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Volume 2

Chapter 16 Recycled Municipal Water

Recommendations from a 40-member Recycled Water Task Force would improve the way projects are planned, increase State and federal financial support for research and project construction, improve the regulatory framework, and advance the use of recycled water.

Chapter 16 *Recycled Municipal Water*

Water recycling, also known as reclamation or reuse, is an umbrella term encompassing the process of treating wastewater, storing, distributing, and using the recycled water. Recycled water is defined in the California Water Code to mean "water which, as a result of treatment of waste, is suitable for a direct beneficial use or a controlled use that would not otherwise occur."

The treatment and use of municipal wastewater for golf course irrigation is an example of water recycling. Higher levels of treatment can make municipal wastewater reusable for school yards, residential landscape and park irrigation, industrial uses or even uses within office and institutional buildings for toilet flushing.

The following discussion of recycled water focuses on treated municipal wastewater. This is wastewater of domestic origin, but includes wastewater of commercial, industrial and institutional origins if such wastewater is mixed with domestic wastewater before treatment. Many industries recycle and reuse their own wastewater. However, because of a lack of data, recycling of non-domestic wastewater is not included in the recycling-quantity estimates below.

Recycled Water Use in California

Californians have used recycled water since the late 1800s and public health protections have been in effect since the early part of the 1900s. Recycled water use has dramatically increased in the past several decades as water agencies needed to supplement their water supplies. Today, California's water agencies recycle about 500,000 acre-feet of wastewater annually, almost three times more than in 1970.

Noting the importance of water recycling to our state, a 40-member Recycled Water Task Force was established pursuant to Assembly Bill No. 331(Goldberg, Chapter 590, Statutes of 2001). The Task Force identified opportunities for, and constraints and impediments to, increasing the use of recycled water in California. Over the course of nearly 14 months, the Task Force conducted intensive study in collaboration with many other experts, the public, and State staff to develop recommendations (see Box 16-1 on following pages) for actions at many levels. The recommendations are not restricted to legislative actions or statutory changes. Many can be implemented by State or local agencies without further legislative authorization or mandate.

The Task Force recommendations, if implemented, would significantly:

- Improve the way projects are planned
- Increase State and federal financial support for research and project construction
- Improve the regulatory framework
- Advance the use of recycled water as a valuable resource that would significantly mitigate growing water demands as called for by the California Water Code, Sections 13500 et seq.

Progress has begun on several of the Task Force recommendations. For example, the SWRCB issued an Executive Memorandum to Regional Board Executive Officers on February 24, 2004, setting a new framework for regulating of incidental runoff associated with recycled water use. AB 334 (Goldberg, Chapter 172, Statutes of 2003) gives communities additional flexibility to regulate water softeners as a source-control measure.

Potential Benefits from Water Recycling

The primary benefit of water recycling is augmenting water supply. Rather than discharging and losing the water, recycled water can be reused as a new water supply. Using recycled water for irrigation can spare high quality potable water used

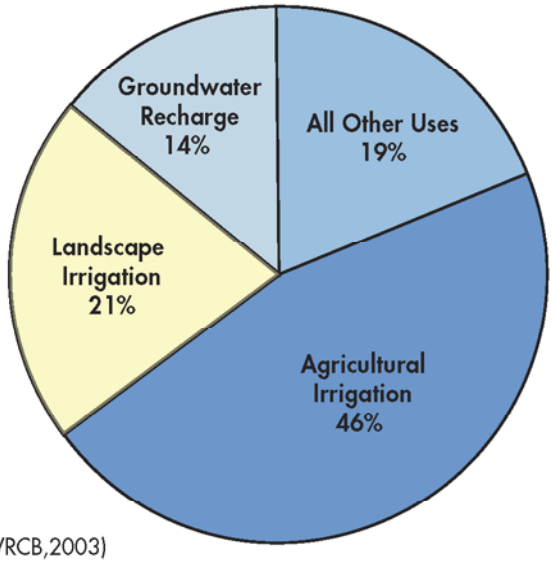
for irrigation, making more potable water supply available. There is a potential of about 0.9 million to 1.4 million acre-feet annually of additional water supply from recycled water by the year 2030.

When looking at California's overall water supply, recycling provides new water for the state only in areas where wastewater is discharged to the ocean or to salt sink. Recycling in other areas may provide new water for the water agency, but does not necessarily add to the state's water supplies. In these locations, discharged wastewater in interior California mixes with other water and becomes source water for downstream water users.

For many communities, an investment in recycled water could also provide other benefits:

1. Provide more reliable local sources of water, nutrients, and organic matter for agricultural soil conditioning and reduction in fertilizer use
2. Reduce the discharge of pollutants to water bodies, beyond levels prescribed by regulations, and allow more natural treatment by land application
3. Provide a more secure water supply during drought periods
4. Provide economic benefits resulting from a more reliable water supply
5. Improve groundwater and surface water quality and contribute to wetland and marsh enhancement
6. Provide energy savings; the use of recycled water as a local source offsets the need for energy-intensive imported water

Figure 6-1 Where recycled water is used in California



(SWRCB,2003)

Recycled water use has dramatically increased in the past several decades for irrigated agriculture and landscapes, groundwater recharge and other uses. Today, California's water agencies recycle about 500,000 acre-feet of wastewater annually, almost three times more than in 1970.

Potential Costs of Recycled Water

The estimated capital cost for the range of potential recycling (from previous section) by 2030 is about $6 billion to $9 billion.[1] The actual cost will depend on the quality of the wastewater, the treatment level to meet recycled water intended use, and the availability of a distribution network. Uses, such as irrigation near the treatment plant, will benefit from lower treatment and distribution costs. Irrigation of a wide array of agriculture and landscape crops can even benefit from the nutrients present in the recycled water by lowering the need for applied fertilizer. However, the use of recycled water for irrigation without adequate soil and water management may cause accumulation of salts or specific ions in soil and groundwater. Some uses, such as an industrial process farther away from the treatment plant, may need to pay higher costs for treatment and distribution. Given the wide range of local conditions that can affect costs, the majority of applications would cost between $300 and $1,300 per acre-foot of recycled water. Costs outside this range are plausible depending on local conditions. Uses that require higher water quality and have higher public health concerns will have higher costs.

Major Issues Facing More Recycled Water Use

Affordability

The cost of recycled water, relative to other water sources, will influence how much recycled water is produced for each region. The costs are dependent on the availability of treatable water, demand for treated water, the quality of the source as well as the product water, the type of the intended beneficial use, and the proximity of recycled water facilities to the end users. In addition, the need for disposal brine lines is considered a major issue for some inland agencies. The lack of adequate local funding to plan feasible recycled water projects can slow the construction of new projects. Public funding as well as incentive measures can help advance water recycling

[1] Water Recycling 2030; Recycled Water Task Force (2003).

Box 16-1 California Recycled Water Task Force Recommendations Summary (2003)

Funding for Water Recycling Projects. State funding for water reuse/recycling facilities and infrastructure should be increased beyond Proposition 50 and other current sources. The California Water Commission in collaboration with DWR and SWRCB should seek federal cost sharing legislation for water recycling.

Funding Coordination. A revised funding procedure should be developed to provide local agencies with assistance in potential State and federal funding opportunities and a Water Recycling Coordination Committee should be established to work with funding agencies.

Department of Water Resources Technical Assistance. Funding sources should be expanded to include sustainable State funding for DWR's technical assistance and research, including flexibility to work on local and regional planning, emerging issues, and new technology.

Research Funding. The State should expand funding sources to include sustainable State funding for research on recycled water issues.

Regional Planning Criterion. State funding agencies should make better use of existing regional planning studies to determine the funding priority of projects. This process would not exclude projects from funding where regional plans do not exist.

Funding Information Outreach. Funding agencies should publicize funding availability through workshops, conferences, and the Internet.

Community Value-Based Decision-Making Model for Project Planning. Local agencies should engage the public in an active dialogue and participation using a community value-based decision-making model in planning water recycling projects.

State-Sponsored Media Campaign. The State should develop a water issues information program, including water recycling, for radio, television, print, and other media.

Educational Curriculum. The State should develop comprehensive education curricula for public schools; and institutions of higher education should incorporate recycled water education into their curricula.

University Academic Program for Water Recycling. The State should encourage an integrated academic program on one or more campuses for water reuse research and education, such as through State research funding.

Statewide Science-Based Panel on Indirect Potable Reuse. As required by AB 331, the Task Force reviewed the 1996 report of the California Indirect Potable Reuse Committee and other related advisory panel reports and concluded that reconvening this committee would not be worthwhile at this time. However, it is recommended to convene a new statewide independent review panel on indirect potable reuse to summarize existing and on-going scientific research and address public health and safety as well as other concerns such as environmental justice, economic issues and public awareness.

Leadership Support for Water Recycling. State government should take a leadership role in encouraging recycled water use and improve consistency of policy within branches of State government and local agencies should create well-defined recycled water ordinances and enforce them.

DHS Guidance on Cross-connection Control. DHS should prepare guidance that would clarify the intent and applicability of Title 22, Article 5 of the California Code of Regulations pertaining to dual plumbed systems and amend this article to be consistent with requirements included in a California version of Appendix J that the Task Force is recommending to be adopted.

Health and Safety Regulation. DHS should involve stakeholders in a review of various factors to identify any needs for enhancing existing local and State health regulation associated with the use of recycled water.

Stakeholder Review of Proposed Cross-Connection Control Regulations. Stakeholders are encouraged to review Department of Health Services draft changes to Title 17 of the Code of Regulations pertaining to cross-connections between potable and nonpotable water systems.

continued

projects that provide local, regional and statewide benefits. The cost of recycled water can influence water markets, especially if recycled water is available for transfer.

Water Quality

The quality of the recycled water will affect its usage. Public acceptance of recycled water use depends on confidence in the safety of its use. Four water quality factors are of particular concern: (1) microbiological quality, (2) salinity, (3) presence of heavy metals, and (4) the concentration of stable organic and inorganic substances or emerging contaminants originating from various pharmaceuticals and personal care products, household chemicals and detergents, agricultural fertilizers, pesticides, fungicides, animal growth hormones, and many other sources. The salinity of recycled water can limit its usefulness for some applications such as salt sensitive landscaping, golf courses, and agriculture. Each use of water generally adds salt to the water. In particular, the use of water softeners adds salt to the water. Also, water conservation can further concentrate salts. Hence, the resulting wastewater, that is high in salts, would be more difficult and expensive to recycle. There is generally a limit to how many times water can be recycled unless a more expensive treatment technology, such as reverse osmosis, is used to remove the salts (see the Desalination strategy).

Box 16-1 continued from previous page

Cross-Connection Risk Assessment. DHS should support a thorough assessment of the risk associated with cross-connections between disinfected tertiary recycled water and potable water.

Uniform Plumbing Code Appendix J. The State should revise Appendix J of the Uniform Plumbing Code, which addresses plumbing within buildings with both potable and recycled water systems, and adopt a California version that will be enforceable in the state.

Recycled Water Symbol Code Change. The Department of Housing and Community Development should submit a code change to remove the requirement for the skull and crossbones symbol in Sections 601.2.2 and 601.2.3 of the California Plumbing Code.

Incidental Runoff. The State should investigate, within the current legal framework, alternative approaches to achieve more consistent and less burdensome regulatory mechanisms affecting incidental runoff of recycled water from use sites.

Source Control. Local agencies should maintain strong source control programs and increase public awareness of their importance in reducing pollution and ensuring a safe recycled water supply.

Water Softeners. The Legislature should amend the Health and Safety Code Sections 116775 through 116795 to reduce the restrictions on local ability to impose bans on or more stringent standards for residential water softeners. Within the current legal provisions on water softeners, local agencies should consider publicity campaigns to educate consumers regarding the impact of self-regenerative water softeners.

Uniform Interpretation of State Standards. The State should create uniform interpretation of State standards in State and local regulatory programs by taking specific steps recommended by the Task Force.

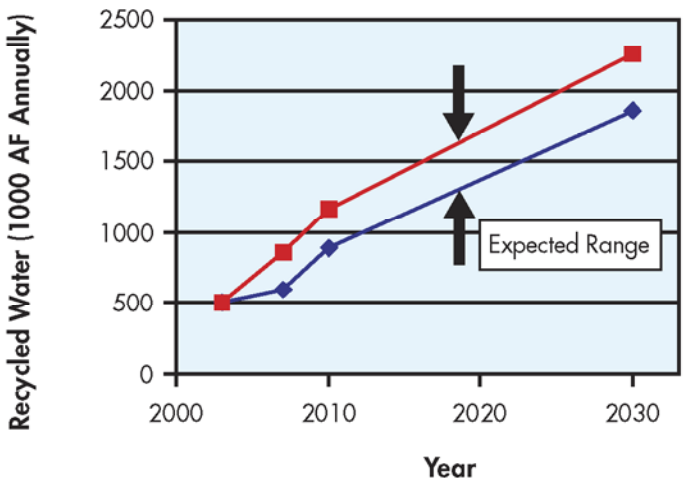
Permitting Procedures. Various measures should be conducted to improve the administration and compliance with local and State permits. State and local tax incentives should be provided to recycled water users to help offset the permitting and reporting costs associated with the use of recycled water.

Uniform Analytical Method for Economic Analyses. A uniform and economically valid procedural framework should be developed to determine the economic benefits and costs of water recycling projects for use by local, State, and federal agencies.

Project Performance Analysis. Resources should be provided to funding agencies to perform comprehensive analysis of the performance of existing recycled water projects in terms of costs and benefits and recycled water deliveries.

Economic Analyses. Local agencies are encouraged to perform economic analyses in addition to financial analyses for water recycling projects and State and federal agencies should require economic and financial feasibility as two criteria in their funding programs.

Figure 16-2 Range of potential water recycling (Water Recycling 2030 Report)



When looking at California's water supply, recycling provides additional statewide supply only in areas where wastewater is discharged to the ocean or to salt sink. Recycling in other areas may provide water supply benefits for the water agency, but does not necessarily add to the state's water supplies.

Public Acceptance

Public perception and acceptance of some recycled water uses currently limits its application. In some areas, public concerns about potential health issues have limited the use of recycled water for indirect potable purposes such as groundwater recharge and replenishment of surface storage, and even for irrigation of parks and school yards.

Potential Impacts

Areas in interior California that discharge their wastewater to streams, rivers, or the groundwater contribute to downstream flows. Recycling water would remove this source of water and potentially affect downstream water users including the environment. In some instances, recycling is discouraged when dischargers are required to maintain a certain flow in the stream for downstream users.

Recommendations to Increase Recycled Water Usage

1. State and local agencies and various stakeholders should actively follow up with the implementation of the Recycled Water Task Force recommendations (see Box 16-1) as they constitute a culmination of intensive study and consultation by a statewide panel of experts drawing upon the experience of many agencies. Such recommendations provide advice that can be used as a toolbox for communities to improve their planning of recycled water projects. (Implementing parties: State and local agencies and various stakeholders)
2. Funding should be increased beyond Proposition 50 and other sources toward sustainable technical assistance and outreach, advanced research on recycled water issues, and adequate water reuse/recycling infrastructure and facilities. (Implementing parties: federal, State, and local agencies)
3. The State should encourage an academic program on one or more campuses for water reuse research and education; develop education curricula for public schools; and encourage institutions of higher education to incorporate recycled water education into their curricula. (Implementing parties: State and academic institutions)
4. Agencies should engage the public in an active dialogue and participation using a community value-based decision-making model (determining what a community values, then making decisions based on that information) in planning water recycling projects. (Implementing parties: State and local agencies)
5. State should create uniform interpretation of State standards in State and local regulatory programs and clarify regulations pertaining to water recycling including: health regulations, permitting procedures, cross-connection control and dual plumbed systems. (Implementing parties: State agencies)

Selected References

Water Recycling 2030, California Recycled Water Task Force Report, 2003.

SWRCB, California Municipal Wastewater Reclamation Survey, 2003.

Water Recycling 2000, California's Plan for the Future. State Water Conservation Coalition, Reclamation/Reuse Task Force and the Bay Delta Reclamation Sub-Work Group, 1991.

Southern California Comprehensive Water Reclamation and Reuse Study, Phase II. Final Report (Draft), 2000.

Other reports such as DWR Water Recycling Survey, 1993; California Water Plan Update 1998.

Volume 2

Chapter 17 Surface Storage – CALFED

The CALFED Bay-Delta Program recognizes that its plan must include the means for more fully integrating California's water supply system to provide more reliable water supplies and to meet competing needs. The San Luis Reservoir is an example of offstream storage. (DWR photo)

Chapter 17 *Surface Storage – CALFED*[1]

The CALFED Record of Decision (2000) identified five potential surface storage reservoirs that are being investigated by the California Department of Water Resources, U.S. Bureau of Reclamation, and local water interests. Building one or more of the reservoirs would be part of CALFED's long-term comprehensive plan to restore ecological health and improve water management of the Bay-Delta. The five surface storage investigations are:

- Shasta Lake Water Resources Investigation (SLWRI)
- In-Delta Storage Project (IDSP)
- Upper San Joaquin River Basin Storage Investigation (USJRBSI)
- North-of-the-Delta Offstream Storage (NODOS)
- Los Vaqueros Reservoir Expansion (LVE)

In one of the most ambitious integrated water management plans in the nation, the CALFED Bay-Delta Program set forth objectives and actions to protect water quality and at-risk species, restore habitat in the San Francisco Bay-Sacramento-San Joaquin River Delta and continue to meet the water needs of farms and cities. CALFED recognized early on that its plan must include the means for more fully integrating California's water supply system to provide more reliable water supplies and to meet competing needs. More storage is crucial to successfully meeting those needs.

The five investigations are being completed under the direction provided by the CALFED Record of Decision (ROD) and the California Bay-Delta Authority (CBDA). The ROD includes a number of implementation commitments and solution principles to guide potential project implementation. For example, a fundamental principle is that costs should, to the extent possible, be paid by the beneficiaries of the program actions. CALFED has also provided a forum for independent scientific review of important project-related issues through development of a Science Program with expert panels. In addition, the CBDA agencies have committed to science-based adaptive management that would allow their facilities operations to be modified as understanding of issues improve or new issues are identified.

Originally, a CALFED interagency team began with an inventory of 52 potential reservoir locations and screened those to 12 locations that appeared to contribute to CALFED goals and satisfy solution principles, objectives, and policies. For example, potential reservoirs smaller than 200,000 acre-feet of storage were considered too small to materially contribute to the program. In addition, CALFED policy focused on offstream reservoirs, but also considered expansion of existing on-stream reservoirs. The five storage investigations identified in the ROD appeared to be more promising in their ability to contribute to ecosystem, water quality, flood control and water supply objectives.

The surface storage regional/local strategy gives a broader background of surface storage in California that may also be helpful to the reader. Details and project-specific descriptions of the investigations can be found in the April 2005 CALFED Bay-Delta Surface Storage Investigations Progress Report that is included in Volume 4, Reference Guide.

Current Status of CALFED Surface Storage

Planning for the five CALFED-directed investigations has made varying levels of progress. Current timelines have targeted 2006–2009 for completing the planning documents. Essen-

[1] The primary source of information for this strategy narrative is the DWR and U.S. Bureau of Reclamation report entitled, "CALFED Bay-Delta Surface Storage Investigation" April, 2005, included in Volume 4, Reference Guide.

tially, the planning consists of project formulation, environmental documentation and engineering design. As relevant and useful information becomes available, both stakeholders and the public are notified to ensure that a broad array of input and response are incorporated into the planning activities and documentation. More specifically, as project costs, environmental effects, and benefits are compiled, regulators, the public, and ultimately decision-makers will be asked to respond to the evaluations and conclusions (see Box 17-1).

The CALFED surface storage investigations have reached a critical milestone. With input from stakeholders and assistance from local agencies, USBR and DWR have completed preliminary environmental impact studies and conceptual modeling scenarios based on general operational objectives. Now each investigation must move toward a specific set of operational objectives to formulate detailed alternatives that can be used in decision-making processes. Future efforts now hinge on the willingness of interested parties and stakeholders to participate and shape the alternative formulations that will be used to make decisions on these projects. Evaluations to date demonstrate that the surface storage projects have the potential to provide both broad public benefits and local/regional benefits.

Potential Benefits from CALFED Surface Storage

CALFED noted that perhaps the greatest benefit of new surface storage would be the operational flexibility that storage adds to today's constrained system (See Box 17-2). The Bay-Delta system provides water for a wide range of needs, including in-stream flows for aquatic species, riparian habitat, wetlands, as well as benefits to municipal, industrial, and agricultural users. These often-competing demands have restricted the operational flexibility of the SWP and CVP systems and consequently negatively impacted the quantity, quality, and timing of deliveries. The inflexibility and resulting consequences are then passed along to water users that are partially or wholly dependent on the operations or deliveries of the CVP and SWP systems. By storing additional water, new surface storage can contribute to improved operational flexibility in the SWP and CVP systems and associated users for the enhanced statewide water resources benefits described below.

Each of the five surface storage reservoirs could be used to improve water supply reliability. The surface storage projects could also improve source water quality directly or facilitate blending of water from different sources. New surface storage can help provide water for the CALFED Environmental Water Account and other environmental needs including ecosystem restoration actions also identified by the CALFED Program. New surface storage can also help reduce the risk associated with potential future climate change by mitigating the effects of a relatively smaller seasonal snowpack storage capacity. Implementation of individual surface storage reservoirs could augment average annual water deliveries by anywhere from a negligible amount to over 400,000 acre-feet (according to initial operations simulations), depending on the mix of benefits selected by participating agencies and operational considerations (DWR and USBR, April 2005).

The total amount of potential water supply improvements from implementation of all five surface storage projects is unknown since operations with multiple new reservoirs have not yet been modeled. However, initial model simulations show that the potential reservoirs could provide a wide range of type and geographic scope of benefits including agricultural uses, CALFED Environmental Water Account and Environmental Water Program and water supply for refuges. Additional potential benefits include urban uses, improvement of Delta water quality for the ecosystem as well as Delta users and exporters, improvement of streamflows during times critical for fisheries and other ecosystem processes, flexibility for changing the timing of existing diversions to protect fisheries, and other water management purposes.

Box 17-1 Ongoing Surface Storage Investigations

The planning process for surface storage is both comprehensive and demanding. The CALFED surface storage investigations have been developed to comply with both the state and federal environmental laws, which require extensive documentation and public involvement. In addition, implementation of any one surface storage project would likely require more than 30 regulatory permits and compliances. Both the environmental laws and the permits and compliances will allow the public to participate in a more comprehensive and informed manner and on specific issues at the appropriate time. For more information related to public involvement in the investigations, visit www.storage.water.ca.gov/index.cfm

Other strategies can be more effective with additional storage. For example, water transfers can be more easily accommodated if water can be stored temporarily and then released from an upstream location at appropriate times and the receiving areas have capacity to store the transferred water. In addition, surface storage can improve the effectiveness of conjunctive management strategies by more effectively capturing runoff that can ultimately be stored in groundwater basins.

Potential Costs of CALFED Surface Storage

New feasibility engineering cost estimates are in various stages of development for each of the five surface storage investigations (DWR and USBR, April 2005). Costs will depend on project selected objectives and configurations. The estimated capital cost for developing the individual surface storage projects identified in the ROD could range from $180 million for the smallest Shasta Lake Expansion, to $2.4 billion for Sites Reservoir with the most extensive conveyance facilities; the least expensive configuration of Sites Reservoir could be about half as much as the most expensive. These costs do not include anticipated annual costs such as operations and maintenance, power, or costs associated with the use of existing facilities. As the investigations continue to move forward, more complete descriptions of costs and more specific allocation of benefits will allow an economic evaluation where costs can be assigned to specific beneficiaries and benefits. Implementation of any of the five potential surface storage projects would likely include some State and federal public funding to pay for broad public benefits.

Major Issues Facing CALFED Surface Storage

Funding

Sufficient and stable State and federal funding are critical to successful completion of the feasibility and environmental studies for the five projects. California's Proposition 50 provided State funding for surface storage investigations. In October 2004, the president reauthorized the CALFED Bay-Delta Program. PL108-361 reaffirms federal feasibility study authorization for four of the five storage investigations (SLWRI, NODOS, LVE, and USJRBSI). DWR, USBR and CBDA recently estimated funding necessary to complete the five investigations at $64.3 million. An estimated $29.2 million remains available from Proposition 50 bond proceeds to support surface storage investigations. The federal budget for this fiscal year and the president's proposed budget for next year amount to approximately $13.5 million, leaving an unmet need of $21.6 million. Any future federal appropriations will reduce this need further. Other efforts are underway that are also likely to help facilitate decisions regarding future funding for the surface storage investigations.

DWR has prioritized its work efforts to focus resources on identifying the most viable projects and project tasks. DWR and USBR will work cooperatively to evaluate projects using information associated with federal planning studies and reports. In addition, DWR and USBR are working with stakeholders to identify which projects have the greatest local interest and possible willingness to pay for project costs. The

Box 17-2 Los Vaqueros, Olivenhain and Diamond Valley Reservoirs

Three locally developed reservoirs that have been completed in the past seven years, Los Vaqueros in Northern California and Olivenhain and Diamond Valley in Southern California, are examples of offstream surface storage. The use or objectives of these reservoirs focused on benefits other than the traditional energy generation, flood control, and water supply. The primary benefits of these new reservoirs are related to water quality, system flexibility, and system reliability against catastrophic events and droughts. More specifically, water supply augmentation is not a primary objective of these reservoirs.

Los Vaqueros, Olivenhain, and Diamond Valley also help illustrate a potential misunderstanding of benefits in applying simplified cost calculations where yield is divided by total cost, generating a cost per acre-foot. This approach would evaluate storage projects based on cost per acre-foot of water supply improvement only. Since these projects were constructed for other benefits, the "yields" of these reservoirs are incidental. Consequently, a simplified cost per acre-foot evaluation would generate almost infinite unit cost. Similarly, application of a simplified cost allocation for the CALFED surface storage investigations is not appropriate, since these projects focus on operational flexibility, water quality, ecosystem restoration or other nontraditional benefits, in addition to water supply improvement.

CALFED surface investigations will then use results of these evaluations to develop partnerships with stakeholders to advance alternatives development and plan formulation. If partnerships are not formed (demonstrating lack of interest in advancing a project) and/or the outcome of technical and economic studies indicate any of the five projects are not feasible, the State may decide to defer future studies of specific projects. Given the estimated funding shortfall, one or more of the studies, of lesser determined priority, may have to be delayed or even terminated unless they are provided specific financial support.

Common Assumptions Effort

DWR, USBR, and CBDA initiated the Common Assumptions process to develop consistency and improve efficiency among the surface storage investigations. While each of the investigations addresses a unique purpose to meet different combinations of water supply and water quality needs, all of the surface storage investigations share some common requirements including completing planning reports and feasibility studies and the associated alternatives analyses to comply with the California Environmental Quality Act (CEQA), National Environmental Protection Act, and Clean Water Act Section 404 requirements.

The Common Assumptions teams have also been developing a set of common tools and consistency protocols among the surface storage investigations. The Common Assumptions effort has established a number of teams to address different areas required to develop consistency among the individual storage studies. Attaining consistency in modeling assumptions and analytical approach will allow the surface storage projects' performance, costs, and benefits to be compared and will inform decisions about project prioritization. The Common Assumptions process also makes more efficient use of limited technical resources.

Developing Project Alternatives

One of the next key steps in the surface storage planning process is developing project alternatives that meet the requirements of federal, State, and local participants. Alternatives development requires identifying and solving specific problems and needs. To date, USBR and DWR have developed general modeling scenarios for the five surface storage investigations. To develop project alternatives, additional detail will be needed to describe the specific goals of potential federal, State, and local participants. Project feasibility studies and environmental documents can be completed when potential participants are able to provide more specificity regarding their needs and interests.

The CALFED surface storage investigations are refining project alternatives and evaluating the level of potential participants' interests. The federal planning process is being used to determine if a federal interest exists for a specific project. In addition, USBR and DWR are working directly with potential participants by performing requested studies and are providing information to these participants as they perform their own evaluations to determine if the surface storage projects can contribute to meeting their specific water resource needs.

USBR and DWR have begun environmental documentation on three of the projects (NODOS, IDSP, and USJRBSI). These reports are being prepared concurrently with the federal feasibility planning process. However, until alternatives are developed, detailed impact analyses cannot be completed. Utilizing the planning process, identifying each surface storage project's broad public benefits and working directly with potential participants to assess their needs and interests in specific surface storage projects, the needs of all participants should be identified when the feasibility studies and the environmental documents are developed.

Recommendations to Help Promote Implementation of CALFED Surface Storage

1. CALFED signatories and stakeholders should continue to prioritize work efforts to complete the feasibility and environmental studies of the surface storage projects identified in the ROD.
   - As indicated in the funding discussion above, DWR is prioritizing future surface storage work efforts due to insufficient funding to complete environmental documentation and feasibility analyses for all five CALFED surface storage investigations. Prioritization criteria include reviewing conclusions and recommendations from ongoing State and federal planning studies; determining federal, State, and local interest, including willingness to pay; and assessing legal and logistical issues related to specific projects.
   - The investigations should continue to test all five potential projects against CALFED solution principles and implementation commitments as well as other local, State, and federal planning criteria for deciding to move to construction of any projects.
   - Engage more stakeholders and potential project participants in the process.

- Develop information on how the projects could be operated for a variety of purposes, costs, and impacts.
- Continue evaluation and presentation of operational scenarios that will allow potential participants to assess their interest in specific projects.
- Develop mechanisms to provide assurances that projects will be operated in a manner consistent with the objectives.

2. DWR, USBR, other CBDA agencies and local interests should cooperatively develop specific project alternatives for the CALFED surface storage projects for use in planning.
3. CBDA, DWR, and the USBR should continue their development of conceptual finance plans that will include descriptions of relevant State and federal financial policies and a determination of the potential for State and federal investment in benefits to the general public. The scenarios and finance plans will help facilitate potential investment decisions by local, regional, State and federal decision-makers.

Selected References

CALFED Programmatic EIS/EIR and ROD, CALFED, July and August 2000

North-of-the-Delta Offstream Storage Investigation Progress Report, DWR, July 2000

North-of-the-Delta Offstream Storage Scoping Report, DWR, October 2002

Initial Surface Water Storage Screening Report, CALFED, August 2000

Draft Project Concept Report, Contra Costa Water District, August 2002

In-Delta Storage Program Draft Summary Report and supplemental reports on operations, water quality, engineering, environmental, and engineering evaluations, DWR, May 2002

In-Delta Storage State Feasibility Study Draft Reports, DWR, January 2004

Flow Regime Requirements for Habitat Restoration along the Sacramento River between Colusa and Red Bluff, CALFED, Revised February 14, 2000

Upper San Joaquin River Basin Storage Investigation, In-Progress Review, Initial Surface Storage Options Screening, U.S. Bureau of Reclamation, November 2002

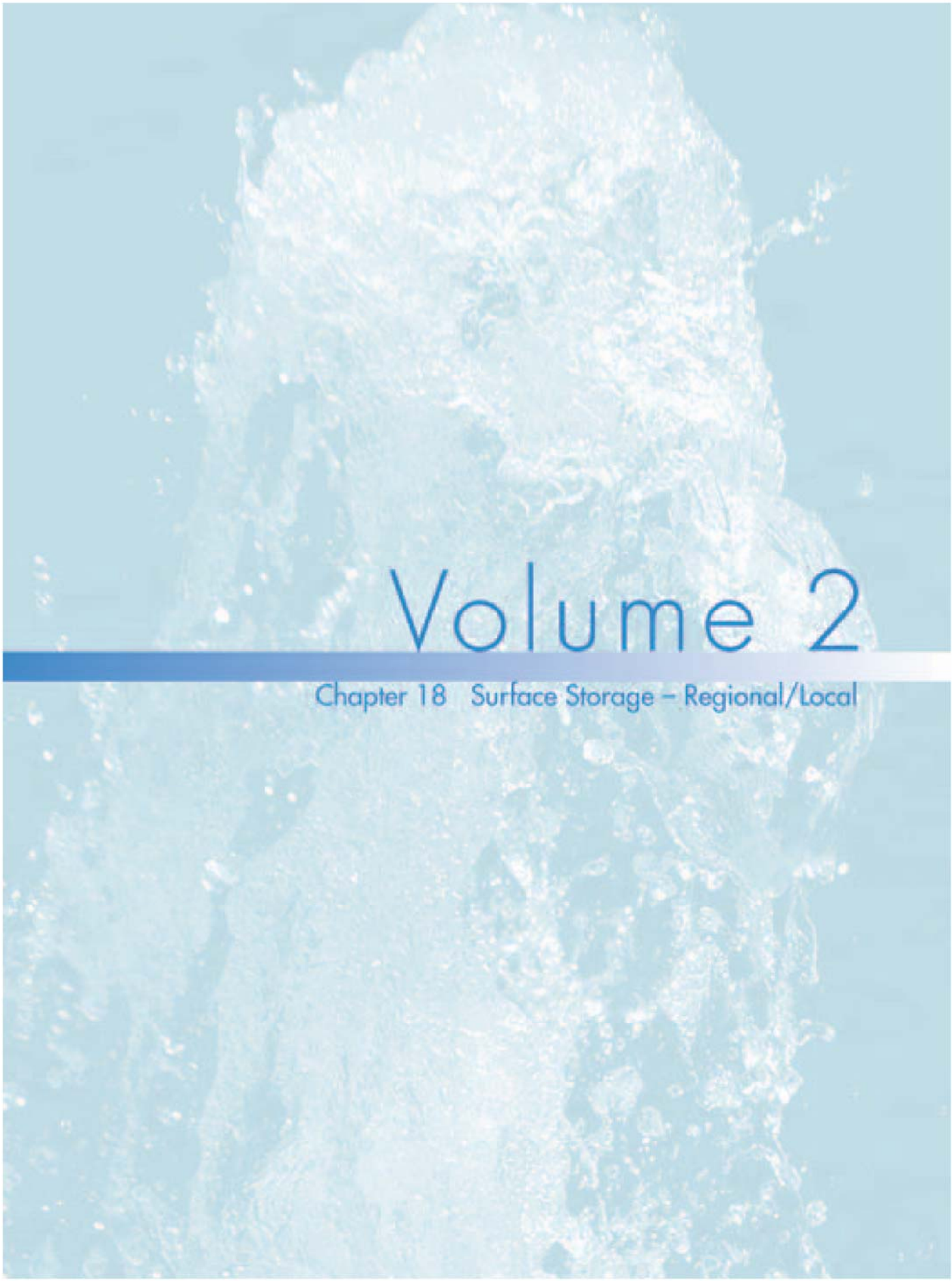
Upper San Joaquin River Basin Storage Investigation, Phase 1 Investigation Report, U.S. Bureau of Reclamation, October 2003

Shasta Lake Water Resources Investigation Mission Statement Milestone Report, U.S. Bureau of Reclamation, March 2003

California Bay-Delta Surface Storage Program Progress Report, DWR and U.S. Bureau of Reclamation, April 2004www.storage.water.ca.gov/docs/Briefing_Report.pdf

California Bay-Delta Surface Storage Program Progress Report, DWR and U.S. Bureau of Reclamation, April 2005
www.storage.water.ca.gov/public_docs.cfm

Project websites: Shasta Lake Water Resources Investigations: www.usbr.gov/mp/slwri
North-of-the-Delta Offstream Storage:
www.storage.water.ca.gov/northdelta/index.cfm
In-Delta Storage:
www.storage.water.ca.gov/indelta/index.cfm
Los Vaqueros Reservoir Enlargement:
www.lvstudies.com
Upper San Joaquin River Basin Storage Investigation:
www.usbr.gov/mp/sccao/storage



Volume 2

Chapter 18 Surface Storage – Regional/Local

Surface storage plays an important role in California where the pattern and timing of water use does not always match the natural runoff pattern. Contra Costa Water District pumps high quality water into its Los Vaqueros Reservoir and uses it to lower salt content of water it pumps from the Delta. (DWR photo)

Chapter 18 *Surface Storage – Regional/Local*

Surface storage is the use of reservoirs to collect water for later release and use. Surface storage has played an important role in California where the pattern and timing of water use does not always match the natural runoff pattern. Most California water agencies rely on surface storage as a part of their water systems. Similarly, surface storage is often necessary for, or can increase, benefits from other water management activities such as water transfers, conjunctive management and conveyance improvements. Some reservoirs contribute to water deliveries across several regions and some only contribute to water deliveries within the same watershed. Surface reservoirs can be formed by building dams across active streams or by building off-stream reservoirs where the majority of the water is diverted into storage from a nearby water source.

Surface storage capacity can also be developed by enlarging, reoperating (see the System Reoperation narrative) or modifying outlets on existing reservoirs. Smaller reservoirs typically store water in one season for use in another season, while larger reservoirs can do the same or store water for use over several years.

This strategy covers regional and local surface storage alternatives not currently under State and federal investigations as described in the CALFED Record of Decision. However, regional/local storage alternatives might include projects that are being investigated by CALFED but not ultimately implemented. They might also include storage alternatives that were eliminated at any juncture of the CALFED process since regional/local priorities and principles may be different than those used by CALFED. The potential CALFED surface storage projects are described in Chapter 17, Volume 2.

Surface Storage in California

California has nearly 200 surface storage reservoirs greater than 10,000 acre-feet with a combined storage capacity of more than 41 million acre-feet. In addition, many smaller reservoirs are used to provide for a wide range of water uses, stabilize water delivery to customers and provide a backup for emergency supply. Similar to many other parts of the world, most California reservoirs were developed over 30 years ago. As of the mid-1990s, there were about 1,242 dams being built worldwide – 55 in the United States[1]. In California, nearly 40 dams have been built over the past decade[2]. Examples of recently completed surface storage reservoirs completed by local/regional entities include: Olivenhain, Los Vaqueros, Diamond Valley and Seven Oaks reservoirs. The primary benefits of these new reservoirs are related to flood control (Seven Oaks), water quality, system flexibility, and system reliability against catastrophic events and droughts rather than for traditional water supply.

Over the past several decades, fisheries have received improved benefits from surface storage reservoirs through regulation and legislation. Specifically, many existing reservoirs have been managed to achieve ecosystem and other benefits beyond water supply. As water supplies dedicated to meeting both environmental and urban uses have grown, the state's surface water system has become increasingly inflexible. Water and ecosystem managers have less ability to adapt as use and regulatory requirements frequently control operations.

The relative need for local surface storage development may be greatest in the interior mountainous areas of the state such as the Cascades and the Sierra Nevada. Although much of the

[1] United States Society on Dams, November 2000

[2] Source: CA Division of Safety of Dams; includes DSOD jurisdictional dams only.

water used throughout the state originates in the mountains, these locations generally possess a much narrower array of available water management strategies to meet local needs. This is largely due to geographic, hydrogeologic or hydrologic limitations. Of these few strategies, some form of surface storage may hold the greatest potential for achieving local supply reliability objectives. Local surface storage development options include the reoperation of existing reservoirs, increasing the yield of existing reservoirs through expansion of their capacity, or construction of new reservoirs.

Potential Benefits of Surface Storage

Many of California's reservoirs were originally built for the primary purposes of hydropower, flood control, and consumptive water use. Although the allocation of benefits for proposed surface storage can affect the occurrence and magnitude of different types of benefits, they generally can include the following:

- Water quality management
- System operational flexibility
- Power generation
- Flood management
- Ecosystem management
- Sediment transport management
- Recreation
- Water supply augmentation
- Emergency water supply

The presence of new surface storage could allow ecosystem and water managers the flexibility to take actions and make real-time decisions that would not be possible without the storage. Water transfers between regions could be easier if water can be released from upstream storage at appropriate times and the receiving regions have reservoirs to store the transferred water. Surface storage can improve the effectiveness of conjunctive water management strategies by more effectively capturing runoff that can ultimately be stored in groundwater basins.

Storage projects can improve the movement of water at times to improve source water quality directly or facilitate blending of water from different sources to optimize system water quality. New surface storage can help provide water resources assets for the CALFED Environmental Water Account and Environmental Water Program, and for refuges. New surface storage can also help reduce the risk associated with potential future climate change by mitigating the effects of a relatively smaller seasonal snowpack storage capacity as well as increased or more sustained peak flood flows.

Potential Costs of Surface Storage

Cost estimates for potential surface storage alternatives are not specified in this narrative since they are only useful if created for a specific project with defined operation rules and allocation of benefits and costs. The costs of multipurpose storage projects will be shared by many beneficiaries. The magnitude of the benefits and corresponding costs for such things as water supply, water quality and flood management can be expected to vary significantly from project to project.

Major Issues Facing Surface Storage

Identifying Beneficiaries

There are concerns related to how the beneficiaries will be determined, who will actually pay, and who will control the storage operation. The challenge is to develop financial and operations agreements for the multiple beneficiaries and uses.

Funding

Construction usually requires a lot of money in a short time – perhaps $1 billion or more over five years for larger projects. Included in the long-term capital outlay are planning costs such as administrative, engineering, legal, financing, permitting and mitigation, which can also require significant investments. Some new storage options such as raising existing reservoirs, reoperating them or the construction of small local reservoirs may require significantly less capital, but may require local funding through revenue or general obligation bonds. Even these less costly projects could face financial challenges.

Impacts

New storage can affect environmental and human conditions, create economic impacts for the surrounding community, and flow impacts both up and downstream of diversions. New reservoirs may result in the loss of property tax revenue to local governments in the area they are located, or by increasing local property values by firming up a water supply. Regulatory and permitting requirements require surface storage investigations to consider potential impacts to stream flow regimes, potential adverse effects on designated wild and scenic rivers, potential water quality issues, potential changes in stream geomorphology, loss of fish and wildlife habitat, and risk of failure during seismic and operational events. Existing environmental laws require that these types of effects be mitigated. Mitigation of environmental effects is normally accomplished through implementation strategies that avoid, minimize, rectify, reduce over time, or compensate for negative impacts. New surface storage projects may need to address impacts

under the application of various laws, regulatory processes and statutes such as Public Trust Doctrine, State dam safety standards, Area of Origin statutes, California Environmental Quality Act, National Environmental Protection Act, the Clean Water Act and the Endangered Species Acts.

Suitable Sites

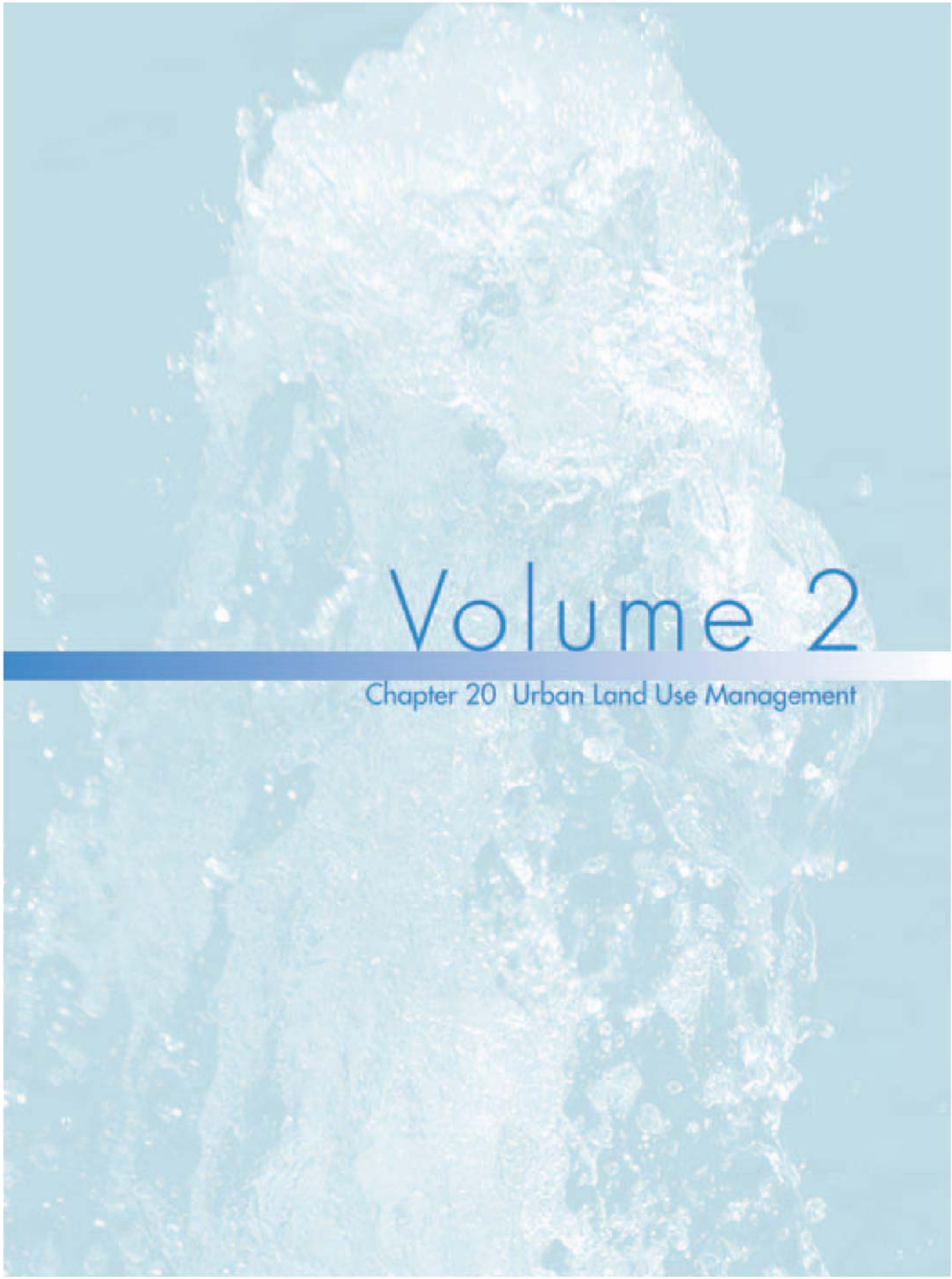
Most of the best reservoir sites have already been used and the new standards of environmental regulations are significant constraints to development of surface storage in the mountains. The range of surface storage development options for smaller local agencies is more limited than for the State and federal governments. Local agencies have limited ability to use State or federal funds, nor do they have the ability to work as closely with their corresponding resource regulatory agencies such as the State and federal agencies do as part of CALFED. Additionally, there are physical limitations on storage options in some parts of the state. In some areas, offstream storage is not feasible. These circumstances severely constrain the ability of local governments and agencies to finance and implement the projects necessary to sustain the local economy and serve increasing populations.

Science

Biologists and water managers continue to struggle to identify and understand the relationships between hydrodynamics, flow timing, water temperature, geomorphology, water quality, environmental responses, and other conveyance related considerations. Increased understanding of these considerations will enable resource planners and managers to better determine the causes of observed impacts and hence, more effectively restore, preserve and manage at-risk resources, such as modified operations and environmental mitigation.

Recommendations to Better Manage and Increase Surface Storage Benefits

1. Local agencies seeking to implement storage projects should develop a comprehensive methodology for analyzing all benefits and full costs of projects. DWR should provide technical expertise and assistance to the local agencies if asked.
2. Reservoir operators and stakeholders should continue to adaptively manage operations of existing facilities in response to increased understanding of system complexities and demands as well as changes in natural and human considerations such as social values, hydrology, and climate change.
3. DWR and other local, State and federal resource management agencies should continue studies, research and dialogue focused on a common set of tools that would help determine the full range of benefits and impacts as well as the costs and complexities of surface storage projects.
4. Water resources scientists, engineers and planners, including DWR should recognize the potential long development time for new surface storage in securing funding needed for continuity of planning, environmental studies, permitting, design, construction, and operation and maintenance.



Volume 2

Chapter 20 Urban Land Use Management

The way in which we use land—the type of use and the level of intensity—has a direct relationship to water supply and quality. (DWR photo)

Chapter 20 *Urban Land Use Management*

Effective urban land use management consists of planning for the housing and economic development needs of a growing population while providing for the efficient use of water and other resources. The way in which we use land — the type of use and the level of intensity — has a direct relationship to water supply and quality.

Urban Land Use Patterns in California

Existing urban development patterns reflect a strong consumer demand for single family homes in suburban locations. Local government and private sector decisions on the placement of offices, industrial sites and retail centers are driven by a combination of workforce availability and state tax policy. Because only 5 percent of California's land area is in urban development, and 50 percent of the state is in public ownership, the result of current development practices is the consumption of farm land, open space, habitat, and other natural resources. Although it comprises a relatively small portion of most watersheds, impervious surfaces such as roads and parking lots result in more rapid and larger amounts of surface runoff. This change in runoff can alter stream flow and watershed hydrology, reduce groundwater recharge, increase stream sedimentation, and increase the need for infrastructure to control storm runoff.

Higher density development and more efficient land use can be encouraged through changes in consumer preferences and public policies to promote more compact development (see Box 20-1 for recent State policies and guidelines). In some of the most densely populated regions of the state, including the San Francisco Bay Area and Los Angeles, headway is being made to grow more compactly, provide jobs closer to housing, and provide transit to connect people with community resources.

Local agency formation commissions (LAFCOs) are regional planning agencies that were established to encourage logical and efficient development patterns. With the recent changes to Government Code § 56000 et. seq., LAFCOs are now required to perform municipal service reviews on a regular basis. This will allow a comprehensive evaluation of how all services, including water, are delivered to developing areas of the state.

Potential Benefits of More Compact Development

There are water-related benefits that accrue from more compact development. It can reduce landscaped areas and therefore reduce landscape water use. Although higher density development may actually increase impervious surfaces and increase traffic congestion in urban areas, it may reduce the total development footprint in the state and reduce urbanization impacts to habitat, watershed functions, and groundwater recharge areas.

Compact, mixed-use development can reduce water demand, even with moderate increases in density. As a rule of thumb, landscaping irrigation accounts for almost half of residential water use. An increase in residential density from four units per acre to five reduces the landscaping area by 20 percent, which should cut water usage by roughly 10 percent compared to the lower density development. A smaller urban footprint reduces impervious surfaces. This generates less surface runoff, and minimizes intrusion into watersheds and groundwater recharge areas which receive the runoff.

The Legislature and Governor Arnold Schwarzenegger via Assembly Bill 2717 (Laird, 2004) asked the California Urban Water Conservation Council to convene a Landscape Task Force with representatives from water suppliers, environmental groups, government agencies, and the landscape and building industries to evaluate landscape water use efficiency and make recommendations for improvements. The AB 2717 Landscape Task Force is currently evaluating in great detail the potential for water savings for both new and existing development. The recommendations of the Task Force may lead to significant improvements in landscape

irrigation through new Model Landscape Ordinance policies, new technologies, changes in rate structures, and new legislation. The Task Force will finish its work and submit a final report to the California Legislature and Governor by December 31, 2005 (See the Urban Water Use Efficiency strategy, Chapter 22, Volume 2 for the draft recommendations by the Landscape Task Force).

Potential Costs

No statewide cost estimates are available for implementing this strategy. The potential state, local and private costs for promoting higher density and more compact development need to be balanced with the need for more housing, economic development and consumer preferences.

There could be significant new costs associated with changing the way local, regional, and State agencies plan urban areas. Among these are costs for increased communication, coordination and information sharing between land use agencies, water suppliers, and agencies which regulate water quality.

However, by implementing this strategy, there will likely be lower long-term costs associated with reduced urban runoff, less infrastructure expansion for water supply, and lower mitigation costs for displaced farm land and/or wildlife habitat.

Major Issues

Disincentives for Change

Local governments make most of the land use decisions in California. There are many reasons why local governments do not use more resource efficient development patterns including: consumer preferences and demands for single family homes with yards, community resistance to infill or higher density development, local zoning ordinances which have not been updated for many years, the added cost to conduct regional planning efforts, the cost and liability associated with pursuing infill projects, and environmental mitigation strategies that encourage lower density development. In addition, landscape, soils, environmental hazards and infrastructure limitations are additional factors that guide local governments in the development of land use policy decisions. Changing land use planning practices and development standards statewide would be a significant and expensive public policy undertaking with as yet unknown water use savings compared to more direct methods of water conservation.

Coordination

Recent changes to the Government Code and the Water Code requires local governments to determine whether there will be enough water to supply a proposed development project before it can be approved. This will require land use agencies and water agencies to improve their communication and

Box 20-1 Recent State Policy and Guidelines

Statute AB 857 (Stats. 2002; ch. 1016) establishes three planning priorities and requires that all State strategic plans and capital improvement plans—including the next update of the Governor's Environmental Goals and Policy Report and the California Water Plan—be consistent with them.

- Promote infill development and equity,
- Protect environmental and agricultural resources, and
- Encourage efficient development patterns.

The State of California General Plan Guidelines, updated in 2003 (OPR), recommends that local governments consider preparing an optional Water Element in their general plans.

Three bills, SB 221, SB 610 and AB 901, were enacted by the Legislature to improve the coordination between water supply and land use planning processes at the local level and became effective January 1, 2002. The new laws are intended to improve the assessment of water supplies during the local planning process before approval of land use projects that depend on water. They require verification of sufficient water supplies as a condition for approving developments, compel urban water suppliers to provide more information on groundwater reliability if used as a supply, and require average and drought year conditions be addressed.

coordination on project-level development decisions that have been made independently in the past. Many of the water supply coordination issues for new development are now addressed in the state's Water Code through existing requirements for the preparation and approval of Urban Water Management Plans every five years and the implementation of SB 610 (Costa) and SB 221 (Kuehl) enacted in 2001. Increased coordination will also be necessary among all levels of government to coordinate inter-agency planning, to develop databases, and to interpret and share data and information.

Recommendations

State

1. Provide incentives to developers and local governments to plan and build using more resource efficient development patterns. This can be done through CEQA exemptions for infill development, reductions in brownfield liability for innocent land purchasers, prioritizing planning grants and other incentives to increase consumer interest in urban living and to encourage infill and compact development forms.
2. Encourage local governments to review the Urban Water Management Plans adopted by water agencies within their jurisdiction; and to work with these water agencies to show compliance with Water Code sections that require local governments to consider water supply availability when making land use decisions for significant (500 homes or more) new development projects, and to prepare the water resource section of their general plans as described in the State's General Plan Guidelines Update (OPR, 2003).
3. Provide technical assistance to local governments on how to incorporate resource efficient development into their local general plan, related zoning ordinances, and specific plans; and how to prepare required water supply assessments before approving major new development projects.
4. Develop and publicize accurate and relevant data on water supply and water quality to help local agencies plan.
5. Encourage more research on the impacts of resource efficient development patterns and best practices.

Local Government

6. Recognize regional needs and resources when developing local general plans and designing and building neighborhoods and communities. Improve communication, coordination and information-sharing with other local agencies, regional planning agencies, and local water agencies and watershed managers.
7. Promote the rehabilitation of aging or inadequate infrastructure to help infill development.
8. Evaluate the potential environmental impacts of new development on prime agricultural land, open space, floodplains, recharge areas and wetlands and consider the water supply impacts when developing appropriate mitigation measures.
9. Update landscape irrigation ordinances to promote consumer choices for more water-efficient landscaping in existing and new developments.
10. Look for opportunities to reduce impervious surfaces, especially near waterways.

Regional Government

11. LAFCOs should consider water supply issues in the context of their charge to encourage logical and efficient development patterns that minimize impacts on agricultural land and maximize meeting housing needs and affordability.

Water Suppliers

12. Develop and make available water resource information, such as water supply and water quality in Urban Water Management Plans, to local governments that can be used in local and regional land use decisions, including general plan formulation and municipal service reviews.
13. Collaborate with local land use agencies to assess water supply availability for new development.

Selected References

Governor's Office of Planning and Research, Environmental Goals and Policy Report, November 2003.

Statutes of 2001 (California), ch 642. (Senate Bill 221), an act to amend § 11010 of the Business and Professions Code, and to amend § 65867.5 of, and to add §§ 66455.3 and 66473.7 to the Government Code, relating to land use. info.sen.ca.gov/cgi-bin/waisgate?WAISdocID=78704329921+8+0+0&WAISaction=retrieve

Statutes of 2001 (California), ch. 643. (Senate Bill 610), an act to amend § 21151.9 of the Public Resources Code, and to amend §§ 10631, 10656, 10910, 10911, 10912, and 10915 of, to repeal § 10913 of, and to add and repeal Section 10657 of the Water Code, relating to water. info.sen.ca.gov/pub/01-02/bill/sen/sb_0601-0650/sb_610_bill_20011009_chaptered.html

Statutes of 2002 (California), ch. 1016. (Assembly Bill 857), an act to amend §§ 13102, 13103, 65041, 65042, 65048, 65049, and 66037 of, and to add §§ 65041.1 and 65404 to, the Government Code, relating to state planning. info.sen.ca.gov/cgi-bin/waisgate?WAISdocID=78698629691+3+0+0&WAISaction=retrieve