Appendix AA

Public Comment Letters and Responses

- Response to Comment 1, Clean Water Action, et al. re Lost Hills Utility District
- Response to Comment 2, WSPA re Subsidence in the 2024 Plan
- Response to Comment 3, DWR re State Water Project Subsidence
- Response to Comment 4, Clean Water Action, et al re Draft SCEP and 2024 Plan

Summary of Public Comment Letter #1

RE: Semitropic Draft 2024 GSP and Lost Hills Public Utility District

August 30, 2024, Clean Water Action, et al. (CWA) to Semitropic GSA
"In Lost Hills (Population of 2,400) residents are entirely dependent on groundwater from two public supply wells serviced through Lost Hills Pubic Utilities District (LHPUD) within SWSD as their source of drinking water, with a water use rate of approximately 400 acre-feet per year…. Semitropic in 2023 negotiated a reduction in groundwater extraction for this disadvantaged community by providing unreliable State Water Project supplies in lieu of groundwater."
November 26, 2024, Semitropic GSA Response to CWA Comments
Effective January 1, 2023, SWSD and SWSD GSA entered into a long-term extraction agreement (Extraction Agreement) with the Lost Hills Utility District (LHUD), the sole drinking water purveyor to the disadvantaged community of Lost Hills. It is correct that LHUD relies on subsurface water exported from its wells in the Semitropic GSA to provide drinking water to the community in Lost Hills. The Extraction Agreement allows LHUD to continue that practice up to an annual extraction limit of 485 acre-feet (AF) per year. This includes a 350 AF annual base extraction budget and extraction of LHUD's existing and future supplies banked in the Semitropic Water Bank. Regarding LHUD's banked supplies, the Extraction Agreement allows LHUD to bank in the Semitropic Water Bank for later recovery and export to Lost Hills its 135 AF of State Water Project (SWP) Table A amount. Accordingly, the Extraction Agreement allows LHUD to continue to extract more than 400 AF from the Semitropic GSA portion of the Kern County Subbasin, and the Extraction Agreement did not provide for use of unreliable SWP supplies in lieu of groundwater.

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November 26, 2024

Via Email

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Dear Navamin Martinez, Mac Glackin, Nataly Escobedo Garcia, and Tien Tran:

Thank you for your letter dated August 30, 2024, regarding Recommendations for Semitropic Water Storage District and Kern County Subbasin on Revised 2024 Groundwater Sustainability Plans ("Comment Letter").

Semitropic Water Storage District and its Groundwater Sustainability Agency ("Semitropic") believe the final 2024 GSPs for the Kern Subbasin including SWSD will address, among other concerns raised in your letter, protections to drinking water users and disadvantaged communities reliant on groundwater as their main source.

More specifically, Semitropic has entered into an agreement Lost Hills Utility District ("LHUD") that addresses the existing community of Lost Hills residents' ability to continue to receive water from LHUD's wells in Semitropic.

In this regard, your Comment Letter states:

> "In Lost Hills (Population of 2,400) residents are entirely dependent on groundwater from two public supply wells serviced through Lost Hills… Utilit[y] District …within [Semitropic] as their source of drinking water, with a water use rate of approximately 400 acre-feet per year…. Semitropic in 2023 negotiated a reduction in groundwater extraction for this disadvantaged community by providing unreliable State Water Project supplies in lieu of groundwater." (Comment Letter, pp. 1-2.)

Your Comment Letter correctly notes that LHUD has historically relied on water exported from two wells in the Semitropic to provide drinking water to Lost Hills residents, and, effective January 1, 2023, Semitropic entered into a further long-term agreement ("Extraction Agreement") with LHUD, the drinking water purveyor to the disadvantaged community of Lost Hills, that addresses LHUD's continued extraction and export of water from such wells.

However, as a matter of clarification, the Semitropic and LHUD did not negotiate and the Extraction Agreement does not require a reduction of LHUD's extractions or exports of water from Semitropic. The Extraction Agreement allows LHUD to extract and export up to 485 acre-feet (AF) of water per year from Semitropic. This includes a 350 AF annual base extraction budget, plus extraction of LHUD's existing and future surface water supplies stored in the Semitropic Water Bank. As of the agreement's effective date, LHUD had approximately 788 AF of water in stored in the Semitropic Water Bank, not including the approximately 135 AF of water LHUD stored in the bank during 2023. Regarding future storage, the agreement also provides LHUD with the ability to annually store in the Semitropic Water Bank, for later extraction and export to Lost Hills, LHUD's 135 AF of its annual State Water Project ("SWP") Table A amount, so that such water can be extracted from LHUD's wells in Semitropic. Finally, the agreement allows LHUD to deliver to and store in the Semitropic Water Bank approximately 560 AF that LHUD had stored in other Kern County water banks as of the effective date of the agreement.

In short, the Extraction Agreement that Semitropic negotiated with LHUD allows LHUD to extract more than 400 AF per year from its two wells in Semitropic and thereby continue to provide for the drinking water needs of Lost Hills' residents. In addition, the Agreement provides LHUD with the ability to store its SWP supplies in the Semitropic Water Bank for later extraction from such wells and use in meeting the drinking water needs Lost Hills' residents.

Sincerely,

Jason Gianquinto
General Manager

cc: Kristin Pittack, Kern Plan Manager
kpittack@rinconconsultants.com
Valerie Kincaid, Attorney for Kern Non-Districted Land Authority
vkincaid@pariskincaid.com

Sent via email

August 30, 2024

Kristin Pittack, *Kern Plan Manager, kpittack@rinconconsultants.com*
Valerie Kincaid, *General Manager, Kern Non-Districted Land Authority GSA3 (formerly Kern Groundwater Authority GSA), vkincaid@pariskincaid.com*
Jason Gianquinto, *General Manager, Semitropic Water Storage District GSA, jgianquinto@semitropic.com*
Laura Gage, *District Secretary, lgage@semitropic.com*

Re: Recommendations for Semitropic Water Storage District & Kern County Subbasin on Revised 2024 Groundwater Sustainability Plans

Dear Semitropic WSD & Kern Subbasin,

On behalf of Clean Water Action, Central California Environmental Justice Network, and the undersigned organizations, we are submitting public comments on the Revised 2024 Kern County Subbasin Groundwater Sustainability Plan (GSP) and Semitropic Water Storage District (SWSD) Groundwater Sustainability Plan (GSP). Our organizations are deeply committed to the successful implementation of the Sustainable Groundwater Management Act (SGMA), as well as ensuring that all beneficial users dependent on groundwater as their main source of drinking water are protected from significant and unreasonable impacts. Unfortunately, the revised plan posted on June 1, 2024 still fails to address protections to drinking water users and disadvantaged communities that rely on groundwater as their main source. **The Kern Subbasin GSAs, and Semitropic WSD in particular, must ensure their revised GSPs comply with SGMA, the Human Right to Water, and relevant state and federal laws**.

We want to provide a summary of community specific concerns to illustrate the high stakes of this GSP revision, and how this GSP's deficiencies affect Kern residents. Residents whose water access is managed under the GSA often have to pay twice for water. First, when they pay their water bill, and second, when buying bottled water becomes an essential substitute for well water.

In Lost Hills (Population of 2,400), residents are entirely dependent on groundwater from two public supply wells serviced through Lost Hills Public Utilities District (LHPUD) within SWSD

as their source of drinking water, with a water use rate of approximately 400 acre-feet per year. Lost Hills is already an overburdened community with multiple pollution sources, including the 6th largest producing oil field in California, a gas plant, a hazardous waste facility, a 4-lane Highway going through the center of the community, a major freeway adjacent and the Wonderful company fields north of town.

No public meetings for the GSA have been held in Lost Hills, either for the original 2022 plan or the 2024 revised plan. Meanwhile, Semitropic in 2023 negotiated a reduction in groundwater extraction for this disadvantaged community by providing unreliable State Water Project supplies in lieu of groundwater.

As public agencies, GSAs must adhere to the public participation and inclusivity requirements laid out in SGMA. SGMA regulations require that, "the groundwater sustainability agency shall encourage the active involvement of diverse social, cultural, and economic elements of the population within the groundwater basin prior to and during the development and implementation of the groundwater sustainability plan."[1] In addition, "Disadvantaged communities, including, but not limited to, those served by private domestic wells or small community water systems."[2]

Although Semitropic has made significant improvements in addressing deficiencies identified via the Department of Water Resources (DWR) 2022 GSP deficiency report, we will highlight several deficiencies that remain in the Revised 2024 GSP that will continue to lead to significant and unreasonable impacts in the region. Among the deficiencies are:

1. Unresolved Deficiencies in 2020 GSP that Remain in the Revised 2024 GSP

- **I. The Revised 2024 GSP Fails to Demonstrate Effective Coordination Across the Subbasin**
- **II. The Revised 2024 GSP Fails to Adequately Define & Avoid Undesirable Results for Groundwater Levels and Groundwater Quality**

2. New Deficiencies Identified by SWRCB & NGO Review of Revised 2024 GSP

- **I. The Revised 2024 GSP is Inadequate Due to the Lack of a Stakeholder Community Engagement Plan (SCEP)**
- **II. The Revised 2024 GSP Does Not Feature a Well Mitigation Plan**
- **III. The Revised 2024 GSP Fails to Adequately Address Ongoing Degradation of Groundwater Quality**

[1] Cal. Water Code § 10727.8(a)
[2] Cal. Water Code § 10723.2(i)

1. Unresolved Deficiencies in 2020 GSP that Remain in the Revised 2024 GSP

I. The Revised 2024 GSP Fails to Demonstrate Effective Coordination Across the Subbasin

Our organizations are deeply concerned that the fragmented coordination efforts of the Kern Non-Districted Land Authority (KNDLA) will exacerbate existing problems in the basin by allowing significant localized exceedances of maximum contaminant levels (MCLs) and declining groundwater levels. The decision by the Semitropic Water Storage District (Semitropic) not to participate in the KNDLA only worsens the situation.

We agree with the State Water Resources Control Board (SWRCB) staff report that the GSAs of the Kern Subbasin need to revise their Coordination Agreement to incorporate a comprehensive minimum threshold exceedance plan for the whole subbasin. In addition, at the basic level, it is necessary for the GSAs to develop clear and coordinated definitions of undesirable results, distinguish GSA boundaries, GSA relationships in the subbasin, and responsibilities between Kern GSAs that are consistent with the requirements of SGMA. As it stands now, the Kern Subbasin will fail to reach sustainability under these conditions.

a. Well Monitoring Networks Do Not Adequately Monitor Shallow Groundwater

Our organizations are deeply concerned that the current monitoring network is insufficient to protect the communities we work with from the impacts of groundwater overdraft and groundwater quality contamination. The calculation of minimum thresholds and undesirable results will not be accurate if the GSA fails to measure water quality and water level impacts in the vicinity of shallow domestic and public supply wells.

We recommend extensive amendments to the monitoring network and monitoring strategies in the Kern Subbasin and for comprehensive monitoring networks to be a substantial consideration in any revisions of the Plan and Coordination Agreement. We agree with SWRCB staff on their characterization of the issue as presented in the Revised 2024 GSP. The plan does not account for the nuances of effective monitoring well networks in instances of differentiation of confining layers (E-clay)[3]. Most of the wells within the GSA's network screen for the confined aquifer, this leaves a massive gap in data monitoring for the unconfined aquifer. This is to the direct detriment of beneficial users in the Kern Subbasin, especially those who draw from the unconfined aquifer for drinking water or other supplies. When groundwater quality degrades or groundwater levels drop in the unconfined aquifer, the GSA is unable to adequately measure this shift due to the gaps in their monitoring network.

[3]Semitropic Water Storage District Groundwater Sustainability Agency. (2024). *Revised 2024 Groundwater Sustainability Plan. Basin Setting - Hydrogeologic Conceptual Model, ES-6.*

These insufficiencies in turn inform all Sustainable Management Criteria (SMC), monitoring networks, well impact analyses, and development of well mitigation plans. This ensures, from top to bottom, that the GSA's management of groundwater resources in the Kern Subbasin will be inadequate and will not be protective of beneficial uses and users.

b. The Revised 2024 GSP's Groundwater Levels Minimum Thresholds Are Inappropriately Averaged

By averaging groundwater level trends across the basin, the Plan will ignore localized impacts and fail to trigger a minimum threshold and necessary project and management to prevent undesirable results. We agree with SWRCB's assessment of this phenomena as it was identified in a preliminary review of the Revised 2024 GSP.[4] The Revised 2024 GSP utilizes an average rate of declining groundwater level trends across the subbasin. This methodology creates acute variation in groundwater level minimum thresholds between hydrological areas in the Kern Subbasin. This in turn results in a skew of the data and lowers thresholds of groundwater levels in wells close to Kern communities. The method, as it is laid out in the revised 2024 GSP, is not consistent with the established scientific literature on best practices for measuring groundwater levels. We recommend reevaluating the methodology that creates this skew in MTs and consulting SGMA guidelines provided by both DWR and SWRCB on correcting this error.

II. The Revised 2024 GSP Fails to Adequately Define & Avoid Undesirable Results for Groundwater Levels and Groundwater Quality

The Revised 2024 GSP proposes a dramatic lowering of a number of minimum thresholds (MTs). Some of the MTs described in the GSP were lowered by 50 feet to 100 feet from the MTs in the 2020 plans, and the Revised 2024 GSP's methodology is described in such a way that groundwater levels throughout the subbasin could deplete past the lowest historical groundwater levels without triggering management actions.[5]

a. Groundwater Levels Should Not be Used as Proxy for Groundwater Quality Measurements

Moreover, in the 2022 GSP and Revised 2024 GSP, groundwater levels appear to have been substituted for groundwater quality measurements. This guarantees that the GSP fails to adequately describe the impacts of groundwater levels on groundwater quality if their definitions appear interchangeable in the implementation of the GSA's proposed Revised 2024 GSP. To that same point, the revised 2024 GSP fails to adequately set

[4]State Water Resources Control Board. (2024). *Kern County Subbasin Probationary Hearing Draft Staff Report. 4.1.6 Preliminary Review of 2024 Draft Groundwater Sustainability Plans*

[5]Semitropic Water Storage District Groundwater Sustainability Agency. (2024). *Revised 2024 Groundwater Sustainability Plan. 7-Hydrogeologic Conceptual Model.*

minimum thresholds and, in fact, utilizes the same faulty method for determining MTs challenged by DWR in their 2022 inadequate determinations.[6]

This altogether is extremely concerning and dangerous for small water systems and domestic wells reliant on shallow wells. A number of wells could go dry that vulnerable disadvantaged communities depend on, and no management action will be taken with the triggers set as this revised 2024 GSP proposes.

SGMA requires watershed basins to avoid chronic lowering of groundwater levels as a pillar of achieving sustainability.[7] Lowering groundwater levels contributes to worsening conditions of groundwater quality, subsidence, and further depletion of interconnected surface waters. We understand that for the overdrafted basins, lowered groundwater levels are likely to occur, but we want to emphasize that this situation necessitates a robust, long-term strategy in the plan to mitigate the impacts of that decline.

2. New Deficiencies Identified by SWRCB & NGO Review of Revised 2024 GSP

I. The Revised 2024 GSP is Inadequate Due to the Lack of a Stakeholder Communication and Engagement Plan (SCEP)

SGMA requires GSAs to include a public engagement plan that determines how they will identify all beneficial uses and users to effectively engage in planning implementation processes in their GSP.[8] While the GSP document references such a plan, there is no Appendix H in either the original or revised plan. The Kern Revised 2024 GSP fails to take into account the impacts of its groundwater management on all beneficial uses and users of groundwater within their basin.[9] Drinking water well users and disadvantaged communities are dependent on the success of SGMA, and are undoubtedly the most vulnerable to the impacts of undesirable results and exceedance of SMCs.[10]As our organizations have stated in past comment letters, "residents of [the] Lost Hills community depend solely on groundwater from Semitropic, their input and consideration in GSP

[6] Department of Water Resources. (2022). *RE: Incomplete Determination of the 2020 Groundwater Sustainability Plans Submitted for the San Joaquin Valley – Kern County Subbasin.*

[7] Cal. Wat. Code § 10721 ((x.1-6)) ["Chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply if continued over the planning and implementation horizon."].

[8] Department of Water Resources. (2018). *Guidance Document for Groundwater Sustainability Plan Stakeholder Communication and Engagement*. Available at: https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Assistance-and-Engagement/Files/Guidance-Doc-for-GSP---Stakeholder-Communication-and-Engagement.pdf.

[9] Department of Water Resources. (2023). *Guidance for Sustainable Groundwater Management Act Implementation: Considerations for Identifying and Addressing Drinking Water Well Impacts*. Available at: https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Files/Considerations-for-Identifying-and-Addressing-Drinking-Water-Well-Impacts_FINAL.pdf?utm_medium=email&utm_source=govdelivery.

[10] Dobbin, Kristin B., and Mark Lubell. "Collaborative governance and environmental justice: Disadvantaged community representation in California sustainable groundwater management." *Policy Studies Journal* 49.2 (2021): 562-590. Available at: https://doi.org/10.1111/psj.12375.

development and implementation is critical to the success of the plan. Lost Hills is one of just two community water systems drawing water from this subbasin, and it is susceptible to the impacts of groundwater level decline as well as groundwater quality degradation. Our review of the revised plan found stakeholder engagement to vulnerable communities was essentially nonexistent."[11]

The GSA MUST comply with SGMA and immediately publish for review and implement a Stakeholder Communications and Engagement Plan. This plan must include a plan for engaging disadvantaged communities and assessing the impacts of the plan on those communities. The Kern County Subbasin must fulfill its obligation under SGMA to meaningfully engage impacted groundwater users. Similarly, the Semitropic GSP must identify how it engaged communities in the development and implementation of the plan. The GSAs MUST develop and implement comprehensive Stakeholder and Community Engagement Plans, assess how stakeholder engagement impacts continued GSP implementation, and examine how stakeholder engagement is administered across the Subbasin and is used to address the deficiencies determined by DWR.

II. The Revised 2024 GSP Does Not Provide a Well Mitigation Plan

We are encouraged by the Kern GSAs indicating their commitment to develop and implement a well mitigation plan in conjunction with consultants from Self-Help Enterprises. However, that mitigation plan has not been published for our review and no financing plan has been provided. Until such time as that happens, this plan remains inadequate and subject to the probationary process. We highly recommend Kern GSAs use the resources available to them to produce a robust and equitable well mitigation plan. Consulting DWR's *Considerations for Identifying and Addressing Drinking Water Well Impacts Guidance*[12] and the *Drinking Water Well Mitigation Framework*[13] are a good place to start.

a. The Revised GSP Fails to Clearly Explain Management Actions in the instances of Groundwater Quality Exceedance

In connection to the issue of lacking a well mitigation plan, a major problem with this GSP is a lack of follow through on management actions. If groundwater quality exceedance occurs, the GSP lacks clear details on what response the GSAs will have. It is unclear what additional water sampling and monitoring the GSAs would employ, and how well water would be restored to safe levels. With parameters for investigation wobbly, the Revised

[11] Re: Comments on the Revised Semitropic Water Storage District Groundwater Sustainability Plan. (2022)

[12] Department of Water Resources. (2023). *Guidance for Sustainable Groundwater Management Act Implementation: Considerations for Identifying and Addressing Drinking Water Well Impacts.* Available at: https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Files/Considerations-for-Identifying-and-Addressing-Drinking-Water-Well-Impacts_FINAL.pdf?utm_medium=email&utm_source=govdelivery

[13] Self-Help Enterprises, Community Water Center and Leadership Counsel for Justice and Accountability. (2022). *Framework for a Drinking Water Well Impact Mitigation Program.* Available at: https://www.selfhelpenterprises.org/wp-content/uploads/2022/07/Well-Mitigation-English.pdf

2024 GSP proves itself to be insufficient in addressing groundwater quality exceedance and protecting safe drinking water for beneficial users.

III. The Revised 2024 GSP Fails to Adequately Address Ongoing Degradation of Groundwater Quality

Setting SMCs for groundwater quality is another area of sustainable management adversely affected by the subbasin's fragmented approach, and we agree with SWRCB staff's identification of the issues. With the 2022 Kern Coordination Agreement, definitions of groundwater level MT triggers were agreed upon and set to trigger when a management area experiences groundwater level decline above historic "MTs in 40% or more RMSs, within the Management Area over four consecutive bi-annual SGMA required monitoring events."[14] Regardless of the Coordination Agreemnet's promises however, GSAs in the subbasin employ inconsistent methods to set SMCs. Moreover, that data itself that GSAs in the Kern Subbasin pull from is inconsistent.

SGMA requires groundwater management implemented by GSAs be effective at preventing, "significant and unreasonable degraded water quality, including the migration of contaminant plumes that impair water supplies."[15] Due to the exacerbation of the fragmented approach, we agree with SWRCB staff's assessment and recommend Kern GSAs commit to a comprehensive system of data reporting on the status of MT exceedances and include this data in their annual reports.

The standard this GSP sets for groundwater quality is concerning, however. To rectify this, we overall recommend that the subbasin GSAs revise their Coordination Agreement to incorporate considerations for groundwater quality using consistent data and methodologies across the subbasin.[16]

Every deficiency we find with the Kern Subbasin's revised 2024 GSP is exacerbated by the fragmentation of groundwater management entities in the Kern subbasin. As it stands now the revised 2024 GSPs will undoubtedly result in considerable impacts to communities that depend on domestic wells for all essential uses of clean and safe water. Their needs are our foremost concern. Sustainability is far out of reach, and undesirable results are all but assured unless the Kern Subbasin as a whole changes course. This GSP is insufficient for any of the GSAs to credible claim to qualify for the good actor clause. **To best protect the beneficial use and users of groundwater**

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[14] State Water Resources Control Board. (2024). *Kern County Subbasin Probationary Hearing Draft Staff Report. 4.1.4 Deficiency GWQ – Degraded Groundwater Quality.*

[15] Wat.Code, § 10721, subd. (x.4)) [""Undesirable result" means one or more of the following effects caused by groundwater conditions occurring throughout the basin: (4) Significant and unreasonable degraded water quality, including the migration of contaminant plumes that impair water supplies."].

[16] State Water Resources Control Board. (2022). Groundwater Quality Considerations For High And Medium Priority Groundwater Basins. Available at: https://www.waterboards.ca.gov/water_issues/programs/sgma/docs/comments-to-dwr/groundwater-quality-considerations-letter-20221121.pdf.

in the Kern Subbasin, this 2024 Revised GSP must be deemed inadequate and the subbasin moved into probation.

While our priorities for comment on the plan center on necessary improvements to coordination across the Kern Subbasin, groundwater levels, equitable stakeholder engagement, establishing a robust well mitigation plan, and groundwater quality; we concur with SWRCB's other identified deficiencies with Land Subsidence and Interconnected Surface Waters (ISW). **We strongly encourage the Kern Subbasin GSAs to build and maintain strong and reliable coordination across the subbasin for the benefit of their work and to reach SGMA's goal of sustainability.**

Sincerely,

Nayamin Martinez
Executive Director
Central California Environmental Justice Network

Mac Glackin
Administrative and Program Associate
Clean Water Action

Nataly Escobedo Garcia, PhD
Water Policy Coordinator
Leadership Counsel for Justice and Accountability

Tien Tran
Senior Policy Advocate
Community Water Center

Summary of Public Comment Letter #2

RE: Kern County Subbasin May 2024 Draft Groundwater Sustainability Plan - Subsidence

August 29, 2024, Western States Petroleum Association (WSPA)
This letter provided comments regarding land subsidence concerns associated with the northern portion of the California Aqueduct. WSPA states that the 2024 Draft GSP fails to provide adequate support for the conclusion that oilfield activities are responsible for subsidence along the Aqueduct in the vicinity of Lost Hills and does not adequately consider other non-GSA and GSA-related sources. This comment was followed by: 1. The WSPA states that the 'six subsidence studies conducted by the Subbasin' are not identified anywhere in the 2024 Draft GSP. 2. Prior studies concluding that oilfield operations are not responsible for aqueduct subsidence were not taken into account. 3. The GSPs do not evaluate the impacts of local and/or regional groundwater pumping on subsidence in the Lost Hills Area. 4. The Use of DWR InSAR data may not represent actual local conditions and provides inaccurate localized determinations due to the distance between CGPS stations being too large. The closest CGPS station to the Lost Hills Oilfield and the Aqueduct being 3.5 miles east. 5. May 2024 Draft GSP continues to use a 5-mile buffer zone to evaluate subsidence and compliance with minimum thresholds after being told that a 5-mile buffer was inadequate. 6. The use of InSAR data to differentiate between GSA and Non-GSA Subsidence, and how the GSAs can differentiate between GSA-related and non-GSA-related subsidence when they both occur in the same area. 7. There is no explanation as to why the 1970 -2007 timeframe of the history of subsidence in the San Joaquin Valley is excluded.
December 2, 2024, Kern Subbasin Response to WSPA Comments
The Subbasin has met with both the SWP and State Water Resources Control Board Office of Sustainable Groundwater Management (OSGM) to discuss the Subbasin responses key comments in the SWP letter dated September 16, 2024. Responses to the SWP comments were also addressed in *Response to Public Comment Letter 3 – DWR Comment re SWP Subsidence*. In summary, SWP Subsidence is addressed in the Final 2024 GSP: 1. As discussed with SWP staff on October 22, 2024, the Subbasin will adjust the Final 2024 GSP and relevant WDWA GSA Blue Pages to:

- Correctly identify and discuss the extent of subsidence impacts attributable to GSA-related and non-GSA subsidence.
- Correctly identify and discuss whether subsidence in certain areas is either: (i) attributed solely to one the types of activities, or (ii) attributable to some combination of both GSA-related and non-GSA related subsidence.
- Provide sufficient evidence supportive of the above determination.

2. The former “risk-based” approach has been removed from the Final 2024 GSP and is replaced with a coordinated and data driven historical rate projection of subsidence based on benchmark survey data, GSP and DWR InSAR.
3. The SMCs for subsidence along the Aqueduct (North and South reaches) have been revised and information in the Draft 2024 GSP is now obsolete. The revised Subbasin subsidence SMCs are data-driven, based on historical subsidence rates, and are coordinated across the Subbasin. Further, the revised SMCs are protective of beneficial users, incorporate a ramp down to 2040 and provide for stable subsidence rates by 2030.

Kern County Subbasin
Groundwater Sustainability Agencies

December 2, 2024

Ms. Catherine Reheis-Boyd
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creheis@wspa.org

RE: Response to Western State Petroleum Association (WSPA) Comments Dated August 29, 2024, on the May 2024 Draft Groundwater Sustainability Plan (GSP), Kern County Subbasin, Related to Land Subsidence.

Dear Ms. Reheis-Boyd,

Thank you for the comments submitted on behalf of WSPA in your August 29, 2024, letter *"May 2024 Draft Groundwater Sustainability Plans for the Kern County Subbasin Issues Related to Land Subsidence"* (hereinto referenced as "WSPA comment letter") pertaining to the causes of land subsidence in the Kern County Subbasin (Subbasin), and in particular, the northern portion of the California Aqueduct (Aqueduct) immediately adjacent to the Lost Hills Oil Field. Because WSPA copied all of the Subbasin Groundwater Sustainability Agencies (GSAs) in the WSPA comment letter, this response has been signed by all of the GSAs. In addition, this response has been copied to the Department of Water Resources (DWR) Sustainable Groundwater Management Office (SGMO), and the DWR State Water Project (SWP) California Aqueduct Subsidence Project (CASP) Division.

Like any public comment letter(s) received on the draft Subbasin 2024 GSPs, the WSPA comment letter and this response will be included in the Final Kern County GSP submitted to the SWRCB for review. To facilitate regulatory agency and stakeholder review of this response, we have attached and numbered each portion of the WSPA comment letter text for which we have provided a corresponding response. These responses are numbered 1 through 14. In addition, to better orient the reader, a summary of each comment is provided prior to the response. We have endeavored to address all significant comments and will utilize the WSPA comment letter to inform any clarifications to the Subbasin GSP and the "Blue Page" additions submitted by the GSAs adjacent to Lost Hills Oil Field (i.e., approximately California Aqueduct Mile Posts [(MP) 195 to 215)].

Context for Responses

In simple form, the purpose of SGMA is to avoid undesirable results, such as land subsidence, caused by groundwater pumping[1]. To achieve this goal, SGMA requires GSAs to set quantitative benchmarks that represent the worst possible groundwater conditions that cannot be exceeded without causing significant and unreasonable land subsidence (i.e., Minimum Thresholds [MT]). If an MT is exceeded, GSAs must implement relevant projects or management actions to improve groundwater conditions to avoid future exceedances.

While the SGMA vests some authorities in GSAs such as the ability to prepare GSPs and the authority to limit, regulate, or require the metering of groundwater extractions (i.e. GSA-related causes of subsidence), GSAs have no legal authority or control over other causes of subsidence such as oil and gas operations or natural geologic processes (i.e. Non-GSA related causes of subsidence).[2] Thus, unlike other sustainability indicators like groundwater levels, GSAs do not have the legal authority to implement projects or management actions that would ameliorate all causes of subsidence and prevent future MT exceedances. Despite this, once an MT is set, a GSA is required to correct any MT exceedance or face regulatory ramifications. Therefore, when developing MTs, it is critical that the Subbasin GSAs ensure that an MT exceedance can be successfully rectified using the limited legal authorities provided to GSAs in statute. The Subbasin does not presume to assign *exact proportional fault* to each category of subsidence causation. However, to set scientifically valid and achievable MTs, **it is critical to delineate areas of the Subbasin where non-GSA related subsidence drivers are material enough that reducing or halting groundwater extraction would not arrest subsidence.**

Response to WSPA Comments

WSPA Comment #1 – Summary: May 2024 Draft GSP fails to provide adequate support for the conclusion that oilfield activities are responsible for subsidence and does not adequately consider other non-GSA and GSA-related sources.

Response to Comment #1:

The Subbasin's delineation between areas experiencing non-GSA vs GSA-related subsidence was developed via the synthesis of diverse data sources such as:

- Oil company Underground Injection Control (UIC) permit application information submitted to the State and the US Environmental Protection Agency (USEPA),
- California Geologic Energy Management (CalGEM) division oil field production data,
- DWR California Aqueduct survey elevation data,

[1] California Water Code §10721(x)
[2] California Water Code §10725.8, §10726.4, §10727

- Satellite-based Interferometric Synthetic Aperture Radar (InSAR) data,
- Oil company and academic papers studying subsidence at Lost Hills and other nearby oil fields on the west side of the Subbasin,
- California Aqueduct construction reports,
- Soil surveys, and
- Current and historical regional groundwater extraction patterns.

These data, when viewed collectively, indicate that non-GSA activities in the Subbasin and, most notably, adjacent to MP 195-215 have, and continue to, contribute to subsidence in the area. Improvements will be made in the Final 2024 GSP to more clearly identify data sources and references (bibliography) used to support the identification of areas experiencing non-GSA vs. GSA-related subsidence. Westside District Water Authority GSA (WDWA GSA) asserts that it is beyond the legal or regulatory scope of a GSA to assign exact proportions of responsibility for subsidence by GSA and non-GSA causes. Rather, WDWA GSA's responsibility is to prevent GSA-related groundwater extraction activities within its jurisdiction from causing significant and unreasonable land subsidence.

Contrary to WSPA comments, current and historical WDWA GSA groundwater extraction patterns were considered when assessing causes of subsidence adjacent to MP 195-215. Due to high salinity levels, groundwater extraction in proximity to MP 195-215 for agricultural, domestic, municipal, and industrial uses is extremely limited. On average, 98% of the agricultural irrigation demand in the area is provided via imported surface water supplies. Municipal supplies for the nearby community of Lost Hills are imported from a well field 10 miles to the east of the city's limits. Despite limited groundwater extractions in the MP 195-215 area, out of an abundance of caution, the WDWA GSA chose to implement a series of preventative Project/Management Actions (P/MAs) in proximity to MP 195-215 to address any potential for GSA-related subsidence and fill data gaps. Briefly, the subject WDWA GSA P/MAs include:

1. "Net-Zero" groundwater well drilling moratorium,
2. Groundwater extraction well registration program,
3. Annual well extraction volume reporting (measured via flow meter),
4. Groundwater extraction moratorium

The limitations placed on groundwater extraction and data collected from the implementation of the above P/MAs will be used to further refine the impacts of groundwater management on local subsidence rates. For additional details, the P/MAs are described in the WDWA "Blue Pages" contained in the Draft 2024 GSP and full copies of the P/MA language are available for review at https://www.westsidedwa.org/management-actions.

Aside from oil activities, contributors to subsidence identified in the Draft 2024 Subbasin GSP in the vicinity of the Lost Hills Oil Field also include:

- Expansive soils,
- Likely type of concrete used in construction of the Aqueduct that can degrade under certain alkali or sulfate soil conditions,
- Age of the infrastructure (over 60 years old),
- Tectonic processes, and
- Lack of adequate geotechnical hydro compaction prior to Aqueduct construction.

Two 1964 DWR studies titled respectively, *Land Subsidence Along the California Aqueduct as Related to the Environment* and, *Design and Construction Studies of Shallow Land Subsidence for the California Aqueduct in the San Joaquin Valley-Interim* Report, revealed that unmitigated hydro compaction was a cause of concern, and that hydro compaction was not conducted on the portion of the Aqueduct constructed immediately adjacent to the Lost Hills Oil Field (i.e., approximately MP 195 to 215). These documents are referenced in **Appendix A** to this response letter.

WSPA Comment #2 – Summary: GSAs rely on six subsidence studies conducted by the Subbasin that are not identified in the May 2024 Draft GSP or otherwise publicly provided. If the studies include the 2021 Earth Consultants International (ECI) report and/or the 2022 Lawrence Berkeley National Laboratory Study (LBL 2022), CASP previously rejected reliance on these studies to support that subsidence in the Lost Hills area is associated with oilfield activities.

Response to Comment #2: Links to copies of all Subbasin studies used to assess the various causes of subsidence in the May 2024 draft GSP are found at https://kerngsp.com/gsp-documents/. Between 2018 and 2022, members of the Subbasin subsidence team met with WSPA member oil companies on at least two occasions and with WSPA representatives regarding the initial four studies as they were being developed (i.e., two Kern Groundwater Authority/ Westside District Water Authority (KGA/WDWA) reviews and the initial Earth Consultant International (ECI) and Lawarence Berkley Laboratory (LBL) reports). It is the Subbasin's recollection that the subject subsidence materials were provided to all participants at those meetings, including at the October 10, 2022, meeting with WSPA and representatives of Chevron. Further, these studies were provided to the Subbasin GSAs, several of which have WSPA members on their Boards of Directors. Moving forward, the Subbasin will endeavor to provide more convenient access to WSPA for referenced studies and data sources. Specifically, all of the Subbasin subsidence materials have been uploaded to the Subbasin website and will be included in the Final 2024 GSP.

To be clear, and contrary to statements in the WSPA comment letter, the CASP did not "*reject*" the findings and conclusions of the 2021 Earth Consultants International (ECI) Report, or the Lawrence Berkeley Laboratories (LBL) 2022 report. Specifically, in the CASP's 12/21/2023 response letter to WSPA, CASP states that while they, "*appreciated some of the critiques provided in your* [WSPA] *letter*", the CASP, "*appreciate the work commissioned by the Authority* [ECI 2021 and LBL 2022 reports] *which adds to the body of knowledge* [understanding the causes of subsidence affecting the California Aque*duct*]".[3] Rather than a rejection of the validity of the studies, the CASP requested additional studies, which were already recommended by the Subbasin via the 2021 ECI and 2022 LBL reports. That work was generally completed and shared with CASP subsequent to the 2022 CASP comment letter. The additional data, among other things, provided InSAR time series that built upon a finding in the earlier studies that indicated it was possible to discern between deformation caused by seasonal GSA-related activities and the non-seasonal activities typical of more sporadic oil field extraction. It is the intention of the Subbasin to continue to monitor subsidence, regardless of its cause, and work with DWR and CASP as they review the data and endeavor to ascertain long term causes of subsidence and apportion responsibility for impacts to the Aqueduct among the various stakeholders (e.g., DWR, oil, and agriculture).

WSPA Comment #3 – Summary: Neither the ECI 2021 Report nor the LBNL 2022 Study consider reinjection of produced water, which is done specifically to address the localized subsidence within Lost Hills Oilfield.

Response to Comment #3: After the CASP's September 2022 comment letter, the Subbasin provided subsequent data pertaining to CalGEM oil field production data and Underground Injection Control (UIC) information to the CASP regarding oil field fluids and dynamics. According to State Water Project (SWP) correspondence dated October 1, 2024, there are over 3,600 oil and gas wells in the Lost Hills Oil Field, many of these in the vicinity of MP 195-215. As WSPA is aware, reinjection of oil field produced water does not ***eliminate*** subsidence caused by oil extraction, at best it can only ameliorate it to a small extent, particularly when a significant volume of produced water is reinjected into deeper zones below oil production zones and the limits of the designated underground source of drinking water (USD) like at Lost Hills. The Lost Hills anticline reservoir is not a closed system, and according to a 1993 Chevron report, "*Massive hydraulic fracturing… has been employed since the 1980s"*. In other words, the produced water is not simply contained within the anticline structure itself, multiple pathways for fluid migration likely exist. As documented in UIC materials produced water is being drawn from areas adjacent to the crest of the oil field (i.e., up the limbs of the oil field anticline), likely including from beneath the Aqueduct by the subsurface pressure differential propagated by oil extraction at the crest of the reservoir structure. A

conceptual cross section from the Lost Hills UIC that illustrates this concept found in **Appendix B** of this response letter.

A Chevron June 1992 publication titled *Reservoir Compaction and Surface Subsidence Above Lost Hills Field, California,* states among other things, "*The surface above Lost Hills Field has been subsiding since the early 1950's and has recently accelerated due to well development in the 1980's*". Further, *" …. surface subsidence have been associated with oil and gas production from several diatomite reservoirs in the area during the past 40 years.*" Portions of the Lost Hills Field extract from such a compaction-prone diatomite reservoir that is adjacent to the Aqueduct (see UIC cross section, **Appendix B**).

It is important to recall that the Lost Hills Oil Field is directly adjacent to the Aqueduct and in fact the administrative boundary of the field extends across the Aqueduct in places. A UIC figure illustrating this close relationship is provided in **Appendix B** of this response letter. In a June 1992 report by Chevron (**Appendix A**) presented the results of a finite element model that compared subsidence model results to field measurements of subsidence collected between 1989 and 1991. This data indicated that around 0.2 ft (2.4 inches) of subsidence could be expected approximately 3,000 ft (0.6 mile) from the center of the field. Since that time, the field has matured further, and enhanced oil recovery (EOR) activities have expanded. All of the contributing factors described herein, and others, were shared in meetings with CASP and at least once jointly with CASP and CalGEM in September 2023. Lastly, the aforementioned number and density of oil field-related wells (over 3,600) in comparison to GSA-related wells adjacent to the Aqueduct between MP 195 and 215 in the five mile-wide CASP monitoring corridor are orders of magnitude apart. Two figures based on CalGEM information illustrating this fact are found in **Appendix B** of this response letter. This disparity in the number of wells is relevant when it is understood that, because of naturally degraded groundwater quality the WDWA GSA relies almost exclusively on surface water deliveries from the Aqueduct and other sources for its supply needs (i.e., over 98 percent surface water). Recently, WDWA GSA received a CEQA project description from CalGEM pertaining to a proposed Chevron project to drill an additional 75 wells in the Lost Hills Field, further demonstrating extraction plans for the Lost Hills Field are ongoing and expanding.

WSPA Comment #4 – Summary: ECI 2021 Report data show that agricultural extraction subsidence trend is more obvious and encompasses the Aqueduct, whereas the oil and gas extraction trend appear more localized and isolated.

Response to Comment #4: The conclusion of CASP in their September 2022 letter regarding the 2021 ECI Report was that "*Further studies are required prior to assigning causality for subsidence along the Aqueduct at the Kern Bowl".* The ECI 2021 report

recommended among other things, that additional studies be conducted to "… *further refine the potential nexus between oil field activities and undesirable results to critical infrastructure in the KCS*". Those studies were conducted by the Subbasin as detailed in the LBL and ECI reports of 2023 (https://kerngsp.com/gsp-documents/). The Subbasin is committed to work in close consultation with DWR and CASP to monitor and report subsidence rates along the entire Aqueduct to help further refine the causes of subsidence between MP 195 and 215 and assist the agencies as they work to apportion responsibility for the SGMA-related impacts to the Aqueduct among the various stakeholders. As previously discussed, WDWA GSA has also implemented management actions requiring well registration and metering in proximity to MP 195 to 215 that will provide valuable data to DWR and CASP in apportioning responsibility for SGMA-related impacts to the Aqueduct.

WSPA Comment #5: Subsidence rates in the Kern Bowl (which runs adjacent to the Aqueduct for a portion of Pool 23, all of Pool 24, and 25, and Pool 26 is comparable to subsidence rates in agricultural lands just east of the Aqueduct as measured by the LBL 2022 Study and ECI 2021 Report.

Response to Comment #5: As noted in the response to **Comment #4**, the Subbasin has subsequently conducted additional studies (i.e., ECI/LBL) as requested by CASP that indicate while high rates of subsidence attributable to the localized areas of intense oil field extraction are clearly evident, the subsurface effects of the oilfield extraction propagate up to and outside of the administrative boundaries of the Lost Hills Oil Field including beneath and immediately adjacent Aqueduct. The driver for this phenomenon is illustrated by a cross section from an approved UIC application (see **Appendix C**). The cross section shows that oil and produced water extraction at the crest of the anticline creates a pressure differential in the subsurface which has the effect of drawing groundwater up the limbs of the Lost Hills field anticline from the surrounding area where it is entrained in the production stream. In simple form, UIC rules require the applicant to demonstrate that its planned activities would not impact the quality of the surrounding groundwater. The subject cross section was provided by the oil company to demonstrate they have met that requirement for approval.

InSAR time series B-B', C-C' and D-D' provided in the 2024 GSP illustrate the effects of oil field pumping extend up to, and beyond, the Aqueduct towards the east. These time series were provided in the 2024 GSP and are also found at https://kerngsp.com/gsp-documents/. Further, 2019 DWR historical land survey subsidence profiles for MP 195 to 215 (DWR Plates 12-14) [**Appendix C**] illustrate that Aqueduct subsidence rates increase significantly beginning at the Lost Hills Oil Field and are markedly less once past the influence of oilfield activities at approximately MP 215.

WSPA Comment #6 – Summary: The ECI 2021 Report and LBL 2022 study need to expand the zone of influence of groundwater pumping surrounding the Aqueduct to beyond the 2.5 mile on either side of the Aqueduct.

Response to Comment #6: The quote attributed to CASP in the WSPA comment letter pertaining to the width of the subsidence monitoring corridor used by the Subbasin in its report is mischaracterized by omission. The full CASP text in its September 2022 letter reads, "*The Amended GSP notes that the subsidence monitoring corridor for the Aqueduct will include lands within the 2.5 miles on either side of the Aqueduct (i.e., total of five miles wide centered on the Aqueduct). (p.235) Although DWR, in its 2017 CASS report and its 2019 Supplemental Report utilized a corridor of similar width, recent observations suggest that the potential zones of influence from groundwater pumping may extend beyond 2.5 miles on either side of the Aqueduct. The CASP is evaluating whether this arbitrary assumption provides a comprehensive consideration of the effects of groundwater pumping on the Aqueduct**, ***and may, in the future, adjust the parameter referenced in its Reports.***" (emphasis added). Thus, the five-mile-wide monitoring corridor utilized by the Subbasin meets current CASP guidance.

WSPA Comment #7 – Summary: 2023 LBL draft study did not establish that localized subsidence associated with Lost Hills Oilfield operations extended to the Aqueduct. The study failed to consider the fluid re-injection that occurs in Lost Hills Oilfield.

Response to Comment #7: Please the response to **Comment #3.** The administrative boundaries of the Lost Hills Oil Field abut and extend over the Aqueduct in places**.** With regards to WSPA implying that reinjection of produced water is a means of eliminating subsidence or otherwise abrogating oil activities from subsidence impacts on the Aqueduct, the data shows such a claim to be misleading at best. In addition to the oil company publications cited in Response to **Comment #3**, a 1993 Mobil Oil publication titled *Lost Hills Dolomite Simulation Study: Predicting Waterflood Performance in a Low-Permeability, Compacting Reservoir*, stated, " *In the late 1980's, it became evident that production from the tightly spaced (as low as 0.42 acre) development of these highly compressible permeability reservoir was resulting in reservoir compaction and surface subsidence*". The Lost Hills Oil field diatomite reservoir is adjacent to the Aqueduct where an embankment failure occurred at MP 208. On September 17, 2024, CalGEM circulated a California Environmental Quality Act (CEQA) Project Description seeking comment on a Chevron project to, among other things, drill another 75 wells in the Lost Hills Oil Field. The focus of this project is the same collapse prone diatomite reservoir adjacent to the Aqueduct. In a response to CalGEM, the SWP in a correspondence dated October 1, 2024, stated that currently there are well over 3,600 oil and gas wells in the vicinity of the Lost Hills Field and MP 195-215 and that "because significant and unavoidable geologic and soil (subsidence) and water facility (the Aqueduct) impacts

are likely to occur as a result of the Proposed Project, SWP recommends an EIR be prepared".

WSPA Comment #8 – Summary: The May 2024 Draft GSP fails to reference or evaluate earlier regulatory agency studies spanning several decades that reached different conclusions with respect to the causes of subsidence associated with the Aqueduct in the vicinity to Lost Hills.

Response to Comment #8: The statement by WSPA that the Subbasin has not reviewed earlier regulatory agency studies regarding the causes and extent of subsidence is without foundation and is incorrect. Further, the USGS professional paper titled *San Joaquin Valley, California, As of 1972* cited by WSPA focuses in large part on areas to the north of Kern County where hydrogeological conditions are markedly different to those in Kern County. Regarding WSPA statements pertaining to subsidence caused by oil extraction, the cited study was focused on the broader implications of subsidence on groundwater storage in the San Joaquin Valley at large and not other impacts. However, pertaining to oil, the subject 1972 report states, "*Present subsidence rates are generally very low.* ***During earlier periods of maximum production, however, subsidence rates in some oil fields undoubtedly were much greater than during the period of measurement.*****"** (emphasis added). As noted in Response to **Comment #3**, subsidence accelerated at the Lost Hills Field in the 1980's with the expansion of enhanced oil recovery (EOR) techniques including hydraulic fracturing.

As noted in Response to **Comment # 5**, the DWR *2019 California Aqueduct Subsidence Study: Supplemental Report*, land subsidence survey profiles provided on Plates 12 through 14 (**Appendix D)** of this response letter) show that significantly increased rates of subsidence correlate to the beginning of Lost Hills Oil Field activities at approximately MP 195 and extend along the Lost Hill Oil Field to approximately MP 215 where oil activities currently end or are reduced. In regard to WSPA's comment that, "*the California Aqueduct Subsidence Study: Supplemental Report, relying on several lines of evidence (including an expanded 5 mile buffer zone on either side of the Aqueduct), concluded that, "subsidence associated with oilfield operations in the Lost Hills area is localized to the Lost Hills Oilfield and does not extend to the Aqueduct with subsidence background rates west of the Aqueduct*", new data show otherwise. In fact, CASP, in their December 21, 2023, response letter to WSPA state, "*These studies* [the 2017 California Aqueduct Subsidence Study and the subsequent 2019 supplemental California Aqueduct Subsidence Study] *contributed to the body of knowledge of subsidence along the Aqueduct. However, given the limited data and information on which these studies were based, it is important that the interpretations they contain* ***not be viewed as the definitive 'end of the story,' but rather an important step towards a collective understanding of the causes of subsidence affecting the California Aqueduct****."* (emphasis added)

While the aforementioned 2019 DWR figures are but one source of data, when viewed with other disparate sources of data, many of which were prepared by WSPA member companies, a reasonable conclusion is that a nexus exists between oil extraction and subsidence impacts to the Aqueduct. Examples of the other data reviewed by the Subbasin are presented in Appendix A and summarized above in Response to WSPA **Comment #1**. As stated elsewhere in this response letter, the Subbasin plans to work cooperatively with CASP and DWR to monitor and further study this phenomenon as those agencies work to apportion responsibility among the various stakeholders for the undesirable results identified between MP 195 and 215.

WSPA Comment #9 – Summary: State Water Resources Control Board staff, in their July 2024 Kern County Subbasin Probationary Hearing Draft Staff Report, do not agree that oilfield operations are a primary cause of subsidence along the Aqueduct and the May 2024 Draft GSP proposes that subsidence along the Aqueduct is the result of oil and gas extraction without substantial evidence.

Response to Comment #9: The WSPA comment appears to be intentionally mischaracterizing SWRCB staff comments by conflating State Water Board Draft Staff Report ("Draft Staff Report") comments requesting additional data pertaining to pumping in the Subbasin and the nexus between oil field extraction activities and the identified impacts (undesirable results) to the Aqueduct between MP 195 to 215. The WSPA comment letter selectively included quotations from the Draft Staff Report that, aggregated at the regional level throughout the San Joaquin Valley, suggest the majority of subsidence is caused by over pumping of groundwater. In comparison to groundwater dependent irrigated agriculture, which is widespread throughout the San Joaquin Valley, conditions in Kern County are more complicated and nuanced. For example, oil and gas operations are primarily concentrated in the Kern County Subbasin and drawing conclusions regarding localized causes of subsidence based on regional generalizations is not appropriate, nor accurate. Specifically, WSPA fails to note that Section 3.5.7 of the SWRCB Draft Staff Report states, "*In areas where oil and gas operations are occurring the activity is likely contributing to subsidence. However, where both extraction activities are occurring, then it is probable that both activities are contributing to the overall subsidence*." The Subbasin concurs with WSPA that there are areas in the Subbasin at large where land subsidence is principally, if not solely, attributable to GSA-related activities. However, MP 195 to 215 is not one of those areas due to the extremely limited use of groundwater for agricultural and municipal use and other disparate sources of data that show groundwater pumping is not contributing to subsidence.

WSPA also fails to note that WDWA GSA has already implemented a series of four management actions (i.e. mandatory well registration, groundwater extraction reporting, net-zero well drilling moratorium, and a groundwater extraction moratorium for wells

within close proximity to the California Aqueduct) to address the quoted Draft Staff Report recommendation that "GSAs should identify the wells that have the greatest impact on subsidence near critical infrastructure and the specific aquifers from which they pump and reduce or eliminate pumping from those wells if thresholds are exceeded". See Response to WSPA Comment #1 for additional information regarding the lack of groundwater extraction in proximity to MP 195 to 215 and the protective management actions WDWA GSA has already implemented.

WSPA Comment #10 – Summary: GSAs relied on publicly available DWR InSAR data in their subsidence analysis that, due to the distance between Continuous Global Positioning Systems (CGPS) the extrapolations of InSAR data may not represent local conditions. Before being able to identify Lost Hills Oilfield as a potential contributor of subsidence, the GSAs need to use a local reference point that does not rely on data extrapolation.

Response to Comment #10: The InSAR subsidence bullseye measured over and proximity to the Lost Hills Oil Field has, over time, been an order of magnitude greater than other areas of the Subbasin. The InSAR time series provided in the Subbasin Draft 2024 GSP demonstrate that the effects of oil extraction at Lost Hills extends up to and beneath the Aqueduct, which is located immediately adjacent to the Lost Hills Oil Field administrative boundary. The causes of these effects are further supported by, among other things, UIC information submitted to CalGEM and the USEPA by the field operators.

Contrary to WSPA comments, InSAR is a proven technology that provides accurate deformation (subsidence) data on a regional and local basis (see Historical Document Table, **Appendix A**, and below). With InSAR, each pixel is a valid and accurate measurement of elevation change. This accuracy is improved when compared to ground-based data (e.g., GPS, spirit level survey etc.). The Subbasin InSAR data utilized DGPS to refine the already accurate data. To check the data acquired for the Subbasin, the InSAR survey also utilized a DGPS station that exhibited minimal vertical deformation.

The Subbasin InSAR time series shows seasonal changes in the subsidence rate for the Subbasin due to seasonal recharge as well as seasonal changes in the extraction rate, mostly due to farming (i.e., areas distal to the westside and oil production). However, no such seasonal fluctuation can be seen in the subsidence for the Lost Hills Oil Field where the subsidence rate is constant (i.e., non-seasonal) over time. Furthermore, according to ECI, the Subbasin InSAR results compared well with the DWR spirit level survey data collected along Aqueduct. Therefore, even without this supplemental check, the Subbasin data is accurate for its intended purpose of assessing oil field and Subbasin subsidence.

The use of InSAR data as a tool to monitor subsidence in oilfields has been supported by several published studies conducted specifically on Lost Hills Oilfield:

- Xu, H., Dvorkin, J., & Nur, A. (2001). Linking oil production to surface subsidence from satellite radar interferometry. *Geophysical Research Letters, 28*(7), 1307-1310.
    - *“The new InSAR technique provides massive, high precision, and real-time data of surface deformation. If this deformation is due to hydrocarbon production, the InSAR technique gives us an opportunity to monitor this production in time and space. […] In this paper we show, using the Belridge and Lost Hills field example, that such monitoring is in principle possible.”*
    - *"The estimate given in the previous section shows that hydrocarbon production and surface subsidence can be quantitatively linked to each other. Therefore, it is possible, in principle, to monitor hydrocarbon production, and, in general, pore-fluid-related changes in the subsurface using InSAR data.”*
- Shi, J., Xu, B., Chen, Q., Hu, M., & Zeng, Y. (2022). Monitoring and analyzing long-term vertical time-series deformation due to oil and gas extraction using multi-track SAR dataset: A study on Lost Hills oilfield. International Journal of Applied Earth Observation and Geoinformation, 107, 102679.
    - *“The multi-temporal interferometric synthetic aperture radar (MT-InSAR) technique can reveal the ground deformation history during the oil and gas extraction period. The timeseries deformation results derived by MT-InSAR have been proven to be spatially correlated with the location of the injection and oil production wells in the area.”*
- Van der Kooij, M., & Mayer, D. (n.d.). *The application of satellite radar interferometry to subsidence monitoring in the Belridge and Lost Hills Fields, California*. Atlantis Scientific Inc. & Aera Energy LLC.
    - *“InSAR deformation data have been compared to and validated with a series of GPS monument survey measurements in the Lost Hills field. These comparisons have shown the InSAR deformation data accuracy to be at sub-cm level.”*

In regard to WSPA request that GSAs use a local reference point that does not rely on data extrapolation and removes regional movement, we have calibrated InSAR data with DGPS. Subbasin review of historical oil company publications and statements made by WSPA members at Subbasin meetings with WSPA, it appears that historical oil operator subsidence monitoring data is available for the Lost Hills Oilfield that is tied to spirit level survey monuments in the field. Members of the Subbasin and DWR CASP have previously requested this data and have not yet received it. It is likely that this data could help to further refine the subsidence rates between MP 195 to 215.

WSPA Comment #11 – Summary: The May 2024 Draft GSP continues to use a 5-mile buffer zone to evaluate subsidence rather than a 10-mile-wide study corridor.

Response to Comment #11: WSPA is mischaracterizing CASP guidance by implying the Subbasin ignored current regulatory guidance**.** Regarding the width of the CASP monitoring corridor on either side of the Aqueduct, please see response **to Comment #6**. The full CASP text pertaining to this item in its September 2022 letter reads, "*The Amended GSP notes that the subsidence monitoring corridor for the Aqueduct will include lands within the 2.5 miles on either side of the Aqueduct (i.e., total of five miles wide centered on the Aqueduct). (p.235) Although DWR, in its 2017 CASS report and its 2019 Supplemental Report utilized a corridor of similar width, recent observations suggest that the potential zones of influence from groundwater pumping may extend beyond 2.5 miles on either side of the Aqueduct. The CASP is evaluating whether this arbitrary assumption provides a comprehensive consideration of the effects of groundwater pumping on the Aqueduct**, ***and may, in the future, adjust the parameter referenced in its Reports.***" (emphasis added). Thus, the monitoring corridor utilized by the Subbasin meets current CASP guidance. It should be noted that within WDWA GSA, to the west of Aqueduct between MP 195 to 215, lies more densely concentrated oilfield activities and open range land. To the east up to the Interstate 5, are a mixture of fallowed fields, limited agriculture, of which some or all, is supported by surface water, and the Town of Lost Hills, which gets its water supply approximately 10 miles away from wells on the other side of Interstate 5 in the Semitropic Water Storage District. This information, when viewed in concert with all the other data, helps support the conclusion that the Lost Hills Oil Field is impacting land subsidence on the Aqueduct between MP 195 to 215.

WSPA Comment #12 – Summary: The May 2024 Draft GSP fails to explain how the GSAs can differentiate between GSA-related and non-GSA related subsidence when both occur in the same area.

Response to Comment #12: As stated in Section 8 of the Draft 2024 GSP Report, using InSAR time series it is possible to differentiate between different types of extraction actives. Agricultural pumping (e.g., GSA-related pumping) has a seasonal pattern that is discernible in InSAR time series data as a sine wave-like pattern over a period of extended time. By contrast, non-seasonal pumping, for example, oilfield activities near the Aqueduct (e.g., MP 195 to 215) and elsewhere, tend to have a "busy" or "noisy" less sinuous pattern and a steeper declining slope reflecting non-seasonal (i.e., full time) activities**.**

To assess the potential for future subsidence and demonstrate the ability to discern between SGMA (GSA) and non-GSA-related subsidence, eight InSAR time series were extracted from the processed InSAR data. The current time series transects depict

annual rates and cumulative displacement between 2019 and 2022**.** The placement of the transects evaluates identified regional critical infrastructure and areas of both GSA and non-GSA-related pumping. All eight of the time series are provided in the Subbasin 2024 GSP.

In the Subbasin 2024 Draft GSA Report, **Figure 8-71** provides an example of the InSAR time series signature for agricultural pumping (i.e., GSA-related). In this time series all the time series lines are in harmony and have a sine-wave shape indicative of seasonal pumping activities. Non-seasonal pumping, for example oilfield activities near Aqueduct MP 204, tend to exhibit a less sinuous pattern (i.e., noisy pattern) and a steeper declining slope reflecting non-seasonal (i.e., more sporadic) pumping. **Figure 8-66** in the 2024 GSP provides an example of a non-GSA time series signal (see also, (**Appendix E**) in this response letter). More detail is provided in Section 8.5 of the Subbasin 2024 Draft GSP Report. Based on the WSPA comment, the Subbasin will review **Section 8** of the Subbasin Draft 2024 GSP to ascertain if we can expand or further clarify the existing text in the Final 2024 GSP.

The 2024 GSP subsidence MOs and MTs are based on historical subsidence rates as determined by DWR and Friant Authority spirit level benchmark data and GPS stations. Further, as such, the Subbasin will continue to monitor and report subsidence in these areas, with the recognition that the GSAs will likely need to coordinate with multiple entities that are influenced by land subsidence from non-GSA causes. Quarterly monitoring will be conducted utilizing DWR Tre-Altamira InSAR data, precise elevations taken at historical benchmarks and GPS surveys. The Subbasin Subsidence SMCs are data driven and based on historical subsidence rates. The SMCs are also coordinated across the entire Subbasin, are protective of beneficial users, and incorporate a subsidence rate ramp down to 2040. Subsidence rates related to GSA activities are projected to be stable by 2030 (in concert with groundwater SMCs) and no new GSA subsidence is projected past 2040.

Where non-GSA causes of subsidence are contributing to subsidence along Critical Infrastructure (such as the Aqueduct), the GSAs will work collaboratively with the relevant regulatory agencies (e.g., DWR's California Aqueduct Subsidence Program [CASP]), DWR, CalGEM etc. to provide relevant data demonstrating the likely root causes of subsidence. For example, the WDWA GSA has recently adopted a pumping moratorium for all supply wells within the CASP Monitoring Corridor between Aqueduct MP 195 to 215 in order to ameliorate the potential for subsidence impact contributions by GSA-related activities. This process of assessing the root causes of subsidence is, and will be, an ongoing process through the SGMA implementation period (i.e., until 2040 and possibly beyond). It is assumed, as the various GSA P/MAs work to decrease demand, potential GSA-related subsidence rates will correspondingly diminish apace and stabilize by 2030. Subsidence related to oil field extraction is expected to be

continuous as long as the oil fields remain operational. For example, WDWA received a CEQA Project Description on September 17, 2024, from CalGEM pertaining to a new Chevron project that plans to drill another 75 wells in the Lost Hills Oil field. By way of contrast, and as described previously, the WDWA has already implemented four P/MAs designed to further reduce their demand within the CASP monitoring corridor between Aqueduct MP 195-215. These P/MAs are 1) a well drilling moratorium “Zero- Net Wells”, 2) a well registration program, 3) an annual well extraction volume reporting management action, and 4), the aforementioned pumping moratorium.

As stated elsewhere in this response letter**,** the September 2022 CASP comment letter requested additional data to substantiate the preliminary finding in the 2021 ECI report that it was possible to differentiate between GSA and non-GSA InSAR time series signatures in the vicinity of the Lost Hills Oil Field and elsewhere. That data was provided to CASP subsequent to the September 2022 CASP letter. Assessment of subsidence causes and rates at Lost Hills is, and will be, an ongoing process through the SGMA GSP implementation period (i.e., until 2040 and possibly beyond). The Subbasin is committed to working with the regulatory agencies to help them assess and apportion responsibility for subsidence impacts (i.e. undesirable results) along the Aqueduct among the key stakeholders (i.e., DWR, oil and agriculture).

WSPA Comment #13 – Summary: The May 2024 Draft GSP does use the timeframes of 1926-1970, 2007-2019, and 2015-2023 with no explanation as to why the 1970-2007 timeframe was excluded. WSPA questions how GSA can make a reduction that risk of future subsidence from GSA-related activities is minimal based on a static interferogram.

Response to Comment #13: Comment noted. Although the Subbasin Draft 2024 GSP did not summarize historical USGS land level survey data for the period 1970-2007, this temporal gap in the USGS data does not materially affect the fact that subsidence has been occurring in the Subbasin since at least the 1920s or subsequent conclusions pertaining to the causes of Subbasin subsidence in the 2024 GSP. The Subbasin Draft 2024 GSP Report (**Section 8**) does explain that historical land subsidence based on leveling surveys by the National Geodetic Survey was documented by the USGS in the Southern San Joaquin Valley from 1926 to 1970 and is shown on **Figure 8-47** in the Subbasin 2024 GSP (Ireland et al., 1984). Based on oil field publications by Chevron and others (**Appendix A of this letter**) it is known that subsidence at the Lost Hills Oil Field accelerated in the 1980’s due to expanded well development and EOR activities (see also Responses to **Comments # 3 and #7**).

WSPA Comment #14 – Summary: GSAs apparent unwillingness to discuss land subsidence issues directly with WSPA, as evidenced by failure to meaningfully respond

to WSPA's prior comment letters and requests to discuss subsidence issues is disappointing.

Response to Comment #14: Members of the Subbasin have met in the past directly with WSPA to discuss subsidence**.** As the Subbasin has demonstrated, it is open to discussing the Subbasin subsidence data and findings with WSPA and is committed to transparent development of the GSP. During the development of the WDWA GSA Draft 2024 GSP, copies of the WDWA GSA subsidence management actions and timeline of the GSP development were shared with WSPA via phone and email conversations with Christine Zimmerman. The Subbasin looks forward to furthering a working relationship with WSPA and combining resources and expertise to refine the complex drivers of land subsidence in the MP 195-215 area. Prior to scheduling a meeting between the Subbasin's technical working group and WSPA's technical experts, the Subbasin reiterates our request that WSPA share, in advance, any Lost Hills Oilfield operator subsidence monitoring data and/or materials WSPA has presented to CalGEM and DWR/CASP regarding this topic.

In closing, the ultimate goal of the Subbasin is to protect the integrity of the California Aqueduct and ensure the sustainable management of groundwater resources in compliance with SGMA. The Subbasin remains committed to transparency and ongoing collaboration with WSPA and all stakeholders involved in groundwater management and land subsidence issues. We look forward to continuing to work closely with WSPA's technical experts to further refine our understanding of subsidence in the Lost Hills Oil Field and adjacent areas.

Respectfully Submitted,

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Mr. Paul Gosselin – Deputy Director, DWR Sustainable Water Management (Paul.Gosselin@water.ca.gov)

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Mr. You Chen Chao – Risk and Resiliency Officer, DWR SWP (YouChen.Chao@water.ca.gov)

Mr. Anthony Meyers – Principal Operating Officer, DWR SWP (Anthony.Meyers@water.ca.gov)

Mr. Jesse Dillon – CASP Program Manager, DWR SWP (Jesse.Dillon@water.ca.gov)

Ms. Natalie Stork – Director, SWRCB Sustainable Groundwater Management (Natalie.stork@waterboards.ca.gov)

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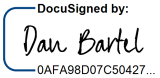
Dan Bartel dbartel@rrbwsd.com Security Level: Email, Account Authentication (None)	DocuSigned by:  0AFA98D07C50427...	Sent: 12/3/2024 4:04:03 PM Resent: 12/5/2024 8:10:22 AM Viewed: 12/5/2024 8:43:55 AM Signed: 12/5/2024 8:44:47 AM
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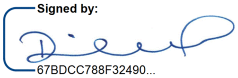
Daniel Maldonado drmaldonado@bakersfieldcity.us Security Level: Email, Account Authentication (None)	Signed by:  67BDCC788F32490...	Sent: 12/3/2024 4:04:05 PM Viewed: 12/4/2024 8:17:21 AM Signed: 12/4/2024 1:14:38 PM
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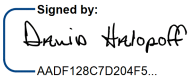
David Halopoff dhalopoff@cawelowd.org Security Level: Email, Account Authentication (None)	Signed by:  AADF128C7D204F5...	Sent: 12/3/2024 4:04:04 PM Viewed: 12/4/2024 9:43:02 AM Signed: 12/4/2024 9:43:27 AM
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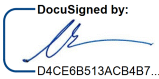
David Hampton DHampton@northkernwsd.com Security Level: Email, Account Authentication (None)	DocuSigned by:  D4CE6B513ACB4B7...	Sent: 12/3/2024 4:04:03 PM Viewed: 12/4/2024 7:28:57 AM Signed: 12/4/2024 7:29:34 AM
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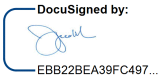
Jeevan Muhar jmuhar@aewsd.org Engineer-Manager Security Level: Email, Account Authentication (None)	DocuSigned by:  EBB22BEA39FC497...	Sent: 12/3/2024 4:04:08 PM Viewed: 12/3/2024 5:04:48 PM Signed: 12/3/2024 5:04:56 PM
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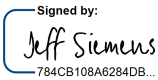
Jeff Siemens JSiemens@nfllc.net Security Level: Email, Account Authentication (None)	Signed by:  784CB108A6284DB...	Sent: 12/3/2024 4:04:11 PM Resent: 12/9/2024 8:10:35 AM Resent: 12/9/2024 12:00:44 PM Viewed: 12/9/2024 12:01:26 PM Signed: 12/9/2024 12:02:18 PM
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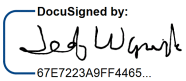
Jeof Wyrick jwyrick@jgboswell.com Security Level: Email, Account Authentication (None)	DocuSigned by:  67E7223A9FF4465...	Sent: 12/3/2024 4:04:09 PM Viewed: 12/3/2024 4:47:15 PM Signed: 12/3/2024 9:58:06 PM
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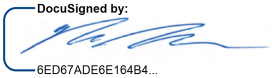
Nick Cooper ncooper@greenfieldcwd.org Security Level: Email, Account Authentication (None)	DocuSigned by:  6ED67ADE6E164B4... Signature Adoption: Uploaded Signature Image Using IP Address: 207.115.115.5	Sent: 12/3/2024 4:04:06 PM Viewed: 12/4/2024 1:47:25 PM Signed: 12/4/2024 1:48:01 PM
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Attachments to Subbasin Response Letter to WSPA Comment letter Dated August 29, 2024

Attachments Pertaining to Comment #1:

Summary Table Historical Subsidence Studies

Historical Subsidence Studies

Source	Title	Takeaway	Link
DWR, 1964 (May)	Land Subsidence Along the California Aqueduct as Related to the Environment	*"The best method of construction has proven to be compaction of the soils by ponding and injection of water through gravel packed infiltration prior to construction…"* The Aqueduct adjacent to the LHOF was not hydro-compacted prior to construction.	Copy available upon request
DWR, 1964 (December)	Design and Construction Studies of Shallow Land Subsidence for the California Aqueduct in the San Joaquin Valley-Interim Report	"*Unless properly treated shallow land subsidence could make the Aqueduct inoperative*". According to this report, no pre-compaction ponding (i.e., hydro-compaction) was conducted by DWR adjacent to LHOF.	Copy available upon request
Chevron, 1992 (June)	Reservoir Compaction and Surface Subsidence above Lost Hills Field, California	In the report, Chevron stated that; "*The surface above the Lost Hills Field has been subsiding since the early 1950's and has recently accelerated due to expanded well development in the late 1980's."* Further, *"…surface subsidence have been associated with oil and gas production from several diatomite reservoirs in the area during the past 40 years."*	https://inis.iaea.org/search/search.aspx?orig_q=RN:25052130

Historical Subsidence Studies

Source	Title	Takeaway	Link
Mobil, 1993 (October)	Lost Hills Diatomite Simulation Study: Predicting Waterflood Performance in a Low-Permeability, Compacting Reservoir	*"In the late 1980's, it became evident that production from the tightly spaced (as low as 0.42 acre) development of these highly compressible, low permeability reservoir was resulting in reservoir compaction and surface subsidence. Since 1985, shear failure of well casings associated with subsidence caused the loss of more than 100 wells in the nearby south Belridge Field."* The LHOF diatomite reservoir is adjacent to the Aqueduct embankment failure at MP 208.	https://onepetro.org/SPEATCE/proceedings-abstract/93SPE/All-93SPE/SPE-26627-MS/55237?redirectedFrom=PDF
Chevron, 1993 (October)	An Improved Recovery and Subsidence Mitigation Plan for the Lost Hills Field, California	With regards to the LHOF, the report states: "*Massive hydraulic fracturing … has been employed since the mid-1980s to accelerate recovery."* … *"the accelerated fluid withdrawal and associated pressure depletion has increased compaction of the highly compressive diatomite."*	https://onepetro.org/SPEATCE/proceedings-abstract/93SPE/All-93SPE/SPE-26626-MS/55171
JPL/Caltech 1998 (September)	Rapid Subsidence Over Oil Fields Measured by SAR Interferometry	*"The major oil reservoir is high porosity and low permeability diatomite. Extraction of large volumes from shallow depths causes*	https://agupubs.onlinelibrary.wiley.com/doi/10.1029/98GL52260

Historical Subsidence Studies

Source	Title	Takeaway	Link
JPL/Caltech 1998 (September) (Continued)	Rapid Subsidence Over Oil Fields Measured by SAR Interferometry	*reduction in pore pressure and subsequent compaction, forming a surface subsidence bowl."* and further, *"Maximum subsidence rates are as high as 40 mm in 35 days or > 400 mm/yr, measured from interferograms with time separations ranging from one day to 26 months. The 8- and 26- month interferograms contain areas where the subsidence gradient exceeds the measurement possible with ERS SAR..."* and further *"This modeling shows that a volume change of roughly 1.5 x 10^6 $m^3 \cdot yr^{-1}$ in the rock units at depth is sufficient to cause the observed signal for the Lost Hills oilfield."*	https://agupubs.onlinelibrary.wiley.com/doi/10.1029/98GL52260
Stanford, 2001 (April)	Linking Oil Production to Surface Subsidence from Satellite Radar Interferometry	*"An InSAR 105-day period (11/5/95 to 2/17/96),monitored subsidence at the center of LHOF, which reached 15 cm. This was interpreted to be due to oil production." "Efforts to mitigate the effect of subsidence (e.g., via water injection) have been only partly successful because well failure persisted [Wallace and pugh, 1993; Fast et al., 1993]."*	https://agupubs.onlinelibrary.wiley.com/doi/abs/10.1029/2000GL012483

Historical Subsidence Studies

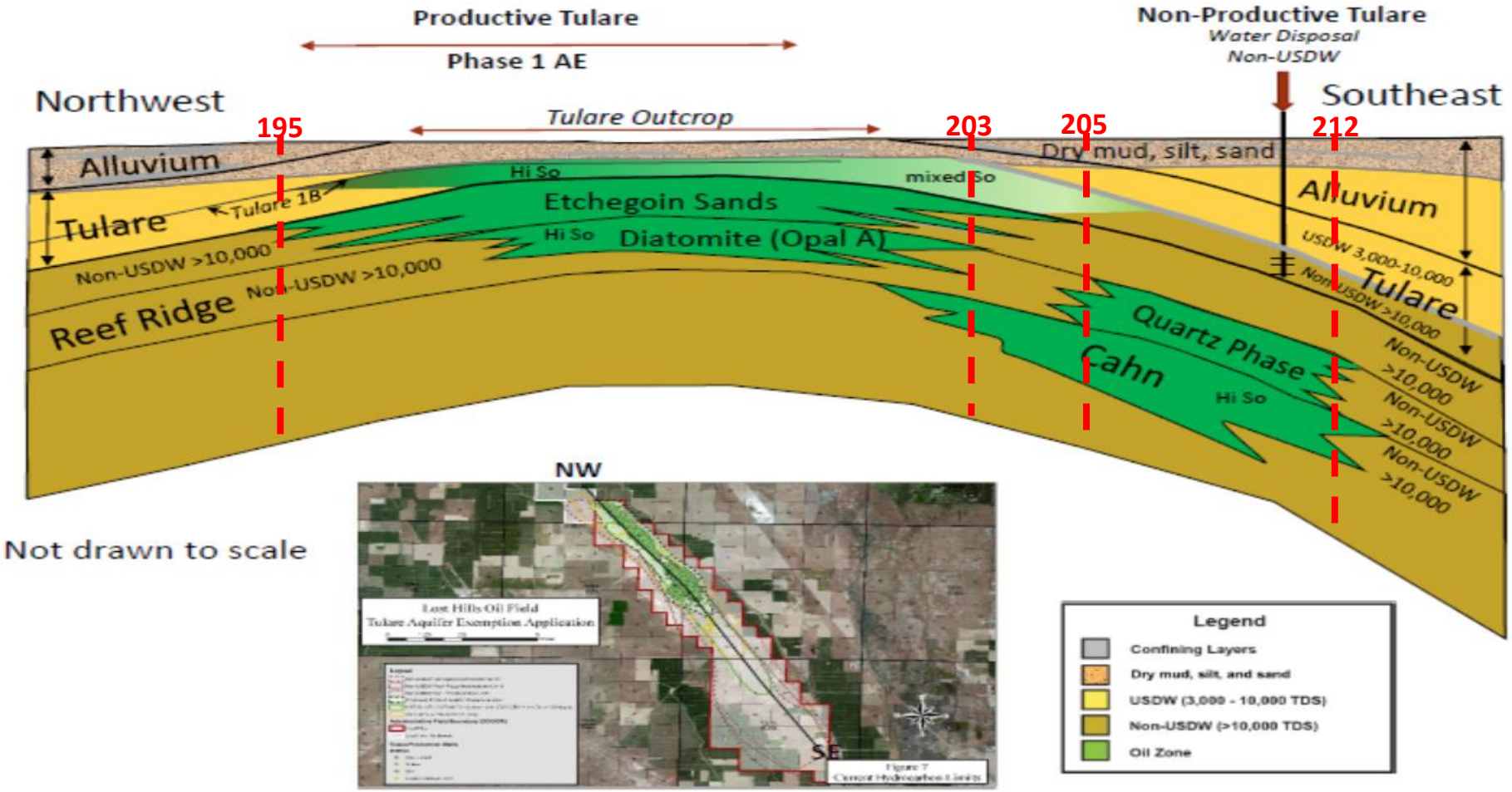
Source	Title	Takeaway	Link
Stanford, 2001 (April) (continued)	Linking Oil Production to Surface Subsidence from Satellite Radar Interferometry	*"…Hydrocarbon production and surface subsidence can be quantitively linked to each other."*	https://agupubs.onlinelibrary.wiley.com/doi/abs/10.1029/2000GL012483
Aera Energy et. Al., 2002 (June)	The Application of Satellite Radar Interferometry to Subsidence Monitoring in the Belridge and Lost Hills Fields, California	*"Production from weak, compactable, and low permeability diatomite oil reservoirs in the Belridge and Lost Hills fields in California has resulted in subsidence. The subsidence cause significant costs due to well failures."* *"InSAR deformation data have been compared to and validated with a series of GPS monument survey measurements in the Lost Hills field. These comparisons have shown the InSAR deformation data accuracy to be at sub-cm Level."* *"The data have added spatial definition to several subsidence bowls which formed over the most productive portions of each of these two fields."*	https://ieeexplore.ieee.org/document/1024987

Attachments Pertaining to Comment #3:

Lost Hills UIC Cross Section

LHOF Conceptual Cross Section

Figure 10: Conceptual strike cross section; Lost Hills Oil Field



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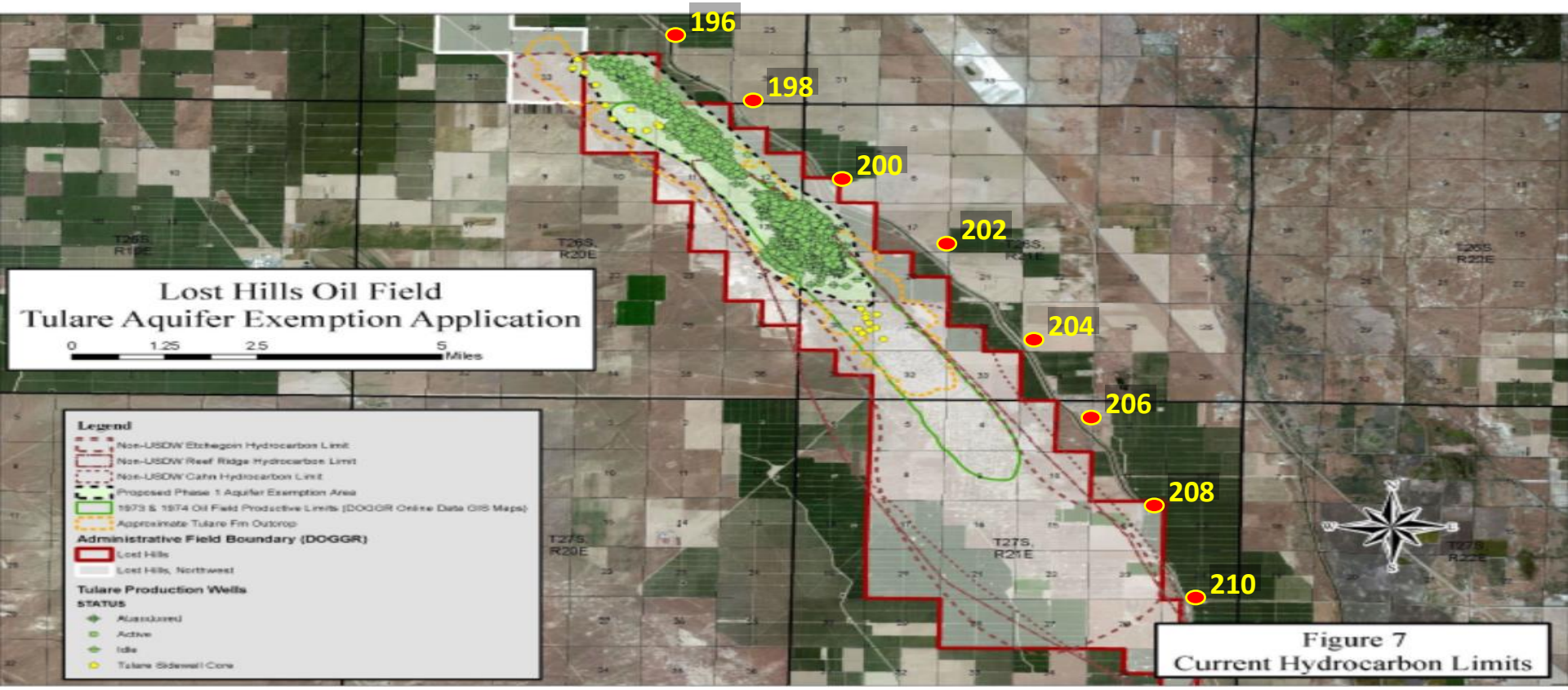
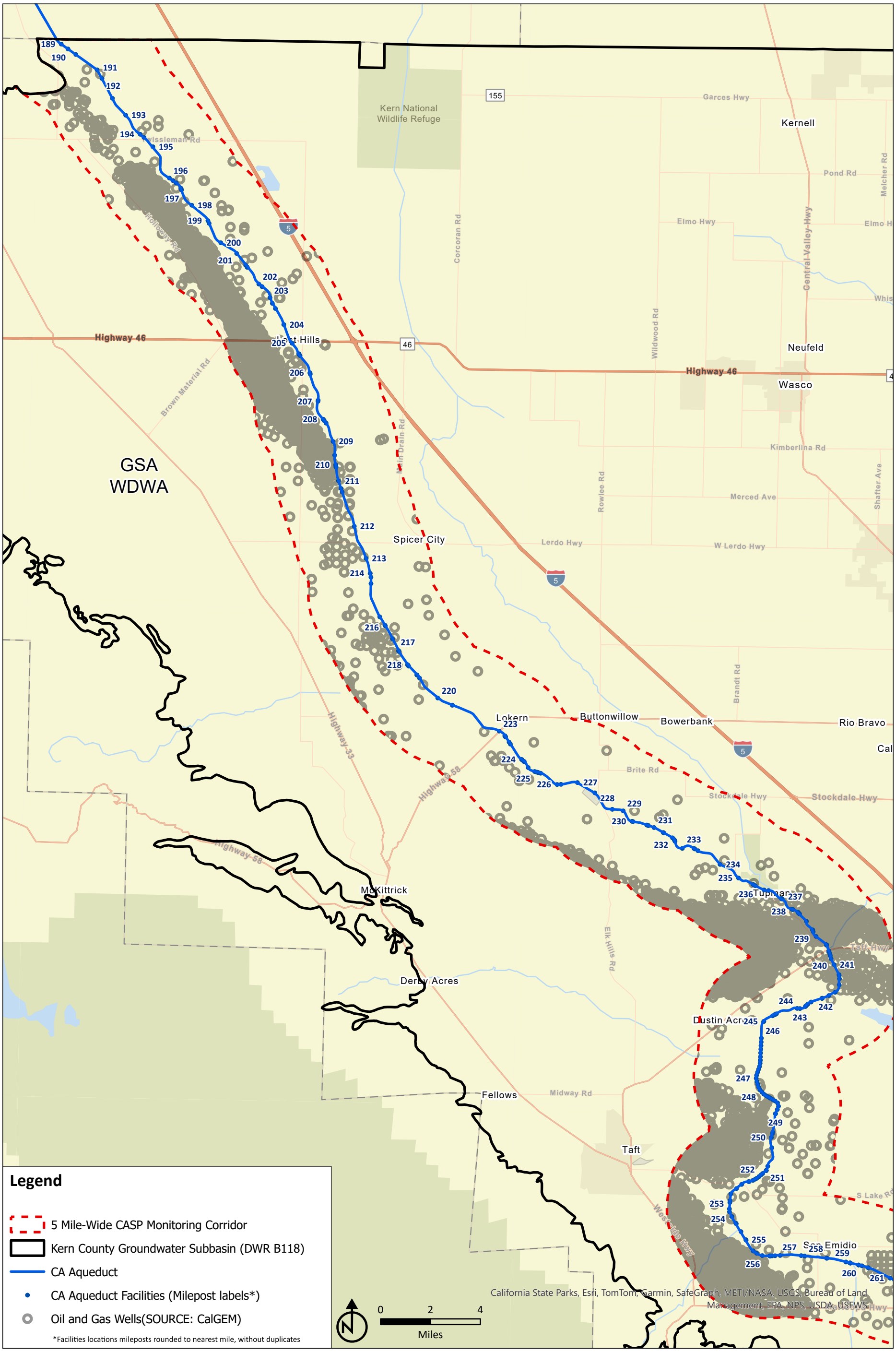
Lost Hills UIC Oil Field Administrative Boundary Figure

Oil Producing Zones



aquilogic

Lost Hills Oil Well V. GSA Well Density Figures



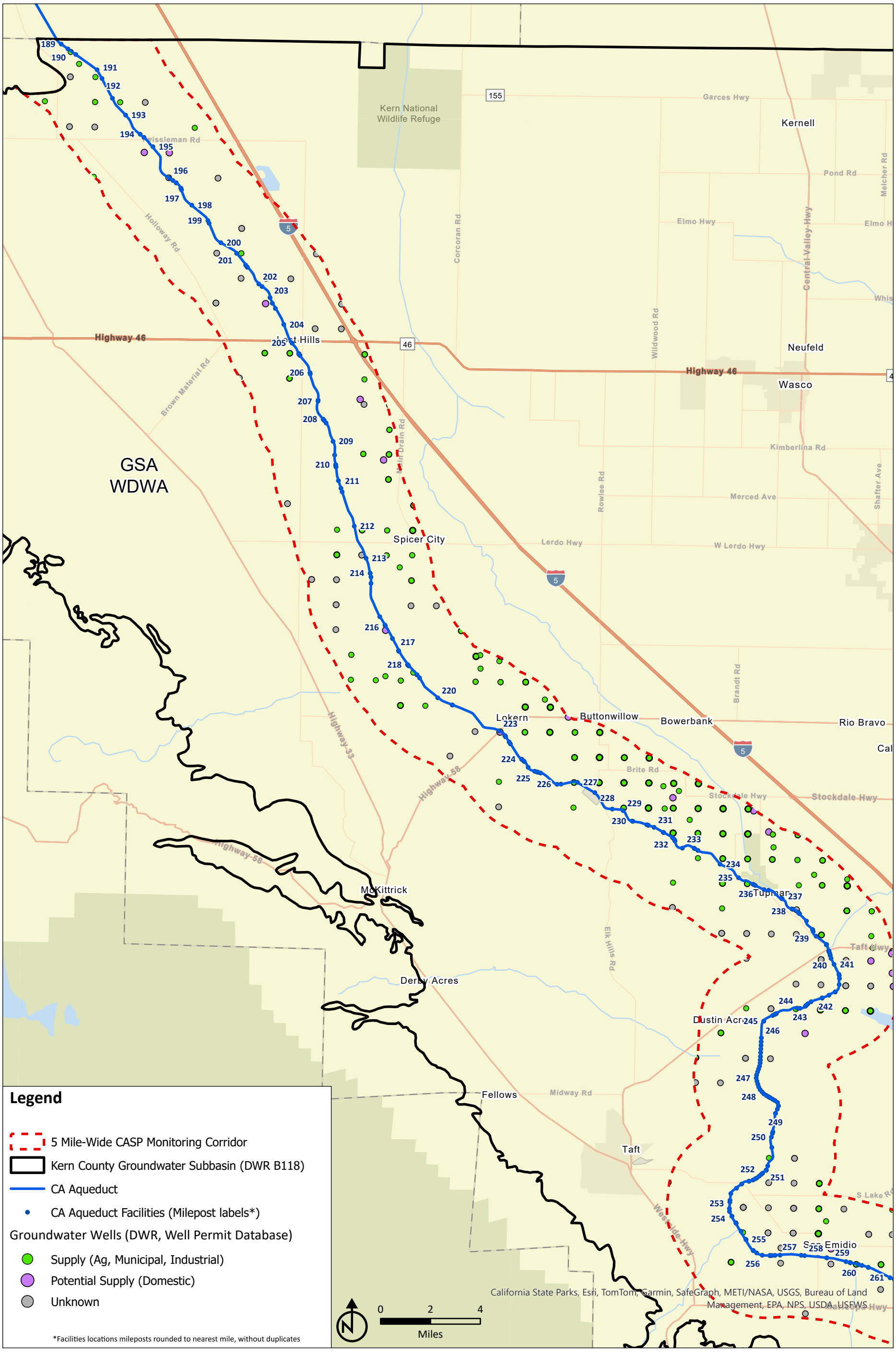
Notes: Modified from Provost & Prichardt.

aquilogic, Inc.

Client Name

Non-GSA Extraction Activities
CASP Aqueduct Monitoring Corridor

Date: 4/29/2024 | Project #: 043-04



Notes: Modified from Provost & Prichardt.

aquilogic, Inc.

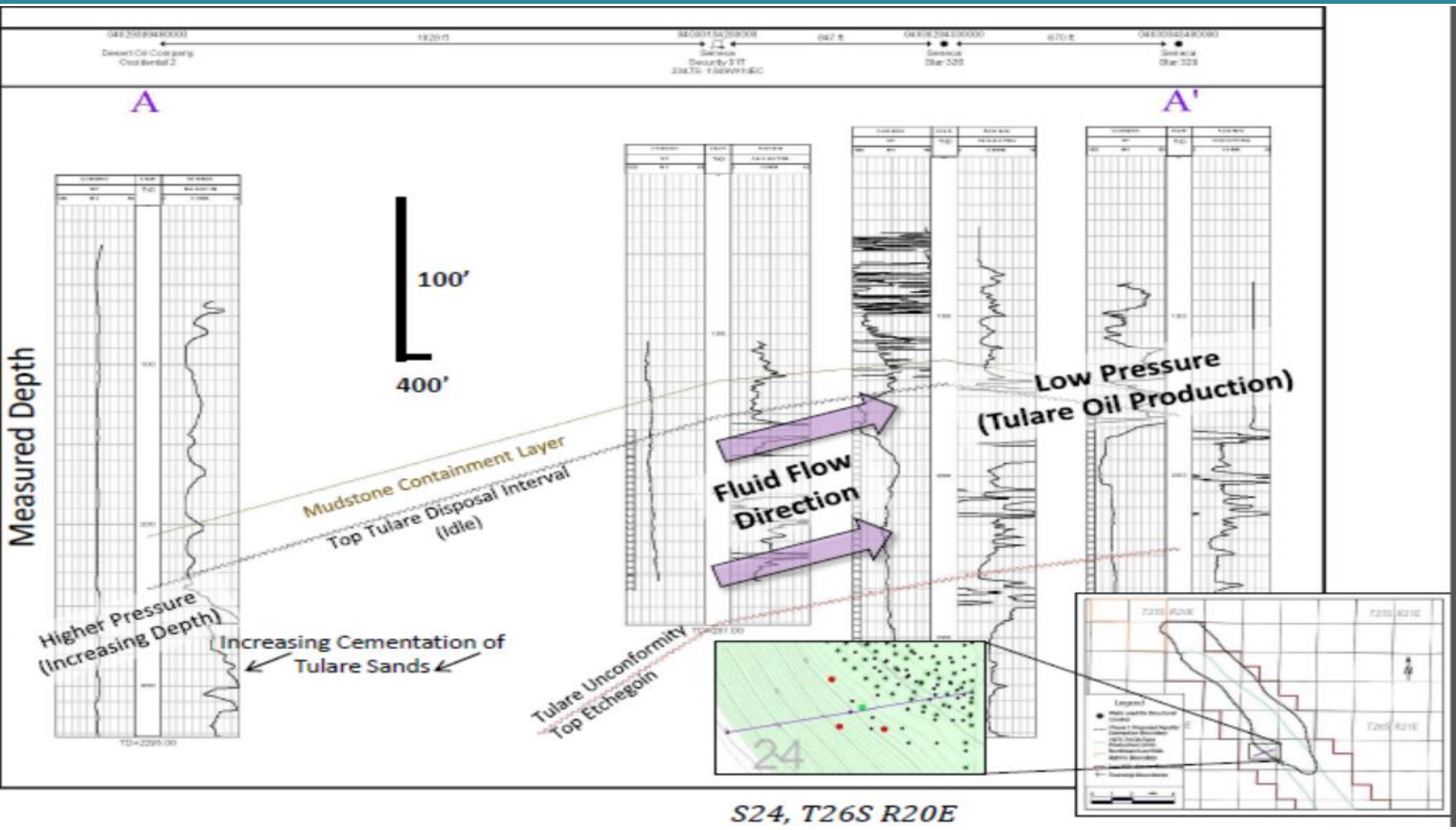
GSA-Related Supply Wells
CASP Aqueduct Monitoring Corridor

Date: 4/29/2024	Project #: 043-04	

Attachments Pertaining to Comment #5:

Lost Hills UIC Cross Section Showing Groundwater Migration

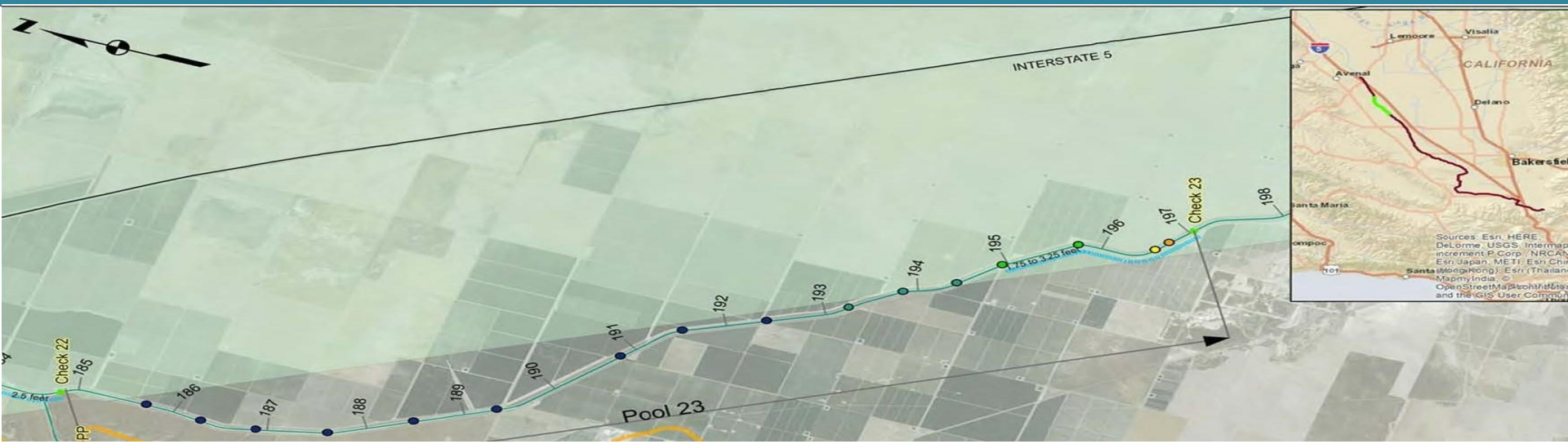
LHOF UIC

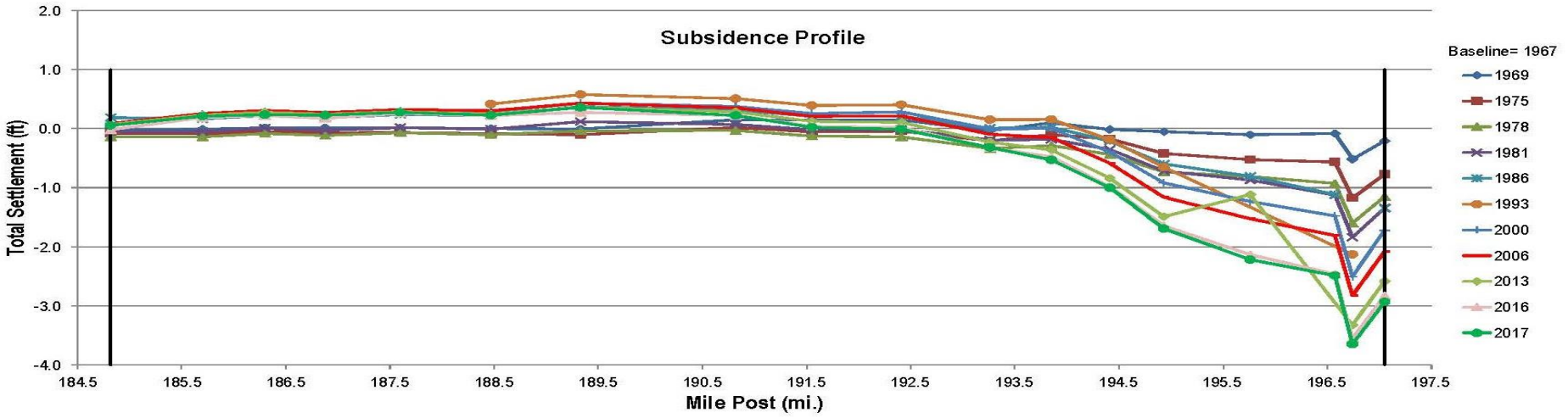

A
A'
100'
400'
Measured Depth
Mudstone Containment Layer
Top Tulare Disposal Interval
(Idle)
Fluid Flow
Direction
Low Pressure
(Tulare Oil Production)
Higher Pressure
(Increasing Depth)
Increasing Cementation of
Tulare Sands
Tulare Unconformity
Top Etchegoin
24
S24, T26S R20E

Attachments Pertaining to Comment #8:

2019 California Aqueduct Plates MP 195-215

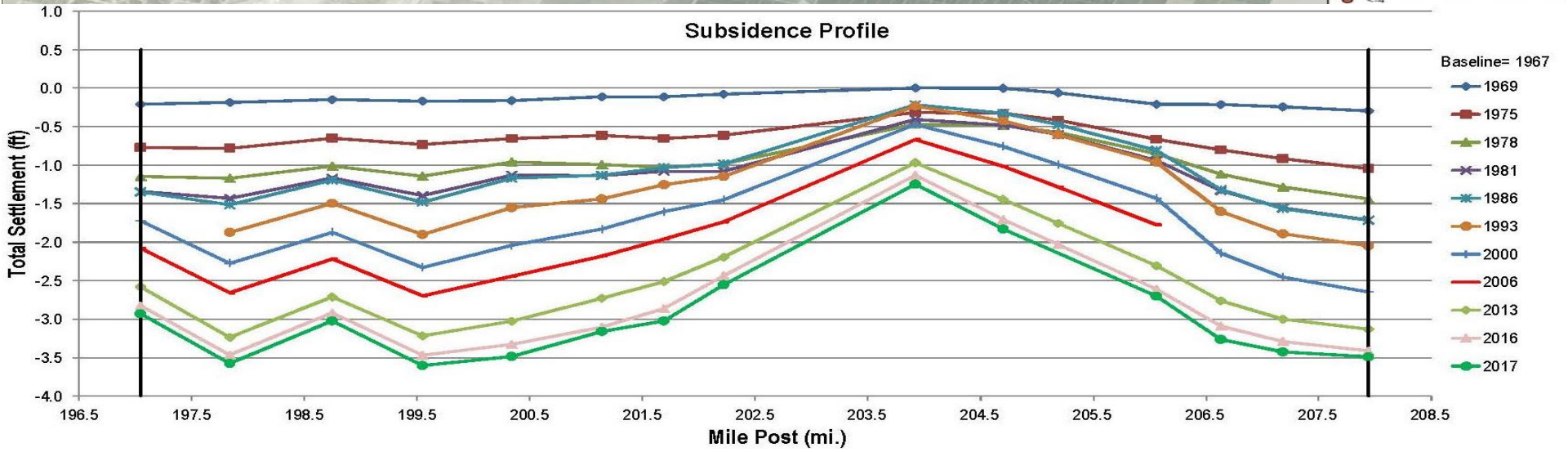
2019 DWR Report Plate 12: MP 185 – 197





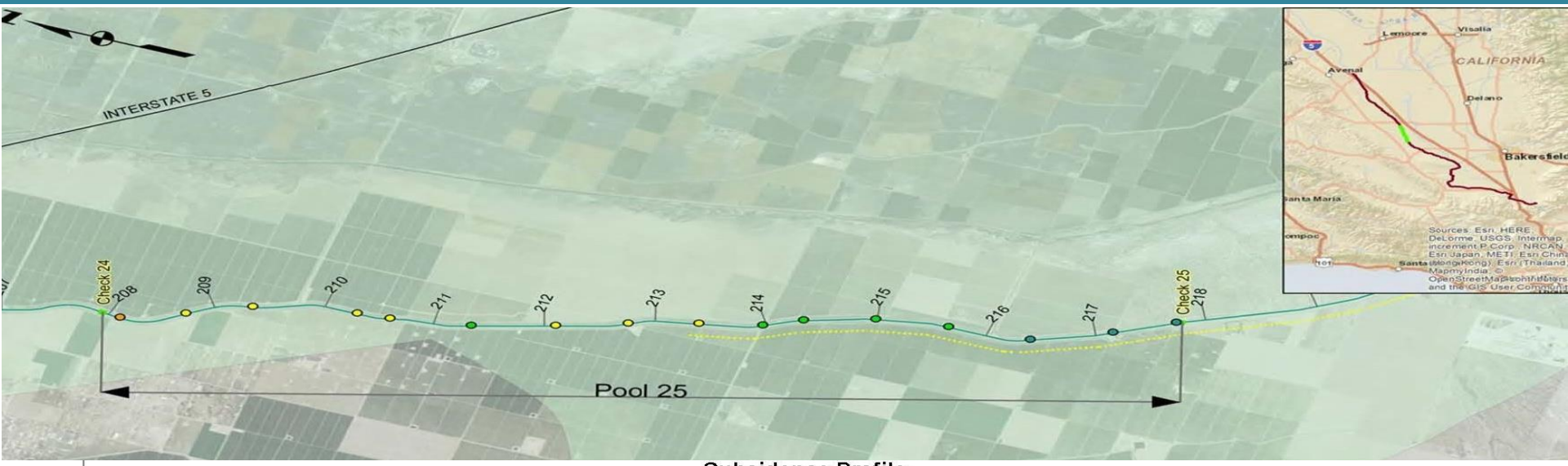
aquilogic

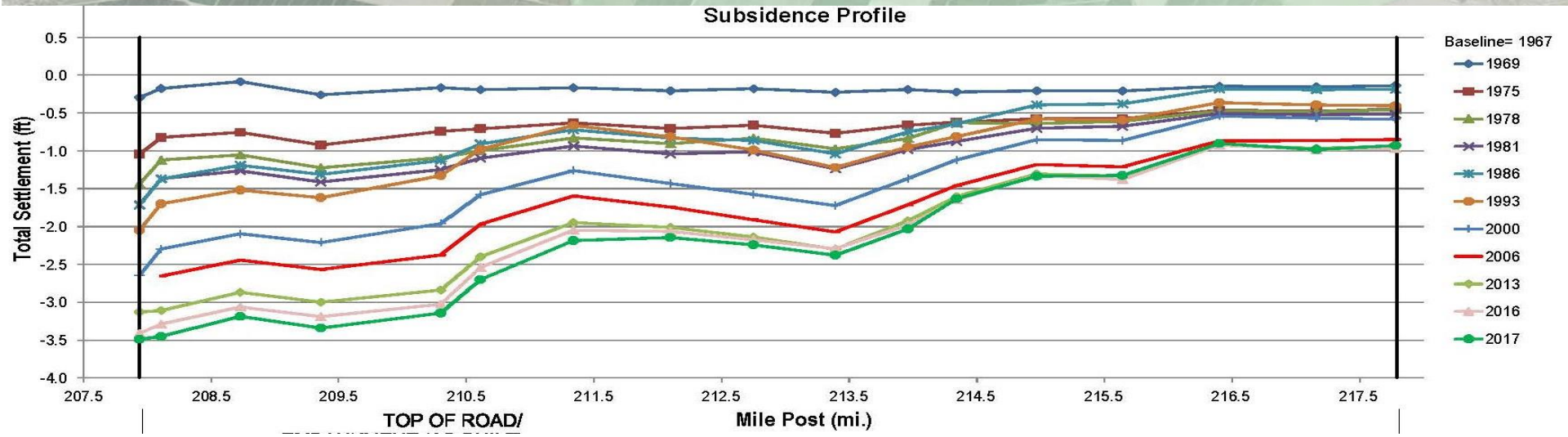
2019 DWR Report Plate 13: MP 197 – 208



aquilogic

2019 DWR Report Plate 14: MP 208 – 218

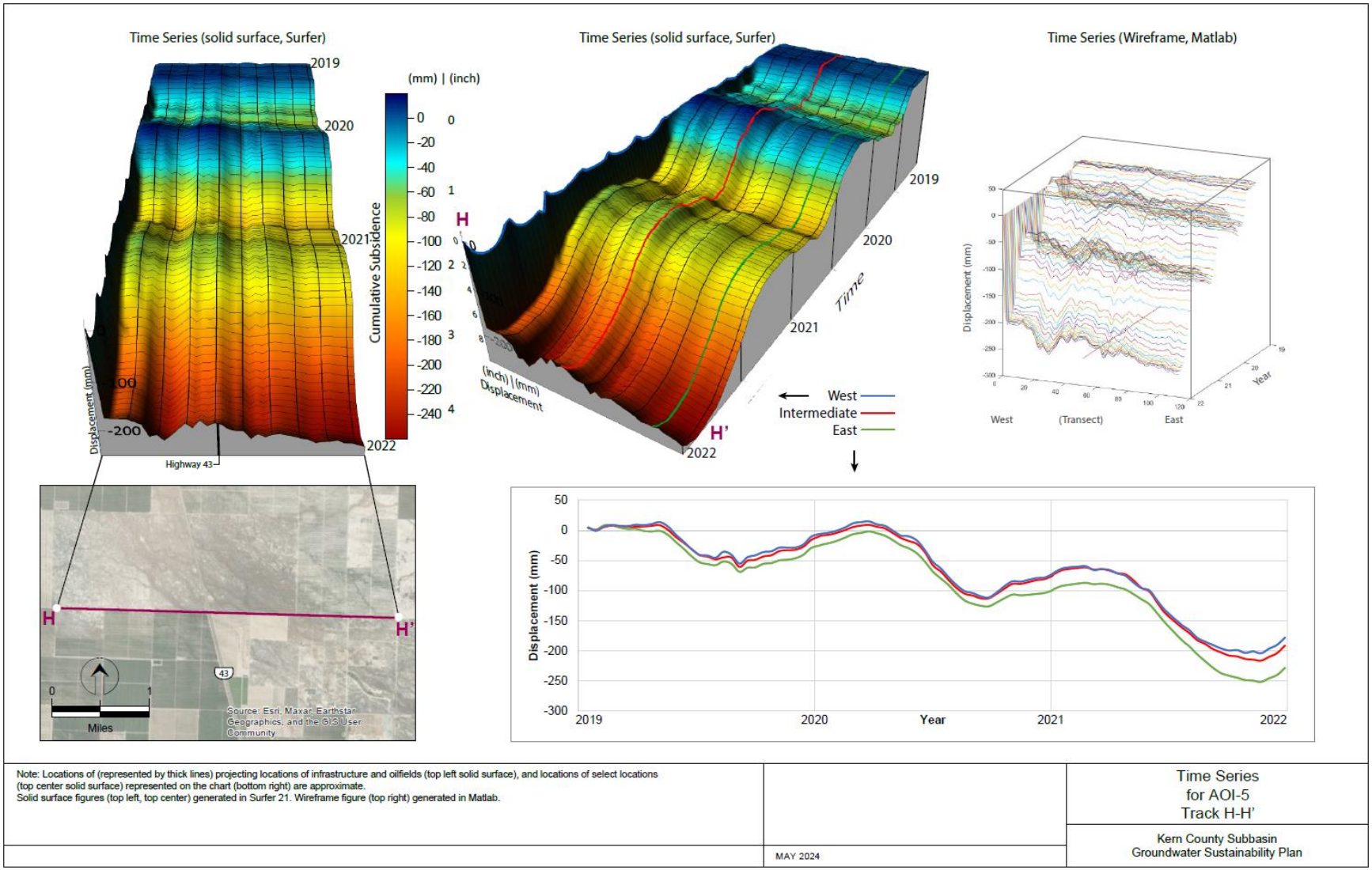




aquilogic

Attachments Pertaining to Comment #12:

Subbasin 2024 GSP Time Series Figures 871 and 866



Note: Locations of (represented by thick lines) projecting locations of infrastructure and oilfields (top left solid surface), and locations of select locations (top center solid surface) represented on the chart (bottom right) are approximate.
Solid surface figures (top left, top center) generated in Surfer 21. Wireframe figure (top right) generated in Matlab.

Time Series for AOI-5 Track H-H'

MAY 2024

Kern County Subbasin Groundwater Sustainability Plan

Figure 8-71. Time Series for AOI-5 Track H-H'

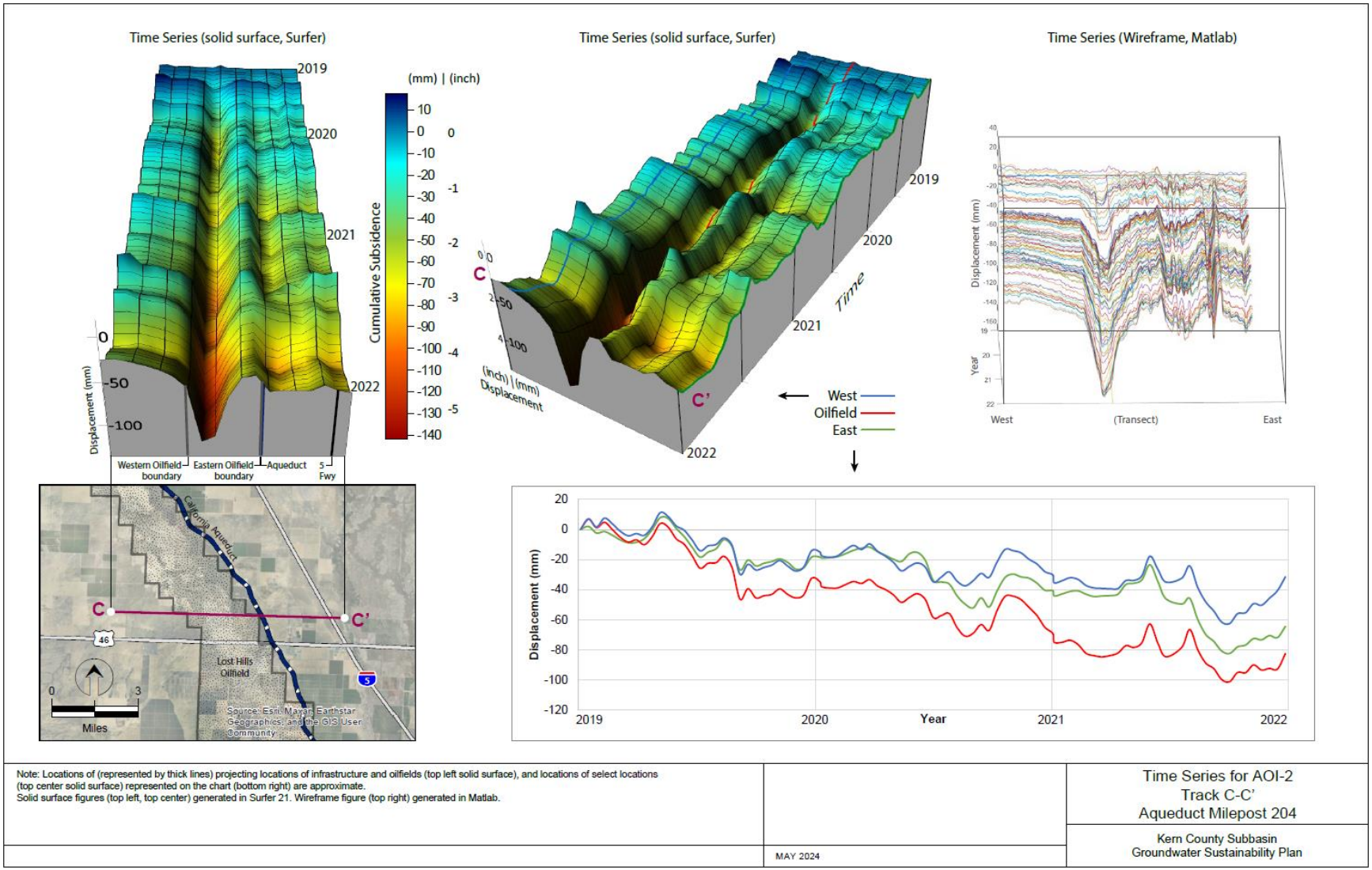


Figure 8-66. Time Series for AOI-2 Track C-C' Aqueduct Milepost 204

WSPA
Catherine Reheis-Boyd
President and CEO

VIA EMAIL

August 29, 2024

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Re: May 2024 Draft Groundwater Sustainability Plans for the Kern County Subbasin
Issues Related to Land Subsidence

Dear Kern County Subbasin Groundwater Sustainability Agencies,

Western States Petroleum Association (WSPA) submits this letter to provide comments regarding land subsidence concerns associated with the northern portion of the California Aqueduct raised by the May

2024 draft Kern County Subbasin Groundwater Sustainability Agencies Groundwater Sustainability Plan (May 2024 Draft GSP). While the Buena Vista Groundwater Sustainability Agency (GSA), Henry Miller Water District GSA, Kern-Tulare Water District GSA, Olcese Water District GSA, Semitropic Water District GSA, and Westside Districts Water Authority (WDWA) GSA submitted their own May 2024 draft Groundwater Sustainability Plans, the starting point for each of these plans was the May 2024 Draft GSP, with certain additions for the individual GSAs identified by supplemental "blue pages" (BPs). Because all GSAs submitted the May 2024 Draft GSP, WSPA is providing its comments to all GSAs rather than just the GSAs with operations in the vicinity of the northern portion of the Aqueduct (defined under the May 2024 Draft GSP to include Pools 23 to 30). *See* May 2024 Draft GSP at 8-157.

The May 2024 Draft GSP maintains that subsidence along the California Aqueduct in the vicinity of Lost Hills is due to conditions or activities outside the control of a GSA, which is referred to as "non-GSA factors." *See e.g. Id*. at 8-157, 8-163, 13-103, Table 13-9, n. 1, Table 13-12. The May 2024 Draft GSP identifies non-GSA factors to "include expansive soil types susceptible to hydrocompaction, oil field activities, age (lifespan) of critical infrastructure, historical preconstruction geotechnical deficiencies (e.g., lack of hydro-compaction on the Aqueduct) and subsidence caused by natural processes (e.g., faulting, compaction, and tectonic down warping)." *Id.* at 8-163. WSPA concurs that oilfield activities are outside of the scope of Sustainable Groundwater Management Act (SGMA). However, the May 2024 Draft GSP fails to provide adequate support for the conclusion that oilfield activities are responsible for subsidence observed along the Aqueduct in the vicinity of Lost Hills and does not adequately consider other non-GSA and GSA-related sources such as current and historic regional extraction for the reasons outlined below.

#1

- **<u>Six Subsidence Studies</u>**: The GSAs rely on "six subsidence studies conducted by the Subbasin" (*id*. at 8-173) to support their conclusion that non-GSA factors, and in particular, oil and gas activities, are responsible for subsidence along the Aqueduct in the vicinity of Lost Hills. *See e.g.*, *Id*. at 13-103, Figures 8-52, 8-60, 13-21, and WDWA BP at 8-2, 8-3. While these six studies were apparently shared with the California Aqueduct Subsidence Program (CASP) and the Department of Water Resources (DWR) (*id*. at 8-165), the studies are not identified anywhere in the May 2024 Draft GSP or otherwise publicly provided to support the conclusions made in the May 2024 Draft GSP. Thus, WSPA is unable to review them or determine whether they provide any support for the GSAs' position.[1] To the extent these six studies include the 2021 Earth Consultants International Report (ECI 2021 Report) and/or the 2022 Lawrence Berkeley National Laboratory study (LBNL 2022), CASP previously rejected reliance on these studies to support the proposition that Aqueduct subsidence in the Lost Hills area is associated with oilfield activities. As detailed in their September 30, 2022 letter commenting on KGA's 2022 Amended GSP, CASP previously determined that these studies do not support such a conclusion citing the following

#2

[1] WSPA has repeatedly tried to engage with the GSAs with respect to subsidence studies related to the Kern County Subbasin (*see e.g.*, our July 8, 2022 and September 5, 2023 letters) but to date has received no response or invitation to participate in the GSA commissioned subsidence studies. WSPA hereby requests copies of the six referenced studies and reserves the right to provide further comments once it has had an opportunity to review them.

reasons at pages 15-17 of their September 2022 letter:

#3
- Neither the ECI 2021 Report nor the LBNL 2022 Study consider reinjection of produced water, which is done specifically to address the localized subsidence within the Lost Hills Oilfield. Once re-injection is taken into account "net fluid production is greater for agricultural pumping than for oil/gas extraction";

#4
- The ECI 2021 Report data show that "[t]he agricultural extraction subsidence trend is more obvious and encompasses the Aqueduct, whereas the oil and gas extraction trend appear more localized and isolated";

#5
- The similarities in the subsidence rate in the Kern Bowl and the subsidence observed at the Aqueduct. Per DWR survey data, the subsidence rates in the Kern Bowl (which runs adjacent to the Aqueduct for a portion of Pool 23, all of Pools 24 and 25 and a portion of Pool 26 per KGA's 2022 Amended GSP at page 253) is comparable to subsidence rates in agricultural lands just east of the Aqueduct as measured by the LBNL 2022 Study and the ECI 2021 Report; and

#6
- The need to use an expanded zone of influence of groundwater pumping surrounding the Aqueduct "beyond the 2.5 miles on either side of the Aqueduct" used in the ECI 2021 Report and the LBNL 2022 Study.

#7
Similarly, to the extent one of the six studies is a 2023 Lawrence Berkeley National Laboratory study, WSPA was only privy to a draft of the study (LBNL 2023 Draft Study). Based on WSPA's review of this draft study, the study did not establish that localized subsidence associated with the Lost Hills Oilfield operations extended to the Aqueduct, let alone that such operations are responsible for Aqueduct subsidence. Likewise, despite CASP's explicit direction otherwise, the LBNL 2023 Draft Study again failed to take into account the fluid re-injection that occurs in the Lost Hills Oilfield.

#8
- **Prior Studies Concluding that Oilfield Operations Are Not Responsible for Aqueduct Subsidence**: The May 2024 Draft GSP fails to reference or evaluate earlier regulatory agency studies spanning several decades that reached different conclusions with respect to the causes of subsidence associated with the Aqueduct in the vicinity of Lost Hills. The *San Joaquin Valley, California, As of 1972, Studies of Land Subsidence* (USGS 1975) (prepared in cooperation with the DWR) concluded that oilfield subsidence is restricted to local areas and has little effect on long-term subsidence trends. Likewise, the *California Aqueduct Subsidence Study: Supplemental Report* (DWR 2019), relying on several lines of evidence (including an expanded 5-mile buffer zone on either side of the Aqueduct), concluded that subsidence associated with oilfield operations in the Lost Hills area is localized to the Lost Hills Oilfield and does not extend to the Aqueduct, with subsidence decreasing to background rates west of the Aqueduct. It also found that (i) Aqueduct subsidence is likely related to groundwater withdrawal and spatial

variations in historical subsidence along the Aqueduct, and (ii) subsidence rates along the Aqueduct are no higher than those in surrounding farmland regions, where presumably the main contributing factor to subsidence is groundwater withdrawal.

- **July 2024 Kern County Subbasin Probationary Hearing Draft Staff Report**: Like the prior regulatory agency studies, in their July 2024 *Kern County Subbasin Probationary Hearing Draft Staff Report* (State Board Staff Draft Probationary Hearing Report) State Water Resources Control Board (State Board) staff do not agree that oilfield operations are a primary cause of subsidence along the Aqueduct, explaining that the May 2024 Draft GSP "propose[s] that subsidence along the CA aqueduct is the result of oil and gas extraction without substantial evidence (2024 Draft Main GS ch. 13, p. 75 and Draft Main GSP, ch. 14, p. 17)." State Board Staff Draft Probationary Hearing Report at 192. Rather, "[i]n the Central Valley, the majority of subsidence . . . is caused by over pumping of groundwater." *Id*. at 19. *See also Id*. at 20 ("In the Kern County Subbasin, subsidence is primarily caused by the removal of water from the clay layers by groundwater extraction of the confined aquifer, which causes irreversible compaction and sinking of the land surface."), 65 ("Several areas within the Kern County Subbasin have experienced subsidence mostly due to groundwater extraction and minimally due to oil and gas related activities."), and 149 ("Because pumping is the primary cause of subsidence in the subbasin, GSAs should identify the wells that have the greatest impact on subsidence near critical infrastructure and the specific aquifers from which they pump and reduce or eliminate pumping from these wells if thresholds are exceeded."). The GSPs do not evaluate the impacts of local and/or regional groundwater pumping on subsidence in the Lost Hills area, instead it simply continues to focus on oil and gas operations without consideration of reinjection volumes or other potential sources, which is contrary to the findings of prior studies that did consider these aspects..

#9

- **Use of DWR InSAR Data**: The GSAs relied on publicly available DWR InSAR data in their subsidence analysis. *See e.g., Id*. at 5-83, 8-146, and 8-173. DWR calibrates InSAR data to the statewide Continuous Global Positioning System (CGPS) network. The distance between CGPS stations is large and the extrapolation of InSAR data to these points may not represent actual local conditions. These regional reference points incorporate regional subsidence data trends from all potential sources making it impossible to make accurate localized determinations or reach localized conclusions. Importantly, until 2023, the nearest CGPS stations to the Lost Hills Oilfield and the Aqueduct were located over 3.5 miles to the east, calling into question the various Kern County Subbasin subsidence studies being relied upon to support subsidence statements in the May 2024 Draft GSP. Before being able to identify the Lost Hills Oilfield as a potential contributor of subsidence observed at the Aqueduct in the vicinity of Lost Hills, the GSAs need to use a local reference point that does not rely on data extrapolation and removes regional movement. There are two newly installed GCPS stations near the Lost Hills Oilfield and the Aqueduct (near mile posts 204 and 208), but those stations were installed in 2023, and only have very few data points that cannot be use for historical subsidence studies.

#10

- **Use of a 5 Mile Buffer Around the Aqueduct/Analysis of Groundwater Pumping East of the Aqueduct**: At page 17 of its September 2022 letter, CASP raised concern about the GSAs' use of a 5-mile buffer around the Aqueduct (2.5 miles on either side of the Aqueduct) to evaluate impacts to the Aqueduct, explaining that "potential zones of influence from groundwater pumping may extend beyond 2.5 miles on either side of the Aqueduct." Despite being told that a 5-mile buffer zone was inadequate, the May 2024 Draft GSP continues to use a 5-mile buffer zone to evaluate subsidence and compliance with minimum thresholds. *See e.g.*, May 2023 Draft GSP at 13-130 (establishment of five mile buffer zone along the Aqueduct to monitor for the cause, rate and total cumulative extent of subsidence). Importantly, the DWR 2019 study referenced above used a "10-mile-wide study corridor centered on the California Aqueduct." DWR 2019 at vii.

#11

- **Use of InSAR Data to Differentiate Between GSA and Non-GSA Subsidence**: At Section 8.5.3 (commencing at 8-173), the GSAs maintain that InSAR data can be used to differentiate between GSA-related and non-GSA-related subsidence. What the May 2024 Draft GSP fails to explain is how the GSAs can differentiate between GSA-related and non-GSA-related subsidence when both occur in the same area, which the GSAs acknowledge is occurring in the southern portion of the Aqueduct. *See e.g.*, May 2024 Draft Report at 13-105 ("Historical subsidence has occurred as a result of both GSA and non-GSA pumping displacement."). Nor do the GSAs explain how they will differentiate between various causes of non-GSA subsidence. Differentiation between types of non-GSA-related subsidence is critical given that "[i]f non-GSA causes of subsidence are contributing to subsidence along critical infrastructure" it is the GSAs' intention to work with "the relevant regulatory agency . . . to provide data from the GSA demonstrating the lack of GSA activities contributing to subsidence in the area." May 2024 Draft GSP at 13-85. Without being able to differentiate between different types of non-GSA subsidence, how will the GSA know which regulatory agency it needs to coordinate with? Importantly, as Figure 8-67 illustrates, InSAR data does not necessarily differentiate between GSA and non-GSA-related subsidence. Moreover, at page 13 of its September 2022 letter, CASP rejected the notion that the ECI 2021 Report and LBNL 2022 study support differentiating between agricultural and oilfield operation subsidence.

#12

- **Historical and Recent Subsidence**: Section 8.5.1.1 (commencing at 8-137) discusses the history of subsidence in the San Joaquin Valley. This section uses the timeframes of 1926-1970, 2007-2019 and 2015-2023. There is no explanation as to why the 1970-2007 timeframe is excluded, including how it may impact the overall analysis. Figure 8-47, which is meant to illustrate subsidence from 1926-1970 shows that GSA activities (groundwater pumping) from east and northeast of the Aqueduct have significant subsidence impacts in the proximity of the Aqueduct. In Section 8.5.1.5, relying on the results of current interferograms, the GSAs maintain that the risk of *future* subsidence from GSA-related activities is minimal. WPSA questions how the GSAs can make such a prediction from a static interferogram given that future subsidence risk would be based upon future dynamic conditions and changes in source parameters.

#13

#14 WSPA welcomes the opportunity to discuss its concerns with the GSAs before the May 2024 Draft Plan is finalized. If the GSAs were to address the issues raised in this letter before going final with the May 2024 Draft GSP, it will go a long way to prevent an adverse ruling with respect to subsidence at the February 2025 State Board probationary hearing.

The GSAs' apparent unwillingness to discuss land subsidence issues directly with WSPA, as evidenced by the failure to meaningfully respond to WSPA's prior comment letters and requests to discuss subsidence issues, is very disappointing given that the GSAs met with the State Board ten times between the submittal of the 2022 Amended GSPs and the May 2024 Draft GSP (*see e.g.*, State Board Staff Draft Probationary Hearing Report at 23) and communicated with CASP and DWR while preparing their subsidence studies (*see e.g.*, May 2024 Draft Report at 1-22, 5-83). Nonetheless, based on the May 2024 Draft GSP statement at 5-104 that "[p]ublic comments received on the Plan will be reviewed, and details regarding public comments will be included in 5.10.2 prior to adopting the final plan", WSPA looks forward to the GSAs' response to the concerns raised in this letter. Please reach out to Christine Luther Zimmerman, 661-343-5753 czimmerman@wspa.org should you like to discuss WSPA's comments further.

Sincerely,

Summary of Public Comment Letter #3

RE: Westside District Water Authority (WDWA) Draft 2024 GSP and State Water Project (SWP) Subsidence

September 16, 2024, SWP Comments re Integrity of the CA Aqueduct
SWP stated three areas of concern where the Draft 2024 GSP does not adequately address the effects of land subsidence along the Aqueduct. 1. All Undesirable Result (URs) and Sustainability Management Criteria (SMC) definitions/development are based upon a methodologically flawed distinction between "GSA related" and "non-GSA" activities as the causative factors for subsidence. There is no explanation as to how the GSA determines whether subsidence is caused by: (i) a GSA activity; (ii) a non-GSA activity; or (iii) a combination of the two. 2. Flawed definition of URs for land subsidence is unchanged from 2022 KGA GSP. The Draft 2024 GSP outlines a complex “risk-based” approach for individual GSAs to determine MTs and MOs in a “coordinated” manner. However, it does not state whether average or maximum subsidence values for HCMs are used to categorize subsidence potential. Additionally, this approach does not appear to follow the standard of practice for qualitative risk assessments. Finally, whereas this approach considers subsidence “rate,” it does not consider the “magnitude” of future subsidence as the determining factor for impacts to the Aqueduct. 3. Issues with the defining and development of appropriate SMCs pertaining to the Aqueduct
December 5, 2024, WDWA and Subbasin Response to SWP Comments

The Subbasin has met with both the SWP and State Water Resources Control Board (SGMA) to discuss the Subbasin responses key comments in the SWP letter of September 16, 2024. Responses to the SWP comments were also addressed in a letter dated December 5, 2025. In summary the responses are:

1. As discussed with SWP staff on October 22, 2024, the subbasin will adjust the Final 2024 GSP and relevant WDWA GSA Blue Pages to:
   - Correctly identify and discuss the extent of subsidence impacts attributable to GSA-related and non-GSA subsidence.
   - Correctly identify and discuss whether subsidence in certain areas is either: (i) attributed solely to one the other types of activities; or (ii) attributable to some combination of both GSA-related and non-GSA related subsidence.
   - Provide sufficient evidence supportive of the above determination.
2. The former “risk-based” approach has been removed from the Final 2024 GSP and is replaced with a coordinated and data driven historical rate projection of subsidence based on benchmark survey data, GSP and DWR InSAR.
3. The SMCs for subsidence along the Aqueduct (North and South reaches) have been revised and information in the Draft 2024 GSP is now obsolete. The revised subbasin subsidence SMCs are data-driven, based on historical subsidence rates, and are coordinated across the Subbasin. Further, the revised SMCs are protective of beneficial users, incorporate a ramp down to 2040 and provide for stable subsidence rates by 2030.

Kern County Subbasin
Groundwater Sustainability Agencies

December 5, 2024

Mr. John Yarbrough
Deputy Director
California Department of Water Resources' State Water Project
P.O. Box 942836
Sacramento, California, 94236-0001

RE: Response to SWP Review of the Kern County Subbasin Groundwater Sustainability Agency 2024 Groundwater Sustainability Plan Dated September 16, 2024, Kern County Subbasin

Dear Mr. Yarbrough,

Thank you for the comments submitted on behalf of the Department of Water Resources' (DWR) State Water Project in your September 16, 2024 *"SWP Review of the Kern County Subbasin Groundwater Sustainability Agency 2024 Groundwater Sustainability Plan "* (hereinto referenced as "SWP comment letter") pertaining to DWR's review of the Kern County Subbasin Draft 2024 Groundwater Sustainability Plan (Draft 2024 Plan), and in particular, to management and corrective actions relating to land subsidence along the California Aqueduct (Aqueduct) within the Kern County Subbasin (Subbasin).

Like any public comment letter(s) received on the Draft 2024 Plan, the SWP comment letter and this response will be included in the Final 2024 Plan submitted to the State Water Resources Control Board (SWRCB) for review. To facilitate regulatory agency and stakeholder review of this response, we have attached and numbered each portion of the SWP comment letter text for which we have provided a corresponding response. These responses are numbered 1 through A-21, with the prefix "A" indicating a comment addressed from the Attachment to the SWP comment letter. In addition, to better orient the reader, a brief summary of each comment is provided prior to the Subbasin response. We have endeavored to address all significant comments and will utilize the SWP comment letter to guide clarifications to the Draft 2024 Plan. Discussion with SWP staff during our meeting on October 22, 2024, together with the revisions to the Draft 2024 Plan, have also informed our responses to SWP comments.

Context for Responses

In simple form, the purpose of SGMA is to avoid undesirable results, such as land subsidence, caused by groundwater pumping[1]. To achieve this goal, SGMA requires GSAs to set quantitative benchmarks called Sustainable Management Criteria (SMC) that represent how the GSAs track and mitigate undesirable results within the Subbasin. These consist of Measurable Objectives (MOs), Interim Milestones (IMs), and Minimum Thresholds (MTs). If an MT is exceeded, GSAs must implement relevant projects or management actions to improve groundwater conditions to avoid future exceedances.

Response to SWP Comments

Summary SWP Comment #1:

There is no explanation as to how the GSA determines whether subsidence is caused by: (i) a GSA activity; (ii) a non-GSA activity; or (iii) a combination of the two.

When subsidence is a result of a combination of causative factors, there is no quantification or apportionment of the respective contributions of GSA-related and non-GSA activities to the historical or expected future subsidence encountered. WDWA Plan waffles between asserting that subsidence is not at all caused by GSA activities and partially caused by GSA factors.

Response to Comment #1:

As discussed with SWP staff on October 22, 2024, the Final 2024 Plan and relevant GSA Blue Pages will be adjusted to:

- Correctly identify and discuss the extent of subsidence impacts attributable to GSA-related and non-GSA subsidence.
- Correctly identify and discuss whether subsidence in certain areas is either: (i) attributed solely to one the other types of activities; or (ii) attributable to some combination of both GSA-related and non-GSA related subsidence.
- Provide sufficient evidence supportive of the above determination.

Summary SWP Comment #2:

The WDWA Blue Pages state that they have completed technical studies to further investigate the cause of subsidence along the California Aqueduct and that these studies have indicated that ... subsidence is caused by factors not related to groundwater pumping.

[1] California Water Code §10721(x)

On the other hand, and WDWA's Blue Pages agree with the "GSA-related" v. "non-GSA" causative distinctions contained in the KCS Draft 2024 Plan and further confirm that its subbasin is marked by *"… minimal to low rates of subsidence caused by GSA-related activities …*"

Response to Comment #2:

Please see the response to Comment #1. The reference to the "groundwater pumping" pertains solely to GSA-related pumping. Historical InSAR data and DWR benchmark survey data distal to oil field activities on the westside of the Subbasin show minimal to low rates of cumulative subsidence for those areas. The Final 2024 Plan will include clarification on this distinction. Please see **Appendix A** to this letter, which provides figures showing both DWR InSAR and land survey data for the period 2015 to 2024.

Summary SWP Comment #3:

In developing its strategy, the Draft 2024 Plan points to the credibility of the TRE ALTIMIRA InSAR data provided by DWR, but nonetheless relies upon conflicting InSAR information provided by its consultant ECI, without explaining or reconciling those conflicts.

Apart from "non-GSA" activities of oil & gas extraction, the Draft 2024 Plan identifies other "non-GSA" causative factors for subsidence along the Aqueduct, which it deems to be outside of the GSA's responsibility including: natural processes, the age of the infrastructure, or expansive soil types susceptible to hydro-compaction. The 2024 Draft Plan does not identify a methodology for quantifying the effects of these factors, nor do any of the studies referenced in the Draft 2024 Plan cite specific evidence supportive of their inclusion or consideration.

Response to Comment #3:

As discussed at the meeting on October 22, 2024, the TRE-Altamira data was found to have limitations that unfortunately rendered it unsuitable for the type of time series work conducted by the Subbasin. The Subbasin will monitor for subsidence on the Quarterly basis along the Aqueduct utilizing DWR TRE-Altamira InSAR data, and precise elevation data collected at historical DWR benchmarks via spirit leveling and GPS surveys to determine rate and extent of long-term cumulative subsidence.

As an example of other non-GSA related subsidence, a DWR 1964 report titled Design and Construction studies of Shallow Land Subsidence for the California Aqueduct in the San Joaquin Valley-Interim Report states "…*unless properly treated shallow land subsidence could make the Aqueduct inoperative.* According to this report, no pre-

compaction ponding (i.e., hydro-compaction) was conducted by DWR adjacent to Lost Hills Oil Field (LHOF) that is approximately Aqueduct Mile Posts (MP) 195-215. Other publications document the age of the infrastructure and Western Fold Belt HCM Area soils that are susceptible to expansion/collapse. The Final 2024 Plan will document these publications and identify the methodology for quantifying the effects of these factors. Please see **Appendix B** to this letter which provides a table of relevant publications.

SGMA vests some authorities in GSAs such as the ability to prepare GSPs and the authority to limit, regulate, or require the metering of groundwater extractions (i.e., GSA-related activities/ subsidence). GSAs have no legal authority or control over other causes of subsidence such as oil and gas operations or natural geologic processes (i.e., Non-GSA related activities/subsidence) per California Water Code Section 10725.8, Section 10726.4, Section10727. GSA's also do not have the legal authority to apportion responsibility for the different non-GSA causes of subsidence or implement projects or management actions (P/MAs) that would ameliorate all causes of subsidence and prevent future Minimum Threshold (MT) exceedance.

Summary SWP Comment #4:

The flawed definition of URs, which were criticized in the September 2022 SWP Public Comment Letters, is essentially unchanged from the 2022 KGA Plan. In addition to being based upon the suspect "GSA-related"/"non-GSA" activities methodology, the Draft 2024 Plan does not define a process or criteria for determining what constitutes a "significant loss in functionality" or how "mitigation through retrofitting" will be deemed "economically feasible" (short of leaving that up to the widely divergent views and subjective determination of beneficial users).

Response to Comment #4:

The Final 2024 Plan will modify the definition for a land subsidence undesirable result (UR), which includes a technical investigation to assess if the subsidence is caused by a groundwater management action (e.g., groundwater level changes, projects or management actions). Per discussions with SWP on October 22, 2024, the Final 2024 Plan will present a revised SMC approach for subsidence that is data-driven (i.e., not risk-based) and will remove references to economic feasibility regarding URs.

Summary SWP Comment #5:

The Draft 2024 Plan reviewed by SWP contains defects in definition and development of MTs, MOs, and IMs for subsidence, particularly in inconsistencies between "average",

"mean", or "maximum" subsidence values within a HCM area between tables and figures.

Response to Comment #5:

A consistent methodology for MOs and MTs based on forward projections of historical subsidence has been developed and applied across all HCM areas. Though SMCs were found to vary on a per-HCM area basis, the methodology of subsidence SMCs is uniform throughout the entire Subbasin. Along the Aqueduct, the Subbasin will continue to utilize a combination of InSAR and DWR benchmark survey data as a basis to monitor the rates of subsidence and SMCs to identify and quantify potential impacts. The Final 2024 Plan and relevant Blue Pages will be expanded to clarify SMC rationale and methodology.

Summary SWP Comment #6:

Specific to WDWA, maximum subsidence rates for the HCMs are presented in Table 8-27 and Figure 13-23, but there is no table listing maximum cumulative subsidence during 2015-2023 for the individual GSAs in Table 13-12.

WDWA GSA blue sheets note that WDWA, which includes the reach of the Aqueduct adjacent to LHOF, primarily falls within the Western Fold Belt HCM. According to the Plan, the maximum subsidence in the Western Fold Belt HCM was 0.43 ft, whereas Figure 13-23 indicates that the maximum subsidence in the Western Fold Belt was 1.7 ft. The WDWA Plan does not resolve this discrepancy.

Further, WDWA, like other GSAs, straddle boundaries between the HCMs. However, the Draft 2024 Plan does not explain how subsidence magnitudes are assigned to the GSAs in Table 13-12, when they include parts of more than one HCM.

Response to Comment #6:

The rate of 0.43 ft is applicable to LHOF. Areas distal to the LHOF displayed lower rates of cumulative subsidence between 2015-2023. Also please see the response to Comment #A-12. As discussed with SWP staff on October 22, 2024, due to the modified and unified SMC approach applied to all Mile Posts along the California Aqueduct (North and South reaches) the values in the Draft 2024 Plan are now obsolete. The Final 2024 Plan explains how projected subsidence rates are assigned to the GSAs adjacent to the Aqueduct and the Subbasin at large.

Summary SWP Comment #7:

It is unclear whether the risk-based approach for subsidence SMC development uses the average or maximum subsidence values in an HCM area, and the approach does not follow standard practice for qualitative risk assessment. The approach also considers rate rather than magnitude as a determining factor for impacts to the Aqueduct

Response to Comment #7:

Comment Noted. The Risk Matrix approach has been removed and has been replaced with a data driven historical rate projection based on benchmark survey data, GPS, and DWR InSAR.

Summary SWP Comment #8:

Northern Aqueduct Segments: In developing subsidence SMC values for the Aqueduct, the Draft 2024 Plan distinguishes between the “northern” section of the Aqueduct (north of MP 251, where subsidence is assessed to be a result of “non-GSA” activities), and the “southern” section of the Aqueduct (south of MP 251, where subsidence is caused by both “GSA-related” and “non-GSA” activities). For the “northern” reach of the Aqueduct within KCS (Pools 23-30): The MTs established by the Draft 2024 Plan may not be insufficient to prevent overtopping of the Aqueduct’s concrete liner.

Response to Comment #8:

As discussed with SWP staff on October 22, 2024, the SMCs for subsidence along the Aqueduct (North and South reaches) have been revised and MT information in the Draft 2024 Plan is now obsolete. The revised subsidence SMCs are data-driven, based on historical subsidence rates, and are coordinated across the Subbasin. Further, the revised SMCs are protective of beneficial users, incorporate a ramp down to 2040 and project no new GSA-related subsidence by 2040. MTs have been set at each Aqueduct MP based on DWR survey data. At MP 195-215, the WDWA GSA has adopted a series of four PM/As designed to minimize the potential of GSA-related activities to cause undesirable results. One of these PM/As is a groundwater pumping moratorium for all supply wells within the CASP Monitoring Corridor between MP 195-215.

Summary SWP Comment #9:

The data used to develop SMCs for the Southern section of the Aqueduct (Pools 31-36) contains errors, including a lack of harmony of MT/MO rates with the extents, inconsistencies in IMs with the proposed “glide path”, a triggering of MT exceedances

without also simultaneously triggering P/MAs, and an unsubstantiated determination of "observed or 'allowable' rates of subsidence" by a GSA.

Response to Comment #9:

The inconsistencies identified in the tables were caused by incorrect units and have been reconciled. All tables in the Final 2024 Plan now report both extents and rates of subsidence in feet per year (ft/yr). Additionally, due to the modified, unified SMC approach applied to all Mileposts along the California Aqueduct (north and south reaches) the values in the Draft 2024 Plan are obsolete. In areas where the 2024 surveyed elevation exceeds the operational requirements of the State Water Project (defined as 2.5 feet of freeboard above the design water surface elevation), the MT rate was reduced to 0 ft/yr. The glide path includes incremental reductions in the IM rate through 2040 so that there is no GSA-related subsidence post 2040.

Summary SWP Comment #10:

Exceedance protocols in the Draft 2024 Plan do not establish a timeline that is adequately protective of critical infrastructure, particularly for monitoring or management action initiation.

Response to Comment #10:

A Standard Operating Procedure (SOP) outlining the Action Plan for addressing Subsidence IM & MT Exceedance (**Appendix C** to this letter) has been developed to address this comment. This SOP identifies steps and actions GSAs must take to immediately investigate local MT exceedances, then outlines protocol for an investigation and initiation of management actions to mitigate any potential subsidence impacts.

Summary SWP Comment #A-1:

Review of the Draft 2024 Plan reveals that KCS has still not adequately defined URs or SMCs in a manner which will allow the SWP to conclude that its critical infrastructure, the Aqueduct, will be protected from subsidence related harm. This is due, in large part to KCSs distinguishing "GSA-related" subsidence and "non-GSA" subsidence. The key distinction between "GSA-related" subsidence (such as that caused by agricultural groundwater pumping), and "non-GSA" subsidence (such as that caused by oil & gas related activities), is that non-GSA subsidence, according to KCS, is outside of its control and authority, and as such, will not be the subject of subsidence mitigation efforts that are outside of GSA authority.

Response to Comment #A-1:

The revised 2024 Subbasin subsidence SMCs are:

- Data Driven
- Based on historical subsidence rates and extend
- Coordinated across Subbasin
- Protective of beneficial users
- Incorporates ramp down to 2040 (and groundwater levels stable by 2030)
- No additional GSA subsidence beyond 2040.

Further, the Final 2024 Plan also includes defined URs and SMCs for all areas even those with non-GSA causes of subsidence (e.g., MP 195-215). The Subbasin Subsidence IM & MT Exceedance Action Plan outlines the steps and actions GSAs must immediately take to investigate a single local exceedance and outlines protocols for investigation and initiation of targeted Management Actions to mitigate any potential GSA subsidence impacts. Please also see response to #A-16 and **Appendix C** to this letter.

Summary SWP Comment #A-2:

The Draft 2024 Plan does not identify whether subsidence related undesirable results were caused only by SGMA-related groundwater extractions, or a combination of SGMA-related and other types of ground water extraction (e.g., oil & gas extraction). It waffles between claiming that subsidence is caused by one factor or a combination of factors. The use of the term **"primarily"** including non-GSA causes leaves the door open for an interpretation that both GSA and non-GSA related factors contribute to subsidence.

Response to Comment #A-2:

The Subbasin had identified a suite of non-GSA related activities that have the potential, either individually or in combination, to result in undesirable results. Examples of these non-GSA factors include deficient Aqueduct pre-construction hydro-compaction, the presence of expanding or collapsable soils, and/or oil and gas activities. These factors were identified through review of various historical documents including DWR engineering reports, historical geologic reports, oil company and data, and studies conducted by the Subbasin and shared with CASP. Please see **Appendix B** to this letter which provides a table of historical documents reviewed. Because of the hydrogeologic complexity of the Subbasin it is not always possible to identify a single cause of subsidence. However, the Subbasin has conducted several studies that help to assess and identify the likely cause and extent of subsidence in a particular area. For

example, at MP 195-215 the Subbasin utilized historical DWR Aqueduct geotechnical reports, Subbasin geological and soils information, oil company reports and technical data, and detailed InSAR time series data to identify the suite of likely non-GSA factors contributing to subsidence. Further, the Westside District Water Authority (WDWA) GSA has, in consultation with CASP, implemented a series of P/MA's to further ameliorate the potential that GSA-related pumping is a cause of subsidence at MP195-215. One of these P/MAs is a groundwater extraction moratorium in the CASP Monitoring Corridor between MP195 to 215. In a letter dated November 20, 2024, the DWR stated that the WDWA P/MAs aligns with the overarching goals of SGMA. Consistent with the Subbasin P/MA KSB-9, other GSAs proximate to the California Aqueduct are considering initiating targeted P/MAs in response to the MT Exceedance Action Plan findings. Should GSA-related activities be identified as a potential cause, the Subbasin Subsidence IM & MT Exceedance Action Plan identifies the steps and actions GSA must take to immediately investigate a single local exceedance. The plan also outlines a protocol for investigation and initiation of management actions to mitigate any potential GSA subsidence impact. This information will be included and clarified in the Final 2024 Plan (please see **Appendix C** and response to Comment #A-16).

Summary SWP Comment #A-3:

The Draft 2024 Plan does not explain how a determination would be made that permanent loss of freeboard from land subsidence due to other causes (including but not limited to oil or gas production) is not within the jurisdiction of a GSA. It also does not explain how these other causes shall not be considered as a loss of freeboard that contributes to the amount specified for any MT or MO.

Response to Comment #A-3:

Comment Noted. The 2024 Plan will clarify and explain the data and information that is utilized to determine land subsidence due to all causes including those not within the jurisdiction (authority) of a GSA and how the rate and extent of subsidence may have impacted the Aqueduct or other Subbasin infrastructure.

Summary SWP Comment #A-4:

The Draft 2024 Plan does not include clear criteria or an explanation of the methodology that has been or will be used for evaluating and quantifying the subsidence cause. The text sidesteps the issue of who may be at fault in causing the subsidence, and instead focuses on whether meaningful and effective SMCs can be developed without consideration of all factors contributing to a loss of freeboard for the Aqueduct.

Response to Comment #A-4:

The Final 2024 Plan will include clear criteria or an explanation of the methodology that will be used for evaluation and identifying the rate and extent of subsidence, regardless of cause. Examples of methodologies include the InSAR time series, and InSAR curve analysis to differentiate between GSA and non-GSA activities. Please see **Appendix D** which provides an example of the INSAR curve analyses. Additionally, the Subbasin will utilize the DWR TRE-Altamira InSAR data for Quarterly monitoring, and precise elevation taken at historical benchmarks and GPS surveys for annual monitoring to determine the cause, rate and extent of long-term cumulative subsidence.

Summary SWP Comment #A-5:

The distinctive patterns of temporally varying subsidence that the 2023 ECI Study attributes to oil field activities are not present or replicated in time series over the Lost Hills Oil Fields (LHOF) developed from TRE-ALTAMIRA InSAR data provided by DWR. The SWP was not able to duplicate the results of the ECI InSAR analysis using the TRE-ALTAMIRA InSAR data. Based on comparison of the ECI and TRE-ALTAMIRA InSAR data products with GPS data, it is believed that ECI's initial analytical approach and decisions during processing of the InSAR data may have introduced errors which have led to unreliable results and conclusions in the ECI subsidence maps, profiles and time series.

Response to Comment #A-5:

As discussed at our meeting with SWP staff on October 22, 2024, there was no apparent air in the ECI time series. The Subbasin did not utilize the publicly available TRE-Altamira data for generation of the detailed InSAR time series because the publicly available TRE-Altamira data is cumulative data and does not contain all data points in time corresponding to the time of acquisition of the Synthetic Aperture Radar (SAR) images. The Subbasin data utilized for the time series analysis were obtained directly from the Alaska Satellite Facility (ASF) and/or European Space Agency (ESA) archives at the Sentinel Open Copernicus Data Hub. The Small Baseline Subset (SBAS) InSAR processing of Sentinel-1 Satellite SAR imagery utilized Generic Mapping Tools Synthetic Aperture Radar (GMTSAR) software. The Subbasin data utilized for the time series analyses were obtained directly from the Alaska Satellite Facility (ASF) and/or European Space Agency (ESA) archives at the Sentinel Open Copernicus Data Hub. The Small Baseline Subset (SBAS) InSAR processing of Sentinel-1 satellite Synthetic Aperture Radar (SAR) imagery utilized Generic Mapping Tools Synthetic Aperture Radar (GMTSAR) software and are summarized in the following steps.

1. Search for available scenes in the archives of the ASF and/or ESA at the Sentinel open Copernicus Data Hub. Both facilities have web-based search applications (http://topex.ucsd.edu/gmtsar/demgen/). Note that it is important that all scenes are from the same track and frame. However, the exact location of the frames can be offset slightly along the track because only the overlapping footprint is processed.
2. Determine the footprint of the target area and download the scenes for the selected time span (January 3, 2019, to December 18, 2021).
3. Extract (unzip) all downloaded files and complete the provided GMSTAR instructions for organizing the directories with the archives and intermediary files.
4. If the area of interest is significantly smaller than the original chosen footprint, it may be beneficial to reduce the processed area to a smaller footprint in order to significantly reduce processing times.
5. Download Precise and/or Restituted Orbits from the ESA Copernicus HUB website to determine the exact locations of the satellites at the time the SAR images were acquired.
6. Preprocess the SAR images and select the master image. Use the provided GMSTAR software script to preprocess and align the SAR images. This generates a plot of the perpendicular baselines for the images that are used when selecting the master image. The master image should be selected so the scene is in the middle of the scatter plot. Then re-run the preprocessing with the selected master image for all three swaths that constitute the complete SAR image.
7. Select the interferometric pairs for the time series and run the interferometry for a single interferogram to verify that everything is set up properly. Once everything is determined to work properly, process the complete stack and repeat for swath two and three on each image.
8. Merge the three swaths to produce the complete interferometric stack using the scripts provided in GMTSAR software.
9. Unwrap all interferograms. Filter out water and areas with low coherence. Note: The mask that is used to filter areas of low coherence needs to be in radar coordinates, and the NetCDF .GRD format used by GMT and GMTSAR can be created by stacking the coherence grids generated by the previous step, and/or by manually creating a mask to remove areas with low coherence.

10. There are two ways of running the SBAS analysis. It can be run without calibration against GPS base stations if relative surface velocities are adequate (good coherence). It can also be calibrated against permanent GPS stations. The Subbasin used the GPS calibration method to calibrate the SBAS stack. For the Subbasin, we used the Continuously Operating Reference Station (CORS) GPS station ISLK that is operated by UNAVCO, which shows long-term stability because it is located far from known sources of deformation (i.e., faults and areas with subsidence or uplift), and also because it is located within the footprint of the Sentinel-1 scenes used in the study. Additionally, selecting a CORS station with demonstrated long-term stability significantly simplifies the mathematics needed for the calibrations. The next step is to calculate the incidence angle of the SAR radar beam at the location of the GPS station and re-calculate the GPS movement over the time span of the interferometric stack to convert the movement from X-Y-Z to movement along the line-of-sight from the satellite.
11. Next, adjust the interferograms so the deformation for the pixel that corresponds to the location of the GPS station matches the deformation measured by the GPS. Once adjusted, the stack of interferograms is run through the SBAS stacking software where atmospheric and ionospheric corrections are made, and a least-squares algorithm is used to calculate the average surface velocity over the time span covered by the interferometric stack.
12. If necessary, re-calculate the surface deformation and velocities vertically from along the (satellite) line-of-sight.

Appendix D provides the results of the time series curve analysis.

Summary SWP Comment #A-6:

In the Draft 2024 Plan, KCS commits to using TRE-ALTAMIRA InSAR data from DWR.

Response to Comment #A-6:

Comment Noted. As discussed with SWP staff on October 22, 2024, the Subbasin will utilize the publicly available TRE-ALTAMIRA InSAR data for Subbasin Quarterly monitoring. For future detailed time series, the Subbasin will work with SWP staff to obtain the necessary data rasters from TRE-ALTAMIRA that are capable of providing resolution similar to the data previously utilized by the Subbasin for its time series.

Summary SWP Comment #A-7:

None of the referenced reports or studies provide sufficient evidence that subsidence adjacent to LHOF is caused by expansive soils, deficient Aqueduct pre-construction

hydro-compaction [or] age of the infrastructure. The 2022 Public Comment Letter, SWP requested that the GSAs in the Kern County Subbasin provide specific examples or locations of expansive soil types susceptible to hydro-compaction age (lifespan) of critical infrastructure, historical pre-construction geotechnical deficiencies (e.g., lack of hydro-compaction on the Aqueduct) and subsidence caused by natural processes, so that the SWP could evaluate these factors as potential sources of subsidence damage to the Aqueduct.

Response to Comment #A-7:

As requested by SWP staff the Subbasin will include additional details, examples and materials regarding the various causes of subsidence within the CASP Monitoring Corridor between MP 195-215. (Please see **Appendix B** to this letter). A 1964 DWR report titled Design and Construction Studies of Shallow Land Subsidence for the California Aqueduct in the San Joaquin Valley states; "*Unless properly treated shallow land subsidence could make the Aqueduct inoperative*". According to this report, no pre-compaction ponding (i.e., hydro-compaction) was conducted by DWR adjacent to the Lost Hills Oil Field. **Appendix D** provides a figure that compares the time series subsidence patterns (relative elevation change through time) near the center (red-colored time series line on each subject transect). The patterns in the agricultural areas are reproduced in all cases; they are clearly defined by a repeating "up, down, up" seasonal pattern every year. The Lost Hills Oil Field, in marked contrast, has a "busy" (i.e., non-seasonal) subsidence pattern. The average of the former compared to the latter, including the range of standard error of the averages, demonstrates significant periods of no overlap between the two patterns. Based on data submitted to CalGEM by oil operators, oil field activities are removing oil and produced water adjacent to and from under the Aqueduct as evidenced by a recent CASP boring installed on the east side of the Aqueduct that reportedly vented steam. The Lost Hills Oil field has been utilizing steam-flood techniques to enhance oil recovery for decades.

Summary SWP Comment #A-8:

The Draft 2024 Plan defines the UR for Land Subsidence as the point at which the amount of subsidence, if caused by GSA-related Subbasin groundwater extractions, creates a significant and unreasonable impact (requiring either retrofitting or replacement to a point that is economically unfeasible to the beneficial users) to surface land uses or critical infrastructure. A significant loss in functionality that could be mitigated through retrofitting and is considered economically feasible to the beneficial users would not be considered undesirable.

Response to Comment #A-8:

Comment Noted. The Final 2024 Plan has redefined the URs for land subsidence and has removed the former reference to economic feasibility in response to SWP comments and concerns.

Summary SWP Comment #A-9:

The GSP does not define a process or criteria for determining what constitutes a "significant loss in functionality" or how "mitigation through retrofitting" will be deemed "economically feasible" (short of leaving that up to the subjective determination of beneficial users). Neither does this approach take into consideration the extended duration of such a significant and unreasonable impact, while the criterion for determining its status is assessed, and mitigation measures can be implemented.

Response to Comment #A-9:

Please see the response to comments #A-8 and #A-16. The Final 2024 Plan includes a Subbasin Subsidence MT Exceedance Plan. The Plan also outlines protocol for investigation and initiation of management actions to mitigate any potential GSA subsidence impact. Further, the Plan requires initial notification and action after a single Mile Post IM rate exceedance based on the annual DWR precise survey data.

Summary SWP Comment #A-10:

The Draft 2024 Plan bifurcates the Aqueduct into "northern" and "southern" sections. The MT for Land Subsidence for the Northern Aqueduct is established based on the avoidance of a permanent loss of conveyance capacity associated with GSA-related subsidence as limited by remaining concrete liner freeboard for specific Aqueduct pools (Pools 23 to 30). However, since data indicates that subsidence within the 5-milewide CASP Monitoring Corridor along the northern Aqueduct is influenced by various non-GSA activities and conditions, some subsidence and its effects will likely be outside the GSA authority to manage.

Response to Comment #A-10:

The Final 2024 Plan has developed MTs for all Mile Posts (North and South reaches) of the Aqueduct. These will be monitored for rate and extent of subsidence on a Quarterly basis using DWR InSAR data and survey data. Exceedance of a single Mile Post IM rate will initiate the Subbasin Subsidence IM & MT Exceedance Action Plan.

However, GSAs have no legal authority or control over other causes of subsidence such as oil and gas operations or natural geologic processes (i.e., non-GSA-related

activities/subsidence) per California Water Code Section 10725.8, Section 10726.4, Section10727. GSAs also do not have the authority to apportion responsibility for the different non-GSA causes of subsidence or implement P/MAs that would ameliorate all causes of subsidence and prevent future MT exceedances. As such, targeted P/MAs will be initiated by the GSAs following the findings of the Action Plan.

Summary SWP Comment #A-11:

The use of the qualifying term **"primarily,"** the inference is that the GSA is not claiming that subsidence in a particular area is totally caused by either GSA-related or non-GSA causes. Thus, the correlative inference is that some portion of subsidence in any given area is caused by some percentage of each of these factors.

Response to Comment #A-11:

Comment Noted. Oil and gas activities and other factors (Aqueduct preconstruction deficiencies and natural geologic processes etc.) are outside the jurisdiction of the GSAs to control. The hydrogeology of the Subbasin is complex, with oil and gas exemption activities scattered throughout. **Appendix E** to this letter provides a figure of exempt oil field activities. The Final 2024 Plan will be modified to clarify Subbasin conditions and potential contributors to land subsidence.

Summary SWP Comment #A-12:

Subsidence in the area around the LHOF has not been included in reported subsidence for Western Fold Belt HCM.

Response to Comment #A-12:

The text of the 2024 Plan contains updated DWR InSAR rates of subsidence for LHOF, and the entire Western Fold Belt (see **Appendix A** to this letter). The LHOF rates were not excluded in the version of the GSP reviewed by SWP. It appears there was some confusion over units in the report version reviewed by SWP. The Final 2024 Plan presents revised subsidence SMCs, established for each MP of the entire Aqueduct (North and South reaches) in the Subbasin. In addition, the WDWA GSA has taken what steps it can to ameliorate any potential contribution to land subsidence at LHOF, including adopting a pumping moratorium for all supply wells within the CASP Monitoring Corridor between MP 195 to 215.

Summary SWP Comment #A-13:

The Draft 2024 Plan does not provide any explanation of how "average" subsidence rates for HCMs were derived.

Response to Comment #A-13:

Please see the response to comment A-12, above. Based on the comment, the Subbasin will ensure that the Final 2024 Plan clarifies how any subsidence rates cited were derived (i.e., data source and methodology).

Summary SWP Comment #A-14:

The GSP provides no information about how the mean was calculated from the InSAR data or other statistics that characterize the distribution of elevation change within a given HCM.

Response to Comment #A-14:

Comment noted. Please see the responses to A-11 and A-12, above. The Final 2024 Plan will clarify how land deformation (i.e., elevation changes) data was derived and calculated.

Summary SWP Comment #A-15:

The “average” subsidence values in Figure 13-23 differ from the “mean” rates for the HCMs reported.

Response to Comment #A-15:

Commented noted. Please see the responses to comments A-12 to A-14, above. The HCM Area rate and extent of subsidence has been updated and reconciled in the Final 2024 Plan based on DWR InSAR data.

Summary SWP Comment #A-16:

The Draft 2024 Plan explains that SMCs were developed using a “risk matrix” that considers both the subsidence potential derived and the type of infrastructure that may be affected by subsidence.

Response to Comment #A-16:

Comment Noted. As explained during our meeting on October 22, 2024, the Final 2024 Plan has replaced the “risk- based approach” referenced in the SWP comment with data- based SMCs for all mileposts on the Aqueduct, including those in areas with non-GSA activities (e.g., LHOF MP 195 to 215). The Subbasin has developed a Subsidence MT Exceedance Action Plan for Subsidence IM & MT Exceedance which requires GSAs to evaluate and initiate targeted P/MAs to reduce GSA-related subsidence (**Appendix C** to this letter). As part of this P/MA, GSAs located within the CASP 5-mile Monitoring Corridor to the California Aqueduct may initiate targeted P/MAs, should future observed

subsidence rates exceed IMs and/or MTs. These targeted P/MAs located within the CASP Monitoring Corridor to the California Aqueduct may include: (1) well registry, (2) metered well extraction volume reporting, (3) net zero well drilling moratorium, (4) targeted pumping reductions, and (5) pumping limitations, among others deemed necessary, informed by the analysis undertaken from the five-step Action Plan. GSA-specific details on targeted P/MAs within close proximity to the California Aqueduct are found in the Final 2024 Plan and/or the GSA Blue Page supplemental materials.

Summary SWP Comment #A-17:

In the Northern Aqueduct area, where non-GSA-related subsidence occurs, and where the subsidence does not encroach on or affect regional critical infrastructure, the 2024 Plan defines the Northern Aqueduct MT as follows:

> *The MT for Land Subsidence along the northern portion of the Aqueduct (i.e., within the 5-mile-wide CASP buffer zone) is defined as the avoidance of a permanent loss of conveyance capacity attributable to subsidence as limited by remaining concrete liner freeboard for a specific Aqueduct pool that exceeds twice the average observed rate from 2016-2022.*

Response to Comment #A-17:

Commented Noted. Please see the response to A-16, above. MT rates along the Aqueduct are now coordinated and based on DWR historical survey data. This includes reaches of the Aqueduct where subsidence is not caused by GSA activities (e.g., MP 195-215). Plates 12 to 14 (CASS 2019 Supplemental Report) are provided in **Appendix F** to this letter. These figures show that subsidence rates increase beginning at approximately MP 195 and begin to decrease at approximately MP 215. This 20-mile reach of the Aqueduct is concomitant to and proximal to the LHOF. Each of these MP's has a separate subsidence MT in the Final 2024 Plan. That said, the Subbasin does not have jurisdiction over oil and gas activities but is committed to taking actions to monitor and ameliorate, where practical, the potential for GSA-related activities to contribute to subsidence. For example, the WDWA GSA has recently adopted a pumping moratorium for all supply wells in the CASP Monitoring Corridor between MP 195-215.

Summary SWP Comment #A-18:

The Draft 2024 Plan assigned identical MTs, MOs, and IMs to all Pools 23-30 inclusive, even though cumulative subsidence documented by DWR Precise Survey data differs significantly within and among these pools.

Response to Comment #A-18:

Commented Noted. The 2024 Plan has developed MTs for each MP of the Aqueduct within the Subbasin (North and South reaches) based on DWR survey data and is adjusted based on potential operational impacts based on available freeboard. Further, as noted above, the Subbasin has developed an Action Plan for Subsidence IM & MT Exceedance which requires GSAs to evaluate and initiate targeted P/MAs to reduce GSA-related subsidence (**Appendix C** to this letter).

Summary SWP Comment #A-19:

Table 13-10 shows errors in the proposed MT, MO, and IM values. There is also a discrepancy between the Extent and Rate for MTs and MOs in the same table.

Response to Comment #A-19:

The unit errors in Table 13-10 have been reconciled, and the table has been updated to reflect the MTs, MOs, and IMs consistent with the data-driven subsidence SMC approach. See Comment # 9.

Summary SWP Comment #A-20:

Similar to Comment #A-19, there are errors also present in the IM values in Table 13-10. They include incorrect values that do not protect critical infrastructure, and present further discrepancies between rates and extents. Additionally, SWP finds confusion between ‘water surface profile’ and ‘design freeboard’, and postulates that GSPs cannot make an unsubstantiated determination of “observed or ‘allowable’ freeboard”.

Response to Comment #A-20:

The errors have been corrected in Table 13-10 (see Comment #7). The tables and associated figures have been updated to reflect the water surface profile based on CASP data downloaded on 26 September 2024.

Summary SWP Comment #A-21:

The Draft 2024 Plan describes MT exceedance protocols as follows: Only the exceedance of the MT extent of subsidence triggers a UR. Per the Subbasin’s MT exceedance policy (Section 16.2.1), exceedance of the MT subsidence rate in any one year would trigger monitoring, and exceedance of the MT rate over two years would trigger investigation and potential initiation of P/MAs.

Response to Comment #A-21:

Comment Noted. The Final 2024 Plan has been updated and clarified. Therefore, the materials reviewed by the SWP are now obsolete. Subbasin has developed an Action Plan for Subsidence IM & MT Exceedance which requires GSAs to evaluate and initiate targeted P/MAs to reduce GSA-related subsidence (**Appendix C** to this letter). As part of this P/MA, GSAs located within or proximate to the CASP 5-mile Monitoring Corridor to the California Aqueduct may initiate targeted P/MAs should future observed subsidence rates exceed IMs and MTs. These targeted P/MAs located within or proximate to the CASP Monitoring Corridor to the California Aqueduct may include: (1) well registry, (2) metered well extraction volume reporting, (3) net zero well drilling moratorium, (4) targeted pumping reductions, and (5) pumping limitations, among others deemed necessary informed by the analysis undertaken from the five-step Action Plan. GSA-specific details on targeted P/MAs within close proximity to the California Aqueduct are found in the Final 2024 Plan and or the GSA Blue Page supplemental materials.

Respectfully Submitted,

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9/16/2024

Mr. Mark Gilkey, General Manager
Westside District Water Authority Groundwater Sustainability Agency
21908 Seventh Standard Road
McKittrick, California 93251

Subject: SWP Review of Westside District Water Authority Groundwater Sustainability Agency 2024 Groundwater Sustainability Plan

Dear Mr. Gilkey,

We appreciate the opportunity for the Department of Water Resources' (DWR) State Water Project (SWP), to evaluate the Westside District Water Authority Groundwater Sustainability Agency (WDWA GSA) Draft 2024 Groundwater Sustainability Plan (Draft 2024 WDWA GSP) submitted in accordance with the Sustainable Groundwater Management Act (SGMA).

Approximately 35 miles of the California Aqueduct (Aqueduct), between Mile Post (MP) 190 (Pool 23) and MP 225 (Pool 26), run through the WDWA Subbasin. As published previously by SWP (*California Aqueduct Subsidence Study* (CASS) (June 2017) and the associated *Supplemental Report* (March 2019)) subsidence in this region has significantly reduced hydraulic conveyance capacity and operational flexibility of the Aqueduct. One of the primary goals of the SWP is to remediate past and ongoing subsidence-related damage to the Aqueduct, while both addressing the underlying causes and attempting to forestall future harm.

In furtherance of the goal of ensuring the integrity of the Aqueduct, the SWP is providing WDWA GSA this letter and its attachment, which detail our review of the Draft 2024 GSP, to assist WDWA GSA in its efforts to develop management and corrective actions to safeguard this vital infrastructure. 1

DEVELOPMENT OF DRAFT 2024 WDWA GSP

We commend the twenty-two Kern Subbasin GSAs who have worked together to develop a basin-wide Coordination Agreement and coordinated amendments to their 2022 GSPs. We acknowledge that the principal GSP amendments, which provide the common text used by the numerous GSAs in their respective draft 2024 GSPs, are contained within the 2024 KCS Draft GSP.

1 All comments and observations offered by the SWP are provided within the context of its position as owner/operator of the Aqueduct. Such comments and observations do not reflect the opinions or views of DWR's Sustainable Groundwater Management Office (SGMO). Neither do the comments/observations offered by the SWP herein represent a forecast of any position SGMO may ultimately take with respect to any GSP.

The Draft 2024 GSP, submitted by KCS to the State Water Resources Control Board (the Board) on May 28, 2024, covers all GSAs in Kern County subbasin, including those GSAs along or near the Aqueduct, like WDWA GSA.2 However, WDWA GSA, and a few other GSAs3 prepared "standalone" draft GSPs to discuss local conditions and activities, and to differentiate their GSAs.

WDWA GSA submitted its own draft GSP, while incorporating in its entirety, the Draft 2024 KCS GSP. However, in conformity with the conventions developed by the Subbasin GSAs for submittal of their individual draft GSPs, WDWA included numerous "blue pages" in its document regarding various aspects of its plan for achieving sustainability by 2040.4

Review of the Draft 2024 WDWA GSP, revealed that WDWA **did not include any new information within its "blue sheets" regarding subsidence.** Thus, the WDWA GSA blue pages do not provide additional subsidence characterization, Undesirable Result (UR) clarification, and Sustainability Management Criteria (SMC) assessment.

The blue pages of the Draft 2024 WDWA GSP do contain three Project and Management Actions (P/MAs) which enhance its subbasin's groundwater management practices and are specifically intended to protect the Aqueduct from further harm through their implementation:

- The Well Drilling Moratorium "Zero-Net" Wells Management Action.
- The Well Registration Management Action.
- The Well Extraction Volume Reporting within Buffer Zone Management Action.

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2 Other relevant GSAs include:

- Buena vista (BV) Groundwater Sustainability Agency
- Semitropic Water Storage District (Semitropic) Groundwater Sustainability Agency
- Henry Miller (HM) Water District Groundwater Sustainability Agency
- West Kern Water District, (WKWD) Groundwater Sustainability Agency
- Wheeler Ridge Maricopa Water Storage District (WRMWSD) Groundwater Sustainability Agency
- Arvin Groundwater Sustainability Agency

3 BVGSA, Semitropic, and HMWD prepared such standalone draft GSPs. WKWD, WRMWSD, and Arvin did not provide standalone GSPs, and as such, are covered entirely by the KCS draft GSP.

4 The Draft 2024 WDWA GSP states:

> "The WDWA GSP includes 24 supplemental blue pages of text (i.e., "BP") plus additional BP cover pages and figures. Except for the BP materials, the WDWA GSA GSP is identical in every way (i.e., text, data, methodologies, tables, figures, appendices, etc.) to the foundational Amended Kern County Subbasin GSP … The purpose of these 'blue pages' is to provide supplemental information pertaining to conditions and characteristics unique to the WDWA GSA that demonstrate WDWA GSA is implementing a GSP that achieves sustainable groundwater management." (WDWA GSP, p. BP-ES-1)

The SWP recognized and commended WDWA GSA on their Board Resolutions to adopt these P/MAs in its May 2024 letter.

Since the Draft 2024 WDWA GSP wholly adopts the Draft 2024 KCS GSP (inclusive of subsidence-related URs, SMCs, and other P/MAs), the Draft 2024 WDWA GSP similarly contains the same issues that SWP has commented on with the Draft 2024 KCS GSP. As such, the SWP offers, by way of this Public Comment Letter, the same critique which was provided in response to the Draft 2024 KCS GSP.5

SWP COMMENTS REGARDING DRAFT 2024 WDWA GSP

While the Draft 2024 GSP includes new and substantial information supportive of the KCS efforts to meet SGMA sustainability goals by 2040 and beyond, the SWP has identified the following three areas of concern6 where **the Draft 2024 GSP does not adequately address the effects of land subsidence along the Aqueduct**:

- **First the underpinning for all Undesirable Result (URs) and Sustainability Management Criteria (SMC) definitions/development in the Draft 2024 GSP are based upon a methodologically flawed distinction between "GSA-related" and "non-GSA" activities as the causative factors for subsidence**. The Draft 2024 GSP defines "GSA-related activities" (e.g., agricultural groundwater pumping) as those for which KCS accepts responsibility. It defines purported "non-GSA" activities (e.g., oil & gas extractions) as those for which KCS, as a GSA, accepts no responsibility. Thus, subsidence associated with the "non-GSA" activities is deemed to be outside of the control of the GSA, and as such, will not be the subject of GSA subsidence mitigation efforts. However, the methodology used by the Draft 2024 GSP to arrive at this distinction is not supported by sufficient evidence in the following respects:

#1

  - There is no explanation as to how the GSA determines whether subsidence is caused by: (i) a GSA activity; (ii) a non-GSA activity; or (iii) a combination of the two.
  - When subsidence is a result of a combination of causative factors, there is no quantification or apportionment of the respective contributions of GSA-related and non-GSA activities to the historical or expected future subsidence encountered. WDWA GSP waffles between asserting that

5 SWP Public Comment Letters for the remaining individual Subbasin GSAs (BVGSA, HMWD, and Semitropic) will be submitted under separate cover.

6 These three areas of concern were also the same subjects voiced in the SWP's September 30, 2022 Public Comment Letter, which addressed perceived deficiencies with the July 2022 Amended GSPs submitted by: (i) the Kern Groundwater Authority GSA; (ii) Buena Vista GSA; (iii) Henry Miller Water District; (iv) Olcese GSA; (v) Kern River GSA; and (vi) South of Kern River GSA.

Cont. #1

subsidence is not at all caused by GSA activities and partially caused by GSA factors. For instance:

- On the one hand, the WDWA blue sheets state that they have completed technical studies to further investigate the cause of subsidence along the California Aqueduct and that these studies have indicated that "... subsidence is caused by factors **not related to groundwater pumping** (WDWA GSP, p. BP-8-3).

#2

- On the other hand, and WDWA's blue sheets agree with the "GSA-related" v. "non-GSA" causative distinctions contained in the KCS Draft 2024 GSP7 and further confirm that its subbasin is marked by "… **minimal to low rates of subsidence caused by GSA-related activities** …"8

- Regardless of the these inconsistencies, WDWA also does not shed any additional light on apportionment or quantification of subsidence caused by either of these two factors.

- In developing its strategy, the Draft 2024 GSP points to the credibility of the TRE ALTIMIRA InSAR data provided by DWR, but nonetheless relies upon conflicting InSAR information provided by its consultant ECI, without explaining or reconciling those conflicts.

#3

- Apart from "non-GSA" activities of oil & gas extraction, the Draft 2024 GSP identifies other "non-GSA" causative factors for subsidence along the Aqueduct, which it deems to be outside of the GSA's responsibility including: natural processes, the age of the infrastructure, or expansive soil types susceptible to hydro-compaction. The 2024 Draft GSP does not identify a methodology for quantifying the effects of these factors, nor do any of the studies referenced in the Draft 2024 GSP cite specific evidence supportive of their inclusion or consideration.

#4

- **Second, the <u>flawed definition of URs</u>, which were criticized in the September 2022 SWP Public Comment Letters, is essentially unchanged from the 2022 KGA GSP**. In addition to being based upon the suspect "GSA-related"/"non-GSA" activities methodology described above, the Draft 2024 GSP does not define a process or criteria for determining what constitutes a "significant loss in functionality" or how "mitigation through retrofitting" will be

7 WDWA GSP, p. BP-ES-3, fn. 2; BP-8-13-2.

8 WDWA GSP, pp. BP-ES-3 thru 4; p. BP-6-3; p. BP-8-1; p. BP-8-13-2).

Cont. #4

deemed "economically feasible" (short of leaving that up to the widely divergent views and subjective determination of beneficial users). The local economic benefits to the GSA of allowing subsidence to occur could result in repair costs to the Aqueduct that would be largely paid by the public water agencies that receive water from the SWP (the SWP water contractors). Those SWP water contractors may consider those resulting costs as "significant and unreasonable." Local entities who may have benefited from the continued extraction responsible for the subsidence may welcome the contribution by the SWP water contractors, thereby making a retrofit more economically feasible from their perspective. Thus, the Draft 2024 GSP does not identify objective, credible criteria for gauging what may be "significant and unreasonable" impacts.

#5

- **Third, the Draft 2024 GSP contains serious defects in the <u>defining and development of appropriate SMCs</u>** (e.g., Minimum Thresholds (MTs), Measurable Objectives (MOs), and Interim Milestones (IMs)). Apart from the "GSA-related"/"non-GSA" activities issues noted above, the Draft 2024 GSP does not consistently analyze rates and cumulative subsidence (in terms of lasting impacts) which were used to establish its SMCs. Examples of such lapses include the following:

    - Hydrologic Conceptual Models (<u>HCMs), Averages, and Means</u>: In many cases, proposed MT and MO values for specific HCM areas, are based on "average", "mean", or "maximum" subsidence values within HCM area, derived from analysis of InSAR data. However, the values are reported inconsistently between tables and figures, and the Draft 2024 GSP provides no explanation for how these values were determined for independent verification.

#6

        - Specific to WDWA, maximum subsidence rates for the HCMs are presented in Table 8-27 and Figure 13-23, but there is no table listing maximum cumulative subsidence during 2015-2023 for the individual GSAs in Table 13-12.

        - WDWA blue sheets note that WDWA, which includes the reach of the Aqueduct adjacent to LHOF, primarily falls within the Western Fold Belt HCM. According to Table 8-27, maximum subsidence in the Western Fold Belt HCM was 0.43 ft, whereas Figure 13-23 indicates that the maximum subsidence in the Western Fold Belt was 1.7 ft. The WDWA GSP does not resolve this discrepancy.

        - Further, WDWA, like other GSAs, straddle boundaries between the HCMs. However, the Draft 2024 GSP does not explain how subsidence magnitudes are assigned to the GSAs in Table 13-12, when they include parts of more than one HCM.

#7

- Risk Matrix: The Draft 2024 GSP outlines a complex "risk-based" approach for individual GSAs to determine MTs and MOs in a "coordinated" manner. However, it does not state whether average or maximum subsidence values for HCMs are used to categorize subsidence potential. Additionally, this approach does not appear to follow the standard of practice for qualitative risk assessments. Finally, whereas this approach considers subsidence "rate," it does not consider the "magnitude" of future subsidence as the determining factor for impacts to the Aqueduct.

#8

- Northern Aqueduct Segments: In developing subsidence SMC values for the Aqueduct, the Draft 2024 GSP distinguishes between the "northern" section of the Aqueduct (north of MP 251, where subsidence is assessed to be a result of "non-GSA" activities), and the "southern" section of the Aqueduct (south of MP 251, where subsidence is caused by both "GSA-related" and "non-GSA" activities). For the "northern" reach of the Aqueduct within KCS (Pools 23-30):

    - The MTs established by the Draft 2024 GSP may be insufficient to prevent overtopping of the Aqueduct's concrete liner.
    - There is no support for an exceedance criterion of "twice" the average observed rate of subsidence, as opposed to some lesser trigger.
    - The method for determining "average" subsidence rates is not described, so it is not possible to independently verify the values derived.
    - Identical MTs, MOs, and IMs were assigned to all Pools 23-30 of the Aqueduct inclusive, even though cumulative subsidence documented by DWR Precise Survey data differs significantly within and among these pools.
    - Averaging rates of significant subsidence with areas of lesser subsidence minimizes the hazard in the most significantly affected Aqueduct pools.
    - The MT rate is presented as a "range", rather than as a single value. Thus, it is unclear what specific subsidence rate would trigger an MT exceedance – the lower end of the range or the upper end.
    - The only Project and Management Action (P/MA) triggered by an SMC exceedance is a "consultation" to confirm causation by "non-

Cont. #8

GSA" activities. However, the Draft 2024 GSP does not describe a process nor a timeline to address the exceedance, or for resolving conflicts if an interested party (including SWP) disagrees with the results of the investigation or the conclusions of the GSA.

- Southern Aqueduct Segments: For the "southern" reach of the Aqueduct within the KCS (Pools 31-36), where subsidence is deemed to be caused by both "GSA-related" and "non-GSA" activities, the data used to develop the SMCs contain numerous errors including the following:

  - The Draft 2024 GSP does not harmonize the MT/MO "rates" with the MT/MO extents (defined as the cumulative amount of vertical subsidence (in feet) that would occur from 2024-2040 at the MT rate.

  - IMs are identified which are excessively high within the context of historic subsidence. Also, the IM rate values all progressively increase at each five-year milestone between 2025 to 2040. This is not consistent with the proposed "glide path" toward a subsidence rate of zero in 2040.

  - MTs listed would allow significant exceedance of the MOs and IMs without triggering a P/MA to mitigate subsidence.

  - Risks are established in terms of "observed or 'allowable' rates of subsidence." However, the SWP cannot support an unsubstantiated determination by a GSA (or any third-party) regarding what harm is or is not allowable for SWP infrastructure.

#9

- Exceedance Protocols: The exceedance policy described in the Draft 2024 GSP establishes a timeline that is not protective of infrastructure which is already critically impacted by subsidence. In such areas, monitoring should be performed regardless of whether MTs are exceeded. As for P/MAs (whose efficacy is limited to mere investigation as opposed to subsidence management actions related to extracted volumes), the Draft 2024 GSP does not justify why an investigation must wait two years, let alone be potential rather than mandatory.

#10

Specific evidence and details in support of the above comments are included in Attachment A at the end of this letter.

In conclusion, the SWP recognizes and appreciates the efforts of WDWA GSA to prepare the Draft 2024 GSPs. We also support the efforts of DWR's Sustainable Groundwater Management Office (SGMO) and the Board to monitor and review the GSA's efforts to ensure both the fulfilment of the goals established by SGMA, as well as

the protection of critical regional infrastructure such as the Aqueduct. We look forward to our continuing collaboration with the WDWA GSA in bringing the Subbasin into a sustainable status, in accordance with SGMA.

If you have any questions, please contact Jesse Dillon (Manager of the California Aqueduct Subsidence Program) by telephone at (916) 699-8403 or by e-mail at jesse.dillon@water.ca.gov

Sincerely,

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ATTACHMENT TO PUBLIC COMMENT LETTER

1. **ISSUE 1: THE UNDERPINNING FOR ALL UNDESIRABLE RESULTS (URs) AND SUSTAINABILITY MANAGEMENT CRITERIA (SMC) DEFINITIONS/DEVELOPMENT IN THE DRAFT 2024 GSP ARE BASED UPON A METHODOLOGICALLY FLAWED DISTINCTION BETWEEN "GSA-RELATED" ACTIVITIES (E.G., AGRICULTURAL GROUNDWATER PUMPING) AND "NON-GSA" ACTIVITIES (E.G., OIL & GAS EXTRACTION) AS THE CAUSATIVE FACTORS FOR SUBSIDENCE.**

    a. **"GSA-Related" v. "Non-GSA" Activities.**

The Draft 2024 GSP affirmatively represented that it would "… achieve sustainable groundwater management within the 20-year implementation schedule [by 2040] …" by, among other things, "… avoiding Undesirable Results for … land subsidence …" (p.ES-3; p.12-1)[1] It also noted that: "The SMCs for Land Subsidence have been developed to avoid impacts of subsidence caused by GSA-managed activities through a risk-based approach that considers subsidence potential and vulnerability." (p.ES-13)

However, review of the Draft 2024 GSP reveals that KCS has still not adequately defined URs or SMCs in a manner which will allow the SWP to conclude that its critical infrastructure, the Aqueduct, will be protected from subsidence related harm. This is due, in large part to KCS's distinguishing of "GSA-related" subsidence and "non-GSA" subsidence. The Draft 2024 GSP specifically states:

> "The SMCs for Land Subsidence have been developed in recognition that subsidence in the Subbasin has been caused by several factors, some of which are within the GSAs' authorities to control (**"GSA-related" subsidence - e.g., groundwater pumping for agricultural and urban uses**), and others that are outside of the GSAs' authorities to control **("non-GSA" subsidence – e.g., oil and gas extraction**, natural processes, and expansive soil types susceptible to hydro-compaction). The SMCs for Land Subsidence have been developed **to avoid impacts of subsidence caused by GSA-managed activities** through a risk-based approach that considers subsidence potential and vulnerability." (p.ES-13; p.8-162-163)[2]

Thus, the key distinction between "GSA-related" subsidence (such as that caused by agricultural groundwater pumping), and "non-GSA" subsidence (such as that caused by oil & gas related groundwater pumping), is that non-GSA subsidence, according to

[1] All page references are to the Draft 2024 GSP, unless otherwise stated.

[2] Bolding and/or underlining in quoted material represents emphasis added, unless otherwise stated.

KCS, is outside of its control, and as such, will not be the subject of subsidence mitigation efforts.

#A-1

Of critical importance to the SWP and the Aqueduct is that the Draft 2024 GSP confirms that URs and SMCs for subsidence were defined and developed in accordance with this "GSA-related" and "non-GSA" convention, noting that:

> "The Subbasin-wide **UR for Land Subsidence** is defined as follows: The point at which the amount of subsidence, **if caused by GSA-related subbasin groundwater extractions**, creates a significant and unreasonable impact …" (p.13-75)
>
> "The SMCs … have been developed to avoid impacts of subsidence caused by **GSA-managed activities** …." (p.ES-13)
>
> "The **MT for Land Subsidence** for the Northern Aqueduct is established based on the **avoidance of a permanent loss of conveyance capacity associated with GSA-related subsidence** …" (p.13-124)

In determining that oil & gas extractions ("non-GSA" activities) are outside of the GSAs' authority to control …," KCS excludes these activities from UR definitions, SMC development, or corrective actions. However, if this strategy is to be deemed credible or effective, KCS must first demonstrate that it has:

- Correctly identified the extent of subsidence impacts attributable to GSA-related and non-GSA subsidence.
- Correctly identified whether subsidence in certain areas is either: (i) attributed solely to one or the other types of activities; or (ii) attributable to some combination of both GSA-related and non-GSA subsidence.
- Accurately apportioned the respective causative impacts of each type of activity, where subsidence is due to both GSA-related and non-GSA related factors.
- Provided sufficient evidence supportive of the above determinations.

Review of the Draft 2024 GSP reveals that KCS has not achieved these necessary goals, as detailed below.[3]

#A-2

b. Flawed Methodological Approach.

[3] These shortcomings were not just identified by the SWP in its 2022 Public Comment letter but were also identified by the Board in its recent July Draft 2024 Staff Report (DSR) regarding the Assessment of KCS GSPs.

cont. #A-2

i. One or Multiple Causes.

The Draft 2024 GSP does not identify whether subsidence related undesirable results were caused only by SGMA-related groundwater extractions, or a combination of SGMA-related and other types of ground water extraction (e.g., oil & gas extraction).[4] It waffles between claiming that subsidence is caused by one factor or a combination of factors. For example, it states:

> "Other Non-GSA Causes of Land Subsidence: Six studies have been conducted in the Subbasin utilizing InSAR and other data to assess the causes of subsidence along a portion of the Aqueduct (MP 195 to 215). These studies found **that various factors not under the control of the Subbasin GSAs were primarily responsible for the observed subsidence."** (p.8-165)
>
> "Agricultural and M&I pumping **primarily occur** in the central portion of the Subbasin, as shown in Figure 8-59. Subsidence in other portions of the Subbasin is **primarily driven** by non-GSA causes." (p.13-85)
>
> "The following considerations were used to establish Land Subsidence SMCs for the northern portions of the California Aqueduct, represented by Pools 23 through 30 (MP 184 to 250) … Historical subsidence has occurred **primarily** as a result of non-GSA activities and conditions … the northern portion of the Aqueduct was determined to have a low vulnerability ranking based on its designation as a Regional Critical Infrastructure with **primarily** non-GSA causes of subsidence." (p.13-103)

The use of the term "primarily" leaves the door open for an interpretation that both GSA and non-GSA related factors contribute to subsidence. However, the Draft 2024 GSP does not quantify the impact of the respective causative factors. It also does not include clear criteria and methodology for evaluating and quantifying the different subsidence causes. There is no quantification or apportionment of the respective contributions of GSA-related and non-GSA activities to the historical or expected future subsidence encountered

ii. Outside GSA Jurisdiction.

[4] Prior to the Draft 2024 GSP, distinctions between activities such as agricultural pumping and oil & gas activities were referred to as SGMA-related and non-SGMA-related activities. With the publishing of the Draft 2024 GSP, that nomenclature has been changed to "GSA" and non-GSA" activities.

#A-3 The Draft 2024 GSP does not explain how a determination would be made that permanent loss of freeboard from land subsidence due to other causes (including but not limited to oil or gas production) is not within the jurisdiction of a GSA. It also does not explain how these other causes shall not be considered as a loss of freeboard that contributes to the amount specified for any MT or MO.

#A-4 The Draft 2024 GSP does not include clear criteria or an explanation of the methodology that has been or will be used for evaluating and quantifying the subsidence cause. This criticism sidesteps the issue of who may be at fault in causing the subsidence, and instead, focuses on whether meaningful and effective SMCs can be developed without consideration of all factors contributing to a loss of freeboard for the Aqueduct.

Further, the need for clarity and transparency in determining causation is twofold:

- First, as discussed below, Project and Management Actions (P/MAs) involving consultation and investigation are only triggered by a determination as to causation. Thus, without an established, accepted approach to determining causation, follow-on actions will be ineffective.

- Second, a sound causation determination strategy will be necessary to ensure that GSPs and Management Area Plans are coordinated and in furtherance of SGMA goals.

c. Lack of Substantiating Evidence.

The Draft 2024 GSP concludes that subsidence along the northern portion of the Aqueduct is due, at least in part, to factors outside the control of the GSAs. The evidence sited in support of this conclusion comes from “six studies” which are described thusly:

> “Additional causes of subsidence **that are outside of the GSAs’ control**, include oil and gas extraction, natural processes …, expansive soil types susceptible to hydrocompaction, and others …. Recent technical studies commissioned by the GSAs **have been able to differentiate the subsidence signals associated with these other causal factors**.” (p.ES-8)

However, despite numerous references throughout the Draft 2024 GSP to these studies, the Draft 2024 GSP makes assertions **without sufficient evidence**. This is because the evidence cited by KCS is suspect, for the reasons set forth below.

i. Oil & Gas Related Studies.

According to the Draft 2024 GSP, the studies commissioned by the GSAs rely upon InSAR and other data, which indicate that subsidence between MP 195 and 215 is not related to agricultural groundwater pumping (i.e., non-GSA-related). (p.8-150). Per the Draft 2024 GSP, the studies reveal two "key takeaways:"

> "1.) it is possible using InSAR to **discern the difference between subsidence due to seasonal (cyclical) groundwater extraction and subsidence caused by non-seasonal extraction (i.e. long term) activities not under the control of Subbasin GSAs;** and
>
> 2.) a risk-based methodology is best suited to accommodate Subbasin complexities and SGMA objectives pertaining to the monitoring and assessment of subsidence." (pp.8-162-163)

However, a review of the studies and the conclusions purportedly derived therefrom, are misaligned. The Draft 2024 GSP cites the 2023 ECI Study in support of its position. However, internal technical reviews of this Study demonstrate that:

- The 2023 ECI Study time series disagrees with time series developed from data at nearby continuous GPS stations.
- The 2023 ECI Study does not offer any criteria or analysis to parse relative contributions of GSA-related vs. non-GSA activities to the total subsidence signal adjacent to LHOF.

#A-5

- The distinctive patterns of temporally varying subsidence that the 2023 ECI Study attributes to oil field activities are not present or replicated in time series over the Lost Hills Oil Fields (LHOF) developed from TRE ALTAMIRA InSAR data provided by DWR. The SWP was not able to duplicate the results of the ECI InSAR analysis using the TRE ALTAMIRA InSAR data. Based on comparison of the ECI and TRE ALTAMIRA InSAR data products with cGPS data, it is believed that ECI's initial analytical approach and decisions during processing of the InSAR data may have introduced errors which have led to unreliable results and conclusions in the ECI subsidence maps, profiles and time series.
- This is critical given the key assertion in the Draft 2024 GSP that KCS commits to using TRE ALTAMIRA InSAR data from DWR to:

#A-6

> "… prepare various subsidence time series and monitor overall subsidence across the Subbasin and to identify rates and extent of subsidence." (p.15-31)

cont. #A-6

This statement suggests that the TRE ALTAMIRA data will be treated as the reference InSAR dataset for monitoring and analyzing future subsidence. But reliance upon the TRE ALTAMIRA data does not support the theory of allegedly distinctive patterns of subsidence (cited by the 2023 ECI Study and KCS as evidence of "non-GSA" causality in and adjacent to LHOF). Thus, in developing its strategy, the Draft 2024 GSP touts the credibility of the TRE ALTIMIRA InSAR data provided by DWR, but nonetheless relies upon conflicting InSAR information provided by its consultant ECI, without explaining or reconciling those conflicts

ii. Other Non-GSA Causative Factors.

#A-7

As noted above, the Draft 2024 GSP cites several "[a]dditional causes of subsidence **that are outside of the GSAs' control …"** which also include

> "… natural processes (i.e. faulting), expansive soil types susceptible to hydrocompaction, and others (e.g., deficient Aqueduct pre-construction hydro-compaction, age of infrastructure, etc.)." (p.ES-8)

However, none of the referenced reports or studies provide sufficient evidence that subsidence adjacent to LHOF is caused by "expansive soils, deficient Aqueduct pre-construction hydro-compaction … [or] age of the infrastructure." The 2024 Draft GSP does not identify a methodology for quantifying the effects of these factors, nor do any of the studies referenced in the Draft 2024 GSP cite specific evidence supportive of their inclusion or consideration

In the 2022 Public Comment Letter, SWP requested that the GSAs in the Kern County Subbasin provide specific examples or locations of expansive soil types susceptible to hydro-compaction age (lifespan) of critical infrastructure, historical pre-construction geotechnical deficiencies (e.g., lack of hydro-compaction on the Aqueduct) and subsidence caused by natural processes, so that the SWP could evaluate these factors as potential sources of subsidence damage to the Aqueduct. To date, none of the GSAs located in the Subbasin have provided any such examples, while continuing to assert in the Draft 2024 GSP that these "non-GSA-related" processes may be significant contributions to subsidence affecting the Aqueduct in the Subbasin.

2. **ISSUE 2: THE FLAWED DEFINITION OF URs, WHICH WERE CRITISIZED IN THE SEPTEMBER 2022 SWP PUBLIC COMMENT LETTERS, IS ESSENTIALLY UNCHANGED FROM THE 2022 KGA GSP, IN THAT THE DRAFT 2024 GSP DOES NOT IDENTIFY OBJECTIVE, CREDIBLE CRITERIA FOR GAUGING WHAT MAY BE A "SIGNIFICANT AND UNREASONABLE" IMPACT.**

As noted above, the Draft 2024 GSP defines the UR for Land Subsidence as follows:

> "The point at which the amount of subsidence, **if caused by GSA-related** Subbasin groundwater extractions, creates a significant and unreasonable impact (**requiring either retrofitting or replacement to a point that is economically unfeasible to the beneficial users**) to surface land uses or critical infrastructure. A significant loss in functionality that could be mitigated through retrofitting and is considered economically feasible to the beneficial users would not be considered undesirable." (p.13-75)

#A-8

This definition is problematic from several standpoints. First, as noted in Issue 1 above, it is limited to impacts which result only from "GSA-related activities", without having justified, validated, quantified, or supported the exclusion of non-GSA factors, such as oil & gas extraction activities.

Second, the Draft 2024 GSP defines "significant and unreasonable impact" as that which requires "… either retrofitting or replacement to a point that **is economically unfeasible to the beneficial users**." In other words, if beneficial users are willing to pay for repairs, the impacts warranting those repairs are not deemed to be significant or unreasonable. For several reasons, this is not a criterion the SWP can support. As the SWP noted in its September 30, 2022 Public Comment letter responding to the 2022 GSPs:

#A-9

> "First, the GSP **does not define a process or criteria** for determining what constitutes a "significant loss in functionality" or how "mitigation through retrofitting" will be deemed "economically feasible" (short of leaving that up to the subjective determination of beneficial users). Neither does this approach take into consideration **the extended duration of such a significant and unreasonable impact**, while the criterion for determining its status is assessed, and mitigation measures can actually be implemented.
>
> Secondly, there is no accounting for the fact that different beneficial users may have **widely divergent views** as to whether retrofitting is "economically feasible." The GSP does not appear to consider which beneficiaries will be paying for the costs to repair subsidence-related damages to the Aqueduct. Thus, the local economic benefits to [the GSA]

cont. #A-9

> of allowing subsidence to occur could result in repair costs that are largely **paid by the SWP's water users**, a result which may be considered significantly unreasonable by those entities, while others more directly responsible for having caused the subsidence would welcome the contribution, thereby making a retrofit more economically feasible.
>
> Thirdly, subsidence has progressed to the point that retrofitting or replacement is **already financially daunting**. The ongoing rehabilitation of subsidence to the Aqueduct is costly and disproportionately burdensome." (Sep. 30, 2022 SWP Letter, pp.3-4)

Thus, the Draft 2024 GSP does not identify objective, credible criteria for gauging what may be "significant and unreasonable" impacts. In that the definition of URs in the Draft 2024 GSP is essentially unchanged from the 2022 GSP, it is not appropriate for assessing subsidence impacting the Aqueduct.

3. **ISSUE 3: SMCs: THE DRAFT 2024 GSP CONTAINS SERIOUS DEFECTS IN THE DEFINING AND DEVELOPMENT OF APPROPRIATE SMCs, IN THAT RATES AND CUMULATIVE SUBSIDENCE (IN TERMS OF LASTING IMPACTS) USED TO ESTABLISH THOSE SMCS (WHICH INCLUDE MINIMUM THRESHOLDS (MTs), MEASURABLE OBJECTIVES (MOs), OR INTERIM MILESTONES (IMs)) ARE NOT CONSISTENTLY ANALYZED.**

The Draft 2024 GSP establishes specific numeric MTs for each of the areas encompassed within the Subbasin, as well as protocols for when those MTs are exceeded. The SWP does not support either the MTs or the exceedance protocols for the following reasons:

a. **GSA v. Non-GSA Factors.**

The Draft 2024 GSP bifurcates the Aqueduct into "northern" and "southern" sections.[5] Specific MTs were developed for each of these sections of the Aqueduct. Regarding the Northern Aqueduct, the Draft 2024 GSP states:

> "The MT for Land Subsidence for the Northern Aqueduct is established based on the **avoidance of a permanent loss of conveyance capacity associated with GSA-related subsidence** as limited by remaining concrete liner freeboard for specific Aqueduct pools (Pools 23 to 30) … **However, since data indicates that subsidence within the 5-milewide CASP buffer zone along the northern Aqueduct is influenced by various non-GSA activities and conditions some subsidence and its affects will likely be outside the GSA authority to manage**." (pp.13-124 and 125)

#A-10

Similar to the comments referenced in Issue 1 above, the SWP does not support the development of MTs which only consider impacts resulting from "GSA-related" activities, without having justified, validated, quantified, or supported the exclusion of non-GSA factors, such as oil & gas extraction activities.

For the most part, the Draft 2024 GSP absolves KCS of any responsibility for addressing non-GSA activities, with the following exception:

> "If **non-GSA causes of subsidence are contributing** to subsidence along critical infrastructure, the GSAs will work collaboratively with the relevant regulatory agency (e.g., DWR's California Aqueduct Subsidence

[5] The Draft 2024 GSP states that the "Northern Aqueduct extends from near the Kern County line southward along the western side of the Subbasin and includes Pools 23 through 30, approximately MP 195 to 251. The Southern Aqueduct, located south of the Kern River, includes Pools 31 to 35 or approximately MP 251 to 278." (p.8-153, Figure 8-53)

> Program [CASP])[6] to provide data from the GSA **demonstrating <u>the lack of GSA activities contributing</u> to subsidence in the area**." (p.13-85)

This is circular logic – if the GSA concludes that non-GSA activities (e.g., oil & gas extractions) are contributing to subsidence, it will provide information showing <u>no</u> GSA activities (e.g., agricultural groundwater extraction) are occurring in the area. But the Draft 2024 GSP has already conceded that both types of activity are ongoing, if only minimally. As noted above, the Draft 2024 GSP states that:

> "Agricultural and M&I pumping **primarily** occur in the central portion of the Subbasin, as shown in Figure 8-59. Subsidence in other portions of the Subbasin is **primarily** driven by non-GSA causes." (p.13-85)

#A-11 Because of the use of the qualifying term "primarily," the inference is that the GSA is not claiming that subsidence in a particular area is totally caused by either GSA-related or non-GSA causes. Thus, the correlative inference is that some portion of subsidence in any given area is caused by some percentage of each of these factors. However, the Draft 2024 GSP does not identify the proportionate shares each factor contributes to subsidence, or the SMCs developed to measure that subsidence.

b. <u>Criteria for MT Development</u>.

i. **HCMs, Averages, and Means**.

Per the Draft 2024 GSP, the KCS Subbasin has been separated into five Hydrologic Conceptual Model (HCM) areas that are characterized by specific geologic and hydrogeologic attributes that dictate land and water uses in the area. Of particular relevance to the SWP is the HCM area designated as the Western Fold Belt, through which the Aqueduct either runs or is immediately adjacent. It also includes the area of the LHOF. (p.13-94, Figure 13-23).

In developing MTs for these areas, several problems exist:

#A-12
- First, subsidence in the area around the LHOF has not been included into reported subsidence for Western Fold Belt HCM. For that area, the maximum subsidence reported in the Table 8-27 is 0.43 ft, and maximum subsidence in the North Basin HCM is 0.29 ft. However, maps of InSAR data in the Draft 2024 GSP

[6] The CASP is NOT a regulatory agency. It is a program within the SWP, and has assisted the SWP prepare the remarks included in the Public Comment Letters. As stated in the footnotes to those Public Comment letters, all comments and observations offered by the SWP are provided within the context of its position as owner/operator of the Aqueduct. Such comments and observations do not reflect the opinions or views of DWR's regulatory Sustainable Groundwater Management Office (SGMO). Neither do the comments/observations offered by the SWP herein represent a forecast of any position SGMO may ultimately take with respect to any GSP.

cont. #A-12

show that 0.5-2.0 ft of subsidence locally occurred in these fields between 2015-2023 (e.g., p.8-151, Figure 8-52). Whereas the apparent exclusion of subsidence data in and around oil fields in Table 8-27 is consistent with statements throughout the Draft 2024 GSP that all subsidence adjacent to the LHOF is entirely due to "non-GSA" pumping of oil, gas, and groundwater (and thus, outside of the control of the GSA) consideration of these factors is totally absent in developing MTs, MOs, and IMs for the Aqueduct.

#A-13

- Second, the Draft 2024 GSP identifies the "**average**" rate of subsidence from 2015-2023 for each HCM. However, it does not provide any explanation of how "average" subsidence rates for HCMs were derived, including how "non-GSA" subsidence was identified and excluded from the calculations.

#A-14

- Third, Table 8-27 in the GSP provides elevation change data for each of the HCMs from 2015-2023 "calculated using InSAR" (p.8-150). The table also lists a "**mean**" subsidence magnitude for each HCM. However, as with average rates, it provides no information about the how the mean was calculated from the InSAR data or other statistics that characterize the distribution of elevation change within a given HCM. The analysis used to derive the values in this table is not described in sufficient detail in the GSP to allow the reader to determine whether the numbers are correct and accurate. Thus, it is not possible to independently verify the values in Table 8-27 from information provided in the Draft 2024 GSP.

#A-15

- Fourth, the "average" subsidence values in Figure 13-23 differ from the "mean" rates for the HCMs reported in Table 8-27. For example, Figure 13-23 shows that the average rate of subsidence for the Western Fold Belt HCM is -0.007 ft/yr, and the average rate of subsidence for the North Basin HCM is -0.053 ft/yr. These average rates differ from the mean subsidence rates listed in Table 8-27 for these HCMs. No statistics are provided to characterize the distribution of rates or show why the average value differs from the mean value.

Thus, the values are reported inconsistently between tables and figures, and the Draft 2024 GSP provides no explanation for how these values were determined for independent verification.

ii. "Risk" Matrix.

#A-16

The Draft 2024 GSP explains that SMCs were developed using a "risk matrix" that considers both the **subsidence potential** derived and the type of infrastructure that may be affected by subsidence. According to the matrix, SMCs in areas with moderate to high subsidence risk are determined by:

"…assessing impacts on infrastructure from future subsidence. If the impacts are found to be significant and unreasonable then mitigation and/or P/MA are proposed to avoid URs..." (p.13-102)

Several problems exist with this strategy:

- First, the 2024 Draft GSP identified areas of subsidence in the subbasin attributed to "GSA-related" groundwater use and characterized those areas for their **potential to cause** "significant and unreasonable impacts", based on the magnitude of cumulative subsidence between 2015-2023. (p.13-86). However, the 2024 Draft GSP does not state whether the average or the maximum subsidence values for HCMs are used to categorize subsidence potential.

- Second, the "risk-based approach" described in Section 13.5.2.1 of the Draft 2024 GSP does not follow the standard practice for qualitative risk assessments.[7] The matrix presented in Table 13-8 of the GSP does not correctly define likelihood for assessing risk to the Aqueduct. As shown in the matrix, "subsidence rate" is used to represent "likelihood" along the rows of the matrix. "Consequences" are defined by classes of infrastructure in the columns, with higher consequences associated with damage to infrastructure that affects larger numbers of people and presumably results in larger economic loss. Subsidence rate alone, however, does not characterize the likelihood that the infrastructure will be damaged.

- Third, the magnitude of future subsidence that could produce loss of conveyance capacity, reduced operational flexibility, or wholesale failure varies along the Aqueduct due to multiple factors, including past subsidence that has reduced available freeboard. To assess the likelihood for damage to occur at a given point, the "magnitude" of subsidence required to produce the damage has to be considered along with the subsidence "rate." However, the matrix in Table 13-8 essentially assumes that all infrastructure in the subbasin has equal vulnerability, and thus, the only variable that matters in assessing risk is subsidence rate. This is clearly not correct for the Aqueduct.

cont. #A-16

iii. Northern and Southern Aqueduct Areas.

[7] In standard risk assessments performed by DWR, the US Army Corps of Engineers, and many other agencies, risk is defined as the product of "likelihood times consequences". The "risk" is the probability that a specified type of damage will occur, e.g., "loss of conveyance capacity", as noted above. In the context of subsidence and the Aqueduct, "risk" would be the probability of subsidence causing damage such as wholesale failure, loss of conveyance capacity, or reduced operational flexibility.

As noted above, the Draft 2024 GSP deems subsidence in the Northern Aqueduct (Pools 23 through 30, approximately MP 189 to 250) to be primarily caused by non-GSA activities (oil & gas extraction, etc.) and subsidence in the Southern Aqueduct (Pools 31 to 35, approximately MP 251 to 278) to be primarily caused by a combination of GSA and non-GSA related activities (agricultural groundwater pumping). The SWP has concerns with how the Draft 2024 GSP establishes MTs for each of these situations.

1. <u>The Northern Aqueduct</u>.

In the Northern Aqueduct area, where non-GSA-related subsidence occurs, and where the subsidence doesn't encroach on or affect regional critical infrastructure, the Draft 2024 GSP defines the Northern Aqueduct MT as follows:

> "The MT for Land Subsidence along the northern portion of the Aqueduct (i.e., within the 5-mile-wide CASP buffer zone) is defined as the **avoidance of a permanent loss of conveyance capacity** attributable to subsidence as **limited by remaining concrete liner freeboard** for a specific Aqueduct pool that exceeds **twice the average observed rate from 2016-2022"** (p.13-103)

This definition is problematic for the following reasons:

#A-17

- First, according to data from the CASS Supplemental Report (DWR 2019, showing current freeboard of less than 1.0 ft near MP 200 and MP 210), the MT extent values of 0.8-1.6 ft for subsidence between 2024-2040 in Pools 24 and 25 could result in overtopping of the concrete liner.

- Second, the Draft 2024 GSP does not show whether or how an MT based on "twice the average observed rate from 2016-2022" will protect the remaining concrete liner freeboard and prevent "permanent loss of conveyance capacity" in Pools 23-30.

- Third, there is no explanation as to why 2016-2022 was chosen for determining average subsidence rate, when the "historical" period defined and used elsewhere in the document is 2015-2023.

#A-18

Subsidence rates for SMCs in Pools 23-30 of the Aqueduct are listed in Table 13-9 (p.13-104). Of note is the fact that the Draft 2024 GSP assigned identical MTs, MOs, and IMs to all Pools 23-30 inclusive, even though cumulative subsidence documented by DWR Precise Survey data differs significantly within and among these pools. Taken at face value, the identical MT values imply that an "average" rate was obtained for the entire reach of the Aqueduct between MP 184 and MP 251. This approach and the presentation in Table 13-9 have multiple flaws:

- First, as noted above, the method for determining "average" subsidence rates is not described, so it is not possible to independently verify the values in Table 13-9.

- Second, the MT rate averages areas of significant subsidence in Pools 23-25 (i.e., the "Kern bowl") with a long reach of little to no subsidence in Pools 26-30, thus minimizing future subsidence hazard in the most significantly affected pools. This approach was previously used in the 2022 KGA GSP, and it was criticized in the September 2022 SWP Public Comment letter as not being sufficiently protective of the Aqueduct (Sep. 30, 2022 SWP Letter, pp.6-7).

- Third, the MT rate is presented as a "range", rather than as a single value. Thus, it is unclear what specific subsidence rate would trigger an MT exceedance – the lower end of the range or the upper end.

- Fourth, the proposed remedy for an MT exceedance is:

  > "… an assessment of the cause…conducted in consultation with CASP. If the exceedance is found to be related to a non-GSA cause, the exceedance will be defined as outside of GSA authority to manage, and the relevant regulatory agency would be contacted." (p.13-104)

  Although not explicitly stated, the GSP implies that individual GSAs are responsible for performing the assessment of causality. However, the GSP does not describe a process for resolving conflicts if the SWP disagrees with the results of the investigation or the conclusions of the GSA. Nor does it indicate what will happen if the GSA is found to be a cause.

cont. #A-18

Such an approach implicitly puts the burden of proof on the SWP to validate claims by GSAs of causality for subsidence that is damaging "regional critical infrastructure" like the Aqueduct. As a practical matter, the Draft 2024 GSP does not provide any reason to expect that the status quo regarding subsidence north of MP 250 will change.

2. <u>The Southern Aqueduct</u>.

The data in Table 13-10, which are the key subsidence metrics for protecting the Southern Aqueduct, contain numerous errors. The proposed MT, MO, and IM for MP 275.5 in Table 13-10 provide representative examples.

#A-19

- **Disagreement Between MT Extent and MT Rate**: According to the footnote on Table 13-10, the "<u>MT extent</u>" listed above is defined as "the cumulative amount of vertical subsidence (in feet) that would occur from 2024-2040 at the <u>MT rate</u>" (p.13-109). The "MT extent" is shown as 2.86 ft, which according to the definition

on the table implies an MT rate of 0.2 ft/yr. "MT Rate" for MP 275.5 is listed as 1.91 ft/yr, however, which is about an order of magnitude higher than the rate that is consistent with the listed MT Extent. This is obviously an error in the table. A review of the entire table reveals that this type of error occurs throughout and is not limited to the entry for MP 275.5.

cont. #A-19

- **Disagreement Between MO Extent and MO Rate**: The MO listed for MP 275.5 exhibit similar errors. According to the footnote on Table 13-10, the "MO extent" listed above is defined as "the cumulative amount of vertical subsidence that would occur from 2024-2040 at the MO rate" (p.13-109). The MO Extent for MP 275.5 is 1.43 ft, which implies a MO Rate of 0.1 ft/yr. The MO Rate listed in the table, however, is 0.95 ft/yr. This rate must be an error because a subsidence rate of nearly 1 foot per year is not even remotely compliant with SGMA as a "measurable objective" for mitigating land subsidence.

#A-20

- **Errors with the IM Values**: Several errors also are present in the IM values listed in Table 13-10. For example, the proposed 2025 IM Rate for MP 275.5 is 0.6 ft/yr.
    - First, this rate is extremely high in the context of historic subsidence of the Pleito bowl. Based on analysis of DWR Precise Survey data, the subsidence rate at nearby MP 275 was about 0.03 ft/yr during the period 1986-2006, and about 0.16 ft/yr during the 2012-2016 drought. Proposing a much higher rate for a future IM than has been observed during the past three decades (including a severe drought) is not consistent with the SGMA goal of eliminating subsidence and protecting infrastructure.
    - Second, if the 0.6 ft/yr IM rate for 2025 is sustained until the 2030 IM milestone, then the potential IM extent in 2030 is 3 ft greater than the 2025 IM extent. An IM Rate that permits 3 ft of subsidence in five years is not protective of the Aqueduct, and it is not consistent with the 0.5 ft differential between the IM extent values for 2025 and 2030 for MP 275.5 in the table.
    - Third, the IM Rate values shown in the table all progressively increase at each five-year milestone between 2025 to 2040. This is not consistent with the proposed "glide path" toward a subsidence rate of zero in 2040.
    - Finally, the IM Extent for 2040 is shown as 1.43 ft. This agrees with the proposed MO extent of 1.43 ft, but it disagrees with both the MT Rate and MT Extent. The MT listed in the table would allow significant exceedance of the MO and IM without triggering a P/MA to mitigate subsidence.

cont. #A-20

- **"Confusion between "water surface profile" and excess freeboard":** The Draft 2024 GSP notes that Specific MT, MO, and IM values based on relationships shown in Figure 13-28 are listed for individual MPs along the Aqueduct in Table 13-10 of the GSP. However, a fundamental problem with Figure 13-28 is the characterization of the water surface profile, which KCS GSA confuses with eating into excess freeboard. The derived MT, MO, and IM values in Table 13-10 are fatally flawed due to a technical error in Figure 13-28. The blue "design water surface" line should descend in a series of discrete steps across each check structure at the downstream end of the pools. The water surface elevation should decline linearly at a low gradient to the south (right) within each pool and between each check or siphon. The concavities in the profile of the water surface elevation and the increase in gradient between Pools 34 and 35 shown in Figure 13-28 are not physically realistic. For comparison, a technically accurate representation of the progressive southward decrease in water surface elevation along the Aqueduct can be found in Figure 4-2 of DWR (2019 CASS Supplement). Because the "design water surface" line in Figure 13-28 is not correct, the "CASP required 2.5 ft freeboard" line also is not correct, and consequently all MT, MO, and IM values based on this line cannot be correct. Thus, these errors suggest that the Subbasin GSAs do not appreciate the significance of the criteria communicated by SWP, to ensure proper infrastructure operation, and guarantee its ongoing protection.

- **"Allowable" Subsidence**: The Draft 2024 GSP notes that according to the risk matrix in Table 13-8, SMCs for pools 31-35 are set as an "observed or allowable rate of subsidence" (p.13-105). However, the SWP cannot support an unsubstantiated determination by a GSA (or any third-party) regarding what harm is or is not allowable for SWP infrastructure. As the SWP noted in its 2022 Public Comment Letter, the GSAs seem to have "… a fundamental misunderstanding of design freeboard." They erroneously assume they are entitled to use excess freeboard, when in fact, the purpose of the freeboard is to allow the SWP to address operational flexibility, flow capacity, operational irregularities, flood storage, and safety factors. (Sep. 30, 2022 SWP Letter, p. 5)

In summary, as to the SMCs for the Southern Aqueduct, the actual MT, MO, and IM metrics in Table 13-10 to implement this rubric are filled with errors, contradictory, and cannot be used as presented for subsidence management. Although the SMC for Pools 31-35 are intended to protect the ability of the Aqueduct to operate at design capacity, they are based on assumption that GSAs may determine how much existing freeboard above the SWP-required 2.5 ft minimum can be lost to subsidence. This is not responsive to the 2022 SWP comment letter, which criticized the previous KGA (2022) GSP for "erroneously" assuming that GSAs are entitled to freely use excess design freeboard. (Sep. 30, 2022 SWP Letter, pp. 5-6)

c. Exceedance Protocols.

The Draft 2024 GSP describes MT exceedance protocols as follows:

> "Only the exceedance of the MT extent of subsidence triggers a UR. Per the Subbasin's MT exceedance policy (Section 16.2.1), exceedance of the MT subsidence rate **in any one year would trigger monitoring**, and exceedance of the MT rate **over two years would trigger investigation and potential initiation of P/MAs**." (p.13-84) [8]

These protocols are deficient for the following reasons:

#A-21

- First, in critically impacted portions of the Aqueduct where design freeboard has already been diminished, "monitoring" should be performed regardless of whether MTs are exceeded at all, rather than only if they are exceeded after one year.

- Second, the Draft 2024 GSP offers no rationale for why an "investigation" of an exceedance must wait until year two, rather than after year one, especially in areas where design freeboard has already been diminished.

- Third, the Draft GSP offers no rationale for why initiation of P/MAs would only be "potential," rather than mandatory, or why such an initiation would wait until two consecutive years of exceedance have occurred, as opposed to after the first year of exceedance.

As the SWP noted in its September 30, 2022 Public Comment letter responding to the 2022 GSPs, the strategy outlined by the GSA "… fails to reflect the immediacy needed to address … exceedances in critically impacted portions of the Aqueduct." (Sep. 30, 2022 SWP Letter, p.11)

[8] Regarding P/MAs, those specified in the 2024 Draft GSP are geared toward eliminating subbasin overdraft. These P/MAs appear to be mostly carryovers of P/MAs identified in earlier versions of GSPs. Unfortunately, they have no specific subsidence thresholds that would trigger their implementation. Further, whereas the proposed water balance P/MAs are anticipated to benefit land subsidence (and other sustainability indicators), they are also not specifically focused on the Aqueduct, and do not have SMC triggers for subsidence.

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APPENDICES

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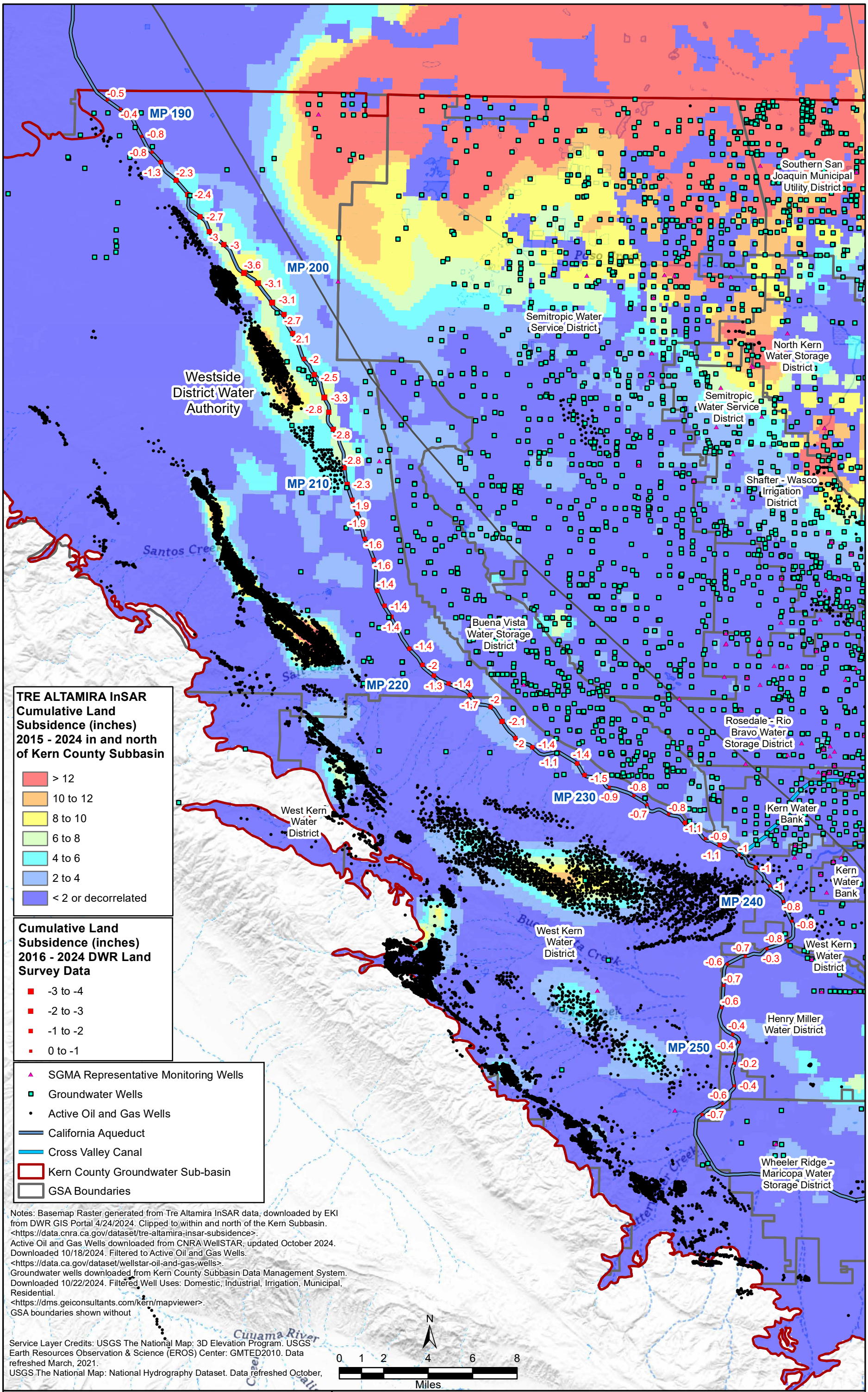
APPENDIX A SUBSIDENCE IN THE NORTHERN AND SOUTHERN POOLS



Notes: Basemap Raster generated from Tre Altamira InSAR data, downloaded by EKI from DWR GIS Portal 4/24/2024. Clipped to within and north of the Kern Subbasin. <https://data.cnra.ca.gov/dataset/tre-altamira-insar-subsidence>.
Active Oil and Gas Wells downloaded from CNRA WellSTAR, updated October 2024. Downloaded 10/18/2024. Filtered to Active Oil and Gas Wells. <https://data.ca.gov/dataset/wellstar-oil-and-gas-wells>.
Groundwater wells downloaded from Kern County Subbasin Data Management System. Downloaded 10/22/2024. Filtered Well Uses: Domestic, Industrial, Irrigation, Municipal, Residential. <https://dms.geiconsultants.com/kern/mapviewer>.
GSA boundaries shown without

Service Layer Credits: USGS The National Map: 3D Elevation Program. USGS Earth Resources Observation & Science (EROS) Center: GMTED2010. Data refreshed March, 2021.
USGS The National Map: National Hydrography Dataset. Data refreshed October,

Kern County Subbasin
Groundwater Sustainability Plan

Sources:

OIL WELLS AND SUBSIDENCE IN THE NORTHERN AQUEDUCT MP 189 TO 254

AQL N:\GIS\043-04A WDWA Subsidence\Events\20241014_PoolSubsidence\20241025_GSAFrmt_OilWells.mxd - 20241028

MP 254.5

MP 278

Legend

- Active Pumping Wells
- Active Oil and Gas Well
- California Aqueduct

Groundwater Subbasin

- Kern County (DWR 5-022.14)
- White Wolf (DWR 5-022.18)

Cumulative Land Subsidence - Lining Markers (inches)

2016 - 2024 CASP Precise Survey

- <-8
- -8 to -7
- -7 to -6
- -6 to -5
- -5 to -4
- -4 to -3
- -3 to -2
- -2 to -1
- -1 to 0

Change in Ground Surface Elevation

(June 2015 to January 2024)

- > 1 ft
- 10 - 12 inches
- 8 - 10 inches
- 6 - 8 inches
- 4 - 6 inches
- 2 - 4 inches
- < 2 inches

Abbreviations

CNRA = California Natural Resources Agency
CASP = California Aqueduct Subsidence Program

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map.
2. Active Production Wells provided by WRMWSD on 30 July 2024.
3. InSAR subsidence data downloaded from CNRA's TRE ALTAMIRA Subsidence Data on 24 April 2024.
https://data.cnra.ca.gov/dataset/tre-altamira-insar-subsidence/resource/78ec5fc8-8ec4-48cf-91fa-1d5f22ff5d75
4. CASP Precise Survey downloaded from CNRA's California Aqueduct Subsidence Study on 30 September 2024.
https://data.cnra.ca.gov/dataset/california-aqueduct-subsidence-study/resource/25e03d20-9c4c-460e-9a1e-a7342abdf686
5. Oil and gas wells downloaded from CalGEM GIS data on 27 September 2024.
https://gis.conservation.ca.gov/portal/home/item.html?id=43f012f07a264138ab5aa58187f32ed3

SUBSIDENCE IN THE SOUTHERN POOLS

Kern County Subbasin
Groundwater Sustainability Plan

0 0.5 1 2 3 4
Miles

N

Service Layer Credits:

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APPENDIX B TABLE OF HISTORICAL SUBSIDENCE DOCUMENTS

Historical Subsidence Studies

Source	Title	Takeaway	Link
DWR, 1964 (May)	Land Subsidence Along the California Aqueduct as Related to the Environment	*"The best method of construction has proven to be compaction of the soils by ponding and injection of water through gravel packed infiltration prior to construction…"* The Aqueduct adjacent to the LHOF was not hydro-compacted prior to construction.	Copy available upon request
DWR, 1964 (December)	Design and Construction Studies of Shallow Land Subsidence for the California Aqueduct in the San Joaquin Valley-Interim Report	"*Unless properly treated shallow land subsidence could make the Aqueduct inoperative*". According to this report, no pre-compaction ponding (i.e., hydro-compaction) was conducted by DWR adjacent to LHOF.	Copy available upon request
Chevron, 1992 (June)	Reservoir Compaction and Surface Subsidence above Lost Hills Field, California	In the report, Chevron stated that; "*The surface above the Lost Hills Field has been subsiding since the early 1950's and has recently accelerated due to expanded well development in the late 1980's."* Further, *"…surface subsidence have been associated with oil and gas production from several diatomite reservoirs in the area during the past 40 years."*	https://inis.iaea.org/search/search.aspx?orig_q=RN:25052130

Historical Subsidence Studies

Source	Title	Takeaway	Link
Mobil, 1993 (October)	Lost Hills Diatomite Simulation Study: Predicting Waterflood Performance in a Low-Permeability, Compacting Reservoir	*"In the late 1980's, it became evident that production from the tightly spaced (as low as 0.42 acre) development of these highly compressible, low permeability reservoir was resulting in reservoir compaction and surface subsidence. Since 1985, shear failure of well casings associated with subsidence caused the loss of more than 100 wells in the nearby south Belridge Field."* The LHOF diatomite reservoir is adjacent to the Aqueduct embankment failure at MP 208.	https://onepetro.org/SPEATCE/proceedings-abstract/93SPE/All-93SPE/SPE-26627-MS/55237?redirectedFrom=PDF
Chevron, 1993 (October)	An Improved Recovery and Subsidence Mitigation Plan for the Lost Hills Field, California	With regards to the LHOF, the report states: "*Massive hydraulic fracturing … has been employed since the mid-1980s to accelerate recovery."* … *"the accelerated fluid withdrawal and associated pressure depletion has increased compaction of the highly compressive diatomite."*	https://onepetro.org/SPEATCE/proceedings-abstract/93SPE/All-93SPE/SPE-26626-MS/55171
JPL/Caltech 1998 (September)	Rapid Subsidence Over Oil Fields Measured by SAR Interferometry	*"The major oil reservoir is high porosity and low permeability diatomite. Extraction of large volumes from shallow depths causes*	https://agupubs.onlinelibrary.wiley.com/doi/10.1029/98GL52260

Historical Subsidence Studies

Source	Title	Takeaway	Link
JPL/Caltech 1998 (September) (Continued)	Rapid Subsidence Over Oil Fields Measured by SAR Interferometry	*reduction in pore pressure and subsequent compaction, forming a surface subsidence bowl."* and further, *"Maximum subsidence rates are as high as 40 mm in 35 days or > 400 mm/yr, measured from interferograms with time separations ranging from one day to 26 months. The 8- and 26- month interferograms contain areas where the subsidence gradient exceeds the measurement possible with ERS SAR..."* and further *"This modeling shows that a volume change of roughly 1.5 x 10^6 $m^3 \cdot yr^{-1}$ in the rock units at depth is sufficient to cause the observed signal for the Lost Hills oilfield."*	https://agupubs.onlinelibrary.wiley.com/doi/10.1029/98GL52260
Stanford,. Xu, H., Dvorkin, J., & Nur, A., 2001 (April)	Linking Oil Production to Surface Subsidence from Satellite Radar Interferometry	*"An InSAR 105-day period (11/5/95 to 2/17/96),monitored subsidence at the center of LHOF, which reached 15 cm. This was interpreted to be due to oil production." "Efforts to mitigate the effect of subsidence (e.g., via water injection) have been only partly successful because well failure persisted [Wallace and pugh, 1993; Fast et al., 1993]."*	https://agupubs.onlinelibrary.wiley.com/doi/abs/10.1029/2000GL012483

Historical Subsidence Studies

Source	Title	Takeaway	Link
Stanford,. Xu, H., Dvorkin, J., & Nur, A., 2001 (April) (continued)	Linking Oil Production to Surface Subsidence from Satellite Radar Interferometry	*"…Hydrocarbon production and surface subsidence can be quantitively linked to each other." "Therefore, it is possible, in principle, to monitor hydrocarbon production, and, in general, pore-fluid-related changes in the subsurface using InSAR data."*	https://agupubs.onlinelibrary.wiley.com/doi/abs/10.1029/2000GL012483
Aera Energy,. Van der Kooij, M., & Mayer, D., 2002 (June)	The Application of Satellite Radar Interferometry to Subsidence Monitoring in the Belridge and Lost Hills Fields, California	*"Production from weak, compactable, and low permeability diatomite oil reservoirs in the Belridge and Lost Hills fields in California has resulted in subsidence. The subsidence cause significant costs due to well failures." "InSAR deformation data have been compared to and validated with a series of GPS monument survey measurements in the Lost Hills field. These comparisons have shown the InSAR deformation data accuracy to be at sub-cm Level." "The data have added spatial definition to several subsidence bowls which formed over the most productive portions of each of these two fields."*	https://ieeexplore.ieee.org/document/1024987

Historical Subsidence Studies

Source	Title	Takeaway	Link
Shi, J., Xu, B., Chen, Q., Hu, M., & Zeng, Y., 2022 (January)	Monitoring and Analysing Long-Term Vertical Time-Series Deformation Due to Oil and Gas Extraction Using Multi-Track SAR Dataset: A Study on Lost Hills Oilfield	*"The multi-temporal interferometric synthetic aperture radar (MT-InSAR) technique can reveal the ground deformation history during the oil and gas extraction period. The timeseries deformation results derived by MT-InSAR have been proven to be spatially correlated with the location of the injection and oil production wells in the area."*	https://www.sciencedirect.com/science/article/pii/S0303243422000058

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APPENDIX C SUBBASIN SUBSIDENCE IM & MT EXCEEDANCE PLAN

Action Plan for Subsidence IM & MT Exceedance

0. Initial Notification
    - After a single Mile Post (MP) IM rate and extent exceedance (based on Precise Survey data), GSA or HCM area average after 6 quarterly consecutive sampling events exceeds the IM rate and extent (based on DWR InSAR data)
        - Was this exceedance previously identified?
            - If yes, initiate subsidence exceedance assessment plan, steps 1-3.
            - If no, initiate subsidence exceedance assessment plan, step 1.
        - Identify potential beneficial users at risk
    - After a single MP MT rate or extent exceedance (based on Precise Survey data), GSA or HCM area average after 6 quarterly consecutive sampling events exceeds the MT rate or extent (based on DWR InSAR data)
        - Was this exceedance previously identified?
            - If yes, did GSA take management actions to address? If exceedance persists so that the average after 6 quarterly consecutive sampling events exceeds the MT rate, additional GSA management action (e.g., pumping cutbacks) must be initiated, the area of which to be determined as part of the following investigative steps 1 – 3.
            - If no, initiate subsidence exceedance assessment plan, steps 1 – 5.
        - Identify potential beneficial users at risk

1. Identify Exceedance and Investigate
    - Locate nearby wells and identify status and use, document any new wells or groundwater users.
    - Map land use and compare changes in local land use
    - Describe local geology
    - Plot hydrographs of nearby Subbasin wells
    - Plot cumulative displacement since 2015 based on InSAR and DWR/Friant precise survey
    - Document GSA operating conditions (i.e. water demand patterns, surface water availability etc.)

- Document GSA-related groundwater extractions using either direct methods (metered data) or indirect methods (Land IQ, or best available data)If data availability allows, estimate critical head using 1-D modeling

2. Review Outside Contributing Factors
   - Communicate with neighboring GSAs and Subbasins
   - Review regional contour maps and/or DMS for the RMS network groundwater levels
   - Review for potential non-GSA factors: map local soil types, identify nearby faults, identify nearby oil and gas operations and quantify extractions and reinjections using data provided on CalGEM dashboard.

3. Evaluate Root Cause
   - For groundwater levels:
     - Analyze trend in water levels since 2015 using observed hydrograph data, Mann-Kendall test, or equivalent
     - Assess seasonal variation and range of water levels
     - Document changes in local demand
     - Have current water levels exceeded the estimated critical head (if available), or historical low groundwater level?
   - For groundwater storage:
     - Have groundwater extraction volumes within 2.5 miles of the exceedance location increased or decreased in the last 1-3 years relative to the period of time preceding the exceedance?
     - Has groundwater extraction concentration within 2.5 miles of the exceedance location increased or decreased in the last 1-3 years relative to the period of time preceding the exceedance?
   - For direct measurements of land subsidence (land-based survey or InSAR):
     - Analyze trend
     - Assess for seasonal variation
     - Identify exceedance cause by assessing DWR TRE-Altamira quarterly Subbasin InSAR Data for previous six consecutive quarters to the reported MT exceedance location (i.e., surrounding 2.5-mile radius), with the previous annual DWR or Friant survey data for the MP with the MT exceedance, identify all wells and uses in the assessment area, if non-GSA activities identified, collect and review supplemental evidence (e.g., CalGEM production information, Underground Injection Control (UIC)

Application data etc.) published hydrogeologic information, determine if a more refined InSAR analysis is required (i.e., InSAR Time Series utilizing 12-step data processing utilized for refined assessment provided in the 2024 GSP Section 8.5).

4. Evaluate and Initiate P/MAs
    - Evaluate need for targeted P/MAs
        - Identify area of influence for P/MAs
    - Identify & initiate targeted P/MAs (e.g., well registration, new well moratorium, metered production, pumping cutbacks)Consider need for increased monitoring until the next survey measurement:
        - For groundwater levels, collect monthly data
        - For groundwater storage, collect monthly data
        - For land subsidence, compile available direct measurement data (e.g. quarterly DWR InSAR)

5. Report to Coordination Committee and CASP/Friant as appropriate or local infrastructure owner
    - Is the exceedance related to GSA actions
        - If yes, report on P/MA(s) initiated
        - If no, continue to monitor
    - Evaluate if additional monitoring is needed

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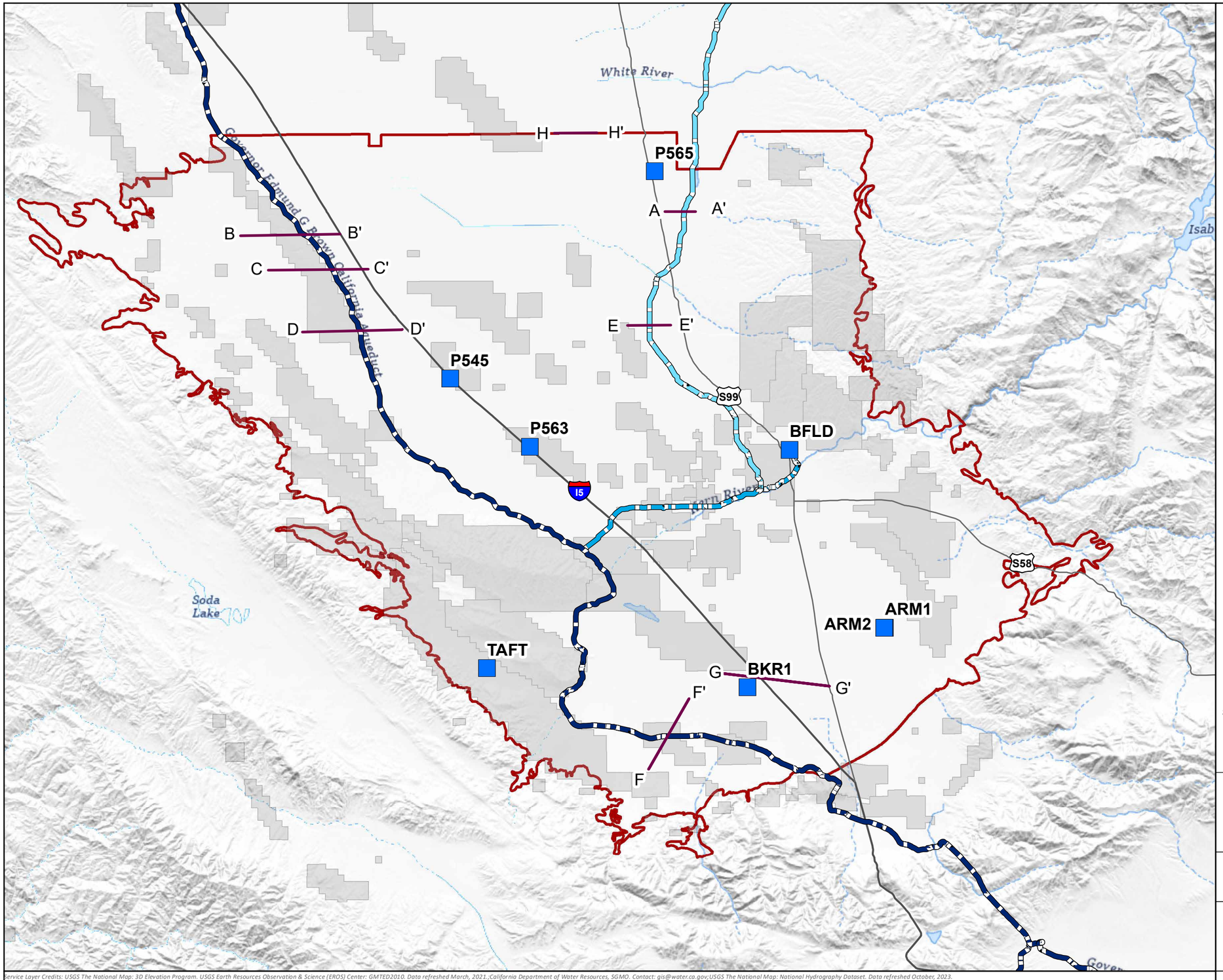
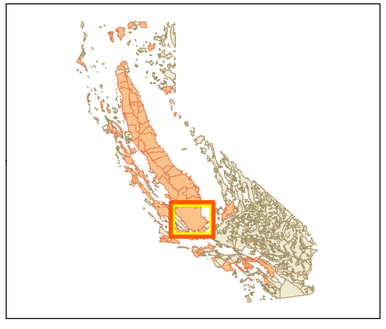
APPENDIX D LOCATIONS OF TRANSECTS AND COMPARISON OF SUBSIDENCE CURVES



Legend

- Time Series Point Locations (GPS Stations)
- Time Series Track Locations (InSAR)
- California Aqueduct
- Friant-Kern Canal
- Cross Valley Canal
- Oilfield Administrative Boundaries
- Kern County Groundwater Sub-basin



Sources:

GPS AND INSAR TRANSECT LOCATIONS

Kern County Subbasin
Groundwater Sustainability Plan

0 2 4 8 12 16
Miles

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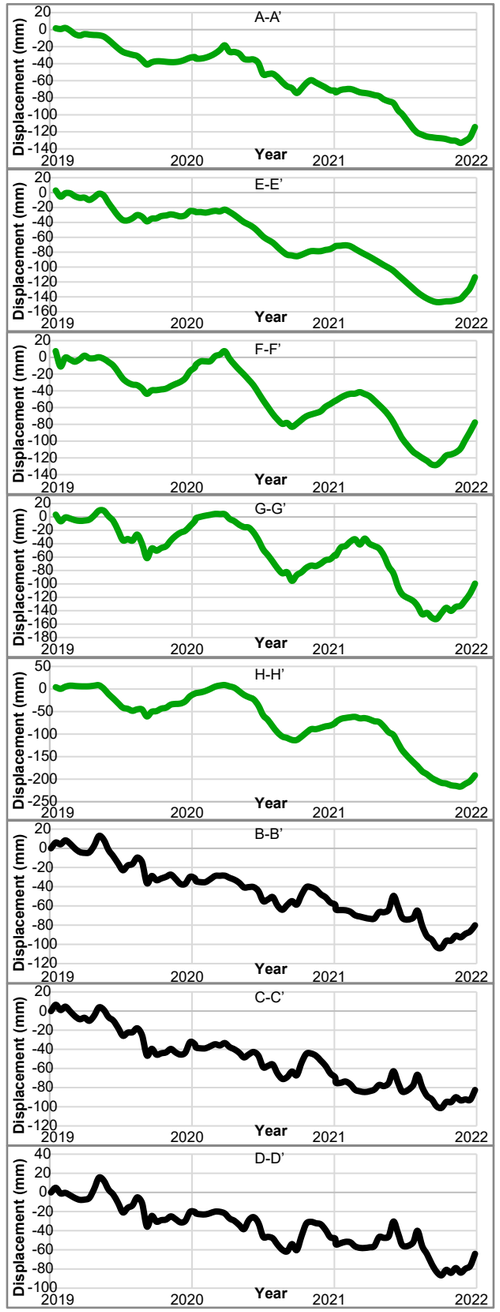
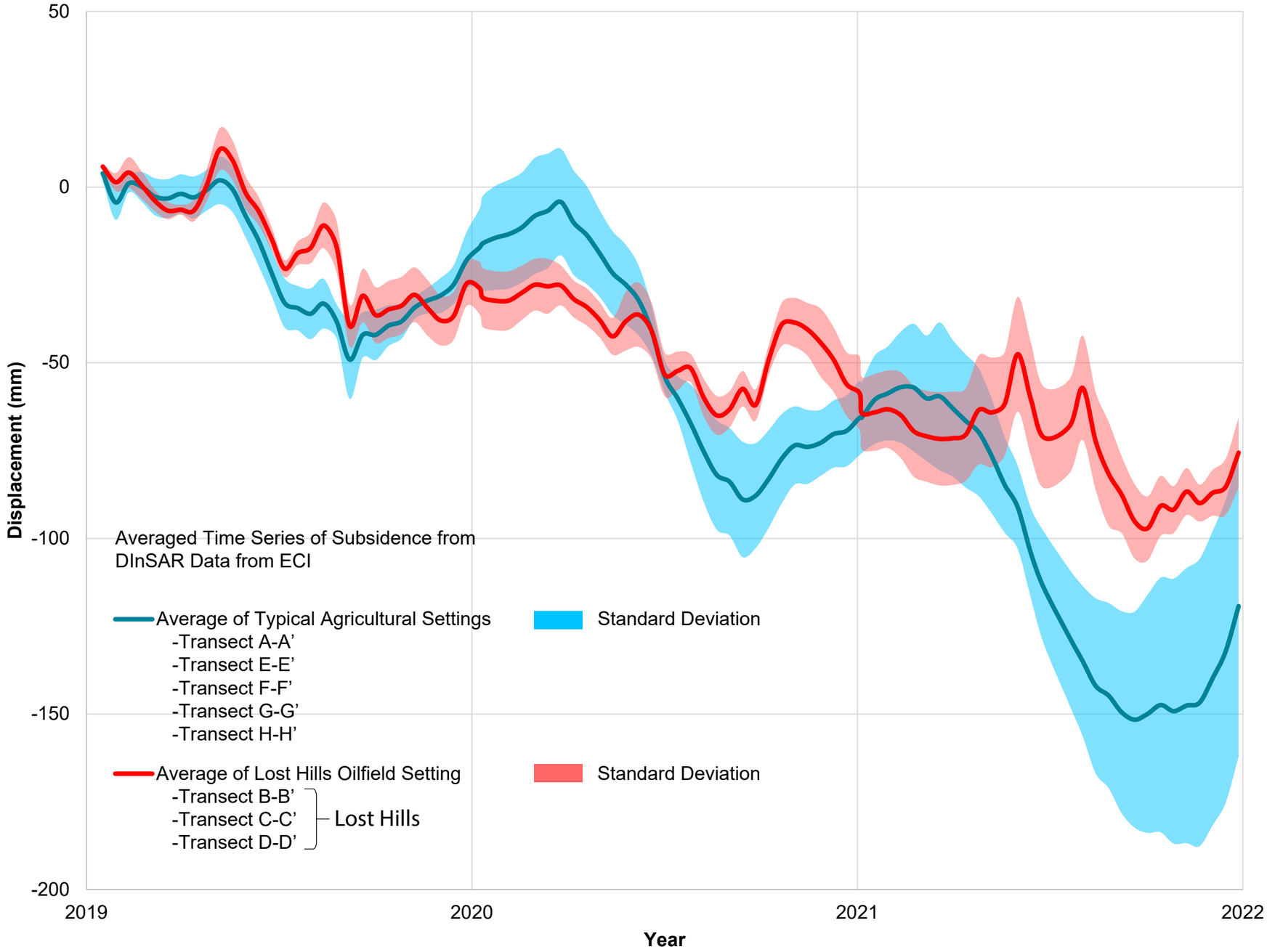
Service Layer Credits: USGS The National Map: 3D Elevation Program. USGS Earth Resources Observation & Science (EROS) Center: GMTED2010. Data refreshed March, 2021.;California Department of Water Resources, SGMO. Contact: gis@water.ca.gov;USGS The National Map: National Hydrography Dataset. Data refreshed October, 2023.

20241111 N:\GIS\043-04A WDWA Subsidence\Events\20241014_PoolSubsidence\Figure BP 8 13 Transect Locations.mxd CONSULTANT/USER INITIALS





Individual Time Series of Subsidence from DInSAR Data from ECI

- Typical Agricultural Settings
- Lost Hills Oilfield Setting

Source: ECI. 2022.

DECEMBER 2024

CURVE COMPARISON

Kern County Subbasin
Groundwater Sustainability Plan

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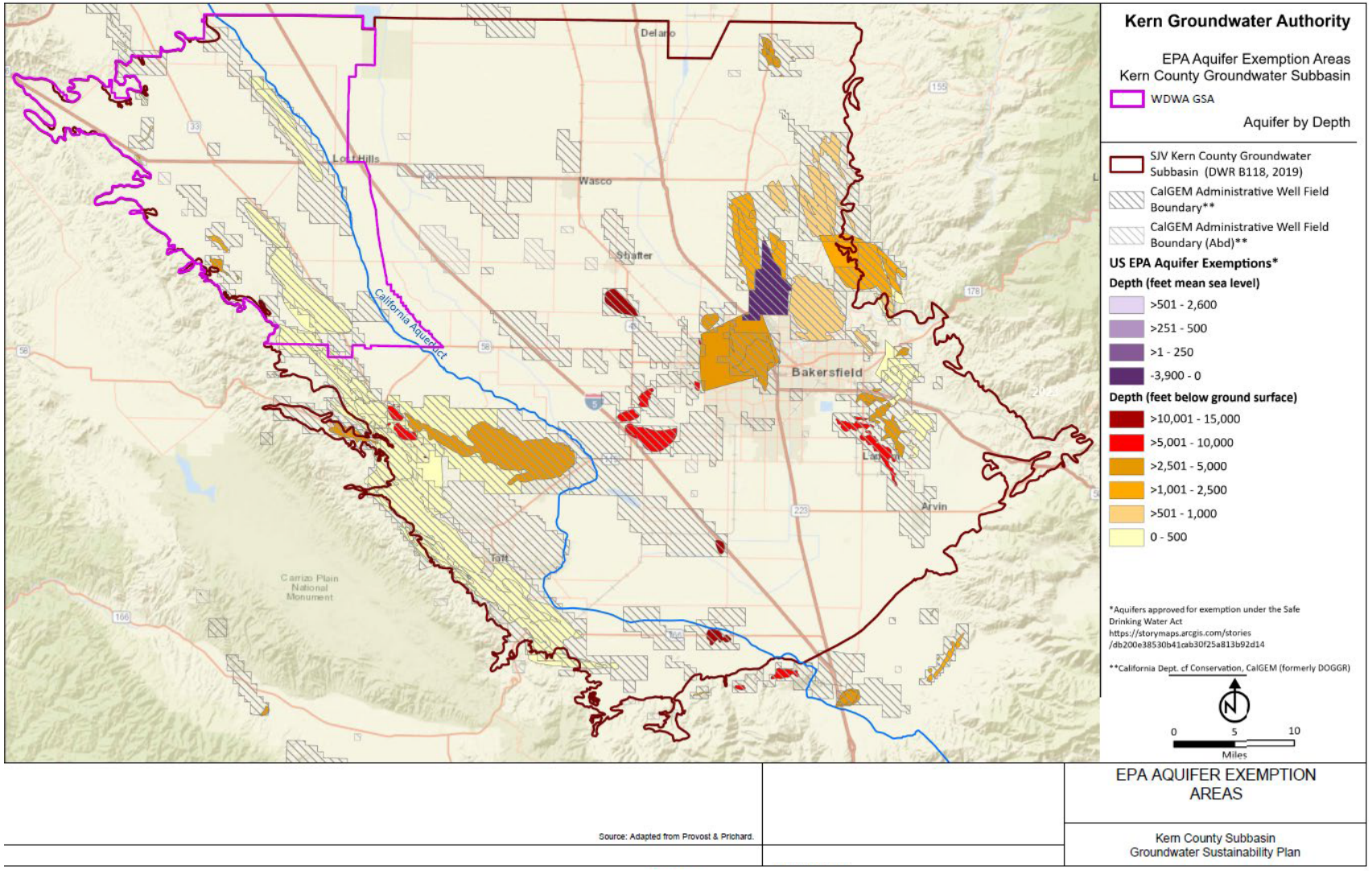
APPENDIX E OILFIELD EXEMPTIONS

Subbasin Exemption Areas



Source: Adapted from Provost & Prichard.

EPA AQUIFER EXEMPTION AREAS

Kern County Subbasin
Groundwater Sustainability Plan

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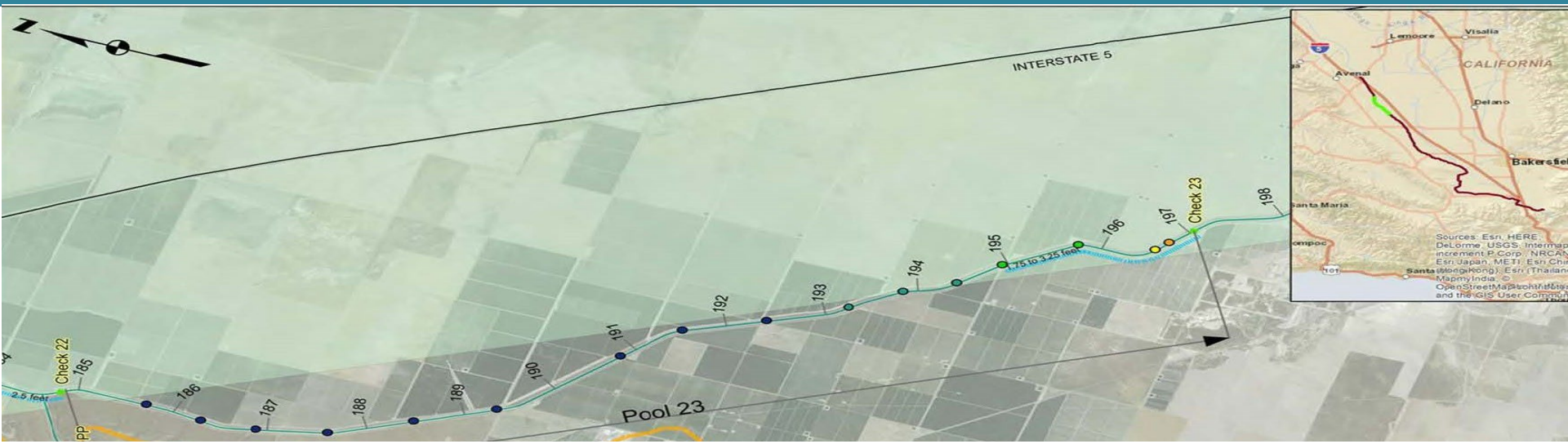
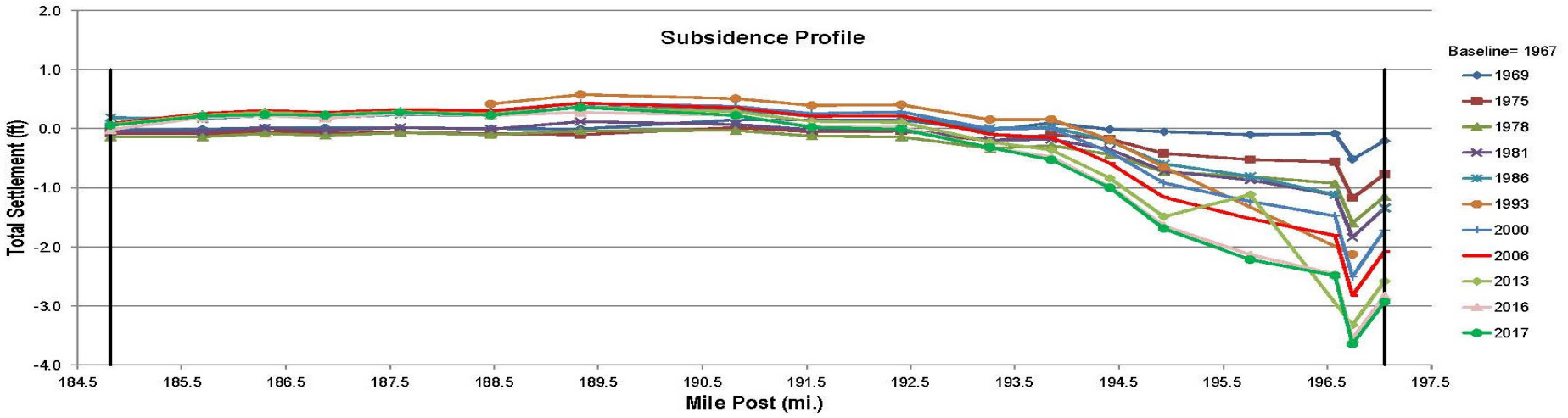
APPENDIX F SUBSIDENCE PROFILES FROM SURVEY DATA (DWR, 2019) PLATES 12 THROUGH 14

2019 DWR Report Plate 12: MP 185 – 197





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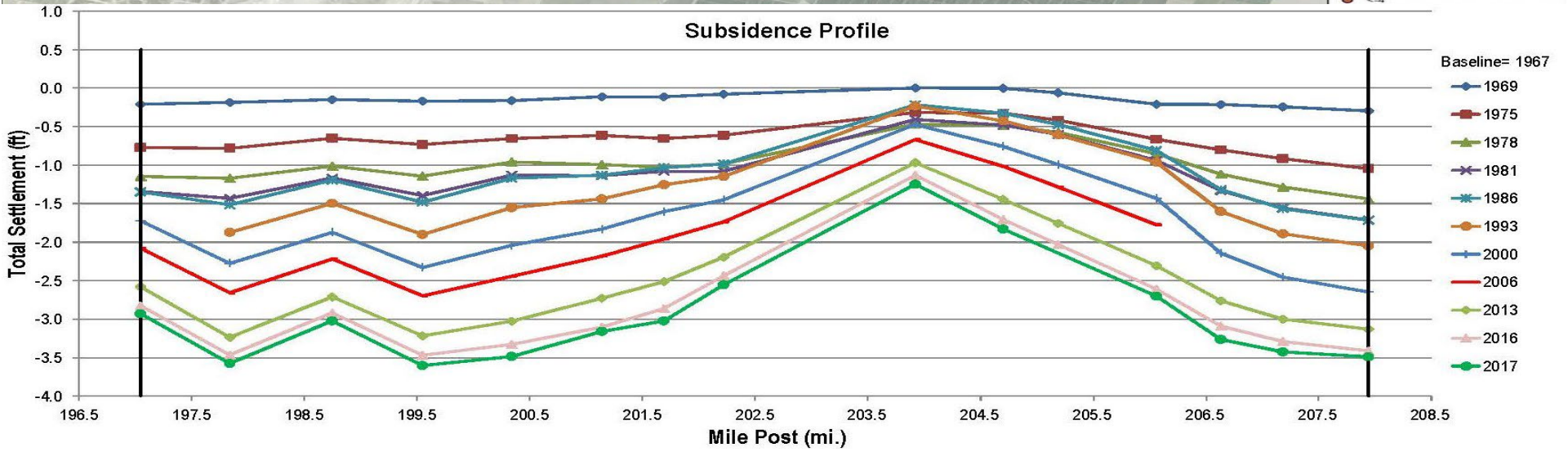
2019 DWR Report Plate 13: MP 197 – 208



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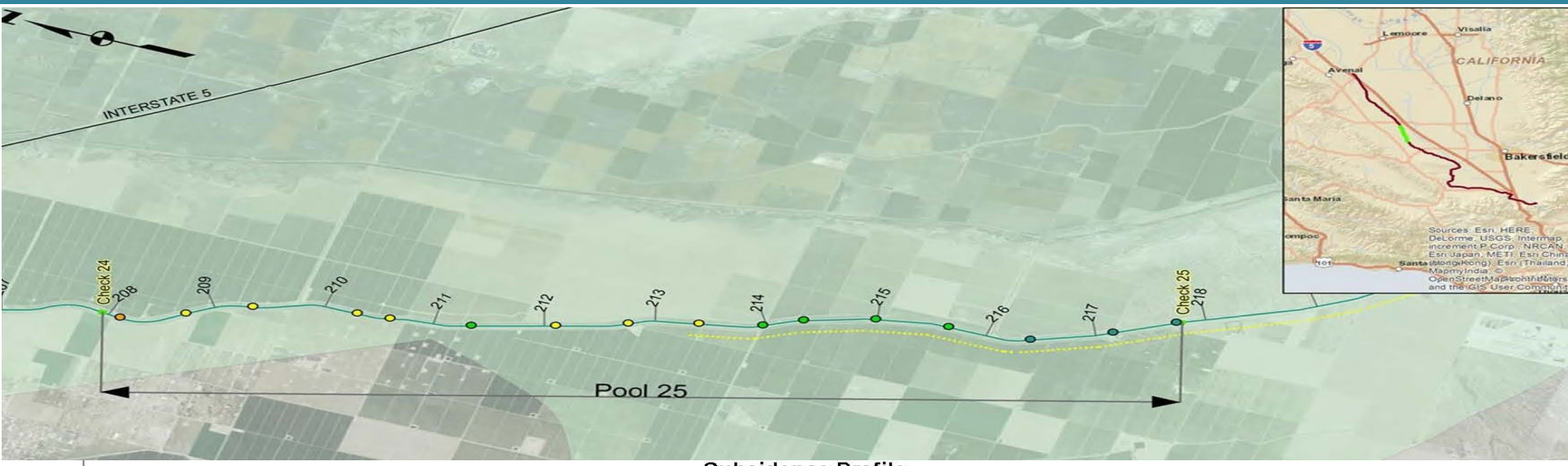
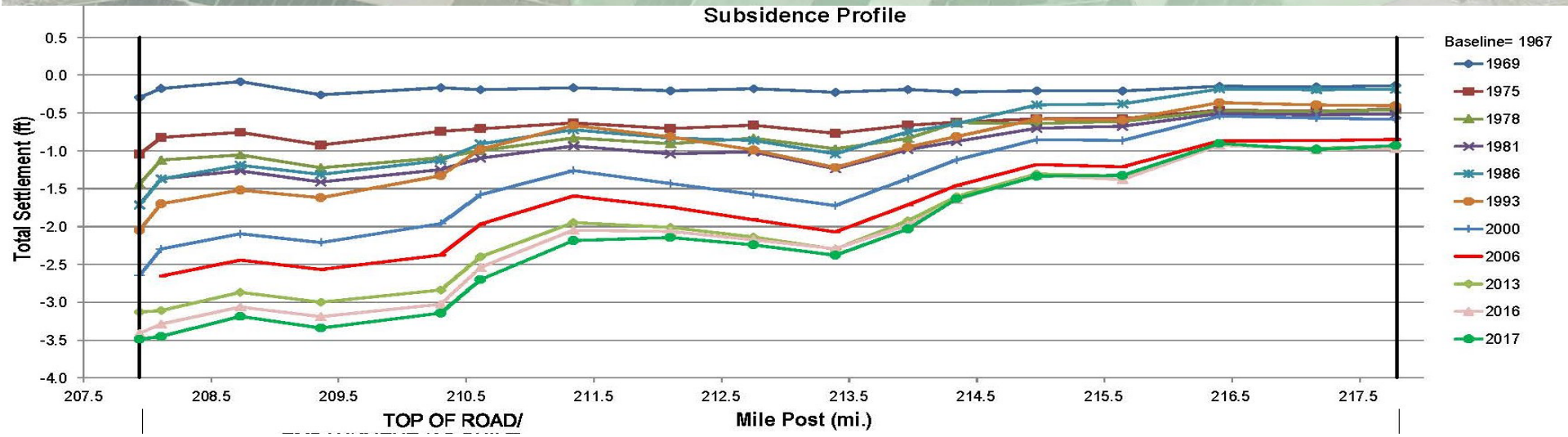
2019 DWR Report Plate 14: MP 208 – 218





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Summary of Public Comment Letter #4

RE: Draft Stakeholder Communication and Engagement Plan (SCEP) for Kern Subbasin

November 4, 2024, Clean Water Action (CWA) et al Comments re Draft SCEP
The Clean Water Action (CWA) et al, 1. **Lack of Governance** from the Subbasin and failure to provide any centralized contact makes it difficult for stakeholders to provide any meaningful input. 2. **Disadvantaged Community Identification and Engagement** claims the SCEP only identifies 2 disadvantaged communities and suggests using the SAFER Dashboard to identify disadvantaged communities in Kern County, and to develop a strategy to engage these disadvantaged communities. 3. **Stakeholder Engagement** requires a strategy to engage disadvantaged communities, identify their concerns, and consider how they are impacted. 4. **Direct Community Outreach** should include door-to-door outreach, posting information/flyers at key locations, attending local community meetings and events, and leveraging local networks. 5. **Meeting Accessibility, Virtual Meetings** are absolutely crucial for achieving equitable stakeholder engagement in Kern. The community-based organizations encourage all 20 GSAs to offer virtual and/or call-in options and to include translations services for full community participation. 6. **Language Accessibility** must consider translation services for the language spoken with more than 5 percent of the population in a community. At a minimum, Spanish and Punjabi translation should be provided at all meetings and outreach materials. **2024 Plan Review (August 30, 2024 letter)** echoes SWRCBs Draft Staff Report with claims that the 2024 Plan fails to adequately define and avoid Undesirable Results for Groundwater Levels and Quality, lacks engagement from the Stakeholder community, does not feature a Well Mitigation Program, and fails to adequately address ongoing degradation of groundwater quality.
December 9, 2024, Subbasin GSAs Response to CWA et al Comments
The Kern Subbasin GSAs appreciate Clean Water Action, et al. in their efforts to guide inclusive stakeholder engagement and inform on key issues that DAC communities are facing. In our response letter, we're pleased to highlight sections of the final SCEP and 2024 Plan where the commenting organizations can find how their comments are incorporated into the final Plan. Representatives of these organizations are strongly encouraged to review the 2024 Plan sections 5, 8 and 13 to gain first-hand knowledge of the Plan Area (GSAs, water resources, management practices, well inventory, community water systems, and stakeholder engagement during Plan

development); characterization of groundwater conditions; and the Subbasin's Undesirable Results Definition with descriptions of the Well Impact Analyses that were conducted to establish what constitutes significant and unreasonable impacts. The Subbasin GSAs strongly believe that the 2024 Plan complies with SGMA, the state's Human Right to Water goal, as well as all other applicable state and federal regulations related to groundwater management.

Kern County Subbasin
Groundwater Sustainability Agencies

December 10, 2024

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RE: Response to Clean Water Action, et al, Comment Letter on the Draft Stakeholder Communication and Engagement Plan (SCEP) for Kern Subbasin.

Dear Mac Glackin, Tien Tran, Nataly Escobedo Garcia, and Nayamin Martinez,

Thank you for the comments submitted on behalf of Clean Water Action, et al, in your November 4, 2024 letter *Comments Regarding the Draft Stakeholder Communication and Engagement Plan for Kern Subbasin*. This letter is provided as a response to comments received on the Draft 2024 Kern County Subbasin Groundwater Sustainability Plan (Draft 2024 Plan), which includes the Draft Stakeholder and Engagement Plan (Draft SCEP). Additional content was provided or incorporated into the Final 2024 Plan and Final SCEP as referenced.

The following sections provide a summary of each comment received and responses to assist your organizations with identifying how feedback was incorporated into the Final 2024 Plan and Final SCEP. The Final 2024 Plan adopted by the Subbasin GSAs, appendices (including the Final SCEP), and supplemental information are posted on KernGSP.com.

COMMENT SUMMARY WITH SUBBASIN RESPONSES

Comment 1. Lack of Governance. Lack of governance from the Subbasin and the failure to provide any centralized contact, which makes it difficult for stakeholders to provide meaningful input. The Draft SCEP must contain details of the specific plans for each of the GSAs included in the 2024 Plan.

Response to Comment 1. As part of the 2024 Plan development process, the Kern County Subbasin GSAs (Subbasin or GSAs) amended and restated their Coordination Agreement ("Second Amended Kern County Subbasin Coordination Agreement," Appendix C), which establishes the governance structure for the GSAs and requires

designated representatives from each GSA to participate in coordination activities and certain subbasin-wide project and management actions. Draft SCEP Section 1.1.1 was updated in the final version to provide three options for landowners to find their local GSA in the final version. Subbasin contact information is provided below with a list of locations you can also find updates when needed. This information is also provided on the Department of Water Resources (DWR) SGMA Portal, which is available to the public as highlighted below.

Kern County Subbasin Plan Manager/Point-of-Contact Information:
Kristin Pittack
kpittack@rinconconsultants.com
559-228-9925

- SCEP *Section 2.1.2 Plan Manager*
- 2024 Plan *Section 3.3, Kern County Subbasin Plan Manager / Point of Contact*
- KernGSP.com/contact-us
- DWR SGMA Portal

Comment 2. Disadvantaged Community Identification. The Draft SCEP only identifies two disadvantaged communities, and the list of disadvantaged communities should be revisited using the SAFER Dashboard.

Response to Comment 2. The Final SCEP clarifies the number of DACs with amended language. *Section 3.2* identifies DACs as being within the Focused Initiatives Outreach Engagement group type, and *Section 5.2* describes DAC participation on GSA Boards in the Subbasin.

Comment 3. Equitable Stakeholder Engagement. The Draft SCEP must include a strategy to engage disadvantaged communities, identify their concerns, consider how they are impacted and identify ways to minimize those impacts. The Draft SCEP must also examine how stakeholder engagement is administered across the Subbasin.

Response to Comment 3. During the 2024 Plan development, representatives from several DAC communities (Arvin, Greenfield, Lamont, Buttonwillow, Shafter, Wasco, McFarland, and Delano) were engaged in GSA and Subbasin meetings; many of these representatives serve as member of a GSA or GSP subcommittees. Additionally, to reach domestic well owners, the GSAs are partnering with Self-Help Enterprises (SHE), Kern Water Collaborative (KWC), and the Water Association of Kern County (WAKC) to assist with community education and outreach and engagement. The Subbasin's relationship with these organizations is detailed in the following Final 2024 Plan sections:

- 2024 Plan *Section 5.10.3.3 Stakeholder Involvement*
- SCEP *Section 3, Table 1. Direct Representation of Small Community Water Systems and DAC Communities on GSAs and GSA Groups Boards*

- SCEP *Section 5.2, Table 2*. The GSAs aim to engage residents of DACs and SDACs through continued participation of community representatives on GSA Boards and GSA subcommittees. Urban representation of DACs is primarily provided by the City of Bakersfield and Cal Water participating in the KRGSA, and West Kern Water District. Smaller municipalities and incorporated communities were directly involved in the development of all Sustainable Management Criteria (SMCs) and selection of the SGMA monitoring network sites. These stakeholders included:
    - Arvin Community Services District, Greenfield County Water District, Buttonwillow Community Services District, City of Shafter, and City of Wasco.

Comment 4. Direct Community Outreach. Importance to conduct meaningful engagement that directly reaches residents, including door-to-door outreach, posting information/flyers at key locations, attending local community meetings and events, and leveraging local networks, including schools. The SCEP should identify the types of outreaches as it has utilized and plans to utilize.

Response to Comment 4. The GSAs have and will continue to engage stakeholders through the recommended approaches described in the SCEP. As described in the Final SCEP, through the GSAs partnerships with SHE, KWC, Farm Bureau Kern Chapter, and WAKC, the following methods of education, outreach, and engagement will be employed:

- Virtual stakeholder workshops, annual meetings with local water well contractors, community events like Kern County Fair Water Day and Annual Water Awareness Events.
- Outreach through social media campaigns, publications in local newspapers, Kern Talk radio, and news segments focused on community issues.
- GSA partnerships with the communities of Delano, McFarland, Shafter, Wasco, Greenfield, Arvin, Lamont, Bakersfield, and the County of Kern have established representatives to participate in local community events to promote the mitigation programs. Examples include Earth Day, Farmers Markets, and Resource Fairs.
- The Subbasin well inventory will be used to identify current domestic well owners. As appropriate, informational flyers or postcards will be provided to these households to inform residents of the Kern County Subbasin Mitigation Program with contact information.
- In the event of a confirmed Minimum Threshold (MT) Exceedance for the sustainability indicators of groundwater levels and/or water quality, notices will be mailed to potentially impacted residents to inform of an exceedance, advising of potential impacts (including health effects related to a water quality exceedance), and recommending outreach to SHE and their local GSA representative.

Comment 5. Meeting Accessibility, Virtual Meetings. Inclusion of a virtual option for meetings as crucial for achieving equitable stakeholder engagement.to facilitate participation from residents who are unable to participate in-person due to time limitations, health limitations, lack of transportation, and/or lack of accessibility to the meeting location. Encouraged GSAs to offer virtual and/or call-in meetings and to include translations services to ensure full community participation.

Response to Comment 5. The GSAs host meetings that are open to the public with accessible locations throughout the Subbasin. Appendix I of the Final 2024 Plan provides tables of meetings and events hosted over the past two years. Table 4 in Appendix I provides a summary of GSA Board and other GSA meetings hosted with virtual participation options.

Comment 6. Language Accessibility. Spanish and Punjabi translation should be provided at all meetings and for all outreach materials. Additional languages should be considered for populations that make up more than 5 percent of the population of a given community.

Response to Comment 6. Three Subbasin public workshop events were held with in-person and virtual options on October 3, 2024. The workshop presentations focused on educating the public regarding the Final 2024 Plan, which included presentation translation from a third-party consulting firm. Additionally, Spanish and Punjabi translators were present at these workshops. The GSAs have provided SGMA-related updates and notices of adoption to various media outlets in both English and Spanish to ensure language accessibility and increase the reach of information-sharing efforts.

Comment 7. Draft 2024 Plan Review. The Draft 2024 Plan fails to adequately define and avoid undesirable results for groundwater levels and quality, lacks engagement from the stakeholder community, does not feature a well mitigation program, and fails to adequately address ongoing degradation of groundwater quality.

Response to Comment 7. We encourage review of the Final 2024 Plan, which includes a Mitigation Program (Appendix K) and updated SCEP (Appendix H) and are posted to KernGSP.com. The GSAs developed the Final 2024 Plan to address DWR and SWRCB deficiencies as noted in your letter comments. Please reference the other responses in this letter regarding stakeholder and community engagement as reflected in the Final SCEP.

In closing, we wanted to acknowledge appreciation for the opportunity to have held several workshops and meetings with your organizations to address these comments directly. The Subbasin looks forward to continuing engagement with your organizations during implementation of the 2024 Plan.

Respectfully Submitted,

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November 4, 2024

Kern County Subbasin Groundwater Sustainability Agencies, Kristin Pittack, *Senior Water Resources Planner*

Re: Comments Regarding Draft Stakeholder Communication and Engagement Plan for Kern Subbasin

To Whom It May Concern,

In August, our organizations submitted public comments on the 2022 and 2024 Revised Groundwater Sustainability Plans (GSP) to ensure the Kern Subbasin (Subbasin) complies with the Sustainable Groundwater Management Act (SGMA), Human Right to Water, and state and federal civil rights law, among other laws and regulations. Now, we write to provide recommendations regarding the Kern County Subbasin: Draft Stakeholder Communication and Engagement Plan (SCEP).

We appreciate that the Subbasin has made their draft SCEP available for review and public comment. However, releasing a plan for stakeholder engagement after the GSP is complete almost inevitably means that stakeholder engagement has been inadequate. The SCEP must identify how it will update its processes to accommodate the needs of stakeholders that have been left out of the process to date and then change GSPs and/or amend projects and management actions to incorporate those changes.

Lack of Governance

The failure of the Kern County Subbasin Groundwater Sustainability Agencies to provide any centralized contact or governance structure already makes it difficult for stakeholders to provide any meaningful input on this or other documents produced or actions proposed by this entity. If each of these GSAs plan to implement the SCEP separately, why compile a single document? If this document is indeed meant to represent the plans for each entity, it must contain details of the specific plans for each GSAS meant to be covered by it.

Disadvantaged Community Identification

Under SGMA, the Subbasin must consider the interests of all beneficial uses and users of groundwater, including disadvantaged communities, municipal well operators, and public water systems.[1] While the Subbasin's GSP clearly identifies disadvantaged communities in Figure 5-8,

[1] Water Code Section 10723.2.

the SCEP only identifies 2 disadvantaged communities. It's not clear how the list of communities was so significantly and inappropriately narrowed, but we suggest that this be revisited. We used the SAFER Dashboard[2] to identify 88 small community water systems serving DACs in Kern County. We suggest using this tool to identify communities that need to be targeted by this document.

Equitable Stakeholder Engagement

The Subbasin must fulfill its obligation under SGMA to meaningfully engage impacted groundwater users. The SCEP must include a strategy to engage disadvantaged communities, identify their concerns, consider how they are impacted and identify ways to minimize those impacts. A comprehensive SCEP must include how the GSAs engaged disadvantaged communities and incorporated their conc. The SCEP must also examine how stakeholder engagement is administered across the Subbasin and is used to address the deficiencies determined by the Department of Water Resources (DWR) and State Water Board.

Direct Community Outreach

In addition to posting meeting notices and materials that provide information on meetings and key SGMA implementation updates on the Kern GSAs websites and sending out updates through the GSA interested parties listservs, it is imperative to conduct meaningful engagement that **directly reaches residents**, including: 1) door-to-door outreach, 2) posting information/flyers at key locations, including grocery stores, community centers, religious centers, libraries, water filling stations, and gas stations, 3) attending local community meetings and events, and 4) leveraging local networks, including schools. With approval from school administrative staff, schools can send information/flyers home with students for their parents. The SCEP should identify the types of outreach it has utilized or plans to utilize to reach these communities.

Meeting Accessibility - Virtual Meetings

Inclusion of a virtual option for meeting is absolutely crucial for achieving equitable stakeholder engagement in Kern. Virtual meetings facilitate participation from residents who are unable to participate in-person due to time limitations, health limitations, lack of transportation, and/or lack of accessibility to the meeting location. We encourage all twenty Kern GSAs to offer a virtual and/or call-in option for **all** meetings, including Board meetings, committee meetings, and Subbasin-wide meetings and to include translation services to ensure full community participation. Please see our previous comment letter on virtual/hybrid accessibility for more details.

Language Accessibility

[2] SAFER Dashboard - https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/saferdashboard.html - contains data from the 2024 Drinking Water Needs Assessment - https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/needs.html.

At minimum, Spanish & Punjabi translation should be provided at all meetings and for outreach materials. Additional languages should be considered for populations that make up more than 5% of the population of a given community. It is a best practice to develop multilingual materials tailored to the intended audience. In addition, translation of materials can be provided by DWR through their written translation services.

In its current state, the Draft SCEP is inadequate and will not address the needs of disadvantaged communities in the Kern Subbasin. To best protect all beneficial uses and users of groundwater in the Kern Subbasin, this Draft SCEP (and the affiliated 2024 Revised GSP) must be updated to address these concerns. Please do not hesitate to reach out with any questions or if you wish to meet to discuss our comments and recommendations further.

Sincerely,

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Sent via email

August 30, 2024

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Laura Gage, *District Secretary, lgage@semitropic.com*

Re: Recommendations for Semitropic Water Storage District & Kern County Subbasin on Revised 2024 Groundwater Sustainability Plans

Dear Semitropic WSD & Kern Subbasin,

On behalf of Clean Water Action, Central California Environmental Justice Network, and the undersigned organizations, we are submitting public comments on the Revised 2024 Kern County Subbasin Groundwater Sustainability Plan (GSP) and Semitropic Water Storage District (SWSD) Groundwater Sustainability Plan (GSP). Our organizations are deeply committed to the successful implementation of the Sustainable Groundwater Management Act (SGMA), as well as ensuring that all beneficial users dependent on groundwater as their main source of drinking water are protected from significant and unreasonable impacts. Unfortunately, the revised plan posted on June 1, 2024 still fails to address protections to drinking water users and disadvantaged communities that rely on groundwater as their main source. **The Kern Subbasin GSAs, and Semitropic WSD in particular, must ensure their revised GSPs comply with SGMA, the Human Right to Water, and relevant state and federal laws**.

We want to provide a summary of community specific concerns to illustrate the high stakes of this GSP revision, and how this GSP's deficiencies affect Kern residents. Residents whose water access is managed under the GSA often have to pay twice for water. First, when they pay their water bill, and second, when buying bottled water becomes an essential substitute for well water.

In Lost Hills (Population of 2,400), residents are entirely dependent on groundwater from two public supply wells serviced through Lost Hills Public Utilities District (LHPUD) within SWSD

as their source of drinking water, with a water use rate of approximately 400 acre-feet per year. Lost Hills is already an overburdened community with multiple pollution sources, including the 6th largest producing oil field in California, a gas plant, a hazardous waste facility, a 4-lane Highway going through the center of the community, a major freeway adjacent and the Wonderful company fields north of town.

No public meetings for the GSA have been held in Lost Hills, either for the original 2022 plan or the 2024 revised plan. Meanwhile, Semitropic in 2023 negotiated a reduction in groundwater extraction for this disadvantaged community by providing unreliable State Water Project supplies in lieu of groundwater.

As public agencies, GSAs must adhere to the public participation and inclusivity requirements laid out in SGMA. SGMA regulations require that, "the groundwater sustainability agency shall encourage the active involvement of diverse social, cultural, and economic elements of the population within the groundwater basin prior to and during the development and implementation of the groundwater sustainability plan."[1] In addition, "Disadvantaged communities, including, but not limited to, those served by private domestic wells or small community water systems."[2]

Although Semitropic has made significant improvements in addressing deficiencies identified via the Department of Water Resources (DWR) 2022 GSP deficiency report, we will highlight several deficiencies that remain in the Revised 2024 GSP that will continue to lead to significant and unreasonable impacts in the region. Among the deficiencies are:

1. Unresolved Deficiencies in 2020 GSP that Remain in the Revised 2024 GSP

- **I. The Revised 2024 GSP Fails to Demonstrate Effective Coordination Across the Subbasin**
- **II. The Revised 2024 GSP Fails to Adequately Define & Avoid Undesirable Results for Groundwater Levels and Groundwater Quality**

2. New Deficiencies Identified by SWRCB & NGO Review of Revised 2024 GSP

- **I. The Revised 2024 GSP is Inadequate Due to the Lack of a Stakeholder Community Engagement Plan (SCEP)**
- **II. The Revised 2024 GSP Does Not Feature a Well Mitigation Plan**
- **III. The Revised 2024 GSP Fails to Adequately Address Ongoing Degradation of Groundwater Quality**

[1] Cal. Water Code § 10727.8(a)
[2] Cal. Water Code § 10723.2(i)

1. Unresolved Deficiencies in 2020 GSP that Remain in the Revised 2024 GSP

I. The Revised 2024 GSP Fails to Demonstrate Effective Coordination Across the Subbasin

Our organizations are deeply concerned that the fragmented coordination efforts of the Kern Non-Districted Land Authority (KNDLA) will exacerbate existing problems in the basin by allowing significant localized exceedances of maximum contaminant levels (MCLs) and declining groundwater levels. The decision by the Semitropic Water Storage District (Semitropic) not to participate in the KNDLA only worsens the situation.

We agree with the State Water Resources Control Board (SWRCB) staff report that the GSAs of the Kern Subbasin need to revise their Coordination Agreement to incorporate a comprehensive minimum threshold exceedance plan for the whole subbasin. In addition, at the basic level, it is necessary for the GSAs to develop clear and coordinated definitions of undesirable results, distinguish GSA boundaries, GSA relationships in the subbasin, and responsibilities between Kern GSAs that are consistent with the requirements of SGMA. As it stands now, the Kern Subbasin will fail to reach sustainability under these conditions.

a. Well Monitoring Networks Do Not Adequately Monitor Shallow Groundwater

Our organizations are deeply concerned that the current monitoring network is insufficient to protect the communities we work with from the impacts of groundwater overdraft and groundwater quality contamination. The calculation of minimum thresholds and undesirable results will not be accurate if the GSA fails to measure water quality and water level impacts in the vicinity of shallow domestic and public supply wells.

We recommend extensive amendments to the monitoring network and monitoring strategies in the Kern Subbasin and for comprehensive monitoring networks to be a substantial consideration in any revisions of the Plan and Coordination Agreement. We agree with SWRCB staff on their characterization of the issue as presented in the Revised 2024 GSP. The plan does not account for the nuances of effective monitoring well networks in instances of differentiation of confining layers (E-clay)[3]. Most of the wells within the GSA's network screen for the confined aquifer, this leaves a massive gap in data monitoring for the unconfined aquifer. This is to the direct detriment of beneficial users in the Kern Subbasin, especially those who draw from the unconfined aquifer for drinking water or other supplies. When groundwater quality degrades or groundwater levels drop in the unconfined aquifer, the GSA is unable to adequately measure this shift due to the gaps in their monitoring network.

[3]Semitropic Water Storage District Groundwater Sustainability Agency. (2024). *Revised 2024 Groundwater Sustainability Plan. Basin Setting - Hydrogeologic Conceptual Model, ES-6.*

These insufficiencies in turn inform all Sustainable Management Criteria (SMC), monitoring networks, well impact analyses, and development of well mitigation plans. This ensures, from top to bottom, that the GSA's management of groundwater resources in the Kern Subbasin will be inadequate and will not be protective of beneficial uses and users.

b. The Revised 2024 GSP's Groundwater Levels Minimum Thresholds Are Inappropriately Averaged

By averaging groundwater level trends across the basin, the Plan will ignore localized impacts and fail to trigger a minimum threshold and necessary project and management to prevent undesirable results. We agree with SWRCB's assessment of this phenomena as it was identified in a preliminary review of the Revised 2024 GSP.[4] The Revised 2024 GSP utilizes an average rate of declining groundwater level trends across the subbasin. This methodology creates acute variation in groundwater level minimum thresholds between hydrological areas in the Kern Subbasin. This in turn results in a skew of the data and lowers thresholds of groundwater levels in wells close to Kern communities. The method, as it is laid out in the revised 2024 GSP, is not consistent with the established scientific literature on best practices for measuring groundwater levels. We recommend reevaluating the methodology that creates this skew in MTs and consulting SGMA guidelines provided by both DWR and SWRCB on correcting this error.

II. The Revised 2024 GSP Fails to Adequately Define & Avoid Undesirable Results for Groundwater Levels and Groundwater Quality

The Revised 2024 GSP proposes a dramatic lowering of a number of minimum thresholds (MTs). Some of the MTs described in the GSP were lowered by 50 feet to 100 feet from the MTs in the 2020 plans, and the Revised 2024 GSP's methodology is described in such a way that groundwater levels throughout the subbasin could deplete past the lowest historical groundwater levels without triggering management actions.[5]

a. Groundwater Levels Should Not be Used as Proxy for Groundwater Quality Measurements

Moreover, in the 2022 GSP and Revised 2024 GSP, groundwater levels appear to have been substituted for groundwater quality measurements. This guarantees that the GSP fails to adequately describe the impacts of groundwater levels on groundwater quality if their definitions appear interchangeable in the implementation of the GSA's proposed Revised 2024 GSP. To that same point, the revised 2024 GSP fails to adequately set

[4]State Water Resources Control Board. (2024). *Kern County Subbasin Probationary Hearing Draft Staff Report. 4.1.6 Preliminary Review of 2024 Draft Groundwater Sustainability Plans*

[5]Semitropic Water Storage District Groundwater Sustainability Agency. (2024). *Revised 2024 Groundwater Sustainability Plan. 7-Hydrogeologic Conceptual Model.*

minimum thresholds and, in fact, utilizes the same faulty method for determining MTs challenged by DWR in their 2022 inadequate determinations.[6]

This altogether is extremely concerning and dangerous for small water systems and domestic wells reliant on shallow wells. A number of wells could go dry that vulnerable disadvantaged communities depend on, and no management action will be taken with the triggers set as this revised 2024 GSP proposes.

SGMA requires watershed basins to avoid chronic lowering of groundwater levels as a pillar of achieving sustainability.[7] Lowering groundwater levels contributes to worsening conditions of groundwater quality, subsidence, and further depletion of interconnected surface waters. We understand that for the overdrafted basins, lowered groundwater levels are likely to occur, but we want to emphasize that this situation necessitates a robust, long-term strategy in the plan to mitigate the impacts of that decline.

2. New Deficiencies Identified by SWRCB & NGO Review of Revised 2024 GSP

I. The Revised 2024 GSP is Inadequate Due to the Lack of a Stakeholder Communication and Engagement Plan (SCEP)

SGMA requires GSAs to include a public engagement plan that determines how they will identify all beneficial uses and users to effectively engage in planning implementation processes in their GSP.[8] While the GSP document references such a plan, there is no Appendix H in either the original or revised plan. The Kern Revised 2024 GSP fails to take into account the impacts of its groundwater management on all beneficial uses and users of groundwater within their basin.[9] Drinking water well users and disadvantaged communities are dependent on the success of SGMA, and are undoubtedly the most vulnerable to the impacts of undesirable results and exceedance of SMCs.[10]As our organizations have stated in past comment letters, "residents of [the] Lost Hills community depend solely on groundwater from Semitropic, their input and consideration in GSP

[6] Department of Water Resources. (2022). *RE: Incomplete Determination of the 2020 Groundwater Sustainability Plans Submitted for the San Joaquin Valley – Kern County Subbasin.*

[7] Cal. Wat. Code § 10721 ((x.1-6)) ["Chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply if continued over the planning and implementation horizon."].

[8] Department of Water Resources. (2018). *Guidance Document for Groundwater Sustainability Plan Stakeholder Communication and Engagement*. Available at: https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Assistance-and-Engagement/Files/Guidance-Doc-for-GSP---Stakeholder-Communication-and-Engagement.pdf.

[9] Department of Water Resources. (2023). *Guidance for Sustainable Groundwater Management Act Implementation: Considerations for Identifying and Addressing Drinking Water Well Impacts*. Available at: https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Files/Considerations-for-Identifying-and-Addressing-Drinking-Water-Well-Impacts_FINAL.pdf?utm_medium=email&utm_source=govdelivery.

[10] Dobbin, Kristin B., and Mark Lubell. "Collaborative governance and environmental justice: Disadvantaged community representation in California sustainable groundwater management." *Policy Studies Journal* 49.2 (2021): 562-590. Available at: https://doi.org/10.1111/psj.12375.

development and implementation is critical to the success of the plan. Lost Hills is one of just two community water systems drawing water from this subbasin, and it is susceptible to the impacts of groundwater level decline as well as groundwater quality degradation. Our review of the revised plan found stakeholder engagement to vulnerable communities was essentially nonexistent."[11]

The GSA MUST comply with SGMA and immediately publish for review and implement a Stakeholder Communications and Engagement Plan. This plan must include a plan for engaging disadvantaged communities and assessing the impacts of the plan on those communities. The Kern County Subbasin must fulfill its obligation under SGMA to meaningfully engage impacted groundwater users. Similarly, the Semitropic GSP must identify how it engaged communities in the development and implementation of the plan. The GSAs MUST develop and implement comprehensive Stakeholder and Community Engagement Plans, assess how stakeholder engagement impacts continued GSP implementation, and examine how stakeholder engagement is administered across the Subbasin and is used to address the deficiencies determined by DWR.

II. The Revised 2024 GSP Does Not Provide a Well Mitigation Plan

We are encouraged by the Kern GSAs indicating their commitment to develop and implement a well mitigation plan in conjunction with consultants from Self-Help Enterprises. However, that mitigation plan has not been published for our review and no financing plan has been provided. Until such time as that happens, this plan remains inadequate and subject to the probationary process. We highly recommend Kern GSAs use the resources available to them to produce a robust and equitable well mitigation plan. Consulting DWR's *Considerations for Identifying and Addressing Drinking Water Well Impacts Guidance*[12] and the *Drinking Water Well Mitigation Framework*[13] are a good place to start.

a. The Revised GSP Fails to Clearly Explain Management Actions in the instances of Groundwater Quality Exceedance

In connection to the issue of lacking a well mitigation plan, a major problem with this GSP is a lack of follow through on management actions. If groundwater quality exceedance occurs, the GSP lacks clear details on what response the GSAs will have. It is unclear what additional water sampling and monitoring the GSAs would employ, and how well water would be restored to safe levels. With parameters for investigation wobbly, the Revised

[11] Re: Comments on the Revised Semitropic Water Storage District Groundwater Sustainability Plan. (2022)

[12] Department of Water Resources. (2023). *Guidance for Sustainable Groundwater Management Act Implementation: Considerations for Identifying and Addressing Drinking Water Well Impacts.* Available at: https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Files/Considerations-for-Identifying-and-Addressing-Drinking-Water-Well-Impacts_FINAL.pdf?utm_medium=email&utm_source=govdelivery

[13] Self-Help Enterprises, Community Water Center and Leadership Counsel for Justice and Accountability. (2022). *Framework for a Drinking Water Well Impact Mitigation Program.* Available at: https://www.selfhelpenterprises.org/wp-content/uploads/2022/07/Well-Mitigation-English.pdf

2024 GSP proves itself to be insufficient in addressing groundwater quality exceedance and protecting safe drinking water for beneficial users.

III. The Revised 2024 GSP Fails to Adequately Address Ongoing Degradation of Groundwater Quality

Setting SMCs for groundwater quality is another area of sustainable management adversely affected by the subbasin's fragmented approach, and we agree with SWRCB staff's identification of the issues. With the 2022 Kern Coordination Agreement, definitions of groundwater level MT triggers were agreed upon and set to trigger when a management area experiences groundwater level decline above historic "MTs in 40% or more RMSs, within the Management Area over four consecutive bi-annual SGMA required monitoring events."[14] Regardless of the Coordination Agreemnet's promises however, GSAs in the subbasin employ inconsistent methods to set SMCs. Moreover, that data itself that GSAs in the Kern Subbasin pull from is inconsistent.

SGMA requires groundwater management implemented by GSAs be effective at preventing, "significant and unreasonable degraded water quality, including the migration of contaminant plumes that impair water supplies."[15] Due to the exacerbation of the fragmented approach, we agree with SWRCB staff's assessment and recommend Kern GSAs commit to a comprehensive system of data reporting on the status of MT exceedances and include this data in their annual reports.

The standard this GSP sets for groundwater quality is concerning, however. To rectify this, we overall recommend that the subbasin GSAs revise their Coordination Agreement to incorporate considerations for groundwater quality using consistent data and methodologies across the subbasin.[16]

Every deficiency we find with the Kern Subbasin's revised 2024 GSP is exacerbated by the fragmentation of groundwater management entities in the Kern subbasin. As it stands now the revised 2024 GSPs will undoubtedly result in considerable impacts to communities that depend on domestic wells for all essential uses of clean and safe water. Their needs are our foremost concern. Sustainability is far out of reach, and undesirable results are all but assured unless the Kern Subbasin as a whole changes course. This GSP is insufficient for any of the GSAs to credible claim to qualify for the good actor clause. **To best protect the beneficial use and users of groundwater**

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[14] State Water Resources Control Board. (2024). *Kern County Subbasin Probationary Hearing Draft Staff Report. 4.1.4 Deficiency GWQ – Degraded Groundwater Quality.*

[15] Wat.Code, § 10721, subd. (x.4)) [""Undesirable result" means one or more of the following effects caused by groundwater conditions occurring throughout the basin: (4) Significant and unreasonable degraded water quality, including the migration of contaminant plumes that impair water supplies."].

[16] State Water Resources Control Board. (2022). Groundwater Quality Considerations For High And Medium Priority Groundwater Basins. Available at: https://www.waterboards.ca.gov/water_issues/programs/sgma/docs/comments-to-dwr/groundwater-quality-considerations-letter-20221121.pdf.

in the Kern Subbasin, this 2024 Revised GSP must be deemed inadequate and the subbasin moved into probation.

While our priorities for comment on the plan center on necessary improvements to coordination across the Kern Subbasin, groundwater levels, equitable stakeholder engagement, establishing a robust well mitigation plan, and groundwater quality; we concur with SWRCB's other identified deficiencies with Land Subsidence and Interconnected Surface Waters (ISW). **We strongly encourage the Kern Subbasin GSAs to build and maintain strong and reliable coordination across the subbasin for the benefit of their work and to reach SGMA's goal of sustainability.**

Sincerely,

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