From:	Ana Citrin
To:	sbcob
Subject:	Document for BOS, Tuesday general public comment
Date:	Friday, September 16, 2022 10:30:26 AM
Attachments:	01 LOMC to CalEPA SYR Complaint 9-8-22 FINAL redux all AA versions.pdf

Dear Clerk,
Attached please find a document for circulation to the Supervisors, that I plan to speak to in general public comment on Tuesday.
If you have any problems opening the document please let me know; it is large so hopefully all distribution can occur electronically and no printing is required.
Thank you, and best regards,
Ana

--
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LAW OFFICE OF MARC CHYTILO, APC
A PROFESSIONAL CORPORATION

ENVIRONMENTAL LAW

September 7, 2022

Secretary Jared Blumenfeld *By Email*
California Environmental Protection Agency
P.O. Box 2815
Sacramento, CA 95814

State Water Resources Control Board
E. Joaquin Esquivel, Chair
P.O. Box 100
Sacramento, CA 95812-0100

California Department of Fish and Wildlife
Director Charlton Bonham
P.O. Box 944209
Sacramento, CA 94244

Re: Complaint Concerning Violations of The State Water Resources Control Board's "Cannabis Cultivation Policy, Principles and Guidelines for Cannabis Cultivation", Including Impermissible Diversion of Subterranean Santa Ynez River Surface Flows for Cannabis Cultivation, Santa Barbara County

Secretary Blumenfeld, Members of the State Water Resources Control Board and Department of Fish and Wildlife:

This office represents the Santa Barbara Coalition for Responsible Cannabis (Coalition), a non-profit California public benefit corporation that is dedicated to ensuring the responsible development of Santa Barbara County's cannabis industry. The Coalition is not a prohibitionist organization, and thereby supports a sustainable cannabis industry. The Coalition has been deeply involved in the Santa Barbara County's cannabis ordinance implementation and permitting decisions, and among various actions, has entered into binding good neighbor agreements with various cannabis industry members and trade associations to protect and advance community and environmental interests while supporting responsible operators.

Fundamental to responsible cannabis operations is, at a minimum, compliance with all applicable laws, regulations, and requirements, while respecting the interests of other community interests and members that may be affected. As California's drought increases in severity and duration, increased attention is focused on water supply. In designing and advancing the state's cannabis policy, the State sought to ensure that existing water supplies would not be compromised by the establishment of the cannabis industry. Water Code § 13149 directs the State Water Resources Control Board (Board) to "adopt principles and guidelines for the diversion and use of water for

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cannabis cultivation in areas where cannabis cultivation may have the potential to substantially affect instream flows. The principles and guidelines . . . may include limits on diversions, . . . [and] may include requirements that apply to groundwater extractions . . ." Water Code § 13149(a)(1)(A). In consultation with the Department of Fish and Wildlife, the Board was directed to adopt "measures to protect springs, wetlands, and aquatic habitats from negative impacts of cannabis cultivation." Water Code § 13149(a)(2) & (3). Significantly, the Legislature assigned to the Board "primary enforcement responsibility for principles and guidelines adopted under this section", making clear the principles and guidelines are to be legally enforceable, not merely advisory, and that the Board is charged with their enforcement. Water Code § 13149(b)(5).

The Board fulfilled its commitments under Water Code § 13149, adopting the State's Cannabis Cultivation Policy, Principles and Guidelines for Cannabis Cultivation, adopted by the Board on February 5, 2019 and approved by the Office of Administrate Law on April 16, 2019 (hereafter SWRCB Cannabis Cultivation Policy). The requirements of this Policy are mandatory and apply to all cannabis growers as it is "incorporated and implemented through the statewide Cannabis Cultivation General Order, any waste discharge requirements addressing cannabis cultivation activities adopted by a Regional Water Quality Control Board, Cannabis SIUR, Water Rights' Permitting and Licensing Program, and CDFA's [now DCC's] CalCannabis Cultivation Licensing Program." (SWRCB Cannabis Policy, at page 15).

Unfortunately, the Board has not undertaken monitoring and enforcement of the SWRCB Cannabis Cultivation Policy, and in particular, has not exercised its jurisdiction over cannabis cultivator's improper diversion of the Santa Ynez River's surface water supplies, including subterranean surface flows. This abdication of jurisdiction is evidenced by the Board's own determination that one of the cannabis cultivators is drawing subterranean surface waters from the Santa Ynez River, by the hydrological reports of many of the cultivators themselves, and by the report of Stetson Engineers for the Santa Ynez River Water Conservation District. The Board has extensive experience with the Santa Ynez River, as most recently expressed in Order WR 2019-0148 (hereafter WRO 2019-0148). The fragile condition of wildlife, fish and other Public Trust resources in the lower Santa Ynez River is documented in WRO 2019-0148 (Section 5, pages 41-99) and the accompanying 2011 Final Environmental Impact Report.

The Board has ample legal authority to act to enforce the SWRCB Cannabis Cultivation Policy, to protect downstream water rights, and to preserve and enhance public trust resources. WRO 2019-0148 expressly prohibits the diversion or use of any water under WRO 2019-0148 for use for commercial cannabis cultivation "unless the water right holder is in compliance with all applicable conditions, including the numeric and narrative instream flow requirements, of the current version of the State Water Board's Cannabis Cultivation Policy – Principles and Guidelines for Cannabis Cultivation." WRO 2019-0148 Order, para 14. "[W]hen the State Water Board determines that any person is violating, or threatening to violate, any term or condition of a right, the State Water Board may issue an order to that person to cease and desist from that violation." Id., para. 8

As detailed below, the SWRCB Cannabis Cultivation Policy adopted explicit restrictions and requirements that are applicable here and which impose mandatory prohibitions against the diversion of surface water, including subterranean surface water flows as defined under California law, for cannabis cultivation during a certain identified "dry season forbearance period" (April 1 to October 31) as described in Section 2 of the Cannabis Policy (SWRCB's Cannabis Policy Mandatory Forbearance Period). As demonstrated below and in attached materials, twenty-two cannabis cultivation operations are situated along the Santa Ynez River with shallow wells extracting from subterranean surface flows of the River in defiance of the SWRCB Cannabis Cultivation Policy's Mandatory Forbearance period. The Board has previously recognized that one of these wells, which shares relevant hydrological features with the twenty-two other wells supplying these cannabis operations, are subterranean surface water and unquestionably subject to the Board's jurisdiction. Additionally, in addition to the Mandatory Forbearance requirements of Section 2 of the SWRCB Cannabis Cultivation Policy, these and other wells are intercepting groundwater that otherwise feeds the Santa Ynez River, materially diminishing downstream flows to the detriment of other beneficial uses, including wildlife habitat including the endangered steelhead trout, triggering Section 3's Instream Flow requirements, including gaging.

This office commissioned Lynker Technologies, LLC to prepare a report on the hydrological conditions of the Santa Ynez River, attached to this Complaint. This report, Hydrogeologic Evaluation of Irrigation Water Supplies for Cannabis Production Projects in the Santa Ynez River Valley, California, authored by James McCord, Ph.D., P.E. (Lynker Hydrogeologic Report or Lynker), identified thirty-one (31) cannabis cultivation projects are located or proposed along the Santa Ynez River floodplain, and found that twenty-nine of these rely on water supply wells drawing water from river gravels intrinsically connected to the River's surface flows." Id., at page 5. Twenty-two of these are above the Lompoc Narrows, where the Cachuma Project must release flows in most years to maintain sufficient water in the river channel to meet the needs of downstream rights holders. Lynker estimated the cumulative impact of these cannabis cultivation operations at 1,289 acre-feet per year, and that this amount represents nearly 30% of the average annual water rights releases from Cachuma Reservoir for the Above Narrows Account. Id. Lynker provides a detailed report on the hydrogeology of the Santa Ynez River based on extensive existing studies and evidence, including Stetson Engineers, Inc.'s December 2021 report prepared for the Santa Ynez River Water Conservation District entitled Hydrogeological Basis for Characterization of Water Within the Santa Ynez River Alluvium Upstream of the Lompoc Narrows as Underflow of the River in a Known and Definite Channel, (Stetson) attached as Appendix D to the Lynker Hydrogeologic Report. Lynker and Stetson concur and demonstrate the Santa Ynez River possesses a known and definite channel in the reach below Cachuma Reservoir to the Lompoc Narrows, such that wells intercepting these waters are diverting subterranean surface flows as defined by the Board in *Garrapata*.

This office prepared a second report further analyzing cannabis cultivation operations along the Santa Ynez River, entitled Cannabis and Surface Water Compliance in the Santa Ynez River

Alluvial Basin, Santa Barbara County, California, authored by Katherine E. Anderson of the LAW OFFICE OF MARC CHYTILO, APC (Anderson Report). The Anderson Report connects the overlapping timing of the releases for fish and downstream water rights with the time that cannabis cultivators are also extracting water from subterranean flows of the Santa Ynez River and observes the potential need for larger Cachuma releases to offset cannabis cultivator's extractions. Id., at p. 19.

Appendix A to the Anderson Report is a detailed assessment and description of the characteristics of water supplies for ten (10) of the highest priority cannabis cultivators along the Santa Ynez River. Sources of evidence are identified and hyperlinked in Appendix B.

The Santa Ynez River supports eleven species of native fish, and is designated Critical Habitat for the federally-endangered Southern California steelhead trout (*O. mykiss*) and supports populations of the federally-endangered Tidewater Goby (*Eucyclogobius newberryi*) and Arroyo Chubb (*Gila orcuti*), a California species of special concern. The Santa Ynez River supports a number of other aquatic, avian and terrestrial species and the riparian habitat along the lower Santa Ynez River "supports a great diversity of aquatic and terrestrial species." WRO 2019 at p. 42.

Regrettably, many of the cannabis operators along the Santa Ynez River have not been forthright, some intentionally misleading state and local regulators concerning the character and quantity of the water they are using on cannabis crops, and diverting subterranean surface flows in violation of the SWRCB Cannabis Cultivation Policy. The County has made no affirmative inquiry into the veracity of cultivator's claims of an acceptable, compliant water supply, nor have state licensing authorities. Operators have been allowed to self-certify through the SWRCB's online, automated registration portal and these self-certifications supply or rely on incorrect information, even in the face of their own hydrologists admitting that Project wells are diverting subterranean surface water flows. SBCRC has raised this issue to the County several times for several different projects, but County officials have relied on the State's review (or lack thereof) and have ignored these concerns. Since these wells unquestionably divert surface water, the Board has a non-discretionary duty to exercise its jurisdiction and enforce the SWRCB Cannabis Cultivation Policy, which was adopted following notice and comment rulemaking pursuant to the California Administrative Procedures Act. The failure to do so harms the public trust, condones nuisance and trespass, and constitutes an unreasonable and wasteful use of water, prohibited under the California Constitution Art. 10, Sec. 2.

Compliance with the SWRCB Cannabis Cultivation Policy is mandatory "to ensure the diversion of water and discharge of waste associated with cannabis cultivation does not have a negative impact on water quality, aquatic habitat, riparian habitat, wetlands, or springs." SWRCB Cannabis Cultivation Policy at pp. 25-26. Prohibitions on the diversion of subterranean riverine surface flows was plainly intended to be enforceable by SWRCB and others. Enforcement falls primarily to the SWRCB.

The Legislature recently underscored the State's commitment to taking enforcement action to stop unauthorized water diversions by cannabis operations. AB 195 was approved by the Governor on June 30, 2022, and included revisions to Water Code § 1052 clarifying that unauthorized diversions of water for any cannabis operation is a trespass, with penalties of $3500/day imposed for unauthorized diversions of water. Ch. 56, Sec. 37. Diversions of surface water, including subterranean surface flows, taken for cannabis cultivation during summer forbearance periods is an unauthorized diversion triggering the penalties authorized by AB 195.

The Board and other Trustee Agencies have obligations to enforce the laws adopted by the Legislature and regulations properly adopted under the California Administrative Procedures Act, including the SWRCB Cannabis Cultivation Policy. This is particularly important in this time of drought, when the cannabis extractions interfere with downstream water rights and public trust resources, including compromising the efficacy of mandatory releases from Cachuma Reservoir to maintain fish flows and downstream water rights under Order WR 2019-0148. This order was imposed specifically to provide higher flows in the Santa Ynez River below Bradbury Dam "to benefit steelhead by providing additional spawning and rearing habitat as well as increasing passage opportunities in the lower mainstem river." Id., at p. 2. The improper cannabis-related diversions in the stretch of the Santa Ynez River that is designated Critical Habitat for the southern steelhead conflict directly with WRO 2019-0148's goal.

Additionally, the Public Trust Doctrine imposes an overarching affirmative duty upon each agency to consider and protect Public Trust Resources, including the State Board's duty of continuing supervision over the appropriation and use of water. See *Audubon Society v. Superior Court* (1983) 33 Cal. 3d 419, 446-447. The Department of Fish and Wildlife has responsibilities as trustee of the state's public trust resources. Fish and Game Code Secs. 711.7(a); 1600 et seq. The impermissible diversion of flows in the Santa Ynez River is having adverse and deleterious impacts to public trust resources, including both fish and wildlife that rely on continuous surface flows. WRO 2019-0148.

The Board's enforcement of the SWRCB Cannabis Cultivation Policy on the Santa Ynez River would also address these cannabis operators' infringement of the rights of lawful downstream diverters and the interference of these improper diversions with the duty of the operators of Cachuma Reservoir to achieve certain downstream flows for both water rights and habitat purposes. "Water rights downstream of Bradbury Dam consist of appropriative and riparian rights to divert water from the Santa Ynez River, and overlying and appropriative rights to divert groundwater from groundwater basins that, under natural conditions, the river would recharge." WRO 2019-0148, p. 8 (see 2002 Settlement Agreement p. 4, WRO 73-37, p. 3, WRO 89-18, p. 6 and attachment). Releases to satisfy downstream water rights are required when depletion of groundwater storage between Bradbury Dam and the Narrows near Lompoc exceeds the threshold of 10,000 acre-feet. Id. Accordingly, when cannabis cultivators improperly extract subterranean flows – particularly when (as now)[1] releases are occurring to recharge the

[1] https://www.syrwcd.com/water-rights-release-2022

groundwater basins along the Santa Ynez River, it affects not only downstream users that divert from the River, but also reduces recharge to surrounding groundwater basins and increases the likelihood that additional releases from Cachuma would be required to satisfy the downstream water rights holders.

Given the immediate and deleterious adverse effects of the improper diversions, Petitioner requests that the SWRCB promptly issue a Cease and Desist Order to each of the identified cannabis cultivators, thereby barring diversions from subterranean surface flows of the Santa Ynez River during the forbearance period.

Petitioner also requests the Board and the Department of Fish and Wildlife initiate a comprehensive investigation of cannabis cultivation operations in the Santa Ynez River watershed, including assessment of cultivation operations relying on wells that interfere with replenishment of the Santa Ynez River and may be beyond Board jurisdiction, but are nonetheless causing adverse impacts to habitat and listed species, in accordance with Section 3 instream flow requirements, and subject to the Department of Fish and Wildlife's jurisdiction. This investigation should include an assessment of potential impacts to habitat and other water users, wet season diversions and the requirements of Cannabis Policy Section 3, including gaging. The Board should undertake more direct and enhanced communications with Santa Barbara County Planning and Development Department to ensure that water supply issues are integrated into local project review and decision making and the Department of Cannabis Control to explicitly confirm that state licensing review ensures that licenses are not issued for cannabis projects which lack an allowable water supply.

This office is available to provide additional information and respond to questions as needed to prompt swift action to stop the improper diversion of water and harm to the important natural resources of the Santa Ynez River.

Respectfully Submitted,

LAW OFFICE OF MARC CHYTILO, APC

Marc Chytilo
For the Santa Barbara Coalition for Responsible Cannabis

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Enclosures:

1. Hydrogeologic Evaluation of Irrigation Water Supplies for Cannabis Production Projects in the Santa Ynez River Valley, California, James McCord, Ph.D., P.E., Lynker Technologies, LLC., August 2022
2. Cannabis and Surface Water Compliance in the Santa Ynez River Alluvial Basin, Santa Barbara County, California, Katherine E. Anderson, LOMC, September 7, 2022

CC: SWRCB Office of Enforcement, Water Rights, Roberto Cervantes
Mr. David Bess, California Department of Fish and Wildlife, Chief of Enforcement
Ms. Yvonne West, State Water Resources Control Board, Director of Enforcement
Mr. Matthew Buffleben, State Water Resources Control Board, Enforcement
Ms. Joyce E. Dudley, Santa Barbara County District Attorney
Ms. Nicole Elliott, Director, Dept of Cannabis Control
Ms. Lisa Plowman, Santa Barbara County Planning and Development Department

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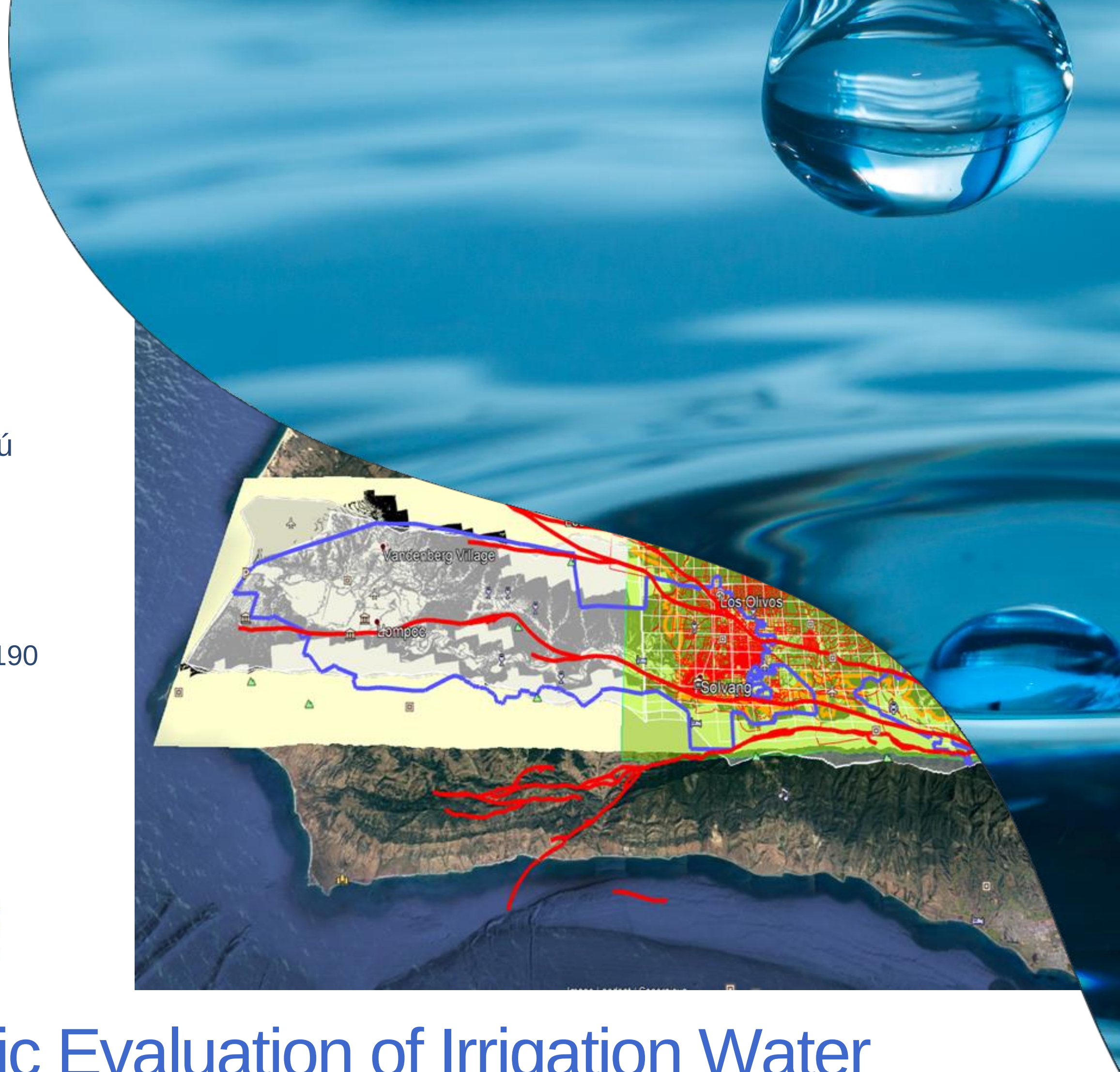
Attention:
Marc Chytilo
Of Counsel



Lynker

Hydrogeologic Evaluation of Irrigation Water Supplies for Cannabis Production Projects in the Santa Ynez River Valley, California

31 July 2022

FINAL DRAFT

Certifications

HUBZone Certified | CMMI-Dev Level 3 | ISO 9001:2015 | ISO 27001 | ISO 20000

31 July 2022

Law Office of Marc Chytilo, APC
Attn: Marc Chytilo
P.O. Box 92233
Santa Barbara, California 93190

RE: Hydrogeologic Evaluation of Irrigation Water Supplies for Cannabis Production Projects in the Santa Ynez River Valley, California

Dear Mr. Chytilo:

Pursuant to your request, I am pleased to submit this technical review of hydrology and hydrogeology in the Santa Ynez River basin. This technical report specifically focuses on the sources of water pumped from wells supplying water for cannabis cultivation projects in the Santa Ynez Valley study area. The analysis presented herein demonstrates that a vast majority of the cannabis projects located in the Santa Ynez River floodplain will directly impact the surface flow of the Santa Ynez River (River), both for downstream users and the wildlife that inhabit it. These projects' irrigation wells extract water from the Santa Ynez River gravels and younger alluvium that is recognized under California water law as a subterranean stream flowing through a known and definite channel, in direct connection with the surface flows of the River. Related to long-standing water-rights associated operations of the Cachuma project, this subterranean stream is also locally known as the Santa Ynez River Underflow Zone.

A number of conclusions can be drawn from the data compilation and related analyses presented herein, including:

- Of the thirty-one (31) proposed cannabis production projects, twenty-two (22) are located in the Santa Ynez River Underflow Zone
- These twenty-two projects would be or are pumping from the subterranean stream connected to the Santa Ynez River flows, subject to the jurisdiction of and to water rights administration by the SWRCB, including the April – October forbearance period for cannabis projects
- The impacts to Santa Ynez River surface and subterranean flows from cannabis project irrigation well pumping are especially significant when compared to average and low flow conditions on the River, with streamflow depletions equivalent to a large fraction of average annual water rights release from Cachuma reservoir and a large fraction of total river flows at the Santa Ynez River at Narrows gage in dry years

We appreciate the opportunity to undertake this analysis and present this summary.

Sincerely,

James T. McCord

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LIST OF FIGURES

List of Acronyms and Abbreviations

af/ac	acre-feet per acre
af/yr	acre-feet per year
Board	State Water Resources Control Board
Bulletin 118	Department of Water Resources (DWR), 2004. “California’s Groundwater, Bulletin 118”, 2004 edition.
CIR	Crop Irrigation Requirement
CMA	Santa Ynez Valley Basin Central Management Area
County	County of Santa Barbara
DWR	California Department of Water Resources
EMA	Santa Ynez Valley Basin Eastern Management Area
GSA	Groundwater Sustainability Agency (established by SGMA)
GSP	Groundwater Sustainability Plan (established by SGMA)
PEIR	Santa Barbara County’s Environmental Impact Report for the Cannabis Land Use Ordinance and Licensing Program
SGMA	Sustainable Groundwater Management Act
SW-GW	Surface Water-Groundwater
SWRCB	California State Water Resources Control Board (also abbreviated as “the Board”)
SY River	Santa Ynez River
SYRWCD	Santa Ynez River Water Conservation District
USGS	United States Geological Survey
WMA	Santa Ynez Valley Basin Western Management Area

1. Introduction

This document has been prepared at the request of the Law Office of Marc Chytilo APC (LOMC) to provide an overarching hydrogeological evaluation of irrigation water supplies for cannabis production projects in the Santa Ynez River Valley and associated groundwater basins in Santa Barbara County. **Figure 1** shows the locations of cannabis cultivation projects that have applied for local land use entitlements through May 2022.

Santa Barbara County's Final Environmental Impact Report for the Cannabis Land Use Ordinance and Licensing Program (PEIR) requires the positive demonstration of water supply in accordance with State and local policies. (PEIR 3.13-21; 3.8-32) In most cases, the proposed projects will rely on pumping groundwater to meet crop irrigation demand. Which State or local groundwater regulation that would be applicable to a particular cannabis project depends on which hydrogeologic formation irrigation water supplies would be drawn, and where the project is located with respect to surface water and subterranean streams and groundwater basins as defined by the California Department of Water Resources (DWR, 2018, Bulletin 118).

For example, to mitigate against potential adverse impacts to streamflows by diversions from a "subterranean stream" for cannabis irrigation, the State Water Resources Control Board (the Board or the SWRCB) has adopted mandatory forbearance limitations to diversions based on calendar dates and for projects whose extractions otherwise may impact Santa Ynez River surface flows, the Board's rules require instream flow gages calculating riparian water flow. Per SWRCB Cannabis Policy, if the proposed project utilizes alluvial groundwater that is hydraulically connected with a surface water stream (e.g., Santa Ynez River and its underflow) and meets the SWRCB's four-part *Garrapata Creek* test, it is characterized as a subterranean stream flow and thus the subject project would be prohibited from diverting this water from April 1 through October 31 under the Board's Cannabis Cultivation Policy, effective as of April 19, 2019 (https://www.waterboards.ca.gov/water_issues/programs/cannabis/cannabis_policy.html) (SWRCB, 2019).

2. Objectives, Findings and Approach

The objective of this report is to provide a hydrogeologic analysis of the source water supplies employed to irrigate proposed and approved cannabis projects in the Santa Ynez Valley. This is accomplished via an analysis of surface water from Lake Cachuma to the Lompoc Narrows, and surface water – groundwater connectivity in the Santa Ynez River basin from the Lompoc Narrows downstream into the Lompoc Plain. Data sources for this analysis include materials from the Santa Ynez River Groundwater Sustainability Agency (coordinated by the Santa Ynez River Water Conservation District), DWR Bulletin 118, the Board's Cannabis Cultivation Policy, individual cannabis cultivation project information such as well logs, hydrological reports and consultant reports, and my background from more than 30years of work in the area. See **Appendix E**, my bio and CV. The analysis shows that groundwater pumping in and from the alluvial gravels in the floodplain of the River basically represents a diversion from the surface flows of the Santa Ynez River, both hydrogeologically as well as in the administration of surface water rights by the SWRCB.

2.1. Key Findings

A number of important findings can be drawn from the analyses presented herein, including:

- Hydrogeologic modeling of well pumping from the younger alluvium and river gravels of the Santa Ynez River floodplain demonstrates how the water drawn from such wells is effectively a diversion from the River at a seasonal timescale;
- Twenty-nine of the thirty-one projects that were analyzed in the Santa Ynez River floodplain will or do rely on such irrigation supply wells drawing water from river gravels intrinsically connected to the River's surface flows
  - Twenty-two are in the portion of the River gravels upstream of the Lompoc Narrows, and groundwater pumped from these river gravels has been long recognized by the SWRCB and Cachuma Project operations as part of the surface water system (denoted the Santa Ynez River "underflow zone" as described by Stetson, 2021)
  - Nine are in the portion of the Santa Ynez River gravels downstream of the Narrows, where the Santa Ynez River crosses the Lompoc Plain; based on the local hydrogeology it appears that these projects are also drawing water from the River, impacting downstream water rights and other beneficial uses.
- The cumulative impact of cannabis projects to Santa Ynez River streamflows due to proposed and/or actual groundwater pumping from the subterranean stream is estimated at 1,289 af annually, representing approximately 30% of the average annual water rights releases from Lake Cachuma for the Above Narrows Account (ANA).

2.2. Approach

Section 3 describes the unique complexities of California groundwater law, and how they apply to cannabis production projects. **Section 4** summarizes how groundwater systems can be connected to surface streams and impact one another from a generic hydrogeologic perspective, in particular how installation and pumping of a well can affect streamflows, and it also considers the particular hydrogeologic settings found in the Santa Ynez River basin and how well pumping causes streamflow losses from the river, and computes expected impacts to Santa Ynez River flows. Finally, **Section 5** provides a summary of findings and conclusions.

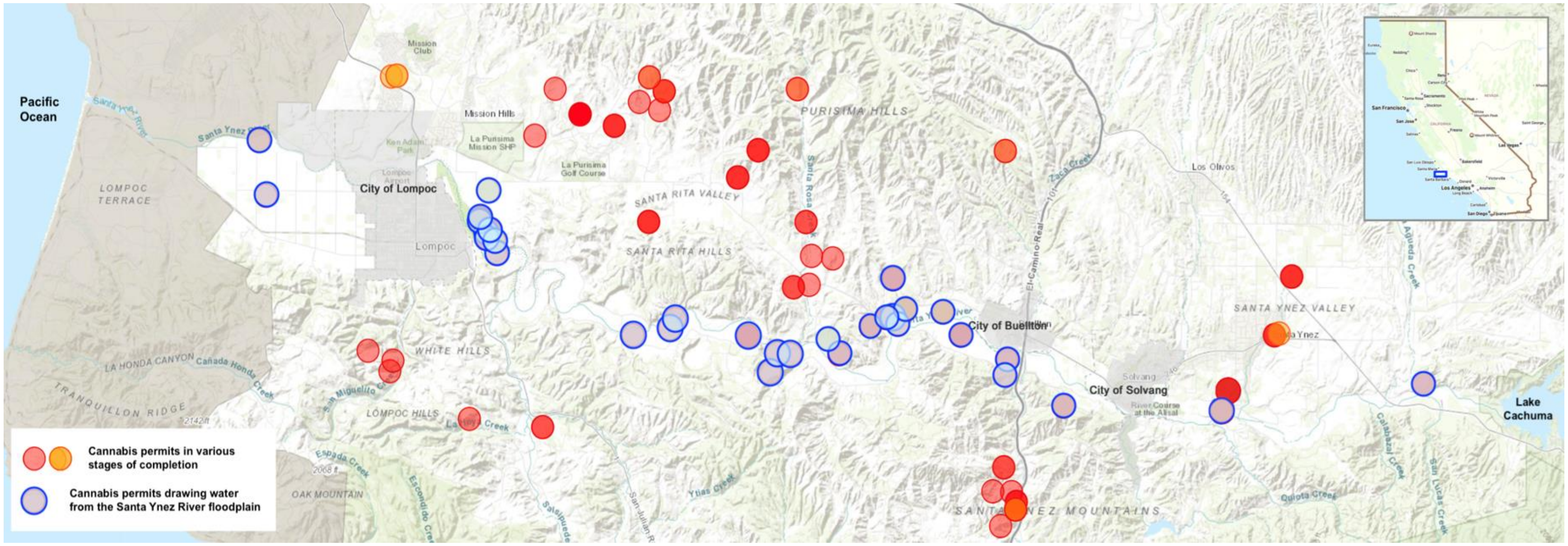

Figure 1. Proposed cannabis cultivation projects in Santa Ynez River Valley from Lake Cachuma downstream to Lompoc

3. California Groundwater Law in General and Applied to Cannabis

Over its history since 1850, California has developed a unique system of water resource management that melds aspects of riparian rights and prior appropriation with overlays from pueblo rights and federal reserved rights. Related to groundwater, state law has defined two types: groundwater flowing in "underground streams" which is managed as part of the surface water system by the SWRCB, and the remaining groundwater, which is termed "percolating groundwater" and not regulated by SWRCB and left to the jurisdiction of local government. Percolating groundwater is considered part of the bundle of property rights of overlying landowners and generally is "managed" by the counties each in their own fashion, recently made subject to the Sustainable Groundwater Management Act. To understand how California arrived at this legal bifurcation of groundwater, and its importance to this issue, **Appendix A** provides a review the historical development of the law, and how it has evolved in its application to both subterranean stream groundwater and percolating groundwater.

As described by Sax (2002), this bifurcation in the legal treatment of groundwater is not strictly consistent with the true physics and hydrogeology of subsurface hydrology, but rather is based on the 1899 *Los Angeles v. Pomeroy* case which defines:

- "subterranean streams flowing through known and definite channels" statutory language from Water Code § 1200; henceforth simply referred to as "subterranean streams," and
- "percolating groundwater," which is all groundwater that is not part of the subterranean stream groundwater.

Groundwater that can be demonstrated to be part of a subterranean stream is considered to be part of the surface water, and as such, is subject to the permitting jurisdiction of the SWRCB (or "Board"). The percolating groundwater was deemed outside the Board's permitting jurisdiction, and thus devolved to local (county by county) "management" of percolating groundwater, effectively as a property right that conveys with the overlying land.

3.1. Legal Test for Subterranean Streams

The current legal test, both in 2002 at the time of the Sax report and today in 2022, rests on the Board decision in the 1999 *Garrapata Creek* case.[1] The Board decision in that case sets four criteria for defining a "subterranean stream flowing through a known and definite channel:"

(1) A subsurface channel must be present;

(2) The channel must have relatively impermeable bed and banks;

(3) The course of the channel must be known or capable of being known by reasonable inference; and

(4) Groundwater must be flowing in the channel

If all four criteria are met, the groundwater in question is considered part of a subterranean stream and administered by the SWRCB as part of the surface water permitting system. As shown in **Figure**

[1] Water Rights Decision 1639 (D-1639), June 17, 1999.

1, thirty-one of Santa Ynez Valley cannabis projects are located in the floodplain, and groundwater in the Santa Ynez River floodplain above the Lompoc Narrows has previously been determined to be part of subterranean stream associated with the River (Stetson, 2021, see also SWRCB Memorandum, Subterranean Stream Determination, Buellton, Santa Ynez River, Santa Barbara County, February 6, 2019 (SWRCB 2019).)

3.2. Wrestling with Percolating Groundwater

As noted above, percolating groundwater falls outside the jurisdiction of the Board, and thus has been subject to local regulation historically, most typically at the county level. Given that there are 58 counties in California, the are 58 approaches to management of percolating groundwater. With the passage of the Sustainable Groundwater Management Act (SGMA) in 2014, the state established uniform rules and criteria for sustainable management of percolating groundwater. To help assure local input and control, SGMA requires that Groundwater Sustainability Agencies (GSAs) be constituted for each basin, and the GSAs must develop Groundwater Sustainability Plans (GSPs) for each of more than 100 basins across the state.

A key aspect of SGMA is that to achieve sustainable groundwater management, six "undesirable conditions" must be avoided or mitigated against, including, most relevant to the Santa Ynez River:

> "Depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water."

If the hydrogeologic analyses in a GSP show that pumping of percolating groundwater in the SGMA basin causes this undesirable result to surface flows, the GSAs have the authority to require that such impacts are mitigated. In **Section 4** below we show that there are certain local hydrogeologic settings where pumping percolating groundwater likely does impact subterranean streams and surface water flows in the Santa Ynez River. The magnitude and timing of that impact, however, is much smaller than the immediate "direct stream diversion" impact that occurs when pumping from the subterranean stream of the Santa Ynez River.

3.3. SWRCB Cannabis Cultivation Policy

Related to cannabis production, the determination of whether irrigation water supplies comes from a subterranean stream is a paramount jurisdictional question. Recognizing the potential for diversions of subterranean streams for cultivating commercial cannabis to adversely impact riparian environments and associated fauna, the SWRCB has established strict policies regulating its diversion and use. Originally adopted in October 2017, and updated in February 2019, the SWRCB promulgated rules that limit the use of groundwater from subterranean streams for cannabis production in its Cannabis Cultivation Policy (SWRCB Cannabis Cultivation Policy, at pages 11-12; Attachment A, Section 3, Requirements 4 & 5; See also Attachment A Section 2, Term #s 67 and 78, at https://www.waterboards.ca.gov/water_issues/programs/cannabis/cannabis_policy.html). As noted in the Introduction, included in the rules are forbearance limitations to diversions based on both calendar dates for subterranean surface flows and instream flow gages calculating riparian water flow for groundwater extractions, summarized as:

- For surface flows, including subterranean surface flows under the Board's jurisdiction, no diversions of surface waters, shall occur in any case during the period from April 1 through October 31

- For groundwaters not established as subterranean surface flows, the diversion season is from November 1 of each year to March 31 of the following year; diversions can occur during this period so long as flows in nearby connected stream exceed promulgated instream flow targets.
    - Per Section 3 Requirement 5, for the period of November 1 through December 14 of each year, diversion shall not begin until the minimum instream flow has been exceeded for 7 consecutive days, after which diversion is subject to meeting the daily instream flow requirement.

Thus, applying the Board's rules, the normal length of the cannabis diversion season would be 106 days (December 15 – March 31) and the maximum duration would be 151 days for those years that the Section 3, Requirement 5 conditions are met. Additionally, these diversions would only be allowed when stream flows exceed instream flow requirements. Given these constraints, cannabis growers with wells diverting from a subterranean stream must rely on alternative sources of irrigation water supply for the period from April 1 through the end of October. Notably, this promulgated forbearance period corresponds to the crop growing season, precisely when the cannabis crop would need supplemental irrigation (see **Figure 7**).

A more comprehensive summary of the SWRCB cannabis rules and requirements associated with the forbearance period and storage in surface reservoirs is provided in the memorandum by Anderson (2022).

4. Groundwater Pumping and Santa Ynez River Streamflows

This section describes how surface water and groundwater interact, and how groundwater well pumping may affect streamflows. Groundwater pumping impacts on streamflow are described in both a general sense, and in particular for cannabis production irrigation wells on the Santa Ynez River streamflows.

4.1. General Impacts of Groundwater Well Pumping on Streamflows

To understand how groundwater pumping for irrigation of cannabis crops can impact Santa Ynez River flows, it is helpful to first develop a general understanding of how surface stream can interact with adjacent and connected groundwater bodies.

4.1.1. Streams as Features of Groundwater Discharge and Recharge

As described by the US Geological Survey (1998), surface water streams can interact with groundwater in three basic ways as illustrated **Figure 2**. In summary: (i) A "Gaining Stream" gains water from inflow of groundwater through the stream banks and stream bed. In this case, all or part of the total stream flow rate is derived from groundwater discharge. (ii) A "Losing Stream" loses water to connected groundwater system via outflow through the stream banks and stream bed. In this case, the stream flow losses are a source of recharge to underlying the groundwater system. (iii) A "Disconnected Stream" loses water through the stream bed but is disconnected from the underlying groundwater zone by an intervening unsaturated zone.

In those situations where the stream is hydraulically connected to a permeable geologic formation saturated with groundwater (both the gaining and losing stream situations described above), pumping groundwater from a well installed in that formation can have significant and rapid impacts on streamflows. One can estimate the impact of well pumping on flows in a nearby stream using a variety of hydrologic models developed for the purpose. **Appendix B** details an approach to employ analytical models to compute groundwater-pumping induced streamflow losses.

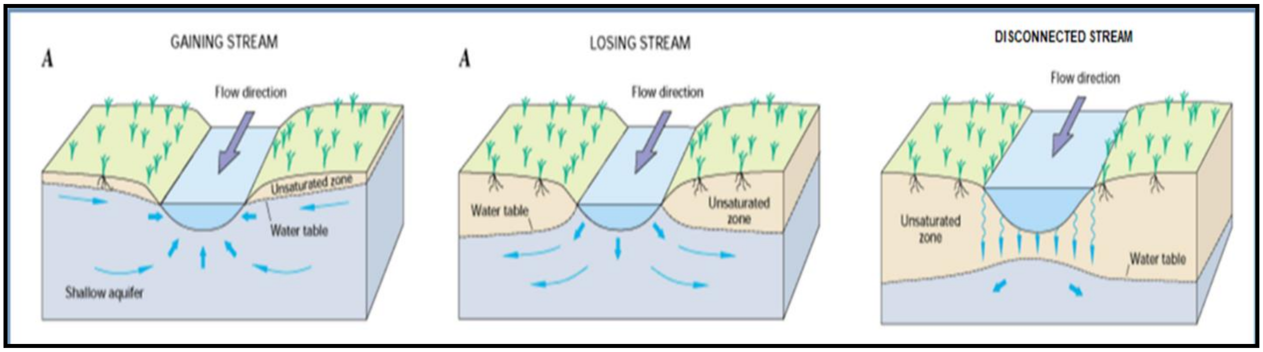

Figure 2. Schematic diagrams showing characteristic types of surface water - groundwater interaction (from Winter et al., 1998)

Applying that approach, these analyses show that streamflow losses increase with higher permeability sediments and well proximity to the stream. If these permeable sediments furthermore are deposited into bedrock channel of much lower permeability, then groundwater diversions would impart an immediate impact to the subterranean stream and associated surface streamflows akin to a surface water diversion. Thus in this limiting situation with the hydrogeologic conditions consistent with the Garrapata criteria, the hydrogeologic models show groundwater impacts to streamflow consistent with the SWRCB rules for management of surface water and hydraulically connected subterranean streams.

4.2. Hydrogeology of Groundwater Pumping Impacts on Santa Ynez River

As noted in the Introduction, there are 31 cannabis production projects proposed or approved in the Santa Ynez River basin that will draw the irrigation supply water the alluvial sediments underlying the Santa Ynez River floodplain, from Bradbury Dam (Lake Cachuma) downstream to the Lompoc Plain where the River discharges to the Pacific Ocean. With the general understanding of groundwater pumping impacts provided above in **Section 4.1**, this section addresses the varying hydrogeologic conditions found along this reach of the Santa Ynez River, and how these impact streamflow losses induced by well pumping for cannabis irrigation. **Appendix C** provides a more detailed data and information on the local Santa Ynez Valley hydrogeology.

4.2.1. Regional Hydrogeologic Context

Figure 3 shows the entire Santa Ynez River Basin and includes the delineation of:

- The Santa Ynez groundwater basin as defined by the DWR Bulletin 118 (2004, "California Groundwater")[2] basin maps[3]; this 2004 edition of this longstanding and important report describes the criteria employed to delineate groundwater basins, and the resulting basin maps derived from application of those criteria; the 2020 edition includes digital maps downloadable from the DWR online dataroom. https://water.ca.gov/Programs/Groundwater-Management/Bulletin-118.
- For groundwater sustainability planning purposes, the basin has been broken into three planning regions (see https://www.santaynezwater.org/). The three planning regions and associated Groundwater Sustainability Agencies in the basin are: the Western Management Area (WMA), the Central Management Area (CMA), and the Eastern Management Area (EMA)
- The Santa Ynez River Alluvium (a.k.a "Santa Ynez River underflow zone") in relation to these regions (Stetson, 2021b).

Also clearly visible in **Figure 3** is Lake Cachuma on the far east side of the map, and the Santa Ynez River flowing from east to west along the southern edge of the EMA and CMA basins.

4.2.1.1. Geologic Structure

The geologic structures and layers beneath this area are well described in the recent detailed compilations by Geosyntec (2020) and GSI Water Solutions (2020). The basin is an east-west trending, linear, irregular structural depression between rugged mountain ranges and hills within the Transverse Range in Santa Barbara County, CA. The basin is bounded by the Purisima Hills on the northwest, the San Rafael Mountains on the northeast, the Santa Ynez Mountains on the south, and the Pacific Ocean on the west. The hydrogeologic setting for the EMA is schematically represented in **Figure 4**, as if one were looking westward "down-valley" from the near Bradbury Dam on Lake Cachuma[4]. Key to note in this diagram is the hydraulic connection between the groundwaters of the principal aquifers that underlie Santa Ynez Uplands and the Santa Ynez River alluvium. As illustrated in **Figure 4**, the hydraulic connection between the Santa Ynez Uplands and the river alluvium is partially blocked by a bedrock ridge parallel to and just north of the river, comprised of upthrown block of Monterey shale and deeper low-permeability formations.

In contrast to the EMA and CMA, in the WMA, the Santa Ynez River discharges from a relatively constricted valley onto the broad Lompoc coastal plain. From the point that the River enters the Lompoc Plain, it crosses along the northern edge of the Plain approximately 10 miles before discharging to the Pacific Ocean (**Fig. 5**). The following subsections describe how these distinct hydrogeologic settings impact SW-GW interactions and streamflow losses due to groundwater pumping, and how they vary locally along the River.

[2] https://data.cnra.ca.gov/dataset/calgw_update2020

[3] https://www.arcgis.com/home/webmap/viewer.html?url=https://gis.water.ca.gov/arcgis/rest/services/Geoscientific/i08_B118_CA_GroundwaterBasins/FeatureServer

[4] In a sense, this diagram shows a Santa Ynez Basin-specific local view of the terrestrial portion of the global hydrologic cycle that we learned about in high school physical science class, including the subsurface groundwater flow component

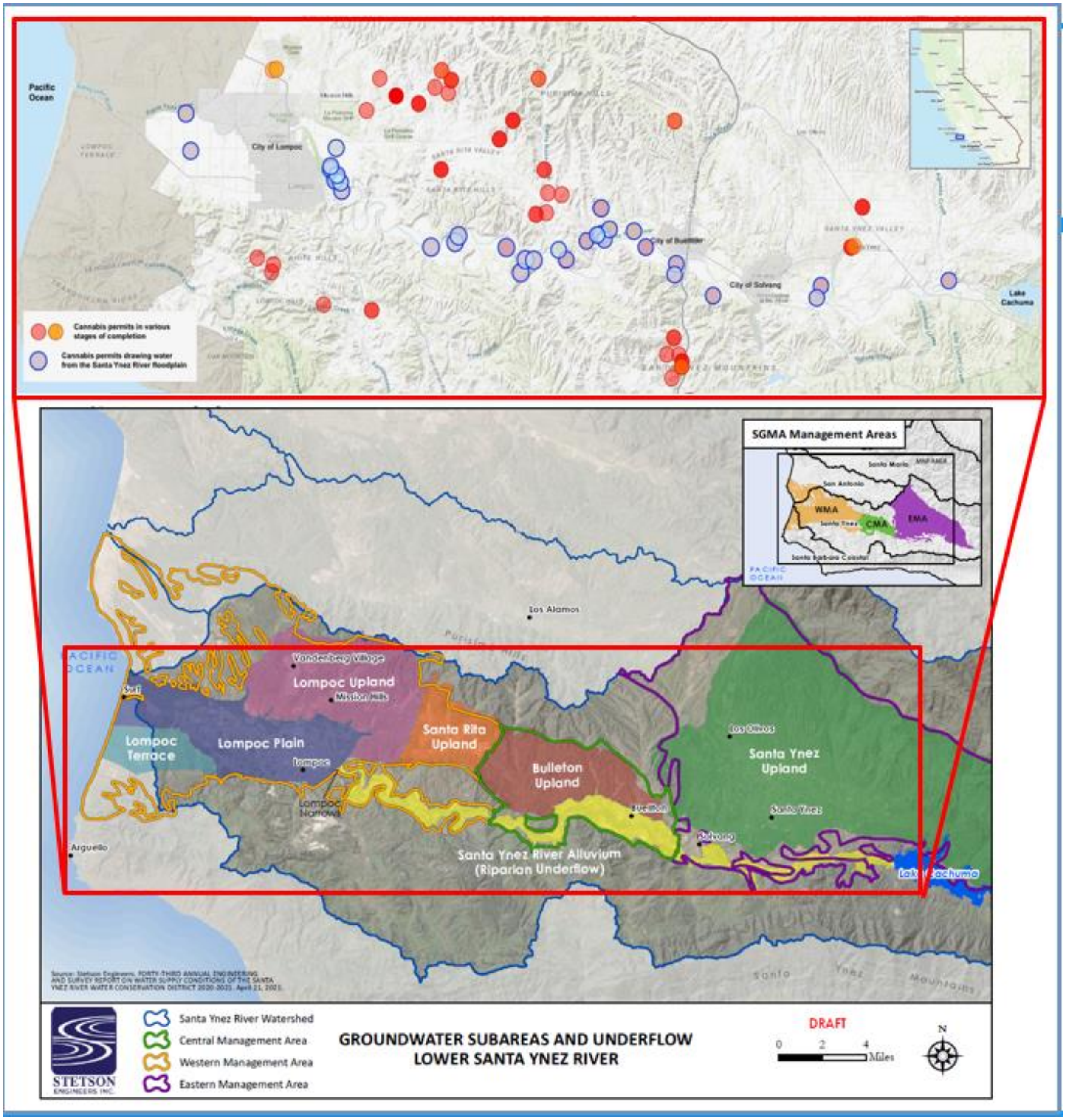

Figure 3. Cannabis project locations within context of DWR Bulletin 118 groundwater basins and SGMA groundwater sustainability planning regions for the Santa Ynez River Basin (WMA = Western Management Area, CMA = Central Management Area, and EMA = Eastern Management Area

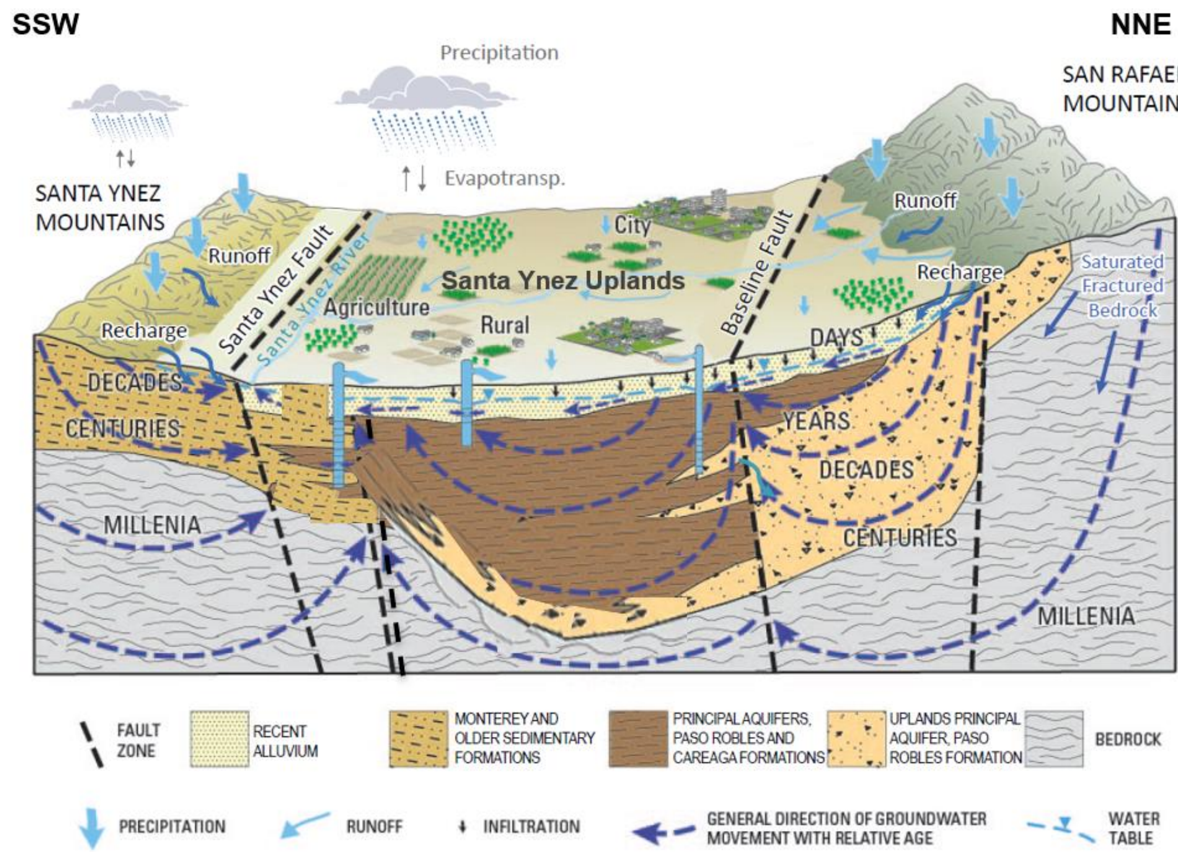

Figure 4. Schematic block diagram of hydrogeologic setting of the Santa Ynez River Basin EMA (adapted from GSI Water Solutions, 2021, Fig. 3-1)

4.2.1.2. Hydrogeologic Formations in the Santa Ynez River Basin

From a groundwater flow perspective, it is important to classify the geologic units according to their hydrologic properties (permeability and porosity/storage characteristics). Specifically, it is important to identify the principal aquifers and aquitards, which largely control groundwater flow patterns at the regional scale. The profile of hydrogeologic units encountered when drilling a borehole or viewed in an outcrop face can be referred to as the hydrostratigraphic profile.

The geologic formations that comprise the water-bearing aquifers are defined as those with sufficient permeability and storage potential to store and convey groundwater. Those without sufficient permeability and/or storage potential are considered aquitard units. Beneath the river channel and across the river floodplain, highly permeable river gravels and recent alluvium are encountered to a combined thickness from 50 feet up to 100 feet and more. These highly permeable deposits are underlain and laterally bounded by geologic formations of much lower permeability. Groundwater stored and flowing in these deposits is considered subterranean stream flow under California groundwater law as described above in **Section 3**.

North of the River are the "upland basins," from east to west being the Santa Ynez uplands in the EMA, the Buellton uplands in the CMA, and the Santa Rita uplands in the WMA as defined by DWR Bulletin 118. The uplands are underlain by a sequence of permeable formations, specifically (from top to bottom, with hydraulic conductivity "K_s" range noted, recalling that well pumping impacts to streams depend on the K_s value):

- Recent Alluvium along the tributaries with Older Alluvium terraces perched above (K_s between 100 and 600 feet/day)
- The Paso Robles Formation of low to moderate permeability (K_s between 0.1 – 10 ft/day)
- The Careaga Sands of moderate permeability (K_s between 0.7 - 20 ft/day)
- Beneath these formations, the Bulletin 118 basin basement is comprised of the lower-permeability rocks of the Sisquoc and Monterey Formations (K_s generally less than 0.01 ft/day, considered as impermeable in the CMA-WMA model)

The configuration of these units relative to the Santa Ynez River are described below in **Section 4.2.2**

4.2.2. Local Hydrogeologic Settings

As described above and illustrated in **Figures 3** and **4,** the Santa Ynez River flows from east to west along the southern edge of the EMA and CMA basins, before passing through the Lompoc Narrows, a narrow constriction in the upper end of the WMA, then spilling into and cross the Lompoc Plain. At the scale of **Figure 3**, it appears that most of the proposed riverine cannabis projects are located close to the River. Recall that the stream loss rate due to well pumping rate varies with time and is function of the hydrogeologic properties of the connected groundwater system (permeability or hydraulic conductivity *K* and storativity *S*), the distance of the well from the stream, and saturated thickness of the aquifer deposits(**Appendix B**). Thus to properly evaluate the degree of streamflow depletion by groundwater pumping, it is important to understand the local hydrogeologic setting and associated flow properties between the pumping well and the nearest connected surface water.

For analysis of the hydrogeologic context of the Santa Ynez Valley, one can rely on the recent comprehensive compilation of the hydrogeologic framework developed by Geosyntec (2020) for the WMA and CMA portions of the basin, and the parallel compilation by GSI Water Solutions (2020) for the EMA. **Appendix C** presents details related to the geologic maps and hydrogeologic cross-sections. For purposes of this analysis, and within the context of California groundwater law as discussed in **Section 3**, it is convenient to break all the riverine / floodplain cannabis projects into one of two broad hydrogeologic settings:

- the projects located above the point where the river discharges onto the Lompoc Plain below the Narrows, and
- the projects below that point in the Lompoc Plain.

4.2.2.1. Projects Above the Narrows / Santa Ynez River Underflow Zone

As illustrated conceptually in **Figure 4** and described in detail in **Appendix C**, for essentially the entire reach from Bradbury Dam down to the Narrows, the Santa Ynez River flows across coarse (silt, sand, gravel, cobble) floodplain sediments. These recent river deposits occupy the Santa Ynez River floodplain. The width of the floodplain deposits ranges from a few hundred feet to approximately a mile wide upstream and downstream of Buellton. Along this entire Above-Narrows reach, these highly permeable sediments are deposited within an entrenched bedrock channel eroded into much lower permeability older geologic formations, for most of it bedrock deposits of the Siquoc, Monterey, and older crystalline formations.

In general, the aquifers of the upland basins (the Paso Robles formation and the Careaga sands; see **Fig. 6**) are hydraulically isolated from the high permeability river sediments, blocked by a shallow bedrock ridge that runs approximately parallel to the river. This type of hydrogeologic setting is illustrated by cross-section E-E' in **Figure 5**.

The exception to this general condition is a short reach from Buellton downstream to the Buellton Bend, where the hydrogeologic mapping indicates that the principal aquifers of the Buellton uplands slope upward and subcrop directly beneath the saturated recent river alluvium, as shown in cross-section G-G' of **Figure 5**. While much more permeable than the Sisquoc and Monterey bedrock formations, the upland basin principal aquifers are still orders-of-magnitude less permeable that the river alluvium. Thus, even in this hydrogeologic setting one finds the condition of highly permeable river alluvium deposited into a bedrock channel of much lower permeability, consistent with the Garrapata criteria.

Hydrogeologically, this characteristic setting above the Narrows means that any well installed into the saturated river alluvium will create a significant and immediate impact on Santa Ynez River flows. Applying the analytical hydrogeologic models described in **Appendix B** to address this setting

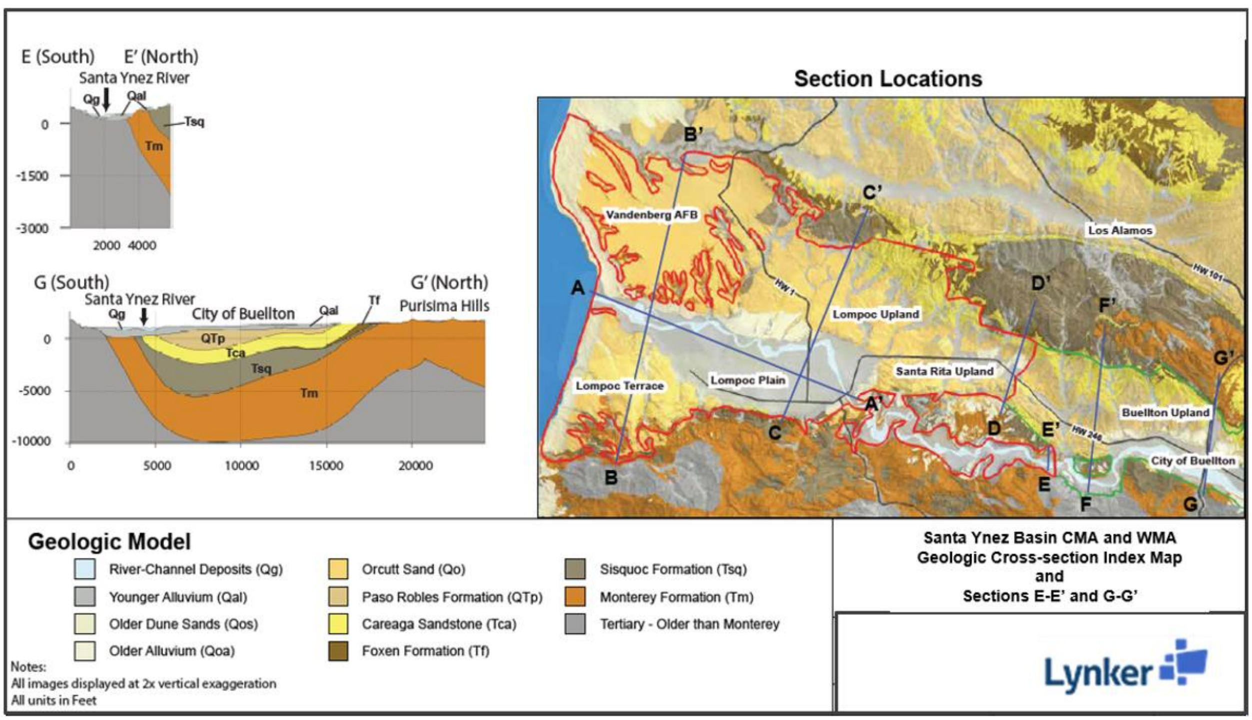

Figure 5. CMA and WMA geologic cross section index map and sections E-E' and G-G' (adapted from Geosyntec, 2020)

of a subterranean stream flowing in a known and definite channel, **Figure 6** shows the estimated stream loss rate over time due to well pumping at a constant rate for a 175-day irrigation season, as a percentage of well pumping rate, with three curves each representing a well a different distance from the active stream channel. This figure shows that after well pumping begins, the stream depletion rate rapidly approaches the well pumping rate. Furthermore, these models show that over the course of an irrigation season more than 90% of the volume pumped from the aquifer is replaced by Santa Ynez River losses.

In summary, for those projects upstream of the Lompoc Narrows, the hydrogeologic setting is consistent with the conditions of the Garrapata criteria for defining subterranean streams that are managed by the SWRCB as part of the California's surface water rights system. Specifically, a subsurface channel is present, the channel has relatively impermeable bed and banks, the course of the channel is known and groundwater is flowing in the channel. Furthermore, quantitative modeling of a well pumping in that hydrogeologic setting shows that wells drawing from the Santa Ynez River alluvium operate akin to a diversion from the Santa Ynez River, and thus is appropriately administered as part of the surface water system per SWRCB rules.

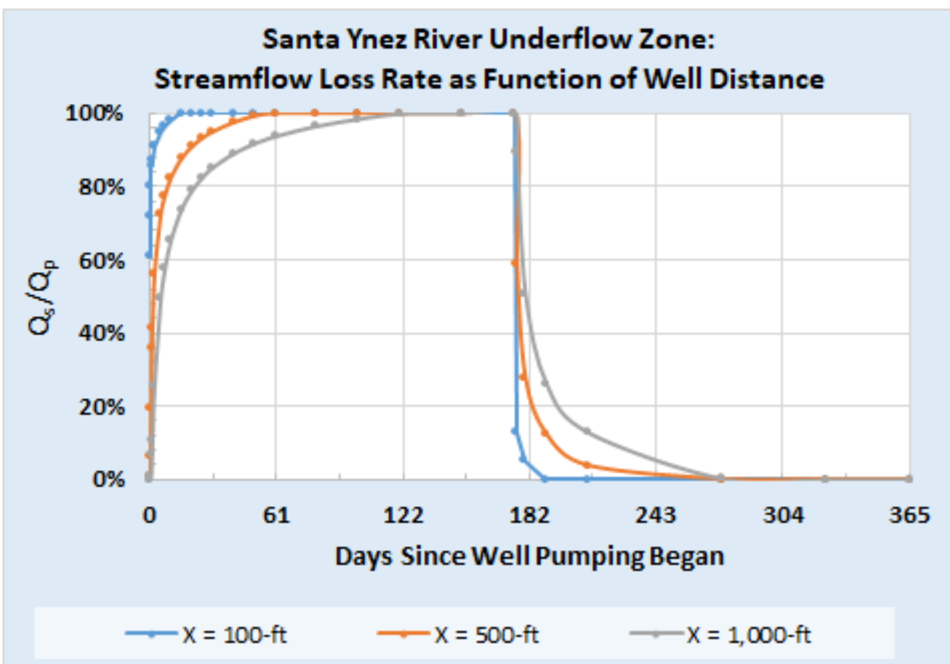

Figure 6. Santa Ynez River loss rate (as a fraction of well pumping rate) due to well pumping in the Santa Ynez River alluvium in the underflow zone above the Narrows., with the well located at various distances from the river

4.2.2.2. Cannabis Projects on the Lompoc Plain

Below the Narrows, the river discharges onto the Lompoc Plain. Once the River enters the Lompoc Plain, the hydrogeologic setting changes dramatically, as illustrated by cross-sections A-A', B-B', and C-C' of Section C.2.2 of **Appendix C**. These cross sections show that the on the top four miles of the Lompoc Plain, the River and younger alluvium deposits thicken considerably and the relatively less permeable deposits that bound the unconsolidated recent alluvium are encountered at much greater depths and lateral distances from the Santa Ynez River channel. This hydrogeologic configuration of this region renders much more uncertain satisfaction of the four criteria defined in the Garrapata case for delineating "a subterranean stream flowing through a known and definite channel." Further downstream in the Lompoc Plain, the lower-permeability Sisquoc and Monterey bedrock units begin to rise toward the ground surface. Simultaneously, the Orcutt sands and Careaga sands thin progressively over the next mile until they largely have been eroded away from the river channel by the time it approaches the ocean. This effectively places the low permeability bedrock units directly beneath river gravels, again creating a well-defined subterranean stream.

All the currently proposed cannabis projects in the Lompoc Plain are situated above the lower reach where shallower bedrock is encountered. All these projects propose pumping groundwater from the shallow alluvial aquifer, and thus lie within a hydrogeologic setting where well pumping will cause significant, but lagged-in-time stream depletion rates, whose magnitude would depend on the aquifer permeability and distance from the river. Due to the less constrained nature of the hydrologic setting below the Narrows, where there is no nearby lateral impermeable boundary, the impacts to the River would need to be determined individually via more detailed hydrogeologic analysis of each particular site. In general, the impacts of pumping on the Lompoc Plain will be notably less than that which occurs when pumping a well in the Santa Ynez River underflow zone above the Narrows.

4.2.3. Hydrogeologic Settings and Applicable Groundwater Law

For these varying hydrogeologic conditions along the Santa Ynez River, the challenge is how does one fit the round peg of the broad range of Surface Water – Ground Water interactions that naturally occur as part of the hydrologic cycle and local hydrogeology into the square hole of California groundwater law. Accomplishing that feat is necessary for knowing which rules and regulations would apply to groundwater diversions for cannabis project irrigation water supply. As summarized below, the evidence is compelling and the issue is quite "cut and dry" for wells installed into the subterranean stream underflow zone of the Santa Ynez River above the Lompoc Narrows, and more complicated below the Narrows for projects located in the Lompoc Plain.

4.2.3.1. Applicable Groundwater Law Above Santa Ynez River Narrows

For this reach of the River, California groundwater law generally comports with the hydrogeology. For example, in this hydrogeologic setting as described above, highly permeable sediments are deposited into a much lower permeability bedrock unit with the surface stream also constricted within said channel. This setting results in nearly immediate impacts to streamflow losses once a well begins pumping (**Figure 8**). This also means that the Garrapata criteria (**Section 3.1** above) will be met for identifying subterranean streamflow groundwater, these waters are subject to the Board's jurisdiction, and thus groundwater pumping in this zone should be administered along with connected surface flows in the Santa Ynez River. In fact, this issue was recently addressed by Stetson (2021) by describing the Santa Ynez River underflow zone (see yellow-shaded area along the river in **Figure 3**) that has been recognized for years as part of Santa Ynez river water rights administration by the SWRCB and Cachuma Reservoir operations, and thus held exempt from administration under SGMA. For completeness, this Stetson (2021b) memo is included here as **Appendix D**.

In summary, for the above-Narrows reach, from both a hydrogeologic perspective and California groundwater law perspective, all projects within that underflow zone are deemed to be drawing water from the subterranean stream of the Santa Ynez River. All of these projects therefore are subject to the SWRCB Cannabis 2019 rules (https://www.waterboards.ca.gov/water_issues/programs/cannabis/cannabis_policy.html). **Table 1** provides list of those cannabis projects, the proposed acreage for each project, and an estimate of the irrigation water demand for each project (see **Section 4.3** below).

4.2.3.2. Applicable Groundwater Law for Cannabis Projects in the Lompoc Plain

As described above in **Section 4.2.2.2**, groundwater pumped from wells installed into the alluvium of the Lompoc Plain will be drawing at least part of their produced water from Santa Ynez River flows. For projects in this area, however, it is uncertain that the four Garrapata criteria will be met. Thus, in the eyes of bifurcated California groundwater law, that produced water likely would be considered percolating groundwater and outside the administrative authority of the SWRCB.

Nonetheless, given the hydrologic properties of the recent alluvium in the Lompoc Plain, a pumping well could still exert significant impacts on streamflows (**Fig. 9**). Such pumping thus could be subject to constraints that may be imposed by the local GSAs under SGMA's mandate to avoid significant adverse impacts to connected surface water (SGMA Undesired Condition #6). These wells are also subject to Section 3 of the Board's Cannabis Policy and an assessment of impacts to instream flows.

4.3. Estimated Quantitative Impacts to SY River and Subterranean Stream Flow by Cannabis Irrigation Wells

As described above, wells completed in highly permeable deposits and located in close proximity to a surface water body will be drawing from the surface water and subterranean stream flow at a rate nearly equal to the groundwater pumping rate. This is the case for irrigation wells installed in the Santa Ynez River underflow zone, where 22 of the 31 floodplain projects are located. Reviewing the project applications reveals that all include irrigation supply wells that are completed in the highly permeable river alluvium that comprises the subterranean stream of the river.

With this immediate impact to the subterranean stream flow established, one can develop a quantitative estimate of such depletions by multiplying the acreage proposed for cannabis cultivation by an estimate of the Crop Irrigation Requirement (CIR). Relevant to this Santa Ynez River study area, Agrosource (2021) performed a detailed analysis of expected CIR using data from the CIMIS (California Irrigation Management Information System[5]) meteorological station #64. Station 64 is located near Santa Ynez, in an agricultural field on the north side of the Santa Ynez River approximately 1.2 mile upstream (east) of the Refugio Road bridge. Using the CIMIS data of 2.66 af/acre developed by Agrosource (2021) for the area, and assuming a 90% irrigation efficiency yields a net water depletion of 2.95 acre-feet per acre (af/ac).

Table 1 provides a summary of all projects proposed in the Santa Ynez River floodplain, sorted based on proposed cultivated acreage from larger to smaller, broken into two groups, the projects above the Narrows in the Santa Ynez River underflow zone, and those below the Narrows on the Lompoc Plain. Crop irrigation demand estimates in the table are based on a consumptive irrigation

[5] https://cimis.water.ca.gov/Stations.aspx?t=1

requirement (CIR) of 2.66 af/acre developed by Agrosource (2021) for the ABL project and assuming a 90% irrigation efficiency (for a net water depletion of 2.95 af/acre).

4.3.1. Impacts of Cannabis Projects Above Santa Ynez River Narrows

Given the high permeabilities of the Santa Ynez River alluvium, the constricted nature of the depositional channels of the Santa Ynez River alluvium, and the close proximity of the wells to the river, essentially all groundwater pumped for cannabis irrigation projects located above the Narrows will immediately deplete river flows. In other words, groundwater pumping by these projects essentially act as surface diversions depleting approximately 1,262 af/yr (acre-feet per year) from the river annually above the Narrows, impacting other surface rights and beneficial uses of surface water near and downstream from the diversion locations.

Table 1. Cannabis projects in the Santa Ynez River floodplain and depletive impacts to the SY River flows; grey shading indicates projects above the Lompoc Narrows, and peach shading projects below the Narrows

Santa Ynez River Basin Cannabis Project ID #	Cannabis Project Name	Within Santa Ynez River Underflow Zone?	Hydrogeologic Formation of Water Supply Well(s)	Proposed Acreage	Crop Irrigation Demand = Acres*CIR	Potential Cumulative Depletion to SY River (acre-feet)
1	Westcoast	Yes	River Alluvium	50.12	148.08	148.08
2	Heirloom	Yes	River Alluvium	47.00	138.86	286.93
3	Santa Rita	Yes	River Alluvium	37.00	109.31	396.25
4	El Dorado	Yes	River Alluvium	35.06	103.58	499.83
5	CCA 8701	Yes	River Alluvium	33.02	97.55	597.38
6	Ag Roots	Yes	River Alluvium	32.00	94.54	691.92
7	Iron Angel	Yes	River Alluvium	27.70	81.84	773.76
8	Los Alamos	Yes	River Alluvium	24.99	73.83	847.59
9	CCA 5645	Yes	River Alluvium	24.45	72.24	919.83
10	Castlerock	Yes	River Alluvium	22.95	67.80	987.63
11	Busy Bee	Yes	River Alluvium	22.00	65.00	1052.63
12	Blanco	Yes	River Alluvium	16.00	47.27	1099.90
13	Tahquitz	Yes	River Alluvium	15.72	46.44	1146.34
14	Coyote Hills	Yes	River Alluvium	11.75	34.71	1181.06
15	Canvinia	Yes	River Alluvium	6.50	19.20	1200.26
16	Petal Lux	Yes	River Alluvium	6.00	17.73	1217.99
17	Givens	Yes	River Alluvium	5.07	14.98	1232.97
18	Goodland MGMT	Yes	River Alluvium	4.45	13.15	1246.11
19	HBF	Yes	River Alluvium	2.33	6.88	1253.00
20	Sugar Hill	Yes	River Alluvium	1.24	3.66	1256.66
21	Red eagle	Yes	River Alluvium	1.00	2.95	1259.62
22	Morrison	Yes	River Alluvium	0.66	1.95	1261.57
23	Hilltop Sweeney	No	River Alluvium	14.85	43.87	1305.44
24	TSBC	No	River Alluvium	14.64	43.25	1348.69
25	Eye n Eye	No	River Alluvium	10.70	31.61	1380.30
26	ABL lot 13	No	River Alluvium	5.20	15.36	1395.67
27	92nd G25	No	River Alluvium	4.93	14.57	1410.23
28	Greenies	No	River Alluvium	4.50	13.29	1423.53
29	Williams	No	River Alluvium	4.49	13.27	1436.79
30	ABL lot 17	No	River Alluvium	3.78	11.17	1447.96
31	ABL lot 14	No	River Alluvium	3.32	9.81	1457.77

4.3.2. Impacts of Cannabis Projects on the Lompoc Plain Below the Narrows

Based on the hydrogeologic analysis summarized above and detailed in **Appendices B** and **C**, groundwater pumping for those projects located on the Lompoc Plain below the Narrows will still impact river flows. While in general groundwater pumping for the Lompoc Plain projects does not impart the same immediate impacts to streamflows as upstream projects in the SY River underflow zone, they nonetheless can have significant but lagged effects on streamflows. Integrating those lagged depletions over time means show that a significant fraction of the pumped volume over an irrigation season is replaced by streamflow losses annually. Thus we can conservatively estimate those impacts to the River on an annual basis to be equal to the annual CIR times the cultivated acreage. This yields an estimated 196.2 af/yr impact to streamflows below the Narrows.

4.3.3. Significance of Cannabis Project Impacts on SY River Flows and Surface Rights

In summary, **Table 1** shows that groundwater pumped by wells in the subterranean stream underflow zone directly leads to accumulated river losses of nearly 1,262 acre-feet on average annually. An additional approximately 196 af/year are depleted by groundwater pumping from the Lompoc Plain sediments to obtain irrigation water for cannabis production. To provide context for the significance of these volumes compared to other beneficial uses of the river, these quantities were compared to annual water rights releases from Lake Cachuma as documented by Stetson (2018). **Table 2** presents the annual flows of the Santa Ynez River at the Narrows gage for the period from 1990 to 2017, and also the annual water rights releases from Bradbury Dam to meet downstream water rights, for both the Above Narrows Account (ANA) and the Below Narrows

Table 2. Cannabis projects depletions to Santa Ynez River flows compared to water rights releases from Lake Cachuma

Year	SY River @ Lompoc Narrows (af/yr)	Annual Water-Rights-Releases (af/yr) Above Narrows Account	Below Narrows Account
1990	-	4,792	-
1991	20,900	7,745	3,638
1992	62,090	4,930	3,287
1993	391,530	-	-
1994	15,600	6,727	4,012
1995	485,520	-	-
1996	24,820	7,319	3,459
1997	39,130	9,572	3,438
1998	681,520	-	-
1999	29,460	-	-
2000	51,850	4,360	1,858
2001	250,425	-	-
2002	9,530	9,054	4,412
2003	15,730	-	-
2004	6,710	11,494	4,512
2005	431,420	-	-
2006	87,730	-	-
2007	6,864	6,703	4,897
2008	72,553	-	-
2009	3,743	-	-
2010	31,900	5,122	3,524
2011	135,294	-	-
2012	5,635	-	-
2013	4,032	10,694	6,779
2014	4,484	4,698	-
2015	46	10,603	-
2016	2,310	9,334	2,286
2017	31,918	7,758	4,454
2018	4,812	6,606	1,448
2019	42,989	-	-
2020	11,277	6,379	4,101
2021	12,315	4,649	-
sum	2,974,137	138,539	56,105
average	92,942	4,329	1,753
Cumulative Cannabis Depletion (af/yr)		1262	196
% of Average Annual Water Rights Release		29.1%	11.2%

Account (BNA), which average 4,318 af/yr and 1,806 af/yr, respectively. Comparing these values to the expected annual cumulative depletion to river flows by the cannabis projects shows that:

- The cannabis project depletions represent nearly 30% of average annual water rights releases for the Above Narrows Account, and 11% of average annual water rights releases for the Below Narrows Account
- In years with very low river flows and no water rights releases (e.g., 2009 and 2012), the cumulative cannabis project stream depletions of 1,458 af/year represent from 22% to 40% of total river flows at the Narrows streamflow gage for that year

The results presented in **Table 2** provides a picture of the annual impacts. The severity of the impacts become more apparent when considering the irrigation demand pattern **(Figure 7**) compared to the Santa Ynez River flow pattern (**Figures 8 and 9**). Comparing these charts

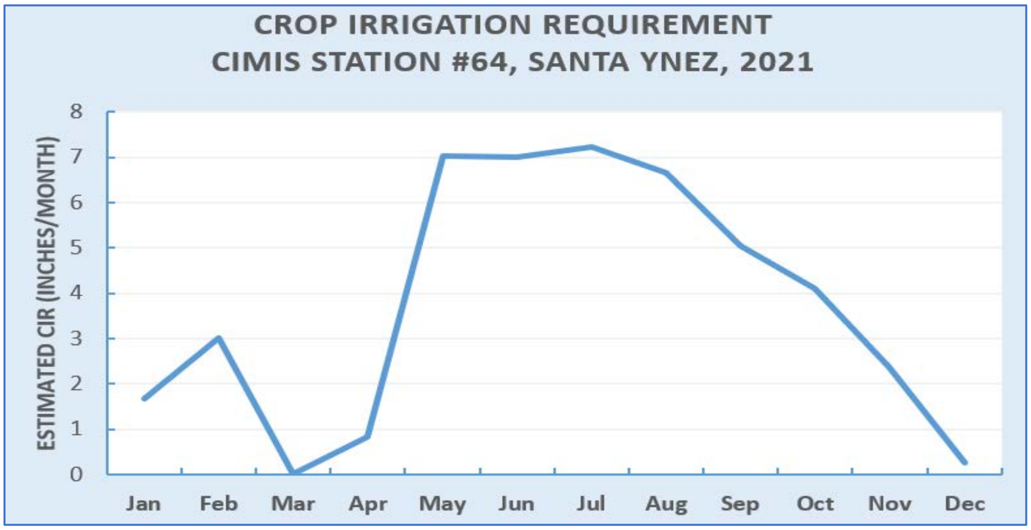

Figure 7. Monthly crop irrigation requirement for Santa Ynez River Valley

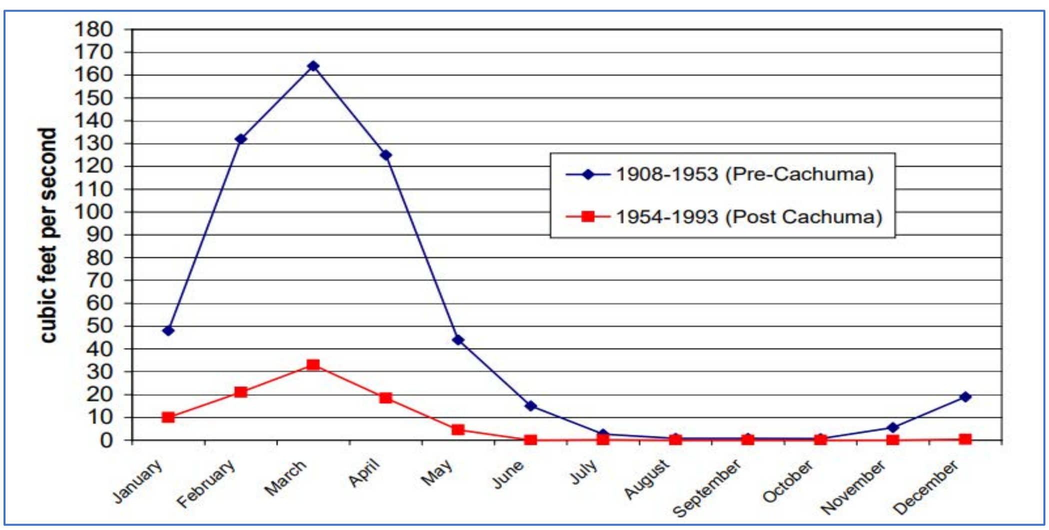

***Figure 8. Monthly average Santa Ynez River flows at the Narrows gage** (downloaded from https://www.waterboards.ca.gov/waterrights/water_issues/programs/hearings/cachuma/phase2/deir/appendixb.pdf)*

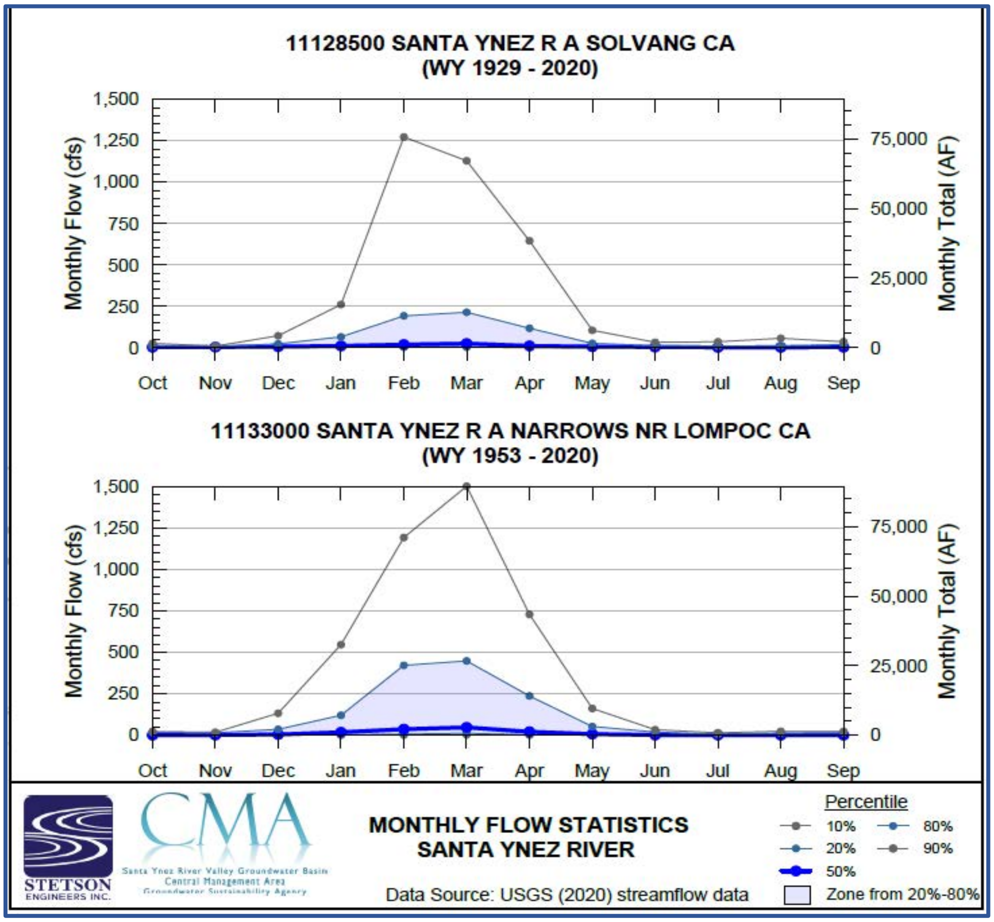

Figure 9. Monthly Santa Ynez River flow statistics (adapted from Stetson, 2022).

clearly illustrates an issue well known by essentially all Valley residents: the months of highest crop irrigation demand occur at the times of the lowest River flows. Thus:

- if the cannabis projects attempt to pump during the SWRCB cannabis forbearance period, they would certainly contribute to drying the River;
- even pumping during the winter months would represent a large impact relative to River flows in more than 50% of the years **(Fig. 9)**

5. Summary of Conclusions

This document has been prepared to provide an overarching hydrogeological evaluation of irrigation water supplies for cannabis production projects in the Santa Ynez River Valley and associated groundwater bodies in Santa Barbara County (see **Figures 1** and **2).** Which State or local regulation(s) that would be applicable to a particular cannabis project depends on hydrogeologic formation from which irrigation water supplies would be drawn, and where the project is located with respect to surface water streams and groundwater basins as defined by the California Department of Water Resources (DWR, 2004, Bulletin 118). To address this issue, this report provides a hydrogeologic analysis of the impacts of groundwater pumping on surface flows in the Santa Ynez River, from Lake Cachuma downstream to the Lompoc Plain.

The impacts to the Santa Ynez River and interconnected subterranean stream above the Lompoc Narrows are indisputable and clear. Key conclusions that can be drawn from the data compilation and related analyses include:

- Of the thirty-one (31) proposed cannabis production projects, twenty-two (22) have irrigation water supply wells that are located in the Santa Ynez River underflow zone, which has been described in detail by Stetson (2021b); irrigation well pumping for these projects essentially represent a direct diversion from the Santa Ynez River surface flows
- These twenty-two projects would be pumping subterranean stream water subject to water rights administration by the SWRCB, including the April – October forbearance period for cannabis projects and all other requirements per the Board's 2019 Cannabis water policies
- The nine projects not located within the Santa Ynez River underflow zone as described by Stetson (2021b) are located in the Lompoc Plain in saturated alluvium less than 1,500 feet from the Santa Ynez River current channel, and thus can be expected to draw a large part of their pumped water from Santa Ynez River streamflows (**Fig. 6**).
- Cumulative impacts of the cannabis projects that draw from the Santa Ynez River flows would be up to nearly 1,500 af/year (**Table 1**).
    - This represents up to nearly 30% of average annual water rights releases from Cachuma reservoir
    - In relatively dry years, these depletions would represent up to nearly 30% or more of the total River flow at the Narrows gage
    - Compared to typical river flows and Cachuma water rights releases, these are significant impacts to existing water rights and other beneficial uses, including instream flows for endangered species, along the Santa Ynez River
- The crop irrigation demand pattern shows highest demands occur during periods of lowest river flows (**Figures 7 and 8**)

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APPENDIX A: Historical Development of California Groundwater Law

APPENDIX B: Generic Analysis of Surface Water – GW Interactions

APPENDIX C: Hydrogeology of Santa Ynez River Groundwater Basin

APPENDIX D: Stetson Memo on Santa Ynez River Underflow Zone

APPENDIX E: CV of Dr. James McCord

APPENDIX A:

Background on California Groundwater Law

A.1 BACKGROUND ON CALIFORNIA GROUNDWATER LAW

Over its history since 1849, California has developed a unique system of water resource management that melds aspects of riparian rights and prior appropriation, with overlays from pueblo rights and federal reserved rights. Related to groundwater, state law has defined two types: groundwater flowing in "underground streams" which is managed as part of the surface water system by the State Water Boards and "percolating groundwater" which is considered part of the bundle of property rights of overlying landowners and generally is "managed" by the counties each in their own fashion. To understand how California arrived at this legal bifurcation of groundwater, and its importance to this issue, it is helpful review the historical development of the law.

As described by Sax (2002), "It was, after all, 1913 and not 1319 in which they were drafting" the State of California Water Commission Act.[1] The Act drafters "were not ignorant of the interactive relationship between groundwater and surface water. They knew perfectly well that much 'percolating groundwater' was on its way to or from a surface stream..." At the behest of the State Water Resources Control Board (the Board or SWRCB) and supported by a Technical Advisory Committee and a Policy Advisory Committee[2], UC Berkeley law professor Joseph Sax was addressing California's bifurcated system of managing groundwater, in which two "types" of groundwater are recognized, based on the 1899 *Los Angeles v. Pomeroy* case:

- "subterranean streams flowing through known and definite channels" statutory language from Water Code § 1200; henceforth simply referred to as "subterranean streams."
- "percolating groundwater," which is all groundwater that is not part of the subterranean stream groundwater.

Groundwater that can be demonstrated to be part of a subterranean stream is considered to be part of the surface water permitting jurisdiction of the Board. The percolating groundwater was deemed outside the Board's permitting jurisdiction, and thus devolved to local (county by county) "management" of percolating groundwater, effectively as a property right that conveys with the overlying land. As described by Sax (2002), defining what is a subterranean stream has been the subject of many Governor's and Legislative Commissions, legislative investigations and tweaking, and legal cases over the last century.

A.1.1 Legal Test for Subterranean Streams

The current legal test, both in 2002 at the time of the Sax report and today in 2021, rests on the Board decision in the 1999 *Garrapata Creek* case. The Board decision in that case sets four criteria for defining a "subterranean stream flowing through a known and definite channel:"

(1) A subsurface channel must be present;

(2) The channel must have relatively impermeable bed and banks;

(3) The course of the channel must be known or capable of being known by reasonable inference; and

(4) Groundwater must be flowing in the channel

[1] The 1913 Water Commission Act was the original version of today's Water Code §1200
[2] Both committees were comprised of esteemed experts in water engineering, hydrogeology, and water law and policy

If all four criteria are met, the groundwater in question is considered part of a subterranean stream and administered by the SWRCB as part of the surface water permitting system.

According to Sax, the original legislative intent in the subterranean stream provision in the Water Code was "to protect the integrity of the agency's jurisdiction over surface stream appropriations by preventing an unpermitted taking of groundwater that appreciably and directly affects the surface stream flows." Based on this notion and the relatively qualitative nature of the subterranean stream tests that have been developed and applied over the decades (including the Garrapata test), Sax suggested that a more quantitative criteria should be developed to better address the groundwater pumping that "appreciably and directly affects the surface stream flows." To that end, Professor Sax proposed a six-part procedure to establish the subterranean stream more quantitatively and definitively, and the procedure included hydrologic analysis to quantify the stream loss due to well pumping (such as that presented above in **Appendix B** and **Appendix C**. The procedure also included steps for applicants and protestants to test the hydrogeologic properties that were the basis for the calculation if well pumping impacts. The procedure proposed by Sax (2002) is similar to that employed in other strict Prior Appropriation states (e.g., Colorado).

The recommendations and underlying legal analyses in the Sax report generated a great deal of interest and discussion (e.g., Aladjem, 2002), but ultimately the recommendations were not adopted, and the Garrapata test remains the standard to this day. That said, even if groundwater does not meet the Garrapata subterranean streams test (and thus defaults to percolating groundwater), that does not necessarily mean that a well pumping that groundwater does not substantially impact surface water flows. In fact, clear examples of percolating groundwater that is strongly connected with surface water can be found certain distinct hydrogeologic settings, such as in the Buellton Reach in the Santa Ynez River Basin as described in the **Appendix C** and **Sections 4** and **5** in of the main body of this report.

A.1.2 Wrestling with Percolating Groundwater

As noted above, percolating groundwater falls outside the jurisdiction of the Board, and thus is subject to local regulation., most typically at the county level. Given that there are 58 counties in California, the are 58 approaches to "management" of percolating groundwater. Over the years, to many this has been an unsatisfactory situation, for example, at the Memorial Luncheon Address at Ninth Biennial Conference on Ground Water held in 1973, future DWR director Ronald Robie stated, "... ad hoc solutions are not satisfactory. I find it curious that although regulation of surface waters is properly a responsibility of the State, groundwater regulation is somehow viewed as a 'local' concern....The result is uncoordinated administration of interrelated resources." Nonetheless, until the Sustainable Groundwater Management Act (SGMA) passed in 2014, for every push to consider integrating percolating groundwater into the statewide water management schema, there was always one or more push backs to keep the status quo. Just four years after Robie's address, the Governor's Commission to Review California Water Rights Law (Governor's Commission, 1978) noted that:

> ""[m]ost other western states have integrated groundwater into state-level appropriation permit systems," it noted that "California's experience with groundwater management...differs from that of other western states." It therefore concluded "that local management, if it is properly undertaken, offers the best opportunity for workable and effective control," and to make clear that it was not calling for anything like a general permitting system, it said "the Commission...intends that proposed legislation not require any unnecessary management actions in areas without critical long-term overdraft, subsidence, or water quality problems."

As noted by Sax (2002), in the decades since passage of the Water Code in the early 20th century, the legislature was frequently pushed to consider more expansive view of groundwater jurisdiction, but the legislature had always made clear its preference for local, basin-specific management of groundwater.

A.1.2.1 Water Rights Adjudication

Before touching on SGMA and how that impacts management of percolating groundwater, it should be noted that sometimes disputes over groundwater in a basin can be taken to court, triggering a legal process known as a water rights adjudication. In basins or areas where a lawsuit is brought to adjudicate, the groundwater rights of all the overlying landowner and appropriators are determined by the court. The court also decides:

- What the sustainable yield of a basin is, and thus how much water is available to adjudicate
- Who the water rights owners are,
- How much groundwater those rights owners can extract,
- How the groundwater area will be managed. Typically, the court appoints a watermaster to manage the ownership of rights and water use.

According to Sax (2002), "the California Supreme Court determination to integrate groundwater and surface water rights in water adjudication suits explains at least in part how California law has been able to endure the "non-administration" of groundwater under Water Code § 1200 for so many decades." In other words, by combining all surface waters and groundwaters into one bucket in an adjudication, and then determining the size of the bucket and all its inflows and outflows over time (the sustainable yield), in a sense the adjudication forces the recognition of the interconnections between the surface and groundwater systems, whether the groundwater be classified as percolating or as part of a subterranean stream. At the time of SGMA's passage, 27 groundwater basins, most located in Southern California, had been or were in the process of water rights adjudication.

A.1.2.2 Sustainable Groundwater Management Act

After nearly a century of wrangling of how the state should deal with percolating groundwater, and recognizing the risks and downside associated with the county-by-county approach to development of percolating groundwater regulations, the legislature passed and the governor signed the Sustainable Groundwater Management Act in 2014. SGMA set forth a statewide framework to help protect groundwater resources over the long-term. Still emphasizing that groundwater management in California is best accomplished locally, SGMA requires local agencies and stakeholders to form groundwater sustainability agencies (GSAs) for all DWR-designated high- and medium-priority groundwater basins. The GSAs are then charged with developing and implementing groundwater sustainability plans (GSPs) for those basins to avoid undesirable results and mitigate overdraft within 20 years.

Surface water streams, interconnected groundwater in subterranean streams, and already adjudicated basins are specifically excluded from SGMA. That said, the SGMA does provide a hook between percolating groundwater and hydraulically connected the surface water and subterranean streams via the sixth undesirable condition that must be avoided:

> "Depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water."

If the hydrogeologic analyses in a GSP show that pumping of percolating groundwater in the SGMA basin causes this undesirable result to surface flows, mitigation plans must be developed to avoid that result.

Proceeding through the SGMA process to develop a GSP does not preclude the possibility that one or more parties dissatisfied with the final GSP from filing suit to initiate a water adjudication. This has been the case, for example, in the Cuyama Basin GSP.

A.1.2.3 Santa Barbara County Basin-Specific Diversion Thresholds

In addition to the potential limitations on percolating groundwater diversions imposed by SGMA and the cannabis-specific rules that limit diversion of surface water and interconnected subterranean streams imposed by the SWRCB (see **Sec. 5.3** below), the County of Santa Barbara (CoSB) has developed basin-specific thresholds that cap the annual increase in diversion for new projects for each of the major groundwater basins in the county.

A.2 SWRCB Cannabis Rules

Related to cannabis production, the determination of whether or not irrigation water supplies comes from a subterranean stream is a paramount question. Recognizing the potential for diversions of subterranean streams for cultivating commercial cannabis to adversely impact riparian environments and associated fauna, the SWRCB has established strict policies regulating its diversion and use. Originally adopted in October 2017, and updated in February 2019, the SWRCB promulgated rules that limit the use of groundwater from subterranean streams for cannabis production. As noted in the Introduction, included in the rules are forbearance limitations to diversions based on both calendar dates and instream flow gages calculating riparian water flow, summarized as:

- The diversion season is from December 15 of each year to March 31; diversions can occur during this period so long as flows in nearby connected stream exceed promulgated instream flow targets.
    - For the period of November 1 through December 15 of each year, diversion may be authorized under certain circumstances (Section 3, Requirement 5 of SWRCB, 2019).
- No diversions shall occur in any case during the period from April 1 through October 31

Thus, the normal length of the diversion season would be 106 days (December 15 – March 31) and the maximum duration would be 151 days for those years that the Section 3, Requirement 5 conditions are met. Furthermore, these diversions would only be allowed when stream flows exceed instream flow requirements. Given these constraints, cannabis growers with wells diverting from subterranean stream must rely on alternative sources of irrigation water supply for the period from April 1 through the end of October. The alternative sources could include reservoirs filled by November through March diversions from subterranean streams, or use of percolating groundwater.

- Related to storage of groundwater diverted from subterranean streams during the November – March diversion season, the cannabis growers will face certain storage conditions and limitations, some imposed by the Board and others by the county.
- Related to use of percolating groundwater, the cannabis growers must assure that the proposed diversions will not result in the undesired condition of depletion of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water

A.3. References

Sax, Joseph, 2002. Review Of The Laws Establishing The SWRCB's Permitting Authority Over Appropriations Of Groundwater Classified As Subterranean Streams And The SWRCB's Implementation Of Those Laws, SWRCB Report No. 0-076-300-0, 104 pp.

APPENDIX B:

Background on Surface Water – Groundwater Interactions

B.1. Background on Surface Water – Groundwater Interactions

This Appendix describes how surface water and groundwater interact are described in a generic sense, and how well pumping may affect those interactions.

B.2. Streams as Features of Groundwater Discharge and Recharge

As described by the USGS (1998), surface water streams can interact with groundwater in three basic ways as illustrated in **Figure B-1**:

- A "Gaining Stream" gains water from inflow of groundwater through the stream banks and stream bed, and it can be inferred from water level maps that indicate groundwater flow paths have a component toward the stream (**Fig. B-1**, lower image). In this case, all or part of the total stream flow rate is derived from groundwater discharge.
- A "Losing Stream" loses water to connected groundwater system via outflow through the stream banks and stream bed, and it can be inferred from water level maps that indicate groundwater flow paths have a component away from the stream (again see lower image). In this case, the stream flow losses are a source of recharge to underlying the groundwater system.
- A "Disconnected Stream" loses water through the stream bed but is disconnected from the underlying groundwater zone via an unsaturated zone. Groundwater flow path directions would not necessarily be impacted by a disconnected stream unless the rate of recharge through of the stream channel to the underlying groundwater table exceeds the lateral ambient groundwater flow rate.

In some cases, the gain / loss characteristic can persist continuously, whereas in other cases it can vary seasonally. For example, the semi-arid Mediterranean environment of the Santa Ynez Valley is characterized by a strong seasonality, with more than 80% of the average annual precipitation failing between December and March, and the months from June through September receiving essentially no precipitation. Due to this seasonality in precipitation, several of the tributary streams to the Santa Ynez River flow only during the winter wet season, and completely dry up during the late Summer into Fall. The is the case for example with Santa Agueda and Zaca Creeks that drain off Figueroa Mountain to the south to the Santa Ynez River. Thus, these streams are disconnected in the early parts of the wet season, but for wet seasons with extended durations of flows and rising water tables, these streams may evolve to connected losing streams, and even perhaps gaining streams in some reaches. The local hydrologic and hydrogeologic conditions are discussed in more detail in **Appendix C** below.

B.2.1 Impact of Well Pumping on Surface Water – Groundwater Interactions

As first described in the seminal paper by USGS Scientist Charles V. Theis (1940)[3] and more recently summarized by Barlow and Leake (2012), installing and then pumping a well in an aquifer is

[3] Theis, C.V., 1940, The source of water derived from wells—Essential factors controlling the response of an aquifer to development; Civil Engineering, v. 10, no. 5, p. 277–280.

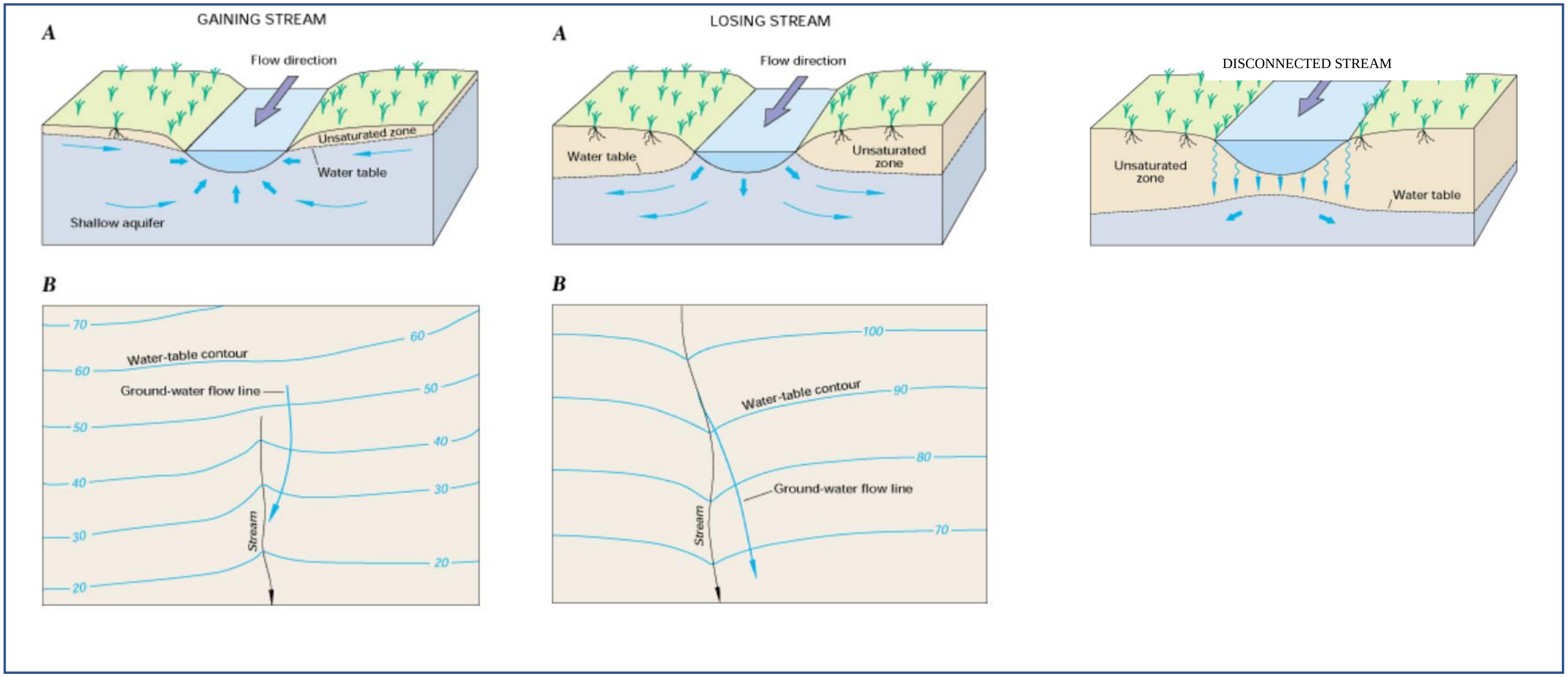

Figure B-1. Schematic diagrams showing characteristic types of surface water - groundwater interaction (from Winter et al., 1998) hydraulically connected with a surface water flow will lead to a transient response in the overall hydrologic system such as that illustrated in **Figure B-2**:

> *"(A) Under natural conditions, recharge at the water table flows toward and eventually discharges to the stream as baseflow. (B) When pumping begins, all of the water pumped by the well is derived from water released from groundwater storage, i.e., by a lowering of the "water table" and associate drainage of water from aquifer pores. The groundwater level drops most significantly right at the wellbore, and the drawdown of the groundwater level decreases as one moves farther from the pumping well, creating what is often referred to as a "cone of depression" in the water table. (C) As the cone of depression expands outward from the well, the well begins to capture groundwater that would otherwise have discharged to the stream. (D) In some circumstances, the pumping rate of the well may be large enough such that the cone of depression extends to the stream, causing water to flow from the stream to the aquifer, a process called induced infiltration of streamflow. Streamflow depletion is equal to the sum of captured groundwater discharge and induced infiltration."*

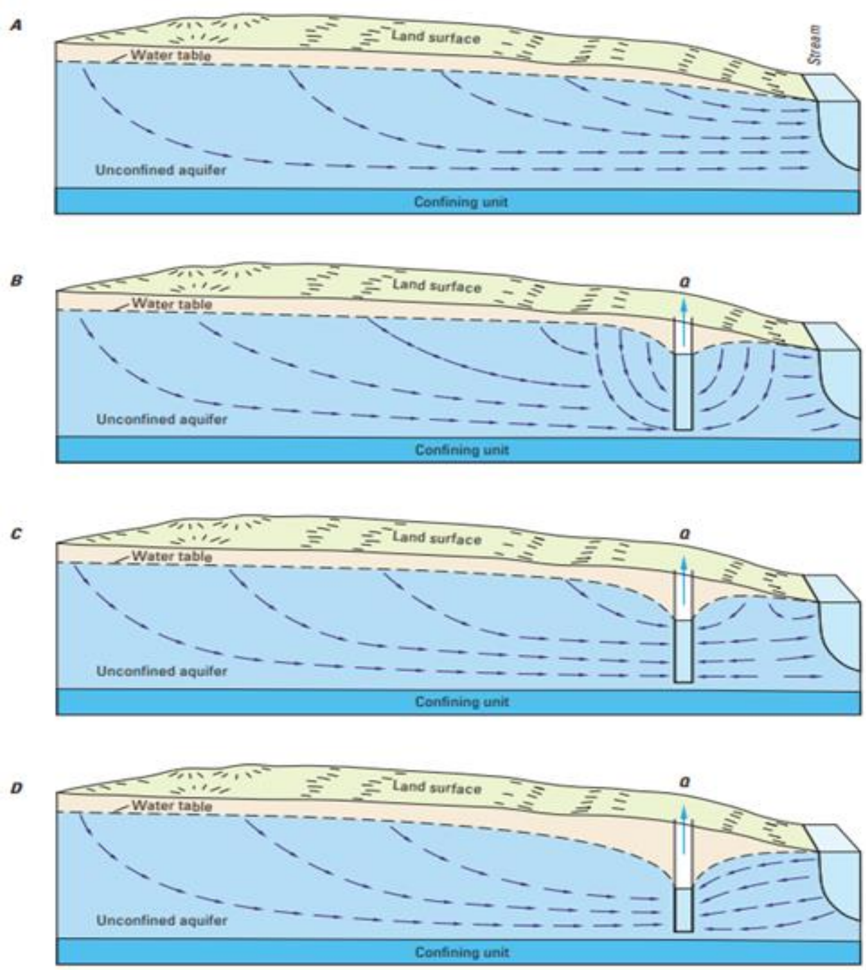

Figure B-2. Transient evolution of groundwater flow patterns and surface water – groundwater interactions in response to installation and pumping of a ground water well in the vicinity of a connected surface stream (from Barlow and Leake, 2012)

To simulate this stream – aquifer interaction behavior, analytical mathematical equations have been developed the model that transient response described above for simplified conditions such as constant aquifer properties, constant well pumping rate, and constant water level in the connected stream. One widely recognized and often applied expression is the well-known Glover – Balmer (1954) equation for calculating the streamflow loss induced by pumping a near the stream. The stream flow loss rate Q_s can be calculated as fraction of the well pumping rate Q_p:

$$Q_s = Q_p * F \qquad \text{(Eqn. 1)}$$

where *F* is a fraction that varies between 0 and 1, or in other words the stream leakage rate can be between 0% and 100% of the well pumping rate. That fractional rate *F* varies with time *t* and is function of the hydrogeologic properties of the connected groundwater system (hydraulic conductivity *K* and storativity *S*), the distance of the well from the stream *d,* and the saturated aquifer thickness *Z*:

$$Q_s/Q_p = F(d, K, S, Z) = erfc\left(\sqrt{\frac{d^2 S}{4[KZ]t}}\right) \qquad \text{(Eqn. 2)}$$

where *erfc* is a mathematical function, termed the "complementary error function," that calculates the stream depletion fraction *F* based on those hydrogeologic parameters. **Figure B-3** shows the stream loss fraction calculated by the Glover-Balmer equation for a well pumping from a 100-ft thick aquifer located 500 feet from the stream channel, with three different curves representative of different hydraulic conductivity values for the connected aquifer. This chart shows, for example, that a well pumping for two months (61 days) in a highly permeable aquifer would induce streamflow loss rates on the order 90% of the well pumping rate, whereas a less permeable aquifer would be drawing water from the stream at 26% of the well rate at 61 days. Similarly, **Figure B-4** shows the transient stream leakage rate as a function of distance between the pumping well and the stream for an aquifer with hydraulic conductivity of 10 feet/day.

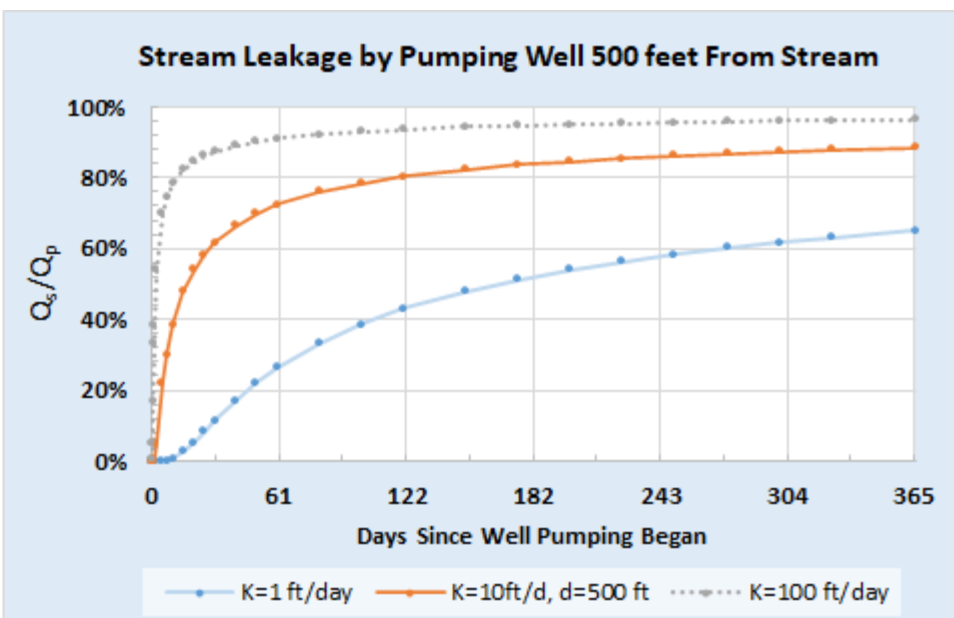

Figure B-3. Illustration of streamflows losses induced by well pumping as a function of aquifer hydraulic conductivity

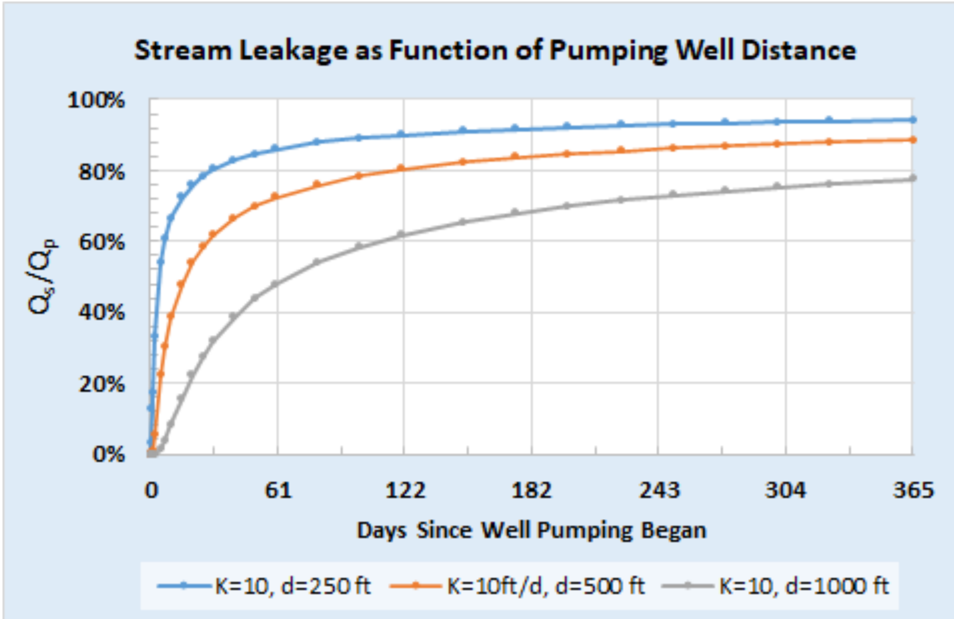

Figure B-4. Illustration of streamflows losses induced by well pumping as a function of well distance to the stream

Note that the Glover – Balmer equation was developed for a very specialized case, such as the simplified system illustrated in **Figure B-2**. But even in more complicated situations, the basic principles remain the same: the impact of well pumping depends on distance from the stream, the well pumping rate, and the aquifer properties. One or more of the following complications are present in many field situations.

- Multiple aquifer layers
- Clogging layer in the streambed
- Aquifers truncated by faulting or otherwise abutting lower permeability formation
- Partial penetration of stream channel compared to full aquifer thickness
- Intermittency and disconnected stream conditions

For these more complicated and realistic conditions, the best way to evaluate the connection between the pumping wells and the Santa Ynez River would be via the calibrated groundwater flow models for the particular hydrogeologic setting. For example, in the Santa Ynez River Basin, two such models were developed as part the Groundwater Sustainability Plans (GSPs) for the under SGMA, one for the Eastern Management Area (GSI and IRP Water, 2021), and the other for the combined Central Management Area and the Western Management Area. These two models specifically incorporated the detailed hydrogeologic layering and structures mapped for the areas as described in **Appendix C** below.

APPENDIX C:
HYDROGEOLOGY OF THE SANTA YNEZ RIVER VALLEY

C.1 HYDROGEOLOGY OF THE SY RIVER VALLEY

As noted in the Introduction, there are over 30 proposed cannabis production projects in the SY River Basin from Lake Cachuma downstream to the Lompoc Plain where the river discharges to the Pacific Ocean.

C.1.1 Regional Hydrogeologic Context

Figure C.1 shows the entire SY River Basin and includes the delineation of:

- The Santa Ynez groundwater basin as defined by the DWR Bulletin 118[4] basin maps[5]. For groundwater sustainability planning purposes, the basin has been broken into three planning regions (see https://www.santaynezwater.org/).
- The three planning regions and associated Groundwater Sustainability Agencies in the basin are: the Western Management Area (WMA), the Central Management Area (CMA), and the Eastern Management Area (EMA).

Also clearly visible in **Figure C.1** is Lake Cachuma and the Santa Ynez river flowing from east to west along the southern edge of the EMA and CMA basins.

C.1.1.1 Geologic Structure

As described by Geosyntec (2020), the basin is an east-west trending, linear, irregular structural depression between rugged mountain ranges and hills within the Transverse Range in Santa Barbara County, CA. The basin is bounded by the Purisima Hills on the northwest, the San Rafael Mountains on the northeast, the Santa Ynez Mountains on the south, and the Pacific Ocean on the west. Primary structural features of the basin include large anticline-syncline pairs. These large folds are evident in the rocks and deposits in the lowland between the folded and faulted Santa Ynez Mountains on the south and the faulted San Rafael Mountains on the north.

The hydrogeologic setting for the EMA is schematically represented in **Figure C.2**, as if one were looking westward "down-valley" from the near Bradbury Dam on Lake Cachuma[6]. Key to note in this diagram is the hydraulic connection between the groundwaters of the principal aquifers that underlie Santa Ynez Uplands and the Santa Ynez River alluvium. As illustrated in **Figure C.2**, the hydraulic connection between the Santa Ynez Uplands and the river alluvium is partially blocked by a ridge parallel to and just north of the river, comprised of upthrown block of Monterey shale and deeper low-permeability formations. This subsurface barrier to groundwater flow is breached in some places where the north side tributaries (e.g., Zanja de Cota Creek and Alamo Pintado Creek) cut through that low-permeability ridge as they drain toward the river.

In contrast to the EMA and CMA, in the WMA, the SY River discharges from a relatively constricted valley onto the broad Lompoc coastal plain. From the point that the river enters the plain, it crosses along the northern edge of the Plain approximately 10 miles before discharging to the Pacific Ocean (**Fig. 7**).

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[4] https://data.cnra.ca.gov/dataset/calgw_update2020

[5] https://www.arcgis.com/home/webmap/viewer.html?url=https://gis.water.ca.gov/arcgis/rest/services/Geoscientific/i08_B118_CA_GroundwaterBasins/FeatureServer

[6] In a sense, this diagram shows a Santa Ynez Basin-specific local view of the terrestrial portion of the global hydrologic cycle that we learned about in high school physical science class, including the subsurface groundwater flow component

How these distinct settings impact SW-GW interactions, and how they vary locally along the river, are described in the **Section C.2**.

C.1.1.2 Hydrogeologic Formations in the Santa Ynez River Basin

From a groundwater flow perspective, it is important to classify the geologic units according to the hydrologic properties. Specifically, it is important to identify the principal aquifers and aquitards, which largely control groundwater flow patterns at the regional scale. The profile of hydrogeologic units encountered when drilling a borehole or viewed in an outcrop face can be referred to as the hydrostratigraphic profile.

The geologic formations that comprise the water-bearing aquifers are defined as those with sufficient permeability, storage potential, and groundwater quality to store and convey groundwater. Those without sufficient permeability or storage potential are considered aquitard units. Beneath the river channel and across the river floodplain, highly permeable river gravels and recent alluvium are encountered to a combined thickness from 50 feet up to 200 feet. North of the river are the Upland basins, from east to west: the Santa Ynez uplands in the EMA, the Buellton uplands in the CMA, and the Santa Rita uplands in the WMA. The uplands are underlain by a sequence of permeable formations, specifically (from top to bottom):

- Recent Alluvium along the tributaries with Older Alluvium terraces perched above
- The Paso Robles Formation of low to moderate permeability (0.1 – 10 ft/day)
- The Careaga Sands of moderate permeability (0.7 - 20 ft/day)
- Beneath these formations, the Bulletin 118 basin basement is comprised of the lower-permeability rocks of the Sisquoc and Monterey Formations (much less than 0.1 ft/day, considered impermeable by in the CMA-WMA model)

The configuration of these units relative to the Santa Ynez River are described below in **Section C.2**, first for the EMA portion of the basin, then for the CMA-WMA.

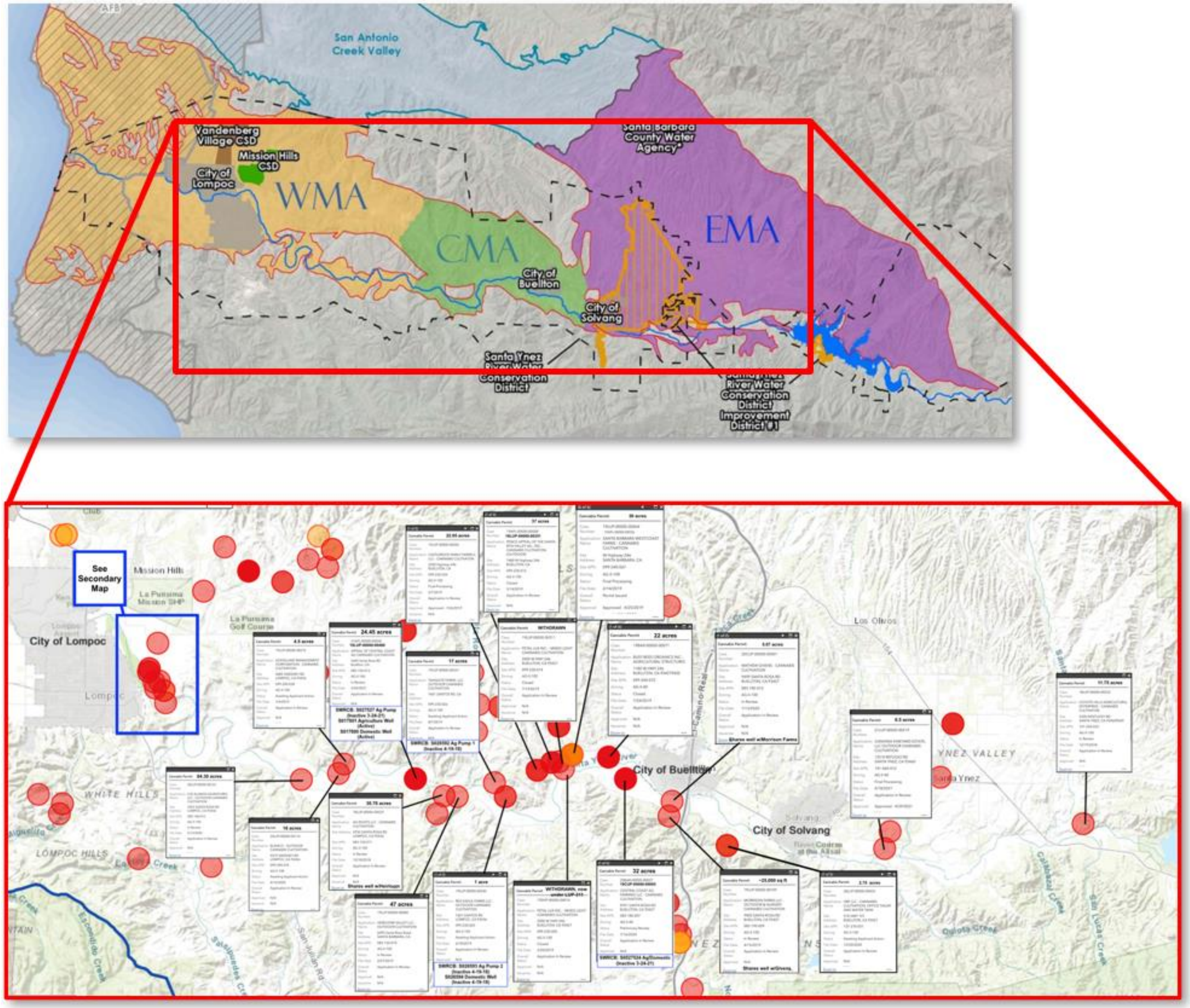


Figure C.1. Cannabis projects locations within context of DWR Bulletin 188 groundwater basins and SGMA groundwater sustainability planning regions for the Santa Ynez River Basin (WMA = Western Management Area, CMA = Central Management Area, and EMA = Eastern Management Area).

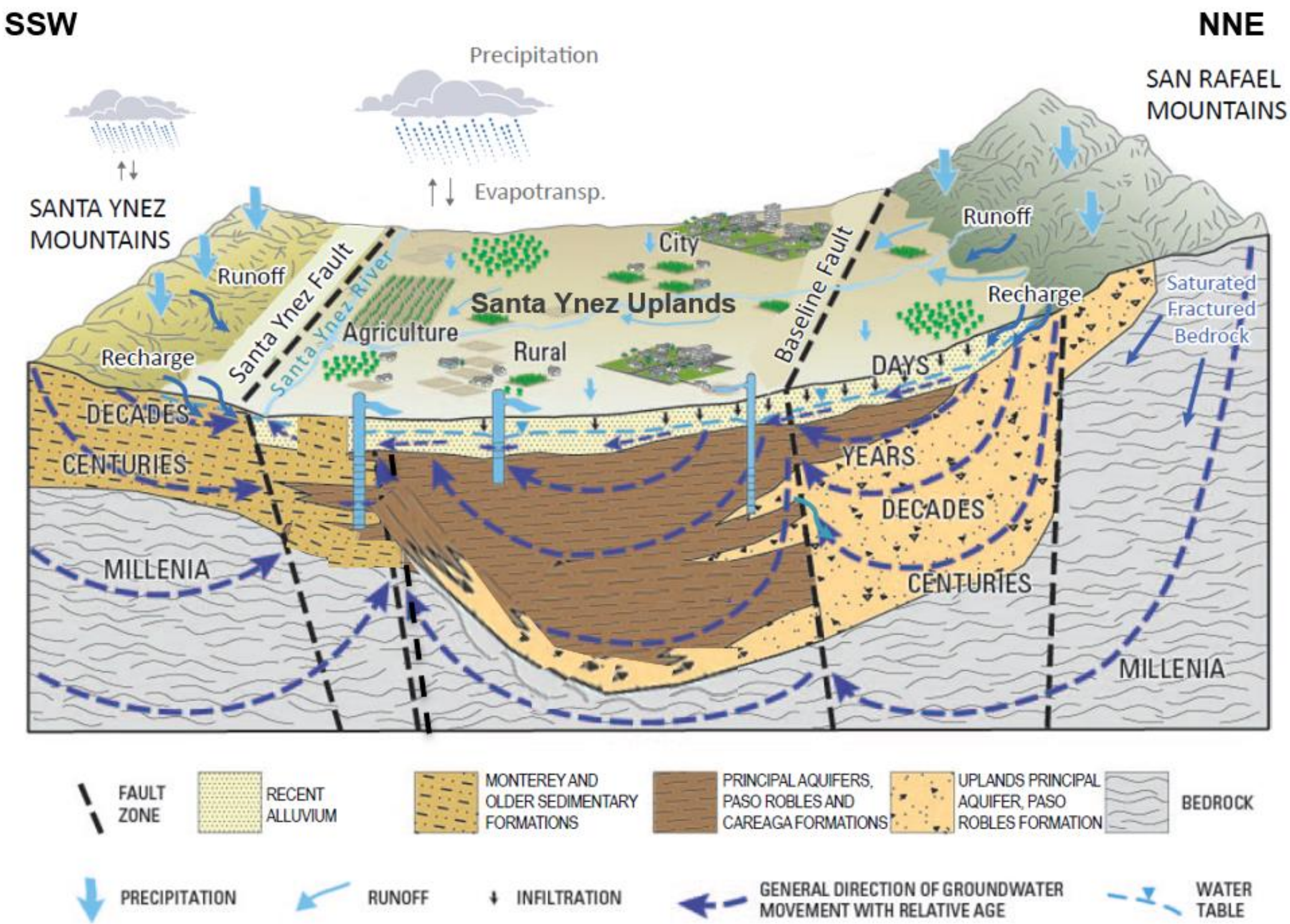


Figure C.2. Schematic block diagram of hydrogeologic setting of the SY River Basin EMA (adapted from GSI Water Solutions, 2021, Fig. 3-1)

C.2. Local Hydrogeologic Context

As described above and illustrated in **Figures C.1** and **C.2,** the Santa Ynez River flows from east to west along the southern edge of the EMA and CMA basins, before passing through a narrow constriction in the upper end of the WMA then spilling into and cross the Lompoc Plain. At the scale of **Figure C.1**, it appears that most of the proposed cannabis projects are located relatively close to the river, whereas the rest are relatively distant from the river. Recall that the stream loss rate due to well pumping rate varies with time and is function of the hydrogeologic properties of the connected groundwater system (hydraulic conductivity *K* and storativity *S*), the distance of the well from the stream, and the saturated aquifer thickness (eqn. 2). So to properly evaluate the degree of connectivity, it is important to understand the local hydrogeologic setting and associated flow properties of the of the geologic units that occur between the pumping well and the nearest connected surface water body.

For analysis of the hydrogeologic context of this area, one can rely on the recent comprehensive compilation of the hydrogeologic framework developed by Geosyntec (2020) for the WMA and CMA portions of the basin, and the parallel compilation by GSI Water Solutions (2020) for the EMA. These two studies were undertaken in support of developing two groundwater flow models for the area:

- one of the models covers the EMA (GSI Water Solutions and IRP Water, 2021), and
- the other covers the combined CMA and WMA (Stetson Engineers, 2021)

These two models in turn were employed as the basis for quantifying the water budgets and for simulating groundwater levels and flows as required for the Groundwater Sustainability Plans (GSPs) for the three planning regions.

The approach taken in both cases (Geosyntec, 2020; GSI Water Solutions, 2020) involved compiling all available hydrogeologic data and information for the study area, including:

- well logs, including descriptive drillers logs, geophysical logs, and well test data when available; over 1,000 well records were reviewed
- surface geologic maps covering the entire area
- geologic cross-sections, including both existing published sections and newly interpreted cross sections based on the logs, more than 70 cross-sections in all

By integrating this data in a spatial framework using the Leapfrog Works software tool (Seequent Ltd., 2020), a three-dimensional (3D) hydrogeologic model of the EMA and CMA-WMA were developed. GSI (2020) provides a high-level description of the methodologies and output of the Leapfrog tool. They also summarize coordination with their counterparts at Geosyntec working on the WMA-CMA 3D model. For continuity and consistency purposes, a number of meetings/phone calls were held between the consultant teams to discuss how geologic units and contacts were defined based on well data and how geologic units were depicted in the model including the use of the same naming and color conventions employed to represent the various geologic units. These units are described in **Section C.2.** below.

Per SGMA requirements, models developed and applied to support GSPs must be based on the best available data and information.

C.2.1 Santa Ynez Basin Eastern Management Area

The hydrogeologic conceptual model (HCM) report for the EMA (GSI, 2020b) provides a detailed description of the geologic history of the study area, including geologic descriptions of each of the units that are found at the ground surface and extend beneath / underlie the area. A summary of the geology is presented here to provide a segue to describing the surface water – groundwater interactions, but for details the reader is referred to the HCM document. **Figure C.3** provides a geologic surface map of the area, specifically presenting the geologic formations which one encounters at the ground surface and the DWR Bulletin 118 basin limits. **Figure C.4** shows geologic cross-section lines projected atop the EMA geologic map, to show the locations of the geologic profiles presented in **Figures C.5** through **C.8**. These geologic profiles were extracted from the final Leapfrog 3D geologic framework model described above.

When reviewing the geologic map and profiles in conjunction with the hydrogeological conceptual model (**Fig. C.2**) and the hydrologic properties of each unit as presented above, a number of observations can be made:

- In the lowland between the Santa Ynez Mountains on the south and the San Rafael Mountains on the north and northeast, the low-permeability bedrock units that underlie the Basin are folded in response to regional tectonic forces. Simultaneous with the down warping of those units, unconsolidated water-bearing sediments accumulated in the basin.
- In the deepest portions of the Basin, up to 3,000 feet of saturated permeable sediments can be encountered atop the much less permeable Sisquoc and Monterey formations. Several minor synclines and anticlines exist throughout the complexly folded bedrock units within the EMA.
- The deepest principal aquifer unit is the referred to as the Careaga Sand (Tca and Tcag on the geologic map and profiles). In some areas (including in the CMA and WMA to the west), the Careaga Sand is broken into two units, the Cebada and Graciosa members. The Careaga is tapped as an aquifer in the southwest portions of the EMA where it rises closer to the ground surface, for example in the vicinity of Solvang.
- The Paso Robles formation, overlying the Careaga, is highly heterogeneous, with alternating coarse-grained beds and fine-grained beds. These fine-grained zones act as local confining beds and are likely the cause of the localized artesian conditions that were historically encountered.
- Overlying these formations are the Quaternary-aged Older Alluvium (Qoa), Santa Ynez River Alluvium (Qg), and Tributary Alluvium (Qa) that each range in thickness from 10 to 150 feet, depending upon location. These similar alluvium materials in the Santa Ynez River and along the Santa Ynez Uplands tributaries are both referred to as Younger Alluvium in the CMA and WMA GSPs.
- Along the southern edge of the basin, the Santa Ynez River flows on top of a relatively younger alluvium that overlies the much older Monterey Formation, which was uplifted closer to the surface, due to faulting and folding in this portion of the Basin.
- As illustrated in the HCM block diagram (**Fig. 8**), the groundwater flow paths in the EMA indicate that recharge to the groundwater system occurs from precipitation infiltrating through the shallow

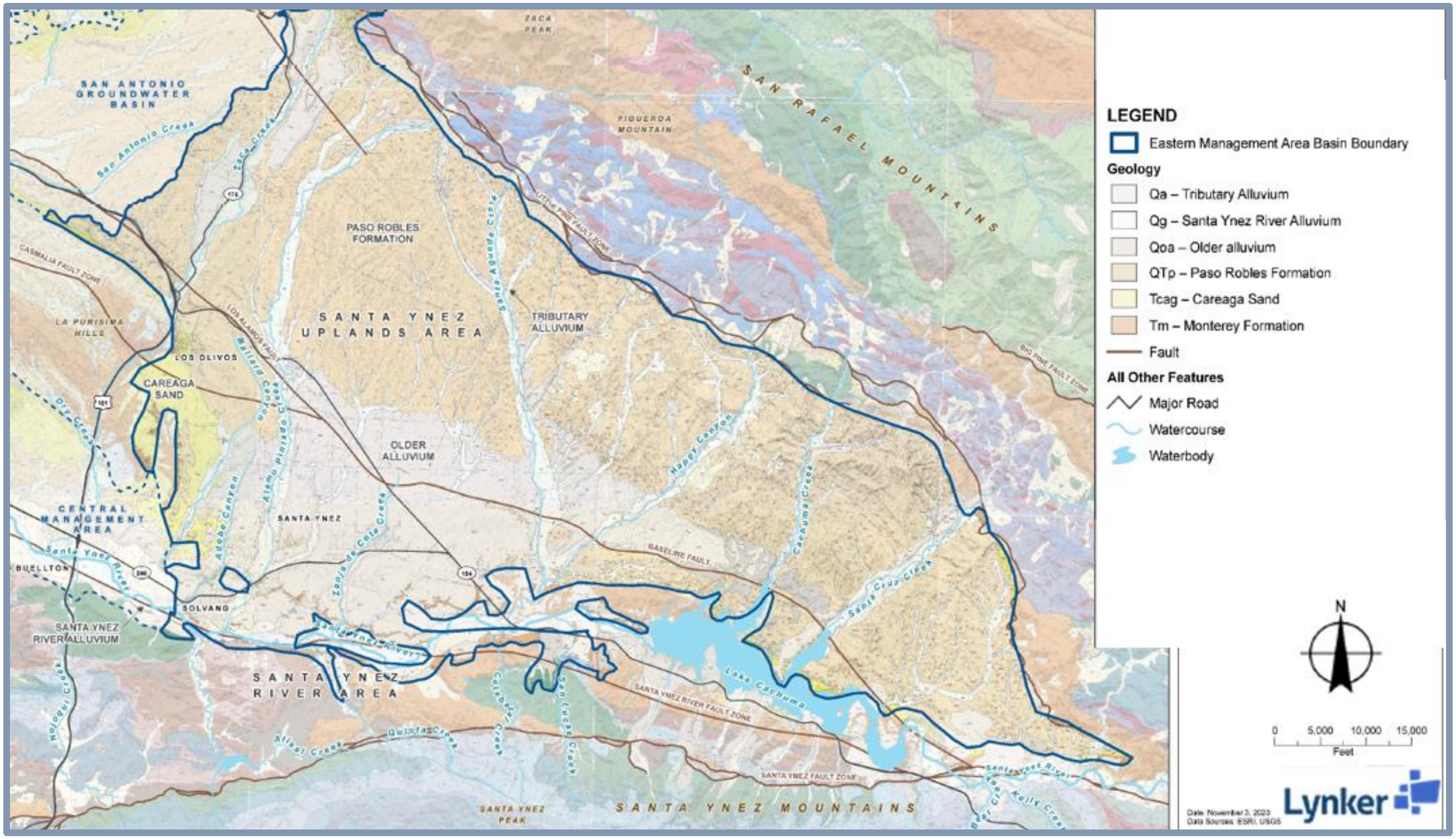


Figure C.3. Surface geological map of the Santa Ynez River Basin EMA (adapted from GSI, 2021, Fig. 3-4)

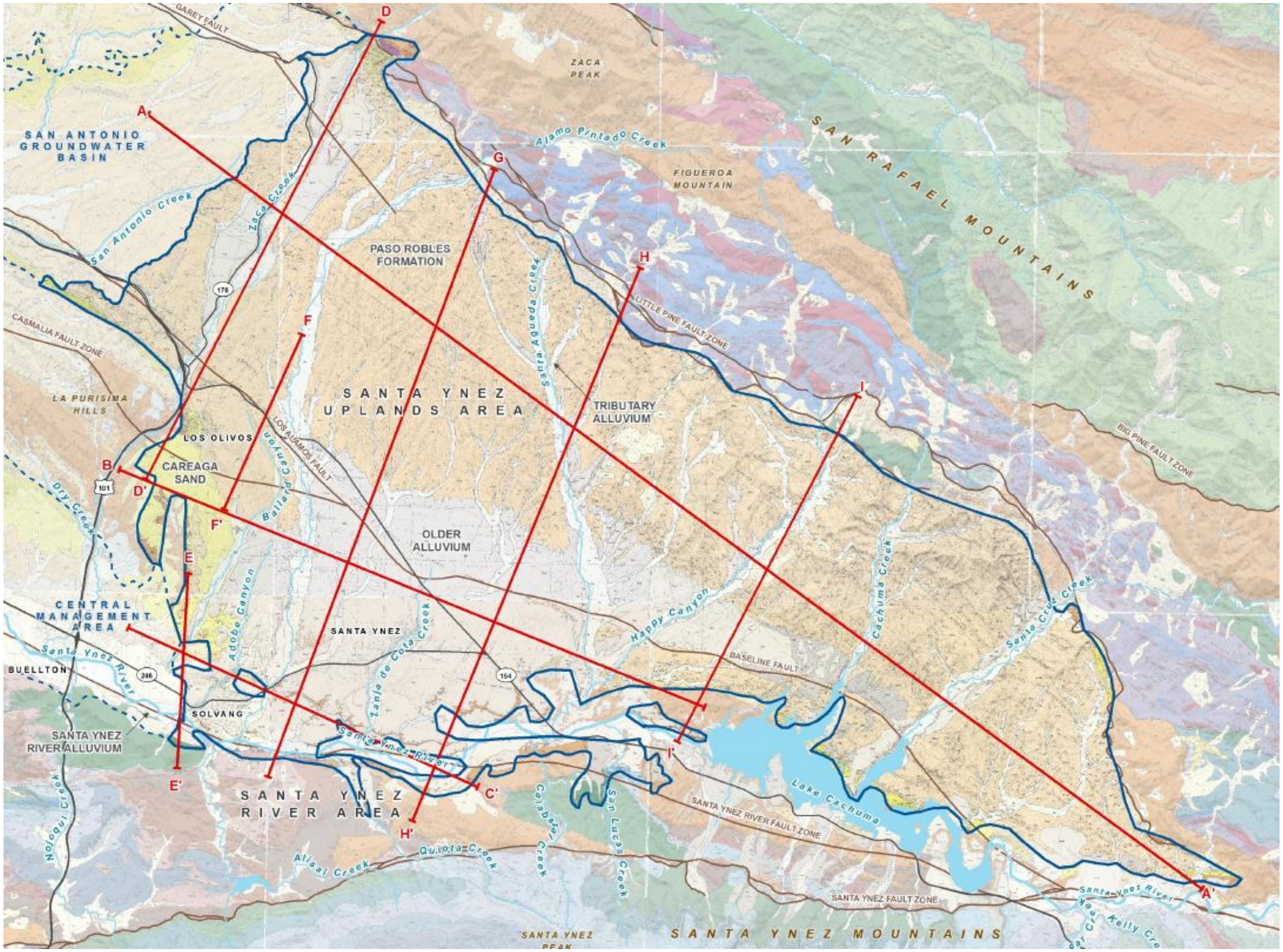


Figure C.4. Transect lines for geologic cross-section in Figs 10 – 14 projected atop surface geological map for EMA

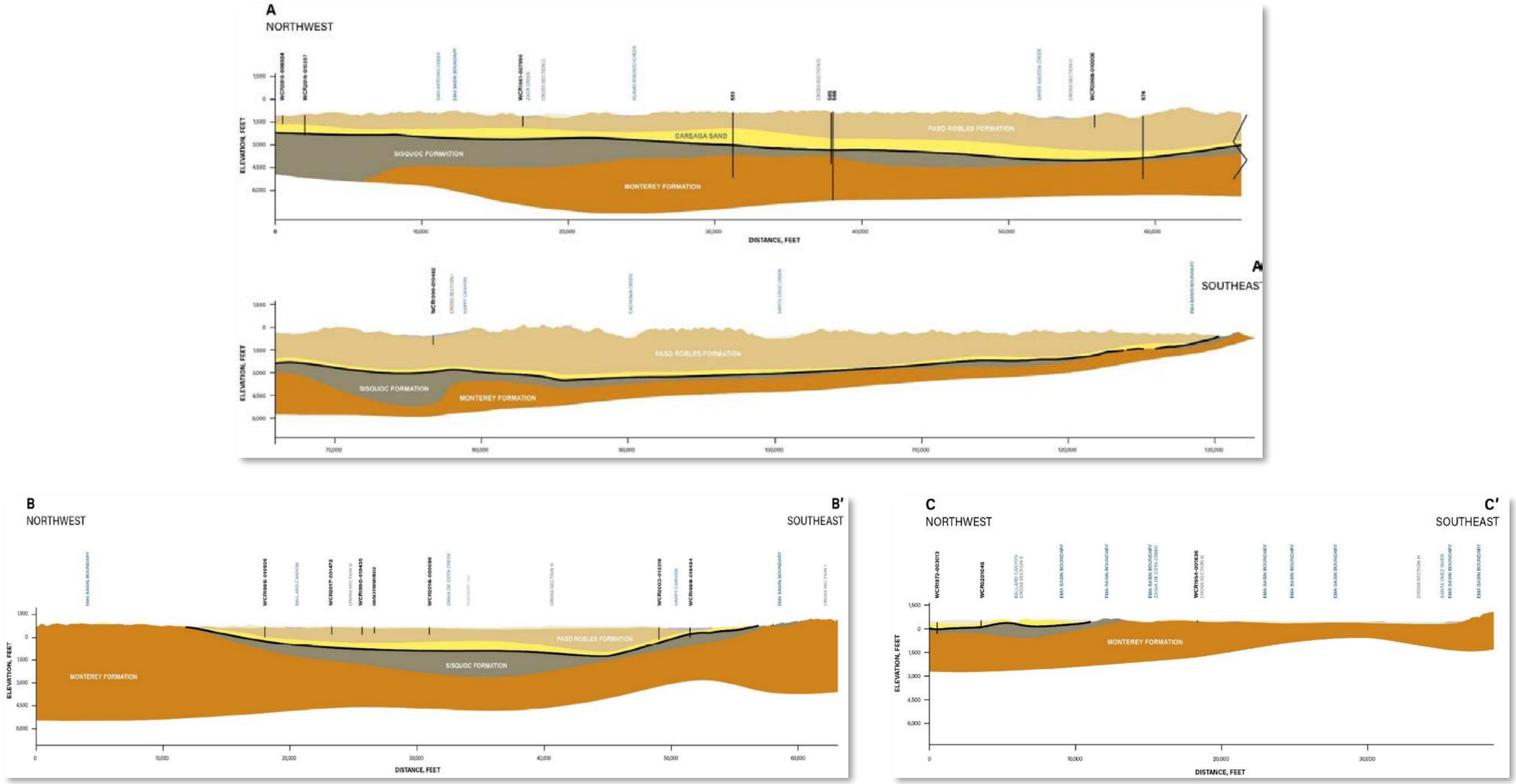


Figure C.5. NW - SE geologic cross-sections across EMA; see Fig. 9 for section locations and geologic unit color legend (adapted from GSI, 2021)

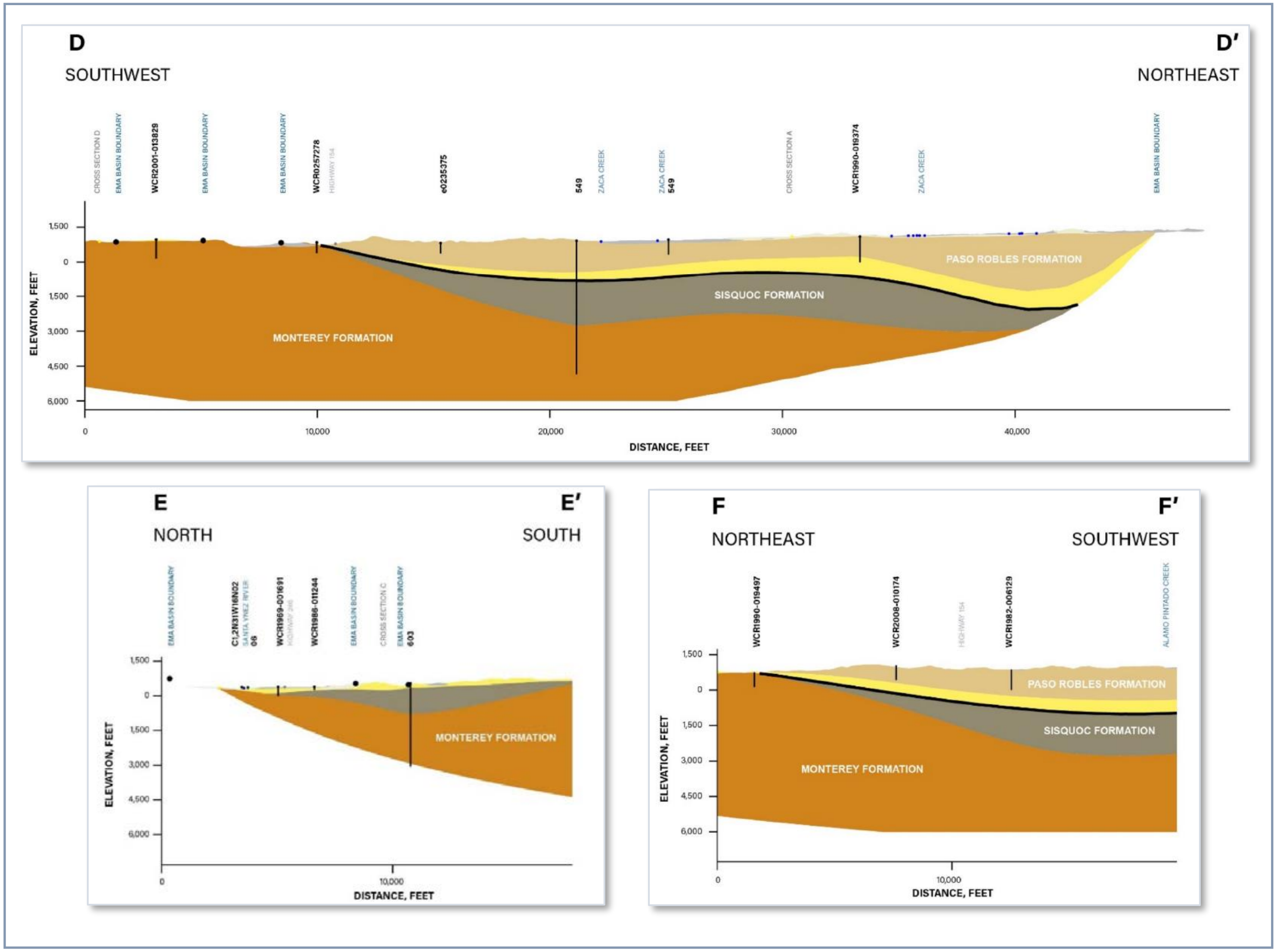
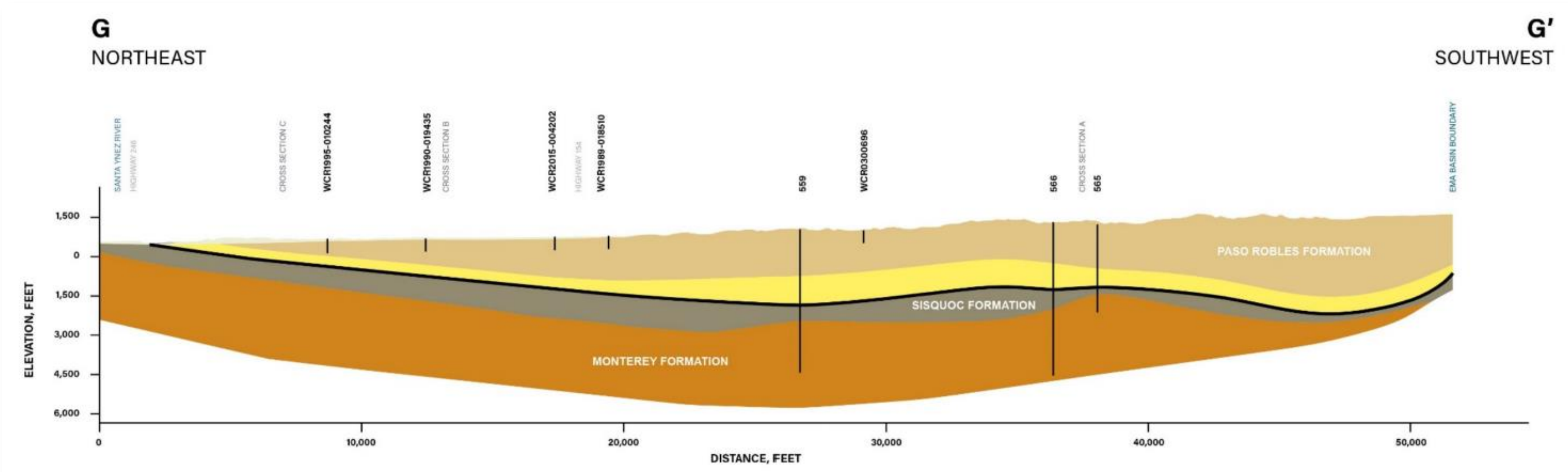


Figure C.6. NE - SW geologic cross sections from western EMA; see Fig. 9 for section locations and geologic unit color legend (adapted from GSI, 2021)



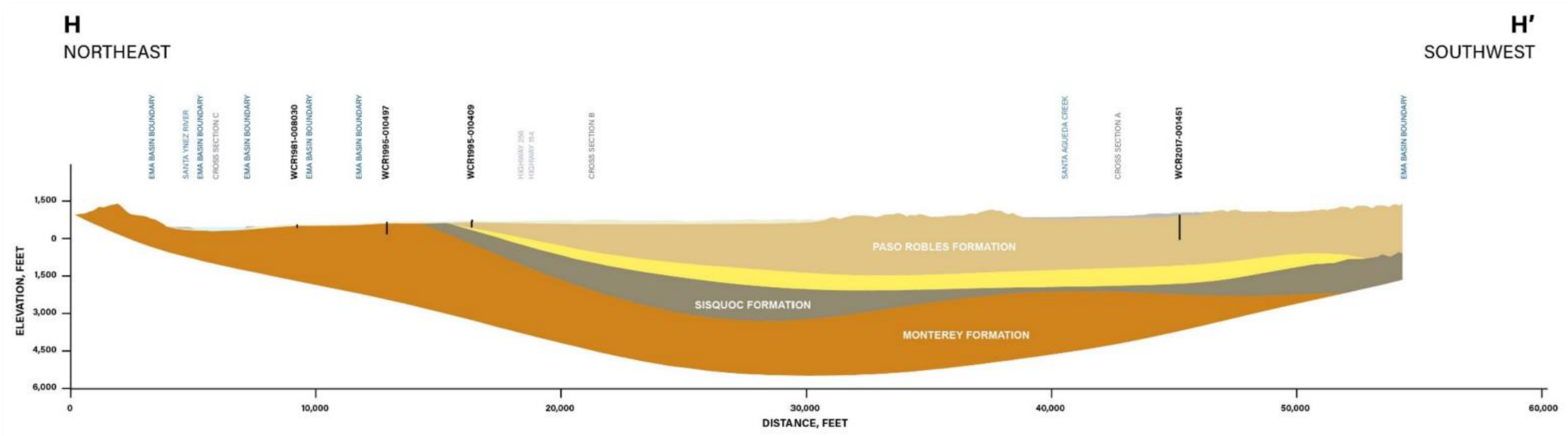


Figure C.7. NE – SW geologic cross sections from central EMA; see Fig. 9 for section locations and geologic unit color legend (adapted from GSI, 2021)

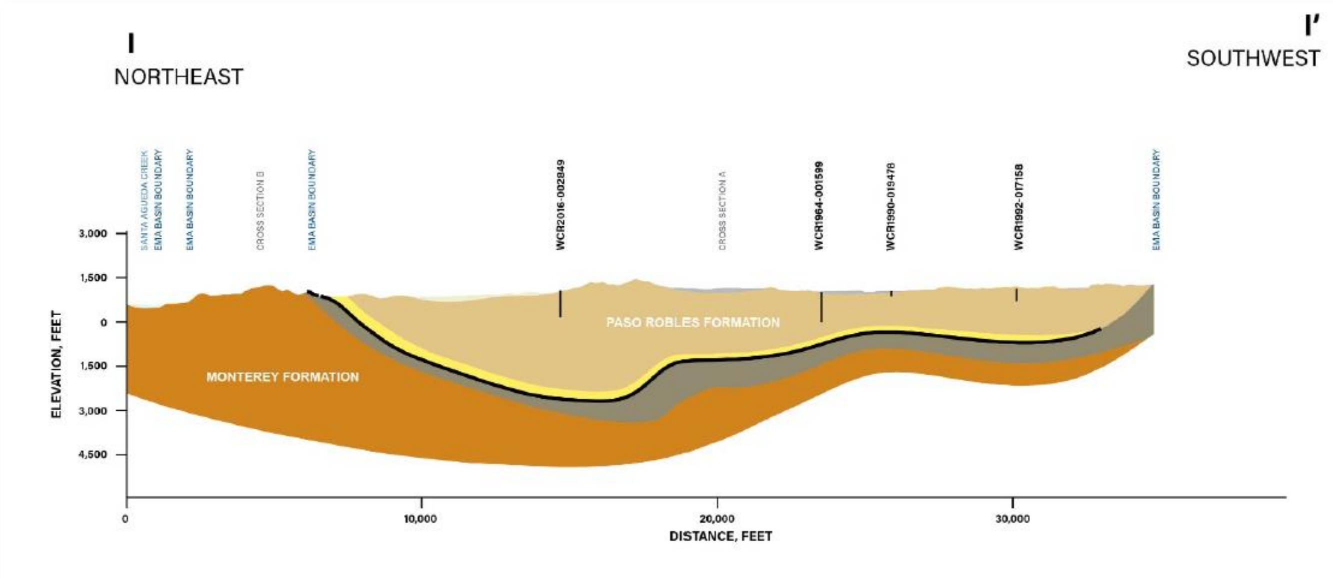


Figure C.8. NE – SW geologic cross sections from eastern EMA; see Fig. 9 for section locations and geologic unit color legend (adapted from GSI, 2021)

soils in the uplands, through fractured bedrock in the mountains, and from irrigation return flows. Groundwater flows from the recharge areas and migrates south and southwest toward the river.

- Key to note in both the block diagram (**Fig. C.2**) and the NE – SW cross sections (**Figs. C.4** through **C.8**). is the fact that along the southern edge of the basin, the low-permeability Sisquoc and Monterey formation rise to the ground surface, creating a hydrogeologic barrier that significantly reduces the connectivity between the groundwater stored in EMA portion of the DWR Bulletin 118 defined Santa Ynez Groundwater Basin and the groundwater in the recent alluvial sediments in the Santa Ynez River channel and floodplain.

C.2.2 Santa Ynez Basin Central and Western Management Area

Figure C.9 provides a geologic surface map of the CMA and WMA portions of the Santa Ynez River Basin, presenting the geologic formations which one encounters at the ground surface in that area. **Figure C.10** shows geologic cross-section lines projected atop the geologic map, to show the locations of the geologic profiles presented in **Figures C.11** through **C.12**. Also shown in **Figure C.2** are the boundaries of the CMA and WMA groundwater sustainability agency planning regions and DWR Bulletin 118 basin limits.

As described by Stetson (2021), in both the WMA and CMA, the river and younger alluvium is a main water bearing formation throughout, including in the Lompoc Plain. Beneath the surficial unconsolidated younger and older alluvium, the Orcutt Sand and Paso Robles formations are major water-bearing units with a combined thickness of approximately 1,000 to 3,000 feet of consolidated to unconsolidated gravels, sands, silts, and clays. The Paso Robles itself is nearly 2,500-feet thick at the upper end of the CMA (cross-section G-G'), but it thins to the west, down to less than a few hundred feet thick by the Lompoc Plain. The bottom-

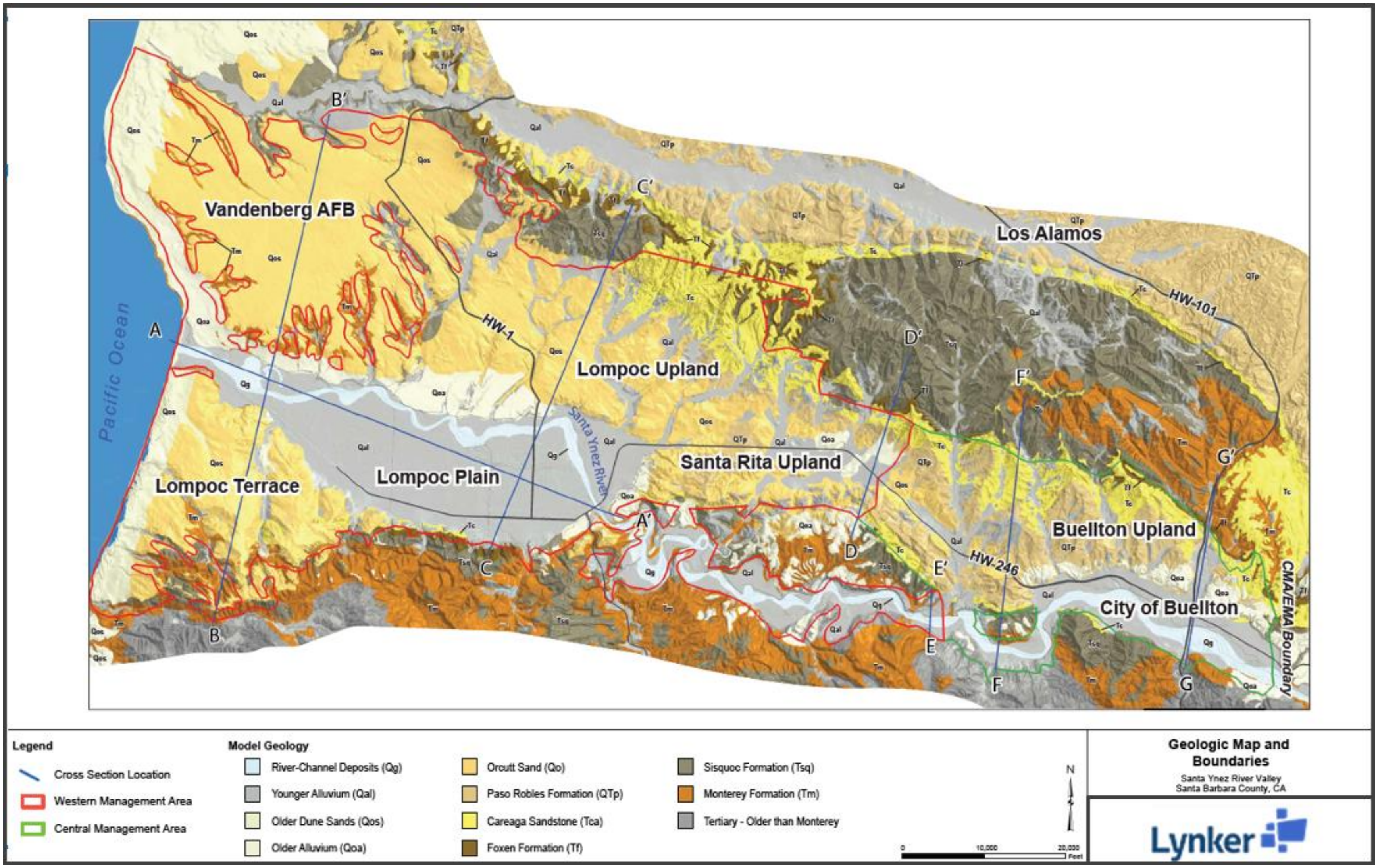


Figure C.9. Surface geological map of CMA and WMA portions of Santa Ynez River basin (adapted from Geosyntec, 2020)

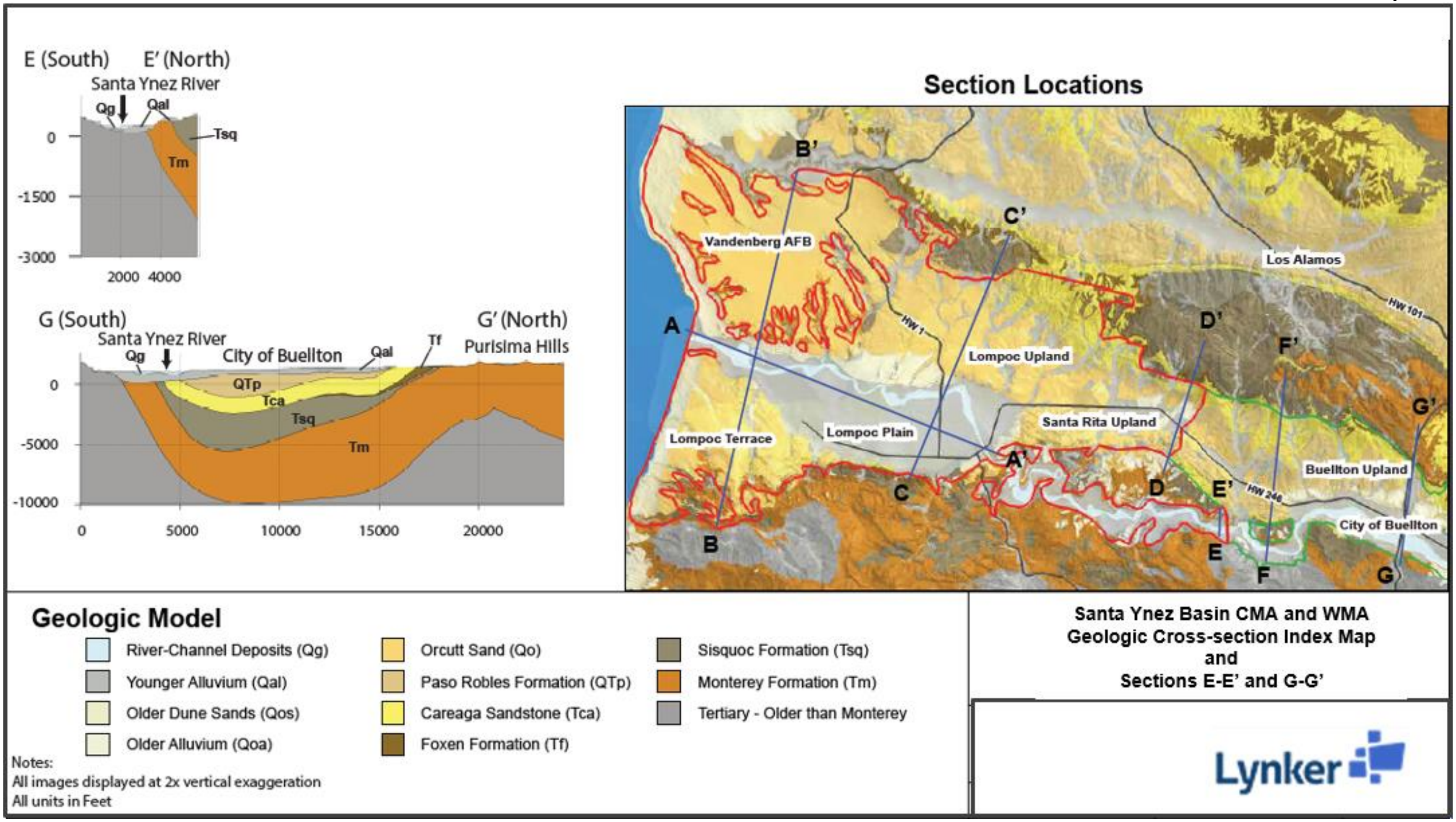


Figure C.10. CMA and WMA geologic cross section index map and sections E-E' and G-G' (adapted from Geosyntec, 2020)

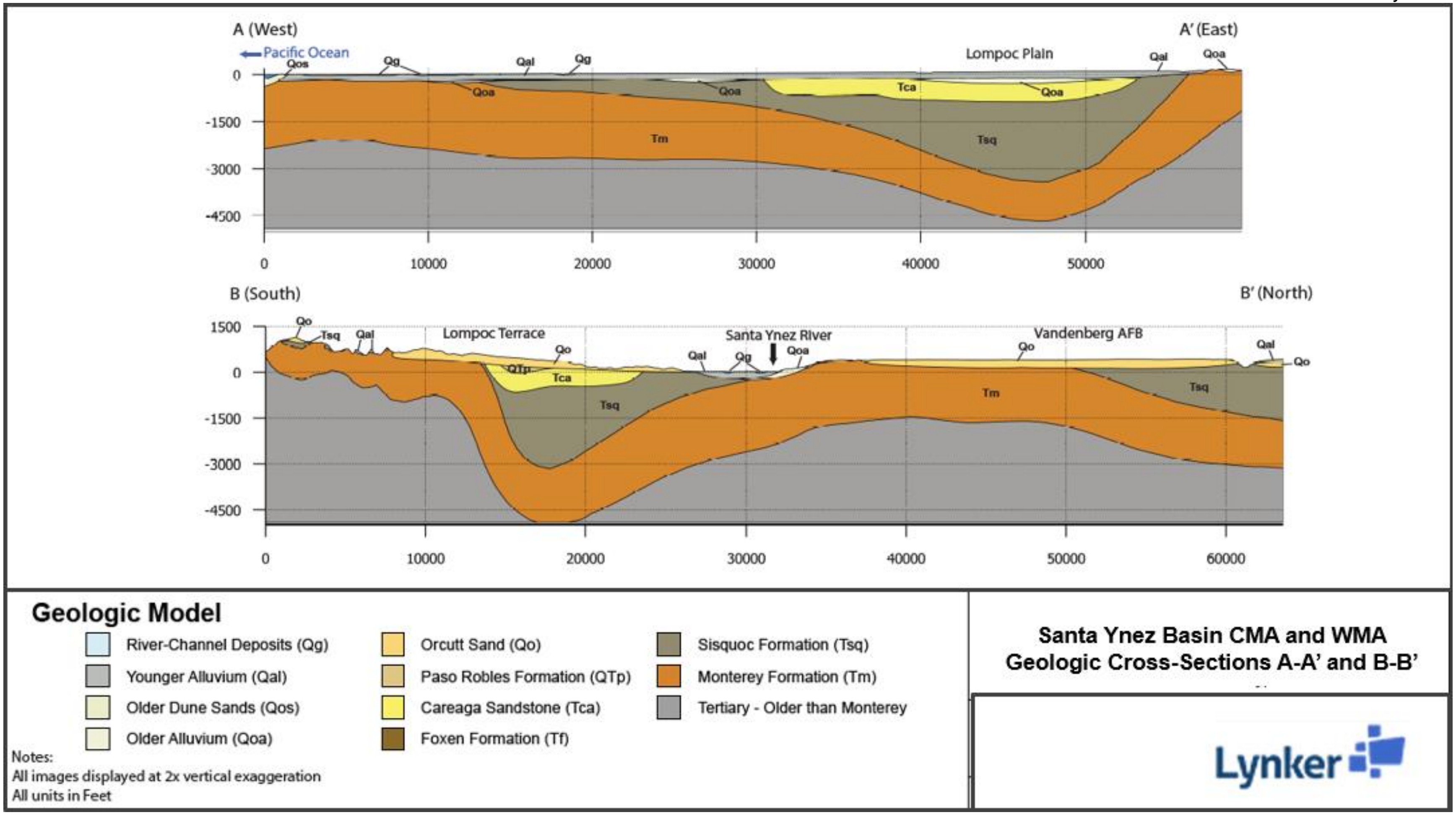


Figure C.11. CMA and WMA geologic cross-sections A-A' and B-B'; see Fig. 15 for index map (adapted from Geosyntec, 2020)

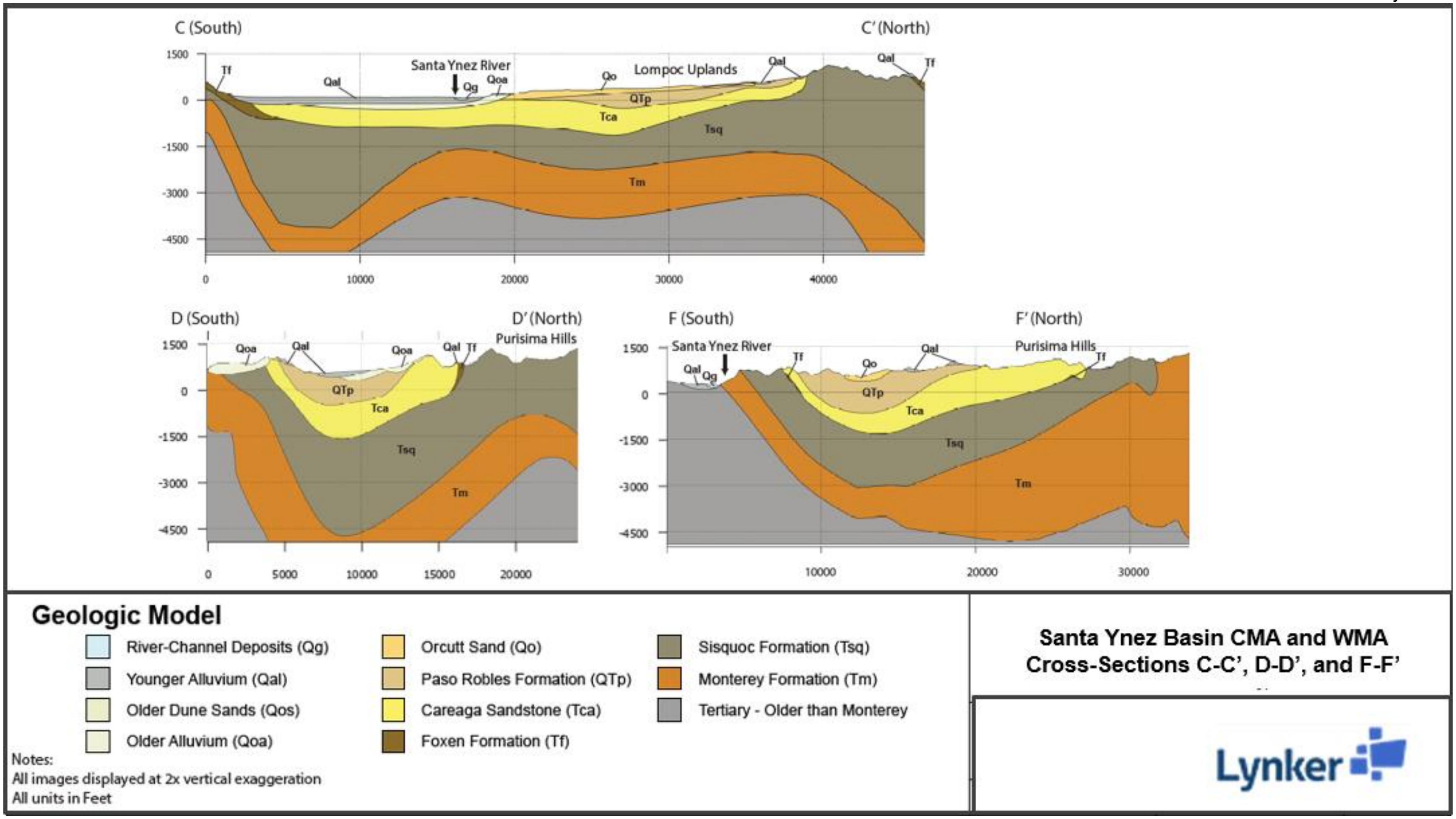


Figure C.12. CMA and WMA geologic cross-sections C-C', D-D', and F-F'; see Fig. 15 for index map (adapted from Geosyntec, 2020) most permeable layer is the Careaga sandstone, represented as two units in the CMA and EMA geologic framework model: the upper Graciosa member (relatively more productive) and lower Cebada member (relatively less productive) (Stetson, 2020). Beneath these principal aquifer units are the low permeable siltstones, claystones, and shales on the Sisquoc and Monterey formation.

Again, when reviewing the geologic map and profiles in conjunction with the hydrogeological conceptual model (**Fig. C.2**) and the hydrologic properties of each unit as presented above (**Sec. 4.1.2**), a number of observations can be made, moving downstream from the point where the river enters the CMA:

- As the river enters the CMA from the EMA (between Buellton and Solvang, see **Fig. C.2**), it flows from east to west across a broad river floodplain underlain by river alluvium and other recent alluvium. The combined saturated thickness of these highly permeable sediments ranges from 40 to 100 feet.
- The Buellton uplands rise north of the river floodplain along this reach, with their ephemeral stream channels draining southward toward the river. The Buellton Uplands are capped by older alluvial terraces, with the Paso Robles and Careaga formations beneath. Further upslope in the Uplands the Paso Robles and Careaga outcrop at the ground surface.
- The surface geologic map and cross-section G-G' (**Fig. C10.**) indicate that the Paso Robles and Careaga formations slope upward beneath the river gravels, creating a direct hydraulic connection between these two formations and the river alluvium along the Buellton Uplands reach.
- Roughly 2.5 miles west of Buellton, Highway 246 takes a dogleg turn to the northwest and the Santa Ynez River makes a hard turn to the south. As shown in cross-sections E-E', F-F', and D-D' (**Fig. 11**), from this point to approximately 13 miles downstream to where it spills onto the Lompoc Plain, the Santa Ynez River and the associated alluvium is relatively isolated from the Paso Robles and Careaga permeable units. This hydraulic isolation of the river alluvium is created by the thick sequences of low-permeability Sisquoc and Monterey formations outcropping in the hills north of the river and subcropping beneath the river gravels.
- There are some short stretches of this reach where drainages from the north appear to cut through this "Monterey barrier," and sequences of younger alluvium, Paso Robles, and Careaga deposits may be in strong hydraulic contact with the river alluvium. Specifically, this hydrogeologic configuration occurs where:
    - Santa Rosa Creek drains south out of the Buellton Uplands into the river floodplain (between cross-sections E-E' and F-F'), and
    - Approximately 7 river-miles further downstream where Santa Rosa Creek drains south out of the Santa Rita Uplands onto the river floodplain (this is also approximately 4 river-miles upstream of the Narrows, past which the river flows on the Lompoc Plain
- Once the river enters the Lompoc Plain, the hydrogeologic setting changes dramatically, as illustrated by cross-sections A-A', B-B', and C-C'.
    - At the upper end of the Lompoc Plain, both the river alluvium and younger alluvium thicken substantially, and the younger alluvium spreads broadly across the surface to depths of 200

feet and more. Geosyntec (2020) describes the river alluvium and younger alluvium as exhibiting similar characteristics, highly permeable and difficult to distinguish in places.

- Directly subcropping beneath these highly permeable alluvial deposits is a thick wedge of Orcutt sand and a thick sequence of Careaga sand beneath that (cross-section C-C'). This hydrogeologic configuration creates the likelihood that Santa Ynez River water and connected alluvial groundwater would be impacted by pumping wells installed in the Paso Robles, Orcutt sands, and Careaga sands in the upper half of the Lompoc Plain and adjacent Lompoc Uplands to the north.
- Roughly four crow-flight miles downstream of the discharge point from the Narrows, the lower-permeability Sisquoc and Monterey bedrock units begin to rise toward the ground surface. Simultaneously, the Orcutt sands and Careaga sands thin progressively over the next mile until they largely have been eroded away from the river channel by the time it approaches the ocean. This effectively places the low permeability bedrock units directly beneath river gravels (western end of cross-section A-A' and cross-section B-B')

1.1.1. Summary of Hydrogeologic SW-GW Interconnectivity in Santa Ynez Basin

The principal groundwater bearing units in the Santa Ynez River basin are the River Alluvium, the Younger Alluvium, and the Paso Robles formation and the Careaga sands that form thick sequences of moderately permeable deposits throughout the study area. In the CMA and EMA, the Orcutt sands also appears as an important water bearing formation sitting unconformably atop the Paso Robles and Careaga. The connectivity between the surface water and alluvial groundwater of the Santa Ynez River and the other water bearing formations varies along the length of the river.

- Over most of the EMA, from Bradbury Dam on Lake Cachuma downstream to Solvang, an upthrown bedrock ridge runs parallel to the river and river alluvium, limiting the surface water connection with the Paso Robles and Careaga aquifers in the Santa Ynez Uplands
- This hydraulic barrier between the river gravels and the Santa Ynez Uplands aquifers is breached in a couple locations where the major tributaries from the north drain toward the river, specifically noted at Zanja de Cota Creek and Alamo Pintado Creek. Interestingly, these are the same locations where groundwater dependent ecosystems (GDEs) occur, as groundwater collects and drains through these breaches.
- As the river passes from the EMA to the CMA near Buellton, the river alluvium sits directly atop the Paso Robles and Careaga, creating a strong hydrogeologic connection between the surface water and Buellton Uplands principal aquifers.
- From roughly 2.5 miles west of Buellton to approximately 13 miles downstream to where the river flows onto the Lompoc Plain, the Santa Ynez River and the associated alluvium is relatively isolated from the Paso Robles and Careaga permeable units. Again, this hydraulic disconnection occurs due to the presented of a bedrock ridge between the Buellton and Santa Rita Uplands and the river alluvium. The bedrock ridge is locally breached at Santa Rosa Creek and Santa Rita Creek.

- For the upper half of the Lompoc Plain, the Lompoc Uplands principal aquifers are strongly connected to the surface waters as the Paso Robles and Careaga appear to directly subcrop beneath the permeable river gravels and recent alluvium.

This interconnectivity evaluation above focused on the hydrogeology and physics of groundwater flow, but California groundwater law takes a unique look at SW-GW interactions that does not comport with the laws of physics (specifically flow continuity and mass balance). Thus to properly characterize SW - GW interactions and the degree of interconnectivity, one must first understand the bright lines drawn by California groundwater law as described in **Appendix A**.

APPENDIX D:

STETSON (2021) MEMO ON SANTA YNEZ RIVER UNDERFLOW ZONE

TECHNICAL MEMORANDUM

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STETSON ENGINEERS INC.

TO:	**Santa Ynez River Water Conservation District**	DATE:	**December 2021**
FROM:	**Ali Shahroody** **Curtis Lawler**	JOB NO:	**1126-2**
RE:	**Hydrogeological Basis for Characterization of Water within the Santa Ynez River Alluvium Upstream of the Lompoc Narrows as Underflow of the River in a Known and Definite Channel**		

1 INTRODUCTION

This memorandum documents the hydrogeological basis for the characterization of the water within the Santa Ynez River Alluvium as underflow of the river flowing in a known and definite channel. The area of this underflow is located downstream of Lake Cachuma and upstream of the Lompoc Narrows[1] (Figure 1).[2] The Groundwater Sustainability Plans ("GSPs") that have been developed for the Western, Central, and Eastern Management Areas of the Santa Ynez River Valley Groundwater Basin, referred to as Bulletin 118 Basin No. 3-015 ("Basin"), appropriately characterize this water as underflow of the river within the jurisdiction of and regulated by the State Water Resources Control Board ("State Board"), and not "groundwater" as defined by the Sustainable Groundwater Management Act ("SGMA"). For purposes of SGMA, "groundwater" is defined as "water beneath the surface of the earth within the zone below the water table in which the soil is completely saturated with water but does not include water that flows in known and definite channels." (Wat. Code, § 10721(g), emphasis added.) Water that flows in known and definite channels is regulated by and subject to the jurisdictional authority of the State Board in the same manner as surface water. (See Wat. Code § 1200 et seq.)

Importantly, SGMA does not require Groundwater Sustainability Agencies ("GSAs") or GSPs to legally establish the distinction between groundwater and surface water in a basin. Instead, GSPs must identify and describe the respective systems, characterize their interrelationship, and explain the basis of those analyses. (See, e.g., SGMA Regulations § 354.18.)In this Basin, the GSPs have reasonably relied upon and utilized the longstanding technical and administrative record that identifies the Santa Ynez River Alluvium above the Lompoc Narrows as a known and definite subsurface channel of the lower Santa Ynez River. In fact, diversion and use of this

[1] This memorandum does not attempt to characterize subsurface water within or downstream of the Lompoc Plain, nor does it make any determination about the particular water rights of any water user.
[2] This underflow area also corresponds to the Above Narrows Area as defined by the United States Bureau of Reclamation ("Reclamation") and to Zone A of the Santa Ynez River Water Conservation District.

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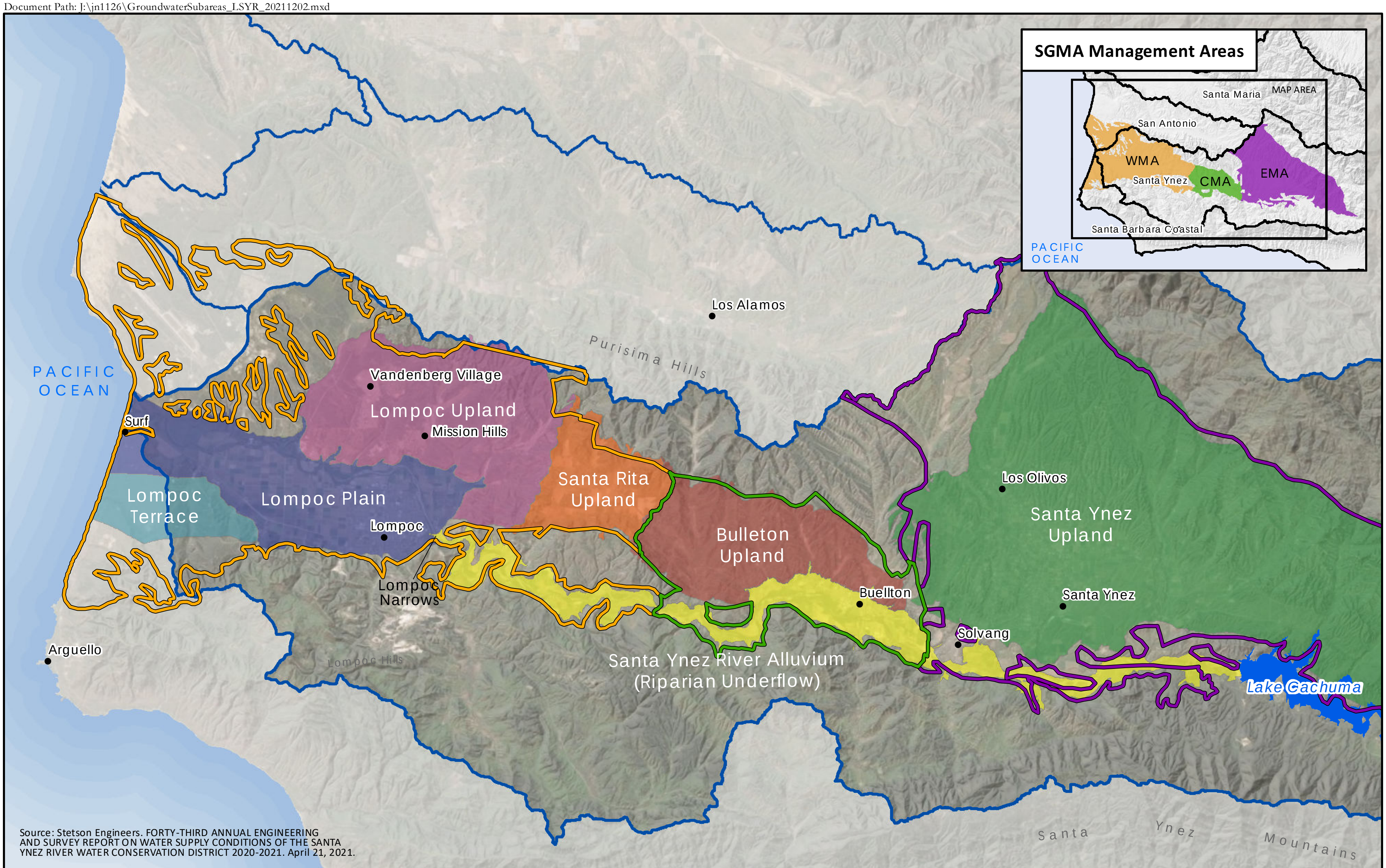

STETSON ENGINEERS INC.

- Santa Ynez River Watershed
- Central Management Area
- Western Management Area
- Eastern Management Area

GROUNDWATER SUBAREAS AND UNDERFLOW LOWER SANTA YNEZ RIVER

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FIGURE 1

subsurface water have historically been regulated by the State Board, which has characterized it as underflow of the Santa Ynez River since at least Water Rights Decision 886 in 1958. The State Board further reinforced this characterization of this alluvium in Water Rights Decisions 1338 and 1486 when it considered applications and granted permits to divert underflow of the river: "The Santa Ynez River in the reach between Cachuma Dam and Robinson Bridge, where it enters the Lompoc subarea, flows over recent river channel deposits and the younger alluvium that range in width from a few hundred feet to about one mile and in thickness from 40 to 85 feet. The underflow of the river moves slowly through these deposits." (State Board Decision 1338, pp. 3-4, emphasis added.)[2]

State Board Water Rights Order ("WRO") 73-37, as amended by WRO 89-18 and incorporated in WRO 2019-0148, has also defined the Santa Ynez River "Above Narrows" alluvial deposits as underflow, and states in relevant part that water shall be released "from Lake Cachuma in such amounts and at such times and rates as will be sufficient, together with inflow from downstream tributary sources, to supply downstream diversions of the surface flow under vested prior rights to the extent water would have been available for such diversions from unregulated flow." (WRO 73-37, Paragraph 5.) Notably, the downstream diversions referenced in these State Board WROs and Water Rights Decisions are made from wells constructed in the underflow of the Santa Ynez River alluvium. As recognized by the State Board and as further discussed below, the geology of the River-channel Deposits and the Younger Alluvium demarcate a known and definite channel through which this subsurface water flows, with older and less permeable formations forming the bed and banks.

2 DESCRIPTION OF THE SUBSURFACE CHANNEL

The geology of the shallow and water bearing sediments of the Santa Ynez River below Lake Cachuma is discussed in United States Geological Survey ("USGS") Water Supply Papers 1107 and 1467. Along much of the Santa Ynez River below Lake Cachuma, the river overlies River-channel Deposits and the Younger Alluvium. These water-bearing units are located in a river-cut channel through older non-water bearing units of the thick Tertiary aged Monterey Formation (primarily lower permeability clays) and other older units. The River-channel Deposits comprise the materials intermittently transported by the present river. The Younger Alluvium includes quaternary alluvial fill of recent age that extends alongside the Santa Ynez River in the flood plain.

[2] For certain purposes, such as under the Water Conservation District Law, underflow of the lower Santa Ynez River has been referred to as groundwater. (See, e.g., Wat. Code, § 75500 et seq.)

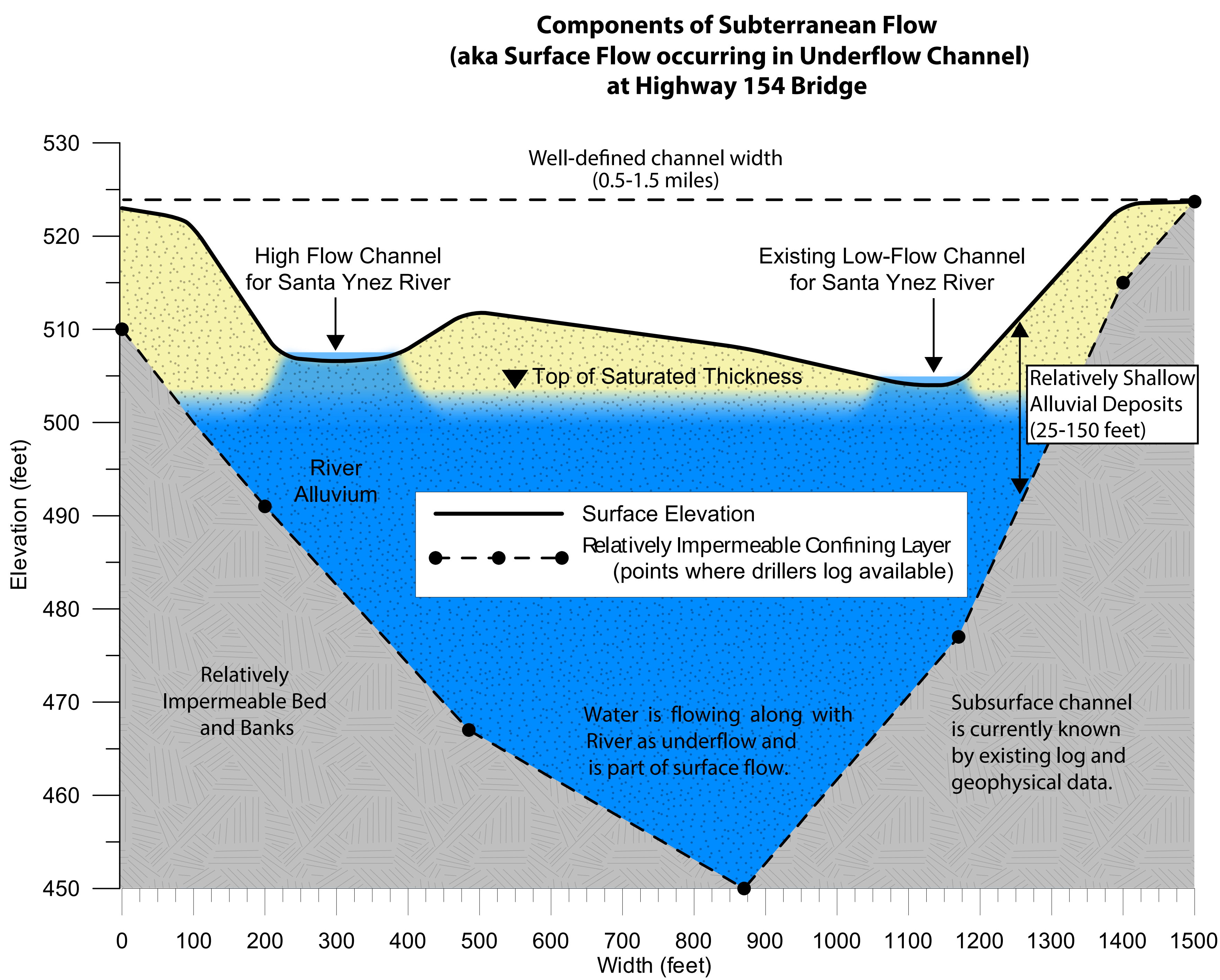
In addition to the State Board record discussed above, the USGS papers provide substantial evidence that reasonably support several technical conclusions:

1. The Santa Ynez River replenishes the River-channel Deposits and Younger Alluvium.
2. Older impermeable formations along the south side of the river form the underflow channel limits on that side. The older formations rise steeply to the south where more rainfall and runoff typically occurs due to the higher elevations and orographic effects.
3. Older impermeable formations along the north side of the river form underflow channel limits on that side. These formations form a bedrock lip that separates older less permeable formations (Paso Robles and Careaga Sand) from the River-channel Deposits and Younger Alluvium adjacent to the Santa Ynez River. There are some additional permeable depositions to the north along tributaries, however the bottom elevations of those depositions are higher than the top of the river channel basin.
4. In the Buellton area, there is limited hydrologic continuity between the Younger Alluvium and the older less permeable formations (Paso Robles and Careaga Sand) which are exposed to the base of the Younger Alluvium. There are extensive clay zones in the upper portion of the Paso Robles and Careaga Sands in this area. This clayey material restricts the hydrologic continuity of Santa Ynez River underflow to the deeper aquifer (see also, Stetson, 1977; Stetson, 1992).

Figure 1 shows the plan view and width of the River-channel Deposits and the Younger Alluvium in the Santa Ynez River Alluvium subarea. Upstream of the Lompoc Narrows, the subsurface channel of the Santa Ynez River ranges from 0.5 to 1.5 miles in width. Figure 2 shows a cross-section of this geology at the Highway 154 Bridge, which is representative of the subsurface channel of the lower Santa Ynez River above the Lompoc Narrows. Throughout the reach from Lake Cachuma to the Lompoc Narrows, the subsurface channel composed of River-channel Deposits and Younger Alluvium ranges from 25 to 150 feet in thickness and is typically 30 - 80 feet thick (Stetson, 1992).

The permeability of the river gravel deposits along the Santa Ynez River ranges from 100 to 700 feet per day with typical values of about 500 feet per day (USGS, 1951). This permeability of the River-channel Deposits and the Younger Alluvium is further indicative of the direct connectivity between the surface and underflow of the Santa Ynez River. In contrast, the permeability of the clays and shales that form the bed and banks for the majority of the subsurface channel would be expected to be less than 0.01 feet per day based on the hydrogeologic properties of clays and shales (Freeze and Cherry, 1979).

In the Buellton area, between Solvang and the Buellton Bend where the subsurface channel River-channel Deposits and the Younger Alluvium are in contact with the older formations of


Components of Subterranean Flow
(aka Surface Flow occurring in Underflow Channel)
at Highway 154 Bridge
Well-defined channel width
(0.5-1.5 miles)
High Flow Channel
for Santa Ynez River
Existing Low-Flow Channel
for Santa Ynez River
Top of Saturated Thickness
Relatively Shallow
Alluvial Deposits
(25-150 feet)
River
Alluvium
Surface Elevation
Relatively Impermeable Confining Layer
(points where drillers log available)
Relatively
Impermeable Bed
and Banks
Water is flowing along with
River as underflow and
is part of surface flow.
Subsurface channel
is currently known
by existing log and
geophysical data.
Elevation (feet)
530
520
510
500
490
480
470
460
450
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
Width (feet)
FIGURE 2

Paso Robles and Careaga Sands, the permeability of the bed and banks is estimated to range from 0.1 to 3 feet per day (Stetson, 2020). This permeability is two to three orders of magnitude less than the permeability of the River-channel Deposits and the Younger Alluvium in the subsurface channel and thus relatively impermeable.

3 EVIDENCE OF UNDERFLOW

The direct hydraulic connection between the River-channel Deposits and the Younger Alluvium and the surface flow in the Santa Ynez River upstream of the Lompoc Narrows is evidenced by the high permeability of the river alluvium and responses in water levels of alluvial wells during surface flows. In USGS Water Supply Paper 1107 (USGS, 1951), this area of underflow was described as follows:

> The unconsolidated deposits beneath and adjacent to the river transmit a certain amount of underflow which is not measured at the successive gaging stations. Obviously, however, this underflow is an integral part of the water resources of the river valley.

The hydraulic connection between the subsurface channel deposits and the Santa Ynez River is described in USGS Water Supply Paper 1467 as follows (USGS, 1959, emphasis added):

> The Santa Ynez River in the reach between Cachuma Dam and Robinson Bridge flows on a body of alluvial deposits that ranges in width from a few hundred feet to more than a mile and in maximum thickness from about 40 to about 185 feet. These deposits, *which are in hydraulic contact with the river*, form a ground-water storage reservoir from which water can be pumped to irrigate the agricultural lands adjacent to the river.

As described above, the hydraulic connection between the water level in the subsurface channel deposits and surface flow is so strong that the water levels in the underflow channel are entirely dependent upon flow in the Santa Ynez River. In fact, the existence of a relatively impermeable subsurface channel and a hydrologic connection between surface and subsurface flows in this area have been relied upon by the State Board, to determine when water is to be released from Bradbury Dam to satisfy downstream water rights.

The Santa Ynez River Valley experienced a prolonged drought from 1947 through 1951, followed by storms in early 1952. Figure 3 shows that over the drought and recovery periods the response of wells to surface flow in the Santa Ynez River is immediate and illustrates the direct connection between subsurface water levels and the surface stream. This quick response in water levels in the underflow is also evident after water rights releases from Bradbury Dam during periods when no storms are occurring.

The hydrograph for well 6N/32W- 9A1 located in the Younger Alluvium about a half mile from the river responds quickly to flow in the river similar to the well located in the River-channel

Response to River Flow

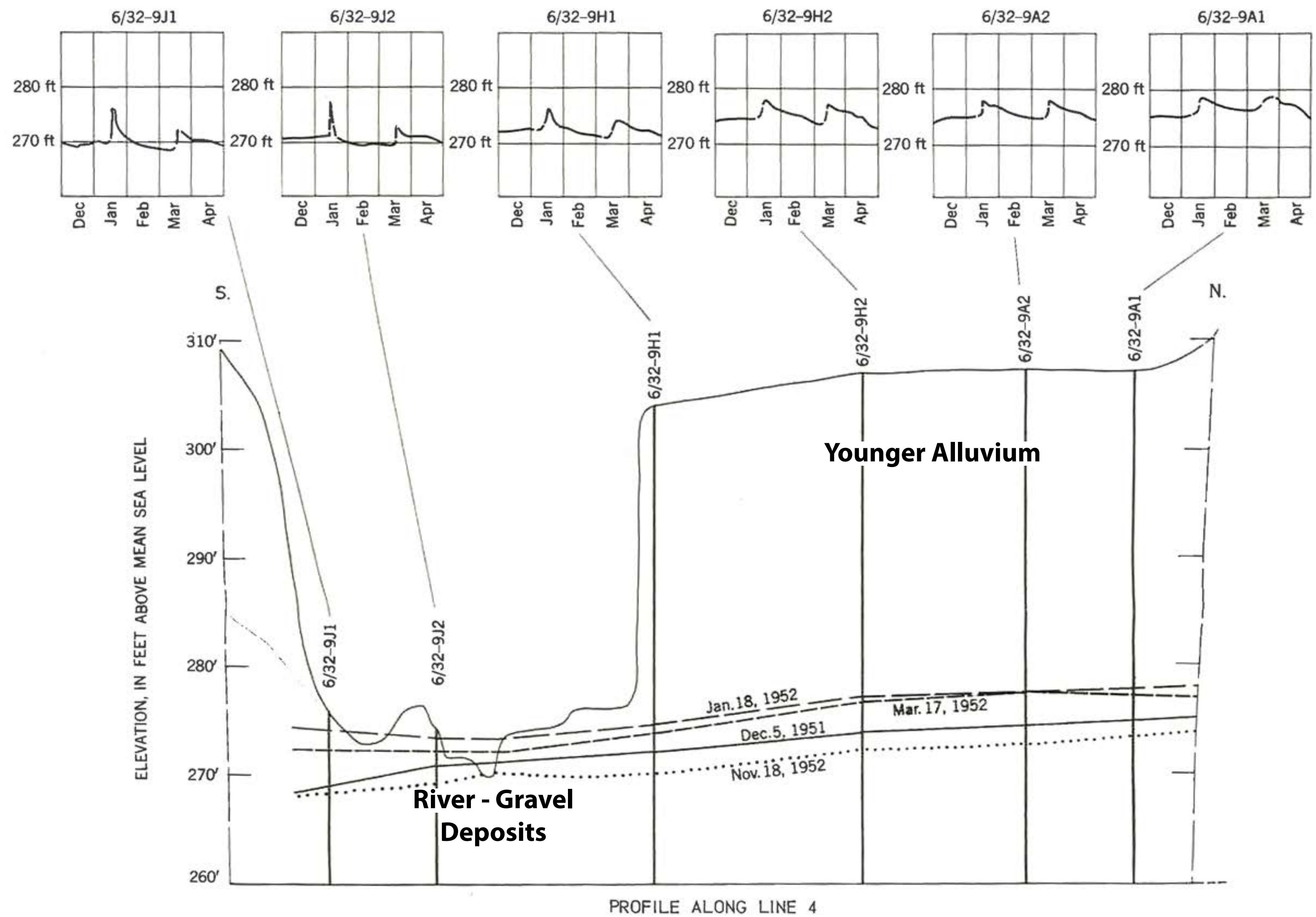


Figure 3 - Underflow Water Level Response to Surface Flow upstream of Buellton Bend in January and March 1952

Source: U.S. Geological Survey. 1959. Wilson. USGS Water Supply Paper 1467.

STETSON ENGINEERS INC.

Deposits, 6N/32W- 9J2. In the USGS Water Supply Paper 1107 (USGS, 1951), the USGS further describes the connection in both geologic formations:

> Thus, throughout its reach from San Lucas Bridge downstream to about 3,000 feet beyond Robinson Bridge, no thick impermeable strata intervene between the bed of the Santa Ynez River and the lower member of the younger alluvium. Accordingly, throughout that reach there is free interchange of water between the river and the lower member of the younger alluvium. Therefore, the lower member contains and transmits river underflow. Also, as its cross-sectional area is much greater than that of the river-channel deposits, the lower member transmits the bulk of that underflow.

4 CONCLUSION

Based on extensive evidence, as well as Stetson's experience of more than 50 years working in the Santa Ynez River Valley for a number of agencies, including work for the State Board, we believe that the water in the River-channel Deposits and the Younger Alluvium downstream of Lake Cachuma and upstream of the Lompoc Narrows constitutes underflow in a definite and known channel with a defined and relatively impermeable bed and banks. This finding is also consistent with the practice of the State Board, which has considered applications and granted permits for diversion of underflow of the Santa Ynez River. (See, e.g., State Board Water Rights Decisions 886, 1338, 1486; State Board WROs 73-37, 89-18, 2019-0148; USGS Papers 1107, 1467.) Accordingly, this water is distinct from "groundwater" as defined by SGMA. In addition to the technical analyses contained in the respective GSPs for the Basin, the information described herein has been used to support the descriptions and analyses of the groundwater system and surface water systems of the Basin in accordance with the provisions of SGMA and the SGMA Regulations.

5 REFERENCES

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Jim McCord, Ph.D., P.E.

Principal Hydrogeologist / Water Resources Engineer

Lynker

Education

Ph.D., Geoscience, Dissertation in Hydrogeology, New Mexico Institute of Mining and Technology, 1989

M.S., Hydrology, New Mexico Institute of Mining and Technology, 1986

B.S., Civil Engineering, Virginia Polytechnic Institute and State University, 1981

Memberships/Affiliations

Professional Engineer (New Mexico #15568, in process for California)

Member, California Groundwater Resources Assoc.

Member, New Mexico Geological Society

Languages

English, Mother Tongue

Spanish, DELE (Diploma in Spanish as Foreign Tongue) Level 2, Fluent spoken and written

Consulting Employment History

Lynker Technologies, LLC, Principal Hydrogeologist - Water Resources Engineer / Groundwater Lead, July 2021 – Present

IRP Water Resources Consulting
Principal Consultant, 2020 – 2021

Geosystems Analysis, Inc.
Principal Hydrogeologist, 2018 – 2020

Amec Foster Wheeler
Principal Water Resources Engineer 2007-2018

Hydrosphere Resource Consultants, Principal Hydrologist, 1999 – 2007 (acquired by Amec)

Daniel B. Stephens & Associates, Hydrology Group Leader, 1997-1999

Summary

Dr. McCord has nearly 35 years of professional experience in hydrology, hydrogeology, and water resource investigations, with emphasis on characterization of groundwater and surface water systems, numerical modeling of hydrologic systems, river basin planning and management, water supply and availability analysis, vadose zone hydrology, contaminant hydrology, surface water and groundwater interaction, water rights, and stochastic hydrology and geostatistics. Prior to embarking on his water resources consulting career, Dr. McCord was employed as Assistant Professor of Civil Engineering and Geology at Washington State University (1988 – 1990) and as Senior Member of the Technical Staff at Sandia National Laboratories (1990 – 1997), where he worked on radioactive waste management issues.

Over his nearly 20 years with Hydrosphere and Amec Foster Wheeler (who acquired Hydrosphere in 2007), Dr. McCord served as New Mexico manager (1999 – 2007), Water Resources Technical Director for Texas – New Mexico (2007-2011), and Water Resources Technical Director for South America (2011 – 2016). He is a recognized expert in Vadose Zone Hydrology, has authored numerous consulting reports and technical peer-reviewed papers, and co-authored the textbook, *Vadose Zone Processes* (CRC Press, 1999). Following a summary of core skills is a listing of representative projects in which Dr. McCord played an important role.

Core Skills

- Mine water management
- Seepage in mine waste rock dumps and tailings storage facilities
- Heap leach optimization studies
- Hydrogeology and Vadose Zone Hydrology
- Groundwater flow and transport modeling, from site- to basin-scale
- Unsaturated flow and contaminant transport
- Groundwater recharge processes
- Surface water/groundwater interactions
- Hydrologic analyses in Water Rights
- Crop Water Use / Irrigation Hydrology

Project Experience

Sustainable Groundwater Management and Water Rights

Development of Spatially Distributed Recharge Estimates and Surface Water-Groundwater Interactions for Aquifers in Central and West Texas *Texas Water Development Board, 2020 - current*

Teamed with WSP, LRE Water Consultants, and Dr. Raghavan Srinivasan (Texas A&M University), Dr. McCord is supporting Development of Recharge Estimates and Surface Water-Groundwater Interactions for Aquifers in Central and West Texas. A variety of modeling approaches are being employed to develop the estimates, and Dr. McCord is leading the effort to evaluate the use of satellite-based tools such as GRACE and MODIS to compare to and in some cases help constrain the estimates.

Hydrology and Hydrogeology Expert Consultant, Casitas Municipal Water District

Casitas Municipal Water District, Ventura County, California, 2020 - current

For Casitas Municipal Water District (Ventura County, California), Dr. McCord is serving as a hydrogeology and hydrologic modeling expert in support of the District's TAC (Technical Advisory Committee) involvement and review of the integrated hydrologic – hydrogeologic – water quality model being developed by the State Water Boards for evaluation of fish flows for the Ventura River, review of models developed to support to GSPs in the Ojai and Upper Ventura River Subbasins, and for potential use of model in the ongoing groundwater adjudication for the basin.

Hydrology Expert, Navajo Nation, Zuni River Basin and Little Colorado River Adjudications

Navajo Nation Department of Justice, Arizona and New Mexico, 2007 - 2019

For the Navajo Nation DOJ, Dr. McCord served as the hydrology expert on two water rights adjudications (Little Colorado River Basin, Arizona, and Zuni River Basin, New Mexico). Tasks include evaluating water claims and demands (including agricultural, M&I, and domestic) by other water users in the basin, developing Navajo claims, evaluating surface water and groundwater supplies and availability in the basins, development of a three-dimensional groundwater flow model for the Zuni River Basin, evaluation and application of a unique surface water model (based on PRMS) to estimate surface water diversions - depletions associated with Hopi agricultural systems, development of expert reports, and expert testimony.

Water Supply and Water Rights Due Diligence for Vineyard Acquisition, Aconcagua River Valley, Chile

Confidential Client, California, 2018

For a confidential client, Dr. McCord led a due diligence assessment of the irrigation water supply reliability and sustainability for a 540-hectare vineyard property in the Aconcagua River Valley of Chile; currently only 105 hectares are being cultivated (1 hectare = 2.47 acres). The assessment included an evaluation of existing water rights (both surface water and groundwater) held by the farm, the historical yield of the surface rights, hydrogeologic analyses to identify preferred areas to install wells and thus perfect existing groundwater rights, and evaluation of various approaches (including groundwater banking) to increase the sustainability of the farm water supply.

GSP Groundwater Model Development, Santa Ynez River Basin Eastern Management Area

San Antonio Creek Basin Groundwater Sustainability Agency, Los Alamos, California, 2020 - current

Working under subcontract to GSI Water Solutions (GSI), Dr. McCord supported development of an annual and monthly timestep water budget tool, utilizing best available historical data and DWR requirements related to GSP development. He led the effort in bringing in gridded hydrologic data (recharge, ETo, ETa, and runoff) from the USGS Basin Characterization Model (BCM), adjusting the gridded data to honor local weather station monthly precipitation, and filtering and processing the data to develop future climate series that met SGMA requirements and incorporated climate change factors per DWR.

Groundwater Sustainability Plan Groundwater Model Development, Tulare Lake Subbasin, San Joaquin Valley

Tulare Lake Subbasin Groundwater Sustainability Agency, San Joaquin Valley, California, 2016 - 2020

Supported the development of the 3D groundwater flow model that will be used as the quantitative basis for development of a Groundwater Sustainability Plan (GSP) for the Tulare Lake subbasin in Kings County, California. The GSP for the Tulare Lake subbasin must be completed and delivered to DWR by 2020 per the requirements of the SGMA. The preliminary model was delivered in March 2018, and the updated GSP model was delivered in December 2019.

Groundwater Hydrology Expert, Surface Water – Groundwater Interactions Along South Platte River

City of Boulder, South Platte Basin, Colorado, 2005-2011

Retained by the City of Boulder, CO as groundwater hydrology expert, Dr. McCord evaluated and critiqued numerous water supply augmentation plans submitted by alluvial aquifer water users / irrigators in the Lower South Platte River, Colorado. The evaluations focused on assessing the quantity and timing of depletions to South Platte flows caused by groundwater pumping. Most of the cases involved development and application of site-specific 3D numerical models of groundwater flow, and preparation of expert reports, as well as depositions and testimony in Colorado Water Court.

Hydrologic Impacts of Water Rights Acquisitions and Transfers, Middle Rio Grande Basin, New Mexico

Middle Rio Grande ESA Collaborative Program, NM ISC, 2004 - 2005

The Water Acquisition and Management Subcommittee (WAMS) of the Middle Rio Grande Endangered Species Act Collaborative Program made preliminary estimates of the volume of water required to meet the flow targets of the 2003 Biological Opinion regarding the silvery minnow. This study addresses how a water rights acquisition program in the Middle Rio Grande Basin might work, how water rights transfers might be affected, recommended terms and conditions for to be placed on transfers to avoid increased depletions in the basin, and the likely magnitude of the acquisitions.

Hydrogeology, Hydrochemistry, and Groundwater Transport Studies, Wadi Ibrahim, Saudi Arabia

Saudi Geological Survey, Mecca Valley, Saudi Arabia 2010 - 2012

On contract to the Saudi Geological Survey, Dr. McCord served as project manager and principal hydrogeologist for a study of Wadi Ibrahim hydrogeochemistry and isotope hydrology Study. Specific tasks included evaluation of aquifer hydrochemistry and geochemistry include isotope chemistry, recharge sources and rates, hydraulic properties, flow path characterization, and design and execution of single- and multi-well tracer tests for aquifer transport characteristics.

Hydrology and Water Resources of Lower Pecos River Basin, New Mexico

New Mexico Interstate Stream Commission, 2000- 2008

Served as Project Manager and lead hydrologist for several New Mexico Interstate Stream Commission (ISC) studies related to water management issues on the lower Pecos River. Tasks included: Representing ISC on the NEPA team Hydrology Work Group for developing an EIS for re-operations of Pecos River projects; develop and apply linked surface water – groundwater hydrologic model to support adjudication settlement discussions for the lower Pecos River; analysis of seepage losses from Carlsbad Irrigation District main canal; disaggregated unidentified losses from Brantley Reservoir into three components: seepage/bank storage, submerged spring inflow, and ungaged tributary inflows.

Impacts of Coalbed Methane Development on Connected Groundwater Systems, Southern Colorado

Public Counsel of the Rockies, Huerfano and Archuleta Counties, Colorado, 2008-2011

Assessed impairment to existing water rights due to Coal-bed Methane (CBM) development in northern San Juan Basin, La Plata and Archuleta counties, and northern Raton Basin, Huerfano County, Colorado. Performed hydrogeologic evaluations and submitted expert witness documents (including affidavits in Colorado District Court, Water Division 7 and Colorado Supreme Court, Vance vs Wolfe, SEO). Included in project tasks was development of a groundwater flow model for the northern Raton Basin in Colorado and critical evaluation of groundwater models developed by energy production companies in San Juan Basin in southwest Colorado. Provided testimony in hearing before Colorado State Engineer on potential impacts of CBM development on connected surface water rights.

Isleta Pueblo Water Resources and Hydrology Expert, New Mexico

Isleta Pueblo, New Mexico, 2007 - 2011

Dr. McCord served as hydrology expert for the Pueblo of Isleta (New Mexico) addressed a variety of technical tasks including surface water and groundwater interactions in support of Rio Grande riverine habitat restoration, and evaluation of injury to Pueblo water rights due to ag to municipal transfers.

Stream – Aquifer Interactions along San Acacia – San Marcial Reach of the Middle Rio Grande

US Bureau of Reclamation, Socorro County, New Mexico, 2000-2001

Project Manager for study funded by US Bureau of Reclamation looking at surface water – groundwater interaction along the San Acacia to San Marcial Reach of Rio Grande, New Mexico. Utilizing a variety of historical data collected as early as the 1960s, Dr. McCord's analysis supported refinement of the hydrogeologic conceptual model for the reach, identified losing and gaining sub-reaches, and quantified the gains and losses (and their variability). This understanding is critical for evaluating management alternatives for this reach of the Rio Grande.

Watershed Hydrology and Habitat Restoration

Recharge Characterization and Enhancement in Semiarid Rangeland, Valencia County, New Mexico

Project manager and technical leader for the planned long-term preservation of Comanche Springs, NM and the enlargement and management of surrounding. A hydrological and ecological investigation was performed to evaluate baseline conditions and develop BMPs for stormwater and land-use management with objectives to increase aquifer recharge, decrease erosion, improve water quality, and provide habitat for "Species of Concern" and "Priority Species." Groundwater recharge under natural conditions was evaluated using environmental tracers present in waters sampled from the vadose and saturated groundwater zones.

Santa Fe Municipal Watershed Management EIS

Under contract to the US Forest Service, Dr. McCord served as lead hydrologist in support of an EIS that evaluated various management alternatives for the Santa Fe Municipal Watershed. As part of a multidisciplinary team of physical, chemical, and social scientists, Dr. McCord provided quantitative estimates of hydrologic impacts of catastrophic fire and the various treatment alternatives. Hydrologic parameters considered included peak flows in the Santa Fe River, annual watershed water yield, erosion, and reservoir sedimentation.

Hydrology and Hydrogeology Associated with Invertebrate Species Listing, Bitter Lake NWR, New Mexico

Retained by NM Interstate Stream Commission for groundwater hydrology review to accompany ISC comments to proposed ESA Listing of Invertebrates at Bitter Lakes National Wildlife Refuge, New Mexico. Report focused on the historical & future hydrology of the Roswell Basin in the vicinity of BLNWR, specifically the springs which comprise the critical habitat of the proposed species.

Surface Water – Groundwater Interactions, San Acacia to San Marcial Reach of Rio Grande, New Mexico

Project Manager for study funded by US Bureau of Reclamation looking at surface water – groundwater interaction along the San Acacia to San Marcial Reach of Rio Grande, New Mexico. Utilizing a variety of historical data collected as early as the 1960s, Dr. McCord's analysis supported refinement of the hydrogeologic conceptual model for the reach, identified losing and gaining sub-reaches, and quantified the gains and losses (and their variability). This understanding is critical for evaluating management alternatives for this reach of the Rio Grande.

Contaminant Fate and Transport / Remediation Studies

Stage 2 Investigation and Remediation of Mine Waste Rock Dump Leachate Plume, New Mexico

Supported a Stage 2 investigation to remediate perched groundwater contamination at the Tyrone Mine, NM. The site investigations are in support of design and construction of a keyed-in, low-permeability barrier and perched groundwater collection system to collect impacted water. Data from the site investigation will be used to design the Stage 2 abatement measures.

Radionuclide Transport Modeling, Uranium Milling Facility, Western US

Groundwater expert responsible for the development and application of flow and transport models to evaluate historical radionuclide concentrations in groundwater. The results of our analysis were used for exposure assessments for off-site individuals via the drinking water and food chain pathways as part of a toxic tort suit.

Tuba City Plume Contaminant Characterization and Site Closure, Arizona

Under contract to the US Bureau of Indian affairs, Dr. McCord served as senior reviewer and consultant for the Tuba City Landfill Remediation Feasibility Study, AZ to develop groundwater flow and transport models to evaluate sources of uranium contamination and potential remediation alternatives.

Evaluation of Contaminant Plume Remediation and Monitored Natural Attenuation, Louisville, Kentucky

Senior reviewer and consultant for development of models to estimate the total, mobile, and recoverable volumes and natural source zone depletion of a 20+ acre LNAPL plume in Louisville, KY. MODFLOW-SURFACT was employed to simulate reactive transport in an active water phase (both saturated and unsaturated flow) with interaction and interphase transfer with a static separate LNAPL phase. Developed remedial strategies to pinpoint locations of the project site amenable to recovery; as well as to define the areas of the site where recovery is technically impractical with use of more innovative enhanced bioremediation approaches to effective management of the LNAPL plume.

Remediation of LNAPL-Contaminated Soil and Groundwater, Southwest Alluvial Basin, Arizona

Senior reviewer and consultant for development of models to estimate the natural and enhanced bioremediation depletion of a jet fuel and aviation gas release at Williams Air Force Base, AZ. The water table at this site has risen some 90 feet creating an uncharacteristically deep LNAPL residual in the site aquifers. MODFLOW-SURFACT was used to predict the fate of residual LNAPL and dissolved phase contamination following aggressive, steam-flushing recovery operations at the site.

Transport of Contaminants through the Vadose Zone, Redlands, California

Redlands Toxic Tort Litigation, California, Served as methodology expert in evaluation of contaminant transport through the vadose zone. Contaminants included organic solvents disposed of from industrial and manufacturing facilities.

Natural Resources Damage Claim, Rocky Mountain Arsenal, Denver, Colorado

As the groundwater expert to the Colorado Office of Attorney General, Dr. McCord worked with interdisciplinary team of scientists and engineers to assess and quantify injury to groundwater resources and water supply impairment due to historical site operations at the Rocky Mountain Arsenal, CO, as part of a Natural Resources Damage Claim by the state. Tasks involved review and analysis of historical site data, as well as development and application of a regional groundwater flow model.

LNAPL Contaminant Plume Characterization and Remediation, Artesia, New Mexico

Evaluation of transport of petroleum contamination plume emanating from a refinery and migrating in an alluvial aquifer toward the Pecos River, NM. Tasks included acquisition and compilation of site data, interpretation of plume migration data, evaluation of site observations to groundwater quality standards at various locations, development and application of groundwater contaminant transport model.

Soil and Groundwater Contamination by DNAPL, Characterization and Remediation, New Mexico

Under contract to US Department of Justice, Dr. McCord served as Project Manager and groundwater expert on a case which involved subsurface contamination by DNAPL at an industrial site on Albuquerque's west mesa, NM. Evaluated observed contaminant plumes (water and gas phases) for current and historical conditions in both the vadose and saturated zones. Considered impacts of municipal well pumping and a nearby irrigation ditch system on the dynamics of the fate and transport processes. Prepared expert report and was involved in technical aspects of the settlement negotiations.

Regional Hydrogeologic Characterization, Sandia National Laboratories, Albuquerque, New Mexico

Project Manager for Sandia National Laboratory (SNL) Site Wide Hydrogeologic Characterization Project. Development and testing of surface and subsurface hydrologic conceptual models for environmental restoration sites at the 200 square mile SNL region. Annual reports, regional groundwater characterization and monitoring wells, definition and characterization of representative vadose zone settings across the region, and characterization and monitoring of the site-wide surface water system.

Vadose Zone Greater Confinement Disposal Site, Nevada Test Site, Nevada

Development and application of vadose zone hydrologic models to project radionuclide migration rates associated with disposal of low-level and "orphan waste" to be disposed of in the Greater Confinement Disposal Test located on the Nevada Test Site in southern Nevada.

Soil and Groundwater Contamination by Wood Treating Chemicals, California, Washington, Texas, Louisiana

Project Manager and groundwater expert in major insurance recovery case involving five separate wood treating plant facilities across the country (LA. TX, MO, CA and WA). Development of contaminant histories based on plant records (going back to the early 20th century), site specific data and contaminant fate and transport modeling.

Performance Assessment Models of Regional Groundwater Flow and Transport, WIPP, New Mexico

Supported the development of a regional MODFLOW model used to define groundwater flow patterns and rates in the vicinity of the Waste Isolation Pilot Plant (WIPP), NM site, and application of the SECO performance assessment model to evaluate potential radionuclide releases over a 10,000-year performance period. Provided written and oral rationales for groundwater transport parameters to EPA and National Academy of Science technical review panels and developed QA records for the WIPP license application.

Contaminant Transport Characteristics in Fractured Dolomite, WIPP Site, New Mexico

Member on a team of scientists from Sandia National Labs, Lawrence Berkeley National Lab, Oregon State University, and private consultants responsible for analysis of single- and multi-well tracer test results. Tracer tests were undertaken to infer flow and transport properties of geologic media along the major release pathway from the proposed WIPP, NM. Provided written and oral rationales for groundwater transport parameters to EPA and National Academy of Science technical review panels and developed QA records for the rationales and values for the parameters as part of the WIPP license application.

Mine Water Management

Analysis of Seepage, Las Bambas Mine Waste Rock Facilities, Apurimac, Peru

Working with DHI under contract to Mining & Minerals Group (MMG), Dr. McCord is leading the effort in detailed seepage analysis. Tasks undertaken in this effort include review and compilation of waste rock materials properties, climate data analysis, and development and application of a numerical model of long-term seepage (including matrix and macropore flow) for the waste rock facility. Dr. McCord's waste rock facility seepage analyses modeling results will be used as input for the regional groundwater flow model developed in FEFLOW

Peer Review of Hydrogeologic Flow Model, Vega Sapunta, Pampa Puno Mine, Chile

Under contract to CODELCO and working with Ausenco hydrogeologists, Dr. McCord served as senior consultant and reviewer of detailed 3D regional hydrogeologic flow model (developed in MODFLOW-USG) of the Cerro Leon and Quebrada Yocas basins that converge and feed the Vega Sapunta wetlands, a protected ecological zone. The model had been developed specific ally to evaluate impacts of well fields located upgradient of the wetlands that supply water for the Pampa Puno mine.

Analysis of Seepage, Zafranal Waste Rock and Tailings Management Facilities, Arequipa, Peru

Under contract to Teck, Dr. McCord led the effort in detailed seepage analysis. Tasks undertaken in this effort included development of a TMF conceptual model for seepage development, and development and application of a numerical model of draindown seepage from the TMF and another for long-term seepage (including matrix and macropore flow) for the waste rock facility. Dr. McCord's TMF and Waste Rock Dump modeling results were used as input for the regional model developed in FEFLOW.

Analysis of Waste Rock Seepage, Antapaccay – Tintaya Mines, Cusco, Peru

Under contract to DHI, Dr. McCord led the effort in detailed seepage analysis. Tasks undertaken in this effort included development and application of a hybrid analytical - numerical model for long-term seepage (including matrix and macropore flow) for the waste rock facility and working closely with regional modeling team (FEFLOW) to ensure consistency between the two modeling efforts.

Analysis of Seepage, Antamina Waste Rock Dump, Ancash, Peru

Working with GeoSystems Analysis scientists under contract to Antamina, Dr. McCord led the effort in detailed seepage analysis for the East Waste Rock Dump. The effort included compilation and integration of more than a decade's worth of monitoring and experimental data generated by the client since 2009 and synthesized the data to support development and application of a transient water balance model for the waste rock facility. The results of this model will be used to support mine closure engineering and water management.

Analysis of Seepage from Tailings Storage Facility and Waste Rock Dumps, Candelaria Mine, Chile

For an EIA in support of expansion of the Candelaria project, Dr. McCord performed detailed seepage analysis, which included development and application of a numerical model for long-term seepage for the waste rock facility. For the tailings management facility, Dr. McCord supported the FEFLOW team in the development and application of post-operations draindown modeling embedded within the regional model.

Analysis of Seepage and , Drystack Tailings Facility, Rosemont Mine, Arizona

In support of mine planning for the planned Hudbay drystack tailings facility (DTF) at the Rosemont Mine in Arizona, Dr. McCord played a senior consultant role in the development of a hydrologic conceptual model for seepage development in the DTF, design and execution of a laboratory characterization program for the drystack tailing materials, analysis of geotechnical and soil-physical properties from the laboratory test results, and development and application of a numerical model of seepage and subsurface flow, with the objective to project long-term seepage rates from the facility.

Analysis of Seepage and Karst Risk, Antamina Nequip Valley Waste Rock Dump, Ancash, Peru

Working with Amec team of engineers in the final design of the Nequip Valley waste rock storage facility, Dr. McCord led the effort in seepage analysis, under drainage, and seepage collection systems. Evaluated and support refined designs of seepage collection systems and geomembrane locations and installation utilizing data and information from drilling programs and previous Nequip Valley karst studies.

Lagunas Norte Project (Barrick Gold), Water Resources Lead for Modification to EIA, Peru

Under contract to Barrick Gold, Dr. McCord led the water resources effort for the EIA study for the Lagunas Norte project expansion and supported the mine operations team by evaluating the ability of the pit dewatering activity to provide the supply required for the mine expansion. For the water resource activity, particular tasks performed by AMEC included: compilation of historical hydrology and hydrogeology data, and development of a GoldSim water balance and water quality model, and a three-dimensional numerical model of groundwater flow for the mine area.

Stage 2 Investigation and Contaminated Groundwater Abatement Plan, Tyrone Mine, New Mexico, USA

Under contract to Freeport McMoran Tyrone mine, DR. McCord served as a senior consultant on a Stage 2 investigation and detailed design for perched groundwater in Oak Grove Wash / Brick Kiln Gulch (OGW/BKG), which has been contaminated by acid drainage associated with the mine operations. As part of implementing these measures, site investigation and conceptual design activities in OGW/BKG had previously been completed, and the objective of this project was to conduct site investigation services to support design and construction of a keyed-in, low-permeability barrier and alluvial (perched) groundwater collection system to collect impacted water which flows to and through OGW/BKG and will accumulate up-gradient of the proposed low-permeability barrier. Data from this site investigation is being used to design the Stage 2 abatement measures for perched groundwater in OGW/BKG.

Fruta del Norte Project, Water Resources Coordinator for Feasibility Study, Ecuador

Under contract to Lundin Gold, Dr. McCord supported the feasibility study for this gold mine, in the “ceja de selva” (edge of the jungle) in southeast Ecuador. For this project, he led the water resource studies for the project, coordinating activities among AMEC staff and subcontractors who performed the hydrogeologic and surface hydrology characterization and modeling efforts, and played a key role in development of mine water management strategies.

Pampa de Pongo Project Water Resources Lead for EIA, Arequipa, Peru

Under contract to Jinzhao Mining Company, AMEC performed the EIA study for the Pampa de Pongo Project, located near the coast in the Department of Arequipa in southern Peru. For this project, Dr. McCord led the water resource studies for the project and supported the geotechnical analysis of the of pit wall stability for the feasibility study. For the water resource activity, particular tasks performed by AMEC included hydrology and hydrogeology field characterization, core drilling, and borehole hydraulic testing; site surface hydrology, meteorology, and project area water balance; and estimation of open pit water inflows using analytical and numerical models.

Analysis of Seepage, San Nicolas Waste Rock and Tailings Management Facilities, Zacatecas, Mexico

Under contract to Teck, Dr. McCord led the effort in detailed seepage analysis, which included development and application of a numerical model of draindown seepage from the TMF and another for long-term seepage (including matrix and macropore flow) for the waste rock facility. The results of these models were used as part of the upper boundary condition for the regional flow model developed in FEFLOW.

Studies and Engineering, Sustainable Management of Tailings, Minera Doña Inés de Collahuasi, Chile

Provided services in disciplines of hydrogeology and acid drainage. Preparation Analysis of Relevance and PAS 135, 137 and 155. Oversight Activities of soil sampling, QA/QC control of soil analysis, and acid mine drainage determination, updated hydrogeologic conceptual and numerical model of seepage and contaminant transport.

Analysis of Seepage and Acid Drainage, Quillayes –El Chinche Tailings Facility, Los Pelambres Mine

In support of closure planning for this tailings facility, AMEC is performing a detailed hydrogeological study, tasks have included sampling activities of tailings and water, QA/QC control of analysis of tailings and water samples, water quality assessment and geochemical modeling of water quality, installation of piezometers, development of a hydrogeological conceptual model, and development and application of a numerical model of seepage, subsurface flow, and contaminant transport.

Antamina Mine Project Regional Hydrogeologic Integration and Hydrogeologic Geodatabase

Under contract to Antamina, Dr. McCord served as project manager for AMEC team charged with integrating all hydrogeologic data collected since site inception into an ArcGIS geodatabase, and compiling a hydrogeologic integration report, as well as developing three- and four-dimensional data visualizations. The hydrogeologic integration report involved summarizing all past work, with a particular focus on site studies undertaken since 2008, identifying important data gaps, and developing a site-wide integrated hydrogeologic conceptual model that could be used to provide a framework for interpreting existing and newly acquired site data.

La Granja Project Water Resources Lead for Prefeasibility Study, Peru

Under contract to Rio Tinto Mining Company, AMEC performed the prefeasibility study for the "starter case" for the La Granja Mine Project, located in the Department of Cajamarca in northern Peru. For this project, Dr. McCord led the water resource studies for the project and supported the analysis of the heap leach planning task. For the water resource task, Dr. McCord coordinated activities among AMEC staff and subcontractors who performed the hydrogeologic and surface hydrology characterization and modeling efforts and played a key role in development of mine water management strategies.

Carmen de Andacollo Project – Hydrogeologic Analyses in Support of Tailings Facility Expansion, Chile

On contract to Compania Minera TECK, AMEC is providing hydrogeological characterization and analyses in support of expansion of the mine tailing facilities. As part of this effort Dr. McCord is providing senior review and consulting to the AMEC E&I team in Santiago involved in data analysis, field characterization, and hydrogeological modeling.

Mina Huaron and Mina Morococha, Water Resources Management and Compliance with LMP and ECA Water Quality Standards

Under contract to Pan American Silver Corporation, AMEC led efforts to characterize mining project water management and discharges to evaluate current conditions and develop water management and treatment plans to ensure compliance with the new Peruvian LMP (Limitacion Maximum Permisible, basically end-of-pipe discharge) and ECA (Estandard de Calidad Ambiental, basically river standards at locations downstream from end-of-pipe discharges) for the Huaron and Morococha mines in the Peruvian Andes. Dr. McCord led the water management team involved in analysis of existing data and development of water management models for evaluation of alternatives to ensure compliance with new standards. Treatment alternatives considered included standard mine water treatment plants, innovative water recycling and management schemes, and constructed wetlands and permeable reactive barriers.

Ollachea Mine Project Hydrology and Hydrogeology for Prefeasibility and Feasibility Studies, Peru

Under contract to IRL / Compania Minera Kuri Kullu, Dr. McCord performed project management, model development, and senior review tasks for the hydrology and hydrogeology activities for the project pre-feasibility study. Particular tasks performed by AMEC hydrology and hydrogeology team included: field characterization, core drilling, and borehole hydraulic testing; site surface hydrology, meteorology, and project area water balance; and estimation of underground mine tunnel inflows using analytical and numerical models (MODFLOW-USG).

Hydrogeological Modeling of the Limestone Quarries, Toromocho Project, Peru

As part of mine development studies for Minera Chinalco Perú S.A., AMEC constructed a groundwater flow model to evaluate likely timing that seepage from the tailings facility would begin flowing into the limestone quarry. Dr McCord served a project manager of this effort which involved staff from US and Peru office. The project was performed on a very accelerated schedule to address concerns that arose during the facility permitting process and utilized the limited available data from the quarry area to generate a numerical model suitable for addressing questions raised by government regulators.

Quechua Mine Water Balance, Peru

For Compañía Minera Quechua performed senior review for the development of a comprehensive water balance of the Proyecto Minero Quechua mine during the operating phase. Water balances for the construction and closure phases are currently under development.

Bongará Mine Hydrogeologic Studies, Amazonas, Perú

Under contract to Votorantim, Amec developed an EIA for an expanded resource exploration program, and Dr. McCord served as senior reviewer on the water resources / hydrogeologic study for the EIA. The hydrogeology study included mapping in the steeply eroded karstic terrain, over 1,000 of hydrogeologic characterization boreholes, hydraulic testing of boreholes, and tracer testing in discrete karstic features. From that data and information, a hydrogeologic conceptual model was developed, as well as a scope and referential budget for follow-on hydrogeologic studies.

Tyrone Mine Pit Lake Model for Closure Plan, New Mexico

Senior reviewer for hydrogeology team in development of pit lake model to address a variety of issues, including estimating the post-closure recovery period of water levels in the mine pits and surrounding aquifers, and project the post-closure steady-state pit lake(s) surface elevation(s), examining the potential for pit lake outflows, and evaluating the potential interactions of pit lake(s) with other mine facilities, hydrologic features, and geologic structures.

Corani Mine, Water Resources Lead for EIA, Peru

Under contract to Bear Creek Mining Company, Dr. McCord performed project management, oversaw model development, and senior review tasks for the hydrology and hydrogeology, and water resource management tasks for the project EIA study. Utilizing existing data supplemented by AMEC-collected data on site hydrology, hydrogeologic measurements and mapping, and water quality sampling team, developed linked surface water and regional groundwater models, and project area water balance to provide EIA impact analysis for water resources.

Unsaturated Flow and Transport Analysis of Heap Leach Operations

Developed a conceptual model for heterogeneous distribution of hydraulic properties within a heap leach pad for the Tyrone Mine in southwest New Mexico. Based on the conceptual model, constructed and applied a variability saturated flow and transport model to evaluate the potential for channeling and flow bypass at various surface application rates, and leaching efficiency as a function of irrigation rates and patterns.

Expert Witness

- 2022, Adjudication of Water Rights in the Ventura River Watershed, California; Civil Case No. 19STCP01176, Superior Court of the State of California, County of Los Angeles. *Deposition testimony* on behalf of the Casitas Municipal Water District, water provided to more than 200,000 persons in the basin. As expert in trial Phase I, Dr. McCord's analysis and testimony focused on critique of the integrated groundwater-surface water model of the basin developed by the State of California experts, and connectivity between the surface water and groundwater systems in the watershed.
- 2019, General Adjudication of All Rights to Use Water in the Little Colorado River System, Civil Case No. 6417-203, Apache County Superior Court, The State Of Arizona. *Trial testimony* on behalf of the Navajo Nation, as expert in trial Phase II, Hopi Water Claims, focus on historical water resource availability, surface water modeling, and water use and depletion for agricultural and irrigation purposes. Phase II court ruling in 2019 favorable to Navajo
- 2018, General Adjudication of All Rights to Use Water in the Little Colorado River System, Civil Case No. 6417-203, Apache County Superior Court, The State Of Arizona. Filing of expert report and subsequent *deposition testimony* on contract to the Navajo Nation Department of Justice. Court-accepted expert in historical water resource availability, surface water model and water depletion analysis, and water use for agricultural irrigation purposes.
- 2012, Steadfast Insurance Company et al. vs. Terracon, Inc., et al., Colorado. Retained as plaintiffs groundwater hydrology expert, Dr. McCord served on a multidisciplinary team of hydrologists, geologists, and civil and geotechnical engineers for a large construction defects insurance recovery case. Contributed expert reports, technical exhibits to support mediation efforts, and *deposition testimony*. Case settled in August 2012 (Client: Zurich Insurance).
- 2009, Colorado State Engineer, CBM Produced Water Nontributary Rulemaking Hearing, Groundwater expert for Public Counsel of the Rockies, *testified at SEO rule-making hearing* on technical review of northern San Juan Basin groundwater model produced by CBM industry consultants (Client: Public Counsel of the Rockies).
- 2009, Isleta Pueblo vs Santa Fe Water Resource Alliance, NEW MEXICO Office of the State Engineer File No. SD-04729 & RG-74141 into SP-4842, Hearing No. 07-059. Expert reports filed and hearing testimony related to hydrologic impact of surface water transfers that moved point of diversion (and depletion) along the Rio Grande from south of Isleta Pueblo to north of Isleta Pueblo, cases settle (Client: Pueblo of Isleta).
- 2007, Vance et al vs Wolfe (Colorado State Engineer) et al. Colorado Water Court Division 7, Case No. 05CW63. Plaintiffs' hydrology expert in case to determine jurisdiction of Colorado State Engineer to adopt permitting requirements for coalbed methane wells that may be impacting plaintiffs' decreed water rights. Plaintiffs prevailed in Water Court, and case was appealed to the Colorado Supreme Court, which in 2009 affirmed the lower court ruling (see http://www.westernwaterlaw.com/articles/Vance_v_Wolfe.html).

- 2007, Sierra Club and Mineral Policy Center vs. El Paso Gold Mine, Civil Action 01-PC-2163, Federal District Court of Colorado. *Trial testimony* as groundwater flow and transport methodology expert. (Client: John Barth, Attorney-at-Law)
- 2006, Low Line Ditch Well Users, An Application For Water Rights And Approval Of Plan For Augmentation, Colorado District Court, Water Division No. 1 Case NO. 2003CW094. *Deposition testimon*y in October 2006 on impacts of groundwater pumping aspects of water rights application on senior water rights holder, case settled. (client: City of Boulder, CO; Moses, Wittemyer, Harrison, and Woodruff, P.C.)
- 2006, Dinsdale Brothers, Inc Well Users, An Application For Water Rights And Approval Of Plan For Augmentation, Colorado District Court Case Nos. 2001CW061 and 2003CW194:, Water Division No. 1. Deposition testimony in September 2006 on impacts of groundwater pumping aspects of water rights application on senior water rights holder, case settled. (client: City of Boulder, CO; Moses, Wittemyer, Harrison, and Woodruff, P.C.)
- 2006, Allen et al. vs. Aerojet General et al., Superior Court of the State of California, County of Sacramento, Consolidated Case No. RCV 31496. *Jury trial testimony* in March 2006 regarding the evaluation of historical groundwater contamination at Aerojet Rancho Cordova Plant. Case Phase I (defendant negligence) ruled in client favor, Phase 2 (damages) settled for undisclosed sum (client: Engstrom, Lipscomb & Lack)
- 2006, Well Augmentation Subdistrict of Central Colorado Water Conservancy District, Water Rights Application and Augmentation Plan, Colorado District Court, Water Division No. 1. Deposition testimony in March 2006 on impacts of groundwater pumping aspects of water rights application on senior water rights holder, case settled. (client: City of Boulder, CO; Moses, Wittemyer, Harrison, and Woodruff, P.C.)

Reports & Publications

Textbooks

Selker, J.S., C.K. Keller, and J.T. McCord, 1999. Vadose Zone Processes, Lewis / CRC Press, Boca Raton, FLA, 339 pp.

McCord, J.T., and J.S. Selker, 2003. Transport Phenomena and Vulnerability of the Unsaturated Zone, in Encyclopedia of Life Support Systems, UNESCO, www.eolss.net.

Refereed Journal Articles

McCord, J.T., C.A. Gotway, and S.H. Conrad. 1997. Impact of geological heterogeneities on recharge estimation using environmental tracers. Water Resources Research, 33(6):1229-1240.

Goodrich, M.T. and J.T. McCord. 1995. Quantification of uncertainty in exposure assessments of hazardous waste sites. Ground Water, 33(5):727-732.

Eaton, R.R. and J.T. McCord. 1995. Monte Carlo stochastic analysis of effective conductivities for unsaturated flow. Transport in Porous Media, 18(3).

McCord, J.T. 1991. On the application of second-type boundaries in modeling unsaturated flow. Water Resources Research, 27(12):3257-3260.

McCord, J.T., J.L. Wilson, and D.B. Stephens. 1991. The importance of hysteresis and state-dependent anisotropy in modeling flow through variably saturated soils. Water Resources Research, 27(7):1501-1518.

McCord, J.T., D.B. Stephens, and J.L. Wilson. 1991. Toward validating macroscopic state-dependent anisotropy in unsaturated soils: Field experiments and modeling considerations. Journal of Contaminant Hydrology, 7:145-175.

McCord, J.T. and D.B. Stephens. 1988. Comment on `Effective and relative permeabilities of anisotropic porous media' by Jacob Bear, Carol Braester, and Pascal Menier. Transport in Porous Media, 3:207-210.

McCord, J.T. and D.B. Stephens. 1987. Comment on `Effect of ground-water recharge on configuration of the water table beneath sand dunes and on seepage in lakes in the Sandhills of Nebraska, USA' by Thomas C. Winter. Journal of Hydrology, 95:365-367.

McCord, J.T. and D.B. Stephens. 1987. Lateral moisture flow beneath a sandy hillslope without an apparent impeding layer. Hydrological Processes, 1(3):225-238.

Conference and Symposia Proceedings

McCord, J.T., S. Sigstedt, S. Gangopadhyay, and R. Uribe, 2018. Stream Depletion Factors, Unit Response Functions, and streambed properties for modeling lagged river depletions due to well pumping, Western Groundwater Summit, Groundwater Resources Association of California, September 2018.

McCord, J.T., and S. Gangopadhyay, 2016. Stochastic numerical analysis of up-scaled aquifer and streambed properties for modeling lagged river depletions due to well pumping, Geological Society of America Annual Meeting, 25-28 Sept 2016, Denver, CO.

McCord, J.T., D.B. Stephens, and T.C. Jim Yeh, 2016. Moisture dependent anisotropy in unsaturated flow: theory and application, Geological Society of America Annual Meeting, 25-28 Sept 2016, Denver, CO.

McCord, J.T., J.A. Clark, N. Starr, R. McGregor, and N. Mandic, 2010. Applied Telescopic Mesh Refinement in Groundwater Modeling: Three Case Studies, NGWA National Groundwater Modeling Summit, Denver, CO, April 11-15.

Gangopadhyay, S., J.T. McCord, and S. Musleh, 2007. A Combined Stochastic-Deterministic Approach to Estimating Effective Streambed and Aquifer Properties and Lagged River Depletions due to Alluvial Well Pumping, Symposium on River, Floodplain, and Terrace Hydrology, New Mexico State University, Las Cruces, NM, Feb 28 – Mar 1, 2007.

Carron, J.C., J.T. McCord, A. Elhassan, P. Barroll, T. Stockton, and M. Rocha, 2006. Pecos River Decision Support System: Tools for Managing Conjunctive Use of Surface and Groundwater Resources, US Committee on Irrigation and Drainage Water Management Conference, October 25-28, Boise, Idaho.

Hall, L.M., J.T. McCord, and J.L. Smith, 2006. Pumping Tests Designed for Investigating Surface Water – Groundwater Interactions Along the Lower South Platte River, Northeast Colorado, NM Water Research Symposium, New Mexico Water Resources Research Institute, August 15, 2006.

Dr. McCord has more than 75 additional conference presentations and publications on a range of water resource topics dating back to 1985, and a list of those can be provided upon request.

Cannabis and Surface Water Compliance in the Santa Ynez River Alluvial Basin, Santa Barbara County, California

Cannabis Hoophouses alongside the Santa Ynez River, June 26, 2022. Photo by author.

Prepared for the Santa Barbara Coalition for Responsible Cannabis,
Santa Barbara, California

Katherine E. Anderson
September 7, 2022

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Cannabis and Surface Water Compliance in the Santa Ynez River Alluvial Basin, Santa Barbara County, California

Prepared for the Santa Barbara Coalition for Responsible Cannabis,
Santa Barbara, California
Katherine E. Anderson
September 7, 2022

1. **Preface:** The author is an investigator and researcher with the Law Office of Marc Chytilo, APC. The author was tasked to review each of the cannabis cultivation operations in the lower Santa Ynez River watershed (below Bradbury Dam) and compile evidence germane to the character of the water used by each such cannabis operator.

2. PURPOSE AND SCOPE OF REPORT

The authorization of legalized cannabis cultivation in California has resulted in numerous commercial cannabis cultivation operations throughout Santa Barbara County. A number of these projects are proposed or are currently operating either as permitted operations or as legal nonconforming operations with permits pending along the Santa Ynez River. This report addresses the characteristics of the Santa Ynez River's water flows, downstream water rights, and the habitat supporting sensitive and threatened species along its length. This report, in conjunction with a companion report prepared by Dr. James McCord of Lynker Technologies, identifies the factors that are used to characterize the waters of the Santa Ynez River and the evidence that supports the State Water Resources Control Board's exercise of jurisdiction over wells diverting subterranean flows that are utilized by these cannabis cultivators. In addition, this report describes the presence of factors justifying Department of Fish and Wildlife's actions to curtail extractions from these and other wells that extract from underflows of the Santa Ynez River that are having deleterious impacts to fish, wildlife, and other public trust resources.

3. HYDROGEOLOGIC BASIS OF STATE JURISDICTION

Almost all rivers that flow on the surface of the soil have a subsurface component, as its water can travel both above and through soil, depending on the soil's porosity. When a river channel's confining bed and banks are composed of relatively impermeable layers, such as bedrock, under California water law its subsurface waters are said to be a subterranean stream flowing through a known and definite channel and is considered surface water, subject to the jurisdiction of the State Water Resources Control Board (SWRCB)[1,2,3]. The determination whether a body of

[1] CA Water Code § 1200

[2] A Guide to California Water Rights for Small Water Users, May, 2019. Trout Unlimited and The Nature Conservancy. https://casalmon.org/wp-content/uploads/2019/11/Guide_Water_Rights_CA_FINAL_Web.pdf

water is a subterranean surface flow subject to the Board's jurisdiction is guided by the Board's Garrapata Creek case, where the Board defined a 4-part test, which requires: (1) a subsurface channel must be present; (2) the channel must have relatively impermeable bed and banks; (3) the course of the channel must be known or capable of being determined by reasonable inference; and (4) groundwater must be flowing in the channel[4].

The SWRCB uses the term 'diversion' when discussing utilization of designated surface waters to differentiate it from the 'extraction' of percolating groundwater, irrespective of whether this surface water is located above or below ground surface.

If a subterranean stream's confining bed is very broad, its floodplain and water-bearing alluvium can be somewhat distant from the visible surface flow, but any wells drawing water from this layer above the confining bed would still be considered surface flow, as defined by SWRCB Cannabis Cultivation Policy Section 2, Term #66:

> *"All water diversions for cannabis cultivation from a surface stream, subterranean stream flowing through a known and definite channel (e.g., groundwater well diversions from subsurface stream flows), or other surface waterbody are subject to the surface water Numeric and Narrative Instream Flow Requirements."*

The State Board's perspective is that water pumped from below ground is presumed to be percolating groundwater unless proven to be otherwise[5]. In the case of the Santa Ynez River, its geology and status as a known and definite channel carrying subterranean surface flow has been described for over 70 years.

The SWRCB uses the term 'diversion' when discussing utilization of designated surface waters to differentiate it from the 'extraction' of groundwater, irrespective of whether this surface water is located above or below ground surface.

3.1. Regional Setting and Subterranean Stream Determination of the Santa Ynez River

The Santa Ynez River runs east to west along the north side of the Santa Ynez Mountains in Santa Barbara County, California. Three dams impound water along its course, shown in Fig. 1[6].

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[3] Joseph L. Sax, Review of the Laws Establishing the SWRCB's Permitting Authority Over Appropriations of Groundwater Classified as Subterranean Streams and the SWRCB's Implementation of Those Laws., 1 (2002). Berkeley Law Scholarship Repository.

[4] Decision In the Matter of Application 29664 of Garrapata Water Company, Extraction of Water by Garrapata Water Company from the Alluvium of the Valley of Garrapata Creek in Monterey County, California. https://www.waterboards.ca.gov/board_info/agendas/1999/june/0617-14.htm

[5] A Guide to California Water Rights for Small Water Users, May, 2019. Trout Unlimited and The Nature Conservancy. https://casalmon.org/wp-content/uploads/2019/11/Guide_Water_Rights_CA_FINAL_Web.pdf

[6] After Southern California Steelhead Recovery Plan, January, 2012. Southwest Regional Office, National Marine Fisheries Service, NOAA, Long Beach, CA.

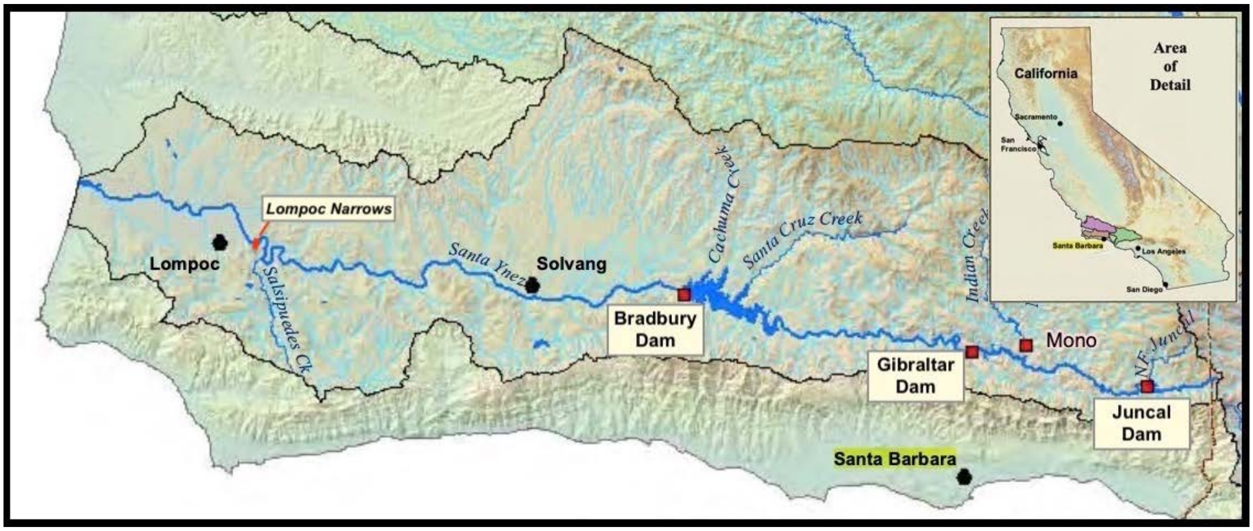

Figure 1. Santa Barbara County Rivers and Dams. ***After Southern California Steelhead Recovery Plan, January, 2012. Southwest Regional Office, National Marine Fisheries Service, NOAA, Long Beach, CA***

Gibraltar Dam began construction in 1920 to serve the city of Santa Barbara, followed by Juncal Dam in 1930 to serve Montecito. Bradbury Dam began construction in 1950.

The underlying geology of the Santa Ynez River varies along its length as it winds westward to the Pacific Ocean and was described comprehensively by Upson and Thomasson in 1951[7]. Numerous scientific research publications since that date describe the nature of the subterranean flow. From Bradbury Dam to a bedrock constriction to the east of the Lompoc Plain known as the Lompoc Narrows (Fig 1.), Stetson (2021) notes "*Its gravel alluvium is contained within banks of relatively impermeable shale, sandstone, and siltstone to the sides and below. This shallow riparian corridor is highly responsive to and primarily recharged by the Santa Ynez River's flow and various tributary streams*[8]" and releases of water from Lake Cachuma. Below the Narrows, the alluvium broadens into the Lompoc floodplain before its water reaches its estuary on the Vandenberg Space Force Base. As this floodplain is in greater contact with other water-bearing strata and receives flow from other tributary sources it is not considered part of the known and definite stream, however, water drawn from the river's alluvium for commercial cannabis cultivation could certainly impact the river's flow and estuary. The connection between the river's flow and available water supply below the Narrows is so strong that litigation settlement agreements made between the City of Lompoc, the Santa Ynez River Conservation District, and the Cachuma Conservation Release Board carefully detail river water allocations for both above the Narrows and below the Narrows[9].

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[7] *Geology and Water Resources of the Santa Ynez River Basin, Santa Barbara County, California.* USGS Geological Survey Water-Supply Paper 1107, 1951. J.E. Upson and H.G. Thomasson, Jr.
[8] Technical Memorandum, *Hydrogeological Basis for Characterization of Water within the Santa Ynez River Alluvium Upstream of the Lompoc Narrows as Underflow of the River in a Known and Definite Channel*. Stetson Engineers, Inc., December 2021. Appendix 1d-B of the CMA Groundwater Sustainability Plan, January 2022.
[9] Settlement Agreement Between Cachuma Conservation Release Board, Santa Ynez River Water Conservation District, Santa Ynez River Water Conservation District Improvement District No. 1, and the City of Lompoc, Relating to Operation of the Cachuma Project, 2002.

The Western Management Area Hydrologic Conceptual Model prepared by Stetson Engineers for the Santa Ynez Valley Water Conservation District describes the Santa Ynez River alluvium and its jurisdiction:

"*The occurrence of water in the WMA Santa Ynez River Alluvium, is considered and regulated as surface water because it flows through a known and defined channel. Water flowing in known and definite channels is not groundwater as defined by SGMA. Surface water is managed by and subject to the jurisdiction of the California State Water Resources Control Board and is not subject to the SGMA management by the WMA GSA*[10]."

Further, Section 2b of the Western Management Area (WMA) Groundwater Sustainability Plan (Groundwater Conditions) states "*In the WMA upstream of the Lompoc Narrows, as discussed in the HCM, the Santa Ynez River Alluvium is considered part of the underflow of the Santa Ynez River, which is regulated by the SWRCB (Appendix 2a-B). Because underflow is considered surface water, the Santa Ynez River Alluvial deposits upstream of the Lompoc Narrows would not be classified as a principal aquifer or managed by a GSP under SGMA.*[11]"

In response to a similar cannabis project in the Santa Ynez River, a memo dated February 6, 2019 from the California State Water Resources Control Board, Division of Water Rights clearly states that the water in the Santa Ynez River alluvium qualifies as a subterranean stream, based on satisfaction of the hydrogeologic Garrapata 4-Part Test[12].

A recent analysis performed by Dr. Jim McCord, Ph.D, PE, stated:

> *"…for those projects upstream of the Lompoc Narrows, the hydrogeologic setting is consistent with the conditions of the Garrapata criteria for defining subterranean streams that are managed by the SWRCB as part of the California's surface water rights system. Specifically, a subsurface channel is present, the channel has relatively impermeable bed and banks, the course of the channel is known and groundwater is flowing in the channel. Furthermore, quantitative modeling of a well pumping in that hydrogeologic setting shows that wells drawing from the Santa Ynez River alluvium operate akin to a diversion from the Santa Ynez River, and thus is appropriately administered as part of the surface water system per SWRCB rules.*[13]*"*

The attractiveness of the river alluvium for agricultural irrigation water is largely because of the high volumes of water available. These alluvial wells "*typically yield a few hundred to as high*

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https://www.waterboards.ca.gov/waterrights/water_issues/programs/hearings/cachuma/phase2/exhibits/ccrbid1_220a.pdf

[10] Western Management Area Hydrogeologic Conceptual Model (HCM), 2021. Section 2a of the WMA Groundwater Sustainability Plan, adopted January, 2022. p. 2a-43

[11] Western Management Area Groundwater Conditions, 2021. Section 2b.1-3-6, Santa Ynez River Alluvium, WMA Groundwater Sustainability Plan, adopted January, 2022. p. 2b-37.

[12] Memo, Subterranean Stream Determination, Buellton, Santa Ynez River, Santa Barbara County. Zach Mayo, State Water Resources Control Board, Division of Water Rights. Feb 6, 2019

[13]Hydrologic Evaluation of Irrigation Water Supplies for Cannabis Production Projects in the Santa Ynez River Valley, California, July 31, 2022. Jim McCord, Ph.D, PE, Lynker Technolo gies, LLC., p. 16

as 1500 or more gallons per minute[14]." By comparison, the confining, relatively impermeable bed and banks comprised of shales and sandstones are poor producers of water, averaging 20 to 40 gallons per minute.

As the major body of scientific knowledge of the hydrogeology of this region confirms that the Santa Ynez River contains a subterranean stream within a known and definite channel, the SWRCB's jurisdiction, and thus role in enforcing compliance with its Cannabis Cultivation Policy is clear.

4. OVERVIEW OF SANTA YNEZ RIVER CANNABIS PROJECTS

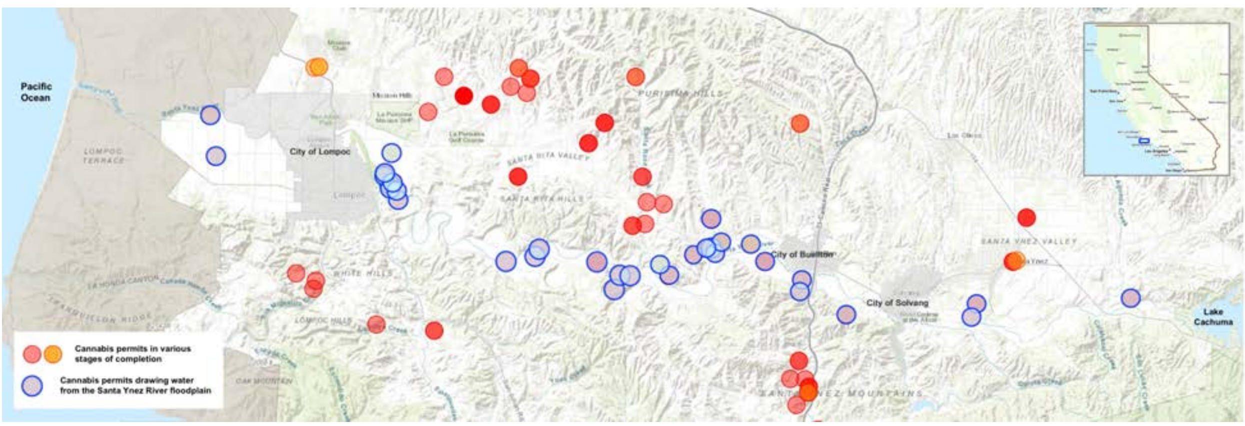

Figure 2. Cannabis Projects in the Santa Ynez River Alluvium and Surrounding Areas. ***After County of Santa Barbara Cannabis ArcGIS Map, https://sbcopad.maps.arcgis.com/apps/webappviewer/index.html?id=f287d128ab684ba4a87f1b9cff438f91***

The County of Santa Barbara has accepted applications for thirty-one commercial cannabis cultivation projects totaling 493.42 acres in the floodplain of Santa Ynez River between Lake Cachuma and Pacific Ocean. (See Appendix A.)

These projects are in various stages of the permitting and business licensing processes at the County, under the Department of Fish and Wildlife Section 1600 permit process, and at the State's cannabis licensing process. Of these thirty-one cannabis cultivation projects along the Santa Ynez River, several have had local land use permits approved, others issued, but most are still in process. Three projects have been withdrawn, but the wells and suitable fields adequate for cultivation remain, and cannabis projects could be resubmitted at a future date. For this reason, the total acreage discussed in this letter includes the acreage for withdrawn permits. The County's Land Use permitting process is discretionary, and is the only step in the County's approval process where the California Environmental Quality Act (CEQA) is applied. The County's Programmatic

[14] Western Management Area Hydrogeologic Conceptual Model (HCM), 2021. Section 2a of the WMA Groundwater Sustainability Plan, adopted January, 2022. p. 2a-43

Environmental Impact Report (PEIR) does not analyze the effects of water diversion from the Santa Ynez River for cannabis cultivation.

A cap of 1,575 acres has been set for the amount of cannabis acreage permissible in the inland (non-coastal zone) areas of Santa Barbara County. These 493.42 acres of cannabis that draw surface water from the Santa Ynez River alluvium constitute nearly one-third of all cannabis acreage in the non-coastal zone of the county.

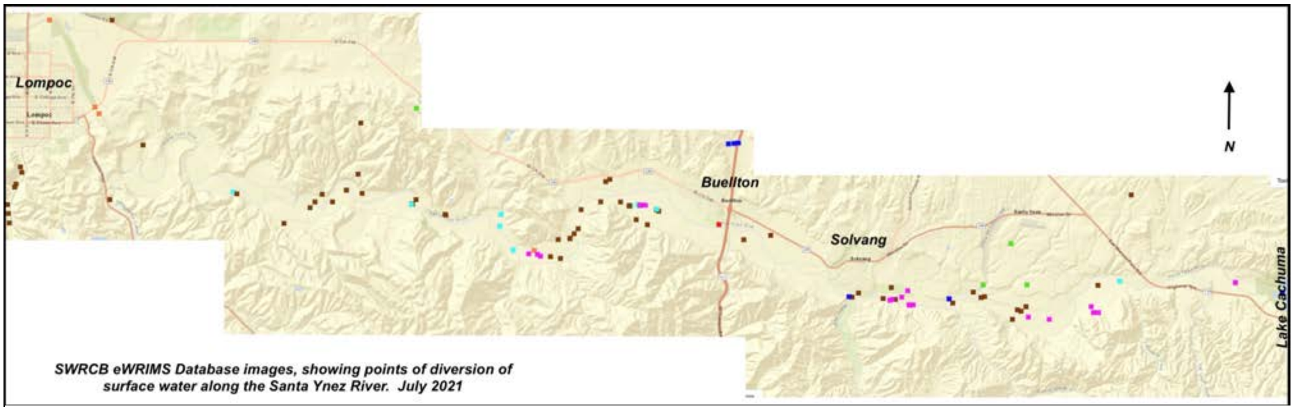

Figure 3. State Water Resources Control Board eWRIMS Database Images With Points of Diversion on the Santa Ynez River, July, 2021.

There is an extensive history of surface diversion along the Santa Ynez River. Although numerous non-cannabis wells along this river corridor report surface water diversion claims to the SWRCB, only four properties that now cultivate cannabis have previous diversion claims registered with the Division of Water Rights. Of these, none appear to have fully complied with the SWRCB's Cannabis Cultivation Policy, despite the fact that a number of them are currently in full production.

5. COUNTY REVIEW AND PERMIT PROCESS

Most large, rural, inland cannabis sites only require a land use permit for commercial cannabis in Santa Barbara County. Because land use permits are ministerial, approved in-house, a public hearing and posting of a project's documents is not required prior to approval. Documents can be requested from the County Planner responsible for the project.

The County's Land Use and Development Codes require a positive finding, based on substantial evidence, that "adequate public or private services and resources (e.g., water, sewer, roads) are available to serve the proposed development." (LUP Finding 2.1.1; LUDC § 35.30.100.A) "Lack of available public or private services or resources shall be grounds for denial of a project". (LUDC § 35.30.100.B). The County also requires that a project comply with all local and State laws (LUDC §§ 35.82.110.E.1.c.).

To satisfy these requirements, the planning process for a cannabis cultivation permit includes oversight from various State and local agencies. Coordination and cross-checks between these various agencies are meant to ensure compliance with all state and local laws. For example, a county planner would send plans and documents with a request for a project review to County Environmental Health to examine adequate water service. The County's cannabis permit process, however, has not included water *rights* and the issue of surface water diversion for cannabis in its evaluation of a project's compliance. Instead, its CEQA Checklist has focused solely on compliance with water *quality* policies. Its focus on water *quality* ensures that the case planner for a project requests and receives an official check from the County's Environmental Health Services for well water *quality*, and review by the Regional Water *Quality* Control Board for stormwater/wastewater discharge compliance. As the issue of surface water has recently been recognized, County planners have contacted the Regional Water Quality Control Board for a determination on surface water issues. There is no established procedure for checking with the SWRCB's Division of Water Rights for a plan review as to whether a project has the legal right to divert the water it plans to use throughout the year for cannabis cultivation.

The County's failure to include surface water rights in its cannabis planning process has not allowed proper coordination with other agencies, some of which are responsible for the eventual approval of a California cannabis business license. The CDFW is a consulting agency at the State cannabis business license level but generally relies on the County's determinations made at the permit planning level.

6. STATE WATER RESOURCES CONTROL BOARD CANNABIS CULTIVATION POLICY

The SWRCB's Cannabis Cultivation Policy states:

"Cannabis cultivation legislation enacted California Water Code (Water Code) section 13149, which directs the State Water Board, in consultation with the California Department of Fish and Wildlife (CDFW), to adopt interim and long-term principles and guidelines for the diversion and use of water for cannabis cultivation in areas where cannabis cultivation may have the potential to substantially affect instream flows[15]*."*

These guidelines, developed as the SWRCB Cannabis Cultivation Policy, detail the General Requirements for commercial cannabis, and substantially limit the ability of cannabis cultivators to utilize surface water and subterranean streams in a known and definite channel. These restrictions are summarized as the following:

- Cannabis cultivators shall not divert surface water unless it is diverted in accordance with an existing water right that specifies, as appropriate, the source, location of the point of diversion, purpose of use, place of use, and quantity and season of diversion[16]. (Most commonly, these water rights are obtained through a Small Irrigation Use Registration

[15] SWRCB Cannabis Cultivation Policy, 2019, Policy Overview, p. 6
[16] SWRCB Cannabis Cultivation Policy, 2019, Attachment A, Section 2, Water Storage and Use, #69

(SIUR)), although the SIUR program is limited to a maximum diversion and storage of 20 AFY[17].

- All water diversions for cannabis cultivation from a surface stream, subterranean stream flowing through a known and definite channel (e.g., groundwater well diversions from subsurface stream flows), or other surface waterbody are subject to the surface water Numeric and Narrative Instream Flow Requirements[18].

- Diversion of surface water can only occur from November 1 to March 31 of each calendar year, with diversions only allowed during this period if the channel's flows exceed the targeted instream flow requirements[19], with the caveat of:

  - For the period of November 1 through December 14 of each calendar year, diversion may not commence until the minimum instream flow has been exceeded for 7 consecutive days, the first day of which cannot be earlier than October 27. After this requirement is met, diversions must adhere to the instream flow requirements[20].

- No diversions shall occur at any time during the period from April 1 through October 31 of the calendar year, termed the forbearance period[21].

- Cannabis cultivators shall block, disconnect, remove, bypass, or otherwise render the diversion intake incapable of diverting water during the surface water forbearance period, unless the diversion intake is used for other beneficial uses[22].

- Cannabis cultivators shall not divert from a surface water or from a subterranean stream at a rate more than a maximum instantaneous diversion rate of 10 gallons per minute, unless previously authorized under an existing appropriative water right[23].

As cannabis cultivators may not use surface water during the forbearance period, growers must divert to storage for use during the growing season. Riparian water rights do not allow storage, so growers whose well parcels directly touch the river's visible flow, and those that are subterranean stream users must apply for a Small Irrigation Use Registration (SIUR). The 2019 Cannabis Cultivation Policy and its 2020 update specify that:

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[17] SWRCB Resolution Revising General Conditions to be Applied to Small Irrigation Use Registrations for Cannabis Cultivation, July 14, 2020, p. 3
[18] SWRCB Cannabis Cultivation Policy, 2019, Attachment A, Section 2, Water Storage and Use, #66
[19] SWRCB Cannabis Cultivation Policy, 2019, Attachment A, Section 3 #5, Narrative Instream Flow Requirements
[20] SWRCB Cannabis Cultivation Policy, 2019, Attachment A, Section 3, #5, Narrative Instream Flow Requirements
[21] SWRCB Cannabis Cultivation Policy, 2019, Attachment A, Section 3 #4, Narrative Instream Flow Requirements
[22] SWRCB Cannabis Cultivation Policy, 2019, Attachment A, Section 2 #1, Water Storage and Use, #77
[23] SWRCB Cannabis Cultivation Policy, 2019, Attachment A, Section 2 #1, Water Storage and Use, #78. We note that this 10 gpm rate was derived from and appears applicable to northern California waterways. Given the arid conditions and reduced flow rates in southern California rivers and streams, the rate applied on the Santa Ynez River should be appreciably lower, such as 1 – 2 GPM.

- A maximum of 20-acre-feet per year may be diverted to storage under a cannabis SIUR. Water appropriated under the SIUR may be used for irrigation, frost protection, heat control, and incidental aesthetic and fire protection purposes[24].
- Cannabis cultivators shall install separate measuring devices to quantify diversion to and from each storage facility, including the quantity of water diverted and the quantity, place, and purpose of use (e.g., cannabis irrigation, other crop irrigation, domestic, etc.) for the stored water[25].
- Cannabis cultivators that divert to reservoirs open to the environment are required to prepare an invasive species management plan[26].

6.1. County Compliance With SWRCB Policies

For cannabis cultivation project water supply issues, the County relies on information provided by the applicant rather than an independent and thorough project review by any regulatory agency. For example, an applicant may choose to say they are relying on groundwater, or provide vague or incomplete documentation to claim a project is not relying on surface water. These documents may lack positive well identification (such as well identification numbers, coordinates, or permits). A hydrogeological analysis of a project's wells and source of water within those wells is generally not required by the County, and when hydrogeological information is made part of the record, it is often vague or incomplete. Large agricultural properties often have multiple wells in disparate locations, and of this date there is no system within the County planning process to ensure that all wells are included in a project's analysis. The County allows applicants to provide vague and incomplete descriptions of cannabis project water supplies, and in many cases does not require applicants to state with certainty which of several wells will be the supply for the cultivation operation, and/or does not require precise well coordinates, preventing a thorough disclosure of the water supply for these projects. Rarely are storage reservoirs included in cannabis cultivation projects' descriptions submitted and approved by the County, despite the need for permit under the County zoning ordinance.

These deficiencies in County Planning's understanding and implementation of the Cannabis Cultivation Policy have allowed projects to be approved without assuring adherence to its strictures. No cannabis permits in the Santa Ynez River floodplain have been analyzed as to whether the project would follow the diversion forbearance requirements set forth by the SWRCB and whether a project's storage requirements would be adequate during the forbearance period. For example, given the water duty of approximately 2.95 acre-feet-per-year per acre of cannabis, the 20-acre-foot-per-year limit on diversion to storage for a SIUR would limit a cultivated area to approximately

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[24] SWRCB Resolution Revising General Conditions to be Applied to Small Irrigation Use Registrations for Cannabis Cultivation, July 14, 2020, p. 3.

[25] SWRCB Cannabis Cultivation Policy, 2019, General Requirements, Section 2 #1, Water Storage and Use, Term #81

[26] SWRCB Cannabis Cultivation Policy, 2019, General Requirements, Section 2 #1, Water Storage and Use, Term #86

6.78 acres, whereas the County has accepted projects up to 50.12 acres of cultivated cannabis in the river alluvium. The County has also systematically failed to adequately analyze any project's impacts on riverine habitat dependent on the subterranean surface waters, both individually and cumulatively.

Belatedly, some permits are beginning to be conditioned for compliance with SWRCB cannabis surface water diversion policy. This, however, is placed as a line-item afterthought at the time of project approval, without proper Planning review to ensure adequate analysis or compliance with the strictures placed on commercial cannabis.

6.2. SWRCB Review

Absent any requirements by the County at the planning level, the SWRCB relies on cannabis water diverters applying for a Small Use Irrigation Registration, or SIUR. Registering for a SIUR is an online portal process, where an applicant checks boxes on a computer screen, and is issued a Notice of Receipt (NOR) based on the applicant's responses and a few uploaded documents. It does not appear that there is a request to the County for a thorough plan check or other review of a cannabis operation's wells in question. For instance, a Santa Ynez River cannabis operator was issued a Notice of Receipt stating that they did not need a SIUR based upon submitting information for its bedrock groundwater well, whereas the applicant failed to mention its four other wells pumping subterranean surface water for cannabis irrigation.

The compliance documents provided by the SWRCB to an applicant is often missing basic information, such as the name of the diverter or operation, address, parcel number, well coordinates, date issued or obtained, and contact information of the issuer. The lack of specific identifying information on such critical documents may allow them to be presented to the County or other enforcing agency as a certificate of proof of compliance for any other property, diverter, or well in the alluvial floodplain.

There are lapses in the circulation of water supply compliance documents to the local regulatory agencies. Subterranean stream determinations, Notices of Violation, Cease and Desist Orders, or other State agency enforcement actions issued regarding a specific cannabis operation are sent to the diverter and to the Department of Cannabis Control[27, 28] (previously to the California Department of Food and Agriculture (CDFA), but are not sent to local authorities to notify them that the operator is not in compliance. For example, one cannabis operation alongside the Santa Ynez River had been issued a Subterranean Stream Determination in 2019 but as the County had not been apprised, the project's permit conditions omit to address compliance with the Cannabis Cultivation Policy's strictures. As local regulatory agencies such as County Planning and Development and California Department of Fish and Wildlife have the authority to demand compliance with all local and state laws, notification of non-compliance will ensure action for violations.

[27] Water Code section 13149(b)(5)

[28] SWRCB Cannabis Cultivation Policy, 2019, Enforcement, pp 25-30.

Agency coordination at the planning level would ensure that the SWRCB receives all of the pertinent information it needs to be able to make a determination as to whether an operation needs to file a SIUR, and for the California Department of Fish and Wildlife (CDFW) in issuing Sec. 1600 authorizations. Relying solely on documents provided by the applicant can allow an operator to sidestep the Cannabis Cultivation Policy's requirements. Compliance at this level can be improved if all permitting and reviewing agencies would:

- Coordinate with County at the planning stage
- Coordinate with CDFW at the planning stage
- Require site plans, hydrogeological analysis, and well coordinates for all wells on the property
- Require that a Notice of Receipt, online or otherwise, for SIUR determination include the name of the diverter, address, date of issue, assessor's parcel number of the parcel containing the well, and well coordinates used to obtain the Notice.
- Require that any subterranean stream determination letter issued by the SWRCB include the name of the diverter, address, the assessor's parcel number containing the well, and the well's total depth, perforated depth, and coordinates used to obtain the determination
- Require SWRCB notification to the appropriate County entity in addition to the California Department of Fish and Wildlife and Department of Cannabis Control regarding compliance and enforcement efforts, Notices, and determinations, such as the County Water Agency, Groundwater Sustainability Agency, so that the County Planning Department can confirm and ensure compliance with SWRCB policies.

7. <u>WATER RESOURCES</u>

7.1. Riparian Water

The SWRCB summarizes riparian water rights as:

"A riparian right exists on the smallest piece of land that touches a water source. Riparian rights that attach to a small parcel cannot be used on adjacent parcels, even if those parcels touch the riparian parcel. Water obtained through a riparian right must be used on the parcel connected to the riparian right.[29]"

Most Santa Ynez River cannabis parcels fit this description and several have historic surface water diversions registered as riparian claims with the SWRCB. At least two projects are reported to be sharing water wells and water storage.

Not all of the cannabis projects in the vicinity of the Santa Ynez River are located on the floodplain. Several projects are situated on the bedrock hills above the riverbed and have offsite

[29]SWRCB Water Rights FAQ https://www.waterboards.ca.gov/waterrights/board_info/faqs.html#toc178761088

source wells located on riparian parcels. These offsite wells would likely fall under the prohibition against sharing the underflow of the known and definite channel of the Santa Ynez River.

7.2. Water Duty of Cannabis Irrigation

Estimating the quantity of water a cannabis farm will use for its crop (known as its water duty) is difficult because of the scarcity of reputable scientific papers on the subject, and the reticence of cannabis cultivators to disclose such information.

A report by Dr. Jim McCord of Lynker Technologies identified water duty information for cannabis utilizing a memo prepared by a licensed, Certified Crop Advisor from Agrosource Group, a reputable, local crop irrigation specialist firm, for a project in the vicinity of the Santa Ynez River just below the Lompoc Narrows. This report utilized evapotranspiration data sourced from the California Irrigation Management Information System (CIMIS) of the California Department of Water Resources, and detailed the projected water use for multiple crops of cannabis per year. McCord's hydrogeological investigation noted total water usage reflects a total crop usage of 2.65 AFY per acre of cannabis grown (actual crop acreage divided by the crops' total water usage)[30]. Crop irrigation is never a perfectly efficient system, and water loss is often rated as a percentage factor known as an irrigation efficiency factor. Drip irrigation is noted to have a 90% irrigation efficiency[31]. When McCord applied this irrigation efficiency to the water duty detailed by Agrosource, he concluded the water used for cannabis irrigation would be 2.95 AFY/acre planted[32].

8. POTENTIAL ENVIRONMENTAL IMPACTS

The SWRCB's Cannabis Cultivation Policy was developed in consultation with the California Department of Fish and Wildlife to ensure not just mitigation, but avoidance of adverse impacts to sensitive riverine habitats and their associated species. Table 1 contains a partial list of threatened and endangered species who rely on the Santa Ynez River.

Table 1. Partial List of Threatened and Endangered Fauna of the Santa Ynez River and Estuary[33]

Endangered	Threatened
Southern Steelhead Salmon	California Red Legged Frog
Southwestern Willow Flycatcher	
Least Bell's Vireo	

[30] Hydrologic Evaluation of Irrigation Water Supplies for Cannabis Production Projects in the Santa Ynez River Valley, California, July 31, 2022. Jim McCord, Ph.D, PE, Lynker Technologies, LLC.
[31] USDA NRCS Conservation Practice Standard, Irrigation System, Microirrigation (Code 441), September 2015
[32] Hydrologic Evaluation of Irrigation Water Supplies for Cannabis Production Projects in the Santa Ynez River Valley, California, July 31, 2022. Jim McCord, Ph.D, PE, Lynker Technologies, LLC., Table 2, p. 18
[33] Threatened and Endangered Species of Los Padres National Forest, US Fish and Wildlife Service, October 1 2015 – September 30, 2016. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd570353.pdf

Tidewater Goby	
Arroyo Chub	

8.1. Seasonal Cannabis Water Use

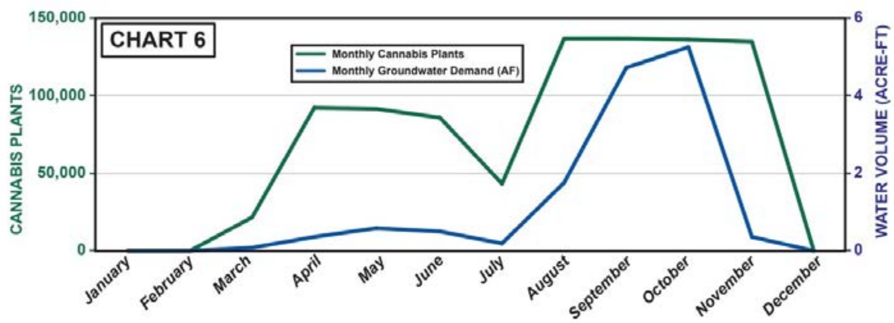

Figure 4. Projected Water Use by Month for a Two-Crop Cannabis Farm. From *Hydrologic Overview and Potential Impact Assessment, 8701 Santa Rosa Road, Vicinity of West Buellton, Santa Barbara County, CA.*, *Kear Groundwater, January 21, 2020. p. 15*

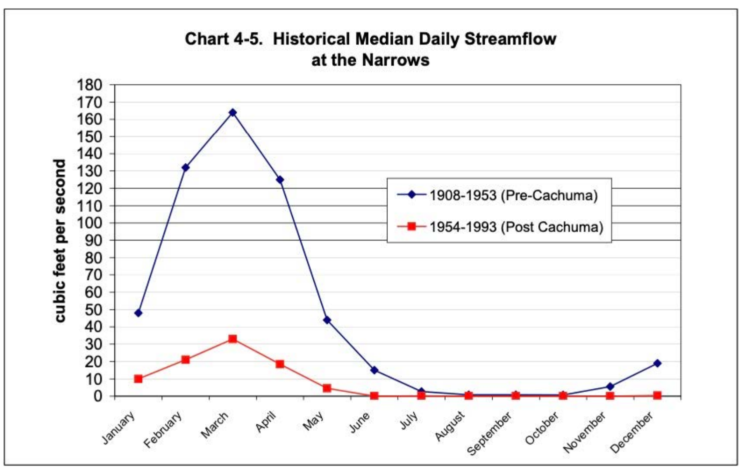

Figure 5. Median Measured Flow of the Santa Ynez River at the Lompoc Narrows. ***Chart 4-5, from https://www.waterboards.ca.gov/waterrights/water_issues/programs/hearings/cachuma/phase2/deir/appendixb.pd***

The water demand for cannabis is at its greatest during the late spring, summer, and fall months. Figure 4 depicts the projected water demand of a cannabis project growing two crops of cannabis per year, outdoor, in the Santa Ynez Valley. Although the actual quantity of water projected to be used is in question, it illustrates the projected periods of use are almost entirely within the SWRCB's forbearance period of April to October 31 and the period of the near-cessation of the natural flow of the Santa Ynez River from June to December (Figure 5).

8.2. Lake Cachuma Water Releases

In the 1933 case of *Gin Chow v. The City of Santa Barbara*, involving the impoundment of the Santa Ynez River's surface waters by the construction of Gibraltar Dam, *"the court directed that the defendant city shall, during the summer and fall months in each year, and until the ensuing rainy season, release and discharge from the Gibraltar dam, into the stream channel of the river below said dam and reservoir, waters in excess of the waters flowing into said reservoir during said period, to the extent of 616 acre-feet…*[34]*"* in order to ensure the availability of water to downstream users. This landmark case is the basis for the modern-day timed summer and fall releases of water from Bradbury Dam and Lake Cachuma[35] and has remained an important court decision regarding surface water rights.

DWR regulated water releases from Lake Cachuma are divided between amounts allocated for steelhead trout maintenance[36, 37] and amounts allocated for downstream water rights holders[38]. The volume of releases for downstream water rights holders are calculated separately from releases for fish maintenance[39, 40], and each may vary in volume and duration of release.

[34] Chow v. City of Santa Barbara, 217 Cal. 673, 691 (Cal 1933)

[35] State Water Board Order WR 73-37 as modified by WR 89-18, modifying Condition 5 of Cachuma Operating Permits 11308 and 11310 (2019)

[36] Endangered Species Act Section 7 Consultation Biological Opinion, U.S. Bureau of Reclamation Operation and Maintenance of the Cachuma Project on the Santa Ynez River in Santa Barbara County, California. National Marine Fisheries Service, Southwest Region, September 11, 2000. https://www.cachuma-board.org/files/73eeead29/2000-09-11+Biological+Opinion.pdf

[37] Lower Santa Ynez River Fish Management Plan, Santa Ynez River Technical Advisory Committee, October 2, 2000., p EX-7. https://www.cachuma-board.org/files/787098885/Executive+Summary+for+the+Fish+Management+Plan.pdf

[38] Settlement Agreement Between Cachuma Conservation Release Board, Santa Ynez River Water Conservation District, Santa Ynez River Water Conservation District Improvement District No. 1, and the City of Lompoc, Relating to Operation of the Cachuma Project, 2002. https://www.waterboards.ca.gov/waterrights/water_issues/programs/hearings/cachuma/phase2/exhibits/ccrbid1_220a.pdf

[39] State Water Board Order WR 2019-0148 Amending Permits 11308 and 11310, p.8

[40] Endangered Species Act Section 7 Consultation Biological Opinion, U.S. Bureau of Reclamation Operation and Maintenance of the Cachuma Project on the Santa Ynez River in Santa Barbara County, California. National Marine Fisheries Service, Southwest Region, September 11, 2000. https://www.cachuma-board.org/files/73eeead29/2000-09-11+Biological+Opinion.pdf

In general, water releases for fish maintenance are based upon recommendations by the National Marine Fisheries Service's Biological Opinion[41], actuated through measured instream flow at a tributary creek [Hilton Creek] near the Bradbury Dam, and releases for downstream water rights holders are based upon measured depletion of the above-Narrows alluvial groundwater basin[42, 43]. Water rights releases generally take place in the summer and fall months, when the river's natural flow has dropped. Releases for downstream water rights users do not occur every year. In certain years those releases can be reduced or nonexistent, as occurred in 13 of the 31 years examined by McCord[44].

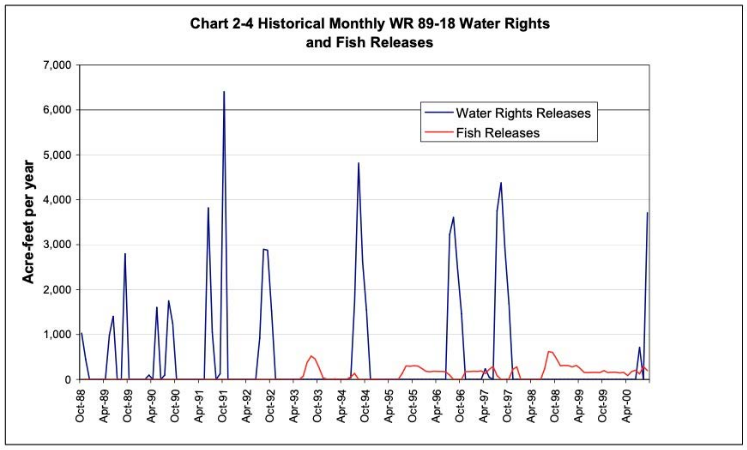

Figure 6. Timing of Downstream Releases from Lake Cachuma, 1988-2000.
https://www.waterboards.ca.gov/waterrights/water_issues/programs/hearings/cachuma/phase2/deir/appendixb.pdf

<u>8.3. Impacts of Cannabis Water Diversion on Water Released from Cachuma Reservoir</u>

Although a single project may have a less-than-significant impact to the river's underflow, McCord (2022) has demonstrated the cumulative impact to the river's downstream water rights releases. If all cannabis projects proposed for the above-Narrows, known and definite channel of the Santa Ynez River were in production, the cumulative water depletion would total 1,261.57 acre-feet per year, representing 29.1% of the 31-year-average of downstream water releases[45]. As the growing season for outdoor cannabis has its greatest water demands during the summer months, commercial cannabis would have a significant impact to downstream water rights holders. If low or no water releases were available in any particular year, unregulated commercial cannabis would then illegally appropriate water intended to maintain endangered steelhead trout and other sensitive species. The County has not curtailed illegal expansion of cannabis cultivation as long as a project claimed it was growing prior to January 19, 2016, and several of these cannabis operations are currently producing at full capacity.

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[41] Endangered Species Act Section 7 Consultation Biological Opinion, U.S. Bureau of Reclamation Operation and Maintenance of the Cachuma Project on the Santa Ynez River in Santa Barbara County, California. National Marine Fisheries Service, Southwest Region, September 11, 2000. https://www.cachuma-board.org/files/73eeead29/2000-09-11+Biological+Opinion.pdf
[42] State Water Board Order WR 2019-0148 Amending Permits 11308 and 11310, p. 8
[43] Settlement Agreement Between Cachuma Conservation Release Board, Santa Ynez River Water Conservation District, Santa Ynez River Water Conservation District Improvement District No. 1, and the City of Lompoc, Relating to Operation of the Cachuma Project, 2002.
[44] Hydrologic Evaluation of Irrigation Water Supplies for Cannabis Production Projects in the Santa Ynez River Valley, California, July 31, 2022. Jim McCord, Ph.D, PE, Lynker Technologies, LLC., Table 2, p. 20
[45] Hydrologic Evaluation of Irrigation Water Supplies for Cannabis Production Projects in the Santa Ynez River Valley, California, July 31, 2022. Jim McCord, Ph.D, PE, Lynker Technologies, LLC.,

The 2002 Settlement Agreement between Lompoc, the Santa Ynez River Water Conservation Districts and the Cachuma Conservation Release Board codified prior water rights orders and refined elements of the annual water releases from Cachuma Reservoir[46]. These summer and fall releases are made to benefit downstream water rights holders, and are designed to replenish depleted groundwater basins. These releases are carefully managed for maximum hydrological benefit, but surplus extractions by cannabis cultivators at the same time along the same stretch of the Santa Ynez River can delay the advance of the release front and require additional releases to accomplish the legally mandated levels of replenishment.[47]

For aquatic species, potential loss of flow encompasses threats of low water, increased exposure to predation, high temperatures, reduced growth, low dissolved oxygen, and stranding of adults, juveniles, and fry when pools are dewatered[48]. Even if the water continues to maintain above-soil levels in pools deep enough for fish, these conditions also affect the availability of insects and invertebrates utilized as food sources[49] for all of the species listed in Table 1.

These conditions can worsen with increased distance from the dam's point of release[50]. Stetson's ArcGIS map of the front of the flow following release from Cachuma indicate that in 2021, it took 22 days for the front of the flow to travel approximately 20 miles, as the crow flies, from the dam's outlet[51]. The majority of these large cannabis operations in the river are between 10 and 22 miles from the dam, and if these cannabis projects take water intended to support fish pools in the lower reaches of the Santa Ynez River, it could have a significant impact on the very small populations of endangered and threatened species of the Santa Ynez River. As drought conditions worsen across the Western states, critical habitat for these species will be under increasing pressure. In contrast to the anecdotal reports of enormous runs of large-sized steelhead in the years before the construction of Bradbury Dam[52], the current population of anadromous adult Southern steelhead

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[46] Settlement Agreement Between Cachuma Conservation Release Board, Santa Ynez River Water Conservation District, Santa Ynez River Water Conservation District Improvement District No. 1, and the City of Lompoc, Relating to Operation of the Cachuma Project, 2002.

[47] See https://stetsonengineers.maps.arcgis.com/apps/webappviewer/index.html?id=dacb4108c41e476f8210f36b80e77f47 for daily mapping of the release flow front. See also https://www.syrwcd.com/where-is-the-santa-ynez-river-water-front-today.

[48] Endangered Species Act Section 7 Consultation Biological Opinion, U.S. Bureau of Reclamation Operation and Maintenance of the Cachuma Project on the Santa Ynez River in Santa Barbara County, California. National Marine Fisheries Service, Southwest Region, September 11, 2000. Water Rights Releases. https://www.cachuma-board.org/files/73eeead29/2000-09-11+Biological+Opinion.pdf

[49] Endangered Species Act Section 7 Consultation Biological Opinion, U.S. Bureau of Reclamation Operation and Maintenance of the Cachuma Project on the Santa Ynez River in Santa Barbara County, California. National Marine Fisheries Service, Southwest Region, September 11, 2000. Water Rights Releases.

[50] Lower Santa Ynez River Fish Management Plan, Santa Ynez River Technical Advisory Committee, October 2, 2000., p EX-7. https://www.cachuma-board.org/files/787098885/Executive+Summary+for+the+Fish+Management+Plan.pdf

[51] https://stetsonengineers.maps.arcgis.com/apps/webappviewer/index.html?id=fcb1c72f2d2245869f51a306a7e4ae76

[52] Alagona, Peter S., et. al., A History of Steelhead and Rainbow Trout (Oncorhynchus mykiss) in the Santa Ynez River Watershed, Santa Barbara County, California. Bull. Southern California Acad. Sci., 111(3), 2012, pp. 163-222.

trout in the Santa Ynez River watershed was estimated in 2000 to be 200 individuals[53]. More recent estimates of this population "indicate that the number of adult steelhead is very low."[54]

If water releases meant for fish are appropriated by commercial cannabis, it can magnify the pressure to ensure adequate water for both wildlife and the human populations and potentially trigger larger Cachuma releases of a resource becoming increasingly precious.

Instream water impoundment reservoirs along the Santa Ynez River provide water not only to municipalities and riparian users below Bradbury Dam, they provide the primary source of potable water to the coastal cities and unincorporated areas of Goleta, Santa Barbara and Montecito. The hierarchy of California water rights dictates that riparian users (those whose properties touch the river) have a superior claim on its surface water and that uses outside the basin, e.g., exported to the South Coast, are subordinate[55]. Therefore, increased extractions of subterranean surface flow by commercial cannabis along the Santa Ynez River necessitate greater water releases to meet the standards required to satisfy downstream users, this deficit could potentially affect the delivery volumes of the South Coast users.

9. SUMMARY AND CONCLUSION

This report provides evidence which supports the State Water Resources Control Board's jurisdiction over wells that divert subterranean surface flows utilized by cannabis cultivators in the Santa Ynez River. It also notes the lack of adherence to the SWRCB Cannabis Cultivation Policy at the land use planning level by its approval of cannabis projects drawing from this subterranean surface flow. Further, this report describes the presence of factors which justify the Department of Fish and Wildlife's actions to ensure compliance and curtail these unauthorized diversions from the underflow of the Santa Ynez River which ignore the rights of downstream users, including those cities and municipalities that depend on this water, and threaten public trust resources.

10. DOCUMENTATION OF SANTA YNEZ RIVER CANNABIS PROJECTS

10.1. Appendix A examines the water supply, water use and hydrological analysis for the ten cannabis projects with the potential for greatest impact to the subterranean flow of the Santa Ynez River:

1. Ag Roots, LLC
2. Busy Bees Organics
3. Central Coast Agriculture (5645)
4. Central Coast Agriculture (8701)
5. HBF, LLC

[53] Lower Santa Ynez River Fish Management Plan, Santa Ynez River Technical Advisory Committee, October 2, 2000., p EX-7. https://www.cachuma-board.org/files/787098885/Executive+Summary+for+the+Fish+Management+Plan.pdf
[54] State Water Board Order WR 73-37 as modified by WR 89-18, modifying Condition 5 of Cachuma Operating Permits 11308 and 11310, p. 56.
[55] California Water Commission Act of 1913 § 17, as quoted by Sax, 2002.

6. Heirloom Valley
7. Iron Angel, LLC
8. Los Alamos Agventures
9. Tahquitz Farms
10. Santa Barbara Westcoast Farms

10.2. Appendix B contains an index of the supporting documents such as project descriptions, site plans, well drilling/completion logs, and any hydrological analysis or reports, which are located in a Google Documents folder at:

https://drive.google.com/drive/folders/1P2DBeDQ7E_ks6yBMKGlR1eY9ikQHeAT4?usp=sharing

This online document repository also contains supporting documents for the balance of the 31 cannabis projects potentially affecting the flow of the Santa Ynez River.

APPENDIX A

SUMMARY OF PROJECTS

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APPENDIX A
Table of Contents PAGE

1. OVERVIEW

The ten projects listed in this appendix total approximately 280 acres, comprising over half of the 493 acres of cannabis proposed for or currently utilizing the underflow of the Santa Ynez River, and represent the greatest potential for adverse impacts to its flow. Although eleven other projects are located in the Santa Ynez River's known and definite channel above the Lompoc Narrows, they are not examined in this document and should be reviewed further.

This appendix examines the project planning documents obtained from the Santa Barbara County's Planning Department and other agencies in order to ascertain compliance with the Cannabis Cultivation Policy of the State Water Resources Control Board (SWRCB). These documents reflect the stage of the planning process at the time they were obtained, and minor changes or adjustments may be reflected in the final permit.

Supporting documents such as project-specific site plans, well completion reports, hydrological analyses, and water demand calculations were analyzed within the framework of California water rights, laws and settlements along with hydrogeologic technical reports and environmental documents regarding the flow of the Santa Ynez River.

2. SANTA YNEZ RIVER CANNABIS PROJECTS

2.1.1. AG ROOTS LLC, 5935 SANTA ROSA RD., LOMPOC, CA 93436

County Planning Case: 18LUP-00000-00529
County Planner: Shawn Archbold, archbolds@countyofsb.org
APN: 083-150-011
Cannabis Acreage: 30.76
Wells: 3 wells, one shared
Proposed Water Storage: Shared reservoir
SIUR Participant: Unknown
Current Project Status: Permit approved 7/7/2021, not yet issued. Currently growing cannabis.

The Ag Roots cannabis operation is located on a riparian parcel in the Santa Ynez River floodplain, within its known and definite channel.

The Ag Roots commercial cannabis project is currently growing cannabis in hoophouses for their full acreage, noted to be 'existing' on the project plans. Formerly, the Ag Roots cannabis project was part of the Nature Farm/Heirloom Valley cannabis project and was subsequently split to reflect its separate parcel ownership.

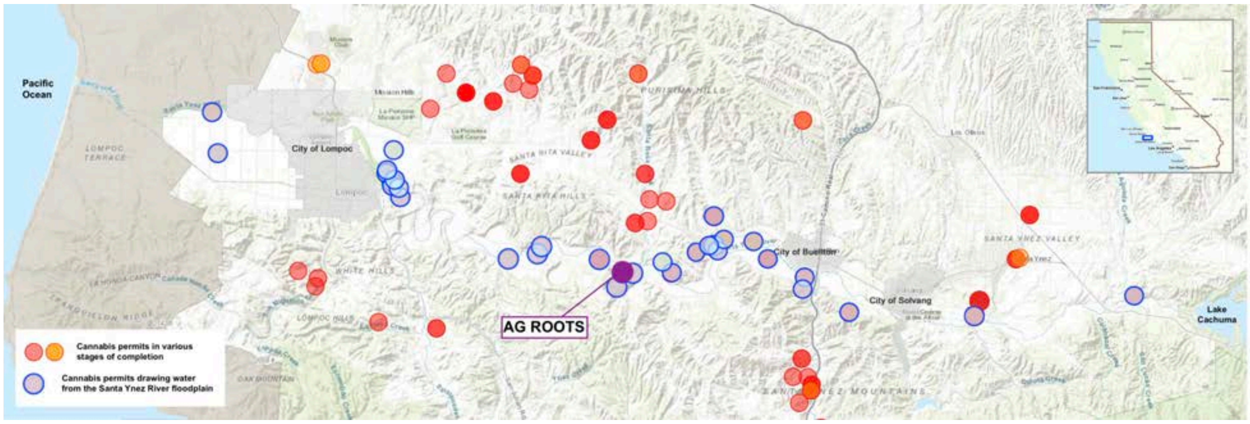

Figure 1. Location of Ag Roots property in relation to the Santa Ynez River. **After County of Santa Barbara ArcGIS, https://sbcopad.maps.arcgis.com/apps/webappviewer/index.html?id=f287d128ab684ba4a87f1b9cff438f91**

2.1.1.1. Wells

Two wells were identified on this parcel from the project's site plans, one of which is located at the edge of the bank of the Santa Ynez River. A third well was identified from the site plans of the Iron Angel project.

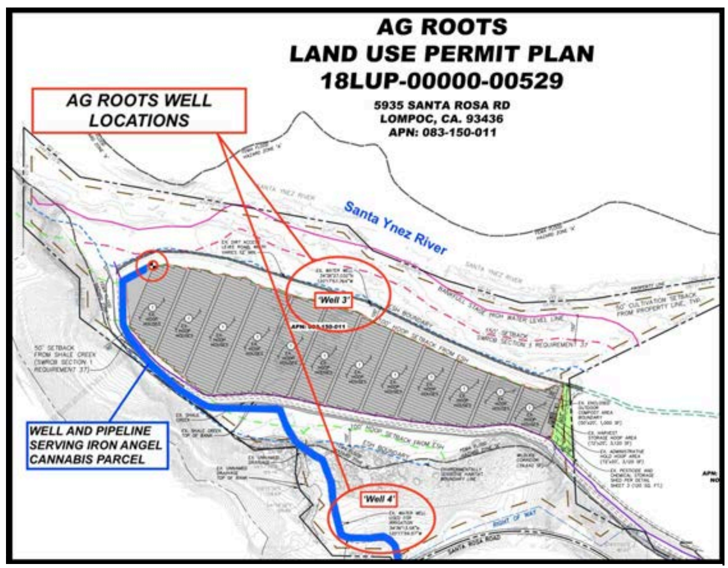

Figure 2. Location of water wells from the Ag Roots parcel's site plans.

The geologic log for the well completion report for Well 3 details alluvial sands, gravels, and clay layers terminating in sandstone and gravel at 97 feet, consistent with the geology of the Santa Ynez River. Katherman's report noted that this well's pump test produced 570 gallons per minute, as is common with these alluvial wells, and far exceeds the SWRCB Cannabis Cultivation Policy's 10-gallon-per-minute limit on instantaneous demand for cannabis irrigation.

No well completion log or drilling report was located for Well 4, located outside of the floodplain. This shallow well is located on hillside lands located above the floodplain, and, according to the Katherman hydrological report appears to be completed in the low-producing Tertiary bedrock forming the relatively impermeable bed and banks of the Santa Ynez River's known and definite channel. Although the CDFW pre-consultation letter for this project states Well 4 is not proposed to be used for the cannabis project[1], such a well could be used to

[1] CDFW Pre-consultation for the Cannabis Cultivation Project at 5935 Santa Rosa Road (Ag Roots), Santa Barbara County, August 6, 2021. Letter to County Planning from Erinn Wilson-Olgin, Environmental Project Manager, South Coast Region.

fraudulently obtain a determination from the SWRCB's Division of Water Rights (DWR) that a cannabis SIUR is not needed for the project, as has occurred for other projects in the Santa Ynez River.

One well, omitted from the project's site plans, serves the Iron Angel cannabis project located on a neighboring parcel. The geologic log of the well completion report for this well shows the typical river alluvium gravel and sand, terminating in bedrock shale at 100 feet, consistent with the known and definite channel geology.

2.1.1.2. Hydrological Analysis

Three hydrological reports pertain to this project, described as an updated addendum to a hydrological analysis of the combined Ag Roots and Heirloom Valley projects of August, 2020, a water demand memo (June, 2021), and its revised version (July, 2021). The original 2019 hydrological report referred to in the hydrological addendum is unavailable.

Both water demand reports (Katherman 2021[2], 2021a[3]) were provided by the County planner, which state: "*The Ag Roots property (APN 083-150-011) overlies the California Department of Water Resources (DWR) designated Santa Ynez River Groundwater Basin, specifically the Central Management Area of the Santa Ynez River*[4]" and essentially presents a discussion of water use as a part of the Buellton Uplands and not the specific hydrogeology of the Santa Ynez River alluvium. It omits discussion of the characteristics of the project's wells such as geologic location, depth to water and other key issues for determining the source of its water. Instead of examining the wells' known hydrogeologic connection with the subterranean stream of the Santa Ynez River, Katherman merely states that the few hundred feet to the river's visible flow precludes hydrogeologic connection.

It is to be noted that these labels and classifications of these groundwater Basins are merely a management tool for the implementation of the California Sustainable Groundwater Management Act through the various Groundwater Sustainability Agencies and do not act in place of a hydrogeological analysis.

Although the scientific and legal documentation of the Santa Ynez River's geology and its known and definite channel has been established since 1951, Katherman's own opinion in the addendum report is that these wells are not hydraulically connected to the river. He bolsters this claim by examining "*1) The physical distance between the subject wells and the riverbed itself, 2) Additional testing and monitoring of key water wells and the measurement of the cone of depression or zone of influence around these wells, 3) The potential segregation of the alluvial intervals by low*

[2] Water Demand Memo of June 18, 2021. Ag Roots Project, Katherman Exploration Co, LLC
[3] Water Demand Memo (Revised 7/8/21) of June 18, 2021. Ag Roots Project, Katherman Exploration Co, LLC
[4] Water Demand Memo (Revised 7/8/21) of June 18, 2021. Ag Roots Project, Katherman Exploration Co, LLC

permeability clay zones, 4) Potential differences in water chemistry, [and] *5) Controlled water releases from Lake Cachuma and Bradbury Dam.*[5]

None of these items are germane to the Garrapata 4-part test for either the proper legal identification or invalidation of a subterranean stream in a known and definite channel. Katherman propounds unproven theories that conflict with the large body of knowledge of this region, such as stating that, by examining riverine well boring logs, the clay layers found in the alluvium represent confining aquitard layers that isolate the subterranean stream's upper flow from the lower layers that contain the terminus of the project's wells, and that minor variations of dissolved solids in its water are the results of these clay layers. Such a claim is unsupported, as lenses of clay are common in any alluvial sediments, and the layers noted all vary in depth, location and composition. These well completion reports are useful, however, in that they all describe alluvial sediments of sands, gravels, and clays terminating in bedrock shales, anddemonstrate and support both the accepted body of scientific knowledge and the Garrapata 4-part test defining the Santa Ynez River as a known and definite channel. Katherman then contradicts his opinion by stating that water releases from Lake Cachuma would recharge water both above and below these layers, implying this water would be available to the project. Hydraulic connection to the river is demonstrated by the geology and transmissivity of the sediments, not distance. As the sustained pumping drawdown was slight and subsequent recovery rates from Katherman's pump tests are remarkably rapid, it points to a high fluid transmissivity of the sediments in the alluvium, as is known in the Santa Ynez River channel.

Katherman's revised water demand memo of June 11, 2021[6] also discusses the Santa Ynez River as part of the Buellton Uplands section of the Santa Ynez River Groundwater Basin, and not part of the Santa Ynez River Alluvial Basin. Katherman's estimate of 51 AFY is calculated from vegetables, whereas other, more scientific estimations place the water demand of cannabis at approximately 2.95 AFY at an irrigation efficiency of 90%, as is common for agricultural drip irrigation[7]. This would place the projected Ag Roots water demand at 90.74 AFY. Katherman's report notes, however, that the actualreported water use for this project is much higher. Figure 1 of this report noted the use of 121 AFY in 2019 and 126 AFY in 2020[8], when the project was planted to its full acreage in cannabis. These actual records place the water duty for the listed 28.37 acres of cannabis at average of 4.36 AFY per acre, nearly two and one half times the proposed 1.8 AFY water duty of vegetables. It is not likely that future water usage for this project will be less than current water usage. The difference between the historic use (95 AFY) and the highest recorded current use (126 AFY) is 31 AFY, and this extensive use should be subject to further environmental review.

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[5] Addendum to Original Hydrology Report Dated 4/24/2019, Nature Farm/Lower Donovan Properties,. Santa Ynez River Basin, Santa Rita Subarea, Santa Barbara County, CA. August, 2020.
[6] Water Demand Memo (Revised 7/8/21) of June 11, 2021. Ag Roots Project, Katherman Exploration Co, LLC
[7] Hydrologic Evaluation of Irrigation Water Supplies for Cannabis Production Projects in the Santa Ynez River Valley, California, July 31, 2022. Jim McCord, Ph.D, PE, Lynker Technologies, LLC.,
[8] Water Demand Memo (Revised 7/8/21) of June 18, 2021. Ag Roots Project, Katherman Exploration Co, LLC, p. 3

2.1.1.3. Water Storage

The Ag Roots cannabis project does not propose storage of water for use during the forbearance period other than the 8.47 acre-foot reservoir shared with Heirloom Valley. Given the water demand of 2.95 acre-feet per year per acre of cannabis as calculated by McCord (2022) [9], this reservoir's volume would allow only 2.87 acres of cannabis to be grown, whereas the combined acreage of the Ag Roots and Heirloom Valley would have a water demand of 229.39 AFY, 27 times the water capacity of the reservoir. As the growing season for cannabis coincides with the summer forbearance period, imposing a moratorium on diverting surface water, the extant reservoir would need to store water for the entire growing season and cannot be refilled or topped off during the summer months.

2.1.1.4. Water Sharing

A letter from the applicant's private planner, dated November 13, 2020, in response to a County incomplete feedback letter, indicates that a well and the 8.47 acre reservoir on the neighboring parcel, Heirloom Valley cannabis project, had been proposed as a water source for Ag Roots. This use was not detailed in the Project Description or the site plans, which states only that the onsite well will be used. A consultation letter with the CDFW (2021) stated, "The water source for the Project is two existing wells, consisting of one existing onsite well and one existing well located on an adjacent land parcel[10]." Given the prohibition on sharing riparian water rights with another parcel, the reservoir and neighboring well would not be available to the Ag Roots cannabis project.

Another neighboring non-riparian cannabis operation, Iron Angel, has its water source and well on the Ag Roots parcel. As Ag Roots is a riparian parcel (as well as utilizing subterranean flow from a known and definite channel subject to the Board's jurisdiction), it cannot export riparian water to a separate parcel.

2.1.2. BUSY BEE'S ORGANICS LLC, 1180 W. Highway 246, Buellton, CA 93427

County Planning Case: 18LUP-00000-00496
County Planner: Petra Leyva, petra@countyofsb.org
APN: 099-240-072
Cannabis Acreage: 22
Wells: 2 wells
Proposed Water Storage: 2 tanks totaling 13,000 gallons

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[9] Hydrologic Evaluation of Irrigation Water Supplies for Cannabis Production Projects in the Santa Ynez River Valley, California, July 31, 2022. Jim McCord, Ph.D, PE, Lynker Technologies, LLC.

[10] CDFW Pre-consultation for the Cannabis Cultivation Project at 5935 Santa Rosa Road (Ag Roots), Santa Barbara County. Comments and Recommendations, #4 CDFW, August 6, 2021

SIUR Participant: Unknown
Current Project Status: Permit issued 7/9/2020

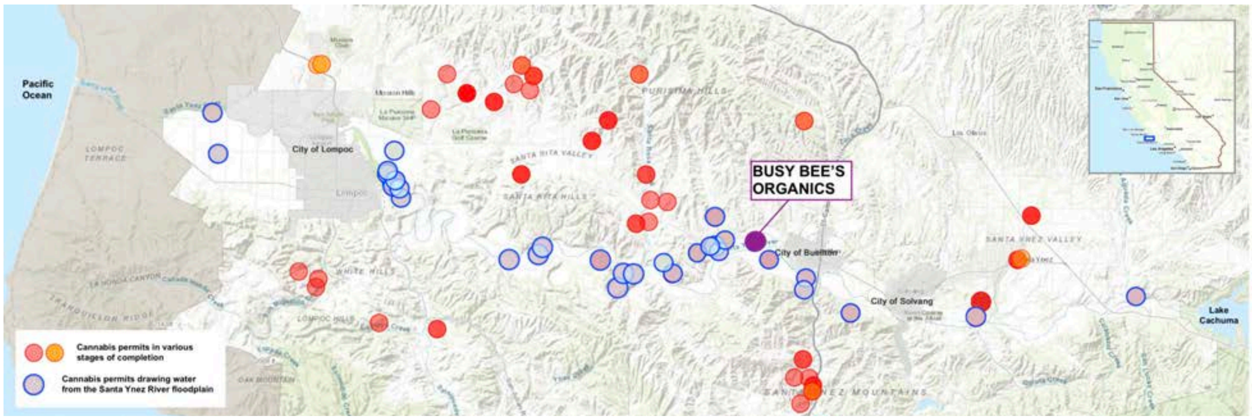

Figure 3. Location of the Busy Bee's property in relation to the Santa Ynez River. After County of Santa Barbara ArcGIS, https://sbcopad.maps.arcgis.com/apps/webappviewer/index.html?id=f287d128ab684ba4a87f1b9cff438f91

The Busy Bee's Organics cannabis operation is located on a riparian parcel in the Santa Ynez River floodplain, within its known and definite channel.

2.1.2.1. Wells

Busy Bee's Organics has two existing wells, one domestic and one agricultural. The agricultural well is located on a high river bench near Highway 246, and its well completion report shows typical alluvial deposits of gravels, sand, and clay to a depth of 435 feet. This well does not terminate in shale, but rather in alluvial sand with clay streaks. Its pump test showed high volume production typical of wells in the river alluvium.

Figure 4. Location of water wells from the Busy Bee's parcel's site plans.

No well driller's report or well completion report was found for the domestic well.

2.1.2.2. Hydrological Analysis

Although the Staff Report prepared for this project refers to the SWRCB Cannabis Cultivation Policy, its analysis focused entirely on its water quality requirements, and ignored its sections on surface water supply and subterranean stream policy.

No hydrological analysis was provided for this project.

2.1.2.3. Water Storage

The Staff Report for this project states that two water tanks are proposed, one 5,000 gallons in volume, and one of 8,000 gallons. This storage would be inadequate to supply irrigation water to 22 acres of cannabis during the forbearance period. Given the previously cited water demand of 2.95 AFY per acre cultivated, largely within the SWRCB-mandated forbearance period of April to October 31, it would require a reservoir large enough to hold its water demand of 64.9 AFY, well beyond the 20 AFY permitted for cannabis SIURs.

2.1.3. CENTRAL COAST AGRICULTURE / CADWELL – 5645 SANTA ROSA RD., BUELLTON, CA 93427

County Planning Case: 19LUP-00000-00480
County Planner: Gwen Beyeler, gvonklan@co.santa-barbara.ca.us
APN: 083-150-013
Cannabis Acreage: 24.45
Well: Five active wells
Proposed Water Storage: 11 water tanks totaling 70,000 gallons in volume
SIUR Participant: No
Current Project Status: Approved, permit not issued

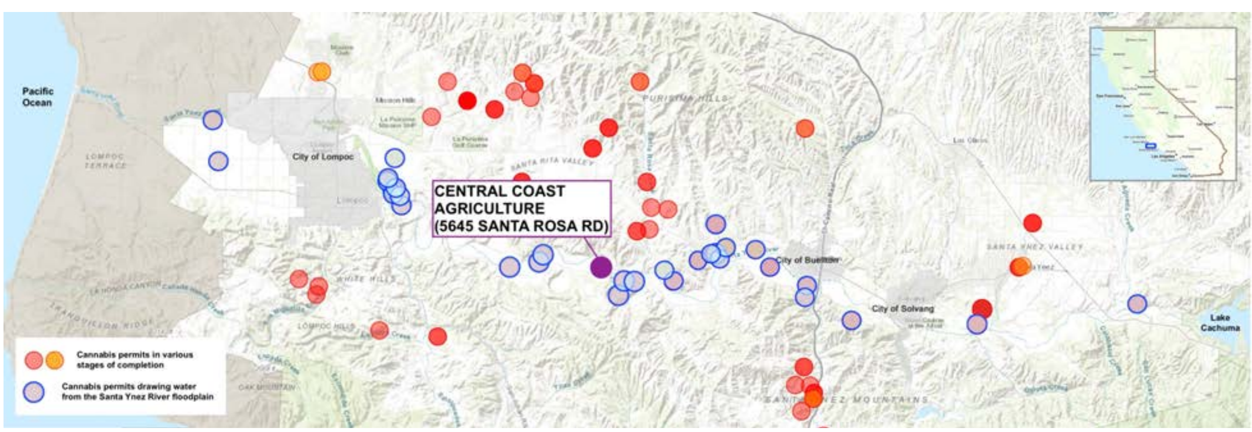

Figure 5. Location of Central Coast Agriculture's 5645 property in relation to the Santa Ynez River. After County of Santa Barbara ArcGIS, https://sbcopad.maps.arcgis.com/apps/webappviewer/index.html?id=f287d128ab684ba4a87f1b9cff438f91

The Central Coast Agriculture 5645 Santa Rosa Road cannabis operation is located on a riparian parcel in the Santa Ynez River's floodplain, within its known and definite channel.

2.1.3.1. Wells

The project description states that three wells will serve the property, however, upon examining older records there appear to be five, with four in the alluvium and one in the bedrock bordering the river. A sixth alluvial well from the late 1970s was apparently decommissioned. Few well completion reports are available for these wells. Correlating which specific documents or records provided by the County correspond to which individual well has been problematic, and most appear to be hand-drawn recollections by the landowner.

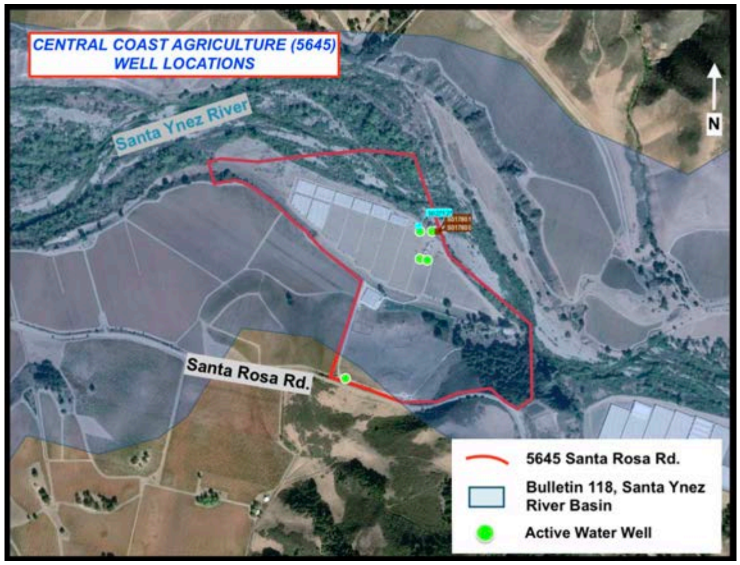

Figure 6. Location of Central Coast Agriculture's 5645 water wells and SWRCB points of diversion, after County of Santa Barbara's ArcGIS.

Two of these alluvial wells have a decades-long history of riparian claims operating under a Statement of Diversion and Use with the SWRCB. In 2010, Chris Cadwell, the property owner, had the mixed use/domestic well under the Statement of Diversion and Use under Application S017801 and the agricultural well under S017800. In 2017, John De Friel of Central Coast Agriculture filed a riparian claim for the agricultural well under S027527 for the irrigation of commercial cannabis, but in March 2021 requested deactivation of this point of diversion, stating it were not in a "delineated subterranean stream" and the operation was now using groundwater, not surface water. As the latitudinal/longitudinal coordinates for three of this cannabis project's wells match those in the previous Statements of Diversion and Use for this property, it is assumed that the wells are indeed identical and continuing to pump the underflow of the Santa Ynez River.

Two other alluvial wells are on the floodplain, but slightly further from the river. One of these was drilled in November, 2020, showing the typical Santa Ynez River Alluvial Basin geologic profile of alluvial sands and gravels terminating at 90' in brown shale. The fourth alluvial well is older, with an unknown date of construction.

The bedrock well is drilled to a depth of 1200' but its screened interval is capped at 690'. The yield of this well is 22 gallons per minute, as compared to the high-yielding alluvial wells. This illustrates not only the incentive for drawing irrigation water from the alluvial wells, but the low-yielding, relatively impermeable nature of the confining bed and banks of the Santa Ynez River's known and definite channel.

2.1.3.2. Water Reporting

Three Statements of Diversion and Use were filed with the SWRCB for wells on this property. One Statement was filed by the cannabis project operator, John De Friel, for the main cannabis irrigation well, and two by the property owner, Chris Cadwell, for the domestic well (S017800) and a separate agricultural well (S017801). The Initial Statement for 2016 (filed in October, 2017) for S027527 describes the intention to use water to irrigate cannabis, and reports using 2.7 AFY for a half-acre of cannabis while using water conservation measures such as drip tape and plastic mulch. The Supplemental Statement for 2017, filed June 28, 2018, then reports using 2.10 AFY for 5 acres of cannabis beginning in March, with no water used in October, November, and December. As these reported monthly measurements are largely identical, it can be deduced that these numbers were estimates rather than actual metered use. No Supplemental Statements of Diversion and Use were filed for this well for 2018 to 2021, despite the fact that an increased water use was reported to the Santa Ynez River Water Conservation District (SYRWCD) during this period. Central Coast Agriculture requested inactivation of S027527 in 2021. Although the latitudinal/longitudinal coordinates for the cannabis irrigation well noted on the project's site plans are identical to S027527, Mr. De Friel has continued to utilize water from this well despite being in continual, expanding production from 2017 to 2021, failing to report its water use to the SWRCB.

When examining the diversion records of this project, it becomes clear that at some time in 2018, Mr. De Friel became aware of the Cannabis Cultivation Policy's strictures on commercial cannabis cultivation and subterranean streams and ceased to accurately report this well's water use.

2.1.3.3. SIUR

A Notice of Receipt was issued by the SWRCB for this property, stating that no SIUR was necessary. However, a Public Records Act request revealed that this NOR, filed by Central Coast Agriculture's attorney Matt Allen, was obtained by claiming the project was only utilizing the low-producing bedrock well located outside of the river channel and neglected to mention the four other alluvial wells being utilized for cannabis irrigation, cannabis infrastructure and/or domestic purposes. During Planning Commission questioning, Mr. Allen declined an invitation to restrict the project's water supply to only the bedrock well. A transcript of this exchange is among the documents listed in Attachment B.

2.1.3.4. Hydrological Analysis

Kear Groundwater provided a memo examining the hydrogeology of the water available to the project, which states:

> *"Based on our review, we conclude that while the existing well extracts from a shallow alluvial aquifer that may be classified as part of the "subterranean stream" of the Santa Ynez River flow system, water usage for cannabis cultivation at 5645 Santa Rosa*

Road is negligible within the larger flow system and will not "substantially affect instream flows" from the baseline condition.[11]*"*

It should be brought to mind that whether a project has a negligible impact is irrelevant when assessing the *legal right* to use the water for irrigating cannabis in a subterranean stream in a known and definite channel. Any water use would need to comply with the SWRCB's Cannabis Cultivation Policy, including pumping and storage limitations and the forbearance period.

In assessing the availability of water for the project, Kear measured instream flow in the river on September 18, 2018. As this flow would include both the volume of water released for fish habitat maintenance as well as downstream water rights users, it would present a false sense of water availability. In fact, Kear's Chart 4c illustrates the fact that there were no downstream rights holder releases for a number of the years represented. Kear performed no calculations for the depletion of instream flows in relation to these water releases, seasonal fluctuation, and the fact that water for downstream users is not released every year.

Kear's claim of a 'negligible impact' is not based on the project's impact in relation the unique geology of a subterranean stream or its flow, but a 2014 Santa Barbara County Water Agency Groundwater Basins Status Report that states 1.11% has been extracted of the 90,000 acre feet of usable groundwater for the Santa Ynez River Alluvial Basin, and that water volume is stable because of releases from Bradbury Dam. Kear makes no calculations as to the actual water use of the project, demonstration of a legal right to the water, or the project's impacts to downstream users or fish habitat maintenance.

2.1.3.5. Water Storage

There is a decommissioned reservoir on the property, however, the project description does not include recommissioning the reservoir and its site plans note that its existence is "non-cannabis" related. The potential volume of this reservoir is unknown, however, even if recommissioned, it may not be enough to provide 72.13 AFY (24.45 acres of cannabis at 2.95 AF/acre/year) during the summer moratorium on water diversion for commercial cannabis. Such a large reservoir would be above the 20 AFY permitted for storage of riparian water for cannabis, and qualify as a jurisdictional dam subject to the State of California's Division of Safety of Dams[12].

Eleven water tanks are proposed to be part of the cannabis project. Seven 5,000 gallon tanks are proposed to serve the cannabis irrigation and infrastructure, and three 10,000 gallon tanks are to serve fire suppression, totaling 70,000 gallons in volume. This volume of stored water would be inadequate to irrigate 24.45 acres of cannabis through the 106-day summer and fall forbearance period imposed by the SWRCB's Cannabis Cultivation Policy.

[11] Hydrologic Overview and Potential Impact Assessment, 5645 Santa Rosa Road, Vicinity Lompoc/Buellton, Santa Barbara County, CA., Kear Groundwater, January 21,2020. p. 2
[12] Statutes and Regulations Pertaining to Supervision of Dams and Reservoirs", California Water Code, Division 3, Dams and Reservoirs, Part 1, Supervision of Dams and Reservoirs, Chapter 1, Definitions, 6000-6008.

<u>2.1.4. CENTRAL COAST AGRICULTURE – 8701 SANTA ROSA RD., BUELLTON, CA 93427</u>

County Planning Case: 19CUP-00000-00005
County Planner: Gwen Beyeler, gvonklan@co.santa-barbara.ca.us
APN: 083-180-007
Cannabis Acreage: 35
Well: Existing alluvial well; new bedrock well
Proposed Water Storage: 5 water tanks totaling 48,000 gallons
SIUR Participant: Unknown
Current Project Status: Approved, permit not issued

Central Coast Agriculture's 8701 Santa Rosa Road cannabis operation is located on a riparian parcel in the Santa Ynez River floodplain, within its known and definite channel. This permit is still in process, as the applicant has put in requests for revisions to storage tanks and shipping containers for storage. Applicant was notified that an amendment will be required.

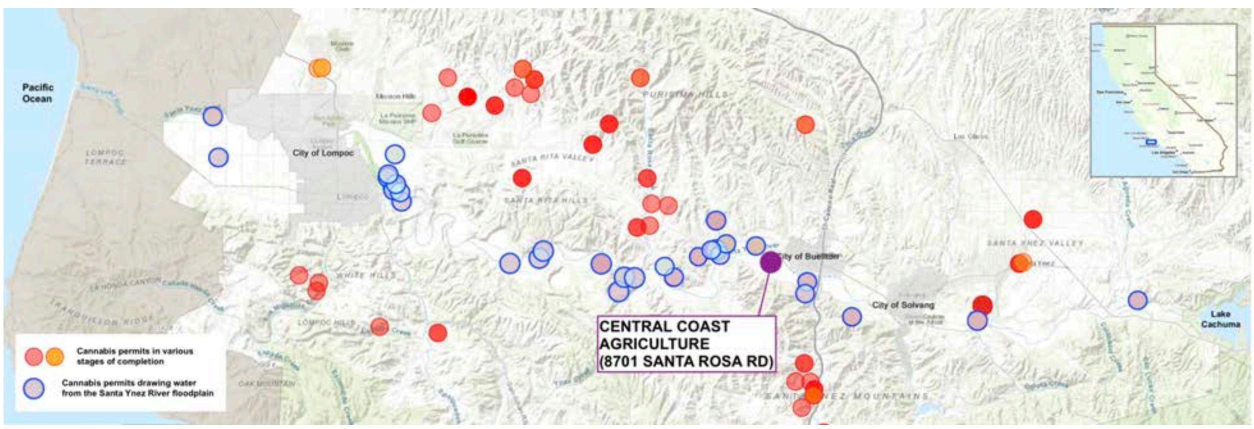

Figure 7. Location of Central Coast Agriculture's 8701 property in relation to the Santa Ynez River. After County of Santa Barbara ArcGIS, https://sbcopad.maps.arcgis.com/apps/webappviewer/index.html?id=f287d128ab684ba4a87f1b9cff438f91

<u>2.1.4.1. Wells</u>

The agricultural well (and the current mixed use (domestic and agriculture) well have lengthy history of operating under a Statement of Diversion and Use with the SWRCB. In 2010 and 2013, Victoria Starr (agent) and William F. Mowry (primary owner) had the well now labeled as a residential well under the Statement of Diversion and Use under Application S017156. In 2017, John De Friel of Central Coast Agriculture filed a riparian claim for the agricultural well under S027524 for the irrigation of commercial cannabis, but in March 2021 requested deactivation of the point of diversion, and stated it was not in a "delineated subterranean stream" and the project was now using groundwater, not surface water. As the latitudinal/longitudinal coordinates for this cannabis project's wells match those in the previous Statements of Diversion and Use for this property, it is assumed that the wells are indeed identical and continuing to pump the underflow of the Santa Ynez River.

No online well completion reports were available for the alluvial wells.

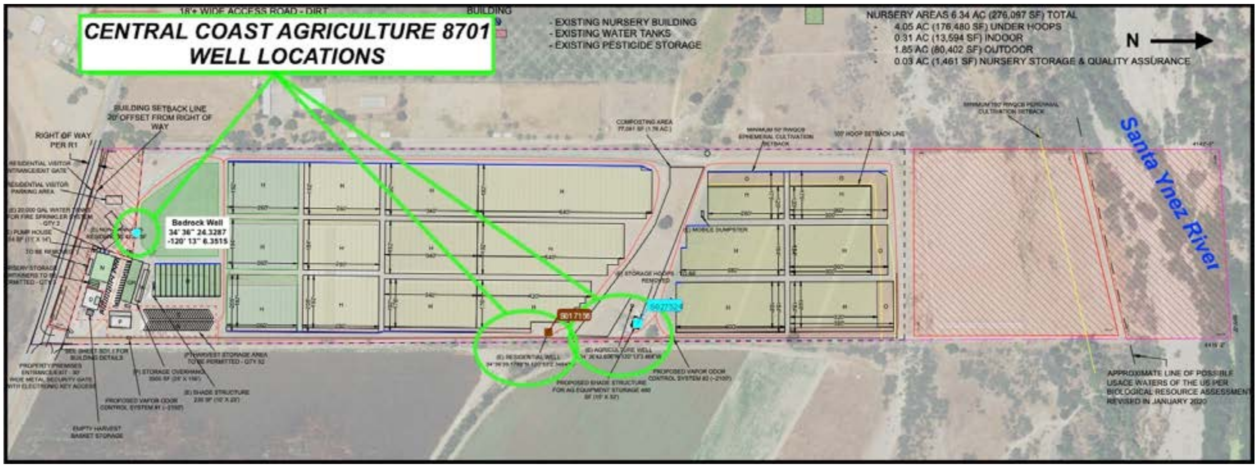

Figure 8. Location of water wells from Central Coast Agriculture's 8701 parcel's site plans and well completion report, with SWRCB points of diversion.

As with Central Coast's other property at 5645 Santa Rosa Rd., a new bedrock well was drilled to attempt to avoid mandatory forbearance requirements associated with subterranean surface flow. This new bedrock well's geologic log shows sand to 58 feet, then solid sandstone to a depth of 1200', and has a yield of approximately 20 gallons per minute. Despite this well being drilled in 2019, it was omitted from the project's site plans. As with Central Coast's 5645 property, this illustrates not only the incentive for drawing irrigation water from the alluvial wells, but the low-yielding, relatively impermeable nature of the confining bed and banks of the Santa Ynez River's known and definite channel.

It is unknown at this time whether this project applied for a SIUR determination using the bedrock well while omitting the alluvial wells, as was done for 5645, however it is likely and should be investigated further.

2.1.4.2. Water Reporting

The Initial Statement for 2016 (filed in October, 2017) for S027524 describes the intention to use water to irrigate cannabis, and reports using 2.7 AFY for a .72 acres of cannabis while using water conservation measures such as drip tape and plastic mulch. The Supplemental Statement for 2017, filed June 28, 2018, then reports using 6.982958 AFY for 15 acres of cannabis beginning in March, with no water used in November, and December. As these reported monthly measurements are largely identical, it can be deduced that these numbers were estimates rather than actual metered use. No Supplemental Statements of Diversion and Use were filed for this well for 2018 to 2021, despite the expansion of its non-conforming use to its full acreage. Central Coast Agriculture requested inactivation of S027524 in 2021. Although the latitudinal/longitudinal coordinates for the cannabis irrigation well noted on the project's site plans are identical to S027524, Mr. De Friel has continued to utilize water from this well despite being in continual, expanding production from 2017 to 2021, failing to report its water use.

When examining the diversion records of this project, it becomes clear that at some time in 2018, Mr. De Friel became aware of the Cannabis Cultivation Policy's strictures on commercial cannabis cultivation and subterranean streams, and ceased to accurately report this well's water use.

The volume of water use reported to the SYRWCD is unknown at this time.

2.1.4.3. Hydrological Analysis

Kear Groundwater performed a hydrological report for the 8701 project and its wells, essentially identical to the report produced for Central Coast Agriculture's 5645 property. It states:

> *"Based on our review, we conclude that while the existing well extracts from a shallow alluvial aquifer that may be classified as part of the "subterranean stream" of the Santa Ynez River flow system, water usage for cannabis cultivation at 8701 Santa Rosa Road is negligible within the larger flow system and will not "substantially affect instream flows" from the baseline condition."*[13].

and:

> *"The shallow well produces groundwater from unconsolidated sand and gravel alluvial aquifers that are, at least in part, in hydraulic connection with the Santa Ynez River flow system."*

Again, it should be brought to mind that whether a project has a negligible impact is irrelevant when assessing the *legal right* to use the water for irrigating cannabis in a subterranean stream in a known and definite channel. Any water use would need to comply with the SWRCB's Cannabis Cultivation Policy, including pumping and storage limitations and the forbearance period.

In assessing the availability of water for the project, Kear measured instream flow in the river on September 18, 2018. As this flow would include both the volume of water released for fish habitat maintenance as well as downstream water rights users, it would present a false sense of water availability. In fact, Kear's Chart 4c illustrates the fact that there were no downstream rights holder releases for a number of the years represented. Kear performed no calculations for the depletion of instream flows in relation to these water releases, seasonal fluctuation, and the fact that water for downstream users is not released every year.

As with the 5645 project, Kear's claim of a 'negligible impact' is not based on the 8701 project's impact in relation to the unique geology of a subterranean stream or its flow, but a 2014

[13] Hydrologic Overview and Potential Impact Assessment, 8701 Santa Rosa Road, Vicinity of West Buellton, Santa Barbara County, CA., Kear Groundwater, January 21,2020. p. 1

Santa Barbara County Water Agency Groundwater Basins Status Report that states 1.11% has been extracted of the 90,000 acre feet of usable groundwater for the Santa Ynez River Alluvial Basin, and further, that water volume is stable because of releases from Bradbury Dam. Kear makes no calculations as to the actual water use of the project, demonstration of a legal right to the water for cannabis, or the project's impacts to downstream users or fish habitat maintenance.

No analysis was offered for water use or impacts from the shallow bedrock well.

2.1.4.4. Water Storage

Water storage for the project consists of two 20,000 gallon tanks, one 5,000 gallon tank, one 1,000 gallon tank, and one 2,000 gallon tank, totaling 48,000 gallons. As this riparian parcel utilizing a subterranean stream in a known and definite channel would need to file for a SIUR, and must store the water to be used during the 106-day summer and fall forbearance period, this volume of stored water would be inadequate to supply the estimated water demand of 103.25 AFY for this project.

The applicant has put in requests to County Planning for revisions to storage tanks and shipping containers for storage and was notified that an amendment will be required. The status of any such amendment is currently unknown.

2.1.5. HBF LLC/HARTB – 510 HIGHWAY 101, BUELLTON, CA 93427
County Planning Case: 18LUP-00000-00387, 20LUP-00000-00435, 20RVP-00000-00017
County Planner: Alia Vosburg (avosburg@co.santa-barbara.ca.us)
APNs: 137-270-031, 137-280-017
Cannabis Acreage: 2.75
Well: Offsite on APN 137-270-032; Well ID WCR2005-016072
Proposed Water Storage: 5 cannabis water tanks, unknown total volume
SIUR Participant: Unknown
Current Project Status: Approved, permit issued; subsequent revisions in process.

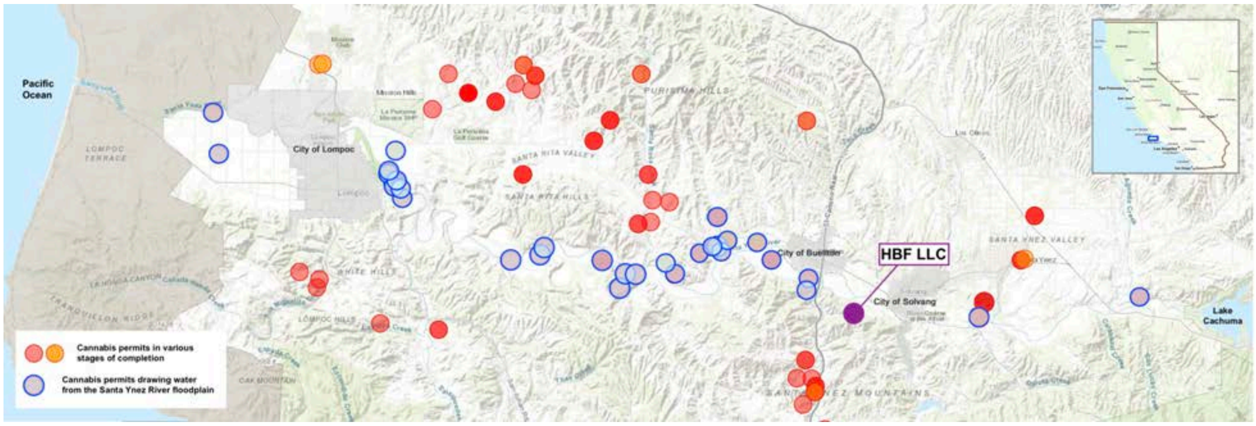

Figure 9. Location of the HBF, LLC property in relation to the Santa Ynez River. After County of Santa Barbara ArcGIS, https://sbcopad.maps.arcgis.com/apps/webappviewer/index.html?id=f287d128ab684ba4a87f1b9cff438f9

The HBF LLC cannabis project consists of two parcels owned by HartB LLC (APNs 137-270-031 and 137-280-017). This cannabis operation is located on a non-riparian parcel adjacent to the Santa Ynez River floodplain, with its offsite well located within its known and definite channel.

2.1.5.1. Well

The project's well is located to the north on a non-contiguous riparian parcel under separate ownership (APN 137-270-032). No coordinates are provided for this well. Consultation of the DWR's ArcGIS mapping tool for well completion reports revealed the well completion report for the well noted on the site plans for the cannabis project is registered under WCR2005-016072 (legacy no. 0905309). This well completion report shows the typical well profile for the Santa Ynez River alluvium, with a shallow well drilled into gravel and sand terminating in shale at a depth of 52 feet.

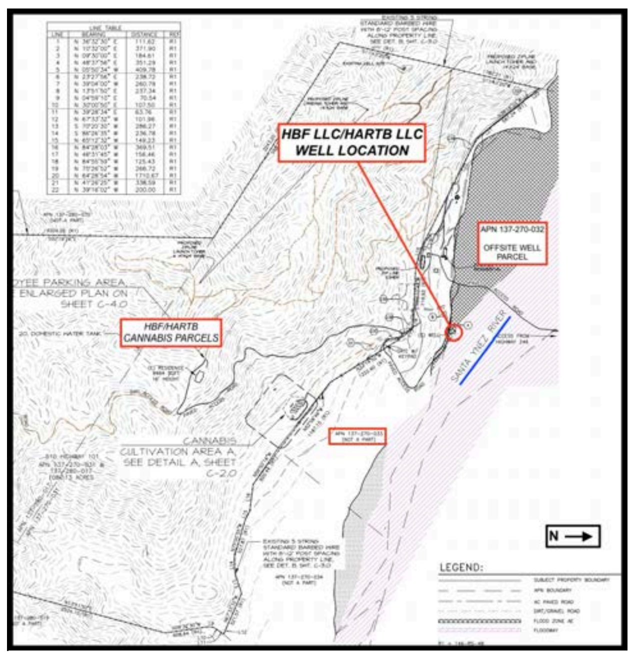

Figure 10. Location of water wells from the HBF, LLC's parcel's site plans.

2.1.5.2. Hydrological Analysis

The HartB cannabis operation has a previous subterranean stream determination detailed in a SWRCB memo dated February 6, 2019. This determination concluded that the HartB well draws water from the subterranean surface water of the Santa Ynez River, based on positive identification of all characteristics present of the Garrapata 4-part test for subterranean streams in a known and definite channel.

It appears that the County of Santa Barbara was unaware of this previous subterranean stream determination and this project was issued a land use permit which does not reflect in its conditions adherence to the SWRCB's Cannabis Cultivation Policy.

Revisions to this permit are currently in process, but its status is currently unknown.

2.1.5.3. Water Storage

One domestic water storage tank of an unknown volume was noted on the project's site plans. No water storage was noted for the cannabis cultivation itself, either on the site plans or in the land use permit's project description, however, the Subterranean Stream Determination from the SWRCB in regard to this project states there are three 5,000 gallon tanks that are being used for diversion. As the project's water demand calculated by McCord (2022) would be estimated at 2.95 AFY per acre cultivated, the project would need to store approximately 8.11 acre-feet of water to allow irrigation of its 2.75 acres of cannabis during the 106-day summer and fall forbearance period.

2.1.5.4. Water Sharing

HBF LLC's parcels arelocated on the relatively impermeable bedrock hills above the floodplain of the Santa Ynez River, and are severed from the riparian flow of the river. Its cannabis cultivation project well sources its water from a neighboring riparian parcel, which is disallowed under the California system of riparian water rights.

2.1.6. HEIRLOOM VALLEY / LUGLI FAMILY TRUST – 6495 SANTA ROSA RD., LOMPOC, CA 93436
County Planning Case: 19LUP-00000-00080
County Planner: Petra Leyva, petra@countyofsb.org
APN: 083-150-010 and 083-160-003
Cannabis Acreage: 47
Well: Four wells
Proposed Water Storage: 11 water tanks totaling 81,000 gallons; Agricultural reservoir, 8.47 acre-feet
SIUR Participant: Unknown
Current Project Status: Approved, Permit Not Yet Issued

The Heirloom Valley cannabis operation is located on a riparian parcel on the Santa Ynez River floodplain, within its known and definite channel. This project is adjacent to, and shares access and some of its facilities with the Ag Roots cannabis project on its western border. Heirloom Valley and Ag Roots operations were formerly a single project but was subsequently split to reflect its separate parcel ownership.

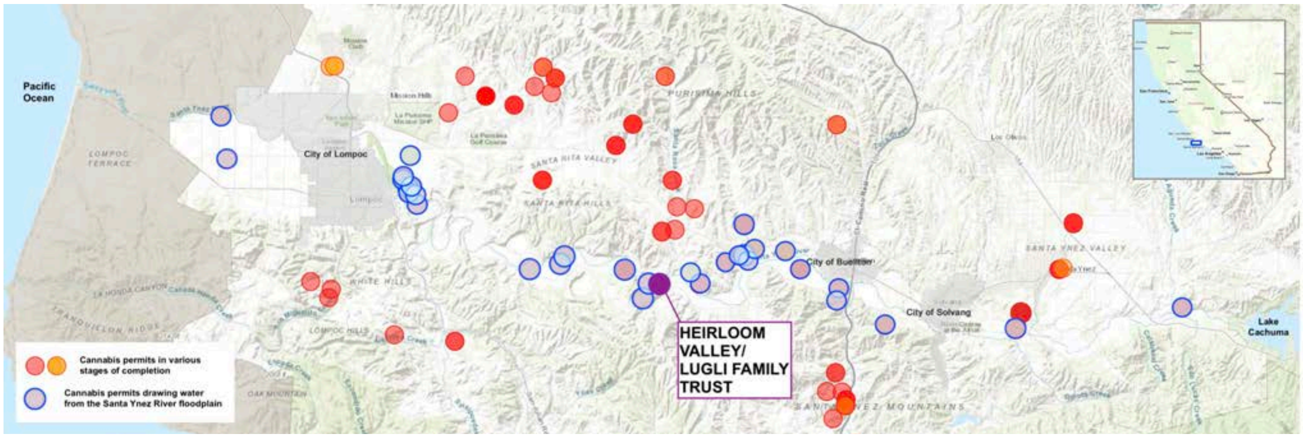

Figure 11. Location of the Heirloom Valley property in relation to the Santa Ynez River. After County of Santa Barbara ArcGIS, https://sbcopad.maps.arcgis.com/apps/webappviewer/index.html?id=f287d128ab684ba4a87f1b9cff438f91

2.1.6.1. Wells

A hydrologist's report[14] describes four wells on the Heirloom Valley project parcel as Well A, Well B, Well 1 and Well 2. Well 1 was mentioned only in passing as providing domestic water and no further information was given in the hydrologist's report, but it is assumed that it is the domestic well noted on the site plans.

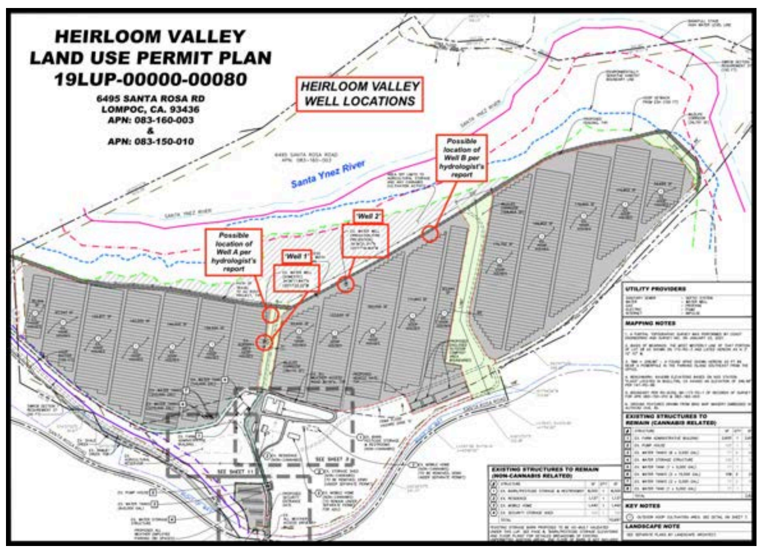

Figure 12. Location of water wells from Heirloom Valley's site plans.

All four wells are located in the within a few hundred feet of the visible flow of the Santa Ynez River. Katherman's pump tests of these wells noted details of both depths and productivity, noted as:

Well A – 80 feet flow of 100 gallons per minute
Well B – 40 feet, flow of 100 gallons per minute
Well 1 – (not examined, domestic supply)
Well 2 – 80 feet, flow of 430 gallons per minute

[14] Addendum to Original Hydrology Report Dated 4/24/2019, Nature Farm/Lower Donovan Properties. Katherman Exploration Co, LLC, August, 2020.

These shallow, highly productive wells are typical of the alluvial wells in the Santa Ynez River floodplain. No well completion reports were available.

Only two wells were noted on the site plans provided for the project. The hydrologist's report states that Well A and B are currently standing idle, however, they have not been destroyed and could certainly be used to avoid well monitoring duties.

Both the location in the river's floodplain as well as Katherman's statements of the termination of the wells in the lower layers of the alluvium support the fact that these wells would indeed draw from the subterranean stream of the Santa Ynez River's known and definite channel.

2.1.6.2. Hydrological Analysis

Katherman's report is erratic in that it claims that the project's wells lie outside the Santa Ynez River basin, yet all information cited in his report describe geologic sediments consistent with riverbed alluvium and point to draw from the subsurface flow.

Both water demand reports (Katherman 2021[15], 2021a[16]) were provided by the County planner, which state: "*The Ag Roots property (APN 083-150-011) overlies the California Department of Water Resources (DWR) designated Santa Ynez River Groundwater Basin, specifically the Central Management Area of the Santa Ynez River*[17]" and essentially presents a discussion of water use as a part of the Buellton Uplands and not the specific hydrogeology of the Santa Ynez River alluvium. It omits discussion of the characteristics of the project's wells such as geologic location, depth to water and other key issues for determining the source of its water. Instead of examining the wells' known hydrogeologic connection with the subterranean stream of the Santa Ynez River, Katherman merely states that the few hundred feet to the river's visible flow precludes hydrogeologic connection.

It is to be noted that these labels and classifications of these groundwater Basins are merely a management tool for the implementation of the California Sustainable Groundwater Management Act through the various Groundwater Sustainability Agencies and do not represent a hydrogeological analysis.

Although the scientific and legal documentation of the Santa Ynez River's geology and its known and definite channel has been established since 1951, Katherman's own opinion in the addendum report is that these wells are not hydraulically connected to the river. He bolsters this claim by examining "*1) The physical distance between the subject wells and the riverbed itself, 2) Additional testing and monitoring of key water wells and the measurement of the cone of depression or zone of influence around these wells, 3) The potential segregation of the alluvial intervals by low*

[15] Water Demand Memo of June 18, 2021. Ag Roots Project, Katherman Exploration Co, LLC
[16] Water Demand Memo (Revised 7/8/21) of June 18, 2021. Ag Roots Project, Katherman Exploration Co, LLC, 2021b
[17] Water Demand Memo (Revised 7/8/21) of June 18, 2021. Ag Roots Project, Katherman Exploration Co, LLC

permeability clay zones, 4) Potential differences in water chemistry, [and] *5) Controlled water releases from Lake Cachuma and Bradbury Dam.*[18]

None of these items are germane to the Garrapata 4-part test for either the proper legal identification or invalidation of a subterranean stream in a known and definite channel. Katherman propounds unproven theories that conflict with the large body of knowledge of this region, such as stating that by examining riverine well boring logs, the clay layers in the alluvium represent confining aquitard layers that isolate the subterranean stream's upper flow from the lower layers that contain the terminus of the project's wells, and that minor variations of dissolved solids in its water are the results of these clay layers. Such a claim is unsupported, as lenses of clay are common in any alluvial sediments, and the layers noted all vary in depth, location and composition. These well completion reports are useful, however, in that they all describe alluvial sediments of sands, gravels, and clays terminating in bedrock shales, and demonstrate and support both the accepted body of scientific knowledge and the Garrapata 4-part test defining the Santa Ynez River as a known and definite channel. Katherman then contradicts his opinion by stating that water releases from Lake Cachuma would recharge water both above and below these layers, implying this water would be available to the project. Hydraulic connection to the river is demonstrated by the geology and transmissivity of the sediments, not distance. As the sustained pumping drawdown was slight and subsequent recovery rates from Katherman's pump tests are remarkably rapid, it points to a high fluid transmissivity of the sediments in the alluvium, as is known in the Santa Ynez River channel.

No cumulative impacts to the river's underflow were analyzed in this report. Despite acknowledging the Lake Cachuma releases and its recharge to the alluvial channel, potential impacts to downstream water rights holders were not discussed.

Katherman's June 2021 addendum to his water demand memo[19] appeared to clarify some of the water demand calculations of his original memo of May 20, 2021. This addendum claimed a water duty for two crops of cannabis of 1.8 AFY. This addendum states that the wells on this property have never had a water meter, and that previous water use data sent to the Santa Ynez River Water Conservation District represent 'educated guesses,' and was over-reported in 2019 and 2020, during the time the cannabis project was planted and producing at full capacity, due to the owners' fear of fines for under-reporting use. It is unfortunate that the original water demand memo of May, 2021 is unavailable through County Planning, as it would contain the calculations of actual water use, likely similar to the Ag Roots water demand memoranda. For further investigation, it could possibly be obtained from the project's owners or managers.

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[18] Addendum to Original Hydrology Report Dated 4/24/2019, Nature Farm/Lower Donovan Properties,. Santa Ynez River Basin, Santa Rita Subarea, Santa Barbara County, CA. August, 2020.

[19] Addendum to Water Demand Memo (5/20/21) For Heirloom Valley Project, June 8, 2021. Katherman Exploration Co, LLC.

As noted previously, the water duty of cannabis cited by McCord in his analysis is estimated to be 2.95 AFY per acre planted[20] for multi-crop cannabis operations, far above the 1.8 AFY proposed by Katherman's water demand addendum report. Applying this estimate to the 47 acres being grown by the Heirloom Valley project, its cannabis water demand would be approximately 138.65 AFY. This estimate does not include incidental project use, such as for composting or landscaping for visual screening.

2.1.6.3. Water Storage

Heirloom Valley is one of the few projects that has an existing agricultural reservoir, with an 8.47 acre-foot volume. Using McCord's estimated water duty, 47 acres of cannabis would need 138.65 AFY, 16 times the storage capacity of the extant reservoir. As the growing season for cannabis coincides with the summer moratorium on diverting surface water, the extant reservoir would need to store water for the entire growing season and cannot be refilled or topped off during the summer months. The extant reservoir's capacity would only support approximately 8 acres of cannabis irrigation. This calculation does not include or account for evaporation from reservoir's surface during the summer months. Should Heirloom Valley build a larger reservoir, its capacity would be limited to 20 AFY by the SWRCB's Cannabis Cultivation Policy's SIUR Revisions of July, 2020.[21]

2.1.6.4. Water Sharing

The SWRCB's Division of Water rights notes that riparian water must only be utilized on the parcel that contains it, and that water rights can be severed through parcel division[22]. Heirloom Valley's cannabis project is composed of two separate parcels, one of which (083-160-003) contains all four wells noted on Katherman's hydrology report. Parcel 083-150-010 would need to drill its own well and apply for a SIUR to irrigate commercial cannabis in order to comply with California riparian rights laws.

Figure 13. Heirloom Valley's Parcels and Riparian Well Locations.

[20] Hydrologic Evaluation of Irrigation Water Supplies for Cannabis Production Projects in the Santa Ynez River Valley, California, July 31, 2022. Jim McCord, Ph.D, PE, Lynker Technologies, LLC.
[21] SWRCB Resolution Revising General Conditions to be Applied to Small Irrigation Use Registrations for Cannabis Cultivation, July 14, 2020, p. 3.
[22] SWRCB Water Rights FAQ https://www.waterboards.ca.gov/waterrights/board_info/faqs.html#toc178761088

A letter from the Ag Roots LLC's private planner, dated November 13, 2020, in response to a County incomplete feedback letter, indicates that the 8.47 acre reservoir on the neighboring parcel, Heirloom Valley cannabis project, had been proposed as a water source for Ag Roots. This use was not detailed in either the Ag Roots or the Heirloom Valley Project Description, CEQA Checklist, or the site plans, which states only that the onsite well will be used. An Ag Roots consultation letter with the CDFW (2021) stated, "The water source for the [Ag Roots] Project is two existing wells, consisting of one existing onsite well and one existing well located on an adjacent land parcel[23]."

Given the prohibition on sharing riparian water rights with another parcel, Heirloom Valley's wells and the reservoir filled with Heirloom Valley's riparian water would not be available to the Ag Roots cannabis project, likely despite the reservoir being located on the Ag Roots parcel.

2.1.7. IRON ANGEL, LLC 5930 SANTA ROSA RD., LOMPOC, CA 93436

County Planning Case: 19LUP-00000-00145
County Planner: Willow Brown, wbrown@countyofsb.org
APNs: 083-150-006, 083-160-001, 083-310-001, 083-310-002
Cannabis Acreage: 27.75 acres
Well: Located offsite, on Ag Roots parcel APN 083-150-011, 34º36'29"N 120º18'12" W
Proposed Water Storage: 14 water storage tanks totaling 68,500 gallons
SIUR Participant: Unknown
Current Project Status: Permit Issued 10/5/2021

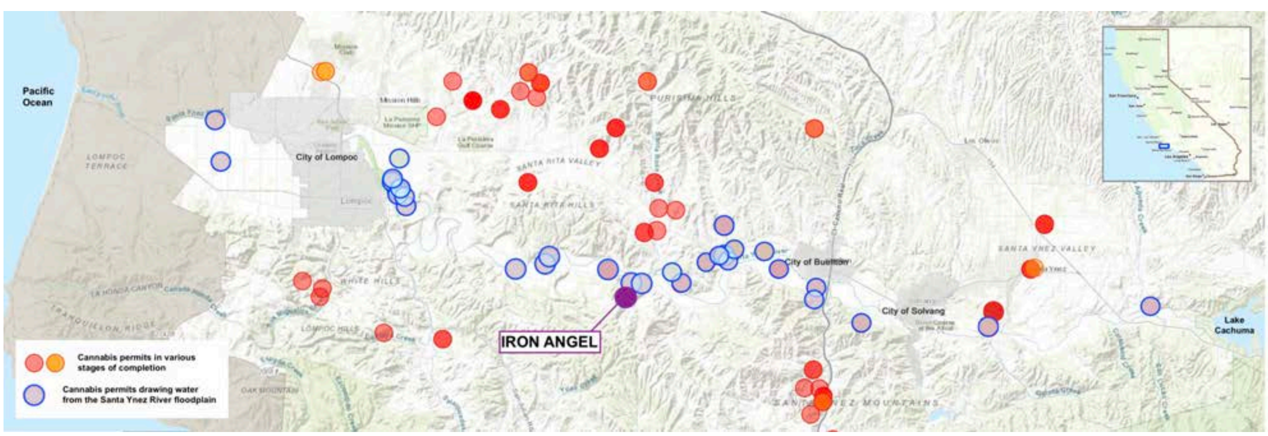

Figure 14. Location of the Iron Angel property in relation to the Santa Ynez River. After County of Santa Barbara ArcGIS, https://sbcopad.maps.arcgis.com/apps/webappviewer/index.html?id=f287d128ab684ba4a87f1b9cff438f91

[23] CDFW Pre-consultation for the Cannabis Cultivation Project at 5935 Santa Rosa Road (Ag Roots), Santa Barbara County. Comments and Recommendations, #4 CDFW, August 6, 2021

The Iron Angel cannabis operation is located on a parcel adjacent to the Santa Ynez River floodplain, with its offsite well located within its known and definite channel.

<u>2.1.7.1. Well</u>

Iron Angel LLC's cannabis operation sources its water offsite from a riparian parcel located to its north, bordering the Santa Ynez River, containing the Ag Roots cannabis operation. Its 2015 well completion report's geologic log included in the hydrogeologic report describes gravel and sand to the depth of 83 feet, followed by gravel and shale from 83 to 100 feet. This report estimated the yield of the well at 450 gallons per minute. This pattern of shallow, highly productive alluvial sediment terminating in shale is consistent with the known and defined subterranean stream morphology of the Santa Ynez River.

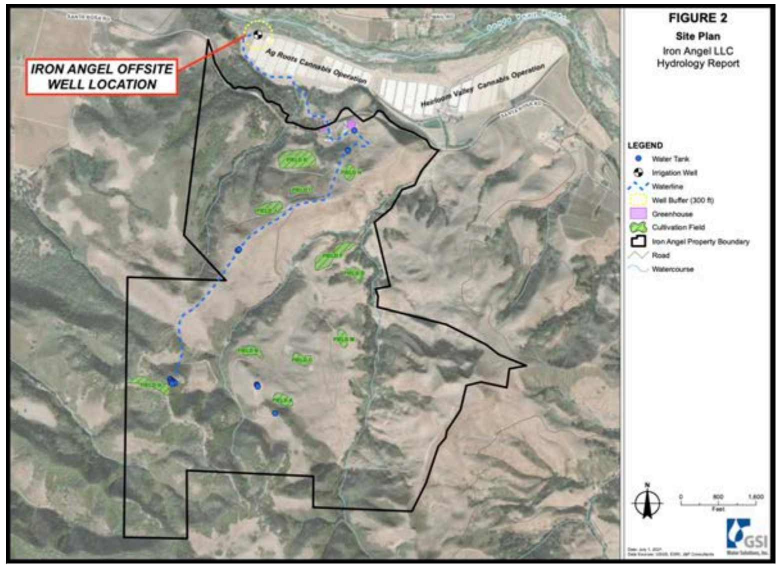

Figure 15. Location of water wells from GSI Water Solutions examination of Iron Angel, July 2021.

<u>2.1.7.2. Hydrological Analysis</u>

This project's hydrogeological report states that this source well draws water from the Santa Ynez River alluvium and describes in detail its direct hydraulic connection to the river, the significance of the water releases from Bradbury Dam and the adverse impacts of its well. Despite the preponderance of the evidence given in this report, and its cite of Stetson's 2020 Hydrologic Conceptual Model, this same report erroneously concludes that the project's well does not constitute a surface diversion and does not need a Lake or Streambed Alteration permit from the California Fish and Wildlife Service.

GSI's report estimates the drawdown impact on the Santa Ynez River's active surface flow at the rate of 1/3 inch of drawdown during the pump's operational cycles[24]. This calculation was based upon 11 acres of cannabis, whereas the issued permit states 27.25 acres, plus another half-acre of nursery cultivation for a total of 27.75 acres, over twice the acreage. Using the water duty for cannabis established by McCord, it is estimated this project would demand 81.86 AFY, nearly a seven-fold increase in the 12 AFY estimated by GSI Water Solutions.

[24] Iron Angel Ranch LLC Hydrologic Report, Lake or Streambed Alteration Notification (EPIMS 06154). GSI Water Solutions, Inc. July 19, 2021

The hydrogeologist's report also claims that the project's impacts are negligible based on the entire storage capacity and flow of the Santa Ynez River Alluvial Basin as measured at the Lompoc Narrows, contradicting the statement that the project's well does not draw its water from the regulated surface flows. Indeed, a further contradiction is presented by stating that *"the annual water use is used to support outdoor cultivation between July 15 to October 15. During a typical year, there is little to no flow in the Santa Ynez River in the Site vicinity during these months except during periods when there are releases from Cachuma Reservoir (Figure 11). Therefore, during typical annual conditions, well use during the summer season will not significantly impact stream flow, since there is little to no stream flow present.[25]"* This statement both confirms the intent to use water during the SWRCB forbearance period and ignores the history and stated purpose of the summer releases from Lake Cachuma in order to preserve fish habitat and the water rights of downstream users.

No analysis was presented as to the cumulative impact of the project's water use on the Santa Ynez River.

The land use permit issued for this project clearly states that the applicant must abide by the SWRCB's Cannabis Cultivation Policy, to include surface water diversion, however, the County neglected to analyze the project's compliance with the SWRCB's prohibition of a.) sharing riparian water with other parcels, b.) diverting surface water during the summer months as well as c.) omitting any analysis of the project's adequacy of water storage during the forbearance period.

2.1.7.3. Water Storage

The Project Description in the CEQA checklist state there will be 14 water storage tanks totaling 68,500 gallons. Given the estimated water demand of 81.86 AFY, this storage volume is wholly inadequate to accommodate the cannabis project's storage needs during the Cannabis Cultivation Policy's forbearance period.

2.1.7.4. Water Sharing

The Iron Angel cannabis project has its water source and well through an easement on the Ag Roots parcel to the north of Santa Rosa Road. As Ag Roots is a riparian parcel, as well as utilizing subterranean flow from a known and definite channel, it cannot export its water to a separate parcel.

2.1.8. LOS ALAMOS AGVENTURES LLC – 3925 SANTA ROSA RD., LOMPOC, CA 93436
County Planning Case: 20LUP-00000-00123
County Planner: Tina Mitchell, tmitchell@co.santa-barbara.ca.us
APN: 083-140-012
Cannabis Acreage: 24.99

[25] Iron Angel Ranch LLC Hydrologic Report, Lake or Streambed Alteration Notification (EPIMS 06154). GSI Water Solutions, Inc. July 19, 2021

Well: 4 active wells, 5 inactive wells
Proposed Water Storage: Unknown
SIUR Participant: Unknown
Current Project Status: In process

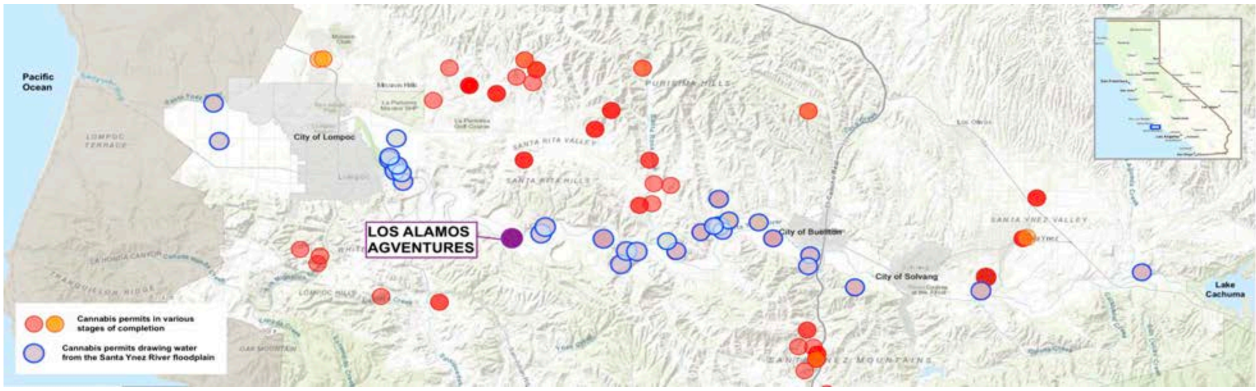

Figure 16. Location of Los Alamos Agventures property in relation to the Santa Ynez River. After County of Santa Barbara ArcGIS, https://sbcopad.maps.arcgis.com/apps/webappviewer/index.html?id=f287d128ab684ba4a87f1b9cff438f91

The Los Alamos Agventurescannabis operation is located on a riparian parcel in the Santa Ynez River floodplain, within its known and definite channel.

2.1.8.1. Wells

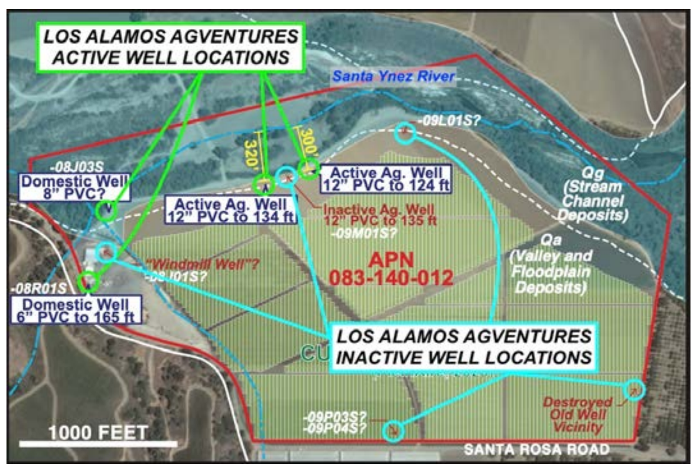

Figure 17. Location of water wells from Kear Groundwater's examination of Los Alamos Agventures, 2020.

This project's site plans show only two agricultural wells, but the hydrological report of 2020[26] depicts four active wells in this area. Three inactive wells are noted, with two other potential inactive wells and one destroyed well noted. It is to be noted that the two active agricultural wells and one active domestic well are located in the 150' riparian setback from the active bed of the Santa Ynez River. The County Planning case notes for this project state that the applicant is looking to decommission the existing wells and drill new wells in order to stay out of the 'riparian area', however, this property is located entirely on the floodplain of the Santa Ynez River, and there would be no location on the property outside of its known and definite channel.

[26] Hydrologic Overview and Potential Riparaian Impact Assessment KG19-0506, 3925 Satna Rosa Road, Lompoc, Santa Barbara County, California, June 5, 2020. Kear Groundwater.

Of the active wells, Kear provided well drilling and completion reports. These record shallow alluvial sand, clay and gravel sediments, terminating in shale bedrock, as is typical for the Santa Ynez River alluvium.

Agricultural Well - 135 ft
Agricultural Well - 124 ft
Agricultural Well - 134 feet
Domestic – unknown depth
Domestic – 165 feet

As only one of the inactive wells is noted to be destroyed, these inactive wells could be recommissioned to avoid water monitoring by the Santa Ynez River Water Conservation District or the SWRCB.

2.1.8.2. Hydrological Analysis

A draft hydrological report prepared by Kear Groundwater[27] was obtained from the project's County Planner. This report does not mention the total acreage of cannabis used for its calculations of stream depletion, however, it appears from the inset image taken from Figure 1 of Page 24 his report it refers to the former intended acreage of 84 acres, rather than the current 24.45 acres under consideration for a land use permit.

As with previous reports, Kear concludes that while the project's wells divert water from a subterranean stream in a known and definite channel, its water use is *"unlikely to acutely "substantially affect instream flows…*" though later acknowledges cumulative impacts may be significant. Kear then presents the Thies equation formula of the projected pumping effects of the project, and states, *"This analytical model suggests that the active well would induce measurable drawdown at the location of the Santa Ynez River,…"* estimated as 0.01ft of depletion of the visible surface flow during active pumping.

Kear's conclusion and recommendations for remedy only involve pumping at appropriate rates and durations to minimize impact: *"A regime of limited pumping periods for cannabis cultivation purposes, with adequate recovery intervals, should result in no acute or significant impact on the Santa Ynez River system."*

Kear does discuss the importance of the water releases from Lake Cachuma and Bradbury Dam but does not analyze the project in terms of its impact to downstream water rights. As this flow would include both the volume of water released for fish habitat maintenance as well as downstream water rights users, the total amount released would present a false sense of water availability. In fact, Kear's Chart 4c illustrates the fact that there were no downstream rights holder

[27] Hydrologic Overview and Potential Riparaian Impact Assessment KG19-0506, 3925 Satna Rosa Road, Lompoc, Santa Barbara County, California, June 5, 2020. Kear Groundwater.

releases for a number of the years represented. Kear performed no calculations for the depletion of instream flows in relation to these water releases, seasonal fluctuation, or its impact during those years that water for downstream rights holders was not released. Kear makes no calculations as to the actual water use of the project, demonstration of a legal right to the water for cannabis, or the project's impacts to downstream users or fish habitat maintenance, just notes that *"the cumulative extraction of local wells may be considered significant over a long pumping season."*

Again, it should be brought to mind that whether a project has a negligible impact is irrelevant when assessing the *legal right* to use the water for irrigating cannabis in a subterranean stream in a known and definite channel. Any water use would need to comply with the SWRCB's Cannabis Cultivation Policy, including pumping and storage limitations and the forbearance period. Kear does note this, however, does not provide specifics for compliance:

> *' The alluvial aquifers currently used at Agventures may still be classified as part of the "subterranean stream" of the larger Santa Ynez River flow system and therefore subject to the current regulatory framework for cultivation operations during forbearance periods."*

Kear's report does not calculate water demand for this project. The site plans' Water efficiency Plan (L-1.18) calculate landscape water use for 89,893 square feet of landscaping, but do not discuss water irrigation or water demand for the cannabis crops. Using the 2.95 AFY per acre water duty for cannabis estimated by McCord[28], the estimated water duty for all 24.99 acres would 73.72 AFY.

2.1.8.3. Water Storage

Although no water tanks are noted on the site plan map, photos of existing conditions on the site plans for this project show a photo of a large water tank, one of which is labeled 'Existing 5,000 Gal. Water Storage Tank,' and three booster pumps as belonging to the project's restroom. It is more likely that this is the location of a well serving all of the structures on site.

As the growing season for cannabis coincides with the summer moratorium on diversion of surface water and cannot be refilled or topped off during the summer months, the project would have to apply for a SIUR and store enough water to meet its needs for the entire growing season. Should Los Alamos Agventures build a reservoir, its capacity would be limited to 20 AFY by the SWRCB's Cannabis Cultivation Policy's SIUR Revisions of July, 2020.[29] This 20 AFY limitation on water would only allow approximately 6 acres of cannabis to be grown, including the 1,030,794

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[28] Hydrologic Evaluation of Irrigation Water Supplies for Cannabis Production Projects in the Santa Ynez River Valley, California, July 31, 2022. Jim McCord, Ph.D, PE, Lynker Technologies, LLC.
[29] SWRCB Resolution Revising General Conditions to be Applied to Small Irrigation Use Registrations for Cannabis Cultivation, July 14, 2020, p. 3.

gallons of water per year for the project's required landscaping as calculated by the Water Efficiency Plan on page L-1.18 of the project's site plans.

2.1.9. TAHQUITZ FARMS LLC – 7601 SANTOS RD., LOMPOC, CA 93436
County Planning Case: 19LUP-00000-00331
County Planner: Petra Leyva, petra@countyofsb.org
APN: 099-230-035 (formerly 099-230-026)
Cannabis Acreage: 15.72
Well: 3 wells; cannabis well 34*36'36.02 N, 120*16'37.27 W
Proposed Water Storage: none
SIUR Participant: Unknown
Current Project Status: Approved, Land Use Permit Issued

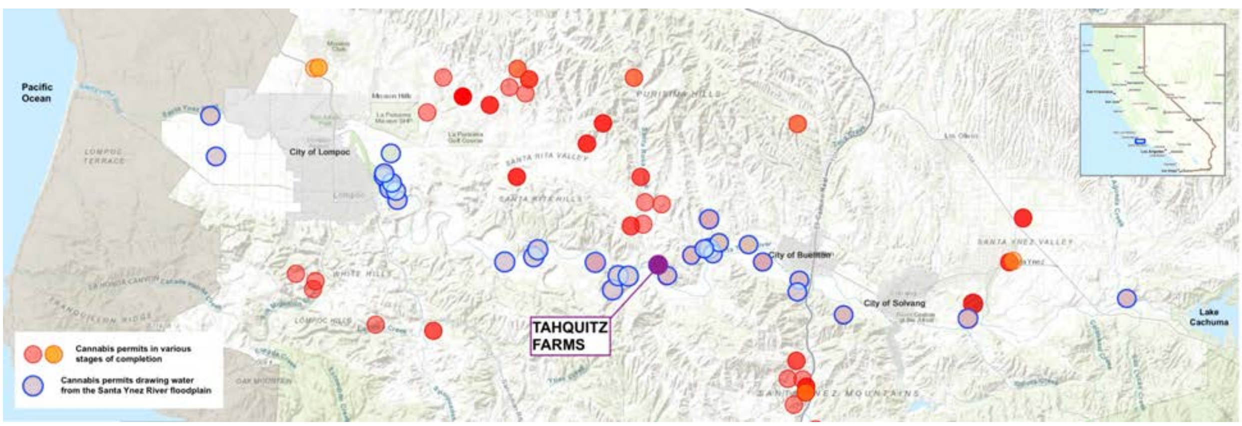

Figure 18. Location of Tahquitz Farms property in relation to the Santa Ynez River. **After County of Santa Barbara ArcGIS, https://sbcopad.maps.arcgis.com/apps/webappviewer/index.html?id=f287d128ab684ba4a87f1b9cff438f91**

The Tahquitz Farms cannabis operation is located on a riparian parcel in the Santa Ynez River floodplain, within its known and definite channel.

The property located at 7601 Santos Rd., Lompoc, CA, contains two operations on the parcel owned by Hilltop Ranch, LLC (APN 099-230-035). Former parcel APN 099-230-026 (containing Tahquitz Farms LLC cannabis operation) and former parcel APN 099-230-025 (containing Red Eagle Farms cannabis operation) were combined into one parcel in the recent years.

2.1.9.1. Wells

The three wells on the Hilltop Ranch parcel have a history of surface water diversion. In 2017 Nathan Osborne, the owner/operator of Tahquitz Farms, filed three statements of diversion and use, listed as S026592 (Ag Pump #1), S026593 (Ag Pump #2), and S026594 (domestic supply). These three Statements of Diversion and Use were rendered inactive on 4/19/2018, though the reason is unknown. Per the site plans provided by Santa Barbara County, the coordinates for the cannabis well for Tahquitz Farms are the same as S026592.

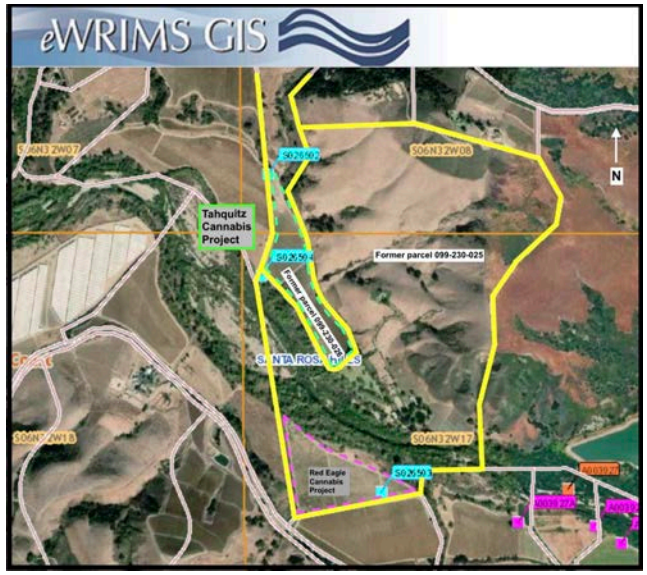

Figure 19. Location of SWRCB points of diversion and the former parcel outlines, after SWRCB eWRIMS database.

Upon inquiry, the County provided a well drilling report from 1976 (Permit Number 578) said to be associated with the former parcel number of 099-230-026. The hand drawn map appears to depict the well associated with S026592.

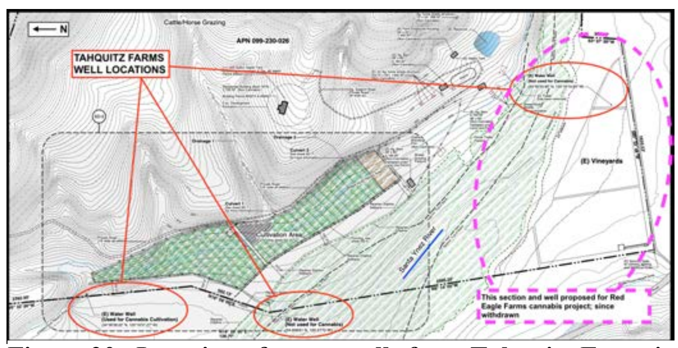

Figure 20. Location of water wells from Tahquitz Farms's site plans.

The well drilling log records alluvial sands and gravels, terminating in shale from 71-80 feet below the surface.

This shallow depth and alluvial sediments terminating in bedrock conform to the known and defined alluvial channel composition of the Santa Ynez River.

2.1.9.2. Water Reporting

A search of the SWRCB eWRIMS water rights database returned no supplemental Statements of Diversion and Use for water use reporting for S026592, S026593, or S026594.

2.1.9.3. Hydrological Analysis

No hydrological analysis was provided for this project. Using the 2.95 AFY per acre water duty for cannabis estimated by McCord[30], the estimated water duty for all 15.72 acres would 46.37 AFY.

[30] Hydrologic Evaluation of Irrigation Water Supplies for Cannabis Production Projects in the Santa Ynez River Valley, California, July 31, 2022. Jim McCord, Ph.D, PE, Lynker Technologies, LLC.

2.1.9.4. Water Storage

No water storage tanks are noted on the plans or in the Project Description of the issued land use permit. As the calculated water use for this project would be 46.37 AFY, plus any landscaping required by the County, a large reservoir would be needed to meet the storage needs of this project during the summer and fall forbearance period on surface diversion. Such a large reservoir would be above the 20 AFY permitted for storage of riparian water for cannabis.

2.1.10. SANTA BARBARA WESTCOAST FARMS –W. HIGHWAY 246, BUELLTON, CA 93427
County Planning Case: 19LUP-00000-00064
County Planner: Kathryn Lehr,
APN: 099-240-067
Cannabis Acreage: 50.12
Well: one well, 34º37'13" N 120º14'24" W
Proposed Water Storage: 6 water tanks totaling 122,000 gallons total volume
SIUR Participant: Unknown
Current Project Status: Approved, permit issued, in current production

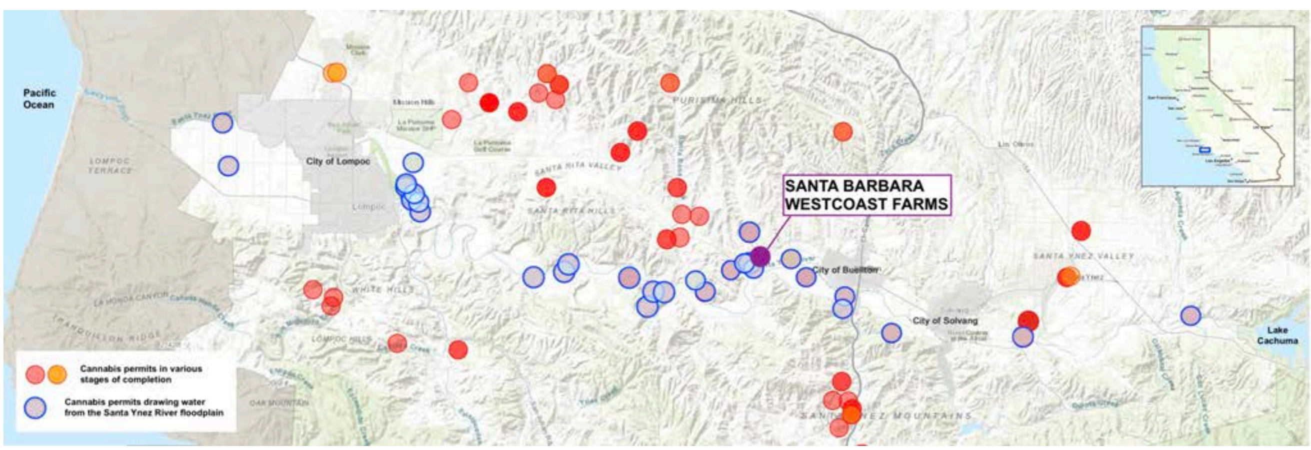

Figure 21. Location of Santa Barbara Westcoast Farms property in relation to the Santa Ynez River. After County of Santa Barbara ArcGIS, https://sbcopad.maps.arcgis.com/apps/webappviewer/index.html?id=f287d128ab684ba4a87f1b9cff438f91

The Santa Barbara Westcoast Farms cannabis operation is located on a riparian parcel in the Santa Ynez River floodplain, within its known and definite channel.

2.1.10.1. Well

The parcel's well is used for cannabis irrigation, water vapor odor control, and cannabis processing.

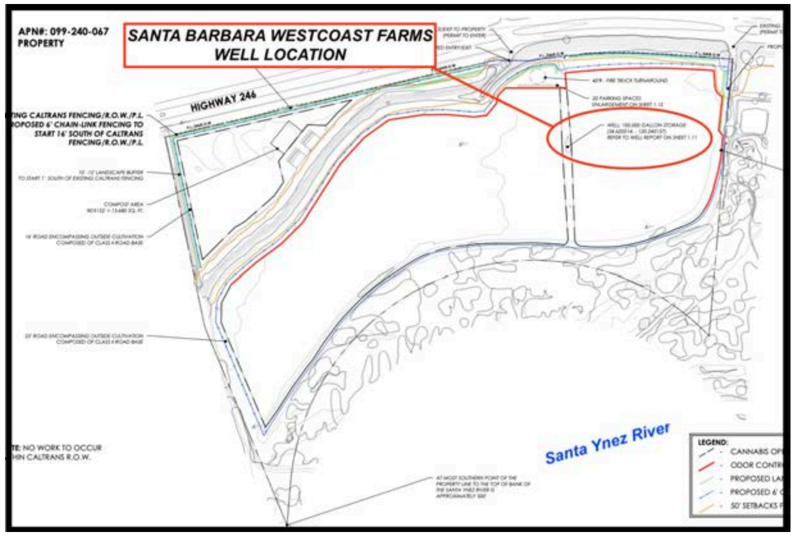

Figure 22. Location of water wells from Santa Barbara Westcoast Farms's site plans.

The Well Completion Report's Geologic Log confirms the stratigraphy of alluvial sands, gravels, and clays, typical of the alluvial wells in the Santa Ynez River. Although this well does not terminate in shale, its shallow depth and high production rate are also known characteristics of these wells drawing from the underflow of the Santa Ynez River.

Although no surface diversions are noted for this property, the SWRCB's Division of Water Rights eWRIMS database identified multiple neighboring parcels with points of diversion claimed with the SWRCB.

2.1.10.2. Hydrological Analysis

This project was approved prior to the County's requirement of a hydrological analysis of the water use by commercial cannabis irrigation, so the analysis that was performed for this project was for a Single Parcel Domestic Water System[31]. As such, no estimate of the impact of cannabis irrigation was examined.

Kear's analysis involved a limited evaluation of the hydrogeology of the region and its connection to the Santa Ynez River:

"The proposed source well is within the alluvial corridor of the delineated Santa Ynez River Valley Groundwater Basin…Local groundwater levels fluctuate seasonally due to recharge/pumping seasonality cycles and yearly due to the variations in Santa Ynez River stream flow. Punctuated groundwater declines do occur during drought periods as a result of reduced surface flow and correspondingly reduced recharge, but groundwater levels historically recover after drought periods."

This seasonal fluctuation is illustrated by the well's production tests. At the time of the well's construction in March, 2015 its production rate was 850 gallons per minute. In August, 2020, when Kear Groundwater performed a pump test, its sustained flow rate was 379.87 gallons per minute. The differences in available flow follow the seasonal availability of alluvial water in its

[31] Single Parcel Domestic Water System – Yield and Quality Evaluation. 1800 W. Highway 246, Buellton, Santa Barbara County, California, KG18-0424, August 28, 2020. Kear Groundwater

known and definite channel and its responsiveness to surface input, such as the water releases from Lake Cachuma.

The transmissivity of the alluvial soils are demonstrated by the rapid recovery of the water levels at during the pump test. *"Following 10 minutes of pump shut- off, the water level recovered to about 95% of its static, pre-pumping conditions."* This would also point to its fluvial connection with the river's underflow.

Kear concluded that: *"The production rate of the well is characteristic of the unconsolidated alluvium aquifer along the Santa Ynez River…"*[32].

2.1.10.3. Water Storage

Santa Barbara Westcoast Farms is one of the larger grows in the Santa Ynez River alluvial basin, cultivating 50.12 acres of cannabis. One 3,000 gallon water tank has been constructed for domestic/commercial use, four 15,000 gallon fire suppression tanks and one 100,000 gallon irrigation tank, totaling 122,000 gallons.

Using the 2.95 AFY per acre water duty for cannabis estimated by McCord[33], the estimated water duty for all 50.12 acres would 147.85 AFY. This total does not include the amount of water that would be used to vapor-disperse the adsorbent used in the odor control system.

As the growing season for cannabis coincides with the summer moratorium on diversion of surface water and cannot be refilled or topped off during the summer months, the project would have to apply for a SIUR and store enough riparian water to meet its needs for the entire growing season. Should Westcoast build a reservoir, its capacity would be limited to 20 AFY by the SWRCB's Cannabis Cultivation Policy's SIUR Revisions of July, 2020.[34] This limited volume of water would need to supply water for cultivation, processing, and any required landscaping for project screening.

2.1.10.4. 2022 Nursery and Processing Facility

Westcoast has applied for a permit for a new 25,000 square foot nursery and processing building. This new structure would be utilizing the same shallow alluvial well drawing water from a subterranean stream in a known and definite channel for young cannabis plant cultivation, equipment, and processing associated with the new building.

[32] Single Parcel Domestic Water System – Yield and Quality Evaluation. 1800 W. Highway 246, Buellton, Santa Barbara County, California, KG18-0424, August 28, 2020. Kear Groundwater
[33] Hydrologic Evaluation of Irrigation Water Supplies for Cannabis Production Projects in the Santa Ynez River Valley, California, July 31, 2022. Jim McCord, Ph.D, PE, Lynker Technologies, LLC.
[34] SWRCB Resolution Revising General Conditions to be Applied to Small Irrigation Use Registrations for Cannabis Cultivation, July 14, 2020, p. 3.

3. CONCLUSION

These ten commercial cannabis projects, totaling nearly 280 acres, will induce a deficit of approximately 825 acre-feet per year, approximately 65% of the water for all projects either proposed or currently permitted in the river's known and definite channel above the Lompoc Narrows. These projects identified in this Appendix represent priorities for SWRCB investigation and compliance action, with many project hydrologists admitting that various project wells extract from subterranean surface flows and thus are surface waters subject to SWRCB jurisdiction and application of the mandatory forbearance period contained in Section 2 of the Cannabis Policy. Careful review of the documents available for this subset of commercial cannabis operations has revealed non-compliance with the SWRCB's Cannabis Cultivation Policy's strictures on utilization of water from a subterranean stream in a known and definite channel. Further, several projects do not comply with the State prohibition of off-site distribution and use of riparian water.

All of these priority projects have a well-developed body of evidence of conflict with the Cannabis Policy and adverse effects to public trust resources, including fish and wildlife, as well as to downstream water rights holders. Given the highly regulated status of the Santa Ynez River, including but not limited to the Settlement Agreement between Lompoc and Cachuma interests, WRO 2019-0148 and its requirements under the Endangered Species Act and the various US Fish and Wildlife Service's Biological Opinions, plus the effect of the mega-drought currently gripping much of the United States, including Santa Barbara County, swift Board action is needed to avert permanent and irreparable harm.

4. ADDITIONAL CANNABIS CULTIVATION PROJECTS

Further review of the remaining projects listed in Table 1 should be performed. Although some of these projects have been withdrawn, they may be resubmitted at any time. Project-specific and technical documents are available for the remaining twenty-one projects in the river's floodplain in a Google Drive folder maintained by the Law Office of Marc Chytilo, at:

https://drive.google.com/drive/folders/1P2DBeDQ7E_ks6yBMKGlR1eY9ikQHeAT4?usp=sharing

Table 1. Additional cannabis projects potentially affecting the Santa Ynez River.

92ND G25	Coyote Hills	Morrison Farms
ABL Partners Lot 13	El Dorado Gardens	Petal Lux
ABL Partners Lot 14	Eye n Eye	Red Eagle Farms
ABL Partners Lot 17	Mathew Givens	Santa Rita Valley Ag., Inc
Blanco	Goodland Management	Sugar Hill
Canvinia	Greenies	TSBC Ranch
Castlerock Family Farms	Hilltop Sweeney	Williams Trust

APPENDIX B

HYPERLINKED INDEX OF SUPPORTING DOCUMENTS

LAW OFFICE OF MARC CHYTILO, APC
P.O. Box 92233 • Santa Barbara, California 93190
Phone: (805) 682-0585 • Fax: (805) 682-2379
Email(s): marc@lomcsb.com (Marc); ana@lomcsb.com (Ana)

APPENDIX B

This index contains hyperlinks to the documents supporting the body of this report and its Attachment A. This online document repository also contains folders of supporting documents for the balance of the 31 cannabis projects potentially affecting the flow of the Santa Ynez River at the link below.

https://drive.google.com/drive/folders/1P2DBeDQ7E_ks6yBMKGlR1eY9ikQHeAT4?usp=sharing

	Document Name	Document Hyperlink
	TECHNICAL DOCUMENTS	
1	Joseph L. Sax, Review of the Laws Establishing the SWRCB's Permitting Authority Over Appropriations of Groundwater Classified as Subterranean Streams and the SWRCB's Implementation of Those Laws., (2002). Berkeley Law Scholarship Repository	Sax 2002
2	A Guide to California Water Rights for Small Water Users, May, 2019. Trout Unlimited and The Nature Conservancy	Guide to Water Rights
3	California Water Code section 1200	CA Water Code 1200
4	California Water Code section 13149(b)(5)	CA Water Code 13149
5	Decision In the Matter of Application 29664 of Garrapata Water Company, Extraction of Water by Garrapata Water Company from the Alluvium of the Valley of Garrapata Creek in Monterey County, California.	Proposed Decision re Garrapata Creek Case in Monterey County
6	SWRCB Cannabis Cultivation Policy, 2019, with Attachment A	SWRCB final_cannabis_policy_with_attach_a
7	SWRCB Resolution Revising General Conditions to be Applied to Small Irrigation Use Registrations for Cannabis Cultivation, July 14, 2020	SWRCB Cultivation Policy Revisions 2020

	Document Name	Document Hyperlink
8	Geology and Water Resources of the Santa Ynez River Basin, Santa Barbara County, California. USGS Geological Survey Water-Supply Paper 1107, 1951. J.E. Upson and H.G. Thomasson, Jr.	USGS #1107 Geology and Water Resources of the SYR 1951
9	Memo, Subterranean Stream Determination, Buellton, Santa Ynez River, Santa Barbara County. Zach Mayo, State Water Resources Control Board, Division of Water Rights. Feb 6, 2019	Santa Ynez River Subterranean Stream Determination
10	Western Management Area Hydrogeologic Conceptual Model (HCM), 2021. Section 2a, WMA Groundwater Sustainability Plan, adopted January 2022	WMA GSP HCM Section 2a 2022
11	Western Management Area Groundwater Conditions, 2021. Section 2b, WMA Groundwater Sustainability Plan, adopted January 2022	WMA GSP Section 2b 2022
12	Technical Memorandum, *Hydrogeological Basis for Characterization of Water within the Santa Ynez River Alluvium Upstream of the Lompoc Narrows as Underflow of the River in a Known and Definite Channel*. Stetson Engineers, Inc., December 2021.	Stetson 2021 Underflow Technical Memorandum
13	Hydrologic Evaluation of Irrigation Water Supplies for Cannabis Production Projects in the Santa Ynez River Valley, California, July 31, 2022. Jim McCord, Ph.D, PE, Lynker Technologies, LLC.,	Lynker SYRiver_OverarchingHydroImpacts_05Aug2022
14	State Water Board Order WR 2019-0148 Amending Cachuma Operating Permits 11308 and 11310	wro2019_0148_withagreement_final
15	Settlement Agreement Relating to Operation of the Cachuma Project, 2002.	Cachuma Settlement Agreement CCRB, SYRWCD, City of
16	Agrosource Group Memo, Re: ABL Partners LP Crop Water Usage Requirements.	2021.08.13_Agrosource Projected Water Use Memo

	Document Name	Document Hyperlink
17	Endangered Species Act Section 7 Consultation Biological Opinion, U.S. Bureau of Reclamation September 11, 2000	EPA Biological Opinion Cachuma-Santa Ynez River 2000
18	Lower Santa Ynez River Fish Management Plan, October 2, 2000	Lower SYR Fish Mgmt Plan 2000
19	A History of Steelhead and Rainbow Trout (Oncorhynchus mykiss) in the Santa Ynez River Watershed, Santa Barbara County, California. 2012,	History of Steelhead SYR 2012
20	Southern California Steelhead Recovery Plan, January, 2012. Southwest Regional Office, National Marine Fisheries Service, NOAA, Long Beach, CA.	noaa_15988_DS1
21	Threatened and Endangered Species of Los Padres National Forest, USFWS, 2016	USFWS Endangered Threatened Los Padres 2016

CANNABIS PROJECTS

AG ROOTS LLC

22	Ag Roots Bio Peer Review	18LUP-00000-00529AgRootsPeerReview 1.21.20
23	Ag Roots Bio Peer Review Comment	18LUP-00000-00529 bio report peer review comment memo
24	Ag Roots Second Feedback Letter	18LUP529 Second feedback letter
25	Ag Roots Third Feedback Letter	18LUP529 Third feedback letter 12.2
26	Ag Roots Fourth Feedback Letter	18LUP00529 Fourth Feedback Letter 1.19.21
27	Ag Roots Site Plans	18025-AgRoots-LUP-Cameras-May4

	Document Name	Document Hyperlink
28	Ag Roots County Planner Case Notes	Ag Roots case notes 3-15-22
29	Ag Roots CEQA Checklist	Ag Roots CEQA GUIDELINES 15168(c)(4) CHECKLIST 8.18.21
30	Aerial Image Ag Roots and Heirloom Valley	Ag Roots Location w/ Heirloom
31	Ag Roots Response to CDFW 8/9/2021	Ag Roots Memo_Response to CDFW Commments_080921
32	Ag Roots Response to CDFW 8/13/21	Ag Roots Memo_Response to CDFW Commments_081321
33	Ag Roots Response to County Peer Review 5/7/2021	Ag Roots Memo_Response to County Commments_050721
34	Ag Roots Response to County 10/29/2019	Ag Roots Response to Incomplete Letter 10-29-19
35	Ag Roots Response to County 5/7/2021	Ag Roots Valley Response to Incomplete Letter 5-7-21
36	Ag Roots Response to County 11/13/2020	Ag Roots Valley Response to Incomplete Letter 11-13-20
37	Ag Roots Well Drilling Report	Ag Roots Well Drilling Report
38	Ag Roots Well Locations	Ag Roots Well Locations.jpg
39	Iron Angel's Well Completion Report	06N33W13_E0255546
40	Ag Roots Revised Biological Assessment	Ag Roots_5935 Santa Rosa Road_REVISED Bio Assessment_111120a

	Document Name	Document Hyperlink
41	Ag Roots Well Completion Report	APN 083-150-011 - WP#0000343 copy
42	CDFW Pre-Consultation Letter	CEQA15063g_5935SantaRosaRd-AgRoots
43	Katherman Hydrogeology	NatureFarms_AgRoots_GroundwaterStatus_June 2021
44	Katherman Revised Water Demand	NatureFarms_AgRoots_WaterDemandMemo_Revised7-8-21_July2021
45	SWRCB Water Quality NOA	NOA Water Quality order Waterboard - Ag Roots 10-30-2020
46	Email Between County and SYRWCD	*RE_ ag roots water report*
47	Email Between County, Planner, and SYRWCD	*RE_ water demand report for 18LUP-00529 1*
	BUSY BEE'S ORGANICS	
48	Busy Bee Findings at Permit Approval	1-Findings_-_CLEAN
49	Busy Bee Planning Commission Conditions of Approval	2A-Conditions_of_Approval_(PC)
50	Busy Bee CEQA Checklist	3-_CEQA_15168_CHECKLIST copy
51	Busy Bee Staff Report	4-PC_SR_19APL012
52	Busy Bee Revised CEQA Checklist	Attachment P - Revised Checklist
53	Busy Bee Issued Permit	Signed 18LUP-496 Final

	Document Name	Document Hyperlink
54	Busy Bee Issued Permit Revisions	2021.12.14 Busy Bee's Revision 21RVP-96 signed
55	Busy Bee Well Completion Report	06N32W02_WCR2018-010308
56	Busy Bee Site Plans	13-Busy_Bee's_Organics_Final_Plan_Set_(Oct_2019)_-_Copy_without_Security_Plan copy
57	Busy Bee Well Application	APN 099-240-072 WP03552 copy
58	Busy Bee Planning Case Notes	Busy Bee Case Notes 3-15-22
59	Busy Bee Well Location	Busy Bees Well location JPEG
60	County Memo Busy Bees	Memo Busy Bees
	CENTRAL COAST AGRICULTURE/CADWELL 5645 Santa Rosa Rd.	
61	Board of Supervisors Findings	1. Findings
62	LUP and Board of Supervisors Conditions of Approval	2. LUP and Conditions
63	CCA 5645 CEQA Checklist	3. CEQA 15168(c)(4) CHECKLIST
64	CCA 5645 Site Plans	6. 2022.01.06 5645 2020 Transfer-A2.1 -DRAFT County.pdf
65	CCA Water Use Memo	9. Water Memo (2)
66	Kear Jan 2020 Hydrology Memo	10.Appendix F Hydrology

	Document Name	Document Hyperlink
67	SWRCB Water Quality NOA	13.B 5645 SWRCB NOA
68	CCA 5645 Notice of Receipt SIUR (Bedrock Well)	14. NOR 5645
69	SWRCB Online Portal SIUR Registration (Bedrock Well)	27_406252_Cannabis General Order and Small Irrigation Use Registration Portal_Summary
70	SYRWCD Statement of Water Use	2022-02-11-CentralCoastAgLLC-WaterUse2016-2021.pdf
71	LOMC Hydrogeology Rebuttal Letter	5645-Hydrogeo-Rebuttal_LOMC_2-11-22 final
72	New Bedrock Well Application	APN 083-150-013 WP03805 copy
73	New Alluvial Well Report	APN 083-150-013 WP4615 copy
74	New Alluvial Well Completion Report	06N33W11_WCR2021-006976
75	Board of Supervisors Appellant Presentation	Appellant Presentation (CCA 5645) BOS 2-15-22 FINAL 2.1 PDF
76	SYRWCD Well Registration domestic	Cadwell House Well Before 1992
77	SYRWCD Well Registration agricultural	Cadwell Main Well 2007
78	SYRWCD New Bedrock Well Registration	Cadwell No 2 Well 2019
79	SYRWCD Well Registration - Shared	Cadwell Rinonada Well 1977 - Inactive
80	DWR Public Summary Page S027527	CCA 5645 Ag Pump S027527
81	DWR Public Summary Page S017801	CCA 5645 AG S017801

	Document Name	Document Hyperlink
82	Cadwell Initial Statement Diversion 2021	CCA 5645 Ag SWRCB Application S017801
83	County Planning Case Notes 5645	CCA 5645 Casenotes 3-15-22
84	DWR Public Summary Page S017800	CCA 5645 Dom S017800
85	Kear Updated Riparian Impact Memo January 2022	Kear 2022 CentralCoastAgLLC_5645 SantaRosa_RiparianImpact Memorandum Figures_Jan2022Update
86	Kear Yield Test Bedrock Well Sept 2019	Kear CentralCoastAg_5645SantaRosa_NewBedrockWellYieldMemorandum Appendices (1).pdf
87	LOMC Letter to the Board of Supervisors Feb 2022	LOMC 5645 Letter to Board_2-11-22_FINAL w. App 1
88	Western Management Area Groundwater Sustainability Plan Geologic Cross Section	Map 5645 geologic cross section JPEG
89	Western Management Area Groundwater Sustainability Plan Geologic Map with 5645 Parcel	Map 5645 WMA Geologic Map
90	2016 Supplemental Statement Diversion/Use	S027527 2016 Application and supplemental Statement
91	2017 Supplemental Statement Diversion/Use	S02SUPPLEMENTAL STATEMENT OF WATER DIVERSION AND USE
92	S027527 Inactivation Request CCA 5645	S027524 Inactivation Request Email Confirmation copy

	Document Name	Document Hyperlink
93	Santa Barbara Independent News Article, Approval of Centra Coast Agriculture 5645	Santa Barbara County Approves Second Cannabis ‘Grow’ for Central Coast Agriculture - The Santa Barbara Independent
94	Transcript excerpt of the Board of Supervisor’s Hearing of Feb 15, 2022	Transcript 5645 BOS Hearing 2-15-22
95	Email from SRYWCD, Image of 5645 Diversion Wells	*Central Coast Ag Diversion Overview*
96	Emails between Bill Buelow, SYRWCD, and SWRCB	*FW Santa Ynez Basin*
97	Emails between Bill Buelow, SYRWCD, County, and SWRCB	*FW Santa Ynez Basin 2*
98	Emails between Regional Water Quality Control Board and County Planner	*RE 5645 Santa Rosa Rd Central Coast Ag 2*
99	Emails between County Planner and Sheridon Evans, SWRCB	*RE Central Coast Ag Cannabis Water Source*
100	Emails between Regional Water Quality Control Board and County Planner	*RE La Hoya and Central Coast Ag cannabis projects*
101	Emails between Lindsay Cokeley, Central Coast Agriculture, and SWRCB	*RE RE Surface Water Diversion Requirements for Cannabis PDF 2*
102	Emails between Bill Buelow, SYRWCD, County Planner, and DWR re Online Meeting	*RE Santa Ynez Basin 4*
103	Emails between Bill Buelow, SYRWCD, County Planner, and DWR	*RE Santa Ynez Basin 13*
104	Emails between Bill Buelow, SYRWCD and County Planner	*RE Santa Ynez Basin 20*
105	Emails between Bill Buelow, SYRWCD and County Planner	*RE Santa Ynez Basin*

	Document Name	Document Hyperlink
	CENTRAL COAST AGRICULTURE **8701 Santa Rosa Rd.**	
106	8701 CEQA Checklist	3.pdf
107	8701 Project Plans	6.pdf
108	8701 Staff Report	10.pdf
109	DWR Public Summary Page S017156	8701 residential well S017156
110	New Bedrock Well Application	APN 083-180-007 WP0003787 copy
111	New Bedrock Well Completion Report	06N32W11_WCR2019-008725 New Bedrock Well
112	8701 County Planner Case Notes	CCA 8701 Case notes 3-15-22.pdf
113	Image of eWRIMS Map For 8701	CCA 8701 eWRIMS map copy
114	Image of 8701's Well Locations	CCA 8701 Well Locations JPEG
115	8701 Hydrology Report January 2020	Kear Groundwater 8701
116	8701 Statement of Diversion S017156	S017156 SWRCB Statement of Diversion
117	2016 Initial Statement Diversion S027524	S027524 copy
118	2017 Supplemental Statement Diversion	SUPPLEMENTAL STATEMENT OF WATER DIVERSION AND USE copy
	HBF, LLC/HART B	
119	HBF/Hart B Offsite Well Completion Report	06N32W11_0905309

	Document Name	Document Hyperlink
120	HBF/Hart B Permit History	137270031
121	HBF County Planner Case Notes	HBF Case Notes 3-15-22
123	Image HBF/Hart B Offsite Well Location	HBF/HARTB Well Location JPEG
124	HBF/Hart B Site Plans	Reduced_2021.03.29_Site Plan Set_20LUP-435
125	HBF/Hart B/ Gardner Ranch SWRCB Subterranean Stream Determination Feb 6, 2019	Santa Ynez River Subterranean Stream Determination
	HEIRLOOM VALLEY/LUGLI FAMILY TRUST	
126	Heirloom Issued Permit	2021-07-07 LAND USE PERMIT NO.-19LUP-00000-00080.signed
127	Heirloom Revised Biological Assessment	6495 Santa Rosa Road_REVISED Biological Assessment (2)_102519A.pdf
128	Heirloom CEQA Checklist	Heirloom CEQA GUIDELINES 15168(c)(4) CHECKLIST
129	Aerial Image Ag Roots and Heirloom Valley	Ag Roots Location w/ Heirloom copy
130	Heirloom Hydrology Report	Heirloom Hydrology report
131	Well Permit Application 1984	APN 083-150-010 WWP1854 copy
132	Well Drilling Application/Reports for 1986 and 1988	APN 083-150-010 - Permit #5109 & 8004 copy

	Document Name	Document Hyperlink
133	NaturFarm (Heirloom) Application for a Shared Water System 1989	APN 083-160-003 SPWS 2056 copy
134	Nature Farm/Lugli Family Trust Well Permit Application 2017	APN 083-160-003 WP0002251 copy
135	Heirloom County Planner Case Notes	Heirloom Case Notes 3-15-22
136	Heirloom Permit History	Heirloom Permit History
137	Image Heirloom Well Locations	Heirloom Well Locations JPEG

IRON ANGEL LLC

138	Iron Angel Offsite Well Completion Report (Ag Roots)	06N33W13_E0255546
139	Iron Angel Site Plans	Approved Plans Final
140	Iron Angel County Planner Case Notes	Iron Angel case notes 3-15-22
141	Iron Angel Final Land Use Permit	Iron Angel Final LUP
142	Iron Angel Hydrologic Report	Iron Angel Ranch Hydrologic Report 7-20-2021 (1)
143	Image Iron Angel Well Location	Iron Angel well location image JPEG

LOS ALAMOS AGVENTURES LLC

144	Well Permit Application/Well Completion Report 2010	APN 083-140-012 - SR0107419 copy
145	Well Permit Applications 1982 and 1984	APN 083-140-012 Permit #1795 & 3251 copy

	Document Name	Document Hyperlink
146	Well Permit Application Domestic	APN 083-140-012 Permit #6801
147	Los Alamos Draft Hydrologic Report	Draft Hydro Report 6-5-20 Kear Groundwater
148	Image Los Alamos Well Locations	Los Alamos AGV well locations JPEG
149	Los Alamos County Planner Case Notes	Los Alamos case notes 3-15-22
150	Los Alamos Site Plans	Los Alamos Site Plans-8.31.2021 Non-confidential
151	Well Driller's Report 1992	Well Report – 352847
152	Well Driller's Report 1993	Well Report – 352872
153	Well Driller's Report 1991	Well report -352841

TAHQUITZ FARMS LLC

154	Tahquitz Issued Land Use Permit	Issued LUP
155	Tahquitz Site Plans	Project Plans 7.14.21 Reduced for Public Distribution
156	Tahquitz Well Drilling Report	APN 099-230-026 Permit #578
157	Image Tahquitz/Red Eagle Diversion Map	eWRIMS Tahquitz map
158	DWR Public Summary Page Tahquitz Farms	Tahquitz Ag S026592
159	Tahquitz Initial Statement of Diversion S026592	S026592 Initial Statement
160	Tahquitz/Red Eagle Initial Statement of Diversion S026593	S026593 Initial Statement
161	Tahquitz Initial Statement of Diversion S026594	S026594 Initial Statement

	Document Name	Document Hyperlink
162	Tahquitz Farms County Planner Case Notes	Tahquitz Case Notes 3-15-22
163	Image Tahquitz Well Locations	Tahquitz well map JPEG
164	Emails between County Planner, Applicant, and County Environmental Health	*2021.05.10 - EHS Confirmation copy*
	SANTA BARBARA WESTCOAST FARMS	
165	Westcoast Issued Land Use Permit	19LUP-00000-00064 - ISSUED
166	Westcoast Conditions of Approval	Attachment B- Conditions of Approval
167	Westcoast Revised Conditions of Approval	Westcoast Attachment 4 - Revised Conditions of Approval
168	Westcoast CEQA Checklist	Attachment 5 - Revised CEQA 15168(c)(4) Checklist
169	Westcoast Site Plans	Westcoast site plans REVISED 2020.04
170	Westcoast Staff Report	Westcoast Staff report Attachment 6
171	Kear Pump Test/Water Quality	Kear Groundwater Westcoast report
172	Single Water System Application/Well Completion Report	APN 099-240-067 SR0111980 copy
173	Westcoast Well Permit Application and Well Completion Report	APN 099-240-067 WP0000447 copy
174	Westcoast County Planner Case Notes	WestCoast Case Notes 3-15-22

	Document Name	Document Hyperlink
175	Image Westcoast eWRIMS Diversion Map	Westcoast eWRIMS Image JPEG
176	Image Westcoast Kear Groundwater	Westcoast Location Kear Groundwater JPEG
177	Image Westcoast Location CMA Geologic Map	Westcoast Project Location Geologic Map
178	Westcoast New Processing Facility 2022	22BAR Case notes
179	Westcoast New Processing Facility Site Plans 2022	220621_SBWCF_CBAR
180	Westcoast New Land Use Permit Application 2022	LUP_Application

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Curriculum Vitae

Education

University of Arizona, Tucson, AZ **1999-2001**
Master's Program, Archaeology
*Specialization in human remains and paleopathology

University of California at Santa Barbara, Santa Barbara, CA **1994-1996**
Bachelor of Arts – Anthropology
*Specialization in lithic reduction and prehistoric quarries, human remains, and paleopathology

Employment

Law Office of Marc Chytilo, APC, Environmental Law, Santa Barbara, CA **2017-current**
Science, Research and Investigation
*Perform research and analysis of various case issues involving earth sciences, land use and planning

University of Arizona Museum, Tucson, AZ **1999-2001**
Inventory Curator, Human Remains Collection
*Inventoried skeletonized human remains to assess age, sex, gross pathology, and number of individuals present
*Specialized in the identification of highly fragmented and/or cremated remains
*Performed background research of the records of the collection; developed research projects and investigations

Federal Bureau of Investigation, Ventura and Santa Barbara Resident Agencies, CA **1995-1997**
Confidential Clerk
*Transcription of recorded audio, specializing in difficult recordings, body wires, foreign languages and complex cases
*Member of an on-call team for forensic excavation
*Held top-secret security clearance

Federal Bureau of Investigation, Santa Ana Resident Agency, Santa Ana, CA **1988-1995**
Data Analyst
*Implemented, built and maintained computer programs for input, storage, organization, and retrieval of information
*Analysis and synthesis of information, to include narcotics, group networks and financial research data
*Data management, reports, transcripts, and case document management from case initiation through prosecution
*Held top-secret security clearance

Research And Awards

Anderson, Katherine; Beck, Lane. April, 2001. ***Secondary Burial Practices in Hohokam Cremations***. Paper presented at the 66th Annual Meeting of the Society for American Archaeology, New Orleans, LA.

2000 -2001 - Experimental Research, Re-Creation of a Prehistoric Cremation. Research in support of Master's Thesis.
2000 - Excavation and Recordation of Human Remains, Pre-Construction, Sunset Mesa, AZ
2000 - Excavation and Recordation of Human Remains, Pre-Construction, Ina Road/Highway 10 Interchange
1996 - Presidential Award for Excellence in Undergraduate Research, University of California
1996 - Valedictorian, College of Letters and Science, University of California, Santa Barbara
1995 - 1996 - Award for Research Promise in Anthropology, University of California, Santa Barbara
1995 - 1996 - Original Field Research, *Trade and Lithic Preform Exchange in the Coastal Chumash.* Research in support of Senior Honors Thesis
1996 - Coordinator/Assistant, Site survey/mapping. UCSB archaeological summer field school, Santa Cruz Island, CA.
1995 - Assistant educational instructor, archaeological forensic excavation seminar. Federal Bureau of Investigation, Los Angeles Field Office
1995 - Assistant, UCSB Archaeological site survey. Lake Constance region, Southern Germany
1994 - Assistant, Excavation of human remains. UCSB archaeological summer field school, Refugio State Park, CA.