

8. TECHNICAL ANALYSIS AND PLAN PERFORMANCE

*This section describes the scientific and technical analyses used in development of the ARB IRWMP. Measurement and monitoring of project and plan performance, as well as the mechanisms to adapt the IRWMP and its component projects are also described. This section along with **Section 9 Data Management** will provide the methods to collect, analyze, and store data for the development and implementation of the ARB IRWMP*

Each project and program in the ARB IRWMP was developed to meet project specific goals while at the same time maximizing regional goals and objectives. The projects and programs have been developed based on analysis of historic and projected data for the individual agencies and overall region, including:

- *Population information;*
- *Land use information;*
- *Water supply data;*
- *Water demand information;*
- *Dry year supply reliability criteria;*
- *Water quality data for recycled water, groundwater, surface water, stormwater.*
- *Environmental/habitat restoration and protection needs*

Depending upon the status of each project and program identified in the IRWMP, studies ranging from feasibility analyses to detailed design have been completed.

As described previously, a responsible agency has been identified for each project or program in the ARB IRWMP. This agency is the primary entity responsible for overseeing project implementation. As part this oversight, the lead agency will be responsible for ongoing assessment of project performance. The ARB will be responsible for periodically reviewing the overall progress of the ARB IRWMP in achieving the regional objectives. Additional progress oversight committees may be established by the ARB as necessary for certain projects and programs as needs dictate.

8.1. Data, Technical Methods, and Analyses used in Development of IRWMP Water Management Strategies

A significant basis of the selection of the Water Management Strategies described elsewhere in **Section 4** the Water Forum Agreement. To review, the two coequal objectives of the Water Forum Agreement were:

1. Provide a reliable and safe water supply for the region's economic health and planned development to the year 2030; and
2. Preserve the fishery, wildlife, recreational, and aesthetic values of the Lower American River.

The regional motivation for developing the Water Forum Agreement (2000) included: impending water shortages, a desire to protect the Lower American River, threatened groundwater reliability, and water supply reliability at risk. These objectives and reasons still ring true today and continually guide water management in the ARB region, including the selection of Water Management Strategies for the ARB IRWMP.

To analyze the Water Forum Agreement, several technical methods, data, and analyses were used. These included:

1. Collection of groundwater quality and elevation data
2. Groundwater/surface water modeling
3. Temperature modeling
4. Salmon mortality modeling
5. Developing landuse based water demand projections
6. Evaluation of water conservation measures
7. Developing analytical models designed to simulate the operations of the Central Valley Project (CVP) and State Water Project (SWP) including water supply, flood control, recreation, maintenance of instream flows, water quality, fish and wildlife, hydroelectric power generation, etc.

The analyses and data gathering conducted for the Water Forum and other subsequent regional efforts outlined the need for several water management strategies in order to manage the region's water supply and water quality. As additional stakeholders with various regional resource interests became involved with the regional planning process, additional water management strategies were articulated, evaluated and incorporated.

8.2. Data Gaps

The ARB region is fortunate to have at least a decade's worth of data and many active stakeholders who are used to collecting and sharing data between themselves. However, as always, there are some data gaps. As an example, data gaps exist where groundwater basins that do not have sufficient measurement and monitoring coverage. Proper coverage would improve the characterization of groundwater elevations. More importantly, the migration of contaminant plumes needs to be known, so that if potable groundwater supplies are in danger, proper mitigation or replacement measure can be taken earlier as opposed to later when it may be too late to implement preventative measures. Another potential data gap is the stream/groundwater interaction along the Cosumnes River. Recognizing this example, TNC is proposing to collect more data on this interaction through all of its monitoring programs.

8.3. Measurement and Monitoring of Project/IRWMP Performance

The ARB is committed to an open public process for identifying, evaluating, prioritizing and attempting to identify funding sources for identified projects and programs. The ARB is also committed to a process for developing a monitoring and performance measurement program with full input from the ARB, its members and stakeholders as the ARB IRWMP progresses. The **Table 8.1** outlines the monitoring efforts for each of the Priority Projects for the ARB IRWMP. Projects are grouped by primary objective but the monitoring and performance measures are detailed for each individual project. Generally, regional objectives will be monitored as follows below:

8.3.1. Water Recycling

Water recycling projects allow for the use of highly treated wastewater for irrigation and other non-potable uses. These projects will be monitored to determine the demand for recycled water, the percent of incoming sewage that is being treated, and the benefits that recycled water brings to the environment.

8.3.1.1. Lincoln Recycled Water Distribution System Expansion (City of Lincoln)

The City of Lincoln is expanding their water recycling program. The benefits associated with implementation of this project will be measured and evaluated by:

- **Sanitary Sewer Deliveries.** The City of Lincoln uses flow meters to monitor influent and effluent flows for the sanitary sewer.
- **Recycled Water Deliveries.** The City of Lincoln has flow meters and water quality monitoring instruments in place that can be used to measure pre- and post-project water quality and flowrates.

- **Stream Water Quality.** The City of Lincoln routinely monitors discharges to assure water quality conditions are met in the receiving waters. This monitoring can be used to verify the added benefits of recycled water usage.

8.3.1.2. Recycled Water Program Expansion – Bartley Cavanaugh (SRCSD)

The SRCSD will be expanding their water recycling efforts in order to serve the Bartley Cavanaugh Golf Course. The benefits associated with implementation of this project will be measured and evaluated by:

- **Sanitary Sewer Deliveries.** The SRCSD uses flow meters to monitor influent and effluent flows for the sanitary sewer.
- **Recycled Water Deliveries.** The SRCSD has flow meters and water quality monitoring instruments in place that can be used to measure pre- and post-project water quality and flowrates.
- **Stream Water Quality.** The SRCSD routinely monitors at its points discharge to assure water quality conditions are met in the receiving waters. This monitoring can be used to verify the added benefits of recycled water usage.

8.3.1.3. Phase II Water Recycling Upgrade and Expansion Project (SRCSD)

The SRCSD will be upgrading and expanding their water recycling efforts. Currently there is infrastructure to measure aspects associated with recycling water including:

- **Sanitary Sewer Deliveries.** The SRCSD uses flow meters to monitor influent and effluent flows for the sanitary sewer.
- **Recycled Water Deliveries.** The SRCSD has flow meters and water quality monitoring instruments in place that can be used to measure pre- and post-project water quality and flowrates.
- **Stream Water Quality.** The SRCSD routinely monitors at its points discharge to assure water quality conditions are met in the receiving waters. This monitoring can be used to verify the added benefits of recycled water usage.

8.3.2. Water Supply

Water supply projects include both groundwater production/injection wells and water delivery pipelines. Groundwater monitoring of the groundwater level and water quality helps to identify how the groundwater basin is impacted. For the pipeline projects and in conjunction with surface water treatment plants, stream water quality is monitored to ensure that the streams or water bodies that they draw water from are not adversely affected and flow through the pipeline is monitored to determine the water demand that the pipe is serving.

Table 8.1 Monitoring Efforts for each IRWMP Project and Program

Monitoring Efforts	Water Supply																							
	Wells				Pipelines				Treatment			Interconnections		Multiple Facilities or Other										Conservation
Del Web Well																								
Fair Oaks Blvd. Groundwater Production Well																								
Groundwater Production Well Imp. Project																								
Groundwater Production Well Project (SSWD)																								
Groundwater Production Well Project (OVWC)																								
HP Well																								
Mesa Verde Groundwater Production Well																								
Old Auburn Rd. Groundwater Production Well																								
Replace Existing Wells/Install New Wells (Rio Linda)																								
Twin Oaks Ave. Groundwater Production Well																								
WRSP Annexation Area (4 wells)																								
Woodcreek North ASR																								
Woodcreek West ASR																								
Carriage/Lauppe Transmission Main Project																								
City of Sacramento Transmission Main																								
Cosumnes R. Blvd. Transmission Main																								
El Centro Transmission Main																								
Ethan Way/Silica Ave. Conjunctive Use Pipeline																								
Indian/Fleming Arrow Conjunctive Use Pipeline																								
Mariposa/Madison Transmission Main																								
Northridge Water Line																								
Panhandle Transmission Main																								
Regional Pipeline for Surface Water																								
Rosemont Conjunctive Use Pipeline																								
Upgrade Water Main (Roseville)																								
Vineyard/Florin Gap Conjunctive Use Pipeline																								
Anatolia Groundwater Treatment Plant																								
Big Horn Groundwater Treatment Plant																								
Bond Groundwater Treatment Plant																								
E. Elk Grove Groundwater Treatment Plant																								
Franklin Groundwater Treatment Plant																								
Laguna Ridge (Whitelock) Groundwater Treatment Plant																								
Poppy Ridge Groundwater Treatment Plant																								
Sunrise Douglas Groundwater Treatment Plant																								
Wildhawk Groundwater Treatment Plant																								
Fairbairn WTP South Cross Tie																								
Mission Ave Pipeline Interconnection - CHWD																								
Mission Ave Pipeline Interconnection - SSWD																								
North Cross Tie																								
PCWA/SSWD Pipeline Interconnection																								
Roseville/Citrus Heights Pipeline Interconnection																								
ARB IRWMP Implementation																								
ARBCA RWMP																								
American River Water Supply Project																								
GIPs																								
City of Sacramento POU N. Vineyard																								
City of Folsom Water Mgmt. Strat. for Dry-year Reliability																								
City of Folsom SOI Water Supply Investigation																								
Dry Creek Project																								
Eastern Sacramento Co. Replacement Water Supply																								
Fairbairn Intake Pump - Sacramento and Zone 40																								
Fairbairn Intake Pump - Cal Am Rosemont/Parkway																								
Freemont Regional Water Project																								
IGSM Hydrologic Model Refinement																								
Mitchell Farms Blending and Storage Facility																								
North Industrial Storage Tank																								
Northeast Storage Tank																								
Palm Ave Blending and Storage Facility																								
PCWA FERC Re-licensing																								
PCWA IWRP																								
PCWA WSIP																								
Rio Linda/Eiverta Groundwater Recharge Project																								
Sheldon Road Storage																								
South City Reservoir and Pump Station																								
SRWRS Elverta Diversion																								
SSWD Water Resources Strategic Plan																								
Stoneridge Zone 2 Storage Tank																								
Storage Tank (Rio Linda)																								
Sunset Industrial Groundwater Supply Imp.																								
UWMPs																								
Water Accounting Framework																								
Water Dist. Facilities - N. Central Spec. Plan Area																								
Water Supply Strategy - Sierra Vista/Creekview																								
Water Sys. Rehabilitation Program																								
Water Sys. Security																								
West Roseville Specific Plan Storage Tank																								
West Side Tank and Pump Station																								
WSMPs																								
Zone 50 Infrastructure																								
"Be Water Wise" Program																								
"Mr. Leaky"																								
Meter Retrofitting Program (Roseville)																								
Meter Retrofitting Program (Sacramento)																								
Meter Retrofitting Program (PCWA)																								
PCWA East Loomis Basin																								
RWA WEP																								
SSWD Demand Management Study																								
WEL Garden Program																								
Water Loss Reduction Project (EID)																								
Water Purveyor Implementation of BMPs																								

Table 8.1 (continued) Monitoring Efforts for each IRWMP Project and Program

Monitoring Efforts	Water Recycling										Water Quality										Ecosystem Restoration										Stormwater & Flood Management										Groundwater Management										Other									
	Lincoln WWTF Expansion																																																											
Roseville Water Recycling Program																																																												
EID Water Recycling Program																																																												
Lincoln Recycled Water Dist. Pipeline Exp.																																																												
Lincoln Recycled Water Dist. Sys. Exp. SW Placer Co.																																																												
Pleasant Grove WWTP Expansion																																																												
Recycled Water Program Exp. (Roseville)																																																												

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To improve the availability of groundwater information, the SGA, Central Sacramento County, South Sacramento County and Western Placer County maintain databases that contain monitoring information, such as groundwater level and quality, for all of their services areas. These data will be available for use by partner organizations as well as other agencies and interest groups concerned with regional water resource issues. Further discussion of data management can be found in **Section 9**.

8.3.2.1. Old Auburn Road Groundwater Production Well (CHWD)

The Old Auburn Road Well will allow CHWD to forgo up to 800 to 900 AF/year of surface water supplies, allowing more surface water to remain in the American River during hydrologic shortages. This project will be evaluated by examining groundwater levels, quality, and pumping rates provided to the groundwater database mentioned above. These parameters will be compared pre- and post-project to evaluate the changes occurring as a result of project implementation.

8.3.2.2. Woodcreek North Aquifer Storage and Recovery (ASR) Project (City of Roseville)

The ASR Project will allow the City of Roseville to forgo between 800 and 1600 AF/year of surface water supplies, allowing more surface water to remain in the American River during hydrologic shortages. In addition, this project can inject and store treated surface water in the groundwater basin during off-peak periods. This project will be evaluated by examining groundwater levels, quality, and pumping rates provided to the groundwater database mentioned above. These parameters will be compared pre- and post-project to evaluate the changes occurring as a result of project implementation.

8.3.2.3. Groundwater Production Well Improvement Projects (OVWC)

This project upgrades and rehabilitates two existing groundwater extraction wells that will provide OVWC with up to 2000 AF/year of reliable water supply. This project will be evaluated by examining groundwater levels, quality, and pumping rates provided to the groundwater database mentioned above. These parameters will be compared pre- and post-project to evaluate the changes occurring as a result of project implementation.

8.3.2.4. Sunset Industrial Area Groundwater Supply Improvements (PCWA)

The Sunset Industrial Area Groundwater Supply Improvements will allow PCWD to provide approximately 3000 AF/year of reliable water supply. This project will be evaluated by examining groundwater levels, quality, and pumping rates provided to the groundwater database mentioned above.

These parameters will be compared pre- and post-project to evaluate the changes occurring as a result of project implementation.

8.3.2.5. Groundwater Production Well Project (SSWD)

The Groundwater Production Well Project will replace existing wells in the SSWD service area. In addition, once permitted, this project will allow for 5000 AF/year of additional groundwater storage during off-peak periods. This project will be evaluated by examining groundwater levels, quality, and pumping rates provided to the groundwater database mentioned above. These parameters will be compared pre- and post-project to evaluate the changes occurring as a result of project implementation.

8.3.2.6. Freeport Regional Water Project (FRWA)

The FRWP will establish the ability for a portion of the region (Central Basin) with groundwater overdraft to engage in conjunctive use activities. The project will provide for the diversion of water from the Sacramento River and delivery to SCWA and EBMUD customers to meet the planned water demands of urban interests and will supplement and offset regional groundwater pumping with surface water. The benefits associated with implementation of this project will be measured and evaluated by:

- **Groundwater Monitoring.** Sacramento County already has the institutional structure in place to measure groundwater levels, quality, and pumping rates. These parameters will be compared pre- and post-project to evaluate the changes occurring as a result of project implementation.
- **Stream Monitoring.** Monitoring equipment will be installed as part of the intake system to measure flow conditions, and discharge and water quality data on the Sacramento River. Information collected will be available for use by partner organizations as well as other agencies and interest groups concerned with regional water resource issues.
- **Flow Monitoring.** Flow monitoring equipment will be installed as part of the pipeline system to measure flow conditions in the pipeline. This information will be available for partner organizations.

8.3.2.7. Rosemont Conjunctive Use Pipeline (City of Sacramento)

The Rosemont Conjunctive Use Pipeline will replace groundwater supplies that have been lost or are threatened by industrial contamination. In addition, the pipeline will help the City of Sacramento expand its conjunctive use capabilities and more fully exercise its surface water rights and contract entitlements. The benefits associated with implementation of this project will be measured and evaluated by:

- **Groundwater Monitoring.** The groundwater database mentioned above already has the institutional structure in place to measure groundwater levels, quality, and pumping rates. These parameters will be compared pre- and post-project to evaluate the changes occurring as a result of project implementation.

- **Stream Monitoring.** Water quality data from the American River, supplied by the City of Sacramento, will be evaluated to ensure that the river is not being negatively impacted.
- **Flow Monitoring.** Flow monitoring equipment will be installed as part of the pipeline system to measure flow conditions in the pipeline. This information will be available for partner organizations.

8.3.3. Water Quality

The main objective of a treatment plant is to improve the quality of the water whether it will be used for human consumption, irrigation, or released back into the environment. In order to best assess the quality of the water being treated, influent and effluent flows and water quality must be monitored.

8.3.3.1. Roseville Water Treatment Plant Expansion (City of Roseville)

The Roseville Water Treatment Plant expansion is needed to meet peak water demands projected for the service area which is currently converting from agricultural to urban land uses. This expansion will deliver surface water to areas that have previously utilized groundwater supplies, thus promoting groundwater recharge. The benefits associated with implementation of this project will be measured and evaluated by:

- **Reservoir Monitoring.** Monitoring equipment will be installed as part of the intake system to measure flow conditions and water quality data on the Folsom Dam. Information collected will be available for use by partner organizations as well as other agencies and interest groups concerned with regional water resource issues.
- **Flow Monitoring.** Flow monitoring equipment will be installed as part of the water treatment plant to measure flow conditions in the plant.
- **Effluent Monitoring.** Monitoring equipment will be installed as part of the discharge system to measure effluent flow conditions and water quality data.

8.3.3.2. Bajamont Water Treatment Plant (Carmichael Water District)

The Bajamont Water Treatment Plant will be expanded from 17 mgd to 22 mgd. The proposed additional treatment capacity at Bajamont will replace lost or threatened groundwater supplies due to contamination, and will allow Carmichael to curtail groundwater pumping near the leading edge of the contamination plume, thus limiting plume migration to the extent possible. The benefits associated with implementation of this project will be measured and evaluated by:

- **Stream Monitoring.** Monitoring equipment will be installed as part of the intake system to measure flow conditions, and discharge and water quality data on the American River. Information collected will be available for use by partner organizations as well as other agencies and interest groups concerned with regional water resource issues.

- **Flow Monitoring.** Flow monitoring equipment will be installed as part of the water treatment plant to measure flow conditions in the plant.
- **Effluent Monitoring.** Monitoring equipment will be installed as part of the discharge system to measure effluent flow conditions and water quality data.

8.3.3.3. County of Sacramento Low Flow Drainage Project (Sacramento County)

The County of Sacramento Low Flow Drainage Project will implement water quality programs aimed at reducing pollutant discharges in stormwater runoff. The benefits associated with implementation of this project will be measured and evaluated through a water quality monitoring program that meets the requirements of the MS4 discharge permit issued under the Central RWQCB NPDES Program. The monitoring program will document the reduction of bacteria and pathogens within urban runoff (both dry and wet weather).

- **Stream Monitoring.** Monitoring equipment will be installed as part of the outflow system to measure flow conditions and water quality data on the American River.
- **Runoff Discharge Monitoring.** Sacramento County's stormwater project will include a monitoring component to define flow parameters in the low-flow runoff discharge(s) prior to diverting these flows into the sanitary sewer systems for treatment. Monitoring may include grab samples to detect water quality conditions in the runoff water, including measurements of constituents of concern. Flow rate records would be kept to track the volume of flow diverted for treatment on an annual basis.
- **Riparian Assessments, Habitat Measures.** For those natural drainage ways from which flow is diverted, a pre and post project assessment will be performed to identify the impacts, all predicted to be positive, that the project will have on the riparian habitat of the water course. This information will be used to refine the project and as a basis for expansion of similar efforts in other regional drainage basins as appropriate.

8.3.4. Ecosystem Restoration

Ecosystem restoration allows local agencies to provide additional community benefits by improving and restoring natural habitats in the ARB region. To evaluate the effectiveness of these projects, the habitat, and the riparian zone must be monitored for use by native species. Additional information, such as groundwater and surface water monitoring, will bring insights as to how the projects can be improved.

8.3.4.1. TNC River Management and Conjunctive Use Management Opportunities of the Cosumnes River Project (TNC)

New data will be used to refine and recalibrate existing UC Davis river-aquifer model of the Cosumnes River and will help couple the model dynamically to the latest Sacramento County groundwater model. Through the use of monitoring data collected over the first one to two years and complementary modeling

analysis of the data, a water management plan will be defined and adaptively modified over the ensuing years based on further monitoring and data analysis. Future benefits associated with Cosumnes River improvements will be measured and evaluated by:

- **Groundwater Monitoring.** TNC will continue to use a network of monitoring wells to measure groundwater levels, quality, and pumping rates. These parameters will be compared pre- and post-project to evaluate the changes occurring as a result of measure implemented by TNC. Additional wells are proposed as part of the TNC project that will further enable the organization to analyze the groundwater / surface water interaction within the watershed and in particular along the stream bed and banks.
- **Stream Monitoring.** TNC has the ability to measure pre- and post-project flows and water quality.
- **Riparian Assessments, Habitat Measures.** TNC plans to monitor and measure the differences between pre- and post-project wetted streambed in regards to the impacts of improved conditions on migratory fish, and riparian habitat.

8.3.4.2. Gardenland Flood Management, Habitat Restoration, and Recreation Project (SAFCA)

SAFCA proposes to acquire the Gardenland site, which has been mined for decades, restore it, and incorporate it into the publicly-owned American River Parkway. This project would provide an opportunity to restore riparian habitat and eliminate the ongoing potential for sedimentation and water quality degradation. The benefits associated with implementation of this project will be measured and evaluated by:

- **In-stream Flows.** Monitoring equipment will be installed by SAFCA as part of the project to measure flow conditions.
- **Riparian Assessments, Habitat Measures.** SAFCA plans to monitor the riparian zone around the lake in order to assess the benefit created by this project. Newly created habitat in and around the lake will also be monitored to ensure its benefit to native animals.
- **Increased Recreational Usage.** SAFCA will monitor the increased recreation usage based on implementation of this project.

8.4. Mechanisms to Adapt Projects/IRWMP

By using the monitoring techniques identified in **Section 8.3** above, local agencies can identify when their projects/programs may not be fulfilling their objectives. In this case the following adaptive model will be implemented:

Section 8
Technical Analysis and Plan Performance

Figure 8.1 is a flow diagram visually representation of the many iterations of planning that occur while a project or program is being implemented. Only by consistent monitoring and analysis can the projects and programs successfully achieve the objectives that were originally set. Monitoring will also assist in determining the planned vs. actual ‘value’ of the project by creating a clear reporting mechanism for the public, decision makers, and regional planners. The monitoring will also allow for adaptive management of the ARB region.



Figure 8.1 Project/Program Evaluation Process