THINK OUTSIDE THE BOTTLE

RESPONSIBLE PURCHASING **GUIDE**

bottled water alternatives

RPN
Responsible Purchasing Network
Center for a New American Dream

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CORPORATE ACCOUNTABILITY INTERNATIONAL
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about this guide

Think Outside the Bottle: the Responsible Purchasing Guide to Bottled Water Alternatives is a joint effort by the Responsible Purchasing Network and Corporate Accountability International. The Guide is published in print, as a PDF file, and on the web. Visit www.ResponsiblePurchasing.org to download a free copy or access the web-based edition of the Guide.

about the Responsible Purchasing Network

The Responsible Purchasing Network (RPN) was founded in 2005 as the first national network of procurement-related professionals dedicated to socially and environmentally responsible purchasing. RPN is a program of the Center for a New American Dream (www.newdream.org) and guided by a volunteer Steering Committee of leading procurement stakeholders from government, industry, educational institutions, standards setting organizations, and non-profit advocacy organizations.

about Corporate Accountability International

Corporate Accountability International saves lives and protects public health by forcing corporations to halt abusive practices. Corporate Accountability International's Think Outside the Bottle campaign is a collaborative effort with the Center for a New American Dream and other major national organizations, communities of faith, student groups, cities, celebrities and concerned individuals across the country. The campaign encourages cities, institutions and individuals to support strong public water systems over bottled water. On the web at www.ThinkOutsidetheBottle.org.

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OVERVIEW

SOCIAL AND ENVIRONMENTAL ISSUES

Americans bought a total of 8.8 billion gallons of bottled water in 2007. According to one estimate, producing these bottles required the energy equivalent of over 17 million barrels of oil and produced over 2.5 million tons of carbon dioxide. This is the same amount of carbon dioxide that would be emitted by over 400,000 passenger vehicles in one year. Nearly 50 billion new PET (polyethylene terephthalate) plastic bottles were produced in 2005 from virgin rather than recycled materials, producing additional greenhouse gases. In 2004, only 14.5 percent of non-carbonated beverage bottles made from PET were recycled. For each gallon of water that is bottled, an additional two gallons of water are used in processing. Many of these impacts can be easily avoided by switching to tap water, filters, fountains and coolers when necessary.

BEST PRACTICES

In a few short years, Americans have become dependent on the convenience of bottled water, so switching to alternatives can seem daunting. But institutional buyers can transition to tap water with relative ease if they use a combination of common sense, careful planning, and the best practices outlined in this Guide, such as the following:

- Involve stakeholders in the process;
- Measure bottled water impacts and project cost and environmental savings from switching to alternatives;
- Upgrade bottle-less infrastructure such as water fountains;
- Cancel or amend bottled water contracts and identify, purchase, and implement alternatives such as filters, fountains, bottle-less coolers, and reusable containers; and
- After implementation, review the program's effectiveness, report the results and recognize the efforts of the people involved in the effort.

COST, QUALITY, AND SUPPLY

On average, the cost to treat, filter, and deliver water to ratepayers in the United States is 0.2 cents per gallon – roughly 750-2,700 times cheaper than bottled water on a per gallon basis. For the most part, this water is also very safe. Over 90 percent of U.S. municipal water systems regularly meet or exceed the EPA's regulatory and monitoring requirements. However, a wide variety of cost-effective water filters are easily available to remove contaminants when they exist. Compared to bottled water, water fountains save money, especially when installed in easily accessible, highly visible areas such as main hallways, waiting areas, and cafeterias. Bottle-less water coolers are another smart option, drawing water from the tap and eliminating the expense of purchasing bulk bottled water. Reusable drinking water containers have low lifecycle costs and have lower human and environmental impacts than single-serve plastic bottles.

POLICIES AND SPECIFICATIONS

A growing number of institutions are phasing out bottled water procurement and switching to alternatives. Their policies, which serve as models for others to replicate, typically:

- Prohibit organizational purchase of bottled water;
- Include phase out timelines;
- Specify alternatives, such as filters, fountains, and bottle-less coolers; and
- Include exceptions for emergency situations or when alternatives are unavailable.

STANDARDS

The EPA sets standards for public water systems. The leading standards for water treatment units (e.g., filters, treatment systems, chemicals) are NSF/ANSI standards 42, 44, 53, 55, 58, 60, 61, and 62.

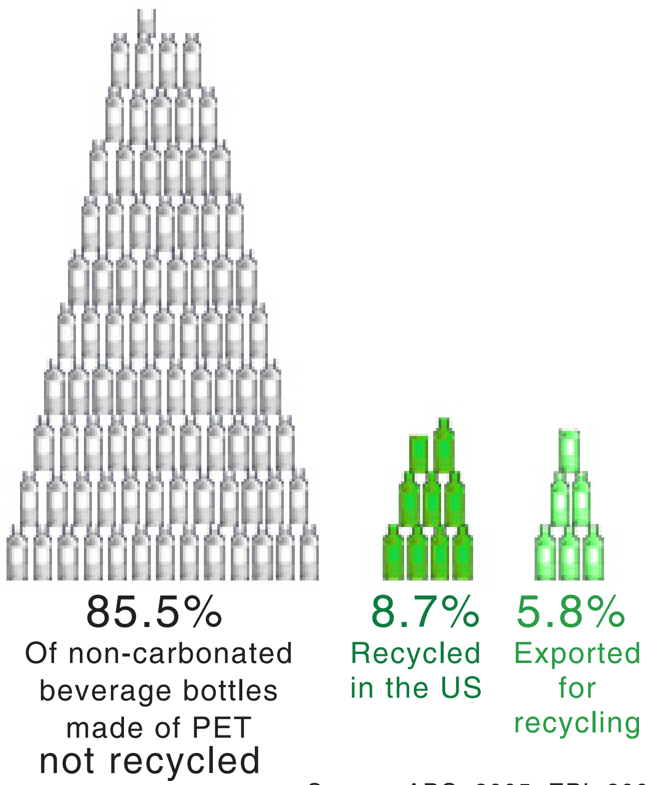
CONCLUSION

Bottled water is environmentally damaging and wasteful. Given the wide availability of safe, low-cost tap water, and the wide array of appropriate and cost-competitive filters and other drinking water dispensing equipment, switching to tap water saves consumers money and dramatically reduces environmental impacts, including greenhouse gas emissions, water consumption, and waste generation. A growing number of buyers, both public and private, are thinking outside the bottle and making the switch – providing models by which others can replicate their success. We hope this guide will ease your organization's transition to bottled water alternatives while cutting costs and lightening your environmental footprint.

Americans bought a total of 8.8 billion gallons of bottled water in 2007, sold in a variety of containers from small single-serving bottles to multi-gallon water cooler bottles (BMC, 2008).

The increasing popularity of bottled drinking water has significant environmental and social impacts, from the energy used to produce the plastic containers and deliver filled bottles to consumers, to the concentrated water withdrawals near bottling facilities, to the plastic waste from discarded bottles. By choosing tap water over bottled water, institutions can significantly reduce negative environmental impacts.

Figure 1: Percentage of Plastic Bottles Recycled (2004)



Source: APC, 2005; EPI, 2006

ENERGY AND GREENHOUSE GAS EMISSIONS

Extraction, pumping, bottling, transporting, and chilling bottled water is less energy efficient than using the existing network of reservoirs, storage tanks, and pipes that furnish tap water to most homes and buildings in the U.S. (EPI, 2006).

Most plastic water bottles are energy intensive and derived from petroleum. Ninety-six percent of the bottled water sold in the U.S. in 2005 was sold in petroleum-based polyethylene terephthalate (PET) containers, most of which were single-serve sizes of one liter or less (CRI, 2007). In 2006, nearly 900,000 tons of PET was used to make bottles for U.S. consumption. According to one estimate, producing these bottles required the energy use equivalent of more than 17 million barrels of oil, and produced over 2.5 million tons of carbon dioxide (Pacific Institute, n.d.) – about the same amount of CO_2 emitted by 400,000 passenger vehicles in one year (EPA, 2007a).

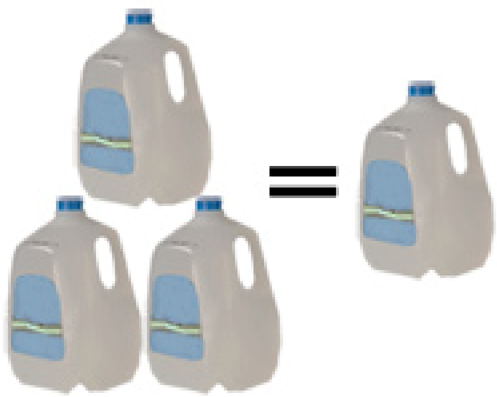
While PET is considered less toxic than many plastics, manufacturing PET resin does generate toxic air emissions in the form of nickel, ethylbenzene, ethylene oxide and benzene (EC, 1996). Furthermore, nearly 50 billion new PET plastic bottles were produced in 2005 from virgin rather than recycled materials, thus producing additional greenhouse gases (CRI, 2007).

END OF LIFE MANAGEMENT

Most plastic water bottles are discarded as trash. In 2004, only 14.5 percent of non-carbonated beverage bottles made from PET were recycled —see Figure 1 (APC, 2005). In 2004, almost 40 percent of the PET bottles for recycling in the U.S. were exported—often to China—requiring additional energy to transport (EPI, 2006). There are also concerns about lax environmental and worker safety standards of overseas recyclers, producing yet more

Figure 2:

For each gallon that goes into bottles, two additional gallons are used in the purification process



Source: UCS, 2007

pollution while endangering the health of workers (Vidal, 2004).

When bottles are burned in industrial incinerators, hazardous materials such as chlorine and dioxin can be released into the air (CRI, 2007).

WATER WASTE

Water resources on local, regional, national, and global scales are becoming even more precious due to increasing population and issues related to climate change. Ironically, it takes substantially more than one gallon of water to produce and distribute one gallon of bottled water. Millions of gallons of water are used in the plastic-making process, and for each gallon that goes into the bottles, two additional gallons are used in the purification process see Figure 2 (UCS, 2007).

LOCAL WATER RIGHTS

Bottling plants can adversely affect local water supplies. Pumping large quantities of water can deplete underground aquifers that supply water to local communities and aquatic wildlife habitats (EPI, 2006). The appropriation of public water supplies by private entities raises social justice concerns when local users are displaced and public resources are commodified (EPI, 2006). These concerns are heightened in the case of imported water, where less affluent local populations may be deprived of vital water resources in order to provide "convenience" water to consumers elsewhere (IFG, 2001).

WATER QUALITY ISSUES

Marketing commonly implies that bottled water is somehow more "pure" than other choices. According to 1999 government and industry estimates, about one fourth of bottled water is actually bottled tap water (and by some accounts, as much as 40 percent is derived from tap water), sometimes with additional treatment, sometimes not (NRDC, 1999).

In the U.S., tap water is actually more closely regulated than bottled water. Under the Safe Drinking Water Act, the Environmental Protection Agency (EPA) is responsible for tap water standards whereas bottled water is regulated by the Food and Drug Administration (FDA). The FDA standards are based on the EPA's tap water standards. However, FDA testing is less frequent and covers fewer contaminants. Moreover, FDA rules do not apply to water packaged and sold within the same state (NRDC, 1999).

The Natural Resources Defense Council (NRDC) completed a four year study in 1999 and found that one-third of 103 brands of bottled water studied contained some levels of contamination, including traces of arsenic and E. coli. The study did not conclude that bottled water quality on the whole was inferior to that of tap water, but cautioned that the regulatory framework for bottled water is inadequate to assure consumers of either purity or safety (NRDC, 1999).

Chemical leaching from plastic bottles is an additional concern. Polyethylene terephthalate (PET, PETE, or #1), the plastic used for packaging most single-serving bottled waters, is not meant for repeated use, but consumers often do refill and reuse these bottles. PET plastic is considered more stable and less prone to leaching than other forms of plastic, but studies suggest that with repeated use PET containers may release di(2-ethylhexyl) phthalate (DEHP), an endocrine-disrupting compound and probable human carcinogen (Masterson, 2006). Another study found elevated levels of antimony in water bottled in PET bottles, and traced the source of contamination to the bottles themselves, although the concentration levels were below those currently considered safe for drinking water in the U.S. and Canada (SKC, 2006). Studies have also found that toxin concentrations increase the longer the water is in the bottle (Masterson, 2006).

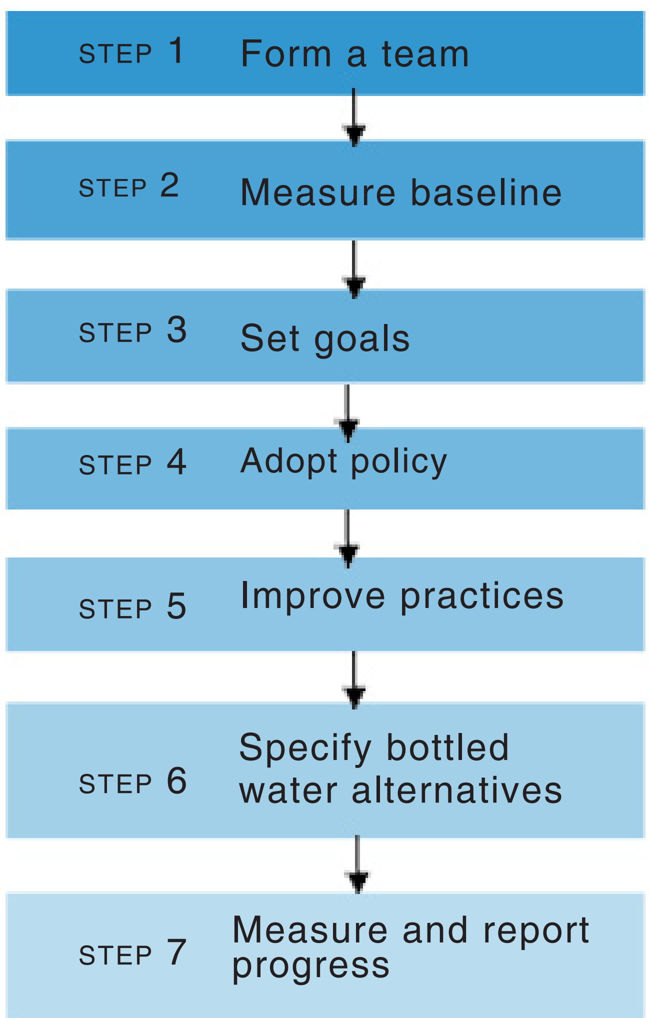
In many cases, simply switching from bottled water to tap water addresses these concerns. However, not all tap water is the same. The EPA reports that over 90 percent of U.S. public water systems meet its standards for safety (EPA, 2007). Even so, due to a combination of pollution and deteriorating equipment and pipes, some public water systems deliver drinking water that contains contaminant levels which exceed EPA limits (either legal limits or unenforced suggested limits) and may pose health risks to some residents. Addressing the problem of aging water infrastructure will require significant investments, but evidence suggests that this investment pays off in increased economic activity. Data from a joint U.S. Conference of Mayors and Cadmus Group study shows that "a $1 increase in local government spending on water and sewer infrastructure and operations and maintenance (O&M) increases total local economic activity by $2.62" (USCM, 2008).

In summary, quality concerns exist for both tap water and bottled water. Before implementing a new policy or practice prohibiting or limiting bottled water, check the EPA's online database of reports from local water quality districts: www.epa.gov/safewater. If the report you need is not in the database, your water district is required to produce and mail a report to customers upon request.

BEST PRACTICES

This section discusses best practices for phasing out bottled water and transitioning to alternative methods of dispensing water such as water filters, bottle-less water coolers, and fountains. We also discuss reusable water bottles.

Figure 3: Best Practices Flow Chart



Best practices include forming a team dedicated to the task, establishing baseline data, setting goals, adopting a policy, improving current behaviors, specifying bottled water alternatives, and measuring and reporting progress (see Figure 3).

1. FORM A TEAM

Form a Drinking Water Team of staff representatives responsible for identifying and implementing bottled water alternatives (see Table 1). Smaller institutions may only need one person to spearhead such an effort. The Team's tasks should include:

- Developing a rationale for phasing out bottled water (e.g., cost savings, waste reduction, public pressure, etc.);
- Identifying the availability and feasibility of alternatives;
- Proposing a timeline to phase-out bottled water and switch to alternatives;
- Presenting an implementation plan to key decision makers; and
- Reporting on progress.

2. MEASURE BASELINE INVENTORY AND IMPACT

Gather the data needed to establish the costs, waste generation and other environmental impacts of current bottled water consumption as a basis for tracking progress.

Table 1: Drinking Water Team Staff & Responsibilities

Staff	Responsibilities
Executives & Senior Management	• Empower and support the program (see Adopt a Policy, below)
Sustainability Committee	• Quantify financial and environmental impacts of current bottled water consumption (also see Measure Baseline Inventory and Impact) • Estimate environmental and cost benefits of alternatives
Environmental Health & Safety	• Test water quality at building entry points and points-of-use and report results (see Box 1, below) • Determine whether water treatment is needed • If treatment is necessary, work with procurement team to identify the best products to meet water quality needs
Procurement	• Cancel/amend bottled water contract(s) • Issue contracts for bottled water alternatives (see Specify Bottled Water Alternatives)
Facilities Management & Staff	• Replace water filters • Maintain and clean fountains and coolers
Events & Conferences, Catering & Dining, Retail & Convenience Store	• Replace bottled water with alternatives • Educate staff on reasons for the switch and availability and location of alternatives
Communications & Publications	• Create and distribute signage and educational materials • Issue press releases about the initiative

Include these data points in the inventory:

- Bottled Water Consumption
  - Volume, type, and cost of bottled water currently purchased.
  - Location where bottled water is being purchased (e.g., dining areas, vending machines, administrative offices, and on-site retail stores).
  - Entity purchasing the bottled water and the reasons for their purchase.

- Revenue earned from bottled water sales in dining areas, on-site retail stores, vending machines, etc.
- Amount of waste generated from plastic water bottles and the associated cost of recycling and disposal. For single-stream recycling venues, calculations can be based on total waste, but results may be less accurate.

▶ Consumption of Other Bottled Beverages

- Volume of other bottled beverages (e.g., soda and juice) purchased and amount of revenue earned through sales of those beverages.

▶ Tap Water

- Tap water consumption by building, facility or department.
- Results of tap water quality tests at building entry points, faucets, fountains, or water lines (see Box 1).
- Number of water fountains currently in place, amount of water consumed from each, and condition and functionality.
- Number of bottle-less water coolers in use and the amount of water consumed from each.

▶ Identify Needs of Final Users

- List who drinks building tap water.
- Note any at-risk populations such as the young, elderly, pregnant, and immuno-suppressed that may be sensitive to certain water contaminants.
- Calculate quantities of water needed by these populations.

3. SET GOALS

Set goals and timeframes for eliminating bottled water consumption, saving money, and reducing environmental impacts. Aim to reduce or eliminate bottled water procurement within 6-12 months. Use our Calculator to project cost savings and environmental benefits such as waste reduction and greenhouse gas emissions reductions, and establish these projections as goals.

Box 1: Determine Water Quality

Prior to phasing out bottled water, find out if your water has contaminants. Obtain water quality information from a Consumer Confidence Report (CCR) from the local water utility company, and/or by testing your on-site water.

While water testing can be costly, many local health departments offer free or low-cost water testing kits. Call the Safe Drinking Water Hotline (800-426-4791) to find what is offered by local health departments.

Or use this EPA list to find a state-certified testing laboratory: http://www.epa.gov/safewater/labs/index.html.

Companies such as National Testing Labs (www.ntllabs.com, 800-458-3330) can test for dozens of contaminants by mail. Consumer Reports found that low-cost test kits such as the Watersafe All-In-One Drinking Water Test Kit ($18) provide "quick, accurate results for chlorine, lead, nitrate, nitrite, two pesticides, pH, and total hardness" (CR, 2007a), though "results for bacteria were less reliable and required waiting 24 hours."

Water quality should be monitored on a regular basis and additional testing may be necessary for groups with higher health risks such as the very young, the elderly, pregnant women, and consumers with weakened immune systems (GG, 2007). These populations can be at risk even when contaminant levels are at or below legal standards.

The degree and pace of reduction or elimination depends partly on whether users embrace or reject the change. If resistance is expected, allow for a phase-out period while efforts are made to persuade stakeholders. Be sure to research bottled water alternatives before implementing a ban so that replacements are ready to be substituted as soon as a ban is enacted. Analyze and factor in the staff, time, and money it will take to ensure compliance with bottled water bans, especially in high-resistance situations.

4. ADOPT A POLICY

Adopt an official procurement policy outlining the general goals related to providing drinking water and establishing accountability. The policy can be a brief Executive Order or can be incorporated into the institutional sustainability plan, procurement policies, and event and conference policies.

A drinking water policy should:

- State a rationale for reducing or eliminating bottled water;
- Establish a team for implementation;
- Authorize funding;
- Identify preferred alternatives;
- Address potential exceptions;
- Set a timeline for implementation; and
- Mandate tracking and reporting procedures.

Refer to the Policies section of this Guide for sample policies.

5. IMPROVE PRACTICES

Changing certain practices related to drinking water can help reduce wasted water and ease transition to bottled water alternatives. For example:

- **Maintain, renovate and/or upgrade existing drinking water infrastructure**. When practical and economical, retrofit fountains, filters, and bottle-less coolers. Locate fountains and coolers strategically, such as in high traffic areas and next to beverage vending machines. Train facilities staff to properly maintain existing fountains, filters and bottle-less coolers.
- **Replace bottled water at conferences and events**. Request that event venues provide adequate tap water and service containers, such as fountains, plumbed-in dispensers, mobile insulated water coolers (like those seen at sporting events), pitchers, glasses, or other reusable containers; and prohibit event caterers from selling or distributing bottled water. In event registration materials, encourage participants to bring reusable containers. Provide reusable bottles or glasses at events, either as a complimentary registration gift or for sale. If reusable containers cannot be supplied, use 100 percent compostable or recyclable cups and establish appropriate receptacles and collection methods. Note locations of watering stations during conferences and in venue maps.
- **Switch to bottle-less coolers**. Bottle-less coolers filter, cool and/or heat water on demand, directly from taps. These plumbed-in coolers are cost competitive with bottled water coolers and most come with multi-year service contracts.
- **Switch to ENERGY STAR rated coolers**. If unable to switch to bottle-less coolers, switch remaining

bottled water coolers to ENERGY STAR rated coolers. (Note: currently no bottle-less water coolers are registered as ENERGY STAR compliant.)

- **Eliminate disposable beverage containers**. Do not place disposable cups near coolers. Instead, supply glasses or other reusable containers.
- **Plan for emergency situations**. Emergency preparedness requires advance planning. Make planning for tap water delivery a priority. Bulk purchase of bottled water should be a last resort.
- **Communicate changes**. Place signs near vending machines, kitchens, cafeterias, meeting rooms, etc., explaining the bottled water phase-out and the alternatives that are being made available.

6. SPECIFY BOTTLED WATER ALTERNATIVES

Cancel or amend existing contracts that include bottled water (either single serve or bulk) for offices, events/conferences, in-house retail or convenience stores, dining services, vending services, and cooler services. If necessary, identify, purchase and implement alternative methods of water dispensing such as filters, fountains, bottle-less coolers, and alternative methods of water supplying, such as reusable containers.

Filters. Filters are commonly part of coolers, some fountains, and some reusable bottles but are not always necessary. Based on tap water testing (see Box 1, above), determine whether filters will be needed and, if so, which filters will best remove unwanted materials from the water (e.g., lead, chlorine, chloramine). Note that some water tests may not indicate whether chlorine or chloramine are in the water, but this information can be obtained from the local water utility.

Specify filters that meet NSF/ANSI standards and are certified to remove the contaminant(s) of concern (NRDC, 2005). See the Standards section of this Guide for more information on NSF/ANSI and Addenda III and IV for detailed charts on water contaminants and filtration methods. When possible, purchase filters from a manufacturer with a filter cartridge take-back or recycling program.

Maintain filters according to manufacturer instructions in order to ensure safe, continuous water filtration and to prevent old filters from releasing harmful materials into the water (NRDC, 2005). Maintenance may include regular filter cartridge or membrane changes or professional cleaning. For units without filter-life monitors, mark the filter-change dates on a calendar. The Centers for Disease Control recommend "wearing gloves and washing hands after changing the filter cartridge – a task to be avoided by people with weakened immune systems" (McEvoy, 2004). Some filter models offer service and maintenance contracts to keep the unit running at peak performance.

Fountains. Since water fountains already exist in many buildings, they are an easy alternative to bottled water. There are four basic types of drinking water fountains:

1. Box-shaped floor models that stand alone or are connected to a wall
2. Models with a pedestal base (also known as 'bubblers')
3. Wall-mounted units that do not touch the floor, allowing wheelchair access
4. Models built into and flush with the wall

Key features to seek when purchasing drinking fountains include:

- **Easy Installation**: Choose fountains that provide quick access to the inside of the unit. This makes installation and maintenance faster and less of a hassle. The height of the water stream should also be easy to adjust and should ideally be adjusted at the time of installation.

- **Durability**: Look for materials made to last such as painted metal or engineered plastic (Sorensen, 2004). Stainless steel is also a strong, easily maintained and aesthetically pleasing option.
- **Easy to Clean**: Purchase fountains with "smooth surfaces and a minimal number of parts" (Sorensen, 2004).
- **Safe Design**: Blunt corners will help prevent injury.
- **Indoor vs. Outdoor**: Make sure the fountain purchased is designed for the environment in which it will be used. Most fountain models are for indoor use, but units do exist for outdoor and extreme temperature conditions.
- **Manufacturer Reputation**: Look for companies with a good reputation for providing superior customer service and products. Ask fountain companies to provide customer references.
- **Free Services**: Some companies offer free shipping, installation, or package deals. These can greatly reduce total costs.
- **Taller Spigots**: These enable users to fill up large reusable bottles with fountain water. Existing fountains can be retrofitted to accommodate these bottles and such requirements should be written into building standards and specifications for new fountains.

Coolers. Consider these factors when evaluating bottle-less water coolers:

- **How much money is available for bottle-less water coolers**. Determine how much money can be invested in installing bottle-less coolers and how much is budgeted for monthly or annual fees for maintenance, repairs, etc.
- **The number of people needed to be served by coolers**. Calculate the total number of people who will need to access coolers, and the number of people each individual cooler must serve. Different size coolers may be better suited for different departments/areas based on their cold water production capabilities. Be sure to include staff as well as visitors.
- **Desired features for coolers**. Major health-focused features can include a filter or UV disinfection light. Minor, more aesthetic or convenience-oriented features can include an LED readout screen; a monitor that tells when the dispenser's catch tray is full; an alert that tells when the UV light has burned out; or special leak protection hardware. Some coolers also have built-in meters that measure water use, a useful tool that can help an institution monitor how much their coolers are being used.
- **Quality of the institution's municipal water supply**. This will determine whether the cooler needs to have a filter, and if so, the appropriate type of filter. See Box 1, above, for information about determining water quality.

Reusable Bottles. Purchase bottles designed for reuse that can be filled with tap water. For maximum effectiveness, combine the use of reusable bottles with alternative methods of water dispensing such as filters, fountains, and bottle-less coolers. Buyers should consider the safety, recycled content and recyclability of bottle materials (such as metal, plastic, glass or ceramic), including materials used as inner linings. Benefits and drawbacks of reusable bottle options are discussed in the Cost, Quality, and Supply section of this Guide. It is important to note that PET bottles (#1 plastic) -- the ones used for packaging most bottled water -- are meant for one time use, not for reuse, so they should not be considered as a viable long-term reusable bottle option.

7. MEASURE & REPORT PROGRESS

Conduct regular reviews to determine effectiveness and maintain commitment to bottled water alternatives. Compare baseline data with current practices based on the timeline set out in the policy. Use RPN's Bottled Water Calculator to measure cost savings and environmental benefits achieved. Identify:

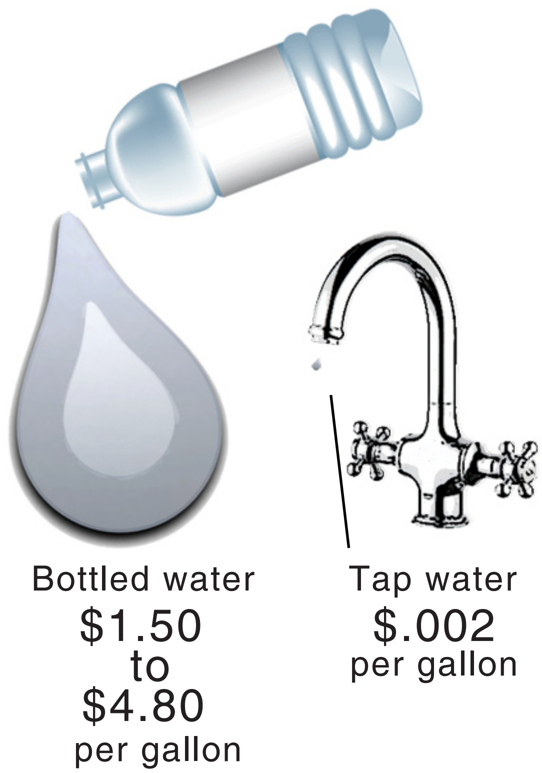
- Consumption of bottled water reduced,
- Money saved,
- Water conserved,
- Waste prevented, and
- Emissions reduced.

Identify whether there were obstacles to success and whether goals need to be reoriented. Publish and distribute periodic progress reports.

Americans enjoy one of the safest, most comprehensive and lowest cost public drinking water systems in the world.

Bottled water is typically 750-2,700 times more expensive than tap water. Though contaminants can and do threaten the nation's water safety, a wide range of cost effective products are available to deliver clean tap water, and many municipalities are taking action to reduce risks associated with contamination.

Figure 4:
Cost comparison of tap water versus bottled water



TAP WATER

On average, tap water costs 0.2 cents per gallon in the U.S (EPA, 2004) – roughly 750-2,700 times cheaper than bottled water on a per gallon basis, although this cost varies regionally—see Figure 4. For instance, the City of Seattle determined that bottled water costs $8 per gallon while tap water costs 0.3 cents per gallon—nearly 2,700 times less (from Seattle's Executive Order Restricting Bottled Water; see Policies below).

Over 90 percent of U.S. municipal water systems regularly meet or exceed the EPA's stringent regulatory and monitoring requirements (EPA, 2007). Federal law requires water utilities to issue annual Consumer Confidence Reports (CCRs), also called "right-to-know" reports, identifying the sources and quality of municipal water. Municipal water customers should receive a CCR in the mail by July 1 each year, although customers of systems serving fewer than 10,000 people may not receive reports via mail. Many CCRs are available online at www.epa.gov/safewater/dwinfo.htm and can be requested from the local water supplier or from the EPA's Safe Drinking Water Hotline (800-426-4791). Reported levels in CCRs are based on annual averages, but spikes can occur at certain times—for example, when spring rains raise nitrate levels (CR, 2007a).

These resources help consumers read and understand CCRs:

- Consumer Reports, "Deciphering your water report", May 2007 http://www.consumerreports.org/cro/home-garden/kitchen/water-filters/water-filters-5-07/deciphering-your-water-report/0507_filter_report.htm?resultPageIndex=1&resultIndex=1&searchTerm=deciphering%20water
- Campaign for Safe and Affordable Drinking Water http://www.safe-drinking-water.org/rtk.html

Contaminants come from a variety of sources, including municipal and agricultural pollution, wells, faulty and aging pipes, flawed water treatment systems, and even from the natural environment (see Addendum III). There are three types of contaminants: microbes, chemicals, and metals (CR, 2007a), all of which can cause serious health effects. Water contamination is of special concern to children, the elderly, pregnant women, and those with weakened immune systems. These populations may experience adverse health effects even if contaminants are at or below legal limits.

While safety is legally regulated and monitored, "drinkability" is more subjective, including aesthetic characteristics such as odor, appearance, and taste. These subjective qualities, however, can be equally vital in ensuring a successful switch from bottled to tap water. Consumers may reject perfectly safe water if they consider its aesthetic qualities displeasing. Water tests and employee polls may help an organization identify and appropriately address any unpleasant non-health-related characteristics of its tap water supply.

WELLS

Private wells supply drinking water for over 40 million Americans. Well water is not regulated by the EPA and should therefore be tested annually by a state-certified laboratory. Contaminants of particular concern for well-users include arsenic, nitrates, coliform bacteria, and total dissolved solids (TDS) (GG, 2007). Additionally, tests for radon and pesticides should also be conducted if they are known to exist in the area. Contact the state or local health department to find out which contaminants may be problematic in a particular region. For more information about wells and well water, contact the Water Systems Council at www.wellcarehotline.org or 888-395-1033.

Box 2: Used Filter Take-Back and Recycling

Since 1992, the European branch of the BRITA company has been collecting filter cartridges to separate and recycle component materials (TBTF, n.d.). However, when Clorox bought BRITA North America (the most popular water filter system in the U.S) (TBTF, n.d.), this practice was not extended to the U.S.

A few smaller filter manufacturers offer refillable cartridges and/or filter take-back programs – such as TerraFlo and Abundant Earth.

Box 3: Filter Labeling Requirements

In California, Wisconsin, Massachusetts, and other states, manufacturers are required by law to disclose in product literature information such as filter replacement cost, filtration method and style, and contaminants removed.

For more information on common tap water contaminants and their health effects, see Addendum III and NRDC's Drinking Water Report http://www.nrdc.org/water/drinking/uscities/contents.asp.

WATER FILTERS

Where safe, clean, aesthetically appealing tap water is available, filters are an unnecessary expense. However, it is important to use filters when water contains contaminants or has undesirable subjective qualities such as unpleasant taste or smell. Water filters range widely in cost, quality and supply. There are two general types of filters: point-of-entry (whole building) and point-of-use (counter top, carafes, faucet mount, under counter).

Water filtration can be accomplished through a variety of methods, including adsorption, filter membranes, distillation, and disinfection. Addendum IV describes some of the most common filtration methods.

Filters come in a wide array of shapes, sizes, and styles to suit performance, convenience, and aesthetic needs. Enhanced features include LED readout screens, electronic touchpads, digital clocks, and monitors or alarms that indicate the need for cartridge replacement. Addendum V describes some common filter styles.

Consider the following when choosing a water filter:

- **Contaminants**. Which contaminants need to be removed and which filtration method removes them? See Determine Water Quality (Box 1) and the Tap Water and Wells sections above for more information on how to determine tap water quality. See the NSF International web site (http://www.nsf.org/certified/dwtu) for a database of drinking water treatment units certified to remove specific contaminants.
- **Location**. Where will filters be located (counter, cabinet, floor, refrigerator) and how much space is required and available?
- **Replacement**. How often do filter cartridges or membranes need to be replaced?
- **Installation**. Is the unit and filter easy to install, clean and change (GG, 2002)?
- **Performanc**e. Will the filtration unit maintain a steady flow rate throughout its lifespan (GG, 2002)?
- **Maintenance**. Who will maintain and clean the unit? When? Will training be required?
- **Resources**. How much energy and excess water does the unit use to filter water?
- **Price**. Factoring in all of the below, estimate cost per gallon of filtered water:
  - Filtration unit price
  - Annual filter and unit replacement costs
  - Cost of electricity required to operate the unit
  - Maintenance and cleaning costs, including cleaning products and staff time

Benefits of water filters include:

- **Low Cost and Wide Availability**. Filters are widely available and consistently cheaper than bottled water. One manufacturer claims that one pour-through filter can replace 300 standard bottles of water (16.9 oz.) (TBTF, n.d.).
- **Suitability to Wide Range of Needs**. Filters allow users to choose which substances are removed from their water (CR, 2007a). The type and quantity of contaminants removed depends on the filtration method, filter style, and manufacturer model. Rely on independent certifications to verify which contaminants are filtered (see Standards).
- **Removal of Contaminants in the Water System**. Filtration addresses pollutants that may have entered the water between the water treatment site or municipal pipes and the point-of-use at the faucet or fountain.

Despite these benefits, filters also present problems, including:

- **Less than 100% Effective**. No filter or filtration method removes one hundred percent of all types of contaminants. Combining filtration methods can come close, but even then there is debate over which substances are considered harmful and which are considered innocuous or even beneficial (i.e. certain minerals).
- **Can be Costly**. Filtration can be expensive. In addition to the upfront purchase of the filtration unit (anywhere from $15 to $1500 for home units and much more for institutional units), there can be costs associated with installation, energy use, filter replacements, maintenance and cleaning.
- **Performance and Aesthetics**. Filters have a multitude of performance and aesthetic issues. For example, some units filter water very slowly, while others take up a large amount of counter or cabinet space. See

Addenda IV and V for a comparison of the pros and cons of common filtration methods and filter styles.

- **Materials and End-of-Life Management**. A large majority of filters and filter components are manufactured using petroleum-derived plastic. Depending on the unit, disposable cartridges must be replaced anywhere from monthly to once every few years. Currently, most filter cartridges are not recyclable and most manufacturers do not offer filter take-back programs (See Box 2). Thus, most filter cartridges are disposed of in landfills. Compounding the waste problem is the fact that the contaminants trapped in the filters can easily leach into water and soil, or be released into the air if incinerated.

FOUNTAINS

Whether using existing drinking fountains or purchasing new ones, there are several practices that can help decrease costs, reduce energy usage, and improve equipment function.

In an average week, a refrigerated fountain uses 8.5 to 10.5 kWh of electricity (NC, 2004). While this number varies depending on frequency of use, air and water temperature, and unit size, this corresponds to a cost of $30-38 per fountain per year (based on average North Carolina electricity rates) (NC, 2004). There are several ways to reduce this electricity use and subsequent costs, including:

- **Increase the water temperature dispensed by the fountain**. Most fountains are set at 40-45 degrees Fahrenheit. Increasing this to 50 degrees will decrease the energy used for refrigeration while still protecting against bacterial growth.
- **Insulate the unit**, especially the piping, chiller, and storage tank, to save energy (DOE, 2001).
- **Disconnect the fountain** during nights, weekends, or other periods of non-use to stop the refrigeration unit from running. Note that disconnecting the fountain for extended periods can lead to bacterial growth inside the unit. Vendors recommend not leaving the fountain disconnected for more than 8 hours at a time. Consider the amount of effort involved in disconnecting the unit. Can the fountain just be unplugged? Will the fountain dispense without electricity? Will users react negatively to getting less chilled or unchilled water? Calculate the potential cost savings of unplugging your fountains here http://www.p2pays.org/ref/40/39997.pdf.
- **Use a timer** to switch the unit's refrigeration system off when not in use. Automatic timers are relatively cheap ($10) and easy to install for plug-in fountains. However, it is not always cost-effective to install a timer on fountains that are already wired into the building's electrical system (MEO, 2005). This cost can be avoided if fountains are wired into the building's light switch circuits at the time of installation or building construction. Again, vendors recommend not leaving the fountain disconnected for more than 8 hours at a time.
- **Purchase unrefrigerated units** to avoid energy costs altogether. So called "direct feed" water fountains dispense water directly from the tap, similar to standard water faucets, but are designed for drinking. Water that comes directly from underground municipal pipes tends to be naturally cooler than room temperature.

While the cost of fountains can seem prohibitive, it is often less expensive over the long run to upgrade or install fountains than it is to purchase bottled water. The County of Santa Clara, California, analyzed the costs of switching from large, multi-serve bottled water coolers to tap water fountains (SCC, 2008). The county spends $131,151 per year on its bottled water contract. They found that installing one fountain would cost $10,000; 75 percent labor costs and 25 percent materials. This cost would double if the installation was considered 'difficult', meaning that hazardous materials or significant structural obstacles were present.

To convert from bottled coolers to fountains in all of its facilities, the County estimated that it would cost

$369,000-539,000, with annual maintenance and service costs totaling $10,000-20,000 (assuming all simple installations). The County also noted that they would need to “divert existing staff from maintenance work or hire extra help” to service the fountains (SCC, 2008). It was estimated that after acquiring the necessary funds, it could take up to three years to make the switch.

Extrapolating these costs, the switch has a five-year return on investment. After the five year mark, they would pay $10,000-20,000 per year for fountain maintenance, compared to $131,151 each year for their bottled water contract. All told, the County estimates savings of up to $500,000 over ten years (see Table 2). If bottled water prices increase during that time, savings on the switch could also increase.

Table 2: Long-term cost savings from water fountains

Cost of Bottled Water	Cost of Drinking Fountains	Savings over 5 Years
$655,755 (5 year contract)	$419,000 - $639,000 (Installation in year 1 and yearly maintenance costs for 4 years)	$16,755 - $236,755

Water fountains require regular maintenance to ensure sanitary conditions. Schedule regular maintenance for each fountain and order high-quality replacement parts. Ask fountain vendors to recommend reputable parts suppliers.

Be aware that proper cleaning and maintenance can be difficult with filtered drinking fountains. Typically, water dispensed from these units passes through a filter before reaching the water storage tanks. Because the filter usually removes chlorine – a sanitizing agent – the stored water is more susceptible to bacterial growth. This can lead to the development of a bacterial “biofilm” that coats the internal fountain components. When this happens, the fountain must be completely dismantled so the components can be manually scrubbed and sanitized (Doughty, 2008).

Install fountains in easily accessible, highly visible areas such as main hallways, waiting areas, cafeterias, and next to vending machines. This will increase their use and deliver a better return on investment. Create educational materials or signs that explain why bottled water is no longer available and encourage the use of tap water, fountains, and reusable bottles.

BOTTLE-LESS WATER COOLERS

Bottle-less water coolers are a great alternative to large bottled water dispensers. These plumbed-in coolers connect directly to a tap water line and are typically equipped with filtration systems. Bottle-less water coolers are very similar in construction to bulk bottled water units, except they draw water from the tap. Water flows from a building’s tap through a filter inside the cooler and is then either chilled directly or piped to a stainless steel storage reservoir to be cooled before dispensing.

Factoring in the costs of cooler rentals, water delivery, and maintenance, the cost of bottle-less filtered water coolers is typically half the cost of delivered bottled water. Depending upon the usage, the cost savings can be as much as 80% when switching to bottle-less systems (Doughty, 2008). There are several costs to consider when purchasing a bottle-less cooler, including:

- Cost of the cooler unit
- Installation
- Filter replacement
- Maintenance and cleaning

Many vendors will bundle these costs into a monthly rate (ranging, generally, between $29 to $99 per month). Cost depends on the size, capacity and other features of the cooler. Multi-year contracts are ideal for institutions that do not want to handle ongoing cooler maintenance.

Bottle-less coolers save money, energy, and greenhouse gas emissions:

- A large national bank switched 7,000 bottled water coolers to bottle-less coolers and saved approximately $5 per month per cooler – approximately $420,000 over the course of a year (Doughty, 2008).
- Over an average week, a bottled water cooler uses approximately 3.5-4.5 kWh (NC, 2004), which, according to the average electricity rates in one state—North Carolina—costs $12-17 per cooler per year. Bottle-less coolers use 30 to 50 percent less energy depending on the model and, based on the North Carolina case study, could save $4-$8 per cooler per week (Doughty, 2008).
- Spectrum Water Coolers claims that "switching out bottled water for…coolers reduces greenhouse gas emissions (GHGs) by 98 percent by eliminating the bottle manufacturing, bottling, storage, distribution, delivery, as well as the removal, recycling, or dumping of used bottles" (Spectrum, n.d.).

Basic filtered bottle-less coolers come with 2-4 liter chilling or heating tanks and are less energy efficient than direct chill coolers (see below). They also require constant cleaning and maintenance to prevent bacteria build-up from stagnant water. To solve the bacteria problem, some coolers use an internal ultraviolet light to prevent bacterial growth inside the cooler and tanks. Without proper cleaning or a UV light, bacteria can end up in the water.

Direct chill technology can eliminate the bacteria issue by chilling water instantly as it passes through the cooler's filter. Thus, water does not sit in a reservoir tank for any length of time. These coolers are energy efficient because the cooler does not have to constantly keep the water in its reservoirs cold or hot.

In some instances, installing bottle-less water coolers may be challenging. For instance, plumbing doesn't exist in some work locations, such as construction trailers. In such cases, the best solution is to purchase a few large reusable water containers, such as the mobile insulated coolers seen at sporting events, and have each construction crew fill their jug with tap water prior to going to the worksite. Another option is an ENERGY STAR rated bottled water cooler (NC, 2004). For locations where there is not access to a water line within 500 feet or running a water line would be too costly, Spectrum has developed a "Mobile Filtered Drinking Water Cooler Solution" that may be suitable. For more information, contact Spectrum directly at 301-362-9000.

Table 3: The pros and cons of bottle-less filtered water coolers.

Pros	Cons
• Decreased maintenance and cleaning (bottled coolers usually require monthly cleaning) • No plastic bottles • No need to transport the water hundreds or thousands of miles by truck or plane • Unlimited supply of water • Use much less energy than bottled coolers • Provide clean, safe filtered water • Save money	• Can be more difficult to clean the unit's complex internal structure • Majority of filter cartridges cannot be recycled (see Cost, Quality, and Supply section on filters for more information)

There are over half a million filtered bottle-less water coolers currently available from vendors (compared to almost five million bottled water coolers) (Doughty, 2008). Bottle-less coolers are sold in a variety of sizes, for a range of applications, and with various optional features. Filtered bottle-less water coolers are growing at approximately one percent market share per year and currently make up 3-5% of the market (Doughty, 2008).

REUSABLE CONTAINERS

Reusable containers have lower lifecycle costs and are less harmful to humans and the environment than single-serve plastic bottles. Reusable containers are convenient to use and widely available in a variety of materials, sizes, and styles.

Many reusable containers, especially those made of metal, are lined with resins to prevent taste and odor contamination and corrosion. These resins may leach chemicals into the liquid inside. To avoid contamination, look for unlined bottles, bottles lined with water-based resins, or bottles that have been independently tested and proven not to leach chemicals. Choose bottle lids that provide a tight seal in a wide temperature range and are made of materials that can be recycled. Many manufacturers now offer several lid options in a variety of materials.

Reusable containers require proper use, care, and cleaning. Do not store full bottles in direct sun or other hot environments since this can promote bacterial growth and increase the leaching capability of some materials, especially plastics and resin linings. Use a mild soap or dishwasher detergent and warm water to clean reusable containers thoroughly but gently, including those that are deemed “dishwasher safe.” For stainless steel bottles, do not use cleansers that contain chlorine, which corrodes steel. Use a bottle brush to clean bottles with narrow mouths. Don’t forget to clean the bottle lids too, which can harbor bacteria.

Reusable bottles made of materials known to leach chemicals (such as polycarbonate plastic) should be washed by hand with warm water and mild soap in order to prevent the need for disposal and replacement. High heat dishwashers, strong detergents, and repeated washing can abrade plastic and intensify leaching. Scratches and cracks (sometimes indicated by cloudy spots) also encourage leaching, so damaged bottles should be replaced. For more advice on reusable bottles, visit http://www.consumerreports.org/cro/consumer-protection/recalls-and-safety-alerts-5-08/plastic-ingredients-in-bottles-and-cans/recalls-plastic.htm.

Metal Bottles. Stainless steel and aluminum are popular options for reusable containers. The most commonly used bottles weigh around 5-8 ounces (stainless steel is heavier), can hold a liter of liquid, and cost about $15-30. Metal bottles are strong and durable, but can be prone to dents and will lose shape if frozen. They retain temperature well but single-walled models should not be used for hot beverages.

Metal bottles generally will not corrode or leach chemicals even when used for hot, cold, or acidic beverages. However, the interior surface of metal bottles is often coated with a food-grade resin lining. This lining can help prevent odors and metallic aftertastes. However, since many of these resins are chemically derived, they have the potential to leach toxins like bisphenol-A (BPA) into any liquid they contact. Some reusable containers, such as certain Sigg aluminum bottles, are lined with water-based epoxies that have been found not to leach chemicals, according to independent tests (Breum, 2001).

Some bottles are dishwasher safe, but most need to be cleaned by hand. This can prove difficult for bottles with small openings, but effective cleaning can be achieved by using a bottle brush and warm, soapy water. For dishwasher-safe stainless steel bottles, use a chlorine-free detergent since chlorine corrodes this material (Karlstrom, 2007). Depending on location and waste hauler/recycler, metal and plastic bottles and bottle caps may be recyclable.

Glass and Ceramic Bottles. These materials are also a relatively safe, low cost option for reusable containers. Glass and ceramic bottles can be repurposed from used jars and containers, thereby preventing waste. As a result, they also save energy, money, and materials because they displace the manufacturing of a new bottle. Glass and ceramic bottles can also be recycled an infinite number of times and do not leach chemicals or toxins.

However, glass and ceramic both have some serious drawbacks. The first and most obvious is that they are breakable. Aside from being inconvenient, a broken bottle can pose a safety hazard. To partially address this concern, cover or wrap glass or ceramic bottles with fabric or another material that will contain the shards if broken. Glass and ceramic bottles are also heavier than metal and plastic alternatives.

Plastic Bottles. Reusable plastic water bottles cost between $3 and $50, depending on features, but most are in the $5-10 range. Plastic bottles come in an array of shapes, sizes, colors, and styles. Some include special caps, covers, built-in filters, and even LED lights.

Polyethylene terephthalate (PET, PETE, or #1) is the plastic used for packaging most single-serving bottled waters. While it is one of the safer plastics, PET is not meant for repeated use. Bottles made from this porous plastic are difficult to clean and can harbor bacteria, especially if reused multiple times. Additionally, studies suggest that with repeated use, PET containers may release di(2-ethylhexyl) phthalate (DEHP), an endocrine-disrupting compound and probable human carcinogen, as well as antimony, an eye, skin and lung irritant at high doses (Masterson, 2006). Studies also found that toxin concentrations increase the longer the water is in the bottle (Masterson, 2006). Number 1 plastic is recyclable, but the quality degrades with each cycle so PET is typically "down-cycled" into products such as carpet fiber and plastic lumber.

Some plastics should be avoided in reusable drinking bottles, including polyvinyl chloride (PVC or #3 plastic), polystyrene (#6), and hard, transparent polycarbonate plastic (#7 and/or PC). These plastics are known to leach chemicals. Polycarbonate, in particular, has been found to leach bisphenol-A (BPA) – an endocrine disruptor, and phthalate compounds, which interfere with reproductive hormones. Some studies indicate a link between extremely low BPA doses and harmful health effects but other studies suggest otherwise. Note that #7 plastic is an "other" designation for plastic containers that includes polycarbonate as well as compostable bio-plastics that do not contain bisphenol-A.

Some safer plastics include high-density polyethylene (HDPE or #2), low-density polyethylene (LDPE or #4), and polypropylene (PP or #5). Of these, #2 plastic is preferred for its durability and wide-ranging recyclability. LDPE and PP are harder to recycle, but polypropylene is frequently used in many reusable containers.

Choose plastic bottles that are recyclable in your area and, regardless of the plastic type, minimize chemical leaching by avoiding hot liquids, harsh cleaning detergents, and heating the bottles in microwaves. Once a polycarbonate bottle becomes unsafe for drinking, it can be repurposed as a lantern or flashlight. A few companies offer plastic caps with built-in LED lights that fit on several popular brands of bottles. These "light caps" replace the bottle's old cap. SolLight makes one model that is solar-powered, eliminating the need for batteries or other external power source.

Many organizations have adopted policies mandating a switch from bottled to tap water.

These policies typically state institutional goals and include systems for tracking and reporting on progress toward these goals. Some policies stand alone, while others are integrated into broader sustainability policies. For an up-to-date list of cities and institutions taking action on bottled water, visit www.ThinkOutsideTheBottle.org.

MODEL POLICY

San Francisco City and County, Bottled Water Phase Out, 2007 (See Addendum I)

San Francisco sets three deadlines for eliminating half-liter bottles and multiple-gallon containers (two of the most common types of bottled water): 1) city departments and agencies must halt the purchase of single-serving bottled water; 2) three months later, agencies must study the feasibility of replacing bottled water coolers with plumbed-in, bottle-less dispensers; and 3) two months after the study, "all city departments and agencies occupying city or rental properties must switch to bottle-less dispensers that connect to main local tap water lines."

MORE SAMPLE POLICIES

STATE

New York, Letter to Governor Eliot Spitzer from New York State Assembly Environmental Conservation Committee Chair Robert K. Sweeney, August 2007

This letter proposes an expansion of the New York State Returnable Beverage Container Act to include plastic, non-carbonated beverage bottles. The proposed policies would also discontinue "the purchase, use, distribution, or sale of single serving bottled water by the State… at State-run operations, meetings, or events" and increase the number of public water fountains available at State events (NY, 2007).

CITY

Ann Arbor, MI, City Council announcement, June 2007

Bans the city government purchase of commercial bottled water for city sponsored events and functions.

Chicago, IL, Chicago Bottled Water Tax Ordinance, 2008

Imposes a 5 cent per bottle retail tax on every bottle of water sold in the City of Chicago. The person purchasing the bottled water will pay the tax and the money goes to Chicago's corporate fund.

Davis, CA, Bottled Water Resolution, 2007

Bans use of public funds for purchasing bottled water, except for emergency personnel, and encourages residents and businesses to stop using bottled water.

Morrow Bay, CA, City Council Resolution Regarding Bottled Water, 2008

Prohibits the spending of public funds on bottled water.

San Jose, CA, Prohibition of Purchase of Single-Serving Bottled Water, 2008

Policy prohibits the use of public funds to purchase single-serving bottled water, with an exception for emergency responders.

Seattle, WA, Executive Order Restricting Bottled Water, 2008

This E.O. restricts the City purchase of single-serving and large-volume bottled water for City facilities and events. The Seattle Public Utilities company is directed to inspect water quality at City facilities upon request. An education program is required to inform City employees about the reasons for the policy and the availability of tap water.

SPECIFICATIONS

Many organizations are shifting their purchases away from bottled water and toward alternatives such as filters, bottle-less water coolers, fountains, and reusable bottles.

MODEL SPECIFICATION

RPN, Model Bid Specification Guidance, 2008 (see Addendum II)
RPN created this model guidance document on developing bid and contract specifications for bottled water alternatives. Guidance is provided on filters, fountains, bottle-less coolers, reusable bottles, and events and catering.

MORE SAMPLE SPECS

STATE

State of Maryland, Department of Health and Mental Hygiene, Bottle-Less Water Cooler Bid Solicitation, 2007
This bid solicitation states health reasons for the discontinuation of 5 gallon water bottles and requires bottle-less coolers that provide hot, warm, and cold drinking water. A four-stage filtration system is required and the cooler must be hooked up to the facility's water supply. The dispenser area must be large enough to refill reusable bottles and carafes. Bidder is required to install the bottle-less coolers.

CITY

Minneapolis, MN, RFP for Outreach on City Water Supply Quality, 2008
Seeks contractors to create a public outreach campaign to educate city residents about tap water quality and encourage its use over bottled water.

BUSINESS

AquaPure, Standard Specification Guidance for Bottle-less Water Coolers, 2008
Contains recommendations for bottle-less water coolers contracts.

Tap and bottled water are evaluated using similar quality standards, but tap water is tested more frequently and has more independent oversight by state and federal environmental authorities (e.g., U.S. EPA and state Departments of Environmental Protection).

The FDA regulates bottled water quality, but often lacks the capacity to adequately regulate bottled water and largely relies on bottled water corporations to police themselves. Also, the FDA has little jurisdiction over the roughly 60% of bottled water that is bottled and consumed in the same state (Gleick, 2005; NRDC, 1999).

There are several NSF/ANSI standards for drinking water treatment units (e.g., water filters).

TAP WATER

United States Environmental Protection Agency, Safe Drinking Water Act, 1974 (Amended in 1986 and 1996).
This law gives the EPA power to set monitoring, treatment, and contaminant standards for the drinking water sources and supply of all U.S. public water systems. Maximum contaminant levels (MCLs) are set for over 90 naturally-occurring as well as man-made contaminants. However, many contaminants are not covered. State standards must meet or exceed the legal limits set by the EPA and both the EPA and the States are responsible for enforcing compliance with these standards. Water systems are tested regularly and randomly at various points in the distribution path. Water suppliers are required to report all violations and remedial actions in Consumer Confidence Reports (see the Cost, Quality, and Supply section of this Guide for more on these reports).

BOTTLED WATER

United States Food and Drug Administration, Federal Food, Drug, and Cosmetic Act, 1938 (FFDCA).
Under the FFDCA, bottled water transported across state lines is regulated as a packaged food product. Bottled water processed, packaged and sold within a single state is regulated by that state. Standards applicable to bottled water can be found in the Code of Federal Regulations (CFR). Title 21 of the CFR defines the various types of bottled water; sets limits for certain contaminants; lists labeling requirements; and establishes processing and bottling regulations under the Current Good Manufacturing Practice. The FDA is required to adopt standards for bottled water that are no less stringent than the EPA's standards for tap water. However, it is the responsibility of the bottler to make sure its water can pass FDA tests and inspections. However, since "bottled water plants generally are assigned low priority for inspection," inspectors tend to focus primarily on plants that have received several complaints or have a previous history of violations (Posnick and Kim, 2002). There is no mandated reporting for bottled water companies, and consumers do not have a guaranteed right to know the contaminants found in bottled water.

DRINKING WATER TREATMENT UNITS

A variety of standards are available for verifying the filtration functions of treatment units. After determining which (if any) contaminants need to be removed from drinking water, choose drinking water treatment units (DWTU) certified to remove those contaminants. The following independent, third-party organizations set standards for drinking water treatment units and certify units that are verified as meeting the standards.

NSF is a non-profit organization that "conducts safety testing for the food and water industries" (Rysavy, 2007). "Through a comprehensive consensus process, the NSF Joint Committee on Drinking Water Treatment Units (DWTUs) has developed key standards for evaluation and certification of drinking water treatment units" (NSF, 2004). DWTUs that meet NSF safety standards and remove 93 percent or more of a particular contaminant are eligible to receive NSF certification for that contaminant. NSF also has standards for particular water treatment methods. A listing of NSF-certified drinking water treatment units is available at http://www.nsf.org/Certified/dwtu or 877-867-3435.

NSF standards for DWTUs include:

- **NSF/ANSI Standard 42: Drinking Water Treatment Units - Aesthetic Effects**
  "This standard covers point-of-use (POU) and point-of-entry (POE) systems designed to reduce specific aesthetic or non-health-related contaminants (chlorine, taste and odor, and particulates) that may be present in public or private drinking water." (NSF, 2004) This includes commonly-used carbon adsorption filters.

- **NSF/ANSI Standard 53: Drinking Water Treatment Units - Health Effects**
  "Standard 53 addresses point-of-use (POU) and point-of-entry (POE) systems designed to reduce specific health-related contaminants, such as Cryptosporidium, Giardia, lead, volatile organic chemicals (VOCs), and MTBE (methyl tertiary-butyl ether), that may be present in public or private drinking water." (NSF, 2004) This includes commonly-used carbon adsorption filters.

- **NSF/ANSI Standard 58: Reverse Osmosis Drinking Water Treatment Systems**
  "This standard was developed for point-of-use (POU) reverse osmosis (RO) treatment systems. These systems typically consist of a pre-filter, RO membrane, and post-filter. Standard 58 includes contaminant reduction claims commonly treated using RO, including fluoride, hexavalent and trivalent chromium, total dissolved solids, nitrates, etc. that may be present in public or private drinking water." (NSF, 2004)

- **NSF/ANSI Standard 44: Cation Exchange Water Softeners**
  "This standard covers residential cation exchange water softeners designed to reduce hardness from public or private water supplies. Additionally, this standard can verify the system's ability to reduce radium or barium" (NSF, 2004).

- **NSF/ANSI Standard 55: Ultraviolet Microbiological Water Treatment Systems**
  "This standard establishes requirements for point-of-use (POU) and point-of-entry (POE) ultraviolet systems and includes two optional classifications. Class A systems (40,000 uwsec/cm2) are designed to disinfect and/or remove microorganisms from contaminated water, including bacteria and viruses, to a safe level. Class B systems (16,000 uwsec/cm2) are designed for supplemental bactericidal treatment of public drinking water or other drinking water, which has been deemed acceptable by a local health agency." (NSF, 2004)

- **NSF/ANSI Standard 62: Drinking Water Distillation Systems**
  "Standard 62 covers distillation systems designed to reduce specific contaminants, including total arsenic, chromium, mercury, nitrate/nitrite, and microorganisms from public and private water supplies." (NSF, 2004)

For more info on above standards, see: http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/devices-dispositifs/appendix-c-annexe-eng.php

- **NSF/ANSI Standard 60: Drinking Water Treatment Chemicals – Health Effects**
  "The nationally recognized health effects standard for chemicals which are used to treat drinking water." (NSF, 2004a)

- **NSF/ANSI Standard 61: Drinking Water System Components – Health Effects**
  "The nationally recognized health effects standard for all devices, components and materials which contact drinking water" (NSF, 2004a). Section 9 of this standard "regulates the levels of contaminants that can leach from drinking water devices into potable water" (Sorensen, 2004). While the U.S. federal government only requires compliance for lead levels, the 2003 International Plumbing Code (IPC) requires that products comply with all sections of this standard.

For more info on the above standards see: http://www.nsf.org/business/water_distribution/standards.asp?program=WaterDistributionSys

Underwriters Laboratories
The Underwriters Laboratories certifies filters with their Water Quality mark, which is based on, but is not verified precisely to, NSF standards.

Water Quality Association (WQA)
The WQA certifies filters with their Gold Seal, which is based on, but is not verified precisely to, NSF standards.

State Department of Health Certificate of Claims
Some states (such as California, Wisconsin, and Massachusetts) require certification of performance claims and promotional literature for water treatment devices. Companies earn this certification by providing extensive laboratory test data for each contaminant removal claim. The Certificate also means the company's literature, website, and packaging have been reviewed to contain no false or exaggerated claims (WFC, n.d.).

ENERGY STAR for Bottled Water Coolers
Energy Star has not created a testing protocol for bottle-less coolers, but many bottled coolers are Energy Star compliant. These coolers use less standby energy (the required energy to maintain cold and/or hot water at appropriate dispensing temperatures) (EPA, n.d.). To earn the Energy Star label, the cold-only and cook-and-cold (i.e., room temperature and chilled) units must use less than or equal to 0.16 kWh per day. Hot-and-cold units must use less than or equal to 1.20 kWh per day. Note that while Europe has regulations requiring that water coolers be sanitized on a quarterly basis, no such standards exist in the United States.

ADA and IPC/UPC Standards for Fountains
Fountains are affected by two additional standards: model plumbing codes and the Americans with Disabilities Act (ADA). Model plumbing codes, such as the International and Uniform Plumbing Codes (IPC and UPC), specify the number of drinking fountains required in public buildings and spaces. The ADA addresses design features of fountains, requiring them to be accessible to wheelchair-bound or disabled persons. Fountains must have a certain amount of knee and toe clearance and limits are set on how high the fountain stream can be set.

PRODUCTS

RPN's online product database includes over 2,100 water filters certified by NSF/ANSI 42 to remove aesthetic contaminants (see Standards), including filters for point-of-use and point-of-entry.

These listings were last updated on August 9, 2008; please check directly with certifying agencies to verify current product certification status.

The Bottled Water Calculator developed by RPN, compares the cost and environmental impacts of 16.9 oz. bottles of water with tap water.

Results are expressed in gallons of water, mega joules of energy, gallons of oil, pounds of CO_2e, and dollars saved. The calculator may be found at http://www.responsiblepurchasing.org/purchasing_guides/bottled_water/calculator/.

HANDY FACTS

- Americans bought 8.8 billion gallons of bottled water in 2007 (BMC, 2008).
- Producing PET bottles uses the equivalent of more than 17 million barrels of oil and produces over 2.5 million tons of carbon dioxide (Pacific Institute, n.d.) - the same amount of carbon dioxide that would be emitted by over 400,000 passenger vehicles in one year (EPA, 2007a).
- On average, the cost to treat, filter, and deliver water to ratepayers in the United States is 0.2 cents per gallon in the U.S (EPA, 2004) – roughly 750-2,700 times cheaper than bottled water on a per gallon basis, although this cost varies regionally.
- Over 90 percent of U.S. municipal water systems regularly meet or exceed the EPA's regulatory and monitoring requirements. (EPA, 2007).
- According to 1999 government and industry estimates, about 25-40% of bottled water is actually bottled tap water, sometimes with additional treatment, sometimes not (NRDC, 1999).
- In 2005, 96% of bottled water sold in the U.S. was packaged in PET containers, most of which were single-serve sizes of one liter or less (CRI, 2007).
- In 2004, only 14.5 percent of non-carbonated beverage bottles made from PET were recycled (APC, 2005).
- For each gallon of water that is bottled, an additional two gallons of water are used in processing (UCS, 2007).
- A $1 increase in local government spending on water and sewer infrastructure and operations and maintenance (O&M) increases total local economic activity by $2.62 (USCM, 2008).
- In an average week, a refrigerated fountain uses 8.5 to 10.5 kWh of electricity (NC, 2004). While this number varies depending on frequency of use, air and water temperature, and unit size, this corresponds to a cost of $30-38 per fountain per year (based on average North Carolina electricity rates) (NC, 2004).
- Over an average week, a bottled water cooler uses approximately 3.5-4.5 kWh, which, according to the average electricity rates in one state—North Carolina—costs $12-17 per cooler per year (NC, 2004). Bottle-less coolers use 30 to 50 percent less energy depending on the model and, based on the North Carolina case study, could save $4-$8 per cooler per week (Doughty, 2008).

DEFINITIONS

Adsorption	The process by which molecules of a substance, such as a gas or a liquid, collect on the surface of another substance, such as a solid. The molecules are attracted to the surface but do not enter the solid's minute spaces as in absorption. Some drinking water filters consist of carbon cartridges that adsorb contaminants.
Aesthetic contaminants	Non-health-related contaminants that affect the odor, appearance, and/or taste of water. These can include chlorine, minerals, and particulates, among others.
Antimony	A potentially toxic trace element that is an eye, skin, and lung irritant at high doses and has chemical properties similar to those of arsenic. It has been found to leach from bottles made of PET plastic.
Arsenic	A highly poisonous metallic element sometimes present in trace amounts in bottled water, municipal water, and well water.
At-risk populations	Groups of people (such as the very young, elderly, pregnant, and those with weakened immune systems) who are particularly susceptible to toxins and contaminants found in bottled and tap water. These populations may experience adverse health effects even when exposed to contaminant levels that meet or fall below legal standards.
Benzene	A toxic substance that can cause drowsiness, dizziness, and unconsciousness. Long-term exposure can cause anemia, leukemia, and bone marrow problems. Sometimes emitted when PET resin is manufactured into plastic bottles.
Bioaccumulate	Process whereby harmful substances accumulate as they move up the food chain.
Biofilm	A slime-like layer of bacterial growth that can coat the internal components of coolers, fountains, and filters. This film can develop when drinking units are not properly cleaned and maintained and when water is allowed to sit in storage tanks for extended periods of time.
Bottle bill	A legislative bill that requires the charging of a refundable deposit on certain beverage bottles and cans, to encourage the return of these containers for recycling and reduce litter.

Bottled water	Drinking water that is put into bottles and offered for sale.
Bottled water cooler	A cooler that dispenses cold, hot, or room-temperature water from a large multi-gallon jug of bottled water.
Bottle-less water dispenser	A dispenser that connects directly to a main municipal water supply line and dispenses tap water as opposed to bottled water (this includes water fountains and coolers, as well as other dispensers with built-in tanks that hold pre-chilled or pre-heated water).
Bulk bottle	Bottles that contain multiple gallons of water (the most common is a 5-gallon bottle).
Chloramine	A chlorine-ammonia compound used as a disinfectant in 29% of U.S. water utilities. Can cause asthma, rashes, and fainting (GG, 2007).
Chlorine	A chemical used effectively as a disinfectant for municipal water treatment systems. When emitted as a gas – such as when plastic bottles are incinerated – it can be highly irritating to respiratory organs. May also be present in tap water in trace amounts, though in a different chemical form than that which leaches from PET and other plastic bottles.
Coliform bacteria	Presence of these bacteria in water can indicate presence of Cryptosporidium and other dangerous microbes. Coliform bacteria are not harmful in themselves (GG, 2007).
Community water system	Public water system that serves at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents (EPA, 2006; EPA, 2007b).
Consumer Confidence Report (CCR)	An annual "right-to-know" report of an area's drinking water quality that the EPA requires water suppliers to send to customers.
Current Good Manufacturing Practice (CGMP)	Part of the Federal Food, Drug, and Cosmetic Act which establishes processing and bottling regulations for beverages.

Dioxins	A particular class of chlorine-containing chemical compounds classified as persistent, bioaccumulative, and toxic (PBT) by the EPA. Not all PBTs are dioxins. See PBT for more information on other persistent, bioaccumulative, and toxic chemicals.
Direct chill coolers	These coolers chill water instantly as it passes through the cooler's filter. Bacterial growth is avoided because water does not sit in storage tanks and, as a result, direct chill coolers also tend to use less energy.
Direct feed fountain	A water fountain that dispenses water directly from the tap, without using refrigeration or storage tanks. These fountains take advantage of the naturally cooler temperature of water that comes from underground municipal pipes.
Distillation	A water purification process by which water is boiled and the steam is recondensed, leaving behind certain contaminants. Typically combined with other filtration methods (such as carbon adsorption) to remove any remaining contaminants.
Downcycled	The process by which recycled materials "lose viability or value in the process of recycling. They can then only be used in a degraded form for components other than their original use" (Sustainability Dictionary, n.d.). PET (#1) plastic can only be fully recycled into new plastic water bottles a few times before it is downcycled into products such as carpet fiber and plastic lumber.
Drinking Water Treatment Unit (DWTU)	A device which reduces or removes aesthetic and/or health-related contaminants from water. DWTUs can include filters, fountains, and bottle-less water coolers.
E. Coli	A bacterium sometimes found in bottled, municipal, and well water which can be pathogenic and threaten food safety.
End-of-life management	Process by which products are reused, recycled, remanufactured, or disposed of after their term of useful service expires.
Environmentally preferable	Products and services that have either a more positive or a less negative effect on human health and the environment when compared to other products and services that serve the same purpose.

Ethylbenzene	A toxic substance that can cause drowsiness, fatigue, headache, and mild eye and respiratory irritation with short term exposure. Long term exposure is linked to damage to the liver, kidneys, central nervous system and eyes. Ethylbenzene is emitted when PET resin is manufactured into plastic bottles.
Ethylene oxide	A toxic substance that, with acute exposures, can cause respiratory irritation and lung injury, headache, nausea, vomiting, diarrhea, shortness of breath, and cyanosis. Chronic exposure has been associated with the occurrence of cancer, reproductive effects, mutagenic changes, neurotoxicity, and sensitization. Emitted when PET resin is manufactured into plastic bottles.
Greenhouse gas	Heat-trapping gas in the Earth's atmosphere responsible for global warming; category includes water vapor, carbon dioxide, methane, ozone, CFCs, and nitrogen oxides.
Hazardous substance	1. Material posing a threat to human health and/or the environment, that can be toxic, corrosive, ignitable, explosive, or chemically reactive, 2. Substance that must be reported to the EPA if released into the environment.
Hazardous waste	Hazardous by-products that can pose a hazard to human health or the environment when improperly managed.
Health-related contaminants	Contaminants that can cause specific negative health effects as a result of short- or long-term exposure. These can include Cryptosporidium, Giardia, lead, volatile organic chemicals (VOCs), and MTBE (methyl tertiary-butyl ether), among many others.
Heavy metals	Metallic elements with high atomic weights; (e.g. mercury, chromium, cadmium, arsenic, and lead) that can damage living things at low concentrations and tend to accumulate in the food chain (EPA, 2007b). When plastic bottles are incinerated, heavy metals can be deposited in the ash. Heavy metals may also leach into water from pipes and can be found in trace amounts in soil, water supplies, and elsewhere.
Lead	Metal used in older plumbing infrastructure (i.e. pipes) that can contaminate water supplies and cause blood and brain disorders as well as damage to the nervous system.

Maximum Contaminant Level (MCL)	The highest level of a naturally-occurring or man-made contaminant the EPA allows in drinking water.
Metric Tons of Carbon Equivalent (MTCE)	The international standard for expressing greenhouse gases in carbon dioxide (CO_2) equivalents.
Multi-serve bottle	Large, multi-gallon jug (or carboy) of water. Usually holds 5 gallons and weighs around 50 pounds.
Nickel	A toxic substance that can cause dermatitis, respiratory irritation, and lung and nasal cancer. Nickel is emitted when PET resin is manufactured into plastic bottles.
Nitrates	Compounds containing nitrogen that can exist as a dissolved gas in water and can have harmful effects on humans. A plant nutrient and inorganic fertilizer, nitrate is found in septic systems, animal feed lots, agricultural fertilizers, manure, industrial waste waters, sanitary landfills, and garbage dumps (EPA, 2007b)
PBTs	Persistent, bioaccumulative, and toxic (PBT) chemicals that remain in the environment for long periods of time, are not readily destroyed, and build up or accumulate in body tissue.
Plumbed-in water dispenser	A dispenser that connects directly to a main municipal water supply line and dispenses tap water as opposed to bottled water (this includes water fountains as well as dispensers with built-in tanks that hold pre-chilled or pre-heated water).
Point-of-entry site	The location where tap water enters a home or building.
Point-of-use site	The location where tap water directly reaches a consumer, such as a faucet or water fountain.
Polycarbonate plastic	Plastic used in baby bottles, food can liners, and sport water bottles. Tends to be hard, transparent, and shatter-proof. Labeled number 7, which is a catchall category for plastics that do not fit into one of the other six categories. Studies have found that polycarbonate bottles leach Bisphenol-A (BPA), an endocrine disruptor, into the beverages they hold.

DEFINITIONS

Polyethylene terephthalate (PET or PETE, #1 plastic)	Plastic labeled number 1, used in making synthetic fibers, beverage bottles, liquid containers, and carpet. This plastic is a type of polyester.
Post-consumer recycled content	Material recovered from a consumer product at the end of its life, diverted from waste destined for disposal.
Public (or municipal) water system	A system that provides piped water for human consumption to at least 15 service connections or regularly serves 25 individuals (EPA, 2007b).
Safe Drinking Water Act (SDWA)	Regulates the U.S. municipal drinking water supply; enforced by the EPA.
Safe Drinking Water Information System (SDWIS)	A database which contains information about public water systems and their violations of EPA's drinking water regulations (EPA, 2006a).
Single-serving bottle	Bottle intended for one-time use and disposal; usually containing half-liter (16.9 oz) of water or less.
Take-back	"A 'producer responsibility' approach to facilitating reuse or recycling whereby consumers return used products back to the company that produced them" (Sustainability Dictionary, n.d.). Some filter companies offer take-back of used filter cartridges, but many do not.
Tap water	Municipal water drawn directly from a tap, faucet, or other direct local water supply line.
Toxic substance	A chemical or chemicals that may present an unreasonable risk of injury to health or the environment.
Ultraviolet (UV) disinfection	A water treatment process, incorporated into many bottle-less water coolers, which uses a 60 watt ultraviolet bulb to irradiate water as it flows through the cooler. UV disinfection systems kill most bacteria and viruses found in water.
Water distribution system (drinking water infrastructure)	An underground network of pipes that delivers drinking water to homes and businesses. Small systems may be relatively simple, while large metropolitan systems can be extremely complex, sometimes consisting of thousands of miles of pipes serving millions of people.

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San Francisco City and County Bottled Water Phase Out, 2007

Office of the Mayor Gavin Newsom

City & County of San Francisco

Executive Directive 07-07

Permanent Phase-Out of Bottled Water Purchases

by San Francisco City and County Government

June 21, 2007

San Francisco is proud of its historic role as an urban leader in environmental protection. For decades, our local government has provided environmental stewardship of the surrounding region's water delivery system. This water delivery system consistently provides among the purest, safest drinking water in the nation from spring snowmelt stored in the Hetch Hetchy Reservoir and flowing down the Tuolumne River.

Over the last decade, San Franciscans have responded to marketing campaigns to purchase bottled water and record amounts of bottled water have been purchased by San Francisco consumers and local government at the expense of the environment. Such marketing has suggested that bottled water is safer than better-regulated, pristine tap water delivered by San Francisco government to its residents. As the city advances its Local Climate Action Plan to combat global warming, it is paramount that we initiate policies that limit the most significant contributors to climate change.

The rise of the bottled water industry is well documented and visible throughout San Francisco and the entire world. The global consumption of bottled water was measured at 41 billion gallons in 2004, up 57 percent from the previous five years. This consumption increase occurred despite the fact that bottled water often costs 240 to 10,000 times more than tap water. In San Francisco, for the price of one gallon of bottled water, local residents can purchase 1000 gallons of tap water.

Data suggests that the environmental impact of the bottled water industry has been profound. According to the Container Recycling Institute, supplying the plastic water bottles that American consumers purchase in one year requires more than 47 million gallons of oil, the equivalent of one billion pounds of carbon dioxide that is released into the atmosphere. More than one billion plastic water bottles end up in California's landfills each year, taking 1000 years to biodegrade and leaking toxic additives such as phthalates into the groundwater. Additionally, water diverted from local aquifers for the bottled water industry can strain surrounding ecosystems.

Furthermore, transporting bottled water by boat, truck and train involves burning massive quantities of fossil fuels. All of this waste and pollution is generated by a product that by objective standards is often inferior to the quality of San Francisco's pristine tap water.

By virtue of the power and authority vested in me by Section 3.100 of the San Francisco Charter to provide administration and oversight of all departments and governmental units in the Executive Branch of the City and County of San Francisco, I hereby issue this Executive Directive to become effective immediately:

- Beginning July 1, 2007, there will be a prohibition from any city department or agency purchasing single serving bottles of water using city funds, unless an employee contract specifies usage. This prohibition will apply to city contractors and city funded and/or sponsored events. There will be no waivers from this prohibition.

- By September 30, 2007, all city departments and agencies occupying either city or rental properties will have completed an audit to determine the viability of switching from bottled water dispensers to bottle-less water dispensers that utilize Hetch Hetchy supplied water. City departments will work with the San Francisco Public Utilities Commission (SFPUC), Department of Real Estate (DRE) and the City Purchaser to conduct the audit. Staff from the SFPUC will contact you shortly to begin the audit for your department.
- By December 1, 2007 all city departments and agencies occupying either city or rental properties will have installed bottle-less water dispensers that utilize Hetch Hetchy supplied water. Waivers will only be granted by the SFPUC based on legitimate engineering, health and fiscal concerns.

For questions concerning this Executive Directive and its implementation, please contact Laura Spanjian, Deputy General Manager of the San Francisco Public Utilities (415-554-1540, LSpanjian@sfwater.org)

Gavin Newsom

Mayor

RPN, Model Bid Specification Guidance, 2008

Bottled Water Alternatives

Model Bid Specification Guidance

This document provides tips on developing bid specifications for Filters, Fountains, Bottle-less Coolers, Reusable Bottles, and Events & Catering. We recommend items that should be specified in a bid request document and information that should be requested from bidders.

I. Filters

a. Specify:

i. The contaminant(s) you want to filter from your water

ii. Whether you seek a point of entry or point of use filter

1. If point of entry:

a. Specify the location where you will place the filter

i. If you're unsure where to locate the filter, ask bidder to provide on-site assessment

2. If point of use:

a. Specify the type of fixture(s) that you will be using to filter water (e.g., faucet, pitcher, bottle-less water cooler, refrigerator, etc.)

b. Provide detailed specifications of these fixtures so vendors can correctly match their filter to your needs

iii. Whether you seek a full service/maintenance contract, or just a contract for the filters

iv. Whether you seek advanced features on filters such as filter replacement indicator lights/alarms

a. Require bidders to:

i. Provide evidence that their filter will remove the desired contaminant(s) from the drinking water and the percentage of the particular contaminant(s) that will actually be removed

ii. Provide evidence of compliance with NSF/ANSI standards

iii. Provide evidence that their filter will serve your point of entry or point of use application

iv. Explain filter installation, maintenance, and replacement requirements

v. Describe how much space the filter requires

vi. Estimate total volume of water filtered before filter needs replacing, and associated cost of the filter per gallon of water (show all assumptions)

vii. If applicable, estimate the amount of electricity required to operate the filter and the total amount of electricity per gallon of water filtered (show all assumptions)

viii. Identify the filtration method used (e.g., adsorption, filter membranes, distillation, or disinfection)

ix. Describe end of life management services that are available to keep waste cartridges and other filter equipment out of landfills

II. **Fountains**

a. Specify:

i. What type of fountain you're looking for (e.g., box-shaped floor model, pedestal base model, wall-mounted unit, models built into and flush with wall)

ii. Where the fountain will be located (e.g., indoor, outdoor)

iii. Whether the contract includes the fountain, installation, and cleaning/maintenance, or some combination

iv. Whether the fountain needs special features such as taller spigots for the refilling of large reusable bottles

v. Whether refrigeration is required

b. Require bidders to:

i. Describe installation requirements

ii. Describe maintenance procedures

iii. Describe the durability, maintenance, and aesthetic characteristics of materials the fountain is made of

iv. Describe design features of the fountain including:

1. How the design accommodates cleaning and maintenance

2. How the design ensures user safety (e.g., no sharp corners)

3. How the stream of water can be adjusted

v. Provide references from previous clients

vi. Explain, if refrigeration is required,:

1. Types and environmental impacts of refrigerants used

2. Whether there is an adjustable thermostat on the fountain

3. Whether the fountain is insulated to conserve energy

vii. Identify warranties for parts and reputable suppliers of replacement parts

viii. Estimate the cost of a delivered gallon of water including costs for fountain purchase, maintenance, and refrigeration (show all assumptions)

ix. Provide evidence of compliance with ADA and IPC/UPC standards

x. For filtered units, provide evidence of compliance with NSF/ANSI standards

III. Bottle-less Coolers

a. Specify:

i. Whether cold or heated (hot and/or warm) water is desired

ii. Total volume of water desired, in terms of gallons per day or number of employees served

iii. Type of fixture to which the cooler will be installed (e.g., a building's cold water line)

iv. Whether a filtration system is desired and, if so, the specifications of that filter (see Filters, above)

v. Whether you seek a full service/maintenance contract, which could include scheduled filter replacement

vi. Whether you seek to lease or purchase the bottle-less water cooler

b. Require bidders to:

i. Describe the features of their bottle-less water cooler, including:

1. Whether it uses direct chill technology, or
2. If there is a tank reservoir, and if so, what it is made of, it's volume, the temperature at which it stores water, and sanitation devices (e.g., ultraviolet light) included in the tank
3. Whether there is a filter and, if so, what type; which contaminants it removes and the percentage it removes; the filter replacement schedule and cost
4. Amount of energy required to operate the unit

ii. Describe installation and maintenance requirements

iii. Estimate cost of the bottle-less water cooler (including filters, if applicable) per gallon of water dispensed (show all assumptions)

iv. For filtered units, provide evidence of compliance with NSF/ANSI standards

IV. Reusable Bottles

a. Specify:

i. The size of the bottle(s) requested

ii. The preferred bottle material(s)

iii. Whether the bottles should be designed for hot and/or cold liquids

b. Request bidders to:

i. Indicate specifications of the bottle(s):

1. Capacity
2. Material it is made of (if plastic, the type of plastic) and any recycled content
3. Indicate whether their bottles are lined with resins and if so:

a. What type of resin is used

b. Propensity of this resin to leach chemicals into the bottle's contents

ii. Indicate whether the bottles are recyclable

iii. Indicate materials used in the bottle lids, including recycled content, and recyclability

iv. Describe recommended cleaning procedures

v. Describe cleaning procedures that should be avoided

V. Events & Catering

a. Specify:

i. The number of event attendees

ii. The time and duration of the event

iii. The desired method for water delivery (e.g., water pitchers, bottle-less coolers, fountains)

iv. Whether vendor will be required to provide drinking vessels, and if so, what type (e.g., glasses, reusable bottles)

b. Request bidders to:

i. Describe the bottle-less water alternatives available through their location/service

ii. Describe the proximity of bottle-less water to event participants

iii. Describe the types of drinking vessels that can be provided

iv. Estimate the total gallons of water needed for the specified number of participants and duration of the event

v. Estimate the cost per gallon of water

ADDENDUM III: COMMON CONTAMINANTS IN TAP WATER

Contaminant	Source	Health Effects	Common Location	Available Filters
2, 4-D	• Widely-used herbicide	• Possible endocrine disruptor		
Arsenic	• Heavy metal that leaches into water from pollution (agricultural or industrial) and natural soil deposits (GG, 2007)	• Linked to bladder, lung, kidney, prostate and skin cancer in animal tests (GG, 2007) • Neurological and carrdiovascular damage • Skin irritation • Endocrine disruptor	• High concentrations in Southwest U.S. but common nationwide	• Pentavalent arsenic: NSF-certified carbon or reverse osmosis filters (McEvoy, 2004) • Trivalent arsenic: use distillation (McEvoy, 2004)
Atrazine	• Corn herbicide • Common pesticide	• Short-term: lung, kidney and heart congestion (GG, 2007) • Long-term: cardiovascular disease (GG, 2007) • Possible endocrine disruptor • “Cancer, weight loss, muscular degeneration” (McEvoy, 2004)	• “Most common in Mississippi River Basin during spring runoff” (McEvoy, 2004) • Common nationwide	• NSF-certified carbon filters or filters certified to reduce VOCs (McEvoy, 2004)
Chloramine	• Chlorine-ammonia compound used as a disinfectant in 29% of U.S. water utilities (GG, 2007)	• Asthma, rashes and fainting (GG, 2007)		
Chlorine	• Used by water treatment facilities to disinfect water	• Eye and nose irritation • Stomach discomfort	• Municipal tap water that has been treated using chlorine	• NSF-certified carbon filters
Coliform bacteria	• Indicators of Cryptosporidium and other dangerous microbes (GG, 2007)	• Not harmful in themselves (GG, 2007)		

E.coli	• Fecal coliform bacteria (GG, 2007)	• Gastrointestinal illness (GG, 2007) • 2-7% of E.coli infections lead to kidney failure (GG, 2007)		
Lead	• Decaying pipes and taps in homes, buildings and public water mains (GG, 2002; GG, 2007)	• Damage to brain and nervous system • Developmental problems in children (McEvoy, 2004) • Damage to blood pressure, kidneys and red blood cells (McEvoy, 2004)	• Exceeded the national standard in Boston*, Newark* and Seattle* (McEvoy, 2004) • Of high concern in Baltimore*, Los Angeles*, Manchester*, Philadelphia* and Washington D.C.* (McEvoy, 2004)	• NSF-certified carbon filters, reverse osmosis or distillation (McEvoy, 2004)
Lindane	• Insecticide • Found in prescription medications for head and body lice (GG, 2007)	• Endocrine disruptor	• Runoff from farmland, homes, and gardens where the insecticide was applied	
Mercury	• Heavy metal	• Brain and kidney damage	• Most comes from the chemical industries, as well as fossil fuel combus-tion, landfills, and industrial manufacturing and waste	
Methyl Tertiary-Butyl Ether (MTBE)	• Gasoline ad-ditive • Leaks into groundwater from underground fuel storage, spills and storm-water runoff (GG, 2007)	• Potential carcinogen	• Banned in many but not all states (GG, 2007)	• NSF-certified carbon filters (McEvoy, 2004)

Misc. Heavy Metals	• Copper, lead, mercury, etc.	• Chromium: carcinogen; upset stomach, ulcers, kidney and liver damage; death (GG, 2007) • Selenium, cadmium, copper (short-term): nausea, vomiting and diarrhea (GG, 2007) • Cadmium and copper (long-term): kidney disease (GG, 2007)	• Naturally occurring in soil; can leach into groundwater • Other sources include landfills, corroding and leaching pipes, mining, and industrial waste	
Nitrates	• Animal waste on cattle farms, feedlots and dairies (GG, 2007)	• Can cause 'blue-baby syndrome', which prevents blood from holding oxygen (GG, 2007)	• More common in rural areas (McEvoy, 2004) • High concern in Fresno* and Phoenix* (McEvoy, 2004)	• Reverse osmosis
Pathogens (aka Cysts)	• Microorganisms carried by animal and human waste (GG, 2007) • Ex: E.coli, giardia, and Cryptosporidium	• Linked to gastrointestinal illness (GG, 2007) • Life-threatening for those with weakened immune systems, especially Crypto (GG, 2007; McEvoy, 2004)	• High concern in Boston*, Detroit*, Houston*, Philadelphia*, Seattle* and Washington D.C.* (McEvoy, 2004)	• Use carbon filters that are NSF certified for cyst reduction; reverse osmosis or ultraviolet light systems (class A) (McEvoy, 2004)
Perchlorate	• Rocket fuel ingredient	• Thyroid damage • Potential carcinogen	• Leakage from a Kerr-McGee plant in NV has reportedly contaminated the Colorado River – drinking water impacted in Los Angeles*, San Diego*, Phoenix*, and other areas (McEvoy, 2004)	• Reverse osmosis or distillation

Perchloro-ethylene (PERC) – aka Tetrachloro-ethylene	• Main solvent used in most dry-cleaning processes (GG, 2007)	• Known carcinogen (GG, 2007) • Neurological, kidney, liver effects (GG, 2007) • Associated with reproductive effects such as spontaneous abortion (GG, 2007)	• Can leach into groundwater when improperly disposed of	
Simazine	• Widely-used pesticide	• Long-term exposure may lead to liver and kidney damage (GG, 2007)		
Trihalometh-anes (THMs)	• Water disinfection byproducts • Formed when chlorine reacts with organic matter, such as animal waste, treated sewage or leaves and soil (GG, 2007)	• Increased risk of cancer (GG, 2007) • Liver, kidney, and neurological damage • Increased rates of miscarriage and birth defects (GG, 2007)	• Highest concern in Boston*, Houston*, Los Angeles*, Manchester*, Newark*, Philadelphia*, Phoenix*, San Diego*, San Francisco*, Seattle* and Washington D.C.* (McEvoy, 2004)	• NSF-certified carbon filters (McEvoy, 2004)
Total Dissolved Solids (TDS)	• Inorganic salts, such as calcium, sodium and sulfates, and small amounts of organic matter that are dissolved in water (GG, 2007)	• Not a health hazard but can cause water to be corro-sive or salty in taste and may lead to mineral build-up (GG, 2007)		
Toxaphene	• Insecticide	• Likely carcinogen • Kidney, lung, and neurological damage at high levels	• Usage is banned but it "breaks down slowly in the environment" (GG, 2007)	

Volatile Organic Compounds (VOCs)	• Includes benzene and toulene among others	• Benzene: cancer, birth defects • Toulene: nausea, weakness, confusion, hearing and vision loss (GG, 2007)	• VOCs that are improperly disposed of can pass through soil easily and end up in groundwater • Not typically found in drinking supplies sourced from surface waters since VOCs evaporate into the air	

* The cities cited in this Addendum come from a National Geographic Green Guide article from 2004. Since the publication of this article, these cities may have taken action to clean up contaminants in their respective water supplies. For the most up-to-date information on a city's water quality, contact the local water utility company, visit the EPA's online database of Consumer Confidence Reports at www.epa.gov/safewater, or call the EPA's Safe Drinking Water Hotline at 800-426-4791.

ADDENDUM IV: FILTRATION METHODS

Method	Description	Benefits	Drawbacks	Styles
Adsorption (General)	• Water is filtered through "an adsorbent medium – like carbon, charcoal, KDF (a copper-zinc formulation), and ceramic – to which liquids, gases, and dissolved or suspended matter will adhere" (Rysavy, 2007)	• Removes organic contaminants, chlorine, and other substances that affect taste and odor (Rysavy, 2007) • Uses gravity, not energy, to filter water • Inexpensive	• Does not remove nitrates, heavy metals, fluoride (Rysavy, 2007) • Filter can harbor bacteria unless changed frequently	• Carafe • Faucet Mount • Counter Top • Under Counter • Whole House (POE) • Portable • Refrigera-tor • Multi-stage
Carbon Adsorption	• Charged carbon attracts and traps contaminants within its porous structure	• Least expensive filter type (GG, 2002) • Removes tastes, odors, chlorine • Adsorp lead, chlorine byproducts, certain parasites, radon, solvents, some pesticides and herbicides, and some organic chemicals as well as odor and bad tastes (GG, 2007) • If NSF-53 certified, can reduce heavy metals such as copper, lead and mercury; disinfection byproducts; parasites such as Giardia and Cryptosporidium; pesticides; radon; and VOCs such as MTBE, dichlorobenzene and trichloroethylene (TCE) (NRDC, 2005)	• Won't remove heavy metals, arsenic, nitrites, bacteria, microbes, (GG, 2007), viruses, parasites, and sodium (Ruddy, 2006)	• Carafe • Faucet Mount • Counter Top • Under Counter • Whole House (POE) • Portable • Refrigera-tor • Multi-stage

Distillation	• Water is boiled and steam recondenses, leaving behind certain contaminants • Frequently combined with a carbon filter (NRDC, 2005) to remove any remaining contaminants	• Removes heavy metals such as cadmium, chromium, copper, lead and mercury, as well as arsenic, barium, fluoride, selenium and sodium (NRDC, 2005) • High temperature kills some microbes • Best at removing inorganic contaminants (Rysavy, 2007) • Removes nitrates, hardness (calcium and magnesium)	• Can cost between \$200 and \$1500 • De-mineralizes water, making its pH more acidic (BW Blues, 2008) • Does not remove chlorine and VOCs (a carbon filter will do this if present) • Does not emove small synthetic organic chemicals which vaporize at lower temperatures than water (BW Blues, 2008) • Does not remove chloramines • Uses significant energy – “it takes 1 kWh to produce one liter of distilled water” (GG, 2007) • Creates significant heat • Requires regular cleaning (McEvoy, 2004) • Can taste ‘flat’ because it “contains less dissolved oxygen” (GG, 2007)	• Counter Top • Whole House (POE) • Multi-stage
Filter Membranes (General)	• Water passes through a membrane(s) that traps particles above a certain size • Many times combined with other filtration methods like UV	• A 1 micron filter will remove particulates and most bacteria, Cryptosporidia, and viruses (Rysavy, 2007)	• Membranes can only filter out particles that are bigger than the holes in the membrane • Membranes need to be replaced periodically and require proper disposal	• Faucet Mount • Counter Top • Under Counter • Whole House (POE) • Multi-stage

Reverse Osmosis	• Water is pushed through a semi-permeable membrane, separating out contaminants and flushing them away with waste water • Typically combined with UV or carbon filters	• Removes many contaminants, including: parasites such as Cryptosporidium and Giardia; heavy metals such as cadmium, copper, lead and mercury; and other pollutants, including arsenic, barium, nitrate/nitrite, perchlorate and selenium (NRDC, 2005) • Removes total dissolved solids • Only filter certified to remove arsenic (CR, 2007) • The only filter that removes nitrates and perchlorate (GG, 2007) • Removes industrial chemicals, chlorine byproducts, asbestos • Best for removing bacteria (Rysavy, 2007) • Removes virtually all pharmaceutical contaminants (Donn, 2008) • Wastewater can be reused as greywater • Good option for institutions with sensitive populations such as the elderly, immuno-suppressed, pregnant, and children • Good option for areas known to have pharmaceutical contamination • New technology allows waste water to be captured through a central drain and collection system and reused for irrigation, janitorial uses, etc.	• Large amount of water waste (3-9 gallons waste water for every filtered gallon, depending on the system) • In the future, certain regions may impose water consumption restrictions or regulations which may penalize or charge users of reverse osmosis systems due to the large amount of water waste • Requires adequate drainage infrastructure • Flushes contaminants back into the water supply • Requires plumbing modifications • Hard to install • Must be cleaned thoroughly and frequently • Membrane lasts 2-3 years • Slow • Takes up space • Very expensive for large-scale use (Donn, 2008), costs between $160 to $450 for the system • Does not remove radon or some pesticides (GG, 2007)	• Under Counter • Whole House (POE) • Multi-stage

Ceramic	• Ceramic acts as a filter membrane with openings as small as 0.2 microns • Frequently combined with carbon filters and other filters	• Removes bacteria, parasites/cysts, asbestos and sediments (GG, 2007)	• Requires regular cleaning to prevent clogs and slow water flow • Contaminants go down the drain	• Counter Top • Under Counter • Multi-stage
Ultraviolet Disinfection	• Used in areas where there is a history of bacteria outbreaks in the water supply (i.e. many wells) • Uses a 60-watt ultraviolet bulb that stays lit continuously. Water is irradiated as it flows around the lamp. • An alarm system should be included to signal when the bulb burns out • Should be used in combination with another filtration method like carbon filters • Class A systems remove bacteria and viruses like Cryptosporidium, E.coli and Giardia • Class B systems make non-disease-causing bacteria inactive (NRDC, 2005)	• Kills 99.9% of harmful bacteria in point-of-use filter systems (Peterson, 2008) • Kills microorganisms and parasites • These are the only systems NSF-certified to remove Giardia, E.coli, and Cryptosporidium • FDA approved to disinfect filtered water • More energy efficient than distillers, despite bulb being lit 24/7	• Expensive: $700+ for NSF-certified models • Not certified to remove pathogens uncommon to North America such as toxoplasma and entamoeba (GG, 2007) • Will not remove chemical pollutants (Rysavy, 2007) • Water treat-ment units that include UV disinfection consume more energy than those that do not	• Under Counter • Whole House (POE) • Multi-stage
Selective Filtration	• Said to be able to distinguish between contaminants and trace minerals such as calcium, magnesium and potassium (BW Blues, 2008)			

Cation Exchange Softener	• Softens hard water by trading minerals with a strong positive charge for one with less of a charge (NRDC, 2005)	• Removes calcium and magnesium, which form mineral deposits in plumbing and fixtures (NRDC, 2005) • Removes barium and other ions which have adverse health effects		• Counter Top • Whole House (POE)

ADDENDUM V: FILTER STYLES

Filter Style	Description	Benefits	Drawbacks	Price Range
Carafe	• Plastic pour-through pitcher • Most use a carbon filter • Best for filtering small quantities of drinking water (CR, 2007)	• Inexpensive • Simple to use • Portable • No installation	• Some models tend to clog easily and filter slowly • Requires frequent filter changes (usually every 1-3 months) • Most filter cartridges cannot be recycled in the U.S.	$15 to $60
Faucet Mount	• Attaches directly to a faucet or tap (i.e. point-of-use) • Most use a carbon filter • Best for filtering drinking and cooking water (CR, 2007)	• Filters faster than carafes • Minimal installation effort (CR, 2007) • Can filter both drinking and cooking water • Easy to switch between filtered and unfiltered water (CR, 2007)	• Slows water flow • Does not fit on all faucets • Requires frequent filter changes (usually every 3 months) • Most filter cartridges cannot be recycled in the U.S.	$20 to $60
Counter Top	• Either manual-fill units, or filled via a tube connected to a faucet (GG, 2007) • Typically use carbon filters or distillation • Best for filtering large quantities of water without plumbing modification (CR, 2007)	• Less likely to clog than carafes or faucet mounts (CR, 2007) • Some manual-fill units can fit on a refrigerator shelf for continuous chilled water	• Take up countertop space • Does not fit on all faucets • Most filter cartridges cannot be recycled in the U.S.	$50 to $300
Under Counter	• Attaches to water pipes under sink and provides hot or cold filtered water through existing tap or separate faucet (GG, 2007) • Best for filtering lots of water without modifying the existing faucet or cluttering the counter (CR, 2007)	• Better water flow compared to faucet mount filters • Infrequent filter changes (about 2 times a year)	• Takes up space under the counter • Requires plumbing modifications (CR, 2007) • Typically needs permanent connection to existing pipe (McEvoy, 2004) • Installation can be expensive, especially if the unit needs a separate faucet – "a hole must be drilled through the sink and/or countertop for the dispenser" (CR, 2007) • Most filter cartridges cannot be recycled in the U.S.	$55 to $350

Whole House (aka Point-of-Entry or POE)	• Filters water at the point-of-entry to a house or building • Best for inexpensively removing sediment, rust, and for some, chlorine, from household water (CR, 2007) • Installed outside or in a basement	• Can prolong the life of major appliances when sediment in water is a problem (GG, 2007) • Long cartridge lifetime (CR, 2007)	• Ineffective at removing lead, chloroform, pesticides, and bacteria (GG, 2007) • Ineffective at removing most contaminants, including pathogens, heavy metals, and VOCs (CR, 2007) • Requires professional installation (CR, 2007) • Most filter cartridges cannot be recycled in the U.S.	$35 to $80
Portable	• Typically found inside reusable water bottles or as screw-on mouthpieces for single-serving bottled water	• Most remove chlorine, bad tastes and odors, heavy metals including lead, mercury, and copper (GG, 2007) • Portable and convenient • Filters water from any source	• Short filter lifespan • Most filter cartridges cannot be recycled in the U.S.	$5 to $50
Refrigerator	• Built into the inside or door of a refrigerator • Filters water at point-of-use	• Convenient, continuous water supply • Chilled water on-demand	• Most filter cartridges cannot be recycled in the U.S.	Refrigerators with filtration units typically cost more than those without
Multi-Stage	• Combine two or more methods of filtration	• Can filter a wide variety of contaminants		Varies.