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The Authoritative Resource for Safe Drinking Water SM

CAP: Capacity Assistance Program Self Assessment Workbook Checklist

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TABLE OF CONTENTS

- I. INTRODUCTION 2**
 - A. THE NEED TO “OPERATE LIKE A BUSINESS” 2**
 - B. BUSINESS PLANNING: GETTING TO YOUR “BOTTOM LINE” 2**
 - C. SELF-ASSESSMENT: HOW TO USE THIS BOOK..... 3**
- II. ASSESSING YOUR FACILITIES 4**
 - A. SUPPLY SOURCES AND FACILITIES..... 4**
 - B. TREATMENT..... 7**
 - C. INFRASTRUCTURE..... 13**
- III. ASSESSING YOUR MANAGEMENT CAPABILITIES..... 19**
 - A. OPERATION & MAINTENANCE 19**
 - B. MANAGEMENT & ADMINISTRATION 20**
 - C. CUSTOMER SERVICE AND PUBLIC INFORMATION..... 22**
- IV. ASSESSING YOUR FINANCES 22**
- V. PUTTING IT ALL TOGETHER: WHAT’S YOUR PLAN TO MEET THE FUTURE?
..... 25**

I. INTRODUCTION

A. THE NEED TO “OPERATE LIKE A BUSINESS”

A water system should be “operated like a business.” This is a frequently repeated phrase. But, what is meant by it? Here’s one useful way to think about what it means to operate as a business:

A successful business manager has to always be aware of changes taking place in the environment in which the business operates. It is necessary to constantly look to the future in order to be prepared:

- 1) To cope with any **threats** to the survival of the business; and*
- 2) To take advantage of **opportunities** to improve the performance of the business.*

When an investor purchases a share of stock in a business, the value of the investment is based entirely on the future prospects of the business -- the future is everything in the business world.

The future value of a water system to a community should be regarded in the same manner. Owners and customers of water systems may face the prospect of making substantial investments in the foreseeable future and should seek to assure themselves that the plan for operating this business is the best that it can be.

Many water systems were formed at a time when the costs of providing water service were low and sources of change were few. Without significant costs or other pressures, there was little incentive to focus on the business aspects of the operation. However, customer expectations and regulatory criteria have significantly increased the level of responsibility and preparedness required of water systems. This guide provides a process for water systems to assess their capacity to function in an effective, “business-like” manner.

B. BUSINESS PLANNING: GETTING TO YOUR “BOTTOM LINE”

In a changing world, the only means of demonstrating that a business will function effectively in the future is through a forward-looking “business plan.”

A business plan presents a two-sided analysis. It consists of a plan for spending money to produce a product or service; and a plan for recovering sufficient revenues from sales to pay for periodic capital investments and routine operating expenditures. The “bottom line” question is a fundamental budget question -- whether the “inflows” can be assured to match the “outgoes,” given the challenges of the future.

A troubled business develops when there is no plan that can be put forward that can allow the business to meet the revenue and capital requirements that it faces in the future. In such circumstances, businesses are often “restructured” in some manner to change their costs or their access to capital to result in a business plan that gives them a better chance of success.

Alternatively, many troubled businesses simply go out of business. This is a frequent occurrence in our dynamic economic system. However, it is not so simple when the business involves provision of public water supply that is vital to a community.

In the business world, past performance is no guarantee of future performance. It is impossible to tell a viable water system from a nonviable one on the basis of how the system appears today or how it performed last year. Because of the changing business environment, the only way to tell if a water system is truly viable is to examine its plan for the future. This self-assessment checklist is intended to help water systems get to this “bottom line” question and start the process of planning their future.

Materials available to assist you; Capacity Development: Helping Utilities Plan for the Future video #65139, AWWA Manuals of Water Supply Practices, Principles of Water Rates, Fees, and Charges M1; Water Utility Management M5; Water Utility Capital Financing M29; Planning and Managing Reliable Urban Water Systems #20412; Basic Management Principals for Small Systems #20462; available from the AWWA bookstore 800-926-7337 or on-line bookstore at www.awwa.org. Also Small Utility Rates and Finances (SURF) on the Small Utility Network at <http://www.awwa.org/sun/sunhome.htm> free downloadable program.

C. SELF-ASSESSMENT: HOW TO USE THIS BOOK

Assessing Capital and Operating Costs

This self-assessment guide presents a structured series of yes/no questions which follow the major elements of a complete business plan: a facilities plan (Section II), a management plan (Section III), and a financial plan (Section IV). The questions are intended to help you identify major capital and operating costs that could arise in the future operation of your system -- things that will impact your “bottom line.”

Within each section of the guide, the questions are grouped according to overall topic areas. Each topic represents an important area where there may be hidden costs in your future. The individual yes/no questions under each topic are intended to stimulate your thinking about the topic in general. In going through them you should keep the general topic in mind and ask yourself: “Is there anything to worry about here?” “Is there anything that could surprise us and cost a lot of money?”

The questions are all structured such that a “yes” answer means that cost surprises are unlikely and a “no” answer means some potential for cost surprises exists. There are questions covering every major category of capital and operating costs. So when you get to the end of the guide, you will have thought about all the major areas where there could be threats to your water system.

When answering the yes/no questions, be honest with yourself and if you don’t know the answer take the time to do the research. In order to answer some of the questions, you may need to look at some records or find someone to help you understand the topic a little better. When you come upon such questions, leave them blank and get what you need to complete them later. Let the blank spaces serve as your reminder.

Some questions may not apply to your circumstances. For example, surface water questions do not apply to ground water systems. When you encounter such questions, simply mark “NA” next to them, so you will remember to ignore those sections.

How do you use the results of this self-assessment to tell if your water system is going to be a successful business in the future?

There is no standard scoring system that can be used to interpret your answers to the yes/no questions. If you have relatively few “no” answers, the potential for cost surprises in your future is probably less than if you have several “no” answers. However, it is important for you to think carefully about each “no”. Consider what can be done to reduce your liability in each instance and make an estimate about what each “no” might cost you. The “bottom line” is -- “What do all the “no” answers add up to?” Is it a cost you can afford?

Assessing Revenue Requirements and Revenue Sources

Once you have completed the self-assessment of potential cost concerns, the next step in business planning is to examine the other side of the ledger to see what your potential cost scenarios mean in terms of revenue requirements and customer rates. Once you have begun to examine your future in this explicit “business-like” manner, the key factors involved in operating your system “like a business” should become very plain.

II. ASSESSING YOUR FACILITIES

A. SUPPLY SOURCES AND FACILITIES

AVAILABILITY AND ADEQUACY OF SUPPLY SOURCES

For many water systems, obtaining sufficient quantity of water supply on a reliable basis is a challenge. In some systems, it is the paramount concern. By contrast, other systems have been pumping from the same well for many years with never a hint of problems. Even if the quantity of water available has never been a problem, it is

worthwhile to "consider the source" in looking to the future. The more frequently you answer "yes" to the following questions, indicates degree to which you have considered the major factors that are important in assessing future source availability. For questions where your answer is "no," it should be relatively clear from the context and the statement of the question what steps you might take to obtain a better assessment of the issue involved.

Materials available to assist you: Principles and Practices of Water Supply Operations Water Sources #1955; Design and Construction of Small Water Systems #20223; AWWA Manual of Water Supply Practices M21 Groundwater; M50 Water Resources Planning; Integrated Resource Planning #20328; Water Resource HandBook #20379; WSO Source Protection (video) #65090V; Source Water Protection and Security (video) # 65246; Surface Water Protection (video) #65144; Water Resources Engineering #20467; available from the AWWA bookstore 800-926-7337 or on-line bookstore at www.awwa.org.

Can existing sources of supply meet existing demands?

1) Do you know how much water you pump on an average day?	YES__ NO__ NA__
2) Do you know how much water you pump on a peak day?	YES__ NO__ NA__
3) Do you know your source capacity in gpd?	YES__ NO__ NA__
4) Is your source capacity higher than your peak day demand with your largest unit out of service?	YES__ NO__ NA__
5) Can you meet peak demand without pumping at peak capacity for extended periods?	YES__ NO__ NA__
6) Have you been able to provide adequate volumes of water during drought periods?	YES__ NO__ NA__
7) Do you have an Emergency Curtailment Plan that will allow you to meet system demand during a drought or shortage such as the loss of the largest unit?	YES__ NO__ NA__

Do you know how your demand is changing?

8) Do you know whether your system demand will be growing, declining, or remaining stable over the next ten years?	YES__ NO__ NA__
9) If you have large commercial, industrial, or irrigation users, do you know their long-term plans and understand their needs?	YES__ NO__ NA__

If you purchase water, do you fully understand the purchasing arrangement?

10) Do you have a contract to purchase water?	YES__ NO__ NA__
11) If you purchase water from another system or a wholesaler, do you know their long-term plans?	YES__ NO__ NA__
12) Do you know the terms affecting your supply during drought conditions?	YES__ NO__ NA__

Are you aware of competing uses of water that may impact availability?

13) Are you knowledgeable about other demands being placed on the same water source that you are using?	YES__ NO__ NA__
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14) Do you know who the other users are and do you understand their future plans?	YES__ NO__ NA__
15) Do you fully understand your legal water rights?	YES__ NO__ NA__

Is your current source the best choice for the long-term?

16) Are alternative water sources possibly available to you?	YES__ NO__ NA__
17) Are you knowledgeable of the characteristics and costs of using alternative sources?	YES__ NO__ NA__

VULNERABILITY OF SUPPLY SOURCES TO CONTAMINATION

It is better to protect water supply sources from being contaminated in the first place, than it is to try to clean them up afterwards with expensive treatment technologies. The first step towards effective pollution prevention is knowledge. Water suppliers need to become informed about the potential sources of contamination that exist within the areas that may influence their source waters. Armed with such knowledge, you can assess whether your source water is vulnerable to contamination, which may result in additional treatment expenditures.

Do you know where your water comes from?

18) Can you draw on a map the boundaries of the land area from which your source waters emanate?	YES__ NO__ NA__
19) Do you know the boundaries of your watershed or the "zone of contribution" of your well?	YES__ NO__ NA__
20) Do you know the depth of your well?	YES__ NO__ NA__
21) Do you know the geological name of the aquifer system from which your water is drawn?	YES__ NO__ NA__

What potential sources of contamination exist in your watershed area or "zone of contribution"?

22) Is your watershed area or "zone of contribution" free from discharges from either human wastewater treatment facilities or agricultural feedlot waste treatment facilities?	YES__ NO__ NA__
23) Is your watershed area or "zone of contribution" free from any facilities engaged in the production, storage, or handling of agricultural chemicals such as manufacturing plants, warehouses, or farm supply stores?	YES__ NO__ NA__
24) Is your watershed area or "zone of contribution" free from any golf courses, corporate or institutional campuses, or intensively landscaped residential developments?	YES__ NO__ NA__
25) Is your watershed area or "zone of contribution" free from any industrial or commercial establishments engaged in significant uses of organic (e.g. solvents) and inorganic (mining, metallurgy, chemical production, etc.) chemicals as part of production processes?	YES__ NO__ NA__
26) Do you know what crops are grown within your watershed area or zone of contribution?	YES__ NO__ NA__

27) Do you know what agricultural chemicals are in most prevalent use for these crops?	YES__ NO__ NA__
28) Do you know what the seasonal patterns of agricultural chemical application are for these crops?	YES__ NO__ NA__
29) Have you asked the county agricultural extension agent about cultivating practices in your area?	YES__ NO__ NA__

B. TREATMENT

TREATMENT: MICROBIOLOGICAL CONTAMINATION

Protecting water supplies from microbiological contamination is a critical utility function. This requires vigilant efforts in source protection, treatment, storage, and distribution. The key is "the multiple barriers approach." In its most elaborate form, this consists of first protecting supplies from coming into contact with sources of contamination and then providing several levels of monitoring and treatment, as well as back-up treatment, to assure inactivation of disease-causing micro-organisms. Safe Drinking Water Act (SDWA) regulations have detailed treatment requirements for protection from microbial contamination in both surface waters and ground waters.

Your treatment may have to change even if you have never had problems with microbiological contamination. Considerations are different for surface water than for ground water. There are also new considerations for maintaining treated water quality in the distribution system. "No" answers to the following questions may imply the potential for increased treatment costs.

Materials to assist you: Principles and Practices of Water Supply Operations Water Treatment AWWA #1956; Water Quality #1958; Water Treatment Troubleshooting and Problem Solving #20436; AWWA Manuals of Water Supply Practices M7Problem Organisms in Water, M12 Simplified Procedures for Water Examination, M20 Water Chlorination Principles and Practices, M21 Groundwater, M48 Waterborne Pathogens; AWWA/ANSI Standard C653 Disinfection of Water Treatment Plants; Standard C654 Disinfection of Wells; Filtration Strategies to Meet the Surface Water Treatment Rule #20268; Theory and Practice of Water and Wastewater Treatment Plants #20468; Operators Guide to Bacteriological Testing #20309; Routine Coliform Sampling for Water Systems (video) #65218; Maintaining Distribution System Water Quality (handbook) #20231; Standard Methods for the Examination of Water and Wastewater #10079 available from the AWWA bookstore 800-926-7337 or on-line bookstore at www.awwa.org.

Surface Water Systems and Systems Using Ground Water Under the Influence of Surface Water

Is your filtration plant in good condition?

30) Is your filter plant well maintained?	YES__ NO__ NA__
31) Free from spalling concrete?	YES__ NO__ NA__
32) Free from peeling paint?	YES__ NO__ NA__
33) Are repair parts available?	YES__ NO__ NA__

34) Do you have redundancy for all units that have an effect on health?	YES__ NO__ NA__
35) Can your plant achieve a filtered water turbidity of 0.1 NTU 95 percent of the time?	YES__ NO__ NA__
36) Do you have the capability to add coagulant before the filter?	YES__ NO__ NA__
37) Can your plant meet the current "CT" requirements with a comfortable margin?	YES__ NO__ NA__
38) Has the state performed a "sanitary survey" or "performance evaluation" of your plant recently with satisfactory results	YES__ NO__ NA__

Ground Water Systems

Are you sure it's ground water?

39) Are you sure your water supply is really "ground water" and not ground water under the influence of surface water?	YES__ NO__ NA__
40) Is your well more than 100 feet deep?	YES__ NO__ NA__
41) Do you annually or after well has been off for extended period routinely test a bacteriological sample?	YES__ NO__ NA__
42) Have you sampled and analyzed for Microscopic Particulate Analysis (MPA) to determine if your well is under the direct influence of surface water?	YES__ NO__ NA__
43) Is your well located outside the zone of influence of nearby streams or rivers?	YES__ NO__ NA__
44) Is your water free from variations in turbidity and temperature in the period after storm events?	YES__ NO__ NA__

If you do not presently disinfect, will you be able to stay that way?

Under the Proposed Groundwater Rule ALL groundwater CWS will have to disinfect.

45) Is your well site approved by a local or state health department?	YES__ NO__ NA__
46) Was your well constructed under a permit issued by an appropriate local or state agency?	YES__ NO__ NA__
47) Does the construction conform to current standards for siting and constructing a well?	YES__ NO__ NA__
48) Is your well shaft encased and is the casing intact?	YES__ NO__ NA__
49) Is your well located inside a pump house?	YES__ NO__ NA__
50) Is your wellhead capped with a pitless adapter that is adequate to prevent contamination from surface water?	YES__ NO__ NA__
51) Are the surface features of the well maintained so as not to allow contamination to enter the well? i.e., vents screened, all ports in the well cap plugged, electrical panels secured, all seals are intact and inspected regularly.	YES__ NO__ NA__
52) Does your state have a Wellhead Protection program in place?	YES__ NO__ NA__
53) Has the state performed a "sanitary survey" of your system recently with	

satisfactory results?	YES__ NO__ NA__
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Is your current ground water disinfection practice providing adequate treatment?

54) Do you regularly inspect and maintain your chlorine dosing equipment?	YES__ NO__ NA__
55) Do you have back-up repair equipment?	YES__ NO__ NA__
56) Do you regularly check and record chlorine residuals?	YES__ NO__ NA__
57) If you use Sodium Hypochlorite (commercial bleach) do you test for chlorite and chlorate?	YES__ NO__ NA__
58) Are you chloraminating?	YES__ NO__ NA__
59) Has the raw supply ever been tested for Ammonia?	YES__ NO__ NA__
60) Do you have adequate contact time following disinfection and before the first user in the system?	YES__ NO__ NA__
61) Can you detect a chlorine residual throughout the distribution system, taps, dead ends and furthest extremities?	YES__ NO__ NA__

Distribution Systems

Are you free from the risk of having hidden problems arise during distribution?

62) Do you keep track of the number and type of customer complaints?	YES__ NO__ NA__
63) Current requirements place an upper limit on chlorine concentrations in finished water of 4.0 mg/l. Are your residuals comfortably below this level?	YES__ NO__ NA__
64) Do you have a cross-connection control program in place?	YES__ NO__ NA__
65) Are the operating pressures in the water distribution system between 35 psi and 85 psi at the service connections of each customer?	YES__ NO__ NA__

TREATMENT: DISINFECTION BY-PRODUCTS

The public health benefits of disinfection are beyond question. However, there have recently been questions raised about the potential health effects of various chemical by-products formed by popular disinfectants such as chlorine. As a result, SDWA regulations will cause small water systems to begin controlling for by-products of disinfection such as "Trihalomethanes."

Materials to assist you: Formulation and Control of Disinfection By-Products in Drinking Water #20422; Stage ID/DBP & IESWTR Compliance Essentials (video) #65158; AWWARF Factors Affecting DBP Formation During Chloramination #90728; AWWARF Removal DBP Precursors by GAC Adsorption #90744; available from the AWWA bookstore 800-926-7337 or on-line bookstore at www.awwa.org.

Are you likely to have to change treatment to control for Disinfection By-Products?

66) Are Trihalomethane levels measured routinely?	YES__ NO__ NA__
67) Are your Trihalomethane levels comfortably below 80 ug/l when	

averaged over the annual cycle?	YES__ NO__ NA__
68) Are your (HAA5) Haloacetic Acids levels comfortably below 60 ug/L?	YES__ NO__ NA__
69) Groundwater or surface water: Have you tested the raw water total organic carbon (TOC)?	YES__ NO__ NA__
70) Do you know the concentration of the raw water alkalinity?	YES__ NO__ NA__
71) If you treat surface water, are you already practicing or could you adopt "enhanced coagulation" in your current plant?	YES__ NO__ NA__
72) If you treat surface water, could you still meet current C-T requirements if disinfection were not allowed before sedimentation?	YES__ NO__ NA__

TREATMENT: CORROSION CONTROL

Lead and copper occur in trace amounts in tap water in part as by-products of corrosion from pipe materials and plumbing fixtures. The allowable concentrations of these metals are governed by "The Lead and Copper Rule." There is going to be a continuing need for careful fine-tuning and adjustment of corrosion control treatment, consisting of pH and alkalinity adjustment and/or addition of chemical additives that act as corrosion inhibitors. While this does not require great capital expenditures, it requires operator diligence and entails chemical costs.

Materials to assist you: Corrosion Control for Operators #20232; Internal Corrosion of Water Distribution Systems #90508; A General Framework for Corrosion Control Based on Utility Experiences #90712; RTW Model for Corrosion Control and Process Chemistry w/Software #53043; available from the AWWA bookstore 800-926-7337 or on-line bookstore at www.awwa.org.

Are you likely to have to change treatment to control for Corrosion By-Products?

73) Have your first draw monitoring results been comfortably below 15 ug/l for lead and 1.3 mg/l for copper?	YES__ NO__ NA__
74) Does your treated water have a pH greater than 8 and an alkalinity greater than 50 mg/l?	YES__ NO__ NA__

TREATMENT: RADIONUCLIDES

Naturally occurring radiologic materials are present in ground and surface waters as a result of gradual weathering of geologic materials. SDWA regulations governing contamination with radionuclides have been adopted with combined Radium 226 and Radium 228 MCL of 5 picocuries per liter (pCi/L), gross Alpha MCL of 15 pCi/L (excluding radon and uranium) and Uranium MCL of 0.30 mg/L compliance effective date of December 8, 2003. This rule affects Community and Non-Transient water systems.

Radon gas is present in ground waters throughout the United States. It is not present in surface waters because they are naturally aerated. When radon gas is vented to the atmosphere, it quickly becomes indistinguishable from background radiation and no longer poses a health threat because the levels are so low, relative to the background. The pattern of occurrence in ground waters is sporadic. There can be wide variability in the levels detected between directly adjacent wells and within the same well under

different pumping and drawdown conditions. Therefore, the only means of knowing for certain is to monitor your well supply.

Materials to assist you: The Chemistry of Water Treatment #20381; available from the AWWA bookstore 800-926-7337 or on-line bookstore at www.awwa.org.

Are you likely to have to change treatment to control for Radon?

75) Have you monitored for radon in your well?	YES__ NO__ NA__
76) Do you know if your levels are in the high (> 4000 pCi/l), medium (300 to 4000 pCi/l), or low (< 300 pCi/l) range?	YES__ NO__ NA__

If there is no radon detected in your well, it is likely you have no compliance liability here. If there is substantially more than 4000 picocuries per liter of radon in your well, aeration or other treatment may lie in your future. If there is radon present at levels below 4000 picocuries per liter, the need for treatment will remain unknown until standards are set.

Are you likely to have to change treatment to control for Radium?

77) The new Radionuclides rule includes Uranium (U), have you tested for U?	YES__ NO__ NA__
78) Are levels of radium (226 and 228 combined) in your water comfortably below 5 pCi/l?	YES__ NO__ NA__
79) Are levels of Gross Alpha (excluding radon and uranium) comfortably below 15 pCi/l?	YES__ NO__ NA__

If you are above these levels, you may need to install treatment equipment to remove radium. Treatment consists of lime softening, ion exchange, and reverse osmosis.

TREATMENT: INORGANIC CONTAMINANTS

Arsenic has very active and complex chemistry. As a result, it exists in a variety of chemical forms and is widely distributed in the environment at trace levels. It is associated with a variety of health effects. Treatment choices include coagulation/filtration, lime softening, ion exchange, micro or ultrafiltration, iron manganese treatment, and activated alumina. In water arsenic can exist in either dissolved or particulate form. Dissolved arsenic in water occurs in two main chemical forms: arsenate As (III) and arsenate As (V), either can significantly impact its removal during treatment, removal rates vary with different treatment processes.

Materials to assist you: The Chemistry of Water Treatment #20381; Arsenic; Answers to Questions Commonly Asked by Drinking Water Professionals #90792; Chemistry & Treatment of Arsenic in Drinking Water #20505; Basic Chemistry for Water & Wastewater Operators #20494; available from the AWWA bookstore 800-926-7337 or on-line bookstore at www.awwa.org.

Are you likely to have to change treatment to control for Arsenic?

80) Are your levels of arsenic comfortably below 0.01 mg/l? If not, you have to treat for arsenic, compliance date is January 23, 2006.	YES__ NO__ NA__
81) If you Have tested for arsenic, do you know which chemical form is more prevalent for purpose of choosing treatment?	YES__ NO__ NA__

Fluoride is naturally occurring, although it is also added to treated water to provide dental benefits. However, excessive fluoride can be harmful.

Are you likely to have to change treatment to control for Fluoride?

82) Are your levels of fluoride comfortably below 4 mg/l?	YES__ NO__ NA__
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Nitrate is naturally occurring, but elevated levels of nitrate are a problem in agricultural areas. The health issues with nitrate involve acute effects on children, causing it to warrant serious attention.

Are you likely to have to change treatment to control for Nitrate?

83) Are your levels of nitrate, as N, comfortably below 10 mg/l?	YES__ NO__ NA__
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TREATMENT: PESTICIDES AND HERBICIDES

Removal of organic chemicals used as pesticides and herbicides can involve expensive treatment employing granular activated carbon (GAC). Fortunately, only a small percentage of water systems are expected to have levels of contamination that exceed the SDWA standards for these contaminants. However, the presence of these chemicals indicates the existence of an active transport pathway from a farmer's field, a golf course, or another cultivated or landscaped area to the river or aquifer from which your supply is withdrawn. "No" answers to the following questions may imply that your water system may have to treat to remove these contaminants.

Are you likely to have to change treatment to control for pesticides and herbicides?

84) Are your compliance monitoring results well below the MCL for regulated pesticides?	YES__ NO__ NA__
85) Are your compliance monitoring results well below the MCL for regulated herbicides?	YES__ NO__ NA__

TREATMENT: INDUSTRIAL/COMMERCIAL CHEMICALS

The organic and inorganic chemicals typically associated with news stories about hazardous waste disposal sites are covered by the Phase I, Phase II, and Phase V SDWA regulations. Most wells and

surface intakes are not adjacent to hazardous waste sites and most will not exhibit this sort of contamination except at very low trace levels.

The Phase I SDWA regulations cover VOCs used as solvents for a multitude of industrial and commercial applications. Although as many as 20 percent of wells may have traces of VOCs present, less than 1 percent have concentrations high enough to require treatment. The typical treatment for these VOCs is aeration. VOCs are primarily a ground water contaminant because they are volatilized from surface waters through natural aeration and leaking underground storage tanks. VOCs serve as an indicator chemical. Since they are organic solvents, they are very mobile through soils and ground water formations. Thus, if you have wells that have tested positive for VOCs -- even if at very low levels -- it is evidence that there is a transport pathway from the source of the pollution to your well. Where there are VOCs, there are often other organic and inorganic contaminants as well. Whereas removal of VOCs via aeration may be relatively inexpensive, treatment to remove other organics and inorganics may entail much more expensive technologies such as granular activated carbon (GAC) or ion exchange.

Are you likely to have to change treatment to control for industrial/commercial chemicals?

86) Are your monitoring results free of volatile organic compounds (VOCs)?	YES__ NO__ NA__
87) Are your monitoring results comfortably below the Maximum Contaminant Levels for regulated organic and inorganic chemicals?	YES__ NO__ NA__

C. INFRASTRUCTURE

INFRASTRUCTURE: PUMPING

Pumping is one of the most critical functions in operating small and individual water distribution systems. Some of the most common centrifugal or jet pump problems have symptoms that are easily recognizable by experienced operators and can be corrected relatively easily. Some of the problems are minor in nature and can be avoided entirely if a preventative maintenance program is established and adhered to over the long-term.

Materials to assist you: Water Distribution System Handbook #20451; WSO Distribution Systems Overview (video) #65109; Distribution System Performance #90677; WSO Water Transmission and Distribution #1957; Centrifugal Pumps (handbook) #20286; WSO Centrifugal Pumps (video) #65110; available from the AWWA bookstore 800-926-7337 or on-line bookstore at www.awwa.org.

Is your pumping equipment maintained in good condition?

88) Do you routinely trouble-shoot for signs of pump or pump motor problems?	YES__ NO__ NA__
89) Do you maintain a daily/weekly log of gallons pumped, running amperages, voltages, flowrate, etc.?	YES__ NO__ NA__

90) Once diagnosed, are problems corrected in a timely enough manner to avoid crisis management, financing, costly repairs and unscheduled downtime?	YES__ NO__ NA__
91) Do you maintain records of all maintenance and repairs?	YES__ NO__ NA__
92) Do you hire a qualified pump contractor to perform an inspection of all pumping equipment, identify potential problems, perform maintenance, and check pump efficiency on an annual basis?	YES__ NO__ NA__

Do you have adequate standby/emergency power equipment and preparedness?

93) Is there sufficient standby/emergency power capacity to supply 100% of the average daily demand of the system (excluding fire demands)?	YES__ NO__ NA__
94) Are existing standby/emergency power equipment, controls and switches tested or exercised routinely under load conditions, for at least 30 minutes at a time or per manufacturer recommendation?	YES__ NO__ NA__
95) Do you have a maintenance program for standby/emergency power units?	YES__ NO__ NA__
96) Has the local electric utility been made aware of the standby/emergency power provisions made by the water system, so that they can reinforce and safeguard the electrical facilities serving the water operations?	YES__ NO__ NA__
97) Has local electric utility secured a loop system so as to provide power to your facility if their stations are out of service and power is interrupted?	YES__ NO__ NA__
98) Can monthly savings be realized by shedding? i.e. operating on emergency power during peak electric periods and gaining refund from electric utility?	YES__ NO__ NA__

INFRASTRUCTURE: STORAGE

Storage tanks are primarily used to meet peak water demands or provide a reserve capacity for fire protection. Elevated storage and ground-level tanks operate as integral parts of the system of pumps, pipes, and connected pressure loads. In operation, all the parts respond to pressure changes as the system follows the daily and seasonal demands. The following questions are designed to help determine if there are problems in the storage facilities that could become major capital outlays to correct.

Materials to assist you: Manual of Water Supply Practices M2 Instrumentation and Control; M31 Distribution System Requirements for Fire Protection; M42 Steel Water Storage Tanks; Elevated Tank Maintenance (video) #65192; M32 Distribution Network Analysis for Water Utilities; Water System Security (Field Guide) #20501; available from the AWWA bookstore 800-926-7337 or on-line bookstore at www.awwa.org.

Is there adequate storage to meet system needs?

99) Does the system have sufficient gravity-flow (non-pumped) distribution	
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storage to provide safe and adequate service for up to 24 hours without power?	YES__ NO__ NA__
100) Is storage adequate to meet peak and daily demands?	YES__ NO__ NA__
101) Is there reserve capacity in the tank for fire protection support and equalizing storage to rest your pumps?	YES__ NO__ NA__

Are security measures adequate?

102) Are any openings such as vent pipes have a mesh screen to protect against the entrance of small animals and other undesirable influences?	YES__ NO__ NA__
103) Is there an entry hatch to allow access for cleaning and painting of the interior of the tank?	YES__ NO__ NA__
104) Is there a filler pipe or hydrant to provide for water to be trucked in?	YES__ NO__ NA__
105) Is the filler pipe capped and locked?	YES__ NO__ NA__
106) Does the overflow line have a mesh screen and/or flapper valve?	YES__ NO__ NA__
107) Is the tank ladder or access hatch secured and locked?	YES__ NO__ NA__
108) Are all water storage facilities checked routinely for sanitary defects or vandalism?	YES__ NO__ NA__
109) Are the tank and the immediate surrounding area secured and fenced in?	YES__ NO__ NA__

Are control systems adequate?

110) Is there a high and low water level signal system to control the pumps?	YES__ NO__ NA__
111) Is there a high and low level alarm system to alert operator?	
112) Is there an altitude valve, to preclude the tank from overflowing?	YES__ NO__ NA__
113) Does the overflow line discharge directly onto the ground?	YES__ NO__ NA__
114) If the overflow line discharges to a watercourse is there adequate air gap or back flow prevention?	YES__ NO__ NA__
115) Is there a drain valve or mechanism in place to allow draining of the tank?	YES__ NO__ NA__
116) Does the drain line discharge directly onto the ground?	YES__ NO__ NA__
117) If the drain line discharges to a watercourse is there adequate air gap or back flow prevention?	YES__ NO__ NA__

Are tanks maintained in good condition?

118) Is the tank inspected at least every 3-5 years by a qualified tank contractor for evidence of corrosion or pitting and structural weakness?	YES__ NO__ NA__
119) Is the tank contractor capable of analyzing the coatings of paint on the interior and exterior surfaces of the tank to determine if it contains lead or other hazardous materials?	YES__ NO__ NA__
120) Is the operator aware of all code deficiencies there might be and how much it would cost to bring the tank into compliance with current standards	

and regulatory requirements (If the tank was erected some time ago, the applicable safety, sanitary and operational codes may have changed)?	YES__ NO__ NA__
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INFRASTRUCTURE: DISTRIBUTION

The increasing cost of water has had implications on the distribution functions of water utilities. The break-even point for replacing leaking mains versus tolerating some water loss has shifted. Reducing overall unaccounted-for water loss has become an important objective. The proper management of a utility's transmission and distribution system includes maintenance, system upgrade, hydrant and meter testing, and repair and replacement of mains. The distribution facilities of a water utility are a measure of its service flexibility and growth potential. The following series of questions are designed to assist in identifying potential operational and maintenance problems in the distribution and transmission systems.

Materials to assist you: WSO Water transmission and Distribution #1957; Water Distribution Systems Handbook #20451; WSO Flushing and Cleaning (video) #65111; Manual of Water Supply Practices M6 Water Meters; M14 Recommended Practice for Backflow Prevention and Cross-Connection Control; M17 Installation and Field Testing Fire Hydrants; M36 Water Audits and Leak Detection; M44 Distribution Valves: Selection, Installation, Field Testing, and Maintenance; M51 Air-Release, Air-Vacuum, & Combination Air Valves; available from the AWWA bookstore 800-926-7337 or on-line bookstore at www.awwa.org.

Is the system being maintained in good condition?

121) Does the operator routinely flush, test and maintain the hydrants in the system?	YES__ NO__ NA__
122) Does the operator routinely flush dead end blow-offs in the distribution systems?	YES__ NO__ NA__
123) Are the locations of all valves in the distribution system precisely known?	YES__ NO__ NA__
124) Are normal operating valve positions, open or closed, known and recorded?	YES__ NO__ NA__
125) Are all valves exercised and lubricated periodically?	YES__ NO__ NA__
126) Are histories, locations, size, and type of mains and valves detailed on records in a secure area?	YES__ NO__ NA__
127) Is your utility responsible for locating and marking buried infrastructure? i.e. before an entity is allowed to dig.	YES__ NO__ NA__
128) Is the system free of severe "water hammer problems?"	YES__ NO__ NA__
129) Are pressure regulating valves, altitude valves, blow-offs, and other appurtenances maintained on a regular basis?	YES__ NO__ NA__
130) Are there blow-off valves installed on all dead ends in the distribution system?	YES__ NO__ NA__
131) Is service line material known and recorded?	YES__ NO__ NA__

132) Are meter pits and curb stops located, unobstructed and accessible?	YES__ NO__ NA__
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Is unaccounted for water being addressed and minimized?

133) Is unaccounted-for water in the water system monitored and analyzed each month or annually?	YES__ NO__ NA__
134) Is the unaccounted-for water less than 15 percent of the total water delivered to the mains?	YES__ NO__ NA__
135) Do you have a program for enforcement to curtail theft of water from hydrants?	YES__ NO__ NA__
136) Do you have a routine leak detection and repair program?	YES__ NO__ NA__
137) Are all sources of supply and customers metered?	YES__ NO__ NA__
138) Is there a meter replacement program in place?	YES__ NO__ NA__
139) Are the meters calibrated and tested routinely to assure their accuracy and reliability?	YES__ NO__ NA__

Are water quality aspects of distribution receiving needed attention?

140) Is an annual inspection for cross connection performed by the system operator or a certified cross connection control technician?	YES__ NO__ NA__
141) Is there a program for installing and testing backflow prevention devices where potential contamination is present?	YES__ NO__ NA__
142) Do you know the detention time on treated water in the distribution system and storage tank?	
143) Is there a program to eliminate "dead ends" in the mains, where feasible?	YES__ NO__ NA__

Are there acceptable standards governing modifications and new construction?

144) Is there a low percentage of mains 4" diameter or less in the water system?	YES__ NO__ NA__
145) Is there a program to gradually replace sub-standard sized mains?	YES__ NO__ NA__
146) Is there a program to replace older failing distribution main lines?	YES__ NO__ NA__
147) Are there suitable right-of-way and easements provided to the water system for expansion, maintenance and replacement of mains and services?	YES__ NO__ NA__
148) Is there sufficient earth cover to protect the mains from frost damage or heavy loads, if driven over?	YES__ NO__ NA__
149) Are materials of mains designed and selected to resist corrosion, electrolysis, and deterioration?	YES__ NO__ NA__
150) Does the utility perform inspections during and at completion of work performed on the system by outside contractors?	YES__ NO__ NA__
151) Do you meet the required fire flow rates and time duration prescribed by the Insurance Services Office for your system?	YES__ NO__ NA__

III. ASSESSING YOUR MANAGEMENT CAPABILITIES

A. OPERATION & MAINTENANCE

Historically, the major element in a small water system was the distribution system. Source development and treatment costs were small in comparison -- all that was required in many circumstances was a well, a pump, a tank, and perhaps a chlorinator. Operational demands were correspondingly very limited. With the combination of infrastructure rehabilitation needs and new SDWA performance requirements, the operational demands placed on small systems are rising to unprecedented levels. Some indication of whether these operational needs can be met is provided through consideration of the following series of questions. "No" answers to the following questions are indicative that the water system's future operational needs may not be fully met.

Materials to assist you: Operator Certification Study Guide #20206; On-Line Institute <http://awwa.advanceonline.com/>; available from the AWWA bookstore 800-926-7337 or on-line bookstore at www.awwa.org.

Does your operations staff have the right training and credentials?

152) Does the person operating your system have current water treatment plant operator certification credentials from the state?	YES__ NO__ NA__
153) Does your operator receive additional training on an ongoing basis to keep abreast of current developments in the field?	YES__ NO__ NA__

Does your staff fully understand and meet all current monitoring requirements?

154) Is your track record free of repeated episodes of monitoring violations?	YES__ NO__ NA__
155) Are you aware of and do you understand provisions for obtaining waivers from monitoring requirements and the role of vulnerability assessment?	YES__ NO__ NA__

Are you confident you understand what it will take to meet future operational demands?

156) Can you make an appraisal of the additional operational requirements on your water system based on the categories of questions presented above regarding the extent of your potential water quantity, water quality, and infrastructure liabilities? These questions may begin to give you an idea of how the water system needed to meet your needs in the future will be different from the one that exists today. (Do you know how this forecast matches up against your current level of operational capability?)	YES__ NO__ NA__
157) Does your water system obtain any regular or occasional technical assistance from outside sources, such as the state, your engineer, other	

utilities, or organizations specifically dedicated to providing technical assistance?	YES__ NO__ NA__
158) Are you aware of all the assistance programs that are available to you?	YES__ NO__ NA__

B. MANAGEMENT & ADMINISTRATION

As the list of quantity, quality, and infrastructure needs implied by all of the above questions grows larger and larger, the extent of management systems needed to meet all these needs also grows. The following questions highlight the general types of management systems that should exist in some form. Although some of these items may sound sophisticated, they can exist in very simple forms and get the job done very effectively. As a general rule, they need be no more sophisticated than necessary to meet the needs of the system. The important issue is that the need for management systems is recognized and is being met. “No” answers to the following questions imply that your water system may have inadequate management systems.

Materials to assist you: Navigating Rough Waters (Ethical Issues in the Water Industry) #20474; Manual of Water Supply Practices M19 Emergency Planning for Water Utilities; Handbook of Public Water Systems #20479; Maintenance Management for Water Utilities; available from the AWWA bookstore 800-926-7337 or on-line bookstore at www.awwa.org.

Is it clear whose in charge of what?

159) Is there a clear plan of organization and control among the people responsible for management and operation of the system?	YES__ NO__ NA__
160) Are the limits of the operator's authority clearly known?	YES__ NO__ NA__
161) Are all the specific functional areas of operations and management assigned?	YES__ NO__ NA__
162) Does everyone involved in operations know who is responsible for each area?	YES__ NO__ NA__
163) Is someone responsible for scheduling work?	YES__ NO__ NA__

Are there clear rules and standards?

164) Do you have explicit rules and standards for system modifications?	YES__ NO__ NA__
165) Do you have rules governing new hook-ups?	YES__ NO__ NA__
166) Do you have a main extension policy?	YES__ NO__ NA__
167) Do you have standard construction specifications to be followed?	YES__ NO__ NA__
168) Do you have measures to assure cross-connection control and backflow prevention?	YES__ NO__ NA__
169) Do you have policies or rules describing customer rights and responsibilities?	YES__ NO__ NA__

Do you have a deliberately organized regulatory compliance program?

170) Do you fully understand monitoring requirements and have a scheduling mechanism to assure compliance?	YES__ NO__ NA__
171) Do you have a mechanism to obtain the most recent information on regulatory requirements?	YES__ NO__ NA__
172) Do you know how to obtain clarification or explanation of requirements?	YES__ NO__ NA__
173) Do you maintain adequate records to document compliance?	YES__ NO__ NA__
174) Do you know what to do in the event of a violation?	YES__ NO__ NA__

Are you prepared to handle emergencies?

175) Do you have an emergency response plan?	YES__ NO__ NA__
176) Is there a contingency for making emergency interconnections to neighboring systems, and do you know they will work when needed?	YES__ NO__ NA__
177) Does everyone involved in operations know what they are to do in the event of contamination from a toxic or hazardous waste spill in your source water or a main break or a tank failure?	YES__ NO__ NA__
178) Do you have a clear chain-of-command protocol for emergency action?	YES__ NO__ NA__
179) Is someone responsible for emergency operations, for communications with state regulators, for customer relations, for media relations?	YES__ NO__ NA__

Are your operations conducted safely?

180) Do you have a safety program defining measures to be taken if someone gets hurt?	YES__ NO__ NA__
181) Does everyone understand the risks and safety measures involved in handling water treatment chemicals?	YES__ NO__ NA__
182) Do you have written operating procedures for both routine and emergency system operations?	YES__ NO__ NA__
183) Are you fully aware of OSHA confined space regulations?	YES__ NO__ NA__

Do you have an organized approach to maintenance?

184) Do you have a planned maintenance management system (PMMS) -- a system for scheduling routine preventive and predictive maintenance?	YES__ NO__ NA__
185) Do you have a system for assuring adequate inventory of essential spare parts and back-up equipment?	YES__ NO__ NA__
186) Do you have relationships with contractors and equipment vendors to assure prompt priority service?	YES__ NO__ NA__
187) Do you have records and data management system for operating and maintenance data?	YES__ NO__ NA__
188) Do you have records and data management system for regulatory	

compliance data?	YES__ NO__ NA__
189) Do you have records and data management system for system management and administration?	YES__ NO__ NA__

Is your management capability complete?

190) Are you getting the outside services and technical assistance you need? Do you have adequate legal counsel, insurance, engineering advice, technical/operations assistance, rate case preparation, and financial advice?	YES__ NO__ NA__
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C. CUSTOMER SERVICE AND PUBLIC INFORMATION

Running a water system is running a business. In business, the most enduring mark of success is always remembering the customer is king. Water businesses that are mindful of this will have the best relations with their customers and strong customer relationships will see the business through thick and thin. Do you maintain a good relationship with your customers? YES answers to the following questions indicate you are on the right path. NO answers indicate areas for improvement.

Materials to assist you: Public Affairs Program for Water Utilities (video) #65113; Customer Service for Water Utilities (video) #65028; Customer Service II A Team Effort (video) #65065v; Customer Service III Working With Difficult Customers (video) #65075; Customer Service IV Strategies for Field Representatives; available from the AWWA bookstore 800-926-7337 or on-line bookstore at www.awwa.org

191) Do you have staff trained in customer service to answer calls and requests from customers?	YES__ NO__ NA__
192) Do you track customer requests, problems and answers?	YES__ NO__ NA__
193) Do you measure customer satisfaction?	YES__ NO__ NA__
194) Do you provide information in your customers' bills?	YES__ NO__ NA__
195) Do you publish an annual Consumer Confidence Report and follow proper distribution procedures to get it to customers?	YES__ NO__ NA__

IV. ASSESSING YOUR FINANCES

The answers to all of the above questions may have alerted you to the potential for higher levels of both capital and operating costs. Any system that can show that they have anticipated all their needs and that they are prepared to charge a rate sufficient to meet the annual revenue requirement implied by those needs, is a system that can obtain capital financing and can pay its bills. The following questions illustrate some features of “good” financial planning and management to serve as points of comparison

for self-assessment. Although every system cannot achieve perfection, the more “yes” answers you have the better.

Materials to assist you: Water Utility Accounting #20403; Manual of Water Supply Practices M29 Water Utility Capital Financing; available from the AWWA bookstore 800-926-7337 or on-line bookstore at www.awwa.org.

Are current financial planning mechanisms adequate?

196) Do you have an annual budget?	YES__ NO__ NA__
197) Does your budget process provide for depreciation of existing plant or infrastructure?	YES__ NO__ NA__
198) Does your budget process provide for funding of reserves? i.e. contingency or planned replacement funds.	YES__ NO__ NA__
199) Do you use the budgeting process to determine your annual revenue requirement via either the cash needs approach or the utility approach, as described in the AWWA Principles of Water Rates, Fees and Charges Manual (M1)?	YES__ NO__ NA__
200) Do you regularly review your rates?	YES__ NO__ NA__
201) Do you have a capital budget or capital improvement plan that projects future capital investment need some distance (at least five years) into the future?	YES__ NO__ NA__
202) Do you have a process for scheduling and committing to capital projects?	YES__ NO__ NA__
203) Does your planning process take account of all the potential capital needs suggested by all of the preceding questions in this manual?	YES__ NO__ NA__
204) Does your long-term planning incorporate analysis of alternative strategies that might offer cost savings to customers, such as consolidation with other nearby systems or sharing of operations and management expenses with other nearby systems?	YES__ NO__ NA__

Are current financial management mechanisms adequate?

205) Does your water system presently operate on a break-even basis?	YES__ NO__ NA__
206) Does the water system keep all the water revenues?	YES__ NO__ NA__
207) Do you employ standardized accounting and tracking systems?	YES__ NO__ NA__
208) Do you track budget performance?	YES__ NO__ NA__
209) Do you have procedures for billing and collection?	YES__ NO__ NA__
210) Do you keep records to substantiate depreciation of fixed assets and accounting for reserve funds?	YES__ NO__ NA__
211) Is your financial management record keeping system organized?	YES__ NO__ NA__
212) Are controls exercised over expenditures?	YES__ NO__ NA__

213) Are controls exercised to keep from exceeding your budget?	YES__ NO__ NA__
214) Are there purchasing procedures in place?	YES__ NO__ NA__
215) Are there procedures for selection of outside contractors and suppliers?	YES__ NO__ NA__

Does your system comply with basic financial performance benchmarks?

These benchmarks examine the adequacy of the system’s operating budget, operating cash reserve, and emergency reserve and allows the system to evaluate the water rate impact on existing and additional operating procedures and/or capital improvements.

Benchmark #1 Operating Budget Comparison

216) Does your water system generate sufficient revenue to meet estimated expenses during the current and forecasted budget years?	YES__ NO__ NA__
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Revenues/Expenses > 1.2

During the operating budget process, a system reviews whether it is generating sufficient revenue to meet its estimated expenses and necessary reserves. If the system does not have sufficient revenue to meet all of its expenses and still have cash in reserve (see the next two questions), it should either raise its water rates or reduce non-essential expenses.

Benchmark #2 Operating Cash Reserve

217) Does your system have an Operating Cash Reserve equal to or greater than 1/8 it’s annual operating budget?	YES__ NO__ NA__
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Operating Cash Reserve \geq 1/8 x Annual O&M + G&A
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This benchmark helps the system evaluate its ability to withstand cash flow fluctuations. There can be a significant length of time between when a system provides a service and when a customer may pay for that service. A study of the system’s historic cash flow can accurately quantify the time period between delivery and payment for service. A 45-day difference is the generally accepted industry norm. Therefore, it is suggested that at least 1/8 of annual operating and maintenance (O&M) and general and administrative (G&A) expenses be collected in an Operating Cash Reserve to prevent potential cash flow problems. The Operating Cash Reserve is essentially the “check-book balance” a system should maintain to meet cash flow needs and provide contingency funds for unforeseen operating emergencies. This reserve can be funded initially with: 1) a one time charge, 2) a transfer of funds from an existing reserve, or 3) funds accumulated in the first year of the budget in an Operating Cash Reserve line.

Benchmark #3 Emergency Reserve Summary

218) Can your system cover the costs of an emergency or failure of its most vulnerable system component?	YES__ NO__ NA__
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Emergency Reserve \geq Cost of Most Vulnerable Facility

Generally, replacement of a production well, a source of supply, the largest pumping equipment, or key transmission lines represents the most vulnerable facility and is used to estimate the minimum Emergency Reserve amount.

Determining the emergency reserve level for a system is also a function of management objectives and overall system reliability. If a system opts to create an Emergency Reserve, this reserve can be funded initially with: 1) a one time charge, 2) a transfer of funds from existing reserves, 3) funds accumulated in the budget in an Emergency Reserve line item, or 4) an alternative financing arrangement.

219) If you are a private water company that is regulated by the state utility commission, the amount of free cash flow allowable through water rate revenue is probably limited by the amount of your depreciation. If that amount is less than the above benchmarks, are the system owners capable and willing to meet the cash requirements of the system?	YES__ NO__ NA__
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**V. PUTTING IT ALL TOGETHER:
WHAT'S YOUR PLAN TO MEET THE FUTURE?**

After progressing through all of the questions in this self-assessment guide, you should be in a position to summarize what you have learned about your status.

- First, you should have accumulated a list of items on which you need to do some more research or investigation in order to fully answer the question, or in order to reverse your answer from “no” to “yes.”
- Second, you should be able to make a qualitative summary of what you have learned by taking a clean sheet of paper and filling in the most important things that come to mind -- reflecting on the issues raised in this manual -- under the following (SWOT) headings:

- strengths
 - weaknesses
 - opportunities
 - threats
- Third, perhaps with some additional research -- or with the right assistance -- you may be within range of being able to begin a more quantitative form of business planning utilizing budget and revenue planning.

Of all of the issues covered by all of the preceding questions in this guide, customer awareness is the true foundation of a successful water system. Getting customers to fully appreciate all of what it takes to operate and maintain a water system is integral to assuring needed support for new capital investment and higher water rates. Moreover, the more customers know about the prospective costs of running a proper water system in the future, the more open-minded they are likely to be in considering alternative strategies for providing water service, conceivably at lower cost. Nothing focuses the mind like cost estimates. Once you have performed an analysis of prospective future liabilities and costs following the questions in this guide, you will have the information needed to begin to get people to focus on the choices involved in determining your future.

The final question, after making it all the way through these questions, to ask yourself is: *How much of all this is known and understood by the customers; and how would this change their attitudes about the future of your community's water system?*

**For more information or assistance in using this guide contact:
Small Systems Helpline 800-366-0107
AWWA Small Systems Division**

