REGIONAL WATER AUTHORITY

WATER ACCOUNTING SYSTEM FOR WATER BANKING IN NORTH AND SOUTH AMERICAN SUBBASINS

Version 2

AUGUST 21, 2026

Regional Water Authority
BUILDING ALLIANCES IN NORTHERN CALIFORNIA

SACRAMENTO REGIONAL
WATER BANK
A Sustainable Storage & Recovery Program


CALIFORNIA
AMERICAN WATER


EID
El Dorado Irrigation District


SAN JUAN WATER
SINCE 1854


CARMICHAEL
WATER DISTRICT


El Dorado
Water Agency


DEPARTMENT OF WATER RESOURCES
STATE OF CALIFORNIA


CITRUS
HEIGHTS
WATER
DISTRICT


Florin Resource Conservation District
Elk Grove Water District


BUREAU OF
RECLAMATION


FAIR OAKS
WATER DISTRICT


CITY OF
FOLSOM
DISTINCTIVE BY NATURE


Golden State
Water Company


City of
Lincoln


PCWA


CITY OF
ROSEVILLE
CALIFORNIA


SACRAMENTO AREA
SEWER DISTRICT
SERVING YOU 24/7


City of
SACRAMENTO
Department of Utilities


DEPARTMENT OF WATER RESOURCES
SACRAMENTO COUNTY
WATER AGENCY


COUNTY
OF
Placer


SACRAMENTO
SUBURBAN
WATER
DISTRICT


RWA
Regional Water Authority
BUILDING ALLIANCES IN NORTHERN CALIFORNIA


SACRAMENTO REGIONAL
WATER BANK
A Sustainable Storage & Recovery Program

TABLE OF CONTENTS

FIGURES

ABBREVIATIONS AND ACRONYMS

ASR	aquifer storage and recovery
CEQA	California Environmental Quality Act
CVP	Central Valley Project
DMS	Data Management System
DWR	California Department of Water Resources
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
MO	Measurable Objective
MT	Minimum Threshold
Reclamation	U.S. Department of the Interior, Bureau of Reclamation
RWA	Regional Water Authority
Sac Water Bank	Sacramento Regional Water Bank
SAF	Stream Accretion Factor
SGMA	Sustainable Groundwater Management Act
Subbasins	North and South American Subbasins
WAS	Water accounting system for the North and South American Subbasins

GLOSSARY OF TERMS

This concept paper draws upon the following commonly used terms in water management:

1. **Accounting Benchmark:** A documented estimate of surface water and groundwater use by a banking participant under conditions without banking activities. It enables accurate tracking of recharge and recovery, which are measured as changes from the benchmark.
2. **Adaptive management**: A process of adjusting water management practices to ensure long-term sustainability. This process is based on ongoing monitoring data, evaluation of changing conditions, and stakeholder input to ensure long-term sustainability.
3. **Alternative water supplies**: Water supplies used as an alternative to pumping groundwater, such as diverted surface water, recycled water, and storm water. Note that in the context of recharge, “surface water” used throughout this paper to represent not only surface water but also other alternatives water supplies.
4. **Banking action**: An activity within a groundwater banking program involving the recharge (deposit), recovery (withdrawal), and/or transfer of banked water.
5. **Banking Balance:** The remaining amount of banked water available for recovery after banking losses and leave-behind volume.
6. **Banking losses**: Banked water that becomes physically unrecoverable due to factors such as migration out of a groundwater basin or discharge into interconnected surface water bodies.
7. **Banked Water**: Surface water stored under a groundwater banking program and tracked and credited to an account for future recovery or exchange. Storage may occur through direct recharge of surface water or through in-lieu recharge where surface water is provided instead of groundwater pumping, leaving groundwater in place.
8. **Banking participant:** A banking participant that actively participates in a groundwater banking program. These participants contribute to and utilize the water bank by providing surface water for recharge, recharging (depositing) water into the aquifer (through in-lieu or direct recharge methods), recovering (withdrawing) banked water to meet water supply needs in the subbasins, using recovered banked water to make surface water available for other uses, or supporting such operations via their extraction, treatment, and conveyance infrastructure.
9. **Conjunctive Use**: The coordinated and planned management of both surface and groundwater resources to maximize the efficient use of the resources; that is, the planned and managed operation of a groundwater basin and a surface water combined through a coordinated conveyance infrastructure.
10. **Direct (physical) recovery**: The process of extracting banked water from a groundwater basin and physically delivering it to the end user through pipelines, canals, or other conveyance systems for beneficial use. Unlike in-lieu recharge, direct recovery involves no exchange of surface water, only the physical transfer of groundwater.
11. **Direct recharge**: A recharge method where water is directly added to a groundwater basin using spreading basins, injection wells, dry wells, or similar methods. Direct

recharge affects the groundwater budget by increasing inflows to the aquifer; therefore, increasing groundwater storage.

12. **Forgone surface water**: Surface water supplies intentionally left unused by a banking participant due to substituting its use with banked water.
13. **Groundwater bank (groundwater banking program, or water bank)**: A system that manages the storage of water in a groundwater basin through recharge methods and allows for its recovery during times of need. A groundwater bank functions as a water savings account with formalized accounting, tracking, management, financial, operational, and ownership agreements. A water groundwater bank typically operates under a water accounting system.
14. **Groundwater banking:** The managed aquifer recharge and extraction by a banking participant that facilitates in-lieu or direct recharge or extraction from a groundwater basin (DWR, 2024). Groundwater banking is a specific practice within the broader conjunctive use strategy that typically involves agreements, formalizing accounting of (or banked) groundwater, and tracking of recharge and recovery.
15. **Groundwater storage rights:** Legal entitlements and permissions that allow entities to store water in a groundwater bank. These rights outline the conditions under which water can be banked, the types of water eligible for storage, and the limitations on its recovery and subsequent use.
16. **Groundwater substitution transfer**: A practice of transferring surface water to another user or region while replacing the transferred supply by increasing groundwater pumping in the source region. A groundwater substitution transfer is a practice within the broader conjunctive use strategy but typically does not require banked water.
17. **In-Lieu (indirect) recharge**: A recharge method where surface water or alternative supplies replace groundwater pumping, allowing natural recharge to accumulate in the groundwater basin. In-lieu (or indirect) recharge affects the groundwater budget by reducing outflows from the groundwater basin; therefore, increasing groundwater storage.
18. **In-lieu recovery**: The process of delivering banked water to an end user through transactions and facilitated exchanges. In-lieu recovery occurs when banking participant extracts and uses banked water to replace its benchmark surface water use, allowing the forgone surface water to be delivered to the end users.
19. **Leave-behind**: A portion of banked groundwater intentionally left in a groundwater basin to support groundwater sustainability and enhance local water supply reliability.
20. **Recharge (deposit)**: The addition of water to a groundwater basin, either directly or indirectly, to increase groundwater storage.
21. **Recovery (withdrawal)**: The extraction of banked water for beneficial use. Recovery typically involves the transfer of banked water to another user or region through facilitated exchanges or direct physical delivery of extracted groundwater.
22. **Streamflow Accretion Factor (SAF)**: An accounting metric that quantifies the net increase in streamflow attributable to groundwater banking operations, relative to the volume of banked water, during Delta Balanced conditions.

23. **Subbasin**: A distinct hydrological unit within a groundwater basin used for water resource management. California Department of Water Resources (DWR) Bulletin 118 delineates groundwater subbasins, based on natural features (such as geologic or hydrologic boundaries) and administrative or management considerations, to support localized groundwater management.
24. **Transfer Parties:** The willing buyers and sellers participating in a water transfer transaction.
25. **Water accounting system**: A framework of policies, procedures, and tools to manage and track the deposit, storage, withdrawal, losses, and balances of banked water in a water banking system program.
26. **Water budget**: A water budget is a quantitative accounting of all the inflows, outflows, and changes in storage within a specific hydrological system or subbasin over a defined period. A water budget is used to evaluate the balance between water inputs and outputs to assess hydrologic conditions and support sustainable management.

In addition, the paper also uses terms associated with the Central Valley Project (CVP), as defined in the *Groundwater Banking Guidelines for Central Valley Project Water* (Reclamation, 2019). These terms are used in relation to federal acknowledgement of a groundwater bank and/or use of CVP supplies.

27. **Article 3(f) Water**: Excess water under a CVP contract, periodically made available during specific conditions, such as flood events.
28. **Banking of CVP Water**: A process whereby a Contractor's CVP Water is deposited and stored in a groundwater bank outside of the Contractor's Service Area and made available for beneficial use in a subsequent month(s) or period(s) consistent with U.S. Department of the Interior, Bureau of Reclamation's (Reclamation) CVP Water rights, permits, and/or licenses and provisions of the applicable CVP contract.
29. **Contractor's Contract Service Area**: The area to which the Contractor is permitted to provide CVP Water under its contract(s) as described in the contract(s), which may be modified from time to time in accordance with the contract without amendment to the contract.
30. **CVP Contract Allocation**: CVP Water made available pursuant to a Contractor's CVP contract, typically expressed as a percentage of contract total.
31. **CVP Contractor:** A party having a contract with the United States for the use of CVP Water pursuant to Federal Reclamation law.
32. **CVP Water**: All water that is developed, diverted, stored, or delivered by the Secretary of the Interior in accordance with the statutes authorizing the CVP and in accordance with the terms and conditions of water rights acquired by Reclamation pursuant to California law.
33. **Section 215 Water**: Excess non-storable water from the CVP made available during specific conditions, such as flood events.

1.0 INTRODUCTION

This concept paper presents a structured Water Accounting System designed to effectively and transparently manage and monitor water banking activities within the North and South American Subbasins (Subbasins) (Figure 1). This Water Accounting System, overseen by the Regional Water Authority (RWA), has been developed in collaboration with RWA members, Groundwater Sustainability Agencies (GSA), and other stakeholders.

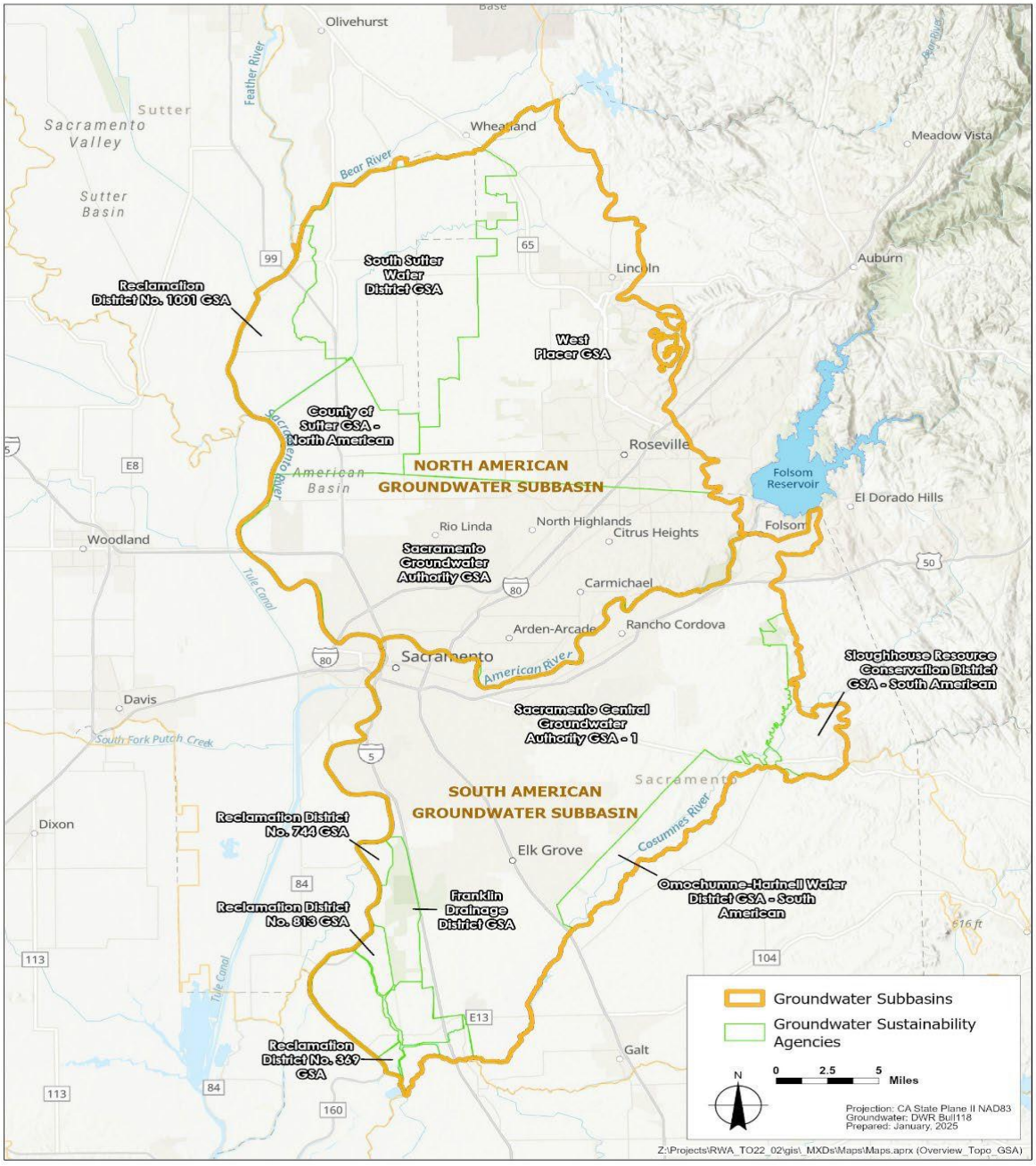


Figure 1. North and South American Groundwater Subbasins

1.1 Need for a Water Accounting System

As part of the efforts to develop the Sacramento Regional Water Bank (Sac Water Bank), RWA and its members recognized the need for a formalized and unified water accounting system for the Subbasins (Water Accounting System) that supports:

- **Effective Management**: Provides a structured approach to facilitate adaptive management of water banking operations within the Subbasins. By accurately tracking recharge, recovery, losses, and storage balances, the Water Accounting System supports operational efficiency and basin health.
- **Compliance Support:** Ensures alignment with applicable and approved Groundwater Sustainability Plans (GSP) to meet regulatory requirements. This adherence promotes the sustainable management of groundwater resources while maintaining compliance with State and federal mandates.
- **Transparency and Accountability**: Offers clear and reliable records of groundwater banking activities, fostering accountability and building trust among banking participants, regulatory agencies, and other interested parties. The Water Accounting System reduces conflicts and promotes collaboration through transparent reporting.
- **Operational Clarity**: Defines processes, roles, and responsibilities, to support the sustainable operation of groundwater banking programs in the Subbasins.

The Water Accounting System is designed to establish consistent accounting procedures for all banking programs within the subbasins, including the Sac Water Bank, Harvest Water,[1] and other current and future initiatives (see Figure 2). It provides standardized recharge and recovery accounting, tracking of banked water balances and losses, adaptive management, conflict resolution, reporting, and coordination with GSAs. While the Water Accounting System provides uniform procedures and protocols, it also allows each banking program the flexibility to align with its specific goals, objectives, and operational needs.

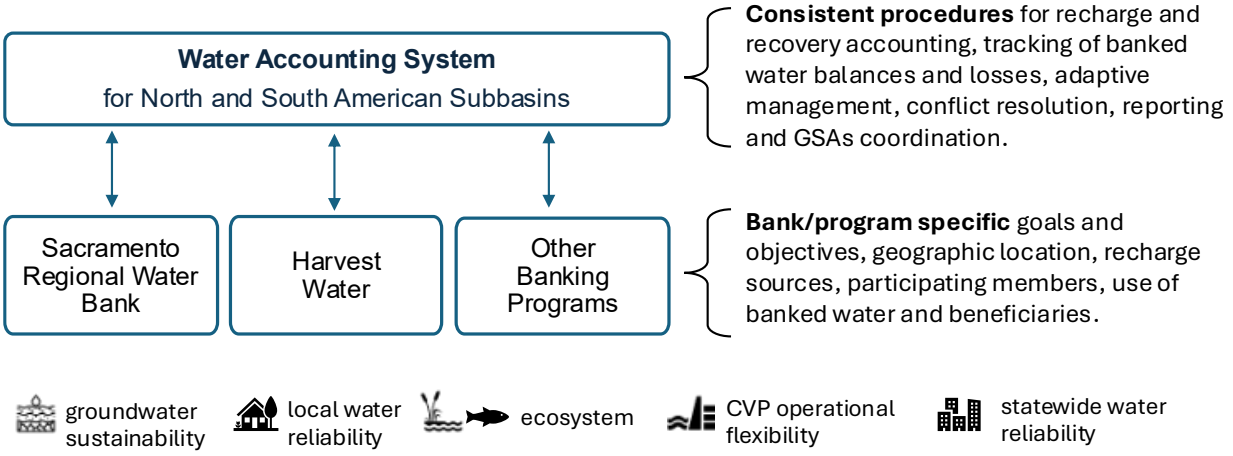


Figure 2. Water Accounting System Relationship to Banking Programs

[1] https://www.sacsewer.com/harvest-water/

1.2 Document Scope

The paper provides a framework for the Water Accounting System that:

- Defines the fundamentals (or principles) that guided its formulation (**Section 2**).
- Describes the components necessary for tracking and monitoring groundwater banking actions (**Section 3**).
- Ensures alignment with sustainability goals outlined in the applicable GSPs and effective coordination with the GSAs (**Section 4**).
- Outlines administrative and implementation activities and responsibilities (**Section 5**).
- Describes the establishment of the Sacramento Regional Water Bank within the Water Accounting System (Section 6).
- Demonstrates the application of recharge and recovery accounting procedures for banking participants with different water supply portfolios using hypothetical examples (**Appendix A**).

2.0 WATER ACCOUNTING SYSTEM FUNDAMENTALS

The Water Accounting System is comprised of a set of policies, procedures, and tools that support the expansion of water banking programs in the basin, consistent with the following fundamentals:

- **Recharge First**—Track that recharge actions occur before recovery actions.
- **Responsible Banking**: Track that no more than the net banked water in the Subbasins is recovered, while accounting for the leave-behind and banking losses.
- **Consistency with Adopted GSPs:** Implement recharge and recovery operations in a manner that is consistent with the avoidance of undesirable results, as defined in the applicable GSPs. Potential impacts shall be evaluated using GSP-defined sustainability criteria, including Minimum Thresholds (MT), Measurable Objectives (MO), and groundwater level trends, with particular attention to areas approaching or exceeding MTs and other designated management areas.
- **Distributed Recharge and Recovery Activities**: Distribute banking activities spatially and temporally and in a manner that is consistent with the avoidance of undesirable results, as defined in the applicable GSPs and in coordination with the pertinent GSAs.
- **Program-Specific Accounts**: Allow for program-specific accounts to track banking transactions associated with distinct banking programs (e.g., Sac Water Bank, Harvest Water), while preserving the ability to observe the banking activities for the entire region. Each banking program may specify a geographic area/zone for the purpose of tracking its recharge, recovery, and balances. This will help accommodate unique requirements for each water banking program. Banking participants within a program will also be able to track their specific transactions and balances.
- **Separate Water Budgets for each GSP**: Implement separate tracking of deposits (recharge), withdrawals (recovery), and balances for the Subbasins to facilitate reporting and basin operations with knowledge and understanding of current GSP water budgets. This will support long-term sustainability of the region's groundwater subbasins by ensuring that accounting rules are consistent with the adopted and governing GSPs.
- **Transparency and Consistency**: Establish a framework for consistent water accounting practices across the subbasins, while allowing for program/project-specific requirements. Maintain transparency of water banking operations through coordination with and reporting to the applicable GSAs.
- **Applicable Regulatory Requirements**: Allow tracking of banking activities consistent with the conditions and guidelines outlined in (1) the U.S. Department of the Interior, Bureau of Reclamation (Reclamation) *Groundwater Banking Guidelines for Central Valley Project Water* (Reclamation, 2019), (2) the California Department of Water Resources (DWR) *Draft Technical Information for Preparing Water Transfer Proposals*

(DWR, 2019), (3) GSPs for the Subbasins, and/or (4) other applicable regulations and requirements.

- **No Restriction on Local Water Management**: Identify and track the activities recognized as banking actions. The Water Accounting System does not restrict local water agencies from managing their water supplies and operations, including, but not limited to, groundwater substitution transfers.

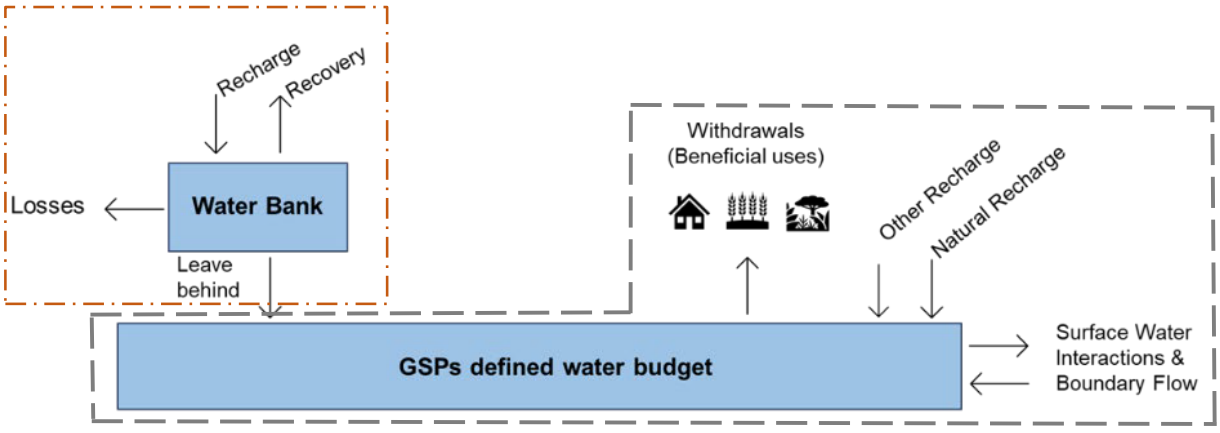
3.0 WATER ACCOUNTING SYSTEM COMPONENTS

3.1 Overview

Water banking involves recharging surface water or alternative supplies into a groundwater basin for temporary storage, with the intention of later recovery and beneficial use. It functions similarly to a savings account, storing water during periods of availability for future needs. However, water banking must operate within a groundwater basin alongside existing and planned beneficial uses. To protect these uses, water banks must be managed to prevent the depletion of native groundwater and support the ongoing compliance with groundwater sustainability goals (DWR, 2024).

Water banking programs and their associated accounting systems must align with the water budgets established in the approved GSPs for the region. Notably, both GSPs for the Subbasins recognize expansion of conjunctive use and establishment of water banking as key management actions to promote long-term groundwater sustainability.

To achieve clear and transparent accounting, a water banking program is conceptualized as a "savings account" that “floats” above the GSP-established water budgets (see Figure 3). Note that the GSP water budgets should already account for all beneficial uses in the Subbasins. Any banking programs are additional management actions. The Water Accounting System function is to not only ensure banked water is available for future beneficial purposes but also to ensure that water banking activities do not reduce overall groundwater storage levels as reflected in GSP-established water budgets. For this reason, a leave-behind volume acts as an additional assurance that water banking actively contributes to enhancing storage in the Subbasins and improving long-term sustainability (see Figure 3).



Key: GSP = groundwater sustainability plan

Figure 3. Relationship of Water Banking Programs to Groundwater Sustainability Plans

The Water Accounting System tracks the following components of water banking activities:

- Recharge: The addition of water to a groundwater basin, either directly or indirectly, to increase groundwater storage.

- Recovery: The extraction of banked water for beneficial use. Recovery typically involves the transfer of extracted banked water to another user or region through facilitated exchanges, or direct physical delivery.

- Banking balance: The remaining amount of banked water available for recovery after banking losses and leave-behind volume.

- Banking losses: Banked water that becomes physically unrecoverable due to factors such as migration out of a groundwater basin or discharge to interconnected surface water bodies.

- Leave-behind: A portion of banked groundwater intentionally left in a groundwater basin to support groundwater sustainability and enhance local water supply reliability.

- Accounting Benchmark: A documented estimate of surface water and groundwater use by a banking participant under conditions without banking activities. It enables accurate tracking of recharge and recovery, which are measured as changes from the benchmark. It is reviewed every five years to reflect changes in water management and to align with GSP updates.

- Forgone surface water: Surface water supplies intentionally left unused by a banking participant due to substituting its use with banked water.

- Groundwater storage rights: Legal entitlements and permissions that allow entities to store water in a groundwater bank. These rights outline the conditions under which water can be banked, the types of water eligible for storage, and the limitations on its recovery and subsequent use.

Additional details on these components of the Water Accounting System are presented in the following sections.

3.2 Accounting Benchmark

3.2.1 Purpose and Use

Recharge (deposits) and recovery (withdrawals) accounting requires establishing an accounting benchmark for each banking participant.

The Accounting Benchmark represents a mode of operation reflecting how participating agencies could have met demands using available groundwater production capacity, absent voluntary conjunctive use actions. It characterizes the quantities of surface water and groundwater use that would occur without banking activities.

The defensibility and credibility of each banking participants accounting benchmark are critical to accuracy and acceptance of the water accounting for in-lieu recharge and recovery.

3.2.2 Core Principles for Benchmark Establishment

The Accounting Benchmark is established based on the following principles:

- **Voluntary action:** In-lieu recharge is recognized only where surface water use replaced groundwater pumping that could have occurred. It does not apply where groundwater pumping was constrained by lack of infrastructure or regulatory prohibition.
- **Consistency with conjunctive use:** The action reflects intentional, planned conjunctive use operations, not incidental changes in pumping due to short-term operational anomalies.
- **Distinction from conservation:** Banked water credits under the Water Accounting System reflect substitution of supply sources, not reductions in demand.

The Accounting Benchmark, as defined above, is a mode of operation in the absence of voluntary banking (or conjunctive use) activities. Accordingly, it is important to clarify that the Accounting Benchmark is:

- NOT a historic pumping level from a specific year (e.g., 2010 or 2015)
- NOT a pre-Sustainable Groundwater Management Act (SGMA) condition
- NOT a pumping allocation under SGMA
- NOT a proxy for groundwater rights or adjudication outcomes
- NOT a guarantee of future recovery
- NOT intended as an environmental baseline under the California Environmental Quality Act (CEQA)

3.2.3 Accounting Benchmark Determination

The development of an Accounting Benchmark begins with identifying the banking participant's water supply sources. Agencies generally fall into three categories:

Surface water–reliant: Agencies that rely entirely on surface water supplies. For these agencies, the Accounting Benchmark reflects continued use of surface water to meet demand, and no in-lieu recharge is recognized.

Groundwater-reliant agencies: Agencies that rely primarily on groundwater. For these agencies, the Accounting Benchmark reflects continued groundwater pumping consistent with historical practice and available infrastructure.

Mixed supply (conjunctive use) agencies: Agencies that utilize both surface water and groundwater. For these agencies, additional evaluation is required to determine whether surface water use represents substitution for groundwater pumping or augmentation of supply.

For surface water–reliant and groundwater-reliant agencies, the Accounting Benchmark is straightforward and directly reflects their primary supply source.

For mixed supply agencies, the Accounting Benchmark must distinguish between the quantity of surface water used in place of groundwater pumping and surface water used to increase total supply. This is critical so that only true reductions in groundwater pumping are recognized as in-lieu recharge.

3.2.4 Test for Mixed Supply Agencies

For mixed supply portfolios, the Accounting Benchmark is anchored in a three-part test applied across all participating agencies to determine whether surface water use represents substitution of groundwater pumping:

1) *Did the agency have the physical and institutional ability to meet water demands using groundwater?*

2) *Did the agency have a historical pattern of using groundwater?*

3) *Did the agency voluntarily choose to use surface water instead?*

When these three questions are affirmed through documentation of accurate data and information, the surface water use is interpreted as a substitution for groundwater pumping rather than an augmentation of total supply. The avoided groundwater pumping is then treated as in-lieu (indirect) recharge.

This distinction is critical so that accounting of in-lieu recharge reflects changes in supply sourcing rather than increases in total water use. Surface water deliveries that augment supply beyond what could have been met with groundwater do not qualify as in-lieu recharge.

3.2.5 Components of Accounting Benchmark

Depending on its water supply sources and operational practices, a banking participant may have a single accounting benchmark or different accounting benchmarks for dry and wet conditions.

- A banking participant reliant on either surface water or groundwater will have a single accounting benchmark.

- A banking participant that utilizes both surface water and groundwater may have different accounting benchmarks for wet and dry conditions to reflect its conjunctive use operations.

For each banking participant, its accounting benchmark(s) will have three components:

4) Average annual demand.

5) The portion of annual demand met using groundwater.

6) The portion of annual demand met using surface water.

3.2.6 Benchmark Review and Update

Each banking participant's Accounting Benchmark(s) is established to reflect representative operating conditions based on recent historical practices as documented in its most recent Urban Water Management Plan, another equivalent plan, or recent water use trends.[2]

Accounting Benchmark(s) may reflect planned operational changes due to operations and maintenance activities and infrastructure modifications. For example, ongoing well rehabilitation or intertie upgrades.

Each banking participant's Accounting Benchmark(s) will be subject to review, and as appropriate, revision on a five-year cycle concurrent with GSP updates. Any proposed revision must be supported by documentation that describes the basis for the change, including underlying data, assumptions, methodologies, and consistency with the applicable GSP. As described in Section 5.1, RWA will review submitted documentation for completeness and consistency with the Water Accounting System and will share updated information with banking participants and applicable GSAs through its regular reporting.

All documentation will be maintained by the banking participant and made available for review by the other banking participants to demonstrate the technical defensibility, transparency, and consistency of the Accounting Benchmark(s) over time.

3.2.7 Treatment of Long-Term Conjunctive Use

Sustained use of surface water over many years does not reset the Accounting Benchmark. The Accounting Benchmark remains tied to a participating agency's demonstrated ability to pump groundwater to meet demands consistent with historical practice, rather than whether that capability is exercised in any given year. The Accounting Benchmark is structured in this way so agencies are not penalized for implementing and maintaining effective conjunctive use strategies. Without it, agencies that have consistently relied on surface water in lieu of groundwater would lose recognition of avoided pumping simply because those practices have been implemented over time. This outcome would desensitize currently effective water management actions and would conflict with the objectives of both SGMA and the Water Bank.

This rationale underlies the core principles in Section 3.2.2, which define an Accounting Benchmark as a mode of operation in the absence of banking, rather than a condition based on a single historical year. Reliance on a single historical year as the benchmark would mischaracterize decades of conjunctive use by:

- Treating long-standing surface water substitution as the benchmark.
- Eliminating recognition of previous groundwater banking actions

[2] Recent historical practices generally refer to operating conditions observed from the mid-1990s through the present, representing the period during which groundwater banking and conjunctive use activities have been actively implemented and documented.

- Creating a disincentive for long and sustained contribution to groundwater sustainability.

3.3 Recharge Accounting

Recharge accounting encompasses tracking all sources of water recharged (deposited) into the Subbasins via both direct and indirect (in-lieu) recharge methods. Both direct and in-lieu recharge methods result in net increases in groundwater storage, yet each impacts different components of the water budget. Direct recharge boosts net inflow to a groundwater basin, whereas in-lieu recharge reduces outflow (withdrawals, in this case pumping) from a groundwater basin.

Figure 4 illustrates recharge for three types of banking participants: (1) surface water-reliant, (2) groundwater-reliant, and (3) mixed supply banking participant that uses both surface water and groundwater. Direct recharge occurs when additional water supplies are directly added to a groundwater basin using spreading basins, injection wells, dry wells, or other methods. Any of the three types of banking participants can participate in direct recharge, if the local hydrogeological setting allows. However, in-lieu recharge occurs only when surface water use replaces benchmark groundwater pumping (i.e., benchmark groundwater pumping is a prerequisite for in-lieu recharge). In addition, a surface water reliant banking participant may provide surface water to another banking participant for direct or in-lieu recharge.

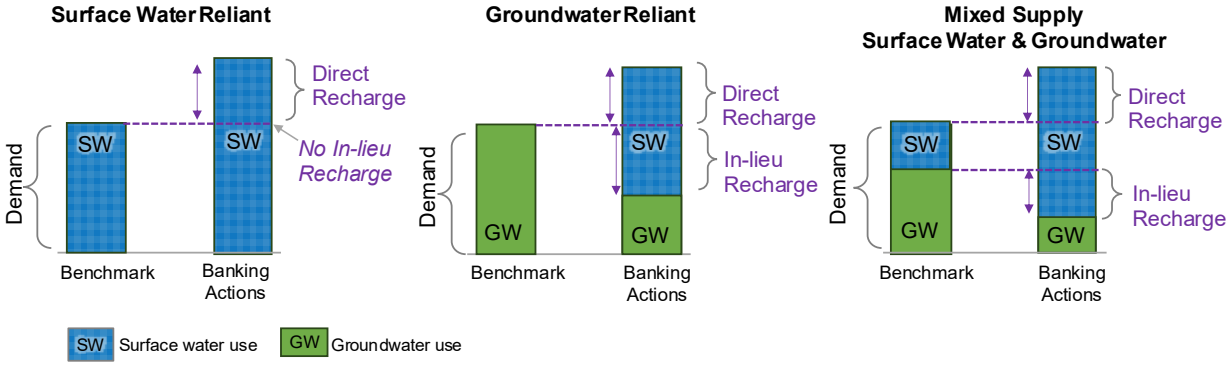


Figure 4. Illustration of Recharge Accounting for Different Water Supply Portfolios

3.3.1 Direct Recharge

Direct recharge occurs when surface water is directly added to a groundwater basin. It affects the groundwater budget by increasing inflows to the basin; therefore, increasing groundwater storage. It can be achieved through spreading basins that allow surface water to percolate into the basin. Injecting surface water into the groundwater basin can also be conducted using wells specifically designed for recharge only (i.e., injection wells) or for both recharge and recovery (i.e., aquifer storage and recovery (ASR) wells). Another recharge method is dry wells, which are gravity-fed excavated pits through layers of poor infiltration to allow for more rapid infiltration of water.

Recharge accounting for direct recharge methods entails the precise measurement or metering of surface water that is applied to a spreading basin or injected via wells. For spreading basins, it is also necessary to monitor and track evaporation and potential overflow losses.

3.3.2 In-lieu Recharge

In-lieu (or indirect) recharge occurs when surface water or alternative supplies replace groundwater pumping, allowing natural recharge to accumulate in a groundwater basin. It affects GSP water budgets by reducing outflows from the groundwater basin; therefore, increasing groundwater storage. In-lieu recharge is an efficient and scalable solution, especially in areas where geology and soils may not be suitable for direct recharge methods.

In-lieu recharge can be calculated as the reduction in groundwater use:

[accounting benchmark groundwater use] – [groundwater use under water banking] ①

It can also be calculated as the increase in use of surface water or alternative supplies:

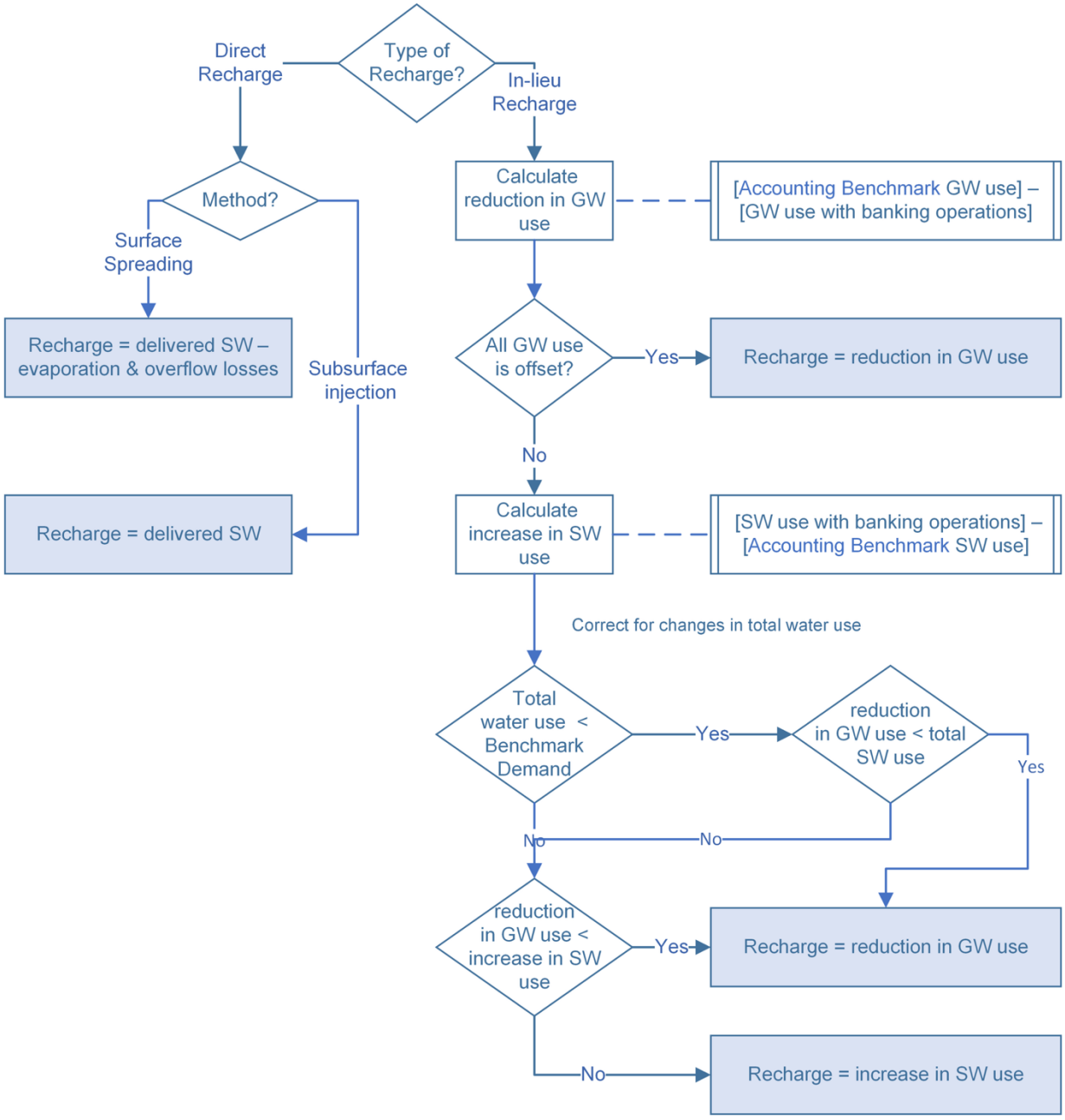
[surface water use under water banking] – [accounting benchmark surface water use] ②

If groundwater use is fully replaced by surface water or alternative supplies, then in-lieu recharge can simply be considered equivalent to the amount of delivered surface water or alternative supplies. This is particularly relevant in agricultural settings, where irrigation demand can vary due to climatic conditions. It is reasonable to assume that any increase in demand would have been met by groundwater pumping, provided there were no changes to irrigated acreage or irrigation practices.

When groundwater use is partially replaced by surface water or alternative supplies, it is important to ensure accurate recharge accounting to prevent overestimation of recharge volumes. Seasonal variations in water demand, in both municipal and agricultural settings, can lead to fluctuations in water needs that may be met by either groundwater or surface water. In the absence of banking actions, it may not be clear which source—groundwater or surface water—would have been used to meet the increased demand. Therefore, for a more accurate and conservative estimation of in-lieu recharge, the following two conditions must be met:

1. Surface water use exceeds that under the accounting benchmark surface water use.
2. There is a corresponding reduction in groundwater pumping relative to the accounting benchmark (i.e., in-lieu recharge is the lesser of ① or ②).

Figure 5 summarizes the recharge accounting procedures. Attachment A also provides detailed examples of direct and in-lieu recharge accounting for various types of entities and under different operational scenarios.



Key: GW = groundwater SW = surface water

Figure 5. Summary of Recharge Accounting Procedure

3.3.3 Modified In-lieu Recharge Accounting Approaches

The in-lieu recharge accounting procedures described above (Section 3.3.2) provide the standard approach for quantifying in-lieu recharge based on changes in groundwater use and surface water or alternative supply use relative to the Accounting Benchmark. However, certain operating conditions may require modified accounting approaches where the standard

procedure is not practical or would create unnecessary complexity, provided that the modified approach remains conservative, measurable, and consistent with the core principles of the Water Accounting System.

Modified accounting approaches may be used where:

1. the alternative supply or groundwater use can be reliably measured;
2. the accounting method clearly demonstrates that groundwater pumping was avoided;
3. the credited volume does not exceed the amount of groundwater pumping that reasonably would have occurred absent the banking action;
4. the method avoids double-counting with other banking, transfer, conservation, or operational actions; and
5. the basis for the method is documented and made available for review.

Two common situations may warrant modified accounting treatment:

A. **Alternative Supply Delivery-Based Accounting**:
Where recycled water, surface water, or another alternative supply is delivered to users that have historically relied on groundwater, but where user-specific groundwater pumping benchmarks are difficult to establish or track, in-lieu recharge may be quantified based on the measured delivery of the alternative supply. This approach may be appropriate when the delivered water directly offsets groundwater pumping and when delivery volumes can be metered or otherwise reliably documented. In such cases, the delivered alternative supply serves as a reasonable proxy for avoided groundwater pumping, provided that the credited volume is limited to the amount delivered and does not include water used to support expanded demand, new irrigated acreage, or uses that would not otherwise have been met with groundwater.

B. **Groundwater Reduction-Based Accounting**:
For agencies with mixed supply portfolios where surface water is the primary supply and groundwater is used as a supplemental source, in-lieu recharge may be quantified based on the reduction in metered groundwater pumping relative to the agency's Accounting Benchmark. This approach may be appropriate where tracking surface water use is complicated by wheeling, exchanges, or deliveries to other agencies, but where groundwater pumping is directly measured and the agency can document that reduced groundwater pumping reflects substitution by available surface water or alternative supplies rather than reduced demand. Under this approach, the credited recharge volume should be limited to the documented reduction in groundwater pumping, adjusted as needed to account for changes in demand, operational constraints, or other factors that could otherwise overstate avoided pumping.

3.4 Recovery Accounting

Accurate recovery tracking is essential for maintaining the sustainability of the groundwater

subbasins and ensuring that the volume of water extracted does not surpass the banked water balance. It is also a critical component for determining each banking participant's banked water balance. Recovery accounting tracks the extraction (recovery) of a volume of banked water for beneficial uses, after reflecting banking losses and leave-behind amounts.

Figure 6 illustrates recovery for three types of banking participants: (1) a surface water-reliant, (2) a groundwater-reliant, and (3) a mixed supply banking participant that uses both surface water and groundwater. Direct recovery occurs when banked groundwater is extracted and physically conveyed to another banking participant. Any of these banking participants types can participate in direct recharge, if local geological setting allows for groundwater extraction. However, in-lieu recovery occurs when banked groundwater replaces benchmarked surface water use (i.e., benchmarked surface water use is a prerequisite for in-lieu recovery).

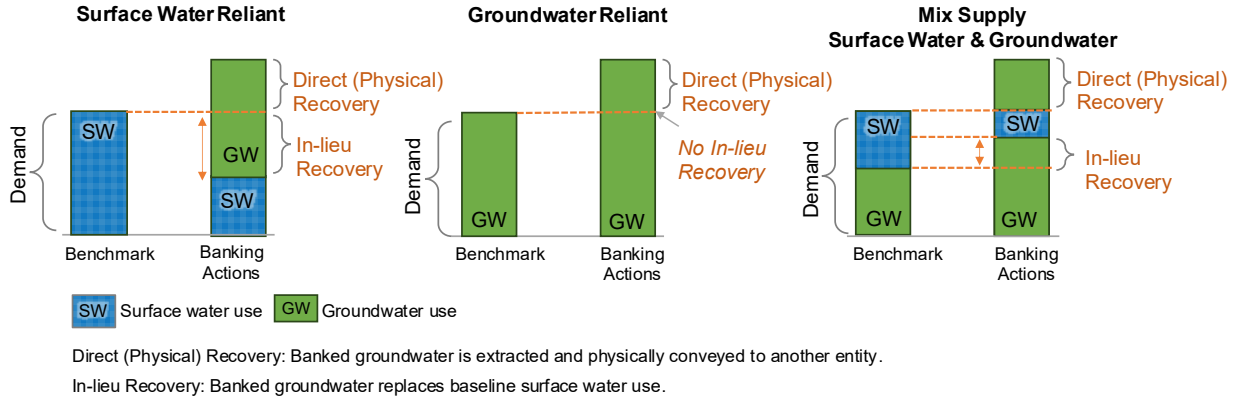


Figure 6. Illustration of Recovery Accounting for Different Water Supply Portfolios

3.4.1 Direct Recovery

Direct (physical) recovery is the process of extracting banked groundwater from a groundwater basin and physically delivering it to the end user through pipelines, canals, or other conveyance systems for beneficial use. Unlike in-lieu recharge, direct recovery involves no exchange of surface water, only the physical transfer of groundwater.

3.4.2 In-lieu Recovery

In-lieu recovery is the process of delivering banked water to an end user through in-lieu transactions and facilitated exchanges. It occurs when a banking participant uses banked groundwater to replace its benchmarked surface water use, allowing the forgone surface water to be delivered to the end users. An in-lieu recovery action can be conducted by a single banking participant or coordinated through multiple banking participants. For example, banked groundwater may be extracted (recovered) by a banking participant and provided to one or more neighboring banking participants to offset their surface water use, which are then made available to end users. Note that benchmarked surface water use is required to allow for in-lieu recovery recognition (see Figure 6).

In-lieu recovery is calculated as the increase in use of banked groundwater:

[groundwater use under water banking] – [accounting benchmark groundwater use] ③

It can also be calculated as the reduction in use of surface water or alternative supplies:

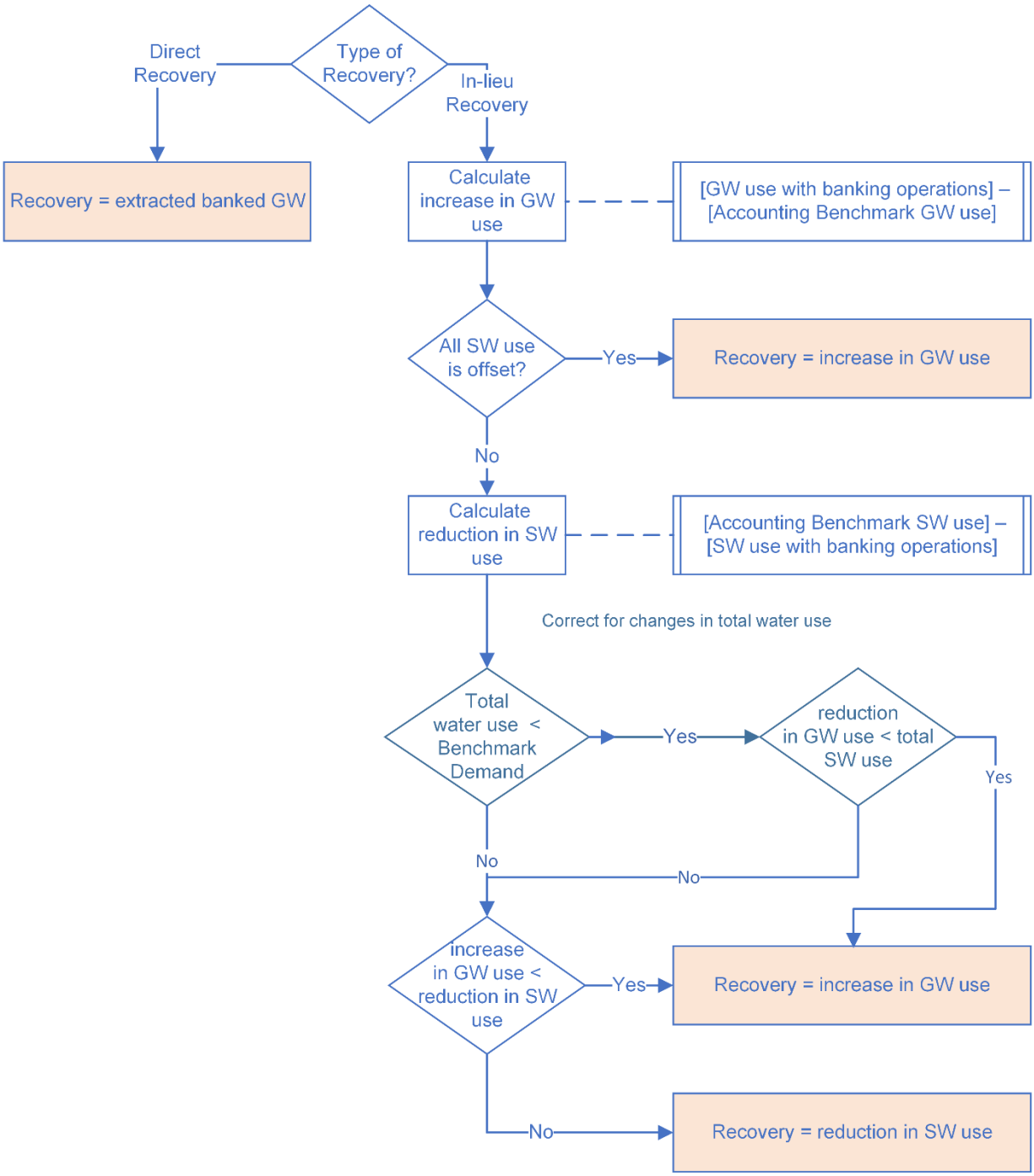
[accounting benchmark surface water use] – [surface water use under water banking] ④

If surface water use is ***fully*** replaced by banked groundwater, the in-lieu recovery can simply be considered equivalent to the amount of extracted banked groundwater.

When surface water use is only ***partially*** replaced by banked groundwater, there is a need to ensure accurate recovery accounting to reduce the risk of overestimation. Seasonal variations in water demand, in both in municipal and agricultural settings, can lead to fluctuations in water needs that may be met by either groundwater or surface water. In the absence of banking actions, it may not be clear which source—groundwater or surface water— would have been used to meet the increased demand. Therefore, for a more accurate and conservative estimation of in-lieu recovery, the following two conditions must be met:

1. Groundwater pumping exceeds that under the accounting benchmark.
2. There is a corresponding reduction in surface water (or alternative supplies) relative to the accounting benchmark (i.e., in-lieu recovery is the lesser of ③ or ④)

Figure 7 summarizes the recovery accounting procedures. Attachment A provides detailed examples of recovery accounting for various situations and conditions.



Key: GW = groundwater SW = surface water

Figure 7. Summary of Recovery Accounting Procedure

3.5 Leave-Behind and Banking Losses Accounting

Accuracy of accounting for both leave-behind and banking losses is needed to demonstrate that banking activities are not affecting other beneficial users of the groundwater basin or the interconnected surface waters. It involves calculating and tracking the portion of banked water that is not available for recovery.

4.3.1 Banking Losses Accounting

Banking losses refer to the portion of banked water that becomes physically unrecoverable due to factors such as migration out of the basin to adjacent water bodies or basins. While these losses reduce the recoverable water, net higher seepage into interconnected surface waters can provide ecosystem benefits to these water bodies and downstream areas. Similarly, outflows to adjacent basins can benefit those areas as well. Accurate estimates of these surface and subsurface flows are crucial, as they impact both the water balances of a banking program and the availability of banked water for withdrawal (recovery).

The average rates of horizontal groundwater movement within a groundwater basin vary spatially due to diverse geological formations and their differing hydraulic properties. The rate of groundwater movement is influenced by factors such as the hydraulic conductivity of aquifer materials, the hydraulic gradient (the slope of the water table or potentiometric surface), and the effective porosity of the geological formations. Sandy or gravel layers often exhibit relatively high hydraulic conductivities, allowing groundwater to move at rates of several feet per day. In contrast, silt and clay layers, which have much lower hydraulic conductivities, result in significantly slower groundwater movement, potentially just a few feet per year or less.

Various analytical methods, numerical modeling tools, and geophysical techniques can be employed to estimate the rate of subsurface flows to adjacent basins or surface water bodies. To estimate banking losses, a regional groundwater model (the Integrated Water Flow Model for the Cosumnes, South American, and North American subbasins, CoSANA) will be utilized to simulate subsurface flow and stream-aquifer interactions. The model simulations reflect the hydrogeological properties of the aquifer (e.g., permeability and porosity), boundary conditions, recharge rates, and water demands from municipal, industrial, irrigation, and environmental uses. The model is validated using data from the regional monitoring network and is typically updated on a 5-year cycle as part of GSP update processes.

Banking losses are estimated by comparing modeled groundwater budget components with- and without water banking operations. Banking losses are then calculated as the net increase in outflows from the subbasins, including changes in net subsurface flows to adjacent basins and changes in net seepage to interconnected surface water bodies. These streamflow interactions can also be represented using a Streamflow Accretion Factor (SAF).

The SAF quantifies the net benefit that banking provides to connected streams on an annual basis. It is defined as the net annual increase in streamflow, measured as the change in stream-aquifer exchange, relative to the volume of water stored in the bank, after accounting for losses, leave-behind, and recovery. The SAF focuses on the net annual increase in

streamflow during Delta Balanced conditions, as these are the conditions where benefits to the overall water system are most needed.

SAF = Net Increase in Streamflow during Delta Balanced Conditions / Banked Volume

A positive SAF indicates that banking is contributing water to streams. That is, the stream, during Delta Balanced Conditions, is better off with the banking program than without it. A negative SAF would indicate net stream depletion during Delta balanced conditions, the condition that would trigger stream depletion concerns, but this is not expected under managed banking operations.

4.3.2 Leave-Behind Accounting

Leave-behind refers to a designated portion of banked groundwater that is set aside to support sustainability of the Subbasins and enhance local water supply reliability. The leave-behind also helps to address uncertainty in the banking losses estimates. It is recommended that each banking program establish a leave-behind amount that is earmarked specifically for bolstering groundwater storage and supporting ecosystem enhancement.

All leave-behind volumes will be integrated into the groundwater subbasin's overall storage—independent of banking program balances—and will not be available for future banking program operations. Instead, they benefit all users of water in the groundwater subbasin.

3.6 Storage Rights Tracking

Effective groundwater banking also requires compliance with the legal and regulatory aspects of water rights. Water banking will use a mix of water types such as surface water rights, CVP water, and other contract water. Entities participating in groundwater banking should maintain records of these surface waters to track their rights to banked supplies and any limitations on use of recovered water.

For proper and transparent accounting and to support compliance with the various legal and contractual requirements, the Water Accounting System will provide for separate subaccounts to track groundwater recharge, recovery, and balances associated with different types of water.

3.7 Recovery Tracking

During recovery operations, banked groundwater is extracted for use by the recovering banking participant or delivered to other entities, where it is used to offset equivalent quantities of surface water. These forgone surface water supplies may span various water types, such as pre-1914 water rights, post-1914 water rights, CVP water allocations, and other types of water contracts.

Tracking of forgone surface water involves documenting the movement of water rights, water allocations, and contract water from transferring entities (or sellers) to the receiving entities (or buyers). This tracking includes recording the source(s) of the transferred water, the volume(s) of water transferred, delivery schedules, and other relevant information. The tracking of forgone surface water supplies is the responsibility of the transfer parties (both sellers and buyers). The

Water Accounting System will document these transactions as reported by the transfer parties.

The transfer parties (sellers and buyers) are responsible for negotiating the terms and conditions of any transfer transaction. Additionally, a transfer transaction must be legally and regulatorily compliant, including adherence to local, State, and Federal regulations, water rights laws, and environmental requirements. This responsibility may entail securing the necessary approvals or permits for a transfer. Furthermore, it is incumbent upon these parties to document all aspects of a transfer agreement including, but not limited to, conveyance of the volume of water transferred, the price of the transfer, the duration of the transfer, and any specific conditions upon which they mutually agree.

3.8 Conserved Water

Surface water saved through efficiency improvements, operational changes, or demand reduction measures is considered “real water” under California law for the purposes of water transfers. Water rights holders are permitted to transfer conserved water provided the transfers comply with legal and environmental requirements[3]. However, conserved surface water is not tracked within this Water Accounting System, as its scope is focused on tracking groundwater banking activities.

While conserved groundwater resulting from efficiency improvements, operational changes, or demand reductions reduce groundwater pumping and enhance groundwater storage, it is not tracked within the Water Accounting System. Incorporating conserved groundwater would add significant complexity, requiring verification of savings and assurance of the long-term reliability and sustainability of these conservation measures.

[3] The legal framework for these transfers is outlined in the California Water Code Sections 1011, 1020-1030, and 1700-1707

4.0 CONSISTENCY WITH GROUNDWATER SUSTAINABILITY PLANS

This section describes the Water Accounting System's consistency with the current approved GSPs and how it will maintain consistency with the GSPs over time.

4.1 Consistency with Adopted GSPs Data and Tools

Accounting benchmarks, which define how each banking participant operates in the absence of water banking activities, align with the water budgets outlined in the applicable and approved GSPs. This alignment also extends to banking losses that will be in accordance with the assumptions made in the GSPs regarding flow exchanges with neighboring groundwater subbasins and interconnected surface waters.

As the GSPs undergo their scheduled 5-year review cycles, there will be parallel reassessment and potential update of the Water Accounting System. This update will maintain consistency with the updated GSP water budget assumptions that may affect estimated banking losses.

The inclusion of water banking as a management action in the GSPs of both Subbasins highlights its role in promoting groundwater sustainability. The Water Accounting System plays a critical role in supporting groundwater sustainability through detailed tracking of water banking activities, while complying with SGMA and adhering to the sustainability goals, criteria, and water budget requirements established by the applicable GSAs and documented in the approved GSPs..

The Water Bank will rely on the Sustainable Management Criteria established in the approved and applicable GSPs to define groundwater basin sustainability and identify conditions that could contribute to Undesirable Results associated with banking operations. Exceedance of applicable Minimum Thresholds (MTs) is considered an indication that conditions may be approaching or contributing to an Undesirable Result. Through the Water Bank governance structure, operational procedures, monitoring programs, and implementation of the Water Accounting System, Banking Participants are committed to avoiding conditions that could cause or contribute to Undesirable Results or exceedance of applicable MTs resulting from banking operations.

4.2 Coordination with GSAs

Water banking, implemented through considerable and purposeful oversight and adaptive management, is intended to contribute to long-term groundwater sustainability through the leave-behind that, over time, will provide further enhancement of groundwater conditions for all beneficial users in the Subbasin.

However, the success of the Sac Water Bank depends on maintaining sustainable pumping levels across the Subbasin, consistent with adopted GSP sustainable management criteria. If non-bank-related pumping exceeds sustainable thresholds over time, it could hinder a water bank's ability to meet its obligations and limit its capacity to recover banked water.

Conversely, Subbasin sustainability under SGMA can only be maintained if all groundwater pumpers, including those outside of water banking activities, operate in a way that does not create or worsen unsustainable groundwater conditions. To achieve this, water banking participants and GSAs must collaborate to address these challenges and ensure that groundwater use remains sustainable for the long term.

The geographic distribution of recharge and recovery (pumping) can have short-term and localized effects due to the complex dynamics of lateral and vertical flows in the subbasins. Despite positive water banking balances, water banking program operations to recover banked water may require additional coordination with the GSAs, including the overlying and adjacent GSAs, as applicable, primarily to avoid or minimize any localized negative effects associated with water level declines during recovery operations, especially during droughts. Water banking programs should implement adaptive management actions to adjust the timing and location of water extraction to mitigate these effects.

Note that similar localized effects could occur during recharge cycles (especially in the proximity of known contamination sites). These areas are identified in the GSPs and coordination with the applicable entities is necessary to ensure that containment activities are not affected.

Each banking program will make available an annual report of its banking activities and balances. To support the required GSP Annual Reports due on April 1st, these banking reports are to be made available at least one month prior to the GSP Annual Report submission deadline. As part of the adaptive management actions (see Section 4.3), additional reporting and/or coordination efforts may be requested of banking programs.

4.3 Adaptive Management

Adaptive management is an approach where current and historical data and information are analyzed to improve future management activities and practices. Applying adaptive management can be of critical importance to effectively manage groundwater due to the inherent uncertainties associated with tracking and evaluating human activities on a resource that, in most cases, can only be evaluated based using a limited dataset (especially in comparison to surface water). However, the overarching challenge confronting any effort to implement adaptive management is the competition between the needs for stability and

flexibility.

Quantitative metrics are necessary for effectively implementing adaptive management, as they provide clear decision points for reassessing management activities when necessary. The ability to implement adaptive management is enhanced by the built-in metrics required in the GSPs to define sustainability through Sustainable Management Criteria (SMCs), and undesirable results (URs), as applicable[4].

While these metrics do not impose operational limitations on any specific banking participant, they can serve as valuable guidelines for adaptive management decisions in water banking operations. By utilizing these metrics, banking entities and GSAs can work collaboratively to achieve their shared goals of basin sustainability and the successful implementation of water banking.

To support sustainable water banking operations and alignment with applicable GSPs, the following adaptive management procedures are established based on GSP-defined sustainability metrics. Specific trigger conditions and associated response actions may be further defined in the Monitoring Plan.

4.3.1 Annual Planning and Coordination

- **Annual Operations Plan**: Each banking program will develop a yearly outline of targeted recharge and recovery volumes for its participants. This annual plan will consider available capacity, operational constraints, and prevailing hydrological and groundwater basin conditions; and it will outline general expectations for recharge and recovery levels rather than imposing restrictions, allowing flexibility for operational adjustments as needed.

- **GSA Notification**: Each banking program will provide its annual operations plan to the relevant GSAs in each subbasin, providing transparency and facilitating effective coordination. The plan is expected to be submitted no later than June 1 of each year and may include participating agencies and points of contact, planned recharge and recovery volumes, locations and timing of pumping, and monitoring well locations and data collection plan.

- Regular Coordination: Banking programs will coordinate with relevant GSAs at two regular points during the banking cycle: (1) in the Spring to review the annual operations plan, planned activities, and relevant groundwater conditions; and (2) in the fall to review completed activities, monitoring information, and any operational considerations for future planning. Banking programs will consider GSA input, as appropriate, in refining planned or future operations.

- **Issue Resolution**: If significant changes to planned operations occur, or if operational challenges arise, additional ad hoc coordination and meetings with the

[4] MTs and MOs as defined in SGMA aid GSAs in the ability to define sustainability in GSPs, however MTs and MOs set at individual representative monitoring sites can be exceeded without causing unsustainable conditions in a given subbasin.

applicable GSAs may be conducted, as needed, to evaluate issues and identify appropriate adjustments.

4.3.2 Monitoring and Early Warning

- **Regular Groundwater Monitoring**: Banking participants will adhere to the Monitoring Plan (e.g., tracking groundwater levels, storage changes, and trends). Monitoring frequency and reporting will align with applicable GSP requirements to support detection of early signs of threshold exceedances. Banking Participants shall share monitoring data and operational reports related to banking activities in a timely, transparent, and consistent manner with RWA and the applicable GSAs.

- **Trigger-Based Assessment**: If groundwater levels approach an MT exceedance or exhibit declining trends toward MTs, GSAs and banking participants will conduct a review of operational impacts and determine necessary adjustments. MO trends will be evaluated to ensure long-term sustainability goals are met.

4.3.3 Response Actions for Areas with MT Exceedances

- No new or additional Sac Water Bank pumping will occur in areas where an MT exceedance is already present unless approved by the overlying GSA and any other affected GSAs, as applicable.

- In coordination with GSAs, banking participants may adjust operations when deemed necessary. Alternative operational adjustments may include redistributing pumping activities to areas with available capacity, delaying or reducing pumping volumes to prevent further groundwater declines, increasing recharge efforts to offset declines and stabilize levels, and/or increasing monitoring frequency and/or locations.

4.3.4 Response Actions for Areas Approaching MT Exceedances

- Banking participants will coordinate with GSAs to assess if pumping can be shifted to areas with more sustainable conditions.

- Banking participants will evaluate reductions in pumping volumes to avoid large drawdowns.

- Banking participants will explore changing the timing of withdrawals to allow for system recovery.

4.3.5 Adaptive Management Review

- As described in Section 4.3.1., Regular Coordination, banking participants will meet annually with GSAs at two regular points: (1), in the Spring, to review the annual operations plan, planned activities, and relevant groundwater conditions, and (2) in the Fall, to review completed activities, monitoring data, operational

effects, and any adjustments to inform future water banking activities. Additional ad hoc coordination and meetings may also be conducted as needed.

- Adaptive management strategies will evolve in response to climate variability, hydrologic trends, and basin-wide sustainability goals.

- If monitoring or operational evaluations indicate the need for adjustments, banking participants will collaborate with to GSAs discuss modification of the operations plan to maintain the goal of long-term groundwater basin sustainability consistent with the adopted GSPs.

4.4 Dispute Resolution

To ensure effective collaboration and conflict resolution, a structured dispute resolution framework is established for addressing issues arising from banking operations. The dispute resolution process is intended to complement the adaptive management framework by providing a structured mechanism to address disagreements regarding operational impacts and sustainability considerations.

The dispute resolution process aims to:

a. Address disputes related to operations of water banking, particularly groundwater pumping and recovery impacts, to ensure water banking activities continue to contribute to the sustainability of the Subbasins and do not lead to non-compliance with SGMA, as evaluated with reference to applicable GSP-defined sustainability criteria (e.g., MTs, MOs, and indicators of undesirable results) and Monitoring Plan provisions, as applicable.

b. Promote collaborative, transparent, and cost-effective conflict resolution.

c. Maintain legal compliance and procedural fairness while supporting basin-wide sustainability goals.

d. Strengthen working relationships among GSAs, banking participants, and interested parties in the Subbasins to prevent future conflicts.

The dispute resolution process may be initiated by any banking participant or a GSA directly affected by the banking activity, including overlying and adjacent GSAs, as applicable, identifying a conflict related to water banking operations. To formally initiate the conflict resolution process, a written notice outlining the dispute must be submitted to all parties involved.

Upon initiation of a dispute, the involved parties will consider interim operational adjustments, as appropriate, to avoid potential contribution to undesirable results until the dispute is resolved.

The parties in the conflict are expected to attempt in good faith to resolve the dispute through informal means. Best practices for conflict resolution recommend a tiered approach to

addressing conflicts collaboratively and efficiently while minimizing legal action. Relevant monitoring data and analyses used to support or evaluate the dispute will be consistent with the Monitoring Plan. This dispute resolution process includes:

a. Negotiation: Direct discussions among parties to resolve disputes within an agreed-upon timeframe established by the parties following notification.

b. Facilitation: If negotiation fails, a neutral facilitator may guide discussions to explore solutions during an agreed-upon period. Facilitation is a process-driven approach used in collaborative settings to help groups organize discussions, make decisions, and ensure productive dialogue.

c. Mediation: If facilitation is unsuccessful, the dispute may escalate to mediation with a mutually agreed-upon mediator. The mediator acts as a neutral third party, helping parties negotiate, clarify their positions, and reach a mutually acceptable agreement. An effective mediator should be knowledgeable about the subbasins and with no vested interest in the outcome.

Resolutions of conflicts will be documented, and an annual review will assess effectiveness and identify improvements. If disputes occur, banking participants may consider modifying water banking operations to prevent future conflicts. Agreed-upon resolutions shall be reflected in subsequent operational adjustments, as appropriate, and incorporated into future planning and coordination activities. Costs for facilitation and mediation will be shared equally among disputing parties.

5.0 IMPLEMENTATION AND ADMINISTRATION

This section outlines responsibilities for administering the Water Accounting System and its key implementation activities.

5.1 Roles and Responsibilities

RWA will lead the implementation and administration of the Water Accounting System. RWA will coordinate data collection, data management, reporting, and maintenance of the Water Accounting System, including maintaining accounting records and supporting consistency across banking programs in the North and South American Subbasins.

Participating Agencies will be responsible for conducting recharge and recovery activities and for providing information necessary to support accounting of those banking activities to RWA. This includes documentation supporting Accounting Benchmarks, recharge and recovery volumes, water supply sources, metered deliveries or pumping records, and any other information necessary to validate banking transactions. Participating Agencies are responsible for the accuracy and completeness of the information they submit and for maintaining supporting records.

RWA will review submitted information for completeness, consistency with the Water Accounting System, and consistency with the applicable accounting procedures. This review may include evaluating Accounting Benchmark documentation, checking recharge and recovery calculations, verifying application of losses and leave-behind requirements, and confirming that reported banking balances are consistent with the accounting records.

RWA will compile accounting results, including recharge, recovery, losses, leave-behind, and remaining balances, and made them available to Participating Agencies and applicable GSAs through regular reporting.

RWA will make relevant accounting information, monitoring information, and banking activity reports available to GSAs in the Subbasins to support coordination with adopted GSPs and the adaptive management framework described in Section 4. The Water Accounting System does not assign review obligations or decision-making responsibilities to GSAs; rather, it provides information that GSAs may consider, as appropriate, in carrying out their independent GSP implementation responsibilities.

If questions arise regarding submitted information, Accounting Benchmarks, or accounting results, RWA will coordinate with the relevant Participating Agency and, as appropriate, the applicable GSA(s) to resolve the issue consistent with the Water Accounting System, Monitoring Plan, adaptive management framework, and dispute resolution procedures.

5.2 Data Collection and Management

It is envisioned that the data and records associated with water banking activities will be maintained within a Data Management System (DMS). This DMS will facilitate transparency, allowing for all information to be queried by banking participants and by RWA, which would

allow RWA to promptly provide information when necessary. At minimum, the records maintained will include detailed monthly accounts during active periods of recharge and recovery. Water banking agreements will outline the types, protocols, and frequency of data collection that are pertinent to their activities. Data collection will make use of the existing data collection and reporting activities, to the extent possible, to minimize duplication of efforts and provide efficiency.

Data management, archiving, and security will be consistent with SGMA best management practices. This involves implementing robust data storage solutions, regular backups, and secure access protocols to ensure data integrity and availability. All data will be stored in secure, encrypted formats, with access strictly controlled through authentication and authorization mechanisms. Archiving strategies will be designed to ensure that data are retrievable and well-organized for long-term storage, while adhering to relevant legal and regulatory requirements.

5.3 Reporting

The Water Accounting System will support reporting of recharge and recovery balances, offering an in-depth look at the transactions conducted during a specific reporting period. The intention is for this reporting to be coordinated with reporting activities of the GSAs, whenever possible. The Water Accounting System could also support the specific reporting needs of banking programs (e.g., the Sac Water Bank and others).

As described in Section 4.2, each banking program will make available an annual report of its banking activities and balances. These banking reports should be made available at least one month prior to the GSP submission deadline of April 1st.

6.0 APPLYING THE WATER ACCOUNTING SYSTEM TO THE SACRAMENTO REGIONAL WATER BANK

The Sac Water Bank is a regional banking program operated by its Participating Agencies[5], with support from RWA. The Water Accounting System fundamentals are consistent with the established goals, objectives, and principles of Sac Water Bank (RWA, 2023)[6]. The Water Accounting System will support tracking of banking activities and transactions for the Sac Water Bank, support its compliance with pertinent and approved GSPs, and provide assurances and transparency about its operations to its Banking Partners,[7] regulatory agencies,[8] and stakeholders.[9]

Sac Water Bank implementation within the Water Accounting System will include the elements discussed below.

6.1 Accounts

One Bank: Sac Water Bank operations will be monitored and accounted as one bank that covers portions of the Subbasins (as several local water agencies, cities, and counties overlie both Subbasins, and recognizing the existing inter- connectivity of local water agencies across the Subbasins).

Multiple Subaccounts: Separate subaccounts will be implemented to track (1) activities subject to the guidelines for banking of CVP water,[10] and (2) activities not related to banking of CVP water (see Figure 8). In addition, other subaccounts may be created, as needed, to track banking activities in specific geographies, using specific sources of supplies, involving specific banking participants, etc.

The banked CVP water account will track the following sources of supplies:

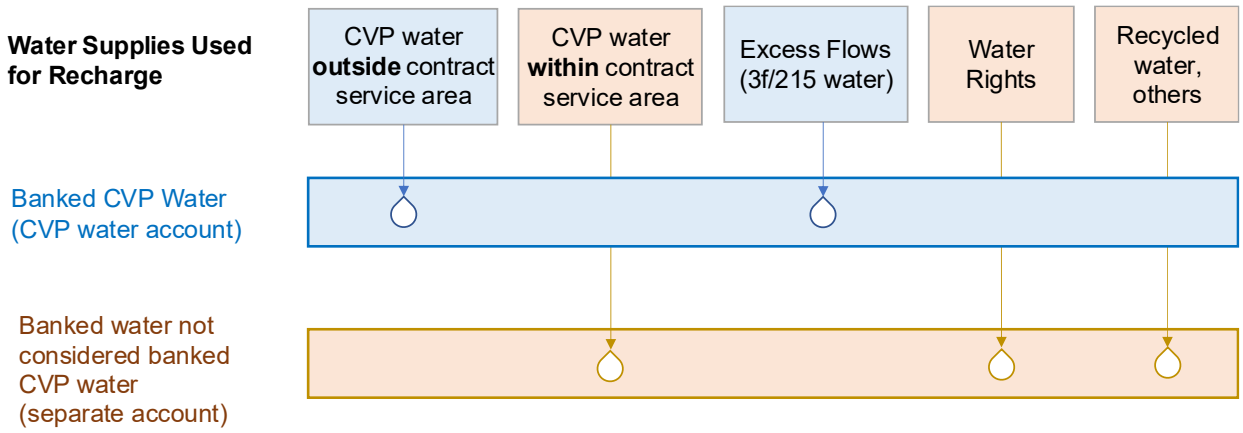
1. CVP contract water banked ***outside*** a CVP contractor service area: This banked water may include CVP water allocations from American River Division CVP contractors or from other CVP contractors. Any banking action that includes CVP water requires Reclamation's approval in accordance with Reclamation's current Water Banking guidelines. Reclamation may place quantity limitations based on the proposed timing of the banking action; historic CVP water use of the contractor seeking to bank CVP water; or any other factor(s) that may cause harm to the CVP, CVP operations, or Reclamation's ability to meet regulatory and other contractual obligations.

[5] Participating Agencies are RWA Members/Associate Members actively involved in recharge and/or recovery actions under the Sac Water Bank.
[6] The Sacramento Regional Water Goal, Objectives, Principles, and Constraints. RWA. July 7, 2023.
[7] Banking Partners are entities that are not Participating Agencies but have entered (or are exploring entering) into banking and transfer agreements with the Sac Water Bank.
[8] Regulatory agencies are entities with authority over some aspects of Sac Water Bank implementation.
[9] Stakeholders are interested parties, non-governmental organizations, other organizations, and individuals that are interested in, or potentially affected by, operations of the Sac Water Bank.
[10] *Groundwater Banking Guidelines for Central Valley Project Water* (Reclamation, 2019).

2. Article 3(f) water of the applicable CVP contract and section 215 water: Reclamation periodically makes these excess non-storable waters in CVP facilities available. Reclamation does not place limits on the use of flood excess water for recharge.[11]

Banked water not considered banked CVP water includes the following sources of supplies:

1. CVP water banked within a CVP contractor service area.
2. American and Sacramento rivers water available to the Banking Partners through existing water rights.
3. Water from other sources when available.



Key: CVP = Central Valley Project

Figure 8. Tracking of Sacramento Regional Water Bank Recharge Using Different Water Supply Sources

6.2 Leave-Behind and Banking Losses

1. **Leave-Behind:** The Participating Agencies have agreed there will be a "leave behind" of no less than 5 percent of recovered water that is transferred out of a subbasin. To further enhance local water supply reliability, a Participating Agency may opt to designate an additional percentage of its banked water as leave-behind, exceeding the minimum 5 percent requirement, potentially up to 100 percent.

[11] *Groundwater Banking Guidelines for Central Valley Project Water* (Reclamation, 2019).

2. **Banking Losses:** Banking losses will be calculated using the approach established in the Water Accounting System Section 3.5.1, ensuring consistency with water budgets in the GSPs.

6.3 Incorporation of Existing Banking Programs

6.3.1 Background and Purpose

For decades, conjunctive use has been a foundation of water management across the North American Subbasin and South American Subbasin. By coordinating the use of surface water and groundwater, this approach has reversed historical groundwater declines, enhanced basin sustainability, and created a more resilient water supply system. This success has demonstrated that carefully managed groundwater banking can provide regional water security while supporting environmental needs.

The Sac Water Bank is built upon these past and ongoing efforts. A fair and equitable approach has been applied to recognize past groundwater banking efforts, ensure transparency and fairness in groundwater banking credits, and protect long-term basin sustainability through adaptive management.

6.3.2 Reconciliation of Past Banking Activities

Banked water volumes associated with these past banking activities have been reconciled with the adopted methodologies under this Water Accounting System to maintain accuracy and consistency:

- Past banking activities were validated using historical records consistent with the direct and in-lieu recharge definitions established under this Water Accounting System.
- In-lieu recharge was quantified through the development and application of Accounting Benchmarks consistent with Section 3.2.3.
- Past groundwater substitution transfers were deducted from banked water to prevent double-counting.
- Banking losses, consistent with Section 6.2, were estimated and applied to ensure that reported volumes reflect recoverable groundwater.
- Banked water amounts were adjusted using the groundwater model developed for the historical GSP water budgets to ensure consistency between banking loss calculations and GSP assumptions regarding streamflow contributions and inter-basin subsurface flows.
- The resulting previously banked water amounts, representing banking activities from 1997 through September 2024, were adopted as the starting balances for the Water Accounting System.

6.3.3 Previously Banked Water Starting Balances

As of September 2024, approximately 900,000 acre-feet of PBW has been documented across six participating agencies. However, because the subbasins are hydraulically connected to river systems and neighboring subbasins, approximately 470,000 acre-feet, about half of the total, remains recoverable after accounting for banking losses, which are contributions to streamflow and inter-basin subsurface flows. This remaining recoverable balance represents the starting balance for the Sac Water Bank under the Water Accounting System. The analysis of past banking activities is documented in the 2025 report "*Analysis of Previously Banked Water*."

6.3.4 Adaptive Management Safeguards for Recovery

While incorporating past banked volumes is essential, it is equally important to ensure that groundwater recovery operations do not jeopardize Subbasin sustainability or disrupt existing users. Therefore, in addition to the framework and requirements described in Sections 2, 3, 4, 5, and 6, Banking Participants are committed to applying adaptive management safeguards to guide the integration and recovery of past banking balances.

- Banked groundwater recovery may be subject to annual recovery limits, and multi-year drought limitations, or other operational adjustments to avoid contributing to undesirable results identified in the applicable GSPs. These limits and adjustments will be informed by monitoring data, groundwater-level trends, proximity to applicable MTs and MOs, and coordination through the annual planning and adaptive management process described in Sections 4.2 and 4.3.

- Recovery operations will consider the spatial and temporal distribution of pumping to avoid localized groundwater-level declines that could contribute to undesirable results identified in the applicable GSPs.

- Recovery of banked water will managed to avoid reducing the operational flexibility available to other groundwater users in a manner that could contribute to undesirable results, particularly during dry years.

- Banking operations will be implemented consistent with applicable GSP Sustainable Management Criteria and will be managed to avoid causing or contributing to water quality or other undesirable results in the Subbasins.

7.0 REFERENCES

Department of Water Resources (DWR) (2024). Conjunctive Water Management Resource Management Strategy, California Water Plan Update 2023. https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/California-Water-Plan/Docs/Update2023/PRD/RMS/Draft-Conjunctive-Water-Management-RMS.pdf

DWR (2019). Draft Technical Information for Preparing Water Transfer Proposals. https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/State-Water-Project/Management/Water-Transfers/Files/Draft_2019WTWhitePaper-012324.pdf

RWA (2023). Sacramento Regional Water Bank Goal, Objectives, Principles, and Constraints. https://rwah2o.org/wp-content/uploads/2023/06/SRWB_Goal-Objectives-Principles-Constraints_07Jun2023.pdf

Sacramento Groundwater Authority (2021). North American Subbasin Groundwater Sustainability Plan.

Sacramento Central Groundwater Authority (2021). South American Subbasin Groundwater Sustainability Plan.

U.S. Department of the Interior, Bureau of Reclamation (2019). Groundwater Banking Guidelines for Central Valley Project.

APPENDIX A—EXAMPLES OF RECHARGE AND RECOVERY ACCOUNTING

Attachment A provides examples of recharge (deposits) and recovery (withdrawals) accounting and tracking using this Water Accounting System for hypothetical entities that represent the three types of water supply portfolios:

1. Primarily reliant on surface water
2. Primarily reliant on groundwater
3. Makes use of both surface water and groundwater

Table A-1 is an example of in-lieu recharge accounting over a 5-year period for a hypothetical banking participant that is primarily reliant on groundwater. The table does not show recovery because this groundwater reliant banking participant does not have established surface water use in its accounting benchmark.

Table A-2 is an example of recovery accounting over a 5-year period for a hypothetical banking participant that is primarily reliant on surface water. The table does not show in-lieu recharge because this surface water reliant banking participant does not have established groundwater use in its accounting benchmark.

Table A-3 is an example of in-lieu recharge and recovery accounting over a 5-year period for a hypothetical banking participant that uses both surface water and groundwater.

Table A-4 is an example of direct recharge using ASR wells, in-lieu recharge, and recovery accounting over a 5-year period for a hypothetical banking participant that uses both surface water and groundwater.

Table A-5 is an example of direct recharge using spreading basins, in-lieu recharge, and recovery accounting over a 5-year period for a hypothetical banking participant that uses both surface water and groundwater.

Table A-6 is an example of in-lieu recharge using recycled water to fully replace groundwater use over a 5-year period for a hypothetical banking participant that historically used groundwater.

Each table illustrates how the recharge and recovery accounting is conducted using the rules described in Sections 3.2, 3.3, and 3.3. For these examples, note the following:

- The total water use fluctuates from year to year relative to the assumed average use under the accounting benchmark. These fluctuations are typical and do not result in recharge or recovery actions by themselves.
- A reduction in groundwater use is not a recharge action unless it is accompanied by an equivalent increase in surface water use.

- An increase in groundwater use is not a recovery action unless it is accompanied by an equivalent reduction in surface use.
- Leave-behind and banking losses accounting are not reflected in these examples.
- Surface water is used for illustration purposes. Other local supply sources such as recycled water and storm water can be accounted for in a similar manner.

In the examples presented in Tables A-1 through A-5, accounting of recharge and recharge reflects the following rules:

- In-lieu recharge for urban water purveyors only occurs when → groundwater use decreases and surface water use increases.
- In-lieu recharge through direct supply of alternative water supplies is calculated as the volume of alternative water supply provided when groundwater use is completely replaced.
- Recovery only occurs when → groundwater use increases and surface water use decreases.
- Estimated in-lieu recharge (or recovery) is the lesser of change in groundwater use or surface water use. This helps to distinguish recharge and recovery actions from the normal variations (fluctuations) in annual water consumption relative to the accounting benchmark.
- Direct recharge is calculated as:
    - The amount of water injected using wells.
    - The amount of water applied to spreading basins – operational losses (evaporation and overflow).
- Direct recovery is calculated as the metered volume of water extracted using groundwater wells.

Table A-1. In-lieu Recharge Accounting for Hypothetical Groundwater Reliant Banking Participant

	a = b + c	*b*	*c*	*d = (b - benchmark)*	*e = (c - benchmark)*			*f = min (|d|, |e|)*			*g = 0*	
	Total Water Use	**GW Use**	**SW Use**	**Change in GW Use**	**Change in SW Use**	**GW decrease?**	**SW increase?**	**In-lieu Recharge**	**GW increase?**	**SW decrease?**	**Recovery**	**Explanation**
Accounting benchmark	**5,000**	**5,000**	**0**									
Year 1	5,050	5,050	0	50	0	No	No	0	Yes	No	0	• GW use decreased and SW use: no change. • No in-lieu recharge.
Year 2	4,750	3,400	1,350	-1,600	1,350	Yes	Yes	1,350	No	No	0	• GW use: decreased and SW use: increased. • In-lieu recharge occurred. • In-lieu recharge is minimum of change in SW use or GW use to account for total water use fluctuation relative to the benchmark.
Year 3	4,200	4,200	0	-800	0	Yes	No	0	No	No	0	• GW use: decreased and SW use: no change. • No in-lieu recharge. • Reduction in GW use alone is not a recharge (fluctuation in total water use relative to the benchmark).
Year 4	5,700	5,200	500	200	500	No	No	0	Yes	No	0	• GW use: increased and SW use: increased • No in-lieu recharge. • SW use increase to meet higher demand.
Year 5	5,300	3,300	2,000	-1,700	2,000	Yes	Yes	1,700	No	No	0	• GW use: decreased and SW use: increased. • In-lieu recharge occurred. • In-lieu recharge is minimum of change in SW use or GW use to account for total water use fluctuation relative to the benchmark.

Key:
GW = groundwater min = minimum SW = surface water

Table A-2. Recovery Accounting for Hypothetical Surface Water Reliant Banking Participant

	a = b + c	*b*	*c*	*d = (b - benchmark)*	*e = (c - benchmark)*			*f = 0*			*g = min (|d|, |e|)*	
	Total Water Use	**GW Use**	**SW Use**	**Change in GW Use**	**Change in SW Use**	**GW decrease?**	**SW increase?**	**In-lieu Recharge**	**GW increase?**	**SW decrease?**	**Recovery**	**Explanation**
Accounting benchmark	**8,500**	**0**	**8,500**									
Year 1	7,650	0	7,650	0	-950	No	No	0	No	Yes	0	• GW use no change and SW use: decreased. • No recovery.
Year 2	8,600	0	8,600	0	600	No	Yes	0	No	No	0	• GW use: no change and SW use: increased. • No recovery
Year 3	7,700	1,700	6,000	1,700	-2,500	No	No	0	Yes	Yes	1,700	• GW use: increased and SW use: decreased. • Recovery occurred. • Recovery is minimum of change in SW use or GW use to account for total water use fluctuation relative to the benchmark.
Year 4	8,950	300	8,650	300	150	No	Yes	0	Yes	No	0	• GW use: increased and SW use: increased. • No recovery.
Year 5	7,200	7,200	0	7,200	-8,500	No	No	0	Yes	Yes	7,200	• GW use: increased and SW use: decreased. • Recovery occurred. • Recovery is minimum of change in SW use or GW use to account for total water use fluctuation relative to the benchmark.

Key:
GW = groundwater min = minimum SW = surface water
Notes:
Assumes that the banking participant already has sufficient banked water for this recovery.

Table A-3. In-lieu Recharge and Recovery Accounting for Hypothetical Mixed Supply (Surface Water-Groundwater Use) Banking Participant

	a = b + c	*b*	*c*	*d = (b - benchmark)*	*e = (c - benchmark)*			*f = min (|d|, |e|)*			*g = min (|d|, |e|)*	
	Total Water Use	**GW Use**	**SW Use**	**Change in GW Use**	**Change in SW Use**	**GW decrease?**	**SW increase?**	**In-lieu Recharge**	**GW increase?**	**SW decrease?**	**Recovery**	**Explanation**
Benchmark	**8,000**	**4,500**	**3,500**									
Year 1	7,500	4,300	4,200	-200	700	Yes	No	200	No	No	0	• GW use: decreased and SW use: increased. • In-lieu recharge occurred • In-lieu recharge is minimum of change in SW use or GW use to account for total water use fluctuation relative to the benchmark.
Year 2	8,100	5,700	2,400	1,200	-1,100	No	No	0	Yes	Yes	1,100	• GW use: increased and SW use: decreased. • Recovery occurred. • Recovery is minimum of change in SW use or GW use to account for total water use fluctuation relative to the benchmark.
Year 3	8,600	4,850	3,750	350	250	No	Yes	0	Yes	No	0	• GW use: increased and SW use: increased. • No in-lieu recharge. No recovery.
Year 4	7,650	3,100	4,550	-1,400	1,050	Yes	Yes	1,050	No	No	0	• GW use: decreased and SW use: increased. • In-lieu recharge occurred. • In-lieu recharge is minimum of change in SW use or GW use to account for total water use fluctuation relative to the benchmark.
Year 5	7,200	4,200	3,000	-300	-500	Yes	No	0	No	Yes	0	• GW use: decreased and SW use: decreased. • No in-lieu recharge. No recovery.

Key:
GW = groundwater use min = minimum SW = surface water use
Notes:
Assumes that the banking participant already has sufficient banked water for this recovery.

Table A-4. Combined Direct (Injection) and In-lieu Recharge, and Recovery Accounting

	a = b + c1	*b*	*c1*	*c2*	*d = (b - benchmark)*	*e = (c1 - c2 - benchmark)*	*f1= c2*			*f2 = min (|d|, |e|)*			*g = min (|d|, |e|)*	
	Total Water Use	**GW Use**	**SW Use**	**Well Injection**	**Change in GW Use**	**Change in SW Use *(less injection)***	**Direct Recharge**	**GW decrease?**	**SW increase?**	**In-lieu Recharge**	**GW increase?**	**SW decrease?**	**Recovery**	**Explanation**
Benchmark	**8,000**	**4,500**	**3,500**	**0**										
Year 1	8,500	4,300	4,200	0	-200	700	0	Yes	Yes	200	No	No	0	• GW use: decreased and SW use: increased. • In-lieu recharge occurred. • In-lieu recharge is minimum of change in SW use or GW use to account for total water use fluctuation relative to the benchmark.
Year 2	7,700	3,700	4,000	300	-800	200	300	Yes	Yes	200	No	No	0	• Direct recharge occurred. • GW use: decreased and SW use: increased. • In-lieu recharge occurred. • In-lieu recharge is minimum of change in SW use (less injection) or GW use to account for total water use fluctuation relative to the benchmark.
Year 3	8,300	5,400	2,900	500	900	-1,100	500	No	No	0	Yes	Yes	900	• Direct recharge occurred. • GW use: increased and SW use: decreased. • Recovery occurred. • Recovery is minimum of change in SW use (less injection) or GW use to account for total water use fluctuation relative to the benchmark.
Year 4	8,600	4,850	3,750	800	350	-550	800	No	No	0	Yes	Yes	350	Same as year 3.
Year 5	7,650	3,100	4,550	400	-1,400	650	400	Yes	Yes	650	No	No	0	Same as year 2.

Key: GW = groundwater use min = minimum SW = surface water use

Notes:

Assumes that the banking participant already has sufficient banked water for this recovery.

Table A-5. Combined Direct (Spreading Basins) and In-lieu Recharge, and Recovery Accounting

	a = b + c1	*b*	*c1*	*c2*	*c3*	*d = (b - benchmark)*	*e = (c1 - c2 - benchmark)*	*f1 = c2 - c3*			*f2 = min (|d|, |e|)*			*g = min (|d|, |e|)*	
	Total Water Use	**GW Use**	**SW Use**	**Spreading Basins SW Use**	**Evap. & Overflow Losses**	**Change in GW Use**	**Change in SW Use** *(less Spreading Basin use)*	**Direct Recharge**	**GW decrease?**	**SW increase?**	**In-lieu Recharge**	**GW increase?**	**SW decrease?**	**Recovery**	**Explanation**
Benchmark	**8,000**	**4,500**	**3,500**	**0**											
Year 1	8,500	4,300	4,200	0	0	-200	700	0	Yes	Yes	200	No	No	0	• GW use: decreased and SW use: increased. • In-lieu recharge occurred. • In-lieu recharge is minimum of change in SW use or GW use to account for total water use fluctuation relative to the benchmark.
Year 2	7,700	3,700	4,000	300	50	-800	200	250	Yes	Yes	200	No	No	0	• Direct recharge occurred. • GW use: decreased and SW use: increased. • In-lieu recharge occurred. • In-lieu recharge is minimum of change in SW use (less spreading basins use) or GW use to account for total water use fluctuation relative to the benchmark.
Year 3	8,300	5,400	2,900	500	150	900	-1,100	350	No	No	0	Yes	Yes	900	• Direct recharge occurred. • GW use: increased and SW use: decreased. • Recovery occurred. • In-lieu recharge is minimum of change in SW use (less spreading basins use) or GW use to account for total water use fluctuation relative to the benchmark.
Year 4	8,600	4,850	3,750	800	300	350	- 550	500	No	No	0	Yes	Yes	350	Same as year 3.
Year 5	7,650	3,100	4,550	400	100	-1,400	650	300	Yes	Yes	650	No	No	0	Same as year 2.

Key:
GW = groundwater use min = minimum SW = surface water use

Table A-6. In-lieu Recharge Accounting for Hypothetical Groundwater Reliant Banking Participant Using Recycled Water to Replace Groundwater Use

	a = b + c	*b*	*c*	*d = (b - benchmark)*	*e = (c - benchmark)*			*f = min (|d|, |e|)*			*g = 0*	
	Total Water Use	**GW Use**	**Recycled Water Use**	**Change in GW Use**	**Change in ReW Use**	**GW decrease?**	**ReW increase?**	**In-lieu Recharge**	**GW increase?**	**ReW decrease?**	**Recovery**	**Explanation**
Accounting benchmark	**5,000**	**5,000**	**0**									
Year 1	5,050	0	5,050	-5,000	5,050	Yes	Yes	5,050	No	No	0	• GW use: decreased and ReW use: increased. • In-lieu recharge occurred. • In-lieu recharge is the increase in ReW because it replaced the entire GW use.
Year 2	4,750	0	4,750	-5,000	4,750	Yes	Yes	4,750	No	No	0	• GW use: decreased and ReW use: increased. • In-lieu recharge occurred. • In-lieu recharge is the increase in ReW because it replaced the entire GW use.
Year 3	4,200	0	4,200	-5,000	4,200	Yes	Yes	4,200	No	No	0	•GW use: decreased and ReW use: increased. • In-lieu recharge occurred. • In-lieu recharge is the increase in ReW because it replaced the entire GW use.
Year 4	5,700	0	5,700	-5,000	5,700	Yes	Yes	5,700	No	No	0	•GW use: decreased and ReW use: increased. • In-lieu recharge occurred. • In-lieu recharge is the increase in ReW because it replaced the entire GW use.
Year 5	5,300	0	5,300	-5,000	5,300	Yes	Yes	5,300	No	No	0	•GW use: decreased and ReW use: increased. • In-lieu recharge occurred. • In-lieu recharge is the increase in ReW because it replaced the entire GW use.

Key:
GW = groundwater min = minimum ReW = recycled water SW = surface water

Table A-7. In-lieu Recharge Accounting for Hypothetical Groundwater Reliant Banking Participant Using Recycled Water to Replace Groundwater Use (Modified In-lieu Accounting Approach)

	A = b + c	*b*	*c*	*d*	*e = (c - benchmark)*	*If d= yes, f = e*	
	Estimated Total Water Use	**Estimated GW Use**	**Recycled Water Use**	**GW decrease? (1)**	**Change in ReW Use**	**In-lieu Recharge**	**Explanation**
Accounting benchmark	**5,000**	**5,000**	**0**				
Year 1	5,050	N/A	2,050	Yes	2,050	2,050	• GW use: decreased and ReW use: increased. • In-lieu recharge occurred. • In-lieu recharge is based on measured ReW deliveries that offset groundwater pumping.
Year 2	4,750	N/A	3,750	Yes	3,750	3,750	• GW use: decreased and ReW use: increased. • In-lieu recharge occurred. • In-lieu recharge is based on measured ReW deliveries that offset groundwater pumping.
Year 3	4,200	N/A	1,200	Yes	1,200	1,200	•GW use: decreased and ReW use: increased. • In-lieu recharge occurred. • In-lieu recharge is based on measured ReW deliveries that offset groundwater pumping.
Year 4	5,700	N/A	2,700	Yes	2,700	2,700	•GW use: decreased and ReW use: increased. • In-lieu recharge occurred. • In-lieu recharge is based on measured ReW deliveries that offset groundwater pumping.
Year 5	5,300	N/A	3,300	Yes	3,300	3,300	•GW use: decreased and ReW use: increased. • In-lieu recharge occurred. • In-lieu recharge is based on measured ReW deliveries that offset groundwater pumping.

Key:
GW = groundwater min = minimum ReW = recycled water SW = surface water

Notes
(1) Where groundwater pumping volumes are not directly metered, avoided groundwater use may be validated using alternative documentation, including well run-time records, reductions in pumping periods, electrical use associated with groundwater production, or other operational records sufficient to demonstrate a reduction in groundwater pumping.