MCLE Self-Study Article

Groundwater Recharge Projects: Considerations for Water Managers and Neighboring Landowners

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I. INTRODUCTION

California has developed an insatiable reliance on groundwater. Demand for water in California far outpaces its supply, and, as a result, water users are faced with a hard choice: increase local supply or reduce groundwater pumping. This imbalance might not have been so severe had California expanded surface water supply and not been the last western state to regulate groundwater use. Now—after almost a century of mismanagement—California has decided to begin addressing its groundwater woes. Although many tools will be required to reverse unsustainable trends, one increasingly popular idea is the use of surface water for groundwater recharge and banking. In an effort to address these problems, the state enacted a new regulatory process to streamline opportunities for groundwater recharge and banking.

This article provides an overview of groundwater recharge and its benefits, examines the state's new framework for implementing recharge projects, and considers significant issues for project managers and neighboring landowners.

II. BACKGROUND: CALIFORNIA GROUNDWATER & GROUNDWATER RECHARGE

Worsening droughts, growing population, expansive regulations protecting endangered fish, and a myriad of other stresses have compounded surface water scarcity in California. The result has been a long-term, unsustainable reliance on groundwater supplies to offset lack of surface water.

For most of California's history, groundwater has been managed locally with almost no state regulation largely because it is viewed culturally and legally as an all-important incident of property ownership. Groundwater rights have occupied a more unique role than surface water rights in the realm of real property. One of the differences has been that groundwater is regulated more at the local level than at the state level. Similar to real property, local regulation of groundwater makes sense because of the enormous variety of land uses and hydrologic conditions in a state as large as California.[1]

Until 2014, few restrictions were placed on the extraction of groundwater.[2] Unlike surface water, there was no comprehensive scheme for allocating groundwater rights.[3] California left that to local government or adjudication by the courts. Adjudication of groundwater rights traditionally have been styled as quiet title actions to settle conflicting claims to property.[4] California also allowed the formation of special districts with limited powers to replenish groundwater districts and institute actions or proceedings to adjudicate water rights.[5]

The Sustainable Groundwater Management Act ("SGMA") was enacted in 2014 to tackle almost a century of unaddressed problems related to groundwater overdraft by restricting pumping to sustainable levels over the next twenty years.[6] SGMA requires formation of groundwater sustainability agencies (GSAs) to prepare groundwater sustainability plans (GSPs) to achieve sustainable yield.[7] As GSAs and other local agencies hastily work to achieve sustainability by the 2040 deadline, many are confronted with either increasing local supply, reducing landowners' ability to pump, or a combination of both.

To avoid the harsh realities of reduced pumping, GSAs and local agencies will increasingly look to groundwater recharge and banking as tools to expand local supplies and ease the severe economic impacts that would follow pumping restrictions.[8] Despite growing demand for groundwater recharge in California—and despite past successes with recharge projects—until 2019, there was no established legal framework for such projects. The urgency to balance groundwater levels under SGMA prompted the state to enact a new permitting framework to streamline opportunities for recharge. Although this new permit system is limited in application to the SGMA context, and is limited to temporary permits, the regulations are a first and important step toward developing a broader regulatory framework for groundwater recharge and groundwater banking.

III. WHAT IS GROUNDWATER RECHARGE AND BANKING?

Groundwater recharge is the augmentation of groundwater by natural or artificial means.[9] Some recharge happens naturally when water flows into the ground from rivers, unlined canals, irrigation, or between adjacent aquifers. Recharge is also done intentionally to restore groundwater levels and store for later use. Where, when, how much, and how fast water can be recharged or banked depends on availability of conveyance infrastructure, soil and crop suitability, and aquifer characteristics that enable rapid recharge rates.[10]

Recharge projects involve either direct recharge, where water is injected into aquifers or flooded over porous soil to percolate underground, or indirect recharge (i.e. "in-lieu" recharge), where surface water is substituted for groundwater pumping.[11] Some projects seek to leave water underground, whereas others seek to extract and use the recharged groundwater. So-called "groundwater banking" projects are sometimes used to create an accounting framework that allows landowners to store, transfer, and trade basin supplies through a central management agency for the purpose of increasing economic efficiency and balancing supplies.[12]

Intentional recharge is undertaken for a variety of purposes across California at present, and more projects are contemplated. The San Joaquin Valley's agricultural region in particular is expected to undertake many new projects as it is home to some of California's most complex and intractable water problems, considered ground zero for SGMA implementation.[13]

Traditionally, the most widespread recharge methods in the San Joaquin Valley include seepage from unlined canals and streambeds, flood irrigation, and in-lieu recharge (defined above). While there already are many established projects in the San Joaquin Valley, there is significant potential for increased on-farm, fallowed land, and open space recharge and the construction of recharge basins.[14] Many water districts have purchased land in recent years to develop recharge basins.[15] There is also potential for injection wells, which are nearly absent from the region and are more common in urban Southern California.[16]

Many new groundwater recharge and banking projects are being contemplated throughout the San Joaquin Valley in an effort to achieve sustainability under SGMA and store for use in dry years. While GSAs have proposed combinations of projects to expand supply and actions to reduce pumping, almost 80 percent of proposed projects in the San Joaquin Valley involve supply expansion—the majority of which are recharge projects.[17] Investments in supply are essential to avoid even costlier fallowing of 500,000 to one million acres of irrigated farmland due to pumping restrictions.[18] Access to surface water when available will be a key factor in determining which croplands stay in production, and which lands are retired.[19]

A critical question is how much water is available for recharge given surface water scarcity. California's water supply in any given year is largely determined by a handful of big weather events and winter floods, which are hard to capture in surface reservoirs because reservoirs need to be simultaneously managed for flood control.[20] California's groundwater basins can store much more water than surface water reservoirs, but recharge is most effective in wet years when there is too much water to store in surface reservoirs and the excess can be banked underground.[21]

Although most current recharge projects involve agricultural and urban water suppliers replenishing water at their locations, recharge can also be accomplished via "groundwater banks."[22] Groundwater banks are essentially collective underground

storage projects, located in areas with soil and other conditions conducive to recharge; such banks store water on behalf of both local water users, and water users located elsewhere who transfer water into and out of the bank.[23] Groundwater banks rely on "formal accounting system[s] to keep track of balances, which decline during dry times as members withdraw water and increase during wet times as water is deposited back in" for future extraction.[24] At present, several groundwater banks in the San Joaquin Valley buy water from state and federal water projects to store underground for use in dry years.[25] Such groundwater banking is promoted as a promising way to stabilize California's water supply without the challenges and costs associated with expanding surface storage.[26] Groundwater banking will not solve the state's sustainability problems—even if California captures and banks all potentially available water, a significant groundwater deficit would remain due to long-term overdraft—but banking would be a meaningful step toward sustainability.[27]

IV. BENEFITS OF GROUNDWATER RECHARGE & BANKING

Groundwater constitutes approximately 40 to 60 percent of California's water supply, depending on surface water conditions in dry years.[28] Successful recharge projects provide many benefits: they can help bring local basins into balance, and play a role in supporting California's agricultural economy.[29] Recharge and banking can also provide environmental habitat for wildlife, help restore vital interconnections to rivers and streams, provide a freshwater barrier to seawater intrusion, prevent further subsidence and damage to water conveyance infrastructure, and strengthen the state's overall drought resilience.[30]

Expanding recharge will also help address water management and availability risks associated with climate change. More intense droughts increase pressures to draw down groundwater reserves, and warming winters have increased interest in recharge as a strategy to help mitigate the loss of snowpack, which historically has accounted for up to a third of the state's seasonal water storage. Recharge will provide state and local agencies greater operational flexibility to store more water while managing growing flood risks from climate change.[31]

V. LEGAL FRAMEWORK FOR GROUNDWATER RECHARGE & BANKING

A. Water Rights

Despite California's widespread reliance on groundwater, there was no coherent framework for implementing recharge projects or quickly capturing high flows for storage in wet years. This is due in part to California's complex water rights system, which historically has not recognized groundwater storage as a "beneficial use" as required by California's Constitution.[32]

Any diversion of surface water in California requires a water right, whether the proposed use is groundwater recharge, irrigating crops, or supplying a community with drinking water. Since 1914, the exclusive method for obtaining appropriative rights has been by submitting an application with the State Water Resources Control Board ("State Water Board" or "Board"), which issues permits and licenses for these so-called "post-1914" rights.[33] Unless one possesses common law surface water rights (i.e. riparian or so-called "pre-1914" appropriative rights), a permit is required to divert and use surface water.[34]

Groundwater recharge may involve surface water, groundwater, or both. Because riparian water typically cannot be stored, use of surface water to store underground usually requires an appropriative right. Common law pre-1914 rights may be used provided that any changes in point of diversion, purpose of use, or place of use do not cause injury to other legal users of water by, e.g., affecting water quality or changing timing of return flow.[35] Pre-1914 rights holders typically do not need the State Water Board's permission to recharge groundwater but must avoid injuring other legal water users or face injunction and liability.[36]

Another ongoing challenge has been the legal relationship between groundwater storage and "beneficial use." There are many beneficial uses of water, but the diversion of surface water for groundwater storage alone has not traditionally been considered a beneficial use.[37] Instead, water generally must be extracted from the ground and put to some other beneficial use.[38] In some instances, the beneficial use can happen underground; for example, protecting groundwater quality is a beneficial use, as is providing water for groundwater-dependent ecosystems.[39] However, California wisdom has traditionally held that groundwater cannot simply be stored for future use when needed. Most beneficial uses require the extraction of the stored water and application to agriculture, drinking water, or other uses.[40] Although this distinction is not problematic in situations where water is moved out of groundwater storage and thereafter applied to beneficial use, such as in groundwater banks, the distinction may be an issue for implementation and expansion of recharge projects vital for balancing groundwater levels and achieving sustainable yield.[41] This issue arose in the context of changes to the Water

Code in 2019 to 2020, described below, and remains an important topic of discussion.

B. AB 658: State Water Right Approvals for Diversion to Underground Storage

The pervading urgency to balance groundwater under SGMA combined with the state's inability to capture and store surplus water during two of the wettest years on record finally prompted legislative action.[42] Assembly Bill ("AB") 658, effective January 1, 2020, amends the Water Code to clarify that GSAs and other local agencies may apply for approvals to divert water to underground storage, either by way of: a temporary permit or a temporary change, both of which are available either: (1) as an "urgency" measure lasting 180 days, subject to renewal; or (2) for a conditional five-year period.[43] Importantly, for five-year permits or changes, AB 658 makes groundwater storage a beneficial use if it advances the sustainability goal of a basin under SGMA.[44] The proposed diversion and storage must be consistent with the adopted GSP or other SGMA-related plan for the basin, and approvals will not be granted for diversions within specific adjudicated basins defined in the Water Code.[45] The mechanisms were developed specifically "to encourage groundwater recharge projects during periods of high-flow events."[46]

1. *Urgency Permits & Changes*

AB 658 amended existing provisions of the Water Code which allow temporary urgency approvals (permits or changes) for the purpose of capturing water during periods of high-flow events. Requests must demonstrate "urgent need" for water consistent with California's constitutional requirements for maximum beneficial use of water.[47] Requests must also demonstrate that there will be no injury to other users of water (see discussion under Five-Year Changes, *infra*) or unreasonable fish, wildlife, and instream impacts, and that they are consistent with the public interest.[48]

2. *Five-Year Permits: Application Requirements*

To receive an approval for a temporary five-year permit, agencies must submit an application to the State Water Board. The application must include information typically required to appropriate surface water, such as where the water will come from, how much water will be used, and where it will be stored.[49] Applications must demonstrate:

- Compliance with the California Environmental Quality Act ("CEQA"), Public Resources Code, §§ 21000 et seq.;
- Consultation with the California Department of Fish and Wildlife;
- A proposed accounting method for storage and extraction that is certified as consistent with the GSP or alternative by the GSA or local agency where the water will be stored; and
- A water availability analysis that quantifies available unappropriated water under a range of foreseeable hydrologic conditions.[50]

Water "availability" must account for water users downstream from the proposed point of diversion, other beneficial uses, and the ability to meet water quality objectives.[51] However, simplified analyses may be used during high-flow events when flows exceed flood stages.[52] The State Water Board may accept a simplified analysis before the agency submits an application if it adequately demonstrates the project would advance the sustainability goal of basin without injury to others.[53]

Notice and Protests. The State Water Board will send applicants a notice that includes a list of those who could be adversely affected by the temporary diversion and use. The applicant must then provide notice to each person on the Board's list and any lists maintained by GSAs or local agencies in the basin where the water will be stored. Interested parties may file objections ("protests") within 30 days of mailing of the notice. The Board will consider protests and may hold hearings before issuing an approval.

State Supervision. The State Water Board will supervise the diversion and use of water under a permit for the protection of all lawful users of water, beneficial uses, including instream beneficial uses, the ability to meet water quality objectives, and for compliance with permit conditions. A permit may require a person who extracts water stored under the permit to comply with regulatory and permitting requirements set by the GSP or alternative plan for the basin.

Permit Subject to Modification. Permits that are issued do not result in vested rights, even of a temporary nature. The permit is subject to modification or revocation at the State Water Board's discretion after the permittee has been given adequate notice and opportunity to be heard. Authorization to divert and use water under the permit expires five years after authorization takes effect and is junior in priority to subsequent appropriators, not including other temporary storage permittees. The Board may renew a permit for another five years if the applicant has exercised due diligence throughout the permit process.

Planned Website Updates. By December 31, 2024, the Board will post information on its website about the effectiveness of the temporary permitting process, including: (1) the number of permits issued; (2) volume of water diverted for groundwater storage; and (3) points of diversion and places of storage.

3. Five-Year Changes: The "No Injury" Rule

AB 658 expressly allows GSAs and local agencies who have existing appropriative rights to petition for temporary changes to their permits to include underground storage, for the purpose of advancing sustainability.[54] The petition process is similar to the application process outlined above, and must similarly demonstrate compliance with CEQA, unless exempt, consultation with DFW, and be consistent with a GSP or demonstrate beneficial use that is not inconsistent with SGMA reporting standards.[55] Before a change petition will be approved, the State Water Board must find based on a preponderance of evidence that the proposed diversion would advance the basin's groundwater sustainability goal without "injuring" other legal users.[56] To avoid injury, temporary changes must not:

- Increase the amount of water authorized for use;
- Enlarge the authorized season of diversion;
- Authorize diversion from a new source; or
- Otherwise in effect initiate a new right.[57]

The "no injury" rule prevents water right holders from changing key elements of their rights, such as point of diversion, place of use, and purpose of use, if there is harm to the quantity or quality of water available to other users of water.[58] A change that affects another water user's ability to meet state or federal water quality standards can constitute injury.[59] The injury analysis also requires consideration of whether sufficient water remains for fish, wildlife, recreation, and other instream beneficial uses.[60]

To prevent injury, storage and extraction will be subject to accounting methods and reporting requirements as imposed by the State Water Board.[61]

As with permits, by 2024, the State Water Board will update its website to report on petitions approved under this section.

C. Groundwater Storage as Beneficial Use

One of the topics addressed in AB 658 is the controversial issue of groundwater storage and beneficial use. The permitting provisions of the law still reference extraction of groundwater, but also recognize sustainability as a beneficial use.[62] For example, applications for a five-year permit must identify a "proposed accounting method for storage and extraction of water diverted under the permit" that is either: 1) consistent with the basin's GSP under SGMA; or 2) adequate to demonstrate beneficial use of water under the permit and be "not inconsistent" with regulations that require GSPs to report extractions, groundwater levels, and storage to the Department of Water Resources.[63]

Outside of the AB 658 context, discussion around the question of groundwater storage as beneficial use continues. Tension looms between the concepts of beneficial use and land subsidence and seawater intrusion, both of which depend on water staying in the ground to prevent potentially catastrophic impacts to water quality and critical infrastructure.[64] GSAs are tasked with fighting subsidence and seawater intrusion under SGMA and must able to store water underground to do so. At the same time, some believe that "declaring that all recharge is a beneficial use would upend California's sensible rule that storage alone is not a beneficial use [as] [d]oing so would effectively eliminate a critical protection against speculation and hoarding."[65] Some groundwater experts note that California's rule of beneficial use does not typically track specific molecules of water, and that because California does not currently report existing beneficial uses of groundwater, it may be possible to leave recharge water in place while reporting pumping sufficient to cover the water left in place, thereby satisfying the beneficial use criterion.[66] Other groundwater experts note that in addition to concerns about hoarding, such an approach might implicate a complex chain of interactions.[67] Legislative refinements or new understandings of existing beneficial use standards may be required to resolve these tensions.

VI. GROUNDWATER RECHARGE & BANKING: CONSIDERATIONS FOR BANKS, NEIGHBORING PROPERTY OWNERS, & ENVIRONMENTAL INTERESTS

The expansion of groundwater recharge and banking projects across the state will result in many benefits for water users and the environment. However, project managers, landowners, and disadvantaged communities each face unique challenges going forward.

A. Considerations for Project Managers

Data Gaps. Data gathering will be challenging for many GSAs and local agencies. Any project proposed to balance groundwater supply requires the availability and quality of data necessary to estimate available groundwater and ascertain the impacts of recharge and extraction. Quality data will be particularly important for developing accounting methods and water availability analyses to obtain temporary storage permits and change orders. SGMA and the Open and Transparent Water Data Act (2016) attempt to address data gaps by requiring data collection and statewide integration of available data, but GSAs will be forced to make some decisions based on incomplete information in the interim.

Funding. Many unanswered questions surround project funding. Proposition 1 (2014), which provides funding for ecosystem and watershed restoration and conservation projects, is one potential source; however, it requires a 50 percent match for the total cost from the applicant.[68] Federal funding may also be available for groundwater projects under the Water Infrastructure Improvements for the Nation Act of 2016. Without state or federal support, local agencies will turn to regional, local, or private funds.[69] Local agencies may impose pumping fees or some other mechanism for local funding of recharge projects that all groundwater users benefit from.[70] However, there could be a significant time lag between project construction and receipt of benefits.[71]

Better accounting of groundwater inflows and outflows will support efforts to secure investment, enable water banking partnerships, expand recharge activities, such as developing incentives for farmers to recharge water on their lands, and provide a sound basis for decision making.

Time to Prepare Permit Application. Agencies seeking a temporary storage permit should consider the length of time required to prepare a viable application and await State Water Board approval. Because temporary storage permits require preparation of environmental documentation and review under CEQA, consultation with DFW, which may take up to 60 days, accounting methods for storage and extraction, and water availability analyses, it is critical that the applicant plan appropriately and recognize that it will take time to complete the process.[72] This is particularly important given the potential of increased flooding from climate change and wet winters—i.e. opportunities for recharge.

B. Considerations for Landowners

Rights to Imported Water. Water that is imported from a different watershed into a groundwater basin for storage belongs to the importer—they are "credited with the fruits of [their] endeavors in bringing into the basin water that would not otherwise be there."[73] This rule is "intended to encourage the use of natural watercourses and basins for efficient transportation and storage of water."[74] As a result, water diverted from a foreign watershed and stored under a temporary storage permit likely belongs to the GSA or local agency (i.e. the permit holder). Landowners overlying the basin only have the right to pump "native" groundwater—groundwater recharged by natural means.[75] This is complicated when the water being stored would have naturally recharged the same basin at some point in the water cycle.

While the right to use imported water belongs to the importer, under classic principles, imported water is considered abandoned and may be extracted for use by others when the importer has no intent to recapture it for use.[76] However, groundwater storage is now a beneficial use under AB 658 if it advances the "sustainability goal" of the basin; defined as "causing the implementation of measures targeted to ensure that the . . . basin is operated within its sustainable yield."[77] With such a broad definition, it may be difficult to demonstrate lack of intent by a GSA or local agency to put imported water to use. Indeed, some GSPs describe their sustainability goal as broadly as "to maintain an economically-viable groundwater resource for the beneficial use of the people of the [basin]."[78]

Interference with Wells. The success of recharge projects requires that most of the recharged water is recoverable by local landowners and contributes to local groundwater sustainability. However, an increase in recharge does not always equal net gain in groundwater stored.[79] Where cones of depression have formed around a well, groundwater will flow from the surrounding aquifer (higher groundwater elevation) toward the well where the groundwater elevation is now lower.[80] This causes a loss of groundwater in nearby wells unless it intercepts some other source of replenishment. As a result, recharged groundwater can be drawn away from the target area into nearby cones of depression.[81] This problem can extend beyond the local basin and affect the ability of adjacent basins to achieve groundwater sustainability.[82] This also suggests that some landowners will benefit from recharge projects not intended for them, whether they are in the same basin or not.

Triggers. Groundwater banks rely on computer models to determine what groundwater conditions would have been like with and without the banking activities, and establish metrics that, if met, initiate action to adjust bank operations.

Accordingly, if recharge or withdrawal impacts surrounding water levels to the selected metric, this "trigger" would cause the bank manager (such as, for example, a monitoring committee) to adjust inputs and extractions to correct the impact. In many groundwater banking situations, the operation of the groundwater bank will improve the levels of local wells on a net basis, even if those wells experience some short-term fluctuations.

Offsets. Proposed recharge projects cannot affect the availability of water native to the groundwater basin for use by overlying landowners. Injury to landowners or the environment may be prevented by integrating offset ratios that require more water to be put in than is taken out, e.g., a 2:1 ratio of recharge to recovery.[83] Offsets also provide a buffer against potential error in calculating groundwater budgets[84] and the movement of groundwater out of the targeted aquifer and into another.[85]

Water Quality. Water quality is a concern because the recharged water mixes with the water in the aquifer, potentially causing adverse effects to human health. Many recharge projects involve treated surface water to meet drinking water standards for subsequent groundwater storage and recovery. Projects that involve direct recharge must comply with federal and state water quality standards that protect drinking water from harmful chemical interactions. Untreated surface water—which often contains a lot of sediment—may also be unsuitable because it can clog underground passageways connecting the aquifer to the well.[86] The State Water Board has adopted water quality standards that require recharge projects to meet drinking water standards and satisfy water quality objectives to ensure compliance with federal law.[87]

Groundwater-Dependent Ecosystems. Impacts of groundwater pumping on surface water ecosystems are an element of sustainable yield under SGMA, as well as an area of concern under federal and state environmental and water laws.[88] Groundwater banks are often structured to improve water levels on a net basis, and are therefore likely to benefit groundwater-dependent ecosystems. Depending on well locations and hydraulic gradients, there may be short-term impacts that will require monitoring; as with local well levels, banks can establish metrics that will trigger adjustment of pumping and recharge operations to protect surface water ecosystems.

Participation by Property Owners. Property owners in the vicinity of proposed recharge and banking activities have the opportunity to learn about projects and participate in discussions about operations, process for ongoing activities, offsets, metrics and triggers, and other details. Such participation will provide information about the long-term benefits of banking, and allow property owners to offer details that will help the bank operate productively. Most recharge and banking operations are undertaken by public entities, providing multiple opportunities during the project development process for participation. Property owners can request to be placed on a notice list, attend agency board meetings, and participate in CEQA scoping and comment processes. In some instances, property owners may wish to designate a representative to interact with or participate in committees that are involved with ongoing project operations.

VII. CONCLUSION

Now that California is woke to the harsh realities of water mismanagement, the state is focused on greater reliance on groundwater storage. California's new permitting framework for streamlining recharge opportunities is a step in that direction. Despite having a clear framework, some uncertainties still surround recharge projects and groundwater storage. These uncertainties will require creative thinking as water managers work to address technical, legal, and political challenges.

Endnotes

* Kevin W. Bursey may be contacted at k_bursey@u.pacific.edu. The opinions expressed in this article are solely his own.

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SAVE THE DATE FOR THE 29TH ANNUAL ENVIRONMENTAL LAW SECTION CONFERENCE: OCTOBER 15-18, 2020

The Environmental Law Section is excited to announce that its popular annual "Environmental Law Conference at Yosemite" will be adapted into a virtual format for 2020. Although we will miss the comradery and scenery of our usual in-person conference, we are energized and excited by the opportunity to plan an innovative conference that is more geographically and financially accessible to all.

Our 2020 Environmental Law Conference will strive to maintain the Yosemite vibe in a virtual world. We envision a mix of educational panels, Book Club, film screenings, fun activities, opportunities for networking and socializing and, if permitted, some smaller in-person activities.

More details are coming soon at **https://calawyers.org/section/environmental-law/yosemite/**. Please save October 15-18, 2020 for this year's conference. And if you have ideas to share on how to take advantage of the opportunities that a virtual conference offers, please contact us at **environmental@calawyers.org**.