COMMONWEALTH OF KENTUCKY
BEFORE THE PUBLIC SERVICE COMMISSION

IN THE MATTER OF:	)	
	)	
NOTICE OF ADJUSTMENT OF THE RATES OF	)	CASE NO. 2004-00103
KENTUCKY AMERICAN WATER COMPANY	)	
EFFECTIVE ON AND AFTER MAY 30, 2004	)	

DIRECT TESTIMONY OF
DR. KENNETH I. RUBIN

April 30, 2004

I. INTRODUCTION

Q1. Please state your name, employer, position, and business address.

A1. My name is Kenneth I. Rubin; I am a Managing Partner in PA Consulting Group, a worldwide management-consulting firm. My office is located at 1750 Pennsylvania Avenue NW, Suite 1000, Washington, DC, 20006, where I am the lead partner for PA's water and wastewater consulting practice.

Q2. Please describe the responsibilities of your current position, your background, and professional affiliation.

A2. I have worked in the water and wastewater utility sector for nearly 30 years. I am co-creator of the Vulnerability Self Assessment Tool, or VSAT™, which with more than 5,000 users in the US, is the industry-standard software used to evaluate water utility vulnerabilities to terrorism and other threats, plan for and implement cost-effective security improvements, and update system-wide Emergency Response Plans to terrorism events. My colleagues and I have trained more than 1,500 water and wastewater managers in vulnerability and risk assessment as well as security planning and management. I have prepared or contributed to more than a dozen vulnerability assessments for water and wastewater utilities in the last 18 months, as required by Section 1433(a) of the Public Health Security and Bioterrorism Preparedness and Response Act (PL. 107-188). I have attached my CV as Schedule1 to this testimony.

Q3. What is the purpose of your testimony in this case?

A3. I have been engaged by the Kentucky American Water Company ("Kentucky American Water") to render an independent, expert opinion as to the prudence, reasonableness, and necessity of security expenditures incurred just prior to September 11, 2001 (the pre-9/11 period), incurred in the period following the terrorist attacks on the World Trade Center and the Pentagon on September 11, 2001 through roughly April 2004 (the current period), as well as those planned for the future (the future period).

Q4. Are you sponsoring any schedules as part of your testimony?

A4. Yes. I prepared the following schedules to accompany my testimony:

KR Schedule 1	Personal Vitae
KR Schedule 2	Kentucky American Water Security Costs pre 9/11
KR Schedule 3	Kentucky American Water Security Costs post 9/11
KR Schedule 4	Timeline of World Events and Kentucky American Water Security Actions
KR Schedule 5	Documented News Accounts and Events
KR Schedule 6	VSAT 11-Step Process Flow Chart
KR Schedule 7	Graph of Total Security Costs Per Capita versus Population Served
KR Schedule 8	Average Total Security Costs Per Capita by Quartile for a 16-Utility Sample

Q5. Please describe briefly KR Schedules 2-8.

A5. Schedule 2 presents security costs incurred by Kentucky American Water prior to September 11, 2001 as provided from company accounting records. Schedule 3 presents security costs incurred by Kentucky American Water between September 11, 2001 and April 2004 as provided from company accounting records. Schedule 4 presents a timeline of world events and actions taken by Kentucky American Water. Schedule 5 presents a selection of documented accounts of suspected terrorist events against water utilities and other types of enterprises. Schedule 6 presents the 11-step process adopted within the VSAT™ software to conduct vulnerability assessments and security planning. Schedule 7 presents a scatter plot of security spend per capita versus population served and line of best fit through these data points for a sample of 16 water utilities. Schedule 8 presents a table of average total security costs per capita by quartile for a sample of 16 water utilities.

II. SUMMARY OF TESTIMONY

Q6. Can you provide a summary of your testimony in this case?

A6. Prior to 9/11, US water utilities focused on delivering high-quality drinking water at low cost to their customers, providing reliable fire-fighting pressure, and generally integrating their operations openly into the communities they served. During this period, virtually all utilities took actions to avoid and respond to accidents, theft, and

vandalism, but very few considered intentional contamination or service interruption by international terrorists a reality. Since 9/11, water utilities in the US have learned immeasurably about terrorism threats to their enterprises and through their infrastructure, threats to the communities they serve and the nation as a whole. As a result, security thinking and strategies for risk reduction in the water industry have matured considerably. It is in this evolutionary context that I have evaluated the security actions and expenditures of Kentucky American Water.

Kentucky American Water is in the business of providing efficient, high-quality water service to its customers. Like virtually all other water utilities in the US, security became a more critical concern to its management as a result of world events leading up to September 11, 2001 and the terrorist attacks on the World Trade Center and the Pentagon, which occurred on this date. The company undertook swift and sure steps to enhance the security of its facilities in the aftermath of these events to assure continuity of water services as required by the State and protect its customers from potential terrorist events. The key questions regarding these investments are whether and the extent to which they were prudent, reasonable, and necessary. To answer these questions, this testimony examines the historical series of events that deepened management's understanding of certain vulnerabilities to terrorist threats and the corresponding expenditures that management authorized to reduce risks of mission failure should any such terrorist events occur.

It is my opinion that Kentucky American Water's management took prudent, reasonable, and necessary steps to meet their security obligations to their customers, the communities they serve, and ultimately to the nation as a whole. Kentucky American Water took immediate action to protect the people of Lexington in response to the company's own security policies and instructions to protect assets from the state and from national infrastructure protection authorities in tone and character never before conveyed to America's water utilities. Over time, as the company retained security experts and drew from the combined experience of its parent companies in the US and overseas[1], it was able to refine and improve its

[1] Tracing the evolution of security activities within the Kentucky American Water system in late 2001, 2002, and 2003, it is clear that the company learned and benefited from the security analyses and actions undertaken by other affiliates in the American Water system; industry-wide initiatives undertaken by the American Water Works Association, the Association of Metropolitan Sewerage Agencies, the Association of Metropolitan Water Agencies, The Water Information Sharing and Analysis Center, the US Environmental Protection Agency, the Department of Homeland Security; and indeed the company's new

approach to security while reducing costs to consumers. Going forward, Kentucky American expects to further refine its security strategy, strengthening levels of protection at reasonable expense.

I have found Kentucky American Water's security expenditures to be reasonable both in the absolute and relative to other water service providers. Further, I have found the timing and character of the company's security initiatives to be prudent based on a thorough company assessment of their vulnerabilities to terrorist attacks and ways to reduce these vulnerabilities. Independently, I have inspected the company's physical facilities and used the VSAT™ software to test and confirm the prudence of these security actions. Based on these analyses, I have concluded that the company identified the appropriate threats on which to base their analyses, prioritized their facilities in terms of highest to lowest risk of mission failure and collateral damages to customers and the community, evaluated the performance of existing countermeasures, and designed new measures to reduce vulnerability to and/or consequences of a terrorist event. Finally, I have examined the necessity of these expenses in an historical context and relative to the company's obligations to its customers and the communities it serves. Again, I have found that the security actions undertaken by Kentucky American Water, as well as those that they are likely to undertake going forward, are necessary to establish a layered, detect-delay-respond security shield designed first to prevent mission failure associated with potential terrorist events, second to respond to these events should they occur, and finally to recover from failure should an attack succeed.

Allowing recovery of Kentucky American Water's security costs sends a signal to its management –- and to all entities responsible for providing potable water across America as well as to the people and businesses that they serve -– that the protection of public health and welfare from potential foreign terrorism, and fair recovery of costs associated with that effort, are necessary to reduce real risks of water service interruption, loss of fire-fighting capabilities, sickness, and even death.

III. HISTORY OF SECURITY ACTIONS UNDERTAKEN AND COSTS INCURRED AT KENTUCKY AMERICAN WATER

parent, RWE/Thames, based on their experience counteracting terrorism threats in the UK

Q7. Can you please review the timing and costs of security improvement actions taken by Kentucky American Water?

A7. Kentucky American Water has invested and will invest in security improvements in three periods: pre-9/11 in response to operational factors, in the immediate and longer-term aftermath of 9/11 in response to these terrorist acts and following completion of the company's Vulnerability Assessment[2], and going forward from April 2004. All costs are based on accounting records provided by Kentucky American Water. During a site inspection conducted in April 2004, I verified the presence of all equipment and structures for which the company has provided cost information.

Pre-9/11 Period

Between December 2000 and September 11, 2001, Kentucky American Water incurred $407,316 in planned security enhancement costs. Interviews with Kentucky American Water staff confirmed that these investments, principally access controls and areawide video surveillance equipment, were designed to reduce vandalism, theft, or possible assault against employees (See KR Schedule 2).

Current Period

Immediately following the terrorist attacks on the World Trade Center buildings and on the Pentagon, Kentucky American Water took a series of security improvement actions of a very different character. These actions responded to potential threats of armed, trained, and determined terrorists seeking to contaminate Lexington's drinking water supply, destroy Kentucky American Water's physical or cyber infrastructure resulting in a catastrophic water service interruption, or release hazardous chemicals that could kill or sicken people as they dispersed with the prevailing winds. In total, these expenses and others that followed through April 2004 amounted to roughly $3.3 million (See KR Schedule 3)

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and Europe over the last several decades.

[2] *Risk-Based Vulnerability Assessment, Kentucky-American Water Company, Lexington System*, prepared in accordance with Section 1433(a)(1) of the Safe Drinking Water Act as amended by the Public health Security and Bioterrorism Preparedness and Response Act of 2002 (P.L. 107-1888, Title IV-Drinking Water Security and Safety (March 2003). This report was submitted to the US EPA on March 31, 2003 and is protected from disclosure to the public by 5 USCA Section 552 from public disclosure.

Q8. Can you generally describe some of the actions Kentucky American took to increase security and the purpose of those actions?

A8. Yes. Securing storage tanks by [redacted] are designed to prevent contamination of finished water in the Kentucky American Water distribution network. Adding [redacted] is designed to detect possible water contamination before it enters the distribution network. Reinforcing [redacted] designed to delay or prevent forced entry of vehicles with explosives into critical sites. [redacted] at remote tank sites are designed to detect entry of intruders on foot carrying hand tools and possibly limited explosive devices. Linking security system alarms to the company's SCADA system is an integral part of the company's detect-delay-respond security approach. Armed police guards at critical facilities are designed to create a deterrent against a wide range of terrorist events, detect them before damage is done, and strengthen the linkage to the local police force in the event that a response action is necessary.

Future Period

Q9. Can you generally describe the types of physical security costs that Kentucky American Water expects to incur in the future?

A9. Yes. According to Kentucky American Water staff and the Security Director of American Water, certain current security costs will continue into the future and other security costs will be incurred as the company strengthens its "system of security systems" consistent with its Vulnerability Assessment and the insights the company has gained from security analyses and actions across its operating companies nationwide and through interaction with its parent companies, Thames Water and RWE, both of which have developed sophisticated approaches to reduce the threats of terrorism in their countries. Future security improvements are likely to include:

- Additional delay countermeasures at vulnerable locations;
- Continued integration of intrusion detection and entry control hardware with video assessment and response capabilities;

- Enhancement of entry control hardware at critical sites across the Kentucky American Water system;
- Additional sensors in the distribution network;
- Enhanced use of video surveillance, central monitoring, off-site recording, and assessment equipment to alarm entry violations at remote sites and initiate response actions quickly;
- Strengthened personnel screening;
- Security training for personnel;
- Preparation, training, and testing of a range of emergency response actions and use of stand-by infrastructure; and
- Use of early-alert networks linked to stepped up security practices at sites;

These enhancements are designed to reduce the long-run costs of continuous improvements in security. Automation through technology enables Kentucky American Water to reduce the level of human interaction in the security chain, which both reduces risks of system or mission failure to terrorist events and reduces combined capital and operating costs. With the basic components of their detect-delay-respond "system of security systems" in place, enhanced response and recovery capabilities cost-effectively reduce both scale and longevity of the consequences of a terrorist event. Security training and testing, as well as emergency response exercises should be considered on-going security maintenance costs for the utility, in the same way that pumps and filters are maintained to assure continuous delivery of high-quality, low-cost water services.

IV. Justification of Investments

Q10. As an expert witness in the area of security, can you discuss the prudence, reasonableness, and necessity of the security investments in question?

A10. To deal with the complexity of this question and the possible subjectivity of answers, I will approach each of the issues of prudence, reasonableness, and necessity separately, drawing on the facts as I know them and analyses drawn from my experience developing and using vulnerability assessment and security enhancement decision support tools for the water industry.

Q11. Can you please address the issue of prudence specifically?

A11. In my opinion, world events leading up to, including, and following the terrorist attacks on the World Trade Center buildings and the Pentagon on September 11, 2001 changed, perhaps forever, security considerations for US water utilities (See KR Schedule 4). The issue of whether and the extent to which any single utility took prudent steps to reduce the risks to potential terrorist events can be evaluated only in the context of these changing conditions. Prudence, in the context of world events, can be characterized in terms of three key issues:

1. Were the terrorist threats that Kentucky American Water chose to drive their security actions appropriate?
2. Did Kentucky American Water conduct a prudent assessment of their vulnerabilities to these threats?
3. Did Kentucky American take prudent steps to reduce the risk of mission failure, given their vulnerabilities to terrorist threats?

Prudence of Threat Determination. Kentucky American Water identified and evaluated the following "design basis" threats.[3]

- One or two outside intruders with hand tools traveling in a pickup truck gain access to facility day or night with intent of (1) destroying or disabling equipment and shutting down operations, (2) contaminating the water supply with chemical or biological toxins that cannot be mitigated with normal treatment and disinfection processes, or (3) causing a catastrophic release of a hazardous chemical to the environment.
- An outsider in a van or similar vehicle loaded with explosives parks and abandons the vehicle on-site, then remotely detonates explosives, with the intent of (1) destroying or disabling the facility, or (2) causing a catastrophic release of a hazardous chemical.
- An outsider accesses a distributed control system remotely and disrupts normal utility operations with the intent of shutting down the facility

[3] Kentucky American Water defined the term, "design basis threats" to mean the maximum credible threats and attack modes that the water system's security and operational practices should be assessed against to determine their ability to prevent or mitigate the intended consequences. This is consistent with EPA's definition, as published in their *Baseline Threat Information for Vulnerability Assessments of Community Water Systems* (September, 2002), Publication Number EPA 810-R-02-002.

- One or more outsiders introduce a toxic or noxious substance into the distribution system via a service line connection or other access point with the intent of sickening or killing customers;
- Any of the above in a coordinated, multi-point attack on multiple local or regional infrastructures;
- Insider gains access to critical facilities with the intent of destroying or disabling equipment, contaminating the water system, or causing a release of a hazardous chemical.

Was it prudent for Kentucky American Water to plan security responses and incur costs to reduce risks to their infrastructure and the community based on these threats? For a number of reasons, the answer is an unqualified yes. First, these are the threats discussed by the US EPA in their congressionally mandated Baseline Threat Document for Water Utilities prepared pursuant to the 2002 Bioterrorism Act. In essence, the US Congress through their implementing agent, the US Environmental Protection Agency, described these very threats as those against which utilities should design their security programs. Second, virtually every other utility with which I have worked directly and that I have trained in the application of risk assessment and security planning to water utilities as well as the use of VSAT™ to evaluate risks and plan security enhancements has adopted this or a similar set of risks to drive their vulnerability assessment and security plan. Third, there is ample evidence in the general literature and in threat warnings issued by the FBI and others that these threats are possible. Consider, for example, the following list of threat warnings and advisories published on the security website of the Northern Kentucky Water District, serving 300,000 customers in Boone, Campbell and Kenton Counties:[4]

- September 11, 2001 - Plant lockdown. FBI issues *"water utility terrorist threat advisory until October 11th."*

- October 8, 2001 - Kentucky Division of Water *"Review your emergency response plan and the security measures you have in place to ensure that your facilities are not vulnerable"* and *"Make security a priority. Limit access to facilities. Limit access to water supply reservoirs."*

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[4] See: http://www.nkywater.org/archives/ftsecurity.html

- October 11, 2001 - American Water Works Association *"The FBI extended its water utility terrorist threat advisory until December 11th. At that time it will be reevaluated".*

- October 11, 2001 - FBI *"U.S. water supplies can be considered a "logical target" for a possible terrorist attack."*

- November 12, 2001 - Water Security Summit PR Newswire *"Water is the quintessential target...People are emotionally and physically dependent on water because it is the only consumable utility. Those charged with providing safe water should be at a heightened state of alert and should implement appropriate security measures."*

- November 19, 2001 - AWWA Testimony to House Science Committee *"More knowledge must be gained and disseminated on the characteristics of possible biological and chemical toxins; instantaneous and on-line probes to detect these contaminants, and remedial/preventative actions to neutralize those contaminants."*

- December 19, 2001 - AMWA *"Utilities are reminded that a heightened state of awareness should be maintained throughout the year-end holidays based on discussions of nonspecific threat information with FBI's NIPC and news reports from the Office of Homeland Security."*

Alternatively, consider the list of documented news accounts and unpublished, but documented events recently compiled by the Virginia Department of Health presented in Schedule 5.[5]

Prudence of Vulnerability Assessment. I have thoroughly reviewed Kentucky American Water's analysis of vulnerability of their enterprise to design basis threats and have found that analysis to be practical and prudent.[6] The company adopted for its own use, the Risk Assessment Methodology for Drinking Water Systems (RAM-W) process developed at Sandia National Laboratories in partnership with the American Water Works Association Research Foundation. Virtually every other US water utility serving a population in excess of 100,000 used this or a variant of this risk assessment method to conduct their vulnerability assessment.

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[5] Compiled by Mark Anderson, Technology Transfer Director, Virginia Department of Health, and sent to Kenneth Rubin via e-mail on March 19, 2004.

In its assessment, Kentucky American Water met each of the six requirements of a Vulnerability Assessment, as specified in EPA guidance:[7]

1. Characterization of the water utility including its mission and objectives,
2. Identification and prioritization of adverse consequences to avoid,
3. Determination of critical assets that might be subject to malevolent acts that could result in undesired consequences,
4. Assessment of the likelihood (qualitative probability) of such malevolent acts from adversaries such as terrorists or vandals,
5. Evaluation of existing countermeasures, and
6. Analysis of current risks and development of a prioritized plan for risk reduction.

Moreover, in preparation for this testimony, I have applied the VSAT™ risk assessment and security planning methodology to the Kentucky American Water system and replicated the results of Kentucky American Water's RAM-W analysis.[8] This is an important measure of the prudence of the original RAM-W approach, since VSAT™ was developed subsequently to RAM-W and is now recognized as the most thorough and powerful industry standard approach to vulnerability assessment, security optimization, and emergency response planning.

Prudence of Security Upgrades. Whether and the extent to which security actions are prudent depends entirely on site-specific conditions with respect to design basis threats, assets at risk, vulnerabilities of these assets to threats, consequences of failure, risk-ranking of assets as a result of the foregoing factors, and security upgrades or countermeasures taken to reduce high-priority risks. I have toured the Kentucky American Water facilities and applied the VSAT™ software to evaluate, given site-specific conditions, whether the company took prudent steps to reduce

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[6] Op Cit., *Vulnerability Assessment*

[7] US Environmental Protection Agency, Instructions to Assist Community Water Systems in Complying with the Public Health Security and Bioterrorism Preparedness and Response Act of 2002, Office of Water, EPA-810-B-02-001, (January 2003)

[8] The Vulnerability Self Assessment Tool (VSAT™) for water and wastewater utilities was developed by PA Consulting, Inc. and SCIENTECH, Inc. in collaboration with the Association of Metropolitan Sewerage Agencies under a grant from the US Environmental Protection

risks from terrorist threats. Using VSAT™'s 11-step process depicted in Schedule 6, I examined the current and future time periods[9] and have determined for the six design-basis threats named above, Kentucky American Water has prudently:[10]

- identified the assets within its system that are most vulnerable (have the greatest probability of failure given security measures in place at the time of analysis);
- characterized the consequences of failure (extent, severity, recoverability, collateral effects on the community);
- prioritized assets in terms of overall risk (the product of probability of failure and consequences of failure);
- taken or planned to take countermeasures to reduce risks, either by reducing vulnerability or by reducing consequences, or both; and
- phased the implementation of countermeasures to address the highest priority risks first.

Taking the beginning of the current period as a baseline and for the six threats noted previously, I have identified 45 assets or groups of assets that are most vulnerable to the six threats noted previously in this testimony. For each asset-threat combination, I have identified the likely consequences should assets fail in the ways that threats intended them to fail. In some cases, the cause of failure is an explosion, which results in loss of infrastructure and water service or release of hazardous chemicals, which for many in its path, results in people dying and equipment and structures corroding. In other cases, the cause of failure is contamination, which results in sickness and death of customers. In still other case, the cause of failure is physical destruction with hand tools, which has similar effects as an explosion — loss of infrastructure and water service. The extent, severity, longevity, and extent of collateral damages varies across the assets and threats examined.

Agency. As of this writing, there are more than 5,500 copies of VSAT™ in use across America and Canada. For details on this tool, see: http://www.vsatusers.net

[9] In the pre-9/11 period, security measures at the Kentucky American Water system were designed to deal principally with vandalism and theft and not with terrorism. Since the VSAT™ analysis was not concerned with non-terrorist threats, this period was not considered in the analysis.

[10] Due to the sensitive nature of vulnerability assessment, it would be inappropriate to discuss the details of vulnerabilities or security strategies in this testimony. Accordingly, I am treating these topics at a somewhat general level and representing results of analyses in aggregate forms to avoid creating a security breach.

Using a standard risk formulation of:

Risk= Probability of Failure X Consequences of Failure

I have used VSAT™ to group asset-threat combinations into 16 cells, ranging from a "1A" (very high probability of failure and very high consequences) to a "4D" (low probability of failure and low consequences).

I then examined the security measures that Kentucky American has already taken or plans to take to protect these 45 assets or groups of assets in terms of their ability to reduce the probability of failure or its consequences or both. These measures, either singly or in combination, are designed to deliver capabilities to detect a terrorist event early in its progress, delay the onset of consequences once a terrorist event has begun, assess the dimensions of the attack (how many individuals, how well armed, where exactly they are, where they appear to be going), initiate and execute an appropriate response action to prevent failure, and restore water service to normal conditions quickly.

Finally, I examined the phasing of security measures. I noted that less than a day after 9/11, Kentucky American established armed police guards at three high-risk facilities. After analyzing their own vulnerabilities at a relatively high level, they began to add automated detection capabilities at these same high-risk facilities and others as well as delay countermeasures and limited assessment capabilities. With more analysis and the benefit of new corporate security staff, Kentucky American refocused their security measures on more automation and less human intervention, eventually as they gained confidence in their technology-based security solution, eliminating armed police guards entirely in August 2003. They also began shifting resources toward response and recovery. Looking forward, the Kentucky American Water security plan contemplates continued strengthening of its technology-based security solution and further development and testing of response and recovery programs.

In my opinion, during the current period, Kentucky American has gone perhaps 2/3 of the way toward completion of a basic detect-delay-respond security shield. The security measures taken are customary and prudent for their specific set of assets and characteristic of the measures that should prudently be taken for a water utility so configured and concerned about the threats so identified. Including the measures

planned for the future, this security shield will be significantly strengthened. My VSAT™ analysis documents this conclusion by noting that of the 45 asset-threat combinations originally at risk, 34 could be considered "high risk," seven could be considered "medium risk," and four could be considered "low risk."[11] After implementing all security measures in the current period as well as those scheduled to be implemented in the future period, overall risk will be reduced considerably: 13 asset-threat combinations will be considered "high risk," 25 will be "medium risk," and seven will be "low risk."

Q12. Can you discuss the prudence specifically of retaining off-duty police versus commercial security guards?

A12. Yes. The use of off-duty police as guards is common across the water utility industry, especially during periods of elevated risk. This is because off-duty police retain full police authority when they are not officially on-duty. Accordingly, they retain the authority to wear their uniforms, drive their police vehicles with access to backup equipment in many cases, use police communications channels, use deadly force, and exercise arrest authority. The also retain access to warning information through the Department of Justice and State Police channels, which are unavailable to commercial security guards. Police typically undergo more thorough and frequent background checks and are usually more thoroughly trained, especially in response actions, than commercial security guards. Police are directly linked to the 911 emergency response system and can be expected to draw their police colleagues in greater numbers and faster simply because it is the police calling for help using their police radios. In a system like Kentucky American Water's, which is spread widely across Fayette County and portions of Scott, Bourbon, Woodford, Clark, and Harrison Counties, police guards that already cruise and are familiar with the service area can be expected to be more effective finding and getting to the scene when called than can commercial guards.

Q13. Can you please address the issue of reasonableness specifically?

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[11] In VSAT™, risks fall into high, medium, and low cells of the risk matrix by virtue of their relative combined probabilities and consequences of failure. In this analysis, I used the standard VSAT™ risk matrix developed and applied to more than 50 utilities within the American Water system. Note that a low risk rating does not mean no risk — it means that risks are low relative to others in the system.

A13. The question of reasonableness of security costs can be answered both in terms of costs in an absolute sense and in relation to an index comparing costs within the Kentucky American Water system to those incurred in comparable systems.

Absolute Costs. By far, temporary police guards constituted the single largest component of Kentucky American Water's security expenses in the current period. I have already discussed why retaining off-duty, City of Lexington Police instead of a commercial security service was entirely reasonable. In the wake of 9/11, with a lack of knowledge and experience in dealing with a threat level posed by these events and in the absence of security technology that might substitute for guards, off-duty police guards represent a reasonable, immediate security shield since they provide potential deterrence, detection, delay and response capabilities.[12]

Kentucky American Water employed police guards through the City of Lexington during the period 9/12/01 to 3/31/02. During this initial period, Kentucky American spent $326,131 for 12,120 hours of overtime service or roughly $26.91/hour. This is well within a reasonable range, compared to hourly costs for police guards elsewhere in the American Water system, which ranged from $14.50/hr to $47/hr (with an average of $30.14/hr) for 92 water systems in 18 states.[13] According to the Bureau of Labor Statistics, the average annual hourly rate for police officers in Lexington, Kentucky in 2002 (combined managers, investigators, and patrol officers) was $20.70/hr for regular wages.[14] Assuming a standard factor of 1.5 times regular wages, average overtime wages would be $31.05/hr.

Prompted by the City of Lexington who could no longer supply off-duty police directly to the company because of the administrative burden of coordinating and scheduling more than 300 police officers to meet needs at three locations, 24 hours a day, seven days a week, as well as the company's own unwillingness to take on this burden or assume liability should an event occur, Kentucky American Water arranged to obtain

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[12] The extent to which any of these components of a security shield is actually delivered is measurable only if an event occurs. During an event, actual delivery of detection, delay and response will vary depending on how well police are trained and whether security protocols and procedures are followed.

[13] Primary data supplied by American Water Company based on accounting records.

[14] US Bureau of Labor Statistics, 2002 State Occupational Employment and Wage Estimates, available on-line: http://www.bls.gov/oes/2002/oes_4280.htm#b33-0000

these services through Alliance Staffing, a local temporary staffing company. From 4/01/02 to 8/19/03, Kentucky American Water spent another $1,854,128 through Alliance Staffing for off-duty City of Lexington police guards seven days a week, 24 hours a day, at three locations (roughly 36,432 overtime hours at approximately $51/hr). According to Jackie Howard, the President of Alliance Staffing, 65-70 percent overhead for temporary W-2 employees is common in the industry and covers the cost of scheduling, management, liability insurance, statutory benefits, and a 10-15 percent profit.[15] Without a full audit of actual costs, I am unable to speculate as to the reasonableness of these overhead charges from Alliance, although in the professional services industry, of which consulting is a part, this level of overhead is considered reasonable.

I have reviewed the other security costs listed in KR Schedule 3 within limits of available information. Compared to my own experience, which includes engineering cost analysis for several water utility security plans as well as the few contemporary literature sources of unit costs for security at water utilities, I have found these remaining costs to be reasonable.[16] In particular, the installation of automated entry control, intrusion detection, alarm assessment, and water quality monitoring equipment can be an effective substitute for guards, especially where site perimeters are long and remote. These technologies, in fact, enabled Kentucky American Water to eliminate police guards in August 2003 and maintain a comparable or better level of security.

Security Cost Per Customer. Cost per customer is arguably the most common metric used today to evaluate reasonableness of security costs.[17] In KR Schedule 7, I plot cost per customer (total population, not connections) of total utility security investments in the period roughly 2001-2003 against population served for 16 US water utilities that serve between 25,000 and 1.5 million population. Kentucky American Water is the point circled in red. I have also drawn a curve that best

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[15] Personal communication with Jackie Howard, April 8, 2004.

[16] See, for example, Joseph S. Kowalczyk, P.E., *and* Jennifer Patoulidis, *Protecting Our Nation's Water Supply: Best Probably Costs for Implementation of Vulnerability Assessments*, Camp Dresser and McKee, Cambridge, Massachusetts (2003).

[17] To respond to a recent Congressional inquiry on cost of meeting security needs in the water sector, the Association of Metropolitan Water Agencies, which represents the 180 or so of the nation's largest water utilities that together serve more than 100 million Americans, chose to examine costs per customer.

explains the underlying trend in these data.[18] Notice that there is a considerable spread in these data, which is to be expected since they represent a wide range in size utilities as well as a wide range in geographic locations, population densities, service areas, alignment of facilities, and in all likelihood, a wide range in both existing security conditions and local security objectives.

Nonetheless, it is appropriate to examine three implications of these data. First, this line of best fit, which is represented by the equation on the exhibit, predicts that Kentucky American Water would have spent $9.75 per capita. Actual expenditure drawn from KR Schedule 3 is very close — $10.72 per capita. Second, across all 16 water utilities in this sample, the average security spend per capita is $11.83 per capita. The Kentucky American Water figure of $10.72 per capita is about 10 percent below the average. Finally, viewed by quartile (see KR Schedule 8), which allows for economies of scale (present in virtually all other types of utility capital costs), Kentucky American Water is 11th largest utility in this sample and squarely in the third quartile by size. The average security spend in this third quartile is $9.37 per capita, again well within reason compared to actual spend of $10.72 per capita.[19]

Q14. Can you please address the issue of necessity specifically?

A14. Perhaps the most difficult of decisions in the security business is the one that addresses how much is enough. Willingness to bear risk is a highly individual decision, yet water utilities are being asked to make such a decision every day. A further complication is the fact that there is no security standard in the water utility industry, as there is for example, in the nuclear power industry.[20]

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[18] This line represents for a logarithmic function, the line that results in the least sum of squared distances from each point to the line.

[19] Perhaps the most important source of variation in such cross-sectional analysis is a utility's security objective. There is no standard of protection in the water utility industry. Every utility must decide for itself how much security risk it is willing to bear (and accordingly, how much risk its community should be willing to bear against the costs of risk reduction). American Water established early on, a comprehensive security posture compared to many public water utilities, and accordingly it is not surprising that measured against them, Kentucky American Water's spend per capita is slightly above the quartile average. What is more surprising is that it is not significantly above that figure.

[20] In 10 CFR PART 73, the US Nuclear Regulatory commission sets a wide range of physical security requirements with which, all 103 operating commercial nuclear power plants must comply.

In the absence of such a standard, water utilities must rely on proxies — requirements articulated for other purposes like overall system reliability and quality of service. One such proxy is found in 807 KAR 5:066, Sections 3 and 4:

> Section 3. Quality of Water. (1) Compliance with Natural Resources Cabinet. Any utility furnishing water service for human consumption or domestic use shall conform to all legal requirements of the Natural Resources Cabinet for construction and operation of its water system as pertains to sanitation and potability of the water.
>
> (2) Water supply. In absence of comparable requirements of the Natural Resources Cabinet, water supplied by any utility shall be:
>
> (a) Adequately protected by artificial treatment to include continuous disinfection throughout the distribution system;
>
> (b) Free from objectionable color, turbidity, taste, and odor; and
>
> (c) From a source reasonably adequate to provide a continuous supply of water.
>
> Section 4. Continuity of Service. (1) Emergency interruptions. Each utility shall make all reasonable efforts to prevent interruptions of service and when such interruptions occur shall endeavor to reestablish service with the shortest possible delay consistent with the safety of its consumers and the general public. If an emergency interruption of service affects service to any public fire protection device, the utility shall immediately notify the fire chief or other public official responsible for fire protection.

To meet these requirements in the face of terrorist threats that include destruction of infrastructure, interruption of service, contamination of finished water supplies, and release of hazardous chemicals, Kentucky American Water undertook a thorough analysis of the risks of each of its assets to failure given each type of terrorist threat. Based on this analysis, it identified those assets that were at greatest risk of violating quality and reliable requirements (and as a result potentially sickening or killing customers, creating unsafe fire fighting capability, leaving parts or all of the service area without water, or releasing toxic chemicals widely inside Lexington City limits). To avoid violating 807 KAR 5:066, Sections 3 and 4 and the consequences associated with a catastrophic failure, contamination, or chemical release, Kentucky

American Water took immediate, necessary, prudent, and practical steps to limit or avoid such undesirable outcomes. The company based its choice of steps on a standard risk assessment approach developed by security specialists for the US EPA.

Some steps were immediately necessary, like the posting of guards at critical facilities as the nation escalated its security level to orange and issued direct warnings to water utilities. Others came after considerable analysis of threats, vulnerabilities, and consequences, including installation and operation of a system of security systems designed to detect a potential terrorist event, assess its significance, delay the onset of consequences to a reasonable extent, establish swift and reliable mechanisms to respond to an event should it occur, and plan for the fast and efficient recovery of water services to the community in the event of failure.

Were these steps necessary to prevent an actual attack? We may never know. In fact, it is not unreasonable to hope we never have to find out. But in my judgment, these steps or others very much like them were most certainly necessary to meet state requirements for water system quality and reliability as well as national and local expectations for the safety of citizens in a world changed by extreme terrorist events on our own soil. And despite these actions, still more remains to be done to complete the security system at Kentucky American Water.

V. THE KENTUCKY AMERICAN WATER SECURITY PROGRAM GOING FORWARD

Q15. What types of security improvements should Kentucky American Water undertake in the future?

A15. According to their vulnerability assessment, Kentucky American Water will continue to invest in security. I concur, based on my inspection of its major facilities as well as the VSAT™ analysis I conducted to evaluate current security risks given the company's suite of existing countermeasures. To avoid an inappropriate security breach, I will not specify in any detail, the nature of any additional security measures that appear to be necessary, but I am able to comment on them at a general level against a standard, comprehensive detect-delay-respond strategy.

At the highest level, I would expect Kentucky American Water to follow a continuous improvement approach to security enhancement and risk reduction, with capital expenditures greater over the next 3-5 years than in the longer term, as the utility completes the remaining components of its security shield. While the trend will be to eliminate humans in the security chain through automation, human judgment will always play a role in security, especially in the response and recovery stages. Over the longer term, perhaps five years out or more, the continuous security improvement cycle will include much more training, refining, contingency planning, and testing of plans. These exercises as well as advances in technology may lead to a second round of relatively intense capital investment perhaps 10 years out. The cycle will continue.

In the near term, it is reasonable to expect additional investment in automated intrusion detection and assessment capabilities, very site-specific delay and hardening of key assets, and the creation and testing of response protocols for a wide variety of events and assets across the Kentucky American Water system. As technology matures, automated water quality sensors and early-alert procedures may be implemented, especially where they have the potential to improve operations as well as security. Human resources activities will undoubtedly shift toward more thorough and repeated screening and selection. Training will be enhanced and refocused, in part, on security. Vigilance generally will be maintained.
As and if new threats are discovered, Kentucky American Water can be expected to react, perhaps with new security investments, perhaps with altered operating or maintenance procedures, perhaps both. All of these investments and adjustments will be needed as the company responds to new challenges to its corporate and public responsibilities to deliver safe, reliable, and low-cost water services.

Q16. Does this conclude your prepared testimony?

A16. Yes, it does.

KR Schedule 1

KENNETH RUBIN, PHD

PA Consulting Group
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Washington, DC 20006
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202-442-2001 (fax)
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Summary of Professional Experience

For the last 25 years, Dr. Rubin has consulted regularly with US municipal and county governments on issues of vulnerability and security, competitiveness, and productivity enhancement; public works finance and numerous domestic and international institutions on issues of water quality and drinking water policy, wastewater and drinking water infrastructure development, and development of market-based alternatives to command and control regulatory programs.

Dr. Rubin is a Managing Partner in PA Consulting Group and the President and CEO of PA Government Services, Inc., a wholly owned subsidiary of PA Consulting, Inc. Dr. Rubin directs the firm's global water sector activities. Accordingly, his expertise is in water resources systems management; water utility strategy, management, and operations; environmental protection and public health economics and finance; and market-based environmental solutions.

Education

PhD. Water Resources Systems Engineering, Harvard University
SM, Water Resources Systems Engineering, Harvard University
MSPH, Environmental Engineering, University of North Carolina at Chapel Hill, School of Public Health
BS, Civil and Environmental Engineering, Cornell University

Selected Project Experience

Vulnerability Assessments, Security Plan, and ERP Update. Over the last two years, Dr. Rubin has managed and conducted a series of vulnerability assessment projects for water, wastewater, and combined water and wastewater utilities. He uses the VSAT$_{wastewater}$ and VSAT$_{water}$, software to evaluate both baseline vulnerabilities of physical infrastructure, IT platform, employees, and other assets to a range of threats from employees and terrorists. Security upgrades typically include specifications for devices and procedures to improve detection, assessment, delay, response, and recovery at vulnerable facilities.

VSAT™ Software Development. Since 2002, Dr. Rubin has lead a team of risk management specialists and programmers to create and upgrade the VSAT™ software for vulnerability assessment, security planning,and emergency response planning for water and wastewater utilities. Since co-creating this software in 2002, subsequent projects have included upgrades to enhance functionality and include

automated Vulnerability Assessment and ERP reporting for submittal to the US EPA in compliance with the 2002 Bioterrorism Act. More than 5,000 copies of VSAT™ are in use.

Project Director, Vulnerability Self-Assessment Checklist. In the wake of the events of September 11, 2001, Dr. Rubin led a team of engineers and analysts in the preparation of a checklist for wastewater utilities to use to assess their own vulnerabilities to terrorist and related threats. He conceived and helped execute the now industry-standard vulnerability assessment framework based on five types of utility assets: physical infrastructure, IT platform, employees, knowledge-base, and customers. This checklist was published and distributed nationwide by the Association of Metropolitan Sewerage Agencies.

Vulnerability Assessment and Security Planning Training. Dr. Rubin has lead a team designing and conducting vulnerability assessment and security planning training workshops for all size water and wastewater utilities. To date, more than 60 workshops have been completed and 1,500 water and wastewater utility managers have been trained in vulnerability assessment, security planning, and emergency response planning. Workshop modules include: Asset Categorization and Identification; Threat and Criticality Assessment; Evaluating Countermeasures; Understanding and Rating Vulnerabilities; Assessing and Accepting Risks; Identifying and Estimating Costs of Risk Mitigation; and Business Continuity and Emergency Response Planning.

Water and Wastewater Utility Strategy, Management, and Operations Consulting. Since 195, Dr. Rubin has created, offered training sessions in, and applied at the utility scale, a series of methods to improve the operational and financial performance of water and wastewater utilities. Productivity improvement methods have focused on core operations and maintenance, business support services (customer service, human resources, IT, engineering, accounting and finance, real estate, and purchasing), and asset management functions. Dr. Rubin as applied these techniques at dozens of public and private water and wastewater utilities across the US.

Due Diligence and Market Verification for Industrial Outsourcing. Dr. Rubin has managed a variety of market assessment, regional economics, outsourcing transactions, utility consolidation, and due diligence projects for water and wastewater utilities and for buyers and sellers of assets of these utilities.

International Water Projects. Over the last ten years, Dr. Rubin has managed or participated in water utility or water resources management projects worldwide. Examples include:

- Water Utility Strengthening in Alexandria, Egypt.
- Privatization of Irrigation Delivery Network for the Jordan Valley Authority (Amman, Jordan).
- Municipal Wastewater Reuse Pilot Program in Jordan
- Trans-boundary Water Management in Central Asia.
- Creation of Agricultural Water Users Associations in Romania.

- Training and Technical Support for Environmental Compliance and Enforcement Worldwide
- Municipal and Industrial Wastewater Reuse Feasibility Study, Tianjin China.
- Regulatory Support for Aguas Argentinas, Water and Wastewater Utility Buenos Aires, Argentina.
- Sustainable Fisheries Development in Senegal.
- Caribbean Coastal Protection Conference.
- Costs, Benefits, and Financing for Estuarine & Coastal Ecosystem Restoration and Preservation
- An Integrated, Multi-Media Industrial Environmental Management System for the 10th of Ramadan City, Egypt.
- Market-Based Instruments for Water Pollution Control in Morocco.
- Industrial Effluent Fee Program for the Philippines.

Professional Experience

2000- Present: Managing Partner, PA Consulting Group, President and CEO, PA Government Services, Inc. (manage a 300-person international development division doing business with US AID, the World Bank, Asian Development Bank, and DFID; direct the firm's global water sector activities, including maintaining a practice serving the US water and wastewater utility sector.)

1998-2000: President and CEO, Hagler Bailly Services, Inc. (managed a 100 person international development and infrastructure company, which was acquired by PA in 2000)

1997-1998: Senior Vice President , Hagler Bailly Services, Inc. (managed the water resources and water utility practice within an international development company)

1986-1997: President, Apogee Research, Inc. (founded and managed a water and transportation consulting firm, which was acquired by Hagler Bailly in 1997)

1981-1986: Principal Analyst for Water Resources and Environmental Programs, U.S. Congressional Budget Office (conducted economic, financial, budgetary, and fiscal analysis of US programs in water resources, including those of US EPA, Corps of Engineers, TVA, Bureau of Reclamation).

1980-1981: Director of the Technical Assistance Program, U.S. Water Resources Council (represented US water policy initiatives to the 50 states and managed grant program)

1979-1980: Water Resources Engineer, Meta Systems, Inc. (conducted water quality and water resources simulations modeling in support of US AID and US EPA projects)

1979: Consultant, Massachusetts Joint Legislative Committee on Energy (prepared report to legislature on alternative energy sources)

1978-1979: Teaching Fellow, Harvard University (taught courses in water resources systems engineering and public health)

1976-1978: Water Resources Engineer, WAPORA, Inc. (conducted environmental, economic, and engineering analyses of regional water and wastewater utility projects)
1974-1976: Water Resources Research Associate, University of North Carolina (water quality laboratory and field sampling services)

Honors and Awards

Advance America Award for creation of the Vulnerability Self Assessment Tool (VSAT™) Software for Water and Wastewater Utilities, 2003

Advance America Award for Asset-Based Vulnerability Checklist for Water and Wastewater Utilities, 2002

Professional Associations

American Water Resources Association (Past President, National Capital Section)
American Water Works Association
Water Environment Federation
Association of Metropolitan Sewerage Agencies
Association of Metropolitan Water Agencies
Scientific Society of Sigma Xi

Country Experience

Argentina, Brazil, Mexico, Canada, UK, Romania, Armenia, Georgia, Kazakhstan, Ukraine, Egypt, Jordan, Morocco, New Zealand, Indonesia, Thailand, Malaysia, China, Philippines

KR Schedule 2

Kentucky American Water Security Costs Pre 9/11				
Item No.	Description	Task Order	Business Unit	Pre 9/11 Costs
1	Security System - [redacted]	12009745	1202000H	$106,512.81
2	Security System - [redacted]	12009746	1202000H	$19,796.90
3	[redacted] - Security Sys	12009748	1202000H	$25,905.67
4	[redacted]	12010129	1202000H	$19,575.75
5	[redacted]	12010164	1202000H	$23,554.76
6	[redacted]	12010170	1202000H	$10,008.73
7	Security Office Building	12011378	12020101	$7,445.26
8	Security System - [redacted]	12011379	12020101	$11,272.15
9	Security System - [redacted]	12011380	12020101	$106,960.66
10	Security System - [redacted]	12011381	12020101	$25,756.30
11	Security System - [redacted]	12011382	12020101	$295.35
12	Security Fence - [redacted]	12011383	12020101	$50,231.34
TOTAL				$407,315.68

KR Schedule 3

Kentucky American Water Security Costs Post 9/11					
Item No.	Description	Task Order	Business Unit	Post 9-11-01 Costs	Task Order Completion Date
7	Security Office Building	12011378	12020101	$ 10,257.18	Nov-01
8	Security System -	12011379	12020101	$ 388.66	Jul-01
9	Security System -	12011380	12020101	$ 58,338.22	Dec-01
10	Security System -	12011381	12020101	$ 73,266.45	Dec-01
11	Security System -	12011382	12020101	$ 15,484.86	Dec-01
12	Security Fence -	12011383	12020101	$ 2,606.19	Sep-01
13	Security Fence -	12011384	12020101	$ 15,894.83	Sep-01
14	Security Phone Line -	12011385	12020101	$ 11,650.51	Oct-01
15	Monitoring Inst -	12011762	12020101	$ 69,283.70	Dec-01
16	Monitoring Inst -	12011763	12020101	$ 73,889.55	Dec-01
17		12012031	12020101	$ 11,317.21	Dec-01
18		12012032	12020101	$ 7,846.02	Dec-01
19		12012033	12020101	$ 14,214.98	Dec-01
20		12012034	12020101	$ 5,316.57	Dec-01
21		12012035	12020101	$ 4,437.46	Dec-01
22		12012036	12020101	$ 6,695.13	Dec-01
23		12012037	12020101	$ 7,683.96	Dec-01
24		12012038	12020101	$ 12,264.98	Dec-01
25		12012039	12020101	$ 4,904.15	Dec-01
26		12012041	12020101	$ 11,157.17	Dec-01
27		12012042	12020101	$ 3,704.01	Dec-01
28	Security Fencing	12012051	12020101	$ 19,040.39	Dec-01
29	Concrete Planters Office Complex	12012060	12020101	$ 6,068.39	Dec-01
30		12012061	12020101	$ -	
31		12012062	12020101	$ 25,140.74	Dec-01
32		12012063	12020101	$ 21,488.86	Dec-01
33		12012064	12020101	$ -	
34		12012065	12020101	$ 5,237.44	Dec-01
35		12012066	12020101	$ 5,237.44	Dec-01
36		12012067	12020101	$ 5,784.76	Dec-01
37		12012076	12020101	$ 5,237.44	Dec-01
38	LFUCG Police Direct	50005793	120205	$ 326,130.61	9-12-01 to 3-31-02
39	Alliance Staffing - LFUCG Police	50005793	120205	$ 1,854,128.42	4-01-02 to 8-19-03
40	Murray Guard - Lobby & Gate	50005793	120205	$ 88,355.94	9-12-03 to Present
41	Porta Potty Rental for Police at Dam 9	50005793	120205	$ 499.76	2001
42	Securing Tanks	50005793	120205	$ 152,581.00	2001
43	Concrete Barriers	50005793	120205	$ 15,918.90	2001
44	Clearing Fence lines	50005793	120205	$ 6,230.55	2001
45	KAW Labor	50005793	120205	$ 4,436.70	2001-2002
46	SCADA Program Change	50005793	120205	$ 8,156.92	2001
47	Inactive account lockout	50005793	120205	$ 45,847.93	2002
48	Security Lights at KRS	50005793	120205	$ 9,171.49	2001
49	Padlocks and Locksets	50005793	120205	$ 3,163.04	2001
50	Survey work at Tank Sites	50005793	120205	$ 9,300.00	2001
51	Attorney Fees	50005793	120205	$ 12,675.90	2001
52	Communications Equip., Fees, and Misc	50005793	120205	$ 194,665.41	2001-2004
53	Planters Concrete	50010494	1202000H	$ 1,616.84	Apr-02
54	Planters Concrete	50010495	1202000H	$ 2,681.68	Apr-02
55		50013613	1202000H	$ 14,335.44	May-02
56	Guard Post -	50015162	1202000H	$ 14,573.27	Aug-02
57	Guard Post -	50015163	1202000H	$ 13,789.10	Aug-02
58		50029452	1202000H	$ 4,701.04	May-03
59	Guardhouse -	50044848	12020101	$ 19,992.00	on going
TOTAL				$ 3,316,789.19	

KR Schedule 4 (Timeline)

WORLD AND LOCAL EVENTS			KENTUCKY AMERICAN WATER EVENTS
Truck bombs explode within five minutes of each other outside the US embassies in Nairobi, Kenya and Dar es Salaam Tanzania. The bombs kill 224 people, including 12 Americans. US launches missile strikes at suspected bases of militant Osama bin Laden, accused of bombing US embassies.	Aug	1998	
Iraq ends cooperation with UN Special Commission to oversee the destruction of Iraq's weapons of mass destruction (Unscom)	Oct		
After UN staff are evacuated from Baghdad, the USA and UK launch a bombing campaign, "Operation Desert Fox", to destroy Iraq's nuclear, chemical and biological weapons programs.	Dec		
Grand Ayatollah Sayyid Muhammad Sadiq al-Sadr, spiritual leader of the Shia community, is assassinated in Najaf.	Feb	1999	
UNSC Resolution 1284 creates the UN Monitoring, Verification and Inspection Commission (Unmovic) to replace Unscom. Iraq rejects the resolution.	Dec		
An explosives-laden rubber raft rams a US Destroyer and explodes in the port of Aden, Yemen, killing 17 US Sailors	Oct	2000	
Month Unknown - Louisville District COE develops remediation plans for the lock chamber walls and valve operating mechanisms at lock/dam 9 facilities (currently on hold as of FMSM report). Also, last Kentucky American rate case	Dec		KAW invests in a series of security measures (security systems at several buildings, video badging system, video cameras and monitoring equipment at certain sites, conduit and external lighting)
UN imposes further sanctions on Taliban in Afghanistan to force them to hand over Osama bin Laden.	Jan	2001	
US and Britain carry out bombing raids to try to disable Iraq's air defense network.	Feb		
	Jul		KAW completes security system for "Stock Building"

WORLD AND LOCAL EVENTS

KENTUCKY AMERICAN WATER EVENTS

Sep

Three hijacked planes crash into New York's World Trade Center and the Pentagon in Washington, DC; Another plane crashes in Pennsylvania

KAW begins use of off-duty police at 3 facilities (Richmond Road, KRS, Lock/Dam 9). Also begins background check policy on all contractors, installs security fencing at two critical facilities.

USA, Britain launch air strikes against Afghanistan after Taliban refuse to hand over Osama bin Laden, held responsible for the September 11 attacks on America.

KAW installs Security Phone Line at KRS.

Oct

Kentucky Division of Water "*Review your emergency response plan and the security measures you have in place to ensure that your facilities are not vulnerable*" and "*Make security a priority. Limit access to facilities. Limit access to water supply reservoirs.*"
American Water Works Association "*The FBI extended its water utility terrorist threat advisory until December 11th. At that time it will be reevaluated*".
FBI "*U.S. water supplies can be considered a "logical target" for a possible terrorist attack.*"
EPA "*Increase lighting...control access to water supply reservoirs.*"

Opposition forces seize Mazar-e Sharif and within days march into Kabul and other key cities.

Kentucky River Authority constructs a reinforced concrete cut-off wall on the upper sill of Dam/Lock 9 facilities. Security Office Building for KAW completed.

Nov

Water Security Summit PR Newswire "*Water is the quintessential target...People are emotionally and physically dependent on water because it is the only consumable utility. Those charged with providing safe water should be at a heightened state of alert and should implement appropriate security measures.*"

WORLD AND LOCAL EVENTS		KENTUCKY AMERICAN WATER EVENTS
Afghan groups agree to deal in Bonn for interim government.	Dec	KAW completes Initial security improvements (entry detection, access controls, monitoring instrumentation, multiple barriers, surveillance at key facilities)
AMWA "*Utilities are reminded that a heightened state of awareness should be maintained throughout the year-end holidays based on discussions of nonspecific threat information with FBI's NIPC and news reports from the Office of Homeland Security.*"		
First contingent of foreign peacekeepers in place in Afghanistan	Jan	FMSM submits proposal to do Lock/Dam #9 study
Baghdad suspends oil exports to protest against Israeli incursions into Palestinian territories. Despite calls by Saddam Hussein, no other Arab countries follow suit. Exports resume after 30 days	Apr	Additional concrete planters added to Richmond Road and KRS
UN Security Council extends mandate of International Security Assistance Force (ISAF) until December 2002 in Afghanistan	May	Installation of security fencing at Jacobson Dam (Reservoir #4)
Public Health Security And Bioterrorism Preparedness and Response Act of 2002 passed into law	Jun	
Loya Jirga, or grand council, elects Hamid Karzai as interim head of state. Karzai picks members of his administration that is to serve until 2004.	Jul	
Vice-President Haji Abdul Qadir is assassinated by gunmen in Kabul. US air raid in Uruzgan province kills 48 civilians, many of them members of a wedding party.	Aug	Guard post for security completed at Richmond Road and KRS
US President George W Bush tells world leaders at a UN General Assembly session to confront the "grave and gathering danger" of Iraq - or stand aside as the US acts. In the same month British Prime Minister Tony Blair publishes a dossier on Iraq's military capability.	Sep	
The US announces that North Korea admitted in their talks to a secret nuclear arms program	Oct	
UN weapons inspectors return to Iraq backed by a UN resolution that threatens serious consequences if Iraq is in "material breach" of its terms. North Korean-made Scud missiles are found aboard a ship bound for Yemen.	Nov	

2002

WORLD AND LOCAL EVENTS

North Korea announces it will withdraw from the Nuclear Non-Proliferation Treaty.

North Korea says it has reactivated its nuclear facilities and their operations are now going ahead "on a normal footing". North Korea warns the United States that any decision to build up its troops in the region could lead the North to make a pre-emptive attack on American forces. North Korea fires a missile into the sea between South Korea and Japan.

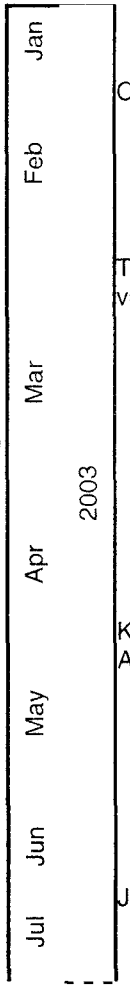
Chief weapons inspector Hans Blix reports that Iraq has accelerated its cooperation but says inspectors need more time to verify Iraq's compliance. On the 17th, UK's ambassador to the UN says the diplomatic process on Iraq has ended; arms inspectors evacuate; President Bush gives Saddam Hussein and his sons 48 hours to leave Iraq or face war. On the 20th, American missiles hit targets in Baghdad, marking the start of a US-led campaign to topple Saddam Hussein. In the following days US and British ground troops enter Iraq from the south.

On the 9th, US forces advance into central Baghdad. In the following days Kurdish fighters and US forces take control of the northern cities of Kirkuk and Mosul.

UN Security Council approves resolution backing US-led administration in Iraq and lifting of economic sanctions. US administrator abolishes Baath Party and institutions of former regime. North Korea says it is scrapping a 1992 agreement with the South to keep the peninsula free from nuclear weapons - Pyongyang's last remaining international agreement on non-proliferation.

Clashes in Afghanistan between Taliban fighters and government forces in Kandahar province leave 49 people dead.

Interim governing council (IGC) in Iraq meets for first time. Commander of US forces says his troops face low-intensity guerrilla-style war. Saddam's sons Uday and Qusay killed in gun battle in Mosul.



KENTUCKY AMERICAN WATER EVENTS

Completion of FMSM dam study

Tier 1 VA's due, Kentucky American Water completes and submits vulnerability assessment within deadline

Kentucky River Authority Structural Failure Contingency Plan released. Additional security measures taken to protect critical tank sites

July 28, Guard removed from Lock/Dam 9.

WORLD AND LOCAL EVENTS		KENTUCKY AMERICAN WATER EVENTS
Bomb attack at Jordanian embassy in Baghdad kills 11; attack at UN HQ in Baghdad kills 22 including UN's chief envoy. Saddam's cousin Ali Hassan al-Majid, or "Chemical Ali", captured. Car bomb in Najaf kills 125 including Shia leader Ayatollah Mohammed Baqr al-Hakim. NATO takes control of security in Kabul, the organization's first operational commitment outside Europe in its history.	Aug	Change in guard policy. Murray Guard replaces police at Richmond Road. Guard removed from Kentucky River Station
UN Security Council approves amended US resolution on Iraq. Agreement gives new legitimacy to US-led administration but stresses power should be transferred to Iraqis "as soon as practicable". Dozens killed in Baghdad bombings, including attack on Red Cross office.	Oct	
Saddam Hussein's capture announced	Dec	Tier 2 VA's due
Grand assembly - or Loya Jirga - adopts new constitution that provides for strong presidency in Afghanistan. US nuclear scientist Siegfried Hecker tells Congress that the delegates visiting Yongbyon were shown what appeared to be weapons-grade plutonium, but he did not see any evidence of a nuclear bomb.	Jan	
US-backed Governing Council agrees to an interim constitution after marathon negotiations and sharp differences over role of Islam and Kurdish autonomy demands. Dozens killed in coordinated attacks on Shia Muslims marking the holy period of Ashura with mass gatherings in Iraqi cities.	Mar	
Shia militias loyal to radical cleric Moqtada Sadr take on coalition forces.	Apr	City of Lexington grants collective bargaining rights to local police
	Jun	Tier 3 VA's due

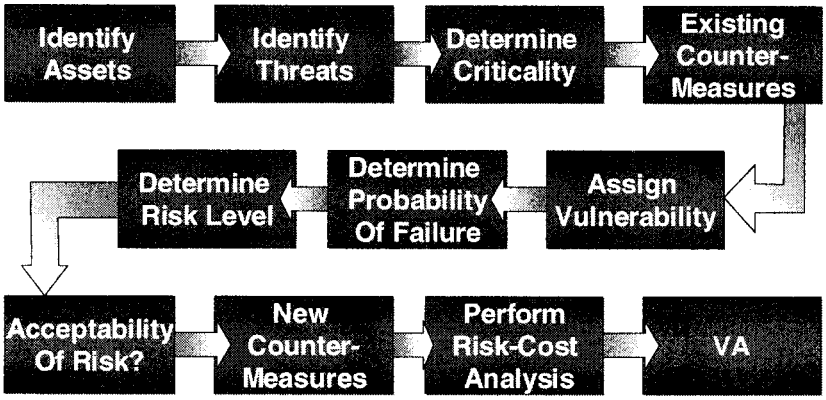
2004

KR Schedule 5

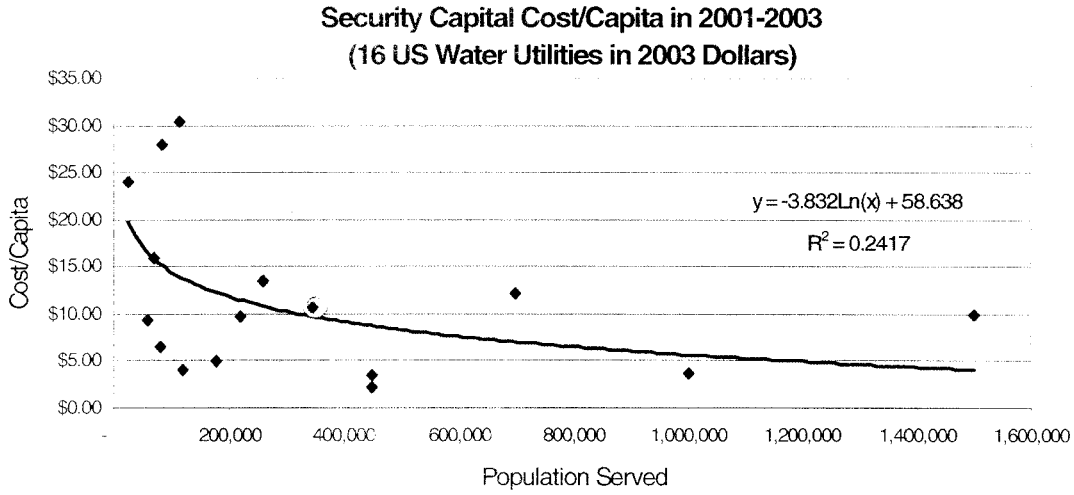
Month	Year	Industry	Incident	Location	Comments
Jan	2004	Water	Intruder at rwo storage tanks	Texas (El Paso)	One tank supplies Fort Bliss
Jan	2004	Chemical	Surveillance at ammonia plant	Texas (Freeport)	Man of Middle Eastern appearance caught by security tanking pictures of ammonia storage tanks shoots guard and flees
Jan	2003	Water	Intruder	Florida (Volusia)	Storage tank tampering
Dec	2003	Bottled water	"Aquabomber" contaminating bottled water	Italy (Rome)	
Sep	2003	Bottled water	Incendiary devices found at bottling plant	Michigan (Martiny Township)	
Feb	2003	Chemical	Explosion causes fire at chemical plant	Rhode Island (Cranston)	Potasssium cyanide stored at plant
Mar	2003	Power	Surveillance at TVA dam	Tennessee (Knoxville)	Middle Eastern man taking pictures of dam was also wanted for using faked Ids to get Virginia drivers licenses
May	2003	Water	Intruder at finished storage water tank	Virginia (Buchanan Co.)	Rope was found suspended inside tank; tennis shoe found at bottom
Feb	2003	Water	Threat to poison waterworks	Virginia (Eastern Shore)	State trooper shot; one suspect killed
Apr	2003	Water	Man dumping chemicals into reservoir	Virginia (Fairfax City)	Man had middle eastern accent; said he was feeding the aquatic plants
Mar	2003	Water	Threat to water supply	Virginia (Richmond)	Threat did not appear credible
Mar	2003	Water	Suspicious vials found at pump stations at water tanks	Virginia (Roanoke)	
Apr	2003	Water	Drum with "bio agent" on it found floating in reservoir	Virginia (Stafford County)	Drum appeared to have been used for trash and had contained algacide at one time
Oct	2002	Water	Threat to destroy underground storage tanks	Colorado (Winter Park)	ELF claimed responsibility for threat
May	2002	Water	Threat to waterworks	Florida (Orlando)	Threats were vague
May	2002	Power	Two intruders at power plant	Pennsylvania (Westwood)	Two men of Middle-eastern appearance
Jun	2002	Water	Vandalism hatch broken at raw water intake	Vermont (Norwich)	
Jul	2002	Water	Surveillance/trespassing at raw water intake	Virginia (Hopewell)	Suspect had digital camera photographing installation, when realized he was spotted by security guard, waled away; two other accomplices, one in car with engine running
Aug	2002	Water	Individual posing as member of bioterrorism work group requesting information from primacy agency on waterworks	Virginia (Virginia Beach)	Individula was interested in knowing what chemicals were used by waterworks in Tidewater area
Dec	2002	Water	Unknown substance found at pump houseNew Jersey (S. Orange)		
Jul	2002	Water	Suspects in water posioning plot arrested by FBI		Ujaama brothers were arrested by FBI in connection with Al Qaeda activities; held in either Virginia or Denver
Jun	2001	Water	Break in at well house	Utah	
Dec	2001	Water	Fuel contamination at reservoir	Utah (Salt lake)	Helicopter crashed into reservoir
Oct	2001	Water	Car in reservoir	Virginia (Lawrenceville)	Individual who was taking pictures of waterworks facilities had car roll into reservoir
Apr	2000	Waste	Takeover of SCADA system	Australia (Queensland)	
Jan	2000	Water	Contamination of reservoir	Utah (Heber)	Truck spilled 150 gallons of diesel
Aug	1999	Water	Contamination threat	Utah (Midvale City)	Anonymous caller said man had large quantity of sodium cyanide and was going to dump into water supply

KR

KR Schedule 6



KR Schedule 7



KR Schedule 8

	Average $/cap
1st Quartile	$14.00
2nd Quartile	$16.90
3rd Quartile	$9.37
4th Quartile	$7.05
All	$11.83