APPENDIX A

Groundwater Sustainability Agency Member Resolutions, Joint Exercise of Powers Agreement, and GSA Bylaws

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BOARD OF DIRECTORS

SAN ANTONIO BASIN GROUNDWATER SUSTAINABILITY AGENCY

RESOLUTION NO. 2017-1

A RESOLUTION OF THE SAN ANTONIO BASIN GROUNDWATER SUSTAINABILITY AGENCY TO ELECT TO BECOME THE GROUNDWATER SUSTAINABILITY AGENCY FOR THE SAN ANTONIO CREEK GROUNDWATER BASIN PURSUANT TO THE SUSTAINABLE GROUNDWATER MANAGEMENT ACT

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

WHEREAS, the legislative intent of the Act 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 agencies with the authority and the technical and financial assistance necessary to sustainably manage groundwater; and

WHEREAS, in order to exercise the authority granted in the Act, a local agency or combination of local agencies must elect to become a groundwater sustainability agency ("GSA"); and

WHEREAS, the San Antonio Basin Groundwater Sustainability Agency ("Agency") is a local agency, as the Act defines that term; and

WHEREAS, the Agency exercises jurisdiction upon land overlying the entire San Antonio Creek Groundwater Basin ("Basin), designated basin number 3-014 in the Department of Water Resources' ("DWR") most recent changes to Bulletin No. 118; and

WHEREAS, the Agency is committed to sustainable management of the Basin's groundwater resources; and

WHEREAS, the Act requires that a GSA be formed for all basins designated by DWR as medium- or high-priority basins by June 30, 2017; and

WHEREAS, the Basin is designated as a medium-priority basin pursuant to the DWR's initial prioritization; and

WHEREAS, it is the intent of the Agency to work cooperatively with other local GSAs and stakeholders, as may be appropriate, to sustainably manage the Basin and ensure that the Act's goals are satisfied; and

WE, THE UNDERSIGNED, do hereby certify that the above and foregoing Resolution No. 2017-1 was duly adopted and passed by the Board of Directors of the San Antonio Basin Groundwater Sustainability Agency at a meeting held on the 14th day of June, 2017, by the following vote:

AYES: Durant, Puga, Sharer, Merrill, Wraither, Branquinho, Barnard
NOES: NONE
ABSENT: Hogenard

Randy Sharer, Board Chair
San Antonio Basin Groundwater Sustainability Agency

ATTEST:

Kevin Barnard, Secretary
San Antonio Basin Groundwater Sustainability Agency

RESOLUTION NO. 2017-02

RESOLUTION OF THE BOARD OF DIRECTORS OF THE CACHUMA RESOURCE CONSERVATION DISTRICT APPROVING THE EXECUTION OF A JOINT EXERCISE OF POWERS AGREEMENT WITH LOS ALAMOS COMMUNITY SERVICES DISTRICT TO FORM THE SAN ANTONIO BASIN GROUNDWATER SUSTAINABILITY AGENCY

WHEREAS, the Los Alamos Community Services District ("LACSD") and the Cachuma Resource Conservation District ("CRCD") are both local agencies, as defined by the Sustainable Groundwater Management Act ("SGMA"), Water Code §§ 10720 *et seq*., located within the San Antonio Creek Valley Groundwater Basin ("Basin") as defined by the California Department of Water Resources ("DWR") Bulletin 118,

WHEREAS, SGMA requires the formation of a groundwater sustainability agency ("GSA") by June 30, 2017, for each groundwater basin designated by DWR as medium- or high-priority, and DWR has designated the Basin as medium-priority,

WHEREAS, SGMA requires the adoption of a groundwater sustainability plan ("GSP") by January 31, 2022, for each medium-priority basin,

WHEREAS, pursuant to SGMA, specifically Water Code § 10723.6, and the Joint Exercise of Powers Act, Government Code §§ 6500 *et seq*., LACSD and CRCD are authorized to create a joint powers authority to jointly exercise any power common to the two agencies, together with such powers as are expressly set forth in the Joint Exercise of Powers Act and in SGMA,

WHEREAS, the Board of Directors of LACSD voted on May 10, 2017 to execute a Joint Exercise of Powers Agreement ("JPA") between LACSD and CRCD relating to the formation of a joint powers authority for the purpose of becoming the GSA and developing a GSP for the Basin,

WHEREAS, the Board of Directors of CRCD desires by this resolution to approve the JPA forming the San Antonio Basin Groundwater Sustainability Agency.

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

The CRCD Board of Directors hereby approves the JPA in the form presented to it and authorizes the President of the CRCD Board of Directors to sign the JPA on behalf of CRCD.

PASSED AND ADOPTED this 16th day of May 2017, by the following vote of the Board of Directors of the CRCD:

AYES: Russell, Cavaletto, Scolari, Bradley, Douglas, Steele, Weiss
NOES: Merritt
ABSENT: None

Resolution No: 2017-02
RESOLUTION OF THE
Cachuma Resource Conservation District

ABSTAIN: Stollberg

Richard Russell, President
of the Board of Directors

ATTEST:

Leroy Scolari, Secretary
of the Board of Directors

CERTIFICATE OF SECRETARY

I, LEROY SCOLARI, SECRETARY OF THE BOARD OF DIRECTORS OF THE CACHUMA RESOURCE CONSERVATION DISTRICT, DO HEREBY CERTIFY THAT THE ABOVE IS A TRUE AND CORRECT COPY OF RESOLUTION PASSED AND ADOPTED BY THE BOARD OF DIRECTORS OF THE CRCD effective ~~March 15,~~ May 16 2017.

SECRETARY OF THE BOARD

RESOLUTION NO. 2017-03

RESOLUTION OF THE BOARD OF DIRECTORS OF THE CACHUMA RESOURCE CONSERVATION DISTRICT APPOINTING SEVEN DIRECTORS TO SERVE ON THE BOARD OF THE SAN ANTONIO BASIN GROUNDWATER SUSTAINABILITY AGENCY

WHEREAS, the Los Alamos Community Services District ("LACSD") and the Cachuma Resource Conservation District ("CRCD") are both local agencies, as defined by the Sustainable Groundwater Management Act ("SGMA"), Water Code §§ 10720 *et seq.*, located within the San Antonio Creek Valley Groundwater Basin ("Basin") as defined by the California Department of Water Resources ("DWR") Bulletin 118,

WHEREAS, pursuant to SGMA, specifically Water Code § 10723.6, and the Joint Exercise of Powers Act, Government Code §§ 6500 *et seq.*, LACSD and CRCD are authorized to create a joint powers authority to jointly exercise any power common to the two agencies, together with such powers as are expressly set forth in the Joint Exercise of Powers Act and in SGMA,

WHEREAS, the CRCD Board of Directors and the LACSD Board of Directors have approved a Joint Exercise of Powers Agreement ("JPA") between CRCD and LACSD relating to the formation of a new joint powers authority to be called the "San Antonio Basin Groundwater Sustainability Agency,"

WHEREAS, the JPA provides that the CRCD Board of Directors may appoint seven individuals to the Board of Directors of the San Antonio Basin Groundwater Sustainability Agency, according to the following representation categories defined in the JPA:

- Vineyards: Two directors
- Row crops: Two directors
- Orchards or other permanent crops: One director
- Cattle: One director
- Transitional land uses: One director

WHEREAS, the CRCD Board of Directors desires by this resolution to appoint seven individuals to the Board of Directors of the San Antonio Basin Groundwater Sustainability Agency.

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

The CRCD Board of Directors hereby appoints the following individuals to serve on the Board of Directors of the San Antonio Basin Groundwater Sustainability Agency formed pursuant to the JPA, each for a term of four (4) years commencing on the date that the San Antonio Basin Groundwater Sustainability Agency votes to become the groundwater sustainability agency for the Basin:

Resolution No: 2017-03
RESOLUTION OF THE
Cachuma Resource Conservation District

1. Pat Huguenard (Vineyards)
2. Kevin Merrill (Vineyards)
3. Randy Sharer (Row crops)
4. Kenneth Pata (Row crops)
5. Tom Durant (Orchards/other permanent crops)
6. Brandy Branquinho (Cattle)
7. Christopher Wrathner (Transitional land uses)

PASSED AND ADOPTED this 16th day of May 2017, by the following vote of the Board of Directors of the Cachuma Resource Conservation District:

AYES: Russell, Cavaletto, Scolari, Bradley, Douglas, Merritt, Steele, Wegis
NOES: NONE
ABSENT: NONE
ABSTAIN: Jim Shallberg

Richard Russell, President
of the Board of Directors

ATTEST:

Leroy Scolari, Secretary
of the Board of Directors

Resolution No: 2017-03
RESOLUTION OF THE
Cachuma Resource Conservation District

CERTIFICATE OF SECRETARY

I, LEROY SCOLARI, SECRETARY OF THE BOARD OF DIRECTORS OF THE CACHUMA RESOURCE CONSERVATION DISTRICT, DO HEREBY CERTIFY THAT THE ABOVE IS A TRUE AND CORRECT COPY OF RESOLUTION PASSED AND ADOPTED BY THE BOARD OF DIRECTORS OF THE CRCD effective May 16, 2017.

LeRoy Scolari
SECRETARY OF THE BOARD

RESOLUTION NO. 17-361

RESOLUTION OF THE BOARD OF DIRECTORS OF THE LOS ALAMOS COMMUNITY SERVICES DISTRICT APPROVING PARTICIPATION BY DISTRICT AS MEMBER OF GROUNDWATER SUSTAINABILITY AGENCY, APPROVING JOINT EXERCISE OF POWERS AGREEMENT WITH CACHUMA RESOURCE CONSERVATION DISTRICT, AND APPOINTING DIRECTOR AND ALTERNATE DIRECTOR TO SERVE ON BOARD OF JOINT POWERS AUTHORITY

WHEREAS, the Los Alamos Community Services District ("LACSD") and the Cachuma Resource Conservation District ("CRCD") are both local agencies, as defined by the Sustainable Groundwater Management Act ("SGMA"), Water Code §§ 10720 *et seq.*, located within the San Antonio Creek Valley Groundwater Basin ("Basin"), and each have water supply, water management, or land use responsibilities within the Basin.

WHEREAS, SGMA requires the formation of a groundwater sustainability agency ("GSA") by June 30, 2017, for each groundwater basin designated by the California Department of Water Resources ("DWR") as a medium or high priority basin. SGMA requires the adoption of a groundwater sustainability plan ("GSP") by January 31, 2022, for each medium priority basin. DWR has designated the Basin as a medium priority basin.

WHEREAS, pursuant to SGMA, specifically Water Code § 10723.6, and the Joint Exercise of Powers Act, Government Code §§ 6500 *et seq.*, LACSD and CRCD are authorized to create a joint powers agency to jointly exercise any power common to the two agencies, together with such powers as are expressly set forth in the Joint Exercise of Powers Act and in SGMA.

WHEREAS, the Board of Directors of LACSD ("LACSD Board") has been presented with a proposed Joint Exercise of Powers Agreement ("JPA") between LACSD and CRCD relating to the formation of a joint powers authority for the purpose of becoming the GSA for the Basin to develop a GSP and manage the Basin.

WHEREAS, the Board of Directors of LACSD desires by this resolution to (i) approve the participation by LACSD as a member of the GSA for the Basin, (ii) approve the JPA, and (iii) appoint a director and an alternate director to serve on the board of the joint powers authority formed pursuant to the JPA.

NOW, THEREFORE, BE IT RESOLVED by the Board of Directors of the Los Alamos Community Services District as follows:

1. **Approval of Participation as GSA Member**. The LACSD Board hereby approves the participation by LACSD as a member of the GSA for the Basin.

2. **Approval of Joint Exercise of Powers Agreement**. The LACSD Board hereby approves the JPA in the form presented to it and authorizes the President of the LACSD Board to sign the JPA on behalf of LACSD.

3. **Appointment of Board Member and Alternate**. The LACSD Board hereby appoints Kevin Barnard to serve as a director and Leonard Bileti to serve as an alternate director on the board of the joint powers authority formed pursuant to the JPA, each for a term of term of four (4) years commencing on the date that said joint powers authority decides to become the GSA for the Basin.

PASSED AND ADOPTED this 10th day of May 2017, by the following vote of the Board of Directors of the Los Alamos Community Services District:

AYES: Torres, Snell, Gregg, Bileti and Solis

NOES: -0-

ABSENT: -0-

ABSTAIN: -0-

Larry A. Torres, President
of the Board of Directors

ATTEST:

Candyce Clark, Secretary
of the Board of Directors

CERTIFICATION

The undersigned Secretary of the Board of Directors of the Los Alamos Community Services District hereby certifies that the foregoing resolutions were duly adopted by the Board of Directors at a special meeting held on the 10th day of May, 2017.

Candyce Clark

Candyce Clark, Secretary
of the Board of Directors

Dated: May 11, 2017

San Antonio Basin Groundwater Sustainability Agency
920 E. Stowell Rd. Santa Maria, CA 93454
(805) 868-4013

May 28, 2020

Department of Water Resources
Mark Nordberg, GSA Project Manager
PO Box 942836
Sacramento, CA 94236-0001

RE: San Antonio Basin Groundwater Sustainability Agency Notice of Non-Material Change to GSA Notification

This letter is to notify the Department of Water Resources of a non-material change with respect to the San Antonio Basin Groundwater Sustainability Agency (GSA) Notification. The GSA was created in May 2017 by a Joint Exercise of Powers Agreement (JPA Agreement) between the Los Alamos Community Services District (Los Alamos CSD) and the Cachuma Resource Conservation District (Cachuma RCD). When the GSA was formed, the Cachuma RCD's participation in the GSA was envisioned as potentially interim in nature. The JPA Agreement expressly provided for the automatic substitution of the Cachuma RCD as a "Member" of the GSA with a subsequently formed water district overlying the San Antonio Creek Groundwater Basin ("Basin") and representing at least 50% of Basin pumping.

Santa Barbara LAFCO recently approved the formation of the San Antonio Basin Water District (a California Water District formed pursuant to Water Code § 34000 et seq.), which meets the requirements set forth in the JPA Agreement and covers the entirety of the Basin with a carve-out for the service area of the Los Alamos CSD. Pursuant to the terms of the JPA Agreement, the newly formed San Antonio Basin Water District has replaced the Cachuma RCD as a Member of the GSA, effective as of May 19, 2020.

Sincerely,

Anna Olsen
Executive Director, San Antonio Basin GSA

JOINT EXERCISE OF POWERS AGREEMENT

by and between

CACHUMA RESOURCE CONSERVATION DISTRICT AND

LOS ALAMOS COMMUNITY SERVICES DISTRICT

creating the

SAN ANTONIO BASIN GROUNDWATER SUSTAINABILITY AGENCY

MAY 2017

JOINT EXERCISE OF POWERS AGREEMENT OF THE SAN ANTONIO BASIN GROUNDWATER SUSTAINABILITY AGENCY

This **Joint Exercise of Powers Agreement of the San Antonio Basin Groundwater Sustainability Agency ("Agreement")** is made and entered into as of May 16, 2017 ("**Effective Date**"), by and between the Cachuma Resource Conservation District ("**CRCD**") and the Los Alamos Community Services District ("**LACSD**"), referred to herein individually as a "**Member**" and collectively as the "**Members**" for purposes of forming the San Antonio Basin Groundwater Sustainability Agency ("**Agency**" or "**SABGSA**") and setting forth the terms pursuant to which the Agency shall operate.

RECITALS

A. Both of the Members to this Agreement are local agencies, as defined by the Sustainable Groundwater Management Act ("**SGMA**"), Water Code §§ 10720 *et seq.*, located within the San Antonio Creek Valley Groundwater Basin ("**Basin**") and duly organized and existing under and by virtue of the laws of the State of California; and,

B. SGMA requires formation of a groundwater sustainability agency ("**GSA**") by June 30, 2017, for each groundwater basin designated by the California Department of Water Resources ("**DWR**") as a medium or high priority basin; and,

C. SGMA requires adoption of a groundwater sustainability plan ("**GSP**") by January 31, 2022, for each medium priority basin; and,

D. Pursuant to SGMA, specifically Water Code § 10723.6, and the Joint Exercise of Powers Act, Government Code §§ 6500 *et seq.*, the Members are authorized to create a joint powers agency to jointly exercise any power common to the Members, together with such powers as are expressly set forth in the Joint Exercise of Powers Act and in SGMA, for the purpose of becoming a GSA for the Basin; and,

E. The Members each have water supply, water management, or land use responsibilities within the Basin, as identified and defined by DWR in Bulletin No. 118 (as Basin No. 3-14); and,

F. The Members intend for the SABGSA to develop a GSP and manage the Basin pursuant to SGMA; and,

G. In order to become the GSA for the Basin, the Agency will comply with the notice and public hearing requirements described in Water Code section 10723(b) and with the notification requirements described in Water Code section 10723.8; and,

H. Based on the foregoing legal authority, the Members desire to create a joint powers authority for the purpose of taking all actions deemed necessary by the Agency, acting as the GSA, to ensure sustainable management of the Basin as required by SGMA.

TERMS OF AGREEMENT

In consideration of the mutual promises and covenants herein contained, the Members agree as follows:

ARTICLE 1
INCORPORATION OF RECITALS

1.1 The foregoing recitals are true and correct and are incorporated herein by reference.

ARTICLE 2
DEFINITIONS

The following terms have the following meanings for purposes of this Agreement:

2.1 "Act" means the Joint Exercise of Powers Act, set forth in Chapter 5 of Division 7 of Title 1 of the Government Code, sections 6500, *et seq.*, including all laws supplemental thereto.

2.2 "Agreement" means this Joint Exercise of Powers Agreement forming the San Antonio Basin Groundwater Sustainability Agency with jurisdiction over the San Antonio Creek Valley Groundwater Basin.

2.3 "Auditor" means the auditor of the financial affairs of the Agency appointed by the Board of Directors pursuant to Section 14.4 of this Agreement.

2.4 "Agency" means the San Antonio Basin Groundwater Sustainability Agency, also referred to herein as "SABGSA," created by this Agreement.

2.5 "Basin" means the San Antonio Creek Valley Groundwater Basin, also referred to as the San Antonio Groundwater Basin, as identified and defined by DWR in Bulletin 118 (as Basin 3-14).

2.6 "Board of Directors" or "Board" means the governing body of the Agency as established by Article 7 of this Agreement.

2.7 "Bulletin 118" means DWR's report entitled "California Groundwater: Bulletin 118" updated in 2016, and as it may be subsequently updated or revised in accordance with Water Code § 12924.

2.8 "Bylaws" means the bylaws adopted by the Board of Directors pursuant to Article 12 of this Agreement to govern the day-to-day operations of the Agency.

2.9 "Director(s)" and "Alternate Director(s)" mean a director or alternate director appointed by a Member pursuant to Article 7 of this Agreement.

2.10 "DWR" means the California Department of Water Resources.

2.11 "Executive Director" means the chief administrative officer of the Agency to be appointed by the Board of Directors pursuant to Article 11 of this Agreement.

2.12 "GSA" means a Groundwater Sustainability Agency as defined by SGMA in Water Code §§ 10720 *et seq.*

2.13 "GSP" means a Groundwater Sustainability Plan, as defined by SGMA in Water Code §§ 10727 *et seq.*

2.14 "Member(s)" means a local agency eligible under SGMA to be a groundwater sustainability agency and included in Article 6 of this Agreement.

2.15 "Officer(s)" means the Chair, Vice Chair, Secretary, or Treasurer of the Agency to be appointed by the Board of Directors pursuant to Article 8 of this Agreement and any additional officers that may be appointed by the Board as it deems necessary.

2.16 "SABGSA" means the San Antonio Basin Groundwater Sustainability Agency, also referred to herein as "Agency," created by this Agreement.

2.17 "SGMA" means the Sustainable Groundwater Management Act, Water Code §§ 10720 *et seq.,* including all laws supplemental thereto.

2.18 "State" means the State of California.

ARTICLE 3
CREATION OF THE AGENCY

3.1 Creation of a Joint Powers Authority. There is hereby created pursuant to the Act and SGMA a joint powers authority, which shall be a public entity separate from the Members to this Agreement, and which shall be known as the San Antonio Basin Groundwater Sustainability Agency. The boundaries of the Agency shall correlate with the boundaries of the Basin as determined by DWR in Bulletin 118 or as modified by DWR pursuant to Water Code section 10722.2.

3.2 Notices. Within 30 days after the Effective Date of this Agreement, and after any amendment, the Agency shall cause a notice of this Agreement or amendment to be prepared and filed with the office of the California Secretary of State containing the information required by Government Code section 6503.5. Within 70 days after the Effective Date of this Agreement, the Agency shall cause a statement of the information concerning the Agency, required by Government Code section 53051, to be filed with the office of the California Secretary of State and with the County Clerk for the County of Santa Barbara, setting forth the facts required to be stated pursuant to Government Code section 53051(a). Within 30 days after deciding to become the GSA for the Basin, the Agency shall inform DWR of its decision and intent to undertake sustainable groundwater management within the Basin in accordance with Water Code § 10723.8.

3.3 Purpose of the Agency. The purpose of the Agency is to implement and comply with SGMA in the San Antonio Groundwater Basin by (i) serving as the Basin's groundwater sustainability

agency, (ii) developing, adopting, and implementing a GSP for the Basin, and (iii) sustainably managing the Basin pursuant to SGMA.

3.4 Principal Office. The principal office of the Agency shall be established by the Board of Directors, and may thereafter be changed by a majority vote of the Board.

ARTICLE 4
TERM

4.1 This Agreement shall become effective on the date first set forth above, which shall correspond to the date on which the last Member listed in Article 6 (Members) signs this Agreement, after which notices shall be filed in accordance with Section 3.2 (Notices). This Agreement shall remain in effect until terminated pursuant to the provisions of Article 17 (Withdrawal of Members) of this Agreement.

ARTICLE 5
POWERS

5.1 The Agency shall possess and shall exercise in its own name any and all powers reasonably necessary for the Agency to implement SGMA, together with such other powers as are expressly set forth in the Act and in SGMA. For purposes of Government Code section 6509, the powers of the Agency shall be exercised subject to the restrictions imposed on the CRCD or on a successor water district, should one replace the CRCD as a Member of the Agency (pursuant to Article 6), and in the event of the withdrawal of the CRCD without a water district replacing it as a Member, then the manner of exercising the GSA's powers shall be exercised subject to those restrictions imposed on the LACSD, and shall include, but not be limited to, the following powers:

(1) To exercise all powers afforded to a GSA pursuant to and as permitted by SGMA;

(2) To develop, adopt and implement the GSP pursuant to SGMA;

(3) To adopt rules, regulations, policies, bylaws and procedures governing the operation of the Agency and adoption and implementation of the GSP in accordance with applicable law;

(4) To obtain rights, permits and other authorizations for or pertaining to implementation of the GSP;

(5) To perform other ancillary tasks relating to the operation of the Agency pursuant to SGMA and applicable law, including without limitation, environmental review, engineering, and design;

(6) To make and enter into all contracts necessary to the full exercise of the Agency's powers;

(7) To employ, designate or otherwise contract for the services of agents, officers, employees, attorneys, engineers, planners, financial consultants, technical specialists, advisors,

and contractors;

(8) To exercise jointly the common powers of the Members, as directed by the Board, in developing and implementing a GSP for the Basin;

(9) To investigate legislation and proposed legislation affecting the Basin and to make appearances regarding such matters;

(10) To cooperate and to act in conjunction and contract with the United States, the State of California or any agency thereof, counties, municipalities, public agencies and private corporations and entities of any kind (including without limitation, investor-owned utilities), and individuals, or any of them, for any and all purposes necessary or convenient for the full exercise of the powers of the Agency;

(11) To incur debts, liabilities or obligations, to issue bonds, notes, certificates of participation, guarantees, equipment leases, reimbursement obligations and other indebtedness, and, to the extent provided for in a duly adopted GSP, to impose assessments, groundwater extraction fees, or other charges, and other means of financing the Agency as authorized by and as provided in Chapter 8 of SGMA commencing at Section 10730 of the Water Code;

(12) To collect and monitor data on the extraction of groundwater from, and the quality of groundwater in, the Basin;

(13) To establish and administer a conjunctive use program for the purposes of maintaining sustainable yields in the Basin consistent with the requirements of SGMA;

(14) To exchange and distribute water;

(15) To regulate groundwater extractions as permitted by SGMA;

(16) To impose groundwater extraction fees as permitted by SGMA;

(17) To spread, sink and inject water into the Basin;

(18) To store, transport, recapture, recycle, purify, treat or otherwise manage and control water for beneficial use;

(19) To apply for, accept and receive licenses, permits, water rights, approvals, agreements, grants, loans, contributions, donations or other aid from any agency of the United States, the State of California, or other public agencies or private persons or entities necessary for the Agency's purposes;

(20) To develop and facilitate market-based solutions for the use and management of water rights;

(21) To acquire property and other assets by grant, lease, purchase, bequest, devise, gift or eminent domain, and to hold, enjoy, lease or sell, or otherwise dispose of, property, including

real property, water rights, and personal property, necessary for the full exercise of the Agency's powers;

(22) To sue and be sued in its own name;

(23) To provide for the prosecution of, defense of, or other participation in actions or proceedings at law or in public hearings in which the Members, pursuant to this Agreement, may have an interest and may employ counsel and other expert assistance for these purposes;

(24) To exercise the common powers of its Members to develop, collect, provide, and disseminate information that furthers the purposes of the Agency, including but not limited to the operation of the Agency and adoption and implementation of the GSP, to the Members, legislative, administrative, and judicial bodies, as well as the public generally;

(25) To accumulate operating and reserve funds for the purposes herein stated;

(26) To invest money that is not required for the immediate necessities of the Agency, as the Agency determines is advisable, in the same manner and upon the same conditions as Members, pursuant to Government Code section 53601, as it now exists or may hereafter be amended;

(27) To undertake any investigations, studies, and matters of general administration; and

(28) To perform all other acts necessary or proper to carry out fully the purposes of this Agreement.

ARTICLE 6
MEMBERSHIP

6.1 Members. The initial Members of the Agency shall be CRCD and the LACSD as long as they have not, pursuant to the provisions hereof, withdrawn from this Agreement.

6.2 Automatic Substitution of CRCD. If at any time the landowners in the Basin form a water district whose boundaries include lands that (i) overlie the Basin, and (ii) represent more than fifty percent (50%) of all groundwater water extractions from the Basin, not including Federal water extractions ("**Water District**"), the Water District shall be entitled, upon written notice ("**Notice**") to the Agency, to be substituted for the CRCD as a Member of the Agency. The Notice shall include a list of proposed Directors who meet all of the qualifications to serve on the Agency Board as set forth in Section 7.1.1 ("**Substitute Directors**"). Upon the substitution of the Water District as a Member of the Agency, the Substitute Directors designated by the Water District shall be substituted for any Directors appointed by the CRCD who are then serving on the Board, and shall fill any vacant positions on the Board for which the CRCD had the right to appoint the Directors. The substitution of the Water District as a Member shall be automatic without any payment of costs or reimbursements by the Water District or any action of the Agency, and shall be effective ten (10) days following delivery to the Agency of the Notice. From and after the date that the substitution is effective, the Water District shall stand in the place and stead of the CRCD.

6.3. New Members. In addition to the substitution of a Member under Section 6.2., any local agency (as defined by SGMA and the Act) that is not a Member on the Effective Date of this Agreement may become a Member upon:

(1) Unanimous approval of the Board of Directors as specified in Article 10 (Voting);

(2) Payment of a pro rata share of all previously incurred costs that the Board of Directors determines have resulted in benefit to the local agency, and are appropriate for assessment on the new Member; and,

(3) Amendment of this Agreement in accordance with Section 18.3 (Amendments to Agreement) to reflect the new Member.

ARTICLE 7
BOARD OF DIRECTORS

7.1 Formation of the Board of Directors. The Agency shall be governed by a Board of Directors ("**Board**"). The Board shall consist of a total of eight (8) Directors consisting of the following representatives who shall be appointed in the manner described below:

7.1.1 Seven (7) Directors appointed by a majority vote of the governing board of the CRCD. At any time upon a unanimous vote of the CRCD governing board, the representation categories below for the seven (7) Directors appointed by the CRCD (the "**Representation Categories**") may be modified to more accurately reflect groundwater usage within the Basin, but as of the Effective Date of this Agreement, the Directors appointed by the CRCD shall include owners or designated representatives of owners of land overlying the Basin that is dedicated to and used for the following Representation Categories:

(a) Vineyards: Two (2) Directors;

(b) Row crops: Two (2) Directors;

(c) Orchards or other permanent crops: One (1) Director;

(d) Cattle: One (1) Director; and

(e) Transitional land uses: One (1) Director. As used herein, the term "transitional land uses" shall refer to lands suitable for productive cultivation that, on the Effective Date of this Agreement, are not in agricultural production, fallowed, or used solely for livestock grazing.

7.1.2 One Director appointed by a majority vote of the governing board of the LACSD.

7.1.3 All Directors shall live or work full-time within the Basin or be a landowner, or be the designated representative of a landowner, within the Basin. In addition, each Director appointed by the CRCD to fill a Representation Category set forth in Section 7.1.1 shall either: (a) live or work full-time on land dedicated to and used for one of the Representation Categories; or, (b) shall be a

landowner, or a landowner's designated representative, of land dedicated to and used for the Representation Category for which the Board member is appointed.

7.2 Duties of the Board of Directors. The business and affairs of the Agency, and all of its powers, including without limitation all powers set forth in Article 5 (Powers), are reserved to and shall be exercised by and through the Board of Directors, except as may be expressly delegated to the Executive Director or others pursuant to this Agreement, Bylaws, or by specific action of the Board of Directors.

7.3 Alternate Directors. Each Member may appoint an alternate to act as a substitute Director for each of the Directors appointed by that Member ("**Alternate Director**"). Each Alternate Director shall meet the same qualifications as are required of the Director for whom the Alternate Director serves. All Alternate Directors shall be appointed in the same manner as set forth in Article 7 for Directors. Alternate Directors shall not vote or participate in any deliberations of the Board unless appearing as a substitute for a Director due to absence or conflict of interest. If a Director is not present, or if a Director has a conflict of interest which precludes participation by the Director in any decision-making process of the Board, the Alternate Director appointed to act in his/her place shall assume all rights of the Director, and shall have the authority to act in his/her absence or inability to participate, including casting votes on matters before the Board. Alternate Directors are strongly encouraged to attend all Board meetings and stay informed on current issues before the Board.

7.4 Requirements. Each Director and Alternate Director shall be appointed by a resolution adopted by a majority vote of the appointing Member's governing board. The LACSD-appointed Director and Alternate Director shall serve for a term of four (4) years, can be reappointed for multiple terms, and can be removed at any time during his or her term by a resolution adopted by a majority vote of the LACSD governing board. CRCD-appointed Directors and Alternate Directors shall serve at the pleasure of the CRCD Board of Directors without a specified term and can be removed at any time by a resolution adopted by a majority vote of the CRCD governing board. No individual Director or Alternate Director may be removed except by the governing board of the Member that appointed him/her. Directors and Alternate Directors may resign at any time upon thirty (30) days prior written notice to the governing board of the Member that appointed him or her.

7.5 Vacancies and Appointments. Upon the vacancy of a Director position, the Alternate Director shall serve as Director until a new Director is appointed as set forth in Article 7. Members shall give notice of any appointments, removals and resignations of Directors or Alternate Directors to the Executive Director or Board by providing a copy of the Member's executed resolution of appointment or removal or a copy of the Director's resignation notice.

7.6 Director Compensation. Agency Directors, and Alternate Directors shall not be entitled to compensation from SABGSA, but nothing in this Article is intended to prohibit a Member from compensating any Director or Alternate Director appointed by the Member.

ARTICLE 8
OFFICERS

8.1 Officers. Officers of the Agency shall be a Chair, Vice Chair, Secretary, and Treasurer.

Additional officers may be appointed by the Board as it deems necessary. The Treasurer shall be appointed consistent with the provisions of Article 14.4. The Vice Chair, or in the Vice Chair's absence, the Secretary, shall exercise all powers of the Chair in the Chair's absence or inability to act.

8.2 Election, Resignation and Removal of Officers. Officers shall be elected annually for one (1) year terms by a majority vote of the Board of Directors. Officers shall be elected at the first Board meeting following the Effective Date, and thereafter at the first Board meeting following January 1st of each year. An Officer may serve for multiple consecutive terms, with no term limit. Any Officer may resign at any time upon written notice to the Board, and may be removed and replaced at any time by a majority vote of the Board.

8.3 Officer Compensation. Officers shall not be entitled to compensation from SABGSA, but nothing in this Article is intended to prohibit a Member from compensating any Officer elected by the Board.

ARTICLE 9
SABGSA DIRECTOR MEETINGS

9.1 Initial Meeting. The initial meeting of the SABGSA Board of Directors shall be held in the County of Santa Barbara, California, within thirty (30) days of the Effective Date of this Agreement.

9.2 Conduct. All meetings of the Board of Directors, including special meetings, shall be noticed, held, and conducted in accordance with the Ralph M. Brown Act (Government Code sections 54950, *et seq.*) and shall be held within the jurisdiction of the SABGSA. The Board may use teleconferencing in connection with any meeting in conformance with and to the extent authorized by the Ralph M. Brown Act and any other applicable law.

9.3 Local Conflict of Interest Code. The Board of Directors shall adopt a local conflict of interest code pursuant to the provisions of the Political Reform Act of 1974 (Government Code sections 81000, *et seq.*)

ARTICLE 10
VOTING

10.1 Quorum. A quorum for any meeting of the Board of Directors shall consist of a majority of the Directors then appointed to the Board. In the absence of a quorum, any meeting of the Directors may be adjourned by any Director or Officer present, and no business may be transacted. For purposes of this Article, a Director shall be deemed present if the Director appears at the meeting in person or participates by teleconferencing, provided that the teleconferencing appearance is consistent with the requirements of the Ralph M. Brown Act.

10.2 Director Votes. Voting by the Board of Directors shall be made on the basis of one vote for each Director. A Director, or an Alternate Director when acting in the absence or inability to act of his or her Director, may vote on all matters of Agency business unless disqualified because of a conflict of interest pursuant to California law or the local conflict of interest code adopted by the Board of Directors.

10.3 Decisions of the Board of Directors. Decisions of the Agency Board of Directors shall be made as follows:

(a) Majority Approval. Except as specified in subsections (b) and (c) below, all decisions of the Board of Directors shall require the affirmative vote of a majority of all Directors then elected to the Board.

(b) Supermajority Approval. Notwithstanding the foregoing, a two-thirds (2/3) affirmative vote of all Directors then elected to the Board shall be required to approve any of the following: (i) any expenditure or estimated expenditure of $100,000 or more; (ii) the annual budget for the Agency; (iii) any stipulation to resolve litigation; (iv) establishment and levying any fee, charge or assessment; (v) groundwater extraction restrictions; (vi) the GSP for the Basin or any substantive amendment to the GSP; or (vii) adoption or amendment of the Bylaws.

(c) Unanimous Approval. Notwithstanding the foregoing, a unanimous affirmative vote of all Directors elected to the Board, not including any Director who is unable to act due to a conflict of interest, shall be required to approve issuance of indebtedness or the addition of new Members pursuant to Article 6.3 (New Members).

ARTICLE 11
EXECUTIVE DIRECTOR AND STAFF

11.1 Appointment. The Board of Directors may appoint an Executive Director, who may be, though need not be, an officer, employee, or representative of one of the Members. The Executive Director's compensation, if any, shall be determined by the Board of Directors.

11.2 Duties. If appointed, the Executive Director shall serve as the chief administrative officer of the Agency, shall serve at the pleasure of the Board of Directors, and shall be responsible to the Board for the proper and efficient administration of the Agency. The Executive Director shall have the powers designated by the Board, or otherwise as set forth in the Bylaws.

11.3 Term and Termination. The Executive Director shall serve until he/she resigns or the Board of Directors terminates his/her appointment.

11.4 Staff and Services. The Executive Director may retain such additional full-time and/or part-time employees and independent contractors as may be necessary from time to time to accomplish the purposes of the Agency, subject to the prior approval of the Board of Directors. Subject to applicable conflict of interest restrictions, the Agency may contract with a Member, another public agency, or a private entity for various services, including without limitation those related to the Agency's finances, purchasing, risk management, information technology, land and water improvement projects, and human resources. Initially, the Agency shall contract with the CRCD for the services of the Executive Director and Treasurer of the Agency, to serve at the pleasure of the Agency Board. A written agreement shall be entered into between the Agency and the other party contracting to provide such service, and that agreement shall specify the terms on which such services shall be provided, including without limitation the compensation, if any, that shall be paid for the provision of such services.

ARTICLE 12
BYLAWS

12.1 The Board of Directors shall approve and may thereafter amend, as it deems necessary, Bylaws of the Agency to govern the day-to-day operations of the Agency. The Bylaws shall be adopted on or before the first annual anniversary of the Board's first meeting.

ARTICLE 13
ADVISORY COMMITTEES

13.1 The Board of Directors from time to time may (i) establish one or more advisory committees, standing committees, or ad hoc committees to assist in carrying out the purposes and objectives of the Agency, and (ii) appoint persons to serve on such committees. At the time it establishes a committee, the Board shall determine the purpose and duration for the committee, the composition of the committee's membership, and the necessary qualifications for individuals appointed to the committee. The Board may terminate any committee in its discretion. Notwithstanding the foregoing, the Board of Directors (a) shall initially establish an advisory committee for the purpose of advising the Board in connection with the development of a Groundwater Sustainability Plan (the "**GSP Committee**"), (b) shall invite the County of Santa Barbara to designate one representative who shall serve as a member of the GSP Committee, and (c) shall not terminate the GSP Committee or the membership thereon by the representative designated by the County of Santa Barbara until such time as the GSP has been finalized. All committee meetings, including special meetings, shall be noticed, held, and conducted in accordance with the Ralph M. Brown Act (Government Code § 54950 *et seq.*).

ARTICLE 14
ACCOUNTING PRACTICES

14.1 General. The Board of Directors shall establish and maintain such funds and accounts as may be required by generally accepted public agency accounting practices. The Agency shall maintain strict accountability of all funds and a report of all receipts and disbursements of the Agency.

14.2 Records. The books and records of the Agency shall be open to inspection by the Members and by the public.

14.3 Fiscal Year. Unless the Board of Directors decides otherwise, the fiscal year for the Agency shall run from July 1st to June 30th.

14.4 Appointment of Treasurer and Auditor; Duties. Pursuant to Section 6505.5 of the Act, and as set forth in Section 11.4 above, CRCD's treasurer is hereby designated to serve as the Treasurer of the Agency. As required by Section 6505.5 of the Act, the person performing the functions of Auditor for the Agency shall also be the auditor of CRCD. The Treasurer and Auditor of the Agency shall perform the duties and responsibilities, specified in Sections 6505.5 and 6505.6 of the Act.

ARTICLE 15
BUDGET AND EXPENSES

15.1 Budget. Within sixty (60) days after the first meeting of the Board of Directors, and thereafter prior to the commencement of each fiscal year, the Board shall adopt a budget for the Agency for the ensuing fiscal year.

15.2 Management of Funds. The GSA shall maintain strict accountability of all funds and a report of all receipts and disbursement of funds.

15.3 Agency Funding and Contributions. Members may, but shall not be required to, make financial contributions to fund the expenses or ongoing operations of the Agency. For the purpose of paying the expenses and ongoing operations of the Agency, the Board of Directors shall maintain a funding account in connection with the annual budget process. The Board of Directors may fund the Agency and the GSP as provided in Chapter 8 of SGMA, commencing with Section 10730 of the Water Code.

15.4 Return of Contributions. Repayment or return to the Members of all or any part of any contributions made by Members may be directed by the Board of Directors at such time and upon such terms as the Board of Directors may decide; provided that (1) any distributions shall be made in proportion to the contributions paid by each Member to the Agency, and (2) any contribution paid by a Member voluntarily, shall be returned to the contributing Member, together with accrued interests at the annual rate published as the yield of the Local Agency Investment Fund administered by the California State Treasurer, before any other return of contributions to the Members is made. The Agency shall hold title to all funds and property acquired by the Agency during the term of this Agreement.

15.5 Issuance of Indebtedness. The Agency may issue bonds, notes or other forms of indebtedness, provided such issuance is approved by a unanimous vote of the Board of Directors as specified in Article 10 (Voting).

ARTICLE 16
LIABILITIES

16.1 Liability. In accordance with Government Code section 6507, the debts, liabilities and obligations of the Agency shall be the debts, liabilities and obligations of the Agency alone, and not of the Members or the Directors.

16.2 Indemnity. The Agency, and those persons, agencies and instrumentalities used by it to perform the functions authorized herein, whether by contract, employment or otherwise, shall be exclusively liable for any injuries, costs, claims, liabilities, damages of whatever kind arising from or related to activities of the Agency, and the Members and Directors shall have no liability for any such injuries, costs, claims, liabilities, or damages.

The Agency agrees to indemnify, defend and hold harmless (i) each Member and its governing board and the members thereof, officers, officials, representatives, agents, and employees, (ii) each Director, and (iii) each Alternate Director from and against any and all claims, suits, actions, arbitration proceedings, administrative proceedings, regulatory proceedings, losses, damages, judgments, expenses

or costs, including but not limited to attorney's fees, and/or liabilities arising out of or attributable to the Agency or this Agreement ("Claims").

Funds of the Agency may be used to defend, indemnify, and hold harmless the Agency, and each Member, each Director and each Alternate Director, and any officers, officials, agents or employees of the Agency for their actions taken within the course and scope of their duties while acting on behalf of the Agency against any such Claims

The Members do not intend hereby to be obligated either jointly or severally for the debts, liabilities, obligations or Claims of the Agency, except as may be specifically provided for in Government Code § 895.2. Provided, however, if any Member(s) of the Agency are, under such applicable law, held liable for the acts or omissions of the Agency, such parties shall be entitled to contribution from the other Members so that after said contributions each Member shall bear an equal share of such liability.

16.3 Insurance. The Agency shall procure and at all times maintain appropriate policies of insurance providing coverage to (i) the Agency and its officers, employees, and agents, (ii) each Director, and (iii) each Alternate Director for general liability, errors and omissions, property, workers compensation, and any other coverage the Board deems appropriate. Such policies shall name the Members and their respective governing boards and the members thereof, officers, officials, representatives, agents, and employees as additional insureds.

ARTICLE 17
WITHDRAWAL OF MEMBERS

17.1 Unilateral Withdrawal. A Member may, at any time and without any liability of any kind to the other Member(s), the Agency, or any other party (except as provided in Section 17.3), unilaterally withdraw from this Agreement without causing or requiring termination of this Agreement, effective upon 30 days written notice to the Board or Executive Director and all other Members.

17.2 Rescission or Termination of Agency. This Agreement may be rescinded and the Agency terminated at any time by unanimous written consent of the Members, except during the outstanding term of any Agency indebtedness.

17.3 Effect of Withdrawal or Termination. Upon termination of this Agreement or unilateral withdrawal by a Member, a Member shall remain obligated to pay its share of all liabilities and obligations of the Agency required of the Member pursuant to terms of this Agreement, and that were incurred or accrued prior to the effective date of such termination or withdrawal. A Member who withdraws from the Agency shall have no right to participate in the business and affairs of the Agency or to exercise any rights of a Member under this Agreement or the Act, but shall continue to share in distributions from the Agency on the same basis as if such Member had not withdrawn, provided that a Member that has withdrawn from the Agency shall not receive distributions in excess of the contributions made to the Agency while a Member. The right to share in distributions granted under this Section 17.3 shall be in lieu of any right the withdrawn Member may have to receive a distribution or payment of the fair value of the Member's interest in the Agency. The substitution of the Water District for the CRCD as a Member shall not constitute a withdrawal by the CRCD and the Water District shall

stand in the CRCD's place and stead with regard to any distribution, reimbursement, or payment that may be payable to the CRCD under this Agreement.

17.4 Return of Contribution. Upon rescission of this Agreement and termination of the Agency, any surplus money on-hand shall be returned to the Members in proportion to their monetary contributions made. The Board of Directors shall first offer any property, works, rights and interests of the Agency for sale to the Members on terms and conditions determined by the Board of Directors. If no such sale to Members is consummated, the Board of Directors shall offer the property, works, rights, and interests of the Agency for sale to any non-Member for good and adequate consideration. The net proceeds from any sale shall be distributed among the Members in proportion to their contributions made.

ARTICLE 18
MISCELLANEOUS PROVISIONS

18.1 No Predetermination or Irretrievable Commitment of Resources. Nothing herein shall constitute a determination by the Agency or any of its Members that any action shall be undertaken, or that any unconditional or irretrievable commitment of resources shall be made, until such time as the required compliance with all applicable local, state, and federal laws.

18.2 Notices. Notices to a Member hereunder shall be in writing and shall be sufficient if delivered to the Member's executive director, or to the clerk or secretary of the Member's governing board and addressed to the Member at the address noted below or at such other address or to such other person that the Member may designate in accordance with this Article. Delivery may be accomplished by (i) personal delivery, (ii) with postage prepaid by first class mail, registered or certified mail or express courier, or (iii) email transmission.

To CRCD:	To LACSD:
Cachuma Resource Conservation District Attn: Executive Director 920 E Stowell Road Santa Maria, CA 93454 Email: ExecutiveDirector@rcdsantabarbara.org	Los Alamos Community Services District Attn: Board Secretary 82 North Saint Joseph Street P.O. Box 675 Los Alamos, CA 93440 Email: Candyce@dock.net

18.3 Amendments to Agreement. This Agreement may be amended or modified at any time only by subsequent written agreement approved and executed by all of the Members, except that in no event shall this Agreement be amended to delete or abridge the rights of a future Water District described in Section 6.2.

18.4 Capitalization. Capitalized defined terms used in this Agreement shall have the meanings given to them in Article 2 of this Agreement.

18.5 Agreement Complete. The foregoing constitutes the full and complete Agreement of the Members. This Agreement supersedes all prior agreements and understandings, whether in writing or

oral, related to the subject matter of this Agreement that are not set forth in writing herein.

18.6 Severability. Should any part, term or provision of this Agreement be decided by a court of competent jurisdiction to be illegal or in conflict with any applicable federal law or any law of the State of California, or otherwise be rendered unenforceable or ineffectual, the validity of the remaining parts, terms, or provisions hereof shall not be affected thereby, provided however, that if the remaining parts, terms, or provisions do not comply with the Act, this Agreement shall terminate.

18.7 Withdrawal by Operation of Law. Should the participation of any Member to this Agreement be decided by the courts to be illegal or in excess of that Member's authority or in conflict with any law, the validity of the Agreement as to the remaining Members shall not be affected thereby.

18.8 Assignment. The rights and duties of the Members may not be assigned or delegated without the written consent of all other Members. Any attempt to assign or delegate such rights or duties in contravention of this Agreement shall be null and void. The substitution of the Water District as a new Member shall not constitute an assignment or delegation of rights in violation of this provision.

18.9 Binding on Successors. This Agreement shall inure to the benefit of, and be binding upon, the successors and assigns, in accordance with Section 18.8, of the Members.

18.10 Dispute Resolution. In the event that any dispute arises between the Members relating to this Agreement, the Members shall attempt in good faith to resolve the dispute through informal means. If the Members cannot agree upon a resolution of the dispute, the dispute may be submitted to mediation prior to commencement of any legal action, if agreed to by all Members. Time is of the essence in resolving any dispute between the Members because the business of the Agency in formulating and submitting to the State a GSP is urgent and subject to statutory deadlines. Therefore, any mediation of a dispute shall be conducted no later than thirty (30) days after a member provides notice of a request for mediation and shall consume no more than a full day unless otherwise agreed by both Members. The cost of mediation shall be paid in equal shares by the Members.

18.11 Counterparts. This Agreement may be executed in counterparts, each of which shall be deemed an original and together shall constitute one and the same instrument.

18.12 Singular Includes Plural. Whenever used in this Agreement, the singular form of any term includes the plural form and the plural form includes the singular form.

18.13 Member Authorization. The legislative bodies of the Members have each authorized execution of this Agreement, and all signatories to this Agreement warrant and represent that they have the power and authority to enter into this Agreement in the names, titles and capacities stated herein and on behalf of the Members.

18.14 Third Party Beneficiaries. Except as expressly set forth in Section 6.2 whereby landowners within the Basin are third party beneficiaries insofar as formation and substitution of a water district is concerned, this Agreement is not intended to benefit any person or entity not a party hereto.

18.15 Waivers. No waiver of any breach of any provision herein and no delay in enforcing performance of any obligation hereunder shall be deemed a waiver of any preceding or succeeding

breach, or of any other provision herein, and no such waiver or delay shall impair any right, power or remedy relating to the breach. No extension of time for performance of any obligation or act shall be deemed an extension of the time for performance of any other obligation or act.

18.16 Professional Fees. In the event of any action or suit arising in connection with the enforcement or interpretation of any of the covenants or provisions of this Agreement, the prevailing party shall be entitled to recover all costs and expenses of the action or suit, including actual attorneys' fees.

18.17 Email Transmission. If executed copies of this Agreement, or if any notices or other written communications permitted or required hereunder, are provided by one party to the other(s) by email transmission, the email copies and the signatures thereon shall for all purposes be treated as originals.

18.18 Further Assurances. The parties agree to take such actions and execute such documents as may be reasonably required to carry out the intent of this Agreement.

IN WITNESS WHEREOF, the Members hereto have executed this Agreement by authorized officials thereof to be effective on the date executed by the last Member as noted on Page 1.

CACHUMA RESOURCE CONSERVATION DISTRICT

By: _____
Richard Russell, President

APPROVED AS TO FORM:

By: _____
Susan F. Petrovich, Counsel

LOS ALAMOS COMMUNITY SERVICES DISTRICT

By: _____
Larry A. Torres, President

APPROVED AS TO FORM:

By: _____
Richard G. Battles, Counsel

BYLAWS OF THE
SAN ANTONIO BASIN GROUNDWATER SUSTAINABILITY AGENCY

Adopted June 14, 2017

ARTICLE 1
NAME

The name of this joint powers authority shall be the San Antonio Basin Groundwater Sustainability Agency (hereinafter called the "Agency").

ARTICLE 2
DEFINITIONS AND CONSTRUCTION

Unless specifically defined in these Bylaws, all defined terms shall have the same meaning as that ascribed to them in the Joint Exercise of Powers Agreement by and between Cachuma Resource Conservation District and Los Alamos Community Services District creating the San Antonio Basin Groundwater Sustainability Agency, executed May 16, 2017 and as subsequently amended (hereinafter called the "JPA Agreement"). If any of the terms within these Bylaws conflict with any term of the JPA Agreement, the JPA Agreement's terms shall prevail, and these Bylaws shall be amended accordingly to conform.

ARTICLE 3
GOVERNING AUTHORITY

The JPA Agreement shall govern the Agency's day-to-day operations in accordance with applicable law.

ARTICLE 4
PRINCIPAL OFFICE

The Agency's principal office shall be established by the Board of Directors, and may thereafter be changed by a majority vote of the Board.

ARTICLE 5
DIRECTORS

The powers and composition of the Board of Directors and the filling of vacancies and removal of the members of the Board of Directors (herein called "Directors") shall be as stated in the JPA Agreement.

ARTICLE 6
OFFICERS

6.1 Duties of the Chair. The Chair shall preside at all meetings of the Board and execute contracts, correspondence, conveyances, and other written instruments as authorized by the Board.

6.2 Duties of the Vice-Chair. The Vice-Chair shall, in the absence of the Chair, assume the duties of the Chair and perform such reasonable duties as may be required by the Board or the Chair of the Board.

6.3 Duties of the Secretary. The Secretary shall be responsible for maintaining Board meeting minutes and other records that may from time to time be required by the Board's activities, and shall perform such reasonable duties as may be required by the Board or Chair of the Board. The Secretary may delegate the actual performance of the tasks necessary to fulfill these duties.

6.4 Duties of the Treasurer. The Treasurer shall keep or maintain, or cause to be kept or maintained, adequate and correct books and accounts of the properties and transactions of the Agency, and shall send or cause to be sent to the Directors such financial statements and reports as are required by law or these Bylaws to be given. The books of account shall be open to inspection by any Director at all reasonable times. The Treasurer shall deposit or shall have caused to be deposited all money and other valuables in the name and to the credit of the Agency with such depositories as may be designated by the Board, shall disburse the funds of the Agency as may be ordered by the Board, shall render to the Chair of the Board, when requested, an account of all transactions as Treasurer and of the financial condition of the Agency and shall have other powers and perform such other duties as may be prescribed by the Board or the Bylaws.

ARTICLE 7
MEETINGS

7.1 Conduct of Meetings. Except as otherwise provided in these Bylaws or in rules and regulations adopted by the Directors, all meetings of the Directors shall be conducted pursuant to Robert's Rules of Order.

7.2 Regular Meetings. The Board will establish a regular meeting date and time, which shall be not less than once each month, and shall establish a regular place for holding such meetings within the Agency's boundaries as defined in the JPA Agreement. Any committee established pursuant to the JPA Agreement shall meet as frequently as is necessary to fulfill the committee's duties.

7.3 Special Meetings. Special meetings may be called by the Board Chair at any time for a specific, announced purpose and in compliance with the Ralph M. Brown Act. At the request of any three Directors, the Board Chair shall call such a special meeting. Written notice of a special meeting shall be delivered to all Board members at least 48 hours in advance of any meeting. Attendance at a special meeting by any Director amounts to a waiver of any defect in the giving of notice to such Director, unless at the meeting the Director specifically objects to the holding of the meeting on the grounds of such defect.

7.4 Voting. Voting on all motions and resolutions of the Board of Directors shall be by voice vote, calling for ayes, noes, and abstentions, except that the vote shall be by roll call if (1) any member of the Board or the Secretary requests a roll call vote, either before or after the voice vote is taken, or (2) a roll call vote is required by law.

7.5 Public Comment

(a) The Chair shall provide an opportunity for members of the public to address the Directors on any agenda item of interest to the public, before or during the Directors' consideration of the item. The Chair may limit the time allowed for each person to speak. Public participation need not be allowed on discussions of procedural issues, such as continuances, the order in which agenda items will be considered, and the like, and public participation need not be allowed on items that are presented by Staff to the Directors for information only.

(b) The agenda for each regular meeting will include a regular time near the beginning of the agenda to receive public comment on items that are within the jurisdiction of the Directors and are not otherwise on the agenda for the meeting. The Directors are not required to respond to any issues raised during the public comment period, and may not take any action on such issues other than to refer the item to staff or schedule action for a future agenda.

7.6 Continuance and Adjournment. The Directors may continue any item to another meeting specified in the order of continuance, may adjourn any meeting without specifying a new meeting date, and may adjourn any meeting to a time and place specified in the order of adjournment. Less than a quorum may so continue an item or adjourn a meeting. If all Directors are absent from any meeting, the Executive Director may so adjourn the meeting, and shall provide notice of any new meeting date and time as required by law.

ARTICLE 8
LIABILITIES

8.1 Liability. In accordance with Government Code section 6507, the debts, liabilities and obligations of the Agency shall be the debts, liabilities and obligations of the Agency alone, and not of the Cachuma Resource Conservation District and Los Alamos Community Services District (collectively, herein called "Members") or the Directors.

8.2 Indemnity. The Agency, and those persons, agencies and instrumentalities used by it to perform the functions authorized herein, whether by contract, employment or otherwise, shall be exclusively liable for any injuries, costs, claims, liabilities, damages of whatever kind arising from or related to activities of the Agency, and the Members and Directors shall have no liability for any such injuries, costs, claims, liabilities, or damages.

The Agency agrees to indemnify, defend and hold harmless (i) each Member and its governing board and the members thereof, officers, officials, representatives, agents, and employees, (ii) each Director, and (iii) each Alternate Director from and against any and all claims, suits, actions, arbitration proceedings, administrative proceedings, regulatory proceedings, losses, damages, judgments, expenses or costs, including but not limited to attorney's fees, and/or liabilities arising out of or attributable to the Agency or this Agreement ("Claims").

Funds of the Agency may be used to defend, indemnify, and hold harmless the Agency, and each Member, each Director and each Alternate Director, and any officers, officials, agents or employees of the Agency for their actions taken within the course and scope of their duties while acting on behalf of the Agency against any such Claims.

8.3 The Members do not intend hereby to be obligated either jointly or severally for the debts, liabilities, obligations or Claims of the Agency, except as may be specifically provided for in Government Code § 895.2. Provided, however, if any Member(s) of the Agency are, under such applicable law, held liable for the acts or omissions of the Agency, such parties shall be entitled to contribution from the other Members so that after said contributions each Member shall bear an equal share of such liability.

8.4 Insurance. The Agency shall procure and at all times maintain appropriate policies of insurance providing coverage to (i) the Agency and its officers, employees, and agents, (ii) each Director, and (iii) each Alternate Director for general liability, errors and omissions, property, workers compensation, and any other coverage the Board deems appropriate. Such policies shall name the Members and their respective governing boards and the members thereof, officers, officials, representatives, agents, and employees as additional insureds.

ARTICLE 9
AMENDMENT

These Bylaws may be amended from time to time by a two-thirds affirmative vote of Directors then appointed, pursuant to the JPA Agreement.

APPENDIX B

Responses to Public Comments on the Draft GSP

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San Antonio Creek Basin GSP Comments and Responses

Reviewer	Section Number	Page Number	Figure Number	Table Number	Comment	Response
SABWD	ES-2.6				In section ES-2.6, reference is made to both “basin yield” and “sustainable yield”, but in neither case is there an explanation as to how those concepts relate to the Water Budget discussion. The discussion of sustainable yield is appropriate insofar as the Sustainable Groundwater Management Act (SGMA) and its implementing regulations provide that sustainable yield is a component of the Water Budget analysis; however, ES-2.6 lacks that foundational background. We suggest that be corrected. As for basin yield, the definition in E-2.6 appears to resemble the legal definition of “safe yield”, and whether that is or is not the intent, we think the reference is lacking context and is not necessary to a discussion of the water budget. If anything it risks causing confusion and we suggest that it be removed. Finally, nowhere in the GSP does there appear to be a summary paragraph or chart that summarizes the Water Budget totals. We think it would be helpful to the reader if the GSP included a summary discussion of what the GSP has determined the Basin’s Water Budget to be.	See revised text and water budget summary table in Sections ES-2.6 through 2.7.
SAB BOD					Add statement to ES and elsewhere in the PMA section that diminimus users will not be affected, have to have a meter, or pay an extraction fee.	See footnote added to Section ES-5.
Steven Slack	GSP Section 3 - 3.2 Groundwater Conditions	86			DATA GAPS per 3.2: Figure 3-45 also shows the locations of active and inactive stream gages along San Antonio Creek and its tributaries. Stream gage 11135800 is active and is located along San Antonio Creek near Los Alamos. Stream gage 11136040 is inactive and is located along Harris Canyon Creek upgradient of the confluence with San Antonio Creek. Stream gage 11136100 is active and is located west of the Basin along San Antonio Creek. Due to the placement of the gages, the recorded flow data cannot be used to accurately quantify stream gains or losses. However, seasonal flow data shown in Figure 3-45 are consistent with the stream classifications in Figure 3-44. CDFW RESPONSE: CDFW hopes that additional stream gages and groundwater wells will be installed to address these data gaps and that more information can be found between groundwater and surface water interaction.	Your comments were considered during development of the Groundwater Monitoring Network and Projects and Management Actions sections of the GSP. Additional stream gage data have been identified from stream gages 11136000 (San Antonio Creek at Harris Canyon) and 11136050 (San Antonio Creek above Barka Slough). However, the period of record for these gages is 1941-1955 and 1984-1987, respectively. Thus, they have had limited value in development of the GSP. We agree that the additional proposed stream gages will substantially improve our understanding of the Barka Slough water budget. Projects including construction of additional stream gages and shallow piezometers are included in Section 6.
Steven Slack	GSP Section 3 - 3.2 Groundwater Conditions	89			It was noted on Page 89 that only federally listed species were included in the Biological Assessment. Please do not forget the California State Listed Species. Some of these include: tricolored blackbird, western spadefoot, California tiger salamander and southern vernal pool as a natural community. This is not an inclusive list by any means. More can be found on our website at: https://wildlife.ca.gov/data/BIOS California National Diversity Database (CNDDB). CNDDB inventories narrative and geospatial information on the status and locations of rare plants and animals in California. The CNDDB spatial data can be downloaded as a shapefile or accessed via the Biogeographic Information and Observation System (BIOS) Data Viewer, a system designed to enable the management, visualization, and analysis of biogeographic data. This tool may inform GDE and ISW identification and prioritization for monitoring and protection. Note, CNDDB may not cover all GDEs and ISW, and as a positive detection database, it is not a replacement for on-the-ground surveys. Geographic areas with limited information on CNDDB often signify an absence of survey work. It is therefore inappropriate to imply that rare and endangered plants and animals do not occur in an area due to lack of information in the CNDDB.	Thank you for identifying the omission of California State Listed Species from Section 3.2.6 of the GSP. As referenced in Section 3.2.6, the biological assessment completed by AECOM in 2019 identifies and discusses potential impacts that the proposed Vandenberg Golf Course Project could have on federally listed species. Included in the AECOM, 2019 report, but omitted from the subject document, is a discussion of natural communities, wetlands, and aquatic features identified during the assessment. The discussion includes federal and state listed species associated with the respective community. GSI will revise the text in Section 3.2.6 to include a discussion of state listed species. Thank you for providing the CNDDB reference information. The reference has been incorporated into Section 3.2.6.

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Steven Slack	GSP Section 3 - 3.2 Groundwater Conditions	88			As trustee for the State's fish and wildlife resources, the California Department of Fish and Wildlife (CDFW) has jurisdiction over the conservation, protection, and management of fish, wildlife, native plants, and the habitat necessary for biologically sustainable populations of such species. [FGC §1802 and 711.7(a).] CDFW has an interest in the sustainable management of groundwater, as many sensitive ecosystems and public trust resources depend on groundwater and interconnected surface waters. Accordingly, CDFW encourages thoughtful groundwater planning that carefully considers fish and wildlife and the habitats on which they depend. CDFW created a groundwater planning considerations document focused on impacts to groundwater dependent ecosystems (GDEs) and interconnected surface waters (ISW) which can be found here: CDFW Groundwater Planning Considerations Attachments Can Be Found at Both These Links and Provide numerous tools: https://wildlife.ca.gov/Conservation/Watersheds/Groundwater https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=170185&inlineMonitoring Systems Effective monitoring methods and systems can aid in understanding groundwater management impacts to GDEs and ISW and informing subsequent action. Groundwater planners are encouraged to design robust monitoring systems with meaningful methods for tracking GDE and ISW conditions over time that account for the following monitoring considerations: 1. An effective monitoring system to evaluate impacts to GDEs and ISW depletions will ideally provide data that is representative of groundwater dependent habitat throughout the alluvial basin and will be designed to capture geospatial and temporal variability at a scale meaningful to fish and wildlife beneficial uses and users of groundwater and ISW. GSAs should consider frequency of measurements and observation point density to ensure measurements capture seasonal and operational variability. Monitoring methods should follow accepted technical procedures established by the USGS (or equivalently robust methods) and reference DWR's best management practices. 2. An effective monitoring system to evaluate impacts to GDEs and ISW depletions will be designed to capture early signs of adverse impacts, so that adaptive management can initiate to avoid undesirable results. Early signs of adverse impacts may manifest as stressed phreatophyte vegetation, increased instream temperature, etc. 3. **Meaningful Baselines**: Where historical baseline information on GDEs and ISW is absent, prompt groundwater information collection is critical to understanding the relationship between climatic variations/water year type and groundwater demand/availability. Monitoring systems can help inform baselines that reflect hydrologic variability and that can be used to measure the impact of management actions on groundwater resources. **Interconnectivity Efficacy**: An effective monitoring system to evaluate impacts to GDEs and ISW depletions will be able to identify and help characterize groundwater-surface water interaction by using appropriate methods including but not limited to paired groundwater and streamflow monitoring; seepage measurements; nested piezometers; geo-chemical and physical property monitoring; and application of monitoring data to water budget calculations, analytical modeling, and numerical modeling. **Monitoring Characteristics**: A groundwater plan may consider tracking a range of GDE and ISW characteristics to determine groundwater management impacts over time. These characteristics include but are not limited to: geospatial and temporal habitat	We agree that effective monitoring systems and protocols like those proposed by CDFW will provide critical information concerning basin conditions and effects of climate, effects of groundwater pumping, and potential for impacts to GDEs. This comment was received prior to the development of the Monitoring Networks and Implementation Sections of this GSP. Additionally, these Sections and the remaining GSP have undergone significant revision since this submittal of this comment. Many of the concepts and online tools recommended by CDFW have been incorporated into the GSP, including Sections 5 and 7.

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					coverage; changes in groundwater interconnectivity status; habitat connectivity, heterogeneity, or density; habitat health (e.g., application of biological indices, remote sensing/aerial imagery); and species/vegetation presence (e.g., biological surveys). **Scalability:** An effective monitoring system will be designed to improve information gaps over time as resources become available; groundwater plans may choose to identify prioritized monitoring locations and systems that can be implemented in phases based on resource availability.	
Steven Slack	GSP Section 3 - 3.2 Groundwater Conditions	89			3.2.5 Interconnected Surface Water Systems (ISW's) Thank you for looking into ISW's. My comment is related to your admission of data gaps where you indicate: "Definitive data delineating any connections between surface water and groundwater or a lack of interconnected surface waters is a data gap that will be addressed during implementation of this GSP" California Department of Fish and Wildlife (CDFW) Asks the Following Questions Pertaining to: INTERCONNECTED SURFACE WATERS (ISW) 1. How will groundwater plans document the timing, quantity, and location of ISW depletions attributable to groundwater extraction and determine whether these depletions will impact fish and wildlife? 2. How will GSAs determine if fish and wildlife are being adversely impacted by groundwater management impacts on ISW? 3. If adverse impacts to ISW-dependent fish and wildlife are observed, how will GSAs facilitate appropriate and timely monitoring and management response actions? CDFW 's Stance on Data Gaps: MANAGEMENT CONSIDERATIONS CDFW encourages groundwater planners to detail how management actions will consider fish and wildlife beneficial uses and users of groundwater and what management actions will be initiated on what timeline if adverse impacts to fish and wildlife beneficial uses and users of groundwater, GDEs, or ISW are observed. The following are considerations to inform responsive management. Multi-Benefit Approach Groundwater planners are encouraged to design project and management actions for multiple-benefit solutions, including habitat improvements. Evaluation of supply augmentation management actions (e.g., managed aquifer recharge) and demand reduction management actions (e.g., limitations on groundwater extraction) may include a quantification of impacts on GDEs and ISW to justify actions that serve multiple beneficial uses and users of groundwater. Planners may also consider marginal cost increases in project and management actions to optimize habitat outcomes, thereby broadening funding opportunities, such as recharge projects that contribute both to aquifers as well as instream flow. Management Considerations: "Data Gaps and Conservative Decision-Making Under Uncertain Conditions" Adaptive Management "Prioritized Resource Allocation" Multi-Benefit Approach	This comment was received prior to the development of the Monitoring Networks and Projects and Management Actions Sections of this GSP. Additionally, these sections and remaining GSP have undergone significant revision since this submittal of this comment. Many of the concepts and online tools recommended by CDFW have been incorporated into the GSP, including Section 5 and 6.

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Matthew Scrudato	GSP Section 3 - 3.1 Hydrogeologic Conceptual Model	1			3.1.1.2 Reference USGS infiltration data collected for the study and how it correlates to dataset ? Not sure if that data are available for reference yet. 3.1.1.3 Why are these three tributaries explicitly referenced in this paragraph and no other intermittent tribs located throughout the basin? Figure 3-3 Harris not labeled Figure 3.5 illustrates the three members of the Paso Formation. Possibly elaborate on the distinction between these members. 3.1.3 Possibly reference (somewhere in section) CalPoly study within Canada De Las Flores (north central) finding potential of subsurface folds separating sub-basins. 3.1.3.1.2 Previous paragraph provided a general description of well yields and specific capacities for Paso. Any general info to provide for Careaga? 3.1.3.1.3 (B) Hydraulic conductivity and restorativity not addressed. 3.1.3.1.4 Artesian conditions also referenced in CalPoly report as potential result of subsurface folding. 3.1.3.1.5 There's pump test data for all wells located on 4-Deer. Wouldn't Katherman have a lot of information to share, or we limiting sources to gov't agencies? Nothing new at VAFB? Suppose I'm surprised our available data is so limited in regard to aquifer properties. Figure 3-10 Aren't there springs and seeps on 4-Deer and Schaff properties? Figure 3-24 would be nice to have well depth available on these graphs if possible 3.2.3.2 (last paragraph) Also appears to be the case for SACC nest for TDS 3.2.3.4.1 (last paragraph) Possible elaboration needed here and for each constituent? Where along creek were samples collected and at what discharge? 3.2.3.4.3 Should there be a more detailed summary for TDS and Chloride (similar to this paragraph for Nitrate) as to what natural and human activities affect the concentration? PAGE 86 (last paragraph) Want to also mention 11136500 and 11136000? Short POY.	3.1.1.2 The USGS infiltration data provided by USGS was delivered as raw data. GSI requested hydraulic properties from the USGS deduced from the infiltration data. The USGS was not prepared to release the analyzed data prior to finalization of the model. GSI did not complete an internal analysis of the raw USGS infiltration data, but will review the USGS model and revise the GSP during plan updates. 3.1.1.3 The listed streams were those named in the USGS NHD. GSI will attempt to modify the text to include an exhaustive list of tributaries to San Antonio Creek. Figure 3-3 GSI will update Figure 3-3 by labeling additional tributaries to San Antonio Creek; at a minimum Harris Canyon Creek. Figure 3.5 Figure 3.5 was modified from a figure provided by the USGS. The USGS divided the Paso Robles formation into three members during development of the preliminary geohydrologic framework model and stated these are not official geologic units. GSI requested further explanation regarding the differentiation of the three units and provided an explanation in Section 3.1.2.2 when referring to Figure 3.5. 3.1.3 The CalPoly study, Carlson, 2019, supports the syncline structure (Los Alamos Syncline) of the Basin and indicates confining layers within the Paso Robles formation are the potential cause of local artesian conditions within Canada De Las Flores. A description of local artesian conditions observed in wells completed in the Paso Robles formation with reference to Carlson, 2019 is included in Section 3.1.3. 3.1.3.1.2 GSI did not identify hydraulic properties for the Careaga Sand formation such as well yields and specific capacities as mentioned in Section 3.1.3.1 for the Paso Robles formation. However, a transmissivity from a pump test completed on a VAFB well located near Barka Slough (Hutchinson, 1980) was identified and is mentioned in Section 3.1.3.1.5. GSI requested pump test data from VAFB, however this information has not yet been made available. Prior to release of the Administrative Draft, pump test data was made available for select wells in the VAFB well field located near Barka Slough and screened in the Careaga Sand. The wells have been added to Table 3-1 and associated text. Pump test data from "4-Deer" wells have been added as well. 3.1.3.1.3 (B) Discussion of principal aquifer hydraulic conductivity and storage coefficients are discussed in Section 3.1.3.1. 3.1.3.1.4 The CalPoly study, Carlson, 2019, supports the syncline structure (Los Alamos Syncline) of the Basin and indicates confining layers within the Paso Robles formation are the potential cause of local artesian conditions within Canada De Las Flores. A description of local artesian conditions observed in wells completed in the Paso Robles formation with reference to Carlson, 2019 is included in Section 3.1.3.

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						3.1.3.1.5 Prior to release of the Administrative Draft, pump test data was made available for select wells in the VAFB well field located near Barka Slough and screened in the Careaga Sand. The wells have been added to Table 3-1 and associated text. Pump test data from "4-Deer" wells have been added as well. Figure 3-10 The locations of springs and seeps identified in the Basin are from the USGS NHD. Additional springs and seeps were added to Figure 3-9 based on landowner observations. Figure 3-24 The hydrographs were revised. 3.2.3.2 (last paragraph) The text in the last paragraph of Section 3.2.3.2 was revised to include the SACC nested wells. 3.2.3.4.1 (last paragraph) The text regarding constituent concentrations in surface water samples for each constituent was modified to include a description of the location of where the sample(s) were collected. 3.2.3.4.3 The text in Section 3.2.3.4 for TDS and Chloride was modified to include a description of what human activities potentially affect the concentration of each constituent. PAGE 86 (last paragraph) The text in Section 3.2.5 was modified to include a discussion of historical stream gages 1136000 and 11136050.
Chris Wrather	GSP Section 3.1 - 3.2 Hydrogeologic Conceptual Model				Comments were received as an electronic letter, dated October 31, 2020.	These comments were received regarding an earlier draft of Section 3. Section 3 and the remaining GSP have undergone significant revision since this submittal of these comments. Response to comments is included as an attachment to this document.
Bryan Bondy	GSP Section 3.1 - 3.2 Hydrogeologic Conceptual Model				Comments were received as an electronic memorandum, dated March 19, 2021.	These comments were received regarding an earlier draft of Section 3. Section 3 and the remaining GSP have undergone significant revision since this submittal of these comments. Response to comments is included as an attachment to this document.

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CDFW	3.2.6				Comment #1 – GDEs based on the 30-foot Depth Groundwater Criterion in Section 3.2.6 of the Draft GSP Issue: A 30-foot depth to groundwater criterion was applied to identify potential GDEs (Section 3.2.6.1). According to Figure 3-55 of the Draft GSP, the groundwater depth is greater than 30 feet throughout the Basin, except in certain areas within Barker Slough. San Antonio Creek within the entire Basin consists of a riparian corridor, despite seasonal surface flows, and despite the Creek being referenced as an area with a depth to groundwater greater than 30 feet. After applying the 30-foot criterion, CDFW is concerned that GDEs along San Antonio Creek and throughout the Basin were eliminated from being considered as potential GDEs. Recommendation #1(a): CDFW recommends SABGSA clarify whether GDEs located where groundwater depth is greater than 30 feet below the surface, were eliminated as GDEs. If so, CDFW recommends the SABGSA identify these areas, and retain these areas as potential GDEs in the final GSP until future monitoring data can eliminate them as GDEs. Recommendation #1(b): CDFW recommends SABGSA utilize The Nature Conservancy's (TNC) GDE Pulse web-map to view vegetation that have been identified as potential GDEs, with data that identifies long term temporal trends of vegetation metrics (TNC 2021). Recommendation #1(c): CDFW recommends SABGSA utilize U.S. Fish and Wildlife Service's (USFWS)'s National Wetlands Inventory (2021) to identify potential GDEs such as riverine habitat, freshwater forested/shrub wetland, and freshwater emergent wetland.	Thank you for the additional data sources. Published TNC guidance literature was used for identifying GDEs within the Basin and is described in Section 3.2.6. GSI also used publicly available online data sources such as the Natural Communities Commonly Associated with Groundwater (NCCAG) dataset which references data from the national wetland inventory. Potential GDEs were first identified using the NCCAG data set. Water level contour maps were prepared using spring 2015 groundwater level data for the Paso Robles Formation (unit underlying San Antonio Creek). Groundwater elevations were compared with creek bed elevations to identify areas where high groundwater levels were at or above 30 feet below ground surface. Figure 3-55 shows these locations. The projects and management actions section of the GSP (Section 6) includes a plan to conduct additional evaluation of GDEs in the basin as recommended by CDFW. The hydrogeological conceptual model and groundwater conditions will be updated as new data become available at a minimum of once every 5-years during the GSP interim review periods.
CDFW					Comment #2 – Unarmored Threespine Stickleback (UTS) Habitat Issue: The maps and figures in the Draft GSP do not show open water habitat that support special-status species such as UTS, a federal Endangered Species Act (ESA) listed and California Endangered Species Act (CESA) listed species, that is also listed as a Fully Protected Species in California. Accordingly, it is unclear if open water habitat was mapped. According to the California Natural Diversity Database (CNDDB; CDFW 2021), San Antonio Creek has known occurrences of UTS within Barka Slough and upstream in Los Alamos. San Antonio Creek through Barka Slough is also considered a Southern California Threespine Stickleback Stream where there are small stands of cattails, overhanging willows in riparian areas that support native fish populations of UTS (Gasterosteus aculeatus williamsoni), prickly sculpin (Cottus asper), ESA-listed Tidewater goby (Eucyclogobius newberryi), and arroyo chub (Gila orcuttii), a California Species of Special Concern (SSC) (CNDDB; CDFW 2021). Recommendation #2: CDFW recommends SABGSA map and document open water habitat in addition to GDEs in the final GSP.	Documented plant and animal species were identified using published literature associated with known GDEs within the Basin (see Section 3.2.6). Publications will continue to be reviewed as they become available or identified and the GSP will be revised appropriately. Thank you for the citations. The CNDDR and USFWS 2021 references will be considered as GDEs are further evaluated during GSP implementation (refer to Sections 3.2.6 and 7). Per SGMA, the GSP must only account for areas of interconnected surface water and associated GDEs. No areas of interconnected surface water were identified along San Antonio Creek (with the exception of Barka Slough) that met both elements of the definition supplied in SGMA in that: "the 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." UTS are identified as a species of concern in Section 3.2.6. Open water habitat was not mapped because the only perennial open water is located within Barka Slough, a mapped GDE area.
CDFW					Comment #3 – Minimum Thresholds for Surface Water Depletion Issue #3.1: CDFW has concerns with the Draft GSP's proposed interim minimum threshold, "0.15 cfs of surface water flow measured at the Casmalia stream gage west of the Slough. This threshold was selected based on the analysis of historical base flow at the Casmalia stream gage presented on Figure 4-2" (Pg. 4-54). The SABGSA has not provided enough information to confirm that low flow measurements below 0.50 cfs can be accurately measured at the Casmalia stream gage.	Review of historical measurements recorded at the Casmalia stream gage and rating curve, generated by the USGS for the Casmalia stream gage (available using the USGS' WaterWatch Toolkit Rating Curve Builder at https://waterwatch.usgs.gov/?m=mkrc), indicate a measurement precision of less than 0.15 cfs. A qualitative evaluation of accuracy of discharge measurements includes consideration of a number of factors, such as: measuring section, velocity conditions, equipment, spacing of observation verticals, rapidly changing stage, and wind. Discharge measurements are assigned ratings from excellent (2 percent) to poor (greater than 8 percent) based on the above

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					Additionally, 0.15 cfs is considerably low for native fish species, including for UTS. Based on the information provided in the Draft GSP, CDFW is not able to determine if the minimum threshold is sufficient to ensure avoidance of significant and unreasonable adverse impacts (undesirable results) to UTS. Hydrologic connectivity should be maintained to provide suitable habitat for UTS. Recommendation #3.1(a): CDFW recommends SABGSA establish the minimum thresholds at 0.50 cfs at the Casmalia gage instead of 0.15 cfs, to consider impacts to UTS, which are particularly sensitive to additional water reductions due to groundwater pumping, and other stressors which can increase with lower surface water levels, such as water quality, temperature, and turbidity. Recommendation #3.1(b): CDFW recommends SABGSA establish a measurable surface water flow trigger of 0.75 cfs to begin the implementation of management actions and priority projects to avoid significant and unreasonable impacts to UTS. A reasonable timetable is also needed to ensure projects are ready to be implemented to avoid surface water flows reaching CDFW's proposed minimum threshold of 0.5 cfs. Issue #3.2: CDFW expressed concerned in Comment #1 of GDEs along San Antonio Creek and throughout the Basin that were eliminated as potential GDEs. The USGS currently measures streamflow at three locations along San Antonio Creek; one upstream of the town of Los Alamos (Los Alamos gage # 11135800), one where San Antonio Creek leaves the basin (Casmalia gage #11136100), and one on a tributary to San Antonio Creek (Harris Canyon Creek gage #11136040) (USGS 2021). The Draft GSP only establishes minimum thresholds at the Casmalia gage. Recommendation #3.2(a): CDFW appreciates SABGSA's efforts to utilize the Casmalia gage, however, CDFW recommends SABGSA incorporate the Harris Canyon and Los Alamos gages into SABGSA's monitoring efforts to supplement SABGSA's ability to assess impacts to interconnected surface waters and GDES within the Basin. Recommendation #3.2(b): CDFW recommends minimum thresholds also be established for gage #1135900 and #11136040. This will ensure avoidance of impacts to any additional GDEs within the Basin, identified as a result of Recommendation #1(a).	items (USGS, 2010). The baseflow analysis reviewed data from 2015-2021. Per SGMA the GSA is not responsible for restoring conditions prior to enactment of SGMA (January 2015). No significant and unreasonable results have been observed in the Basin pertaining to all sustainable management criteria (SMCs) to date. Basin stakeholders have acknowledged the need to stabilize groundwater levels and change of groundwater in storage and have developed projects and management actions (discussed in Section 6) as such. Due to the lack of observed significant and unreasonable results and evaluation of multiple MT scenarios, MTs have been set below current conditions for most of the SMCs. A measured flow of 0.5 cfs at the Casmalia stream gage was calculated as the geometric mean since 2015 (enactment of SGMA). A measured flow of 0.15 cfs at the Casmalia stream gage is representative of potential baseflow conditions since 2015. Flow leaving the Slough indicates that there is still water in the slough to support GDEs. The MT of 0.15 cfs is not intended to be reached, but rather avoided. Nonetheless, per SGMA, it is not the responsibility of the GSA to restore conditions, including measured baseflow, prior to what was observed before January 2015. Projects and management actions (P&MAs) designed to move the Basin toward sustainable groundwater management are discussed in Section 6 and are planned to be initiated upon implementation of the GSP. GSI and the GSA acknowledge additional analysis of the Basin's interconnected surface water and groundwater dependent ecosystems (GDEs) (e.g., Barka Slough groundwater budget) is needed. This is evidenced by stating the current MT of 0.15 cfs as interim and outlining P&MAs to better understand the hydrology in areas of interconnected surface water/GDEs. The GSP will be revised, at a minimum of once every 5 years during the interim GSP periods, appropriately based on findings from these studies. Only two active USGS stream gages remain in the Basin: the Casmalia stream gage and the Los Alamos stream gage. The Harris Canyon stream gage was decommissioned. The GSA has included the installation of additional stream gages in the P&MAs section of the GSP. The SMC is related to interconnected surface water. No interconnected surface water (as defined by SGMA, "the 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.") was identified in the area of the Los Alamos stream gage and the flow in this area is categorized as intermittent. If further evaluation of interconnected surface water and existing GDEs indicates SMC should be assigned to the Los Alamos stream gage, the GSP will be revised accordingly.in the area of the Los Alamos stream gage and the flow in this area is categorized as intermittent. If further evaluation of interconnected surface water and existing GDEs indicates SMC should be assigned to the Los Alamos stream gage, the GSP will be revised accordingly. Reference: USGS. 2010. Discharge Measurements at Gaging Stations. Chapter 8 of Book 3, Section A. Techniques and Methods 3—A8. By D. Phil Turnipseed and Vernon B. Sauer. U.S. Department of the Interior, U.S. Geological Survey. https://pubs.usgs.gov/tm/tm3-a8/tm3a8.pdf.

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CDFW	3.2.6.2				Comment #4 – Section 3.2.6.2 Terrestrial and Aquatic Special-Status Species Occurrence Issue #4.1: CDFW has concerns with the limited number of terrestrial and aquatic special-status species that the SABGSA lists in the Draft GSP. The San Antonio Creek Valley provides habitat that supports several sensitive species (some listed as endangered or threatened) throughout their life cycles, including the ESA and southwestern willow flycatcher (Empidonax traillii extimus), least Bell's vireo (Vireo bellii pusillus), tricolored blackbird (Agelaius tricolor), and arroyo chub, an SSC (CNDDB 2021; USFWS 2021). Habitats that support these species also consist of phreatophytes and other vegetation communities that are dependent on shallow aquifers that support surface water in each of these systems. Phreatophytic vegetation is a critical contributor to nesting and foraging habitat and forage for a wide range of species and can be affected by sensitive to depth to groundwater threshold impacts (Naumburg et.al. 2005) and (Froend et. al. 2010). This sensitivity to groundwater level thresholds means that localized pumping and recharge actions altering groundwater levels can impact the health and extent of phreatophyte vegetation health. Both decreasing (drying out) or increasing (drowning) groundwater elevation has the potential to stress phreatophytes depending on the plant species and the groundwater elevation and duration (e.g., short term wetness/dryness versus prolonged wetness/dryness). Recommendation #4.1: CDFW recommends SABGSA add the following species to the final GSP: the southwestern willow flycatcher, least Bell's vireo, tricolored blackbird, and arroyo chub. Issue #4.2: Based on the information provided in the Draft GSP, CDFW is not able to determine if southern California steelhead (Oncorhynchus mykiss; steelhead) is present within the Basin. Recommendation #4.2: CDFW recommends SABGSA identify steelhead as a species that has the potential to occur within the Basin, and has the potential to be impacted by groundwater pumping.	Documented plant and animal species were identified using published literature associated with known GDEs within the Basin (see Section 3.2.6). Publications will continue to be reviewed as they become available or identified and the GSP will be revised appropriately. Thank you for the citations. These references will be further considered when additional GDE characterization is conducted during GSP implementation. See revisions to Section 3.2.6.2.
CDFW	2.2.3				Comment #5: Section 2.2.3 Land Use and General Plans Summary; Cannabis Cultivation (Cannabis Priority Watershed) Issue: CDFW is concerned that cannabis groundwater use is not being fully accounted for when evaluating this SGMA area. Ignoring the growth potential of this industry could result in a lack of groundwater management accountability. There are approximately eight cannabis projects within the San Antonio Creek Watershed. Six of those are within 1000 feet of San Antonio Creek and all are likely using groundwater. Page 2-12 of the Draft GSP states that "Land uses in the Basin are primarily agricultural. Of note, in 2019 the Santa Barbara County Board of Supervisors placed a limit on outdoor cannabis cultivation in the unincorporated areas of the County outside the Carpinteria Agricultural Overlay District County to no more than 1,575 acres (Santa Barbara County Code § 50-7) and requires a special land use permit". The Basin has sensitive, natural communities consisting of Coast Live Oak, Valley Oak, Riparian Mixed Hardwood and Willow habitats along Santa Antonio Creek and its tributaries. According to CNDDB, these habitats support several sensitive species (some listed as endangered or threatened) throughout their life cycles, including California red-legged frog (Rana draytonii), tricolored blackbird, La Graciosa thistle (Cirsium scariosum var. loncholepis), Gambel's water cress (Nasturtium gambelii)),	GSI agrees and acknowledges the growth, and potential growth, of cannabis projects within the Basin. GSI has seen evidence of this during quarterly groundwater monitoring events, stakeholder feedback, and permit applications publicly accessible via the Santa Barbara County (County) website. Cannabis is one of several crop types considered within the water budget in the context of this GSP. The water sources for this crop are treated in a similar fashion as the water sources for the other crop types included in the GSP. However, cannabis is different than the other crops included in the group of agricultural crops in that it is subject to permitting by the Planning and Development department of the County of Santa Barbara and therefore the locations of these crops will be well understood into the future. GSI reviewed land use surveys provided by the USGS from 1959-2016 as well as land use data available through the County website (pesticide application permit data) for 2020. GSI compared the agricultural acreages with acreage within the Basin categorized as "Prime Farmland" per the USDA online Web Soil Survey tool. According to the 2020 land survey data the Basin had already surpassed the number of acres available in the Basin categorized as "Prime Farmland." In conjunction with feedback from Basin Stakeholders and a collective understanding the Basin has been experiencing a chronic decline in water levels and groundwater in storage (i.e., projects and management

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					and unarmored threespine stickleback, and California tiger salamander (CTS) (Ambystoma californiense). There are approximately 52 known/potential CTS ponds in the Basin (CNDDB; CDFW 2021). Groundwater and interconnected surface water depletion is a major concern for fish and wildlife beneficial users in the Basin. Designating this area as a High Priority Cannabis Watershed requires groundwater to be monitored and sustainably managed for the benefit of all beneficial users, including groundwater dependent vegetated communities and interconnected surface waters that are necessary to support riparian and aquatic habitat, and the sensitive species therein such as steelhead. Decreased stream flow may contribute to direct mortality if fish eggs are exposed, covered with silt, or left without sufficient oxygenated water. Water degraded in temperature or chemical composition can displace or limit fish populations. Recommendation #5: CDFW recommends the SABGSA monitor the Basin as a Cannabis High Priority Watershed. This High priority captures the documented impacts within the groundwater basin and the shifting groundwater consumption rates, as influenced by legalization of cannabis [Water Code §§ 10933. (b)(7,8)]. Based on the number of Departmental applications for legal cultivation, there is documented significant demand and potential adverse impacts to beneficial users of groundwater. The cannabis market growth is expected to increase almost ten times during an eight-year span (Fortune Business Insights 2021). North America is expected to lead the world cannabis market. Santa Barbara County recently approved a zoning permit for 87 acres of outdoor cannabis cultivation.	actions will plan to be implemented to begin to sustainably manage and accurately measure groundwater consumption), GSI determined it appropriate to use the 2020 agricultural acreage for purposes of the projected groundwater budget. The projected groundwater budget takes trends into account such as changes in crop types and improvement of irrigation efficiency. Although cannabis has only recently begun to grow in respect to planted acreage within the Basin, acreage of planted vineyards has generally increased throughout the period of record. Battany, 2019, estimated a water duty factor of 1.5 AF/acre/yr for CBD/Hemp. The water duty estimate for vineyards is 1.6 AF/acre/year; based on this reference the projected water budget appropriately accounts for the potential growth (or replacement of existing crops) of cannabis acreage within the Basin. It is important to note that the accuracy of the hydrogeological conceptual model, water budget, and efficacy of projects and management actions will be reviewed and revised as needed at a minimum of once every 5-years during the GSP interim review periods. Although some existing cannabis projects are located near San Antonio Creek, it is likely any new irrigation groundwater well constructed in support of the project will be completed deep within the Paso Robles Formation or Careaga Sand. This is supported by existing well completion records. According to the hydrogeological conceptual model developed by the USGS (included in Section 3 and further described in Appendix E) and measured groundwater levels, pumping from these deep wells have less, if any, impact on potential plant communities and wildlife species within San Antonio Creek and its tributaries compared to climatic conditions and adjacent shallow domestic wells. It is also possible that increased groundwater pumping to support agricultural irrigation has resulted in increased agricultural irrigation runoff into San Antonio Creek and its tributaries (as shown in the water budget). GSI has attempted to identify documented plant and animal species using published literature associated with known GDEs within the Basin (see Section 3.2.6). GSI will continue to review publications as they become available or identified and revise the GSP appropriately. Thank you for the citations. GSI was unaware or did not have access to the CNDDR and USFWS 2021 references. The GSA plans to monitor interconnected surface water and groundwater dependent ecosystems using the proposed interconnected surface water monitoring network along with investing to better understand areas such as San Antonio Creek and its tributaries and Barka Slough through projects and management actions. The GSA plans to continue monitoring Basin water quality through the groundwater quality monitoring network described in Section 5. The classification of the Basin or larger watershed as a Cannabis High Priority Watershed is currently understood as the responsibility of the CA Water Board and the CADFW and not the GSA per SGMA. If the Basin is classified as a Cannabis High Priority Watershed the GSP will be updated to reflect the designation and associated monitoring and reporting protocols.

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CDFW	2.2.3				Comment #6: Section 2.2.3 Land Use and General Plans Summary; Cannabis Cultivation Issue #6.1: Without the designation of the Basin as a Cannabis High Priority Watershed, evaluation of cannabis crop water usage may be overlooked throughout the Basin. Cannabis cultivation is a water intensive crop that can have a significant impact to environmental beneficial users of groundwater Cannabis groundwater wells provide water for the irrigation of water-intensive cannabis cultivation (assuming six gallons of water per day per plant) (Bauer S. 2015). CDFW is concerned that without management of the two principal aquifers under SGMA by the SABGSA, significant and unreasonable surface water depletions may occur, compromising groundwater dependent ecosystems within and along the streams. Recommendation #6.1(a): CDFW recommends a more careful review of the existing information on cannabis cultivation within the principal aquifers and recommends the information be considered when evaluating groundwater management. The majority of cannabis cultivation rely on groundwater for cannabis crops irrigation, and the likely interconnected nature between Basin groundwater levels and the Slough suggests that such uses (individually or cumulatively) should be considered when evaluating cannabis impacts in the underlying Careaga Sand water bearing formation. Recommendation #6.1(b): CDFW recommends the Basin be classified as a Cannabis High Priority Watershed. Issue #6.2: The majority reliance on groundwater for cannabis crops irrigation, and the possible areas of interconnected surface waters in San Antonio Creek and its tributaries and seeps suggest that such uses (individually or cumulatively) should be considered when evaluating cannabis impacts in the Paso Robles Formation and the Careaga Sand. Recommendation #6.2: CDFW recommends a more careful review of the existing information on cannabis cultivation within the Basin and recommends the information be considered when evaluating groundwater management.	The accuracy of the hydrogeological conceptual model, uncertainties associated with the water budget, and efficacy of projects and management actions will be reviewed and revised as needed at a minimum of once every 5-years during the GSP interim review periods. The Paso Robles Formation and the Careaga Sand have been identified as principal aquifers and will be managed by the GSA under SGMA as such. The classification of the Basin or larger watershed as a Cannabis High Priority Watershed is currently understood as the responsibility of the CA Water Board and the CADFW and not the GSA per SGMA. If the Basin is classified as a Cannabis High Priority Watershed the GSP will be updated to reflect the designation and associated monitoring and reporting protocols.
CDFW	General				Comment #7: SABGSA may need to revise the GSP before it is finalized and adopted by SABGSA. Recommendation #7: CDFW recommends SABGSA provide a red-lined version of the final GSP to understand the changes made between the Draft GSP and final GSP. Alternatively, CDFW recommends SABGSA provide a summary of changes made and comments addressed by SABGSA in preparation of a final GSP.	The plan for completion and submission of the GSP is to provide this complete list of all of the public comments received and to both respond to and address these comments. The form of these responses and addressed comments will be in this table and the finalized GSP in coordination with the stakeholders and GSA staff and board. These will provide the summary of changes that were made between the public draft and finalized GSPs.
Tannis Thorlakson				3-17	It would be helpful if either in a new column or in the Notes you could put the average crop water use factors used to make these calculations, so we can look back as we have more data on water use by crops to update these numbers.	Crop water use factors were added to the *Notes* section of Table 3-22 (formerly 3-17).
Tannis Thorlakson		31, last parag raph			Ag water use is described as increasing by 27% during the current water budget compared to the historical period. Can a sentence be added to explain what the main driver of that increase was? (e.g. increase in acres, change in crop type, reduced precipitation, etc.).	Language added to text explaining increase is due to an increase in irrigated acres.

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Tannis Thorlakson		37-38			Projected hydrology. Very helpful section and description. According to this section, we should expect about the same total amount of precipitation with climate change in the Basin. Do the climate models project intensity of future precipitation events? If precipitation increases in intensity, we would expect more surface water runoff and less percolation. A brief description of how intensity of rainfall was (or was not) incorporated into the projections would be helpful.	Language was added to the text explaining the DWR-provided climate-change data does not include descriptions regarding precipitation intensity.
Tannis Thorlakson		40-41			Can you include the projected agriculture water use in AF/ac (not just totals) for 2042 and 2072? I believe this will be helpful for people to interpret the future ag water demands provided in the last sentence of paragraph 3 on page 41. It might be helpful to include the population growth you expect when describing projected M&I demands.	Projected agricultural water use of the future project water budgets 2042 and 2072 were added to the text. Assumed population growth for projected demand is included in Table 3-32 (formerly 3-27) *Notes*.
Jim Stollberg					The assumption that groundwater pumping for agriculture will increase may be in error. It is very possible that ag pumping will not increase over time and potentially will decrease with increased efficiencies in farming techniques. I recommend the increase pumping assumption or calculation should be fleshed out with stakeholders.	Projected agricultural pumping is based on historical trends in irrigated acreage by crop-type, historical land-use survey data from the USGS and Santa Barbara County, crop water-use factors from adjacent basins and reviewed/revised by Basin stakeholders, and DWR provided climate change factors for precipitation and ET. Future updates to the water budget will be made as actual pumping and irrigated crop area data are obtained.
Bryan Bondy	GSP Section 3.3 Water Budget				Comments were received as an electronic memorandum, dated March 19, 2021.	These comments were received regarding an earlier draft of Section 3. Section 3 and the remaining GSP have undergone significant revision since this submittal of these comments. Response to comments is included as an attachment to this document.
SAB BOD					Include discussion of monitoring several rainfall gauges in addition to the Fire station to get a handle on variability. SB County Flood Control has 5 or 6 gauges in the basin.	See footnote following Table 3-13.
SAB BOD					The District's attorney has some comments about the water budget – those will be sent to us.	No comments were received from the District's attorney.
Tannis Thorlakson		4-12			You still don't define what 'average' is when setting the undesirable result. This should be defined in a foot note for clarity. The average should also be based on a rolling-average. If it doesn't, it won't incorporate incorporate potential changes in 'average' precipitation due to climate change, and thus has the potential for MT to never be triggered as we never return to an 'above average' rainfall period in the next 20 years.	A 20-year rolling average was included in the revised text.
Tannis Thorlakson	Section 4: Sustainable Management Criteria	12			At the top of page 12 in defining the significant and unreasonable conditions, we refer to MT being triggered "after average or above-average precipitation periods." How is average or above-average precipitation periods defined? Will what is considered 'average' be adjusted moving forward (e.g. using some form of rolling average, or accounting for wetting or drying trends in the region)? I think it would be helpful to have more clarity on how these terms are defined if they are helping to evaluate when a MT is being triggered.	A 20-year rolling average was included in the revised text.

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Matthew Scrudato (email)	4.5.2				I understand we're doing this in a lot of basins, but an arbitrary 10-foot drop seems so - well - arbitrary. What is this based on? Possibly more detail about the historical low. When it occurred, drought conditions, time frame. Included in this email is some general vegetation information from VAFB. A 2010 study of base wetlands and riparian habitat. It names a few of the plants located in the slough. Most with root depth much more shallow than 15 feet. Shouldn't we make this MT the maximum barka elevation and not the average? By saying we're using the average we're saying that all barka land ABOVE the average will experience water levels even greater than the 15 feet. Essentially, we're ok with that % of property shifting from the native riparian to something different as a result of water level declines. I understand we don't have much room for play and not much more time until we hit the 15 feet. Just putting my thoughts out there.	The proposed MTs for Groundwater Levels mentioned in this comment were changed based on stakeholder feedback. Additional plant species were added to Table 3-9 based on the source you provided. The MT for interconnected surface water mentioned in this comment was revised based on basin stakeholder feedback. The efficacy of the MT with respect to avoiding impacts to Barka Slough will be further evaluated as more information is obtained about the Barka Slough water budget after stream gages are installed.
Matthew Scrudato	4.5.2.3				Data not yet published, but there does appear to be contamination as indicated in the COGG study. There's mention of rooting depth throughout the report. Which plants specifically are we referring to when setting thresholds based on rooting depth? I'm no biologist, but it's hard to imagine all wetland plants have such a deep rooting depth. Maybe I'm visualizing this wrong but shouldn't the min threshold be set at 15 feet below the highest elevation of the slough? What's the range in elevation and what % of Barka is about this average elevation? Just appears we're trying to maintain vegetation at average elevations and below, everything above average elevation is prone to levels dropping below rooting depth.	A discussion of the COGG study is included in Section 3. Table 3-9 has been added to reference maximum rooting depths of common riparian plants. The MT for depletion of interconnected surface water was changed based on stakeholder feedback. The efficacy of the MT with respect to avoiding impacts to Barka Slough will be further evaluated as more information is obtained about the Barka Slough water budget after stream gages are installed.
Matthew Scrudato	4.6.2.1				GDEs.....How are we handling springs? There's no mention of springs in the report. Known springs on Hunter and Synize (sp?) property in center of basin. Possibly more. RE....no significant or unreasonable effects have been observed.....I keep reading this statement and suppose I don't understand. How were effects monitored during the drought to determine if there was or wasn't an effect on vegetation? Was baseflow reduced in channel? Suppose I'm saying that there doesn't really appear to be any data that I'm aware of to substantiate this statement.	A discussion of springs is now included in Section 3. There is no known documentation regarding condition of GDE vegetation during the drought. Basin stakeholders defined significant and unreasonable and they reported no significant and unreasonable results had occurred. GSI spoke with CDFW personnel regarding any known changes in the condition of the Slough (and inland wetlands in CA), reviewed available reports (some provided by SB County) regarding occurrence of plant populations in the Slough or west of the Slough (AECOM, 2019), and GSI completed an EVI analysis of the Slough area and a discussion is included in Section 3.2.6. Baseflow at the Casmalia stream gage is discussed in Section 4.10.
Matthew Scrudato	4.8				Can we present these wq data in a table? or reference where these data are located?	A description of data sources used to compile the summarized water quality data is included in Section 3.2.3.
Matthew Scrudato	4.8.2.1				No mention of N, Calcium or magnesium as an indication of agricultural return flow and fertilizer use. an important parameter to add for this basin.notice in chart but no discussion.highest concentrations of TDS near Orcutt Oil Field in Careaga should here be mention of COGG study and initial water quality results?	Additional discussion regarding nitrogen, calcium, and magnesium in relation to agricultural runoff will be considered during of the text. A discussion of the COGG study is included in Section 3.

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Matthew Scrudato	4.8.4				There's mention of no significant or unreasonable results..... What about the constituents that currently don't meet MCL (molybdenum, arsenic, chromium, etc.)? When does it become significant and unreasonable if not now?	No minimum thresholds have been established for contaminants because state regulatory agencies, including the RWQCB and the Department of Toxic Substances Control, have the responsibility and authority to regulate and direct actions that address contamination. The WQOs presented in Table 4-3 are the minimum thresholds for TDS, chloride, sulfate, boron, sodium, and nitrate as measured by SWRCB ILRP and DDW programs in 20 percent of wells monitored. In cases where the ambient (prior to January 2015) water quality exceeds the WQO, the minimum threshold concentration is 110 percent of the ambient water quality in 20 percent of the wells. This is the basis for establishing an undesirable result for water quality.
Matthew Scrudato	4.9.1				Subsidence...has it been a steady decrease during this 20 year period, or or are we seeing fluctuation? Any increase on average or above average precip years? Would be nice to see a 20 year graph of these data (possibly elsewhere in report?).InSAR data provided by DWR shows that meaningful land subsidence did not occur during the period between June 2015 and June 2019 in the Basin. May want to elaborate on this sentence help reader understand conditions (drought, excessive pumping, etc.).Should potential subsidence be observed, the GSA will first assess.....there already appears to be subsidence. Are you referring to increased subsidence? At what point is this considered an issue? Anything greater than 0.49 inches/year?	Analysis of land subsidence was limited by available period of record datasets. GEI completed a preliminary land subsidence evaluation and it is included in Appendix D. The MT for land subsidence is included in Section 4.9.2. Expanded discussion of the conditions during the InSAR dataset period of record were considered during revision of the text.
Matthew Scrudato	4.10.1				Thinking back to gage and visually monitoring flow. How about SERS or even a stationary camera to monitor flow. Won't know how much Q, but will know days of flow. However, no impact to GDEs have been observed.....I don't understand this statement. who is observing what to make this statement factual?	This comment was received regarding an earlier draft of Section 4. Section 4 and the remaining GSP have undergone significant revision since this submittal of this comment. The interconnected surface water monitoring network was revised based on stakeholder feedback. Two additional stream gages are proposed up and downstream of Barka Slough (see Section 6). Visual observation is no longer being considered for the interconnected surface water monitoring network. Surface water flow measurement at the Casmalia stream gage will be the sole interim measurement for sustainable management criteria regarding the interconnected surface water sustainability indicator.
Matthew Scrudato	4.10.2				The Barka Slough area is the only location in the Basin where groundwater is interconnected with surface water.....What about the springs?	An expanded discussion of GDEs and springs is included in Sections 3.2.5 and 3.2.6.
Matthew Scrudato			4-1		Can you plot the casmalia gage on this map as a reference?	The location of the Casmalia stream gage is included on Figures 3-54 and 4-4.
Matthew Scrudato			4-2		Legend should reference the average elevation line, the MO and the MT	This figure has been revised based on stakeholder feedback.
Matthew Scrudato	4.10.2.2				Separate report, by water level and qw data indicate minor connection with SYR basin at far east area.	A discussion of the potential connection between the Basin and the EMA is included in Section 3.1.3.2.

Reviewer	Section Number	Page Number	Figure Number	Table Number	Comment	Response
Matthew Scrudato	Section 4: Sustainable Management Criteria	10			Thinking about the Casmalia stream gage and wondering if we can use baseflow as a threshold. Baseflow analysis shows continued reduction.RE-Impacts to the slough and vegetation. The 1980 USGS OFR 80-750 mentions no impact to vegetation from 1958-77. There's an aerial photo specifically to view/categorize Barka vegetative conditions on 7/1/78. VAFB was supposed to continue with yearly aerial photos to monitor veg change (most likely never happened). Anyway, this photo could be a good baseline and future photos could/should be scheduled for comparisons (obviously I'm not considering cost here, but VAFB may be able to commit to this?).	The interconnected surface water monitoring network and SMCs were modified based on feedback from Basin stakeholders. In addition, EVI satellite data has been included in the monitoring program to detect changes in GDE vigor within Barka Slough.
Tiffany Abeloe	Section 4: Sustainable Management Criteria	18			Using only 20% of the monitored wells to determine thresholds for undesirable results seems like a pretty small percentage of the total wells monitored. Â This would only be approximately 7 wells determining mitigation measures for the entire Basin. Could that percentage be higher? How was that percentage decided upon? Thank you.	The percentage was changed to 50% based on basin stakeholder input.
SAB BOD					Make sure it is clear that when we discuss the 25' foot MT for water levels that we also state that PMAs will be implemented upon adoption of the GSP and not when the water levels cross the MT. They hope to never get to the MT.	See additional language in Section 4.5.2.
SAB BOD					Matt S raised the concern about how the 25' MT might affect the Slough.	More data on the water budget for the Slough will be obtained during GSP implementation to better understand how water levels in the basin affect the slough. VSFB is planning to build a model of the Slough and looking for ways to mitigate the impact of their pumping. The stream gages will be needed, as well as the other surface water inflow terms on the flanks. See existing language in 4.5.2.2.
Tiffany Abeloe	4				I would rather see the MT set at 15' rather than 25' below Fall 2018 groundwater levels. Pushing the threshold to the lowest point before negative impacts occur seems foolhardy to me. As it is, the 25' MT is already below current groundwater levels which could result in the undesirable result of degraded water supplies. The basin is already in arrears (10K' afy b/w in and out flows?) and a 15' decline is a lot of water lost. I believe 15' gives the SABWD time to implement project and management actions before reaching that level. As a domestic well water user, I believe 25' will result in undesirable results for my shallow well.	Multiple groundwater level minimum threshold (MT) scenarios have been presented to the advisory committee, board of directors, and GSA over the last year and more recently at the July public workshop and August Board of Directors meeting. A vote took place by the attendees of the August meeting determining the groundwater level MTs to be included in the Public Draft of the GSP. Potential impacts of the various MT scenarios discussed included impacts, if any, to domestic, agricultural, and municipal wells (see Section 3.2.1.3 for the well impact analysis and Section 4.5.2 for a description of the rationale for the selection of 25 feet below Fall 2018 groundwater levels) as well as potential impacts to interconnected surface water at Barka Slough. If the current MTs are deemed inadequate during the GSP implementation period, the GSA may revise the MTs at a minimum of once every 5 years during the GSP interim periods.
SAB BOD					Address concern from Tiffany Abeloe re domestic wells by pointing to the well impact analysis showing not much increase in domestic well issues when going with the 25'MT. Include graphic with response to comment.	See response to Ms. Abeloe's comment above.
Bryan Bondy	4	4-1			End of second paragraph: Consider noting that the SMC reevaluation and potential modification will happen no less frequently than the required 5-year GSP assessments.	See added language in Section 4.
Bryan Bondy	4.1	4-3			Definition of "Undesirable result" differs from the definition in the cited Water Code section. The text "…caused by groundwater pumping…" should read "…caused by groundwater conditions…" There may be other differences; this just happens to be the one I noticed.	The definition has been revised.
Bryan Bondy	4.2.1	4-4			It may be helpful to qualify the objectives for "Avoid Degraded Groundwater Quality" by noting that the GSA is only responsible for groundwater quality degradation caused by groundwater pumping or GSP implementation and explain the nexus between pumping or GSP implementation and potential water quality changes.	GSI agrees with the qualifications provided and adds that they are applicable to all the sustainable management criteria (SMCs). These qualifications are included in the respective SMC sections.

Reviewer	Section Number	Page Number	Figure Number	Table Number	Comment	Response
Bryan Bondy	4.3.2	4-6			Bullet List: a. It is unclear whether the three criterion bullets are intended to be applied conjunctively or disjunctively. b. Third bullet – There is a concern with the use of the term “Impacts” because not all impacts may be significant and unreasonable. Consider replacing “Impacts” with “Significant and unreasonable impacts” to better align with the SGMA definition of undesirable results.	See added language to Section 4.3.2.
Bryan Bondy	4.5.1	4-13			Bullet List: a. It is unclear whether the three criterion bullets are intended to be applied conjunctively or disjunctively. b. First bullet – It may be helpful to explain the basis for selecting 50% of representative wells exceeding the minimum thresholds. c. Second bullet – There is a concern with the use of the term “impact” because not all impacts may be significant and unreasonable. Consider replacing “impact” with “significant and unreasonable impacts” to better align with the SGMA definition of undesirable results. d. Third bullet – i. What are the historical average production rates that will be used as the baseline for evaluation of this criterion (I did not find the values in the GSP)? ii. The logic for the third bullet seems questionable. The average historical production likely includes some years with lower-than-average values. Why would it be significant and unreasonable in the future to not be able to produce at average historical rates when the historical rates themselves include years with less than average production, which was not considered an undesirable result historically? iii. Consider providing quantitative measures. Is one well unable to produce historical average quantities of water considered significant and unreasonable, or is it some larger number (or percentage) of wells?	See added language and footnotes to Section 4.5.1. The undesirable result described in the third bullet has been revised to be more consistent with that of the reduction of groundwater in storage sustainability indicator. The undesirable result has been revised to consider the Basin’s calculated sustainable yield. See revised text in Section 4.5.1.
Bryan Bondy	4.5.2	4-14 - 4-16			It is noted that the well impact analysis used to support the minimum thresholds is not very sensitive to the groundwater elevation, as indicated by the small change in the percentages of wells with various groundwater levels below top of screen. The well impact analysis results for the range of groundwater levels considered appears to be controlled by a small number of wells that are located in apparently unconfined areas near the edges of the basin and some wells that appear to be outliers compared to nearby wells. For these reasons, the well impact analysis results may not be representative of most wells in the basin and the resulting minimum thresholds may not be as representative as thought. It is suggested this analysis be revisited during the first 5-year GSP assessment period and refined by including additional wells (assuming more well construction information become available) and/or other approaches to evaluating potential significant and unreasonable impacts.	It is not clear if the wells in question are located in unconfined portions of the basin. The distribution of the wells included in the well impact evaluation have broad spatial coverage and include all well types (e.g., municipal, agricultural, domestic). For these reasons, we conclude the well impact evaluation to be reasonably representative of water levels and wells in the Basin. GSI agrees with the recommendation to continue to revise the well impact analysis as more data become available.
Bryan Bondy	4.8	4-31			The text states: “The SABGSA has no responsibility to manage groundwater quality unless it can be shown that water quality degradation is caused by pumping in the Basin, or the SABGSA implements a project that degrades water quality.” It is suggested that the GSP include a discussion about the potential for pumping or GSP implementation to degrade water quality and describe criteria for evaluating whether those conditions are occurring (or describe how and when those criteria will be developed).	See added language to Section 4.8.

Reviewer	Section Number	Page Number	Figure Number	Table Number	Comment	Response
Bryan Bondy	4.9.1	4-40			Bullet list in middle of page: a. It is unclear whether the three criterion bullets are intended to be applied conjunctively or disjunctively. b. Consider caveating all criteria as only applying if groundwater levels are below historical low levels during the period in question.	See added language to Section 4.9.1.
Bryan Bondy	4.9.1	4-43 & 4-46			The text on page 4-43 (minimum threshold) and page 4-46 (measurable objective) both say the criteria are based on the measured subsidence at the UNAVCO CGPS Station ORES from 2000-2020. However, the minimum threshold and measurable objective values are different (0.05 vs 0.04 feet per year). The text suggests that the values should be the same; therefore, it is unclear why the values are different.	The land subsidence minimum threshold of 0.05 feet per year is meant to signify an increased land subsidence rate compared to the average rate measured at the UNAVCO CGPS over its period of record (0.04 feet per year, or the measurable objective). See revised text in Section 4.9.2. To GSI's knowledge, there are no available infrastructure evaluations indicating the likely rate or amount of land subsidence that could cause damage to existing infrastructure in the Basin. Consequently, an increased rate of land subsidence compared to the average rate over the historical period is being used as the minimum threshold for the land subsidence sustainability indicator.
Bryan Bondy	4.10.2				There are concerns with using the Casmalia stream gage to establish the minimum threshold for depletion of interconnected surface water: First, the GSP Emergency Regulations require the minimum threshold to be the rate of depletion of surface water flow caused by groundwater pumping, not the surface water flow rate itself. Second, because the gage is downstream of the basin, it is measuring unused water leaving Barka Slough area. In theory, some of water measured by the gage is available for transpiration in Barka Slough if it is needed. In other words, the surface water flows at the gage could potentially decrease before undesirable results occur in Barka Slough. It is possible that flows at the gage could go to zero before significant and unreasonable effects at the Barka Slough manifest. Lastly, the flows measured by the gage may be impacted by processes unrelated to depletion by pumping, which are beyond the GSA's authority and control. These include: (1) flows from the four tributaries that confluence with San Antonio Creek downstream of the basin boundary; (2) variability in transpiration rates within the Barka Slough; and (3) transpiration along the portion of San Antonio Creek located between the basin boundary and the gage. The GSP discusses a historical depletion rate estimate developed using Darcy's Law. It is suggested that consideration be given to setting the initial minimum threshold based on the Darcy's Law calculation using the chronic lowering of groundwater levels minimum thresholds as a calculation input. This approach may align better with the GSP Emergency Regulations (using a depletion rate instead of surface water flow) and would eliminate concerns about other physical processes affecting the measurement of flow. The minimum threshold could be revisited, as planned, using the numerical model during the first 5-year GSP assessment period. If the current approach of using the Casmalia gage is retained, it is recommended that the minimum threshold be better explained and set lower. Page 4-54 says "This threshold was selected based on the analysis of historical base flow at the Casmalia stream gage presented on Figure 4-2." That is not enough information to understand the basis for the selected minimum threshold value. Based on visual inspection of Figure 4-2, it appears that the minimum threshold was exceeded in 2015, yet the GSP says "the EVI analysis indicates no discernible long-term trend in Barka Slough	Until the hydrology in the area of Barka Slough is better understood and uncertainties involved with the Darcian Flux calculations can be minimized, measured surface water flow at the Casmalia stream gage will serve as a proxy for measurement of the depletion of interconnected surface water sustainable management criteria (SMC). Currently, the water budget for Barka Slough is not well understood. The GSA is proposing to install stream gages immediately upgradient and potentially immediately downgradient of Barka Slough to quantitively measure annual surface water flow in and out of Barka Slough. Additionally, the GSA will evaluate the need for shallow piezometers in Barka Slough to more accurately measure depth to water in relation to likely GDE maximum rooting depths. It is understood the Vandenberg Space Force Base (VSFB) is working with the USGS to develop a water budget for Barka Slough as well as modeling scenarios of variable groundwater pumping from the VSFB well field near Barka Slough as a primary and or secondary water resource for the proposed VSFB Golf Courses Project. In conjunction with the numerical groundwater model, this information is anticipated to allow the SMCs, including the minimum threshold (MT), for depletion of interconnected surface water to more directly measure the rate of depletion of surface water flow caused by groundwater pumping. As more information is obtained, the minimum threshold for surface water depletion will be revisited. Based on the hydrogeological conceptual model developed by the USGS and presented in Section 3, surface water outflow from Barka Slough accounts for all surface and groundwater outflow from the Basin that is not captured by groundwater pumping or evapotranspiration. Consequently, it is possible to calculate, after accounting for surface water inflow and outflow components downgradient of Barka Slough and upgradient of the Casmalia stream gage, the volume of water exiting the Basin using the Casmalia stream gage. As mentioned previously, the installation of a stream gage immediately upgradient of Barka Slough would account for the surface water inflow component into Barka Slough. Subtracting this value from the volume measured at the Casmalia stream gage would allow calculation of the groundwater discharge to surface water component of the groundwater budget. This value can be used to compare to previous Darcian Flux calculations for the Barka Slough and enhance the ability to quantify the measurement of the depletion of interconnected surface water.

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					vegetative health" (p. 3-117). This suggests that there have not been undesirable results historically, including 2015. If undesirable results did not occur at the 2015 flows, then the minimum threshold is probably too high.	Surface water flow in Barka Slough and downgradient of Barka Slough are classified as perennial according to the USGS NHD. Although it is possible significant and unreasonable results within the Basin may not be observed until a lower flow (than the current MT) and potentially no flow is observed at the Casmalia stream gage, special status aquatic species have been reported along San Antonio Creek west of the Basin. The surface water depletion MT is intended to be protective of, a groundwater pumping induced, decrease in streamflow that could impact habitat for special status species. The depth to groundwater in the shallow sediments within the Slough and the existing GDE plant rooting depths is also not well understood. Additionally, less flow or no measured flow at the Casmalia stream gage could indicate there is no longer outflow from the Basin; resulting in a closed Basin and potential degradation of groundwater quality. Therefore, an MT below that selected from the baseflow analysis of the Casmalia (note the current MT of 0.15 cfs is the average base flow measured for 3 consecutive months from June to September) cannot be adequately justified until the hydrology of Barka Slough and the existing GDE can be further assessed. The EVI analysis was conducted to aid in the evaluation of historical and current "health" of Barka Slough. The planned EVI analysis will provide an indication of vegetative health but does not represent a full characterization of GDE conditions, including aquatic habitat. EVI is calculated from the proportions of visible and near-infrared sunlight reflected by vegetation. EVI data provide an indicator of healthy, well-watered vegetation; however, does not account for plant species type or change in plant species type (potentially due to lowering of available groundwater). No complete original biological analysis was conducted for the Barka Slough GDE. Following the EVI analysis discussion in the Section 3.2.6, the GSP states, "The Nature Conservancy guidance recommends that the condition of each GDE unit be inventoried and documented by describing the species composition, habitat condition, and other relevant information reflected in Worksheet 2 of the guidance (Rohde et al., 2018). TNC further states that the ecological condition of the GDE unit should be characterized as having a high, moderate, or low ecological value based on criteria provided in the TNC guidance. These tasks would likely rely heavily on field surveys. This additional characterization was not conducted but may be undertaken during GSP implementation. Until the additional characterization has been conducted, Barka Slough will be characterized as having high ecological value."
Matthew Scrudato	Section 5_Monitoring Networks				Last thought RE DMS, What type of data will be associated with and linked to the water level data? Maybe this isn't the place for this detail in the report. Will this have info like:date, time, accuracy, equipment used, RP used, well status (nearby pumping, recently pumped, cycling, rising, etc.), measurement method (steel tape, etape, etc.)	These details are included in the DMS. The DMS is described generally in Section 5.9.
Matthew Scrudato	5.7				There's mention that the significant land subsidence didn't occur between 2015-2019. Are you using this period because this was a time of significant pumping, drought, and limited runoff? If so, possibly elaborate. Think it would be a good idea to establish a small network of benchmarks with high accuracy elevation as a baseline. PAGE 39 There's mention in paragraph 1 that there's no way to quantify the degree to which SW depletion has occurred. How about a baseflow analysis of both streamgages? There's a big dataset for both gages. Just an idea. PAGE40 recommend transducers in 16G3, 16C2 16C4 (c wells may have that already), recommend installation of SERS at entry and exit of slough to at least determine number of days the channel is flowing. Better data set (and cheap) than a visit every 3 months.	2015-2019 was used because this is the period of record for the InSAR dataset. No significant land subsidence has been observed over the available period of record. A network of benchmarks will be considered (including funding) and is discussed in Section 5.7.1. Baseflow of the Casmalia stream gage is discussed in Section 4.10. Transducers are already installed in 16G3, 16C2, and 16C4. The installation of SERS will be considered for improvement of the Depletion of Interconnected Surface Water Monitoring Network.

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Matthew Scrudato	5.6.1				This probably goes back to my earlier comment and my confusion with the water quality network. SWRCB DDW protocols from appendix D7 would relate to the municipal wells. The ILRP would relate to the Ag Order 3.0. If you're also planning to sample additional wells, or use the USGS data (2 wells sampled annually), or sample from the vault wells, you'll need to reference the first reference in the appendix from DWR which mentions water quality sampling and recommends following USGS protocols outlined in the USGS field manual. Ignore comment if there are no wells outside of municipal and ag order wells. PAGE32 Should we also mention the COGG survey. Preliminary results indicate quality issues.	The text referred to the incorrect table (Table 5-1). The correct table is Table 5-3 and the text has been revised. A discussion of the COGG study is included in Section 3.
Matthew Scrudato	Section 5_Monitoring Networks	22			A couple of things come to mind RE water quality. There's reference to table 5.1 and the water quality well list. There's plans to sample all these 31 wells as the QW network and all the wells in Figure 5.4? I'm checking to be sure that what I'm reading is correct. Maybe it's the way this is written is what makes it a bit confusing to me. There are 50 wells in table 5.1. There's mention of 7 municipal wells and 21 ag wells. What about all the baseline data from general USGS monitoring over the years? Why are you only referencing the 2017 sampling only? There's quite of bit of data in NWIS.https://maps.waterdata.usgs.gov/mapper/nwisquery.html?URL=https://nwis.waterdata.usgs.gov/ca/nwis/qwdata?huc_cd=18060009&format=sitefile_output&sitefile_output_format=xml&column_name=agency_cd&column_name=site_no&column_name=station_nm&inventory_output=0&rdb_inventory_output=file&TZoutput=0&pm_cd_compare=Greater%20than&radio_parm_cds=all_parm_cds&qw_attributes=0&qw_sample_wide=wide&rdb_qw_attributes=0&date_format=YYYY-MM-DD&rdb_compression=file&list_of_search_criteria=huc_cd_by_name&column_name=site_tp_cd&column_name=dec_lat_va&column_name=dec_long_va&column_name=agency_use_cdWe also still sample 2 wells annually in the basin.7N/33W/27G1 and 9N/33W/2B1Any additional baseline data in the GAMA database?	The text referred to the incorrect table (Table 5-1). The correct table is Table 5-3 and the text has been revised.
Matthew Scrudato	Section 5_Monitoring Networks				PAGE12 I located a few wells in these data gap areas. The USGS were supposed to add them to the quarterly samples, but only took a water quality sample. Anyway, not sure which wells you tried to get access to. Some that come to mind are: EAST UPLAND Chamberlin Property. We have a water quality sample. They may provide continued access for monitoring. NW UPLAND We measured and sampled a well on the Careaga Oil lease. They were very helpful and welcoming. What about the Stevens property directly north of the SACR cluster?	The GSA will continue to request landowners participate in the Groundwater Level Monitoring Network by allowing access to their wells. Wells in "data gap" areas, including the wells you mention, will be prioritized.
Matthew Scrudato	Section 5_Monitoring Networks	12			paragraph 3 provides density information and mentions this was "from various cited sources". Please cite these sources in this paragraph so the reader knows where to look in the references.	The well density information is from the DWR BMP which cites various sources. Because GSI is referencing the DWR BMP and cites the DWR BMP, the "from various sources" was removed from the text.
Matthew Scrudato	Section 5_Monitoring Networks	10			Â RP description(s), and elevation. Sometimes there are 2 RPs.2)-Measurement Protocols very vague. Here are some references you may want to add and use as a reference: https://pubs.usgs.gov/tm/1a1/pdf/GWPD4.pdfÂ and here: https://pubs.usgs.gov/tm/1a1/pdf/GWPD1.pdf3)-There's mention of QA/QC in measurement protocols. What does this program entail exactly? Need more information here. Too vague.4)-Collection underfollowing conditions paragraph should include stable(static) water level (which gets back to QA/QC-how do you know it's static?). Also need to consider surrounding conditions. Has it been pumped recently? Nearby well pumping?5)-How is equipment decontaminated? Procedures are outlined in the USGS manual for steel and electric tapes. Chapter 3, 3.3.8.Option A with 0.1 to 2%Liqui-nox solution. Procedure 2using 0.005% bleach. Other recommendations for oilhttps://pubs.usgs.gov/twri/twri9a3/final508Chap3book.pdf6)-If there's pressure in well I would recommend drilling a vent hole.7)-How did you already determine that	Additional detail and language have been added to the Groundwater Level Monitoring Network Protocols section.

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					the RP elevation is accurate to 0.5 feet? From USGS DGPS? What about new additions? What equipment will be used to determine elevation? If using a cell phone you'll get a much different accuracy.	
SABWD	6	6-1			The bulk of Section 6 appropriately refers to management actions of the GSA. However, the introduction on Page 6-1 refers to a portfolio of management actions developed by SABWD and LACSD that could be implemented as part of the GSP. The District wishes to clarify that no such portfolio exists, at least as to the SABWD, and we ask that this reference be stricken from the GSP.	The GSP has been revised to address this comment
SAB BOD	6				Include hoop house recharge concept in the list of projects.	The GSP has been revised to address this comment. An additional project has been added to the Tier 4 Non-Priority Projects, entitled "SABGSA to provide Technical Assistance and Financial Incentives for High Tunnel ("Hoop Houses" Rainwater Harvesting Projects for Supplemental Irrigation Water Supplies and / or Groundwater Recharge Projects"
SAB BOD					Mention use of vegetative swales for enhancing recharge. This concept is being studied by Dr. Andy Fisher at UCSC. Perhaps this is an add on to our discussion about distributed recharge.	After review of the work that Dr. Andy Fisher has been working on and that has been reported in the literature, GSI believes that the use of vegetative swales for enhancing recharge is sufficiently covered in the discussion of the Tier 3 Priority Project DSW-MAR Basins (In-Channel and Off-Stream Basins)
SAB BOD					Add statement to ES and elsewhere in the PMA section that diminimus users will not be affected, have to have a meter, or pay an extraction fee.	The GSP has been revised to address this comment. A sentence has been added in Section 6.4 which states "De minimus pumpers will not be metered and will not be required to pay an extraction-related pumping fee."
Bryan Bondy	6				The projects and management actions described in this section appear to be reasonable. Other projects that may be worth investigating or considering include: a. Bedrock wells – consideration could be given to pumping and treating groundwater from bedrock formations to create an alternative water supply. b. Oilfield-produced water – consideration could be given to working with the owners of the active oil production wells surrounding the basin to evaluate the feasibility of treating and using oilfield-produced water for irrigation. c. Water exchanges – consideration could be given to funding local water projects in other regions in exchange for State Water Project allocation.	The GSP has been revised to address this comment. An additional project has been added to the Rier 4 Non-Priority Projects, entitled "Additional Projects for Potential Future Consideration by SABGSA "
Bryan Bondy				6-1	Header row - Groundwater Dependent Ecosystems is not a sustainability indicator identified in SGMA.	The Header in Table 6-1 was revised to reflect the MO to read Depletion of Interconnected Surface Water
Bryan Bondy	6.9				Tier 2 Management Action 7 – Voluntary Agricultural Crop Fallowing Programs: It is noted that voluntary fallowing would likely only occur if a cap-and-trade system is in place (i.e., the proposed "Base Pumping Allocation" and "Groundwater Extraction Credit Marketing and Trading Program"). Therefore, it is suggested that this dependency be noted in the description of the management action. It is also noted that the program may potentially be enhanced (or a separate program could be implemented, depending on who it is framed) by the having the GSA lease or purchase agricultural land for fallowing. The GSA could use fees to lease/purchase the lands, if necessary or desired. The GSA could also consider purchasing groundwater extraction credits.	The GSP has been revised to address this comment. A sentence has been added in Section 6.9 which states, "The Voluntary Agricultural Crop Fallowing Programs will be developed in parallel to the Groundwater BPA and the GEC Marketing and Trading Programs (see Management Actions 5 and 6 in Sections 6.7 and 6.8, respectively). It is also noted that the Voluntary Fallowing Program may potentially be enhanced, or a separate program could be implemented, which may provide for GSA to lease or purchase agricultural land for fallowing. The GSA could use fees generated through the Groundwater Pumping Fee Program to lease/purchase the lands to be fallowed, if necessary or deemed desirable by the GSA. Additionally, the GSA may also consider purchasing groundwater extraction credits.
SAB BOD	7				We need to revise our discussion about funding options. Jessica Diaz will help us. Need to better explain that the Water District raises money but has no responsibility for implementation. The per acre charge the District collects covers administration but grants and an extraction fee will have to cover MAs.	There is no reference in Section 7 GSP Implementation with regard to funding obligations or responsibilities on the part of the Water District.

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Tiffany Abeloe	General				I believe the last 2 SABGSA meetings were recorded, but I am unable to find the recordings. I understand there is a desire to increase efforts for stakeholder communication yet I can't find much of anything. The only minutes I found were for the SABWD meetings. Am I missing something somewhere or are there no minutes or recordings available for the GSA?	The agenda, minutes and presentations are available on the San Antonio Basin Groundwater Sustainability Agency, sanantoniobasingsa.org. They can be found by viewing past events or found on the calendar under the respective meeting date.
Samantha Arthur (Audubon Society)					Hello, I am writing on behalf of Audubon California, Clean Water Action, Clean Water Fund, Local Government Commission, The Nature Conservancy, and Union of Concerned Scientists with the attached comments on the draft Groundwater Sustainability Plan for this basin. Please refer to this updated comment letter as opposed to the previous comment submitted, which included an incorrect attachment. 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 us at ngos.sgma@gmail.com for more information or to schedule a conversation. Sincerely, Samantha Arthur Working Lands Program Director Audubon California	No response to this comment is warranted. A copy of the comment letter dated October 31, 2021 is included as an attachment.
Samantha Arthur (Audubon Society)					1. Consideration of Beneficial Uses and Users in GSP development Consideration of beneficial uses and users in GSP development is contingent upon adequate identification and engagement of the appropriate stakeholders. The (A) identification, (B) engagement, and (C) consideration of disadvantaged communities, drinking water users, tribes, 1 groundwater dependent ecosystems, streams, wetlands, and freshwater species are essential for ensuring the GSP integrates existing state policies on the Human Right to Water and the Public Trust Doctrine. A. Identification of Key Beneficial Uses and Users Disadvantaged Communities and Drinking Water Users The identification of Disadvantaged Communities (DACs) and drinking water users is insufficient. We note the following deficiencies with the identification of these key beneficial users. - The GSP fails to identify and map the locations of DACs and describe the size of each DAC population within the basin. - While the plan provides a density map of domestic wells in the basin (Figure 2-4), the GSP fails to provide depth of these wells (such as minimum well depth, average well depth, or depth range) within the basin. - The GSP fails to identify the population dependent on groundwater as their source of drinking water in the basin. Specifics are not provided on how much each DAC community relies on a particular water supply (e.g., what percentage is supplied by groundwater). These missing elements are required for the GSA to fully understand the specific interests and water demands of these beneficial users, and to support the consideration of beneficial users in the development of sustainable management criteria and selection of projects and management actions. RECOMMENDATIONS - Map the locations of DACs and provide the population of each identified DAC. The	No disadvantaged communities (DACs) were identified within the Basin, based on several datasets (refer to the IRWMP (Dudek, 2019); California Air Resources Board's (CARB) California Climate Investments (CCI) Priority Populations online mapping tool; California Office of Environmental Health Hazard Assessment's CalEnviroScreen online mapping tool of Senate Bill 535 DACs; and DWR's DACs online mapping tool using 2018 data at the places and tracts scale). Figure 3-26 Well Impact Analysis for Domestic Wells includes all domestic wells within the Basin with usable location and well construction data (specifically depth to top of screen) compared to Fall 2018 groundwater levels. Figure 3-23 shows how many wells, by type, are anticipated to be impacted (groundwater levels reaching top of screen) as groundwater levels drop incrementally from Fall 2018 levels. Average depths of wells, by well type, included in the well impact analysis has been included in Section 3.2.1.3.

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					DWR DAC mapping tool can be used for this purpose.2 Identify the sources of drinking water for DACs, including an estimate of how many people rely on groundwater (e.g., domestic wells, state small water systems, and public water systems). - Include a map showing domestic well locations and average well depth across the basin.	
Samantha Arthur (Audubon Society)					A. Identification of Key Beneficial Uses and Users (Cont.) Interconnected Surface Waters The identification of Interconnected Surface Waters (ISWs) is insufficient, due to lack of supporting information provided for the ISW analysis. The GSP presents a conceptual representation of gaining and losing streams (Figure 3-52. Gaining and Losing Streams). The GSP also presents a map (Figure 3-53. Stream Classification) of the basin's stream reaches, as classified by the USGS National Hydrography Dataset (NHD), with labels `Intermittent' and 'Perennial'. The GSP states (p. 3-102): "Figure 3-53 is a stream classification map of the Basin as defined by the USGS NHD (USGS, 2020b). Based on the USGS NHD, all the streams in the Basin are classified as intermittent and likely to be losing streams. The stream channels located in Barka Slough are classified as perennial and likely to be gaining streams." The GSP continues (p. 3-103): "Interconnected surface water and groundwater within the Paso Robles Formation and Careaga Sand is indicated by the Barka Slough and perennial classification of streams in that area." With these two statements, the GSP implies that interconnected reaches are defined by perennial conditions. However, this is an incorrect conclusion. Note the regulations [23 CCR §351(o)] define ISW 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". "At any point" has both a spatial and temporal component. Even short durations of interconnections of groundwater and surface water can be crucial for surface water flow and supporting environmental users of groundwater and surface water. Using seasonal groundwater elevation data over multiple water year types is an essential component of identifying ISWs. The GSP does not present or analyze depth to groundwater data when identifying ISWs in the basin. RECOMMENDATIONS - Provide a map showing all the stream reaches in the basin, with reaches clearly labeled as interconnected or disconnected. Consider any segments with data gaps as potential ISWs and clearly mark them as such on maps provided in the GSP. - Provide depth-to-groundwater contour maps using the best practices presented in Attachment D, to aid in the determination of ISWs. Specifically, ensure that the first step is contouring groundwater elevations, and then subtracting this layer from land surface elevations from a digital elevation model (DEM) to estimate depth to groundwater contours across the landscape. This will provide accurate contours of depth-to-groundwater along streams and other land surface depressions where GDEs are commonly found. - Use seasonal data over multiple water year types to capture the variability in environmental conditions inherent in California's climate, when mapping ISWs. We	Figure 3-53 provides all stream reaches in the Basin and classification. The analysis described in Section 3.2.6 that identifies groundwater dependent ecosystems refers to the period described by the SGMA Emergency Regulations [§354.16(g)]: "including data from January 1, 2015, to current conditions." The choice of the period selected is described to be a relatively dry year. As noted in that section 3.2.6: groundwater elevations are generally the highest in the spring, following recharge from winter rains. Spring-time groundwater elevations in 2015, a relatively dry year, are considered representative of average modern conditions as measured throughout the spring-summer months, during the period of maximum annual evapotranspiration. It also represents the period when SGMA was enacted; interconnected surface water observed after January 2015 are subject to evaluation under SGMA. No interconnected surface water (as defined by SGMA, "the 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.") was identified elsewhere in the Basin using this analysis. As stated in the comment, the regulations state that surface water that is hydraulically connected to groundwater requires a continuous saturated zone between the surface water and groundwater systems be present at any point. The intermittent ephemeral portions of San Antonio Creek and tributaries do not have a continuous saturated zone between the surface water and groundwater system. In these areas, rainfall that percolates through the stream bed does not form a continuous saturated zone. Groundwater elevation contours included shallow and nested observation well sets across the Basin. Groundwater level contours for the underlying Paso Robles Formation show substantial separation between the stream bed and the saturated portion of the aquifer. Nested wells also show that the flow is downward until the Paso Robles Formation and Careaga Sand discharges to the surface at Barka Slough. The identification of interconnected surface water and groundwater dependent ecosystems is directly related. These two analyses and the review of the hydrogeological conceptual model, developed by the USGS and presented in Section 3.1, adequately identify interconnected surface water within the Basin since enactment of SGMA. The hydrogeological conceptual model and groundwater conditions will be updated as new data become available at a minimum of once every 5-years during the GSP interim review periods.

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					recommend the 10-year pre-SGMA baseline period of 2005 to 2015. - Reconcile ISW data gaps with specific measures (shallow monitoring wells, stream gauges, and nested/clustered wells) along surface water features in the Monitoring Network section of the GSP.	
Samantha Arthur (Audubon Society)					A. Identification of Key Beneficial Uses and Users (Cont.) Groundwater Dependent Ecosystems The identification of Groundwater Dependent Ecosystems (GDEs) is insufficient. The GSP took initial steps to identify and map GDEs using the Natural Communities Commonly Associated with Groundwater dataset (NC dataset). However, insufficient groundwater data was used to characterize groundwater conditions in the basin's GDEs. The GSP states (3-90): "Contoured groundwater elevation data for spring 2015 were used to determine areas where the Natural Communities polygons were within 30 feet depth to groundwater. Spring 2015 groundwater elevations were chosen for this analysis because this marked a period of the greatest recent data availability. These data are considered representative of average spring-summer conditions within the last 5 years." We recommend using groundwater data from multiple seasons and water year types to determine the range of depth to groundwater around NC dataset polygons. Using seasonal groundwater elevation data over multiple water year types is an essential component of identifying GDEs and is necessary to capture the variability in environmental conditions inherent in California's climate. We commend the GSA for including an inventory of flora and fauna species in the basin's GDEs. Section 3.2.6.1 presents a discussion of potential GDE vegetation classifications and their acreage, and each of these GDE units is mapped individually on Figure 3-10 (Natural Communities Commonly Associated with Groundwater Dataset). Table 3-9 presents the plants and their rooting depths likely present in Barka Slough. Table 3-12 presents the special-status species that may be located within the basin, which are further discussed in the GSP text and mapped on Figure 3-57 (Special-Status Species Critical Habitat). Within Section 3.2.6.1 (Identification of Potential GDEs), the GSP states that the maximum rooting depth of Valley Oak (Quercus lobata) is 80 feet. However, this deeper rooting depth was not used when verifying whether Valley Oak polygons from the NC Dataset are supported by groundwater. Figure 3-10 shows acreage of Valley Oak polygons across the basin in areas covered by the > 30 ft depth to water area mapped on Figure 3-55. Of the 495 acres of Valley Oak mapped on Figure 3-10, no acreage is retained as a potential GDE in the GSP. RECOMMENDATIONS - Refer to Attachment D of this letter for best practices for using local groundwater data to verify whether polygons in the NC Dataset are supported by groundwater in an aquifer. If insufficient data are available to describe groundwater conditions within or near polygons from the NC dataset, include those polygons as "Potential GDEs" in the GSP until data gaps are reconciled in the monitoring network. - Use depth-to-groundwater data from multiple seasons and water year types (e.g., wet, dry, average, drought) to determine the range of depth to groundwater around NC dataset polygons. We recommend that a pre-SGMA baseline period (10 years from 2005 to 2015) be established to characterize groundwater conditions over multiple water year types.	The analysis described in Section 3.2.6 refers to the period described by the SGMA Emergency Regulations included in the blue box at the beginning of that section [§354.16(g)]: "including data from January 1, 2015, to current conditions." The choice of the period selected is described to be a relatively dry year. As noted in that section: groundwater elevations are generally the highest in the spring, following recharge from winter rains. Spring-time groundwater elevations in 2015, a relatively dry year, are considered representative of average modern conditions as measured throughout the spring-summer months, during the period of maximum annual evapotranspiration. It also represents the period when SGMA was enacted; GDEs observed after January 2015 are subject to evaluation under SGMA. The comment requests preparation of depth to groundwater maps. This is unnecessary because groundwater elevation contour maps were prepared and compared to ground surface elevations to derive the locations where the water table is within 30 feet of land surface. Using this analysis, depth to groundwater in areas where populations of Valley Oak were identified were greater than 100 feet based on the Spring 2015 groundwater elevations. Thank you for the additional data sources. Published TNC guidance literature was used for identifying GDEs within the Basin and is described in Section 3.2.6. The hydrogeological conceptual model and groundwater conditions will be updated as new data become available at a minimum of once every 5-years during the GSP interim review periods.

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					- Provide depth-to-groundwater contour maps, noting the best practices presented in Attachment D. Specifically, ensure that the first step is contouring groundwater elevations, and then subtracting this layer from land surface elevations from a digital elevation model (DEM) to estimate depth-to-groundwater contours across the landscape. The GSP maps the 30-foot groundwater depth contour on Figure 3-55, showing two areas (<= 30 ft Depth To Water and > 30 ft Depth To Water). However, full depth to groundwater contours are needed to evaluate the valley oak NC dataset polygons. - Re-evaluate the 495 acres of valley oak present in the basin. Refer to Attachment B for more information on TNC's plant rooting depth database. Deeper thresholds are necessary for plants that have reported maximum root depths that exceed the averaged 30-ft threshold, such as valley oak (Quercus lobata). We recommend that the reported max rooting depth for these deeper-rooted plants be used. For example, a depth-to-groundwater threshold of 80 feet should be used instead of the 30-ft threshold, when verifying whether valley oak polygons from the NC Dataset are connected to groundwater. It is important to emphasize that actual rooting depth data are limited and will depend on the plant species and site-specific conditions such as soil and aquifer types, and availability to other water sources.	
Samantha Arthur (Audubon Society)					A. Identification of Key Beneficial Uses and Users (Cont.) Native Vegetation and Managed Wetlands Native vegetation and managed wetlands are water use sectors that are required to be included in the water budget. , The integration of native vegetation into the water budget 3 4 is sufficient. We commend the GSA for including the groundwater demands of this ecosystem in the historical, current and projected water budgets. Managed wetlands are not mentioned in the GSP, so it is not known whether or not they are present in the basin. RECOMMENDATION - State whether or not there are managed wetlands in the basin. If there are, ensure that their groundwater demands are included as separate line items in the historical, current, and projected water budgets.	No managed wetlands have been identified in the Basin. See additional text added to Section 2.2.1 and 2.3.1.

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Samantha Arthur (Audubon Society)					B. Engaging Stakeholders Stakeholder Engagement During GSP Development Stakeholder engagement during GSP development is insufficient. SGMA's requirement for public notice and engagement of stakeholders is not fully met by the description in the Communication and Engagement Plan (Appendix C).5 The Communication and Engagement Plan describes engagement with environmental stakeholders during the GSP development process through the inclusion of an environmental representative on the GSA Advisory Committee. However, we note the following deficiencies with the overall stakeholder engagement process: - The opportunities for public involvement are described in very general terms. They include public notices, meetings, and workshops. No specific outreach was described for DACs and drinking water users. DACs were mentioned once in the initial list of stakeholders and interested parties within the basin, but were not otherwise mentioned in the GSP. - The plan does not include a plan for continual opportunities for engagement through the implementation phase of the GSP for any stakeholders, including DACs, domestic well owners, and environmental stakeholders. RECOMMENDATIONS - In the Communication and Engagement Plan, describe active and targeted outreach to engage DAC members, drinking water users, and environmental stakeholders through the GSP development and implementation phases. Refer to Attachment B for specific recommendations on how to actively engage stakeholders during all phases of the GSP process. - Describe efforts to consult and engage with DACs and domestic well owners within the basin. - Utilize DWR's tribal engagement guidance to comprehensively address all tribes and tribal interests in the basin within the GSP.	No disadvantaged communities (DACs) were identified within the Basin, based on several datasets (refer to the IRWMP (Dudek, 2019); California Air Resources Board's (CARB) California Climate Investments (CCI) Priority Populations online mapping tool; California Office of Environmental Health Hazard Assessment's CalEnviroScreen online mapping tool of Senate Bill 535 DACs; and DWR's DACs online mapping tool using 2018 data at the places and tracts scale). The outreach has been conducted in accordance with the Communication and Engagement Plan, which included outreach to the entire Basin. No federally recognized tribes were identified within the Basin, therefore no special outreach efforts were warranted.

Reviewer	Section Number	Page Number	Figure Number	Table Number	Comment	Response
Samantha Arthur (Audubon Society)					C. Considering Beneficial Uses and Users When Establishing Sustainable Management Criteria and Analyzing Impacts on Beneficial Uses and Users The consideration of beneficial uses and users when establishing sustainable management criteria (SMC) is insufficient. The consideration of potential impacts on all beneficial users of groundwater in the basin are required when defining undesirable results and establishing minimum thresholds.7,8,9 Disadvantaged Communities and Drinking Water Users For chronic lowering of groundwater levels, the GSP presents a well impact analysis in Section 3.2.1.3. The GSP states (p. 3-50): "Fall 2018 groundwater elevations measured in basin monitoring wells were used to assess how many wells have static water levels that are below the top of screen elevation as of that date and how many would be below top of screen if groundwater levels were lower. The results of the analysis presented on Figure 3-23 indicate that groundwater water elevations in fall 2018 were below top of screen in 20 percent of domestic wells and 12 percent of agricultural wells in the Basin." Minimum thresholds for groundwater levels are set at 25 feet below fall 2018 water levels. The GSP states (p. 4-15): "The analysis indicates that water levels declining 25 feet below fall 2018 water levels do not result in a substantial increase in the number of wells affected by this condition. If water levels continue to decline, the analysis indicates well owners could observe some depletion of supply. Based on this analysis, stakeholders in the Basin believe that setting the minimum threshold for water levels at 25 feet below fall 2018 water levels will not result in depletion of supply or undesirable results. Setting the minimum threshold at this level allows time for project and management actions to be implemented before minimum thresholds are reached. The well impact analysis presented in Section 3.2 indicates that the majority of the agricultural and domestic wells can tolerate additional groundwater level decline without experiencing undesirable results." Despite this well impact analysis, the GSP does not sufficiently describe whether minimum thresholds are consistent with California's Human Right to Water policy and will avoid significant and unreasonable loss of drinking water, especially given the absence of a domestic well mitigation plan in the GSP.10 Furthermore, undesirable results are characterized by groundwater levels dropping below the minimum threshold after periods of average and above-average precipitation in 50 percent of representative wells for two consecutive years. Using 50% as the threshold suggests that minimum thresholds reached during dry years or periods of drought will not result in an undesirable result. This is problematic since the GSP is failing to manage the basin in such a way that strives to minimize significant adverse impacts to beneficial users, which are often felt greatest in below-average, dry, and drought years. In addition, the GSP does not sufficiently describe or analyze direct or indirect impacts on DACs when defining undesirable results, nor does it describe how the existing groundwater level minimum thresholds will avoid significant and unreasonable impacts to DACs and domestic well users beyond 2015 and be consistent with Human Right to Water policy.10 For degraded water quality, the GSP presents water quality standards for constituents of concern (COCs) in Table 4-3. The GSP establishes minimum thresholds pertaining to salts and nutrients as follows (p. 4-34): "The WQOs presented in Table 4-3 are the	The well impact analysis presents a part of the rationale for the setting of minimum thresholds and measurable objectives to Avoid Chronic Lowering of Groundwater Levels for all well users in the Basin, including agricultural, municipal wells, and domestic wells in Section 4.5.2 in the Plan. This analysis, described in detail in Section 3.2.1.3, was conducted over several months in development of the Plan with multiple public meetings to set the MTs and MOs with the input of the GSA and public in protection of all well users. No disadvantaged communities (DACs) were identified within the Basin, based on several datasets (refer to the IRWMP (Dudek, 2019); California Air Resources Board's (CARB) California Climate Investments (CCI) Priority Populations online mapping tool; California Office of Environmental Health Hazard Assessment's CalEnviroScreen online mapping tool of Senate Bill 535 DACs; and DWR's DACs online mapping tool using 2018 data at the places and tracts scale). As discussed in Section 4.5.2: There was considerable debate among stakeholders about how much depletion of supply could result from water levels falling below the top of screen. Municipal, agricultural, and domestic wells have different sensitivities to this condition and will experience depletion of supply differently. The methodology and results of this analysis were discussed with stakeholders and ultimately accepted by the GSA Committee as the basis for establishing undesirable results and minimum thresholds. Furthermore: Domestic well owners and local municipalities cannot easily respond to a reduction in supply, particularly during extended dry periods, and would have to absorb substantial cost if wells had to be deepened. The GSA decided to not allow water levels in municipal wells to drop below the top of screen if possible. Local agricultural interests were less concerned about water levels falling below top of screen because they have not observed undesirable results or depletion of supply and so wanted to set the minimum thresholds deeper. The selected MT does not result in a significant increase in the number of domestic wells that would experience water levels falling below top of screen; thus, we believe the MT for water levels is adequately protective of domestic wells. Minimum threshold and undesirable results for the Degraded Groundwater Quality Sustainability Indicator have been set in accordance with Federal and State Drinking Water MCLs and SMCLs as well as the Water Quality Control Plan for the Central Coastal Basin developed by the Central Coast Regional Water Quality Control Plan and the California Environmental Protection Agency. The GSA however, has no authority regarding regulation of regulated contaminants and therefore those constituents will continue to be regulated by state agencies such as the Regional Water Quality Control Board and the Department of Toxic Substances Control. The GSA will coordinate with these agencies should contamination be identified in the future. Effects of sustainable management criteria for the Degraded Groundwater Quality Sustainability Indicator is included in Section 4.8.2.5. Table 4-3 presents water quality standards for selected constituents of concern. Table 3-5 presents historical water quality data and associated MCLs, SMCLs, and Water Quality Objectives. Per SGMA, groundwater conditions, including groundwater quality, occurring prior to 2015 are not required to be restored. Therefore, based on available groundwater quality data, the water quality data presented in Figures 3-33 through 3-46 is considered ambient and indicate the distribution of constituent concentrations.

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					minimum thresholds for TDS, chloride, sulfate, boron, sodium, and nitrate as measured by SWRCB ILRP and DDW programs in 20 percent of wells monitored. In cases where the ambient (prior to January 2015) water quality exceeds the WQO, the minimum threshold concentration is 110 percent of the ambient water quality in 20 percent of the wells." The GSP does not, however, state which COCs have ambient concentrations that exceed the WQO, or provide a summary table of the resulting minimum thresholds. The GSP states (p. 4-32): "No minimum thresholds have been established for contaminants because state regulatory agencies, including the RWQCB and the Department of Toxic Substances Control, have the responsibility and authority to regulate and direct actions that address contamination." However, SMC should be established for all COCs in the basin that may be impacted by groundwater use and/or management, in addition to coordinating with water quality regulatory programs. The GSP only includes a very general discussion of impacts on drinking water users when defining undesirable results and evaluating the impacts of proposed minimum thresholds. The GSP does not, however, mention or discuss direct and indirect impacts on DACs or drinking water users when defining undesirable results for degraded water quality, nor does it evaluate the cumulative or indirect impacts of proposed minimum thresholds on DACs or drinking water users. RECOMMENDATIONS Chronic Lowering of Groundwater Levels - Describe direct and indirect impacts on drinking water users and DACs when describing undesirable results and defining minimum thresholds for chronic lowering of groundwater levels. Degraded Water Quality - Describe direct and indirect impacts on drinking water users and DACs when defining undesirable results for degraded water quality. For specific guidance on how to consider these users, refer to "Guide to Protecting Water Quality Under the Sustainable Groundwater Management Act."11 - Evaluate the cumulative or indirect impacts of proposed minimum thresholds for degraded water quality on drinking water users and DACs. - In Table 4-3 (Water Quality Standards for Selected Constituents of Concern), compare WQOs, MCLs, and ambient (prior to January 2015) water quality concentrations. Present the final minimum threshold for each COC. - Set minimum thresholds and measurable objectives for all water quality constituents within the basin that can be impacted and/or exacerbated as a result of groundwater use or groundwater management. Ensure they align with drinking water standards.12	Projects and Management Actions (see Section 6) implemented by the GSA that have the potential to impact groundwater quality will go through an evaluation and planning process prior to implementation. The actions will be monitored regarding surface and groundwater conditions as well as be subject to the Basin's sustainable management criteria for all sustainability indicators.

Samantha Arthur (Audubon Society)					C. Considering Beneficial Uses and Users When Establishing Sustainable Management Criteria and Analyzing Impacts on Beneficial Uses and Users (cont.) Groundwater Dependent Ecosystems and Interconnected Surface Waters When defining undesirable results for chronic lowering of groundwater levels, the GSP briefly mentions impacts to GDEs in the Barka Slough area. However, these impacts are not described or analyzed. This is problematic because without identifying potential impacts on GDEs, groundwater level minimum thresholds may compromise these environmental beneficial users. Furthermore, our comments above in the GDE section note that insufficient shallow groundwater data was used to verify the NC dataset polygons and deeper rooting depths of valley oak were not considered. After re-analyzing GDEs based on our comments above, consider potential impacts to GDEs for the chronic lowering of groundwater levels sustainability indicator. The GSP recognizes data gaps with respect to the interconnected surface water SMC. For the Barka Slough area, the GSP states (p. 4-54): "Without an improved understanding of the slough water budget, it is not possible at this time to confidently establish a minimum threshold for depletion of interconnected surface water. Until more is known about the relationship between groundwater and surface water in the vicinity of the Slough and depletion can be quantified and monitored, an interim minimum threshold, based on the best available information, focuses on avoiding depletion and maintaining surface water and groundwater flow entering and leaving the Slough." The minimum threshold is 0.15 cfs of surface water flow measured at the Casmalia stream gage west of the Slough, selected based on the analysis of historical base flow at the Casmalia stream gage (Figure 4-2). However, no analysis or discussion is presented to describe how the SMC will affect GDEs, or the impact of this minimum threshold on GDEs in the basin. Furthermore, the GSP makes no attempt to evaluate the impacts of the proposed minimum threshold on environmental beneficial users of surface water. The GSP does not explain how the chosen minimum thresholds and measurable objectives avoid significant and unreasonable effects on surface water beneficial users in the basin, such as increased mortality and inability to perform key life processes (e.g., reproduction, migration). The GSP also recognizes data gaps with respect to ISW in the Las Flores watershed and northeast of Los Alamos on Price Ranch. The GSP states (p. 4-48): "Until flow of groundwater is better understood in these areas, meaningful SMCs related to interconnected surface water and supporting associated GDEs cannot be developed. If analysis of these areas indicates interconnected surface water with the Paso Robles Formation or the Careaga Sand, SMCs will be developed pursuant to avoid undesirable results as described below." As noted above in the ISW section of this letter, the GSP did not utilize groundwater elevation data to identify ISWs in the basin. Therefore, in addition to the data gap areas noted above (i.e., Las Flores watershed and northeast of Los Alamos on Price Ranch), additional analyses may be required to develop depletion of interconnected surface water SMC after further identification of ISWs based on groundwater elevation data. RECOMMENDATIONS - Define chronic lowering of groundwater SMC directly for environmental beneficial users of groundwater. When defining undesirable results for chronic lowering of groundwater levels, provide specifics on what biological responses (e.g., extent of habitat, growth, recruitment rates) would best characterize a significant and unreasonable impact on GDEs. Undesirable results to environmental users occur when 'significant and unreasonable' effects on beneficial users are caused by one of the sustainability indicators (i.e., chronic lowering of groundwater levels, degraded water quality, or depletion of interconnected surface water). Thus, potential impacts on environmental beneficial uses and users need to be considered when defining	The groundwater dependent analysis described in Section 3.2.6 refers to the period described by the SGMA Emergency Regulations included in the blue box at the beginning of that section [§354.16(g)]: "including data from January 1, 2015, to current conditions." The choice of the period selected is described to be a relatively dry year. As noted in that section: groundwater elevations are generally the highest in the spring, following recharge from winter rains. Spring-time groundwater elevations in 2015, a relatively dry year, are considered representative of average modern conditions as measured throughout the spring-summer months, during the period of maximum annual evapotranspiration. It also represents the period when SGMA was enacted; GDEs observed after January 2015 are subject to evaluation under SGMA. Depth to groundwater in areas where populations of Valley Oak were indicated were greater than 100 feet based on the Spring 2015 groundwater elevations. Effects of sustainable management criteria for the Depletion of Interconnected Surface Water Sustainability Indicator is included in Section 4.10.2.3. The GSP states the need for additional analysis of Barka Slough and actions are described in Section 6. An EVI analysis of Barka Slough was completed and described in Section 3.2.6. No original and complete biological assessment has been completed on the Slough. Consequently, other than satellite-based data such as EVI and ET, measurable changes regarding existing species populations within the Slough is impossible to evaluate. The minimum threshold at the downgradient Casmalia stream gage of 0.15 cfs is representative of baseflow conditions since SGMA enactment in 2015 and, based on the EVI analysis, adequate to support existing GDE conditions in Barka Slough. This flow rate ensures that there is water in the slough to support GDEs. This MT may be revised as additional data regarding the slough water budget is obtained and the character of this GDE is further evaluated as discussed in Section 6 projects and management actions. Groundwater elevation data was used evaluate GDEs in the Basin (see Section 3.2.6 for description of the analysis). Based on the analysis depth to groundwater in the location of the potential GDE located in Las Flores watershed was greater than 30 feet. However, based on stakeholder feedback, field observations, satellite imagery, and reported artesian conditions in this area, the Plan states, similar to Barka Slough, that further analysis is needed to better understand the hydrology and plant species in this area. Actions to do so are included in Section 6. Additionally, unlike Barka Slough, a downgradient stream gage with an adequate historical period of record is not available. Therefore, it is not well understood how historical changes in groundwater levels have impacted the potential discharge rates. Until further analysis can be completed (including determination of potential groundwater source), meaningful sustainable management criteria for the potential GDE cannot be established.

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					undesirable results in the basin. Defining undesirable results is the crucial first step 13 before the minimum thresholds can be determined.14 - When defining undesirable results for depletion of interconnected surface water, include a description of potential impacts on instream habitats within ISWs when minimum thresholds in the basin are reached.15 The GSP should confirm that minimum thresholds for ISWs avoid adverse impacts on both environmental beneficial users of groundwater and surface water as these environmental users could be left unprotected by the GSP. These recommendations apply especially to environmental beneficial users that are already protected under pre-existing state or federal law.6,16 - When establishing SMC for the basin, consider that the SGMA statute [Water Code §10727.4(l)] specifically calls out that GSPs shall include "impacts on groundwater dependent ecosystems".	
Samantha Arthur (Audubon Society)					2. Climate Change The SGMA statute identifies climate change as a significant threat to groundwater resources and one that must be examined and incorporated in the GSPs. The GSP Regulations require integration of climate change into the projected water budget to ensure that projects and management actions sufficiently account for the range of potential climate futures 17. The effects of climate change will intensify the impacts of water stress on GDEs, making available shallow groundwater resources especially critical to their survival. Condon et al. (2020) shows that GDEs are more likely to succumb to water stress and rely more on groundwater during times of drought.18 When shallow groundwater is unavailable, riparian forests can die off and key life processes (e.g., migration and spawning) for aquatic organisms, such as steelhead, can be impeded. The integration of climate change into the projected water budget is insufficient. The GSP incorporates climate change into the projected water budget using DWR change factors for 2030 and 2070. However, the plan does not consider multiple climate scenarios (e.g., the 2070 extremely wet and extremely dry climate scenarios) in the projected water budget. The GSP should clearly and transparently incorporate the extremely wet and dry scenarios provided by DWR into projected water budgets or select more appropriate extreme scenarios for the basin. While these extreme scenarios may have a lower likelihood of occurring, their consequences could be significant and their inclusion can help identify important vulnerabilities in the basin's approach to groundwater management. The GSP incorporates climate change into key inputs (e.g., precipitation, evapotranspiration, and surface water flow) of the projected water budget. However, while climate change is acknowledged to be a likely influence on future basin yields, the GSP does not provide a sustainable yield based on the projected water budget with climate change incorporated. If the water budgets are incomplete, including the omission of extremely wet and dry scenarios, and sustainable yield is not calculated based on climate change projections, then there is increased uncertainty in virtually every subsequent calculation used to plan for projects, derive measurable objectives, and set minimum thresholds. Plans that do not adequately include climate change projections may underestimate future impacts on vulnerable beneficial users of groundwater such as ecosystems and domestic well owners.	As stated in your comment, the projected water budget incorporates DWR climate change factors for 2030 and 2070 as required by the SGMA Emergency Regulations (§354.18). The regulations do not explicitly require extreme climate change factors. The projected water budget includes a calculated basin yield with DWR climate change factors for 2030 and 2070 incorporated. Based on the proposed sustainable management criteria, the basin yield is equal to the sustainable yield for the Basin calculated for the historical period. Future updates to the GSP will include reevaluation of the water budget and sustainable yield based on conditions observed during that time. All elements of the projected water budget, basis for development of sustainable management criteria and projects and management actions considered DWR climate change factors for 2030 and 2070.

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					RECOMMENDATIONS - Integrate climate change, including extremely wet and dry scenarios, into all elements of the projected water budget to form the basis for development of sustainable management criteria and projects and management actions. - Estimate sustainable yield based on the projected water budget with climate change incorporated. - Incorporate climate change scenarios into projects and management actions.	
Samantha Arthur (Audubon Society)					3. Data Gaps The consideration of beneficial users when establishing monitoring networks is insufficient, due to lackof specific plans to increase the Representative Monitoring Sites (RMSs) in the monitoring network that represent water quality conditions and shallow groundwater elevations around DACs, domestic wells, GDEs, and ISWs in the basin. Figure 5-1 (Groundwater Level Monitoring Network) shows insufficient representation of drinking water users and DACs for groundwater elevation monitoring. Figure 5-4 (Groundwater Quality Monitoring Network) shows sufficient spatial representation of drinking water users and DACs for water quality monitoring, but depth representation cannot be verified. Refer to Attachment E for maps of these monitoring sites in relation to key beneficial users of groundwater (note we were only able to prepare water quality monitoring maps with publicly available information). These beneficial users may remain unprotected by the GSP without adequate monitoring and identification of data gaps in the shallow aquifer. The Plan therefore fails to meet SGMA's requirements for the monitoring network.19 The GSP provides some discussion of data gaps for GDEs and ISWs in Sections 5.8 (Depletion of Interconnected Surface Water Monitoring Network), Section 5.8.2 (Assessment and Improvement of Monitoring Network), and 6.3 (Tier 1 Management Action 1 – Address Data Gaps), but does not provide specific plans, such as locations or a timeline, to fill the data gaps. RECOMMENDATIONS - Provide maps that overlay current and proposed monitoring well locations with the locations of DACs, domestic wells, GDEs, and ISWs to clearly identify monitored areas. - Increase the number of RMSs in the shallow aquifer across the basin as needed to adequately monitor all groundwater condition indicators across the basin and at appropriate depths for all beneficial users. Prioritize proximity to DACs, domestic wells, GDEs, and ISWs when identifying new RMSs. - Ensure groundwater elevation and water quality RMSs are monitoring groundwater conditions spatially and at the correct depth for all beneficial users - especially DACs, domestic wells, and GDEs.	Section 5.3.2 describes the GSAs continued effort to expand the monitoring network, including contacting landowners to request their wells be added to the groundwater level monitoring network and land access agreements be established. The rationale for the selection of the existing monitoring network is included in Section 5.3. The existing groundwater level monitoring network can adequately demonstrate groundwater occurrence, flow directions, and hydraulic gradients between principal aquifers and surface water features. The existing groundwater level monitoring network provides a sufficient density of monitoring wells to collect representative measurements through depth-discrete perforated intervals that characterize the groundwater table or potentiometric surface for each principal aquifer (§ 354.34). Principal aquifers in the Basin include the Paso Robles Formation and the Careaga Sand. Shallower units including the channel alluvium are not considered principal aquifers based on criteria of a Principal Aquifer defined by SGMA ("aquifers or aquifer systems that store, transmit, and yield significant or economic quantities of groundwater") because it does not reliably store, transmit, or yield enough water to wells. Based on Basin stakeholder feedback, available well completion reports, and the hydrogeologic conceptual model, no wells completed in the channel alluvium were identified. The proposed groundwater quality monitoring network adequately allows for collection of 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 (§ 354.34). Section 5.6.2 describes the GSAs continued effort to expand the monitoring network, including contacting landowners to request their wells be added to the groundwater level monitoring network and land access agreements be established.

Reviewer	Section Number	Page Number	Figure Number	Table Number	Comment	Response
Samantha Arthur (Audubon Society)					4. Addressing Beneficial Users in Projects and Management Actions The consideration of beneficial users when developing projects and management actions is insufficient due to the failure to completely identify benefits or impacts of identified projects and management actions, including water quality impacts, to key beneficial users of groundwater such as GDEs, aquatic habitats, surface water users, DACs, and drinking water users. Therefore, potential project and management actions may not protect these beneficial users. Groundwater sustainability under SGMA is defined not just by sustainable yield, but by the avoidance of undesirable results for all beneficial users. The GSP fails to include projects and management actions with explicit near-term benefits to the environment. While Section 6.11 documents In Lieu Recharge Projects, they are described as being in the conceptual phase and may be considered by the GSA in the future. The plan includes a municipal well mitigation program. However, the GSP fails to specify the mitigation program's benefits to DACs, if any. RECOMMENDATIONS - For DACs and domestic well owners, include a drinking water well impact mitigation program to proactively monitor and protect drinking water wells through GSP implementation. Refer to Attachment B for specific recommendations on how to implement a drinking water well mitigation program. The GSP includes a discussion of an offsite well impact mitigation program in Section 6.3, however this program is for municipal wells, not domestic wells. If this program will have benefits to DACs, describe them in detail. - For DACs and domestic well owners, include a discussion of whether potential impacts to water quality from projects and management actions could occur and how the GSA plans to mitigate such impacts. - Recharge ponds, reservoirs, and facilities for managed aquifer recharge can be designed as multiple-benefit projects to include elements that act functionally as wetlands and provide a benefit for wildlife and aquatic species. For further guidance on how to integrate multi-benefit recharge projects into your GSP, refer to the "Multi-Benefit Recharge Project Methodology Guidance Document."20 - Develop management actions that incorporate climate and water delivery uncertainties to address future water demand and prevent future undesirable results.	The GSP has been revised to address this comment. A sentence has been added in Section 6.5, which states "The information to be acquired through the well registration program can be used by the GSA for the purposes of potential risk and impact assessment with regard to the water supply adequacy and water quality for domestic and community drinking water wells within the Basin. If the information obtained through the well registration program indicates that there is a potential for adverse impacts to the future water supply adequacy or water quality of domestic and / or community drinking water supply wells then the GSA can elect to develop and implement a Drinking Water Well Impact Mitigation Program." No disadvantaged communities (DACs) were identified within the Basin, based on several datasets (refer to the IRWMP (Dudek, 2019); California Air Resources Board's (CARB) California Climate Investments (CCI) Priority Populations online mapping tool; California Office of Environmental Health Hazard Assessment's CalEnviroScreen online mapping tool of Senate Bill 535 DACs; and DWR's DACs online mapping tool using 2018 data at the places and tracts scale).

Chris Wrather comments on San Antonio Creek Valle y Basin GSP – Draft Chapter 3.
10/31/2020

Really well-done piece of work!

Introduction: No mention of USGS new study? (Oh, I see you mention it later.)

Fig 3.2 – I find it difficult to identify the regions on the map that correspond to the coloring of the legend. Would it be possible to use different colors or shading that makes it clearer?

Response: The colors to represent the different hydrologic soil groups were revised on Figure 3-2.

3.1.2.1. Would it be possible to draw the axes of these two synclines on one of the maps, and label them? I have a tough time following the textual descriptions.

Response: The Los Alamos Syncline and San Antonio Syncline are included on Figure 3-4. Note the projection of the Los Alamos Syncline is based on Dibblee et al. 1989, 1993, and 1994 in which both synclines were mapped as a single geologic structure.

What does "conformably" and "unconformably" mean?

Response: A conformity and unconformity are geology terms, stratigraphy specifically, describing a geologic contact between two rock layers in terms of the geologic record. If there is a large time gap between the two layers, the contact is referred to as an unconformity. Large time gaps between rock units can be caused by periods of non-deposition or erosion. Conversely, if the age of rock layers indicate there is no time gap in the geologic record, the contact is referred to as a conformity.

3.1.2.3 You use the word "Subbasin" in the heading. Is this different from "Basin"?

Response: This was a typo and has been corrected.

Fig 3.8 – Is this figure really necessary? It only shows the lateral boundaries of the basin. The lateral boundaries have already been shown in a number of other maps.

Response: The former Figure 3-8 was removed and the in-text references to the DWR Bulletin 118 basin boundary was changed to Figure 3-1.

Figure 3.10 – I notice you didn't include the "pond" on the Harris Ranch just NE of Los Alamos. I do see you included it in Fig. 3-11. Isn't it a spring?

Response: According to the U.S. Geological Survey National Hydrology Dataset, the locations of springs or seeps identified in the Basin are included on Figure 3-9. It is possible that more springs or seeps exist, or formerly existed within the Basin. It is also possible that surface water features exist due to surrounding land use or infrastructure (anthropogenic). Springs or seeps located in Las Flores watershed and Price Ranch were added to Figure 3-9 based on landowner observations.

Fig 3-13 – 3.16 (Ground water elevations) – These maps appear to show the groundwater elevations of the Careaga (600') as being higher than the Paso Robles (450') in the vicinity of Los Alamos. That doesn't make sense to me because the Careaga formation lies below the Paso Robles. What am I missing?

Response: The water levels are collected from wells completed in the Paso Robles Formation and Careaga Sand aquifers, which occur at different depths. The data indicate that the hydraulic head, or pressure within the Careaga Sand is higher than that of the Paso Robles Formation, and so the water levels in a well screened within the Careaga Sand are higher than those screened within the Paso Robles Formation. Nested well sets are useful for determining vertical groundwater gradients (which way is the groundwater flowing vertically, up or down?).

Fig 3-17 What would you think about running a linear regression analysis on the Annual Precipitation numbers to see if there is a trend?

Response: Cumulative departure from mean precipitation was used to indicate rainfall trends because this helps us understand the antecedent conditions that determine whether we have conditions that could drive more recharge (positive slope to the cumulative departure trend line) versus conditions that would create a moisture deficit and reduce recharge to the aquifer (negative slope).

3.2.1.2.1 "Notably, since 2016, water levels have begun to increase in the majority of monitoring wells as normal rainfall conditions returned after 2016." This strikes me as a bit misleading. We noted previously that in the most recent period during which the cumulative rainfall has achieved the long-term average, there was a significant decrease in static water levels in most wells, especially those in the Los Alamos "pumping center." I think the sentence as written leaves one with the impression that things might be turning around. I don't believe the data supports that they are.

Response: This sentence will be removed.

It would be helpful to add a vertical grid to the hydrographs so it is easier to match the data point to the year on the *x*-axis.

Response: The hydrographs were revised.

"thalweg" – Had to Google that one!

Response: The use of "thalweg" was removed from the text.

Fig. 3-24, 3-25, 3-27 and 3-27 It would be helpful to add a horizontal grid to make the decline over time clearer, and a vertical grid to better identify data point by year.

Response: The hydrographs were revised.

Table 3-5 – I'm a bit confused. In the 5th column (Number of Samples at or above WQ Standard), what is the WQ standard being used? It can't be WQO or SMCL, because those are not defined for most of the constituents.

Response: The table has been revised.

Fig 3-29 The red markers mark "Lust Cleanup" sites. What is that?

Response: It is an acronym meaning Leaking Underground Storage Tank (LUST). The State and Regional Water Quality Control Boards oversee and track LUST Cleanup sites. The SWRCB's online GeoTracker tool lists these sites and any correspondence and documents related to the site for public access.

3.2.3.4.2 – "Increasing chloride concentrations have been detected in a public supply well (LACSD 4) east of Los Alamos." Should this well be shown in Fig 3-32? I don't see it there.

Response: Yes. In the Notes section of Figure 3-37 (formerly 3-32), sample location 4210002-004 is defined as synonymous with LACSD 4. We left the 421002-004 naming scheme to be consistent with the groundwater sample names from the database source.

3.2.3.4.5 – Sodium – The text describes and MQO of 100 mg/L. But Fig 3-36 shows values much less than 1 mg/L. Wondering if the units in the figure should be g/L, not mg/L?

Response: Figure 3-45 (formerly 3-36) shows Boron concentrations. We reported all constituent concentrations as mg/L (except for Arsenic which is reported as micrograms per liter) in the text, tables, and figures.

3.2.3.5 Oil and Gas. I understand that there are no results yet from the COGG program. But is the fact that the Cat Canyon, Zaca, Lompoc and Orcutt fields are categorized as "high priority" relevant? Looks like Table 3-7 describes the factors that go into this ranking. What do we do with this information?

Response: The purpose of this section to is communicate that a study evaluating potential impacts of nearby oil and gas fields on local groundwater quality is being conducted and that the existence of the nearby oil and gas fields and the nature of oil and gas exploration is being considered in terms of water quality of the Basin. The figures and tables in the section are to provide context and further explanation of the COGG program. When the COGG program releases any findings/recommendation we can implement into the GSP where appropriate.

The 487 onshore oil and gas fields in California were prioritized based on potential risk to groundwater from oil and gas development. The USGS developed a criteria-based approach to prioritize the oil and gas fields, the criteria include petroleum-well density, volume of water injected in oil fields, vertical proximity of groundwater resources to oil and gas resource development, and water-well density (Davis et al., 2018).

3.2.5 Surface water systems. Suggested addition to text to make it unambiguous:
"[Surface water systems] gain water from inflow of groundwater through the stream bed."

Response: The suggested text was added to the three level one bullets in Section 3.2.5.

California Professional Geologist License No. 7676
California Certified Hydrogeologist No. 821

March 19, 2021

Bryan Bondy, President
Bondy Groundwater Consulting, Inc.
10488 Graham Ct.
Ventura, CA 93004

Anna Olsen, Executive Director
San Antonio Basin Groundwater Sustainability Agency
920 East Stowell Rd
Santa Maria, CA 93454

RE: Peer Review of Draft Water Budget for the San Antonio Creek Valley Basin GSP

Via E-mail to aolsen@sanantoniobasingsa.org

Dear Anna:

As requested, I have completed a peer review of the draft water budget prepared by GSI Water Solutions, Inc. for the San Antonio Creek Valley Basin (the Basin) Groundwater Sustainability Plan (GSP). As part of the water budget review, I found it necessary to read the draft hydrogeologic conceptual model (HCM) for the Basin to gain a prerequisite understanding of the geologic and hydrogeologic framework of the Basin. Comments on the HCM are included in this letter, with the caveat that a full peer review of that document was not performed.

Summary of Peer Review Findings

BGC agrees with the general conclusion that groundwater storage is in a state of chronic decline. This is clear from measured groundwater level data alone. There is, however, significant uncertainty in the volumetric rate of groundwater storage decline both historically and projected into the future. This uncertainty should be communicated in the document to help inform forthcoming planning decisions and schedules.

The uncertainty stems from the fact that the water budget was developed using a spreadsheet tool that cannot be calibrated to measured groundwater levels. There is the potential for significant error in the estimates of individual water budget components. Moreover, errors for multiple terms can be cumulative or offsetting[1]. There is currently no reliable method for producing

[1] Even though many of the water budget terms are derived from the USGS Basin Characterization Model (BMC), there are significant uncertainties in its results because it is a statewide scale model that is not calibrated to local measured data. In basins where the BCM is calibrated, the calibration is limited to the runoff term.

independent estimates of groundwater storage change for comparison with the spreadsheet tool results. This is primarily due to the fact that the Basin has deep, confined aquifers that transition to an unconfined condition where they are folded upward and exposed along the Basin periphery. Groundwater storage properties change by orders of magnitude where the aquifer transitions from a confined to unconfined condition and the location of this transition changes as groundwater levels change. This complexity can only be reliably accounted for using a properly calibrated numerical flow model of the Basin.

Preliminary results from the USGS numerical model were provided to BGC for consideration during this peer review. BGC notes that, in general, the USGS model calculated similar rates groundwater storage depletion as the spreadsheet tool. However, BGC notes that the spreadsheet tool and USGS model water budget differ dramatically in their estimated inflows terms. Notably, the spreadsheet tool inflow terms have much more annual variability than the USGS model. For example, the USGS model total inflow values during the recent drought are not materially different that the wetter period prior to the drought. In contrast the spreadsheet tool inflows drop dramatically during the drought, as would be expected. Intuitively, the greater variability exhibited in the spreadsheet tool makes much more sense. However, as mentioned earlier, the spreadsheet tool is not calibrated to groundwater levels. The fact that these two independent analyses of the Basin storage depletion arrived as similar storage change rates should not be taken as evidence that the storage depletion rates are well constrained because the independent estimates employed very different assumptions about the recharge processes.

Key Findings:

In summary, BGC agrees with the author that groundwater levels and storage are clearly in a state of chronic decline. However, there is significant uncertainty in the rate of groundwater storage depletion, both historically and projected into the future that is not characterized and communicated in the document. This uncertainty should be evaluated quantitatively and clearly communicated to the stakeholders and GSA Board for consideration when developing sustainable management criteria and projects/management actions for the GSP. The GSP should lay out a path to reducing uncertainty in the rate of storage depletion over time, commensurate with the costs of projects/management actions necessary to address the storage depletion. Actions that may be most impactful in reduce uncertainty include streamflow gauging and groundwater extraction reporting/metering.

As written, the water budget does not meet all of the GSP Emergency Regulations requirements. Additionally, the text is not clear about the assumptions and/or methods used in specific water budget calculations in many instances. The detailed comments provide specific feedback on these points. In general, the document would benefit from more discussion of methods and assumptions. This may help reduce comments from stakeholders and DWR and will provide a more defensible basis for projects and management actions.

Detailed Comments

The following are detailed comments on the documents. Most comments highlight aspects that were unclear to the reviewer. Addressing these comments may help stakeholders better understand the information and may streamline DWR's review of the GSP.

Water Budget

1. Section 3.3.2.1 - Surface Water Inflow Components, Page 10:
    a. Footnote 1: It is unclear why streamflow adjustments are exclusively taken from / added to the BCM recharge component as opposed to the BCM ET term or both terms. More explanation would be helpful.

    b. More explanation is needed in Section 3.3.2.2.2 for the reader to be able to understand the assumptions and methodology utilized in the streamflow percolation calculations.

2. It is unclear what modifications were made to the BCM datasets. Table 3-9 mentions that the BCM data are "calibrated" to either gage data (streamflow) or meteorological data (recharge). Section 3.3.2.1 discusses "adjustments" to the BCM data but does not mention "calibration." Section 3.3.2.3.1 says the BCM data were "adjusted" and "calibrated". It seems clear that the BCM data were adjusted. It is not clear whether or how the BCM data were "calibrated." More information is needed for the reader to understand what calibration, if any, was performed and what methods were used.

3. Section 3.3.2.3.4. - Percolation of Treated Wastewater (Effluent Spray Irrigation), Page 11: The author concludes that the effluent spray irrigation activities do not result in groundwater recharge, presumably because the applied water is equal to or less than the crop water requirement. It is unclear whether rainfall was accounted for in this analysis. In other words, if the crop water requirement is met by effluent spray irrigation, then precipitation would become recharge instead of being transpired by crops.

4. Section 3.3.2.3.6. - Irrigation Return Flow, Page 12:
    a. It is unclear whether irrigation system uniformity is accounted for in the calculations.

    b. Consider providing references for the three efficiency factors discussed in this section.

5. Section 3.3.2.4.1. - LACSD Pumping, Page 12: The calculations for pre-1994 LACSD pumping does not make sense to the reviewer.
    a. In the example provided, how can you calculate 1992 LACSD pumping using 1993 LACSD pumping if 1993 LACSD pumping is not known to begin with?

b. It is unclear why scaling using rural domestic pumping would be relevant to estimating LACSD pumping. More explanation is needed for the reader to understand.

6. Section 3.3.2.4.5. - Riparian Evapotranspiration, Page 13:
   a. Consider providing a reference for the riparian water duty factor.

   b. Are there invasive species (e.g., *Arundo donax*) present that might justify a higher water duty factor?

7. Section 3.3.2.4.6. - Discharge to Surface Water, Page 13:
   a. The calculations described in this section are unclear, especially the text stating "…or determined using monitoring well data and surficial topography." (Please note that Appendix D-4 was not provided for the peer review).

   b. It is unclear what the calculation described in the last sentence of this section is for and how it relates to the calculations described earlier in this section.

   c. It is unclear whether vertical hydraulic conductivity values were considered in the calculations.

   d. The document should describe the potential range of uncertainty in these calculations.

8. Section 3.3.3.1 - Historical Surface Water Budget, Pages 14-15: It is unclear why the average surface water inflow (5,000 AFY [Table 3-11]) is not balanced with the average surface water outflow (5,400 AFY [Table 3-12]), given that all of the years shown in Figure 3-48 appear to be balanced. Is groundwater discharge to surface water included in the outflow, but just not shown on Figure 3-48? If so, groundwater discharge should be included as a surface water inflow in Table 3-11 and shown explicitly in Table 3-12.

9. Section 3.3.4.1 – Current Surface Water Budget, Pages 27-28: Similar question as in Water Budget Comment No. 8.

10. Section 3.3.5.1 - Projected Water Budget Calculation Methods, Pages 36-38:
    a. BGC was unable to determine what 50-year period of historical hydrology was used to develop the project water budget. Page 37, last full paragraph, discusses the time periods of various data sets, but does not state what historical period is used to develop the projected water budgets. This paragraph says, "The precipitation and ET change projections are computed relative to a baseline period of 1981 to 2011." Is that the period that was used? If so, the reviewer notes that this period is only 31 years whereas a 50-yr period is required. The historical period needs to be stated explicitly for the reader.

b. Concerning the statement "The USGS BCM, as discussed in Section 3.3.2.1.1, was calibrated to the DWR Variable Infiltration Capacity (VIC) hydrology model…" It does not appear the VIC model was used to calibrate the BCM model. It appears that author instead means to say that the climate change factors derived from the VIC model were used to adjust the BCM results to account for climate change in the water budget. The term "calibrate" is used in this same context in Section 3.3.5.1.2 and Table 9. Consider revising.

11. Section 3.3.5.2 – Projected Surface Water Budget, Pages 38-39: Similar question as in Water Budget Comment No. 8.

12. Sections 3.3.5.2 - 3.3.5.3, Tables 3-23 – 3-27, and Figures 3-55 – 3-56:
    a. 2042 and 2072 water budgets are presented and compared with the historical water budget. It is unclear what the 2042 and 2072 water budgets represent. Are they single year water budgets? Alternatively, do they represent average conditions over some period projected in the future?

    b. The projected water budget information presented in these sections does not meet the GSP Emergency Regulations requirement for annual quantification of the water budget for the 50-yr projection period (GSP Emergency Regulations § 354.18).

    c. The projected water budget information presented in these sections does not meet the GSP Emergency Regulations requirement for including a baseline future conditions against which effects of climate change and projected water demand are compared (GSP Emergency Regulations § 354.18(c)(3(A)&(B)).

    d. An annual water budget table and bar chart like that provided for the historical water budget (Table 3-16 and Figure 3-50) should be provided for the future water budget in the GSP.

13. Section 3.3.5.3.1. - Projected Water Demand, Pages 41-42, and Table 3-27:
    a. It is unclear how the projected agricultural water demand was calculated. Based on the text description of the approach, BGC calculated 2072 Ag Demand as follows: 13,459 acres X 1.75 AF/acre X 1.08 (i.e., the 2070 ET change factor) = 25,440 AF. The text and Table 3-27 indicate 26,800 AF. More clarifying explanation would be helpful.

    b. It would be helpful to explain that imported water became available to VAFB during the historical period to provide context for why the VAFB water demand is projected to decrease in the future relative to historical demand.

14. Section 3.3.5.3.2. - Projected Water Budget and Change in Groundwater Storage, Page 44: The statement "Average annual precipitation for the projected period is equal to the historical period average annual precipitation for the 2042 projected period and—interestingly—2.6 percent greater than the historical period average for the 2072 projected period" appears to conflict with the following statements on Page 38: "Annual precipitation increases by approximately 1 percent projected under 2030 conditions relative to the baseline period. Under 2070 conditions, small decreases in annual precipitation, of approximately 2 percent, are projected."

15. Section 3.3.5.3.4. - Basin Yield Estimate, Page 48: The statement "The projected average annual amount of groundwater in storage is estimated to decrease by…" is incorrect. This statement should refer to the *change in* groundwater storage, not the amount of groundwater in storage.

16. Section 3.3.6 – Spreadsheet Tool Assumptions and Uncertainty, Page 49:

    a. The text states that "The GSP spreadsheet tool is based on…calibrated USGS BCM for the Basin." It is unclear whether the BCM model was actually calibrated to measured data for the San Antonio Creek Valley Basin. The BCM model is a statewide model and has only been calibrated to surface water flow and only in selected basins. The memo does not describe whether San Antonio Creek Valley Basin is one of those basins. If it is, more information should be provided concerning the quality of the calibration and clarify that the calibration only applies to streamflow (i.e., recharge is uncalibrated). If it is not, the text should not say the BCM model is calibrated for the Basin.

    b. The text states that "Uncertainty inherent in the spreadsheet tool has been considered in the development of management actions and projects discussed in Section 6." It is unclear how the uncertainty in the spreadsheet tool can be considered in other GSP sections because the uncertainty is not characterized here. A more comprehensive descriptive assessment of the uncertainty in the spreadsheet tool results should be presented in this section together with quantitative estimates of the uncertainty.

    c. The text states that "It is GSI's opinion that the results of the water budget analysis using the spreadsheet tool are sufficient to establish the magnitude of the annual and cumulative change in groundwater in storage." Building on the prior comment, this statement should tempered by including discussion of the estimated magnitude of potential errors in the annual and cumulative change in storage.

    d. The text describes an independent calculation of storage change for the period 2015-2018 using groundwater levels and assumed aquifer storage coefficients. The text concludes that the spreadsheet tool 2015-2018 storage change result

compares favorably with the independent storage change calculation for the same period. However, this does not appear to be correct. The spreadsheet tool 2015-2018 storage change result of 52,100 AF does not compare favorably with the independent calculation result of 83,800 AF (61% difference). Moreover, the independent calculation is very error-prone given the lack of knowledge concerning the location where groundwater transitions from confined to unconfined conditions.

HCM

1. It would be helpful to label Harris Canyon on one or more figures because it is frequently referred to in the text.

2. Los Alamos and San Antonio Synclines should be depicted on the geologic map, as they are important structures discussed in the text (Figure 3-4).

3. Potential Groundwater Dependent Ecosystems (pGDEs):

    a. The pGDEs discussed in Section 3.1.3.2.2. and depicted on Figure 3-11 should be reviewed to screen out pGDEs that are not actually dependent on groundwater in a principal aquifer. Top of aquifer and groundwater elevation data should be used for this screening. The screening should also include review of aerial photos to identify and screen out and pGDEs that appear to be reliant discharges from human-made structures, such as irrigation canals, irrigated fields reservoirs, septic systems, cattle ponds, or water treatment works. It is highly recommended that these tasks be completed before developing sustainable management criteria.

    b. The wetland areas called out on Figure 3-11 should be screened to assess whether they are actually wetlands and whether they are connected to groundwater in a principal aquifer. BGC reviewed Google Earth and groundwater levels from Figures 3-13 and 3-15. BGC's found that some mapped wetlands lack visual evidence of a wetland or may be an irrigation reservoir. With one exception, BGC found that the mapped wetlands are at elevations that are at least 25 feet above the groundwater elevation in the underlying aquifer, with most being 100 feet or more above. This suggests that the mapped wetland features are not likely connected to groundwater in a principal aquifer and should be screened out. In the one exception, further evaluation is needed to determine if the groundwater is confined or unconfined before concluding the mapped wetland is hydraulically connected to the principal aquifer.

    c. Page 26, last sentence: "Additional field reconnaissance is necessary to verify the existence of these potential GDEs." The screening described above can be

completed without field reconnaissance and should be performed. Field reconnaissance may only be necessary for pGDEs that cannot be screened out or confirmed via the desktop screening methods.

4. The Section 3.1.4 discussion of data gaps and uncertainty should be revised to be consistent with the SGMA definitions of those terms. The definitions are as follows. GSP Emergency Regulations §351(l) define the term “data gap” as "a lack of information that significantly affects the understanding of the basin setting or evaluation of the efficacy of Plan implementation and could limit the ability to assess whether a basin is being sustainably managed." GSP Emergency Regulations §351(ai) define the term "uncertainty" as "a lack of understanding of the basin setting that significantly affects an Agency’s ability to develop sustainable management criteria and appropriate projects and management actions in a Plan, or to evaluate the efficacy of Plan implementation, and therefore may limit the ability to assess whether a basin is being sustainably managed." Essentially, these definitions mean that a data limitation or lack of information must materially impact the ability to sustainably manage the basin to be considered a "data gap" or "uncertainty". Section 3.1.4 does not make the case that the items listed would materially impact the ability to sustainably manage the Basin. Further explanation is needed, or the discussion of these items should be revised to make clear they are not “data gaps” as the term is defined for SGMA. This is important because the implication is that "data gaps" and "uncertainties" identified in the GSP must be filled to sustainably manage the basin, likely at a significant cost to the groundwater users.

   Similarly, Page 39 states that “The limited spatial coverage of publicly available groundwater level data for the Paso Robles Formation Aquifer is a significant data gap.” A similar statement is made for the Careaga Sand Formation Aquifer on Page 44. These statements seem inconsistent with groundwater level contour maps which show data coverage across the basin for contour preparation. More information is needed to justify the conclusion that the current well network is so limited that it materially impacts the ability of the GSA to sustainably manage the basin. Specific data gaps in the monitoring network should be identified and tied to specific sustainable management issues.

5. Groundwater Contours (Figures 3-13 and 3-14) – Consider dashing contours that lack data control.

6. Section 3.2.4 concerning land subsidence should discuss the possibility that the small measured land surface elevation changes could be related to tectonic activity. The Basin is located in a tectonically active region and is itself a down warping synclinal trough. The lack of discussion about tectonics creates an impression that the land surface elevation changes are exclusively attributed to groundwater withdrawal. The text should be revised to eliminate this impression. Over time, it will likely be possible to distinguish land surface elevation changes due to tectonic motion from those caused by groundwater

withdrawal by comparing InSAR and long-term groundwater level date with UNAVCO continuous GSP elevation trends.

Closing

Thank you for the opportunity to peer review the water budget. Please contact me if you have any questions about the review findings.

Sincerely,

Bryan Bondy

Bryan Bondy, President
Bondy Groundwater Consulting, Inc.

cc: Jeff Barry, GSI

TECHNICAL MEMORANDUM

San Antonio Creek Valley Groundwater Basin – Draft Water Budget Peer Review

To:	San Antonio Creek Valley Groundwater Basin Groundwater Sustainability Agency Ad Hoc Committee
From:	Michael McAlpin, GSI Water Solutions, Inc. Jeff Barry, GSI Water Solutions, Inc. Nate Page, GSI Water Solutions, Inc.
CC:	Jim McCord, IRP Water
Attachments:	Appendix D-4
Date:	November 19, 2021

Introduction

The purpose of this document is to address comments made by Mr. Bryan Bondy of Bondy Groundwater Consulting, Inc. on March 19, 2021 regarding the Draft Water Budget (Section 3.3) of the Groundwater Sustainability Plan for the subject basin.

Comments made by Mr. Bondy are shown in *italicized* and **bold** font. Mr. Bondy's comments include a reference to a specific sub-section followed by associated comments. GSI's response is shown as regular body text following each comment.

Draft Water Budget Peer Review Comments and Response

Water Budget

1. Section 3.3.2.1 - Surface Water Inflow Components, Page 10:

a. Footnote 1: It is unclear why streamflow adjustments are exclusively taken from / added to the BCM recharge component as opposed to the BCM ET term or both terms. More explanation would be helpful.

Response: Further explanation of calculations of surface and groundwater budget components will be included in the revised text and or as Appendix E.

b. More explanation is needed in Section 3.3.2.2.2 for the reader to be able to understand the assumptions and methodology utilized in the streamflow percolation calculations.

Response: Further explanation of calculations of surface and groundwater budget components will be included in the revised text and or as Appendix E.

2. It is unclear what modifications were made to the BCM datasets. Table 3-9 mentions that the BCM data are "calibrated" to either gage data (streamflow) or meteorological data (recharge). Section 3.3.2.1

discusses "adjustments" to the BCM data but does not mention "calibration." Section 3.3.2.3.1 says the BCM data were "adjusted" and "calibrated". It seems clear that the BCM data were adjusted. It is not clear whether or how the BCM data were "calibrated." More information is needed for the reader to understand what calibration, if any, was performed and what methods were used.

Response: Further explanation of calculations of surface and groundwater budget components will be included in the revised text and or as Appendix E.

The BCM precipitation data was adjusted to regional precipitation station data (by adjusting the BCM precipitation data to honor the regional precipitation station data for the pixels where the precipitation gages are located). Initial adjustments to BCM recharge and runoff terms were based on the adjusted precipitation ratio (adjusted precipitation ÷ raw precipitation). Subsequent adjustments were made between recharge and runoff terms to match surface water flow gauge data or to match general understanding of runoff to recharge relationships in the area. This was based on a simple hydrologic conceptual model (rejected recharge and streambed percolation of runoff) and related mathematical models were calibrated to the surface water gauge flow data. All the BCM generated recharge and runoff in the basin was always accounted for, no mass was lost or removed. Rejected recharge was accounted for as surface water and all runoff generated during drier years percolated as streambed percolation.

3. Section 3.3.2.3.4. - Percolation of Treated Wastewater (Effluent Spray Irrigation), Page 11: The author concludes that the effluent spray irrigation activities do not result in groundwater recharge, presumably because the applied water is equal to or less than the crop water requirement. It is unclear whether rainfall was accounted for in this analysis. In other words, if the crop water requirement is met by effluent spray irrigation, then precipitation would become recharge instead of being transpired by crops.

Response: Further explanation of calculations of surface and groundwater budget components will be included in the revised text and or as Appendix E.

4. Section 3.3.2.3.6. - Irrigation Return Flow, Page 12:

a. It is unclear whether irrigation system uniformity is accounted for in the calculations.

Response: Further explanation of calculations of surface and groundwater budget components will be included in the revised text and or as Appendix E.

For irrigated agriculture in the Basin, an irrigation efficiency of 80 percent is assumed for all crops except vineyards, which are generally irrigated using a drip system at an efficiency of 90 percent.[1] The urban landscape irrigation efficiency is assumed to be 70 percent. These irrigation return flow proportions were based on feedback with the Basin's GSA Special Advisory Committee and with representatives from the Santa Ynez EMA, CMA, and WMA GSAs. These irrigation return flows were used throughout the Basin. Irrigation return flow volumes have been calculated using these efficiencies multiplied by the calculated annual volumes of irrigation water applied to each crop type (based on land use surveys within the Basin in from 1959, 1968, 1977, 1986, 1996, 2006, 2016, and 2020) and assigned crop-specific water duty factors.

b. Consider providing references for the three efficiency factors discussed in this section.

Response: References will be included in the revised text.

5. Section 3.3.2.4.1. - LACSD Pumping, Page 12: The calculations for pre-1994 LACSD pumping does not make sense to the reviewer.

[1] Irrigation efficiencies within vineyards have increased from 70 percent in the 1970s to 80 percent in the 1980s, and to 90 percent more recently, based on personal conversations with regional irrigators.

a. In the example provided, how can you calculate 1992 LACSD pumping using 1993 LACSD pumping if 1993 LACSD pumping is not known to begin with?

Response: The projected historical (1981-1993) and future (2022-2072) LACSD pumping is calculated using reported LACSD pumping data (1994-2018). The WYs used for the example calculations in the text will be revised to include a WY with reported LACSD pumping. Further explanation of calculations of surface and groundwater budget components will be included in the revised text and or as Appendix E.

b. It is unclear why scaling using rural domestic pumping would be relevant to estimating LACSD pumping. More explanation is needed for the reader to understand.

Response: The population data (historical and projected) used for scaling of LACSD pumping and rural domestic pumping is the same. Therefore, the scaling factors for both groundwater budget components were equal. The calculations were completed first on the projected rural domestic pumping and subsequently used to calculate the LACSD projected pumping. Further explanation of calculations of surface and groundwater budget components will be included in the revised text and or as Appendix E.

6. Section 3.3.2.4.5. - Riparian Evapotranspiration, Page 13:

a. Consider providing a reference for the riparian water duty factor.

Response: References will be included in the revised text.

b. Are there invasive species (e.g., Arundo donax) present that might justify a higher water duty factor?

Response: Currently, no complete biological survey has been conducted or made available for review to identify specific plant species that may be contributing to riparian ET. Thus, we have no information concerning invasive species in the basin. Surveys completed adjacent to the Basin have been reviewed and the identified plant species will be considered during revision of the riparian ET groundwater budget component.

7. Section 3.3.2.4.6. - Discharge to Surface Water, Page 13:

a. The calculations described in this section are unclear, especially the text stating "…or determined using monitoring well data and surficial topography." (Please note that Appendix D-4 was not provided for the peer review).

Response: The monitoring well data referred to nested monitoring wells located adjacent to Barka Slough used to calculate vertical gradient. The surficial topography was used to calculate the hydraulic gradient of the alluvium located east of Barka Slough. Explanation of these calculations were included as Appendix D-4 which we neglected to include in the review package.

The Discharge to Surface Water groundwater budget component has been revised since the release of the subject draft section.

GSI revised the groundwater discharge to surface water and surface water discharge components of the water budgets to directly incorporate surface water flow data from the Casmalia stream gage, located on San Antonio Creek downstream (west) of the slough. This allowed a direct calculation of the Barka Slough outflows utilizing available recorded flow data in San Antonio Creek as described below.

The USGS BCM runoff model (adjusted to regional rain gauge data) was used directly to estimate the annual surface water inflow to the Barka Slough (**SswIN**). The annual surface water flow discharging from the slough (**SswOUT**) was estimated by subtracting the USGS BCM runoff model flows for the watershed areas contributing flow to San Antonio Creek downstream of the slough and upstream of the Casmalia gage (**BCMds**)

and adding the estimated annual agricultural ET for the crops located adjacent to the creek between the slough and the gage (**AgET**) to the annual surface water flow measured at the Casmalia gage (**Cas**), as shown here:

$$SswOUT = Cas - BCMds + AgET$$

The agriculture ET (**AgET**) was estimated using a fixed annual water duty factor of 2.1 AF/ac-yr (for truck and berry crops per the 2018 LandIQ dataset available on SGMA DataViewer) and an assumed 20 percent irrigation return flow rate. The **AgET** estimate is based on the assumption that crop irrigation water is derived from shallow alluvial wells in direct communication with San Antonio Creek and that irrigation return flows wind up back in direct communication with the creek[2].

The estimated total annual volume of groundwater discharge to surface water in the slough (**GWdis**) was estimated as follows:

$$GWdis = SswOUT - SswIN + SET$$

where, **SswIN** is the surface water inflows to the Slough and **SET** is the estimated annual slough riparian evapotranspiration.

Appendix D will be included in the revised document.

b. It is unclear what the calculation described in the last sentence of this section is for and how it relates to the calculations described earlier in this section.

Response: The Discharge to Surface Water groundwater budget component has been revised since the release of the subject draft section. See response to comment 7a.

c. It is unclear whether vertical hydraulic conductivity values were considered in the calculations.

Response: The Discharge to Surface Water groundwater budget component has been revised since the release of the subject draft section. See response to comment 7a.

d. The document should describe the potential range of uncertainty in these calculations.

Response: A discussion of uncertainty regarding calculation of each groundwater budget component will be included in the revised text.

8. Section 3.3.3.1 - Historical Surface Water Budget, Pages 14-15: It is unclear why the average surface water inflow (5,000 AFY [Table 3-11]) is not balanced with the average surface water outflow (5,400 AFY [Table 3-12]), given that all of the years shown in Figure 3-48 appear to be balanced. Is groundwater discharge to surface water included in the outflow, but just not shown on Figure 3-48? If so, groundwater discharge should be included as a surface water inflow in Table 3-11 and shown explicitly in Table 3-12.

Response: Groundwater discharge to surface water will be included as an inflow term in the revised Surface Water Budget (including text, tables, and figures); consequently, resulting in a balance of average surface water inflow and outflow.

9. Section 3.3.4.1 – Current Surface Water Budget, Pages 27-28: Similar question as in Water Budget Comment No. 8.

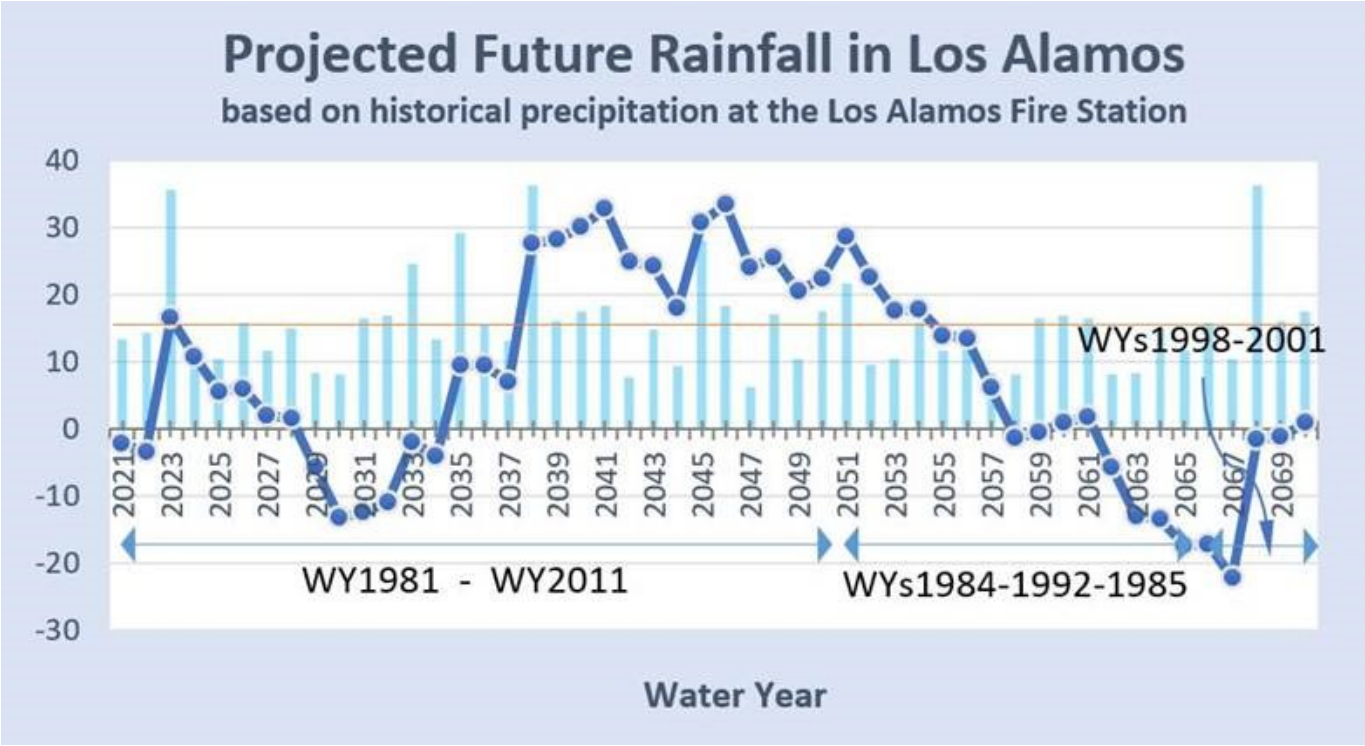
[2] This assumption is supported by geologic mapping showing that San Antonio Creek is contained within a narrow package of recent alluvium underlain by relatively impermeable bedrock between Barka Slough and the Casmalia gage (Dibblee and Ehrenspeck, 1989).

Response: Groundwater discharge to surface water will be included as an inflow term in the revised Surface Water Budget (including text, tables, and figures); consequently, resulting in a balance of average surface water inflow and outflow.

10. Section 3.3.5.1 - Projected Water Budget Calculation Methods, Pages 36-38:

a. BGC was unable to determine what 50-year period of historical hydrology was used to develop the project water budget. Page 37, last full paragraph, discusses the time periods of various data sets, but does not state what historical period is used to develop the projected water budgets. This paragraph says, "The precipitation and ET change projections are computed relative to a baseline period of 1981 to 2011." Is that the period that was used? If so, the reviewer notes that this period is only 31 years whereas a 50-yr period is required. The historical period needs to be stated explicitly for the reader.

Response: The historical period included the following sequence of WYs and a graphic is included for illustration below: 1981-2011, 1984-1992-1985, and 1998-2001.



WYs used in the projected 50-year base period were limited by the following data sets: the historical water budget period (1981-2018), the USGS BCM data set (1980-2018), and the VIC model data set (1915-2011).

The revised text will include further clarification of the 50-year period used for historical hydrology to develop the projected water budget.

b. Concerning the statement "The USGS BCM, as discussed in Section 3.3.2.1.1, was calibrated to the DWR Variable Infiltration Capacity (VIC) hydrology model…" It does not appear the VIC model was used to calibrate the BCM model. It appears that author instead means to say that the climate change factors derived from the VIC model were used to adjust the BCM results to account for climate change in the water budget. The term "calibrate" is used in this same context in Section 3.3.5.1.2 and Table 9. Consider revising.

Response: The use of terms such as "calibrated" and "adjusted" will be reviewed and revised appropriately in the revised text.

11. Section 3.3.5.2 – Projected Surface Water Budget, Pages 38-39: Similar question as in Water Budget Comment No. 8.

Response: Groundwater discharge to surface water will be included as an inflow term in the revised Surface Water Budget (including text, tables, and figures); consequently, resulting in a balance of average surface water inflow and outflow.

12. Sections 3.3.5.2 - 3.3.5.3, Tables 3-23 – 3-27, and Figures 3-55 – 3-56:

a. 2042 and 2072 water budgets are presented and compared with the historical water budget. It is unclear what the 2042 and 2072 water budgets represent. Are they single year water budgets? Alternatively, do they represent average conditions over some period projected in the future?

Response: The 2042 and 2072 water budgets represent average conditions over a 50-year projected period (see response to comment 10a for 50-year base period). Further clarification will be included in the revised text.

b. The projected water budget information presented in these sections does not meet the GSP Emergency Regulations requirement for annual quantification of the water budget for the 50-yr projection period (GSP Emergency Regulations § 354.18).

Response: The projected water budgets were developed using a 50-year projection period (see response to comment 10a for 50-year base period). An average of the annual conditions is used for in text discussion and graphics. Annual quantification of the water budget for the 50-year projection was completed to calculate the average for the 2042 and 2072 projected future water budgets. A table (like the Spreadsheet Tool) representing annual quantification over the 50-year projected water budget period will be included in the revised text and or Appendix E.

c. The projected water budget information presented in these sections does not meet the GSP Emergency Regulations requirement for including a baseline future conditions against which effects of climate change and projected water demand are compared (GSP Emergency Regulations § 354.18(c)(3(A)&(B)).

(A) Projected hydrology shall utilize 50 years of historical precipitation, evapotranspiration, and streamflow information as the baseline condition for estimating future hydrology. The projected hydrology information shall also be applied as the baseline condition used to evaluate future scenarios of hydrologic uncertainty associated with projections of climate change and sea level rise.
(B) Projected water demand shall utilize the most recent land use, evapotranspiration, and crop coefficient information as the baseline condition for estimating future water demand. The projected water demand information shall also be applied as the baseline condition used to evaluate future scenarios of water demand uncertainty associated with projected changes in local land use planning, population growth, and climate.

Response: A 50-year baseline period was used in the development of the projected water budget (see response to comment 10a for 50-year base period). In order to develop a projected water budget with climate change factors and projected water demand incorporated, a 50-year baseline period had be to developed first; consequently satisfying regulations 354.18(c)(3(A)&(B) in GSI's interpretation. Tables similar to the Spreadsheet Tool for the 50-year baseline period and projected periods are included in Appendix E.

d. An annual water budget table and bar chart like that provided for the historical water budget (Table 3-16 and Figure 3-50) should be provided for the future water budget in the GSP.

Response: The projected water budgets were developed using a 50-year projection period. An average of the conditions is used for in text discussion and graphics. A table (like 3-21) representing annual quantification over the 50-year projected water budget period was developed to calculate average conditions will be included in the revised text or Appendix E. Generation of a chart showing annual water budget factors (like Figure 3-50) from this table will be considered.

13. Section 3.3.5.3.1. - Projected Water Demand, Pages 41-42, and Table 3-27:

a. It is unclear how the projected agricultural water demand was calculated. Based on the text description of the approach, BGC calculated 2072 Ag Demand as follows: 13,459 acres X 1.75 AF/acre X 1.08 (i.e., the 2070 ET change factor) = 25,440 AF. The text and Table 3-27 indicate 26,800 AF. More clarifying explanation would be helpful.

Response: This was a mathematical error using the incorrect change factor and will be revised.

b. It would be helpful to explain that imported water became available to VAFB during the historical period to provide context for why the VAFB water demand is projected to decrease in the future relative to historical demand.

Response: Further clarification will be included in the revised text regarding SWP water becoming available to VAFB via the CCWA during the historical period.

14. Section 3.3.5.3.2. - Projected Water Budget and Change in Groundwater Storage, Page 44: The statement "Average annual precipitation for the projected period is equal to the historical period average annual precipitation for the 2042 projected period and— interestingly—2.6 percent greater than the historical period average for the 2072 projected period" appears to conflict with the following statements on Page 38: "Annual precipitation increases by approximately 1 percent projected under 2030 conditions relative to the baseline period. Under 2070 conditions, small decreases in annual precipitation, of approximately 2 percent, are projected."

Response: This was a typo and will be revised.

15. Section 3.3.5.3.4. - Basin Yield Estimate, Page 48: The statement "The projected average annual amount of groundwater in storage is estimated to decrease by…" is incorrect. This statement should refer to the change in groundwater storage, not the amount of groundwater in storage.

Response: GSI interprets the change of groundwater storage as storage capacity (e.g., land subsidence resulting from collapse of pore space and a loss of groundwater storage). GSI understands change of groundwater in storage as the change in the volume of groundwater in storage, rather than the loss of groundwater storage capacity.

16. Section 3.3.6 – Spreadsheet Tool Assumptions and Uncertainty, Page 49:

a. The text states that "The GSP spreadsheet tool is based on…calibrated USGS BCM for the Basin." It is unclear whether the BCM model was actually calibrated to measured data for the San Antonio Creek Valley Basin. The BCM model is a statewide model and has only been calibrated to surface water flow and only in selected basins. The memo does not describe whether San Antonio Creek Valley Basin is one of those basins. If it is, more information should be provided concerning the quality of the calibration and clarify that the calibration only applies to streamflow (i.e., recharge is uncalibrated). If it is not, the text should not say the BCM model is calibrated for the Basin.

Response: The use of terms such as "calibrated" and "adjusted" will be reviewed and revised appropriately in the revised text. Further clarification of the use of the USGS BCM will be included in the revised text.

b. The text states that "Uncertainty inherent in the spreadsheet tool has been considered in the development of management actions and projects discussed in Section 6." It is unclear how the uncertainty in the spreadsheet tool can be considered in other GSP sections because the uncertainty is not characterized here. A more comprehensive descriptive assessment of the uncertainty in the spreadsheet tool results should be presented in this section together with quantitative estimates of the uncertainty.

Response: A discussion of uncertainty regarding calculation of each groundwater budget component used in the spreadsheet tool will be included in the revised text.

c. The text states that "It is GSI's opinion that the results of the water budget analysis using the spreadsheet tool are sufficient to establish the magnitude of the annual and cumulative change in groundwater in storage." Building on the prior comment, this statement should be tempered by including discussion of the estimated magnitude of potential errors in the annual and cumulative change in storage.

Response: A discussion of uncertainty regarding calculation of each groundwater budget component and, if feasible, potential errors in the estimated magnitude of annual and cumulative change in storage will be included in the revised text.

d. The text describes an independent calculation of storage change for the period 2015-2018 using groundwater levels and assumed aquifer storage coefficients. The text concludes that the spreadsheet tool 2015-2018 storage change result compares favorably with the independent storage change calculation for the same period. However, this does not appear to be correct. The spreadsheet tool 2015- 2018 storage change result of 52,100 AF does not compare favorably with the independent calculation result of 83,800 AF (61% difference). Moreover, the independent calculation is very error-prone given the lack of knowledge concerning the location where groundwater transitions from confined to unconfined conditions.

Response: The spreadsheet tool calculation of change in storage for the period 2015-2018 includes 4 water years (2015, 2016, 2017, and 2018) resulting in a change in storage value of 77,600 AF (7 percent difference when compared to the groundwater level elevation-based calculation of 83,800 AF).

HCM

1. It would be helpful to label Harris Canyon on one or more figures because it is frequently referred to in the text.

Response: The location of Harris Canyon is labeled on Figure 3-1. The labeling of Harris Canyon will be considered during revision of other figures.

2. Los Alamos and San Antonio Synclines should be depicted on the geologic map, as they are important structures discussed in the text (Figure 3-4).

Response: The Los Alamos Syncline and San Antonio Syncline are included on Figure 3-4. Note the projection of the Los Alamos Syncline is based on Dibblee et al. 1989, 1993, and 1994 in which both synclines were mapped as a single geologic structure.

3. Potential Groundwater Dependent Ecosystems (pGDEs):

a. The pGDEs discussed in Section 3.1.3.2.2. and depicted on Figure 3-11 should be reviewed to screen out pGDEs that are not actually dependent on groundwater in a principal aquifer. Top of aquifer and groundwater elevation data should be used for this screening. The screening should also include review of aerial photos to identify and screen out and pGDEs that appear to be reliant discharges from human-made structures, such as irrigation canals, irrigated fields reservoirs, septic systems, cattle ponds, or water

treatment works. It is highly recommended that these tasks be completed before developing sustainable management criteria.

Response: Further evaluation of pGDEs was conducted after the distribution of the draft HCM section of the Basins GSP. The analysis considered elements included in the above comment.

b. The wetland areas called out on Figure 3-11 should be screened to assess whether they are actually wetlands and whether they are connected to groundwater in a principal aquifer. BGC reviewed Google Earth and groundwater levels from Figures 3-13 and 3-15. BGC's found that some mapped wetlands lack visual evidence of a wetland or may be an irrigation reservoir. With one exception, BGC found that the mapped wetlands are at elevations that are at least 25 feet above the groundwater elevation in the underlying aquifer, with most being 100 feet or more above. This suggests that the mapped wetland features are not likely connected to groundwater in a principal aquifer and should be screened out. In the one exception, further evaluation is needed to determine if the groundwater is confined or unconfined before concluding the mapped wetland is hydraulically connected to the principal aquifer.

Response: Further evaluation of pGDEs (including wetlands) was conducted after the distribution of the draft HCM section of the Basins GSP. The analysis considered elements included in the above comment.

c. Page 26, last sentence: "Additional field reconnaissance is necessary to verify the existence of these potential GDEs." The screening described above can be completed without field reconnaissance and should be performed. Field reconnaissance may only be necessary for pGDEs that cannot be screened out or confirmed via the desktop screening methods.

Response: Further evaluation of pGDEs (including wetlands) was conducted after the distribution of the draft HCM section of the Basins GSP. The analysis considered elements included in the above comment.

4. The Section 3.1.4 discussion of data gaps and uncertainty should be revised to be consistent with the SGMA definitions of those terms. The definitions are as follows. GSP Emergency Regulations §351(l) define the term "data gap" as "a lack of information that significantly affects the understanding of the basin setting or evaluation of the efficacy of Plan implementation and could limit the ability to assess whether a basin is being sustainably managed." GSP Emergency Regulations §351(ai) define the term "uncertainty" as "a lack of understanding of the basin setting that significantly affects an Agency's ability to develop sustainable management criteria and appropriate projects and management actions in a Plan, or to evaluate the efficacy of Plan implementation, and therefore may limit the ability to assess whether a basin is being sustainably managed." Essentially, these definitions mean that a data limitation or lack of information must materially impact the ability to sustainably manage the basin to be considered a "data gap" or "uncertainty". Section 3.1.4 does not make the case that the items listed would materially impact the ability to sustainably manage the Basin. Further explanation is needed, or the discussion of these items should be revised to make clear they are not "data gaps" as the term is defined for SGMA. This is important because the implication is that "data gaps" and "uncertainties" identified in the GSP must be filled to sustainably manage the basin, likely at a significant cost to the groundwater users.

Response: The use of the terms "data gap" and "uncertainty" will be evaluated for consistency with SGMA definitions.

Similarly, Page 39 states that "The limited spatial coverage of publicly available groundwater level data for the Paso Robles Formation Aquifer is a significant data gap." A similar statement is made for the Careaga Sand Formation Aquifer on Page 44. These statements seem inconsistent with groundwater level contour maps which show data coverage across the basin for contour preparation. More information is needed to justify the conclusion that the current well network is so limited that it materially impacts the ability of the

GSA to sustainably manage the basin. Specific data gaps in the monitoring network should be identified and tied to specific sustainable management issues.

Response: The use of the terms "data gap" and "uncertainty" will be evaluated for consistency with SGMA definitions.

Groundwater contour figures were revised to identify areas that lack data control.

5. Groundwater Contours (Figures 3-13 and 3-14) – Consider dashing contours that lack data control.

Response: Groundwater contour figures were revised to identify areas that lack data control.

6. Section 3.2.4 concerning land subsidence should discuss the possibility that the small measured land surface elevation changes could be related to tectonic activity. The Basin is located in a tectonically active region and is itself a down warping synclinal trough. The lack of discussion about tectonics creates an impression that the land surface elevation changes are exclusively attributed to groundwater withdrawal. The text should be revised to eliminate this impression. Over time, it will likely be possible to distinguish land surface elevation changes due to tectonic motion from those caused by groundwater withdrawal by comparing InSAR and long-term groundwater level data with UNAVCO continuous GSP elevation trends.

Response: Further discussion will be included regarding land subsidence including consideration of the regional geomorphic setting as well as oil and gas extraction in Section 3.2.4.

BONDY
Groundwater Consulting, Inc.

California Professional Geologist License No. 7676
California Certified Hydrogeologist No. 821

October 31, 2021

Bryan Bondy, President
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10488 Graham Ct.
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Anna Olsen, Executive Director
San Antonio Basin Groundwater Sustainability Agency
920 East Stowell Rd
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RE: Peer Review of Draft GSP Sustainable Management Criteria and Projects and Management Actions

Via E-mail to aolsen@sanantoniobasingsa.org

Dear Anna:

As requested, I have completed a peer review of the draft Groundwater Sustainability Plan (GSP) for the San Antonio Creek Valley Basin (the Basin) prepared by GSI Water Solutions, Inc. As you may recall, I previously reviewed the draft water budget and hydrogeologic conceptual model sections of the GSP; those sections were not reviewed again. Also, pursuant to your request, this review focused on the sustainable management criteria (Section 4) and projects and management actions (Section 6). Monitoring Networks (Section 5) and GSP Implementation (Section 7) were not reviewed.

Overall, the GSP is well written and seeks to comply with the GSP Emergency Regulations. Many of the comments offered below highlight aspects that were unclear to the reviewer. Addressing these comments may help stakeholders better understand the information and may help avoid some DWR comments. Some of the comments below address potential concerns that the GSA may wish to evaluate prior to adopting the GSP or during the first 5-year GSP assessment period.

Section 4: Sustainable Management Criteria

1. Section 4 – Sustainable Management Criteria, Page 4-1: End of second paragraph: Consider noting that the SMC reevaluation and potential modification will happen no less frequently than the required 5-year GSP assessments.

2. Section 4.1 – Definitions, Page 4-3: Definition of "Undesirable result" differs from the definition in the cited Water Code section. The text "…caused by groundwater pumping…" should read "…caused by groundwater conditions…" There may be other differences; this just happens to be the one I noticed.

3. Section 4.2.1 – Qualitative Objectives for Meeting Sustainability Goals, Page 4-4: It may be helpful to qualify the objectives for "Avoid Degraded Groundwater Quality" by noting that the GSA is only responsible for groundwater quality degradation caused by groundwater pumping or GSP implementation and explain the nexus between pumping or GSP implementation and potential water quality changes.

4. Section 4.3.2 – Criteria for Defining Undesirable Results, Page 4-6: Bullet List:

    a. It is unclear whether the three criterion bullets are intended to be applied conjunctively or disjunctively.

    b. Third bullet – There is a concern with the use of the term "Impacts" because not all impacts may be significant and unreasonable. Consider replacing "Impacts" with "Significant and unreasonable impacts" to better align with the SGMA definition of undesirable results.

5. Section 4.5.1 –Undesirable Results for Groundwater Levels, Page 4-13: Bullet List:

    a. It is unclear whether the three criterion bullets are intended to be applied conjunctively or disjunctively.

    b. First bullet – It may be helpful to explain the basis for selecting 50% of representative wells exceeding the minimum thresholds.

    c. Second bullet – There is a concern with the use of the term "impact" because not all impacts may be significant and unreasonable. Consider replacing "impact" with "significant and unreasonable impacts" to better align with the SGMA definition of undesirable results.

    d. Third bullet –

        i. What are the historical average production rates that will be used as the baseline for evaluation of this criterion (I did not find the values in the GSP)?

        ii. The logic for the third bullet seems questionable. The average historical production likely includes some years with lower-than-average values. Why would it be significant and unreasonable in the future to not be able to produce at average historical rates when the historical rates themselves include years with less than average production, which was not considered an undesirable result historically?

iii. Consider providing quantitative measures. Is one well unable to produce historical average quantities of water considered significant and unreasonable, or is it some larger number (or percentage) of wells?

6. Section 4.5.2 – Minimum Thresholds for Groundwater Levels, Pages 4-14 – 4-16: It is noted that the well impact analysis used to support the minimum thresholds is not very sensitive to the groundwater elevation, as indicated by the small change in the percentages of wells with various groundwater levels below top of screen. The well impact analysis results for the range of groundwater levels considered appears to be controlled by a small number of wells that are located in apparently unconfined areas near the edges of the basin and some wells that appear to be outliers compared to nearby wells. For these reasons, the well impact analysis results may not be representative of most wells in the basin and the resulting minimum thresholds may not be as representative as thought. It is suggested this analysis be revisited during the first 5-year GSP assessment period and refined by including additional wells (assuming more well construction information become available) and/or other approaches to evaluating potential significant and unreasonable impacts.

7. Section 4.8 – Degraded Groundwater Quality Sustainable Management Criteria, Page 4-31: The text states: "The SABGSA has no responsibility to manage groundwater quality unless it can be shown that water quality degradation is caused by pumping in the Basin, or the SABGSA implements a project that degrades water quality." It is suggested that the GSP include a discussion about the potential for pumping or GSP implementation to degrade water quality and describe criteria for evaluating whether those conditions are occurring (or describe how and when those criteria will be developed).

8. Section 4.9.1 –Undesirable Results for Land Subsidence, Page 4-40m, bullet list in middle of page:

    a. It is unclear whether the three criterion bullets are intended to be applied conjunctively or disjunctively.

    b. Consider caveating all criteria as only applying if groundwater levels are below historical low levels during the period in question.

9. Land Subsidence Minimum Threshold and Measurable Objective: The text on page 4-43 (minimum threshold) and page 4-46 (measurable objective) both say the criteria are based on the measured subsidence at the UNAVCO CGPS Station ORES from 2000-2020. However, the minimum threshold and measurable objective values are different (0.05 vs 0.04 feet per year). The text suggests that the values should be the same; therefore, it is unclear why the values are different.

10. Section 4.10.2 - Minimum Thresholds for Surface Water Depletion:

    There are concerns with using the Casmalia stream gage to establish the minimum threshold for depletion of interconnected surface water:

    First, the GSP Emergency Regulations require the minimum threshold to be the rate of depletion of surface water flow caused by groundwater pumping, not the surface water flow rate itself.

    Second, because the gage is downstream of the basin, it is measuring unused water leaving Barka Slough area. In theory, some of water measured by the gage is available for transpiration in Barka Slough if it is needed. In other words, the surface water flows at the gage could potentially decrease before undesirable results occur in Barka Slough. It is possible that flows at the gage could go to zero before significant and unreasonable effects at the Barka Slough manifest.

    Lastly, the flows measured by the gage may be impacted by processes unrelated to depletion by pumping, which are beyond the GSA's authority and control. These include: (1) flows from the four tributaries that confluence with San Antonio Creek downstream of the basin boundary; (2) variability in transpiration rates within the Barka Slough; and (3) transpiration along the portion of San Antonio Creek located between the basin boundary and the gage.

    The GSP discusses a historical depletion rate estimate developed using Darcy's Law. It is suggested that consideration be given to setting the initial minimum threshold based on the Darcy's Law calculation using the chronic lowering of groundwater levels minimum thresholds as a calculation input. This approach may align better with the GSP Emergency Regulations (using a depletion rate instead of surface water flow) and would eliminate concerns about other physical processes affecting the measurement of flow. The minimum threshold could be revisited, as planned, using the numerical model during the first 5-year GSP assessment period.

    If the current approach of using the Casmalia gage is retained, it is recommended that the minimum threshold be better explained and set lower. Page 4-54 says "This threshold was selected based on the analysis of historical base flow at the Casmalia stream gage presented on Figure 4-2." That is not enough information to understand the basis for the selected minimum threshold value. Based on visual inspection of Figure 4-2, it appears that the minimum threshold was exceeded in 2015, yet the GSP says "the EVI analysis indicates no discernible long-term trend in Barka Slough vegetative health" (p. 3-117). This suggests that there have not been undesirable results historically, including 2015. If undesirable results did not occur at the 2015 flows, then the minimum threshold is probably too high.

Section 6: Projects and Management Actions

11. The projects and management actions described in this section appear to be reasonable.

    Other projects that may be worth investigating or considering include:

    a. Bedrock wells – consideration could be given to pumping and treating groundwater from bedrock formations to create an alternative water supply.

    b. Oilfield-produced water – consideration could be given to working with the owners of the active oil production wells surrounding the basin to evaluate the feasibility of treating and using oilfield-produced water for irrigation.

    c. Water exchanges – consideration could be given to funding local water projects in other regions in exchange for State Water Project allocation.

12. Table 6-1: Header row - Groundwater Dependent Ecosystems is not a sustainability indicator identified in SGMA.

13. Section 6.9 Tier 2 Management Action 7 – Voluntary Agricultural Crop Fallowing Programs: It is noted that voluntary fallowing would likely only occur if a cap-and-trade system is in place (i.e., the proposed "Base Pumping Allocation" and "Groundwater Extraction Credit Marketing and Trading Program"). Therefore, it is suggested that this dependency be noted in the description of the management action. It is also noted that the program may potentially be enhanced (or a separate program could be implemented, depending on who it is framed) by the having the GSA lease or purchase agricultural land for fallowing. The GSA could use fees to lease/purchase the lands, if necessary or desired. The GSA could also consider purchasing groundwater extraction credits.

Closing

Thank you for the opportunity to peer review the draft GSP. Please contact me if you have any questions about the review findings.

Sincerely,

Bryan Bondy

Bryan Bondy, President
Bondy Groundwater Consulting, Inc.

cc: Jeff Barry, GSI

October 31, 2021

San Antonio Basin GSA
920 East Stowell Rd
Santa Maria, CA 93454

Submitted via web: https://portal.sanantoniobasingsa.org/comment/new

Re: Public Comment Letter for San Antonio Creek Valley Groundwater Basin Draft GSP

Dear Anna Olsen,

On behalf of the above-listed organizations, we appreciate the opportunity to comment on the Draft Groundwater Sustainability Plan (GSP) for the San Antonio Creek Valley Groundwater Basin being prepared under the Sustainable Groundwater Management Act (SGMA). Our organizations are deeply engaged in and committed to the successful implementation of SGMA because we understand that groundwater is critical for the resilience of California's water portfolio, particularly in light of changing climate. Under the requirements of SGMA, Groundwater Sustainability Agencies (GSAs) must consider the interests of all beneficial uses and users of groundwater, such as domestic well owners, environmental users, surface water users, federal government, California Native American tribes and disadvantaged communities (Water Code 10723.2).

As stakeholder representatives for beneficial users of groundwater, our GSP review focuses on how well disadvantaged communities, drinking water users, tribes, climate change, and the environment were addressed in the GSP. While we appreciate that some basins have consulted us directly via focus groups, workshops, and working groups, we are providing public comment letters to all GSAs as a means to engage in the development of 2022 GSPs across the state. Recognizing that GSPs are complicated and resource intensive to develop, the intention of this letter is to provide constructive stakeholder feedback that can improve the GSP prior to submission to the State.

Based on our review, we have significant concerns regarding the treatment of key beneficial users in the Draft GSP and consider the GSP to be **insufficient** under SGMA. We highlight the following findings:

1. Beneficial uses and users **are not sufficiently** considered in GSP development.
    a. Human Right to Water considerations **are not sufficiently** incorporated.
    b. Public trust resources **are not sufficiently** considered.
    c. Impacts of Minimum Thresholds, Measurable Objectives and Undesirable Results on beneficial uses and users **are not sufficiently** analyzed.

2. Climate change **is not sufficiently** considered.
3. Data gaps **are not sufficiently** identified and the GSP **does not have a plan** to eliminate them.
4. Projects and Management Actions **do not sufficiently consider** potential impacts or benefits to beneficial uses and users.

Our specific comments related to deficiencies of the San Antonio Creek Valley Groundwater Basin Draft GSP along with recommendations on how to reconcile them, are provided in detail in **Attachment A.**

Please refer to the enclosed list of attachments for additional technical recommendations:

Attachment A	GSP Specific Comments
Attachment B	SGMA Tools to address DAC, drinking water, and environmental beneficial uses and users
Attachment C	Freshwater species located in the basin
Attachment D	The Nature Conservancy's "Identifying GDEs under SGMA: Best Practices for using the NC Dataset"
Attachment E	Maps of representative monitoring sites in relation to key beneficial users

Thank you for fully considering our comments as you finalize your GSP.

Best Regards,

Ngodoo Atume
Water Policy Analyst
Clean Water Action/Clean Water Fund

J. Pablo Ortiz-Partida, Ph.D.
Western States Climate and Water Scientist
Union of Concerned Scientists

Samantha Arthur
Working Lands Program Director
Audubon California

Danielle V. Dolan
Water Program Director
Local Government Commission

E.J. Remson
Senior Project Director, California Water Program
The Nature Conservancy

Melissa M. Rohde
Groundwater Scientist
The Nature Conservancy

Attachment A

Specific Comments on the San Antonio Creek Valley Groundwater Basin Draft Groundwater Sustainability Plan

1. Consideration of Beneficial Uses and Users in GSP development

Consideration of beneficial uses and users in GSP development is contingent upon adequate identification and engagement of the appropriate stakeholders. The (A) identification, (B) engagement, and (C) consideration of disadvantaged communities, drinking water users, tribes,[1] groundwater dependent ecosystems, streams, wetlands, and freshwater species are essential for ensuring the GSP integrates existing state policies on the Human Right to Water and the Public Trust Doctrine.

A. Identification of Key Beneficial Uses and Users

Disadvantaged Communities and Drinking Water Users

The identification of Disadvantaged Communities (DACs) and drinking water users is **insufficient**. We note the following deficiencies with the identification of these key beneficial users.

- The GSP fails to identify and map the locations of DACs and describe the size of each DAC population within the basin.
- While the plan provides a density map of domestic wells in the basin (Figure 2-4), the GSP fails to provide depth of these wells (such as minimum well depth, average well depth, or depth range) within the basin.
- The GSP fails to identify the population dependent on groundwater as their source of drinking water in the basin. Specifics are not provided on how much each DAC community relies on a particular water supply (e.g., what percentage is supplied by groundwater).

These missing elements are required for the GSA to fully understand the specific interests and water demands of these beneficial users, and to support the consideration of beneficial users in the development of sustainable management criteria and selection of projects and management actions.

RECOMMENDATIONS
• Map the locations of DACs and provide the population of each identified DAC. The DWR DAC mapping tool can be used for this purpose.[2] Identify the sources of drinking water for DACs, including an estimate of how many people rely on groundwater (e.g., domestic wells, state small water systems, and public water systems).

[1] Our letter provides a review of the identification and consideration of federally recognized tribes (Data source: SGMA Data viewer) within the GSP from non-tribal members and NGOs. Based on the likely incomplete information available to our organizations for this review, we recommend that the GSA utilize the California Department of Water Resources' "Engagement with Tribal Governments" Guidance Document (https://water.ca.gov/Programs/Groundwater-Management/SGMA-Groundwater-Management/Best-Management-Practices-and-Guidance-Documents) to comprehensively address these important beneficial users in their GSP.

[2] The DWR DAC mapping tool is available online at: https://gis.water.ca.gov/app/dacs/.

- Include a map showing domestic well locations and average well depth across the basin.

Interconnected Surface Waters

The identification of Interconnected Surface Waters (ISWs) is **insufficient**, due to lack of supporting information provided for the ISW analysis. The GSP presents a conceptual representation of gaining and losing streams (Figure 3-52. Gaining and Losing Streams). The GSP also presents a map (Figure 3-53. Stream Classification) of the basin's stream reaches, as classified by the USGS National Hydrography Dataset (NHD), with labels `Intermittent' and 'Perennial'.

The GSP states (p. 3-102): *"Figure 3-53 is a stream classification map of the Basin as defined by the USGS NHD (USGS, 2020b). Based on the USGS NHD, all the streams in the Basin are classified as intermittent and likely to be losing streams. The stream channels located in Barka Slough are classified as perennial and likely to be gaining streams."* The GSP continues (p. 3-103): *"Interconnected surface water and groundwater within the Paso Robles Formation and Careaga Sand is indicated by the Barka Slough and perennial classification of streams in that area."* With these two statements, the GSP implies that interconnected reaches are defined by perennial conditions. However, this is an incorrect conclusion. Note the regulations [23 CCR §351(o)] define ISW 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". "At any point" has both a spatial and temporal component. Even short durations of interconnections of groundwater and surface water can be crucial for surface water flow and supporting environmental users of groundwater and surface water.

Using seasonal groundwater elevation data over multiple water year types is an essential component of identifying ISWs. The GSP does not present or analyze depth to groundwater data when identifying ISWs in the basin.

RECOMMENDATIONS

- Provide a map showing all the stream reaches in the basin, with reaches clearly labeled as interconnected or disconnected. Consider any segments with data gaps as potential ISWs and clearly mark them as such on maps provided in the GSP.
- Provide depth-to-groundwater contour maps using the best practices presented in Attachment D, to aid in the determination of ISWs. Specifically, ensure that the first step is contouring groundwater elevations, and then subtracting this layer from land surface elevations from a digital elevation model (DEM) to estimate depth to groundwater contours across the landscape. This will provide accurate contours of depth-to-groundwater along streams and other land surface depressions where GDEs are commonly found.
- Use seasonal data over multiple water year types to capture the variability in environmental conditions inherent in California's climate, when mapping ISWs. We recommend the 10-year pre-SGMA baseline period of 2005 to 2015.

- Reconcile ISW data gaps with specific measures (shallow monitoring wells, stream gauges, and nested/clustered wells) along surface water features in the Monitoring Network section of the GSP.

Groundwater Dependent Ecosystems

The identification of Groundwater Dependent Ecosystems (GDEs) is **insufficient**. The GSP took initial steps to identify and map GDEs using the Natural Communities Commonly Associated with Groundwater dataset (NC dataset). However, insufficient groundwater data was used to characterize groundwater conditions in the basin's GDEs. The GSP states (3-90): "*Contoured groundwater elevation data for spring 2015 were used to determine areas where the Natural Communities polygons were within 30 feet depth to groundwater. Spring 2015 groundwater elevations were chosen for this analysis because this marked a period of the greatest recent data availability. These data are considered representative of average spring-summer conditions within the last 5 years.*" We recommend using groundwater data from multiple seasons and water year types to determine the range of depth to groundwater around NC dataset polygons. Using seasonal groundwater elevation data over multiple water year types is an essential component of identifying GDEs and is necessary to capture the variability in environmental conditions inherent in California's climate.

We commend the GSA for including an inventory of flora and fauna species in the basin's GDEs. Section 3.2.6.1 presents a discussion of potential GDE vegetation classifications and their acreage, and each of these GDE units is mapped individually on Figure 3-10 (Natural Communities Commonly Associated with Groundwater Dataset). Table 3-9 presents the plants and their rooting depths likely present in Barka Slough. Table 3-12 presents the special-status species that may be located within the basin, which are further discussed in the GSP text and mapped on Figure 3-57 (Special-Status Species Critical Habitat).

Within Section 3.2.6.1 (Identification of Potential GDEs), the GSP states that the maximum rooting depth of Valley Oak (*Quercus lobata*) is 80 feet. However, this deeper rooting depth was not used when verifying whether Valley Oak polygons from the NC Dataset are supported by groundwater. Figure 3-10 shows acreage of Valley Oak polygons across the basin in areas covered by the > 30 ft depth to water area mapped on Figure 3-55. Of the 495 acres of Valley Oak mapped on Figure 3-10, no acreage is retained as a potential GDE in the GSP.

RECOMMENDATIONS

- Refer to Attachment D of this letter for best practices for using local groundwater data to verify whether polygons in the NC Dataset are supported by groundwater in an aquifer. If insufficient data are available to describe groundwater conditions within or near polygons from the NC dataset, include those polygons as "Potential GDEs" in the GSP until data gaps are reconciled in the monitoring network.

- Use depth-to-groundwater data from multiple seasons and water year types (e.g., wet, dry, average, drought) to determine the range of depth to groundwater around NC dataset polygons. We recommend that a pre-SGMA baseline period (10 years from 2005 to 2015) be established to characterize groundwater conditions over multiple water year types.

- Provide depth-to-groundwater contour maps, noting the best practices presented in Attachment D. Specifically, ensure that the first step is contouring groundwater elevations, and then subtracting this layer from land surface elevations from a digital elevation model (DEM) to estimate depth-to-groundwater contours across the landscape. The GSP maps the 30-foot groundwater depth contour on Figure 3-55, showing two areas (<= 30 ft Depth To Water and > 30 ft Depth To Water). However, full depth to groundwater contours are needed to evaluate the valley oak NC dataset polygons.

- Re-evaluate the 495 acres of valley oak present in the basin. Refer to Attachment B for more information on TNC's plant rooting depth database. Deeper thresholds are necessary for plants that have reported maximum root depths that exceed the averaged 30-ft threshold, such as valley oak (*Quercus lobata*). We recommend that the reported max rooting depth for these deeper-rooted plants be used. For example, a depth-to-groundwater threshold of 80 feet should be used instead of the 30-ft threshold, when verifying whether valley oak polygons from the NC Dataset are connected to groundwater. It is important to emphasize that actual rooting depth data are limited and will depend on the plant species and site-specific conditions such as soil and aquifer types, and availability to other water sources.

Native Vegetation and Managed Wetlands

Native vegetation and managed wetlands are water use sectors that are required to be included in the water budget.[3,4] The integration of native vegetation into the water budget is **sufficient**. We commend the GSA for including the groundwater demands of this ecosystem in the historical, current and projected water budgets. Managed wetlands are not mentioned in the GSP, so it is not known whether or not they are present in the basin.

RECOMMENDATION

- State whether or not there are managed wetlands in the basin. If there are, ensure that their groundwater demands are included as separate line items in the historical, current, and projected water budgets.

B. Engaging Stakeholders

Stakeholder Engagement During GSP Development

Stakeholder engagement during GSP development is **insufficient**. SGMA's requirement for public notice and engagement of stakeholders is not fully met by the description in the Communication and Engagement Plan (Appendix C).[5]

[3] "'Water use sector' refers to categories of water demand based on the general land uses to which the water is applied, including urban, industrial, agricultural, managed wetlands, managed recharge, and native vegetation." [23 CCR §351(al)]

[4] "The water budget shall quantify the following, either through direct measurements or estimates based on data: (3) Outflows from the groundwater system by water use sector, including evapotranspiration, groundwater extraction, groundwater discharge to surface water sources, and subsurface groundwater outflow." [23 CCR §354.18]

[5] "A communication section of the Plan shall include a requirement that the GSP identify how it encourages the active involvement of diverse social, cultural, and economic elements of the population within the basin." [23 CCR §354.10(d)(3)]

The Communication and Engagement Plan describes engagement with environmental stakeholders during the GSP development process through the inclusion of an environmental representative on the GSA Advisory Committee. However, we note the following deficiencies with the overall stakeholder engagement process:

- The opportunities for public involvement are described in very general terms. They include public notices, meetings, and workshops. No specific outreach was described for DACs and drinking water users. DACs were mentioned once in the initial list of stakeholders and interested parties within the basin, but were not otherwise mentioned in the GSP.

- The plan does not include a plan for continual opportunities for engagement through the *implementation* phase of the GSP for any stakeholders, including DACs, domestic well owners, and environmental stakeholders.

RECOMMENDATIONS

- In the Communication and Engagement Plan, describe active and targeted outreach to engage DAC members, drinking water users, and environmental stakeholders through the GSP development and implementation phases. Refer to Attachment B for specific recommendations on how to actively engage stakeholders during all phases of the GSP process.

- Describe efforts to consult and engage with DACs and domestic well owners within the basin.

- Utilize DWR's tribal engagement guidance to comprehensively address all tribes and tribal interests in the basin within the GSP.[6]

C. Considering Beneficial Uses and Users When Establishing Sustainable Management Criteria and Analyzing Impacts on Beneficial Uses and Users

The consideration of beneficial uses and users when establishing sustainable management criteria (SMC) is **insufficient**. The consideration of potential impacts on all beneficial users of groundwater in the basin are required when defining undesirable results and establishing minimum thresholds.[7,8,9]

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[6] Engagement with Tribal Governments Guidance Document. Available at: https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Sustainable-Groundwater-Management/Best-Management-Practices-and-Guidance-Documents/Files/Guidance-Doc-for-SGM-Engagement-with-Tribal-Govt_ay_19.pdf

[7] "The description of undesirable results shall include [...] 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." [23 CCR §354.26(b)(3)]

[8] "The description of minimum thresholds shall include [...] how minimum thresholds may affect the interests of beneficial uses and users of groundwater or land uses and property interests." [23 CCR §354.28(b)(4)]

[9] "The description of minimum thresholds shall include [...] how state, federal, or local standards relate to the relevant sustainability indicator. If the minimum threshold differs from other regulatory standards, the agency shall explain the nature of and the basis for the difference." [23 CCR §354.28(b)(5)]

Disadvantaged Communities and Drinking Water Users

For chronic lowering of groundwater levels, the GSP presents a well impact analysis in Section 3.2.1.3. The GSP states (p. 3-50): *"Fall 2018 groundwater elevations measured in basin monitoring wells were used to assess how many wells have static water levels that are below the top of screen elevation as of that date and how many would be below top of screen if groundwater levels were lower. The results of the analysis presented on Figure 3-23 indicate that groundwater water elevations in fall 2018 were below top of screen in 20 percent of domestic wells and 12 percent of agricultural wells in the Basin."*

Minimum thresholds for groundwater levels are set at 25 feet below fall 2018 water levels. The GSP states (p. 4-15): *"The analysis indicates that water levels declining 25 feet below fall 2018 water levels do not result in a substantial increase in the number of wells affected by this condition. If water levels continue to decline, the analysis indicates well owners could observe some depletion of supply. Based on this analysis, stakeholders in the Basin believe that setting the minimum threshold for water levels at 25 feet below fall 2018 water levels will not result in depletion of supply or undesirable results. Setting the minimum threshold at this level allows time for project and management actions to be implemented before minimum thresholds are reached. The well impact analysis presented in Section 3.2 indicates that the majority of the agricultural and domestic wells can tolerate additional groundwater level decline without experiencing undesirable results."* Despite this well impact analysis, the GSP does not sufficiently describe whether minimum thresholds are consistent with California's Human Right to Water policy and will avoid significant and unreasonable loss of drinking water, especially given the absence of a domestic well mitigation plan in the GSP.[10]

Furthermore, undesirable results are characterized by groundwater levels dropping below the minimum threshold after periods of average and above-average precipitation in 50 percent of representative wells for two consecutive years. Using 50% as the threshold suggests that minimum thresholds reached during dry years or periods of drought will not result in an undesirable result. This is problematic since the GSP is failing to manage the basin in such a way that strives to minimize significant adverse impacts to beneficial users, which are often felt greatest in below-average, dry, and drought years.

In addition, the GSP does not sufficiently describe or analyze direct or indirect impacts on DACs when defining undesirable results, nor does it describe how the existing groundwater level minimum thresholds will avoid significant and unreasonable impacts to DACs and domestic well users beyond 2015 and be consistent with Human Right to Water policy.[10]

For degraded water quality, the GSP presents water quality standards for constituents of concern (COCs) in Table 4-3. The GSP establishes minimum thresholds pertaining to salts and nutrients as follows (p. 4-34): *"The WQOs presented in Table 4-3 are the minimum thresholds for TDS, chloride, sulfate, boron, sodium, and nitrate as measured by SWRCB ILRP and DDW programs in 20 percent of wells monitored. In cases where the ambient (prior to January 2015) water quality exceeds the WQO, the minimum threshold concentration is 110 percent of the ambient water quality in 20 percent of the wells."* The GSP does not, however, state which COCs have ambient concentrations that exceed the WQO, or provide a summary table of the resulting minimum thresholds.

The GSP states (p. 4-32): *"No minimum thresholds have been established for contaminants because state regulatory agencies, including the RWQCB and the Department of Toxic Substances Control, have the responsibility and authority to regulate and direct actions that address contamination."* However, SMC should be established for all COCs in the basin that may

[10] California Water Code §106.3. Available at: https://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?lawCode=WAT&sectionNum=106.3

be impacted by groundwater use and/or management, in addition to coordinating with water quality regulatory programs.

The GSP only includes a very general discussion of impacts on drinking water users when defining undesirable results and evaluating the impacts of proposed minimum thresholds. The GSP does not, however, mention or discuss direct and indirect impacts on DACs or drinking water users when defining undesirable results for degraded water quality, nor does it evaluate the cumulative or indirect impacts of proposed minimum thresholds on DACs or drinking water users.

RECOMMENDATIONS

Chronic Lowering of Groundwater Levels

- Describe direct and indirect impacts on drinking water users and DACs when describing undesirable results and defining minimum thresholds for chronic lowering of groundwater levels.

Degraded Water Quality

- Describe direct and indirect impacts on drinking water users and DACs when defining undesirable results for degraded water quality. For specific guidance on how to consider these users, refer to "Guide to Protecting Water Quality Under the Sustainable Groundwater Management Act."[11]
- Evaluate the cumulative or indirect impacts of proposed minimum thresholds for degraded water quality on drinking water users and DACs.
- In Table 4-3 (Water Quality Standards for Selected Constituents of Concern), compare WQOs, MCLs, and ambient (prior to January 2015) water quality concentrations. Present the final minimum threshold for each COC.
- Set minimum thresholds and measurable objectives for all water quality constituents within the basin that can be impacted and/or exacerbated as a result of groundwater use or groundwater management. Ensure they align with drinking water standards.[12]

Groundwater Dependent Ecosystems and Interconnected Surface Waters

When defining undesirable results for chronic lowering of groundwater levels, the GSP briefly mentions impacts to GDEs in the Barka Slough area. However, these impacts are not described or analyzed. This is problematic because without identifying potential impacts on GDEs, groundwater level minimum thresholds may compromise these environmental beneficial users. Furthermore, our comments above in the GDE section note that insufficient shallow groundwater data was used to verify the NC dataset polygons and deeper rooting depths of valley oak were not considered. After re-analyzing GDEs based on our comments above, consider potential impacts to GDEs for the chronic lowering of groundwater levels sustainability indicator.

The GSP recognizes data gaps with respect to the interconnected surface water SMC. For the Barka Slough area, the GSP states (p. 4-54): *"Without an improved understanding of the slough*

[11] Guide to Protecting Water Quality under the Sustainable Groundwater Management Act https://d3n8a8pro7vhmx.cloudfront.net/communitywatercenter/pages/293/attachments/original/1559328858/Guide_to_Protecting_Drinking_Water_Quality_Under_the_Sustainable_Groundwater_Management_Act.pdf?1559328858.

[12] "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." [23 CCR §354.34(c)(4)]

water budget, it is not possible at this time to confidently establish a minimum threshold for depletion of interconnected surface water. Until more is known about the relationship between groundwater and surface water in the vicinity of the Slough and depletion can be quantified and monitored, an interim minimum threshold, based on the best available information, focuses on avoiding depletion and maintaining surface water and groundwater flow entering and leaving the Slough." The minimum threshold is 0.15 cfs of surface water flow measured at the Casmalia stream gage west of the Slough, selected based on the analysis of historical base flow at the Casmalia stream gage (Figure 4-2). However, no analysis or discussion is presented to describe how the SMC will affect GDEs, or the impact of this minimum threshold on GDEs in the basin. Furthermore, the GSP makes no attempt to evaluate the impacts of the proposed minimum threshold on environmental beneficial users of surface water. The GSP does not explain how the chosen minimum thresholds and measurable objectives avoid significant and unreasonable effects on surface water beneficial users in the basin, such as increased mortality and inability to perform key life processes (e.g., reproduction, migration).

The GSP also recognizes data gaps with respect to ISW in the Las Flores watershed and northeast of Los Alamos on Price Ranch. The GSP states (p. 4-48): "*Until flow of groundwater is better understood in these areas, meaningful SMCs related to interconnected surface water and supporting associated GDEs cannot be developed. If analysis of these areas indicates interconnected surface water with the Paso Robles Formation or the Careaga Sand, SMCs will be developed pursuant to avoid undesirable results as described below."* As noted above in the ISW section of this letter, the GSP did not utilize groundwater elevation data to identify ISWs in the basin. Therefore, in addition to the data gap areas noted above (i.e., Las Flores watershed and northeast of Los Alamos on Price Ranch), additional analyses may be required to develop depletion of interconnected surface water SMC after further identification of ISWs based on groundwater elevation data.

RECOMMENDATIONS

- Define chronic lowering of groundwater SMC directly for environmental beneficial users of groundwater. When defining undesirable results for chronic lowering of groundwater levels, provide specifics on what biological responses (e.g., extent of habitat, growth, recruitment rates) would best characterize a significant and unreasonable impact on GDEs. Undesirable results to environmental users occur when 'significant and unreasonable' effects on beneficial users are caused by one of the sustainability indicators (i.e., chronic lowering of groundwater levels, degraded water quality, or depletion of interconnected surface water). Thus, potential impacts on environmental beneficial uses and users need to be considered when defining undesirable results in the basin.[13] Defining undesirable results is the crucial first step before the minimum thresholds can be determined.[14]

- When defining undesirable results for depletion of interconnected surface water, include a description of potential impacts on instream habitats within ISWs when minimum thresholds in the basin are reached.[15] The GSP should confirm that minimum

[13] "The description of undesirable results shall include [...] 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". [23 CCR §354.26(b)(3)]

[14] The description of minimum thresholds shall include [...] how minimum thresholds may affect the interests of beneficial uses and users of groundwater or land uses and property interests." [23 CCR §354.28(b)(4)]

[15] "The minimum threshold for depletions of interconnected surface water shall be the rate or volume of surface water depletions caused by groundwater use that has adverse impacts on beneficial uses of the surface water and may lead to undesirable results." [23 CCR §354.28(c)(6)]

thresholds for ISWs avoid adverse impacts on both environmental beneficial users of groundwater and surface water as these environmental users could be left unprotected by the GSP. These recommendations apply especially to environmental beneficial users that are already protected under pre-existing state or federal law.[6,16]

- When establishing SMC for the basin, consider that the SGMA statute [Water Code §10727.4(l)] specifically calls out that GSPs shall include "impacts on groundwater dependent ecosystems".

2. Climate Change

The SGMA statute identifies climate change as a significant threat to groundwater resources and one that must be examined and incorporated in the GSPs. The GSP Regulations require integration of climate change into the projected water budget to ensure that projects and management actions sufficiently account for the range of potential climate futures.[17] The effects of climate change will intensify the impacts of water stress on GDEs, making available shallow groundwater resources especially critical to their survival. Condon *et al.* (2020) shows that GDEs are more likely to succumb to water stress and rely more on groundwater during times of drought.[18] When shallow groundwater is unavailable, riparian forests can die off and key life processes (e.g., migration and spawning) for aquatic organisms, such as steelhead, can be impeded.

The integration of climate change into the projected water budget is **insufficient**. The GSP incorporates climate change into the projected water budget using DWR change factors for 2030 and 2070. However, the plan does not consider multiple climate scenarios (e.g., the 2070 extremely wet and extremely dry climate scenarios) in the projected water budget. The GSP should clearly and transparently incorporate the extremely wet and dry scenarios provided by DWR into projected water budgets or select more appropriate extreme scenarios for the basin. While these extreme scenarios may have a lower likelihood of occurring, their consequences could be significant and their inclusion can help identify important vulnerabilities in the basin's approach to groundwater management.

The GSP incorporates climate change into key inputs (e.g., precipitation, evapotranspiration, and surface water flow) of the projected water budget. However, while climate change is acknowledged to be a likely influence on future basin yields, the GSP does not provide a sustainable yield based on the projected water budget with climate change incorporated. If the water budgets are incomplete, including the omission of extremely wet and dry scenarios, and sustainable yield is not calculated based on climate change projections, then there is increased uncertainty in virtually every subsequent calculation used to plan for projects, derive measurable objectives, and set minimum thresholds. Plans that do not adequately include climate change projections may underestimate future impacts on vulnerable beneficial users of groundwater such as ecosystems and domestic well owners.

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[16] Rohde MM, Seapy B, Rogers R, Castañeda X, editors. 2019. Critical Species LookBook: A compendium of California's threatened and endangered species for sustainable groundwater management. The Nature Conservancy, San Francisco, California. Available at: https://groundwaterresourcehub.org/public/uploads/pdfs/Critical_Species_LookBook_91819.pdf

[17] "Each Plan shall rely on the best available information and best available science to quantify the water budget for the basin in order to provide an understanding of historical and projected hydrology, water demand, water supply, land use, population, climate change, sea level rise, groundwater and surface water interaction, and subsurface groundwater flow." [23 CCR §354.18(e)]

[18] Condon et al. 2020. Evapotranspiration depletes groundwater under warming over the contiguous United States. Nature Communications. Available at: https://www.nature.com/articles/s41467-020-14688-0

RECOMMENDATIONS

- Integrate climate change, including extremely wet and dry scenarios, into all elements of the projected water budget to form the basis for development of sustainable management criteria and projects and management actions.
- Estimate sustainable yield based on the projected water budget with climate change incorporated.
- Incorporate climate change scenarios into projects and management actions.

3. Data Gaps

The consideration of beneficial users when establishing monitoring networks is **insufficient**, due to lack of specific plans to increase the Representative Monitoring Sites (RMSs) in the monitoring network that represent water quality conditions and shallow groundwater elevations around DACs, domestic wells, GDEs, and ISWs in the basin.

Figure 5-1 (Groundwater Level Monitoring Network) shows insufficient representation of drinking water users and DACs for groundwater elevation monitoring. Figure 5-4 (Groundwater Quality Monitoring Network) shows sufficient spatial representation of drinking water users and DACs for water quality monitoring, but depth representation cannot be verified. Refer to Attachment E for maps of these monitoring sites in relation to key beneficial users of groundwater (note we were only able to prepare water quality monitoring maps with publicly available information). These beneficial users may remain unprotected by the GSP without adequate monitoring and identification of data gaps in the shallow aquifer. The Plan therefore fails to meet SGMA's requirements for the monitoring network.[19]

The GSP provides some discussion of data gaps for GDEs and ISWs in Sections 5.8 (Depletion of Interconnected Surface Water Monitoring Network), Section 5.8.2 (Assessment and Improvement of Monitoring Network), and 6.3 (Tier 1 Management Action 1 – Address Data Gaps), but does not provide specific plans, such as locations or a timeline, to fill the data gaps.

RECOMMENDATIONS

- Provide maps that overlay current and proposed monitoring well locations with the locations of DACs, domestic wells, GDEs, and ISWs to clearly identify monitored areas.
- Increase the number of RMSs in the shallow aquifer across the basin as needed to adequately monitor all groundwater condition indicators across the basin and at appropriate depths for *all* beneficial users. Prioritize proximity to DACs, domestic wells, GDEs, and ISWs when identifying new RMSs.

[19] "The monitoring network objectives shall be implemented to accomplish the following: [...] (2) Monitor impacts to the beneficial uses or users of groundwater." [23 CCR §354.34(b)(2)]

- Ensure groundwater elevation and water quality RMSs are monitoring groundwater conditions spatially and at the correct depth for *all* beneficial users - especially DACs, domestic wells, and GDEs.

4. Addressing Beneficial Users in Projects and Management Actions

The consideration of beneficial users when developing projects and management actions is **insufficient** due to the failure to completely identify benefits or impacts of identified projects and management actions, including water quality impacts, to key beneficial users of groundwater such as GDEs, aquatic habitats, surface water users, DACs, and drinking water users. Therefore, potential project and management actions may not protect these beneficial users. Groundwater sustainability under SGMA is defined not just by sustainable yield, but by the avoidance of undesirable results for *all* beneficial users.

The GSP fails to include projects and management actions with explicit near-term benefits to the environment. While Section 6.11 documents In Lieu Recharge Projects, they are described as being in the conceptual phase and may be considered by the GSA in the future. The plan includes a municipal well mitigation program. However, the GSP fails to specify the mitigation program's benefits to DACs, if any.

RECOMMENDATIONS

- For DACs and domestic well owners, include a drinking water well impact mitigation program to proactively monitor and protect drinking water wells through GSP implementation. Refer to Attachment B for specific recommendations on how to implement a drinking water well mitigation program. The GSP includes a discussion of an offsite well impact mitigation program in Section 6.3, however this program is for municipal wells, not domestic wells. If this program will have benefits to DACs, describe them in detail.

- For DACs and domestic well owners, include a discussion of whether potential impacts to water quality from projects and management actions could occur and how the GSA plans to mitigate such impacts.

- Recharge ponds, reservoirs, and facilities for managed aquifer recharge can be designed as multiple-benefit projects to include elements that act functionally as wetlands and provide a benefit for wildlife and aquatic species. For further guidance on how to integrate multi-benefit recharge projects into your GSP, refer to the "Multi-Benefit Recharge Project Methodology Guidance Document."[20]

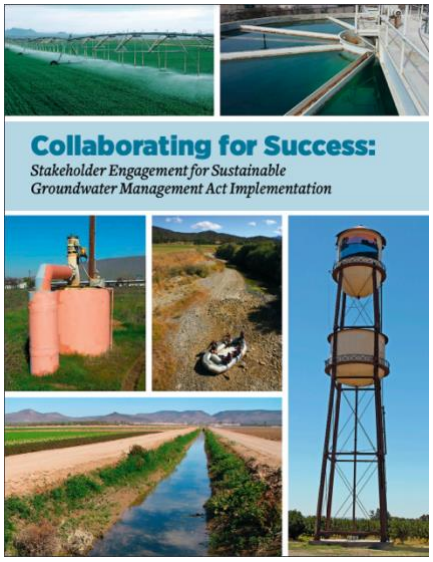
- Develop management actions that incorporate climate and water delivery uncertainties to address future water demand and prevent future undesirable results.

[20] The Nature Conservancy. 2021. Multi-Benefit Recharge Project Methodology for Inclusion in Groundwater Sustainability Plans. Sacramento. Available at: https://groundwaterresourcehub.org/sgma-tools/multi-benefit-recharge-project-methodology-guidance/

Attachment B

SGMA Tools to address DAC, drinking water, and environmental beneficial uses and users

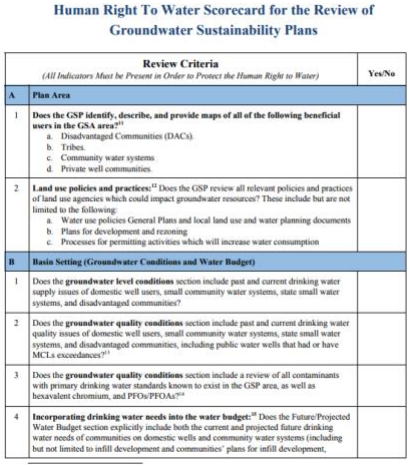
Stakeholder Engagement and Outreach



Clean Water Action, Community Water Center and Union of Concerned Scientists developed a guidance document called Collaborating for success: Stakeholder engagement for Sustainable Groundwater Management Act Implementation. It provides details on how to conduct targeted and broad outreach and engagement during Groundwater Sustainability Plan (GSP) development and implementation. Conducting a targeted outreach involves:

- Developing a robust Stakeholder Communication and Engagement plan that includes outreach at frequented locations (schools, farmers markets, religious settings, events) across the plan area to increase the involvement and participation of disadvantaged communities, drinking water users and the environmental stakeholders.
- Providing translation services during meetings and technical assistance to enable easy participation for non-English speaking stakeholders.
- GSP should adequately describe the process for requesting input from beneficial users and provide details on how input is incorporated into the GSP.

The Human Right to Water

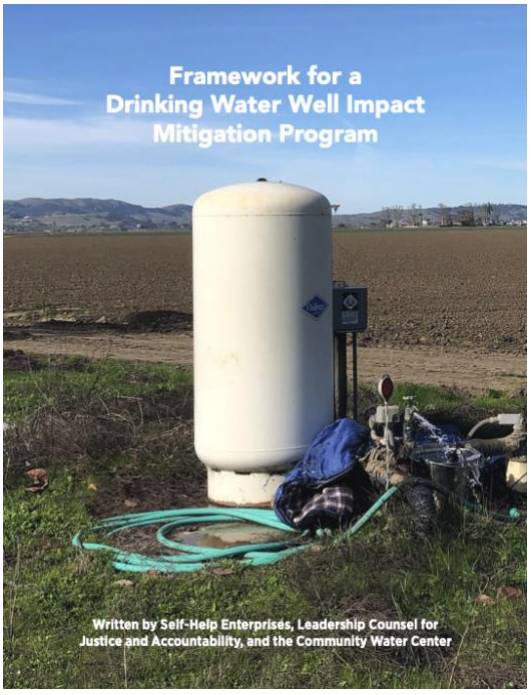


Human Right To Water Scorecard for the Review of Groundwater Sustainability Plans

	Review Criteria *(All Indicators Must be Present in Order to Protect the Human Right to Water)*	Yes/No
A	**Plan Area**	
1	**Does the GSP identify, describe, and provide maps of all of the following beneficial users in the GSA area?**[43] a. Disadvantaged Communities (DACs). b. Tribes. c. Community water systems. d. Private well communities.	
2	**Land use policies and practices:**[44] Does the GSP review all relevant policies and practices of land use agencies which could impact groundwater resources? These include but are not limited to the following: a. Water use policies General Plans and local land use and water planning documents b. Plans for development and rezoning c. Processes for permitting activities which will increase water consumption	
B	**Basin Setting (Groundwater Conditions and Water Budget)**	
1	Does the **groundwater level conditions** section include past and current drinking water supply issues of domestic well users, small community water systems, state small water systems, and disadvantaged communities?	
2	Does the **groundwater quality conditions** section include past and current drinking water quality issues of domestic well users, small community water systems, state small water systems, and disadvantaged communities, including public water wells that had or have MCLs exceedances?[45]	
3	Does the **groundwater quality conditions** section include a review of all contaminants with primary drinking water standards known to exist in the GSP area, as well as hexavalent chromium, and PFOs/PFOAs?[46]	
4	**Incorporating drinking water needs into the water budget:**[47] Does the Future/Projected Water Budget section explicitly include both the current and projected future drinking water needs of communities on domestic wells and community water systems (including but not limited to infill development and communities' plans for infill development,	

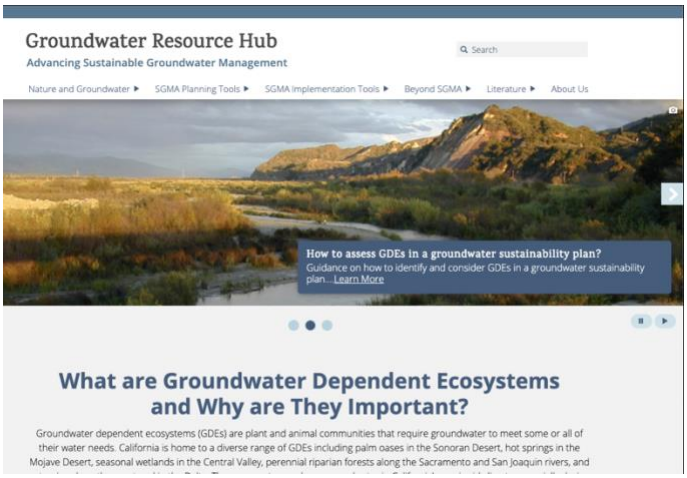
The Human Right to Water Scorecard was developed by Community Water Center, Leadership Counsel for Justice and Accountability and Self Help Enterprises to aid Groundwater Sustainability Agencies (GSAs) in prioritizing drinking water needs in SGMA. The scorecard identifies elements that must exist in GSPs to adequately protect the Human Right to Drinking water.

Drinking Water Well Impact Mitigation Framework



The Drinking Water Well Impact Mitigation Framework was developed by Community Water Center, Leadership Counsel for Justice and Accountability and Self Help Enterprises to aid GSAs in the development and implementation of their GSPs. The framework provides a clear roadmap for how a GSA can best structure its data gathering, monitoring network and management actions to proactively monitor and protect drinking water wells and mitigate impacts should they occur.

Groundwater Resource Hub



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.

Rooting Depth Database

The Plant Rooting Depth Database provides information that can help assess whether groundwater-dependent vegetation are accessing groundwater. Actual rooting depths will depend on the plant species and site-specific conditions, such as soil type and

availability of other water sources. Site-specific knowledge of depth to groundwater combined with rooting depths will help provide an understanding of the potential groundwater levels are needed to sustain GDEs.

How to use the database

The maximum rooting depth information in the Plant Rooting Depth Database is useful when verifying whether vegetation in the Natural Communities Commonly Associated with Groundwater (NC Dataset) are connected to groundwater. A 30 ft depth-to-groundwater threshold, which is based on averaged global rooting depth data for phreatophytes[1], is relevant for most plants identified in the NC Dataset since most plants have a max rooting depth of less than 30 feet. However, it is important to note that deeper thresholds are necessary for other plants that have reported maximum root depths that exceed the averaged 30 feet threshold, such as valley oak (*Quercus lobata*), Euphrates poplar (*Populus euphratica*), salt cedar (*Tamarix spp.*), and shadescale (*Atriplex confertifolia*). The Nature Conservancy advises that the reported max rooting depth for these deeper-rooted plants be used. For example, a depth-to groundwater threshold of 80 feet should be used instead of the 30 ft threshold, when verifying whether valley oak polygons from the NC Dataset are connected to groundwater. It is important to re-emphasize that actual rooting depth data are limited and will depend on the plant species and site-specific conditions such as soil and aquifer types, and availability to other water sources.

The Plant Rooting Depth Database is an Excel workbook composed of four worksheets:

1. California phreatophyte rooting depth data (included in the NC Dataset)
2. Global phreatophyte rooting depth data
3. Metadata
4. References

How the database was compiled

The Plant Rooting Depth Database is a compilation of rooting depth information for the groundwater-dependent plant species identified in the NC Dataset. Rooting depth data were compiled from published scientific literature and expert opinion through a crowdsourcing campaign. As more information becomes available, the database of rooting depths will be updated. Please Contact Us if you have additional rooting depth data for California phreatophytes.

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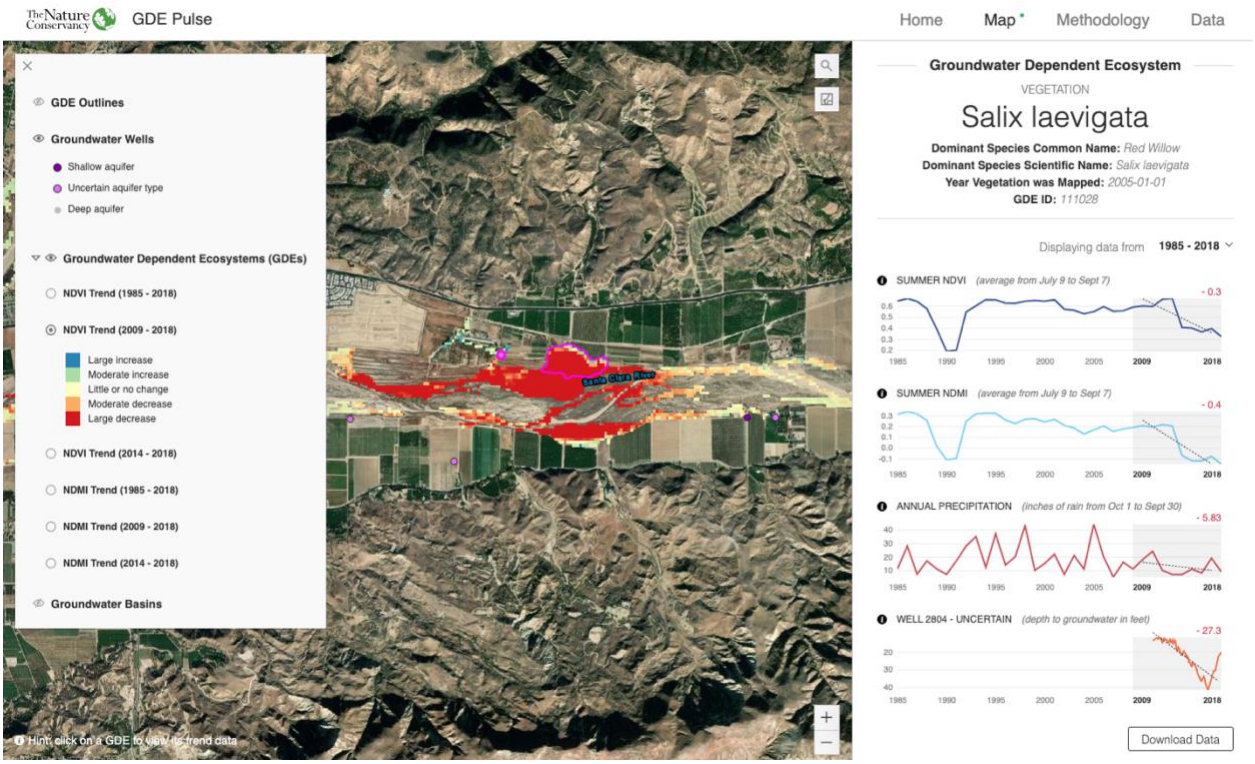
[1] Canadell, J., Jackson, R.B., Ehleringer, J.B. et al. 1996. Maximum rooting depth of vegetation types at the global scale. Oecologia 108, 583–595. https://doi.org/10.1007/BF00329030

GDE Pulse



GDE Pulse is a free online tool that allows Groundwater Sustainability Agencies to assess changes in groundwater dependent ecosystem (GDE) health using satellite, rainfall, and groundwater data. 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. The following datasets are available for downloading:

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.

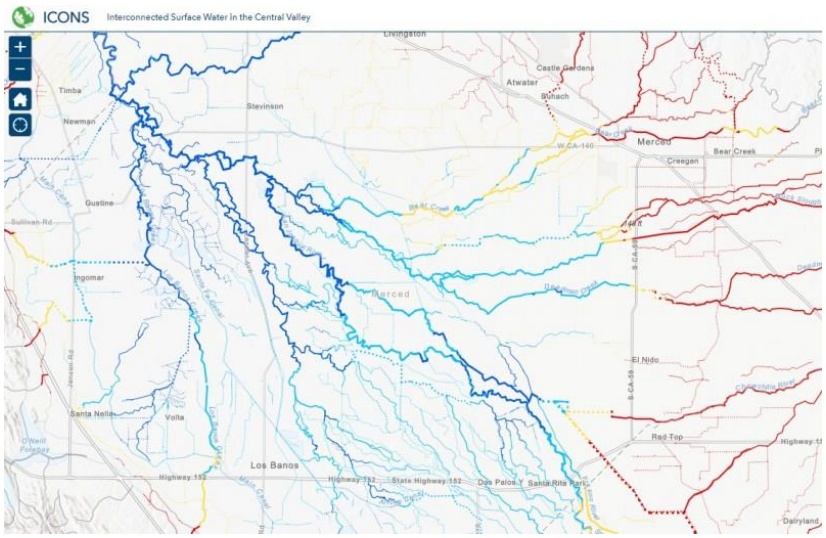
Normalized Difference Moisture Index (NDMI) is a satellite-derived index that represents water content in vegetation. NDMI is derived from the Near-Infrared (NIR) and Short-Wave Infrared (SWIR) channels. Vegetation with adequate access to water tends to have higher NDMI, while vegetation that is water 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. 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.

ICONOS Mapper

Interconnected Surface Water in the Central Valley



ICONS maps the likely presence of interconnected surface water (ISW) in the Central Valley using depth to groundwater data. Using data from 2011-2018, the ISW dataset represents the likely connection between surface water and groundwater for rivers and streams in California's Central Valley. It includes information on the mean, maximum, and minimum depth to groundwater for each stream segment over the years with available data, as well as the likely presence of ISW based on the minimum depth to groundwater. The Nature Conservancy developed this database, with guidance and input from expert academics, consultants, and state agencies.

We developed this dataset using groundwater elevation data available online from the California Department of Water Resources (DWR). DWR only provides this data for the Central Valley. For GSAs outside of the valley, who have groundwater well measurements, we recommend following our methods to determine likely ISW in your region. The Nature Conservancy's ISW dataset should be used as a first step in reviewing ISW and should be supplemented with local or more recent groundwater depth data.

Attachment C

Freshwater Species Located in the San Antonio Creek Valley Basin

To assist in identifying the beneficial users of surface water necessary to assess the undesirable result "depletion of interconnected surface waters", Attachment C provides a list of freshwater species located in the San Antonio Creek Valley Basin. To produce the freshwater species list, we used ArcGIS to select features within the California Freshwater Species Database version 2.0.9 within the basin 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				
Anas americana	American Wigeon			
Anas clypeata	Northern Shoveler			
Anas cyanoptera	Cinnamon Teal			
Anas platyrhynchos	Mallard			
Ardea alba	Great Egret			
Ardea herodias	Great Blue Heron			
Bucephala albeola	Bufflehead			
Calidris minutilla	Least Sandpiper			
Fulica americana	American Coot			
Gallinago delicata	Wilson's Snipe			
Icteria virens	Yellow-breasted Chat		Special Concern	BSSC - Third priority
Limnodromus scolopaceus	Long-billed Dowitcher			
Oxyura jamaicensis	Ruddy Duck			
Podilymbus podiceps	Pied-billed Grebe			
Porzana carolina	Sora			
Setophaga petechia	Yellow Warbler			BSSC - Second priority
Tachycineta bicolor	Tree Swallow			

[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

CRUSTACEANS				
Cyprididae fam.	Cyprididae fam.			
Hyalella spp.	Hyalella spp.			
FISH				
Gasterosteus aculeatus williamsoni	Unarmored threespine stickleback	Endangered	Endangered	Endangered - 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			
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
Thamnophis hammondii hammondii	Two-striped Gartersnake		Special Concern	ARSSC
Thamnophis sirtalis sirtalis	Common Gartersnake			
Pseudacris regilla	Northern Pacific Chorus Frog			
Taricha torosa	Coast Range Newt		Special Concern	ARSSC
Thamnophis sirtalis infernalis	California Red-sided Gartersnake			Not on any status lists
INSECTS & OTHER INVERTS				
Acilius abbreviatus				Not on any status lists
Agabus spp.	Agabus spp.			
Apedilum spp.	Apedilum spp.			
Argia nahuana	Aztec Dancer			
Argia spp.	Argia spp.			
Argia vivida	Vivid Dancer			
Baetis spp.	Baetis spp.			
Chironomidae fam.	Chironomidae fam.			
Chironomus spp.	Chironomus spp.			
Cricotopus spp.	Cricotopus spp.			
Dicrotendipes spp.	Dicrotendipes spp.			
Dytiscidae fam.	Dytiscidae fam.			

Dytiscus marginicollis				Not on any status lists
Ephydridae fam.	Ephydridae fam.			
Fallceon quilleri	A Mayfly			
Hydrophilidae fam.	Hydrophilidae fam.			
Hydroptila spp.	Hydroptila spp.			
Labrundinia spp.	Labrundinia spp.			
Laccobius spp.	Laccobius spp.			
Limnophyes spp.	Limnophyes spp.			
Optioservus spp.	Optioservus spp.			
Oxyethira spp.	Oxyethira spp.			
Paracladopelma spp.	Paracladopelma spp.			
Parametriocnemus spp.	Parametriocnemus spp.			
Paratanytarsus spp.	Paratanytarsus spp.			
Peltodytes spp.	Peltodytes spp.			
Psychodidae fam.	Psychodidae fam.			
Rheotanytarsus spp.	Rheotanytarsus spp.			
Simulium spp.	Simulium spp.			
Sperchon spp.	Sperchon spp.			
Stictotarsus spp.	Stictotarsus spp.			
Tanytarsus spp.	Tanytarsus spp.			
Tricorythodes spp.	Tricorythodes spp.			
Tropisternus spp.	Tropisternus spp.			
MAMMALS				
Ondatra zibethicus	Common Muskrat			Not on any status lists
Castor canadensis	American Beaver			Not on any status lists
MOLLUSKS				
Physa spp.	Physa spp.			
PLANTS				
Alopecurus saccatus	Pacific Foxtail			
Callitriche marginata	Winged Water-starwort			
Cladium californicum	California Sawgrass		Special	CRPR - 2B.2
Eleocharis palustris	Creeping Spikerush			
Eleocharis rostellata	Beaked Spikerush			
Euthamia occidentalis	Western Fragrant Goldenrod			
Helenium puberulum	Rosilla			
Isolepis cernua	Low Bulrush			
Juncus textilis	Basket Rush			
Paspalum distichum	Joint Paspalum			

Persicaria lapathifolia				Not on any status lists
Phacelia distans	NA			
Plagiobothrys undulatus	NA			Not on any status lists
Psilocarphus tenellus	NA			
Salix lasiolepis lasiolepis	Arroyo Willow			
Veronica anagallis-aquatica	NA			
Veronica peregrina	NA			

Attachment D

The Nature Conservancy

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[1] 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)[2]. This document highlights six best practices for using local groundwater data to confirm whether mapped features in the NC dataset are supported by groundwater.

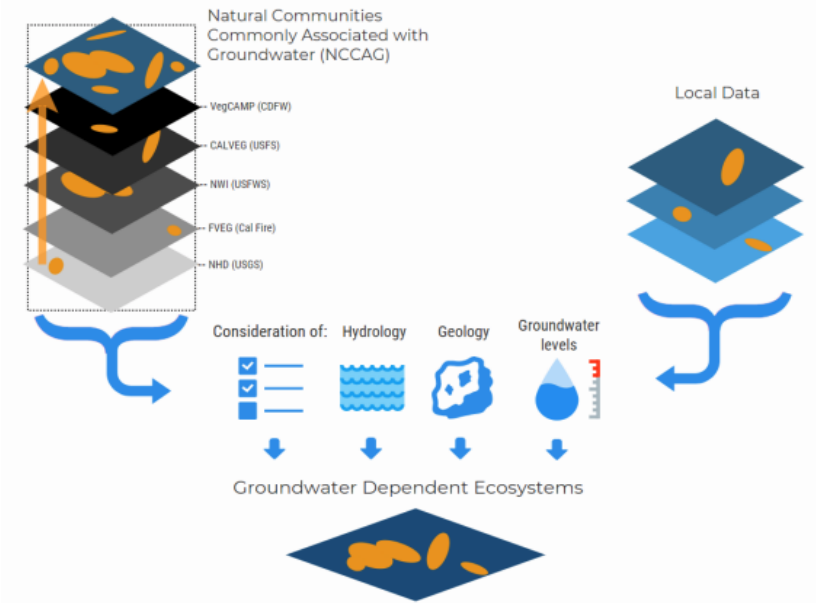


Figure 1. Considerations for GDE identification.
Source: DWR[2]

[1] NC Dataset Online Viewer: https://gis.water.ca.gov/app/NCDatasetViewer/
[2] 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

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, springs, and seeps commonly associated with groundwater in California[3]. 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[4] on the Groundwater Resource Hub[5], 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*.

[3] 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
[4] "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/
[5] The Groundwater Resource Hub: www.GroundwaterResourceHub.org

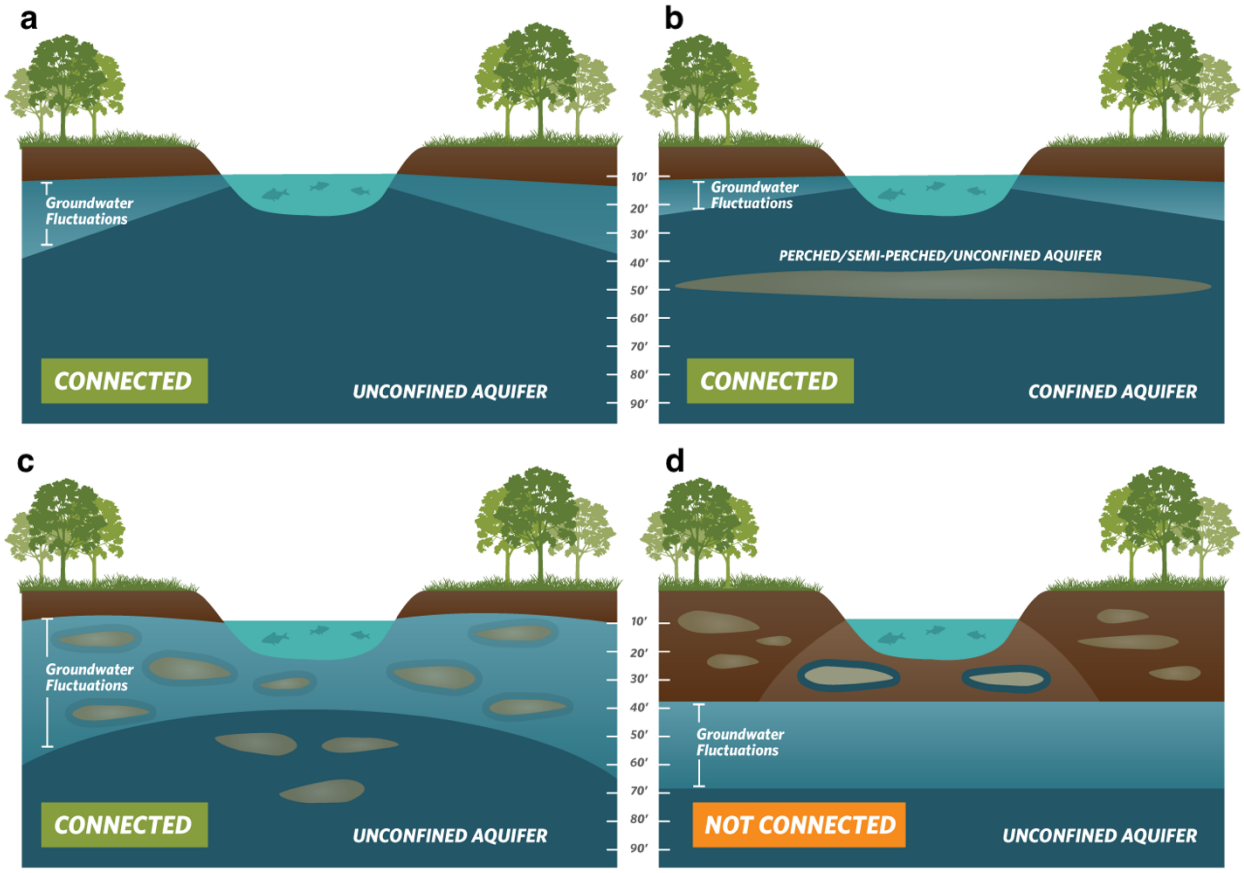


Figure 2. Confirming whether an ecosystem is connected to groundwater. Top: (a) Under the ecosystem is an unconfined aquifer with depth-to-groundwater fluctuating seasonally and interannually within 30 feet from land surface. **(b)** Depth-to-groundwater in the shallow aquifer is connected to overlying 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[6] 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[7] 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[8] 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[9]. 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).

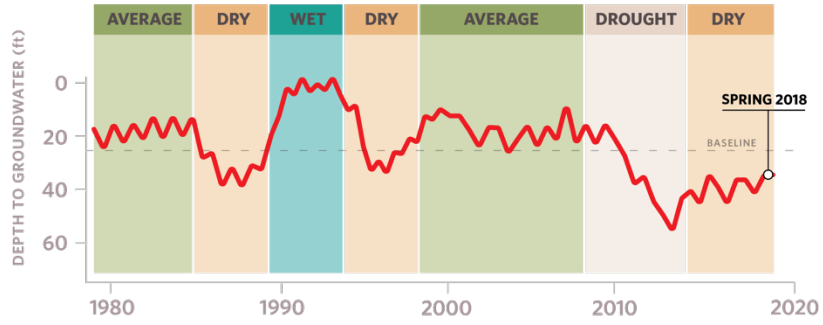


Figure 3. Example seasonality and interannual variability in depth-to-groundwater over time. Selecting one point in time, such as Spring 2018, to characterize groundwater conditions in GDEs fails to capture what groundwater conditions are necessary to maintain the ecosystem status into the future so adverse impacts are avoided.

[6] 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

[7] 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)]

[8] 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]).

[9] 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[10], 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).

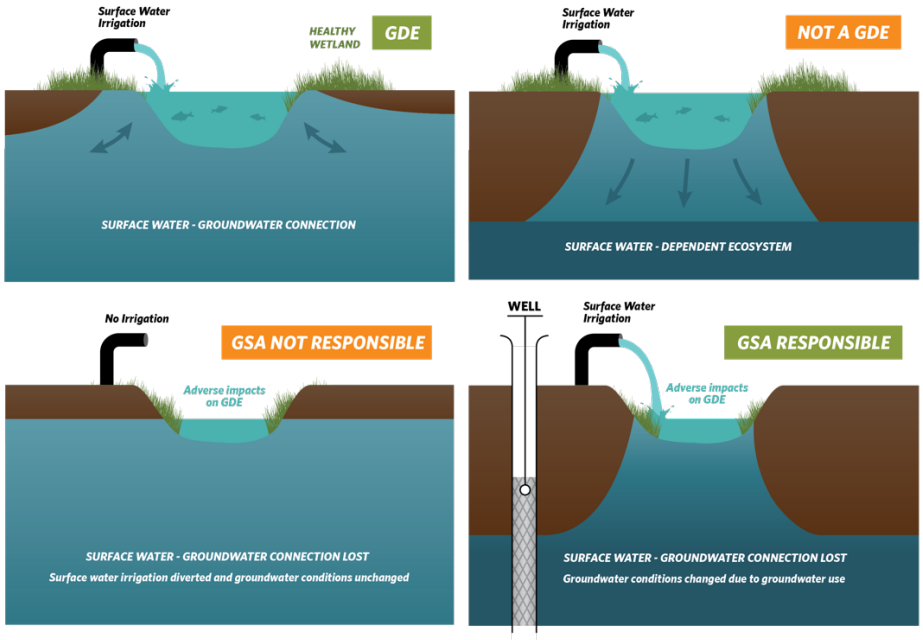


Figure 4. Ecosystems often depend on multiple sources of water. Top: (Left) Surface water and groundwater are interconnected, meaning that the GDE is supported by both groundwater and surface water. **(Right)** Ecosystems that are only reliant on non-groundwater sources are not groundwater-dependent. **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.

[10] 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.

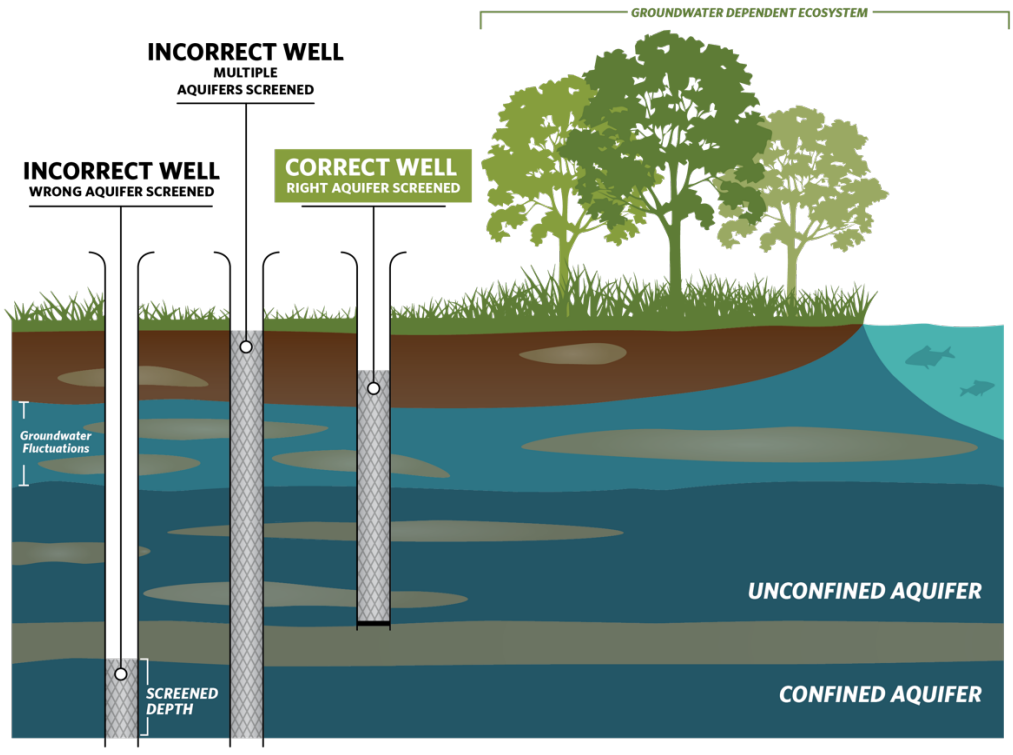


Figure 5. Selecting representative wells to characterize groundwater conditions near GDEs.

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)[11] 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.

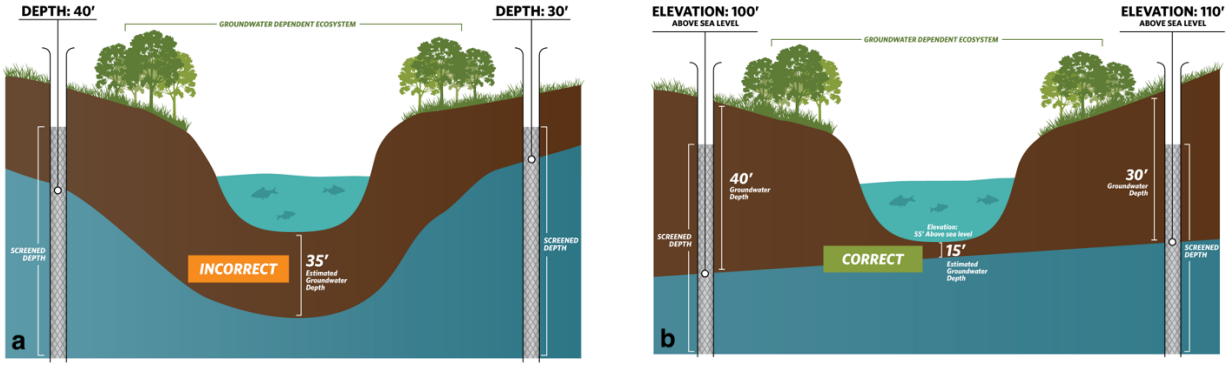


Figure 6. Contouring depth-to-groundwater around surface water features and GDEs. (a) Groundwater level interpolation using depth-to-groundwater data from monitoring wells. **(b)** Groundwater level interpolation using groundwater elevation data from monitoring wells and DEM data.

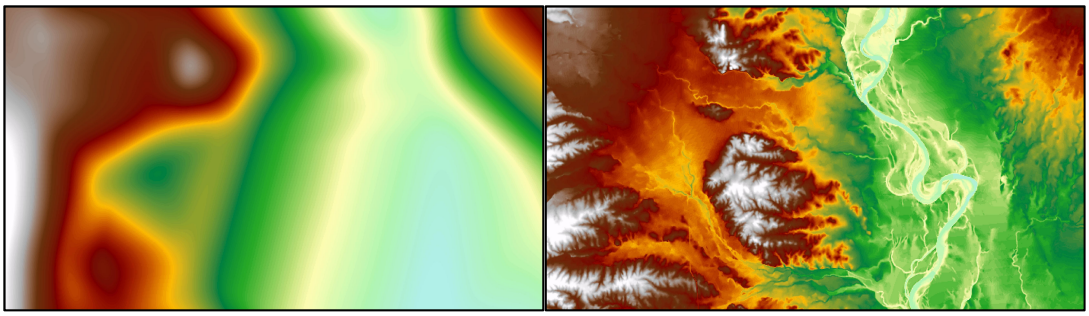


Figure 7. Depth-to-groundwater contours in Northern California. (Left) Contours were interpolated using depth-to-groundwater measurements determined at each well. **(Right)** Contours were determined by interpolating groundwater elevation measurements at each well and superimposing ground surface elevation 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.

[11] 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 E

Maps of representative monitoring sites in relation to key beneficial users

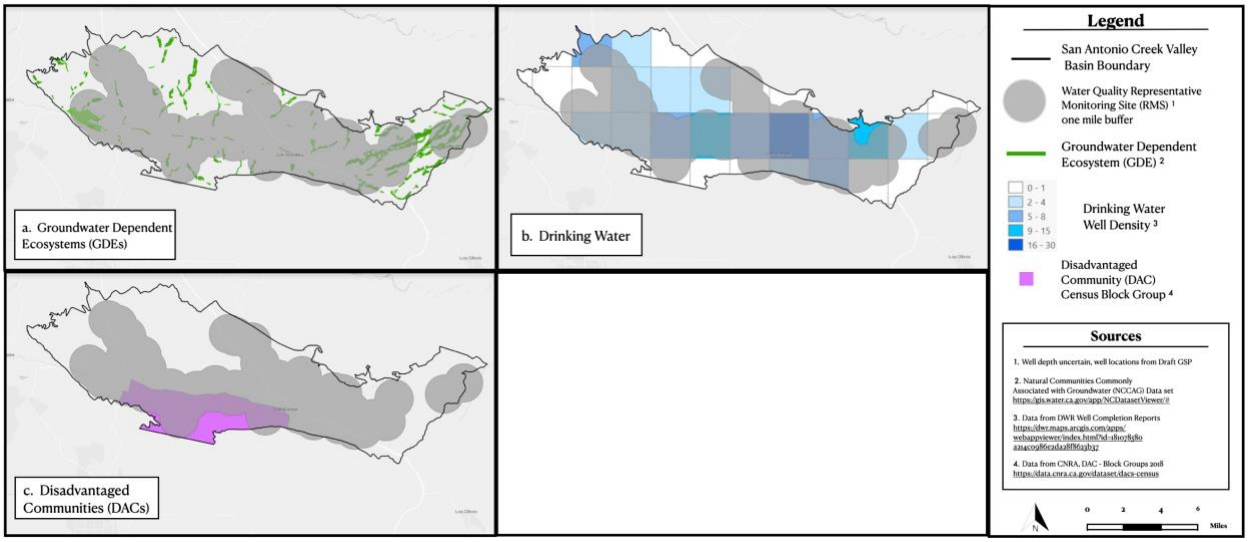


Figure 1. Groundwater quality representative monitoring sites in relation to key beneficial users: a) Groundwater Dependent Ecosystems (GDEs), b) Drinking Water users, c) Disadvantaged Communities (DACs), and d) Tribes.

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State of California – Natural Resources Agency
DEPARTMENT OF FISH AND WILDLIFE
South Coast Region
3883 Ruffin Road
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GAVIN NEWSOM, Governor
CHARLTON H. BONHAM, Director

October 28, 2021

Via Electronic Mail and Online Submission

Anna Olsen
Executive Director
San Antonio Basin Groundwater Sustainability Agency
920 East Stowell Rd
Santa Maria, CA 93454
AOlsen@sanantoniobasingsa.org

Subject: California Department of Fish and Wildlife Comments on the San Antonio Creek Valley Groundwater Basin Draft Groundwater Sustainability Plan

Dear Ms. Olsen:

The California Department of Fish and Wildlife (CDFW) appreciates the opportunity to provide comments on the San Antonio Basin Groundwater Sustainability Agency (SABGSA) San Antonio Creek Valley Basin (Basin) Draft Groundwater Sustainability Plan (Draft GSP) prepared pursuant to the Sustainable Groundwater Management Act (SGMA). The Basin is designated as medium priority under SGMA and must be managed under a GSP by January 31, 2022.

CDFW is writing to support ecosystem preservation and enhancement in compliance with SGMA and its implementing regulations based on CDFW expertise and best available information and science. As trustee agency for the State's fish and wildlife resources, CDFW 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, species, and public trust resources depend on groundwater and interconnected surface waters (ISWs), 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 GSPs:

- GSPs must **consider impacts to groundwater dependent ecosystems** (GDEs) (Water Code § 10727.4(l); see also 23 CCR § 354.16(g));
- GSPs must consider the interests of all beneficial uses and users of groundwater, including environmental users of groundwater (Water Code § 10723.2) and GSPs 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));

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- GSPs 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,
- GSPs 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)).

Furthermore, the Public Trust Doctrine imposes a related but distinct obligation to consider how groundwater management affects public trust resources, including navigable surface waters and fisheries. Groundwater hydrologically connected to surface waters is also subject to the Public Trust Doctrine to the extent that groundwater extractions or diversions affect or may affect public trust uses. (*Environmental Law Foundation v. State Water Resources Control Board* (2018), 26 Cal. App. 5th 844; *National Audubon Society v. Superior Court* (1983), 33 Cal. 3d 419.) SABGSA has "an affirmative duty to take the public trust into account in the planning and allocation of water resources, and to protect public trust uses whenever feasible." (*National Audubon Society*, *supra*, 33 Cal. 3d at 446.) Accordingly, groundwater plans should consider potential impacts to and appropriate protections for ISWs and their tributaries, and ISWs that support fisheries, including the level of groundwater contribution to those waters.

Individually and collectively, the SGMA statutes and regulations, and Public Trust Doctrine considerations, necessitate that groundwater planning carefully consider and protect environmental beneficial uses and users of groundwater, including fish and wildlife and their habitats, GDEs, and ISWs.

The Basin supports both riparian and aquatic habitat. The Basin's riparian habitat supports several special status avian species including the least Bell's vireo (*Vireo belli pusillus*) and southwestern willow fly catcher (*Empidonax traillii extimus*). The aquatic habitat also supports several special status fish species including unarmored three-spined stickleback (*Gasterosteus aculeatus williamsoni*) and arroyo chub (*Gila orcuttii*). Pertaining to the protection of these species and their habitat, CDFW is providing comments regarding GDE monitoring and implementation of management actions to avoid a significant and unreasonable effect to GDEs and ISWs. CDFW is providing additional comments and recommendations as notated in Attachment A. Editorial comments or other suggestions are included for SABGSA's consideration during development of a final GSP.

If you have any questions related to CDFW's comments and/or recommendations on the San Antonio Creek Valley Basin GSP, please contact Steve Slack, Environmental Scientist, at Steven.Slack@wildlife.ca.gov.

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Sincerely,

DocuSigned by:
B6E58CFE24724F5...

Erinn Wilson-Olgin
Environmental Program Manager
South Coast Region

Enclosure(s): Attachment A, Attachment B

ec: California Department of Fish and Wildlife

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Attachment A

CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE COMMENTS ON THE SAN ANTONIO CREEK VALLEY BASIN DRAFT GROUNDWATER SUSTAINABILITY PLAN

SPECIFIC COMMENTS AND RECOMMENDATIONS

CDFW's comments are as follows:

Comment #1 – GDEs based on the 30-foot Depth Groundwater Criterion in Section 3.2.6 of the Draft GSP

Issue: A 30-foot depth to groundwater criterion was applied to identify potential GDEs (Section 3.2.6.1). According to Figure 3-55 of the Draft GSP, the groundwater depth is greater than 30 feet throughout the Basin, except in certain areas within Barker Slough. San Antonio Creek within the entire Basin consists of a riparian corridor, despite seasonal surface flows, and despite the Creek being referenced as an area with a depth to groundwater greater than 30 feet. After applying the 30-foot criterion, CDFW is concerned that GDEs along San Antonio Creek and throughout the Basin were eliminated from being considered as potential GDEs.

Recommendation #1(a): CDFW recommends SABGSA clarify whether GDEs located where groundwater depth is greater than 30 feet below the surface, were eliminated as GDEs. If so, CDFW recommends the SABGSA identify these areas, and retain these areas as potential GDEs in the final GSP until future monitoring data can eliminate them as GDEs.

Recommendation #1(b): CDFW recommends SABGSA utilize The Nature Conservancy's (TNC) GDE Pulse web-map to view vegetation that have been identified as potential GDEs, with data that identifies long term temporal trends of vegetation metrics (TNC 2021).

Recommendation #1(c): CDFW recommends SABGSA utilize U.S. Fish and Wildlife Service's (USFWS)'s National Wetlands Inventory (2021) to identify potential GDEs such as riverine habitat, freshwater forested/shrub wetland, and freshwater emergent wetland.

Comment #2 – Unarmored Threespine Stickleback (UTS) Habitat

Issue: The maps and figures in the Draft GSP do not show open water habitat that support special-status species such as UTS, a federal Endangered Species Act (ESA) listed and California Endangered Species Act (CESA) listed species, that is also listed as a Fully Protected Species in California. Accordingly, it is unclear if open water habitat was mapped. According to the California Natural Diversity Database (CNDDB; CDFW 2021), San Antonio Creek has known occurrences of UTS within Barka Slough and upstream in Los Alamos. San Antonio Creek through Barka Slough is also considered a Southern California Threespine Stickleback Stream where there are small stands of cattails, overhanging willows in riparian areas that support native fish populations of UTS (*Gasterosteus aculeatus williamsoni*), prickly sculpin (*Cottus asper*), ESA-listed tidewater goby (*Eucyclogobius newberryi*), and arroyo chub (*Gila orcuttii*), a California Species of Special Concern (SSC) (CNDDB; CDFW 2021).

Recommendation #2: CDFW recommends SABGSA map and document open water habitat in addition to GDEs in the final GSP.

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Comment #3 – Minimum Thresholds for Surface Water Depletion

Issue #3.1: CDFW has concerns with the Draft GSP's proposed interim minimum threshold, "0.15 cfs of surface water flow measured at the Casmalia stream gage west of the Slough. This threshold was selected based on the analysis of historical base flow at the Casmalia stream gage presented on Figure 4-2" (Pg. 4-54). The SABGSA has not provided enough information to confirm that low flow measurements below 0.50 cfs can be accurately measured at the Casmalia stream gage. Additionally, 0.15 cfs is considerably low for native fish species, including for UTS. Based on the information provided in the Draft GSP, CDFW is not able to determine if the minimum threshold is sufficient to ensure avoidance of significant and unreasonable adverse impacts (undesirable results) to UTS. Hydrologic connectivity should be maintained to provide suitable habitat for UTS.

Recommendation #3.1(a): CDFW recommends SABGSA establish the minimum thresholds at 0.50 cfs at the Casmalia gage instead of 0.15 cfs, to consider impacts to UTS, which are particularly sensitive to additional water reductions due to groundwater pumping, and other stressors which can increase with lower surface water levels, such as water quality, temperature, and turbidity.

Recommendation #3.1(b): CDFW recommends SABGSA establish a measurable surface water flow trigger of 0.75 cfs to begin the implementation of management actions and priority projects to avoid significant and unreasonable impacts to UTS. A reasonable timetable is also needed to ensure projects are ready to be implemented to avoid surface water flows reaching CDFW's proposed minimum threshold of 0.5 cfs.

Issue #3.2: CDFW expressed concerned in Comment #1 of GDEs along San Antonio Creek and throughout the Basin that were eliminated as potential GDEs. The USGS currently measures streamflow at three locations along San Antonio Creek; one upstream of the town of Los Alamos (Los Alamos gage # 11135800), one where San Antonio Creek leaves the basin (Casmalia gage #11136100), and one on a tributary to San Antonio Creek (Harris Canyon Creek gage #11136040) (USGS 2021). The Draft GSP only establishes minimum thresholds at the Casmalia gage.

Recommendation #3.2(a): CDFW appreciates SABGSA's efforts to utilize the Casmalia gage, however, CDFW recommends SABGSA incorporate the Harris Canyon and Los Alamos gages into SABGSA's monitoring efforts to supplement SABGSA's ability to assess impacts to interconnected surface waters and GDES within the Basin.

Recommendation #3.2(b): CDFW recommends minimum thresholds also be established for gage #1135900 and #11136040. This will ensure avoidance of impacts to any additional GDEs within the Basin, identified as a result of Recommendation #1(a).

Comment #4 – Section 3.2.6.2 Terrestrial and Aquatic Special-Status Species Occurrence

Issue #4.1: CDFW has concerns with the limited number of terrestrial and aquatic special-status species that the SABGSA lists in the Draft GSP. The San Antonio Creek Valley provides habitat that supports several sensitive species (some listed as endangered or threatened) throughout their life cycles, including the ESA and southwestern willow flycatcher (*Empidonax traillii extimus*), least Bell's vireo (*Vireo bellii pusillus*), tricolored blackbird (*Agelaius*

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tricolor), and arroyo chub, an SSC (CNDDB 2021; USFWS 2021). Habitats that support these species also consist of phreatophytes and other vegetation communities that are dependent on shallow aquifers that support surface water in each of these systems. Phreatophytic vegetation is a critical contributor to nesting and foraging habitat and forage for a wide range of species and can be affected by sensitive to depth to groundwater threshold impacts (Naumburg et.al. 2005) and (Froend et. al. 2010). This sensitivity to groundwater level thresholds means that localized pumping and recharge actions altering groundwater levels can impact the health and extent of phreatophyte vegetation health. Both decreasing (drying out) or increasing (drowning) groundwater elevation has the potential to stress phreatophytes depending on the plant species and the groundwater elevation and duration (e.g., short term wetness/dryness versus prolonged wetness/dryness).

Recommendation #4.1: CDFW recommends SABGSA add the following species to the final GSP: the southwestern willow flycatcher, least Bell's vireo, tricolored blackbird, and arroyo chub.

Issue #4.2: Based on the information provided in the Draft GSP, CDFW is not able to determine if southern California steelhead (*Oncorhynchus mykiss*; steelhead) is present within the Basin.

Recommendation #4.2: CDFW recommends SABGSA identify steelhead as a species that has the potential to occur within the Basin, and has the potential to be impacted by groundwater pumping.

Comment #5: Section 2.2.3 Land Use and General Plans Summary; Cannabis Cultivation (Cannabis Priority Watershed)

Issue: CDFW is concerned that cannabis groundwater use is not being fully accounted for when evaluating this SGMA area. Ignoring the growth potential of this industry could result in a lack of groundwater management accountability. There are approximately eight cannabis projects within the San Antonio Creek Watershed. Six of those are within 1000 feet of San Antonio Creek and all are likely using groundwater. Page 2-12 of the Draft GSP states that "*Land uses in the Basin are primarily agricultural. Of note, in 2019 the Santa Barbara County Board of Supervisors placed a limit on outdoor cannabis cultivation in the unincorporated areas of the County outside the Carpinteria Agricultural Overlay District County to no more than 1,575 acres (Santa Barbara County Code § 50-7) and requires a special land use permit".*

The Basin has sensitive, natural communities consisting of Coast Live Oak, Valley Oak, Riparian Mixed Hardwood and Willow habitats along Santa Antonio Creek and its tributaries. According to CNDDB, these habitats support several sensitive species (some listed as endangered or threatened) throughout their life cycles, including California red-legged frog (*Rana draytonii*), tricolored blackbird, La Graciosa thistle (*Cirsium scariosum var. loncholepis*), Gambel's water cress (*Nasturtium gambelii)*), and unarmored threespine stickleback, and California tiger salamander (CTS) (*Ambystoma californiense*). There are approximately 52 known/potential CTS ponds in the Basin (CNDDB; CDFW 2021).

Groundwater and interconnected surface water depletion is a major concern for fish and wildlife beneficial users in the Basin. Designating this area as a High Priority Cannabis Watershed requires groundwater to be monitored and sustainably managed for the benefit of all beneficial users, including groundwater dependent vegetated communities and interconnected surface

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waters that are necessary to support riparian and aquatic habitat, and the sensitive species therein such as steelhead. Decreased stream flow may contribute to direct mortality if fish eggs are exposed, covered with silt, or left without sufficient oxygenated water. Water degraded in temperature or chemical composition can displace or limit fish populations.

Recommendation #5: CDFW recommends the SABGSA monitor the Basin as a Cannabis High Priority Watershed. This High priority captures the documented impacts within the groundwater basin and the shifting groundwater consumption rates, as influenced by legalization of cannabis [Water Code §§ 10933. (b)(7,8)]. Based on the number of Departmental applications for legal cultivation, there is documented significant demand and potential adverse impacts to beneficial users of groundwater. The cannabis market growth is expected to increase almost ten times during an eight-year span (Fortune Business Insights 2021). North America is expected to lead the world cannabis market. Santa Barbara County recently approved a zoning permit for 87 acres of outdoor cannabis cultivation.

Comment #6: Section 2.2.3 Land Use and General Plans Summary; Cannabis Cultivation

Issue #6.1: Without the designation of the Basin as a Cannabis High Priority Watershed, evaluation of cannabis crop water usage may be overlooked throughout the Basin. Cannabis cultivation is a water intensive crop that can have a significant impact to environmental beneficial users of groundwater

Cannabis groundwater wells provide water for the irrigation of water-intensive cannabis cultivation (assuming six gallons of water per day per plant) (Bauer S. 2015). CDFW is concerned that without management of the two principal aquifers under SGMA by the SABGSA, significant and unreasonable surface water depletions may occur, compromising groundwater dependent ecosystems within and along the streams.

Recommendation #6.1(a): CDFW recommends a more careful review of the existing information on cannabis cultivation within the principal aquifers and recommends the information be considered when evaluating groundwater management. The majority of cannabis cultivation rely on groundwater for cannabis crops irrigation, and the likely interconnected nature between Basin groundwater levels and the Slough suggests that such uses (individually or cumulatively) should be considered when evaluating cannabis impacts in the underlying Careaga Sand water bearing formation.

Recommendation #6.1(b): CDFW recommends the Basin be classified as a Cannabis High Priority Watershed.

Issue #6.2: The majority reliance on groundwater for cannabis crops irrigation, and the possible areas of interconnected surface waters in San Antonio Creek and its tributaries and seeps suggest that such uses (individually or cumulatively) should be considered when evaluating cannabis impacts in the Paso Robles Formation and the Careaga Sand.

Recommendation #6.2: CDFW recommends a more careful review of the existing information on cannabis cultivation within the Basin and recommends the information be considered when evaluating groundwater management.

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GENERAL COMMENTS AND RECOMMENDATIONS

Comment #7: SABGSA may need to revise the GSP before it is finalized and adopted by SABGSA.

Recommendation #7: CDFW recommends SABGSA provide a red-lined version of the final GSP to understand the changes made between the Draft GSP and final GSP. Alternatively, CDFW recommends SABGSA provide a summary of changes made and comments addressed by SABGSA in preparation of a final GSP.

CONCLUSION

CDFW appreciates the opportunity to comment on the Draft GSP. CDFW recommends SABGSA address the comments above to avoid a potential 'incomplete' or 'inadequate' GSP determination per SGMA Regulations, as assessed by the Department of Water Resources, for the following reasons derived from regulatory criteria for GSP evaluation:

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. [CCR § 355.4(b)(1)] (See Comments # 1, 2, and 3);

2. The Draft GSP does not identify reasonable measures and schedules to eliminate data gaps. [CCR § 355.4(b)(2)] (See Comments # 1, 2, and 3);

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 Draft GSP. [CCR § 355.4(b)(3)] (See Comments # 1, 2, 3, 4 and 5);

4. The interests of the beneficial uses that are potentially affected by the use of groundwater in the basin, have not been considered. [CCR § 355.4(b)(4)] (See Comments # 1, 2, 3, 4, 5, and 6).

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Attachment B

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APPENDIX C

Communication and Engagement

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San Antonio Basin Groundwater Sustainability Agency's Groundwater Sustainability Plan Stakeholder Communication and Engagement Plan

GSP Stakeholder Communication and Engagement Plan

As Adopted by the San Antonio Basin Groundwater Sustainability Agency Board of Directors on July 17, 2018

Overview

In 2014, California enacted the Sustainable Groundwater Management Act (SGMA). The purpose of the SGMA is to ensure local sustainable groundwater management in medium- and high- priority groundwater basins statewide. SGMA requires that groundwater sustainability plans be adopted for these medium- and high-priority groundwater basins in California.

The San Antonio Creek Groundwater Basin ("Basin") is designated as a medium-priority basin. As such, SGMA requires formation of a locally-controlled groundwater sustainability agency (GSA) as the entity responsible for developing and implementing a groundwater sustainability plan (GSP). The primary goal of the GSP is to develop sustainable groundwater management practices for the future. As a medium-priority basin, the GSP must be submitted to the State by January 31, 2022 and to achieve sustainability by 2042.

After numerous meetings among stakeholders in the Basin regarding the optimal governance structure, the San Antonio Basin Groundwater Sustainability Agency (SABGSA) formed in May 2017 under a joint powers agreement between the Cachuma Resource Conservation District and the Los Alamos Community Services District. The SABGSA immediately commenced monthly Board of Directors meetings noticed and open to the public in compliance with the Ralph M. Brown Act.

In an effort to understand and involve stakeholders and their concerns in the decision-making and activities of the SABGSA, this Stakeholder Communication and Engagement Plan has been developed to achieve broad, enduring and productive involvement during the GSP development and implementation phases. This Stakeholder Communication and Engagement Plan describes how decisions regarding groundwater management will be made and will assist the SABGSA in providing timely information to stakeholders and receiving and incorporating input from interested parties during GSP development. This Stakeholder Communication and Engagement Plan identifies stakeholders who have an interest in groundwater in the Basin, and recommend outreach, education

and communication strategies for engaging those stakeholders during the development and implementation of the GSP. In consideration of the interests of all beneficial uses and users of groundwater in the Basin, this Stakeholder Communication and Engagement Plan has been developed pursuant to California Water Code Section 10723.2 and the California Code of Regulations, Title 23, Section 354.10.

The purpose of the outreach activities described in this Stakeholder Communication and Engagement Plan is to provide individual stakeholders, stakeholder organizations, and other interested parties an opportunity to be involved in the development and evaluation of the GSP for the Basin. The projects and management actions necessary to implement the GSP could affect individuals and groups who have a stake in ensuring the Basin is sustainably managed as required by SGMA.

Stakeholder Communication and Engagement Strategy Goals

SGMA requires the SABGSA to consider the interests of all beneficial uses and users of groundwater, and encourage involvement of diverse social, cultural, and economic elements of the population within the Basin during GSP preparation and implementation. The goals of the Stakeholder Communication and Engagement Plan are to:

- Conduct an inclusive outreach and education process that facilitates the development of a well- prepared GSP that meets SGMA requirements and achieves SGMA's sustainability goal.
- Enhance understanding and inform the public about water governance and groundwater resources in the Basin and the purpose and need for the GSP.
- Engage a diverse group of interested parties and stakeholders and promote informed community feedback throughout the GSP preparation and implementation process.
- Coordinate communication and involvement between the GSA (Board, Advisory Committee and staff), and other local agencies (including other GSAs), elected and appointed officials, and the general public.
- Utilize the Advisory Committee to facilitate a comprehensive public engagement process.
- Employ a variety of outreach methods that make public participation easy and accessible. Hold meetings at times and venues that encourage broad participation.
- Respond to public concerns and provide accurate and up-to-date information.
- Manage the community engagement program in a manner that provides maximum value to the public and an efficient use of GSA and local agency resources.
- Evaluate and update the engagement methods throughout the GSP process as needed.
- Utilize and explain the 2020 United States Geological Survey (USGS) San Antonio Basin study, currently under development, which will provide groundwater data and modeling of the basin.Update stakeholders on the USGS San Antonio Basin study at the semi-annual update meetings.

Outreach Roles

SABGSA Board

The SABGSA Board of Directors ("Board"), which is comprised of appointed members, will make the ultimate decisions regarding how the groundwater basin will be managed and how the management actions described in the GSP will be financed. As required by the Joint Exercise of Powers agreement that created the GSA, the Board will consider the recommendations of the Advisory Committee (described below). The Board typically meets on the third Tuesday of the month at the Los Alamos

Community Services District office at 6pm.

In regards to outreach, the Board is responsible for:

- Adopting and overseeing implementation of the Stakeholder Communication and Engagement Plan;
- Receiving public comments made in writing, and verbally at Board meetings and public hearings;
- Considering the recommendations of the Advisory Committee.

GSP Advisory Committee

The GSP Advisory Committee**,** which is comprised of members appointed by the GSA Board, will become familiar with issues related to the GSP. The Advisory Committee is charged with developing recommendations on GSP-related issues and incorporating the community and stakeholder interests into these recommendations. This charge will be carried out through various venues and a variety of activities, but generally includes:

- Actively seeking input from the represented public and stakeholder groups on issues before the GSA;
- Sharing input and feedback with the full Advisory Committee at Advisory Committee meetings; and
- Making recommendations to the Board.

Advisory Committee meetings are typically the first Tuesday of the month at the Los Alamos Community Services District office at 1:30pm.

Executive Director

The Executive Director is considered SABGSA staff and will be available to provide information about SABGSA and the GSP status. The GSA's Executive Director is Anna Olsen and she may be reached by email at aolsen@sanantoniobasingsa.org or by telephone at 805-868-4013.

The Board, the Advisory Committee, and staff are committed to: keeping the public informed; providing balanced and objective information to assist the public in understanding SGMA, available options and recommendations; and creating an open process for public input on the development and implementation of the GSP. When evaluating the options and making decisions, the Board, Advisory Committee and staff will solicit public input through a variety of methods, including public workshops, written and verbal comments, meetings with stakeholder organizations and community events. Input will also be received during public comment periods at Advisory Committee and Board meetings and in writing. As noticed on all Board and Advisory Committee meeting agendas, comments made in writing can be submitted directly to the GSA's executive director at aolsen@sanantoniobasingsa.org.

Stakeholder Identification

SGMA mandates that a GSA 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. (Water Code § 10723.4.) A list of interested persons wishing to receive information and/or participate has been compiled and will be updated and maintained throughout the GSP development phases. The initial list of stakeholders and interested parties include, but are not limited to, the following:

- Local land use planning agencies, including but not limited to the County of Santa Barbara
- Holders of overlying groundwater rights, including but not limited to the following:
    - Domestic well owners
    - Agricultural well owners, including farmers, ranchers, and dairy professionals
- Business
- Municipal well operators/Public water systems (Los Alamos Community Services District, represented on the SABGSA Board of Directors)
- Environmental uses of groundwater and environmental advocacy groups
- Land conservancies
- Surface water users
- Disadvantaged communities and environmental justice interests
- Vandenberg Air Force Base
- California Native American tribes (note: there are no presently known California Native American tribes within the Basin)
- Federal Government
- Other groundwater users identified through the communications and engagement process

Maintenance of the Interested Persons List

To distribute information about GSP development, an email list has been compiled into a database of interested persons and stakeholders. Board members and the agencies they represent, Advisory Committee members and staff can contribute names of organizations, agencies, and individuals to the list. The database will also be updated regularly to add names of attendees at public meetings along with those requesting information via email or the through the GSA's website.

The purpose of the interested persons list is broad and includes anyone who would like to stay informed about SGMA activities and anyone the Board and Advisory Committee thinks should be informed about GSP process and the outcome of other groundwater management efforts. This list will also be used for dissemination of information on public workshops, public meetings, release of draft documents, public comment deadlines, and other GSP milestones.

Outreach Methods

Anticipated outreach methods include facilitating the public's access to information and documents through the GSA's website and email distribution list, as well as making information available where needed in hard copy form. For instance, the GSA will use already-established outreach venues in the Basin's predominantly rural, agricultural community such as community posting locations for placement and/or distribution of informational materials (e.g. flyers or posters). Locations for posting of materials may include: Los Alamos Community Service District, Cachuma Resource Conservation District, Los Alamos Public Library, and the Los Alamos Post Office. Public meetings and project information will be disseminated through email or direct mail, if requested. This communication will provide information for the Basin community, public agencies, and other interested persons/organizations about milestones, meetings, and the progress of GSP development. The following are some of the outreach methods envisioned for this project:

1. **Public Notices**

To ensure that the general public is apprised of local activities and allow stakeholders to access information, SGMA specifies several public notice requirements for GSAs. All meetings, hearings and workshops will be noticed in compliance with the Ralph M. Brown Act. As outlined below, there will be a variety of opportunities for people to participate in the development and implementation of the GSP, including workshops, public hearings, providing comments at Board of Director and Advisory Committee meetings and through written comments.

In addition to open meeting requirements, three sections of the California Water Code require public notice before establishing a GSA, adopting (or amending) a GSP, or imposing or increasing fees:

- Section 10723(b). "Before electing to be a groundwater sustainability agency, and after publication of notice pursuant to Section 6066 of the Government Code, the local agency or agencies shall hold a public hearing in the county or counties overlying the basin." In accordance with California Water Code Section 10723(b), the following occurred: on May 10 and May 16, 2017, at the duly noticed public meetings of the Los Alamos Community Services District and the Cachuma Resource Conservation District, respectively, the two agencies approved a Joint Exercise of Powers agreement creating the SABGSA. On June 14, 2017, SABGSA held a noticed public hearing to consider becoming a GSA for the San Antonio Basin, and voted to become such a GSA. The June 14, 2017 public hearing was noticed in the Santa Maria Times in accordance with Government Code Section 6066.

- 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. …"

- Section 10730(b)(1). "Prior to imposing or increasing a fee, a groundwater sustainability agency shall hold at least one public meeting, at which oral or written presentations may be made as part of the meeting....(3) At least 10 days prior to the meeting, the groundwater sustainability agency shall make available to the public data upon which the proposed fee is based."

2. **Public Meetings/Hearings**

Comprehensive stakeholder involvement will include regularly scheduled public meetings of the Board and the Advisory Committee to aid in developing and implementing the GSP. In addition to signing up to receive information about GSP development at the SABGSA webpage, interested parties may participate in the development and implementation of the GSP by attending and participating in public meetings. (Water Code Section 10727.8(a)). Public meetings or hearings are formal opportunities for people to provide official comments on programs, plans and proposals. During development of the GSP, topics associated with each chapter will be presented at various Board meetings to keep the Board and public informed about the progress of the GSP and to obtain input as the GSP is being prepared. Each meeting will have a scheduled time for public comments. Information about upcoming meetings can be found on the San Antonio Basin GSA website: https://sanantoniobasingsa.org/.

3. **Stakeholder Briefings**
   Regular meetings of the Advisory Committee will facilitate technical review of GSP progress and allow for increased opportunity for discussion and input. Advisory Committee members will meet with and communicate regularly with organizations comprised of the stakeholder groups they represent. To facilitate cohesive communication and messaging, all briefings will be coordinated with staff. All meetings are open to the public and stakeholder groups.

4. **Public Input**
   Meetings will also be held as GSP elements are being developed and will serve as opportunities for public input. Public educational meetings provide less formal opportunities for people to learn about groundwater, SGMA, and GSP elements. Meetings can be organized in a variety of ways, including open houses and traditional presentations with facilitated question and answer sessions. Whatever format of meeting is used, it will be designed to maximize opportunities for public input. Community meetings (workshops, open houses, town halls) may be conducted for key stakeholders where project experts share educational information by topic, clarify technical data and issues, and offer opportunities for public questions and input. The timing and precise format of public workshops will be informed by the key issues that arise and the input received during early stages of GSP development.
   Meetings may be held in coordination with the following milestones/tasks:
   - Preparation of the Hydrogeologic Conceptual Model and draft groundwater conditions section of the GSP
   - Preparation of the Basin Model and Water Budget
   - Establishment of Basin Sustainability Criteria
   - Establishment of monitoring objectives and a monitoring network
   - Identification and prioritization of projects and management actions
   - Draft Sustainability Plan Implementation
   - GSP draft document

5. **Briefings for the JPA Member Agencies**
   Cachuma Resource Conservation District (https://www.rcdsantabarbara.org/) and Los Alamos Community Service District (http://www.losalamoscsd.com/) staff will brief their respective board of directors regularly on GSA activities.

6. **Website**
   The SABGSA website will house information about SGMA, the GSP process, SABGSA Board, Advisory Committee, public meetings, project reports and studies, and groundwater data and information. The project website, https://sanantoniobasingsa.org/, will be a tool for distributing and archiving meeting and communication materials as well as a repository for studies and other documents. Staff anticipates updating the website at least monthly, and more often when needed.

7. **Email / Direct Mailings**
   Public meetings and other information will be disseminated through email, from the SABGSA office, or direct mail under special circumstances and/or if requested. This communication will provide information for the community, public agencies, and other interested

persons/organizations about milestones, meetings, and the progress of GSP development.

8. **Additional Opportunities**
   Additional opportunities for stakeholder participation will be considered as GSP development progresses and as stakeholder interests evolve.

Plan Evaluation

To determine the level of success of the Engagement Plan, the SABGSA will implement the following measures:

Attendance/Participation

A record of those attending public meetings will be maintained throughout the GSP development process. SABGSA will utilize sign-in sheets and request feedback from attendees to determine adequacy of public education and productive engagement in the GSP development and implementation process. Meeting minutes will also be prepared and will be provided on the SABGSA website once approved.

Plan Update

This Stakeholder Communication and Engagement Plan will be reviewed at least annually and updated if necessary.

Incorporation into the GSP

The GSP will include a section describing how public input and comments were addressed as necessary and incorporated into the GSP document.

APPENDIX D-1

Los Alamos Community Services District Pumping Test Data and Analysis - Wells 3a and 5

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A & A Pump and Well Service
(805) 735-9797 (805) 688-8805
Mobil: (805) 452-5205 Fax: (805) 686-8282
ST Lic# 577455

WELL NAME: Los Alamos WELL LOCATION: 3 A

DATUM POINT (ie top of casing): Top of casing DEPTH OF WELL:

DEPTH OF PUMP SETTING: HP & MOTOR TYPE:

DEPTH OF AIRLINE: BLOW

WaterLevelForm.xls

DATE	ON / OFF	TIME	FLOW RATE (aprx gpm)	TOOL LEVEL (feet)	WATER LEVEL	AIR LINE (psi)	REMARKS (adjust flow, odor, gas, color, sand, ect.)
				6" pipe	Sonic		
1.18.11	Off	8.15					Set air tool and air pipe
	Blow	10.55	60-70	190'			Blow slightly cloudy a few seconds
	Off	11.03					Surge with air 4x then blow out
	Blow	11.45		190			Slight color
	Off	11.51					Added to tool
	Blow	12.30		200			
	Off	12.53					Added to tool
	Blow	2.02		230			Slightly cloudy a few seconds
	Off	2.38					Added to tool
	Blow	3.08		240			No color
	Off	3.25					Tear down piping and secure site
	Leave	4.45					
1.19.11		8.00					On job, set up pipe and prepare compressor, set tool
	Blow	9.21		240			
	Off	9.23					Blew 2" well seal off of piping
	Blow	9.29					
	Off	9.51 ?					Added to tool
	Blow	11.55		260			
	Off	11.59					3" discharge hose blew out of piping, secure
	Blow	12.07					
	Off	12.21					Added to tool
	Blow	2.35		270			Color at start up, then milky for 5 min to clear
	Off	2.50					Surge with air
	Blow	4.07					Color on startup then milky 5 min, with fine sands
	Off	4.24					Set tool to next level Tear down piping and secure site
	Leave	4.45					
11.20.11		8.00					Prepare site to blow
	Blow	8.23					Color on startup then milky with fine silt
	Off	8.27					Fitting repair, then surge
	Blow	9.30					Slight yellowish color
	Off	10.03					Added to tool
	Blow	11.49		290			Slight color very minimal
	Off	12.05					Pulled 2" pipe, lower tool, re-install 2"
	Blow	2.53		350			Color on startup then milky with fine silt
	Off	3.08					Surge 3x
	Blow	3.30					Some silty color with fine sands, then clear
	Off	3.40					Set tool to next level Tear down piping and secure site
	Leave	5.00					
11.21.11		8.00					Onsite, rig batteries need replaced
	Blow	12.12		360			Cloudy yellowish with sandy grit
	Off	12.30					Surge 3x
	Blow	12.40					Slight color to clear
	Off	12.50					Pulled 2" pipe, lower tool, re-install 2"
	Blow	2.41		370			Slight color to clear
	Off	3.05					Pulled 2" pipe, lower tool, re-install 2", secure site

A & A Pump and Well Service
(805) 735-9797 (805) 688-8805
Mobil: (805) 452-5205 Fax: (805) 686-8282
ST Lic# 577455

WELL NAME: Los Alamos **WELL LOCATION:** 3 A

DATUM POINT (ie top of casing): Top of casing **DEPTH OF WELL:**

DEPTH OF PUMP SETTING: **HP & MOTOR TYPE:**

DEPTH OF AIRLINE: BLOW

WaterLevelForm.xls

DATE	ON / OFF	TIME	FLOW RATE (aprx gpm)	TOOL LEVEL (feet)	WATER LEVEL	AIR LINE (psi)	REMARKS (adjust flow, odor, gas, color, sand, ect.)
	Leave	4.45					
11.24.11		8.00					Prepare site to blow
	Blow	8.35		370			Slight color to clear
	Off	8.55					Pulled 2" pipe, lower tool, re-install 2"
	Blow	10.47		390			Surge of slight color, cloudy for 5 min then clear
	Off	11.09					Pulled 2" pipe, lower tool, re-install 2"
	Blow	1.00		400			Slight color to clear
	Off	1.25					Pulled 2" pipe, lower tool, re-install 2"
	Blow	3.25		435			Initial color, cloudy, for 6 min then clear
	Off	3.58					Tear down piping and secure site
	Leave	4.45					
Pulling tool out and revisiting several areas for a second time							
11.25.11		8.00					Pulled 2" pipe, raise tool, re-install 2" set up to blow
	Blow	9.37		370			Surge of slight color, cloudy for 5, with reddish tint
	Off	9.55					Pulled 2" pipe, raise tool, re-install 2" set up to blow
	Blow	11.36		360			10 sec color cloudy for 5 min then clear
	Off	11.50					Pulled 2" pipe, raise tool, re-install 2" set up to blow
	Blow	2.04		280			Slight brownish tint 30 sec, milky 30 sec then clear
	Off	2.20					Pulled 2" pipe, raise tool, re-install 2" set up to blow
	Blow	3.27		270			3 sec color surge then clear at 30 sec.
	Off	3.45					Pull tool out of well
	leave	4.45					

Development

A & A Pump and Well Service
(805) 735-9797 (805) 688-8805
Mobil: (805) 452-5205 Fax: (805) 686-8282
ST Lic# 577455

WELL NAME: Los Alamos **WELL LOCATION:** 3 A

DATUM POINT (ie top of casing): **DEPTH OF WELL:**

DEPTH OF PUMP SETTING: 300 ft **HP & MOTOR TYPE:**

DEPTH OF AIRLINE:

WaterLevelForm.xls

DATE	ON / OFF	TIME	FLOW RATE (gpm)	WATER LEVEL (feet)	WATER LEVEL	AIR LINE (psi)	REMARKS (adjust flow, odor, gas, color, sand, ect.)
11.27.11	Surge	9.47			114.9		Surge 21 x
	On	10.37	300				45 hz for 2 min then increase to 59 hz
			700				59 hz
			600				5 min run time
	Off	10.50					
	Surge	10.54			115.8		30 surges
	On	11.55	300				45 hz for 3 min then to 59 hz
			600				Slight brownish tint in flow
	Off	12.10					
	Surge	12.20					30 surges
	On	1.22	300		115.8		45 hz then to 60 hz
		1.25	600				Slight yellowish
		1.29	650			45psi	
		1.47				43psi	
	Off	1.49					
	Surge	1.52					30 surges
	On	2.52					50 hz start then to 60 hz w/in 30 sec.
			650				Slight tannish yellow
		2.55				46psi	
	Off	3.17				42psi	Very slight color
	Surge	3.20		116	115.9		
	On	4.14	650				Light tannish yellow color
		4.16		128			
		4.24		135		43psi	
	Off	4.30					
		4.43		117.6			
11.28.11	Off	6.55		114		80psi	
	Surge	7.00					30 surges
	On	8.18	650				59 hz little color cloudy for 10 min then clear
	Off	8.38					7 min recovery to 80psi
	Surge	8.45					30 surges
	On	9.50	650				Milky tan
		9.54					Clearing
		10.00		133.9		46psi	Clear
		10.10		136.2		45psi	
	Off	10.15					
	Surge	10.20					30 surges
	On	11.20	650				Tannish yellowfor 1.5 min, clear at 6min then cloudy then clear @ 9 min
		11.50				44psi	
	Off	12.05					
	Surge	12.10					30 surges
	On	1.11	650				59hz, slightly cloudy for 10 min then clear
		1.47				44psi	Valve back to 500gpm
	Off	1.52				77psi	After 16 min recovery

Development

A & A Pump and Well Service
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ST Lic# 577455

WELL NAME: Los Alamos **WELL LOCATION:** 3 A

DATUM POINT (ie top of casing): **DEPTH OF WELL:**

DEPTH OF PUMP SETTING: 300 ft **HP & MOTOR TYPE:**

DEPTH OF AIRLINE:

WaterLevelForm.xls

DATE	ON / OFF	TIME	FLOW RATE (gpm)	WATER LEVEL (feet)	WATER LEVEL	AIR LINE (psi)	REMARKS (adjust flow, odor, gas, color, sand, ect.)
				line	Sonic		
1.28.11	Surge	2.00					30 surges
	On	3.10					Tannish yellow for 5 min then clear
		3.15		135		47psi	
	Off	3.35					
	On	4.00					
	Off	4.25					
1.31.11	Off	8.30					
	Surge	8.50					
	On	9.00	650				Spurts of yellowish tan 1 min then clear
	9.05			184		47psi	
	Off	9.10					
	Surge	9.12					30 surges
	On	10.00					2 min then clear
		10.05	570			47psi	
	Off	10.11					
	Off	10.41		115.9		79psi	30 min recovery

Step Tests

A & A Pump and Well Service
(805) 735-9797 (805) 688-8805
Mobil: (805) 452-5205 Fax: (805) 686-8282
ST Lic# 577455

WELL NAME: Los Alamos WELL LOCATION: 3A

DATUM POINT (ie top of casing): Top Of Case DEPTH OF WELL:

DEPTH OF PUMP SETTING: 304 HP & MOTOR TYPE:

DEPTH OF AIRLINE: 300 4 hr test

WaterLevelForm.xls

DATE	ON / OFF	TIME	SAND CONTENT	FLOW RATE (gpm)	WATER LEVEL (feet)	WATER LEVEL	AIR LINE (psi)	REMARKS (adjust flow, odor, gas, color, sand, ect.)	TOTAL WATERMETER
					line	Sonic		Old well	
1.31.11	Off			0	115.4	114.6	80		07416600
	On	11.00						57Hz	
		11.01			177	178			
		11.02			180.1	181.9			
		11.03			182	183.2	50		
		11.04			183	184.1			
		11.05			183.10	185			
		11.07			184.6	186	50		
		11.09			185.4	186.7	50		
		11.11		540	185.11	187.2			
		11.13			186.3	187.6			
		11.15			186.7	188.1		135	
		11.20		525	190.2	188.9	48.5	135.5	
		11.25			191	191.9		137 adjust to 58Hz	
		11.30		650	189.11	192.5		137.5	
		11.35		550	190	191.3		Adjust to 57.3Hz	
		11.40				191.6			
		11.45		520	190.3	191.9			
		11.50			190.9	192.2			
		11.55			191	192.4			
		12.00			191.1	192.6			
		12.05			191.3	193		140	
		12.10		520	191.5	193.1			
		12.15			191.8	193.4			
		12.20			191.11	193.5		140.7	
		12.25			192.1	193.6		Adjust to 56 Hz	
		12.30			186.2	187.5	49	140	
		12.35		470	186.1	187.5		139.6	
		12.40		470	186.1	187.5			
		12.45			186.1	187.5	49		
		12.50			186.1	187.6	49		
		12.55			186.2	187.6	49		
		1.00		470	186.3	187.8	49		
		1.10			186.6	188			
		1.15			186.9	188.1			
		1.16						350 gpm	
		1.20		410	178.10				
		1.23							
		1.25		380	175.8	176.6	54	138.3	
		1.30		380	175.5	176.4			
		1.35						Adjust to 50.7Hz	
		1.40			174.6	175.5		136.5	
		1.45			174.6	175.4		136.5	
		1.50			174.5	175.4	54	136.5	
		1.55			174.4	175.4		136.5	
		2.00			174.3	175.4		136.5	

A & A Pump and Well Service
(805) 735-9797 (805) 688-8805
Mobil: (805) 452-5205 Fax: (805) 686-8282
ST Lic# 577455

WELL NAME: Los Alamos WELL LOCATION: 3A

DATUM POINT (ie top of casing): Top Of Case DEPTH OF WELL:

DEPTH OF PUMP SETTING: 304 HP & MOTOR TYPE:

DEPTH OF AIRLINE: 300 4 hr test

WaterLevelForm.xls

DATE	ON / OFF	TIME	SAND CONTENT	FLOW RATE (gpm)	WATER LEVEL (feet)	WATER LEVEL	AIR LINE (psi)	REMARKS (adjust flow, odor, gas, color, sand, ect.)	TOTAL WATERMETER
					line	Sonic			
		2.05						Adjusted to 50.7Hz	
		2.10		300	163	163.6	60		
		2.15						Adjust gate valve for flow	
		2.20		260	156.1	156.5	62.5	132.5	
		2.25		250	155.10	156.1			
		2.30			155.7	156		132	
		2.35							
		2.40			155.4	155.6		131.5	
		2.45			155.2	155.5		131.2	
		2.50			155.1	155.5		131	
------	-----	------	----------	-------	---------	---------	------	----------	----------
	Off	3.00							
		3.01			125.6				
		3.02			125.1	124.7			
		3.05			124.4	123.7		124	
		3.10			122.11	122.3		122	
		3.20			121.1	120.8		120.9	
		3.30			121	120.2		120	

Constant Run
24hr +

A & A Pump and Well Service
(805) 735-9797 (805) 688-8805
Mobil: (805) 452-5205 Fax: (805) 686-8282
ST Lic# 577455

WELL NAME: Los Alamos **WELL LOCATION:** 3A

DATUM POINT (ie top of casing): Top Of Case **DEPTH OF WELL:**

DEPTH OF PUMP SETTING: 304 to top of suction **HP & MOTOR TYPE:**

DEPTH OF AIRLINE: 300 Ft **24 hr test pump**

WaterLevelForm.xls

DATE	ON / OFF	TIME	SAND CONTENT	FLOW RATE (gpm)	WATER LEVEL (feet)	WATER LEVEL	AIR LINE (psi)	REMARKS (adjust flow, odor, gas, color, sand, ect.)	TOTAL WATERMETER
					line	Sonic		Old Well water level	
2.2.11	Off	7:20	----------	------	113.11	113.1		113	7518800
	On	8.00		470					
		8.01				166			
		8.02			169.3	169.5			
		8.03			170.4	170.9		125	7520800
		8.04				171.8			
		8.05			171.8	172.3			
		8.06			172	173		128.5	
		8.07			172.3	173.1			
		8.08			172.8	173.4			
		8.09			173	173.6			7523100
		8.10		460	173.1	173.9		130 adjust Hz to 52	7524900
		8.15	Trace		171.8	172.1	55		
		8.20			171.10	172.6		131	7529250
		8.25		430	172.1	173		131.6 adjust Hz to 51.5	7531000
		8.30		420	171.2	172		132	7533100
		8.45		415	171.11	172.8	55	132.8	
		9.00			172.7	173.4	55	133.9	
		9.15		415	173	173.9			7550400
		9.30			173.2	174.2	54.5	134.6	7556500
		9.45			173.7	174.5		135	7562800
		10.00			173.10	174.7	54.5	135.2	7568700
		11.00		405	174.9	175.6	54	136.6	7592900
		11.10						adjust Hz to 51.7	7597000
		11.20						adjust Hz to 52	7600900
		11.22				177.1			7601700
		11.27			176.7	177.4			7603750
		11.32			176.9	177.5			7605800
2.3.11		12.00	Trace	410	176.11	177.8	53.5	138	7617300
		1.00		408	177.6	178.4		138.10	7641800
		2.00			177.10	178.8	53	139.4	7666000
		3.00		405	178.1	179.2	53	139.10	7690300
		4.00			178.4	179.5			7713650
		5.00		407	178.10	179.8	52.5	140.6	7738100
		6.00		397	179.0	180	52.5	140.10 adjust Hz to 52	7761900
		7.00		400	179.3	180.3	51.5	141.2	7785900
		8.00		397	179.5	180.58	51.5	141.5	7809700
		9.00		397	179.7	180.7	51	141.9 adjust Hz to 52.2	7833500
		10.00		402	180.5	181.6	50.5	142.3	7857600
		11.00		398	180.8	181.8	50	142.5	7881500
		12.00	Trace	400	181	182	50	142.9	7905500
		1.00		400	181.1	182.2	50	143.2	7929500
		2.00		400	181.4	182.5	50	142.6	7953500
		3.00			181.7	182.8	49	142.10	7977400
		4.00			181.7	182.8	49	142.11	8001000
		5.00		397	181.9	182.9	49	143.2	8024800

A & A Pump and Well Service
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Mobil: (805) 452-5205 Fax: (805) 686-8282
ST Lic# 577455

WELL NAME: Los Alamos WELL LOCATION: 3A

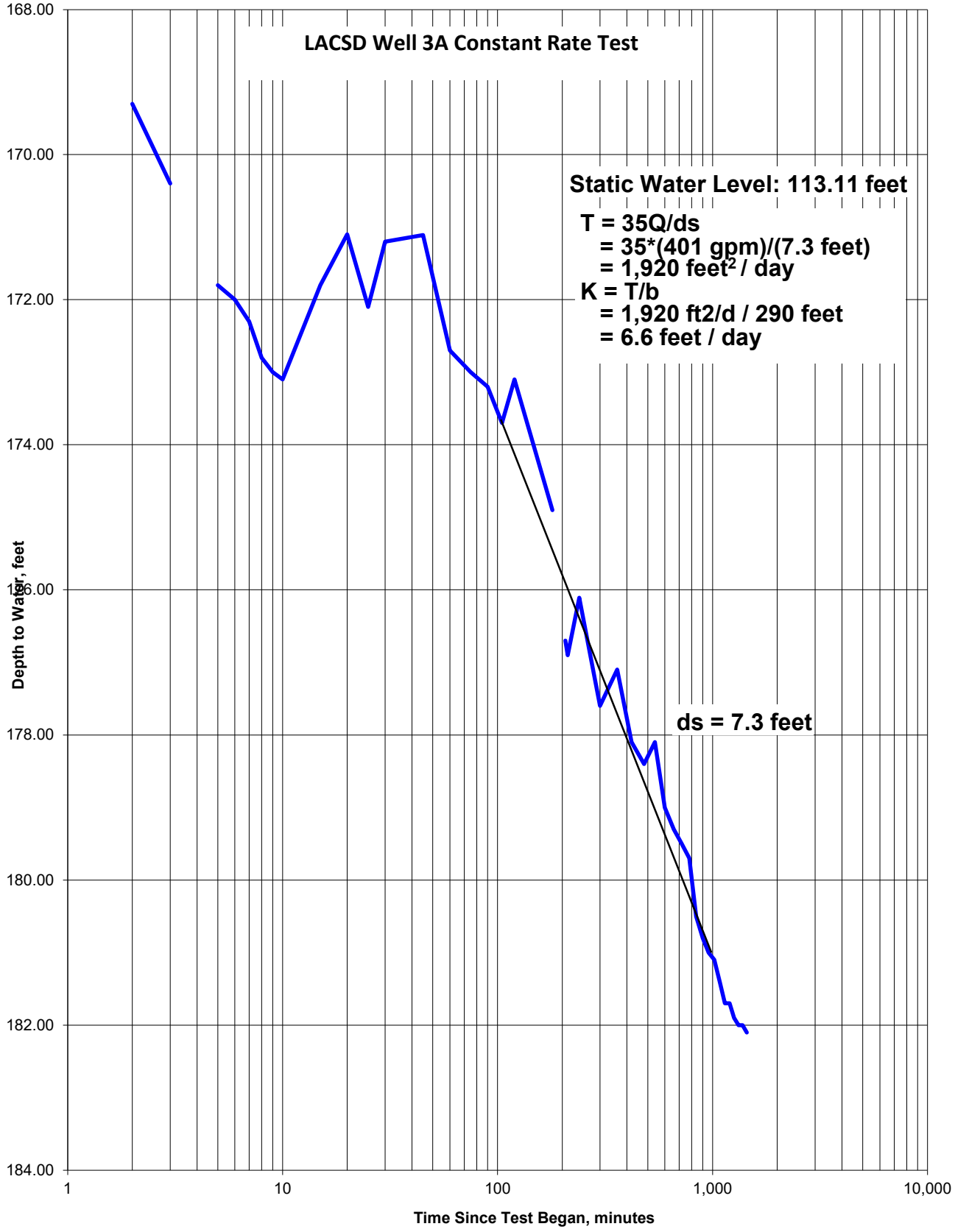
DATUM POINT (ie top of casing): Top Of Case DEPTH OF WELL:

DEPTH OF PUMP SETTING: 304 HP & MOTOR TYPE:

DEPTH OF AIRLINE: 300 24hr test pump

WaterLevelForm.xls

DATE	ON / OFF	TIME	SAND CONTENT	FLOW RATE (gpm)	WATER LEVEL (feet)	WATER LEVEL	AIR LINE (psi)	REMARKS (adjust flow, odor, gas, color, sand, ect.)	TOTAL WATERMETER
					line	Sonic			
2.3.11	On	6.00	Trace	393	182	183	49	144.7	8048400
		7.00		394	182	183.1	49	144.7	8072050
	Off	8.00			182.1	183.2	49	144.9	8095750
-------	-----	------	----------	-------	---------	---------	-----	----------	----------
								Recovery	
		8.05		0	133	132.7	72	132	
		8.10		0	131	130.6		130.2	
		8.15		0	130	129.5		129.1	
		8.20		0	129.1	128.6		128.8	
		8.25		0	128.6	128			
		8.30		0	128.1	127.5	74		
		8.45		0	126.10	126.1	74	126	
		9.00		0	126	125.4	74	125.1	


LACSD Well 3A Constant Rate Test
Static Water Level: 113.11 feet
T = 35Q/ds
= 35*(401 gpm)/(7.3 feet)
= 1,920 feet2 / day
K = T/b
= 1,920 ft2/d / 290 feet
= 6.6 feet / day
ds = 7.3 feet
Depth to Water, feet
168.00
170.00
172.00
174.00
176.00
178.00
180.00
182.00
184.00
1
10
100
1,000
10,000
Time Since Test Began, minutes

Cleath & Associates
Engineering Geologists
Hydrogeologists
(805) 543-1413
1390 Oceanaire Drive
San Luis Obispo
California 93405

December 13, 2006

Mr. Kevin Barnard
Los Alamos Community Services District
82 North St. Joseph Street
Los Alamos, California 93440

SUBJECT: Well construction and testing report for St. Joseph Street Well #5, Los Alamos Community Services District, Santa Barbara County.

Dear Mr. Barnard:

Cleath & Associates was retained by the Community Services District (District) of Los Alamos to supervise the construction and testing of a new supply well. This letter documents the results of these activities.

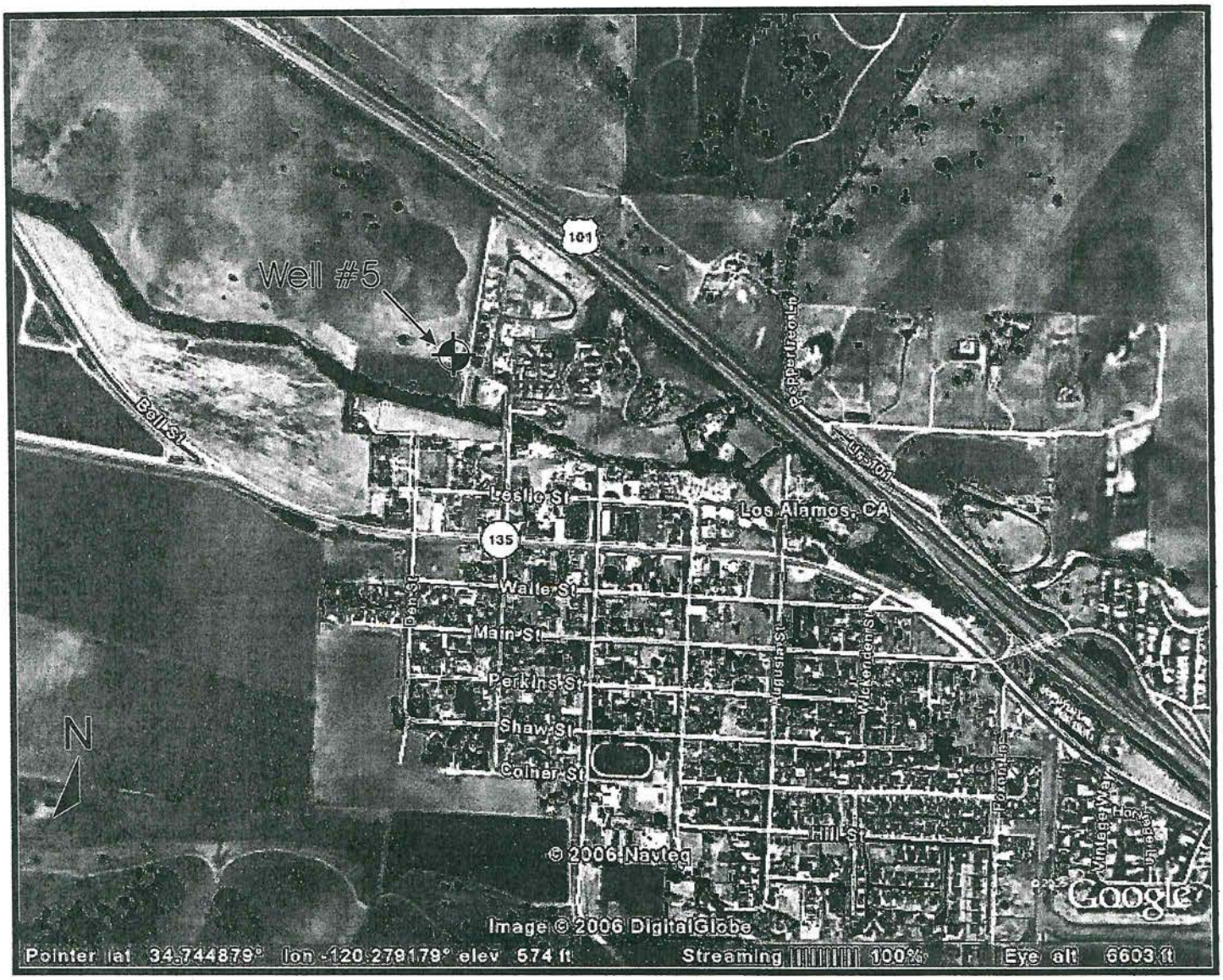
Background Information

The St. Joseph Street Well #5 is located approximately 350 feet west of St. Joseph Street, and approximately 280 feet north San Antonio Creek (Figure 1). The well taps unconsolidated sand and gravel aquifer zones of the Pleistocene and Pliocene age Paso Robles Formation. Land uses in the immediate vicinity of the site include open space and residential.

Test Hole Drilling

Prior to drilling and completing the new well, a test hole was drilled on March 29-31, 2005 to a depth of 1,000 feet by drilling contractor Floyd V. Wells, Inc. of Santa Maria, California, approximately 150 feet southeast of the well site. The test hole was documented in Cleath & Associates' letter report of April 13, 2005. The bore hole for the new well was drilled on October 5-14, 2006 by Best Drilling and Pump, Inc. of Highland, California. The lithology was logged by Cleath & Associates at both hole locations, and consisted of unconsolidated sands, gravels, silts and clays. Well completion report and lithologic log for the well are included in Appendix A. The bore hole was drilled by reverse rotary method, using water. No bentonite was used during drilling.

An electric log, natural gamma, and caliper log of the borehole were performed by Pacific Surveys on October 14, 2006 (Appendix A). The geophysical and lithologic logs indicated three main aquifer zones. The upper zone consists of alternating beds of sand and gravel with clay, clayey sand, and clay between a depth of 70 feet and a depth of 365 feet. To allow for the expected water level drawdown during production, only the lower portion of this upper zone can be tapped. A second permeable zone consists



Base Map: Google Earth
Scale: 1 inch = 2,000 feet

Figure 1
Location Map
St. Joseph Street Well (Well #5)
Los Alamos CSD
Los Alamos, California

Cleath & Associates

of two mostly sand beds, 15 feet and 30 feet thick respectively, between 580 feet and 675 feet. The lowest permeable zone consists of sand and gravelly sand beds approximately 15 feet and 55 feet thick respectively. A comparison of the geophysical and lithologic logs of the test hole and the well bore hole indicated that the beds are nearly flat lying in the vicinity of the two hole locations.

Well Construction

On October 5, 2006 a 36-inch diameter hole was drilled to a depth of 60 feet, and a 28-inch diameter, 5/16-inch thick mild carbon steel conductor casing was grouted in place to 60 feet depth. A 24-inch diameter bore hole was subsequently drilled to 1,010 feet depth. Photographs of the drilling and well construction activities are included in Appendix B.

The well was cased on October 14, 2006 using Roscoe Moss 1/4-inch wall, 12-inch diameter mild carbon steel blank from the wellhead through 212 feet depth; Roscoe Moss 12-inch diameter, 304 stainless steel 1/4-inch wall blank from 212-217 feet depth; 304 stainless steel wire wrap screen with 0.040-inch slots from 217-352 feet depth; 304 stainless steel 1/4-inch wall blank from 352-502 feet depth; 304 stainless steel wire wrap screen with 0.040-inch slots from 502-702 feet depth; 304 stainless steel 1/4-inch wall blank from 702-792 feet depth; 304 stainless steel wire wrap screen with 0.040-inch slots from 792-952 feet depth; and 304 stainless steel 1/4-inch wall blank casing with end cap from 952-962 feet depth. One carbon to stainless steel mechanical connector, two feet in length with 3/4-inch wall by 1-1/2-inch length mild carbon steel, was used to connect carbon steel blank sections to stainless steel screen sections at 210 feet depth. A summary of casing materials is included in Appendix C.

Nineteen sets of stainless steel centralizers were installed at approximately 40-foot intervals below the top of the highest screen interval, and one set of carbon steel centralizers was installed 67 feet above the top of the highest screen. The filter pack was composed of RMC Lapis #3 (8 x 20) sand and placed from the total depth up to 120 feet depth. A deep grout seal was placed from 120 feet depth to the ground surface. Well construction details are shown in Figure 2.

Development and Testing

The St. Joseph Street Well #5 was developed initially by air lift from during the week of October 18. The drilling rig was moved off-site the following week, and a pump rig was brought in to continue pump surge development with a test pump through October 27.

On November 2, 2006, a 4-hour step test was performed (data and graphs in Appendix D). Four successive 60 minute steps were run at nominal flow rates of 600 gallons per minute (gpm), 800 gpm, 1,000 gpm and 1,200 gpm, as measured by an in-line flow meter. The static water level was 92.52 feet depth prior to pumping and reached pumping water levels of 147.4 feet, 185.9 feet, 216.9 feet, and 252.2 feet at the end of the respective steps. The incremental specific capacity values show a 5.7 gpm/ft loss

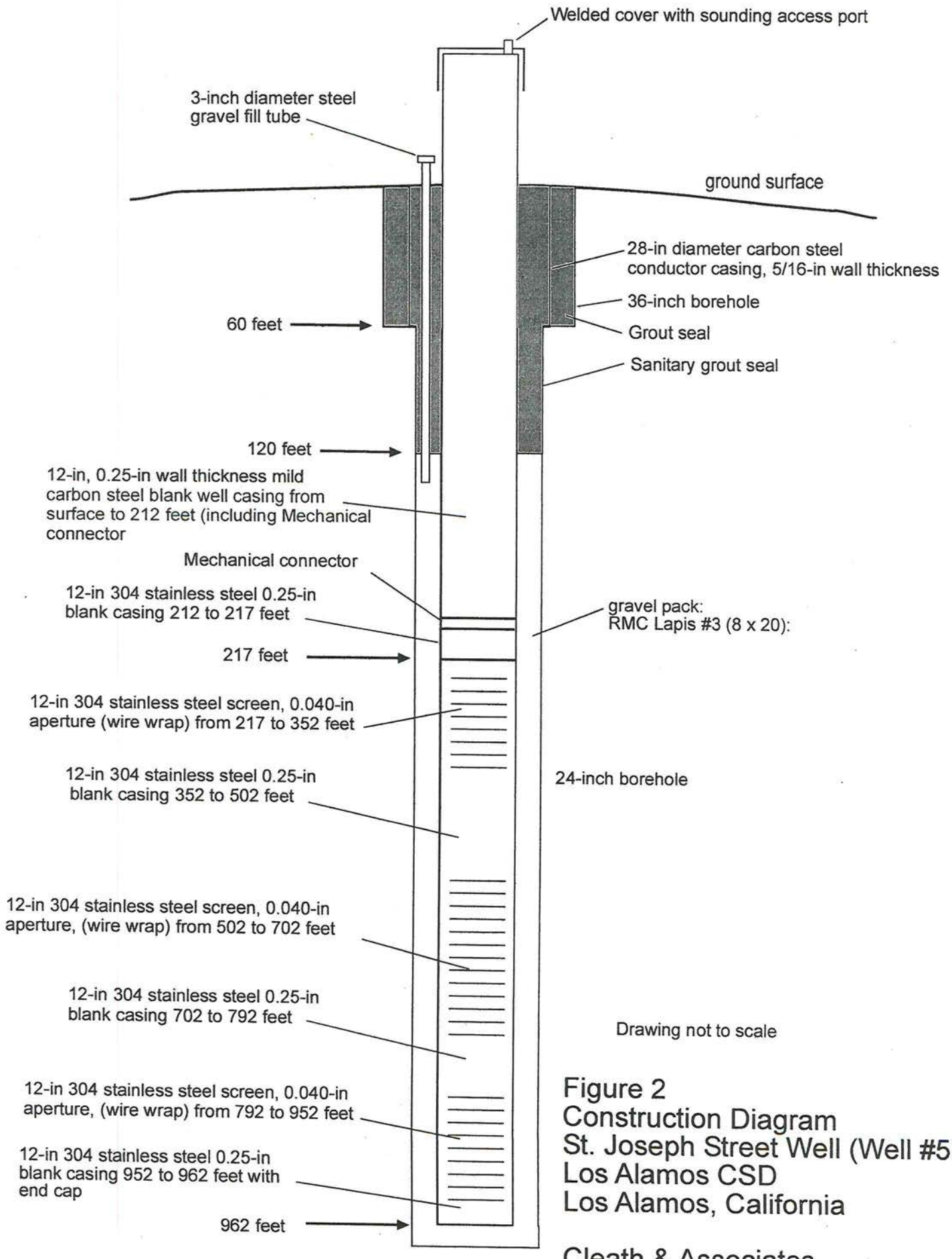


Figure 2
Construction Diagram
St. Joseph Street Well (Well #5)
Los Alamos CSD
Los Alamos, California

Cleath & Associates

in capacity during the second step when comparing specific capacities at flow rates of 600 gpm and 800 gpm. A flow rate of 800 gpm was selected for the constant discharge test, based on the step test results.

A 72-hour constant discharge test was performed at an average rate of 785 gpm on November 7 to 10, 2006 (data and graphs in Appendix D). Static water level prior to the test was at 89.3 feet depth. The one-hour specific capacity at 783 gpm measured 8.8 gpm/ft, and the one-day specific capacity at 778 gpm measured 7.12 gpm/ft. Total drawdown at the conclusion of the test measured 115.66 feet. The aquifer transmissivity measured 14,594 gallons per day per foot (gpd/ft) over the three days of pumping, based on an average rate of water level drawdown of 14.2 feet per log cycle of time. Flow rate adjustments on three occasions during the pump test resulted in short-term water level drops.

Water levels at the St. Joseph Street Well #5 recovered to within 22.3 feet of original static after 2 hours following pump shut down. The recovery curve (Appendix D) can be extrapolated to full recovery at a t/t(0) ratio of close to 1.4, indicating a normal response for a laterally extensive aquifer with no active recharge during the test.

A Rossum sand tester was used to measure sand production during the step test and the 72-hour pump test. Negligible sand was produced during the tests.

Well Efficiency

The theoretical one-day specific capacity of the St. Joseph Street Well #5 at 778 gpm is 7.3 gpm/ft, based on the Cooper-Jacob equation, assuming the following aquifer parameters:

Transmissivity = 14,594 gpd/ft (from pump test)
Storativity = 0.0005 (estimate)
Borehole radius = 1 foot (actual)

The actual one-day specific capacity for the St. Joseph Street Well #5 was 7.12 gpm/ft at 778 gpm during the constant discharge test. The resulting estimated well efficiency is approximately 97 percent, which is very good for a high-capacity well.

Design Flow

The pumping test was conducted during early fall conditions when the ground water level is expected to be at its seasonal low, however, static water level can be expected to drop following the onset of production, due to the establishment of a local pumping depression. For example, at the District's Well #4, a static water level of 77 feet was recorded immediately following well completion in May 1988, and had declined 26 feet to 103 feet depth in May 1990.

For the purpose of pump discharge recommendations, future static water levels at the St. Joseph Street Well #5 in late fall are assumed to drop 30 feet from current conditions, due to the anticipated pumping depression and regional pumping. Therefore, rather than beginning a 72-hour pumping cycle from the November 2006 static of 89.3 feet depth, future pumping cycles would likely begin from static water levels of close to 119 feet depth.

Cleath & Associates recommends sizing a pump based on the pumping schedule anticipated by the District. The pump design and recommended flow rate would allow up to 10 hours of operation per day over a seven-day period without dewatering the production zones. For the St. Joseph Street Well #5, the corresponding design flow would be 713 gpm from a maximum pumping level of 217 feet. We recommend setting the pump at 240 feet depth within the screened interval, or below within the blank casing interval (approximately 355 feet depth. This yield estimate is based on the Cooper-Jacob (1946) modification of the Theis Equation. The yield calculations are included in Appendix D.

Pump sizing based on the seven-day cycle requires careful water level monitoring to ensure that the well is not over pumped. Over pumping occurs when pumping water levels drop into the screened casing, causing cascading water and aquifer zone dewatering, which decreases the well capacity and may result in sanding and plugging problems at the well.

Water Quality

Ground water samples were collected on November 9, 2006, and submitted to Clinical Laboratory of San Bernardino, Inc., in Lompoc for analyses. Water quality samples were analyzed for general mineral, general physical, inorganics, boron, volatile organic compounds, semi-volatile organic compounds, gross alpha and beta radionuclides, uranium, radium 226 and 228, strontium 90, and tritium. At the time of this report, results were not available for gross beta, radium 226 and 228, strontium, and tritium.

The water quality is good and suitable for domestic use. The total dissolved solids (TDS) concentration was reported at 620 milligrams per liter (mg/l). This TDS concentration is above the recommended secondary drinking water standard maximum contaminant level (MCL) of 500 mg/l established by the California Department of Health Services (DHS), but below the upper MCL of 1,000 mg/l. The specific conductance (E.C.) of 930 umhos/cm was also slightly above the recommended MCL of 900 umhos/cm for secondary drinking water standards, but below the upper MCL of 1600 umhos/cm. Contaminants listed by the DHS under secondary standards are regulated to maintain the aesthetic qualities of the water. Their presence in tap water does not pose a health hazard. All other compound concentrations were below their respective MCLs.

Samples were also analyzed for various organic compounds, none of which tested above laboratory detection limits. A summary of the water quality results for general mineral, general physical, and inorganics is shown on Table 1. A complete listing of the water quality results is attached in Appendix E.

Table 1
Analytical Results of Water Samples, November 9, 2006
St. Joseph Street Well #5, Los Alamos CSD

Analyte	Results	MCL	DLR
Total Hardness (as $CaCO_3$) (mg/L)	350	--	5.0
Calcium (mg/L)	90	--	1.0
Magnesium (mg/L)	34	--	1.0
Sodium (mg/L)	71	--	1.0
Potassium (mg/L)	3.8	--	1.0
Total Alkalinity, (as $CaCO_3$) (mg/L)	210	--	5.0
Sulfate (mg/L)	190	500	0.50
Chloride (mg/L)	73	500	1.0
Nitrate (as NO_3) (mg/L)	7.4	45	2.0
Fluoride (mg/L)	0.16	2	0.10
pH (Std. Units)	7.2	--	--
Electrical Conductance (umhos/cm)	930	1,600	2.0
Total Dissolved Solids (mg/L)	620	1,000	5.0
Aluminum (ug/L)	ND	1,000	50
Antimony (ug/L)	ND	6	6.0
Arsenic (ug/L)	ND	10	2.0
Barium (ug/L)	ND	1,000	100
Beryllium (ug/L)	ND	4	1.0
Cadmium (ug/L)	1.6	5	1.0
Chromium (ug/L)	ND	50	10
Copper (ug/L)	ND	1,000	50
Iron (ug/L)	ND	300	100
Lead (ug/L)	ND	15	5.0
Manganese (ug/L)	35	50	20
Mercury (ug/L)	ND	2	1.0
Nickel (ug/L)	ND	100	10
Selenium (ug/L)	ND	50	5.0
Silver (ug/L)	ND	100	10
Thallium (ug/L)	ND	2	1.0
Zinc (ug/L)	ND	5,000	50
Boron (ug/L)	130	--	100
Nitrate + Nitrite as Nitrogen (N) (ug/L)	1700	10,000	400
Nitrite as Nitrogen (N) (ug/L)	ND	1,000	400
Cyanide (ug/L)	ND	150	100
Vanadium (ug/L)	6.6	--	3.0

mg/L = milligrams per liter

ug/L = micrograms per liter

MCL = maximum contaminant level

DLR = Detection levels for purposes of reporting

ND = Not detected above the DLR

Summary

A new water well for the Community of Los Alamos, St. Joseph Street Well #5, was completed west of St. Joseph Street, and north of San Antonio Creek in Los Alamos. The well is constructed with 12-inch diameter mild carbon steel and stainless steel wire wrap screen to a total depth of 962 feet, with perforations from 217-352, 502-702, and 792-952 feet.

The pumping tests indicate excellent well efficiency. The recommended **pump design flow is 713 gpm** from a pumping water level of **217 feet depth** (not including system pressures required at the wellhead) with the **pump setting at a minimum of 240 feet depth**. If you have any questions regarding this report, please call our office.

Sincerely,

David R. Williams
Associate Geologist

Timothy S. Cleath, HG 81
Principal Hydrogeologist

Appendix A

Well Construction Information:

Well Completion Report
Lithologic Log
Electric/Gamma Logs
Caliper Log

The free Adobe Reader may be used to view and complete this form. However, software must be purchased to complete, save, and reuse a saved form.

File Original with DWR

Page 1 of 2

Owner's Well Number WELL NO 5

Date Work Began 10-4-06 Date Work Ended 11-18-06

Local Permit Agency LOS ALAMOS COMM. SERV. DIST

Permit Number N.A Permit Date N.A

State of California

Well Completion Report

Refer to Instruction Pamphlet

No. e046752

DWR Use Only – Do Not Fill In

State Well Number/Site Number

Latitude N Longitude W

APN/TRS/Other

Geologic Log

Orientation ☒ Vertical ○ Horizontal ○ Angle Specify

Drilling Method Drilling Fluid

Depth from Surface Feet	to Feet	Description Describe material, grain size, color, etc
0	90	BROWN SAND
90	110	GRAVEL AND SAND
110	230	CLAY W/ SAND AND GRAVEL
230	360	BROWN SAND CLAY
360	500	HARD BROWN CLAY
500	700	BROWN GRAVELLY CLAY AND SAND
700	800	BROWN CLAY W/ SAND
800	900	SANDY CLAY
900	970	BROWN GRAVELLY SAND
970	1010	HARD GREY CLAY

Total Depth of Boring 1010 Feet

Total Depth of Completed Well 962 Feet

Well Owner

Name LOS ALAMOS COMM. SERV. DISTRICT

Mailing Address 82 NORTH ST. JOSEPH ST

City LOS ALAMOS State CA Zip 93440

Well Location

Address 33 ST JOSEPH ST

City LOS ALAMOS County SANTA BARBARA

Latitude Deg. Min. Sec. N Longitude Deg. Min. Sec. W

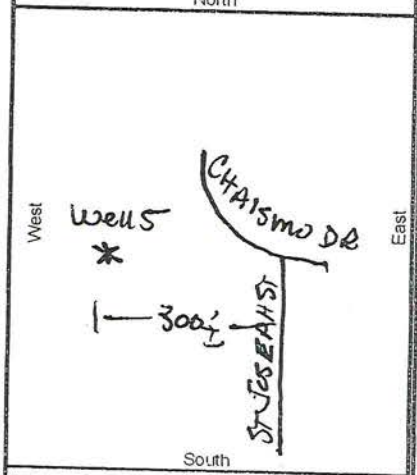
Datum Decimal Lat. Decimal Long.

APN Book 101 Page 110 Parcel 035

Township Range Section

Location Sketch

(Sketch must be drawn by hand after form is printed.)



Illustrate or describe distance of well from roads, buildings, fences, rivers, etc. and attach a map. Use additional paper if necessary. Please be accurate and complete.

Activity

☒ New Well
○ Modification/Repair
○ Deepen
○ Other
○ Destroy
Describe procedures and materials under "GEOLOGIC LOG"

Planned Uses

☒ Water Supply
☐ Domestic ☒ Public
☐ Irrigation ☐ Industrial
○ Cathodic Protection
○ Dewatering
○ Heat Exchange
○ Injection
○ Monitoring
○ Remediation
○ Sparging
○ Test Well
○ Vapor Extraction
○ Other

Water Level and Yield of Completed Well

Depth to first water 40 (Feet below surface)

Depth to Static Water Level 89 (Feet) Date Measured 11-7-06

Estimated Yield * 800 (GPM) Test Type CONSTANT

Test Length 72 (Hours) Total Drawdown 115 (Feet)

*May not be representative of a well's long term yield.

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size if Any (Inches)
0	60	36	COND	STEEL	5/16	28		
+2	210	24	BLANK	STEEL	1/4	12 3/4		
210	212	"	MECHICAL CONNECTOR			12 3/4		
212	217	"	BLANK	T 304 SS	1/4	12 3/4		
217	352	"	SCREEN	T 304 SS		12 3/4	WW	40
352	502	"	BLANK	T 304 SS	1/4	12 3/4		

Annular Material

Depth from Surface Feet	to Feet	Fill	Description
0	60	CEMENT	10.5 SK
60	120	CEMENT	10.5 SK
120	1010	GRAVEL	RMC #3

Attachments

☐ Geologic Log
☐ Well Construction Diagram
☐ Geophysical Log(s)
☐ Soil/Water Chemical Analyses
☐ Other

Attach additional information, if it exists.

Certification Statement

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

Name BEST DRILLING AND PUMP, INC. (Person, Firm or Corporation)

Address 2950 OLETA LANE City HIGHLAND State CA Zip 92346

Signed (C-57 Licensed Water Well Contractor) Date Signed 12-7-06

C-57 License Number 826672

DWR 188 REV. 1/2006

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

*The free Adobe Reader may be used to view and complete this form. However, software must be purchased to complete, save, and reuse a saved form.

File Original with DWR

Page 2 of 2

Owner's Well Number WELL 5

Date Work Began _____ Date Work Ended _____

Local Permit Agency _____

Permit Number _____ Permit Date _____

State of California

Well Completion Report

Refer to Instruction Pamphlet

No. e046752 CONT.

DWR Use Only – Do Not Fill In

State Well Number/Site Number

Latitude N Longitude W

APN/TRS/Other

Geologic Log

Orientation ○ Vertical ○ Horizontal ○ Angle Specify _____

Drilling Method _____ Drilling Fluid _____

Depth from Surface Feet	to Feet	Description Describe material, grain size, color, etc

Total Depth of Boring _____ Feet

Total Depth of Completed Well _____ Feet

Well Owner

Name _____

Mailing Address _____

City _____ State _____ Zip _____

Well Location

Address _____

City _____ County _____

Latitude _____ Deg. _____ Min. _____ Sec. N Longitude _____ Deg. _____ Min. _____ Sec. W

Datum _____ Decimal Lat. _____ Decimal Long. _____

APN Book _____ Page _____ Parcel _____

Township _____ Range _____ Section _____

Location Sketch

(Sketch must be drawn by hand after form is printed.)

North

West East

South

Illustrate or describe distance of well from roads, buildings, fences, rivers, etc. and attach a map. Use additional paper if necessary. Please be accurate and complete.

Activity

○ New Well

○ Modification/Repair

○ Deepen

○ Other _____

○ Destroy

Describe procedures and materials under "GEOLOGIC LOG"

Planned Uses

☒ Water Supply

☐ Domestic ☒ Public

☐ Irrigation ☐ Industrial

○ Cathodic Protection

○ Dewatering

○ Heat Exchange

○ Injection

○ Monitoring

○ Remediation

○ Sparging

○ Test Well

○ Vapor Extraction

○ Other _____

Water Level and Yield of Completed Well

Depth to first water 440 (Feet below surface)

Depth to Static Water Level 489 (Feet) Date Measured 11-7

Estimated Yield * 800 (GPM) Test Type CONSTANT

Test Length 72 (Hours) Total Drawdown 115 (Feet)

*May not be representative of a well's long term yield.

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size if Any (Inches)
502	702	24	SCREEN	T304 SS		12 3/4	WW	.040
702	792	24	BLANK	T304 SS	1/4	12 3/4		
792	952	24	SCREEN	T304 SS		12 3/4	WW	.040
952	962	24	BLANK	T304 SS	1/4	12 3/4		

Annular Material

Depth from Surface Feet	to Feet	Fill	Description

Attachments

☐ Geologic Log

☐ Well Construction Diagram

☐ Geophysical Log(s)

☐ Soil/Water Chemical Analyses

☐ Other _____

Attach additional information, if it exists.

Certification Statement

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

Name _____ Person, Firm or Corporation

Address _____ City _____ State CA Zip _____

Signed _____ C-57 Licensed Water Well Contractor Date Signed _____ C-57 License Number _____

DWR 188 REV. 1/2006

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

Well Log
St. Joseph Street Well (Well #5)
Los Alamos Community Services District

Well ID: St. Joseph Street Well (Well #5)
Date: October 5 to October 14, 2006
Location: Saint Joseph Street, north of San Antonio Creek
Elevation: 560.20 ft above sea level (from survey)
Geologists: D. Williams, and D. Burke, Cleath & Associates.
Drilling Company: Best Drilling and Pump, Inc.
Drilling Method: reverse rotary
Total depth: 1,010 feet

Lithologic Log
Depth to top and bottom in feet

Top	Bottom	Thickness	Description
0	7	7	**Sandy Silt;** trace gravel; dark yellowish brown (10YR 4/4); fine to medium grained sand, gravel to 3", subrounded shale gravel; damp.
7	8	1	**Sandy Clay;** yellowish brown (10YR 5/4); soft, fine to medium grained sand; moist.
8	16	8	**Clayey Sand;** trace gravel; yellowish brown (10YR 5/4); fine grained sand; siliceous shale gravel to 3"; moist.
16	18	2	**Sandy Clay;** trace gravel; yellowish brown (10YR 5/4) to grayish brown (10YR 5/2); soft, fine grained sand; moist.
18	28	10	**Clayey Sand;** trace gravel; yellowish brown (10YR 5/4); fine grained sand; gravel to 3". Becomes wet at 25' depth.
28	41	13	**Clayey Sand with Gravel;** light yellowish brown (10YR 6/4); fine grained sand; gravel to ½", subrounded; saturated. Hole sloughing.
41	45	4	**Clayey Sand;** light yellowish brown (10YR 6/4); fine grained sand. Base of alluvium.
45	47	2	**Gravelly Sand with Clay;** with cobbles; grayish brown (10YR 5/2); fine to medium grained sand; clasts to 6", porcelaneous shale gravel, subrounded to rounded; interbedded with clay.
47	50	3	**Sandy Clay;** grayish brown (10YR 5/2); stiff.
50	55	5	**Clayey Sand;** trace gravel; grayish brown (10YR 5/2); fine grained sand.

Los Alamos CSD St. Joseph Street Well (Well #5); (Continued)

Top	Bottom	Thickness	Description
55	70	15	**Clay;** trace sand; grayish brown (10YR 5/2); stiff, fine grained sand.
70	105	35	**Gravelly Sand**; pale brown (10YR 6/3); medium to coarse grained quartzose sand, subangular to subrounded; subrounded to rounded porcelaneous shale and chert gravel to 2".
105	115	10	**Clay with Sand;** brown (10YR 5/3); soft, fine to medium grained sand.
115	134	19	**Sand with Gravel;** pale brown (10YR 6/3); fine to coarse grained, lesser coarse; gravel to ½".
134	140	6	**Sandy Clay;** trace gravel; brown (10YR 5/3); soft clay; fine to coarse grained sand.
140	155	15	**Clayey Sand;** trace gravel; brown (10YR 5/3); fine to coarse grained sand; gravel to ½".
155	175	20	**Sandy Clay;** trace gravel; brown (10YR 5/3); soft clay; fine to coarse grained sand; gravel to ½".
175	185	10	**Sand with Clay and Gravel;** yellowish brown (10YR 5/4); fine to coarse grained sand; gravel to ¾".
185	200	15	**Gravelly Sand with Clay;** yellowish brown (10YR 5/4); fine to coarse grained sand; subrounded porcelaneous shale gravel.
200	205	5	**Clay;** brown (10YR 5/3); soft, sticky.
205	225	20	**Sand and Gravel with Clay;** yellowish brown (10YR 5/4); fine to coarse grained sand; shale gravel to 1".
225	245	20	**Clay with Sand;** trace gravel; brown (10YR 5/3); fine to medium grained sand; gravel to ½".
245	265	20	**Sandy Clay;** yellowish brown (10YR 5/4); soft; fine to medium grained sand.
265	275	10	**Clayey Sand;** trace gravel; yellowish brown (10YR 5/4); fine to coarse grained, lesser coarse; gravel to ½".
275	278	3	**Clayey Sand with Gravel;** yellowish brown (10YR 5/4); fine to coarse grained sand; gravel to ¾".
278	285	7	**Gravelly Sand;** yellowish brown (10YR 5/4); fine to coarse grained sand; gravel to 2", mostly siliceous shale and chert gravel.
285	298	13	**Clayey Sand with Gravel;** brown (10YR 5/3); fine to coarse grained, lesser coarse; gravel to 1".
298	315	17	**Clay;** brown (10YR 5/3); soft, sticky.

Los Alamos CSD St. Joseph Street Well (Well #5); (Continued)

Top	Bottom	Thickness	Description
315	327	12	**Sandy Clay;** brown (10YR 5/3); soft clay; fine to medium grained sand.
327	330	3	**Clayey Sand with Gravel;** yellowish brown (10YR 5/4); fine to coarse grained; gravel to ¾".
330	340	10	**Clay with Sand;** brown (10YR 5/3); soft; fine grained sand.
340	352	12	**Sand with Clay;** brown (10YR 5/3); fine to medium grained sand; olive yellow (5Y 6/6) clay from 251 to 352.
352	365	13	**Clayey Sand;** brown; (10YR 5/3); fine grained sand; soft clay.
365	385	20	**Sandy Clay;** trace gravel; yellowish brown (10YR 5/4); soft clay; fine to coarse grained sand; gravel to ½".
385	388	3	**Clayey Sand with Gravel;** yellowish brown (10YR 5/4); fine to medium grained; gravel to ½".
388	391	3	**Clay with Sand;** yellowish brown (10YR 5/4); soft; fine to medium sand, lesser medium.
391	430	39	**Clay with Sand;** brown (10YR 5/3); soft; fine to medium grained, mostly fine.
430	450	20	**Clayey Sand;** trace gravel; brown (10YR 5/3); fine to coarse grained; porcelaneous shale gravel to ½".
450	480	30	**Clay;** trace sand; grayish brown (10YR 5/2); soft; fine to medium grained sand.
480	490	10	**Clay;** grayish brown (10YR 5/2); soft, plastic.
490	510	20	**Clay with Sand;** grayish brown (10YR 5/2); soft; fine to medium grained sand.
510	578	68	**Clay;** trace sand; grayish brown (10YR 5/2), soft, mottled yellowish brown (10YR 5/4); fine grained sand.
578	590	12	**Sandy Clay;** brown; (10YR 5/3); soft; fine to medium grained sand.
590	595	5	**Clayey Sand with Gravel;** yellowish brown (10YR 5/4); fine to coarse grained sand; gravel to ½", subrounded porcelaneous shale gravel.
595	610	15	**Clayey, Gravelly Sand;** yellowish brown (10YR 5/4); fine to coarse grained sand; porcelaneous shale gravel to ¾".
610	620	10	**Clay with sand;** grayish brown (10YR 5/2); soft to medium consistency; fine grained sand.
620	625	5	**Sandy Clay;** trace gravel; yellowish brown (10YR 5/4); soft; fine to medium grained sand; gravel to ½".
625	630	5	**Clay with Sand;** grayish brown (10YR 5/2); soft to medium consistency; fine grained sand.

Los Alamos CSD St. Joseph Street Well (Well #5); (Continued)

Top	Bottom	Thickness	Description
630	638	8	**Clay with Sand;** trace gravel; yellowish brown (10YR 5/4); soft to medium consistency; fine to coarse grained sand; gravel to ½".
638	660	22	**Gravelly Sand with Clay;** yellowish brown (10YR 5/4); fine to coarse grained; siliceous and cherty gravel to ¾".
660	664	4	**Gravelly Sand;** thinly interbedded with clay; yellowish brown (10YR 5/4); fine to coarse grained sand; gravel to ¾".
664	675	11	**Clay;** grayish brown (10YR 5/2); soft, sticky.
675	690	15	**Clay;** dark greenish gray (5GY 4/1); stiff.
690	698	8	**Clayey Sand;** trace gravel; dark greenish gray (5GY 4/1); fine to medium grained; shale and mudstone gravel to ½".
698	722	24	**Clay with Sand;** trace gravel; dark greenish gray (10Y 4/1); stiff clay; fine grained sand; gravel to ½".
722	725	3	**Clay;** trace sand; dark greenish gray (10Y 4/1); stiff clay; fine grained sand.
725	740	15	**Sandy Clay;** trace gravel; greenish gray (10Y 5/1); stiff clay; fine to medium grained sand; gravel to ½".
740	750	10	**Clay with Sand;** greenish gray (10Y 5/1); soft clay; fine to medium grained sand.
750	765	15	**Sandy Clay;** trace gravel; greenish gray (10Y 5/1); soft clay; fine to medium grained sand; gravel to ¾".
765	772	7	**Clay with Sand;** greenish gray (10Y 5/1); soft clay; fine to medium grained sand.
772	790	18	**Clay;** trace sand; dark greenish gray (10Y 4/1); stiff; fine to medium grained sand.
790	805	15	**Clay;** trace sand; olive (5Y 5/3); soft; fine grained sand.
805	810	5	**Clay with Sand;** olive (5Y 5/3); soft; fine to medium grained sand.
810	824	14	**Sandy Clay;** olive (5Y 5/3); soft; mostly fine grained sand, lesser medium to coarse.
824	835	11	**Clay;** trace sand; yellowish brown (10YR 5/4); stiff; fine grained sand.
835	852	17	**Clayey Sand;** yellowish brown (10YR 5/4); sand mostly fine grained, lesser medium to coarse.
852	880	28	**Clay with Sand;** yellowish brown (10YR 5/4); soft clay; fine grained sand.
880	898	18	**Sandy Clay;** yellowish brown (10YR 5/4); soft; fine grained sand.

Los Alamos CSD St. Joseph Street Well (Well #5); (Continued)

Top	Bottom	Thickness	Description
898	910	12	**Clayey Sand with Gravel;** yellowish brown (10YR 5/4); fine to coarse grained sand; porcelaneous shale gravel to ½".
910	925	15	**Gravelly Sand;** yellowish brown (10YR 5/4); fine to coarse grained sand; subrounded porcelaneous shale gravel to ¾".
925	930	5	**Clayey Sand with Gravel;** light brownish gray (10YR 6/2); fine to coarse grained; gravel to ½".
930	950	20	**Sand and Gravel with Clay;** grayish brown (10YR 5/2); fine to coarse grained sand; porcelaneous shale gravel to 1".
950	960	10	**Sand with Gravel;** trace clay; light brownish gray (10YR 6/2); fine to coarse grained sand; gravel to ½".
960	970	10	**Sand and Gravel;** grayish brown (10YR 5/2); medium to coarse grained; porcelaneous shale gravel to ¾".
970	980	10	**Sandy, Gravelly Clay;** gray (10YR 6/1); fine to coarse grained sand; gravel to 1".
980	990	10	**Clay with Sand and Gravel;** gray (10YR 6/1); fine grained sand; gravel to 1".
990	1000	10	**Clay;** gray (10YR 6/1).
1000	1010	10	**Clay with Sand;** trace gravel; gray (10YR 6/1); fine grained sand; gravel to ½".

PACIFIC SURVEYS

ELECTRIC LOG
GAMMA RAY

Job No. 12824

File No.

Company BEST DRILLING

Well WELL #5

Field LOS ALAMOS

County SANTA BARBARA State CA

Location:

END OF ST. JOSEPH ST.

Sec. Twp. Rge.

Other Services:

CALIPER

Permanent Datum	G.L.		Elevation	Elevation
Log Measured From	G.L.	0'	above perm. datum	K.B.
Drilling Measured From	G.L.			D.F.
				G.L.

Date	10-14-06		
Run Number	ONE		
Depth Driller	1011'		
Depth Logger	1010'		
Bottom Logged Interval	1009'		
Top Log Interval	35'		
Casing Driller	30" @ 60'		
Casing Logger	60'		
Bit Size	24"		
Type Fluid in Hole	WATER		
Density / Viscosity	N/A		
pH / Fluid Loss	N/A		
Source of Sample	PIT		
Rm @ Meas. Temp	12.8 @ 77F		
Rmf @ Meas. Temp	13.5 @ 77F		
Rmc @ Meas. Temp	N/A		
Source of Rmf / Rmc	MEAS		
Rm @ BHT	N/A		
Time Circulation Stopped	2:00 AM		
Time Logger on Bottom	8:45 AM		
Max. Recorded Temperature	N/A		
Equipment Number	PS-2		
Location	L.A.		
Recorded By	LAPORTE		
Witnessed By	D. BURKE		

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All interpretations are opinions based on inferences from electrical or other measurements and we cannot and do not guarantee the accuracy or correctness of any interpretation, and we shall not, except in the case of gross or willful negligence on our part, be liable or responsible for any loss, costs, damages, or expenses incurred or sustained by anyone resulting from any interpretation made by any of our officers, agents or employees. These interpretations are also subject to our general terms and conditions set out in our current Price Schedule.

Comments

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Comments

ELOG Calibration Report

Serial:	D1
Model:	DTQ
Shop Calibration Performed:	Tue Aug 01 12:21:23 2006
Before Survey Verification Performed:	Tue Aug 01 12:20:23 2006
After Survey Verification Performed:	Tue Aug 01 12:20:53 2006

Shop Calibration

	Readings			References			Results	
	Zero	Cal		Zero	Cal		Gain	Offset
Short	7.913	99.350		10.200	102.200	Ohm-m	1.006	2.238
Long	6.484	96.090		10.200	102.200	Ohm-m	1.027	-17.567
IEE	103.705	4668.852	counts	0.113	5.110	A		
VSN	7.884	5226.093	counts	0.150	99.681	V		
VLN	126.600	1393.972	counts	2.415	26.588	V		

Before Survey Verification

Readings	References	Results

Short	7.913	99.350		10.200	102.200	Ohm-m	1.006	2.238
Long	6.484	96.090		10.200	102.200	Ohm-m	1.027	-17.567
IEE	103.705	4668.852	counts	0.113	5.110	A		
VSN	7.884	5226.093	counts	0.150	99.681	V		
VLN	126.600	1393.972	counts	2.415	26.588	V		

Before Survey Verification

	Readings			References			Results	
	Zero	Cal		Zero	Cal		Gain	Offset
Short	8.407	99.675		6.767	99.630	Ohm-m	1.017	-1.787
Long	419.427	106.300		106.299	106.299	Ohm-m	1.049	-5.162
IEE	106.074	4729.556	counts	0.116	5.176	A		
VSN	10.019	5296.417	counts	0.191	101.023	V		
VLN	124.963	1412.120	counts	2.384	26.934	V		

After Survey Verification

	Readings			References			Results	
	Zero	Cal		Zero	Cal		Gain	Offset
Short	8.048	99.680		8.407	99.675	Ohm-m	0.996	0.391
Long	420.004	106.304		106.300	106.300	Ohm-m	0.998	0.190
IEE	105.787	4734.505	counts	0.116	5.181	A		
VSN	9.565	5302.234	counts	0.182	101.134	V		
VLN	124.796	1413.645	counts	2.380	26.964	V		

After Survey Verification compared to Before Survey Calibration

	Zero			Cal		
	Before	After		Before	After	
Short	6.767	8.407	Ohm-m	99.630	99.675	Ohm-m
Long	434.627	419.427	Ohm-m	106.299	106.300	Ohm-m

Gamma Ray Calibration Report

Serial Number:	D1	
Tool Model:	ELOG	
Performed:	Tue Aug 01 12:19:10 2006	
Calibrator Value:	162	GAPI
Background Reading:	167.616	cps
Calibrator Reading:	722.887	cps

Gamma Ray Calibration Report

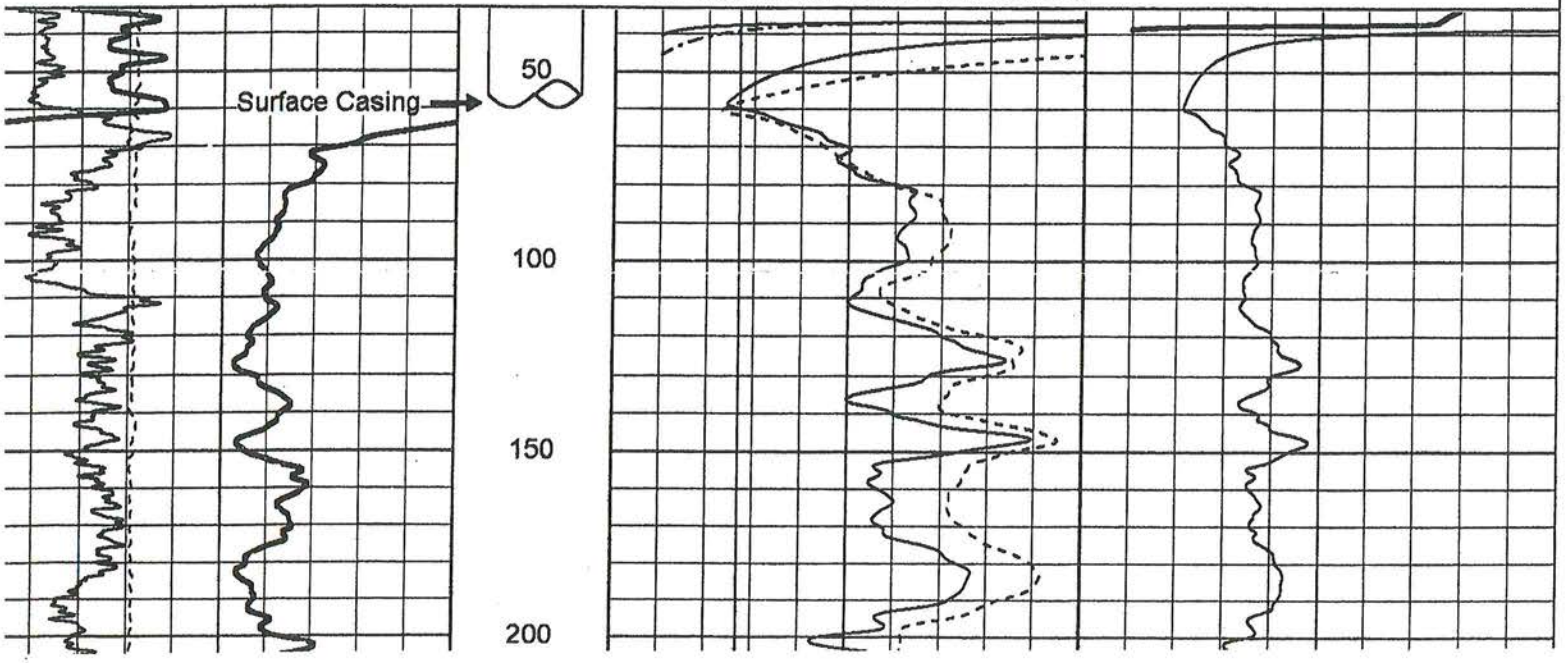
Serial Number:	D1	
Tool Model:	ELOG	
Performed:	Tue Aug 01 12:19:10 2006	
Calibrator Value:	162	GAPI
Background Reading:	167.616	cps
Calibrator Reading:	722.887	cps
Sensitivity:	0.291745	GAPI/cps

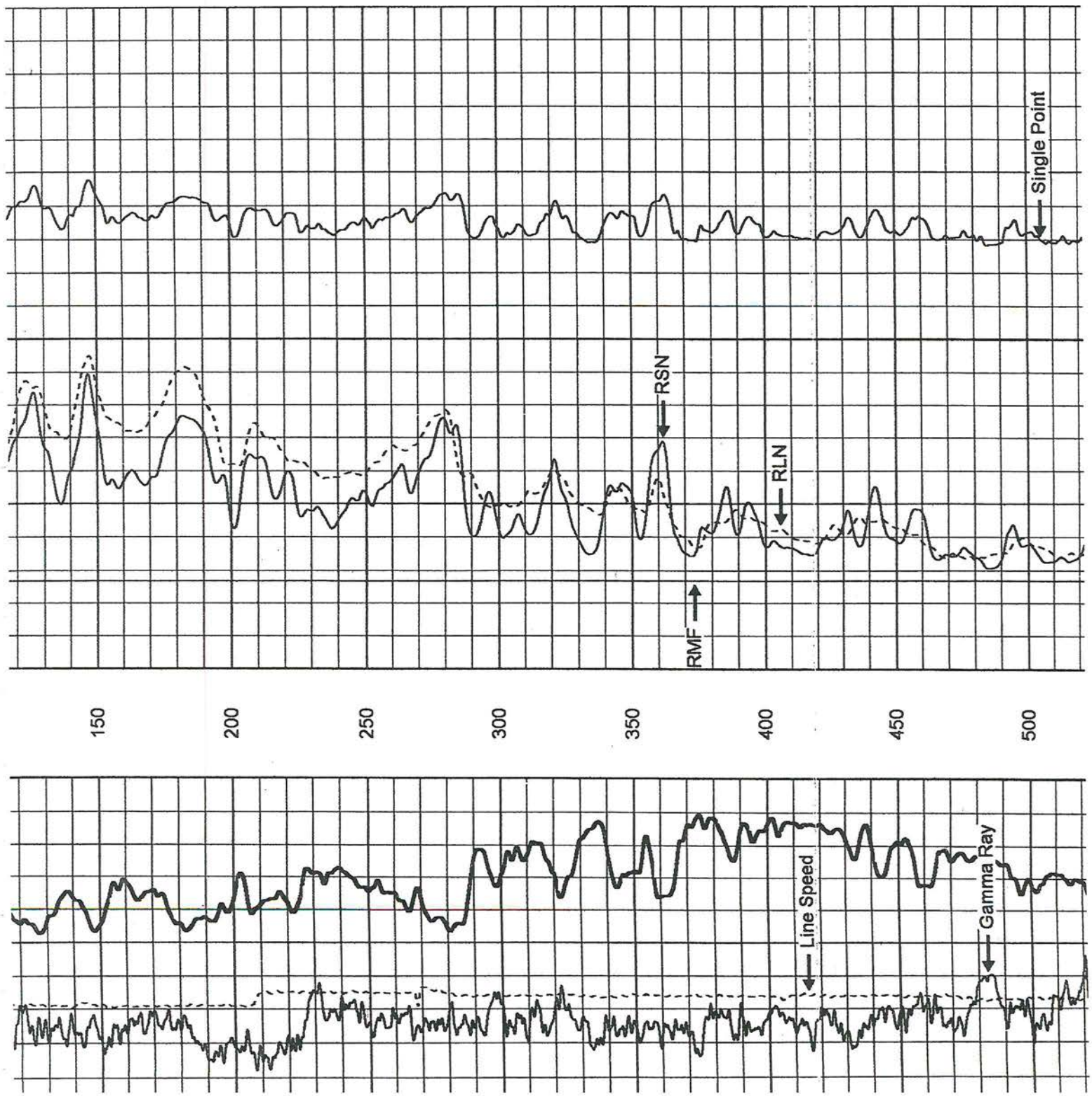
Database File:	12824.db
Dataset Pathname:	Best/LosAlam/run1/Elog
Presentation Format:	elog2
Dataset Creation:	Sat Oct 14 08:43:29 2006 by Log 6.0
Charted by:	Depth in Feet scaled 1:600

35	S.P. (mV)	15
0	Gamma Ray (GAPI)	110
)	Line Speed (ft/min)	100

0	RSN (Ohm-m)	50
0	RLN (Ohm-m)	50
0	RMF (Ohm-m)	50
50	RSN X10 (Ohm-m)	500
50	RLN X10 (Ohm-m)	500

0	Single Point (Ohm-m)	100
100	SPR X10 (Ohm-m)	1000

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RLN
RMF
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250
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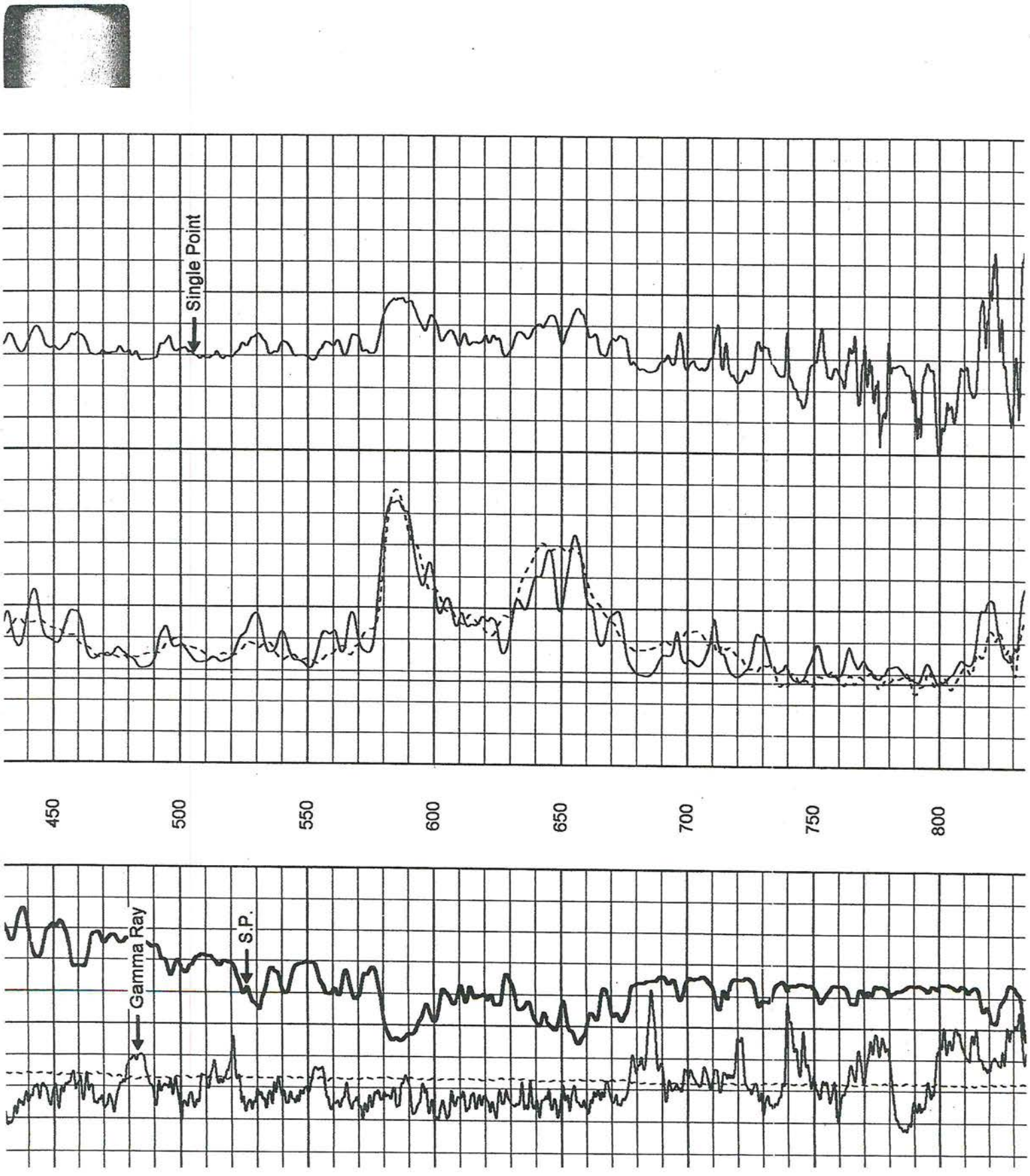
500
Line Speed
Gamma Ray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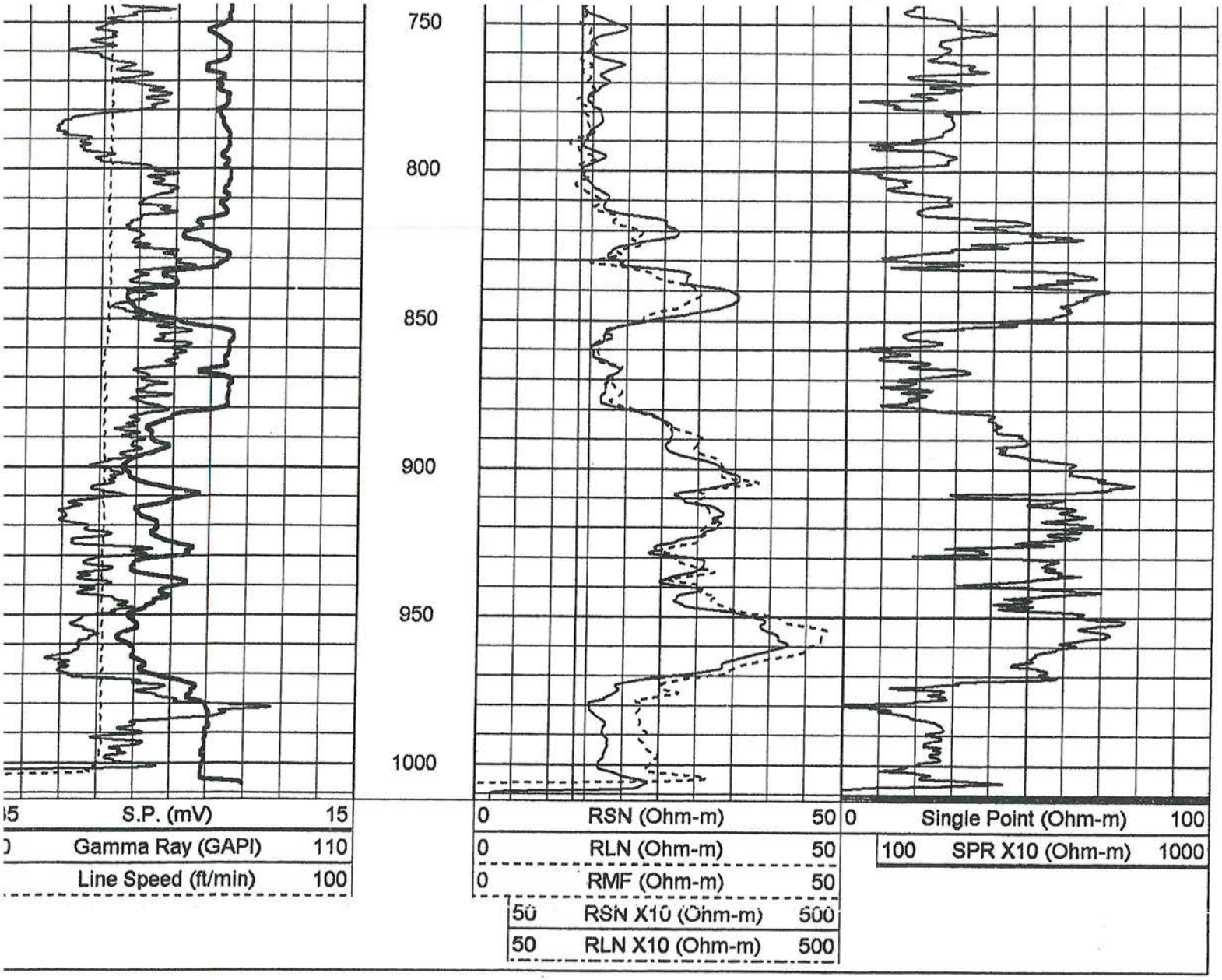
550
600
650
700
750
800
Gamma Ray
S.P.


750
800
850
900
950
1000
5 S.P. (mV) 15
) Gamma Ray (GAPI) 110
Line Speed (ft/min) 100
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0 RLN (Ohm-m) 50
0 RMF (Ohm-m) 50
50 RSN X10 (Ohm-m) 500
50 RLN X10 (Ohm-m) 500
0 Single Point (Ohm-m) 100
100 SPR X10 (Ohm-m) 1000

PACIFIC SURVEYS

CALIPER BOREHOLE VOLUMES

Job No. 12824

File No.

Company BEST DRILLING

Well WELL #5

Field LOS ALAMOS

County SANTA BARBARA State CA

Location:

END OF ST. JOSEPH ST.

Sec. Twp. Rge.

Other Services:

E-LOG

Permanent Datum	G.L.		Elevation	Elevation
Log Measured From	G.L.	0'	above perm. datum	K.B.
Drilling Measured From	G.L.			D.F.
				G.L.

Date	10-14-06		
Run Number	ONE		
Depth Driller	1011'		
Depth Logger	1010'		
Bottom Logged Interval	1005'		
Top Log Interval	0'		
Type Caliper	3 ARM		
Type Fluid in Hole	WATER		
Density / Viscosity	N/A		
Max. Recorded Temp.	N/A		
pH/Fluid Loss	N/A		
Time Well Ready	8:30 AM		
Time Logger on Bottom	8:45 AM		
Equipment Number	PS-2		
Location	L.A.		
Recorded By	LAPORTE		
Witnessed By	D. BURKE		

Borehole Record

Run Number	Bit	From	To
ONE	24"	60'	1011'

Gravel Feed/Tubing Schedule

Size	Type	From	To

Casing Schedule	Size	Wgt/Ft	Top	Bottom
Surface String	28"	COND	0	60'
Production String	12"	CSG	0	935'
Production String				
Production String				
Production String				

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nterpretations are opinions based on inferences from electrical or other measurements and Pacific Surveys cannot and do not guarantee the accuracy or correctness of any nterpretation, and we shall not, except in the case of gross or willful negligence on our part, be liable or responsible for any loss, costs, damages, or expenses incurred or ained by anyone resulting from any interpretation made by any of our officers, agents or employees. These interpretations are also subject to Pacific Surveys' general terms and conditions set out in our current Price Schedule.

Comments

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Comments

XY Caliper Calibration Report

Serial Number:	LONG		
Tool Model:	Comprobe		
Performed:	Sat Oct 14 09:20:52 2006		
Small Ring:	23	in	
Large Ring:	33	in	
	X Caliper	Y Caliper	
Reading with Small Ring:	555.7	555.7	cps
Reading with Large Ring:	873.4	873.4	cps
Gain:	0.0314762	0.0314762	
Offset:	5.50866	5.50866	

Database File:	12824.db
Dataset Pathname:	Best/LosAlam/run1/CAL.1
Presentation Format:	xyc
Dataset Creation:	Sat Oct 14 09:52:04 2006 by Calc 6.0
Charted by:	Depth in Feet scaled 1:600

Gain:	0.0314762	0.0314762
Offset:	5.50866	5.50866

Database File: 12824.db
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Presentation Format: xyc
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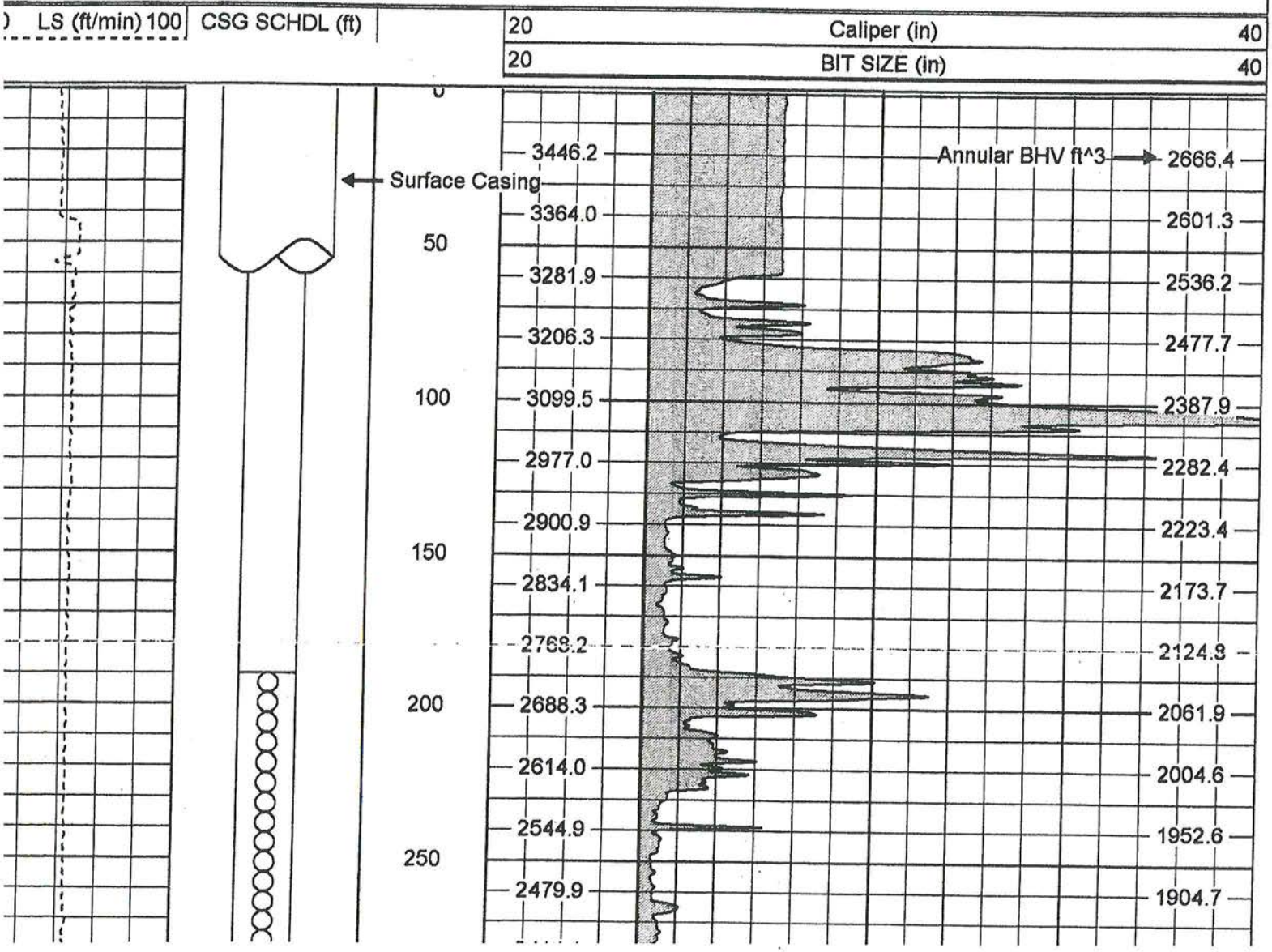
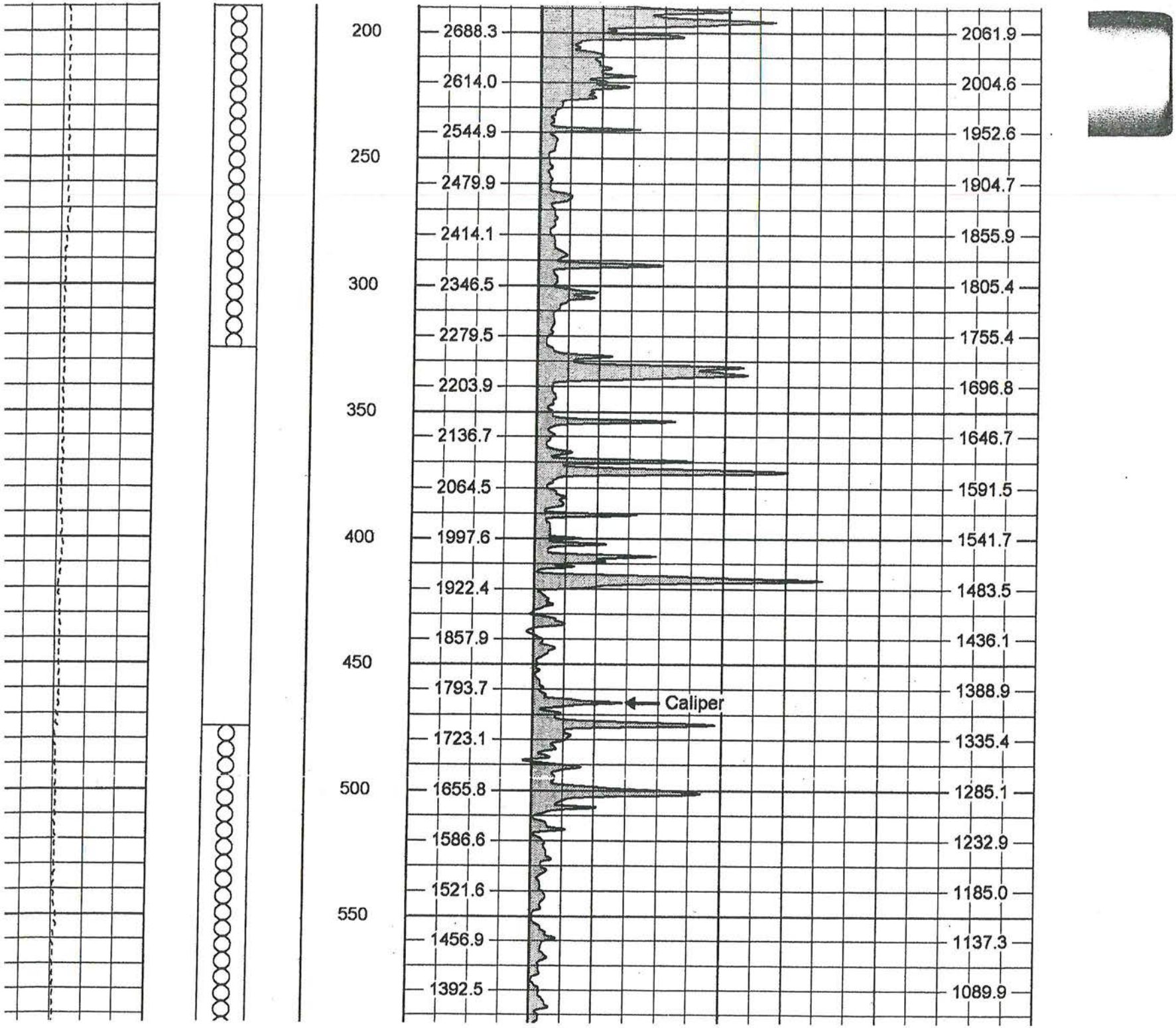
Charted by: Depth in Feet scaled 1:600

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1952.6
1904.7
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1591.5
1541.7
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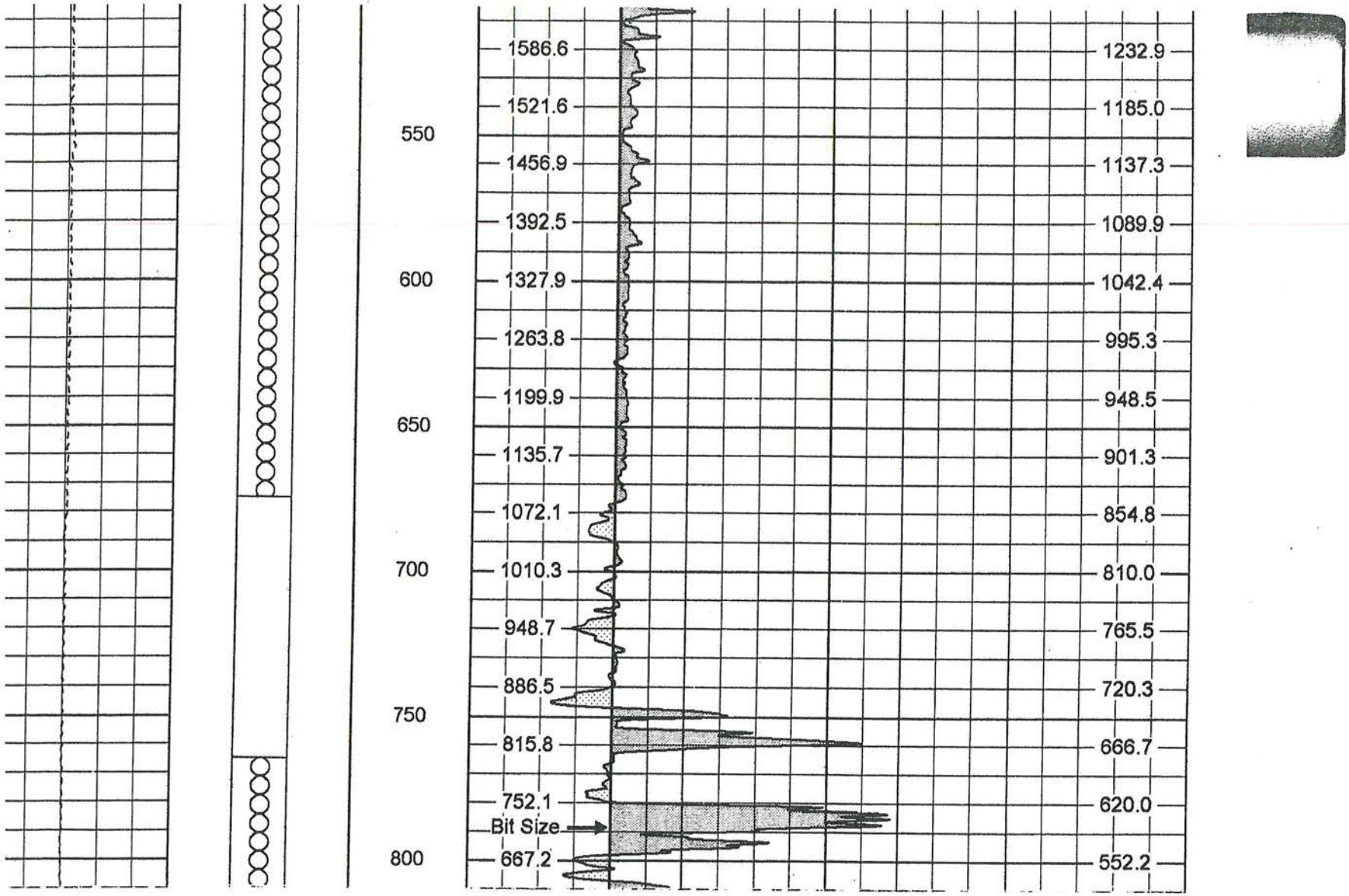
1089.9
Caliper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750
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1072.1
1010.3
948.7
886.5
815.8
752.1
Bit Size
667.2
1232.9
1185.0
1137.3
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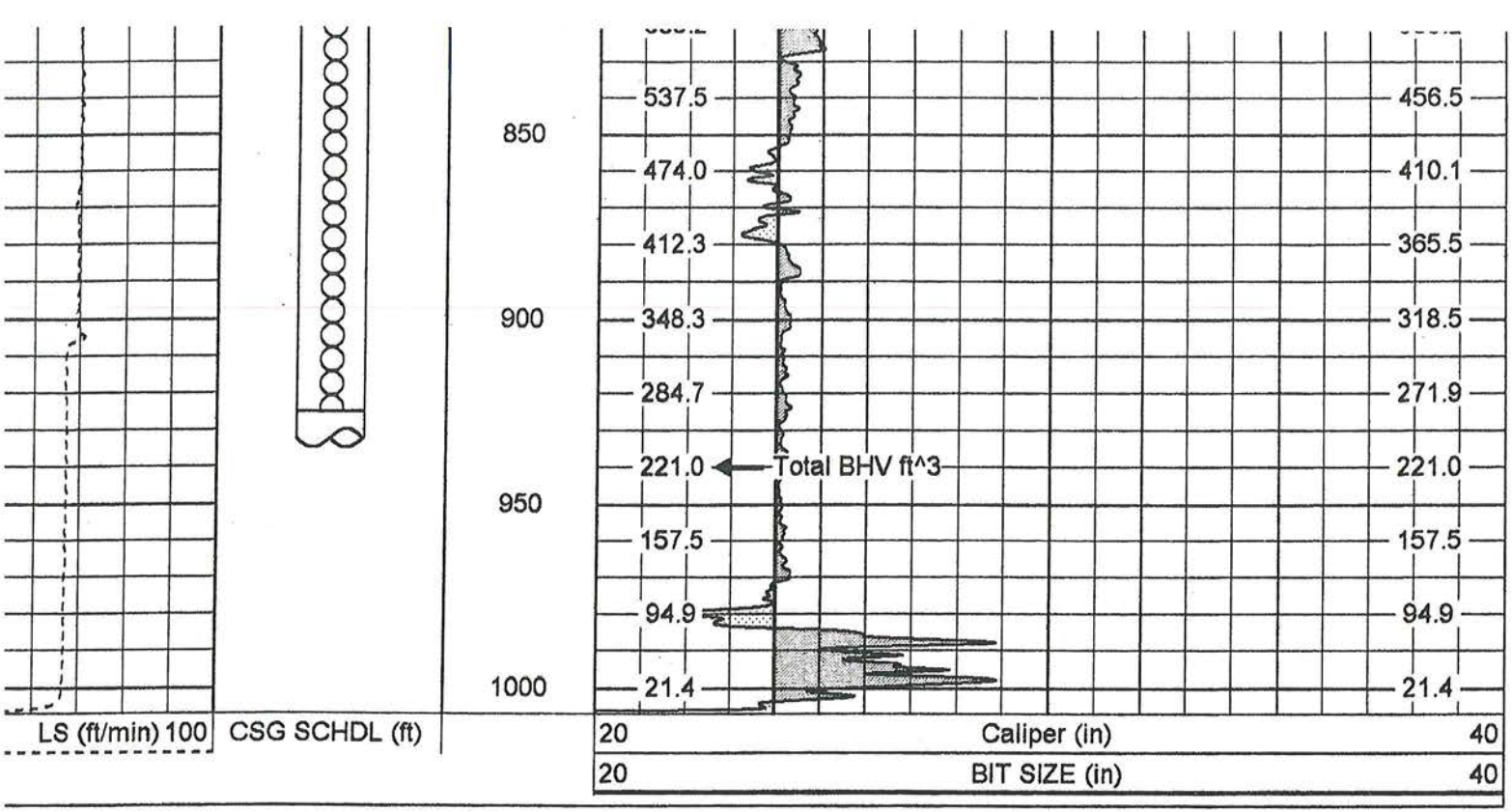
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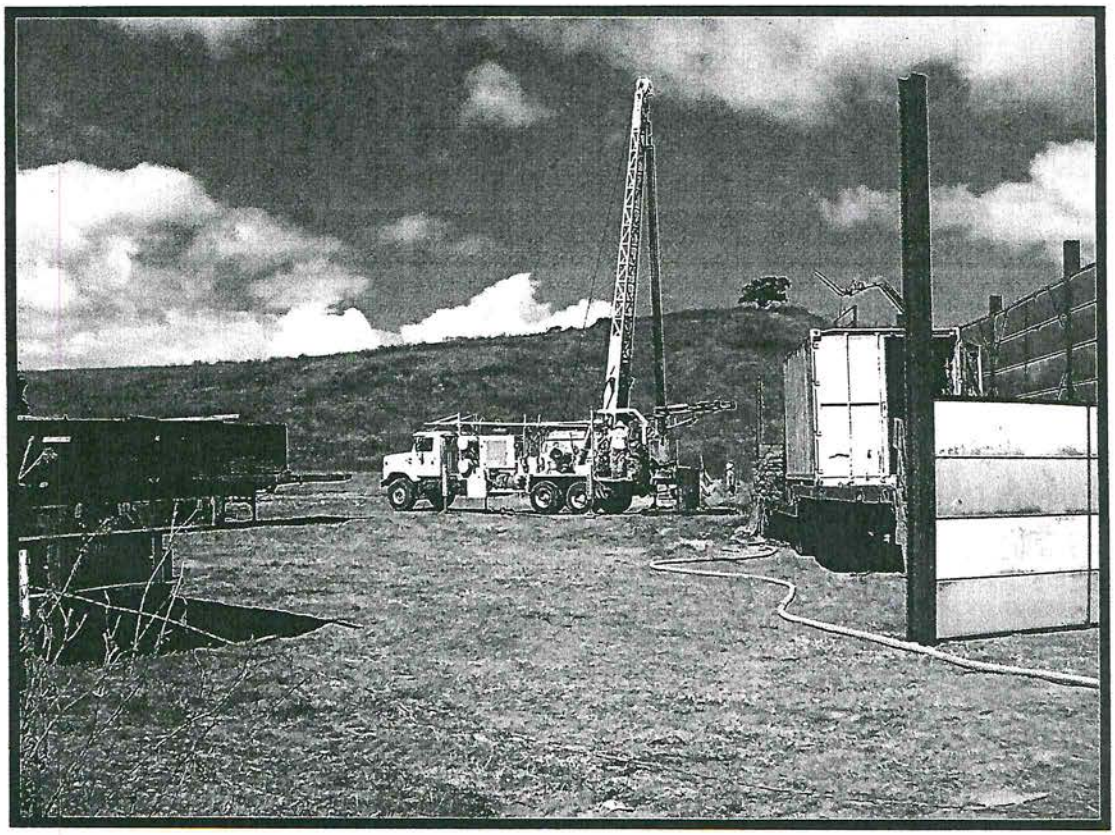
348.3
284.7
221.0
157.5
94.9
21.4
456.5
410.1
365.5
318.5
271.9
221.0
157.5
94.9
21.4
850
900
950
1000
Total BHV ft^3
LS (ft/min) 100
CSG SCHDL (ft)
20
Caliper (in)
40
20
BIT SIZE (in)
40

Appendix B

Photographs

Appendix B

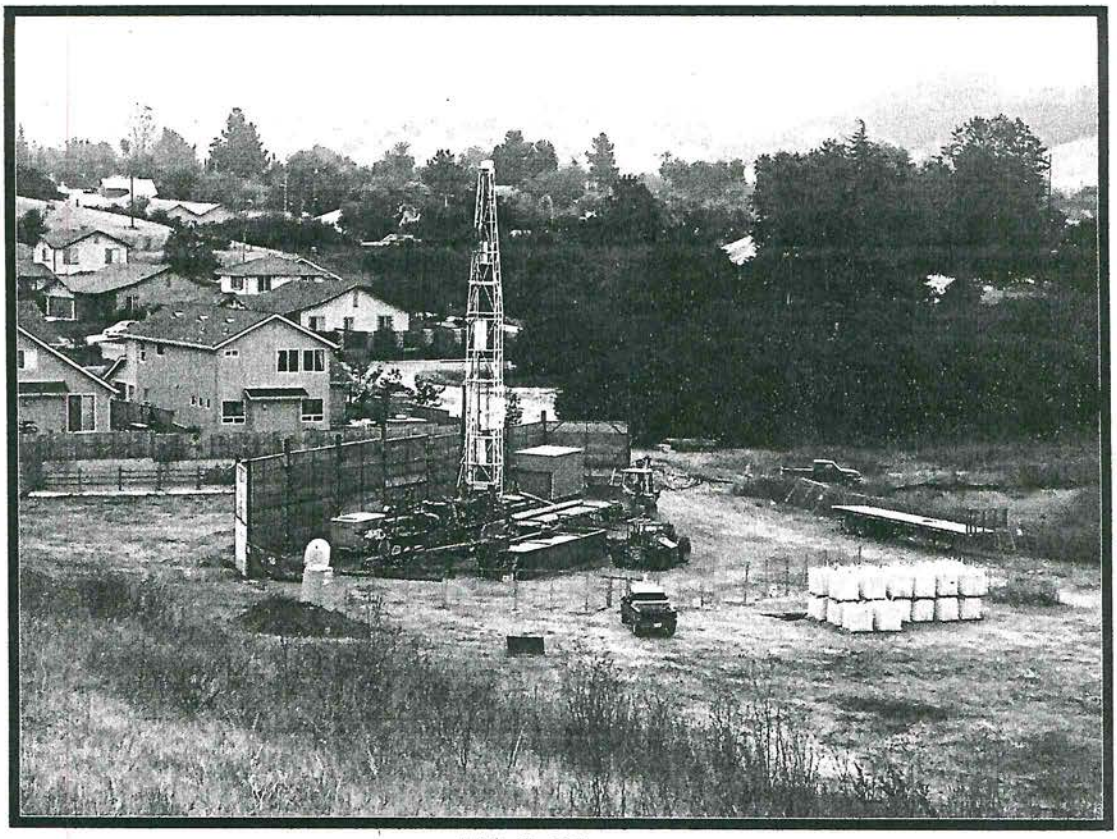
Photographs



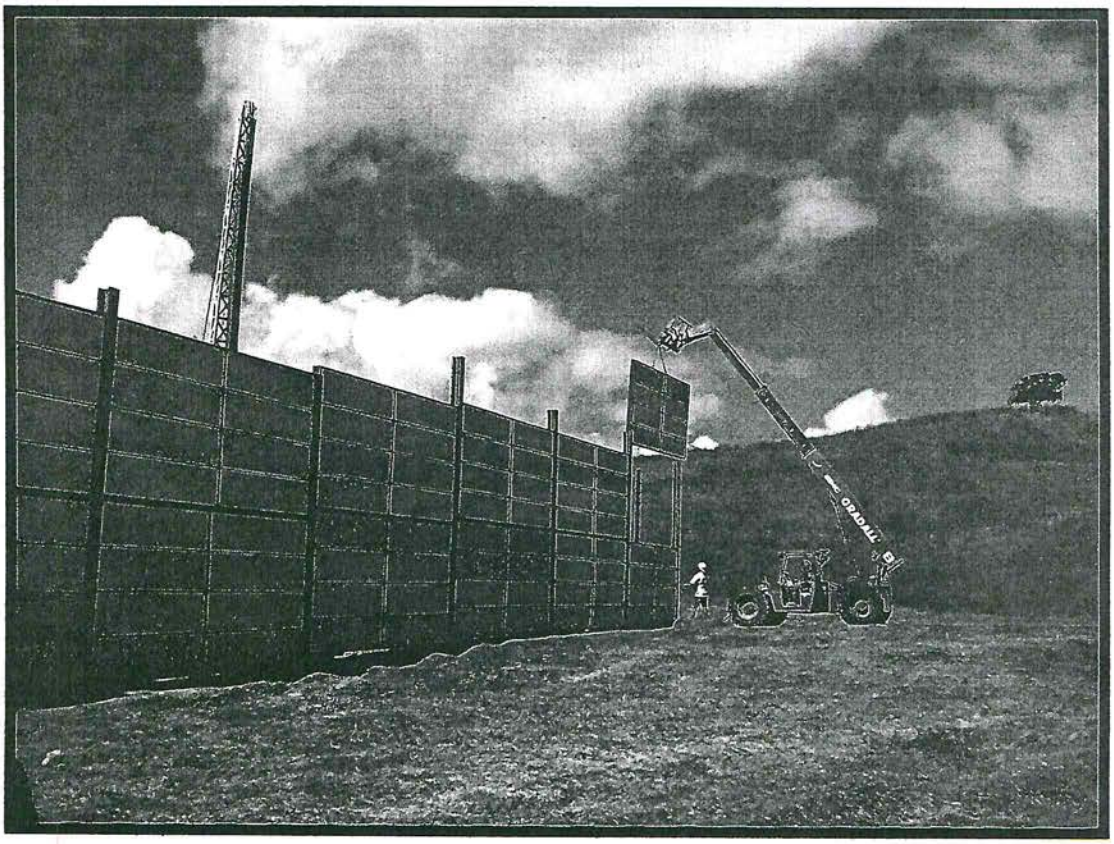
Drilling 60-foot hole with bucket auger for conductor pipe

Installing 36-inch conductor pipe

St. Joseph Street Well #5, LACSD

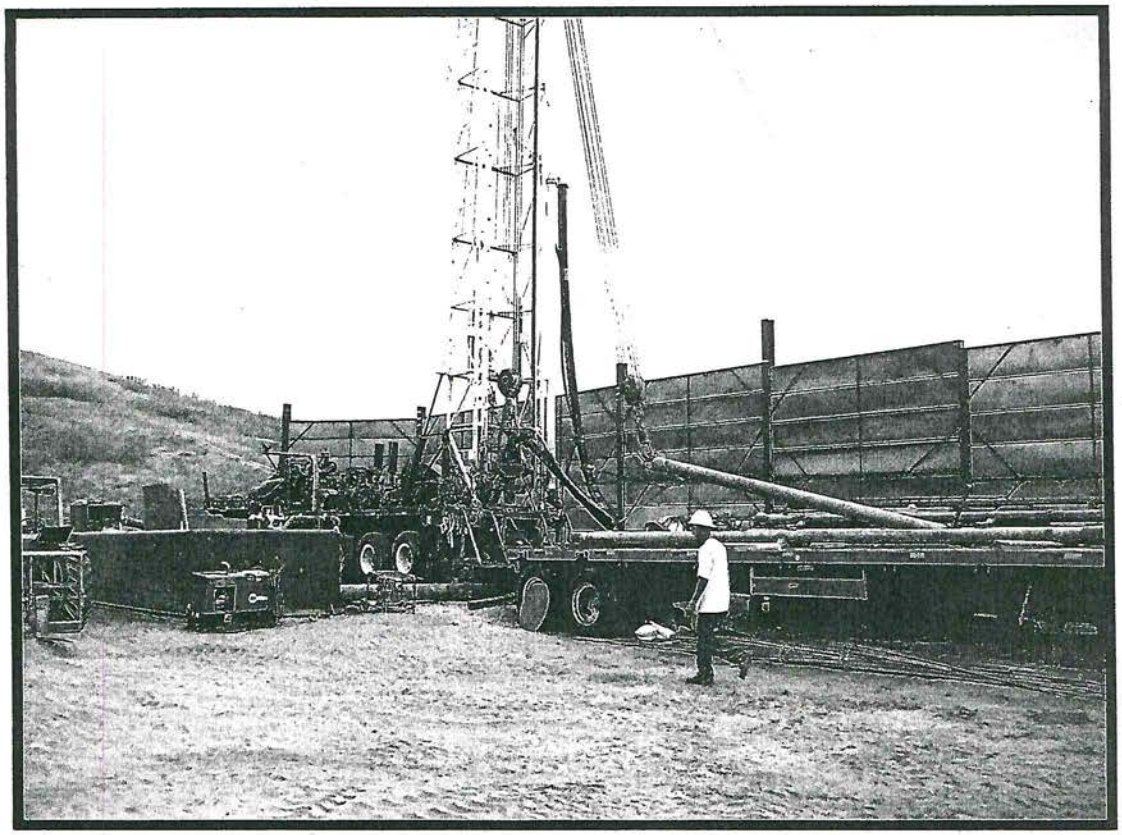


Well Site

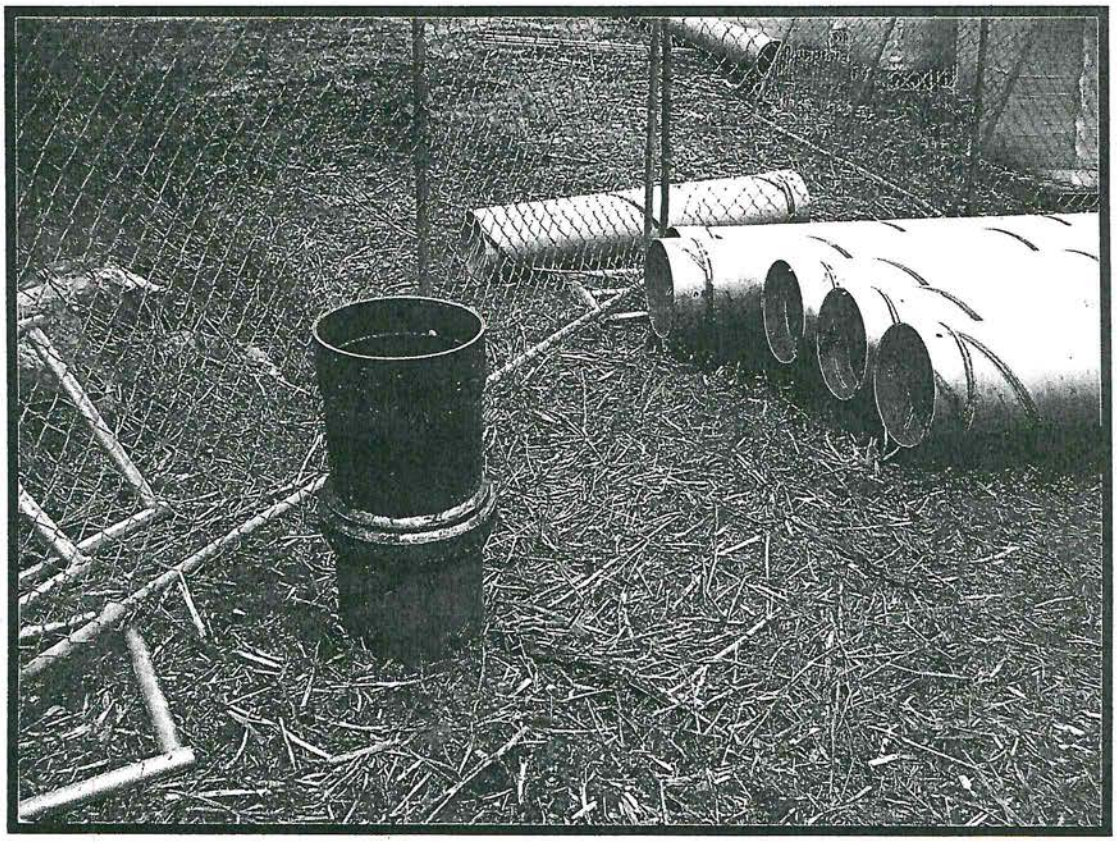


Sound Wall Installation

St. Joseph Street Well #5, LACSD

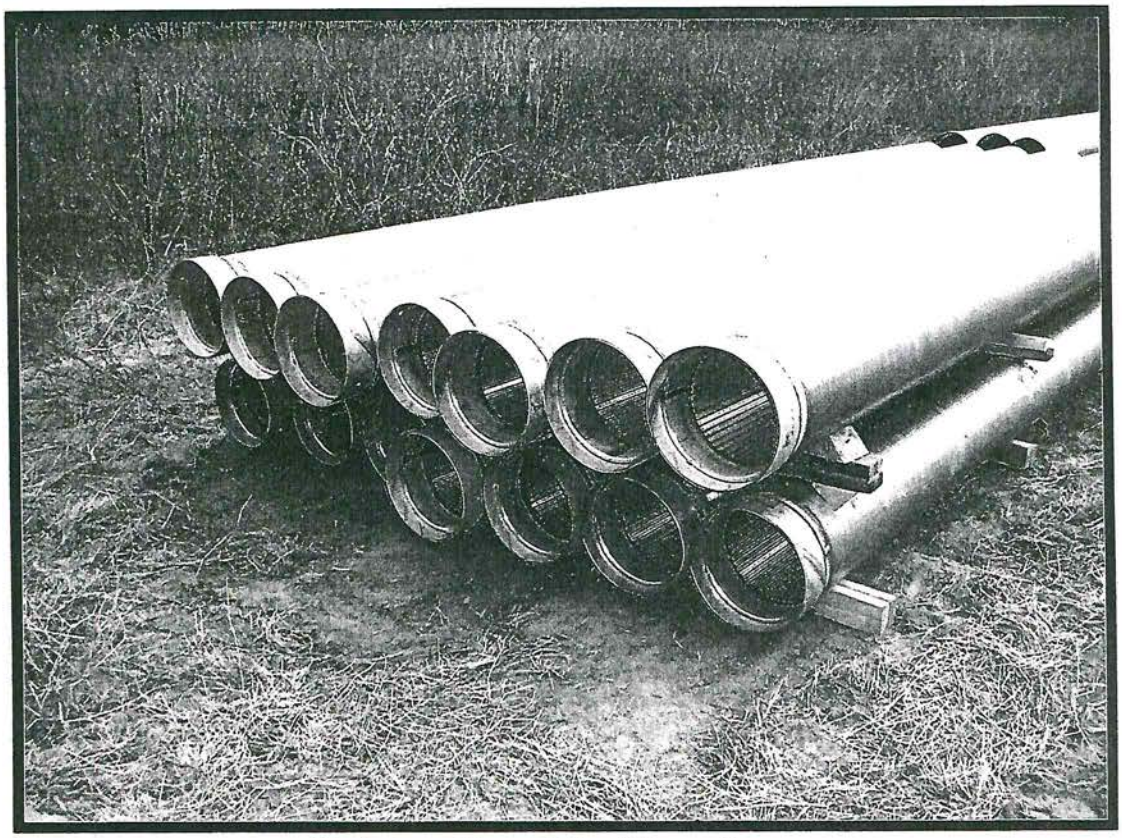


Drilling 24-inch pilot hole

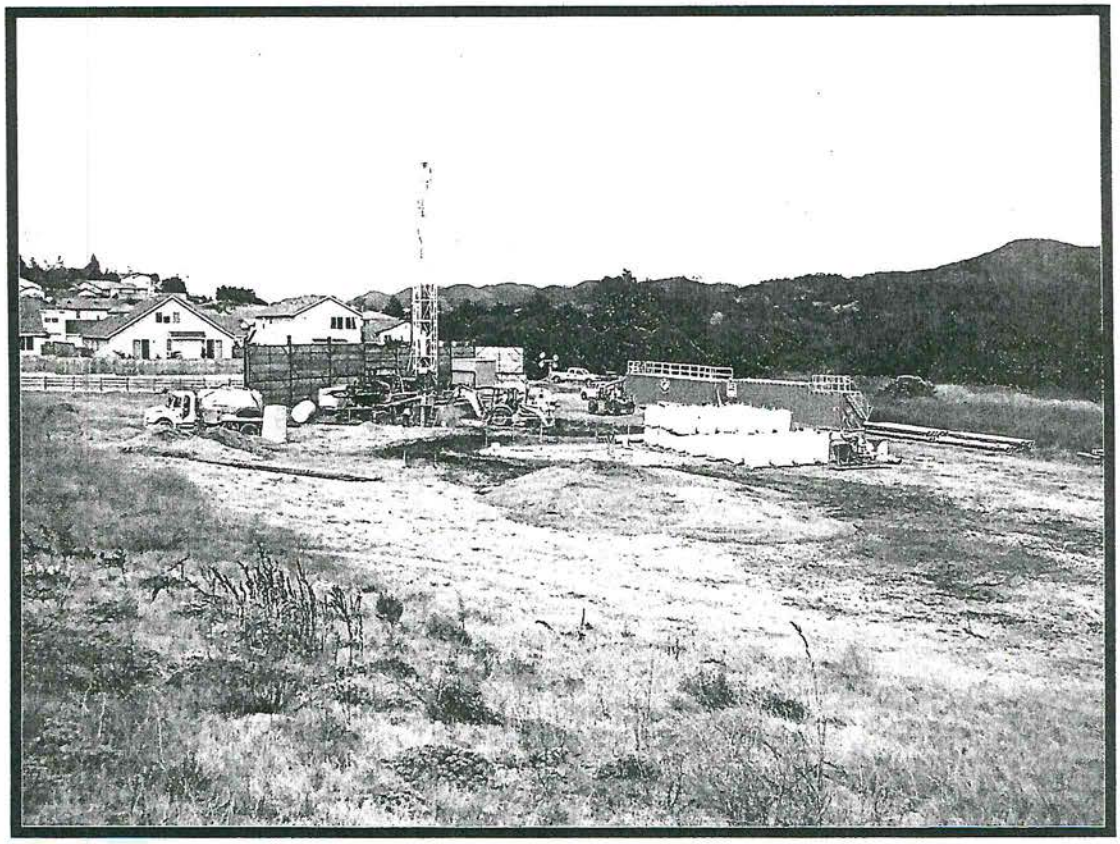


Mechanical Coupling - carbon to stainless steel

St. Joseph Street Well #5, LACSD



Stainless Steel Wire-Wrap Screen



Well Site

St. Joseph Street Well #5, LACSD

Appendix C

Construction materials documentation

TECHNICAL SERVICES LABORATORY
4750 Norris Canyon Road, Suite A
San Ramon, CA 94583
Telephone: (925) 866-2780 Fax: (925) 866-2983

November 17, 2006

Best Drilling
Attn: Mark Best
Fax: (909) 421-9070

Project Reference: Los Alamos

We submit the typical test data information below for your approval and as certification of the following product:

Source: Lapis #310
Product: #3, Lapis Lustre Sand
Nominal Sieve Size: #8 x #20

U.S. Sieve		% Passing
#6	(3.35 mm)	100
#8	(2.36 mm)	99 +/- 1
#12	(1.70 mm)	59 +/- 12
#16	(1.18 mm)	9 +/- 5
#20	(850 µm)	2 +/- 1
#30	(600 µm)	1 +/- 1

Respectfully,

Ron Novak
Quality Control Representative
CEMEX

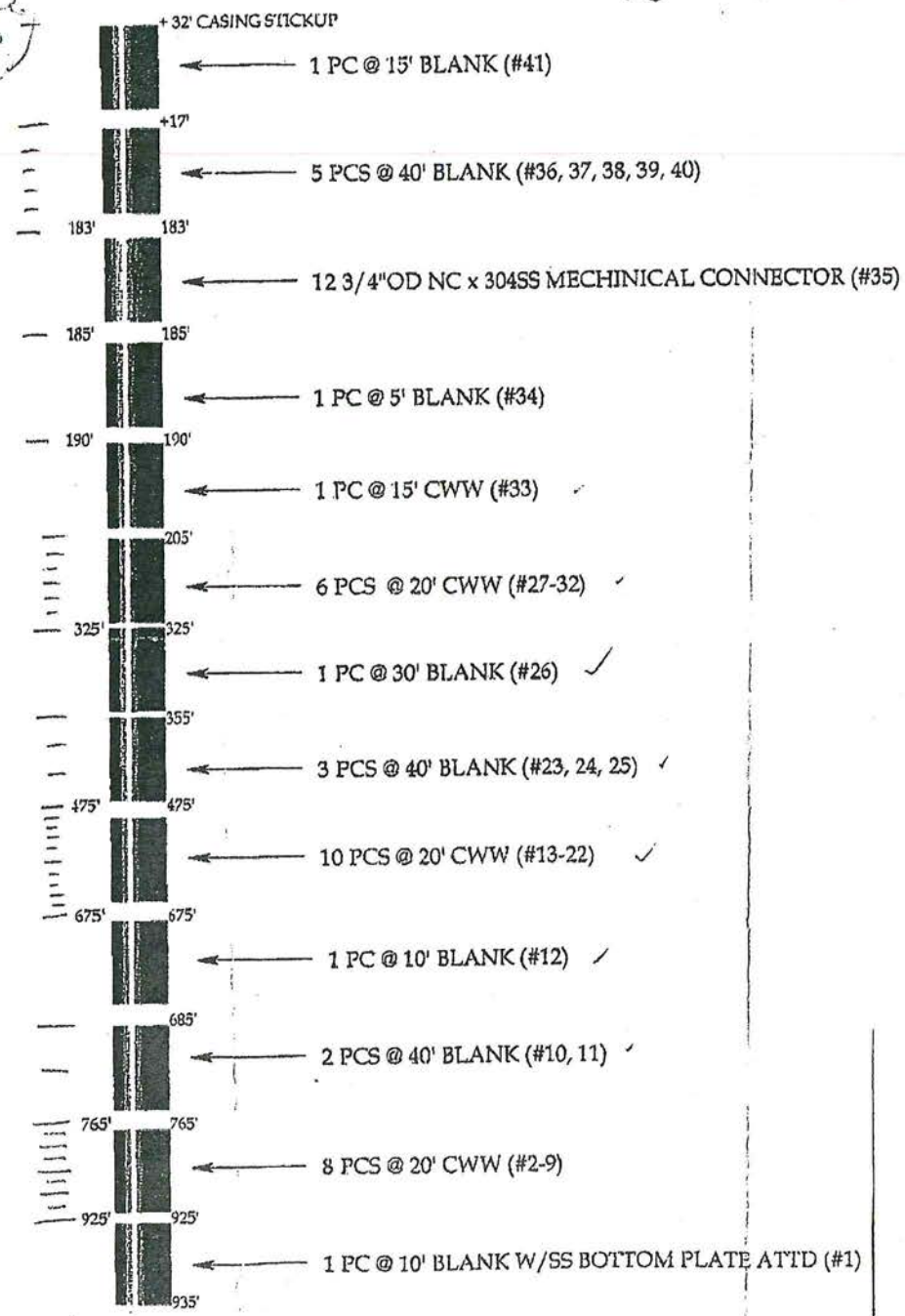
cc: Dale Kendall
Chris Mathias

CASING SCHEDULE

BEST DRILLING - LOS ALAMOS

Includes Additional 30' Piece

WELL NO 5



BLUE SECTION - WIREWRAP SCREEN

RED SECTION - BLANK CASING

SPECIFICATIONS

12 3/4"OD 304SS CWW 0.165" x 0.217" (0.040"SLOT) W/W

* 24 PCS @ 20' CWW (#2-9, 13-22, 27-32)
* 1 PC @ 15' CWW (#33)

12 3/4"OD x 1/4" 304SS BLANK W/COLLARS

* 1 PC @ 10' BLANK W/SS BOTTOM PLATE ATTD (#1)
* 2 PCS @ 40' BLANK (#10, 11)
* 1 PC @ 10' BLANK (#12)
* 3 PCS @ 40' BLANK (#23, 24, 25)
* 1 PC @ 30' BLANK (#26)
* 1 PC @ 5' BLANK (#34)

12 3/4"OD x 1/4" NC BLANK W/COLLARS

* 5 PCS @ 40' BLANK (#36, 37, 38, 39, 40)
* 1 PC @ 15' BLANK (#41)

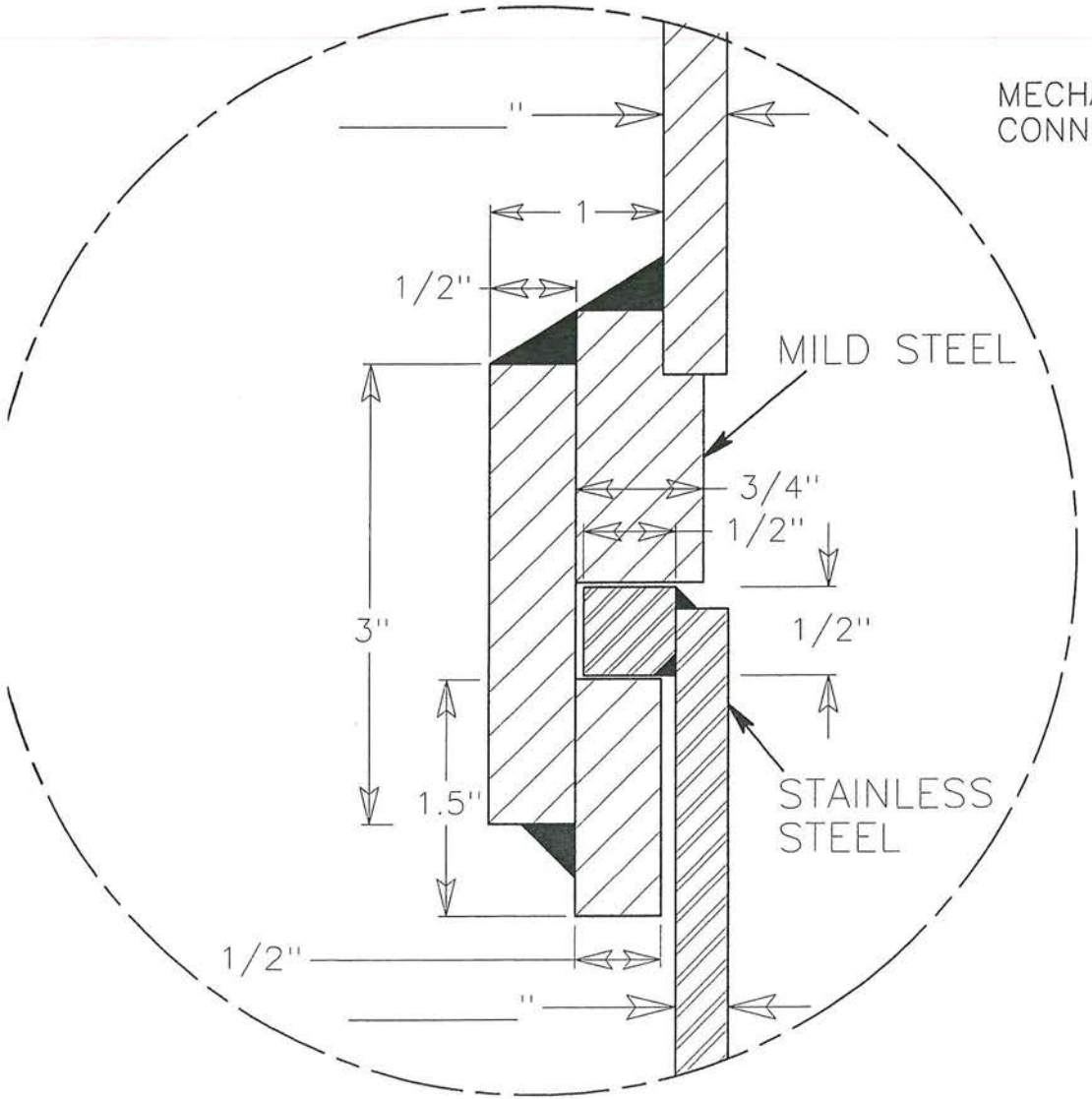
ACCESSORIES

1 ONLY - 12 3/4"OD NC x 30SS MECHINICAL CONNEC
1 ONLY - 12 3/4"OD x 1/4" 304SS BTTOM PLATE ATTD
12EA - 1/4" MS CASING GUIDES W/4" BEND
57EA - 1/4" 304SS "C" TYPE CASING GUIDES W/4" BEN

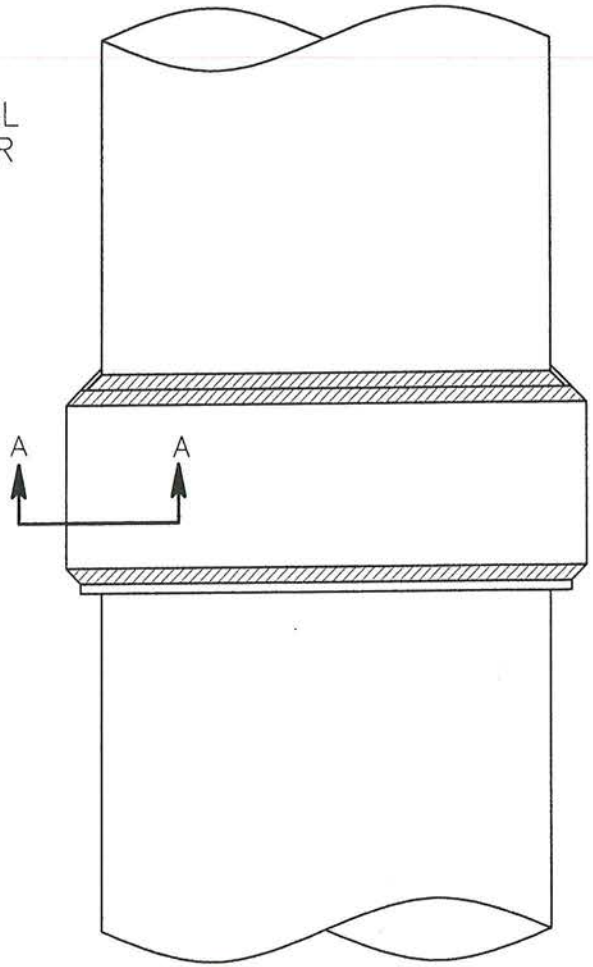
TIME OF WELD IN

10/06/2006 11:44 FAX 505 662 4427 RUSSUD MUSS COMPANY

SECTION A–A



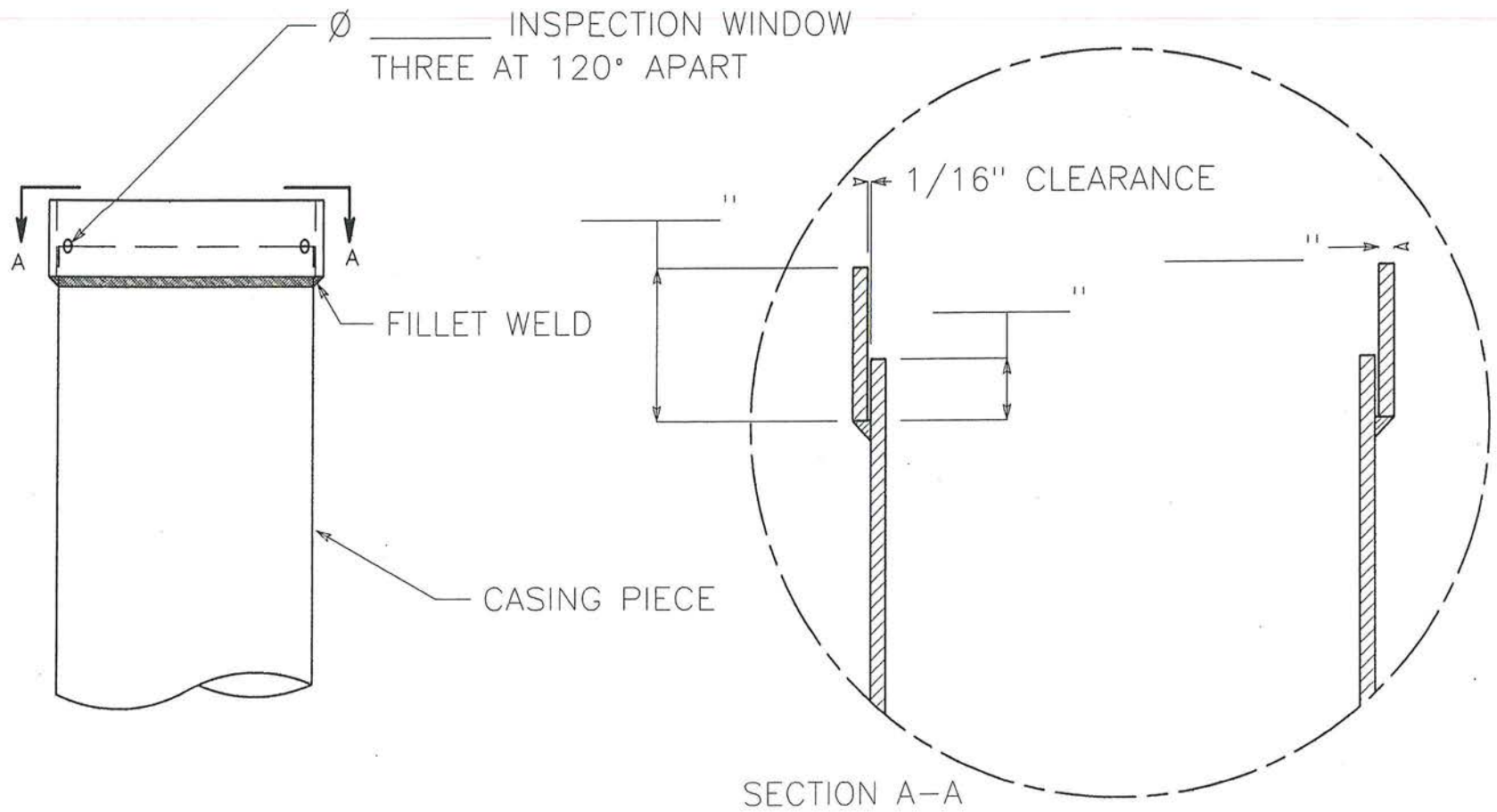
MECHANICAL
CONNECTOR



" O.D.
STEEL CASING
" WALL

" O.D.
STAINLESS STEEL CASING
" WALL

OMJ 3–3–04	MECHANICAL CONNECTOR
NOT TO SCALE	ROSCOE MOSS CO.



TFB 9-04-03	WELDING COLLAR
NOT TO SCALE	ROSCOE MOSS CO.

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Water Well Casing and Screen

Specifications

♦Mild Steel Well Casing

Well casing shall be manufactured in accordance with applicable parts of ASTM A 139 Grade B with the following additions:

Welding shall be by the automatic submerged-arc process using at least one pass on the inside and one pass on the outside.

Casing shall be 12¾ inches outside diameter and ⅜ inch wall thickness.

Casing shall be furnished in 30 foot lengths with welding collars attached.

♦Mild Steel

Well screen shall be manufactured in accordance with the aforementioned casing requirements.

Screen openings shall be machine made, horizontal to the axis of the casing and of a louver form with the aperture facing downward. The aperture size shall be ..... inch with ..... openings per lineal foot. The minimum area of opening shall be ..... square inches per lineal foot. N/A

♦Field Assembly of Mild Steel Casing and Screen Sections

For field assembly by welding, section ends shall be furnished with collars in accordance with the following standard:

Collars shall be the same thickness and have the same physical and chemical properties as the corresponding casing section. Collars must be 6 inches wide, rolled to fit the outside diameter, and factory welded to one end of each section. The inside edge of the collars shall be free of sharp edges and burrs. Section ends shall be machined flat perpendicular to the axis of the casing and shall not vary more than 0.010 inch at any point from a true plane at right angles to the axis of the casing.

Three 11/16 inch diameter inspection windows must be provided in each collar to assure proper matching of the sections.

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Weights and Strengths of Mild Steel Casing

6	3/16	4.76	6-5/8	168	6-1/4	159	12.89	19.22	718	1656	50.5	505	113.7	103.4
6	1/4	6.35	6-5/8	168	6-1/8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8	3/16	4.76	8-5/8	219	8-1/4	210	16.90	25.19	393	908	27.7	277	149.0	135.6
[illegible]	[illegible]	[illegible]	[illegible]	219	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10	3/16	4.76	10-3/4	273	10-3/8	263	21.15	31.53	228	527	16.1	161	186.6	169.6
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10	5/16	7.94	10-3/4	273	10-1/8	257	34.84	51.94	760	1755	53.5	535	307.3	279.3
[illegible]	[illegible]	[illegible]	12-3/4	324	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12	1/4	6.35	12-3/4	324	12-1/4	311	33.38	49.76	306	707	21.5	215	294.4	267.6
* [illegible]	[illegible]	[illegible]	[illegible]	324	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12	3/8	9.53	12-3/4	324	12	305	49.56	73.89	779	1799	54.8	548	437.1	397.4
14	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
14	1/4	6.35	14	356	13-1/2	343	36.71	54.74	242	560	17.1	171	323.8	294.3
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
14	3/8	9.53	14	356	13-1/4	337	54.57	81.36	636	1468	44.7	447	481.3	437.5
[illegible]	[illegible]	[illegible]	16	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
16	1/4	6.35	16	406	15-1/2	394	42.05	62.70	172	398	12.1	121	370.9	337.2
16	[illegible]	7.94	16	406	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	213	[illegible]	[illegible]
16	3/8	9.53	16	406	15-1/4	387	62.58	93.30	470	1084	33.0	330	552.0	501.7
18	3/16	4.76	18	457	[illegible]	[illegible]	[illegible]	[illegible]	58	[illegible]	[illegible]	41	[illegible]	[illegible]
18	1/4	6.35	18	457	17-1/2	445	47.39	70.66	126	292	8.9	89	418.0	380.0
18	[illegible]	7.94	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	226	521	[illegible]	159	[illegible]	[illegible]
18	3/8	9.53	18	457	17-1/4	438	70.59	105.24	355	819	25.0	250	622.6	565.9
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
20	1/4	6.35	20	508	19-1/2	495	52.73	78.62	95	220	6.7	67	465.1	422.8
20	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	492	[illegible]	[illegible]	172	[illegible]	[illegible]	121	[illegible]	[illegible]
20	3/8	9.53	20	508	19-1/4	489	78.60	117.18	274	632	19.3	193	693.3	630.2
22	3/16	[illegible]	[illegible]	559	[illegible]	549	[illegible]	[illegible]	33	77	2.3	23	385.3	350.2
22	1/4	6.35	22	559	21-1/2	546	58.07	86.58	74	170	5.2	52	512.2	465.6
22	5/16	7.94	22	559	21-3/8	[illegible]	[illegible]	[illegible]	134	310	9.4	94	[illegible]	580.3
22	3/8	9.53	22	559	21-1/4	540	86.61	129.13	215	497	15.2	152	763.9	694.4
[illegible]	3/16	4.76	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	26	60	1.8	18	420.6	[illegible]
24	1/4	6.35	24	610	23-1/2	597	63.41	94.54	58	134	4.1	41	559.3	508.4
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
24	3/8	9.53	24	610	23-1/4	591	94.62	141.07	172	398	12.1	121	834.6	758.6

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Water Well Casing and Screen

Specifications

♦Stainless Steel Type 304 Well Casing

Well casing shall be manufactured in accordance with applicable parts of ASTM A 778 with the following additions:

Welding shall be by the gas tungsten-arc process using at least one pass on the inside and one pass on the outside.

Lengths shall be furnished as specified, circumferentially welded joints will not be permitted.

Minimum wall thickness shall not be less than 5% of the nominal wall thickness specified.

Ovality of the casing supplied shall not exceed 1%.

Straightness of the casing will be determined by placing a 10-ft straightedge so that both ends are in contact with the length, a maximum gap of 0.125 inch is allowable. In addition, section ends shall be machined flat perpendicular to the axis of the casing and shall not vary more than 0.010 inch at any point from a true plane at right angles to the axis of the casing.

The steel from which the casing is manufactured shall be stainless steel Type .....

Casing shall be 12¾" inches inside diameter and ¼" inch wall thickness. Casing shall be furnished in 20 foot lengths with welding collar attached.

♦Stainless Steel Shutter Screen

Well screen shall be manufactured in accordance with the aforementioned casing requirements.

N/A

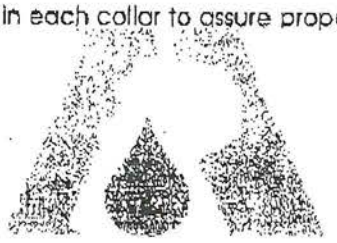
Screen openings shall be machine made, horizontal to the axis of the casing and of a louver form with the aperture facing downward. The aperture size shall be ..... inch with ..... openings per lineal foot. The minimum area of opening shall be ..... square inches per lineal foot..

♦Field Assembly of Stainless Steel Casing and Screen Sections

For field assembly by welding, section ends shall be furnished with collars in accordance with the following standard:

Collars shall be the same thickness and have the same physical and chemical properties as the corresponding casing section. Collars must be 5 inches wide, rolled to fit the outside diameter, and factory welded to one end of each section. The inside edge of the collars shall be free of sharp edges and burrs. Section ends shall be machined flat perpendicular to the axis of the casing and shall not vary more than 0.010 inch at any point from a true plane at right angles to the axis of the casing.

Three 11/16 inch diameter inspection windows must be provided in each collar to assure proper matching of the sections.



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Weights and Strengths of Stainless Steel Casing

6	3/16	4.76	6-5/8	168	6-1/4	159	13.19	19.67	646	1490	45.4	454	142.1	129.2
6	1/4	[illegible]	6-5/8	168	6-1/8	156	17.42	25.97	1136	2622	[illegible]	799	[illegible]	[illegible]
8	3/16	4.76	8-5/8	219	8-1/4	210	17.29	25.78	361	833	25.4	254	186.3	169.3
8	1/4	6.35	8-5/8	219	8-1/8	[illegible]	22.86	34.12	679	1566	47.7	477	[illegible]	[illegible]
10	3/16	4.76	10-3/4	273	10-3/8	263	21.65	32.27	213	492	15.0	150	233.2	212.0
10	1/4	6.35	10-3/4	273	10-1/4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10	5/16	7.94	10-3/4	273	10-1/8	257	35.65	53.15	683	1576	48.0	480	384.1	349.1
12	3/16	4.76	12-3/4	324	12-3/8	314	25.75	38.38	139	320	9.7	97	277.[illegible]	[illegible]
* 12	1/4	6.35	12-3/4	324	12-1/4	311	34.16	50.92	283	654	19.9	199	368.0	334.5
12	5/16	7.94	12-3/4	324	12-1/8	308	[illegible]	[illegible]	[illegible]	1093	[illegible]	[illegible]	[illegible]	[illegible]
12	3/8	9.53	12-3/4	324	12	305	50.72	75.62	699	1614	49.2	492	546.4	496.7
14	3/16	4.76	14-1/2	368	14-1/8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
14	1/4	6.35	14-1/2	368	14	356	38.94	58.05	207	478	14.6	146	419.5	381.3
14	5/16	[illegible]	[illegible]	368	13-7/8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
14	3/8	9.53	14-1/2	368	13-3/4	349	57.89	86.32	533	1230	37.5	375	623.7	566.9
16	3/16	[illegible]	16-5/8	422	16-1/4	[illegible]	[illegible]	[illegible]	69	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
16	1/4	6.35	16-5/8	422	16-1/8	410	44.74	66.71	147	339	10.3	103	482.0	438.2
16	5/16	7.94	16-5/8	422	16	406	[illegible]	[illegible]	256	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
16	3/8	9.53	16-5/8	422	15-7/8	403	66.60	99.30	393	907	27.6	276	717.5	652.2
18	3/16	4.76	18-5/8	473	18-1/4	464	37.79	56.33	51	117	[illegible]	[illegible]	[illegible]	[illegible]
18	1/4	6.35	18-5/8	473	18-1/8	460	50.21	74.86	109	253	7.7	77	540.9	491.7
18	5/16	7.94	18-5/8	473	18	457	62.65	93.35	193	447	13.6	136	[illegible]	[illegible]
18	3/8	9.53	18-5/8	473	17-7/8	454	74.80	111.52	302	696	21.2	212	805.9	732.5
20	3/16	4.76	20-5/8	524	20-1/4	[illegible]	[illegible]	[illegible]	38	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
20	1/4	6.35	20-5/8	524	20-1/8	511	55.67	83.01	84	193	5.9	59	599.8	545.2
20	5/16	7.94	20-5/8	524	20	508	[illegible]	103.42	150	345	10.6	106	[illegible]	[illegible]
20	3/8	9.53	20-5/8	524	19-7/8	505	83.00	123.76	236	544	16.6	166	894.2	812.8
22	3/16	4.76	22-1/2	572	22-1/8	562	45.73	68.17	30	70	2.1	21	[illegible]	[illegible]
22	1/4	6.35	22-1/2	572	22	559	60.80	90.64	66	153	4.7	47	655.0	595.4
22	5/16	7.94	22-1/2	572	21-7/8	556	75.76	112.99	120	276	8.4	84	816.4	742.1
22	3/8	9.53	22-1/2	572	21-3/4	552	90.68	135.20	190	439	13.4	134	977.0	888.1
24	3/16	4.76	24-1/2	622	24-1/8	[illegible]	[illegible]	[illegible]	24	[illegible]	1.7	17	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
24	1/4	6.35	24-1/2	622	24	610	66.26	98.79	53	122	3.7	37	713.9	648.9
24	3/8	9.53	24-1/2	622	23-3/4	603	98.88	147.42	153	354	10.8	108	1065.3	968.3

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Continuous Slot Screen
Information Sheet

Project	Best
Date	29-Sep-06

Nominal diameter (in.)	12.75
Screen length	20
Slot size (in.)	0.050
Wire width (in.)	0.215
Wire altitude (in.)	0.320
Wire base (in.)	0.040
Rod diameter (in.)	0.250
Rod count (ea)	60
Weight (lb/ft)	31.53
Length of weld ring (in)	4x4,w/clr
Collapse strength (psi)	385
Safe hanging weight (lbs)	30,909
Transmitting capacity @0.1 (gpm/ft)	28.27
Transmitting capacity @1.5 (gpm/ft)	424.00
Open area (%)	18.87
Open area (sq. in.)	90.65

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Roscoe Moss Company Continuous Slot Screen

Summary

Continuous slot screens are designed for production wells where there are a limited number of thin, well defined, and highly permeable aquifers. Continuous slot screens are very effective in wells of this type since they can be manufactured with very small slot openings and yet maintain the necessary open area to minimize frictional head loss.

Continuous slot screen is manufactured by wrapping and resistance welding a shaped wire around an internal array of longitudinal rods. This process lends itself to close tolerances required for very fine aperture sizes; the V- shaped slot configuration minimizes clogging by formation or filter pack particles. This type of screen is usually produced from stainless steel Types 304 or 316L in order to avoid problems associated with pumping sand that may result from corrosion of carbon steel screens.

Users of continuous slot screen are cautioned against using this product for purposes other than those for which it was originally designed because of inherent disadvantages associated with its relatively low strength and limited durability. As a result of these restrictions, special handling during installation and development may be required. For example, the use of highly effective well development techniques such as swabbing is precluded since the screen's interior is obstructed by rods. In addition, the extent of future well maintenance and repair efforts may be restricted as repair by swaging is impractical.

A thorough technical discussion of the selection of well casing and screen can be found in the Handbook of Ground Water Development (published by John Wiley and Sons, 1990). Additional information is also available on our web site www.roscoemoss.com.

Design of continuous slot screen

The specifier of continuous slot screen must determine: type of steel, slot size, wire size, rod size, number of rods, screen length, and the type of end fitting required. Slot size and screen length most likely will be determined from information collected from test well samples and logs. The other construction components must be determined prior to bidding.

Steel selection

Stainless steel should always be considered as the material of choice for continuous slot screens. Mild steel material seldom, if ever, provides adequate corrosion resistance for long lived wells. Stainless steel Types 304 or 316L are most commonly used for continuous slot screen.

Selection of wire size

The shape of the wire, slot size, and screen diameter determines the collapse strength of continuous slot screen. As a general rule, the width of the wire should never be less than the slot size.

Collapse strength

With regard to collapse strength, the screen should have collapse resistance at least equal to that determined by Equation 1. In no case should screen with a collapse strength of less than 50 psi be considered.

Equation 1: Minimum collapse strength (psi) = (Maximum depth setting (feet)/10) + 50

Example: Screen will be set to a maximum depth of 500 feet

Minimum collapse strength (psi) = (500/10) + 50

Minimum collapse strength = 100 psi

Note that this is the minimum collapse strength requirement. Site specific requirements and the designer's experience may require significantly higher collapse strength.

Calculating collapse strength of continuous slot screen

The pressure at which a single wire ring will collapse is calculated by Equation 2. This same formula can be used to approximate the collapse strength of continuous slot screen.

Equation 2: $Pww = \frac{24\,EI}{(w+s)D^3}$

where Pww = collapse pressure of continuous slot screen (psi)
E = Young's modulus (3×10^7) for steel
I = moment of inertia of the external face $(in.)^4$
w = width of the wire on the external face (in.)
S = slot width of the screen (in.)
D = mean diameter of the screen

The moment of inertia (I) depends on the shape of the wire; but is generally between $wt^3/12$ (a rectangle) and $wt^3/36$ (a triangle), where t is the thickness of the wire. An interactive program to determine collapse strength can be found on our web site www.roscoemoss.com and is also available from your Roscoe Moss Company representative.

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Selection of rod size and number of rods

The amount of static weight that can be safely supported by the uppermost screen is referred to as the safe hanging weight. The cross sectional rod area of the screen determines the load limit of the screen. Safe hanging weight of continuous slot screen can be determined from Equation 3.

Equation 3: $T = 5.25A$

where T = safe hanging weight (tons)

A = cross sectional rod area

Example: If the screen is constructed with 60 rods and each rod is 0.250" in diameter, the total cross sectional area of the screen is 2.94 sq. in. Therefore the safe hanging weight is:

$T = 5.25 \times 2.94$

$T = 15.44$ tons

Users are cautioned that many factors determine the joint efficiency between the screen body and fitting. Also, many dynamic forces are applied during installation, gravel packing, and well development. For these reasons, the actual safe hanging weight of the screen may be less than indicated by this theoretical formula.

End fittings

Continuous slot screens manufactured by Roscoe Moss Company may be fabricated with weld rings, welding collars, flush threaded ends, or threaded and coupled connections. It is the designer's responsibility to select the type of end fitting most suitable for site specific conditions.

Specifications for continuous slot screen

General

Continuous slot screen shall be constructed of shaped wire helically wrapped over a circular array of internal rods. Using electrical resistance welding, each wire and rod juncture will be fusion welded under water. The slot size will be based on sieve analysis of the water-bearing sediments or selected pack materials.

Materials

The screen shall be constructed from stainless steel Type 304

Diameter

The screen shall have a maximum outside diameter of 12¾" inches and a minimum clear inside diameter of 12 inches.

Strength

The screen shall meet the following minimum strength requirements:

Collapse pressure 306 psi at .050 slot size

Safe hanging weight 30,900 lbs.

Field Assembly

For field assembly the screen shall be furnished with COLLARS

If weld rings are used they shall be 4 inches long and ⅜" inches thick. Weld rings shall be fabricated from the same grade of steel used for the screen bodies.

If welding collars are used they shall be 4 inches long and ⅝ inches thick. Welding collars shall be fabricated from the same grade of steel used for the screen bodies.

If flush threaded joints are used they shall be compatible with those described by ASTM F 480 standards. Material used to fabricate these fittings shall be from the same grade of steel used for the screen bodies.

Documentation

If required, the manufacturer will provide documentation that the screen meets contract specifications. Examples of such documentation are: mill test reports, manufacturer's certificate of compliance, and calculations used to determine collapse strength and safe hanging weight.

4360 Worth Street, Los Angeles, California 90063 • Telephone: (323) 263-4111 Facsimile: (323) 263-4497

Appendix D

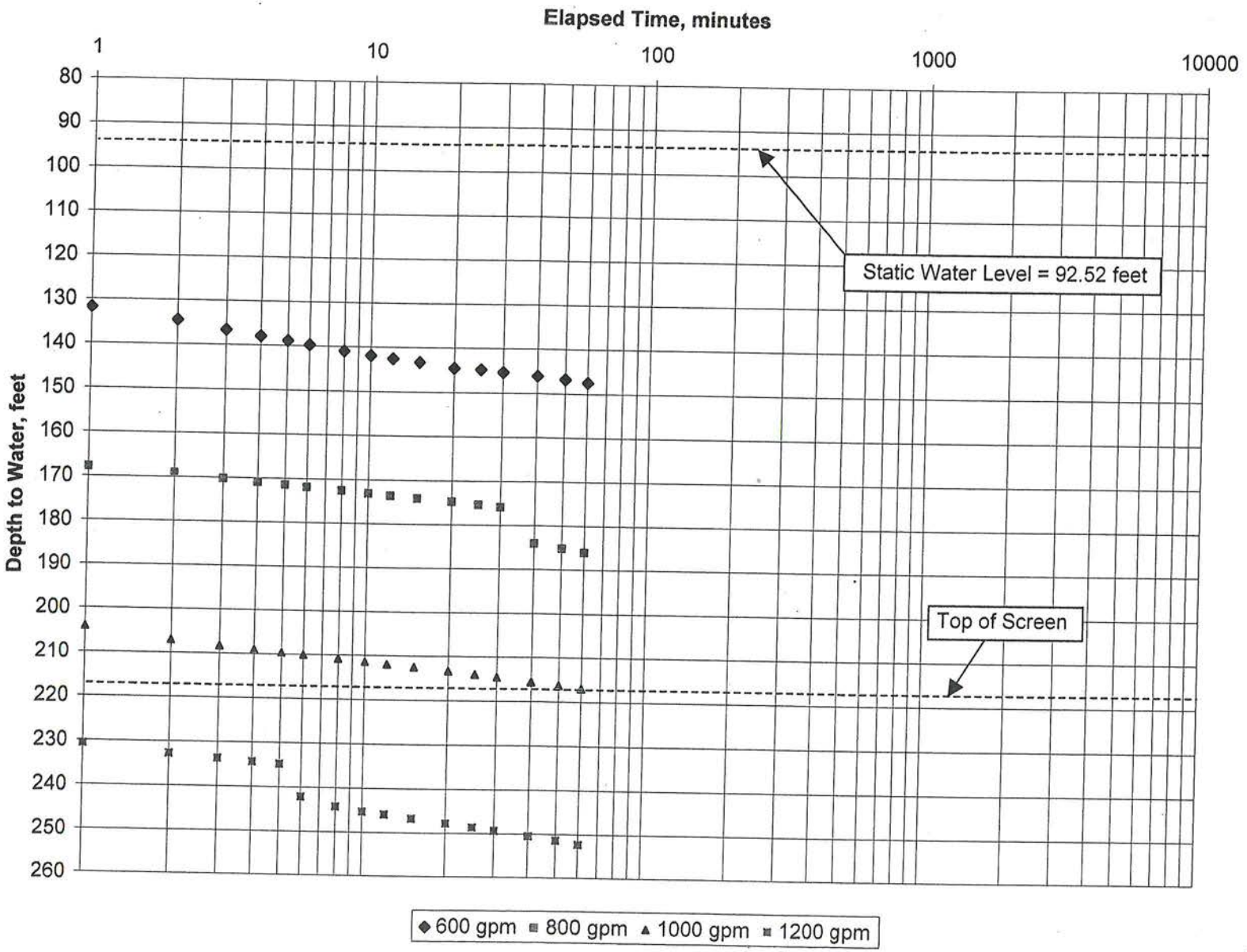
Pumping test data

Pumping Test Step test, St. Joseph Street Well (Well #5) November 2, 2006

Day	Time	Elapsed Time	Depth to Water	Drawdown	Recorded Pumping Rate
Mo./Day/Yr	hr:min	minutes	feet	feet	gallons per minute
11/2/2006	10:00	0	92.52	0	Start
	10:01	1	131.72	39.20	600
	10:02	2	134.45	41.93	600
	10:03	3	136.55	44.03	600
	10:04	4	137.85	45.33	600
	10:05	5	138.78	46.26	600
	10:06	6	139.66	47.14	600
	10:08	8	140.91	48.39	600
	10:10	10	141.80	49.28	600
	10:12	12	142.44	49.92	600
	10:15	15	143.22	50.70	600
	10:20	20	144.45	51.93	600
	10:25	25	144.67	52.15	600
	10:30	30	145.25	52.73	600
	10:40	40	145.98	53.46	600
	10:50	50	146.71	54.19	600
	11:00	60	147.40	54.88	600
	11:01	1	167.80	75.28	800
	11:02	2	168.97	76.45	800
	11:03	3	170.13	77.61	800
	11:04	4	170.89	78.37	800
	11:05	5	171.40	78.88	800
	11:06	6	171.85	79.33	800
	11:08	8	172.5	79.98	800
	11:10	10	173.05	80.53	800
	11:12	12	173.50	80.98	800
	11:15	15	174.07	81.55	800
	11:20	20	174.70	82.18	800
	11:25	25	175.29	82.77	800
	11:30	30	175.80	83.28	800
	11:40	40	183.98	91.46	800
	11:50	50	185.08	92.56	800
	12:00	60	185.90	93.38	800
	12:01	1	204.10	111.58	1000
	12:02	2	206.93	114.41	1000
	12:03	3	208.17	115.65	1000
	12:04	4	208.95	116.43	1000
	12:05	5	209.52	117.00	1000
	12:06	6	210.00	117.48	1000
	12:08	8	210.73	118.21	1000
	12:10	10	211.32	118.80	1000
	12:12	12	211.83	119.31	1000
	12:15	15	212.41	119.89	1000
	12:20	20	213.22	120.70	1000
	12:25	25	213.91	121.39	1000
	12:30	30	214.49	121.97	1000
	12:40	40	215.48	122.96	1000
	12:50	50	216.19	123.67	1000
	13:00	60	216.90	124.38	1000
	13:01	1	230.60	138.08	1200
	13:02	2	232.65	140.13	1200
	13:03	3	233.58	141.06	1200
	13:04	4	234.27	141.75	1200
	13:05	5	234.67	142.15	1200
	13:06	6	242.00	149.48	1200
	13:08	8	244.11	151.59	1200
	13:10	10	245.14	152.62	1200
	13:12	12	245.73	153.21	1200
	13:15	15	246.61	154.09	1200
	13:20	20	247.64	155.12	1200
	13:25	25	248.50	155.98	1200
	13:30	30	249.20	156.68	1200
	13:40	40	250.37	157.85	1200
	13:50	50	251.30	158.78	1200
	14:00	60	252.20	159.68	1200

Step Test - St. Joseph Street Well (Well #5)
Los Alamos Community Services District
November 2, 2006

Depth to Static Water Level: 92.52 feet **600, 800, 1,000, and 1,200 gallons per minute**



Pumping Test 72-Hour, St. Joseph Street Well (Well #5) November 7 to 10, 2006

Day	Time	Elapsed Time	Depth to Water	Drawdown	Recorded Pumping Rate	Meter Reading
Mo./Day/Yr	hr:min	minutes	feet	feet	gallons per minute	gallons
11/7/06	6:15	0	89.30	0	Start	9897500
	6:19	4	154.28	64.98		
	6:20	5	155.55	66.25		
	6:21	6	156.62	67.32		
	6:23	8	158.62	69.32	750	9903500
	6:25	10	160.01	70.71	750	9905000
	6:27	12	161.16	71.86		
	6:30	15	162.40	73.10	700	9908500
	6:35	20	171.66	82.36	800	9912500
	6:40	25	173.25	83.95	800	9916500
	6:45	30	174.35	85.05	800	9920500
	6:55	40	176.03	86.73	800	9928500
	7:05	50	177.34	88.04	800	9936500
	7:15	60	178.40	89.10	800	9944500
	7:30	75	179.55	90.25	800	9956500
	7:45	90	180.52	91.22	800	9968500
	8:00	105	181.36	92.06	767	9980000
	8:15	120	182.10	92.80	800	9992000
	8:45	150	183.40	94.10	800	10016000
	9:15	180	184.16	94.86	767	10039000
	10:15	240	186.55	97.25	783	10086000
	11:15	300	190.85	101.55	783	10133000
	12:15	360	192.19	102.89	783	10180000
	13:15	420	192.81	103.51	800	10228000
	14:15	480	193.47	104.17	800	10276000
	15:15	540	194.12	104.82	783	10323000
	16:15	600	194.58	105.28	783	10370000
	17:15	660	195.32	106.02	792	10417500
	18:15	720	195.73	106.43	792	10465000
	19:15	780	196.15	106.85	783	10512000
	20:15	840	196.67	107.37	783	10559000
	21:15	900	196.93	107.63	792	10606500
	22:15	960	197.33	108.03	775	10653000
	23:15	1020	197.43	108.13	800	10701000
11/8/06	0:15	1080	197.56	108.26	783	10748000
	1:15	1140	197.75	108.45	783	10795000
	2:15	1200	198.20	108.90	767	10841000
	3:15	1260	198.35	109.05	650	10880000
	4:15	1320	198.61	109.31	917	10935000
	5:15	1380	198.69	109.39	783	10982000
	6:15	1440	198.62	109.32	600	11018000
	8:15	1560	199.10	109.80	875	11123000
	10:15	1680	199.27	109.97	775	11216000
	12:15	1800	199.45	110.15	783	11310000
	14:15	1920	199.71	110.41	775	11403000
	15:15	1980	200.07	110.77	767	11449000
	16:15	2040	201.60	112.30	800	11497000
	17:15	2100	201.82	112.52	783	11544000
	18:15	2160	202.07	112.77	792	11591500
	19:15	2220	202.07	112.77	792	11639000
	20:15	2280	202.24	112.94	783	11686000
	21:15	2340	202.30	113.00	792	11733500
	22:15	2400	202.65	113.35	775	11780000
	23:15	2460	202.69	113.39	817	11829000
11/9/06	0:15	2520	202.73	113.43	817	11878000
	1:15	2580	202.85	113.55	750	11923000
	2:15	2640	202.91	113.61	800	11971000
	3:15	2700	203.05	113.75	767	12017000
	4:15	2760	203.11	113.81	783	12064000
	5:15	2820	203.33	114.03	800	12112000
	6:15	2880	203.38	114.08	783	12159000
	7:15	2940	203.64	114.34	800	12207000
	8:15	3000	203.50	114.20	783	12254000
	9:15	3060	203.50	114.20	783	12301000
	10:15	3120	203.48	114.18	783	12348000
	11:15	3180	203.49	114.19		
	12:15	3240	203.49	114.19	783	12442000
	13:15	3300	203.45	114.15	783	12489000
	14:15	3360	203.57	114.27	800	12537000
	15:15	3420	203.44	114.14	783	12584000
	16:15	3480	203.60	114.30	783	12631000
	17:15	3540	203.80	114.50	783	12678000
	18:15	3600	203.86	114.56	783	12725000

Pumping Test 72-Hour, St. Joseph Street Well (Well #5) November 7 to 10, 2006

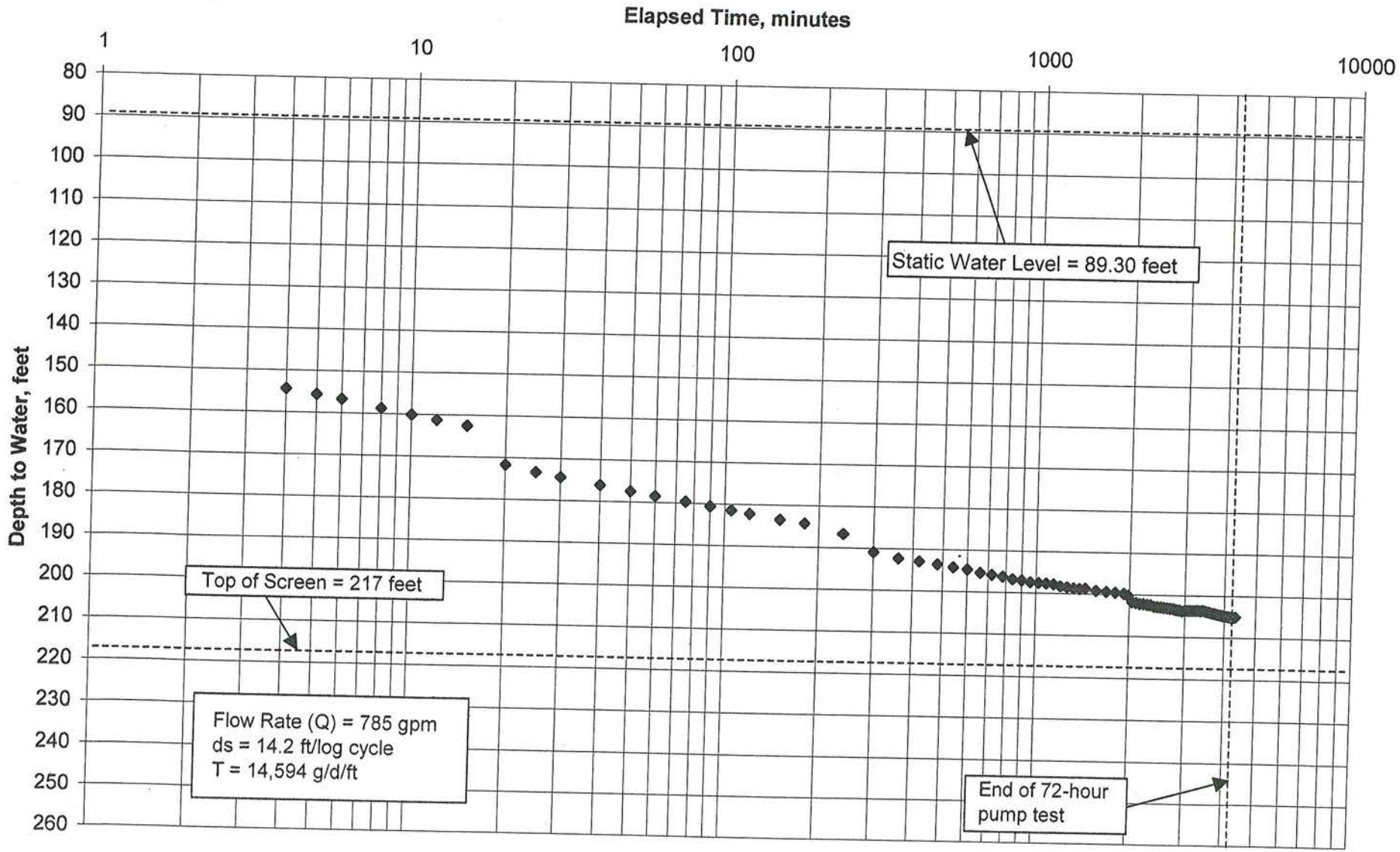
Day	Time	Elapsed Time	Depth to Water	Drawdown	Recorded Pumping Rate	Meter Reading
Mo./Day/Yr	hr:min	minutes	feet	feet	gallons per minute	gallons
	19:15	3660	204.08	114.78	783	12772000
	20:15	3720	204.12	114.82	783	12819000
	21:15	3780	204.32	115.02	783	12866000
	22:15	3840	204.44	115.14	783	12913000
	23:15	3900	204.52	115.22	800	12961000
11/10/06	0:15	3960	204.64	115.34	783	13008000
	1:15	4020	204.72	115.42	783	13055000
	2:15	4080	204.80	115.50	783	13102000
	3:15	4140	204.88	115.58	783	13149000
	4:15	4200	205.03	115.73	783	13196000
	5:15	4260	205.05	115.75	783	13243000
	6:15	4320	204.96	115.66	783	13290000
					Average = 785 gpm	

Recovery Test, St. Joseph Street Well (Well #5)

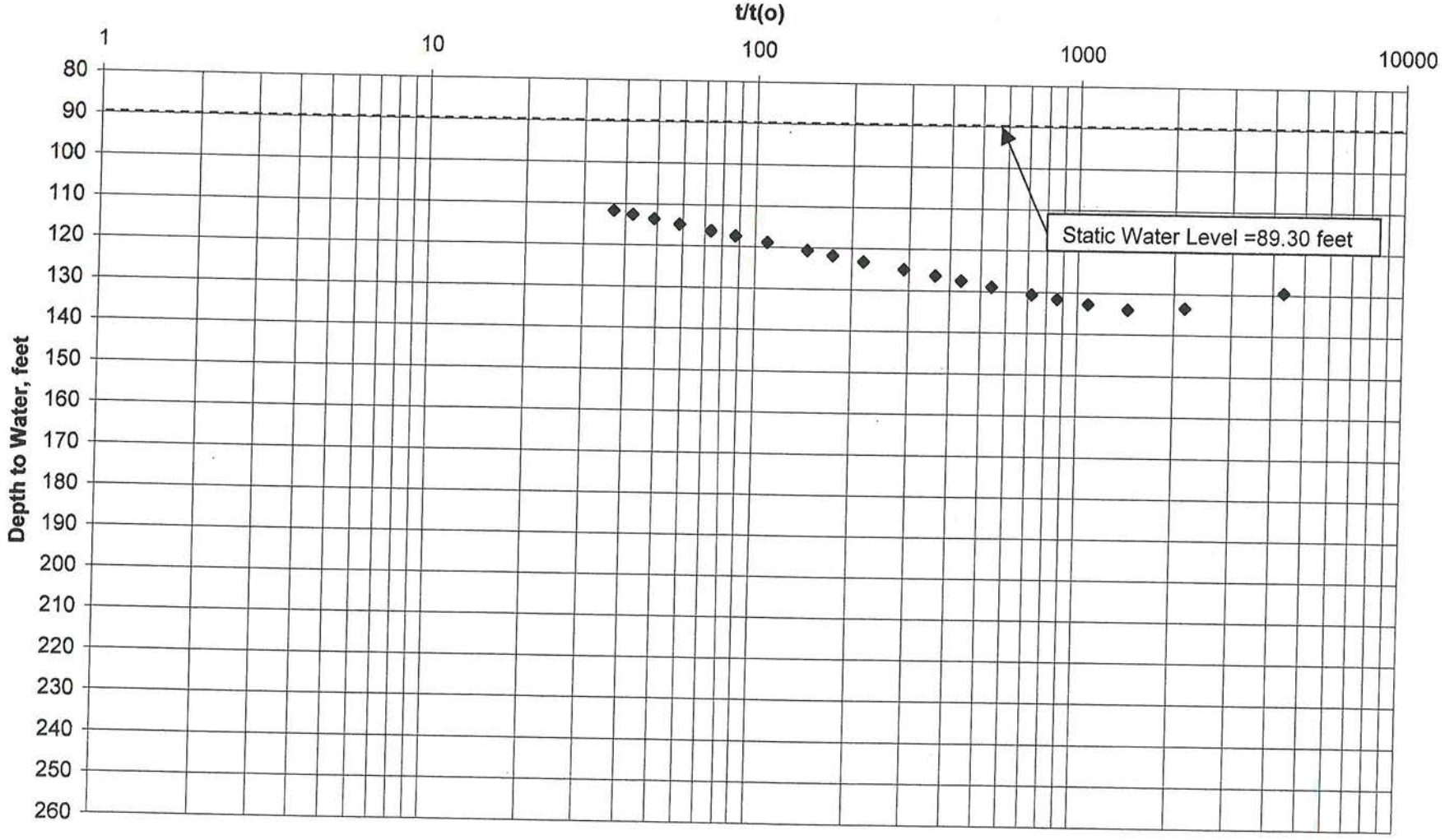
Day	Time	Elapsed Time	Depth to Water	Elapsed Time	Recovery Time Ratio
Mo./Day/Yr	hr:min	minutes	feet	minutes	
Recovery		t	s	t(0)	t/t(0)
11/10/06	6:16	4321	129.41	1	4321.0
	6:17	4322	133.41	2	2161.0
	6:18	4323	133.89	3	1441.0
	6:19	4324	132.72	4	1081.0
	6:20	4325	131.55	5	865.0
	6:21	4326	130.52	6	721.0
	6:23	4328	128.78	8	541.0
	6:25	4330	127.40	10	433.0
	6:27	4332	126.26	12	361.0
	6:30	4335	124.87	15	289.0
	6:35	4340	123.12	20	217.0
	6:40	4345	121.72	25	173.8
	6:45	4350	120.57	30	145.0
	6:55	4360	118.77	40	109.0
	7:05	4370	117.37	50	87.4
	7:15	4380	116.20	60	73.0
	7:30	4395	114.73	75	58.6
	7:45	4410	113.51	90	49.0
	8:00	4425	112.49	105	42.1
	8:15	4440	111.61	120	37.0

Pump Test (72-Hour) - St. Joseph Street Well (Well #5)
Los Alamos Community Services District
November 7 to 10, 2006

Depth to Static Water Level: 89.30 feet **Average flow rate: 785 gallons per minute**



Recovery Test - St. Joseph Street Well (Well #5)
Los Alamos Community Services District
November 7 to 10, 2006
Depth to Static Water Level: 89.30 feet



St. Joseph Street Well #5
Los Alamos CSD

Operational drop 30 ft

Items	pre-prod static	operat. static	ref drop	design drop	actual drop	10 min static	Top of zone	max draw	cycles	max draw per cycle	ref draw	ref rate	well yield
	89.3	119.3	71	64	64.5	183.3	217	33.7	2.62	12.9	14.2	785	713
	(ft bgs) pump test	(ft bgs) Static + op. drop	(ft) 10 min @785 pump test	(ft) manual input	(ft)	(ft bgs)	(ft bgs)	(ft)	(cycles) log cycles from 10 min to 2.9 d	(ft) 33.7/2.62	(ft/log cycle) @785gpm pump test	(gpm) pump test	(gpm)

Notes: Yield estimate is based on Cooper-Jacob modification of Theis Equation.