



THE CITY OF SAN DIEGO



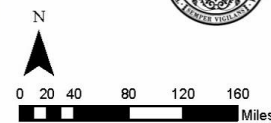
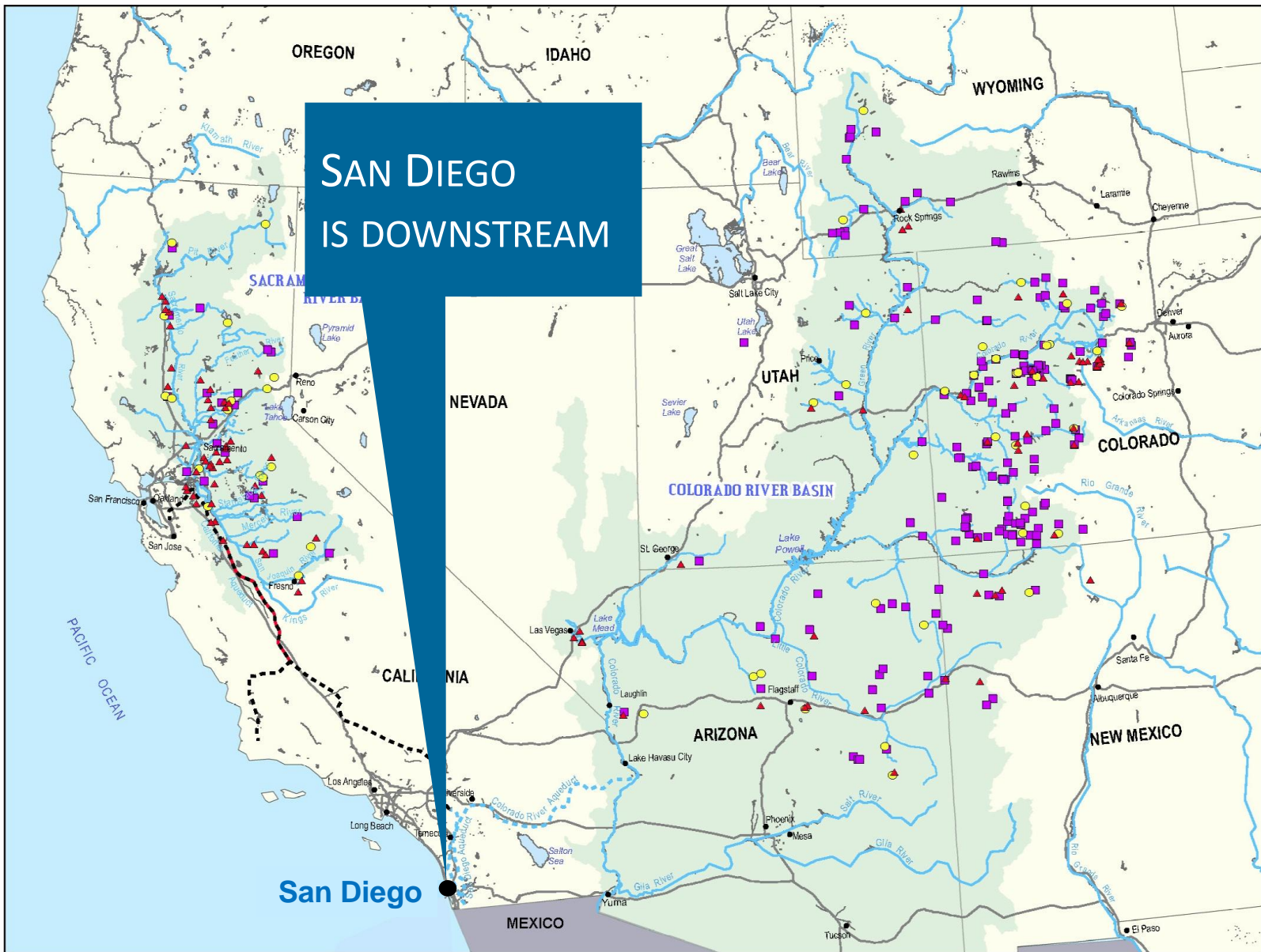
WATER PURIFICATION DEMONSTRATION PROJECT RESULTS

HOOMAN PARTOW, PE
MEHDI KHALILI, PE

OCTOBER 22, 2013



SAN DIEGO IS DOWNSTREAM



LEGEND

- ▲ 1.0 ≥ MGD
- .5 - <1.0 MGD
- <.5 MGD
- FREEWAYS
- RIVERS
- COLORADO/SAN DIEGO AQUEDUCT
- - - SWP AQUEDUCT
- STATE-FEDERAL WATER PROJECT
- BASINS



Municipal Wastewater NPDES Facilities
 Colorado River & State Water Projects

WATER SUPPLY CHALLENGES

- Limited local supplies
- Increasing cost of imported water
- Pumping restrictions
- Recurring drought conditions
- Population growth
- Natural disasters



WHAT IS BEING DONE...

Regional:

Desalination



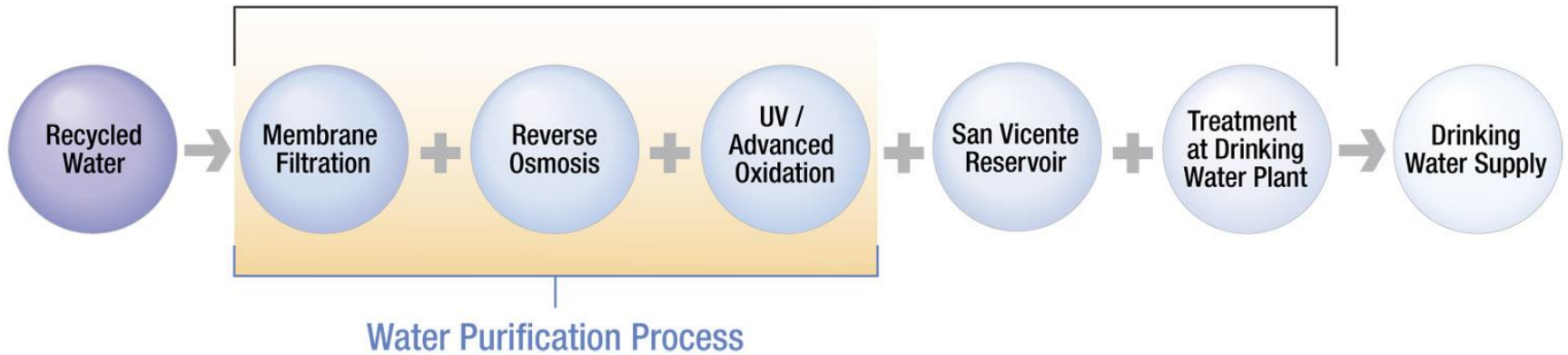
Local:

- Water Conservation
- Groundwater Development
- Recycled Water
- Water Purification

**SAN DIEGANS
WASTE
NO WATER**
ALL DAY. EVERY DAY.

Water Purification Process

Multi-Barrier Water Purification Steps



Microfiltration & Ultrafiltration



Reverse Osmosis



Ultraviolet Light / Hydrogen Peroxide



WATER PURIFICATION DEMONSTRATION PROJECT

COMPONENTS

- Advanced Water Purification (AWP) Facility
- Independent Advisory Panel (IAP)
- San Vicente Reservoir Study
- Regulatory requirements
- Energy and cost analysis
- Education and outreach program

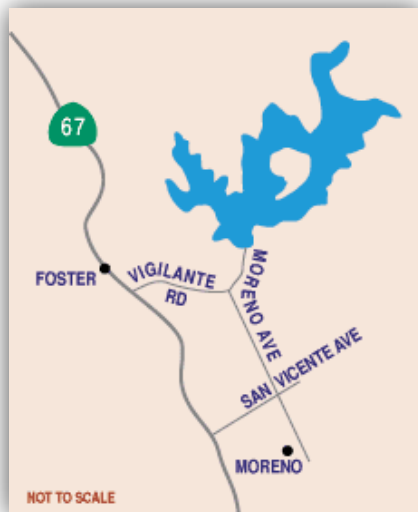


AWP FACILITY TESTING & MONITORING PLAN

- Testing period August 1, 2011 to July 31, 2012
- Measured for 342 constituents and parameters in recycled water, purified water, and imported water
- Conducted 9,000 individual water quality laboratory tests
- Implemented continuous and daily monitoring before and after each treatment step to verify integrity of each treatment process
- Visit www.purewatersd.org for more information

SAN VICENTE RESERVOIR STUDY RESULTS

- Reservoir provides an environmental barrier that satisfies anticipated regulatory requirements
- Purified water will be diluted at least 200:1 under all anticipated reservoir operations
- Water quality in San Vicente will not be affected by adding purified water



REGULATORY FRAMEWORK

- Regulatory agencies, CDPH, Regional Water Board, and County Dept of Environmental Health, attended IAP meetings
- Regulators commented on:
 - AWP Facility equipment
 - Testing & Monitoring Plan
 - San Vicente Reservoir Study



ENERGY & COST ANALYSIS

Energy:

- Energy consumption and greenhouse gas emissions of purified water delivered to San Vicente comparable to that of imported water
- Energy consumption and greenhouse gas emissions of purified water lower than ocean desalination

Cost:

- \$2,000 per acre-foot to produce and convey 15 mgd of purified water to San Vicente Reservoir



WRRC

WATER RELIABILITY COALITION



- BIOCUM
- Building Industry Association of San Diego
- Building Owners and Managers Association, San Diego Chapter
- Citizens Coordinate for Century 3
- Coastal Environmental Rights Foundation
- Empower San Diego
- Endangered Habitats League
- Environmental Health Coalition
- Equinox Center
- Friends of Infrastructure
- Industrial Environmental Association
- National Association of Industrial and Office Properties
- San Diego and Imperial Counties Labor Council
- San Diego Audubon Society
- San Diego Regional Economic Development Corporation
- San Diego Coastkeeper
- San Diego County Apartment Association
- San Diego County Taxpayers Association
- San Diego Business Leadership Alliance
- San Diego Regional Chamber of Commerce
- San Diego River Park Foundation
- Surfrider Foundation, San Diego Chapter
- Sustainability Alliance of Southern California
- Utility Consumers' Action Network

SUMMARY

ADVANCED WATER PURIFICATION FACILITY

Operated 12 months; produced water that met all state and federal standards

SAN VICENTE RESERVOIR STUDY

Satisfied all anticipated regulatory requirements

REGULATORY FRAMEWORK

Received conceptual approval for a full-scale project from CDPH & Regional Water Board

ENERGY & COST ANALYSIS

Determined energy use is comparable to imported water and costs \$2,000 per AF

EDUCATION & OUTREACH

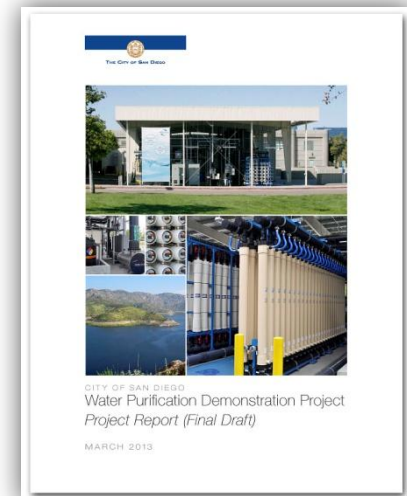
Increased understanding and approval of water purification

PROJECT REPORT

Adopted by City Council in April 2013

AND NOW WE'RE...

- Responding to directives set forth by City Council
- Continuing tours, presentations and events



INFORMATION

Visit: www.purewatersd.org
Email: purewatersd@sandiego.gov
Call: (619) 533-7572

Reports: purewatersd.org/projectreports

Public Utilities Water

Water Home • General Info • Lakes and Recreation • Water & Sewer Bill/Rates • Water Conservation • Recycled Water • Water Quality • Capital Improvements • **Water Reuse**

Water Home • Water Reuse • Water Purification Demonstration Project

Water Reuse

- Water Reuse Home
- Water Reuse Study
- Water Purification Demonstration Project
 - News and Publications
 - General Information
 - Public Involvement
 - Independent Advisory Panel
 - Links & Resources
 - Full-Scale Reservoir Augmentation

Project Objective

Evaluate the feasibility of using advanced treatment technology to produce water that can be sent to San Vicente Reservoir and later distributed as potable water.

Determine if the Demonstration Project provides evidence of viability for a full-scale IPR/RA project.

Water Purification Demonstration Project

City of San Diego's Water Purification Demonstration Project

Phase 2: Demonstration-Scale Project

Phase 3: Full-Scale Advanced Water Purification System & Reservoir Augmentation

As part of the City's water resource strategy, the **Water Purification Demonstration Project (PDF)** is examining the use of advanced water purification technology to provide safe and reliable water for San Diego's future. The Demonstration Project will determine the feasibility of a full-scale reservoir augmentation project, which would diversify San Diego's water supply, reduce its dependence on imported water and provide a safe source of drinking water for residents.

In an effort to keep San Diegans informed about this important project, free public tours of the Advanced Water Purification Facility are available, as well as project presentations to all interested groups and opportunities to learn more about the project at community events throughout San Diego. For more information, please call (619) 533-7572 or email purewatersd@sandiego.gov.

(No purified water will be added to San Diego's drinking water supply during this demonstration phase.)

Water Reuse Program Water Purification Demonstration Project

The City of San Diego • Public Utilities Department

The City of San Diego has limited local water sources and relies on importing approximately 85 to 99 percent of its water supply. In the past, importing water from the Colorado River and Northern California has been a low-cost, reliable option, but environmental stresses and court-ordered pumping restrictions have continued to reduce the amount of water that can be delivered to San Diego. These circumstances and the threat of further limitations on our water supplies have intensified the need for new sources of water. As part of the City's effort to provide a local and sustainable water supply, the Water Purification Demonstration Project is examining the use of advanced water purification technology to provide safe and reliable water for San Diego's future.

The Demonstration Project is the second phase of a process evaluating ways for the City to increase its use of recycled water. The first phase was the City's 2005 Water Reuse Study that identified reservoir augmentation as the preferred option for developing recycled water sources. The Demonstration Project will determine if reservoir augmentation is a feasible option for San Diego.

The project is a multi-step process that includes:

- Water Reuse Program
- Water Purification Demonstration Project
- Full-Scale Reservoir Augmentation

FAQs

Does San Diego need more water?

Water is essential to our quality of life. The City of San Diego imports approximately 85 to 99 percent of its water supply from Northern California and the Colorado River. For the past few years, California has been affected by a historic dry period and a drought on the Colorado River. In addition, legal and regulatory decisions to protect endangered species in the Sacramento-San Joaquin Delta have resulted in restrictions on the amount of water that can be imported from Northern California. Population projections predict the City will need more water in the future than it can supply. Since San Diego is at the end of the imported water pipeline, and reserves an average of 10 inches of rain each year, we need to develop all possible local water supplies to secure a reliable supply of water for present and future residents and businesses in San Diego.

Why can't we just conserve more water?

Using less water through conservation should always be the first step in protecting our local water supply. The City's conservation programs have helped reduce our dependence on imported water by saving more than 31,000 acre-feet of drinking water a year, which is enough to meet the needs of around 60,000 typical families for a year. However, while conservation is important, efforts to save water need to be combined with other sustainable strategies to meet San Diego's water needs in the future.

Doesn't the City already recycle water?

Yes. The City of San Diego operates two state-of-the-art water recycling facilities capable of producing close to 43 million gallons a day of recycled water for irrigation and industrial purposes. Recycled water distribution requires a separate pipeline system of purple pipes to distinguish them from drinking water pipes. The city's recycled water distribution system continues to expand, especially during rain periods. Constructing the Purple Pipe System is an essential step in examining other ways to use more recycled water.

Water Purification Demonstration Project INFORMATION CARD

Please check all that apply:

- I am interested in the Water Purification Demonstration Project as a reliable local water source.
- I would like a project representative to make a presentation to my organization.
- I would like to receive periodic updates about the Demonstration Project.
- I support the City of San Diego pursuing the Demonstration Project.

Please send information to:

Name: _____ Organization: _____
Address: _____
City: _____ State: _____ Zip: _____
Phone: _____ E-mail: _____

purewatersd@sandiego.gov • (619) 533-7572 • www.purewatersd.org

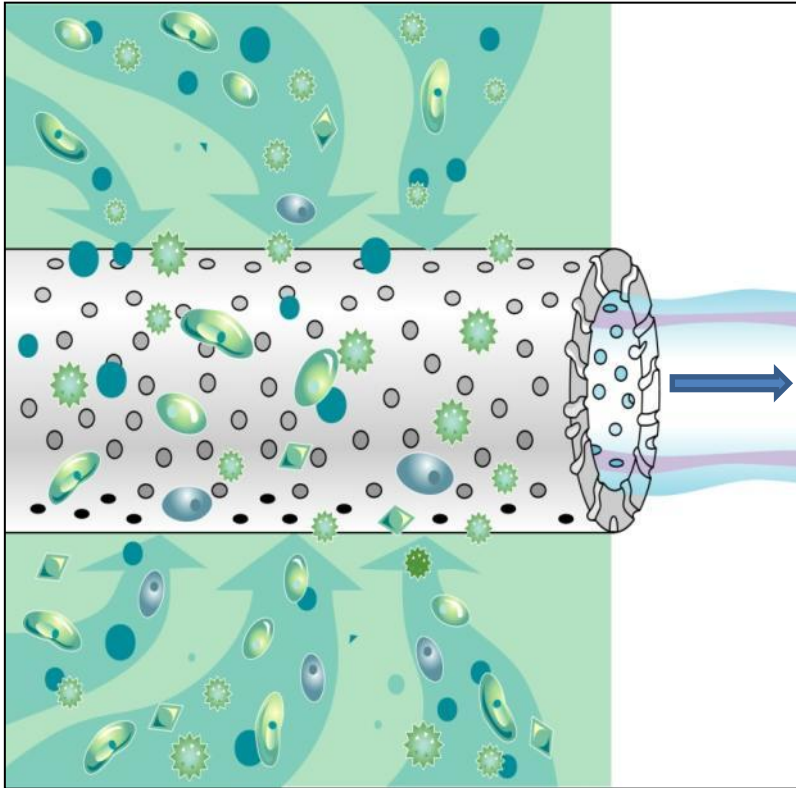


THE CITY OF SAN DIEGO



BACK-UP SLIDES

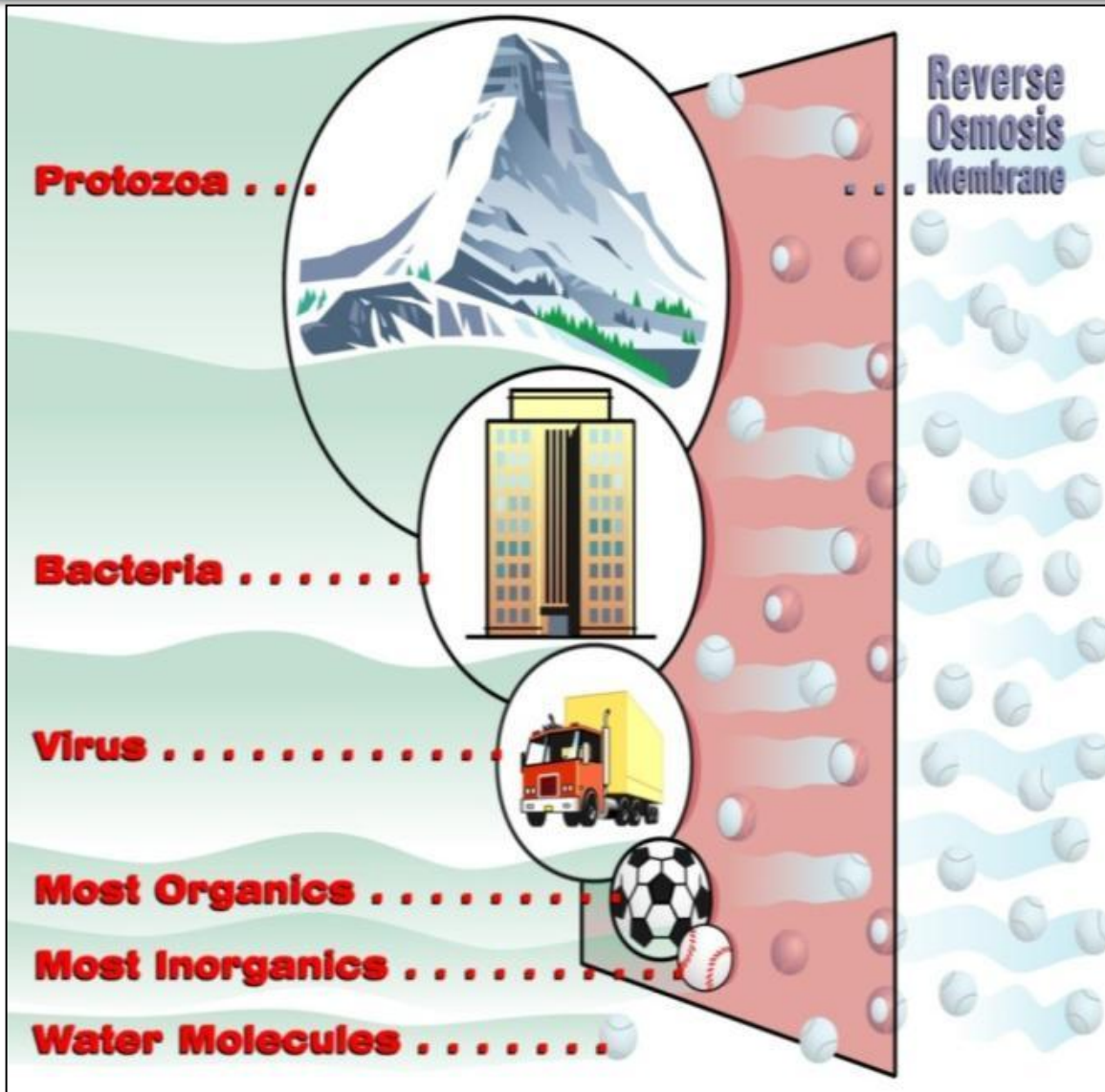
Membrane-filtration: Step One



- Hollow fiber with holes in the sides
- Used to make baby food, purify medicines, fruit juices and more
- Excellent pre-filter before reverse osmosis

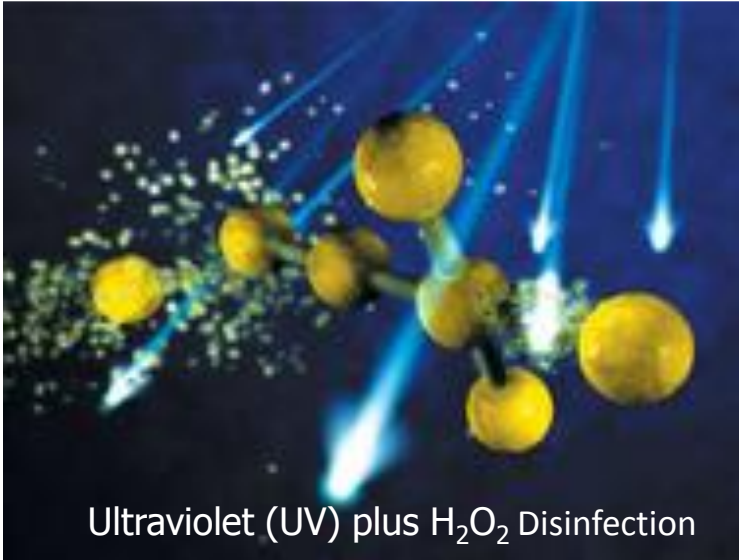


Reverse Osmosis: Step Two

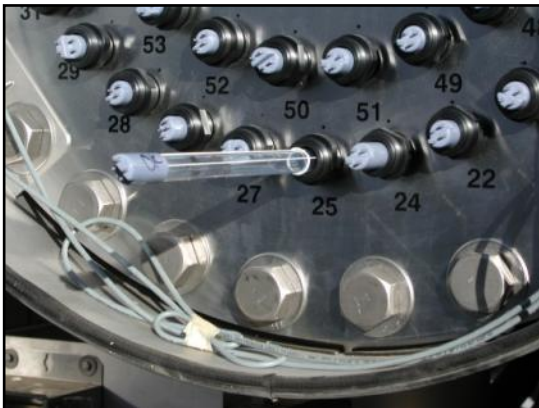


- Same technology used by bottled water companies
- Forces water under high pressure through sheets of plastic membrane
- Demineralizes and purifies water

Ultraviolet Light plus H₂O₂: Step Three



- High-intensity light and hydrogen peroxide
- Creates advanced oxidation reaction, essentially destroys anything in the water



SAN VICENTE RESERVOIR STUDY

RESERVOIR ENLARGEMENT

- San Vicente Dam and Reservoir constructed in 1944
- Reservoir enlarged from 90,000 acre feet to 247,000 acre feet
- Water Authority is constructing facilities
- City will operate reservoir, dam, and outlet works
- Refilling will take three to five years

1944 to 2012



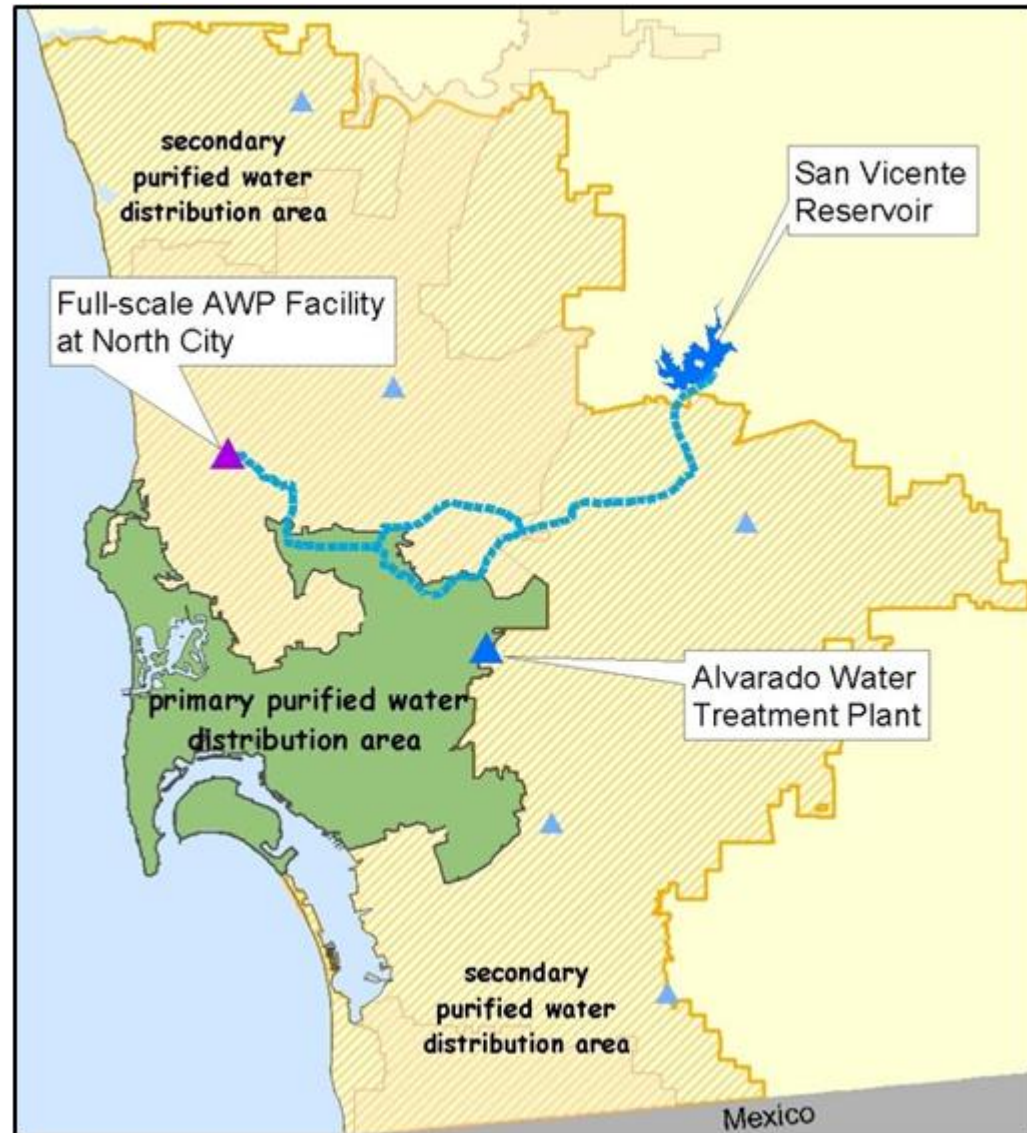
2013



PURIFIED WATER DISTRIBUTION AREAS

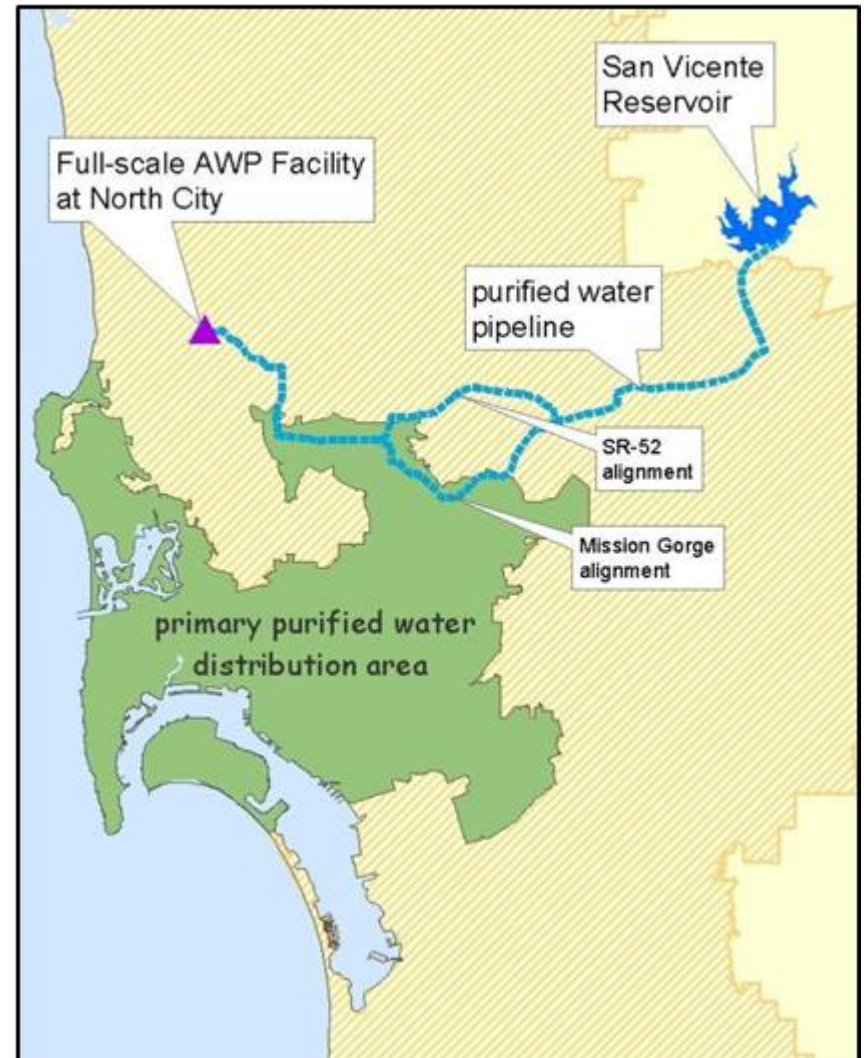
Under normal operations, purified water is delivered to the Alvarado WTP and to the area in green.

In an extraordinary event, such as extended drought, purified water could go to six WTPs and to the crosshatched area.



PIPELINE ALIGNMENT STUDY

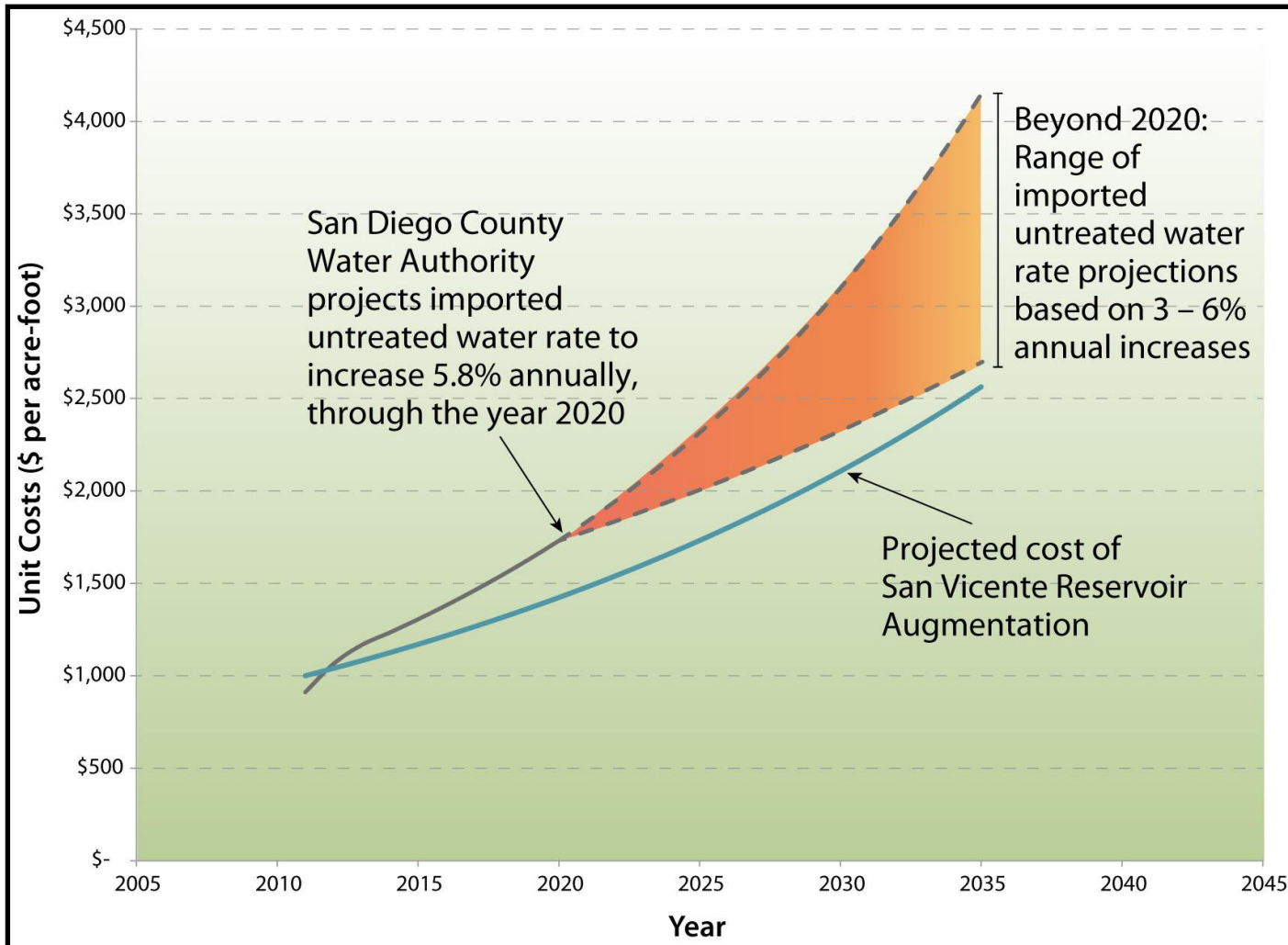
- 22 mile, 36-inch pipeline to convey water from the AWP Facility to San Vicente Reservoir
- Two potential alignments identified:
 - State Route 52 alignment
 - Mission Gorge alignment
- Additional analysis is needed to refine alignment



REGULATED CONSTITUENTS

Regulations/Guidelines	Number of Constituents
California Department of Public Health Goals	
Primary Drinking Water Maximum Contaminant Levels (MCLs)	90
Secondary Drinking Water MCLs	18
Microbial	4
Notification Levels	30
Groundwater Replenishment Criteria	142
San Diego Water Board (projected)	
San Vicente Reservoir Limits	143
Total	231

COMPARING THE COST OF THE WATER



Projected cost of purified water (solid line) of a full-scale reservoir augmentation project at San Vicente Reservoir compared to actual and projected costs of untreated imported water (dashed lines).

DEMONSTRATION PROJECT SAN VICENTE IPR/RA COST ESTIMATE

	Capital	Annual Operating and Maintenance
AWP Facility	\$144,700,000	\$8,145,000
Pipeline & Pump station	\$224,500,000	\$3,385,000
Increased North City Tertiary Treatment	\$0	\$3,965,000
Total	\$369,200,000	\$15,495,000

- Result - \$2,000 per acre-foot to produce and convey 15 mgd of purified water to San Vicente Reservoir

DEMONSTRATION PROJECT, SAN VICENTE IPR/RA AVOIDED WASTEWATER COSTS

	Capital	Annual Operating and Maintenance
Point Loma Wet Weather Storage Facility	\$123,000,000	\$6,150,000
Reduced Treatment at Point Loma	\$0	\$2,210,000
Reduced Pumping at Pump Station No. 2	\$0	\$450,000
Total	\$123,000,000	\$8,810,000
Total (per-acre-foot basis)	\$1,000	

- Net cost: \$1,000 per acre-foot to produce and convey 15 mgd of purified water to San Vicente Reservoir

PUBLIC OUTREACH & EDUCATION



San Diego City Council Approves Water Purification

Water Reliability Coalition says new safe, reliable drinking water could supply up to 40 percent of City of San Diego's demand



Council committee asks for staff report on implementing recycled drinking water

Recommend 7 people recommend this. Sign Up to see what your friends recommend.

Posted: Mar 20, 2013 6:33 PM PDT
Updated: Mar 20, 2013 6:33 PM PDT



SAN DIEGO (CNS) - The San Diego City Council's Natural Resources and Ci planning for a syst report back in three



Final Report Says Recycling Water Is Not So Expensive

Wednesday, March 20, 2013
By Tom Fudge

SAN DIEGO — The San Diego Public Utilities Department today presents its final report on water recycling and estimates it would cost no more to recycle water than to import it.



Final Report Says Recycling Water is Not So Expensive

Aired 3/20/13

The San Diego water department today presents its final report on water recycling and estimates it would cost no more to recycle water than to import it.



The report will be presented the San Diego City Council's Natural Resources and Culture Committee.

Turning wastewater into drinking water could provide a large, reliable source of water for San Diego. But water recycling has been politically controversial because some people think reusing wastewater is distasteful.

It's also been seen as expensive: about twice the cost of importing water from outside the region.

But the final report on San Diego's Water Purification Demonstration Project now claims the future cost of recycled and imported water would be about the same, around \$1,000 per acre foot.

The report indicates recycling water does money by reducing the need for imported by cutting the volume of water the city mu

Tide turns for water purification plan



By Deborah Sullivan Brennan 6 A.M. APRIL 22, 2013



The New York Times Sunday Review | The Opinion Pages

'Taking the Waste Out of Wastewater'



As 'Yuck Factor' Subsides, Treated Wastewater Flows From Toilets to Tap

By FELICITY BARNHURST
SAN DIEGO — As the yuck factor subsides, the city's water department plans to start recycling wastewater into drinking water. The plan is to take the water from the toilets and use it to flush the toilets. The water is treated to a high standard and is safe to drink. The city is currently testing the technology and expects to start recycling water by next year.



COVER STORY
From toilets to tap

As water becomes more precious, more drinking water will come from treated sewage. Here's how it works.



LOCAL NEWS

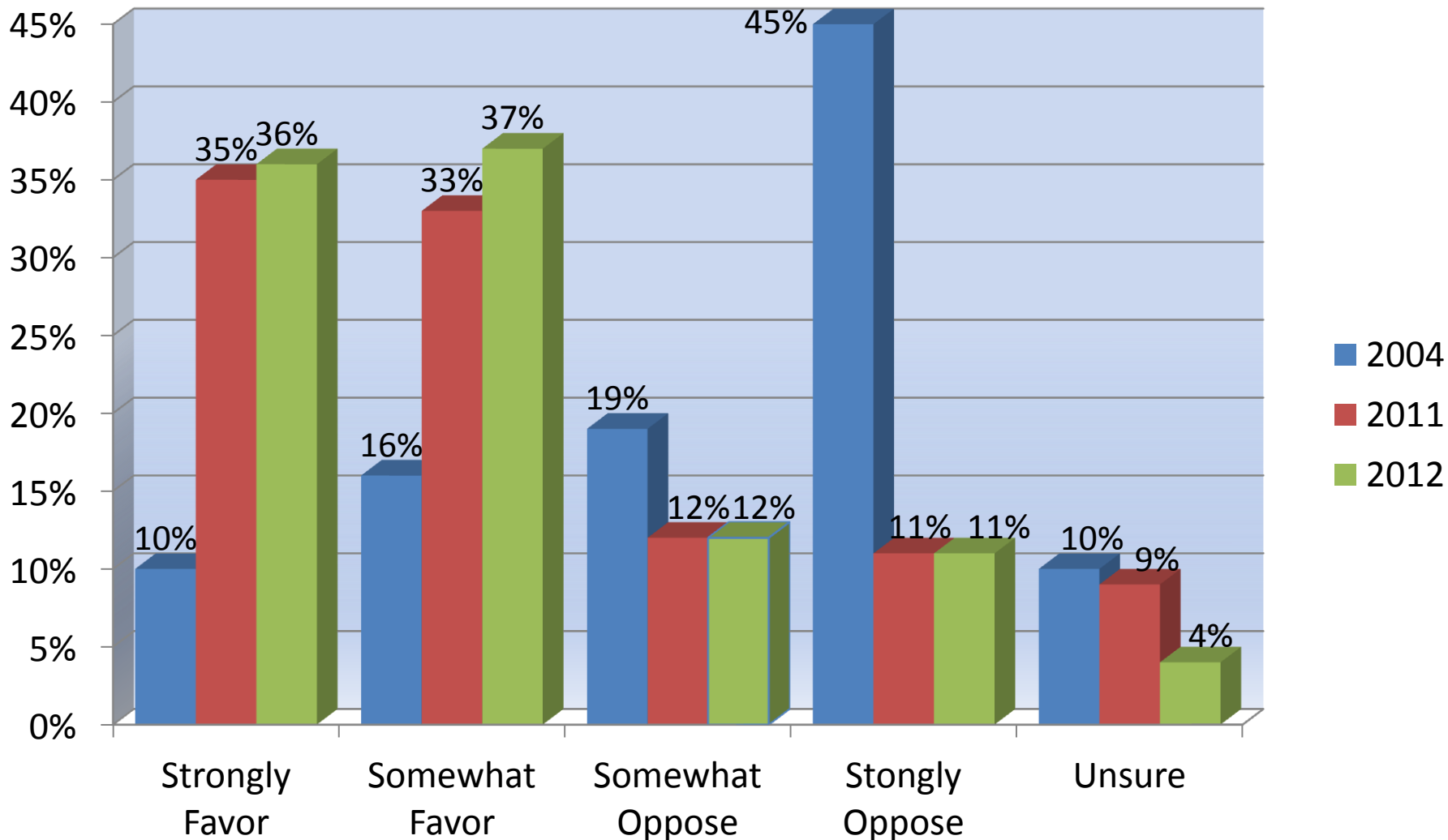
San Diego studies making drinking water from waste water



Purification system that makes toilet water clean enough to drink is closer to coming to San Diego

PUBLIC OUTREACH & EDUCATION PROGRAM RESEARCH RESULTS

USE ADVANCED TREATED RECYCLED WATER AS AN ADDITION TO DRINKING WATER SUPPLY



PUBLIC OUTREACH & EDUCATION PROGRAM RESEARCH RESULTS

ACCEPTING OF RECYCLED WATER TO SUPPLEMENT DRINKING WATER IF RESPONDENT LEARNED CERTAIN FACTS

