Agenda Item: 6A
Meeting Date: July 27, 2020

Sonoma Valley Groundwater Sustainability Agency

Information Item

TO: BOARD OF DIRECTORS
FROM: Jay Jasperse, Plan Manager, and Marcus Trotta, Technical Project Manager
SUBJECT: Draft Sustainable Management Criteria – Seawater Intrusion

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Summary: The Groundwater Sustainability Plan is due January 31, 2022. As part of the GSP, Sustainable Management Criteria (SMC) must be developed for six sustainability indicators as defined by the Sustainable Groundwater Management Act. This informational item requests Board input regarding the key elements of a proposed draft SMC for seawater intrusion that is being developed by staff with input from the Advisory Committee. Although staff is not ready to present a complete draft SMC proposal for Board consideration, several key elements of the SMC have been developed and vetted with the AC. Board input on these elements will be helpful as the remainder of the draft SMC is developed. As described below, although staff endeavor to bring forward options to the Board for determination of undesirable results as part of each SMC, for seawater intrusion this was not possible due to a lack of data.

Background

The Sustainable Groundwater Management Act (SGMA) requires Groundwater Sustainability Agencies (GSAs) in high- and medium-priority basins to develop and submit Groundwater Sustainability Plans (GSPs) to the California Department of Water Resources by January 31, 2022. GSPs are detailed road maps for how groundwater basins will reach and maintain long term sustainability.

Sustainable Management Criteria – General Overview

A central aspect of the GSP is to develop Sustainable Management Criteria (SMC) for each of the six sustainability indicators listed below:

1. Chronic **lowering of groundwater levels** indicating a significant and unreasonable depletion of supply if continued over the planning and implementation horizon.
2. Significant and unreasonable **reduction of groundwater storage**
3. Significant and unreasonable **seawater intrusion**
4. Significant and unreasonable **degraded water quality**, including the migration of contaminant plumes that impair water supplies
5. Significant and unreasonable **land subsidence** that substantially interferes with surface land uses

6. **Depletions of interconnected surface water** that have significant and unreasonable adverse impacts on beneficial uses of the surface water (e.g. water in streams or wetlands).

As discussed at the June 1, 2020 Board meeting, among the requirements of the GSP are the development of SMCs which include: (1) quantitative minimum thresholds; (2) quantitative measureable objectives; (3) a qualitative description of significant and unreasonable conditions; and (4) a definition of what constitutes an undesirable result for the basin. Attachment 1 provides a "cheat sheet" that defines these terms for the six sustainability indicators.

The initial draft SMCs for each of these indicators will be presented to the GSA Board for consideration as they are each developed over the next few months. Once draft SMCs are developed for the six sustainability indicators, the GSA will evaluate whether any management programs or projects are necessary to avoid undesirable results as defined by the SMCs for current and future (through 2072) conditions. It is important to recognize that the GSP and the implementation process is adaptive and provides opportunities for continued refinement and improvement throughout the process. For example, if any of the draft SMCs are found to require management programs or projects that are deemed by the Board to be infeasible (e.g., technical or cost considerations), the draft SMC will be revised accordingly. For these reasons, the SMCs are considered draft until the completion of the GSP. In addition, it is anticipated that during GSP implementation, some SMCs will be refined or modified based on new information.

Process for SMC Development for Seawater Intrusion

The general process for SMC development was presented to the Board on June 1, 2020. As part of that briefing, staff stated that the goal will be to vet technical aspects of the SMC (e.g., technical methodology, minimum thresholds, measurable objectives) with the AC and also to work with the AC to develop policy options for determination of basin-wide undesirable results for Board consideration. Since that time, staff have been actively involved, working closely with the AC, to develop a draft SMC proposal for seawater intrusion for Board consideration.
The Seawater Intrusion SMC was discussed at the May 12, June 6, and July 14 AC meetings. In addition, written materials presenting technical information and requests for additional input were also sent to the AC. After much evaluation of existing data/information and discussions among the technical staff and the AC, it became apparent that there is not sufficient water quality data (in terms of both a historical record and number of monitoring locations) to establish with confidence various options for determination of an undesirable result. Instead, staff with AC concurrence, believe that the most prudent approach at this time is to acknowledge the data shortcoming and to develop an initial SMC that allows for adaptation, and accounts for these uncertain conditions. The proposed approach will allow the GSA time to develop a refined SMC during GSP implementation after additional data is collected and studies are conducted. These activities will provide a more robust understanding of not only current conditions, but also potential future impacts from climate change (i.e., sea level rise) and land use practices in the Baylands area of the basin.

Many of the key elements of the draft SMC have been developed with the AC and are described below. At this time, the Measurable Objective component of the SMC has not been fully vetted by the AC. Staff plan to work with the AC to develop the Measurable Objective and bring the entire draft SMC to the Board for consideration in September. Ultimately, it is envisioned that the GSP will couple the seawater intrusion SMC with a plan to continue refining the SMC during implementation. Staff believe that an adaptive approach as proposed is consistent with California Department of Water Resources (DWR) guidance.

Additional Considerations

There are several factors to be considered when developing SMC for seawater intrusion, including the GSA's ability to determine where and when seawater intrusion is occurring, and its relationship to groundwater pumping. Some of these considerations are summarized below.

A natural saline water – fresh water interface exists in the southern portion of the groundwater basin. It is understood that there is a natural interface between saline water associated with San Pablo Bay and fresh groundwater from the Sonoma Valley groundwater basin. This interface has occurred through history and has fluctuated over time .

Existing groundwater users in the brackish areas of the Baylands. It is recognized that there are groundwater users with wells within the brackish groundwater areas of the Baylands that are located near San Pablo Bay and exhibit elevated chloride concentrations. Several vineyards in this area use recycled water for irrigation purposes. Groundwater use in this area has occurred for over a century. The proposed draft SMC does not account for the wells or uses in this area for the following reasons: (1) SGMA requires that groundwater conditions be evaluated for compliance with SMCs beginning January 1, 2015, and these wells have been in use (pumping groundwater influenced by brackish conditions) for decades; (2) they represent a relatively small use of groundwater (few wells and few residences); and (3) the salinity has not been caused by groundwater pumping as they are located in the natural brackish area.

Sea level rise impacts. Staff are requesting confirmation from DWR regarding the premise that because the impacts from sea level rise are not a result of GSA activities or groundwater pumping, the GSA is not required to address impacts from sea level rise. However, it is important that the GSA evaluate the potential impacts of sea level rise through numerical modeling coupled with sea level rise projections to account for these impacts in a refined SMC. It is expected that monitoring and assessment of sea level rise impacts will be ongoing throughout the implementation of the GSP.

Land use impacts. Historical changes in land use in the Baylands area of the basin have affected the distribution of saline and fresh surface water, which, in turn affect the distribution and occurrence of salinity in underlying groundwater. There are ongoing planning activities associated with wetlands restoration that could affect the occurrence and distribution of saline groundwater in the future. Although the GSA has no authority over such activities, the GSA should coordinate with parties involved in such activities and work with those parties to assess

potential impacts of these projects on seawater intrusion that may affect beneficial uses of groundwater in the subbasin.

Connate Water: Management of high salinity connate waters (older groundwater not associated with recent seawater) is not covered by this SMC.

Proposed Draft SMC for Seawater Intrusion: An Adaptive Approach

The key components of the proposed initial SMC for seawater intrusion are as follows:

Definition of Significant and Unreasonable Conditions

The proposed definition of significant and unreasonable conditions is:
Seawater intrusion inland of areas of existing brackish groundwater due to groundwater pumping is a significant and unreasonable condition.

Minimum Threshold (MT)

In general, the MT represents conditions that are to be avoided to ensure sustainable groundwater conditions. As specified by the DWR SGMA regulations, (SGMA Emergency Regulations § 354.28(c)(3)), the MT for seawater intrusion must be defined by an isocontour of chloride concentrations in groundwater. A chloride isocontour is a line drawn on a map that estimates an equal concentration of chloride based on water quality from wells. For purposes of this SMC, this isocontour is referred to as the "MT reference isocontour".

A key factor in defining the MT reference isocontour is to identify the appropriate chloride concentration. Staff, with concurrence from the AC, propose that 250 milligrams per liter (mg/l) of chloride be used to establish the MT reference isocontour. This concentration is the secondary drinking water maximum contaminant level for chloride and is also similar to chloride levels in irrigation water that can be tolerated by grapes (262 mg/L) without showing adverse effects (Suitability Study of Napa Sanitation District Recycled Water For Vineyard Irrigation, UC Cooperative Extension, 2006).

Accordingly, the MT reference isocontour represents the acceptable boundary of chloride concentrations of 250 mg/l in groundwater. In developing the MT reference isocontour, there are two factors that must be considered: (1) the isocontour must be based on chloride water quality data from wells known as Representative Monitoring Points (RMPs); and (2) the isocontour must be protective of beneficial uses. Each of these factors is further described below.

The first factor relates to the adequacy of available water quality data. The more robust the available water quality dataset, the more confidently the isocontour can be drawn to approximate the extent of MT concentrations. Ideally, there would be a sufficient number of wells that meet DWR's requirements to be considered to be RMPs to provide sufficient spatial coverage, with a corresponding historical record of chloride concentration data from each of the RMPs that allows an evaluation of trends and variability. As previously discussed, the

existing data is sparse in terms of number of wells (not to mention wells that meet RMP requirements) and time-series data from these wells.

Regarding the second factor of beneficial uses, the proposed MT reference isocontour will be developed to be protective of drinking water as a beneficial use, consistent with the use of the secondary drinking water standard for chloride in the MT reference isocontour. As described above, the secondary drinking water standard is also considered to be protective of other existing beneficial uses, such as agricultural irrigation, in the vicinity of the proposed MT reference isocontour.

Measurable Objective (MO)
The MO is the isocontour of chloride concentrations in groundwater that represents an aspirational goal to maintain or improve optimal protection of groundwater conditions from seawater intrusion. The MO isocontour can be based on a different chloride concentration and have a different aerial extent than the MT reference isocontour, or it can be the same. Staff will be working with the AC to finalize a recommendation to be included as part of the draft SMC for Board consideration at the next meeting.

Undesirable Results
The draft SMC proposes that an undesirable result occurs when two conditions are met: (1) the MT is triggered because the monitoring data indicates that the current extent of the 250 mg/l chloride isocontour encroaches inland relative to the MT Reference contour; and (2) the MT exceedance is caused by groundwater pumping. The draft SMC proposes an undesirable result will be evaluated as follows:

- Chloride water quality data will be collected at least semiannually (to account for potential seasonal fluctuations) from existing RMPs and other wells that are available for sample collection.
- On an annual basis, these data will be averaged for each well and an isocontour will be drawn to approximate the current extent of chloride concentrations in groundwater. The location of this “baseline isocontour” will be compared relative to the location of the MT reference isocontour to assess whether the baseline isocontour of 250 mg/l of chloride has migrated inland beyond the MT reference isocontour.
- The MT would be triggered if three consecutive years of baseline isocontours show an inland encroachment beyond the MT reference isocontour in the same area. Although a MT would not be triggered unless the baseline isocontour encroaches past the MT reference isocontour for three years, if such an incursion were to occur after one year, the GSA should investigate the cause for the encroachment of the baseline isocontour. For example, the GSA could consider resampling Representative Monitoring Points or wells and evaluate whether there are any significant changes in nearby groundwater levels.
- Finally, to determine whether an undesirable result exists, the MT exceedance must be caused by groundwater pumping. This assessment, which will be detailed in the GSP,

will include a detailed evaluation of water level and chloride data, numerical modeling and other studies.

As previously mentioned, staff and the AC evaluated alternatives to the above-described approach, however, given the lack of existing data, it was not possible to develop with any confidence additional viable options at this time.

Advisory Committee Process and Input

A memorandum from facilitator Tim Parker (Parker Groundwater), Attachment 2 provides a summary of the AC meetings in which seawater intrusion was discussed. The memo also describes summary input received from the AC and different aspects of the draft SMC. In addition, supplemental information contained in the July AC meeting package was sent to the AC via email between the June and July meetings. In general, the AC concurs with the above-described approach for the definition of significant and unreasonable conditions, determination of the MT and definition of undesirable results. The remaining item for discussion with the AC is the Measurable Objective.

Requested Board Action

Provide input to staff regarding key elements of a draft SMC for seawater intrusion.

Fiscal Information

None.

List of Attachments

1. Sustainable Management Criteria Cheat Sheet
2. Memorandum from facilitator Tim Parker, with a summary of Advisory Committee activities and input provided

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Sustainable Management Criteria Terminology: Super Quick Reference Guide

SGMA Term	Layperson Description
Sustainability Goal	A succinct big-picture statement of the GSA's objectives and desired conditions and how they will be reached. To be finalized at the end of the GSP process.
Significant and Unreasonable Effects	A qualitative statement that our gut tells us we don't want to happen. For example: It's significant and unreasonable for groundwater levels to drop to the point that wells can no longer produce water.
Sustainability Indicators	The six conditions defined by the water code that we don't want to experience Significant and Unreasonable Effects in the groundwater basin: (1) Chronic **lowering of groundwater levels**; (2) **reduction of groundwater storage** (the difference between recharge and discharge, over time); (3) **seawater intrusion;** (4) **degraded water quality;** (5) **land subsidence** that substantially interferes with surface land uses; and (6) d**epletions of interconnected surface water** (e.g. water in streams or wetlands).
Representative Monitoring Sites	Monitoring sites that reliably provide high quality data that characterize representative groundwater conditions in the basin. Representative monitoring sites are a subset of a basin's complete monitoring network, where minimum thresholds, measurable objectives, and interim milestones are set for each applicable Sustainability Indicator and monitored for compliance.
Measurable Objectives	Specific, quantifiable goals at each representative monitoring site to maintain or improve groundwater conditions in order to maintain or achieve the sustainability goal for the basin. Measureable Objectives reflect the GSA's desired groundwater conditions in the basin and guide the GSA to achieve its sustainability goal within 20 years. Measurable Objectives should include flexibility to accommodate wet-to-dry year fluctuations, droughts, climate change, and groundwater management activities. For example for groundwater levels (Santa Cruz Mid-County Basin): *Measurable objectives are the 75th percentile of historical groundwater elevations for the period of record of each monitoring point, which is higher than median or average groundwater elevations.*
Minimum Thresholds	The numerical line in the sand that we don't want to cross. For each sustainability indicator, the Minimum Thresholds are the quantitative, measurable values that reflect what is significant and unreasonable at every measuring site. The numeric value used to define minimum thresholds at a representative monitoring site in the basin (such as at a well) that if exceeded, may cause undesirable results. For example, for groundwater levels (Santa Cruz Mid-County Basin): *The minimum threshold is the numeric groundwater elevation (as measured at representative monitoring sites over a period of time) required to meet the typical overlying water demand in the shallowest well in the vicinity.*
Undesirable Results	This is the worst-case scenario, and is a quantitative combination of the minimum thresholds that define sustainability for each sustainability indicator. For example (from Salinas, for groundwater levels): *Over the course of any one year, no more than 15% of groundwater elevation minimum thresholds in any single aquifer and no one well shall exceed its minimum threshold for more than two consecutive years*
Interim milestones	Interim milestones are five-year check-ins to measure progress on the groundwater conditions that the GSA hopes to achieve during the 20-year implementation period. Measurements occur at representative monitoring sites.

Technical Memorandum July 21, 2020

To: Ann DuBay, Administrator, Sonoma Valley Groundwater Sustainability Agency
Jay Jasperse, Director of Groundwater Management, Sonoma Water

From: Timothy K. Parker, Senior Facilitator

Subject: Sonoma Valley Advisory Committee Process and Input on Seawater Intrusion Sustainable Management Criteria

The purpose of this memo is to summarize the Sonoma Valley Groundwater Sustainability Agency Advisory Committee (AC) process and input on the Seawater Intrusion Sustainable Management Criteria (SMC) discussion and recommendations to the SVGSA Board.

The current staff analysis of the baseline for seawater intrusion, which was conveyed to the AC, is that no measurable seawater intrusion has been recorded in the Sonoma Valley groundwater subbasin based on the limited data that are currently available. The 250 mg/L chloride concentration isocontour is located just north of the San Pablo Baylands area, which is in the basin and is where groundwater is brackish as a result of the tidal march environment.

On the 2020 dates indicated below, the AC discussed the following **seawater intrusion SMC** topics:

- May 12 - **SGMA consideration and background information**: Staff suggested general approach to significant and unreasonable conditions, metrics and measurement/monitoring, minimum thresholds and measurable objectives, and defining undesirable results. Initial AC input was acceptance of the general approach to significant and unreasonable conditions. However, since the location of the proposed chloride concentration isocontour minimum threshold is based on incomplete data, the rationale for proposing a 150 mg/L measurable objective is unclear, and may be unattainable. Additionally, the AC suggested that sustainable management criteria should consider crop tolerances and sea level rise impacts.

- June 6 - **Key points and consideration reminders and range of new options for Board consideration for defining undesirable results including information on crop tolerances**: The AC discussed concerns, preferences, and additional proposed modifications and other possible options. Poll of AC on options indicated generally split.

- July 14 – **Recap of prior discussions, and Staff recommendation:** The AC expressed near unanimous support to send ***Option Two, the only*** viable *seawater intrusion SMC option* to the Board. Staff advised **Option Two**, based on the AC understanding that an adaptive approach will be taken to address the additional data and monitoring wells needs to further refine the understanding of the distribution of potential seawater intrusion based on chloride data. Seven AC Members present at AC meeting. One dissenting AC member voiced a concern that seawater intrusion exceedances caused by

groundwater pumping from only one well could trigger the proposed minimum threshold that would have to be addressed by the SVGSA.

Final proposed Options presented at July 14 AC meeting for establishing undesirable results for seawater intrusion:

1. The chloride concentration isocontour minimum threshold* is exceeded **AND** the seawater intrusion is determined to be correlated with groundwater level declines due to groundwater pumping.
   Not considered viable so not carried forward.

2. The chloride concentration isocontour minimum threshold* is exceeded for three consecutive water years **AND** seawater intrusion is determined to be correlated with groundwater level declines due to groundwater pumping.
   Adaptive management approach will be taken in the future by installing additional monitoring wells and collecting and analyzing additional chloride data to revisit the MT during implementation.

***** Seawater intrusion concentration proposed *minimum threshold* is **250 mg/L.**

No **Measurable Objective** is currently proposed, due to a lack of data and no apparent seawater intrusion to improve upon; this will be revisited later in the GSP preparation process.