MEETING SUMMARY

Groundwater – Surface Water (GW-SW) Interactions Workshop
State Water Resource Control Board
December 3, 2018

The document is a high-level summary of the presentations and discussions at the GW-SW Interactions Workshop. More detail is available on the workshop webpage (https://www.waterboards.ca.gov/water_issues/programs/gmp/gwsw_wkshp.html).

The summary is organized as follows:

I. KEY TAKEAWAYS & AREAS OF INTEREST: *Synthesis of key takeaways from presentations and panel discussions that reflects areas of attendee interest based on questions, comments, and notes from small group discussions.*

- Impacts of groundwater pumping on surface water can be delayed and long lasting – even after pumping stops.
- The Sustainable Groundwater Management Act (SGMA) is one of many laws/legal frameworks with implications for GW-SW interactions; others include traditional water rights, the reasonable use doctrine, the public trust doctrine, the Endangered Species Act, and water quality statutes. Groundwater Sustainability Agencies (GSAs) should consider these laws when they decide what impacts are significant and unreasonable.
- SGMA allows, but does not require, GSAs to address any undesirable results that occurred prior to January 1, 2015. If impacts are ongoing, GSAs are only responsible for the incremental increase in those impacts since 2015. There is a distinction between cause and effect: GSAs are responsible for addressing undesirable results that worsen after January 1, 2015, even if the causes of those effects occurred prior to 2015.
- Stakeholder buy-in and successful implementation of Groundwater Sustainability Plans (GSPs) require early engagement with all stakeholder groups, including disadvantaged populations.
- Transparency around data collection and model development may improve credibility of model outputs.

- GSA investment in data collection (e.g. high-resolution stream gages) will be crucial for creating and calibrating models. Widespread metering has been a central part of successful groundwater management elsewhere.
- GSAs should consider the pros and cons of analytical and numerical models as GSAs design their approaches in order to maximize basin understanding and use financial resources efficiently.
    - Analytical models are useful in basins where data, modeling expertise, and funding may be lacking, and tend to be more accurate in "flatter," more homogenous settings. Analytical models can be used to identify areas where exiting basin understanding is adequate for making management decisions and areas where problems and/or inconsistencies remain and where more targeted numerical models can be useful.
    - Numerical models are often necessary to understand complex, three-dimensional aquifer systems. Numerical models can simulate stream depletion spatially over time, which can help GSAs understand the pattern(s) of pumping causing current conditions and what depletions could look like in the future given impact delays. However, numerical models also require high-quality data at sufficient spatial and temporal scales, which can be prohibitively expensive.
- There is recognition that collecting data and building representative models that parse out all the contributing factors of surface water depletion will take time. GSAs should do their best to understand how pumping is impacting surface water depletion (i.e. reasonableness approach).
- Ongoing monitoring and adaptive management will be essential, particularly in the face of climate change impacts on GW-SW resources. Any time there is a difference between monitoring and what is anticipated by modeling, GSAs will need to investigate the discrepancy.
- Groundwater recharge is not a beneficial use. However, it is a potential method of diversion that can lead to an end use that is beneficial (e.g. prevention of subsidence, prevention of seawater intrusion, maintenance of ecological instream flows).

II. SUMMARY OF PRESENTATIONS: *Brief summary of workshop presentations*.

Introductions

Erik Ekdahl, State Water Resource Control Board (State Water Board or Board), discussed the workshop objective to provide water managers with a menu of approaches for managing surface water depletions in their groundwater basins. SGMA requires that groundwater withdrawals not cause "significant and unreasonable adverse impacts on beneficial uses of surface water" – also known as "undesirable result no. 6." To fulfill this mandate, GSAs must 1) gather adequate information to determine if there are GW-SW interactions in their basin, what the impacts of groundwater withdrawals are on beneficial uses of surface water, and if those impacts are “significant and unreasonable” and 2) craft GSPs that mitigate impacts (if present) and achieve and maintain sustainable groundwater use long-term. There are also a variety of laws, regulations, and other legal doctrines beyond SGMA that protect beneficial uses of surface water and need to be considered throughout the SGMA process. Ekdahl acknowledged the challenge of this task given that many areas have little GW-SW interactions data.

GW-SW Interactions: A Scientific Primer

Steve Phillips, USGS, provided a summary of the science behind GW-SW interactions and the tools that can be used to assess changes to streamflow. Phillips explained that streamflow depletion by wells generally occurs over time and emphasized that there can be a substantial delay between the start of pumping and the onset of streamflow depletion – and the effects can continue even if pumping is stopped. Phillips discussed the factors that affect the timing and rate of streamflow depletion and outlined three approaches to analyze streamflow depletion (in order of complexity): field techniques and data analysis, analytical models, and numerical models. He noted that models are necessary to better understand historical patterns and to simulate future climate and management scenarios.

State Agency Perspectives: SGMA Overview

Steven Springhorn, DWR, and Sam Boland-Brien, State Water Board, presented an overview of SGMA from the State’s perspective. SGMA divides groundwater management responsibilities across three groups: (1) local GSAs have authority and are required to design and apply sustainable management criteria for their groundwater basin via GSPs, (2) DWR provides technical assistance and evaluates the technical adequacy of GSPs, and (3) the State Water Board intervenes to directly manage groundwater if necessary.

Starting in 2020, State Water Board will intervene if GSAs in critically overdrafted basins have not filed a GSP. Starting in 2025, if a GSP is found inadequate by DWR, the Board can designate a basin probationary. If a GSA is unable to fix the issues during the probationary period, the Board will implement an interim plan to do so. Boland-Brien emphasized that under SGMA, the State Water Board only steps in when local efforts fail, and any Board intervention will only last until the GSA remedies the issues that led to state intervention.

Springhorn explained that GSPs need to identify physical characteristics of basins, stakeholders involved in pumping, where and how much pumping is occurring, and how sustainability is going to be defined, maintained, and achieved. He noted that only GSAs in basins with interconnected surface water, as defined in the GSP regulations, have to assess and prevent “undesirable result no. 6.” These GSAs will each set a minimum thresholds (e.g. location, quantity, and timing) for the rate or volume of surface water depletion caused by groundwater. If those thresholds are exceeded, adaptive management actions outlined in the GSP will need to be implemented. Springhorn acknowledged that given the imperfect knowledge of groundwater and the best ways to manage it, GSPs will almost certainly be iterative, requiring adaptive management as better information is developed over the next 20+ years SGMA implementation horizon.

State Agency Perspectives: The Public Trust and Beneficial Uses

Erin Ragazzi and Nicole Kuenzi, State Water Board, reviewed Board responsibilities to maximize the beneficial use of surface water while protecting the public trust, preventing waste and unreasonable use, and ensuring surface waters meet Porter-Cologne Water Quality Control Act and federal Clean Water Act requirements. Ragazzi reviewed instances where the Board has successfully regulated groundwater diversions that impacted ecological instream resources, including the 2011 Russian River Frost Protection Regulation, 2015 Russian River Tributaries Drought Emergency Regulation, and 2017 Cannabis Cultivation Policy. Ragazzi emphasized the importance of collecting data, using GW-SW models, and promoting local planning and preventative actions before impacts require State Water Board intervention.

Kuenzi explained that under the Public Trust Doctrine, the State Water Board must consider the interests of the public in navigable waterways, including recreational, subsistence, and ecological interests, and fisheries in non-navigable waterways. The Board must balance public trust resources with other priorities and manage to protect public trust resources whenever feasible. In 2018, a court ruled that the public trust doctrine applies to the extraction of groundwater that adversely affects surface water public trust resources (Environmental Law Foundation v. State Water Resources Control Board).

Kuenzi stressed that local agencies are also guardians of the public trust, and recommended that GSAs identify public trust resources, potential impacts, options to avoid impacts, and clearly state the public interests they are weighing in GSPs. Kuenzi also emphasized that the State Water Board will evaluate adverse impacts on beneficial uses of surface water under both SGMA and the Public Trust Doctrine.

Subject Matter Expert Perspectives: Tools, Legal Frameworks, Compliance – *Key takeaways from presentations on how to approach SGMA based on subject matter expertise.*

Tools for Assessing GW-SW Connectivity, Tara Moran

- GSAs first need to determine whether there are interconnected surface waters in their basin.

- Agencies should publicize instream flow criteria methods, so GSAs can use those methods to calculate their instream flow needs (for streams without existing instream flow criteria) and better understand the water needed for ecological purposes.
- GSAs should prioritize investment in high-resolution stream gages, since that data will be crucial for creating and calibrating models.
- Analytical models are useful in basins where data and modeling expertise is lacking. Numerical models can be used later in specific areas where problems are identified, allowing GSAs to prioritize resources.
- There are many online tools to support water management decisions; however, sufficient funding is necessary for operations and maintenance and to communicate results.

Key Legal Issues for SGMA and GW-SW Integration, Dave Owen

- SGMA is one of many laws with implications for GW-SW interactions. Other laws may create obligations that go beyond SGMA and should inform GSAs as they decide what impacts are significant and unreasonable.
- SGMA allows, but does not require, GSAs to address undesirable results that occurred prior to January 1, 2015. However, that does not remove the necessity of compliance with other laws.
- Pay attention to the implications of conflicting surface and groundwater rights, the Reasonable Use Doctrine, the Public Trust Doctrine, the Endangered Species Act, and water quality statutes. Avoid looking at SGMA alone; SGMA-compliance is a way to integrate legal responsibilities.

Guide to SGMA Compliance, Letty Belin

- Groundwater uses that impact/violate state/federal requirements relating to surface water beneficial uses will almost certainly be considered unreasonable. These include groundwater uses that cause or contribute to violation of state/federal endangered species law, instream flow requirements; flow impairment of “wild and scenic” rivers; adverse effects on surface waters in specially protected areas; senior surface water right impairment; and adverse effects on groundwater dependent ecosystems (GDEs) protected under the Public Trust Doctrine.
- Surface water depletions will often be linked to multiple causes. Work with other potentially responsible parties to collect data, create models, and develop solutions.
- Aim to keep GW levels at least as high as they were in 2014. This will not be protective against delayed impacts, but it represents a good preliminary benchmark.

Depletions and Management: Case Studies & Discussion – *Experiences and approaches to addressing GW-SW interaction issues from other states, nations, and interest groups. Audience members discussed approaches and their own challenges in small groups.*

Environmental Defense Fund (EDF), Maurice Hall

- EDF proposed a management approach that maintains a groundwater gradient near the stream at or above pre-2015 levels. This requires a robust monitoring program and, potentially, a series of management actions if levels are falling.

University of Victoria and Foundry Spatial, British Columbia (BC), Ben Kerr

- BC proposed the use of an analytical model to apportion depletions from wells to surrounding streams and calculate depletion values. Using this model, BC developed a watershed tool that provides rapid access to information on stream reaches affected by wells.
- The model can generate information with little data, but assumptions must be made where there are data gaps. Better available data means more accurate results, but for areas with little data, some information is better than none.
- Numerical models can augment this approach in areas with complex surface water and geology.
- BC's government retains most of the authority over groundwater regulation, which minimizes local autonomy, but means support and resources from the state are consistent.

Danish EPA, Kingdom of Denmark, Jasper Hannibalsen

- Denmark's groundwater protection plans required identifying existing data, filling gaps with extensive surveys, building and integrating more than 200 models, and conducting vulnerability assessments based on model output.
- Denmark provided opportunities for stakeholders to review data and modeling throughout development, which created consensus around baseline work products early.
- Models are publicly available and updated regularly based on information submitted by users. Data loggers are installed in the wells whenever new groundwater areas are mapped.
- Extensive modeling is funded by national water taxes.

Former Colorado State Engineer, Dick Wolfe

- Colorado began with analytical models, but rapid well installation led to less reliable analytical modeling overtime, particularly for anticipating specific local impacts. Starting in the 1980s, basins across Colorado invested in numerical models ($5 to $10 million per model).

- Colorado appointed a technical advisory committee to help establish the numeric models, which gave model outputs more credibility. To insure all stakeholders were able to provide input, advisory committees had 100+ members.
- Measuring and reporting groundwater extractions is required in Colorado. All high-capacity wells (over 15 gal/min) must be metered; many of the new meters are broadcast in real time.
- Consistent, high-quality measurements are essential to building good models and for incentivizing conservation. Reliable models have provided regulatory certainty, particularly for Colorado's agricultural economy.
- Establishing funding mechanisms is crucial.
- Colorado groundwater rights are junior to surface water rights; groundwater users must compensate senior users "injured" by pumping through augmentation programs (e.g. monetary compensation for lost hay production). Numerical models track and assign responsibility.

Small Group Observations: Selected comments and questions from small group discussions.

- Existing records of groundwater pumping are sparse (self-reporting is low). GSAs can require metering and reporting, but it will be politically difficult and expensive.
- California has monitored groundwater and surface water separately for so long, it will be difficult for stakeholders to think about a single system.
- Key challenges: managing groundwater during drought years; getting stakeholders to engage now before plans have coalesce; and finding funding mechanisms to do more analysis.
- Accessing existing data can be challenging (multiple data sources and uneven public access). Data often needs to be a finer resolution to be useful. How can we incentivize data sharing?
- Attendees appreciated the democratization of information in British Columbia's approach.
- If you use models of varying specificity, does that advantage some overlying users over others?
- Compensation for status quo pumping could be the first step in implementing cut-backs.
- Land use agencies need to help problem-solve for SGMA planning and implementation.
- Wildlife agencies and other stakeholders need to reach out to GSAs, and GSAs need to engage with agencies and get buy-in. They would like the Board to share an agency stakeholder contact list (e.g. fish, tribes, water quality/rights) to help coordination between these groups and GSAs.

III. SUMMARY OF DISCUSSIONS, QUESTIONS & COMMENTS. *Summary of group discussions and questions and answers that occurred throughout the workshop.*

The morning discussion included the following topics: coordination between GSAs on streamflow depletion, pre-SGMA conditions and undesirable results, State expectations for GSA understanding of how pumping is impacting surface water, data needs, and groundwater recharge as a beneficial use.

The afternoon discussion included the following topics: establishing credibility with stakeholders, engaging with stakeholders, GSA governance structures that support stakeholder engagement, fee structures, moving from analytical models to numeric models overtime, how to determine if an analytical or numerical model is needed, best management practices for collecting and handling data, importance of metering groundwater extractions, the need for publicly accessible groundwater data, the need for adaptive management with any approach to managing surface depletions caused by groundwater pumping, and the costs and benefits of numerical models.

IV. TOPICS FOR FURTHER DISCUSSION: *The following were identified by participants as topics they would like to learn more about in future workshops.*

Fee structures, public goods charge, water models, methods of allocating sustainable yields among competing users, governance, Public Trust Doctrine, groundwater substitution transfers, incentivizing data sharing, and how to overcome groundwater user aversions to monitoring.