

**AN ASSESSMENT OF THE VULNERABILITY OF
NON-COMMUNITY WATER SYSTEMS
TO SDWA COST INCREASES**

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Executive Summary

This report represents one component of the U.S. Environmental Protection Agency's (EPA) effort to characterize the technical, financial, and economic aspects of the water supply industry, as required under the 1996 Safe Drinking Water Act (SDWA) Amendments. Under the SDWA Amendments, EPA is required to determine the technologies that are suitable for three size categories of small water systems, the technical and managerial feasibility of technologies in these three size categories, and the affordability of technologies to Community Water Systems (CWSs) and Non-Community Water Systems (NCWSs). In addition, affordability is used as part of the EPA or a state primacy agency's decision criteria for granting a variance to a small water system.

This report evaluates the affordability of water service to NCWSs and their ability to absorb future cost increases relative to residential users of CWSs. It examines the specific question of whether affected categories of NCWSs can pass along their costs of compliance to their customers or end users, or are otherwise more likely to be able to afford to comply with water treatment requirements promulgated under the SDWA than residential users.

EPA's affordability effort assumes that residential water system customers are much more sensitive to increased costs than any other categories of water user, including nonresidential users. This report will evaluate this assumption by reviewing the economic literature that evaluates the response of categories of nonresidential water consumers to changes in the price of water and by assessing the ability of NCWS categories to afford increased expenses associated with SDWA compliance. If the expense is a relatively insignificant portion of the total cost of doing business, then there is no reason to believe that the business could not afford to comply with the requirement.

Vulnerability of NCWSs to Water Cost Increases

The vulnerability of NCWS categories to water treatment cost increases is related to three factors:

- ▶ Can the NCWS category pass on increased costs to its customers?
- ▶ Do NCWS categories respond to price increases by decreasing their water consumption (an indication that they did not find it possible to simply pass on water price increases or absorb those price increases)?
- ▶ If the NCWS category is potentially sensitive to price increases and is not likely to have the ability to pass those costs on to customers, then is the cost of water a significant cost of doing business?

If, based on these three criteria, all categories of NCWSs are shown to be less impacted by cost increase than residential users of CWSs, it would confirm EPA's approach of focusing the bulk of its affordability analysis on residential water users.

Studies of the price elasticity¹ of demand for water by nonresidential consumers show that commercial consumers' responses to price changes are very similar to those of residential consumers and are highly inelastic. That is, commercial consumers do not tend to alter their water consumption if the price of water changes. This would indicate that, with the possible exception of water that is used for irrigation, it is very likely that commercial consumers will be able to either absorb or pass on increases in the cost of water.

Industrial consumers are more difficult to characterize. The elasticity of demand for water varies depending on the industry and the specific purpose for which water is used within the industrial facility. For at least some industries, the consumer does respond to changes in the price of water by decreasing consumption (that is, that the price elasticity of demand is close to -1.0). This would indicate that, at least for some industrial processes, the consumer does not have the ability to absorb or pass on an increase in the price of water; rather, the consumer will respond by changing the way in which water is used, which may entail making an additional investment.

Affordability of Water Service

Recently, EPA prepared a comprehensive reference (U.S. EPA, 1998) to assist States in developing plans to address potentially burdensome drinking water costs through the State Revolving Fund and other assistance programs. These plans generally recognize that extra assistance might be needed when drinking water costs exceed from 1.0% to 2.0% of a community's median household income. (This is in line with financial assistance thresholds of other Federal agencies as well.) The purpose of these thresholds is simply to recognize potentially burdensome, less affordable situations for which financial relief might be appropriate. The purpose of the affordability threshold for obtaining a variance, however, is to recognize that there is a point, inevitably higher than these "less affordable" levels, where costs are so burdensome as to warrant consideration of reducing the level of public health protection by installing a less costly variance technology instead of a compliance technology. Because of the public health trade-off, logic dictates that this affordability threshold be set higher than those used by States to identify water systems possibly in need of financial assistance.

A forthcoming study (Rubin, 1998) shows that, for residential consumers throughout the United States, water costs were typically less than 1% of median household income in 1989, with some

¹ The price elasticity of demand measures the change in consumption compared to the change in price. For example, if consumption declines by 5% when the price increases by 10%, then the price elasticity of demand would be $-5\% \div 10\%$, or -0.50 . The closer that the price elasticity is to zero, the more inelastic the demand. That is, the consumer will continue to use roughly the same amount of water regardless of the change in price.

states having a median household water bill as high as 1.4% of median household income. Accounting for the relative changes in water costs and median income levels since 1989, nationwide median water costs may now be in the range of 1.1% to 1.2% of median household income in 1998, while in some states this percentage may exceed 1.5% in 1998. Therefore, it is reasonable to conclude that water costs that are in the range of 1.0% to 1.5% of total income during the 1990's are affordable, since that is the typical level of water costs already paid by median households in the United States. That is not to say that a higher percentage would not be affordable, only that data exist to demonstrate that 1.0% to 1.5% of income already is being spent for water.

Analysis of NCWS Categories

EPA identified 57 categories of NCWSs based on service area types (e.g., day care, restaurant, medical facility), of which 23 were selected for inclusion in this analysis. These categories are ordered in Table ES-1 based on the total population served; i.e., the first category below, schools, serves the largest population among all NCWS categories, the second category serves the second largest population, and so on. All 20 categories serving more than 1% of the total population served by all NCWSs were included, plus day care centers (serving 0.5% of the total population served), migrant labor camps (serving 0.2% of the total population served), and nursing homes (serving 0.1% of the total population served). Table ES-1 contains a summary of results obtained from the literature, information regarding competition and financial constraints within each business category, and specific cost information for categories where further consideration was needed.

For categories requiring an examination of costs, typical expenditures for water are compared to total operating expenses. If current water expenditures appear to be at (or below) the range of 1.0% to 1.5% of total revenues, then the NCWS category would be in a similar (or better) position to the median household. This may imply that an increase in the cost of water would have less effect on the NCWS category than it would have on the median household.

Table ES-1: Summary Evaluation of Factors Influencing the Vulnerability of NCWS Categories to SDWA-Related Cost Increases

NCWS Category	Category Type	Does literature review suggest inelastic demand for water for this type of user?	Cost increases likely to be passed along?	Estimated Water Cost as % of Revenues ¹
Schools	Institutional	yes	not in all cases	0.4% - 0.7%
Restaurants	Commercial	yes	not in all cases	0.6%
Churches	Institutional	yes	yes	N.A.
State Parks	Institutional	yes	yes	N.A.
Water Wholesalers	Commercial	no	yes	N.A.

Table ES-1: Summary Evaluation of Factors Influencing the Vulnerability of NCWS Categories to SDWA-Related Cost Increases

NCWS Category	Category Type	Does literature review suggest inelastic demand for water for this type of user?	Cost increases likely to be passed along?	Estimated Water Cost as % of Revenues ¹
Summer Camps	Institutional	yes	not in all cases	1.3%
Campgrounds/ RV Parks	Commercial	yes	not in all cases	1.3%
Hotels/Motels	Commercial	yes	not in all cases	1.0%
Highway Rest Areas	Institutional/ Public	yes	yes	N.A.
Manufacturing (food)	Industrial	yes	not in all cases	< 1.2%
Misc. Recreation Areas	Commercial/ Institutional	yes	not in all cases	0.6%
Medical Facilities	Commercial/ Institutional	yes	not in all cases	0.2%
Service Stations	Commercial	yes	yes	N.A.
Office Parks	Commercial	yes	yes	N.A.
Mixed Knowns	all	see other categories	see other	N.A.
Retailers (excluding food)	Commercial	yes	yes	N.A.
Manufacturing (misc.)	Industrial	somewhat; however, some	not in all cases	< 0.8%
Golf and Country Clubs	Commercial/ Public	no	not in all cases	0.6%
Retailers (food)	Commercial	yes	yes	N.A.
Misc. Amusement Parks	Commercial	yes	not in all cases	0.6%
Day Care Centers	Commercial/ Institutional	yes	not in all cases	0.5%
Migrant Labor Camps	Commercial	yes	yes	N.A.
Nursing Homes	Commercial/ Institutional	yes	not in all cases	< 0.2%

N.A. = not applicable.

1. For this study, all “water, sewer, and other utilities” costs, as identified in U.S. Census data, attributed to water service as a worse case scenario.

Conclusions

All of the NCWS categories reviewed were found to be less vulnerable to SDWA-related cost increases than a typical household. In each NCWS category, expenditures on water were found to be a relatively small percentage of total revenues. In nearly all cases, water expenditures (including expenditures for sewer service and miscellaneous other utilities) totaled less than 1% of total revenues, and never more than 1.3% of total revenues. Several caveats must be made, however, concerning these categories:

- ▶ The category of summer camps was evaluated based upon statistics from a much larger category, “rooming and boarding houses, camps and trailer parks, organization and lodging houses, on membership basis.” It is possible that summer camps may face particular affordability issues not shared by other enterprises in this category.
- ▶ The category of golf and country clubs was also evaluated as part of a larger category, “miscellaneous amusement and recreation services.” Due to their potentially extensive outdoor watering requirements (e.g., associated with golf course maintenance), these establishments may also face a greater burden than is indicated by the review of Census statistics.
- ▶ The assessment of the food manufacturing category found that one industry, manufactured ice, may be vulnerable due to 1) a significantly higher ratio of electricity costs to total value of shipments, 2) the tendency of these firms to be very small (fewer than 20 employees), and 3) the importance of water in the product that is produced.
- ▶ Finally, this analysis focused on identifying broad categories of NCWS. In any particular case, it is possible to have one specific business that would be more vulnerable than a “median household” to cost increases. However, such case-by-case problems are the proper focus of specific variance requests rather than national-level investigations into the applicability of a regulatory regime for an entire category of NCWSs.

1.0 Introduction

1.1 Background

This report represents one component of the U.S. Environmental Protection Agency's (EPA) effort to characterize the technical, financial, and economic aspects of the water supply industry, as required under the 1996 Safe Drinking Water Act (SDWA) Amendments. Section 1412(b)(4)(e) of the SDWA, as amended, recognizes that treatment technologies that are appropriate for large water systems may not always be suitable for small water systems due to their high costs or complex technical requirements. Consequently, that section requires EPA to determine technologies that are suitable for three size categories of small water systems, the technical and managerial feasibility of technologies in these three size categories, and the affordability of technologies to Community Water Systems (CWSs) and Non-community Water Systems (NCWSs).

In addition, section 1415(e) of the SDWA, as amended, states that a variance may be granted to public water systems serving fewer than 3,300 persons (and public water systems serving more than 3,300 persons but fewer than 10,000 persons, with the approval of the Administrator) for compliance with a requirement specifying a maximum contaminant level or treatment technique contained in a national primary drinking water regulation. Such variances may be granted to systems "that cannot afford to comply, in accordance with affordability criteria established by the Administrator (or State in the case of a State that has primary enforcement responsibility under section 1413), with a national primary drinking water regulation." Variances are further conditioned upon the availability of alternative technology that is applicable to the size and source water quality conditions of the public water system.

This report thus responds to the need to evaluate the affordability of water service to NCWSs and their end-users as a result of 1996 SDWA treatment and variance requirements. It examines the specific question of whether affected categories of NCWSs can pass along their costs of compliance to their customers or end users, or are otherwise likely to be able to afford to comply with water treatment requirements promulgated under the SDWA.

1.2 Purpose of this Report

It may be reasonable to assume that all water systems, whether community or non-community, will attempt to pass their treatment costs on to their customers. This is certainly true for CWSs that are in the business of selling water. Thus, the primary focus of affordability analysis for CWSs is the ability of the end users to afford the increased costs associated with compliance. The larger issue of CWS affordability is being addressed in another report entitled "National-level Affordability Criteria under the 1996 Amendments to the Safe Drinking Water Act," (U.S. EPA, July 1998).

NCWSs, however, are an incredibly diverse group. They consist of businesses (industrial plants, commercial centers, day care centers, nursing homes, camp grounds, for example) or non-profit organizations (churches, schools, hospitals, are some examples) that may not be able to increase the price of their services or products to recover increased water treatment costs. For NCWSs, therefore, it is necessary to begin by examining whether the increased costs of compliance will be passed through to consumers in the cost of the organization's products and services. This may be true for certain types of organizations, but not for others. Thus, one purpose of this report is to identify those categories of NCWSs that might not be able to recover the increased cost of SDWA compliance from their customers.

In addition, it should be recognized that the mere inability of a business to recover an increased cost from its customers may mean little about the ability of the business to afford the increased expense. If the expense is a relatively insignificant portion of the total cost of doing business, then there is no reason to believe that the business could not afford to comply with the requirement. Moreover, if there is a readily available substitute (such as bottled water or the ability to connect to a CWS), then the price of that substitute would represent the maximum compliance cost of the business with a new requirement.

EPA's affordability effort assumes that residential water system customers are much more sensitive to increased costs than any other categories of water user, including nonresidential users. This report will evaluate this assumption by reviewing the economic literature that evaluates the response of nonresidential water consumers to changes in the price of water and then by assessing the ability of NCWS categories to afford increased expenses associated with SDWA compliance. If the expense is a relatively insignificant portion of the total cost of doing business, then there is no reason to believe that the business could not afford to comply with the requirement.

2.0 A Framework for Investigating Vulnerability of Non-Community Water Systems

The vulnerability of NCWSs to water treatment cost increases is related to three factors:

- ▶ Can the NCWS pass on its increased costs to its customers? A major consideration in assessing this factor would include the amount of competition faced by the NCWS for its goods or services.
- ▶ How elastic is the demand for water on the part of each NCWS category? Qualitatively assessing the elasticity of demand for water for each category also provides an indication of the ability of the NCWS to pass on its increased costs to customers. That is, if studies show that nonresidential consumers respond to price increases by decreasing their water

consumption, then it is reasonable to assume that they did not find it possible to simply pass on water price increases to their customers or absorb those price increases.

- ▶ If a NCWS is potentially sensitive to price increases and is not likely to have the ability to pass those costs on to its customers, then is the cost of water a significant cost of doing business? If water is a relatively insignificant expense, then a large increase in the cost of water is unlikely to have any significant effect on the ability of the NCWS to remain in operation.

The following overview of NCWSs and literature review of the elasticity of demand for water provide a useful framework to examine these issues. Section 3.0 presents results for each of 23 selected categories of NCWSs based upon this framework.

2.1 Overview of NCWSs

EPA's Safe Drinking Water Information System (SDWIS) provides a registry of public water systems. According to SDWIS, NCWSs serve less than 10 percent of the total public water system (PWS) population. Yet these systems actually comprise two-thirds of the total number of PWSs (SAIC, April 1998). Approximately 95 percent of NCWSs serve fewer than 500 persons per day, and less than one percent of these systems serve more than 3,300 persons per day. Thus, the NCWS universe is characterized by many small systems serving few consumers. Additionally, NCWS flows are typically substantially lower than CWS flows (SAIC, April 1998).

Precise information about NCWSs is limited. No NCWS survey exists that is similar in scope to that done for CWSs. Therefore, information from other literature sources has been used to characterize these systems (SAIC, April 1998).

2.2 Review of Literature on Response of Nonresidential Water Users to Price Changes

In many cases, nonresidential consumers differ from residential households in that water tends to be just one input in the product or service for which their end-users ultimately pay, rather than an identifiable item to the end user (the individual or household). There have been a few studies that examine the response of nonresidential water consumers to changes in the price of water. These studies attempt to measure the price elasticity of demand for water among nonresidential consumers.

These studies are important to this investigation because they provide direct evidence of the ability of nonresidential consumers to either: 1) pass on water price increases to their customers (or other users of the goods or services that they provide), or 2) absorb those price increases. In other words, if nonresidential consumers respond to price increases by decreasing their water consumption, then it is reasonable to assume that they did not find it possible to pass on water

price increases to their customers and that they were not willing to absorb those price increases. Conversely, if studies show that the demand for water is relatively inelastic to changes in price, then it can be assumed that non-residential consumers either: 1) believe that they can recover the increased price of water from their customers, 2) cannot significantly reduce their water use, or 3) are willing to absorb cost increases themselves.

Initially, a brief review of the concept of price elasticity is in order. The price elasticity of demand measures the change in consumption compared to the change in price. For example, if consumption declines by 5% when the price increases by 10%, then the price elasticity of demand would be $-5\% \div 10\%$, or -0.50 . The closer that the price elasticity is to zero, the more inelastic the demand. That is, the consumer will continue to use roughly the same amount of water regardless of the change in price. As the price elasticity decreases from zero, demand is said to be more elastic, meaning that consumers respond to price increases by reducing their consumption.

While there have been many studies that examine the response of residential consumers to changes in the price of water, only a few studies examine the response of nonresidential consumers to water price changes. These studies were summarized recently by Billings and Jones (1996). They conclude that most commercial customers respond in the same fashion to price changes as do residential consumers. Specifically, other than commercial consumers who irrigate their landscaping, there is a very inelastic demand for water, ranging between 0 and -0.3 . This would imply that commercial consumers have the ability to either absorb or pass on to their customers any increase in the price of water that is used for domestic (indoor) purposes.

The price elasticity for outdoor water use, however, appears to be much higher. The authors find that commercial accounts with irrigated landscapes have elasticities ranging up to -0.7 (Billings and Jones, 1996). At these higher levels of elasticity, it appears that commercial consumers are less confident in their ability to absorb or pass on the cost increases and, instead, look for ways to reduce their water consumption.

In contrast, studies of the response of industrial consumers to price changes show results that vary dramatically depending on the industry. Estimates range from -0.12 (petrochemical industry) to -1.0 (metal fabrication industry), with numerous values in between (Babin et al., 1981; De Rooy, 1974; and Renzetti, 1988; as cited in Billings and Jones, 1996). Part of the reason for this substantial variation may lie in the different ways in which industrial consumers use water. De Rooy (1974) shows that the price elasticity of demand varies from -0.35 for process water to -0.89 for cooling water. De Rooy did not attempt to measure the effect of price changes on the demand for water used for sanitation or human consumption. He did find, though, that the amount of water used for sanitation was highly correlated with the number of employees in the facility (an R^2 of 0.920).

Renzetti (1993) also found a wide range of price elasticities for industrial water consumers that use a public water supply. His findings show elasticities ranging from -0.68 (paper manufacturing) to -1.68 (metals industries).

These results are consistent with another recent review of the literature on nonresidential responses to water price changes. Vista (1996) found that industrial price elasticities of demand for water ranged from -0.72 to -0.98, while commercial elasticities were much lower and very similar to residential elasticities, ranging from -0.23 to -0.34.

In a recent study of the City of Phoenix, Chesnutt et al. (1995) found that the price elasticity of demand for commercial customers was -0.38, while attempts to measure the elasticity of demand for the entire industrial class produced results that were not statistically significant. This study reinforces the conclusion that the industrial class is too diverse to attempt to measure in the aggregate.

2.3 Summary: Literature Review on the Price Elasticity of Demand for Water

In summary, studies of the price elasticity of demand for water by nonresidential consumers show that commercial consumers' responses to price changes are very similar to those of residential consumers and are highly inelastic. That is, commercial consumers do not tend to alter their water consumption if the price of water changes. This would indicate that, with the possible exception of water that is used for irrigation, it is very likely that commercial consumers will be able to either absorb or pass on increases in the cost of water.

Industrial consumers are harder to characterize. The elasticity of demand for water varies depending on the industry and the specific purpose for which water is used within the industrial facility. For at least some industries, the consumer does respond to changes in the price of water by decreasing consumption (that is, that the price elasticity of demand is close to -1.0). This would indicate that, at least for some industrial processes, the consumer does not have the ability to absorb or pass on an increase in the price of water; rather, the consumer will respond by changing the way in which water is used, which may entail making an additional investment.

2.4 Measuring the Affordability of Water Service

Virtually no work has been done to measure how high water prices would have to rise before they would be unaffordable to consumers. However, the thresholds used by other government agencies for determining eligibility of a water system for grants or low-interest loans offer some indication of where financial stress begins to occur. Calculated as a percent of median household income for the community in question, these thresholds range between 1.0% and 2.0%. Note that thresholds in this range are not intended to designate "unaffordability." They merely indicate minimum cost burdens that must be experienced in order to qualify or receive priority

consideration for certain financial assistance programs. Clearly then, costs that are unaffordable must lie above this range.

Recently, EPA prepared a comprehensive reference (U.S. EPA, 1998; and summarized in Beecher, 1998) to assist States in developing plans to address potentially burdensome drinking water costs through the State Revolving Fund and other assistance programs. These plans generally recognize that extra assistance might be needed when drinking water costs exceed from 1.0% to 2.0% of a community's median household income. (This is in line with financial assistance thresholds of other Federal agencies as well.) The purpose of these thresholds is simply to recognize potentially burdensome, less affordable situations for which financial relief might be appropriate. The purpose of the affordability threshold for obtaining a variance, however, is to recognize that there is a point, inevitably higher than these "less affordable" levels, where costs are so burdensome as to warrant consideration of reducing the level of public health protection by installing a less costly variance technology instead of a compliance technology. Because of the public health trade-off, logic dictates that this affordability threshold be set higher than those used by States to identify water systems possibly in need of financial assistance.

A forthcoming study by Rubin (1998) shows that, for residential consumers throughout the United States, water costs were typically less than 1% of median household income in 1989. He notes, however, that there is a substantial variation among the states, such that in some states the median household's water bill was as high as 1.4% of its income. He also recognizes that, since 1989, inflation-adjusted incomes have declined while inflation-adjusted water costs have increased. Thus, nationwide median water costs may be in the range of 1.1% to 1.2% of median household income in 1998 and in some states this percentage may exceed 1.5%.

It is reasonable to conclude, therefore, that water costs that are in the range of 1.0% to 1.5% of total income during the 1990's are affordable, since that is the typical level of water costs already paid by median households in the United States. That is not to say that a higher percentage would not be affordable, only that data exist to demonstrate that 1.0% to 1.5% of income already is being spent for water.

In addition, U.S. EPA (1998) briefly addresses the affordability of water service for nonresidential consumers. That report states (U.S. EPA, 1998, page 27):

For NTNCWSs, the nature of ownership has an important bearing on affordability. In the case of systems run for profit, a market test may be particularly appropriate. If the cost of compliance can be incorporated into the cost of business (like other expenses) and the entity can price its product competitively and stay in business, then the compliance technique might be considered affordable. For some systems, private capital for improvements may be available from a parent corporate entity if the effect on costs and prices is so extreme as to threaten the existence of the business.

Systems managed by and for public purposes cannot pass costs along through prices of goods and services, but instead must rely on public sources of funding. Measures of the fiscal stress for the relevant public entity and access to public capital are applicable to publicly-owned systems. The difficulty in applying affordability measures to these systems is due to the intrinsic relationship between the fiscal health of the water system and the fiscal health of the larger entity.

For both privately and publicly-owned NTNCWSs, measures of general socioeconomic distress may also prove useful for assessing affordability. Although indirect, these indicators provide a general assessment of the financial condition of the water service population, and its ability-to-pay for water system compliance.

3.0 Investigation of NCWS Categories

3.1 Summary of Investigation

EPA identified 57 categories of NCWSs based on service area types (e.g., day care, restaurant, medical facility), of which 23 were selected for inclusion in this analysis. These categories are ordered in Table 1 based on the total population served; i.e., the first category below, schools, serves the largest population among NCWS categories (about 3.16 million people, or about 20% of the total population served by *all* NCWSs). The second category serves the second largest population, and so on. All 20 categories serving more than 1% of the total population served by all NCWSs were included, plus day care centers (serving 0.5% of the total population served), migrant labor camps (serving 0.2% of the total population served), and nursing homes (serving 0.1% of the total population served). Table 1 contains a summary of results from the literature, information about competition and financial constraints within each business category, and specific cost information that is discussed in Sections 3.2 through 3.13.

Our analysis assumes that, if water demand is inelastic and if cost increases can be passed along, that particular category of NCWS would be able to afford cost increases. If there was any doubt about a category's ability, we then looked at the estimated water costs as a percent of revenues. For those categories that do not have a "yes" appearing in both the third and fourth columns of Table 1, we collected data on revenues and expenditures. Available data sources, such as data collected by the Bureau of the Census, were used to characterize the relative contribution of water costs to total input costs and the ability of each business category to withstand increases in the cost of water.

Typical expenditures on water are evaluated for each business category, comparing them to total operating expenses. This results in a determination of the percentage of total expenses represented by water service. If current water expenditures appear to be at (or below) the range of 1.0% to 1.5% of total revenues, then the NCWS category would be in a similar (or better)

position to the median household. This would imply that an increase in the cost of water would have no greater an effect on the NCWS category than it would have on the median household.

Key sources of this information are the 1992 Census of Retail Trade and the 1992 Census of Service Industries. In these sources, information is available on the cost of utilities for businesses in a variety of Standard Industrial Code (SIC) categories. Utility costs are further broken down to present costs for electricity; fuels (non-highway); and water, sewer, and other utilities. (Telecommunications expenditures are presented on a separate table in these reports.) From the “water, sewer, and other utilities” category, we can reasonably approximate the typical cost of water service. For this study, all “water, sewer, and other utilities” costs have been attributed to water service as a worse case scenario.

Table 1: Summary of the Vulnerability of NCWS Categories to SDWA-Related Cost Increases

NCWS Category	Percent of Total Population Served by NCWSs	Category Type	Does literature review suggest inelastic demand for water for this type of user?	Cost increases likely to be passed along?	Estimated Water Cost as % of Revenues ^a	Comments
Schools	20.1%	Institutional	yes	not in all cases	0.4% - 0.7%	1
Restaurants	15.3%	Commercial	yes	not in all cases	0.6%	2, 3
Churches	8.4%	Institutional	yes	yes	N.A.	1
State Parks	5.5%	Institutional	yes	yes	N.A.	4
Water Wholesalers	5.3%	Commercial	no	yes	N.A.	5
Summer Camps	4.9%	Institutional	yes	not in all cases	1.3%	6
Campgrounds/ RV Parks	4.2%	Commercial	yes	not in all cases	1.3%	3, 6
Hotels/Motels	3.9%	Commercial	yes	not in all cases	1.0%	3, 7
Highway Rest Areas	3.3%	Institutional/ Public	yes	yes	N.A.	8

Table 1: Summary of the Vulnerability of NCWS Categories to SDWA-Related Cost Increases

NCWS Category	Percent of Total Population Served by NCWSs	Category Type	Does literature review suggest inelastic demand for water for this type of user?	Cost increases likely to be passed along?	Estimated Water Cost as % of Revenues ^a	Comments
Manufacturing (food)	2.8%	Industrial	yes	not in all cases	< 1.2%	9, 10
Misc. Recreation Areas	2.3%	Commercial/ Institutional	yes	not in all cases	0.6%	3
Medical Facilities	2.2%	Commercial/ Institutional	yes	not in all cases	0.2%	11
Service Stations	2.2%	Commercial	yes	yes	N.A.	8, 12
Office Parks	2.1%	Commercial	yes	yes	N.A.	8, 12
Mixed Knowns	2.0%	all	see other categories	see other categories	N.A.	see other categories
Retailers (excluding food)	1.9%	Commercial	yes	yes	N.A.	8, 12
Manufacturing (misc.)	1.8%	Industrial	somewhat; however, some effects on demand expected	not in all cases	< 0.8%	13
Golf and Country Clubs	1.7%	Commercial/ Public	no	not in all cases	0.6%	3, 14
Retailers (food)	1.2%	Commercial	yes	yes	N.A.	12
Misc. Amusement Parks	1.0%	Commercial	yes	not in all cases	0.6%	14, 15

Table 1: Summary of the Vulnerability of NCWS Categories to SDWA-Related Cost Increases

NCWS Category	Percent of Total Population Served by NCWSs	Category Type	Does literature review suggest inelastic demand for water for this type of user?	Cost increases likely to be passed along?	Estimated Water Cost as % of Revenues ^a	Comments
Day Care Centers	0.5%	Commercial/ Institutional	yes	not in all cases	0.5%	16
Migrant Labor Camps	0.2%	Commercial	yes	yes	N.A.	6, 16
Nursing Homes	0.1%	Commercial/	yes	not in all cases	< 0.2%	6, 16

a. For this study, all “water, sewer, and other” costs have been attributed to water service as a worse case scenario.
N.A. = not applicable.

Comments

1. Literature is less specific about impacts on institutional users. Because schools and churches may have extensive outdoor water use, however, literature suggests that systems may be less confident about ability to pass along costs and would attempt to reduce water consumption.
2. Substitute restaurants are generally readily available to consumers; therefore those restaurants on NCWSs may be reluctant to incorporate cost increases into their menu pricing.
3. Billings (1996) finds that commercial users using larger water volumes exhibit a more elastic demand for water.
4. Because the category of state parks is entirely public, it does not require further analysis under this investigation. While exceptions may exist (e.g., a private food concessionaire in a park), these are individual exceptions and do not characterize the category as a whole.
5. Generally close substitutes do not exist.
6. Food preparation activities and showering imply water use that make this category potentially vulnerable; use of bottled water may not be feasible.
7. Substitute lodging is often readily available to consumers; therefore those hotels/motels on NCWSs may be reluctant to incorporate cost increases into their pricing.
8. Bottled water may be a feasible option for this category.
9. Renzetti (1993) found a price elasticity of -0.05 for the water intake demand in the food processing industry that is not served by a CWS.

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a. For this study, all “water, sewer, and other” costs have been attributed to water service as a worse case scenario.
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5. Generally close substitutes do not exist.
6. Food preparation activities and showering imply water use that make this category potentially vulnerable; use of bottled water may not be feasible.
7. Substitute lodging is often readily available to consumers; therefore those hotels/motels on NCWSs may be reluctant to incorporate cost increases into their pricing.
8. Bottled water may be a feasible option for this category.
9. Renzetti (1993) found a price elasticity of -0.05 for the water intake demand in the food processing industry that is not served by a CWS.

Table 1: Summary of the Vulnerability of NCWS Categories to SDWA-Related Cost Increases

10. Competitive nature of this industry may make this category potentially vulnerable/less competitive.
11. Due to restructuring (e.g., growth of managed care) in the health care industry, medical facilities may not be able to recover all costs.
12. The literature suggests that most commercial customers do not tend to alter their water consumption if the price of water changes, suggesting that they are able to either absorb or pass on increases in the cost of water.
13. Renzetti (1993) finds a price elasticity of demand for intake water of -0.31 for the manufacturing industry not served by a CWS, suggesting that firms in the manufacturing category may not feel that they can pass all increased costs along to customers.
14. Food preparation activities may make use of bottled water unfeasible.
15. The availability of substitutes such as other forms of recreation (e.g., zoos) and parks may prevent amusement parks from passing along all costs.
16. Because customers tend to be very sensitive to price increases, it may not be possible to pass along increased water costs.

3.2 Schools

Financial data for public elementary and secondary schools are summarized in Tables 2, 3, and 4. Data for post-secondary schools (public and private) are summarized in Table 5. Data sources include the Bureau of the Census' Annual Survey of Government Finances and the U.S. Department of Education's Integrated Post-secondary Education System.

The following conclusions about elementary and secondary schools can be drawn from these data:

- ▶ Revenue totaled \$261.9 billion for the 1993-1994 school year;
- ▶ Current spending totaled \$236.9 billion, with remaining expenditures for capital and other non-current items (Table 2);
- ▶ Of the total current expenditures, \$80.2 billion was spent on support services (Table 3), including \$23.6 billion for operation and maintenance of plant (Table 4);
- ▶ Operation and maintenance of plant includes "expenditures for building services" including heating and electricity, security, and upkeep of grounds (U.S. Department of Commerce, Bureau of the Census, 1997b). While water is not specifically mentioned, it should be included in this category.

Thus, approximately 10% (\$23.6 billion out of \$236.9 billion) of current spending by public elementary and secondary schools in 1993-1994 was for operation and maintenance of plant. The available information does not include detailed data on water expenditures. However, if we assume that the ratio of utility costs to total operation and maintenance costs for institutions of higher education holds for elementary and secondary schools, this would imply that approximately 36% of the operation and maintenance expenditures are for utilities (Table 5). If we further assume that the same ratio of water costs to total utility costs exists for schools as exists for day care centers (approximately 1/5 of utility costs are for water and sewer, see Table 14), this would imply water and sewer costs equal to approximately \$1.7 billion, or 0.7% of total current expenditures and revenues.

The following conclusions are apparent for institutions of higher education in the United States:

- ▶ Current revenues totaled \$193.6 billion and total current expenditures totaled \$191.4 billion for fiscal year 1995 (Table 5);
- ▶ Of total current expenditures, \$11.7 billion was spent for operation and maintenance of plant, including \$4.3 billion for utilities.

That is, utility costs represented 2.2% of total current expenditures. The available information does not include detailed data on water expenditures. However, if we assume that the ratio of water and sewer costs to total utility costs for day care centers (approximately 1/5) holds for

institutions of higher education, this would imply that water and sewer expenditures total approximately \$0.9 billion, or 0.4% of total current expenditures or revenues.

**Table 2. U.S. Census Financial Data for Schools:
Summary of Public School System Finances for Elementary-Secondary Education by State (1993-1994)
(Billions of Dollars)**

Total Revenue	Expenditures					
	Total	Current Spending	Capital Outlay	Other	Outstanding	Cash and Securities
261.898	264.436	236.910	21.947	5.579	86.870	56.150

Source: U.S. Department of Commerce, Bureau of the Census, 1997b.

**Table 3. U.S. Census Financial Data for Schools:
Current Spending of Public Elementary-Secondary School Systems (1993-1994) (Billions of Dollars)**

Total	All Functions		Instruction			Support Services			Other
	Salaries and Wages	Benefits	Total	Salaries and Wages	Benefits	Total	Salaries and Wages	Benefits	
236.910	151.701	37.370	142.171	103.064	24.759	80.182	43.423	11.125	14.558

Source: U.S. Department of Commerce, Bureau of the Census, 1997b.

**Table 4. U.S. Census Financial Data for Schools:
Support Services Expenditures for Public Elementary-Secondary Systems by Function (1993-1994)
(Billions of Dollars)**

Total	Pupil Support Services	Instructional Staff Support Services	General Admin.	School Admin.	O&M of Plant	Pupil Transportation	Nonspec.	All other
80.182	10.742	9.052	5.762	13.254	23.592	9.750	2.152	5.877

Source: U.S. Department of Commerce, Bureau of the Census, 1997b.

Table 5. U.S. Department of Education Data for Institutions of Higher Education (FY 1995)

Total Current Funds Revenues	Current Fund Expenditures by Function: Operation & Maintenance of Plant	Utility Expenditures: Total Expenditures for Utilities (excluding hospitals)
\$193,644,833,375	\$11,745,905,100	\$4,253,126,215

Source: U.S. Department of Education, National Center for Education Statistics.

3.3 Restaurants

Available financial data for the restaurant category are summarized in Table 6, derived from U.S. Census data, and Table 7, derived from National Restaurant Association data. Data sources include the 1992 Census of Retail Trade and the National Restaurant Association. Data from the Census reflect both large and small businesses. Data from the trade association include data for full service establishments with average checks per person under and over \$10 and for limited service fast-food restaurants.

Data from the Census suggest average sales per restaurant establishment of approximately \$497,000. As shown in Table 6:

- ▶ Revenues exceed operating expenditures for the category by approximately 66%;
- ▶ Total utility expenditures account for approximately 3.5% of revenues; and
- ▶ Expenditures on water and sewer represent approximately 0.6% of revenues.

The National Restaurant Association data are consistent with the Census data, showing utility expenditures to be between 3.2% and 2.3% of total sales, as shown in Table 7.

These data suggest that current expenditures for water are a relatively insignificant share of total expenditures for the restaurant category and reflect less than one percent of total sales.

Table 6. U.S. Census Financial Data for Restaurants¹
(Dollar Amounts in Millions of 1996 \$)

Number of Establishments²	Sales or Revenues³	Operating Expenditures⁴ (% of Revenues)	Utility Expenditures⁴ (% of Revenues)	Water Expenditures^{4,5} (% of Revenues)
377,760	\$187,758	\$113,204 (60.3%)	\$6,562 (3.5%)	\$1,068 (0.6%)

NA: = Not Available

1. Data reflect SIC 5812 for eating places.

2. Source: U.S. Department of Commerce, Bureau of the Census (1995).

3. Source: U.S. Department of Commerce, Bureau of the Census (1998a).

4. Source: U.S. Department of Commerce, Bureau of the Census (1996a).

5. Includes expenditures for water, sewer and other utilities but not electricity and fuel.

**Table 7. National Restaurant Association Financial Data for Restaurants:
Keeping Track of the Restaurant Industry Dollar, 1996
(Percent of Total Sales)**

Category	Full Service, Average Check per person under \$10	Full Service, Average Check per person over \$10	Limited Service: Fast Food
Cost of Food Sold	32.2	30.0	28.4
Cost of Beverages Sold	3.2	7.8	1.2
Salaries and Wages	28.0	26.9	24.2
Employee Benefits	3.9	4.2	3.7
Direct Operating Expenses	7.0	6.5	6.7
Music and Entertainment	0.2	0.9	0.1
Marketing	2.3	2.5	5.7
Utilities	3.2	2.3	2.8
Restaurant Occupancy Costs	5.2	5.3	7.4
Repairs and Maintenance	1.7	1.6	2.0
Depreciation	2.3	1.8	3.1
Other Operating Expense/ (Income)	0.3	0.2	(0.4)
General and Administrative	3.2	4.2	3.7
Corporate Overhead	2.7	1.4	0.8
Interest	0.8	0.6	0.8
Other	0.2	0.3	0.3
Income Before Income Tax	3.6	3.5	9.5
Source: National Restaurant Association (1997).			

3.4 Summer Camps, Campgrounds, and RV Parks

Available financial data for summer camps, campgrounds, and RV parks are summarized in Table 8. Data are taken from the 1992 Census of Service Industries and reflect both large and small businesses.

Statistics for these categories are tabulated as part of the larger category “Rooming and boarding houses; camps and trailer parks; organization and lodging houses, on membership basis.” Data from the Census suggest:

- ▶ Average revenues per establishment in this category are approximately \$216,000;
- ▶ Revenues exceed operating expenditures for the category by approximately 24%;
- ▶ Total utility expenditures account for approximately 6.8% of revenues; and
- ▶ Expenditures on water and sewer represent approximately 1.3% of total revenues.

Because this SIC category includes a broad range of enterprises, ranging from for-profit trailer parks to non-profit summer camps, it is not possible to identify specific issues that may be particular to any specific category. However, the available data suggest that current expenditures for water are a relatively insignificant share of revenues for the category as a whole.

Table 8. U.S. Census Financial Summary for Summer Camps, Campgrounds, and RV Parks¹
(Millions of 1996 \$)

Number of Establishments ²	Sales or Revenues ³	Operating Expenditures (% of Revenues) ⁴	Utility Expenditures (% of Revenues) ⁴	Water Expenditures ^{4,5} (% of Revenues)
15,448	\$3,338	\$2,701 (80.9%)	\$226 (6.8%)	\$43 (1.3%)

1. Data reflect SIC 702, 703, and 704 for Rooming/Boarding Houses, Camps and Trailer Parks, Lodging Houses.
 2. Source: U.S. Department of Commerce, Bureau of the Census (1997a).
 3. Source: U.S. Department of Commerce, Bureau of the Census (1998b).
 4. Source: U.S. Department of Commerce, Bureau of the Census (1996b).
 5. Includes expenditures for water, sewer and other utilities but not electricity and fuel.

3.5 Hotels and Motels

Available financial data for the category of hotels and motels are summarized in Table 9. Data are taken from the 1992 Census of Service Industries and reflect both large and small businesses.

Census data indicate:

- ▶ Average revenues per establishment in this category are approximately \$1,644,000;
- ▶ Revenues exceed operating expenditures for the category by approximately 24%;
- ▶ Total utility expenditures account for approximately 4.8% of revenues; and
- ▶ Expenditures on water and sewer account for approximately 1% of total revenues.

Thus, current expenditures for water are relatively insignificant for the hotels and motels category.

Table 9. U.S. Census Financial Summary for Hotels and Motels
(Millions of 1996 \$)¹

Number of Establishments ²	Sales or Revenues ³	Operating Expenditures ⁴ (% of Revenues)	Utility Expenditures ⁴ (% of Revenues)	Water Expenditures ^{4,5} (% of Revenues)
41,684	\$68,508	\$55,151 (80.5%)	\$3,269 (4.8%)	\$703 (1.0%)

1. Data reflect SIC 701 for hotels, motels, and tourist courts.
2. Source: U.S. Department of Commerce, Bureau of the Census (1997a).
3. Source: U.S. Department of Commerce, Bureau of the Census (1998b).
4. Source: U.S. Department of Commerce, Bureau of the Census (1996b).
5. Includes expenditures for water, sewer and other utilities but not electricity and fuel.

3.6 Manufacturing (Food)

Data for this category were obtained from the U.S. Census Bureau's Census of Manufactures (1992). The Census of Manufactures does not list expenditures for water or for all utility expenditures. However, it does provide information on electricity and fuels expenditures, as well as on total revenues and expenditures. Manufacturing plants likely spend more on electricity than on water, even plants that use water very heavily (for example, beverage manufacturers or plants with very large cooling needs). Thus, water costs are unlikely to be higher than electricity costs. More realistically, water costs will be substantially lower than electricity costs.

For miscellaneous food products (food preparations not elsewhere classified), the total value of all shipments was \$12.17 billion, while the total cost of electricity was \$113 million, or just 0.9% of the total value of all goods shipped. For the other industries included in this report, the ratio of electricity costs to total value of shipments ranged from a low of 0.5% (potato chips and similar snacks) to a high of 3.6% (manufactured ice). Manufactured ice was the only industry included in this miscellaneous food products category that had a ratio above 1.2%.

Manufactured Ice

Manufactured ice appears to be a special, and very small, category that not only has substantially higher electricity costs as a percentage of total costs (for cooling) than other food products industries, but also may have a substantially higher percentage of water costs due to the fact that the product that is being produced is made up solely of water.

For manufactured ice, the census data show that there were 562 establishments nationwide, with nearly all of them (503) having fewer than 20 employees. That is, these tend to be very small businesses with average annual revenues of approximately \$638,000 per establishment. These 562 establishments account for more than 14% of the businesses in the miscellaneous category, but produce only about 1% of the value of goods shipped within this category.

3.7 Miscellaneous Recreation Areas, Golf and Country Clubs, and Miscellaneous Amusement Parks

Available financial data for the categories of miscellaneous recreation areas, golf and country clubs, and miscellaneous amusement parks are summarized in Table 10. Data are taken from the 1992 Census of Service Industries and include both large and small businesses.

Statistics for this category are tabulated as part of the larger category "Miscellaneous amusement and recreation services." The data suggest:

- ▶ Average revenues per establishment in this category are approximately \$1,138,000;
- ▶ Revenues exceed operating expenditures for the category by approximately 25%;
- ▶ Total utility expenditures account for approximately 3.6% of revenues; and
- ▶ Expenditures on water and sewer represent approximately 0.6% of total revenues.

These data suggest that current expenditures for water are a relatively insignificant share of total expenditures for the category as a whole. However, within the category of "miscellaneous amusement and recreation services," golf and country clubs may use far more water for grounds maintenance than do other types of establishments. Nevertheless, even if water expenditures are twice as high for golf and country clubs as for other types of establishments in this category, they would represent less than 1.2% of total operating expenditures. Further, if the quantity of water used for irrigation resulted in significantly higher treatment expenses, the establishment could investigate the feasibility of bypassing the treatment facilities for irrigation water.

**Table 10. U.S. Census Financial Summary for
Miscellaneous Recreation Areas, Golf and Country Clubs, and Miscellaneous Amusement Parks¹**
(Millions of 1996 \$)

Number of Establishments ²	Sales or Revenues ³	Operating Expenditure ⁴ (% of Revenues)	Utility Expenditures ⁴ (% of Revenues)	Water Expenditures ^{4,5} (% of Revenues)
33,480	\$38,109	\$30,591 (80.3%)	\$1,369 (3.6%)	\$216 (0.6%)
1. Data reflect SIC 799 for miscellaneous amusement and recreation services. 2. Source: U.S. Department of Commerce, Bureau of the Census (1997a). 3. Source: U.S. Department of Commerce, Bureau of the Census (1998b). 4. Source: U.S. Department of Commerce, Bureau of the Census (1996b). 5. Includes expenditures for water, sewer and other utilities but not electricity and fuel.				

3.8 Medical Facilities and Nursing Homes

Available financial data for the categories of medical facilities and nursing homes are summarized in Table 11. Data are taken from the 1992 Census of Service Industries. Data from the Census reflect both large and small facilities.

Data from the Census suggest:

- ▶ Average revenues per establishment in this category are approximately \$1,340,000;
- ▶ Revenues exceed operating expenditures for the category by approximately 9%;
- ▶ Total utility expenditures account for approximately 1.2% of revenues for the health services category in general;
- ▶ Percentages of utility expenditures for different subcategories range from 0.3% (home health care services) to 1.4% (hospitals); and
- ▶ Expenditures on water and sewer generally represent about 0.2% of total revenues.

Nursing and personal care facilities make up just four percent of the total number of establishments in this category. Therefore, the data may not be reflective of conditions within the specific category of nursing and personal care facilities. However, of the seven health care categories for which data are available, water expenditures as a percentage of revenues do not exceed 0.2%. If nursing homes share the characteristics of most facilities within the health care category, water expenditures would most likely constitute a very small percentage of revenues.

Table 11. Financial Summary for Medical Facilities and Nursing Homes¹
(Dollar Amounts are in Millions of 1996 \$)

Kind of Business	Number of Establishments ²	Sales or Revenues ³	Operating Expenditures ⁴ (% of Revenues)	Utility Expenditures ⁴ (% of Revenues)	Water Expenditure ^{4,5} (% of Revenues)
Health Services	465,356	\$623,482	\$572,901 (91.9%)	\$7,410 (1.2%)	\$1,231 (0.2%)
Offices of physicians	197,701	\$157,977	\$133,827 (84.7%)	\$755 (0.5%)	\$116 (0.1%)
Offices of dentists	108,804	\$35,597	\$27,199 (76.4%)	\$320 (0.9%)	\$48 (0.1%)
Offices of osteopathic physicians	8,708	\$3,638	\$2,905 (79.8%)	\$22 (0.6%)	NA (NA)
Offices of other health practitioners	74,672	\$18,926	\$13,967 (73.8%)	\$161 (0.9%)	\$17 (0.1%)
Nursing and personal care facilities	20,879	NA	NA (NA)	NA (NA)	NA (NA)
Hospitals	7,120	\$310,819	\$266,091 (85.6%)	\$4,404 (1.4%)	\$702 (0.2%)
Medical and dental laboratories	15,961	\$14,459	\$12,291 (85.0%)	\$107 (0.7%)	\$19 (0.1%)
Home health care services	10,260	\$16,128	\$13,341 (82.7%)	\$49 (0.3%)	\$9 (0.1%)
Health and allied services, n.e.c.	17,949	\$16,727	\$13,639 (81.5%)	\$150 (0.9%)	\$29 (0.2%)

n.e.c. = not elsewhere classified

NA = not available

1. Data reflect SIC 80 for health services.

2. Source: U.S. Department of Commerce, Bureau of the Census (1997a).

3. Source: U.S. Department of Commerce, Bureau of the Census (1998b)

4. Source: U.S. Department of Commerce, Bureau of the Census (1996b).

5. Includes expenditures for water, sewer and other utilities but not electricity and fuel.

3.9 Service Stations

Available financial data for the category of service stations are summarized in Table 12. Data are taken from the 1992 Census of Service Industries and reflect both large and small businesses.

Census data indicate:

- ▶ Average revenues per establishment in this category are approximately \$457,000;
- ▶ Revenues exceed operating expenditures for the category by approximately 55%;
- ▶ Total utility expenditures account for approximately 1.6% of revenues; and
- ▶ Expenditures on water and sewer account for approximately 0.3% of total revenues.

Thus, current expenditures for water are relatively insignificant for the service stations category.

Table 12. U.S. Census Financial Summary for Service Stations
(Millions of 1996 \$)¹

Number of Establishments ²	Sales or Revenues ³	Operating Expenditures ⁴ (% of Revenues)	Utility Expenditures ⁴ (% of Revenues)	Water Expenditures ^{4,5} (% of Revenues)
171,970	\$78,511	\$50,577 (64.4%)	\$1,227 (1.6%)	\$219 (0.3%)

1. Data reflect SIC 75 for automotive repair, services, and garages.
 2. Source: U.S. Department of Commerce, Bureau of the Census (1997a).
 3. Source: U.S. Department of Commerce, Bureau of the Census (1998b).
 4. Source: U.S. Department of Commerce, Bureau of the Census (1996b).
 5. Includes expenditures for water, sewer and other utilities but not electricity and fuel.

3.10 Mixed Knowns

The category “Mixed Knowns” represents systems that supply water to two or more different types of establishments. The majority of establishments include service station and restaurant combinations or hotel/motel and restaurant combinations. Because these categories are not found to be vulnerable in this assessment, this category is not considered vulnerable.

3.11 Manufacturing (Miscellaneous)

Data for evaluating this category were obtained from the U.S. Census Bureau’s Census of Manufactures (1992). As described under Manufacturing (Food), the Census of Manufactures does not list expenditures for water or for all utility expenditures. However, it does provide information on electricity and fuels expenditures, as well as on total revenues and expenditures. Manufacturing plants likely spend more on electricity than on water, even plants that use water

very heavily (for example, beverage manufacturers or plants with very large cooling needs). Thus, we can assume that water costs will be no higher than electricity costs. More realistically, water costs will be substantially lower than electricity costs.

The category of miscellaneous manufacturing appears to be similar to most of the miscellaneous food products companies. Electricity costs for the several categories of manufactures in this category are all within the range of 0.7% to 0.8% of the value of goods shipped, with the exception of the hard surface floor coverings industry (electricity costs are 1.9% of the value of shipments). It is unlikely that water costs in this industry would be as large as the cost of electricity. Therefore, it is very likely that in all of these industries, the cost of water would be relatively insignificant (much less than 1% of the value of goods shipped).

3.12 Day Care Centers

Available financial data for the day care centers category are summarized in Table 13. Data sources include the 1992 Census of Service Industries. Data from the Census reflect both large and small businesses.

Statistics for this category are tabulated as part of the larger category “job training, vocational rehabilitation, child day care, and residential care.” Child day care centers comprise the majority of establishments in this category (59%) (U.S. Department of Commerce, 1996c); therefore, the data reported should be relatively characteristic of day care centers. Data from the Census suggest:

- ▶ Average revenues per establishment in this category are approximately \$356,000;
- ▶ Revenues exceed operating expenditures for the category by approximately 11%;
- ▶ Total utility expenditures account for approximately 2.4% of revenues; and
- ▶ Expenditures on water and sewer represent approximately 0.5% of revenues.

These data suggest that current expenditures for water are a relatively insignificant share of total expenditures for the day care center category, reflecting less than one percent of total sales.

3.13 Migrant Labor Camps

No data were located to characterize the financial condition of migrant labor camps. However, information on two federal programs suggests that increases in the cost of water may be largely recoverable from the federal government and might not affect the camp owners directly. This assumes, of course, that the migrant labor camp already is in compliance with existing drinking water, and other public health, regulations.

The U.S. Department of Agriculture has two programs that result in the Federal government paying for most of these costs (7 CFR Part 1930). The Farm Labor Housing Program provides

Table 13. U.S. Census Financial Summary for Day Care Centers¹
(Millions of 1996 \$)

Number of Establishments ²	Sales or Revenues ³	Operating Expenditures ⁴ (% of Revenues)	Utility Expenditures ⁴ (% of Revenues)	Water Expenditures ^{4,5} (% of Revenues)
87,210	\$31,042	\$27,943 (90.0%)	\$753 (2.4%)	\$149 (0.5%)

1. Data reflect SIC 833, 835, and 836 for job training, vocational rehabilitation, child day care, and residential care.
2. Source: U.S. Department of Commerce, Bureau of the Census (1997a).
3. Source: U.S. Department of Commerce, Bureau of the Census (1998b).
4. Source: U.S. Department of Commerce, Bureau of the Census (1996b).
5. Includes expenditures for water, sewer and other utilities but not electricity and fuel.

low-interest loans and grants to developers of housing for low-income migrant workers and other farm laborers. The Rental Assistance Program provides subsidies to farm laborers such that they will not pay more than 30% of their income for housing costs. Housing costs include utility costs, which include water costs. Therefore, substantial increases in the costs of providing water to migrant labor camps would likely be borne by the Federal government.

4.0 Other Factors and Considerations

4.1 Regional Differences

Vulnerability of NCWS categories rests in part on whether impacts are likely to be short-term or long-term, and whether mitigating measures can be employed. These two factors are inter-related, since short-term impacts may induce businesses to consider such mitigation. Some of the literature suggests that impacts can reasonably be mitigated over the long term, although information on the ability of specific categories of NCWSs to do this is not readily available. On this topic, one study (Vista, 1996) finds that “customers typically respond to price increases in the short term by reducing the more discretionary seasonal demand, such as lawn sprinkling, more quickly and to a greater extent than their year-round usage but that changes in year-round usage are more permanent.” Such mitigating measures may include such actions as installing low-flow fixtures, adopting low-water-use landscaping approaches, or, in the case of industrial users, employing process changes or recirculating water (Vista, 1996; Renzetti, 1992; Billings, 1996).

Another consideration relevant to this investigation is the finding that water price elasticity is strongly dependent upon geographical region and local climate (Vista, 1996). In addition to regional differences in consumer response to cost increases, other regional factors come into play as well. For example, in some regions, customers are accustomed to having lawns turn brown

during parts of the year, while in other areas this may not be tolerated. The Vista study cautions that “great care should be taken to account for local climatic conditions when evaluating the likely demand and revenue effects” of price changes.

It also must be recognized that not all NCWSs need water that is fit for human consumption for all of their water users. While some NCWSs cannot avoid the need to treat their water (such as food processors, restaurants, hospitals, day care centers, and nursing homes), other NCWSs (such as some factories and many commercial businesses) may be able to purchase bottled water for drinking and leave their own water production untreated. Similarly, some NCWSs that use a substantial amount of water for irrigation (such as golf courses) may find it cost-effective to separate their irrigation system from the water system that is used for human consumption, sanitation, and bathing.

Finally, it is also important to focus on the national impacts of drinking water regulations. It is important to identify any categories of NCWS that are likely to have a compliance problem on a broad scale and to deal with such concerns on a national level. In any particular case, it is possible to have one specific business that will be adversely affected by a new regulation. However, such case-by-case problems are the proper focus of specific exemption requests rather than national-level investigations into the applicability of a regulatory regime for an entire category of NCWSs.

4.2 Size Categories of NCWSs and Affordability Issues

Generally, the smallest NCWSs (those serving 25 to 500 persons) are considered to be the most financially vulnerable to cost increases. Although the Census data upon which this affordability assessment is based do not provide insight into the financial condition of small versus large firms within any given category, general conclusions can be drawn about the vulnerability of smaller size categories.

Table 14 shows the population served by each category of NCWS for which we evaluated cost and revenue data. As the table indicates, all of the categories serve an average population of fewer than 500 persons. Absent information to the contrary, we can assume that the characteristics of establishments within each category on NCWSs are essentially the same as those of firms on CWSs. For example, the subset of restaurants on NCWSs can be assumed to closely resemble the larger universe of restaurants for which Census data are available (i.e., most restaurants, whether they are on CWSs or NCWSs, serve a rather small population, as indicated by the fact that per-establishment sales average less than \$500,000). Consequently, affordability issues particular to the smallest size category for the NCWS categories under consideration have not been separately considered.

Table 14. Population Served by NCWS Categories¹

NCWS Categories Evaluated	Average Population Served	Total Population Served	Percent of Total Population Served
Schools	339	3,165,520	20.1%
Restaurants	93	2,410,487	15.3%
Churches	111	1,313,052	8.4%
Summer Camps	125	772,453	4.9%
Campgrounds/RV Parks	45	658,840	4.2%
Hotels/Motels	70	605,123	3.9%
Manufacturing (food)	192	444,211	2.8%
Medical Facilities	339	352,684	2.2%
Mixed Knowns	176	307,142	2.0%
Manufacturing (misc.)	140	284,137	1.8%
Golf and Country Clubs	108	265,732	1.7%
Misc. Amusement Parks	203	154,500	1.0%
Day Care Centers	71	71,866	0.5%
Migrant Labor Camps	46	29,979	0.2%
Nursing Homes	107	13,910	0.1%

1. Source: SAIC (1998).

5.0 Summary and Conclusions

We determined that eight of the 23 NCWS categories reviewed were not vulnerable to SDWA-related cost increases because of an inelastic demand for water and an ability to pass on increased costs to customers. Of the remaining 15 NCWS categories reviewed, we found all to be less vulnerable to SDWA-related cost increases than a typical household. We found expenditures on water to be a relatively small percentage of total revenues. In nearly all cases, water expenditures (including expenditures for sewer service and miscellaneous other utilities) totaled less than 1% of total revenues, and never more than 1.3% of total revenues. Several caveats must be made, however, concerning these categories:

- ▶ The category of summer camps was evaluated based upon statistics from a much larger category, “rooming and boarding houses, camps and trailer parks, organization and lodging houses, on membership basis.” It is possible that summer camps may face particular affordability issues not shared by other enterprises in this category.
- ▶ The category of golf and country clubs was also evaluated as part of a larger category, “miscellaneous amusement and recreation services.” Due to their potentially extensive outdoor watering requirements, these establishments may also face a greater burden than is indicated by the review of Census statistics.
- ▶ The assessment of the food manufacturing category found that one industry, manufactured ice, may be vulnerable due to 1) a significantly higher ratio of electricity costs to total value of shipments, 2) the tendency of these firms to be very small (fewer than 20 employees), and 3) the importance of water in the product that is produced.
- ▶ It was not possible to isolate water costs for NCWSs because reference sources lumped them together with sewer and other costs. Thus, water costs expressed as a percent of revenues appear higher than they really are, representing a “worse case” scenario.

6.0 References

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