

SACRAMENTO GROUNDWATER AUTHORITY

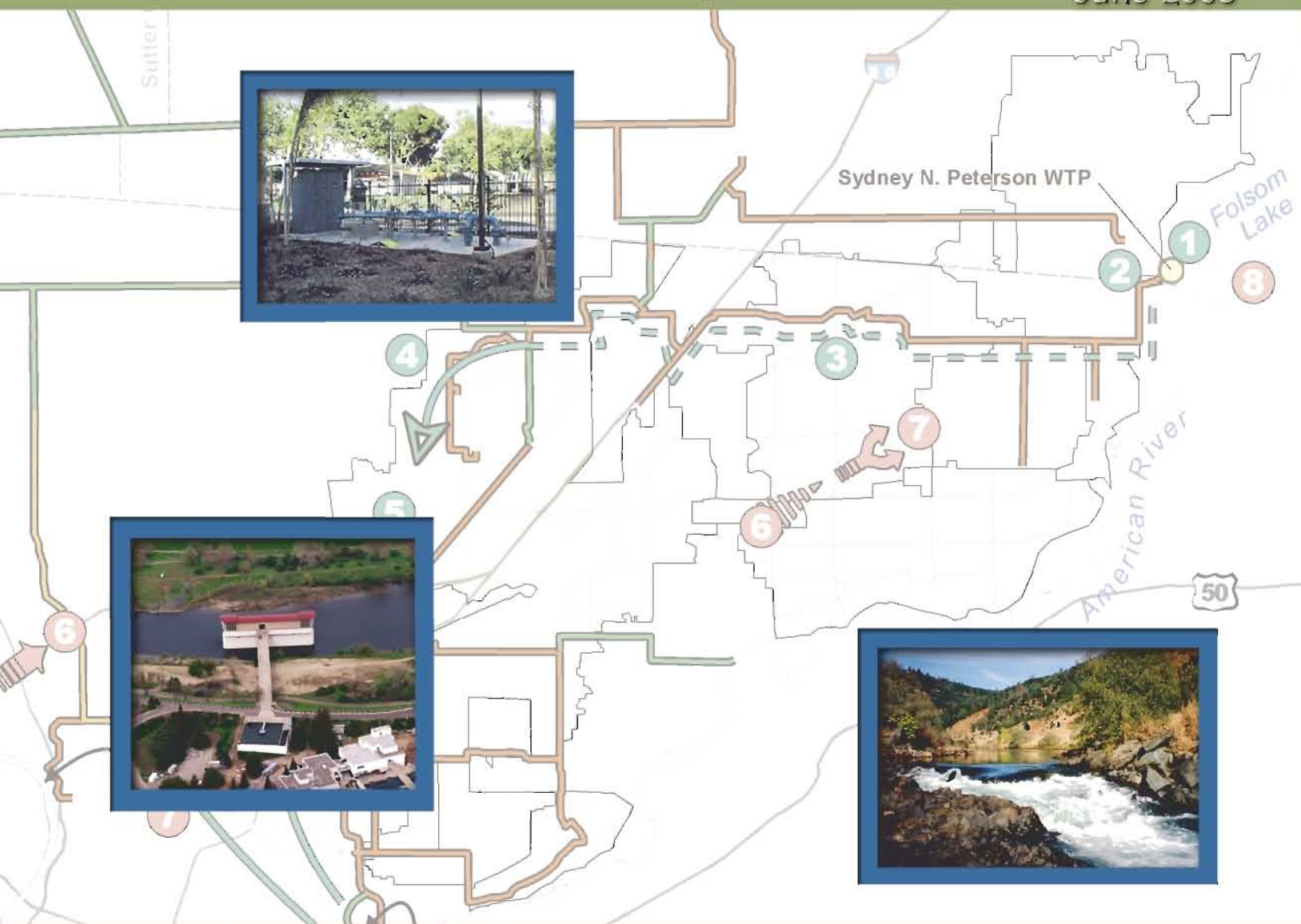
in cooperation with

CALFED Bay-Delta Program

Environmental Water Account

PILOT STUDY

June 2003



BACKGROUND

In April 2002, the Sacramento Groundwater Authority (SGA) entered into an agreement with the CALFED Bay-Delta Program (CALFED) Environmental Water Account (EWA) for the one-year sale of up to 10,000 acre-feet (AF) of surface water. A portion of this surface water (up to 5,000 AF) was made available in Folsom Lake through a transfer of a portion of the Central Valley Project (CVP) contract entitlement of the San Juan Water District (San Juan). The other 5,000 AF was made available by the City of Sacramento through forbearance of a surface water diversion right on the lower American River. In both cases, local demand was met by the recovery of previously banked groundwater (made available by regional groundwater banking and exchange operations). The surface water was acquired by the U.S. Bureau of Reclamation (Reclamation) on behalf of the EWA.



SACRAMENTO GROUNDWATER AUTHORITY (SGA)

The SGA is a joint powers authority formed pursuant to the recommendation of the Water Forum Agreement and charged with the protection and management of the groundwater basin underlying the service areas of water purveyors north of the American River in Sacramento County. The SGA Board of Directors includes representatives (principally elected officials) from sixteen organizations:

- Carmichael Water District
- California-American Water Company
- Citrus Heights Water District
- City of Folsom
- City of Sacramento
- County of Sacramento
- Del Paso Manor Water District
- Fair Oaks Water District
- Natomas Central Mutual Water Company
- Orange Vale Water Company
- Rio Linda/Elverta Community Water District
- Sacramento Suburban Water District
- San Juan Water District
- Southern California Water Company
- Individuals representing agricultural and self-supplied groundwater users



CALFED ENVIRONMENTAL WATER ACCOUNT (EWA)

A key component of the CALFED Water Management Strategy, the EWA was created to address two problems: declining fish populations and unreliable water supplies. The purpose of the EWA is to better protect fish by making it possible to modify water export operations in the Bay-Delta, while meeting the needs of the water users.

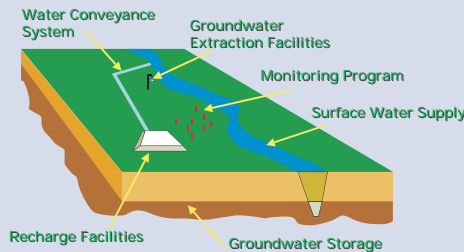
The EWA buys water from willing sellers or diverts surplus water when safe for fish, then banks, stores, transfers, and releases that water as needed to protect fish and compensate water users. The EWA is funded jointly by the State and Federal governments. Initial acquisitions have been made by the U.S. Bureau of Reclamation and the California Department of Water Resources.

GROUNDWATER BANKING AND EXCHANGE

The local conjunctive use program prescribed by the Water Forum Agreement facilitates a regional groundwater banking and exchange program.

The “banking” portion of the program occurs in “wet” years when surface water diversions are maximized. Banking can occur through in-lieu and/or direct recharge.

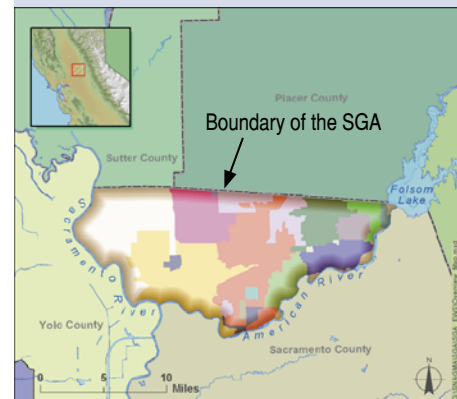
The “exchange” portion of the program occurs in “dry” years when the water balance prescribed by the WFA provides for the forbearance of surface water diversions from Folsom Lake and the lower American River.



DEFINITIONS:

“Direct recharge”: increasing the amount of groundwater available in an aquifer by conducting surface water into the ground by various means, including, without limitation, spreading ponds and injection wells.

“In-lieu recharge”: increasing the amount of groundwater available in an aquifer by substituting surface water supplies to a user who would otherwise extract groundwater.



Location Map

Building upon a previous SGA pilot study conducted with the Sacramento Area Flood Control Agency (SAFCA), this effort further demonstrated the viability of conjunctive use opportunities within the basin. In addition to the regional benefits that were realized, implementation of this effort provided statewide benefits by enhancing instream flows and water quality for environmental purposes and increasing the availability of water for export from the Delta.

SACRAMENTO AREA WATER FORUM (WATER FORUM)

Begun in 1993, the **Water Forum** is a group comprised of business and agricultural leaders, citizens groups, environmentalists, water managers, and local governments in the Sacramento Region that joined together to fulfill two co-equal objectives: (1) to provide a reliable and safe water supply for the region's economic health and planned development to the year 2030; and (2) to preserve the fishery, wildlife, recreational, and aesthetic values of the Lower American River. In 2000, Water Forum members approved the Water Forum Agreement (WFA) that consists of seven integrated actions necessary to provide a regional solution to water shortages, environmental damage, groundwater contamination, and limited economic prosperity.



EWA PILOT STUDY OPERATIONS

The one-year EWA Banking and Exchange Pilot Study (EWA Pilot Study) yielded 7,143 AF of surface water for transfer. There were two principal operations (see **Figures 1a** and **1b**):

- **San Juan Element:** This operation involved San Juan, Citrus Heights Water District (Citrus Heights), Fair Oaks Water District (Fair Oaks), and Sacramento Suburban Water District (Sac Suburban). Citrus Heights and Fair Oaks met a portion of their local demands with groundwater extraction (in substitution for surface water supplies). The undiverted surface water remained in Folsom Lake and was transferred to Reclamation to meet downstream EWA objectives. For the purposes of the EWA Pilot Study, it was assumed that the previous year's operations by Sac Suburban (i.e., delivery of surface water in-lieu of groundwater extraction) mitigated for any potential negative impacts to the groundwater basin. This operation provided 65 percent (or 4,646 AF) of the 7,143 AF transferred.
- **City of Sacramento Element:** Under this operation, the City of Sacramento extracted groundwater to meet a portion of its local demands while forbearing diversion of surface water from the lower American River. This surface water was allowed to flow from the lower American River to the Sacramento/San Joaquin Delta where it was exported at the CVP/State Water Project (SWP) pumping plants in a manner consistent with all regulatory requirements and the EWA Operating Principles. For the purposes of the EWA Pilot Study, it was assumed that the City of Sacramento's earlier activities (i.e., delivery of surface water in-lieu of groundwater extraction) mitigated for any potential negative impacts to the groundwater basin. This operation provided 35 percent (or 2,497 AF) of the 7,143 AF transferred.

SGA/SAFCA PILOT STUDY

In 1999/2000, a pilot study was conducted with SAFCA and Reclamation as a means of exercising the groundwater storage potential resulting from the regional cone of depression and investigating the mechanics of a large-scale banking and exchange program.

In this pilot study, an on-call surface water supply was provided to SAFCA. Specifically, SAFCA diverted and stored (banked) 2,100 AF of water in the basin. The following year, surface water in the amount of 1,995 AF was made available by exchange through the extraction of groundwater in-lieu of diverting a CVP supply from Folsom Lake. SAFCA used this water on an as-needed basis to satisfy its refill obligations associated with flood management reservation in Folsom Lake.

The "active" participants in this pilot study included: SGA, SAFCA, San Juan Water District, Northridge Water District (now consolidated with Arcade Water District to form Sacramento Suburban Water District), and Citrus Heights Water District. The word active is emphasized because it is acknowledged that all SGA member agencies had an interest in the success of the pilot study.

The San Juan Element was initiated in mid-June; The City of Sacramento Element was initiated at the beginning of July. If these elements had been triggered earlier, yield in excess of 7,143 AF could have been produced for transfer.

Figure 1a: Operations of San Juan Element

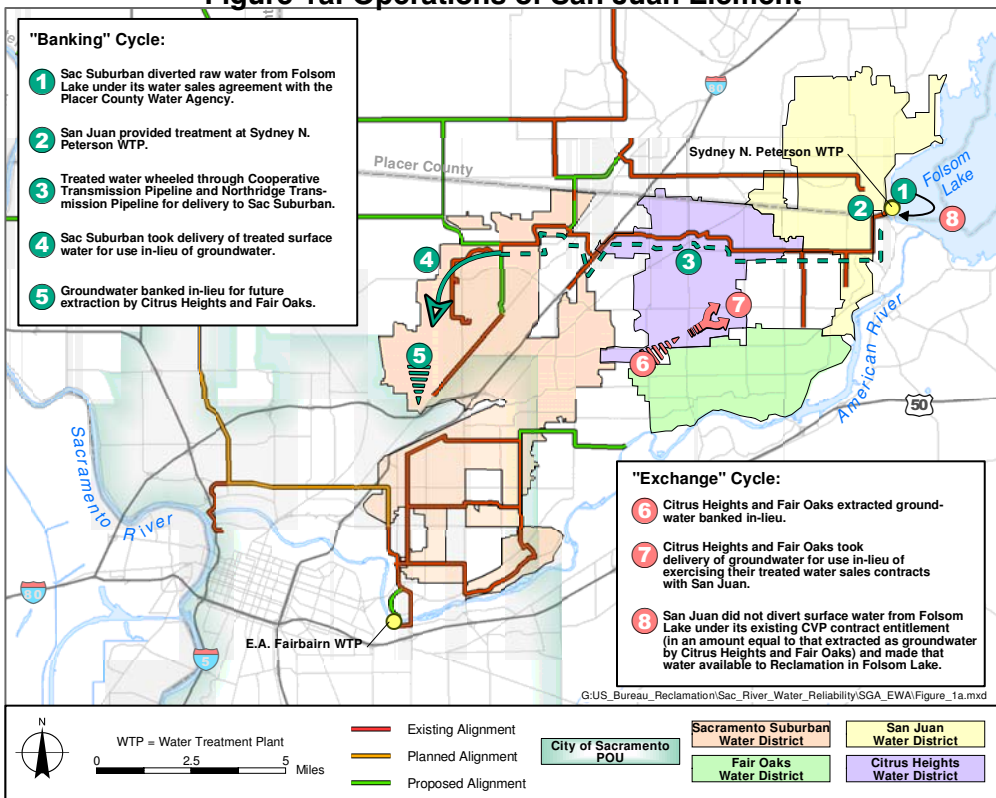
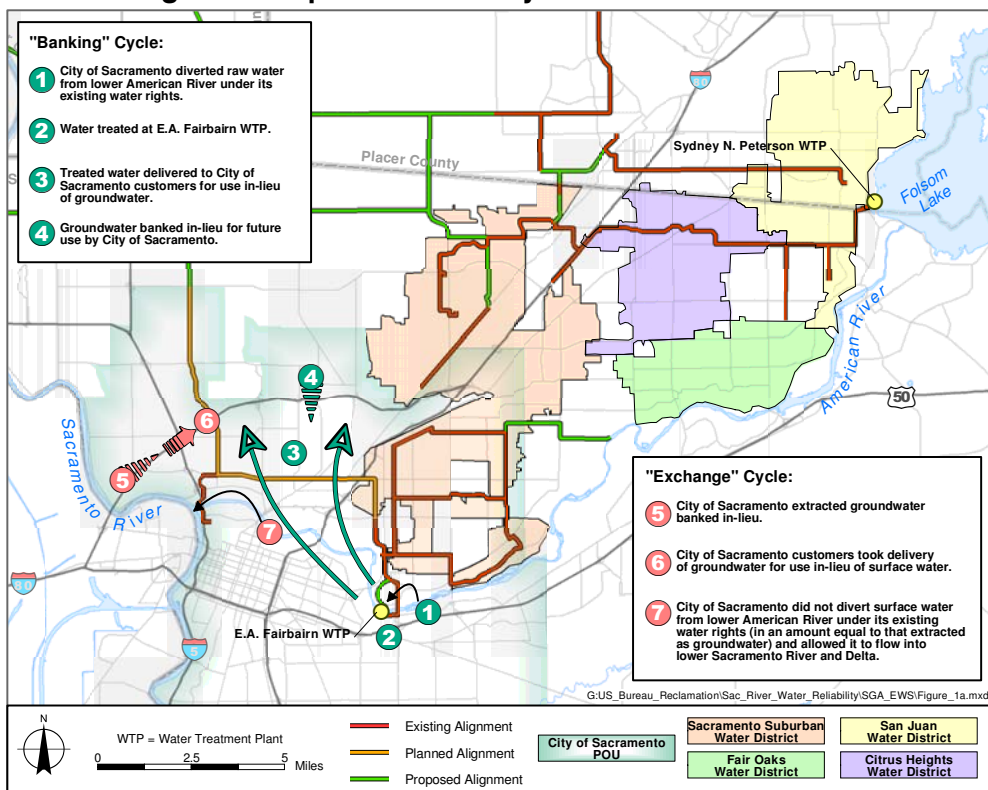


Figure 1b: Operations of City of Sacramento Element



WATER ACCOUNTING MECHANISM

A water accounting mechanism was implemented for the EWA Pilot Study to track the volume of groundwater banked through in-lieu recharge, changes in the volume of groundwater storage, estimated volumes of basin losses, the volume of groundwater extracted, and the volume of surface water forbearance.

Groundwater Banking

The banking portion of the EWA Pilot Study was accomplished through in-lieu recharge within the service areas of Sac Suburban and the City of Sacramento. Existing water rights and contract entitlements were used.

Aquifer Storage Impacts

For the purposes of the EWA Pilot Study, it was assumed that the prior efforts of Sac Suburban and the City of Sacramento had banked groundwater in excess of the amount exchanged. Thus, there was no net impact to storage in the groundwater basin.

Surface Water Exchange

The volume of surface water made available for acquisition by Reclamation was determined by subtracting an estimate of the volume of groundwater that would have been extracted but for the EWA Pilot Study (i.e., an historical groundwater production curve) from the actual measured volume of groundwater extracted during the period of performance. The surface water made available for transfer consisted of the existing water rights and contract entitlements held by San Juan and City of Sacramento.

Figure 2a shows the groundwater extraction capacity, historical groundwater production curve, and groundwater extracted and resulting transferable supply during the EWA Pilot Study for Citrus Heights. Using September as an example:

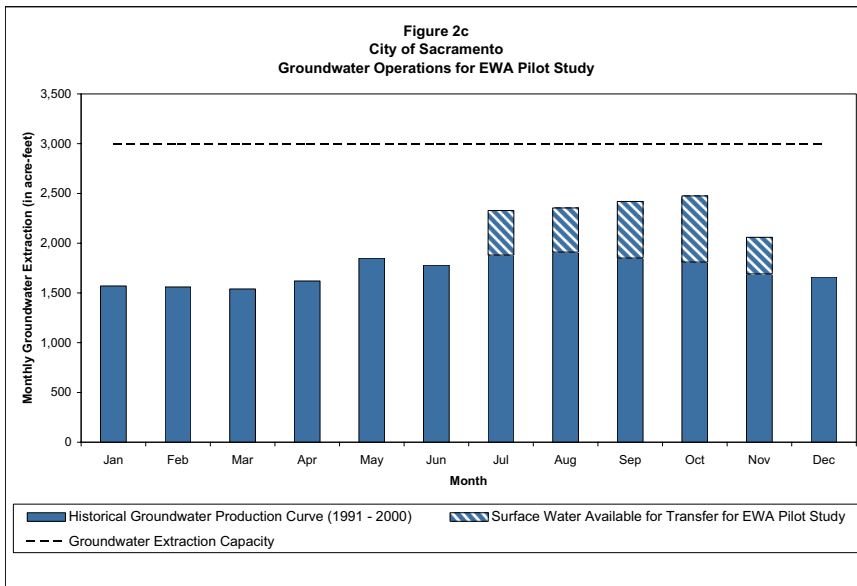
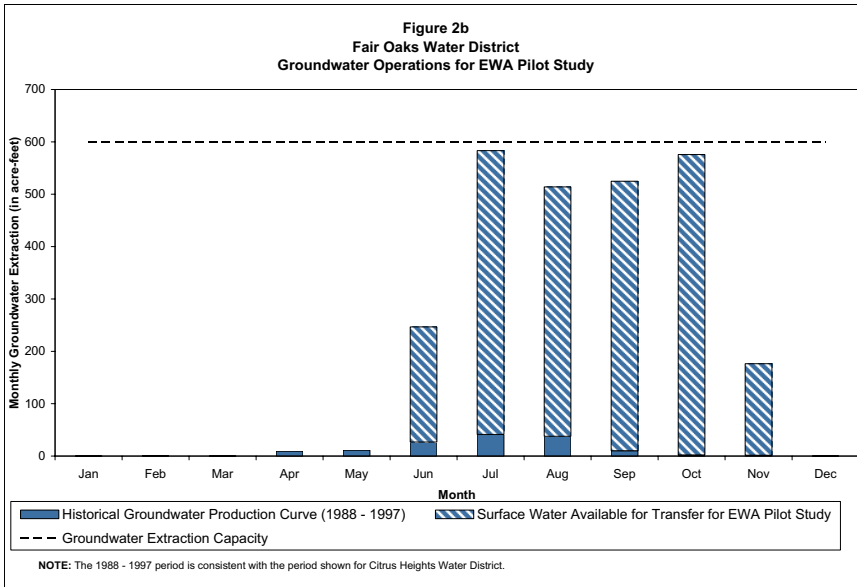
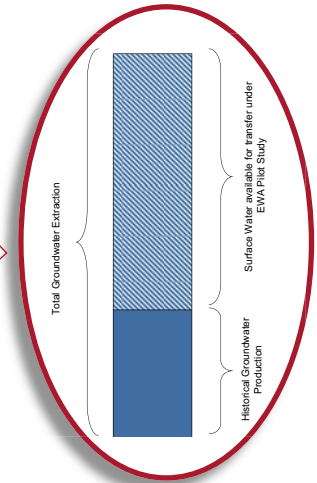
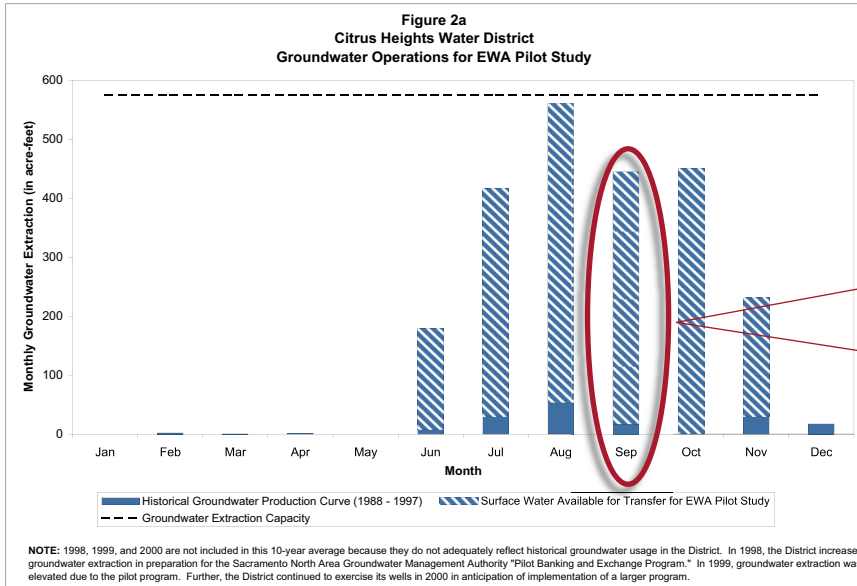
Actual measured volume of groundwater extracted during September:	445.0 AF
- Estimated volume of groundwater that would have been extracted in September but for the EWA Pilot Study (i.e., historical groundwater production):	16.5 AF
<hr/>	
Volume of surface water made available for transfer:	428.5 AF

Figures 2b and **2c** present the same information for Fair Oaks and the City of Sacramento, respectively.

Folsom Lake Storage Impacts

Because the EWA Pilot Study was completed during a relatively short period of time and involved a small volume of water, it was assumed that there were no impacts to Folsom Lake storage.

Figure 2: Groundwater Operations for EWA Pilot Study



FINANCIAL STRUCTURE

The financial structure for the EWA Pilot Study involved contractual arrangements, a pricing structure and strategy, and a mechanism for distributing the generated revenue. This was accomplished through the application and refinement of concepts developed through previous efforts of the American River Basin Cooperating Agencies Regional Water Master Plan (Cooperating Agencies RWMP), the SGA, and the Regional Water Authority (RWA).

Contractual and Institutional Arrangements

The role of the SGA was to facilitate the EWA Pilot Study by exercising its authority under the joint powers agreement. This authority permitted the SGA to make the contractual arrangements required for implementation, while also providing the pre-requisite political and legal certainty required by the EWA. The relationships of Reclamation, SGA, and the participating SGA agencies are shown in **Figure 3**.

Master Agreement between the SGA and Reclamation

Through the Master Agreement, surface water was acquired by Reclamation on behalf of the EWA. Reclamation agreed to pay the SGA \$75/AF to undertake the activities required to make up to 10,000 AF of surface available for transfer.

Implementation Agreement between the SGA and SGA Member Agencies


The SGA entered into an Implementation Agreement with San Juan, Citrus Heights, Fair Oaks, Sac Suburban, and the City of Sacramento, contracting for the specific activities required to conduct the EWA Pilot Study (i.e., surface water diversion, treatment, conveyance, groundwater extraction, and diversion forbearance). SGA paid for these activities using the funds received under the Master Agreement. Pursuant to the Master Agreement, monthly invoices were submitted by SGA to Reclamation following initiation of the exchange process.

**Figure 3
Contractual And
Institutional Agreements**




Pricing Structure and Strategy

The \$75/AF price negotiated by the participants in the EWA Pilot Study was the prevailing market price at that time for transfer water north of the Delta. On a comparative basis the EWA Pilot Study resulted in a positive cash flow for the SGA and each of the participating SGA member agencies (see next section). However, implementation of the EWA Pilot Study required the exercise of previous investments made by the participants including: surface water rights and/or contract entitlements,



**COOPERATING AGENCIES
REGIONAL WATER MASTER PLAN (RWMP)**

In 1998, water purveyors in western Placer County and northern Sacramento County formed the **Cooperating Agencies** and initiated work on implementation of the regional conjunctive use program envisioned by the Water Forum. The objective of this effort, referred to as the **RWMP**, is the development of equitable, cost-effective water resource management strategies for enhancing water supply reliability and operational flexibility for water users of Folsom Lake, the lower American River, and the adjacent groundwater basin. The RWMP is being implemented by the local water purveyors, the SGA, and the RWA.



REGIONAL WATER AUTHORITY (RWA)

The **RWA** is a joint powers authority charged with serving and representing the regional water supply interests of its members and protecting and enhancing the reliability, availability, affordability, and quality of water resources in the greater Sacramento area.

surface water diversion and treatment facilities, water transmission and distribution facilities, and groundwater extraction and treatment facilities. All represent substantial investments by the purveyor holding those water rights or contract entitlements and/or owning and operating those facilities. Justifiably, these purveyors wanted to recoup at least a portion of those investments for participation in the EWA Pilot Study. Full recovery of these investments would have required a sales price in excess of the \$75/AF in the EWA Pilot Study. However, participation in the EWA Pilot Study was part of a larger strategy to secure Proposition 13 grant funds. An agreement with the EWA was a cornerstone of the RWA's successful Proposition 13 Groundwater Storage Program Construction Grant application. This agreement was considered necessary to prove the viability of a banking and exchange program within the greater Sacramento area. The negotiated price for the EWA Pilot Study was set at an amount greater than a net "break even" amount, but less than the amount required for full recovery of all capital costs.

REVENUE DISTRIBUTION

In accordance with provisions in the Master Agreement, the SGA disbursed payments to the participating SGA member agencies after Reclamation paid for all acquired water.

SAN JUAN ELEMENT

San Juan, Citrus Heights, Fair Oaks, and Sac Suburban received \$75 for each AF sold to Reclamation under this element, less \$25,000 retained by SGA for administration of the EWA Pilot Study. The proceeds (less the \$25,000) were distributed as follows:

- San Juan: 5 percent (or, \$16,171.75)
- Citrus Heights and Fair Oaks: 43 percent, pro-rated according to the quantities of groundwater extracted (or, \$61,191.94 and \$74,885.11, respectively)
- Sac Suburban: 52 percent (or, \$168,186.20)

CITY OF SACRAMENTO ELEMENT

The City of Sacramento received \$75 for each AF sold to Reclamation under this element, less 10 percent retained by SGA for administration of the EWA Pilot Study (or, \$168,534.00 and \$18,726.00, respectively).

PROPOSITION 13 GRANT FUNDS

The RWA received a \$21.7 million Proposition 13 grant for its **American River Basin Regional Conjunctive Use Program**. The grant will be used to provide surface water to areas that have historically used groundwater during wet years and withdraw the stored water in dry years, creating a subterranean bank to protect the region against drought. The project will include construction of pipelines, pumps, wells, and other facilities to store, treat and move water around the region north of the American River. This infrastructure will increase the potential yield of the program from 10,000 AF/year to 26,600 AF/year.

Cost of Service Comparison

To evaluate the impacts to each of the participating SGA member agencies, a financial analysis of the amount each would have spent for water supplies with and without the EWA Pilot Study was conducted. These cost of service comparisons included both costs and revenue. Charges included the corpus of the water (i.e., \$/AF charge for the raw water supply), debt service on existing infrastructure, and variable costs (i.e., operations, maintenance, and energy). Revenue included proceeds received for conduct of the EWA Pilot Study. The comparisons are discussed below (see **Tables 1** through **5**) and summarized in **Table 6**.

San Juan

A cost of service comparison for San Juan is presented in **Table 1**.

Service Charge. Regardless of the scenario and quantity of surface water received, Citrus Heights, Fair Oaks, and San Juan's retail customers would have paid their annual service charges to San Juan. The service charge is the same both with the EWA Pilot Study and without.

Commodity Charge. Citrus Heights and Fair Oaks would have paid for the corpus of the surface water either for water supply purposes or as part of the exchange component. Without the EWA Pilot Study, both agencies would have needed to treat the water at San Juan's Peterson Water Treatment Plant (WTP) prior to delivery. There was no difference in the variable costs between either scenario. The variable costs associated with treatment (i.e., energy and chemicals) would have been pass-through charges, resulting in no cost to San Juan. With the EWA Pilot Study, no treatment was necessary and variable costs were not incurred. The commodity charge was the same both with and without the EWA Pilot Study.

Revenue. The San Juan Element generated revenue of \$90,504.55 for San Juan. A portion of that amount (\$16,171.85) was from the EWA Pilot Study revenue distribution. The remainder (\$74,332.80) was the amount paid by Sac Suburban for the debt recovery component of treating water at the Peterson WTP. For the banking component of the San Juan Element, Sac Suburban's surface water was treated at the Peterson WTP. Sac Suburban also paid variable costs (i.e., energy and chemicals), but these were pass-through charges and thus did not result in "revenue" for San Juan). Without the EWA Pilot Study, no revenue would have been generated.

Difference. At a sales price of \$75/AF, participation in the EWA Pilot Study netted San Juan **\$90,504.44 more** than non-participation. [Note: At the end of each year, San Juan reconciles its service charge account with Citrus Heights and Fair Oaks. Thus, a portion of the \$90,504.44 will be returned to Citrus Heights and Fair Oaks in the form of reduced service charges in subsequent years.]

Table 1: Cost of Service Comparison for San Juan

Description	Without EWA Pilot Study	With EWA Pilot Study	Difference
Service Charge			
From Citrus Heights	\$325,681.00	\$325,681.00	\$0.00
From Fair Oaks	\$274,556.00	\$274,556.00	\$0.00
San Juan Retail	\$382,669.00	\$382,669.00	\$0.00
		Subtotal:	\$0.00 [A]
Commodity Charge (4,645.8 AF)			
Corpus (\$18.92/AF blended cost) ¹	\$87,898.54	\$87,898.54	\$0.00
Variable Costs ² at Peterson WTP (\$21.84/AF)	\$101,464.27 ³	\$0.00 ⁴	\$0.00
		Subtotal:	\$0.00 [B]
Revenue			
From EWA Pilot Study	\$0.00	\$16,171.75	\$16,171.75
From Sac Suburban (4,645.8 AF @ \$16/AF)	\$0.00	\$74,332.80 ⁵	\$74,332.80
		Subtotal:	\$90,504.55 [C]
		Difference in Cost ([A]+[B]+[C]):	\$90,504.55⁶

Notes:

- 1 The \$/AF associated with "blended cost" is reflective of San Juan's multiple sources of supply (i.e., pre-1914 water right, CVP contract, PL 101-514 "Fazio" water, and PCWA water sales agreement).
- 2 Variable costs include energy and chemicals. These costs are approximate and change from year to year.
- 3 Pass-through costs for Citrus Heights and Fair Oaks.
- 4 \$0.00 because no cost incurred (i.e., no water treated).
- 5 Debt recovery only. Sac Suburban also paid variable costs (i.e., energy and chemicals) at a rate of \$24/AF, however these were pass-through charges and thus did not result in "revenue" for San Juan.
- 6 A portion of these monies will be distributed to Citrus Heights and Fair Oaks in subsequent years in the form of reduced service charges.

Citrus Heights

A cost of service comparison for Citrus Heights is presented in **Table 2**.

Service Charge. Regardless of the scenario and quantity of surface water received, Citrus Heights would have been subject to an annual service charge from San Juan. The service charge was the same both with and without the EWA Pilot Study.

Commodity Charge. Citrus Heights would have paid for the corpus of the surface water either for water supply purposes or as part of the exchange component. Without the EWA Pilot Study, it would have needed to treat the water at San Juan's Peterson Water Treatment Plant (WTP) prior to delivery. With the EWA Pilot Study, no treatment was necessary. The commodity charge was \$46,831.51 less with the EWA Pilot Study than without.

Groundwater Extraction. Regardless of the scenario and quantity of groundwater extracted in-lieu, Citrus Heights would have accounted for depreciation on its extraction wells. With the EWA Pilot Study, it needed energy to extract the groundwater for in-lieu use. Without the EWA Pilot Study, this extraction would not have occurred. The groundwater extraction charge was \$134,944.65 more with the EWA Pilot Study than without.

Revenue. The EWA Pilot Study generated revenue of \$64,191.94 for Citrus Heights. Without the EWA Pilot Study, no revenue would have been generated.

Difference. At a sales price of \$75/AF, participation in the EWA Pilot Study cost Citrus Heights **\$23,954.20 more** than non-participation. However, the reduced service charge from San Juan in subsequent years will offset a portion of this cost (see previous discussion).

Table 2: Cost of Service Comparison for Citrus Heights

Description	Without EWA Pilot Study	With EWA Pilot Study	Difference
Service Charge	\$325,681	\$325,681	\$0.00 [A]
Commodity Charge (2,144.3 AF)			
Corpus (\$18.92/AF blended cost) ¹	\$40,570.16	\$40,570.16	\$0.00
Variable Costs ² at Peterson WTP (\$21.84/AF)	\$46,831.51	\$0.00	\$46,831.51
		Subtotal:	\$46,831.51 [B]
Groundwater Extraction (2,144.3 AF)			
Debt Service	X	X	\$0.00
Energy (\$55.55/AF) ³	\$0.00	\$119,115.87	-\$119,115.87
Variable Costs ⁴ at Citrus Heights Wells	\$0.00	\$15,861.78	-\$15,861.78
		Subtotal:	-\$134,944.65 [C]
Revenue			
From EWA Pilot Study	\$0.00	\$64,191.94	\$64,191.94 [D]
		Difference in Cost ([A]+[B]+[C]+[D]):	-\$23,954.20⁵

Notes:

- 1 The \$/AF associated with "blended cost" is reflective of San Juan's multiple sources of supply (i.e., pre-1914 water right, CVP contract, PL 101-514 water, and PCWA water sales agreement).
- 2 Variable costs include energy and chemicals. These costs are approximate and change from year to year.
- 3 These costs are approximate and change from year to year.
- 4 Operation and maintenance costs (e.g., labor, equipment, chemicals).
- 5 Reduction in service charge in subsequent years will offset a portion of this cost.

Fair Oaks

A cost of service comparison for Fair Oaks is presented in **Table 3**.

Service Charge. Regardless of the scenario and quantity of surface water received, Fair Oaks would have been subject to an annual service charge from San Juan. The service charge was the same both with and without the EWA Pilot Study.

Commodity Charge. Fair Oaks would have paid for the corpus of the surface water either for water supply purposes or as part of the exchange component. Without the EWA Pilot Study, it would have needed to treat the water at the Peterson WTP prior to delivery. With the EWA Pilot Study, no treatment was necessary. The commodity charge was \$54,632.76 less with the EWA Pilot Study than without.

Groundwater Extraction. Regardless of the scenario and quantity of groundwater extracted in-lieu, Fair Oaks would have paid debt service on its extraction wells. With the EWA Pilot Study, it needed energy to extract the groundwater for in-lieu use. Without the EWA Pilot Study, this extraction would not have occurred. The groundwater extraction charge was \$156,093.60 more with the EWA Pilot Study than without.

Revenue. The EWA Pilot Study generated revenue of \$74,885.11 for Fair Oaks. Without the EWA Pilot Study, no revenue would have been generated.

Difference. At a sales price of \$75/AF, participation in the EWA Pilot Study cost Fair Oaks **\$26,575.73 more** than non-participation. However, the reduced service charge from San Juan in subsequent years will offset a portion of this cost (see previous discussion).

Table 3: Cost of Service Comparison for Fair Oaks

Description	Without EWA Pilot Study	With EWA Pilot Study	Difference	
Service Charge	\$274,556.00	\$274,556.00	\$0.00	[A]
Commodity Charge (2,501.5 AF)				
Corpus (\$18.92/AF blended cost) ¹	\$47,328.38	\$47,328.38	\$0.00	
Variable Costs ² at Peterson WTP (\$21.84/AF)	\$54,632.76	\$0.00	\$54,632.76	
		Subtotal:	\$54,632.76	[B]
Groundwater Extraction (2,501.5 AF)				
Debt Service	X	X	\$0.00	
Energy (\$55/AF) ³	\$0.00	\$137,582.50	-\$137,582.50	
Variable Costs ⁴ at Fair Oaks Wells	\$0.00	\$18,511.10	-\$18,511.10	
		Subtotal:	-\$156,093.60	[C]
Revenue				
From EWA Pilot Study	\$0.00	\$74,885.11	\$74,885.11	[D]
		Difference in Cost ([A]+[B]+[C]+[D]):	-\$26,575.73	⁵

Notes:

- 1 The \$/AF associated with "blended cost" is reflective of San Juan's multiple sources of supply (i.e., pre-1914 water right, CVP contract, PL 101-514 water, and PCWA water sales agreement).
- 2 Variable costs include energy and chemicals. These costs are approximate and change from year to year.
- 3 These costs are approximate and change from year to year.
- 4 Estimated variable costs include operation and maintenance costs (e.g., labor, equipment, chemicals).
- 5 Reduction in service charge in subsequent years will offset a portion of this cost.

Sac Suburban

A cost of service comparison for Sac Suburban is presented in **Table 4**.

Debt Service on Cooperative Transmission Pipeline (CTP)/Northridge Transmission Pipeline (NTP). Regardless of the scenario, Sac Suburban would pay debt service on the CTP/NTP. The service charge was the same both with and without the EWA Pilot Study.

Surface Water from PCWA. Per its “take or pay” water sales agreement with PCWA, Sac Suburban would have paid for the corpus of the surface water under either scenario. With the EWA Pilot Study, it needed to treat the water at the Peterson WTP prior to delivery and to pay Warren Act charges to wheel non-CVP water through CVP facilities. Without the EWA Pilot Study, no treatment or wheeling charges would have been necessary. The surface water charge was \$312,848.17 more with the EWA Pilot Study than without.

Groundwater Extraction. Regardless of the scenario and quantity of groundwater extracted in-lieu, Sac Suburban would have paid debt service on its extraction wells. Without the EWA Pilot Study, it would have needed energy to extract the groundwater to meet demands. With the EWA Pilot Study, this extraction did not occur. The groundwater extraction charge was \$275,960.52 less with the EWA Pilot Study than without.

Revenue. The EWA Pilot Study generated revenue of \$168,186.20 for Sac Suburban. Without the EWA Pilot Study, no revenue would have been generated.

Difference. At a sales price of \$75/AF, participation in the EWA Pilot Study netted Sac Suburban **\$131,298.55 more** than non-participation.

Table 4: Cost of Service Comparison for Sac Suburban

Description	Without EWA Pilot Study	With EWA Pilot Study	Difference	
Debt Service on CTP	X	X	\$0.00	[A]
Surface Water from PCWA (4,645.8 AF)				
Corpus (\$35/AF)	\$162,603.00	\$162,603.00	\$0.00	
Treatment at Peterson WTP (\$40/AF) ¹	\$0.00	\$185,832.00	-\$185,832.00	
Warren Act (\$27.34/AF)	\$0.00	\$127,016.17	-\$127,016.17	
		Subtotal:	-\$312,848.17	[B]
Groundwater Extraction (4,645.8 AF)				
Debt Service	X	X	\$0.00	
Energy (\$52/AF) ²	\$241,581.60	\$0.00	\$241,581.60	
Variable Costs ³ at Sac Suburban Wells	\$34,378.92	\$0.00	\$34,378.92	
		Subtotal:	\$275,960.52	[C]
Revenue				
From EWA Pilot Study	\$0.00	\$168,186.20	\$168,186.20	[D]
		Difference in Cost ([A]+[B]+[C]+[D]):	\$131,298.55	

Notes:

- 1 Treatment includes \$24/AF in variable costs (e.g., energy and chemicals) and \$16/AF for debt recovery. The variable costs are approximate and change from year to year.
- 2 These costs are approximate and change from year to year.
- 3 Estimated variable costs include operation and maintenance costs (e.g., labor, equipment, chemicals).

City of Sacramento

A cost of service comparison for San Juan is presented in **Table 5**.

Surface Water. Without the EWA Pilot Study, the City of Sacramento would have paid for the corpus of the surface water for water supply purposes. With the EWA Pilot Study, it paid for the corpus first as part of the banking component, and then later as part of the exchange component. Regardless of the scenario, it would have needed to treat the water at the Fairbairn or Sacramento River WTP prior to delivery (either for normal water supply purposes or for the banking component). The surface water charge was \$22,471.20 more with the EWA Pilot Study than without.

Groundwater Extraction. Regardless of the scenario and quantity of groundwater extracted in-lieu, the City of Sacramento would have paid debt service on its extraction wells. With the EWA Pilot Study, it needed energy to extract the groundwater for in-lieu use. Without the EWA Pilot Study, this extraction would not have occurred. The groundwater extraction charge was \$148,309.92 more with the EWA Pilot Study than without.

Revenue. The EWA Pilot Study generated revenue of \$168,534.00 for the City of Sacramento. Without the EWA Pilot Study, no revenue would have been generated.

Difference. At a sales price of \$75/AF, participation in the EWA Pilot Study cost the City of Sacramento **\$2,247.12 more** than non-participation.

Table 5: Cost of Service Comparison for City of Sacramento

Description	Without EWA Pilot Study	With EWA Pilot Study	Difference
Surface Water (2,496.8 AF)			
Corpus (\$9/AF) ¹	\$22,471.20	\$44,942.40	-\$22,471.20
Debt Service	X	X	\$0.00
Variable Costs of Treatment ²	\$119,846.40	\$119,846.40	\$0.00
		Subtotal:	-\$22,471.20 [A]
Groundwater Extraction (2,496.8 AF)			
Debt Service	X	X	\$0.00
Energy (\$52/AF) ³	\$0.00	\$129,833.60	-\$129,833.60
Variable Costs ⁴ at City of Sacramento Wells	\$0.00	\$18,476.32	-\$18,476.32
		Subtotal:	-\$148,309.92 [B]
Revenue			
From EWA Pilot Study	\$0.00	\$168,534.00	\$168,534.00 [C]
		Difference in Cost ([A]+[B]+[C]):	-\$2,247.12

Notes:

- 1 "With EWA Pilot Study" requires the corpus be purchased twice: 1) to bank it, and 2) to exchange it.
- 2 Variable costs include energy and chemicals. These costs are approximate and change from year to year.
- 3 These costs are approximate and change from year to year.
- 4 Estimated variable costs include operation and maintenance costs (e.g., labor, equipment, chemicals).

COST OF SERVICE SUMMARY

The cost of service comparisons for San Juan, Citrus Heights, Fair Oaks, Sac Suburban, and the City of Sacramento are summarized in **Table 6**.

NEPA/CEQA DETERMINATION

The EWA Pilot Study was implemented under an Initial Study/Negative Declaration for compliance with the California Environmental Quality Act (CEQA) and an Environmental Assessment/Finding Of No Significant Impact for compliance with the National Environmental Policy Act (NEPA).

Table 6: Cost of Service Summary for EWA Pilot Study

SGA Member Agency	Gain or Loss
San Juan	\$90,504.55
Citrus Heights	(\$23,954.20)
Fair Oaks	(\$26,575.73)
Sac Suburban	\$131,298.55
City of Sacramento	(\$2,247.12)
Total:	\$169,026.05

APPLICABILITY TO SGA GROUNDWATER MANAGEMENT PROGRAM

If a large-scale banking and exchange program is to be successfully implemented, a water accounting framework must be developed and accepted by the SGA and its member agencies. Additionally, it is recognized that the accounting system must ultimately be accepted by potential partners outside the region. This framework will be utilized to track the volume of groundwater banked, changes in the volume of groundwater storage, estimated volumes of basin losses and rejected recharge, the volume of groundwater extracted (i.e., recovered), and the volume of surface water forbearance (i.e., made available for transfer).

To ensure sustainability of a large-scale, long-term banking and exchange program, the operational yield of the underlying groundwater basin must be maintained. Currently, the SGA is preparing a Groundwater Management Plan (GMP) for the North Area Basin, consistent with recent amendments to the California Water Code Section 10750 et seq. The GMP will establish as one of its management objectives to operate within the yield of the basin as agreed upon in the Water Forum Agreement (WFA).

A basic premise of the SGA and its management program is that groundwater extraction will not be restricted. Rather, the intent is that economic incentives and disincentives be developed and applied as a means of managing the groundwater basin and implementing the conjunctive use program prescribed in the WFA.

Establishing a basin-wide pumping target and baseline pumping allowances (BPAs) for each SGA member agency are potential first steps to applying economic principles to management of the groundwater basin. In order to be effective, BPAs must be equitable, legally defensible, encourage conjunctive use, and account for existing capital infrastructure. Several methods of BPA establishment are currently being evaluated. There are both advantages and disadvantages to having a high or a low BPA. In a sense, the groundwater production curves (see **Figure 2**) used in the EWA Pilot Study represent one potential metric for establishing BPAs.

BASELINE PUMPING ALLOWANCE (BPA)

An agency-specific **BPA** is the volume of groundwater available to that agency in a given year. It is one tool the agency may utilize to manage its available water supply to ensure local reliability, participate in banking and exchange programs, and take part in effective basin-wide management.



FUTURE OPPORTUNITIES

The success of the EWA Pilot Study furthers the potential for establishing a groundwater banking and exchange program within the region. Building upon the WFA, the Cooperating Agencies RWMP, and efforts of the SGA and RWA, future opportunities with greater regional or statewide benefits may be realized. Prospective partners for a full-scale banking and exchange program include, but are not limited to, the following:

- **EWA** – A longer-term, larger-scale arrangement with the EWA could be pursued. Because this agreement would mostly likely require re-operation of Folsom Lake (i.e., reservoir storage and releases), Reclamation would be a likely partner.
- **Sacramento Valley Water Management Program** – Because Folsom Lake is considered more efficient and effective in meeting Delta objectives than many other reservoirs (i.e., shorter travel time) and American River water quality is often better than that of the Sacramento River, an agreement to provide water supply as part of the “Phase 8 Proceedings” could be pursued.
- **SAFCA** –An agreement with SAFCA could be pursued for an expanded version of the 1999/2000 pilot study. Reclamation must also be a partner.
- **CVP** – An agreement with Reclamation and the CVP could be pursued. This water could be used to meet contract obligations or facilitate implementation of the provisions of the Central Valley Project Improvement Act (CVPIA), including:
 - CVP operational changes (Section 3406(b)(1)(B))
 - Fish and wildlife water dedication and management (Section 3406(b)(2))
 - Refuge water supplies (Section 3406(d)(1-4))
- **SWP** – An agreement with the California Department of Water Resources (DWR) and the SWP could be pursued. The water could be used to help DWR meet its obligations in the Bay-Delta (i.e., flow requirements and water quality improvements) or increase dry-year Delta exports. Reclamation must also be a partner.
- **Internal Exchange Pool** – An internal exchange pool could be utilized by the participating SGA member agencies to satisfy future unmet regional needs in Sacramento and/or adjacent counties.

SACRAMENTO VALLEY WATER MANAGEMENT PROGRAM

SRWCB Decision-1641 required the CVP and SWP be responsible for meeting Delta water quality flow and salinity objectives, as specified in the 1995 draft Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary, until a settlement is reached with other Sacramento Valley water right holders. This is also known as the “Phase 8 Proceedings”. In December 2002, over 40 water suppliers in the Sacramento Valley executed the Short-Term Settlement Agreement (Agreement). This resulted in the dismissal of the Phase 8 process on January 31, 2003. The more than 50 projects proposed in the Agreement will be implemented over the next 10 years.

CENTRAL VALLEY PROJECT IMPROVEMENT ACT (CVPIA)

The CVPIA amends the previous authorizations of the CVP to include fish and wildlife protection, restoration, and mitigation as project purposes having equal priority with irrigation and domestic uses, and fish and wildlife enhancement as a project purpose equal to power generation.

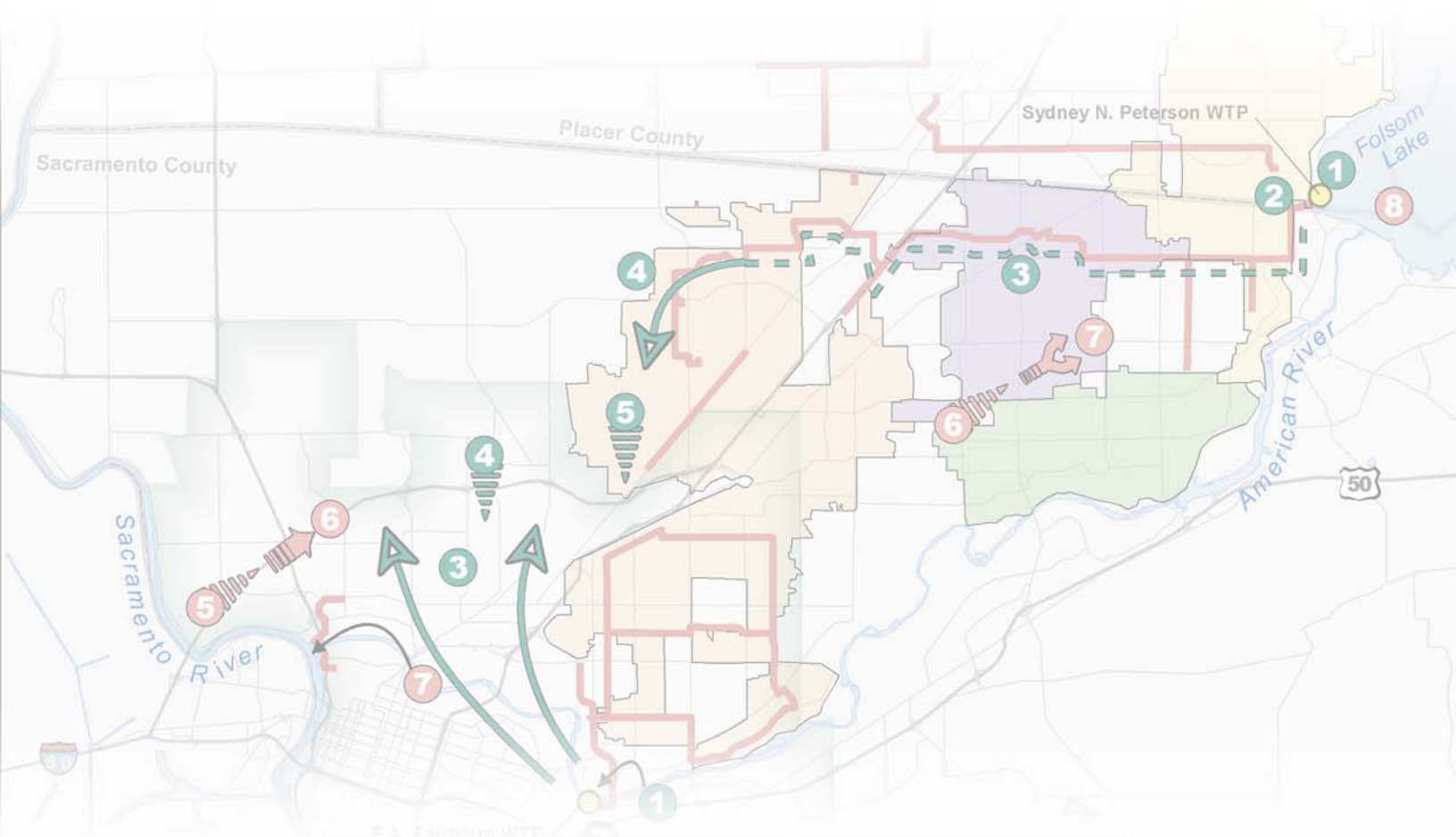
ACCOMPLISHMENTS AND CONCLUSIONS OF THE EWA PILOT STUDY

Accomplishments

- The SGA's joint powers authority successfully secured contractual and institutional arrangements.
- The SGA ensured no net impacts to the groundwater basin.
- The SGA member agencies successfully produced 7,143 AF of yield.
- The viability of a banking and exchange program was proven.

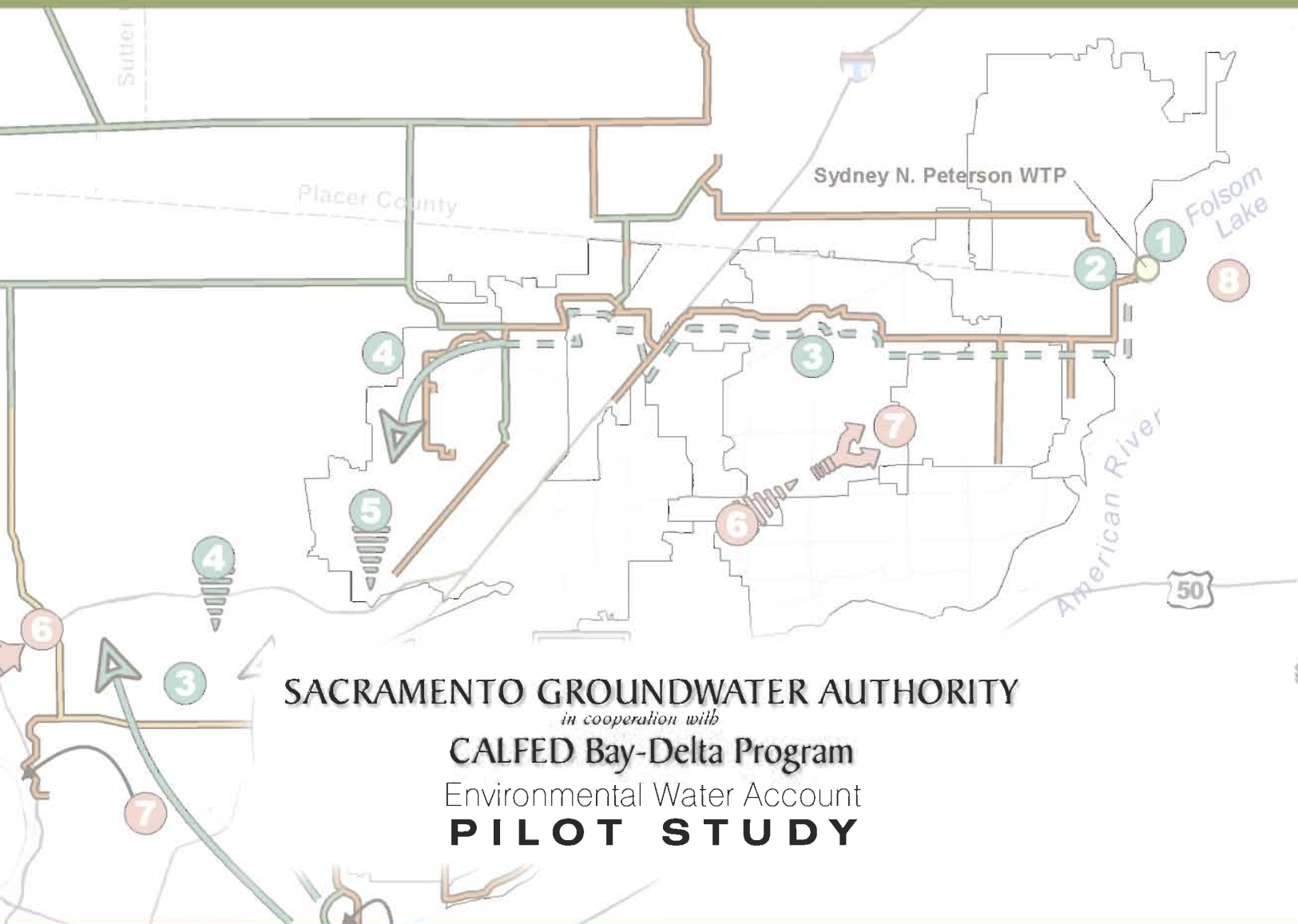
Conclusions

- Additional conjunctive use infrastructure investments (e.g., through Proposition 13 grants) are warranted. With modest infrastructure investments, the potential exists to provide larger benefits to EWA and other potential partners.
- The \$75/AF sales price did not allow for capital recovery of local system investments.
- The SGA should develop a water accounting framework to better facilitate future banking and exchange programs.
- Prospective partners for future banking and exchange programs could include (but would not be limited to): the EWA, the Sacramento Valley Water Management Program, SAFCA, the CVP, the SWP, and an internal exchange pool.



Prepared by:





SACRAMENTO GROUNDWATER AUTHORITY
in cooperation with
CALFED Bay-Delta Program
Environmental Water Account
PILOT STUDY