

The following piece is the “Water Quality Systems” chapter of Farkas Berkowitz & Company’s annual State of the Industry Report.

Farkas Berkowitz & Company is a premier management-consulting firm focused on serving clients in environmental, infrastructure, and related industries. Our clients include the most prestigious firms in the U.S. involved in engineering and construction; solid, hazardous, and nuclear waste management; air quality systems; water quality systems; and industrial outsourcing services. We enter each assignment with a thorough and objective understanding of the financial, technical, and competitive aspects of our clients’ markets. We are therefore able to focus all of our time with clients on the specific issues that are key to their current and future profitability.

[Farkas Berkowitz & Company](http://www.farkasberkowitz.com)
<http://www.farkasberkowitz.com>
1220 19th Street, NW Suite 300
Washington, DC 2003
(202) 833-7530
info@farkasberkowitz.com

About the [State-of-the-Industry Report](#)

Learn from industry insiders about environmental and infrastructure markets. Farkas Berkowitz & Company offers a unique perspective on the trends, issues, competitors, and outlook of the following markets:

- **Infrastructure engineering, including: Power, transportation, telecommunications, water quality and remediation**
- **Water quality systems**
- **Solid waste management**
- **Industrial waste management and related in-plant services**

Covering 1999 and the first half of 2000, this 250-page report not only presents the key statistics on market size and growth, but also offers insights on what the numbers mean. The analysis includes predictions for growth, why some firms succeed while others do not, future challenges awaiting firms, and emerging market drivers. As management consultants to leading environmental and infrastructure firms for over 15 years, the firm’s analysis will provide you with the knowledge to make decisions for your business.

WATER QUALITY SYSTEMS

The water quality systems sector, as we define it in this report, includes both public and private entities that provide equipment, chemicals, and/or services related to water supply and wastewater treatment. We include municipally-operated water and sewage facilities because they are a source of revenue for the municipalities and are potential candidates for privatization. We do not include design-engineering services for municipal and industrial water and wastewater treatment plants, which we discussed in a preceding chapter.

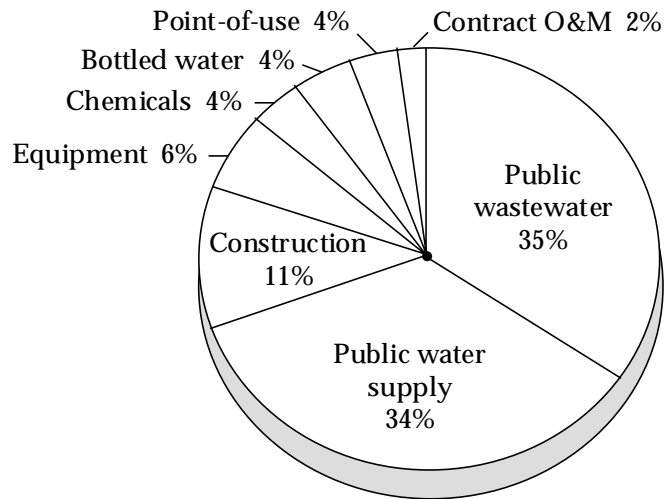
We base our analysis of the water quality systems sector on the consulting work we have done for clients that participate in the sector, our extensive collection of published information on the sector, and our automated database of publicly traded firms that report financial performance for their water quality systems business.

We begin with an overview of the \$86 billion water quality systems market. We then discuss four market areas in more detail – privatization of government facilities; outsourcing of water and wastewater functions at industrial facilities; water conservation, reuse, and reclamation; and e-commerce as it pertains to the water and wastewater sector. We next discuss the financial performance and strategies of commercial product and service providers, and finally we present our views on the outlook for the sector.

MARKET OVERVIEW

We estimate the size of the water quality systems market in the U.S. in 1999 at \$86 billion. The market is made up of many diverse segments as shown in Exhibit 17.

Exhibit 17
Distribution of \$86 Billion Water Quality Systems
Market in 1999 by Segment



Source: Farkas Berkowitz & Company, 2000

Public wastewater accounts for 35 percent of the market, around \$30 billion. Almost all of the “revenues” accrue to municipalities in the form of sewer charges to users or allocations from the general fund.

Public water supply accounts for 34 percent of the market, around \$29 billion. Of that, \$24 billion accrues to municipalities and \$5 billion to investor-owned regulated water utilities.

Construction accounts for 11 percent of the market, around \$9 billion. Services involve mainly laying of sewer pipe and pouring of concrete.

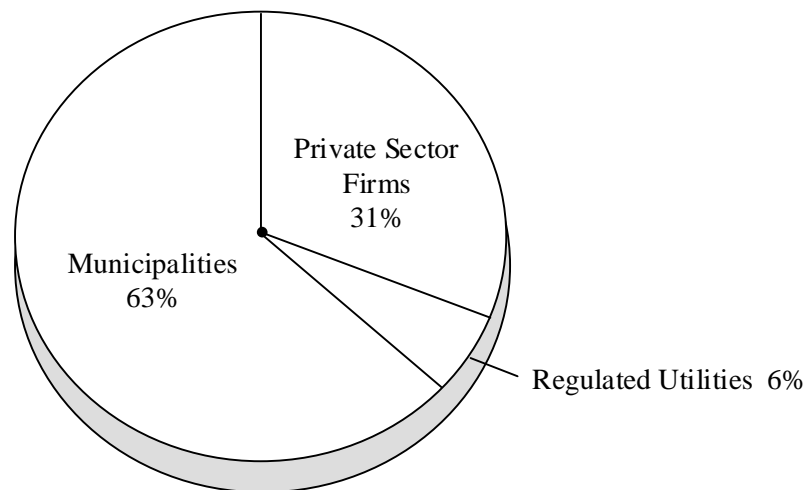
Equipment, such as pumps, valves, meters, control systems, and physical/chemical/biological treatment systems, accounts for six percent of the market, around \$5 billion.

Water and wastewater treatment chemicals, bottled water, and point-of-use/point-of-entry systems each account for four percent of the market, around \$3 billion. The chemicals market in the U.S. was approximately flat in 1999. Public fears about the quality of their drinking water drove an eight percent growth in sales of bottled water, and a five percent growth in sales of point-of-use/point-of-entry systems. Point-of-use (POU) systems are basically pitchers equipped with some type of water filter in the spout to remove impurities from drinking water. Point-of-entry (POE) systems are installed between the line carrying municipal water and the household plumbing and are designed to remove residual impurities from all water used for household purposes.

Contract operation and maintenance of both municipal and industrial water and wastewater treatment plants accounted for the remaining two percent of the market, less than \$2 billion.

As shown in Exhibit 18, private sector firms control only 37 percent of the market, regulated utilities accounting for 6 percent and unregulated water quality systems firms for 31 percent. Municipalities control 63 percent of the market.

Exhibit 18
Distribution of \$86 Billion Water Quality Systems Market in 1999 by Type of Service Provider



Source: Farkas Berkowitz & Company, 2000

Our \$86 billion market size estimate does not include the \$3 billion water and wastewater engineering market that we addressed in a previous section of this report. It also does not include the \$10 billion costs incurred internally by manufacturing plants to operate and maintain their wastewater treatment systems.

Overall growth in the water quality systems market, as we have defined it, was about three percent, approximately the same as that of the GDP. The slow overall growth, however, masks the major transformation that is occurring in the industry.

Segment boundaries are breaking down. Design engineering firms are moving into construction, construction firms are adding design capability, and both are eyeing opportunities in contract operations and maintenance. Equipment firms are bundling their products into systems and providing after-market services. Suppliers of water and wastewater treatment chemicals are offering equipment and systems to help customers reduce their dependence on chemicals.

Ownership structure is also changing. U.S. firms are merging and acquiring to form larger entities. Electric utilities are reinventing themselves. Some have plunged into water/wastewater. Others are evaluating the potential synergies. French and British water quality systems firms are implementing their announced strategies to penetrate the U.S. market. The boldest example of the latter is Vivendi's acquisition of U.S. Filter, which combines the largest water firm in France with the largest water firm in the U.S. to create the largest water firm in the world. The acquisition of Nalco by Suez Lyonnaise des Eaux ended Nalco's 50-year history as an independent publicly traded company, and totally changed the structure of water and wastewater treatment chemicals market. British water utilities are drawing on their core competencies in operating water treatment plants to acquire investor owned water utilities in the U.S. Kelda (formerly Yorkshire Water) acquired Aquarion. Thames Water is in the process of acquiring E'town.

Products and services are being delivered in new ways. The Internet has not yet had a major impact on the market, but it could become a major force in shaping the industry. Most water quality systems firms have Web sites, but they are mainly informational sites rather than e-commerce sites. They describe the firm and the products and services offered, but do not provide an opportunity for customers to make purchases on line. Reverse auctions are a new Internet-based business arena that could severely depress margins for firms selling water quality products like pumps, valves, and other hardware that the customer may consider to be commodities. In a broader context, information technology (IT) is an enabling mechanism for one-to-one marketing that few water quality firms have implemented. With the aid of contemporary IT tools, firms can identify their best customers in terms of profitability and use the information to develop customer-specific marketing strategies.

While contract operations and maintenance account for only two percent of the water quality systems market currently, privatization in the government sector and outsourcing in the industrial sector are driving growth. Longer term, impending water shortages will drive growth in markets related to water conservation, reuse, and reclamation. We discuss each of these areas further in the following sections of this report.

PRIVATIZATION IN THE GOVERNMENT SECTOR

Privatization can take many forms. Design-build is growing most rapidly. Strictly speaking, design-build is not true privatization, but it is a major break with the traditional design-bid-build model that municipalities have followed for close to a hundred years. As such, design-build paves the way for municipalities to consider a broader spectrum of alternatives for satisfying the water needs of their communities. Possible alternatives include operations and maintenance contracts, design-build-operate, and asset sales.

Operations and maintenance contracts may encompass the entire water delivery and wastewater treatment system, or only a part of the system, such as billing, meter reading, or distribution. Design-build-operate is a hybrid of design-build and contract operations and may in itself take different forms. Two are design-build-own-operate and design-build-own-operate-transfer. In the U.S., municipalities generally want to retain ownership. Outside of the U.S., particularly in newly industrializing countries, finance is often the critical factor in contract awards and effectively entails the contractor's assuming some type of equity position. If the municipality wants to include a transfer option in the contract, agreement needs to be reached on when transfer may occur and how fair market value will be determined at that time.

The final mode of privatization is asset sale, which is very rare in the municipal market in the U.S. In the federal market, the Department of Defense has been ordered by Secretary Cohen to sell all internally managed water and power utilities. That effort is proceeding very slowly.

The U.S. lags the rest of the world in privatizing its water and wastewater facilities. The municipal contract operations market grew 15 percent in 1999 to \$1.3 billion. That represents only three percent of municipal budgets for water and wastewater plant operations.

Since the change in the tax law in January 1997 allowing long-term operation and maintenance (O&M) contracts, the French concession model has prevailed in the U.S. Up to that time, an Internal Revenue Service rule had effectively limited O&M contracts to a maximum period of five years for any water or wastewater facility built in whole or in part with federal funds. The rule required payment of all outstanding tax-exempt debt if longer-term contracts were issued. The five-year contract limitation precluded significant investment by the contractor in maintaining or upgrading the facility. Longer-term contracts provide time for the contractor to recover investment costs from user fees over the lifetime of the contract. Within the past three years, 54 operations and maintenance contracts of 10 or more years in duration have been negotiated with a total lifetime value of close to \$5 billion in constant dollars.

Exhibit 19 shows revenue and growth in 1999 for the top ten contract operations and maintenance firms as reported by *Public Works Financing*.

Exhibit 19
Revenues and Growth in Contract Operations
in the U.S. for the Top Ten Firms

Firm	1999 Revenues (\$ millions)	1999 Growth
U.S. Filter Operating Services	\$369	10%
United Water Services	\$136	42%
CH2M Hill OMI	\$103	20%
Severn Trent	\$74	14%
ECO Resources	\$39	7%
American Water Services	\$36	-6%
Earth Tech	\$34	13%
U.S. Water LLC	\$33	45%
Azurix	\$30	3%
Environmental Management Corp.	\$18	28%

Source: *Public Works Financing*, March 2000

The French and British have a major presence in the market. U.S. Filter Operating Services, now part of Vivendi, was the market share leader in 1999. United Water Services, now wholly owned by Suez Lyonnaise des Eaux, had considerably higher growth. Severn Trent, the fourth ranked firm, is one of the ten British water utilities that were privatized in 1989 under the Thatcher government. U.S. Water LLC, which led the top ten in growth, is a joint venture between Bechtel and United Utilities. The latter is another of the British water utilities, formerly called North West Water.

U.S. firms are well represented. CH2M Hill and Earth Tech are both U.S.-based environmental engineering consulting firms. ECO Resources and American Water Services are the unregulated arms of publicly traded U.S. water utilities. ECO Resources is a wholly-owned subsidiary of Southwest Water, whose revenues split about equally between water utility services and contract operations. American Water Services had been a joint venture between American Waterworks and Anglian Water, but American Waterworks bought out their partner in 1999. American Waterworks is the largest water utility in the U.S. and has been much less aggressive than Southwest Water in pursuing operations and maintenance contracts.

Azurix, a publicly traded spin-off of Enron, has been acquiring small firms with operations and maintenance contracts. Environmental Management Corporation is a privately held firm, headquartered in St. Louis, that specializes in contract operations and maintenance for both municipalities and industry.

The municipal contract operations market is growing less rapidly than many had anticipated, and profits are elusive. Competition is intense. Every procurement typically attracts three to seven qualified bidders.

Procurement times are long and getting longer. The procurement process will often begin with a one- to two-year study of the advantages and disadvantages of the various types of privatization or public/private partnership. Then if the municipal water district decides to proceed, another couple of years can elapse in developing bid specifications, drafting the RFP, rewriting the RFP in response to numerous technical, legal, and financial reviews, and finally soliciting bids. Next, the lengthy process ensues of reviewing and evaluating written proposals, interviewing competitors, and entering into negotiations with the preferred contractor. By that time, the political winds may have shifted, and the entire procurement could be cancelled.

Bidding costs can be over a million dollars for a large concession contract, and the required capital investment can be significant in terms of up-front concession fees and system upgrades. As a result, the first years of a long-term contract may be unprofitable.

A backlash has set in that threatens to slow future growth in contract operations, but not stop it. Four large procurements were cancelled in 1999, each originally budgeted at \$10-20 million per year for periods of 15-20 years. The municipalities involved were Birmingham, Alabama; Camden County, New Jersey; Chattanooga, Tennessee; and Essex/Union, New Jersey. The Birmingham example is instructive. The mayor had originally proposed an asset sale of the city's water and sewer system. The voters defeated that proposal in a referendum, and the city issued an RFP for an O&M contract. Three finalists were selected – OMI, American Waterworks, and United Water. The OMI bid was less than the city's estimate, but only by ten percent; the other bids were higher. In the end, Birmingham concluded that a reengineering plan developed by city employees would capture most of the savings of privatization. Malcolm Pirnie both assisted in the development of the reengineering plan and advised the mayor on adopting it.

The backlash giving rise to slower growth in contract operations stems from three sources. The metropolitan sewerage agencies fear loss of power. The unions fear loss of jobs. And consultants fear loss of relationships that have supported their business for many years.

The Association of Metropolitan Sewerage Agencies (AMSA) is one of the leading opponents of privatization. AMSA concedes that private operations and maintenance contractors have set new industry standards. On average, private contractors have demonstrated a 24 percent reduction in operation and maintenance costs with comparable or better service and a higher return on assets. The latter is a key measure of operating efficiency. AMSA argues that municipalities could achieve similar results, but have not previously had an incentive to do so. AMSA has published a handbook to help the municipalities get started, and many consulting firms are offering their services. Two of the most active are HDR and Malcolm Pirnie.

AMSA and AMWA (Association of Metropolitan Water Agencies) were the lead groups in establishing the Water Infrastructure Network (WIN), a coalition of 25 organizations involved with water and wastewater. One of WIN's first projects was to prepare a report entitled *Clean & Safe Water for the 21st Century*. That report estimates that \$2 trillion is needed over the next 20 years for repair, rehabilitation, operation, and maintenance of the U.S. water and wastewater treatment infrastructure. About half is required for capital improvements. The WIN report provides data that demonstrate a \$23 billion annual shortfall to meet the needs and calls on the Federal government to close the gap. The report fails to consider contributions to solving the problem that might be made by the private sector. Public-private partnerships, in their many forms, and technology innovation may not be the total answer, but they can play a role in assuring clean and safe water without imposing an unacceptable burden on the ratepayers.

A major shift towards privatization of municipal water and wastewater facilities would impact equipment suppliers. The shift would change the buying hierarchy from the municipal engineers and their trusted consultants to the maintenance and operations contractor. On the positive side, long-term maintenance and operations contracts increase the incentives for facility upgrades and for greater consideration of life cycle costs. On the negative side, if a small number of maintenance and operations contractors gain a foothold in many municipalities, they will be able to apply increased pressure on equipment suppliers to lower prices. One counter strategy for suppliers is to place increased emphasis on customer service.

OUTSOURCING IN THE INDUSTRIAL SECTOR

Outsourcing in the industrial sector is the counterpart to privatization in the government sector. The market is small but growing rapidly.

We estimate that industrial outsourcing of water and wastewater operations was a \$500 million market in 1999. Annual growth is approaching 40 percent. The potential exceeds \$10 billion, the aggregate cost reported by manufacturing industries to operate their wastewater treatment

facilities, according to the latest Department of Commerce Pollution Abatement and Capital Expenditure (PACE) survey. That survey was published in 1995, and Congress subsequently cancelled the funding to conduct updates. Costs have probably increased due to inflation, and even the 1995 survey only covered pollution abatement costs associated with environmental regulations. It therefore did not include costs of treating intake water to the level of purity required for use in manufacturing operations.

Outsourcing of industrial water and wastewater treatment operations is gaining favor. The principal reason is that potential customers do not want to be in the water business. Still, they must have clean water for manufacturing. They must treat their wastewater to assure compliance with regulatory requirements. Those functions are therefore essential but non-core. The operator of the wastewater treatment facility at a manufacturing plant does not have much of a career path.

Impending new requirements under the Clean Water Act provide further incentive for outsourcing. Congress intended regulations under the Clean Water Act to be promulgated in two Phases. Phase I was to issue technology-based National Pollution Discharge Elimination System (NPDES) permits to all point sources discharging to surface water. An overwhelming majority of industrial plants are in compliance with their NPDES or SPDES permits; a few municipalities are not. Since the Phase I standards were technology based, rather than risk based, they could be overprotective or underprotective of the nation's waterways. Phase II requires the states, under the guidance of the EPA, to establish total maximum daily loadings (TMDL's) on a pollutant-by-pollutant basis for all water bodies that are still impaired, i.e. water bodies that still pose a threat to human health or the environment. The states then have the further obligation to allocate the loadings among point and non-point dischargers. The result may be more stringent limitations on discharges under NPDES or SPDES permits, and the need for capital upgrades of wastewater treatment facilities. Capital expenditure requests may trigger a detailed assessment of the relative merits of outsourcing water and wastewater treatment and eliminating the facilities from the balance sheet, versus retaining the functions and facilities internally.

Outsourcing of water and wastewater treatment are in different stages of development. Contracting for ultrapure water is common. Wastewater outsourcing is newer. Integrated management of water from intake through manufacturing to discharge is embryonic.

Ionics pioneered the concept of providing ultrapure water to industry under contract in the mid-1980's. At the time, Ionics derived most of its revenue from the sale of large capital equipment, mainly for desalination. That market is highly volatile from the standpoint of both revenues and earnings. Operating or service contracts offer greater stability over time. Many firms have since

emulated Ionics and competition has increased. Typically, the suppliers own and operate the systems and provide customers with specified quantities of water at an acceptable level of quality.

Four industries are primary buyers of water under outsourcing contracts. These are the industries that are most dependent on a reliable source of ultrapure water for their production operations - electronics, food and beverage, pharmaceuticals, and electric utilities. All are major water users and trace impurities in the water could seriously degrade the quality of their products or their production processes.

Outsourcing of wastewater treatment operations is newer. Firms in the chemicals, food and beverage, and petroleum refining industries were early adopters. Firms active in the market include U.S. Filter Operating Services, CH2M Hill OMI, and Nalco Industrial Outsourcing (NIO). The first two are also active in the municipal privatization market. Nalco Industrial Outsourcing serves industry exclusively. A sister company, United Water Services, also under the control of Suez Lyonnaise des Eaux, focuses almost exclusively on the municipal market.

In the industrial wastewater outsourcing market, industry knowledge is key and service is critical. Water and wastewater treatment is a small cost relative to the total cost of production. However, impure water can ruin a product and discharge violations can lead to major fines. Therefore, technology must be proven and well-tested. Firms such as Coca-Cola or Anheuser-Busch cannot afford to get customer complaints that are traced back to a new water treatment or total water management system installed to save money.

Outsourcing by industry, like privatization by government, presents new challenges to equipment suppliers. Consolidation has already resulted in fewer customers. Outsourcing creates a different set of buyers. The trend on the part of industry to reduce the number of suppliers with whom they do business places a premium on quality and service, combined with a continuous effort to reduce manufacturing and delivery costs in order to maintain profit margins. The specialty equipment supplier faces further competition from firms such as Vivendi and Suez Lyonnaise des Eaux that are promoting "one-stop shopping."

CONSERVATION, REUSE, AND RECLAMATION

Water supply is the next global crisis. The quantity of fresh water is fixed. The world population is increasing. Demand outstrips supply in growing urban areas. Rivers are running dry. Groundwater is over-pumped, leading among other things, to salt water intrusion in coastal

areas. And controversy continues over the Colorado Compact, which allocates water from the Colorado River among the Western states.

Resolving the issues will not be easy. Eyes have turned northward to the country most richly endowed with fresh water resources, but Canada adamantly opposes export and has passed laws against it. Many have proposed redistribution of water between urban and agricultural areas. Several of the Western states are experimenting with underground storage reservoirs to capture water in wet periods for sale in dry periods. Finally, desalination costs are decreasing dramatically.

A front-page article in the *Wall Street Journal* this year carried the banner, "Farmers find water worth more than crops." The article discussed in some detail the buying up of water rights by developers in Colorado. State law assigns the right to appropriate water to the owners of the land. Small farms in Colorado use their water entitlements for irrigation. Developers want to shift that water to the cities where it will command higher prices. The developers are making offers to the farmers that they are finding increasingly difficult to refuse, but the loss of water for irrigating their crops forces the farms to close. In 1999, Colorado farmers could sell water to Denver and neighboring cities for \$4000/1000m³. In 2000, the average price had increased to \$14,000/1000m³.

In California, where the city of San Diego and the Imperial Valley vie for water, a win-win approach might be possible. Farms in the Imperial Valley have rights to Colorado River water that date back a long time. The many parties at interest generally agree that irrigation use has been profligate, and that conservation might free water for sale to San Diego, without loss of agricultural production in the Valley. The Imperial Valley Irrigation District has agreed in principle to sell surplus water to the city, but has not yet decided on the conservation methods that will be implemented. U.S. Filter has proposed to reclaim farm runoff for reuse in irrigation, and hopes to be able to pilot test the idea. A further complication is reaching agreement with the Metropolitan Water District of Southern California (MWD) on payment for delivery of the water. MWD controls the distribution network that carries water from the Valley to San Diego.

Water banking is another concept that is attracting attention. The idea is to store surplus water in wet years in underground aquifers, for a price, and to withdraw it for sale in dry years. The Water Banking Rule promulgated by the Department of Interior in October 1999 sets the stage. In anticipation, private firms have acquired land with water rights attached that would enable them to offer aquifer storage. The firms include Cadiz, Western Water, Azurix, U.S. Filter, and Vidler. Each is pursuing a somewhat different strategy as we discuss below.

Cadiz, a publicly traded firm, acquired the agricultural interests of Sun World in 1996. Cadiz was not attracted by the prospect of selling raisins, but rather by the fact that the land carries water rights.

Western Water, also a publicly traded firm, has been acquiring real estate with associated water rights in Colorado and California. Aguas de Barcelona (Agbar), a Spanish water company that is owned in part by Suez Lyonnaise des Eaux, has a 20 percent equity interest in Western Water.

Azurix has acquired an interest in a cotton farm. Although Azurix has been pursuing a somewhat eclectic acquisition strategy, as we discuss in the next section of the report, they are not trying to establish a leading position in growing cotton. The attraction of the cotton farm was a suitable aquifer for water storage. The planned storage area will have a capacity of 480 million cubic meters. Customers will store (i.e. bank) surplus water in wet years and borrow it back in dry years.

U.S. Filter acquired agricultural land in the Imperial Valley from the Bass Brothers, again to obtain rights to water that might be sold to San Diego at a substantial profit.

Vidler Water Company is a subsidiary of publicly traded PICO Holdings. PICO has holdings in land and resources with associated water rights, insurance, and various other industries, in addition to Vidler Water. Vidler owns water rights in Nevada, Arizona, and Colorado; and has interests in water storage facilities in Arizona and California. Their strategy is to “generate revenue by locating, aggregating, developing and converting water rights from fragmented agricultural markets to more profitable municipal and industrial uses.” While Vidler has been successful in locating and aggregating water rights, monetizing them has been slow. Vidler’s revenues from the sale of water increased from \$300,000 in 1997 to \$1.1 million in 1999. Over the same period, pretax losses have increased from \$600,000 to \$4.6 million.

The lower Colorado River basin states, which have long fought over their allocations from the river, are beginning to negotiate banking agreements. One allows Arizona to sell its unused allotment to California and Nevada; and also allows California and Nevada to bank surface water in underground aquifers in Arizona for future use. California and Nevada will pay pumping and storage costs plus a fixed rate for the water.

Water banking is a simple concept, but arduous in its implementation. It remains to be seen whether the investment in water rights will yield a significant return. In a *Wall Street Transcript* interview, Michael George, President and CEO of Western Water, described the three-step process required to generate earnings as follows:

In order to generate revenues from water wholesaling, we have to complete an interlocking chain or series of transaction parts – first, lining up and developing the water resource; second, moving or conveying that water from its place of origin or its historic place of use to a new and higher-value place of use that may be nearby or may be far away; . . . third, identifying and developing a customer base. So you have to have the resource, you have to have a mechanism for moving the resource . . . , and you have to have the customers to receive it, use it and pay for it at its ultimate place of use . . . while observing all of the necessary environmental and regulatory requirements for making water transfers.

Mr. George identifies the major barrier as coming to agreement with municipal districts that control the water distribution networks on a fair price for accessing the networks.

Another important measure to enhance the supply of water is desalination, and it is making headlines. It was the subject of a feature story in the *New York Times* earlier this year. Membrane processes for converting saline and brackish water to fresh water have improved dramatically since they were first introduced in 1952. Costs have come down, and reliability has come up. Developers of membranes and desalination systems are bullish. Dean Spatz, the President and CEO of Osmonics, is quoted as saying, “In three years desalting has quintupled to ten percent of Osmonics sales, and I wouldn’t be surprised if it becomes a third of our business.”

Realistically, the growth prospects for desalination depend to a significant extent on the outcome of a major desalination project that has been initiated in Tampa Bay. Stone & Webster, the successful bidder, promised to produce fresh water at under \$2 per thousand gallons. That is still twice the cost of extracting fresh water from surface water or groundwater sources, but those sources may be insufficient to satisfy growing needs. Stone & Webster has since gone into bankruptcy, for reasons unrelated to Tampa Bay, and most of their assets have been acquired by The Shaw Group. Neither Shaw nor Jacobs, which also had bid for Stone & Webster, included the Tampa Bay project among the assets they accepted. Preparation of the permit application is proceeding and is expected to be completed in September 2000. Poseidon, which is providing the financing and which has a 90 percent equity interest in the project, is seeking a replacement for Stone & Webster. (Note that the Tampa Bay desalination project is not related to the 15-year \$135 million contract awarded to U.S. Filter to design, build, and operate a 60 mgd regional surface water treatment plant for Tampa Bay.)

E-COMMERCE

The water quality systems sector has been slow to utilize e-commerce, or more generally information technology, for competitive advantage. Most firms have web sites that describe their products and services. Few have the infrastructure in place to sell via the Internet.

We are aware of two initiatives for selling water rights electronically. In February 2000, Azurix launched Water2Water.com, an Internet exchange that allows buyers and sellers to agree upon price and exchange water, water rights, water storage, water supply assets, and other water related services.

In May 2000, ResourceNet, LLC, announced the establishment of WaterRightsMarket.com to enable large water users in the Western United States to trade water rights. The press release stated that the site included a list of water rights valued at close to \$50 million, but did not indicate whether any sales had been made.

We are aware of several firms that are beginning to sell water and wastewater products electronically. In December 1999, Culligan launched the first phase of its e-commerce strategy. The company's web-site provides information about water quality products, referrals to its dealer network for personalized services, and a mechanism for buying new products or replacement parts on-line.

Culligan's parent company, U.S. Filter (now part of Vivendi), is consolidating its suppliers on line. The concept is to reduce SG&A costs for suppliers and to pass on some of the savings to U.S. Filter in the form of lower prices. U.S. Filter is requiring its suppliers to load their catalogs with pre-negotiated prices on iProcure.com, an internet portal maintained by Datastream Systems. iProcure also tracks all purchases made through the portal by U.S. Filter subsidiaries, which enables the firm to gain better control over its supply chain.

In June 2000, Waterwares.com launched an e-commerce portal to link manufacturers and end users of water treatment products and related accessories. The site lists over 100,000 items from 150 manufacturers and enables both price comparison and instant on-line purchasing.

Sales representatives for commodity water and wastewater equipment could be severely impacted if their products come to be auctioned over the Internet. One antidote is superb service that adds value to the product in the eyes of the customer.

E-commerce has the potential to revolutionize the industry. Investment in information technology, however, can also be a black hole for money. Moreover, the technology is changing so rapidly that timing becomes critical.

PRODUCT AND SERVICE PROVIDERS

The water quality systems market is highly fragmented with over 50,000 firms serving the industry. Most of the firms are privately held. Some are divisions of publicly traded firms that do not report financial data for their water business units. The number of publicly traded pure plays (i.e. firms that derive over 50 percent of revenues from the water quality systems sector) is also shrinking. There were fewer publicly reporting water utilities and fewer publicly reporting non-regulated water quality systems firms in 1999 than in 1998.

The characteristics of the regulated water utility sector and the non-regulated water quality systems sector are very different. Regulated water utilities tend to be more capital intensive. They generally have an exclusive franchise to supply water to customers in a particular geographic area, but the prices they may charge are set by a state regulatory agency. The opportunities for growth are therefore limited to acquisition of other regulated water utilities or diversification into non-regulated areas of business where their core competencies might provide a competitive advantage. Operating margins for regulated water utilities tend to be higher than those for non-regulated water quality systems firms. In the remainder of this section, we discuss each of the sectors separately.

REGULATED WATER UTILITIES

Among water utilities that had reported financial results publicly, some have consolidated. Others have transferred to foreign ownership. American Waterworks is acquiring Citizens Water and San Jose Water (SJW). California Water is acquiring Dominguez. Philadelphia Suburban is acquiring Consumers Water. Vivendi, which owns 13 percent of Philadelphia Suburban and 23 percent of Consumers, will have a 16 percent equity interest in the combined firm. Aquarion was acquired by Kelda (formerly Yorkshire Water). E'town will be acquired by Thames Water. United Water Resources is now 100 percent owned by Suez Lyonnaise des Eaux.

Among non-regulated water quality systems firms that had reported financial results publicly, some have become divisions of larger entities, foreign or domestic. Some have gone into bankruptcy. The biggest news of 1999 was the sale of U.S. Filter to Vivendi. Almost simultaneously, Vivendi merged Professional Services Group (PSG), the contract operations division of Aqua Alliance, with U.S. Filter Operating Service. (The former Air and Water

Technologies changed its name to Aqua Alliance in 1998 after divesting most of its air subsidiaries. In 1999, Vivendi increased its ownership in Aqua Alliance from 83 percent to 100 percent.) Nalco was acquired by Suez Lyonnaise des Eaux, totally transforming the water treatment chemical market. Recovery Engineering was acquired by Proctor and Gamble at a significant premium over market. Recovery Engineering manufactures and sells point-of-use and point-of-entry systems. Suntory acquired Great Pines, thereby increasing its share of the bottled water market.

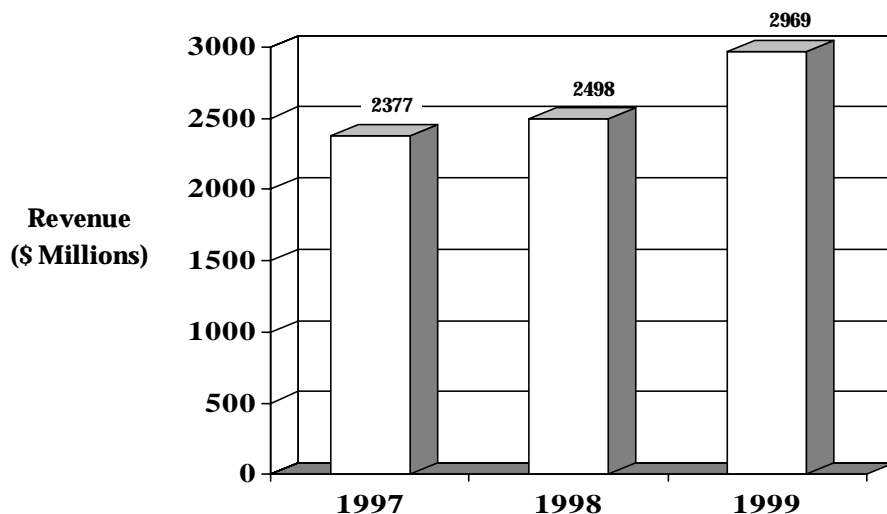
In all, the following fourteen water utilities reported financial results in 1999:

- American Water Works
- Artesian
- California Water
- Connecticut Water Services
- E'town
- Middlesex Water
- Minnesota Power
- NiSource
- Philadelphia Suburban
- San Jose Water
- Southern California Water
- Southwest Water
- United Water Resources
- Vermont Pure Holdings

Data for 1999 were available for E'town and San Jose Water because the announced acquisitions of those firms had not been finalized by the end of the year.

For the fourteen firms as a group, revenues increased 19 percent in 1999 to close to \$3 billion as shown in Exhibit 20.

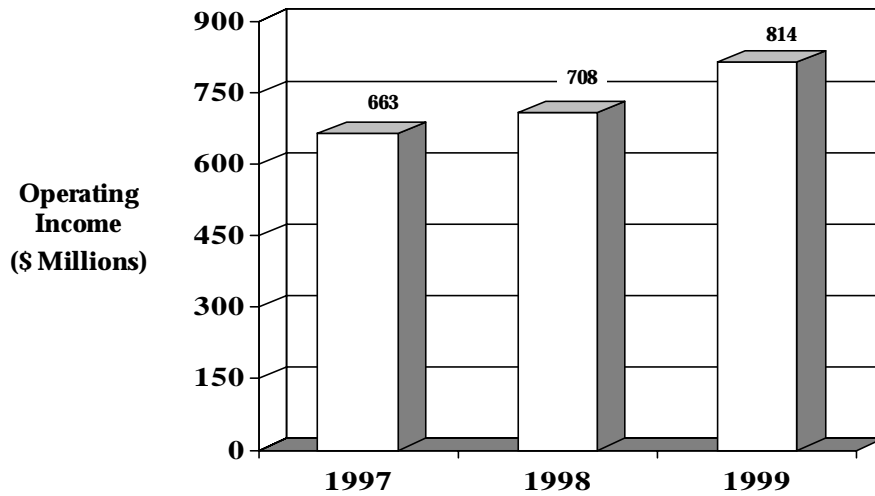
Exhibit 20
Revenue of Publicly Traded Water Utilities, 1997-1999



Source: Farkas Berkowitz & Company, 2000

Operating income, however, increased only 15 percent to just over \$800 million, due mainly to delayed rate increases. See Exhibit 21.

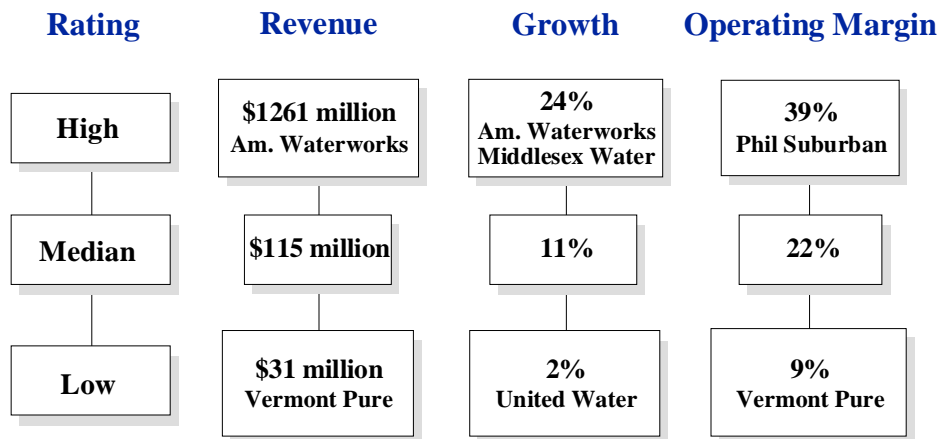
Exhibit 21
Operating Income of Publicly Traded Water Utilities, 1997-1999



Source: Farkas Berkowitz & Company, 2000

Financial results for the individual firms vary widely as indicated in Exhibit 22.

Exhibit 22
Variation in Growth and Operating Margins for Publicly Traded Water Utilities in 1999



Source: Farkas Berkowitz & Company, 2000

The median firm had revenues of \$115 million in 1999. American Waterworks had revenues of \$1.3 billion, and is now the only U.S. water quality systems firm with revenues over a billion dollars. The smallest firm of the publicly traded group was Vermont Pure with revenues of \$31 million.

Median growth for the 14 indexed firms was 11 percent. Both American Waterworks and Middlesex Water grew 24 percent, the former by acquisition and the latter as a result of a 20-year management contract with the city of Perth Amboy, New Jersey and approved rate increases. United Water grew by only two percent.

In terms of one measure of profitability, the median operating margin (earnings before interest and taxes as a percentage of revenue) was 22 percent. Philadelphia Suburban had an operating margin of 39 percent. Vermont Pure had an operating margin of only nine percent.

In spite of limited opportunities for internal growth, few U.S. investor owned water utilities have diversified. Only three have been attracted to the privatization market. None has ventured abroad.

The three water utilities that have entered the privatization market are United Water Resources, Southwest Water, and American Waterworks. Each is pursuing that market in a different way.

United Water Resources had a 50 percent equity interest in United Water Services, a joint venture with Suez Lyonnaise des Eaux. Since Suez Lyonnaise bought the public share of United Water Resources, both Resources and Services are wholly owned by the French firm. United Water Services has focused mainly on large, long-term operations and maintenance procurements issued by major cities and has been the most successful bidder. United Water Resources does not report separate operating results for the joint venture and includes its share of earnings as part of "equity earnings of affiliates" on the consolidated income statement.

Southwest Water derives about half of its revenues from operations and maintenance contracts and the other half from regulated water utility services. Southwest started just after World War II as a water utility serving southern California. The company made a strategic acquisition of a contract operations firm in 1985 to operate both water and wastewater treatment plants owned by municipalities. Southwest's focus in their non-regulated business is on small and medium sized municipalities where the competition, particularly from the large French and British firms is less intense. Southwest Water views contract operations for municipalities, and possibly industry, as a major area for organic growth. The firm does not intend to venture abroad. Their president and CEO, Anton Garnier, stated in an interview with the *Wall Street Transcript*, "Our

management team members . . . have done almost all of their business here in the U.S. Currently, we do not have the experience to move outside of our national borders. We believe there's enough business for us to do here and to keep ourselves focused.”

In contrast to Southwest Water, American Waterworks has approached the privatization market very cautiously. In an interview with WaterInvestments.com, their president and CEO, Jim Barr, stated, “Frankly we've looked at every one of those opportunities, and we have chosen not to participate for variety of reasons. In selecting a potential opportunity we consider carefully many issues as they relate to what the community expects, what the long-term implications of being involved are, and how the opportunity would relate to our present business. We would have to be able to combine and complement all of those issues.” Barr characterized American Water Works' core business as providing water service through the regulated utility model. Recognizing an evolving challenge to that model, Barr added, “The position we're striving for is to be able to respond to any of the needs of a community . . . Let's say a community was thinking about privatizing wastewater, but for whatever reason chose not to sell the asset. If we already own and operate the water system in the community, we think there is a natural fit for us to be of benefit to the governing body by entering into a partnership whereby we operate their wastewater system through a contract.” (We note that American Water Works seems to prefer owning the assets that it operates.)

Barr and Garnier are in agreement about entering international markets. Barr, representing the largest U.S. investor owned water utility, stated, “Our focus frankly has been on the domestic market for some time and continues to be. We have however looked at a variety of international initiatives from time to time. For instance, in the early 90's, we were a bidder in a privatization project in Sydney, Australia. . . . One concern that we had in that situation was that we did not want that project to serve as a premise of suggesting there was no U.S.-based water utility capable of participating on that level. We were very active in that bidding process so as not to leave that impression. Since then, we've looked at a number of other international initiatives, but frankly with all that's going on in the development of the industry in this nation, we've been able to remain very comfortable in the domestic market.”

The reluctance of U.S. water utilities to diversify internationally is not shared by their European counterparts. European water utilities have made a strong strategic commitment to penetrate the U.S. and are also pursuing opportunities aggressively in developing countries.

Admittedly, it is much easier for a European firm to enter the U.S. market than for an U.S. firm to enter the European market. It would be close to impossible for a U.S. firm to enter France for example. Vivendi and Suez Lyonnaise des Eaux have controlled that market for a long time, and

part of the reason for their interest in the U.S. is that they have saturated their home markets. The U.K. is more open. Azurix made its initial entry into the water quality systems industry by acquisition of Wessex Water in the U.K., and RWE of Germany recently acquired Thames Water.

RWE paid a premium of close to 25 percent to enter the water market in the U.K. Their Chairman, Dieter Kuhnt, explained the move to *Public Works Financing* (September 2000) as follows, "Thames Water will be the driving force in implementing RWE's objectives in the water sector and in developing a world class global business." RWE has an equity interest in Berliner Wasser Betriebe, the German water utility that was privatized in 1999, and a few water concessions in Eastern Europe. The acquisition of Thames Water represents RWE's initial entry into the U.S. water market, since Thames will be acquiring E'town.

The U.K. market has become less attractive, however, because the Office of Water Services (OFWAT), the rate setting agency, has imposed price cuts and caps on the industry while at the same time setting more stringent standards on leakage, and introducing measures to increase competition.

The Thatcher government privatized the water/wastewater industry in the U.K. in 1989 by transferring assets to ten publicly traded firms. Each firm was effectively granted a franchise to provide water and wastewater services within a designated geographic area. Rates were regulated much as they are for investor owned water and wastewater utilities in the U.S. In 1999, OFWAT conducted a regulatory pricing review that resulted in imposition of price cuts in 2000 and a cap on prices through 2005. OFWAT also established mandatory targets to reduce leakage, thereby requiring higher capital expenditures. In addition, OFWAT required the utilities to allow free use of their water and wastewater distribution lines by competitors.

The OFWAT rulings have created pandemonium within the industry. Stock prices have fallen in anticipation of revenue and earnings declines, and the regulated firms are attempting to restructure their operations. Kelda and Anglian water illustrate two different approaches.

In June 2000, Kelda (formerly Yorkshire Water) proposed to create a non-profit, customer-owned mutual that would acquire Kelda's water and sewage assets, and that would be 100 percent debt-financed. Kelda would retain its non-regulated service operations and offer contract O&M services to the regulated mutual and other facilities, keeping a share of the savings achieved through introduction of operating efficiencies. In July, OFWAT rejected the proposal because of concern about whether it would be in the best interests of customers. Kelda has indicated that it would submit a revised proposal, and the other British water utilities are watching closely.

Anglian Water recently acquired Morrison Construction, headquartered in Edinburgh, Scotland, for \$395 million. Morrison is an engineering construction firm serving the electric, gas, transportation, and telecommunications industries. Anglian's strategy is to extend its operations beyond water into construction, operation, and maintenance of a wide range of infrastructure assets.

The U.K. does not currently permit mergers among the ten regulated water and wastewater firms. OFWAT has indicated that it might relax the restrictions if the mergers were shown to result in lower prices for consumers. However, OFWAT's requirement that any synergies or cost savings resulting from mergers must be returned to the ratepayers creates a strong disincentive. Takeover of British water utilities by foreign firms is not prohibited and, as noted previously, has occurred.

The reluctance of U.S. water utilities to compete head-to-head with their French, British, Spanish, and German counterparts in developing countries is harder to understand. The risks are certainly significant, but on a global basis, the U.S. is definitely losing ground.

NON-REGULATED WATER QUALITY SYSTEMS FIRMS

Nineteen non-regulated U.S. water quality systems firms reported operating results in 1999. They competed in different segments of the industry as shown in Exhibit 23.

Exhibit 23
Non-Regulated Publicly Traded Water Quality Systems Firms

Segment	Firms
Multiple	Azurix, Ionics, Waterlink
Equipment	Aqua Care, Global, Isco, Osmonics, Trojan, Zenon
Chemicals	Calgon Carbon, Sybron
Construction	Ameron, Insituform
Bottled Water	Glacier, WTC Industries
Biosolids	N-Viro, Synagro
Water Rights	Cadiz, Western Water

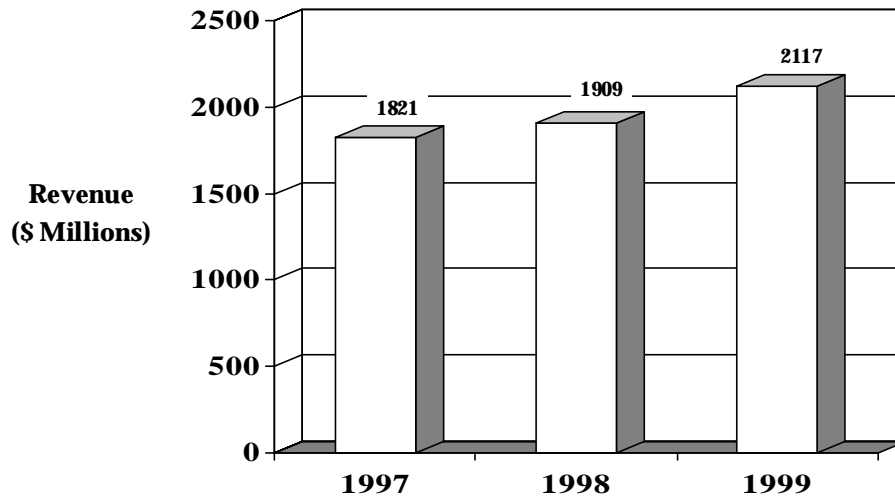
Source: Farkas Berkowitz & Company, 2000

For these 19 firms as a group, revenues increased 11 percent in 1999 to \$2 billion, as shown in Exhibit 24 on the following page, excluding Azurix. The publicly traded pure plays therefore account for less than seven percent of the unregulated water quality systems market.

For the same group of firms, again excluding Azurix, operating income declined by seven percent in 1999, and has been on the decline since 1997 as shown in Exhibit 25 on the following page.

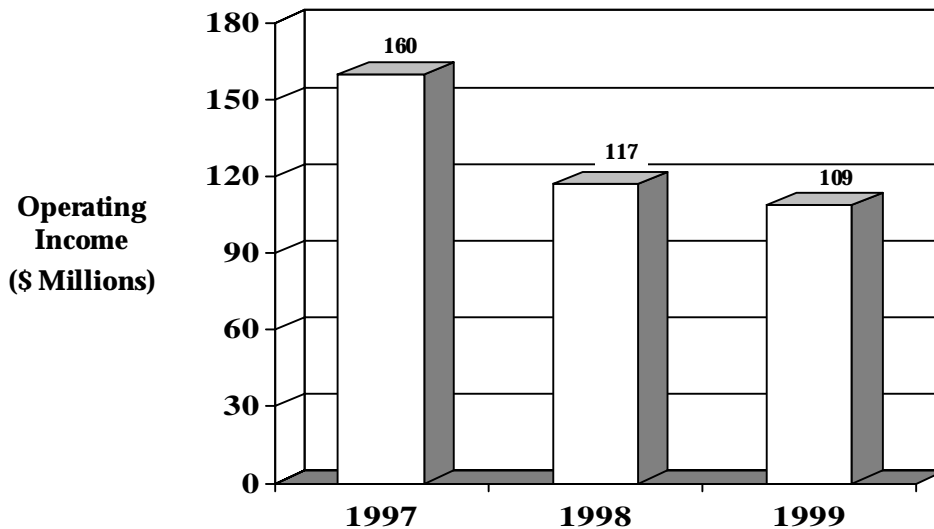
The financial performance of individual firms in 1999 varied greatly, as displayed in Exhibit 26 on page 94.

Exhibit 24
Revenue of Non-Regulated Publicly Traded
Water Quality Systems Firms, 1997-1999



Source: Farkas Berkowitz & Company, 2000

Exhibit 25
Operating Income of Non-Regulated Publicly Traded
Water Quality Systems Firms, 1997-1999



Source: Farkas Berkowitz & Company, 2000

Exhibit 26
Variation in Growth and Operating Margins for
Publicly Traded Water Quality Systems Firms in 1999

Rating	Revenue	Growth	Operating Margin
High	\$358 million Ionics	96% Global	16% Ameron
Median	\$79 million	11%	3.5%
Low	\$3 million Western	-11% Aqua Care	-171% Western

Source: Farkas Berkowitz & Company, 2000

With the sale of U.S. Filter to Vivendi, not one single publicly traded U.S.-based water quality systems firm generates as much as a billion dollars in revenue. The largest firm is now Ionics with 1999 revenues of \$358 million. The median firm generated \$79 million in revenue. Western Water generated only \$3 million.

Median growth for the index firms was 11 percent. Global, which specializes in products and services related to industrial cooling water grew 96 percent and most of that growth was internal. Aqua Care's water filtration and purification equipment business shrank 11 percent during the year.

The median operating margin (earnings before interest and taxes as a percentage of revenues) for the index group was 3.5 percent. Ameron generated operating margins of 16 percent from the laying of water pipelines. Insituform, which specializes in trenchless pipe installation, was not far behind with an operating margin of 15 percent. Western Water had major losses.

Appendix A presents key financial performance data for publicly traded water utilities. Appendix B presents key financial performance data for non-regulated water quality systems firms. Information includes revenues, operating income (earnings before interest and taxes), pretax income, and net income after taxes for the latest reported six months and the last four fiscal years. We also show operating and net margins. For the end of each fiscal year, we include data on net assets (assets net of goodwill and intangibles), long-term debt, equity, return on equity, and long-term debt as a function of total capitalization. For comparative purposes, we also include a five-year chart of weekly stock prices. In addition, we present brief notes on each

firm. We excerpted the information presented from our much more extensive database on firms in the industry.

With a few exceptions, financial performance of the publicly traded water quality systems firms has been disappointing to investors. We discuss several of the larger firms in the remainder of this section.

Azurix had a bold strategy for competing with the French and British water companies around the world. The strategy, however, was based on a long-term view of the market. The publicly traded French and British water firms have that luxury. They report financial results semi-annually, not quarterly, and their investors tend to be more patient. Azurix, as a publicly traded U.S. firm, is subject to quarter-to-quarter scrutiny and investors expect steady, predictable earnings growth. Azurix' largest shareholder is Enron with a 34 percent equity stake. Enron invested \$800 million in the firm and its shares were worth \$200 million as of September 15, 2000. Not surprisingly, the Enron-dominated Board has elected new management to oversee a "thorough review of all our businesses, our cost structure, and our strategy." Azurix' future is unclear.

Ionics generated \$358 million in 1999. Operating margin was 7.9 percent. Both absolute operating earnings and margins have been in decline every year since 1997. The run rate for 2000, based on the first six months, was \$411 million, but operating margin was down to 6.1 percent. We noted earlier Ionics' strategic move into services in the mid-1980's. That goal was achieved over a period of about ten years. It has not been replaced by a similarly bold and energizing strategic intent.

Waterlink generated revenues of \$170 million in FY 1999 [September]. Operating margin was a paltry 2.8 percent. The revenue run rate for FY 2000 based on the nine months ending in June was \$180 million, and operating margins had improved to 4.7 percent. The company has grown at a compound annual rate of 62 percent since its IPO in 1997. However, net earnings were negative in FY 1998 and 1999 and losses continued in the first nine months of FY 2000. Waterlink has retained an investment banker to explore strategic options, including possible sale of the company.

Osmonics generated \$185 million in revenue in 1999. Operating margins were 2.4 percent. Osmonics' run rate for 2000, based on financial performance in the first six months, is \$199 million, and operating margins have improved to 5.0 percent. Osmonics' strategy is to become the low-cost producer of replaceable components, such as membranes, pumps, and housings, for water and wastewater treatment plants. They do not intend to compete with their potential

customers for operations and maintenance contracts. Osmonics has made a significant investment in information technology and e-commerce that has been slower to generate returns than originally anticipated.

Trojan is a Canadian-based firm sharply focussed on U.V. disinfection systems. Trojan generated \$90 million in revenue in FY 1999 [August]. Operating margins were negative. The run rate for FY 2000, based on the six months ended in February, is only \$59 million, and operating margins are still negative. The company discovered some accounting errors in 1998, and the need to restate prior financial results may have had an adverse affect on operations.

Zenon is also a Canadian-based company. Revenues were \$99 million in 1999, and operating margin was 2.6 percent. The run rate for 2000, based on the first six months of the year, is only \$64 million, and operating margin is negative. Zenon is primarily in the business of supplying membrane filtration systems.

Calgon Carbon generated revenues of \$296 million in 1999 and operating margin was negative. The run rate for 2000, based on the first nine months of the year, is \$270 million, but operating margins have improved to 8.8 percent. Calgon Carbon is a leader in granular activated carbon, but that market is becoming commoditized. A new CEO has rejuvenated the company and articulated a strategy for controlled diversification.

Insituform generated 1999 revenues of \$340 million. Operating margin was 14.9 percent. Run rate for 2000, based on the first nine months of the year, is \$333 million. Operating margins have increased slightly to 15 percent. Insituform is the leading firm in trenchless technology, a market that should grow if water and wastewater treatment plants invest in their aging distribution systems.

Synagro generated revenues of \$57 million in 1999. Operating margin was 7.2 percent. Run rate for 2000, based on the first six months of the year, is \$93 million. Operating margin has increased to 11.6 percent, but net earnings are negative. Synagro is a consolidator in the biosolids industry, specializing in the management of wastewater treatment sludge from municipal facilities. The firm grew at a compound annual rate of 49 percent from 1997 to 1999, mainly by acquisition. Their most recent acquisition was the Bio-Gro division of Wheelabrator, which had been reabsorbed into Waste Management. Synagro contrasts sharply with N-Viro, also in the sludge management business. N-Viro generated less than \$5 million in revenue in 1999.

Stock prices for the regulated water utilities followed a generally upward trend from 1996 through 1999 and have been somewhat erratic in 2000 (see Appendix A). The sharp increase in

E'town's stock is due to its pending acquisition by Thames Water. Similarly, the recent run up in stock price for SJW (San Jose Water) is due to its pending acquisition by American Water Works. Long known as widows and orphans stocks, the regulated water utilities are exciting more investor interest due to the expectation that many may be acquired by foreign companies at a substantial premium to market.

Stock prices for the unregulated water quality systems firms have followed a generally downward trend since 1996 with a few exceptions (see Appendix B). The price of Azurix' stock has dropped precipitously since its much heralded IPO. The price of Insituform's stock has trended generally upward. The price of Ionics stock is highly variable, but it has declined from a plateau of around \$45 per share from 1996 to early 1998 to a plateau of around \$30 per share from mid-1998 to mid-2000. The sharp drop in Waterlink's stock in 1998 was prelude to the company's retaining an investment banker to explore potential sale of the company.

The price of Trojan's stock had followed a generally upward trend from 1996 to 1999. Discovery of accounting errors resulted in a sharp drop. Zenon's stock had also trended upward from 1996 to 1999 and has since been in decline. Calgon Carbon's stock lost approximately half its value in 1998 and has hovered around \$7 per share since.

Glacier Water Services generated investor enthusiasm from 1996 to 1998. Investor disappointment has since driven the stock down from a peak of \$30 per share to \$12 per share. The price of Synagro stock has varied considerably over the past four years, with no evident trend. Western Water's stock has trended downward, perhaps because of investor impatience with the vagaries of the water rights business.

OUTLOOK

Waves of change are transforming the water quality systems sector in the U.S. The U.S. remains the world's largest market for water quality systems. Although growth in the overall U.S. market is slow, approximately equal to the rate of inflation, the market characteristics are different today than they were even a year ago, and they will continue to change over the next few years. The most important trends are the internationalization of the U.S. market, consolidation, and new modes of delivery of products and services.

The internationalization of the U.S. market is reflected in the aggressive entry of European firms. Having saturated their home markets, those firms have articulated a clear strategic intent to penetrate the U.S. market. Vivendi and Suez Lyonnaise des Eaux, the world's two largest water firms, have made significant inroads in the U.S. and will continue to compete with U.S.-based

firms on their home turf. The British water utilities are active in the U.S. and are likely to become even more active as a result of the rate caps that have been imposed upon them in the U.K. We also expect to see more of RWE and Berliner Wasserbetriebe of Germany, and Aguas de Barcelona of Spain.

Consolidation will continue and probably accelerate. We have already noted that the number of publicly traded U.S. firms is shrinking in both the regulated and non-regulated segments of the industry. Those that remain will acquire or be acquired. The European firms are clearly potential buyers, but consolidation among U.S. firms, both public and private, is also likely. Mergers between electric and water utilities, which is occurring in Europe, is also a possibility in the U.S. Opportunities abound since the market is still highly fragmented. Some firms will ride the waves in implementing a consolidation strategy; others will drown in them. The only non-regulated U.S. water quality systems firm to have grown to well over a billion dollars in revenue, mainly by acquisition, is U.S. Filter. No other U.S. firm has been able to duplicate U.S. Filter's strategy or to achieve a comparable level of success. Even U.S. Filter, however, appeared to be faltering when they were able to negotiate an agreement to be acquired by Vivendi at a price that was highly favorable to shareholders.

New modes of delivery of products and services are limited only by the creativity of the vendors. In water and wastewater treatment chemicals, the venerable six-pack became a four-pack. The acquisition of Nalco, the leader of the pack, by Suez Lyonnaise des Eaux reflects a recognition by Nalco of trends in the industry and provides them with the opportunity to participate in the industry transformation. Betz-Dearborn, the number two firm in water and wastewater treatment chemicals, was acquired by Hercules several years ago, and now Hercules is rationalizing its lines of business.

Privatization of U.S. water and wastewater facilities is proceeding less rapidly than many had expected. We do not expect acceleration in the pace of either privatization of municipal facilities or outsourcing of industrial facilities, but we do expect continued growth. The market is highly competitive, however, and margins have been razor thin. Over the next five years, we anticipate that supply and demand will come into better balance through consolidation and exits from the market.

Municipalities are increasingly open to modes of delivery other than the traditional design-bid-build. Design-build, build-own-operate-transfer, design-build-finance-operate-transfer, and multiple variations are gaining favor. The result will be an increase in mergers, acquisitions, joint ventures, and strategic alliances among design engineering, construction, operations, and financing firms.

Finally, the impact on the sector of information technology generally, and e-commerce in particular, is impossible to predict, but will almost certainly be profound.