San Diego County
Water Authority

Strategic Plan

SAN DIEGO COUNTY WATER AUTHORITY

APRIL 2008

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LETTER OF TRANSMITTAL

The Board of Directors of the San Diego County Water Authority is pleased to present this strategic plan to our member agencies and the residents of our service area. This document and subsequent updates, will guide the Board in setting the Water Authority's strategic policies over the next 25 years. We acknowledge the water challenges and opportunities that face the region and have selected three key result areas on which to focus and base our priorities. These include 1) Water Supply Diversification, 2) Leadership, and 3) Asset Management. Each key result area (KRA) consists of a statement of the issues, strategies surrounding the issues, and one or more measurable objectives.

The Board studied past trends and current issues. They affirmed the current mission, sharpened the vision, and expanded the values statement to support new partnerships and increased communication. All this investment in planning is directed toward the challenges we face in providing water to our members, capturing every advantage and opportunity presented, and positioning the region for a bright, prosperous future.

BACKGROUND

In 1995 the San Diego County Water Authority created its first strategic plan to guide the Board in making policy, and staff in implementing the policy. Since 1995 various subordinate planning documents were created that gave the Water Authority the direction necessary to successfully move forward for the next ten years. While we have a robust and active five-year business plan, in 2007 the Board decided it was time to update the strategic plan and bring both plans into alignment.

In February 2007 the Board formed a Strategic Plan Ad Hoc Committee to review the 1995 Strategic Plan and recommend an update process. The Ad Hoc Committee reviewed other public agency strategic plans to gain insight as to methodology, plan maintenance and performance tracking. The Committee also reviewed the Water Authority's existing 2011 Business Plan. The firm of LL Decker & Associates, Inc. was hired to facilitate the planning process and help develop the plan.

The Board met on October 11, 2007 to provide initial input on the elements of the plan. They subsequently met on February 14, 2008 to review and discuss the draft plan as developed by the Ad Hoc Committee.

PURPOSE AND APPROACH

The purpose of the San Diego County Water Authority Strategic Plan is to develop a clear picture of the future from the Board's perspective as a policy making body. The Plan sets into writing a vision of what the Water Authority will be over the long term - 25 years from now. It identifies the key result areas of critical concern that the Board must address if it is to be successful, and provides management and staff with clear policy direction.

OBJECTIVES OF THE STRATEGIC PLAN

The objectives of the San Diego County Water Authority Strategic Plan are to...

- Identify the business factors (strengths, weaknesses, opportunities and threats) that will affect the Water Authority Board over the next 25 years.
- Update the mission, vision, values and guiding principles to guide the Water Authority's Board of Directors and staff.
- Identify and develop a limited number of key result areas (goals) on which the Water Authority Board will focus.
- Provide clear policy direction for the organization.

ANALYSIS OF BUSINESS TRENDS

A number of trends will drive the Water Authority over the 25-year planning period.

Technology and Energy
Technology is ever changing and rapidly advancing. While we recognize that the cost of water will continue to rise with inflation and limited supplies, new technologies, such as those associated with the development and treatment of desalinated water, may reduce the relative cost of that new water. Likewise, energy costs represent a significant portion of the cost of water. Technology improvements in how we pump and convey water will not only increase operating efficiencies but may also reduce energy costs potentially resulting in lower water costs.

Climate Change
For whatever reason, climate change is taking place. The present trend throughout the state, country and the world can no longer be ignored. It's getting warmer and

drier, and ocean levels are rising. While precipitation may remain constant, snowfall in the Sierras is occurring later, melting earlier and the snow pack is lessening. Our historical climate modeling fails to adequately predict the future, and California now mandates that government agencies address climate change impacts and reduce their carbon footprint.

Intergovernmental Arena
The nexus between growth and water is an ongoing and important discussion. Growth in the San Diego region has been significant in the past decade. As a result, the region is trying to identify better ways to put into place critical infrastructure such as water and transportation, to address current and future needs.

It is important that the Water Authority continue to communicate, cooperate and collaborate with local and regional land-use agencies. While statutory authority to mandate water conservation and encourage efficient water use policies is in the Water Authority's interest, gaining that authority would be a lengthy and difficult task.

Limited Traditional Water Supplies
Our traditional sources of water supplies are limited and becoming less reliable. While these supplies represent the historically least-costly source water, climate changes, warmer temperatures, less precipitation and earlier runoff in the spring may negatively impact these traditional water sources. While these traditional supplies will always be the core of our regional water supply, they will comprise a smaller percentage of our future portfolio.

Increasing Cost of Water
Scarcity of water supplies, increased competition for water, and the increasing energy cost of conveying that water will have an impact on water rates. Recent judicial decisions have given rate-payers greater power to challenge water rates. This means that the cost of water will come under greater scrutiny. In the foreseeable future, the unit cost of water will continue to increase - new supplies will cost more than existing supplies. New technology may reduce some of this cost of new water, but the trend for water rates to increase is still a safe prediction.

Conveyance and Environmental Issues
While new water supplies could be procured, there are significant costs and environmental challenges to conveying that water to the San Diego region. This would require close coordination and negotiation with MWD and the State Department of Water Resources.

Desalination
Desalination will become a necessary source of potable water in the future. While real barriers to turning seawater and brackish groundwater into fresh water exist, the process represents a viable source of new water for the region. Improved technology has increased efficiencies and reduced the unit cost of desalination. Economies of scale will continue to improve the cost effectiveness of desalination relative to other

resource options. As supplies of traditional water become scarce, this new water source will become increasingly important in meeting the needs of the region.

Water Reuse

All the water that ever was on this Earth is still here being used over and over again. Recycling is part of the natural water cycle. Water can be reused safely and economically and should be included as part of our sustainable water supply portfolio. The key to successful water reuse is infrastructure for treatment and distribution. The Water Authority is an agency advocate for reclaiming and reusing water. Reuse is part of the region's Urban Water Management Plan. It is more important than ever to beneficially reuse our treated water supply.

Current Water Allocations

Current water sources - the State Water Project, Colorado River and other sources within California - are under pressure. As these resources become scarcer, the potential for competition and conflict will increase. The result will be the need to look at water in a new and cooperative manner whereby agencies partner for the benefit of all. Voluntary water transfers may become more common and play a significant role in dry and normal weather conditions.

Integrated Public Policies

Regional agencies need to work toward the integration of policies affecting energy, housing, transportation, and water quality and supply. Working to clarify policies to ensure that all public agencies are working in a consistent direction is in the best interest of the public.

Public / Private Partnerships

The Water Authority has successfully engaged in partnerships with its member agencies and private sector organizations in the past (e.g. Twin Oaks Valley Treatment Plant; Helix Water Treatment Plant). When cost-effective and feasible, the Water Authority and its member agencies will identify and evaluate opportunities for collaboration with each other and/or with private enterprises to provide services and supplies.

Human Resources and Workforce Planning

The Water Authority is viewed as a progressive and business-oriented employer. Like many water agencies, our managers and staff are approaching retirement; others are looking for advancement. The Water Authority must attract and retain experienced professionals to be competitive in the future.

STRATEGIC DIRECTION

MISSION STATEMENT

The mission of the Water Authority is to provide a safe and reliable supply of water to its member agencies serving the San Diego region.

VISION OF THE FUTURE

In partnership with member agencies and stakeholders, meet the region's water supply needs by:

- providing a safe and reliable water supply,
- diversifying the region's water supply sources, and
- building, maintaining and operating critical water facilities in a cost effective and environmentally sensitive manner.

ORGANIZATIONAL VALUES

- We will consider our partner agencies' and stakeholders' interests in our decisions.
- We will do our work in the most cost-effective ways.
- We will have open communications with the partner agencies and the public.
- We will have an open and inclusive policy development process.
- We value diversity in the water supply.
- We value long-range planning.

KEY RESULT AREAS (KRAS)

The following three key result areas reflect the "vital few" business issues that will "make or break" the San Diego County Water Authority in the future.

KRA 1: Water Supply Diversification
- Strategy 1 – Conservation
- Strategy 2 – Desalination
- Strategy 3 – Non Potable Reuse
- Strategy 4 – Water Transfers

KRA 2: Leadership
- Strategy 1 – Political Influence
- Strategy 2 – Regional Growth and Development
- Strategy 3 – Public Awareness
- Strategy 4 – Workforce Planning

KRA 3: Asset Management
- Strategy 1 – Facilities Planning
- Strategy 2 – Capital Financing
- Strategy 3 – Facilities Operation & Maintenance

KEY RESULT AREA 1 – WATER SUPPLY DIVERSIFICATION

KRA Statement

The Water Authority and its member agencies work in partnership to assure a reliable water supply for the region. The Water Authority is responsible for imported water while the member agencies are largely responsible for the development of local supplies.

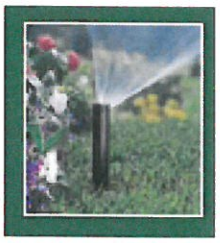
The Water Authority can make current water sources last longer and go further by encouraging conservation. It can actually expand water supplies by developing more effective reuse options. It can also ensure that additional opportunities are available to the San Diego region by encouraging desalination and groundwater projects.

Strategy 1: Conservation

Conservation has been a traditional part of the Water Authority's role. Outdoor water use accounts for almost 60% of the urban residential water used in the region. Changing public attitudes toward outdoor use will save significant volumes of water. To some degree, water conservation will occur in response to market forces; increased water prices may drive people to conserve. But pricing is not enough, and water rates and pricing signals can not provide the full answer. Every gallon of water saved is a gallon that doesn't have to be imported into the region.

Objectives:

By January 1, 2010 all municipal water agencies within the Water Authority service area will approve, implement and enforce substantially uniform outdoor water conservation standards within their statutory authority.



By January 1, 2015 the average regional residential per capita water consumption will be reduced by 10% from the current 10-year regional average.

By January 1, 2015 75% of the region's residents can identify water conservation as one of their most important civic obligations.

We know we have been successful when...

- By 2020 the 10-year average for overall per capita water use will be 170 gallons per day or less.

Strategy 2: Desalination

The Pacific Ocean is an untapped local water resource, and is a critical component of our water supply diversification strategy. All that has to be done is to find a way to remove the salt, dispose of the brine, and deliver it to the users at a price they can afford. Brackish groundwater is also an underutilized resource. There are a variety of barriers to making desalination of ocean and groundwater a reality including regulatory and environmental factors. Even so, seawater and brackish groundwater are resources worthy of our pursuit. The Water Authority is committed to incorporating desalination as part of the region's water portfolio. We will closely monitor the research and development of desalination technologies and take an active role in project development.

Objectives

By January 1, 2020 the Water Authority will have facilitated and/or developed local seawater and brackish groundwater desalination facilities that represent 10% of the region's total water supply requirements.

We know we have been successful when...

- Ten percent of our water portfolio comes from seawater and brackish groundwater.
- The production goals as established in the Urban Water Management Plan are met.

Strategy 3: Non Potable Reuse

Recycled water can be used safely as part of our water supply portfolio and the general public already supports the concept of its use. This source of water will be particularly important in the future since it is sustainable. The key barrier to using non potable water is the cost of the infrastructure needed to convey the resource to where it's needed and can be used. We need more "purple pipes."

Objectives

By January 1, 2025 the member agencies, with the assistance of the Water Authority, will supply at least 6% of the region's total water supply through non potable reuse.

We know we have been successful when...

- Member agencies exceed their production goals by 4% as established in the Urban Water Management Plan.

Strategy 4: Water Transfers

The uncertainties of climate conditions and fluctuations in core supplies dictate that the Water Authority continue to look for innovative water transfer opportunities. We need to extend our water transfer portfolio to include spot market, dry year, and groundwater banking transfers.

Objectives

By January 1, 2010 obtain 30,000 AF/year of short-term water transfers and groundwater banking to meet dry year supply needs.

We know we have been successful when...

- We are able to meet the region's water demands during multiple dry years through supplemental supplies from outside the region.

KEY RESULT AREA 2: LEADERSHIP

KRA Statement:

As a policy body, the Water Authority Board must position itself to assert influence within local political jurisdictions, within the county, in Sacramento, in the seven basin state region, and in Washington, D.C. Our policy agenda must be clear, our voice strong and our resolve unwavering in positioning the Water Authority and member agencies. All Board members and executive management must be knowledgeable of and involved in water issues and policies and be willing to step up when asked to advance the Water Authority's interests. The Water Authority must assure the continuation of effective policy and executive leadership.

It is this group's responsibility to ensure that the region has an ample water supply, and to provide information and guidance to policy makers fostering smart decisions about local growth and regional water issues.

Strategy 1: Political Influence

The Board must take the opportunity to assert leadership and expend political capital to tell our story and advance our agenda to elected officials and business interests at the federal, state and local level. The Water Authority must assume a higher profile on critical issues and begin dialog with a broader group of capable, innovative leaders and problem solvers. We must be on the "front-end" of policy-making particularly as it relates to our major supply sources such as the Colorado River and State Water Project.

Objectives

By June 30, 2009 adopt and implement a biennial water policy agenda directed toward MWD, the state, seven basin states, and various federal agencies.

By January 1, 2010 and every two years after, the Authority Board and staff will conduct a series of informational presentations for agency boards and other interested local officials to provide a comprehensive overview of Water Authority issues and the region's water supply.

By January 1, 2010 at least 75% of the region's local government policy makers understand the importance of connecting development with good water policy, support the Water Authority's long term direction, and endorse water conservation.

We know we have been successful when...

- Water Authority Board members are recognized as influential leaders outside of the San Diego region regarding water issues.
- We have developed programs with the other basin states and Mexico that would allow more water deliveries to Southern California during dry and normal years.
- Southern California receives adequate water supplies from the State Water Project.
- State water bond funding is primarily dedicated to projects that result in new and/or more reliable water supply.
- We have frequent and ongoing interaction with other public agencies maximizing cooperative programs for sharing resources.

Strategy 2: Regional Growth and Development

The Water Authority will use its political capital to ensure adoption of uniform local development standards promoting water use efficiency. We believe it's in the region's best interest that the Water Authority leadership becomes more visible in policy discussions on the need to grow in a manner that is water efficient. In this way, local policy makers will have informed discussions about water supply reliability, the efficient use of water, the impacts of growth, and the consequences of those decisions on water supply and reliability.

Objectives:

By January 1, 2009 the Water Authority will approve a regional landscape model ordinance to be adopted by local land-use agencies to apply to new residential and commercial construction projects and major improvements to existing developments.

By January 1, 2010 encourage local land-use agencies to enforce the model outdoor water program.

By January 1, 2015 encourage local land-use agencies to adopt development standards and programs that reduce the average per capita water consumption for that jurisdiction.

We know we have been successful when...

- All local land-use agencies have adopted and are enforcing the model outdoor water use ordinance.

Strategy 3: Public Awareness

The Water Authority, its member agencies, and the Metropolitan Water District, must all inform and involve the region's residents and businesses on water issues. The water industry is complicated. It's based on longstanding historical precedents, federal and multi-state legal judgments, court decisions and even Indian treaties. Very few members of the regional community understand where their water comes from or how it's delivered to their tap.

In the future, water is going to be more expensive and may take a greater percentage of the average family's total income. Additionally, our water supply will,

by necessity, become more diverse and include sources such as reclaimed water and desalination.

The Water Authority and member agencies need to coordinate their efforts to increase public awareness of their missions and gain support for their supply diversification efforts as well as investments in regional and state-wide infrastructure.

Objectives:

By January 1, 2012 periodic public surveys show continuing increases in public support for Water Authority programs.

By January 1, 2012 a majority of residents will know, understand and believe that indirect potable reuse is already part of the existing water supply, and is a safe and acceptable part of the region's water supply.

By January 1, 2015 create broad public support for and awareness of issues surrounding water, water resources, and water infrastructure.

We know we have been successful when...

- There is ongoing public support for Water Authority programs.
- Indirect potable reuse water is part of our treated drinking water supply.
- Overall per capita water use declines.
- There is public support of capital improvements and water rate increases.
- Key stakeholders and the public support wise water policies and an ethic of water being a limited resource rather than just a commodity.

Strategy 4: Workforce Planning

Demographic trends indicate that there will be a critical shortage of skilled workers developing nationally and locally over the next decade. In addition, fewer young people are entering the public sector workforce to replace them. Workforce planning strategies need to address recruitment and retention issues related to a growing CIP, retirement eligibility of approximately one third of the staff, and the need for specialized skill sets within a competitive labor market.

Objectives:

By June 30, 2010 the Water Authority will revisit the work force management issues identified in the Water Authority Business Plan.

We know we have been successful when...

- Employee turnover is less than 6% after factoring out retirements.
- Staff development initiatives result in existing staff being fully qualified to compete for promotional opportunities.

KEY RESULT AREA 3: ASSET MANAGEMENT

KRA Statement:

The single largest factor in the Water Authority's portion of retail water rates is the cost to build, operate and maintain the water delivery infrastructure. We have over $1.8 billion invested in facilities, today, and another $3.5 billion planned, designed or under construction. It is estimated that the total system is worth over $3 billion including land. Many of these new facilities are much more complex and costly to operate and maintain than the pure pipeline systems of the past. As these new facilities come on line, the Water Authority will need to implement more sophisticated approaches to manage and operate the water system.

Strategy 1: Facilities Planning

The Water Facilities Master Plan describes the water infrastructure projects required to meet the region's needs through 2030. Most of the projects included in the Master Plan advance member agency investments in treatment plant capacity, diversification, and system reliability. All the other projects either replace, protect or enhance existing capital investments. While many capital projects can be anticipated, new projects and challenges that are currently unplanned will occur.

Objectives:

By January 1, 2012 update the Water Facilities Master Plan in conjunction with the 2015 Urban Water Management Plan.

We know we have been successful when...

- The Board has adopted a facilities plan that intends to meet the demands of our member agencies in the most cost effective manner.

Strategy 2: Capital Financing

The Board's fiduciary responsibility includes creation, adoption and oversight of the Long Range Financing Plan. Continuing a well-planned debt financing and investment strategy can save the Water Authority significant money over the long

term but that strategy must be integrated with other asset management elements. There must be balance between efficient debt financing strategies and the timely construction, maintenance, rehabilitation, and replacement of capital assets.

Objectives:

By June 30, 2008 prepare a Long Range Financing Plan to determine the best fit and structure of an upcoming debt issue. Take into account such issues as reserves, bond ratings, coverage ratios, insurance and political climate, to position the Water Authority to achieve the minimum net cost of funds when debt financing capital improvements.

By June 30, 2010 conduct outreach programs to investors and credit rating agencies to assure them of our financial stability and ability to pay our obligations.

We know we have been successful when...

- Our capital financing rates are competitive.
- The Water Authority's water rate increases to our retail agencies are smooth and predictable.

Strategy 3: Facilities Operation & Maintenance

Effective asset management means that the operation, maintenance, rehabilitation, and replacement of capital facilities and infrastructure occurs at the right time and in the right ways; represents the best value to our customers; and meets or exceeds stakeholders' expectations. An integrated asset management program will enhance our ability to 1) systematically appraise performance, risk, and new technologies, and, 2) determine the most cost effective and reliable ways to manage current capital infrastructure.

Objectives:

By January 1, 2009 adopt an integrated asset management plan that will be used to support all budget proposals related to water assets for the next two-year budget.

By January 1, 2010 the Water Authority Board of Directors will adopt a policy regarding funding of asset replacement.

We know we have been successful when...

- System reliability meets member agency requirements.
- We have agreed on the funding mechanisms we will use to replace our capital assets.

MONITORING / EVALUATION

We will use the following methods to monitor our progress.

- The Strategic Plan will be updated no less than every five years in anticipation of updates to the Business Plan.
- The Board may, if significant changes in the business environment warrant consideration, update individual portions of the Strategic Plan as needed.
- Every two years a briefing on the status of the Strategic Plan will be given to new officers and committee chairs as they are installed. Committee chairs will subsequently give the full Board a briefing on the status and accomplishments of the Strategic Plan.
- Once approved and adopted, the Board of Director's Strategic Plan will be monitored as part of the normal Business Plan evaluation. In order to assure linkage and coordination with other business planning efforts, there will be annual assessment of the Plan's metrics, and a review of how the organization's business plans align with the Board's Strategic Plan.
- The Water Authority will make information about the performance of the plan available to stakeholders and the public on line. To view current performance, click here.

San Diego County Water Authority
Operations & Maintenance Department

Lake Hodges Projects
Reservoir Regulation Manual

Manual 2008-1

April 2008
Final

San Diego County Water Authority
Operations & Maintenance Department

Manual 2008-1
Lake Hodges Projects
Reservoir Regulation Manual

April 2008
Final

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Authority upon completion of the Lake Hodges Projects facilities. After completion of the San Vicente Dam Raise project, the Water Authority will obtain 20,000 acre-feet (AF) of storage rights in Lake Hodges. This RRM primarily addresses operation of the reservoir after the completion of the San Vicente Dam Raise project.

Nothing in this RRM is meant to supersede requirements and provisions of agreements and provisions of agreements between the Water Authority and the City or between the City and the San Dieguito Water District/Santa Fe Irrigation District (collectively referred to as the "Districts"), related to Lake Hodges operations.

1.2 Intended Users

The information in this document is primarily for the use of the Operations and Maintenance (O&M) staffs of the Water Authority and City.

1.3 Scope

The scope of this RRM complies with the requirements of Section 9.2 of the Joint Use Agreement with the addition of hydroelectric pumped storage operations. This RRM is divided into five areas, as follows:

1. Background Information – Sections 1, 2, and 3: These sections present introductory information relevant to the RRM, background on the ESP and how the Lake Hodges Projects fit into the ESP, and information on sources of water that enter Lake Hodges.

2. Measurement of Reservoir Storage Gains and Losses – Sections 4 and 5: These sections present information on the physical control and measurement of water deliveries to and from reservoir storage and the procedures for determining reservoir storage volume at any point in time taking into account the many variables that can cause an increase or decrease in reservoir storage.

3. Reservoir Capacities, Pools, and Operating Requirements – Section 6: This section presents information on reservoir capacities and storage pools, ownership of capacity, and reservoir operating requirements.

4. Water Control Plans – Section 7: This section presents information on development of an annual operating plan and pumped storage operating plan, as well as a water supply emergency operating plan.

5. Water Control Management – Section 8: This section presents information on water management responsibilities, and accounting for ownership of storage in the reservoir.

characteristics of the reversible pump/turbines have been set to allow operation in either the pumping or generating mode with Lake Hodges at El 290 or higher, and to allow pumping limited to emergency conditions with Lake Hodges at El 280 or higher.

2.4 Operating Conditions

2.4.1 Normal Conditions

2.4.1.1 General

Normal conditions consist of water supply operations and pumped storage operations. Water supply operations typically require large fluctuations of Lake Hodges storage over the course of a year, and are typically viewed on a month-to-month, or seasonal basis. On the other hand, pumped storage operations for generation of electricity by use of the OHPS facilities consist of day-to-day exchanges of Lake Hodges water and Olivenhain Reservoir water, with no net weekly change in the storage amounts in either reservoir. Each type of normal operation of Lake Hodges is discussed below.

2.4.1.2 Water Supply Operations

Lake Hodges has historically received all of its water supply from local runoff. With construction of the Lake Hodges Projects, Lake Hodges will be hydraulically connected to Pipeline 5 of the Water Authority's Second Aqueduct. A schematic of the Olivenhain/Hodges conveyance system is shown in Figure 2.2.

Water in Lake Hodges has historically only been used by the Districts. The water flows by gravity through existing conveyance facilities that originate at Lake Hodges Dam. Water delivered is treated by the Districts at the Badger Water Treatment Plant. Use of the existing facilities will continue as a separate function from the Hodges/Olivenhain conveyance system.

Under normal operations, filling of Lake Hodges from runoff can be supplemented as needed with imported untreated water supplies from MWD via Pipeline 5 in the following manner. Untreated water in Pipeline 5 can be delivered to Olivenhain Reservoir either by gravity flow or by pumping using the Olivenhain Pump Station. The decision to use gravity versus pumped flow will depend on the elevation of the hydraulic grade in Pipeline 5, water surface elevation of Olivenhain Reservoir, and the flow rate desired. Olivenhain Reservoir water can then be delivered to Lake Hodges by gravity via the LHOP.

Water in Lake Hodges can also be pumped to Olivenhain Reservoir, where it can be delivered in turn to Pipeline 5 and/or to the Olivenhain Municipal Water District's water

treatment plant (OWTP). Deliveries of Olivenhain Reservoir water (now a mixture of Lake Hodges water and Olivenhain Reservoir water) to the OWTP would be by gravity, and deliveries to Pipeline 5 would be by gravity or pumping, depending on the hydraulic conditions.

Lake Hodges will continue to be used by the City, and Districts, to capture runoff to increase local water supplies. Another key function of the reservoir is to store regional emergency water supplies, made possible by construction of the Lake Hodges Projects. The reservoir can also be used for other normal water supply functions, such as for carryover storage and seasonal storage. Under normal operations, storage levels in Lake Hodges are expected to fluctuate seasonally. Withdrawal of water will generally take place in the late summer and early fall with the objective of maximizing local yield. Runoff, if it occurs, will typically increase storage levels in the winter and early spring. The reservoir will be filled as needed in the spring to provide adequate emergency water supplies for the summer peak demand period. This filling will occur by runoff, supplemented by imported water deliveries as needed.

The target storage levels in Lake Hodges for normal operations will be determined annually on the basis of numerous factors. These factors include the Water Authority's desired emergency storage amount which can vary with demand projections; the City's desired reservoir fluctuations to capture runoff, maintain emergency supplies, and utilize imported water programs; actual operating conditions of Olivenhain Reservoir; and other agreement conditions.

2.4.1.3 Pumped Storage Operations

Pumped storage operations require exchange of a relatively small volume of water (typically around 400 AF) between Lake Hodges and Olivenhain Reservoir. This exchange consists of delivery of water from Olivenhain Reservoir to Lake Hodges by gravity to generate electricity, generally during "on-peak" electrical demand periods - defined as a dispatch to generate. Generation is followed by pumping back of the same volume from Lake Hodges to Olivenhain Reservoir during "off-peak" electrical demand periods - defined as a dispatch to pump. These generation and pump back cycles result in no net weekly change in storage in either reservoir.

2.4.2 Emergency Conditions

2.4.2.1 Description of Emergency Events

A regional emergency event is a catastrophic interruption of imported water supplies, or any other emergency situation in which the Water Authority has insufficient water available to supply at least 75 percent of the total demand of its service area, or any

portion thereof. The Water Authority has identified two emergency scenarios that form the basis for planning and operation of ESP facilities: a two-month emergency event, and a six-month emergency event. These are described below.

2.4.2.2 Two-Month Emergency Event

The two-month emergency event is based on the occurrence of a major earthquake on the Elsinore Fault, located a few miles north of the Riverside-San Diego County line. In this scenario, the First and Second Aqueducts are assumed to be severed, thereby isolating San Diego County from MWD water supplies. Studies indicate (B&V, 1993) that pipeline failures of this magnitude may take approximately two months to repair. Therefore, in this scenario, San Diego County is assumed to be totally reliant on local and regional water supplies.

2.4.2.3 Six-Month Emergency Event

The six-month emergency event is based on a major earthquake on either the San Andreas or San Jacinto Faults that severs the aqueducts that convey imported water to Los Angeles and Riverside Counties. In this scenario, MWD would supply the Water Authority with a portion of the emergency water stored in Lake Skinner and Diamond Valley Reservoir. Under this scenario, MWD has estimated that it may take up to six months to repair the damage to their aqueducts and to reestablish normal supplies to the Water Authority.

2.4.2.4 Other Emergency Events

Other emergency scenarios that could possibly trigger the need for delivery of ESP supplies to Water Authority member agencies include, but are not limited to, the following:

- An earthquake event of lesser magnitude than assumed for the Elsinore or San Andreas/San Jacinto Fault scenarios, which results in less severe failures of conveyance facilities and shorter repair times, but nevertheless causes a need to use ESP supplies due to severe reductions in supplies.

- An earthquake event on one of the other regional fault zones (known or unknown), including the Rose Canyon and La Nacion faults. These events are predicted to cause less damage than the two- or six-month events, but may be expected to sever vital pipelines that serve the Water Authority service area.

- A flooding event that may cause a significant hazard to the pipelines at river and creek crossings, including the San Luis Rey River.

- Terrorism or similar deliberate act of sabotage directed at civil infrastructure and public services and utilities. Such scenarios may involve physical damage to

pipelines, equipment, facilities, and other related installations, or they might include biochemical or other hazardous material incursions that can render certain water sources and delivery systems unusable.

- A severe prolonged drought, which disrupts imported water deliveries.

runoff that cannot be captured within the Impound Capacity. The portion of the Surcharge Capacity between the maximum normal pool and the spillway crest provides temporary storage space for small increases in reservoir level due to wave action and wind set, as well as unanticipated overfilling of the reservoir due to pumped storage operations.

6.2.2 Storage Pool Descriptions

Total Pool* – The total volume of water physically present in Lake Hodges at any given time.

Regional Emergency Pool – Water controlled by the Water Authority, and reserved for use by the Water Authority in the event of a catastrophic interruption of imported water supplies, or any other emergency situation in which the Water Authority has insufficient water available to supply at least 75 percent of the total demand of its service area or any portion thereof.

Local Emergency Pool – Water controlled by the City for use during local emergencies as defined by City policies.

Carryover Pool – Water that is typically withdrawn during years of below normal availability of imported water and replenished during periods of above normal availability of imported water.

Seasonal Pool – Water that is typically withdrawn and replenished as per specific terms of imported water seasonal storage programs.

Discretionary Pool* – Water that is not contained in Dead Storage, Regional Emergency Pool, Local Emergency Pool, Carryover Pool, or Seasonal Pool. Water that occupies the Surcharge Capacity is also part of the Discretionary Pool.

Surcharge Pool* – Water that is contained above the maximum normal pool, El 314.

A depiction of reservoir capacity and storage pool zones is shown in Figure 6.1.

6.3 Capacity Ownership

The City owns Lake Hodges Dam and Reservoir and has full capacity rights until the completion of the San Vicente Dam Raise Project (as part of Phase 4 of the ESP) at which time the Water Authority will receive from the City the rights to 20,000 AF of storage capacity in Lake Hodges.

Following the completion of the Lake Hodges Projects, the Water Authority has the right to utilize City water in storage in Lake Hodges in the event of an emergency that adversely affects the water supply for the region, if the use of City water is deemed necessary by the Water Authority to meet the water supply needs of the region. A regional emergency is one in which the Water Authority has insufficient water available to supply at least 75 percent of the total demand of its service area or any portion thereof. The Water Authority will refill City water as soon as practical following the emergency event.

6.4 Reservoir Operating Requirements

Lake Hodges must be operated in accordance with the requirements and provisions of the following agreements, defined in Section 1.4 of this RRM:

- 1998 Joint Use Agreement – between the Water Authority and City
- 2003 Principles of Understanding – between the Water Authority and City
- 2003 Agreement for OHPS Project Operation – between the Water Authority and City
- 2004 MPPSA – between the Water Authority and SDG&E

The key aspects of these documents related to the operation of Lake Hodges are summarized in the following sections, separated by topic area:

- General
- Emergency Storage
- Pumped Storage Operations
- Operational Priorities

Where applicable, the source of an operating requirement or provision is contained in brackets at the end of the description of the requirement or provision.

6.4.1 General

The City is not obligated to maintain any minimum amount of storage in Lake Hodges, for emergency or any other purpose. The City may withdraw all City water from Lake Hodges. [1998 Joint Use Agreement]

operations, as opposed to transfer of water for seasonal filling and withdrawal from Lake Hodges.

Allowable pumped storage operating hours to stay within reservoir water level variation limits for both Lake Hodges and Olivenhain Reservoir are shown in Table 6.1 at the end of this chapter. In this table, operating hours are provided as a function flow.

6.4.3.3 MPPSA Operational Targets

Operational targets contained in the MPPSA are summarized below. These targets are essentially operational expectations conveyed to SDG&E so that pumped storage operations can be integrated with typical water supply management needs associated with Lake Hodges and Olivenhain Reservoir.

Target Water Levels

- From September to February, the target water levels in Lake Hodges and Olivenhain Reservoir are El 296 and El 1040, respectively.
- From May to June, the target water levels in Lake Hodges and Olivenhain Reservoir are El 311 and El 1078, respectively.
- Water level elevation transitions are targeted to occur in March/April for filling of Lake Hodges and July/August for withdrawals from Lake Hodges.
- The targeted water level of El 296 in Lake Hodges starting in September requires pumping of approximately 12,000 AF of water from Lake Hodges to Olivenhain Reservoir during the period from July 1 through August 31 of each year. These dates may be later as adjusted by the Water Authority to meet seasonal storage goals.

Pumping of Local Runoff

- The conveyance facilities may need to pump local water runoff from Lake Hodges to Olivenhain Reservoir to dispatch to the City and the Districts, at City's request, an estimated annual average of 5,700 AF each. The conveyance facilities may also need to pump local water from Lake Hodges to Olivenhain Reservoir to prevent or minimize spills from Lake Hodges.

Turnover Requirements

- The conveyance facilities must pump a minimum of 9,075 AF per year from Lake Hodges to Olivenhain Reservoir and then release the water to Lake Hodges to meet turnover requirements. The intent of this requirement is to allow Lake Hodges to be filled with aqueduct water (via

Olivenhain Reservoir) to promote water-quality in Lake Hodges.

Water Loss Replacement

- The Water Authority may release approximately 4,000 AF of water annually from Olivenhain Reservoir to Lake Hodges to replace evaporative and seepage losses.

Water Supply Emergency

- The pumped storage facility must have the ability to pump 20,000 AF of water from Lake Hodges to Olivenhain Reservoir in a two-month period.

6.4.4 Operational Priorities

First Operational Priority – The first operational priority is to maintain the respective emergency storage pools of the Water Authority and City. When both the Water Authority and City emergency storage pools are being filled at the same time they will be filled as commingled pools. This means that filling will be in proportion to the amount of emergency water needed to fill the respective emergency pools. [2003 Principles of Understanding]

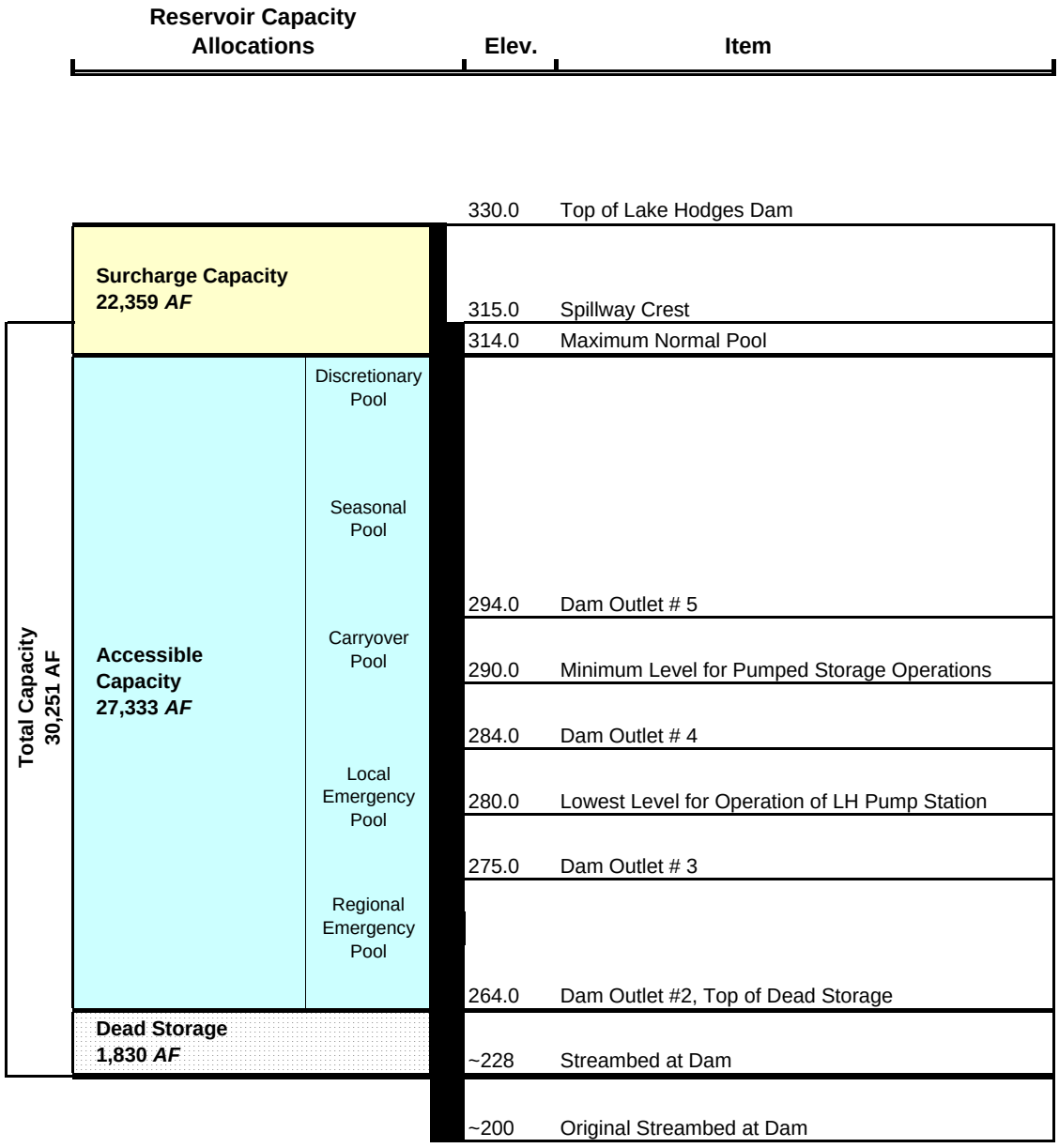
Second Operational Priority – Once the emergency storage pools are filled, the second operational priority will be to operate the City's non-emergency pool(s). However, if the Water Authority is unable to meet the total of the demands of the City and its other member agencies through its facilities that carry water to or from Lake Hodges, the Water Authority may limit the amount of water transported under this operational priority to the extent necessary to equitably meet the daily demands of its member agencies, including the City. The ability to convey City water for this second operational priority is based on the LHOP and LHPS&I/O facilities sized for a flow of 168 cfs, equivalent to the projected year 2030 maximum emergency flow through these facilities. The LHOP and LHPS&I/O facilities were actually constructed with a capacity greater than 168 cfs to allow for pumped storage operations. The Water Authority will allow the use of the additional flow capacity (capacity above 168 cfs) to move City water to the Aqueduct system only if the Water Authority determines that the capacity in excess of 168 cfs is available and not needed for other purposes. [2003 Principles of Understanding]

Third Operational Priority – The third operational priority will be to operate the Water Authority's non-emergency pool(s).

Fourth Operational Priority – The fourth operational priority will be to use OHPS Project facilities for pumped storage operations. Notwithstanding the above operational priorities, the maximum and minimum water surface elevations in Lake Hodges levels

Lake Hodges Reservoir Capacity and Elevation Data
Reservoir Regulation Manual

Not to Scale



Notes:
AF = acre-feet
Elev. = Elevation (NGVD, or Mean Seal Level Datum)
I/O = Inlet/Outlet
LH = Lake Hodges

Reservoir capacities based on bathymetric survey performed by Pelagos (1994)

A.1 Glossary

acre - a measure of area; equivalent to 43,560 square feet.

acre-foot (AF) - the volume of water, equal to the quantity required to cover an acre of area to a depth of one foot or 43,560 cubic feet, or 325,827 gallons.

Accessible Water Storage Capacity – The Total Capacity minus the Dead Storage. The top of the Accessible Water Storage Capacity is at El 314. Accessible Water Storage Capacity is used for operation of the following storage pools: Regional Emergency, Carryover, Seasonal, and Discretionary, also referred to as Accessible Capacity.

Carryover Capacity – The portion of the accessible water storage capacity specifically designated to contain the Carry-over Pool.

Carryover Pool – Water that is typically withdrawn during years of below normal availability of imported water and replenished during periods of above normal availability of imported water.

cubic feet per second - the flow rate of water equal to 724 acre-feet per year.

Dead Storage - Water that is located lower in elevation than the lowest inlet of the outlet works, or which otherwise cannot be accessed and utilized for water supply purposes.

Discretionary Pool – Water that is not contained in either Dead Storage, Regional Emergency Pool, Local Emergency Pool, Carryover Pool, or Seasonal Pool. Water that occupies the surcharge capacity is also part of the Discretionary Pool.

drawdown - the decrease in elevation of a lake or reservoir due to a release or discharge from the lake or reservoir.

Impound Capacity – The capacity in Lake Hodges from which water is withdrawn for the express purpose of being replenished with captured runoff from the Lake Hodges watershed. Impound capacity is utilized to achieve both local water supply and flood control purposes.

Local Emergency Pool – Water controlled by the City for use during local emergencies as defines by City policies,

Regional Emergency Pool – Water controlled by the Water Authority and reserved for use by the Authority in the event of a catastrophic interruption of imported water supplies, or any other emergency situation in which the Water Authority has insufficient water available to supply at least 75 percent of the total demand of its service area or any portion thereof.

Appendix B – Measurement Systems

B.1 Area Capacity Data and Curves

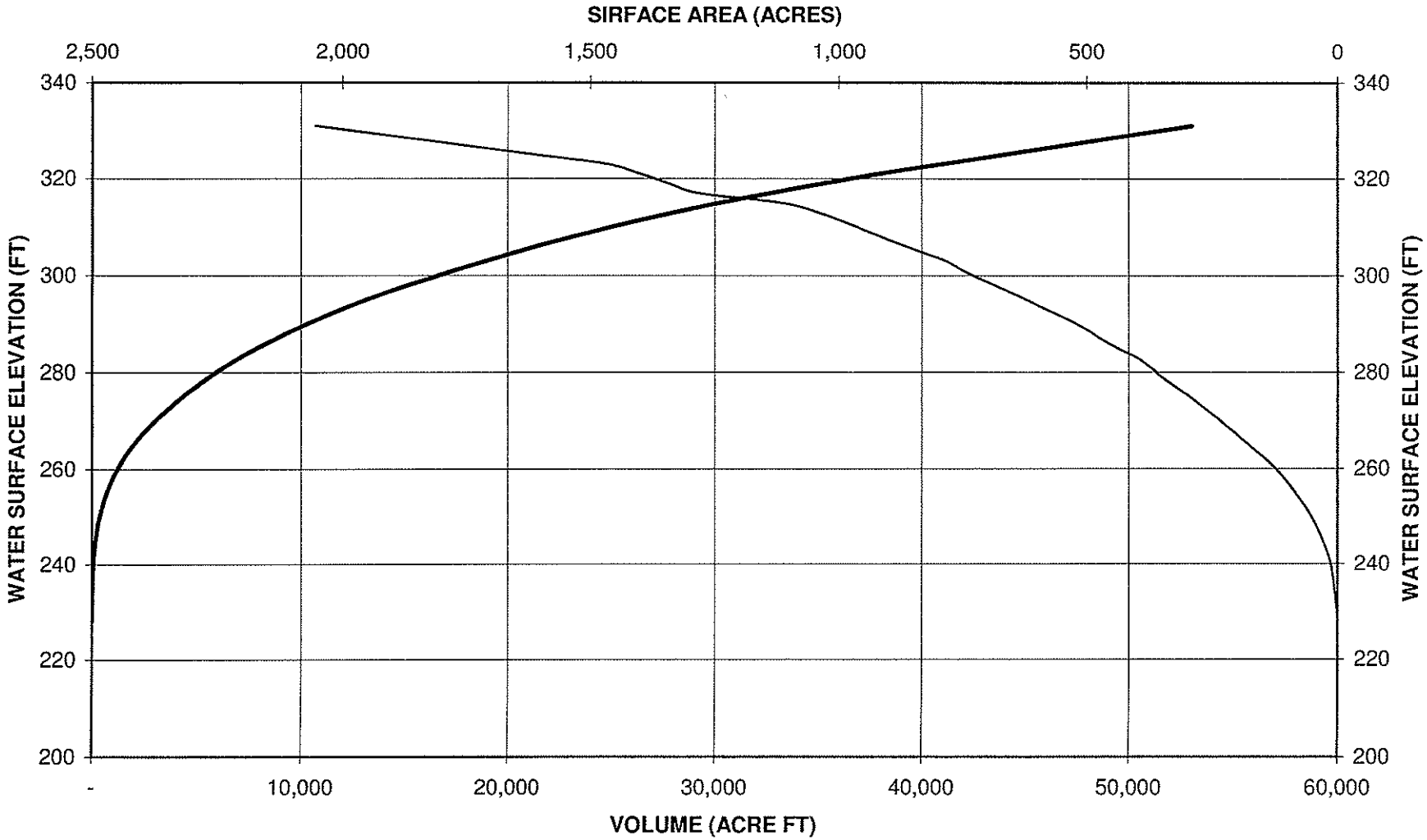
B.2 Spillway Discharge Rating

B.1 Area Capacity Data and Curves

APPENDIX B1
LAKE HODGES SURFACE AREA VOLUME CURVES

	Lake Hodges	
Elevation	Surface Area (acres)	Volume (acre ft)
228	0	0
230	1.5	0.8
235	6.6	18.9
240	14.3	65.6
245	30.1	171.7
250	52.9	371.4
255	84.1	709.6
260	123.5	1,225.7
265	178.9	1,980.5
270	234.5	3,015.3
275	295.0	4,336.7
277	324.0	4,953.8
279	351.1	5,627.5
281	374.4	6,350.8
283	401.4	7,123.9
285	440.3	7,961.5
287	475.7	8,880.2
289	505.4	9,861.5
291	542.4	10,907.9
293	584.8	12,035.9
295	624.0	13,242.0
297	666.1	14,527.6
299	709.9	15,986.1
301	751.7	17,450.2
303	784.8	18,969.9
305	838.1	20,546.8
307	891.1	22,259.6
309	939.4	24,074.5
311	987.9	26,003.9
313	1,041.5	28,075.6
315	1,114.0	30,250.7
317	1,282.7	32,714.2
319	1,342.6	35,288.0
321	1,402.5	38,046.1
323	1,466.0	40,974.6
325	1,613.1	43,988.2
327	1,760.2	47,001.8
329	1,907.3	50,015.4
331	2,054.4	53,029.0

APPENDIX B1
LAKE HODGES SURFACE AREA VOLUME CURVES



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B.2 Spillway Discharge Rating

Hodges Spillway Capacity

H (ft)	Q (cfs)	H (ft)	Q (cfs)
0.0	0	4.8	12,228
0.1	37	4.9	12,612
0.2	104	5.0	13,000
0.3	191	5.1	13,392
0.4	294	5.2	13,788
0.5	411	5.3	14,188
0.6	540	5.4	14,591
0.7	681	5.5	14,999
0.8	832	5.6	15,409
0.9	993	5.7	15,824
1.0	1,163	5.8	16,242
1.1	1,342	5.9	16,664
1.2	1,529	6.0	17,090
1.3	1,724	6.1	17,519
1.4	1,926	6.2	17,951
1.5	2,136	6.3	18,387
1.6	2,353	6.4	18,827
1.7	2,577	6.5	19,270
1.8	2,808	6.6	19,716
1.9	3,045	6.7	20,166
2.0	3,289	6.8	20,619
2.1	3,539	6.9	21,076
2.2	3,794	7.0	21,535
2.3	4,056	7.1	21,998
2.4	4,323	7.2	22,465
2.5	4,596	7.3	22,935
2.6	4,875	7.4	23,407
2.7	5,159	7.5	23,883
2.8	5,448	7.6	24,363
2.9	5,743	7.7	24,845
3.0	6,042	7.8	25,331
3.1	6,347	7.9	25,819
3.2	6,656	8.0	26,311
3.3	6,971	8.1	26,806
3.4	7,290	8.2	27,304
3.5	7,614	8.3	27,805
3.6	7,943	8.4	28,309
3.7	8,276	8.5	28,816
3.8	8,614	8.6	29,326
3.9	8,956	8.7	29,839
4.0	9,302	8.8	30,355
4.1	9,653	8.9	30,874
4.2	10,009	9.0	31,396
4.3	10,368	9.1	31,920
4.4	10,732	9.2	32,448
4.5	11,100	9.3	32,978
4.6	11,472	9.4	33,512
4.7	11,848	9.5	34,048

Note: Depth 15 ft. correspondes to crest of dam.

Hodges Spillway Capacity

H (ft)	Q (cfs)	H (ft)	Q (cfs)
9.6	34,587	12.4	50,774
9.7	35,129	12.5	51,389
9.8	35,673	12.6	52,007
9.9	36,221	12.7	52,627
10.0	36,771	12.8	53,250
10.1	37,324	12.9	53,875
10.2	37,880	13.0	54,503
10.3	38,438	13.1	55,133
10.4	38,999	13.2	55,766
10.5	39,563	13.3	56,400
10.6	40,130	13.4	57,038
10.7	40,699	13.5	57,677
10.8	41,271	13.6	58,319
10.9	41,845	13.7	58,964
11.0	42,422	13.8	59,611
11.1	43,002	13.9	60,260
11.2	43,584	14.0	60,911
11.3	44,170	14.1	61,565
11.4	44,757	14.2	62,221
11.5	45,347	14.3	62,879
11.6	45,940	14.4	63,540
11.7	46,535	14.5	64,203
11.8	47,133	14.6	64,869
11.9	47,734	14.7	65,536
12.0	48,337	14.8	66,206
12.1	48,942	14.9	66,878
12.2	49,550	15.0	67,553

Note: Depth 15 ft. correspondes to crest of dam.

TABLE C.1
MAJOR PHASES OF LAKE HODGES RESERVOIR OPERATIONS

	Initial Phase Lake Hodges Projects Completion through SVPL Completion	**Intermediate Phase** SVPL Completion through SV Dam Raise Completion	**Long Term Phase** After SV Dam Raise Completion
Approximate Dates	**Mar 2009 thru Dec 2010**	**Jan 2011 thru Nov 2012**	**After Nov 2012**
Water Authority Capacity Ownership in Lake Hodges	**None** ▪ Water Authority allowed to store water in unused City capacity ▪ Water Authority water spills in proportion to its storage volume versus the total reservoir volume	**None** ▪ Water Authority allowed to store water in unused City capacity ▪ Water Authority water spills in proportion to its storage volume versus the total reservoir volume	**20,000 AF** ▪ Water Authority's 20,000 AF does not spill
Emergency Storage Need in Lake Hodges	**High** ▪ Limited access to San Vicente Reservoir storage ▪ Lake Hodges needed to serve all of Water Authority's service area	**Moderate** ▪ SVPL allows increased access to San Vicente Reservoir storage ▪ Lake Hodges needed to primarily serve northern portion of Water Authority service area	**Moderate & Increasing** ▪ Lake Hodges needed to serve Water Authority's northern service area ▪ Demands increase over time.
Water Quality Considerations	**Assess Mitigation Effectiveness** ▪ Assess dilution effect due to initial filling from Olivenhain Reservoir ▪ Assess air eductor effect on Dissolved Oxygen levels and mixing ▪ Assess pumped storage effects on mixing in Olivenhain & Hodges ▪ Assess need for additional mitigation and modify action plans as needed	**Additional Mitigation, If Needed** ▪ Continued learning ▪ Need for additional mitigation better defined ▪ Additional mitigation implemented, if needed ▪ Assess water treatment plant capabilities and adjust thresholds	**Predict and Manage** ▪ Water quality more predictable ▪ Systems in place to appropriately manage and control water quality

SV = San Vicente
SVPL = San Vicente Pipeline

TABLE C.2
LAKE HODGES RESERVOIR OPERATING PLAN FOR 2009
MONTHLY STORAGE TARGETS

Storage Volume in Acre-Feet (AF)

Pool Designation		2009												2010
		Jan 1	Feb 1	Mar 1	Apr 1	May 1	Jun 1	Jul 1	Aug 1	Sep 1	Oct 1	Nov 1	Dec 1	Jan 1
Total Pool Range	Maximum	10,385	10,385	12,820	21,574	27,655	27,655	27,655	27,655	27,655	24,364	16,279	10,699	10,385
	Minimum	10,385	10,385	10,385	13,371	22,895[2)]	26,004	26,004	26,004	26,004	16,791	10,385	10,385	10,385
Target Pool for City Storage		7,000	7,000	7,000	10,000	15,000	20,000	15,000	10,000	7,000	7,000	7,000	7,000	7,000

Notes: Mid Month Storage Targets
1) Maximum Total Pool = 27,655 AF on April 20
2) Minimum Total Pool = 26,004 AF on May 10

Reservoir Elevation in Feet, Mean Sea Level Datum

Pool Designation		2009												2010
		Jan 1	Feb 1	Mar 1	Apr 1	May 1	Jun 1	Jul 1	Aug 1	Sep 1	Oct 1	Nov 1	Dec 1	Jan 1
Total Pool Range	Maximum	290.0	290.0	294.3	306.2[1)]	312.6	312.6	312.6	312.6	312.6	309.3	299.4	290.6	290.0
	Minimum	290.0	290.0	290.0	295.2	307.7[2)]	311.0	311.0	311.0	311.0	300.1	290.0	290.0	290.0
Target Pool for City Storage		282.7	282.7	282.7	289.3	297.6	304.3	297.6	289.3	282.7	282.7	282.7	282.7	282.7

Notes: Mid Month Reservoir Elevation Targets
1) Maximum Total Pool = Elevation 312.6 on April 20
2) Minimum Total Pool = Elevation 311.0 on May 10

TABLE C.3
PRIMARY WATER QUALITY PARAMETERS -
LIMITS ON DELIVERY OF OLIVENHAIN RESERVOIR WATER

Water Quality Parameter	Manganese	Total Organic Carbon	Specific Ultraviolet Absorbance	Turbidity	Total Coliforms	Bromide	2-Methylisoborneol	Geosmin
Symbol	Mn	TOC	SUVA	Turbidity	Total Coliforms	Bromide	MIB	Geosmin
Units	ppb	mg/L	L/mg-m	NTU	cfu/100 ml	mg/L	ng/l	ng/l
Measurement Frequency	Monthly	Monthly	Weekly	Hourly	Weekly, but change to daily if measurement exceeds 1,000 cfu/100 ml	Monthly	Weekly	Weekly
Measurement Type	Running 90-day average	Single measurement	Single measurement	Running 24-hour average	Single measurement	Running 90-day average	Single measurement	Single measurement
Conserved Parameter? *	No	No	No	No	No	Yes	No	No
Limits	No amount in the blend that exceeds 30 ppb	No increase of greater than 15% of imported water TOC	No increase of greater than 15% of imported water SUVA and no increase that would cause the blend to exceed 2 L/mg-m	No increase of greater than 30% of imported water turbidity	Less than the amount in the blend that would result in CDHS requiring a level of treatment or disinfection that is more stringent than would be required for the imported water supply	No increase of greater than 15% of the imported water supply	No amount in the blend that would result in an increase of more than 15% of the imported water or cause the blend to exceed 7 ng/l	No amount in the blend that would result in an increase of more than 15% of the imported water or cause the blend to exceed 7 ng/l

The following three delivery scenarios trigger the use of the above water quality limits after introduction of Lake Hodges water into Olivenhain Reservoir:

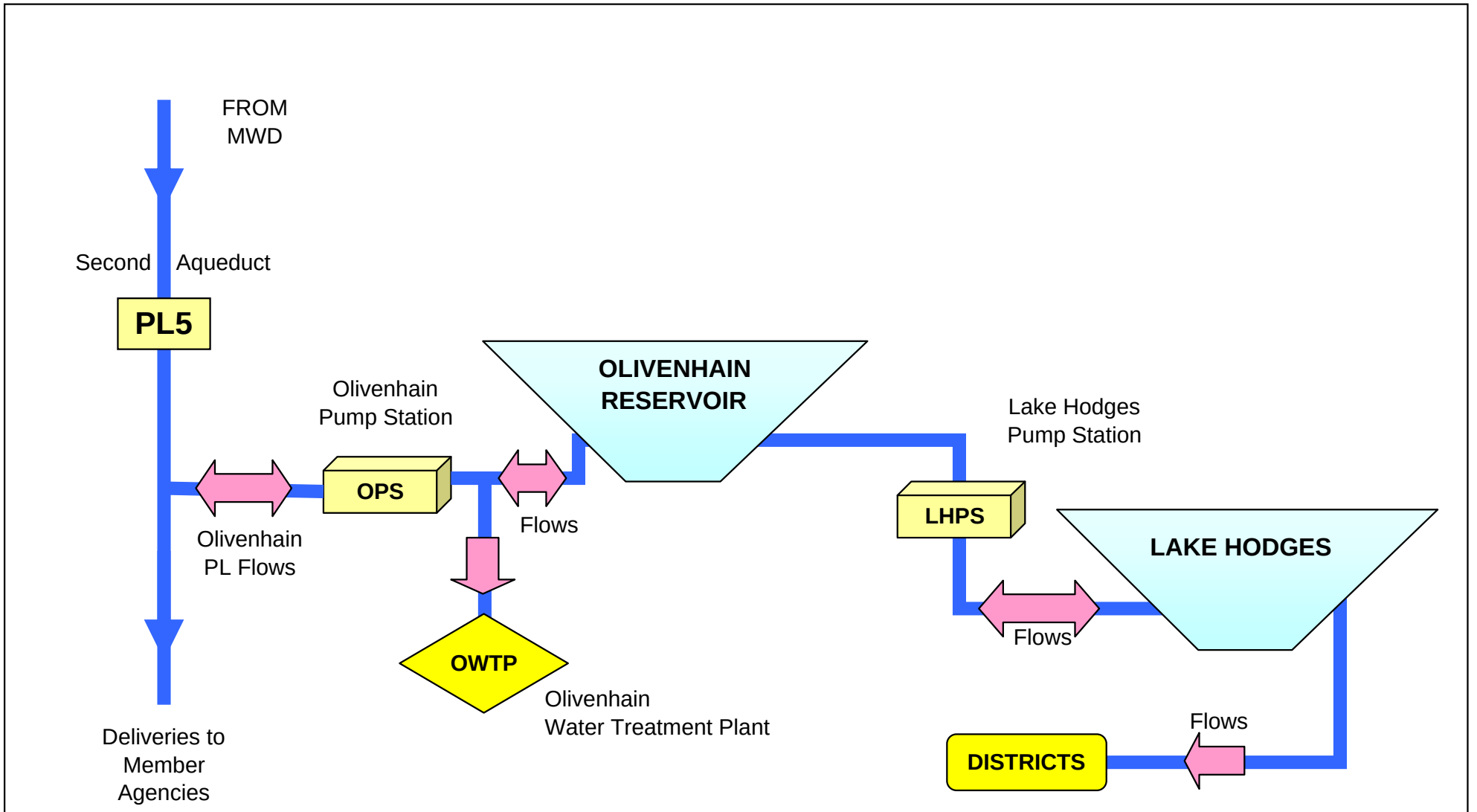
1. Olivenhain Water Treatment Plant being fed completely from Olivenhain Reservoir; limits based on measurements of Olivenhain Reservoir water quality
2. Olivenhain Reservoir water being introduced into Pipeline 5; limits are for blend of Olivenhain Reservoir water and imported water from Metropolitan Water District
3. Olivenhain Water Treatment Plant being fed simultaneously from Olivenhain Reservoir and Pipeline 5; guidance applies to blend of Olivenhain Reservoir water and imported water from Metropolitan Water District

* Parameters that are assumed to conserved during blending, allowing water quality measurement of a blend to be based on proration of water quality measurements of source waters.

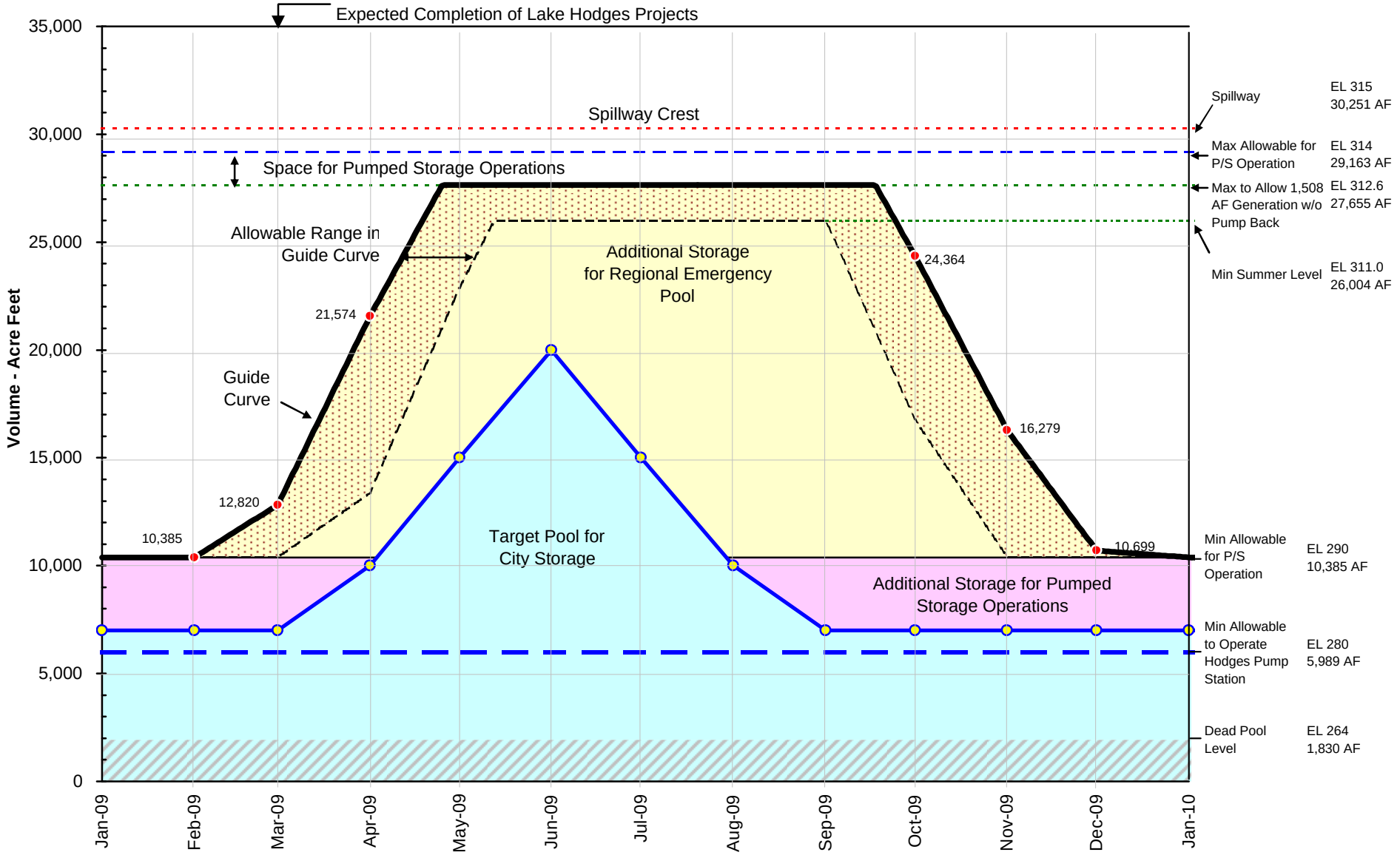
Abbreviations:

ppb	parts per billion
mg/L	milligrams per liter
L/mg-m	liters per milligram mole
NTU	nephelometric turbidity units
cfu/100 ml	colony forming units per 100 milliliters
ng/L	nanograms per liter
CDHS	California Department of Health Services

Primary water quality parameters and associated limits established by the Source Water Technical Advisory Committee

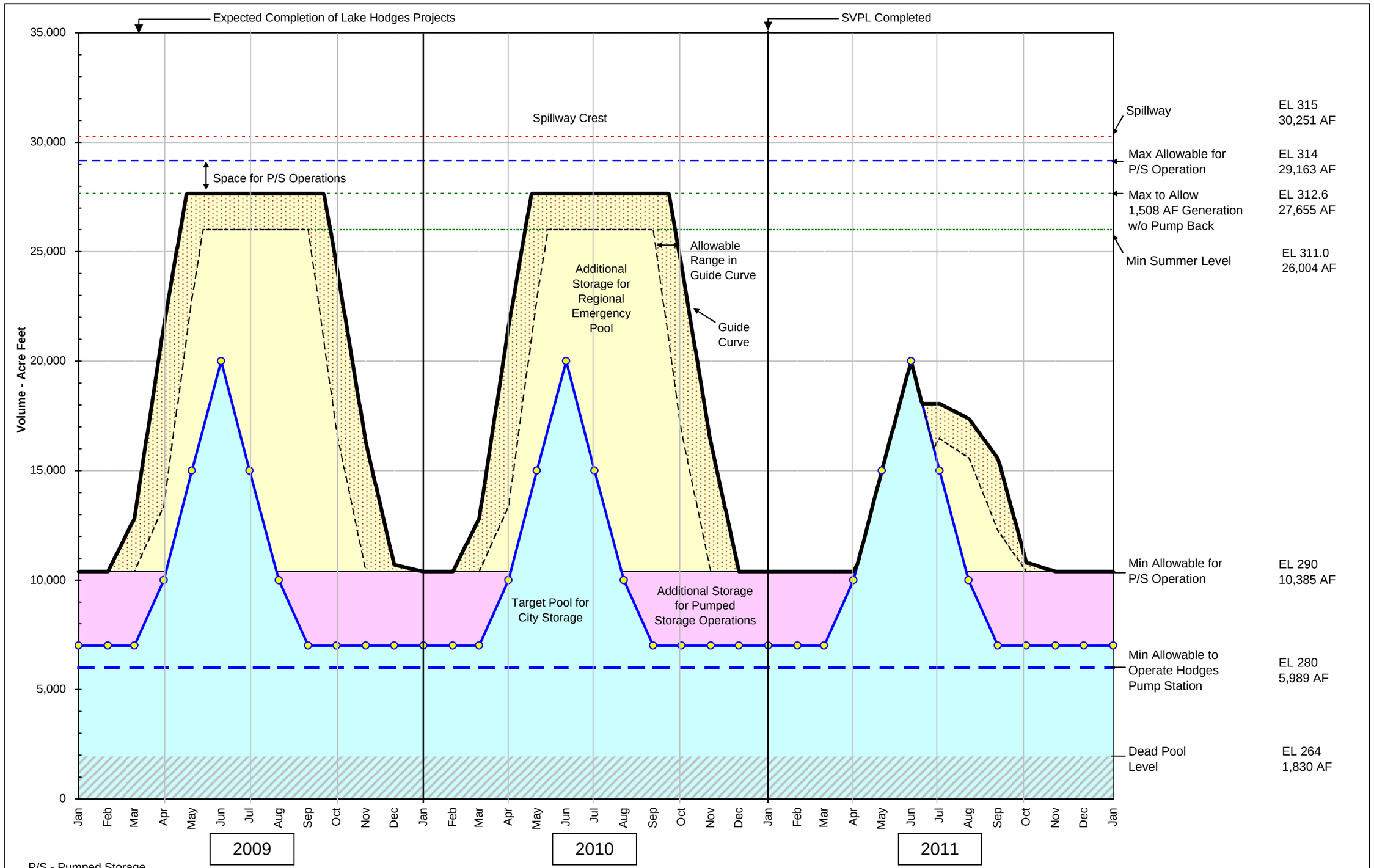


Revision 00 April 2008	**SCHEMATIC OF OLIVENHAIN / HODGES SYSTEM**	**Figure C.1**



P/S - Pumped Storage
AF - Acre-Feet

Revision 00 April 2008	**GUIDE CURVE FOR LAKE HODGES STORAGE - 2009**	**Figure C.2**



P/S - Pumped Storage
AF - Acre-Feet
SVPL - San Vicente Pipeline

Revision 00	LOOK-AHEAD GUIDE CURVES FOR LAKE HODGES STORAGE IN 2010 - 2011	Figure C.3
April 2008		

2010

San Diego County Water Authority

URBAN WATER Management Plan

Prepared by
San Diego County Water Authority
Water Resources Department

<<

2010 URBAN WATER MANAGEMENT PLAN

Prepared by:

San Diego County Water Authority

Water Resources Department

With assistance provided by the following departments:

General Counsel
MWD Program
Colorado River Program
Water Conservation Program
Finance
Public Affairs

June 2011

San Diego County Water Authority
4677 Overland Avenue
San Diego, CA 92123
858-522-6600
www.sdcwa.org

1.5.3 Member Agencies

The Water Authority's 24 member agencies purchase water from the Water Authority for retail distribution within their service territories. A 36-member Board of Directors (Board) comprised of member agency representatives governs the Water Authority. The member agencies' six cities, five water districts, eight municipal water districts, three irrigation districts, a public utility district, and a federal military reservation have diverse and varying water needs.

In terms of land area, the city of San Diego is the largest member agency with 210,726 acres. The smallest is the city of Del Mar, with 1,159 acres. Some member agencies, such as the cities of National City and Del Mar, use water almost entirely for municipal and industrial purposes. Others, including Valley Center, Rainbow, and Yuima Municipal Water Districts, deliver water that is used mostly for agricultural production.

Primary water sources and distribution of water in Southern California.

1.6 WATER AUTHORITY PHYSICAL WATER DELIVERY SYSTEM

The Water Authority was organized for the primary purpose of supplying imported water to San Diego County for wholesale distribution to its member agencies. These imported water supplies consist of water purchases from Metropolitan, core water transfers from Imperial Irrigation District (IID) and canal lining projects that are wheeled through Metropolitan's conveyance facilities, and spot water transfers that are pursued on an as-needed basis to offset reductions in supplies from Metropolitan. The largest single-year of imported water sales recorded by the Water Authority was 661,300 AF in fiscal year 2007.

1.6.1 Aqueduct System

Imported water supplies are delivered to the Water Authority member agencies through a system of large-diameter pipelines, pumping stations, and reservoirs. The pipelines deliver supplies from Metropolitan are divided into two aqueduct alignments, both of which originate at Lake Skinner in southern Riverside County and run in a north to south direction through the Water Authority service area. Metropolitan's ownership of these pipelines extends to a "delivery point" six miles into San Diego County. From there, Pipelines 1 and 2 comprise the First San Diego Aqueduct, which reaches from the delivery point to the San Vicente Reservoir. These two pipelines share five common tunnels and operate as a single unit to provide 180 cubic feet per second (cfs) of conveyance capacity. Pipelines 3, 4, and 5 form the Second San Diego Aqueduct. These pipelines, which are located several miles to the west of the First San Diego Aqueduct, have delivery point capacities as follows: Pipeline 3 provides 280 cfs; Pipeline 4 provides 470 cfs; and Pipeline 5 provides 500 cfs.

The population of San Diego County is projected to increase by 844,800 people between 2010 and 2035, for a total county population in excess of 4.0 million. This change represents an average annual increase of about 33,800 people, or roughly 1.1 percent annually. These regional growth projections are based on the San Diego Association of Governments (SANDAG) 2050 Regional Growth Forecast, adopted by its Board on February 26, 2010.

Water Authority service area population projections are also based on SANDAG's 2050 Regional Growth Forecast and are presented in Table 1-6. Water Authority member agencies are projected to have varying future growth. Some, such as the Santa Fe Irrigation District and the city of Del Mar, are expected to experience relatively modest growth. Others, including the Otay Water District and the city of San Diego, anticipate sizeable increases in both population and water demand.

TABLE 1-6. WATER AUTHORITY SERVICE AREA POPULATION FORECAST (2015-2035)

Year	Population
2015	3,271,773
2020	3,438,837
2025	3,599,952
2030	3,758,933
2035	3,906,718
Average Annual Growth	**31,747**

Source: SANDAG 2050 Regional Growth Forecast

TABLE 2-6. SBX7-7 POTABLE RETAIL DEMAND TARGETS AND GPCD TARGETS

	2015	2020	2025	2030	2035
SBX7-7 Retail Demand Target (AF)[1]	636,412	640,914	672,861	703,531	731,064
Member Agency Population	3,271,773	3,438,837	3,599,952	3,758,933	3,906,718
Estimated Regional Member Agency Potable GPCD Target	174	167	167	167	167

[1]Demand targets based on the individual member agency GPCD target demands.

2.4.3 Projected Dry-Year Water Demands

In addition to a baseline normal demand projection, the Act also requires single dry-year and multiple dry-year demand estimates to evaluate water service reliability during dry-year events. Based on observed historic demand impacts associated with each of these events, separate approaches were taken to forecast single and multiple dry-year conditions.

To develop single dry-year projections, a demand response index formula was used to identify the historic high temperature and low rainfall weather parameters that resulted in the maximum impact. Using this index, a representative single dry-year was selected. For this forecast, the year 1989 was selected. The monthly weather patterns associated with 1989 were then substituted into the CWA-MAIN model to generate dry-year demands projections. By holding all non-weather related predictive variables constant, the model produces an annual forecast of dry-year weather-driven demand. Projected single dry-year demands are shown in Table 2-7.

TABLE 2-7. SINGLE DRY-YEAR REGIONAL WATER DEMAND FORECAST (AF)

Adjusted for Water Conservation

	2015	2020	2025	2030	2035
Single Dry-Year Demand	694,257	765,409	836,967	901,210	956,544
SBX7-7 Additional Conservation Savings	-6,737	-46,951	-72,234	-97,280	-117,528
Total Demands with SBX7-7 Conservation	**687,520**	**718,458**	**764,733**	**803,930**	**839,016**

In accordance with the Act, agencies are also required to prepare additional dry period scenarios spanning multiple consecutive years. The major challenge in developing multiple dry-year forecasts is that persistent drier than normal weather over 24 to 36 months results in a compounding effect on rates of water use. Since the CWA-MAIN model was constructed to forecast demand for discrete 12-month periods, other statistical methods were required to develop projected water use for consecutive dry years. The modeling

Evaluation of the downscaled climate change scenarios indicated no dramatic shifts in seasonal patterns of precipitation for the San Diego area under either emission scenario. Additionally for reference year 2035, the end of the 2010 Plan planning horizon, mixed results were observed in the variation of precipitation projections among the climate models. Three of the climate projections resulted in annual precipitation estimates lower than the historic average. Similarly, temperature modeling revealed no dramatic shifts in seasonal patterns, and mixed results prevailed between projected temperatures and historic averages for reference year 2035. The disagreement in short-term climate projections is not entirely unexpected given the protracted lead-time forecasted for significant build up of greenhouse gases. Over an extended timescale, the ensemble of climate scenarios converge on the direction of temperature impact – with five of the six climate scenarios indicating warmer annual average temperature conditions for 2050 and 2099.

The range of climate change impacts on Water Authority demands was calculated by substituting the six climate scenarios into the CWA-MAIN model. For reference year 2035, all but one of the climate scenarios resulted in total water use slightly higher than baseline normal weather demands. The average climate change impact on 2035 demand, across all three GCMs, ranged from 0.63 percent increase under Emission Scenario B1 to 1.8 percent increase for Emission Scenario A2. The relatively small increase in 2035 demand under all climate scenarios suggests that significant water demand impacts associated with the forecasted trend toward warmer and drier climate conditions may occur on a time-step beyond the 2010 Plan planning horizon.

2.4.5 Member Agency Demand on the Water Authority

Table 2-9 shows the Water Authority's projected water demands (sales) by member agency. Water demands were calculated using SBX7-7 compliant baseline demands for each member agency, as forecasted in **Section 2.4.2,** minus verifiable local supply projections. Therefore, the projected imported demands (sales) are directly tied to the success of local supply development in **Section 5,** "Member Agency Supplies," and compliance with SBX7-7 conservation savings requirements discussed in **Section 3.2**.

section 3

Demand Management

Demand management, or water conservation, is an important part of the Water Authority's water supply portfolio and its diversification efforts for the San Diego region. The Water Authority's water conservation programs: (1) reduce demand for expensive, imported water; (2) demonstrate a continued commitment to the Best Management Practices and Agricultural Efficient Water Management Practices; (3) assist the Water Authority's member agencies to meet the statutory requirements of the Water Conservation Act of 2009 (SBX7-7); and (4) ensure a reliable future water supply.

As the regional wholesale supplier of water to San Diego County, the Water Authority coordinates many of the region's activities and programs to save water. The Water Authority works closely with its member agencies to implement water conservation programs, including the installation of hundreds of thousands of water-saving devices, development of a landscape auditor internship program, and development of a water budget software tool. With the active cooperation of the public and businesses, the region's water-providers are instilling a water conservation ethic in San Diego County. The Water Authority's member agencies, whose direct contact with their retail customers is crucial to implementing conservation programs, partner with the Water Authority and take a proactive approach to educate and work with their customers to save water. Since 1991, over 656,000 AF of water has been conserved through the region's conservation programs, including 65,000 AF in 2010.

The Water Authority works closely with its member agencies to implement water conservation programs, including the installation of hundreds of thousands of water-saving devices, development of a landscape auditor internship program, and development of a water budget software tool.

3.3.5 Model Water Efficient Landscape Ordinance

The Water Authority and the Conservation Action Committee (CAC) provided technical feedback to DWR on its Model Water Efficient Landscape Ordinance. In early 2007, the Water Authority tasked the CAC's Model Ordinance Group with developing a regional model for adoption by the cities in the region and the county of San Diego. In 2009, DWR updated its own model. The group's initial work on a regional model and its feedback to DWR on the state model is credited with shaping the final ordinance. The group was comprised of stakeholders that represented various areas, including landscape architects, the county, cities, water agencies, soil experts, and landscape contractors.

3.3.6 Smart Water Application Technologies

The Water Authority is one of several water utilities throughout the United States represented on the Smart Water Application Technologies (SWAT) committee, which convenes under the auspices of the Irrigation Association. SWAT is a forum where water utility representatives engage with irrigation industry leaders to jointly identify and promote water efficient irrigation technologies on a national scale. Recent achievements include a standardized testing protocol for weather-based irrigation controllers, including the dissemination of product testing results; as well as progress with developing new protocols for emerging technologies, such as soil moisture–based controllers and other products.

The regional SoCal Water$mart rebate program includes rebates on high-efficieny clothes washers.

3.4 WATER CONSERVATION PROGRAMS AND ACTIVITIES

This section provides information on the Water Authority's existing and future measures, programs, and policies to support member agency compliance with SBX7-7, as well as to ensure future water reliability for the region beyond 2020. The water conservation measures, programs, and policies are continually evaluated based on current conditions and adjusted accordingly to support member agency water conservation efforts. The region's programs and activities are funded by multiple sources, including the Water Authority's customer service charge, Metropolitan's water stewardship charge, individual retail member agency charges, and grant funding. The information below provides a description of the water conservation programs and activities being implemented in the Water Authority's service area.

3.4.1 Residential Water Conservation Incentive Programs

The Water Authority implemented its first incentive program for water conserving devices in 1991. From 1991 to 2008 financial incentives in the form of vouchers were used to encourage the replacement of water-wasting devices that would not otherwise be replaced. The program was extremely successful and resulted in the installation of over 500,000 water-efficient toilets, 80,000 high-efficiency clothes washers, and other devices that will generate lifetime water savings of over 383,000 AF.

In 2008, the Water Authority transitioned from operation of its own voucher incentive program to participation in the regional SoCal Water$mart rebate program. The regional program offers rebates for high-efficiency clothes washers, weather-based irrigation controllers, rotating nozzles, and other devices.

Through the program over 22,400 high-efficiency clothes washers and 1.5 million square feet of synthetic turf was installed. The installation of these devices and others rebated through the program will generate a lifetime water savings of more than 22,000 AF.

3.4.2 Commercial, Industrial, and Institutional Water Conservation Incentives

Prior to 2008, the Water Authority managed a commercial, industrial, and institutional (CII) voucher program. In July 2008, the Water Authority transitioned from the Water Authority–managed CII Voucher Incentive Program (VIP) to Metropolitan's regional CII Save A Buck Program. Joining the Save A Buck program centralized program administration and reduced overhead costs previously incurred by the Water Authority and its member agencies. Through both the VIP and Save A Buck programs over 56,000 CII water saving devices were installed that provided 18,400 AF of water savings from 1993 to 2009. Examples of the types of CII devices available through the Save A Buck program are shown in Table 3-2.

TABLE 3-2. COMMERCIAL, INDUSTRIAL, & INSTITUTIONAL WATER CONSERVATION DEVICES

Weather-Based Irrigation Controllers
Central Computer Irrigation Controllers
Large Rotary Nozzles
Rotating Nozzles for Pop-up Spray Nozzles
Commercial High Efficiency Toilets
Ultra Low Water Urinal and Zero Water Urinals
pH-Cooling Tower Conductivity Controllers
Cooling Tower Conductivity Controllers
Dry Vacuum Pumps
Connectionless Food Steamers
Ice-Making Machines
Water Brooms

3.4.3 Water & Energy Pilot Program

In December 2007, the California Public Utilities Commission approved a pilot program between the Water Authority and SDG&E to develop a partnership to implement specific water and energy conservation programs. As part of the pilot program, SDG&E funded the studies necessary to understand more accurately the relationship between water savings and a reduction in energy

use. The period for the pilot programs and studies began in January 2008, ran for more than 18 months, and consisted of three phases.

During the first phase, the Water Authority and SDG&E designed the pilot programs. In phase two, consultants were hired to work on the pilots, begin baseline studies, and work with the Water Authority and SDG&E to ensure that the pilot programs produce useful information. In phase three, the Water Authority and SDG&E implemented the pilot programs. The results of the pilot program will be used to determine the benefits that result when water conservation efforts and energy efficiency programs are integrated into one program. Below is a brief description of each component of the pilot program.

3.4.3.1 Large Customer Audits

This component of the pilot program integrated water and energy audit services into one comprehensive audit and included implementation of recommendations on a previous large customer audit where the initial audit recommendations were not acted upon by the customer. The development and implementation of eight integrated water-energy audits for large customers were performed. Preliminary results show significant water and energy savings were achieved through both the implementation of the previous audit recommendations and implementation of the additional eight audits.

Canyonside Community Park is one of six sites the recycled water program retrofitted to convert users from a potable water source to a lower energy recycled water source.

3.4.3.2 Managed Landscape

The managed landscape component documented and verified achieved water savings and related energy savings obtained through a guaranteed performance contract with the participant that was based on a pre-implementation audit and work plan. The pilot project focused on efficient use of potable water for landscapes. The pilot involved 13 sites of four acres each. Preliminary results show water savings in excess of 20 percent may be possible.

3.4.3.3 Recycled Water

The recycled water program retrofitted six sites to convert users from a potable water source to a lower energy recycled water source. The Water Authority and its member agencies identified sites with completed retrofit plans that allowed the customer to immediately switch from potable water usage to recycled water usage. Initial results show significant potable water savings for parks.

Once finalized, the results from the pilot program will be used to design future programs that target water and energy partnership opportunities.

3.4.4 Agricultural Water Management Program

Mission Resource Conservation District (Mission RCD) has been under contract to the Water Authority to operate agricultural water management services since 1990 as part of the Water Authority's Agriculture Water Management Program (AWMP). During that time, Mission RCD provided more than 1,700

audits on more than 28,000 acres of avocados, citrus, field flowers, and other fruits and ornamentals. The goal of the program is to provide technical assistance to growers to enable them to irrigate crops as efficiently as possible in order to obtain the maximum economic benefit from limited water resources.

In addition to providing technical assistance, the AWMP provides agricultural audits that include visual observations of the irrigation system, examination of soil and crop materials, pump testing, and answering the grower's questions. A written report is provided that summarizes the irrigation system's hydraulic characteristics and soil profiles, and provides recommendations to improve the overall system efficiency. Local weather data and crop water demand information is also provided. Potential yield improvements and water savings realized from improvements in irrigation efficiency are explained to the grower. Follow-up service is provided to determine if system improvements were implemented and, if not, to encourage implementation of the recommendations. Additionally, the program complies with the requirements of the Efficient Water Management Practices of the Memorandum of Understanding Regarding Efficient Water Management Practices by Agricultural Water Suppliers in California.

The goal of the Agricultural Water Management Program is to provide technical assistance to growers to enable them to irrigate crops as efficiently as possible.

3.4.5 Conservation Action Committee

The CAC was created in 2003 by the city of San Diego as a forum to communicate with the landscape industry and property and community managers on issues related to water efficiency. In the following years membership in the CAC increased to include additional retail water agencies. In 2006, the Water Conservation Summit expanded the CAC's purpose to include the following:

- ☐ Encourage industries, government, and communities to conserve water and develop tools, programs, and systems to promote water efficiency in the San Diego region.
- ☐ Provide a forum to exchange information regarding water efficiency.
- ☐ Promote working together for long-term solutions and success.

After the 2006 Summit, the Water Authority began to provide the CAC with administrative support and a more active role in the subcommittees. The CAC includes representation from industry, government, environmental, and community interests. Some of the CAC's and its subcommittees' recent accomplishments include the following:

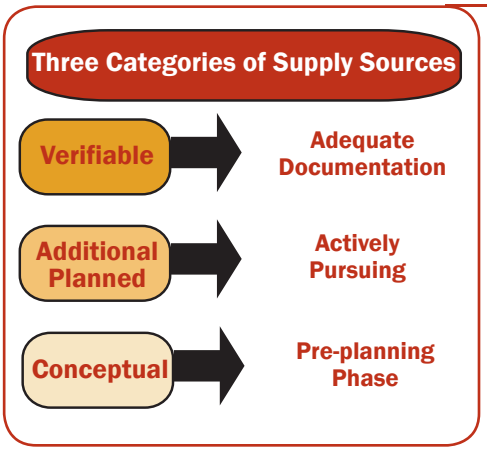
- ☐ As required by AB 1881[1], developed a Regional Model Landscape Ordinance that regulatory agencies utilized as they developed their local ordinances.
- ☐ Provided detailed feedback to the state on the state's Model Landscape Ordinance with many of CAC's Ordinance Work Group's recommendations and concerns being addressed in the final document.

[1] AB 1881 amended Civil Code §1353.8; repealed and added Article 10.8 (commencing with §65591) of Chapter 3, Div. 1 of Title 7 of the Government Code; added §25401.9 to the Public Resources Code; and added Article 4.5 to Chapter 8 of Div. 1 of the Water Code.

section 4

San Diego County Water Authority Supplies

Historically, the Water Authority has relied on imported water supplies purchased from Metropolitan to meet the needs of its member agencies. Metropolitan's supplies come from two primary sources, the State Water Project (SWP) and the Colorado River. After experiencing severe shortages from Metropolitan during the 1987–1992 drought, the Water Authority began aggressively pursuing actions to diversify the region's supply sources. Comprehensive supply and facility planning over the last 18 years provided the direction for implementation of these actions.



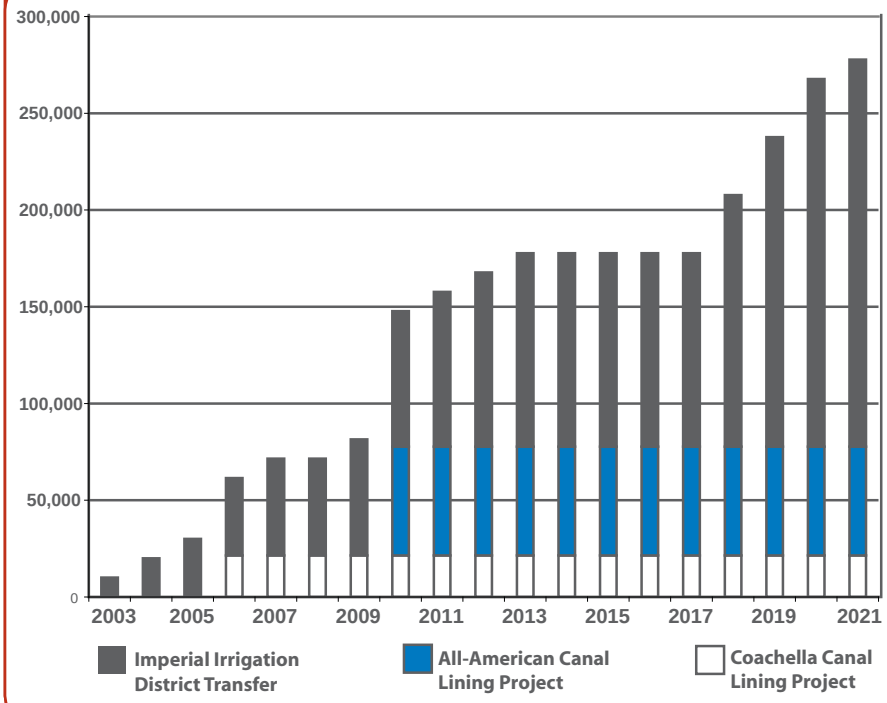
This section provides specific documentation on the existing and projected supply sources being implemented by the Water Authority. For purposes of analysis in the 2010 Plan, supplies are separated into one of three categories: verifiable, additional planned, or conceptual. "Verifiable" projects are those with adequate documentation regarding implementation and supply utilization, and are used in the reliability assessment in Section 9, "Water Supply Reliability." "Additional planned" projects are those that either the Water Authority or member agencies are actively pursuing and currently funding, but do not rise to the level of verifiable for implementation. The additional planned projects are utilized in Section 10, "Scenario Planning – Managing an Uncertain Future," as potential strategies to manage future uncertainty planning scenarios. "Conceptual" projects are those considered to be in the pre-planning phase, where the projects have not progressed to a point where the project yield can be factored into reliability assessments or uncertainty planning for this 2010 Plan.

A Water Resources Plan developed in 1993 and updated in 1997 emphasized the development of local supplies and core water transfers. Consistent with the direction provided in the 1997 plan, the Water Authority entered into a Water Conservation and Transfer Agreement with IID, an agricultural district

4.2.2 Expected Supply

Deliveries into San Diego County from the transfer began in 2003 with an initial transfer of 10,000 AF. The Water Authority received increasing amounts of transfer water each year, according to a water delivery schedule contained in the transfer agreement. In 2010, the Water Authority received 70,000 AF. The quantities will increase annually to 200,000 AF by 2021 then remain fixed for the duration of the transfer agreement. The initial term of the Transfer Agreement is 45 years, with a provision that either agency may extend the agreement for an additional 30-year term.

Transfer of Conserved Water 2003 - 2021



During dry years, when water availability is low, the conserved water will be transferred under IID's Colorado River rights, which are among the most senior in the Lower Colorado River Basin. Without the protection of these rights, the Water Authority could suffer delivery cutbacks.

4.2.3 Transportation

The Water Authority entered into a water exchange agreement with Metropolitan on October 10, 2003, to transport the Water Authority–IID transfer water from the Colorado River to San Diego County. Under the exchange agreement, Metropolitan takes delivery of the transfer water through its Colorado River Aqueduct. In exchange, Metropolitan delivers to the Water Authority a like quantity and quality of water. The Water Authority pays Metropolitan's applicable wheeling rate for each acre-foot of exchange water delivered. Under the terms of the water exchange agreement, Metropolitan will make delivery of the transfer water for 35 years, unless the Water Authority and Metropolitan elect to extend the agreement another 10 years for a total of 45 years.

4.2.4 Cost/Financing

The costs associated with the transfer are financed through the Water Authority's rates and charges. In the agreement between the Water Authority and IID, the price for the transfer water started at $258/AF and increased by a set amount for the first seven years. In December 2009, the Water Authority and IID executed a fifth amendment to the water transfer agreement that sets the price per acre-foot for transfer water for calendar years 2010 through 2015, beginning at $405/AF in 2010 and increasing to $624/AF in 2015. For calendar years 2016 through 2034, the unit price will be adjusted using an agreed-upon index. The amendment also required the Water Authority to pay IID $6 million at the end of calendar year 2009 and another $50 million on or before October 1, 2010, provided that a transfer stoppage is not in effect as a result of a court order in the QSA coordinated cases. Beginning in 2035, either the Water Authority or IID can, if certain criteria are met, elect a market rate price through a formula described in the water transfer agreement.

constructed a 37-mile parallel canal adjacent to the CC. The AAC lining project began in 2005 and was completed in 2010. The lining project constructed a concrete-lined canal parallel to 24 miles of the existing AAC from Pilot Knob to Drop 3.

4.3.2 Expected Supply

The AAC lining project makes 67,700 AF of Colorado River water per year available for allocation to the Water Authority and San Luis Rey Indian water rights settlement parties. The CC lining project makes 26,000 AF of Colorado River water each year available for allocation. The 2003 Allocation Agreement provides for 16,000 AF/YR of conserved canal lining water to be allocated to the San Luis Rey Indian Water Rights Settlement Parties. The remaining amount, 77,700 AF/YR, is to be available to the Water Authority, with up to an additional 4,850 AF/YR available to the Water Authority depending on environmental requirements from the CC lining project. For planning purposes, the Water Authority assumes that 2,500 AF of the 4,850 AF will be available each year for delivery, for a total of 80,200 AF/FY of that supply. According to the Allocation Agreement, IID has call rights to a portion (5,000 AF/YR) of the conserved water upon termination of the QSA for the remainder of the 110 years of the Allocation Agreement and upon satisfying certain conditions. The term of the QSA is for up to 75 years.

The The AAC lining project makes 67,700 AF of Colorado River water per year available for allocation to the Water Authority and San Luis Rey Indian water rights settlement parties.

4.3.3 Transportation

The October 2003 Exchange Agreement between the Water Authority and Metropolitan provides for the delivery of the conserved water from the canal lining projects. The Water Authority pays Metropolitan's applicable wheeling rate for each acre-foot of exchange water delivered. In the Agreement, Metropolitan will deliver the canal lining water for the term of the Allocation Agreement (110 years).

4.3.4 Cost/Financing

Under California Water Code Section 12560 et seq., the Water Authority received $200 million in state funds for construction of the canal lining projects. In addition, $20 million was made available from Proposition 50 and $36 million from Proposition 84. The Water Authority was responsible for additional expenses above the funds provided by the state.

In accordance with the Allocation Agreement, the Water Authority is responsible for a portion of the net additional Operation, Maintenance, and Repair (OM&R) costs for the lined canals. Any costs associated with the lining projects are to be financed through the Water Authority's rates and charges.

section 6

METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

6.1 DESCRIPTION

The Water Authority's imported water sources include purchases from Metropolitan. Metropolitan was formed in 1928 to develop, store, and distribute supplemental water in Southern California for domestic and municipal purposes. Metropolitan supplies water to approximately 19 million people in a service area that includes portions of Ventura, Los Angeles, Orange, San Bernardino, Riverside, and San Diego counties. The Metropolitan service area, shown in Figure 6-1, covers a 70-mile-wide strip of the Southern California coastal plain, extending from the city of Oxnard on the north to the Mexican border. Close to half of the water used in this 5,200-square-mile region is supplied by Metropolitan, and about 90 percent of its population receives at least some of its water from Metropolitan. The Water Authority, one of 26 Metropolitan member agencies, is the largest in terms of purchases, purchasing 331,825 AF, or about 21 percent of all the water Metropolitan delivered in fiscal year 2010. The extent to which Metropolitan's member agencies rely upon Metropolitan supplies varies by the amount of local supplies available or their own reliability goals. Water Authority demands on Metropolitan, provided by Metropolitan, can be found in **Appendix I**.

- Inclusion of the San Vicente Dam Raise and Carryover Storage Project in Water Authority's CIP (**Section 11.2.3**); and
- Agreements and actions related to out-of-region groundwater banking program.

9.2 NORMAL WATER YEAR ASSESSMENT

Table 9-1 shows the normal year assessment, summarizing the total water demands for the Water Authority through the year 2035 along with the supplies necessary to meet demands under normal conditions. **Section 2** contains a discussion of the normal year water demands in the Water Authority's service area. If Metropolitan, the Water Authority and member agency supplies are developed as planned, along with achievement of the SBX7-7 retail conservation target, no shortages are anticipated within the Water Authority's service area in a normal year through 2035. As part of preparation of their 2010 Plan, Metropolitan staff identified the Water Authority's demands on Metropolitan, which are shown to be adequate to cover the supplemental need identified in Table 9.1. The member agency level data was not included in their 2010 Plan, but provided by Metropolitan to their member agencies separately and the Water Authority's data is included in **Appendix I**.

TABLE 9-1. NORMAL WATER YEAR SUPPLY AND DEMAND ASSESSMENT (AF/YR)[1]

	2015	2020	2025	2030	2035
WATER AUTHORITY SUPPLIES					
IID Water Transfer	100,000	190,000	200,000	200,000	200,000
ACC and CC Lining Projects	80,200	80,200	80,200	80,200	80,200
Proposed Regional Seawater Desalination	0	56,000	56,000	56,000	56,000
Sub-Total	**180,200**	**326,200**	**336,200**	**336,200**	**336,200**
MEMBER AGENCY SUPPLIES					
Surface Water	48,206	47,940	47,878	47,542	47,289
Water Recycling	38,660	43,728	46,603	48,278	49,998
Groundwater	11,710	11,100	12,100	12,840	12,840
Groundwater Recovery	10,320	15,520	15,520	15,520	15,520
Sub-Total	**108,896**	**118,288**	**122,101**	**124,180**	**125,647**
Metropolitan Water District Supplies	358,189	230,601	259,694	293,239	323,838
Total Projected Supplies	**647,285**	**675,089**	**717,995**	**753,619**	**785,685**
Total Demands w/ SBX7-7 Conservation	647,285	675,089	717,995	753,619	785,685

[1] Normal water year demands based on 1960 – 2008 hydrologies.

9.3 DRY WATER YEAR ASSESSMENT

In addition to a normal water year assessment, the Act requires an assessment to compare supply and demands under single dry and multiple dry water years over the next 20 years, in five-year increments. **Section 2** describes the derivation of the dry water year demands. Table 9-2 shows the single dry-year assessment. The projected groundwater and surface water yields shown in the table are based on historic 1990 supplies during the 1987-1992 drought years. The supplies available from projected recycling and groundwater recovery projects are assumed to experience little, if any, reduction in a dry-year. The Water Authority's existing and planned supplies from the IID transfer, canal lining projects, and seawater desalination are also considered "drought-proof" supplies as discussed in **Section 4**. For this single dry-year assessment, it was assumed that Metropolitan would have adequate supplies in storage and would not be allocating supplies. With the previous years leading up to the single dry-year being wet or average hydrologic conditions, Metropolitan should have adequate supplies in storage to cover potential shortfalls in core supplies and would not need to allocate.

TABLE 9-2. SINGLE DRY WATER YEAR SUPPLY AND DEMAND ASSESSMENT FIVE YEAR INCREMENTS (AF/YR)

	2015	2020	2025	2030	2035
WATER AUTHORITY SUPPLIES					
IID Water Transfer	100,000	190,000	200,000	200,000	200,000
ACC and CC Lining Projects	80,200	80,200	80,200	80,200	80,200
Proposed Regional Seawater Desalination	0	56,000	56,000	56,000	56,000
Sub-Total	**180,200**	**326,200**	**336,200**	**336,200**	**336,200**
MEMBER AGENCY SUPPLIES					
Surface Water	17,932	17,932	17,932	17,932	17,932
Water Recycling	38,660	43,728	46,603	48,278	49,998
Groundwater	9,977	9,977	9,977	9,977	9,977
Groundwater Recovery	10,320	15,520	15,520	15,520	15,520
Sub-Total	**76,889**	**87,157**	**90,032**	**91,707**	**93,427**
Metropolitan Supplies	430,431	305,101	338,501	376,023	409,389
Total Projected Supplies	**687,520**	**718,458**	**764,733**	**803,930**	**839,016**
Total Demands w/ SBX7-7 Conservation	687,520	718,458	764,733	803,930	839,016

If Metropolitan, the Water Authority and member agency supplies are developed as planned, along with achievement of the SBX7-7 retail conservation target, no shortages are anticipated within the Water Authority's service area in a single dry-year through 2035.

In accordance with the Act, Tables 9-3, 9-4, 9-5, 9-6, and 9-7 show the multiple dry water year assessments in five-year increments. The member agencies' surface and groundwater yields shown in these tables are reflective of supplies available during the 1987-92 drought, in years 1990, 1991 and 1992. The Water Authority supplies consist of yield from the IID transfer, canal lining projects, and Carlsbad Seawater Desalination project.

For the multi dry-year reliability analysis, the conservative planning assumption is that Metropolitan will be allocating supplies to its member agencies. By assuming allocations in this reliability assessment, it allows the Water Authority to analyze how storage supplies could be utilized and the likelihood of shortages. Currently Metropolitan allocates supplies through its Water Supply Allocation Plan. Because it is uncertain in the future how Metropolitan will allocate supplies to its member agencies, the analysis in the tables assumes they are allocated based on preferential right to Metropolitan supplies. As discussed in **Section 6.1.1**, Section 135, Preferential Right to Purchase Water, is included in Metropolitan's Act and allows a Metropolitan member agency to acquire for use within the agency supplies based on preferential rights at any time.

TABLE 9-3. MULTIPLE DRY WATER YEAR SUPPLY AND DEMAND ASSESSMENT FIVE-YEAR INCREMENTS (AF/YR) – 2012–2014

	2012	2013	2014
Member Agency Supplies	69,597	84,440	103,907
Water Authority Supplies	170,200	180,200	180,200
Metropolitan Allocation (Preferential Right)	317,760	319,177	320,456
Total Estimated Core Supplies w/o Storage Takes	**557,557**	**583,817**	**604,563**
Total Demands w/ SBX7-7 Conservation	658,381	679,509	711,241
Potential Supply (Shortage) or Surplus (Difference between Supplies and Demands)	(100,824)	(95,692)	(106,678)
Utilization Carryover Supplies	40,000	40,000	30,000
Total Projected Core Supplies with Utilization of Carryover Storage Supplies	**597,557**	**623,817**	**634,563**
Remaining Potential Surplus Supply, or (Shortage) that will be handled through Management Actions	(60,824)	(55,692)	(76,678)

TABLE 9-4. MULTIPLE DRY WATER YEAR SUPPLY AND DEMAND ASSESSMENT FIVE-YEAR INCREMENTS (AF/YR) – 2016–2018

	2016	2017	2018
Member Agency Supplies	78,943	93,408	112,499
Water Authority Supplies	236,200	236,200	266,200
Metropolitan Allocation (Preferential Right)	322,661	323,350	324,100
Total Estimated Core Supplies w/o Storage Takes	**637,804**	**652,958**	**702,799**
Total Demands w/ SBX7-7 Conservation	682,338	705,461	740,326
Potential Supply (Shortage) or Surplus (Difference between Supplies and Demands)	(44,534)	(52,503)	(37,527)
Utilization Carryover Supplies	44,534	40,000	30,000
Total Projected Core Supplies with Utilization of Carryover Storage Supplies	**682,338**	**692,958**	**732,799**
Remaining Potential Surplus Supply, or (Shortage) that will be handled through Management Actions	0	(12,503)	(7,527)

TABLE 9-5. MULTIPLE DRY WATER YEAR SUPPLY AND DEMAND ASSESSMENT FIVE-YEAR INCREMENTS (AF/YR) – 2021–2023

	2021	2022	2023
Member Agency Supplies	87,732	100,719	118,331
Water Authority Supplies	336,200	336,200	336,200
Metropolitan Allocation (Preferential Right)	326,697	327,671	328,695
Total Estimated Core Supplies w/o Storage Takes	**750,629**	**764,590**	**783,226**
Total Demands w/ SBX7-7 Conservation	724,294	751,800	790,177
Potential Supply (Shortage) or Surplus (Difference between Supplies and Demands)	26,335	12,790	(6,951)
Utilization Carryover Supplies	0	0	6,951
Total Projected Core Supplies with Utilization of Carryover Storage Supplies	**750,629**	**764,590**	**790,177**
Remaining Potential Surplus Supply, or (Shortage) that will be handled through Management Actions	26,335	12,790	0

TABLE 9-6. MULTIPLE DRY WATER YEAR SUPPLY AND DEMAND ASSESSMENT FIVE-YEAR INCREMENTS (AF/YR) – 2026–2028

	2026	2027	2028
Member Agency Supplies	90,367	103,114	120,486
Water Authority Supplies	336,200	336,200	336,200
Metropolitan Allocation (Preferential Right)	332,058	333,272	334,532
Total Estimated Core Supplies w/o Storage Takes	**758,625**	**772,586**	**791,218**
Total Demands w/ SBX7-7 Conservation	772,892	801,649	844,137
Potential Supply (Shortage) or Surplus (Difference between Supplies and Demands)	(14,267)	(29,063)	(52,919)
Utilization Carryover Supplies	14,267	29,063	40,000
Total Projected Core Supplies with Utilization of Carryover Storage Supplies	**772,892**	**801,649**	**831,218**
Remaining Potential Surplus Supply, or (Shortage) that will be handled through Management Actions	0	0	(12,919)

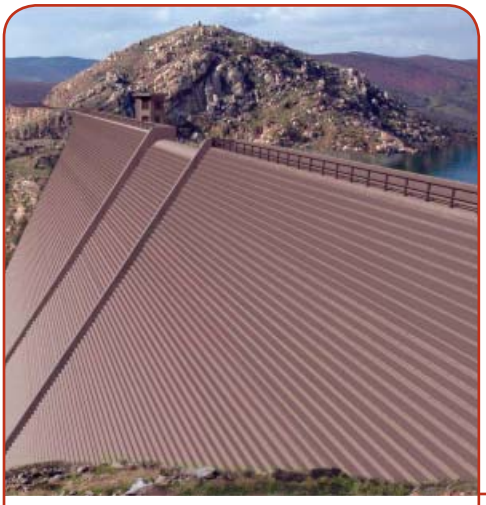
TABLE 9-7. MULTIPLE DRY WATER YEAR SUPPLY AND DEMAND ASSESSMENT FIVE-YEAR INCREMENTS (AF/YR) – 2031–2033

	2031	2032	2033
Member Agency Supplies	92,051	104,807	122,188
Water Authority Supplies	336,200	336,200	336,200
Metropolitan Allocation (Preferential Right)	338,575	340,009	341,486
Total Estimated Core Supplies w/o Storage Takes	**766,826**	**781,016**	**799,874**
Total Demands w/ SBX7-7 Conservation	811,421	842,947	882,795
Potential Supply (Shortage) or Surplus (Difference between Supplies and Demands)	(44,595)	(61,931)	(82,921)
Utilization Carryover Supplies	44,595	40,000	30,000
Total Projected Core Supplies with Utilization of Carryover Storage Supplies	**811,421**	**821,016**	**829,874**
Remaining Potential Surplus Supply, or (Shortage) that will be handled through Management Actions	0	(21,931)	(52,921)

The Water Authority's annual preferential right percentage of Metropolitan supplies is estimated through 2035 and total Metropolitan dry-year supplies available for allocation are estimated to be 1,800,000 AF. This total supply assumes reduced deliveries from the State Water Project and Colorado River Aqueduct along with limited storage supplies. For reference, during the fiscal year 2010 allocation period, Metropolitan allocated approximately 1,890,000 AF of supplies to its member agencies.

Under the specific parameters assumed in the multi dry-year analysis, some level of shortage could potentially be experienced, as shown in Tables 9-3, 9-4, 9-5, 9-6, and 9-7. Shortages occur in the early years because the Carlsbad Seawater Desalination project is not yet on-line and the IID transfer supplies have not yet fully ramped up to 200,000AF/YR maximum deliveries. The shortages occurring in the later years are due primarily to increasing water demands due to growth within the region.

As discussed in **Section 11.2.3**, the Water Authority has invested in carryover storage supply capacity, which can be utilized in dry-years to improve reliability. The carryover storage investment includes both surface water storage in San Vicente Reservoir and out-of-region groundwater storage in California's central valley, for a total of approximately 170,000 AF of storage capacity available by 2012, when the San Vicente Dam raise is scheduled for completion. Once completed, it will take three to five years to fill the reservoir.



The carryover storage investment includes both surface water storage in San Vicente Reservoir and out-of-region groundwater storage in California's central valley, for a total of approximately 170,000 AF of storage capacity.

As described in **Section 11.2.3,** there are a number of factors to consider when determining the utilization of carryover supplies to reduce or eliminate shortages. The storage take amount should be handled on a case-by-case basis, considering such items as, current demand trends, core supply availability, hydrologic conditions, and storage supply available for withdrawal. These factors will vary depending upon the situation. For the analysis in the 2010 Plan, it was assumed the carryover storage supplies would be full going into the dry-year period. In determining the amount to utilize, the analysis takes into account the take capacity of the groundwater banking program (approximately 12,000AF/YR) and uses general guidelines that approximately one third of the carryover supplies available in storage will be utilized in one year. Utilizing only a portion of available storage supplies avoids depletion of storage reserves, thereby making water available for potential ongoing or future shortages. The supplies taken from carryover storage will be considered a Water Authority regional supply to be combined with Water Authority's core supplies and any potential dry-year transfers.

Another factor that will be considered when utilizing carryover supplies is the Special Agricultural Water Rate (SAWR) program requirement that customers in the SAWR class of service receive no water from the Carryover Storage Program during Stage 2 or 3 of the Water Shortage Drought Response Plan. The Water Authority will work with its member agencies to develop a proposed method for administering this program prior to completion of the San Vicente Dam raise. Because the method has yet to be developed, the assessments in Tables 9-3 through 9-7 do not factor in this program requirement.

Demand hardening diminishes the ability or willingness of a customer to reduce demands during shortages as a result of having implemented long-term conservation measures.

In years where shortages may still occur, after utilization of carryover storage, additional regional shortage management measures, consistent with the Water Authority's Water Shortage and Drought Response Plan (described in **Section 11.2.2**), will be taken to fill the supply shortfall. These measures could include securing dry-year transfers, which the Water Authority successfully acquired and utilized during the recent shortage period. (Description of the Water Authority's dry-year transfer program is included in **Section 11.2.3**.) In addition to dry-year supplies, extraordinary conservation, achieved through voluntary or mandatory water-use restrictions, could also assist in managing shortages. A description of the savings achieved during the 2007-2011 shortage period is described in **Section 11.2.1**. As discussed in the following section, the amount of savings achieved through extraordinary conservation measures could be limited due to demand hardening, especially following compliance with SBX7-7 conservation savings.

9.3.1 Demand Hardening

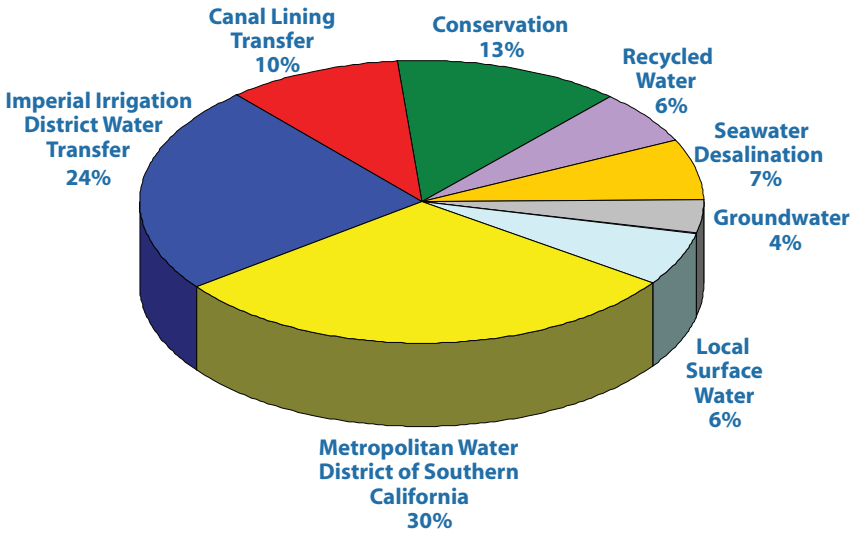
It should be emphasized that the amount of extraordinary conservation savings expected to be achieved through mandatory measures, such as water-use restrictions, could be less than that experienced in the 2007-2011 previous shortage periods. This is due to the concept known as demand hardening. Demand hardening diminishes the ability or willingness of a customer to reduce demands during shortages as a result of having implemented long-term conservation measures. Responsiveness to drought pricing and general price increases will diminish because remaining essential uses are less responsive to price. The required reduction levels through SBX7-7 compliance will reduce customer discretionary demands and create less flexibility in the managing of demand during shortages. This will increase the importance of acquiring supplemental dry-year supplies to eliminate or reduce potential supply shortages. **Section 11.2.3** discusses the Water Authority's potential dry-year supplies. Long-term permanent conservation savings is critical to ensuring water is used most efficiently and for achieving the SBX7-7 conservation compliance targets. Due to potential demand hardening, resulting from SBX7-7, shortage management measures such as water-use restrictions and drought pricing may not be as effective in the future in achieving necessary savings to help reduce the supply gap.

9.4 RELIABILITY OF SUPPLY

The above sections identify the diverse mix of resources planned to meet future demands in both a normal and dry-year. Implementation of this regional resource mix will require development of projects and programs by the Water Authority, its member agencies, and Metropolitan. The Water Authority coordinated with its member agencies and Metropolitan during preparation of the 2010 Plan on the future demands and supplies projected for the region. The steps being taken by the member agencies and Metropolitan to develop supplies are addressed in their respective urban water management plans. **Section 4** contains the steps taken and remaining actions necessary to develop and maintain the Water Authority supplies.

The Act requires agencies to describe reliability of the water supply and vulnerability to seasonal and climatic shortage. **Sections 9.2** and **9.3** describes the results of the water supply reliability assessment for the region, during normal

San Diego County Water Authority Water Supply Diversification by 2020*



The unavailability of any one water supply source will be buffered because of the diversity of the supplies: the region is not reliant on a single source.

*Normal/average year

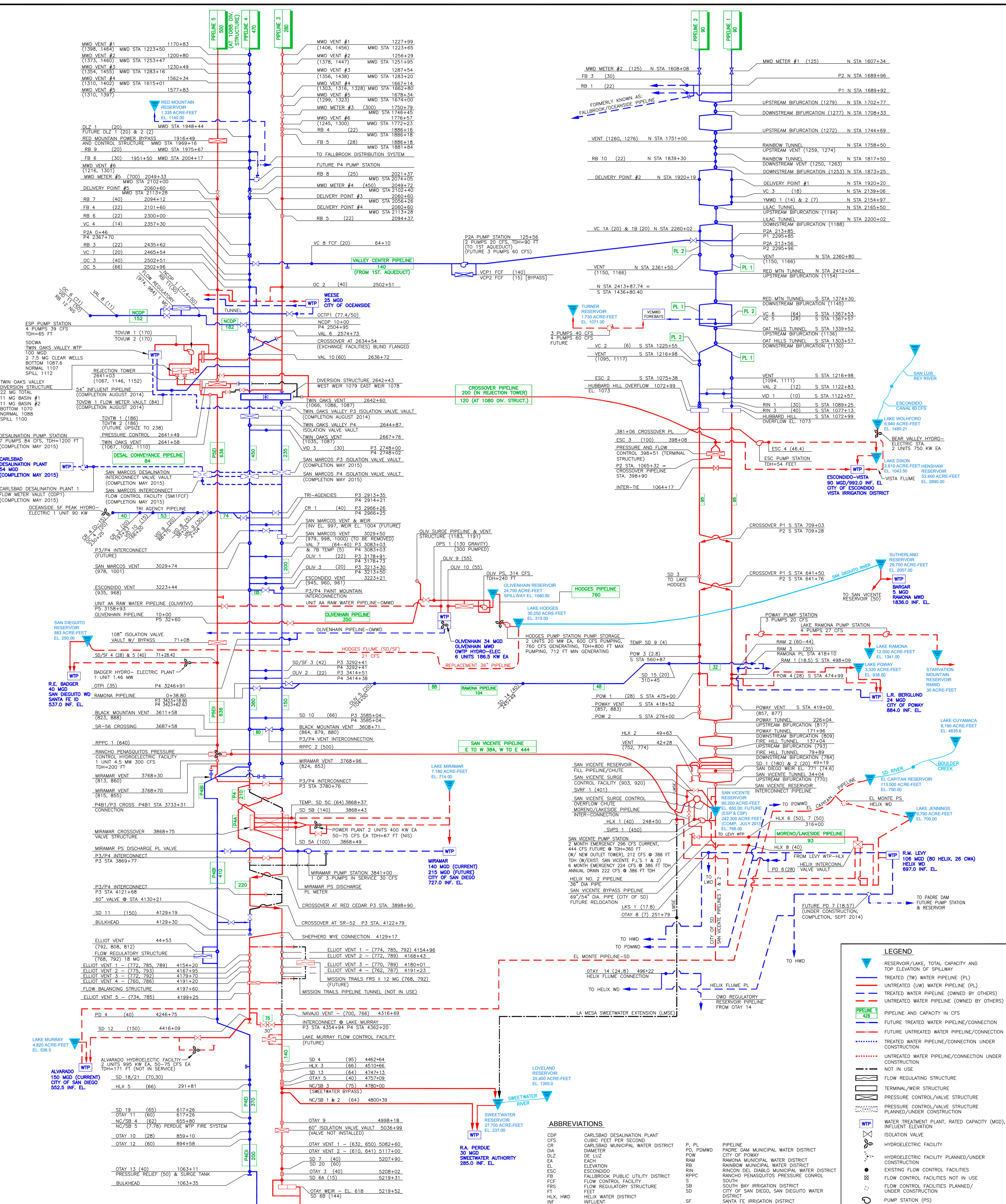
water years, single dry years, and multiple dry years. The Act also requires the 2010 Plan to contain historic data on supplies available for the three water year types. The following is the historic total supplies, both local and imported, that were utilized during the periods identified: Normal/ average (595,000AF) based on 30-year average between 1979 and 2008, single dry year (645,000AF) based on 1990, and multiple dry water years (645,000AF, 505,000AF, and 541,000AF) based on years 1990-1992. Supplies utilized in a non-allocation dry period could exceed the supplies utilized in a normal year, due to the ability to purchase additional imported supplies from Metropolitan.It should also be noted that in the reliability assessment, contained in **Section 9.2**, the average local supply yields are not based on historic yields, but projected numbers provided by member agencies. These figures more accurately reflect the expected yield based on current local agency policies and procedures on operations and management of the supply.

Key to long-term reliability will be the monitoring of supplies and demands in order to make necessary modifications to the core and dry-year resources identified in the normal and dry-year resource mixes. The Water Authority Board will monitor reliability of existing supplies and development of identified future supplies through the Annual Supply Report and five year updates to the UWMP.

The Act requires that, for any water source that may not be available at a consistent level of use, given specific legal, environmental, water quality, or climatic factors, that the agency describe, to the extent practicable, plans to replace that source with alternative sources or water demand management measures. As stated throughout the 2010 Plan, the Water Authority and its member agencies are planning to develop a diverse supply of resources. The unavailability of any one supply source will be buffered because of the diversity of the supplies: the region is not reliant on a single source. To replace or supplement an existing supply, the Water Authority could take steps to increase development of transfers or seawater desalination. Member agencies could also further maximize development of recycled water, groundwater, and seawater desalination. In order to adequately plan for potential supply uncertainties and identify alternative sources, the 2010 Plan contains a scenario planning process described in **Section 10**.

9.5 ADDITIONAL PLANNED SUPPLY PROJECTS

The mix of current and future supplies is developed jointly between the Water



LEGEND

- RESERVOIR/LAKE, TOTAL CAPACITY AND TOP ELEVATION OF SPILLWAY
- TREATED (TW) WATER PIPELINE (PL)
- UNTREATED (UW) WATER PIPELINE (PL)
- TREATED WATER PIPELINE (OWNED BY OTHERS)
- UNTREATED WATER PIPELINE (OWNED BY OTHERS)
- PIPELINE 1 426 — PIPELINE AND CAPACITY IN CFS
- FUTURE TREATED WATER PIPELINE/CONNECTION
- FUTURE UNTREATED WATER PIPELINE/CONNECTION
- TREATED WATER PIPELINE/CONNECTION UNDER CONSTRUCTION
- UNTREATED WATER PIPELINE/CONNECTION UNDER CONSTRUCTION
- NOT IN USE
- FLOW REGULATING STRUCTURE
- TERMINAL/WEIR STRUCTURE
- PRESSURE CONTROL/VALVE STRUCTURE
- PRESSURE CONTROL/VALVE STRUCTURE PLANNED/UNDER CONSTRUCTION
- WTP — WATER TREATMENT PLANT, RATED CAPACITY (MGD), INFLUENT ELEVATION
- ISOLATION VALVE
- HYDROELECTRIC FACILITY
- HYDROELECTRIC FACILITY PLANNED/UNDER CONSTRUCTION
- EXISTING FLOW CONTROL FACILITIES
- FLOW CONTROL FACILITIES NOT IN USE
- FLOW CONTROL FACILITIES PLANNED/ UNDER CONSTRUCTION
- PUMP STATION (PS)
- PUMP STATION PLANNED/UNDER CONSTRUCTION
- VENTS/BIFURCATION
- BULKHEAD/BLIND FLANGE
- MWD METER
- (772, 789) INVERT/SPILL EL @ VENT, SPILL EL @ BIFURCATION, ENTRANCE AND EXIT OF TUNNEL
- (774, 785, 792) INVERT/OVERFLOW/SPILL EL @ VENT FOR OVERFLOW VENT TYPE
- (20) CUBIC FEET PER SECOND (METER CAPACITY)
- (20–15) METER MAX– METER RECALIBRATED

ABBREVIATIONS

CDP	CARLSBAD DESALINATION PLANT
CFS	CUBIC FEET PER SECOND
CR	CARLSBAD MUNICIPAL WATER DISTRICT
DIA	DIAMETER
DLZ	DE LUZ
EA	EACH
EL	ELEVATION
ESC	ESCONDIDO
FB	FALLBROOK PUBLIC UTILITY DISTRICT
FCF	FLOW CONTROL FACILITY
FRS	FLOW REGULATORY STRUCTURE
FT	FEET
HLX, HWD	HELIX WATER DISTRICT
INF	INFLUENT
KW	KILOWATT
LKS, LWD	LAKESIDE WATER DISTRICT
MG	MILLION GALLONS
MGD	MILLION GALLONS PER DAY
MWD	METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA
N	NORTH
NC	CITY OF NATIONAL CITY
NIS	NOT IN SERVICE
NO	NUMBER
OC	CITY OF OCEANSIDE
OLIV	OLIVENHAIN MUNICIPAL WATER DISTRICT
OPS	OLIVENHAIN PUMP STATION
OTP	OLIVENHAIN WATER TREATMENT PLANT
OTAY, OWD	OTAY WATER DISTRICT
P, PL	PIPELINE
PD, PDMWD	PADRE DAM MUNICIPAL WATER DISTRICT
POW	CITY OF POWAY
RAM	RAMONA MUNICIPAL WATER DISTRICT
RB	RAINBOW MUNICIPAL WATER DISTRICT
RIN	RINCON DEL DIABLO MUNICIPAL WATER DISTRICT
RPPC	RANCHO PENASQUITOS PRESSURE CONROL
S	SOUTH
SB	SOUTH BAY IRRIGATION DISTRICT
SD	CITY OF SAN DIEGO, SAN DIEGUITO WATER DISTRICT
SF	SANTA FE IRRIGATION DISTRICT
STA	STATION
TEMP	TEMPORARY
TDH	TOTAL DESIGN HEAD
TOVDW	TWIN OAKS VALLEY DESALINATION WATER
TOVTW	TWIN OAKS VALLEY TREATED WATER
TOVUT	TWIN OAKS VALLEY UNTREATED WATER
TOVTP	TWIN OAKS VALLEY WATER TREATMENT PLANT
VAL	VALLECITOS WATER DISTRICT
VC	VALLEY CENTER
VID	VISTA IRRIGATION DISTRICT
VV	VALVE VAULT
W/	WITH
WD	WATER DISTRICT
WTP	WATER TREATMENT PLANT
YMWD	YUIMA MUNICIPAL WATER DISTRICT

SYMBOLS

&	AND
@	AT
=	EQUAL
"	INCHES
#	NUMBER
+	PLUS

NOTES

1. ALL VENTS ARE HOODED.
2. ALL BIFURCATION STRUCTURES ARE COVERED WITH VENT OVERFLOW.
3. THIS SCHEMATIC WAS PREPARED BY SAN DIEGO COUNTY WATER AUTHORITY FOR ITS OWN USE AND IS FOR GENERAL INFOMATION ONLY. THIS SCHEMATIC IS UPDATED AT IRREGULAR INTERVALS AND MAY NOT SHOW CURRENT STATUS AND SHOULD NOT BE USED FOR DESIGN PURPOSES. NO WARRANTY IS EXPRESSED OR IMPLIED TO OTHERS AS TO THE CORRECTNESS OR CONTENT OF THE INFORMATION SHOWN HEREIN.

San Diego County Water Authority

CAPITAL IMPROVEMENT PROGRAM

WATER SYSTEM PLANNING SCHEMATIC

AQUEDUCTS, FLOW CONTROL FACILITIES AND GRADIENT CONTROL STRUCTURES

STATUS: AS OF APRIL 2013

San Diego County Water Authority

Turf Replacement Program

Now accepting applications for incentives!

Residents, businesses, homeowner associations and public agencies in San Diego County are eligible for rebates to help pay for replacing turf grass with water-efficient landscaping options more suited to the county's semi-arid climate.

The San Diego County Water Authority's program offers $1.50 per square foot, and this website includes everything you need to know to complete a successful project. In addition, the SoCal Water$mart Turf Removal Program offers a separate rebate. For more about that program, go to SoCal Water$mart.com.

Water Authority and SoCal Water$mart rebates can be combined, though they require separate applications, and they include some differing requirements and limits. Both programs require participants to register and be approved for participation before removing turf grass.

Using water efficiently is a way of life in San Diego County and an important responsibility that comes with living in the beautiful Mediterranean climate that we enjoy. Working together, we can help ensure a reliable water supply while keeping the region prosperous and naturally beautiful for generations to come.

WaterSmart Landscapes provide a number of important benefits. **They include:**

Saving Water

WaterSmart landscapes can use about 70% less water than traditional landscaping.

Beautifying Landscapes

WaterSmart landscapes can transform regular yards into neighborhood showpieces.

Reducing Maintenance

State-of-the-art irrigation systems and plants appropriate for the local climate can trim the amount of time spent on yard maintenance.

WaterSmart Landscapes

WaterSmart Landscapes combine water-efficient design, state-of-the-art irrigation, climate-appropriate plant selection, and best maintenance practices to create a beautiful and sustainable environment, ideally suited for San Diego County's mild, Mediterranean climate.

Minimizing Runoff

WaterSmart landscapes reduce the amount of polluted water that flows into creeks and ultimately ends up in the ocean.

Conserving Energy

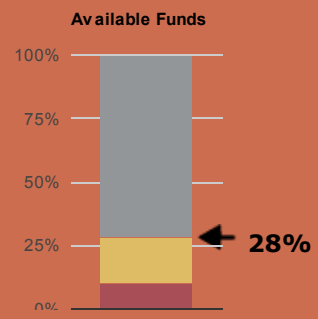
WaterSmart landscapes demand less water be treated and transported across the state, saving huge amounts of energy.

Acknowledgements

This program is made possible by financial support from:

- The Bureau of Reclamation through a Water Conservation Field Services Grant
- The California Department of Water Resources' Integrated Regional Water Management Program financed under the California Water Security, Clean Drinking Water, Coastal and Beach Protection Fund of 2002

The Water Authority is particularly grateful to the Long Beach Water Department for special assistance developing content and other material for the website.



San Diego County Water Authority

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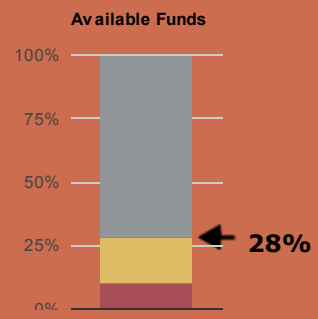


San Diego County Water Authority

San Diego County Water Authority

Turf Replacement Program

Process Guidelines

Based on the following criteria, the San Diego County Water Authority is providing a $1.50 per square foot incentive for sites that replace existing, water-intensive turf grass with alternative, water-efficient landscaping:

- Existing landscaped turf area to be replaced:
  - Residential sites: Minimum 400 square feet to maximum 2,000 square feet.
  - Commercial, industrial, or institutional sites: Minimum 1,000 square feet to maximum 6,000 square feet.
- Photographs of existing and post-conversion site conditions will be required.
- Site must have existing turf and an operational in-ground irrigation system.
  - Examples of Turf Areas that Do and DO NOT qualify for the Turf Replacement Program
- Artificial or synthetic turf (or other turf-looking grasses) and invasive species-type plants are **not** eligible.
- Site must be visible from the street (front or side yards only)
- Customers using recycled or well water for irrigation are currently not eligible to apply for this rebate.
- Participants agree to maintain upgraded site a minimum of 5 years.
- Rebate amount based on actual, verified conversion square footage.
- Project must be completed within 120 days of rebate reservation application approval.
- Project must comply with all applicable laws, permits, ordinances, codes, policies, covenants, conditions, and restrictions applicable to the site.
- ***Note: Installation and labor costs are ineligible for reimbursement.***

Landscape Criteria

- At maturity, plant density of the converted area must cover at least 50% of project area; tree canopy coverage will not be counted in the 50% plant coverage calculation.
- 100% of the new landscape MUST be covered with materials such as plants and mulch (minimum 3-inch layer) and must be permeable to air and water (i.e., gravel, loose flagstone, decomposed granite); permeable weed barriers are required under pervious hardscapes. Concrete, plastic sheeting, and other impermeable surfaces do not qualify.
- Program requires the replacement of high-water use turf with plants that have moderate, low, or very-low watering requirements as defined in any of the below:
  - A Homeowner's Guide to a WaterSmart Landscape
  - Water Use Classification of Landscape Species Reference (WUCOLS)
  - 2010 Edition UC Davis Arboretum All-Stars brochure
  - Nifty 50 Plants for WaterSmart Landscapes
  - Other reference of plant water use approved by the Water Authority.
- Program requires submittal of a plant coverage worksheet (and landscape design plans for commercial, industrial, and institutional sites) at time of online rebate reservation.
- To maximize water savings, plants should be grouped by similar water requirements (hydrozones).
- Retrofitted irrigations systems must incorporate low-volume irrigation with a precipitation rate of 1 inch per hour or less (e.g., drip, micro-irrigation, rotating nozzles, etc.) within conversion area. The newly converted area must be on a separate irrigation valve from remaining turf. System must be capped if improved area will not have irrigation.

- The entire irrigation valve (station) must be converted to low-volume irrigation and must have a backflow prevention device. Most low-volume systems will require pressure regulation to perform properly. To reduce the pressure of the new low-volume system, entire valve must be converted and fitted with a pressure regulator at the individual valve, or a pressure compensating device must be included at each retrofitted sprinkler head. For drip and micro-irrigation systems a filter is required either at the valve or at each individual head that is retrofitted with a micro-irrigation emitter.

Program Requirements

- Participant must submit online rebate reservation and rebate request applications and agree to the Program's Terms and Conditions that include a photo release, a release of water use records (three years prior to the project and five years after project implementation); agree to allow signage within the re-landscaped area; allow pre- and post-conversion inspection of the site; and, allow the Water Authority or its agents to publicize efforts/results associated with this project (including, but not limited to, photos on website, project location detailed on website, potential tours, etc.)

IMPORTANT: Rebate Reservation must be approved PRIOR to starting project.

- Residential participants must complete an online training class to be eligible for a rebate. They will be automatically directed to the one-hour class as soon as they submit a rebate application and the course must be completed at that time.
- Completed Projects are subject to onsite inspections and verifications by the Water Authority. If the Project cannot be verified, any funds received from the Program must be returned.
- Participants must submit original receipts reflecting purchases of low-water use plants; low-volume irrigation equipment; soil amendments; mulch; and design services (up to $500); costs for installation and labor are **not** eligible for reimbursement.
- Rebate amount cannot exceed total project cost.
- Only one turf removal rebate per site address will be issued. Commercial accounts may apply for the rebate once per year, as funding permits.
- Project must comply with all applicable laws, codes, policies, covenants, conditions and restrictions applicable to the site.
- Water Authority will only reimburse that part of the Project actually installed that is congruent with the approved plant coverage worksheet and/or landscape design, up to the maximum amount of square feet approved in the application. Any design or plant changes must be approved in writing by the Water Authority prior to Project completion.
- Prohibited Participants: Employees, Board of Directors, officers, representatives, agents, and contractors of the Water Authority, and any other entity involved in the administration of the Program, and their immediate family members and/or those living in the same household of such persons are **not** eligible to participate in the Program.

Acknowledgements

Program is made possible by financial support from:

- The Bureau of Reclamation through a Water Conservation Field Services Grant.
- The California Department of Water Resources' Integrated Regional Water Management Program financed under the California Water Security, Clean Drinking Water, Coastal and Beach Protection Fund of 2002

Water/Energy Relationship at SDG&E

SDGE connected

A Sempra Energy utility℠

San Diego County Water Authority

SDG&E Business Overview

- 4,100 square miles in San Diego and southern Orange counties
- Serving 3.5 million electric and gas consumers
- 1.4 million electric and 850,000 natural gas meters
- 5,000 employees

SDGE connected
A Sempra Energy utility

San Diego County Water Authority

SDG&E's History w/San Diego County Water Authority

- SDG&E has a twenty plus year relationship with SDCWA
- Through our decades-long Partnership some of our achievements include:
  - Distributed over half a million low-flow showerheads
  - Assisted small businesses w/water equip installations, at low or no-cost
  - Made high-efficiency washers affordable for customers through our joint rebate program
- Established a formal Institutional Partnership with SDCWA in 2006 which established co-rebates for residential & commercial high efficiency washing machines

SDGE connected
A Sempra Energy utility™

San Diego County Water Authority

More History - Pilots

- SDG&E filed an application with the CPUC on 1/16/07
- Pilots began July 2008 and ran through December 2009
- Each IOU partnered with local water agencies to fund and manage the Water Pilots
- All IOUs developed different pilots – residential, commercial, low income - to measure the indirect energy savings and water savings in different ways
- SDG&E developed three water/energy pilots
  - Managed Landscape
  - Water/Energy Audits
  - Recycled Water

SDG&E EE Programs 2013-2014

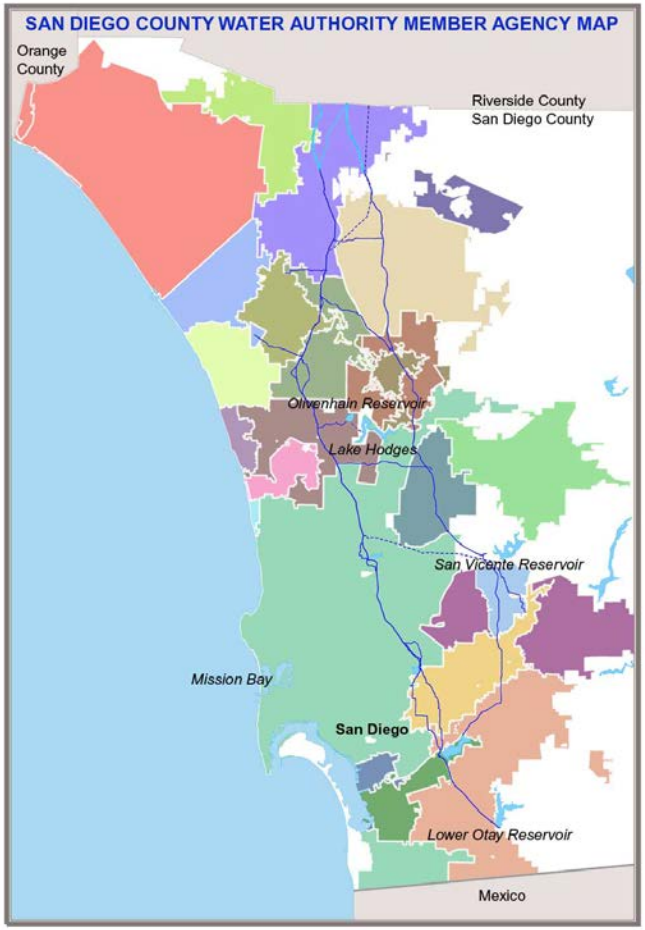
- In 2013-2014 SDG&E:
  - Promote energy and water savings equipment by offering rebates, incentives on custom projects and agricultural pump testing
  - Leverage SDG&E's financing offerings where applicable
  - Implemente a leak loss detection and pressure management service in partnership with SDCWA.
  - Explore incorporating water efficiency into our IDSM audit process
  - Initiate planning efforts with our LGPs to develop comprehensive water efficiency programs for the 2015 and beyond.
  - Work with local agencies to implement water energy savings measures at SDG&E's facilities

What is the Water Authority?

- Wholesale water agency created by State Legislature in 1944
  - 24 member agencies
  - 36-member board of directors
  - Serves 3.1 million people and region's $188 billion economy

- Mission is to provide safe and reliable water supply to member agencies

- Service area
  - 950,000 acres
  - 97% of county's population



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San Diego County Water Authority

Sources of San Diego County's Water Supply

San Diego County imports ~70% of its water supply

State Water Project (Bay-Delta) 28%

Colorado River 44%

Local Supplies and Conservation 28%

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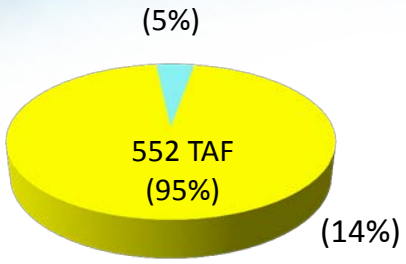
San Diego County Water Authority

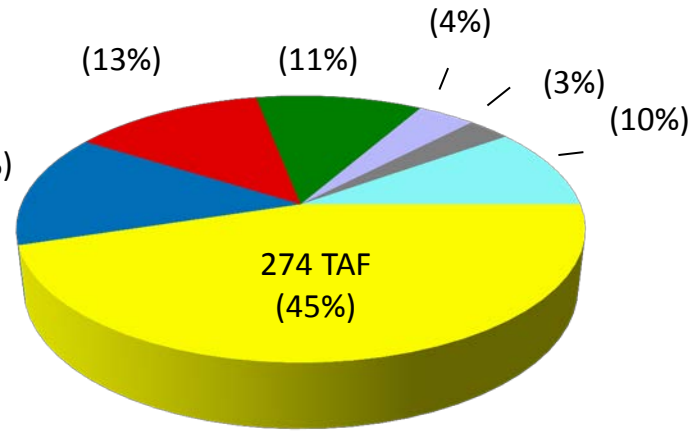
Increasing San Diego County's Water Supply Reliability through Supply Diversification

1991



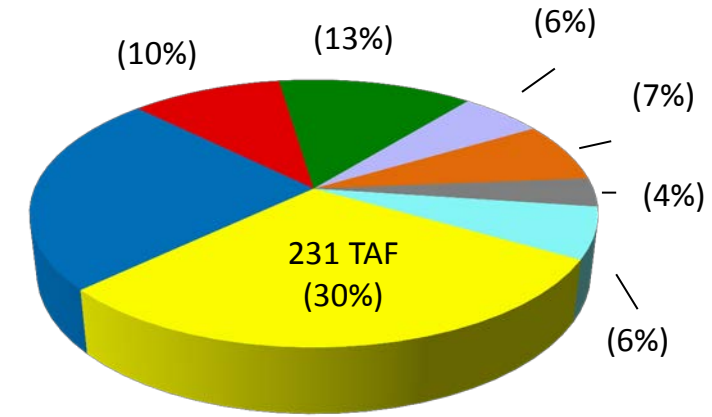
Total = 578 TAF

2012



Total = 612 TAF

2020



Total = 779 TAF

- Metropolitan Water District
- Imperial Irrigation District Transfer
- All American & Coachella Canal Lining
- Conservation (existing and additional)
- Recycled Water
- Seawater Desalination
- Groundwater
- Local Surface Water

SDGE connected
A Sempra Energy utility

San Diego County Water Authority

Partnership Benefits and History

- *Water efficiency programs reduce energy use*
- *Embedded energy saved through less transporting and heating of water*
- *Implemented numerous programs through partnership*

Past Partnership Activities

- *Showerhead Distributions*
  - Implemented in early 1990s
  - Distributed more than 500,000 low-flow showerheads
  - Distributed through community events, home water use surveys, etc.

- *Pre-Rinse Spray Valve Installations*
  - Implemented in mid-2000s
  - Installed in more than 300 restaurants
  - Water Authority facilitated a financial incentive
  - SDG&E performed the installations

SDGE connected
A Sempra Energy utility™

San Diego County Water Authority

Past Partnership Activities

- *High-Efficiency Clothes Washer Rebates (HEWs)*
  - Installed more than 100,000 residential HEWs since 1994
  - Installed more than 9,100 commercial HEWs

- *Energy Efficiency Assessments for Water Agencies*
  - Implemented in 2010
  - Offered energy efficiency assessments to Water Authority and member agencies
  - Assessments performed on 103 water agency facilities

SDGE connected
A Sempra Energy utility™

San Diego County Water Authority

Past Partnership Activities

- *Home Energy and Water Savings Kits Distribution*
  - SDG&E provides free energy and water savings kits
  - Includes showerhead and aerators
  - Water Authority and member agencies distribute

- *Marketing*
  - Cross-market water and energy efficiency programs
  - Includes messaging on websites and distribution of program marketing materials

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San Diego County Water Authority

Past Partnership Activities

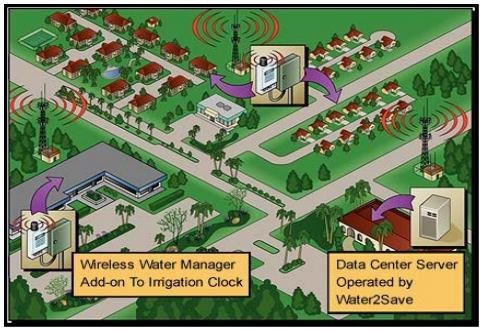
- *Water-Energy Pilot Program*
  - Implemented in 2008
  - Evaluated embedded energy use in three programs
    - Comprehensive water/energy audits
    - Managed landscape program
    - Retrofits of sites from potable water to recycled water

SDGE connected
A Sempra Energy utility

San Diego County Water Authority

2013-2014 Partnership Activities

- *WaterSmart Landscape Efficiency Program*
  - Targets reduction in water use at sites with multiple acres of irrigated landscape
  - Achieves water savings through
    - Pre-implementation audit of site's irrigation system
    - Services provided by a water management service company



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San Diego County Water Authority

2013-2014 Partnership Activities

- *Leak Loss Detection Program*
  - Provides top-down water audits of retail water agency distribution systems
  - No cost to water agencies
  - Performed by a third-party contactor
  - Identifies opportunities to implement pressure management measures

SDGE connected
A Sempra Energy utility

San Diego County Water Authority

2013-2014 Partnership Activities

- *Detention Facility Retrofits Program*
  - Saves water and embedded energy through the installation of water-efficient devices
  - Modeled after previous pilot program with savings of 300+ acre-feet per year
  - County of San Diego will provide financial and in-kind services

SDGE connected
A Sempra Energy utility

San Diego County Water Authority

2013-2014 Partnership Activities

- *Other activities include*
  - Continue to cross-promote SDG&E's programs
  - Distribution of energy and water savings kits
  - Host events/workshops at SDG&E's Energy Innovation Center

Questions?

Contact

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SANTA FE IRRIGATION DISTRICT

2010 URBAN WATER MANAGEMENT PLAN

Final - June 2011

Prepared By:

RMC Water and Environment

SANTA FE IRRIGATION DISTRICT

2010 URBAN WATER MANAGEMENT PLAN

Final

June 16, 2011

Prepared For:

5920 Linea Del Cielo

Rancho Santa Fe, CA 92067

Prepared By:

RMC Water and Environment

Chapter 2 System Description

Chapter 2 provides a description of the District's service area, water supply system, population, climate, and demographics.

2.1 District History and Service Area

10631(a): #8. Describe the service area of the supplier.

10631(a): #9. Describe the service area climate.

Santa Fe Irrigation District (District) was formed January 26, 1923 under the California Irrigation District Act. A Board of Directors composed of five members governs the District. The District provides retail water supply to approximately 19,400 residents within the City of Solana Beach, and the communities of Rancho Santa Fe and Fairbanks Ranch located within unincorporated areas of the County of San Diego. The District's 16-square mile area is supplied by three water sources: imported raw and treated water, local surface water, and recycled water.

The boundaries of the District's water service area are shown in **Figure 2-1**. The District service area contains approximately 10,200 acres, of which 2,850 acres are in Solana Beach, 6,490 acres are in Rancho Santa Fe, and 920 acres are in Fairbanks Ranch. The present population of the District is approximately 19,386, of which two-thirds is in the Solana Beach area. In fiscal year (FY) 2010, the District distributed approximately 11,208 acre-feet of potable water through 6,484 water meters and 504 acre-feet of recycled water through 47 meters. The District provides potable water service for domestic, commercial, outdoor irrigation, and agricultural demands. As a result of conservation efforts, the District's potable water demands have dropped substantially over the past two years. Demands for 2011 are expected to be substantially lower than demands for FY 2010. Projected demands and the impacts of conservation measures are described in detail in later chapters of this 2010 UWMP. Recycled water is used for irrigation of golf courses, parks, and other landscape irrigation demands. Further discussion regarding the District's recycled water supplies is also provided in Section 4.3 of this UWMP.

The District obtains its potable water supply from two sources: local surface water from Lake Hodges and imported raw and treated water purchased from the Water Authority. Lake Hodges was built in 1918 with the construction of Hodges Dam on San Dieguito Creek. The City of San Diego purchased the dam and reservoir in 1925. The District jointly retains water rights to the surface water in Lake Hodges through an agreement with the City of San Diego. When full, the reservoir has 1,234 surface acres and a water storage capacity of approximately 30,250 acre-feet (AF). Over the last decade, the District has obtained approximately 26% of its water from Lake Hodges. In the near future, the Water Authority is scheduled to begin using Lake Hodges to store water in conjunction with its Emergency Storage Project (ESP), and the lake will be connected to the Water Authority's aqueduct system. The use of capacity in Lake Hodges for ESP storage is not anticipated to impact the District's ability to collect and store the District's portion of local surface water supply.

Wholesale Water

The District has been a member agency of the Water Authority since 1948. Membership in the Water Authority was essential due to the fact that local water supplies (Lake Hodges) could not provide sufficient, reliable quantities to meet demands within the service area. A majority of the imported water purchased from the Water Authority is raw water that is treated at the District's Badger Plant. On occasion, treated imported water from the Water Authority is used to supplement supply at the Badger Plant. Section 4.2 below provides a detailed discussion of the Water Authority's wholesale water sources.

Wholesale Water Projections

In accordance with the Act, the District provided water use projections to the Water Authority (refer to Table 3-8 in Chapter 3) and the Water Authority provided a draft UWMP for the District's review and comment. The District does not have a fixed limit on the volume of water that can be acquired from the Water Authority. In its 2010 UWMP, the Water Authority confirms its ability to deliver the supplies needed by the District (to supplement the District's local resources) throughout the 20-year planning horizon. To this end, Section 10631(k) of the UWMP Act provides that the District may rely upon the water supply information provided by the Water Authority for purposes of quantifying the existing and planned amounts of imported water available to the District throughout the UWMP planning horizon, and for describing the reliability of that supply and vulnerability to seasonal or climatic shortages during average, single-dry and multiple-dry year periods.

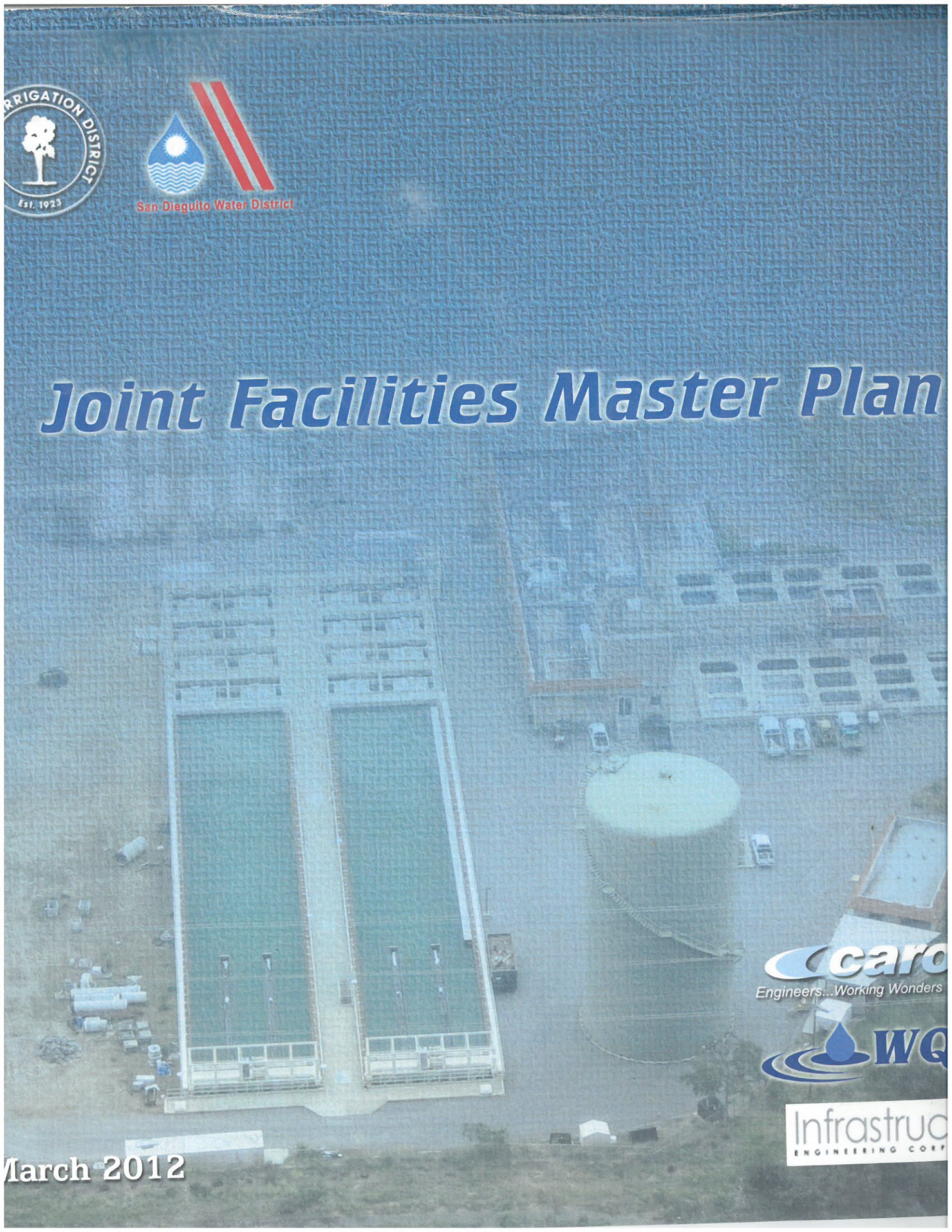
The District's existing and planned wholesale potable supplies to be provided by the Water Authority are shown in **Table 4-2** and are discussed in further detail in Section 4.2 below.

Table 4-2: Existing and Planned Wholesale Supplies

Wholesale Potable Supplies — Existing and Planned Sources of Water (DWR Table 17)						
Wholesale potable sources[1,2]	**Contracted Volume[3]**	**2015**	**2020**	**2025**	**2030**	**2035**
San Diego County Water Authority	No Set Limit	7,438	7,570	7,888	8,153	8,358
*Units are in **acre-feet per year**.*						

Local Surface Water

Since the turn of the century, the District and San Dieguito Water District (SDWD) have jointly maintained property rights to local surface waters entering Lake Hodges. At 347 square-miles, Lake Hodges has the largest drainage basin of any surface water source in the County of San Diego. When full, Lake Hodges spans 1,234 acres and holds approximately 30,000 AF of water. The District, SDWD, and the City of San Diego (City) have an agreement that defines property rights for the water entering Lake Hodges. The agreed annual yield is approximately 11,400 AFY. A copy of that agreement is included within **Appendix G**. In any single year, 50% of the annual hydraulic yield is the shared property of the District and SDWD, and the remaining 50% is the City's. The District and SDWD have rights to the first 5,700 AF entering the lake. Any surface runoff in excess of 11,400 AF is split 50/50 between the Districts and the City.


RRIGATION DISTRICT
Est. 1923
San Dieguito Water District
Joint Facilities Master Plan
caro
Engineers...Working Wonders
WQ
Infrastruc
ENGINEERING CORP
March 2012

JOINT FACILITIES MASTER PLAN

R.E. Badger Water Filtration Plant

03/07/2012

Prepared for

SANTE FE IRRIGATION DISTRICT &
SAN DIEGUITO WATER DISTRICT

March 2012

WQTS

carollo
Engineers...Working Wonders With Water®

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ENGINEERING CORPORATION

PAST STUDIES

In the past, SFID/SDWD has commissioned studies to identify improvements to the raw water supply system and the WFP. These studies include the following:

1. 1999 San Dieguito Reservoir Rehabilitation Study (1999 SDR Study)
2. 2003 R.E. Badger Water Filtration Plant Master Plan Final Report (2003 Master Plan)
3. 2006 Final Report on the Blue Ribbon Panel R.E. Badger Process Study (2006 Report)
4. 2009 Asset Management Master Plan (2009 AMMP)
5. 2009 Mass-Balance and 1-D Water Quality Modeling of San Dieguito Reservoir: Development of Management Strategies (Anderson, M.A., 2009a).
6. 2009 Review of Available Water Quality Data for San Dieguito Reservoir and Lake Hodges Inflow (Anderson, M.A., 2009b).
7. 2011 Bathymetry and Basin Characteristics of San Dieguito Reservoir (Anderson, M.A., 2011).

Each of the above studies has made recommendations for improvements to the raw water system or the WFP. Many of these recommendations have been or are in the process of completion. The most recent master plan (2009 AMMP) primarily focused on the treated water distribution system. The 2009 AMMP recommended a separate master plan be completed for the WFP. As a result, SFID/SDWD commissioned Carollo Engineers to prepare a JFMP for the WFP and its associated raw water facilities. This master plan is being undertaken to provide a 10-year road map for SFID/SDWD with respect to the Joint Facilities.

JOINT FACILITIES

A general description of the Joint Facilities follows.

Raw Water System

Raw water entering the WFP primarily comes from SDR via the SDPS and an inter-tie from the CWA system. Water from SDR consists primarily of water from Lake Hodges with a small portion coming from the local watershed. Water is transferred from Lake Hodges to SDR through a 36-inch steel pipeline that reduces to an 18-inch high-density polyethylene (HDPE) pipeline. The CPS can be used to increase flows from Lake Hodges to SDR. The primary purpose of the CPS is to provide water from Lake Hodges directly to the WFP; however, it is infrequently used this way because water from Lake Hodges is more difficult to treat without first flowing through SDR for pre-conditioning. A schematic of the raw water system is shown in Figure 1.2.

Hydroelectric Facility

Raw water from CWA is at a high pressure that must be reduced before entering the WFP. This needed pressure reduction is accomplished using a hydroelectric facility that was constructed in 1985. The hydroelectric facility consists of two turbines, each having different flow capacities and has a total flow capacity of 67 cfs. The maximum power output from the turbine generators is 1,485 kW. The hydroelectric facility is connected to the SDG&E power grid and includes bi-directional revenue meter. More detailed information on the hydroelectric facility can be found in Section 6.

Section 2 IDENTIFICATION OF WATER QUALITY & TREATMENT CHALLENGES

As part of the JFMP, water quality challenges facing the WFP were evaluated with water treatment modifications identified that could be implemented at the plant to mitigate these challenges. This section presents the outcome of this evaluation.

OVERVIEW OF THE BADGER WATER FILTRATION PLANT

The WFP treats water from two primary supplies: 1) Imported water from Lake Skinner purchased through the CWA, and 2) local water stored in Lake Hodges and SDR. These two water supplies vary greatly in quality to the extent that their blend ratio tends to dictate the treatment practice at WFP. Specifically, compared to CWA water, the local water supply has three challenging water quality characteristics. The first is the presence of elevated levels of total organic carbon (TOC) resulting in formation of elevated levels of Disinfection By-Products (DBPs). The second is the presence of elevated levels of manganese, which could cause discoloration of drinking water. The third is prevalence of T&O chemicals, primarily Geosmin and 2-methylisoborneol (MIB), which impart an objectionable T&O in drinking water. These three water quality challenges very much define the treatment needs at the WFP. A more detailed discussion of these challenges is presented later in this section.

WFP is a 40 mgd conventional water treatment plant. Figure 2.1 shows a schematic process flow diagram of the main water treatment processes employed at the plant, as well as the types of treatment chemicals added. Local water is pumped to the plant through the SDPS, which draws water from SDR, or through the CPS, which draws water directly from Lake Hodges. In this mode, chlorine dioxide is added directly to Lake Hodges water before it either goes to SDR or is treated at WFP. After water from SDR blends with CWA water, SFID/SDWD adds chlorine dioxide (ClO_2), to the raw water as a preoxidant. The primary purpose of ClO_2 addition is to oxidize dissolved manganese to form manganese dioxide ($MnO_{2(s)}$), which is removed through sedimentation and filtration. The plant also adds PACL to meet its TOC removal requirements. SFID/SDWD relies on multiple disinfectants and short chlorine contact time to control formation of DBPs, primarily trihalomethanes (THMs) and haloacetic acids (HAAs).

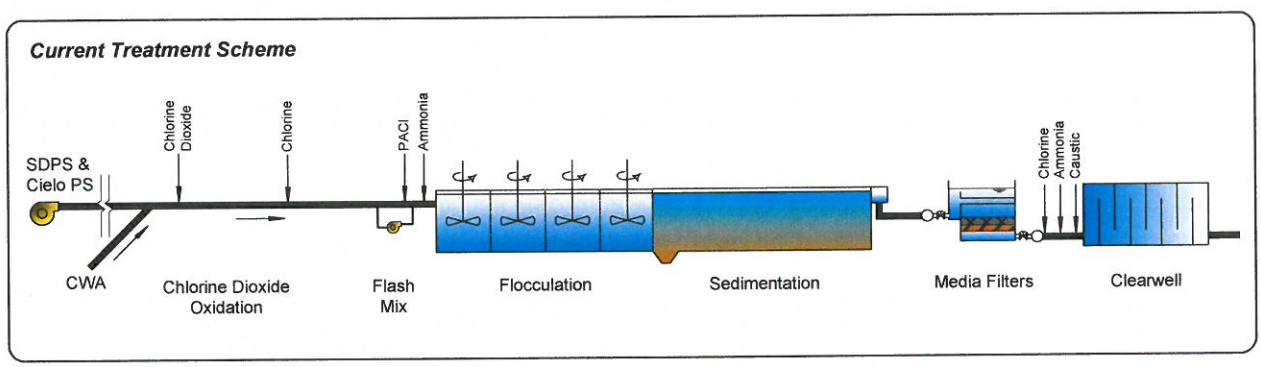


Figure 2.1 Current Treatment Scheme at the WFP

Section 3 PLANT PROCESS AND HYDRAULIC EVALUATION

BACKGROUND

The WFP treats local Lake Hodges water diverted directly to the plant or through San Dieguito Reservoir and imported new water provided by CWA. Local water is of lesser quality compared to imported CWA water and exhibits the following treatment challenges:

- Higher turbidity
- Higher TOC
- Manganese
- Algae
- T&O compounds
- Additional disinfection requirements
- High coagulant dosages and sludge production
- Low dissolved oxygen levels
- Hydrogen sulfide

Plant staff prefers treating water from SDR rather than directly from Lake Hodges because of the lake management program implemented at SDR. The result of this lake management program is higher dissolved oxygen and lower sulfur (corrosive) compounds in SDR. Although treating local water is difficult, plant staff has done a great job operating the plant with the tools that are available. For the past several years, most of the plant's water production (up to 70 percent) has been obtained from the local raw water supply.

The purpose of this analysis is to identify process deficiencies in the plant that hinder water treatment and to develop solutions, improvements, and capital costs for treating the raw water sources while meeting regulatory requirements.

PLANT PROCESS EVALUATION

Site inspections and desk-top evaluations of the existing WFP were conducted to assess capacity, performance, and physical condition of the plant process facilities. The following processes and equipment were evaluated:

- Coagulation (flash mix)
- Flocculation
- Sedimentation
- Filtration
- Disinfection
- Solids handling
- Utility water
- Chemical handling

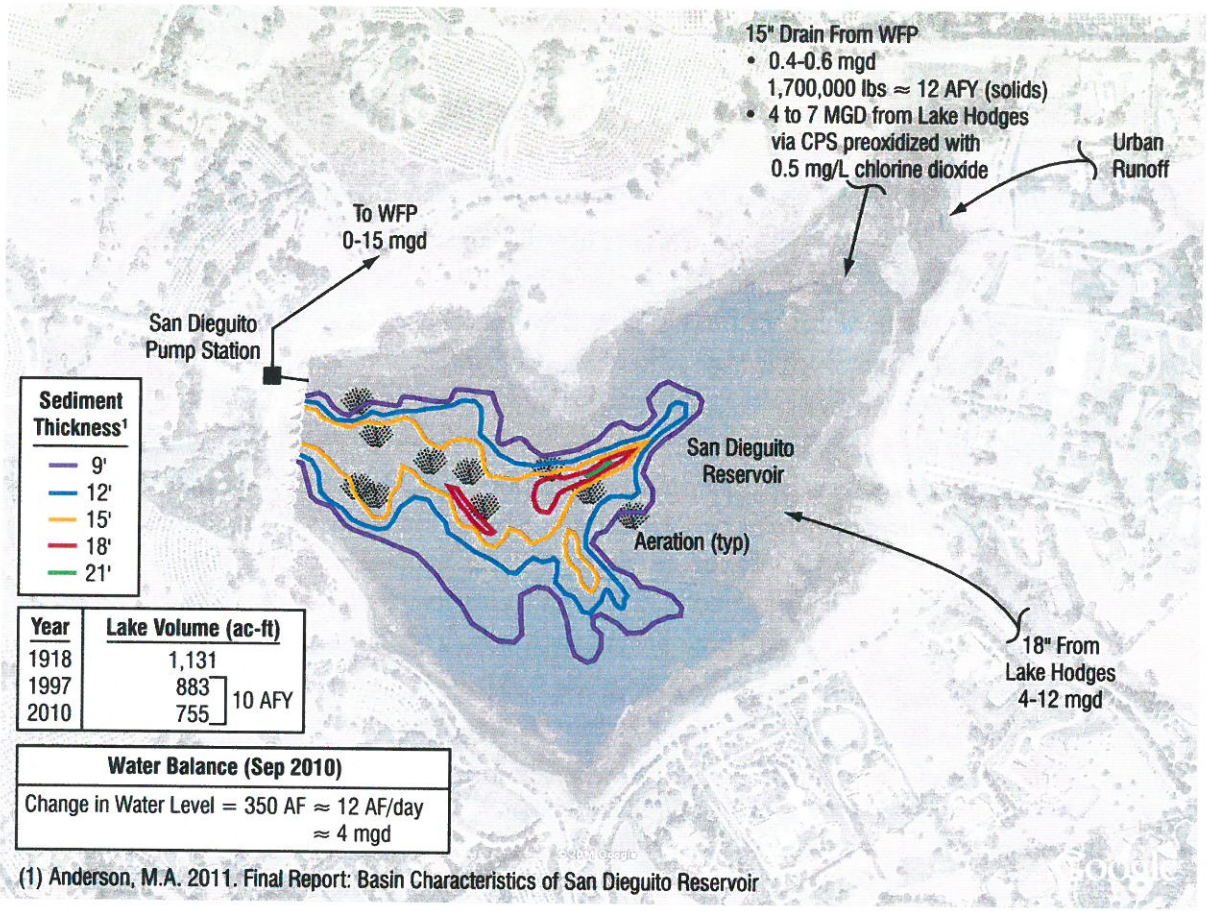


Figure 4.2 **San Dieguito Reservoir Flow and Mass Balance**

Pretreatment of Water from Lake Hodges

In the mid to late 2000's, SFID/SDWD implemented a Lake Management System for SDR. Use of Aquamats, floating islands, aeration, real time water quality monitors, and perimeter vegetation removal has transformed SDR into an active unit process in the cost effective treatment of local water. As discussed in Section 2, the following observations regarding water quantities in SDR and Lake Hodges were presented.

- TOC is about 10 percent lower in SDR than Lake Hodges.
- Manganese is marginally lower but more consistent in SDR.
- T&O causing compounds, TDS, and coliforms were comparable between the two local source waters.

At the current capacity of SDR (755 AF) and the maximum flow from Lake Hodges at 12 mgd, theoretical residence time at SDR is 20 days. With proposed modifications to add a 30-inch parallel pipeline to bring total transfer capacity to 22 mgd, the residence time would be reduced to 11 days. Current lake management practices can handle 18 mgd of flow through SDR. However, the new proposed SDPS is recommended to have a firm capacity of 15 mgd expandable to 25 mgd (see later discussion). Currently, plant staff adds chlorine dioxide to flow from CPS and sends 4 to 7 mgd to SDR as part of their lake management program. With a new

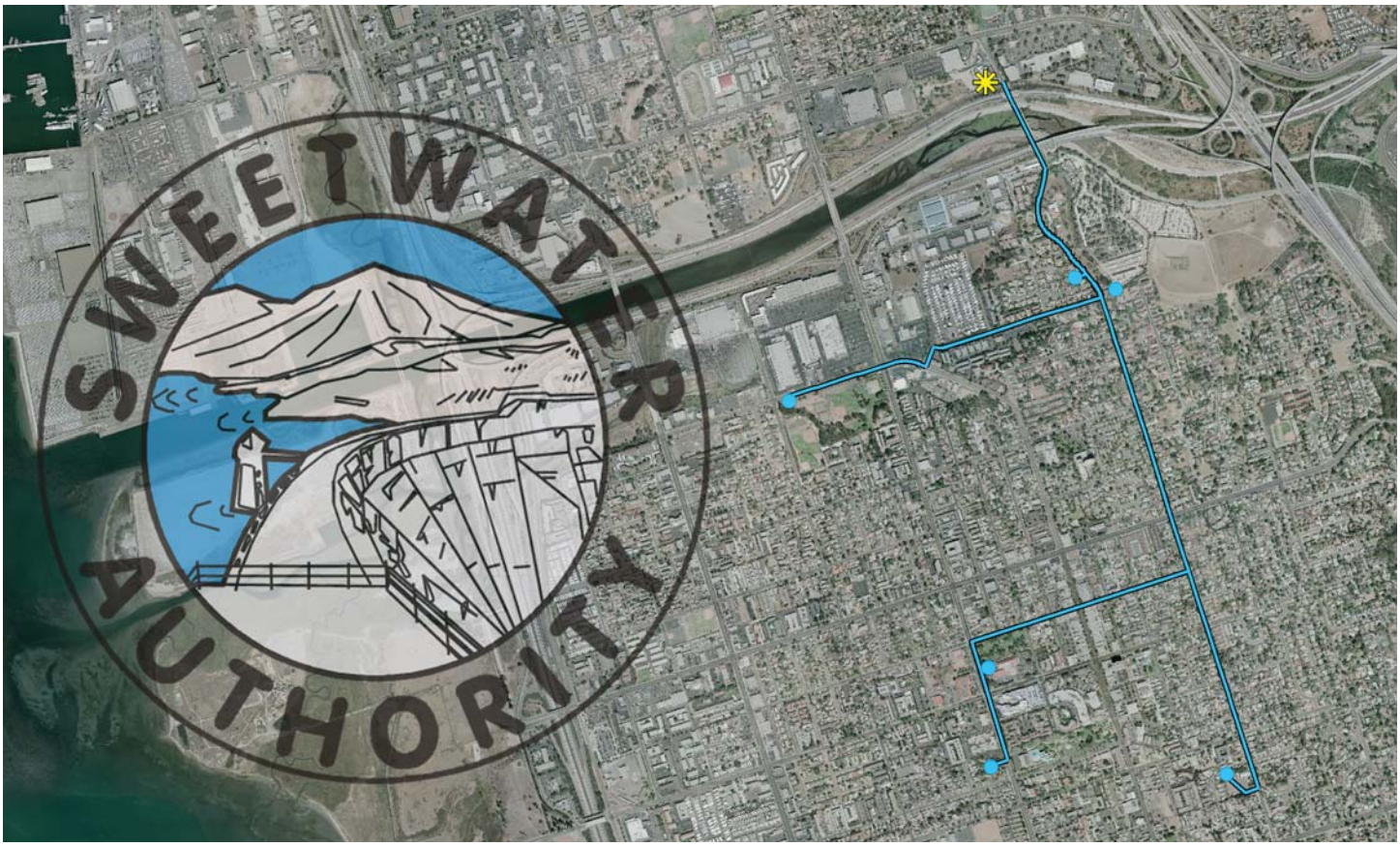
RICHARD REYNOLDS BRACKISH GROUNDWATER DESALINATION FACILITY - PHASE II EXPANSION

Final Environmental Impact Report
SCH No. 2007101055

Prepared for
Sweetwater Authority

February 2010

ESA

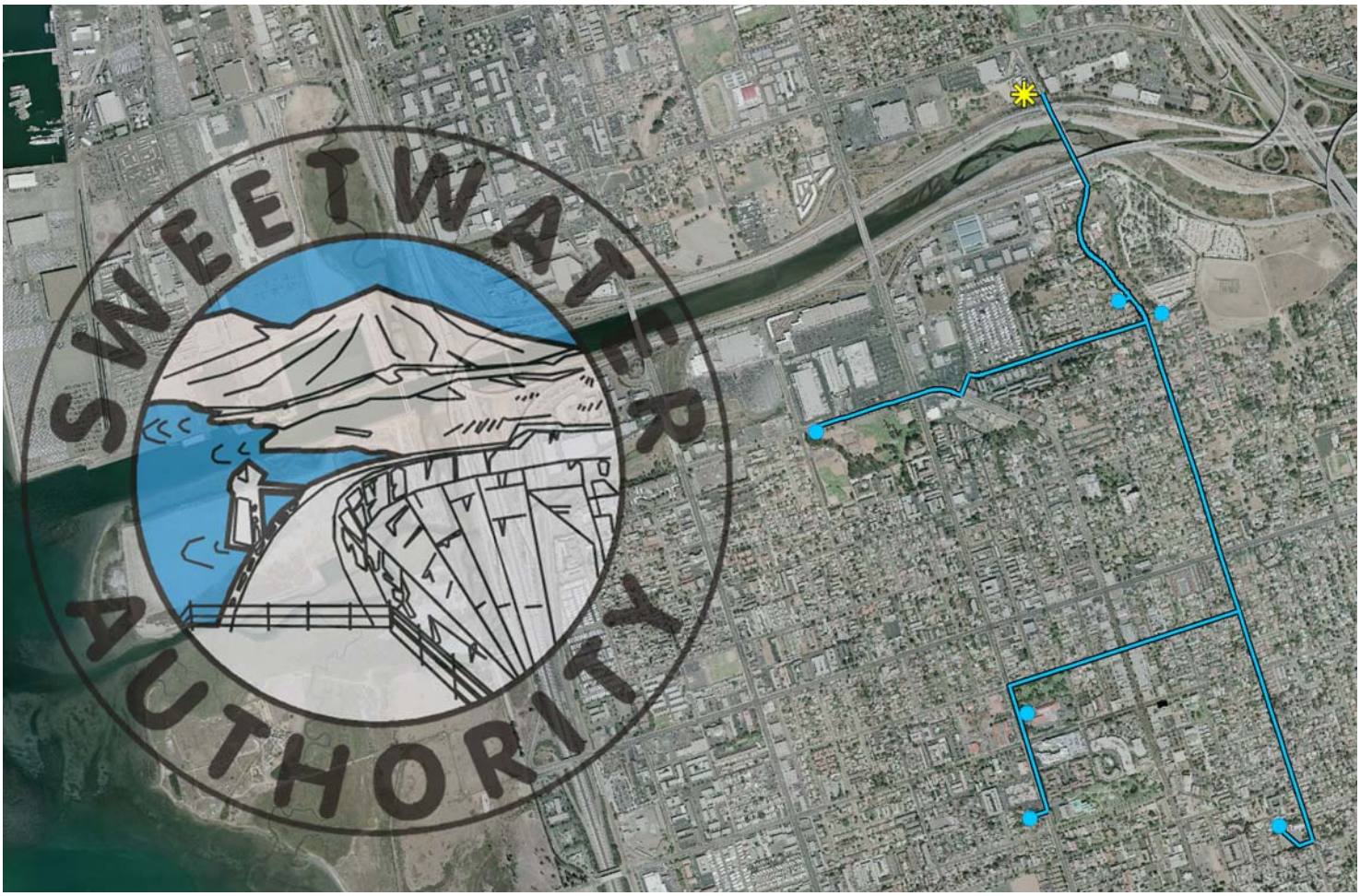


SWEETWATER AUTHORITY BRACKISH GROUNDWATER DESALINATION PROJECT

Draft Environmental Impact Report

Prepared for
Sweetwater Authority

July 2009



SWEETWATER AUTHORITY BRACKISH GROUNDWATER DESALINATION PROJECT

Draft Environmental Impact Report

Prepared for
Sweetwater Authority

July 2009

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Oakland

Petaluma

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Tampa

Woodland Hills

207291

ESA

Electrical

The proposed project includes upgrades to the current electrical system. The project would need the electrical equipment to run the RO feed pumps to the new RO treatment trains, the new CIP system, the new degassifier, the new clearwell pump motors, and the new VFDs for the high service pump. Modifications to the new electrical room cooling system would also be required if the existing cooling system is not adequate for the new VFD units.

Environmental Impacts and Mitigation Measures

The potential environmental impacts of the project are summarized in **Table ES-1** at the end of this chapter. This table lists impacts and mitigation measures in three major categories: significant impact that would remain significant even with mitigation; significant impacts that could be mitigated to a level of less-than-significant; and impacts that would not be significant. For each significant impact, the table includes a summary of the mitigation measure(s) and an indication of whether the impact would be mitigated to a less-than-significant level. Please refer to Chapter 3, *Environmental Setting, Impacts, and Mitigation,* for a complete discussion of each impact and associated mitigation measure.

Alternatives

The California Environmental Quality Act requires that a reasonable range of project alternatives be discussed in an Environmental Impact Report. This EIR identifies and analyzes such a reasonable range of alternatives; identifies the environmental effects of each alternative; and compare the environmental effects of each alternative with the environmental setting with the effects of each other alternative, and with the project. The alternatives consist of the following:

Alternative 1: No Project/No Build Alternative

The CEQA Guidelines require the No Project/No Development Alternative to be addressed in an EIR (Section 15126.6(e)). Typically, the No Project/No Development Alternative implies no development at the proposed project site, which means that project-related impacts are eliminated because the site would be retained in its present condition. Under this alternative, nothing would be built at the desalination facility or well site locations. The desalination facility and well site locations would remain as is, and occupied by the already existing desalination facility or vacant lands at each of the proposed well site locations. The desalination facility site would have been maintained, as required by the Authority, as would each of the proposed well site locations by each of the property owners at these respective locations.

In general, the No Project/No Build Alternative would result in virtually no impacts on the environment, although the alternative would result in some potential hazards and hazardous materials remaining at the site. This alternative would not, however, meet the goals and objectives of the Authority to increase the desalination potable water production to 10 mgd.

Alternative 2: San Diego Metro KOA Campground Location

As an alternative to San Diego Formation (SDF) well 7, a location within the limits of the San Diego Metro KOA campground was considered as a potential well site location. The Alternative 2 site is an existing disturbed recreational vehicle (RV) Storage Park. This alternative well site is generally located just east of Second Avenue at the base of a steep slope that starts at the right-of-way of North Second Avenue and slopes downward towards the RV Park. This location is positioned below the intersection of North 2nd Avenue and C Street in proximity to low-lying vegetative groundcover on the southern corner of the campground. The well would be connected to the 2nd Avenue pipeline just north of C Street.

Unlike the primary well site, the alternative site would not be limited in the size of available workspace for construction equipment. In addition, Alternative 2 would not incur additional costs due to the additional drilling needed to compensate for the higher elevation of this property location. The additional drilling associated with Alternative 2 would also result in additional environmental impacts associated with the required piping construction along the hillside. Finally, the purchase cost of the primary well site property would be approximately the same as the KOA campground site. Alternative 2 would meet the goals and objectives of the Authority to increase the desalination potable water production to 10 mgd; however, this location is not preferred due to access issues associated with the KOA campground site and the cost associated with constructing a pipeline on the hillside between the KOA well site and the 2nd Avenue raw water pipeline. The cost of the hillside pipeline would make this alternative more expensive than the 2nd Avenue site.

Alternative 3: Memorial Park Alternative Location

As an alternative to SDF 9, a location within the limits of Memorial Park was considered as a potential well site location. Memorial Park stretches between 4th and 3rd Avenue along Park Way. Under this Alternative the project would have additional impacts associated with construction of the well site pump and associated distribution pipelines. The proposed alternative well site location would be situated approximately 4 feet from the northern edge of the existing parking lot, in the grassy area just east of 4th Avenue. The pipeline would connect into this alternative location from 4th Avenue. In addition, the project would require a 4(f) compliance analysis. Specifically, federally funded transportation projects that involve the use of Section 4(f) property (publicly owned Public Park, recreation area, or designated wildlife and waterfowl refuge land or significant historic property) must undergo a formal evaluation and approval process that can be long and complex. Transportation use of these properties is subject to the requirements of Section 4(f) of the U.S. Department of Transportation (USDOT) Act of 1966.

In general, Alternative 3 would result in similar potential impacts compared to the proposed project. This alternative would meet the goals and objectives of the Authority to increase the desalination potable water production to 10 mgd, however, the City is opposed to using Memorial Park as a potential well pump location, as it would encumber the already existing park use designation and create a visual impact within a public location.

Alternative 4: 4th Avenue Adjacent Property Alternative Location

As another alternative to SDF 9, the adjacent property along 4th Avenue to the south of the primary site is being considered as a potential well site location. As this alternative location is not situated adjacent to an existing drainage, it would have fewer potential biological impacts associated with construction of the well site pump and associated distribution pipelines compared to the primary location for SDF 9. In addition, the purchase price of this alternative lot is certain, unlike the primary lot to the north designated for SDF 9. The pipeline would connect into this alternative location from 4th Avenue.

Alternative 4 would result in fewer biological and hydrological impacts compared to the proposed project, as this lot is not located along an existing drainage. This alternative would also meet the goals and objectives of the Authority to increase the desalination potable water production to 10 mgd. However, this alternative location is not desirable because it is anticipated that the rear portion of this lot (approximately 25 percent) would require soil amendments to create a level building surface. Additionally, construction within this lot would be more difficult due to its restricted size in comparison to the neighboring lot to the north. As previously stated under this alternative, the well site building would be visible to the public from 4th Avenue once the existing structure is demolished. In comparison, public views of the well housing building on the primary property location to the north would be mostly blocked by the existing home onsite.

Alternative 5: 2nd Avenue Bridge Alternative

Each of the five new SDF wells would require conveyance piping from their respective locations to a point south of the 2nd Avenue Bridge. Alternative 5 would involve, transport of the raw water to the existing desalination facility via an 18-inch groundwater transmission pipeline over the Sweetwater River using the existing 2nd Avenue bridge utility corridor rather than using a directional boring operation under the Sweetwater River. The installation of a fiber optic cable would also be required in the 2nd Avenue bridge utility corridor for communication associated with this project.

In general, Alternative 5 would result in virtually no impacts on the environment, although the alternative would result in some short-term potential impacts to aesthetics, air, noise and traffic. Alternative 5 would not be feasible, however, because an 18-inch groundwater transmission pipeline and the fiber optic cables would not fit in the existing 2nd Avenue Bridge utility corridor.

Alternative 6: Box Model Discharge Alternative

Concentrate discharge from the desalination facility is currently released through a 14-inch diameter pipe into the concrete-lined Upper Paradise Creek Flood Control Channel to the Sweetwater River. The Upper Paradise Creek Flood Control Channel releases into the Sweetwater River several hundred feet downstream, or west of the bridge at 2nd Avenue. Operation of the proposed project would result in an increase in the volume of concentrate discharge from the desalination plant from 0.8 mgd to a maximum of 2.5 mgd, or about a three-fold increase. This discharge is neither freshwater, nor as saline as seawater, but is intermediate in salinity and

therefore potentially alters the ambient salinity regime within the Sweetwater River Estuary. As an alternative to the current discharge point, a location approximately 1,000 feet further downstream, where the tidal prism is greater, was considered as an alternative. In order to address potential impacts of the proposed project upgrade and plant expansion, a box modeling effort was proposed to predict average salinities within different areas of the estuary. This approach would help determine the spatial changes in salinity associated with changes in the concentrate discharge rate and concentrate discharge locations. To apply the Box Model to analyze salinity changes within the Sweetwater River associated with changes in concentrate discharge at the Reynolds' Demineralization Facility, the study area was subdivided into seven (7) smaller boxes to capture the desired level of spatial distribution for the results. As shown in the model, the Alternative 6 discharge point would be located approximately between Box 4 and Box 5. The Alternative 6 discharge point would reduce the salinity variation at the existing discharge location. Although moving the discharge to the Alternative 6 location would increase the salinity variation in this area, that variation would be less than the variation at the current discharge area (i.e., existing discharge condition) because there is better mixing at the Alternative 6 location.

In general, the Reynolds concentrate discharge from the desalination plant, at this alternative discharge point, would be diluted more rapidly with San Diego Bay waters as compared to the proposed project discharge point to achieve lower toxicity effects on the Sweetwater River Estuary. Additional impacts could result from construction of additional piping to the new discharge point. All other project-related impacts would be similar to those described under the proposed project. Alternative 6 would be more costly because it would require additional piping construction in order to extend into the new discharge area.

Alternative 7: Regional Concentrate Conveyance Facility (Brine Line) Alternative

The Brine Line would serve existing and future regional desalting facilities as well as benign industrial discharge and could provide an environmentally friendly solution to the challenge of concentrate and effluent management. The regional concentrate conveyance facilities would involve the construction of a primary pipeline running north to south in southern San Diego County, discharging to the existing South Bay Ocean Outfall (SBOO) as well as an additional pipeline alternative serving the Otay Mesa industrial area. Located near Imperial Beach, the SBOO discharges treated wastewater from the International Wastewater Treatment Plant to the Pacific Ocean. It also discharges effluent from the South Bay Water Reclamation Plant. The SBOO extends approximately 3.5 miles offshore and discharges effluent in approximately 100 feet of water. Both existing and planned groundwater desalination facilities in the region could utilize the proposed concentrate conveyance facilities.

In general, Alternative 7 would result in reduced impacts on the environment, although the alternative would result in some short-term potential impacts to aesthetics, air, noise and traffic. At this time, the Brine Line is only being evaluated on a feasibility level by the San Diego County Water Authority and has not been funded for construction. In addition, the Brine Line has not yet been designed, permitted, nor has a reasonable timeline been established for construction.

Alternative 8: Sanitary Sewer System Discharge Alternative

As an alternative to concentrate disposal into the river, Alternative 8 would involve disposal into the National City sanitary sewer. National City currently has a sewer line located in proximity to the Richard A. Reynolds Desalination Facility that could be used for concentrate disposal. In order to connect into the sanitary sewer, the Authority would need to purchase capacity with the Metropolitan Wastewater Department as National City does not currently have excess capacity for this flow. In addition, a one time capacity buy-in charge would be required along with a monthly sewer fee. The capacity buy-in charge is based on gallons per day discharged to the sanitary sewer. In addition to the capacity charge, the 15-inch sewer main located in front of the Richard A. Reynolds Desalination Facility would require upgrading, as it is not large enough to handle 900 gpm. The upgrade would extend 1.5 miles. The installation of a sewer metering station would also be required. Alternative 8 also assumes that the Metropolitan Wastewater Department and National City will accept highly saline water for processing in their sewer system. Preliminary discussions with Metropolitan Wastewater Department have indicated that they would accept the highly saline water, but would not commit to it until a permit was applied for by the Authority.

In general, Alternative 8 would result in fewer impacts compared to the proposed project as a result of decreased concentrate discharge; however, Alternative 8 could impact future treatment recycling. This alternative is not preferred due to the costs associated with connecting into the National City sewer system. In addition, this alternative is difficult to evaluate because there are unknown variables, such as salinity tolerance levels if South Bay effluent (currently being directed to Point Loma) were to be redirected to the South Bay Outfall.

Alternative 9: Deep Well Injection of Brine Alternative

As an alternative to concentrate disposal into the river, Alternative 9 would involve injection of 900 gpm of concentrate discharge into two 1,200-foot deep injection wells near San Diego Bay. This is based on the assumption that injection wells will accept approximately half the flow (450 gpm) that a production well can produce in the deep aquifer. A total of approximately 6,000 feet of 8-inch PVC pipe would be needed from the Richard A. Reynolds Desalination Facility to the injection wells near San Diego Bay.

This alternative is not preferred because little is known at this time regarding the deep aquifer near San Diego Bay. The construction of a test well would be required to evaluate the deep aquifer near the San Diego Bay and evaluate the feasibility of injecting concentrate. The California Department of Health Services would also have to approve the injection of the concentrate waste into the deep aquifer.

Alternative 10: Evaporation Ponds Alternative

Alternative 10 would involve a reduction in concentrate through the combination of evaporation ponds and use of additional RO membranes. About 300 acres of land would be used for salt evaporation ponds and disposal of concentrate from the desalination plant. The evaporation rate of concentrate would occur at a rate of approximately 3 gpm per acre of land. In addition, the

costs for the disposal of concentrate could be reduced if the feed water recovery rate of the Richard A. Reynolds Desalination Facility membranes was increased to 90 percent from the current rate of 82 percent. The 90 percent recovery rate would be achieved by increasing the RO membrane process from a two train process to a three train process by adding membranes. The additional RO membrane train would reduce the amount of concentrate produced from 2,500,000 gallons per day (1,700 gpm) to approximately 1,300,000 gallons per day (900 gpm), at 82percent and 90percent respectively.

In general, Alternative 10 would result in fewer impacts compared to the proposed project as a result of decreased concentrate production. This alternative is not preferred due to the costs associated with the construction of additional membranes and lack of available acreage required for the evaporation ponds.

Environmentally Superior Alternative

Section 15126.6(e) (2) of the CEQA Guidelines requires that an EIR identify the environmentally superior alternative. If the No Project Alternative is the environmentally superior alternative, the EIR must identify an environmentally superior alternative among the remaining alternatives. Based on the above analysis, Alternatives 6, 7 and 8 would result in fewer biological and hydrological impacts compared to the proposed project while achieving the goals and objectives of the Authority to increase the desalination potable water production to 10 mgd. Although the construction of required piping under these alternatives would result in a temporary increase in noise and air quality impacts, the long-term environmental impacts associated with these alternatives would be reduced when compared to the proposed project. However, these alternatives are not feasible. Alternative 6 is infeasible because it would be more costly than the proposed project, as it would require additional piping construction in order to extend into the new discharge area. Alternative 7 is infeasible because at this time, the Brine Line is only being evaluated on a feasibility level by the San Diego County Water Authority and has not been funded for construction. As previously explained, the Brine Line has not yet been designed, permitted, nor has a reasonable timeline been established for construction. Alternative 8 is infeasible due to the costs associated with connecting into the National City sewer system. As also noted, Alternative 8 is difficult to evaluate because there are unknown variables, such as salinity tolerance levels if South Bay effluent (currently being directed to Point Loma) were to be redirected to the South Bay Outfall.

TABLE ES-1 (continued)
SUMMARY OF IMPACTS AND MITIGATION MEASURES FOR THE SWEETWATER AUTHORITY BRACKISH GROUNDWATER DESALINATION PROJECT

Environmental Impact	Mitigation Measures	Level of Significance after Mitigation
Biological Resources		
Impact 3.3-1: Construction of pipeline trenches in an urban setting and the installation of five well-site buildings could have a substantial adverse effect on special-status species, natural communities of special concern, federally protected wetlands, wildlife movement, or other biological resources present on and adjacent to the project site.	**Measure 3.3-1a:** The Authority shall have a qualified biologist conduct a pre-construction survey for nesting birds for project elements constructed between February 1st and August 31st on the project site within two weeks prior to construction. The applicant shall avoid direct impacts on any nesting birds located within the limits of construction by establishing the construction right of way and removal of plant material outside of the typical breeding season for birds (February 1 through August 31). If construction and vegetation removal is proposed for the bird nesting period February 1 through August 31, then active nest sites located during the pre-construction surveys shall be avoided and a non-disturbance buffer zone established by a qualified biologist dependent on the species and in consultation with the USFWS and CDFG as needed. Active nest sites shall be avoided with a non-disturbance buffer zone until the adults and young are no longer reliant on the nest site for survival as determined by a qualified biologist. **Measure 3.3-1b:** The Authority shall avoid tree removal and to minimize impacts to trees projected by the city tree ordinance to the extent feasible. Where removal and/or injury to trees are unavoidable, the Authority will obtain the necessary tree removal permits from the City.	Less than Significant.
Impact 3.3-2: The implementation of five HDD bore pits in disturbed habitat for pipeline construction under the Sweetwater River could result in a frac-out, or pressure induced mud leak, in the Sweetwater River that could cause a substantially adverse impact on aquatic biological resources.	**Measure 3.3-2:** Prior to the commencement of any directional boring for water conveyance pipeline construction, the Authority shall prepare a Frac-Out Contingency Plan. The plan shall establish clean up measures and protocols, and criteria under which a bore would be shut down (e.g. loss of pressure, loss of a certain amount of returns) and the number of times a single bore should be allowed to Frac-Out before the bore is shut down and re-evaluated. It would also clearly state what measure would be taken to seal previous Frac-outs that have occurred on a given bore to ensure that it does not become the path of least resistance for subsequent Frac-outs. Additionally, the site-specific Frac-Out Contingency Plan would be prepared and submitted the appropriate resource agencies for approval prior to commencement of the HDD project element.	Less than Significant.
Impact 3.3-3: The implementation of the proposed project could result in an increase in concentrate water discharge from the treatment plant that may have an adverse impact on the aquatic ecosystems within the Sweetwater River.	None required.	Less than Significant.

CHAPTER 1
Introduction

1.1 Purpose of the EIR

This Draft Environmental Impact Report (Draft EIR) has been prepared by the Sweetwater Authority (Authority), pursuant to the California Environmental Quality Act (CEQA) of 1970 (as amended), codified at California Public Resources Code Sections 21000 et. seq., and the State *CEQA Guidelines* in the Code of Regulations, Title 14, Division 6, Chapter 3. The Authority is the Lead Agency for this EIR, which examines potential physical impacts to the environment that could occur as a result of the proposed expansion of the Richard A. Reynolds Desalination Facility. The proposed project would increase the desalinated potable water production from its current five million-gallons-per-day (mgd) capacity to 10 mgd and would construct five new brackish groundwater wells and associated conveyance pipelines.

This EIR is intended to inform responsible agencies and the public of the proposed project's environmental effects. As the Lead Agency, the Authority has the "principal responsibility for carrying out or approving a project which may have a significant effect upon the environment" (CEQA Section 21067). The EIR is therefore intended to publicly disclose those impacts that may be significant and adverse, describe possible measures that would mitigate or eliminate such impacts, and describe a range of alternatives to the proposed project that could avoid or substantially lessen impacts. The impact analyses are based on a variety of sources, including agency consultation, technical studies, and field surveys.

1.2 Project Background

1.2.1 Phase 1

In 1992, the Authority initiated a resource management program with a goal of reducing the Authority's dependence on imported supplies, particularly during periods of drought. Financial incentives are available from wholesaler agencies (Metropolitan Water District and San Diego County Water Authority) to fund the development of alternative sources of water. The Authority proposed the rehabilitation of the lower Sweetwater River Basin which once supplied much of the drinking water for the local area. The project proposed the construction of new well fields and a desalination facility to develop this brackish water resource. The following facilities were constructed and permitted as part of Phase 1:

- Six San Diego Formation (SDF) wells (a deep aquifer);

- Four alluvial aquifer groundwater wells;
- Conveyance pipelines;
- Reverse osmosis (RO) treatment and appurtenances;
- A building designed to house the Phase 1 treatment facilities as well as future Phase 2 treatment facilities;
- Production of 5.0 mgd of potable water; and
- Discharge of 0.8 mgd of concentrate into the tidally influenced portion of Sweetwater River adjacent to the plant site.

The Authority completed an EIR in May 1996 (State Clearing House #94031062) and an Environmental Assessment leading to a Finding of No Significant Impact (FONSI) under National Environmental Policy Act (NEPA) in September1997. The objective of the original phase of the project was to improve water supply reliability through the development of local water resources to reduce reliance on imported water, particularly during periods of drought.

Previously referred to as the Lower Sweetwater River Demineralization Facility, the Richard A. Reynolds Desalination Facility was completed in 1999. The facility began operation in January 2000. The California Department of Public Health Services (CDPH) refused to permit the project due to its determination that the alluvial groundwater was "under the influence of surface water," and that surface water was not treatable by the RO process. As a result, the Authority has been unable to use the alluvial wells.

The brackish groundwater from the SDF wells has a total dissolved solids (TDS) concentration of approximately 2,500 mg/l. The concentrate produced by the plant is concentrated to approximately 9,000 mg/l TDS and is discharged to lower Sweetwater River under waste discharge requirements (WDRs) issued by the Regional Water Quality Control Board (RWQCB).

1.2.2 Phase 2

The proposed expansion of the Richard A. Reynolds Desalination Facility would involve the following elements to increase the desalination potable water production to 10 mgd (**Figure 1-1**):

- Five additional SDF groundwater wells to a depth of approximately 800 feet (ft), with each extracting 850 gallons of groundwater per minute (gpm);
- Additional pipelines to convey well water to desalinate;
- Additional RO treatment trains and appurtenances within the existing desalination building; and
- Iron and manganese removal treatment system outside the existing building.

Grant Funding

To augment the cost of expanding the desalination, the Authority applied for and received grant funding under Proposition 50 from the CDPH. In addition, the Authority received Title 16 funding from the United States Bureau of Reclamation (Bureau) for Phase I. The CDPH grant

CHAPTER 7
Project Alternatives

This chapter addresses alternatives to the project, describes the rationale for including them in the EIR, discusses the environmental impacts associated with each alternative, compares the relative impacts of each alternative to those of the project and each of the other alternatives, and discusses the relationship of each alternative to the project objectives.

7.1 Criteria for Selecting Alternatives

CEQA requires that an EIR compare the effects of a "reasonable range of alternatives" to the effects of the project. The alternatives selected for comparison should be those that would attain most of the basic objectives of the project and avoid or substantially lessen one or more significant effects of the project (CEQA Guidelines Section 15126.6). The "range of alternatives" is governed by the "rule of reason," which requires the EIR to set forth only those alternatives necessary to permit an informed and reasoned choice by the decision-making body and informed public participation (CEQA Guidelines Section 15126.6[f]). CEQA generally defines "feasible" to mean an alternative that is capable of being accomplished in a successful manner within a reasonable period of time, while also taking into account economic, environmental, social, technological, and legal factors.

7.2 Factors in Selection of Alternatives

The alternatives addressed in this EIR were selected in consideration of one or more of the following factors:

- The extent to which the alternative would accomplish most of the basic objectives of the project;
- The extent to which the alternative would avoid or lessen any of the identified significant environmental effects of the project;
- The feasibility of the alternative, taking into account site suitability, economic viability, availability of infrastructure, general plan consistency, and consistency with other applicable plans and regulatory limitations;
- The appropriateness of the alternative in contributing to a "reasonable range" of alternatives necessary to permit a reasoned choice; and
- The requirement of the *CEQA Guidelines* to consider a "no project" alternative; and to identify an "environmentally superior" alternative in addition to the no-project alternative (*CEQA Guidelines* Section 15126.6(e)).

The installation of the pipeline would not include trenching. Therefore, this alternative location would have a reduced potential impact on archeological resources as compared to the proposed project location.

Geology and Soils: As previously described, Alternative 2 would be located within an existing disturbed RV Storage Park. There would be mostly similar geology and soils impacts as compared to the proposed project as described in Section 3.5. The mitigation measures described in Section 3.5 of this EIR would apply to the potential geology and soils impacts associated with Alternative 2.

Hazards and Hazardous Materials: Alternative 2 would result in similar hazardous materials impacts as compared to the proposed project as described in Section 3.6. The mitigation measures described in Section 3.6 of this EIR would apply to the potential hazardous materials impacts associated with Alternative 2.

Hydrology and Water Quality: Alternative 2 could result in increased hydrology and water quality impacts as compared to the proposed project as described in Section 3.7. Under this alternative, existing storm water runoff drainage patterns and volumes could be impacted as a result of additional construction needed to install piping along the adjacent hillside slope. However, there would be no increase concentate discharge to the Sweetwater River and ultimately San Diego Bay, potentially affecting surface and groundwater quality. On-site drainage would not be altered as a result of project construction of this alternative. The mitigation measures described in Section 3.7 of this EIR would apply to the potential hydrology and water quality impacts associated with Alternative 2.

Noise: Alternative 2 would result in similar noise impacts as compared to the proposed project as described in Section 3.8. This alternative site would be located within the limits of the KOA campground to the east of the primary site for SDF 7. In comparison to the primary well site, Alternative 2 would result in a reduction of temporary noise impacts to residential properties along 2nd Avenue during the construction phase and an increase of temporary noise impacts to the KOA campground. Section 3.8 further describes these temporary noise impacts related to construction of the well pump site and associated pipeline. Upon completion, the well pump would be housed in a block building to decrease the minimal noise output during pump operation. The mitigation measures described in Section 3.8 of this EIR would apply to this Alternative 2. As such, noise impacts would be less than significant.

Transportation/Traffic: Alternative 2 would result in similar transportation and traffic impacts compared to the proposed project as described in Section 3.9. It is anticipated that worker trips would be relatively constant throughout construction. However, truck trips would be greater during the roadway demolition phase (2nd Avenue) of construction, during excavation and trenching. The KOA campgrounds would be disturbed under this alternative. The project would use the open trenching methods for installation of the conveyance pipelines and would require temporarily closing and/or detours of portions of the roadway during the installation process. The pipelines would be installed in phases depending on which wells site is constructed and is operating first. As a result, the construction of the proposed project could have temporary traffic

impacts associated with trenching activities along, 2nd Avenue. However, the implementation of a traffic control plan during construction would reduce traffic impacts to below a level of significance. Therefore, the proposed project would have less than a significant impact on traffic conditions and road capacity with incorporation of Mitigation Measure 3.10.1.

Conclusion

Unlike the primary well site, the alternative site would not be limited in the size of available workspace for construction equipment. In addition, Alternative 2 would not incur additional costs due to the additional drilling needed to compensate for the higher elevation of this property location. The additional drilling associated with Alternative 2 would also result in additional environmental impacts associated with the required piping construction along the hillside. Finally, the purchase cost of the primary well site property would be approximately the same as the KOA campground site. Alternative 2 would meet the goals and objectives of The Authority to increase the desalination potable water production to 10 mgd; however, this location is not preferred due to access issues associated with the KOA campground site and the cost associated with constructing a pipeline on the hillside between the KOA well site and the 2nd Avenue raw water pipeline. The cost of the hillside pipeline would make this alternative more expensive than the 2nd Avenue site.

Alternative 3: Memorial Park Alternative Location

As an alternative to SDF 9, a location within the limits of Memorial Park was considered as a potential well site location (see **Figure 7-2**). Memorial Park stretches between 4th and 3rd Avenue along Park Way. Under this alternative the project would have additional impacts associated with construction of the well site pump and associated distribution pipelines. As shown on Figure 7.2, the proposed alternative well site location would be situated approximately 4 feet from the northern edge of the existing parking lot, in the grassy area just east of 4th Avenue. The pipeline would connect into this alternative location from 4th Avenue. In addition, the project would require a 4(f) compliance analysis. Specifically, federally funded transportation projects that involve the use of Section 4(f) property (publicly owned Public Park, recreation area, or designated wildlife and waterfowl refuge land or significant historic property) must undergo a formal evaluation and approval process that can be long and complex. Transportation use of these properties is subject to the requirements of Section 4(f) of the U.S. Department of Transportation (USDOT) Act of 1966.

Aesthetics: Alternative 3 would result in increased aesthetic impacts compared to the proposed project, as described in Section 3.1. The construction of a well site pump would introduce a new visual impact to the existing Memorial Park area. Although the actual pump house block building is relatively small in size (13 feet by 23 feet), the Memorial Park location would be more frequently viewed by the public along 4th Avenue in comparison to the originally proposed pump site location proposed for SDF 9. However, construction of the pump site housing building would mitigate visual impacts resulting from the well pump itself. As such, impacts would be less than significant.

Air Quality: Alternative 3 would result in similar air quality impacts as compared to the proposed project, as described in Section 3.2. Construction of a well site pump and associated pump housing building would generate temporary air quality impacts within the vicinity of Memorial Park. The mitigation measures described in Section 3.2 of this EIR would apply to these potential temporary impacts.

Biological Resources: Alternative 3 would result in reduced biological resource impacts as compared to the proposed project. This proposed alternative site would be located in an open grassy area located to the north of an existing parking lot and east of 4th Avenue. No additional potential impacts would be associated with the use of Memorial Park as an alternative well pump site. There would be no potential impacts to an existing drainage under this alternative as compared to the originally proposed well site for SDF 9. The mitigation measures described in Section 3.3 of this EIR would apply to any potential biological resource impacts associated with Alternative 3.

Cultural Resources: Alternative 3 would result in similar cultural resource impacts as compared to the proposed project, as described in Section 3.4. Construction of a well site pump in Memorial Park would involve excavation which could potentially encounter cultural or paleontological resources. The mitigation measures described in Section 3.4 of this EIR would apply to any potential cultural resource impacts associated with Alternative 3.

Geology and Soils: Alternative 3 would result in similar geology and soils impacts as compared to the proposed project as described in Section 3.5. The mitigation measures described in Section 3.5 of this EIR would apply to the potential geology and soils impacts associated with Alternative 3.

Hazards and Hazardous Materials: Alternative 3 would result in similar hazardous materials impacts as compared to the proposed project as described in Section 3.6. The mitigation measures described in Section 3.6 of this EIR would apply to the potential hazardous materials impacts associated with Alternative 3.

Hydrology and Water Quality: Alternative 3 would result in mostly similar hydrology and water quality impacts as compared to the proposed project as described in Section 3.7. However, as previously described, there would be no potential impacts to an existing drainage under this alternative as compared to the originally proposed well site for SDF 9. The mitigation measures described in Section 3.7 of this EIR would apply to the potential hydrology and water quality impacts associated with Alternative 3.

Noise: Alternative 3 would result in similar noise impacts as compared to the proposed project as described in Section 3.8. This proposed alternative site would be located in an open grassy area located to the north of an existing parking lot and east of 4th Avenue, a well traveled road. As described in Section 3.8, there would be temporary noise impacts related to construction of the well pump site and associated pipeline. The well pump would be housed in a block building to decrease the minimal noise output during pump operation. The mitigation measures described in

Section 3.8 of this EIR would apply to this Alternative 3. Noise impacts would be less than significant.

Transportation/Traffic: Alternative 3 would result in similar transportation and traffic impacts as compared to the proposed project as described in Section 3.9. It is anticipated that worker trips would be relatively constant throughout construction. However, truck trips would be greater during the roadway demolition phase (4th Avenue, 3rd Avenue and Park Way) of construction, during excavation and trenching. The project would use the open trenching methods for installation of the conveyance pipelines and would require temporarily closing and/or detours of portions of the roadway during the installation process. The pipelines would be installed in phases depending on which wells site is constructed and is operating first. As a result, the construction of the proposed project could have temporary traffic impacts associated with trenching activities along, 4th and 3rd Avenue and along Park Way. However, the implementation of a traffic control plan during construction would reduce traffic impacts to below a level of significance. Therefore, the proposed project would have less than a significant impact on traffic conditions and road capacity with incorporation of Mitigation Measure 3.10.1.

Conclusion

In general, Alternative 3 would result in similar potential impacts compared to the proposed project. This alternative would meet the goals and objectives of The Authority to increase the desalination potable water production to 10 mgd, however, the City is opposed to using Memorial Park as a potential well pump location, as it would encumber the already existing park use designation and create a visual impact within a public location.

Alternative 4: 4th Avenue Adjacent Property Alternative Location

As another alternative to SDF 9, the adjacent property along 4th Avenue to the south of the primary site is being considered as a potential well site location (see **Figure 7-3**). As this alternative location is not located adjacent to an existing drainage, it would have fewer potential biological impacts associated with construction of the well site pump and associated distribution pipelines compared to the primary location for SDF 9. In addition, the purchase price of this alternative lot is certain, unlike the primary lot to the north designated for SDF 9. As shown on Figure 7.3, the pipeline would connect into this alternative location from 4th Avenue.

Aesthetics: Alternative 4 would result in increased aesthetic impacts compared to the proposed project, as described in Section 3.1. It is anticipated that the existing structure on this property would be demolished under this alternative is used. Construction of a well site pump would introduce a new visual impact to the existing lot; however, construction of the pump site housing building would mitigate visual impacts resulting from the well pump itself. Although the actual pump house block building is relatively small in size (13 feet by 23 feet), the Alternative 4 location would be viewed by the public from 4th Avenue on a more frequent basis in comparison to the five originally proposed primary pump site locations. Impacts, however, would be less than significant.

SOURCE: Sweetwater Authority; CH2MHill

Sweetwater Authority Brackish Groundwater Desalination Project

Figure 7-3

Alternative 4: SDF 9 - 4th Avenue Adjacent Property Alternative Location

Air Quality: Alternative 4 would result in similar air quality impacts as compared to the proposed project, as described in Section 3.2. Construction of a well site pump and associated pump housing building would generate temporary air quality impacts within the vicinity of this location. The mitigation measures described in Section 3.2 of this EIR would apply to these potential temporary impacts.

Biological Resources: Alternative 4 would result in reduced biological resource impacts as compared to the proposed project. This proposed alternative site would be located in the adjacent property along 4th Avenue to the south of the primary site. As this alternative location is not located adjacent to an existing drainage, it would have fewer potential biological impacts associated with construction of the well site pump and associated distribution pipelines compared to the primary location for SDF 9. No additional potential impacts would be associated with this location as an alternative well pump site. The mitigation measures described in Section 3.3 of this EIR would apply to any potential biological resource impacts associated with Alternative 4.

Cultural Resources: Alternative 4 would result in similar cultural resource impacts as compared to the proposed project, as described in Section 3.4. Construction of a well site pump in this adjacent lot would involve excavation which could potentially encounter cultural or paleontological resources. The mitigation measures described in Section 3.4 of this EIR would apply to any potential cultural resource impacts associated with Alternative 4.

Geology and Soils: Alternative 4 would result in similar geology and soils impacts as compared to the proposed project as described in Section 3.5. The mitigation measures described in Section 3.5 of this EIR would apply to the potential geology and soils impacts associated with Alternative 4.

Hazards and Hazardous Materials: Alternative 4 would result in similar hazardous materials impacts as compared to the proposed project as described in Section 3.6. The mitigation measures described in Section 3.6 of this EIR would apply to the potential hazardous materials impacts associated with Alternative 4.

Hydrology and Water Quality: Alternative 4 would result in reduced hydrology and water quality impacts as compared to the proposed project. As previously described, this alternative location is not located adjacent to an existing drainage, it would have fewer potential biological impacts associated with construction of the well site pump and associated distribution pipelines compared to the primary location for SDF 9. The mitigation measures described in Section 3.7 of this EIR would apply to the potential hydrology and water quality impacts associated with Alternative 4.

Noise: Alternative 4 would result in similar noise impacts as compared to the proposed project as described in Section 3.8. This proposed alternative site would be located in the adjacent property along 4th Avenue to the south of the primary site for SDF 9. As described in Section 3.8, there would be temporary noise impacts related to construction of the well pump site and associated pipeline. The well pump would be housed in a block building to decrease the minimal noise

output during pump operation. The mitigation measures described in Section 3.8 of this EIR would apply to this Alternative 4. Noise impacts would be less than significant.

Transportation/Traffic: Alternative 4 would result in similar transportation and traffic impacts as compared to the proposed project as described in Section 3.9. It is anticipated that worker trips would be relatively constant throughout construction. However, truck trips would be greater during the roadway demolition phase (4th Avenue, 3rd Avenue and Park Way) of construction, during excavation and trenching. The project would use the open trenching methods for installation of the conveyance pipelines and would require temporarily closing and/or detours of portions of the roadway during the installation process. The pipelines would be installed in phases depending on which wells site is constructed and is operating first. As a result, the construction of the proposed project could have temporary traffic impacts associated with trenching activities along, 4th and 3rd Avenue and along Park Way. However, the implementation of a traffic control plan during construction would reduce traffic impacts to below a level of significance. Therefore, the proposed project would have less than a significant impact on traffic conditions and road capacity with incorporation of Mitigation Measure 3.10.1.

Conclusion

Alternative 4 would result in fewer biological and hydrological impacts compared to the proposed project, as this lot is not located along an existing drainage. This alternative would also meet the goals and objectives of The Authority to increase the desalination potable water production to 10 mgd. However, this alternative location is not desirable because it is anticipated that the rear portion of this lot (approximately 25 percent) would require soil amendments to create a level building surface. Additionally, construction within this lot would be more difficult due to its restricted size in comparison to the neighboring lot to the north. As previously stated under this alternative, the well site building would be visible to the public from 4th Avenue once the existing structure is demolished. In comparison, public views of the well housing building on the primary property location to the north would be mostly blocked by the existing home onsite.

Alternative 5: 2nd Avenue Bridge Alternative

Each of the five new SDF wells would require conveyance piping from their respective locations to a point south of the 2nd Avenue Bridge. Alternative 5 would involve, transport of the raw water to the existing desalination facility via an 18-inch groundwater transmission pipeline over the Sweetwater River using the existing 2nd Avenue bridge utility corridor rather than using a directional boring operation under the Sweetwater River. The installation of a fiber optic cable would also be required in the 2nd Avenue bridge utility corridor for communication associated with this project.

Aesthetics: Under this alternative, an 18-inch groundwater transmission pipeline would trace along the 2nd Avenue Bridge utility corridor over the Sweetwater River. Use of the 2nd Avenue Bridge corridor would not substantially degrade the existing visual character of the immediate area. Installation of the 18-inch pipe along the bridge corridor would involve only temporary visual impacts during the construction phase; however, there would be no further aesthetic

impacts during operation, as the pipe would trace along the 2nd Avenue Bridge itself upon completion.

Air Quality: Under Alternative 5, there could be a minimal amount of temporary construction-related traffic and/or equipment, and additional traffic associated with installation of the 18-inch pipe along the 2nd Avenue Bridge corridor and connection to the existing desalination plant and pipeline. However, the additional traffic volumes and air emissions in the vicinity would not significantly increase from current conditions; as such, the impact to air quality would be less than significant.

Biological Resources: The 2nd Avenue Bridge Alternative would result in no change to potential biological resources. Under this alternative, a directional boring operation under the Sweetwater River would not be necessary. As such, this alternative would not result in potential impacts to marine organisms within the Sweetwater River, including a potential temporary increase in turbidity. Inadvertent indirect impacts could occur through runoff and siltation, the release of toxic substances or fugitive dust that may be associated with construction activities. Overall, this alternative would not have the potential to impact sensitive habitat and or effect jurisdictional, state or federally designated jurisdictional waters. Therefore, no impact to biological resources would occur.

Cultural Resources: Under this alternative, buildings and structures would remain unchanged and would be allowed to further deteriorate over time. This alternative would not involve excavation and grading activities that could potentially disturb the subsurface; as such, no impact to historic resources would occur.

Geology and Soils: Under Alternative 5, no excavation and/or grading would occur at the project site. The site would continue to be exposed to existing seismic risks. Usage of the 2nd Avenue Bridge corridor itself would not potentially adversely affect the safe yield of the San Diego Formation and the Alluvial aquifers due to increased groundwater pumping. This alternative would result in a less than significant impact related to the exposure of people and structures to geologic hazards.

Hazards and Hazardous Materials: Use of the 2nd Avenue Bridge as a pipeline corridor would not result in exposure to hazards associated with the routine transport, use, or disposal of hazardous materials. Under this alternative, there would be no required assessment and characterization for potential sources of environmental contamination which could include contamination to soil or groundwater or those that could expose construction workers and future residents to certain health hazards, from sources such as underground storage tanks at the site or in the vicinity. Implementation of Alternative 5 could potentially cause short-term hazards associated with construction materials; however this alternative would be considered to result in less than significant impacts related to the exposure of people and structures to hazards and hazardous materials.

Hydrology and Water Quality: Under Alternative 5, existing storm water runoff drainage patterns and volumes would remain unchanged. No potential impacts to water quality, such as

new point and non-point source discharges, resulting from construction activities, or subsequent business operations would occur. There would be no increase concentate discharge to the Sweetwater River and ultimately San Diego Bay, potentially affecting surface and groundwater quality. On-site drainage would not be altered as a result of project construction.

Noise: Use of the 2nd Avenue Bridge as a pipeline corridor would not result in any change to existing ambient noise levels and would not introduce a new source of noise. Traffic and noise impacts related to the construction phase of Alternative 5 would be minimal and temporary in nature. This alternative would result in less than significant impacts related to noise at or in the vicinity of the project site.

Transportation/Traffic: Alternative 5 would not result in any significant impacts to traffic, congestion on roadways, air traffic patterns, traffic hazards, inadequate emergency access, or inadequate parking. Short-term minimal impacts could potentially result during the construction phase of this alternative. Alternative 5, however, would not conflict with policies, plans, or programs supporting alternative transportation. As a result, Alternative 5 would have less than significant impacts on transportation or traffic.

Conclusion

This alternative would meet the goals and objectives of The Authority to increase the desalination potable water production to 10 mgd. In general, Alternative 5 would result in virtually no impacts on the environment, although the alternative would result in some short-term potential impacts to aesthetics, air, noise and traffic. Alternative 5 would not be feasible, however, because an 18-inch groundwater transmission pipeline and the fiber optic cables would not fit in the existing 2nd Avenue Bridge utility corridor.

Alternative 6: Box Model Discharge Alternative

Concentate discharge from the desalination facility is currently released through a 14-inch diameter pipe into the concrete-lined Upper Paradise Creek Flood Control Channel to the Sweetwater River. The Upper Paradise Creek Flood Control Channel releases into the Sweetwater River several hundred feet downstream, or west of the bridge at 2nd Avenue. Operation of the proposed project would result in an increase in the volume of concentate discharge from the desalination plant from 0.8 mgd to a maximum of 2.5 mgd, or about a three-fold increase. This discharge is neither freshwater, nor as saline as seawater, but is intermediate in salinity and therefore potentially alters the ambient salinity regime within the Sweetwater River Estuary. As an alternative to the current discharge point, a location approximately 1,000 feet further downstream, where the tidal prism is greater, was considered as an alternative. In order to address potential impacts of the proposed project upgrade and plant expansion, a box modeling effort was proposed to predict average salinities within different areas of the estuary. This approach would help determine the spatial changes in salinity associated with changes in the concentate discharge rate and concentate discharge locations. To apply the Box Model to analyze salinity changes within the Sweetwater River associated with changes in concentate discharge at the Reynolds' Demineralization Facility, the study area was subdivided into seven (7) smaller

Hydrology and Water Quality: Alternative 6 could result in reduced hydrology and water quality impacts as compared to the proposed project as described in Section 3.7. As previously described, temporary impacts to the Sweetwater River corridor may result during construction of the additional piping required to extend west towards the new outfall location; however, these impacts would be minimal and temporary in nature. The Alternative 6 location would be situated where the tidal prism is greater and provide improved mixing as compared to the proposed project location.

Noise: Alternative 6 would result increased temporary noise impacts as compared to the proposed project as described in Section 3.8. This proposed alternative would be located in the Sweetwater River corridor. As described in Section 3.8, there would be temporary noise impacts related to construction of the associated pipeline extension approximately 1,000 feet to the west of the current outfall site. The mitigation measures described in Section 3.8 of this EIR would apply to this Alternative 6. Noise impacts would be less than significant.

Transportation/Traffic: Alternative 6 would result in increased temporary transportation and traffic impacts during construction of the additional pipeline needed to extend the concentate outfall west of the primary discharge point. As a result, the construction of this alternative could have temporary traffic impacts associated with trenching activities. However, the implementation of a traffic control plan during construction would reduce traffic impacts to below a level of significance. Therefore, the proposed project would have less than a significant impact on traffic conditions and road capacity with incorporation of Mitigation Measure 3.10.1.

Conclusion

This alternative would meet the goals and objectives of The Authority to increase the desalination potable water production to 10 mgd. In general, the Reynolds concentate discharge from the desalination plant, at this alternative discharge point, would be diluted more rapidly with San Diego Bay waters as compared to the proposed project discharge point to achieve lower toxicity effects on the Sweetwater River Estuary. Additional impacts could result from construction of additional piping to the new discharge point. All other project-related impacts would be similar to those described under the proposed project. Alternative 6 would be more costly because it would require additional piping construction in order to extend into the new discharge area.

Alternative 7: Regional Concentrate Conveyance Facility (Brine Line Alternative)

The Brine Line would serve existing and future regional desalting facilities as well as benign industrial discharge and could provide an environmentally friendly solution to the challenge of concentrate and effluent management. The regional concentrate conveyance facilities would involve the construction of a primary pipeline running north to south in southern San Diego County, discharging to the existing South Bay Ocean Outfall (SBOO) as well as an additional pipeline alternative serving the Otay Mesa industrial area (see **Figure 7-5**). Located near Imperial Beach, the SBOO discharges treated wastewater from the International Wastewater Treatment

SOURCE: SanGIS 2007, CDM 2008: SDCWA Regional Concentrate Conveyance System Feasibility Study

Sweetwater Authority Brackish Groundwater Desalination Project

Figure 7-5

SDCWA Regional Concentrate Conveyance System (Brine Line)

Plant to the Pacific Ocean. It also discharges effluent from the South Bay Water Reclamation Plant. The SBOO extends approximately 3.5 miles offshore and discharges effluent in approximately 100 feet of water. Both existing and planned groundwater desalination facilities in the region could utilize the proposed concentrate conveyance facilities. For existing facilities, this would potentially reduce or eliminate impacts and discharges resulting from current concentrate management practices. The project could also facilitate further groundwater development, maximizing the use of existing groundwater supplies. Connection of the Reynolds Desalination Facility into the Brine Line alignment would occur along 30th St.

Aesthetics: Under this alternative, a primary regional concentrate conveyance pipeline would run north to south in southern San Diego County, discharging to the existing South SBOO. Both existing and planned groundwater desalination facilities in the region could utilize the proposed concentrate conveyance facilities. Connection of the Reynolds Desalination Facility into the regional concentrate conveyance pipeline would involve only temporary visual impacts during the pipeline construction trenching phase along 30th St.; however, once installation of the connecting pipeline is complete there would be no further aesthetic impacts during operation, as the pipe would be located underground.

Air Quality: Under Alternative 7, there would be a minimal amount of temporary construction-related traffic and/or equipment, and additional traffic associated with connection into the primary regional concentrate conveyance pipeline. The additional traffic volumes and air emissions in the vicinity would not significantly increase from current conditions; as such, the impact to air quality would be less than significant.

Biological Resources: Under Alternative 7, impacts could be reduced in comparison to those described in Section 3.3. Development or operation under this alternative could still increase the volume of operational drawdown of the groundwater table that could adversely impact habitat for threatened and endangered species (TES) and wildlife movement corridors within the Sweetwater River and San Diego Bay. However, the SBOO discharges effluent approximately 3.5 miles offshore and in approximately 100 feet of water. As such, connection to the regional concentrate conveyance facilities and eventual discharging to the existing SBOO would potentially reduce or eliminate impacts and discharges resulting as compared to the proposed project.

Cultural Resources: Alternative 7 would result in similar cultural resource impacts as compared to the proposed project, as described in Section 3.4. Construction of a connection into the primary regional concentrate conveyance pipeline would involve excavation and trenching which could potentially encounter cultural or paleontological resources. The mitigation measures described in Section 3.4 of this EIR would apply to any potential cultural resource impacts associated with Alternative 7.

Geology and Soils: Alternative 7 would result in similar geology and soils impacts as compared to the proposed project as described in Section 3.5. The mitigation measures described in Section 3.5 of this EIR would apply to the potential geology and soils impacts associated with Alternative 7.

Hazards and Hazardous Materials: Alternative 7 would result in similar hazardous materials impacts as compared to the proposed project as described in Section 3.6. The mitigation measures described in Section 3.6 of this EIR would apply to the potential hazardous materials impacts associated with Alternative 7.

Hydrology and Water Quality: Alternative 7 would result in reduced hydrology and water quality impacts as the originally proposed project. This alternative would involve connection into the regional concentrate conveyance primary pipeline, discharging to the existing SBOO, as well as an additional pipeline alternative serving the Otay Mesa industrial area. Under this alternative, the proposed concentrate conveyance facilities would potentially reduce impacts and discharges resulting from concentrate management of the proposed project.

Noise: Alternative 7 would result in a temporary increase in noise impacts as compared to the proposed project as described in Section 3.8. Again, this proposed alternative site would involve connection into the regional concentrate conveyance primary pipeline. Similar to the pipeline installation impacts as described in Section 3.8, there would be temporary noise impacts related to construction trucks and excavation equipment. Under the proposed project, conveyance of the concentate discharge into the Sweetwater River would occur through the existing outfall point. In comparison, Alternative 7 would create an additional temporary noise impact from the required pipe construction to redirect the concentate through the SBOO. The mitigation measures described in Section 3.8 of this EIR would apply to this Alternative 7. Noise impacts would be less than significant.

Transportation/Traffic: Alternative 7 would result in similar transportation and traffic impacts as compared to the proposed project as described in Section 3.9. It is anticipated that worker trips would be relatively constant throughout construction. However, truck trips would be greater during excavation and trenching of 30th Street. to the connection pipeline. This alternative would use the open trenching methods for installation of the connection pipeline and would possibly require temporarily closing and/or detours of portions of 30th Street. during the installation process. As a result, the construction of this alternative could have temporary traffic impacts associated with trenching activities. However, the implementation of a traffic control plan during construction would reduce traffic impacts to below a level of significance. Therefore, the proposed project would have less than a significant impact on traffic conditions and road capacity with incorporation of Mitigation Measures as detailed in Section 3.9.

Conclusion

In general, Alternative 7 would result in reduced impacts on the environment, although the alternative would result in some short-term potential impacts to aesthetics, air, noise and traffic. This alternative would meet the goals and objectives of The Authority to increase the desalination potable water production to 10 mgd; however, at this time, the Brine Line is only being evaluated on a feasibility level by the San Diego County Water Authority and has not been funded for construction. In addition, the Brine Line has not yet been designed, permitted, nor has a reasonable timeline been established for construction.

Alternative 8: Sanitary Sewer System Discharge Alternative

As an alternative to concentate disposal into the river, Alternative 8 would involve disposal into the National City sanitary sewer. National City currently has a sewer line located in proximity to the Richard A. Reynolds Desalination Facility that could be used for concentate disposal (see **Figure 7-6**). In order to connect into the sanitary sewer, the Authority would need to purchase capacity with the Metropolitan Wastewater Department as National City does not currently have excess capacity for this flow. In addition, a one time capacity buy-in charge would be required along with a monthly sewer fee. The capacity buy-in charge is based on gallons per day discharged to the sanitary sewer. In addition to the capacity charge, the 15-inch sewer main located in front of the Richard A. Reynolds Desalination Facility would require upgrading, as it is not large enough to handle 900 gpm. The upgrade would extend 1.5 miles. The installation of a sewer metering station would also be required. Alternative 8 also assumes that the Metropolitan Wastewater Department and National City will accept highly saline water for processing in their sewer system. Preliminary discussions with Metropolitan Wastewater Department have indicated that they would accept the highly saline water, but would not commit to it until a permit was applied for by the Authority.

Aesthetics: Alternative 8 would result in similar aesthetic impacts compared to the proposed project, as described in Section 3.1. Alternative 8 would require that the Richard A. Reynolds Desalination Facility connect into the current National City sewer line for concentate disposal. To do so, the 15-inch sewer main located in front of the Richard A. Reynolds Desalination Facility would require upgrading, as it is not large enough to handle 900 gpm. The upgrade would extend 1.5 miles. The installation of a sewer metering station would also be required. These upgrades would result in predominantly short-term aesthetic impacts; as such, aesthetic impacts would be less than significant under Alternative 8.

Air Quality: Alternative 8 would result in increased temporary air quality impacts compared to the proposed project, as described in Section 3.2. As previously described, the Authority would be required to upgrade a 15-inch sewer main and extend this upgrade 1.5 miles, in addition to the installation of a sewer metering station. The additional construction would result in temporary impacts to air quality. However, the mitigation measures described in Section 3.2 of this EIR would apply to these potential temporary impacts.

Biological Resources: As an alternative to concentate disposal into the river, Alternative 8 would involve disposal into the National City sanitary sewer; as such biological impacts under this alternative would be reduced as compared to the propose project. The additional construction efforts required to upgrade the 15-inch sewer main to handle 900 gpm and connect into the current National City sewer line for concentate disposal and installation of sewer metering stations could result in additional impacts; however these impacts would be minimal as they would occur in previously disturbed areas. The mitigation measures described in Section 3.3 of this EIR would apply to any potential biological resource impacts associated with Alternative 8.

SOURCE: Sweetwater Authority 2007; Boyle Engineering 1993

Sweetwater Authority Brackish Groundwater Desalination Project

Figure 7-6

Alternative 8: Sanitary Sewer System Discharge

Cultural Resources: Alternative 8 would result in similar cultural resource impacts as compared to the proposed project, as described in Section 3.4. As previously described, Alternative 8 would require that the Richard A. Reynolds Desalination Facility connect into the current National City sewer line for concentate disposal. To do so, the 15-inch sewer main located in front of the Richard A. Reynolds Desalination Facility would require upgrading, as it is not large enough to handle 900 gpm. The upgrade would extend 1.5 miles. The installation of a sewer metering station would also be required. These improvements would involve excavation which could potentially encounter cultural or paleontological resources. The mitigation measures described in Section 3.4 of this EIR would apply to any potential cultural resource impacts associated with Alternative 8.

Geology and Soils: Alternative 8 would result in similar geology and soils impacts as compared to the proposed project as described in Section 3.5. The mitigation measures described in Section 3.5 of this EIR would apply to the potential geology and soils impacts associated with Alternative 8.

Hazards and Hazardous Materials: Alternative 8 would result in similar hazardous materials impacts as compared to the proposed project as described in Section 3.6. The mitigation measures described in Section 3.6 of this EIR would apply to the potential hazardous materials impacts associated with Alternative 8.

Hydrology and Water Quality: Alternative 8 would involve disposal of concentate discharge into the National City sanitary sewer rather than the Sweetwater River and therefore result in reduced hydrology and water quality impacts compared to the proposed project as described in Section 3.7. The mitigation measures described in Section 3.7 of this EIR would apply to any additional potential hydrology and water quality impacts associated with Alternative 8.

Noise: Alternative 8 would result in increased temporary noise impacts as compared to the proposed project as described in Section 3.8. Alternative 8 would require that the Richard A. Reynolds Desalination Facility connect into the current National City sewer line for concentate disposal. To do so, the 15-inch sewer main located in front of the Richard A. Reynolds Desalination Facility would require upgrading, as it is not large enough to handle 900 gpm. The upgrade would extend 1.5 miles. The installation of a sewer metering station would also be required. As described in Section 3.8, there would be temporary noise impacts related to construction of the associated pipeline. The mitigation measures described in Section 3.8 of this EIR would apply to this Alternative 8. Noise impacts would be less than significant.

Transportation/Traffic: Alternative 8 would result in similar temporary transportation and traffic impacts as a result of construction needed to connect the Richard A. Reynolds Desalination Facility into the current National City sewer line for concentate disposal. The 15-inch sewer main located in front of the Richard A. Reynolds Desalination Facility would require upgrading, as it is not large enough to handle 900 gpm. The upgrade would extend 1.5 miles. The installation of a sewer metering station would also be required. As a result, the construction of this alternative could have short-term traffic impacts associated with trenching activities. However, the implementation of a traffic control plan during construction would reduce traffic impacts to

below a level of significance. Therefore, the proposed project would have less than a significant impact on traffic conditions and road capacity with incorporation of Mitigation Measure 3.10.1.

Conclusion

In general, Alternative 8 would result in similar impacts compared to the proposed project as a result of decreased concentate discharge; however, Alternative 8 could impact future treatment recycling. This alternative would meet the goals and objectives of The Authority to increase the desalination potable water production to 10 mgd; however, it is not preferred due to the costs associated with connecting into the National City sewer system. In addition, this alternative is difficult to evaluate because there are unknown variables, such as salinity tolerance levels if South Bay effluent (currently being directed to Point Loma) were to be redirected to the South Bay Outfall.

Alternative 9: Deep Well Injection of Concentate Alternative

As an alternative to concentate disposal into the river, Alternative 9 would involve injection of 900 gpm of concentate discharge into two 1,200-foot deep injection wells near San Diego Bay. This is based on the assumption that injection wells will accept approximately half the flow (450 gpm) that a production well can produce in the deep aquifer. A total of approximately 6,000 feet of 8-inch PVC pipe would be needed from the Richard A. Reynolds Desalination Facility to the injection wells near San Diego Bay.

Aesthetics: Alternative 9 would result in reduced aesthetic impacts compared to the proposed project, as described in Section 3.1. The construction of a total of approximately 6,000 feet of 8-inch PVC pipe needed from the Richard A. Reynolds Desalination Facility to the injection wells near San Diego Bay would not introduce new significant aesthetic impacts within the Sweetwater River corridor; as such, aesthetic impacts would be less than significant under Alternative 9.

Air Quality: Alternative 9 would result in increased temporary air quality impacts as compared to the proposed project, as described in Section 3.2. The construction of a total of approximately 6,000 feet of 8-inch PVC pipe needed from the Richard A. Reynolds Desalination Facility to the injection wells near San Diego Bay would require additional construction and result in temporary air quality impacts associated with construction. However, the mitigation measures described in Section 3.2 of this EIR would apply to these potential temporary impacts.

Biological Resources: Development under Alternative 9 would require the construction of a total of approximately 6,000 feet of 8-inch PVC pipe needed from the Richard A. Reynolds Desalination Facility to the injection wells near San Diego Bay; this could result in short term construction impacts to biological resources within the vicinity of the pipe area. The mitigation measures described in Section 3.3 of this EIR would apply to any potential biological resource impacts associated with Alternative 9. Little is known at this time regarding the deep aquifer near San Diego Bay. The construction of a test well would be required to evaluate the deep aquifer near the San Diego Bay and evaluate the feasibility of injecting concentate. The California Department of Health Services would also have to approve the injection of the concentate waste

into the deep aquifer; as such, impacts to biological resources could be greater under this alternative.

Cultural Resources: Alternative 9 would result in similar cultural resource impacts as compared to the proposed project, as described in Section 3.4. Construction of approximately 6,000 feet of 8-inch PVC pipe needed from the Richard A. Reynolds Desalination Facility to the injection wells near San Diego Bay would involve excavation which could potentially encounter cultural or paleontological resources. The mitigation measures described in Section 3.4 of this EIR would apply to any potential cultural resource impacts associated with Alternative 9.

Geology and Soils: Alternative 9 would result in similar geology and soils impacts as compared to the proposed project as described in Section 3.5. The mitigation measures described in Section 3.5 of this EIR would apply to the potential geology and soils impacts associated with Alternative 9.

Hazards and Hazardous Materials: Alternative 9 would result in similar hazardous materials impacts as compared to the proposed project as described in Section 3.6. The mitigation measures described in Section 3.6 of this EIR would apply to the potential hazardous materials impacts associated with Alternative 9.

Hydrology and Water Quality: Alternative 9 would result in mostly similar hydrology and water quality impacts as compared to the proposed project as described in Section 3.7. However, as previously described, little is known at this time regarding the deep aquifer near San Diego Bay. The construction of a test well would be required to evaluate the deep aquifer near the San Diego Bay and evaluate the feasibility of injecting concentate. The California Department of Health Services would also have to approve the injection of the concentate waste into the deep aquifer; as such, impacts to hydrology and water quality could be greater under this alternative.

Noise: Alternative 9 would result in increased temporary noise impacts as compared to the proposed project as described in Section 3.8. As described in Section 3.8, there would be temporary noise impacts related to construction of the associated 6,000 feet of 8-inch PVC needed from the Richard A. Reynolds Desalination Facility to the injection wells near San Diego Bay. The mitigation measures described in Section 3.8 of this EIR would apply to this Alternative 9. Noise impacts would be less than significant.

Transportation/Traffic: Alternative 9 would result in similar temporary transportation and traffic impacts during construction of the additional pipeline needed from the Richard A. Reynolds Desalination Facility to the injection wells near San Diego Bay. As a result, the construction of this alternative could have temporary traffic impacts associated with trenching activities. However, the implementation of a traffic control plan during construction would reduce traffic impacts to below a level of significance. Therefore, the proposed project would have less than a significant impact on traffic conditions and road capacity with incorporation of Mitigation Measure 3.10.1.

Conclusion

In general, this alterative would result in similar potential impacts compared to the proposed project. This alternative would meet the goals and objectives of The Authority to increase the desalination potable water production to 10 mgd; however, this alternative is not preferred because little is known at this time regarding the deep aquifer near San Diego Bay. The construction of a test well would be required to evaluate the deep aquifer near the San Diego Bay and evaluate the feasibility of injecting concentate. The California Department of Health Services would also have to approve the injection of the concentate waste into the deep aquifer.

Alternative 10: Evaporation Ponds Alternative

Alternative 10 would involve a reduction in concentate through the combination of evaporation ponds and use of additional RO membranes. About 300 acres of land would be used for salt evaporation ponds and disposal of concentate from the desalination plant. The evaporation rate of concentate would occur at a rate of approximately 3 gpm per acre of land. In addition, the costs for the disposal of concentate could be reduced if the feed water recovery rate of the Richard A. Reynolds Desalination Facility membranes was increased to 90 percent from the current rate of 82 percent. The 90 percent recovery rate would be achieved by increasing the RO membrane process from a two-train process to a three-train process by adding membranes. The additional RO membrane train would reduce the amount of concentate produced from 2,500,000 gallons per day (1,700 gpm) to approximately 1,300,000 gallons per day (900 gpm), at 82 percent and 90 percent respectively.

Aesthetics: Alternative 10 would result in an increase in aesthetic impacts compared to the proposed project, as described in Section 3.1. As required under Alternative 10, approximately 300 acres of land would be used for salt evaporation ponds and disposal of concentate from the desalination plant, resulting in increased visual impacts to the surrounding areas. Although a relatively large area of land would be needed to achieve the goals of the salt evaporation ponds, aesthetic impacts from this land would not be considered visually significant.

Air Quality: Alternative 10 could potentially result in an increase in short-term air quality impacts during construction of the required 300-acre pond where water from concentrate would be allowed to evaporate while the remaining salts accumulate in the base of the pond. The mitigation measures described in Section 3.2 of this EIR would apply to these potential temporary impacts.

Biological Resources: Alternative 10 would result in reduced biological resource impacts compared to the proposed project as this alternative would involve a reduction in concentate through the combination of evaporation ponds and use of additional RO membranes. The mitigation measures described in Section 3.3 of this EIR would apply to any additional potential biological resource impacts associated with Alternative 10.

Cultural Resources: Alternative 10 would require construction of an approximately 300-acre pond where water from concentrate would be allowed to evaporate while the remaining salts

accumulate in the base of the pond. Excavation associated with this alternative could potentially encounter cultural or paleontological resources. The mitigation measures described in Section 3.4 of this EIR would apply to any potential cultural resource impacts associated with Alternative 10.

Geology and Soils: Alternative 10 would result in similar geology and soils impacts as compared to the proposed project as described in Section 3.5. The mitigation measures described in Section 3.5 of this EIR would apply to the potential geology and soils impacts associated with Alternative 10.

Hazards and Hazardous Materials: Alternative 10 would result in similar hazardous materials impacts as compared to the proposed project as described in Section 3.6. The mitigation measures described in Section 3.6 of this EIR would apply to the potential hazardous materials impacts associated with Alternative 10.

Hydrology and Water Quality: Alternative 10 would require construction of an approximately 300-acre pond where water from concentrate would be allowed to evaporate while the remaining salts accumulate in the base of the pond. It is likely that the evaporation pond would have liners in order to prevent saline water from leaking into the groundwater aquifer. Maintenance at a significant depth would be required to prevent liners from drying and cracking. Unlike the proposed project, this alternative would result in reduced water quality impacts as no concentate would be discharged in the Sweetwater River. The mitigation measures described in Section 3.7 of this EIR would apply to any potential additional hydrology and water quality impacts associated with Alternative 10.

Noise: Alternative 10 would involve a reduction in concentate through the combination of evaporation ponds and use of additional RO membranes. About 300 acres of land would be used for salt evaporation ponds and disposal of concentate from the desalination plant. In addition, the 90percent recovery rate would be achieved by increasing the RO membrane process from a two train process to a three train process by adding membranes. There would be no increase in long-term noise impacts associated with increasing the RO membrane process, however, Alternative 10 could potentially result in an increase in short-term noise impacts during construction of the required 300-acre pond where water from concentrate would be allowed to evaporate while the remaining salts accumulate in the base of the pond. The mitigation measures described in Section 3.8 of this EIR would apply to this Alternative 10. Noise impacts would be less than significant.

Transportation/Traffic: Alternative 10 would involve a reduction in concentate through the combination of evaporation ponds and use of additional RO membranes. Alternative 10 would result in increased short-term transportation and traffic impacts during construction of the evaporation ponds. As a result, the construction of this alternative could have temporary traffic impacts associated with trenching activities. However, the implementation of a traffic control plan during construction would reduce traffic impacts to below a level of significance. Therefore, the proposed project would have less than a significant impact on traffic conditions and road capacity with incorporation of Mitigation Measure 3.10.1.

Conclusion

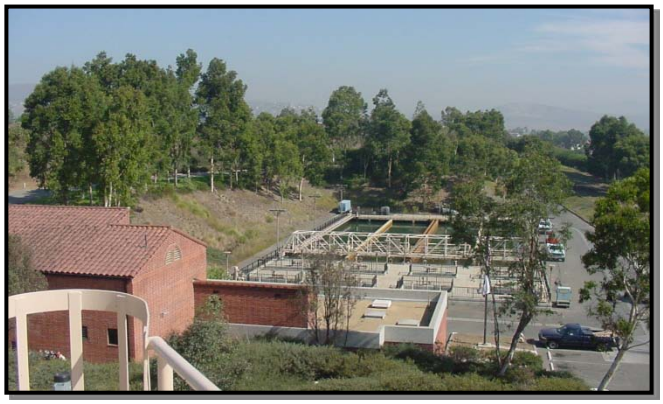
In general, Alternative 10 would result in fewer impacts compared to the proposed project as a result of decreased concentate production. This alternative would meet the goals and objectives of The Authority to increase the desalination potable water production to 10 mgd; however, this alternative is not preferred due to the costs associated with the construction of additional membranes and lack of available acreage required for the evaporation ponds.

7.5 Environmentally Superior Alternative

Section 15126.6(e) (2) of the CEQA Guidelines requires that an EIR identify the environmentally superior alternative. If the No Project Alternative is the environmentally superior alternative, the EIR must identify an environmentally superior alternative among the remaining alternatives. Based on the above analysis, Alternatives 6, 7 and 8 would result in fewer biological and hydrological impacts compared to the proposed project while achieving the goals and objectives of The Authority to increase the desalination potable water production to 10 mgd. Although the construction of required piping under these alternatives would result in a temporary increase in noise and air quality impacts, the long-term environmental impacts associated with these alternatives would be reduced when compared to the proposed project. However, these alternatives are not feasible. Alternative 6 is infeasible because it would be more costly than the proposed project, as it would require additional piping construction in order to extend into the new discharge area. Alternative 7 is infeasible because at this time, the Brine Line is only being evaluated on a feasibility level by the San Diego County Water Authority and has not been funded for construction. As previously explained, the Brine Line has not yet been designed, permitted, nor has a reasonable timeline been established for construction. Alternative 8 is infeasible due to the costs associated with connecting into the National City sewer system. As also noted, Alternative 8 is difficult to evaluate because there are unknown variables, such as salinity tolerance levels if South Bay effluent (currently being directed to Point Loma) were to be redirected to the South Bay Outfall.

Sweetwater Authority
2010 Urban Water Management Plan

Final
Adopted June 8, 2011



2010 Urban Water Management Plan

Adopted by the Sweetwater Authority Governing Board
June 8, 2011

Prepared by
Sweetwater Authority
and

RMC
Water and Environment

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Chula Vista, CA 91910
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Table 4-3: Past Groundwater Supply (2006 to 2010)

DWR Table 18						
Groundwater — Volume Pumped, 2006 - 2010						
Basin name(s)	Metered or Unmetered	2006	2007	2008	2009	2010
San Diego Formation – National City Wells	Metered	1,670	2,161	2,180	1,945	2,175
San Diego Formation – Reynolds Desalination Facility	Metered	2,271	3,237	3,699	3,454	3,176
Total groundwater pumped		3,941	5,398	5,879	5,399	5,351
Percent of total water supply		16%	22%	25%	24%	26%
Units (circle one): acre-feet per year million gallons per year cubic feet per year						

Table 4-4 provides projected groundwater pumping volumes for 2015 – 2035. These projections were based on estimated pumping volumes for the existing National City Well Nos. 3 and 4 and the Reynolds Desalination Facility, as well as planned future expansion of the Desalination Facility. Sweetwater Authority is in the design phase to expand the Desalination Facility to a maximum 10 MGD capacity with an average production of 8.0 MGD; this would result in approximately 8,800 acre-feet of production each year. The planned expansion is anticipated to be complete by 2016. Groundwater production is projected to increase from approximately 26% of total water supply in 2015 to an average of 44% after completion of the expansion.

Table 4-4: Projected Groundwater Supply (2015 to 2035)

DWR Table 19					
Groundwater — Volume Projected, 2015 - 2035					
Basin name(s)	2015	2020	2025	2030	2035
San Diego Formation – National City Wells	2,200	2,200	2,200	2,200	2,200
San Diego Formation – Reynolds Desalination Facility	3,600	8,800	8,800	8,800	8,800
Total groundwater pumped	5,800	11,000	11,000	11,000	11,000
Percent of total water supply	26%	48%	45%	43%	41%
Units (circle one): acre-feet per year million gallons per year cubic feet per year					

4.1.3 Transfers and Exchanges

10631(d): #24. Describe the opportunities for exchanges or transfers of water on a short-term or long-term basis.

Sweetwater Authority currently transfers and exchanges water on an emergency basis with three neighboring water districts: five interconnections with the City of San Diego, which borders to the north and south; six interconnections with Otay Water District, which borders to the east and south; and one interconnection with California American Water Company, which borders to the south. At the present time, the agency interconnections are used for emergencies and planned shutdowns. These interconnections play a vital role in maintaining service to Sweetwater Authority customers should there be interruption of service due to tanks, water mains, or pump stations. The interconnections with California-American Water Company benefit both agencies, and the interconnections with the City of San Diego and Otay Water District only benefit Sweetwater Authority due to hydraulic gradient differentials. However, pumps could be temporarily connected to the City of San Diego and Otay Water District interconnections to serve these municipalities.

When Sweetwater Reservoir is at full capacity and spilling, Sweetwater Authority has in the past sold excess water to California-American Water Company. In the winter of 1995, Sweetwater sold excess water to California-American Water Company for several months. However, such occurrence is not a planned transfer and therefore is not included within Sweetwater's projections.

Table 4-5: Transfer and Exchange Opportunities

DWR Table 20			
Transfer and Exchange Opportunities			
Transfer agency	Transfer or exchange	Short term or long term	Proposed Volume
City of San Diego	Transfer	Emergency	Emergency
Otay Water District	Transfer	Emergency	Emergency
California American Water Company	Transfer	Emergency	Emergency
		Total	N/A
Units (circle one): acre-feet per year million gallons per year cubic feet per year			

4.1.4 Desalinated Water

10631(i): #31. Describe the opportunities for development of desalinated water, including, but not limited to, ocean water, brackish water, and groundwater as a long-term supply.

Sweetwater's brackish groundwater desalination facility is described and quantified above in Section 4.2.1. The facility was designed to extract groundwater from four alluvial wells and five deep San Diego Formation wells, located on the north side of the Sweetwater River. A sixth San Diego Formation well was constructed in 2006. Sweetwater Authority is in the design phase to expand the facility to a maximum 10 MGD capacity with an average production of 8.0 MGD.

Sweetwater Authority is not currently pursuing seawater desalination. Rather, the Water Authority is pursuing construction of a regional seawater desalination plant, described under Section 4.4 below.

4.1.5 Water Recycling Opportunities

10633: #44. Provide, to the extent available, information on recycled water and its potential for use as a water source in the service area of the urban water supplier. The preparation of the plan shall be coordinated with local water, wastewater, groundwater, and planning agencies that operate within the supplier's service area.

10633(a): #45. Describe the wastewater collection and treatment systems in the supplier's service area, including a quantification of the amount of wastewater collected and treated and the methods of wastewater disposal.

10633(b): #46. Describe the quantity of treated wastewater that meets RW standards, is being discharged, and is otherwise available for use in a recycled water project.

10633(c): #47. (Describe) the recycled water currently being used in the supplier's service area, including but not limited to the type, place, and quantity of use.

10633(d): #48. (Describe and quantify) the potential uses of recycled water, including, but not limited to, agricultural irrigation, landscape irrigation, wildlife habitat enhancement, wetlands, industrial reuse, groundwater recharge, IPR, and other appropriate uses, and a determination with regard to the technical and economic feasibility of serving those uses.

10633(e): #49. (Describe) the projected use of recycled water within the supplier's service area at the end of 5, 10, 15, and 20 years, and a description of the actual use of recycled water in comparison to uses previously projected pursuant to this subdivision.

10633(f): #50. (Describe the) actions, including financial incentives, which may be taken to encourage the use of recycled water, and the projected results of these actions in terms of acre-feet of recycled water used per year.

10633(g): #51. Provide a plan for optimizing the use of recycled water in the supplier's service area, including actions to facilitate the installation of dual distribution systems, to promote recirculating uses, to facilitate the increased use of treated wastewater that meets recycled water standards, and to overcome any obstacles to achieving that increased use (10633(g).

Sweetwater Authority currently does not produce or distribute recycled water. Past planning efforts assessed the potential for development of recycled water sources to serve new development and/or redevelopment. Such projects include the planned construction of a new South Bay Power Plant with a potential to produce up to 5 MGD of recycled water demand. However, current political, legal, environmental, and other factors have delayed this project to the extent that it may no longer move

WaterSMART: Title XVI Water Reclamation and Reuse Program
Funding for Fiscal Year 2014

Sweetwater Authority Water Reclamation Project, Phase II: Richard A. Reynolds Groundwater Desalination Facility

Grant Application Proposal
(FOA No. R14AS00002)

Prepared for:
United States Bureau of Reclamation

Prepared by:
Sweetwater Authority

January 2014

WaterSMART: Title XVI Water Reclamation and Reuse Program Funding for Fiscal Year 2014

"San Diego Area Water Reclamation Program"

Sweetwater Authority Water Reclamation Project, Phase II: Richard A. Reynolds Groundwater Desalination Facility

(Agreement No. R98AC35146)

Technical Proposal

(FOA No. R14AS00002)

Prepared for:

United States Bureau of Reclamation

Prepared by:

Sweetwater Authority
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January 3, 2014

Technical Proposal and Evaluation Criteria

Chapter 1 Executive Summary

Sweetwater Authority is applying to the *WaterSMART: Title XVI Water Reclamation and Reuse Program* for $9.275 million for expansion of the Richard A. Reynolds Groundwater Desalination Facility, under the Title XVI-authorized "San Diego Area Water Reclamation Program" (43 U.S.C. 390h-10). Construction and expansion of the Reynolds Facility is the Phase II portion of the *Sweetwater Authority Water Reclamation Project*. Current project activities will expand the groundwater desalination facility to increase the amount of brackish groundwater that can be reclaimed for potable use, reduce demand for imported water, conserve energy and reduce greenhouse gas emissions related to imported water, protect Sacramento-San Joaquin Bay-Delta and Colorado River habitats by reducing water imports, and improve water supply reliability by reducing supply vulnerabilities. The Reynolds Facility expansion will result in a total of 8,800 acre-feet per year (AFY) of locally-produced desalinated groundwater.

Date: **January 3, 2014**
Applicant: **Sweetwater Authority**
City: **Chula Vista**
County: **San Diego County**
State: **California**

1.1 Project Summary

The *Sweetwater Authority Water Reclamation Project, Phase II* will result in a total of 8,800 AFY in local water supplies and reduced demand for imported water in the Sweetwater Authority's service area. The unreliability of imported water supplies within Southern California, combined with the availability of brackish groundwater for treatment and use, has led the Sweetwater Authority to pursue construction and expansion of the Richard A. Reynolds Groundwater Desalination Facility (Reynolds Facility). The *Sweetwater Authority Water Reclamation Project, Phase II* comprises two components: Reynolds-Phase I involved construction of the Reynolds Facility and was completed in 2000 with a current capacity of 3,600 AFY; and Reynolds-Phase II involves expansion of the Reynolds Facility to its planned total capacity of 8,800 AFY (an increase of 5,200 AFY). Water produced by the Reynolds Facility supplements potable water supplies, and represents a direct offset for imported water from the Sacramento-San Joaquin Bay-Delta and Colorado River systems.

Chapter 2 Technical Project Description

2.1 San Diego Area Water Reclamation Program

The *Sweetwater Authority Water Reclamation Project, Phase II* is part of the Title XVI-authorized "San Diego Area Water Reclamation Program" which promotes the treatment and use of previously non-potable or unusable local water supplies by a set of water agencies in San Diego County. The "San Diego Area Water Reclamation Program" was authorized in the Reclamation Wastewater and Groundwater Study and Facilities Act of 1992 (Title XVI) under 43 U.S.C. 390h-10. This authorization allowed for up to 25% of the facilities costs to be provided by federal funding, not including operations and maintenance. Projects that qualify as

2. **Comparison of the cost per acre-foot of the project to the cost per acre-foot of one alternative (i.e., nonrecycled water option) that would satisfy the same demand as the proposed project. Provide the cost per acre-foot for one nonrecycled water alternative that would satisfy the same demand. Reclamation will compare the cost per acre-foot that it calculates using the information requested in question No. 1 to the cost per acre-foot for the nonrecycled water alternative provided by the project sponsor.**

The costs for Sweetwater Authority to treat, transport, and deliver water produced by the Reynolds Facility are included in the O&M, replacement, and debt service costs. A summary of the Reynolds Facility costs (O&M, replacement, and debt service costs) that can be reasonably compared to the non-recycled water alternative are provided below.

Annual per-acre-foot costs for the project were calculated using the following formula:

$$\text{Reynolds Facility Water Costs} = \frac{\text{O\&M Costs + Replacement Costs + Debt Service Costs}}{\text{Total Water Produced by Reynolds Facility}}$$

As shown in **Table 3-15** above, O&M costs will be accrued on an annual basis. As shown in **Table 3-16** above, replacement costs will be incurred for years 2009, 2019, 2027, 2029, 2037, and 2039. **Table 3-17** shows the per acre-foot cost of water produced by the Reynolds Facility for each year of the project life, assuming a 3.5% discount rate beginning in 2013 (Reclamation, 2013). Sweetwater Authority financed construction of Reynolds-Phase I from 2000 to 2010. Sweetwater Authority and City of San Diego will also likely finance Reynolds-Phase II from 2017 to 2046; costs incurred related to debt service (interest) from Reynolds-Phase I and Reynolds-Phase II are included in **Table 3-17**. Costs associated with debt service for Reynolds-Phase I were $1,319,172 per year from 2000 to 2010. Because the Reynolds-Phase I debt was paid off in 2010, no costs associated with debt service were incurred for the period of 2011 to 2016. Additional costs associated with debt service will be incurred from 2017 to 2046 to fund Reynolds-Phase II through a 30-year loan of $12,660,362 that has a Capital Recovery Factor (A/P) of 5.437%. As such, Reynolds-Phase II debt service costs are anticipated to total $688,344 per year ($12,660,362 x 5.437%) from 2017 to 2046.

The non-recycled water alternative that would satisfy the same demand as the project is the continued use of imported water purchased from SDCWA. The cost per acre-foot of SDCWA water will vary over time and are based on the cost to SDCWA to treat, transport, and deliver imported water to member agencies such as the Sweetwater Authority. **Table 3-18** shows the projected cost per acre-foot of imported water over the project life (from 2000 through 2046), in 2012 dollars.

Table 3-17: Annual Cost per Acre-Foot of Water Produced by Reynolds Facility

Year	Water Produced per Year	Annual O&M	Replacement Costs	Debt Service	Total Annual Cost	Average Discounted Annual Cost per AF
2000-2008	3,600	$1,050,000	$0	$1,319,172	$2,369,172	$658
2009	3,600	$1,050,000	$400,000	$1,319,172	$2,769,172	$769
2010	3,600	$1,050,000	$0	$1,319,172	$2,369,172	$658
2011-2016	3,600	$1,050,000	$0	$0	$1,050,000	$276
2017-2018	8,800	$2,750,000	$0	$688,344	$3,438,344	$323
2019	8,800	$2,750,000	$400,000	$688,344	$3,838,344	$343
2020-2026	8,800	$2,750,000	$0	$688,344	$3,438,344	$268
2027	8,800	$2,750,000	$500,000	$688,344	$3,938,344	$267
2028	8,800	$2,750,000	$0	$688,344	$3,438,344	$225
2029	8,800	$2,750,000	$700,000	$688,344	$4,138,344	$262
2030-2036	8,800	$2,750,000	$0	$688,344	$ 3,438,344	$190
2037	8,800	$2,750,000	$800,000	$688,344	$4,238,344	$204
2038	8,800	$2,750,000	$0	$688,344	$3,438,344	$160
2039	8,800	$2,750,000	$600,000	$688,344	$4,038,344	$181
2040-2046	8,800	$2,750,000	$0	$688,344	$3,438,344	$135
2000-2046 Average Cost per AF						**$329**

SDCWA imported water costs for years 2000-2012 were based on values from SDCWA associated with the costs required to treat, transport, and deliver imported water to member agencies, which are available in annual reports from 2000-2012 that are published by SDCWA; the 2000 to 2012 annual reports are referenced in **Table 3-18**, and direct links to each report are provided in the list of references in **Chapter 8**. Specific costs for years 2000 to 2012 were calculated from values listed in the annual reports using the following formula:

$$\text{SDCWA Imported Water Costs} = \frac{\text{Total Water Sales + Taxes + Storage Charges + Capacity Charges + Transportation/Infrastructure Access Charges}}{\text{Total SDCWA Water Purchases by Member Agencies}}$$

Projected SDCWA imported water costs for years 2013-2046 were obtained from SDCWA, and include projected rate increases from Metropolitan. The projected imported water costs include similar taxes, storage charges, capacity charges, and transportation/infrastructure access charges that are reported in the SDCWA annual reports, and are therefore considered to be a reasonable estimation of future imported water costs.

Please note that all costs in **Table 3-18** are provided in 2012 dollars; the costs for years 2000-2012 from the SDCWA annual reports were converted into 2012 dollars to be consistent with the cost projections for years 2013-2046.

Recognizing that Reclamation intends to compare the cost per acre-foot of the project to the cost per-acre foot of the alternative of purchasing imported water, for purposes of discussion, the tables below provide lifetime project costs and benefit calculations for the project vs. the project alternative. The total present value of the cost of imported water was calculated using a discount rate of 3.5% for future costs. The 3.5% discount rate is from the Federal Register for water resources planning projects for Fiscal Year 2014 (Reclamation, 2013).

Table 3-18: Annual Cost Per Acre-Foot of Imported Water from SDCWA

Year	Cost per AF[1]	Year	Cost per AF[1]	Year	Cost per AF[1]
2000	$695	**2016**	$1,396	**2032**	$1,915
2001	$695	**2017**	$1,445	**2033**	$1,944
2002	$671	**2018**	$1,495	**2034**	$1,973
2003	$719	**2019**	$1,548	**2035**	$2,003
2004	$661	**2020**	$1,602	**2036**	$2,033
2005	$729	**2021**	$1,626	**2037**	$2,063
2006	$692	**2022**	$1,650	**2038**	$2,094
2007	$648	**2023**	$1,675	**2039**	$2,126
2008	$830	**2024**	$1,700	**2040**	$2,157
2009[2]	$825	**2025**	$1,726	**2041**	$2,190
2010	$890	**2026**	$1,751	**2042**	$2,223
2011	$939	**2027**	$1,778	**2043**	$2,256
2012	$1,070	**2028**	$1,804	**2044**	$2,290
2013	$1,259	**2029**	$1,831	**2045**	$2,324
2014	$1,303	**2030**	$1,859	**2046**	$2,359
2015	$1,349	**2031**	$1,887		
			2000-2046 Average Cost per AF		**$1,544**

Source: SDCWA 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011a, 2012, 2013a

[1] All costs were converted to 2012 dollars using the US Inflation Calculator (www.usinflationcalculator.com)

[2] The 2009 Annual Report from SDCWA was unclear on the total water purchases by member agencies; therefore, the value used to calculate the 2009 cost of imported water per acre-foot used costs from the Annual Report, but also used imported water use amounts from the Water Authority's webpage regarding water use (http://www.sdcwa.org/water-use).

Calculating the difference in the cost of water produced by the Reynolds Facility (provided in **Table 3-17**) and the cost of imported water (provided in **Table 3-18**) finds that the total present value savings of the project is $223,628,928 over the course of the project life. **Table 3-19** shows the cost savings from producing reclaimed groundwater at the Reynolds Facility compared to purchasing imported water.

A second alternative of a similar nature to the project is the Carlsbad Desalination Project, which produces desalinated seawater. Under the terms of a purchase agreement between SDCWA and the project owner, Poseidon Resources, costs for water from this project are anticipated to range between $1,849 and $2,064 per acre-foot ($2,014 - $2,257 per acre-foot when including delivery charges), in 2012 dollars (SDCWA, 2013b). Based on a contract that SDCWA has with Poseidon Resources, delivery of desalinated seawater is anticipated to begin in 2016. For calculation purposes, the cost of purchasing imported water was used for 2000 to 2015, with desalinated seawater purchased from 2016 to 2046. Using a conservative estimate of $1,849 for costs from the Carlsbad Desalination Project, and the same calculations as described above, the present value of the savings of the project over the costs of water from the Carlsbad Desalination Project would be $226,853,040 over the course of the project life. **Table 3-20** shows the cost savings from producing reclaimed groundwater at the Reynolds Facility compared to purchasing desalinated seawater from the Carlsbad Desalination Project.

As shown through **Tables 3-19** and **3-20**, the cost savings associated with reclaiming groundwater through the *Authorized Project* are immense when compared to two non-recycled water alternatives available to Sweetwater Authority and City of San Diego.

5-SW-308

SETTLEMENT AGREEMENT BETWEEN SWEETWATER AUTHORITY AND CITY OF SAN DIEGO REGARDING JOINT EXPANSION OF RICHARD A. REYNOLDS DESALINATION FACILITY

This Settlement Agreement ("Agreement"), dated and made effective as of August 28, 2013, ("Effective Date") is entered into between Sweetwater Authority, a Joint Powers Authority operating pursuant to the Irrigation District Law, Water Code section 20500 *et seq.* ("Sweetwater"), and the City of San Diego, a charter law city ("City"). City and Sweetwater are sometimes referred to collectively as "Parties" and individually as "Party" in this Agreement. This Agreement establishes the terms of a settlement in the action *The City of San Diego v. Sweetwater Authority*, SDSC Case No. 37-2010-00088653-CU-TT-CTL, Consolidated with Case No. 37-2010-00105688-CU-TT-CTL ("Lawsuit") related to Sweetwater's approval and implementation of the Richard A. Reynolds Desalination Facility Expansion Project ("Desal Expansion").

RECITALS

A. Sweetwater owns, operates, and maintains the National City Wells production facility ("NC Wells") and the existing Richard A. Reynolds Desalination Facility ("Desal Facility"). The primary source of water for both production facilities is the San Diego Formation ("SDF"). The NC Wells was placed into service in the 1950s and the Desal Facility was originally commissioned in 1999. The locations of the Desal Facility and the NC Wells are illustrated in Exhibit A to this Agreement.

B. The Desal Expansion will add a capacity of 5,200 acre-feet per year ("AFY") to the Desal Facility. The source of supply for the Desal Expansion will be five (5) new wells that draw from the SDF.

C. On February 24, 2010, Sweetwater's Governing Board certified the Final Environmental Impact Report ("EIR") for the Desal Expansion, adopted a Mitigation Monitoring and Reporting Program and Findings of Fact, and approved the Desal Expansion. On November 10, 2010, the Governing Board re-approved the Desal Expansion to correct a procedural defect.

D. City filed the Lawsuit challenging Sweetwater's compliance with the California Environmental Quality Act ("CEQA") and Sweetwater's right to take water from the SDF for the Desal Expansion. The City dismissed the water rights claim without prejudice.

E. Through discussions subsequent to the filing of the Lawsuit, the Parties recognized the mutual benefit of both Parties participating in the Desal Expansion.

F. In settlement of the Lawsuit, the Parties have agreed to share the water treated at the Desal Expansion according to the terms and conditions set forth in this Agreement.

G. The Parties have agreed to fully and completely resolve the Lawsuit, as more fully described below.

H. Sweetwater sought and has been selected for grant funding to offset capital costs associated with the Desal Expansion from the State of California Prop 50 program and the Bureau of Reclamation ("BOR") Title XVI program.

AGREEMENT

In consideration of the mutual covenants, agreements, representations, and warranties contained in this Agreement, and other good and valuable consideration the receipt and sufficiency of which is hereby acknowledged, the Parties agree as follows:

1. **Definitions.**

1.1 "Desal Expansion" refers to the expansion portion of the Desal Facility as reflected in the EIR, which is intended to add a nominal annual production capacity of 5,200 AFY.

1.2 "Desal Facility" refers to the existing Richard A. Reynolds Desalination Facility, which has a nominal production capacity of 3,600 AFY.

1.3 "Desal Water Year" refers to a period of time starting on April 1 and ending the following March 31, and represents a period of time in which the maximum demands occur during the first part of the period and the lowest demands occur at the end of the period. This also represents the time period for the production capacities noted in Sections 1.1, 1.2, and 1.8.

1.4 "Direct transfer" refers to potable water delivered from the Sweetwater water system to City's water system.

1.5 "In-lieu" is an alternative method of delivering water to City involving the San Diego County Water Authority ("SDCWA") as a third party to convey its water instead (or in-lieu) of direct transfer from the Sweetwater water system under the conditions set forth in Section 4.3 of this Agreement.

1.6 "Potable water" is water that meets all federal and state standards for drinking water.

1.7 "Proceedings" refer to any petition, complaint, motion, proceeding or action of any kind, in any state or federal court of law or before any local, state or federal agency.

1.8 "Reynolds Facility" refers to the completed Richard A. Reynolds Desalination Facility after expansion with a maximum annual production of 8,800 AFY.

1.9 "Sweetwater water system" refers to the system of potable water transmission and distribution pipelines, storage tanks, and booster pump stations used to convey potable water to the customers within the Sweetwater service area.

1.10 "Water" is a general reference to water supply and may either be untreated water or potable water.

2. **Description of Desal Expansion.**

2.1 The existing capacity of the Desal Facility is 3,600 AFY and the Desal Expansion is planned to be 5,200 AFY, for a total Reynolds Facility maximum annual production of 8,800 AFY.

2.2 The Desal Expansion generally includes, but is not limited to, the following, the estimated cost of which is presented in Exhibit B to this Agreement:

2.2.1 Reverse osmosis (RO) treatment units with related components to be constructed in the existing Desal Facility building.

2.2.2 Auxiliary system to support the new RO treatment systems, including high service pumps, cleaning systems, etc.

2.2.3 Electrical and controls system modifications.

2.2.4 Iron/manganese treatment system and ancillary facilities.

2.2.5 San Diego Formation Wells #7 through #11.

2.2.6 Well discharge pipelines.

2.2.7 Potable water pipelines to connect to Sweetwater's water system.

2.2.8 Brine line relocation.

2.2.9 Preliminary study by USGS.

2.2.10 CEQA and National Environmental Policy Act ("NEPA") compliance.

2.2.11 Land acquisition.

2.2.12 Monitoring well.

2.3 Reference Documents that assist in the description of the Desal Expansion include:

2.3.1 EIR, dated February 2010, SCH No. 2007101055, the cover sheet of which is included in Exhibit C to this Agreement.

2.3.2 List of Drawings from the Final Design phase, included in Exhibit D to this Agreement.

3. **Operation of Desal Expansion.**

3.1 Prior to the completion of the Desal Expansion, Sweetwater has no obligation or responsibility to provide any water to City.

3.2 Upon commissioning of the Desal Expansion, Sweetwater shall operate the Reynolds Facility at the maximum capacity reasonably feasible based on operational constraints.

3.3 Transfer of water from Sweetwater to City shall be managed such that at the end of the Desal Water Year, Sweetwater shall have received 3,600 AFY plus a minimum of fifty (50) percent of any additional potable water produced at Desal Expansion in excess of 3,600 AFY, and City shall have received up to fifty (50) percent of any additional potable water produced at Desal Expansion in excess of 3,600 AFY, subject to the conditions described in this Agreement.

3.4 During times when City is receiving delivery of direct transfer water from the Reynolds Facility, the Parties shall confer on a monthly basis to review the Reynolds Facility production along with the direct transfer quantity, and City shall adjust the direct transfer rate as necessary to achieve the end result described in Section 3.3 of this Agreement.

3.5 Sweetwater Responsibility for Desal Expansion Activities.

3.5.1 Sweetwater shall plan, design, construct, solely own, and operate and maintain the Desal Expansion.

3.5.2 Sweetwater shall act as lead agency for the Desal Expansion and shall be responsible for any CEQA and NEPA compliance for all work involved in the Desal Expansion.

3.5.3 Sweetwater shall be responsible for all quality issues related to potable water produced by Desal Expansion.

3.5.4 Throughout construction of the Desal Expansion, Sweetwater will be responsible for approving all changes to construction documents as well as contract change orders.

(a) Sweetwater will consult with City on significant change orders. Change orders with single amounts greater than $75,000 shall be mutually discussed and agreed upon between the Parties.

(b) Final approval of change order(s) will be the sole responsibility of Sweetwater.

(c) Sweetwater shall provide City a copy of all change orders, no matter the amount, within twenty-one (21) business days following full execution.

(d) All change orders approved by Sweetwater shall be binding upon City as they relate to cost sharing as determined in this Agreement.

3.6 City Responsibility for Desal Expansion Activities.

3.6.1 City may attend construction meetings throughout the expansion project. City will provide timely input to Sweetwater staff and Sweetwater consulting engineers regarding construction.

3.6.2 City will comply with its funding responsibilities in accordance with Section 6 of this Agreement.

3.6.3 Except to the extent arising out of City's negligence or willful misconduct, City shall not be liable for any claims whatsoever related to the Desal Facility or the Desal Expansion or its construction including, but not limited to, the following: injuries to any persons caused on the premises or arising out of construction, contract or other claims related to construction of the facilities, and any property damage. Sweetwater agrees to indemnify City for any such claim. Sweetwater also agrees to make City an additional insured on any related insurance policies.

4. **Water Delivery Method.**

4.1 Water produced through the Desal Expansion may be delivered directly to City, in-lieu of City's purchase of water from SDCWA, or if approved by Sweetwater jointly delivered directly and in-lieu. By March 20 each year, both Parties shall meet to discuss the next Desal Water Year anticipated water budget in order to predict delivery of water via either transfer method for water produced through the Desal Expansion. This jointly developed water budget/operational plan will establish the amount of direct transfer water and in-lieu water to be taken each Desal Water Year.

4.2 Direct Transfer.

4.2.1 Potable water may be obtained either from modification to an existing emergency interconnection between City's water system and Sweetwater's water system, or a new interconnection may be constructed by City ("Direct Transfer Facility"). The design of the Direct Transfer Facility shall incorporate the following elements (at a minimum):

(a) The location shall be along the alignment of one of Sweetwater's transmission mains. The Parties are in conceptual agreement that the area in the vicinity of the intersection of Willow Street and Sweetwater Road would be an optimal location due to the proximity of existing Sweetwater and City pipelines and that an emergency interconnection exists in this area.

(b) City's potable distribution operates at a greater hydraulic gradient than Sweetwater's potable distribution system, thus requiring a booster pump station to convey water from Sweetwater to City.

(c) The booster pump station shall have a maximum pumping capacity of 3.0 million gallons per day (mgd).

(d) Metering facilities shall be included to measure the rate of flow and the total volume conveyed between the Sweetwater system and the City system.

(e) The functionality of the existing emergency interconnection near the intersection of Willow Street and Sweetwater Road shall be maintained by either leaving the existing emergency interconnection in place or by incorporating the emergency interconnection into the Direct Transfer Facility.

4.2.2 Consent and mutual agreement of the Parties is required to finalize the location and design features of the Direct Transfer Facility. Such consent and agreement shall not be unreasonably withheld.

4.2.3 The Direct Transfer Facility shall be owned and operated by City and is intended to be operational within four (4) years after the commissioning of the Desal Expansion.

4.2.4 All costs for any environmental review, planning, design, construction, construction management, operation, and maintenance of the Direct Transfer Facility, including retaining or re-establishing the emergency interconnection between City and Sweetwater, shall be paid by City. The Direct Transfer Facility shall be subject to City's Guidelines and Standards, Water and Sewer Design Guide, Standard Specifications for Public Works Construction and supplements (latest edition adopted by City), and Standard Drawings (latest edition adopted by City).

4.2.5 City's approval and implementation of the Direct Transfer Facility is conditioned upon City's determination, as the lead agency, that any potential environmental impacts of the Direct Transfer Facility have been adequately considered in compliance with CEQA and NEPA, as applicable. City assumes the risk of delays and damages that may result to Sweetwater from any third-party legal actions related to City's approval of the Direct Transfer Facility. Sweetwater agrees not to fund, sponsor, encourage, support, institute, participate in, or file any Proceedings challenging the City's Direct Transfer Facility so long as that facility complies with the terms of this Agreement.

4.2.6 Sweetwater may attend pre-design, design and construction meetings associated with the Direct Transfer Facility. Sweetwater will provide

timely input to City staff and City consulting engineers regarding design and construction.

4.2.7 Prior to connection of the Direct Transfer Facility to the Sweetwater water system, the Parties shall establish by agreement the terms and conditions for direct delivery that includes (at a minimum) the following matters:

(a) Mutually agreed upon operational flow rate based on Reynolds Facility production rate,

(b) Notice requirements to turn on or turn off connection,

(c) Avoiding repeated "on-off" requests by either Party (e.g. meeting peak demands),

(d) Monthly deadline for reading meter, and primary responsibility for meter reading and reporting, and

(e) Actions required under emergency conditions that result in the need to activate the emergency interconnection between City and Sweetwater.

4.2.8 If in any month when the Direct Transfer Facility is operational at a 3.0 mgd capacity and Sweetwater is not able to supply water to the extent that City would not be allowed to obtain by direct transfer its portion of the output of the Reynolds Facility in that month then, notwithstanding the provisions of Section 4.3.2 of this Agreement, City may, in the month following, take an in-lieu transfer in the amount of such deficiency, or by any other mutually agreed upon solution. The Parties agree to work together to accommodate changing facility demands, operational conditions and other scenarios to avoid reductions in direct transfers provided that such accommodation is mutually agreeable and reasonably feasible.

4.2.9 If, for any reason outside the control of Sweetwater, City determines that it will not take by direct transfer its portion of the output of the Reynolds Facility in any month, then Sweetwater is under no obligation to make up such Desal Expansion water to City. The Parties agree to work together to accommodate changing facility demands, operational conditions and other scenarios to avoid reductions in deliveries provided that such accommodation is mutually agreeable and reasonably feasible. In the event that such accommodation cannot be made, the Parties agree that:

(a) The direct transfer rate will be adjusted downward to reflect City's direct transfer limitations,

(b) City's share of the potable water produced by the Desal Expansion will be adjusted accordingly for that Desal Water Year, and

(c) If Sweetwater will receive more than 6,200 AFY during that same Desal Water Year, then notwithstanding the provisions of Sections 4.3.2 and 5.3, and the first sentence of Section 4.2.9 of this Agreement, Sweetwater shall compensate City by providing in-lieu water equal to the amount in excess of 6,200 AFY that Sweetwater received at a mutually agreed upon time.

4.3 In-Lieu Transfer.

4.3.1 During the first four (4) years after commissioning the Desal Expansion, or until City has implemented its Direct Transfer Facility, whichever occurs first, Sweetwater shall provide City a total amount of acre feet equal to half the production of the Reynolds Facility in excess of 3,600 AFY by in-lieu transfer as described herein.

4.3.2 Starting four (4) years following the commissioning of the Desal Expansion, or after the implementation of City's Direct Transfer Facility, whichever occurs first, in-lieu transfer is only available during years when the combined volume of Loveland Reservoir and Sweetwater Reservoir is 20,000 AF or less as of March 31. Requests by City for in-lieu transfer at times that do not meet the above listed criteria shall be considered by Sweetwater on a case-by-case basis, and may be approved at Sweetwater's sole discretion. Under these in-lieu circumstances, City would receive its share of potable water produced at the Desal Expansion by Sweetwater paying SDCWA for untreated water City would have purchased from SDCWA in-lieu of direct delivery from Sweetwater to City.

4.3.3 The in-lieu transfer requires that Sweetwater, on behalf of City, pay the SDCWA for untreated water, which is to be delivered from the SDCWA to City as directed by City.

4.3.4 Sweetwater shall have the right to retain its full allocation of Desal Facility water plus an equal volume of Desal Expansion water to that provided to City through the in-lieu program.

5. **Sweetwater and City Cost Allocation.**

5.1 Contribution for Use of Desal Facility.

5.1.1 City shall pay Sweetwater three successive annual installment payments, totaling up to $1.2 million, for use of those portions of the existing Desal Facility which were initially constructed to accommodate an expansion of capacity. Exhibit E to this Agreement provides the basis of the total buy-in amount based on producing 8,800 AFY for each of the first three years of operation of the Desal Expansion. If the production is less than 8,800 AFY for any of the first three years of operation, the annual installment for that year shall be adjusted using the methodology in Exhibit E based on the actual production. For the purposes of this buy-in, the start of the buy-

in period shall be the first full fiscal year following a minimum of four months of operation after commissioning the Desal Expansion (i.e., if commissioning starts prior to February 28, 2015, then the start of the buy-in period shall be July 1, 2015; if commissioning starts after the last day in February 2015, then the start of the buy-in period shall be July 1, 2016).

5.2 Shared Costs Related to Desal Expansion.

5.2.1 The following table summarizes the anticipated end result of funding for the Desal Expansion based on the costs shown in Exhibit B to this Agreement. Full Title XVI funds from BOR are not anticipated to be received in a timely manner (i.e., full payment equal to invoice amount received). These funds are typically available in varying amounts year-to-year.

	Prop 50	Title XVI	Sweetwater	City
Percent	50%	25%	12.5%	12.5%
Amount	$11,943,500	$5,971,750	$2,985,875	$2,985,875

5.2.2 The Parties shall share capital costs involved in the Desal Expansion that are not covered by grant funding.

(a) Sweetwater shall pay fifty (50) percent of all costs not covered by grant funding associated with environmental review, planning, design, construction, and construction management of the Desal Expansion.

(b) City shall pay fifty (50) percent of all costs not covered by grant funding associated with environmental review, planning, design, construction, and construction management of the Desal Expansion.

(c) For the purposes of this cost allocation, construction costs include all costs incurred in preparing the public bid and any change order costs associated with the Desal Expansion.

5.2.3 Example Payment Distribution.

(a) A hypothetical example payment distribution showing payments during construction with Prop 50 funding, Sweetwater funding, City funding, and Title XVI reimbursements is presented in Exhibit F to this Agreement. This example illustrates how payments during the Desal Expansion could be distributed over time and how the Title XVI reimbursements could be received and distributed.

5.3 Annual Operation and Maintenance Cost Allocation.

5.3.1 Annual operation and maintenance costs shall be based on Sweetwater's actual annual costs to operate and maintain the Reynolds Facility.

5.3.2 City shall pay its proportionate costs of the operation and maintenance expenses on a per acre foot basis on delivered water in accordance with the Delivery Method provisions in Section 4 of this Agreement. Sweetwater will bill City monthly for potable water produced through the Desal Expansion.

5.3.3 City's proportionate costs of the operation and maintenance expenses shall be based on the total annual actual cost multiplied by a factor equal to the amount of water delivered to City divided by the total annual Reynolds Facility production. For example, to illustrate the calculation, assume the cost is $400 per acre foot and 8,800 acre feet is produced from the Reynolds Facility. The total annual cost is $3,520,000 and the amount of water delivered to City is (8,800 – 3,600)/2 = 2,600 AFY. City's cost in this example is 2,600/8,800 x $3,520,000 = $1,040,000. A different example is for a year when only 8,000 AF of potable water is produced, resulting in $3,200,000 in annual costs, and a City delivered amount of (8,000 – 3,600)/2 = 2,200 AFY. The cost to City would be 2,200/8,000 x $3,200,000 = $880,000. A third example is for a year when 8,000 AFY of potable water is produced resulting in $3,200,000 in annual costs, and a City delivered amount of 1,800 AFY. The cost to City would be 1,800/8,000 x $3,200,000 = $720,000.

5.3.4 In-Lieu Method of Delivery Payments

(a) If City elects to receive water from SDCWA at City's Alvarado Water Treatment Plant (WTP) or any other raw water connection from SDCWA in lieu of pumping from Sweetwater's system, Sweetwater shall pay SDCWA the prevailing rate for the delivery of untreated water on a per acre foot basis for a quantity of water equal to City's share of Desal Expansion.

(b) Sweetwater shall pay City its proportionate share of the actual operation and maintenance costs on a per acre foot basis for treatment of "in-lieu" water at City's Alvarado WTP. Sweetwater may credit this payment back to City through an offset to the monthly charges provided for in Section 5.3.2 above.

(c) Annual operation and maintenance costs for treatment of "in-lieu" water at City's Alvarado WTP shall be based on City's actual annual costs to operate and maintain the Alvarado WTP.

(d) In accordance with Section 5.3.2, City shall be required to pay all operation and maintenance costs of the Reynolds Facility related to the volume of water taken through the in-lieu program.

5.3.5 Maintenance activity costs at the Reynolds Facility that exceed $50,000 per event (i.e., replacing reverse osmosis membranes in the Desal Expansion units) shall be shared equally between the Parties, and shall be paid for independently from the on-going operation and maintenance costs. Maintenance activity costs less than this threshold amount shall be incorporated into the annual cost of operation and maintenance.

5.4 Estimated Charges.

5.4.1 At the meeting noted in Section 4.1 of this Agreement, both parties shall submit the operations and maintenance costs for the ensuing fiscal year associated with this Agreement which shall notify each Party of its share of these estimated annual costs.

5.5 Annual Reconciliation.

5.5.1 Sweetwater will provide City no later than July 1 of each year an accounting of costs incurred in the operation and maintenance of the Reynolds Facility for the previous Desal Water Year.

5.5.2 City will provide Sweetwater no later than July 1 of each year an accounting of costs incurred in the operation and maintenance costs for treatment of "in-lieu" water at City's Alvarado WTP for the previous Desal Water Year.

5.5.3 Accompanying such accounting will be an invoice from each Party for underpayment for the preceding Desal Water Year or a credit for overpayments for the preceding Desal Water Year should the unit operation and maintenance costs increase or decrease, respectively.

5.6 Financial Statements.

5.6.1 The Parties shall keep appropriate records and accounts of all costs and expenses relating to the treatment and distribution of water and the acquisition, planning, design, construction, administration, monitoring, and operation and maintenance of the Desal Expansion. Upon written request, said books and records shall be subject to reasonable inspection by any duly authorized representative of either Party at its expense.

5.6.2 Either Party may audit the other Party's records for a three fiscal year period previous to its request, at the auditing Party's own expense.

6. **Payment Schedule.**

6.1 The payment schedule below shall apply to the Desal Expansion.

City to Pay Sweetwater	Time of Payment
Three successive annual installments adding up to $1.2 million for buy-in to existing Desal Facility initially constructed to accommodate expansion	30 calendar days following date of invoice from Sweetwater for potable water produced during prior fiscal year
City's share of the Project costs incurred prior to the Notice to Proceed on the Desal Expansion	30 calendar days following NTP on the Desal Expansion
City's share of construction and construction management costs	30 calendar days following date of invoice from Sweetwater for work included in billing period
Operation and maintenance cost for City's share of potable water produced at Reynolds Facility	30 calendar days following date of invoice from Sweetwater for potable water produced during billing period
City's share of major maintenance activities that exceed threshold	30 calendar days following date of invoice from Sweetwater for major maintenance work
Balance of City's share of all remaining costs	At Notice of Completion of Project
Sweetwater to Pay City	**Time of Payment**
Reimburse City 50% of Title XVI grant funds received from BOR	30 calendar days following receipt of payment from BOR
Reimburse City for treatment of water taken from SDCWA in-lieu of direct transfer from Sweetwater system	30 calendar days following date of invoice from City for water produced during billing period
Sweetwater to Pay SDCWA	**Time for Payment**
Pay the prevailing rate for delivery of untreated water to the City WTP in-lieu of direct transfer from the Sweetwater system	30 calendar days following date of invoice from SDCWA for in-lieu water taken during billing period

7. **Variations in Water Delivery.**

7.1 Supply.

7.1.1 The Parties recognize that the development of a new or expanded water supply is not a guaranteed supply and agree that any potable water obtained through the Desal Expansion in excess of the amount available from the Desal Facility is to be mutually and equally shared.

7.1.2 Changes in the groundwater supply that affect Sweetwater's ability to produce potable water at Desal Expansion shall be monitored by Sweetwater, City, and/or an independent entity such as the U.S. Geological Survey (USGS). Variations in water supply resulting from changes to the groundwater may affect the production from Desal Expansion.

7.2 Maintenance.

7.2.1 The Parties recognize that maintenance activities will be required for the Reynolds Facility which may interrupt potable water production and agree that such interruptions will be considered to be expected in the operation of the Reynolds Facility.

7.3 Sweetwater Operational Plan.

7.3.1 Sweetwater is responsible for overall operational management of the Sweetwater water system, and operation of the Reynolds Facility will be implemented to maximize the overall utilization of the local water resources available.

7.3.2 The annual water budget meeting identified in Section 4.1 of this Agreement shall be used to orchestrate and implement the transfer of water in order for Sweetwater to receive its full allocation of Desal Facility production and for both parties to receive their allocation of the shared Desal Expansion production.

8. **Term of Agreement.**

8.1 Subject to the provisions in this Section 8, the term of this Agreement shall end thirty (30) years after the Effective Date of this Agreement. City shall have the option to renew for an additional thirty (30) year term, upon mutual written agreement of the Parties, if City agrees to the same maintenance and delivery terms set forth in this Agreement. Sweetwater shall not be obligated to provide water to City after the termination of this Agreement.

8.2 Sweetwater may terminate this Agreement upon thirty (30) days written notice to City if it is determined that the capacity of the Reynolds Facility needs to be reduced to 3,600 AFY or less. If this Agreement is terminated on this basis and

termination occurs within the first three (3) years of the Desal Expansion, Sweetwater shall refund to City its buy-in payment provided for in Section 5.1.1 of this Agreement.

8.3 Either Party may terminate this Agreement prior to Sweetwater's issuance of the Notice to Proceed with the construction of the Desal Expansion. If City terminates on this basis, then Sweetwater may proceed with the Desal Expansion for Sweetwater's sole benefit at Sweetwater's sole cost and City agrees not to fund, sponsor, encourage, support, institute, participate in, or file any Proceedings challenging the Desal Expansion. If City terminates this Agreement as a result of unrealized grant funding, then the termination is without prejudice to City's ability to challenge the Desal Expansion.

8.4 At the beginning of the fourth year (reflecting three years of operation) after the Desal Expansion is commissioned, if the Desal Expansion is unable to deliver to City its anticipated share of 2,600 AFY due to seawater intrusion, subsidence or adaptive management requirements, City may terminate this Agreement and Sweetwater shall refund to City that portion of its capital investment in the Desal Expansion equal to the proportion of potable water not received (see example below). This capital investment is the total money City has paid Sweetwater (less any reimbursements).

8.4.1 For example if City paid Sweetwater $6.0 million and is reimbursed $1.0 million for a total investment of $5.0 million and City anticipates receiving 2,600 AFY for three years for a total of 7800 acre-feet, and at the beginning of the fourth year City received only 5200 acre-feet over the three year period and City wishes to terminate, City would be refunded ((7800-5200)/7800) x $5.0 = $1.66 Million.

8.5 This Agreement may be terminated by either Party for cause upon sixty (60) days written notice to the other party. "Cause" shall mean any material breach of this Agreement. The breaching Party shall be given a reasonable opportunity to cure the material breach, but in no event shall the cure opportunity exceed sixty (60) days from the date of written notice unless the Parties agree otherwise in writing. Termination for cause shall not bar either Party from seeking damages related to the breach or alleged breach of the other Party.

9. Resolution of Lawsuit.

9.1 Within fifteen (15) calendar days of approval of this Agreement by the Parties' respective governing bodies, City will dismiss its motion for attorney's fees filed in the Lawsuit. The Parties will each bear their own attorney's fees and costs incurred in the Lawsuit and in the negotiation and preparation of this Agreement.

9.2 City agrees to support any effort by Sweetwater to have the court rescind or vacate the judgment issued in the Lawsuit, including but not limited to, joining any motion or application filed by Sweetwater to rescind or vacate the judgment.

The Court shall retain jurisdiction over the Lawsuit pursuant to Code of Civil Procedure section 664.6 until full performance of all terms in the Agreement to ensure compliance with the Agreement and in the event enforcement is necessary.

9.3 Within five (5) calendar days from the rescission or vacation of the judgment in the Lawsuit and notification from City that its motion for attorney's fees has been dismissed, Sweetwater shall notify the State that the parties have approved this Agreement and that the Lawsuit has been resolved.

10. **Agreement Not to Challenge Environmental Review and Project Approvals.** City agrees not to fund, sponsor, encourage, support, institute, participate in, or file any Proceedings challenging (i) the EIR or any other environmental review conducted for the Desal Expansion under CEQA or NEPA or (ii) any other approvals, permits, grants, rights-of-way, entitlements or licenses necessary for the design, construction or operation of the Desal Expansion.

11. **Agreement Not to Challenge Uses of Water.** During the term of this Agreement, City agrees not to fund, sponsor, encourage, support, institute, participate in, or file any Proceedings challenging Sweetwater's right to its uses of water in the SDF for the Reynolds Facility or the existing NC Wells.

12. **Water Rights.** The Parties agree that this Agreement and any renewal thereof shall not create or prejudice either Party's rights or priorities to water and shall not be used as evidence of either Party's right to or lack of a right to any specific supply from any specific location. Upon termination of this Agreement or any renewal thereof, nothing herein shall prejudice either Party's claims to water in the SDF or otherwise.

13. **Future Projects.** The Parties agree to mutually review any future proposed projects to utilize groundwater within the area associated with the SDF and to coordinate the implementation of such projects to the mutual benefit of the Parties. If such coordination is not possible for whatever reason, nothing herein shall prevent either Party from pursuing separate projects in the SDF or prejudice any Proceedings challenging such projects.

14. **SDCWA Drought Allocation.** Implementation of the Desal Expansion shall accrue to the benefit of both Parties in relation to the SDCWA Drought Allocation.

14.1 Sweetwater's Local Projects Development Adjustment for the Desal Facility shall remain at 3,600 AFY.

14.2 Sweetwater's Local Projects Development Adjustment for the Desal Expansion shall be equal to 50 percent the Reynolds Facility production in excess of 3,600 AFY.

14.3 City's Local Projects Development Adjustment for the Desal Expansion shall be equal to 50 percent the Reynolds Facility production in excess of 3,600 AFY.

14.4 Loss of Local Supply Adjustments, if applicable, may be applied by each Party as appropriate within the provisions of the SDCWA Allocation Methodology.

14.5 The untreated "in-lieu" water purchased from SDCWA by Sweetwater and delivered to the Alvarado WTP shall be included in the Drought Allocation for Sweetwater.

15. **Groundwater Management.** The Parties agree to undertake the development of an AB 3030 groundwater management plan for the SDF and to jointly fund and commence development of such a plan within six (6) months of execution of the funding agreement with the State. The Parties shall make a good faith effort to complete the plan within four (4) years of commencement.

16. **Sustainable Use.** The Desal Expansion shall be utilized by both Parties for the long term sustainable use of the SDF for municipal potable use. If it is determined by either Party that the Desal Expansion is causing a significant adverse impact to the long term sustainable use of the SDF, then the Parties shall work together to prevent those impacts including ceasing operations if necessary.

17. **Ownership.** City shall not be a partner, owner or operator of the Desal Facility, Desal Expansion, or Reynolds Facility by reason of this Agreement or any subsequent agreement provided for herein, or by reason of participation in the financing of the Desal Expansion and payment for the delivery of potable water from the Desal Expansion. Sweetwater shall bear the responsibility, but both Parties shall proportionally bear the cost, for monitoring and safeguarding the Reynolds Facility. The cost of monitoring and safeguarding the Reynolds Facility is an integral component of the operation and maintenance cost. Historical operation and maintenance costs of the Desal Facility are shown in Exhibit G.

18. **CEQA Compliance.** The Parties shall equally share expenses incurred for CEQA compliance associated with the Desal Expansion in accordance with Section 5.2.2. of this Agreement, except for any attorneys' fees, which shall be borne by the Party on behalf of whom the fees are incurred.

19. **No Third Party Beneficiaries.** The Parties acknowledge and agree that the provisions of this Agreement are for the sole benefit of the Parties, and not for the benefit, directly or indirectly, of any other person or entity, except as otherwise expressly provided herein.

20. **Entire Understanding.** This Agreement constitutes the entire understanding among the Parties. Evidence of conduct or statements made in the course of negotiating this Agreement, including the Term Sheet approved by the Parties on May 15, 2013 in advance of this Agreement and any previous drafts of this Agreement, is inadmissible in any legal proceedings other than one for approval or confirmation of this Agreement.

21. **Modifications to Agreement.** No modification of this Agreement shall be effective unless it is in writing and signed by the Parties.

22. **Notice.** All notices, requests, payments or other communications provided for or permitted to be given or made under this Agreement must be in writing and must be given by personal delivery, or by certified or registered United States mail (postage prepaid, return receipt requested), addressed as follows or addressed to such other address or addressee as the Party to receive such notice shall have designated by written notice as required by this Section 22. Notice or payment shall be deemed to have been effective and properly delivered or made on the earlier of (a) if given by personal delivery, the date of actual delivery, (b) if sent by certified or registered mail, the first business day that is at least four (4) calendar days after the notice or payment has been deposited in the U.S. mail in accordance with this Section 22.

As to City

Mail and Personal Delivery:

Marsi A. Steirer
Deputy Director
600 B Street, Suite 600
San Diego, CA 92101

Electronic Delivery:
Msteirer@sandiego.gov

As to Sweetwater

Mail:
James L. Smyth
General Manager
P.O. Box 2328
Chula Vista, CA 91912-2328

Personal Delivery:
James L. Smyth
General Manager
505 Garrett Avenue
Chula Vista, CA 91910

Electronic Delivery:
jsmyth@sweetwater.org

23. **Unlimited Rights of Parties' Governing Bodies to Approve or Disapprove.** The Governing Body of each Party signing this Agreement shall have the unlimited right to approve or disapprove the settlement provided for in this Agreement. If any Governing Body disapproves this Agreement, then neither Party is bound by this Agreement.

24. **No Personal Liability.** No member, officer, office holder, employee, affiliate, agent or representative of either Party shall have any personal liability for any obligations under this Agreement.

25. **No Admission of Liability.** Nothing in this Agreement shall be interpreted as an admission of liability by either Party.

26. **Enforcement/Interpretation of Agreement; Attorneys' Fee.** If either of the Parties brings or is made a party to an action or proceeding to enforce or interpret the terms of this Agreement, the prevailing Party in any such action or proceeding shall recover its reasonable attorney's fees and costs incurred to enforce or interpret the terms of this Agreement.

27. **Authority of Signatories.** The individuals executing this Agreement represent and warrant that they have authority to sign on the behalf of their respective Party.

28. **Successors and Assigns.** Neither of the Parties hereto shall assign or transfer any of its rights, duties or obligations under this Agreement without the prior written consent of the other Party hereto. Without such prior written consent, no such assignment shall relieve any Party of its obligations under this Agreement.

29. **Waiver.** Any Party hereto shall have the right to waive any of the conditions precedent to its obligations under this Agreement. No such waiver, nor a modification, discharge or amendment of this Agreement shall be valid in the absence of the written and signed consent of the Party against which enforcement of such is sought.

30. **Construction.** The Parties acknowledge that each Party and its counsel have reviewed and revised this Agreement and that the normal rule of construction to the effect that any ambiguities are to be resolved against the drafting Party shall not be employed in the interpretation of this Agreement or any amendment or exhibits hereto.

31. **Governing Law.** This Agreement shall be governed by, construed and enforced in accordance with, the laws of the State of California.

32. **Counterparts.** This Agreement may be executed in any number of counterparts, each of which shall be deemed an original, and all such counterparts taken together shall be deemed to constitute one and the same instrument.

33. **Effective Date.** This Agreement is effective upon its execution by the Parties as of the Effective Date first mentioned above.

34. **Force Majeure.** Should any Party be unable to perform any obligation required of it under this Agreement, other than the payment of money, because of any cause beyond its control (including, but not limited to war, insurrection, riot, civil commotion, shortages, strike, lockout, fire, earthquake, calamity, windstorm, flood, material shortages or any other force majeure), then such Party's performance of any such obligation shall be suspended for such period as the Party is unable to perform such obligation.

35. **Limited Releases.** Each Party, and its affiliated agencies, departments, employees, agents, officials, officeholders, insurers, attorneys and all other representatives release and forever discharge the other Party, and its affiliated agencies, departments, employees, agents, officials, officeholders, insurers, attorneys and all other representatives from all claims, demands, causes of action, damages, attorneys' fees, costs, suits, or liabilities of whatever kind or nature, fixed or contingent, known or unknown, in law or equity that were or could have been alleged in the Lawsuit or are in any way connected with or arise directly or indirectly out of the Desal Expansion. Subject to Sections 8.3 and 11 of this Agreement, these limited releases do not apply to any claims the Parties may have regarding either Party's rights or priorities to water in the SDF.

35.1 Each of the Parties has read Section 1542 of the California Civil Code, has consulted with its respective counsel regarding its terms, and understands its provisions. Accordingly, each Party expressly waives the rights and benefits conferred upon it by the provisions of Section 1542 of the California Civil Code, which provides:

> A GENERAL RELEASE DOES NOT EXTEND TO CLAIMS WHICH THE CREDITOR DOES NOT KNOW OR SUSPECT TO EXIST IN HIS OR HER FAVOR AT THE TIME OF EXECUTING THE RELEASE, WHICH IF KNOWN BY HIM OR HER MUST HAVE MATERIALLY AFFECTED HIS OR HER SETTLEMENT WITH THE DEBTOR.

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36. **Survival Provisions.** In the event this Agreement is terminated, Sections 10, 13, 15, and 16 shall survive.

IN WITNESS WHEREOF, this Agreement is executed by the City of San Diego, acting by and through its Mayor, and Sweetwater Authority, acting by and through the Chair of its Governing Board.

Dated this 20th day of August, 2013.

THE CITY OF SAN DIEGO
Mayor or Designee

By: _____
Print Name: Walter Ekard
Title: Chief Operating Officer

SWEETWATER AUTHORITY

By: _____
Jose Preciado
Chair of the Governing Board

I HEREBY APPROVE the form of the foregoing Agreement this 21st day of August, 2013.

JAN I. GOLDSMITH, City Attorney

By: _____
Print Name: Glenn Spitzer
Title: Deputy City Attorney

I HEREBY APPROVE the form of the foregoing Agreement this 22nd day of August, 2013.

BEST BEST & KRIEGER LLP

By: _____
Print Name: Paula C. P. de Sousa
Title: General Counsel

7/30/13
Item # 52

(O-2014-3)

ORDINANCE NUMBER O- 20287 (NEW SERIES)

DATE OF FINAL PASSAGE AUG 05 2013

AN ORDINANCE OF THE COUNCIL OF THE CITY OF SAN DIEGO AUTHORIZING SETTLEMENT OF THE CITY'S LAWSUIT AGAINST THE SWEETWATER AUTHORITY.

WHEREAS, on March 26, 2010, the City filed a lawsuit against the Sweetwater Authority regarding expansion of Sweetwater's Richard Reynolds Desalination Facility, *City of San Diego v. Sweetwater Authority, et al,* San Diego Superior Court Case 37-2010-00088653-CU-TT-CTL; and

WHEREAS, Sweetwater owns, operates, and maintains the National City Wells production facility ("NC Wells") and the existing Richard A. Reynolds Desalination Facility ("Desal Facility") and the primary source of water for both production facilities is the San Diego Formation ("SDF"); and

WHEREAS; the Richard A. Reynolds Desalination Facility Expansion Project ("Desal Expansion") will add a capacity of 5,200 acre-feet per year ("AFY") to the Desal Facility by adding five (5) new wells that draw from the SDF; and

WHEREAS; on February 24, 2010, Sweetwater's Governing Board certified the Final Environmental Impact Report ("EIR") for the Desal Expansion, adopted a Mitigation Monitoring and Reporting Program and Findings of Fact, and approved the Desal Expansion and on November 10, 2010, the Governing Board re-approved the Desal Expansion to correct a procedural defect; and

WHEREAS; the City filed the Lawsuit challenging Sweetwater's compliance with CEQA and Sweetwater's right to take water from the SDF for the Desal Expansion and the City dismissed its water rights claim without prejudice; and

WHEREAS; through discussions subsequent to the filing of the Lawsuit, the Parties recognized the mutual benefit of both Parties participating in the Desal Expansion and in settlement of the Lawsuit, the Parties have agreed to share the water treated at the Desal Expansion according to the terms and conditions set forth in the Settlement Agreement; and

WHEREAS; the City and Sweetwater have agreed to participate in a joint Assembly Bill 3030 Groundwater Management Plan to protect the SDF from seawater intrusion and other environmental harms; NOW, THEREFORE,

BE IT ORDAINED, by the Council of the City of San Diego, as follows:

Section 1. That the Mayor or his designee is authorized and directed to execute, for and on behalf of the City, an agreement with Sweetwater Authority resolving the litigation *City of San Diego v. Sweetwater Authority, et al,* San Diego Superior Court Case 37-2010-00088653-CU-TT-CTL, as set forth in the Settlement Agreement, on file with the City Clerk as Document Number OO- 20287.

Section 2. That the Chief Financial Officer is authorized to expend an amount not to exceed $7,200,000 from Water Fund 700011, solely and exclusively to provide funds for the Settlement Agreement and related costs as set forth therein, provided that the Chief Financial Officer furnishes one or more certificates demonstrating that the funds are, or will be, on deposit with the City Treasurer.

Section 3. That the Chief Financial Officer, upon advice from the administering department, is authorized to transfer excess funds, if any, to the appropriate reserves.

Section 4. That a full reading of this ordinance is dispensed with prior to its passage, a written or printed copy having been made available to the City Council and the public prior to the day of its passage.

Section 5. That this ordinance shall take effect and be in force on the thirtieth day from and after its final passage.

APPROVED: JAN I. GOLDSMITH, City Attorney

By _____
Raymond C. Palmucci
Deputy City Attorney

RCP:mb
07/9/13
Or.Dept: City Atty
Doc.No:587382

I hereby certify that the foregoing Ordinance was passed by the Council of the City of San Diego, at its meeting of JUL 30 2013.

ELIZABETH S. MALAND, City Clerk

By _____
Deputy City Clerk

Approved: 8/2/13 _____
(date) BOB FILNER, Mayor

Vetoed: _____ _____
(date) BOB FILNER, Mayor

This ordinance is effective August 5, 2013, which represents the day this ordinance was returned to the Office of the City Clerk with the Mayor's signature of approval.

Passed by the Council of The City of San Diego on JUL 30 2013, by the following vote:

Councilmembers	Yeas	Nays	Not Present	Recused
Sherri Lightner	☑	☐	☐	☐
Kevin Faulconer	☑	☐	☐	☐
Todd Gloria	☑	☐	☐	☐
Myrtle Cole	☑	☐	☐	☐
Mark Kersey	☑	☐	☐	☐
Lorie Zapf	☐	☐	☑	☐
Scott Sherman	☑	☐	☐	☐
David Alvarez	☑	☐	☐	☐
Marti Emerald	☑	☐	☐	☐

Date of final passage AUG 05 2013.

AUTHENTICATED BY: BOB FILNER
Mayor of The City of San Diego, California.

(Seal) ELIZABETH S. MALAND
City Clerk of The City of San Diego, California.
By _____, Deputy

I HEREBY CERTIFY that the foregoing ordinance was not finally passed until twelve calendar days had elapsed between the day of its introduction and the day of its final passage, to wit, on JUL 15 2013, and on AUG 05 2013.

~~I FURTHER CERTIFY that said ordinance was read in full prior to its final passage.~~

I FURTHER CERTIFY that the reading of said ordinance in full was dispensed with by a vote of not less than a majority of the members elected to the Council, and that there was available for the consideration of each member of the Council and the public prior to the day of its passage a written or printed copy of said ordinance.

ELIZABETH S. MALAND
City Clerk of The City of San Diego, California.

(Seal) By _____, Deputy

Office of the City Clerk, San Diego, California

Ordinance Number O- 20287

THE SUSTAINABLE SITES INITIATIVE™

THE CASE FOR SUSTAINABLE LANDSCAPES

American Society of Landscape Architects

Lady Bird Johnson Wildflower Center
at The University of Texas at Austin

United States Botanic Garden

GARDEN\GARDEN

A Comparison in Santa Monica

In 2003, the City of Santa Monica, CA, initiated a project called garden\garden, designed to encourage city residents and the local landscaping community to adopt sustainable garden practices. The city wished to promote practices that would, among other things, conserve water and energy, reduce waste and also decrease urban runoff, the single largest source of pollution in Santa Monica Bay. Although the city had been providing seminars and tours of local sustainable landscapes, as well as a large demonstration garden at City Hall, most residents were not moved to alter their gardening practices. Similarly, members of the landscaping community were still inclined to continue recommending and installing the traditional kinds of non-native plants with which they were most familiar.

The City of Santa Monica's challenge was to persuade both homeowners and landscape professionals that sustainable gardening was not only better for the environment than traditional gardening, but also was attractive and made good economic sense. To prove their case, the city created garden\garden—two gardens in adjacent residential front yards, one landscaped in the traditional manner and the other with a climate-appropriate, sustainable design, allowing residents to make a direct comparison. Using garden\garden as a model, the city has since awarded 51 Sustainable Landscape Grants for properties including single-family homes, multi-family buildings, and two schools. Sustainable landscape principles have been taught to more than a hundred residents and more than 120 landscape professionals since 2004. Garden\garden has served as a learning laboratory and working example for all of the workshop attendees, garden tour visitors, and for the general public who walk past the garden daily.

In the native garden (above), California native cultivars replicate the drought-tolerant chapparal of the Santa Monica Mountains and use 77 percent less water than required by conventional turf and exotic plants from the Eastern United States and Europe in the traditional garden (right).

SIZE/TYPE OF PROJECT
Approximately 1,900 square feet in each garden

SITE CONTEXT
Southern California's climate is coastal Mediterranean and is dominated by the Pacific Ocean. Average daily temperatures are mild and morning fog is common, with daily afternoon winds. The air tends to be salt laden and the average annual rainfall ranges from 11 to 20 inches. The soils are commonly alkaline and sandy in texture. The side-by-side bungalows are in an urban residential neighborhood. Each garden is approximately 1,900 square feet in area.

ISSUES/CONSTRAINTS OF THE SITE
In both gardens the soil type was sandy loam (moderate permeability), poor in organic matter, and highly compacted from decades of turf. Tests also indicated high alkalinity and high levels of heavy metals, including zinc and copper. The existing landscape on both sites was completely removed to create an identical environmental base condition for study, with all waste exported for recycling. Soil amendments were applied as appropriate for the respective plant material. The intent was to bring the soil to a basic level of balance, facilitate a long-term development of healthy soil life, and to increase plant health. Both gardens also are exposed to unusually high vehicular traffic and resulting air pollution.

SUSTAINABLE PRACTICES IN THE NATIVE GARDEN
- No chemical herbicides or insecticides (per Santa Monica City policy)
- Climate-appropriate California native cultivars, designed to replicate the chaparral of the Santa Monica Mountains
- Low-volume drip irrigation with a weather-sensitive controller
- System for capturing stormwater runoff for groundwater recharge
- Wildlife habitat for local and migratory fauna

PRACTICES IN THE TRADITIONAL GARDEN
- No chemical herbicides or insecticides; occasional use of blood meal
- Exotic plants from northern Europe and the eastern United States
- Standard, user-controlled sprinkler irrigation system
- No provision for runoff mitigation

CONSTRUCTION COSTS
Traditional garden	**$12,400**
Native garden	**$16,700**

The higher cost of the native garden included demolition and replacement of an existing access ramp, installation of permeable paving, and installation of a rainwater recovery system—rain gutters that tie into an underground infiltration pit. These figures do not take into account the costs and benefits to the larger community. Benefits may include, for example, water conservation, waste reduction, and improvements in human and environmental health.

MONITORING
Construction was completed in March 2004. From 2004 to 2008, the city tracked costs, labor hours, plant growth, water consumption, green waste production, and other environmental factors for both gardens. The ever increasing costs of water, maintenance man hours, and the transporting costs of green waste disposal required to support a traditional landscape will determine the long-term dollar amount offset of costs for installation.

- **Water Use (gallons):** Each garden is separately metered. Water consumption was recorded at two-month intervals until November 2004, after which it was recorded monthly.
  - TG = 283,981 gallons/year
  - NG = 64,396 gallons/year
  - Difference = 219,585 gallons/year or 77% less water use for NG
- **Green Waste (pounds):**
  - TG =647.5 pounds/year
  - NG = 219.0 pounds/year
  - Difference = 428.5 pounds/year or 66% less waste produced from NG
- **Maintenance Labor (U.S. dollars):**
  - TG = $223.22/year
  - NG = $ 70.44/year
  - Difference = $152.78/yr or 68% fewer dollars spent on maintenance labor for NG

LESSONS LEARNED
Collected site data have validated theories that a south California native landscape would yield significant reductions in resource consumption and waste production as compared to a traditional south California–style landscape.

eGRID 9th edition Version 1.0
Year 2010 Summary Tables

(created February 2014)

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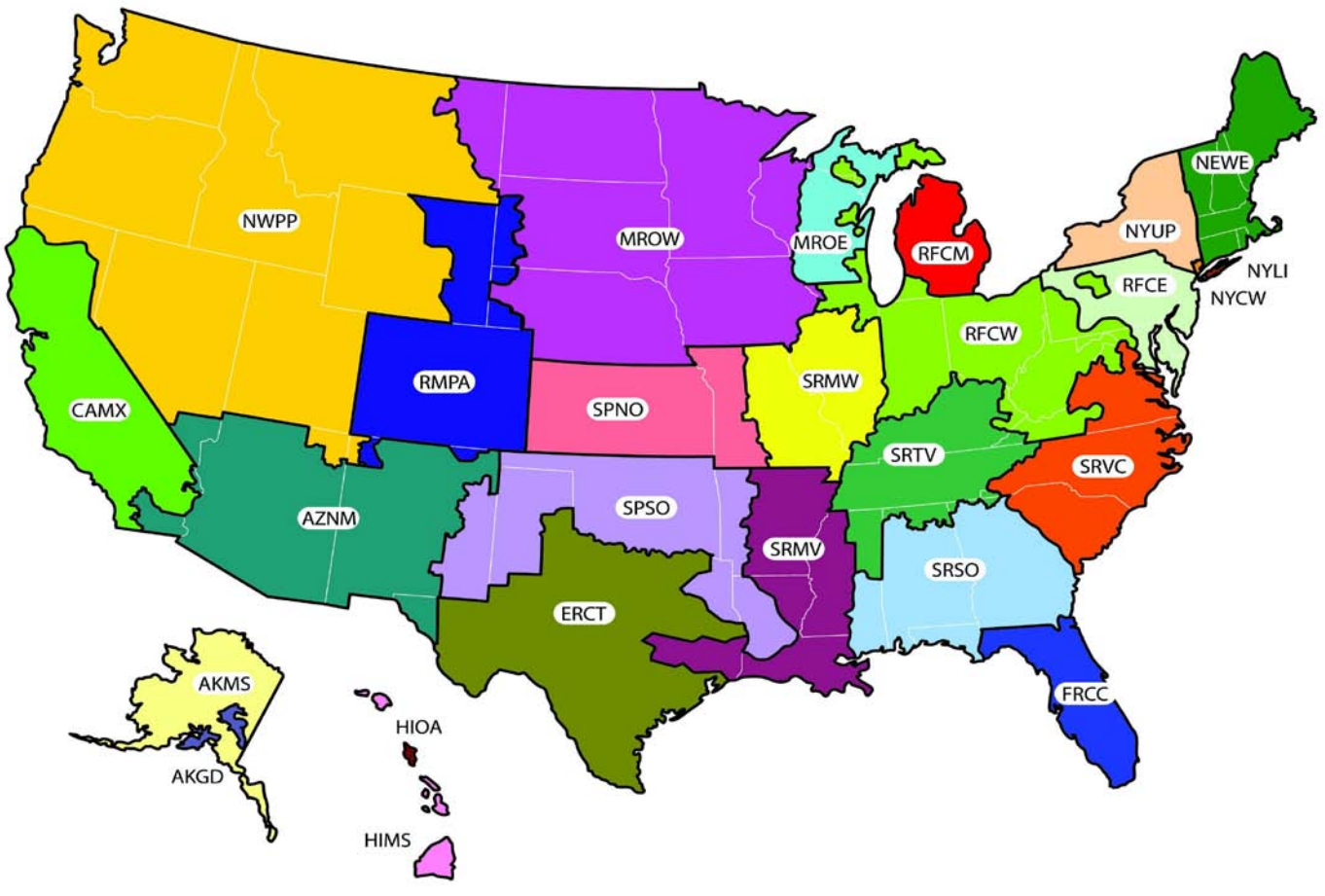
Year 2010 eGRID Subregion Emissions - Greenhouse Gases

eGRID subregion acronym	eGRID subregion name	Carbon dioxide (CO_2)		Methane (CH_4)		Nitrous oxide (N_2O)		Carbon dioxide equivalent (CO_2e)	
		Emissions (tons)	Total output emission rate (lb/MWh)	Emissions (lbs)	Total output emission rate (lb/GWh)	Emissions (lbs)	Total output emission rate (lb/GWh)	Emissions (tons)	Total output emission rate (lb/MWh)
AKGD	ASCC Alaska Grid	3,350,817.0	1,256.87	139,035.5	26.08	38,279.9	7.18	3,358,210.3	1,259.64
AKMS	ASCC Miscellaneous	317,398.6	448.57	26,527.0	18.74	5,208.6	3.68	318,484.5	450.10
AZNM	WECC Southwest	104,967,483.8	1,177.61	3,424,005.1	19.21	2,802,975.8	15.72	105,437,897.1	1,182.89
CAMX	WECC California	64,799,260.4	610.82	6,044,809.1	28.49	1,278,773.3	6.03	65,060,940.8	613.28
ERCT	ERCOT All	210,366,837.2	1,218.17	5,820,108.3	16.85	4,859,884.0	14.07	211,181,230.4	1,222.88
FRCC	FRCC All	130,376,587.7	1,196.71	8,478,102.7	38.91	2,995,217.6	13.75	130,929,866.5	1,201.79
HIMS	HICC Miscellaneous	1,963,642.7	1,330.16	218,438.7	73.98	40,985.9	13.88	1,972,289.1	1,336.02
HIOA	HICC Oahu	6,393,027.4	1,621.86	782,825.4	99.30	176,679.8	22.41	6,428,632.4	1,630.90
MROE	MRO East	26,009,237.7	1,610.80	784,331.9	24.29	888,770.5	27.52	26,155,232.6	1,619.84
MROW	MRO West	156,444,752.4	1,536.36	5,809,874.5	28.53	5,354,351.3	26.29	157,335,680.5	1,545.11
NEWE	NPCC New England	46,905,984.7	722.07	9,322,707.0	71.76	1,685,853.4	12.98	47,265,180.4	727.60
NWPP	WECC Northwest	112,891,853.5	842.58	4,300,901.6	16.05	3,502,980.9	13.07	113,479,975.1	846.97
NYCW	NPCC NYC/Westchester	12,733,660.7	622.42	974,161.1	23.81	114,582.6	2.80	12,761,649.6	623.78
NYLI	NPCC Long Island	8,115,858.7	1,336.11	989,929.6	81.49	124,943.6	10.28	8,145,619.2	1,341.01
NYUP	NPCC Upstate NY	24,165,154.6	545.79	1,443,157.6	16.30	641,283.5	7.24	24,279,706.7	548.37
RFCE	RFC East	137,558,868.7	1,001.72	7,434,984.1	27.07	4,210,267.5	15.33	138,289,527.5	1,007.04
RFCM	RFC Michigan	74,602,328.8	1,629.38	2,789,651.5	30.46	2,457,844.2	26.84	75,012,586.0	1,638.34
RFCW	RFC West	449,994,271.4	1,503.47	10,897,168.6	18.20	14,813,680.5	24.75	452,404,812.2	1,511.52
RMPA	WECC Rockies	61,839,528.9	1,896.74	1,477,560.7	22.66	1,904,448.4	29.21	62,150,232.8	1,906.27
SPNO	SPP North	62,457,258.2	1,799.45	1,444,401.4	20.81	1,986,994.1	28.62	62,780,408.5	1,808.76
SPSO	SPP South	117,325,297.0	1,580.60	3,444,187.9	23.20	3,095,469.5	20.85	117,841,258.7	1,587.55
SRMV	SERC Mississippi Valley	90,967,299.2	1,029.82	3,650,522.7	20.66	1,900,187.0	10.76	91,300,158.7	1,033.58
SRMW	SERC Midwest	123,042,911.4	1,810.83	2,783,643.6	20.48	4,019,051.2	29.57	123,695,092.6	1,820.43
SRSO	SERC South	183,236,856.9	1,354.09	6,176,437.4	22.82	5,653,138.2	20.89	184,177,945.9	1,361.05
SRTV	SERC Tennessee Valley	163,960,526.8	1,389.20	4,177,202.5	17.70	5,290,412.2	22.41	164,824,401.3	1,396.52
SRVC	SERC Virginia/Carolina	167,452,188.6	1,073.65	6,766,296.6	21.69	5,502,582.8	17.64	168,376,135.0	1,079.57
U.S.		**2,542,238,893.0**	**1,232.35**	**99,600,972.2**	**24.14**	**75,344,845.9**	**18.26**	**2,554,963,154.4**	**1,238.52**



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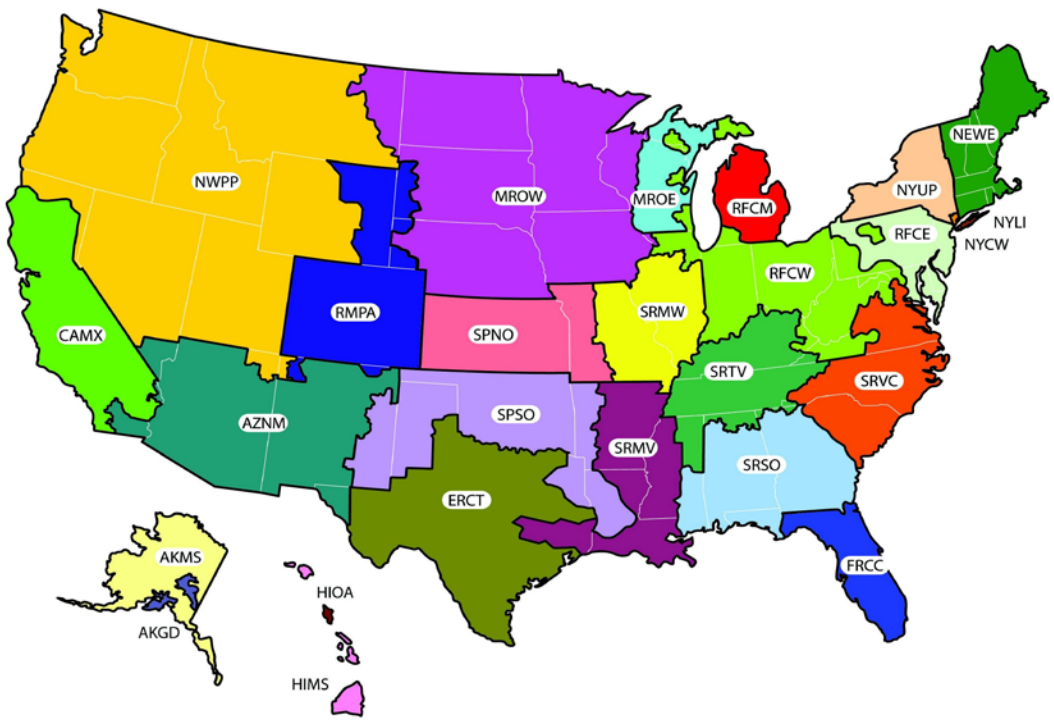
Year 2010 eGRID Subregion Emissions - Criteria Pollutants

eGRID subregion acronym	eGRID subregion name	Nitrogen oxides (NO_x)				Sulfur dioxide (SO_2)	
		Emissions (tons)	Total output emission rate (lb/MWh)	Ozone season emissions (tons)	Ozone season total output emission rate (lb/MWh)	Emissions (tons)	Total output emission rate (lb/MWh)
AKGD	ASCC Alaska Grid	6,747.78	2.5310	2,483.95	2.4531	1,218.16	0.4569
AKMS	ASCC Miscellaneous	4,190.35	5.9221	1,283.02	4.8215	119.64	0.1691
AZNM	WECC Southwest	126,803.83	1.4226	56,734.05	1.3558	54,384.88	0.6101
CAMX	WECC California	42,935.54	0.4047	18,951.31	0.3980	18,114.85	0.1708
ERCT	ERCOT All	112,686.33	0.6525	53,116.56	0.6318	388,236.16	2.2482
FRCC	FRCC All	77,861.56	0.7147	36,505.33	0.7058	154,674.97	1.4197
HIMS	HICC Miscellaneous	8,265.74	5.5992	3,655.16	5.6423	5,555.84	3.7635
HIOA	HICC Oahu	9,822.55	2.4919	3,473.29	2.0489	15,846.99	4.0203
MROE	MRO East	22,388.78	1.3866	9,773.05	1.3457	84,527.18	5.2349
MROW	MRO West	202,395.91	1.9876	83,125.52	1.9047	386,476.47	3.7954
NEWE	NPCC New England	33,872.13	0.5214	13,062.90	0.4453	91,903.02	1.4148
NWPP	WECC Northwest	136,341.44	1.0176	54,279.01	0.9348	134,623.44	1.0048
NYCW	NPCC NYC/Westchester	5,507.03	0.2692	3,174.62	0.3203	1,895.26	0.0926
NYLI	NPCC Long Island	5,739.65	0.9449	3,186.08	1.0224	3,346.78	0.5510
NYUP	NPCC Upstate NY	18,704.86	0.4225	8,393.89	0.4287	49,396.12	1.1156
RFCE	RFC East	118,630.07	0.8639	54,277.28	0.8714	293,625.57	2.1382
RFCM	RFC Michigan	76,828.93	1.6780	33,224.72	1.5480	240,734.60	5.2579
RFCW	RFC West	416,995.47	1.3932	180,238.54	1.3824	1,489,089.68	4.9752
RMPA	WECC Rockies	78,970.58	2.4222	32,666.01	2.3263	61,109.45	1.8743
SPNO	SPP North	66,593.95	1.9186	29,964.11	1.8933	88,544.89	2.5511
SPSO	SPP South	136,008.22	1.8323	64,420.86	1.7981	236,116.02	3.1809
SRMV	SERC Mississippi Valley	118,153.08	1.3376	59,670.07	1.4449	127,939.31	1.4484
SRMW	SERC Midwest	71,474.29	1.0519	31,153.17	1.0524	335,167.04	4.9327
SRSO	SERC South	150,786.79	1.1143	66,651.11	1.0437	484,599.01	3.5811
SRTV	SERC Tennessee Valley	134,430.67	1.1390	58,229.66	1.1400	387,669.47	3.2846
SRVC	SERC Virginia/Carolina	124,727.96	0.7997	57,608.45	0.8113	317,964.62	2.0387
U.S.		**2,307,863.49**	**1.1187**	**1,019,301.72**	**1.0885**	**5,452,879.41**	**2.6433**



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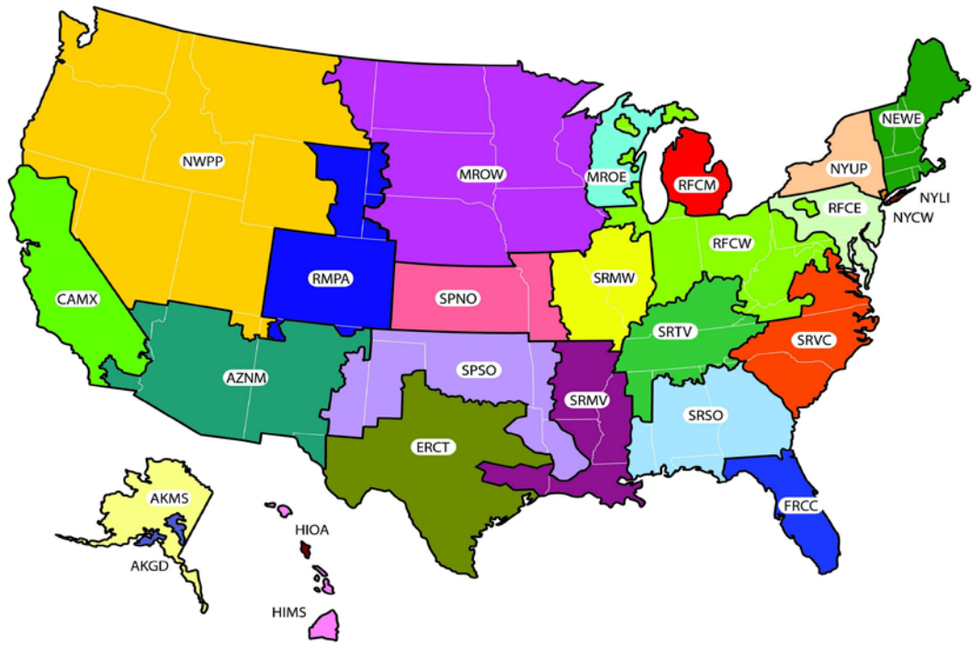
Year 2010 eGRID Subregion Output Emission Rates - Greenhouse Gases

eGRID subregion acronym	eGRID subregion name	Total output emission rates			Fossil fuel output emission rate	Non-baseload output emission rates		
		CO_2 (lb/MWh)	CH_4 (lb/GWh)	N_2O (lb/GWh)	CO_2 (lb/MWh)	CO_2 (lb/MWh)	CH_4 (lb/GWh)	N_2O (lb/GWh)
AKGD	ASCC Alaska Grid	1,256.87	26.08	7.18	1,377.76	1,387.37	34.05	6.93
AKMS	ASCC Miscellaneous	448.57	18.74	3.68	1,413.40	1,427.76	59.97	11.80
AZNM	WECC Southwest	1,177.61	19.21	15.72	1,613.24	1,210.44	21.88	9.86
CAMX	WECC California	610.82	28.49	6.03	1,014.49	932.82	35.91	4.55
ERCT	ERCOT All	1,218.17	16.85	14.07	1,508.72	1,181.70	20.12	7.63
FRCC	FRCC All	1,196.71	38.91	13.75	1,342.00	1,277.42	38.73	10.83
HIMS	HICC Miscellaneous	1,330.16	73.98	13.88	1,712.90	1,690.72	104.05	19.12
HIOA	HICC Oahu	1,621.86	99.30	22.41	1,596.89	1,588.23	119.48	20.10
MROE	MRO East	1,610.80	24.29	27.52	2,120.96	1,755.66	31.53	27.99
MROW	MRO West	1,536.36	28.53	26.29	2,225.15	2,054.55	59.86	35.53
NEWE	NPCC New England	722.07	71.76	12.98	1,115.40	1,106.82	61.55	12.07
NWPP	WECC Northwest	842.58	16.05	13.07	1,819.02	1,340.34	41.38	17.84
NYCW	NPCC NYC/Westchester	622.42	23.81	2.80	1,004.41	1,131.63	23.58	2.44
NYLI	NPCC Long Island	1,336.11	81.49	10.28	1,269.76	1,445.94	34.03	3.91
NYUP	NPCC Upstate NY	545.79	16.30	7.24	1,384.41	1,253.77	36.83	13.67
RFCE	RFC East	1,001.72	27.07	15.33	1,695.25	1,562.72	35.93	20.02
RFCM	RFC Michigan	1,629.38	30.46	26.84	1,966.47	1,744.52	32.31	26.00
RFCW	RFC West	1,503.47	18.20	24.75	2,040.18	1,982.87	24.50	31.07
RMPA	WECC Rockies	1,896.74	22.66	29.21	2,103.57	1,808.03	24.56	22.89
SPNO	SPP North	1,799.45	20.81	28.62	2,218.66	1,951.83	25.15	26.90
SPSO	SPP South	1,580.60	23.20	20.85	1,762.16	1,436.29	27.94	12.10
SRMV	SERC Mississippi Valley	1,029.82	20.66	10.76	1,433.94	1,222.40	27.71	6.63
SRMW	SERC Midwest	1,810.83	20.48	29.57	2,124.43	1,964.98	23.93	29.65
SRSO	SERC South	1,354.09	22.82	20.89	1,754.16	1,574.37	26.52	21.49
SRTV	SERC Tennessee Valley	1,389.20	17.70	22.41	1,977.32	1,873.83	24.99	28.88
SRVC	SERC Virginia/Carolina	1,073.65	21.69	17.64	1,835.13	1,624.71	36.42	23.06
U.S.		**1,232.35**	**24.14**	**18.26**	**1,745.14**	**1,520.20**	**31.27**	**18.34**



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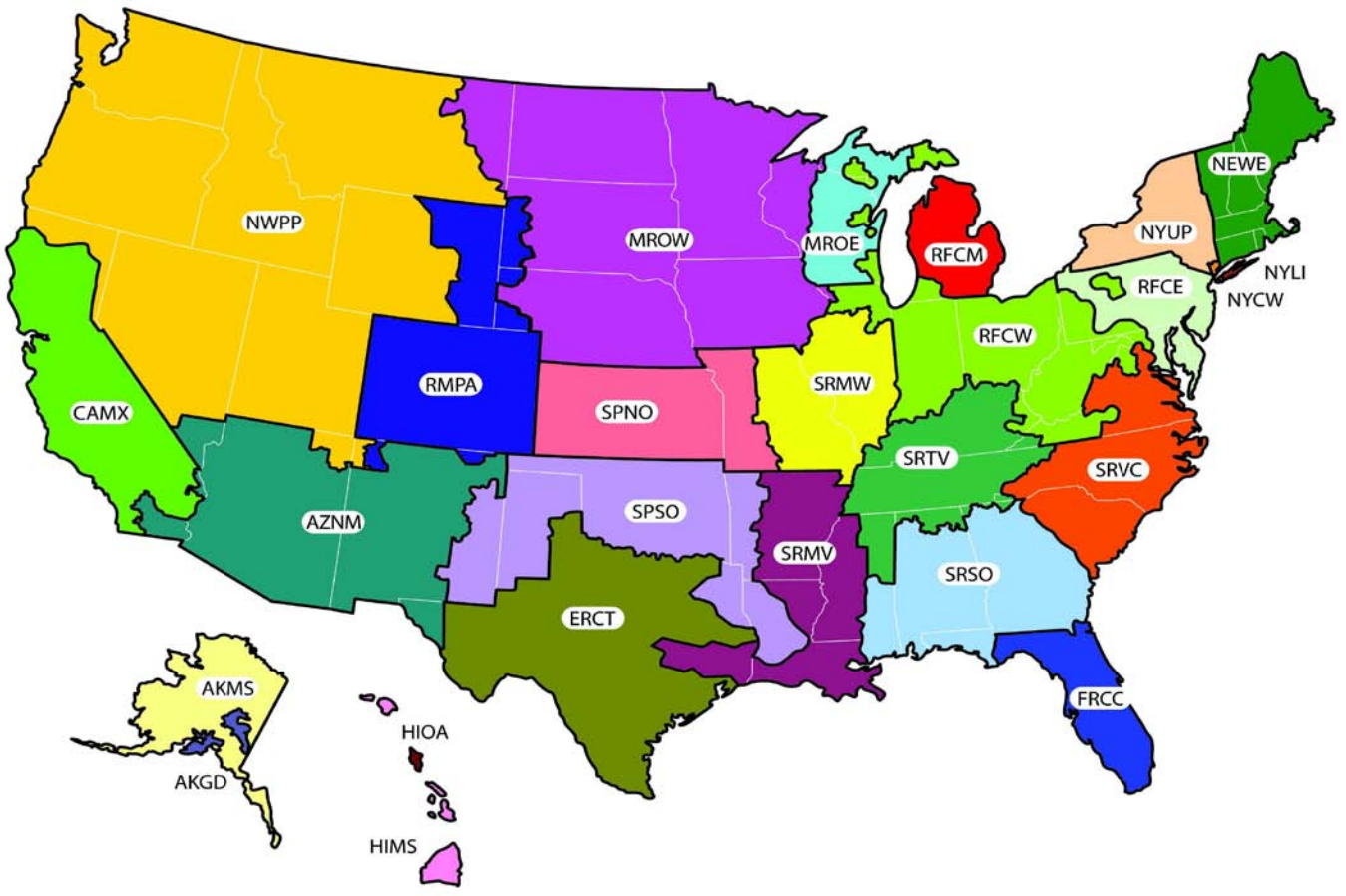
Year 2010 eGRID Subregion Output Emission Rates - Criteria Pollutants

eGRID subregion acronym	eGRID subregion name	Total output emission rates			Fossil fuel output emission rates			Non-baseload output emission rates		
		NO_x (lb/MWh)	Ozone season NO_x (lb/MWh)	SO_2 (lb/MWh)	NO_x (lb/MWh)	Ozone season NO_x (lb/MWh)	SO_2 (lb/MWh)	NO_x (lb/MWh)	Ozone season NO_x (lb/MWh)	SO_2 (lb/MWh)
AKGD	ASCC Alaska Grid	2.5310	2.4531	0.4569	2.7745	2.7521	0.5009	3.0246	2.8092	0.3259
AKMS	ASCC Miscellaneous	5.9221	4.8215	0.1691	18.6600	18.1551	0.5328	19.8413	19.0429	0.5650
AZNM	WECC Southwest	1.4226	1.3558	0.6101	1.9411	1.8081	0.8258	0.9297	1.0420	0.3530
CAMX	WECC California	0.4047	0.3980	0.1708	0.6281	0.7057	0.2692	0.2297	0.2411	0.0353
ERCT	ERCOT All	0.6525	0.6318	2.2482	0.8081	0.7579	2.7844	0.4978	0.6096	0.6151
FRCC	FRCC All	0.7147	0.7058	1.4197	0.7297	0.7218	1.3664	0.9144	1.0966	1.6357
HIMS	HICC Miscellaneous	5.5992	5.6423	3.7635	7.1599	7.5503	4.8125	10.0149	10.2218	4.6127
HIOA	HICC Oahu	2.4919	2.0489	4.0203	2.1156	2.1299	4.0004	3.0144	2.5090	3.0473
MROE	MRO East	1.3866	1.3457	5.2349	1.7560	1.6704	6.7674	2.0548	1.8436	5.7894
MROW	MRO West	1.9876	1.9047	3.7954	2.8218	2.6886	5.4912	2.8321	2.5897	5.4565
NEWE	NPCC New England	0.5214	0.4453	1.4148	0.4811	0.4586	2.1040	0.6342	0.7031	1.4931
NWPP	WECC Northwest	1.0176	0.9348	1.0048	2.1644	2.1853	2.1380	1.3986	1.2181	1.0904
NYCW	NPCC NYC/Westchester	0.2692	0.3203	0.0926	0.3712	0.4364	0.0551	0.6647	1.0352	0.1156
NYLI	NPCC Long Island	0.9449	1.0224	0.5510	0.8396	0.9442	0.4555	1.0904	1.4493	0.6610
NYUP	NPCC Upstate NY	0.4225	0.4287	1.1156	1.0072	0.9434	2.8092	0.8264	1.0011	2.3687
RFCE	RFC East	0.8639	0.8714	2.1382	1.4340	1.3786	3.6029	1.3913	1.7091	3.8673
RFCM	RFC Michigan	1.6780	1.5480	5.2579	1.9799	1.8406	6.3198	1.8329	1.7387	6.1011
RFCW	RFC West	1.3932	1.3824	4.9752	1.8841	1.8503	6.7425	2.0632	2.0945	8.0711
RMPA	WECC Rockies	2.4222	2.3263	1.8743	2.6863	2.6180	2.0787	2.0440	1.9649	1.5854
SPNO	SPP North	1.9186	1.8933	2.5511	2.3656	2.3119	3.1454	2.2149	2.3211	3.3784
SPSO	SPP South	1.8323	1.7981	3.1809	2.0274	1.9639	3.5117	1.7566	2.0256	1.9672
SRMV	SERC Mississippi Valley	1.3376	1.4449	1.4484	1.8094	1.8819	1.8602	1.5096	1.8411	0.5643
SRMW	SERC Midwest	1.0519	1.0524	4.9327	1.2341	1.2222	5.7869	1.2024	1.1874	5.5356
SRSO	SERC South	1.1143	1.0437	3.5811	1.3853	1.2723	4.5101	1.6404	1.6834	5.6683
SRTV	SERC Tennessee Valley	1.1390	1.1400	3.2846	1.6093	1.5641	4.6351	1.5843	1.6606	4.8449
SRVC	SERC Virginia/Carolina	0.7997	0.8113	2.0387	1.2994	1.2772	3.3959	1.3915	1.5785	4.3637
U.S.		**1.1187**	**1.0885**	**2.6433**	**1.5479**	**1.4877**	**3.7004**	**1.3930**	**1.5101**	**3.4026**



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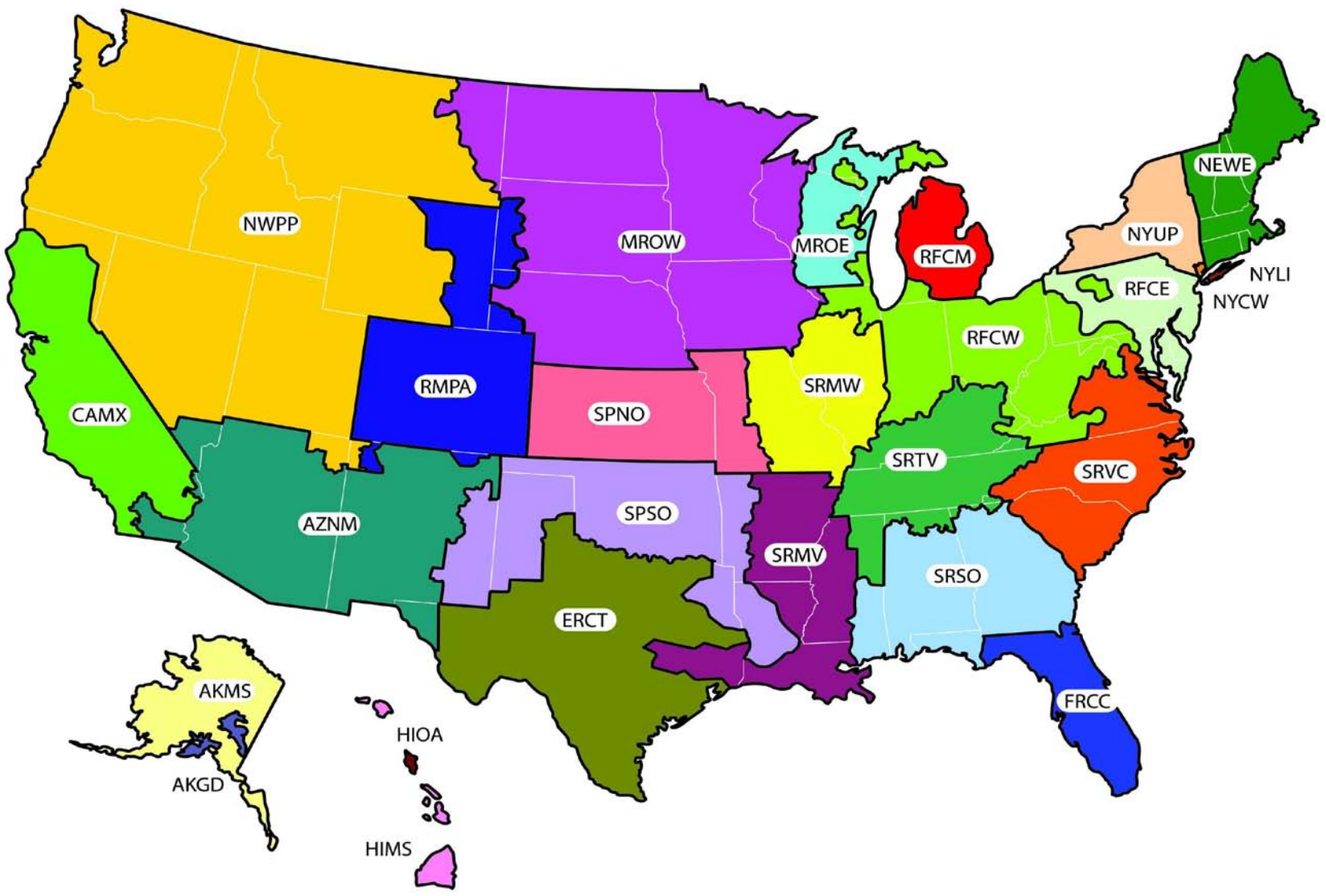
Year 2010 eGRID Subregion Resource Mix

eGRID subregion acronym	eGRID subregion name	Nameplate capacity (MW)	Net Generation (MWh)	Generation resource mix (percent)										
				Coal	Oil	Gas	Other fossil	Biomass	Hydro	Nuclear	Wind	Solar	Geo-thermal	Other unknown/ purchased fuel
AKGD	ASCC Alaska Grid	1,522.2	5,332,020.2	11.6362	10.1930	69.3962	0.0000	0.0000	8.7746	0.0000	0.0000	0.0000	0.0000	0.0000
AKMS	ASCC Miscellaneous	713.2	1,415,158.2	0.0000	27.7721	3.5193	0.0000	0.4455	67.3723	0.0000	0.8909	0.0000	0.0000	0.0000
AZNM	WECC Southwest	49,321.6	178,271,415.3	39.4515	0.0661	33.4001	0.0056	0.3422	6.1810	17.5014	0.6862	0.1295	2.2366	0.0000
CAMX	WECC California	75,066.4	212,172,138.5	7.1466	1.1510	50.4490	0.2316	2.6248	15.1942	15.1767	3.0538	0.3564	4.3187	0.2970
ERCT	ERCOT All	100,595.3	345,382,525.6	34.8356	0.7898	44.9525	0.1266	0.1306	0.2040	11.9680	6.8938	0.0024	0.0000	0.0968
FRCC	FRCC All	64,862.9	217,890,866.6	24.3846	4.1835	57.3321	0.6049	1.6658	0.0815	10.9853	0.0000	0.0369	0.0000	0.7254
HIMS	HICC Miscellaneous	895.3	2,952,481.9	1.6723	69.1861	0.0000	7.4198	3.6384	2.3852	0.0000	8.8441	0.0599	6.7941	0.0000
HIOA	HICC Oahu	1,925.6	7,883,554.0	18.9780	76.9519	0.0000	1.9673	2.1028	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
MROE	MRO East	8,897.0	32,293,505.5	69.4580	2.1436	4.0010	0.0783	3.2994	3.3210	15.4528	2.1402	0.0000	0.0000	0.1058
MROW	MRO West	55,325.0	203,656,312.3	65.2593	0.1544	3.1566	0.1293	1.2099	5.8722	14.2313	9.8081	0.0000	0.0000	0.1789
NEWE	NPCC New England	36,485.3	129,920,243.4	10.8375	0.8196	45.2791	1.5167	5.6102	5.9300	29.5263	0.4698	0.0000	0.0000	0.0101
NWPP	WECC Northwest	69,721.0	267,967,318.0	31.3015	0.3279	14.3386	0.1423	1.2372	43.5510	3.4486	4.8371	0.0000	0.6973	0.1179
NYCW	NPCC NYC/Westchester	13,906.9	40,916,871.9	0.0000	1.2934	57.3676	0.4697	0.5234	0.0000	39.8873	0.4585	0.0000	0.0000	0.0000
NYLI	NPCC Long Island	6,000.4	12,148,487.3	0.0000	6.9312	85.4961	3.5635	4.0093	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NYUP	NPCC Upstate NY	25,067.6	88,551,618.2	15.3388	0.8398	22.2004	0.3017	1.6451	28.1600	28.8520	2.6622	0.0000	0.0000	0.0000
RFCE	RFC East	74,350.1	274,646,405.8	35.2745	0.5476	20.6192	0.6873	1.2794	1.0071	39.9059	0.6687	0.0104	0.0000	0.0000
RFCM	RFC Michigan	29,590.2	91,571,321.5	68.0216	0.3973	13.2495	0.6553	1.8774	0.0000	15.1705	0.6284	0.0000	0.0000	0.0000
RFCW	RFC West	147,391.4	598,607,320.8	68.5984	0.3959	4.1640	0.4478	0.4818	0.6593	23.7740	1.4141	0.0042	0.0000	0.0606
RMPA	WECC Rockies	18,178.1	65,206,132.2	72.9959	0.0427	17.1257	0.0000	0.0923	3.9125	0.0000	5.6469	0.0770	0.0000	0.1070
SPNO	SPP North	21,261.8	69,418,232.2	72.8397	0.2706	7.9546	0.0394	0.0792	0.1460	13.7654	4.9051	0.0000	0.0000	0.0000
SPSO	SPP South	44,883.8	148,456,365.7	52.1508	1.2466	35.9421	0.2062	1.4223	4.4055	0.0000	4.6265	0.0000	0.0000	0.0000
SRMV	SERC Mississippi Valley	50,942.3	176,667,075.4	22.9107	1.1187	46.9265	1.0137	1.8933	1.3544	24.5124	0.0000	0.0000	0.0000	0.2703
SRMW	SERC Midwest	33,454.6	135,896,937.1	80.9052	0.0814	4.0123	0.0576	0.1064	1.0568	12.9569	0.6540	0.0000	0.0000	0.1695
SRSO	SERC South	71,782.9	270,641,138.1	52.3701	0.3031	24.6072	0.1211	2.6539	2.6959	17.2486	0.0000	0.0000	0.0000	0.0000
SRTV	SERC Tennessee Valley	62,065.4	236,050,232.4	58.7899	1.0760	10.4018	0.0144	0.8583	6.5970	22.2454	0.0172	0.0000	0.0000	0.0000
SRVC	SERC Virginia/Carolina	80,849.7	311,931,345.0	45.7303	0.5484	11.7297	0.1706	1.9584	1.4920	38.2454	0.0000	0.0036	0.0000	0.1215
U.S.		**1,145,056.0**	**4,125,847,023.5**	**44.7748**	**1.0174**	**23.9686**	**0.3498**	**1.3571**	**6.1730**	**19.5589**	**2.2864**	**0.0290**	**0.3689**	**0.1162**



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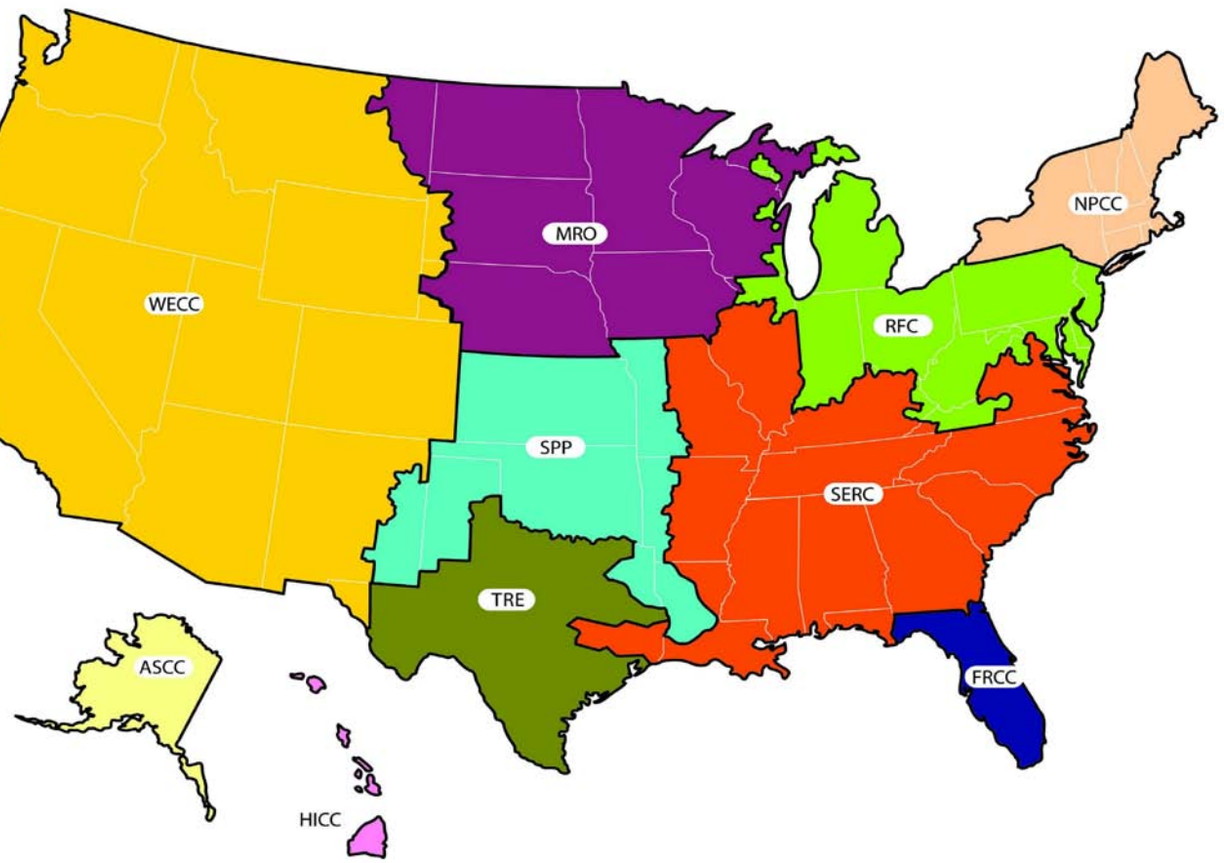
Year 2010 NERC Region Emissions

NERC region acronym	NERC region name	Nitrogen oxides (NO_x)				Sulfur dioxide (SO_2)		Carbon dioxide (CO_2)		Methane (CH_4)		Nitrous oxide (N_2O)	
		Emissions (tons)	Total output emission rate (lb/MWh)	Ozone season emissions (tons)	Ozone season total output emission rate (lb/MWh)	Emissions (tons)	Total output emission rate (lb/MWh)	Emissions (tons)	Total output emission rate (lb/MWh)	Emissions (lbs)	Total output emission rate (lb/GWh)	Emissions (lbs)	total output emission rate (lb/GWh)
ASCC	Alaska Systems Coordinating Council	10,938.14	3.2423	3,766.96	2.9460	1,337.80	0.3966	3,668,215.6	1,087.33	165,562.5	24.54	43,488.4	6.45
FRCC	Florida Reliability Coordinating Council	77,861.56	0.7147	36,505.33	0.7058	154,674.97	1.4197	130,376,587.7	1,196.71	8,478,102.7	38.91	2,995,217.6	13.75
HICC	Hawaiian Islands Coordinating Council	18,088.29	3.3385	7,128.45	3.0424	21,402.83	3.9503	8,356,670.1	1,542.39	1,001,264.1	92.40	217,665.6	20.09
MRO	Midwest Reliability Organization	224,784.69	1.9054	92,898.57	1.8249	471,003.65	3.9924	182,453,990.1	1,546.55	6,594,206.4	27.95	6,243,121.8	26.46
NPCC	Northeast Power Coordinating Council	63,823.66	0.4701	27,817.49	0.4491	146,541.18	1.0793	91,920,658.6	677.04	12,729,955.3	46.88	2,566,663.1	9.45
RFC	Reliability First Corporation	612,454.47	1.2696	267,740.55	1.2503	2,023,449.85	4.1944	662,155,468.9	1,372.59	21,121,804.2	21.89	21,481,792.2	22.27
SERC	SERC Reliability Corporation	599,572.79	1.0601	273,312.46	1.0641	1,653,339.44	2.9232	728,659,782.9	1,288.31	23,554,102.9	20.82	22,365,371.3	19.77
SPP	Southwest Power Pool	202,602.16	1.8598	94,384.98	1.8273	324,660.92	2.9803	179,782,555.2	1,650.33	4,888,589.3	22.44	5,082,463.6	23.33
TRE	Texas Regional Entity	112,686.33	0.6525	53,116.56	0.6318	388,236.16	2.2482	210,366,837.2	1,218.17	5,820,108.3	16.85	4,859,884.0	14.07
WECC	Western Electricity Coordinating Council	385,051.39	1.0642	162,630.38	1.0066	268,232.62	0.7414	344,498,126.7	952.16	15,247,276.5	21.07	9,489,178.4	13.11
U.S.		**2,307,863.49**	**1.1187**	**1,019,301.72**	**1.0885**	**5,452,879.41**	**2.6433**	**2,542,238,893.0**	**1,232.35**	**99,600,972.2**	**24.14**	**75,344,845.9**	**18.26**



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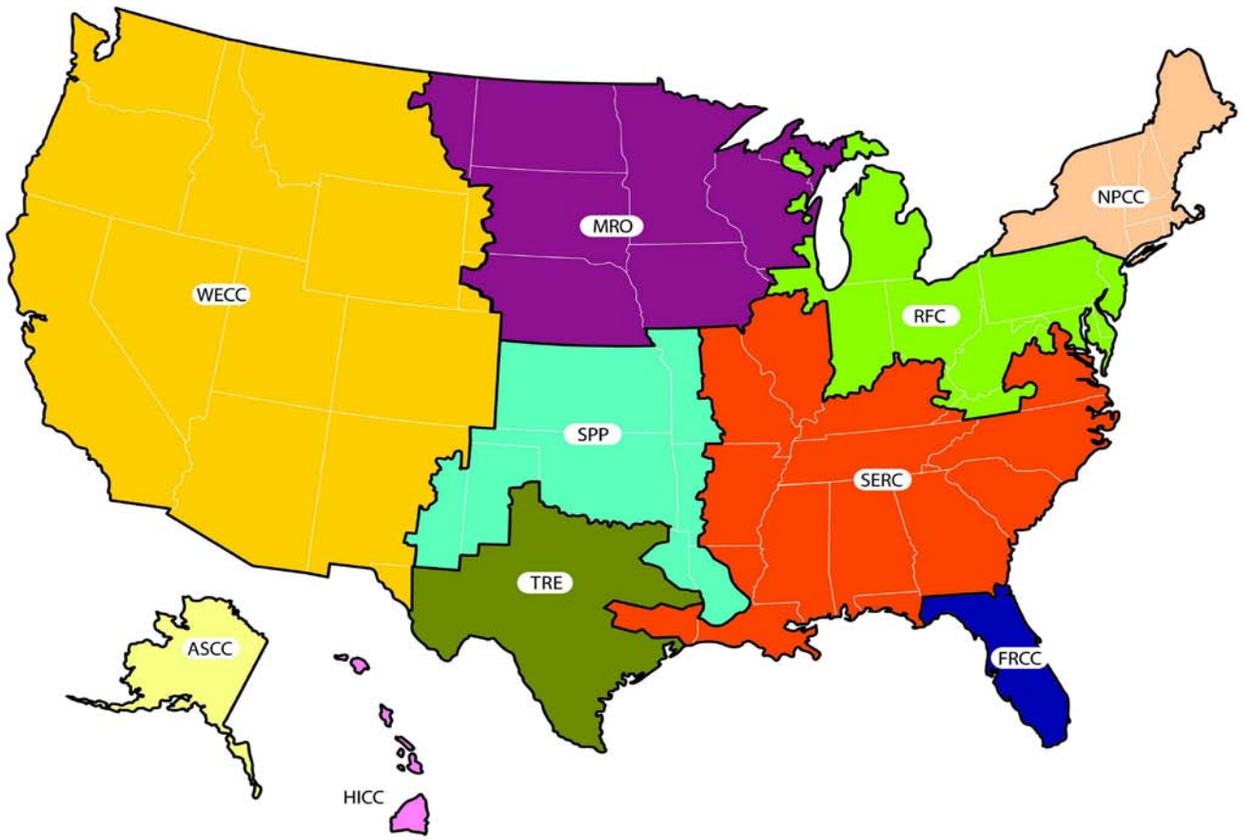
Year 2010 NERC Region Output Emission Rates

NERC region acronym	NERC region name	Total output emission rates						Fossil fuel output emission rates				Non-baseload output emission rates					
		NO_x (lb/MWh)	Ozone season NO_x (lb/MWh)	SO_2 (lb/MWh)	CO_2 (lb/MWh)	CH_4 (lb/GWh)	N_2O (lb/GWh)	NO_x (lb/MWh)	Ozone season NO_x (lb/MWh)	SO_2 (lb/MWh)	CO_2 (lb/MWh)	NO_x (lb/MWh)	Ozone season NO_x (lb/MWh)	SO2 (lb/MWh)	CO2 (lb/MWh)	CH4 (lb/GWh)	N2O (lb/GWh)
ASCC	Alaska Systems Coordinating Council	3.2423	2.9460	0.3966	1,087.33	24.54	6.45	4.1173	3.8706	0.5036	1,380.77	6.9664	5.4081	0.3820	1,396.84	40.13	8.07
FRCC	Florida Reliability Coordinating Council	0.7147	0.7058	1.4197	1,196.71	38.91	13.75	0.7297	0.7218	1.3664	1,342.00	0.9144	1.0966	1.6357	1,277.42	38.73	10.83
HICC	Hawaiian Islands Coordinating Council	3.3385	3.0424	3.9503	1,542.39	92.40	20.09	3.2744	3.3516	4.1870	1,623.54	5.1001	4.8970	3.5137	1,618.77	114.89	19.81
MRO	Midwest Reliability Organization	1.9054	1.8249	3.9924	1,546.55	27.95	26.46	2.6634	2.5294	5.6808	2,209.67	2.7289	2.4894	5.5007	2,014.87	56.10	34.53
NPCC	Northeast Power Coordinating Council	0.4701	0.4491	1.0793	677.04	46.88	9.45	0.6155	0.6063	1.8000	1,172.71	0.7317	0.9133	1.3935	1,180.62	46.59	10.05
RFC	Reliability First Corporation	1.2696	1.2503	4.1944	1,372.59	21.89	22.27	1.7906	1.7338	5.9677	1,952.00	1.8552	1.9460	6.7014	1,840.57	28.55	27.48
SERC	SERC Reliability Corporation	1.0601	1.0641	2.9232	1,288.31	20.82	19.77	1.4578	1.4253	4.0491	1,822.04	1.5089	1.6445	4.1395	1,612.56	28.47	21.13
SPP	Southwest Power Pool	1.8598	1.8273	2.9803	1,650.33	22.44	23.33	2.1280	2.0630	3.4028	1,897.95	1.8588	2.0957	2.2821	1,551.33	27.31	15.40
TRE	Texas Regional Entity	0.6525	0.6318	2.2482	1,218.17	16.85	14.07	0.8081	0.7579	2.7844	1,508.72	0.4978	0.6096	0.6151	1,181.70	20.12	7.63
WECC	Western Electricity Coordinating Council	1.0642	1.0066	0.7414	952.16	21.07	13.11	1.7282	1.7233	1.2051	1,565.73	0.9287	0.9372	0.5462	1,217.45	30.76	11.30
U.S.		**1.1187**	**1.0885**	**2.6433**	**1,232.35**	**24.14**	**18.26**	**1.5479**	**1.4877**	**3.7004**	**1,745.14**	**1.3930**	**1.5101**	**3.4026**	**1,520.20**	**31.27**	**18.34**



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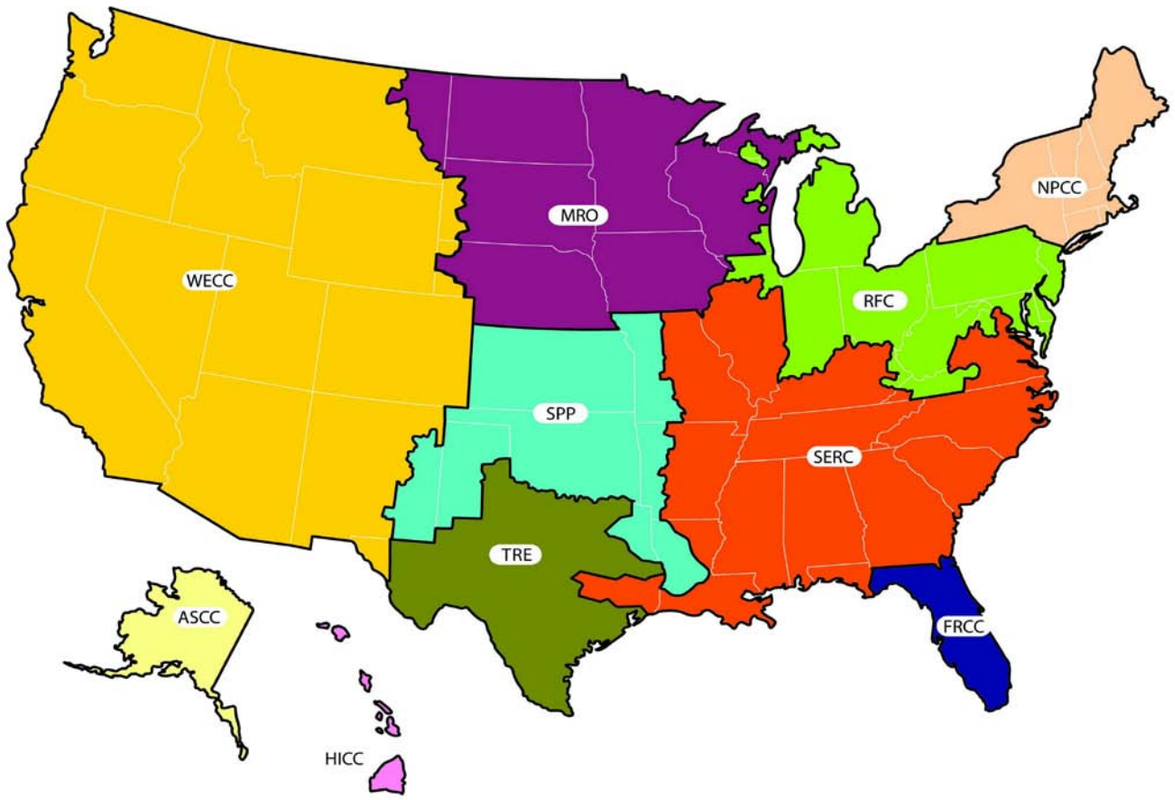
Year 2010 NERC Region Resource Mix

NERC region acronym	NERC region name	Nameplate capacity (MW)	Net Generation (MWh)	Generation resource mix (percent)										
				Coal	Oil	Gas	Other fossil	Biomass	Hydro	Nuclear	Wind	Solar	Geo-thermal	Other unknown/ purchased fuel
ASCC	Alaska Systems Coordinating Council	2,235.4	6,747,178.4	9.1956	13.8801	55.5791	0.0000	0.0934	21.0649	0.0000	0.1868	0.0000	0.0000	0.0000
FRCC	Florida Reliability Coordinating Council	64,862.9	217,890,866.6	24.3846	4.1835	57.3321	0.6049	1.6658	0.0815	10.9853	0.0000	0.0369	0.0000	0.7254
HICC	Hawaiian Islands Coordinating Council	2,820.9	10,836,036.0	14.2627	74.8360	0.0000	3.4529	2.5212	0.6499	0.0000	2.4097	0.0163	1.8512	0.0000
MRO	Midwest Reliability Organization	64,222.0	235,949,817.8	65.8340	0.4266	3.2722	0.1223	1.4959	5.5230	14.3985	8.7586	0.0000	0.0000	0.1689
NPCC	Northeast Power Coordinating Council	81,460.2	271,537,220.9	10.1875	1.1710	41.3737	1.0543	3.4790	12.0206	29.5467	1.1621	0.0000	0.0000	0.0048
RFC	Reliability First Corporation	251,331.7	964,825,048.1	59.0980	0.4394	9.7183	0.5361	0.8424	0.6365	27.5585	1.1277	0.0056	0.0000	0.0376
SERC	SERC Reliability Corporation	299,094.9	1,131,186,728.1	50.7060	0.6328	19.1034	0.2443	1.6626	2.7715	24.7002	0.0822	0.0010	0.0000	0.0961
SPP	Southwest Power Pool	66,145.6	217,874,597.9	58.7426	0.9356	27.0248	0.1531	0.9944	3.0483	4.3859	4.7153	0.0000	0.0000	0.0000
TRE	Texas Regional Entity	100,595.3	345,382,525.6	34.8356	0.7898	44.9525	0.1266	0.1306	0.2040	11.9680	6.8938	0.0024	0.0000	0.0968
WECC	Western Electricity Coordinating Council	212,287.1	723,617,004.1	29.9840	0.4790	29.8737	0.1220	1.3204	22.4581	10.0387	3.3646	0.1436	2.0755	0.1404
U.S.		**1,145,056.0**	**4,125,847,023.5**	**44.7748**	**1.0174**	**23.9686**	**0.3498**	**1.3571**	**6.1730**	**19.5589**	**2.2864**	**0.0290**	**0.3689**	**0.1162**



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Year 2010 eGRID 9th edition Grid Gross Loss (%)

Region	Grid Gross Loss (%)
Eastern	5.82
Western	6.84
ERCOT	7.12
Alaska	6.89
Hawaii	7.38
U.S.	**6.18**

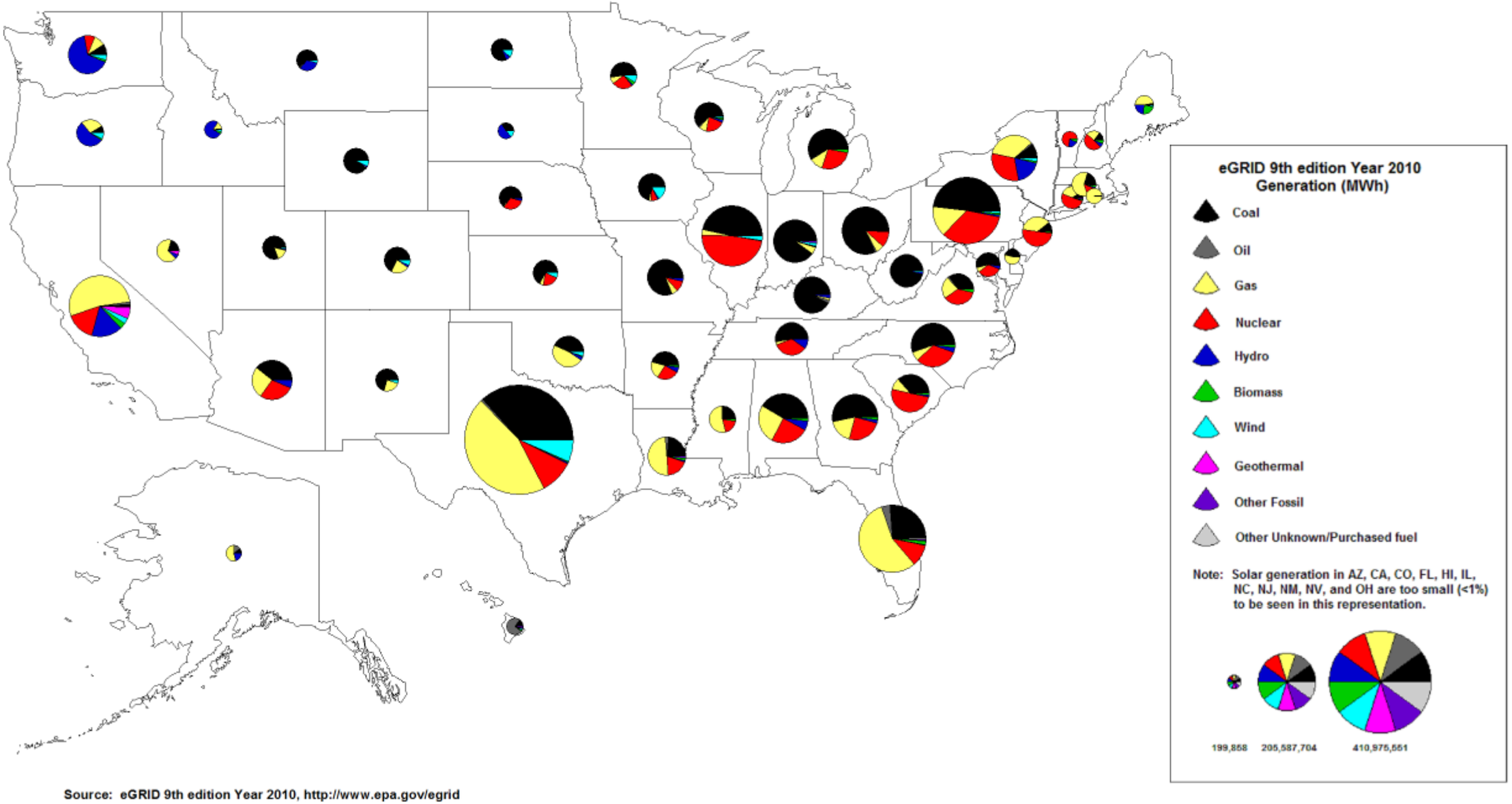
Year 2010 State Emissions and Input Emission Rates

State	Nitrogen oxides (NO_x)				Sulfur dioxide (SO_2)		Carbon dioxide (CO_2)		Methane (CH_4)	Nitrous oxide (N_2O)	Carbon dioxide equivalent (CO_2e)
	Emissions (tons)	Input emission rate (lb/MMBtu)	Ozone season emissions (tons)	Ozone season Input emission rate (lb/MMBtu)	Emissions (tons)	Input emission rate (lb/MMBtu)	Emissions (tons)	Input emission rate (lb/MMBtu)	Emissions (lbs)	Emissions (lbs)	Emissions (tons)
AK	10,938.14	0.4031	3,766.96	0.3708	1,337.80	0.0493	3,668,215.6	135.20	165,562.5	43,488.4	3,676,694.7
AL	66,622.21	0.1358	28,823.32	0.1241	209,590.23	0.4274	85,715,048.6	174.77	2,993,903.1	2,540,640.2	86,140,283.8
AR	39,423.06	0.1960	18,971.25	0.1873	70,842.77	0.3522	36,164,186.1	179.82	1,244,587.7	1,119,887.4	36,350,836.8
AZ	61,480.17	0.1787	27,179.65	0.1641	37,021.35	0.1076	61,050,565.5	177.49	1,724,431.1	1,686,270.6	61,330,044.0
CA	17,579.95	0.0383	7,473.64	0.0409	13,726.92	0.0299	52,220,430.3	113.66	6,272,224.6	903,490.5	52,426,329.7
CO	59,701.07	0.2463	25,364.24	0.2394	48,893.16	0.2017	46,144,407.7	190.34	1,129,077.5	1,383,861.1	46,370,761.5
CT	6,107.73	0.0855	3,047.11	0.0862	5,463.70	0.0765	10,253,243.4	143.51	1,984,006.9	340,003.9	10,326,776.1
DC	381.82	0.2738	356.54	0.2732	889.58	0.6378	226,368.4	162.30	19,464.6	3,894.0	227,176.4
DE	4,551.24	0.1665	2,372.17	0.1524	15,107.28	0.5527	4,326,901.8	158.31	127,536.4	116,018.8	4,346,223.9
FL	92,384.69	0.1012	42,104.05	0.0949	175,571.78	0.1922	140,801,771.3	154.17	8,944,921.3	3,337,706.8	141,413,037.6
GA	64,109.32	0.1341	28,211.81	0.1204	236,463.00	0.4946	88,428,450.5	184.97	2,724,620.9	2,797,085.9	88,890,607.4
HI	18,088.29	0.3640	7,128.45	0.3371	21,402.83	0.4307	8,356,670.1	168.16	1,001,264.1	217,665.6	8,400,921.6
IA	46,871.57	0.2073	19,913.17	0.2025	113,880.84	0.5036	46,718,005.7	206.61	1,070,014.1	1,536,928.7	46,967,464.8
ID	733.98	0.0886	262.63	0.0828	1,267.85	0.1530	793,345.7	95.77	146,715.0	27,701.4	799,180.0
IL	81,514.56	0.1543	30,192.93	0.1319	232,967.64	0.4409	107,988,153.3	204.37	2,476,797.1	3,497,646.7	108,556,294.9
IN	123,751.71	0.1995	53,881.14	0.1955	419,876.66	0.6768	125,300,699.5	201.96	2,945,056.5	4,115,309.6	125,969,495.6
KS	49,566.37	0.2519	22,754.87	0.2496	45,257.35	0.2300	39,853,473.1	202.57	914,404.8	1,279,980.3	40,061,471.3
KY	92,165.97	0.1840	39,223.15	0.1808	272,033.30	0.5432	101,776,482.9	203.24	2,368,627.8	3,428,294.9	102,332,739.2
LA	81,650.26	0.2125	40,702.71	0.2152	112,313.06	0.2923	58,043,121.0	151.09	2,413,780.1	1,197,371.3	58,254,058.3
MA	16,206.00	0.1036	5,264.39	0.0692	43,043.41	0.2752	22,829,787.4	145.94	2,909,216.0	631,688.1	22,958,245.8
MD	21,731.66	0.1434	10,473.72	0.1390	34,508.33	0.2277	29,435,319.8	194.20	1,476,599.3	1,012,842.9	29,607,814.8
ME	4,676.07	0.0942	1,694.85	0.0735	4,892.91	0.0986	4,110,254.7	82.79	2,415,898.5	346,206.6	4,189,283.7
MI	84,762.09	0.2075	36,639.52	0.1941	253,278.56	0.6201	78,302,919.0	191.71	3,137,100.8	2,626,947.8	78,743,035.5
MN	38,030.18	0.2056	15,865.27	0.1883	46,864.13	0.2533	34,938,226.7	188.84	2,607,814.6	1,323,661.7	35,170,776.4
MO	62,419.34	0.1515	27,479.55	0.1504	248,739.78	0.6036	84,647,824.2	205.39	1,920,562.8	2,747,571.4	85,093,863.7
MS	30,663.49	0.1521	16,469.41	0.1577	56,675.49	0.2811	30,615,271.3	151.86	1,127,202.4	663,138.6	30,729,893.4
MT	23,004.30	0.2171	8,930.98	0.2160	31,607.98	0.2983	22,228,592.4	209.78	493,021.9	736,585.4	22,347,939.8
NC	54,538.31	0.1374	24,744.90	0.1327	123,403.67	0.3108	76,432,458.8	192.50	2,332,576.7	2,550,615.2	76,852,296.2
ND	55,465.94	0.3550	21,831.90	0.3414	125,576.20	0.8038	33,931,163.2	217.19	731,527.3	1,090,089.2	34,107,808.1
NE	38,001.58	0.2964	15,947.19	0.2911	65,002.36	0.5070	26,646,390.3	207.84	594,805.1	880,411.6	26,789,099.5
NH	5,882.45	0.1247	2,624.83	0.1206	38,441.83	0.8151	6,178,537.5	131.01	1,452,810.8	297,656.3	6,239,928.7
NJ	10,857.95	0.0782	5,725.25	0.0817	17,100.88	0.1231	20,279,670.9	146.04	1,487,132.6	412,036.0	20,359,151.3
NM	60,817.45	0.3473	27,366.27	0.3416	16,576.43	0.0947	32,828,620.2	187.49	814,428.3	966,457.8	32,986,972.7
NV	13,716.25	0.1075	6,137.02	0.1037	8,068.82	0.0632	18,532,489.6	145.27	593,046.7	307,689.7	18,586,408.5
NY	29,682.22	0.0966	14,636.21	0.0928	54,626.86	0.1777	43,255,846.7	140.72	3,338,932.5	873,966.3	43,426,370.3
OH	110,770.95	0.1769	49,991.05	0.1757	595,525.49	0.9509	126,605,522.9	202.16	3,157,858.3	4,178,568.0	127,286,358.5
OK	76,560.04	0.2368	37,249.09	0.2284	90,317.68	0.2793	53,474,671.9	165.39	1,547,352.0	1,268,905.7	53,687,599.5
OR	10,761.32	0.1326	3,590.32	0.1330	15,973.27	0.1968	11,112,587.0	136.91	873,122.3	240,968.9	11,159,105.0
PA	136,940.19	0.1908	59,947.76	0.1860	420,696.93	0.5863	134,692,699.6	187.71	5,549,904.2	4,304,606.4	135,418,187.6
RI	673.13	0.0220	298.74	0.0205	28.71	0.0009	3,524,651.0	115.42	138,535.3	13,966.9	3,528,270.5
SC	31,229.71	0.1258	14,842.03	0.1242	106,152.84	0.4276	45,600,605.9	183.69	1,584,510.2	1,487,071.1	45,847,739.3
SD	12,897.43	0.6825	4,861.77	0.6546	12,844.12	0.6797	3,895,860.1	206.17	88,106.8	126,620.9	3,916,411.4
TN	32,659.61	0.1403	15,119.87	0.1416	122,116.65	0.5248	46,817,471.5	201.18	1,187,033.8	1,573,736.7	47,073,864.5
TX	156,493.51	0.0999	73,211.95	0.0951	463,923.55	0.2962	261,563,593.8	167.00	7,431,309.4	6,079,946.8	262,584,014.3
UT	63,268.33	0.3191	27,853.95	0.3171	26,054.71	0.1314	38,664,161.7	194.99	931,731.4	1,233,200.5	38,865,090.9
VA	40,080.56	0.1773	18,711.11	0.1682	96,676.48	0.4276	37,871,435.6	167.50	2,704,342.2	1,216,140.6	38,088,333.0
VT	326.75	0.1021	132.97	0.0965	32.46	0.0101	9,510.7	2.97	422,239.5	56,331.7	22,675.6
WA	14,444.51	0.1466	5,355.06	0.1377	4,131.33	0.0419	15,516,229.8	157.43	1,250,091.0	512,209.0	15,608,748.1
WI	36,012.24	0.1408	15,745.28	0.1368	117,717.52	0.4602	50,101,006.6	195.86	1,731,707.7	1,675,594.5	50,378,906.7
WV	53,129.94	0.1385	24,189.26	0.1454	110,445.10	0.2880	79,503,716.3	207.29	1,784,259.2	2,671,080.7	79,936,468.5
WY	63,537.87	0.2639	24,640.46	0.2546	67,927.83	0.2821	50,262,255.0	208.75	1,119,196.7	1,665,087.0	50,532,095.1
U.S.	**2,307,863.49**	**0.1616**	**1,019,301.72**	**0.1549**	**5,452,879.41**	**0.3864**	**2,542,238,893.0**	**182.21**	**99,600,972.2**	**75,344,845.9**	**2,554,963,154.4**

Year 2010 State Resource Mix

State	Nameplate capacity (MW)	Net Generation (MWh)	Generation resource mix (percent)										
			Coal	Oil	Gas	Other fossil	Biomass	Hydro	Nuclear	Wind	Solar	Geo-thermal	Other unknown/ purchased fuel
AK	2,235.4	6,747,178.4	9.1956	13.8801	55.5791	0.0000	0.0934	21.0649	0.0000	0.1868	0.0000	0.0000	0.0000
AL	35,263.2	152,150,512.1	41.4395	0.1314	25.7870	0.1837	1.8013	5.7208	24.9364	0.0000	0.0000	0.0000	0.0000
AR	17,085.5	60,994,581.5	46.1556	0.0741	20.4413	0.0466	2.6549	5.9980	24.6295	0.0000	0.0000	0.0000	0.0000
AZ	29,616.6	111,750,756.6	39.0546	0.0594	26.5555	0.0000	0.1637	6.1129	27.9192	0.1207	0.0139	0.0000	0.0000
CA	73,142.4	204,267,352.5	1.0282	1.1935	52.7141	0.2427	2.9521	16.2824	15.7640	2.9758	0.3702	6.1684	0.3085
CO	15,668.2	50,759,105.5	68.0849	0.0344	21.8716	0.0000	0.1186	2.8714	0.0000	6.8005	0.0813	0.0000	0.1374
CT	8,916.7	33,349,623.3	7.8094	1.2262	35.1716	2.2348	2.0925	1.1999	50.2264	0.0000	0.0000	0.0000	0.0392
DC	850.0	199,858.0	0.0000	100.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
DE	3,486.5	5,627,645.0	45.6385	0.9968	50.9091	0.0000	2.4103	0.0000	0.0000	0.0454	0.0000	0.0000	0.0000
FL	67,640.2	229,267,216.5	26.1256	3.9865	56.1774	0.5867	1.8817	0.0774	10.4402	0.0000	0.0351	0.0000	0.6894
GA	39,656.6	137,576,941.3	53.2779	0.4656	17.3608	0.0115	2.3131	2.2124	24.3588	0.0000	0.0000	0.0000	0.0000
HI	2,820.9	10,836,036.0	14.2627	74.8360	0.0000	3.4529	2.5212	0.6499	0.0000	2.4097	0.0163	1.8512	0.0000
IA	15,927.1	57,506,610.6	71.7882	0.2683	2.2818	0.0274	0.3032	1.6488	7.7394	15.9430	0.0000	0.0000	0.0000
ID	4,002.5	12,024,564.1	0.7341	0.0000	14.0482	0.0000	4.1700	76.1295	0.0000	3.6654	0.0000	0.5975	0.6547
IL	50,253.8	201,353,080.0	46.4912	0.1032	2.8432	0.0658	0.3329	0.0589	47.7716	2.2119	0.0070	0.0000	0.1144
IN	31,562.2	125,224,661.1	89.7393	0.3617	5.1707	1.4890	0.2478	0.3623	0.0000	2.3397	0.0000	0.0000	0.2895
KS	13,440.3	47,923,760.2	67.8266	0.2151	4.7728	0.0000	0.1133	0.0276	19.9394	7.1052	0.0000	0.0000	0.0000
KY	25,137.3	98,240,668.7	92.6845	2.3258	1.8998	0.0157	0.4478	2.6265	0.0000	0.0000	0.0000	0.0000	0.0000
LA	30,928.2	103,722,692.1	23.0651	3.1631	50.3090	1.5839	2.3792	1.0690	17.9704	0.0000	0.0000	0.0000	0.4604
MA	15,372.5	42,991,075.5	19.3200	0.6879	59.9465	1.9270	2.7749	1.5335	13.7652	0.0431	0.0019	0.0000	0.0000
MD	13,609.8	43,607,183.5	54.2759	0.7394	6.6434	1.1578	1.2655	3.8237	32.0909	0.0034	0.0000	0.0000	0.0000
ME	4,583.5	17,018,659.6	0.5123	1.6000	49.2025	1.9722	21.3903	22.3894	0.0000	2.9332	0.0000	0.0000	0.0000
MI	32,940.8	111,551,371.3	58.8109	0.3425	10.9808	0.5746	2.2069	0.2044	26.5569	0.3230	0.0000	0.0000	0.0000
MN	16,797.4	53,637,617.5	52.3561	0.0580	8.0929	0.4231	3.4167	1.5668	25.1280	8.8727	0.0000	0.0000	0.0857
MO	23,723.8	92,312,563.4	81.2969	0.1364	5.0875	0.0350	0.0673	2.6291	9.7452	1.0026	0.0000	0.0000	0.0000
MS	17,077.3	54,486,051.7	25.0137	0.1496	54.3613	0.0150	2.7608	0.0000	17.6985	0.0000	0.0000	0.0000	0.0000
MT	6,142.4	29,727,586.6	62.5703	1.3805	0.3042	0.0000	0.0000	31.6698	0.0000	3.1292	0.0000	0.0000	0.9460
NC	30,835.8	129,430,192.8	55.5907	0.2263	6.7996	0.0219	1.6007	3.9830	31.4761	0.0000	0.0088	0.0000	0.2929
ND	6,514.1	34,709,793.9	82.0000	0.2125	0.0471	0.0000	0.0357	5.8834	0.0000	11.7140	0.0000	0.0000	0.1073
NE	8,624.6	36,630,006.2	63.7804	0.0842	1.0238	0.0000	0.1952	3.5868	30.1784	1.1511	0.0000	0.0000	0.0000
NH	4,493.0	22,195,912.0	13.8883	0.3229	24.1704	0.2756	5.1913	6.6570	49.1534	0.3410	0.0000	0.0000	0.0000
NJ	20,911.1	65,682,493.6	9.7450	0.6590	37.8120	0.7832	1.1891	0.0000	49.7604	0.0192	0.0320	0.0000	0.0000
NM	8,965.7	36,294,249.0	70.5836	0.1272	23.5808	0.0000	0.0377	0.5979	0.0000	5.0481	0.0246	0.0000	0.0000
NV	13,491.4	35,146,247.7	19.9091	0.0317	67.3989	0.0161	0.0000	6.1381	0.0000	0.0000	0.6172	5.8889	0.0000
NY	43,853.7	136,910,481.4	9.9209	1.4644	35.7281	0.6517	1.5762	18.2181	30.5817	1.8589	0.0000	0.0000	0.0000
OH	36,946.0	143,596,345.0	82.0550	1.0045	4.9642	0.1849	0.4698	0.2988	11.0064	0.0088	0.0076	0.0000	0.0000
OK	23,690.3	72,318,205.6	43.5231	0.0250	47.0271	0.0000	0.4866	3.6725	0.0000	5.2657	0.0000	0.0000	0.0000
OR	14,955.8	55,126,999.1	7.4853	0.0062	28.3911	0.0748	1.5282	55.4035	0.0000	7.1109	0.0000	0.0000	0.0000
PA	49,858.6	229,751,956.0	48.0385	0.2921	14.6759	0.5641	1.0372	0.7070	33.8749	0.8070	0.0033	0.0000	0.0000
RI	2,020.5	7,738,719.0	0.0000	0.1507	97.9914	0.0000	1.7697	0.0479	0.0000	0.0404	0.0000	0.0000	0.0000
SC	25,867.1	104,153,132.7	36.1690	0.1831	10.4915	0.0587	1.7984	1.3843	49.9150	0.0000	0.0000	0.0000	0.0000
SD	3,741.8	10,049,636.1	32.8197	0.0609	1.3404	0.0000	0.0000	52.1293	0.0000	13.6497	0.0000	0.0000	0.0000
TN	23,487.9	81,937,881.8	53.2967	0.2647	2.7952	0.0196	1.1557	8.5646	33.8540	0.0495	0.0000	0.0000	0.0000
TX	117,753.5	410,983,759.8	36.5398	0.7642	45.3293	0.2100	0.3516	0.3070	10.0576	6.3570	0.0020	0.0000	0.0813
UT	7,860.7	42,249,354.6	80.6101	0.2049	15.2793	0.0106	0.1326	1.6462	0.0000	1.0596	0.0000	0.6555	0.4011
VA	25,926.1	72,966,456.0	34.8917	1.7719	23.2972	0.6067	3.0029	0.0131	36.4166	0.0000	0.0000	0.0000	0.0000
VT	1,097.2	6,619,990.0	0.0000	0.0681	0.0571	0.0000	7.0762	20.3458	72.2429	0.2098	0.0000	0.0000	0.0000
WA	30,907.4	103,277,990.5	8.2563	0.3142	9.9089	0.0648	1.8083	66.1726	8.9478	4.5270	0.0000	0.0000	0.0000
WI	19,767.9	64,314,067.1	62.4571	1.1169	8.5469	0.0469	2.1529	3.2837	20.6501	1.6924	0.0000	0.0000	0.0531
WV	17,225.5	80,788,947.2	96.7305	0.1913	0.1728	0.0504	0.0000	1.6925	0.0000	1.1625	0.0000	0.0000	0.0000
WY	8,379.2	48,119,253.8	89.3333	0.1385	0.9538	0.5581	0.0000	2.1278	0.0000	6.7474	0.0000	0.0000	0.1410
U.S.	**1,145,056.0**	**4,125,847,023.5**	**44.7748**	**1.0174**	**23.9686**	**0.3498**	**1.3571**	**6.1730**	**19.5589**	**2.2864**	**0.0290**	**0.3689**	**0.1162**

Year 2010 Generation by Fuel Type



Source: eGRID 9th edition Year 2010, http://www.epa.gov/egrid

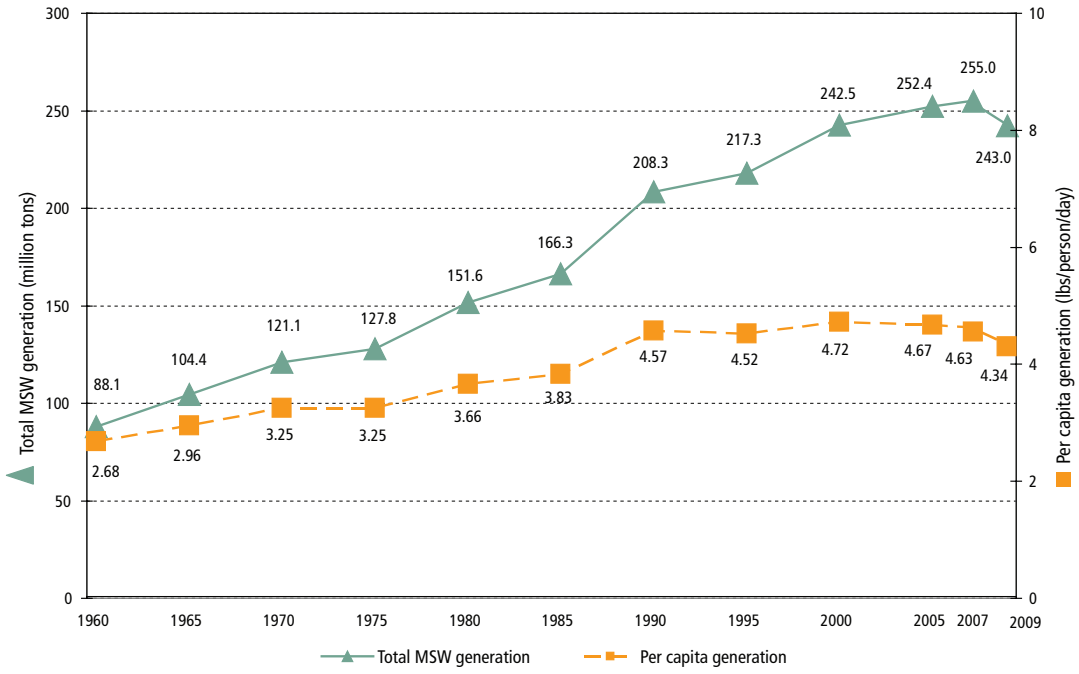
EPA
United States
Environmental Protection
Agency

Municipal Solid Waste Generation, Recycling, and Disposal in the United States: Facts and Figures for 2009

The U.S. Environmental Protection Agency (EPA) has collected and reported data on the generation and disposal of waste in the United States for more than 30 years. We use this information to measure the success of waste reduction and recycling programs across the country. These facts and figures are current through calendar year 2009.

In 2009, Americans generated about 243 million tons of trash and recycled and composted 82 million tons of this material, equivalent to a 33.8 percent recycling rate* (see Figure 1 and Figure 2). On average, we recycled and composted 1.46 pounds of our individual waste generation of 4.34 pounds per person per day.

Figure 1. MSW Generation Rates, 1960 to 2009



* The previously published 2008 recycling rate, 33.2 percent, was revised to 33.4 percent in this year's report, based on updated data (see Figure 2).

Sources of MSW

We estimated residential waste (including waste from apartment houses) to be 55 to 65 percent of total MSW generation. Waste from commercial and institutional locations, such as schools, hospitals, and businesses, amounted to 35 to 45 percent.

Nationally, we recycled and composted 82 million tons of municipal solid waste. This provides an annual benefit of 178 million metric tons of carbon dioxide equivalent emissions reduced, comparable to the annual GHG emissions from almost 33 million passenger vehicles.

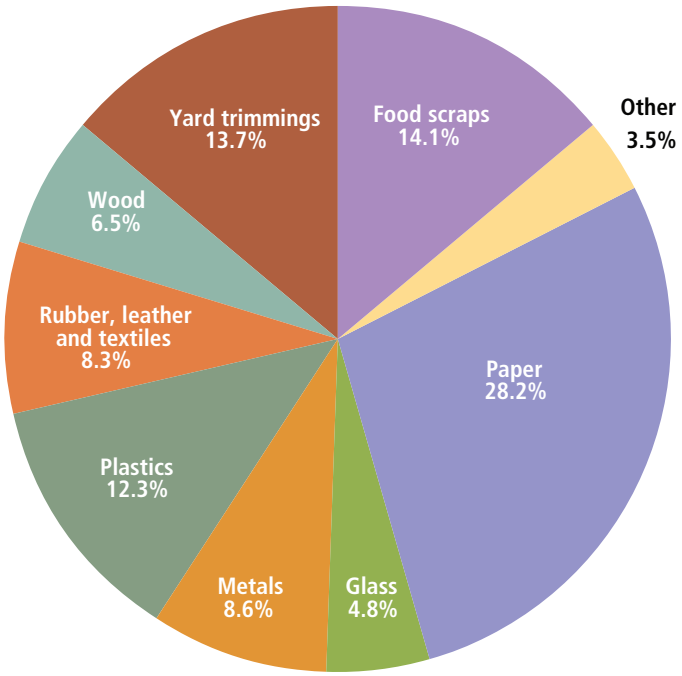
Analyzing MSW

We analyze waste by material, such as paper and paperboard, yard trimmings, food scraps, and plastics, and by major product categories, which include durable goods (such as furniture), nondurable goods (such as paper or clothing), containers and packaging (such as milk cartons and plastic wrap), and other materials (such as food scraps).

Materials in MSW

Total MSW generation in 2009 was 243 million tons. Organic materials continue to be the largest component of MSW. Paper and paperboard account for 28 percent and yard trimmings and food scraps account for another 28 percent. Plastics comprise 12 percent; metals make up almost 9 percent; and rubber, leather, and textiles account for 8 percent. Wood follows at around 7 percent and glass at 5 percent. Other miscellaneous wastes make up approximately 4 percent of the MSW generated in 2009 (see Figure 5).

Figure 5. Total MSW Generation (by material), 2009
243 Million Tons (before recycling)



South San Diego Bay Unit

The predominant native habitats within the South San Diego Bay Unit include shallow **subtidal habitat** and **intertidal mudflats**. In addition, the **salt ponds** provide resting and foraging habitat for a variety of avian species, while the levees around the ponds provide important nesting habitat for seven species of ground nesting seabirds. Based on observations of these nesting colonies, it appears that the ground nesting seabirds prefer limited human disturbance, isolation, availability of exposed or lightly vegetated open ground, and unrestricted visual access from the levees into the surrounding area. In San Diego Bay, shallow subtidal habitat supports an abundance of fish, and bird abundance and diversity is higher in this habitat than in any other subtidal habitats in the bay. Within the boundaries of the South San Diego Bay Unit, there are areas of vegetated and unvegetated shallow subtidal habitat. **Eelgrass beds**, which make up much of the vegetated areas within this habitat, also occur within the Refuge boundary. Eelgrass beds provide highly productive microhabitats for a wide variety of invertebrates and small fish. Eelgrass provides food both directly and indirectly to a wide array of organisms. It can enter the food web as detritus, be eaten by fish that are sometimes eaten by fish-eating birds, or be consumed directly by birds, such as **black brant**, **gadwall**, and **northern pintail**. The bay's small population of **Eastern Pacific green sea turtles** also relies on eelgrass as an important food source. The density and biomass of the South Bay's eelgrass beds can vary widely from one season to another and are affected by water depth, sediment grain size, nutrients, light levels, temperature, salinity, and water quality.

The South Bay's shallow subtidal habitat also supports a group of twelve species of fish that are indigenous to the bays and estuaries of the *Southern California Bight*. The extensive shallow water habitat and eelgrass beds of the South Bay provide important habitat for these and a variety of other fish, including midwater, schooling fishes, such as **northern anchovies, slough anchovies**, and **topsmelt**. These species, in turn, represent a major forage resource for predatory fish and avian species. The warmer, hypersaline waters of the South Bay also offer shelter for a number of fish species commonly encountered further south in the Eastern Subtropical and Tropical Pacific. The south end of San Diego Bay also appears to function as an important nursery area for juvenile **California halibut** and young spotted and barred **sand bass**.

Intertidal mudflats provide foraging habitat for fish during high tide, while at low tide, great numbers of shorebirds assemble to forage on the many invertebrates available on the exposed flats. In addition to foraging, shorebirds also depend upon the mudflats for roosting and resting. The most extensive mudflats within the South Bay are those that lie to the north of the salt ponds within the Refuge Unit. The Service observed tens of thousands of birds, representing 67 species, in this area during a year-long survey conducted in 1993 and 1994. The majority of the birds observed were shorebirds and seabirds. Smaller areas of coastal salt marsh occur in the few natural drainages that flow through the Refuge Unit, as well as along the bayside of the outer levees of the salt ponds. This habitat provides the **Belding's savannah sparrow** with nesting and foraging opportunities. Within the lower reach of the Otay River, this habitat as well as some **brackish** and **freshwater marsh** areas, provide habitat for the endangered **light-footed clapper rail**, various shorebirds, and wintering and breeding waterfowl.

Although not considered a natural habitat, the **salt evaporation ponds** located within the South San Diego Bay Unit provide relatively isolated nesting and resting habitat for a wide range of avian species, as well as some unique foraging habitat for several species of birds.

Solar salt production has occurred in this location for over 100 years. During this time, the salt ponds have been an important stopover point for large numbers of migratory and wintering birds. In addition, the salt pond levees provide regionally important nesting habitat for seven species of colonial seabirds.

Due to the hypersaline nature of the ponds, native wetland vegetation and bay invertebrates are essentially absent from the majority of the ponds. The only fish in the ponds are those that come in with the initial intake of tidal water. Once in the system, they can only survive in the lowest salinity primary ponds, cannot escape back into the bay, and do not reproduce. The ponds do however support several species of brine invertebrates that are preyed upon by a variety of birds, particularly **eared grebes** and **phalaropes**.

Last Updated: Feb 27, 2013

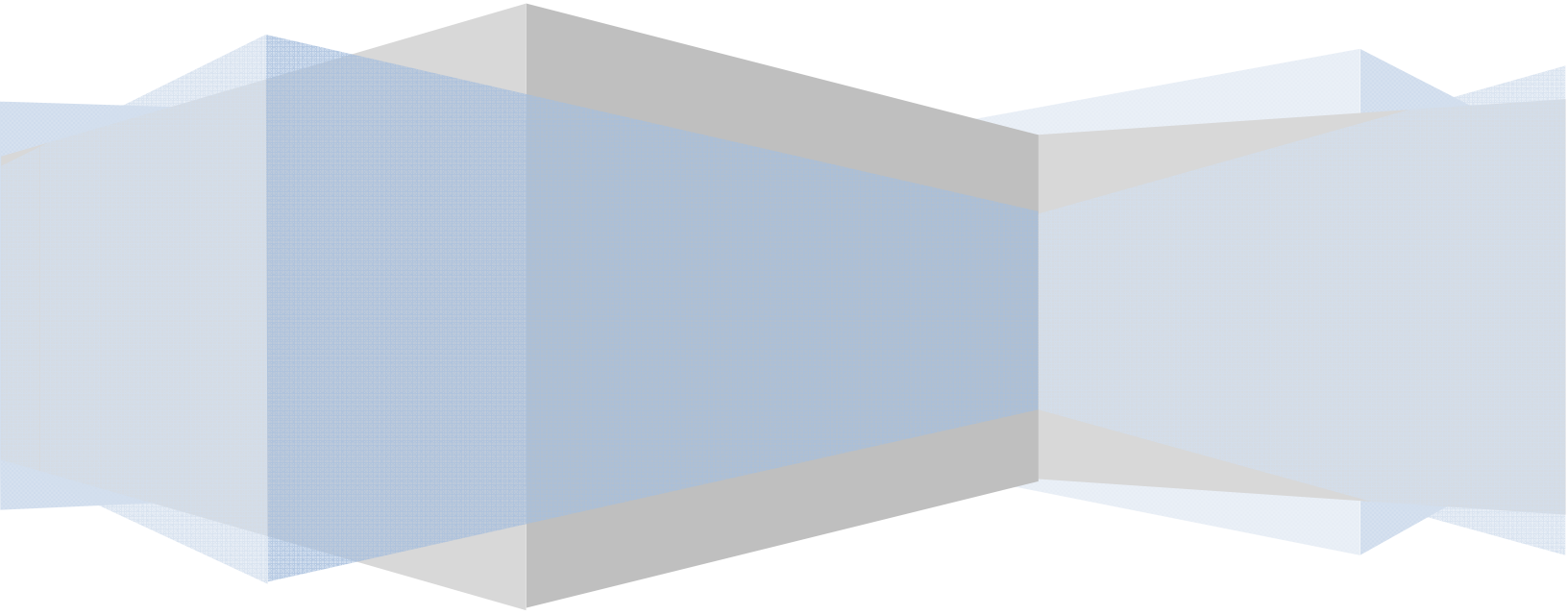
WATEREUSE ASSOCIATION

Sustainable Solutions for a Thirsty Planet®

Seawater Desalination Power Consumption

White Paper

November 2011



The WateReuse Desalination Committee's White Papers are living documents. The intent of the Committee is to enhance the content of the papers periodically as new and pertinent information on the topics becomes available. Members of the desalination stakeholder community are encouraged to submit their constructive comments to white-papers@watereuse.org and share their experience and/or case studies for consideration for inclusion in the next issuance of the white papers.

Table 2
Energy Use of Various Water Supply Alternatives
(1 kWh/kgal = 325.8 kWh/AF)

Supply Alternative[17]	Power Consumption, Range	
	kWh/kgal	kWh/AF
State Water Project (California)		
Raw water delivery to treatment points	9.0 – 10.6	2930 – 3450
Conventional treatment	0.8 – 1.5	260 – 490
State Water Project (California) – Total	9.8 – 12.1	3190 – 3940
Imported Colorado River (California)		
Raw water delivery to treatment points	6.0 – 8.0	1950 – 2600
Conventional treatment	0.8 – 1.5	260 – 490
Imported Colorado River (California) – Total	6.8 – 9.5	2210 – 3090
Reclaimed water for Indirect Potable Reuse		
Wastewater treatment	2.0 – 4.0	650 – 1300
Tertiary treatment for Indirect Potable Reuse	5.0 – 7.5	1630 – 2440
Reclaimed water for indirect potable reuse – Total	7.0 – 11.5	2280 – 3740
Brackish Water Desalination	3.0 – 5.0	980 – 1630
Desalination of Pacific Ocean Water	10.0 – 14.0	3260 – 4560
Desalination of Gulf of Mexico Water	9.1 – 13.2	2970 – 4300

VII Challenges and Perceptions: Is the Relative Power Consumption REALLY Excessive?

No, the relative power consumption is not excessive. Documented yearly gains in SWRO efficiency certainly help. In fact, the total power cost to produce desalinated seawater for a family of four[18] is equivalent to the power consumption of about one household refrigerator. Considering carbon footprint issues, the impact of seawater desalination is comparatively modest; for example, the average person, through the natural process of breathing, produces approximately 2.3 pounds (1 kg) of carbon dioxide per day[19]. Similarly, the amount of carbon dioxide generated from 3-4 minutes of moderate exercise (e.g., taking the stairs instead of the elevator) is equivalent to the CO2 emissions from a SWRO facility producing one gallon of water for an individual to drink throughout the day[20].

Additionally, the energy requirements of conventional water treatment processes are increasing. The reason is that for most surface water sources, the typical treatment process is chemical addition, coagulation and settling, followed by filtration and disinfection. In the case of groundwater (well) systems,

17 http://www.affordabledesal.com/home/news/WConPurJan07.pdf
18 Family of four consuming 400 gpd at 0.0144 kWh/gal with a total annual energy use for water production = 2,102 kW/yr; versus a 16 cu ft. refrigerator with consumption of 725 (http://www.energysavers.gov/your_home/appliances/index.cfm/mytopic=10040) x a conservative 33% operating time = 2,117 kW/yr.
19 United States Environmental Protection Agency. Considered part of the "Natural emissions"cycle and does not count towards greenhouse gas generation.
20 Calculation based on 600 lbs. CO2 generated per MWh, which is a recognized, conservative equivalent value representative of a power provider in Southern California; 50 MGD SWRO facility; 35 MWh power required for SWRO facility; 120 gpd consumed per 3.2-person household; and respiration rate doubled during exercise time.

23 Questions and Answers about

Water Pressure Reducing Valves

HOW THEY

- Save WATER
- Save ENERGY
- Save WASTEWATER
- Save MAINTENANCE
- Save MONEY

Conserve Both "Automatically"

with Water Pressure Reducing Valves

This booklet was prepared by
WATTS REGULATOR COMPANY
North Andover, Massachusetts

The following information will familiarize you with water pressure reducing valves, also typically called regulators. It will emphasize that regulators are not only water pressure controls but are actually "primary conservation controls" which automatically conserve water and energy when used in high pressure areas.

INTRODUCTION

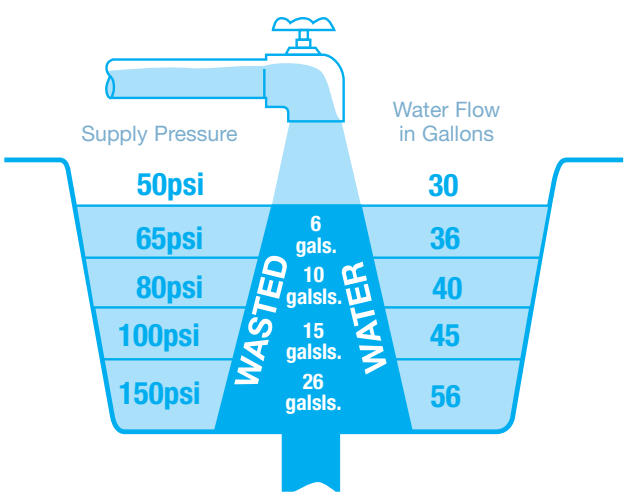
The supply of water and energy is one of our most critical national problems. If we cannot increase our supply, then it is imperative to reduce our consumption. Fortunately it's been proven that we can conserve dramatically and in a manner which will not seriously affect the lifestyles we have become used to.

Water and energy conservation are so intimately intertwined that they are practically synonymous. Any reduction in the usage of water will automatically result in a reduction of the use of energy. What this means, therefore, is that our whole philosophy on the use of water is changing and we are finally recognizing that we have been "water rich" over the years and it is now time to get back to reality by adjusting to our actual needs and to practice good conservation principles.

The purpose of this brochure is to acquaint you with a simple way to conserve water and energy. The hub of the program is the use of water pressure reducing valves (regulators), an automatic control which is installed at the water meter in homes and other buildings to reduce the city main's pressure to a lower, more functional pressure (for most purposes 50 psi water pressure is adequate.) Regulators are simple inexpensive products that have a pay-back period of anywhere from 6 months to 12 months. As you will see on the following pages, they can save between 30,000 and 40,000-gallons of water per year in the average home alone. If these savings were applied to 1,000,000 typical homes throughout the country, consider the tremendous impact this would have on our national conservation goals. Thus, water and energy conservation, through the use of water pressure reducing valves (regulators), is not only in the national interest but provides a significant benefit to the homeowner, the local water purveyor and energy utility as well.

As shown below, the higher the water pressure, the greater the amount of water that is wasted. (See question 5 for detailed explanation.)

Faucet with 10 minutes running time



1 What is a Water Pressure Regulator?

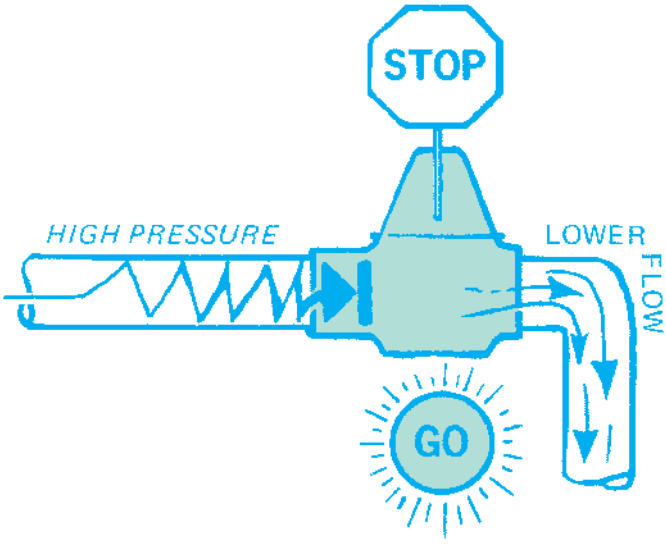
Also called water pressure reducing valves, they are compact, inexpensive devices that perform two functions: (1) they automatically reduce the high incoming water pressure from the city mains to provide a lower, more functional pressure for distribution in the home; (2) they "regulate" by maintaining a set pressure in the home usually 50 psi -- thereby insuring that the home piping and appliances operate under a safe, more moderate, but satisfactory pressure.

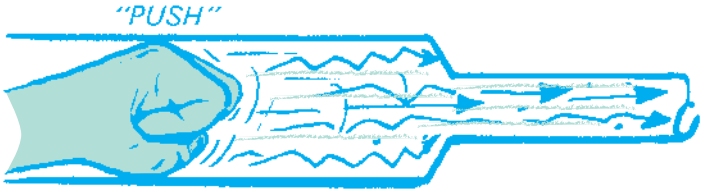
2 What is water pressure?

When a fixture in a home is opened and water flows from it, it is because the water is "pushed." This "push" is pressure. The speed at which water flows from the opened outlet depends on the amount of "push" or pressure which exists at that time in the system. In short, the higher the pressure, the stronger the "push" behind the water.

3 What is wrong with high water pressure?

High water pressure, which is generally considered anything above 60 lbs., has some advantage, such as in firefighting systems. However, in the home plumbing system, it can be damaging because water, with a strong "push" behind it, can erode or wear away many materials and cause water heaters to leak, banging water pipes, dripping faucets, excessive dishwasher and clothes washer noise and breakdown, and leaking water pipes. Therefore, water flowing at a rate in excess of that necessary to satisfy normal fixture or appliance demands becomes damaging, wasteful and reduces the life expectancy of equipment in the system. But, most important to the average homeowner is that high water pressure can add to the cost of **water, energy** and **waste water** bills.





Leaking water heater

Banging water pipes

Dripping faucets

Dishwasher breakdown

4 Does high water pressure cause “water hammer”?

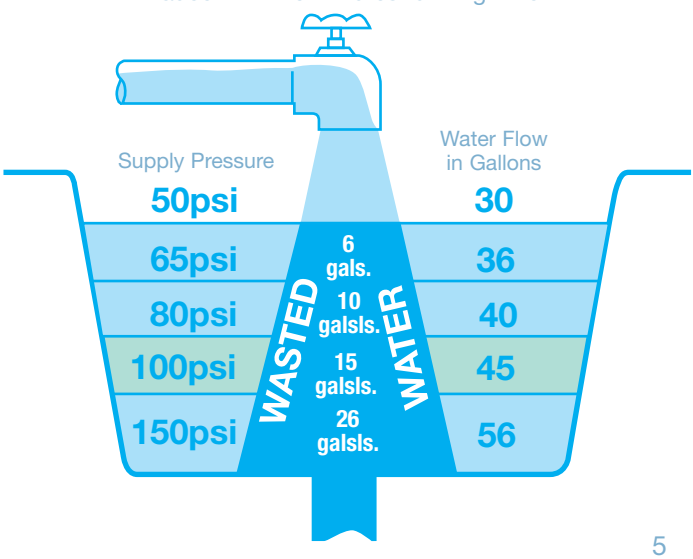
Yes. Water hammer is simply the noise generated by the shocks of high-speed water flowing in a pipe when a fixture is suddenly closed. This abrupt stoppage causes a “bounceback” of the water and is called water hammer, causing banging pipes, noisy systems and damage to appliances. It might be compared to driving your car at slow speed into a wall where the effect is negligible. However, if you drove the car at a much higher speed, the impact would be greater and, consequently, so would the bounceback or shock. Another description of the water hammer effect of high water pressure can be easily demonstrated. First, walk around a sharp corner and then run around the same corner. We can equate walking around the corner to a lower, more functional, controlled water pressure. However, when you run around the corner, the momentum forces your body to swing in a wider, uncontrolled arc. This principles based on the fact that moving objects, and this includes water, tend to move in a straight line. They resist changes in direction. Therefore, in a home where the piping has many changes in direction, water hammer shock can be limited by reducing the water pressure.

5 What is the difference in water flow from a fixture when the pressure is at 100 psi vs. a pressure of 50 psi?

Reducing the pressure from 100 psi to 50 psi will result in a saving of approximately 1/3 because 1/3 less water flows at this lower pressure. Remember, there is more "push" behind the water at 100 psi than at 50 psi and most of this water is wasted. Note the illustration where almost twice as much water flows at 150 psi than 50 psi, most of which is wasted. A moderate savings would result if your supply pressure was reduced to 65 psi However, even at this lower pressure, savings with a regulator would be 20%.

Fast motions exert greater forces.

Faucet with 10 minutes running time.



6 Are there any studies to support this savings figure?

Yes. In 1971 the Washington Suburban Sanitary Commission conducted a test program in 2,400 dwelling units that has attracted widespread interest from more than 40 states and various foreign countries. One of the devices used in their conservation study was a water pressure regulator. It is interesting to note that their report concluded that in test locations using regulators, there was a water consumption reduction of 30% in October and November and 37% in December.

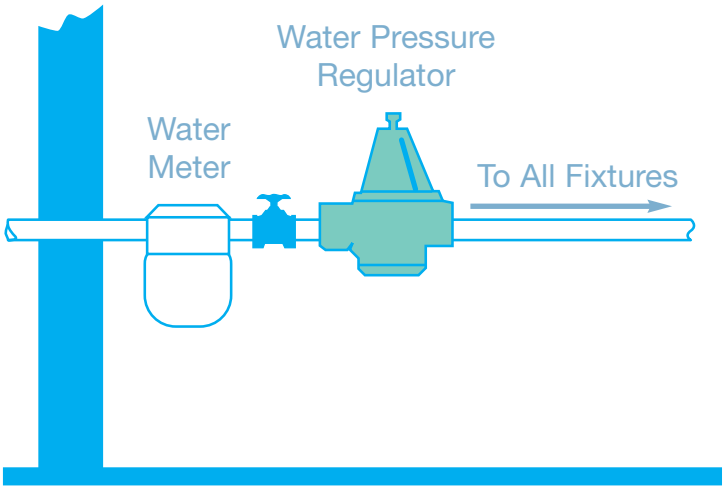
7 Where are Water Pressure Regulators most commonly used?

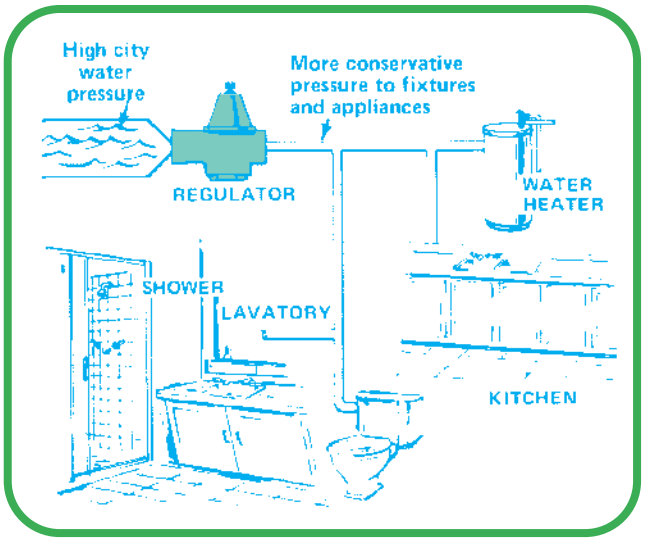
Water pressure regulators are commonly installed at the meter in residential, commercial and industrial buildings. This location is desirable because it then controls the water pressure flowing to all appliances and outlets within the building and provides an inexpensive means of supplying lower, more functional water pressure to outlets and appliances.

8 Why do we now call Regulators "Primary Conservation Controls"?

Most people have considered regulators as pressure controls because, as described in the foregoing, they are used to protect appliances and piping from the effects of high water pressure. However, because of water and energy shortage and cost problems, regulators have become increasingly more important because they automatically provide the advantage of conserving water and energy.


October
30%
30%
December
37%


Water Pressure
Regulator
Water
Meter
To All Fixtures


High city
water
pressure
More conservative
pressure to fixtures
and appliances
REGULATOR
WATER
HEATER
SHOWER
LAVATORY
KITCHEN

9 How do Regulators save water?

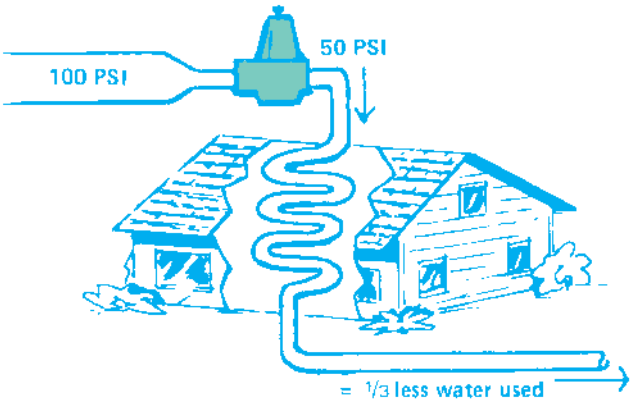
As mentioned before, 1/3 less water flows at 50 psi than at 100 psi Therefore, when you reduce the city main pressure to a more moderate pressure of 50 psi, you can look forward to conserving up to 1/3, or more, of the water previously consumed. This will be reflected on your water bills.

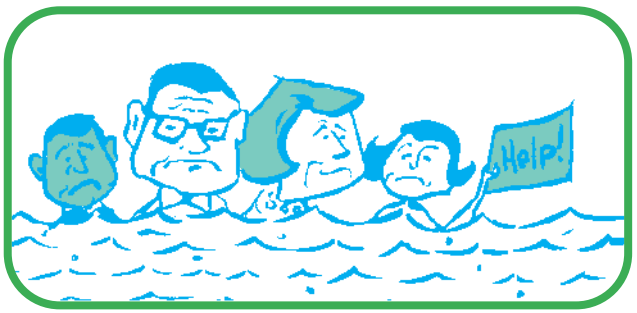
10 How much does a typical family of four use?

A typical family of four uses an average of 255 gallons of water each day. This is broken down by: dishwashing - 15 gallons; cooking/drinking - 12 gallons; utility sink - 5 gallons laundry - 35 gallons; bathing - 80 gallons; bathroom sink - 8 gallons; toilet - 100 gallons. When you multiply this by a year, typical family usage totals 93,000 gallons of water. Your family particularly if it includes teenagers, would undoubtedly use more than the above averages.

11 How do Regulators affect the waste water system?

When we can save 1/3 of the water previously consumed, this also represents a similar saving of water which will not be going into the sewer system where it has to be treated. Water does not evaporate after we use it and it has to be piped to the wastewater system. Many sewer bill taxes or surcharges are based on the amount of water you use, with the assumption that this water is going into the wastewater system. This is billed to you as a sewer surcharge and, in many cases, the sewer tax can equal the water cost. Therefore, when pressure regulators save 1/3 of the metered water, they also contribute to saving up to 1/3 of the wastewater load and this is extremely important because it benefits both the user, by a lower sewer bill, and the community, as this is water they do not have to treat.


100 PSI
50 PSI
= 1/3 less water used


Help!

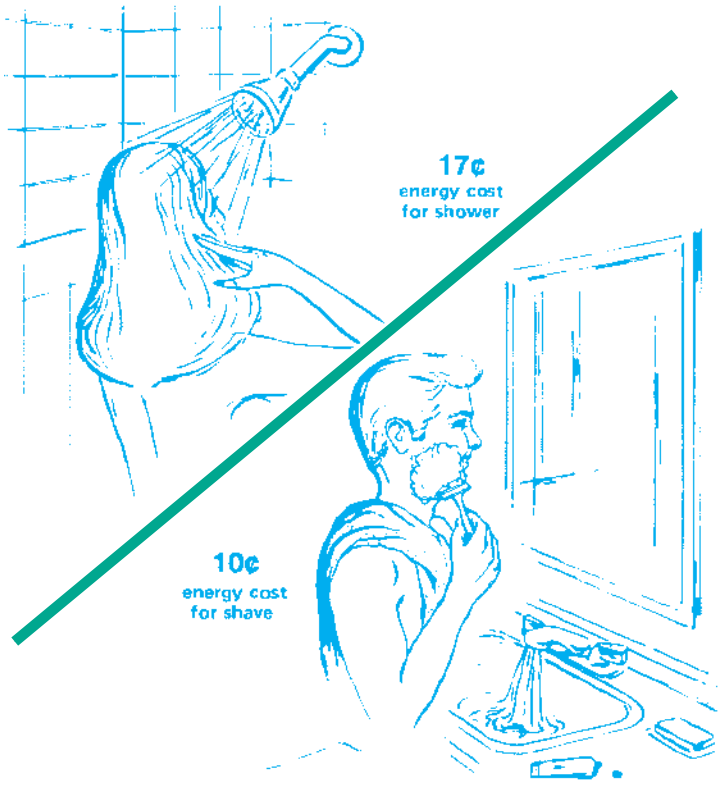

WASTE BILL
SEWER

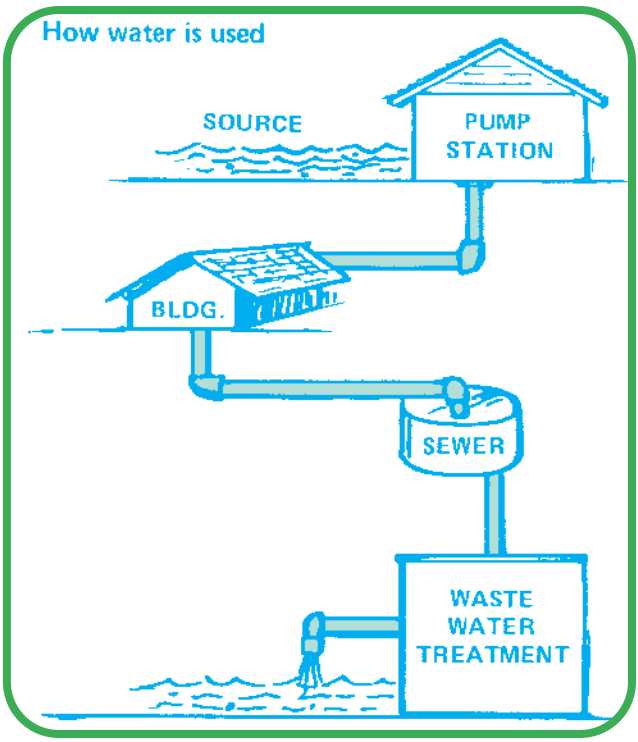
12 How do Water Pressure Regulators save on energy?

The Environmental Protection Agency estimates that 30% of the water used in households is heated. In order to heat this water, it takes energy. Logically, therefore, if a pressure regulator can reduce consumption by 1/3, we automatically cut down on the amount of hot water we're using in lavatories and showers and, therefore, it follows that we automatically reduce the amount of energy required to heat that load. Thus, it can be easily seen that water conservation has a direct relationship to energy conservation. An average shower, for example, costs approximately 17 cents in energy and a shave with the faucet running cost 10 cents in energy.

13 How do these savings benefit the water and energy utilities?

A high rise office building in Chicago was designed using water conservation products which resulted in savings of more than 3,000,000 gallons of water per year. This is significant in that the municipal water utility did not have to pump that extra gallonage, the water purification plant didn't have to treat it, the building itself saved on pumping of 3,000,000 gallons, and there must have been significant savings in energy by conserving hot water. Also, there were further savings by the fact that 3,000,000 gallons of water, or the normal portion thereof, did not have to be distributed to the wastewater system and consequently the water treatment plant did not have to retreat this water. The heating of water takes energy and it should also be remembered that "pumping" water from one place to another also requires a considerable amount of energy.


17¢
energy cost
for shower
10¢
energy cost
for shave


How water is used
SOURCE
PUMP
STATION
BLDG.
SEWER
WASTE
WATER
TREATMENT

14 How do Regulators save on maintenance?

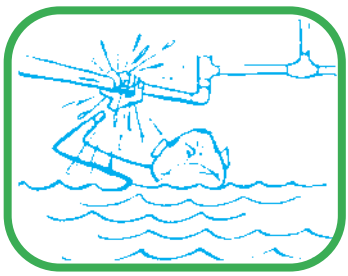
We have previously described the effects of high water pressure on piping and appliances. By having these appliances work under a lower pressure, their life expectancy will be much longer. Use of lower pressure will also cut down on service calls caused by problems with dish washers and clothes washers, leaky water heaters, leaking water pipes and the potential water damage which could result.

15 Do codes require Water Pressure Reducing Valves?

Yes. They are required by the Federal Housing Administration, the regional plumbing codes such as IAPMO, Southern Building Code, and BOCA, and numerous city and state codes. The requirement is that whenever the city main water pressure exceeds 80 psi, a regulator must be installed. However because of the recently acknowledged advantages of regulators conservation wise, regulators could be economically installed even where supply pressures are in the vicinity of 60 psi because of the water and energy saving benefits they can provide.

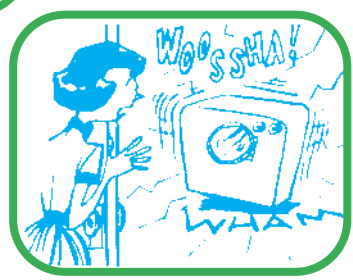
16 How long will a Regulator last?

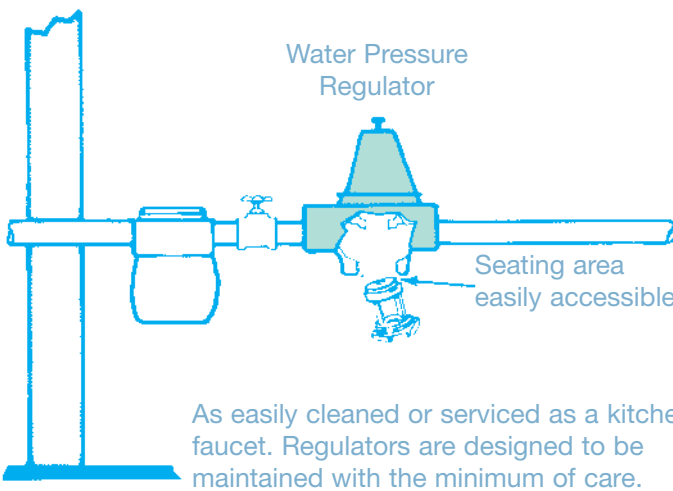
Regulators have been described as "life-of-mortgage" products, because historically a malfunctioning pressure regulator is not replaced but simply cleaned or repaired via an inexpensive service kit. Design wise, it is similar to the kitchen faucet in that dirt or foreign matter on the seating area can cause problems. Actually it is no more difficult to repair a regulator than it is to fix the kitchen faucet.



Leaking water pipes

Washing machine breakdown





As easily cleaned or serviced as a kitchen faucet. Regulators are designed to be maintained with the minimum of care.

17 If I install a Pressure Regulator, what savings can I expect?

An average savings would be from $50 to $150 per year, probably much higher.

A. Based on the fact that 1/3 less water flows at 50 psi than 100 psi, you can expect to save up to 1/3 of the water previously consumed. As a typical family of four uses 93,000 gallons per year, that would mean a savings of approximately 30,000 gallons of water. The higher the pressure, the higher the savings. Lower pressures result in less savings. (Your water Co. can provide the rate.)

B. Remember also, however, that 1/3 of the water used in homes is heated; so 1/3 of the 30,000 gallons of water saved divided by 2 to reflect a cold water mixing factor would mean a savings in heating up to 5,000 gallons of hot water per year. If you figure 4 cents to heat a gallon of water, the savings would be $200.00.

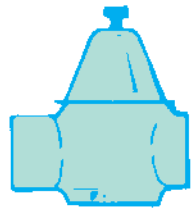
C. You can also figure on a savings in your sewer surcharge bill, since most of the 30,000 gallons of water saved will not be going into the wastewater system. Therefore, you would not be assessed for that disposal. (Contact your local authority for any assessment charges.)

D. You would also have to figure the savings generated by not having to have appliances repaired or replaced more frequently. This is a nebulous figure but, based on your own experience over the past years, you could look for a reduction in the frequency of maintenance and certainly for an improved performance by these appliances.

18 Should we consider using other water and energy conservation devices?

Certainly. The water pressure regulator we're talking about today is the hub of a conservation program; but you should also consider other flow control devices, low-flush toilets, improved water heating equipment and better disciplined usage habits. However, if none of these other devices were installed, the water pressure regulator would still serve to contribute important and significant savings in energy and water. This would provide an average savings of anywhere from $50 to $150 per year, or more depending on your local rates.

INVEST HERE →



and

SAVE

UP TO

30%

OR MORE

- WATER USED
- WATER HEATED
- WATER BILLS
- ENERGY BILLS
- WASTE WATER BILLS
- MAINTENANCE &
- REPAIR BILLS

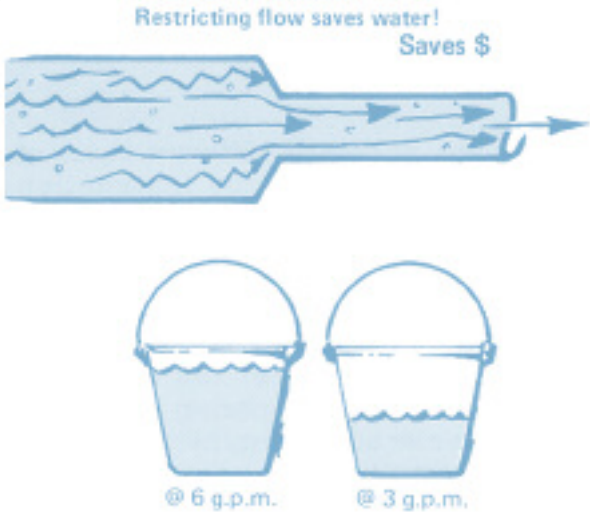
19 Do flow-restricting devices actually save water?

Yes, and they can effectively be installed on showerheads, fixtures and tankless heaters in boilers. Many showerheads, for example, supply water at a rate of 6 gpm. Applying a 3 gallon per minute flow restrictor will cut the flow in half providing savings in water and energy. It should be remembered however that their capacity is based on a "fixed" supply pressure like 50 psi and operating under a higher pressure will permit greater flow. That's why we say a water regulator is the "hub" of a program because it maintains a constant pressure throughout the home, thereby even improving the performance of flow-restricting devices.

20 What are some tips the user can employ to save water and energy?

1. Put a stopper in your sink or use a dishpan when you wash dishes. Washing with running water uses 30 gallons per meal.
2. Keep a bottle of drinking water in the refrigerator -- running the water from the faucet until cold will waste a gallon.
3. Wait until you have a full nine-pound wash before you run your washing machine. The average machine uses 50 gallons per load.
4. Turn the hot water off while you shave, and turn the cold water off while you brush your teeth. Shaving with a running faucet uses about 20 gallons.
5. Take showers instead of baths. The usual bath requires 36 gallons, the usual shower, only 25. Ten gallons is enough for a shower if you turn it off while you lather.
6. Don't use the toilet bowl to dispose of cigarette ashes, facial tissues, and other materials. A normal flush requires 5 - 8 gallons.
7. Use dishwasher only when completely full.
8. Fix dripping faucets promptly. Nearly two gallons can be wasted per day of dripping.
9. Running toilets can waste four gallons per hour. Keep them in good repair.
10. THINK before you turn on the tap.

NOTE: Tips provided through courtesy of Plumbing Manufactures Institute.



Based on 50 psi supply pressure

$ $ $ $ $ $ $ $ $

MONEY SAVING TIPS

USE DISHPAN

REFRIGERATE DRINKING WATER

USE FULL CAPACITY
ON DISH/CLOTHES WASHERS

MAKE SURE WATER
THAT GOES DOWN THE DRAIN
HAS BEEN USED.

KEEP PLUMBING SYSTEM
IN GOOD REPAIR.
LEAKY FAUCETS AND
TOILETS ARE COSTLY.

21 What does a Water Pressure Regulator cost?

There are, of course, different styles of regulators and various installation charges throughout the country. An estimate can be obtained from your local qualified plumbing contractor. To determine how much you, as an individual, would be saving, it would be necessary to consider the factors in question 17, in comparing with your current water and energy bills. See page 20 for examples.

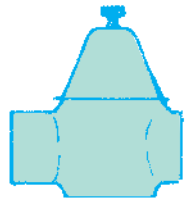
22 How do I know if I have high water pressure?

A rule of thumb is: If you hear banging pipes in your home or observe water splashing in your sink, you probably have excessive pressure. However, for a precise reading, your local plumbing contractor or utility can test your pressure with a gauge.

23 How can I get a Water Pressure Regulator installed?

The easiest way would be to call your local qualified plumbing contractor who can provide you with an estimate and also advise of the various type regulators available and the one best suited for your home. Although regulators are fairly simple to install and could be a do-it-yourself project, there are some laws which provide that only a licensed plumbing contractor be permitted to work on the home potable drinking water system for health and safety purposes.

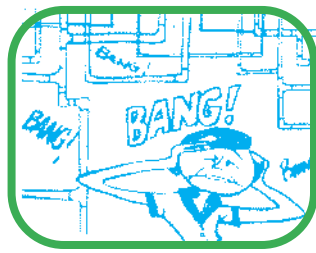
It's either this →



or this

Water splashes

Banging pipes



EASY!
Save all around just call your plumber.

HOW TO FIGURE YOUR

(Refer to your annual water and energy bills for your specific rates and usage)

1. WATER BILLS

Cubic Feet of Water x Rate = Total Bill

EXAMPLE:

15,000 Cubic Feet x $ .90 P/C Cu. Ft. =

(Approx. 112,000 Gallons)

SAVINGS with Regulator - 1/3 or 5,000 Cu. Ft. @ $ .90 P/C Cu. Ft.

2. SEWER ASSESSMENT

Cubic Feet of Water x Rate = Total Bill

EXAMPLE:

15,000 Cubic Feet x $ .90 P/C Cu. Ft. =

SAVINGS with Regulator - 1/3 or 5,000 Cu. Ft. @ $ .90 P/C Cu. Ft.

3. ENERGY COST

(Approximately 1/3 of total water used is heated.)

$$\frac{\text{Gallons Water Heated}}{2} \times \$ .02 \text{ P/Gal.}$$

EXAMPLE:

$$\frac{37{,}000 \text{ Gal.}}{2} = 18{,}500 \times \$ .02 =$$

SAVINGS with Regulator - Approx. 1/3 or 12,000 Gal. with additional adjustment factor of 1/2 = 6,000 gal.

4. MAINTENANCE

Actual Maintenance Bill

EXAMPLE:

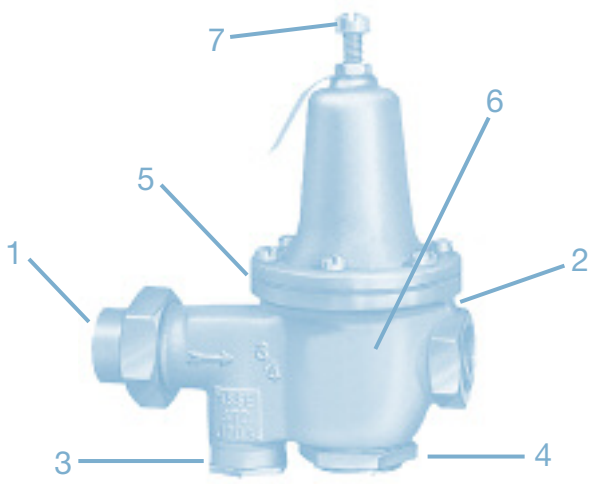
One "high-pressure" related service call @ $50.

POTENTIAL SAVINGS

ANNUAL BILL	APPROX. ANNUAL SAVINGS WITH REGULATOR
$135.00	$ 45.00
$135.00	$ 45.00
$370.00	$120.00
$50.00	$50.00

Total Potential Savings – $260.00

¾" Typical Water Regulator



1. Union Connection
2. Bronze Body
3. Integral Stainless Steel Strainer Screen with Separate Plug
4. Removable Disc Assembly
5. Durable Diaphragm
6. Thermal Expansion By-Pass Check
7. Adjustable Pressure Screw

TYPICAL SPECIFICATIONS

Initial Pressures - Up to 300 psi
Reduced Pressure - Adjustable 25-75 psi
Capacity - ¾": size; 20-25 gpm
Height - 7"
Length - 6"
Weight - 5 lbs.

WATTS®

USA: 815 Chestnut St., No. Andover, MA 01845-6098; www.watts.com
Canada: 5435 North Service Rd., Burlington, ONT L7L 5H7; www.wattscanada.ca

ISO 9001-2008 CERTIFIED

Water Safety & Flow Control Support - Helpful Tools and Resources

Water Pressure Regulators

1. What is a Water Pressure Regulator?

Also called water pressure reducing valves, are compact, inexpensive regulators that perform two functions:

1. They automatically reduce the high incoming water pressure from the city mains to provide a lower, more functional pressure for distribution in the home.
2. They "regulate" by maintaining a set pressure in the home usually 50 lbs. thereby insuring that the horne piping and appliances operate under a safe, more moderate, but satisfactory pressure.

2. What is Water Pressure?

When a fixture in a home is opened and water flows from it, it is because the water is "pushed." This "push" is pressure. The speed at which water flows from the opened outlet depends on the amount of "push" or pressure which exists at that time in the system. In short, the higher the pressure, the stronger the "push" behind the water.

3. What is Wrong with High Water Pressure?

High water pressure, which is generally considered anything above 60 lbs., has some advantage, such as in firefighting systems. However, in the home plumbing system, it can be damaging because water, with a strong "push" behind it, can erode or wear away many materials and cause leaking water heaters, banging water pipes, dripping faucets, dishwasher and clothes washer noise and breakdown, and leaking water pipes. Therefore, water flowing at a rate in excess of that necessary to satisfy normal fixture or appliance demands becomes damaging, wasteful and reduces the life expectancy of equipment in the system. But, probably most important to the average homeowner is that it can add to the cost of water, energy and waste water bills.

4. Does High Water Pressure Cause "Water Hammer"?

Yes, and water hammer is very simply the noise generated by the shocks of high-speed water flowing in a pipe when a fixture is suddenly closed. The sudden stoppage causes a "bounce back" of the water and is called water hammer, causing banging pipes, noisy systems and damage to appliances. It might be compared to driving your car at slow speed into a wall where the effect is negligible. However, if you drove the car at a much higher speed, the impact would be greater and, consequently, so would the bounce back or shock. Another description of the water hammer effect of high water pressure can be easily demonstrated. First, walk around a sharp corner and then run around the same corner. We can equate walking around the corner to a lower, more functional, controlled water pressure. However, when you run around the corner, the momentum forces your body to swing in a wider, uncontrolled arc. This principle is based on the fact that moving objects, and this includes water, tend to move in a straight line. They resist changes in direction. Therefore, in a home where the piping has many changes in direction, water hammer shock can be limited by reducing the water pressure.

5. What is the difference in water flow from a fixture when the pressure is at 100 lbs. vs. a pressure of 50 lbs.?

Reducing the pressure from 100 lbs. to 50 lbs.will result in a saving of approximately 1/3 because 1/3 less water flows at this lower pressure. Remember, there is more "push" behind the water at 100 lbs. than at 50 lbs. and most of this water is wasted. Note the illustration where almost twice as much water flows at 150 lbs. than 50 lbs., most of which is wasted. Moderate savings would result if your supply pressure was 65 lbs. However, even at this lower pressure, savings with a regulator would be 20%.

6. Are there any studies to support this savings figure?

Yes. In 1971 the Washington Suburban Sanitary Commission conducted a test program in 2,400 dwelling units that has attracted widespread interest from more than 40 states and various foreign countries. One of the devices used in their conservation study was a water pressure regulator. It is interesting to note that their report concluded that in test locations using regulators, there was a water consumption reduction of 30% in October and November and 37% in December.

7. Where are Water Pressure Regulators most commonly used?

Water pressure regulators are commonly installed at the meter in residential, commercial and industrial buildings. This location is desirable because it then controls the water pressure flowing to all appliances and outlets within the building and provides an inexpensive means of supplying lower, more functional water pressure to outlets and appliances.

8. Why do we now call Regulators "Primary Conservation Controls"?

Most people have considered regulators as pressure controls because, as described in the foregoing, they are used to protect appliances and piping from the effects of high water pressure. However, because of water and energy shortage and cost problems, regulators have become increasingly more important because they automatically provide the advantage of conserving water and energy.

9. How do Regulators save water?

As mentioned before, 1/3 less water flows 50 lbs. than at 100 lbs. Therefore, when you reduce the city main pressure to a more moderate pressure of 50 lbs., you can look forward to conserving up to 1/3, or more, of the water previously consumed and this will be reflected on your water bills.

10. How much does a typical family of four use?

A typical family of four uses an average of 255 gallons of water each day for interior plumbing. This is broken down by: dishwashing - 15 gallons; cooking/drinking - 12 gallons; utility sink - 5 gallons laundry - 35 gallons; bathing - 80 gallons; bathroom sink - 8 gallons; toilet - 100 gallons. When you multiply this by a year, typical family usage totals 93,000 gallons of water. Your family particularly if it includes teenagers, would undoubtedly use more than the above averages.

11. How do Regulators affect the wastewater system?

When we can save 1/3 of the water previously consumed, this also represents a similar saving of water which will not be going into the sewer system where it has to be treated. Water does not evaporate after we use it and it has to be piped to the wastewater system. Many sewer bill taxes or surcharges are based on the amount of water you use, with the assumption that this water is going into the wastewater system. This is billed to you as a sewer surcharge and, in many cases, the sewer tax can equal the water cost. Therefore, when pressure regulators save 1/3 of the metered water, they also contribute to saving up to 1/3 of the wastewater Icad and this is extremely important because it benefits both the user, by a lower sewer bill, and the community, as this is water they do not have to treat.

12. How do Water Pressure Regulators save on energy?

The Environmental Protection Agency estimate that 30% of the water used in households is heated and, in order to heat this water, it takes energy. Logically, therefore, if a pressure regulator can reduce consumption by 1/3, we automatically cut down on the amount of hot water we're using in lavatories and showers and, therefore, it follows that we automatically reduce the amount of energy required to heat that load. Thus, it can be easily seen that water conservation has a direct relationship to energy conservation. An average shower, for example, costs approximately 17 cents in energy and a shave with the faucet running cost 10 cents in energy.

13. How do these savings benefit the water and energy utilities?

A high rise office building in Chicago was designed using water conservation products which resulted in savings of more than 3,000,000 gallons of water per year. This is significant that the municipal water utility did not have to pump that extra gallonage, the water purification plant didn't have to treat it, the building itself saved on pumping of 3,000,000 gallons, and there must have been significant savings in energy by conserving hot water. Also, there were further savings by the fact that 3,000,000 gallons of water, or the normal portion thereof, did not have to be distributed to the wastewater system and consequently the water treatment plant did not have to retreat this water. The heating of water takes energy and it should also be remembered that "pumping" water from one place to another also requires a considerable amount of energy.

14. How do Regulators save on maintenance?

We have previously described the effects of high water pressure on piping and appliances. When having these appliances work under a lower pressure, their life expectancy will be much longer and will also cut down on service calls caused by problems with dish washers and clothes washers, leaky water heaters, leaking water pipes and the potential water damage which could be resulting.

15. Do codes require Water Pressure Reducing Valves?

Yes. They are required by the Federal Housing Administration, the regional plumbing codes such as IAPMO, Southern Building Code, and BOCA, and numerous city and state codes. The requirement is that whenever the city main water pressure exceeds 80 lbs., a regulator must be installed. However, because of the recently acknowledged advantages of regulators conservation wise, regulators could be economically installed even where supply pressures are in the vicinity of 60 lbs. because of the water and energy saving benefits they can provide.

16. How long will a Regulator last?

Regulators have been described as "life-of-mortgage" products, because historically a malfunctioning pressure regulator is

not replaced but simply cleaned or repaired via an inexpensive service kit. Design wise, it is similar to the kitchen faucet in that dirt or foreign matter on the seating area can cause problems and actually it is no more difficult to repair a regulator than it is to fix the kitchen faucet.

17. If I install a Pressure Regulator, what savings can I expect?

An average savings would be from $50 to $150 per year, probably much higher. Based on the fact that 1/3 less water flows at 50 lbs. than 100 lbs., you can expect to save up to 1/3 of the water previously consumed. As a typical family of four uses 90,000 gallons per year, that would mean a savings of approximately 30,000 gallons of water. The higher the pressure, the higher the savings. Lower pressures result in less savings. (Your water Company can provide the rate.) Remember also, however, that 1/3 of the water used in homes is heated; so 1/3 of the 30,000 gallons of water saved divided by 2 to reflect a cold water mixing factor would mean a savings in heating up to 5,000 gallons of hot water per year. If you figure 4 cents to heat a gallon of water, the savings would be $200.00. You can also figure on a savings in your sewer surcharge bill, since most of the 30,000 gallons of water saved will not be going into the wastewater system, therefore, you will not be assessed on that. (Contact your local authority for any assessment charges.) You would also have to figure the savings, generated by not having to have appliances repaired or replaced more frequently. This is a nebulous figure but, based on your own experience over the past years, you could look for a reduction in the frequency of maintenance and certainly for an improved performance by these appliances.

18. Should we consider using other water and energy conservation devices?

Certainly. The water pressure regulator we're talking about today is the hub of a conservation program; but you should also consider flow control devices, low-flush toilets, improved water heating equipment and better disciplined habits by the user. However, if none of these devices were installed, the water pressure regulator would still serve to contribute important and significant savings in energy and water, resulting in average savings of anywhere from $50 to $150 per year, or more depending on your local rates.

19. Do flow-restricting devices actually save water?

Yes, and they can effectively be installed on showerheads, fixtures and tankless heater boilers. Many showerheads, for example, apply water at a rate of 6gpm. Applying a 3gpm flow restrictor will cut the flow in half providing savings in water and energy. It should be remembered however that their capacity is based on a "fixed" supply pressure like 50 lbs. and operating under a higher pressure will permit greater flow. That's why we say a water regulator is the "hub" of a program because it maintains a constant pressure throughout the home, thereby even improving the performance of flow-restricting devices.

20. What are some tips the user can employ to save water and energy?

- Put a stopper in your sink or use a dishpan when you wash dishes.
- Washing with running water uses 30 gallons per meal.
- Keep a bottle of drinking water in the refrigerator running the water from the faucet until cold will waste a gallon.
- Wait until you have a full nine-pound wash before you run your washing machine. The average machine uses 50 gallons per load.
- Turn the hot water off while you shave, and turn the cold water off while you brush your teeth. Shaving with a running faucet uses about 20 gallons.
- Take showers instead of baths. The usual bath requires 36 gallons, the usual shower, only 25. Ten gallons is enough for a shower if you turn it off while you lather.
- Don't use the toilet bowl to dispose of cigarette ashes, facial tissues, and other materials. A normal flush requires 8 gallons.
- Use dishwasher only when completely full.
- Fix dripping faucets promptly. Nearly two gallons can be wasted per day of dripping.
- Running toilets can waste four gallons per hour. Keep them in good repair.
- THINK before you turn on the tap.

21. What does a Water Pressure Regulator cost?

There are, of course, different styles of regulators and various installation charges throughout the country. An estimate can be obtained from your local qualified plumbing contractor. To determine how much you, as an individual, would be saving, it would be necessary to consider the factors in question 17, in comparing with your current water and energy bills.

22. How do I know if I have high water pressure?

A rule of thumb is: If you hear banging pipes in your home or observe water splashing in your sink, you probably have excessive pressure. However, for a precise reading, your local plumbing contractor or utility can test your pressure with a gauge.

23. How can I get a Water Pressure Regulator installed?

The easiest way would be to call your local qualified plumbing contractor who can provide you with an estimate and also advise of the various type regulators available and the one best suited for your home. Although regulators are fairly simple to install and could be a do-it-yourself project, there are some laws which provide that only a licensed plumbing contractor be permitted to work on the home potable drinking water system for health and safety purposes.

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