EQUINOX CENTER

HEALTHY ENVIRONMENT STRONG ECONOMY VIBRANT COMMUNITIES

H2OVERVIEW PROJECT

The Potential of Purified Recycled Water

JULY 2010

About H2Overview

Equinox Center is pleased to present its second publication, *The Potential of Purified Recycled Water*, in its H2Overview Project. As the region adds 750,000 more people in the next 20 years, it is important to prepare today for the difficult decisions our region faces to properly steward our water resources as we accommodate a growing population and business sector.

H2Overview provides balanced, easy-to-understand research on San Diego County's water supply to help inform the decision-making process. Our region's imported water supply is increasingly vulnerable. There is a sense of urgency to develop more local, reliable and sustainable sources of water. One option is purified recycled water and this study assesses the opportunities and challenges of that source.

About Equinox Center

To ensure a health environment, vibrant communities and a strong economy for the San Diego Region, Equinox Center researches and advances innovative solutions to balance regional growth with our finite natural resources. We are proponents for our region's responsible growth and we support the conscientious care-taking of the natural and economic assets that we have inherited.

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Executive Summary

- According to the latest demographic projections, **San Diego County's population will grow by another 750,000 in the next twenty years**, putting increased pressure on already strained resources.

- S**an Diego County imports 80% of its water supply.** Legal, environmental and structural issues combined with a long term drought, have constrained this supply and escalated its cost. **The region needs more local, reliable and sustainable water sources to meet the demand.**

- **Indirect Potable Reuse (IPR)**, also known as **advanced treated water, purified water or recycled water**, cleanses treated effluent to the point that it is drinkable, adds it to a reservoir or aquifer from where it is treated again and distributed through the existing drinking water infrastructure.

- **IPR has been safely used for a number of years** in California in Los Angeles, Long Beach, and Orange County and in many other places in the U.S. and globally including Scottsdale, AZ, Las Vegas, NV and Singapore.

- Within San Diego County, the **City of San Diego**, the **Helix Water District** and the **City of Escondido** are considering adding IPR to their districts' diversified portfolios.

- The City of San Diego is farthest along pursuing a demonstration project which would test the feasibility of using IPR to augment water supplies in the San Vicente Reservoir.

- Equinox Center research finds that **IPR** as a strategy for the City of San Diego to increase local water supplies has **several benefits** compared to other potential sources:

    - ***Cost:*** The **marginal cost of IPR is less than many other available sources of water**, including "purple pipe" non-potable recycled water, which requires a separate pipe system. Building this infrastructure costs **about $2 million per mile.** Marginal costs of IPR range from $1,200-$1,800/acre-foot, depending on the type of project implemented, as compared to $1,600-$2,600 for non-potable recycled water.

    - ***Reliability:*** Because IPR uses available water already within the region, it is **less vulnerable to interruptions that could occur with imported water**. Local water agencies accountable to the citizens of their districts can **control the price of water** produced through IPR more than they can control the price of water imported from elsewhere. Recycled water provides the **opportunity for businesses to expand** and for our population to grow, while the region **reduces its over-dependence on vulnerable imported water.**

    - ***Water Quality/Safety:*** Studies show that **water produced through IPR treatment processes**, which generally include reverse osmosis and ozone disinfection, **will have fewer contaminants than our existing treated imported water supply**. IPR projects in current use consistently demonstrate the production of water of an excellent quality for human consumption and testing on populations where IPR is in use has not determined any significant health risks as a result of IPR.

    - ***Environmental:*** By using recycled wastewater, IPR reduces the amount of waste flowing to the Point Loma Treatment Plant, which is operating under an

EPA waiver from the Clean Water Act. IPR therefore **reduces the amount of potentially harmful pollutants being released into the ocean** from the Pt. Loma Plant's effluent. In addition, using **IPR may reduce the costs of upgrading the Pt. Loma Treatment Plant in the future.**

- Equinox research also found there are some **challenges associated with an IPR strategy:**

  - ***Energy:*** The energy intensity of the IPR process is somewhat higher than some of the other potential sources in our region, including recycled water in purple pipes. Compared to conservation, groundwater, surface water or non-potable recycled water, IPR generates a higher carbon footprint. However, at a range of 1,500-2000 kWh/acre-foot, **IPR still uses significantly less energy than desalinated or imported water**.

  - ***Social Acceptance:*** The success of IPR in other cities **required significant public education campaigns,** such as the efforts currently being undertaken by San Diego and by the Helix water district. Results from 2009 San Diego County Water Authority survey show that public acceptance of IPR as a water source has increased significantly from 28% 2005 to 63% in 2009.

Based on its research and available data, Equinox Center concludes that exploring IPR as a local, reliable and sustainable water source is a sound strategy for regional water districts to pursue. IPR would be a strong, viable addition to the region's diversified water portfolio and would help ensure our continued quality of life as our region grows.

San Diego's Vulnerable Water Supply

Because of its arid climate and geological make up, the County of San Diego imports over 80% of its water through the San Diego County Water Authority (SDWCA), mostly from Northern California and the Colorado River. Exacerbating years of drought, a federal court ruling requires California to reduce water consumption from the Colorado River to comply with previously agreed upon water allocations. In addition, a 2007 Federal Court decision cut the water supply available through the State Water Project to protect endangered species, including the Delta Smelt, at the source in the Sacramento-San Joaquin Delta.

As the region's population continues to grow, access to imported water will be constrained. Local water districts in the county have been analyzing potential new water sources to meet the projected demand. Like many other water districts, the City of San Diego is attempting to diversify its local water supply so that it is less vulnerable to impacts from shortages and less susceptible to the sudden price increases of imported water. The City is studying the potential of using an Indirect Potable Reuse strategy as a way to augment its local supplies. IPR has a long history in San Diego (for a brief summary of IPR in San Diego see Appendix 1).

The Helix Water District and the City of Escondido are also considering IPR strategies to augment local water supply. In this paper, the Equinox Center provides a synthesis of available research and new data to address some of the questions about the suitability of IPR in the region. While much of Equinox Center's research is applicable to all IPR projects, some is more specific to the City of San Diego's demonstration project.

What is Indirect Potable Reuse, or IPR?

IPR is a process to treat wastewater and sewage using advanced technology to produce potable water fit for human consumption. It is referred to as "indirect" potable reuse because instead of being delivered directly through the water distribution system, the treated water is first directed to either a groundwater source or a surface water holding area, such as a reservoir, then treated again at drinking water facilities, before eventually entering the drinking water supply. IPR is also sometimes known as purified water, advanced treated water, recycled or reclaimed water.

Most IPR processes are comprised of a multi-tiered filtration system, described in Figure 1.

Figure 1: Multi- Step IPR Filtration Process:

Step	Process	Purpose
Steps 1 & 2	Initial Treatment	Water passes through several screens and sedimentation to remove suspended solids – water at the end of this process is safe for irrigation and other non-consumption uses
Step 3	Microfiltration	Further filters remaining solids
Step 4	Reverse Osmosis	Water pumped through membranes eliminating viruses, bacteria, and protozoa
Step 5	Advanced Oxidation	Further disinfection and removal of emerging contaminants using UV or ozone and hydrogen peroxide
Step 6	Fresh Water Blend	Water blended with surface water reservoirs or added to groundwater

Step 7	Standard Water Filtration	Water moved from reservoir or groundwater and goes through standard water filtration* before being added to potable piping system
		*Step not required but usually done to address public perception concerns or because recycled water has been blended with less treated water

IPR vs. Recycled Water in Purple Pipes

Many people are familiar with recycled water distributed through the purple pipe system, but that type of recycled water should not be confused with IPR.

The IPR process cleanses treated wastewater to the point that it is drinkable and able to be added to the existing drinking water infrastructure. Recycled water in purple pipes is also treated wastewater that meets strict standards, and can be used for many purposes including irrigation for parks and landscaping, certain types of agriculture, as well as some industrial uses. But it is not treated to the same level as IPR and is non-potable, therefore it is not fit for human consumption. Purple pipe recycled water cannot be added to the existing drinking water infrastructure, and requires a separate pipe infrastructure which costs about $2 million/mile to build. It also requires homes and businesses to be plumbed with two sets of pipes, one for recycled water and one for potable water, adding expenses.

Why is the City of San Diego Pursuing IPR?

Concerns about Reliability of and Control over Water Supply in the Region

As noted above, most of the region's water is imported from northern California or the Colorado River, and both of those sources are seriously constrained well into the future, impelling water districts in the region to reduce consumption and identify new sources of water. Although conservation efforts in the past year have successfully reduced the city's residential water consumption by 11.9% from 2009 figures, the city estimates that it will still need approximately 13% more water than it uses today by the year 2030.

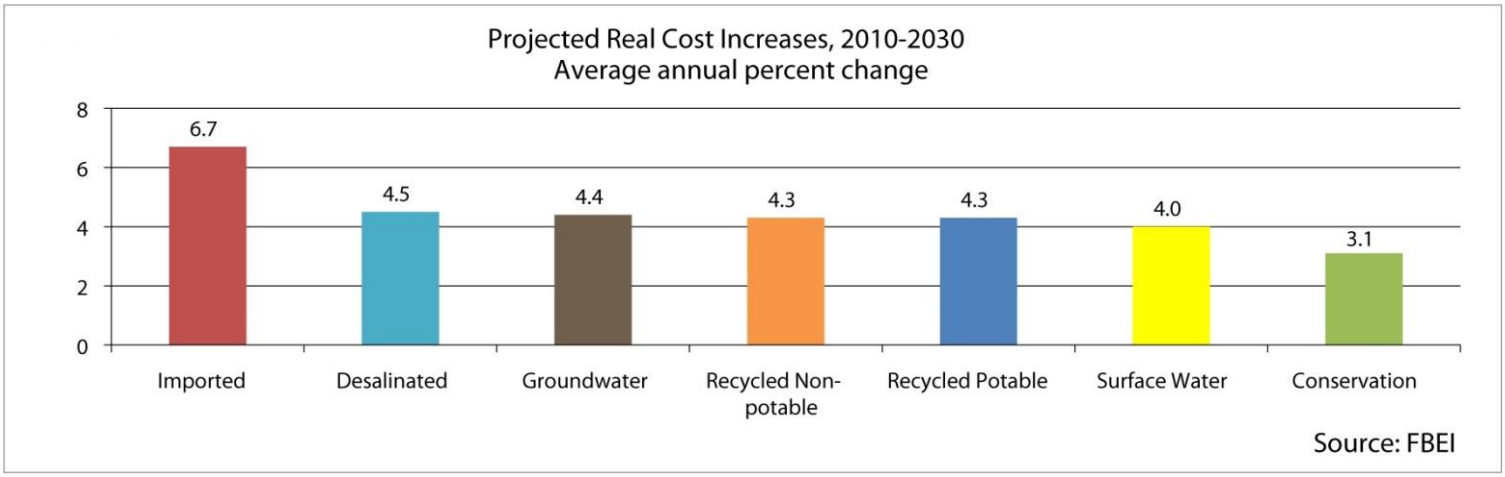
Extending the purple pipe network could help fill this demand, assuming the city could increase the amount of recycled water currently being used for landscape and irrigation. But currently, the city's recycled water plants are not working at capacity. Also, the City Council cut back on funding allocations for the purple pipe network beginning in 2005, in part because of the high cost of building and maintaining a separate pipe infrastructure, especially amidst the city's current fiscal situation. In addition, there are some businesses in the region whose water needs would not be satisfied by non-potable recycled water, as they require highly treated water to produce their products. IPR negates the need for a separate water infrastructure and would maximize the use of the available recycled water supply.

> *Currently the City of San Diego's water recycling plants are not working at capacity because there is limited demand for non-potable recycled water.*

In addition to the questionable reliability of imported water, the costs of imported water are of concern to businesses, residents and decision-makers in the region. Equinox-sponsored

research conducted by Dr. Lynn Reaser at the Fermanian Business and Economic Institute (see Figure 2) shows that imported water costs will rise at a faster rate than any other source of water over the next 20 years.

Figure 2: Projected Cost Increases for Water in San Diego



A more detailed analysis of the costs of various water sources is discussed later in this document.

Environmental Concerns about the Point Loma Wastewater Treatment Plant

Another benefit that will be realized if the City's IPR demonstration project moves forward is the reduction of wastewater being treated at the City's Point Loma Wastewater Treatment Plant. The plant currently discharges 175 million gallons of wastewater per day into the ocean that has not been treated to Clean Water Act standards. The treatment plant serves over 2 million residents from 16 jurisdictions in the county, and accounts for 80% of all treated wastewater discharges. The City has been granted a series of waivers by the federal government, allowing it to avoid upgrading the facility to a secondary treatment facility. The latest waiver was issued in June 2010 for five years.

> If the city can divert enough wastewater from the Point Loma facility it will reduce the costs associated with upgrading the facility in the future, and reduce pollution entering the Pacific Ocean.

However, the EPA and other regulating entities such as the California Coastal Commission indicate that it will be increasingly difficult for the city to receive waivers in the future if the city does not have a clear plan and timeline to upgrade the Point Loma plant. The chance that the waiver will not be renewed in the future places an increased focus on IPR because if the city can divert enough of its wastewater from the Point Loma facility, it will reduce costs associated with upgrading the facility in the future.

It is important to note however, that the full-scale IPR demonstration plant proposed to be built would divert about 16,000 acre-feet of water from the Point Loma plant to produce about 12,000 acre-feet of potable water per year, a fraction of the more than the 196,000 acrefeet of water annually processed and discharged into the ocean at the Point Loma facility (1 acre-foot of water equals 325,851 gallons of water, enough for 2 households of 4 people each for 1 year, at current consumption rates). The 12,000 acre-feet alone will not be enough to significantly reduce the costs of the Point Loma upgrade. To get to the desired

reduction of wastewater needed to significantly reduce the amount of pollutants entering the Pacific Ocean, other actions would need to be taken, such as enhancing conservation efforts, expanding IPR capacity or increasing the amount of non-potable recycled water used in the city.

What is the City of San Diego's IPR Demonstration Project?

Currently, there are three approved ways to direct highly treated, purified water back into the drinking water supplies: groundwater recharge through spreading reclaimed water on the surface, groundwater recharge through injecting reclaimed water into an aquifer, and reservoir augmentation. Given the San Diego region's limited groundwater aquifers, the City of San Diego's demonstration project will evaluate the feasibility of using advanced water treatment on recycled wastewater from the North City Water Reclamation Plant to augment drinking water supplies in the San Vicente reservoir. The treatment system will be operated for at least one year to satisfy California Department of Public Health requirements. During this time, the highly-treated water would be regularly tested to ensure the IPR technology is capable of supplying high-grade potable water for public consumption. It is important to note that during the demonstration project, the highly-treated water will not be pumped into the reservoir. Rather, once treated to potable standards and tested, it will be placed into the purple pipe system to be distributed as highly treated reclaimed water.

> The City of San Diego will evaluate the feasibility of using advance water treatment on recycled wastewater from the North City Water Reclamation Plant to augment drinking water supplies in the San Vicente reservoir.

If the advanced treated water from the demonstration project meets all public health and safety requirements, it would be pumped to the San Vicente Reservoir, blended with the reservoir water, and then treated again at drinking water treatment facilities before being distributed through the existing pipe infrastructure. Reservoir augmentation with recycled water has been done in several locations around the world, including Occoquan, Virginia (since 1978), Essex, England (since 1997) and Singapore (since 2000), and tested in many other sites.

If deemed technically feasible for San Diego during the demonstration project, and if the Mayor and City Council approve the final project, a full scale advanced treatment plant will create 12,000 acre feet of drinking water annually. At the same time, the San Vicente Reservoir dam is being raised by over 100 feet to create additional water storage capacity for the region. Although the decision to raise the dam was made independently of a decision to implement a full scale IPR plant, the additional capacity will provide ample storage for IPR water and avoid additional infrastructure expenditures to create a separate storage facility.

Quality and Safety of IPR

Historical epidemiological and toxicology studies of recycled water

IPR has been tested and implemented in several regions with good results to date. In 1962 the County Sanitation Districts of Los Angeles County implemented an IPR project at Montebello Forebay. The Orange County Water District at Fountain Valley successfully implemented IPR where the water is released into the groundwater and surface lakes before reuse. Las Vegas discharges treated wastewater into Lake Mead (one of the sources of San Diego's water supply) before reuse. Other projects in the U.S. include the Gwinnett County Department of Public Utilities, Lawrenceville, Georgia; Inland Empire Utilities Agency, Chino, California; Water Campus, City of Scottsdale, Arizona; El Segundo, California; Tahoe-Truckee Sanitation Agency Water Reclamation Plant, Reno, Nevada; Loe J. Vander Lans Advanced Water Treatment Facility, Long Beach, California; and Northwest Water Resource Centre, Las Vegas, Nevada.

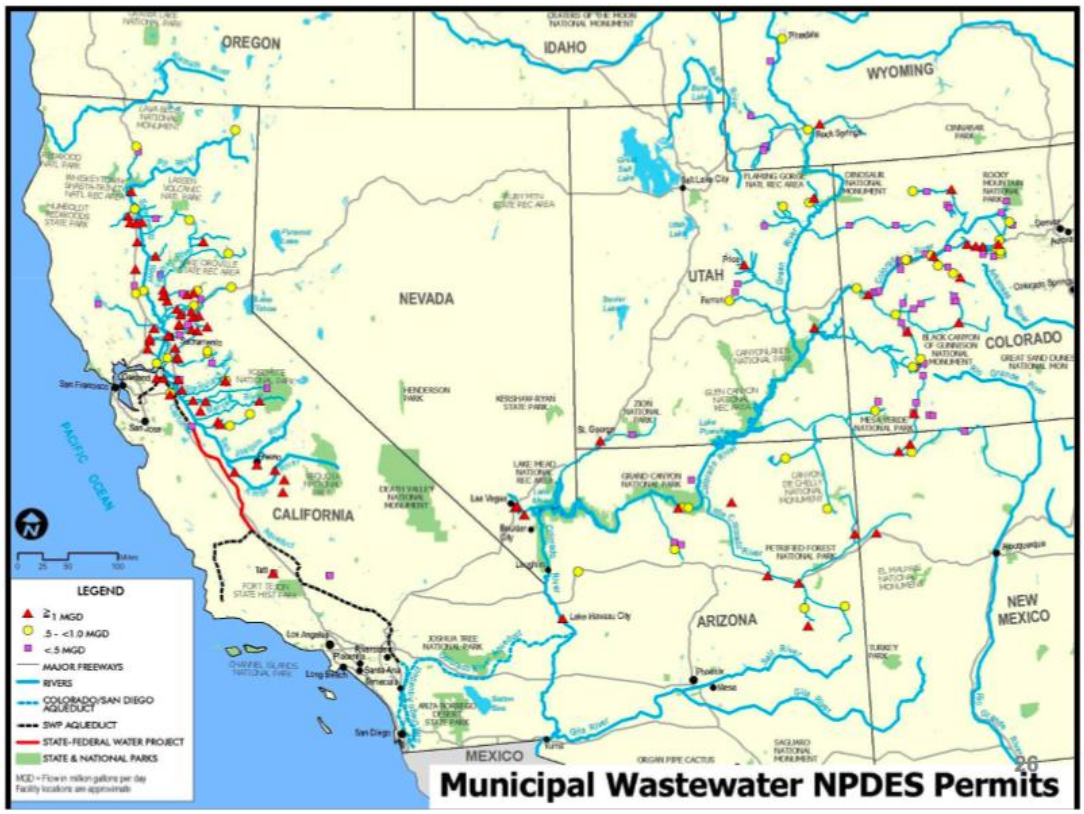
A comprehensive study on the safety of IPR was performed by the National Research Council in 1998. The study concluded that there were no health detriments in the quality of the water produced and that with on-going testing and monitoring, IPR is a feasible source of potable water. Some of the specific findings included the following:

- IPR projects in current use consistently demonstrate the production of excellent quality water for human consumption.
- The best available information reveals that the risks of IPR water are equal to or less than the risks from more widely available water supplies.
- Testing on populations where IPR is in use has not determined any significant health risks as a result of IPR.

> Testing on human populations where IPR is in use has not determined any significant health risks as a result of IPR.

When considering IPR as a component of a diversified water portfolio, it is important to understand that residents of San Diego County currently already drink unplanned recycled water. Because the San Diego region is at the end of the pipelines for both the State Water Project and the Colorado River, the water San Diego obtains from these sources is affected by the release of treated wastewater from 350 public sewage treatment plants upstream (see Figure 3).

Figure 3: San Diego Upstream Wastewater Discharges



Source: City of San Diego's Recycled Water Program

A study by the City of San Diego in 2006 has shown that IPR water will be superior to San Diego's current raw water supply. The City of San Diego's Senior Engineer reported that augmenting San Diego's water supply with IPR water would result in an improvement to water quality over San Diego's current supply. The demonstration project will allow the city and state to confirm these findings.

Emerging Contaminants

Recent developments and improvements in monitoring and testing methods are producing a larger database of detected chemicals and microbes in current drinking water supplies (i.e., recycled water, rivers, lakes and groundwater) and wastewater. These emerging sources of potential environmental or human concern include trace levels of personal care and pharmaceutical products, disinfection byproducts, bacteria, viruses and parasites. Many of these contaminants are being subjected to toxicological testing and studied to determine to what degree they are removed by currently available treatment technologies. The most recent studies indicate that at least some of these substances are present in recycled water, but at significantly lower concentrations than in our current drinking water supply.

> Studies show that emerging contaminants are present in all water sources, but in significantly lower concentrations in water produced by IPR than in San Diego's current imported water supply.

In the case of the City of San Diego's demonstration project, the brine will be sent to the Point Loma Treatment Plant. The San Diego County Water Authority and other water districts are evaluating the feasibility of a separate regional brine line for the existing and proposed water recycling and brackish water desalination projects in the region. The brine line would be linked to the South Bay Ocean Outfall. As the number of recycling and desalination projects in the region grows, other treatment and disposal methods for brine will likely need to be considered.

The California State Water Resources Control Board (SWRCB) is taking a proactive approach to these emerging contaminants. In February 2009, the SWRCB adopted a Recycled Water Policy to provide clarity for permitting recycled water projects. In April 2010 the SWRCB published for public comment recommendations for monitoring strategies for chemicals of emerging concern (CECs). As part of that report, the independent scientific advisory panel convened by SWRCB reviewed all available information on human health risks from recycled water (including IPR) and reported that recycled water represents a source of safe drinking water.

Reverse Osmosis is the most common technology used in the advanced water treatment process. It uses pressure to force water through a semi-permeable membrane, producing one potable water stream (the product stream) and another with a high concentration of remaining salts and other contaminants, typically referred to as *brine*. As noted above, studies show that reverse osmosis and other advanced treatment processes do a good job in removing contaminants from the product water. However it should be noted that uncertainty still exists with regard to the potential effects of brine in the environment. In many cases, the brine streams are blended with treated wastewater effluents prior to discharge to the ocean and according to the panel, virtually no published studies exist on their potential impacts. The State Board, in cooperation with the Packard Foundation, established another Science Advisory Panel that was charged in January of 2010 to address questions related to CEC discharge to the ocean and exposure to human health and ocean life. That panel's report is due out in 2011.

> The new reality is that emerging contaminants will require water agencies to upgrade monitoring techniques for all potential sources of water, including the region's current imported supplies.

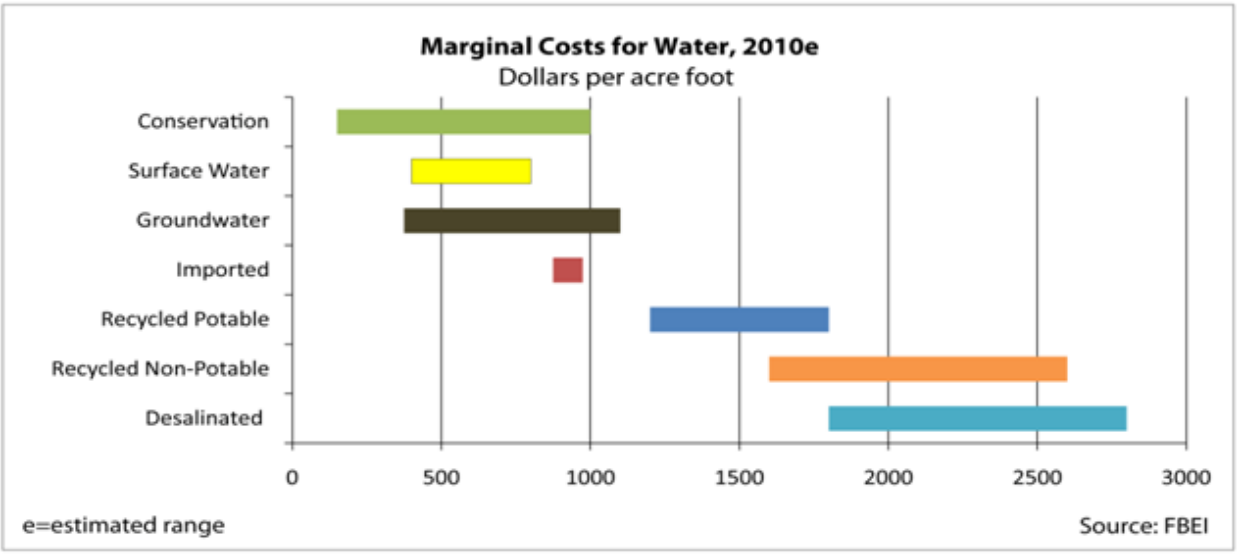
While the reviews of toxicological and epidemiological studies to date have found no adverse human health effects, keeping the precautionary principle in mind as it relates to public health, scientists agree that a rigorous monitoring program for emerging contaminants and monitoring of treatment processes for early warning of any issues before there is a problem is necessary for IPR. A National Water Research Institute independent advisory panel, consisting of national experts and local scientists from the Salk Institute and San Diego State University was convened to make monitoring recommendations to the City of San Diego as it plans for IPR. The new reality is that emerging contaminants will require water agencies to upgrade monitoring techniques for all potential sources of water, including our current imported supplies, in the future.

IPR Costs vs. Other Sources

Dr. Lynn Reaser, Chief Economist at the Fermanian Business and Economic Institute (FBEI) analyzed the marginal costs of producing IPR in San Diego County as compared to six other alternative water sources for Equinox Center. Marginal cost is the cost of producing an additional acre-foot of water and includes both operating costs and amortized fixed capital costs. The ranges indicated in Figure 4 allow for significant variation that may exist in different areas of San

Diego arising from, among other factors, variations in distance from water sources and treatment facilities.

Figure 4: Marginal Costs of Water Alternatives



FBEI's analysis finds that compared to other available sources, the 2010 cost to produce IPR is moderate, with a range of $1,200-$1,800 per acre-foot for the San Diego region. This range is lower than the marginal cost range of purple pipe recycled water ($1,600-$2,600 per acre-foot) because of the high capital costs required to install new distribution systems for the recycled non-potable water. Although the cost of treatment to potable levels adds about 10% to 15% to the cost of IPR, the expense of conveying it to a reservoir is less than that required to construct an entirely separate system for distribution that would be required for non-potable recycled water. The capital costs of retrofitting much of San Diego's water system with new purple pipe distribution systems would be substantial, costing about $2 million per mile to install these pipes.

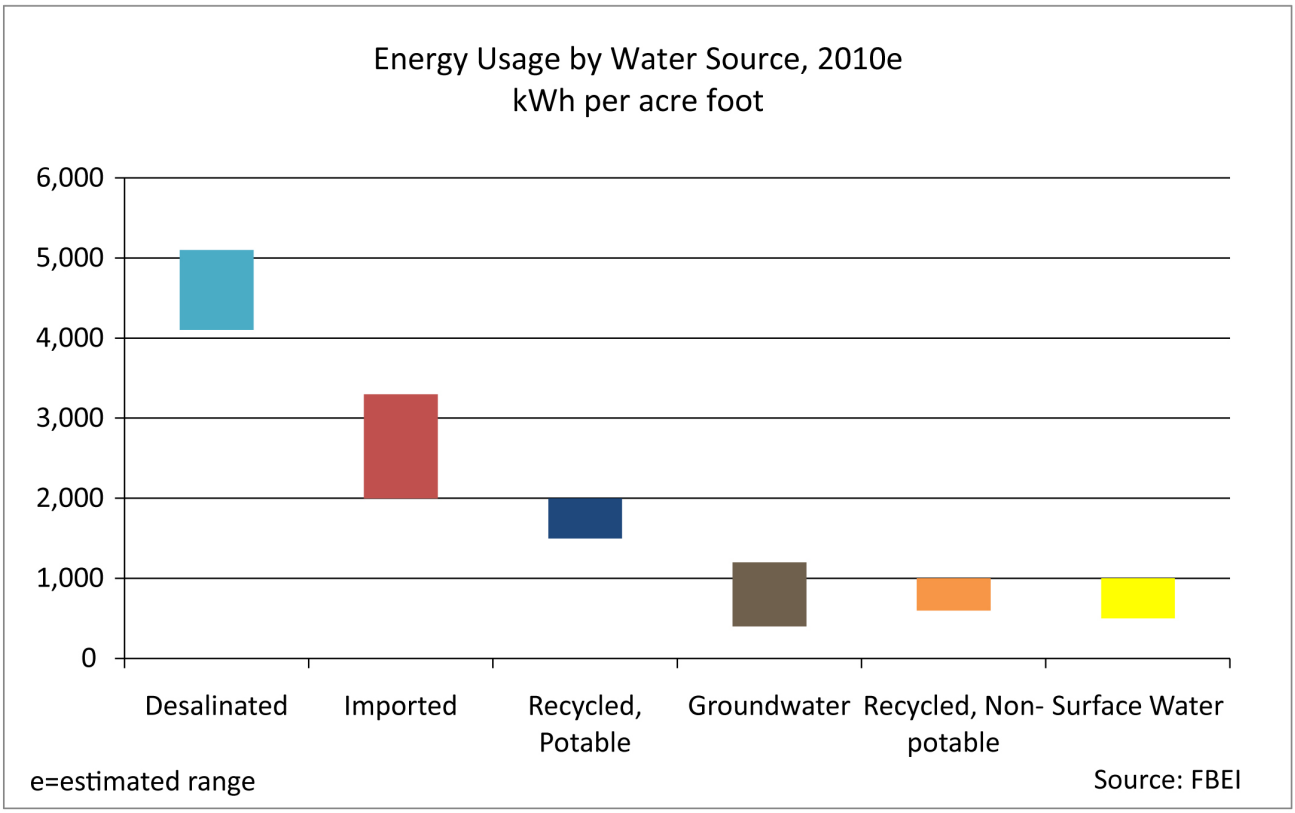
Last November, California's Building Standards Commission adopted a dual-plumbing code requiring new commercial, retail, office, hotels, apartments, educational, and other facilities to be plumbed for potable and non-potable systems when recycled water is available. This standard could help reduce the costs of recycled, non-potable water over time. However, the potential uses of non-potable water are still limited as it is not available in many geographic areas of San Diego County.

While IPR is more expensive than imported water now, by 2030 the costs are projected to be about the same as imported water. For more detailed information and the methodology FBEI used to conduct their analysis, please see the publication "San Diego's Water Sources: Assessing the Options" on Equinox Center's website.

Energy Requirements for Water Treatment and Distribution

Energy usage for water is important to understand not only because of the implications for the region's total energy supply and demand, but also because of the implications for greenhouse gas emissions and San Diego County's climate goals. Estimates of the energy intensity of the different water alternatives are analyzed in this section in terms of kilowatt hours (kWh) per acre-foot for 2010. Analysis was conducted for Equinox Center by the Fermanian Business and Economics Institute. See Figure 5.

Figure 5: Energy Usage by Water Source



While IPR is less energy intensive than either imported water or desalination, the process takes about double the amount of energy as extracting groundwater or reclaiming water for non-potable reuse. FBEI assumed energy consumption for conservation to be negligible for the purposes of this study.

In the case of the City of San Diego's demonstration project, IPR requires considerably more energy than non-potable recycled water because of the transportation costs necessary to convey the treated water to a storage reservoir. Where significant pumping is required, as in the case of pumping the advanced treated water to the San Vicente Reservoir, energy expenditures could be substantial. Energy costs for this IPR scenario are estimated at 1,500 to 2,000 kWh per acre-foot. Although Direct Potable Reuse (where advanced treated water is directly added to the drinking water infrastructure) could significantly reduce the energy expenditures of pumping, this process is not currently being considered in the San Diego region due to regulatory standards.

Public Perceptions of IPR

In addition to economic and environmental considerations, public opinion of IPR has played a critical role in the political debate, and it became the tipping point for abandoning IPR in 1998. Across the country, other IPR projects have implemented aggressive education campaigns to inform the public that IPR is purified to a point that it is safer than most drinking water available through the current technology used in many water districts today. For this reason, the City of San Diego decided to include a comprehensive education campaign in its current demonstration project to ensure the public understands the city's proposed IPR demonstration project and the

safety factors built into the design. Helix Water District is also engaged in educating water consumers in its district through a series of focus groups and other outreach activities.

A recent 2009 San Diego County Water Authority Public Opinion Poll found that public opinion may be shifting in favor of IPR. 63% of respondents favored advanced treatment of recycled water as an addition to the potable water supply, a significant increase from 28% in 2005. 35% believe that recycled water is already blended with the existing water supply.

Equinox Center Conclusions

As our populations continue to grow, and imported water supplies escalate in cost and become further constrained, San Diego County will require a more diversified water portfolio. IPR has some considerable advantages compared to other water sources, and a few challenges, listed in Figure 6.

Based on costs, energy intensity, environmental and health factors, as well as the positive impact on the business community, Equinox Center's research finds that pursuing IPR as a local, sustainable water source is a sound strategy for regional water agencies to pursue. **Equinox Center concludes that IPR would be a strong, viable addition to the region's water portfolio and will allow us to maintain our quality of life as the region grows.**

Figure 6: Opportunities and Challenges in IPR

Opportunities Associated with IPR	Challenges Associated with IPR
Augments total supply of potable water and reduces reliance on imported water	Cost of building necessary infrastructure such as piping from Point Loma to San Vicente Reservoir, and new or upgraded reclamation facilities
Reliable local supply with huge source potential	Energy intense compared to conservation, groundwater removal, and producing non-potable recycled water
Cleaner than the treated imported water currently distributed by San Diego	Overcoming public safety perceptions
Reduces energy consumption to import water and associated greenhouse gases	Approval from the State of California's Department of Public Health for full scale reservoir augmentation project
Reduces wastewater discharge to ocean; helps address wastewater permitting issues and can help reduce costs of upgrading treatment facilities such as the Point Loma Treatment Plant	Works best when wastewater treatment and drinking water supply agencies are united or working closely together, which is not the case in many San Diego County water districts
Potential to avoid drastic and mandatory water conservation efforts	

Less costly than purple pipe recycled water and desalination	
Maximizes currently available and unused capacity of recycled water	

Appendix 1

Budget and Timeline for the IPR Demonstration Project

In 2006 the City of San Diego's San Diego Water Reuse Study identified IPR as a potential source of local drinking water. The San Diego City Council debated the merits of IPR in 2007 and allocated funds for an IPR/Reservoir Augmentation (RA) demonstration project. In 2007 San Diego Mayor Jerry Sanders vetoed the City Council's plan for the demonstration project for economic reasons but the City Council overrode his veto.

The total cost of the project, including $3.9 million in state and federal funds, is $11,811,000. In 2008, the City Council authorized a temporary water rate increase that went into effect in January 2009 to fund the remainder of the project that was not already covered by the state and federal grants. The rate increase is scheduled to sunset September 30, 2010.

IPR/RA Demonstration Project Budget

Project Management	$1,688,000 *
• Award contract Winter 2010	
Independent Advisory Panel	$250,000
• First meeting May 2009	
AWT Demonstration Plant	$7,400,000
• Estimate award contract Spring 2010	
Reservoir Detention Study	$420,000
• Award contract April 2009	
Pipeline Alignment	$50,000 *
• Project Management contract	
Public Outreach	$1,700,000 *
• Project Management contract	
Contingency	$338,000
TOTAL PROJECT BUDGET	**$11,811,000**
GRANT FUNDING	**$3,970,000**

Source: City of San Diego's Recycled Water Program

PLEASE NOTE that the asterisks denote that the Project Management, Pipeline Alignment, and Public Outreach components are combined as one agreement to be provided by one firm. The other tasks are separate components each requiring a separate agreement with outside firms to provide the service.

After it authorizes funds, the City Council then allocates funds for specific contracts. Funding for the public outreach contract was approved at a January 2010 City Council meeting. The construction contract for the IPR advanced treatment plant was considered by the City Council's Natural Resource Committee in June 2010 and will be considered by the full City Council in July 2010.

Timeline of IPR-related activities, 1997-2010

Year	Action
1997	Strategic Plan for Water Supply launched by City of San Diego
2002	Long-Range Water Resources Plan updates 1997 plan
2006	San Diego Water Reuse Study identifies IPR as a potential source of local water
2007	San Diego City Council debates and passes IPR/RA demonstration project; Mayor Sanders vetoes the place for economic reasons; City Council overrides the veto
2009	San Diego City Council authorizes funds for IPR/RA demonstration project through a water rate increase; approves the contract for public education campaign on IPR project
2010	IPR/RA demonstration project scheduled to commence subject to San Diego City Council contract approval (expected summer 2010)

Sources

Equinox Center gratefully acknowledges the sources that contributed to this paper and research assistance provided by Marc Potash.

Arrandale, Tom. "Flushing Away Fears: Toilet-to-Tap Water Recycling Gets Past the Yuck Factor." Governing Magazine 4 Apr. 2008. http://www.governing.com/topics/energy-env/Flushing-Away-Fears.html .

Barrera, E.A. "Overcoming the Stigma of 'Toilet-to-Tap' Water." San Diego News Network 27 May 2009. http://www.sdnn.com/sandiego/2009-05-27/special-sections/water/overcoming-the-stigma-of-toilet-to-tap-water .

Bertch, Dr. Timothy. "Point Loma Secondary Treatment Discussion: Brief for Council." City of San Diego Metropolitan Wastewater Department 17 Oct. 2009.

Busetti, Francesco, Kathryn Linge, and Anna Heitz, "Analysis of Pharmaceuticals in Indirect Potable Reuse Systems Using Solid-Phase Extraction and Liquid Chromatography–Tandem Mass Spectrometry." Curtin Water Quality Research Centre, Curtin University, Perth Australia. (2009).

"Carlsbad Desalination Project, San Diego, California, USA." Water-Technology. 16 Jul 2010. http://www.water-technology.net/projects/carlsbaddesalination/ .

"Case Study 2: Water Agency and Function Component Study and Embedded Energy-Water Load Profiles." GEI Consultants/Navigant Consulting 2010.

City of Escondido Utilities Department, Telephone Interview with Lori Vereker, 29 June, 2010

City of San Diego Public Utilities Department, E-mail exchange with Equinox Center, 21 Apr 2010.

City of San Diego Public Utilities Department, E-mail exchange with Equinox Center, 17 June 2010 through 28 June 2010.

Dingfelder, Sadie F. "From Toilet To Tap." Monitor on Psychology, American Psychological Association 35.8 (2004). 16 Jul 2010. http://www.apa.org/monitor/sep04/toilet.aspx .

"Energy Down the Drain: The Hidden Costs of California's Water Supply." Natural Resources Defense Council 1 Aug 2004: http://www.nrdc.org/water/conservation/edrain/edrain.pdf .

Guendert, Dawn, Telephone Interview, 22 July 2010

Helix Water District, Presentation to IPR Coalition, June, 2010

"Independent Rates Oversight Committee (IROC) Annual Report on the San Diego Water Department (SDWD) and Metropolitan Wastewater Department (MWWD) for the Fiscal Year ended June 30, 2008." City of San Diego (2009): 10 Feb. 2009. http://www.sandiego.gov/mwwd/pdf/irocannualreport090209.pdf .

"Issues in Potable Reuse: The Viability of Augmenting Drinking Water Supplies with Reclaimed Water." National Research Council 1998.

Khan, Stuart, and David Roser. "Risk Assessment and Health Effects Studies of Indirect Potable Reuse Schemes." Centre for Water and Waste Technology, School of Civil and Environmental Engineering, University of New South Wales, Australia, CWWT Report 2007/08 18 Apr. 2007.

Lee, Mike. "Coastal Panel Grants San Diego Waiver on Pollution, a Potential $1.5 Billion Savings." San Diego Union-Tribune 10 Oct. 2009. http://www.signonsandiego.com/news/2009/oct/07/striking-change-direction/ .

Lee, Mike. "Reclaimed Water Law is Largely Forgotten." San Diego Union-Tribune 8 Mar. 2008. http://legacy.signonsandiego.com/news/metro/20080308-9999-1n8pipes.html .

Lee, Mike, and Terry Rodgers. "Panel to Weight in on Sewage Plant." San Diego Union-Tribune 29 June 2007. http://legacy.signonsandiego.com/news/metro/20070629-9999-7m29loma.html .

Leslie, Greg. "A Question of Energy." Waste Management and Environment 5 Aug. 2004. http://www.wme.com.au/categories/water/august5_04.php .

Lightner, Councilwoman Sherri Lightner. "Memo: Updating the City Council's Water Policies." 1 Oct 2009.

"National Water Research Institute White Paper: Regulatory Aspects of Direct Potable Reuse in California." Publication Number NWRI-2010-01 1 Apr. 2010.

"National Water Research Institute White Paper: Views on the Status of "Water Recycling 2030: Recommendations of California's Recycled Water Task Force." Publication Number NWRI-2009-01 1 May 2010.

"National Water Research Institute Final Report." Meeting of the Independent Advisory Panel for the City of San Diego Indirect Potable Reuse/Reservoir Augmentation (IPR/RA) Demonstra-tion Project 12 May 2009. http://www.sandiego.gov/water/waterreusestudy/pdf/nwrireport.pdf

"National Water Research Institute Final Project Report: Source, Fate, and Transport of Endo-crine Disruptors, Pharmaceuticals, and Personal Care Products in Drinking Water Sources in Cali-fornia." Publication Number NWRI-2010-02 1 May 2010.

"Online Water Calculator." Western-Water. http://www.western-water.com/Acre-Foot_formula.htm .

"Point Loma Wastewater Treatment Plant." City of San Diego. http://www.sandiego.gov/mwwd/facilities/ptloma.shtml .

"Recommendations of a Science Advisory Panel on Monitoring Strategies for Chemicals of Emerging Concern, Draft Final Report", California State Water Resources Control Board 15 Apr. 2010.

"Recycled Water Overview." City of San Diego 1 Jan. 2010. http://www.sandiego.gov/water/recycled/overview.shtml .

"Reservoir Augmentation Demonstration Project." City of San Diego 11 Sept. 2009. http://www.sandiego.gov/water/waterreusestudy/pdf/090911prdemo.pdf .

"Sanders Vetoes Water Recycling." Voice of San Diego 14 Nov. 2007. http://www.voiceofsandiego.org/this_just_in/article_1609d32a-17dd-5882-9204-fbc19303e4f7.html .

"San Diego Water Reuse Study, Final Draft Report." City of San Diego 01 Mar. 2006. http://www.sandiego.gov/water/waterreusestudy/pdf/ir06sec4.pdf

"San Diego's Water Sources: Assessing the Options." Fermanian Business and Economic Institute and Equinox Center. (2010).

Steirer, Marsi. "City of San Diego's Recycled Water Program: UCSD Technical Seminar Series." City of San Diego 1 Jan. 2010.

"Surface Water Ambient Monitoring Program (SWAMP) Proposed Monitoring in the San Diego Region for FY 2010-11." City of San Diego, 1 June 2010. http://www.swrcb.ca.gov/sandiego/water_issues/programs/swamp/docs/updates_June_2010/SWAMP_proposed_monitoring_for_FY_2010-11.pdf .

"U.S. Commercial Services: Water Treatment Technologies and Trends in San Diego." U.S. Department of Commerce. May 2009.

"Water Facts No. 23." California Department of Water Resources, Oct. 2004.

Wilkinson, R. "Methodology for Analysis of the Energy Intensity of California's Water Systems and An Assessment of Multiple Potential Benefits through Integrated Water-Energy Efficiency Measures". Jan. 2009.

"2009 Public Opinion Poll Report." San Diego County Water Authority 2009. http://www.sdcwa.org/about/pdf/PublicOpinionSurvey/2009_SurveyReport.pdf