AGENDA NO. ______

WEST BASIN MUNICIPAL WATER DISTRICT

AUGUST 7, 2002 – Water Resources
McDonald, Little
AUGUST 26, 2002 – Board Meeting
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INFORMATION CALENDAR

WATER QUALITY UPDATE
HOME POINT OF USE SYSTEMS

SUMMARY:

According to a recent water survey conducted on 601 registered voters in the Southern California area, consumers perceive water issues as a future problem, not a current one. An additional survey conducted recently by the Public Policy Institute of California on 2,029 Californians though illustrates that 76% of all California residents do not drink unfiltered tap water in their homes; this figure increases to 80% in the Los Angeles area. This 80% breaks down into 48% drinking bottled water, 32% drinking filtered tap water, and 2% other.

Although consumers may not think of water issues as a current problem, there is enough awareness and concern about the safety and quality of tap water that consumers are taking control. Sales of home water treatment systems have escalated over the past few years, rivaling that of increased bottled water sales. Home water treatment systems come in two basic types; point of use (POU) and point of entry. POU systems are the most common choice for the consumer in today's market.

What are POU Systems?

POU systems are treatment systems installed near the point of use of water; typically at the end of faucets, plumbed under the sink, or placed on the counter. These systems use a variety of technologies to treat only the water used for drinking, cooking, beverage preparation, etc. with the intended purpose to remove or reduce a variety of contaminants in the water.

Who uses POU Systems?

Both consumers and small drinking water systems.

Why are POU Systems used?

Consumers are concerned about a variety of water quality issues including inadequate testing, bad taste or smell, water contamination, lack of choice for water supplier, unappealing appearance, safety, etc. By using a POU system, consumers perceptively feel that they gain control over what they consume and may receive a selective improvement in their water.

The United States Environmental Protection Agency as well as Congress have given the explicit right for small drinking water systems to use POU systems to achieve compliance with maximum contaminant levels established in the National Primary Drinking Water Regulations, except for microbial contaminants. Centrally managed POU systems owned, controlled, and maintained by the public water system have proven useful in rural areas and small communities where constructing, upgrading, or expanding a central treatment plant would be too expensive or would require technical expertise not readily available.

Technology Options

There are many different treatment technologies available with the POU systems. The three main categories of treatment technologies used with POU systems are disinfection, filtration, and ion exchange. Each method targets different contaminants in the water.

Disinfection

Although not the most common choice for home POU systems, disinfection is quite effective on microbiological contaminants. Ultraviolet (UV) radiation is one form of disinfection for POU systems.

> **UV Radiation:** Water passes through a chamber where it is exposed to UV light, whose radiation destroys the genetic material of pathogens, preventing them from reproducing. It is not effective on hard-shelled cysts like Cryptosporidium and Giardia, nor does it remove chemicals, lead, or asbestos. Color, turbidity, and organic impurities in the water can interfere with the UV light actually reaching the pathogens. The UV light must also be replaced annually.

Filtration

Filtration technologies are the most common choice for POU systems and work on a variety of contaminants.

> **Activated Alumina:** Activated alumina is a filter media composed of porous aluminum ore. It will remove fluoride, arsenic, and selenium, but requires periodic cleaning with a regenerant like alum or acid to stay effective.

> **Activated Carbon:** Activated Carbon uses replaceable cartridges containing granular or solid block carbon. The granular activated carbon (GAC) acts as an absorbent for aesthetic compounds such as natural organics, but is also effective in reducing fluoride, a few metals, volatile organic compounds (benzene, trichloroethylene), pesticides, industrial solvents, residual chlorine, synthetic organic compounds, and radon gas. The GAC cartridges must be replaced on a regular basis. GAC is the most popular treatment technology for POU systems in use today.

> Solid block carbon is typically more effective at reducing heavy metals such as lead and mercury, and if a small enough pore size, can be effective against biological contaminants too.

> **Distillation:** Distillation removes all nonmetallic inorganics, metals, microbiological contaminants, physical contaminants, synthetic organic compounds, most pesticides, and radiological contaminants by heating water until it vaporizes as steam. The steam is then cooled until it condenses, and the distillate drips into a container. Distillation does not effectively remove volatile organic compounds so a carbon filter must also be used with a distiller to ensure appropriate removal. A disadvantage to distillation is the high-energy cost to operate it, plus maintenance to remove the built-up contaminants on the boiler side of the unit.

Microfiltration: Microfiltration physically prevents biological contaminants from passing through a very small filter media, and is useful on the full range of biological contaminants. Depending on the media used for the filter, it will need to be either cleaned and/or replaced.

Reverse Osmosis (RO): RO pressurizes water and passes it through a semi-permeable membrane that removes approximately 90% of mineral and biological contaminants such as microorganisms, asbestos, metals, and nitrate. The pollutants collect on one side of the membrane while the pure water collects on the other side. Membranes are replaced approximately once a year. It takes approximately 1-2 gallons of raw water to produce one gallon of RO water.

Ion Exchange

Ion exchange consists of a resin bed loaded with anions and cations. The process essentially swaps anions and cations from the resin bed for anions and cations of the contaminant that's being removed. Over time, the anions and cations on the resin bed are exhausted and must be recharged by backwashing a solution rich with anions and cations through the bed. Ion exchange is most often used in water softeners, but is also used in POU systems to remove mercury, nitrates, arsenic, lead, and radium.

Pitcher Filters

Pitcher filters (Brita, PUR, Omni) tend to use an activated carbon treatment technology, sometimes combined with ion exchange, activated alumina, or microfiltration. As convenient as they are, and popular to those under age 35, they are limited in the contaminants they remove. Pitcher filters are designed to improve the aesthetics of drinking water first and foremost, but can remove lead, copper, and/or cysts.

The table below categorizes what treatment technologies most effectively work on some of the constituents that are of current interest to consumers today. However, treatment efficiency is based on individual POU systems and can vary greatly.

Most Efficient Technology to Remove/Reduce Constituents of Interest

	Disinfection	Filtration						
Constituent of Interest	**UV Radiation**	**Activated Alumina**	**Activated Carbon**	**Distillation**	**Micro-filtration**	**RO**	**Ion Exchange**	**Pitcher Filters**
Arsenic		X		X			X	
Bacteria	X			X	X	X		
Chlorine			X	X		X		X
Chromium-6				X		X		
Fluoride		X	X	X		X		
Taste and Odor			X	X		X		X
Total Dissolved Solids (Salts)				X		X		
TCE/PCE			X	X				

Are POU Systems Regulated?

Home treatment systems are not regulated by federal, state, or local laws. However, most POU systems, as well as home water treatment systems, are tested, inspected, and certified by the National Sanitation Foundation (NSF). The NSF is an independent, not-for-profit testing organization. A majority of POU manufacturers voluntarily submit their products to the NSF, who then performs analytical testing in NSF-laboratories to validate the claims of the POU systems submitted. Tests are conducted to ensure compliance with established NSF standards for aesthetic and health conditions, and for specific treatment technologies.

The NSF also performs unannounced manufacturing plant inspections and periodic re-tests of products.

To receive the NSF certification, five basic requirements must be met:

1. Contaminant reduction claims are true,
2. System is not adding anything harmful to the water,
3. System is structurally sound,
4. Advertising, literature, and labeling are not misleading,
5. Materials and manufacturing processes don't change.

The NSF certification process essentially takes the place of federal regulations. However, some states also establish their own regulations, such as California, who requires that all filters sold in the state clearly have the NSF certification rating marked.

What is the Cost of POU Systems?

When the Los Angeles Department of Water and Power conducted a focus group on consumer's perceptions of water quality, cost of a POU system was the only significant negative mentioned. Otherwise, consumers reacted favorably to POU systems.

When purchasing a POU system, consumers pay out an initial cost, but also acquire maintenance costs to keep the system in proper working condition. Besides the maintenance costs listed below, consumers may also choose to have expensive laboratory tests conducted to ensure maximum performance by their POU system.

Purchase and Maintenance Costs

Technology Option	Daily Treatment/Storage Capacity	Initial Cost	Maintenance Costs
Activated Carbon	Variable	\$10 - \$800	Regular carbon cartridge replacement
Distillation	5 – 11 gallons	\$100 - \$1,200	High energy cost to operate system
Pitcher Filters	Variable	\$30-\$50	Regular filter replacement
RO	3 – 10 gallons	\$40 - \$900	Regular membrane replacement
UV Radiation	Variable	\$300 - \$900	Ultraviolet light replacement

POU systems, if not properly and regularly maintained may adversely affect drinking water quality, and actually create water quality problems worse than the original tap water. The time and money must be invested into maintenance.

Over the long-term these costs magnify and must be considered before investing in a POU system, versus using your tap water. The table below illustrates a comparison in long-term costs between tap water, bottled water, and some of the more common POU systems for a family of four, based on an average faucet use of 22 gallons a day (2 for drinking, 20 for kitchen faucet).

Long-Term Costs

Technology Option	Detailed Costs	Total Cost for treating water 1 year (8,030 gallons)*
Tap Water	< $0.01 per gallon	< $80
Bottled Water	~ $0.85 per gallon	~ $620.50**
Activated Carbon	$330 initial cost, $50 cartridge replacement annually	$380
Distillation	$250 initial cost, ~ $0.30 per gallon to operate	$2,659
Pitcher Filter	$30 initial cost, $10 filter replacement every 40 gallons	$212.50**
RO	$600 initial cost, $65 membrane replacement annually	$665
UV Radiation	$500 initial cost, $80 UV light replacement annually	$580

* Does not include tap water costs that are still incurred.
** Based on drinking water only (730 gallons). Does not include faucet use.

Conclusions

Although consumers perceive water issues as a future problem, many are concerned enough now to take action by purchasing home water treatment systems, nearly two-thirds of consumers use some type. Sales exceeded 5 million units in 1999 alone, which indicates cost is not a factor compared to the consumer's comfort level. Since nearly nine out of ten adults have some concern with their drinking water quality and POU systems give them some feeling of control over what they are consuming, it's clear why the home water treatment system industry is booming.

<u>FISCAL IMPACTS:</u>

None.

<u>ENVIRONMENTAL COMPLIANCE:</u>

Not applicable.

<u>COMMITTEE STATUS:</u>

This item was reviewed by the Water Resources Committee on August 7, 2002 and agendized to the August 26, 2002 Board meeting as information.

<u>RECOMMENDED MOTION:</u>

This item is for information only.

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