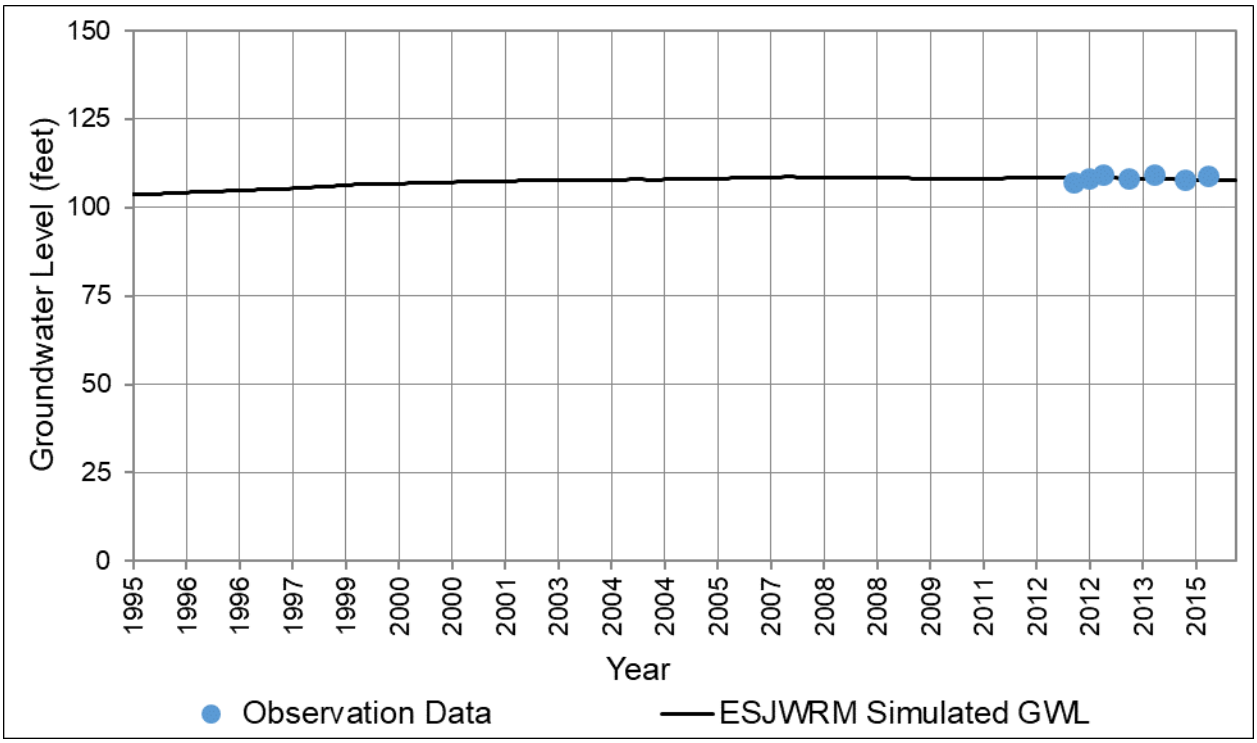


Figure 52f: ESJWRM Groundwater Level Hydrograph – Hydrograph #6

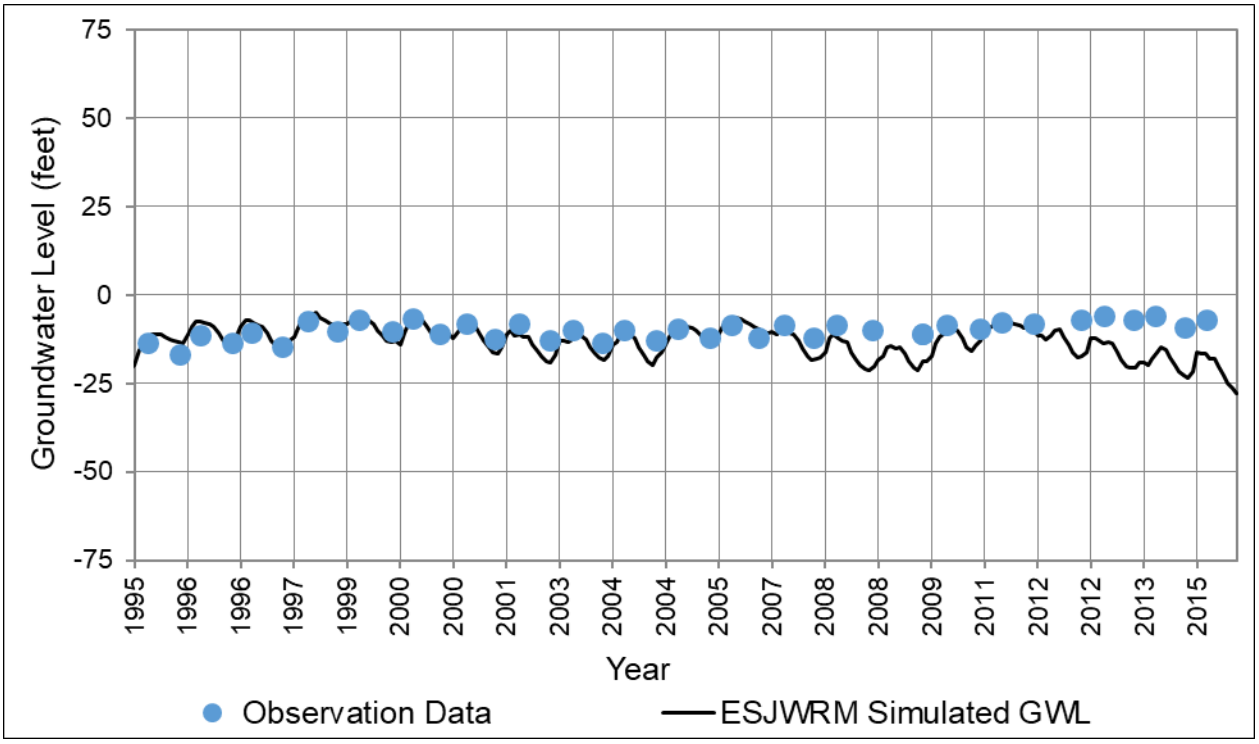


Figure 52g: ESJWRM Groundwater Level Hydrograph – Hydrograph #7

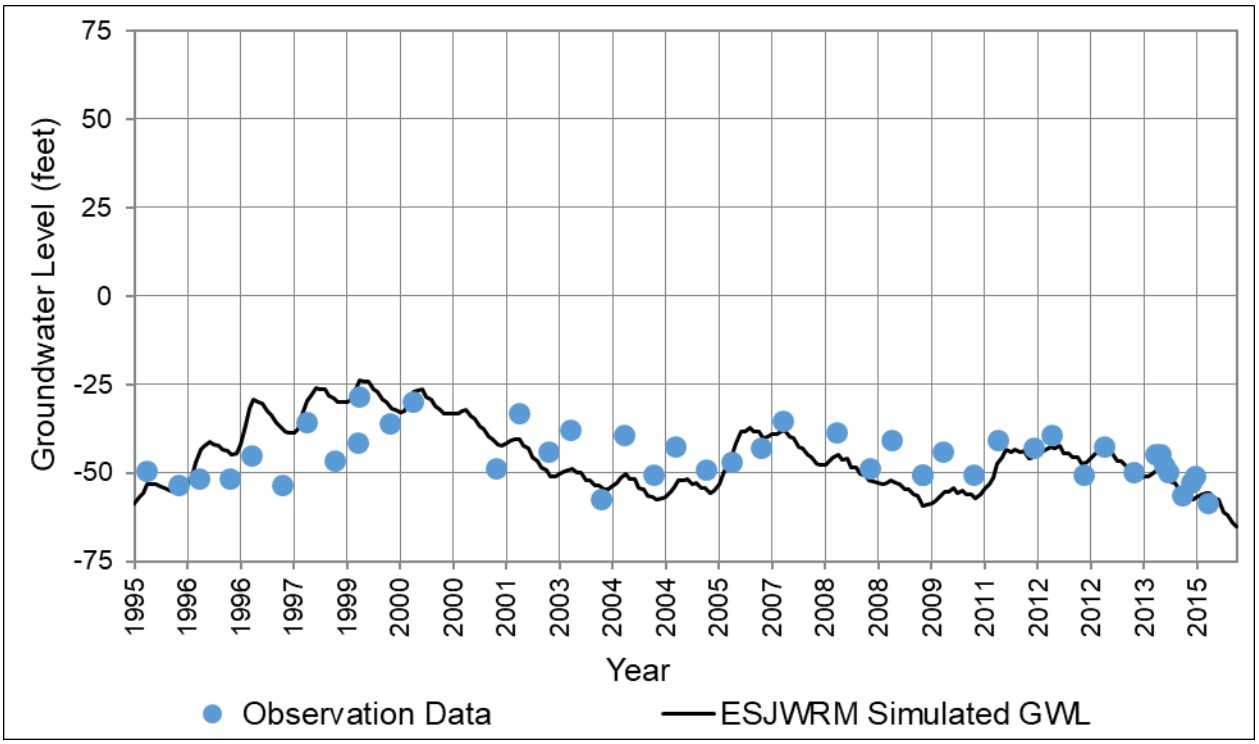


Figure 52h: ESJWRM Groundwater Level Hydrograph – Hydrograph #8

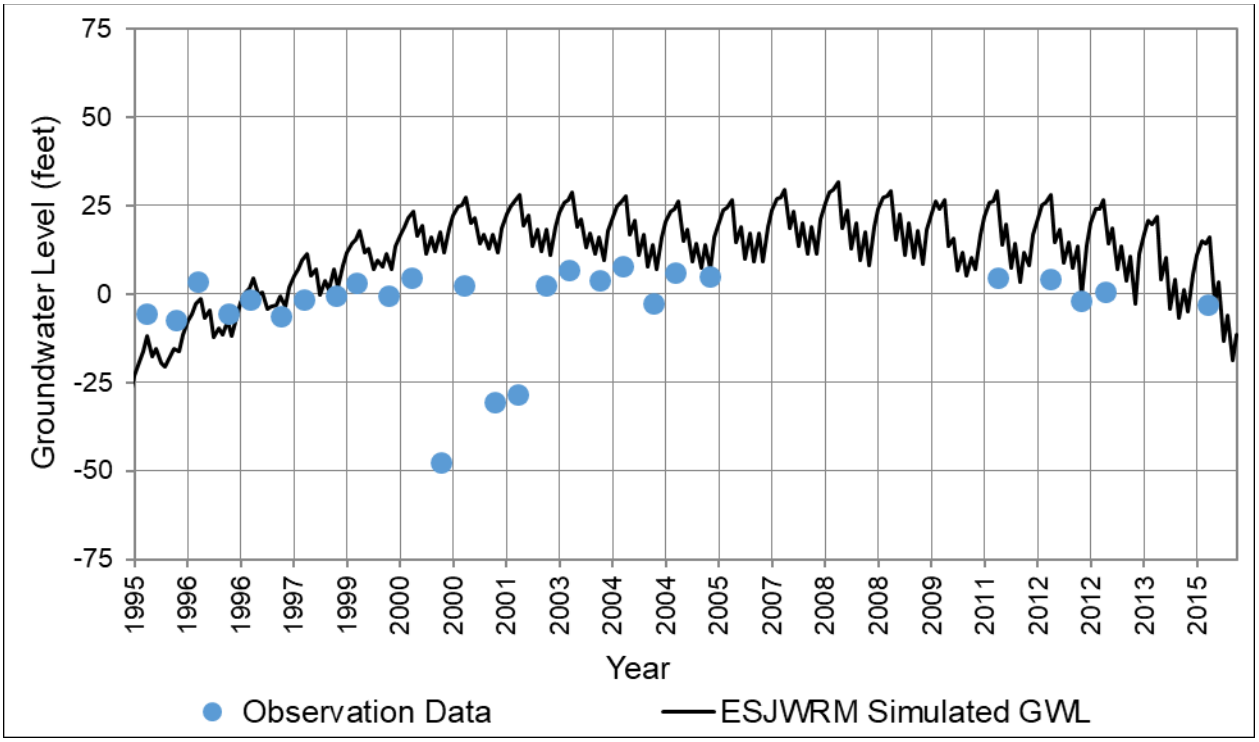


Figure 52i: ESJWRM Groundwater Level Hydrograph – Hydrograph #9

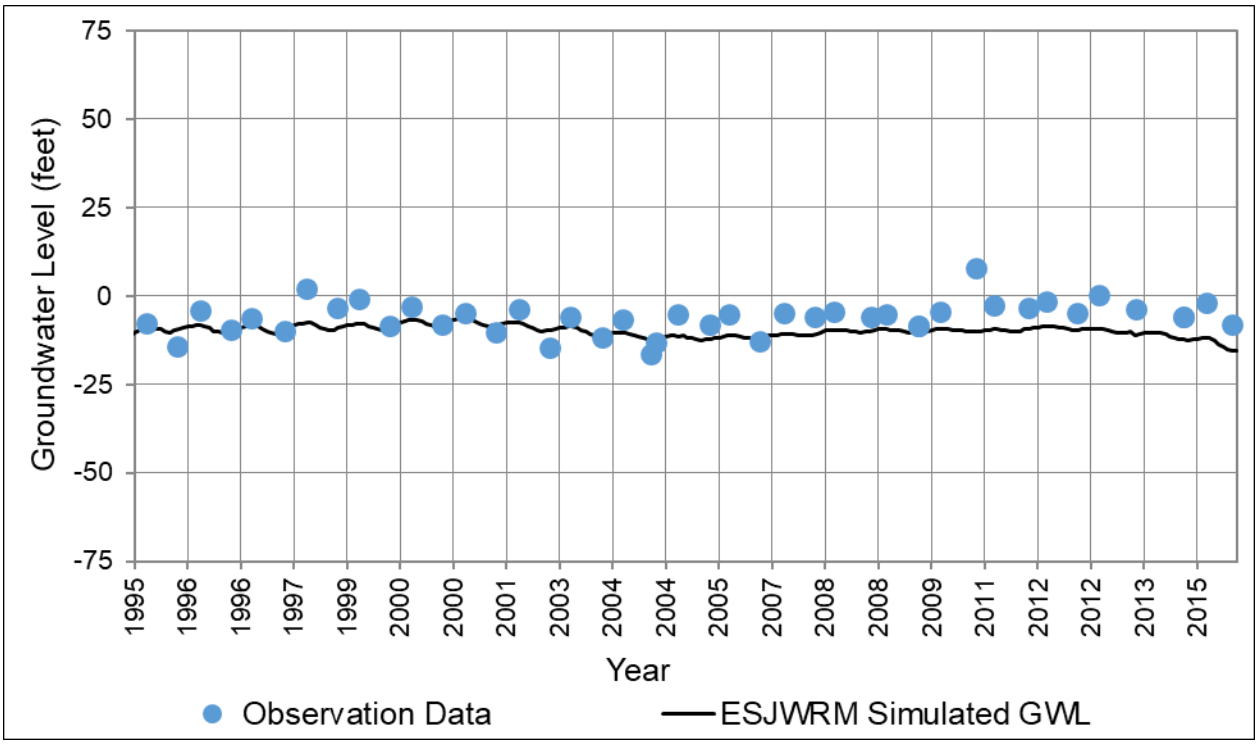


Figure 52j: ESJWRM Groundwater Level Hydrograph – Hydrograph #10

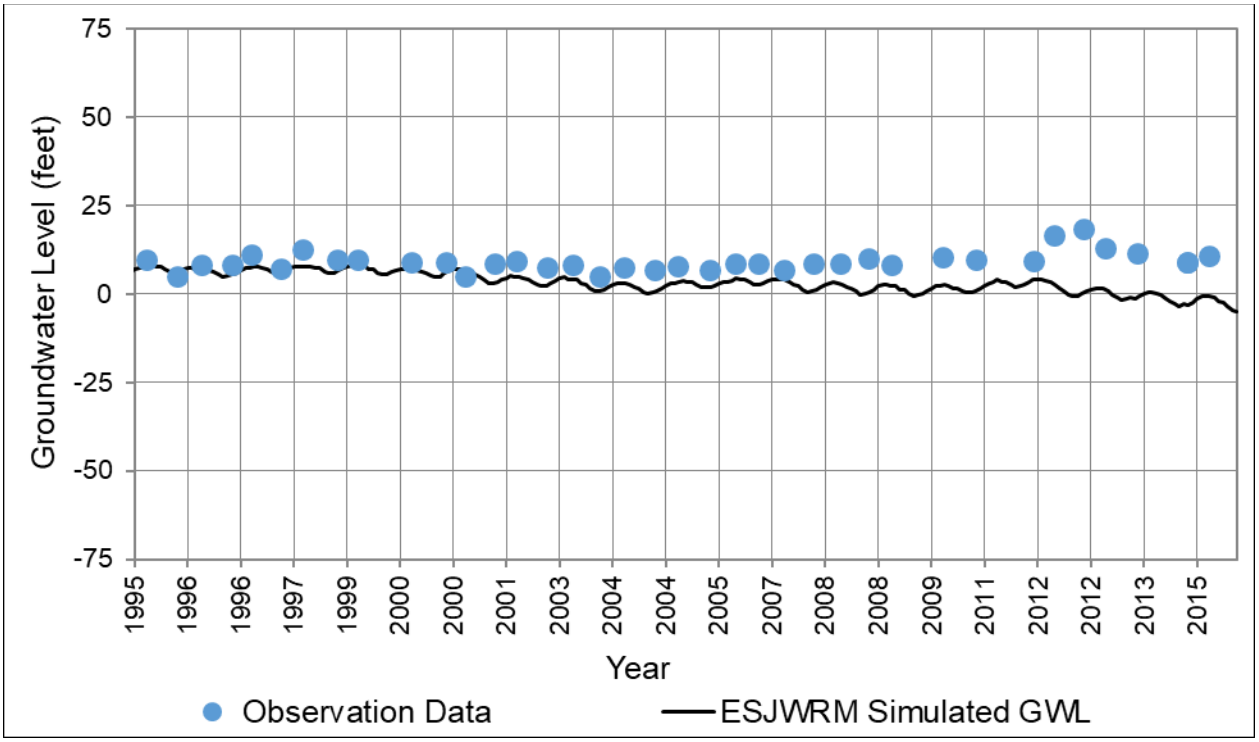


Figure 52k: ESJWRM Groundwater Level Hydrograph – Hydrograph #11

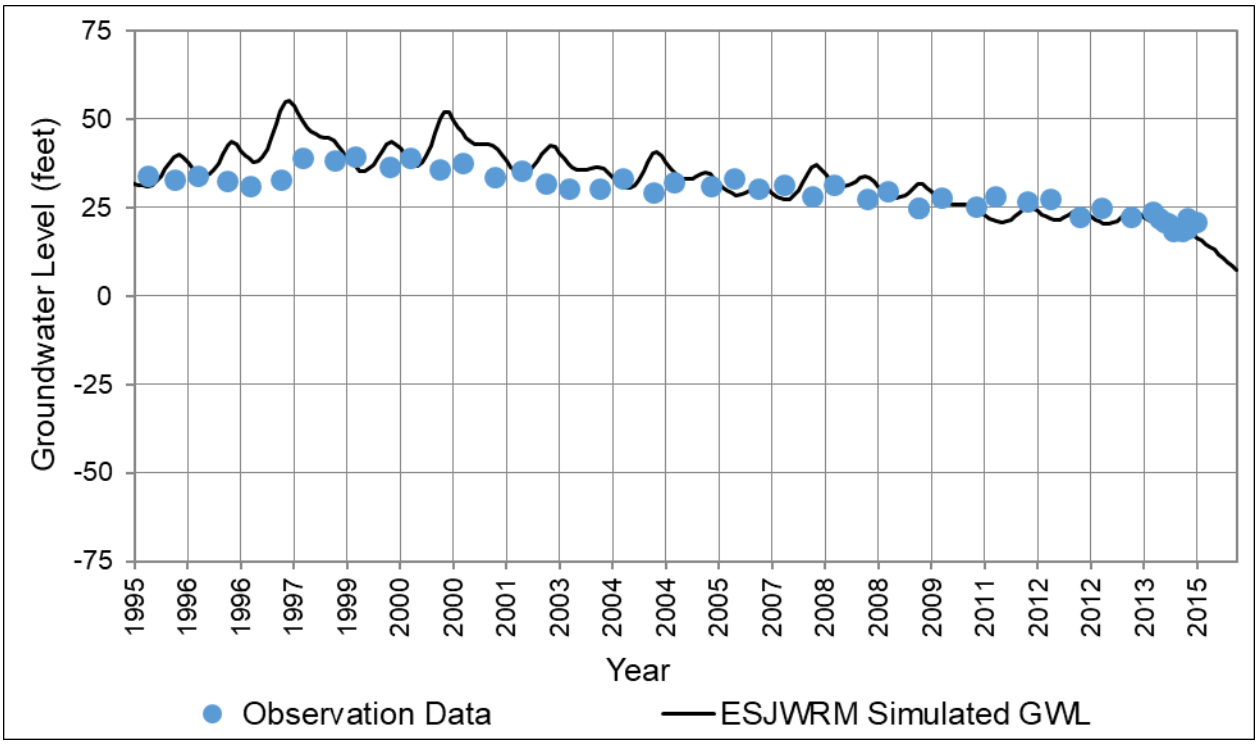


Figure 52l: ESJWRM Groundwater Level Hydrograph – Hydrograph #12

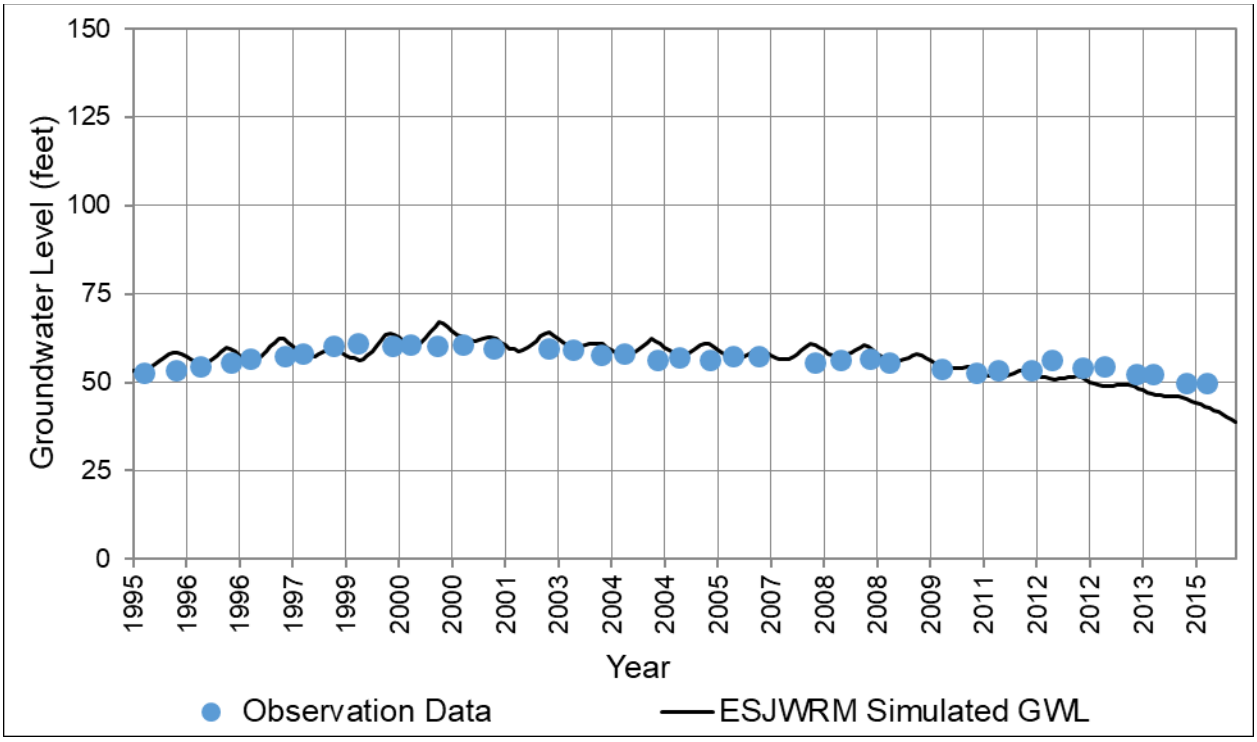


Figure 52m: ESJWRM Groundwater Level Hydrograph – Hydrograph #13

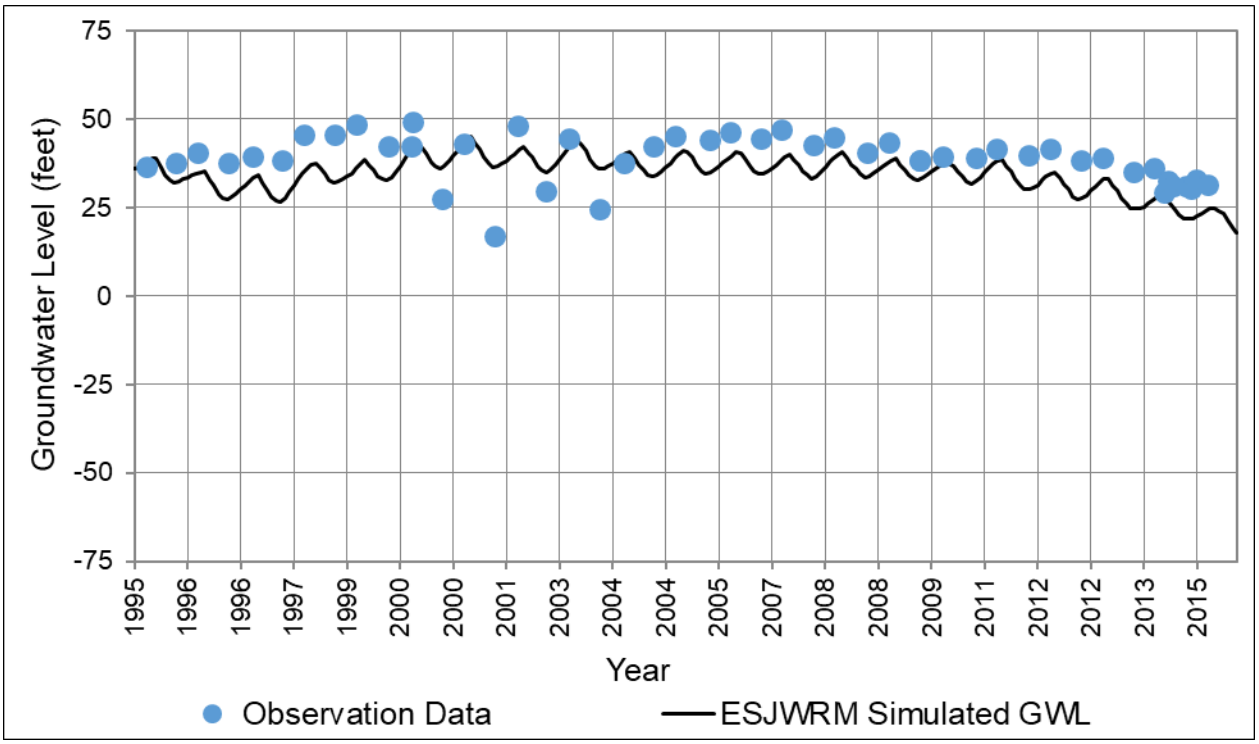


Figure 52n: ESJWRM Groundwater Level Hydrograph – Hydrograph #14

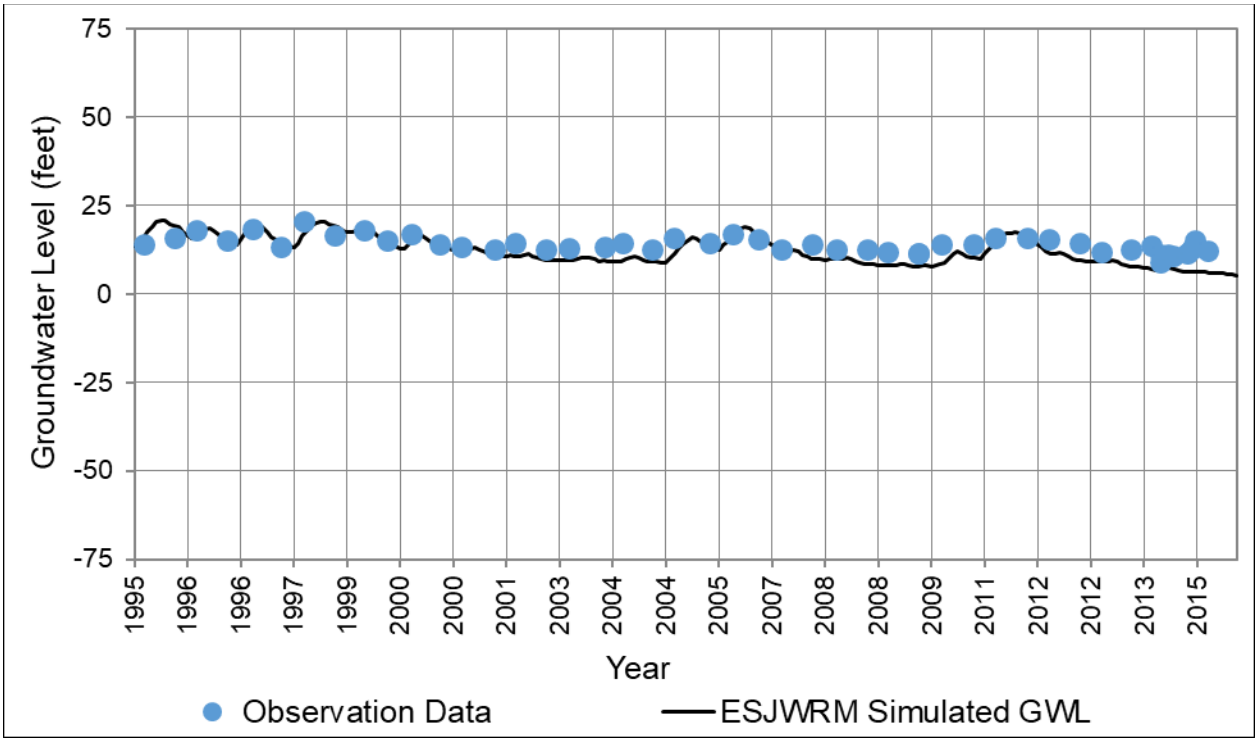


Figure 52o: ESJWRM Groundwater Level Hydrograph – Hydrograph #15

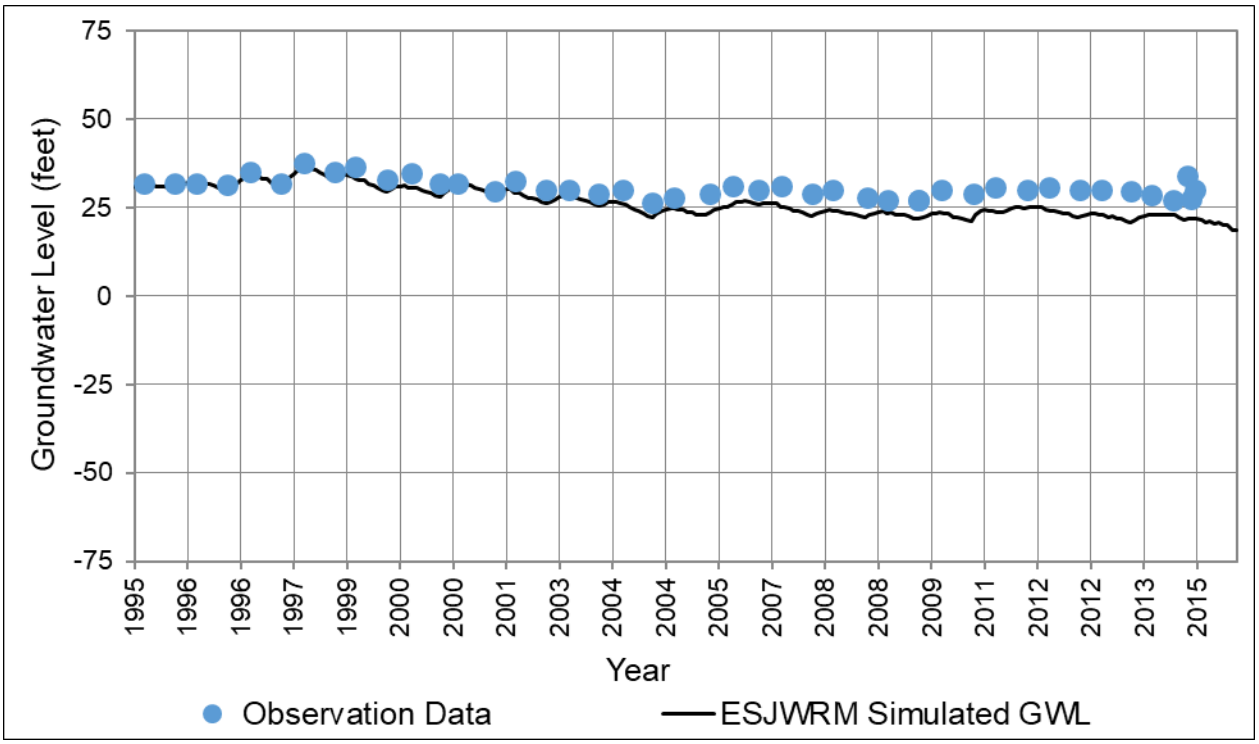


Figure 52p: ESJWRM Groundwater Level Hydrograph – Hydrograph #16

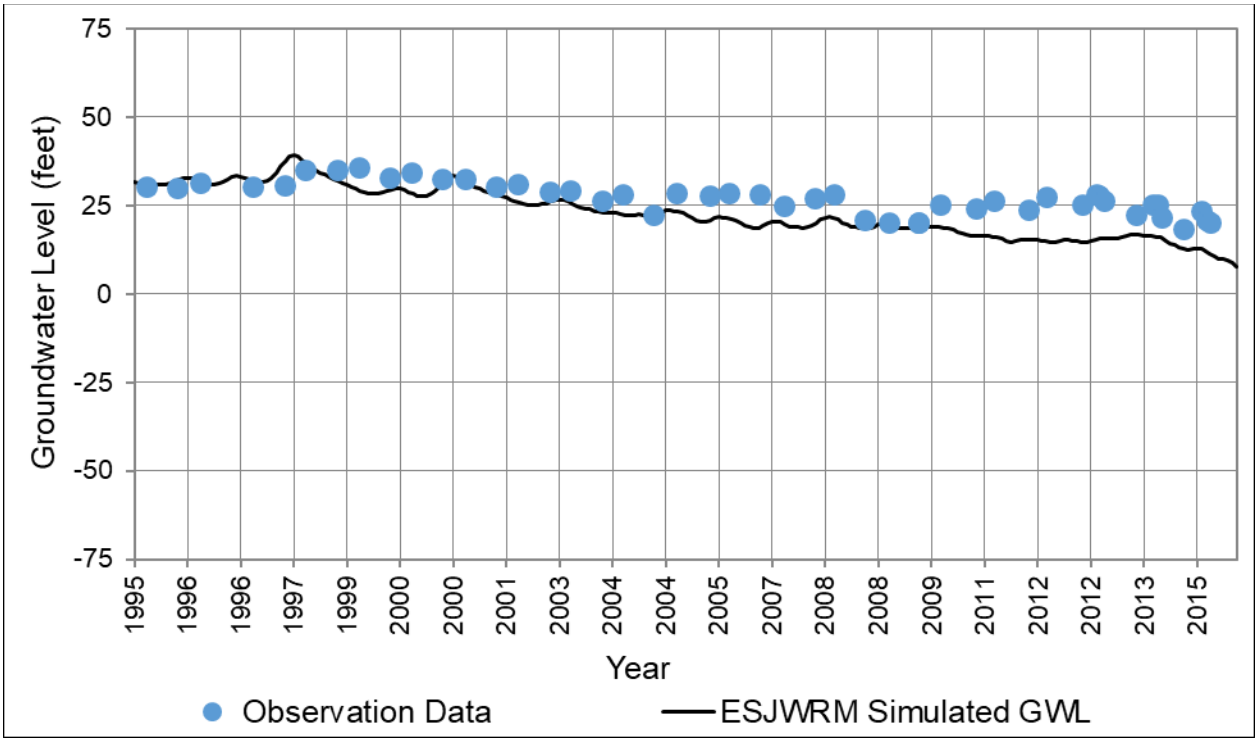


Figure 52q: ESJWRM Groundwater Level Hydrograph – Hydrograph #17

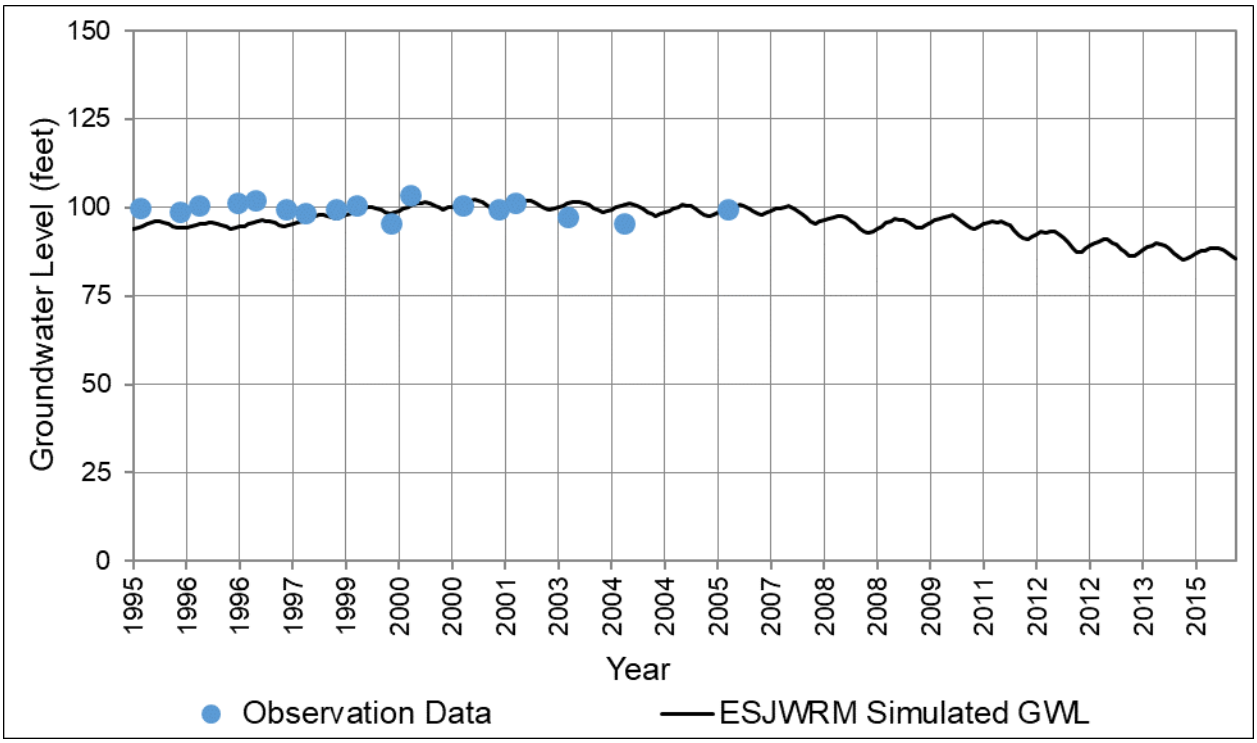


Figure 52r: ESJWRM Groundwater Level Hydrograph – Hydrograph #18

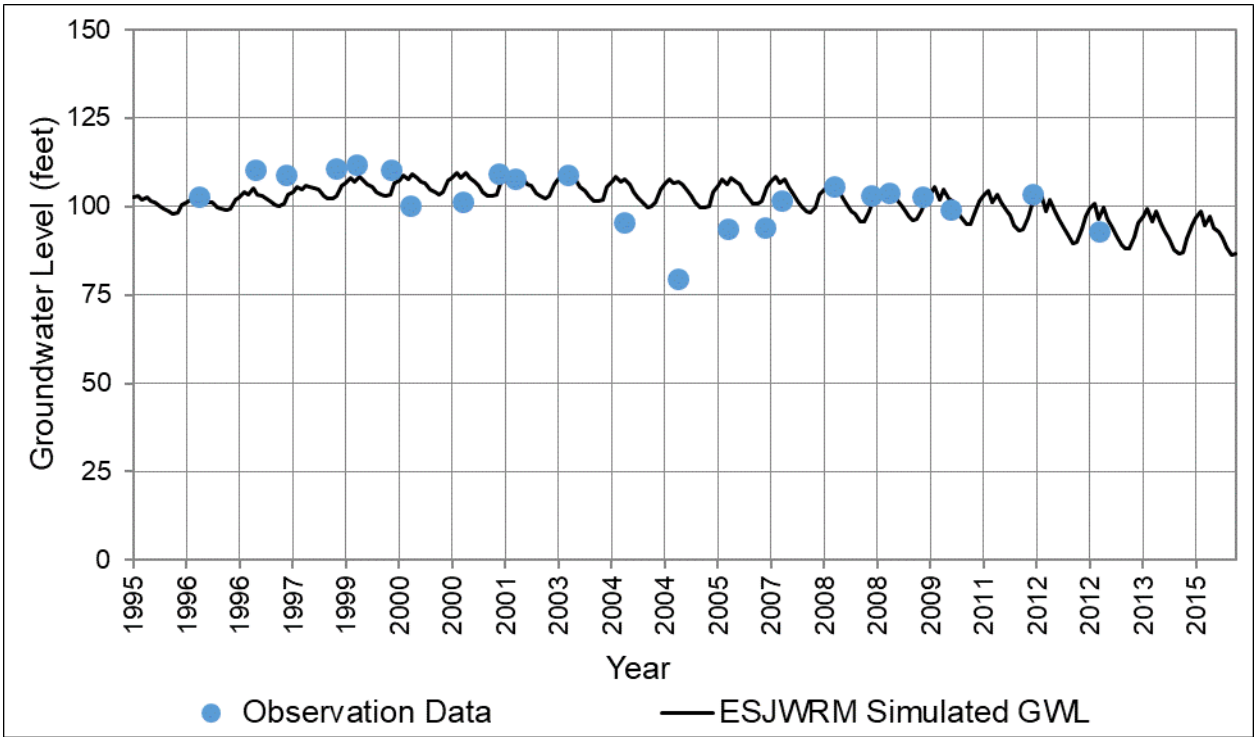


Figure 53: ESJWRM ESJ Subbasin Groundwater Level Histogram

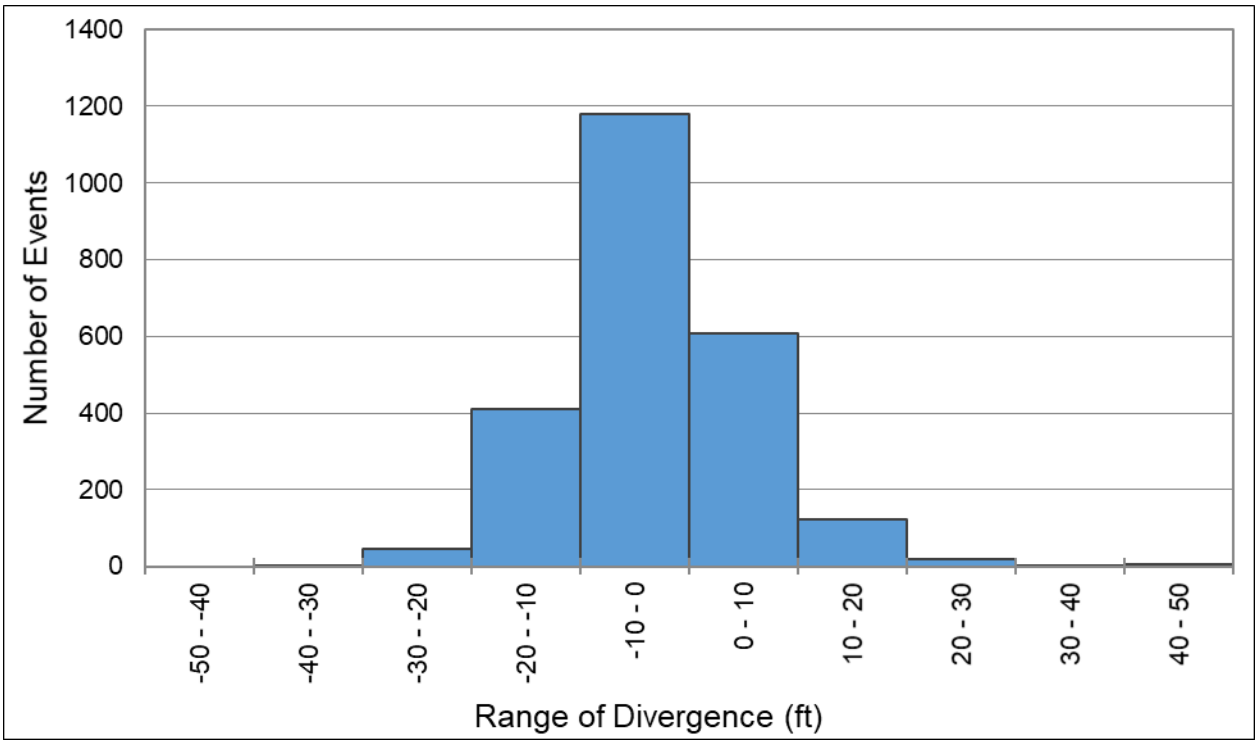


Figure 54: ESJWRM ESJ Subbasin Groundwater Level Scatter Plot

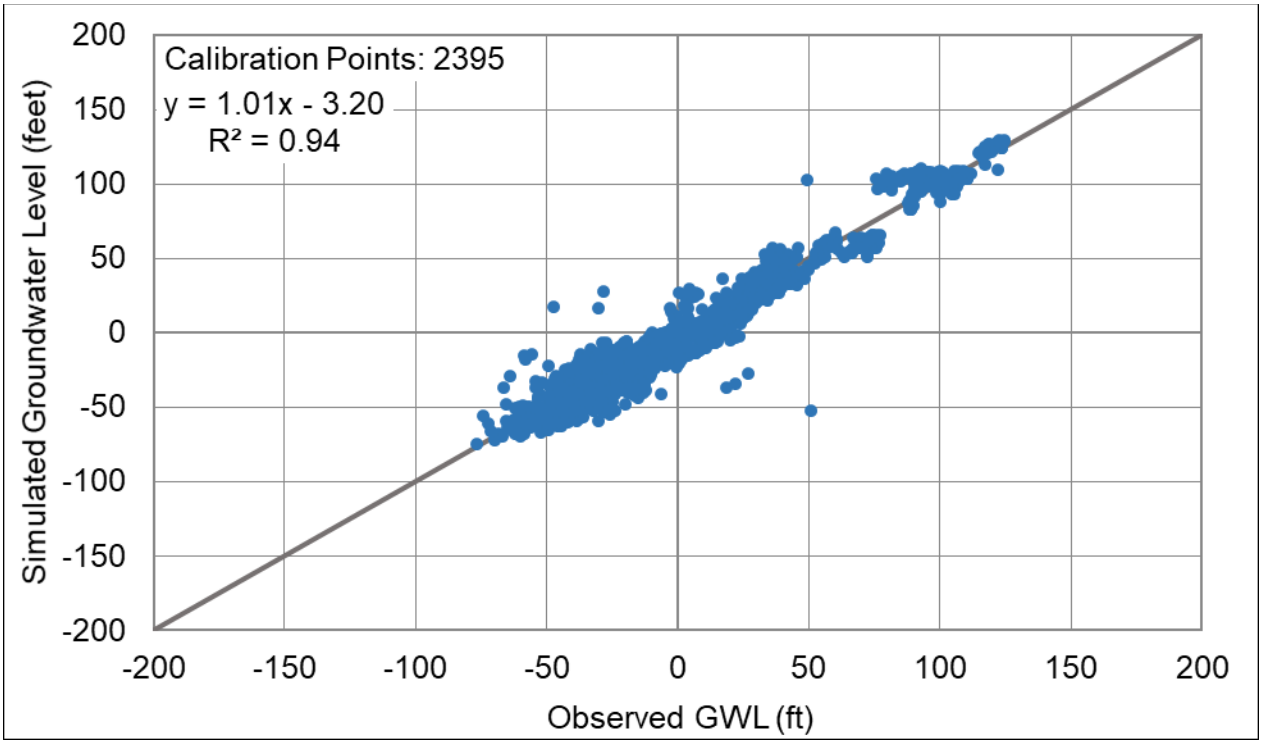


Figure 55: ESJWRM Parametric Grid

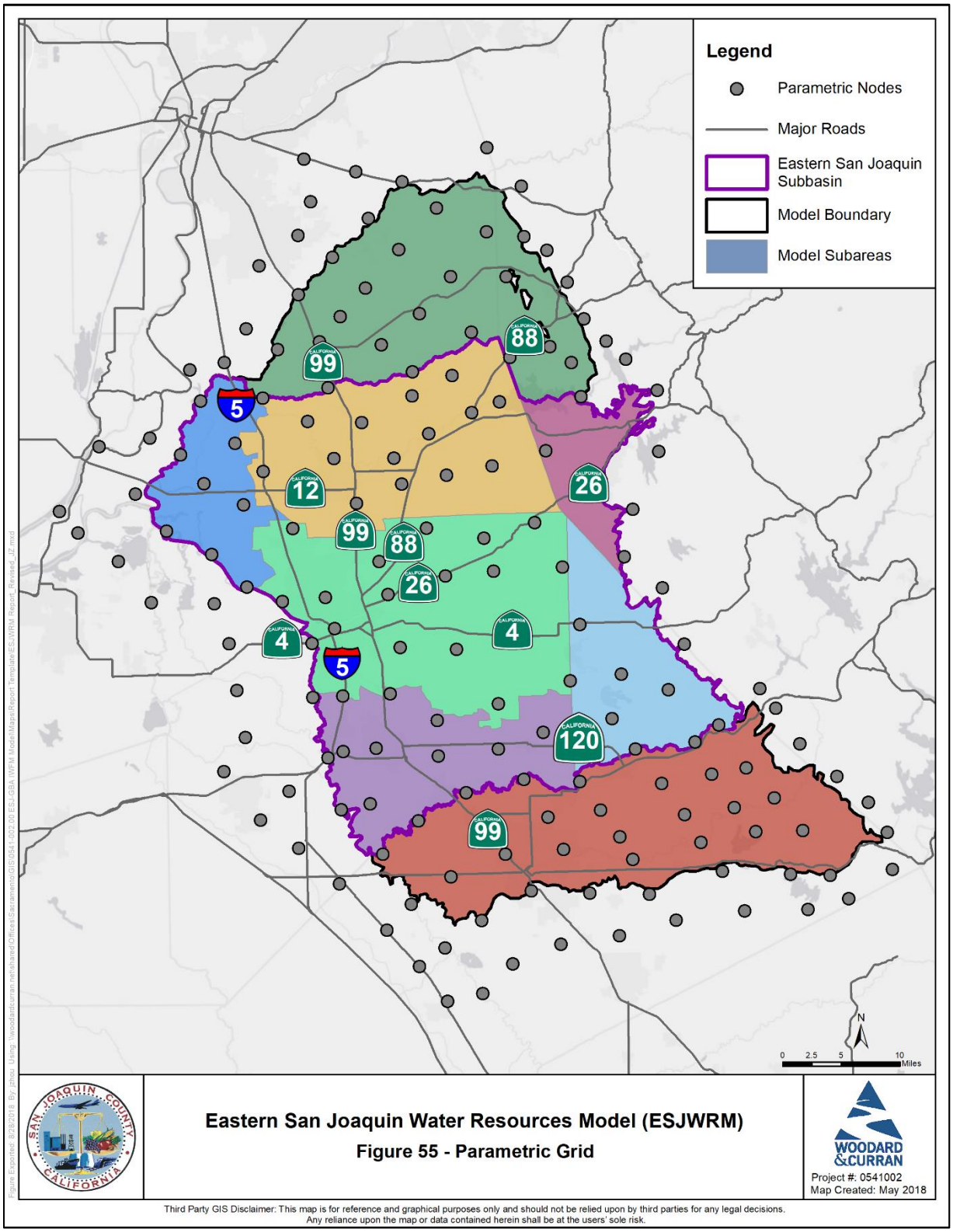


Figure 56: ESJWRM Layer 1 Horizontal Hydraulic Conductivity

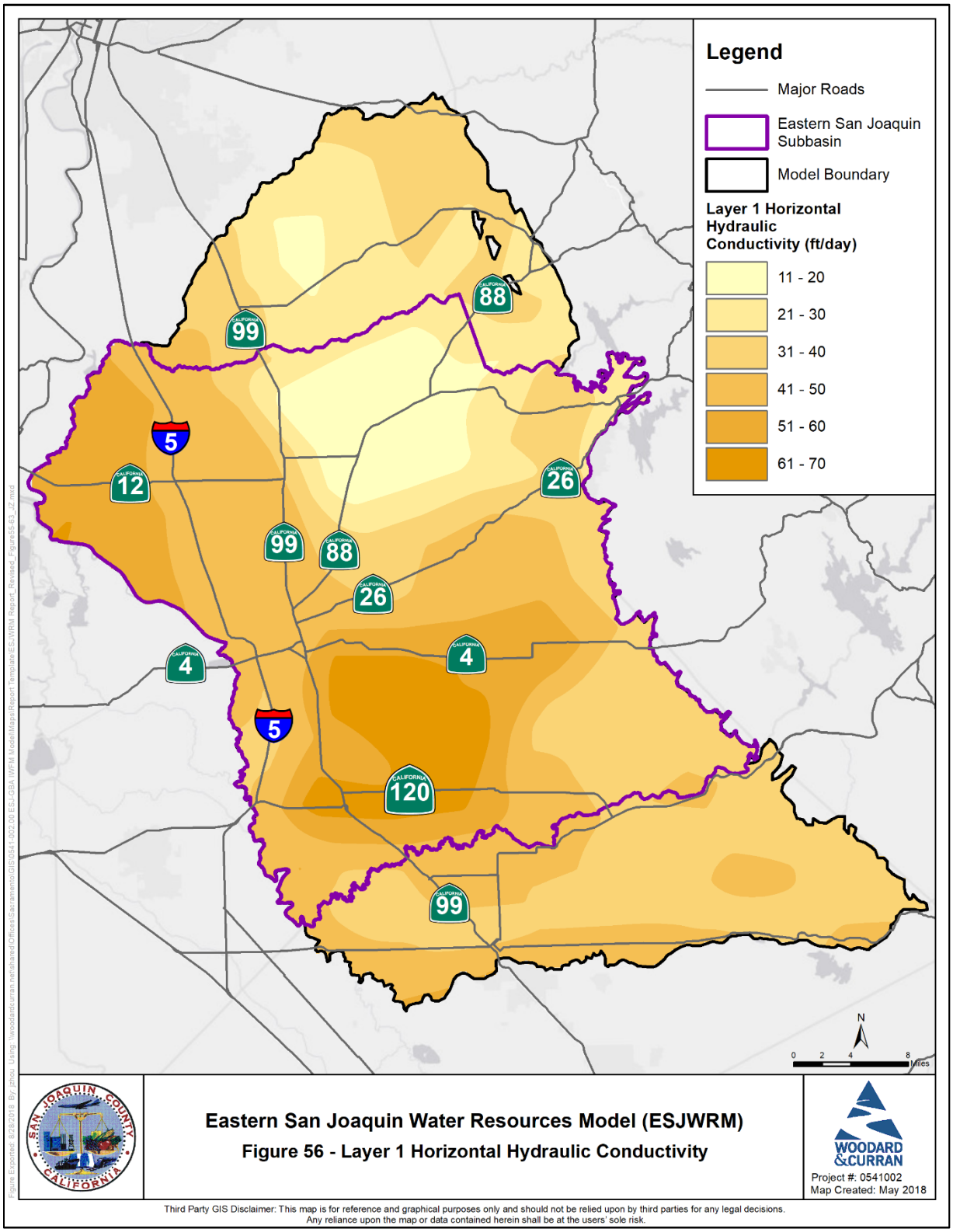


Figure 57: ESJWRM Layer 2 Horizontal Hydraulic Conductivity

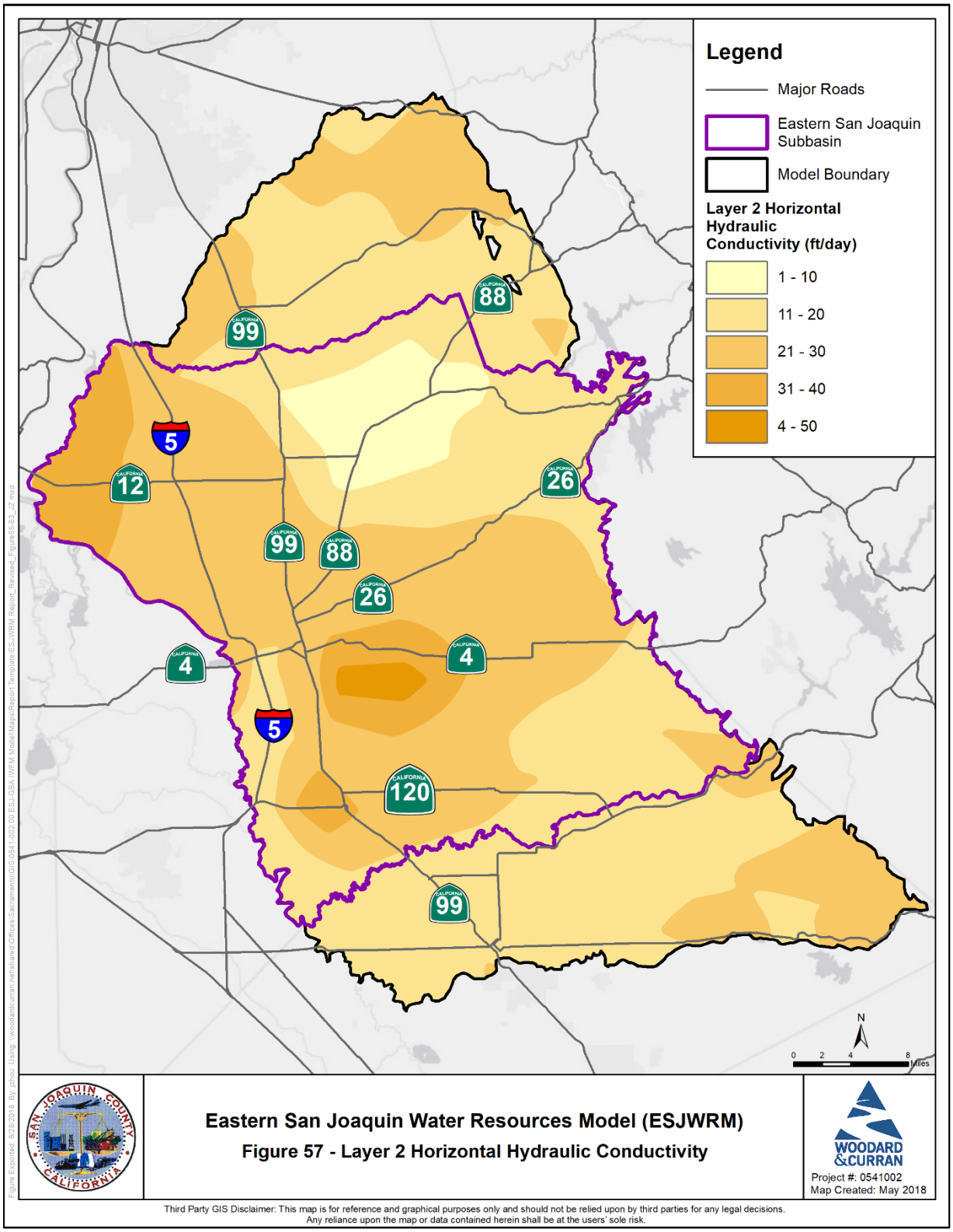


Figure 58: ESJWRM Layer 3 Horizontal Hydraulic Conductivity

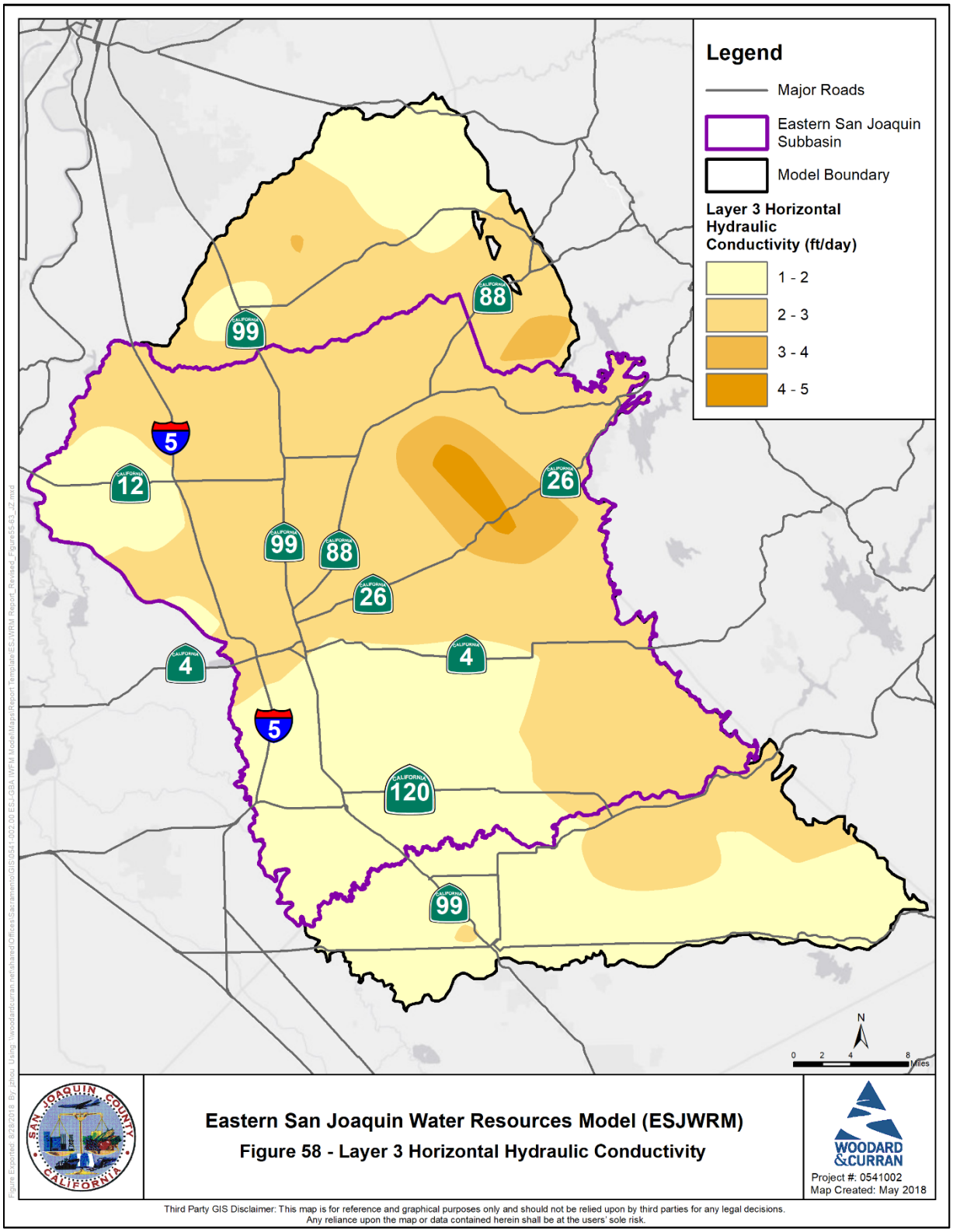


Figure 59: ESJWRM Layer 1 Specific Storage

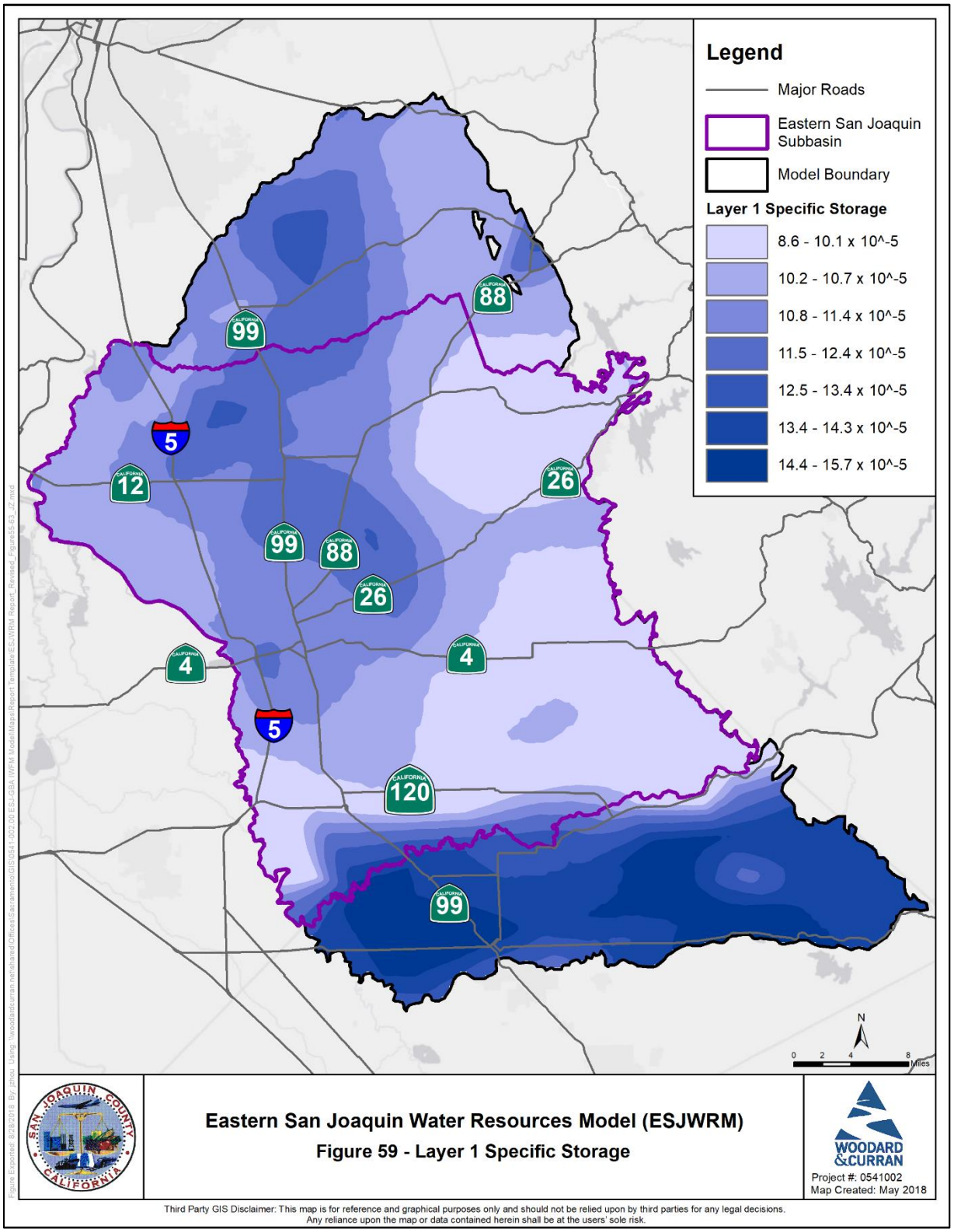


Figure 60: ESJWRM Layer 2 Specific Storage

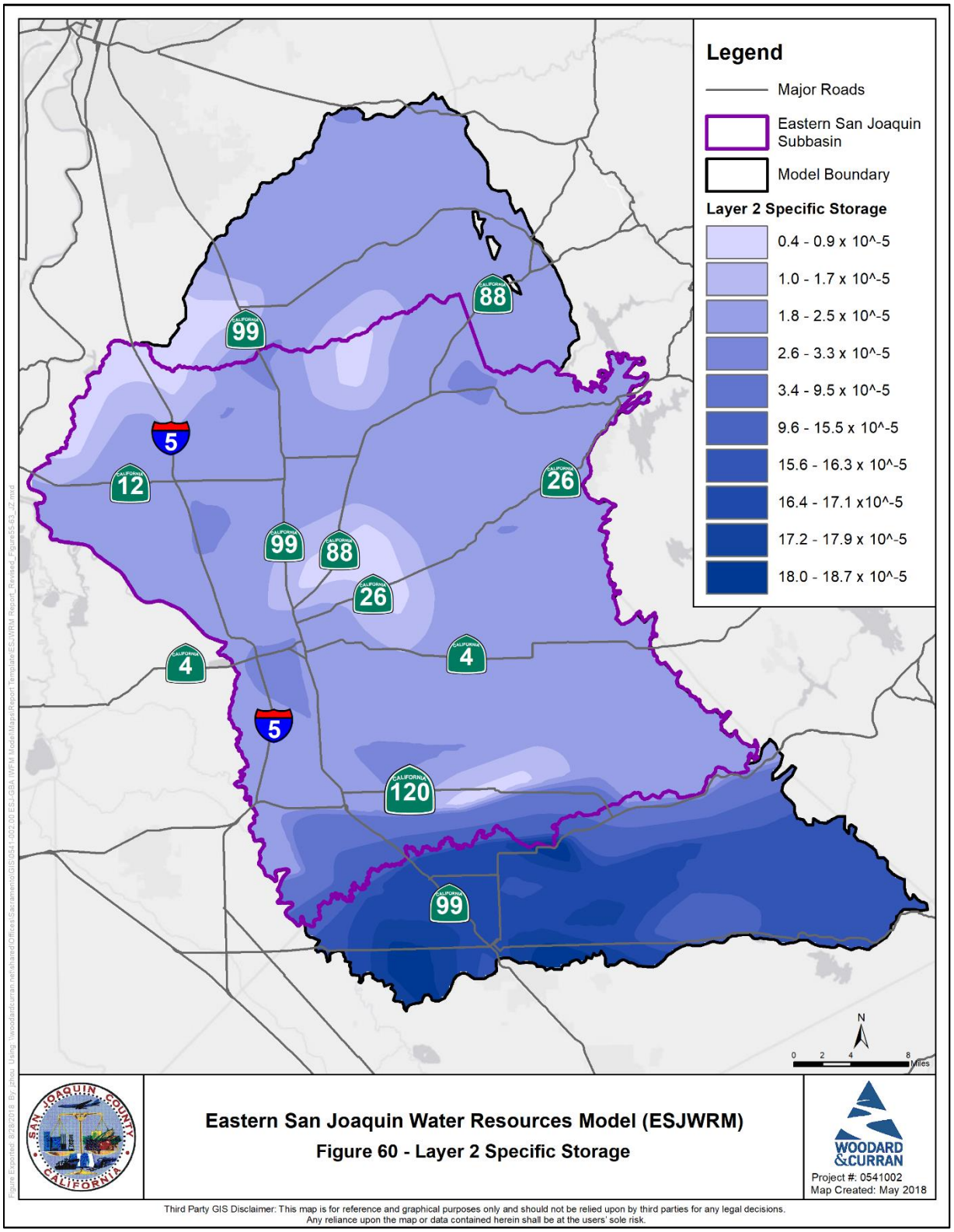


Figure 61: ESJWRM Layer 3 Specific Storage

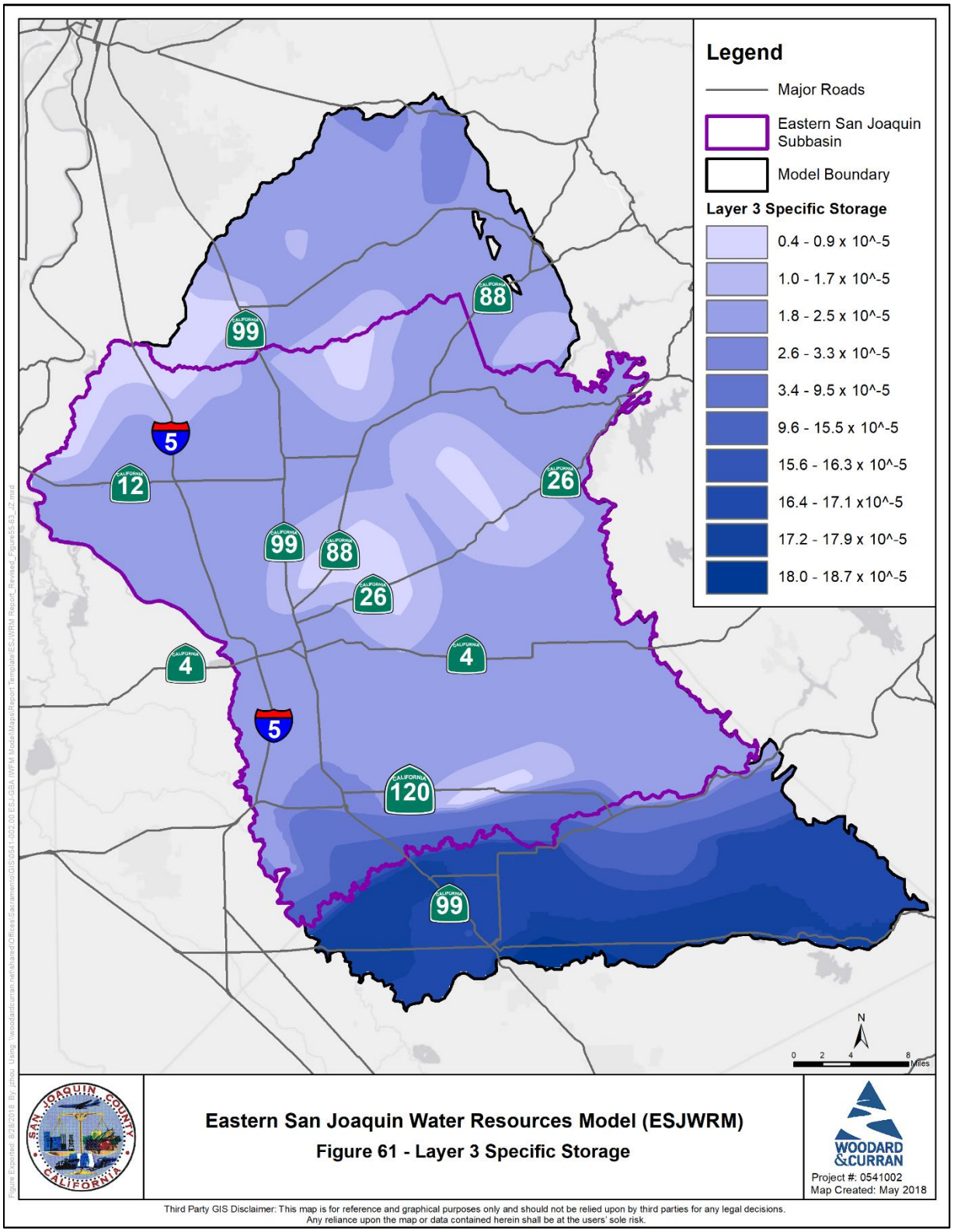


Figure 62: ESJWRM Layer 1 Specific Yield

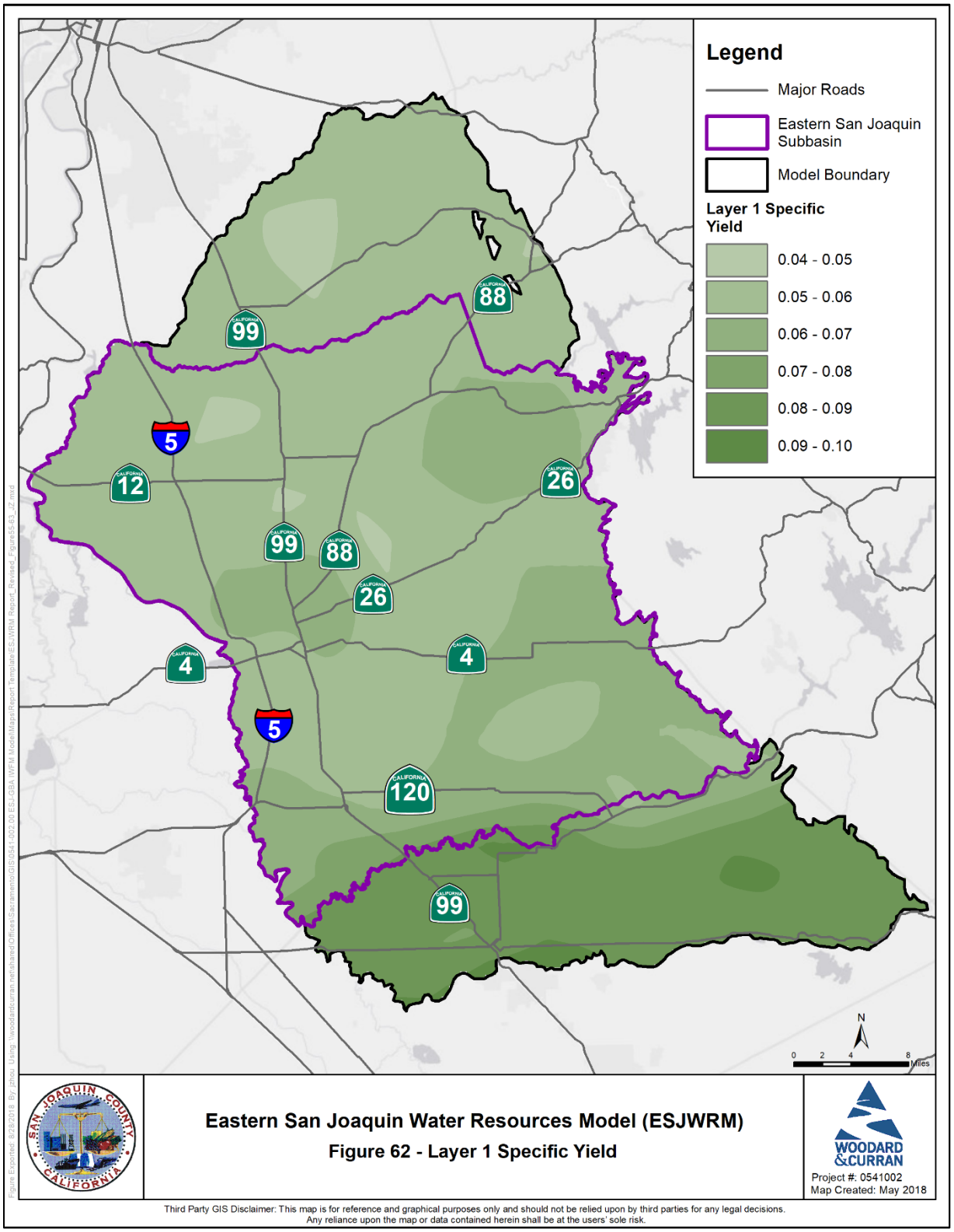


Figure 63: ESJWRM Layer 2 Specific Yield

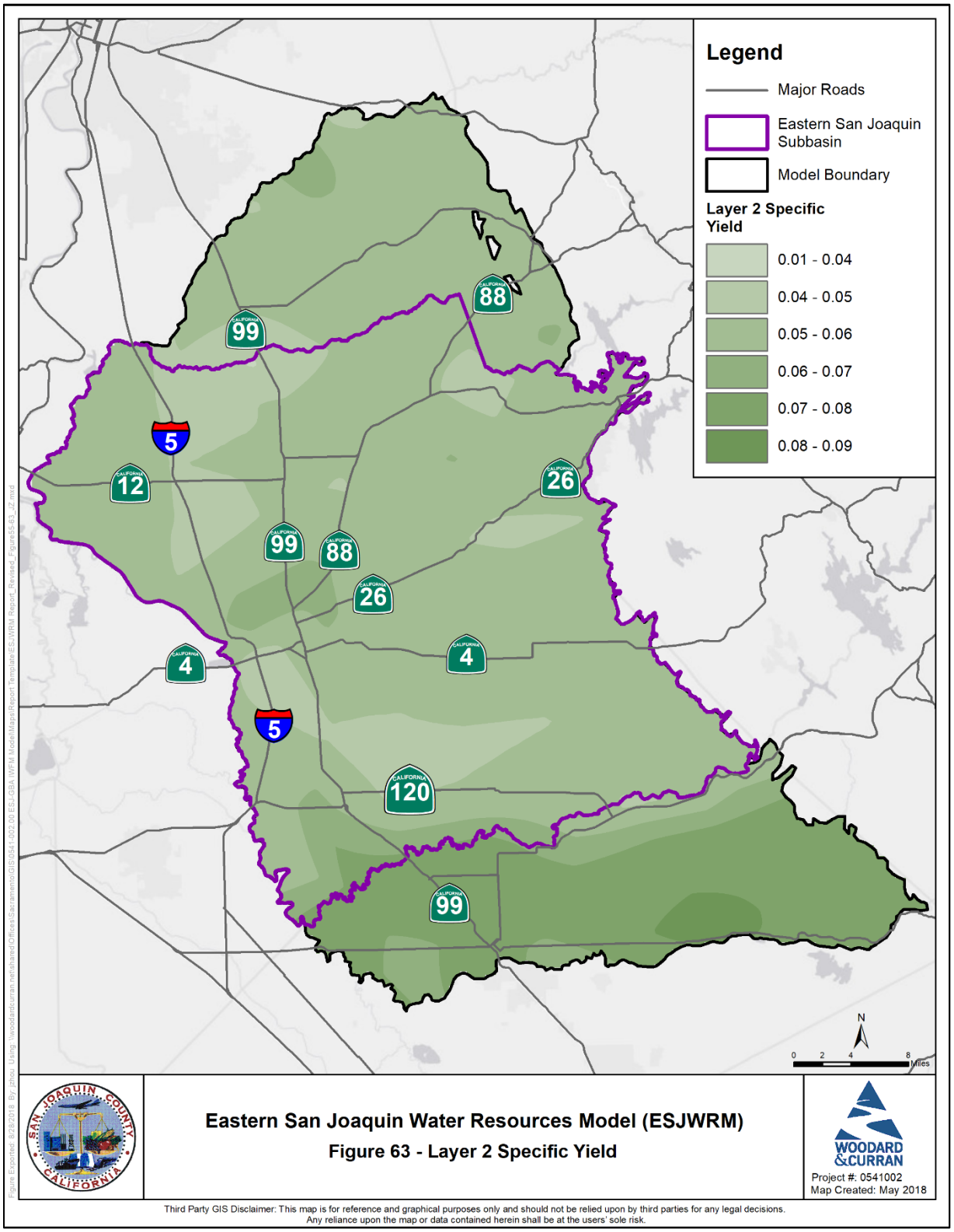


Figure 64: ESJWRM Layer 3 Specific Yield

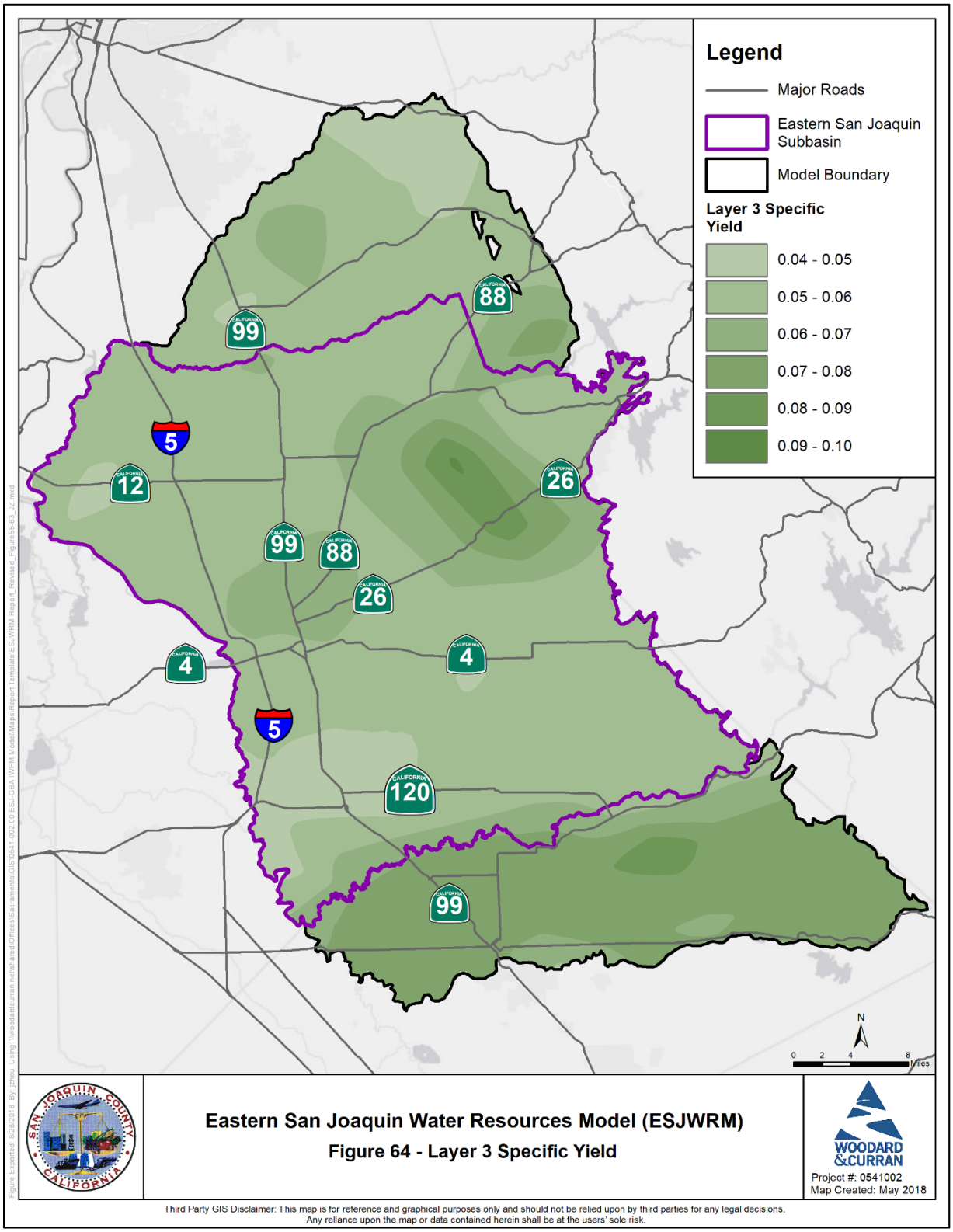


Figure 65: ESJWRM Sensitivity Analysis of Horizontal Hydraulic Conductivity – Difference in Average Groundwater Elevation (feet)

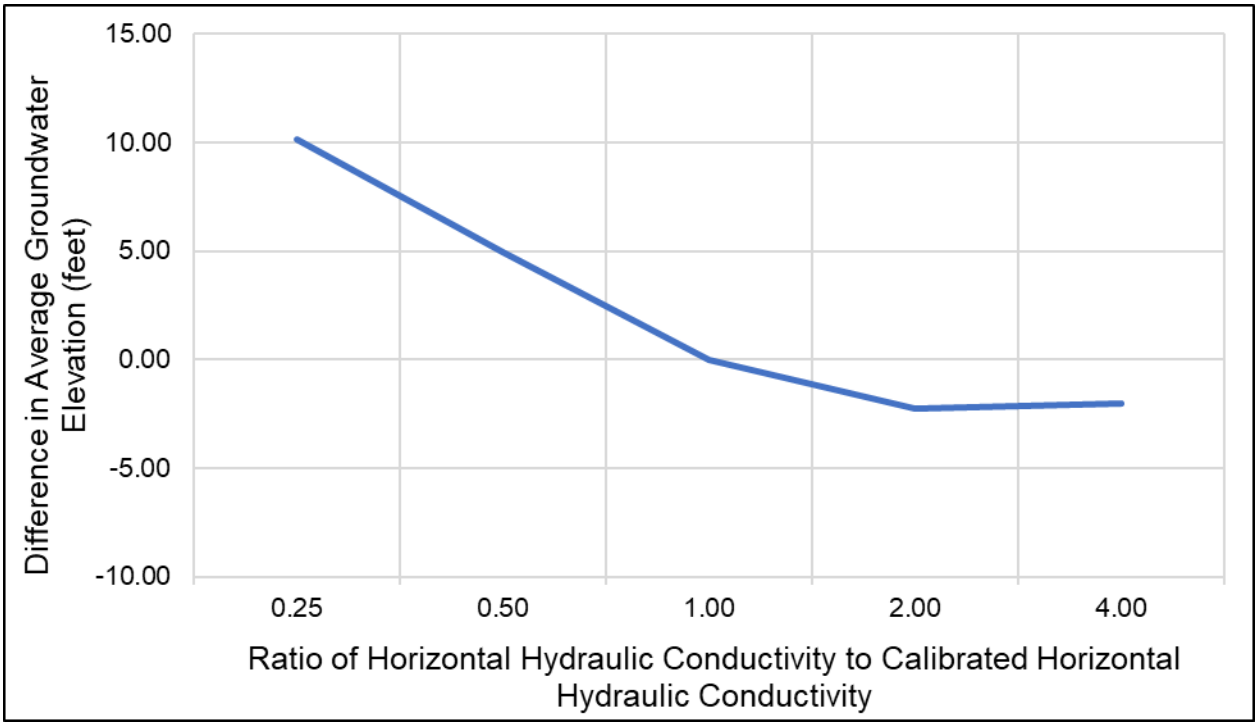


Figure 66: ESJWRM Sensitivity Analysis of Horizontal Hydraulic Conductivity – Relative Root Mean Square Error

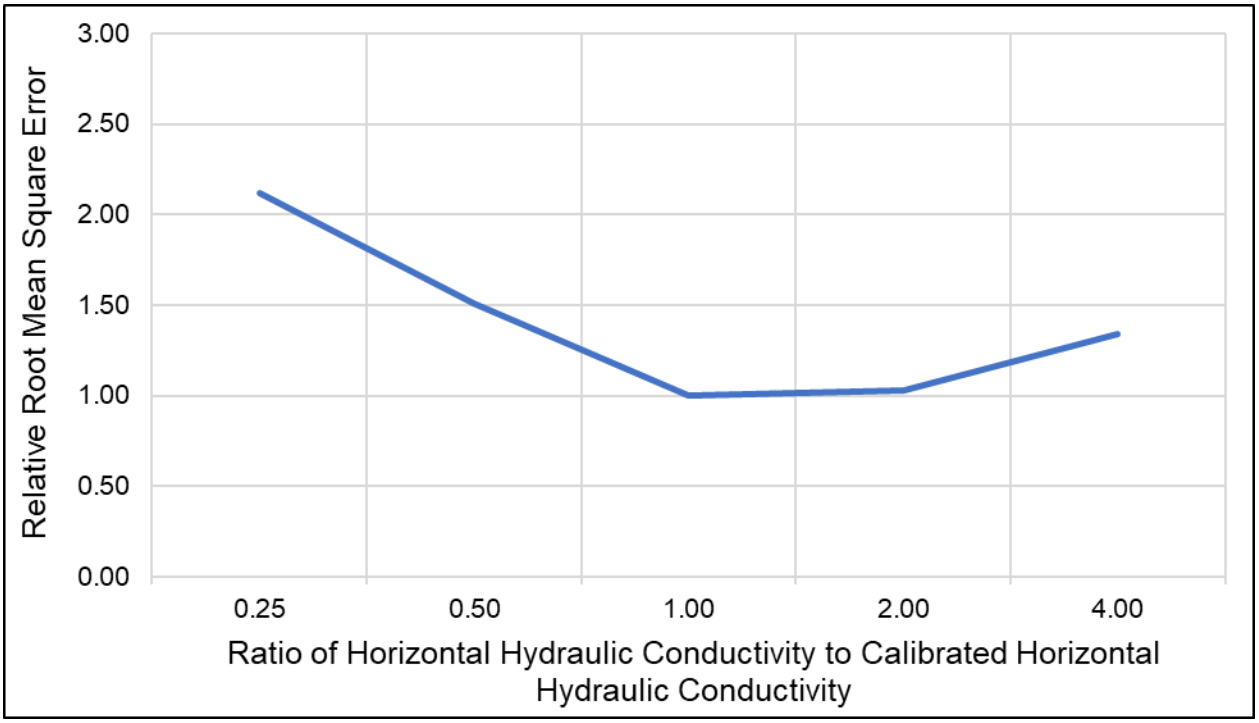


Figure 67: ESJWRM Sensitivity Analysis of Vertical Hydraulic Conductivity – Difference in Average Groundwater Elevation (feet)

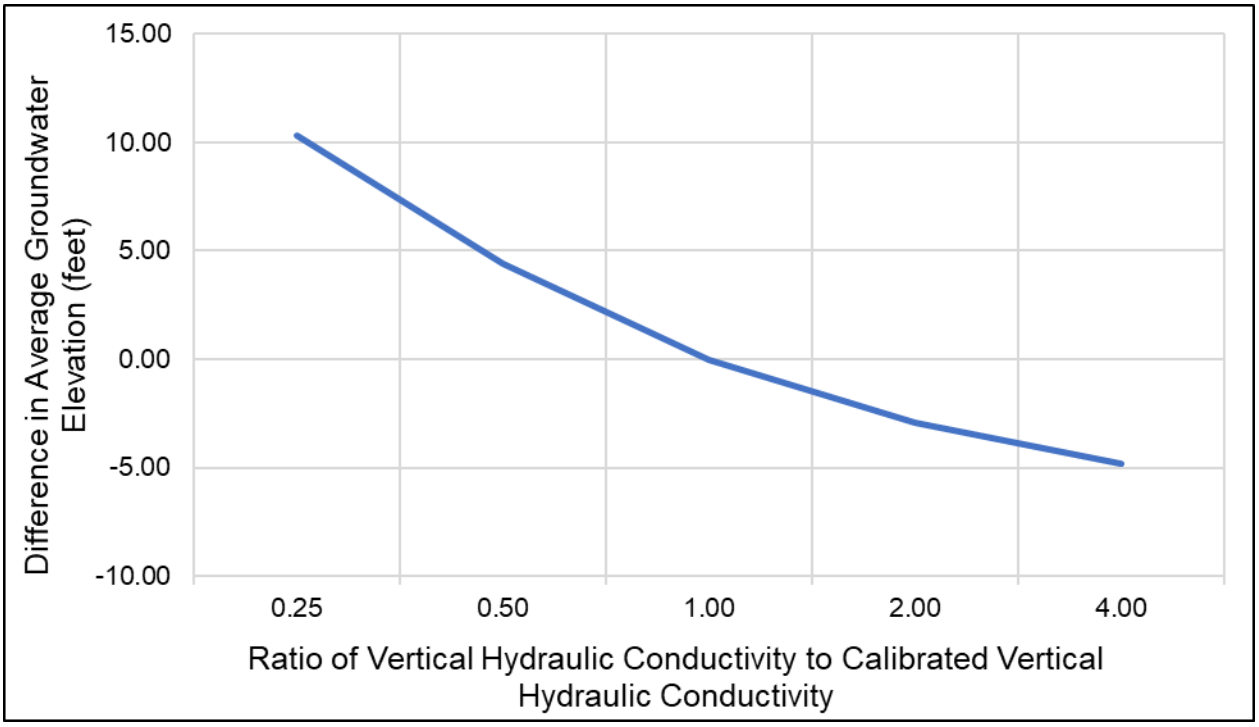


Figure 68: ESJWRM Sensitivity Analysis of Vertical Hydraulic Conductivity – Relative Root Mean Square Error

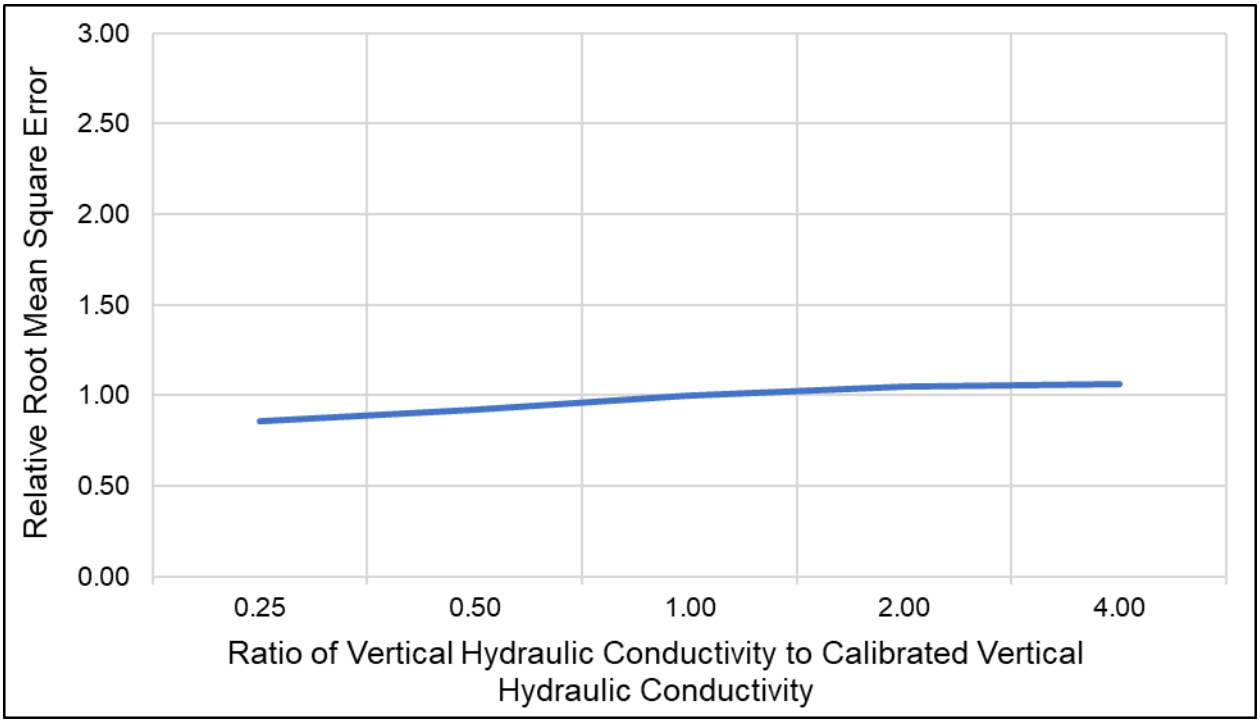


Figure 69: ESJWRM Sensitivity Analysis of Specific Storage – Difference in Average Groundwater Elevation (feet)

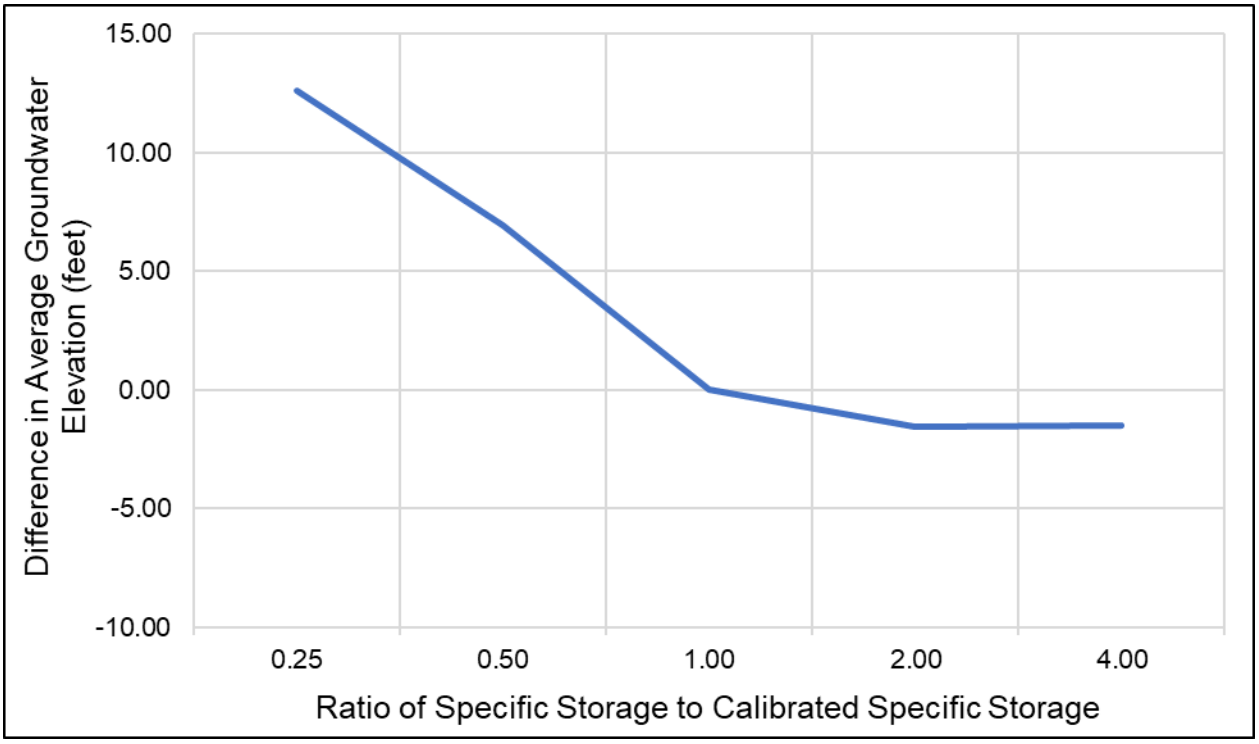


Figure 70: ESJWRM Sensitivity Analysis of Specific Storage – Relative Root Mean Square Error

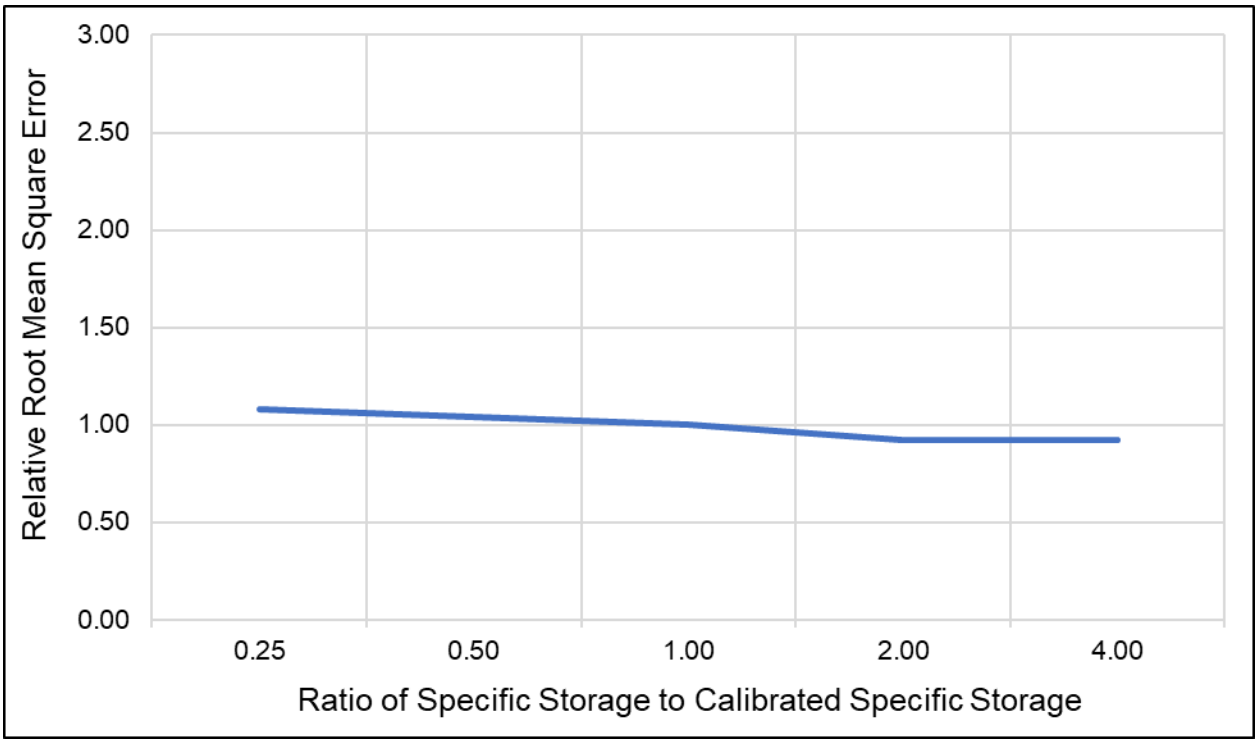


Figure 71: ESJWRM Sensitivity Analysis of Specific Yield – Difference in Average Groundwater Elevation (feet)

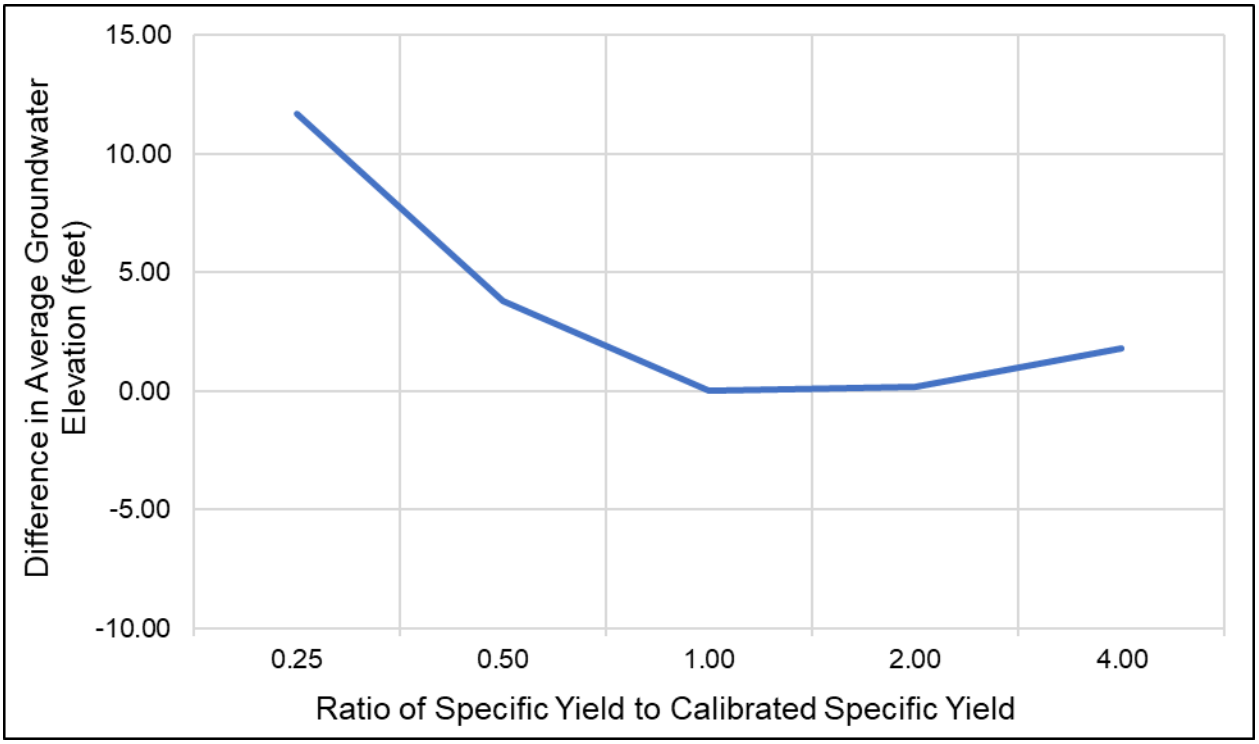


Figure 72: ESJWRM Sensitivity Analysis of Specific Yield – Relative Root Mean Square Error

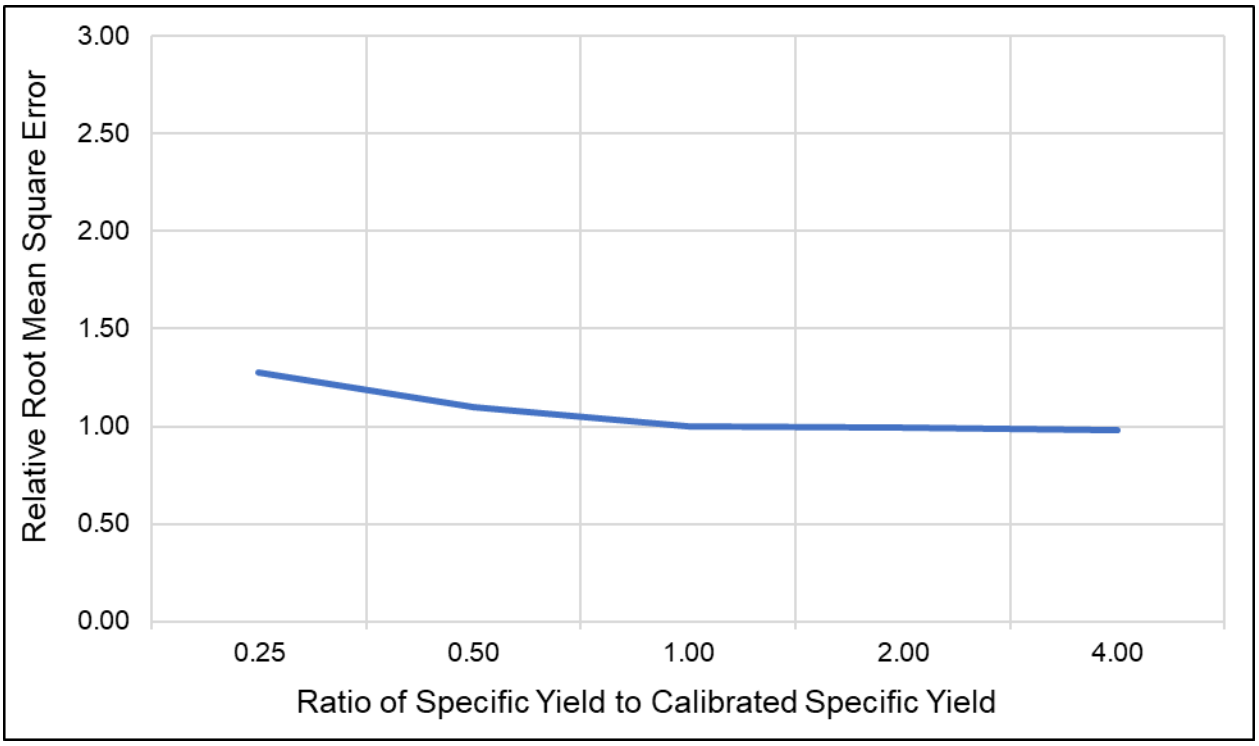


Figure 73: ESJWRM Sensitivity Analysis of Streambed Conductance – Difference in Average Groundwater Elevation (feet)

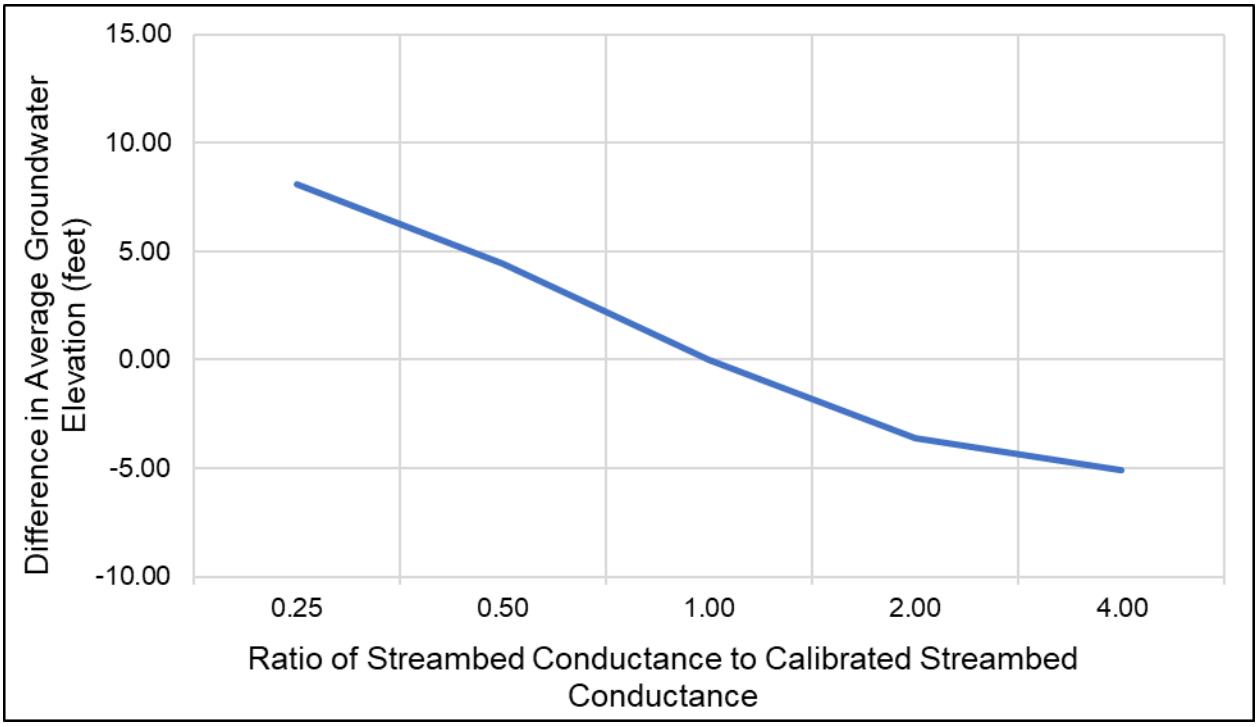
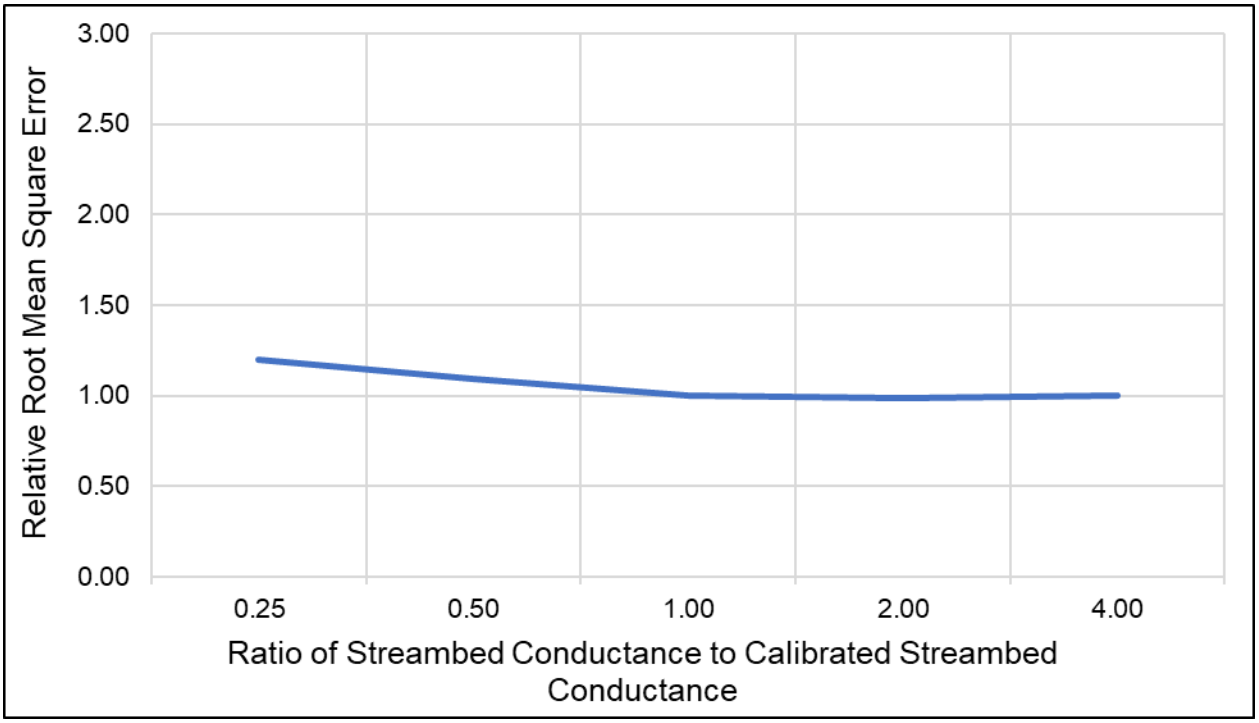


Figure 74: ESJWRM Sensitivity Analysis of Streambed Conductance – Relative Root Mean Square Error



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COMMITMENT & INTEGRITY DRIVE RESULTS

WOODARD &CURRAN

EASTERN SAN JOAQUIN WATER RESOURCES MODEL (ESJWRM)

Final Report Appendices

August 2018

APPENDIX A: PRESENTATIONS TO TECHNICAL REVIEW COMMITTEE

Sustainable Groundwater Management Act Readiness Project

Meeting No. 1

September 28, 2016

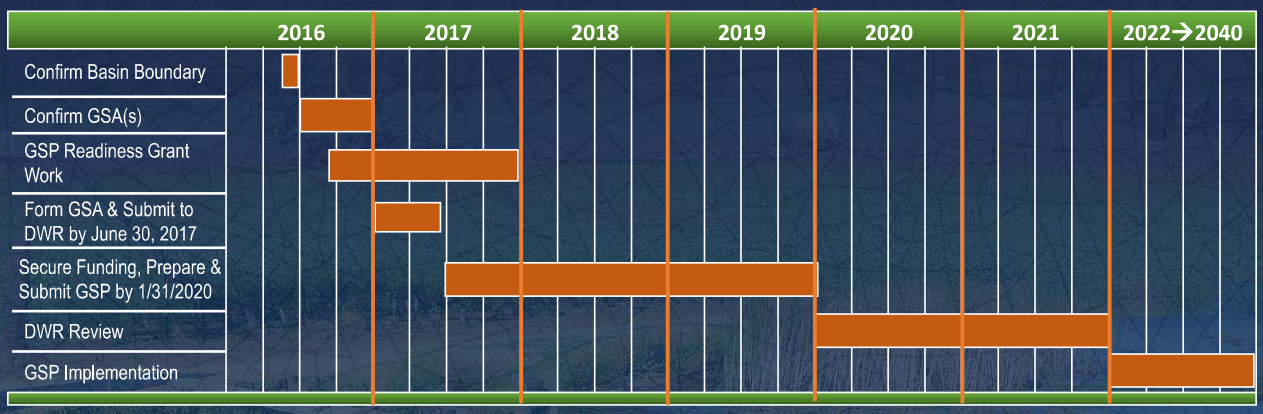
RMC water and environment

Complex Challenges | Innovative Solutions

Project Kick-Off Meeting
September 28, 2016
Agenda

- Introductions
- Project Logistics
- Schedule
- Work Plan Review
- Issues/Concerns
- Coordination with Other On-Going Activities
- Other

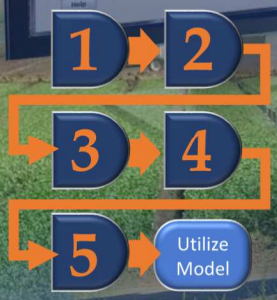
SGMA Timeline



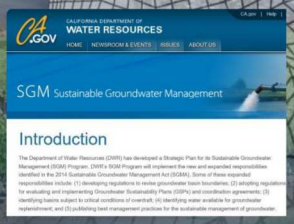
Project General Schedule

Our Approach Focuses on Delivering a Useful and Accepted Model that Meets Your Future Needs

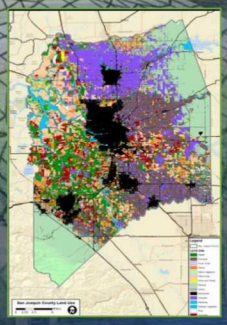
CHALLENGE 1
Confirming Proposed Approach



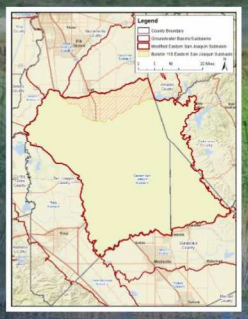
CHALLENGE 2
Maintaining Compliance with DWR Funding Requirements



CHALLENGE 3
Augmenting Available Data Sources



CHALLENGE 4
Coordinating with Neighboring Regions and DWR



CHALLENGE 5
Flexibility to Adapt to Local Conditions and Operations

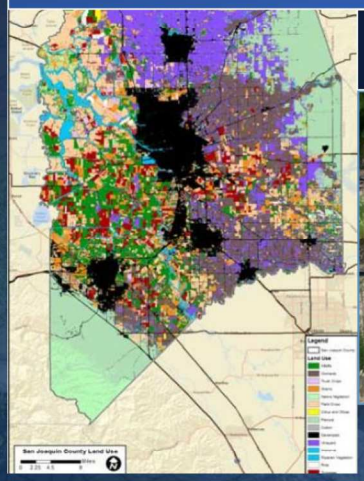
CHALLENGE 1
Confirming Proposed Approach

1. **Determine Modeling Needs**
   - SGMA Requirements
   - Long-term sustainable GW management
   - Future scenarios
2. **Define Objectives Select Model**
   - DYNFLOW → IWFM VS. Refine C2VSim
3. **Build Model**
   - Non-Time Series Data
   - Time Series Data
4. **Calibrate Model**
   - Aquifer parameters
   - GW Levels
   - Stream flows
5. **Perform Sensitivity Analyses**
   - Aquifer parameters
   - Boundary conditions

Utilize Model
- Historical calibrated model
- Future scenarios
- GW Monitoring Plan

Use IDC to Estimate Agricultural Water Demand

Verify Remote Sensing Cropping Data Information Using Other Information



Confirm Irrigation Practices

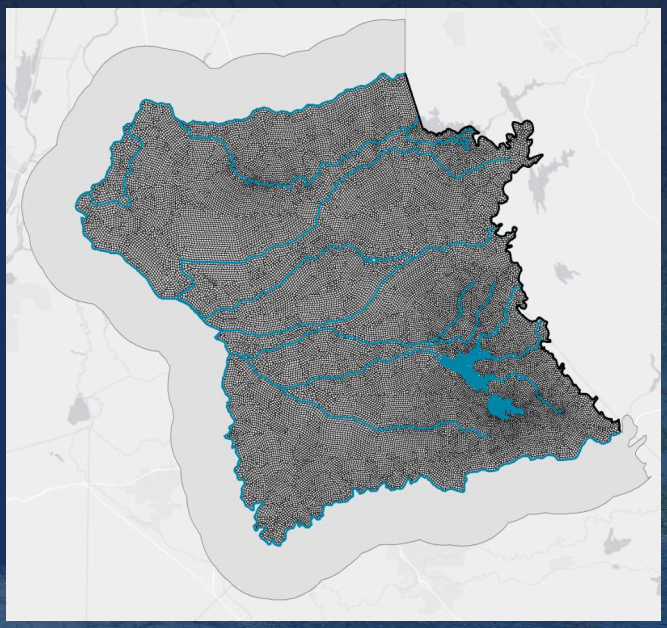
Incorporate Climate and Soil Information

Crop Specific Water Demands

- ✓ Consumptive Use
- ✓ Groundwater Use
- ✓ Return Flows

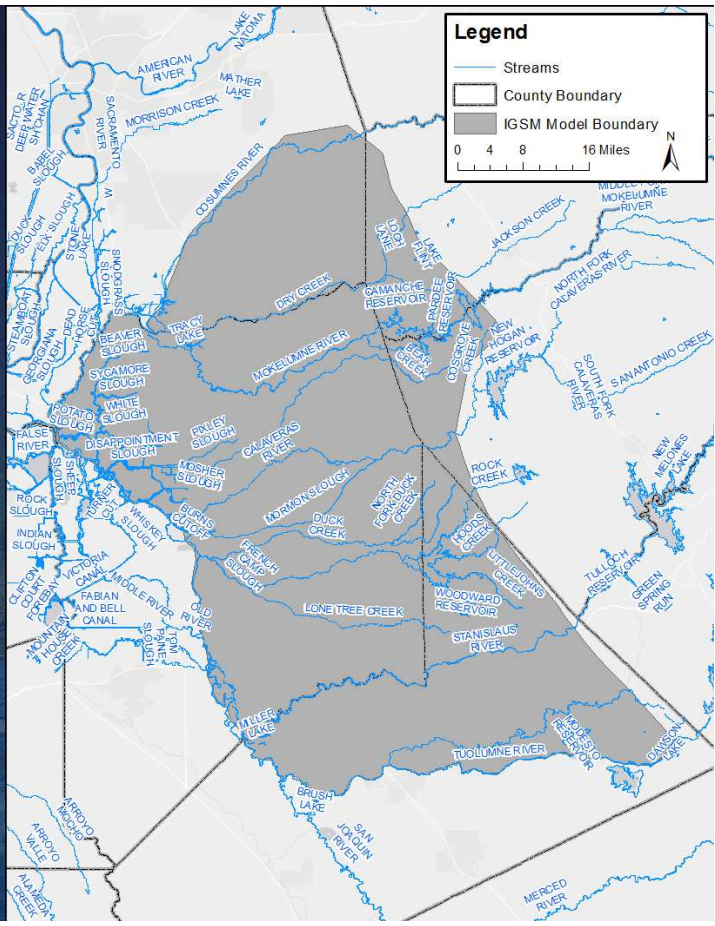
Need to confirm foundational modeling assumptions

- Model Platform
- Model Boundaries
- Hydrogeologic Conditions
- Hydrologic Period
- Calibration Period
- Hydrologic Features
- Management Regions
- Land Use and Cropping Patterns

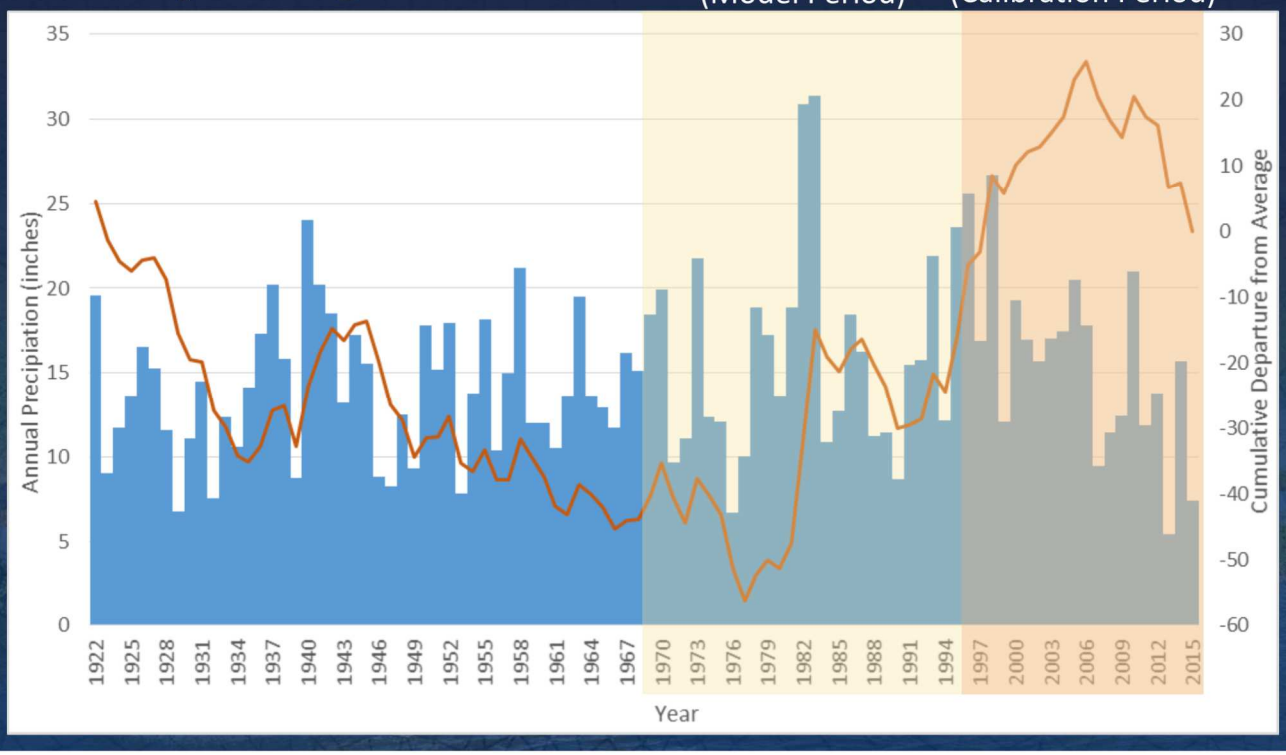


Model Features

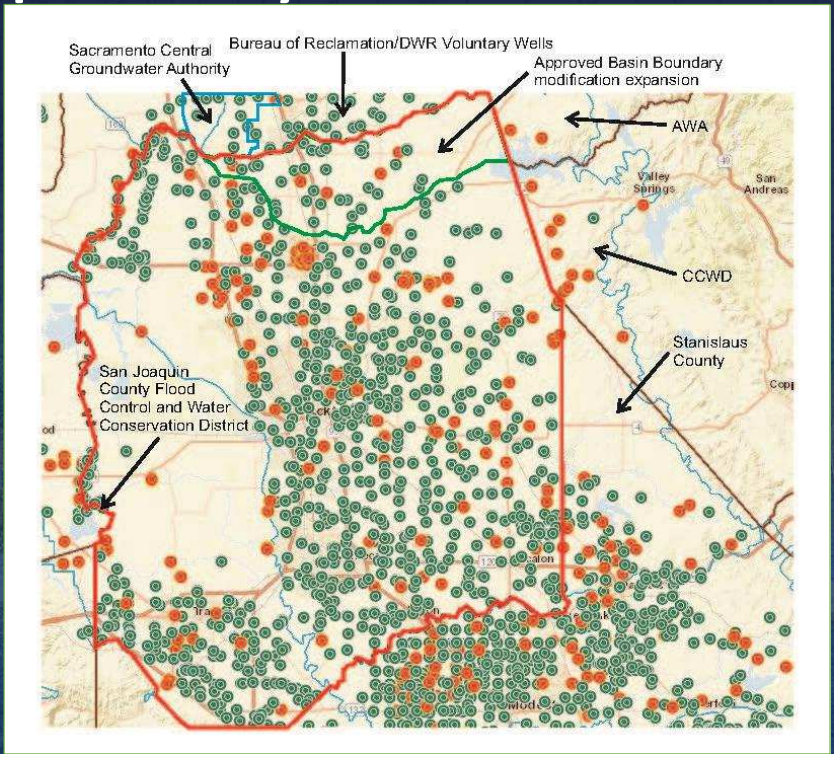
- Model Area
- ID/WD Boundaries
- GSA Boundaries
- Hydrologic Features



Model Hydrologic Period

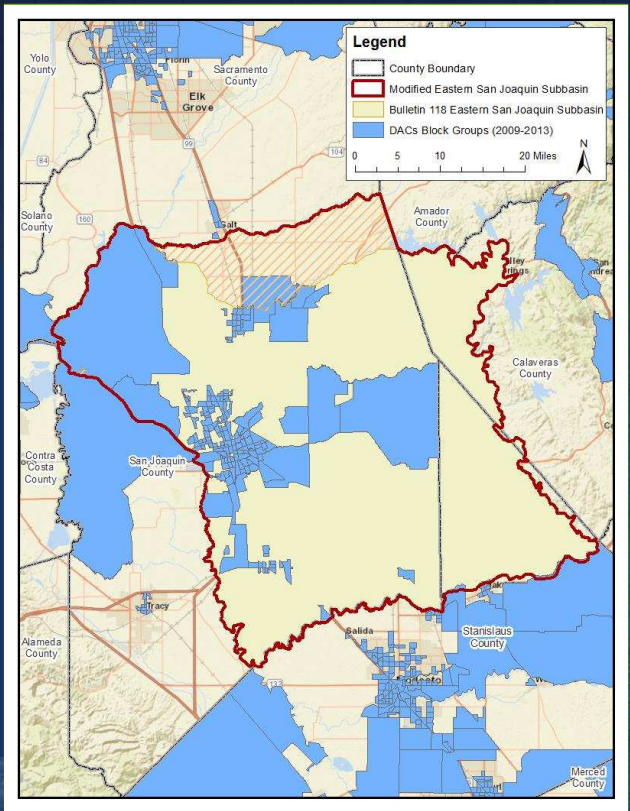


San Joaquin County CASGEM Network



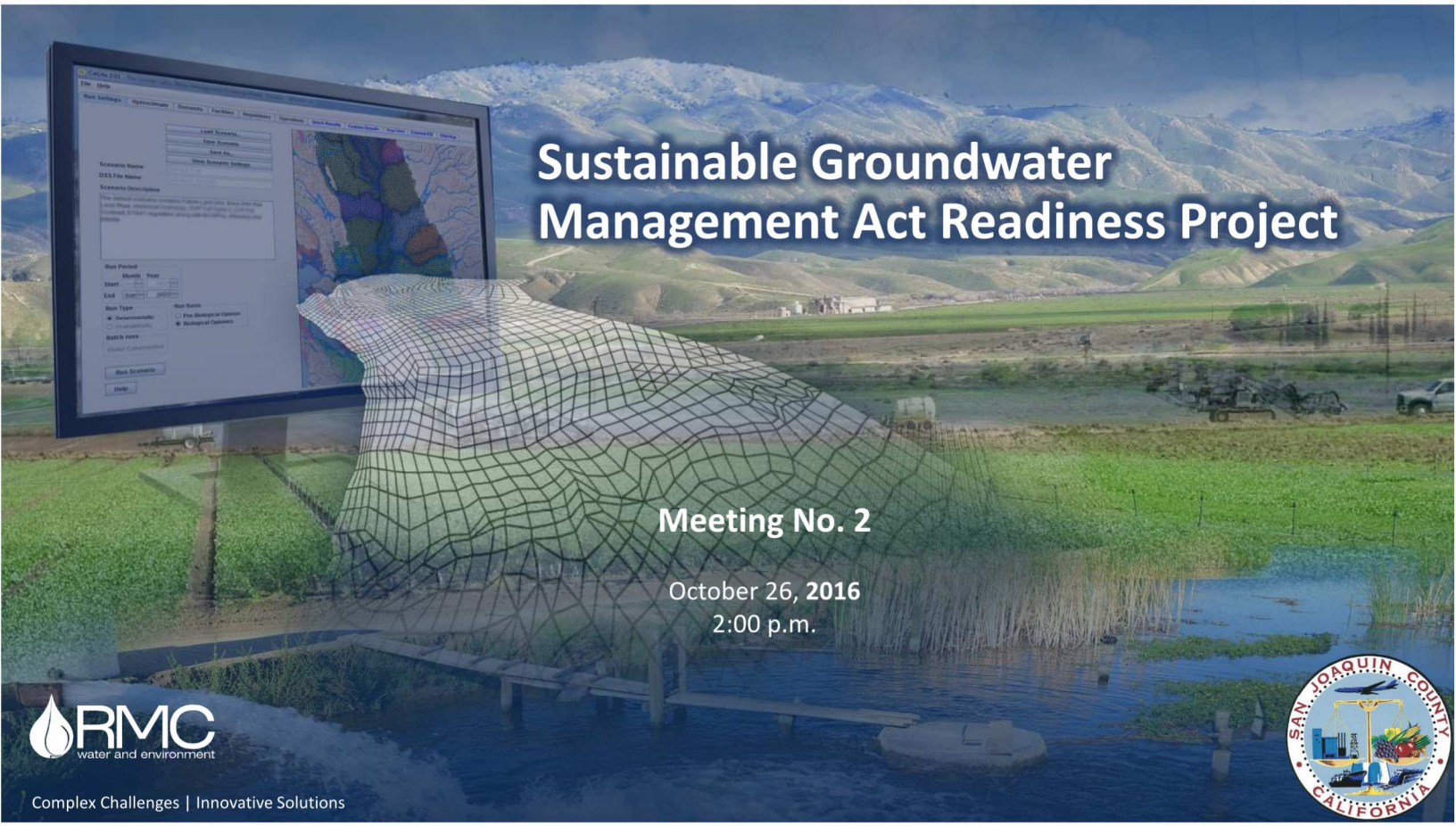
Water Quality Monitoring Program for DAC areas

- Utilize existing wells – coverage over data gaps
- Sampling of wells and water quality database management



What Data can Come from Existing Models?

Major Data Items/Types	C2VSim	DYNFLOW	Other Sources	RMC Scope
Topography	✓	✓	DEM	Only Data in DynFlow and C2VSim
Geology	✓	✓	USGS texture model, drillers logs	Only Data in DynFlow and C2VSim
Aquifer Parameters	✓	✓	USGS report	✓
Stream Geometry	✓		DWR floodplain program	Only for Rivers in Dynflow and C2VSim
Stream Flows	✓		USGS stream gages	Only for Rivers in Dynflow and C2VSim
Soil Parameters	✓	✓	SSURGO, STATSGO2	✓
Rainfall	✓		PRISM, weather stations	✓
Evapotranspiration	✓		CIMIS, Merced & SSID METRIC	Scope does not include DWR ET Maps; will report back, when data is available
Surface Water Diversion	✓	✓	Water providers, SWRCB	Only Data in DynFlow and C2VSim
Groundwater Pumping	✓	✓	Local knowledge, well permits	Municipal Pumping Rates in DynFlow and C2VSim; Ag Pumping estimated by IDC (Will need assessment of Vertical and Spatial distribution of pumping)
Land Use	✓	✓	DWR (LandIQ) LU survey, CropScape, AWMPs, Ag Commissioner Reports/Map, Local District Data	Will Evaluate the level of effort for processing LandIQ data, once its available, and report back on the level of effort



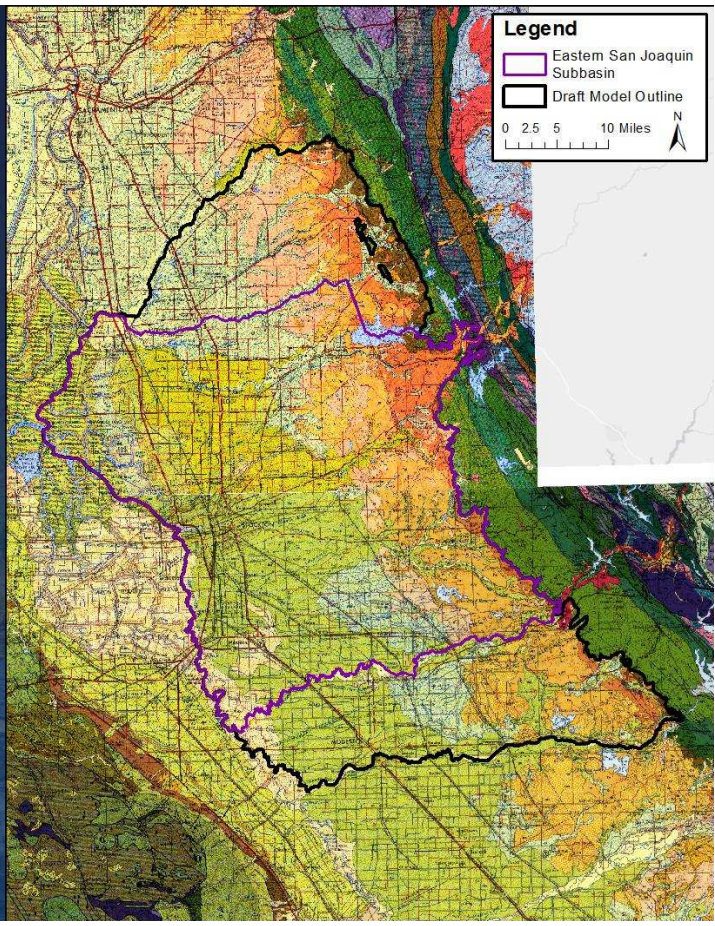
October 26, 2016
Discussion Topics

- **Model Area Boundaries**
- **Model Subregions**
- **Model Surface Water Courses**

Model Area Boundaries

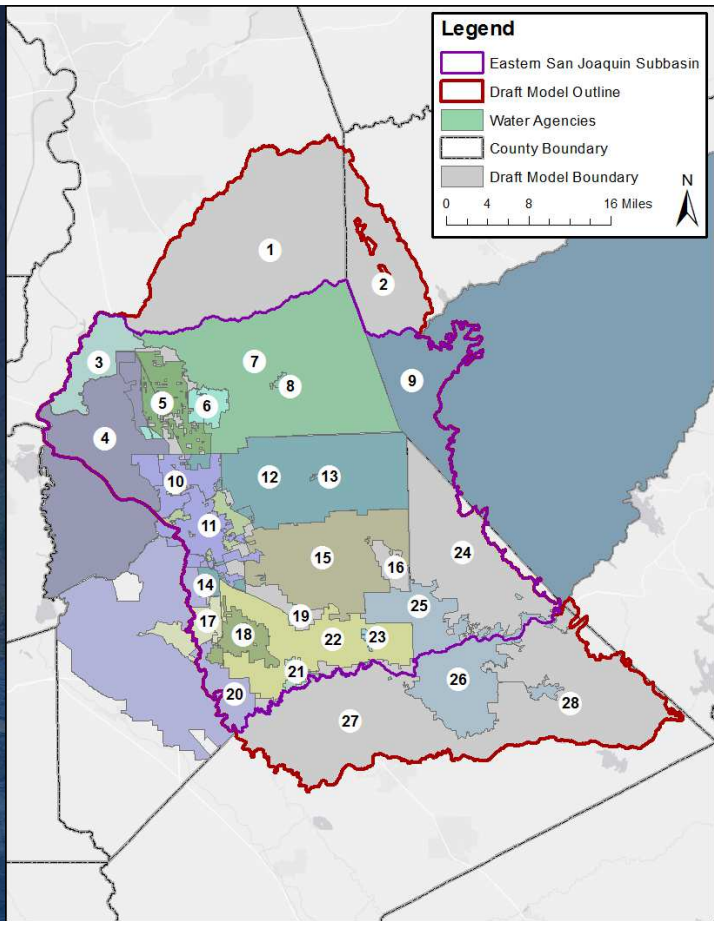
- Primary Area- DWR B-118 ESJ Subbasin
  - Major Formations:
    - Alluvium and Modesto/Riverbank
    - Flood Basin Deposits
    - Laguna
    - Mehrten
- Secondary Area- Cosumnes and Modesto GW Subbasins

California Geological Survey's regional geologic maps for the Sacramento (1981) and San Francisco (1991) quadrangles



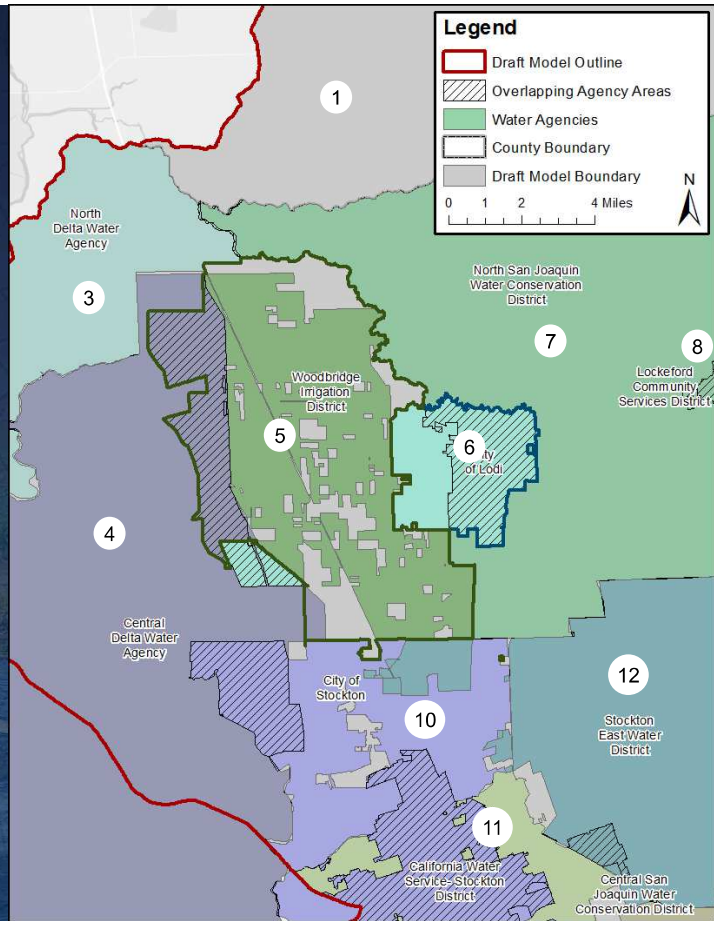
Model Subregions

- Plan to broadly delineate subregions by agency
- Issues:
  - Overlapping agencies
  - Discontinuous agency service areas, including "Swiss Cheese" areas
  - Areas of unincorporated county land



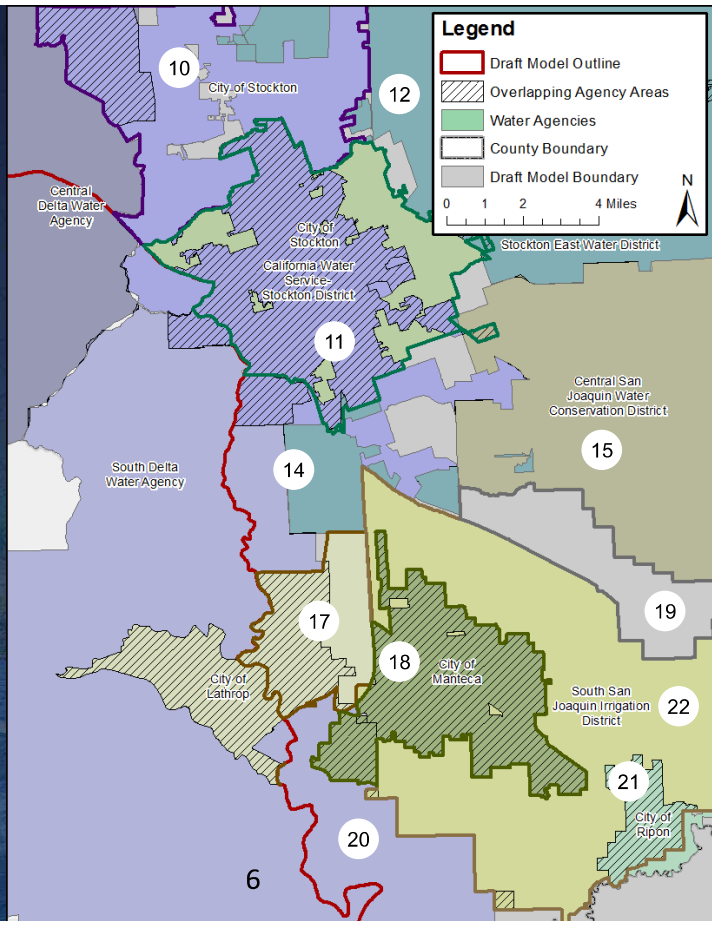
Example: Woodbridge ID Area

- Major overlaps between…
  - Central Delta Water Agency and Woodbridge Irrigation District
  - Central Delta Water Agency and City of Lodi
  - Central Delta Water Agency and City of Stockton
  - North San Joaquin Water Conservation District and City of Lodi
  - City of Stockton and California Water Service- Stockton District
- Woodbridge ID has "Swiss Cheese" exclusions in its service area
- Patches of unincorporated county land



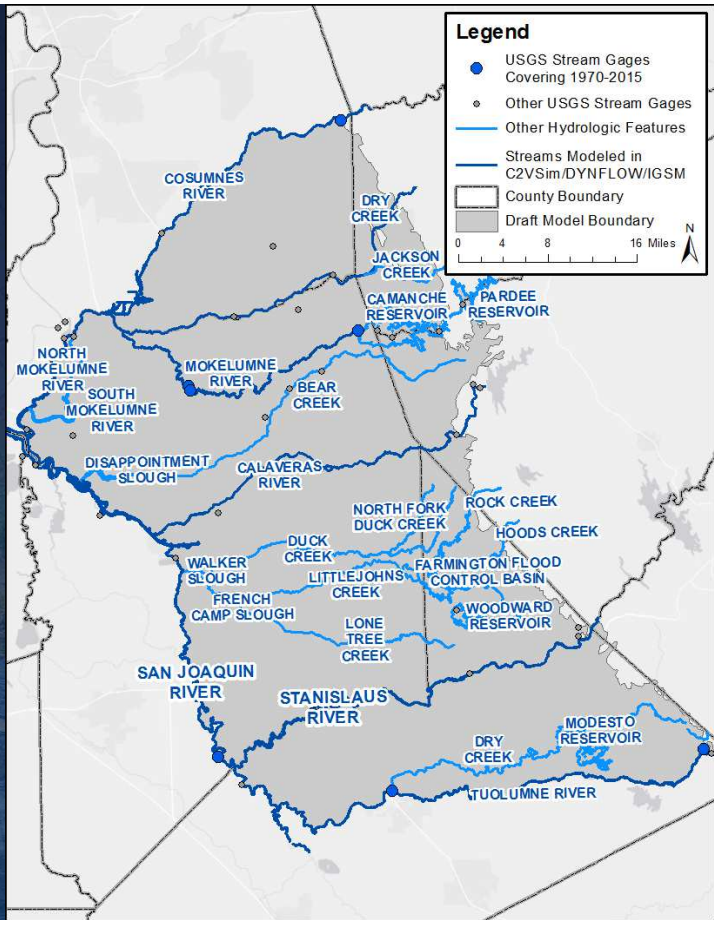
Example: South Stockton Area

- Major overlaps between…
  - California Water Service- Stockton District and City of Stockton
  - California Water Service- Stockton District and Stockton East Water District
  - California Water Service- Stockton District and Central San Joaquin Water Conservation District
  - South Delta Water Agency and City of Lathrop
  - South San Joaquin Irrigation District and City of Manteca
- Patches of unincorporated county land, including large area that could be own subregion (#19)



Streams Modeled in C2VSim, DYNFLOW, and IGSM Models

Stream Name	USGS Gage Covering 1970-2015?	Stream Geometry Available?
San Joaquin River	Yes	Yes
Cosumnes River	Yes	Yes
Dry Creek (near Mokelumne River)	No	Yes
Mokelumne River	Yes	Yes
Calaveras River	New Hogan Lake releases	Yes
Stanislaus River	Yes	Yes
Tuolumne River	Yes	Yes



Other Hydrologic Features

- Brown and Caldwell (January 1990) manual discussed seepage estimates in IGSM model for following features:
  - Calaveras River and Mormon Slough
  - Mokelumne River
  - Camanche Reservoir
  - Little Johns, Bear, Duck, and Lone Tree Creeks
  - Woodbridge Canals
  - Oakdale ID Channels
  - Woodward Reservoir
  - Farmington Flood Control Basin
- Annual seepage from studies of seepage per wetted acre, from information obtained from agencies (e.g., EBMUD, OID, and SSJID), or estimated from known seepage of nearby rivers

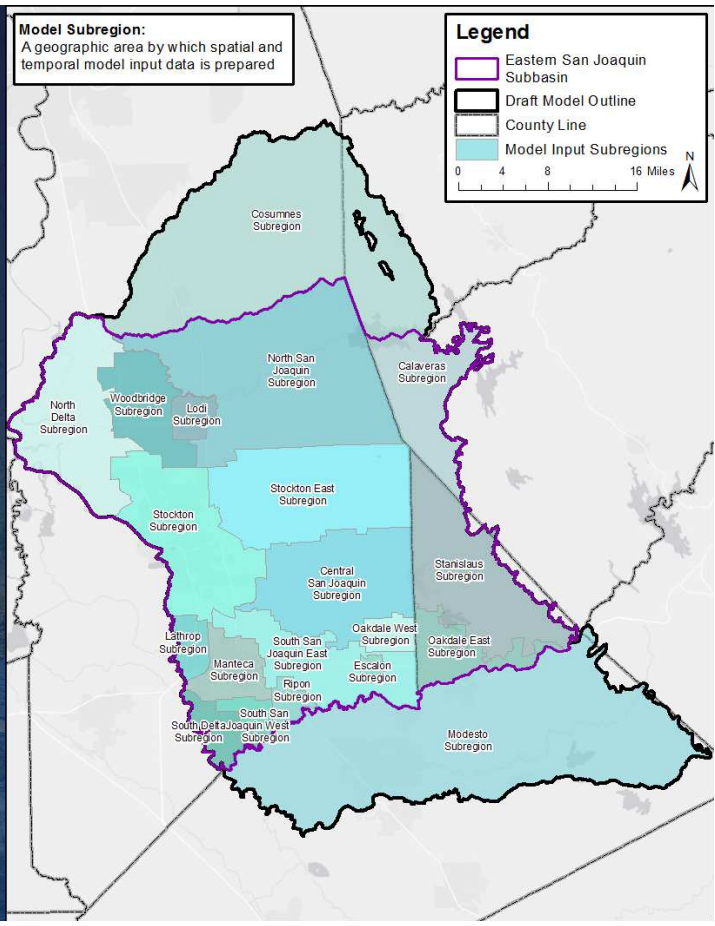
Stream Name	USGS Gage Covering 1970-2015?	Stream Geometry Available?
Jackson Creek	No	No
South Mokelumne River	No	No
Disappointment Slough	No	No
Bear Creek	No	No
Walker Slough	No	No
Duck Creek	No	No
North Fork Duck Creek	No	No
French Camp Slough	No	No
Little Johns Creek	No	No
Farmington Flood Control Basin	No	No
Rock Creek	No	No
Hoods Creek	No	No
Lone Tree Creek	No	No
Dry Creek (near Tuolumne River)	No	No
Camanche Reservoir	Potentially from East Bay MUD	
Pardee Reservoir	Potentially from East Bay MUD	
Woodward Reservoir	Potentially from South San Joaquin ID	
Modesto Reservoir	Potentially from Modesto ID	

Description of ESJ GW Basin Hydrologic Model Subregions & Subareas

- Model Input Subregions - Proposed boundaries in the model domain for model input data collection and preparation
- Model Output Subareas - Proposed boundaries in the model domain for reporting model results

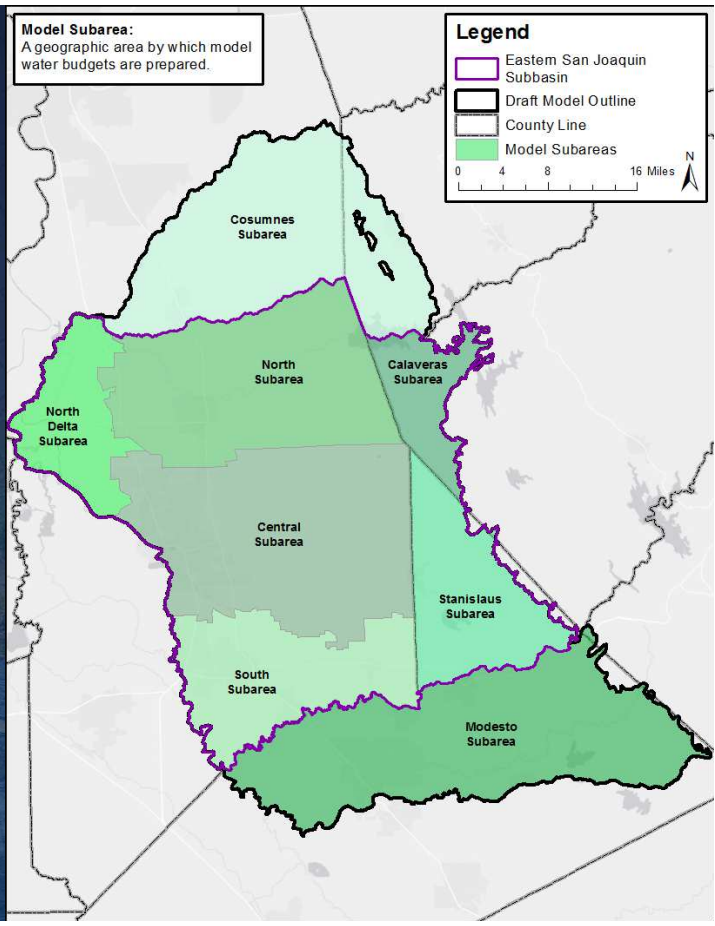
Model Input Subregions

- 20 subregions
- For data collection and preparation of model input files
- Used SOI boundaries as reference for cities



Model Output Subareas

- 8 subareas
- For model output and reporting of results



SGMA Draft Best Management Practices (BMP) Implications in the ESJ SubBasin

Purpose

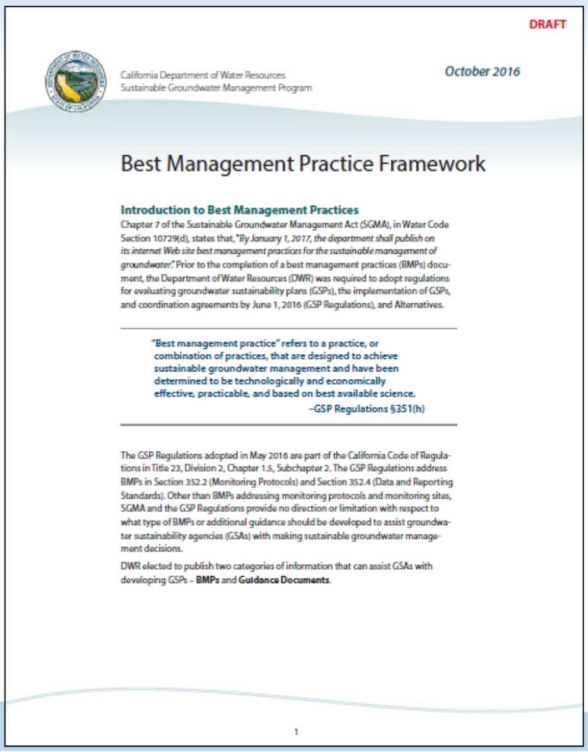
The purpose is to present the Draft SGMA Best Management Practices (BMP) as published by the DWR and discuss how the BMPs would apply to the implementation of SGMA in ESJ GW SubBasin.

Slides in Light Blue are from DWR

Slides in Dark Blue are our interpretations for application to ESJ Basin

SGMA BMP Overview
Draft BMP Framework and Intent

- Definitions
  - BMPs – DWR technical assistance
  - Guidance Documents - informational
- How to Utilize
  - Optional – do not create new requirements
  - Documents are not a substitute for GSP Regulations
- Organization/Workflow
- Identify Future Documents and Revisions
- Relationship with other BMPs



DRAFT

California Department of Water Resources
Sustainable Groundwater Management Program

October 2016

Best Management Practice Framework

Introduction to Best Management Practices

Chapter 7 of the Sustainable Groundwater Management Act (SGMA), in Water Code Section 10729(d), states that, "*By January 1, 2017, the department shall publish on its internet Web site best management practices for the sustainable management of groundwater.*" Prior to the completion of a best management practices (BMPs) document, the Department of Water Resources (DWR) was required to adopt regulations for evaluating groundwater sustainability plans (GSPs), the implementation of GSPs, and coordination agreements by June 1, 2016 (GSP Regulations), and Alternatives.

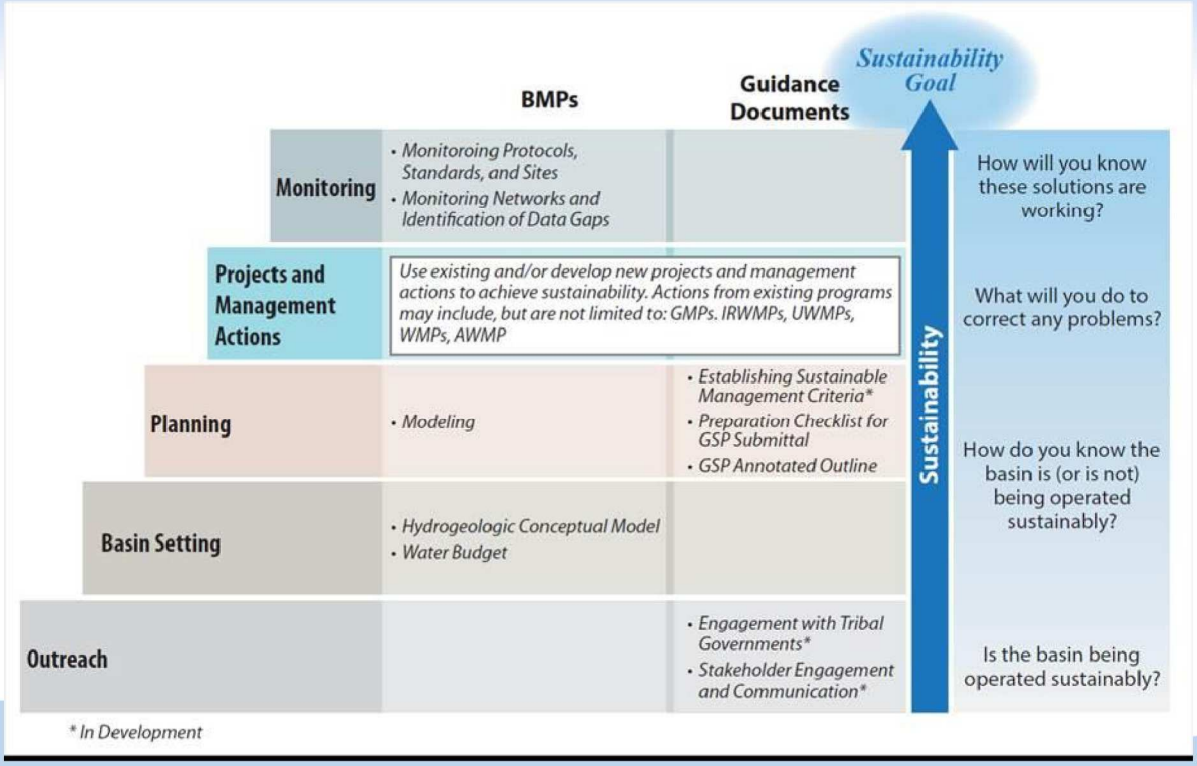
> **"Best management practice" refers to a practice, or combination of practices, that are designed to achieve sustainable groundwater management and have been determined to be technologically and economically effective, practicable, and based on best available science.**
>
> **–GSP Regulations §351(h)**

The GSP Regulations adopted in May 2016 are part of the California Code of Regulations in Title 23, Division 2, Chapter 1.5, Subchapter 2. The GSP Regulations address BMPs in Section 352.2 (Monitoring Protocols) and Section 352.4 (Data and Reporting Standards). Other than BMPs addressing monitoring protocols and monitoring sites, SGMA and the GSP Regulations provide no direction or limitation with respect to what type of BMPs or additional guidance should be developed to assist groundwater sustainability agencies (GSAs) with making sustainable groundwater management decisions.

DWR elected to publish two categories of information that can assist GSAs with developing GSPs – **BMPs** and **Guidance Documents**.

1

SGMA BMP Overview – BMP Building Blocks



BMP # 1 – Monitoring Protocols, Standards, and Sites

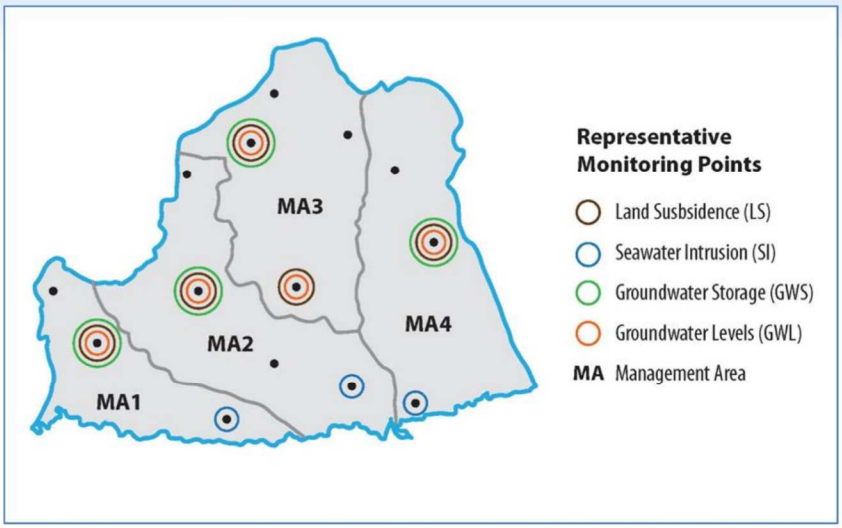
- Protocols for:
  - Establishing Monitoring Sites
  - Measuring GW Levels
  - Sampling GW Quality
  - Monitoring Seawater Intrusion
  - Measuring Streamflow
  - Measuring Subsidence

SGMA BMP 1: How It Applies to San Joaquin County SGMA Readiness Project

- Historical County program meets the intent of the BMP
- Review monitoring site unique identifiers for GIS
  - All monitoring locations update horizontal control; long term lease or access agreement review
- Compare existing monitoring protocols to determine necessary adjustments
  - Stream and sea-water intrusion locations, water quality and subsidence assessment protocols need to be updated
- Incorporate protocols and standards into GSP development for specific elements
  - Measurable indicators of sustainability

BMP # 2 – Monitoring Networks and Identification of Data Gaps

- General Monitoring Networks
  - Improvement of Monitoring Network

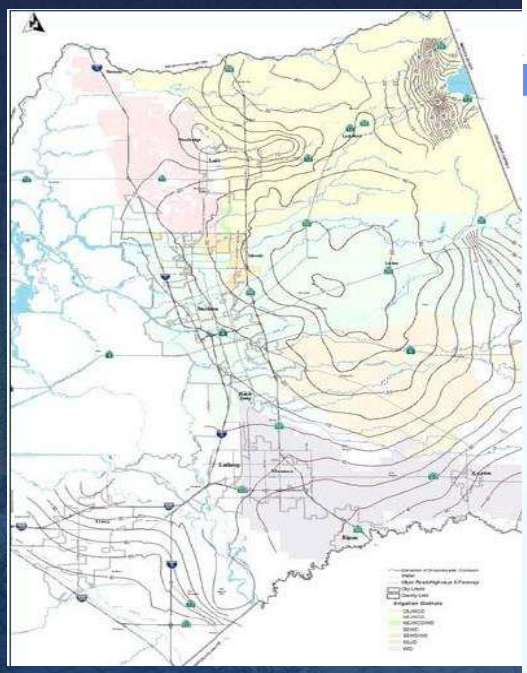


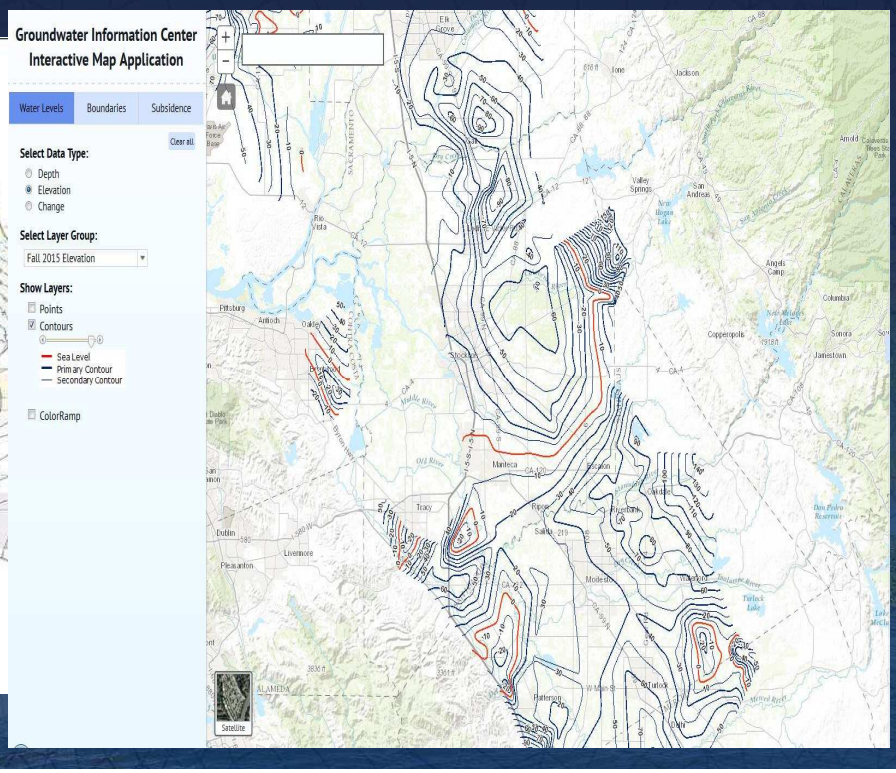
- Specific Monitoring Networks

SGMA BMP 2: How It Applies to San Joaquin County SGMA Readiness Project

- Historical Network meets the intent of the BMP
  - Spacing and seasonal and long-term trends established
- Assessment of adjustments to existing monitoring networks (CASGEM and Future Hydro Model)
  - Data gaps, shallow and deep aquifers, known well construction information, installation of new monitoring wells (State funding?)
  - Expansion on approved network (County and E-Pur Data)
  - Monitoring wells are needed east and at the base of the fresh water
- Coordination with County and State agencies to acquire well log information; coordination with land owners for long-term access
- Determination of high and low gw use areas with measurable indicators (modeling coordination)

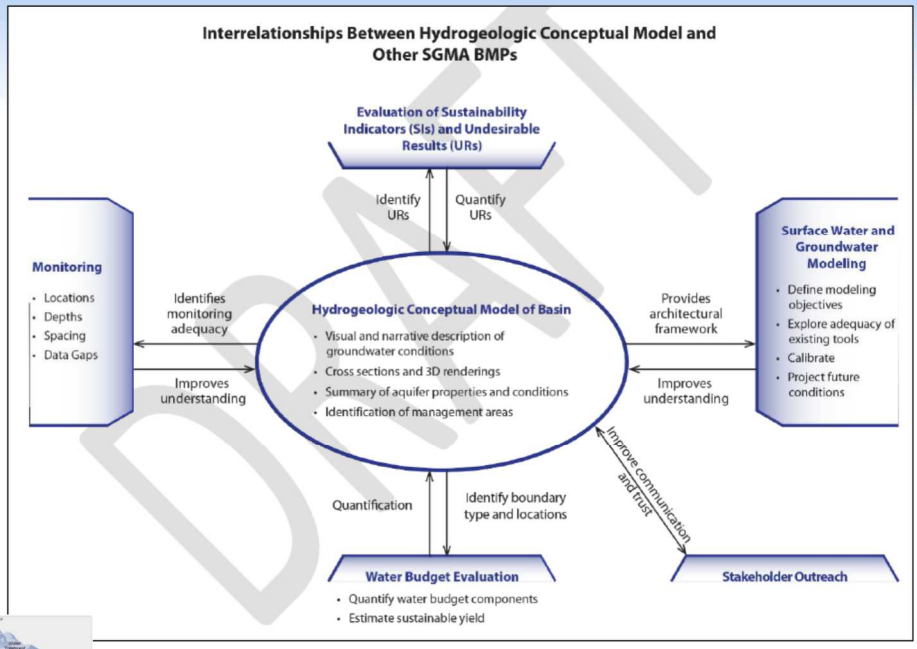
Known Data Gaps - Observed Critical Areas for Recharge and Overdraft

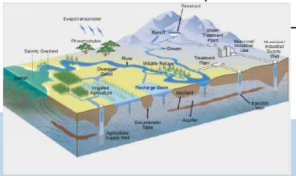


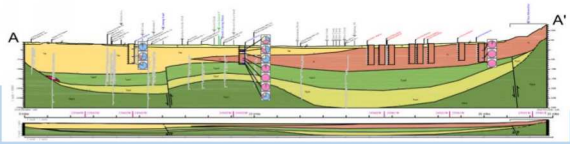


BMP # 3 – Hydrogeologic Conceptual Model

- Characterizing Physical Components
  - Geologic and structural boundaries
  - Lateral boundaries
  - Bottom of the basin
  - Principal Aquifers and Aquitards
  - Graphical Representation
- Mapping Requirements





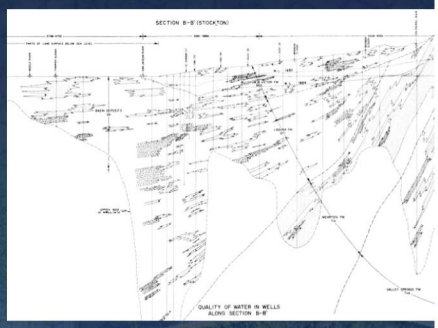


SGMA BMP 3: How It Applies to San Joaquin County SGMA Readiness Project

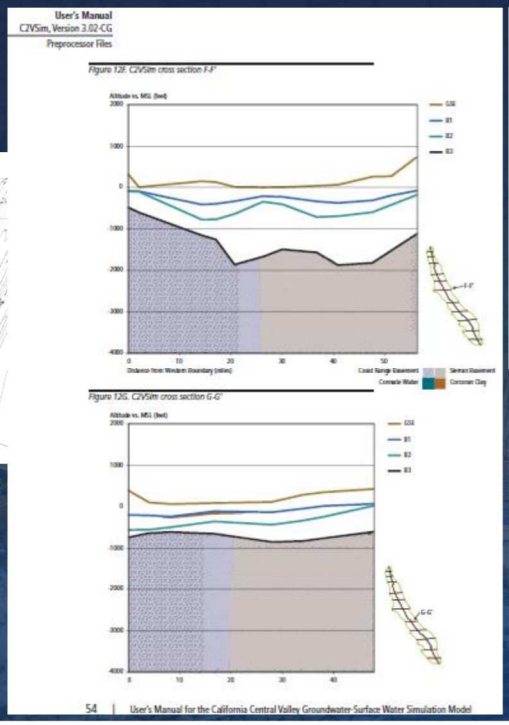
- Extensive base of existing knowledge for HCM
  - J.Montgomery, 1990, CH2MHill & Papadopoulous 2006, Taghavi 2000, 1967 Bulletin 146 – Great start for data from surface to ~400 feet; other known sources with well log information
- Data gaps in deep well logs and limited number of wells
  - More well logs >400 feet
  - Aquifer data, base of fresh aquifer, saline aquifer, bedrock Eastern Margin Area
- Coordination with DWR for technical assistance for guidance and direction on data acquisition (well logs)

Schematic Hydrogeo Cross-Sections Compared and Refined

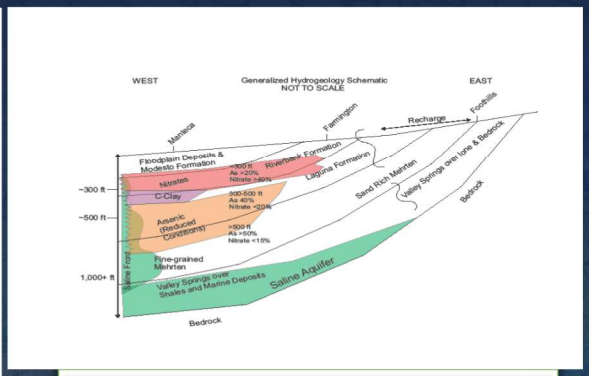
DWR 1967

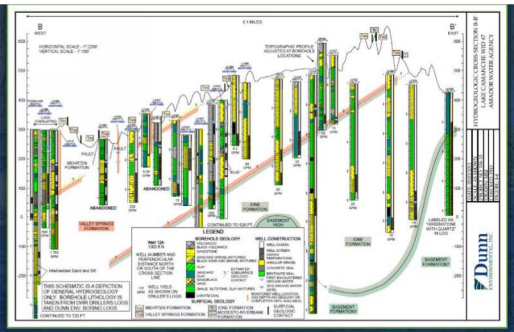


C2vSim 2013



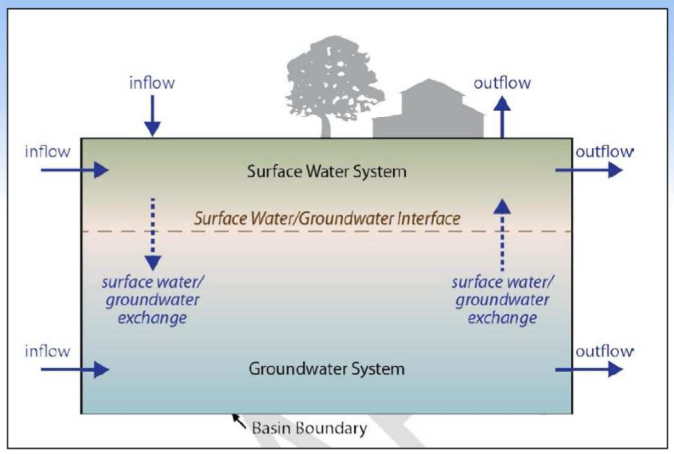
Draft 2016





BMP # 4 – Water Budget (WB)

- General WB Requirements
  - Certification
  - WB Data, Information, and Modeling Requirements
  - Defining Basin Area and Water Budget Systems
  - Accounting and Quantification of WB Components
- Tabular and Graphical Representation of WB Components
- Defining WB Time Frames
  - Current, Historical, Projected



Water Year:
Water Year Type:

INFLOWS		OUTFLOWS	
Inflow Source	Volume (af/yr)	Outflow Sink	Volume (af/yr)
Surface Water Inflow[1]		Surface Water Outflow[1]	
Precipitation		Evapotranspiration[4]	
Subsurface Groundwater Inflow		Subsurface Groundwater Outflow	
Total Basin Inflow		Total Basin Outflow	
Subsurface Groundwater Inflow		Subsurface Groundwater Outflow	
Infiltration of Precipitation		Groundwater Extraction[1]	
Infiltration from Surface Water Systems[2]		Discharge to surface water systems[2]	
Infiltration of Applied Water[3]			
Total Groundwater Inflow		Total Groundwater Outflow	

Change in Surface Storage Volume	
Change in Groundwater Volume	

\1 by water source type
\2 lakes, streams, canals, springs, conveyance systems
\3 includes applied surface water, groundwater, recycled water, and reused water
\4 by water use sector

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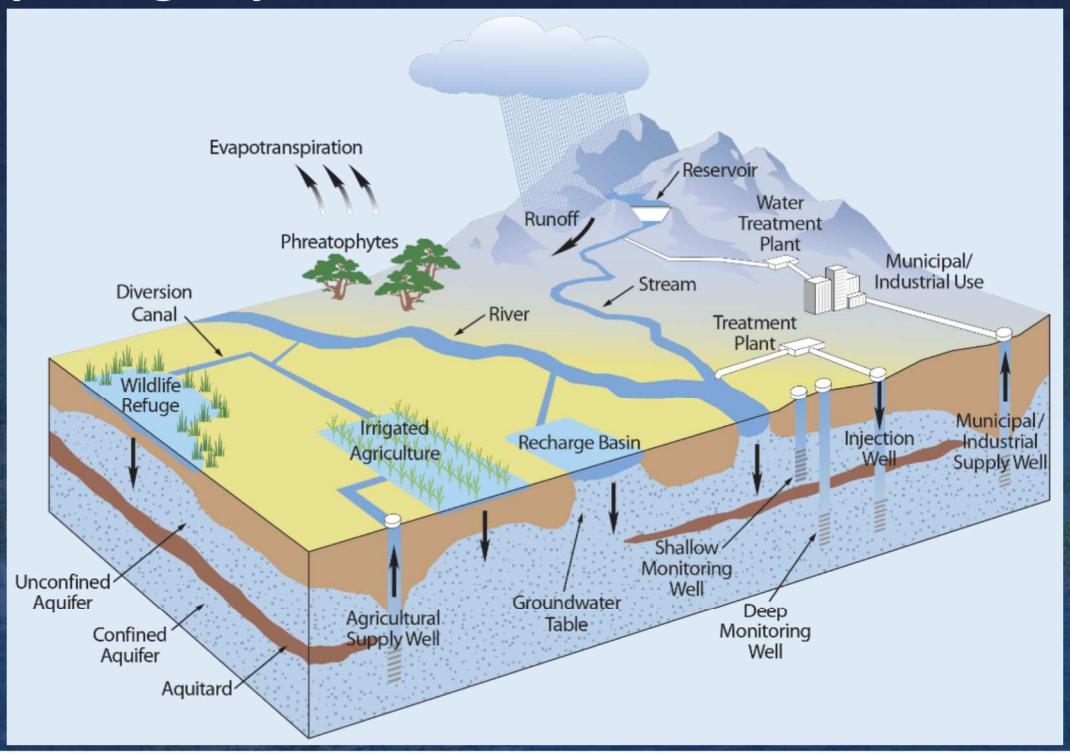
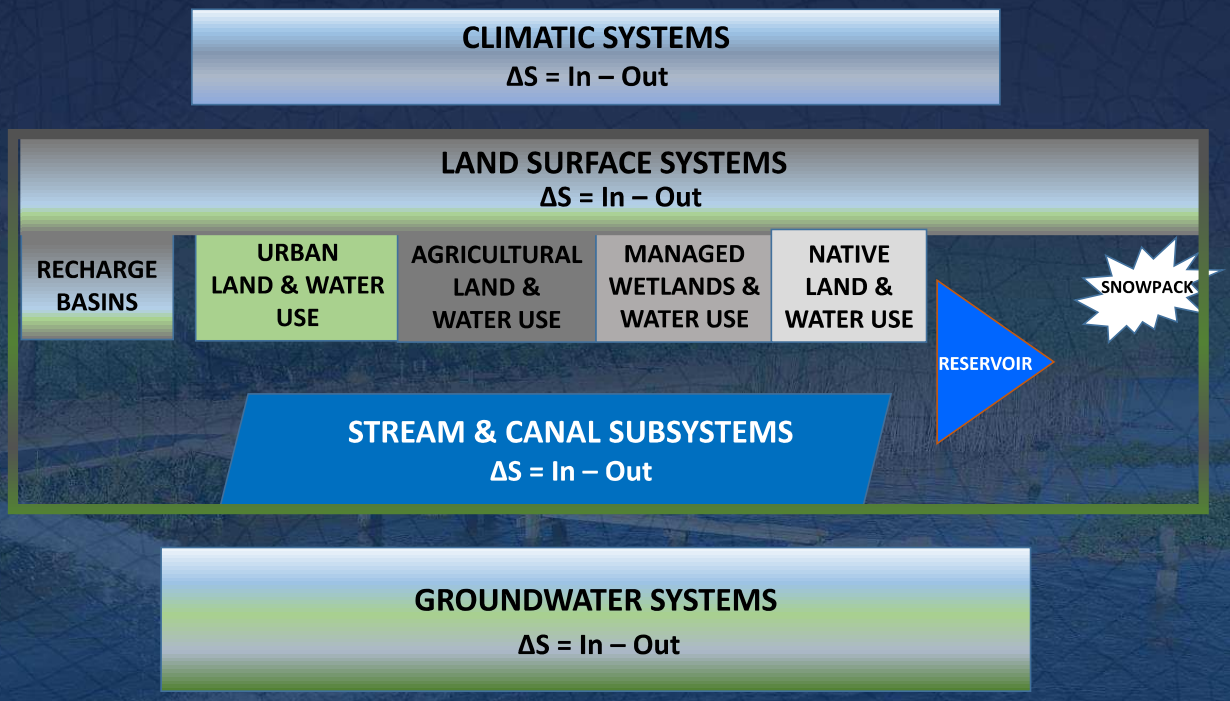
Water budget
A hydrologic systems view

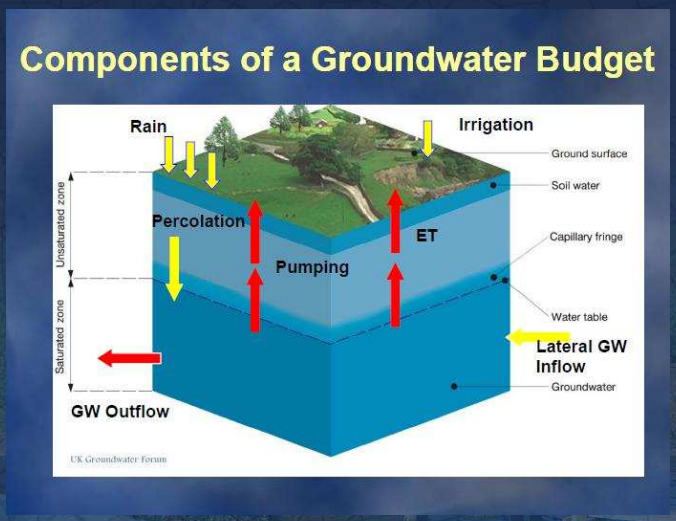


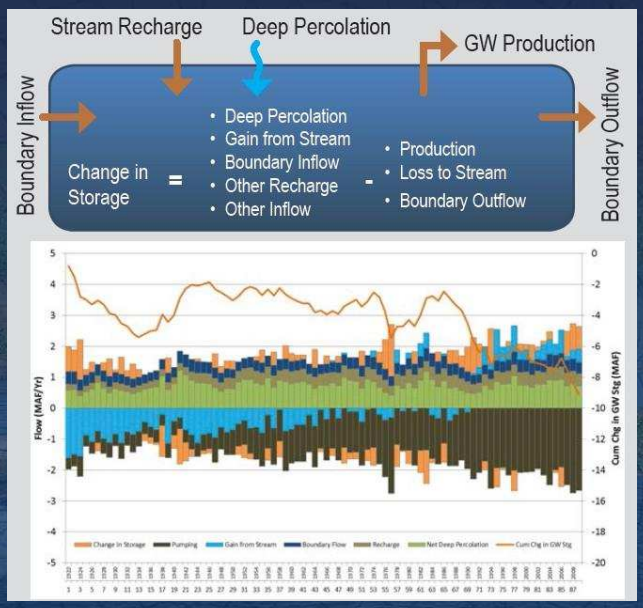
Systems Accounting

Change in storage =
water entering minus water leaving



Water Budget Components





SGMA BMP 4: How It Applies to San Joaquin County SGMA Readiness Project

- Coordination with all GSPs in the basin
- Reporting WB for the basin and by subareas
- Evaluation of GW storage conditions - current and historical WB evaluations; projects/management actions for mitigation
- Sustainable yield assessment - current, historical, and projected WB conditions
- Forecasting future projected WB assessment & management actions - over 50-year planning/ implementation horizon with climate change

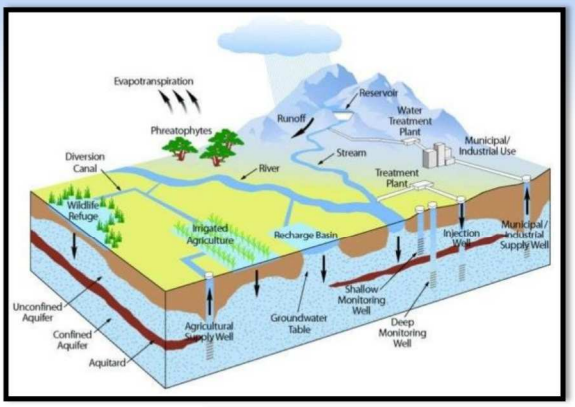
BMP # 5 – Modeling

Fundamentals

- Types of Models, Software, Uses
- Models Used for SGMA

Technical Assistance

- Guiding Principles For Models
- General Modeling Requirements

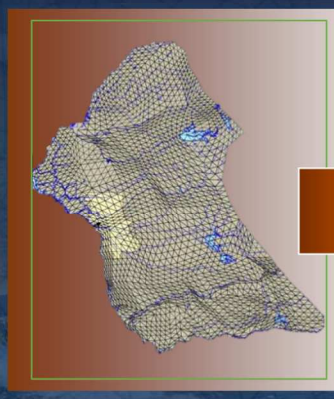


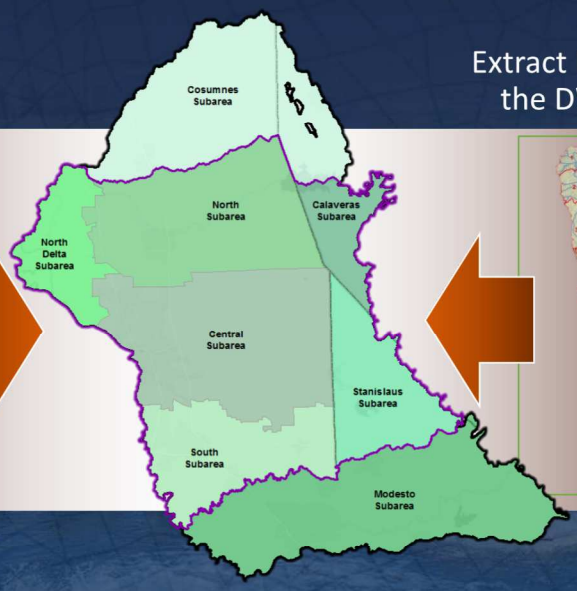
- Modeling Considerations
  - Addressing Sustainability Indicators

  - Developing Water Budgets
  - Forecasting Future Conditions, Projects, Actions
  - Assessing Impacts on Adjacent Basins
- Groundwater Modeling Process
- Related References and Guidance Material

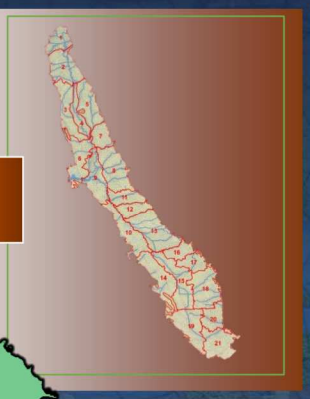
ESJ Integrated Hydrologic Model will benefit from Basin-scale models and previously developed local models and data

Migration of Existing DYNFLOW Data





Extract Information from the DWR C2VSim-FG



ESJ GW Basin Hydrologic Model Development Approach

1. **Determine Modeling Needs**
   - Incorporate SGMA requirements
   - Consider long-term sustainable GW management options
   - Consider management scenarios
2. **Define Objectives Select Model**
   - Build Model based on IWFM framework
3. **Build Model**
   - Define Model Subregions and SubAreas
   - Develop IDC & Ag demand
   - Develop Model data
4. **Calibrate Model**
   - Calibrate IDC
   - Calibrate to GW levels
   - Calibrate to streamflows
   - Develop Historical Water Budgets
5. **Perform Sensitivity Analyses**
   - Aquifer parameters
   - System Stresses
   - Boundary conditions

Utilize Model
- Develop Baselines
- Perform Management scenarios
- Conduct Sustainability Analysis
- Develop Water Budgets
- Develop GW Monitoring Plan

Ad-Hoc Technical Committee Participation
Regular Reports to SGMA Workgroup
DWR Coordination

Sustainable Groundwater Management Act Readiness Project

Meeting No. 4: Model Grid Development, Model Hydrologic Data, and Model Data Request

RMC water and environment

Complex Challenges | Innovative Solutions

January 25, 2017

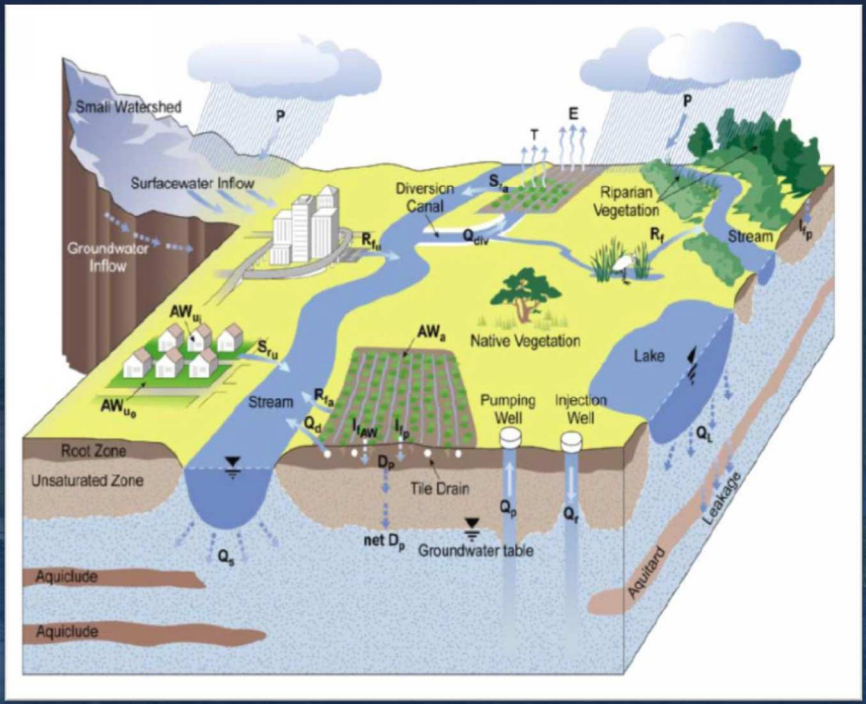
ESJ GBA AdHoc Technical Committee Meeting No. 4 January 25, 2017

Agenda

- Model grid development
- Model hydrologic period and data
- Status of data request

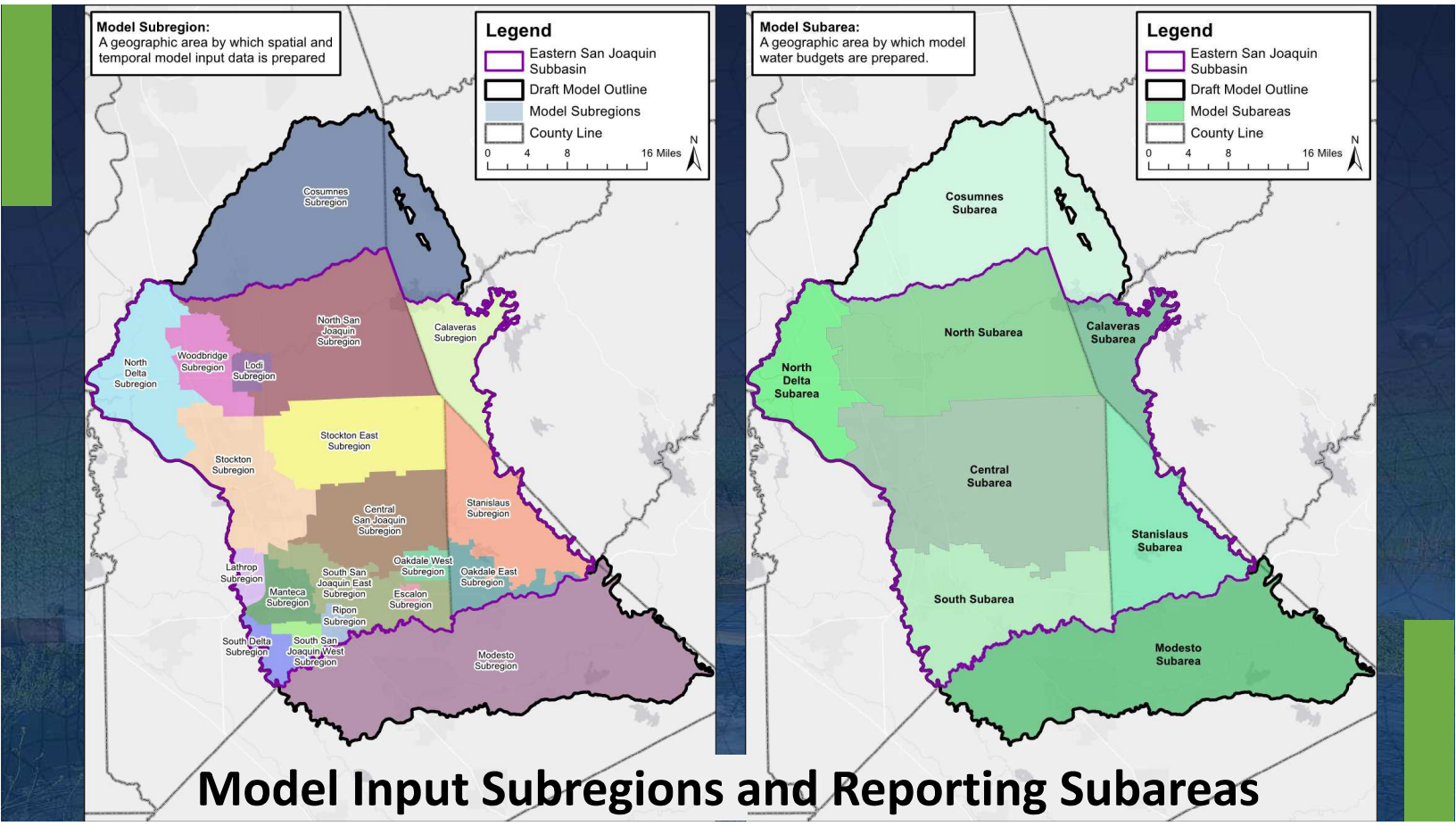
Integrated Hydrologic Modeling

- Land Surface Processes
- Groundwater Flow
- Streamflow
- Physical Systems Integration
- Water Balance Preservation Over time and space

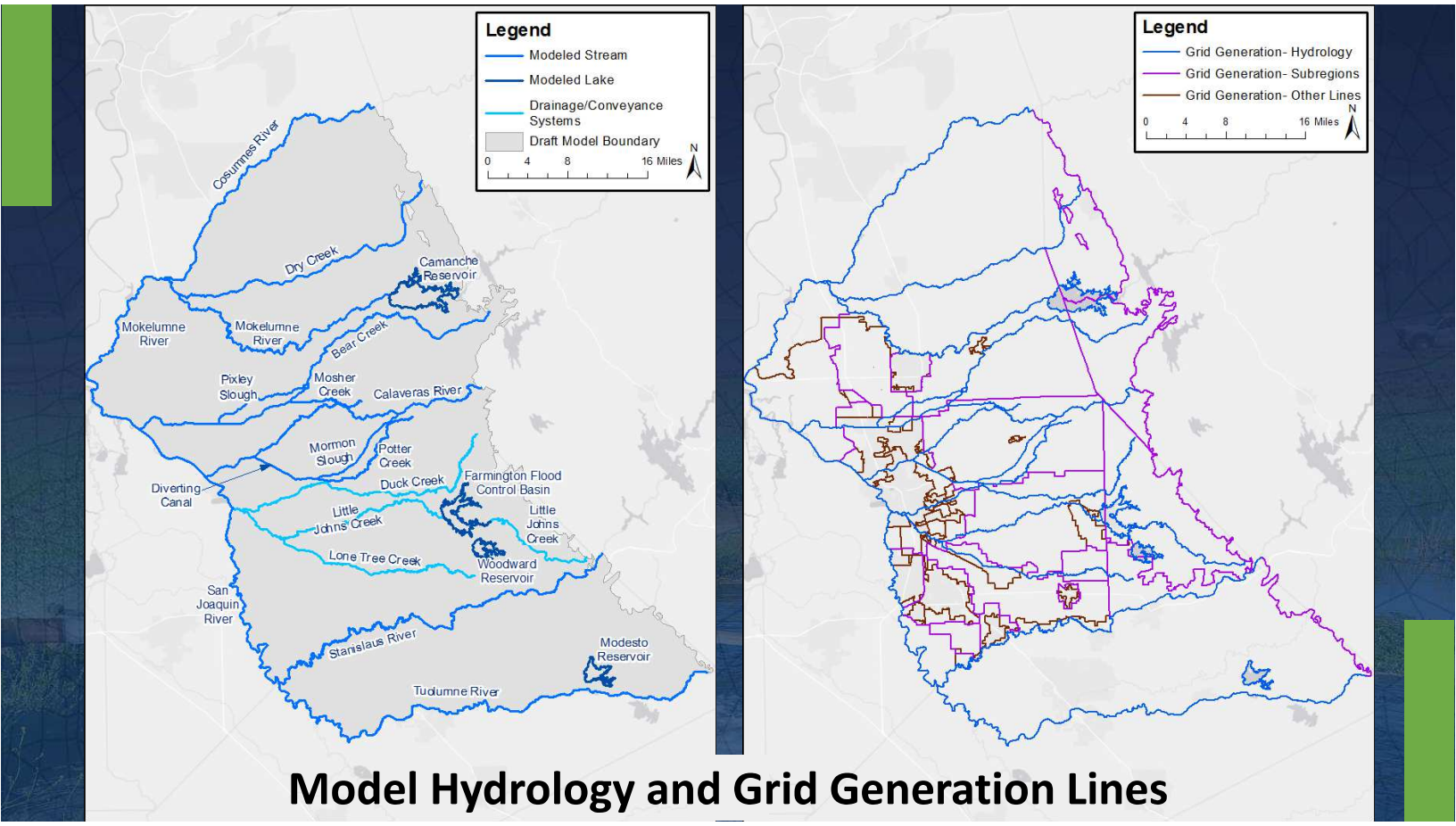


Model Grid Development Goals and Process

- Include Features:
  - Groundwater Subbasin Boundaries
  - Model Input Subregions/Model Output Subareas
  - Model Hydrologic and Hydrogeologic Features
  - Surface Drainage Patterns
  - Subsurface Flow Patterns
  - Other Boundaries (e.g., current city limits)
- Other Considerations:
  - Maintain manageable number of elements/nodes
  - Optimize resolution for streamlined data analysis
  - Finer resolution along rivers to allow for better stream-aquifer interaction
  - Optimize model run time
  - Streamline model output



Model Input Subregions and Reporting Subareas

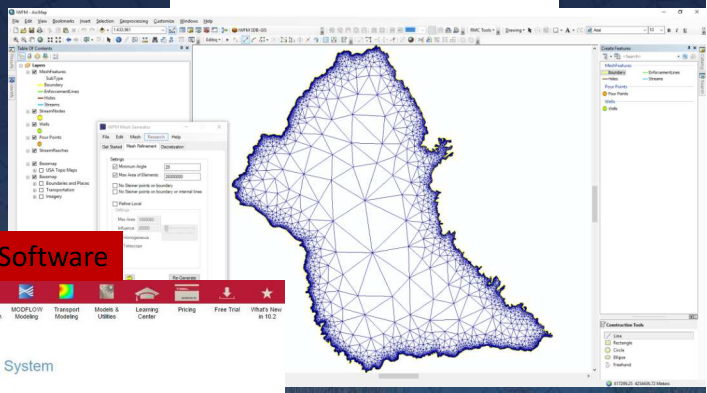


Model Hydrology and Grid Generation Lines

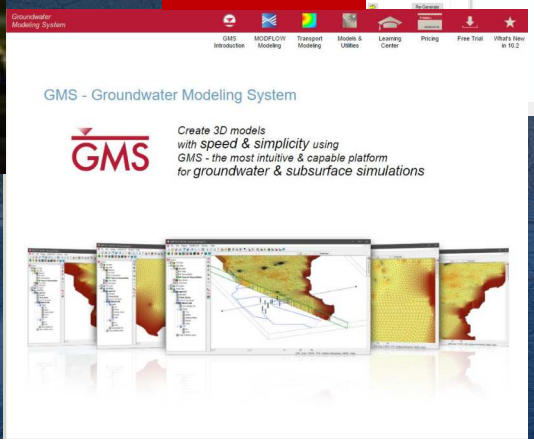
Tools to Develop a Model Grid

Good Old Fashion Grid Development

IWFM Grid Generator



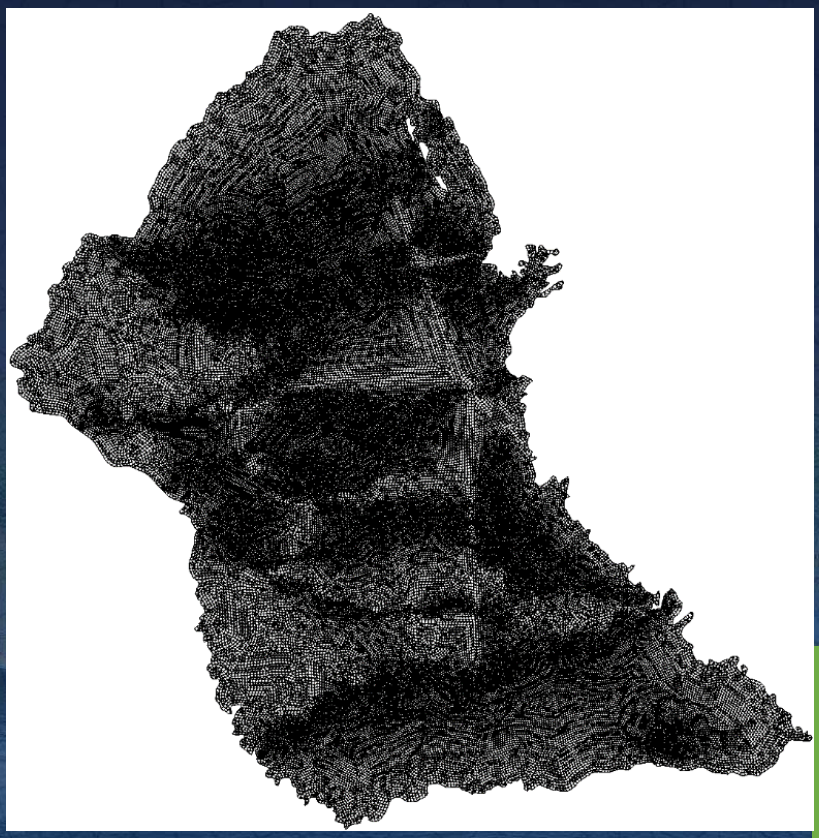
GMS Software



Grid Iteration #1

- Criteria: Hydrology and subregion lines
- Spacing:
  - Subregion lines: 0.25 miles
  - Model boundary lines (even streams): 0.25 miles
  - Other hydrology lines: 0.125 miles

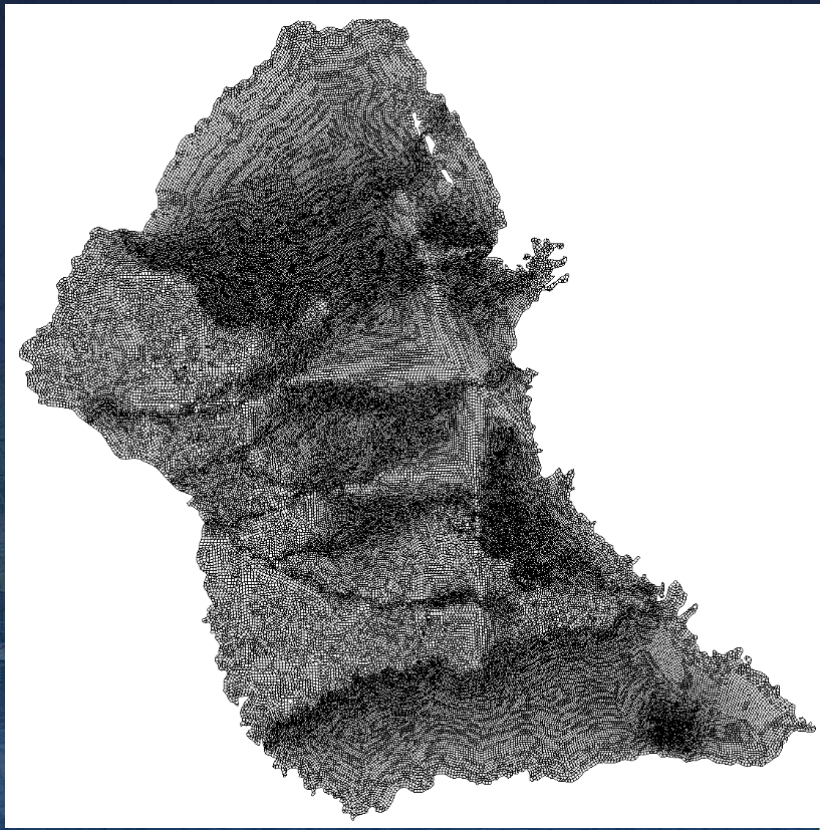
Type of Element	Number of Elements
Triangular	69,333
Quadrilateral	47,920
Total	**117,253**



Grid Iteration #2

- Criteria: Hydrology, subregion, and other features
- Spacing:
  - Subregion and other lines: 0.25 miles
  - Model boundary lines (even streams): 0.25 miles
  - Other hydrology lines: 0.125 miles

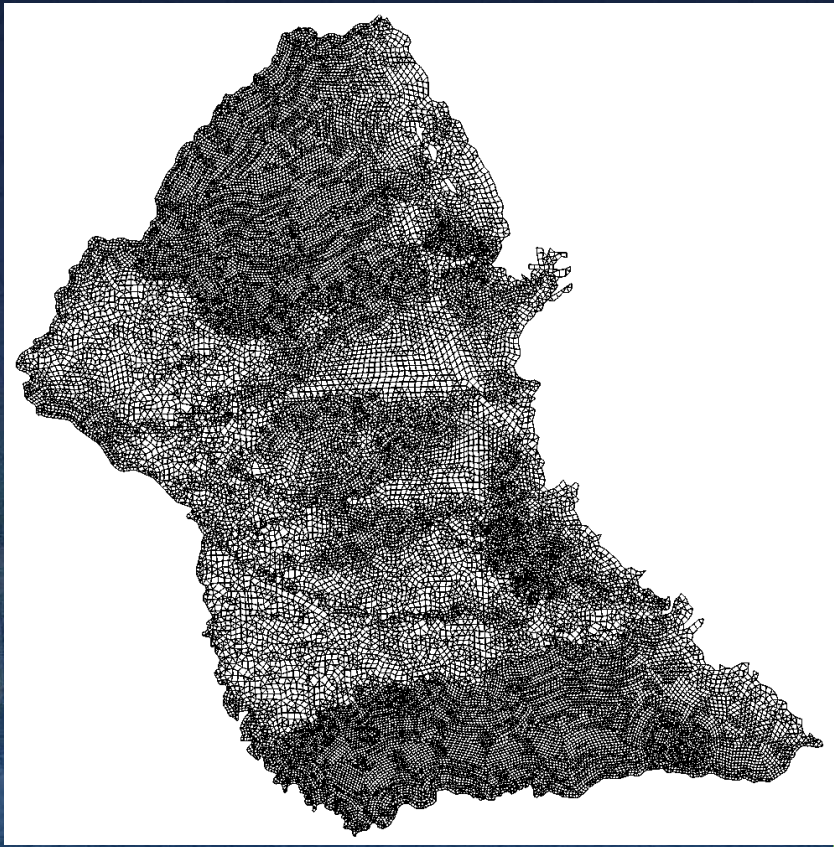
Type of Element	Number of Elements
Triangular	70,088
Quadrilateral	47,643
Total	**117,731**



Grid Iteration #3

- Criteria: Hydrology, subregion, and other features
- Spacing:
  - All subregion and other lines: 0.5 miles
  - All hydrology lines: 0.25 miles

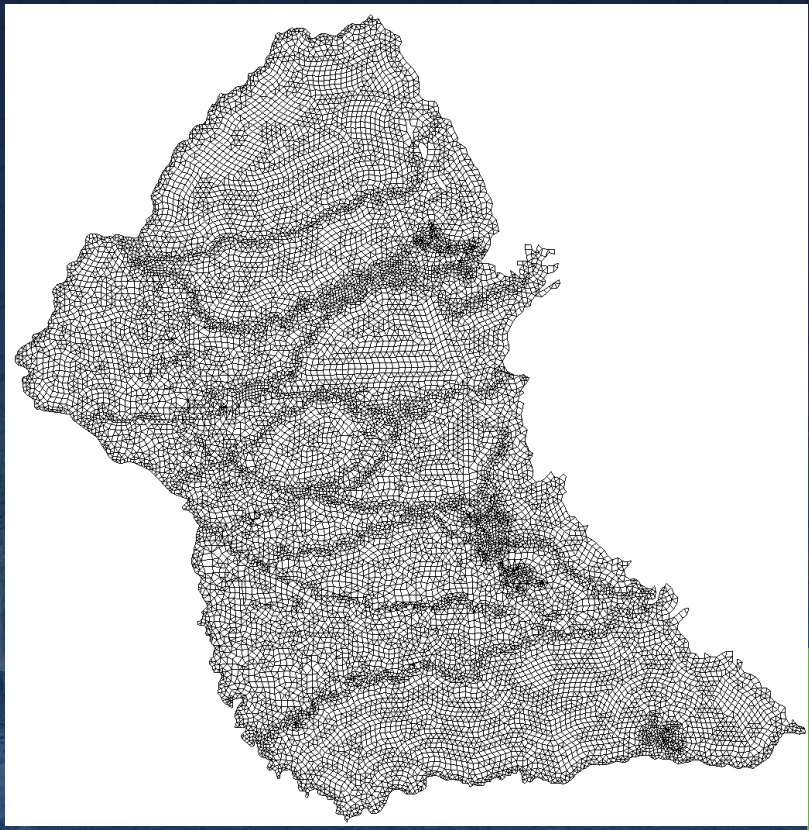
Type of Element	Number of Elements
Triangular	23,541
Quadrilateral	15,009
Total	**38,550**



Grid Iteration #4

- Criteria: Hydrology, subregion, and other features
- Buffer lines approximately 0.75 miles away from some streams
- Spacing:
  - All subregion and other lines (including stream buffers): 0.5 miles
  - All hydrology lines: 0.25 miles

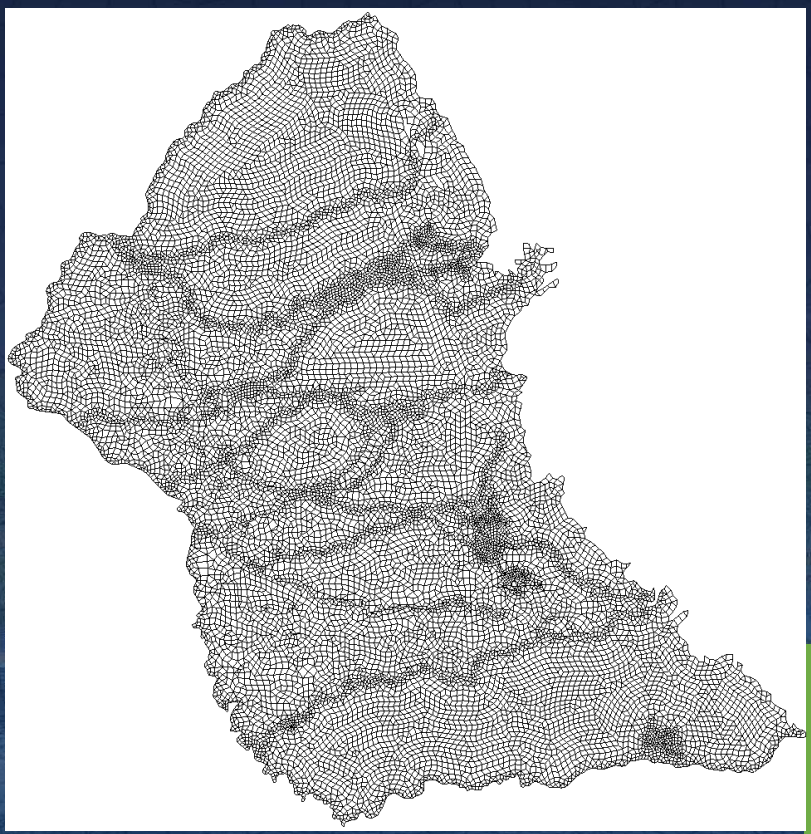
Type of Element	Number of Elements
Triangular	14,983
Quadrilateral	7,769
Total	**22,752**



Grid Iteration #5

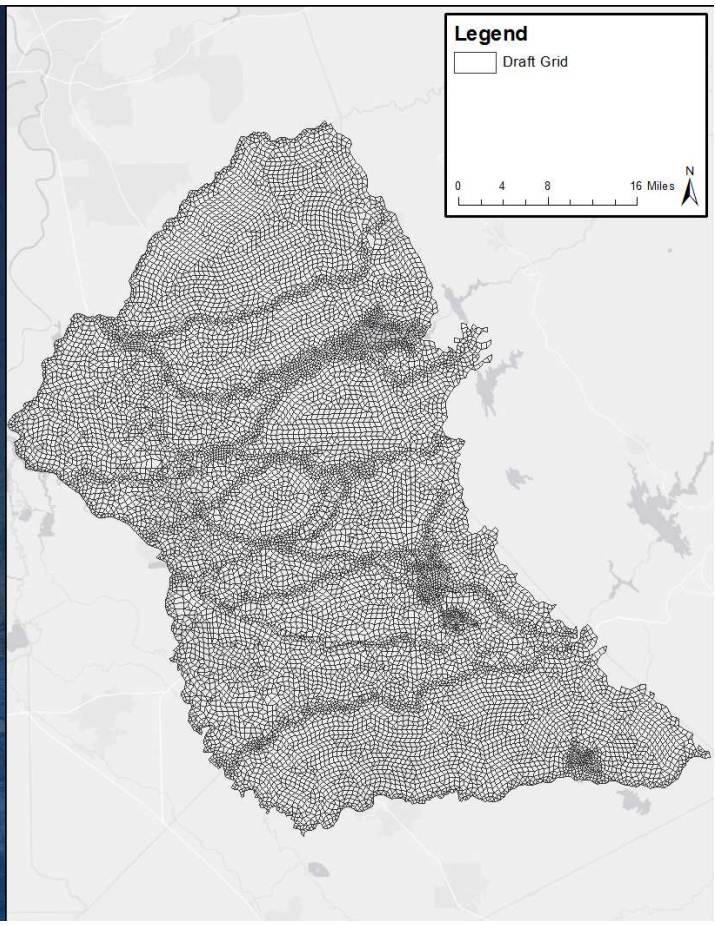
- Criteria: Hydrology, subregion, and other features
- Buffer lines approximately 0.75 miles away from some streams
- Spacing:
  - All subregion and other lines (including stream buffers): 0.5 miles
  - All hydrology lines: 0.25 miles
- Minimum interior angle for merging triangles (gradually decreased from 65° to 15°)

Type of Element	Number of Elements
Triangular	3,514
Quadrilateral	13,453
Total	**16,967**



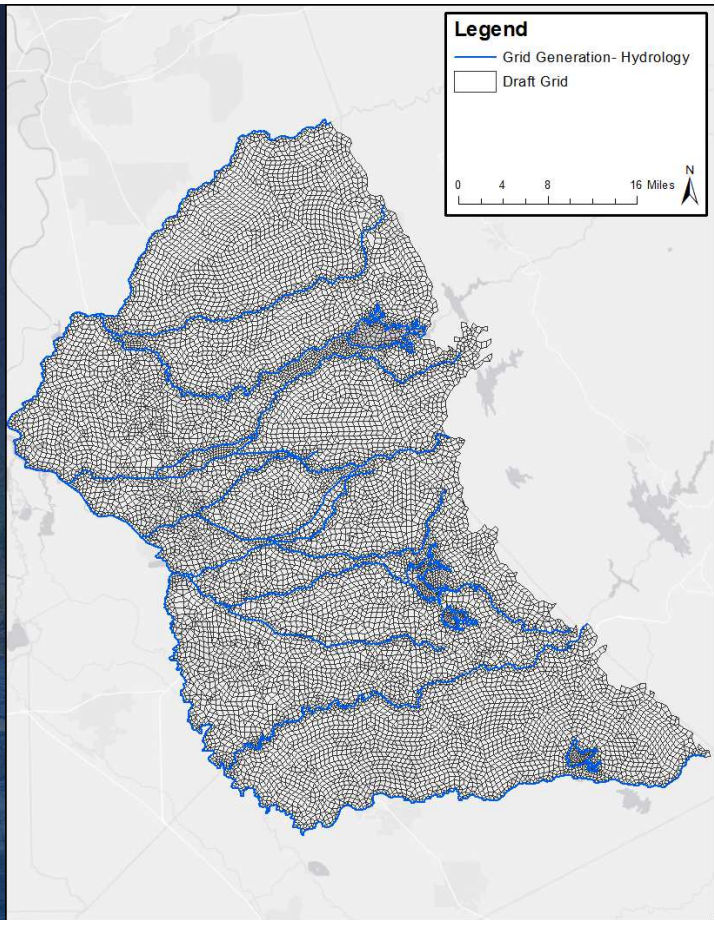
Draft Grid with Model Features

Draft Grid



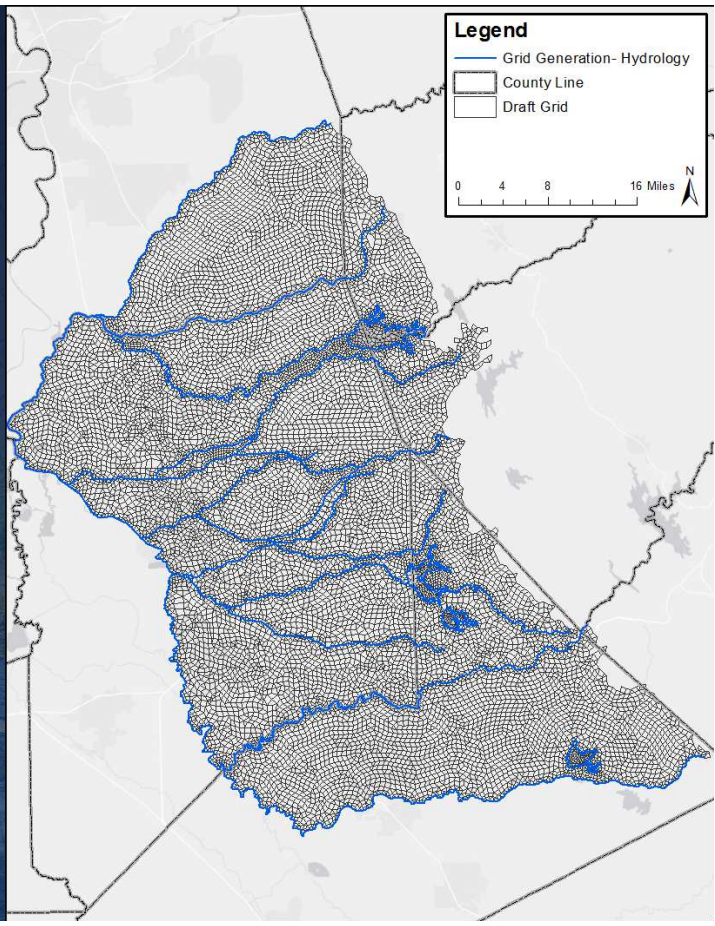
Draft Grid with Model Features

Draft Grid
+ Hydrology



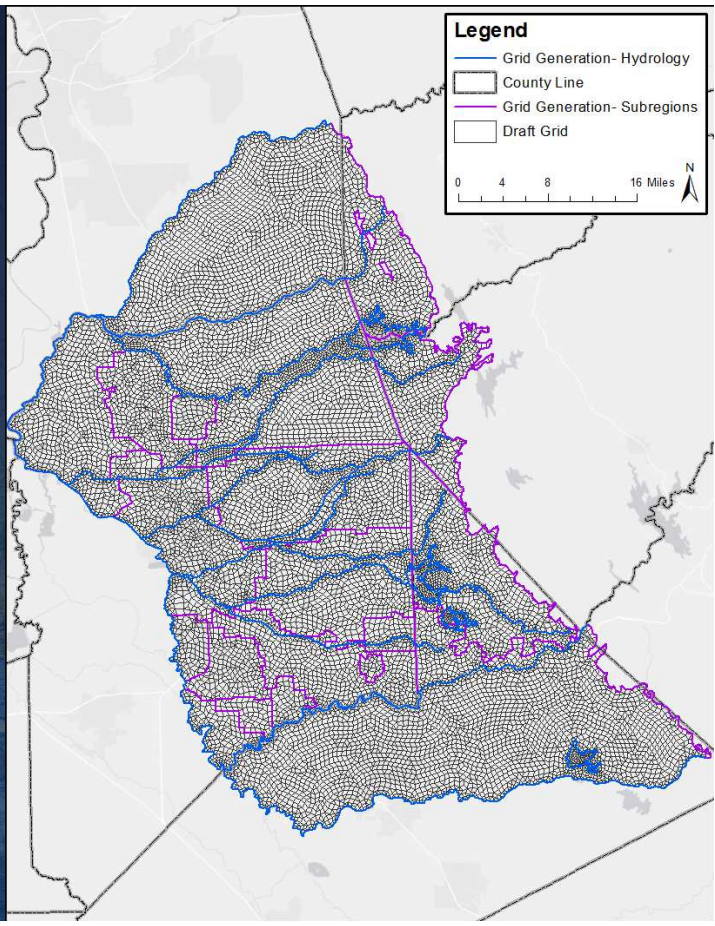
Draft Grid with Model Features

Draft Grid
+ Hydrology
+ County lines



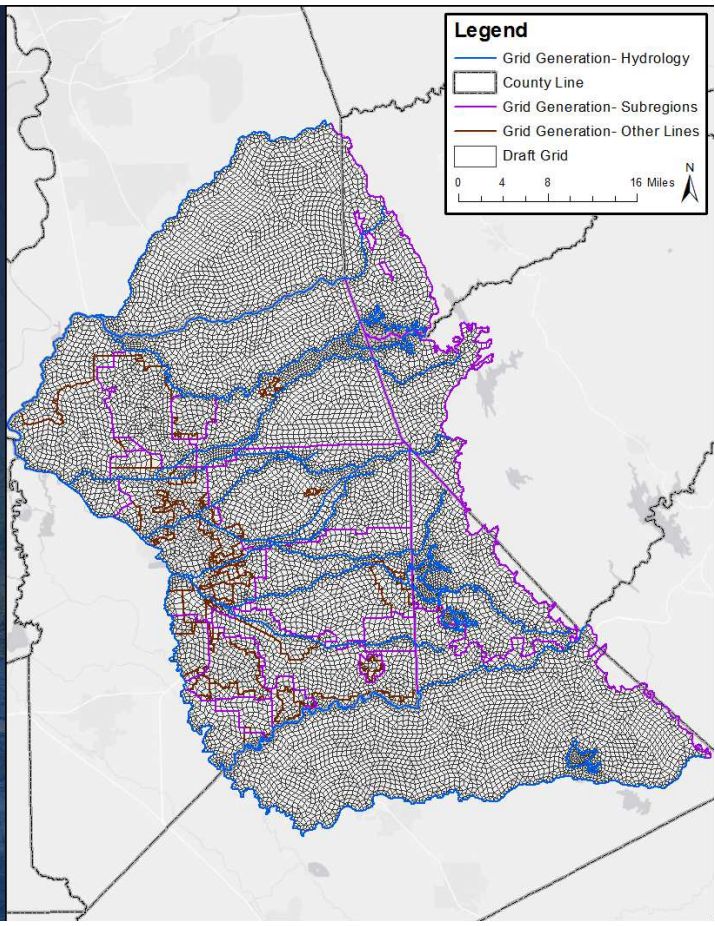
Draft Grid with Model Features

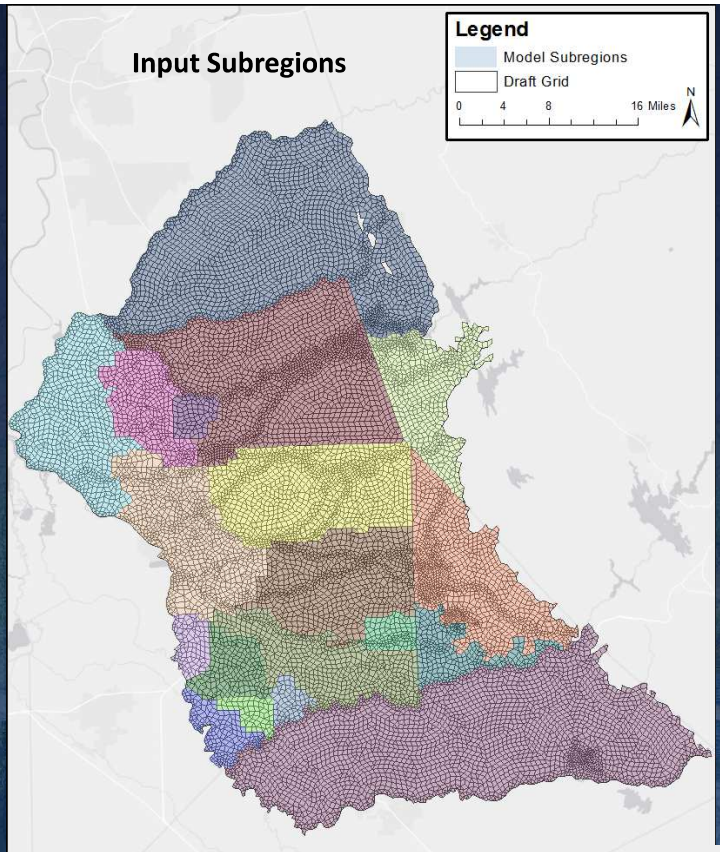
Draft Grid
+ Hydrology
+ County lines
+ Remaining subregion lines

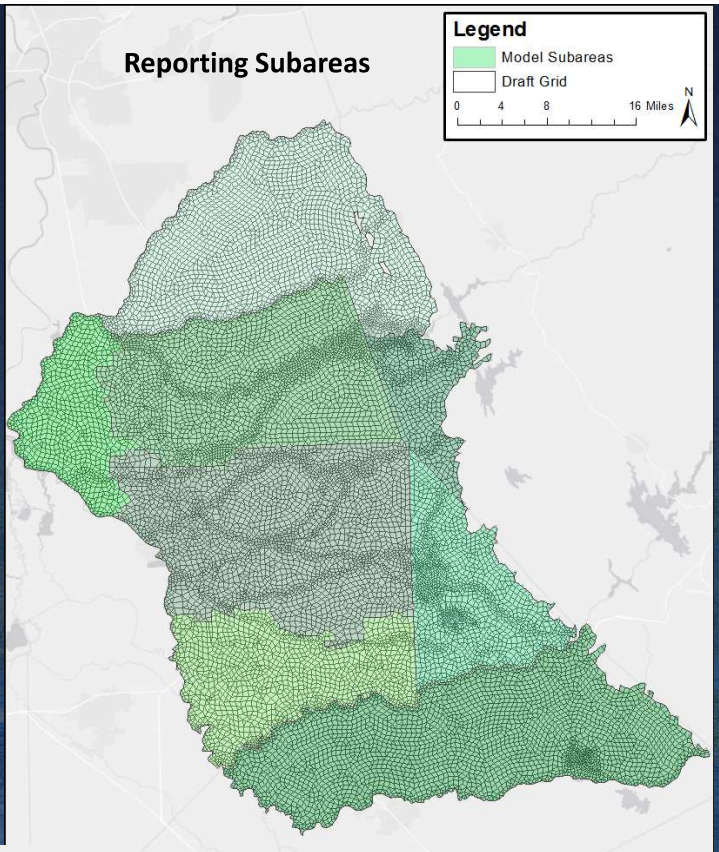


Draft Grid with Model Features

Draft Grid
+ Hydrology
+ County lines
+ Remaining subregion lines
+ Other district lines



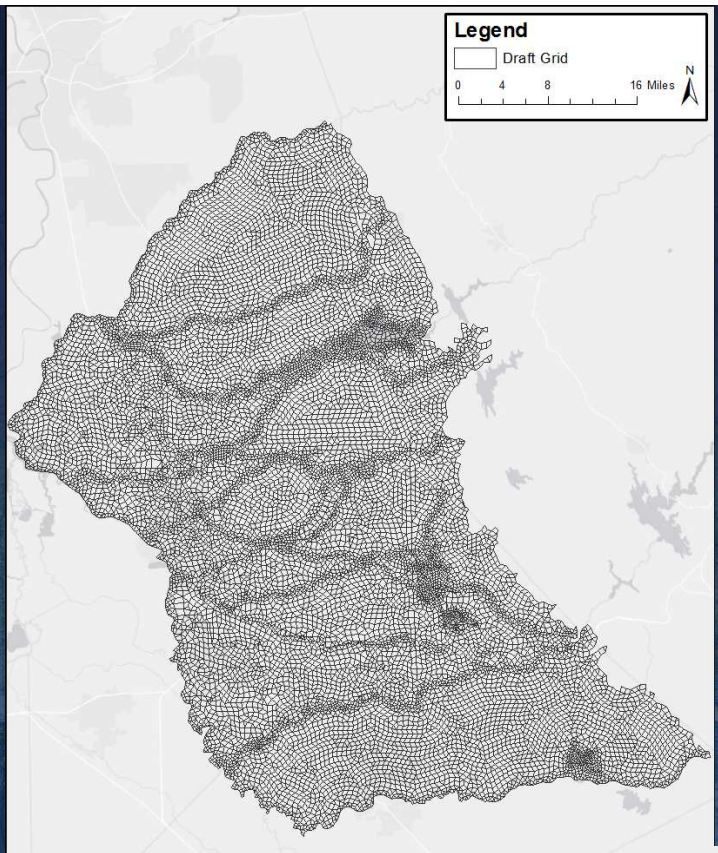


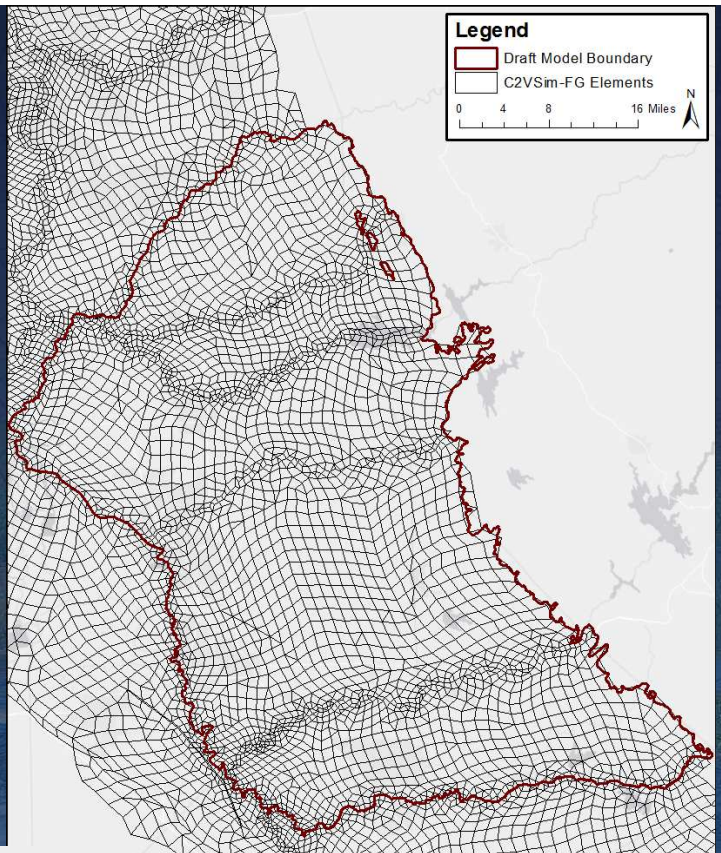


Model Input Subregions and Reporting Subareas

Comparison with Other Models

Model Name	Model Area (acres)	Number of Elements	Average Element Area (acres)	Average Stream Node Spacing	Average Other Node Spacing
Merced Water Resources Model (Merced WRM)- Merced Groundwater Region	491,000	15,441	39	0.25 miles	0.5 miles
Yuba Groundwater Model (YGM)	224,377	10,593	21	~1,000 feet (ranges 500-2,000 feet)	1,000 feet
C2VSim-FG- ESJ Subbasin (w/o Cosumnes and Modesto Subbasins)	772,376	2,093	372	0.59 miles	1.01 miles
Eastern San Joaquin Water Resources Model	**1,227,899**	**16,967**	**72**	**0.25 miles**	**0.5 miles**





Comparison of ESJ Draft Grid with C2VSim-FG

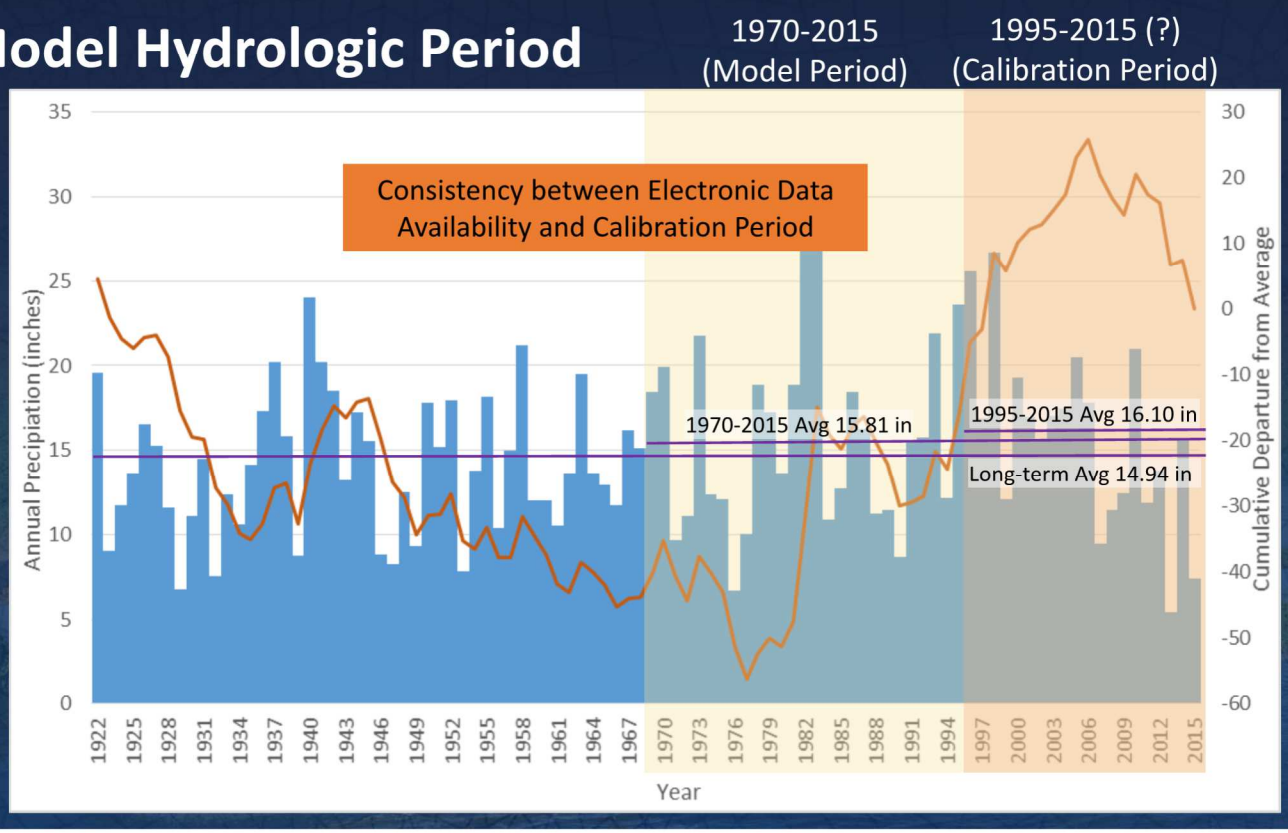
Next Steps for Finalizing Grid

- Address comments from stakeholders
- Considerations on coarser spacing in Modesto and Cosumnes subbasins
- Manual refinement to finalize grid

Model Data Categories

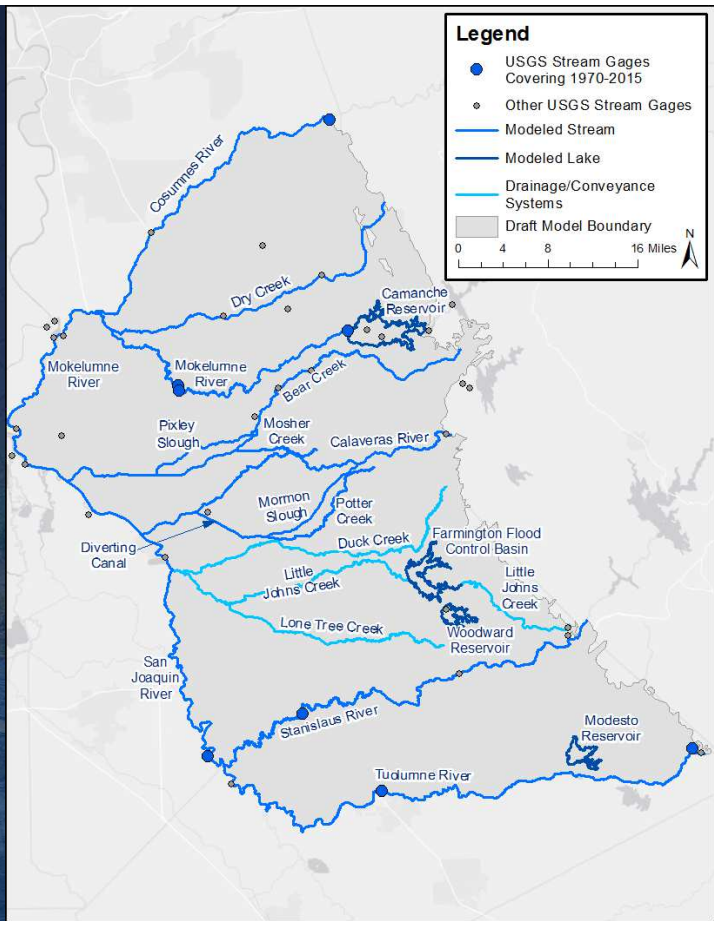
- Hydrology / Rainfall
- Geology and Hydrogeology
- Land Use and Cropping Pattern
- Ag Water Supply (SW Delivery and GW Pumping)
- Estimated Ag Demand (Applied SW or GW Pumping for Ag)
- Urban Water Use (SW, GW, and wastewater)
- GW Operations (Recharge, ASR, quality, monitoring, etc.)
- Well Information (Well IDs, locations, depths, construction, etc.)

Model Hydrologic Period



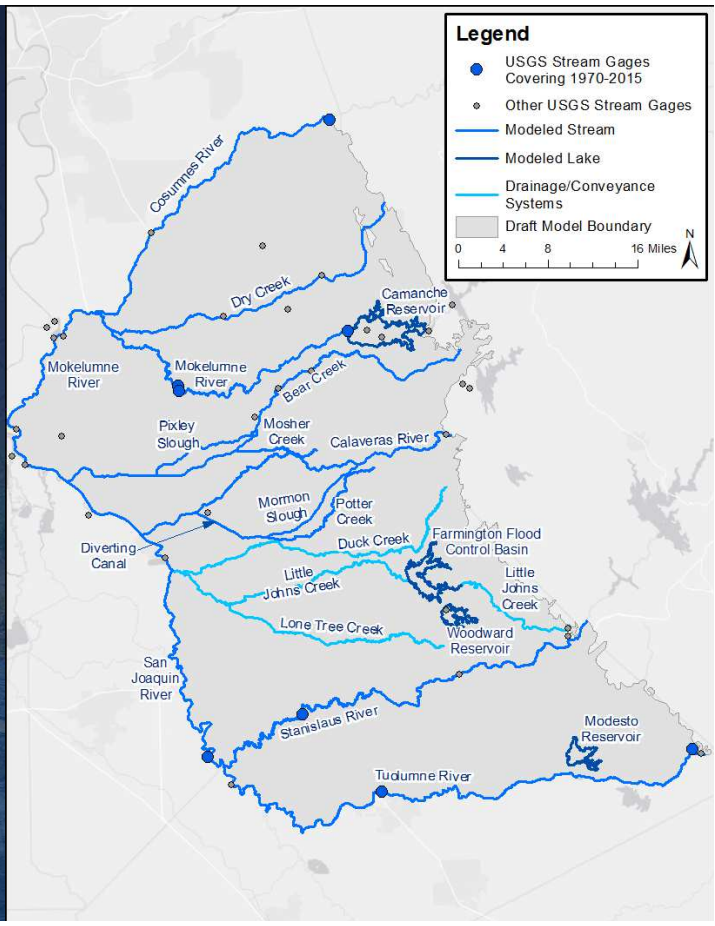
Modeled Streams

Number	Stream Name	Data Period (1970 – 2015)	Stream Geometry Available	USGS Gage
1	San Joaquin River	Yes	Yes	11303500
2	Cosumnes River	Yes	Yes	11335000
3	Dry Creek	N/A	Yes	C2VSim
4	Mokelumne River	Yes	Yes	11323500 11325500 11325000
5	Calaveras River	Yes	Yes	USACE New Hogan Lake releases
6	Stanislaus River	Yes	Yes	11303000
7	Tuolumne River	Yes	Yes	11290000 11289000



Additional Modeled Features

	Additional Modeled Features	Geometry	Flow
	Model Streams		
8	Bear Creek	TBD	Rainfall/Runoff + Conveyance
9	Pixley Slough	TBD	Rainfall/Runoff + Conveyance
10	Mosher Creek	TBD	Rainfall/Runoff
11	Mormon Slough	TBD	Rainfall/Runoff + Conveyance
12	Potter Creek	TBD	Rainfall/Runoff + Conveyance
13	Diverting Canal (connects Mormon Slough back to Calaveras River)	TBD	Rainfall/Runoff + Conveyance
	Model Reservoirs		
14	Camanche Reservoir	N/A	CDEC
15	Farmington Flood Control Basin	N/A	USACE
16	Woodward Reservoir	N/A	SSJID
17	Modesto Reservoir	N/A	CDEC



Status of Data Request

- Land Use and Cropping Pattern
- Ag Water Supply (SW Delivery and GW Pumping)
- Estimated Ag Demand (Applied SW or GW Pumping for Ag)
- Urban Water Use (SW, GW, and wastewater)
- GW Operations (Recharge, ASR, quality, monitoring, etc.)
- Well Information (Well IDs, locations, depths, construction, etc.)

Sustainable Groundwater Management Act Readiness Project

Meeting No. 5: Integrated Water Resources Model Development Update

RMC water and environment

Complex Challenges | Innovative Solutions

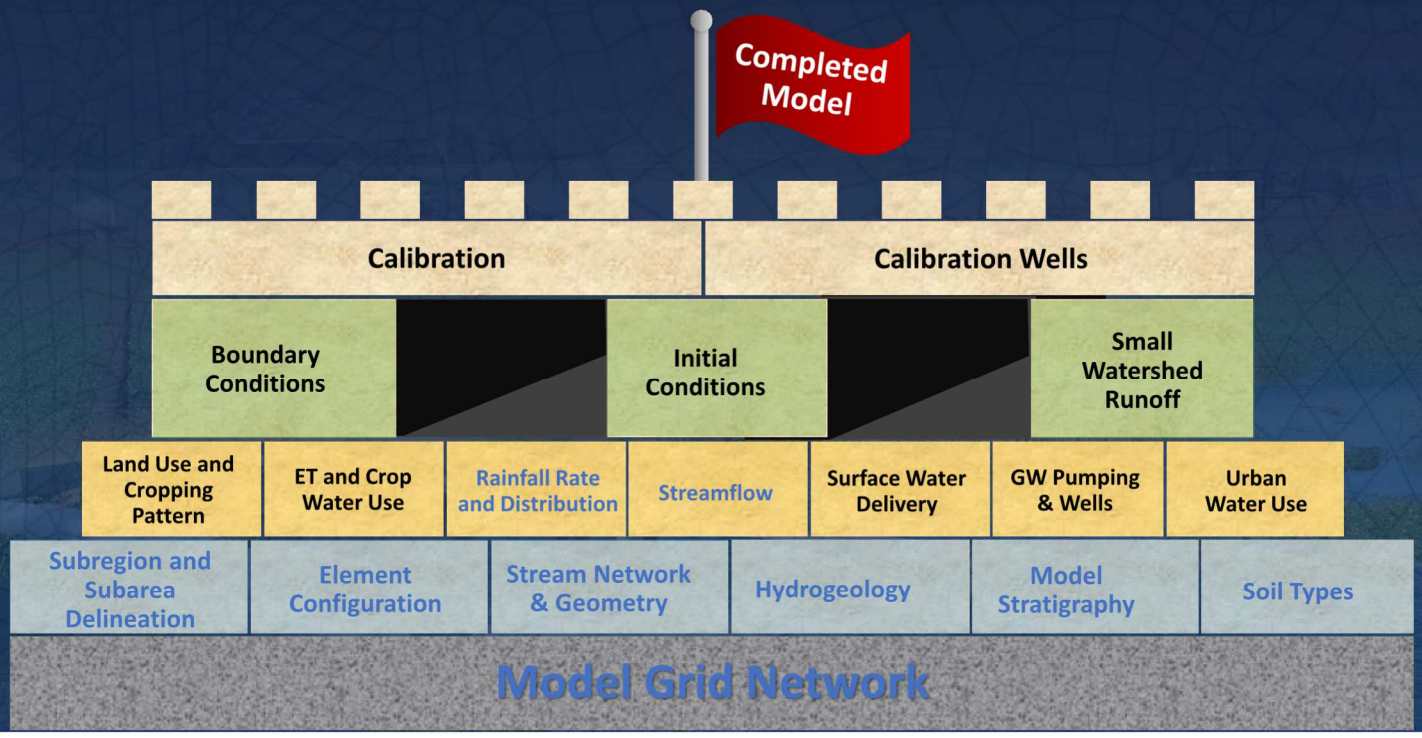
SAN JOAQUIN COUNTY CALIFORNIA

April 26, 2017

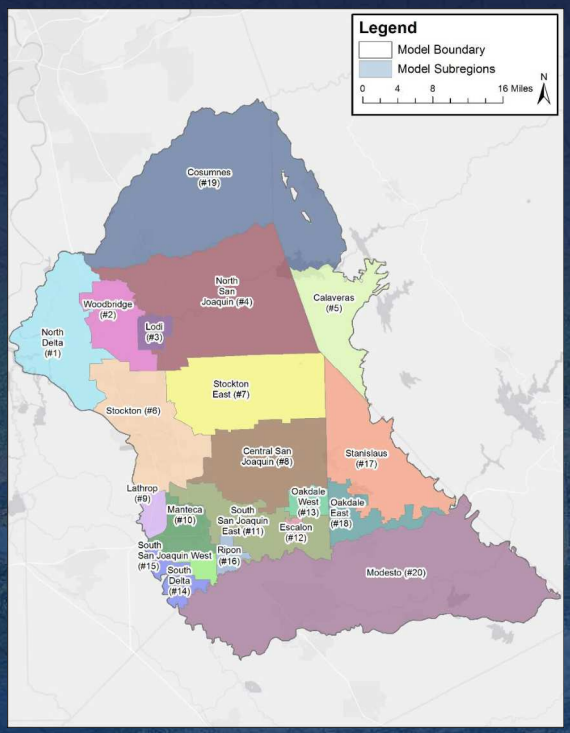
Agenda

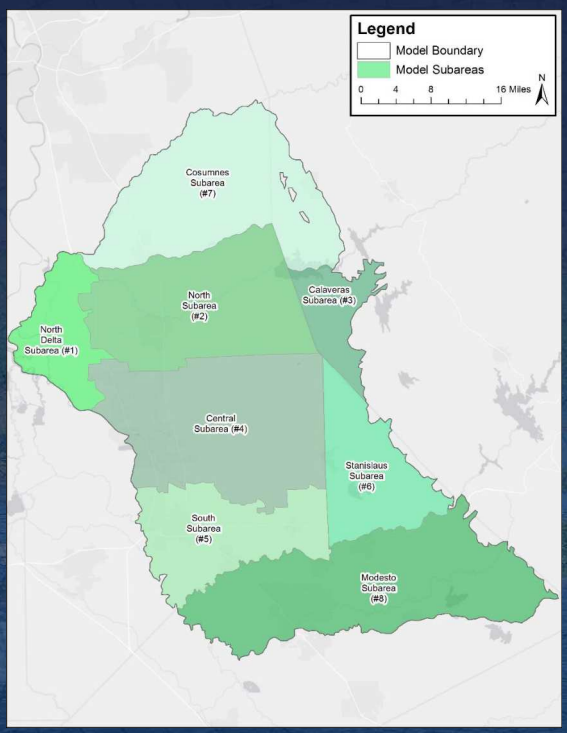
- Model Stratigraphy
- Land Use Processing Update
- Data Development for IDC Model
  - Soil
  - Precipitation
- Agency Data Compilation
  - Groundwater Pumping
  - Urban Demand
- Next Steps

Integrated Model Construction



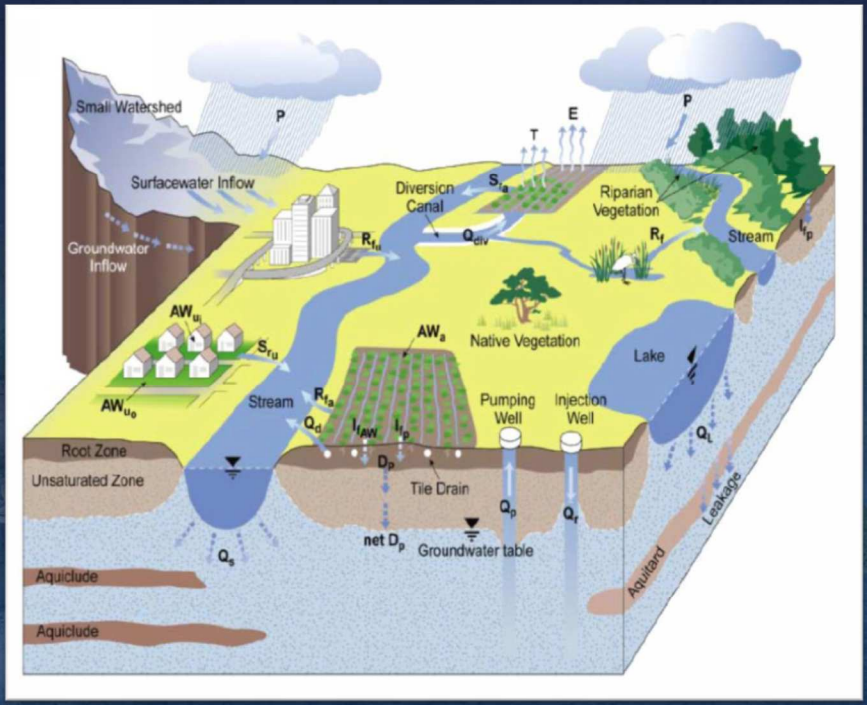
Completed Model Component: Model Boundary and Subregions





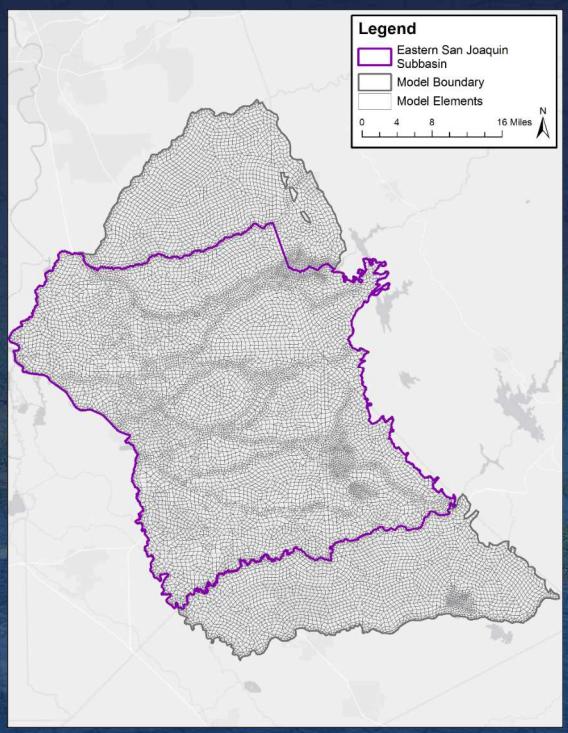
Integrated Water Resources Modeling

- Land Surface Processes
- Groundwater Flow
- Streamflow
- Physical Systems Integration
- Water Balance Preservation Over time and space

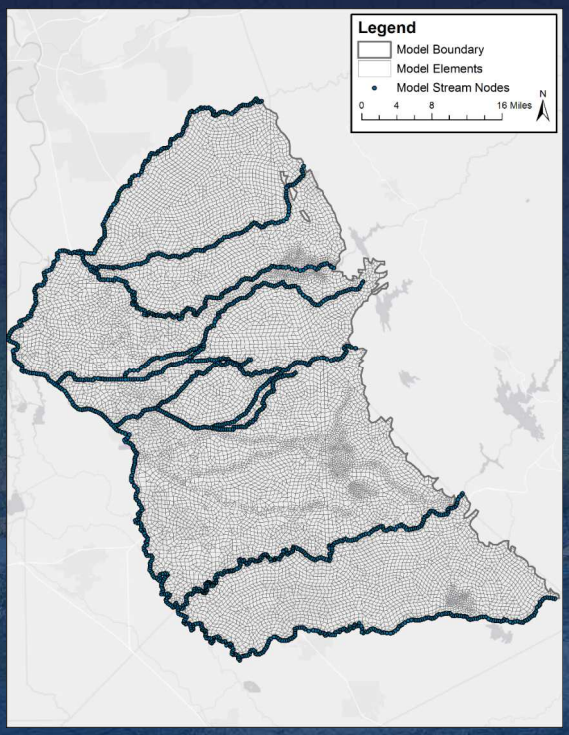


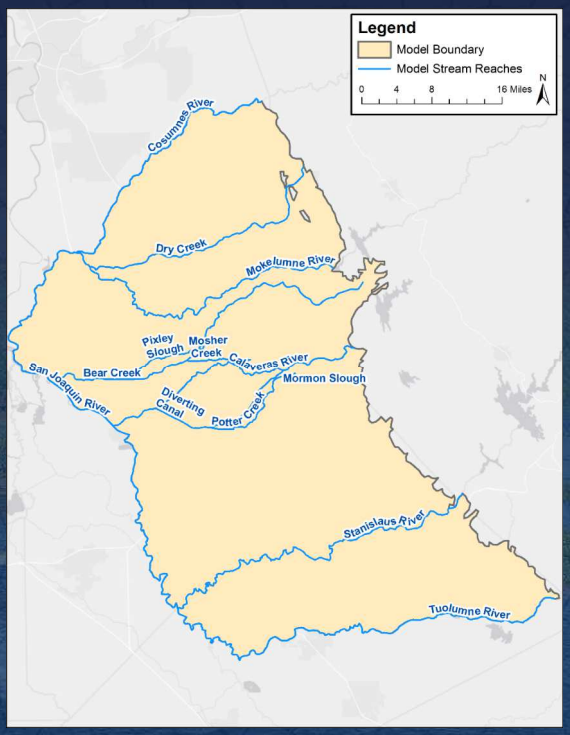
Completed Model Component: Elements and Node Configuration

- Model Grid
  - 16,054 elements
  - 15,302 nodes
- Covering Cosumnes , Eastern San Joaquin, and Modesto Groundwater Subbasins



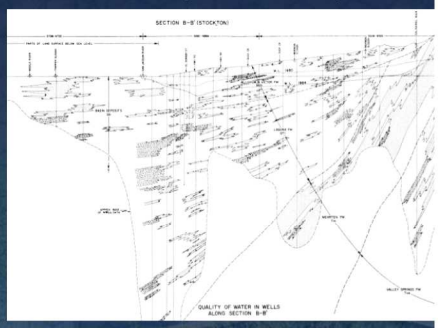
Completed Model Component: Stream Hydrology



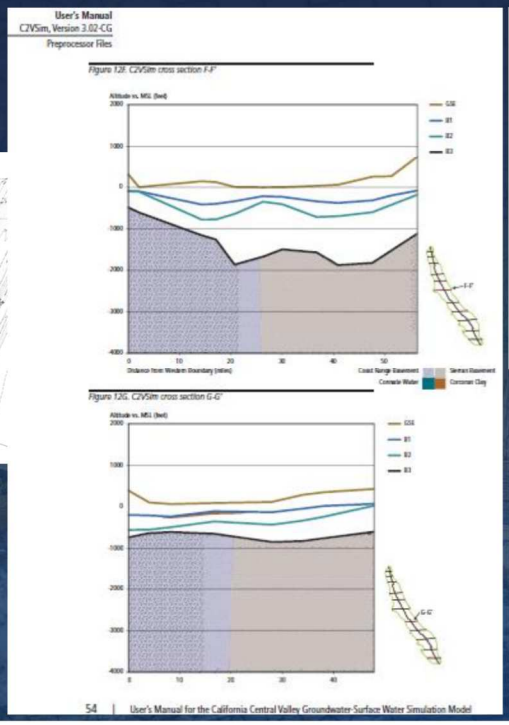


Schematic Hydrogeological Cross-Sections Compared and Refined

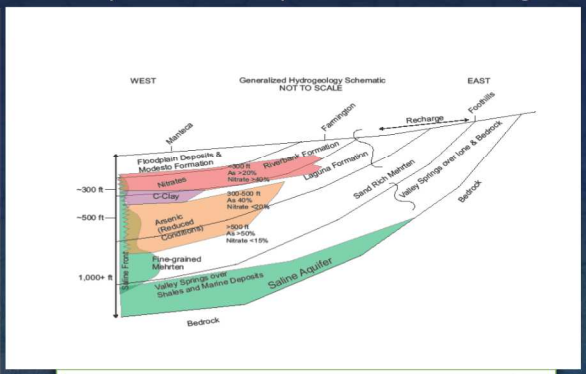
DWR (San Joaquin County Ground Water Investigation, 1967)

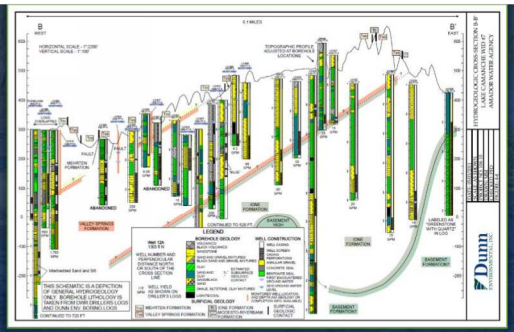


C2VSim 2013



Updated Conceptual Understanding



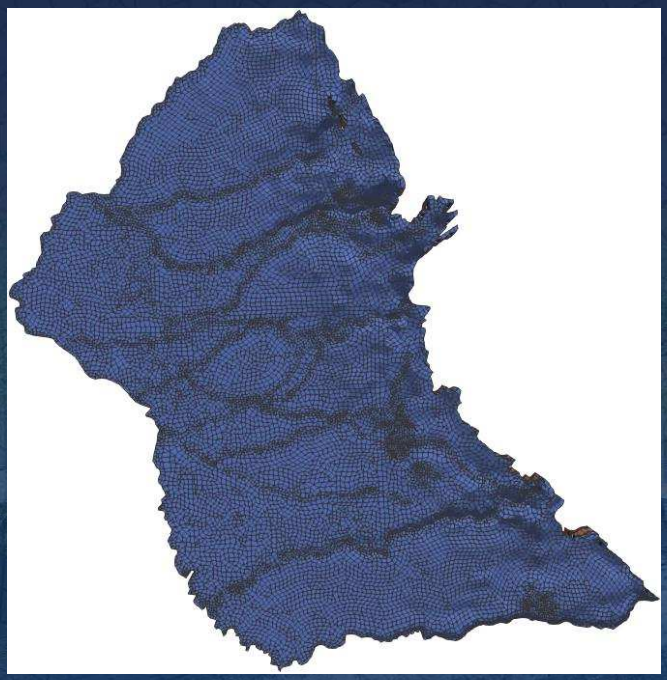


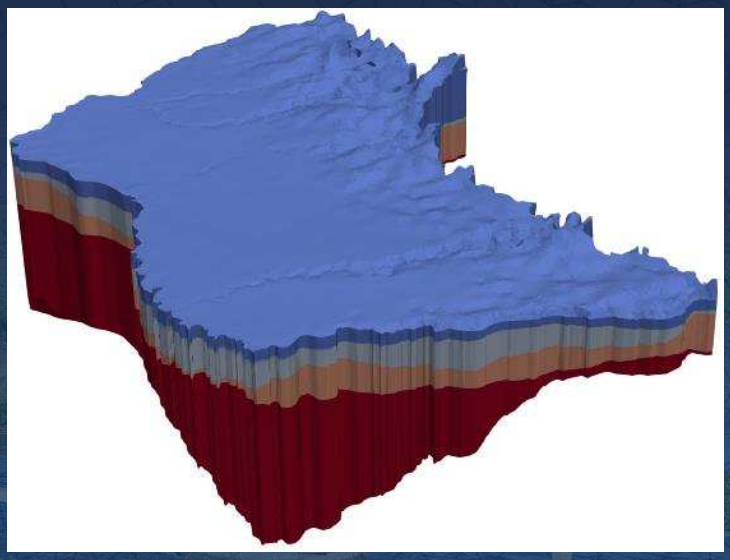
Basis for Model Stratigraphy

- Based on C2VSim-FG updated 4-layer stratigraphy:
  - Ground Surface Elevation: National Elevation Dataset (USGS, 10 meter DEM)
  - Bottom of Layers 1 and 2
    - From latest available version of C2VSim (DWR, Development and Calibration of the California Central Valley Groundwater-Surface Water Simulation Model, 2013)
    - Bottom of Layer 1 represents top of Corcoran Clay in areas with Corcoran Clay (USGS, CVHM Texture Model)
  - Bottom of Layer 3- Base of Freshwater
    - DWR North Central Regional Office (Sacramento Valley) (Pers. Comm. Steven Springhorn)
    - DWR South Central Regional Office (San Joaquin Valley) (Pers. Comm. Christopher Olvera)
    - Williamson 1989 D43 (USGS, Williamson et al., Ground-Water Flow in the Central Valley California, 1989)
    - Latest available version of C2VSim
  - Bottom of Layer 4- Bottom of Continental Deposits
    - Base and Thickness of the Post Eocene Continental Deposits in Sacramento Valley (USGS, Page, 1974)
    - Williamson 1989 D11 Thickness of Aquifer (USGS, Williamson et al., Ground-Water Flow in the Central Valley California, 1989)
    - Latest available version of C2VSim

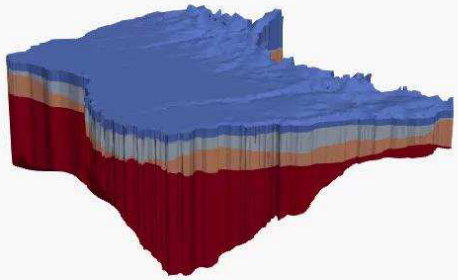
C2VSim: Sample Cross-Section Through ESJ Model Area

Model Stratigraphy

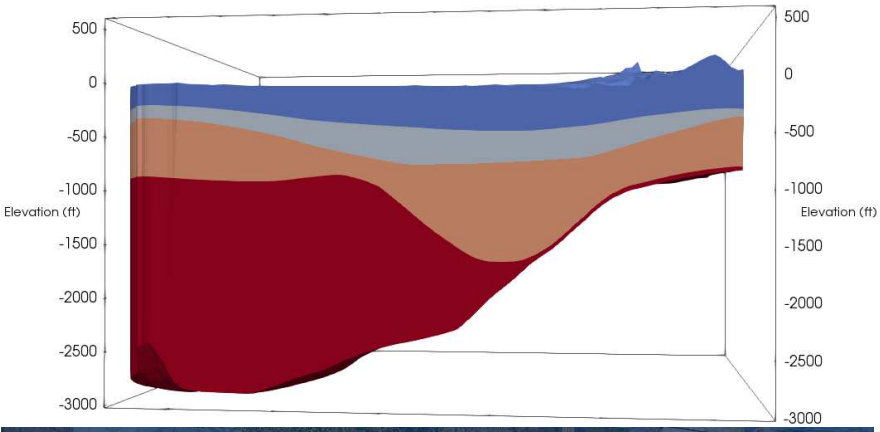


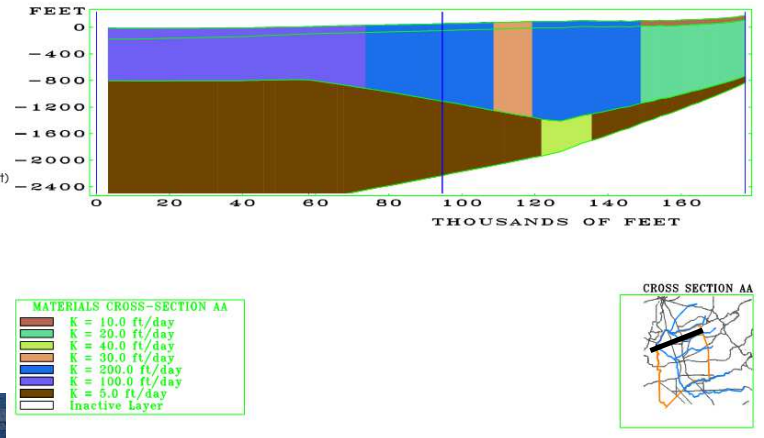


Model Stratigraphy: Rotation Around Model Edges



Comparison: ESJ Stratigraphy and DYNFLOW



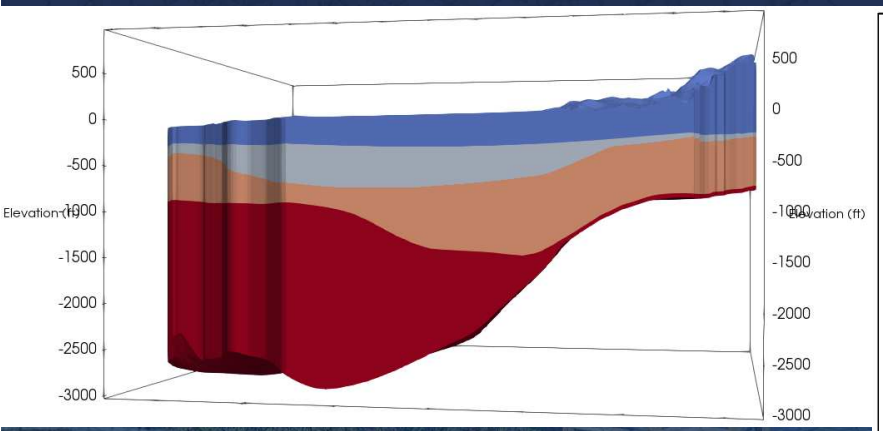


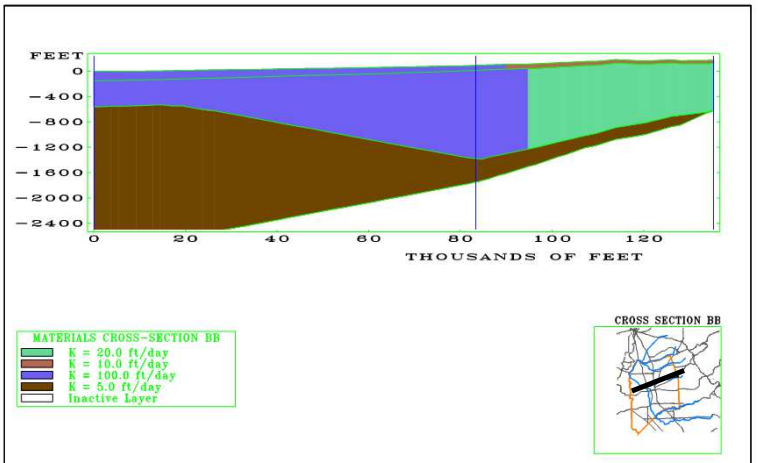
consulting engineering construction operations CDM

Cross Section Through Model
Wsst to East: From Delta Along Mokelumne River
to Eastern Border of San Joaquin County
San Joaquin County Water Management Plan

FIGURE 3-2

Comparison: ESJ Stratigraphy and DYNFLOW



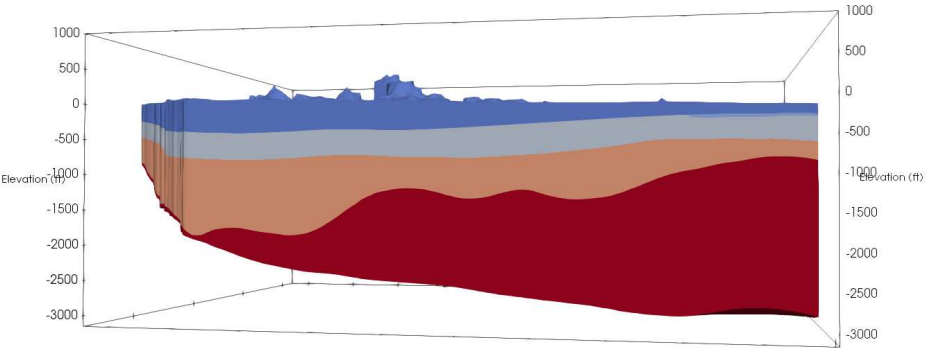


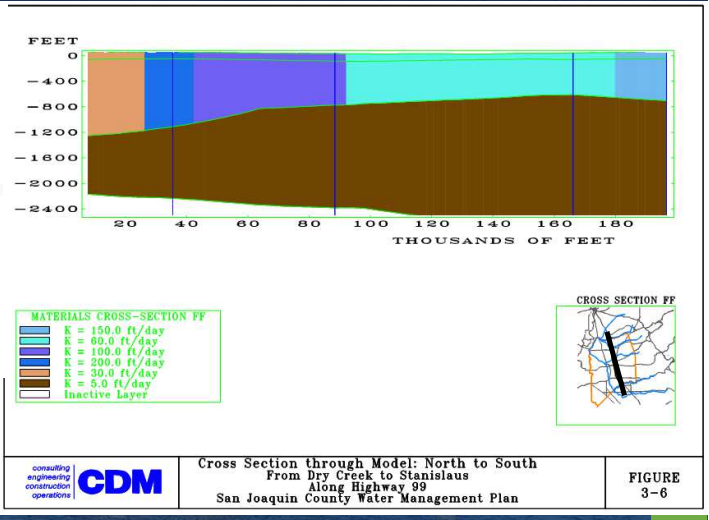
consulting engineering construction operations CDM

Cross Section Through Model: West to East
From San Joaquin River Along Calaveras River
to Eastern Border of San Joaquin County
San Joaquin County Water Management Plan

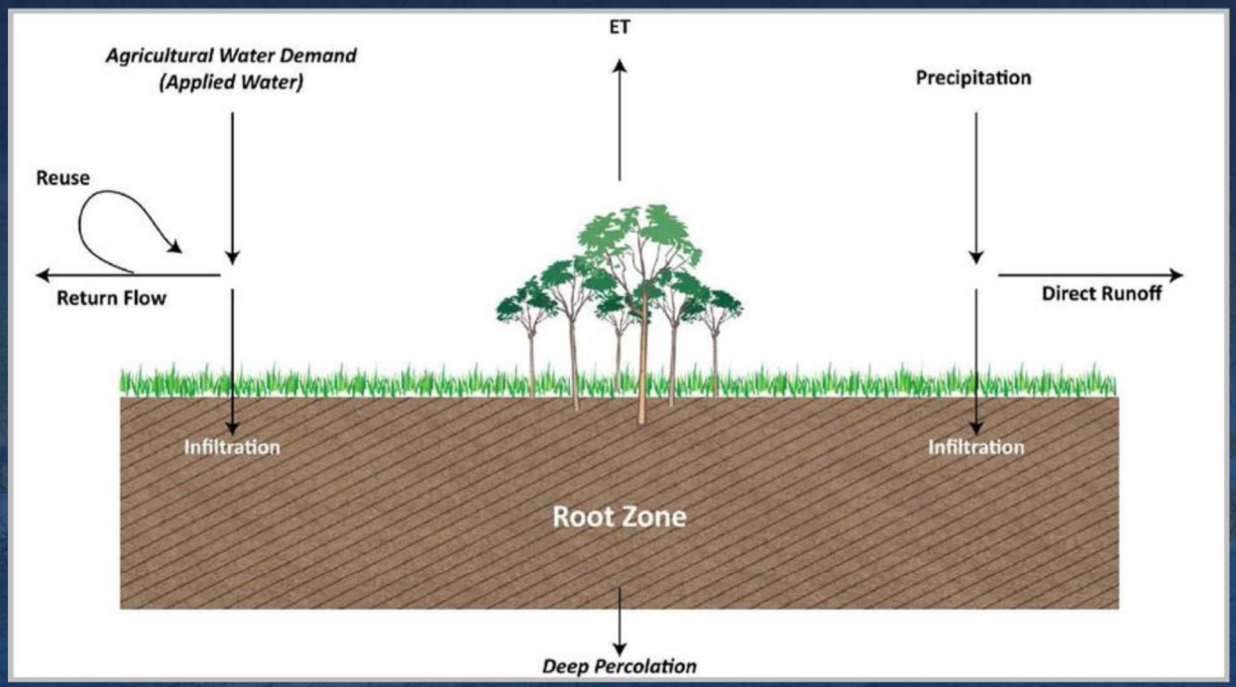
FIGURE 3-3

Comparison: ESJ Stratigraphy and DYNFLOW



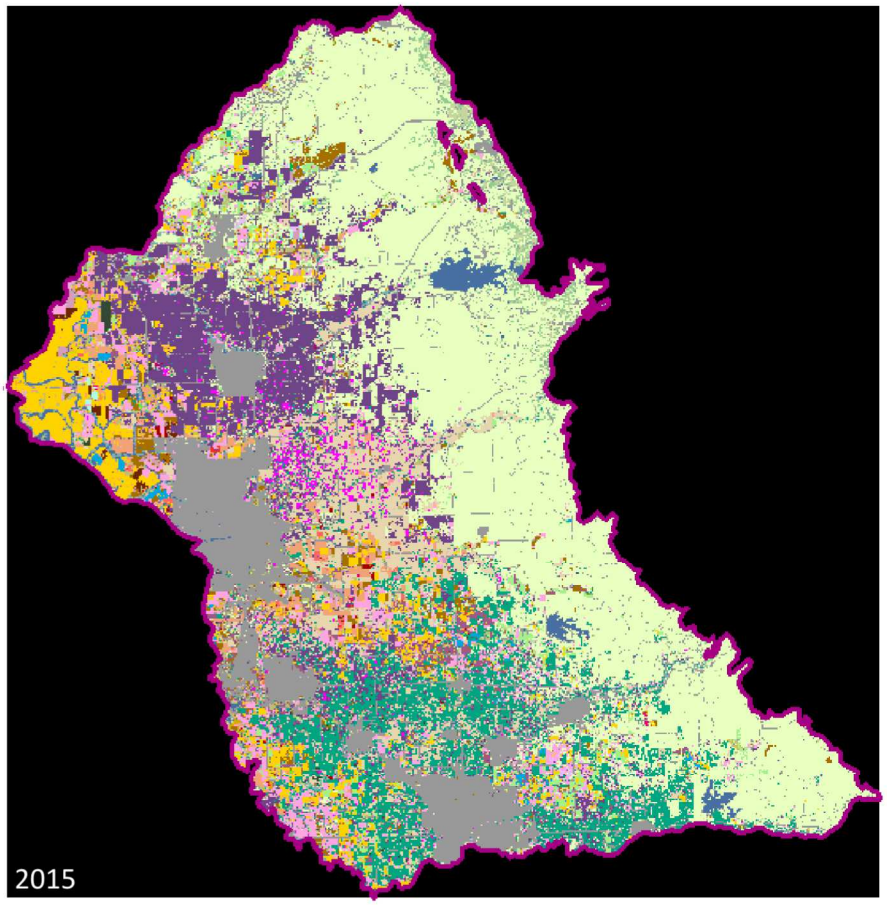


IWFM Demand Calculator: IDC

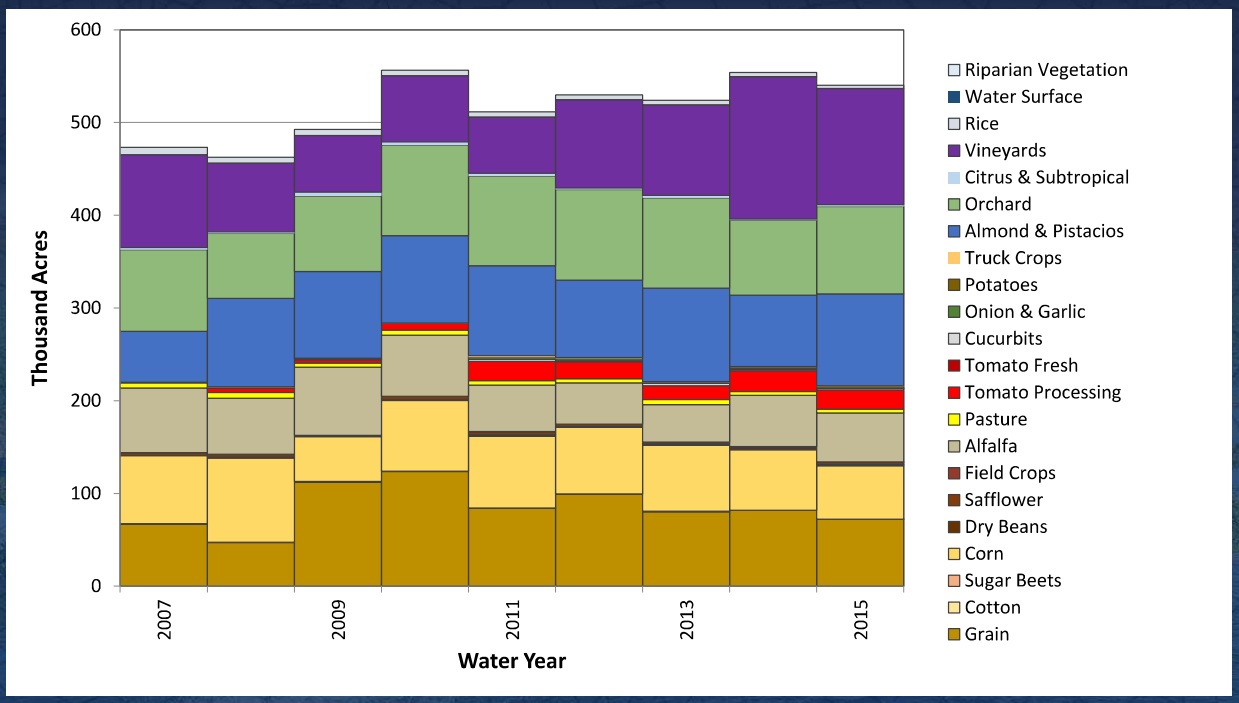


Land Use and Crop Coverage

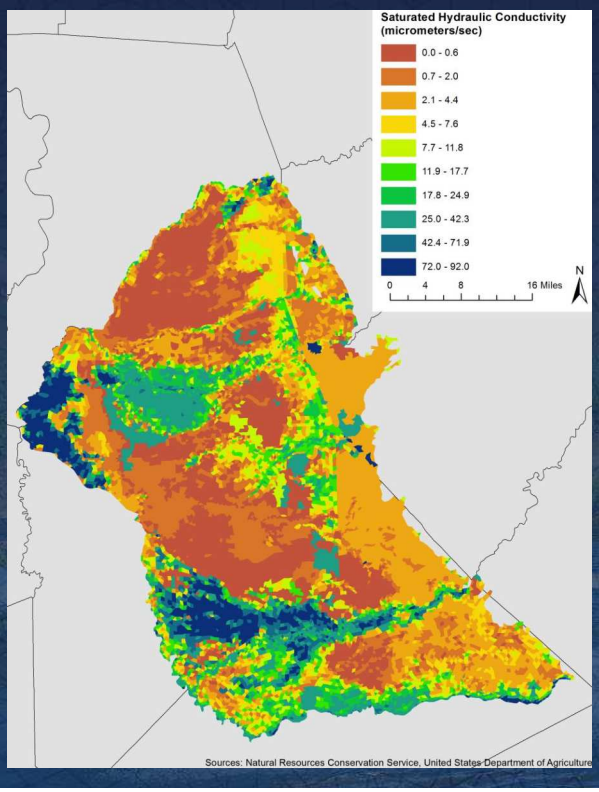
- DWR Land Use Surveys
- USDA's CropScape – Remote Sensing
- DWR's LandIQ Survey; 2014-Remote Sensing
- Local Data Sources

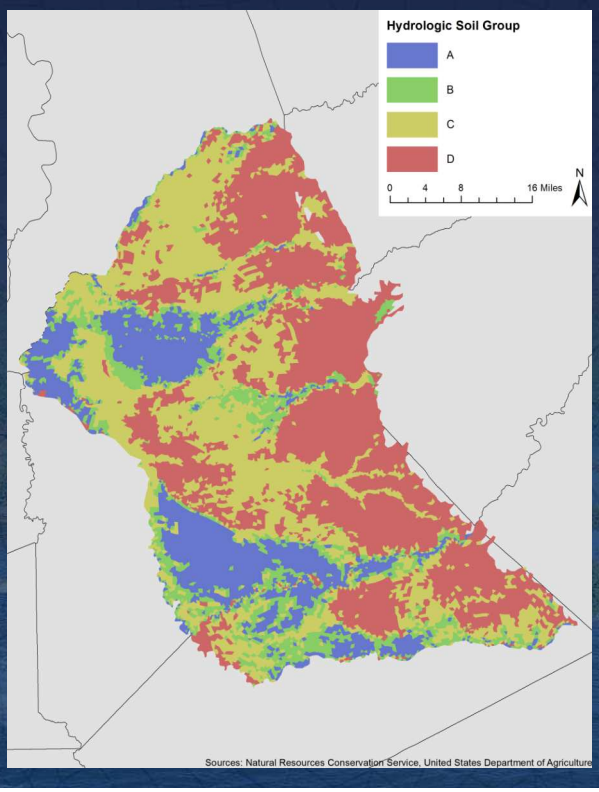


Draft Land Use Acreages



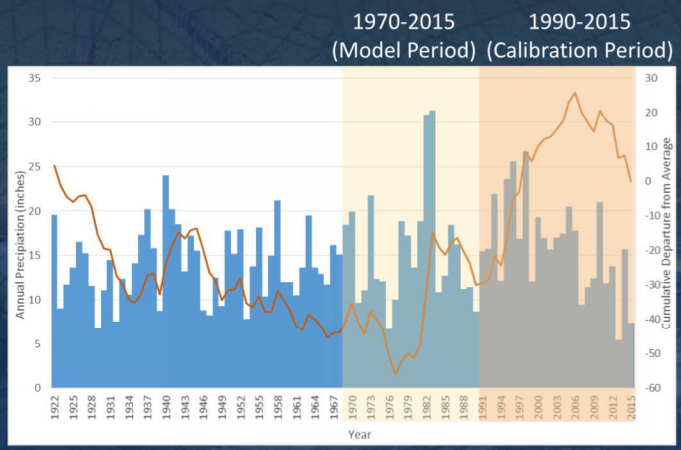
Root Zone Parameters

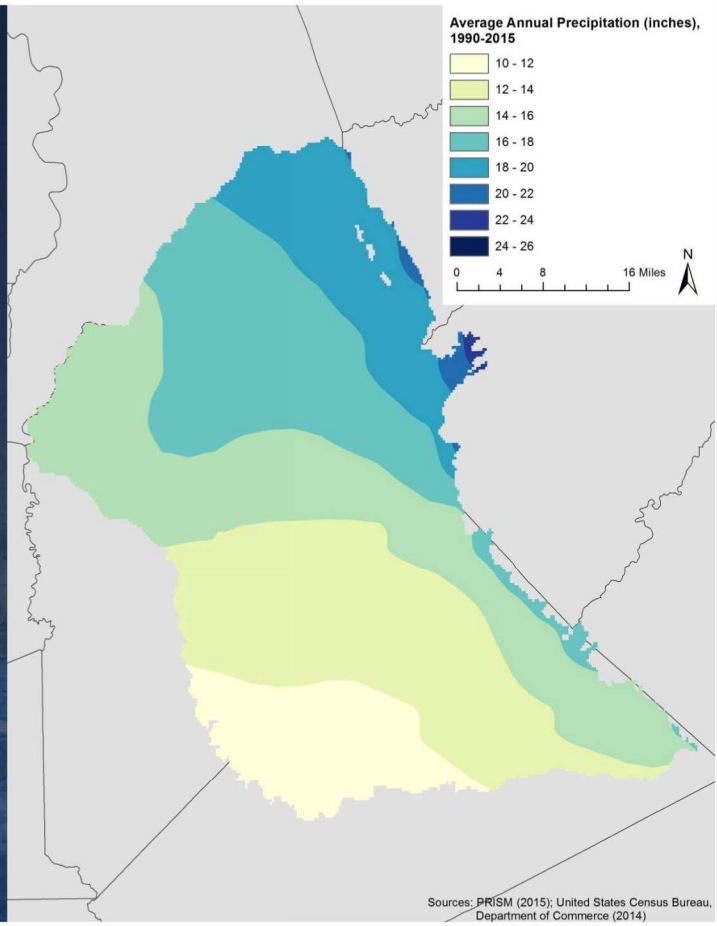




Precipitation

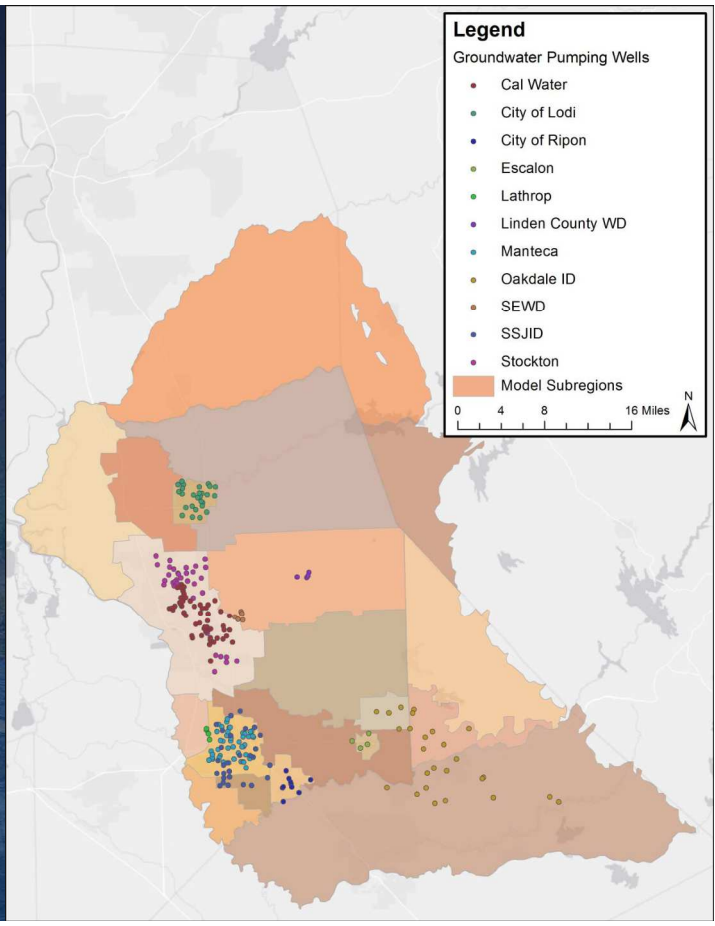
- Completed model input file for precipitation
- Source of Data: PRISM for entire model period (1990-2015)



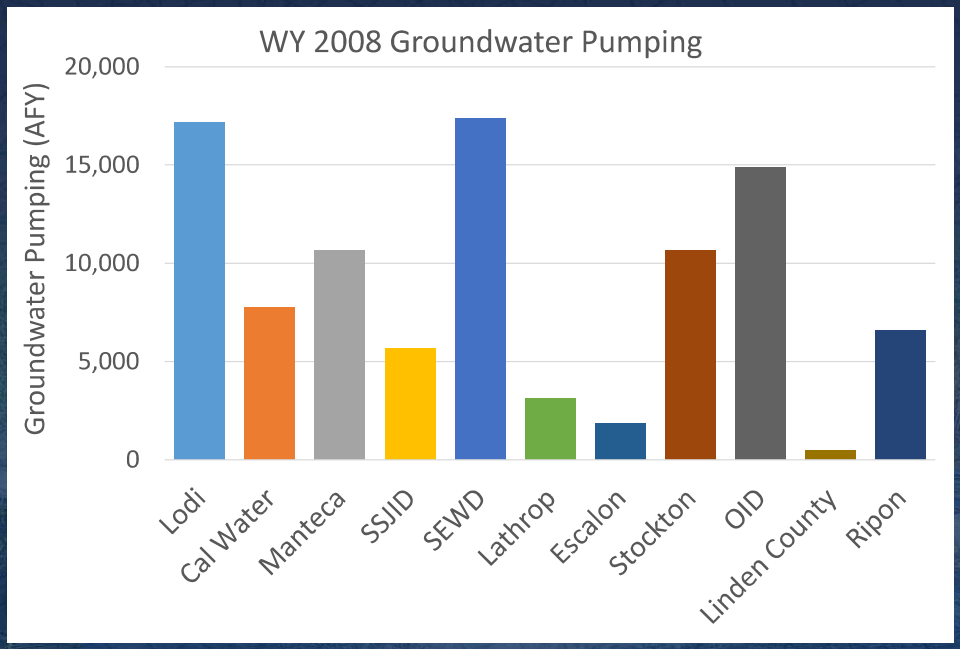


Groundwater Pumping

Agency	Number of Wells Contributing to Water Demand
Cal Water	56
City of Escalon	4
City of Lathrop	5
City of Lodi	35
City of Manteca	46
City of Ripon	10
City of Stockton	38
Linden County WD	4
Oakdale ID	26
Stockton East WD	5
South San Joaquin ID	28
TOTAL (as of 4/25/17)	**257**



Groundwater Pumping



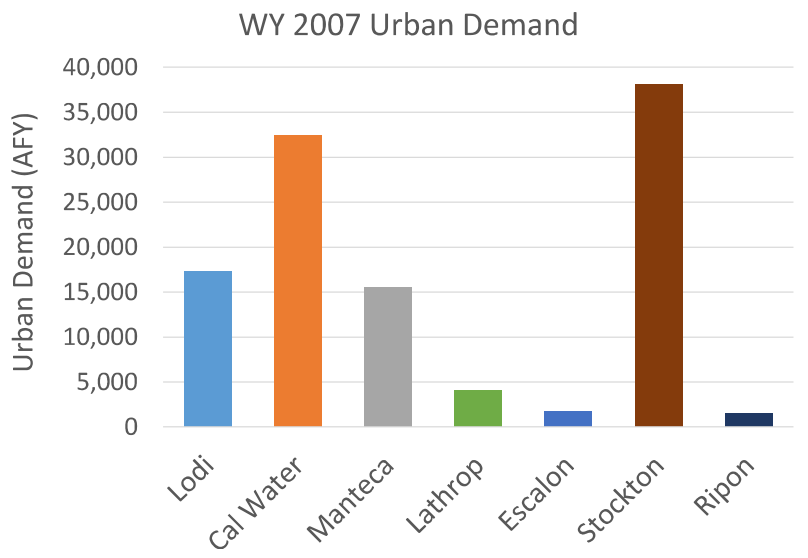
- Data issues:
  - Incomplete monthly time series for many agencies
  - Interpolation between years not always feasible

Agency	Data Period of Record
Lodi	1990-2015
Cal Water	1990-2015
Manteca	2002-2015 with gaps depending on well type
SSJID	1990-2015
SEWD	2005-2015
Lathrop	2006-2010 (need breakdown by well)
Escalon	1998-2015
Stockton	2002-2015
OID	2001-2010
Linden County	1995-2015
Ripon	Need breakdown by well

Urban Water Demand

- Based on GPCD and population if water demand information unavailable
- Data issues:
  - Incomplete agency data
  - Estimates about demand are tricky to balance with supply

Agency	Data Period of Record
Lodi	1990-2015
Cal Water	1995-2015
Manteca	1996-2007
Lathrop	1990-2011
Escalon	1998-2015
Stockton	1998-2009
Ripon	1995, 2002, 2005, 2007, 2014-2015



* Values for Cal Water and Stockton may represent total demand, not just urban

Project General Schedule

Sep 2016 – Apr 2017 | Jan 2017 – Jun 2017 | Jun 2017 - Sep 2017 | Oct 2017 - Dec 2017

Task 1 – Project Management

Task 2: Ag Water Demand and Land Use Budget

Task 3: Enhance and Update San Joaquin County Hydrologic Model

Task 4: Develop a Comprehensive Basin Scale Water Budget

Task 5: Groundwater Monitoring and Enhancement Program

Next Steps

- Complete Stream Geometry Data
- Compile and Process pumping well construction information
- Compile and Process GW pumping for urban and agricultural use
- Compile and Process Surface water diversions for urban and agricultural use
- Communicate LU/Cropping patterns with local agencies
- Complete IDC input data files:
  - Annual land use acreages
  - ET maps from DWR
  - Ag water budget from agencies

Sustainable Groundwater Management Act Readiness Project

Meeting No. 6:

Integrated Water Resources Model Development Update

RMC water and environment

Complex Challenges | Innovative Solutions

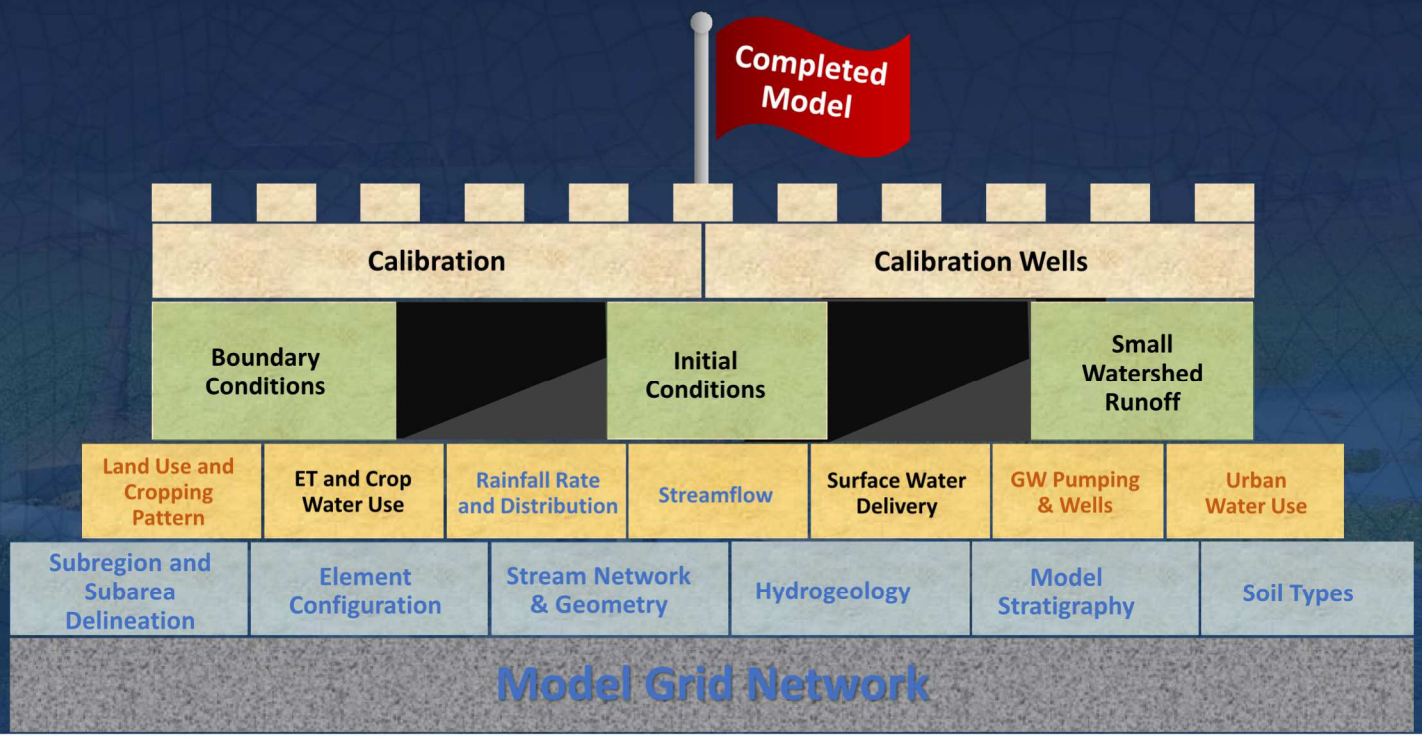
SAN JOAQUIN COUNTY CALIFORNIA

May 24, 2017

Agenda

- Introduction
- Model Crop and Other Land Use Acreage
- Model Urban Water Demand and Groundwater Pumping
- Prop 1 SGMA Groundwater Sustainability Plans Grant
- Next Meeting

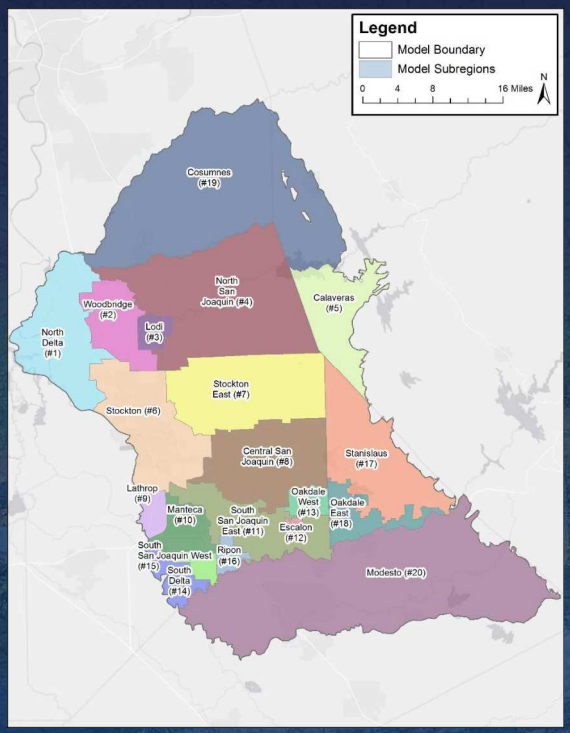
Integrated Model Construction

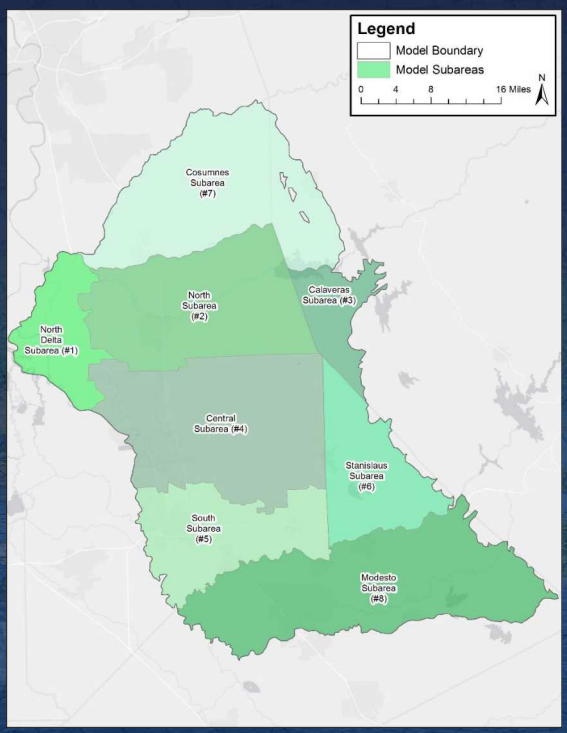


ESJ Model Trivia Part I

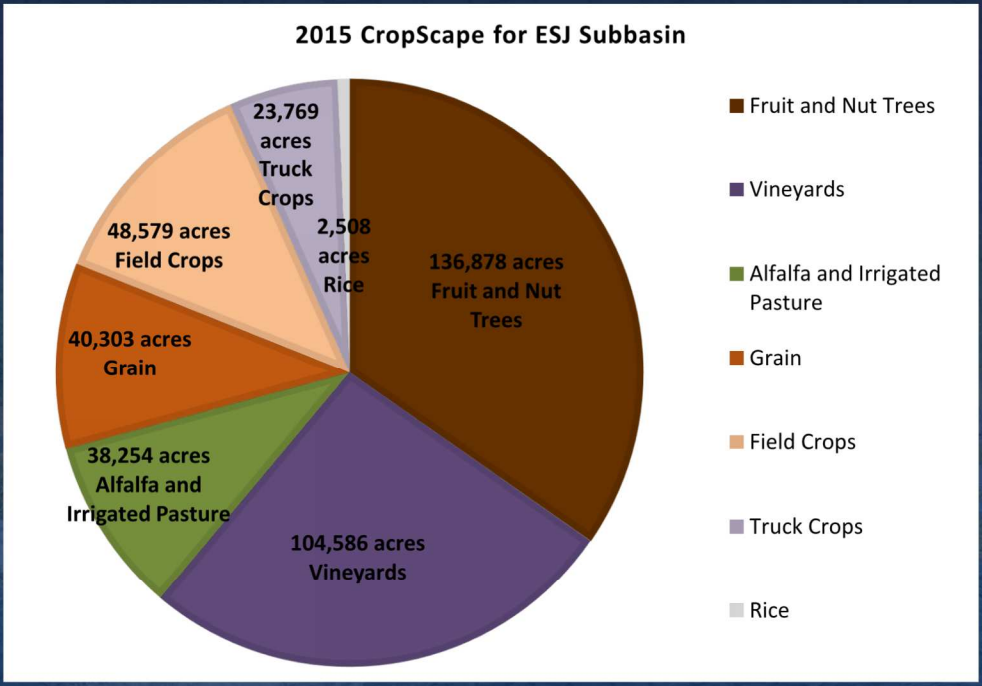
1. What are the neighboring Subbasins of the ESJ GW Subbasin?
   Solano, South American, Cosumnes, Tracy, Delta-Mendota, and Modesto
2. What are the geographic features of ESJ GW Subbasin at the boundaries?
   - Northern boundary: Dry Creek and County Boundary
   - Eastern boundary: Foothills
   - Southern boundary: Stanislaus River
   - Western boundary: San Joaquin River
3. What is the total gross acreage of ESJ GW Subbasin?
   772,377 acres (~1,207 square miles or ~3,126 square kilometers)
4. What is the total irrigated acres in ESJ Subbasin?
   381,907 acres (~597 square miles or ~1,546 square kilometers)

Completed Model Component: Model Boundary and Subregions

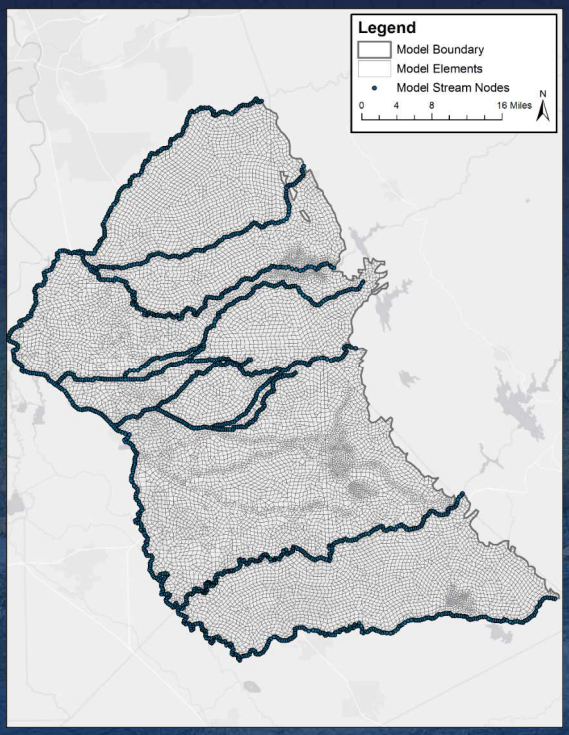


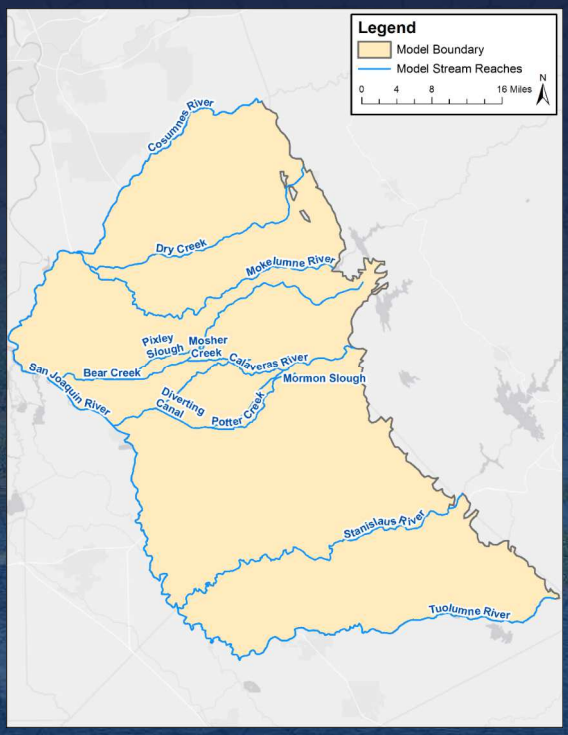


Primary Cropping Pattern in ESJ Subbasin



Completed Model Component: Stream Hydrology

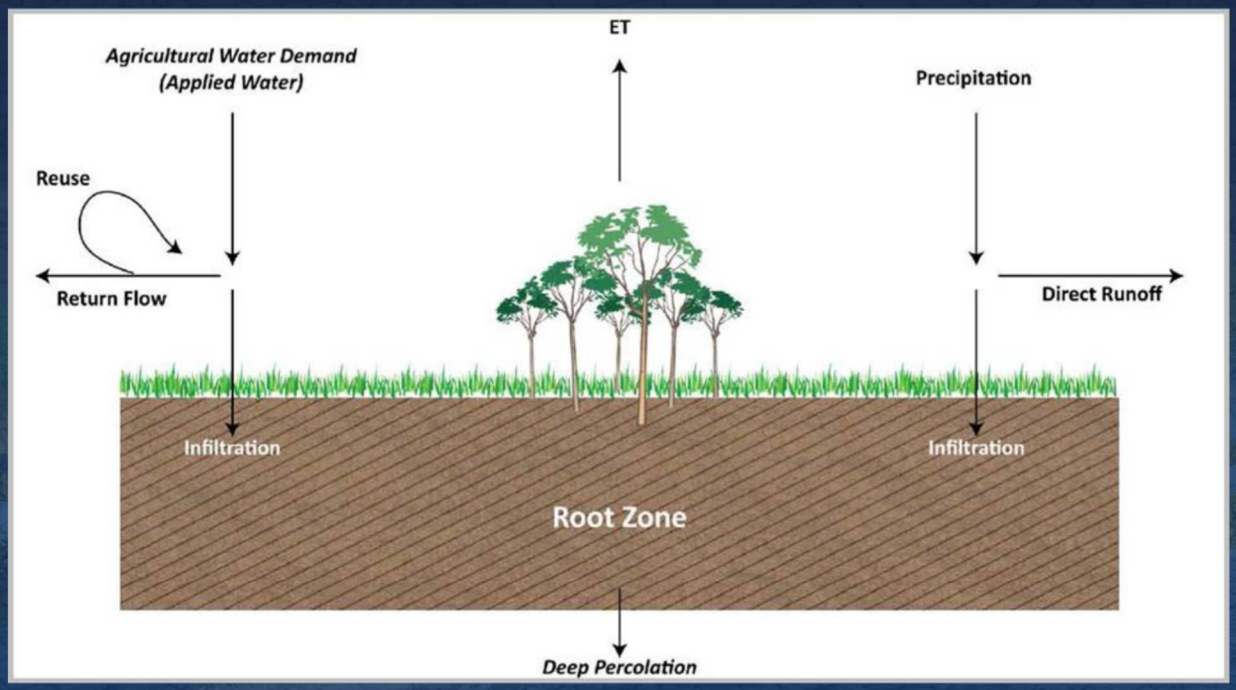




ESJ Model Trivia Part II

1. How many elements are in the model?
   16,054 elements
2. What is the average node spacing in the model area?
   - Across Model Area: 0.37 miles
   - Along the Rivers / Water Courses: 0.28 miles
3. Why do we break up the model into elements?
   - Delineate hydrologic and jurisdictional features at local scale
   - Simulate hydrologic processes at local scale

AG Water Demand Estimation

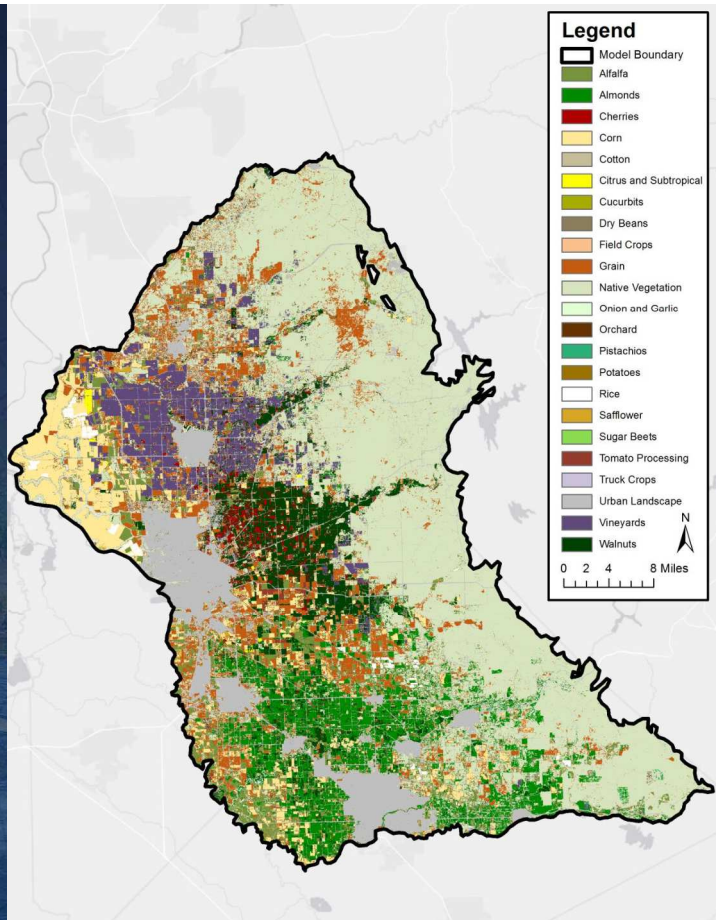


Land Use and Crop Coverage

1. DWR Land Use Surveys (Representing ~1995 Era)
   - San Joaquin County (1996)
   - Sacramento County (1993)
   - Amador County (1997)
   - Calaveras County (2000)
   - Stanislaus County (1996)
2. Remote Sensing Data:
   - USDA's CropScape
   - DWR's LandIQ Survey; 2014
3. Local Data Sources

USDA CropScape

- Satellite imagery collected during growing season
- 30 meter by 30 meter pixels
- Level of accuracy: Generally 85% to 95% for crop-specific land cover categories
- 256 land use categories

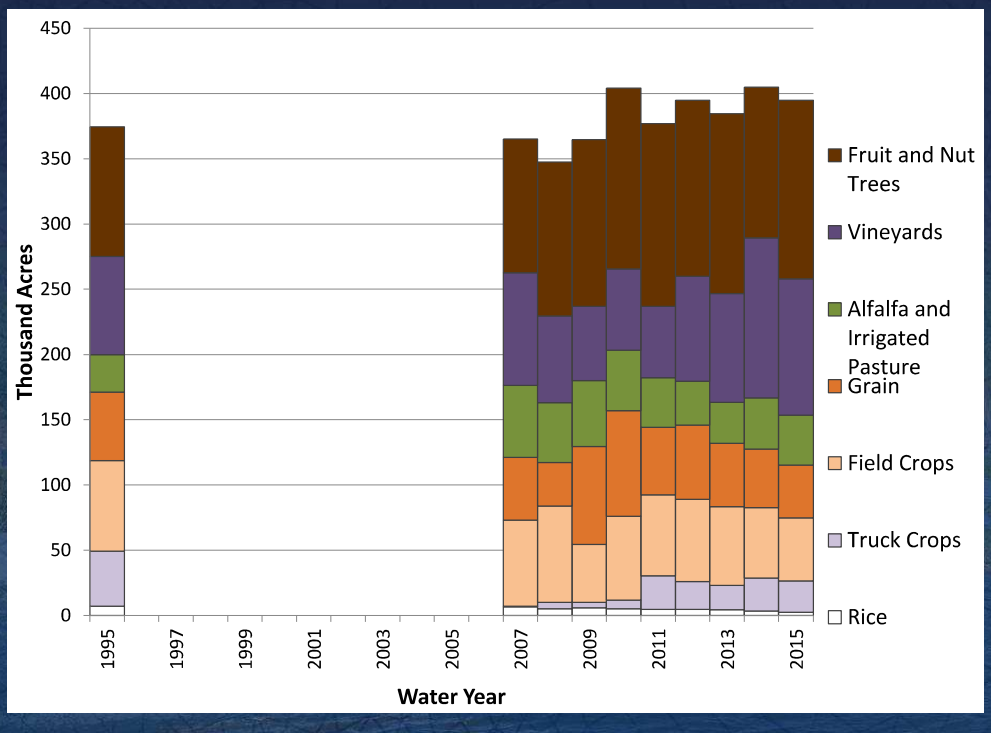


Model Land Use Types

- 23 irrigated crop categories
- 4 other land use categories
- 7 high-level categories used for verification purposes

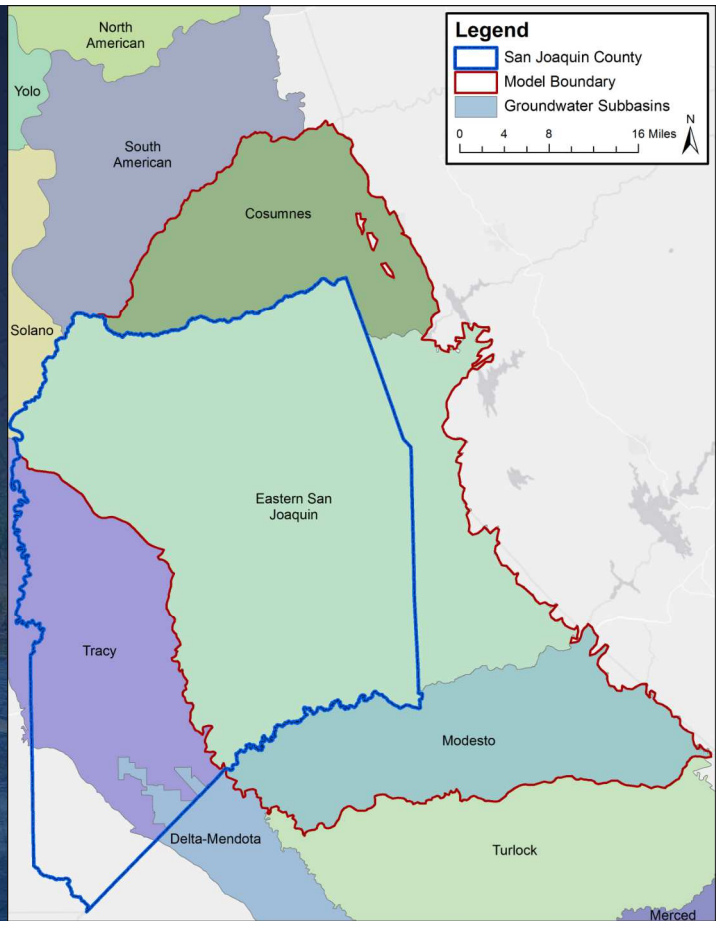
Model Crop Category	Grouped Crop Categories
Almonds Cherries Citrus & Subtropical Other Orchard Pistachios Walnuts	Fruit and Nut Trees
Vineyards	Vineyards
Alfalfa Pasture	Alfalfa and Irrigated Pasture
Grain	Grain
Corn Cotton Dry Beans Field Crops Safflower Sugar Beets	Field Crops
Cucurbits Onion & Garlic Potatoes Tomato Fresh Tomato Processing Truck Crops	Truck Crops
Rice	Rice
Urban Landscape Water Surface Riparian Vegetation Native Vegetation	Other Land Use

Primary Cropping Pattern in ESJ Subbasin



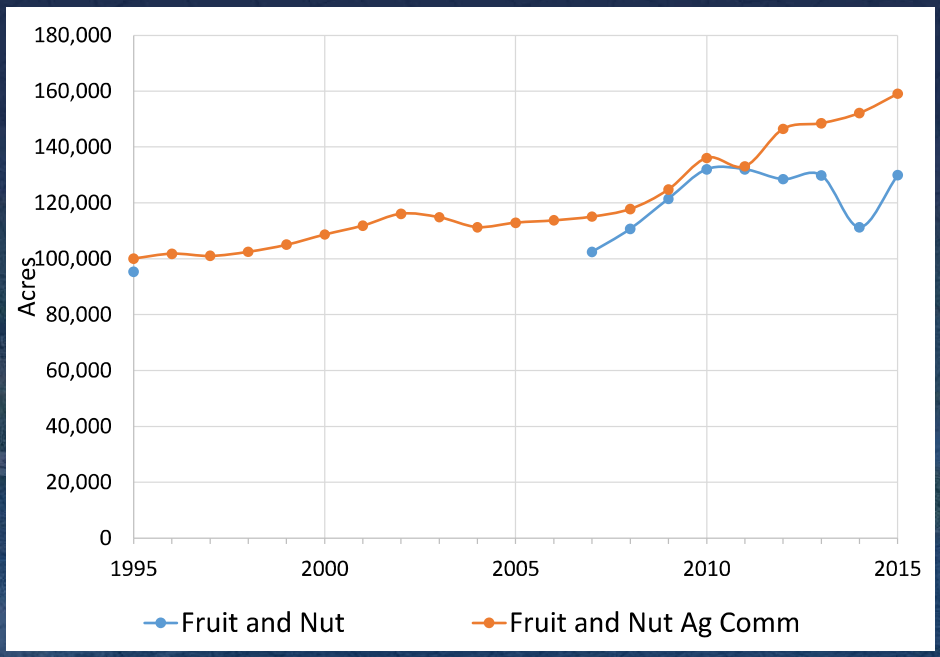
Regional Data: Comparison with Agricultural Commissioner Reports

- Ag Commissioner annual reports cover the entire county
- Model covers only the portion of the Eastern San Joaquin groundwater subbasin within the county
- Numbers not directly comparable, but can be used to glean trends



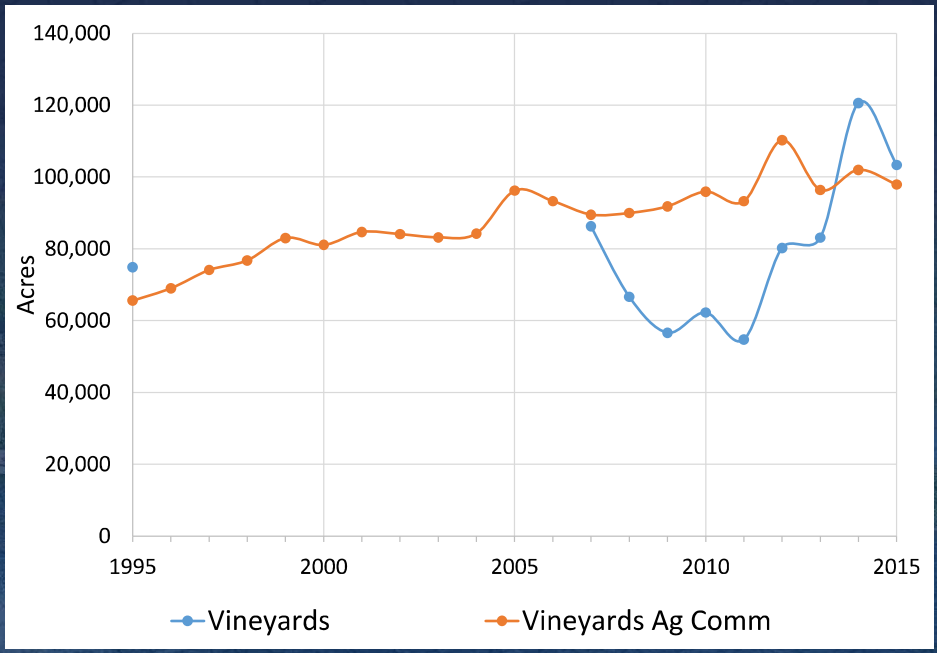
Fruit and Nut Crops

- Categories:
  - Almonds
  - Cherries
  - Citrus & Subtropical
  - Other Orchard
  - Pistachios
  - Walnuts



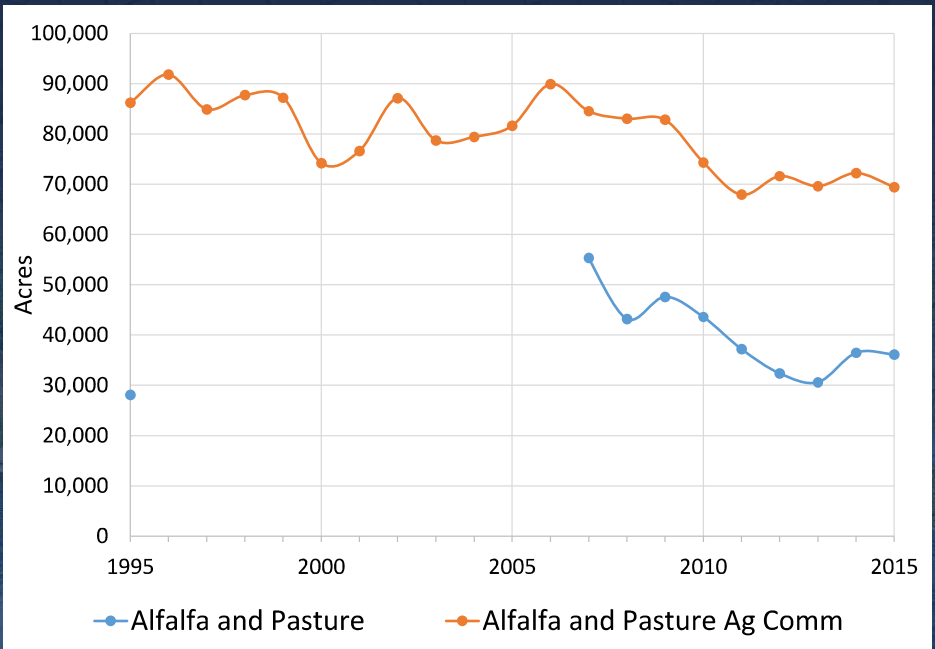
Vineyards

- Categories:
  - Vineyards



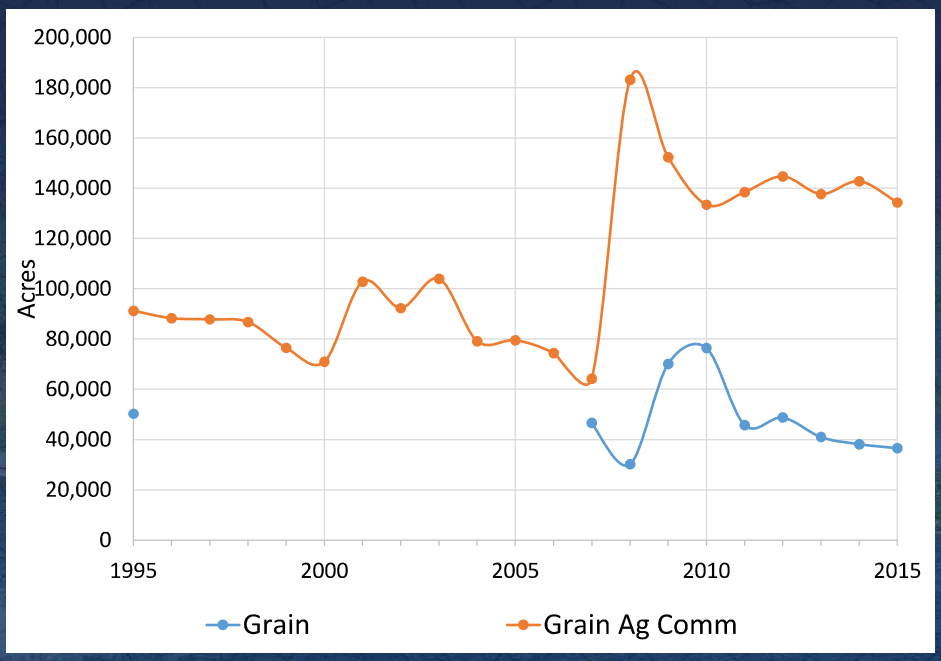
Alfalfa and Irrigated Pasture

- Categories:
  - Alfalfa
  - Pasture



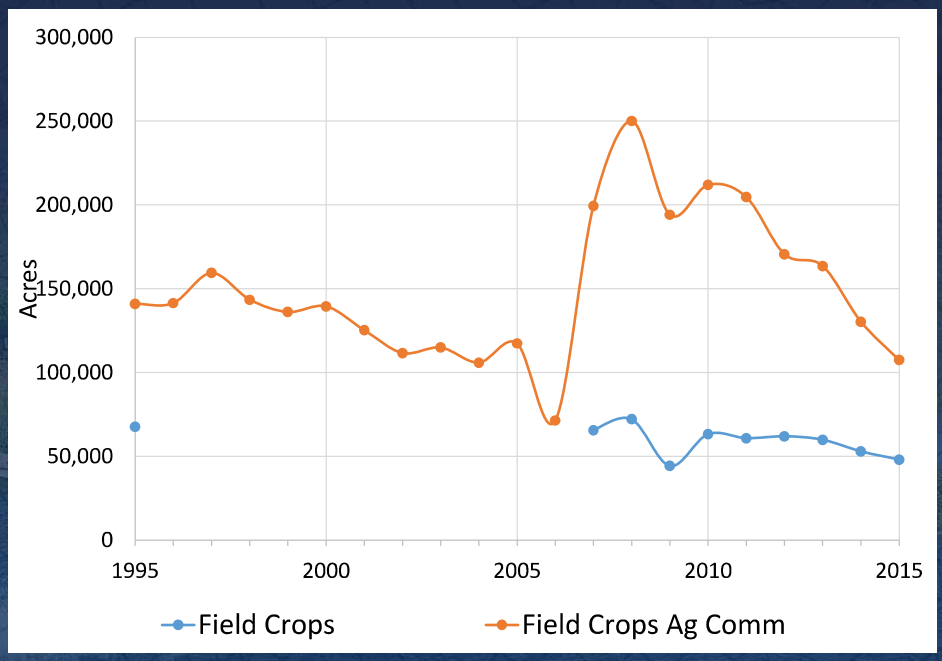
Grain

- Categories:
  - Grain
  - Silage



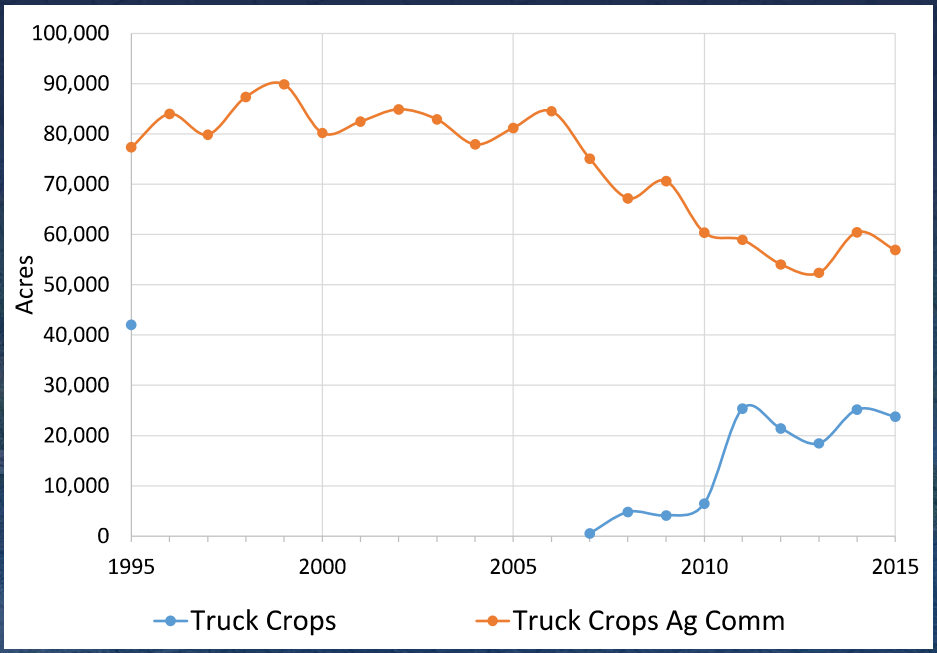
Field Crops

- Categories:
  - Corn
  - Cotton
  - Dry Beans
  - Field Crops
  - Safflower
  - Sugar Beets



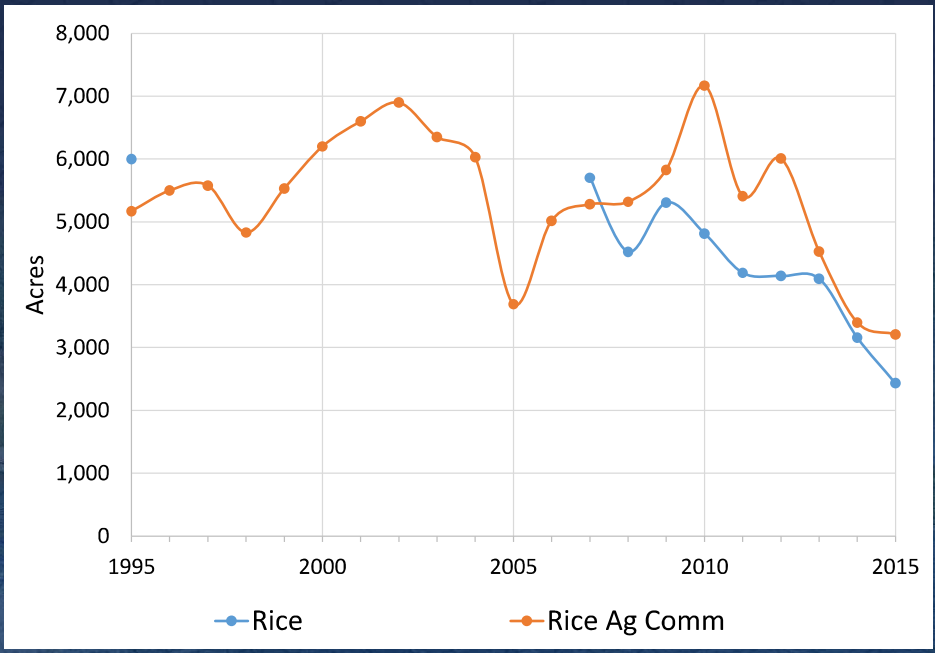
Truck Crops

- Categories:
  - Cucurbits (e.g., squash, melons, cucumbers, etc.)
  - Onion & Garlic
  - Potatoes
  - Tomato Fresh
  - Tomato Processing
  - Truck Crops



Rice

- Categories:
  - Rice

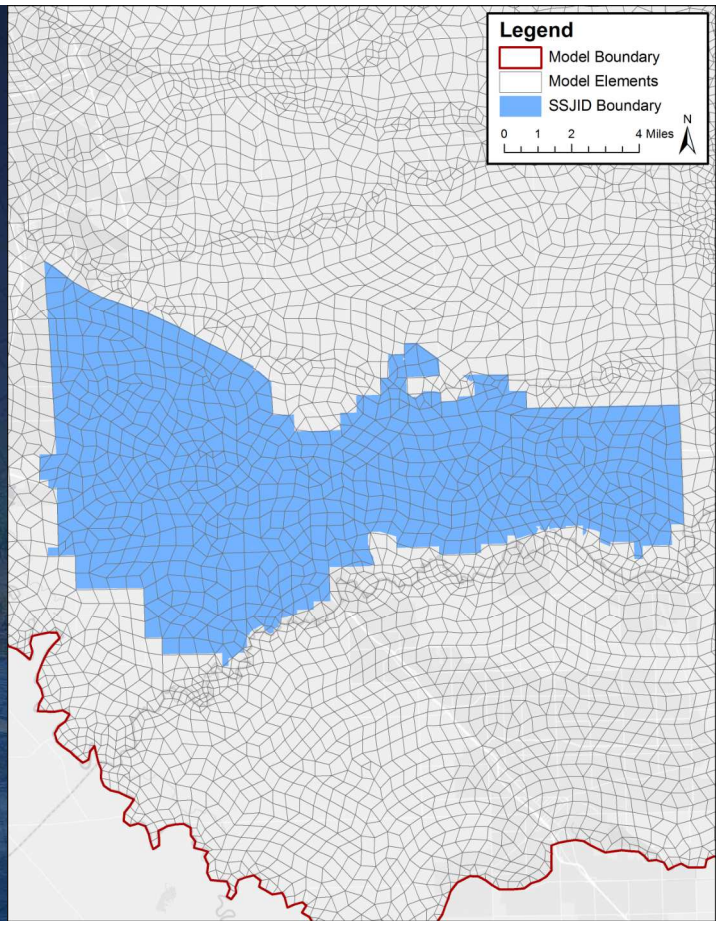


Summary

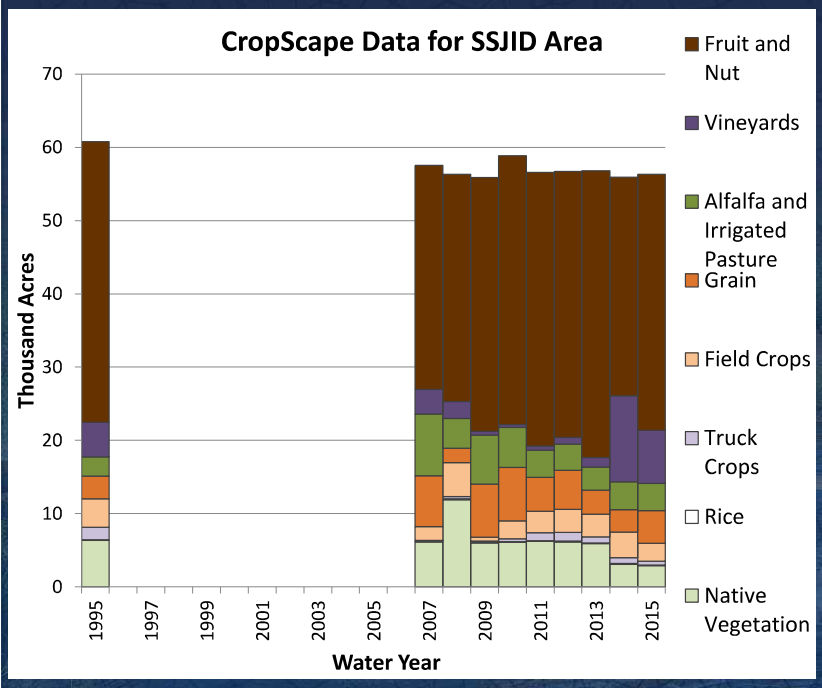
- Ag Commissioner data provides reasonable trends in the cropping pattern by major cropping categories, which can be used to modify CropScape trends
- Additional information for CropScape adjustment:
  - San Joaquin & Delta Water Quality Coalition
  - DWR's LandIQ survey
  - Local data from irrigation districts

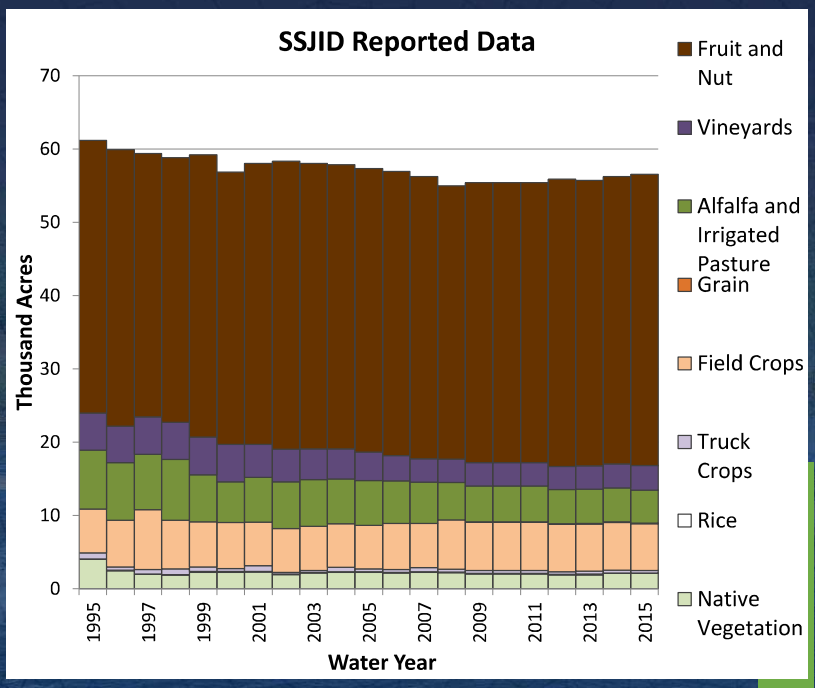
Local Data: Comparison with SSJID Acreages

- SSJID provided annual acreages by crop
- SSJID crop categories were mapped to model categories
- For CropScape years, overall agricultural area is larger for SSJID-provided acreages by average of ~3,000 acres, which may most likely be attributed to immature orchards or immature croplands

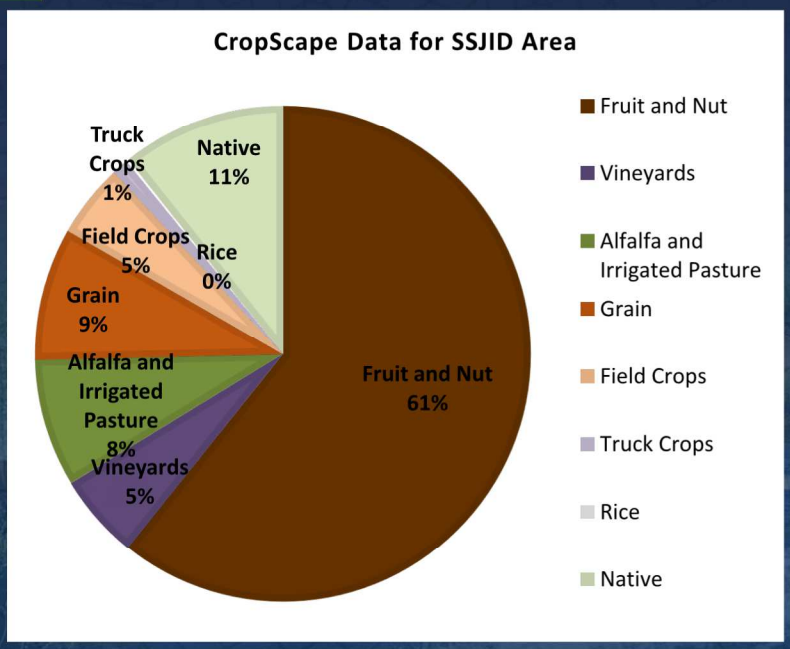


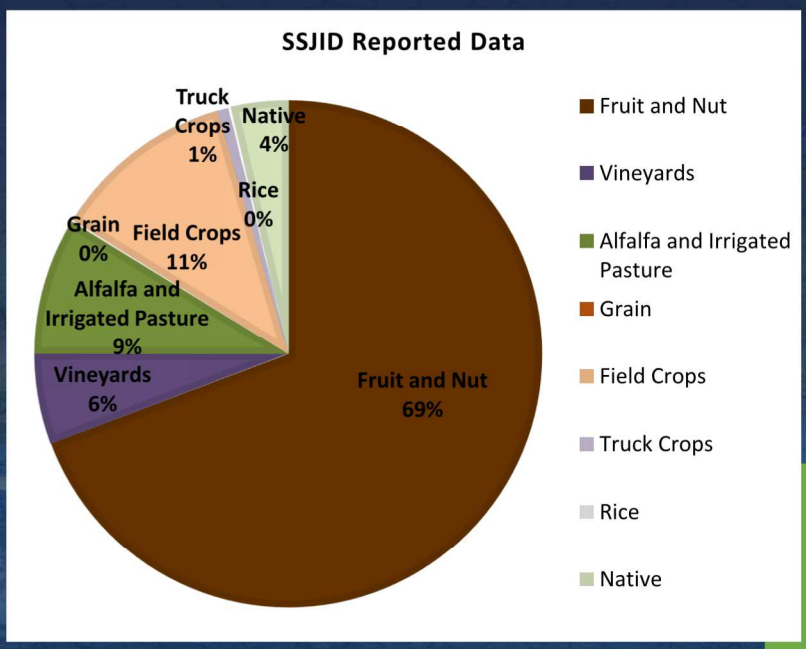
Bar Chart of Grouped Crop Categories





Comparison Pie Charts: Grouped Crop Categories





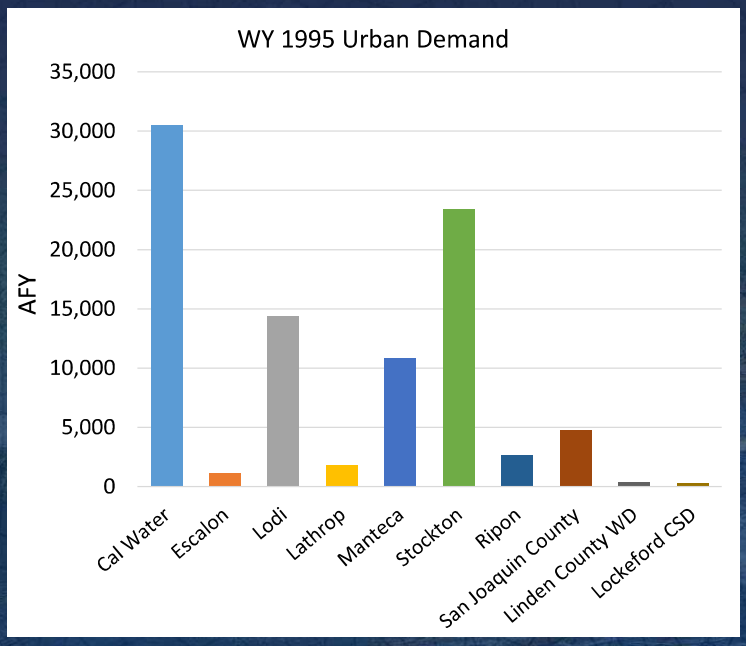
Note: Data is averaged across CropScape years (2007-2015)

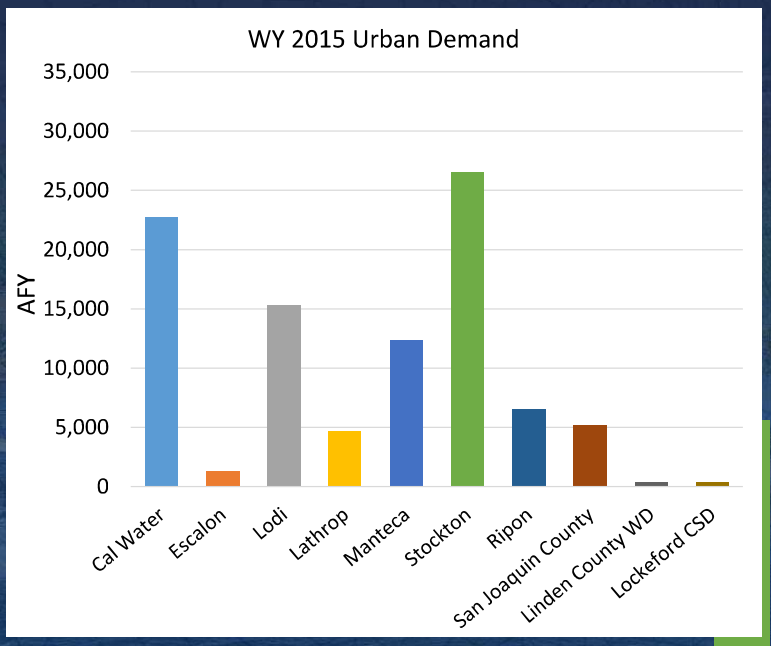
Ag Cropping Pattern: What We Need From You

- Any local crop acreages and spatial information
- Local knowledge of crop trends/types to help correct problems in CropScape data
- Any direction needed by Friday May 26, 2017; COB

Urban Water Demand

- Based on GPCD and population if water demand information unavailable





Urban Water Demand: What We Need From You

- Review of population, GPCD, and urban water use data
- Breakdown between indoor and outdoor water use
- Any direction needed by Friday May 26, 2017; COB

Next Steps

1. Complete LU/Cropping acreages
2. Complete IDC input data files
3. Complete GW pumping for urban
4. Compile and Process Surface water deliveries for urban
5. Compile and Process Surface water deliveries for agricultural use
6. Complete GW pumping for agricultural use
7. Complete pumping well construction information

Sustainable Groundwater Management Act Readiness Project

Meeting No. 7:

Integrated Water Resources Model Development Update

RMC water and environment

Complex Challenges | Innovative Solutions

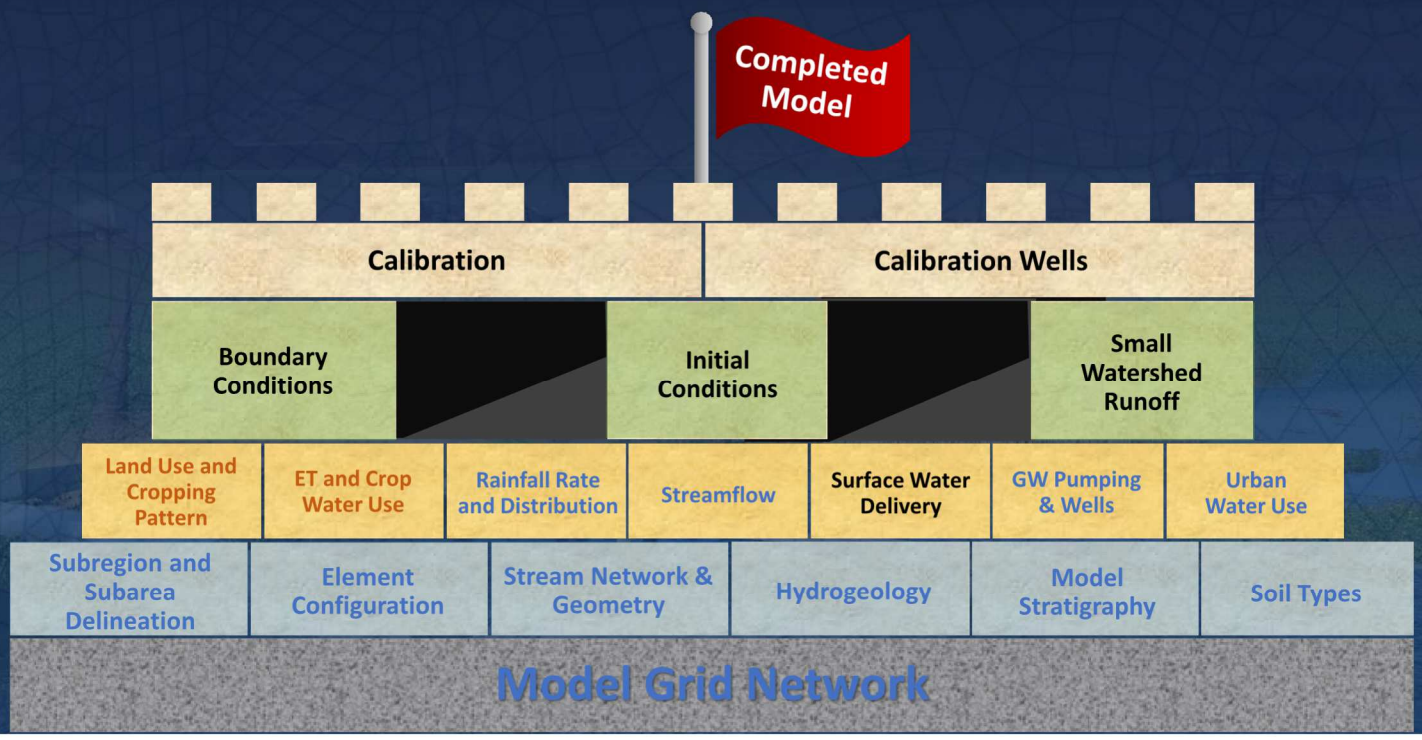
SAN JOAQUIN COUNTY CALIFORNIA

June 28, 2017

Agenda

- Introduction
- Recap of Land Use and Cropping Patterns
- Ag Demand Estimation Methodology (IDC)
- Preliminary Ag Demand Estimates
- SJ County – GSP Work Plan
- Next Meeting

Integrated Model Construction



Model Name Examples

- Other IWFM Models:
  - MercedWRM (Merced Water Resources Model)
  - YGM (Yuba Groundwater Model)
  - BBGM (Butte Basin Groundwater Model)
  - YCIWFM (Yolo County IWFM)
- Other Models:
  - SacIGSM (Sacramento County IGSM)
  - NARIGSM (North American River Basin IGSM)
  - Stony Creek Fan (SCF) IGSM
  - KingsIGSM (Kings Basin IGSM)
  - C2VSim (California Central Valley Groundwater-Surface Water Simulation Model

IWFM
Integrated Water Flow Model

IGSM
Integrated Groundwater and Surface Water Model

Our Model Name

For your consideration…

ESJ Integrated Water Flow Model

Or

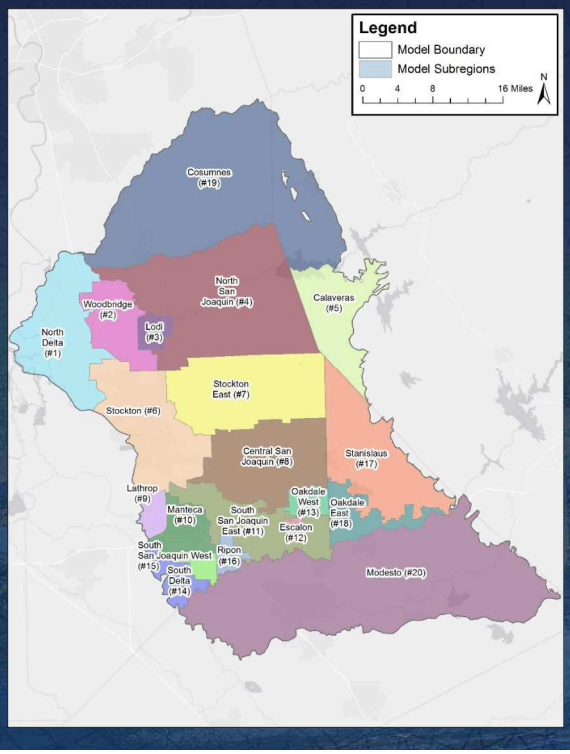
ESJ Integrated Water Resources Model

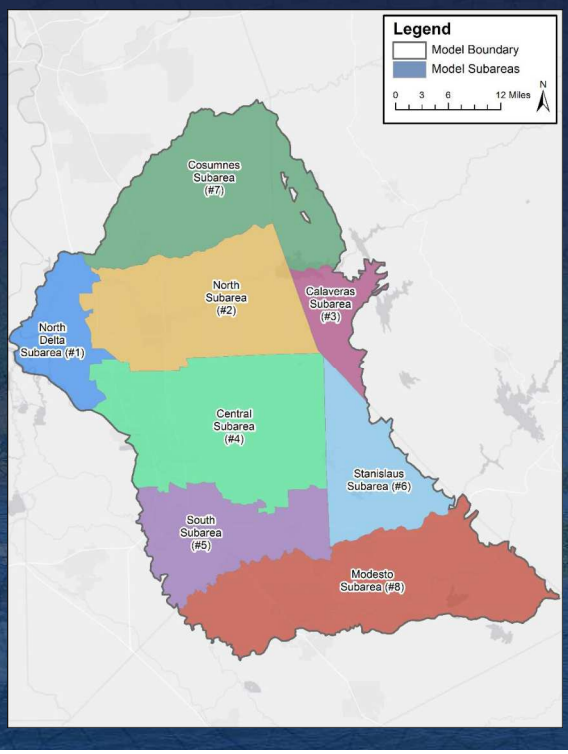
Thoughts?

ESJ Model Trivia Part I

1. How many data input subregions are in ESJ-IWFM? ESJ Subbasin?
   20 data input subregions (ESJ-IWFM) / 18 data input subregions (ESJ Subbasin)
2. How many model output subareas make up ESJ-IWFM? ESJ Subbasin?
   8 model output subareas (ESJ-IWFM) / 6 model output subareas (ESJ Subbasin)
3. How many land use categories are in ESJ-IWFM?
   27 (23 crop categories and 4 other land use types)
4. What is the gross irrigated acreage in the ESJ Subbasin in 2015?
   394,877 acres
5. What are the biggest 3 crops by acreage in the ESJ Subbasin in 2015?
   Vineyards (104,586 acres), Walnuts (71,365 acres), and Almonds (52,614 acres)

Completed Model Component: Model Subregions and Subareas





Model Land Use Types

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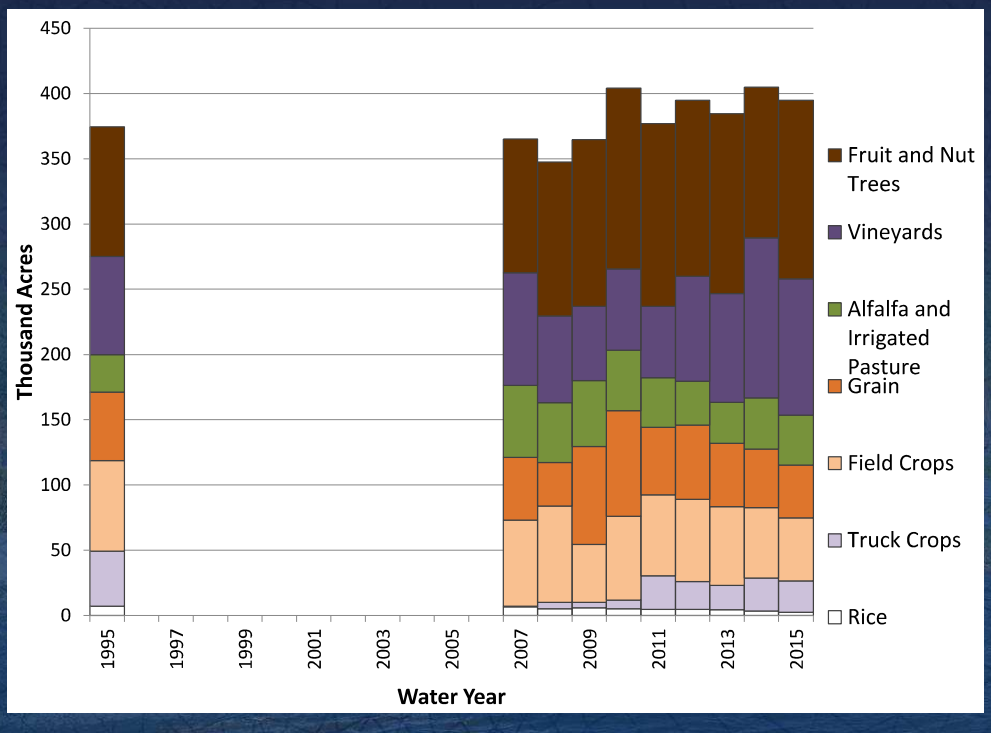
Cucurbits Onion & Garlic Potatoes Tomato Fresh Tomato Processing Truck Crops	Truck Crops
Rice	Rice
Urban Landscape Water Surface Riparian Vegetation Native Vegetation	Other Land Use

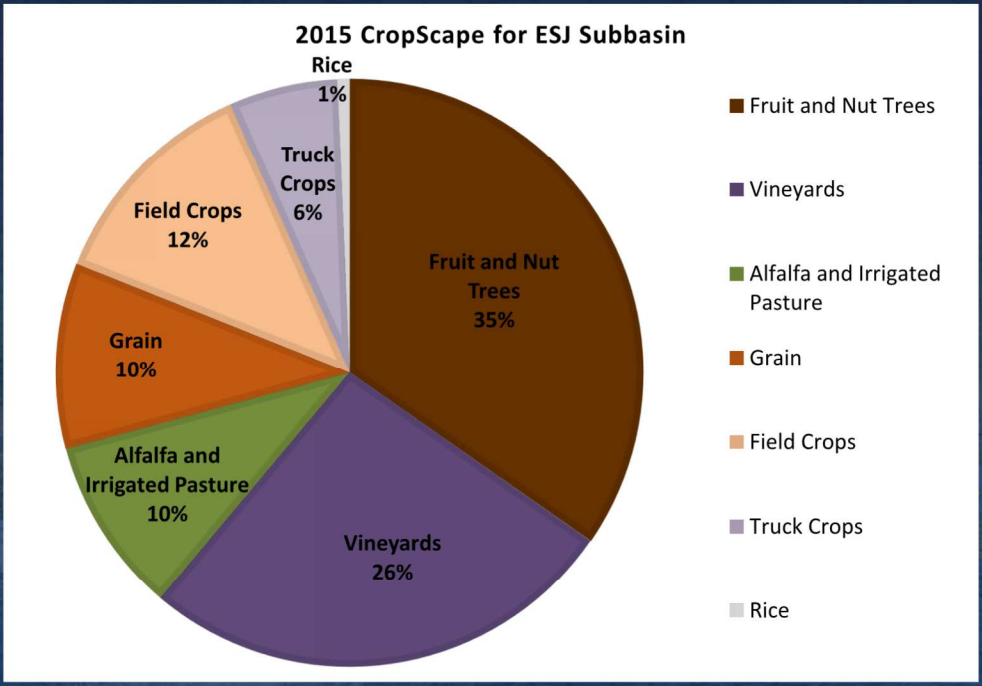
Recap of Land Use and Cropping Patterns

1. DWR Land Use Surveys (Representing ~1995 Era)
   - San Joaquin County (1996)
   - Sacramento County (1993)
   - Amador County (1997)
   - Calaveras County (2000)
   - Stanislaus County (1996)
2. Remote Sensing Data:
   - USDA's CropScape
   - DWR's LandIQ Survey; 2014
3. Local Data Sources

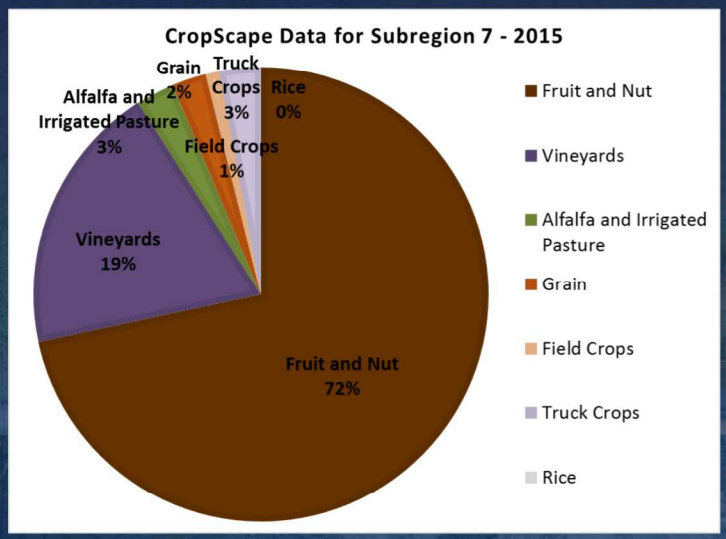
Primary Cropping Pattern in ESJ Subbasin

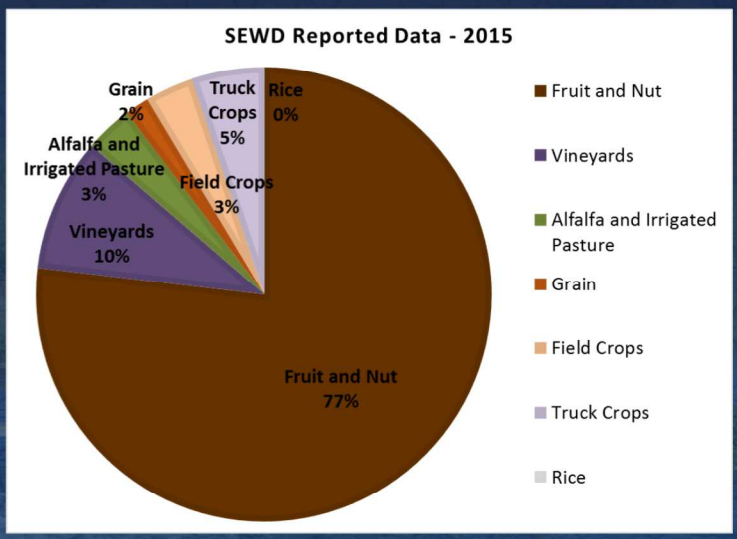


Primary Cropping Pattern in ESJ Subbasin



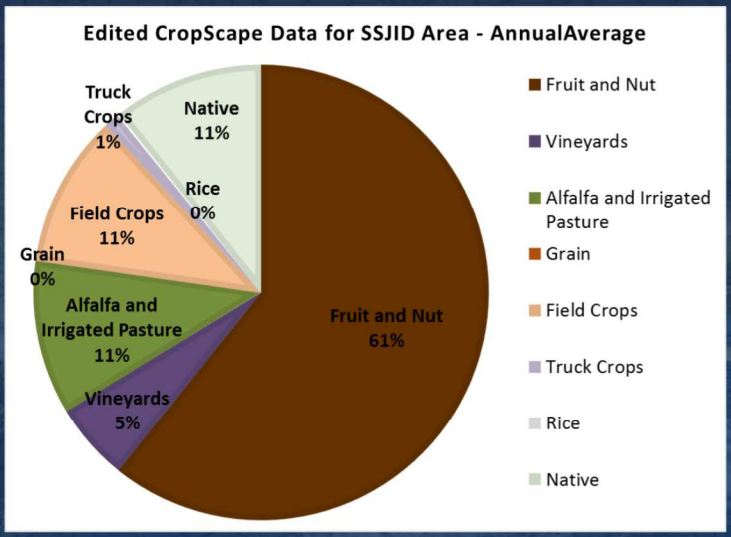
SEWD Crop Acreage Comparison

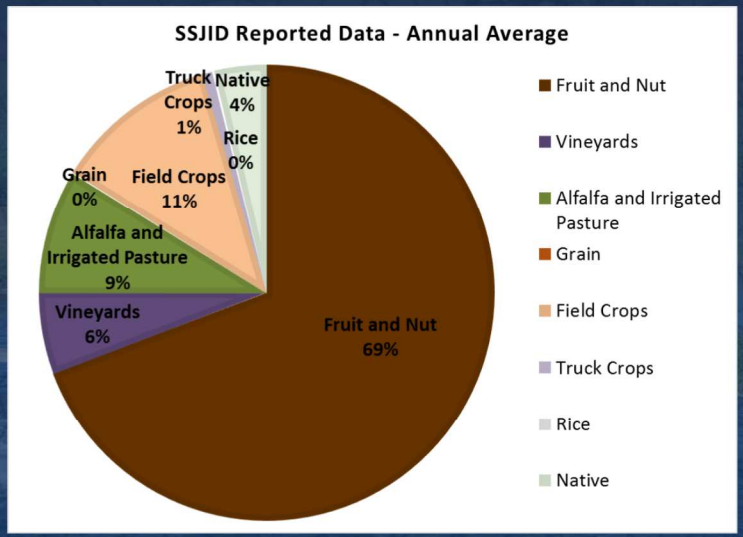




SSJID Acreage Edits

- Based on information provided by SSJID, transferred what CropScape was picking up as grain to either corn or alfalfa

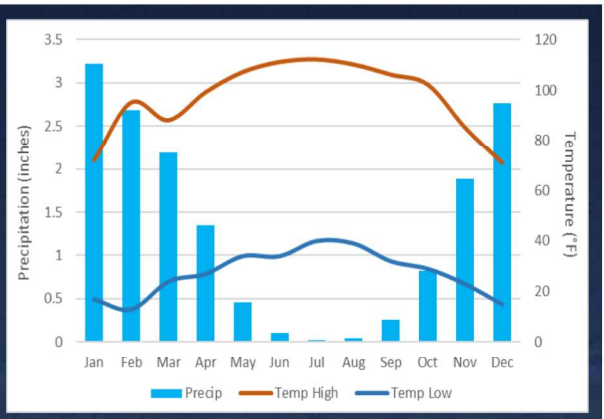




Future Land Use Edits

- Coordination with Stanisalus County model effort:
  - Jacobson James & Associates estimating end of July for updating land use data based on Ag Commissioner reports
  - Will consider edits to Stanislaus triangle and Modesto Subbasin at that time
- Incorporation of LandIQ spatial data for WY 2014
- Additional input from others

ESJ Model Trivia Part II

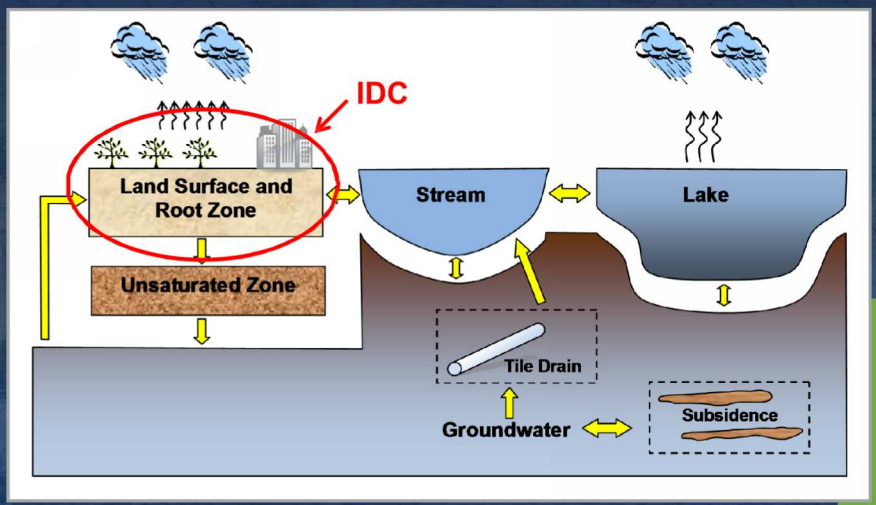


1. What does IDC stand for? What does it do?
   IWFM Demand Calculator
   IDC estimates agricultural demand
2. What is the County's average daily temperature in the past 60 years?
   Daily average temperature is 54.4°F[1]
3. What is the County's average annual precipitation in the past 60 years?
   Annual average observed precipitation is 14.7 inches[1]
4. What is the County's average monthly reference evapotranspiration in the past 30 years?
   Monthly average reference evapotranspiration is 4.2 inches[2]

1. Stockton Fire Station #4 – NCDC Weather Station
2. Manteca CIMIS Station

Ag Demand Estimation using IDC

- IWFM Demand Calculator (IDC) is a software that calculates land use based water demands and routes water through the land surface and root zone using physically-based simulation methods
- Uses methods from irrigation-scheduling-type models and applies them at regional scales
- Stand-alone executable or root zone module of Integrated Water Flow Model (IWFM) v2015



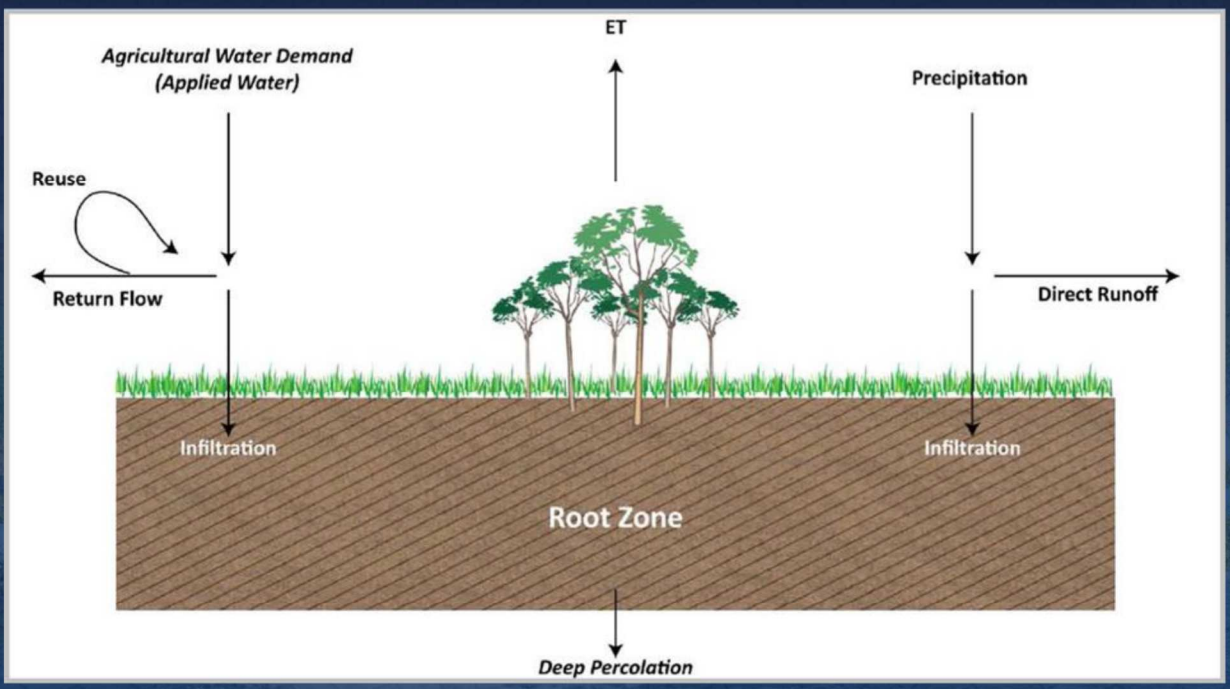
Source: IDC training workshop (Emin Can Dogrul, DWR)

IDC Background

- IDC was initially developed to…
  - Maintain consistency between C2VSim and CalSim
  - Calculate downstream water demands for CalSim under current conditions and future scenarios
- First version of IDC did not have rice and refuge simulations, had incompatible calculations for daily runs
- IDC v4.0 was developed to improve upon the initial version of IDC
- With alternative root zone routing schemes developed (v4.0, v4.1 and v3.02) IDC-2015 became a container for different root zone routing methods

Source: IDC training workshop (Emin Can Dogrul, DWR)

IDC Data



Source: IDC training workshop (Emin Can Dogrul, DWR)

Features of IDC-2015

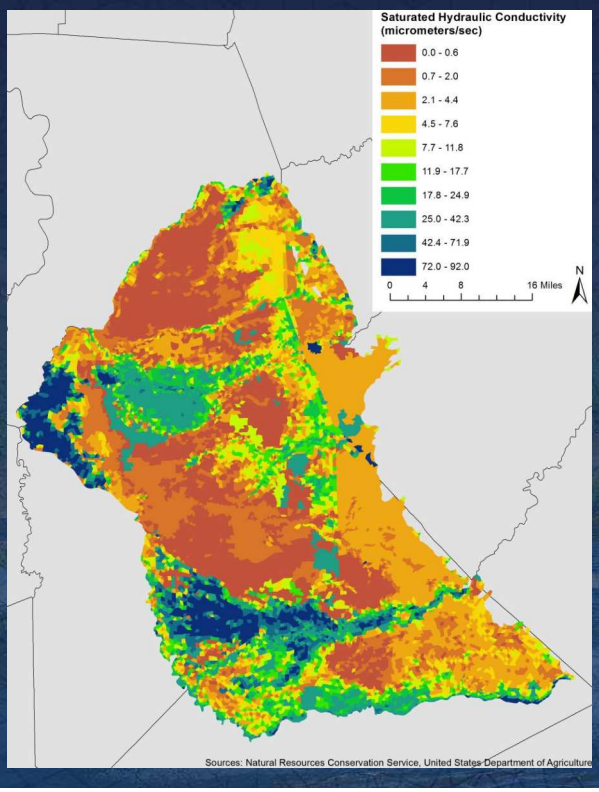
- Use of a computational grid, finite-element or finite-difference, to represent spatial distribution of land-use, climatic, soil and farm management properties; each cell can have multiple land-use types specified as time-series data
- Simulation of land surface and root zone flow processes as well as water demand computations are done at each grid cell for each land-use type
- Irrigation-scheduling-type approach at each grid cell for each agricultural crop
- Direct representation of rice fields (including simulation of flooded decomposition, non-flooded decomposition and no decomposition) and refuges (seasonal and permanent)
- Riparian vegetation access to stream flows and simulation of evapotranspiration from groundwater
- Urban water demand computation based on population and per capita water usage
- Simulation of ETAW and effective precipitation
- Simulation of re-use of irrigation return flow that takes place at a grid cell, between grid cells or between subregions
- Budget output includes soil moisture, and land and water use budgets for individual crops at each subregion

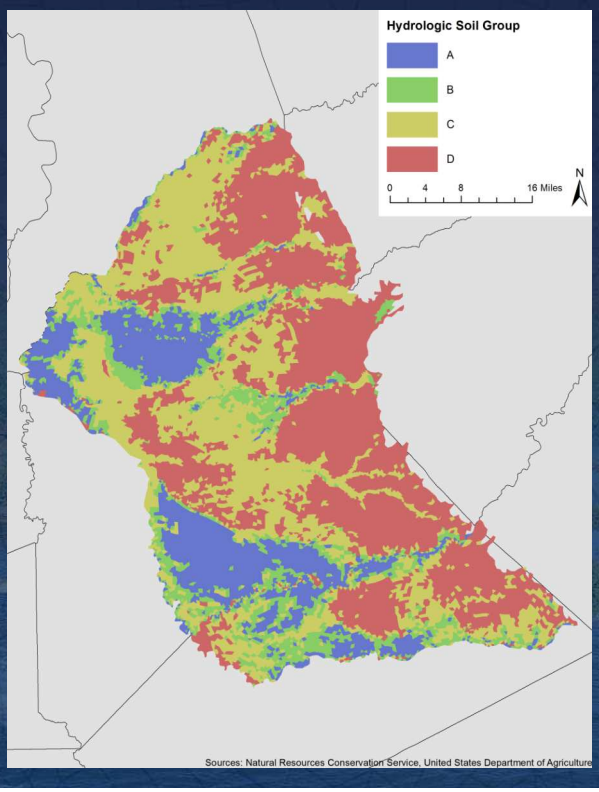
Source: IDC training workshop (Emin Can Dogrul, DWR)

Key Parameters and Data in IDC

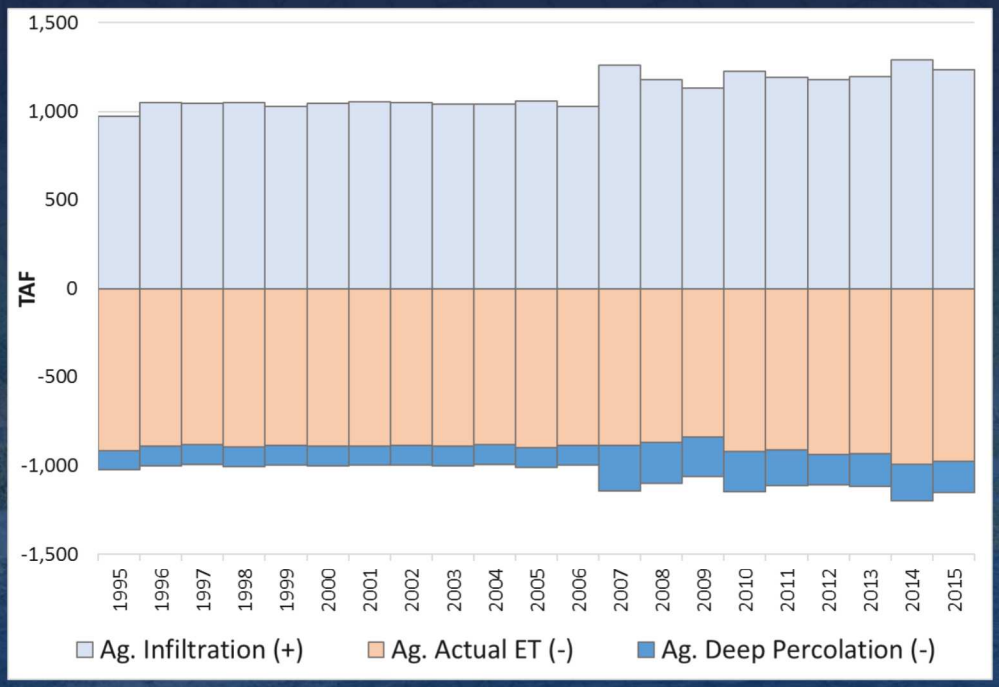
- Monthly Rainfall
- Crop Evapotranspiration, Et_c
- Return and reuse fractions
- Irrigation period
- Land use and crop acreages
- Urban population and per capita water use
- Soil Properties:
  - Hydraulic Conductivity
  - Pore Size Distribution Index
  - Others: Wilting Point, Field Capacity, Total Porosity

Root Zone Parameters

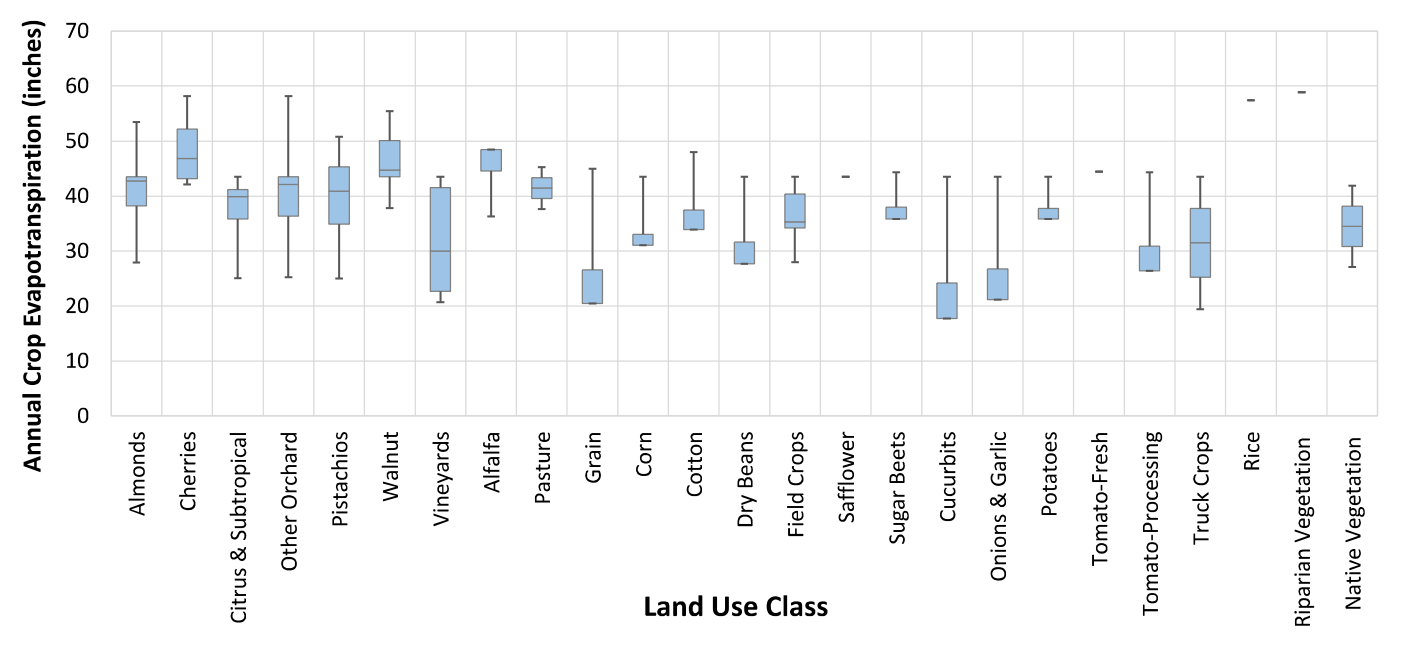




Preliminary IDC Results for ESJ Subbasin: Agricultural Root Zone Budget

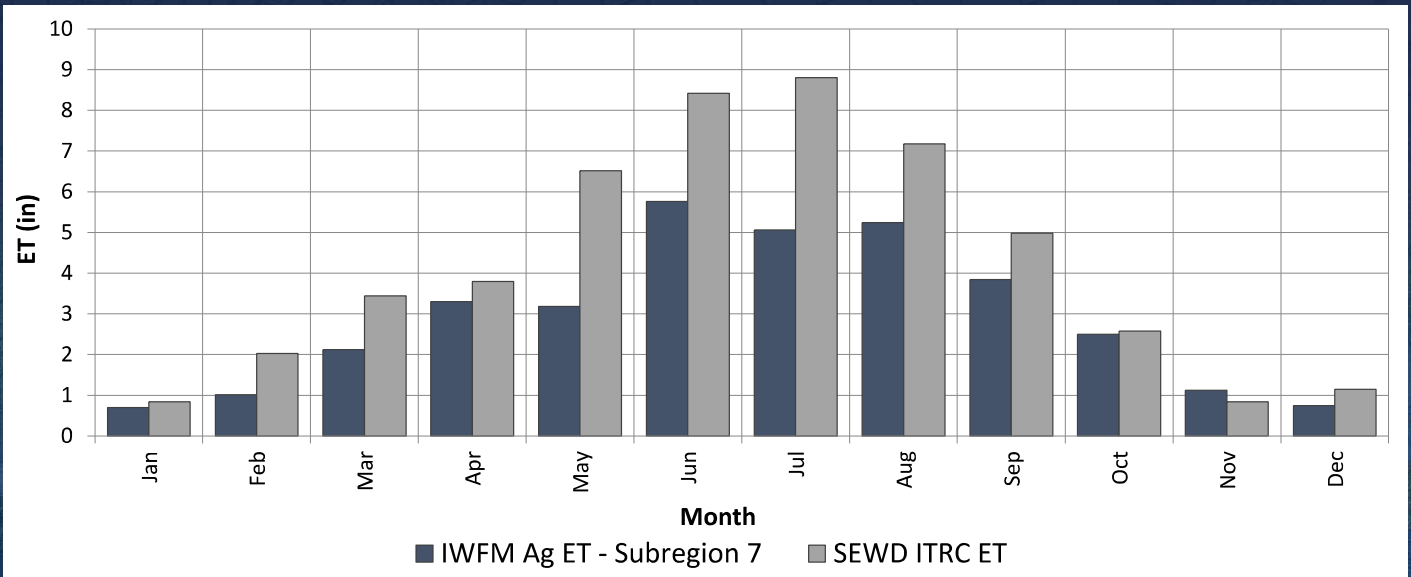


Range of Crop Evapotranspiration in Model Area



Sources: C2VSim Subregion 8 ETc, SEWD ITRC Typical Year ETc, and SSJID ITRC Average ETc

Ag Evapotranspiration Comparison



Note: ITRC includes cover crops with all tree crops (annual ET of trees with cover crops is ~10 inches higher than trees alone)

Preliminary IDC Results: Estimated Irrigation Efficiency

- Irrigation efficiency estimated as agricultural evapotranspiration (i.e., use of applied water by plants) divided by total water applied to irrigated lands

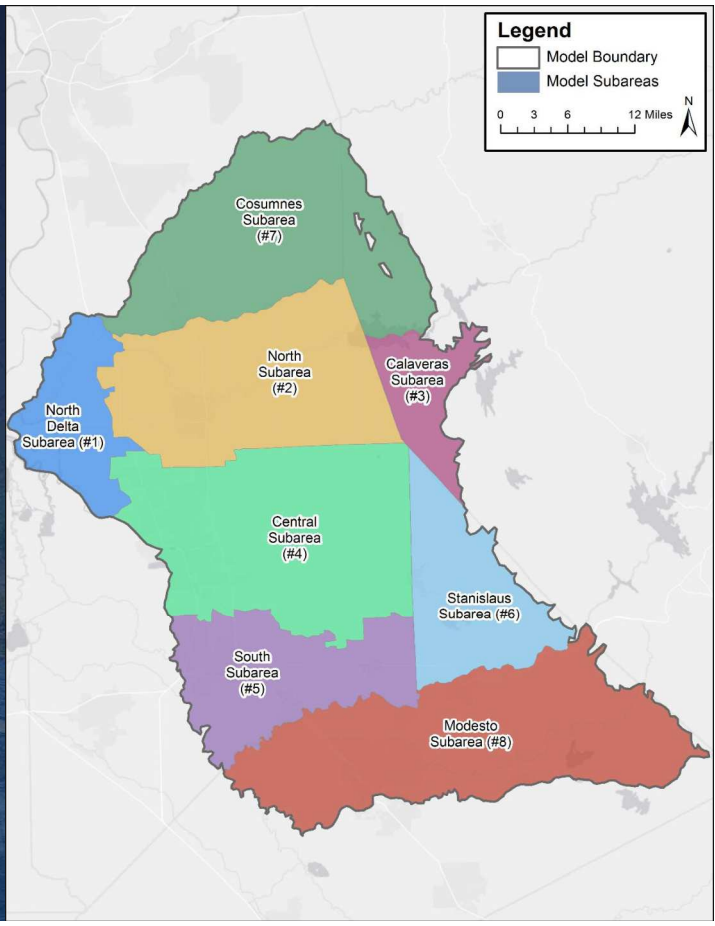
$$IE = \frac{Ag\ ET}{Applied\ Water}$$

Subarea	Name	Estimated Irrigation Efficiency
1	North Delta Subarea	73%
2	North Subarea	77%
3	Calaveras Subarea	74%
4	Central Subarea	74%
5	South Subarea	76%
6	Stanislaus Subarea	71%
TOTAL	Eastern San Joaquin Subbasin	75%

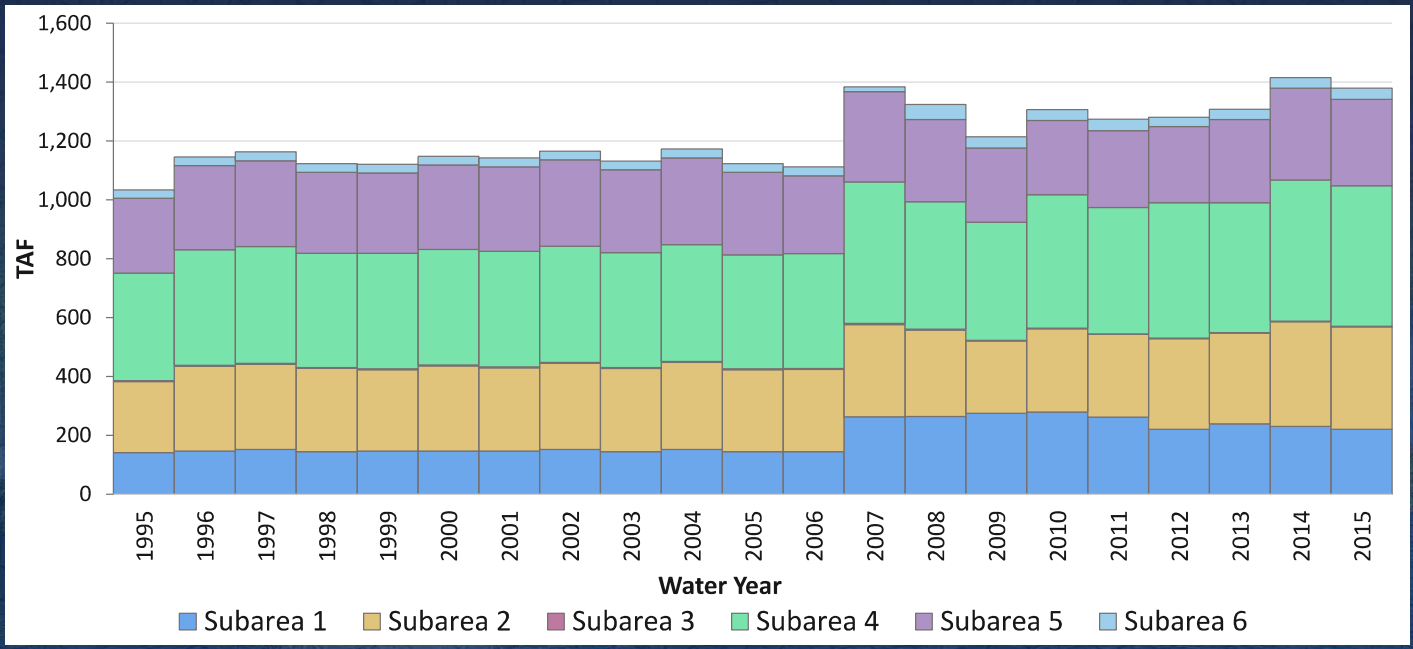
Note: Using averages from irrigation period (March-October)

Model Subareas

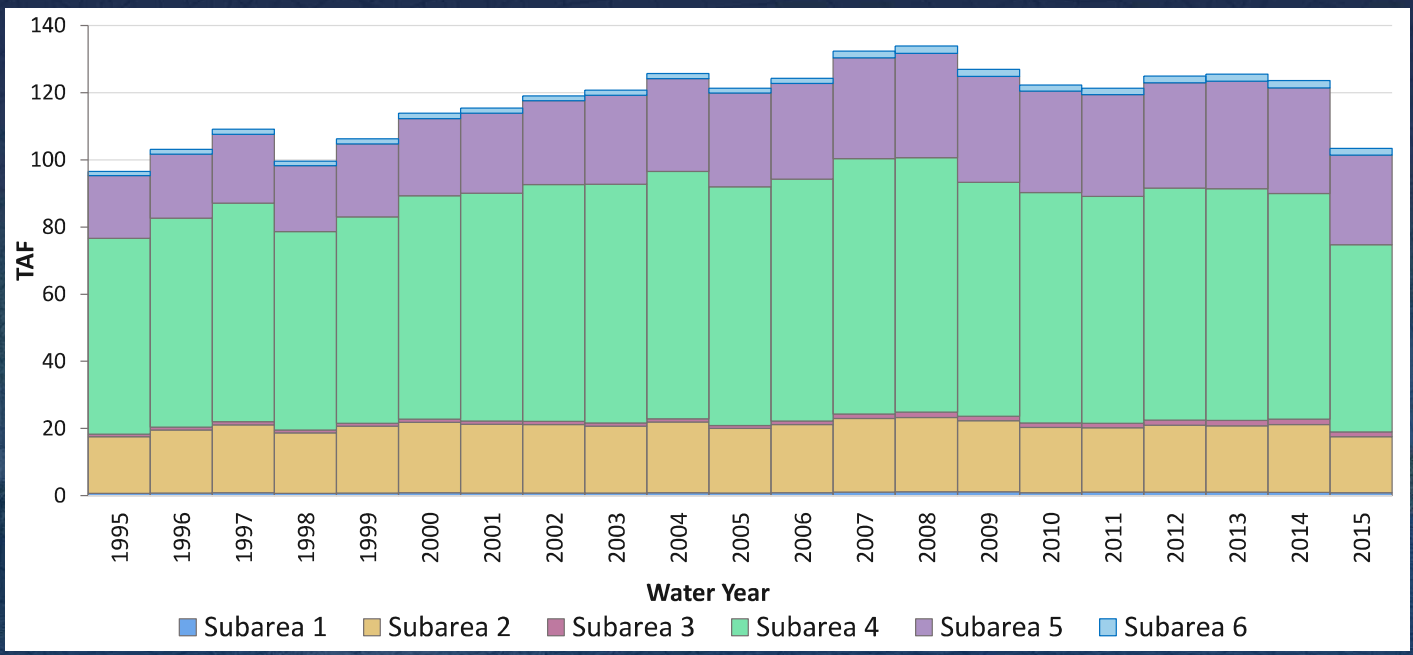
- Eastern San Joaquin Subbasin
  - Subarea 1 – North Delta
  - Subarea 2 – North
  - Subarea 3 – Calaveras
  - Subarea 4 – Central
  - Subarea 5 – South
  - Subarea 6 – Stanislaus
- Subarea 7 – Cosumnes
- Subarea 8 - Modesto



Preliminary IDC Results for ESJ Subbasin: Agricultural Water Demand Estimate



Preliminary IDC Results for ESJ Subbasin: Urban Water Demand Estimate



Data Request

- IDC Calibration:
  - METRIC rasters and applied water estimates
- IWFM Model:
  - SW diversions and deliveries
    - Information Provided: CCWD, Manteca, Stockton, OID, SEWD (including info on Stockton, Cal Water, CSJWCD, OID, and SSJID), SSJID, and WID (including info on Lodi and Stockton)
    - Additional Information: Breakdown of diversions by delivery for SSJID
  - Recharge
    - No Projects: Cal Water, Escalon, Lathrop, Linden County WD, Lockeford CSD, and SSJID
    - Information Provided: Lodi, OID, SEWD, and Stockton/WID
    - Need Response on Recharge Practices (if any): Manteca and Ripon

Next Steps

1. Finalize IDC and document results in a TM
2. Compile and Process Surface water deliveries for urban and agricultural use
3. Transfer completed information to IWFM input files
   - Stream flows and stream geometry
   - Well location and pumping information
   - Surface water diversion and deliveries
   - Small watersheds

Project General Schedule

Sep 2016 – Apr 2017 | Jan 2017 – Jun 2017 | Jun 2017 - Sep 2017 | Oct 2017 - Dec 2017

Task 1 – Project Management

Task 2: Ag Water Demand and Land Use Budget

Task 3: Enhance and Update San Joaquin County Hydrologic Model

Task 4: Develop a Comprehensive Basin Scale Water Budget

Task 5: Groundwater Monitoring and Enhancement Program

Sustainable Groundwater Management Act Readiness Project

Meeting No. 8:

Integrated Water Resources Model Development Update

RMC water and environment

Complex Challenges | Innovative Solutions

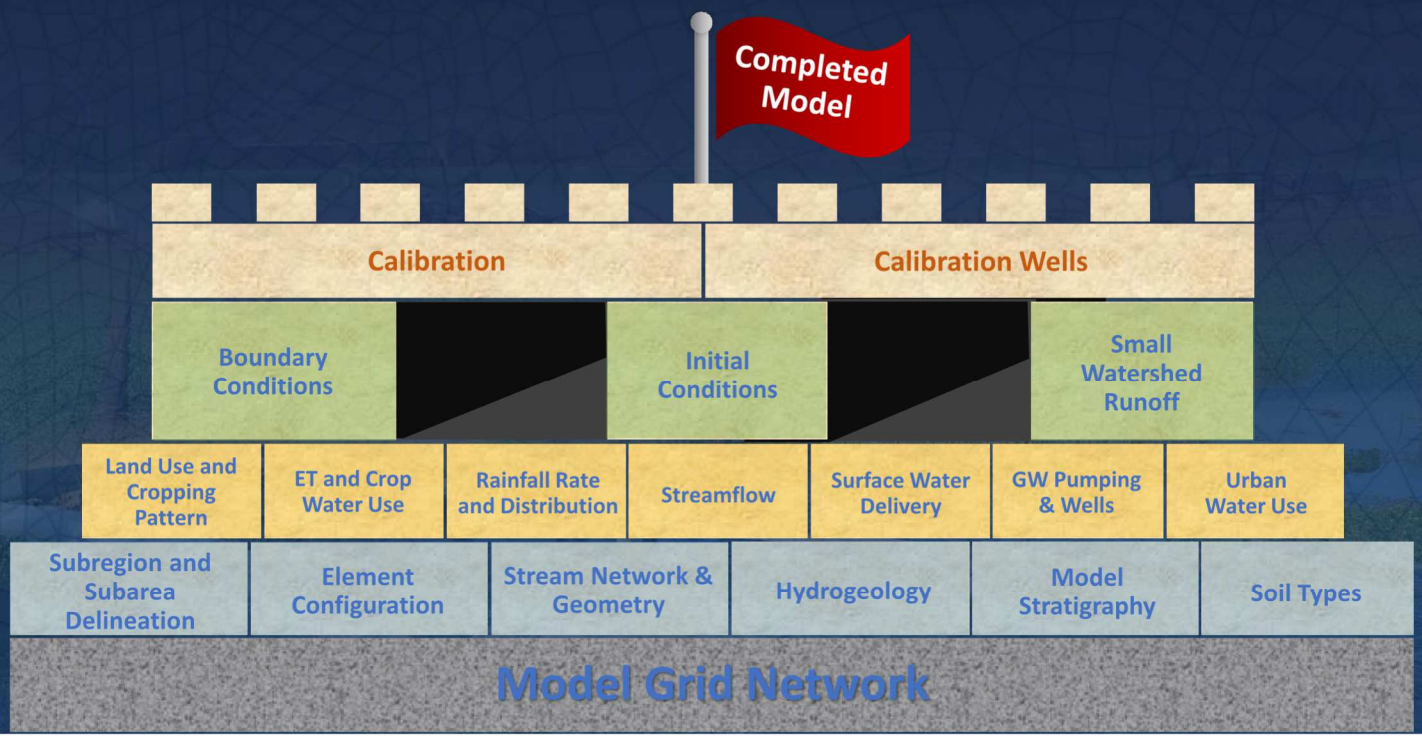
SAN JOAQUIN COUNTY CALIFORNIA

August 23, 2017

Agenda

- Introduction
- Updated Land Use and Cropping Patterns
- Preliminary Land and Water Use Budgets
- IWFM Calibration Process and Sample Hydrographs
- Next Steps

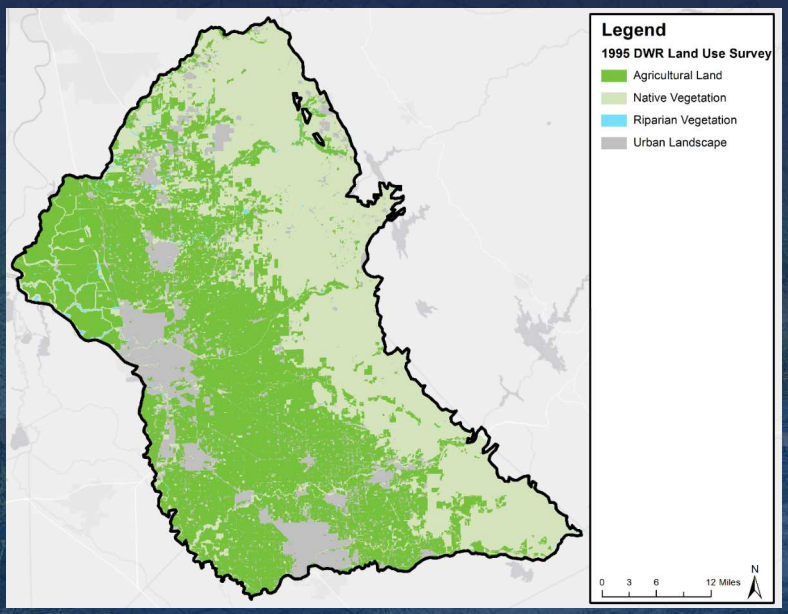
Integrated Model Construction

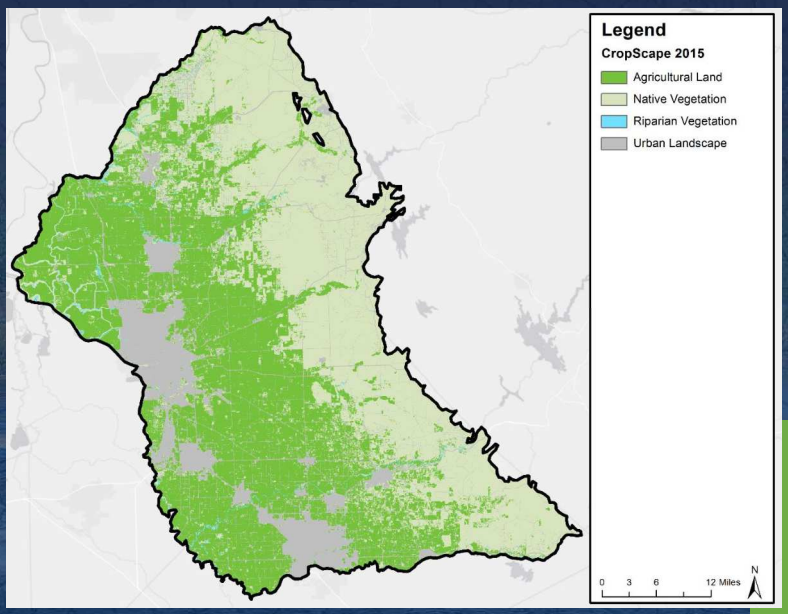


Recap of Land Use and Cropping Patterns

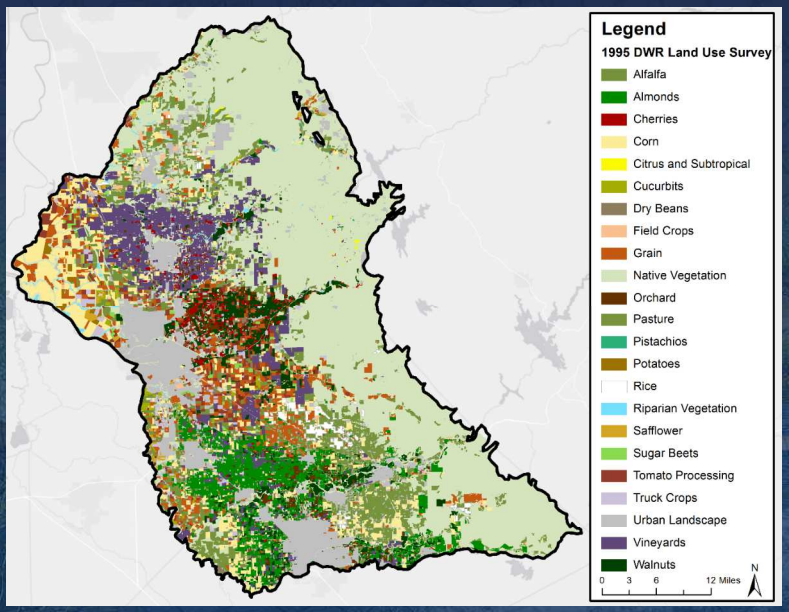
1. DWR Land Use Surveys (Representing ~1995 Era)
   - San Joaquin County (1996)
   - Sacramento County (1993)
   - Amador County (1997)
   - Calaveras County (2000)
   - Stanislaus County (1996)
2. Remote Sensing Data:
   - USDA's CropScape
   - DWR's LandIQ Survey; 2014
3. Local Data Sources

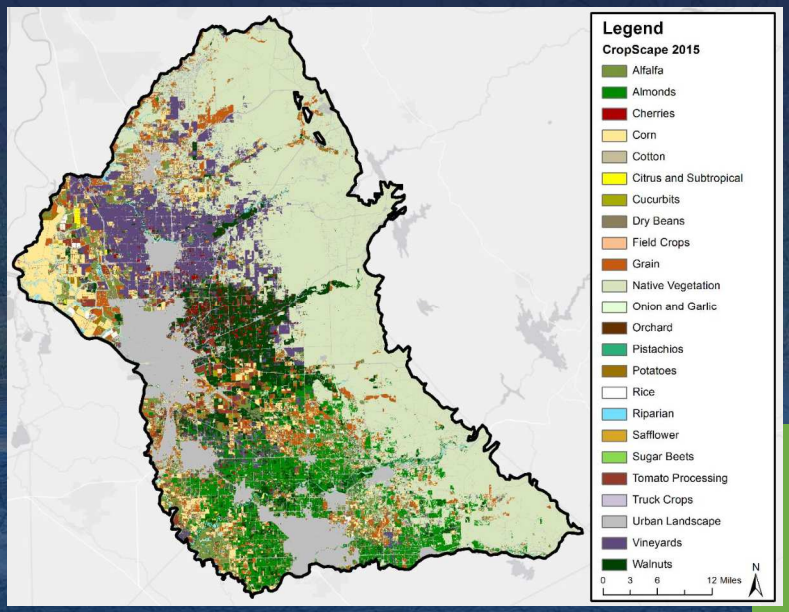
ESJ Model Area Land Use (1995 & 2015)





ESJ Model Area Cropping Pattern (1995 & 2015)



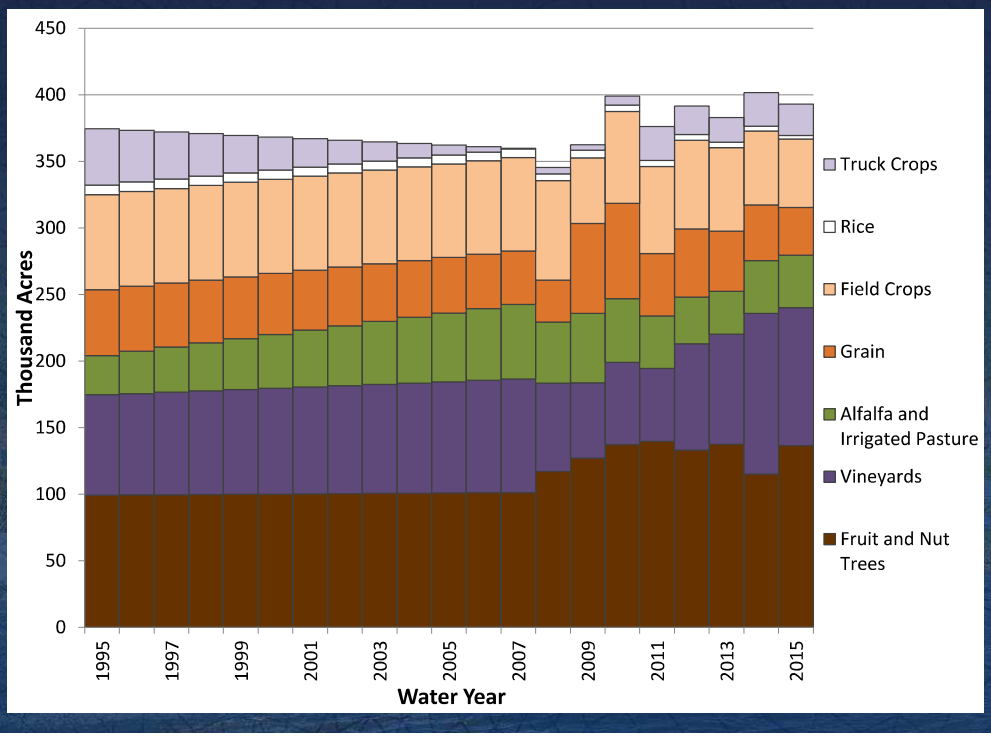


Model Land Use Types

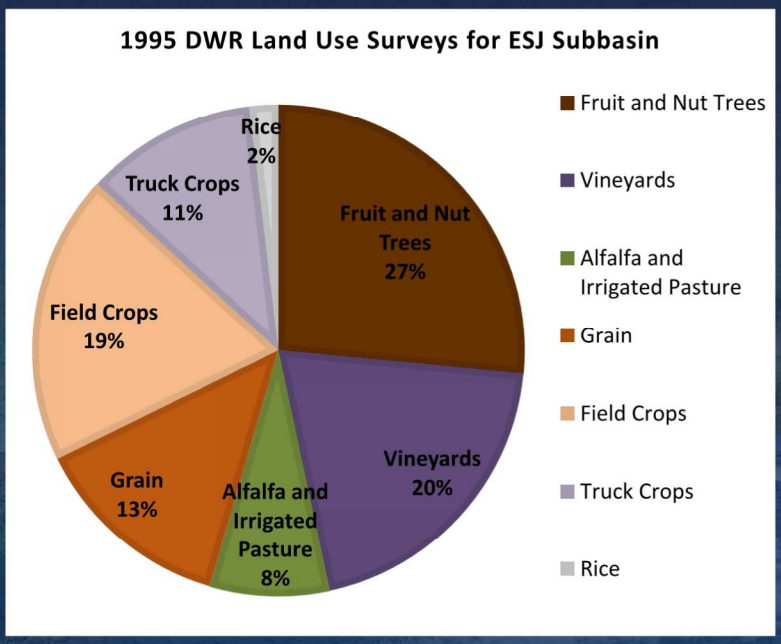
- 23 irrigated crop categories
- 4 other land use categories
- 7 high-level categories used for verification purposes

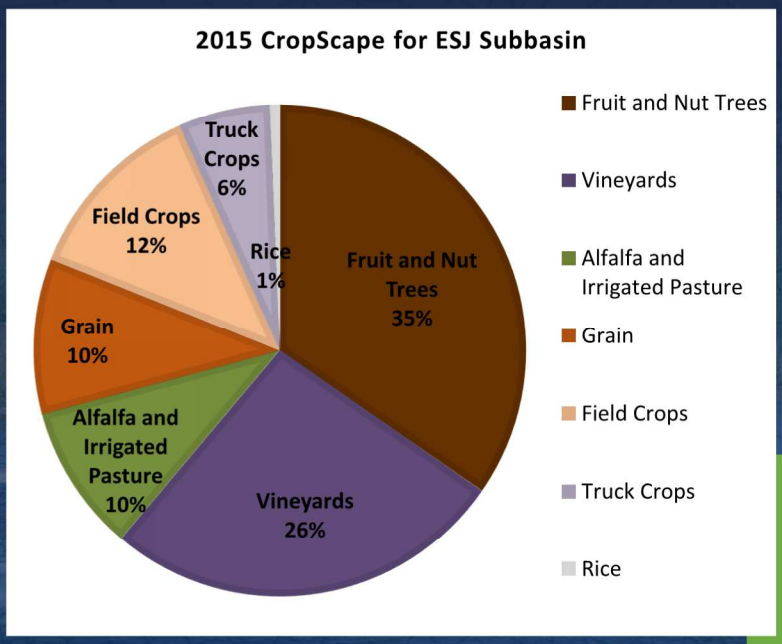
Model Crop Category	Grouped Crop Categories
Almonds Cherries Citrus & Subtropical Other Orchard Pistachios Walnuts	Fruit and Nut Trees
Vineyards	Vineyards
Alfalfa Pasture	Alfalfa and Irrigated Pasture
Grain	Grain
Corn Cotton Dry Beans Field Crops Safflower Sugar Beets	Field Crops
Cucurbits Onion & Garlic Potatoes Tomato Fresh Tomato Processing Truck Crops	Truck Crops
Rice	Rice
Urban Landscape Water Surface Riparian Vegetation Native Vegetation	Other Land Use

Primary Cropping Pattern in ESJ Subbasin

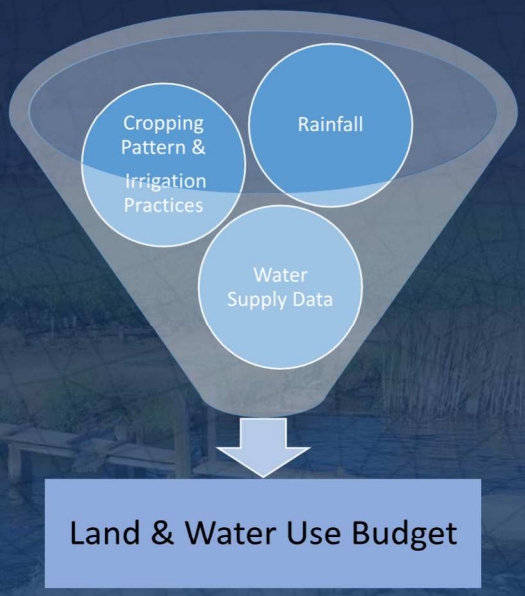


Primary Cropping Pattern in ESJ Subbasin



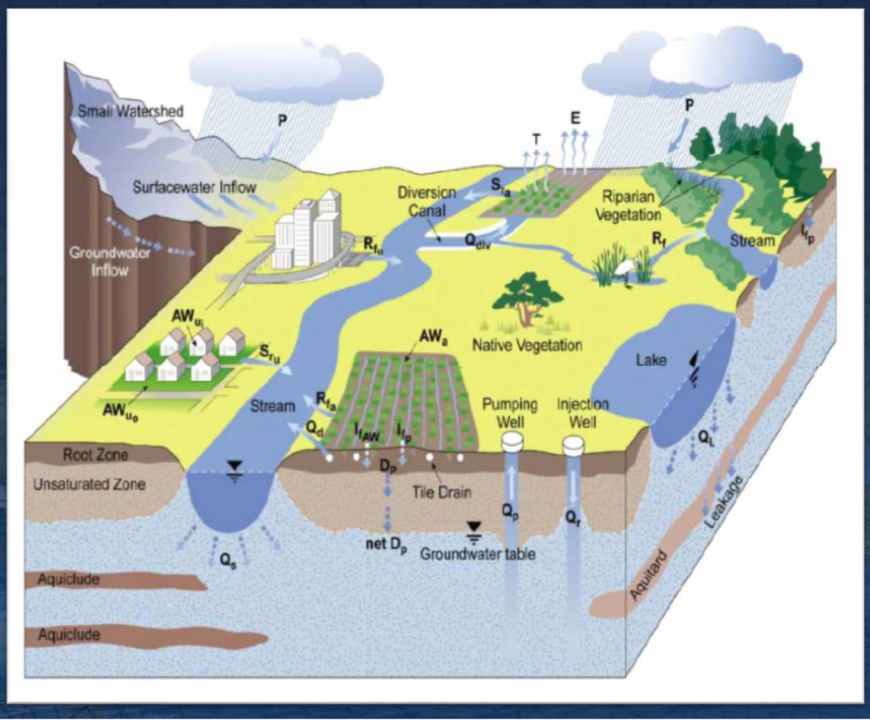


Land & Water Use Budget Components

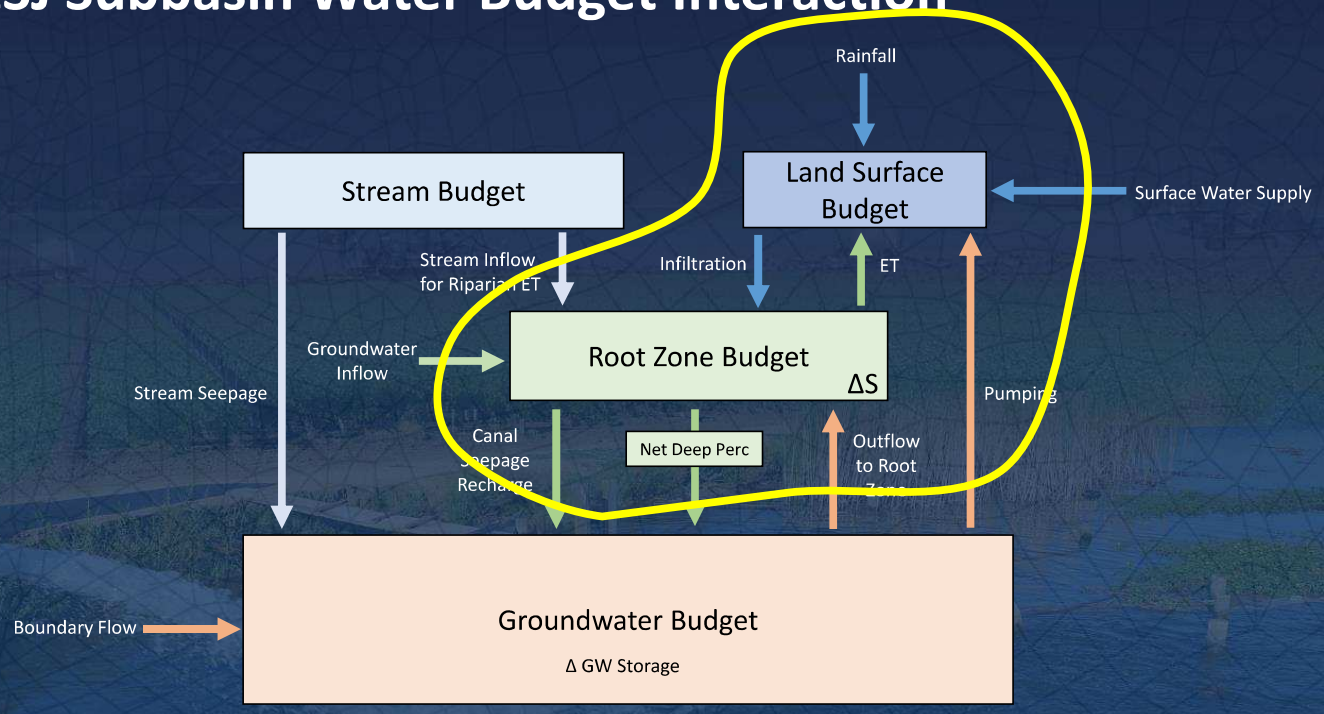


Integrated Hydrologic Processes

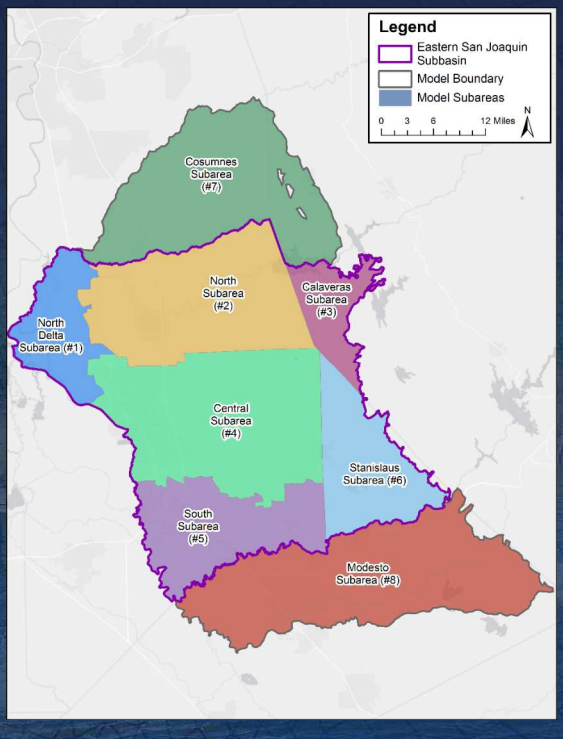
- Land Surface Processes
- Groundwater Flow
- Streamflow
- Physical Systems Integration
- Water Budgets



ESJ Subbasin Water Budget Interaction

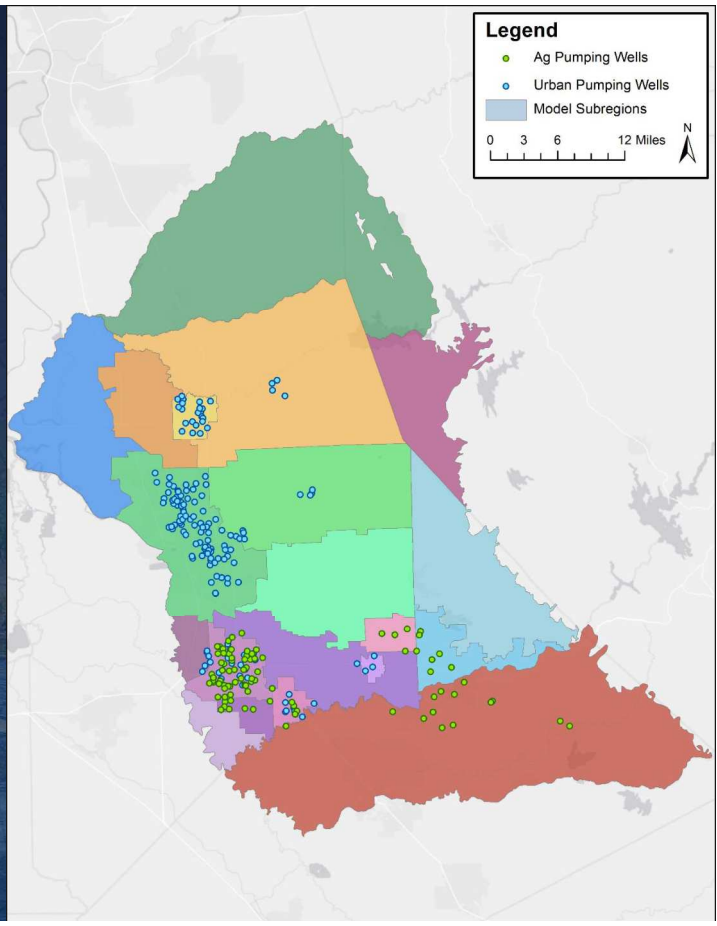


Model Area and ESJ Subbasin



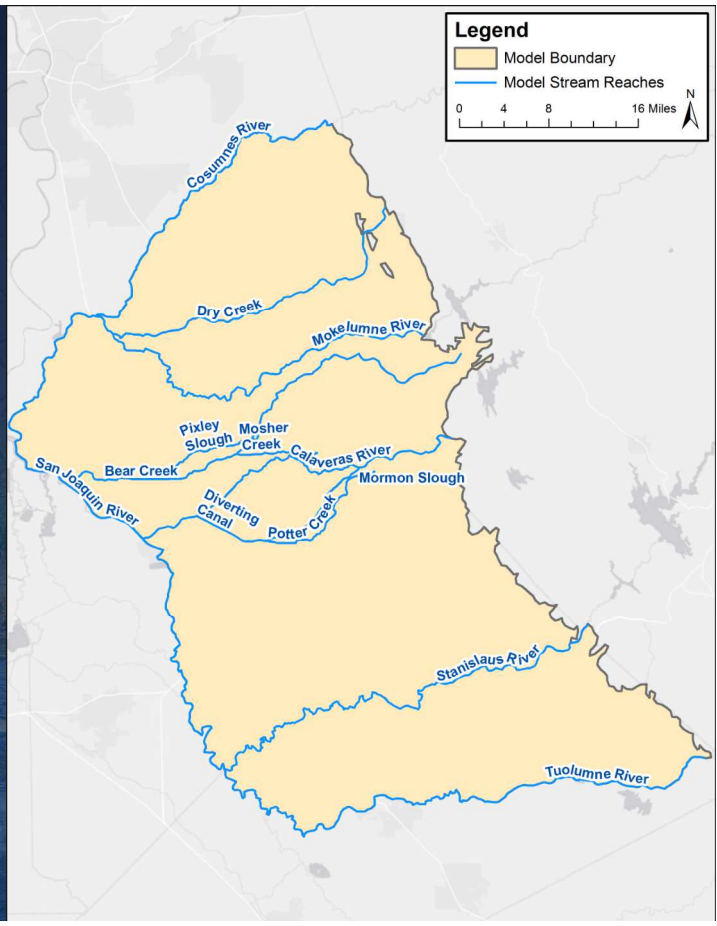
Water Supply Data Sources

- Groundwater pumping for ag or urban purposes:
  - Cal Water
  - Escalon
  - Lathrop
  - Linden County
  - Lockeford
  - Lodi
  - Manteca
  - Ripon
  - SEWD
  - Stockton
  - Oakdale
  - SSJID

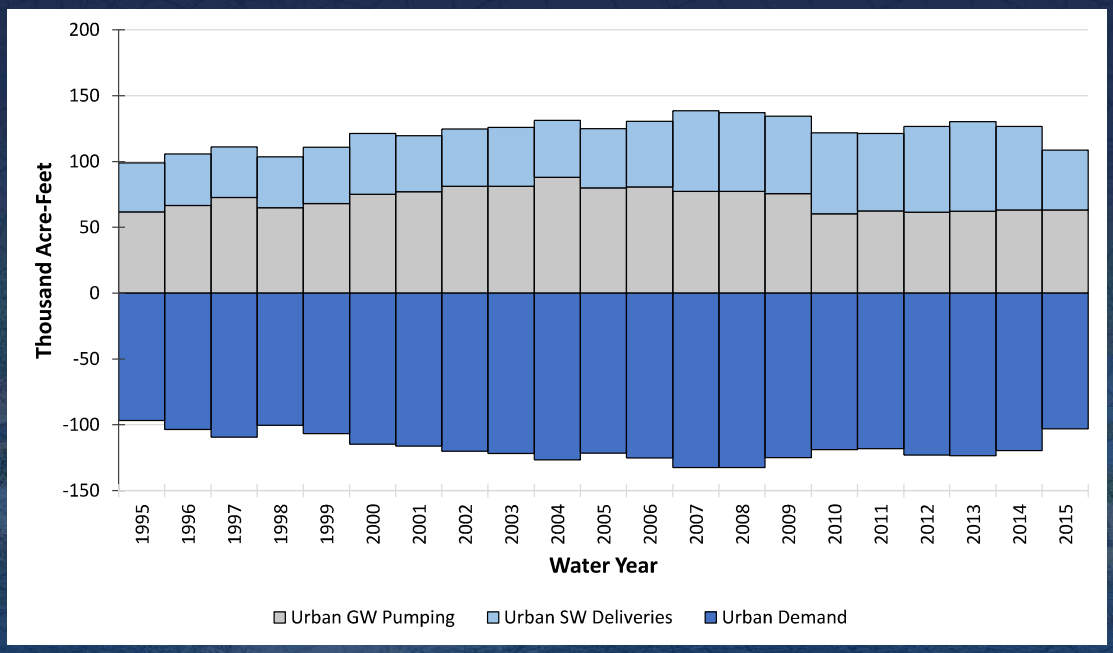


Water Supply Data Sources

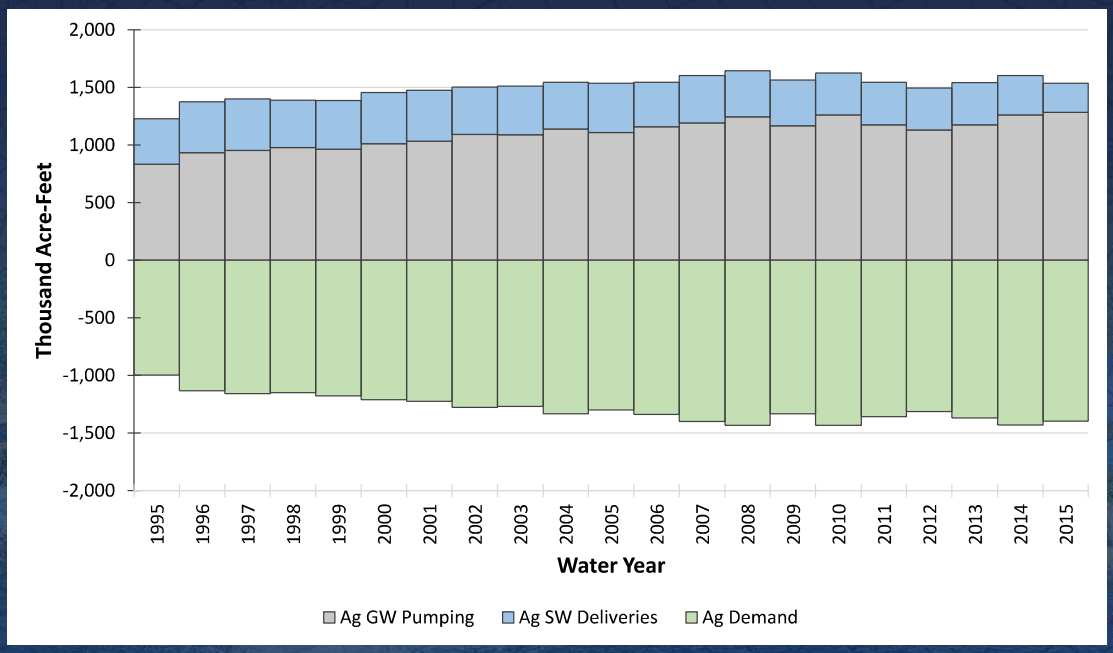
- Surface water deliveries for ag or urban purposes:
  - WID
  - Lodi
  - CCWD
  - Stockton
  - SEWD
  - CSJWCD
  - Lathrop
  - Manteca
  - SSJID
  - Oakdale ID
  - Modesto ID



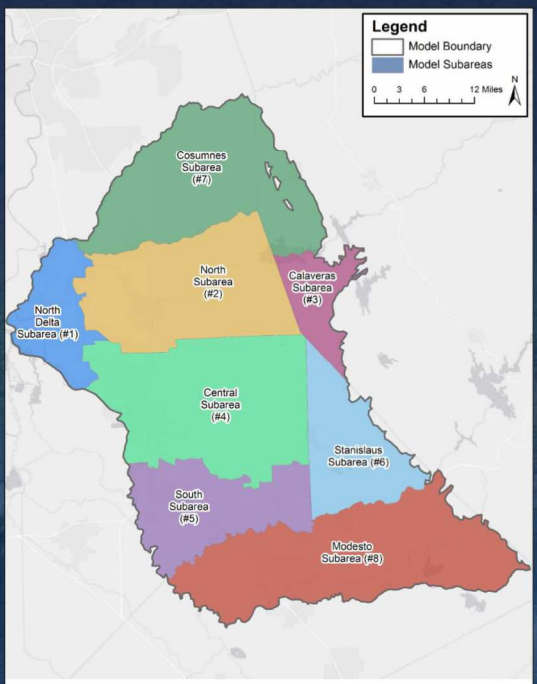
Land and Water Use Budget: ESJ Subbasin



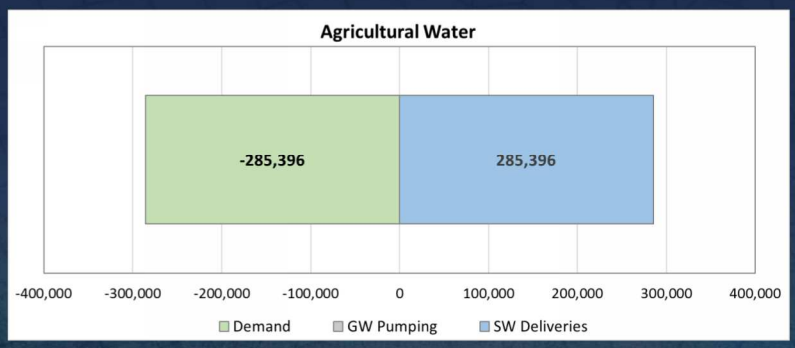
Land and Water Use Budget: ESJ Subbasin

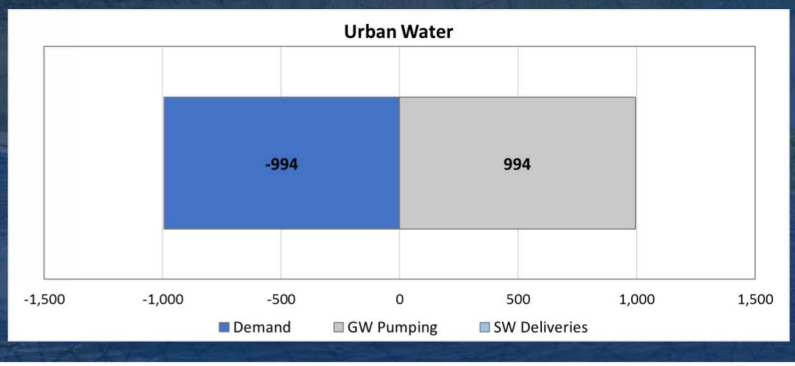


Average Annual Water Budget: Subarea 1

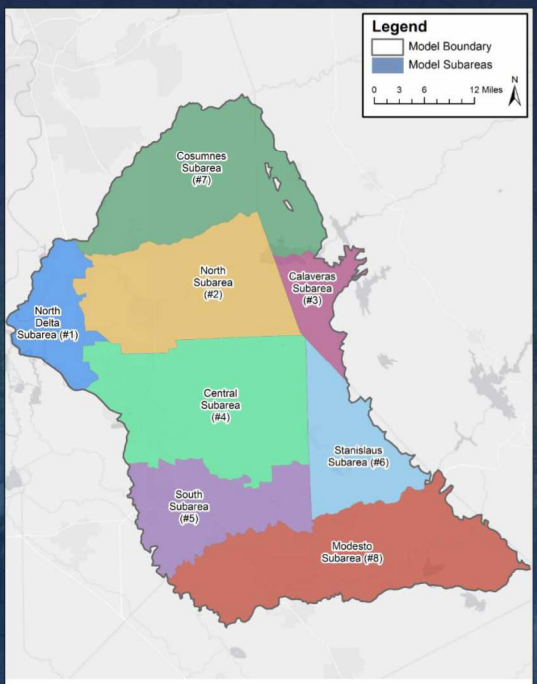


Average Annual for WY 1995-2015, Acre-Feet Per Year

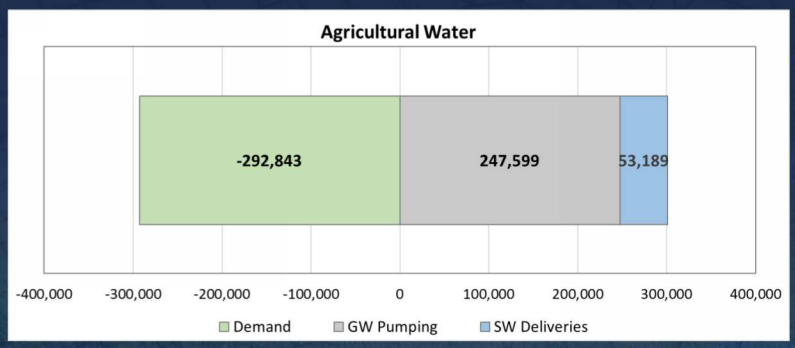


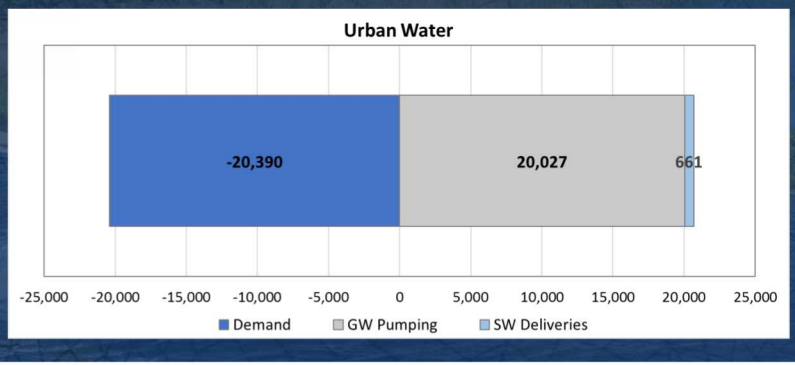


Average Annual Water Budget: Subarea 2

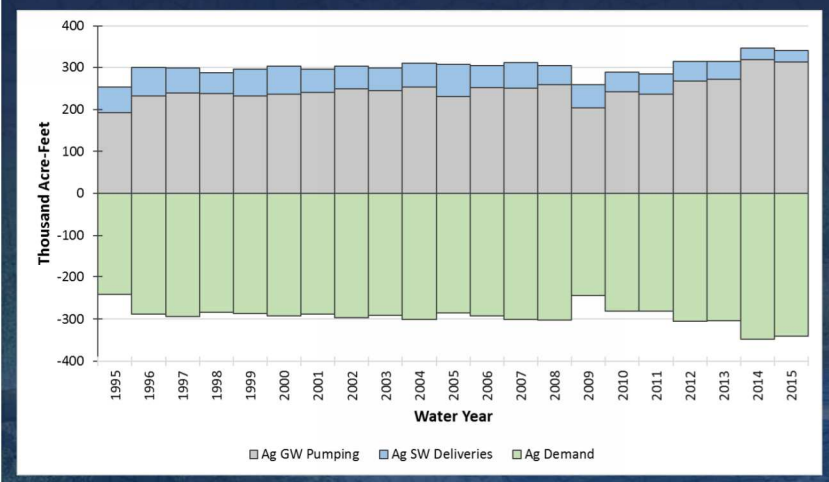


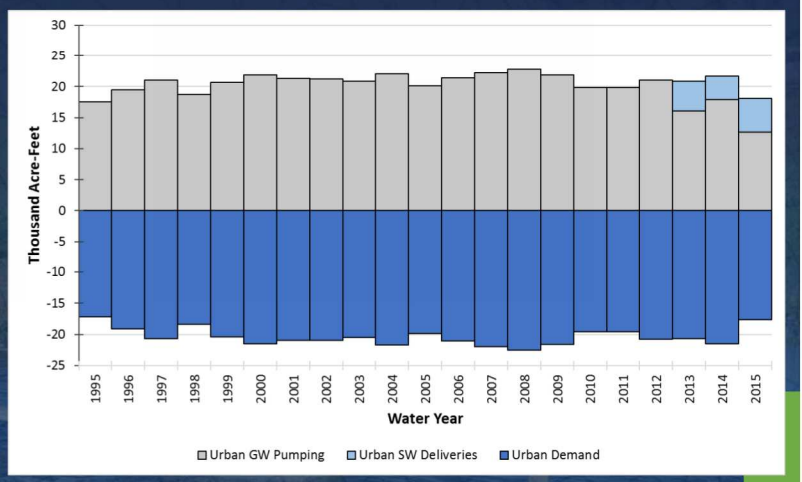
Average Annual for WY 1995-2015, Acre-Feet Per Year



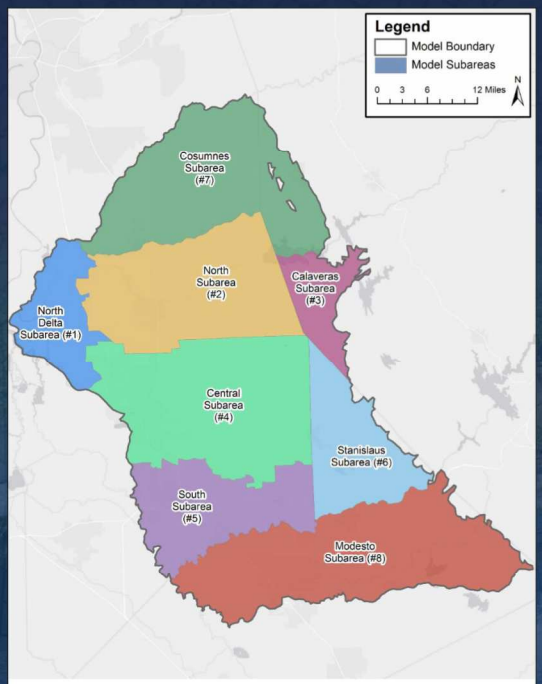


Annual Water Budget: Subarea 2

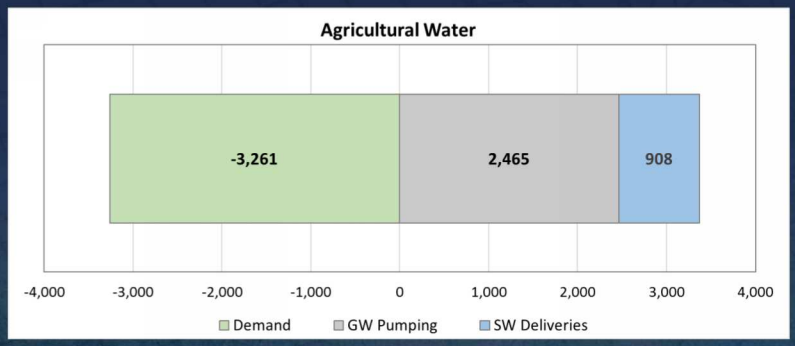


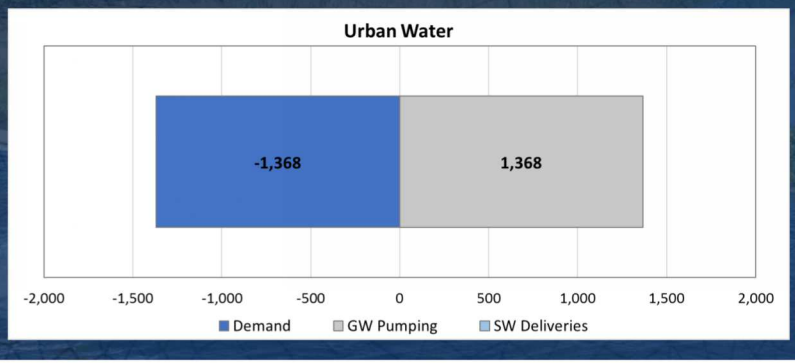


Average Annual Water Budget: Subarea 3

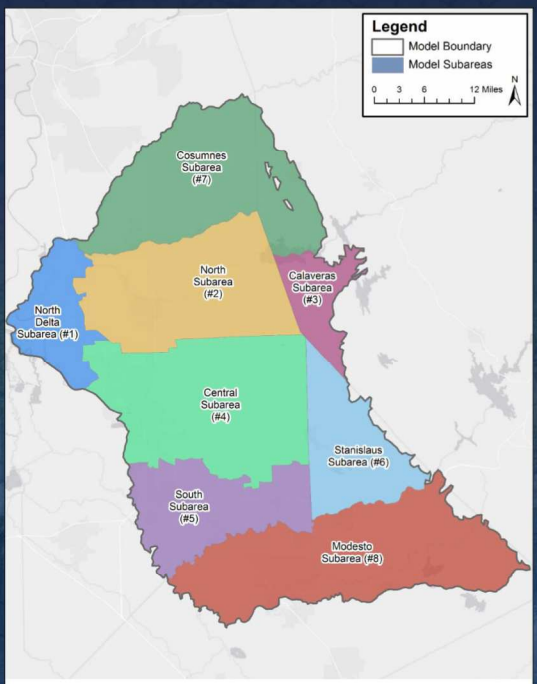


Average Annual for WY 1995-2015, Acre-Feet Per Year





Average Annual Water Budget: Subarea 4



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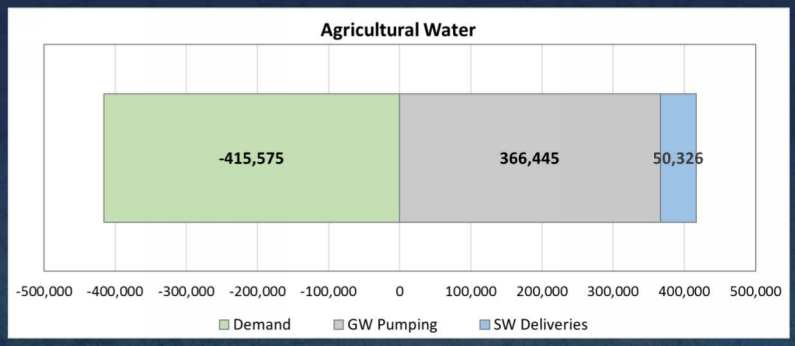
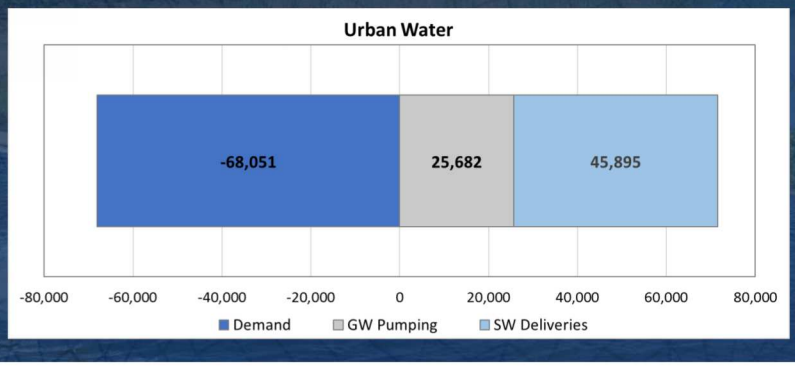
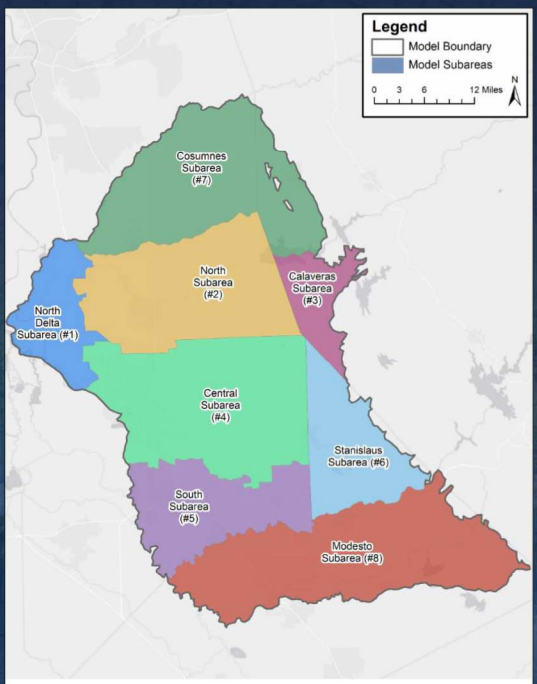
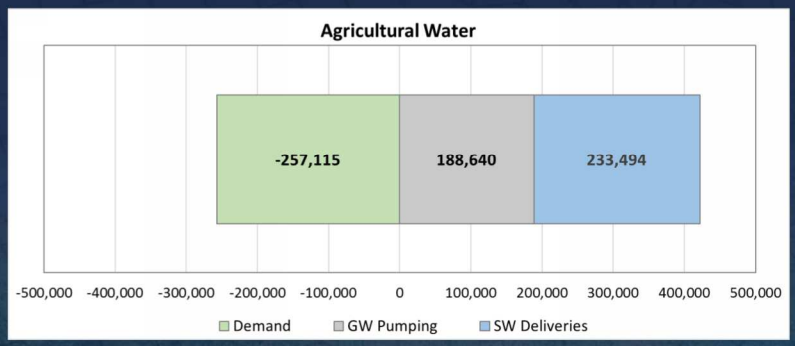


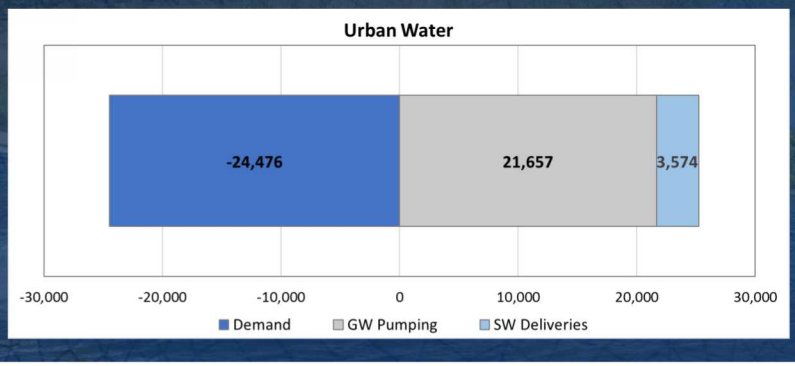


Average Annual Water Budget: Subarea 5

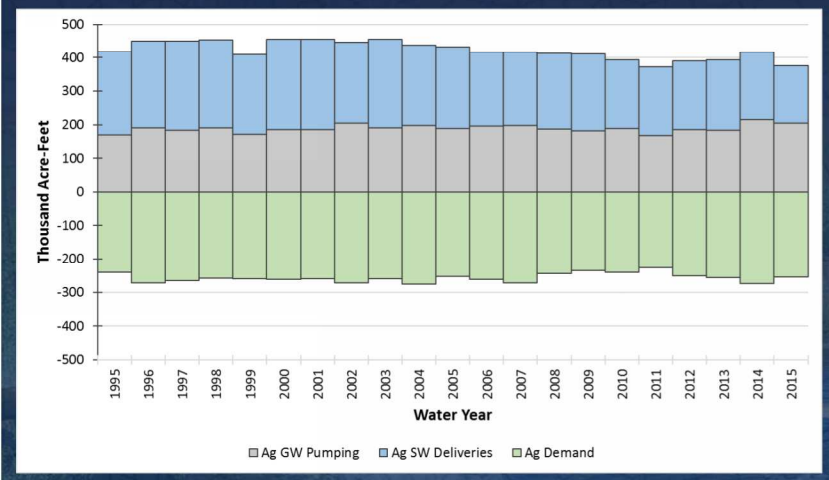


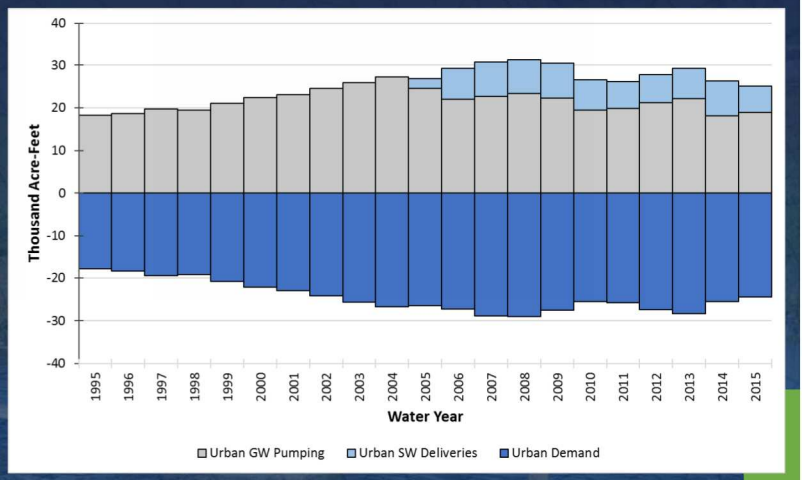
Average Annual for WY 1995-2015, Acre-Feet Per Year



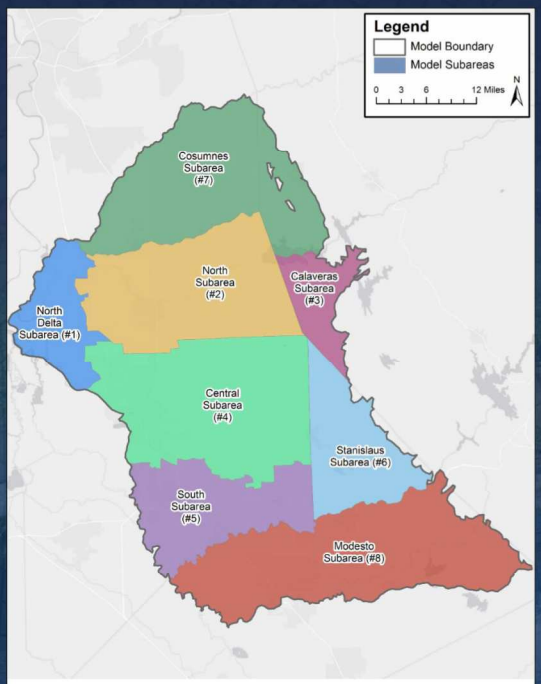


Annual Water Budget: Subarea 5





Average Annual Water Budget: Subarea 6



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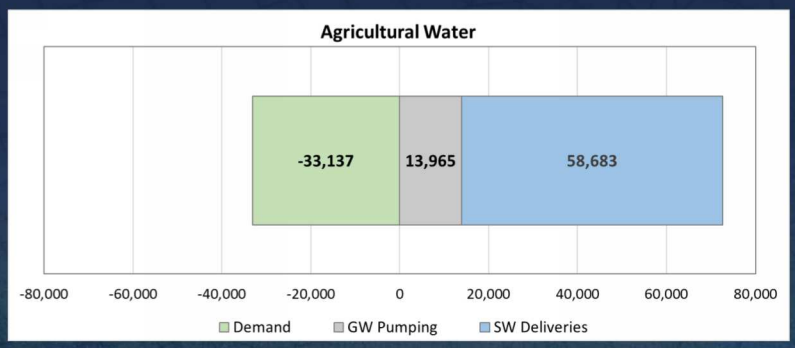
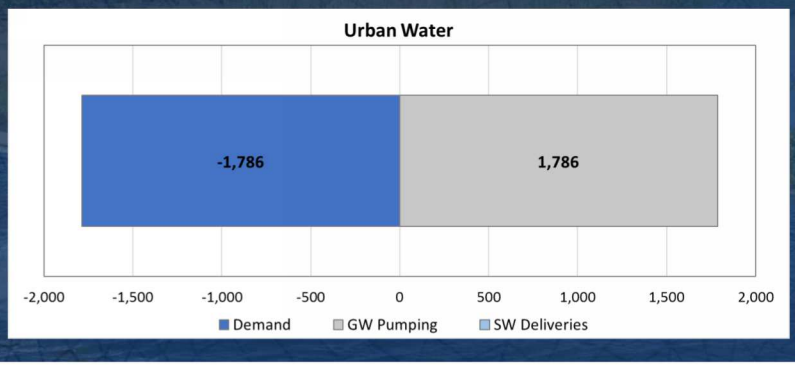
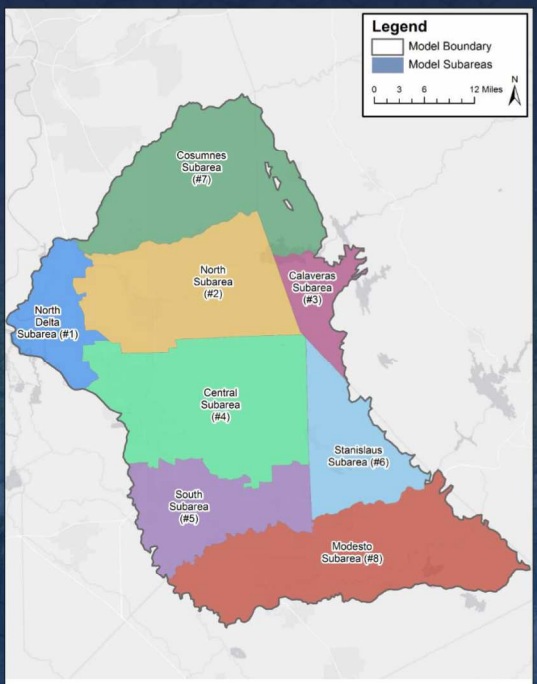
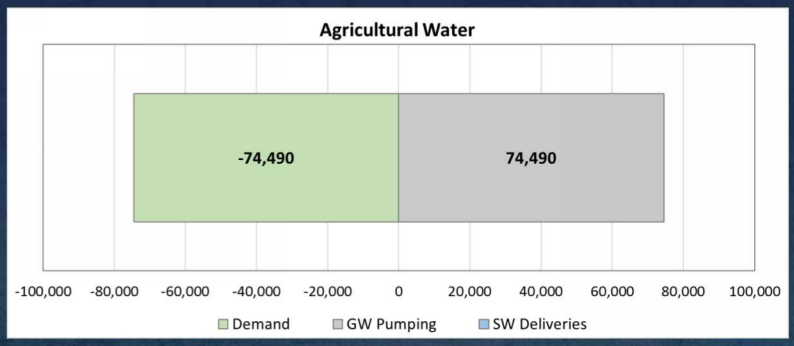


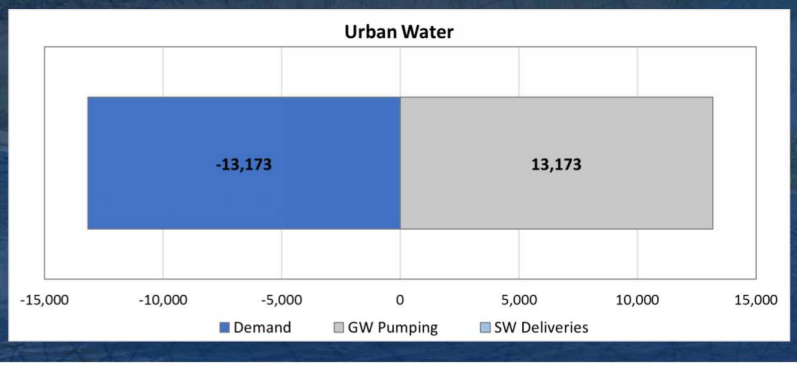


Average Annual Water Budget: Subarea 7

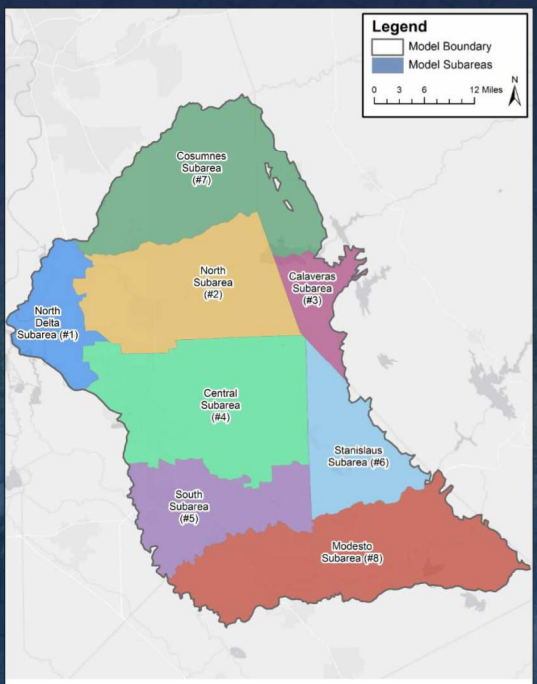


Average Annual for WY 1995-2015, Acre-Feet Per Year

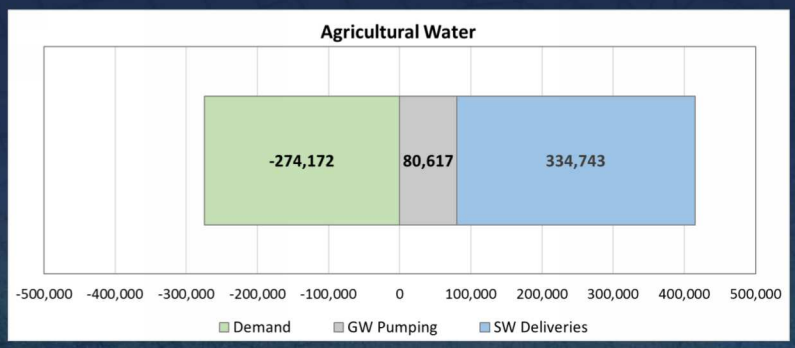


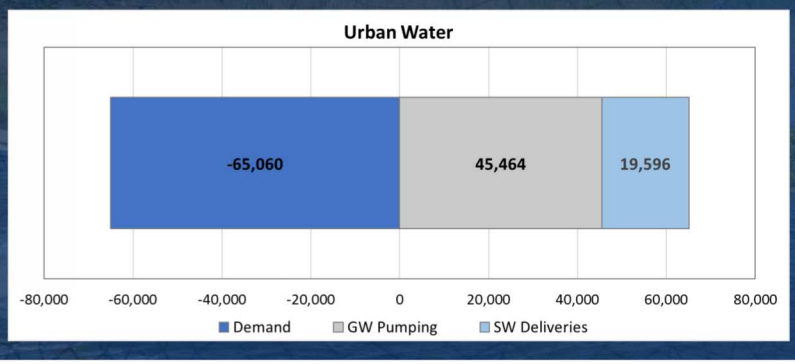


Average Annual Water Budget: Subarea 8

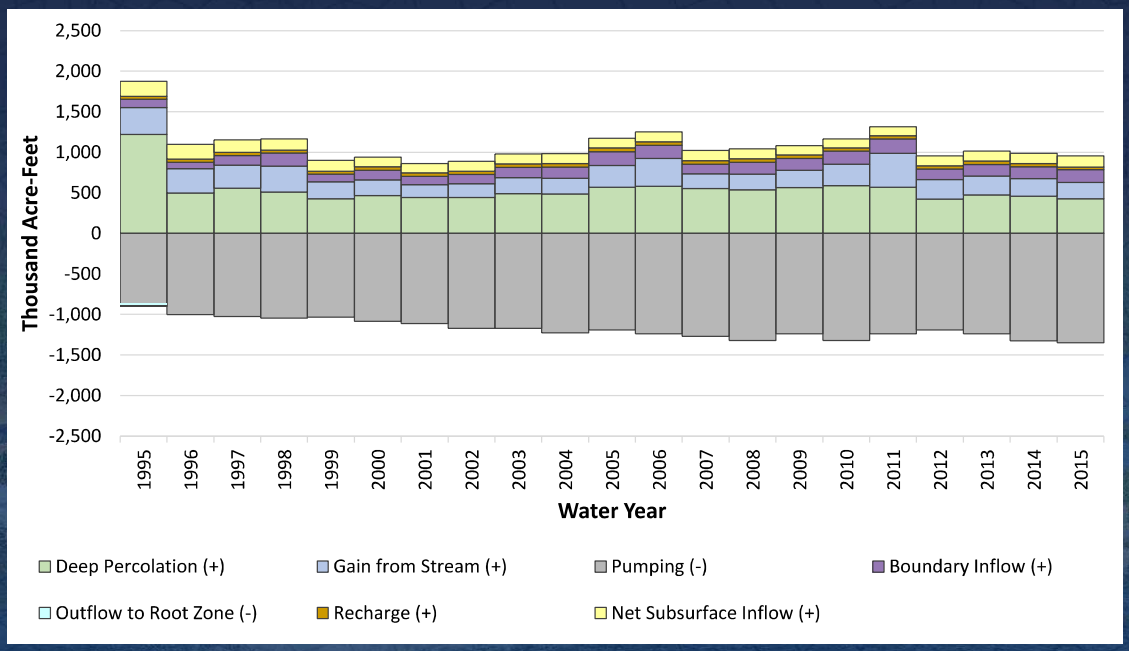


Average Annual for WY 1995-2015, Acre-Feet Per Year





Groundwater Budget: ESJ Subbasin

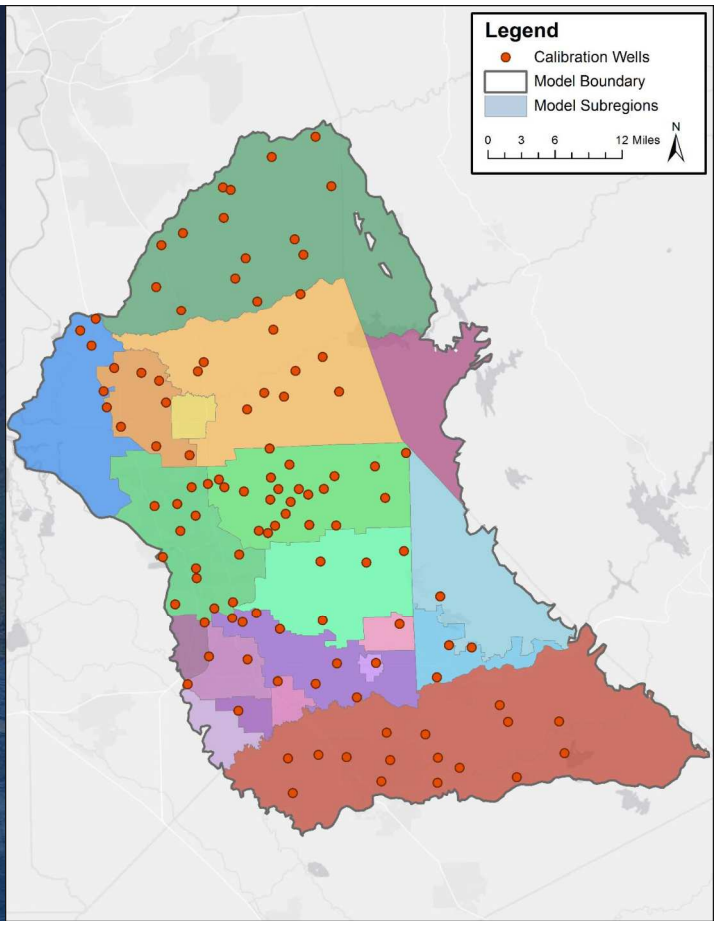


Calibration Process

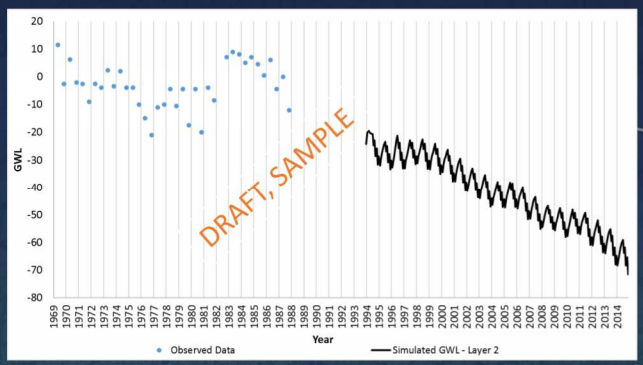
- Identify:
  - Target calibration wells
  - Target streamflow gaging stations
- Review observed data and set calibration targets
- Calibrate model by adjusting model parameters to attain reasonable match between modeled and opbserved data for:
  - Water budgets for each component of the hydrologic cycle modeled
  - GW levels at select wells
  - Streamflows at select gaging stations
- Compare calibration performance with calibration targets
- Conduct additional refinements as necessary

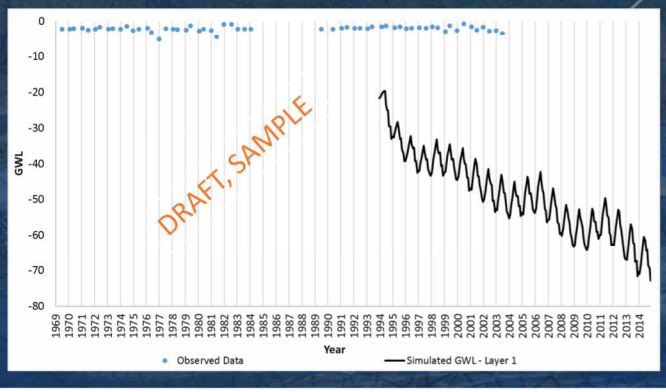
Preliminary Calibration Wells

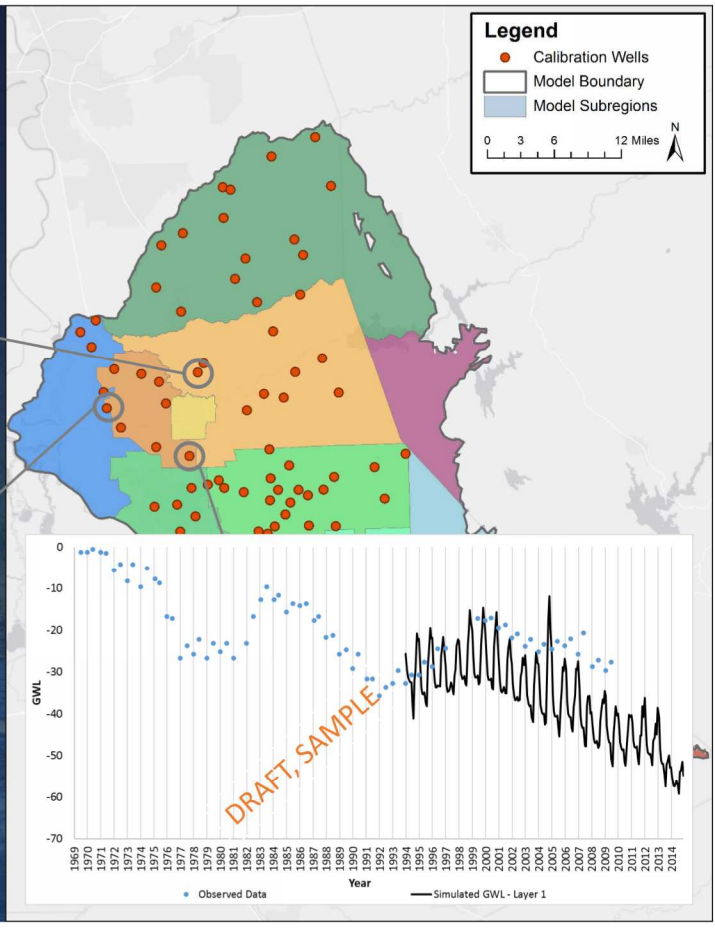
- Correspond to calibration wells in other models:
  - C2VSim-FG
  - San Joaquin-Stanislaus IGSM & DynFlow



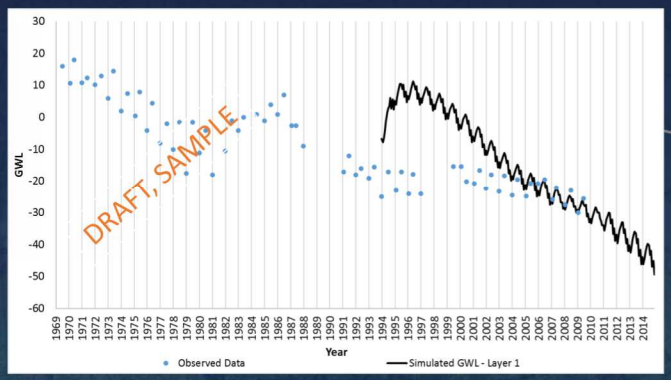
Sample Hydrographs

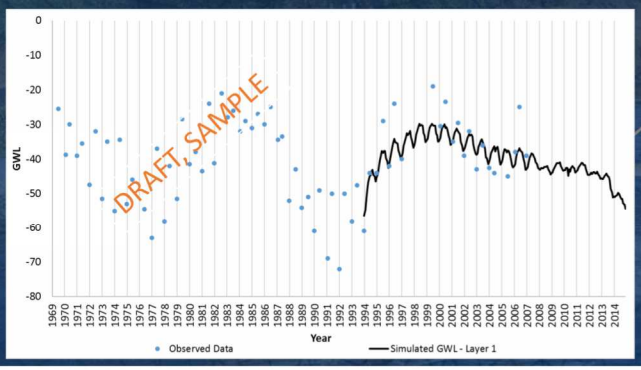


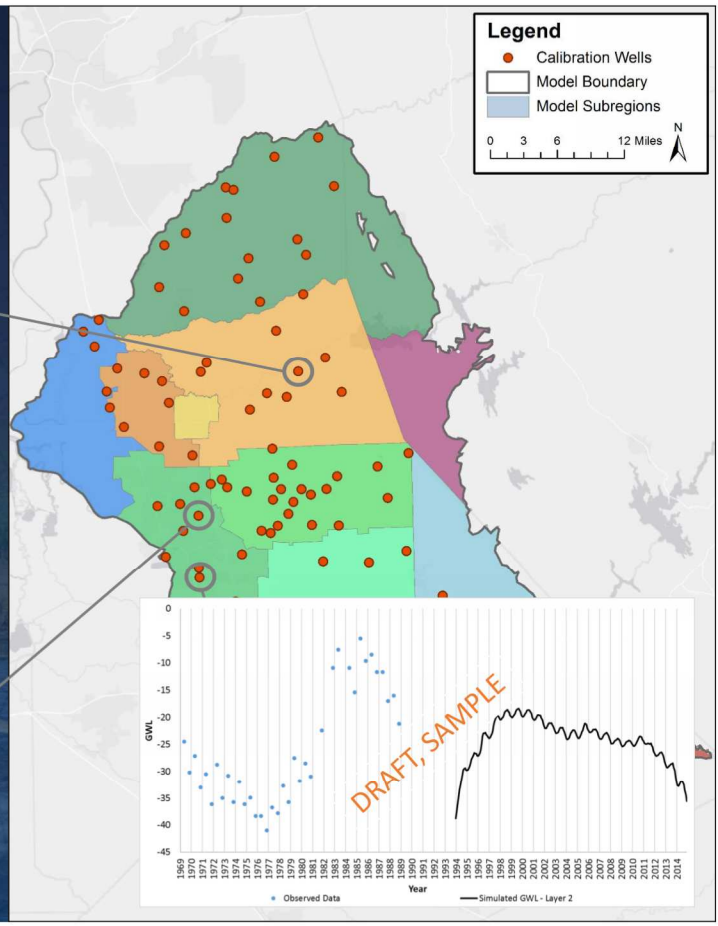




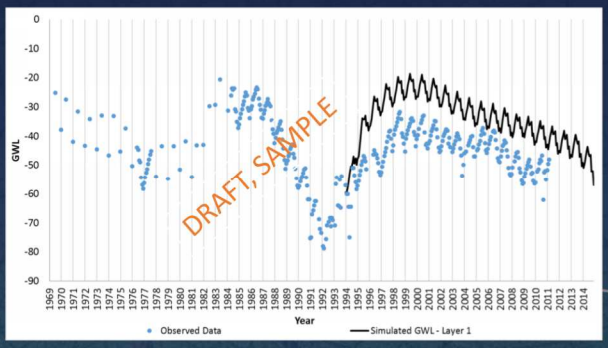
Sample Hydrographs

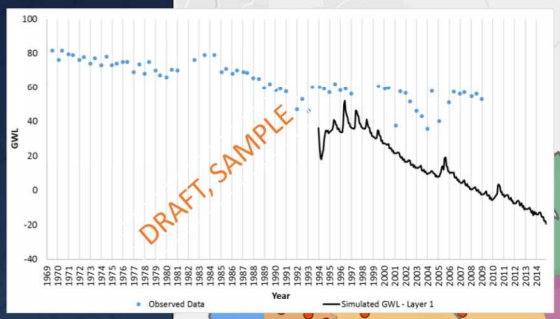


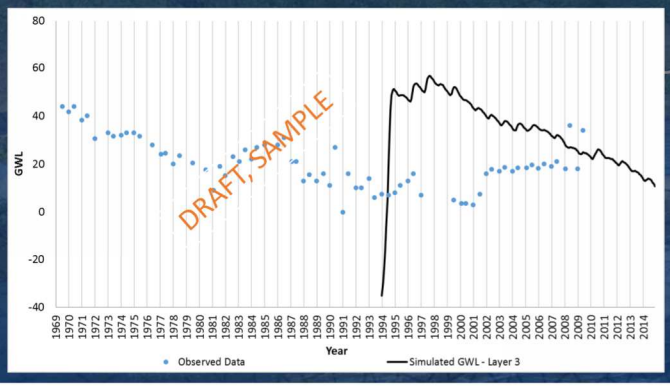


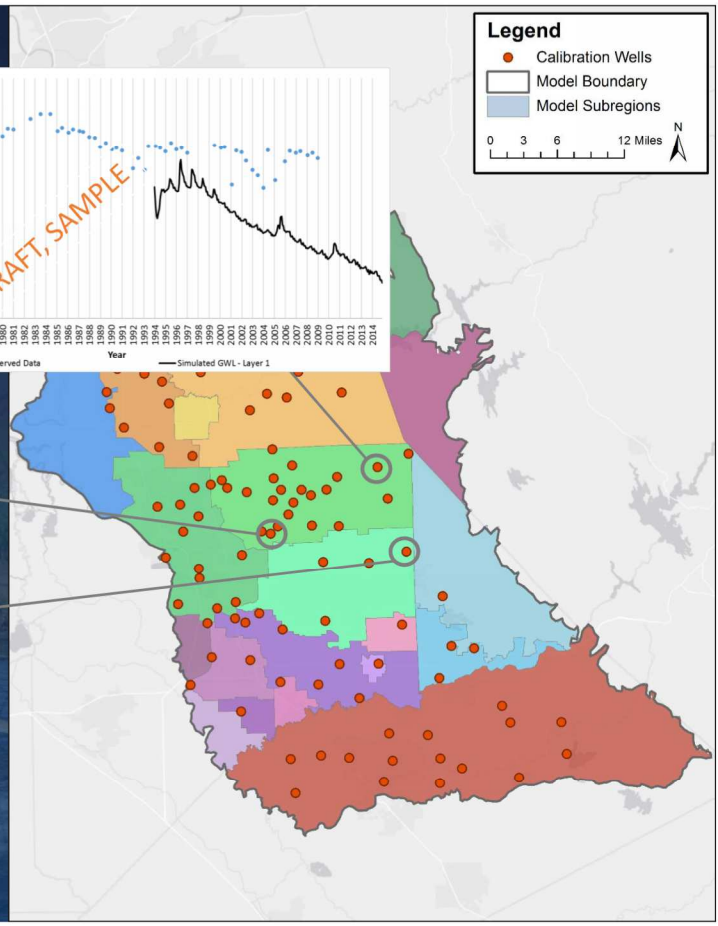


Sample Hydrographs

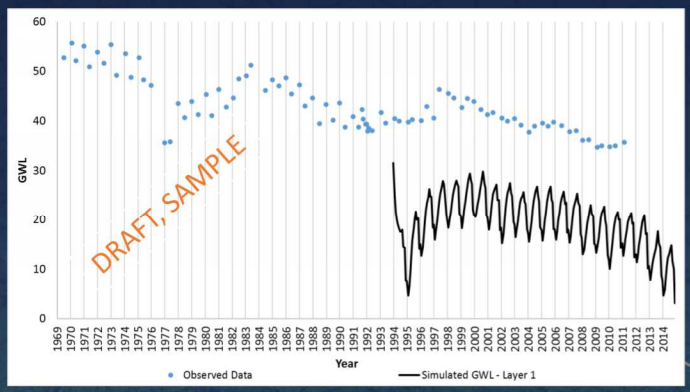


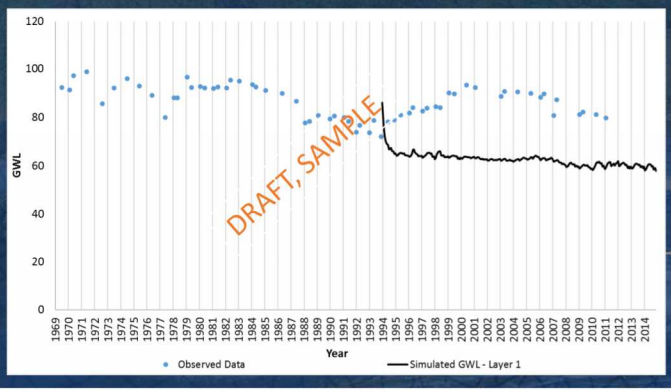


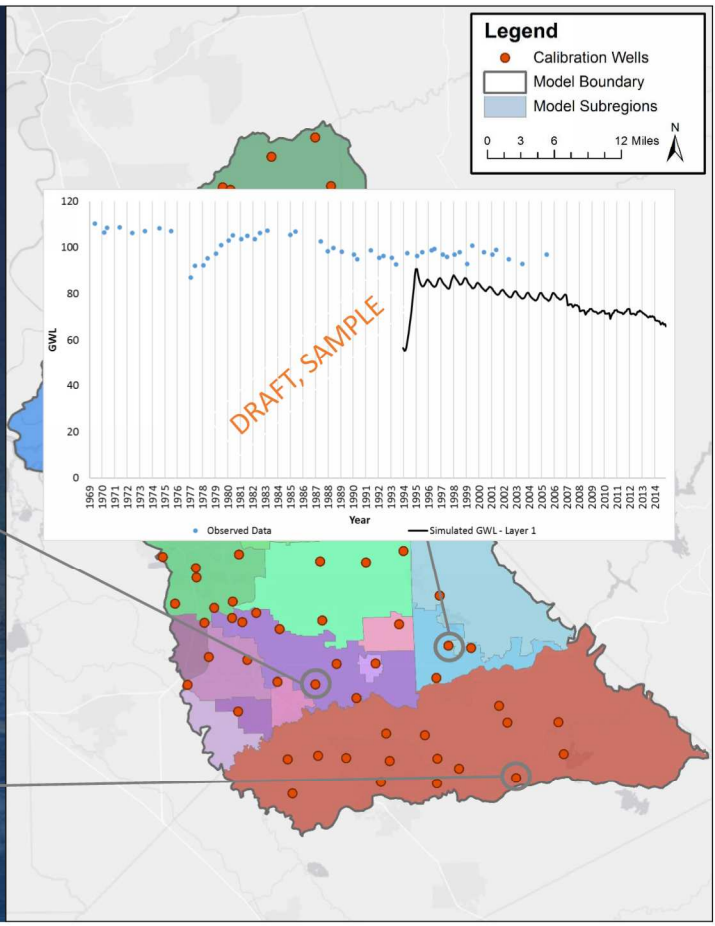




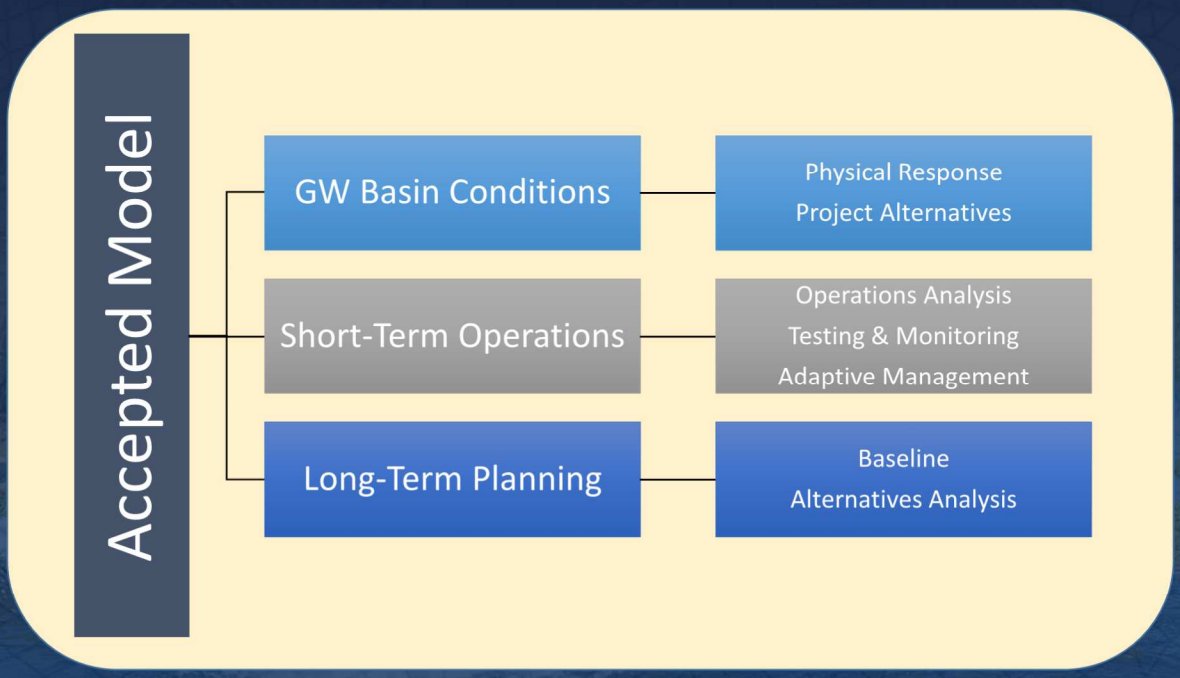
Sample Hydrographs







Model Applications Next Steps …



Model Objectives: Historical Conditions

Basin Characteristics

Historical, Current and Projected Levels of Development

GW & SW Conditions

Stream-Aquifer Interaction

Model Objectives: Projected Conditions

Projected Conditions

IRWM, GWMP
SGMA

Storm water and Recycled Water Opportunities

Groundwater Banking

Groundwater Sustainability

Hydro-Economic Evaluations

Water Availability

Urban Water Supply

Project Beneficiary Assessment

Next Steps

1. Finalize IDC and document assumptions, data sources, and results
2. Finalize IWFM datasets and parameters
3. Calibrate IWFM

Project General Schedule

Sustainable Groundwater Management Act Readiness Project

ESJ Water Resources Model (ESJWRM) IDC Workshop

RMC water and environment

WOODARD & CURRAN

National Experience. Local Focus.

SAN JOAQUIN COUNTY CALIFORNIA

April 25, 2018

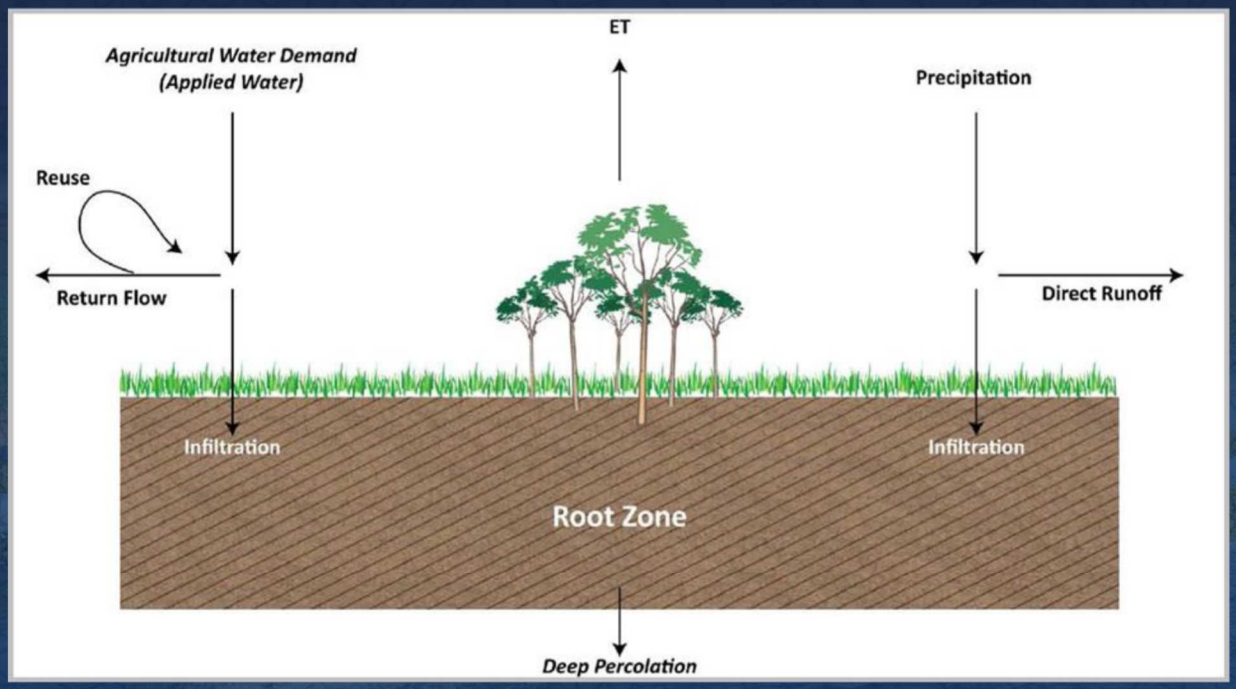
Agenda

- Introduction
- Review IDC
- Review IDC data
- Review IDC results

Stakeholder Collaboration

- Cal Water
- Calaveras County Water District
- Escalon, City of
- Lathrop, City of
- Lockeford Community Services District
- Lodi, City of
- Manteca, City of
- North San Joaquin Water Conservation District
- Oakdale Irrigation District
- San Joaquin County
- South San Joaquin Irrigation District
- Stanislaus County
- Stockton, City of
- Stockton East Water District
- Woodbridge Irrigation District

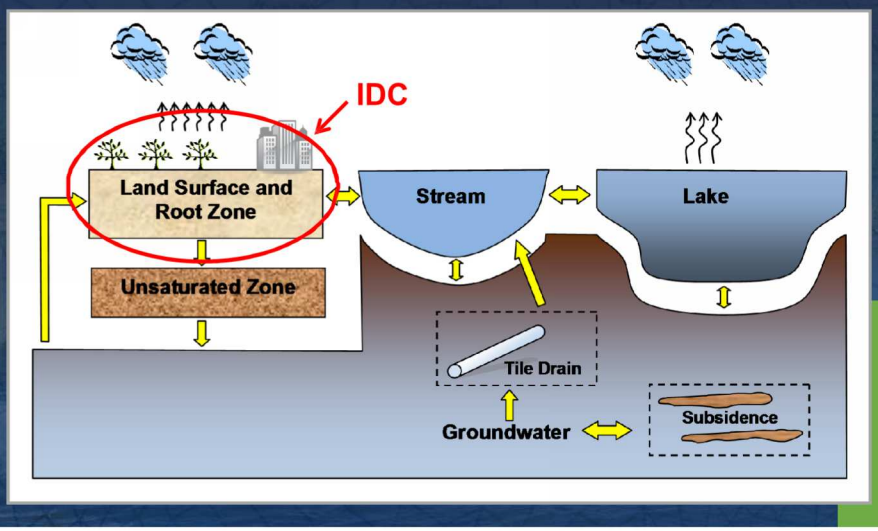
IWFM Demand Calculator: IDC



Source: IDC training workshop (Emin Can Dogrul, DWR)

Ag Demand Estimation using IDC

- IWFM Demand Calculator (IDC) is a software that calculates land use based water demands and routes water through the land surface and root zone using physically-based simulation methods
- Uses methods from irrigation-scheduling-type models and applies them at regional scales
- Stand-alone executable or root zone module of Integrated Water Flow Model (IWFM) v2015



Source: IDC training workshop (Emin Can Dogrul, DWR)

IDC Background

- IDC was initially developed to…
  - Maintain consistency between C2VSim and CalSim
  - Calculate downstream water demands for CalSim under current conditions and future scenarios
- First version of IDC did not have rice and refuge simulations, had incompatible calculations for daily runs
- IDC v4.0 was developed to improve upon the initial version of IDC
- With alternative root zone routing schemes developed (v4.0, v4.1 and v3.02) IDC-2015 became a container for different root zone routing methods

Source: IDC training workshop (Emin Can Dogrul, DWR)

Features of IDC-2015

- Use of a computational grid, finite-element or finite-difference, to represent spatial distribution of land-use, climatic, soil and farm management properties; each cell can have multiple land-use types specified as time-series data
- Simulation of land surface and root zone flow processes as well as water demand computations are done at each grid cell for each land-use type
- Irrigation-scheduling-type approach at each grid cell for each agricultural crop
- Direct representation of rice fields (including simulation of flooded decomposition, non-flooded decomposition and no decomposition) and refuges (seasonal and permanent)
- Riparian vegetation access to stream flows and simulation of evapotranspiration from groundwater
- Urban water demand computation based on population and per capita water usage
- Simulation of ETAW and effective precipitation
- Simulation of re-use of irrigation return flow that takes place at a grid cell, between grid cells or between subregions
- Budget output includes soil moisture, and land and water use budgets for individual crops at each subregion

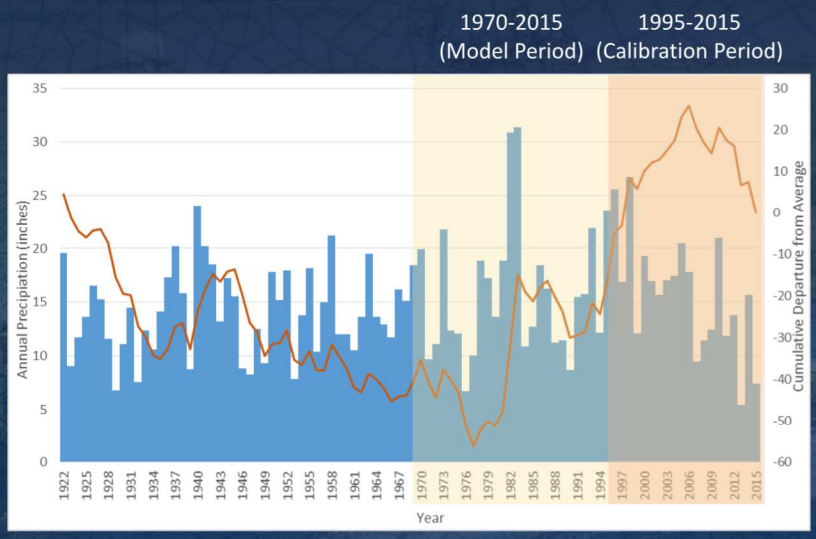
Source: IDC training workshop (Emin Can Dogrul, DWR)

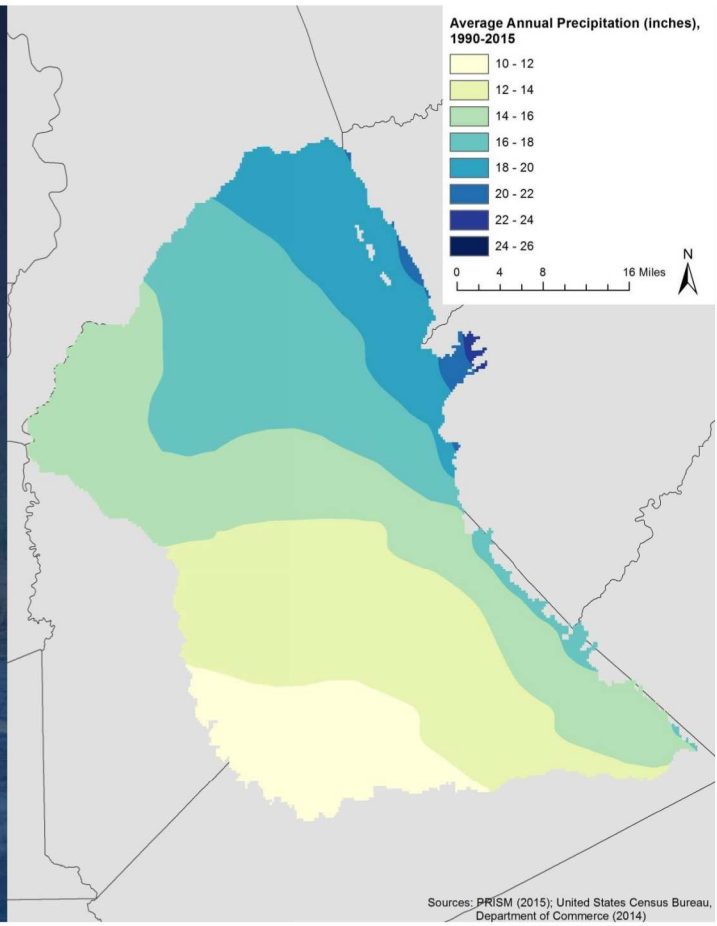
Key Parameters and Data in IDC

- Monthly Rainfall
- Crop Evapotranspiration, Et_c
- Return and reuse fractions
- Irrigation period
- Land use and crop acreages
- Urban population and per capita water use
- Soil Properties:
  - Hydraulic Conductivity
  - Pore Size Distribution Index
  - Others: Wilting Point, Field Capacity, Total Porosity

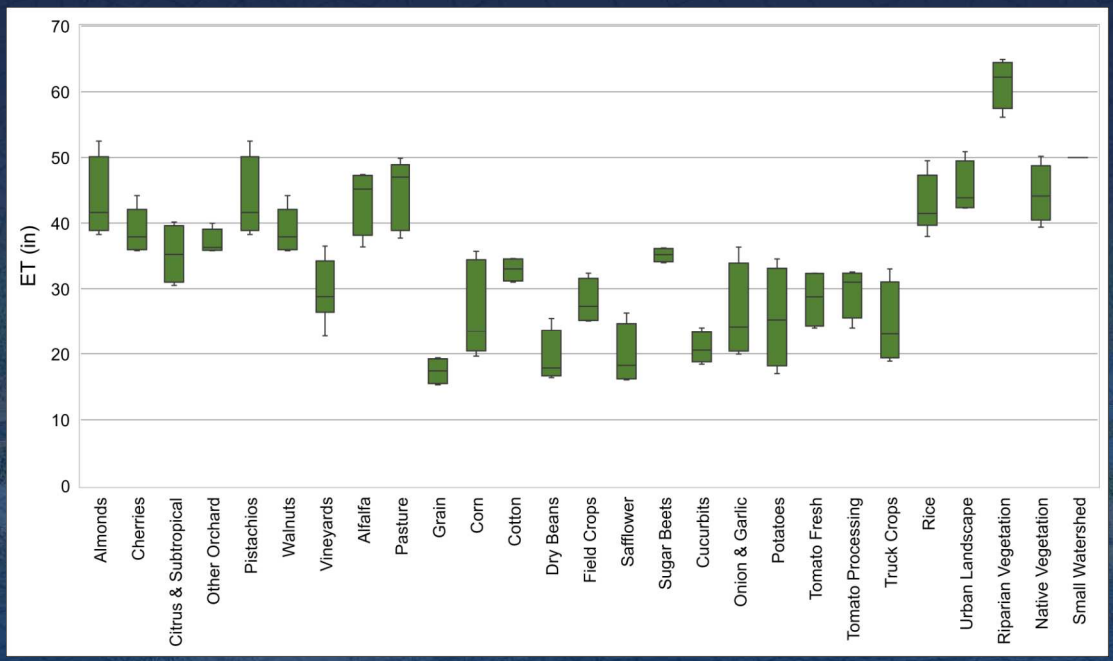
Precipitation

- Source of Data: PRISM for entire model period (1970-2015)





Crop Evapotranspiration, ET_c



Recap of Land Use and Cropping Patterns

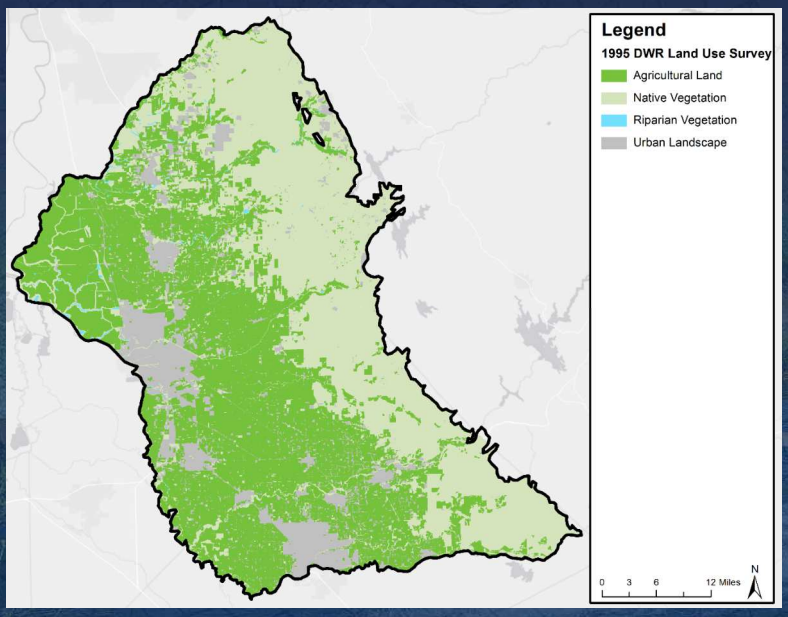
1. DWR Land Use Surveys (Representing ~1995 Era)
   - San Joaquin County (1996)
   - Sacramento County (1993)
   - Amador County (1997)
   - Calaveras County (2000)
   - Stanislaus County (1996)
2. Remote Sensing Data:
   - USDA's CropScape
   - DWR's LandIQ Survey; 2014
3. Local Data Sources

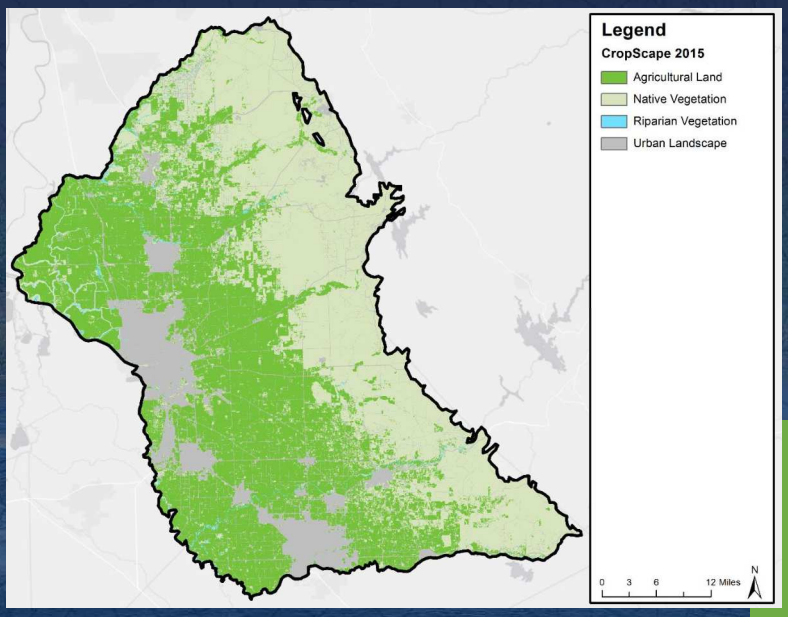
ESJWRM:

- 23 irrigated crop categories
  - Form 7 high-level categories used for verification purposes
- 4 other land use categories

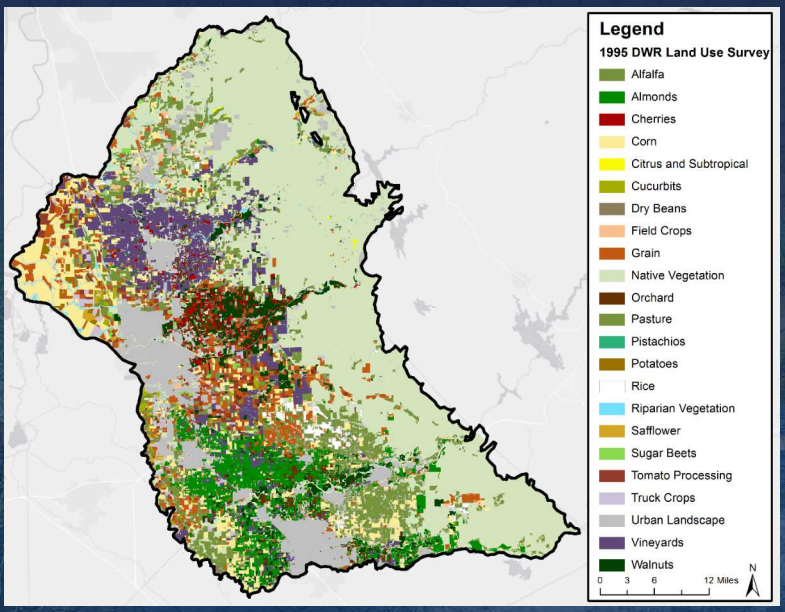
Model Crop Category	Grouped Crop Categories
Almonds Cherries Citrus & Subtropical Other Orchard Pistachios Walnuts	Fruit and Nut Trees
Vineyards	Vineyards
Alfalfa Pasture	Alfalfa and Irrigated Pasture
Grain	Grain
Corn Cotton Dry Beans Field Crops Safflower Sugar Beets	Field Crops
Cucurbits Onion & Garlic Potatoes Tomato Fresh Tomato Processing Truck Crops	Truck Crops
Rice	Rice
Urban Landscape Water Surface Riparian Vegetation Native Vegetation	Other Land Use

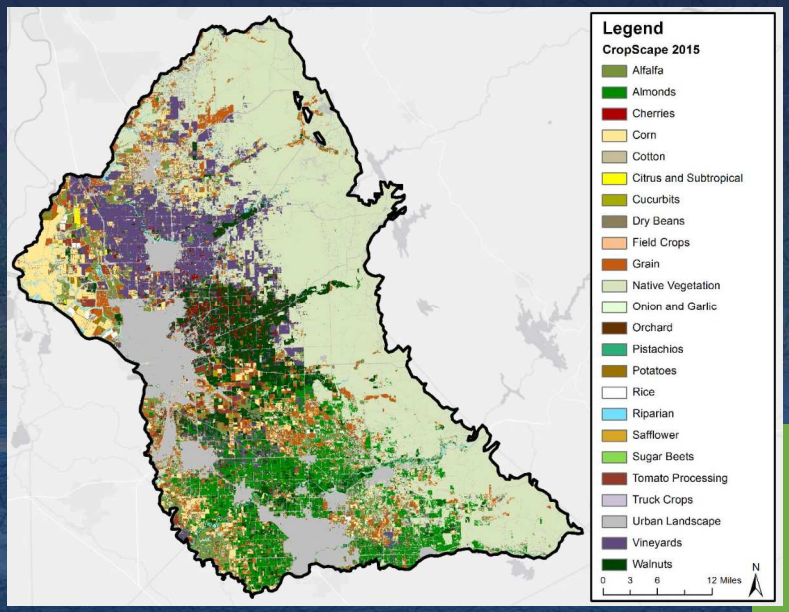
ESJ Model Area Land Use (1995 & 2015)



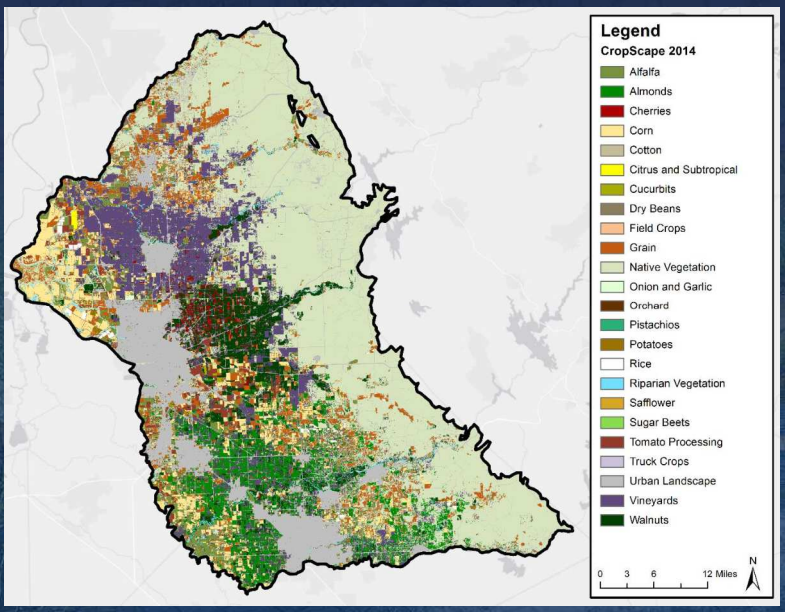


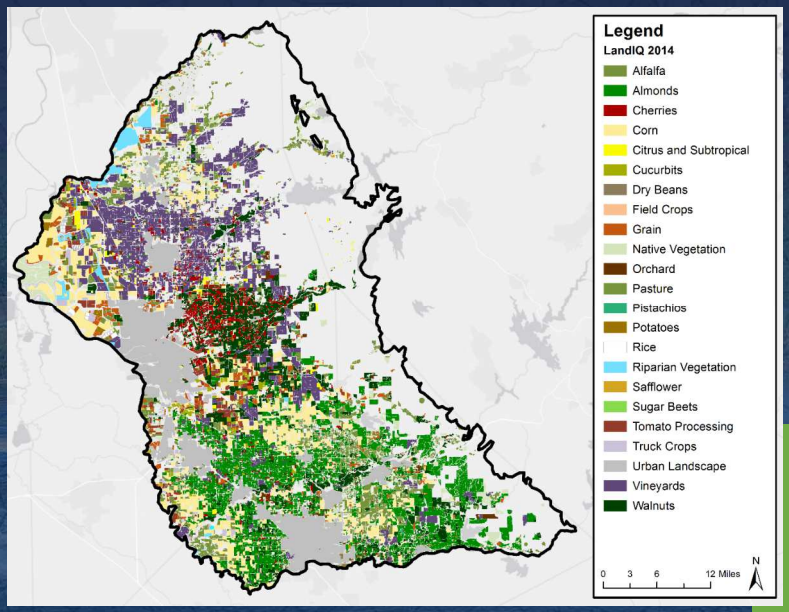
ESJ Model Area Cropping Pattern (1995 & 2015)



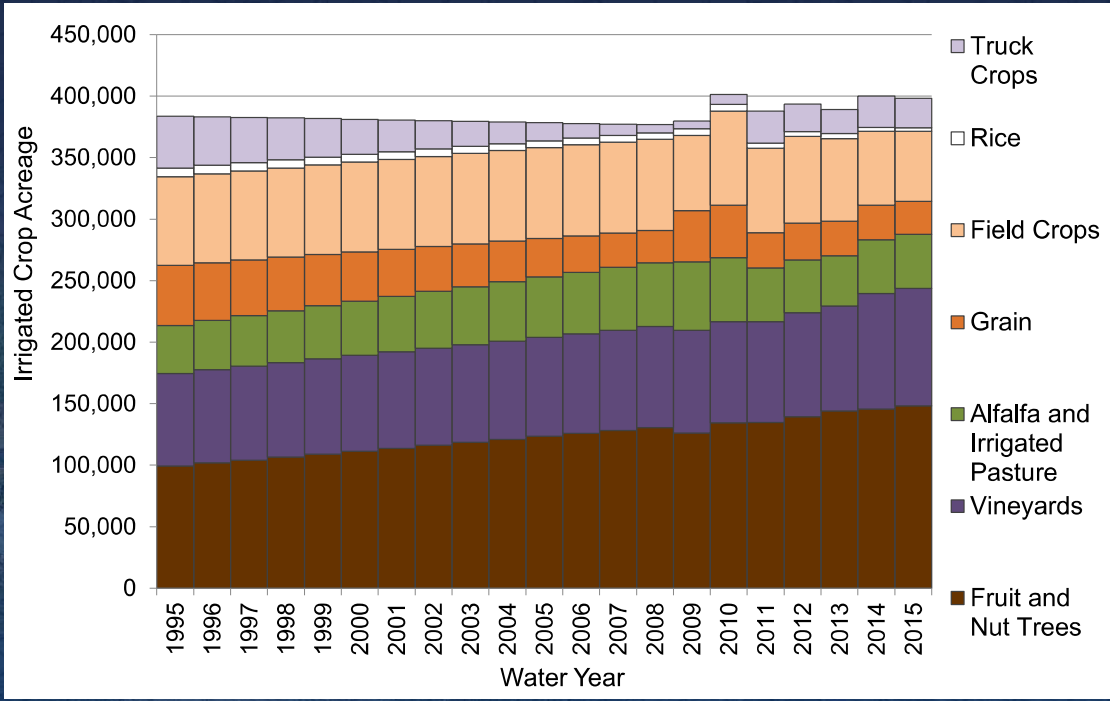


2014 Cropping Pattern (CropScape & LandIQ)

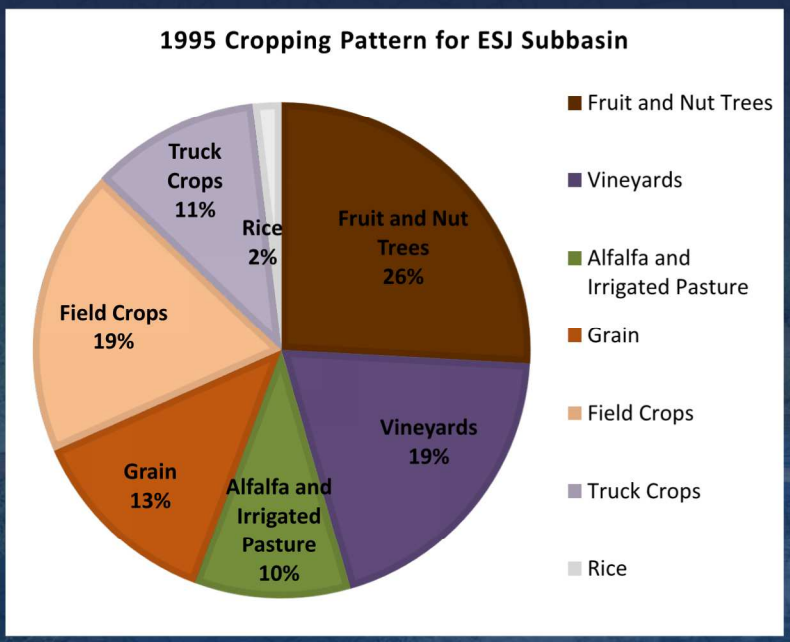


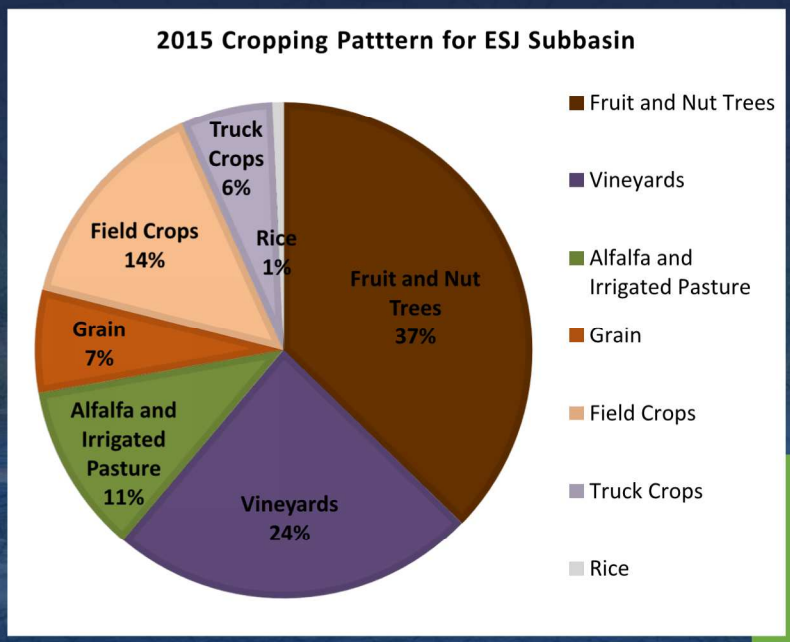


Primary Cropping Pattern in ESJ Subbasin

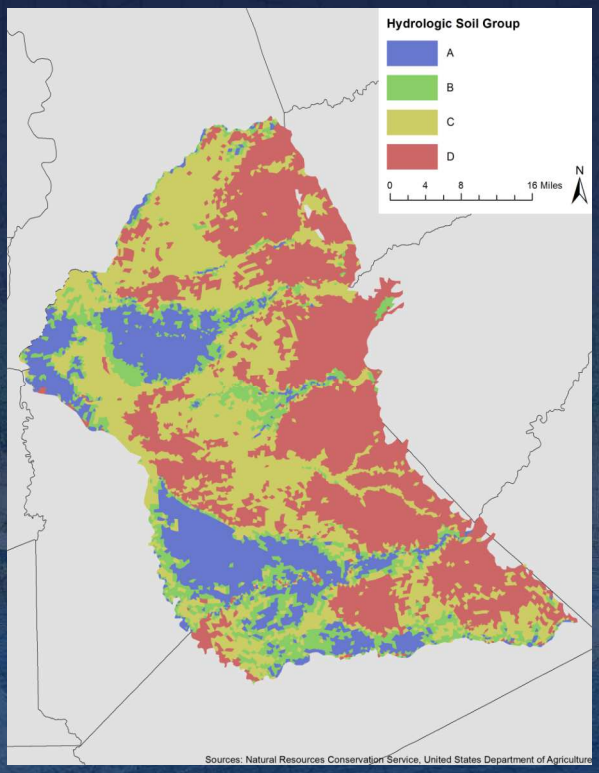


Primary Cropping Pattern in ESJ Subbasin



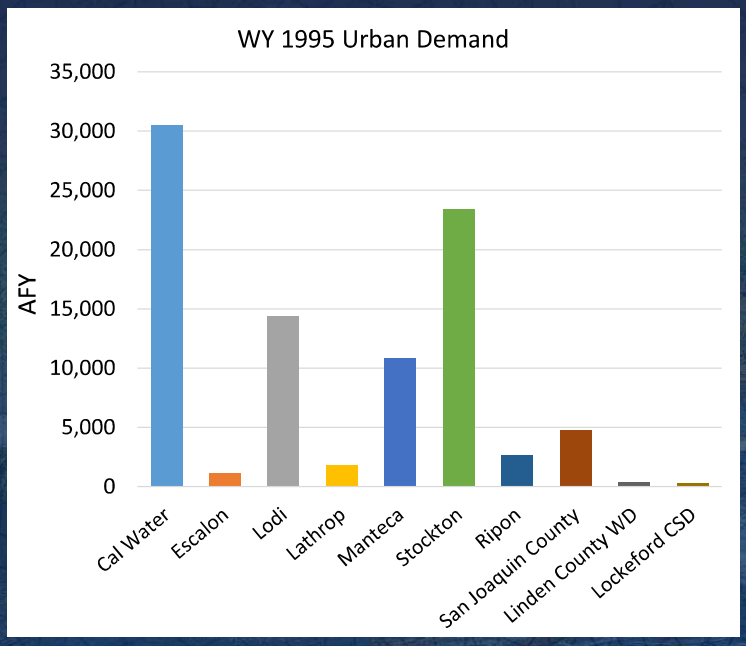


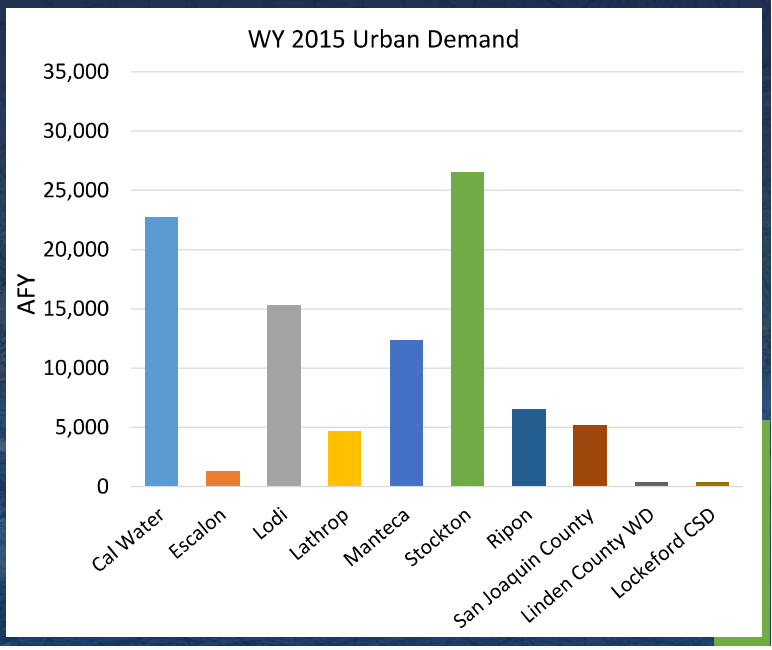
Root Zone Parameters



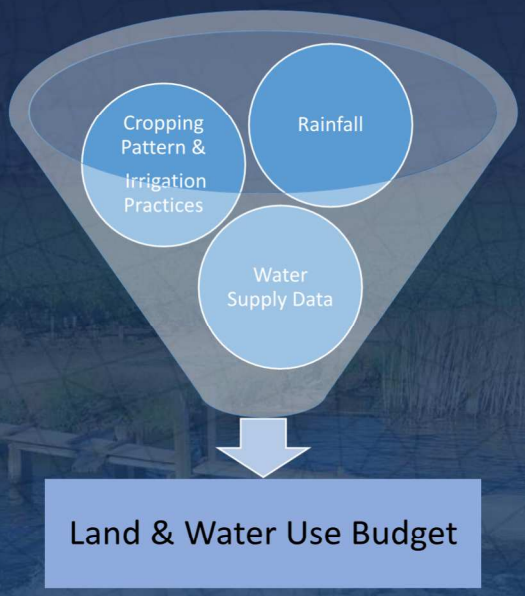
Urban Water Demand

- Based on GPCD and population if water demand information unavailable



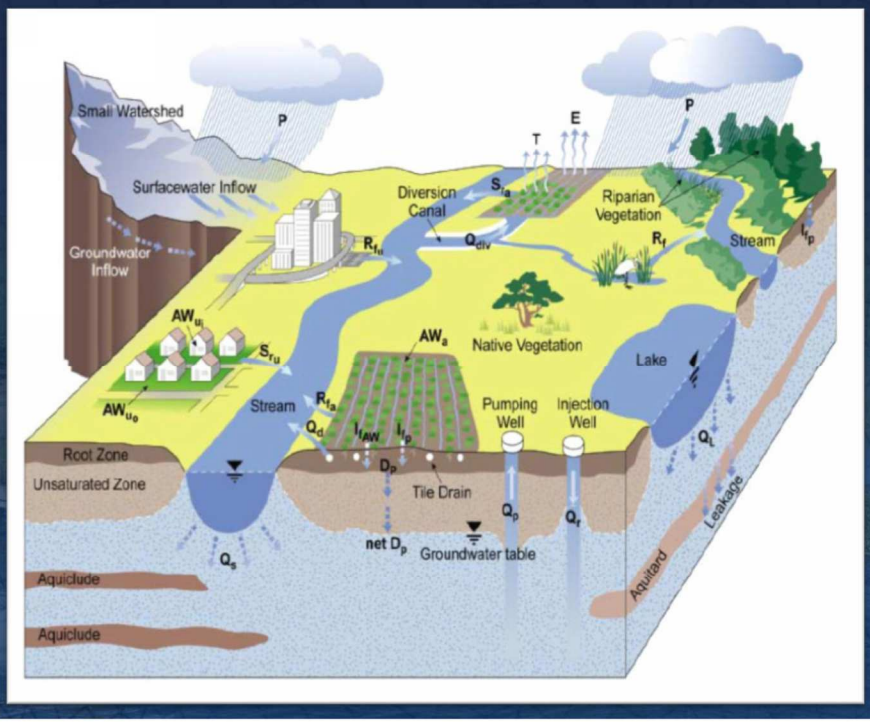


Land & Water Use Budget Components



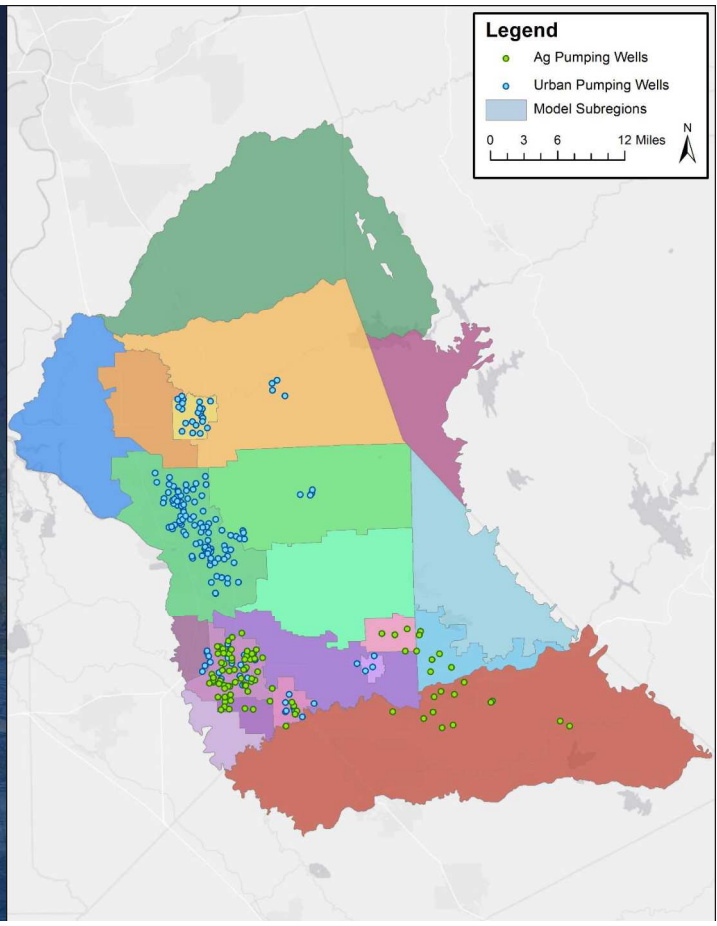
Integrated Hydrologic Processes

- Land Surface Processes
- Groundwater Flow
- Streamflow
- Physical Systems Integration
- Water Budgets



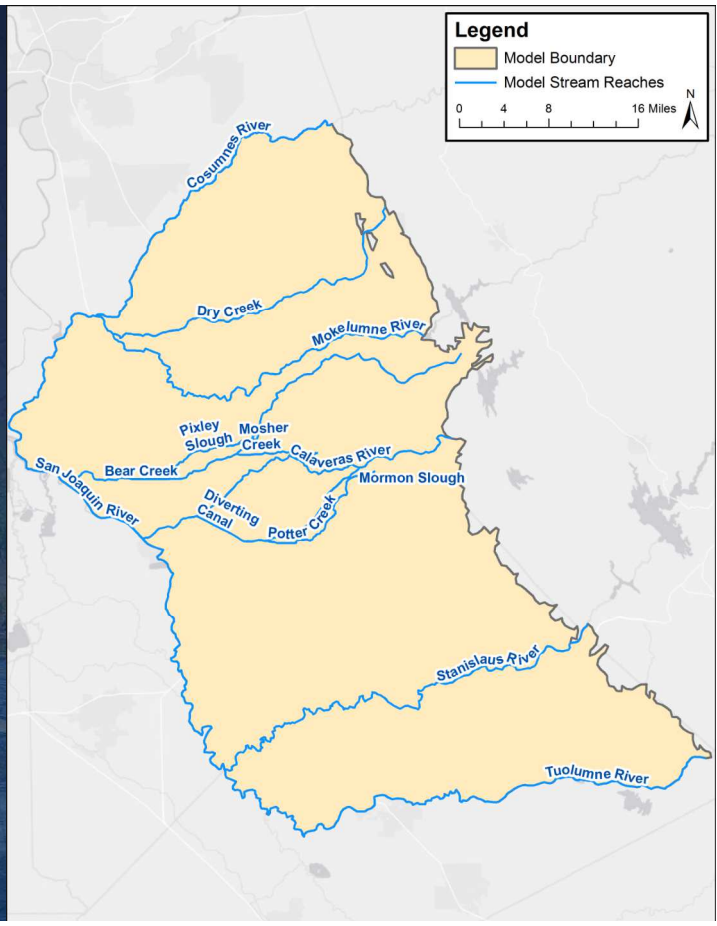
Water Supply Data Sources

- Groundwater pumping for ag or urban purposes:
  - Cal Water
  - Escalon
  - Lathrop
  - Linden County
  - Lockeford CSD
  - Lodi
  - Manteca
  - Oakdale ID
  - Ripon
  - Stockton East WD
  - South San Joaquin ID
  - Stockton



Water Supply Data Sources

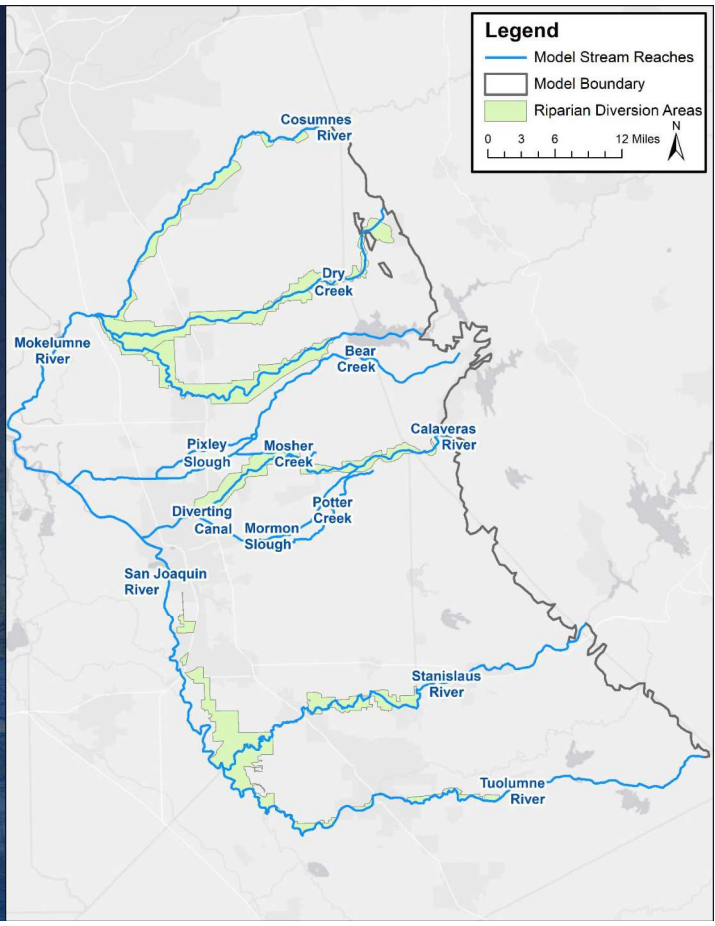
- Surface water deliveries for ag or urban purposes:
  - North Delta
  - Woodbridge ID
  - Lodi
  - North San Joaquin WCD
  - Calaveras County WD
  - Stockton/Cal Water
  - Stockton East WD
  - Central San Joaquin WCD
  - Lathrop
  - Manteca
  - Escalon
  - South San Joaquin ID
  - Oakdale ID
  - Modesto ID/Modesto
  - Riparian



Riparian Diversions

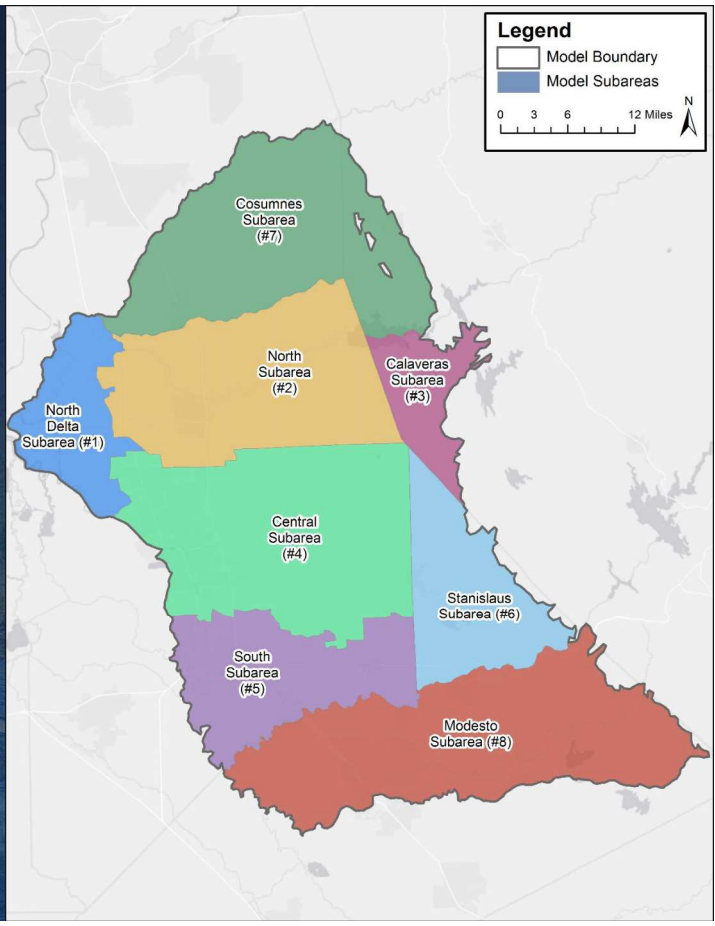
- Accounts for non-district SW users with access to streams
- From C2VSim-2015
  - Recoverable Loss: 10-15%
  - Non-recoverable Loss: 2-3%
- Delivery areas pers. comm. Charlie Brush (DWR)

Stream	Annual Average (AFY)
Cosumnes River	4,283
Dry Creek	6,026
Mokelumne River	9,724
Calaveras River	20,356
Stanislaus River	20,705
Tuolumne River	2,547
San Joaquin River	6,210

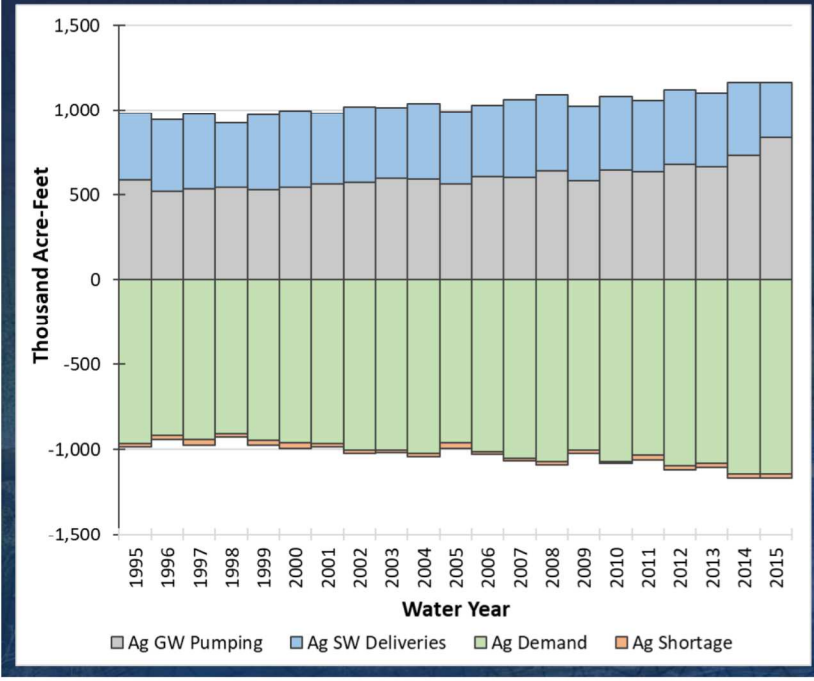


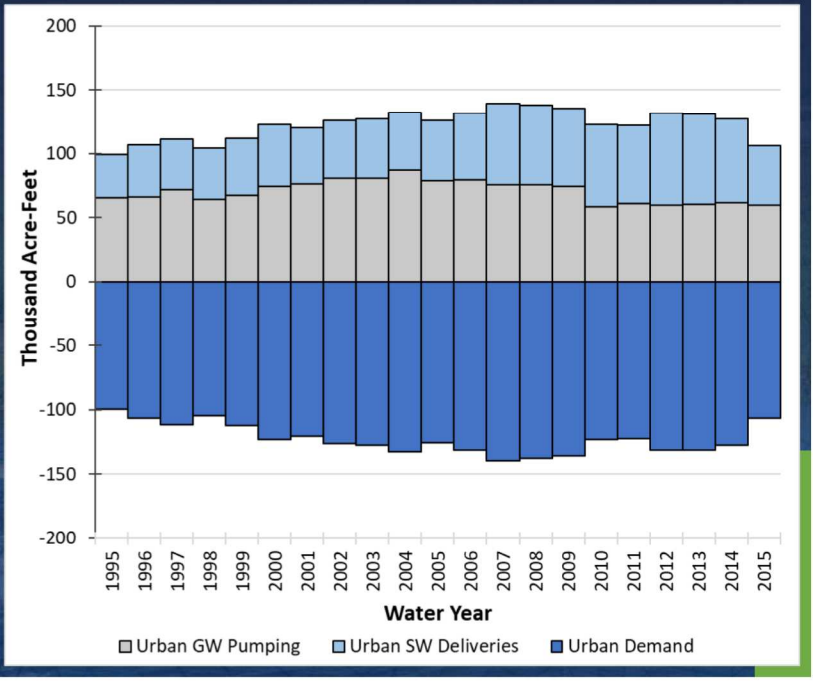
Model Subareas

- 8 subareas
- For model output and reporting of results

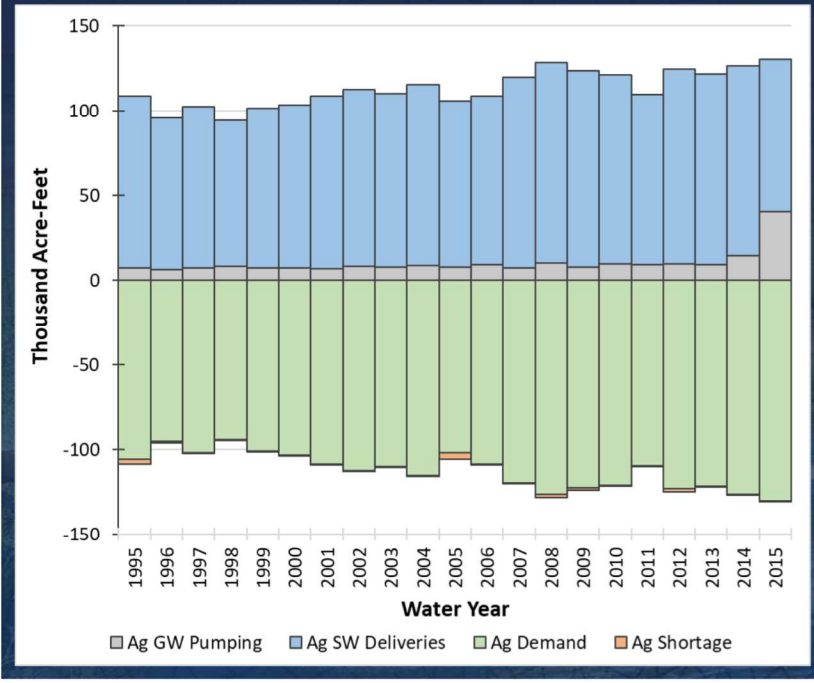


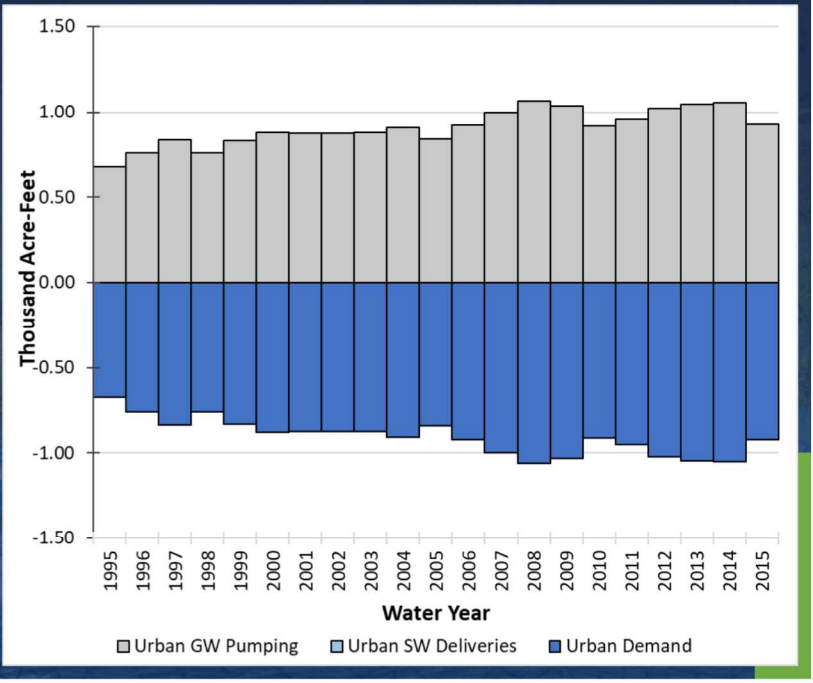
L&WU Budget- ESJ Subbasin



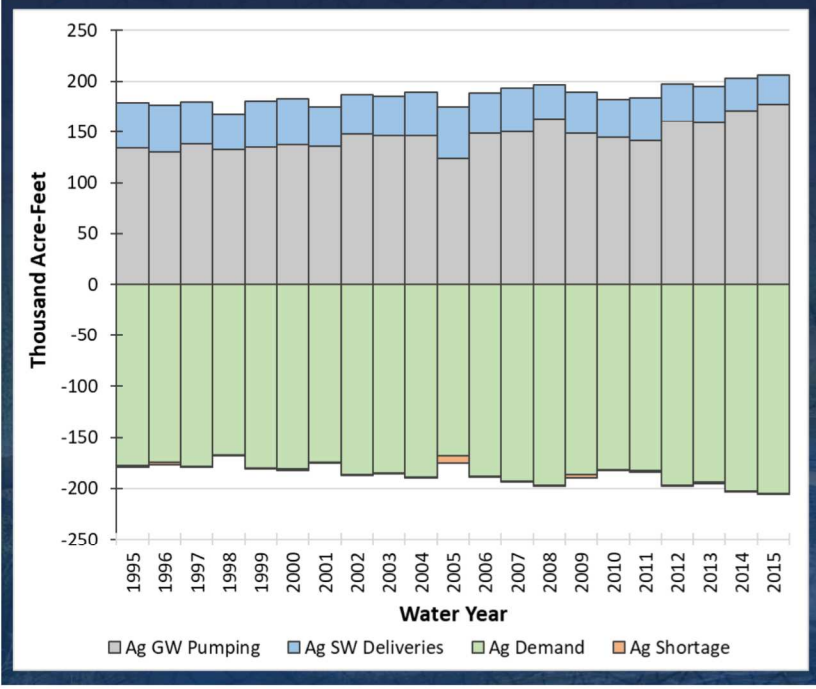


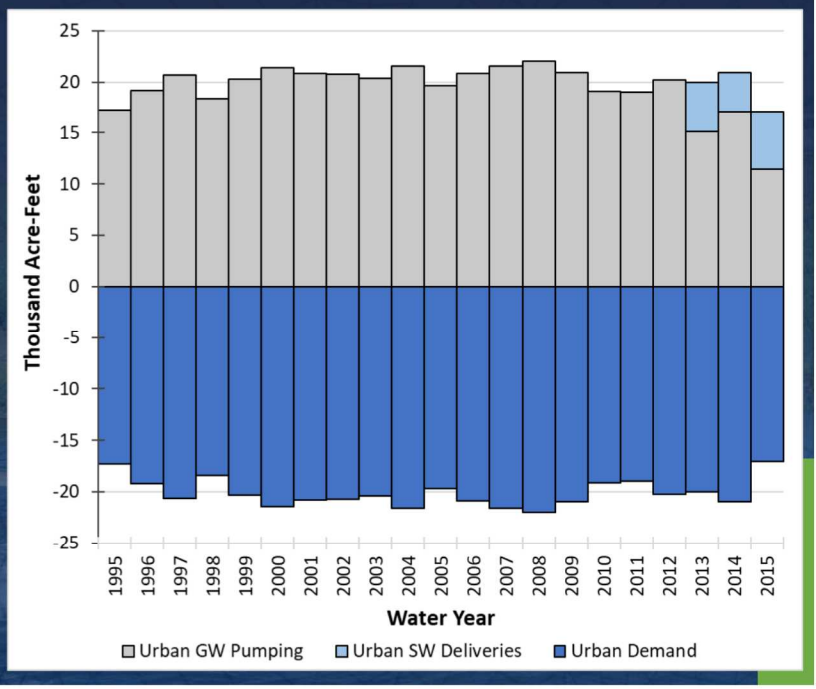
North Delta Subarea



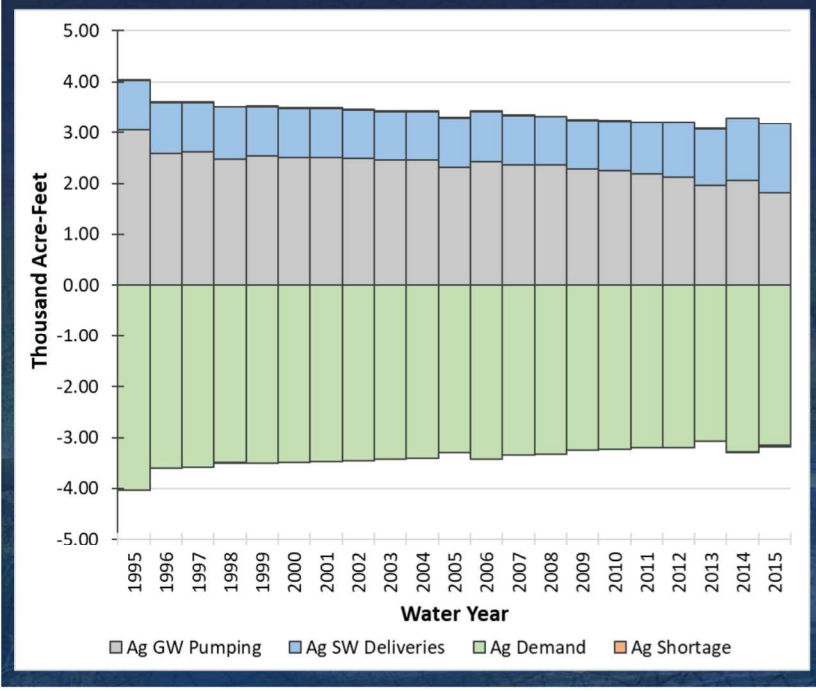


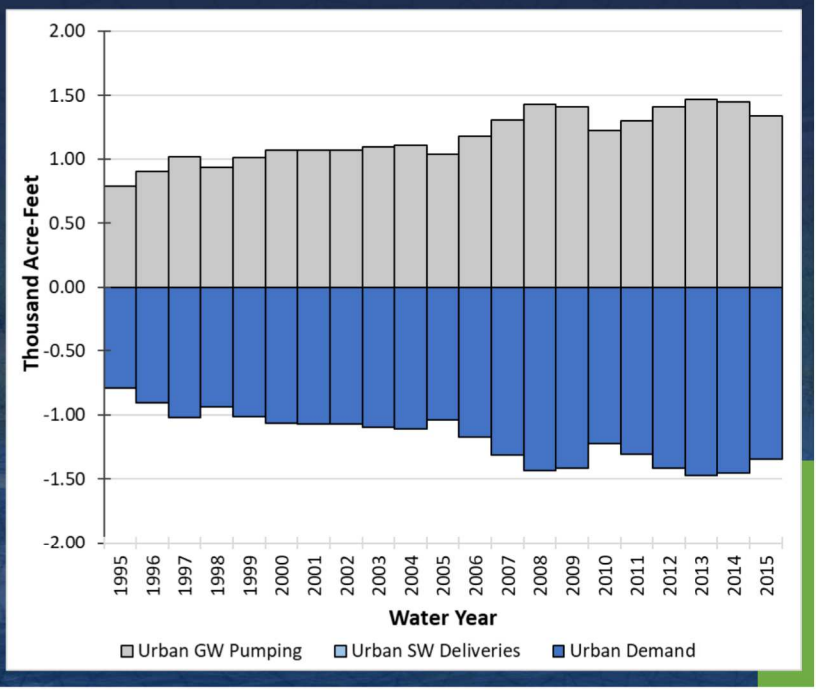
North Subarea



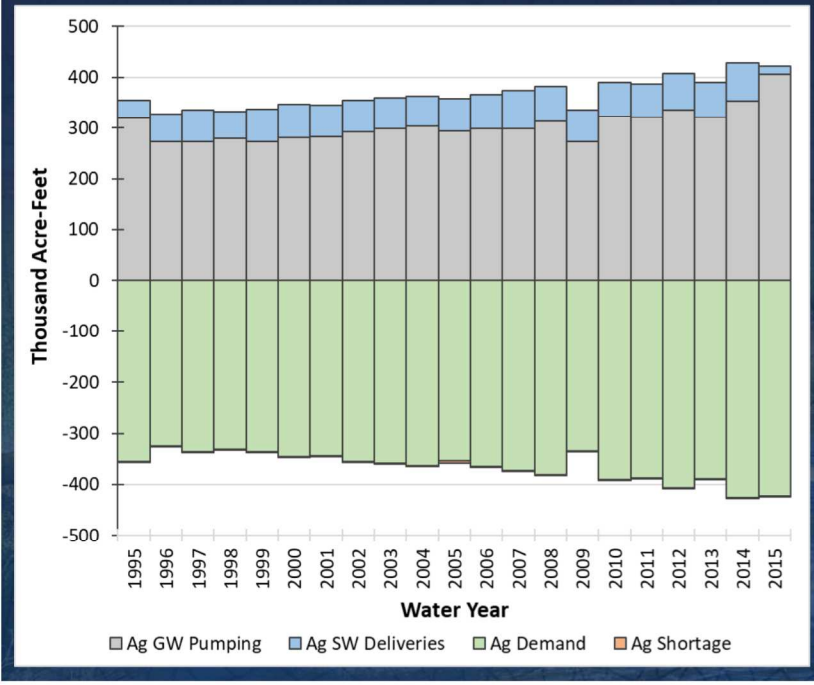


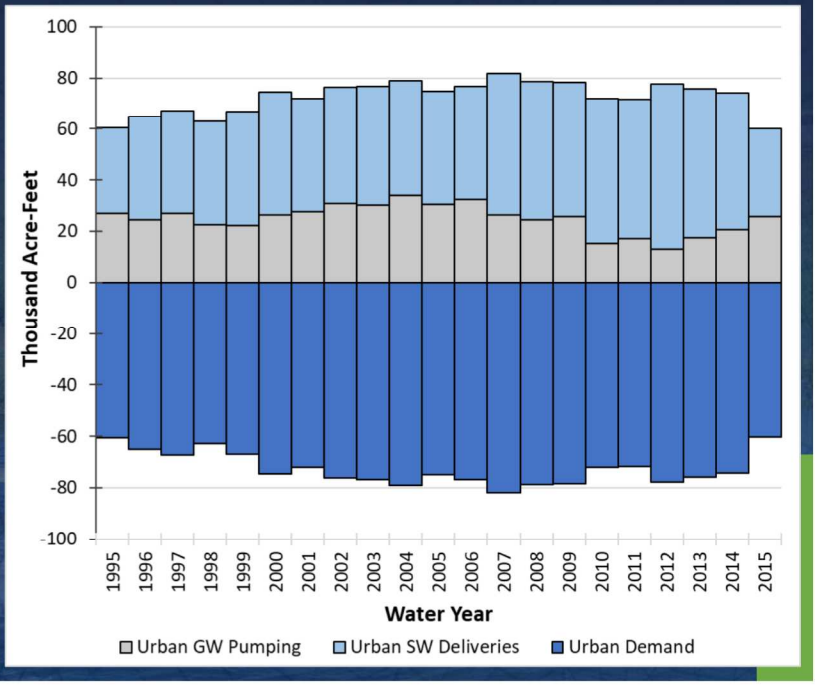
Calaveras Subarea



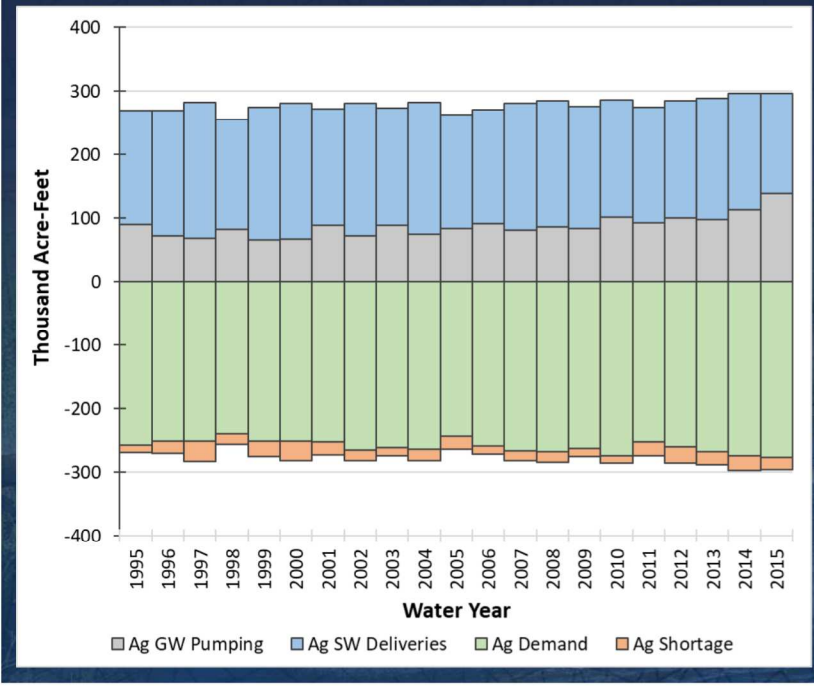


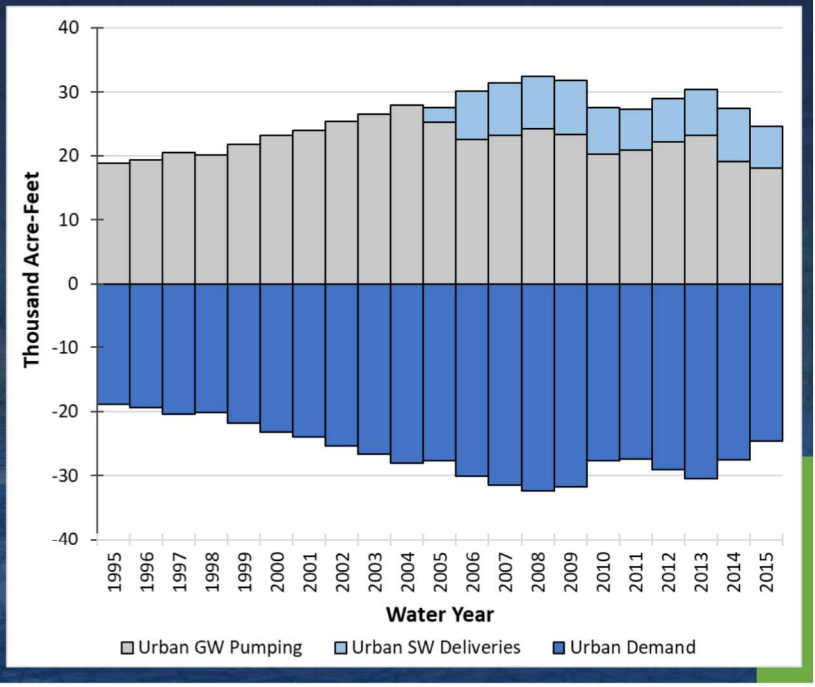
Central Subarea



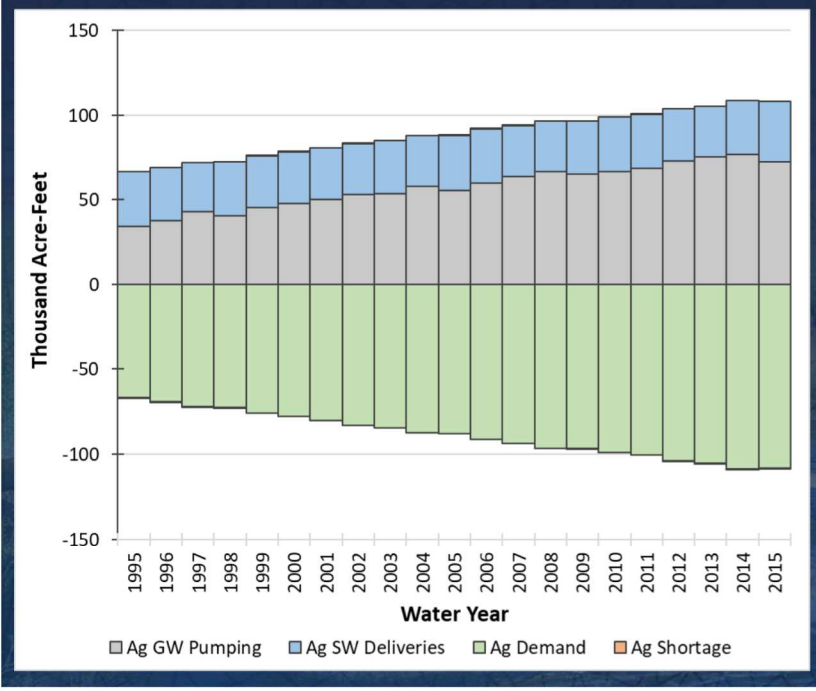


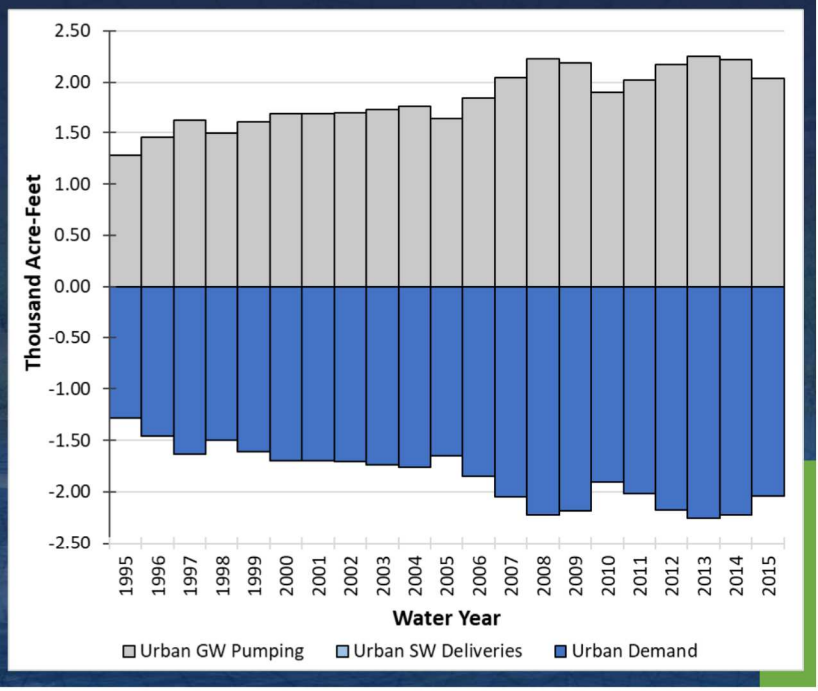
South Subarea





Stanislaus Subarea





Summary

- The **I**WFM **D**emand **C**alculator (IDC) simulates the agricultural and urban water demands in the ESJ model area
- The IDC input data and parameters, assumptions and results have been reviewed by the irrigation districts and agricultural community in the ESJ Subbasin
- The IDC data, assumptions and results have also been presented in a number of stakeholder workshops at the SJ County
- There is general consensus that the IDC reasonably simulates the agricultural and urban water use in the ESJ Subbasin
- The IDC will be incorporated in the ESJWRM to simulate the integrated SW/GW conditions in the ESJ Subbasin

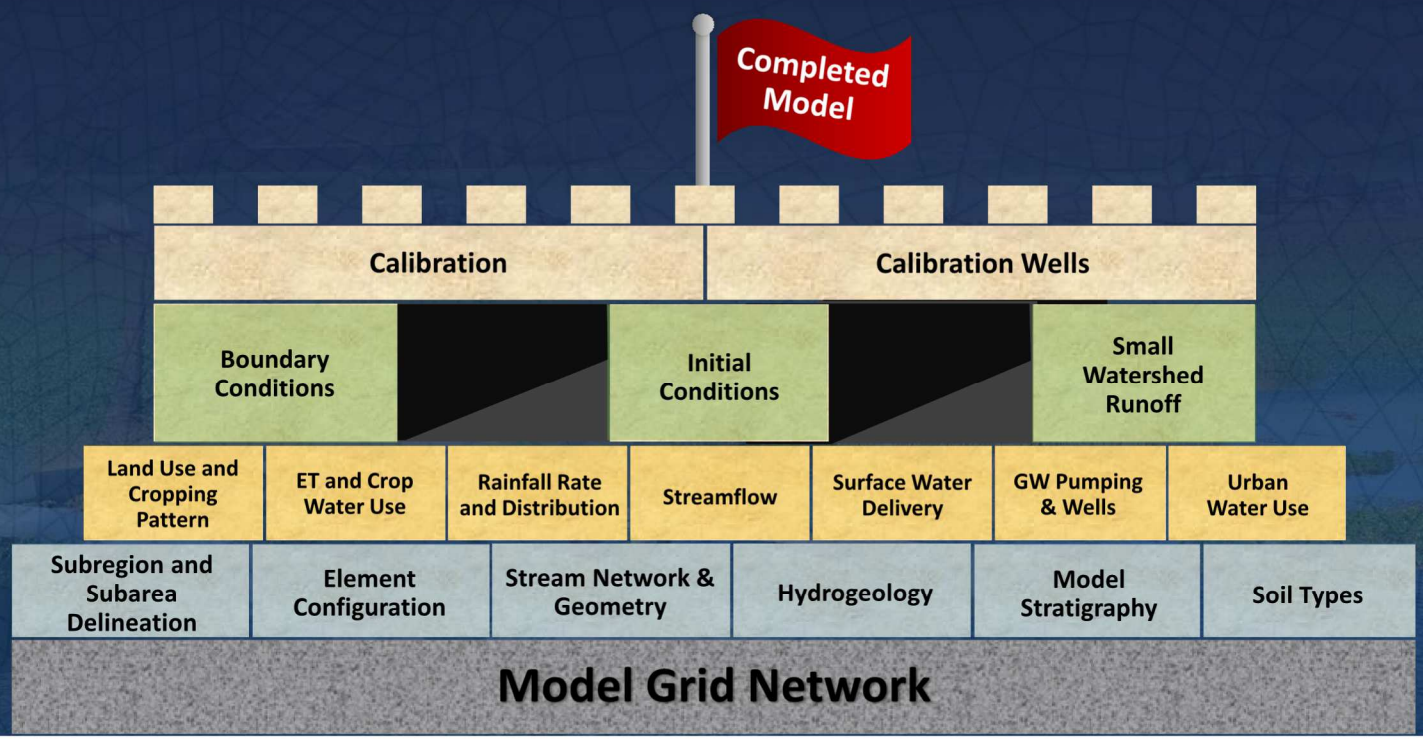
Agenda

1. Stakeholder Workshop for IDC
2. Model Calibration Workshop
3. Sustainability Indicator Questionnaire

Calibration Workshop Agenda

- Calibration Process
- GWL Calibration
  - Wells
  - Statistics
  - Hydrographs
  - Contours
- GW Budgets
- Streamflow Calibration
  - Stations
  - Hydrographs
- Next Steps

ESJWRM Construction

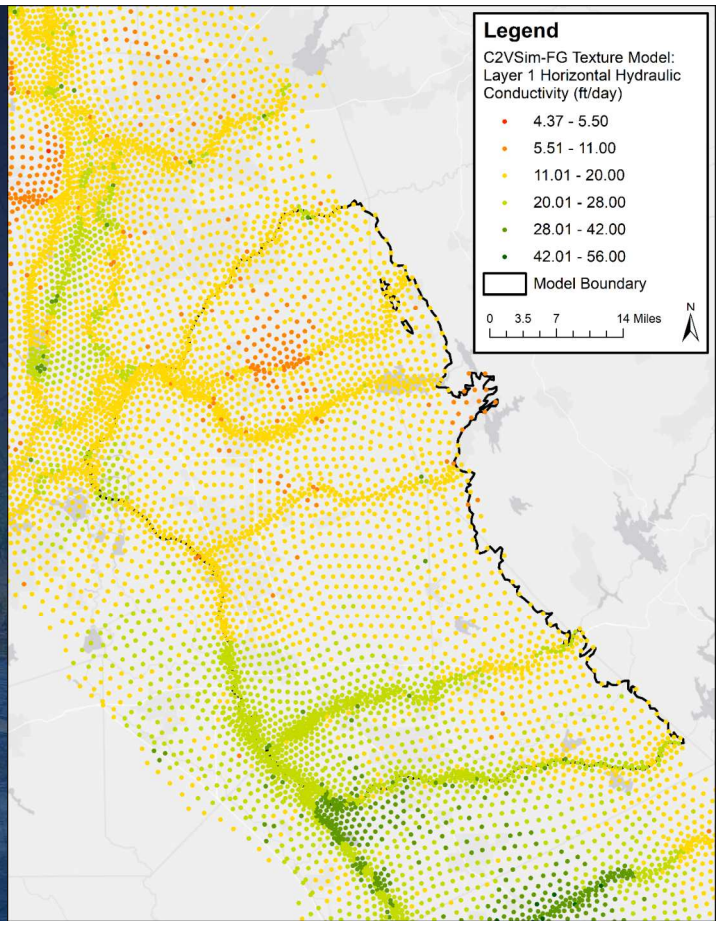


Calibration Process

- Identify:
  - Target calibration wells
  - Target streamflow gaging stations
- Review observed data and set calibration targets
- Calibrate model by adjusting model parameters to attain reasonable match between modeled and observed data for:
  - Water budgets for each component of the hydrologic cycle modeled
  - GW levels at select wells
  - Streamflows at select gaging stations
- Compare calibration performance with calibration targets
- Conduct additional refinements as necessary

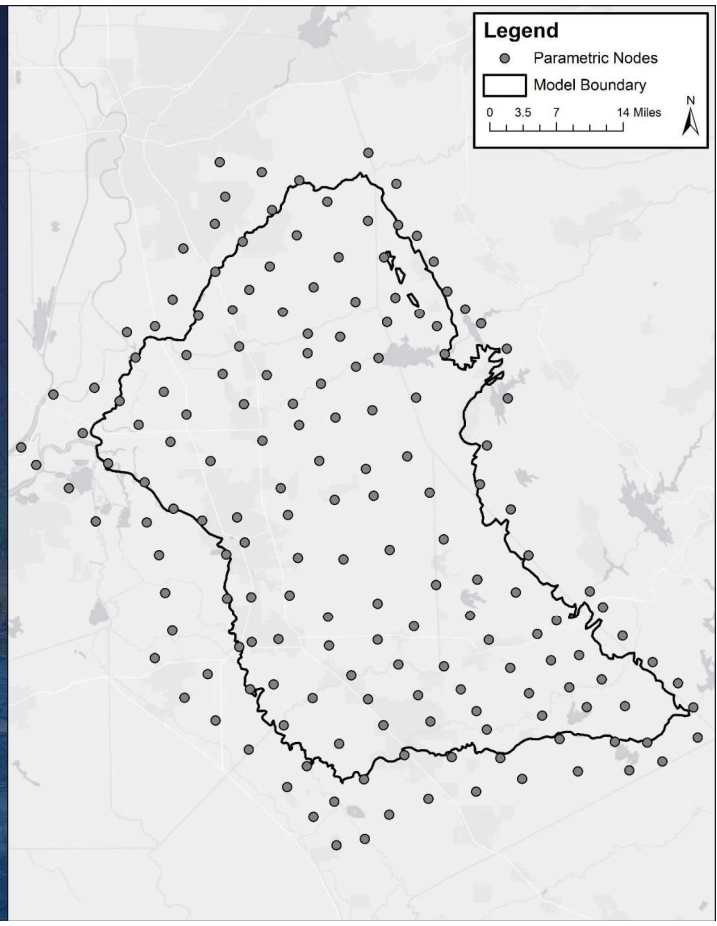
Calibration Process

- Assign initial aquifer parameters using texture model
- Aquifer parameters include:
  - Horizontal hydraulic conductivity
  - Vertical hydraulic conductivity (both aquifer and aquitard)
  - Specific storage
  - Specific yield



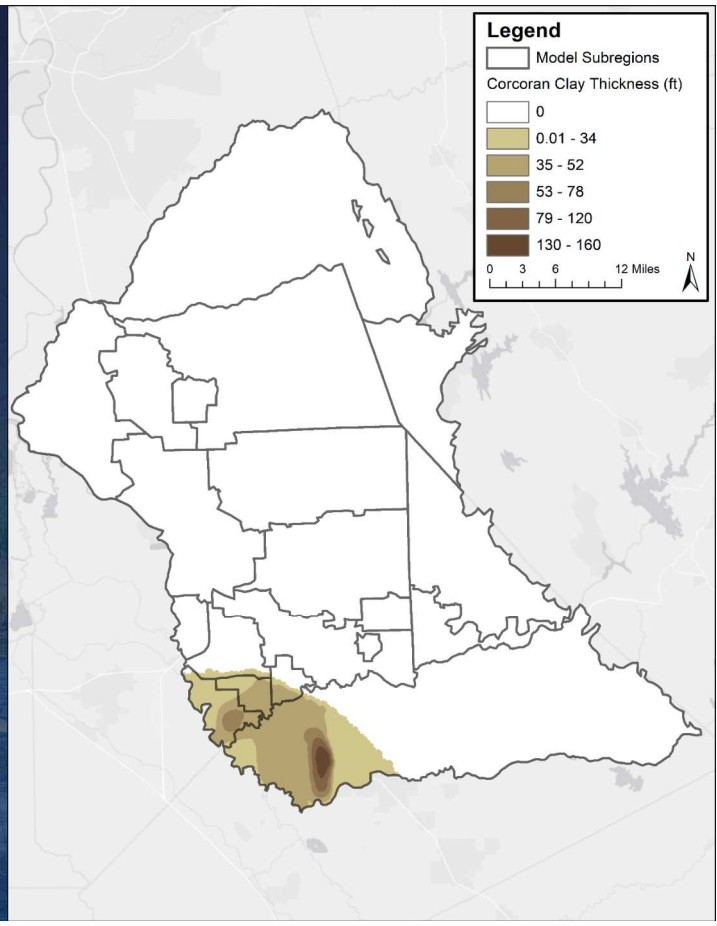
Calibration Process

- Aquifer parameters assigned for each of the four model stratigraphic layers by parametric node
- Texture-based parameters are mapped to the ESJWRM Parametric nodes, which are the C2VSim-CG groundwater nodes in the ESJWRM area (171 C2VSim-CG nodes)



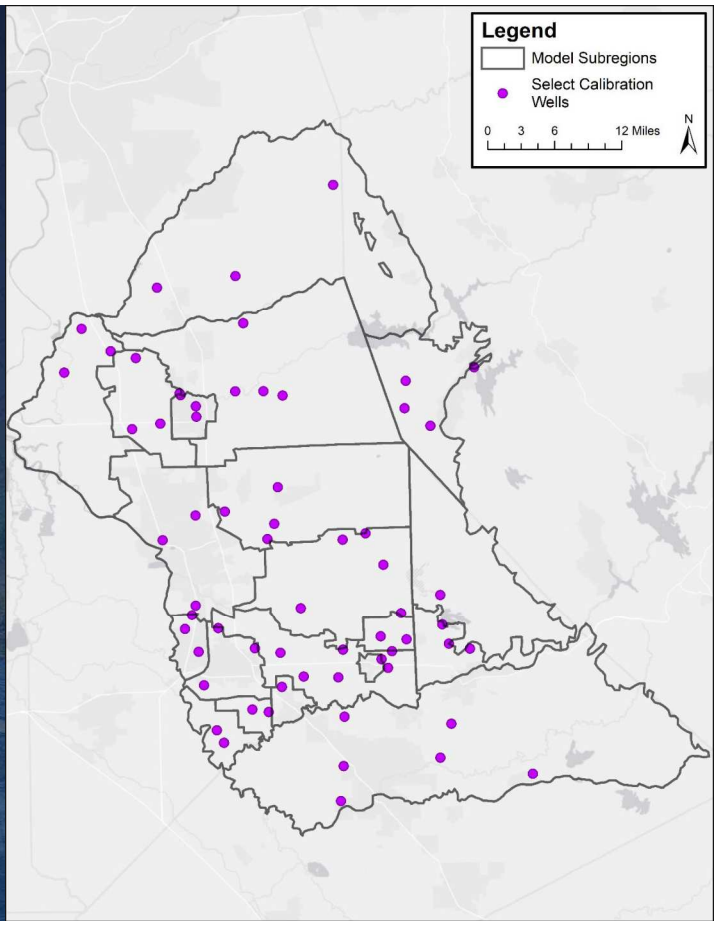
Calibration Process

- Determined model sensitivity to editing parameters:
  - Horizontal hydraulic conductivity
    - Affects spatial movement of groundwater within model area
  - Vertical hydraulic conductivity (both aquifer and aquitard)
    - Aquitard only for area with Corcoran Clay
    - Aquifer affects interaction between layers
  - Specific storage
    - Affects confined aquifer (Layers 2, 3, and 4)
  - Specific yield
    - Affects unconfined aquifer (Layer 1)

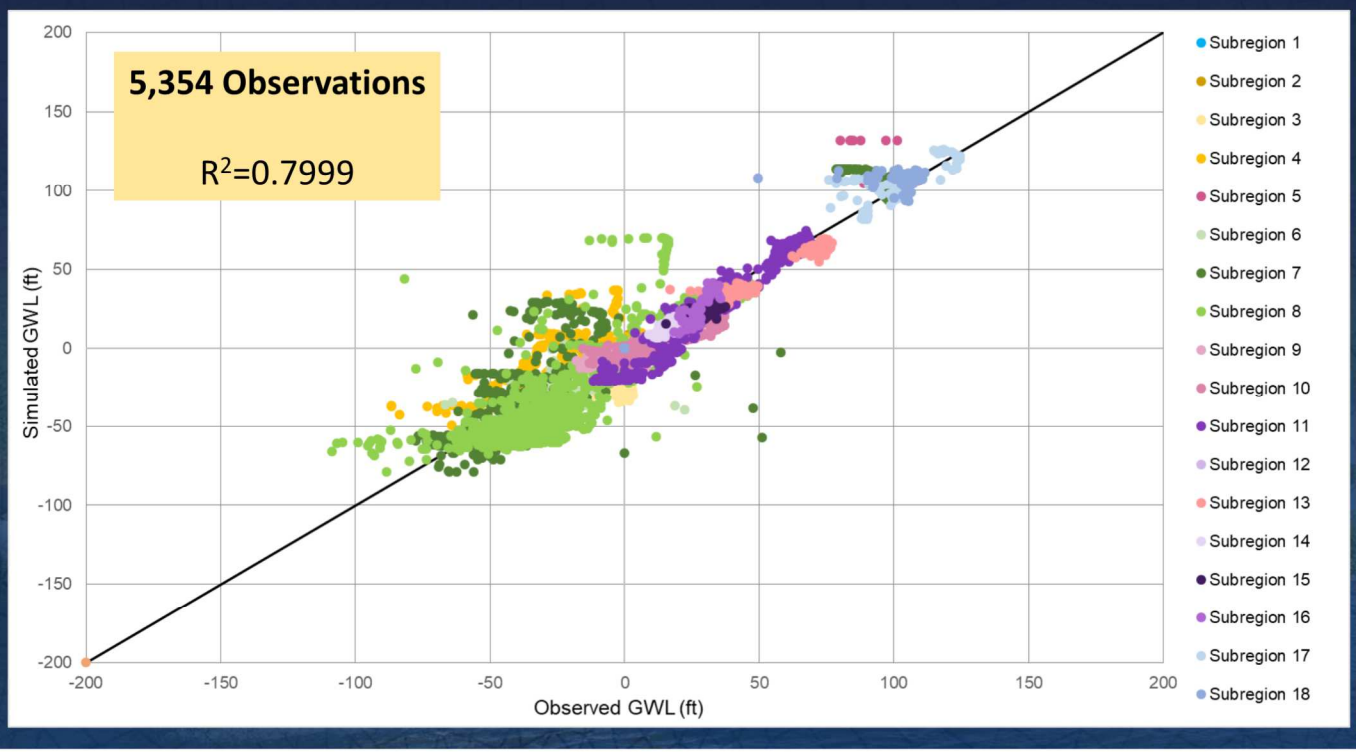


GWL Calibration Wells

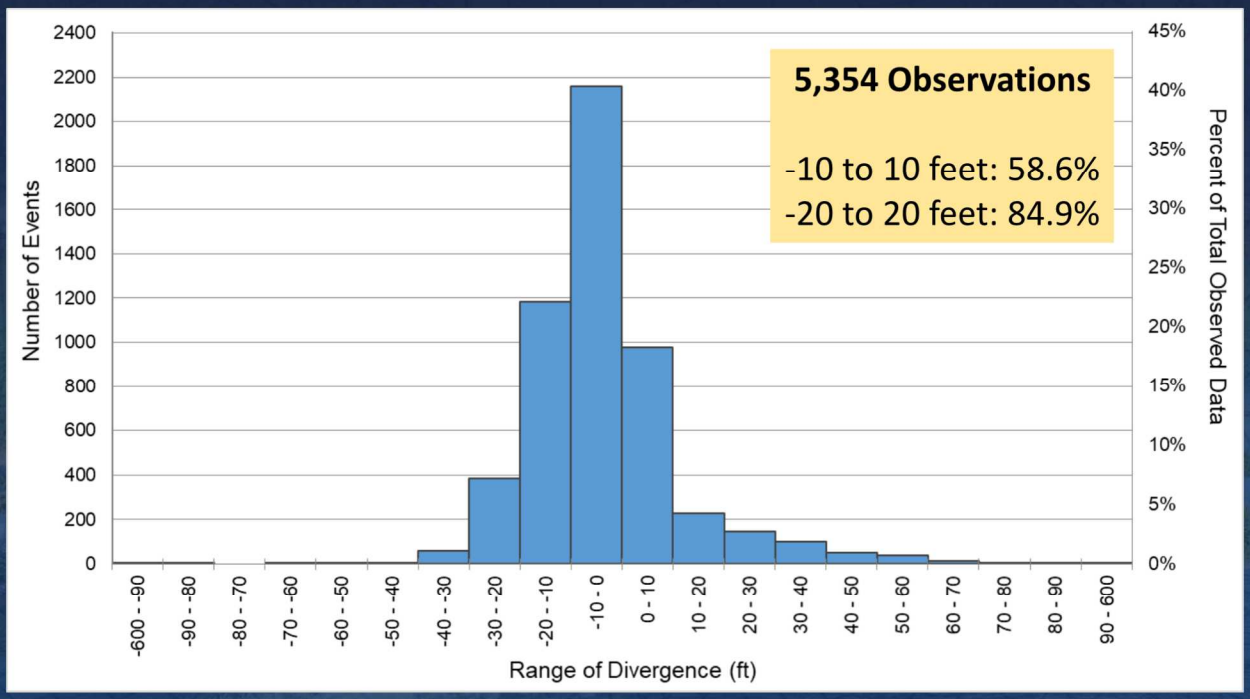
- 160 model calibration wells selected to represent spatial and temporal variability across model time period
- As many as 63 model calibration wells selected to represent calibration and GWL trends across the model area

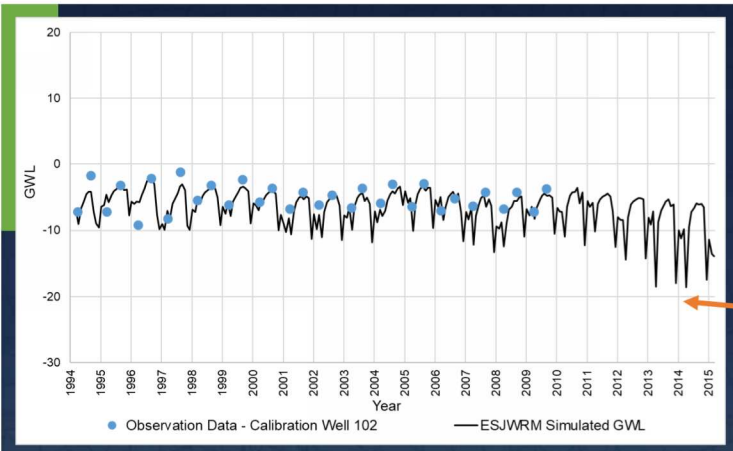


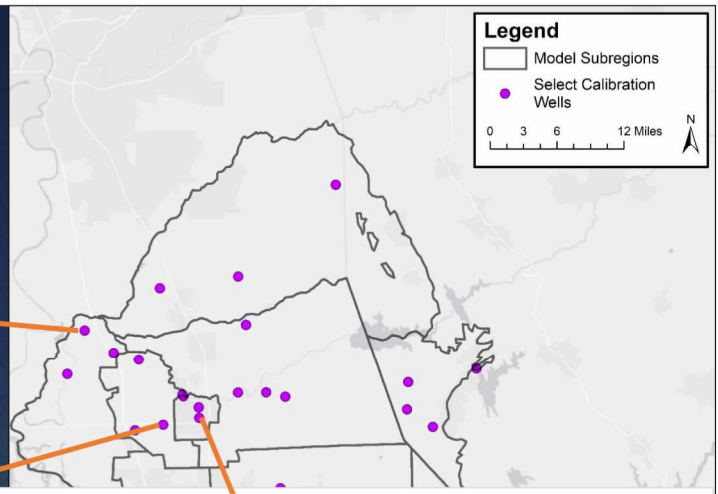
GWL Calibration Statistics

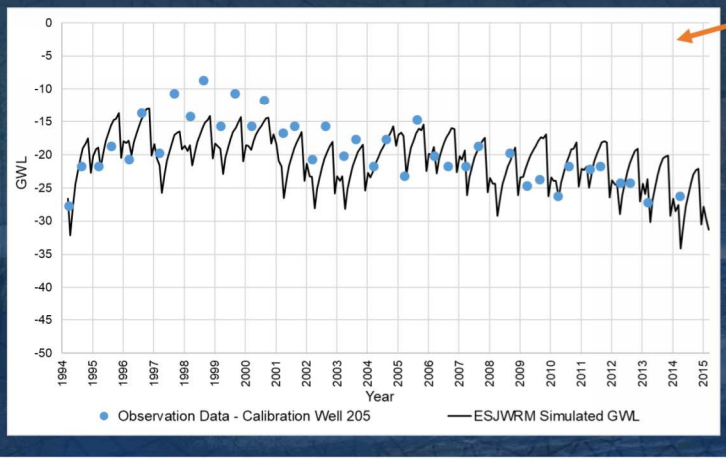


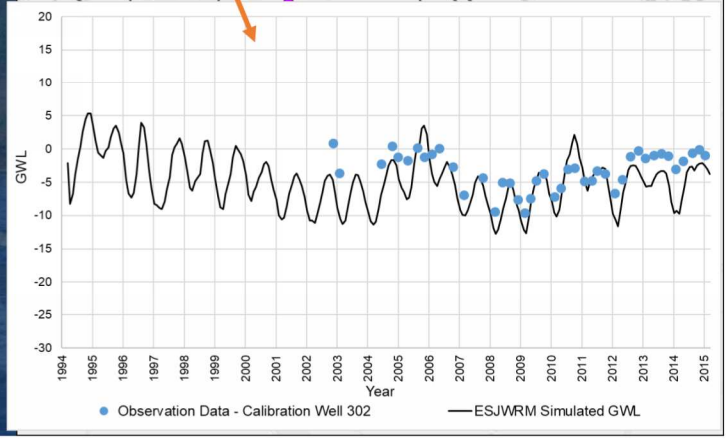
GWL Calibration Statistics

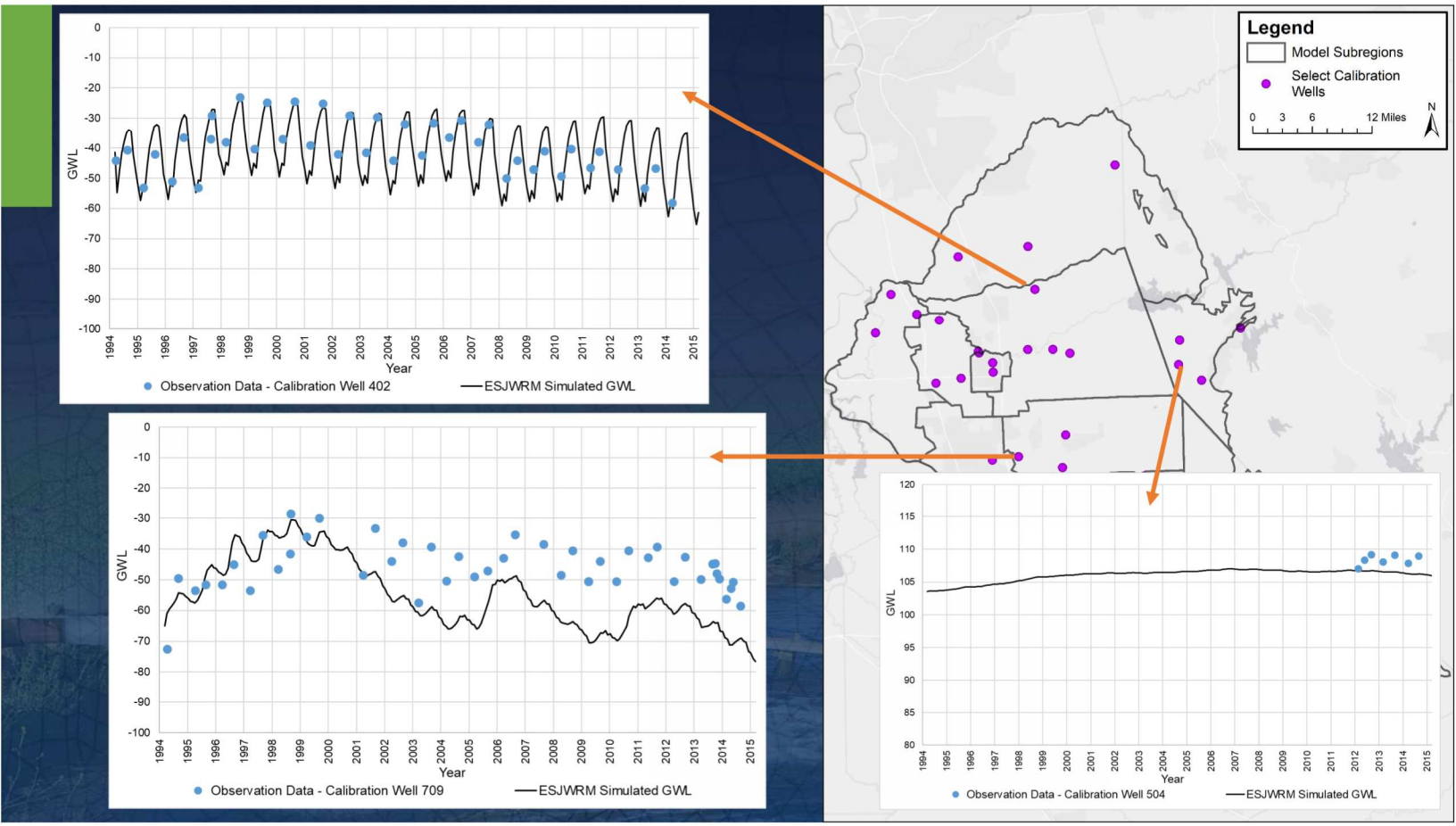


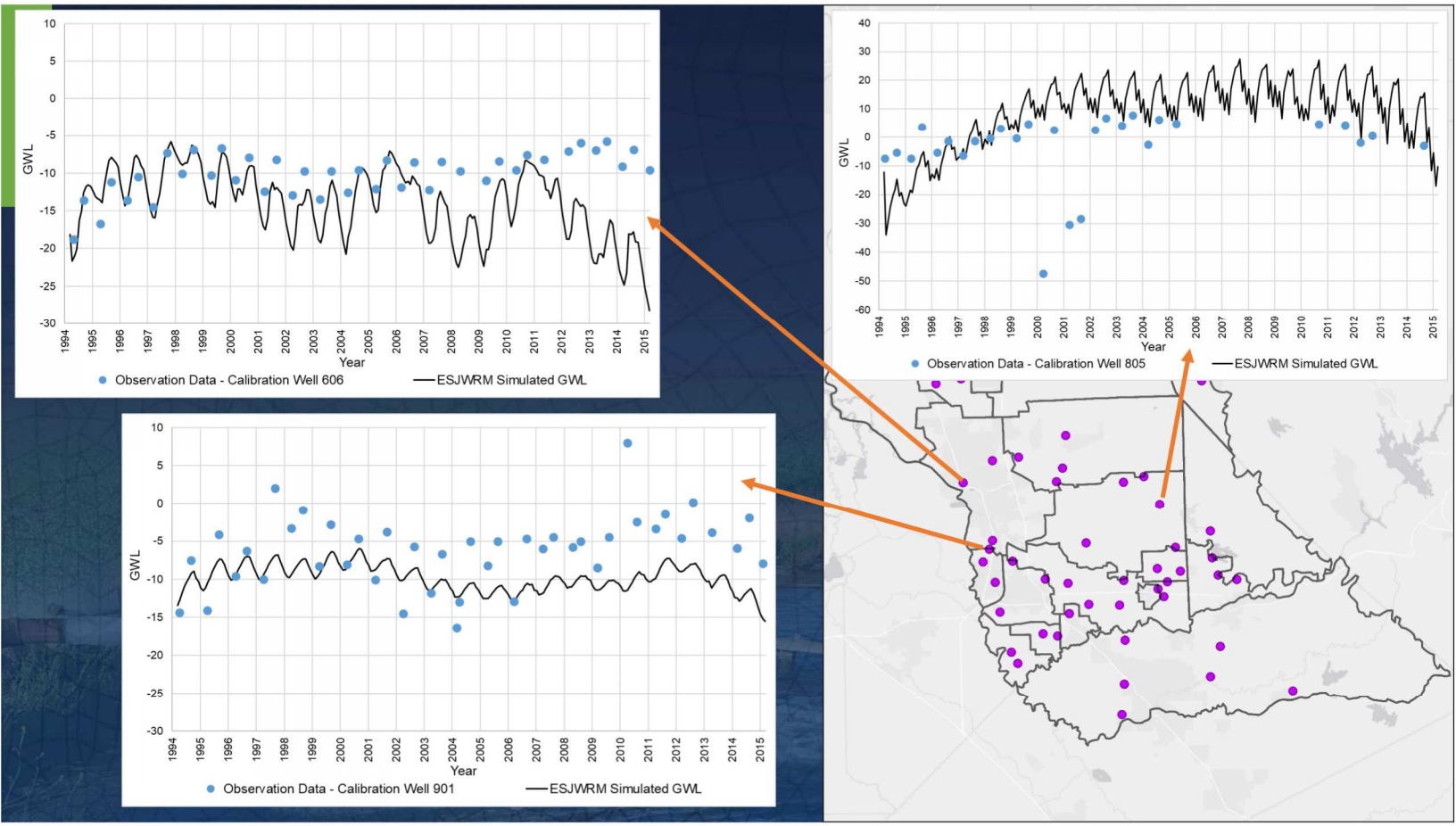









Legend
Model Subregions
Select Calibration Wells
0 3 6 12 Miles
N
GWL
Year
Observation Data - Calibration Well 402
ESJWRM Simulated GWL
Observation Data - Calibration Well 709
ESJWRM Simulated GWL
Observation Data - Calibration Well 504
ESJWRM Simulated GWL


GWL
Year
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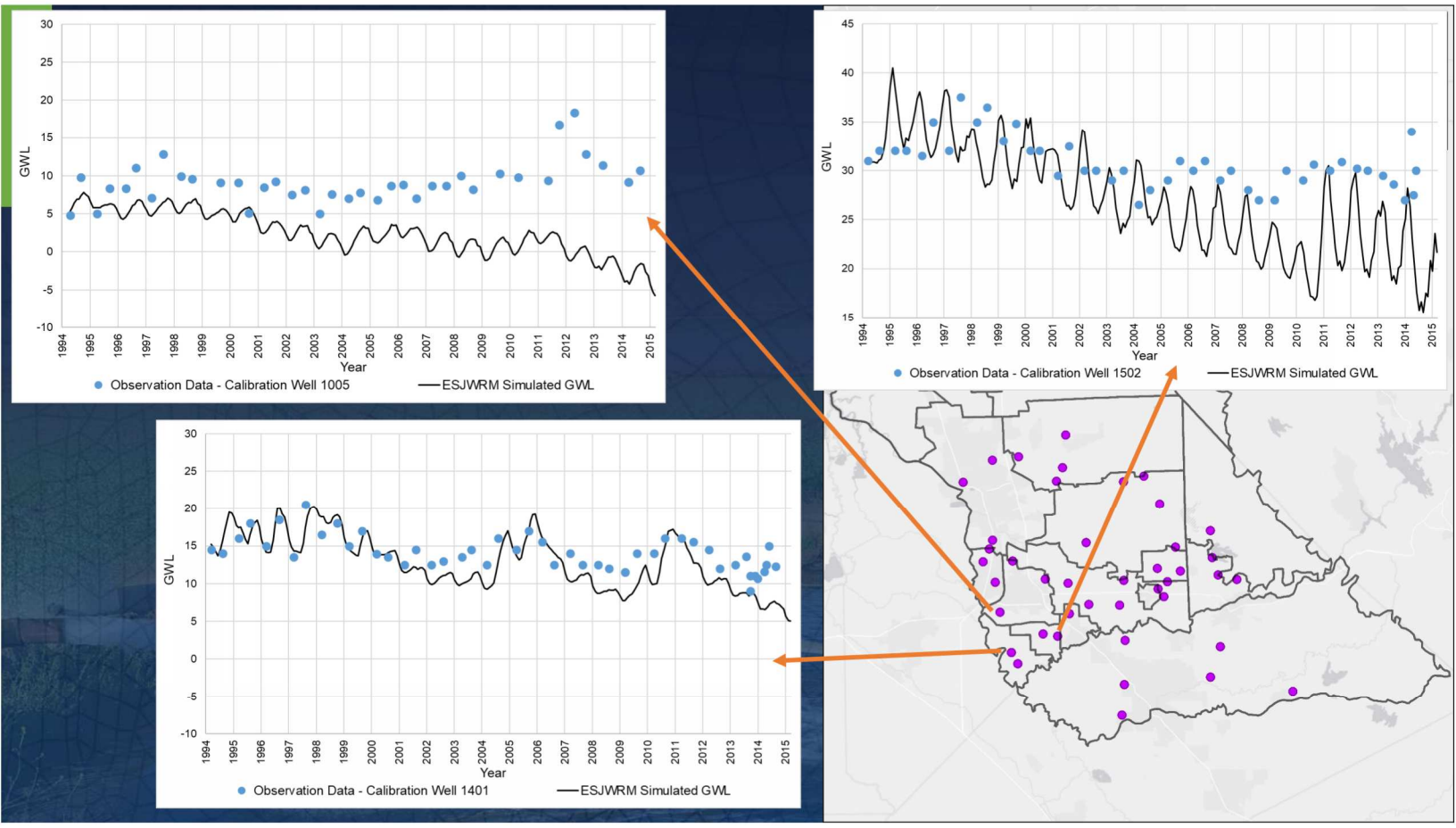
ESJWRM Simulated GWL
Observation Data - Calibration Well 901
ESJWRM Simulated GWL


GWL
Year
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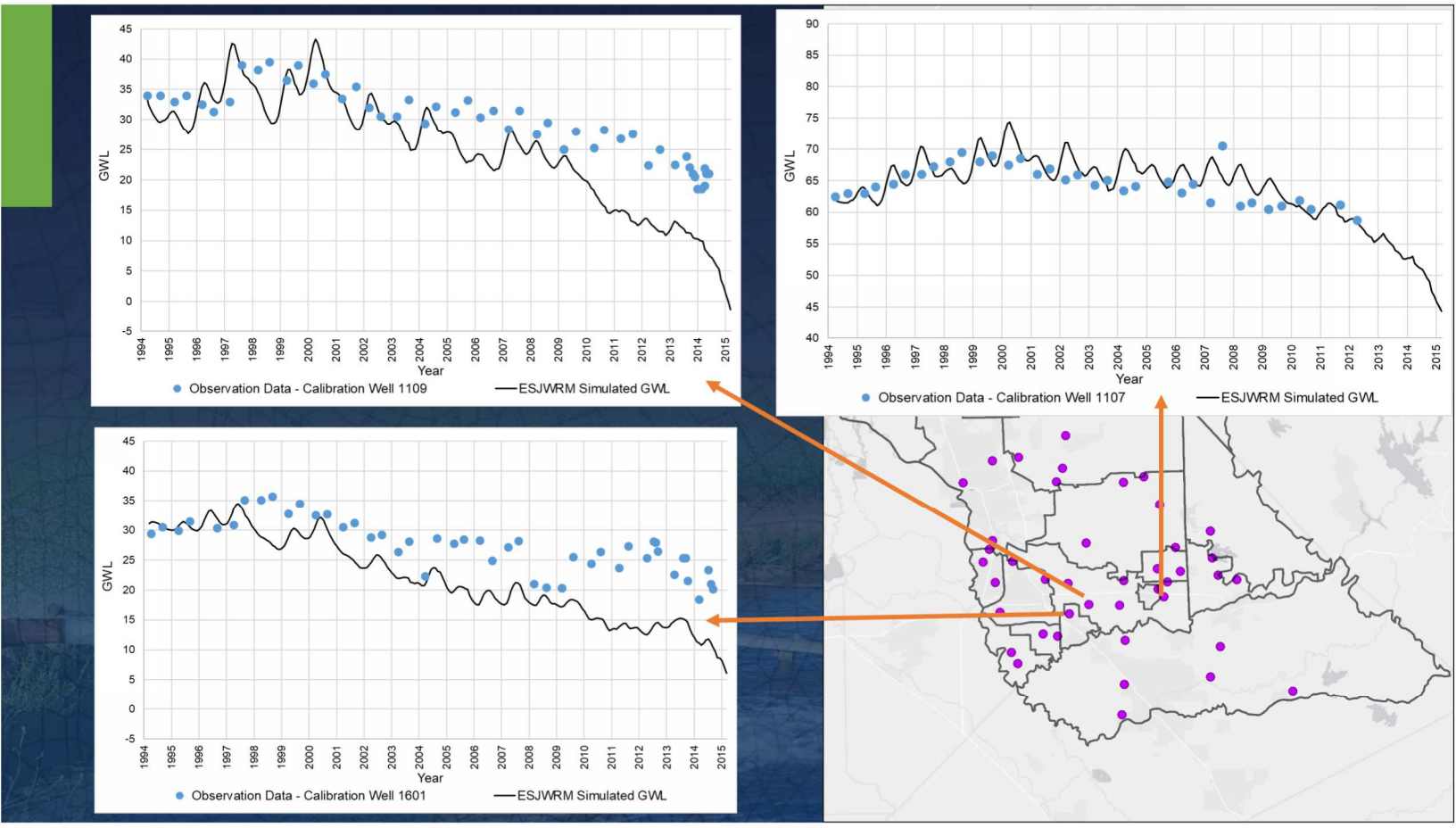
ESJWRM Simulated GWL
Observation Data - Calibration Well 1502
ESJWRM Simulated GWL
Observation Data - Calibration Well 1401
ESJWRM Simulated GWL


GWL
Year
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ESJWRM Simulated GWL
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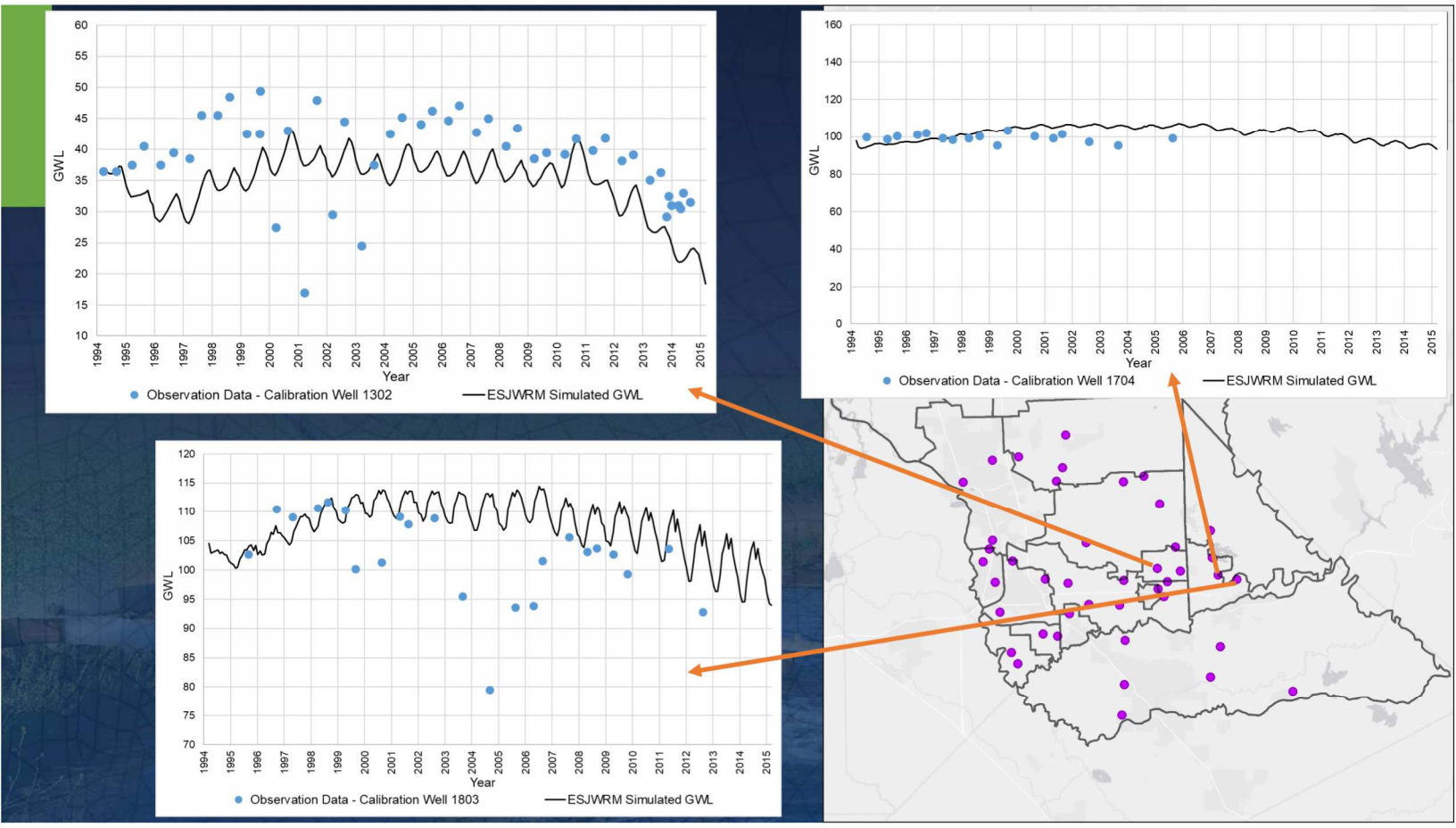
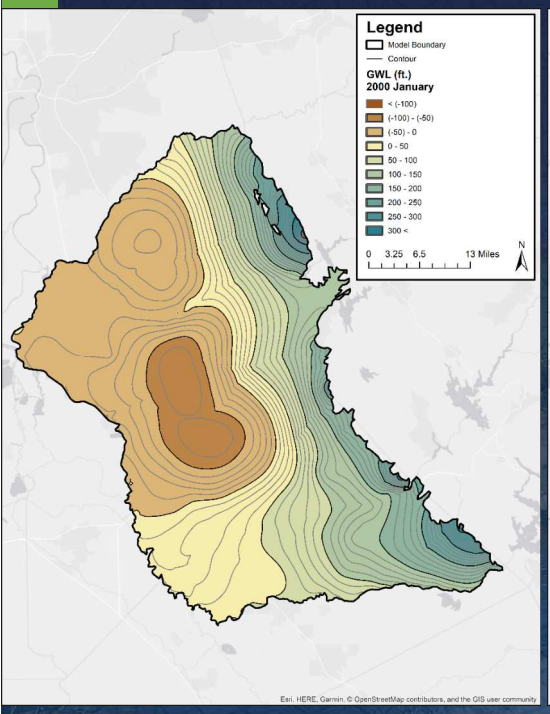
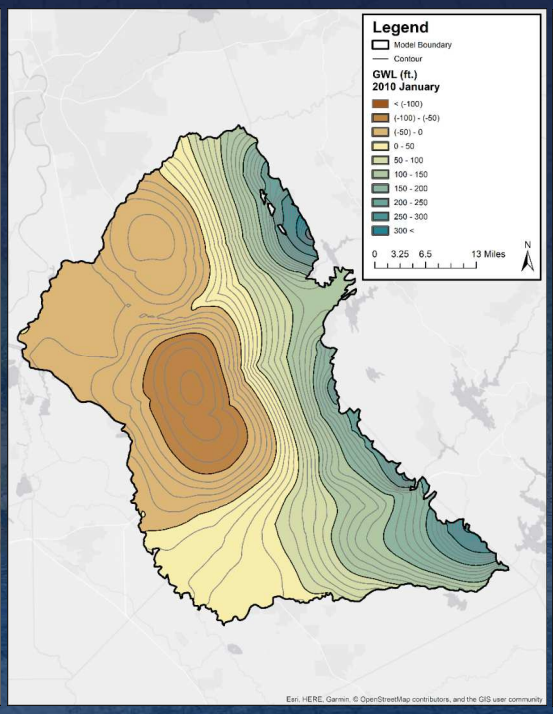
ESJWRM Simulated GWL



GWL Contours



January 2000



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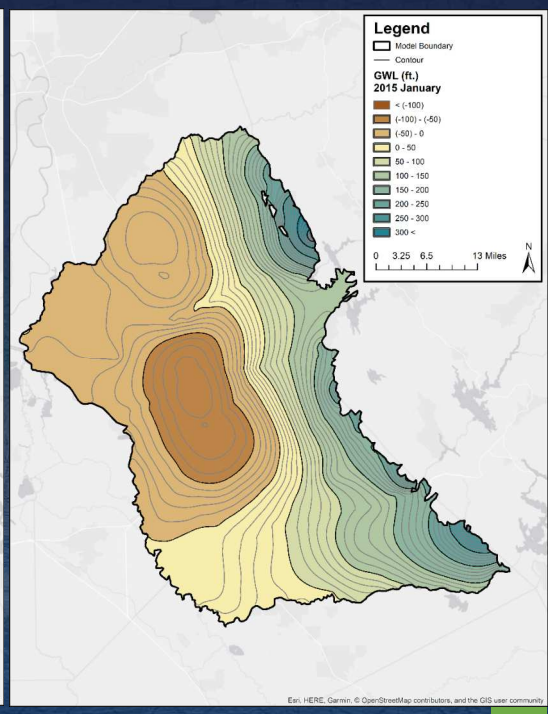
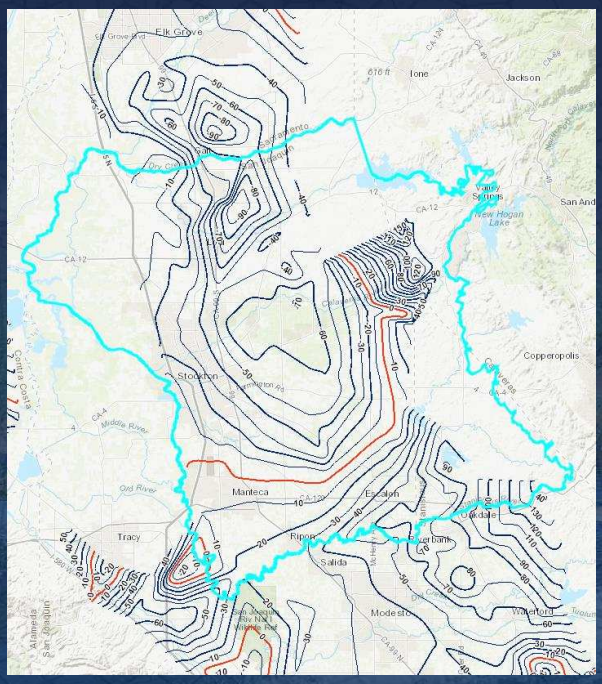
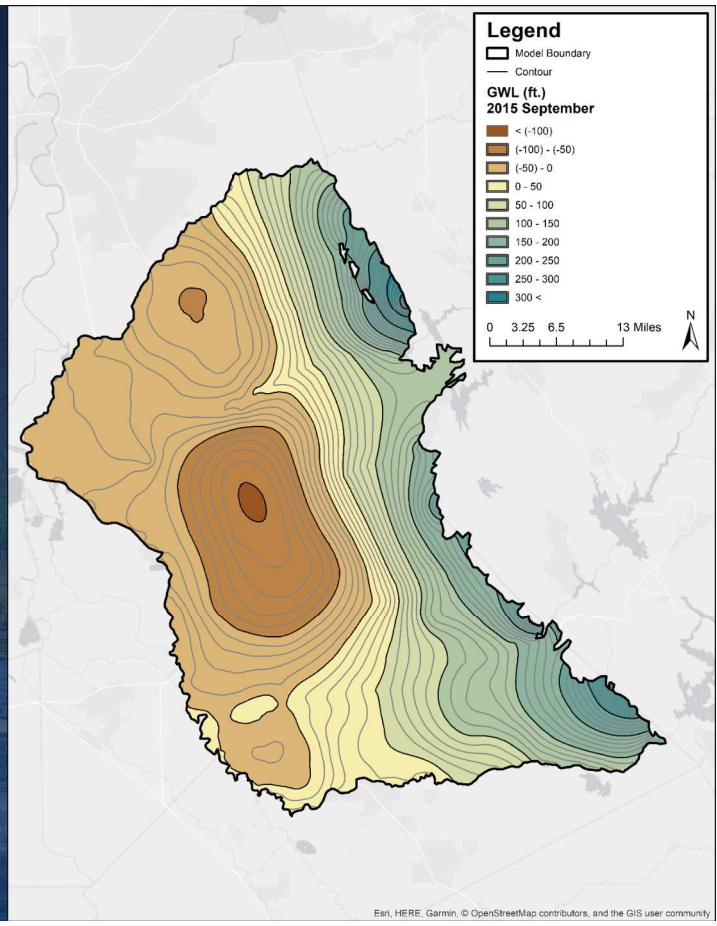


January 2015

GW Level Animation

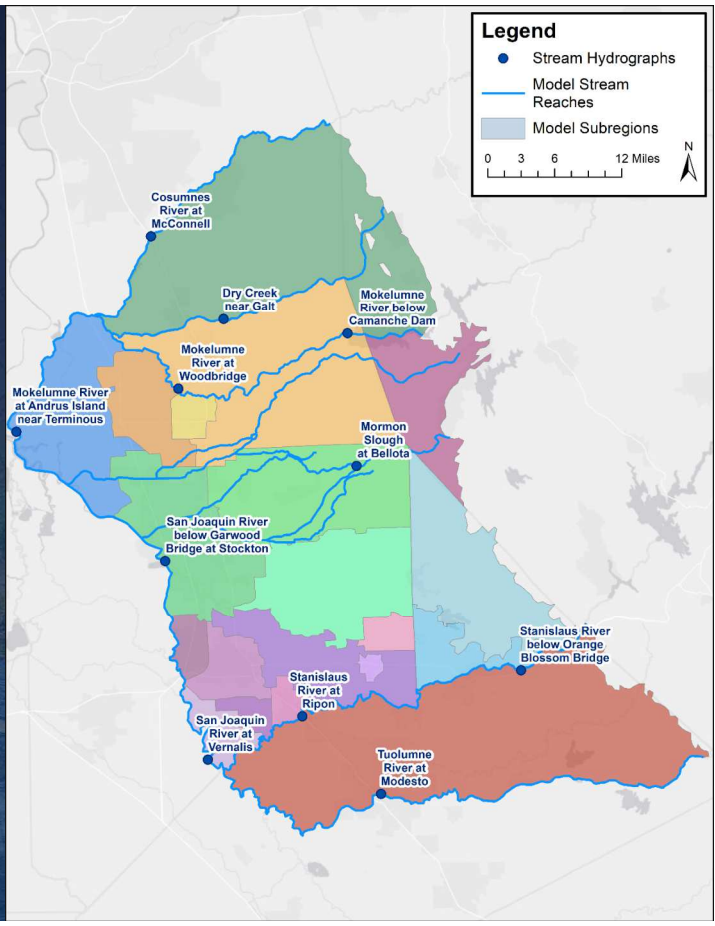
Fall 2015

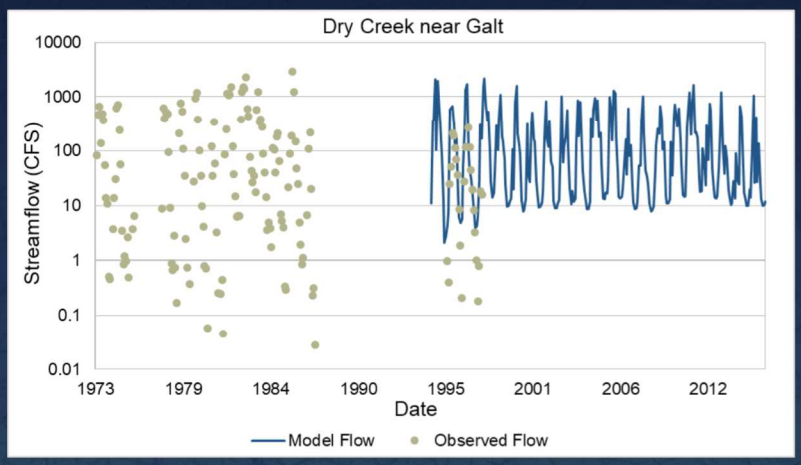


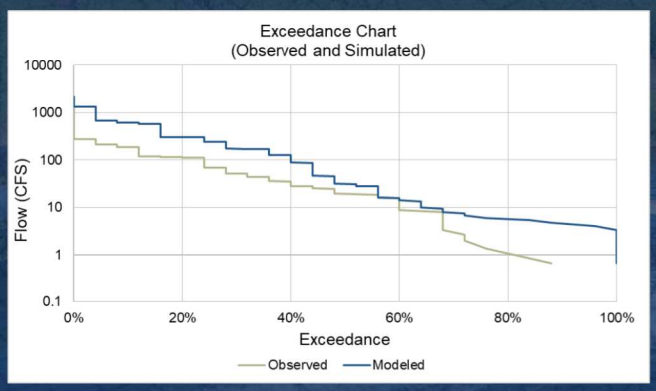


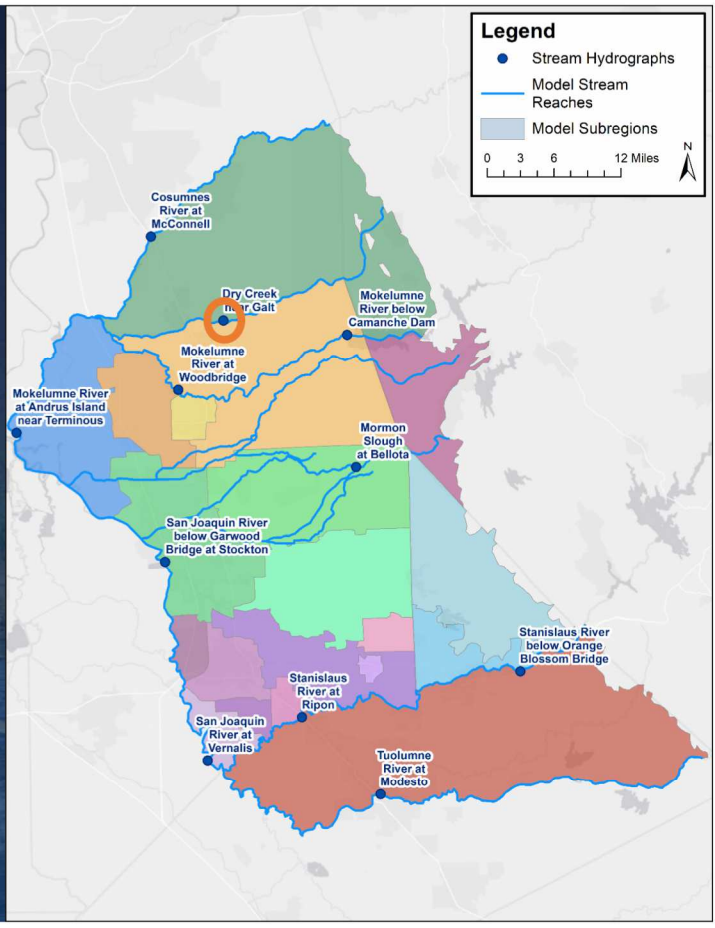
Streamflow Calibration Stations

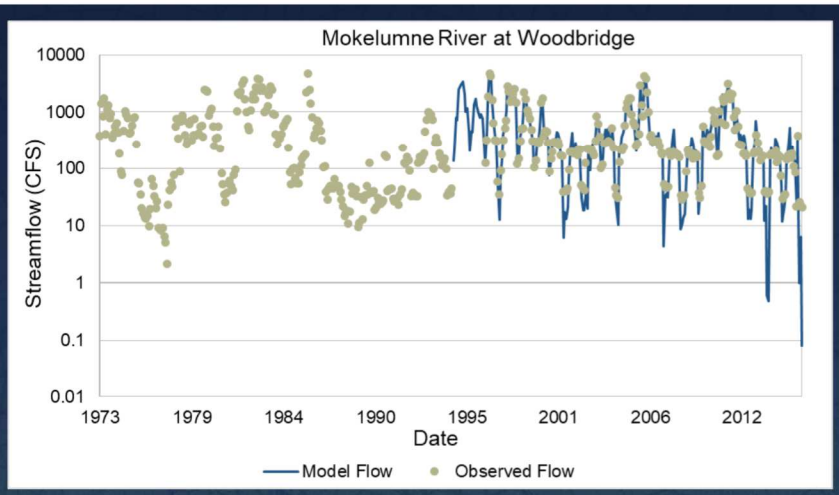
- 11 streamflow calibration stations
  - USGS, USACE, or DWR CDEC
- Since boundary of model is largely controlled by boundary conditions, important stations are those interior in the model










Mokelumne River at Woodbridge
Streamflow (CFS)
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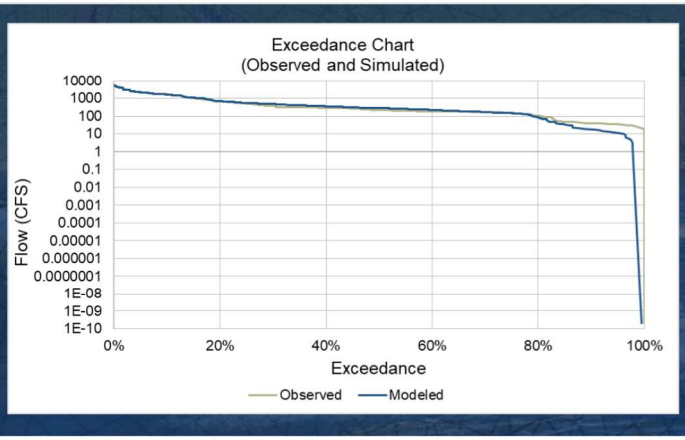
Date
Model Flow
Observed Flow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(Observed and Simulated)
Flow (CFS)
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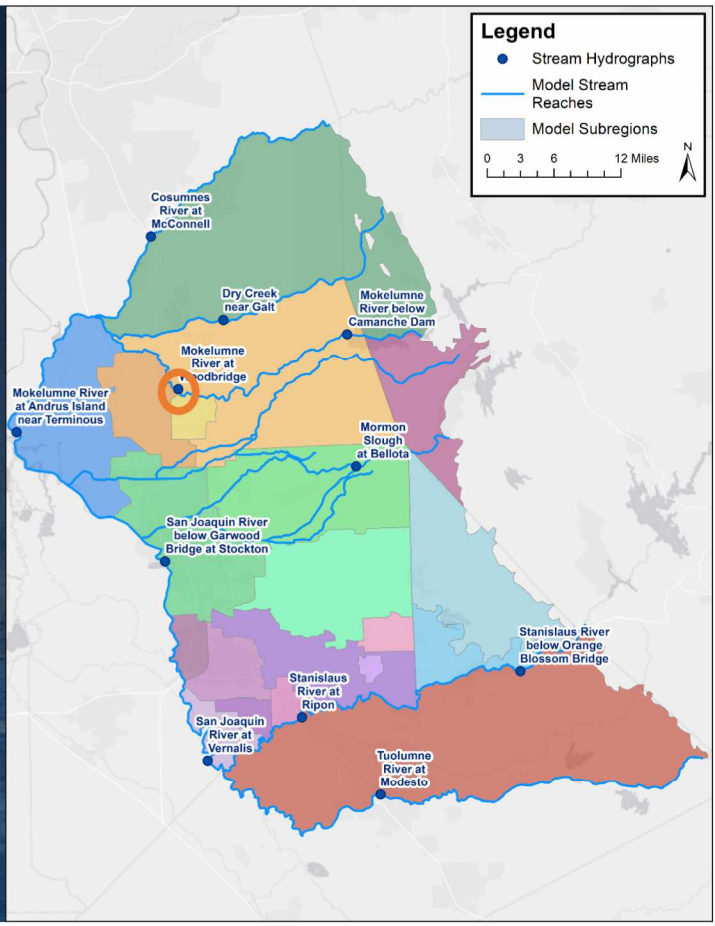
Legend
Stream Hydrographs
Model Stream Reaches
Model Subregions
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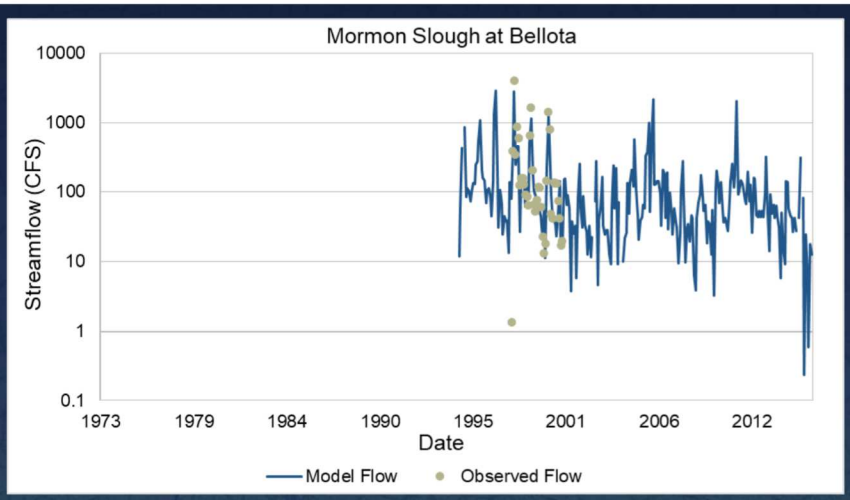
Cosumnes River at McConnell
Dry Creek near Galt
Mokelumne River below Camanche Dam
Mokelumne River at Woodbridge
Mokelumne River at Andrus Island near Terminous
Mormon Slough at Bellota
San Joaquin River below Garwood Bridge at Stockton
Stanislaus River below Orange Blossom Bridge
Stanislaus River at Ripon
San Joaquin River at Vernalis
Tuolumne River at Modesto


Mormon Slough at Bellota
Streamflow (CFS)
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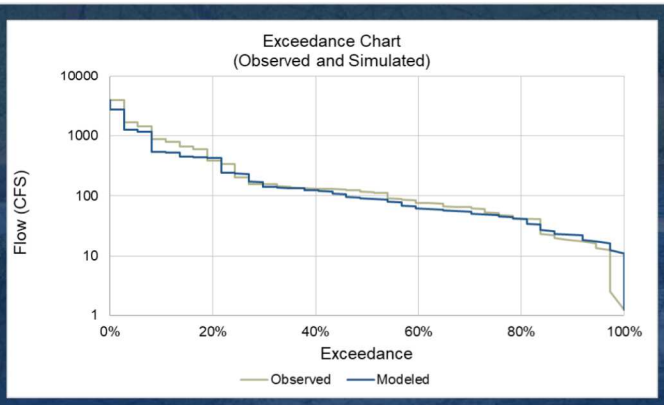
Model Flow
Observed Flow


Exceedance Chart
(Observed and Simulated)
Flow (CFS)
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Exceedance
Observed
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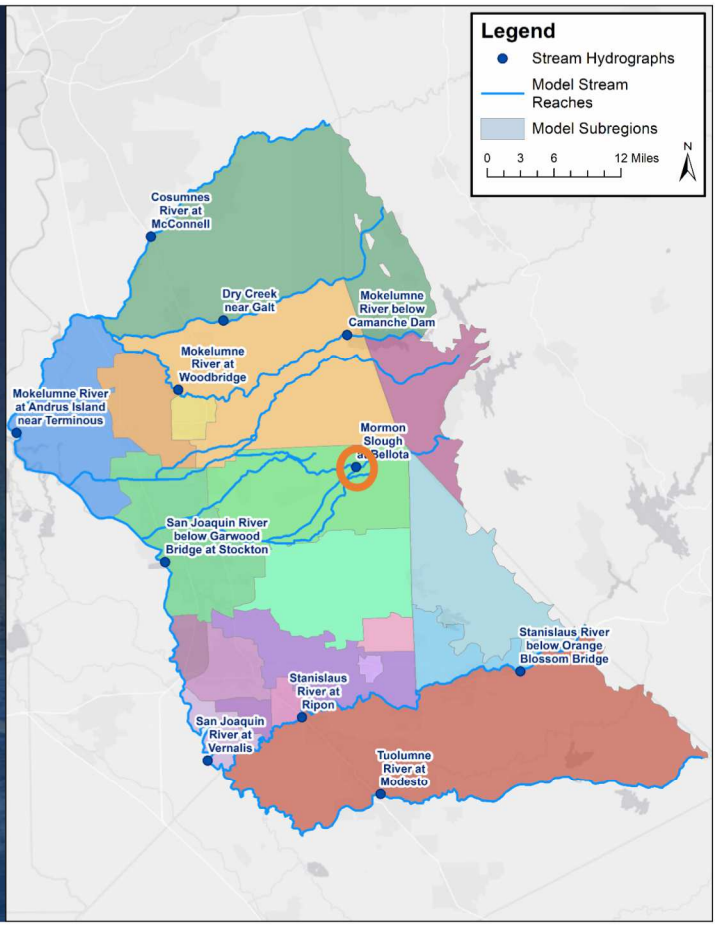
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Stream Hydrographs
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Cosumnes River at McConnell
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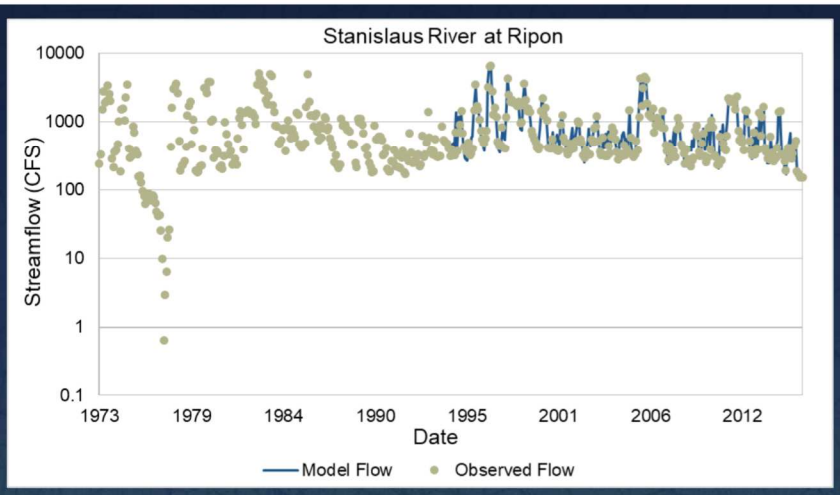
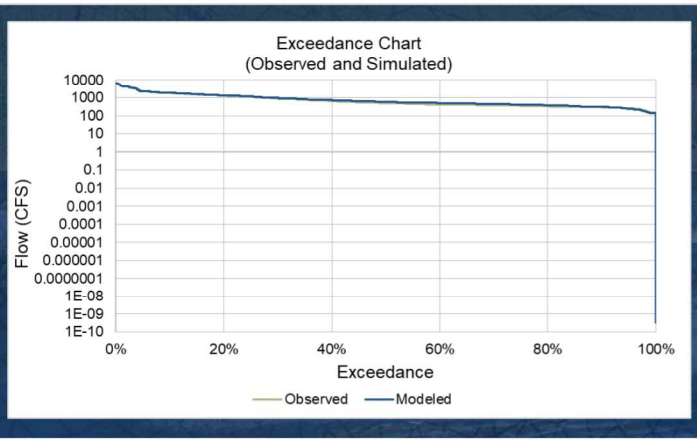
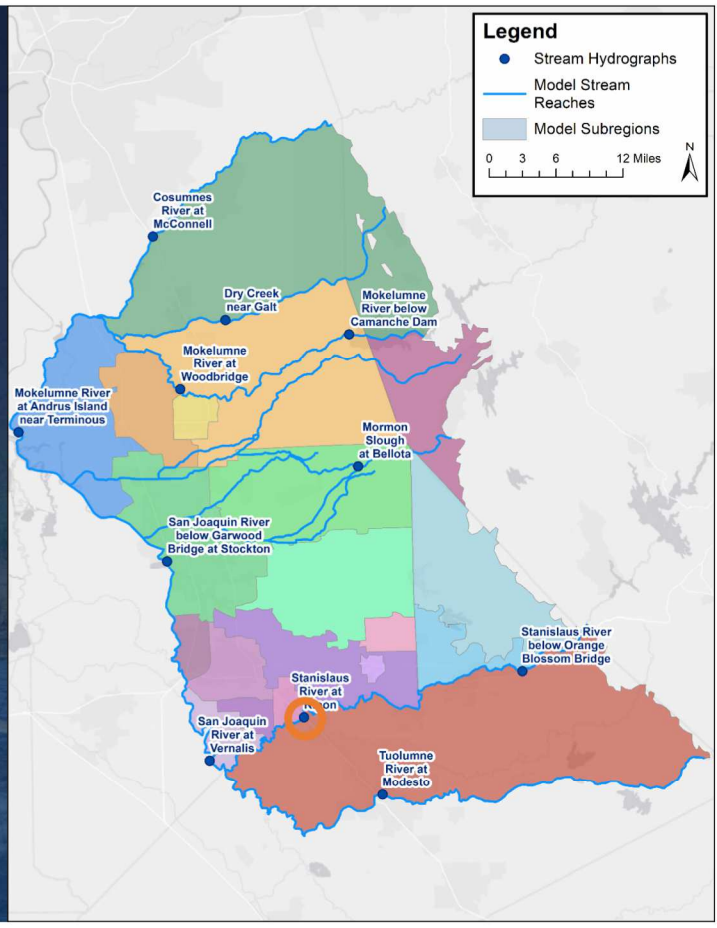
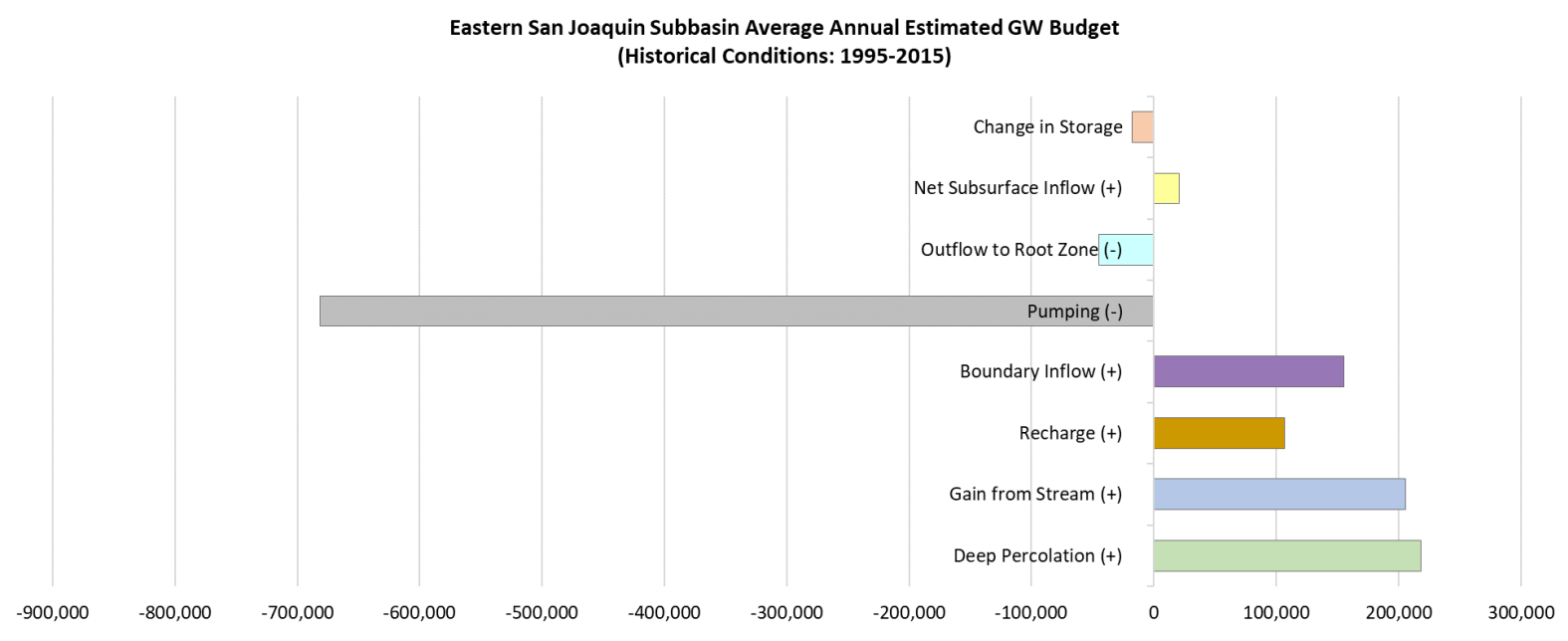


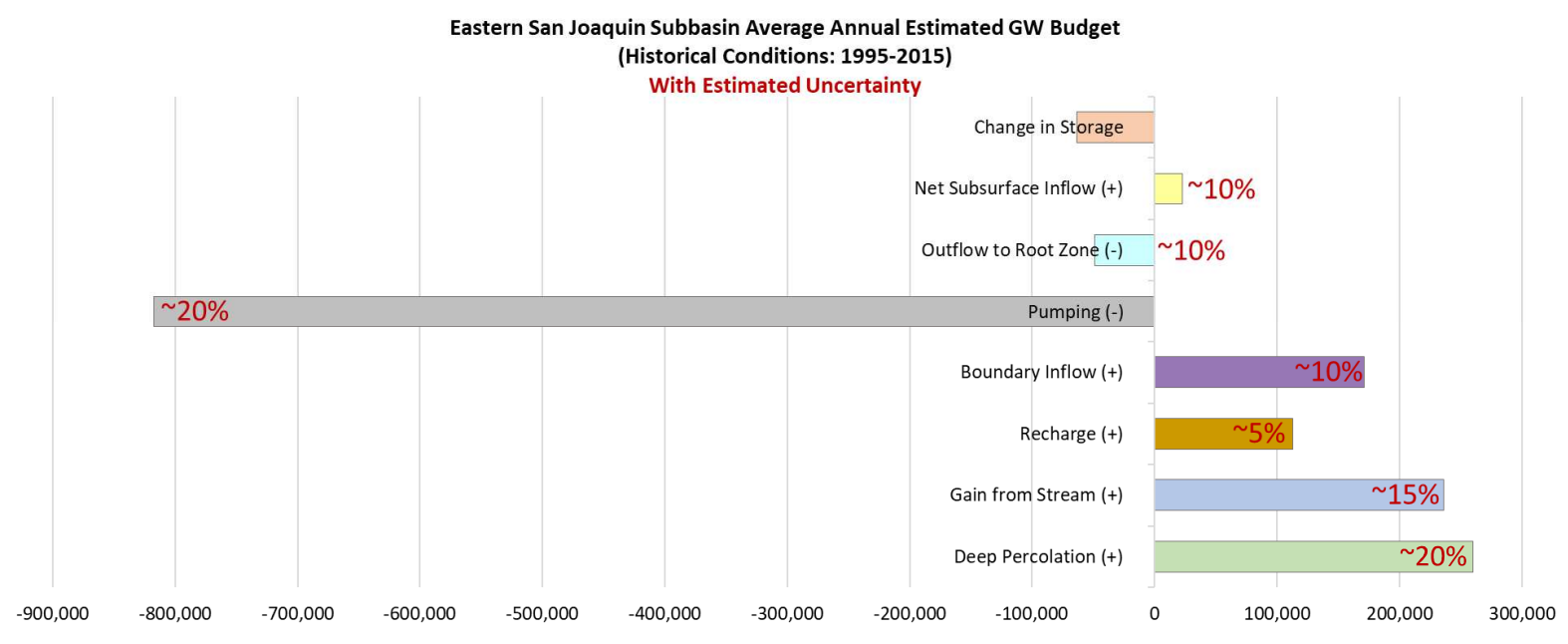




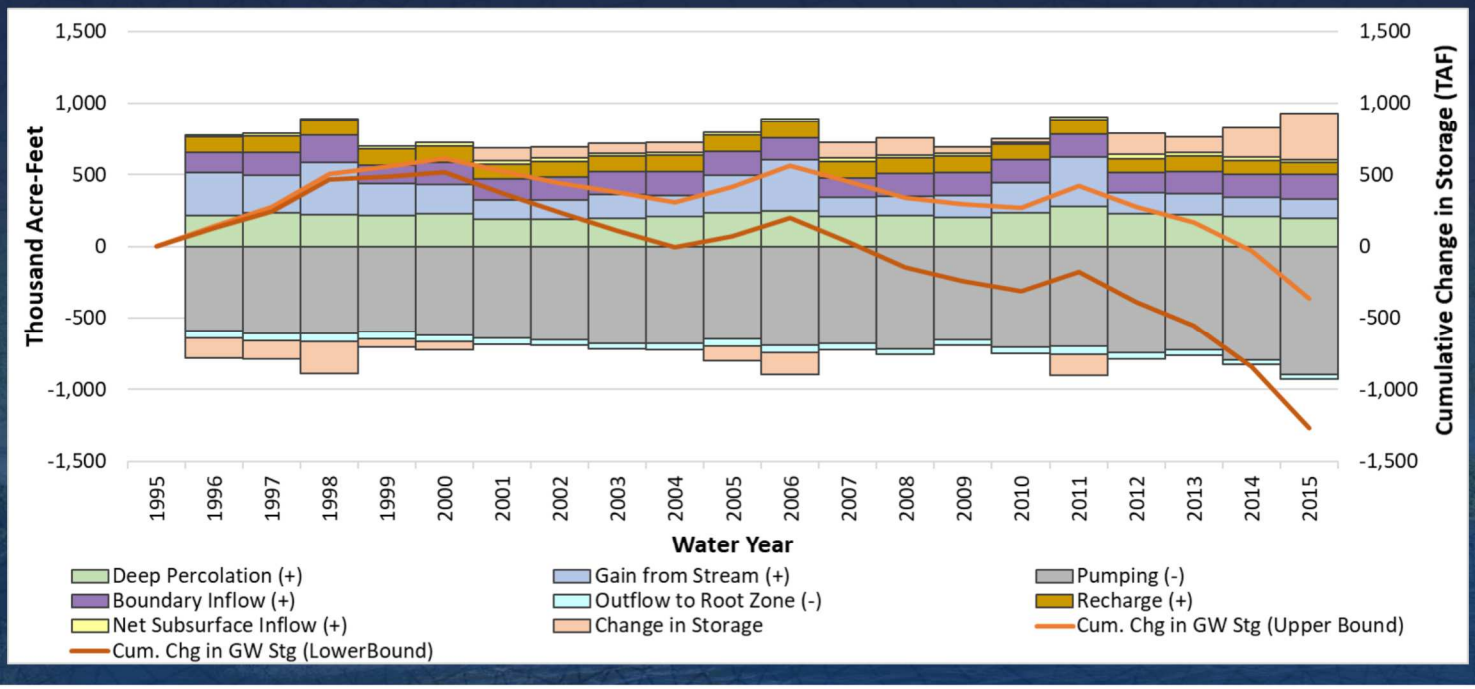
ESJ Subbasin Estimated Average Annual GW Budget Historical Conditions



ESJ Subbasin Estimated Average Annual GW Budget Historical Conditions

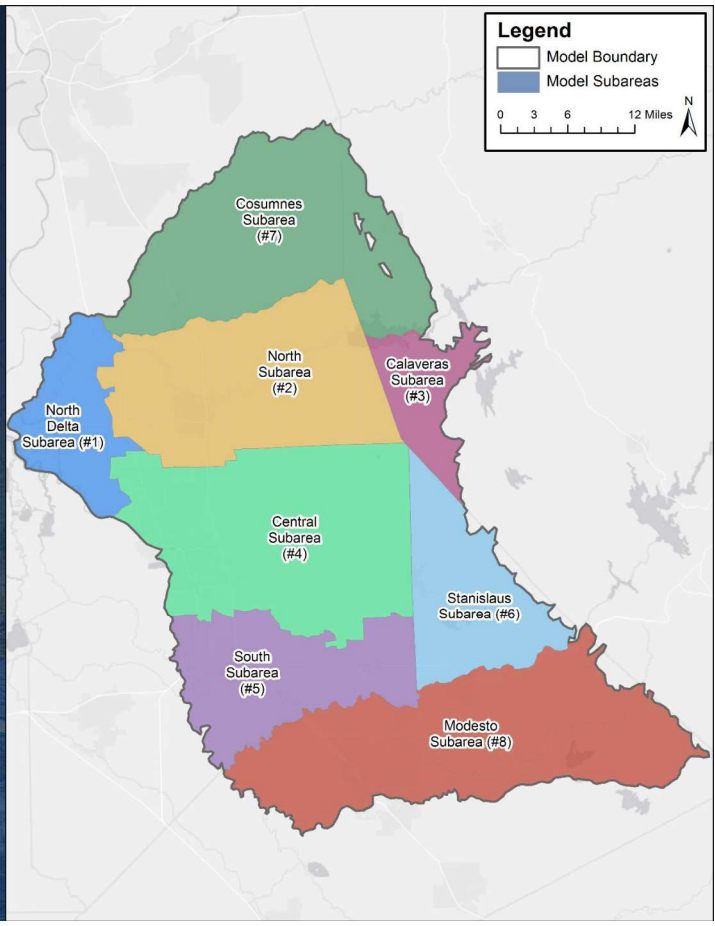


ESJ Subbasin Estimated Average Annual GW Budget Historical Conditions

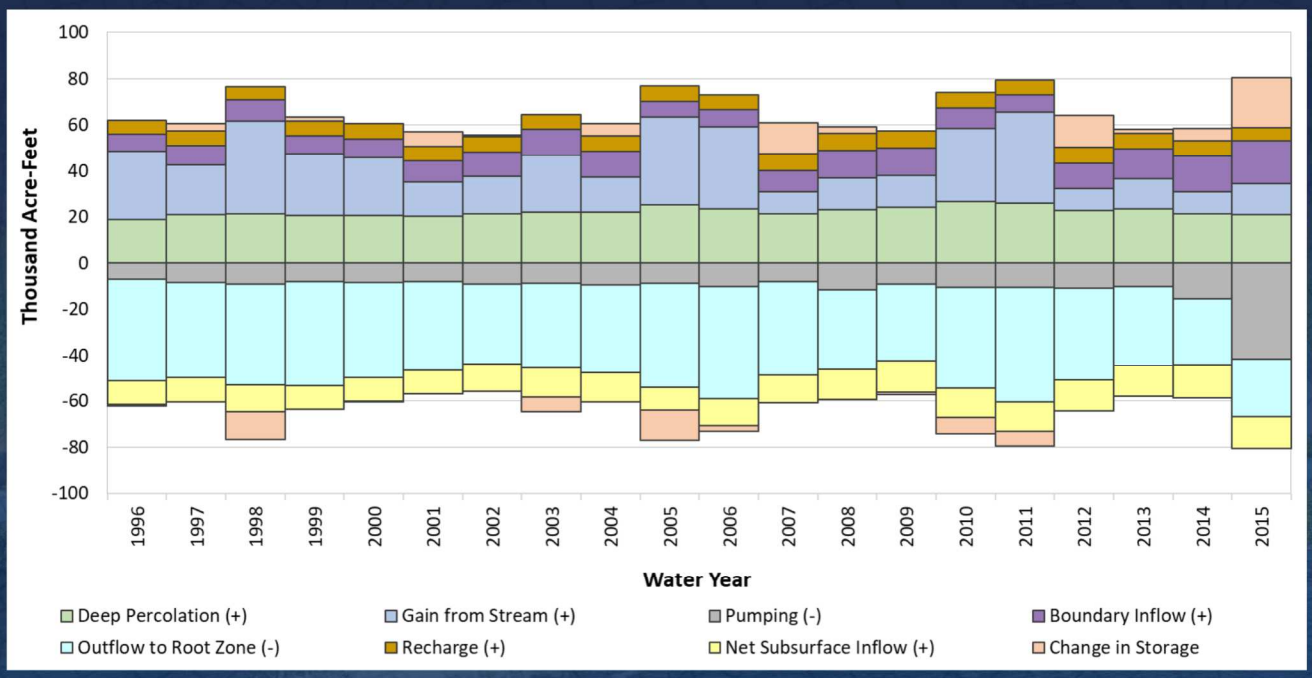


Budgets by Subarea

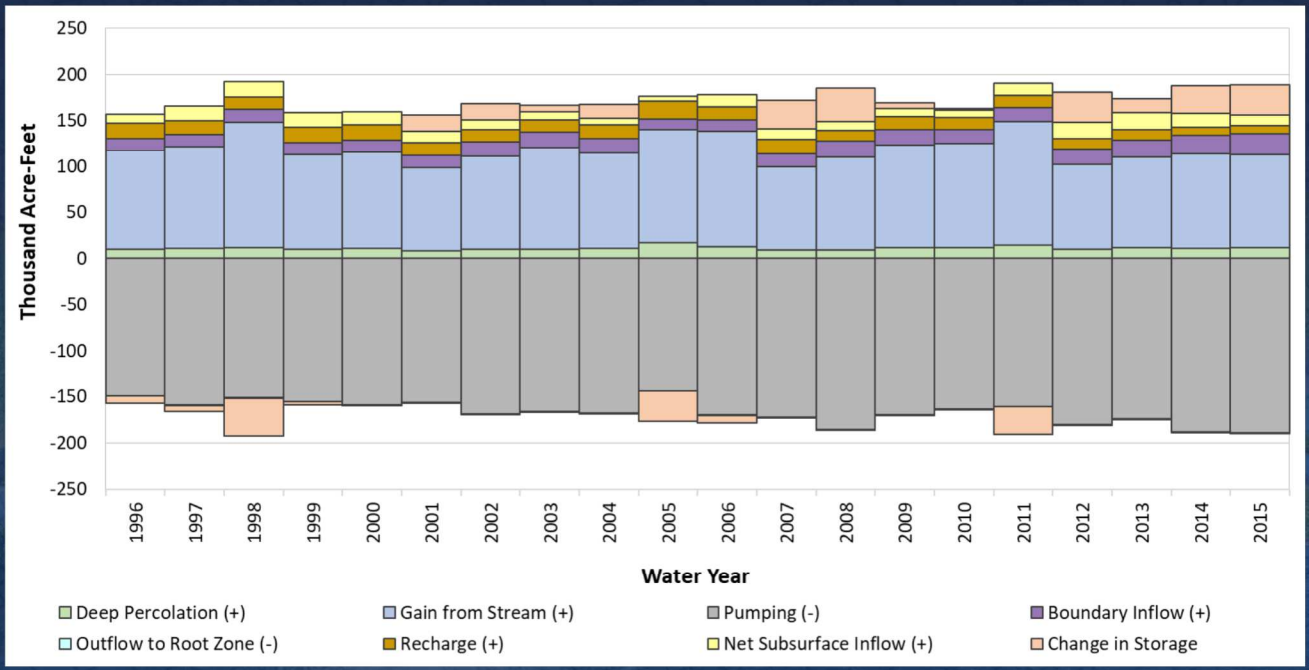
- Data input subregions versus model output subareas
  - For data verification and QA/QC, focus has been on data input subregions
  - Model output subareas are the scale for output of results



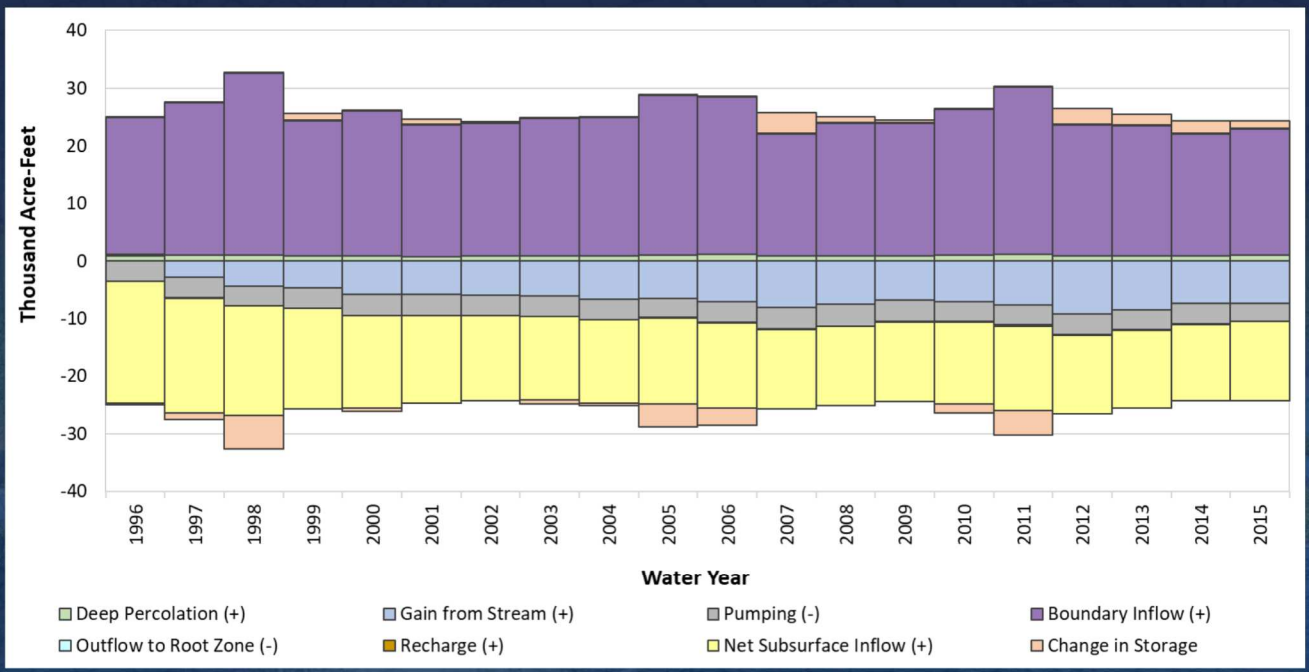
North Delta Subarea



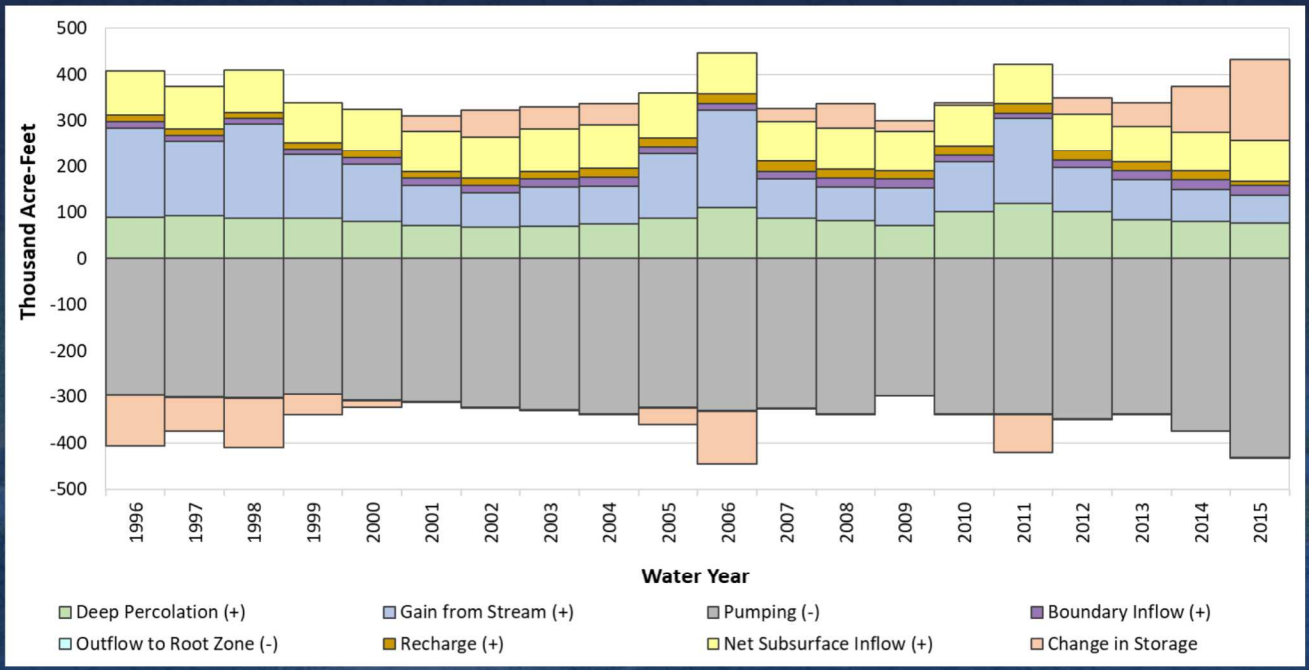
North Subarea



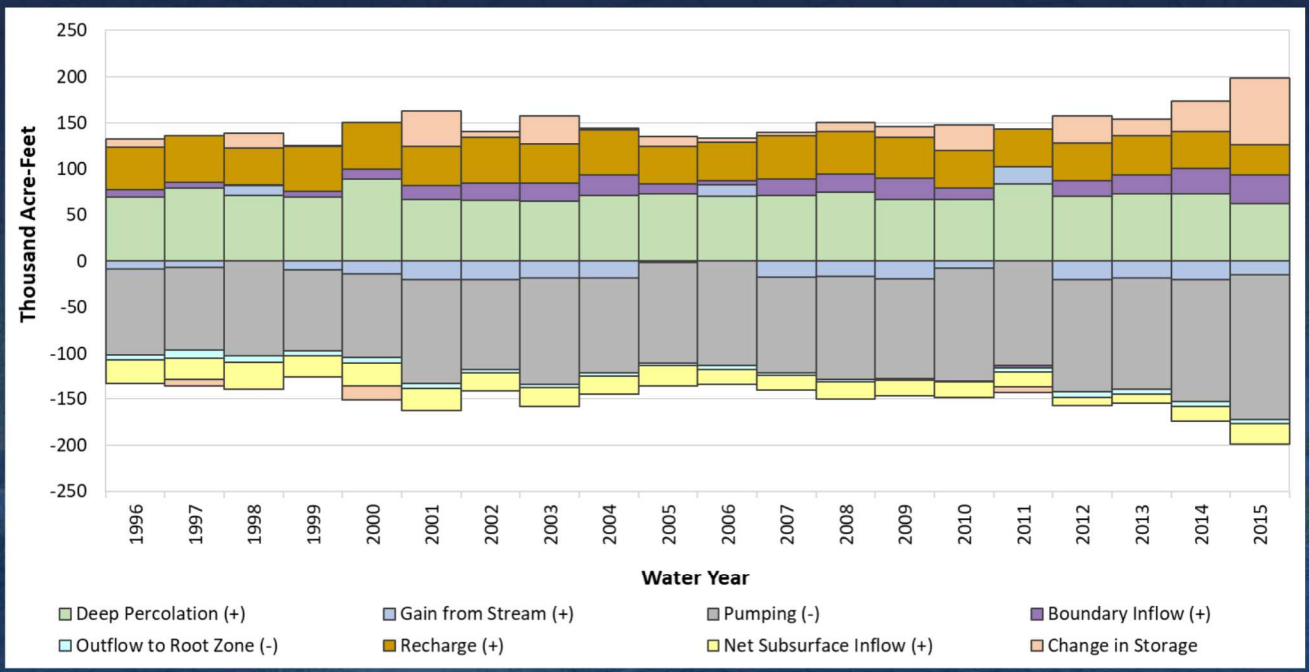
Calaveras Subarea



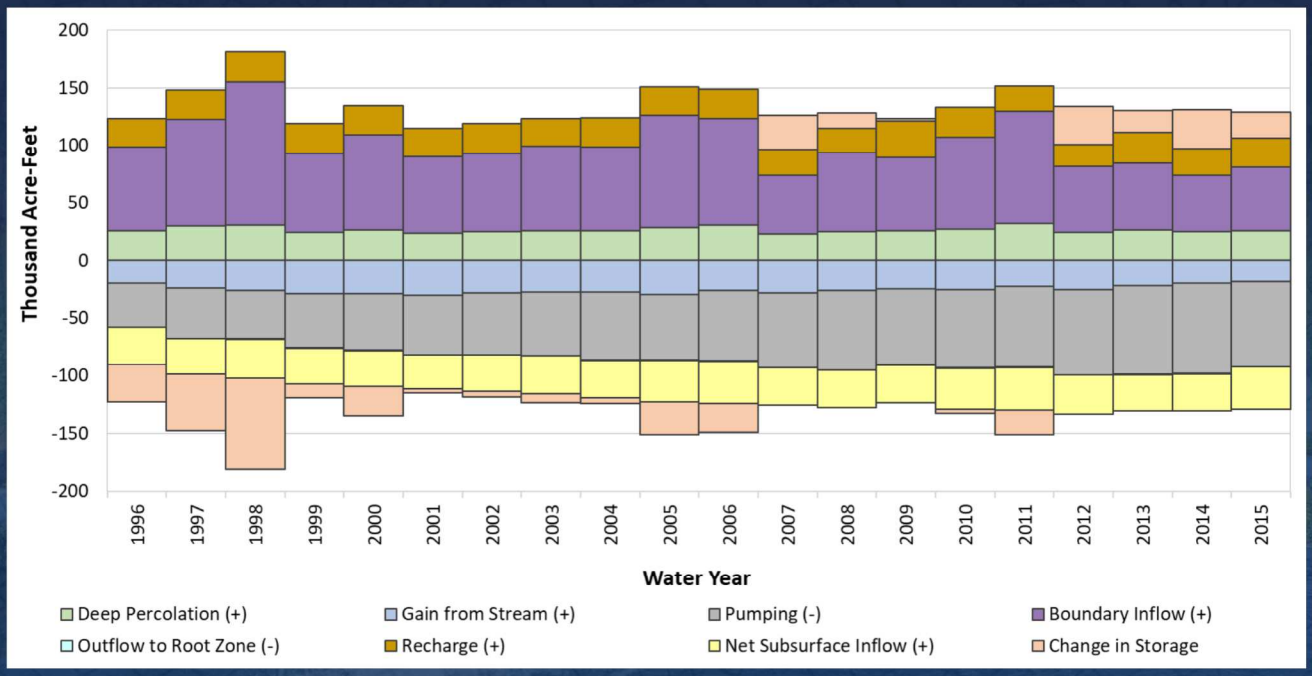
Central Subarea



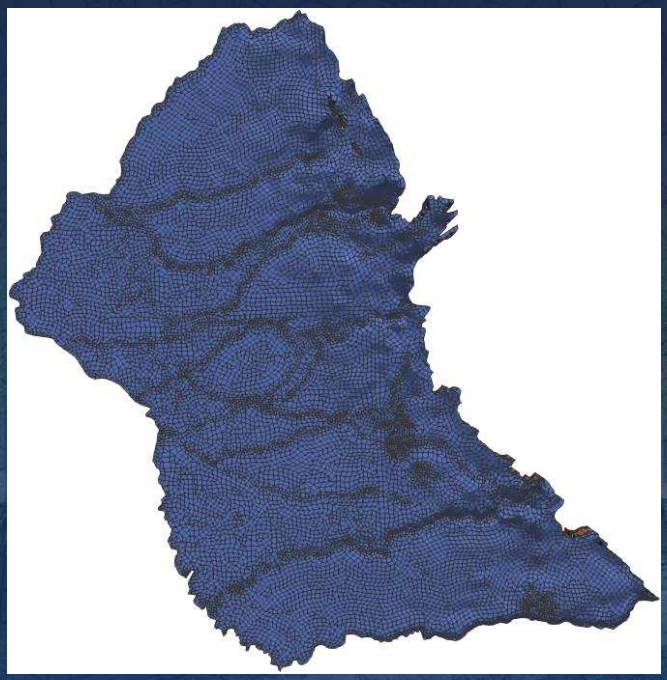
South Subarea

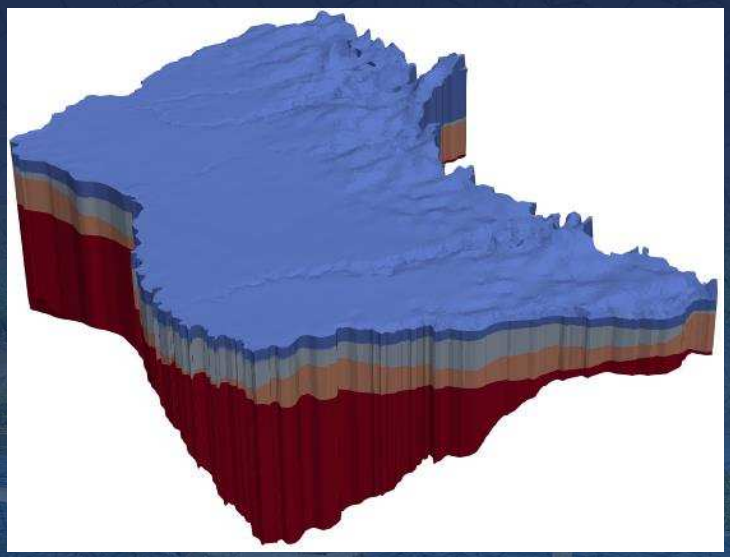


Stanislaus Subarea

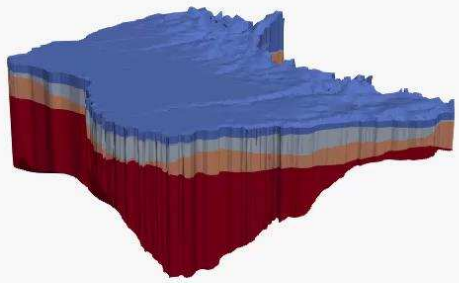


Model Stratigraphy





Model Stratigraphy: Rotation Around Model Edges

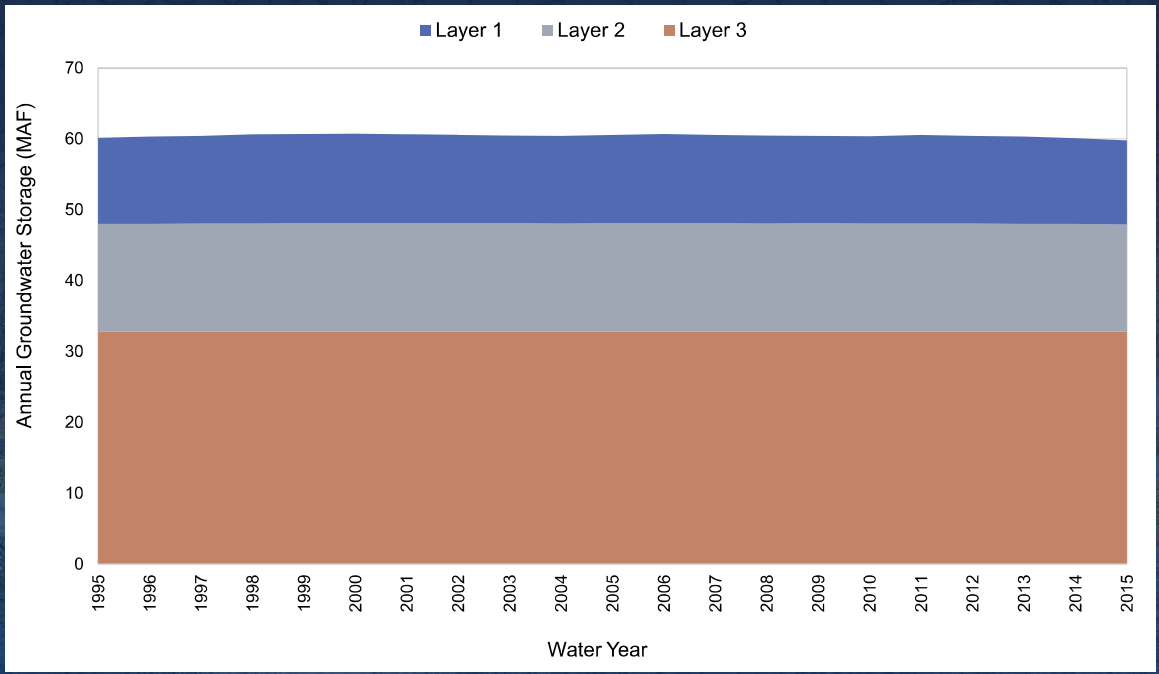


Estimates of Groundwater Storage

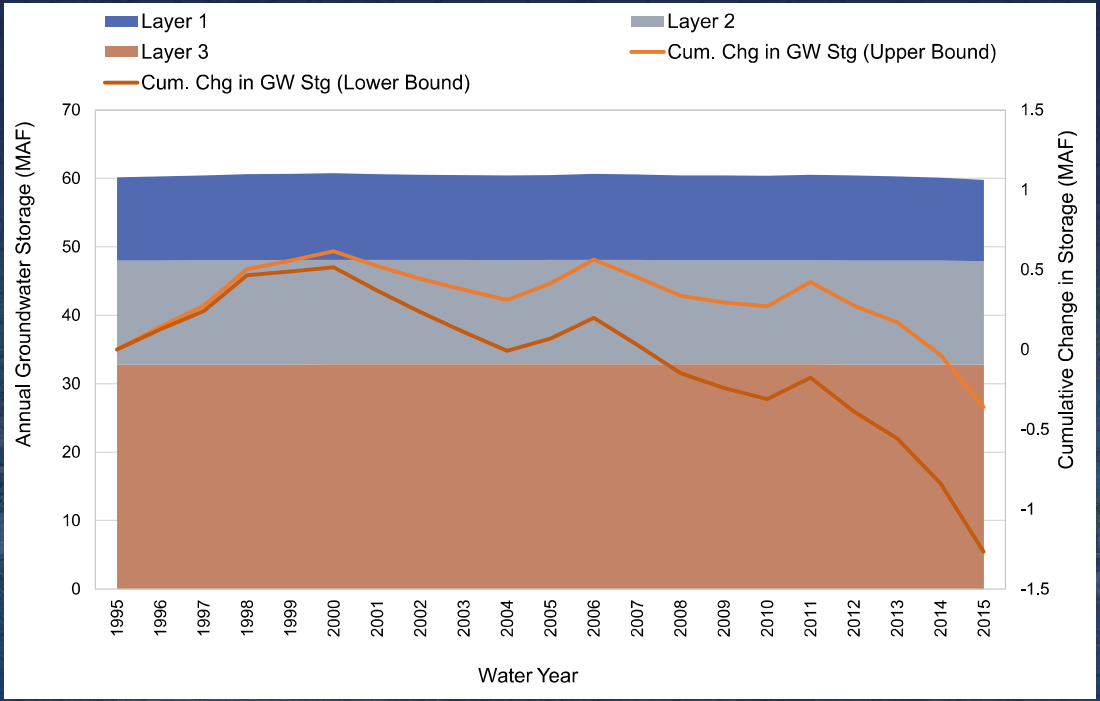
Bulletin 118 (1/20/2006)

Groundwater Storage Capacity. The total available groundwater storage capacity from a depth of 20 feet to the base of the groundwater basin is about 42,400,000 af based on a total aquifer material volume of 579,900,000 af and an average specific yield of 7.3 percent (DWR 1967). This estimate was based on a study area that encompassed approximately 586,000 acres. Since the currently defined subbasin size is over 707,000 acres, the storage value mentioned above underestimates the total storage capacity for the subbasin as defined in Bulletin 118 – Update 2002.

Groundwater Storage



Change in Groundwater Storage



Next Steps

- Finalize Calibration
- Prepare Model Report
- Present Model Development and Results to ESJ GWA Board
- Support GSP Development
  - Develop Baseline Scenarios
    - Current Conditions
    - Future Conditions
  - Perform Sustainability Scenarios

APPENDIX B: ESJWRM IDC TECHNICAL MEMORANDUM

Technical Memorandum

SGMA Readiness Project

Subject:	**Eastern San Joaquin Water Resources Model** **Agricultural and Urban Demand Estimates (Task 2 Deliverable)**
Prepared For:	San Joaquin County
Prepared by:	Sara Miller
Reviewed by:	Ali Taghavi
Date:	2/1/2018
Reference:	0541002 Task 2

1 Introduction

The purpose of this Technical Memorandum is to document the data and information used in analyzing land surface processes, to briefly discuss the analytical tools used, and to present estimates of the agricultural and urban water use in the Eastern San Joaquin Groundwater Subbasin (ESJ Subbasin) as part of the development of the Eastern San Joaquin Water Resources Model (ESJWRM).

The IWFM Demand Calculator (IDC) (Dogrul et al., 2017) is used to estimate the agricultural and urban water use in the ESJ Subbasin portion of ESJWRM. IDC, the stand-alone version of the Integrated Water Flow Model's (IWFM) root zone component, calculates agricultural and urban water demands with major inputs including climate conditions, soil parameters, and land use types and distribution. The hydrologic period of the ESJWRM spans from October 1994 though September 2015 and covers water years 1995 through 2015.

The ESJWRM boundaries include the ESJ Subbasin (primary model area), as well as the Cosumnes Subbasin to the north and the Modesto Subbasin to the south. The model network is a Finite Element based grid that contains 16,054 elements and 15,302 nodes. The model elements are grouped into 20 model subregions that are used to organize input data for the model and to report standard model output water budgets (Figure 1). These subregions are aggregated into 8 larger units (model subareas) used to output model results for basin-scale planning (Figure 2). ESJ Subbasin, the primary model area, is made up of 18 subregions and is the focus of this Technical Memorandum.

2 Technical Review and Oversight

The development of the ESJWRM, including the development and calibration of IDC, is taking place in an open and transparent process. The Eastern San Joaquin County Groundwater Basin Authority (GBA) was the organizational structure for model development coordination before the creation of the Eastern San Joaquin Groundwater Authority (GWA). The GBA's Ad Hoc Technical Review Committee was the forum to review model input data and assumptions, as well as calibration results. The monthly committee meetings were open to all interested parties and generally consisted of technical representatives from local agencies, consultants with knowledge of the area, representatives for neighboring groundwater subbasins, DWR staff, and San Joaquin County personnel.

Local agencies with consistent representation included San Joaquin County, Woodbridge Irrigation District, City of Lodi, North San Joaquin Water Conservation District, Lockeford Community Services District, Calaveras County Water District, City of Stockton, Cal Water, Stockton East Water District, City of

Lathrop, City of Manteca, South San Joaquin Irrigation District, City of Escalon, Oakdale Irrigation District, and Stanislaus County.

3 Land Use

Spatial land use data was used to develop land use and crop acreages for each model element. Model element acreages were then aggregated by subregion for reporting and verification purposes.

The Department of Water Resources (DWR) conducts periodic land use surveys for each county that include over 70 different crop categories, as well as urban and native vegetation (DWR, 1993-2000). DWR land use surveys by county were merged and assumed to represent water year 1995 in the model. The surveys used include:

1. San Joaquin County (1996)
2. Sacramento County (1993)
3. Amador County (1997)
4. Calaveras County (2000)
5. Stanislaus County (1996)

Data for water years 2007 through 2015 are from the United States Department of Agriculture's remote sensing CropScape data (USDA NASS, 2007-2015). CropScape includes 256 land use categories that come from annual satellite imagery collected during the growing season on 30 meter by 30 meter pixels. Based on reports on the CropScape website, the level of accuracy for this data is about 85-97% for crop-specific land cover categories. Although this level of accuracy is high, the accuracy varies depending on many factors, including the time of the satellite image, growing season timing, cloud cover, type of crop, and maturity state of the crop.

DWR retained LandIQ, LLC to develop a statewide assessment of agricultural land use in summer 2014. LandIQ used remote sensing methods to collect and process the data, which was then ground truthed for a reported overall accuracy of 96.6% (DWR, 2014). In ESJWRM, this data was broadly used as verification of CropScape 2014 data and, in a few specific cases, as replacement or enhancement of the CropScape data.

Local data and knowledge was also utilized to refine and correct, as needed, the cropping acreages developed based on the DWR land use surveys and CropScape years. ESJWRM includes 23 irrigated crop categories and 4 general land use categories. The irrigated crop categories were combined into 6 high-level groupings of crops with similar water use or irrigation practices. Table 1 lists the land use categories.

To fill the gap between 1995 and 2007, all land use and crop categories were interpolated at the spatial resolution level of the model element. Thus, the geographic distribution of interpolated land use and cropping patterns are honored. Adjustments were made, as needed, at the element level to ensure that the land use and cropping pattern trends over time are reflective of local data. These adjustments were mostly based on local knowledge and information received from various entities, including irrigation districts, water districts, and municipalities.

Figure 3 and Figure 4 show the spatial distribution of the major land use categories in the ESJ Subbasin. Figure 5 shows the annual trends of land use categories in the ESJ Subbasin.

Figure 6, Figure 7, and Figure 8 show the spatial distribution of the irrigated crops for 1995, 2014, and 2015. Figure 9a-9m show the annual cropping patterns, by high level categories, for the ESJ Subbasin and those major model input subregions that are not predominantly urban centers (i.e., all subregions in the primary model area except subregions 3, 6, 9, 10, 12, and 16).

Table 1: Land Use Categories

Land Use Type	Model Category	Grouped Categories
Irrigated Crops	Almonds Cherries Citrus & Subtropical Other Orchard Pistachios Walnuts	Fruit and Nut Trees
	Vineyards	Vineyards
	Alfalfa Pasture	Alfalfa and Irrigated Pasture
	Grain	Grain
	Corn Cotton Dry Beans Field Crops Safflower Sugar Beets	Field Crops
	Cucurbits Onion & Garlic Potatoes Tomato Fresh Tomato Processing Truck Crops	Truck Crops
	Rice	Rice
Other Land Use	Urban Landscape Water Surface Riparian Vegetation Native Vegetation	

4 Urban Demand

IDC calculates urban demand based on per capita water use, population, and the breakdown of indoor versus outdoor water use by month. Figure 10 shows the annual population trends for each urban center. Figure 11 shows the annual per capita water use values of these urban centers used in the calculation of urban water demand. Figure 12a-12g show the model estimated annual urban demand for predominantly urban subregions and the total ESJ Subbasin area.

Population and per capita water use for the major urban areas were largely provided directly by the urban areas or were contained in Urban Water Management Plans (UWMPs). Additional annual population, including an estimate for rural urban areas, came from the United States Census Bureau and the California Department of Finance. Monthly per capita water use, commonly reported in gallons per capita per day (GPCD), was generally estimated for each urban entity using the annual population and monthly urban water use (provided by cities based on water delivery records). To estimate the urban water demand of rural domestic water areas, the average major urban area GPCD was combined with the estimated rural population.

It was assumed that an annual average of 60% of urban water was used indoors and 40% was used outdoors. The monthly fractions entered into the model had the majority of urban water demand due to indoor activities from November through March and up to a maximum of 60% of urban water used outdoors for the remainder of the year.

The indoor/outdoor breakdown received concurrence from the urban water providers who attended the Ad Hoc Technical Review Committee meetings. Population and per capita water use data were reviewed by the major urban areas and confirmed at the meetings (pers. comm. Kathryn Garcia, Andrew Richle, Michael Bolzowski, Greg Gibson, and Elba Mijango).

5 Agricultural Demand

IDC estimates agricultural water demand based on model input data for evapotranspiration (ET), monthly precipitation, return and reuse fractions, irrigation period, land use and cropping acreages, and soil properties (e.g., hydraulic conductivity, pore size distribution index, etc.). This data was compiled, analyzed, synthesized, and processed for input in ESJWRM.

The ET requirement is based on a variety of sources, including locally-developed data for the South San Joaquin Irrigation District and the Oakdale Irrigation District Agricultural Water Management Plans (AWMPs) (SJJID, 2015; OID, 2016) and averages for DWR's CIMIS (California Irrigation Management Information System) Zone 12 developed using the METRIC methodology, which is a remote-sensing based technology to estimate crop actual ET. Based on discussions with locals (pers. comm. Jennifer Spaletta and Bryan Thoreson), deficit irrigation of vineyards was simulated in ESJWRM with reference to the growing season ET values in the Lodi area (Prichard). Figure 13 shows the range in annual evapotranspiration rates from the various sources for the 27 model land use categories.

Monthly rainfall data was derived from the PRISM (OSU, 1970-2015) database and mapped to the model element in order to preserve the spatial distribution of the monthly rainfall over the model hydrologic period of 1995 through 2015. Figure 14 shows the annual rainfall in the model area and the cumulative departure from mean, which is an indication of long-term rainfall trends in the area.

The soil properties included in the model for each element are field capacity, wilting point, total porosity, hydraulic conductivity, and pore size distribution index. The soil survey geographic (SSURGO) database was downloaded first from the Web Soil Survey and any gaps in data were filled in using the General Soil Map of the United States (STATSGO2). These spatial datasets were averaged over each model element using IWFM's Soil Data Builder with GIS tool available at http://baydeltaoffice.water.ca.gov/modeling/hydrology/IWFM/SupportTools/index_SupportTools.cfm.

IDC was used to simulate the monthly agricultural demand estimates for each model element. The IDC model was calibrated to agricultural water use values reported by irrigation districts in their AWMPs and then checked against local data with input from irrigation district representatives and consultants (pers. comm. Doug Heberle, Jennifer Spaletta, Tom Flinn, Peter Martin, Cathy Lee, Manuel Verduzco, Sam Bologna, Bryan Thoreson, Emily Sheldon, Eric Thorburn, and Byron Clark). ESJWRM as a whole will undergo a more rigorous calibration process comparing model streamflow and groundwater levels to actual observed data.

The calibrated IDC was used to estimate monthly agricultural water demand at each model element during the model hydrologic period. The element-level estimates were then aggregated to report the information for each model subregion. Figure 15a-15n show the agricultural water demand, unit agricultural water use, and unit evapotranspiration of applied water (ETAW) estimates by the total ESJ Subbasin area and the subregions with irrigation districts who participated in the IDC development and calibration process.

The IDC model will be integrated with the comprehensive IWFM model, ESJWRM, to simulate the surface water and groundwater conditions in the ESJ Subbasin.

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Figure 1: Model Subregions

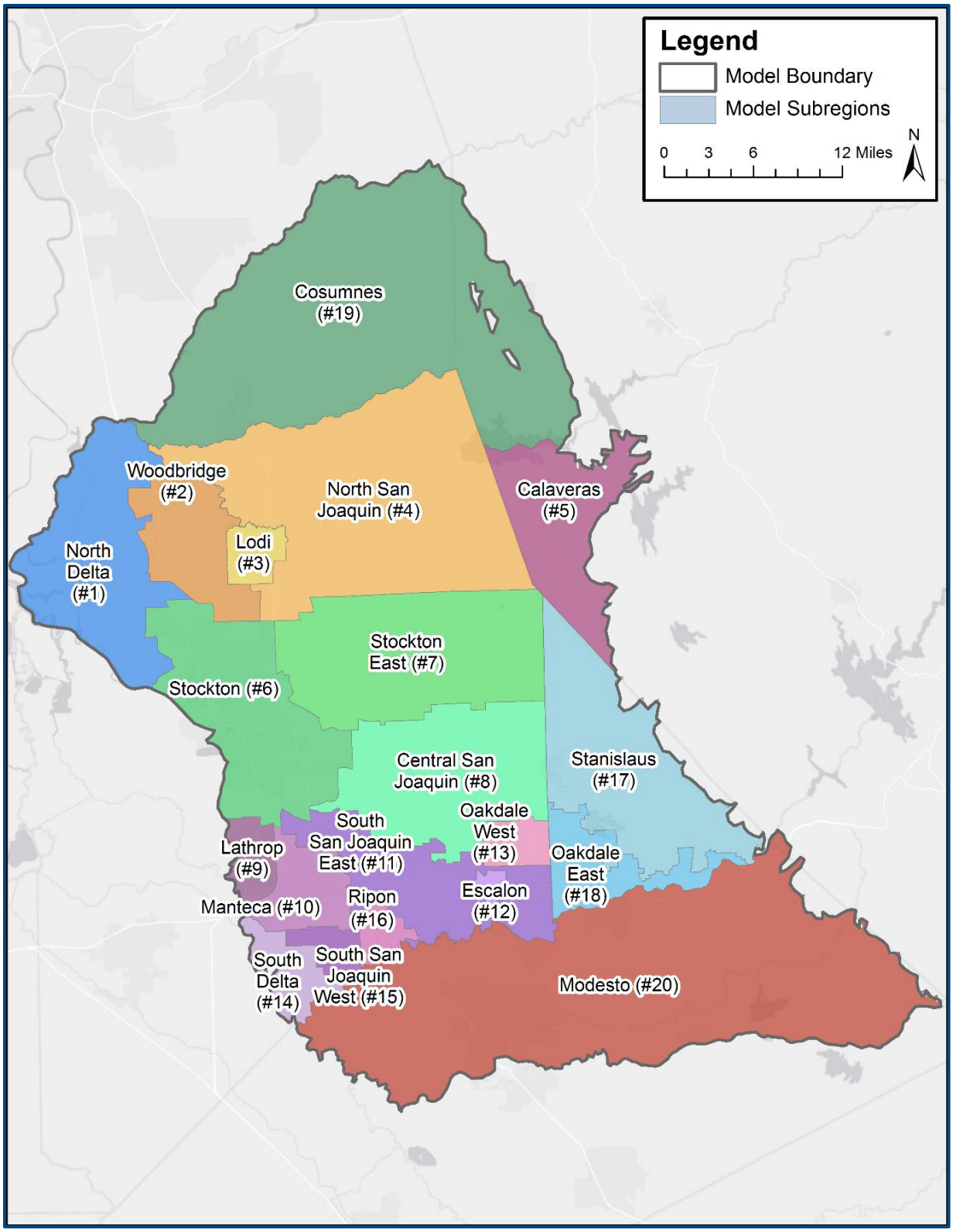


Figure 2: Model Subareas with Eastern San Joaquin Subbasin

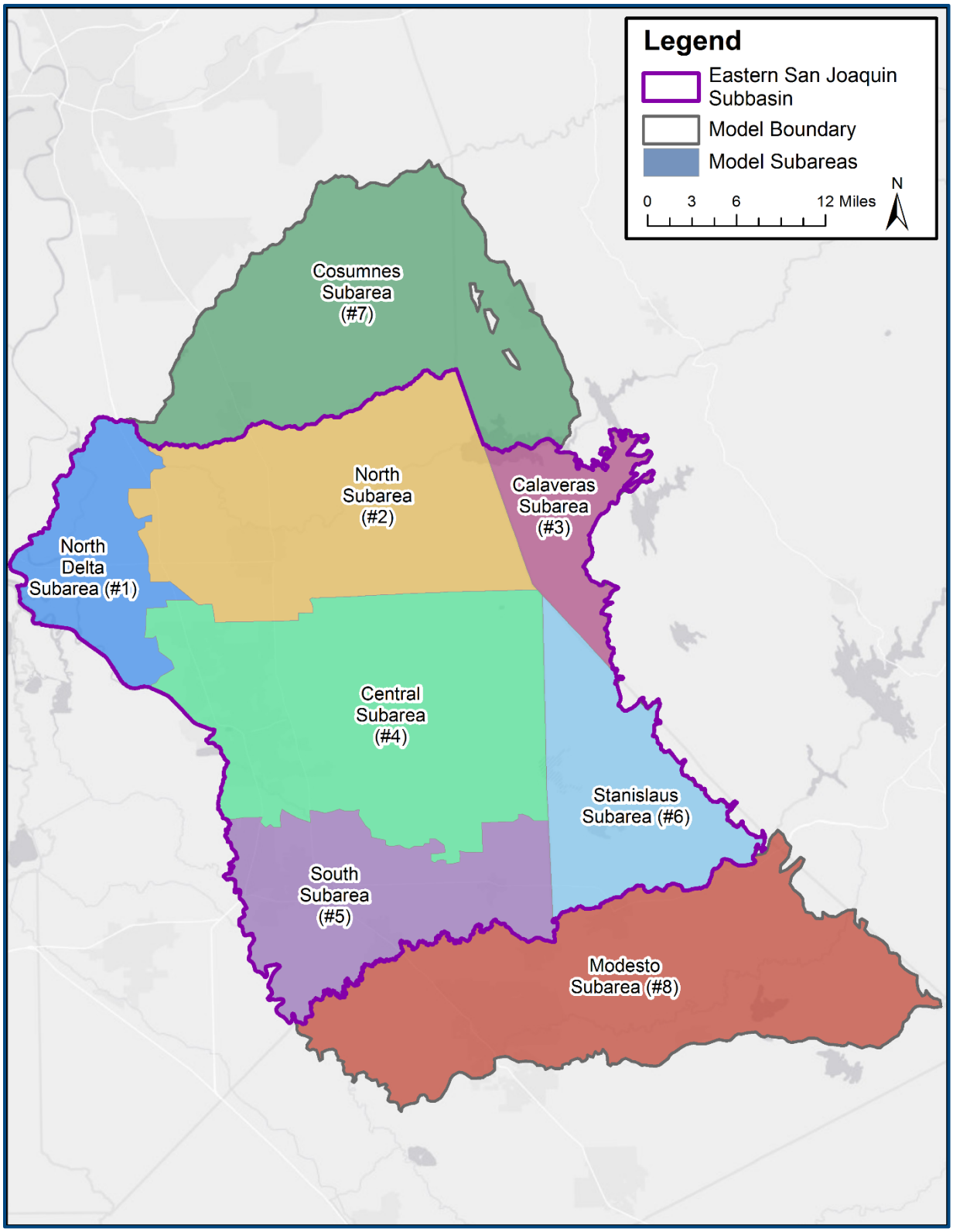


Figure 3: General Land Use in 1995 DWR Land Use Survey

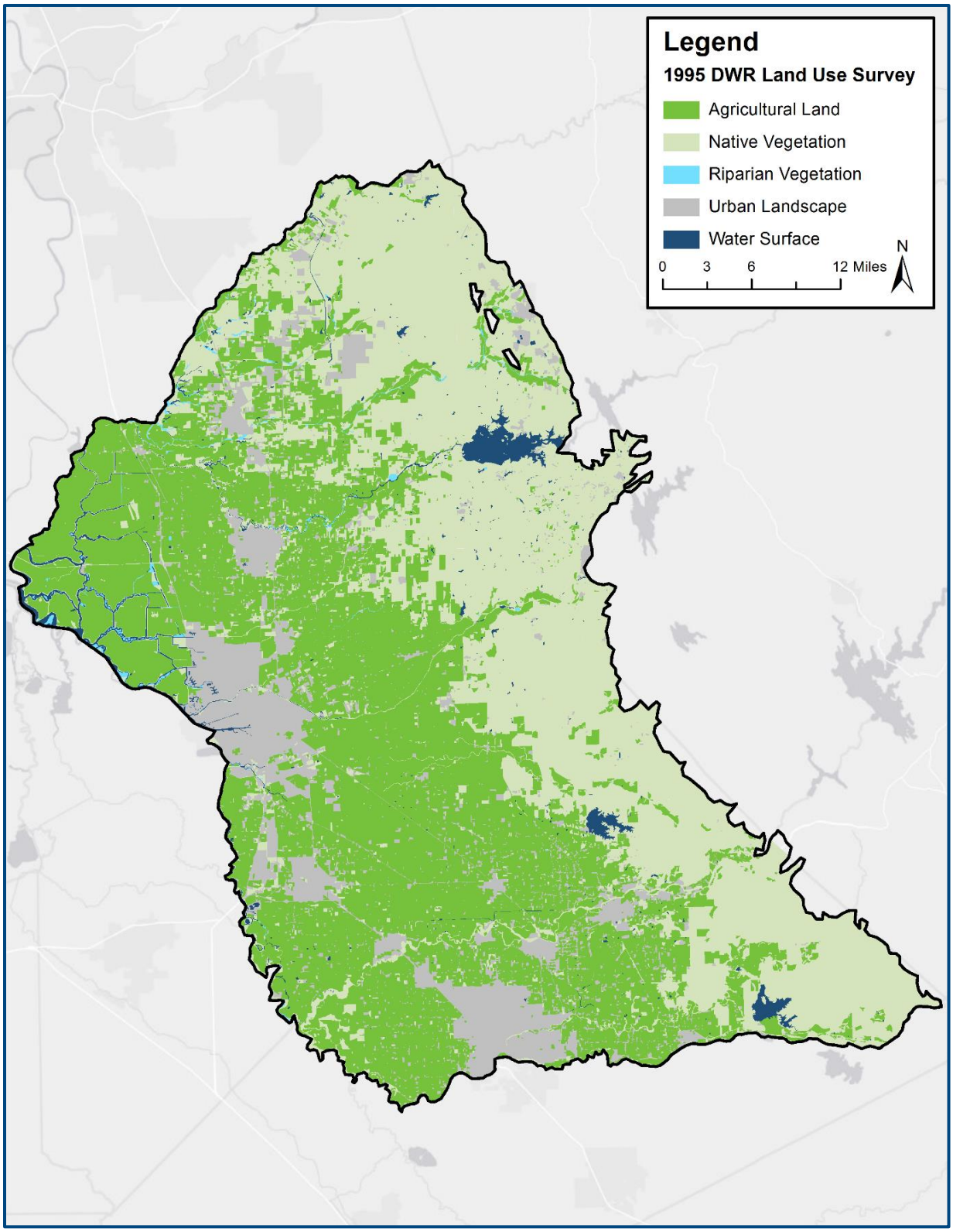


Figure 4: General Land Use in 2015 CropScape

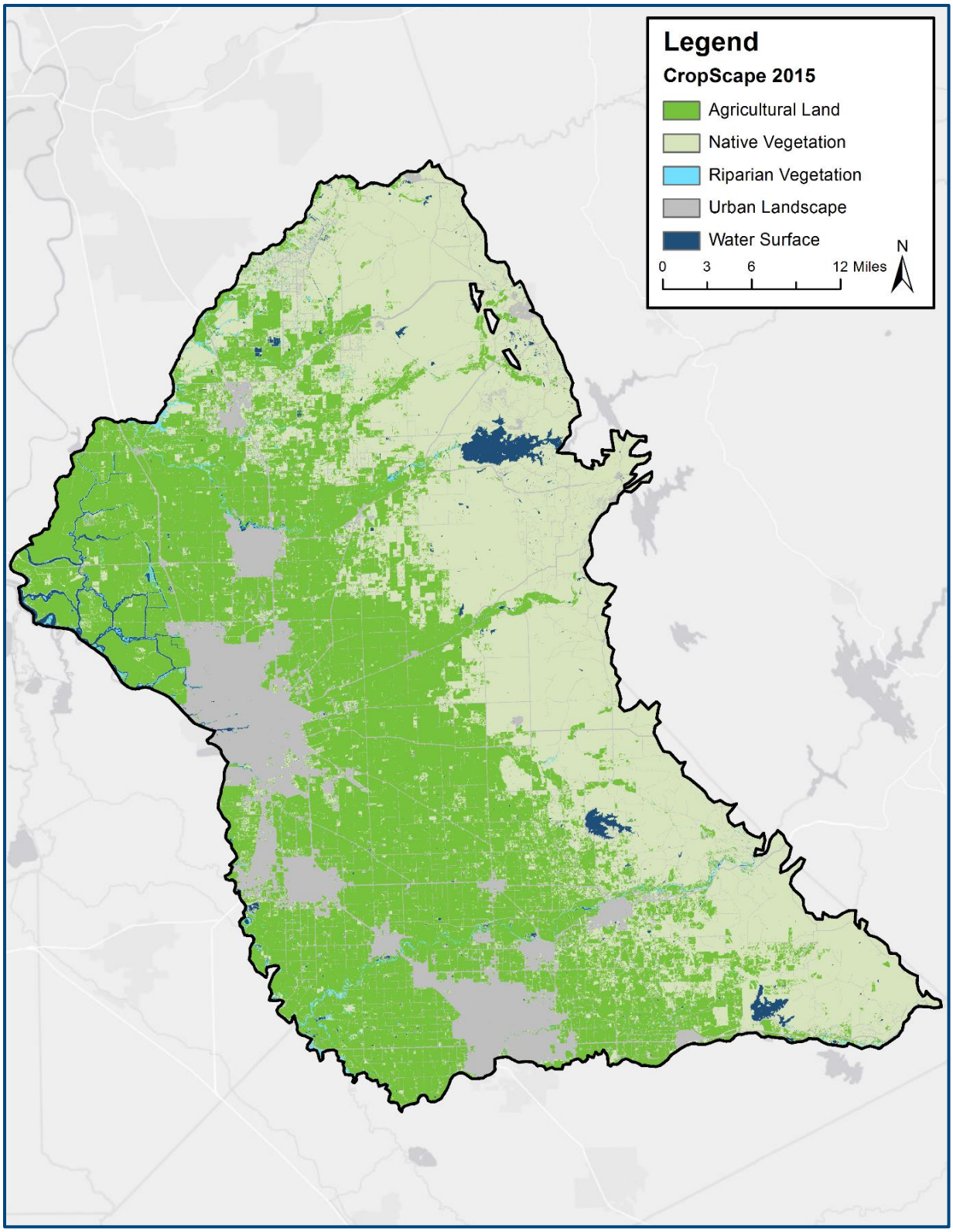


Figure 5: Eastern San Joaquin Subbasin General Land Use Acreages

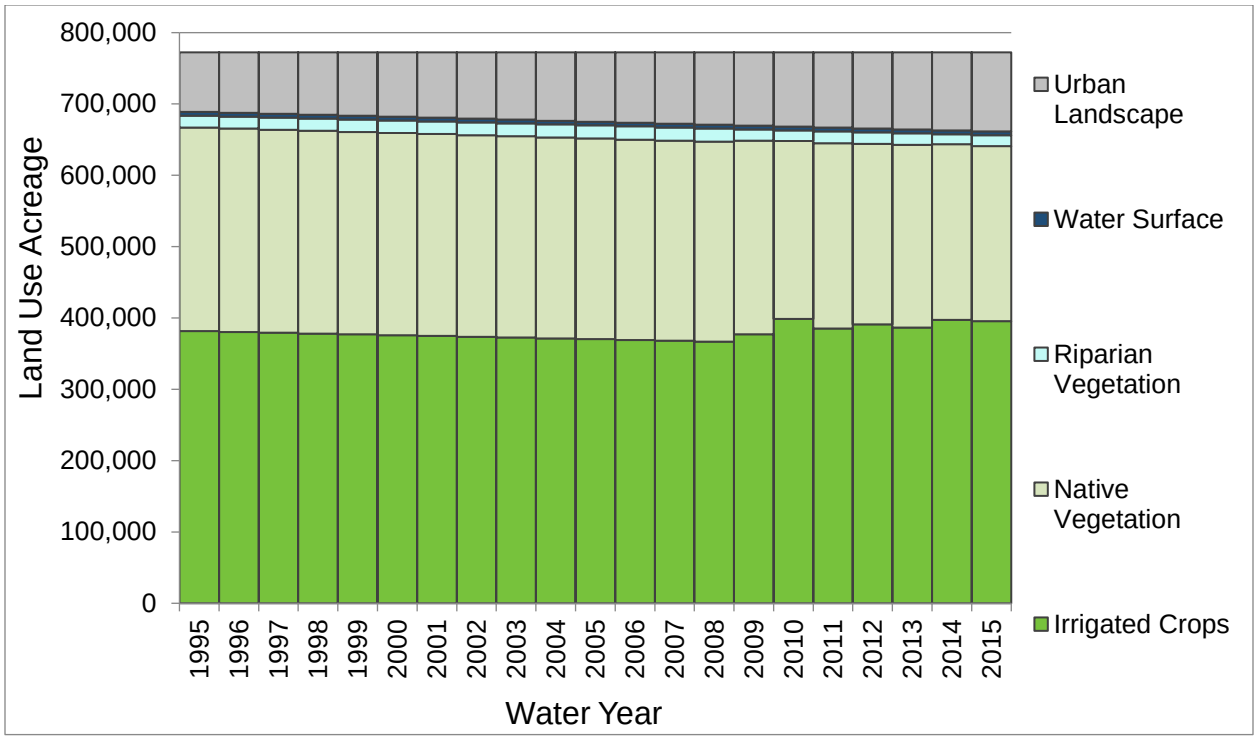


Figure 6: Cropping Pattern in 1995 DWR Land Use Survey

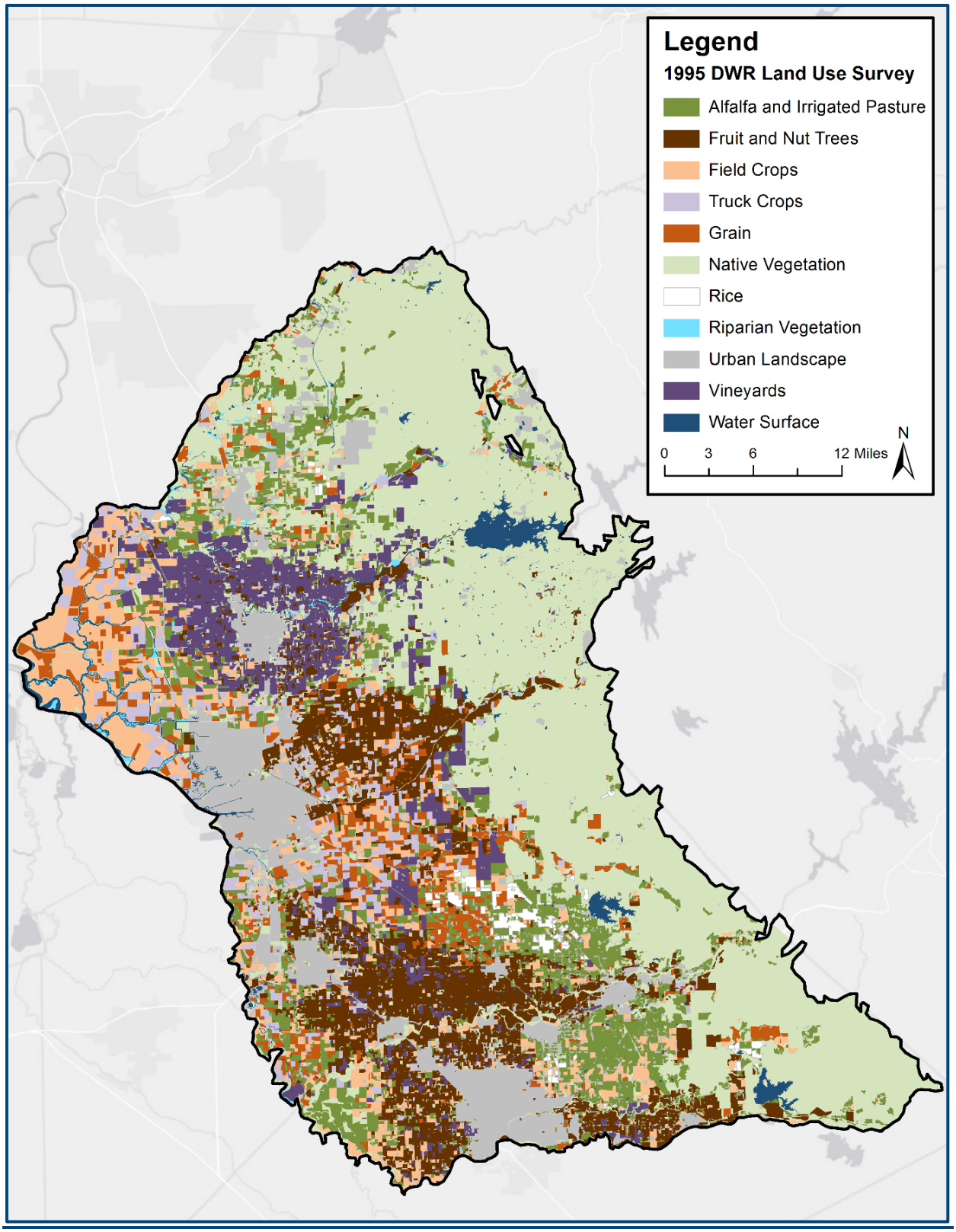


Figure 7: Cropping Pattern in 2014 LandIQ

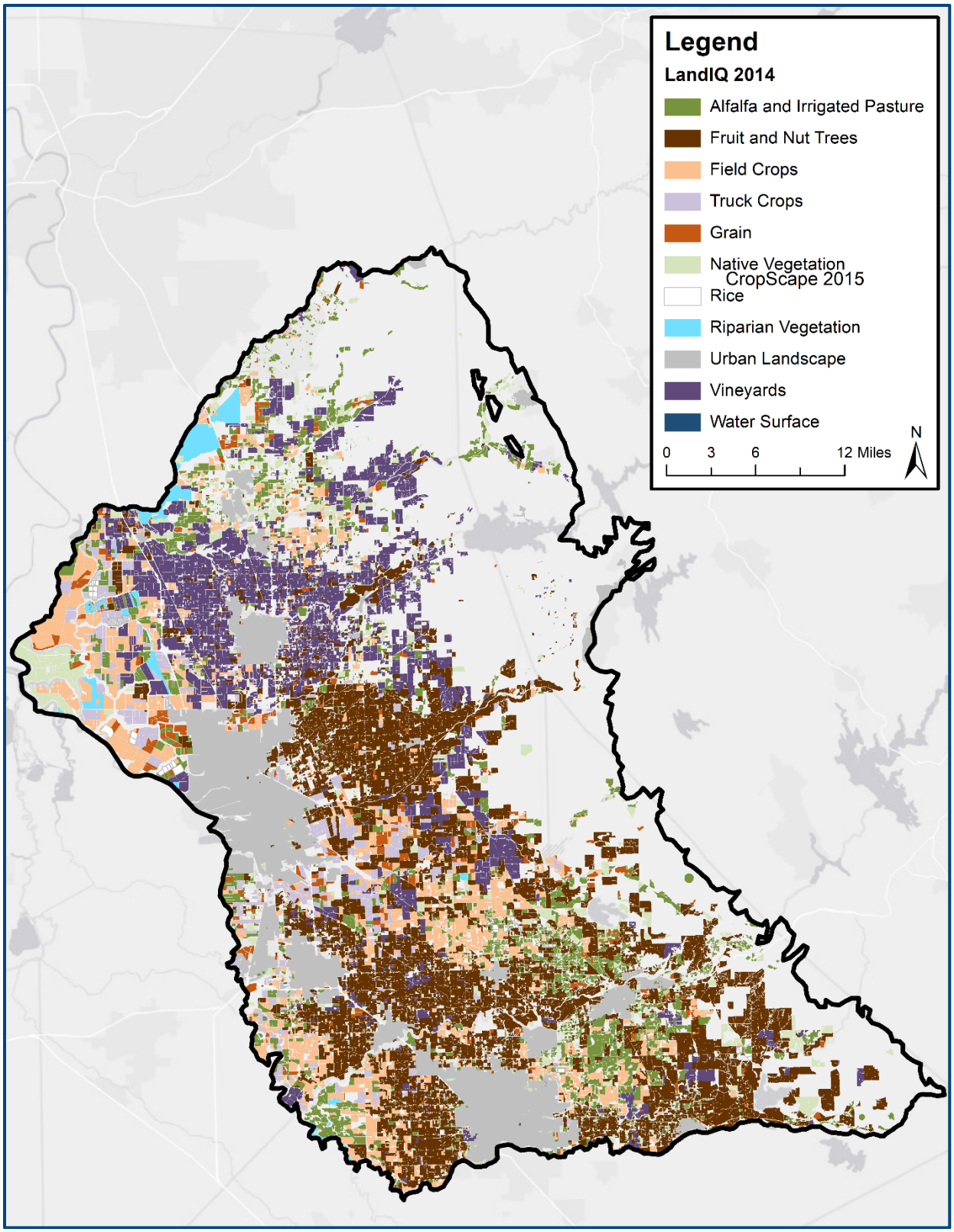


Figure 8: Cropping Pattern in 2015 CropScape

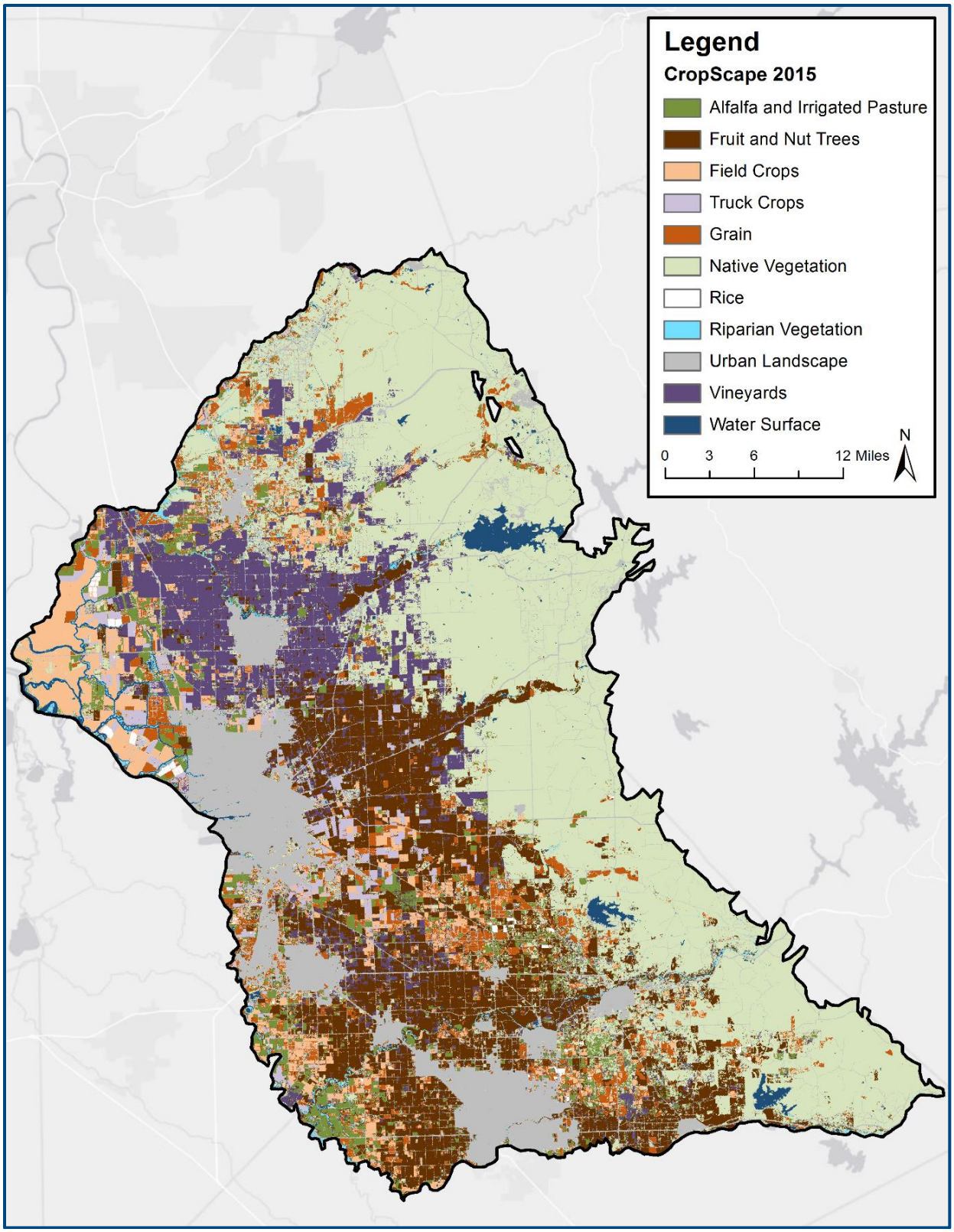


Figure 9a: Irrigated Crop Acreages- Eastern San Joaquin Subbasin

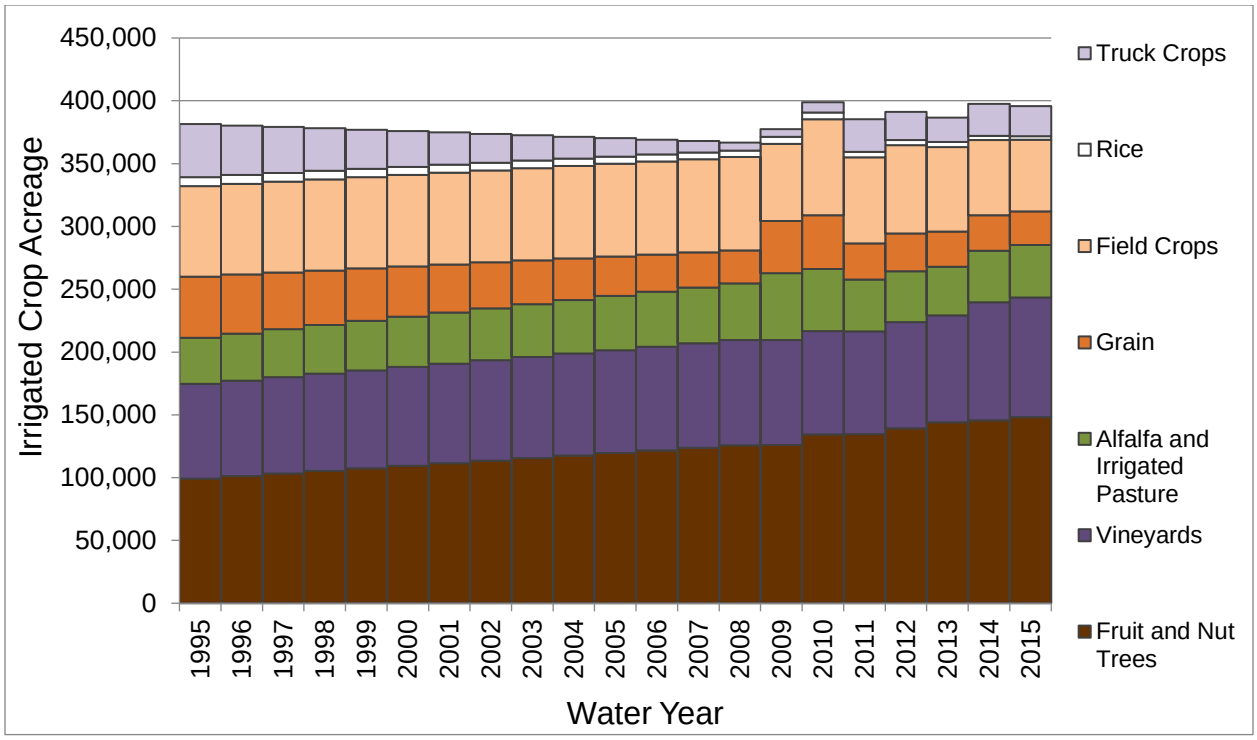


Figure 9b: Irrigated Crop Acreages- Subregion 1 (North Delta Subregion)

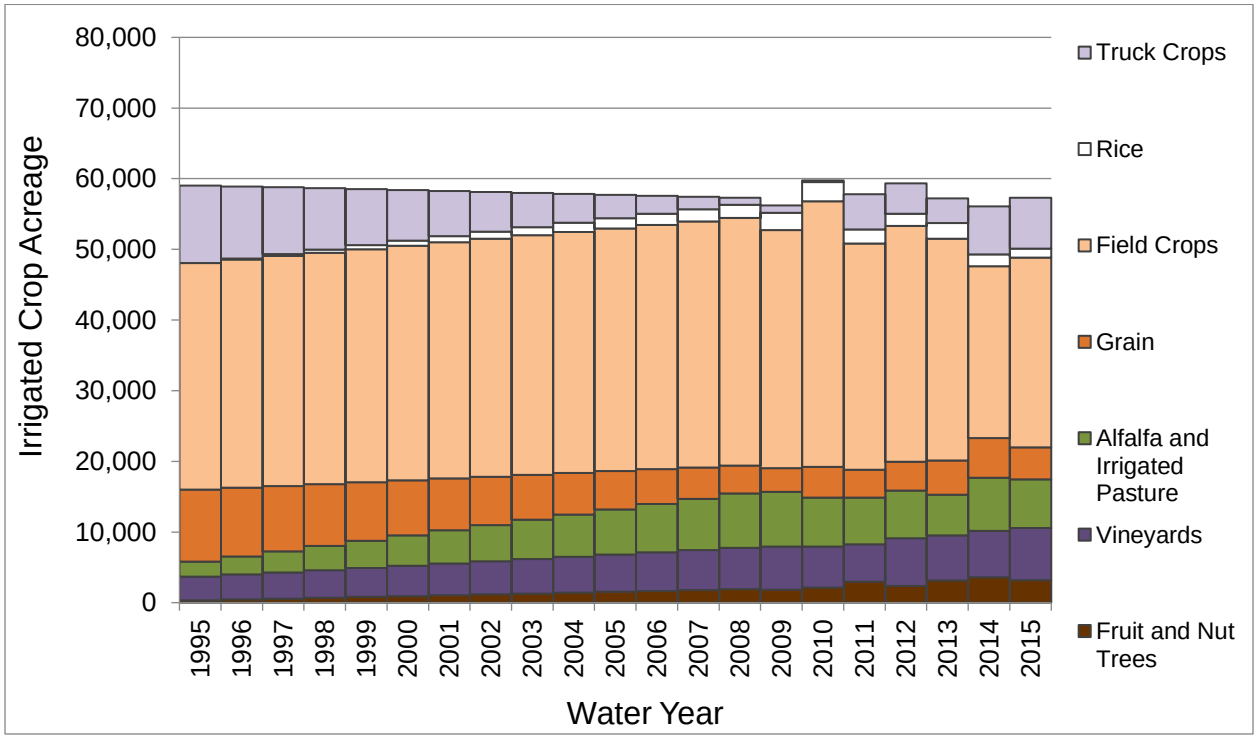


Figure 9c: Irrigated Crop Acreages- Subregion 2 (Woodbridge Subregion)

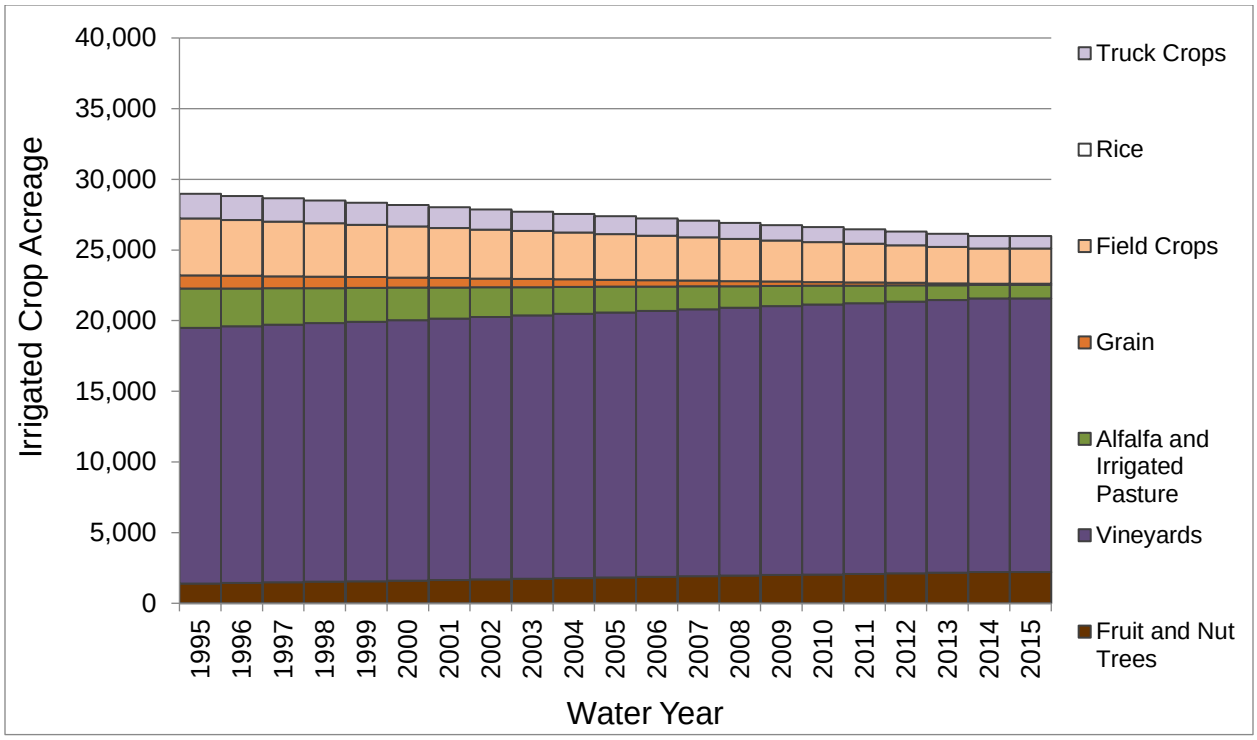


Figure 9d: Irrigated Crop Acreages- Subregion 4 (North San Joaquin Subregion)

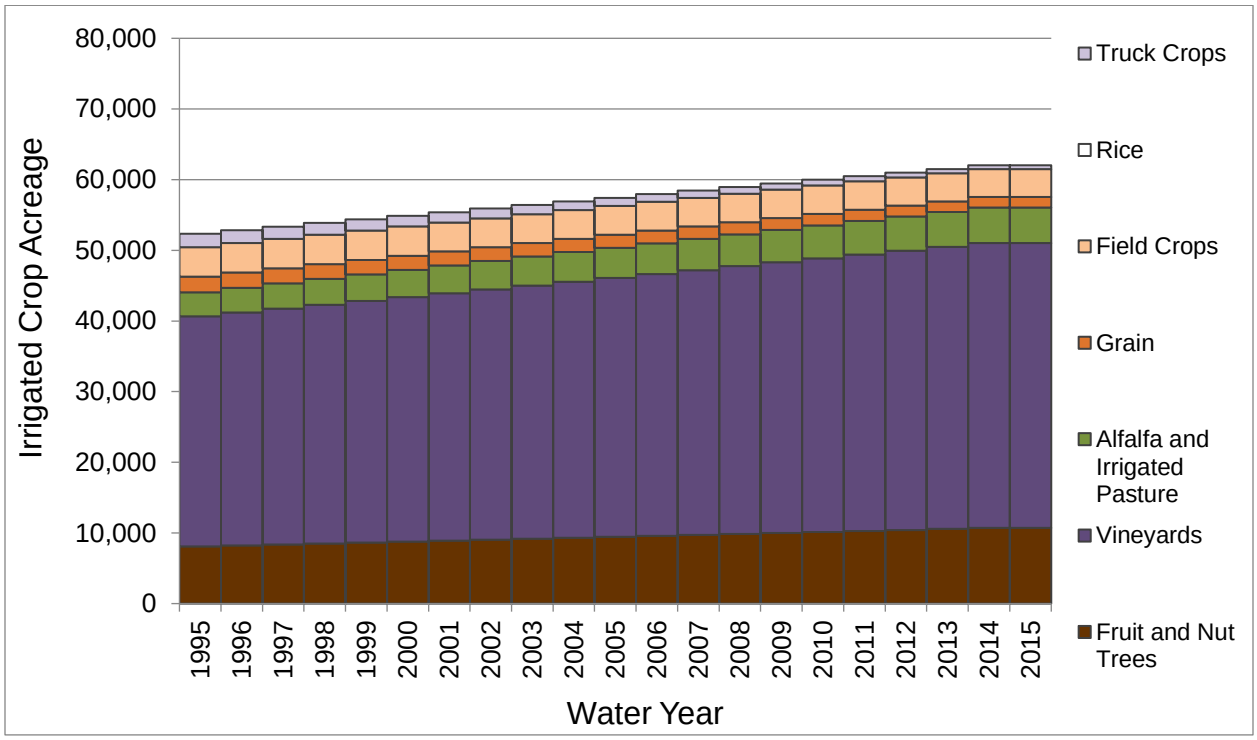


Figure 9e: Irrigated Crop Acreages- Subregion 5 (Calaveras Subregion)

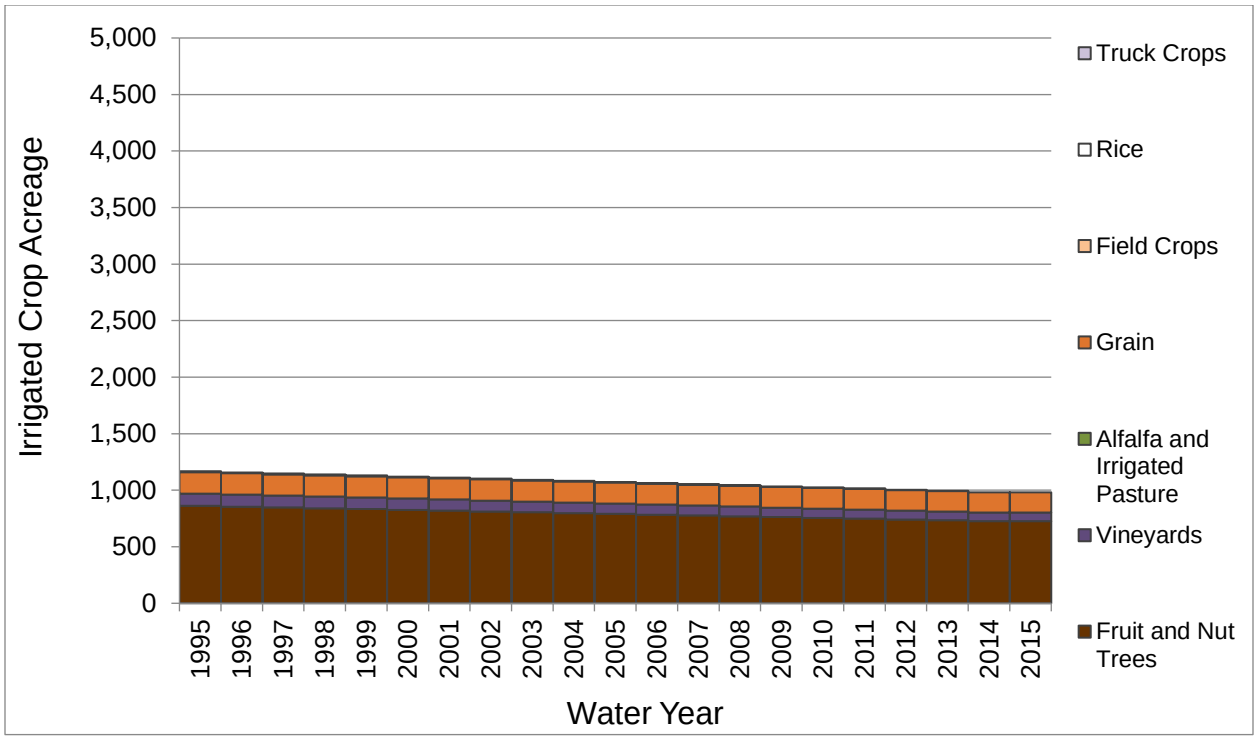


Figure 9f: Irrigated Crop Acreages- Subregion 7 (Stockton East Subregion)

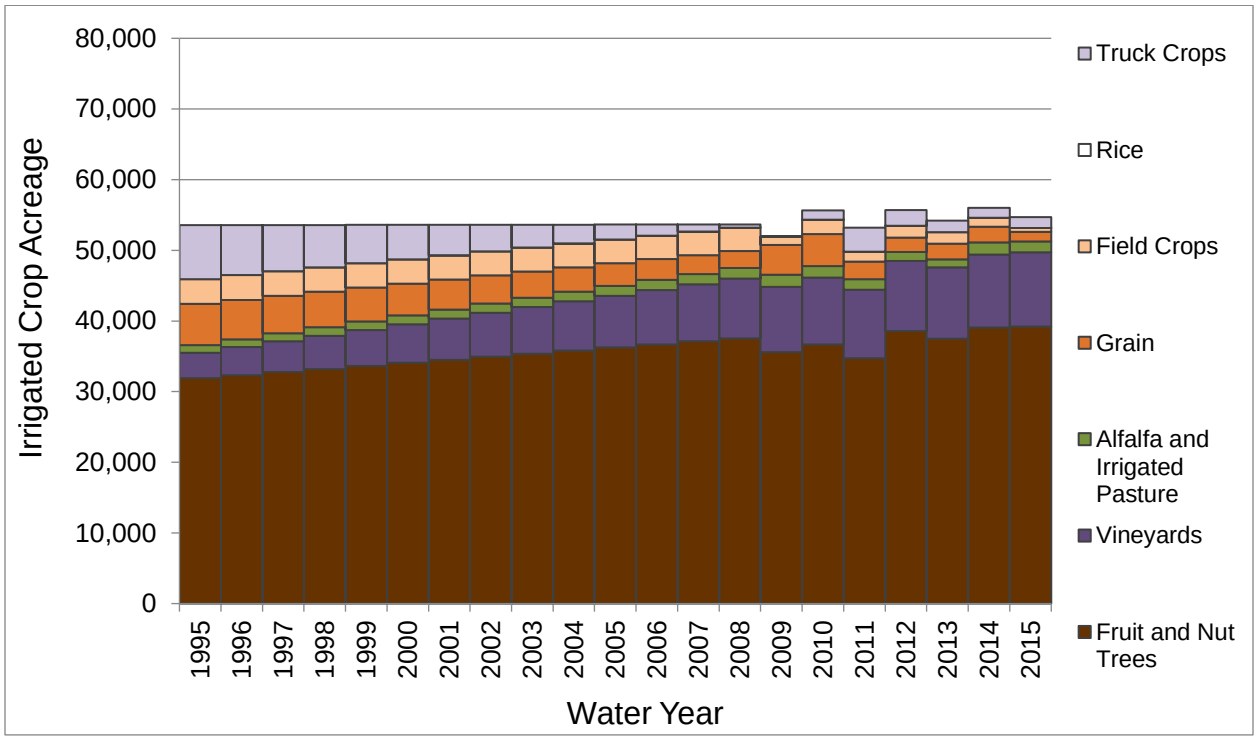


Figure 9g: Irrigated Crop Acreages- Subregion 8 (Central San Joaquin Subregion)

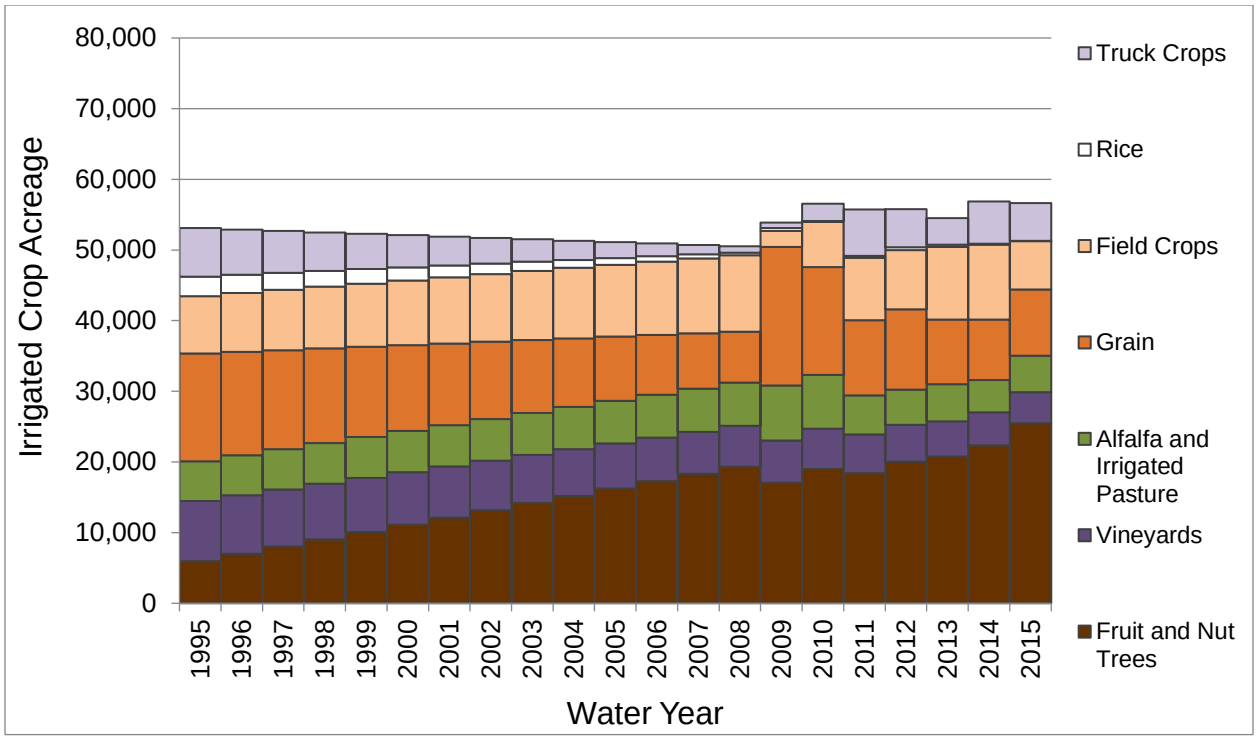


Figure 9h: Irrigated Crop Acreages- Subregion 11 (South San Joaquin East Subregion)

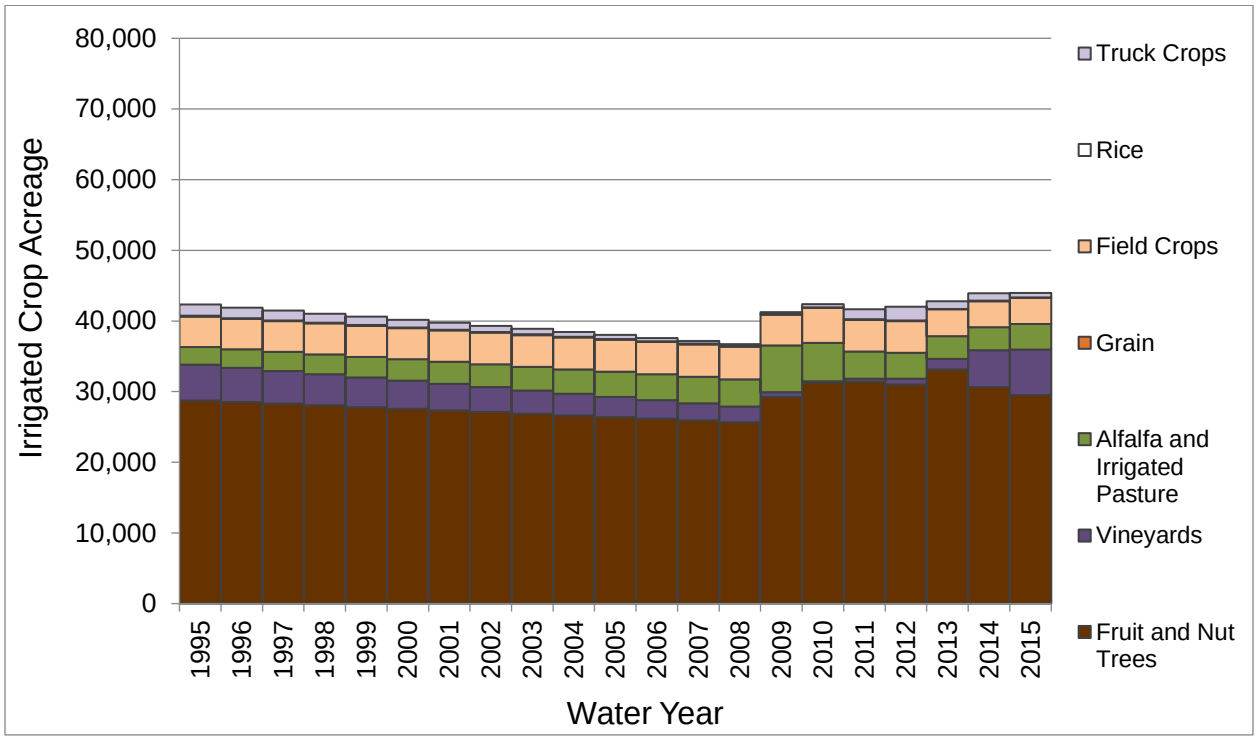


Figure 9i: Irrigated Crop Acreages- Subregion 13 (Oakdale West Subregion)

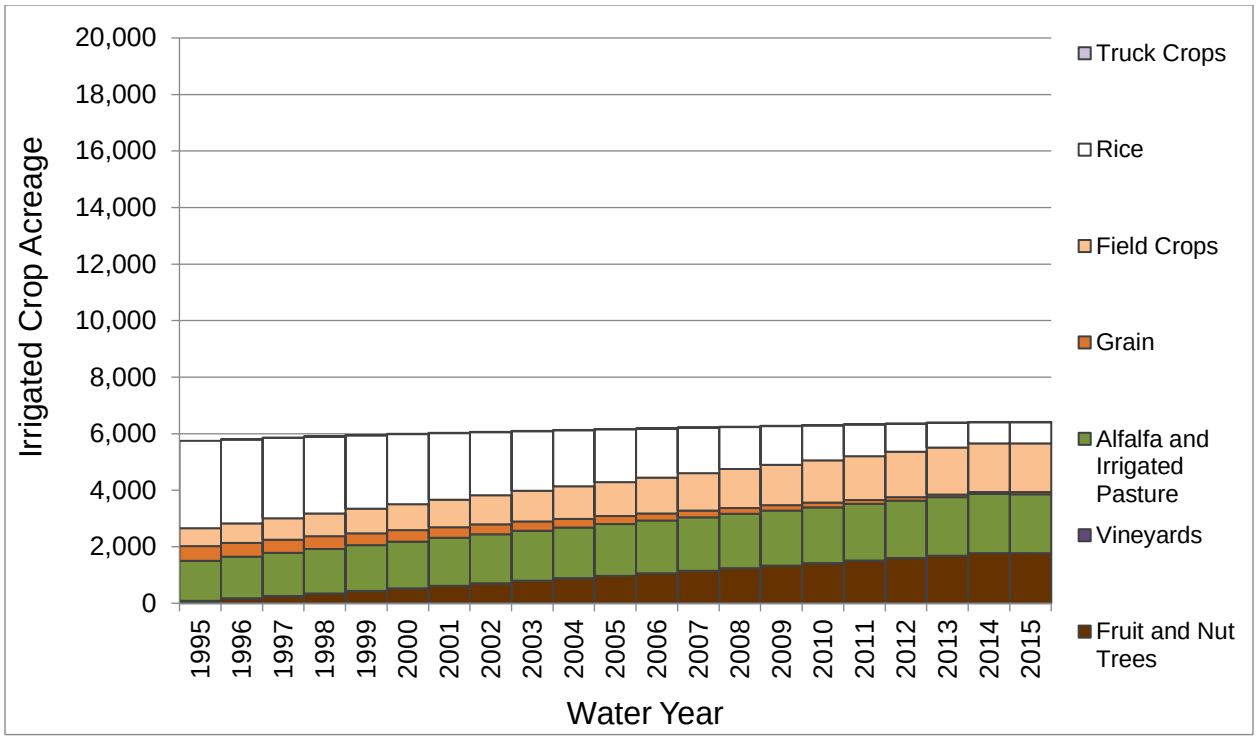


Figure 9j: Irrigated Crop Acreages- Subregion 14 (South Delta Subregion)

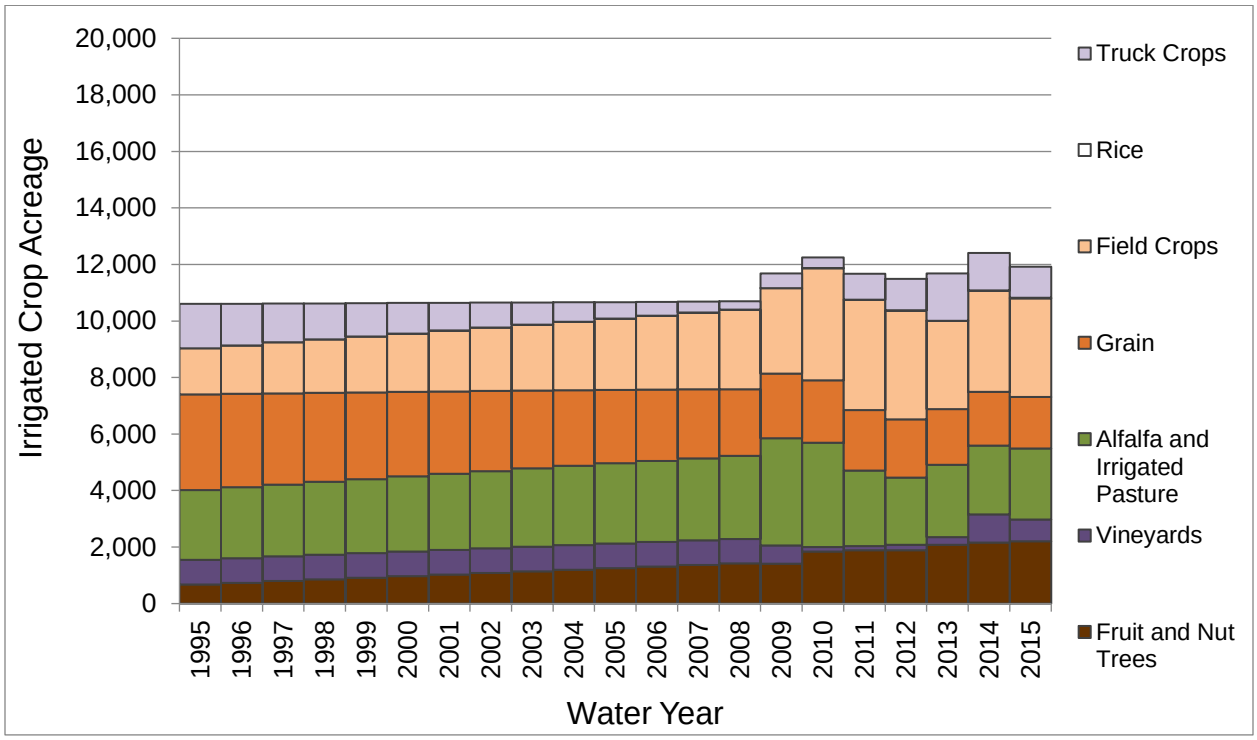


Figure 9k: Irrigated Crop Acreages- Subregion 15 (South San Joaquin West Subregion)

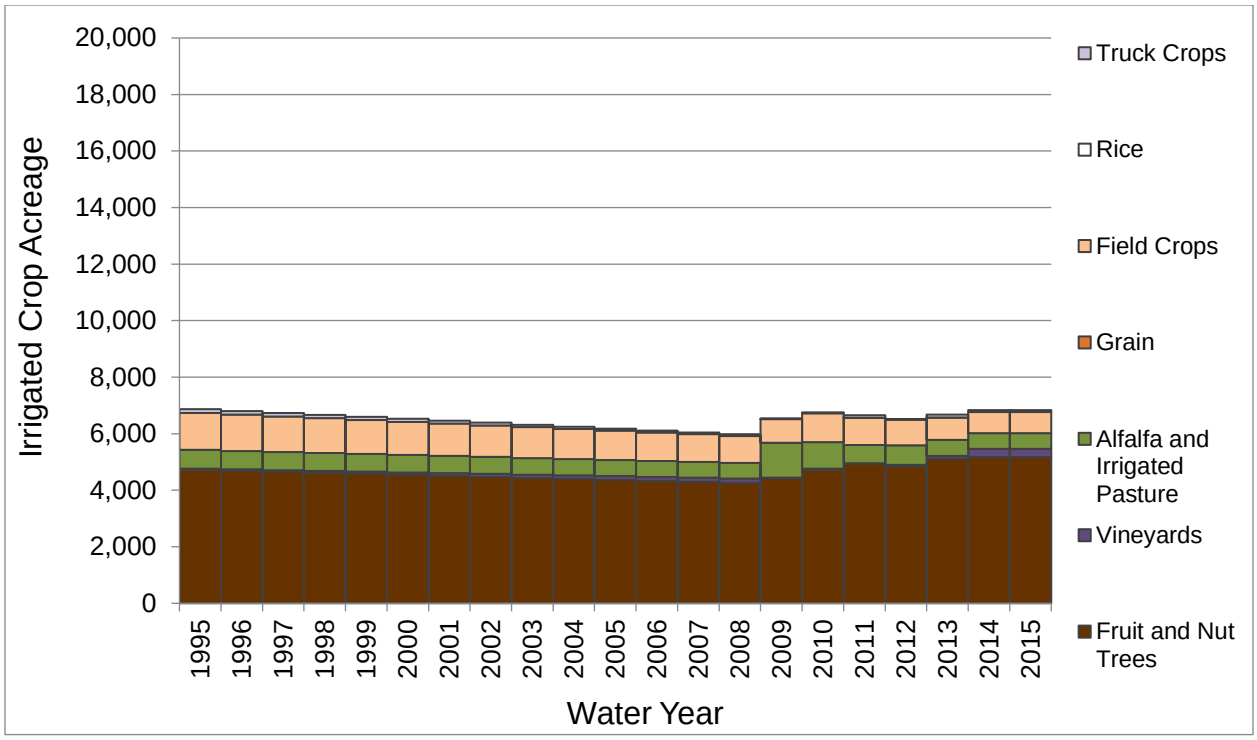


Figure 9l: Irrigated Crop Acreages- Subregion 17 (Stanislaus Subregion)

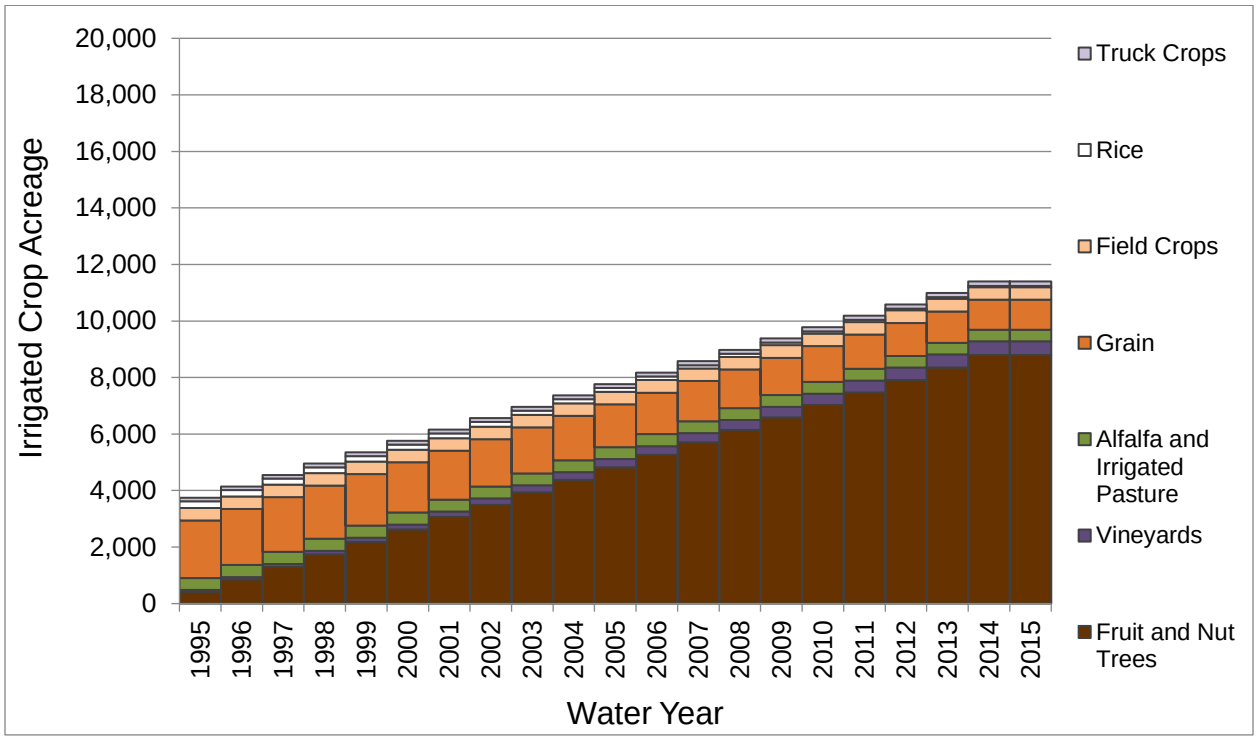


Figure 9m: Irrigated Crop Acreages- Subregion 18 (Oakdale East Subregion)

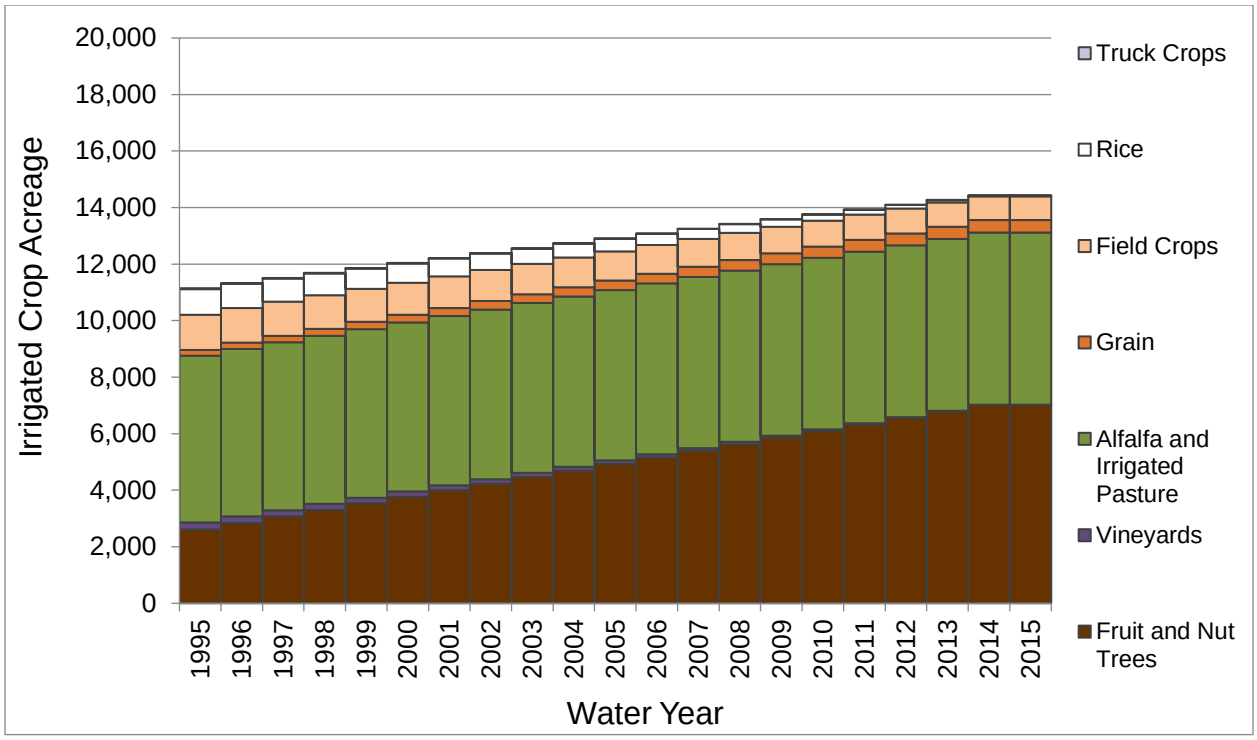


Figure 10: Urban Population Centers in Eastern San Joaquin Subbasin

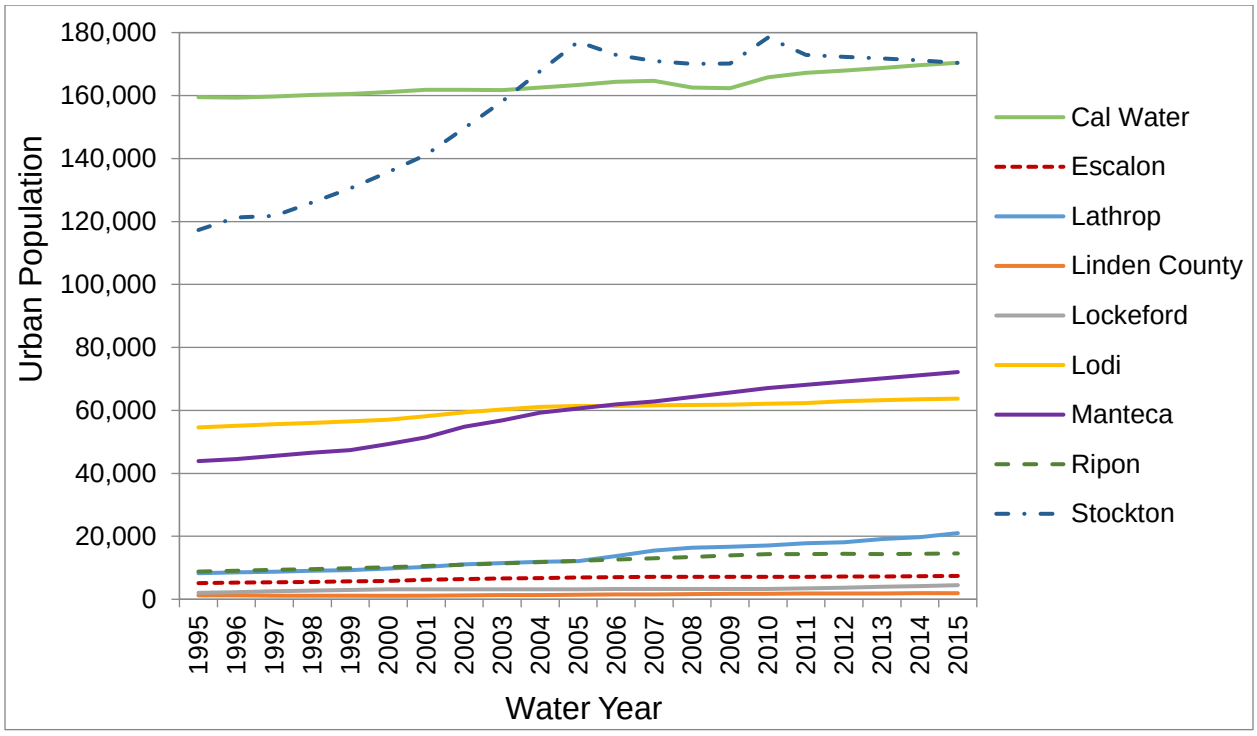


Figure 11: Urban Per Capita Water Use in Eastern San Joaquin Subbasin

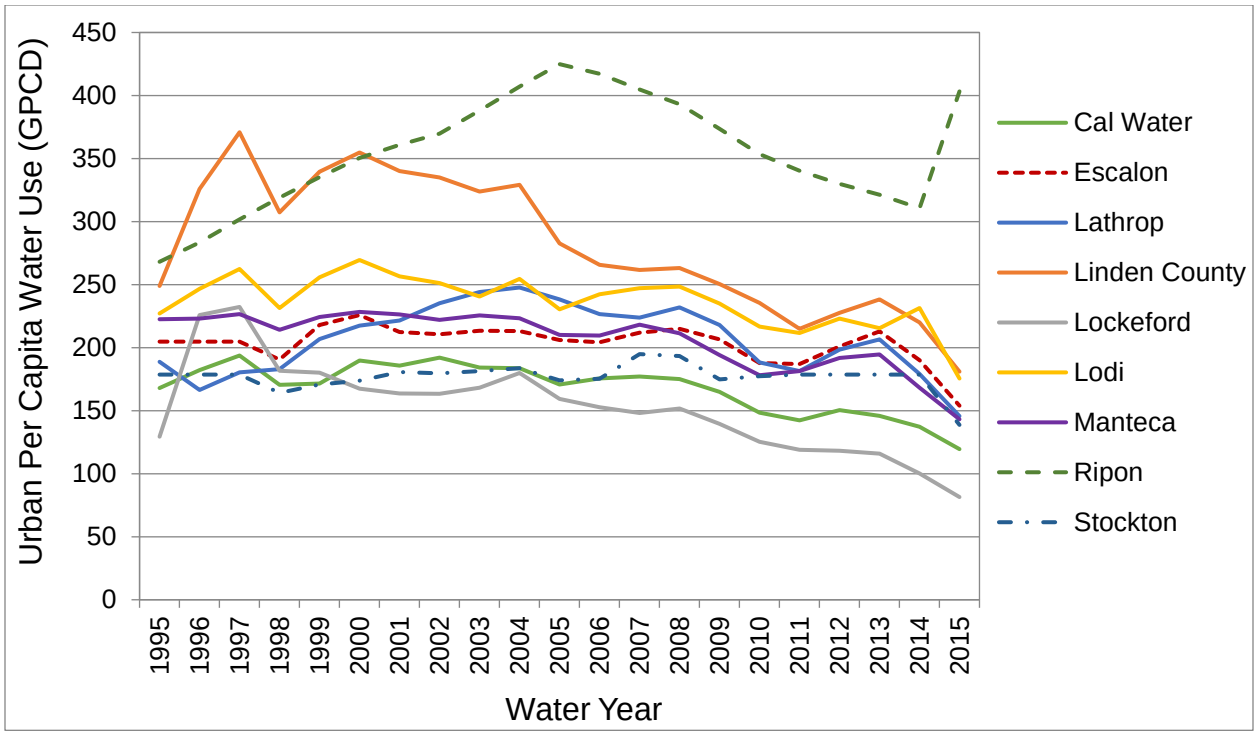


Figure 12a: Urban Demand- Eastern San Joaquin Subbasin

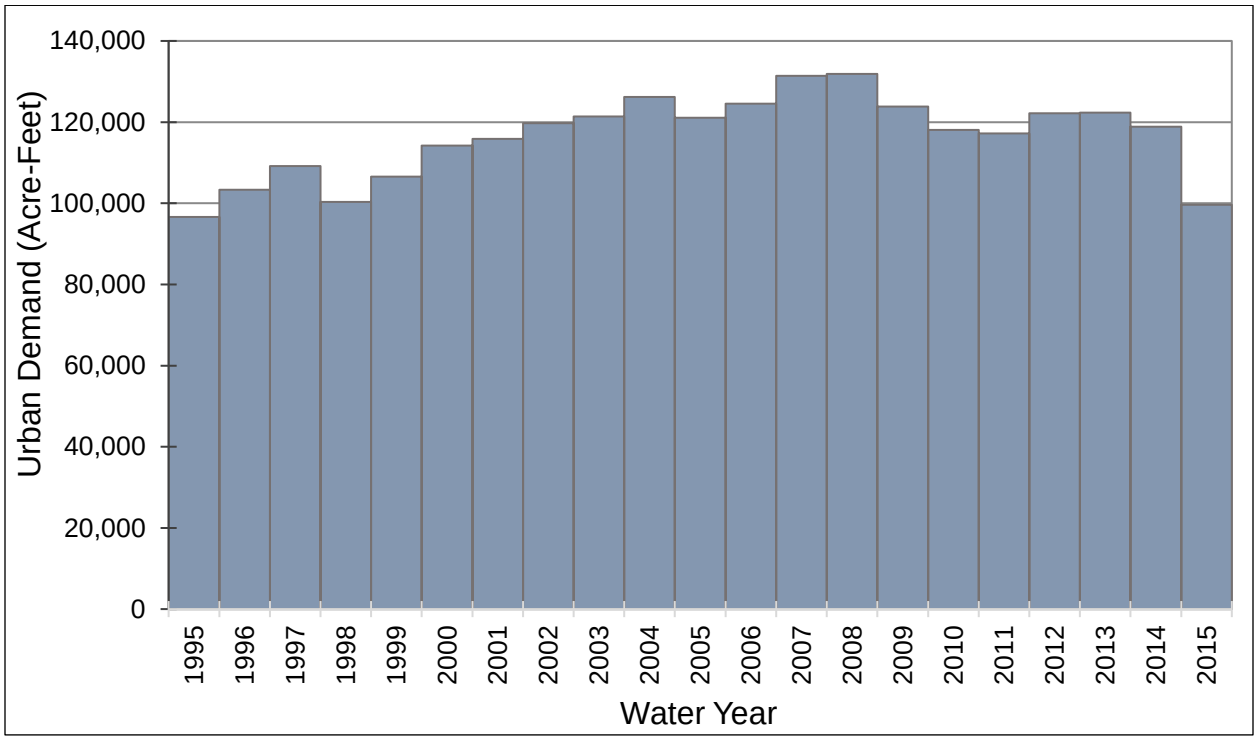


Figure 12b: Urban Demand- Subregion 3 (Lodi Subregion)

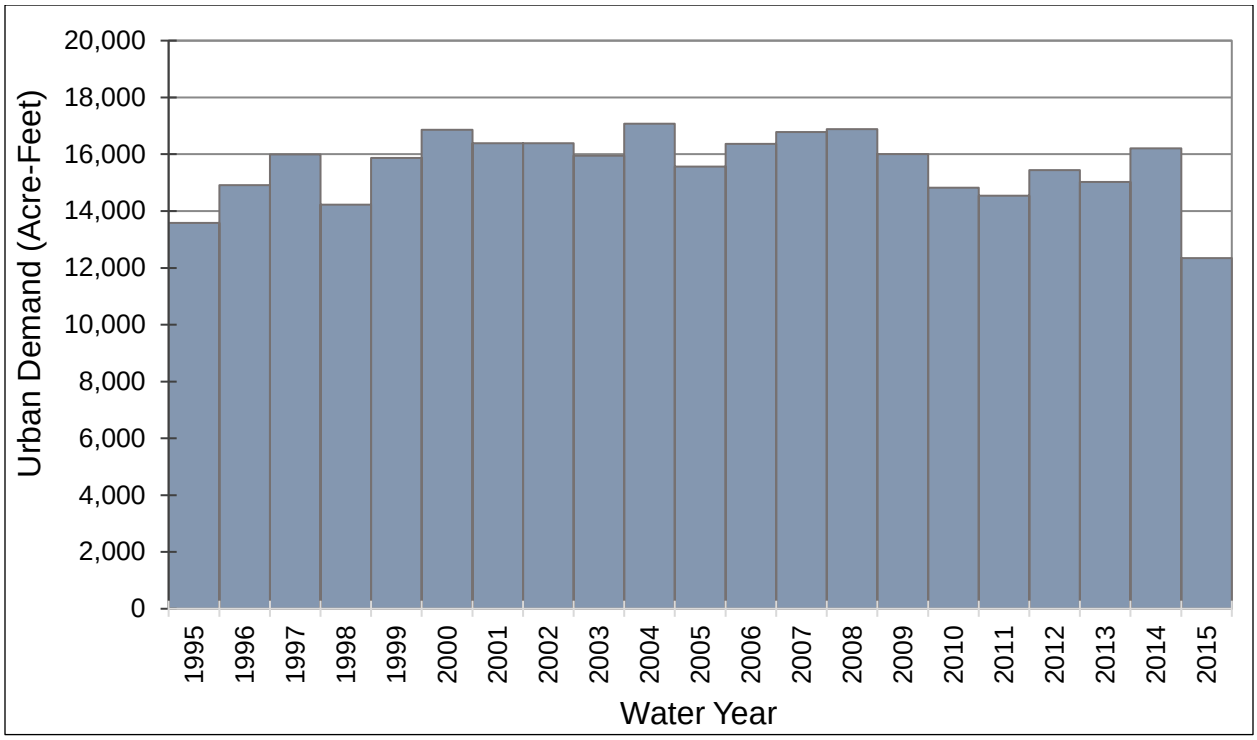


Figure 12c: Urban Demand- Subregion 6 (Stockton Subregion)

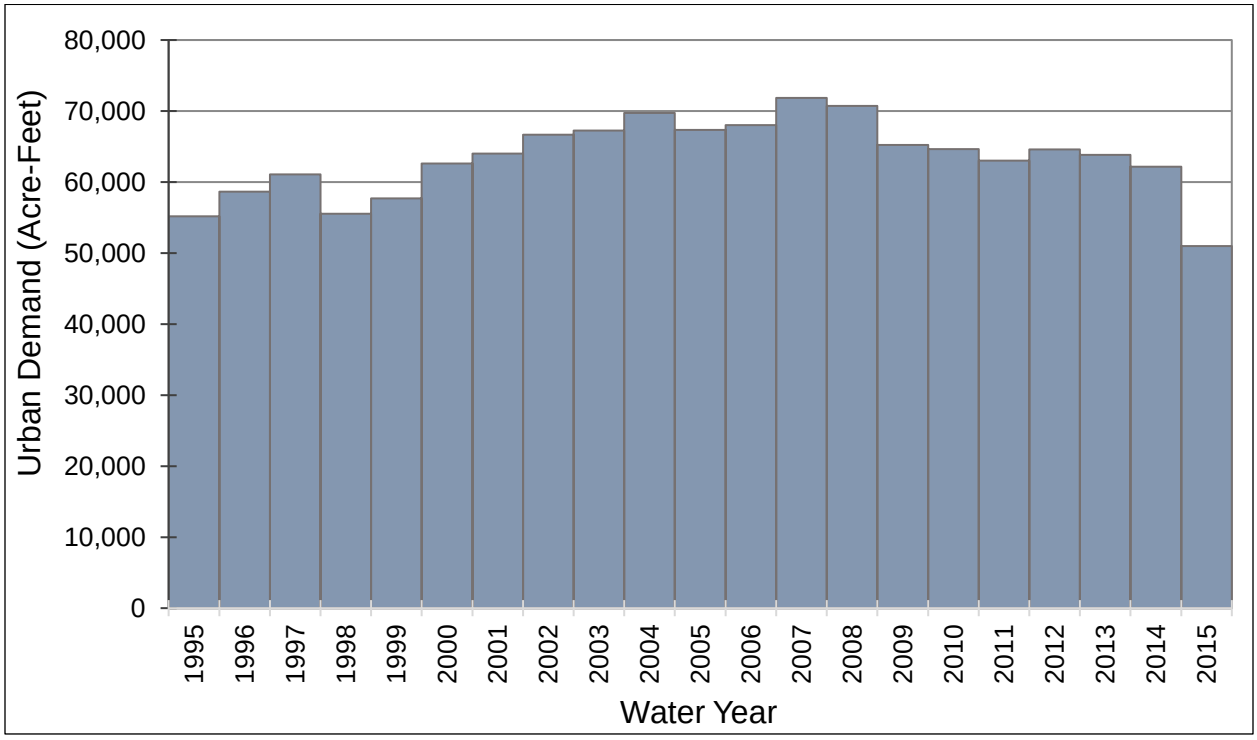


Figure 12d: Urban Demand- Subregion 9 (Lathrop Subregion)

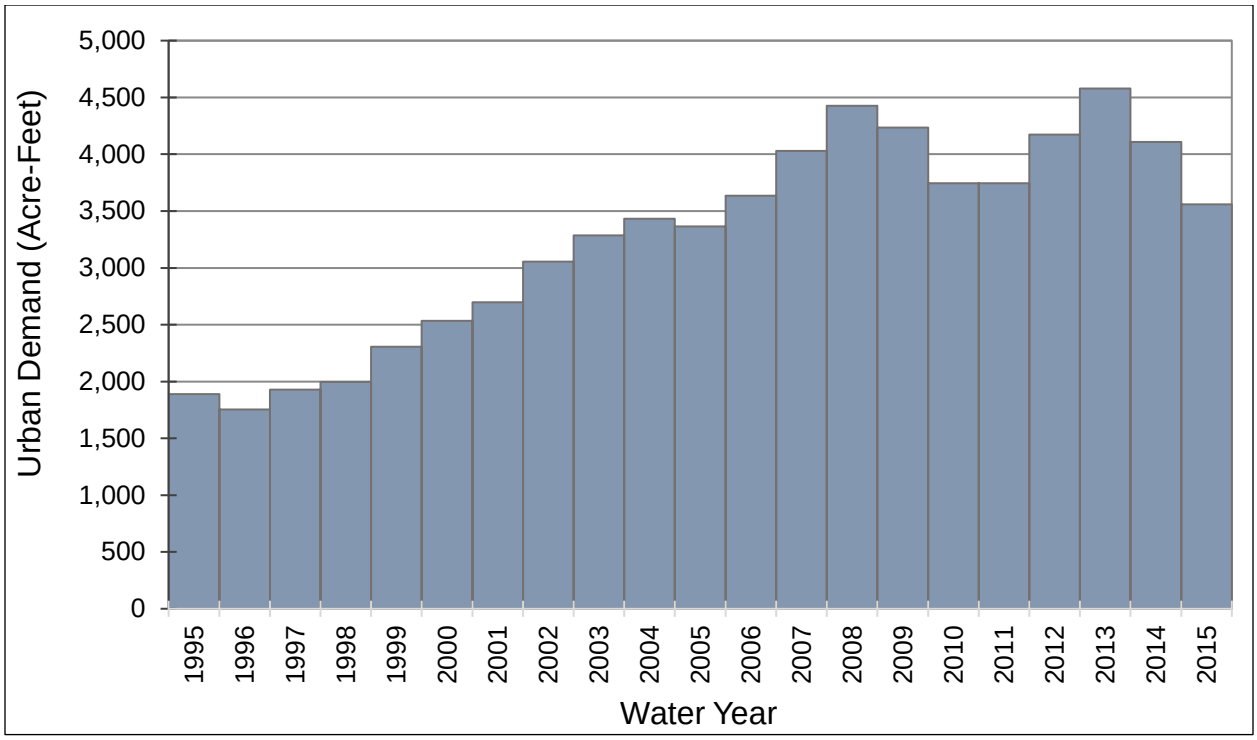


Figure 12e: Urban Demand- Subregion 10 (Manteca Subregion)

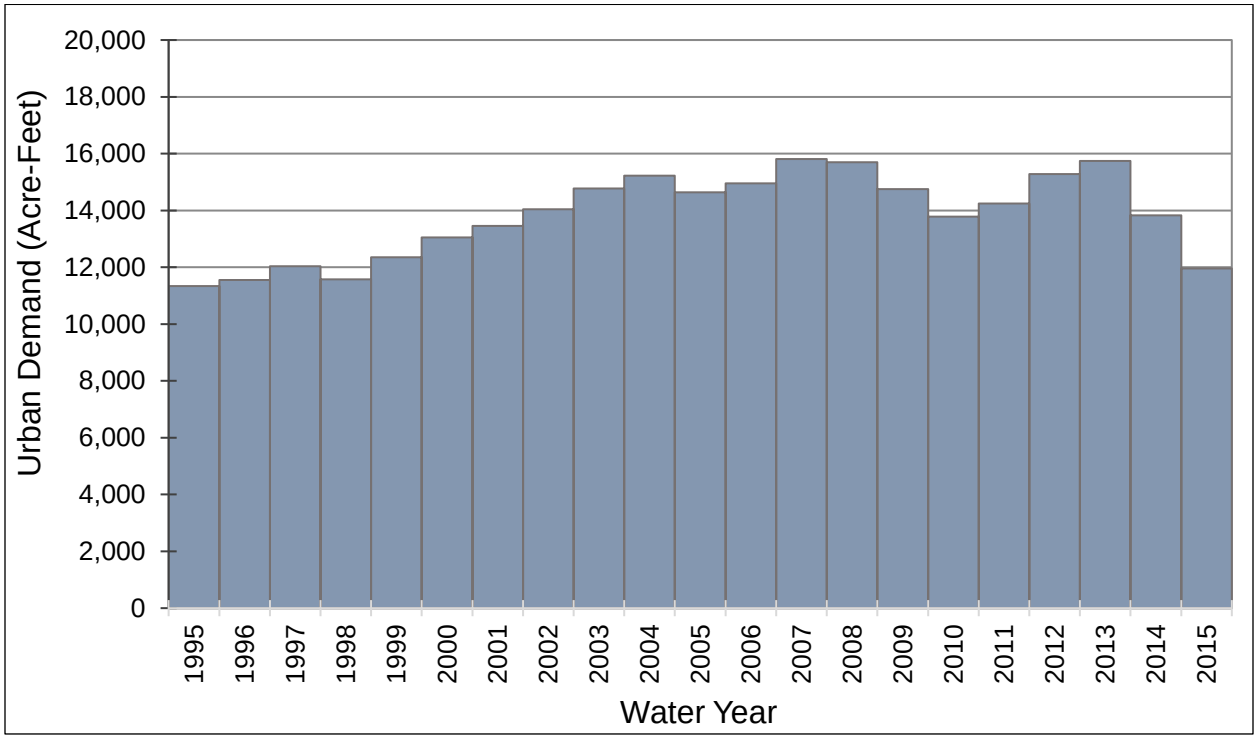


Figure 12f: Urban Demand- Subregion 12 (Escalon Subregion)

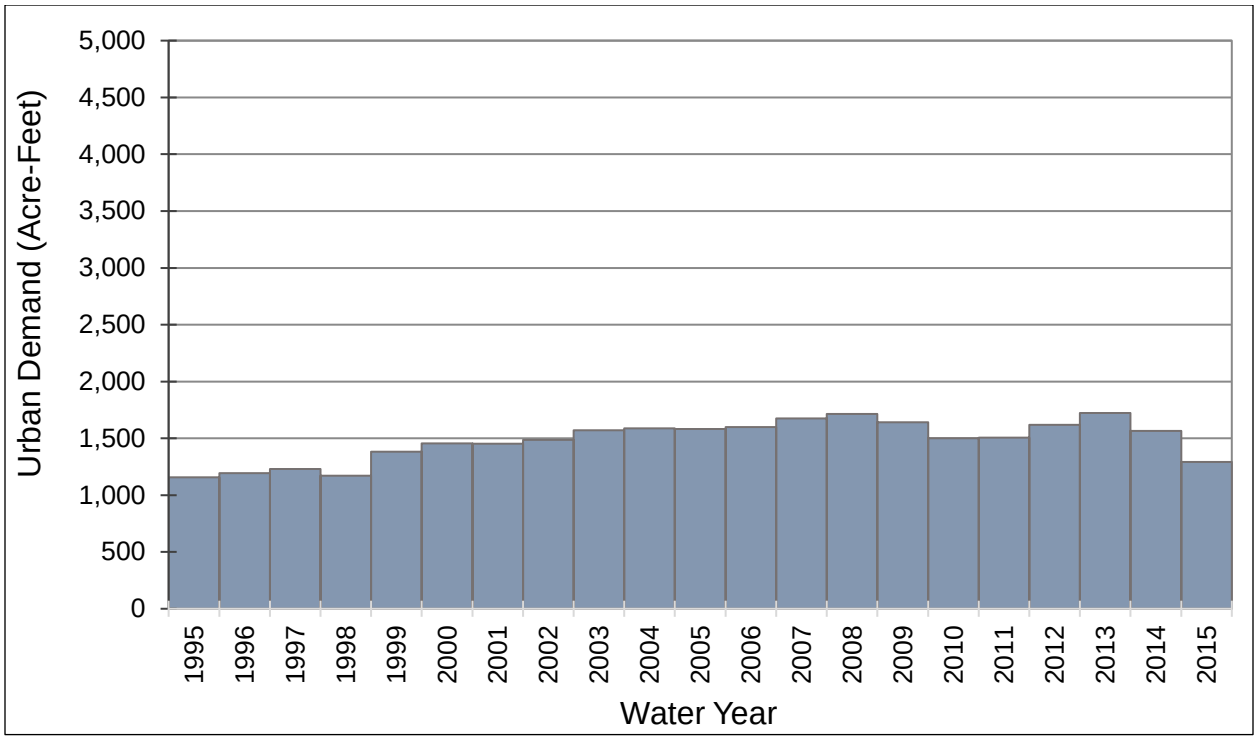


Figure 12g: Urban Demand- Subregion 16 (Ripon Subregion)

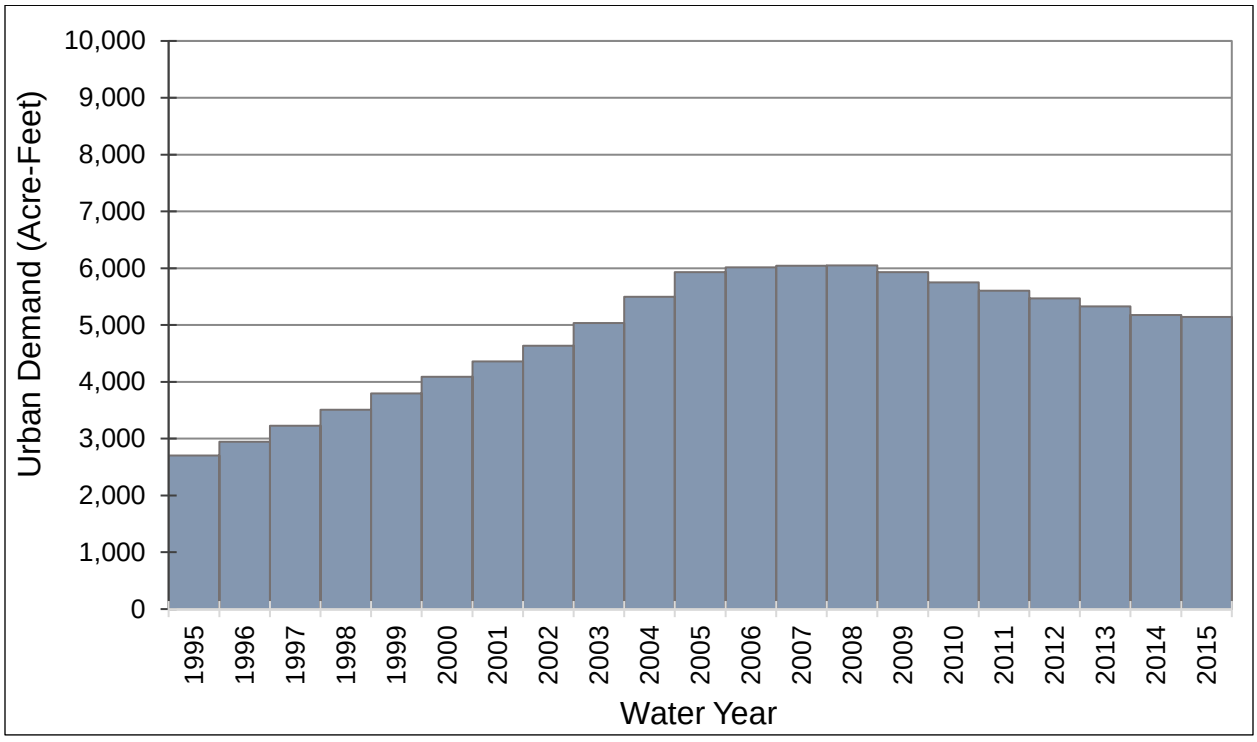


Figure 13: Annual Crop Evapotranspiration

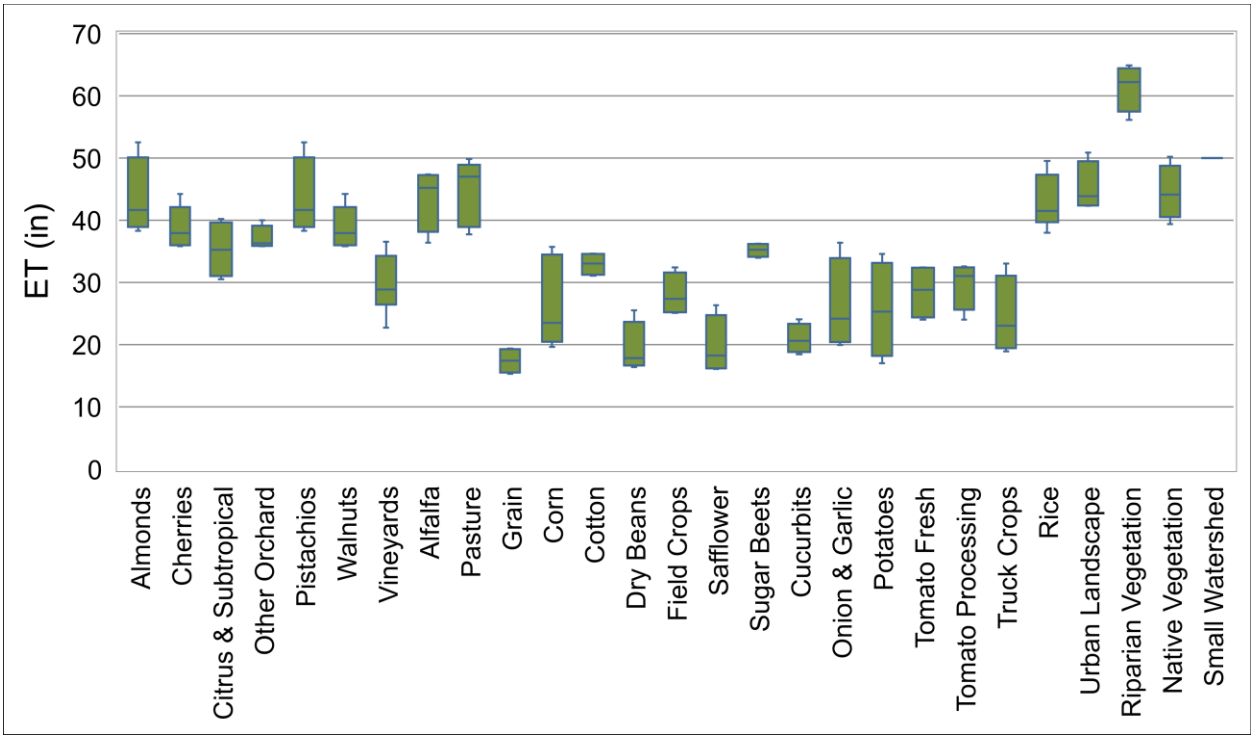


Figure 14: Annual Precipitation

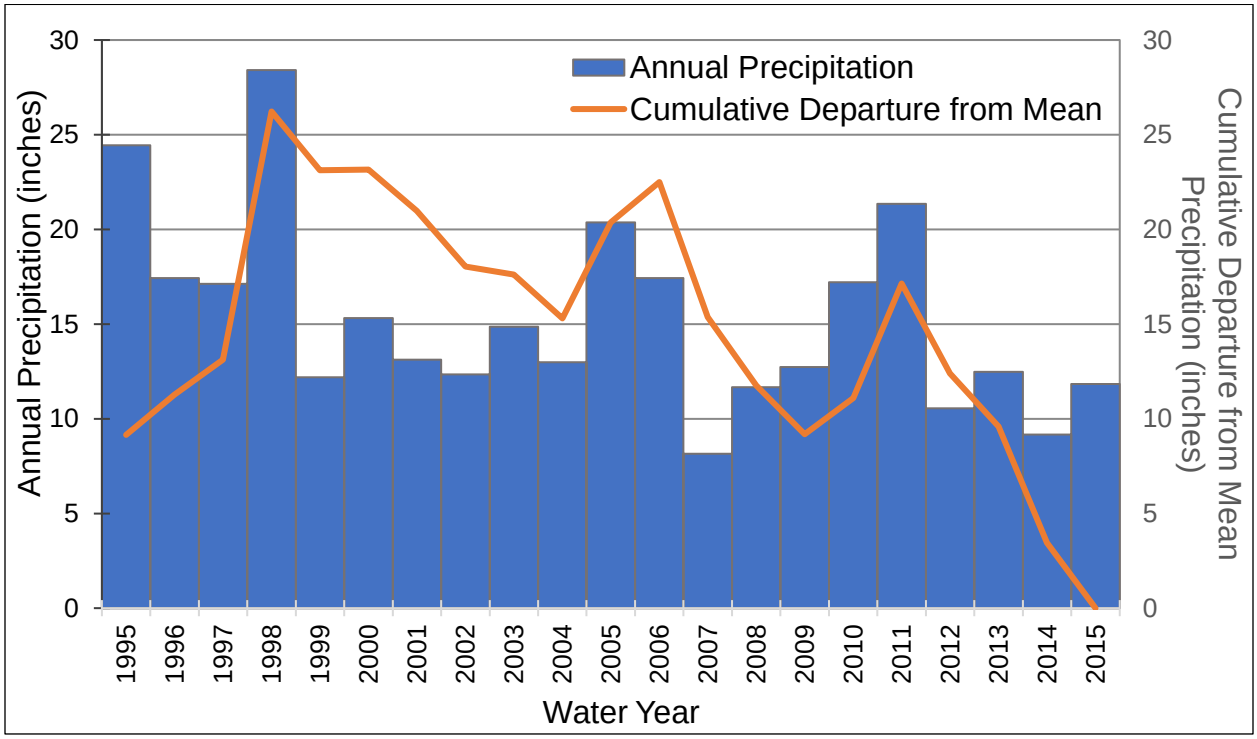


Figure 15a: Agricultural Demand- Eastern San Joaquin Subbasin

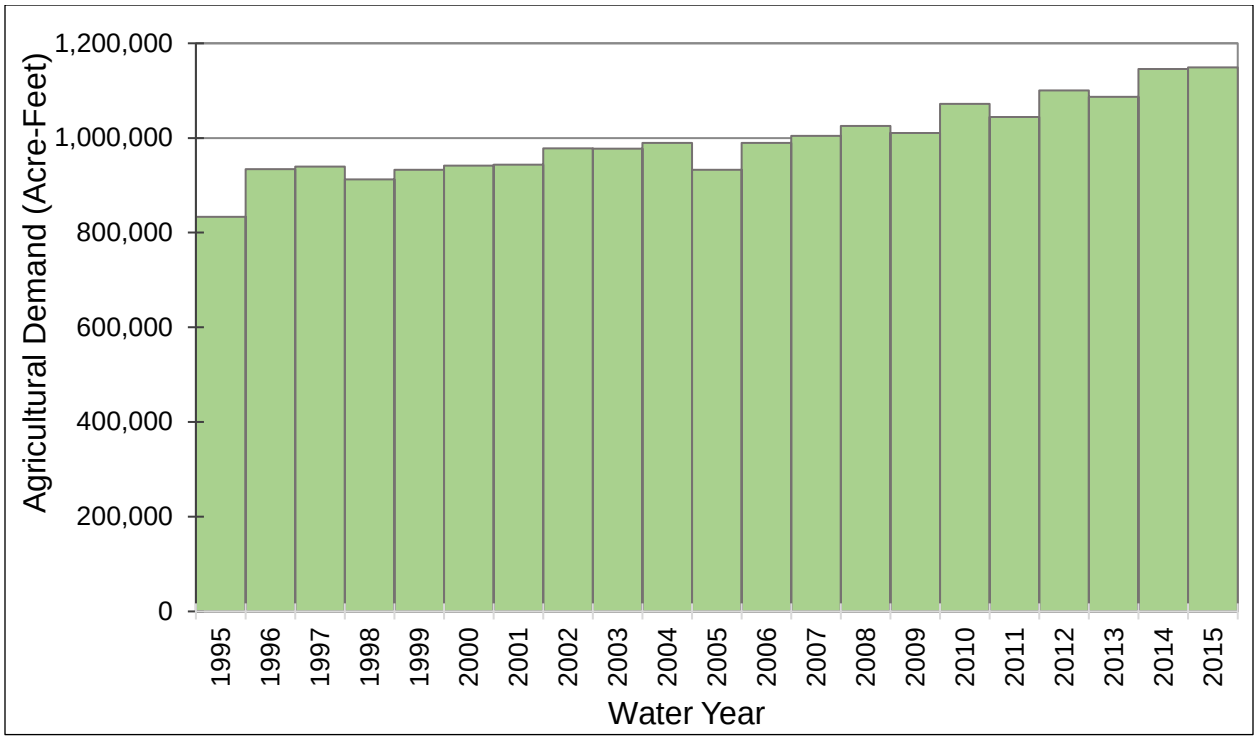


Figure 15b: Unit Agricultural Water Use and ETAW- Eastern San Joaquin Subbasin

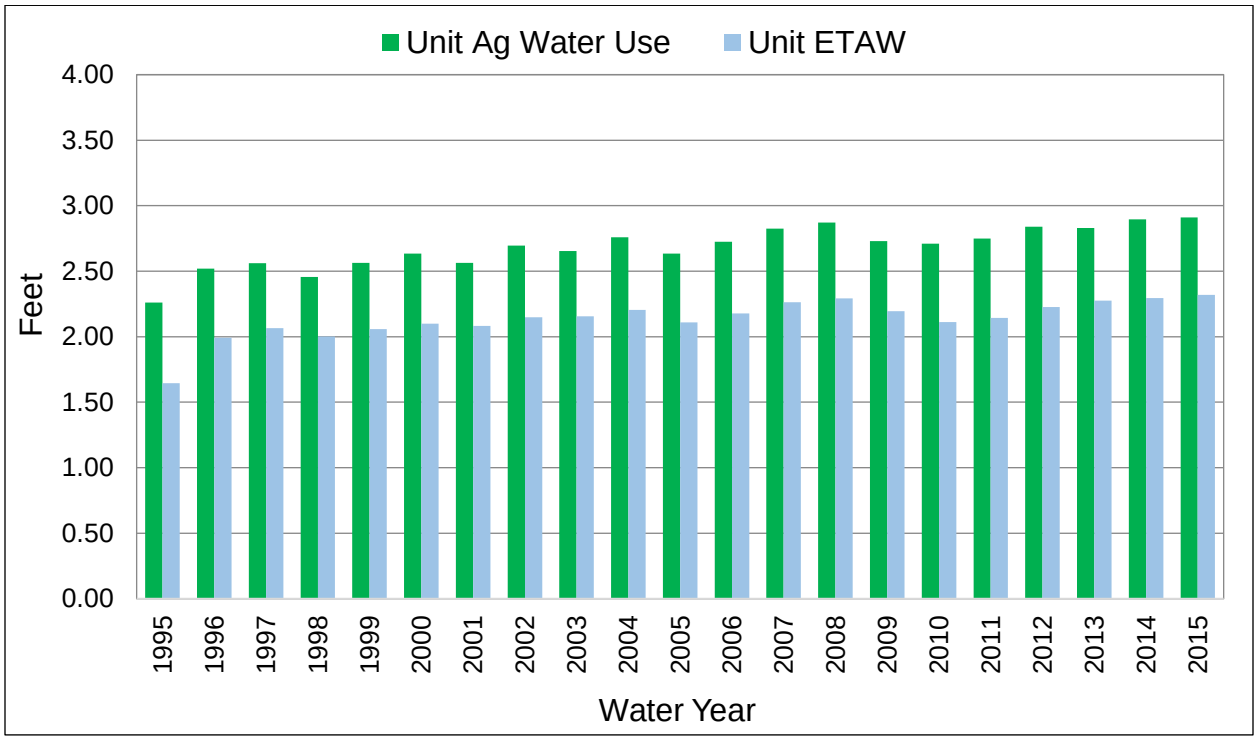


Figure 15c: Agricultural Demand- Subregion 2 (Woodbridge Subregion)

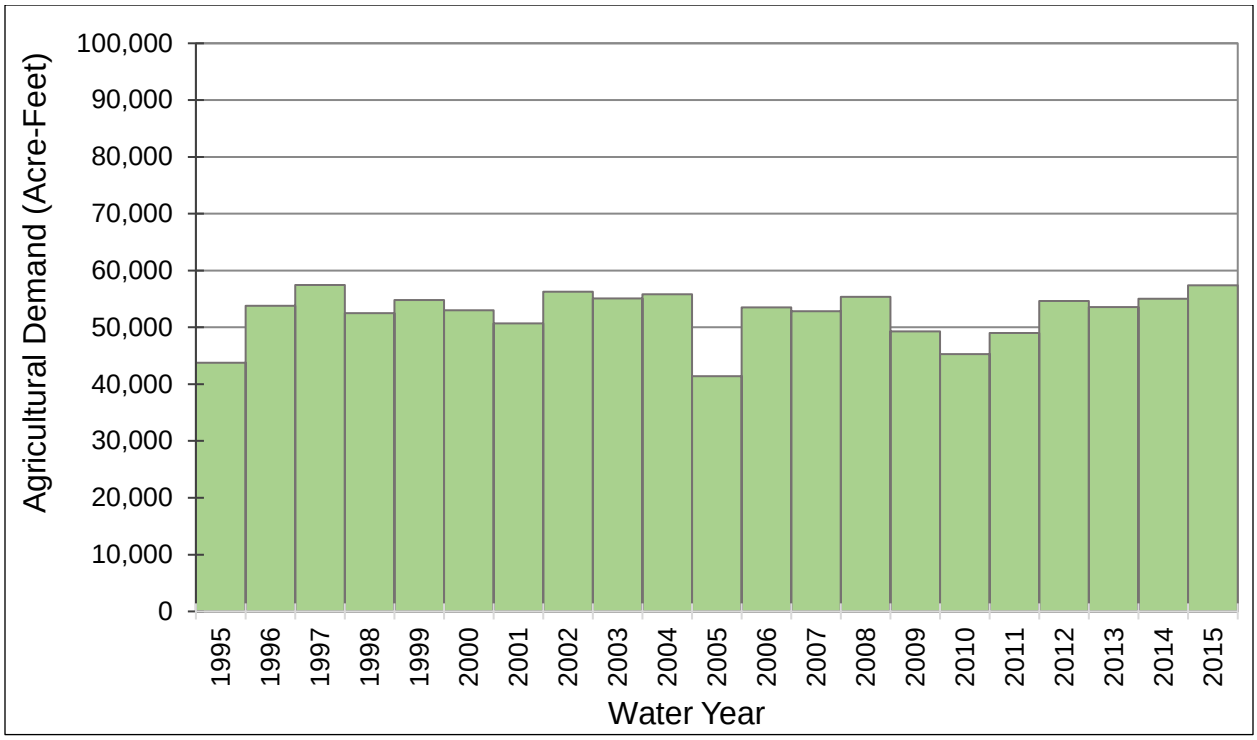


Figure 15d: Unit Agricultural Water Use and ETAW- Subregion 2 (Woodbridge Subregion)

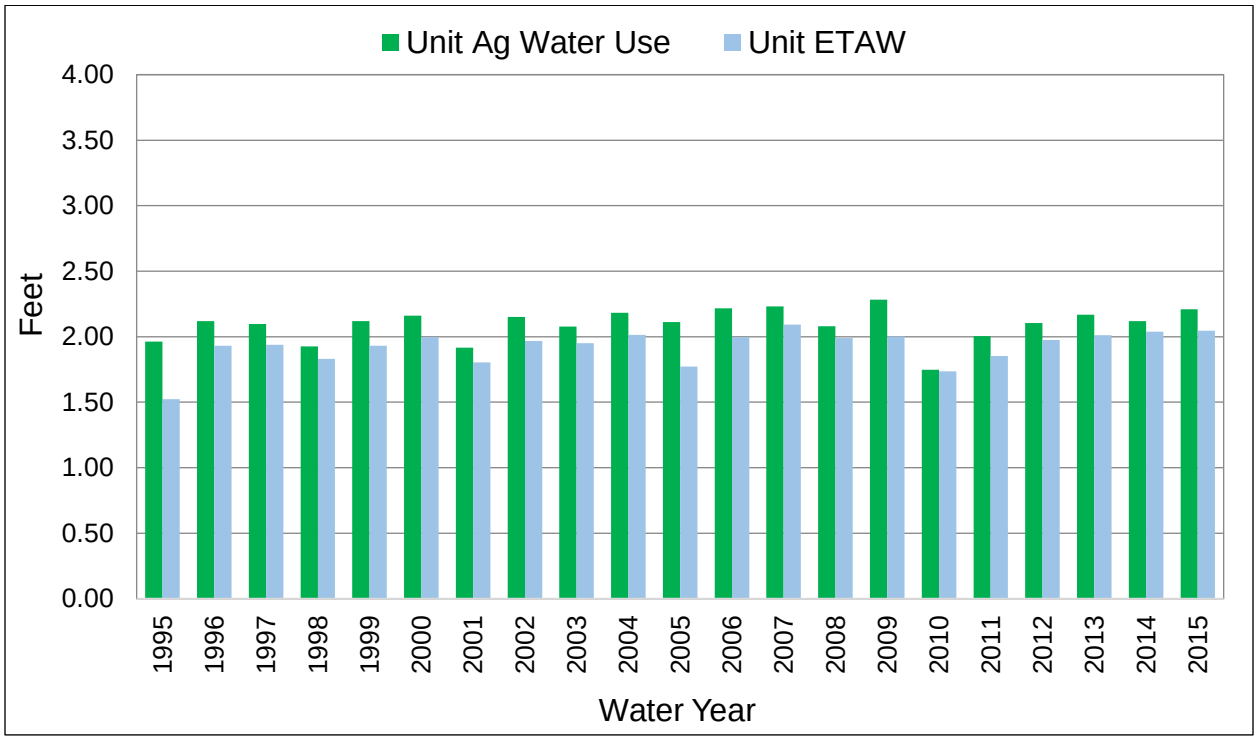


Figure 15e: Agricultural Demand- Subregion 4 (North San Joaquin Subregion)

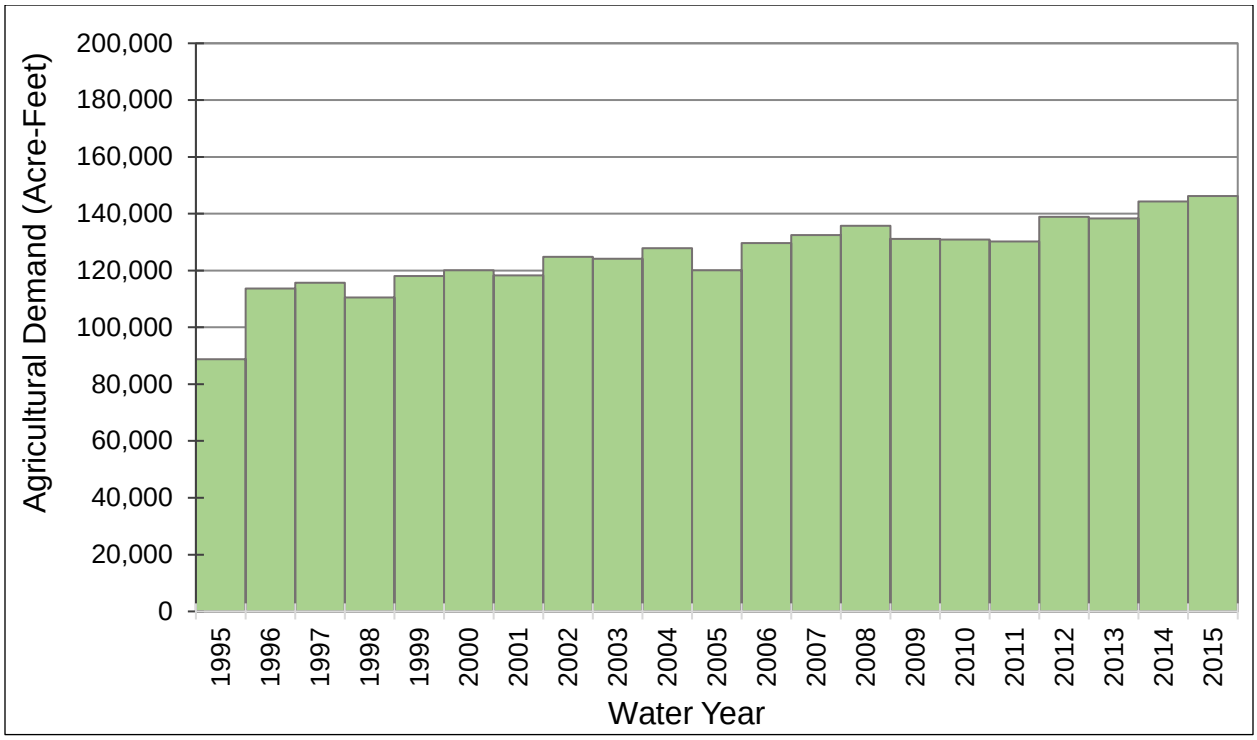


Figure 15f: Unit Agricultural Water Use and ETAW- Subregion 4 (North San Joaquin Subregion)

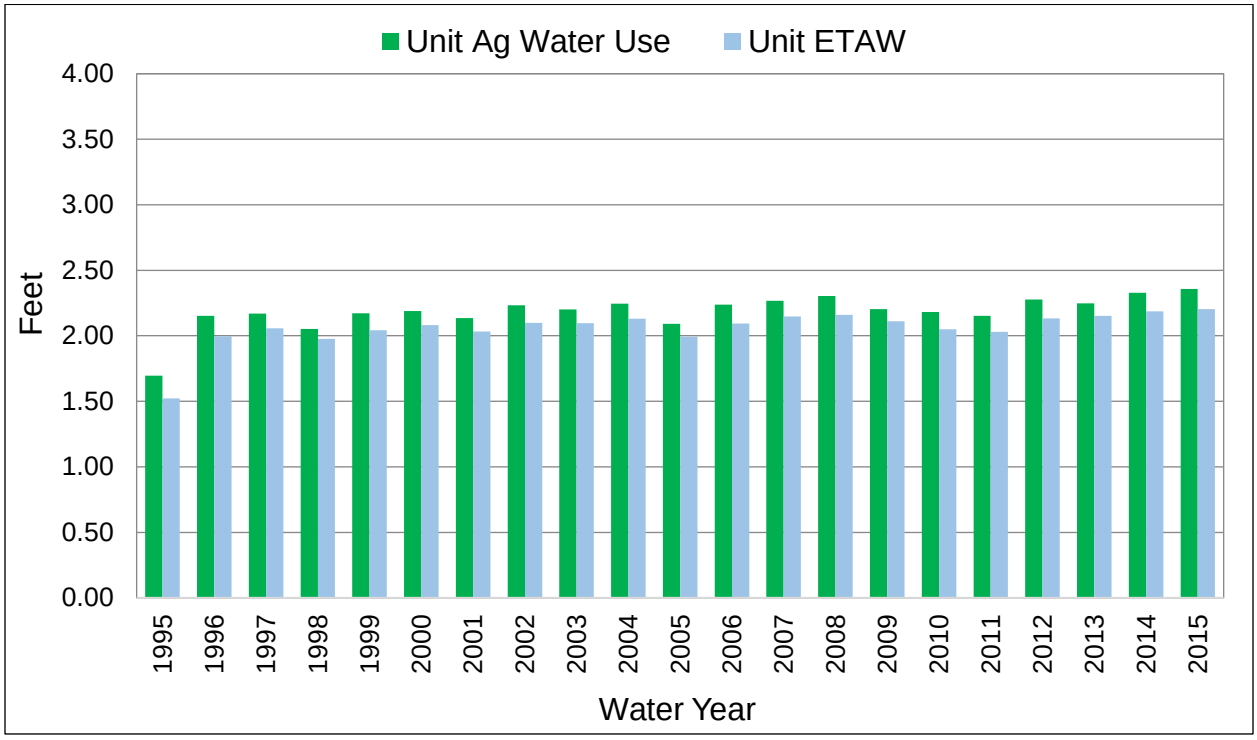


Figure 15g: Agricultural Demand- Subregion 7 (Stockton East Subregion)

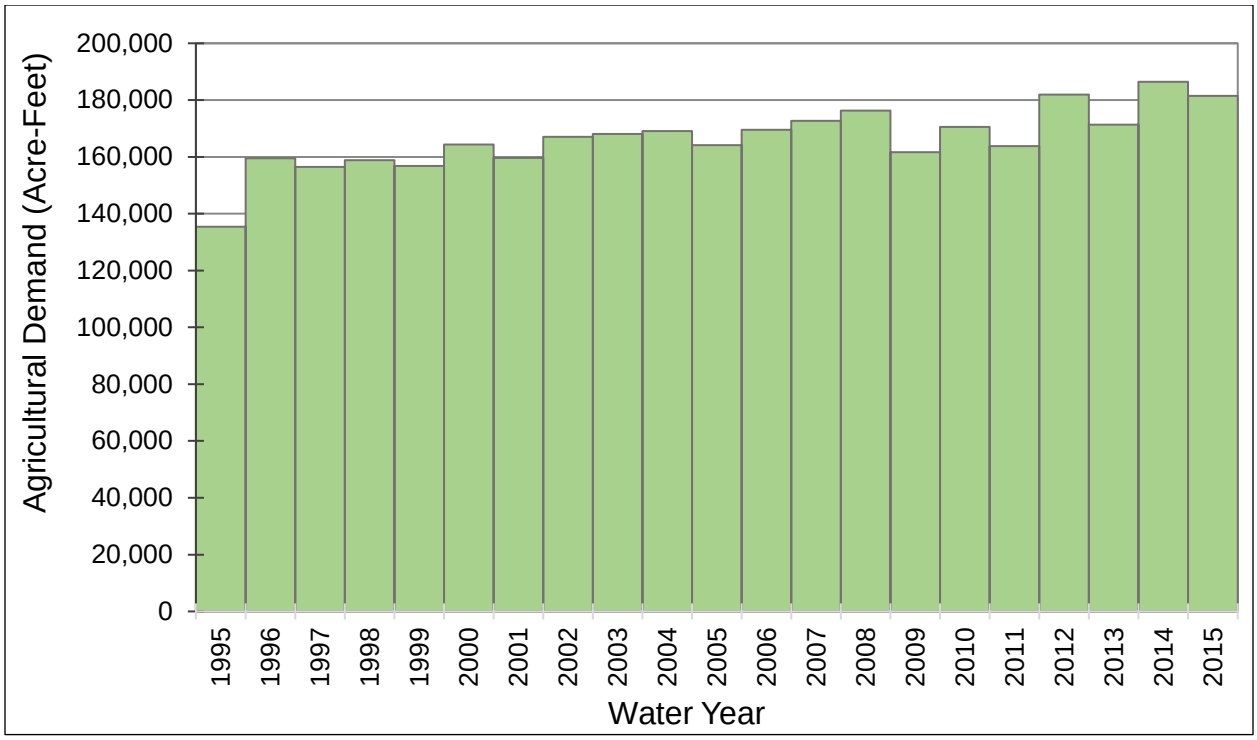


Figure 15h: Unit Agricultural Water Use and ETAW- Subregion 7 (Stockton East Subregion)

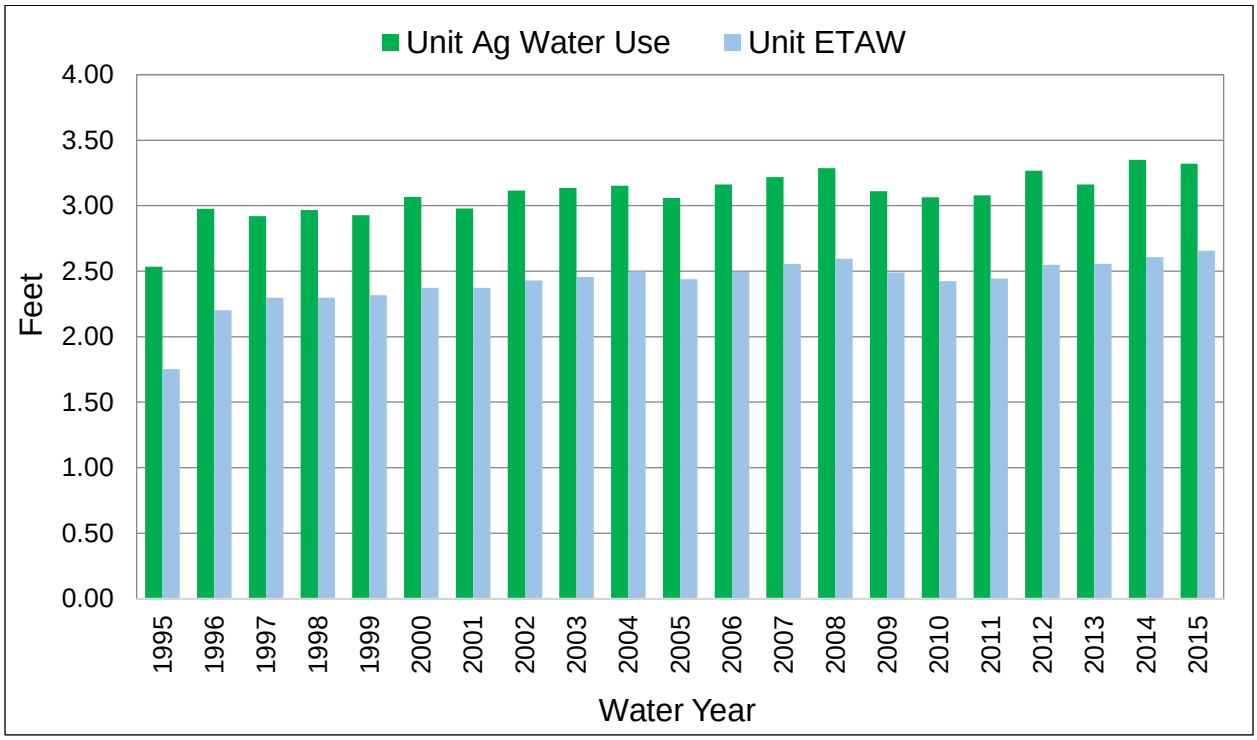


Figure 15i: Agricultural Demand- Subregion 11 (South San Joaquin East Subregion)

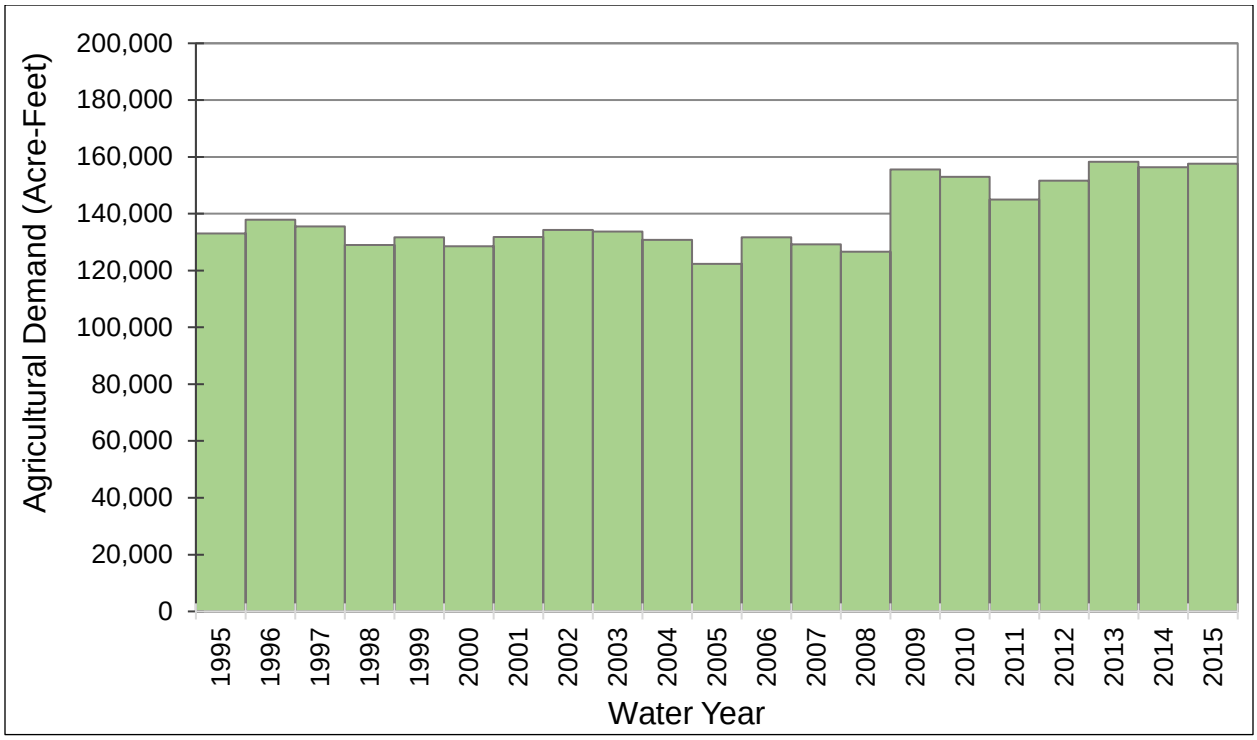


Figure 15j: Unit Agricultural Water Use and ETAW- Subregion 11 (South San Joaquin East Subregion)

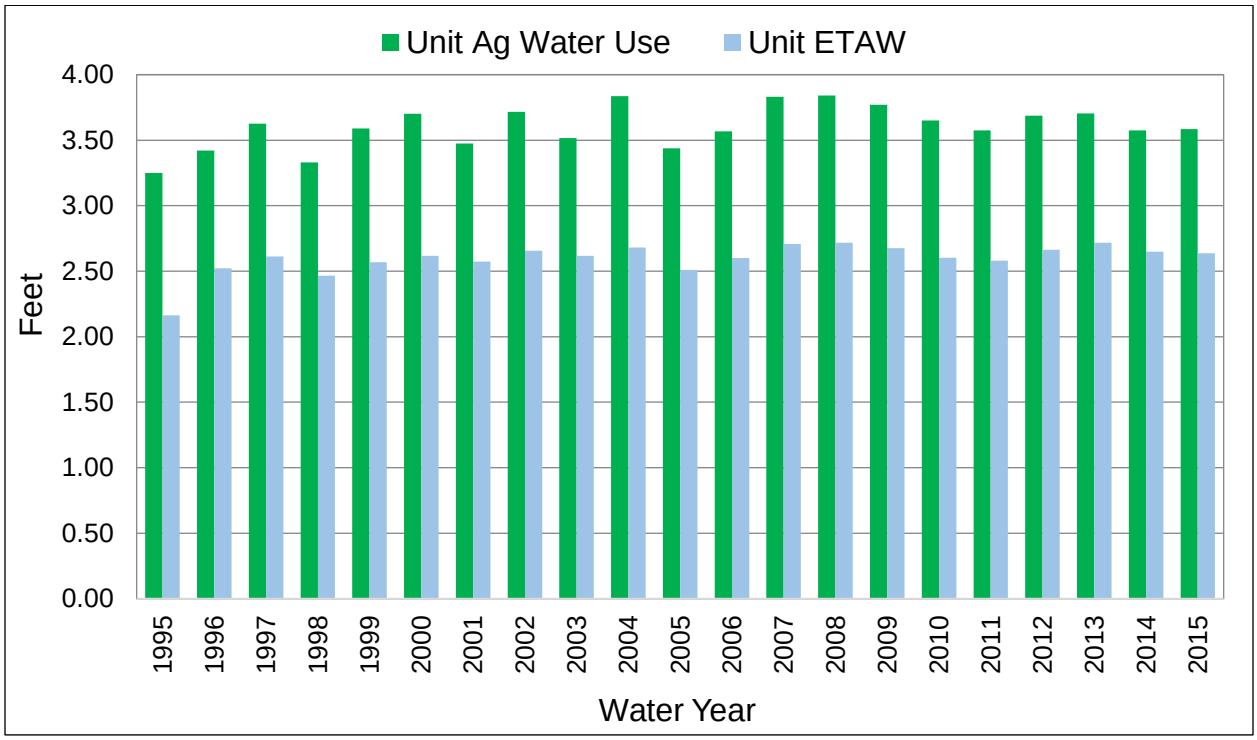


Figure 15k: Agricultural Demand- Subregion 13 (Oakdale West Subregion)

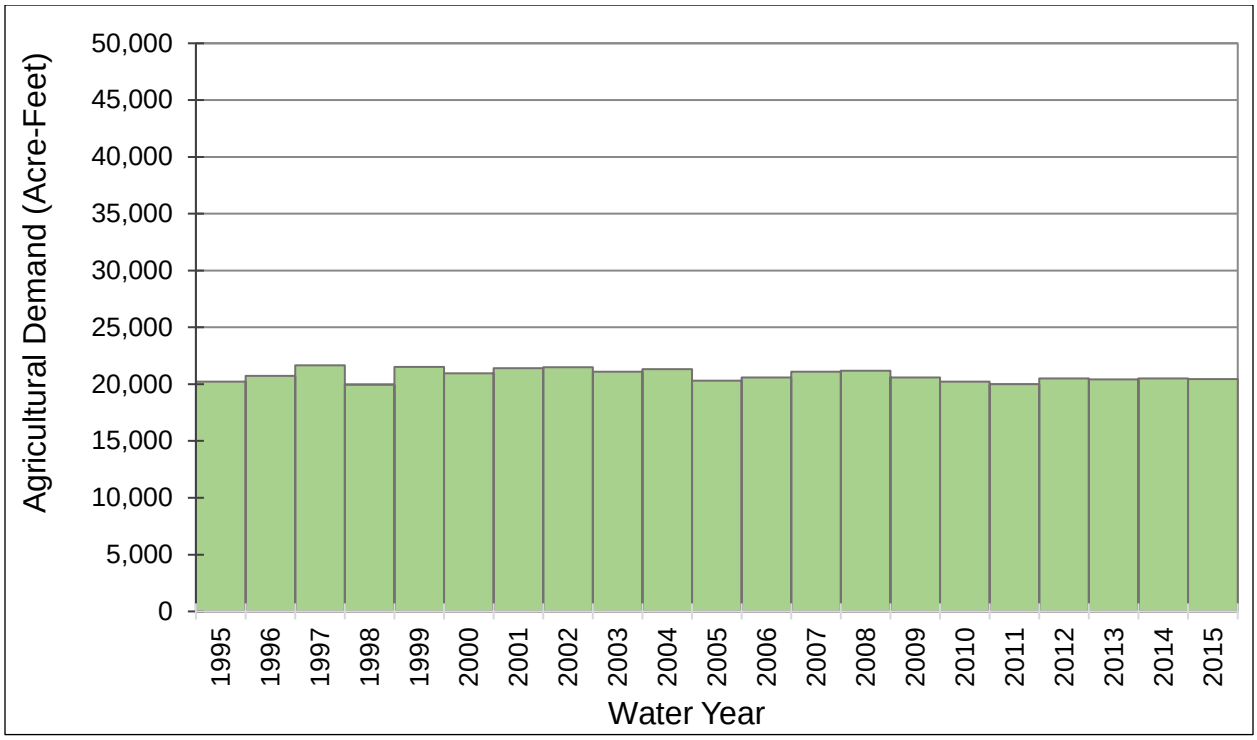


Figure 15l: Unit Agricultural Water Use and ETAW- Subregion 13 (Oakdale West Subregion)

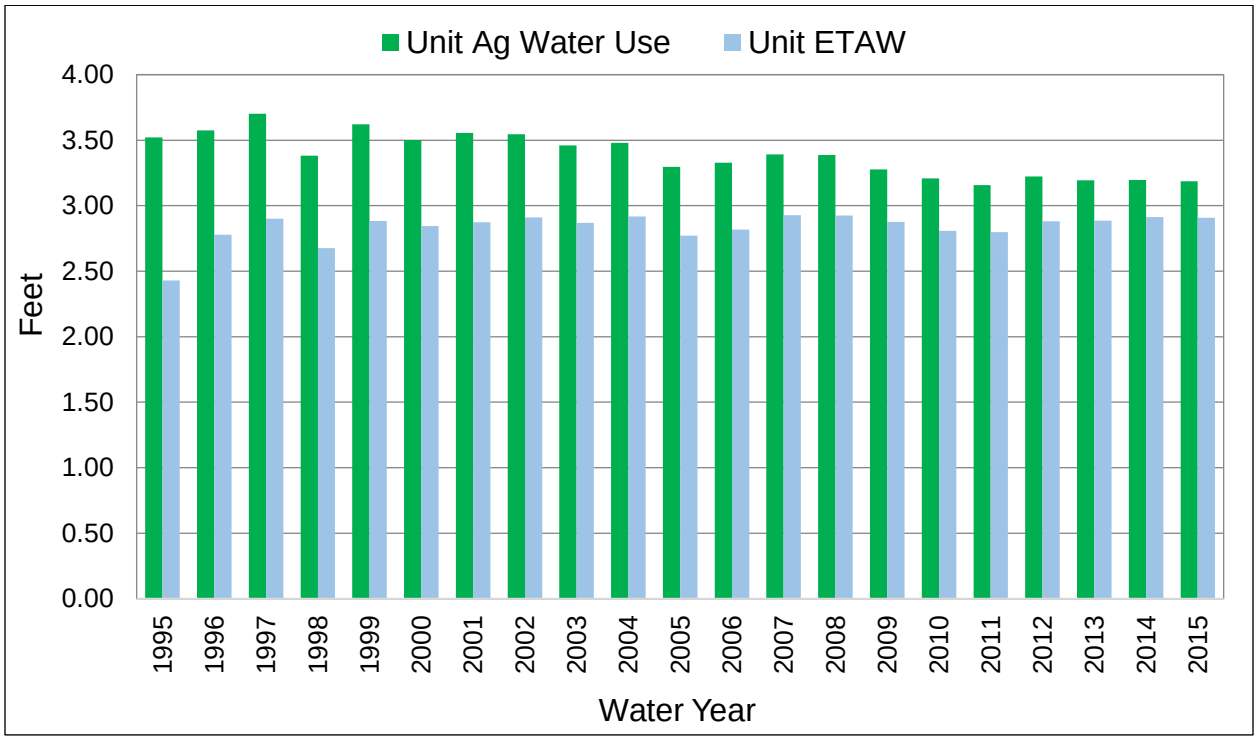


Figure 15m: Agricultural Demand- Subregion 18 (Oakdale East Subregion)

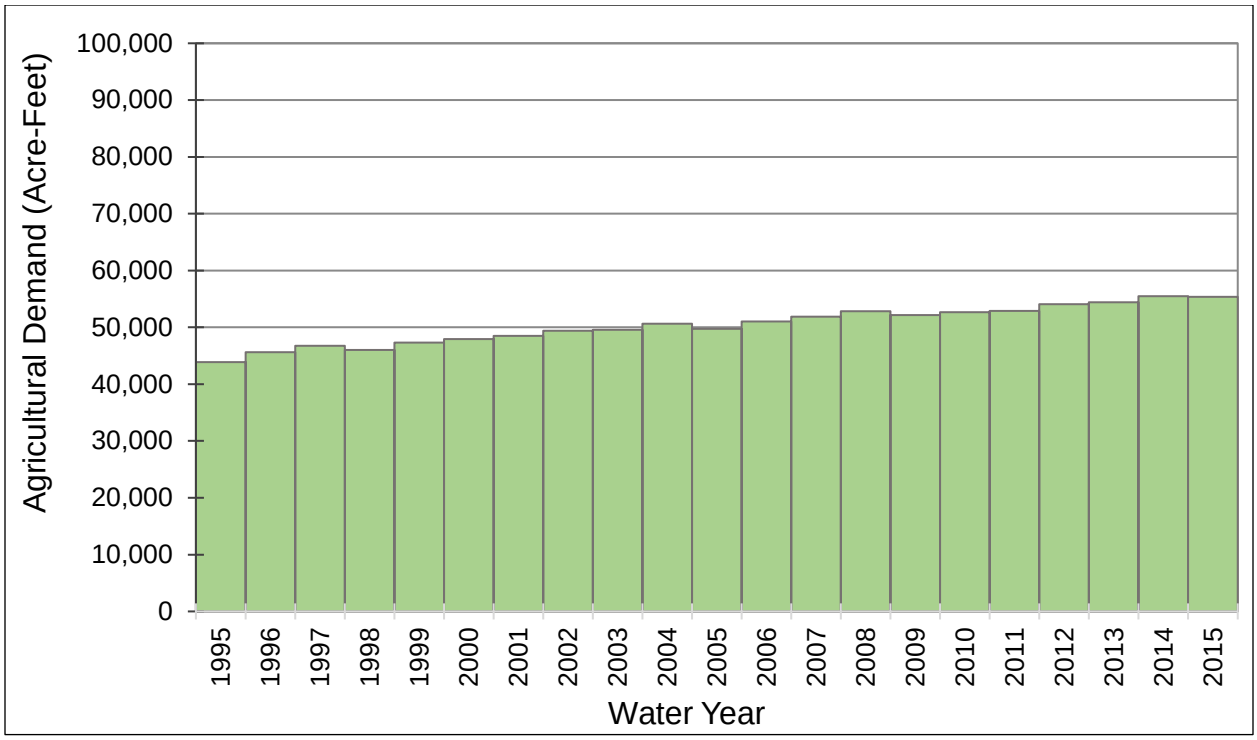
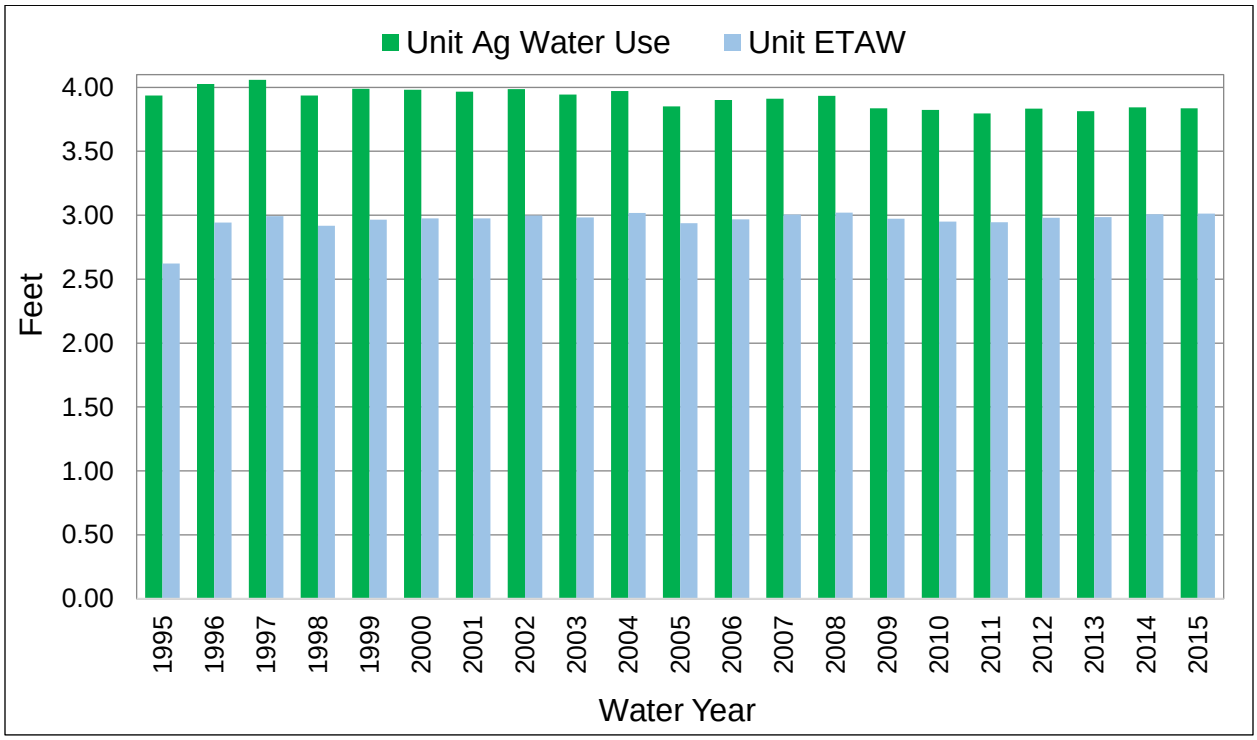


Figure 15n: Unit Agricultural Water Use and ETAW- Subregion 18 (Oakdale East Subregion)



APPENDIX C: ESJWRM CALIBRATION WELLS

Figure C-1: ESJWRM Groundwater Level Calibration Wells

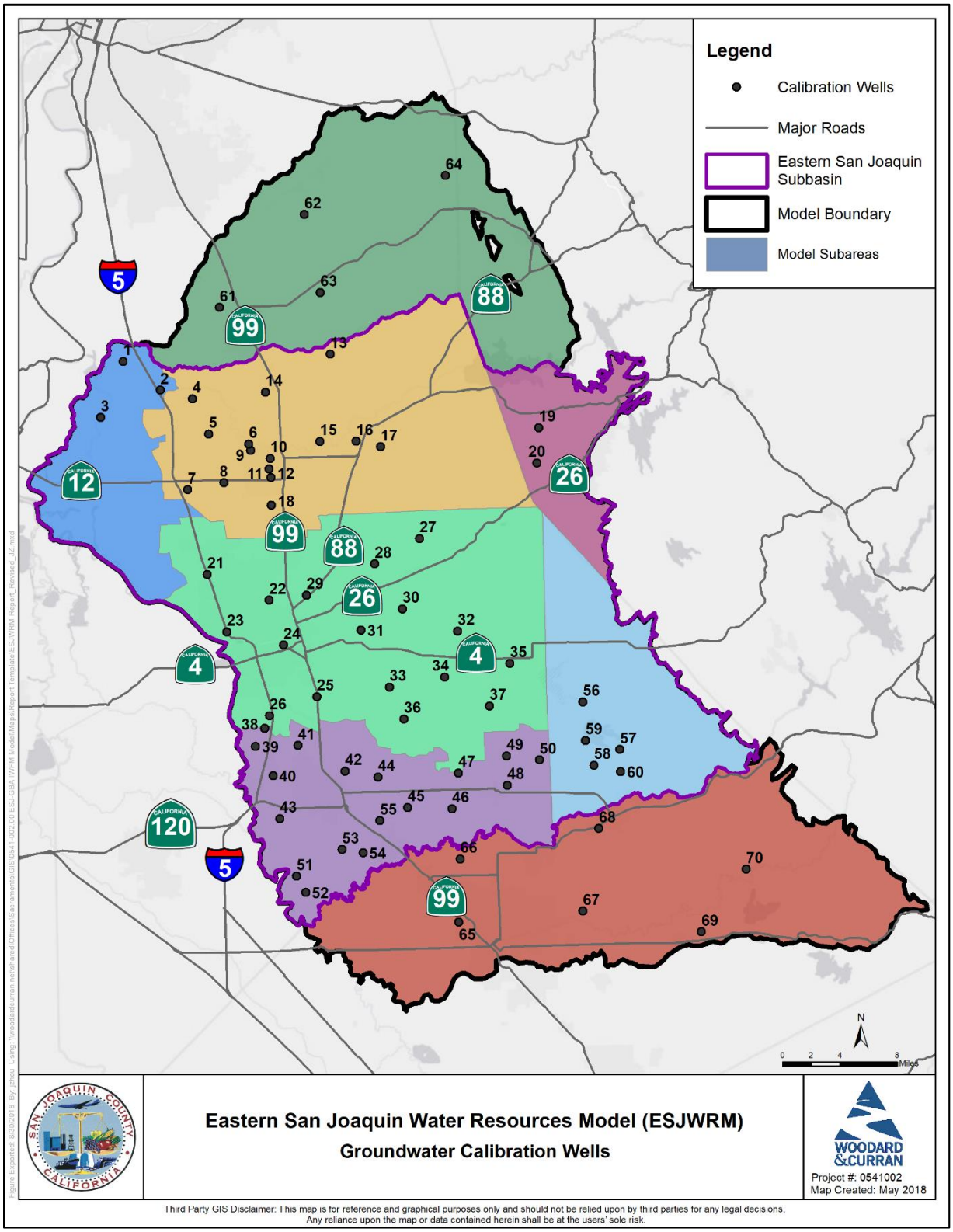


Table C-1: ESJWRM Groundwater Level Calibration Wells

Hydrograph ID	ID by Model Subregion	Well Name	Well Source	Agency*	Well Type	Depth	Screening Intervals
1	101	05N05E32M001	Voluntary	SJCFCWCD	Stockwatering	145	Unknown
2	102	04N05E10K001	CASGEM	SJCFCWCD	Residential	115	90/115
3	103	04N04E24F001M	Voluntary	DWR	Observation	20	Unknown
4	201	04N05E13H001	CASGEM	SJCFCWCD	Irrigation	190	50/190
5	202	04N06E29N002	Voluntary	SJCFCWCD	Irrigation	475	204/475
6	203	04N06E34J002	Voluntary	SJCFCWCD	Irrigation	466	94/167, 172/466
7	204	03N05E13L001	Voluntary	SJCFCWCD	Irrigation	65	Unknown
8	205	03N06E17A004	Voluntary	SJCFCWCD	Unknown	128	60/128
9	301	Lodi Well 7	Local Agency	City of Lodi	Production	422	142/422
10	302	Lodi Well 2	Local Agency	City of Lodi	Production	315	109/310
11	303	Lodi G-25B	Local Agency	City of Lodi	Observation	150	140/150
12	304	Lodi MW-19	CASGEM	SJCFCWCD	Observation	73	58/73
13	401	05N07E34G001M	Voluntary	DWR	Irrigation	590	Unknown
14	402	04N06E12N002	CASGEM	SJCFCWCD	Irrigation	320	104/320
15	403	04N07E33H001	Voluntary	SJCFCWCD	Irrigation	104	Unknown
16	404	04N07E36L001	Voluntary	DWR	Irrigation	565	Unknown
17	405	04N08E32N001	Voluntary	SJCFCWCD	Irrigation	Unknown	Unknown
18	406	03N06E24M003M	Voluntary	DWR	Irrigation	237	156/237
19	501	CCWD 010	CASGEM	CCWD	Observation	390	Unknown
20	502	CCWD 006	CASGEM	CCWD	Observation	230	Unknown
21	601	02N06E18K001M	Voluntary	DWR	Unknown	650	Unknown
22	602	02N06E26H001	Voluntary	SJCFCWCD	Irrigation	Unknown	Unknown
23	603	01N06E05H001	Voluntary	DWR	Irrigation	315	235/277
24	604	01N06E12G001	Voluntary	DWR	Irrigation	230	210/230
25	605	01N07E32A001	Voluntary	DWR	Irrigation	232	178/232
26	606	01S06E02G002	Voluntary	DWR	Irrigation	135	101/135
27	701	02N08E03G002	Voluntary	SJCFCWCD	Residential	125	Unknown
28	702	02N08E18C001	Voluntary	SJCFCWCD	Irrigation	544	Unknown
29	703	02N07E29B001	CASGEM	SJCFCWCD	Irrigation	202	130/202
30	704	02N08E33E001	Voluntary	SJCFCWCD	Irrigation	168	Unknown
31	705	01N07E01M002	Voluntary	SJCFCWCD	Irrigation	364	104/108
32	801	01N09E06N001	Voluntary	SJCFCWCD	Irrigation	300	92/300
33	802	01N08E29M002	Voluntary	SJCFCWCD	Irrigation	460	Unknown
34	803	01N08E26A002	Voluntary	SJCFCWCD	Irrigation	216	176/216
35	804	01N09E22G002	Voluntary	SJCFCWCD	Irrigation	340	Unknown
36	805	01S08E05R001	Voluntary	SJCFCWCD	Unknown	125	Unknown

Hydrograph ID	ID by Model Subregion	Well Name	Well Source	Agency*	Well Type	Depth	Screening Intervals
37	806	01S09E05H002	CASGEM	SJCFCWCD	Irrigation	256	148/256
38	901	01S06E11E001M	Voluntary	DWR	Irrigation	185	Unknown
39	902	01S06E15F001M	Voluntary	DWR	Residential	188	160/184
40	903	01S06E26K001M	Voluntary	DWR	Irrigation	248	191/195
41	1001	01S07E18L001M	Voluntary	DWR	Residential	248	144/154
42	1002	01S07E27K001	Voluntary	SJCFCWCD	Irrigation	300	120/300
43	1003	02S06E11J001	Voluntary	DWR	Irrigation	165	Unknown
44	1101	01S07E25R001M	Voluntary	DWR	Irrigation	130	Unknown
45	1102	02S08E08A001	CASGEM	SJCFCWCD	Irrigation	180	50/180
46	1103	02S08E12D001	Voluntary	DWR	Residential	82	72/82
47	1104	01S08E25Q001	Voluntary	SJCFCWCD	Irrigation	450	Unknown
48	1105	01S09E33J002	Voluntary	DWR	Residential	95	88/95
49	1301	01S09E21J002	CASGEM	SJCFCWCD	Irrigation	223	195/223
50	1302	01S09E24R001	Voluntary	SJCFCWCD	Irrigation	264	176/264
51	1401	02S07E31N001	Voluntary	SJCFCWCD	Irrigation	226	130/226
52	1402	03S07E06Q001	Voluntary	DWR	Stockwatering	71	Unknown
53	1501	02S07E22N002	Voluntary	DWR	Irrigation	162	52/162
54	1502	02S07E26B001	Voluntary	SJCFCWCD	Irrigation	386	56/386
55	1601	02S07E12R001	Voluntary	SJCFCWCD	Residential	310	Unknown
56	1701	01S10E04C001	Voluntary	DWR	Unknown	Unknown	Unknown
57	1702	01S10E23H001M	Voluntary	DWR	Irrigation	300	Unknown
58	1703	01S10E28J001	Voluntary	DWR	Unknown	Unknown	Unknown
59	1801	1S10E16Q1-18	Voluntary	DWR	Irrigation	299	Unknown
60	1802	01S10E26J001M	CASGEM	Stanislaus County	Unknown	Unknown	Unknown
61	1901	05N06E08R001M	Voluntary	DWR	Irrigation	Unknown	Unknown
62	1902	06N07E08R001M	Voluntary	DWR	Residential	332	Unknown
63	1903	05N07E10D001M	Voluntary	DWR	Residential	260	180/260
64	1904	07N08E36B001M	CASGEM	SSCAWA	Observation	15	Unknown
65	2001	03S08E23H001M	CASGEM	MID	Irrigation	467	Unknown
66	2002	American 208	CASGEM	MID	Irrigation	320	Unknown
67	2003	03S10E17K001M	CASGEM	MID	Irrigation	476	116/400
68	2004	Birnbaum OID-03	CASGEM	STRGBA GSA	Irrigation	293	55/110, 147/154, 170/175, 185/200, 238/250, 265/270, 285/293

Hydrograph ID	ID by Model Subregion	Well Name	Well Source	Agency*	Well Type	Depth	Screening Intervals
69	2005	03S11E27G003M	CASGEM	STRGBA GSA	Irrigation	248	Unknown
70	2006	Paulsell 2 OID-12	CASGEM	STRGBA GSA	Irrigation	815	132/159, 160/815

* CCWD = Calaveras County Water District
DWR = Department of Water Resources
MID = Modesto Irrigation District
SJCFCWCD = San Joaquin County Flood Control and Water Conservation District
SSCAWA = Southeast Sacramento County Agricultural Water Authority
STRGBA GSA = Stanislaus & Tuolumne Rivers Groundwater Basin Association GSA

Figure C-2: ESJWRM Groundwater Level Hydrograph – Calibration Well #1

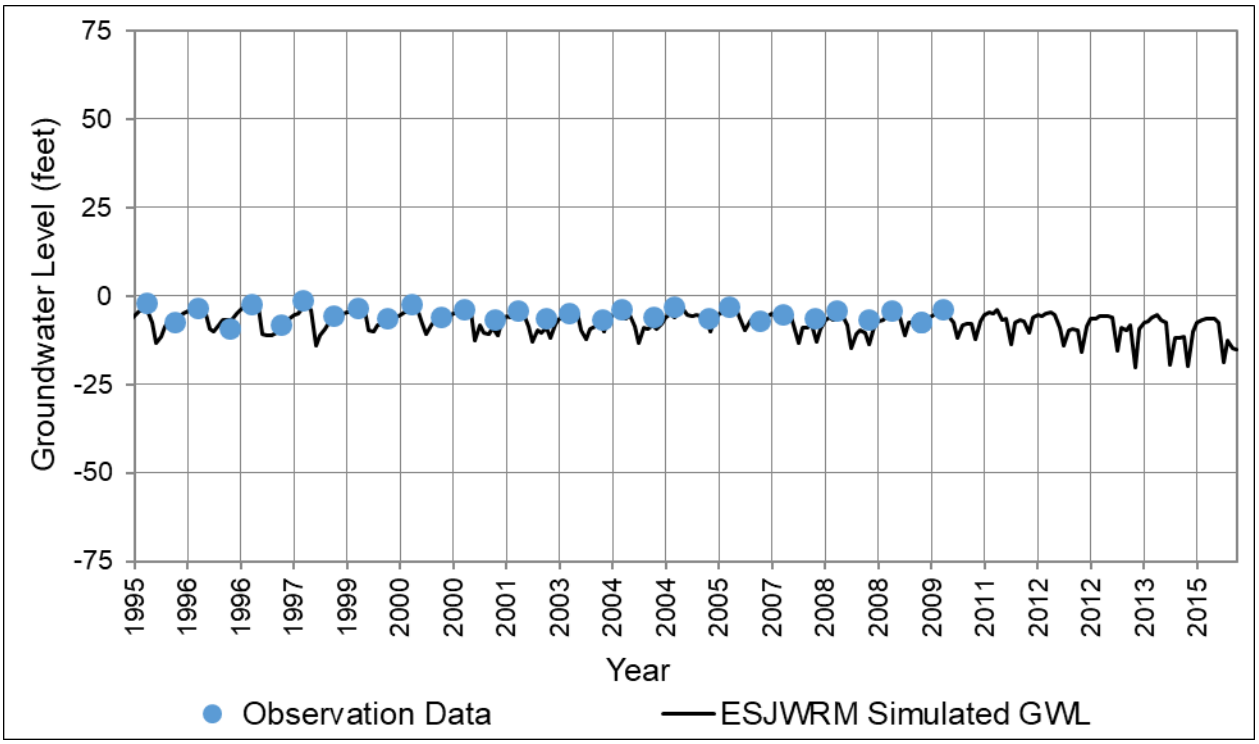


Figure C-3: ESJWRM Groundwater Level Hydrograph – Calibration Well #2

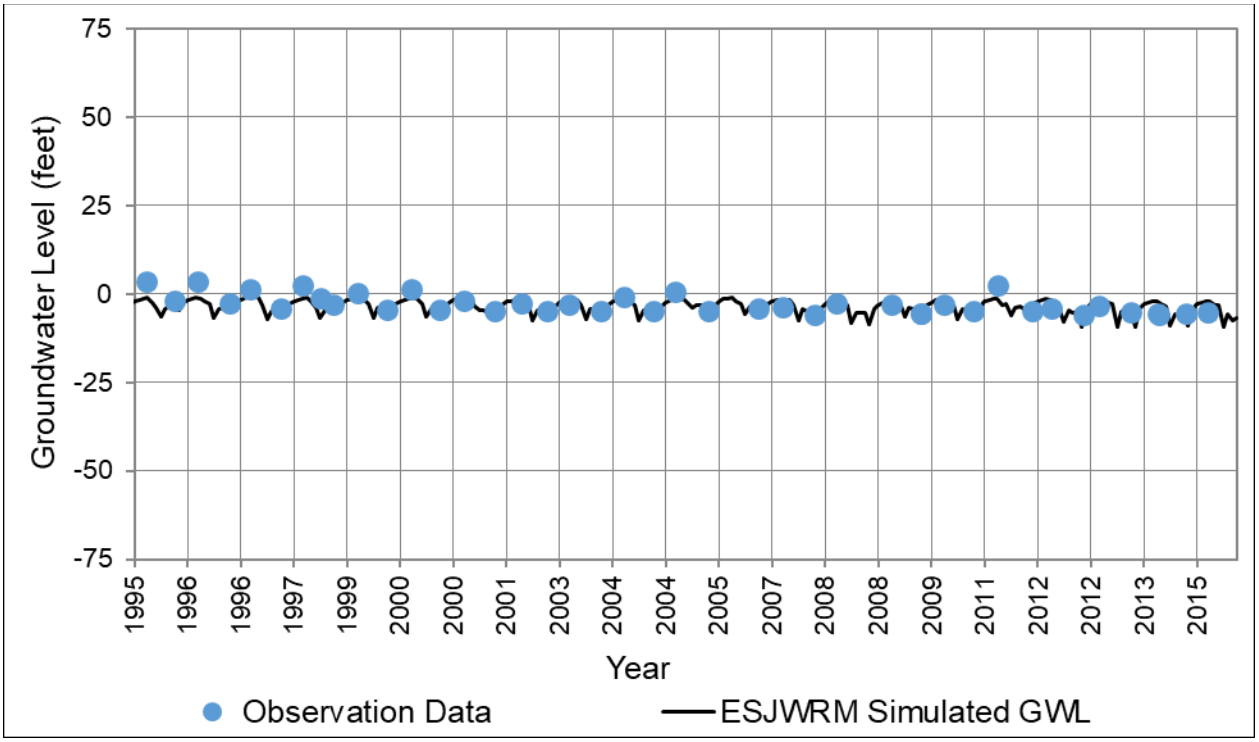


Figure C-4: ESJWRM Groundwater Level Hydrograph – Calibration Well #3

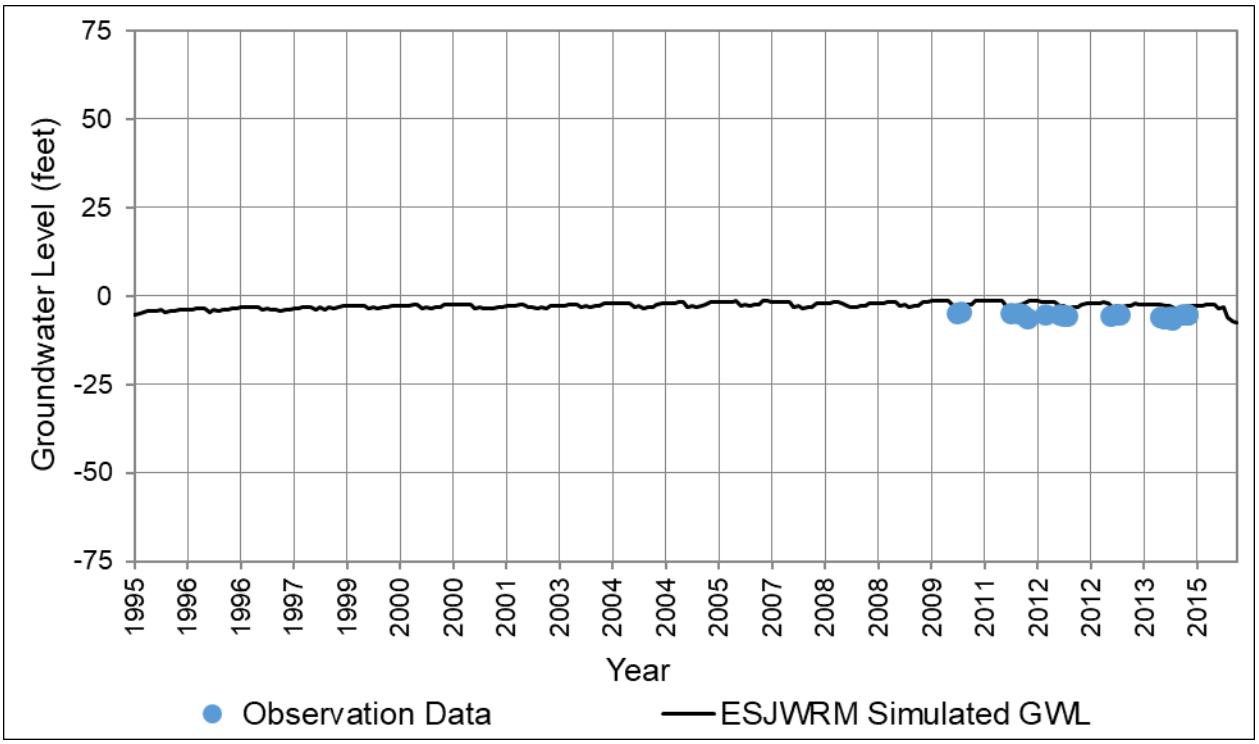


Figure C-5: ESJWRM Groundwater Level Hydrograph – Calibration Well #4

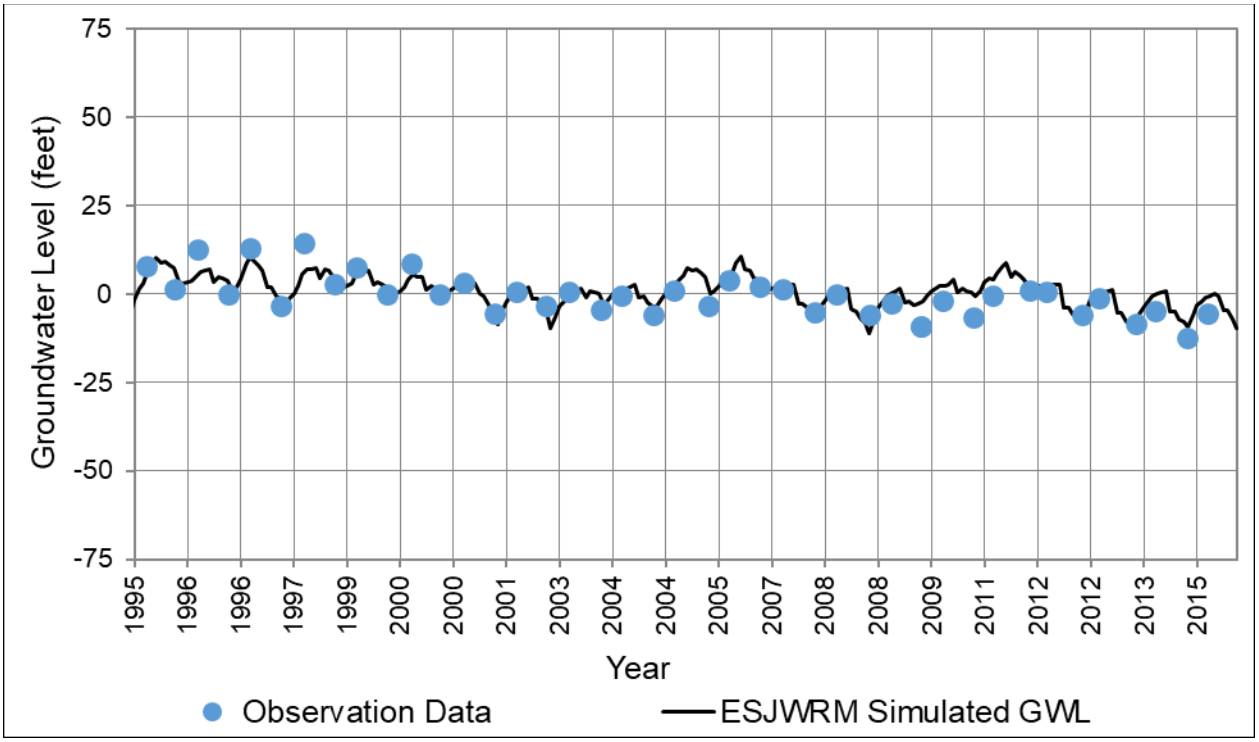


Figure C-6: ESJWRM Groundwater Level Hydrograph – Calibration Well #5

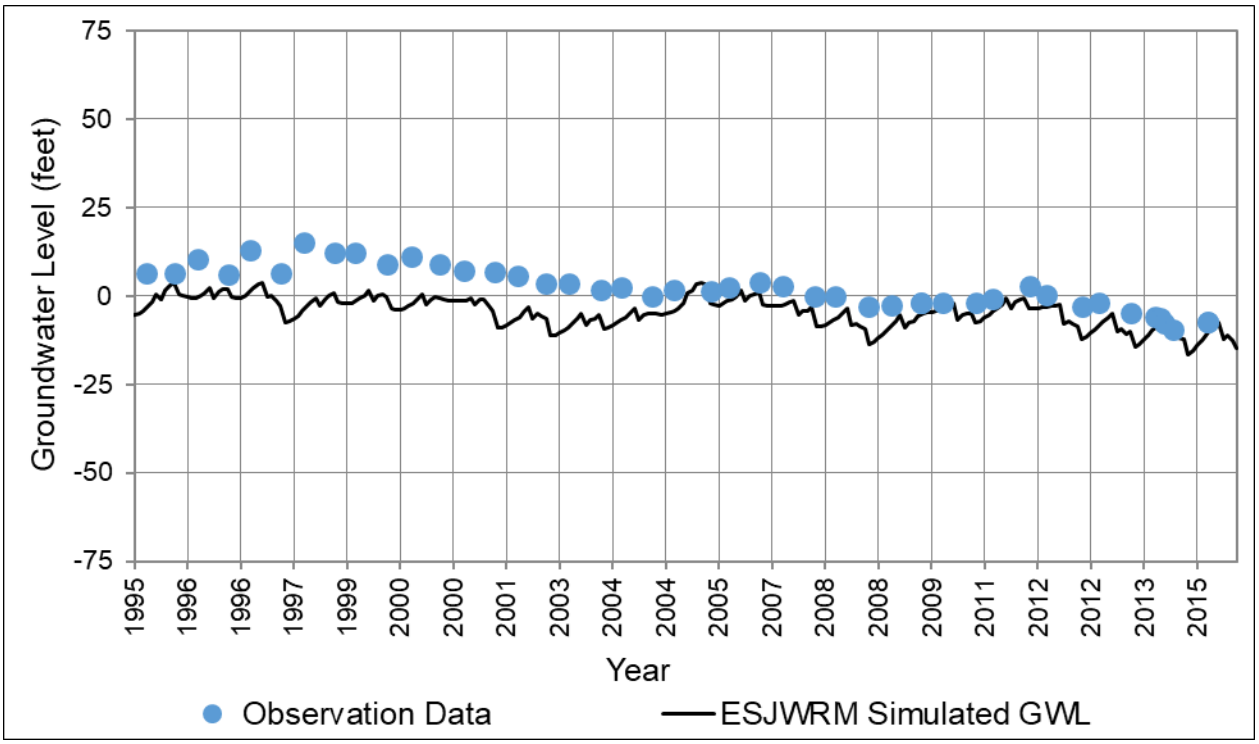


Figure C-7: ESJWRM Groundwater Level Hydrograph – Calibration Well #6

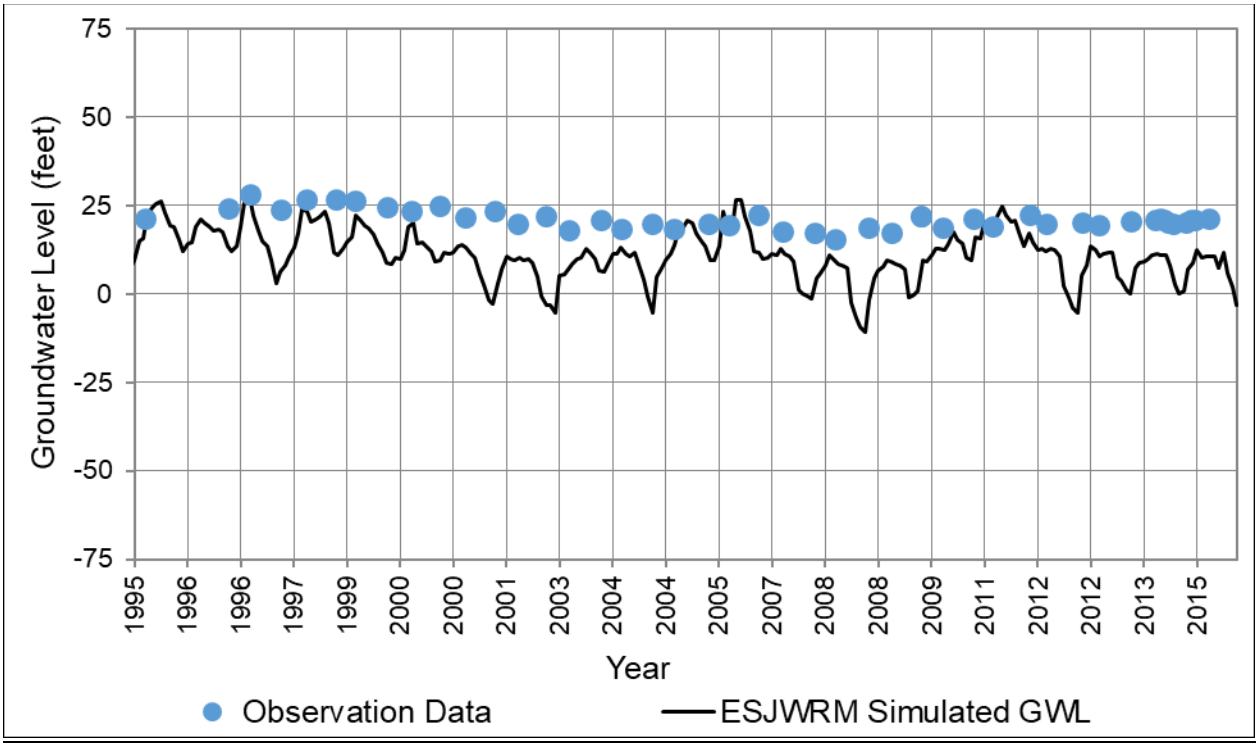


Figure C-8: ESJWRM Groundwater Level Hydrograph – Calibration Well #7

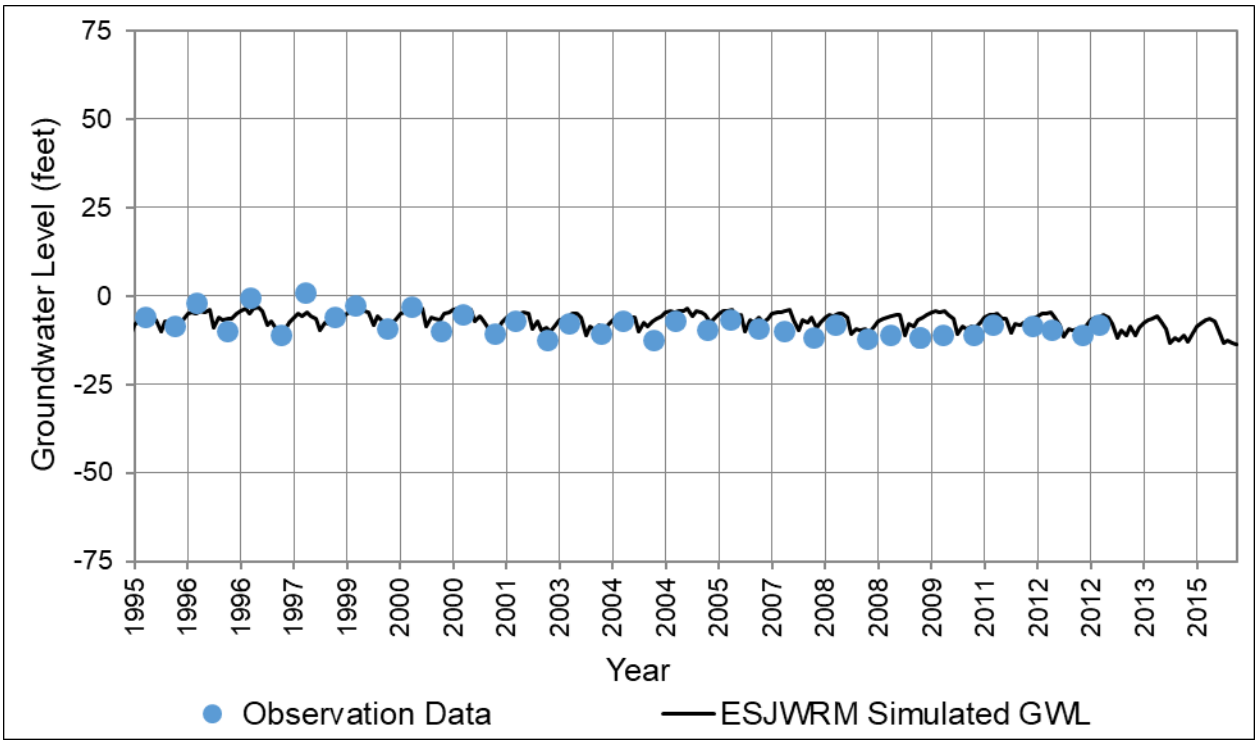


Figure C-9: ESJWRM Groundwater Level Hydrograph – Calibration Well #8

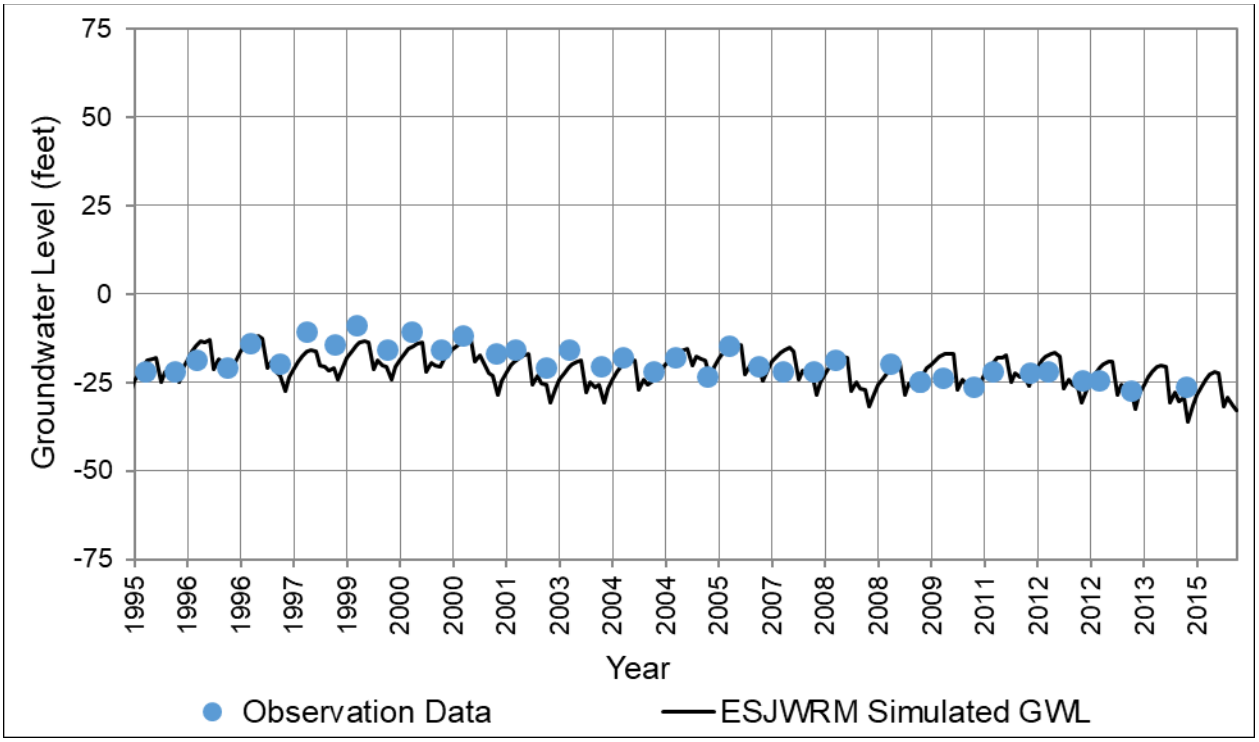


Figure C-10: ESJWRM Groundwater Level Hydrograph – Calibration Well #9

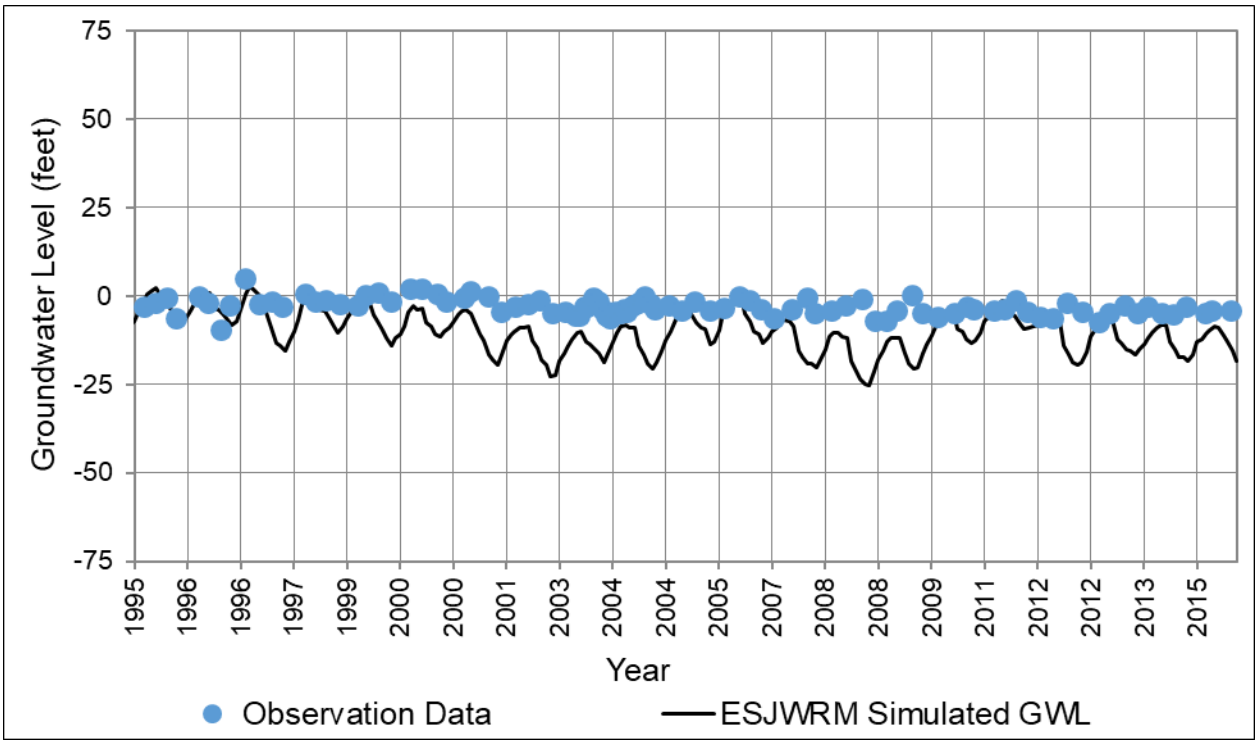


Figure C-11: ESJWRM Groundwater Level Hydrograph – Calibration Well #10

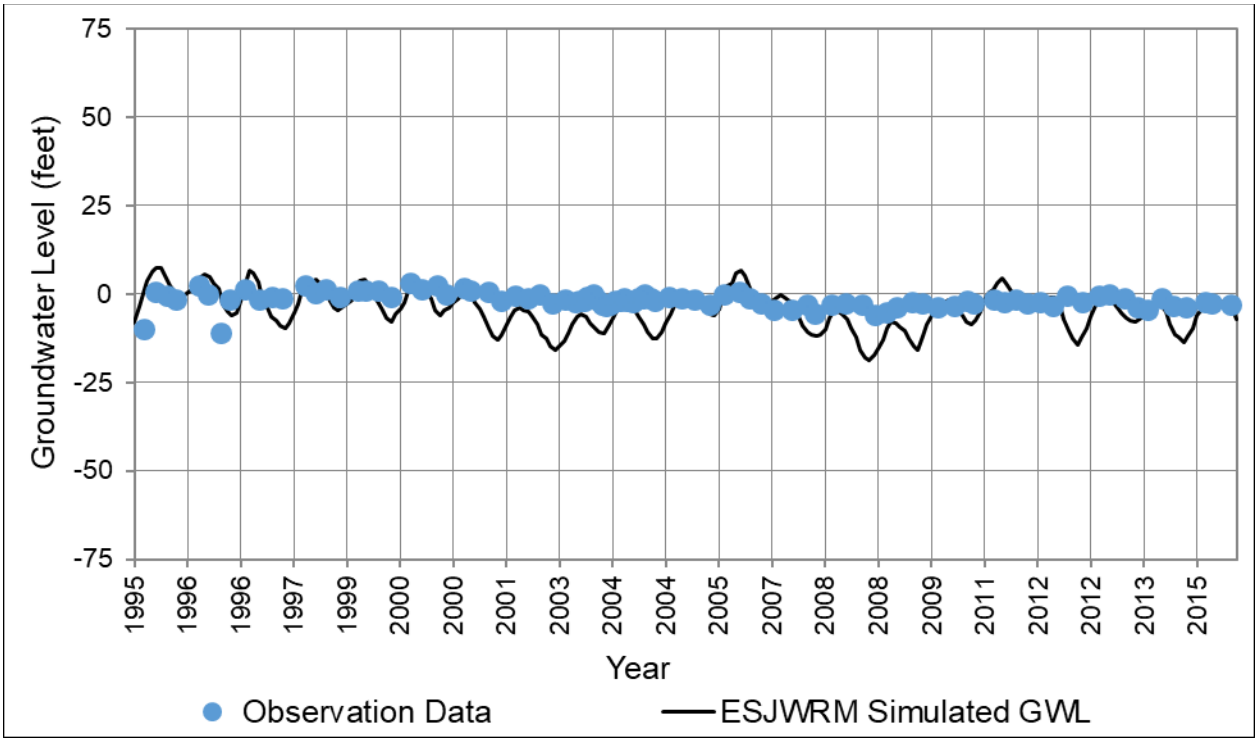


Figure C-12: ESJWRM Groundwater Level Hydrograph – Calibration Well #11

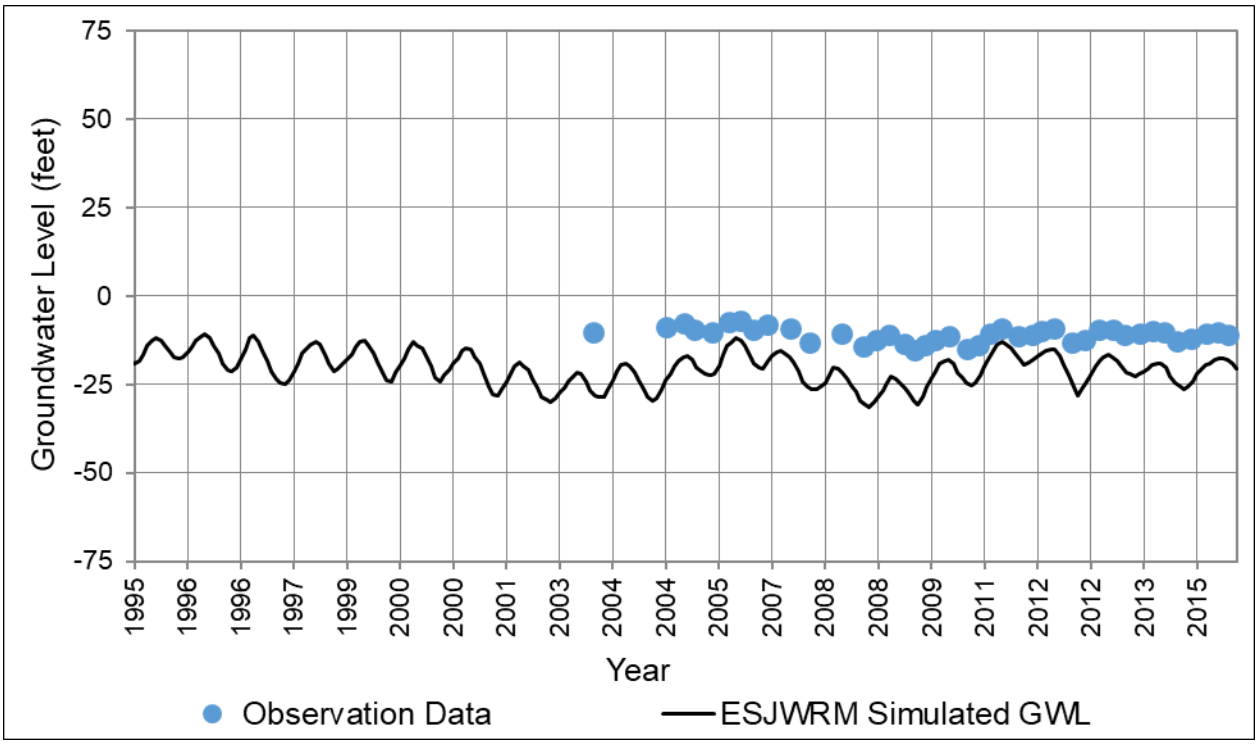


Figure C-13: ESJWRM Groundwater Level Hydrograph – Calibration Well #12

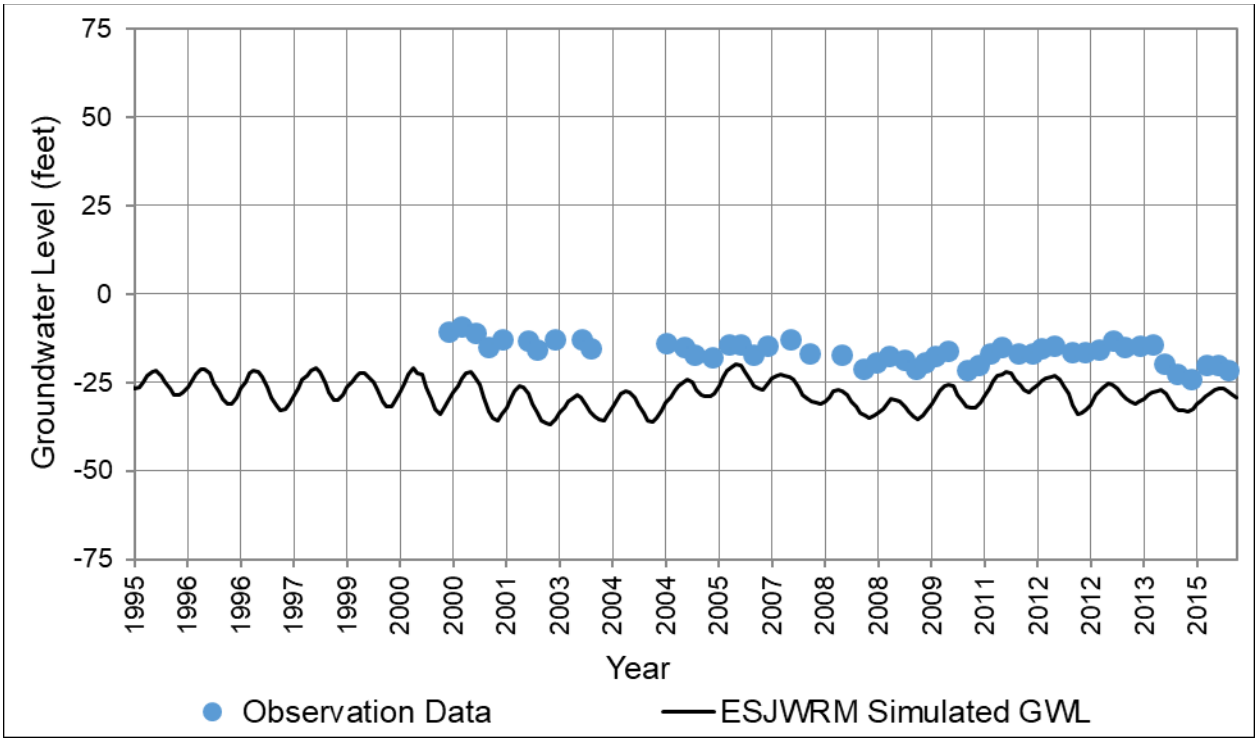


Figure C-14: ESJWRM Groundwater Level Hydrograph – Calibration Well #13

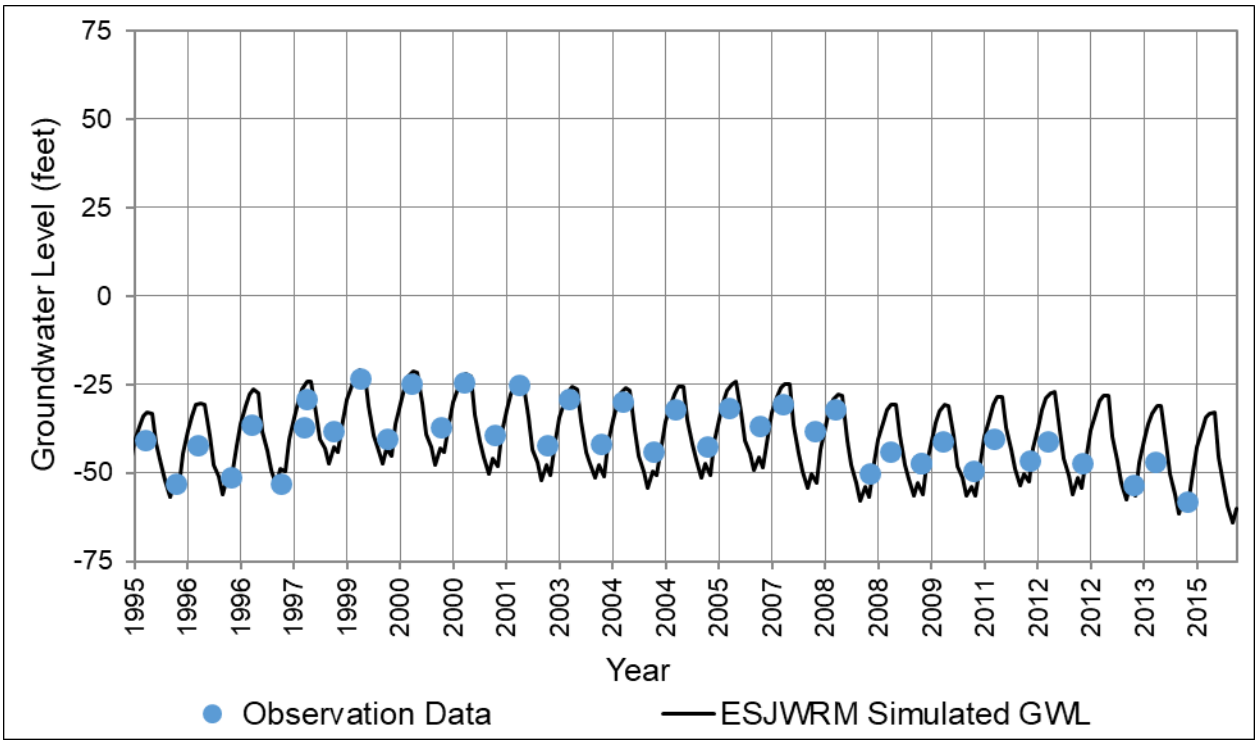


Figure C-15: ESJWRM Groundwater Level Hydrograph – Calibration Well #14

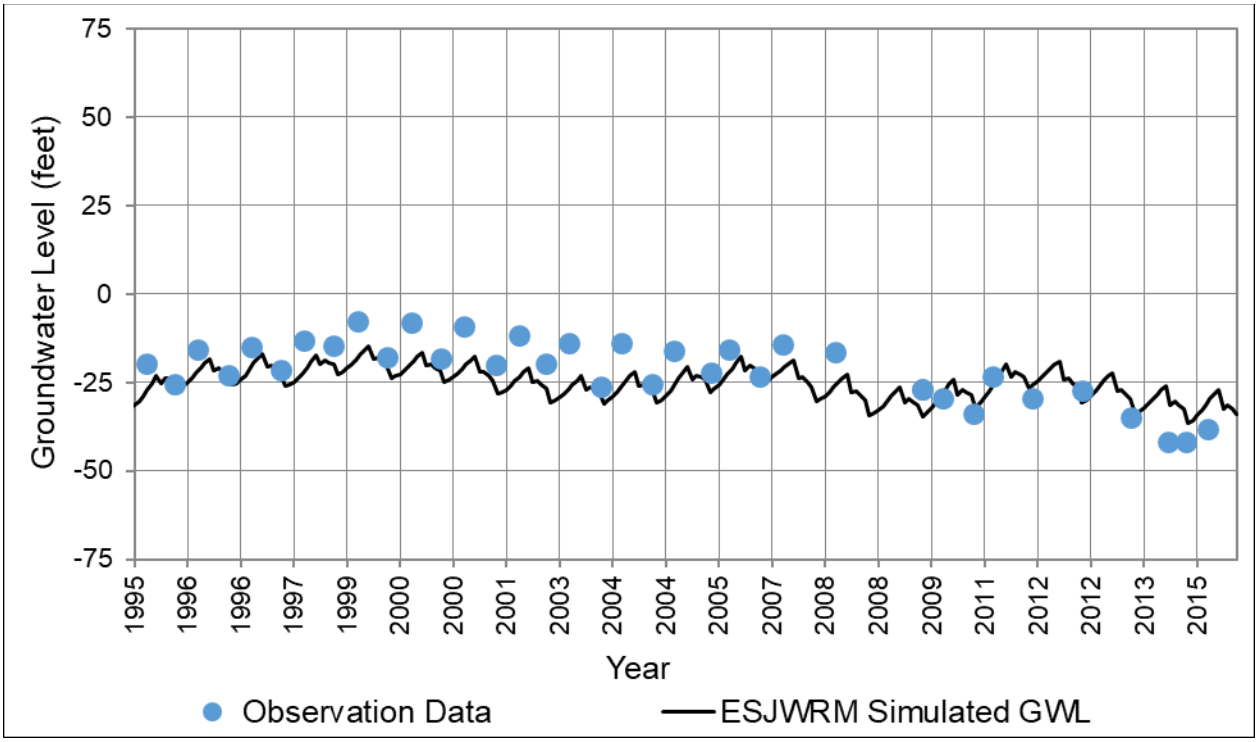


Figure C-16: ESJWRM Groundwater Level Hydrograph – Calibration Well #15

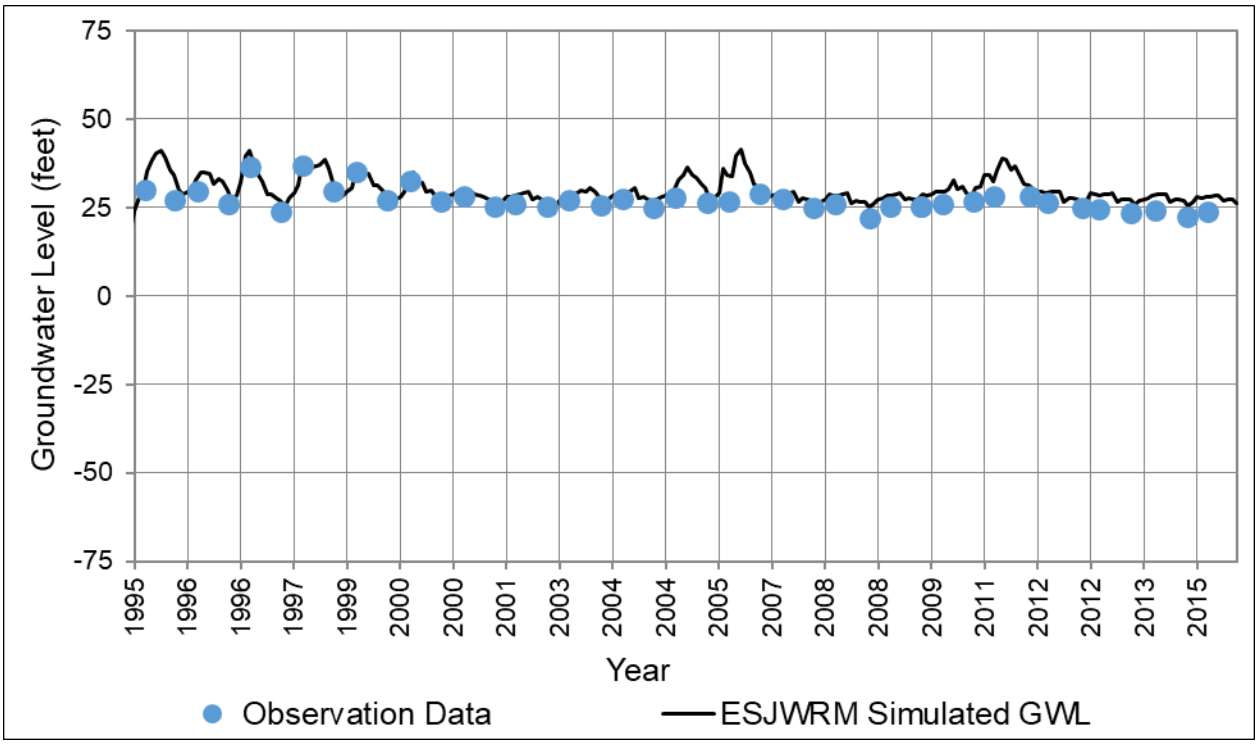


Figure C-17: ESJWRM Groundwater Level Hydrograph – Calibration Well #16

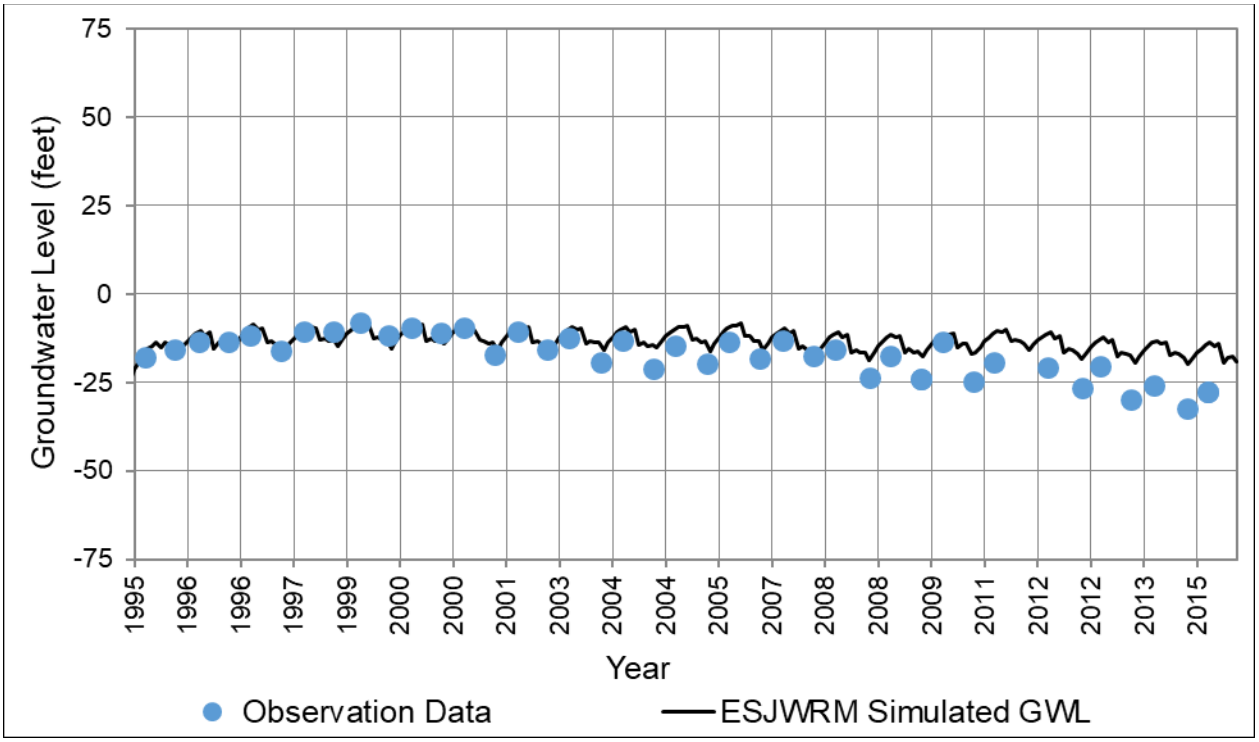


Figure C-18: ESJWRM Groundwater Level Hydrograph – Calibration Well #17

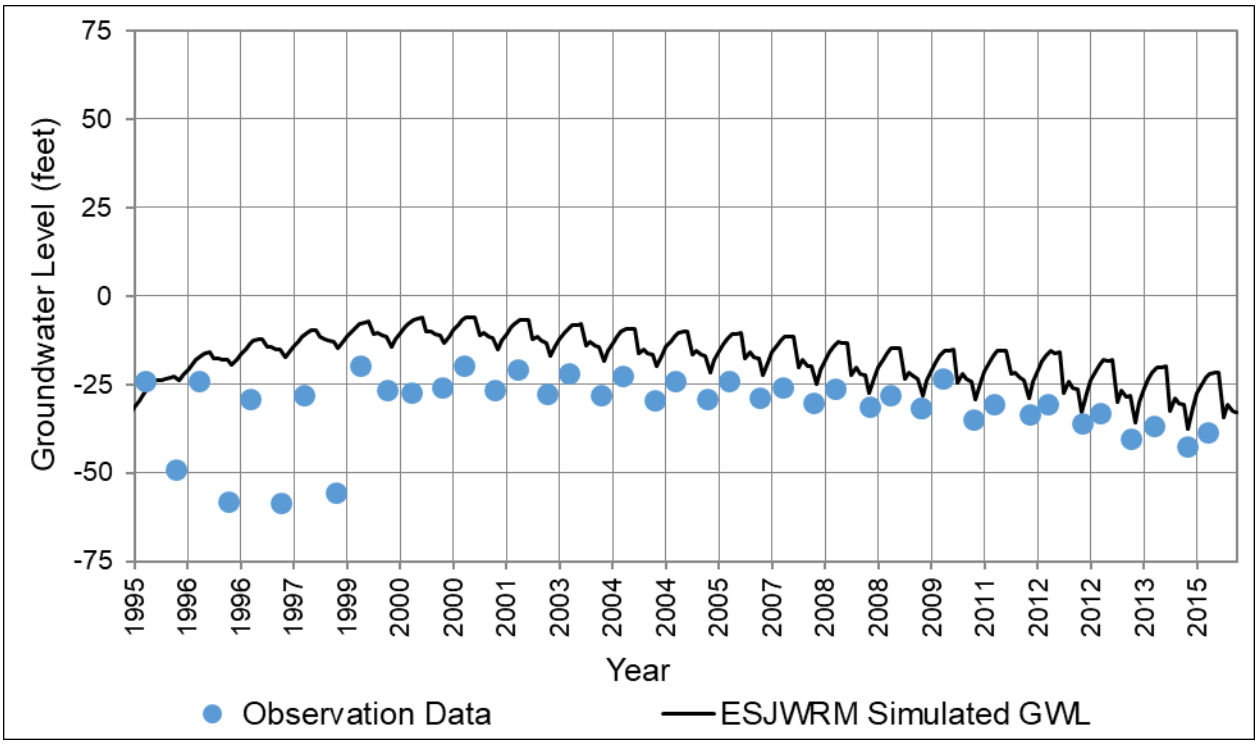


Figure C-19: ESJWRM Groundwater Level Hydrograph – Calibration Well #18

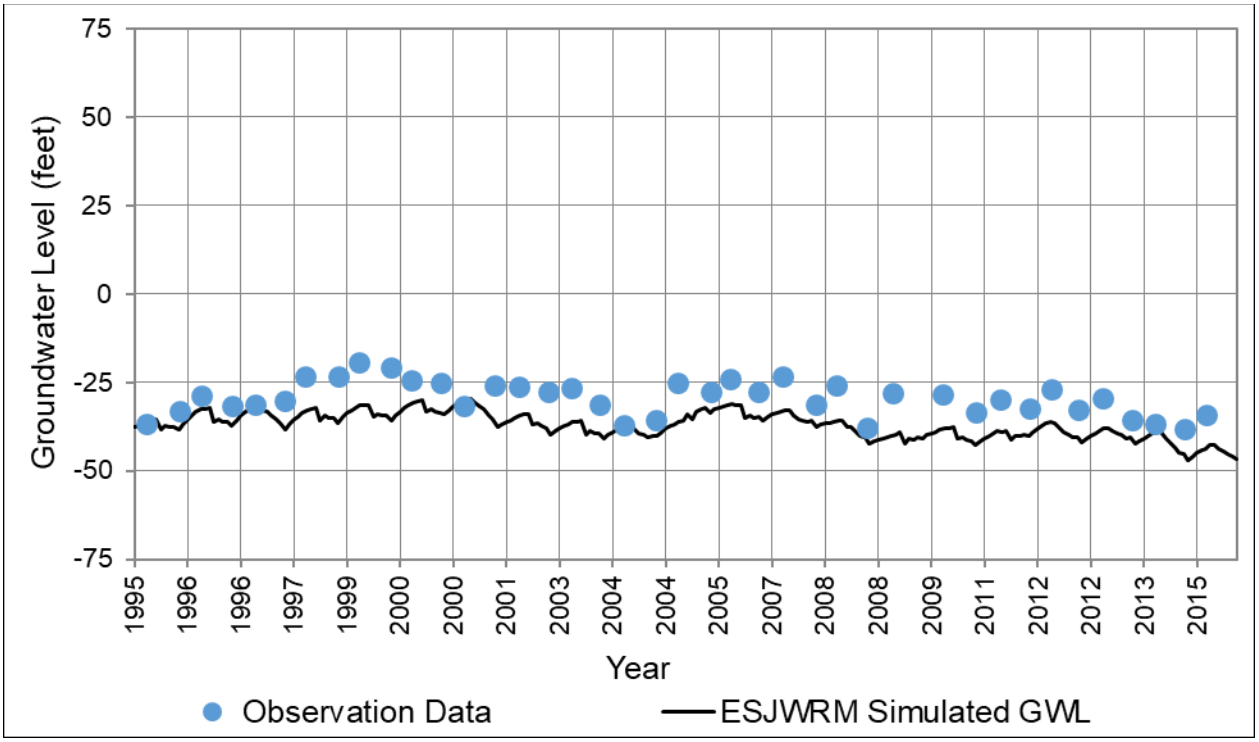


Figure C-20: ESJWRM Groundwater Level Hydrograph – Calibration Well #19

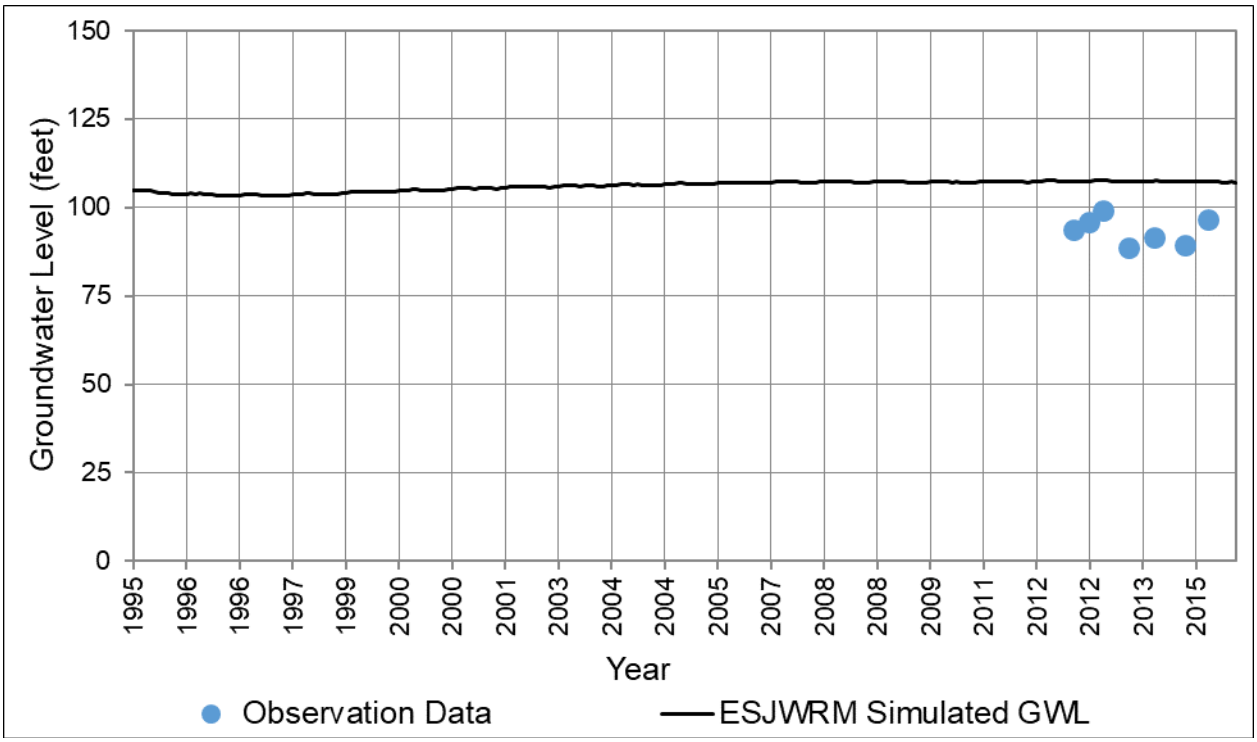


Figure C-21: ESJWRM Groundwater Level Hydrograph – Calibration Well #20

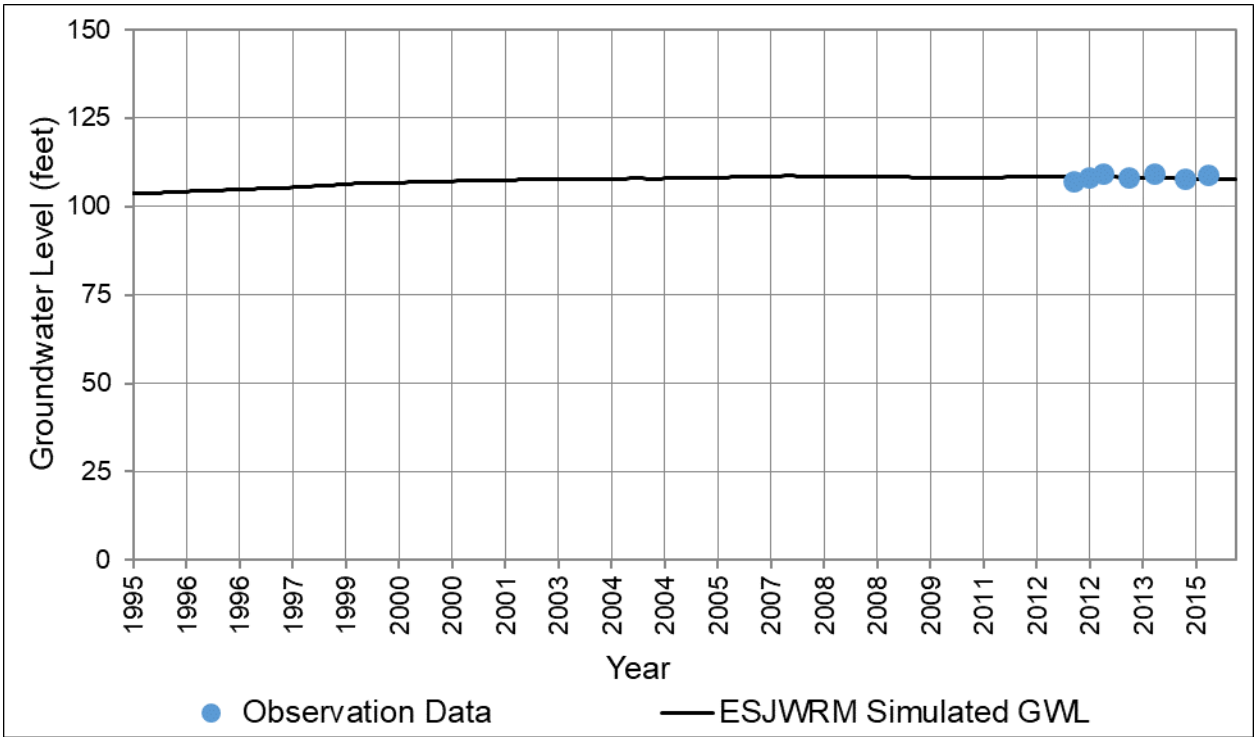


Figure C-22: ESJWRM Groundwater Level Hydrograph – Calibration Well #21

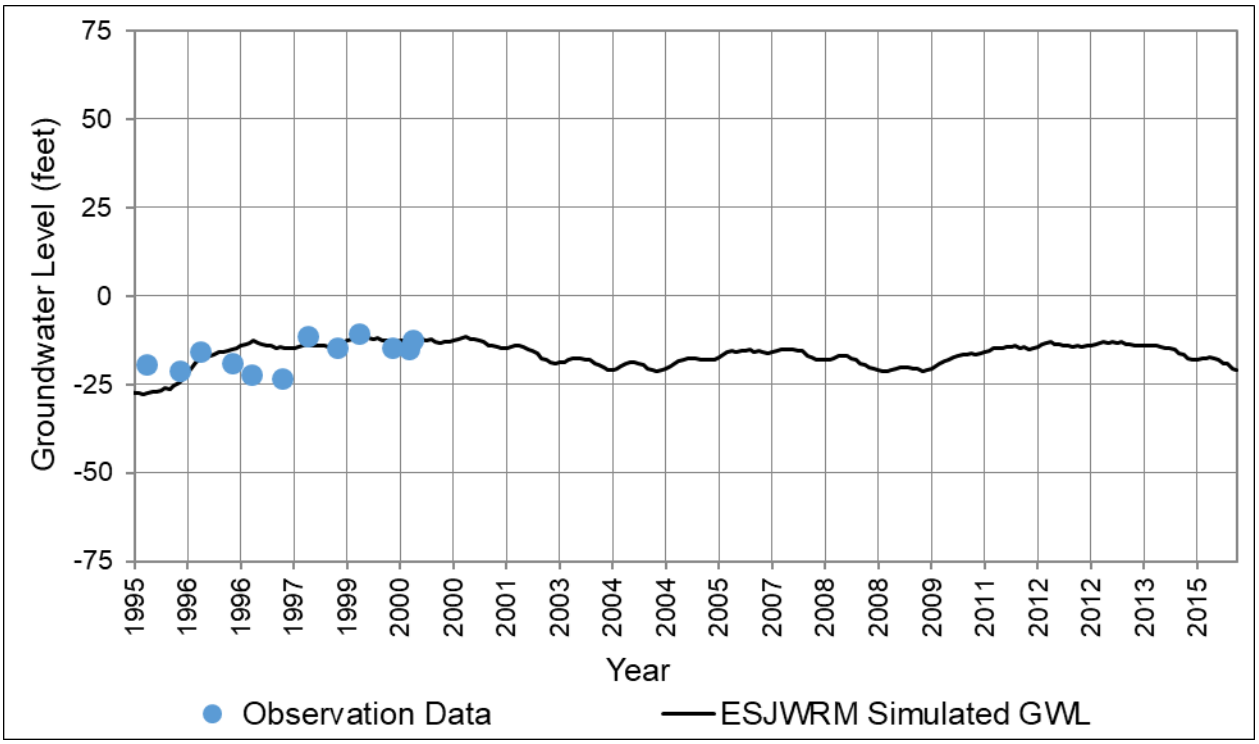


Figure C-23: ESJWRM Groundwater Level Hydrograph – Calibration Well #22

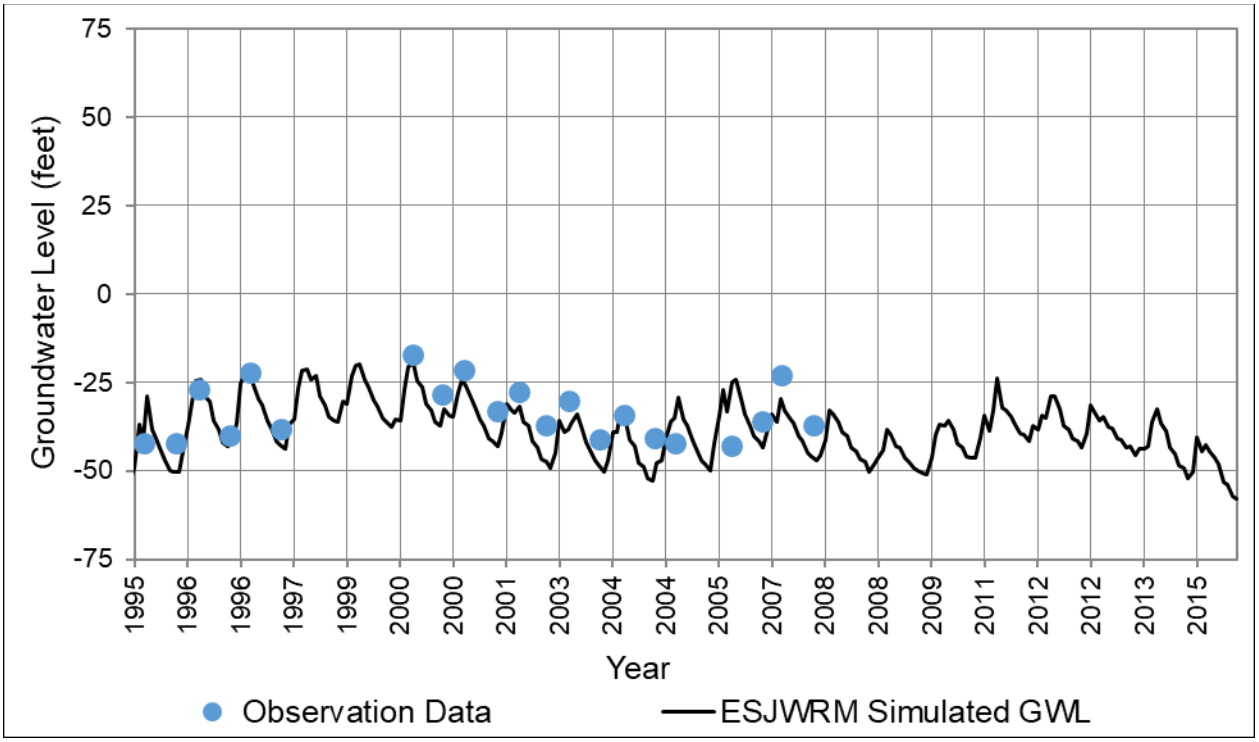


Figure C-24: ESJWRM Groundwater Level Hydrograph – Calibration Well #23

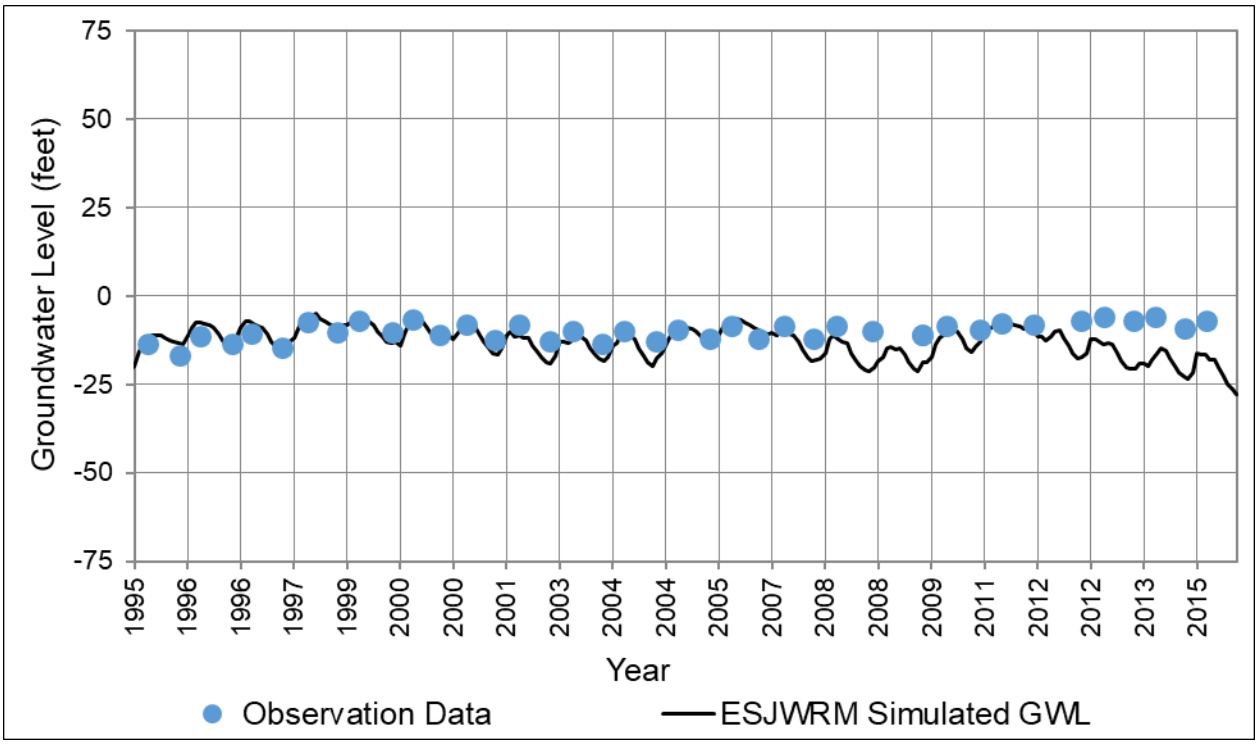


Figure C-25: ESJWRM Groundwater Level Hydrograph – Calibration Well #24

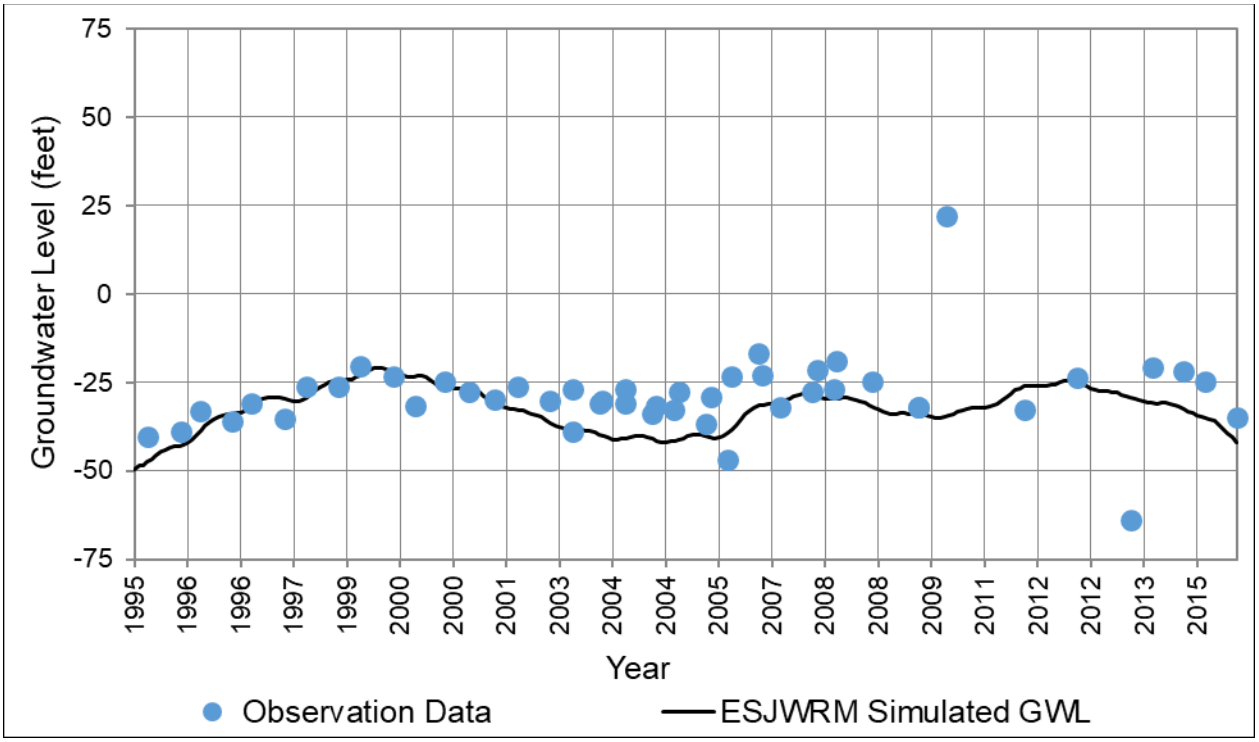


Figure C-26: ESJWRM Groundwater Level Hydrograph – Calibration Well #25

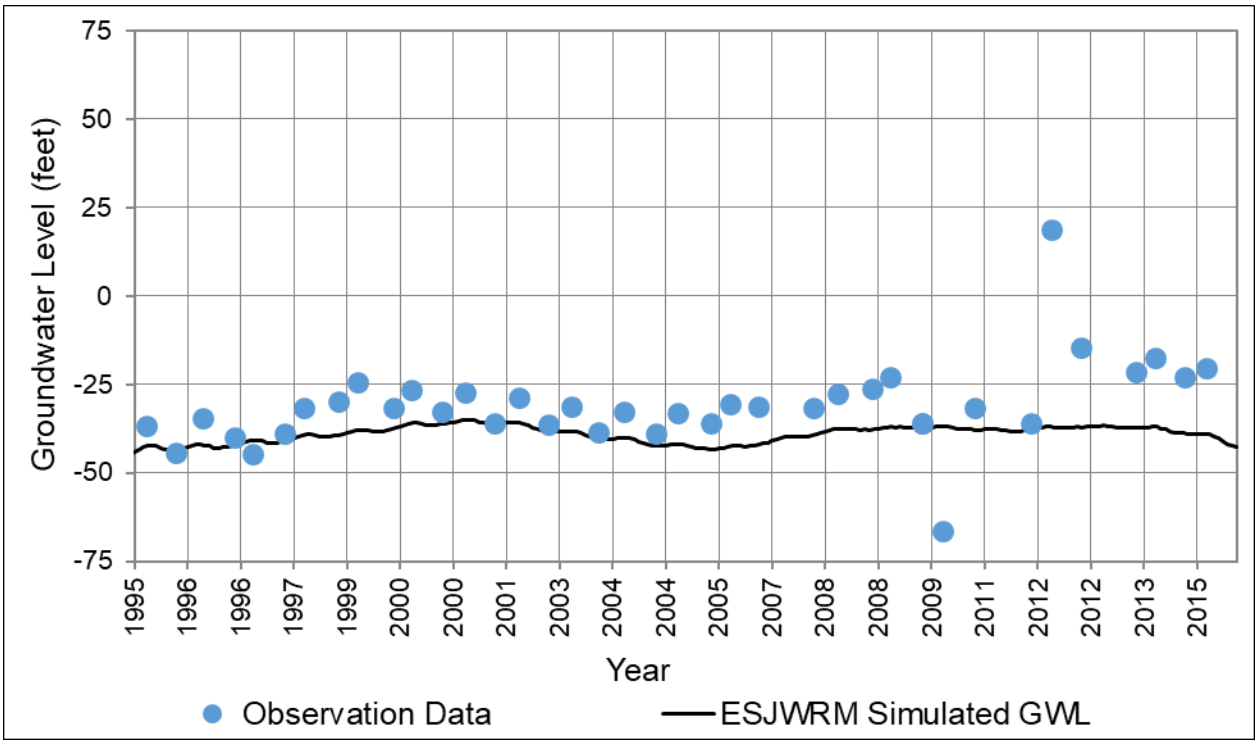


Figure C-27: ESJWRM Groundwater Level Hydrograph – Calibration Well #26

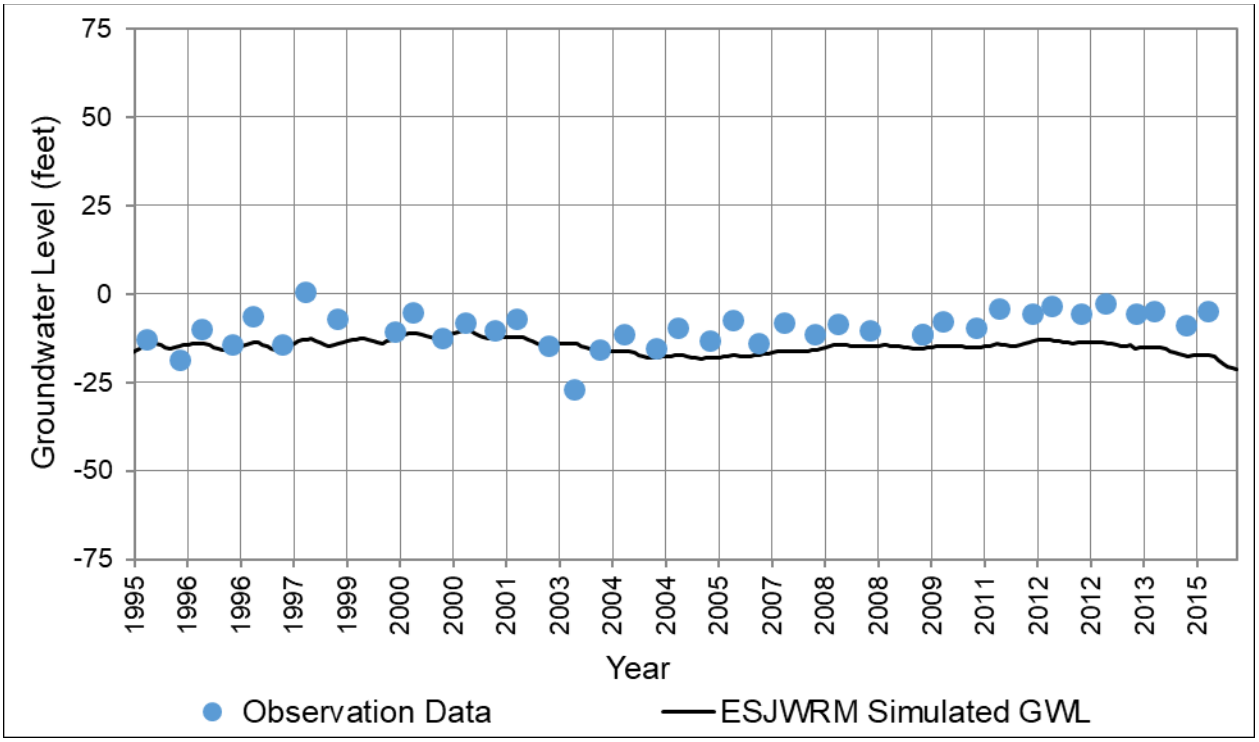


Figure C-28: ESJWRM Groundwater Level Hydrograph – Calibration Well #27

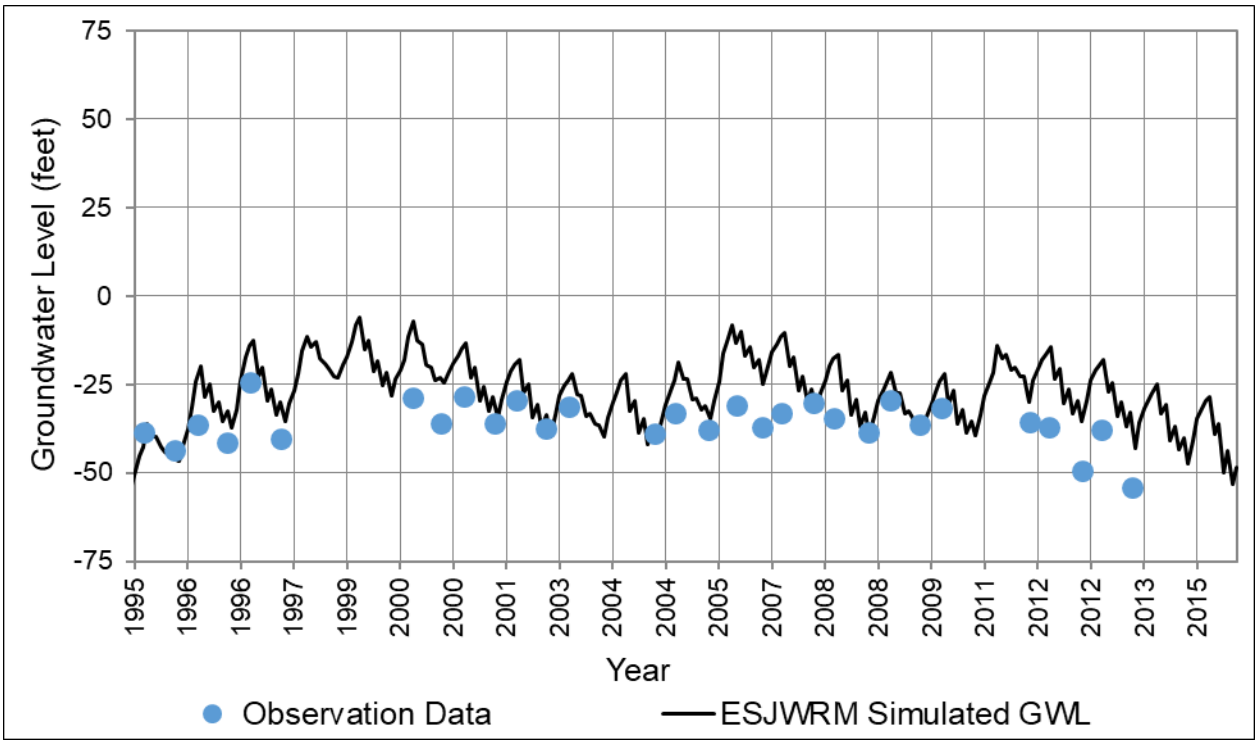


Figure C-29: ESJWRM Groundwater Level Hydrograph – Calibration Well #28

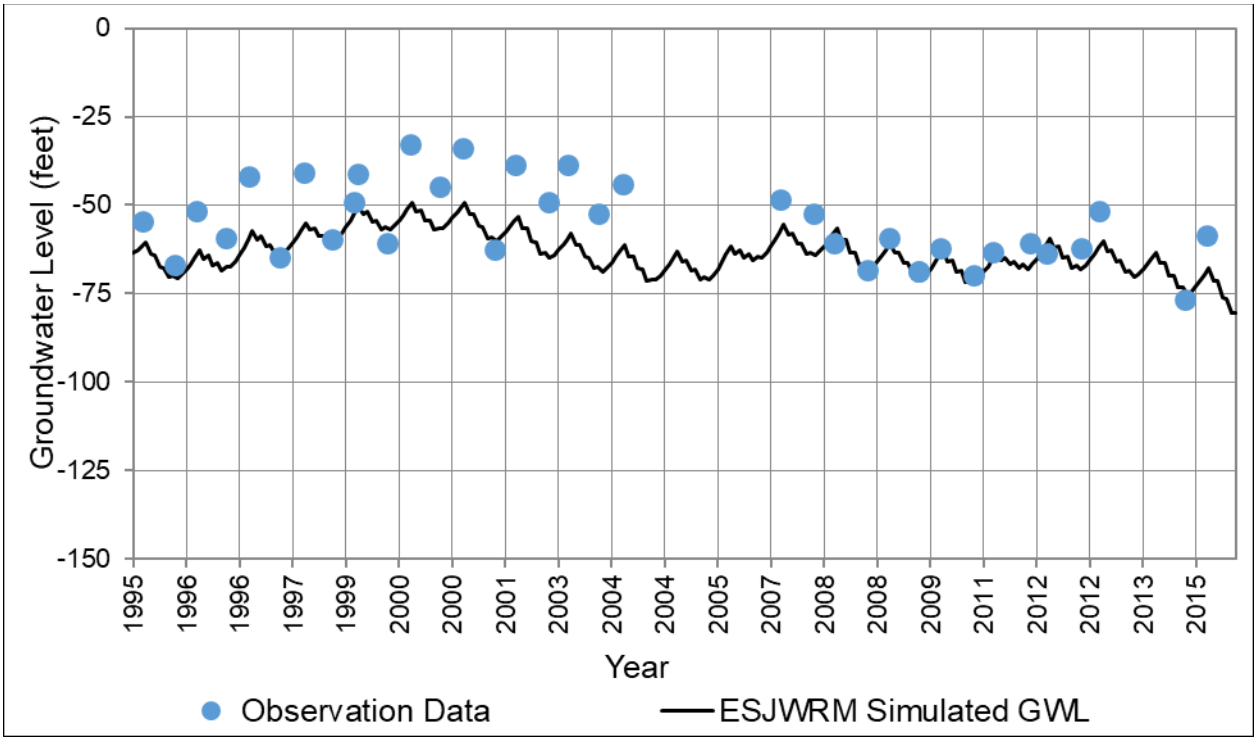


Figure C-30: ESJWRM Groundwater Level Hydrograph – Calibration Well #29

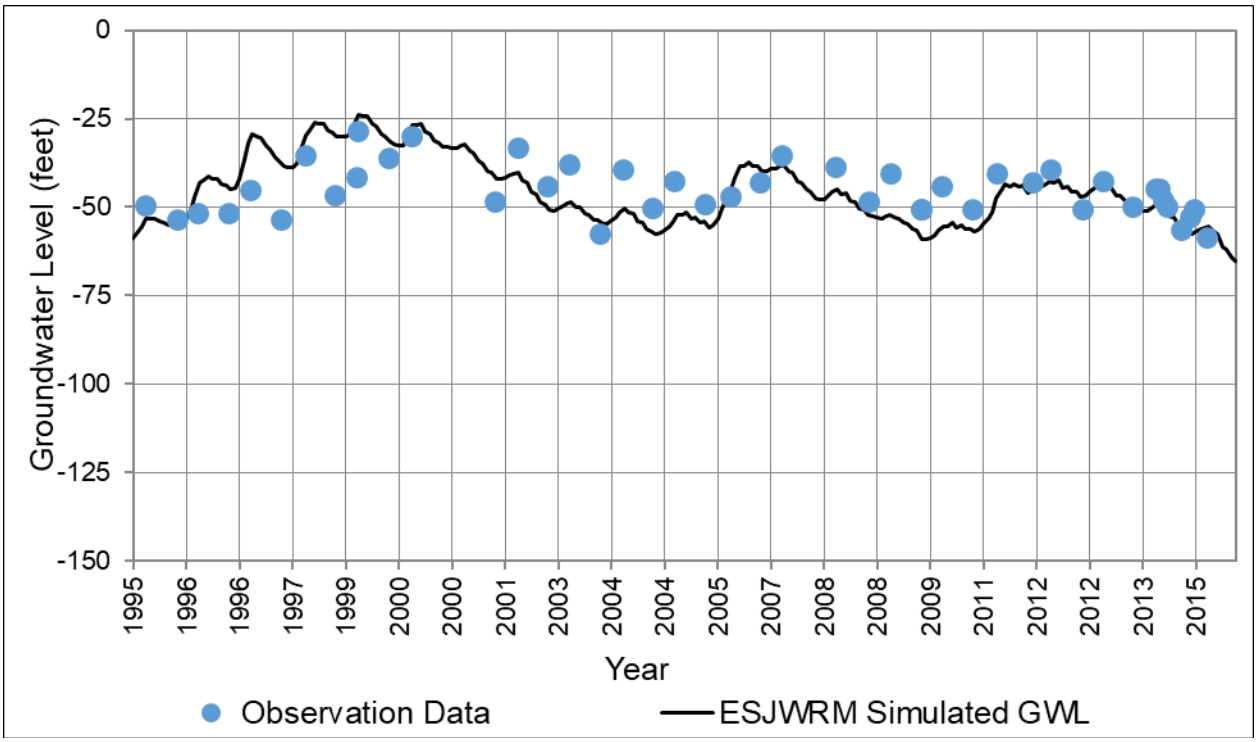


Figure C-31: ESJWRM Groundwater Level Hydrograph – Calibration Well #30

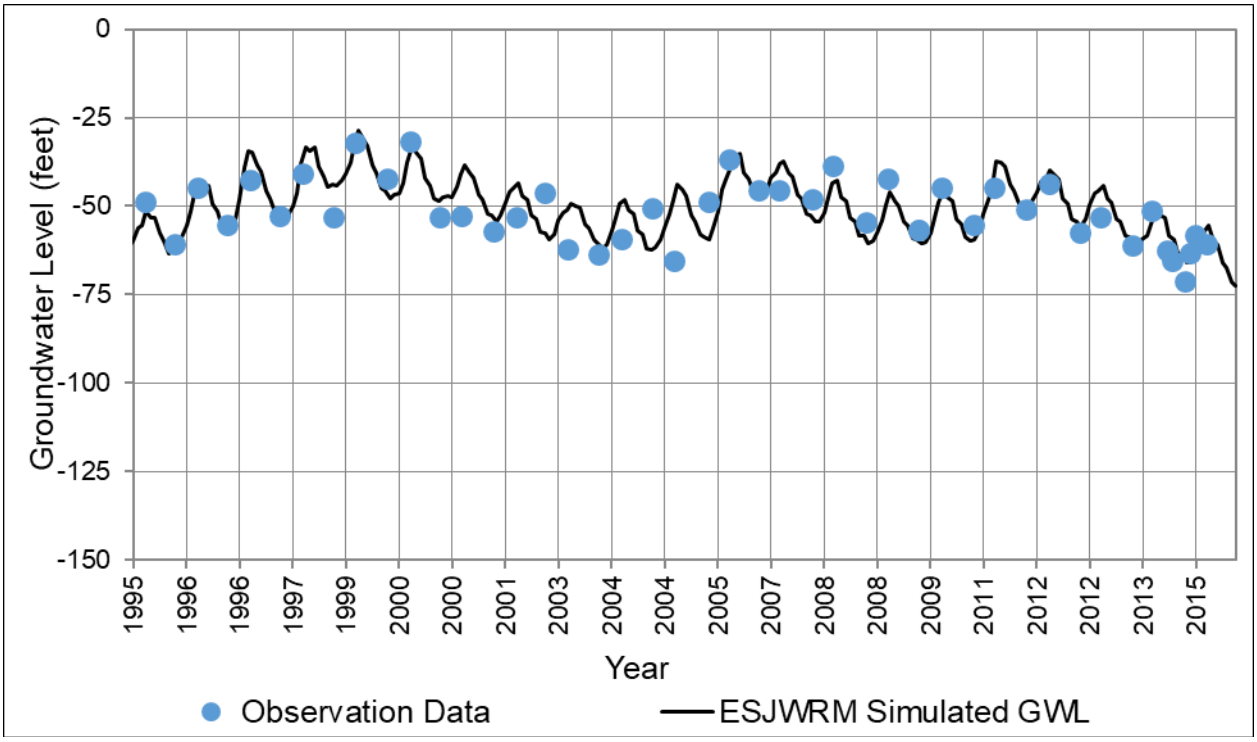


Figure C-32: ESJWRM Groundwater Level Hydrograph – Calibration Well #31

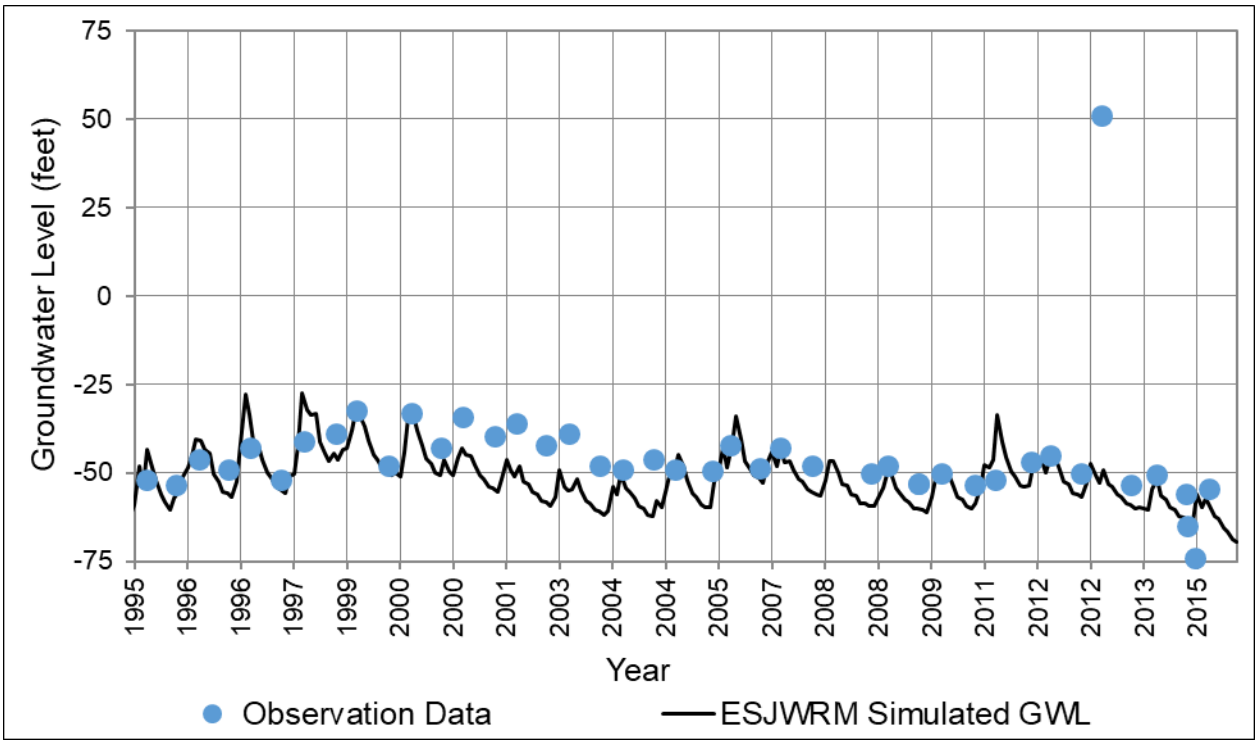


Figure C-33: ESJWRM Groundwater Level Hydrograph – Calibration Well #32

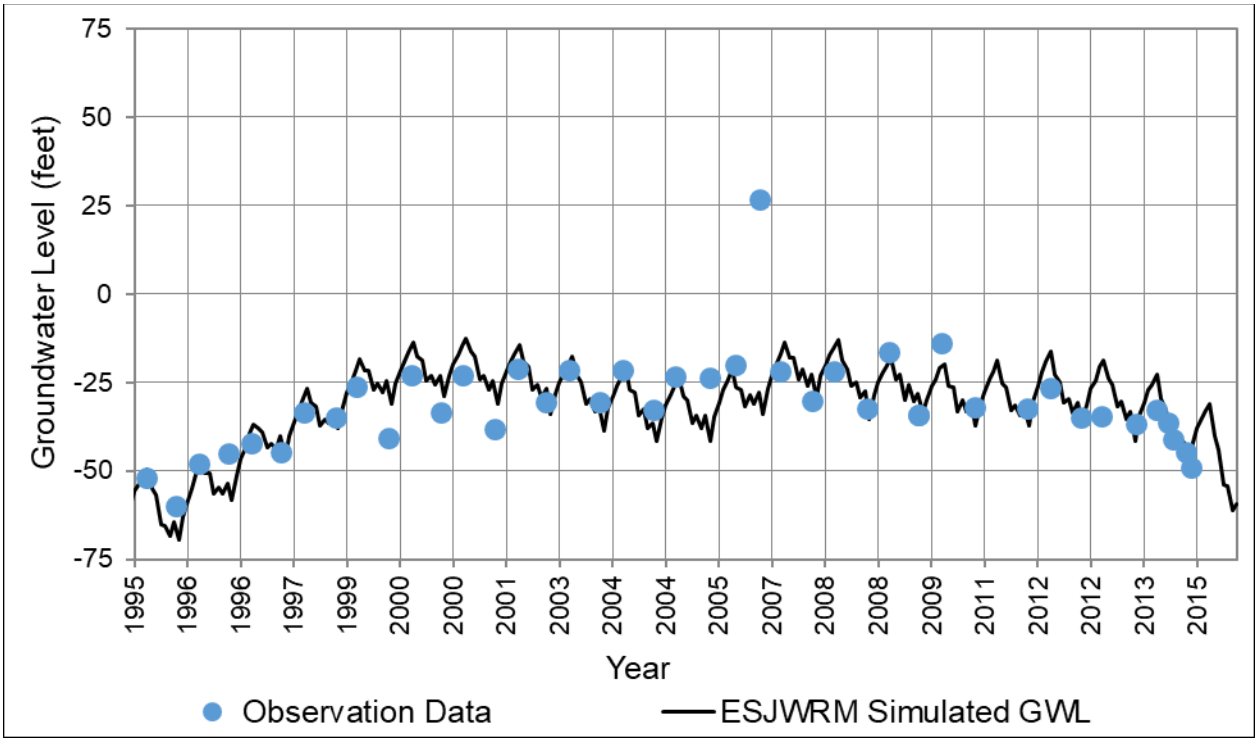


Figure C-34: ESJWRM Groundwater Level Hydrograph – Calibration Well #33

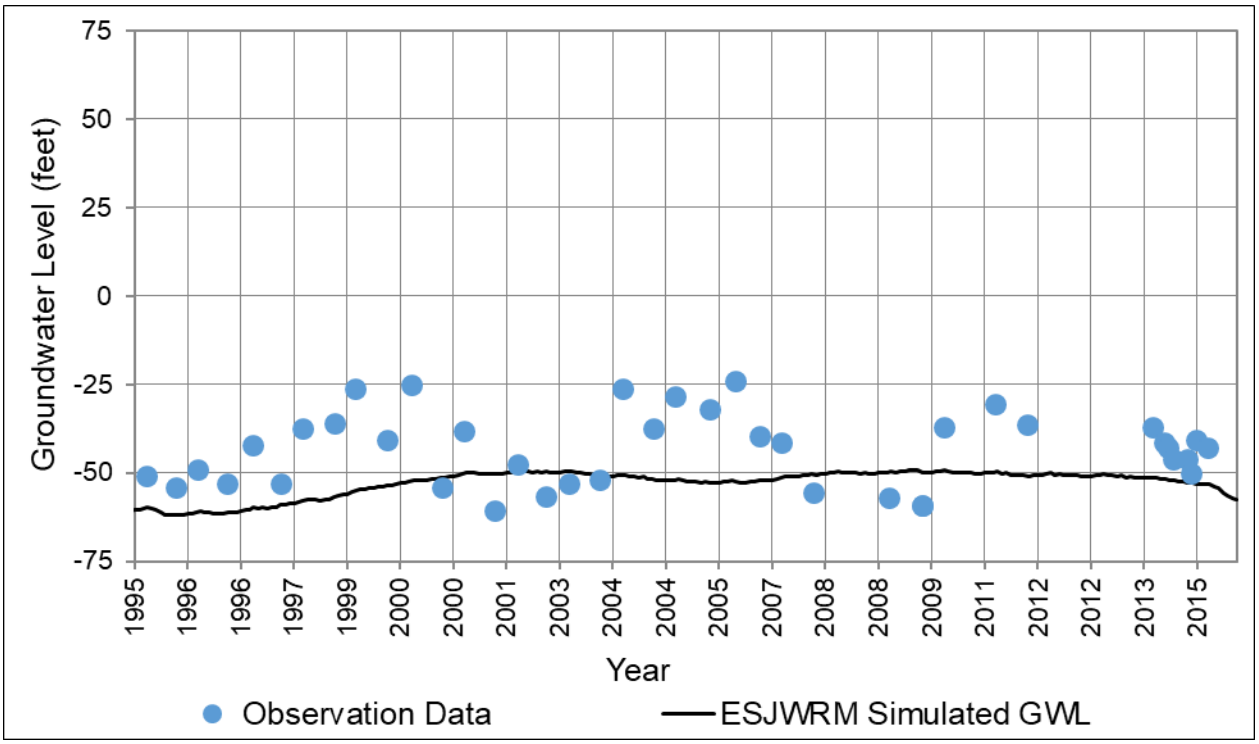


Figure C-35: ESJWRM Groundwater Level Hydrograph – Calibration Well #34

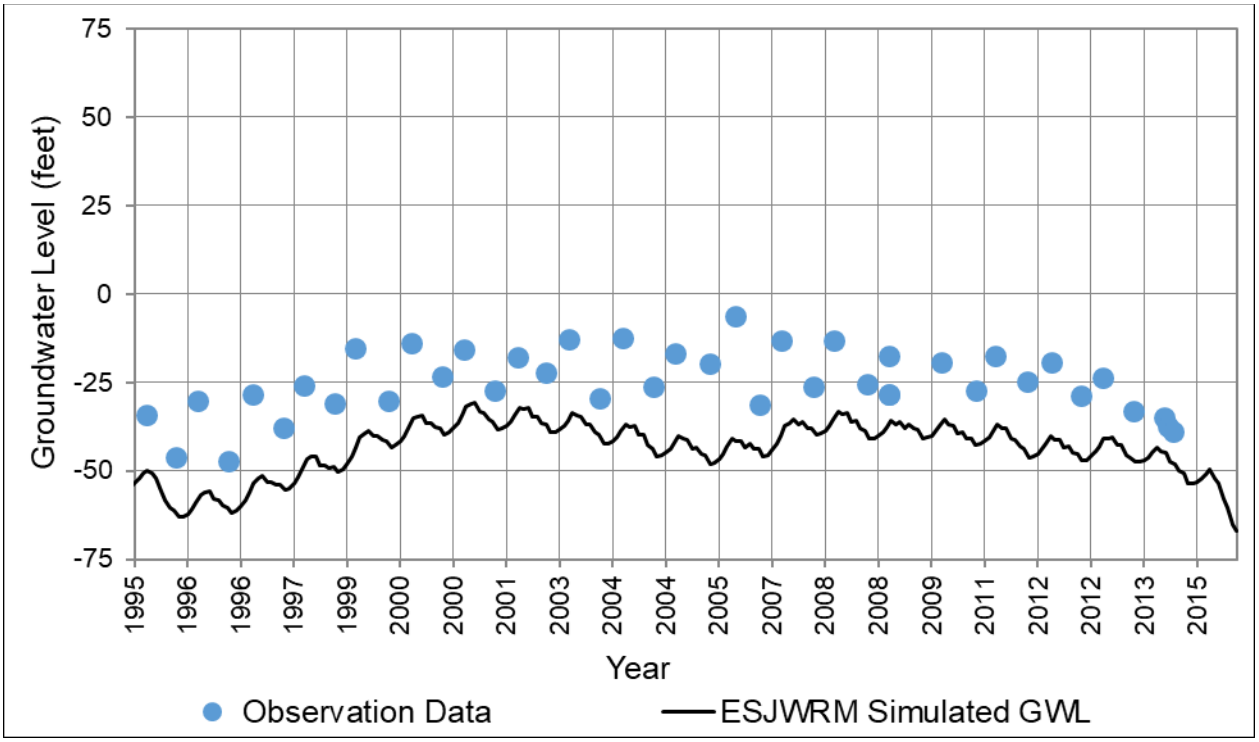


Figure C-36: ESJWRM Groundwater Level Hydrograph – Calibration Well #35

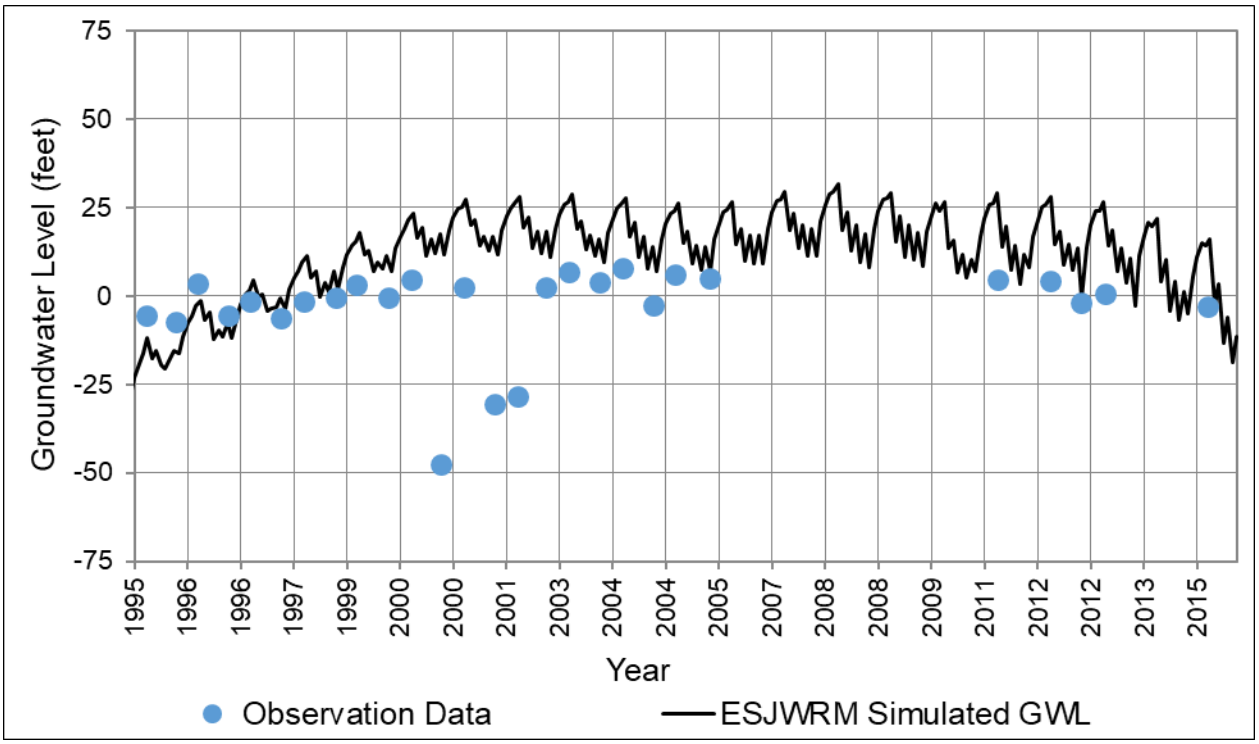


Figure C-37: ESJWRM Groundwater Level Hydrograph – Calibration Well #36

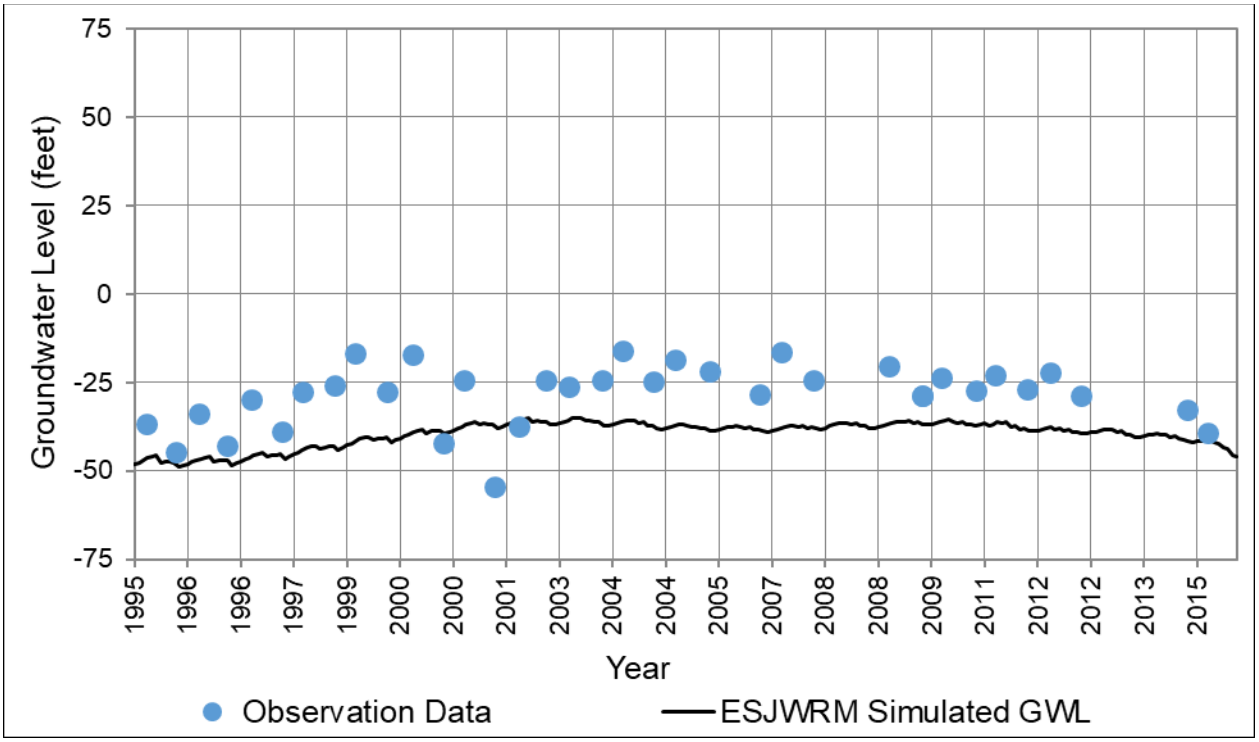


Figure C-38: ESJWRM Groundwater Level Hydrograph – Calibration Well #37

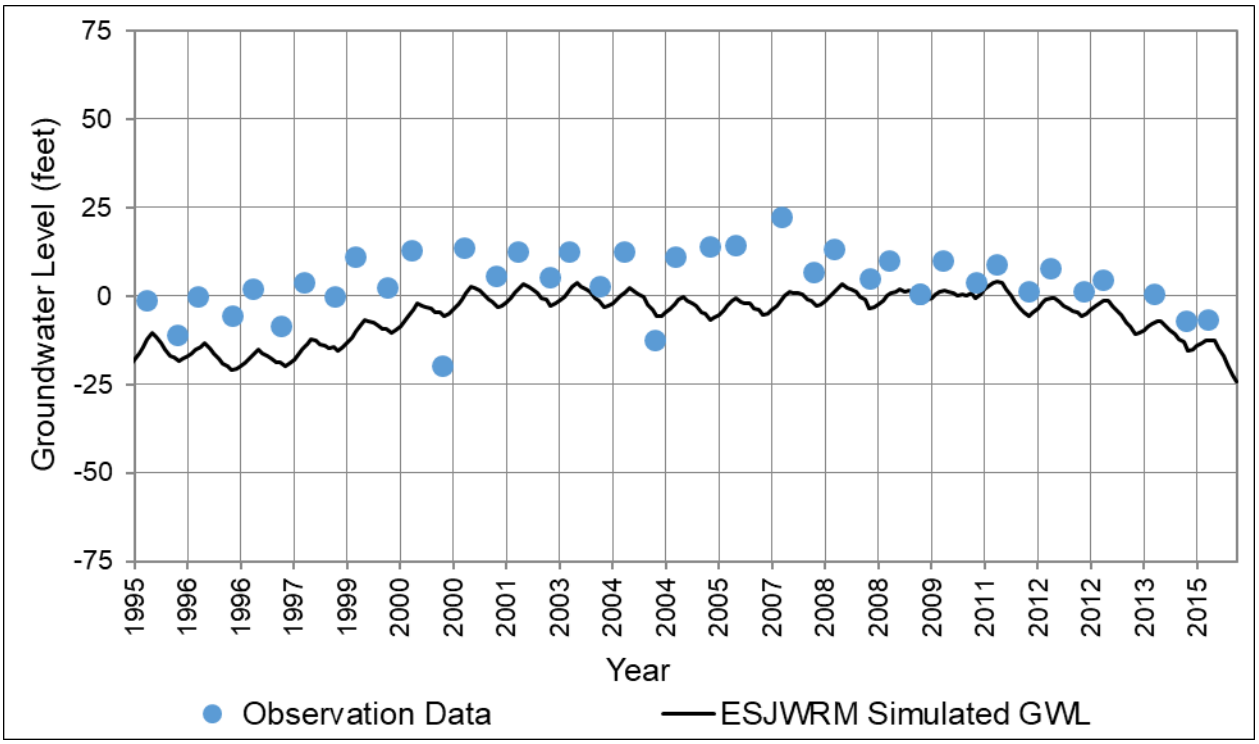


Figure C-39: ESJWRM Groundwater Level Hydrograph – Calibration Well #38

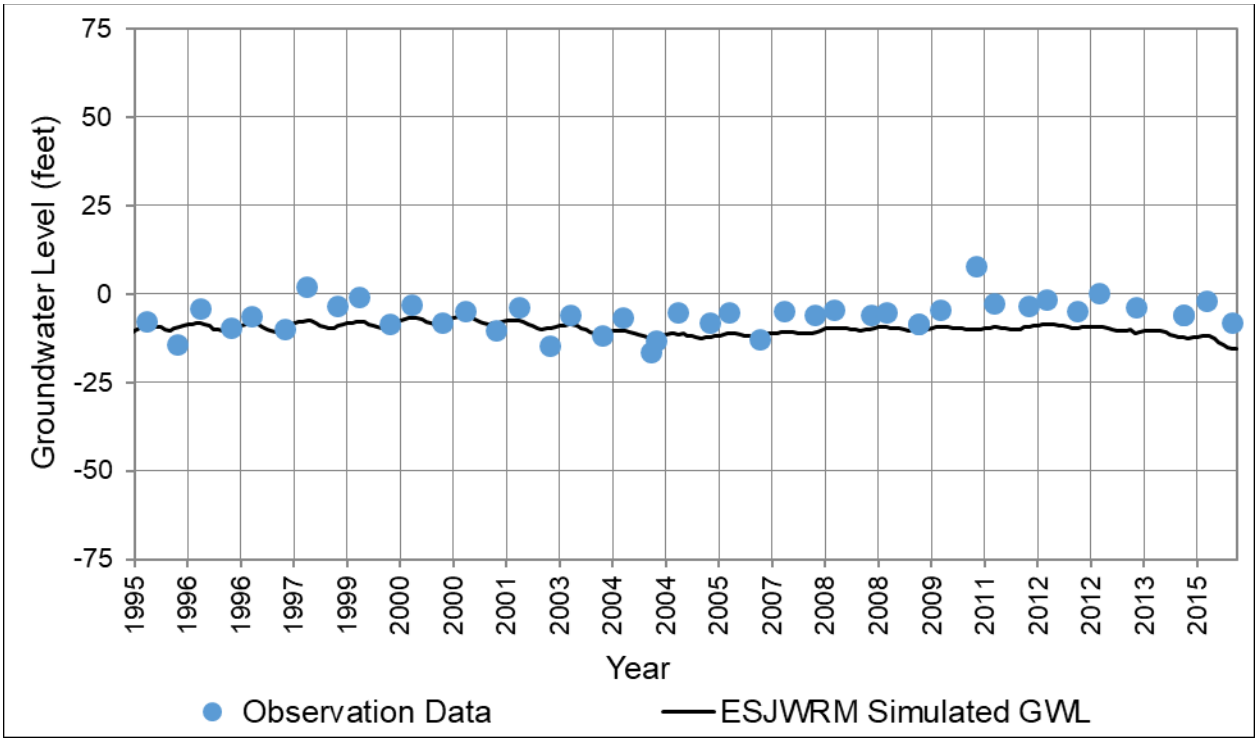


Figure C-40: ESJWRM Groundwater Level Hydrograph – Calibration Well #39

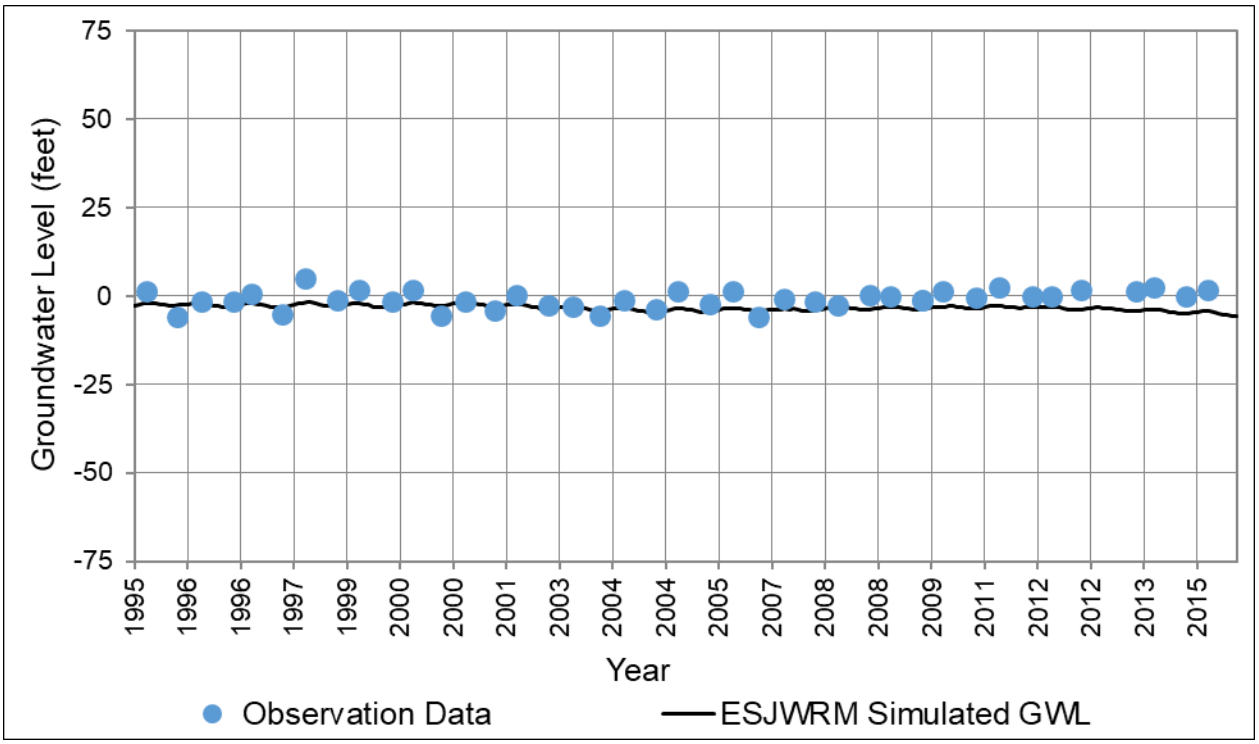


Figure C-41: ESJWRM Groundwater Level Hydrograph – Calibration Well #40

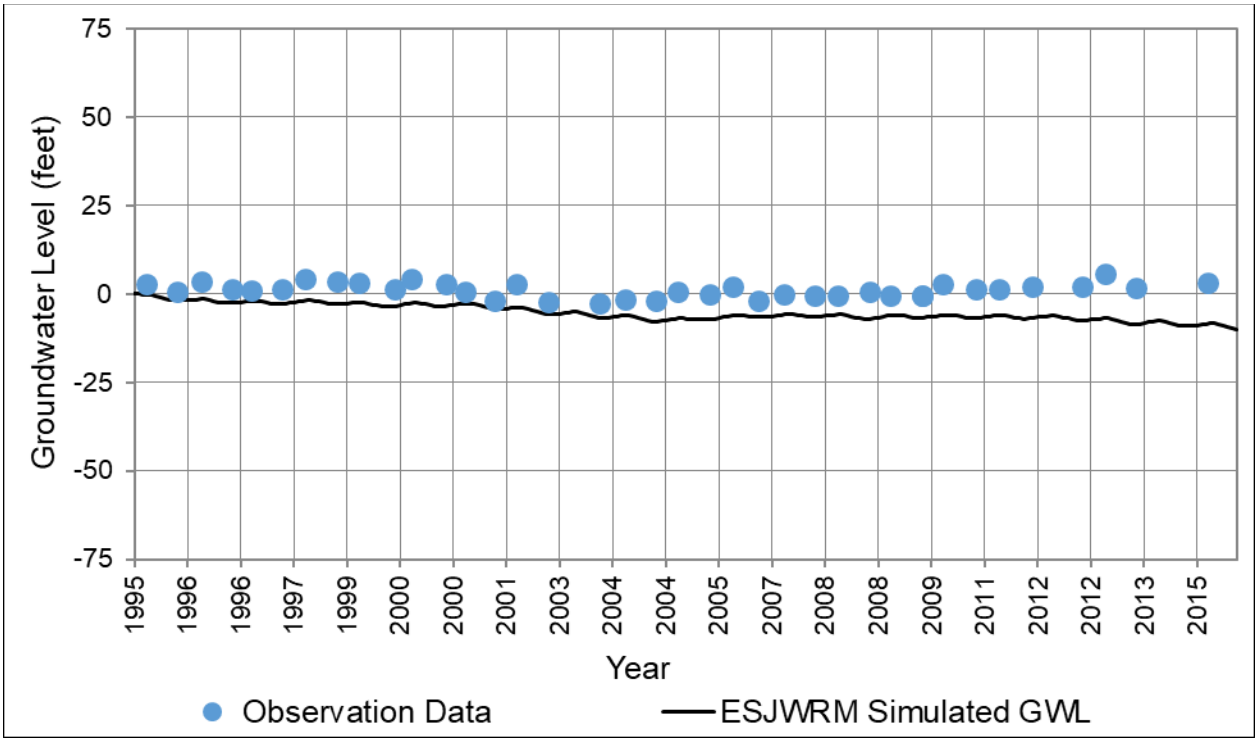


Figure C-42: ESJWRM Groundwater Level Hydrograph – Calibration Well #41

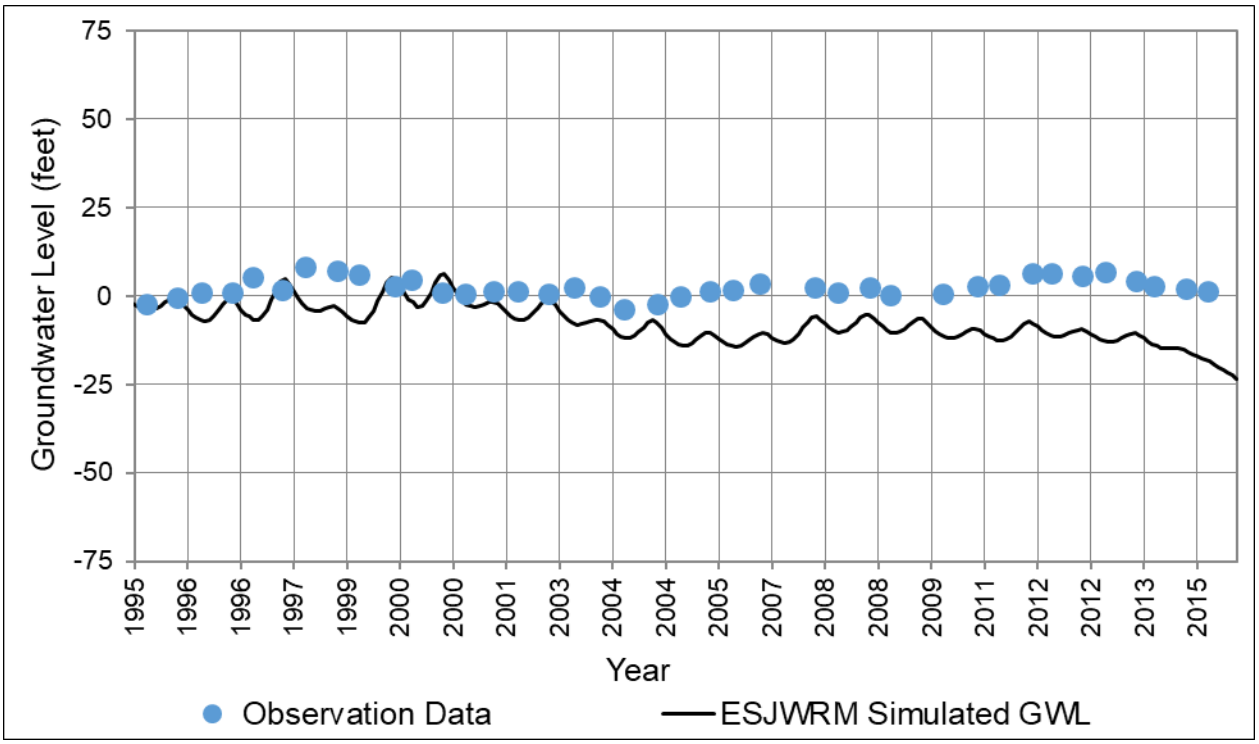


Figure C-43: ESJWRM Groundwater Level Hydrograph – Calibration Well #42

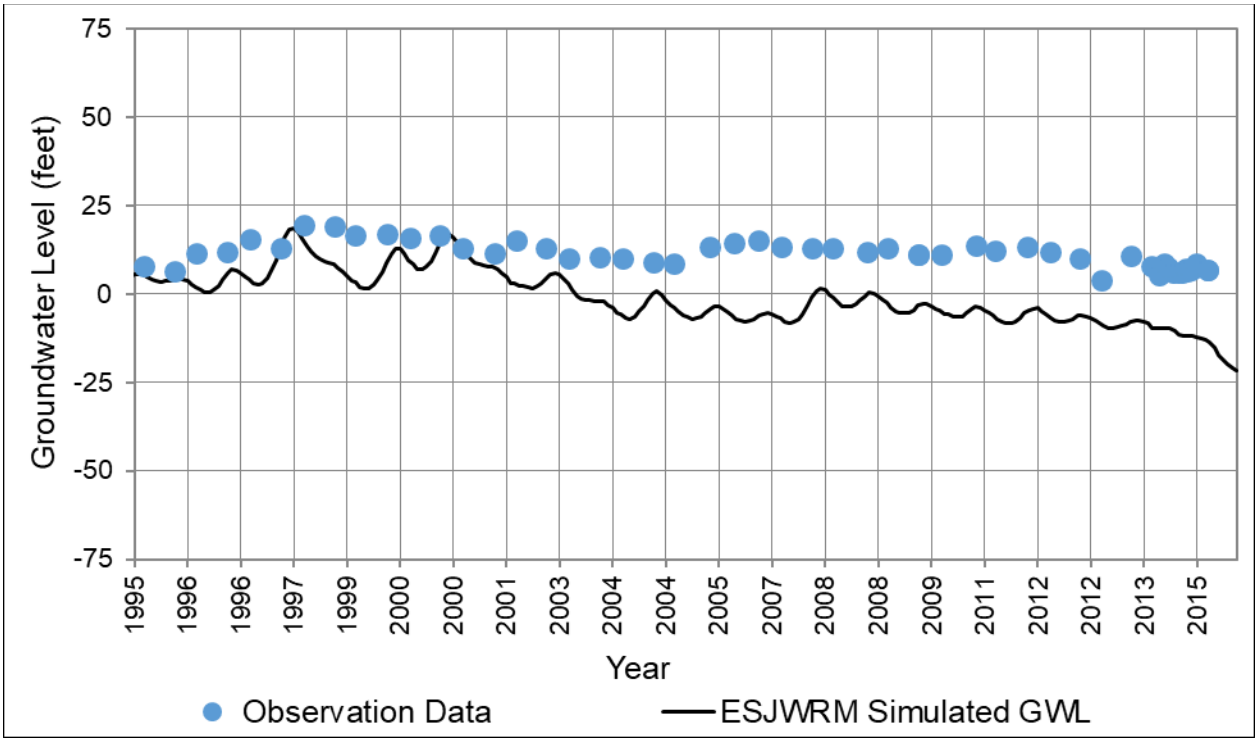


Figure C-44: ESJWRM Groundwater Level Hydrograph – Calibration Well #43

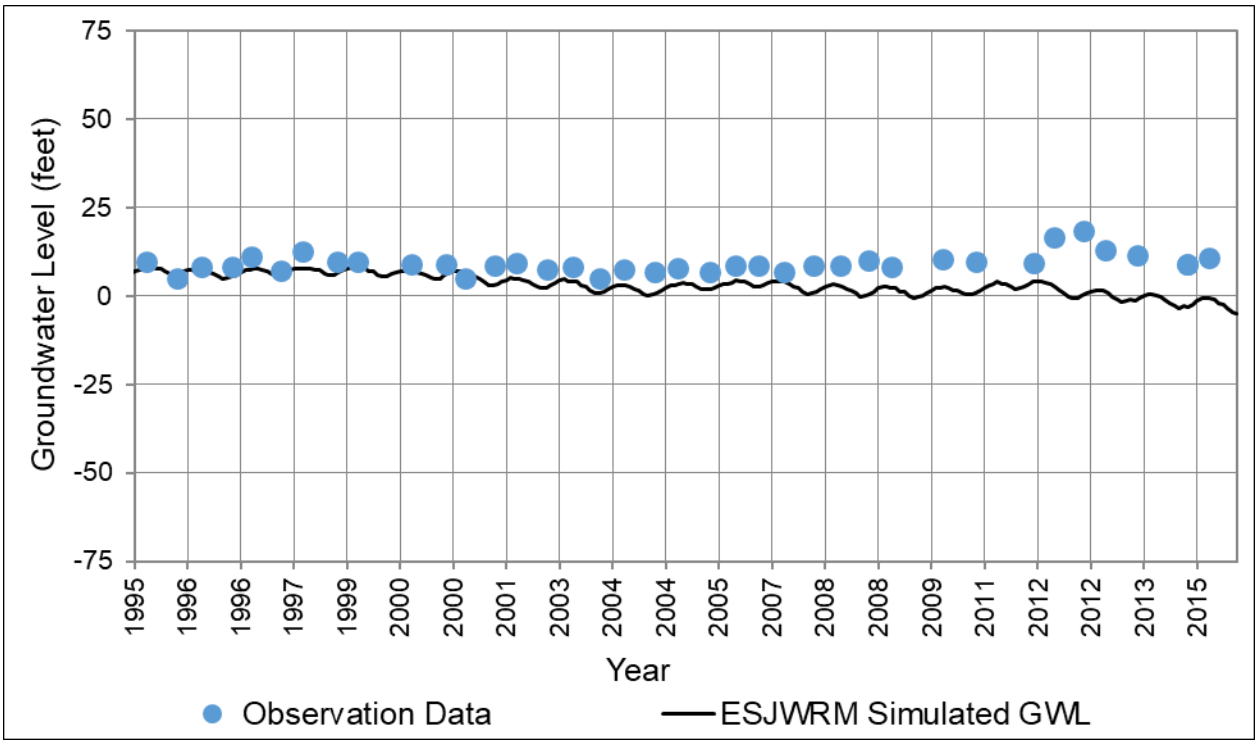


Figure C-45: ESJWRM Groundwater Level Hydrograph – Calibration Well #44

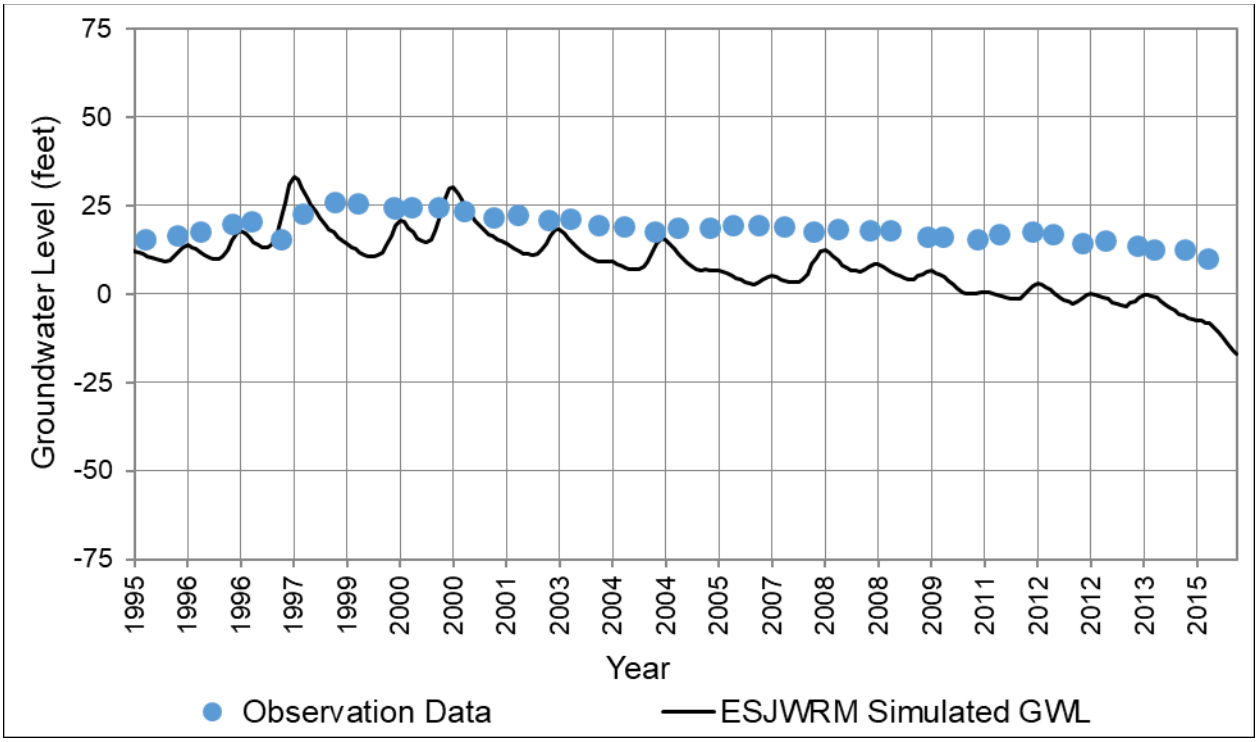


Figure C-46: ESJWRM Groundwater Level Hydrograph – Calibration Well #45

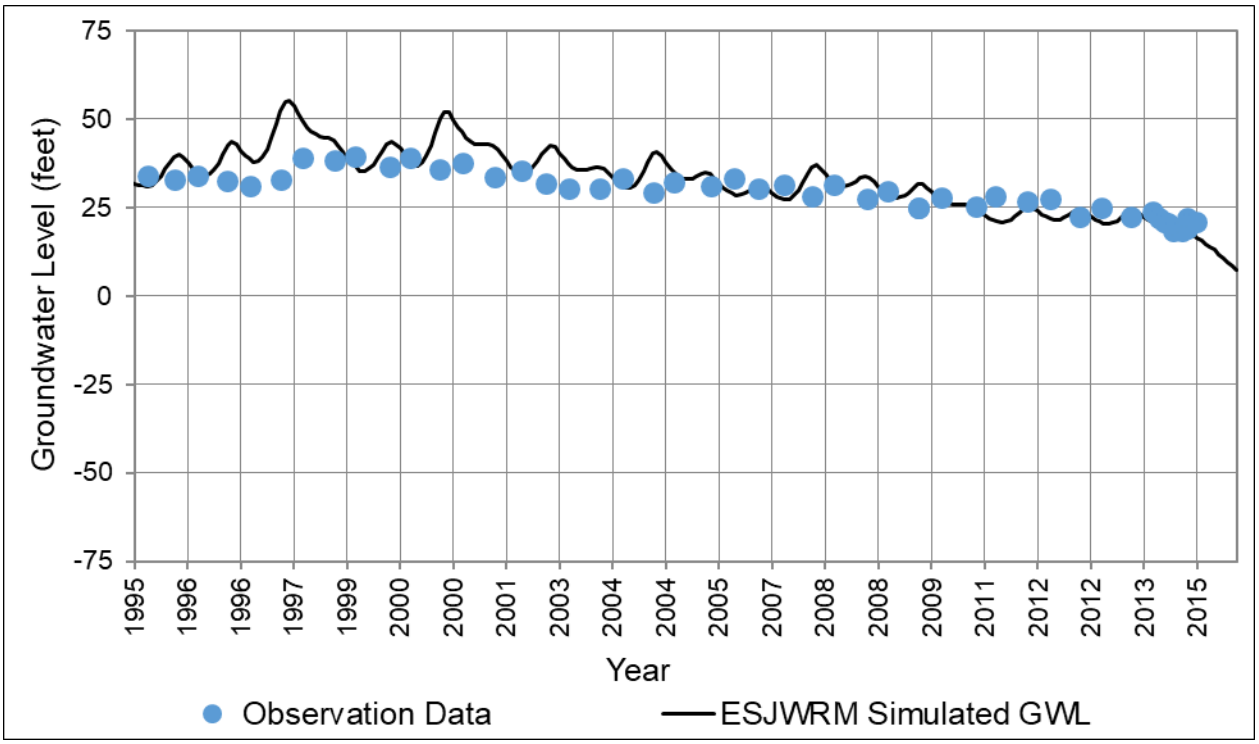


Figure C-47: ESJWRM Groundwater Level Hydrograph – Calibration Well #46

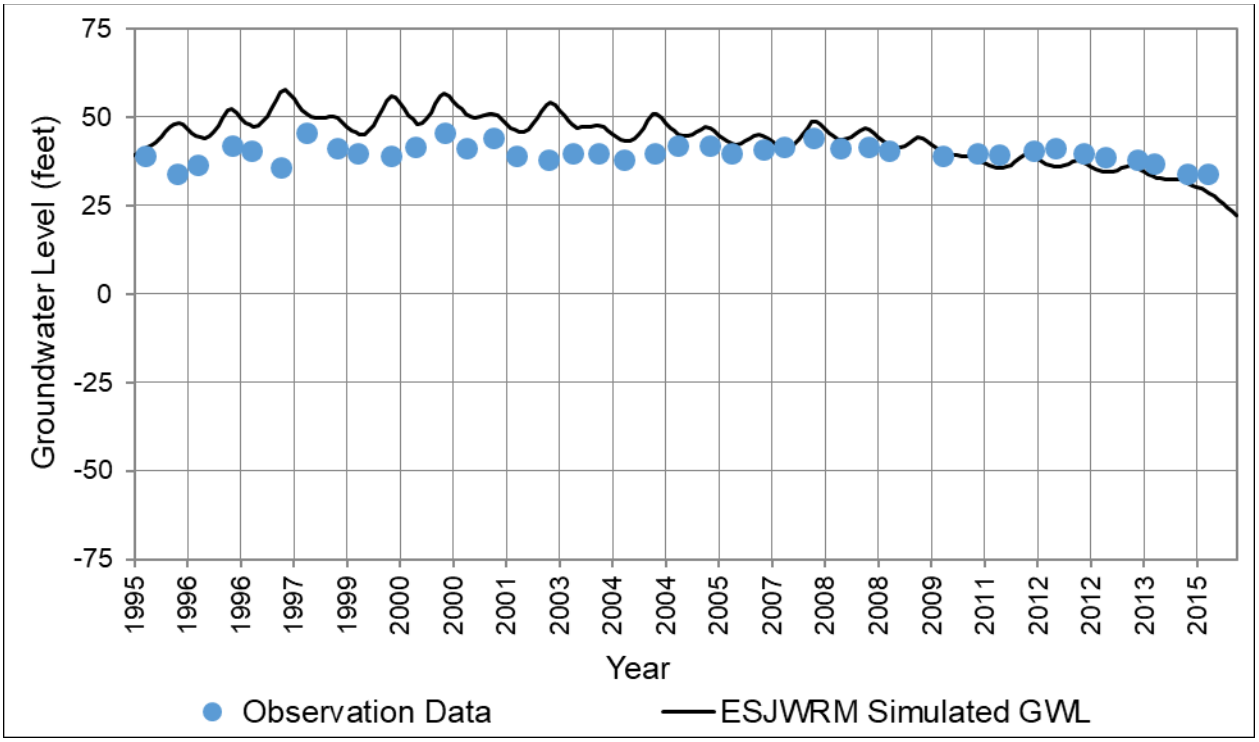


Figure C-48: ESJWRM Groundwater Level Hydrograph – Calibration Well #47

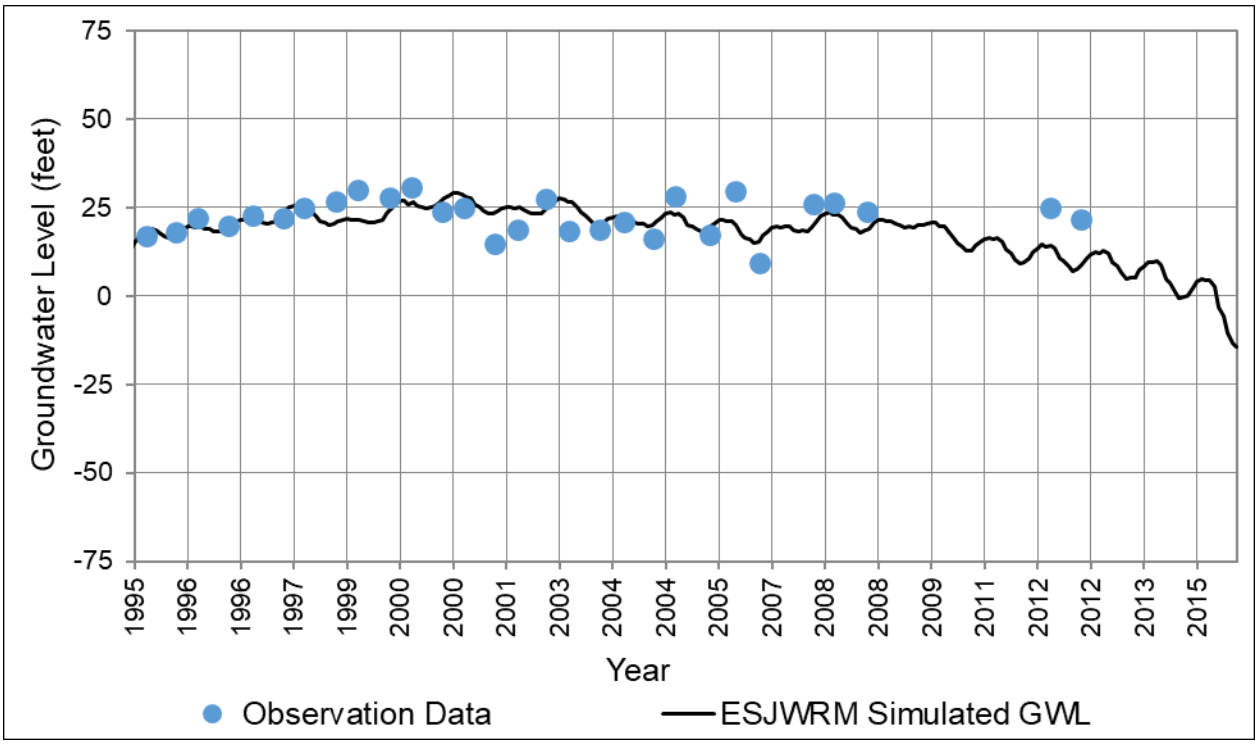


Figure C-49: ESJWRM Groundwater Level Hydrograph – Calibration Well #48

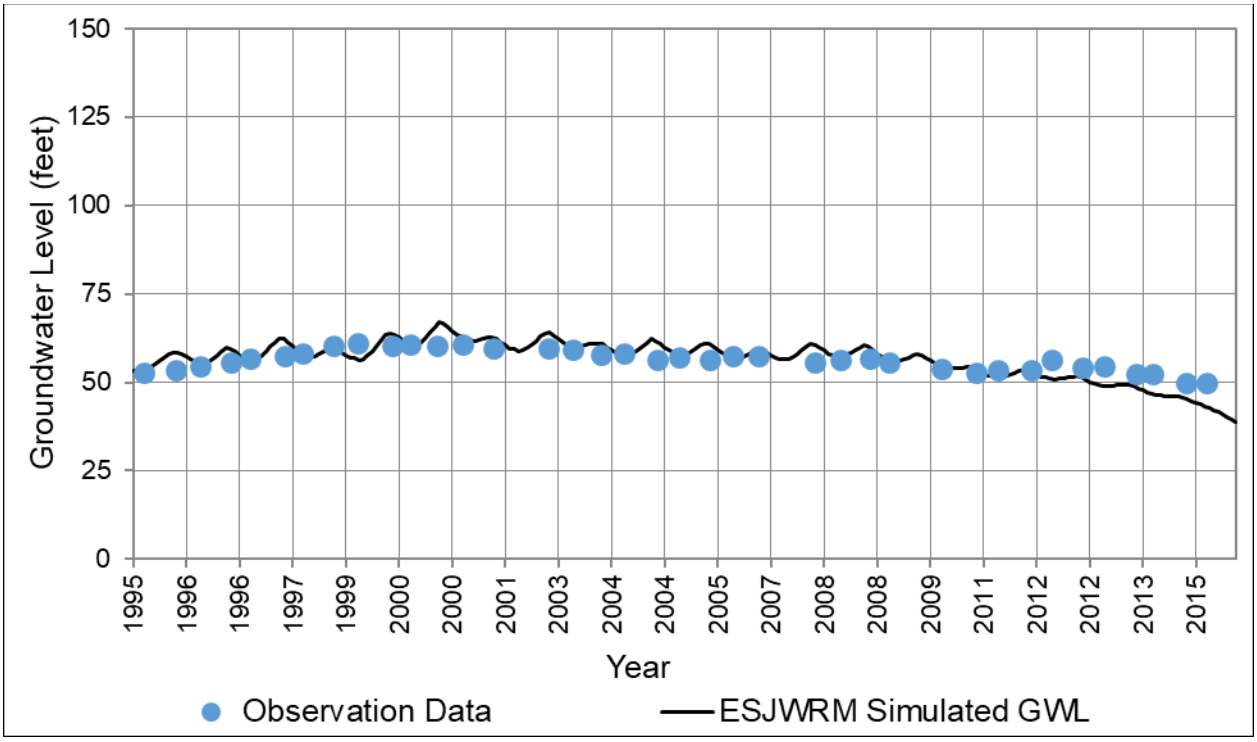


Figure C-50: ESJWRM Groundwater Level Hydrograph – Calibration Well #49

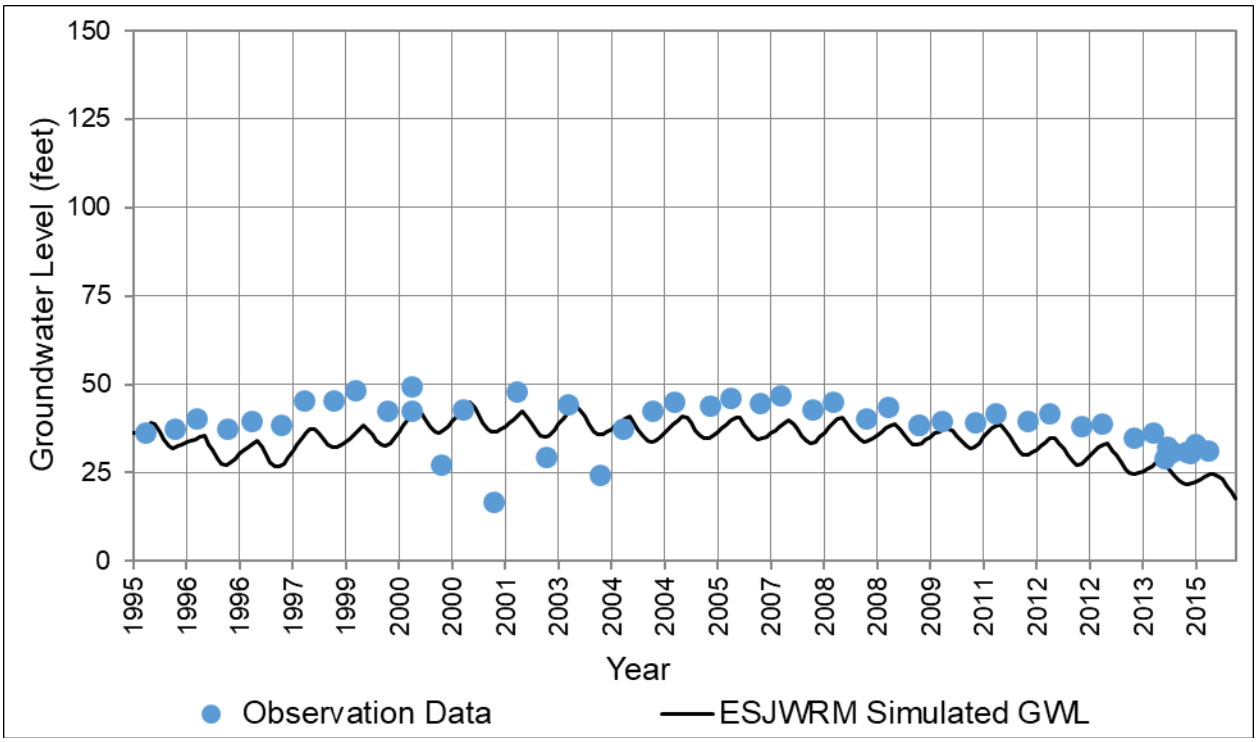


Figure C-51: ESJWRM Groundwater Level Hydrograph – Calibration Well #50

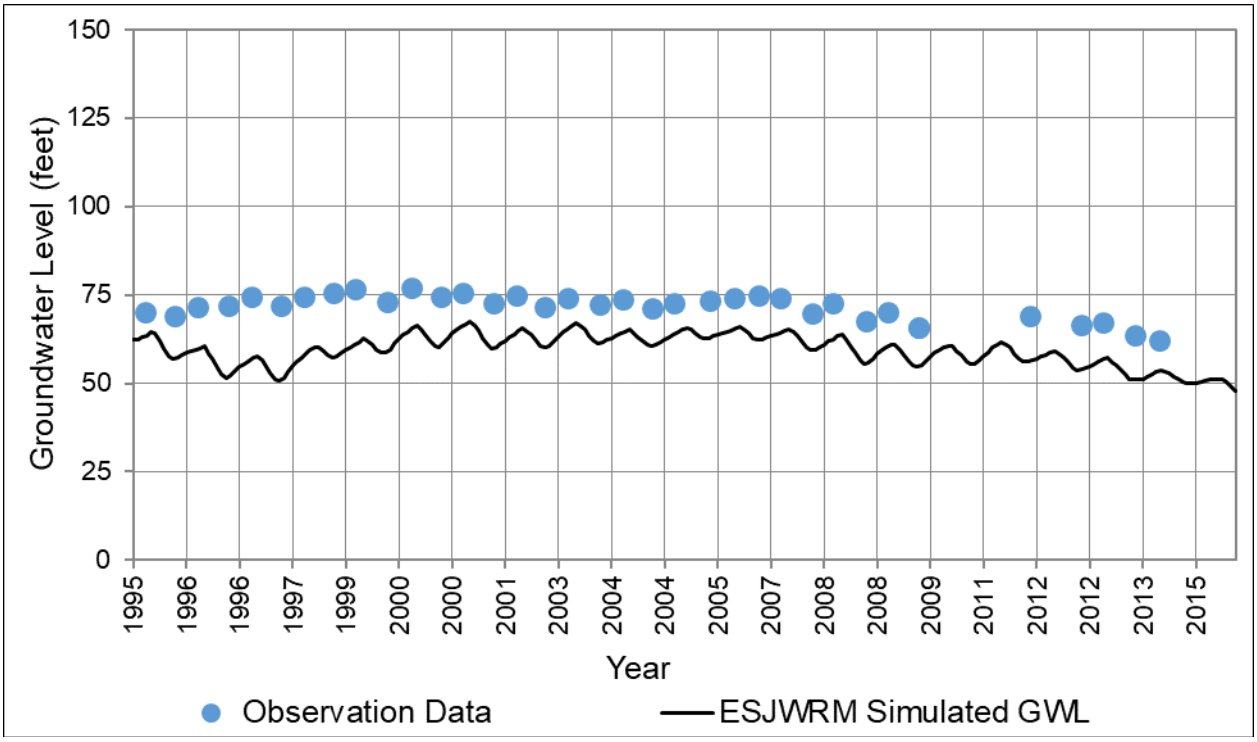


Figure C-52: ESJWRM Groundwater Level Hydrograph – Calibration Well #51

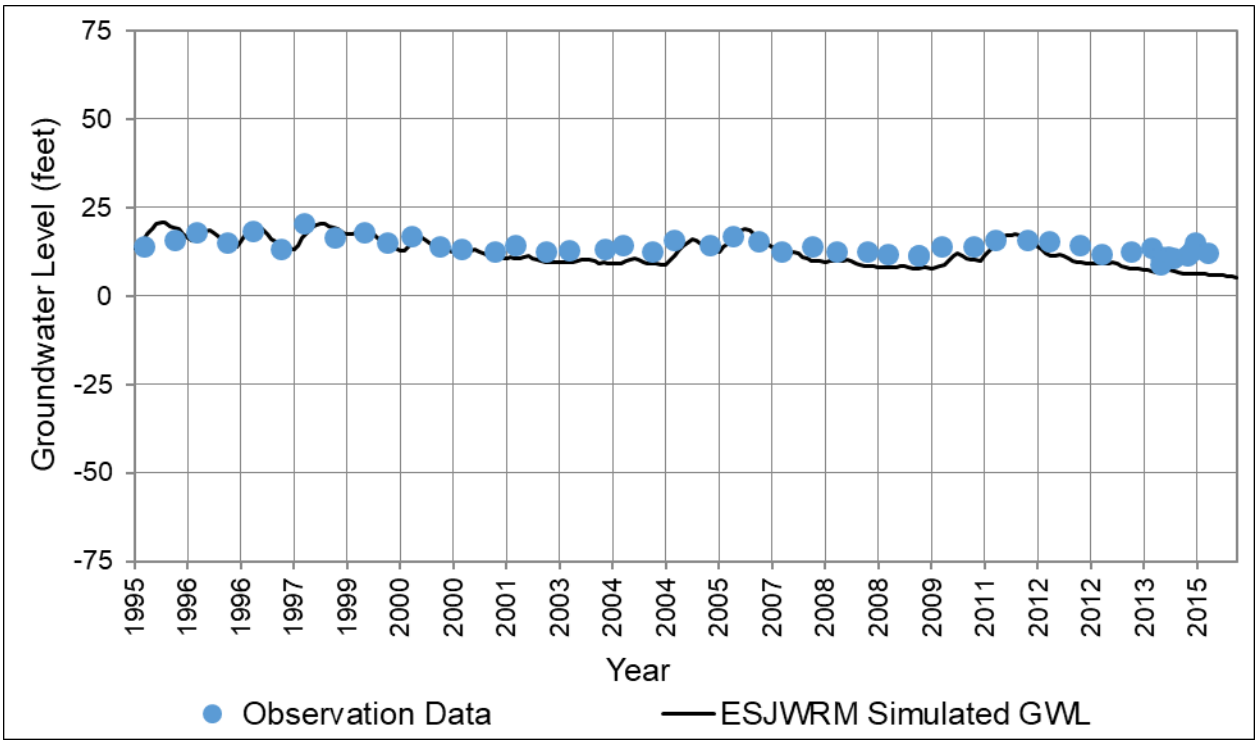


Figure C-53: ESJWRM Groundwater Level Hydrograph – Calibration Well #52

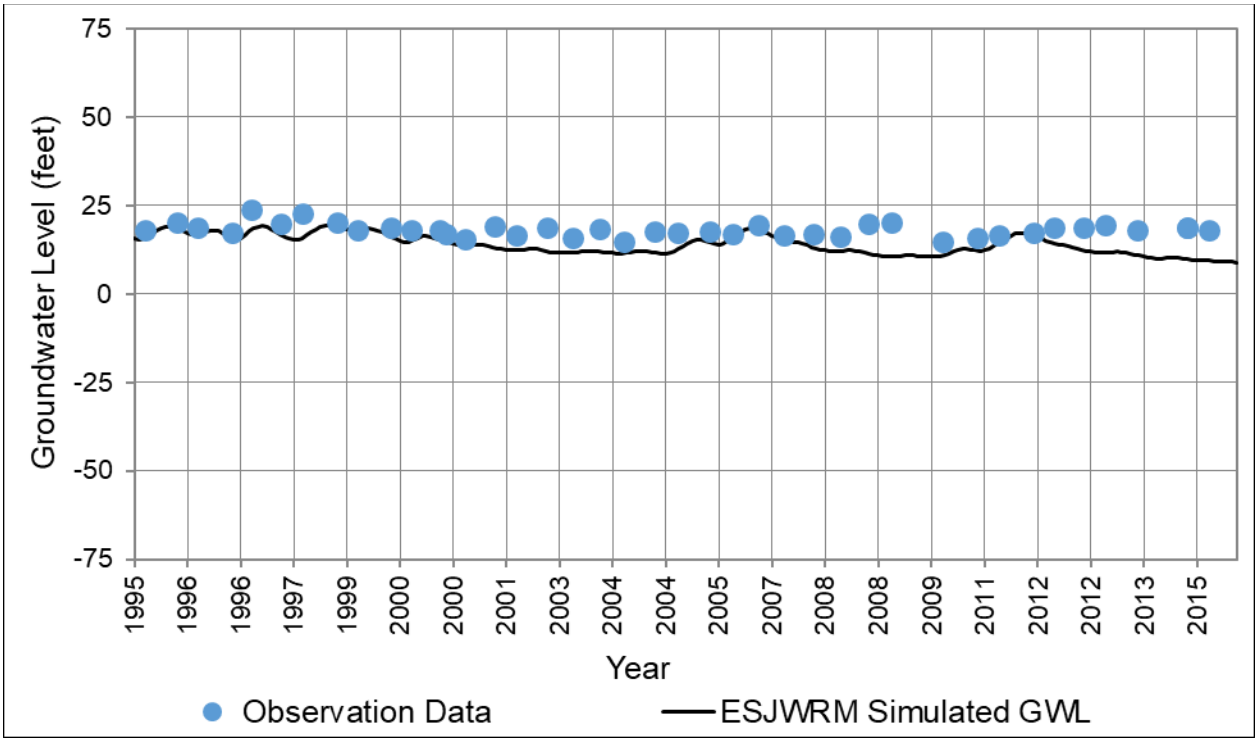


Figure C-54: ESJWRM Groundwater Level Hydrograph – Calibration Well #53

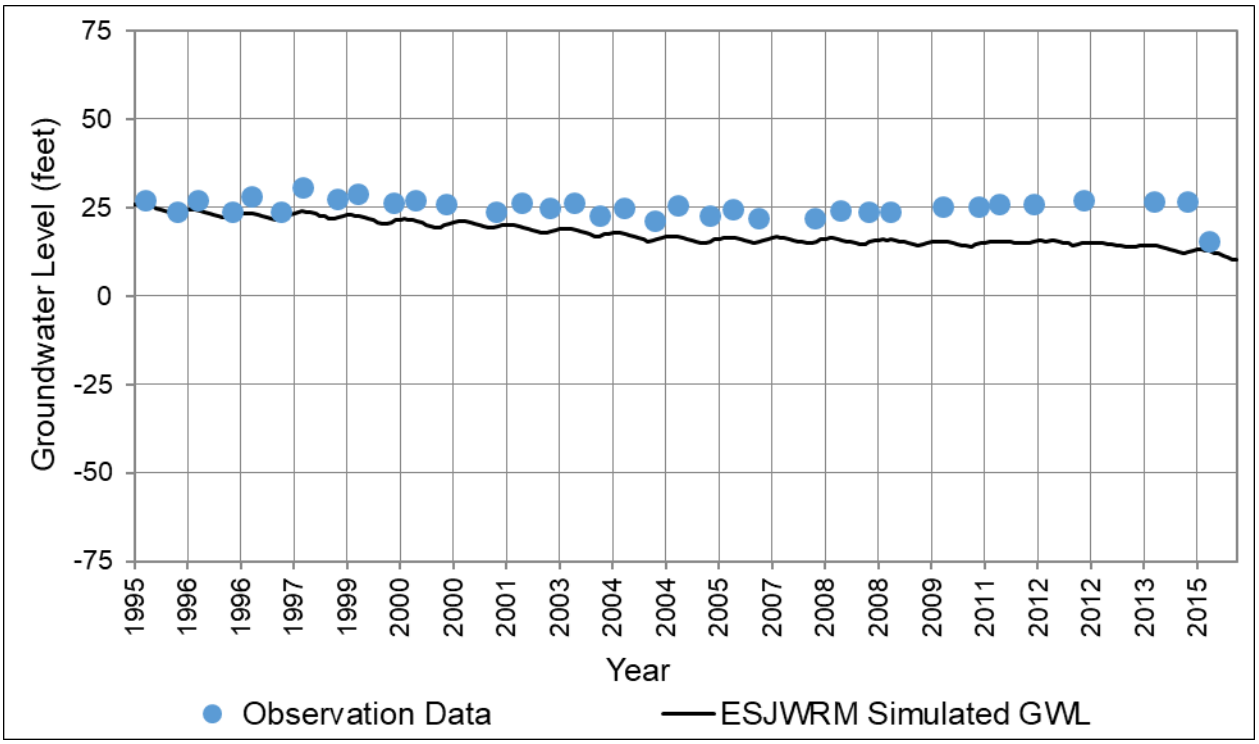


Figure C-55: ESJWRM Groundwater Level Hydrograph – Calibration Well #54

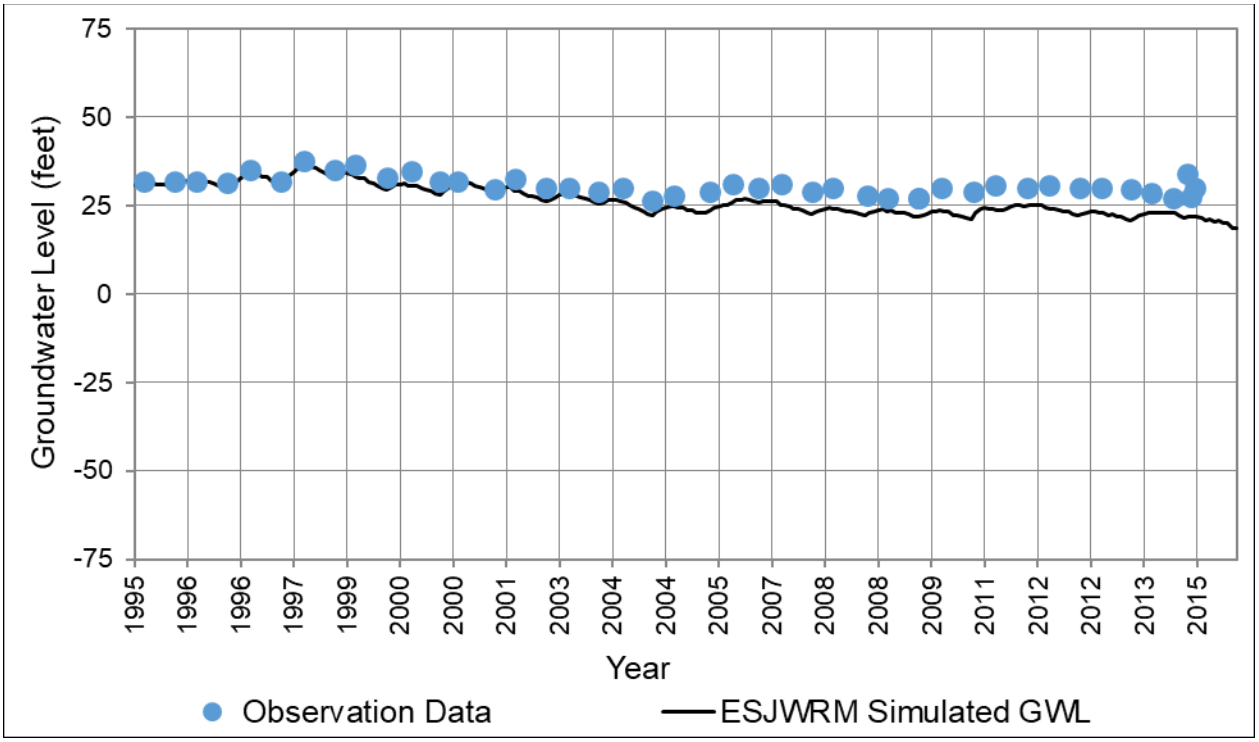


Figure C-56: ESJWRM Groundwater Level Hydrograph – Calibration Well #55

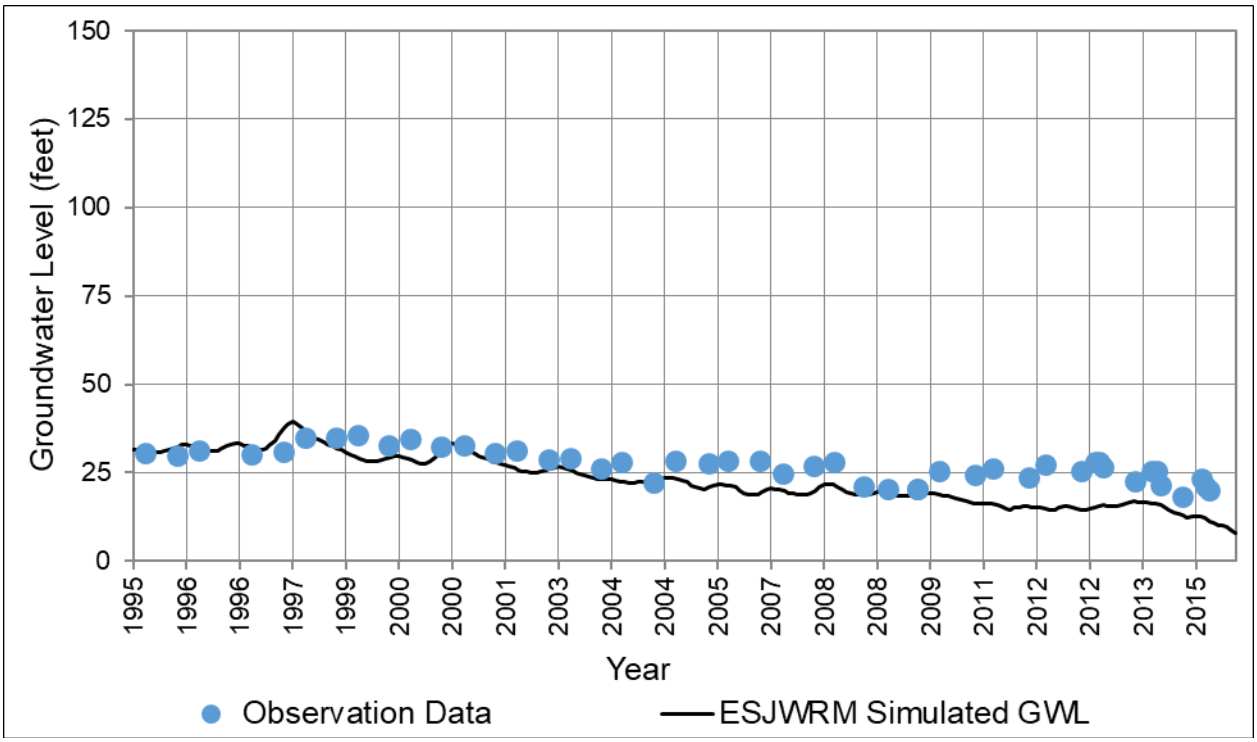


Figure C-57: ESJWRM Groundwater Level Hydrograph – Calibration Well #56

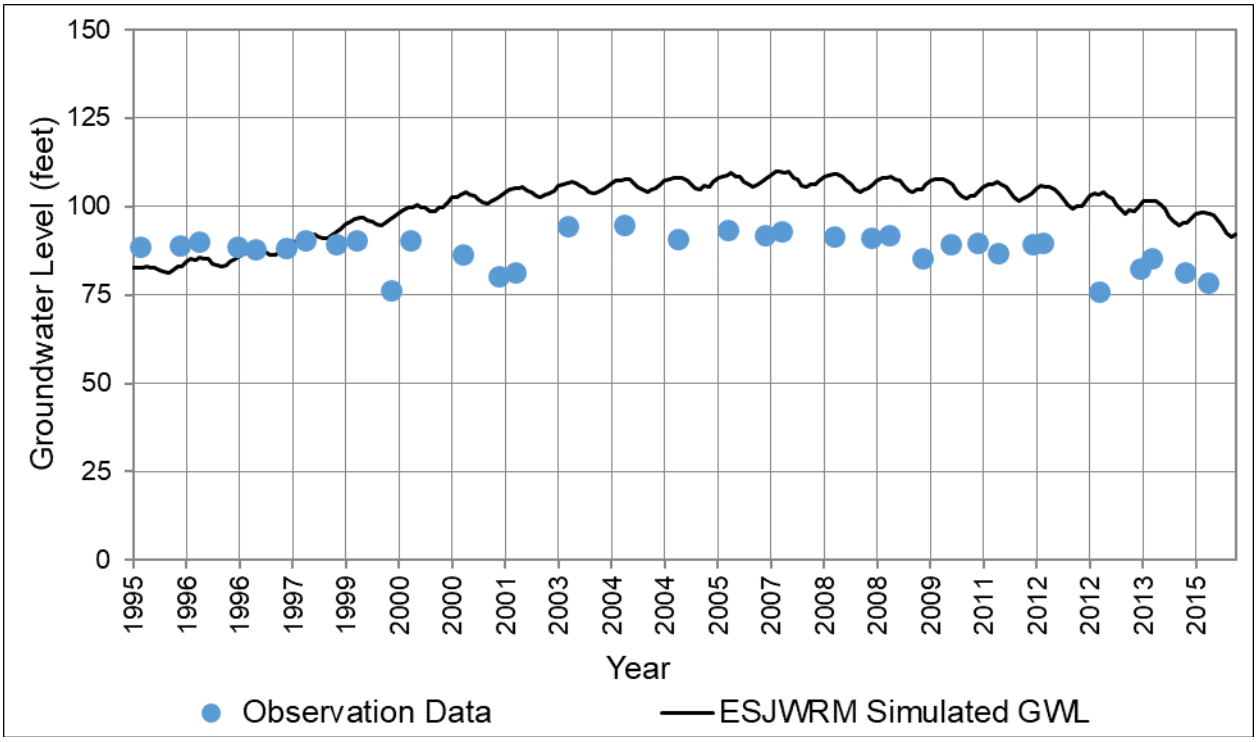


Figure C-58: ESJWRM Groundwater Level Hydrograph – Calibration Well #57

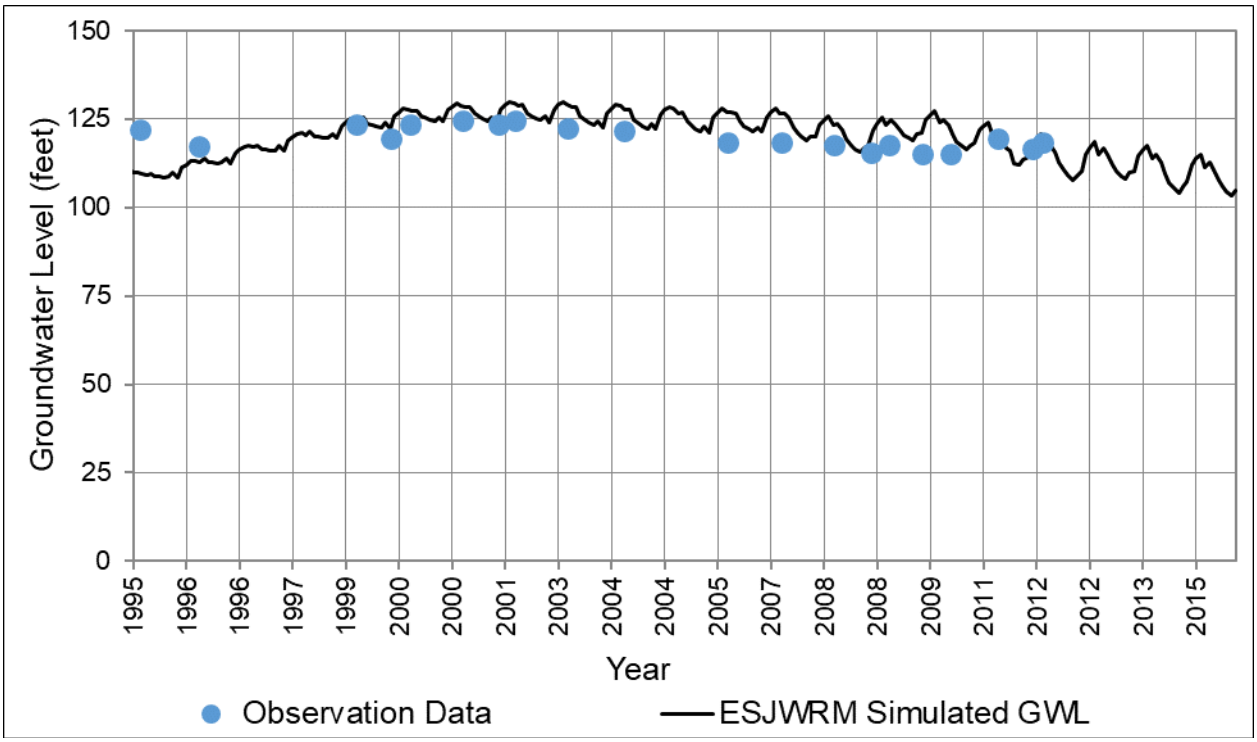


Figure C-59: ESJWRM Groundwater Level Hydrograph – Calibration Well #58

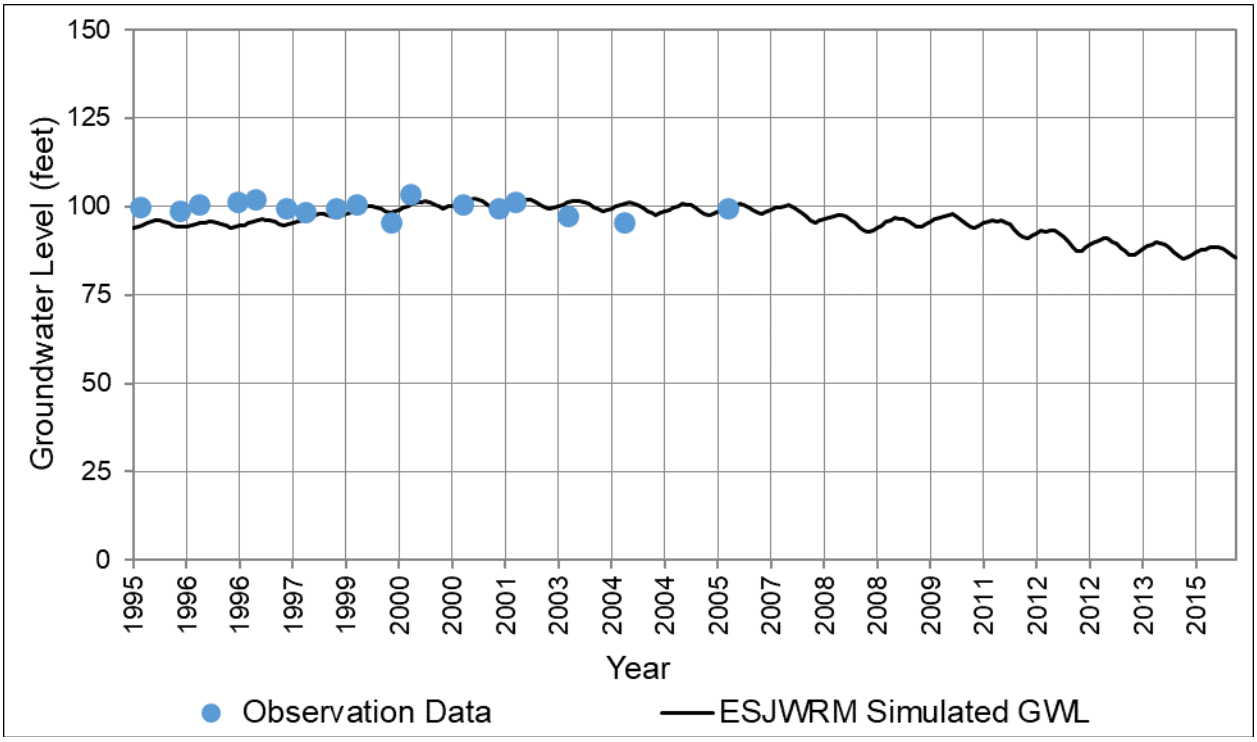


Figure C-60: ESJWRM Groundwater Level Hydrograph – Calibration Well #59

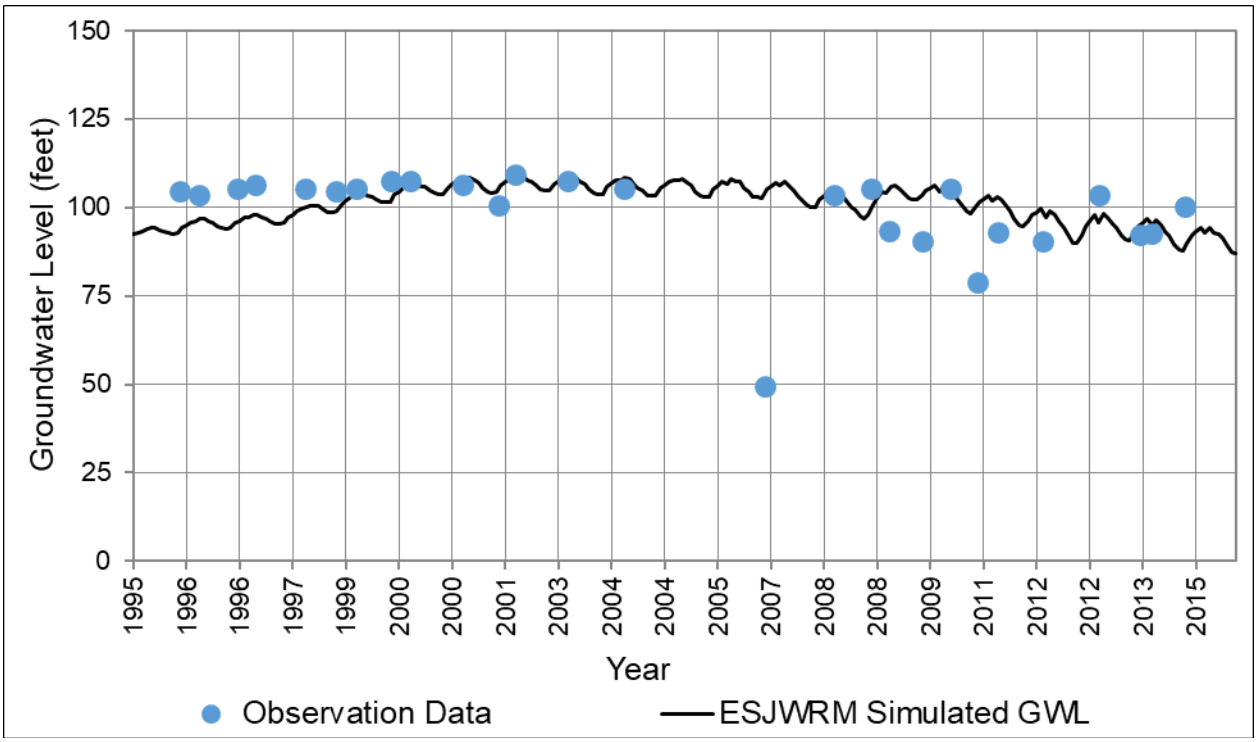


Figure C-61: ESJWRM Groundwater Level Hydrograph – Calibration Well #60

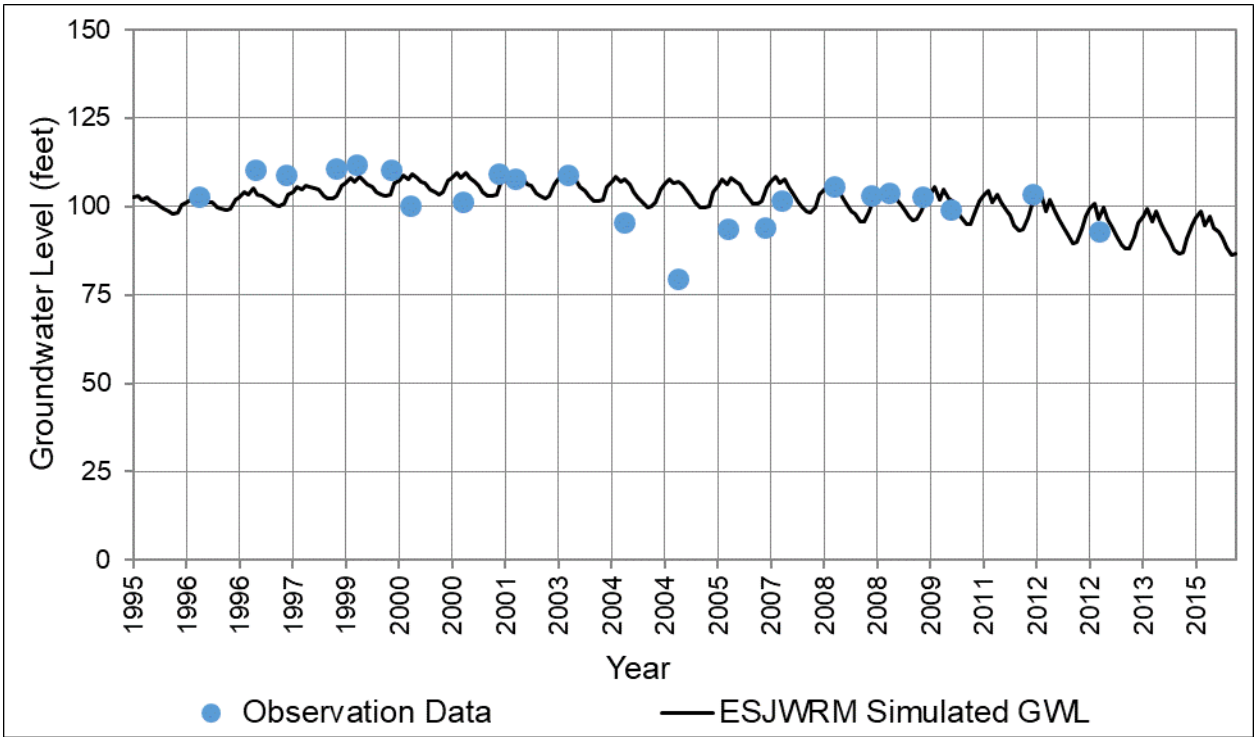


Figure C-62: ESJWRM Groundwater Level Hydrograph – Calibration Well #61

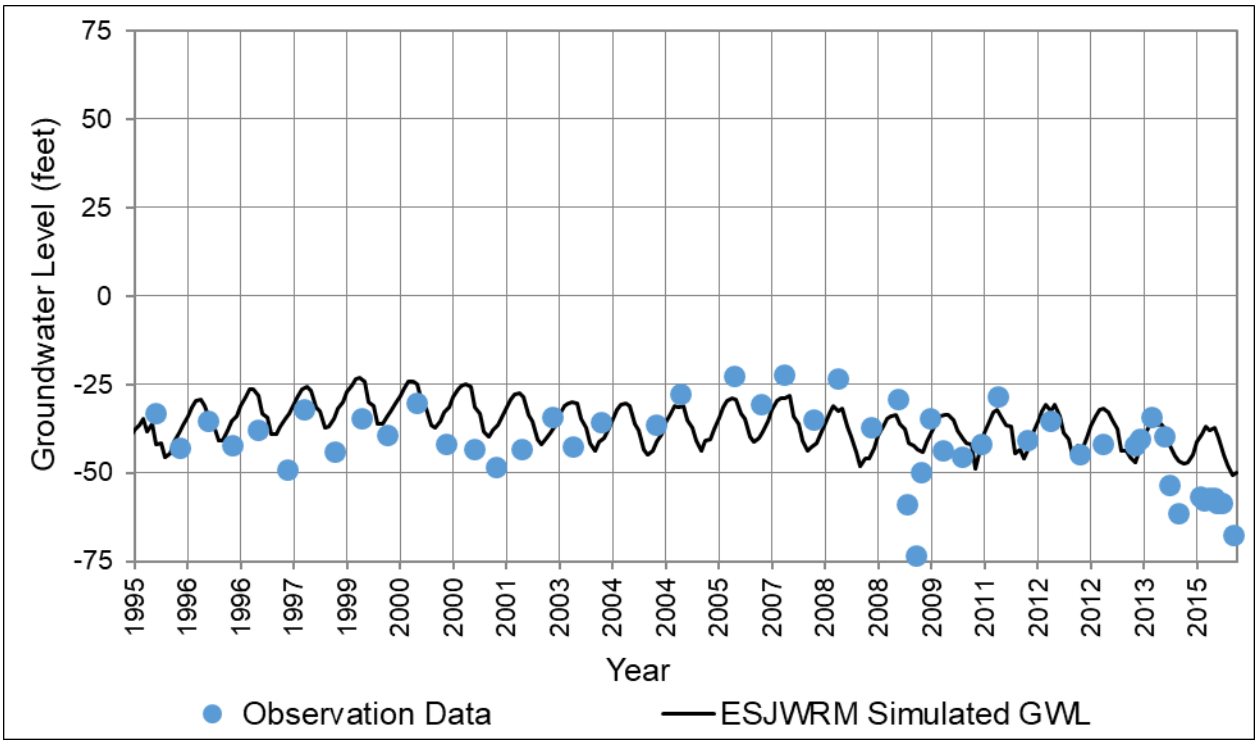


Figure C-63: ESJWRM Groundwater Level Hydrograph – Calibration Well #62

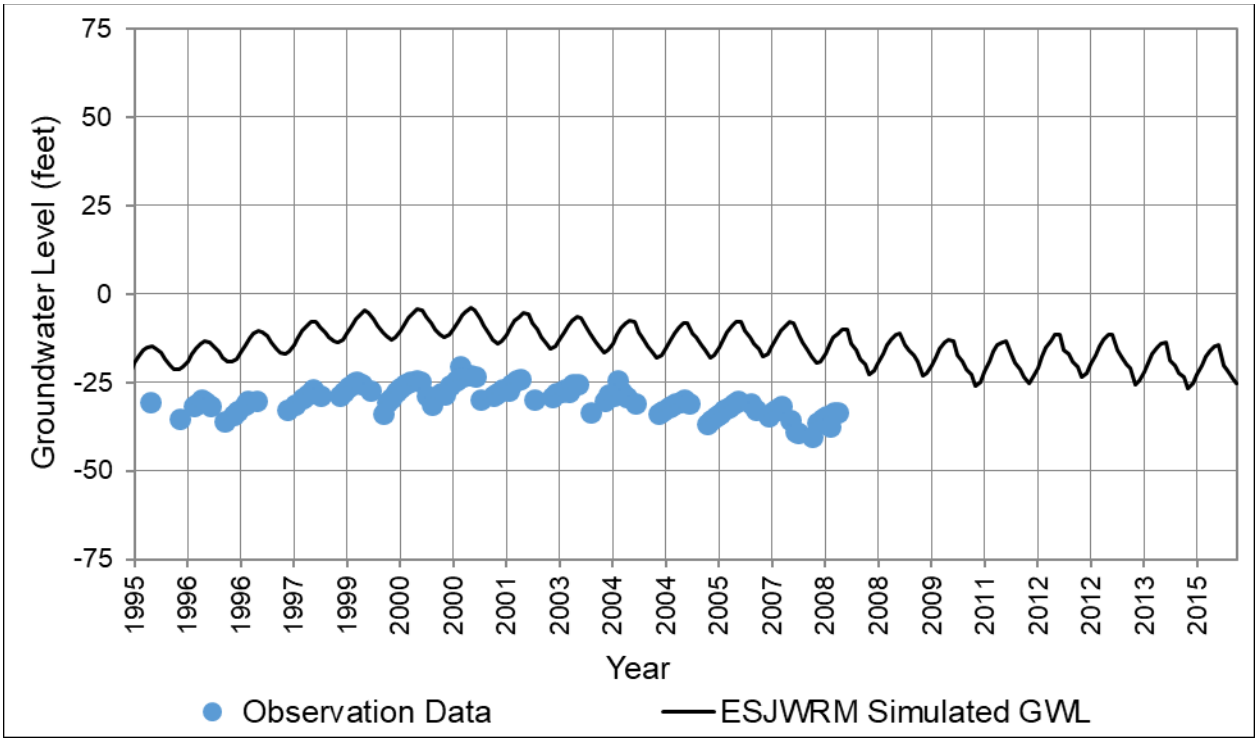


Figure C-64: ESJWRM Groundwater Level Hydrograph – Calibration Well #63

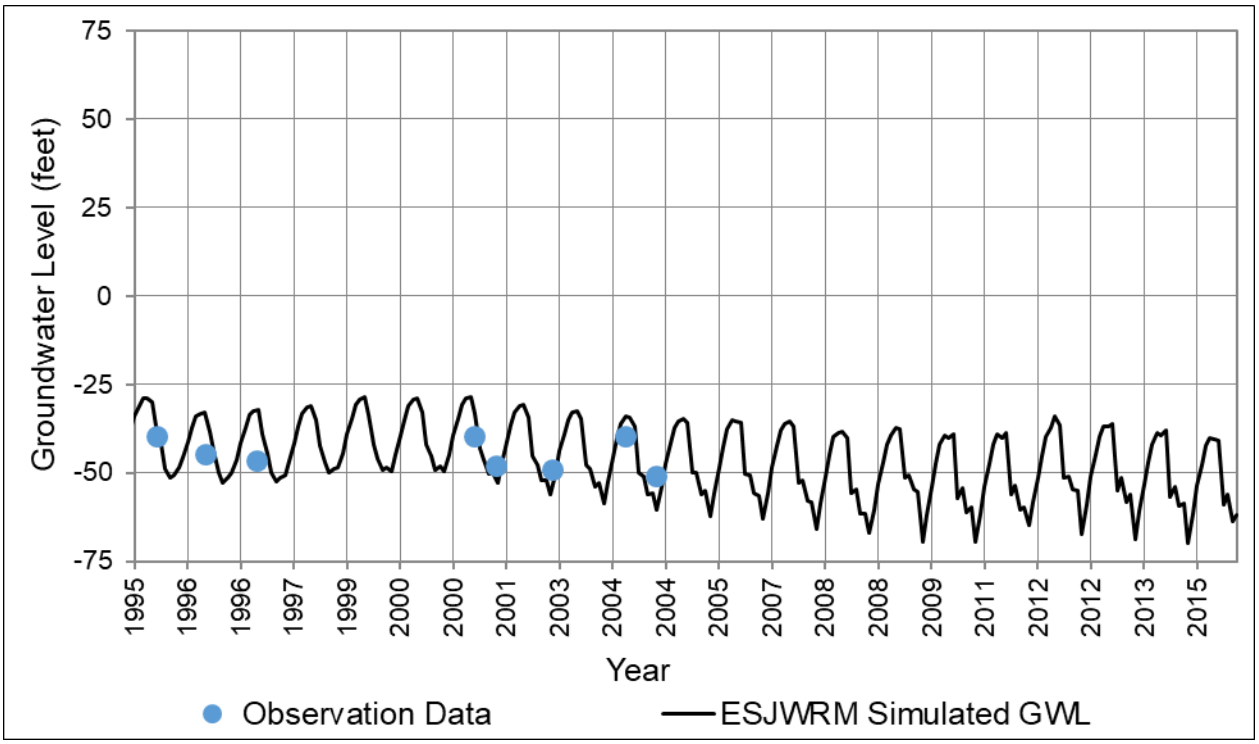


Figure C-65: ESJWRM Groundwater Level Hydrograph – Calibration Well #64

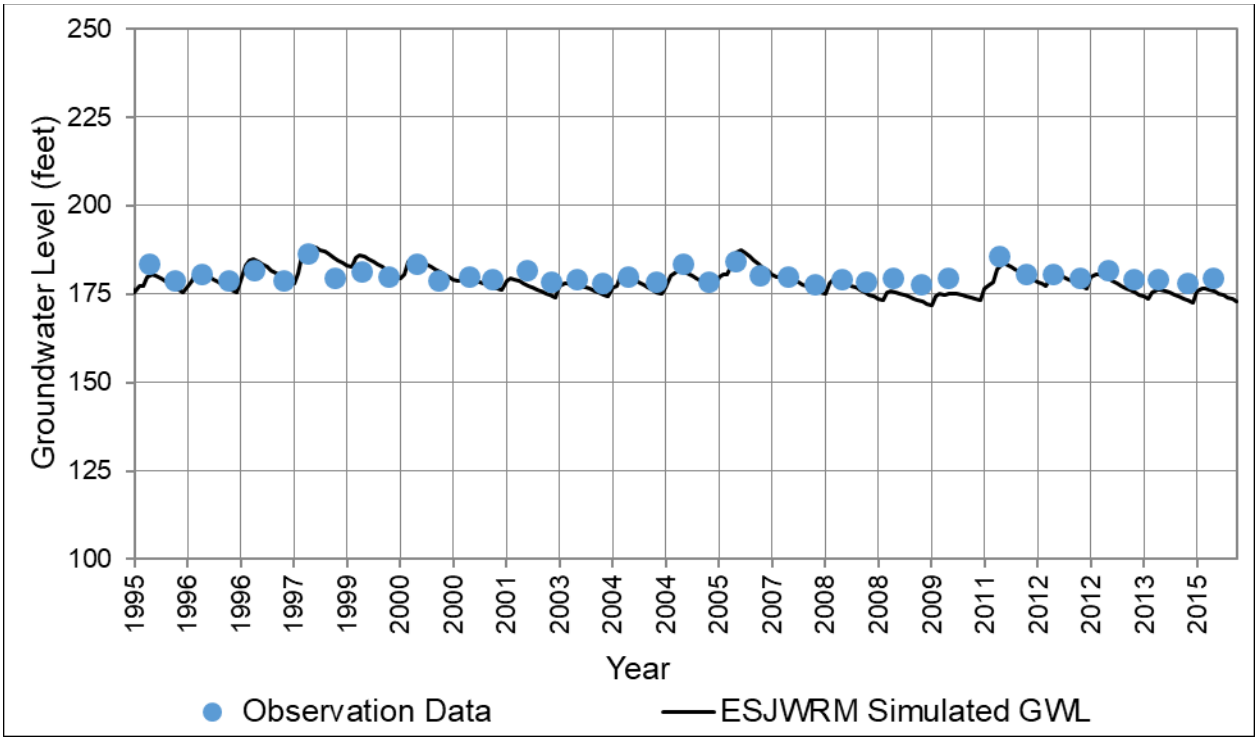


Figure C-66: ESJWRM Groundwater Level Hydrograph – Calibration Well #65

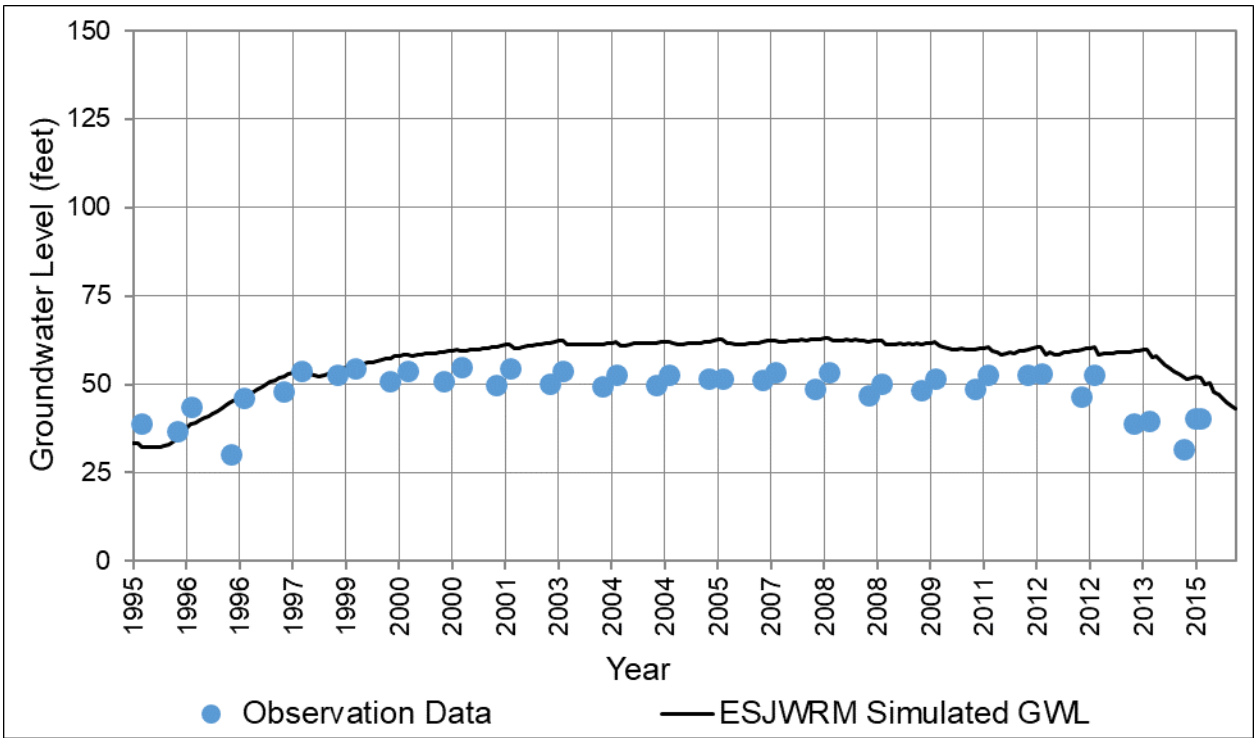


Figure C-67: ESJWRM Groundwater Level Hydrograph – Calibration Well #66

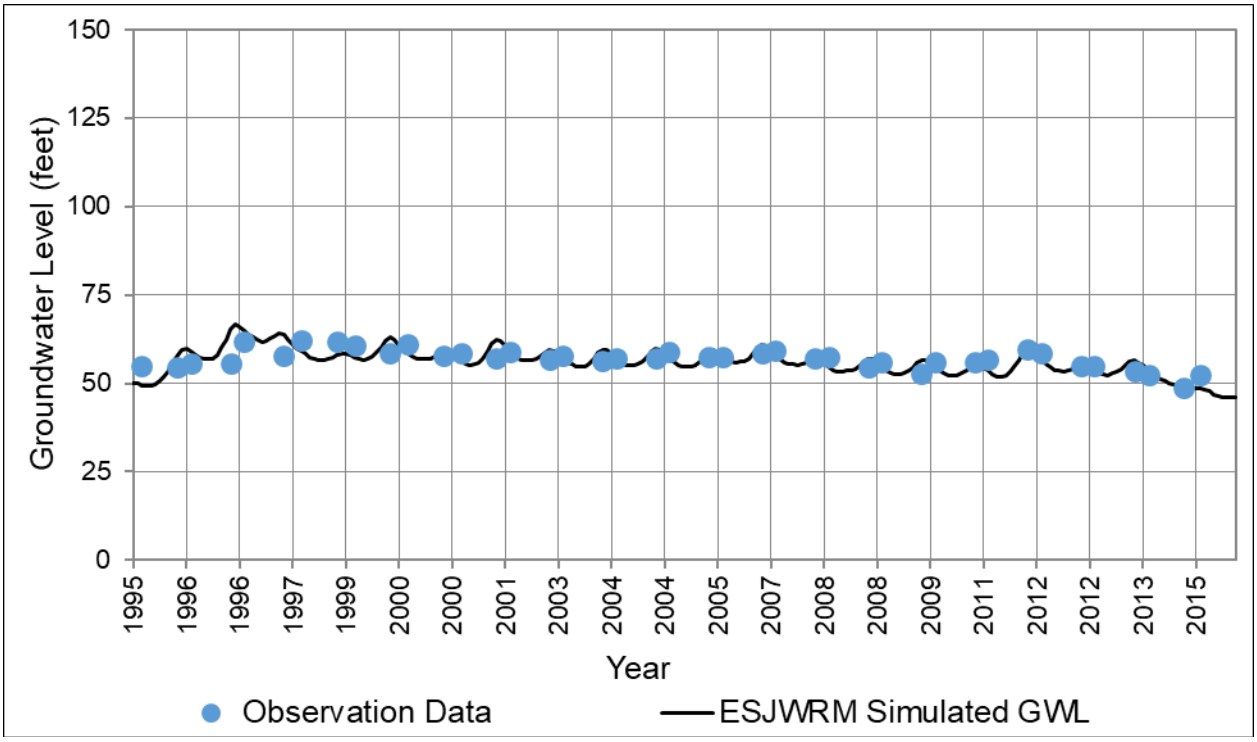


Figure C-68: ESJWRM Groundwater Level Hydrograph – Calibration Well #67

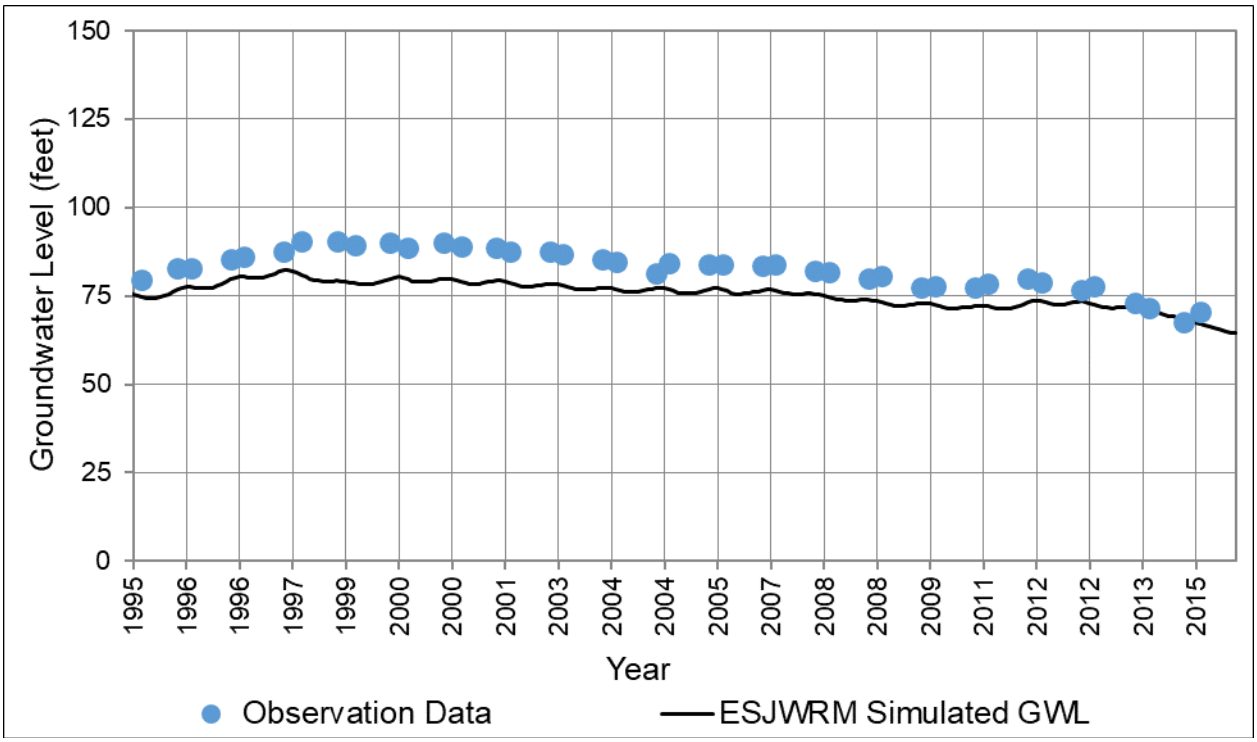


Figure C-69: ESJWRM Groundwater Level Hydrograph – Calibration Well #68

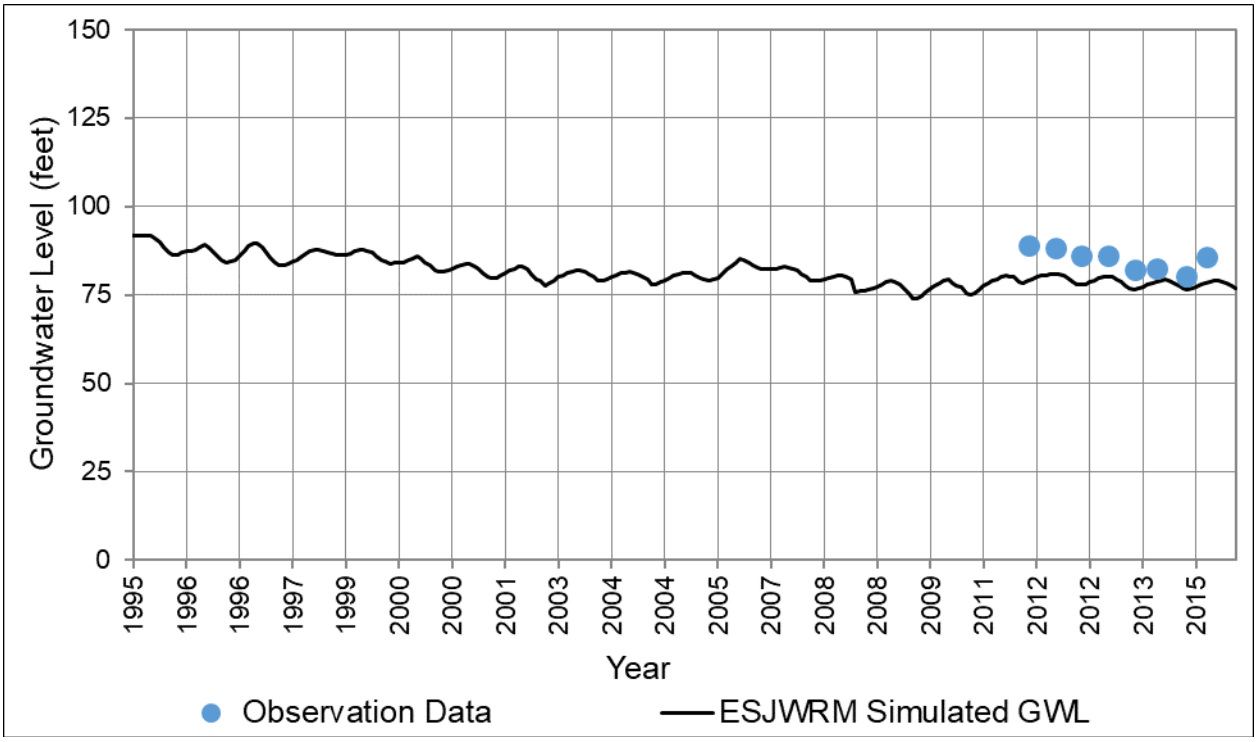


Figure C-70: ESJWRM Groundwater Level Hydrograph – Calibration Well #69

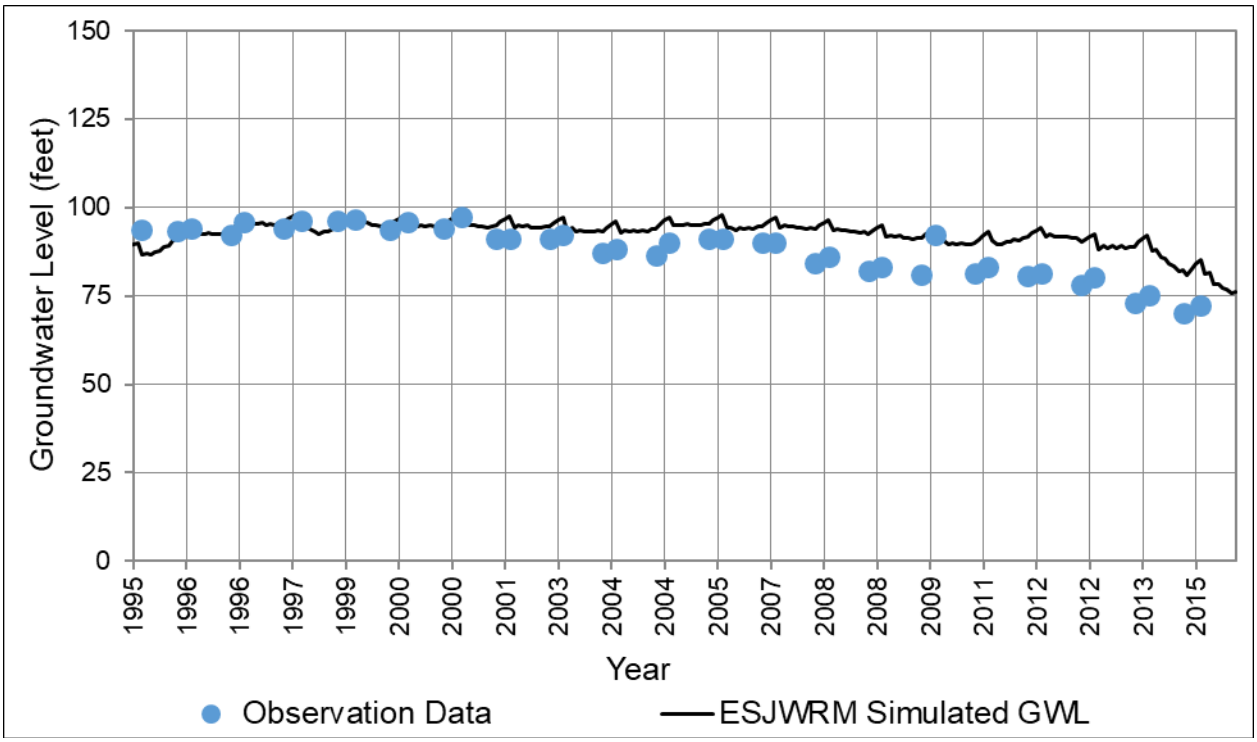
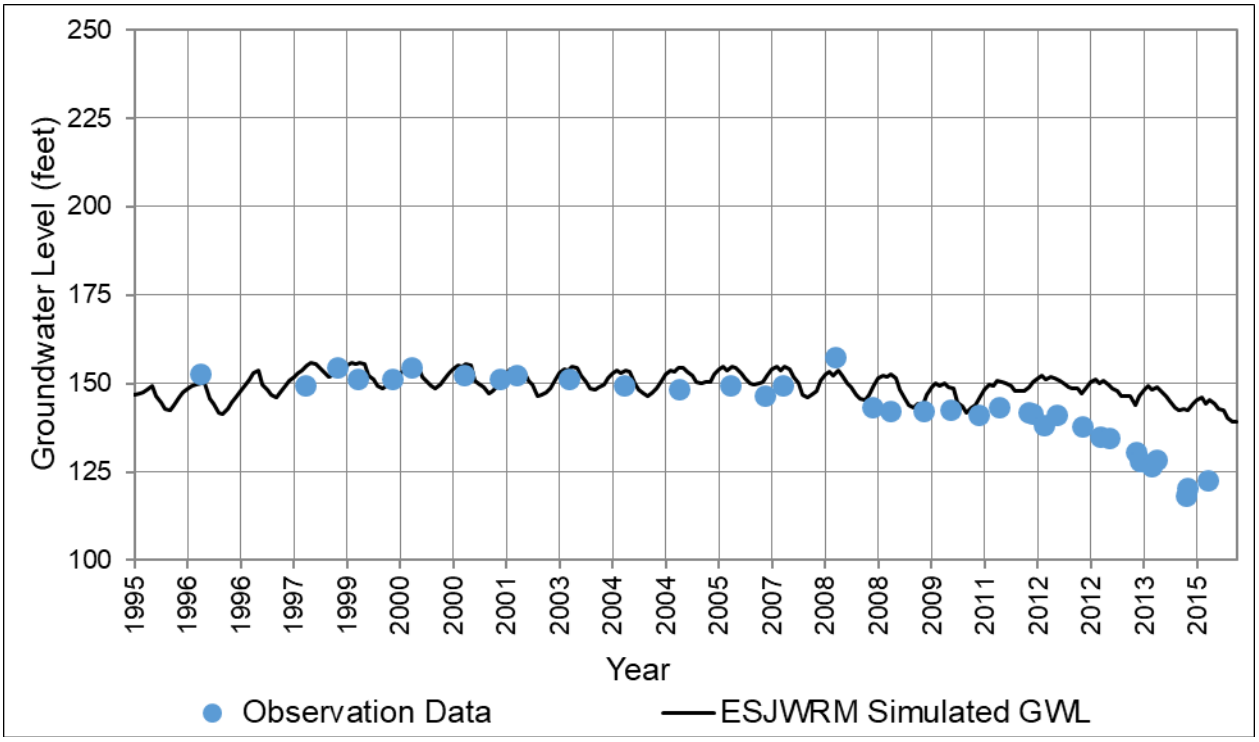


Figure C-71: ESJWRM Groundwater Level Hydrograph – Calibration Well #70



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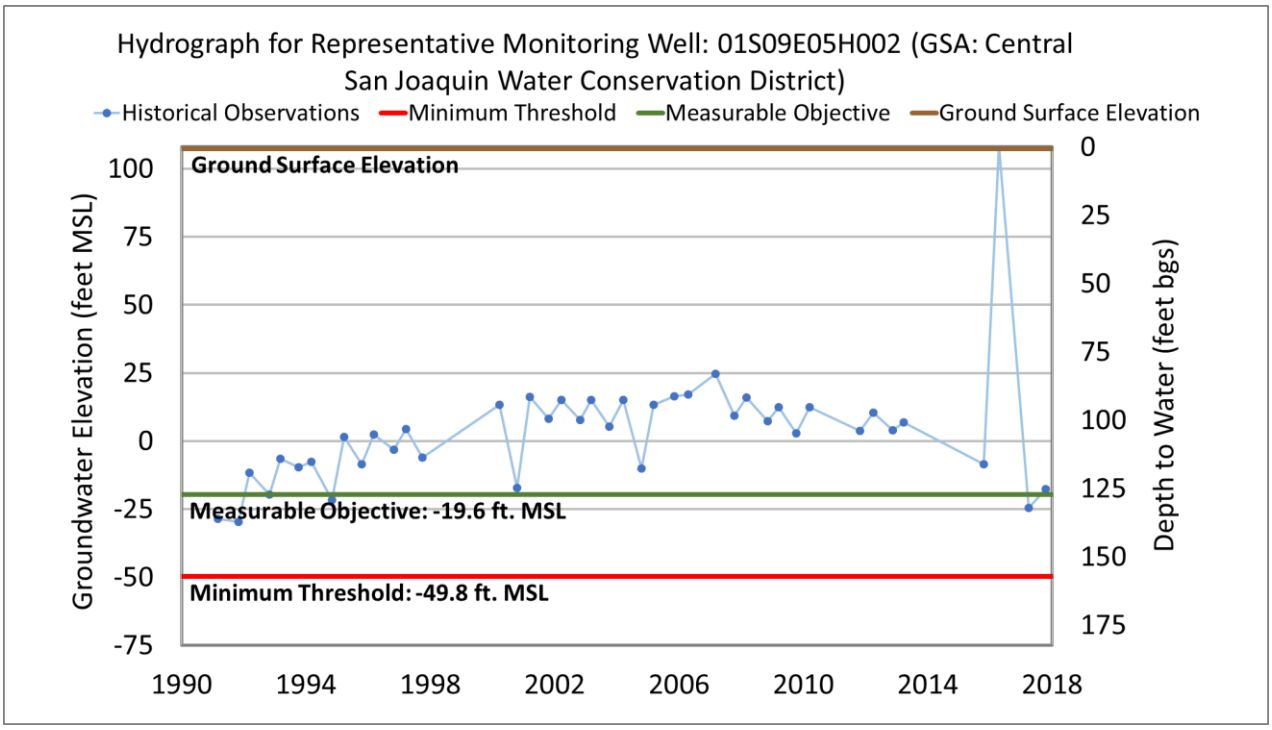
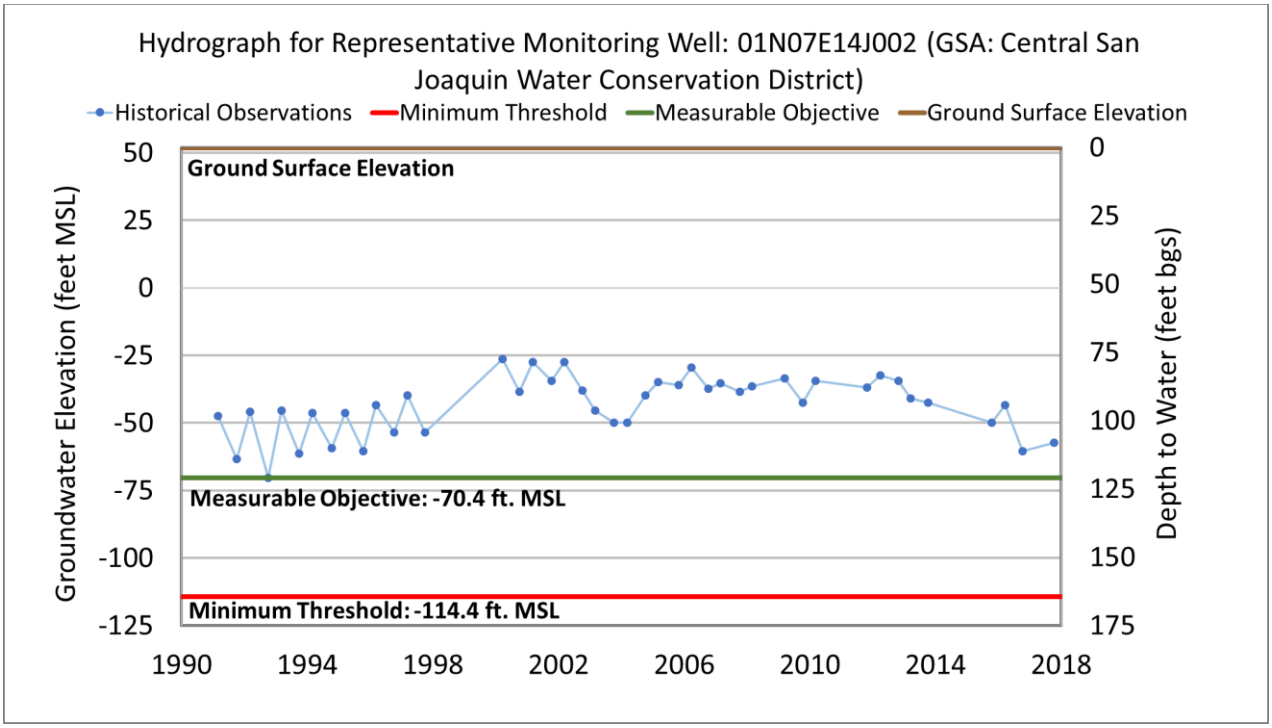
APPENDIX 3-A.
SUPPLEMENTAL DATA FOR CHRONIC LOWERING OF GROUNDWATER LEVEL MINIMUM THRESHOLDS

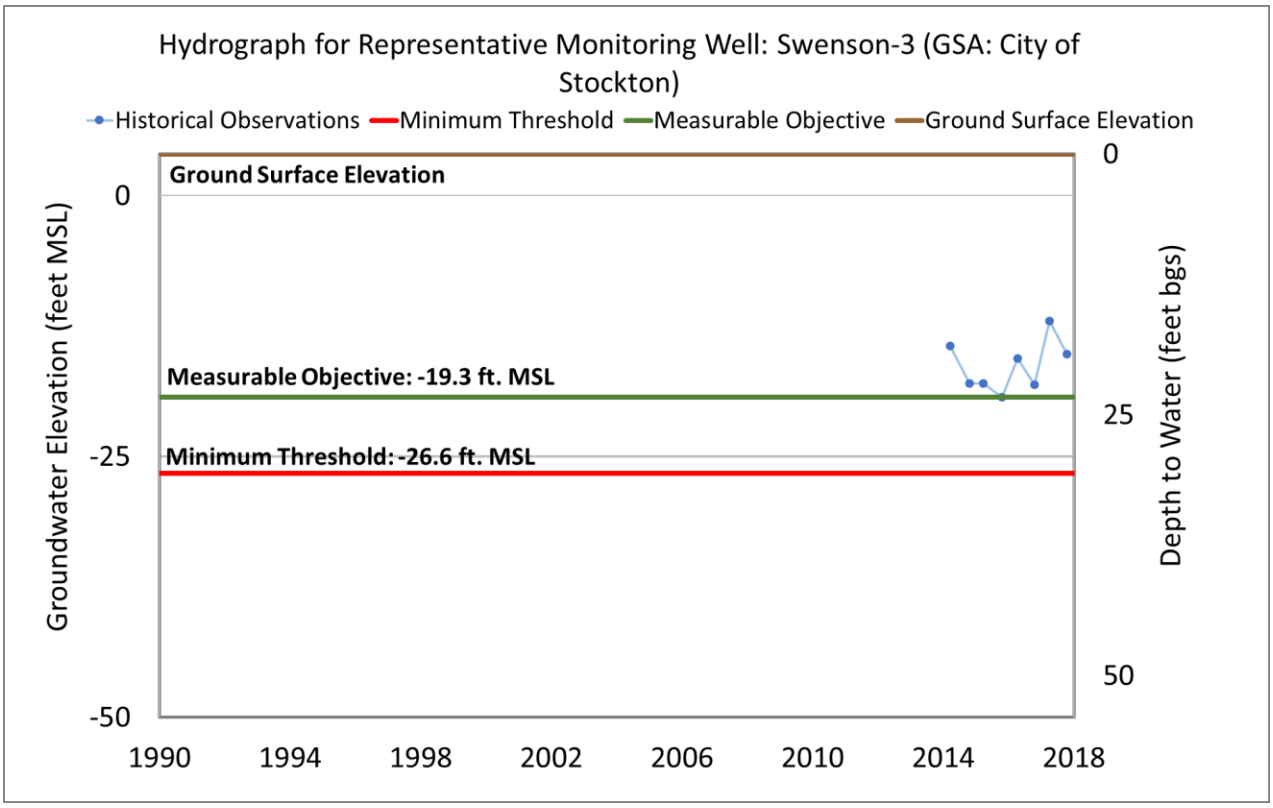
CASGEM ID	Local ID	GSA Well is Located In	Historical Drought Low (1992 or 2015-16) (ft bgs)	Historical Drought Low (1992 or 2015-16) (ft msl)	Year of Historical Drought Low	Total Well Depth (ft bgs)	Calculated Buffer (ft msl)	Depth of 10th Percentile Nearby Domestic Well (ft bgs)*	Depth of 10th Percentile Nearby Domestic Well (ft msl)*	Depth of 10th Percentile Nearby Municipal Well (if applicable) (ft msl)*	Historical Drought Low + Buffer (DTW) (ft bgs)	Historical Drought Low + Buffer (ft msl)	Minimum Threshold (ft msl)	Measurable Objectives (ft msl)	Average Groundwater Elevation (ft msl)	Most Recent Recorded Groundwater Elevation (ft msl)
378824N1210000W001	01S09E05H002	Central San Joaquin Water Conservation District	127.0	-19.6	1992	256.0	54.3	150.4	-49.8	N/A	181.3	-73.9	-49.8	-19.6	3.3	-17.6
379316N1211665W001	01N07E14J002	Central San Joaquin Water Conservation District	124.0	-70.4	1992	176.0	44.0	149.0	-129.0	N/A	168.0	-114.4	-114.4	-70.4	-43.5	-57.4
Not in CASGEM	Lodi City Well #2	City of Lodi	56.6	-3.5	1992	No Data	35.0	96.0	-56.3	-157.2	91.6	-38.5	-38.5	-3.5	13.8	0.6
Not in CASGEM	Manteca 18	City of Manteca	41.0	5.8	2016	No Data	21.8	100.0	-58.2	-120.1	62.8	-16.0	-16.0	5.8	8.2	4.8
380067N1213458W003	Swenson-3	City of Stockton	23.3	-19.3	2015	204.0	7.3	100.0	-97.4	-254.4	30.6	-26.6	-26.6	-19.3	-16.3	-15.2
378163N1208321W001	01S10E26J001M	Eastside San Joaquin GSA	100.9	81.7	2015	No Data	38.0	320.2	15.1	N/A	138.9	43.7	43.7	81.7	99.7	87.7
380206N1210943W001	02N08E15M002	Linden County Water District	153.5	-69.7	2016	403.0	74.5	205.0	-124.1	N/A	228.0	-144.2	-124.1	-69.7	-41.7	-69.7
Not in CASGEM	#3 Bear Creek	Lockeford Community Services District	152.0	-50.3	2016	No Data	22.0	168.0	-122.9	N/A	174.0	-72.3	-72.3	-50.3	-45.6	-46.3
381843N1212261W001	04N07E20H003M	North San Joaquin Water Conservation District	114.2	-36.7	2016	180.0	45.0	138.0	-110.3	N/A	159.2	-81.7	-81.7	-36.7	-15.6	-34.8
380909N1212153W001	03N07E21L003	North San Joaquin Water Conservation District	115.5	-57.5	1992	No Data	42.5	156.4	-109.4	N/A	158.0	-100.0	-100.0	-57.5	-35.0	-46.8
Not in CASGEM	Hirschfeld (OID-8)	Oakdale Irrigation District	100.5	31.5	2015	No Data	23.6	144.0	-11.5	N/A	124.1	8.0	8.0	31.5	44.2	31.8
377909N1208675W001	Burnett (OID-4)	Oakdale Irrigation District	108.2	79.7	2015	249.0	18.9	135.0	28.2	N/A	127.1	60.7	60.7	79.7	90.1	80.1
377136N1212508W001	02S07E31N001	South Delta Water Agency	11.0	13.0	1992	226.0	11.5	95.0	-62.5	N/A	22.5	1.5	1.5	13.0	14.6	16.0
377810N1211142W001	02S08E08A001	South San Joaquin GSA	49.4	24.0	2016	180.0	23.4	104.0	-42.2	N/A	72.8	0.6	0.6	24.0	29.1	23.0
380578N1212017W001	02N07E03D001	Stockton East Water District	137.0	-79.7	2016	484.0	52.0	170.0	-122.8	N/A	189.0	-131.7	-122.8	-79.7	-46.0	-71.7
379661N1210011W001	01N09E05J001	Stockton East Water District	207.0	-51.1	1992	750.0	120.2	198.0	-86.8	N/A	327.2	-171.3	-86.8	-51.1	-15.2	-16.3
379976N1212308W001	02N07E29B001	Stockton East Water District	122.5	-80.4	1992	202.0	60.6	165.0	-130.1	N/A	183.1	-141.0	-130.1	-80.4	-51.7	-47.4
381559N1213727W001	04N05E36H003	Woodbridge Irrigation District	30.0	-5.1	2015	112.0	26.0	83.0	-63.9	N/A	56.0	-31.1	-31.1	-5.1	5.6	6.4
381317N1213524W001	03N06E05N003	Woodbridge Irrigation District	42.0	-14.1	2015	292.0	21.0	77.4	-55.3	N/A	63.0	-35.1	-35.1	-14.1	-9.8	-7.0
381816N1213723W001	04N05E24J004	Woodbridge Irrigation District	30.0	-6.2	2015	190.0	25.0	75.5	-65.5	N/A	55.0	-31.2	-31.2	-6.2	3.5	5.3

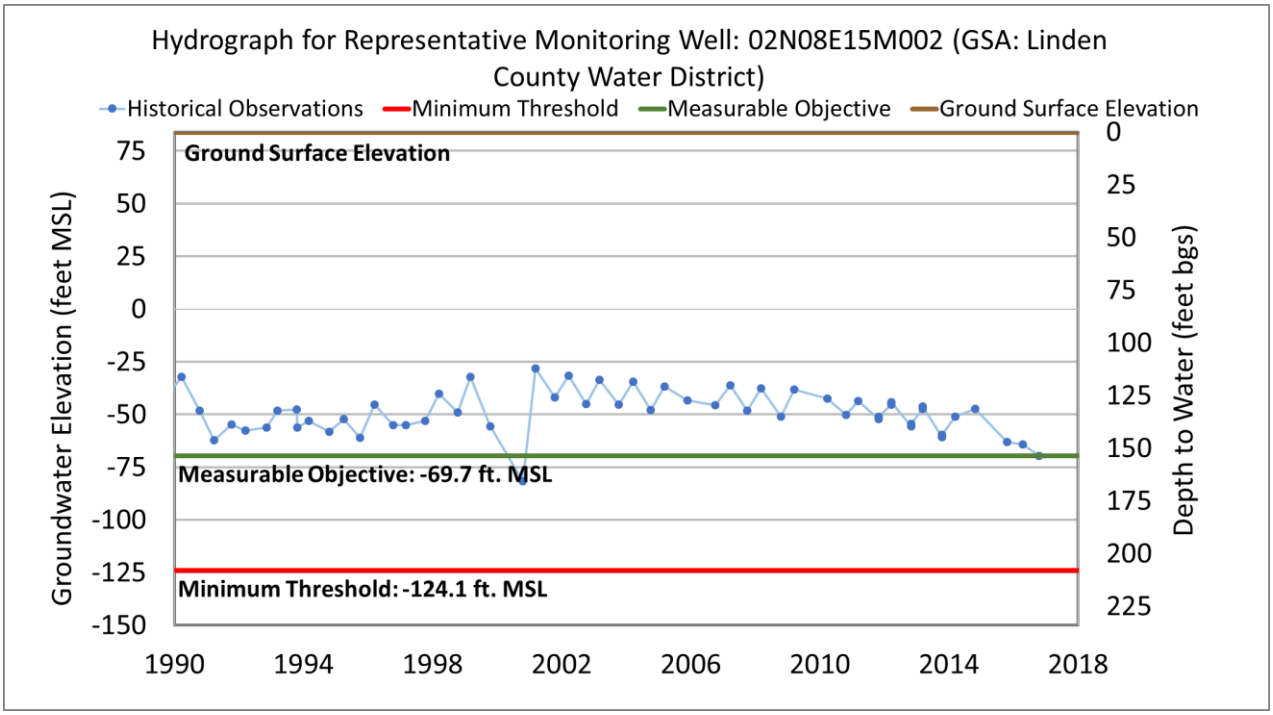
*Data source for domestic and municipal well depths is the California DWR Online System for Well Completion Reports (OSWCR)
N/A = Not Applicable

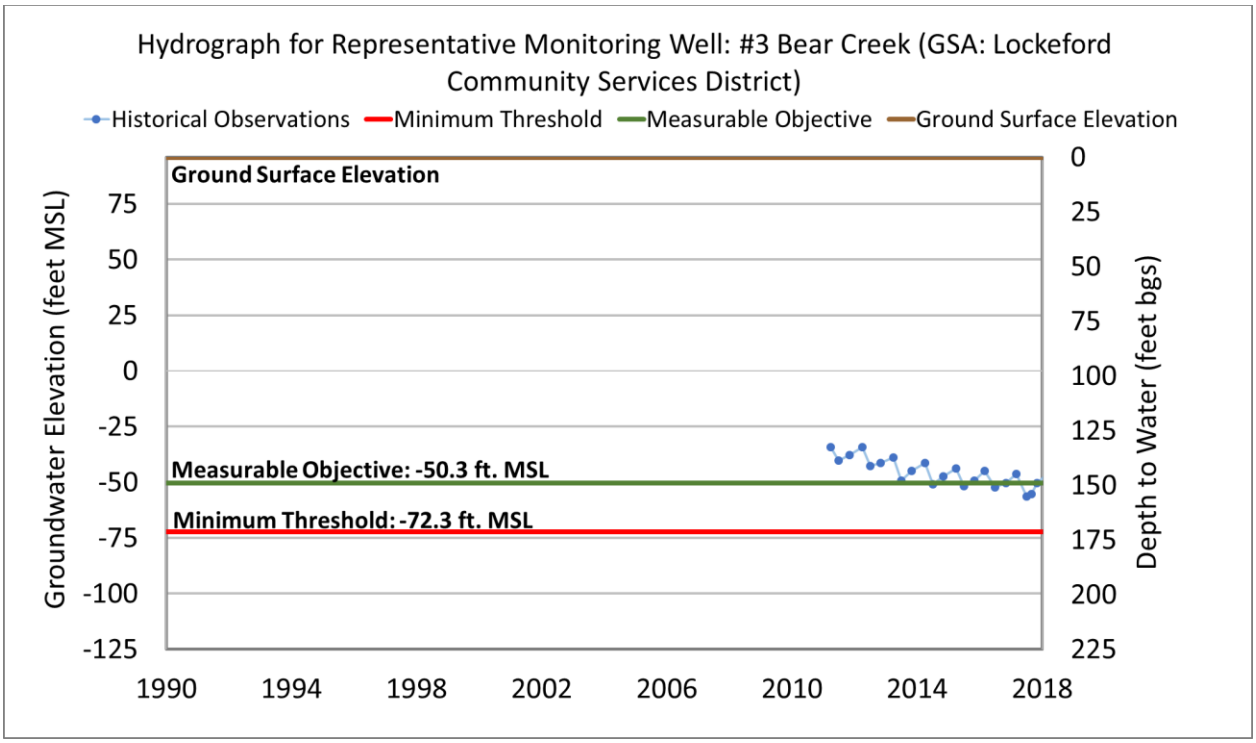
APPENDIX 3-B.
GROUNDWATER LEVEL REPRESENTATIVE MONITORING WELL HISTORICAL HYDROGRAPHS

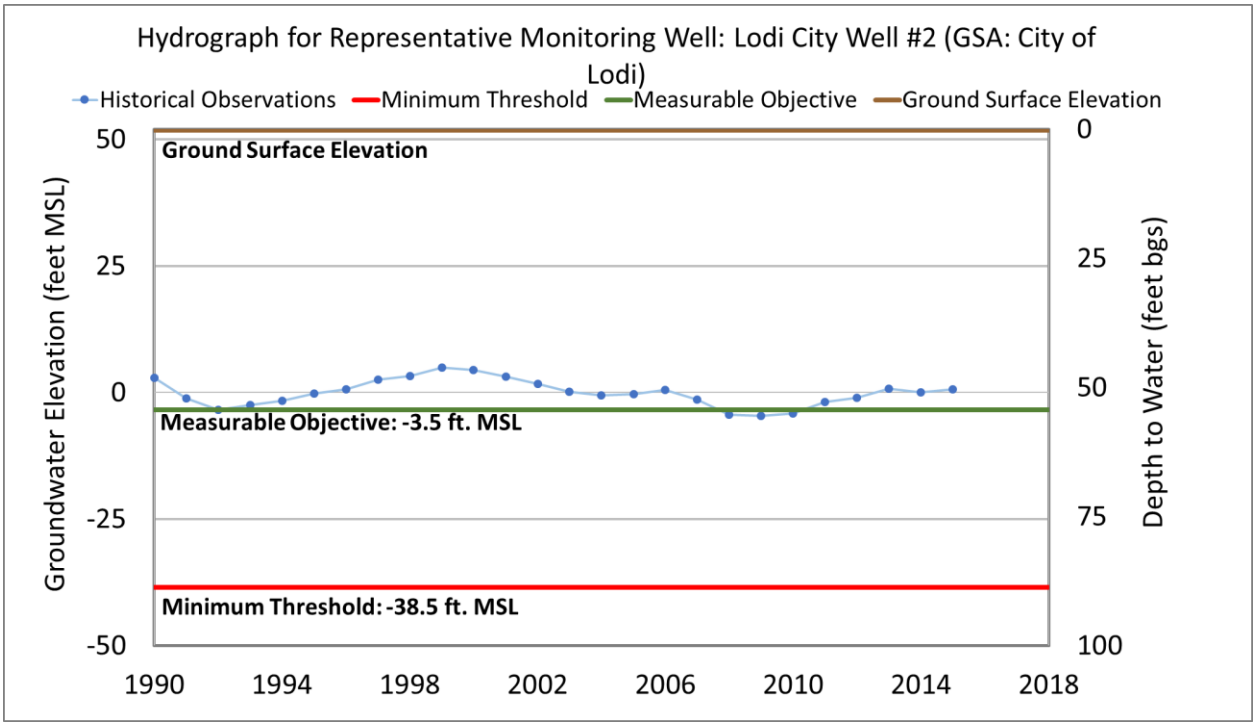

Hydrograph for Representative Monitoring Well: 01S09E05H002 (GSA: Central San Joaquin Water Conservation District)
Historical Observations
Minimum Threshold
Measurable Objective
Ground Surface Elevation
Ground Surface Elevation
Measurable Objective: -19.6 ft. MSL
Minimum Threshold: -49.8 ft. MSL
Groundwater Elevation (feet MSL)
Depth to Water (feet bgs)
100
75
50
25
0
-25
-50
-75
0
25
50
75
100
125
150
175
1990
1994
1998
2002
2006
2010
2014
2018

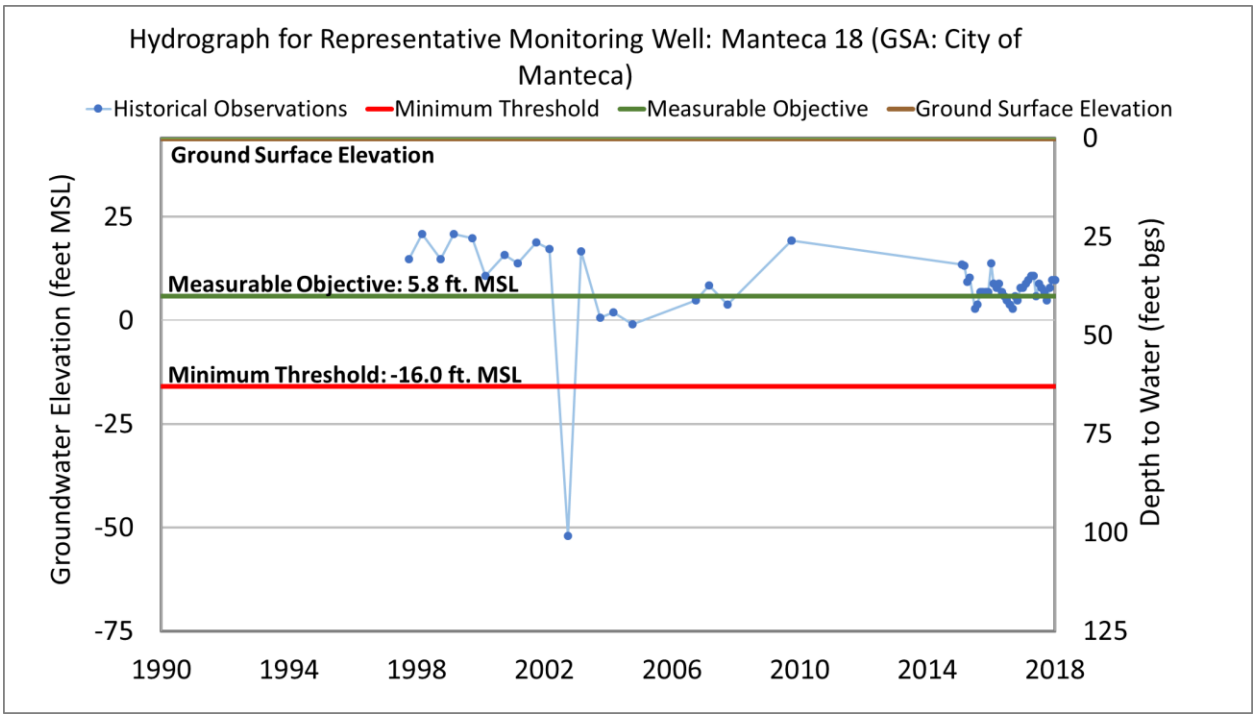

Hydrograph for Representative Monitoring Well: 01N07E14J002 (GSA: Central San Joaquin Water Conservation District)
Historical Observations
Minimum Threshold
Measurable Objective
Ground Surface Elevation
Ground Surface Elevation
Measurable Objective: -70.4 ft. MSL
Minimum Threshold: -114.4 ft. MSL
Groundwater Elevation (feet MSL)
Depth to Water (feet bgs)
50
25
0
-25
-50
-75
-100
-125
0
25
50
75
100
125
150
175
1990
1994
1998
2002
2006
2010
2014
2018

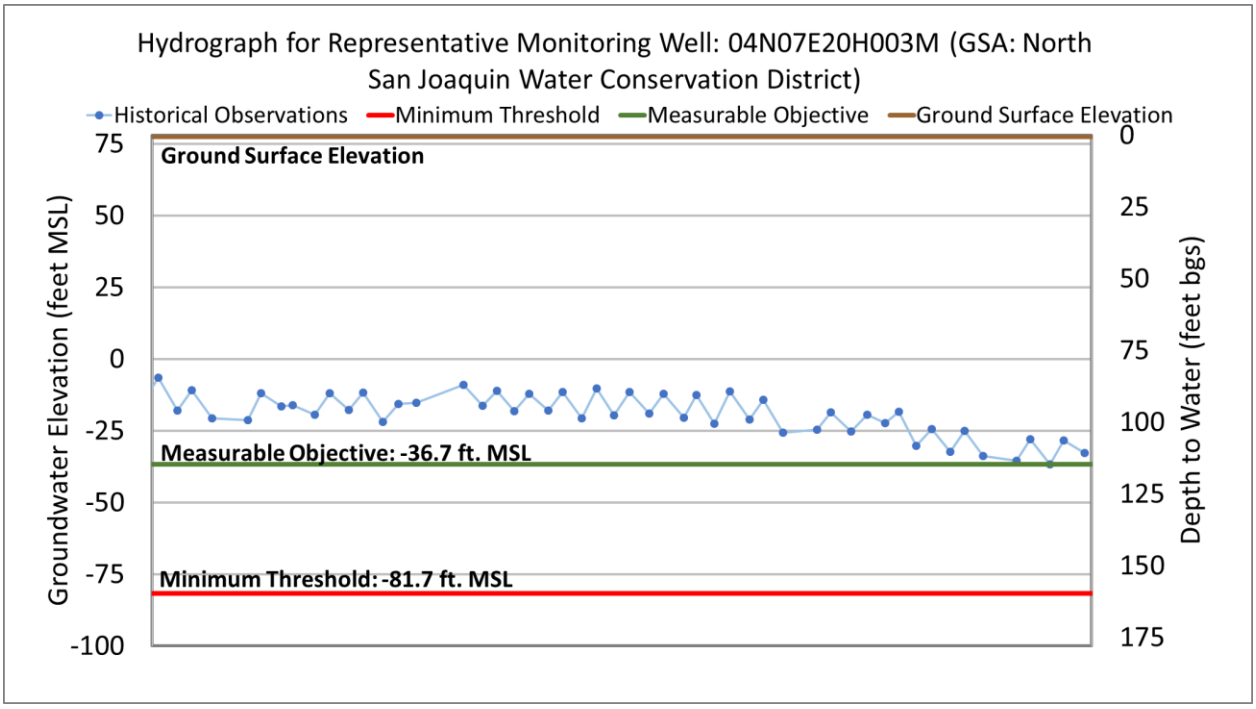

Hydrograph for Representative Monitoring Well: Swenson-3 (GSA: City of Stockton)
Historical Observations
Minimum Threshold
Measurable Objective
Ground Surface Elevation
Ground Surface Elevation
Measurable Objective: -19.3 ft. MSL
Minimum Threshold: -26.6 ft. MSL
Groundwater Elevation (feet MSL)
Depth to Water (feet bgs)
0
-25
-50
0
25
50
1990
1994
1998
2002
2006
2010
2014
2018

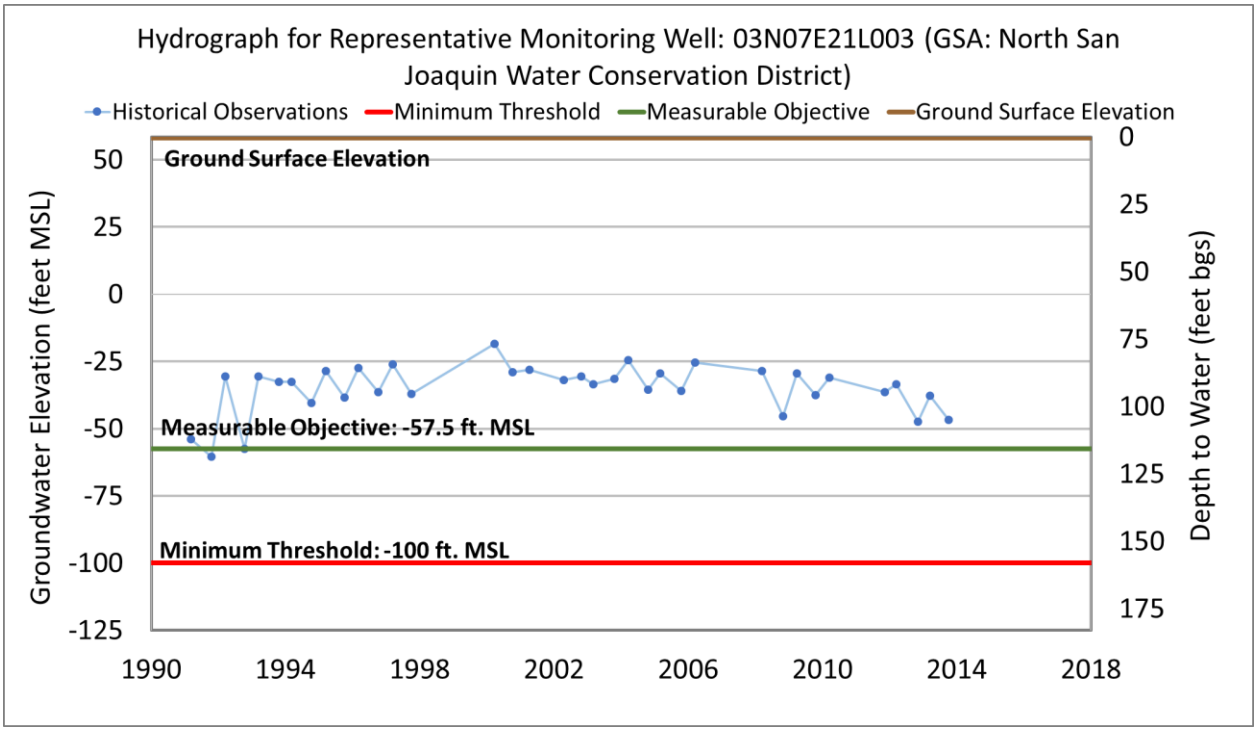

Hydrograph for Representative Monitoring Well: 02N08E15M002 (GSA: Linden County Water District)
Historical Observations
Minimum Threshold
Measurable Objective
Ground Surface Elevation
Ground Surface Elevation
Measurable Objective: -69.7 ft. MSL
Minimum Threshold: -124.1 ft. MSL
Groundwater Elevation (feet MSL)
Depth to Water (feet bgs)
75
50
25
0
-25
-50
-75
-100
-125
-150
0
25
50
75
100
125
150
175
200
225
1990
1994
1998
2002
2006
2010
2014
2018

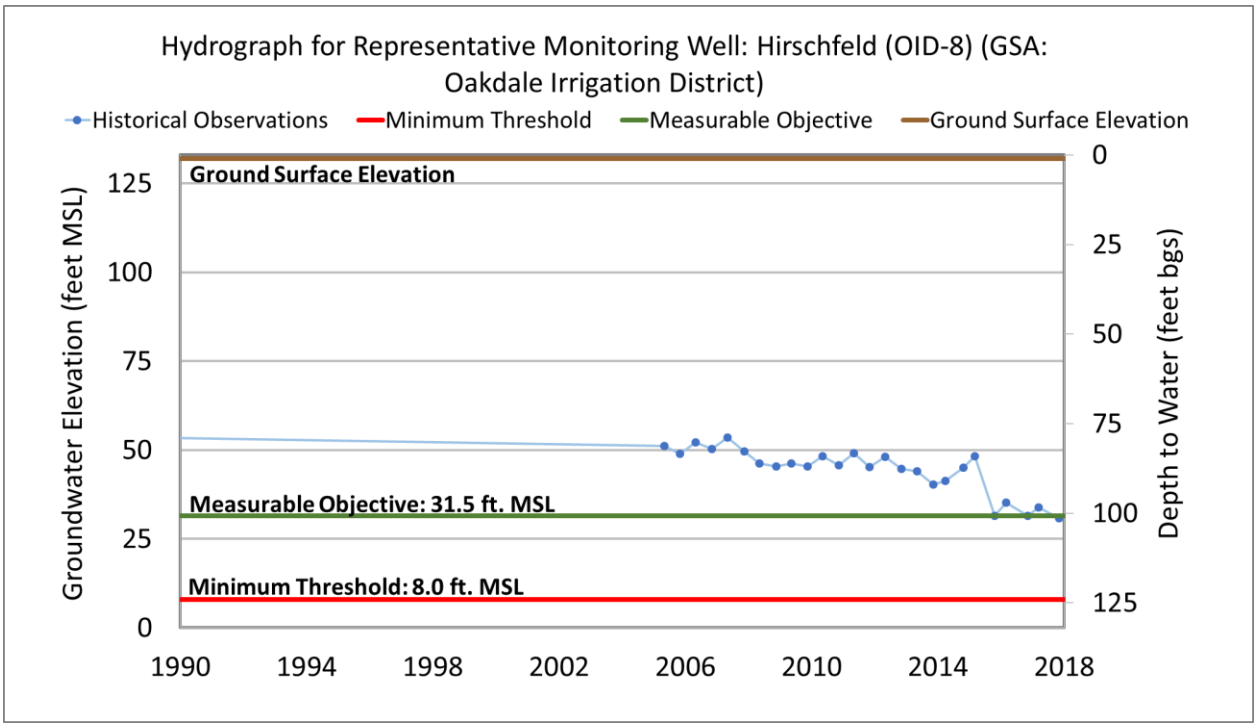

Hydrograph for Representative Monitoring Well: #3 Bear Creek (GSA: Lockeford Community Services District)
Historical Observations
Minimum Threshold
Measurable Objective
Ground Surface Elevation
Ground Surface Elevation
Measurable Objective: -50.3 ft. MSL
Minimum Threshold: -72.3 ft. MSL
Groundwater Elevation (feet MSL)
Depth to Water (feet bgs)
75
50
25
0
-25
-50
-75
-100
-125
0
25
50
75
100
125
150
175
200
225
1990
1994
1998
2002
2006
2010
2014
2018

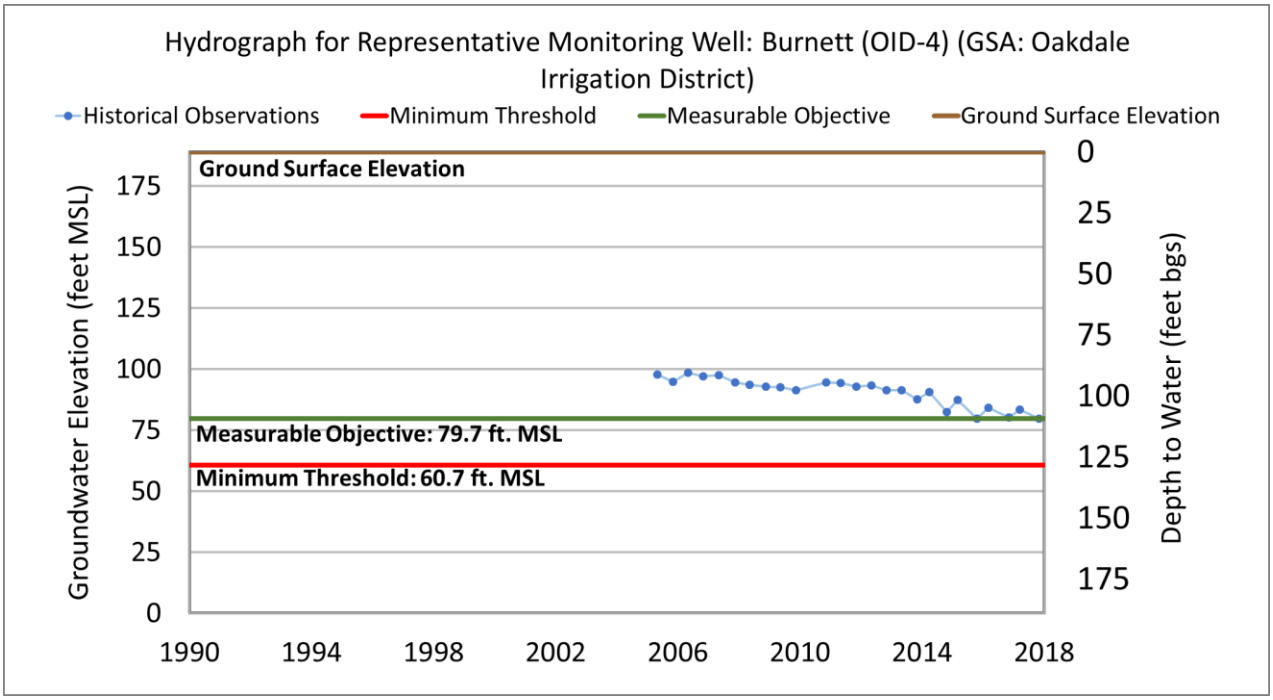

Hydrograph for Representative Monitoring Well: Lodi City Well #2 (GSA: City of Lodi)
Historical Observations
Minimum Threshold
Measurable Objective
Ground Surface Elevation
Ground Surface Elevation
Measurable Objective: -3.5 ft. MSL
Minimum Threshold: -38.5 ft. MSL
Groundwater Elevation (feet MSL)
Depth to Water (feet bgs)
50
25
0
-25
-50
0
25
50
75
100
1990
1994
1998
2002
2006
2010
2014
2018

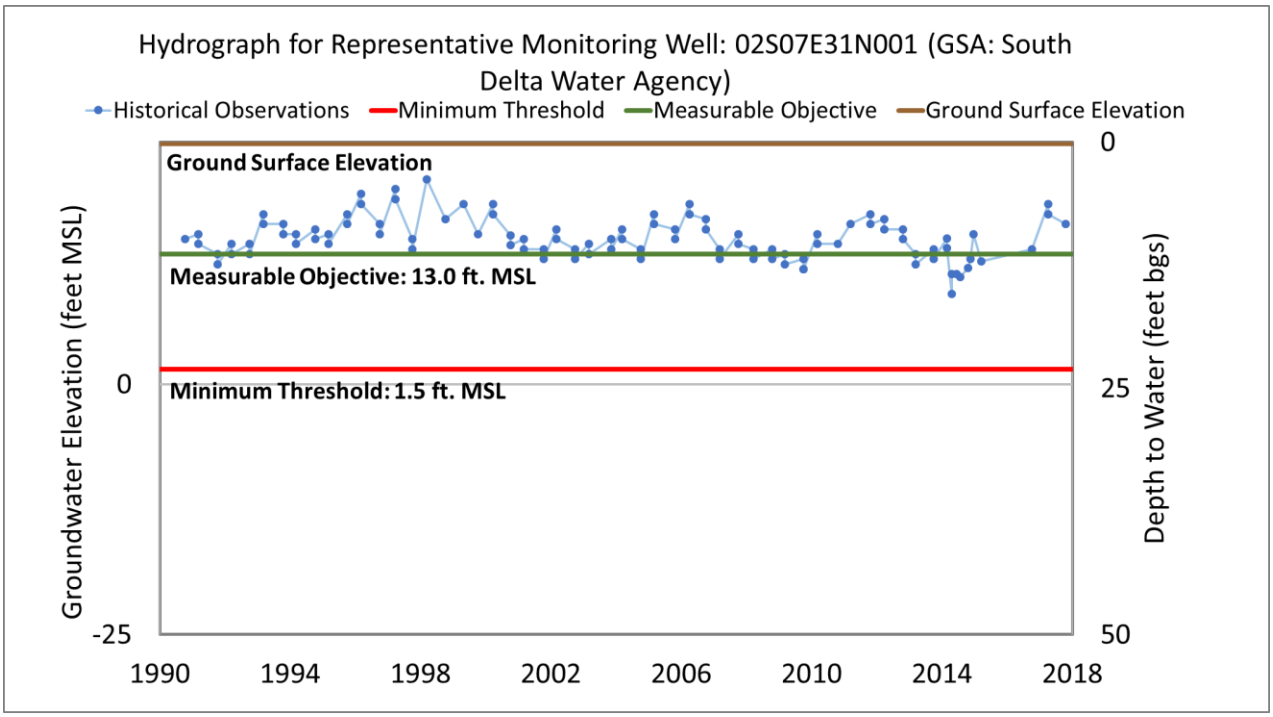

Hydrograph for Representative Monitoring Well: Manteca 18 (GSA: City of Manteca)
Historical Observations
Minimum Threshold
Measurable Objective
Ground Surface Elevation
Ground Surface Elevation
Measurable Objective: 5.8 ft. MSL
Minimum Threshold: -16.0 ft. MSL
Groundwater Elevation (feet MSL)
Depth to Water (feet bgs)
25
0
-25
-50
-75
0
25
50
75
100
125
1990
1994
1998
2002
2006
2010
2014
2018

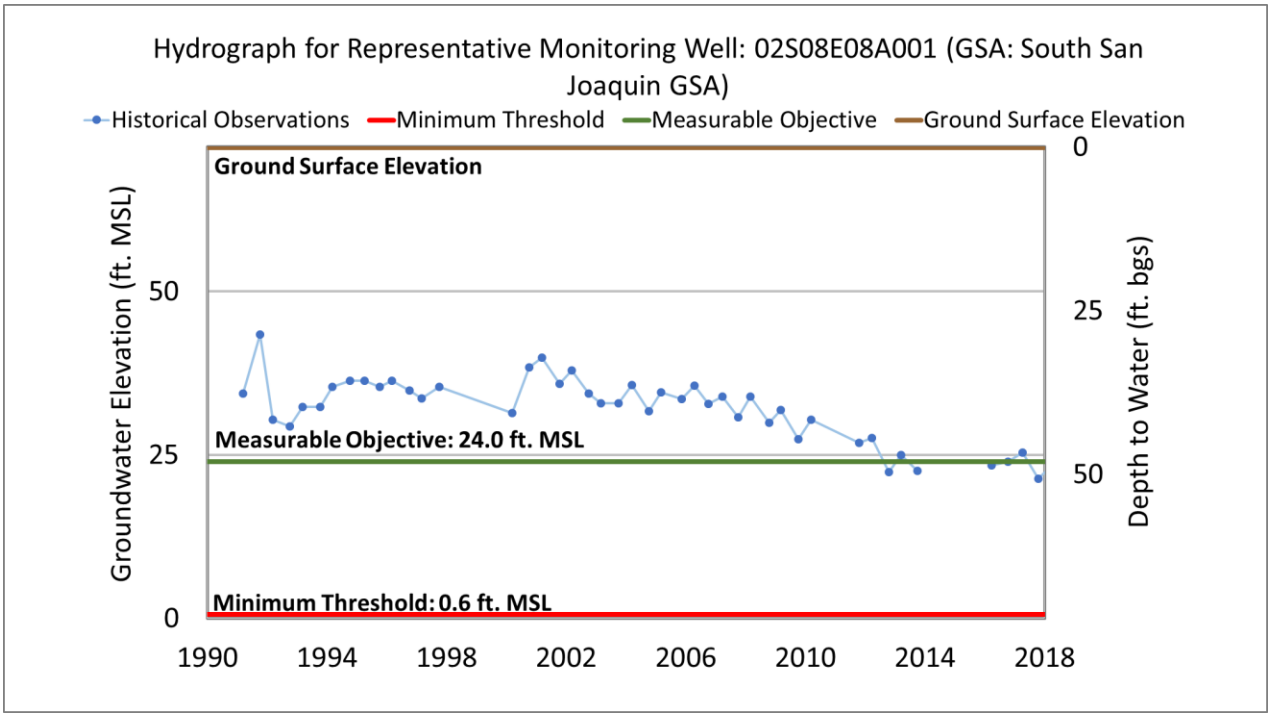

Hydrograph for Representative Monitoring Well: 04N07E20H003M (GSA: North San Joaquin Water Conservation District)
Historical Observations
Minimum Threshold
Measurable Objective
Ground Surface Elevation
Ground Surface Elevation
Measurable Objective: -36.7 ft. MSL
Minimum Threshold: -81.7 ft. MSL
Groundwater Elevation (feet MSL)
Depth to Water (feet bgs)
75
50
25
0
-25
-50
-75
-100
0
25
50
75
100
125
150
175

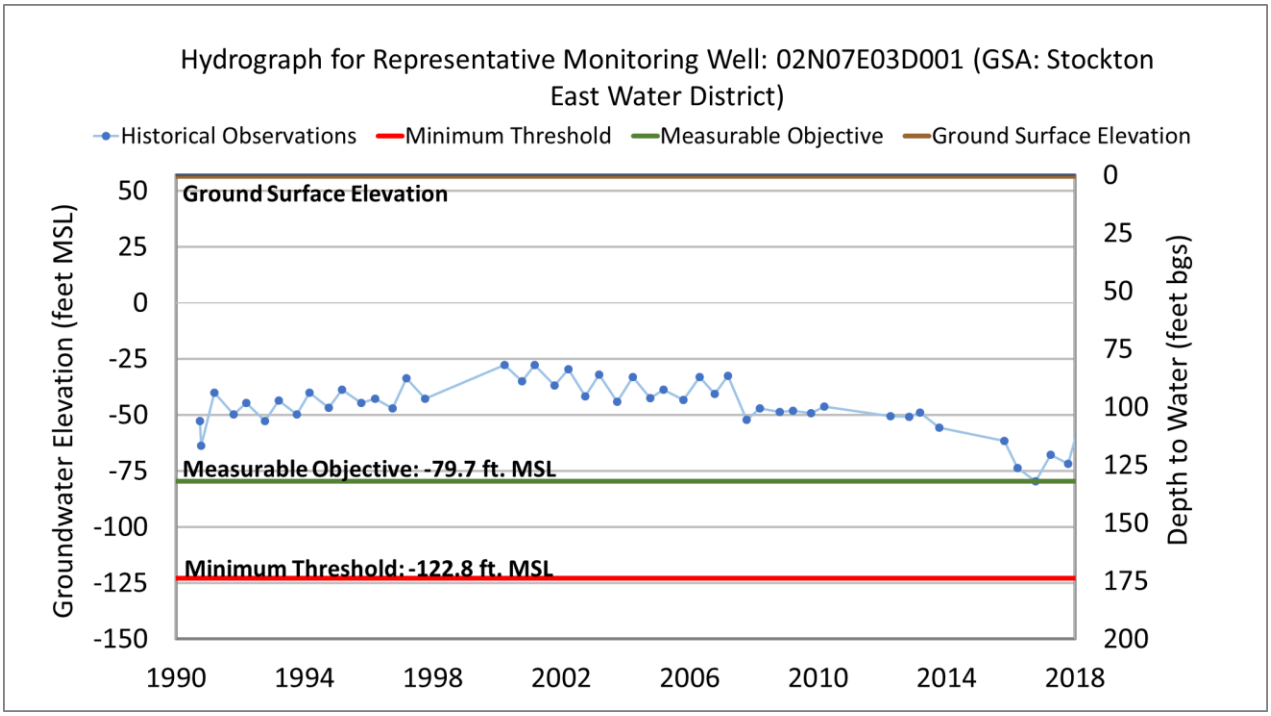

Hydrograph for Representative Monitoring Well: 03N07E21L003 (GSA: North San Joaquin Water Conservation District)
Historical Observations
Minimum Threshold
Measurable Objective
Ground Surface Elevation
Ground Surface Elevation
Measurable Objective: -57.5 ft. MSL
Minimum Threshold: -100 ft. MSL
Groundwater Elevation (feet MSL)
Depth to Water (feet bgs)
50
25
0
-25
-50
-75
-100
-125
0
25
50
75
100
125
150
175
1990
1994
1998
2002
2006
2010
2014
2018

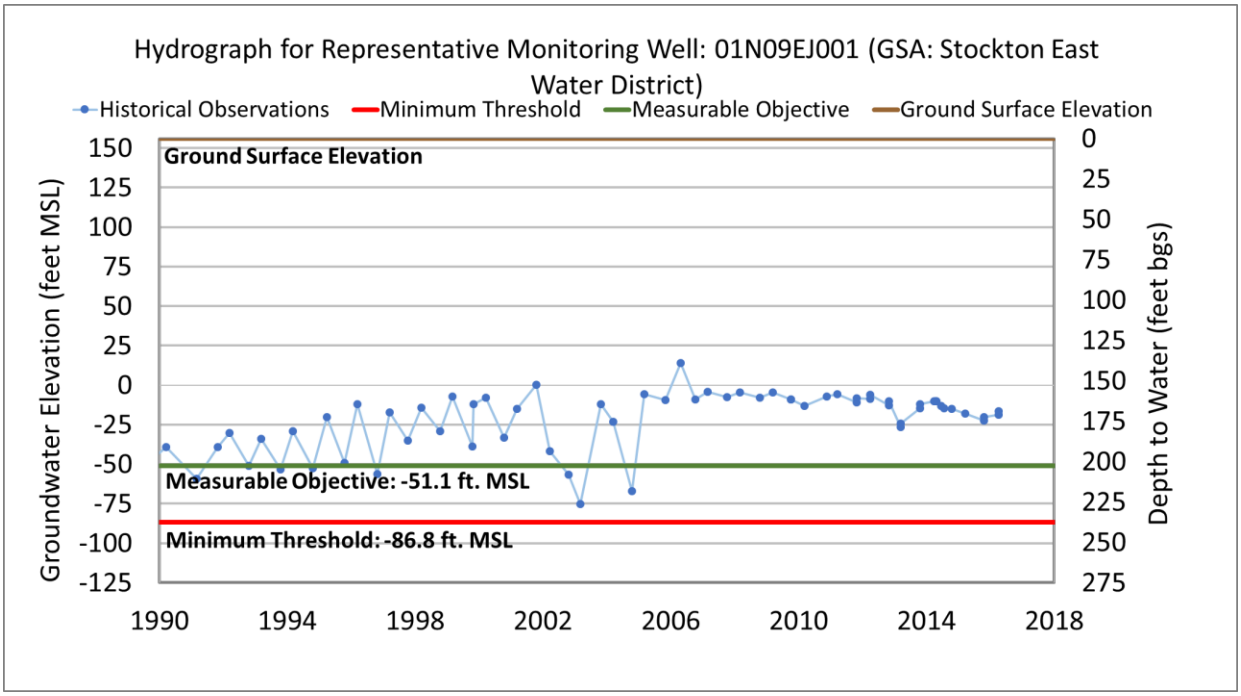

Hydrograph for Representative Monitoring Well: Hirschfeld (OID-8) (GSA: Oakdale Irrigation District)
Historical Observations
Minimum Threshold
Measurable Objective
Ground Surface Elevation
Ground Surface Elevation
Measurable Objective: 31.5 ft. MSL
Minimum Threshold: 8.0 ft. MSL
Groundwater Elevation (feet MSL)
Depth to Water (feet bgs)
125
100
75
50
25
0
0
25
50
75
100
125
1990
1994
1998
2002
2006
2010
2014
2018

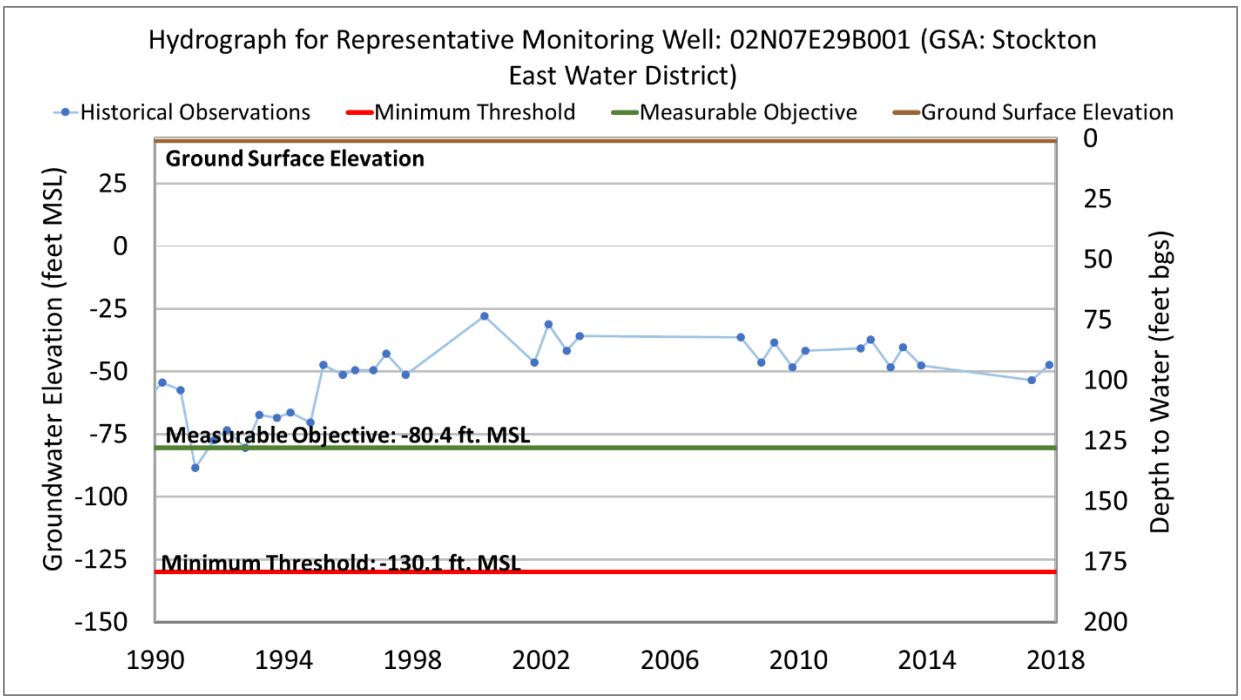

Hydrograph for Representative Monitoring Well: Burnett (OID-4) (GSA: Oakdale Irrigation District)
Historical Observations
Minimum Threshold
Measurable Objective
Ground Surface Elevation
Ground Surface Elevation
Measurable Objective: 79.7 ft. MSL
Minimum Threshold: 60.7 ft. MSL
Groundwater Elevation (feet MSL)
Depth to Water (feet bgs)
175
150
125
100
75
50
25
0
0
25
50
75
100
125
150
175
1990
1994
1998
2002
2006
2010
2014
2018

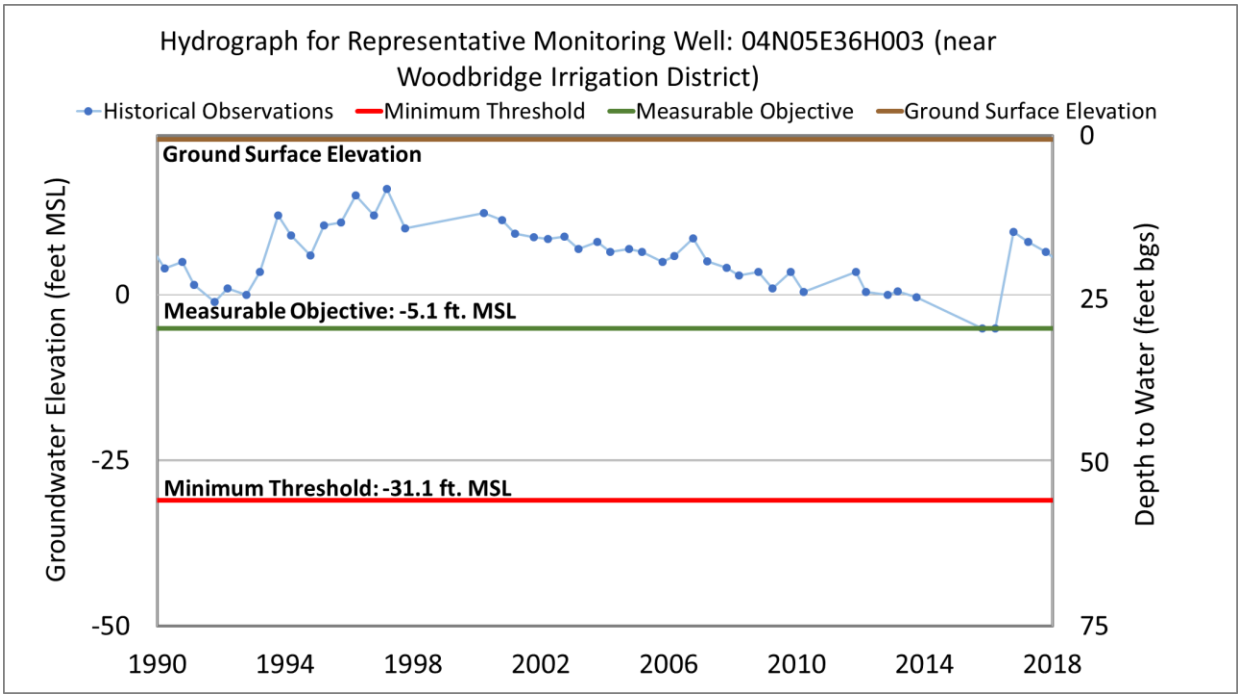

Hydrograph for Representative Monitoring Well: 02S07E31N001 (GSA: South Delta Water Agency)
Historical Observations
Minimum Threshold
Measurable Objective
Ground Surface Elevation
Ground Surface Elevation
Measurable Objective: 13.0 ft. MSL
Minimum Threshold: 1.5 ft. MSL
Groundwater Elevation (feet MSL)
Depth to Water (feet bgs)
0
-25
0
25
50
1990
1994
1998
2002
2006
2010
2014
2018

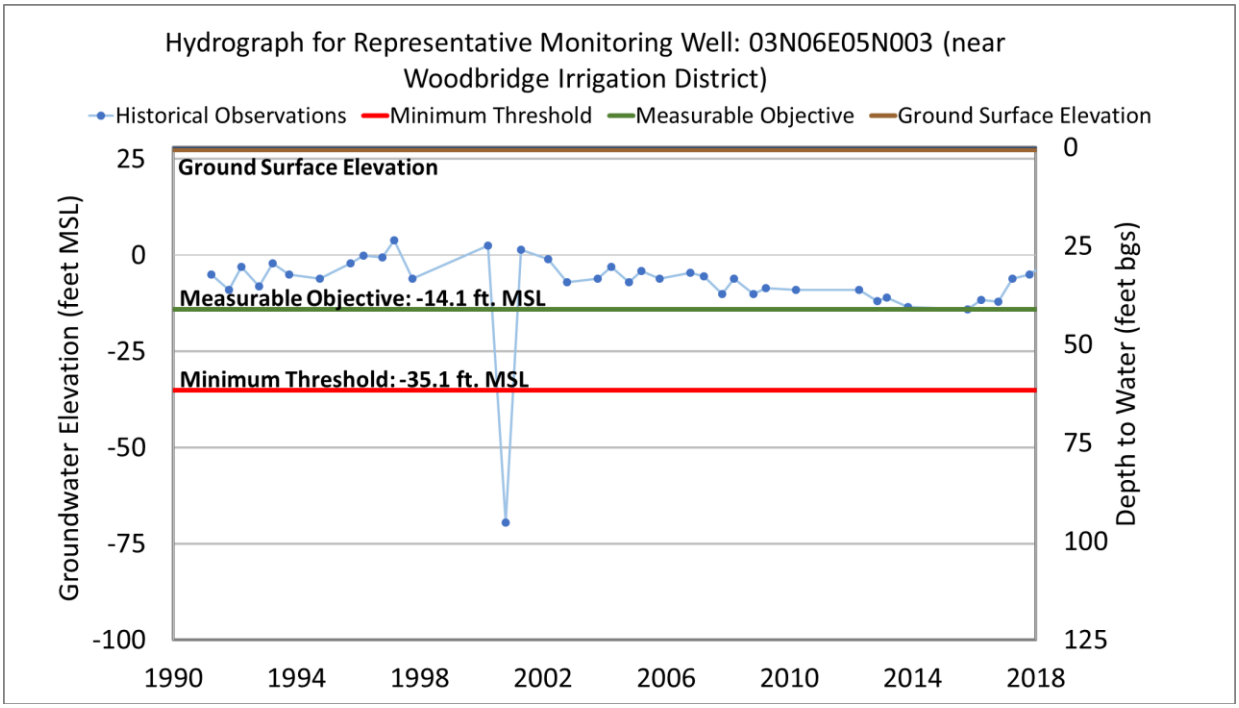

Hydrograph for Representative Monitoring Well: 02S08E08A001 (GSA: South San Joaquin GSA)
Historical Observations
Minimum Threshold
Measurable Objective
Ground Surface Elevation
Ground Surface Elevation
Measurable Objective: 24.0 ft. MSL
Minimum Threshold: 0.6 ft. MSL
Groundwater Elevation (ft. MSL)
Depth to Water (ft. bgs)
50
25
0
0
25
50
1990
1994
1998
2002
2006
2010
2014
2018

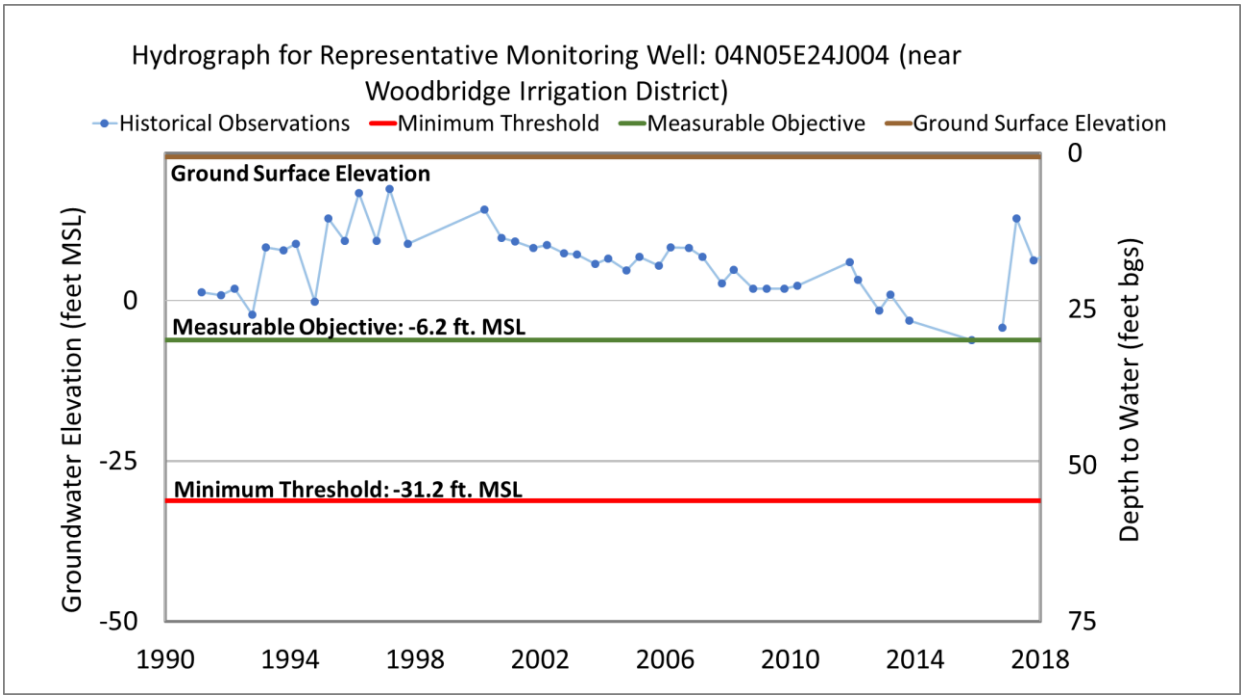

Hydrograph for Representative Monitoring Well: 02N07E03D001 (GSA: Stockton East Water District)
Historical Observations
Minimum Threshold
Measurable Objective
Ground Surface Elevation
Ground Surface Elevation
Measurable Objective: -79.7 ft. MSL
Minimum Threshold: -122.8 ft. MSL
Groundwater Elevation (feet MSL)
Depth to Water (feet bgs)
50
25
0
-25
-50
-75
-100
-125
-150
0
25
50
75
100
125
150
175
200
1990
1994
1998
2002
2006
2010
2014
2018

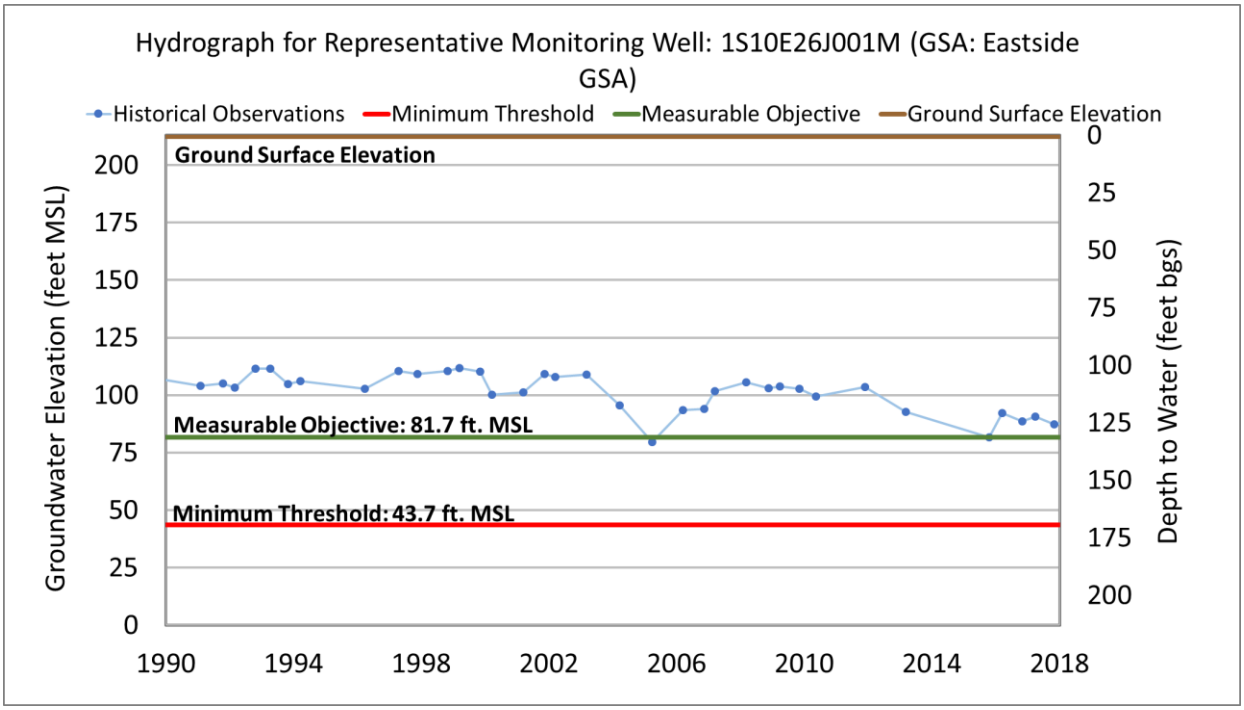

Hydrograph for Representative Monitoring Well: 01N09EJ001 (GSA: Stockton East Water District)
Historical Observations
Minimum Threshold
Measurable Objective
Ground Surface Elevation
Ground Surface Elevation
Measurable Objective: -51.1 ft. MSL
Minimum Threshold: -86.8 ft. MSL
Groundwater Elevation (feet MSL)
Depth to Water (feet bgs)
150
125
100
75
50
25
0
-25
-50
-75
-100
-125
0
25
50
75
100
125
150
175
200
225
250
275
1990
1994
1998
2002
2006
2010
2014
2018


Hydrograph for Representative Monitoring Well: 02N07E29B001 (GSA: Stockton East Water District)
Historical Observations
Minimum Threshold
Measurable Objective
Ground Surface Elevation
Ground Surface Elevation
Measurable Objective: -80.4 ft. MSL
Minimum Threshold: -130.1 ft. MSL
Groundwater Elevation (feet MSL)
Depth to Water (feet bgs)
25
0
-25
-50
-75
-100
-125
-150
0
25
50
75
100
125
150
175
200
1990
1994
1998
2002
2006
2010
2014
2018


Hydrograph for Representative Monitoring Well: 04N05E36H003 (near Woodbridge Irrigation District)
Historical Observations
Minimum Threshold
Measurable Objective
Ground Surface Elevation
Ground Surface Elevation
Measurable Objective: -5.1 ft. MSL
Minimum Threshold: -31.1 ft. MSL
Groundwater Elevation (feet MSL)
Depth to Water (feet bgs)
0
-25
-50
0
25
50
75
1990
1994
1998
2002
2006
2010
2014
2018


Hydrograph for Representative Monitoring Well: 03N06E05N003 (near Woodbridge Irrigation District)
Historical Observations
Minimum Threshold
Measurable Objective
Ground Surface Elevation
Ground Surface Elevation
Measurable Objective: -14.1 ft. MSL
Minimum Threshold: -35.1 ft. MSL
Groundwater Elevation (feet MSL)
Depth to Water (feet bgs)
25
0
-25
-50
-75
-100
0
25
50
75
100
125
1990
1994
1998
2002
2006
2010
2014
2018


Hydrograph for Representative Monitoring Well: 04N05E24J004 (near Woodbridge Irrigation District)
Historical Observations
Minimum Threshold
Measurable Objective
Ground Surface Elevation
Ground Surface Elevation
Measurable Objective: -6.2 ft. MSL
Minimum Threshold: -31.2 ft. MSL
Groundwater Elevation (feet MSL)
Depth to Water (feet bgs)
0
-25
-50
0
25
50
75
1990
1994
1998
2002
2006
2010
2014
2018


Hydrograph for Representative Monitoring Well: 1S10E26J001M (GSA: Eastside GSA)
Historical Observations
Minimum Threshold
Measurable Objective
Ground Surface Elevation
Ground Surface Elevation
Measurable Objective: 81.7 ft. MSL
Minimum Threshold: 43.7 ft. MSL
Groundwater Elevation (feet MSL)
Depth to Water (feet bgs)
200
175
150
125
100
75
50
25
0
0
25
50
75
100
125
150
175
200
1990
1994
1998
2002
2006
2010
2014
2018

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APPENDIX 4-A.
BROAD MONITORING NETWORK FOR GROUNDWATER LEVELS WELL INFORMATION

Local Well ID	CASGEM Site Code	Monitoring Agency*	Well Depth (ft.)	Screen Interval (ft.)
CASGEM Wells				
02S10E02P001M	377843N1208435W001	Stanislaus County	Unknown	Unknown
01S10E27Q001M	378138N1208591W001	Stanislaus County	234	118–158
CCWD 008	380867N1209233W001	CCWD	Unknown	Unknown
CCWD 002	381036N1208903W001	CCWD	260	Unknown
CCWD 009	381042N1209111W001	CCWD	240	140–240
CCWD 014	381511N1209406W001	CCWD	360	275–355
CCWD 017	381783N1208162W001	CCWD	67	51.5–66.5
CCWD 015	381986N1209661W001	CCWD	340	150–340
02S10E05N001M	377860N1209016W001	Stanislaus County	475	98–232
OID-17	378112N1208251W001	Stanislaus County	720	190–310
Searway Dom	378164N1206958W001	Stanislaus County	Unknown	Unknown
01S10E21A001M	378402N1208710W001	Stanislaus County	400	Unknown
01N10E32Q001M	378874N1208954W001	Stanislaus County	Unknown	Unknown
01N07E19G001M	379209N1212476W001	SJCFCWCD	185	165–185
Sonora Rd #5	378521N1207663W001	Stanislaus County	220	60–220
02S07E11N002M	377708N1211790W001	SJCFCWCD	79	50–79
01S09E29M002M	378189N1210150W001	SJCFCWCD	132	120–132
01S09E21J002M	378312N1209797W001	SJCFCWCD	223	195–223
01S08E14B001M	378562N1210588W001	SJCFCWCD	396	244–396
01S09E02R001M	378734N1209447W001	SJCFCWCD	280	127–280
01N09E29R001M	379039N1210005W001	SJCFCWCD	700	100–700
01N07E26H003M	379061N1211661W001	SJCFCWCD	194	160–194
01N09E30C005M	379133N1210282W001	SJCFCWCD	376	340–376
01N08E22J001M	379200N1210700W001	SJCFCWCD	250	190–250
01N08E16H002M	379367N1210944W001	SJCFCWCD	420	120–180
01N09E17M001M	379370N1210162W001	SJCFCWCD	345	204–345
01N08E16G001M	379381N1210983W001	SJCFCWCD	296	112–120
01N09E17D001M	379428N1210162W001	SJCFCWCD	220	99–220
01N08E11L001M	379472N1210711W001	SJCFCWCD	372	168–372
01N07E11L001M	379487N1211759W001	SJCFCWCD	356	196–204
02N07E32M002M	379782N1212375W001	SJCFCWCD	270	164–175
03N08E22A001M	381008N1210810W001	SJCFCWCD	700	100–700
03N07E23C002M	381016N1211791W001	SJCFCWCD	248	152–248
04N07E17N001M	381919N1212436W001	SJCFCWCD	290	100–290
04N05E13H001M	381990N1213727W001	SJCFCWCD	190	50–190
04N06E12N002M	382041N1212799W001	SJCFCWCD	320	104–320
04N05E10K001M	382107N1214297W001	SJCFCWCD	115	90–115
Lodi WSM 05	380799N1213850W001	SJCFCWCD	20	5-20
CCWD 003	380914N1209167W001	CCWD	300	240–300
Lodi WSM 15	380943N1213991W001	SJCFCWCD	20	5-20
Lodi WSM 10	380982N1213658W001	SJCFCWCD	40	20–40
CCWD 001	381042N1208903W001	CCWD	240	176–180
Lodi WSM 17	381160N1213339W001	SJCFCWCD	59	34–54
Lodi MW-11	381287N1212851W001	SJCFCWCD	55	40–55
C-1	380078N1211315W001	SJCFCWCD	480	440–480
Foothill MW-2R	380313N1209362W001	SJCFCWCD	300	240–280

Local Well ID	CASGEM Site Code	Monitoring Agency*	Well Depth (ft.)	Screen Interval (ft.)
Foothill MW-3	380362N1209379W001	SJCFCWCD	295	270.96–289.89
Foothill MW-1	380402N1209279W001	SJCFCWCD	215	190–210
DWS-IPS	380438N1214959W001	SJCFCWCD	90	70–90
Lodi WSM 13	380751N1213908W001	SJCFCWCD	20	5-20
Lodi RMW2	380794N1214137W001	SJCFCWCD	17	16.82–16.83
Lodi WSM 02	380877N1213898W001	SJCFCWCD	20	5-20
Lodi WSM 11	380880N1213523W001	SJCFCWCD	50	25–50
North G-6	380926N1211057W001	SJCFCWCD	168	138–158
North G-4	380943N1211057W001	SJCFCWCD	170	129.5–169.5
Harney MW-3	380951N1211370W001	SJCFCWCD	148	95–145
North G-3D	380960N1211057W001	SJCFCWCD	167	127.5–166.5
North G-1	380962N1210966W001	SJCFCWCD	160	130–160
Harney MW-4	380964N1211407W001	SJCFCWCD	144	88–135
North G-5	380971N1211057W001	SJCFCWCD	170	129.5–169.5
Harney MW-2	380982N1211333W001	SJCFCWCD	147	93–143
Lodi WSM 01	380986N1213869W001	SJCFCWCD	20	5-20
Harney MW-1	381024N1211355W001	SJCFCWCD	159	100–150
Lodi WSM 19	381130N1214087W001	SJCFCWCD	31	6-26
Lodi MW-19	381181N1212736W001	SJCFCWCD	73	58–73
Lodi MW-16	381211N1212856W001	SJCFCWCD	60	45–60
Lodi MW-13	381291N1212688W001	SJCFCWCD	62	47–62
Lodi MW-08	381338N1212785W001	SJCFCWCD	55	40–55
02S10E10M002M	377766N1208657W001	Stanislaus County	225	Unknown
01S10E34R001M	377985N1208524W001	Stanislaus County	Unknown	Unknown
01S10E26J001M	378163N1208321W001	Stanislaus County	Unknown	Unknown
OID-16	378088N1208895W001	Stanislaus County	280	55–72
OID-5	378130N1209240W001	Stanislaus County	502	120–245
01S10E19L001M	378332N1209185W001	Stanislaus County	390	60–68
Sonora Rd #8	378589N1207522W001	Stanislaus County	155	90–155
Olive #2	377952N1207505W001	Stanislaus County	575	292–312
Local Wells				
Well 1	n/a	SJ County Flag City	170	120–170
Well 2	n/a	SJ County Flag City	180	130–180
Well 3	n/a	SJ County Flag City	Unknown	Unknown
Stockton 10R	n/a	City of Stockton	277	177–277
Stockton 28	n/a	City of Stockton	278	178–278
Stockton SSS8	n/a	City of Stockton	277	177–277
Manteca 15	n/a	City of Manteca	265	140–265
Manteca 16	n/a	City of Manteca	304	137–294
Manteca 17	n/a	City of Manteca	372	110–362
119-075-01	n/a	Cal Water	310	176–276
119-059-01	n/a	Cal Water	520	169–269
119-069-01	n/a	Cal Water	530	180–280
Lodi Well #5	n/a	City of Lodi	230	Unknown
Lodi Well #7	n/a	City of Lodi	422	Unknown
Lodi Well #11R	n/a	City of Lodi	465	140–462

Local Well ID	CASGEM Site Code	Monitoring Agency*	Well Depth (ft.)	Screen Interval (ft.)
Clustered and/or Nested Wells				
CCWD 004	381272N1209322W001	CCWD	435	415-435
CCWD 005	381272N1209322W002	CCWD	365	355-365
CCWD 006	381272N1209322W003	CCWD	230	210-230
CCWD 007	381272N1209322W004	CCWD	110	90-110
CCWD 010	381628N1209292W001	CCWD	390	370-390
CCWD 011	381628N1209292W002	CCWD	350	250-270
CCWD 012	381628N1209292W003	CCWD	135	115-135
Sperry-1	378972N1212936W001	SJCFCWCD	460	440-460
Sperry-2	378972N1212936W002	SJCFCWCD	282	262-282
Sperry-3	378972N1212936W003	SJCFCWCD	124	114-124
STK-7.1	379814N1212031W001	SJCFCWCD	665	545-565
STK-7.2	379814N1212031W002	SJCFCWCD	435	415-435
STK-7.3	379814N1212031W003	SJCFCWCD	305	270-295
STK-7.4	379814N1212031W004	SJCFCWCD	183	145-165
STK-4-1	379815N1212032W001	SJCFCWCD	560	540-560
STK-4-2	379815N1212032W002	SJCFCWCD	360	340-360
STK-4-3	379600N1213136W001	SJCFCWCD	220	200-220
STK6-1	379949N1213426W001	SJCFCWCD	618	540-560
STK6-2	379949N1213426W002	SJCFCWCD	470	450-470
STK6-3	379949N1213426W003	SJCFCWCD	260	240-260
STK2-1	380561N1212772W001	SJCFCWCD	635	615-635
STK2-2	380292N1212772W001	SJCFCWCD	540	520-540
STK2-3	380561N1212772W002	SJCFCWCD	300	280-300
STK2-4	380561N1212772W003	SJCFCWCD	220	200-220
Lodi SMW-1A	381147N1212722W001	SJCFCWCD	115	105-115
Lodi SMW-1B	381147N1212722W002	SJCFCWCD	210	200-210
Lodi WMW-2A	381164N1212792W001	SJCFCWCD	189	179-189
Lodi WMW-2B	381164N1212792W002	SJCFCWCD	214	204-214
Lodi WMW-2C	381164N1212792W003	SJCFCWCD	241	231-241
Lodi WMW-2D	381164N1212792W004	SJCFCWCD	293	283-293
Lodi WMW-1A	381203N1212787W001	SJCFCWCD	150	140-150
Lodi WMW-1B	381203N1212787W002	SJCFCWCD	205	195-205
Lodi WMW-1C	381203N1212787W003	SJCFCWCD	242	232-242
Lodi MW-21A	381227N1212718W001	SJCFCWCD	76	66-76
Lodi MW-21B	381227N1212718W002	SJCFCWCD	102	92-102
Lodi MW-21C	381227N1212718W003	SJCFCWCD	128	118-128
Lodi MW-24A	381269N1212711W001	SJCFCWCD	70	60-70
Lodi MW-24B	381269N1212711W002	SJCFCWCD	106	95.5-105.5
Lodi MW-24C	381269N1212711W003	SJCFCWCD	124	114-124
Lodi MW-25B	381292N1212757W001	SJCFCWCD	96	86-96
Lodi MW-25C	381292N1212757W002	SJCFCWCD	158	148-158
STK5-1	382476N1213481W001	SJCFCWCD	580	560-580
STK5-2	380292N1213481W001	SJCFCWCD	430	410-430
STK5-3	380292N1213481W002	SJCFCWCD	230	210-230
STK1-1	385330N1213710W001	SJCFCWCD	880	860-880
STK1-2	385330N1213710W003	SJCFCWCD	540	520-540

Local Well ID	CASGEM Site Code	Monitoring Agency*	Well Depth (ft.)	Screen Interval (ft.)
STK1-3	385330N1213710W004	SJCFCWCD	380	360-380
STK1-4	385330N1213710W005	SJCFCWCD	240	220-240
STK1-5	385330N1213710W002	SJCFCWCD	68	58-68
Swenson-1	380067N1213458W001	SJCFCWCD	502	482-502
Swenson-2	380067N1213458W002	SJCFCWCD	314	294-314
Swenson-3	380067N1213458W003	SJCFCWCD	204	194-204

* CCWD = Calaveras County Water District
SJ County Flag City = San Joaquin County Flag City
SJCFCWCD = San Joaquin County Flood Control and Water Conservation District

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APPENDIX 5-A.
LIST OF DMS DATA TYPES

Data Type	Parameter	Unit
Groundwater Level	Depth to Groundwater	feet
Groundwater Level	Groundwater Elevation	feet
Groundwater Quality	1,1,1-Trichloroethane (111-TCA)	micrograms per liter
Groundwater Quality	1,2,3-Trichloropropane (123-TCP)	micrograms per liter
Groundwater Quality	Aggressiveness Index	-
Groundwater Quality	Aluminum	micrograms per liter
Groundwater Quality	Antimony	micrograms per liter
Groundwater Quality	Apparent Color	-
Groundwater Quality	Arsenic	micrograms per liter
Groundwater Quality	Arsenic	micrograms per liter
Groundwater Quality	Arsenic	picocuries per liter
Groundwater Quality	Barium	parts per billion
Groundwater Quality	Barium	micrograms per liter
Groundwater Quality	Benzene	micrograms per liter
Groundwater Quality	Beryllium	micrograms per liter
Groundwater Quality	Bicarbonate (HCO3)	milligrams per liter
Groundwater Quality	Boron	micrograms per liter
Groundwater Quality	Cadmium	micrograms per liter
Groundwater Quality	Calcium	parts permillion
Groundwater Quality	Calcium	milligrams per liter
Groundwater Quality	Carbonate (CO3)	milligrams per liter
Groundwater Quality	Chloride	milligrams per liter
Groundwater Quality	Chloride	milligrams per liter
Groundwater Quality	Chloride	parts permillion
Groundwater Quality	Chlorine	milligrams per liter
Groundwater Quality	Chromium	parts per billion
Groundwater Quality	Chromium	micrograms per liter
Groundwater Quality	Conductivity @ 25C	micromhos per centimeter
Groundwater Quality	Copper	parts per billion
Groundwater Quality	Copper	micrograms per liter
Groundwater Quality	Corrosivity	-
Groundwater Quality	Cyanide	micrograms per liter
Groundwater Quality	Dibromochloropropane (DBCP)	micrograms per liter
Groundwater Quality	Fluoride	parts permillion
Groundwater Quality	Fluoride	milligrams per liter
Groundwater Quality	Gross Alpha Activity	picocuries per liter
Groundwater Quality	Hardness	parts permillion
Groundwater Quality	Hexavalaent Chromium (CR6)	micrograms per liter
Groundwater Quality	Hexavalaent Chromium(CR6)	micrograms per liter
Groundwater Quality	Hydroxide (OH)	milligrams per liter

Data Type	Parameter	Unit
Groundwater Quality	Iron	micrograms per liter
Groundwater Quality	Laboratory pH	-
Groundwater Quality	Laboratory Turbidity	nephelometric turbidity unit
Groundwater Quality	Lead	micrograms per liter
Groundwater Quality	Magensium	parts permillion
Groundwater Quality	Magnesium	milligrams per liter
Groundwater Quality	Manganese	micrograms per liter
Groundwater Quality	Mercury	micrograms per liter
Groundwater Quality	Methyl Tertiary Butyl Ether (MTBE)	micrograms per liter
Groundwater Quality	Methylene Active Blue Substances	milligrams per liter
Groundwater Quality	Nickel	micrograms per liter
Groundwater Quality	Nitrate (as N)	milligrams per liter
Groundwater Quality	Nitrate (as N)	parts permillion
Groundwater Quality	Nitrate (as N)	micrograms per liter
Groundwater Quality	Nitrate (as N)O4	milligrams per liter
Groundwater Quality	Nitrate (as N)O5	milligrams per liter
Groundwater Quality	Nitrate (as N)O6	milligrams per liter
Groundwater Quality	Nitrate (NO3)	milligrams per liter
Groundwater Quality	Odor Threshold (60'C)	-
Groundwater Quality	Perchlorate	micrograms per liter
Groundwater Quality	Perchlorate	micrograms per liter
Groundwater Quality	Potassium	parts permillion
Groundwater Quality	Potassium	milligrams per liter
Groundwater Quality	Selenium	micrograms per liter
Groundwater Quality	Silver	micrograms per liter
Groundwater Quality	Sodium	parts permillion
Groundwater Quality	Sodium	milligrams per liter
Groundwater Quality	Specific Conductance	microohmns
Groundwater Quality	Specific Conductance	micromhos per centimeter
Groundwater Quality	Specific Electrical Conductivity (SC)	UMHOS/CM
Groundwater Quality	Specific Electrical Conductivity (SC)	micromhos per centimeter
Groundwater Quality	Sulfate	parts permillion
Groundwater Quality	Sulfate	milligrams per liter
Groundwater Quality	Tetrachloroethylene (PCE)	micrograms per liter
Groundwater Quality	Thallium	micrograms per liter
Groundwater Quality	Total Alkalinity	parts permillion
Groundwater Quality	Total Alkalinity (CaCO3)	milligrams per liter
Groundwater Quality	Total ANIONS, meq/L	micromhos per centimeter

Data Type	Parameter	Unit
Groundwater Quality	Total ANIONS, meq/L	micromhos per centimeter
Groundwater Quality	Total ANIONS, meq/L	micromhos per centimeter
Groundwater Quality	Total CATIONS, meq/L	micromhos per centimeter
Groundwater Quality	Total CATIONS, meq/L	micromhos per centimeter
Groundwater Quality	Total Dissolved Solids (TDS)	milligrams per liter
Groundwater Quality	Total Dissolved Solids (TDS)	milligrams per liter
Groundwater Quality	Total Hardness (calc.)	milligrams per liter
Groundwater Quality	Total Trihalomethanes (TTHM)	parts per billion
Groundwater Quality	Trichloroethylene (TCE)	micrograms per liter
Groundwater Quality	Turbidity	-
Groundwater Quality	Uranium	picocuries per liter
Groundwater Quality	Vanadium	parts per billion
Groundwater Quality	Vanadium	micrograms per liter
Groundwater Quality	Zinc	micrograms per liter
Precipitation	Average Air Temperature	°F
Precipitation	Precipitation	inches
Precipitation	Reference Evapotranspiration (ETo)	Inches permonth
Streamflow	Streamflow	cubic feet per second
Surface Water Quality	(E)-Dimethomorph,water,filtered, recoverable	micrograms per liter
Surface Water Quality	(Z)-Dimethomorph,water,filtered, recoverable	micrograms per liter
Surface Water Quality	1,1,1-Trichloroethane,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	1,1,2,2-Tetrachloroethane,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	1,1,2-Trichloroethane,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	1,1-Dichloroethane,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	1,1-Dichloroethene,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	1,2,4-Trichlorobenzene,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	1,2-Dibromoethene, water, unfiltered, recoverable	micrograms per liter
Surface Water Quality	1,2-Dichlorobenzene, water, unfiltered, recoverable	micrograms per liter
Surface Water Quality	1,2-Dichlorobenzene,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	1,2-Dichloroethane,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	1,2-Dichloropropane,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	1,2-Dimethylnaphthalene,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	1,3-Dichlorobenzene, water, unfiltered, recoverable, micrograms per liter	micrograms per liter
Surface Water Quality	1,3-Dichlorobenzene,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram

Data Type	Parameter	Unit
Surface Water Quality	1,3-Dichloropropene,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	1,4-Dichlorobenzene, water, unfiltered, recoverable	micrograms per liter
Surface Water Quality	1,4-Dichlorobenzene,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	1,4-Naphthoquinone,water,filtered,recoverable	micrograms per liter
Surface Water Quality	1,6-Dimethylnaphthalene,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	1-Methyl-9H-fluorene,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	1-Methylphenanthrene,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	1-Methylpyrene,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	1-Naphthol,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	2-(4-tert-Butylphenoxy)-cyclohexanol,water,filtered,recoverable	micrograms per liter
Surface Water Quality	2, 4-DB,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	2,2-Biquinoline,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	2,3,6-Trimethylnaphthalene,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	2,4,5-T,bed sediment,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	2,4,5-T,surrogate,Schedule 9060/2060, water, filtered	percent recovery
Surface Water Quality	2,4,5-T,water,filtered,recoverable	micrograms per liter
Surface Water Quality	2,4,5-T,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	2,4-D,bed sediment,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	2,4-D,water,filtered,recoverable	micrograms per liter
Surface Water Quality	2,4-D,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	2,4-Dinitrotoluene,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	2,5-Dichloroaniline,water,filtered,recoverable	micrograms per liter
Surface Water Quality	2,6-Diethylaniline,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	2,6-Dimethylnaphthalene,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	2,6-Dinitrotoluene,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	2-[(2-Ethyl-6-methylphenyl)amino]-1-propanol,water,filtered,recoverable	micrograms per liter
Surface Water Quality	2-Amino-N-isopropylbenzamide,water,filtered,recoverable	micrograms per liter
Surface Water Quality	2-Chloro-2 6-diethylacetanilide,water,filtered,recoverable	micrograms per liter
Surface Water Quality	2-Chloro-4-isopropylamino-6-amino-s-triazine,water,filtered,recoverable	micrograms per liter
Surface Water Quality	2-Chloro-6-ethylamino-4-amino-s-triazine,water,filtered,recoverable	micrograms per liter

Data Type	Parameter	Unit
Surface Water Quality	2-Chloroethyl vinyl ether,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	2-Chloronaphthalene,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	2-Chlorophenol,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	2-Ethyl-6-methylaniline,water,filtered,recoverable	micrograms per liter
Surface Water Quality	2-Ethylnaphthalene,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	2-Fluorobiphenyl,surrogate,bed sediment smaller than 2 millimeters, wet sieved (native water), field	percent recovery
Surface Water Quality	2-Hydroxy-4-isopropylamino-6-ethylamino-s-triazine,water,filtered,recoverable	micrograms per liter
Surface Water Quality	2-Methyl-4,6-dinitrophenol,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	2-Methylanthracene,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	3-(Trifluoromethyl)aniline,water,filtered,recoverable	micrograms per liter
Surface Water Quality	3,4-Dichloroaniline,water,filtered,recoverable	micrograms per liter
Surface Water Quality	3,5-Dichloroaniline,water,filtered,recoverable	micrograms per liter
Surface Water Quality	3,5-Dimethylphenol,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	3-Hydroxy carbofuran,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	3-Nitrotoluene,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	3-Phenoxybenzyl alcohol,water,filtered,recoverable	micrograms per liter
Surface Water Quality	4-(Hydroxymethyl) pendimethalin,water,filtered,recoverable	micrograms per liter
Surface Water Quality	4,4-Dichlorobenzophenone,water,filtered,recoverable	micrograms per liter
Surface Water Quality	4-Bromophenyl phenyl ether,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	4-Chloro-2-methylphenol,water,filtered,recoverable	micrograms per liter
Surface Water Quality	4-Chloro-3-methylphenol,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	4-Chlorophenyl methyl sulfone,water,filtered,recoverable	micrograms per liter
Surface Water Quality	4-Chlorophenyl phenyl ether,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	4H-Cyclopenta[def]phenanthrene,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	9,10-Anthraquinone,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	9H-Fluorene,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Acenaphthene,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Acenaphthylene,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram

Data Type	Parameter	Unit
Surface Water Quality	Acetochlor oxanilic acid,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Acetochlor sulfonic acid,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Acetochlor,water,filtered, recoverable	micrograms per liter
Surface Water Quality	Acid neutralizing capacity,water,unfiltered, inflection-point titration method (incremental titration method)	milligrams per liter as calcium carbonate
Surface Water Quality	Acid neutralizing capacity,water,unfiltered,fixed endpoint (pH 4.5) titration	milligrams per liter as calcium carbonate
Surface Water Quality	Acid neutralizing capacity,water,unfiltered,fixed endpoint (pH 4.5) titration, laboratory	milligrams per liter as calcium carbonate
Surface Water Quality	Acifluorfen,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Acridine,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Agency analyzing sample	code
Surface Water Quality	Alachlor oxanilic acid,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Alachlor sulfonic acid,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Alachlor, water, unfiltered, recoverable	micrograms per liter
Surface Water Quality	Alachlor,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Aldicarb sulfone,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Aldicarb sulfoxide,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Aldicarb,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Aldrin,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Aldrin,bed sediment,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Aldrin,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Alkalinity,water,filtered, inflection-point titration method (incremental titration method), field	milligrams per liter as calcium carbonate
Surface Water Quality	Alkalinity,water,filtered,Gran titration, field	milligrams per liter as calcium carbonate
Surface Water Quality	Allethrin,bed sediment,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Allethrin,suspended sediment,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	alpha-Endosulfan, water, unfiltered, recoverable	micrograms per liter
Surface Water Quality	alpha-Endosulfan,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	alpha-Endosulfan,bed sediment,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	alpha-Endosulfan,water,filtered,recoverable	micrograms per liter
Surface Water Quality	alpha-HCH,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram

Data Type	Parameter	Unit
Surface Water Quality	alpha-HCH,water,filtered,recoverable	micrograms per liter
Surface Water Quality	alpha-HCH-d6,surrogate,bed sediment smaller than 2 millimeters, wet sieved (native water), field	percent recovery
Surface Water Quality	alpha-HCH-d6,surrogate,Schedule 2002/9002,water,unfiltered	percent recovery
Surface Water Quality	alpha-HCH-d6,surrogate,Schedule 2003, water, filtered	percent recovery
Surface Water Quality	alpha-HCH-d6,surrogate,water,filtered (0.7 micron glass fiber filter)	percent recovery
Surface Water Quality	Aluminum,bed sediment smaller than 62.5 microns,wet sieved, filed, total digestion, dry weight	percent
Surface Water Quality	Aluminum,bed sediment,recoverable, dry weight	milligrams per kilogram
Surface Water Quality	Aluminum,suspended sediment,recoverable	micrograms per liter
Surface Water Quality	Aluminum,water,filtered	micrograms per liter
Surface Water Quality	Aluminum,water,recoverable, dry weight	micrograms per liter
Surface Water Quality	Ametryn,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Aminomethylphosphonic acid,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Ammonia plus organic nitrogen,water,filtered	milligrams per liter as nitrogen
Surface Water Quality	Ammonia plus organic nitrogen,water,unfiltered	milligrams per liter as nitrogen
Surface Water Quality	Ammonia,water,filtered	milligrams per liter as nitrogen
Surface Water Quality	Ammonia,water,filtered	milligrams per liter as NH4
Surface Water Quality	Ammonia,water,unfiltered	milligrams per liter as nitrogen
Surface Water Quality	Ammonia,water,unfiltered	milligrams per liter as NH4
Surface Water Quality	Analytical reference number,Schedule 2501	
Surface Water Quality	Anthracene,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Antimony,bed sediment smaller than 62.5 microns,wet sieved, filed, total digestion, dry weight	milligrams per kilogram
Surface Water Quality	Arsenic,bed sediment smaller than 62.5 microns,wet sieved, filed, total digestion, dry weight	milligrams per kilogram
Surface Water Quality	Arsenic,bed sediment,total digestion, dry weight	milligrams per kilogram
Surface Water Quality	Arsenic,suspended sediment,total	micrograms per liter
Surface Water Quality	Arsenic,water,filtered	micrograms per liter
Surface Water Quality	Arsenic,water,unfiltered	micrograms per liter
Surface Water Quality	Atrazine,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Atrazine,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Azinphos-methyl oxygen analog,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Azinphos-methyl,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Azobenzene,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram

Data Type	Parameter	Unit
Surface Water Quality	Barban,surrogate,Schedules 2060/9060, water, filtered	percent recovery
Surface Water Quality	Barium,bed sediment smaller than 62.5 microns,wet sieved, filed, total digestion, dry weight	milligrams per kilogram
Surface Water Quality	Barium,bed sediment,recoverable, dry weight	milligrams per kilogram
Surface Water Quality	Barium,suspended sediment,recoverable	micrograms per liter
Surface Water Quality	Barium,water,filtered	micrograms per liter
Surface Water Quality	Barium,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Barometric pressure	millimeters ofmercury
Surface Water Quality	BDMC,surrogate,water, unfiltered	percent recovery
Surface Water Quality	Bed sediment,sieve diameter	percent smaller than 0.0625millimeters
Surface Water Quality	Bed sediment,sieve diameter	percent smaller than 0.125millimeters
Surface Water Quality	Bed sediment,sieve diameter	percent smaller than 0.25millimeters
Surface Water Quality	Bed sediment,sieve diameter	percent smaller than 0.5millimeters
Surface Water Quality	Bed sediment,sieve diameter	percent smaller than 1millimeter
Surface Water Quality	Bed sediment,sieve diameter	percent smaller than 2millimeters
Surface Water Quality	Bed sediment,sieve diameter	percent smaller than 4millimeters
Surface Water Quality	Bed sediment,sieve diameter	percent smaller than 8millimeters
Surface Water Quality	Bendiocarb,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Benfluralin,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Benomyl,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Bensulfuron-methyl,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Bentazon,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Benzene,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Benzo[a]anthracene,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Benzo[a]pyrene,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Benzo[b]fluoranthene,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Benzo[c]cinnoline,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Benzo[ghi]perylene,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Benzo[k]fluoranthene,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Benzyl n-butyl phthalate,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram

Data Type	Parameter	Unit
Surface Water Quality	Beryllium,bed sediment smaller than 62.5 microns,wet sieved, filed, total digestion, dry weight	milligrams per kilogram
Surface Water Quality	Beryllium,bed sediment,recoverable, dry weight	milligrams per kilogram
Surface Water Quality	Beryllium,water,filtered	micrograms per liter
Surface Water Quality	Beryllium,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	beta-Endosulfan,water,filtered,recoverable	micrograms per liter
Surface Water Quality	beta-HCH,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Bicarbonate,water,filtered,inflection-point titration method (incremental titration method)	milligrams per liter
Surface Water Quality	Bicarbonate,water,unfiltered,fixed endpoint (pH 4.5) titration,field	milligrams per liter
Surface Water Quality	Bicarbonate,water,unfiltered,inflection-point titration method (incremental titration method)	milligrams per liter
Surface Water Quality	Bifenthrin,bed sediment,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Bifenthrin,suspended sediment,recoverable	micrograms per liter
Surface Water Quality	Bifenthrin,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Biochemical oxygen demand, water, unfiltered, 5 days at 20 degrees Celsius	milligrams per liter
Surface Water Quality	Biomass,periphyton,ash free dry mass	grams per squaremeter
Surface Water Quality	Biomass,periphyton,ash weight	grams per squaremeter
Surface Water Quality	Biomass,periphyton,dry weight	grams per squaremeter
Surface Water Quality	Biomass,plankton,ash weight	milligrams per liter
Surface Water Quality	Biomass,plankton,dry weight	milligrams per liter
Surface Water Quality	Biomass/chlorophyll ratio,periphyton	number
Surface Water Quality	Biomass/chlorophyll ratio,plankton	number
Surface Water Quality	Bis(2-chloroethoxy)methane,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Bis(2-ethylhexyl) phthalate,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Bismuth,bed sediment smaller than 177 microns,wet sieved, filed, total digestion, dry weight	milligrams per kilogram
Surface Water Quality	Bismuth,water,filtered	micrograms per liter
Surface Water Quality	Boron,bed sediment,recoverable, dry weight	milligrams per kilogram
Surface Water Quality	Boron,water,filtered	micrograms per liter
Surface Water Quality	Boron,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Bromacil,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Bromide, water, filtered	milligrams per liter
Surface Water Quality	Bromodichloromethane,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Bromomethane,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Bromoxynil,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Butylate,water,filtered,recoverable	micrograms per liter
Surface Water Quality	C8-Alkylphenol,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram

Data Type	Parameter	Unit
Surface Water Quality	Cadmium,bed sediment smaller than 62.5 microns,wet sieved, filed, total digestion, dry weight	milligrams per kilogram
Surface Water Quality	Cadmium,bed sediment,recoverable, dry weight	milligrams per kilogram
Surface Water Quality	Cadmium,suspended sediment,recoverable	micrograms per liter
Surface Water Quality	Cadmium,water,filtered	micrograms per liter
Surface Water Quality	Cadmium,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Caffeine,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Caffeine-13C,surrogate,Schedule 9060/2060, water, filtered	percent recovery
Surface Water Quality	Calcium,bed sediment smaller than 62.5 microns,wet sieved, filed, total digestion, dry weight	percent
Surface Water Quality	Calcium,water,filtered	milligrams per liter
Surface Water Quality	Carbaryl,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Carbaryl,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Carbaryl,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Carbazole,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Carbofuran,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Carbofuran,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Carbon (inorganic plus organic), bed sediment, total, dry weight	grams per kilogram
Surface Water Quality	Carbon (inorganic plus organic),bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	grams per kilogram
Surface Water Quality	Carbon (inorganic plus organic),bed sediment smaller than 62.5 microns,wet sieved (native water), field,recoverable,dry weight	percent
Surface Water Quality	Carbon (inorganic plus organic),suspended sediment,total	milligrams per liter
Surface Water Quality	Carbon dioxide,water,unfiltered	milligrams per liter
Surface Water Quality	Carbonate,water,filtered,inflection-point titration method (incremental titration method)	milligrams per liter
Surface Water Quality	Carbonate,water,unfiltered,fixed endpoint (pH 8.3) titration,field	milligrams per liter
Surface Water Quality	Carbonate,water,unfiltered,inflection-point titration method (incremental titration method)	milligrams per liter
Surface Water Quality	Carbonate,water,unfiltered,inflection-point titration method (incremental titration method),field	milligrams per liter as calcium carbonate
Surface Water Quality	Carbophenothion,bed sediment,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Carbophenothion,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Cerium,bed sediment smaller than 62.5 microns,wet sieved, filed, total digestion, dry weight	milligrams per kilogram
Surface Water Quality	Chemical oxygen demand, low level, water, unfiltered	milligrams per liter
Surface Water Quality	Chloramben methyl ester,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Chlordane (technical),bed sediment,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Chlordane (technical),water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Chlordane plus degradates,bed sediment,recoverable,maximum summation, dry weight	micrograms per kilogram

Data Type	Parameter	Unit
Surface Water Quality	Chloride,water,filtered	milligrams per liter
Surface Water Quality	Chlorimuron-ethyl,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Chlorobenzene,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Chloroethane,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Chloromethane,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Chloroneb,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Chlorophyll a,periphyton,chromatographic-fluorometric method	milligrams per squaremeter
Surface Water Quality	Chlorophyll a,phytoplankton,chromatographic-fluorometric method	micrograms per liter
Surface Water Quality	Chlorophyll b,phytoplankton,chromatographic-fluorometric method	micrograms per liter
Surface Water Quality	Chlorothalonil,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Chlorpyrifos oxygen analog,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Chlorpyrifos,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Chlorpyrifos,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Chromium(VI),water,filtered	micrograms per liter
Surface Water Quality	Chromium,bed sediment smaller than 62.5 microns,wet sieved, filed, total digestion, dry weight	milligrams per kilogram
Surface Water Quality	Chromium,bed sediment,recoverable	milligrams per kilogram
Surface Water Quality	Chromium,suspended sediment,recoverable	micrograms per liter
Surface Water Quality	Chromium,water,filtered	micrograms per liter
Surface Water Quality	Chromium,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Chrysene,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	cis-1,3-Dichloropropene, water, unfiltered, recoverable	micrograms per liter
Surface Water Quality	cis-Chlordane,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	cis-Nonachlor,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	cis-Permethrin,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	cis-Permethrin,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	cis-Propiconazole,water,filtered, recoverable	micrograms per liter
Surface Water Quality	Clopyralid,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Cobalt,bed sediment smaller than 62.5 microns,wet sieved, filed, total digestion, dry weight	milligrams per kilogram
Surface Water Quality	Cobalt,suspended sediment,recoverable	micrograms per liter
Surface Water Quality	Cobalt,water,filtered	micrograms per liter
Surface Water Quality	Cobalt,water,unfiltered, recoverable	micrograms per liter
Surface Water Quality	Copper,bed sediment smaller than 62.5 microns,wet sieved, filed, total digestion, dry weight	milligrams per kilogram
Surface Water Quality	Copper,bed sediment,recoverable, dry weight	milligrams per kilogram

Data Type	Parameter	Unit
Surface Water Quality	Copper,suspended sediment,recoverable	micrograms per liter
Surface Water Quality	Copper,water,filtered	micrograms per liter
Surface Water Quality	Copper,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Cyanazine,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Cyanazine,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Cycloate,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Cyfluthrin,bed sediment,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Cyfluthrin,suspended sediment,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Cyfluthrin,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Cypermethrin,bed sediment,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Cypermethrin,suspended sediment,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Cypermethrin,water,filtered,recoverable	micrograms per liter
Surface Water Quality	DCPA monoacid,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	DCPA,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	DCPA,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	DDT plus degradates,bed sediment smaller than 2 millimeters,wet sieved (native water),recoverable,minimum summation, dry weight	micrograms per kilogram
Surface Water Quality	DDT plus degradates,bed sediment smaller than 2 millimeters,wet sieved (native water),recoverable,minimum summation, dry weight	micrograms per kilogram
Surface Water Quality	Deltamethrin,bed sediment,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Deltamethrin,suspended sediment,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Desulfinylfipronil amide,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Desulfinylfipronil,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Diazinon,bed sediment,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Diazinon,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Diazinon,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Diazinon-d10,surrogate,Schedule 2002/9002,water,unfiltered	percent recovery
Surface Water Quality	Diazinon-d10,surrogate,Schedule 2003, water, filtered	percent recovery
Surface Water Quality	Diazinon-d10,surrogate,water,filtered (0.7 micron glass fiber filter)	percent recovery
Surface Water Quality	Diazoxon,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Dibenzo[a,h]anthracene,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Dibenzothiophene,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Dibromochloromethane,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Dicamba,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter

Data Type	Parameter	Unit
Surface Water Quality	Dicamba,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Dichlobenil,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Dichlorodifluoromethane,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Dichloromethane,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Dichlorprop,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Dichlorprop,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Dichlorvos,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Dicrotophos,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Dieldrin,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Dieldrin,bed sediment,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Dieldrin,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Dieldrin,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Diethyl phthalate,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Dimethenamid oxanilic acid,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Dimethenamid sulfonic acid,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Dimethoate,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Dimethyl phthalate,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Di-n-butyl phthalate,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Di-n-octyl phthalate,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Dinoseb,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Diphenamid,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Discharge	cubic feet per second
Surface Water Quality	Discharge	cubicmeters per second
Surface Water Quality	Discharge,instantaneous	cubic feet per second
Surface Water Quality	Discharge,instantaneous	cubicmeters per second
Surface Water Quality	Dissolved oxygen,water,unfiltered	milligrams per liter
Surface Water Quality	Dissolved oxygen,water,unfiltered	percent of saturation
Surface Water Quality	Dissolved solids dried at 180 degrees Celsius,water,filtered	milligrams per liter
Surface Water Quality	Dissolved solids,water	tons per day
Surface Water Quality	Dissolved solids,water,filtered	tons per acre-foot
Surface Water Quality	Dissolved solids,water,filtered,sum of constituents	milligrams per liter
Surface Water Quality	Disulfoton sulfone,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Disulfoton sulfoxide,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Disulfoton,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Diuron,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Endosulfan ether,water,filtered,recoverable	micrograms per liter

Data Type	Parameter	Unit
Surface Water Quality	Endosulfan sulfate,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Endrin,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Endrin,bed sediment,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Endrin,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	EPTC,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Esfenvalerate,bed sediment,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Esfenvalerate,suspended sediment,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Esfenvalerate,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Ethalfluralin,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Ethion monoxon,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Ethion,bed sediment,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Ethion,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Ethion,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Ethoprop,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Ethylbenzene,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Europium,bed sediment smaller than 62.5 microns,wet sieved, filed, total digestion, dry weight	milligrams per kilogram
Surface Water Quality	Fenamiphos sulfone,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Fenamiphos sulfoxide,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Fenamiphos,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Fenpropathrin,bed sediment,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Fenpropathrin,suspended sediment,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Fenthion sulfoxide,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Fenthion,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Fenuron,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Fipronil sulfide,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Fipronil sulfone,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Fipronil,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Flufenacet oxanilic acid,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Flufenacet sulfonic acid,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Flumetralin,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Flumetsulam,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Fluometuron,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Fluoranthene,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram

Data Type	Parameter	Unit
Surface Water Quality	Fluoride,water,filtered	milligrams per liter
Surface Water Quality	Fonofos oxygen analog,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Fonofos,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Fonofos,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Gage height	feet
Surface Water Quality	Gage height,above datum	meters
Surface Water Quality	Gallium,bed sediment smaller than 62.5 microns,wet sieved, filed, total digestion, dry weight	milligrams per kilogram
Surface Water Quality	Gallium,water,filtered	micrograms per liter
Surface Water Quality	Germanium,water,filtered	micrograms per liter
Surface Water Quality	Glufosinate,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Glyphosate,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Gold,bed sediment smaller than 62.5 microns,wet sieved, filed, total digestion, dry weight	milligrams per kilogram
Surface Water Quality	Hardness,water	milligrams per liter as calcium carbonate
Surface Water Quality	Heptachlor epoxide,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Heptachlor epoxide,bed sediment,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Heptachlor epoxide,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Heptachlor,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Heptachlor,bed sediment,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Heptachlor,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Hexachlorobenzene,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Hexazinone,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Holmium,bed sediment smaller than 62.5 microns,wet sieved, filed, total digestion, dry weight	milligrams per kilogram
Surface Water Quality	Hydrogen ion,water,unfiltered	milligrams per liter
Surface Water Quality	Imazaquin,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Imazethapyr,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Imidacloprid,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Indeno[1,2,3-cd]pyrene,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Inorganic carbon, bed sediment, total, dry weight	grams per kilogram
Surface Water Quality	Inorganic carbon,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	grams per kilogram
Surface Water Quality	Inorganic carbon,bed sediment smaller than 62.5 microns,wet sieved (native water), field,recoverable,dry weight	percent
Surface Water Quality	Inorganic carbon,suspended sediment,total	milligrams per liter
Surface Water Quality	Iprodione,water,filtered,recoverable	micrograms per liter

Data Type	Parameter	Unit
Surface Water Quality	Iron, water, unfiltered, micrograms per liter	micrograms per liter
Surface Water Quality	Iron,bed sediment smaller than 62.5 microns,wet sieved, filed, total digestion, dry weight	percent
Surface Water Quality	Iron,bed sediment,total digestion,dry weight	milligrams per kilogram
Surface Water Quality	Iron,suspended sediment,recoverable	micrograms per liter
Surface Water Quality	Iron,water,filtered	micrograms per liter
Surface Water Quality	Iron,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Isodrin,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Isofenphos,surrogate,Schedule 1319, water, unfiltered	percent recovery
Surface Water Quality	Isofenphos,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Isophorone,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Isoquinoline,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	lambda-Cyhalothrin,bed sediment,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	lambda-Cyhalothrin,suspended sediment,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	lambda-Cyhalothrin,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Lanthanum,bed sediment smaller than 62.5 microns,wet sieved, filed, total digestion, dry weight	milligrams per kilogram
Surface Water Quality	Lead,bed sediment smaller than 62.5 microns,wet sieved, filed, total digestion, dry weight	milligrams per kilogram
Surface Water Quality	Lead,bed sediment,recoverable, dry weight	milligrams per kilogram
Surface Water Quality	Lead,suspended sediment,recoverable	micrograms per liter
Surface Water Quality	Lead,water,filtered	micrograms per liter
Surface Water Quality	Lead,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Lindane,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Lindane,bed sediment,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Lindane,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Lindane,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Linuron,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Linuron,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Lithium, suspended sediment, recoverable	micrograms per liter
Surface Water Quality	Lithium,bed sediment smaller than 62.5 microns,wet sieved, filed, total digestion, dry weight	milligrams per kilogram
Surface Water Quality	Lithium,bed sediment,dry weight	milligrams per kilogram
Surface Water Quality	Lithium,water,filtered	micrograms per liter
Surface Water Quality	Lithium,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Loss on ignition of suspended solids, water, unfiltered	milligrams per liter

Data Type	Parameter	Unit
Surface Water Quality	Magnesium,bed sediment smaller than 62.5 microns,wet sieved, filed, total digestion, dry weight	percent
Surface Water Quality	Magnesium,water,filtered	milligrams per liter
Surface Water Quality	Malaoxon,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Malathion,bed sediment,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Malathion,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Malathion,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Manganese,bed sediment smaller than 62.5 microns,wet sieved, filed, total digestion, dry weight	milligrams per kilogram
Surface Water Quality	Manganese,bed sediment,recoverable, dry weight	milligrams per kilogram
Surface Water Quality	Manganese,bulk atmospheric deposition,suspended,micrograms per liter	micrograms per liter
Surface Water Quality	Manganese,suspended sediment,recoverable	micrograms per liter
Surface Water Quality	Manganese,water,filtered	micrograms per liter
Surface Water Quality	Manganese,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	MCPA,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	MCPB,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Mercury,bed sediment smaller than 62.5 microns,wet sieved, filed, total digestion, dry weight	milligrams per kilogram
Surface Water Quality	Mercury,bed sediment,recoverable, dry weight	milligrams per kilogram
Surface Water Quality	Mercury,biota,tissue,recoverable,dry weight	milligrams per kilogram
Surface Water Quality	Mercury,solids,total,dry weight	micrograms per kilogram
Surface Water Quality	Mercury,suspended sediment,recoverable	micrograms per liter
Surface Water Quality	Mercury,suspended sediment,total	nanograms per liter
Surface Water Quality	Mercury,water,filtered	nanograms per liter
Surface Water Quality	Mercury,water,filtered	micrograms per liter
Surface Water Quality	Mercury,water,unfiltered, recoverable	micrograms per liter
Surface Water Quality	Metalaxyl,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Metalaxyl,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Methidathion,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Methiocarb,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Methomyl,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Methomyl,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Methyl cis-3-(2,2-dichlorovinyl)-2,2-dimethylcyclopropane-1-carboxylate,water,filtered, recoverable	micrograms per liter
Surface Water Quality	Methyl paraoxon,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Methyl parathion,bed sediment,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Methyl parathion,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Methyl parathion,water,unfiltered,recoverable	micrograms per liter

Data Type	Parameter	Unit
Surface Water Quality	Methyl trans-3-(2,2-dichlorovinyl)-2,2-dimethylcyclopropane-1-carboxylate,water,filtered, recoverable	micrograms per liter
Surface Water Quality	Methyl trithion,bed sediment,dry weight,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Methyl trithion,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Methylene blue active substances, water, unfiltered, recoverable	milligrams per liter
Surface Water Quality	Methylmercury,solids,total,dry weight	micrograms per kilogram
Surface Water Quality	Methylmercury,suspended sediment,total	nanograms per liter
Surface Water Quality	Methylmercury,water,filtered, recoverable	nanograms per liter
Surface Water Quality	Metolachlor oxanilic acid,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Metolachlor sulfonic acid,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Metolachlor, water, unfiltered, recoverable	micrograms per liter
Surface Water Quality	Metolachlor,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Metribuzin, water, unfiltered, recoverable	micrograms per liter
Surface Water Quality	Metribuzin,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Metsulfuron-methyl,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Mirex,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Mirex,bed sediment,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Mirex,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Molinate,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Molybdenum,bed sediment smaller than 62.5 microns,wet sieved, filed, total digestion, dry weight	milligrams per kilogram
Surface Water Quality	Molybdenum,suspended sediment,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Molybdenum,water,filtered	micrograms per liter
Surface Water Quality	Molybdenum,water,unfiltered	micrograms per liter
Surface Water Quality	Myclobutanil,water,filtered,recoverable	micrograms per liter
Surface Water Quality	N-(4-Chlorophenyl)-N-methylurea,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Naphthalene,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Napropamide,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Neburon,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Neodymium,bed sediment smaller than 62.5 microns,wet sieved, filed, total digestion, dry weight	milligrams per kilogram
Surface Water Quality	Nickel,bed sediment smaller than 62.5 microns,wet sieved, filed, total digestion, dry weight	milligrams per kilogram
Surface Water Quality	Nickel,bed sediment,recoverable, dry weight	milligrams per kilogram
Surface Water Quality	Nickel,suspended sediment,recoverable	micrograms per liter
Surface Water Quality	Nickel,water,filtered	micrograms per liter

Data Type	Parameter	Unit
Surface Water Quality	Nickel,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Nicosulfuron,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Niobium,bed sediment smaller than 62.5 microns,wet sieved, filed, total digestion, dry weight	milligrams per kilogram
Surface Water Quality	Nitrate plus nitrite,water,filtered	milligrams per liter as nitrogen
Surface Water Quality	Nitrate plus nitrite,water,unfiltered	milligrams per liter as nitrogen
Surface Water Quality	Nitrate,water,filtered	milligrams per liter as nitrogen
Surface Water Quality	Nitrate,water,filtered	milligrams per liter
Surface Water Quality	Nitrite,water,filtered	milligrams per liter as nitrogen
Surface Water Quality	Nitrite,water,filtered	milligrams per liter
Surface Water Quality	Nitrobenzene,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Nitrobenzene-d5,surrogate,bed sediment smaller than 2 millimeters, wet sieved (native water), field	percent recovery
Surface Water Quality	N-Nitrosodi-n-propylamine,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	N-Nitrosodiphenylamine,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Noncarbonate hardness,water,filtered	milligrams per liter as calcium carbonate
Surface Water Quality	Noncarbonate hardness,water,unfiltered	milligrams per liter as calcium carbonate
Surface Water Quality	Norflurazon,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	o, p-DDD,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable, dry weight	micrograms per kilogram
Surface Water Quality	o, p-DDE,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable, dry weight	micrograms per kilogram
Surface Water Quality	o, p-DDT,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable, dry weight	micrograms per kilogram
Surface Water Quality	o, p-Methoxychlor,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	O-Ethyl-O-methyl-S-propylphosphorothioate,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Organic carbon, bed sediment, total, dry weight	grams per kilogram
Surface Water Quality	Organic carbon,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	grams per kilogram
Surface Water Quality	Organic carbon,bed sediment smaller than 62.5 microns,wet sieved (native water), field,recoverable,dry weight	percent
Surface Water Quality	Organic carbon,suspended sediment,total	milligrams per liter
Surface Water Quality	Organic carbon,water,filtered	milligrams per liter
Surface Water Quality	Organic carbon,water,unfiltered	milligrams per liter
Surface Water Quality	Organic nitrogen,water,filtered	milligrams per liter
Surface Water Quality	Organic nitrogen,water,unfiltered	milligrams per liter

Data Type	Parameter	Unit
Surface Water Quality	Orthophosphate,water,filtered	milligrams per liter
Surface Water Quality	Orthophosphate,water,filtered	milligrams per liter as phosphorus
Surface Water Quality	Oryzalin,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Oxamyl,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Oxychlordane,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Oxyfluorfen,water,filtered,recoverable	micrograms per liter
Surface Water Quality	p, p-DDD,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable, dry weight	micrograms per kilogram
Surface Water Quality	p, p-DDD,bed sediment,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	p, p-DDD,water,unfiltered, recoverable	micrograms per liter
Surface Water Quality	p, p-DDE,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable, dry weight	micrograms per kilogram
Surface Water Quality	p, p-DDE,bed sediment,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	p, p-DDE,water,filtered,recoverable	micrograms per liter
Surface Water Quality	p, p-DDE,water,unfiltered, recoverable	micrograms per liter
Surface Water Quality	p, p-DDT,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable, dry weight	micrograms per kilogram
Surface Water Quality	p, p-DDT,bed sediment,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	p, p-DDT,water,unfiltered, recoverable	micrograms per liter
Surface Water Quality	p, p-Methoxychlor,bed sediment,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	p, p-Methoxychlor,unfiltered,recoverable	micrograms per liter
Surface Water Quality	p, p-Methoxychlor,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	p,p-Ethyl-DDD, water, unfiltered, recoverable	micrograms per liter
Surface Water Quality	p,p-Ethyl-DDD,bed sediment,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Paraoxon,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Parathion,bed sediment,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Parathion,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Parathion,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Particulate nitrogen,suspended in water	milligrams per liter
Surface Water Quality	PCB congener 14,surrogate,bed sediment smaller than 2 millimeters, wet sieved (native water), field	percent recovery
Surface Water Quality	PCB congener 204,surrogate,bed sediment smaller than 2 millimeters, wet sieved (native water), field	percent recovery
Surface Water Quality	PCBs,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	PCBs,bed sediment,recoverable,dry weight	micrograms per kilogram

Data Type	Parameter	Unit
Surface Water Quality	PCBs,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	p-Cresol,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Pebulate,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Pendimethalin,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Pentachloroanisole,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Pentachloronitrobenzene,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Permethrin,bed sediment,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Permethrin,suspended sediment,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	pH,water,unfiltered, field	standard units
Surface Water Quality	pH,water,unfiltered., laboratory	standard units
Surface Water Quality	Phenanthrene,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Phenanthridine,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Phenol,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Phenothrin,bed sediment,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Phenothrin,suspended sediment,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Pheophytin a,periphyton	milligrams per squaremeter
Surface Water Quality	Phorate oxygen analog,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Phorate,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Phorate,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Phosmet oxygen analog,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Phosmet,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Phosphate,water,unfiltered	milligrams per liter
Surface Water Quality	Phosphorus,bed sediment smaller than 62.5 microns,wet sieved, filed, total digestion, dry weight	percent
Surface Water Quality	Phosphorus,water,filtered	milligrams per liter as phosphorus
Surface Water Quality	Phosphorus,water,unfiltered	milligrams per liter as phosphorus
Surface Water Quality	Phosphorus,water,unfiltered	milligrams per liter as phosphate
Surface Water Quality	Picloram,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Picloram,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Polychlorinated naphthalenes,bed sediment,recoverable,dry weight	micrograms per kilogram

Data Type	Parameter	Unit
Surface Water Quality	Polychlorinated naphthalenes,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Potassium,bed sediment smaller than 62.5 microns,wet sieved, filed, total digestion, dry weight	percent
Surface Water Quality	Potassium,water,filtered	milligrams per liter
Surface Water Quality	Profenofos,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Prometon,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Prometon,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Prometryn,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Prometryn,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Propachlor,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Propanil,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Propargite,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Propazine,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Propetamphos,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Propham,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Propham,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Propiconazole,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Propoxur,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Propyzamide,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	p-Terphenyl-d14,surrogate,bed sediment smaller than 2 millimeters, wet sieved (native water), field	percent recovery
Surface Water Quality	Pyrene,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Quinoline,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Ratio of particulate nitrogen to particulate organic carbon	number
Surface Water Quality	Resmethrin,bed sediment,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Resmethrin,suspended sediment,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Sample purpose	code
Surface Water Quality	Sample source	code
Surface Water Quality	Sample volume,Schedule 1319	milliliters
Surface Water Quality	Sample volume,Schedule 2001	milliliters
Surface Water Quality	Sample volume,Schedule 2003	milliliters
Surface Water Quality	Sample volume,Schedule 2010	milliliters
Surface Water Quality	Sample volume,Schedule 2050	milliliters
Surface Water Quality	Sample volume,Schedule 2051	milliliters
Surface Water Quality	Sample volume,Schedules 2002 and 9002	milliliters
Surface Water Quality	Sample volume,Schedules 2060 and 9060	milliliters
Surface Water Quality	Sample weight,Schedule 2501	grams
Surface Water Quality	Sampler type	code

Data Type	Parameter	Unit
Surface Water Quality	Sampling condition	code
Surface Water Quality	Sampling method	code
Surface Water Quality	Scandium,bed sediment smaller than 62.5 microns,wet sieved, filed, total digestion, dry weight	milligrams per kilogram
Surface Water Quality	Selenium,bed sediment smaller than 62.5 microns,wet sieved, filed, total digestion, dry weight	milligrams per kilogram
Surface Water Quality	Selenium,bed sediment,total digestion,dry weight	milligrams per kilogram
Surface Water Quality	Selenium,suspended sediment,total	micrograms per liter
Surface Water Quality	Selenium,water,filtered	micrograms per liter
Surface Water Quality	Selenium,water,unfiltered	micrograms per liter
Surface Water Quality	Set number	lab code 0113
Surface Water Quality	Set number	lab code 0114
Surface Water Quality	Set number	Schedule 2001
Surface Water Quality	Set number	Schedule 2010
Surface Water Quality	Set number	Schedule 2050
Surface Water Quality	Set number	Schedule 2051
Surface Water Quality	Set number	Schedule 2002
Surface Water Quality	Set number,Schedule 1319	code
Surface Water Quality	Set number,Schedule 2060	lab code 9060
Surface Water Quality	Set number,Schedule 2502	
Surface Water Quality	Siduron,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Silica,water,filtered	milligrams per liter as SiO2
Surface Water Quality	Silver,bed sediment smaller than 62.5 microns,wet sieved, filed, total digestion, dry weight	milligrams per kilogram
Surface Water Quality	Silver,suspended sediment,recoverable	micrograms per liter
Surface Water Quality	Silver,water,filtered	micrograms per liter
Surface Water Quality	Silver,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Silvex,bed sediment,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Silvex,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Silvex,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Simazine,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Simazine,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Simetryn,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Site visit purpose	code
Surface Water Quality	Sodium adsorption ratio,water	number
Surface Water Quality	Sodium fraction of cations,water	percent in equivalents ofmajor cations
Surface Water Quality	Sodium,bed sediment smaller than 62.5 microns,wet sieved, filed, total digestion, dry weight	percent
Surface Water Quality	Sodium,water,filtered	milligrams per liter

Data Type	Parameter	Unit
Surface Water Quality	Specific conductance,water,unfiltered	microsiemens per centimeter at 25 degrees Celsius
Surface Water Quality	Specific conductance,water,unfiltered, laboratory	microsiemens per centimeter at 25 degrees Celsius
Surface Water Quality	Strontium,bed sediment smaller than 62.5 microns,wet sieved, filed, total digestion, dry weight	milligrams per kilogram
Surface Water Quality	Styrene, water, unfiltered, recoverable	micrograms per liter
Surface Water Quality	Sulfate,water,filtered	milligrams per liter
Surface Water Quality	Sulfometuron-methyl,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Sulfotepp,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Sulfur,bed sediment smaller than 62.5 microns,wet sieved, filed, total digestion, dry weight	percent
Surface Water Quality	Sulprofos,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Suspended sediment concentration	milligrams per liter
Surface Water Quality	Suspended sediment discharge	tons per day
Surface Water Quality	Suspended sediment,sieve diameter	percent smaller than 0.0625millimeters
Surface Water Quality	Suspended solids remaining after ignition, water, unfiltered	milligrams per liter
Surface Water Quality	Suspended solids, water, unfiltered	milligrams per liter
Surface Water Quality	Tantalum,bed sediment smaller than 62.5 microns,wet sieved, filed, total digestion, dry weight	milligrams per kilogram
Surface Water Quality	tau-Fluvalinate,bed sediment,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	tau-Fluvalinate,suspended sediment,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Tebupirimfos,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Tebupirimphos oxygen analog,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Tebuthiuron,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Tefluthrin acid benzyl ester,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Tefluthrin acid pentafluorobenzyl ester,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Tefluthrin,bed sediment,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Tefluthrin,suspended sediment,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Tefluthrin,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Temephos,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Temperature,air	degrees Celsius
Surface Water Quality	Temperature,water	degrees Celsius
Surface Water Quality	Terbacil,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Terbacil,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Terbufos oxygen analog sulfone,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Terbufos,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter

Data Type	Parameter	Unit
Surface Water Quality	Terbuthylazine,surrogate,water,filtered (0.7 micron glass fiber filter)	percent recovery
Surface Water Quality	Terbuthylazine,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Tetrachloroethene,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Tetrachloromethane,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Tetramethrin,bed sediment,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Tetramethrin,suspended sediment,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Thiobencarb,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Thorium,bed sediment smaller than 62.5 microns,wet sieved, filed, total digestion, dry weight	milligrams per kilogram
Surface Water Quality	Tin,bed sediment smaller than 62.5 microns,wet sieved, filed, total digestion, dry weight	milligrams per kilogram
Surface Water Quality	Titanium,bed sediment smaller than 62.5 microns,wet sieved (native water), field,recoverable,dry weight	percent
Surface Water Quality	Titanium,water,filtered	micrograms per liter
Surface Water Quality	Toluene,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Topical quality-control data purpose	code
Surface Water Quality	Total nitrogen (nitrate + nitrite + ammonia + organic-N),water,filtered,analytically determined	milligrams per liter
Surface Water Quality	Total nitrogen (nitrate + nitrite + ammonia + organic-N),water,unfiltered,analytically determined	milligrams per liter
Surface Water Quality	Total nitrogen,bed sediment,total, dry weight	milligrams per kilogram
Surface Water Quality	Total nitrogen,water,filtered	milligrams per liter
Surface Water Quality	Total nitrogen,water,unfiltered	milligrams per liter
Surface Water Quality	Total nitrogen,water,unfiltered	milligrams per liter as nitrate
Surface Water Quality	Toxaphene,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Toxaphene,bed sediment,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	Toxaphene,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	trans-1,2-Dichloroethene,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	trans-1,3-Dichloropropene, water, unfiltered, recoverable	micrograms per liter
Surface Water Quality	trans-Chlordane,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	trans-Nonachlor,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	trans-Permethrin,bed sediment smaller than 2 millimeters,wet sieved (native water),field,recoverable,dry weight	micrograms per kilogram
Surface Water Quality	trans-Propiconazole,water,filtered, recoverable	micrograms per liter
Surface Water Quality	Triallate,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Tribenuron-methyl,water,filtered,recoverable	micrograms per liter
Surface Water Quality	Tribromomethane,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Tribuphos,water,filtered,recoverable	micrograms per liter

Data Type	Parameter	Unit
Surface Water Quality	Tribuphos,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Trichloroethene,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Trichlorofluoromethane,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Trichloromethane,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Triclopyr,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Trifluralin, water, unfiltered, recoverable	micrograms per liter
Surface Water Quality	Trifluralin,water,filtered (0.7 micron glass fiber filter),recoverable	micrograms per liter
Surface Water Quality	Trihalomethanes,water,unfiltered,maximum summation	micrograms per liter
Surface Water Quality	Turbidity, water, unfiltered	nephelometric turbidity units
Surface Water Quality	Turbidity,water,unfiltered	Jackson Turbidity Units
Surface Water Quality	Type of quality assurance data associated with sample	code
Surface Water Quality	Type of replicate	code
Surface Water Quality	Uranium,bed sediment smaller than 62.5 microns,wet sieved, filed, total digestion, dry weight	milligrams per kilogram
Surface Water Quality	Vanadium,bed sediment smaller than 62.5 microns,wet sieved, filed, total digestion, dry weight	milligrams per kilogram
Surface Water Quality	Vanadium,water,filtered	micrograms per liter
Surface Water Quality	Vinyl chloride,water,unfiltered,recoverable	micrograms per liter
Surface Water Quality	Water present,biota,tissue, recoverable, dry weight	percent
Surface Water Quality	Xylene (all isomers), water, unfiltered, recoverable	micrograms per liter
Surface Water Quality	Ytterbium,bed sediment smaller than 62.5 microns,wet sieved, filed, total digestion, dry weight	milligrams per kilogram
Surface Water Quality	Yttrium,bed sediment smaller than 62.5 microns,wet sieved, filed, total digestion, dry weight	milligrams per kilogram
Surface Water Quality	Zinc,bed sediment smaller than 62.5 microns,wet sieved, filed, total digestion, dry weight	milligrams per kilogram
Surface Water Quality	Zinc,bed sediment,recoverable, dry weight	milligrams per kilogram
Surface Water Quality	Zinc,suspended sediment,recoverable	micrograms per liter
Surface Water Quality	Zinc,water,filtered	micrograms per liter
Surface Water Quality	Zinc,water,unfiltered,recoverable	micrograms per liter