Topic 1 - Pre-SGMA Conditions and Undesirable Results

Department of Water Resources - Sustainable Groundwater Management Program
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1.0 PURPOSE

The purpose of this paper is to provide information to advance the discussion with stakeholders and the public as the Department of Water Resources (DWR) develops regulations as required in the Sustainable Groundwater Management Act (SGMA). DWR identified a series of ten topics related to the development of Groundwater Sustainability Plan (GSP) regulations and Alternatives to GSP regulations that were deemed of special interest to further discuss with stakeholders and the public. This paper covers information specific to Topic 1 – Pre-SGMA Conditions and Undesirable Results.

"Pre-SGMA Conditions" is a term used by DWR and is meant to reference the provisions identified in California Water Code (Water Code) §10727.2(b)(4). Undesirable results are defined in Water Code §10721 and again addressed in Water Code §10727.2(b)(4) as previously indicated. Select provisions of the Water Code are provided in Section 4.0 of this document.

2.0 BACKGROUND

In 2014, legislation passed that provides a statewide framework for sustainable groundwater management in California (Senate Bill 1168, Assembly Bill 1739, and Senate Bill 1319). This legislation, collectively referred to as the SGMA, is intended to support local groundwater management through the oversight of local agencies, which are required to form Groundwater Sustainability Agencies (GSAs) by June 30, 2017. SGMA requires these GSAs to develop GSPs by 2020 or 2022 to achieve sustainability by 2040 or 2042. In addition, the SGMA allows the State to intervene where GSPs are found to be incomplete or inadequate.

This document presents preliminary draft information to promote discussion and is subject to revision. Furthermore, because this discussion paper addresses a variety of issues raised by individuals and entities outside of DWR, inclusion of the issues in this document does not constitute an endorsement of any particular issue. DWR invites comment and input on the preliminary draft information and questions presented in this document. Comments should be submitted to sgmps@water.ca.gov.

3.0 SUMMARY OF TOPIC ISSUES AND CHALLENGES

As part of the SGMA outreach effort, DWR continues to meet with various organizations and individual experts to receive input for *Pre-SGMA Conditions and Undesirable Results* issues and challenges that should be considered for implementation of the SGMA. Based on these meetings, the following

represents some of the *Pre-SGMA Conditions and Undesirable Results* issues and challenges presented by stakeholders and advisory groups to DWR.

- The requirements of the SGMA went into effect on January 1, 2015, which was during year four of a drought when many groundwater levels throughout the State were at a historical low. Future GSP regulations need to determine how to account for conditions that do not reflect the undesirable effects of drought conditions.
- Can declining groundwater-level trends prior to January 1, 2015 continue as part of the sustainability plan then level off, or should trends be required to level off immediately?
- Does this (i.e. pre-SGMA) provision equate to a voluntary requirement for GSAs to address undesirable results before January 1, 2015? Conversely, after January 1, 2015, do GSAs need to begin to address undesirable results and obtain balance or sustainability by 2040 or 2042 and avoid significant and reasonable undesirable results?
- How will establishment of baseline conditions recognize future undesirable results realized from management practices of the recent past?
- Should groundwater levels be addressed independent of storage or linked to storage?
- Does this requirement to address undesirable results after January 1, 2015 apply everywhere in the GSP area, or should it only represent an average condition of the GSP area or basin?
- Will DWR rely on existing Porter Cologne and/or Clean Water Act policy, which is regulated by the State Water Resources Control Board (SWRCB), to address the undesirable result related to water quality, or should SGMA requirements go above and beyond existing water quality law?
- Surface water-groundwater interaction – how to address transient impacts (impacts that occur decades after pumping)?
- Inelastic land subsidence cannot be reversed. What will be the requirement to address any subsidence impacts realized between January 1, 2015 and the date of GSP adoption and/or start of GSP implementation (i.e. January 31, 2020 or 2022)?
- Will the regulations have enough flexibility to allow GSAs to draw down groundwater levels where groundwater levels are relatively high for the purposes of conjunctively using the basin or creating future storage?
- Will groundwater flow to legally established pre-2015 uses down-gradient from an adjacent basin or GSA be protected as a pre-SGMA condition?
- Will streamflow depletions established pre-2015 be protected as a pre-SGMA condition?
- Will habitat or species reduction established pre-2015 be protected as a pre-SGMA condition?
- Will groundwater levels that caused wells to dry out be protected as pre-SGMA conditions?
- Should GSAs be required to outline short-term and long-term expected undesirable results and resulting impacts while the GSP is being implemented?
- Will DWR establish a minimum standard for significant and unreasonable undesirable results?

4.0 SELECT CALIFORNIA WATER CODE SECTIONS RELATED TO "PRE-SGMA" CONDITIONS AND UNDESIRABLE RESULTS

This part identifies select sections of the Water Code related to "Pre-SGMA" conditions and undesirable results. Each identified Water Code section includes the relevant Water Code text and identifies questions and considerations specific to that section.

10727.2. Required Plan Elements

Note: Water Code Section 10727.2(b)(4) is referred to in this paper as "Pre-SGMA Conditions."

A groundwater sustainability plan shall include all of the following:

(b) (1) Measurable objectives, as well as interim milestones in increments of five years, to achieve the sustainability goal in the basin within 20 years of the implementation of the plan.

(b) (2) A description of how the plan helps meet each objective and how each objective is intended to achieve the sustainability goal for the basin for long-term beneficial uses of groundwater.

(b) (4) The plan may, but is not required to, address undesirable results that occurred before, and have not been corrected by, January 1, 2015. Notwithstanding paragraphs (1) to (3), inclusive, a groundwater sustainability agency has discretion as to whether to set measurable objectives and the timeframes for achieving any objectives for undesirable results that occurred before, and have not been corrected by, January 1, 2015.

Considerations

It will be important to document and distinguish between past undesirable results that occurred in the basin prior to the effective date of SGMA, and are not subject to SGMA, from future undesirable results that are subject to SGMA.

SGMA includes the provision that a GSP is required to set measurable objectives, describe how the GSP meets these objectives, and describe how progress in meeting these objectives will be demonstrated. A GSA has discretion whether to set measurable objectives and the timeframes for achieving any objectives for uncorrected undesirable results that occurred before January 1, 2015.

As it relates to the above mentioned paragraphs, it will be important to identify the appropriate and defensible assumptions and methodologies to establish a baseline as it relates to evaluating pre-SGMA conditions. If so, it may be reasonable to include the following to establish a baseline:

- A literature review of historical basin conditions including water balance estimates, water levels, groundwater quality, and land subsidence.
- Records for a sufficient base period prior to 2015.
- A description and quantification of water demand including applied and consumptive water demands for agricultural, municipal, industrial, recreational, and environmental purposes.
- A description of land use and changes in land use over the base period.

- Description of groundwater-level information over the baseline for the entire basin, spatially and temporally.
- Historical surface water supply and groundwater availability, including source of supplies, records of diversions, pumping depths, aggregate pumping volumes, a description of water rights, and regulatory restrictions.
- Identification of surface water and groundwater monitoring network, data gaps, and assessment of data measurement accuracy.
- Review and certification of the baseline conditions relative to undesirable results documented by a California licensed Professional Geologist or Professional Civil Engineer.

The baseline for measuring water availability may need to include the historic average groundwater pumping and deliveries of surface water to the agency or water users in the basin. Additional information useful for establishing baseline conditions may include:

- Groundwater levels identifying the location of the salt water wedge adjacent to coastal basins for areas experiencing seawater intrusion.
- Groundwater levels relative to historic lows and identification of compressible clays in areas experiencing land subsidence.
- Survey data showing historical representative land surface elevations.
- Horizontal and vertical extent, concentrations of any contaminants of interest, and identification of the sources of contamination.
- An estimated historical water budget, including contributions from streams and from adjacent groundwater basins.

Questions

- Do undesirable results that occurred before January 1, 2015 not have to be addressed, but need to be fully defined and GSP actions included, that will manage undesirable results above significant and unreasonable levels by 2040 or 2042? Or should, in some cases, GSP actions be included to manage undesirable results to return to or be maintained at January 1, 2015 conditions?
- In general, what challenges are there in defining the baseline? Does the approach to evaluate baseline differ based on the six types of undesirable results, and should there be special baseline considerations within each basin?
- To what standards should GSPs be held on documenting and supporting a reasonable baseline?
- How should uncertainty be considered when establishing baseline?

10721. Definitions – Undesirable Results

(u) "Sustainable groundwater management" means the management and use of groundwater in a manner that can be maintained during the planning and implementation horizon without causing undesirable results.

(w) "Undesirable result" means one or more of the following effects caused by groundwater conditions occurring throughout the basin:

(1) Chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply if continued over the planning and implementation horizon. Overdraft during a period of drought is not sufficient to establish a chronic lowering of groundwater levels if extractions and recharge are managed as necessary to ensure that reductions in groundwater levels or storage during a period of drought are offset by increases in groundwater levels or storage during other periods.
(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 has significant and unreasonable adverse impacts on beneficial uses of the surface water.

The following are some general considerations and questions as they relate to all six undesirable results.

Considerations

Undesirable results must be "significant and unreasonable." It is assumed the definition of significant and unreasonable, as it relates to undesirable results, will be highly variable depending upon geographic, water management, economic, and environmental considerations.

Questions

- Should "significant and unreasonable" largely be based on site-specific considerations and defined as a measurable objective (developed at the local level), and be based on broad consideration of whether implementation of the measurable objectives will avoid or minimize permanent or irreversible impacts?
- Should there be a state-developed minimum standard (i.e. threshold) or framework for each undesirable result established, regardless of site specific conditions? If so, what existing standards or frameworks are available and appropriate?
- What criterions are important to confirm and justify how significant and unreasonable thresholds for undesirable results are developed?

- Will it be important to document the variability of basin conditions if site-specific definitions of significant and unreasonable undesirable results are developed locally, to support DWR's evaluation of future thresholds for management of those undesirable results?

A more detailed list of considerations and questions is provided for each of the undesirable results as follows.

GROUNDWATER LEVELS

Considerations

Sustainability will likely only occur if there is a demonstration of a long-term basin-wide balance between supply and demand. This in part can be monitored by establishing an acceptable range of groundwater levels and a network of monitoring points. This can also be completed through more complex methods, such as detailed computer modeling calibrated to a recent historical period. Specific actions (e.g., voluntary or mandatory pumping reductions) might be specified if groundwater levels approach or exceed established thresholds.

Questions

- How would a GSA approach groundwater levels, such as operating within certain limits, as a measurable objective to avoid significant and unreasonable undesirable results?
- Should long-term, as described above, be quantified on a site-specific basis or be a statewide standard (e.g. 10 years)?
- Is there a scenario where the operation of a basin at lower-than-historical (or pre-January 1, 2015) groundwater levels (assuming there are no significant and unreasonable undesirable results) is sustainable?

STORAGE

Considerations

In addition to the groundwater level data, the calculation of storage may need to include some knowledge of the water-yielding capacity of the aquifer (e.g., specific yield or coefficient of storage). This can be estimated locally by analysis of well pumping tests and can be extrapolated using statistical or modeling techniques. The lower extent of the basin will also likely need to be established, either through geologic evidence, water quality constraints at depth, or an economic pumping level, to understand the storage or yield of the basin. Where the aquifer is thin, or where aquifers release lower volumes of water (i.e., low specific yield), additional sub-basin constraints may be needed to avoid undesirable results.

For many stakeholders, especially in areas of critical conditions of overdraft, storage (groundwater as a source of water supply for agricultural, domestic, and/or municipal and industrial use) may be the key consideration related to sustainability. From a stakeholder perspective, achieving a sustainability goal may be solely addressing overdraft conditions.

Questions

- Should groundwater storage be considered only where the "emptying" of the aquifer threatens supply reliability?

SEAWATER INTRUSION

Considerations

Seawater intrusion may be induced by creating a landward gradient through lowering of the groundwater table. Once seawater reaches the area of groundwater production, the production wells will not be suitable for drinking or irrigation use and it will likely take decades and significant changes in water supply and use patterns to restore an aquifer's productivity. Maintaining a "wedge" of freshwater in coastal areas, between the ocean and the freshwater aquifers, may prevent undesirable results. Knowledge of the aquifer system, groundwater levels, and water gradients are needed to manage seawater intrusion.

Questions

- What are the appropriate water quality standards for evaluating seawater intrusion?
- The SWRCB has existing pre-SGMA authority to regulate groundwater in certain situations where seawater intrusion threatens the irreparable injury to the aquifer. Should this authority be used to further define perhaps a minimum standard for significant and unreasonable for this undesirable result?
- How should SGMA relate to existing water quality law for seawater intrusion?

WATER QUALITY

Considerations

Water quality issues may arise from natural or man-made sources. Natural causes include mineral leaching, saline migration, or other sources. Man-made causes include farming and ranching operations, septic releases, and chemical spills. Migration of these contaminants may be influenced by surface water applications or groundwater pumping patterns that may impair water supplies.

It will be important to include identification of any water quality issues that affect water supply sustainability at the present, or might potentially affect sustainability in the future. Data gaps and a data collection plan should be identified. Additional information on planned remediation and treatment that will maintain groundwater sustainability should be identified.

Questions

- What level of information on the horizontal and vertical extent of the water quality variability in the aquifer, the types of constituents, the concentration of constituents, and proximity to sensitive receptors or wells should be considered in establishing significant and unreasonable?

- Which existing water quality management programs might complement or conflict with management under a GSP?
- Should GSAs solely define significant and unreasonable water quality undesirable results for the purposes of planning and only provide limited acknowledgement of existing, and often complex, regulatory programs when doing so?
- How should SGMA relate to existing water quality law?

LAND SUBSIDENCE

Considerations

Land subsidence can be caused by many factors, including mining activities, oil and gas extraction, oxidation of organic soils, and consolidation of compressible soils due to dewatering. Although groundwater use can be a major factor in causing subsidence, subsidence associated with some of these other factors is not a result of groundwater extraction by local agencies or individual landowners.

Consolidation of compressible soils is generally caused by the dewatering of clays and silts. Land subsidence due to short-term dewatering may be elastic and recoverable as water pressures in the pores of these materials are restored. More severe dewatering can cause a collapse of the pores and result in inelastic or non-recoverable land subsidence. This collapse may result in the permanent sinking of the ground surface, loss of aquifer storage capacity, and disruption of the functioning of surface features such as rivers, canals, and foundations. The reduction of pressure in thick clay units can be very slow, and once reduced pressure has begun to propagate through the unit, consolidation may continue for years or decades. Generally, land subsidence due to consolidation can be prevented by avoiding the initial dewatering of clay and silt aquifer units.

If subsidence or subsidence potential is identified in a basin, it may be important to identify the likely cause (e.g., mining, oxidation, and consolidation), identify compressible aquifer units in the subsurface, develop a geologic map, and inventory water-level information in the susceptible area.

In areas subject to consolidation, it may be important to consider strategies to maintain or restore water pressures to above the top of the compressible aquifer units. In areas where groundwater pressures are already reduced in the compressible units, it may be important to consider the impacts of expected subsidence on critical infrastructure.

Questions

- Some areas will continue to experience some land subsidence even with cessation of all pumping, or with continued pumping where groundwater level conditions are relatively static. In these areas, or areas where the groundwater basin is being operated conjunctively (periodically drawing down groundwater levels and refiling the basin during times of surplus surface water supply), how should a significant and unreasonable undesirable result threshold be defined? Should significant and unreasonable undesirable results in this example be based on a risk assessment evaluation of potential impacts to infrastructure (ex. conveyance or highway infrastructure) and/or other criterion?

- Should the development of a risk assessment to infrastructure and other impacts be considered for establishment of significant and unreasonable undesirable results statewide?
- What type of mitigation measures should be considered where impacts from land subsidence affect infrastructure (ex. conveyance or highway infrastructure) or the environment?

DEPLETIONS OF INTERCONNECTED SURFACE WATER

Considerations

Both the loss of streamflow to groundwater and the loss of groundwater to surface streams are part of the natural hydrologic system. The direction of flow depends on the relative elevation of these inter-connected waters, and the rate of flow depends on the properties of the aquifer matrix and the gradients of the water sources. Many surface water-groundwater systems reverse the flow direction seasonally in response to groundwater extraction.

The flow rate between interconnected surface water-groundwater systems will generally increase as groundwater levels are pumped below the bottom of the surface channel and the flow gradient steepens. In many areas, the depth-to-groundwater results in a nearly vertical gradient from the surface stream, and depletion of streamflow becomes nearly constant, varying only with the wetted area of the stream channel.

Declining groundwater levels may decrease the discharge to surface streams and result in reduced instream flow and supply to wetland, estuary areas, and other groundwater dependent ecosystems. Loss of streamflow may reduce the supply available for downstream diverters, or require additional releases to be made from surface water reservoirs to meet required instream and downstream needs.

An analysis of baseline conditions should be performed. Gaged streamflow and groundwater-level information may need to be collected and an estimate of streamflow contribution to the groundwater supply may need to be included in the water budget.

In addition, the cumulative effects of wet year and drought year impacts might need to be studied and estimated. Reaches of a stream that contributes the most to groundwater sources might be identified from groundwater-level information. Sophisticated groundwater models may be necessary, where the groundwater and surface water systems have a hydrologic connection, to defensibly estimate this interconnection where critical or consequential impacts are identified.

Specific hydrogeologic parameters may be necessary, including transmissivity of the aquifer materials, to defensibly evaluate the timing and rate of streamflow depletion from groundwater pumping. The transmissivity of the aquifer materials can be estimated from pumping tests of wells in the vicinity of the stream.

Questions

- Should standardized methods for estimating streamflow depletion be defined by industry standards?

- How will potential environmental impacts associated with streamflow depletion be identified and quantified?
- How should surface water rights be integrated into the stream-aquifer dynamic?