

DRAFT TECHNICAL MEMORANDUM

Date:	May 7, 2021
To:	Cameron Tana, Montgomery & Associates
From:	Greg Kamman, cbec eco engineering
Project:	20-1044
Subject:	Sustainability Management Criteria for Depletions of Interconnected Surface Waters Basin Management Plan: Groundwater Sustainability Update 2022 (GSU22)

1. SUMMARY OF DEPLETIONS OF INTERCONNECTED SURFACE WATERS SUSTAINABLE MANAGEMENT CRITERIA

The following paragraphs summarize sustainable management criteria (SMC) for depletions of interconnected surface waters (ISW) in the Pajaro Valley Subbasin (Pajaro Valley Basin or Basin). The development process and rationale for each of the SMC components is described further below.

Statement of Significant and Unreasonable Conditions

Based on the best available information described in *Quantify Depletions of Interconnected Surface Waters, Basin Management Plan: Groundwater Sustainability Update 2022 (GSU22)* dated January 8, 2021, surface water in the Basin is typically disconnected from groundwater in the Aromas aquifer. Thus, there is no potential for significant and unreasonable depletions of ISW from pumping groundwater in the Aromas aquifer.

Minimum Thresholds

As there is no potential for significant and unreasonable conditions in the Basin for ISW, there is no need to define minimum thresholds for depletion of ISW.

Undesirable Results

As there is no potential for significant and unreasonable conditions for ISW in the Basin for ISW, there is no need to define undesirable results that could trigger State intervention.

Measurable Objectives

Measurable objectives are equal to the adjacent channel bed elevations to increase the frequency and duration of ISW between the Aromas aquifer and surface water in the Basin where reasonably achievable.

2. INTRODUCTION

The Pajaro Valley Water Management Agency (PV Water) submitted a Groundwater Sustainability Plan (GSP) Alternative for the Pajaro Valley Basin on December 31, 2016, which was approved by the California Department of Water Resources (DWR). DWR's assessment included recommendations that PV Water quantify depletions of ISW and define SMC for these depletions that have adverse impacts on beneficial uses of the surface water in its 5-year update to the Alternative as follows:

- Recommended Action 2: "Staff recommend that the Agency quantify depletions of interconnected surface waters (ISW) occurring as of January 1, 2015, which the Agency intends to use the threshold beyond which undesirable results occur, or other thresholds as defined and justified by the Agency."
- Recommended Action 5 also recommends that the "Agency define specific, quantitative criteria for depletion of ISW that can be used to objectively determine compliance of the Plan with the objectives of SGMA on an ongoing basis", consistent with Recommended Action 2.

In response to DWR's recommendations, PV Water will include an evaluation of current and historical ISW and ISW SMC in the Basin Management Plan (BMP): Groundwater Sustainability Update 2022 (GSU22). The GSU22 will be submitted as the five-year update to DWR by January 1, 2022.

3. RATIONALE FOR NO MINIMUM THRESHOLDS AND NO UNDESIRABLE RESULTS

Recommended Actions 2 and 5 require PV Water to define sustainable management criteria for depletion of ISW as required for GSPs. Recommended Action 2 includes quantifying historical and current depletion of ISW, which is also required for GSPs. Section 351 (o) of the GSP Regulations define ISW as, "surface water that is hydraulically connected at any point by a continuous saturated zone to the underlying aquifer and the overlying surface water is not completely depleted." Depletions of ISW refers to reduction in surface water flow caused by groundwater pumping. As PV Water's accepted GSP Alternative provides a plan for sustainably managing groundwater in the Pajaro Valley Basin and the principal aquifer of the Basin is the Aromas Red Sands (or Aromas), the GSU22 will address depletions of ISW from pumping in the Aromas Red Sands.

cbec eco engineering prepared a technical memorandum entitled, *Quantify Depletions of Interconnected Surface Waters, Basin Management Plan: Groundwater Sustainability Update 2022 (GSU22)* dated January 8, 2021 and presented to the GSU22 Committee on January 8, 2021 that meets Recommended Action 2. cbec's study approach in quantifying depletions of ISW was to review available current and

historical streamflow and groundwater monitoring data representative of the principal aquifer and identify the spatial and temporal extent of hydraulically connected surface water reaches¹. cbec's study concluded that there are no instances of hydraulic connection between Corralitos and Carneros Creek and the Aromas and only a couple of locations along the Pajaro River where monitoring data indicate any hydraulic connection and potential ISW with the Aromas. The ISW locations on the Pajaro River occur at an area downstream of Watsonville at well site PV6SM and upstream at Murphy Crossing at well site PV14. ISW conditions only develop at these sites during winter high river flow periods, especially during wet water year types and do not persist beyond the duration of the high flow events. During periods when there is ISW, the surface water bodies are losing reaches. Apart from these locations and limited time periods, monitoring data indicate there is a significant vadose zone (i.e., lack of hydraulic connection) present between surface waters and the Aromas. Analysis of stream flow records indicate notable reaches of stream leakage and flow reductions on the Pajaro River and Corralitos Creek. Analysis of stream flow monitoring data also identify reaches of gaining flow on both the Pajaro River and Corralitos Creek below the confluence with tributary creeks. However, groundwater level monitoring data in these reaches do not indicate ISW with the Aromas and flow gains can be attributed to tributary surface water inflows.

The potential for adverse impacts to surface water beneficial uses during periods of ISW at these limited locations is very low as ISW occurs only during the wet season periods of high flow. For example, continuous flow records on the Pajaro River at Murphy Crossing during winter of water years 2018-2020 indicate ISW conditions only occurred during a single 2-3 week-long period in February 2019 when sustained river flows were between 500- and 5000-cubic feet per second (cfs). The potential for impacts is further reduced as groundwater pumping is at a minimum during the wet season period of the year. Exchange between the surface water and aquifer is one-directional during ISW periods where the surface waters are losing systems. Surface water exchange at these times is dominated by natural hydrologic process and any change in flow volume, either greater (gaining) or smaller (losing) due to management actions, would be small and difficult to identify, let alone quantify during peak river flood flows. Because of the limited spatial and temporal extent of ISW conditions, there are no depletions of interconnected surface water to quantify. Thus, without evidence of depletions from ISW due to pumping from the Aromas, there is no potential to generate undesirable results. In turn, there is no need to define minimum thresholds (MT) for depletion of ISW.

¹ cbec's study prioritized analysis of groundwater level and stream flow data and did not complete an in-depth analysis of streambed composition. Based on the findings of virtually no hydraulic connection, cbec decided that further analysis of streambed composition was unnecessary.

4. MONITORING NETWORK AND REPRESENTATIVE MONITORING POINTS

Although no MT are proposed for ISW SMC and there are no potential undesirable results, Section 354.30 (g) of the GSP Regulations states, “An Agency may establish measurable objectives that exceed the reasonable margin of operational flexibility for the purpose of improving overall conditions in the basin, but failure to achieve these objectives shall not be grounds for a finding of inadequacy of the Plan.” The ISW SMC must be defined at representative monitoring points (RMPs) that are located adjacent to and capture potential hydraulic connection with surface waters within the Basin. Selection of wells as RMPs for ISW is based on the following characteristics:

- a. Long-term reliable record and consistent sampling access,
- b. Represents historical hydraulic conditions² and ISW between the Aromas and surface water within an area,
- c. Represents where hydraulic conditions and ISW between the Aromas and surface water are reasonably achievable³,
- d. Representative of nearby wells screened in the same aquifer
- e. Preferably a dedicated monitoring well located a sufficient distance away from pumping wells to minimize influences from pumping cycles, and
- f. PV Water has permission from the well owner to make well information public.

ISW conditions in the Basin may be supported by groundwater in the alluvium overlying the Aromas aquifer, the Basin’s principal aquifer. Although the GSP-Alternative considers the effect of groundwater levels in the Basin’s principal aquifer on ISW, RMPs are identified in the alluvium for ongoing evaluation of the relationship between groundwater levels in the Aromas and alluvial aquifers and how that may affect potential ISW. Co-located wells where one is screened in the Aromas aquifer and another screened in the alluvium are prioritized for this ongoing evaluation.

Selection of the proposed RMP network began with all monitoring wells owned by PV Water, where groundwater level data are collected on a monthly or semi-annual basis and wells are located within

² RMPs with historical maximum seasonal groundwater level elevations within 10-feet of the surface water channel bed elevation are considered RMPs where future groundwater levels may establish hydraulic connection with the surface water body.

³ Due to the tens of feet of existing and historical vadose zone between surface waters and the Aromas aquifer, ISW conditions are not reasonably achievable and no RMPs are proposed along Corralitos Creek. However, monitoring data collected for Corralitos Creek wells as part of the ongoing PV Water groundwater monitoring network will continue to be evaluated for ISW conditions.

proximity to surface waters. The depth at which potential RMPs are screened was based on the Pajaro Valley Hydrologic Model (PVHM) layering, which was derived from existing well log information. To resolve spatial data gaps, select wells monitored by Basin water purveyors, Soquel Creek Water District and Monterey County Water Resources Agency were also considered for ISW RMPs.

Hydrographs at qualifying locations were created and analyzed for data availability and quality. Wells with longer and more thorough records were prioritized over wells with short records and inconsistent measurements. Analysis of hydrographs in combination with well screen depths and spatial distribution resulted in additional exclusions of wells that lacked consistently measured historical data and/or provided redundant spatial distribution. The final proposed RMP network is presented on Figure 1 and in Table 1.

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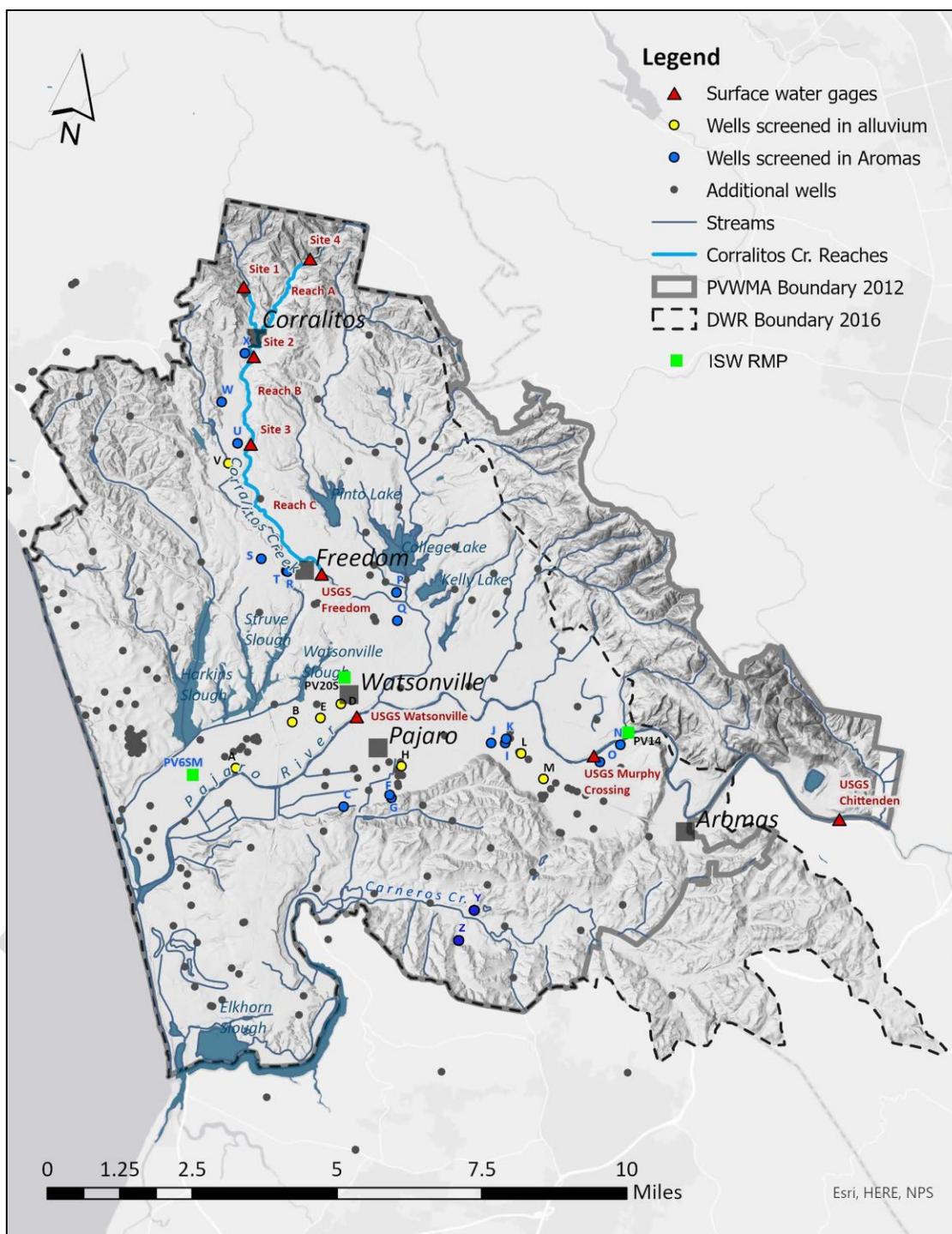


FIGURE 1: Proposed ISW RMP locations and other monitoring wells in the Basin.

TABLE 1: Proposed Depletion of ISW RMPs and MO

Well Name*	Surface Water Body	Screened Formation	MO (feet MSL)
PV6SM	Pajaro River	Aromas	3.5
PV6S	Pajaro River	Alluvium	3.5
PV20SM	Pajaro River	Aromas	12
PV20S	Pajaro River	Alluvium	12
PV14	Pajaro River	Alluvium	44

5. MEASURABLE OBJECTIVES

Measurable objectives (MO) are quantitative goals set at RMP that reflect the groundwater sustainability agency's desired groundwater and ISW conditions. The MO are not enforceable but must be achievable. The proposed approach for establishing ISW MOs and interim milestones is based on current and historical trends of increasing groundwater elevations that would lead to increased ISW conditions where reasonably achievable. The current trend of increasing Aromas aquifer groundwater elevations is attributable to implementation of BMP projects and management actions to eliminate critical overdraft and achieve sustainability in the Basin.

To provide an achievable goal for ISW, the process to develop a proposed MO starts with establishing groundwater elevations measured at each RMP that equal or exceed the channel thalweg⁴ elevation of an adjacent water body. RMP groundwater elevations that equal or exceed the adjacent channel bed elevations indicate a hydraulic connection with the river and an ISW condition.

Therefore, the proposed MO is as follows:

Proposed MO: Groundwater elevations equal to the adjacent channel bed elevations to increase the frequency and duration of hydraulic connection and ISW at surface waters where reasonably achievable. MOs for selected RMP that identify ISW conditions are presented on Table 1.

Achieving higher groundwater level MOs at RMPs will enhance the frequency and duration of hydraulic connection and ISW condition, increase groundwater supply to surface water, and reduce the likelihood of undesirable streamflow depletions from occurring.

⁴ The thalweg of a stream channel is defined as the lowest elevation or deepest point of the channel.

6. INTERIM MILESTONES

Interim milestones are quantifiable objectives set at RMP that are used to evaluate progress towards the measurable objective over time until 2040, specifically in 2025, 2030, and 2035. Interim milestones for each of these years will be estimated based on the constant rate of increasing groundwater levels to achieve the MO by 2040.

7. DATA GAPS

As described above, RMPs are identified to include co-located pairs of wells that are screened in the Aromas aquifer and the alluvium. There is a no RMP in the Aromas aquifer co-located with PV14, which is approximately 45 feet deep and screened in the alluvium. A monitored private well in the Aromas adjacent to PV14 such as Well N or O (see Figure 1) can be added as an RMP if the well owner agrees. Otherwise, PV Water should consider installing a new monitoring well in the Aromas in this area. The MO planned for the additional RMP would be 44 feet MSL based on approximate elevation of the nearby channel thalweg, same as for PV14.

There are also no RMPs along Carneros Creek. Although no longer indicating interconnection between the Aromas aquifer and Carneros Creek, groundwater levels in the 1960s in nearby monitored private well Z (location on Figure 1) were above the approximate elevation of nearby channel thalweg (Figure 2) indicating historical interconnection. A monitored private well such as Well Y or Well Z could be added as an Aromas RMP for Carneros Creek if permission is granted by the well owner, but a nearby monitoring well in the Aromas would still be recommended. Without permission from the private well owner, installing a well screened in the Aromas is needed to monitor whether there is progress towards re-establishing ISW along Carneros Creek. The MO planned for the additional RMP located in the vicinity of well Y and Z would be 18 feet MSL based on approximate elevation of the nearby channel thalweg.

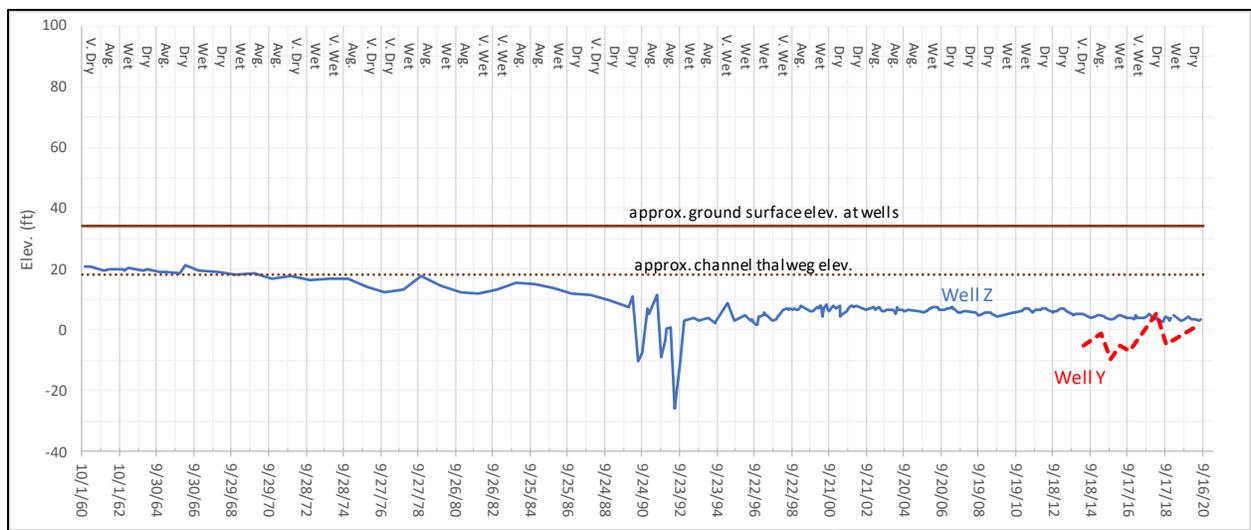


FIGURE 2: Groundwater level hydrographs for wells Y (QaUp) and Z (QaLo) on Carneros Creek.

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