

**AN ALTERNATIVE APPROACH TO SECURITY SYSTEM
DESIGN PROVIDING REDUCED COSTS TO WATER
FACILITIES**

INTRODUCTION:

In June 2002, the President signed into law the **Public Health Security Bioterrorism and Response Act (PL107-188)** which resulted in the Environmental Protection Agency mandating that all water facilities serving 3,300 users or more conduct a Vulnerability Assessment (VA) of their respective facility.

Recommendations arising from these VA's, included various measures related to Security Improvements that would be required to reduce the level of risk as determined by the individual VA.

Given that many water facilities had never considered a need for security prior to the events of "9/11", the associated costs for many of these security improvements proved to be quite substantial, and for many water facilities, were simply cost prohibitive.

The issue then became one of looking at possible sources of funding for such improvements including rate increases or special surcharges for security against each user. With a multitude of water facilities already facing extensive demands on capital funding, and having no prior budgets for security expenditure, the problem of cost prohibitive measures recommended in the different VA's has proven to be a very real problem.

Is there a solution to this problem? Can security measures be designed and implemented for substantially less cost than currently estimated in the VA reports? The answer with some exceptions, is a very positive Yes.

The possible solution is that of the **Deterrent or Prescriptive Approach to Security System Design**.

Wivenhoe Management Group is by no means alone in suggesting this approach which has been successfully implemented within the Security Industry for many years, and leading consultants have commented as follows:

"Most 'off-the-rack' security system design approaches miss the mark for water and wastewater sites. The preventive, or deterrent approach presented by Wivenhoe is not only more effective, practical and easily implemented – it can cut costs in half"

**Ken Burris
Senior Consultant & Head of the Water/Wastewater Section
Environmental Resources Management (ERM)**

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INTRODUCTION:

“The most cost-effective security programs incorporate a proper balance of security Deterrents, Delays, Detection, and Response. The strength of each component is dependent on the attributes of the facility. If the value of Deterrents are not employed or considered, the other components must be greater, at significant ly greater cost, in order to achieve the same level of protection as could be achieved at a lower cost when Deterrents are properly applied.”

**Ronald S. Libengood, CPP
CEO – SecuraComm Consulting, Inc.**

The Deterrent or Prescriptive approach can reduce security costs at water facilities by as much as 50% or more based on experience with actual VA examples at different sites throughout the United States.

As such, it is a solution that can also avoid irate water users upset with the extensive costs of meeting VA recommendations which are based on several factors that may not apply to individual water facilities.

THE ALTERNATIVE APPROACH:

The current approach for the Water Industry involves VA’s being based on the Sandia Laboratories Methodology where large water facilities, (those serving 100,000 users and above), were required to use the RAM-W methodology or RAM-Lite (a lesser version of RAM-W) or Best Practices.

The Sandia Laboratories Methodology was originally developed from measures used by the Military and was specifically created to protect Nuclear Power Plants. The Sandia methodology is an excellent approach to security system design in many circumstances but for many water facilities may be considered “overkill”.

From the results experienced in many VA’s, the high costs associated with the various security improvements were directly related to providing significant **Delay** measures to counteract the likely response time from local law enforcement response to an incident or break-in to a water facility.

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THE ALTERNATIVE APPROACH:

The Sandia methodology stresses **Detect – Delay – Respond**.

However, such a methodology poses several problems for typical water facilities as follows:

- 1). Many water facilities have more than one location, and may have several critical assets at each location.
- 2). The response time for the more remote locations, and even with main locations was found to be considerable in a large number of situations and would require substantial **Delay** measures.
- 3). A number of the proposed **Delay** measures would also have an impact on the practical operation of the facility, and thus, further added to the overall cost to implement such measures.

The disparity between the time it takes an adversary to successfully take out a critical asset against the likely local law enforcement response time can be seen in a typical Sandia Delay/Response comparison chart overleaf. See Exhibit 1

This was a situation where the adversary was identified as an “extremist” with both a degree of military training and equipped with explosives. The critical asset involved traveling across a lake area and then negotiating an Intake Pit area, placing explosives in such a way as to destroy certain valve equipment and cause a rupture of certain piping at that location.

Even with such obstacles and distance, and even with **Detection** (which did not exist), the time to achieve the mission was less than six minutes. The local law enforcement response time was considered to be not less than ten minutes and would likely be twice that in reality. In many other scenario situations, the time to achieve the “mission” was often less than three minutes.

The necessary **Delay** measures required to address this particular situation were extensive.

As will be seen in the Security Improvement Cost Estimate provided for this same facility, the costs are very significant. See Exhibit 2

Exhibit 1

Asset/Location	Main WTP Facility - Intake Pit				
Facility (xxxxx)					
Strategy:	Sabotage / Destroy ASSET by Outsider DBT				
Path 1: A	Use Light Sea Craft to traverse lakes and come ashore at Intake Pit area, Remove explosives, Access Gate, Pack & Set Explosives, set Detonator/Timer, Return to craft & Detonate safe distance away				
	<i>Estimate of Adversary Sequence Interruption</i>	Probability of Alarm Communication		Response Force Time (in Seconds)	
		0		Mean	Standard Deviation
				600	180
				Delays (in Seconds):	
Task	Description	P(Detection)	Location	Mean:	Standard Deviation
1	Using light sea craft come ashore at Intake Pit area and remove explosives	0	E	60	18
2	Access Gate	0	E	30	9
3	Cross to Intake Pit	0	E	8	2.4
4	Pack & Set Explosives in Piping & Valves	0	E	120	
5	Set Detonator/Timer	0	E	30	
6	Return to Craft and Detonate Safe Distance Away	0	E	90	
7					
8					
	Adversary Task Time			338	
	Probability of Interruption:	0.00			
(1)	Response Force Unlikely to Respond as No Detection				
(2)	No Perimeter Detection or Assessment				
(3)	No Detection at Structure				

Exhibit 2

REDUCTION	ASSET	DESCRIPTION	ESTIMATED COST
(1A)	Control # X	Relocate with New Housing	\$TBD
(1B)	Control # X		\$600,000
(2A)	Control # Y & I-XX/C-XX	Perimeter Security Improvements	\$200,000
(2B)	As Above	Hardening Measures	\$190,000
(3A)	WTP Facility	Perimeter Security Improvements	1,240,000
(3B)	As Above	Perimeter Security Improvements & Upgrade	300,000
(3C)	As Above	Hardening Measures	1,060,000
TOTAL			\$3,590,000

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THE ALTERNATIVE APPROACH:

It must also be stressed that even with such costly security measures in place, there is no such thing as “Guaranteed Security”. Given human ingenuity, it is simply not possible to ensure that a water facility is impenetrable or secure from various forms of attack or unauthorized entry.

An example of this is the unfortunate suicide bombing in Iraq recently, at a US military base in the Baghdad area where an insurgent was able to gain entry dressed in an Iraqi military uniform and where the person had worked in a lowly position to gain inside knowledge on entry procedures. The insurgent then blew himself up as US soldiers were having lunch with some 14 US soldiers killed.

The **Alternative Approach** referred to as the **Deterrent or Prescriptive Approach** follows the direction of **Deter – Detect – Respond**. Professional Security Consultants apply such an approach in security system design whereby the intent is to **Deter** an adversary from entering the facility in the first place.

This same approach is utilized by the Natural Gas Transmission and Distribution Industry in accordance with security guidelines issued by the Department of Transportation’s Office of Pipeline Safety (OPS). The Prescriptive or Deterrent approach is described as follows:

Basically, the Prescriptive Approach requires the gas utility to determine the facility’s existing detection and deterrent (existing security including perimeter fence and gates, perimeter access control, security lighting, perimeter and site surveillance, signage, secured building [access control, intrusion detection], SCADA, voice communications capability, and back-up and law enforcement response) methods and operations, and the response and recovery (security and operational countermeasures) methods. From this evaluation an operational action plan would be developed based on the level of threat. The steps in the prescriptive approach include:

1. Determine if the facility is critical and conduct a risk assessment
2. If the facility is determined to be critical, then based on the level of risk, identification of the detection and deterrent methods (security and operational counter-measures)
3. Develop a Threat Response Plan which addresses the risk level based on the risk assessment and details the detection and deterrent (security and operational countermeasures) methods selected.

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THE ALTERNATIVE APPROACH:

4. Develop Response Procedures - there are typically three types of plans that would be developed. They include Emergency Plans, Incident Management Plans, and Regional Management Plans.
5. Develop Recovery Procedures - the recovery procedures typically include an Operations and Maintenance Manual, Disaster Recovery Plan, and a Regional Emergency Recovery Plan.

A **Deterrent** or **Prescriptive** Approach places a strong emphasis on Perimeter Security incorporating such elements as:

- **Fencing**
- **Signage**
- **Lighting**
- **Surveillance**
- **Detection**
- **Effective Audible Alarms**

Differences in Cost:

The following comparison highlights specific differences in terms of actual measures where with the Sandia Approach, security improvements apply to all areas of the water facility and critical asset locations, and where specific hardening measures are used to protect critical assets.

In the Prescriptive Approach, the emphasis is on Perimeter Security where the intent is to **Deter** the adversary from considering this particular facility as a target due to obvious security measures that substantially increase the risk of being caught or identified in carrying-out the mission.

From a practical aspect, a typical **Deterrent** system will clearly show attention to security on the perimeter of the facility and imply additional measures within that will deter the adversary from selecting this facility in favor of an easier (or softer) target elsewhere where there are no such obvious measures in effect.

Simply stated, should an adversary attempt to break-in to a **Deterrent** system site despite the obvious security, as soon as they climb over the fence, they will trip an intrusion detection system that will switch-on additional lighting (giving the impression even in an unmanned location that there are personnel in attendance), and will immediately trigger loud siren drivers that will be heard for some distance. See Exhibit 3.

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THE ALTERNATIVE APPROACH:

Differences in Cost (Cont.):

In the event that there is also surveillance being deployed at that facility, the detection system will automatically cause the nearest camera or cameras to focus on that section of the facility with a reasonable chance of identifying the adversaries.

The majority of adversaries, confronted by such a situation will instantly abort the mission and attempt to escape as quickly as possible.

Going back to the previous Security Improvement Cost Estimate under the Sandia Approach where the likely costs were over **\$ 3.5 million**, it will be seen that the same Security Improvement Cost Estimate is now just over **\$ 1.13 million**. This represents an approximate **68.42%** savings for the facility. See Exhibit 4

Working with many other examples of cost taken from actual RAM-W or RAM-Lite VA studies, and then recalculating the costs for the same examples under a **Deterrent** approach, it was found that the average savings fell within a general range of 30% to 60%.

Again, it should be stressed that this Approach is not something new and is strongly recommended by many leading security consultants who have participated in many water facility VA's.

“The current approach to Water Utility security ignores the tremendous value of deterrence that can be achieved at a fraction of the cost proposed for hardening the site. Except at the highest profile sites, the threat to the site can be reasonably be deterred without building a fortress.”

**James M. Woodruff, PE, CPP
CEO – American Consulting Engineers**

The Design Basis Threat for many water facilities is ‘Environmental/Social Extremist’ or lower. This level of threat does not need the levels of protection recommended for ‘domestic terrorist’ or ‘state sponsored terrorist’. Concentration on deterrence counter-measures can markedly reduce the cost of protecting the site and provide an appropriate measure of security protection consistent with the Design Base Threat level.”

**David L. Rockford
President – The Wickford Group**

Exhibit 3**Differences In Cost**

Sandia Approach	Deterrent Approach
Fencing	Fencing
Lighting	Perimeter Lighting
Signage	Perimeter Signage
Surveillance	Perimeter Surveillance
Detection	Perimeter Detection
Alarm	Effective Audible Alarm(s)
Hardening of Assets	

Exhibit 4

RISK REDUCTION SOLUTION	CRITICAL ASSET	DESCRIPTION	ESTIMATED COST
(1A)	Control # X	Relocate with New Housing	\$TBD
(1B)	Control # X	Perimeter Security Improvements & Upgrades	\$276,000
(2A)	Control # Y & I-XX/C-XX Culverts	Perimeter Security Improvements	\$105,400
(2B)	As Above	Hardening Measures	N/A
(3A)	WTP Facility	Perimeter Security Improvements & Upgrade	\$560,500
(3B)	As Above	Perimeter Security Improvements & Upgrade	\$192,000
(3C)	As Above	Hardening Measures	\$1,060,000
TOTAL		REDUCTION OF 68.42%	\$1,133,900

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THE ALTERNATIVE APPROACH:

Considerations:

The **Deterrent** approach is not recommended for water facilities that have a credible Design Base Threat of Domestic Terrorist or State Sponsored Terrorist. In such situations, hardening of critical assets will be required.

It is also strongly recommended that water facilities considering the **Deterrent or Prescriptive** approach consider professional assistance in ascertaining their eligibility for such an approach and in the actual design of such systems.

Deterrent measures may involve various perimeter security electronic systems, decoy measures, adequate surveillance, specific fencing requirements, landscape security application, a **Detection** system that must operate in all weather conditions and operational circumstances, and adequate physical security procedures and training.

As such, water facilities should consider guidance from suitable experienced security professionals who not only have water security expertise but who also have a broad risk/vulnerability expertise and capability.

There are many security consultants that can fulfill such a requirement.

Even where the water facility may choose to implement a **Deterrent** system design by themselves, it is recommended that they consider having a suitable security professional provide an appraisal of their intended system before committing to that system.

During the course of many years in the Security Industry, there have been numerous occasions when alleged security systems were found to be inoperative, badly designed, and totally inappropriate to the task at hand.

“Buyer Beware” has particular significance in the security field where mistakes can cause fatal consequences.

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CONCLUSION:

The current methodology advocated by the EPA stresses **Detect – Delay – Response** and does not include a **Deterrent** methodology. From experience of many water VA's together with other industry VA's, the implementation of **Delay** security measures requires high cost (in many cases considered prohibitive), and also affects the practical operation of the water facility.

Employing an alternative methodology known as the **Deterrent or Prescriptive Methodology**, the costs of security improvements can be significantly reduced, on average by 30% to 60% against the measures required to implement security improvements based on the Sandia Laboratories methodology.

The alternative methodology may not apply to all water facilities where the credible Design Base Threat is considered to be "State Sponsored Terrorist" or "Domestic Terrorist".

However, it should also be recognized that there is no such thing as "Guaranteed Protection" even if funding is available for the more comprehensive security measures that may include hardening of critical assets.

The **Deterrent or Prescriptive** approach to security system design is a tried and proven approach utilized by many leading security consultants very successfully over many years. However, it does require substantial experience and expertise in the application of such an approach, and at the very least, it is strongly recommended that water facilities employ security professionals to properly advise them and to comment on proposed security systems and solutions before implementation.

The benefits of the **Deterrent Approach to Security System Design for Water Facilities** will result in the following:

- 1). **Significant Reduction in Cost**
- 2). **Less Operational Impact**
- 3). **Easier Implementation**
- 4). **Greater Acceptance by Staff and Vendor/Visitors**
- 5). **Flexibility in Meeting Different Needs or Changed Requirements**
- 6). **More Likely to Receive Customer Appreciation and Acceptance**
- 7). **Provides a level of Security consistent with the Design Basis Threat.**

David S. McCann
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