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Reducing Notices of Violation

Citations Received Under the Safe Drinking Water Act

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Douglas M. Brown
Linda McConnell
Sonny Oh

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Logistics Management Institute
6400 Goldsboro Road
Bethesda, Maryland 20817-5886

PREFACE

The Logistics Management Institute was tasked to determine the causes of the notices of violation received by the Army under the Federal Safe Drinking Water Act (SDWA) and similar state statutes and to review readily available historical compliance data. On the basis of a review of the violation citations and through telephone interviews with environmental staff members at all of the cited installations, we have identified several very consistent violation patterns, which are discussed in this report.

This is the fourth report in LMI's series on compliance management. It is also the first in an anticipated sequence of reports that will review the Army's experience with notices of violation in several regulatory programs.

Executive Summary

REDUCING NOTICES OF VIOLATION
Citations Received Under the Safe Drinking Water Act

A major focus of the Army's environmental compliance program in the past two years has been the reduction of cases in which the Army is issued a notice of violation (NOV) or other legal citation for compliance failures. Because of the obvious health risks posed by substandard drinking water, NOVs based on the Safe Drinking Water Act (and similar state provisions) were selected as model cases in order to identify possible systemic problems. Although the total number of violations is quite low, we found that such problems do exist. Many installations must deal with inadequate training, inadequate work forces, delayed funding, and unclear responsibilities. The Army will need to identify the responsible persons, hold them accountable, and provide them with adequate resources of funding and personnel.

We investigated 47 NOVs from 20 installations. We found that the NOVs fell into three general groups: administrative/procedural, poor operations and maintenance (O&M), and exceeding maximum containment levels (MCLs). The most dominant cause for administrative/procedural violations is that the responsible individuals lack knowledge about the regulatory requirements at the installation level. Administrative/procedural NOVs are simple to resolve; most installations are able to correct them easily. *The Army should ensure that one responsible person at each installation is designated as the "compliance monitor" for each of the regulatory programs, and that person should be trained adequately.*

Often, installations are understaffed; as a result, they cannot effectively monitor changes in regulatory requirements and make the appropriate changes in their own procedures to avoid receiving NOVs. *The Army should develop a manpower forecasting model to assist in determining the appropriate staffing requirement at each installation.*

The dominant cause for O&M violations is the inadequate training of the facilities engineers who operate the water systems. Once the deficiencies are made known (via NOVs), they are quickly resolved. Plant supervisors are primarily responsible for resolving this category of violations. *Professional certification and ongoing training are needed to properly equip the plant supervisors and/or the facilities engineers to avoid future O&M NOVs.*

Although only a few NOVs were issued for exceeding MCLs, installations had difficulty implementing corrective actions because of the limited availability of in-house technical experts and limited funding for contract support and for capital projects. Many installations express concern about their ability to meet continuously tightening MCL requirements over the next few years. *The Army should establish adequate technical expertise and a forward-looking funding system to ensure that its treatment systems are capable of meeting new MCLs.*

Achieving full compliance with the SDWA requires concerted efforts among three major functional groups (i.e., environmental staff members, plant operators, and facility engineers) to avoid future NOVs. The NOVs in the current data base indicate a breakdown of coordinated efforts among those groups as a result of confusion about their operating responsibilities and their roles in resolving NOVs. This confusion creates a lack of accountability and hinders coordinated team efforts; it is a structural management weakness. *The Army should properly define the tasks of its environmental and functional managers and provide them with adequate staff to carry out their responsibilities. Then, the Army should institutionalize these requirements to become part of normal operating procedure by making facility operators and their supervisors accountable for resolving situations that could lead to NOVs in their areas of responsibility.*

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CHAPTER 1

OVERVIEW OF THE SAFE DRINKING WATER PROGRAM

FUNDAMENTAL DRINKING WATER SYSTEMS

Most major Army installations own and operate their own drinking water treatment plants and water distribution supply lines within the installations' boundaries. Tables 1-1 and 1-2 show the size and annual operations and maintenance (O&M) cost, respectively, of Army-owned water systems within CONUS. Although many Army installations purchase treated water, in the majority of cases, the Army still provides potable water through its own treatment plants and water distribution lines: as of 1989, 181 Army facilities had permits under the Safe Drinking Water Act (SDWA) or similar State provisions.

TABLE 1-1

CAPACITY OF ARMY-OWNED WATER SYSTEMS (CONUS)

Water system features	Capacity
Total population served	1,471,432
Total volume of water service provided (million gallons per year)	111,910
Treatment and filtration capacity	
Treated water (gallons/day)	352,638,000
Purchased water (gallons/day)	321,725,000
Wells (gallons/day)	332,302,000
Total (gallons/day)	1,006,665,000
Distribution system	
Mains and laterals (feet)	59,688,000
Pump stations (gallons/day)	567,860,000
Storage capacity (gallons)	272,047,000

Source: U.S. Army Engineering and Housing Support Center. *Department of the Army Facilities Engineering and Housing Annual Summary of Operations* (the "Red Book"), Vol. II (1990).

TABLE 1-2

TOTAL ANNUAL O&M COST OF ARMY-OWNED WATER SYSTEMS (CONUS)

Water system features	Annual O&M costs
Water service operations	
Operations cost	$36,239,398
Water system maintenance cost	
Treatment and filtration	8,507,723
Production wells	1,643,358
Distribution system	16,043,620
Total O&M cost	$62,434,099

Source: U.S. Army Engineering and Housing Support Center. *Department of the Army Facilities Engineering and Housing Annual Summary of Operations* (the "Red Book"), Vol II (1990)

These systems employ one of three sources of water supply for providing potable water. The first source of supply is pumping ground water; 51 percent of Army installations draw their water from their own production wells. The second source is withdrawing surface water from nearby reservoirs. The third source is purchasing treated water from a nearby municipal water system.

Depending on the quality of intake water, different water treatment processes are needed to produce potable water that does not exceed maximum contaminant levels (MCLs). A water treatment facility consists of treatment equipment that uses physical processes such as filtration; carbon adsorption; sedimentation; and/or chemical processes such as chlorination, flocculation, fluoridation, and pH adjustment. Most Army water plants use a combination of these treatment technologies to achieve regulatory standards. Even at those Army installations that receive their water supplies from municipalities, some additional treatment may be required once the water flows into the installation's distribution system.

For contingency protection, most Army installations have more than one water supply source; generally, one primary source exists with other sources that could be activated or expanded. Some installations have a number of small self-contained units consisting of ground water production wells and distribution systems because it is not cost effective to tie into an existing major water system. As installations

employ more water supply sources and as regulations become more encompassing, more of those water treatment systems are subject to SDWA regulations.

Figure 1-1 is a schematic of a typical drinking water system. Figure 1-2 shows how the SDWA regulations affect each component of the system. Normally, a permit is required to build and operate a water treatment facility. Operators must have a state certification. Water sampling is required before and after treatment; sampling results must be reported to regulators. Also, many states require a permit for water withdrawals and a permit to construct production wells.

The SDWA regulations cover all aspects of design and O&M of drinking water systems including production wells. Deficient or inadequately maintained water systems are subject to notices of violation (NOVs).

Based on the limited information currently available, it is very difficult to estimate the impacts on the Army drinking water systems when new regulations provide more stringent standards or regulate additional chemicals; however, the cost of sampling is bound to increase because of the larger number of chemicals to be tested. As long as Army installations own and operate water treatment systems or distribution lines, they will continue to be subject to the SDWA regulations.

To achieve full and continuous compliance with the SDWA standards, Army environmental professionals must understand the changing regulatory requirements and develop appropriate technical solutions.

THE SAFE DRINKING WATER ACT

The SDWA, established by Congress in 1974, directed the U.S. Environmental Protection Agency (EPA) to establish minimum national drinking water standards. The statute was codified in the Code of Federal Regulations (CFR) in 1975 (40 CFR 141). The act provides the technical standards that drinking water systems must achieve and the procedural requirements intended to ensure that the technical standards are met and maintained. There are numerous State statutes based on SDWA; the provisions are essentially the same and for the purposes of this discussion all will be considered under the generic SDWA label.

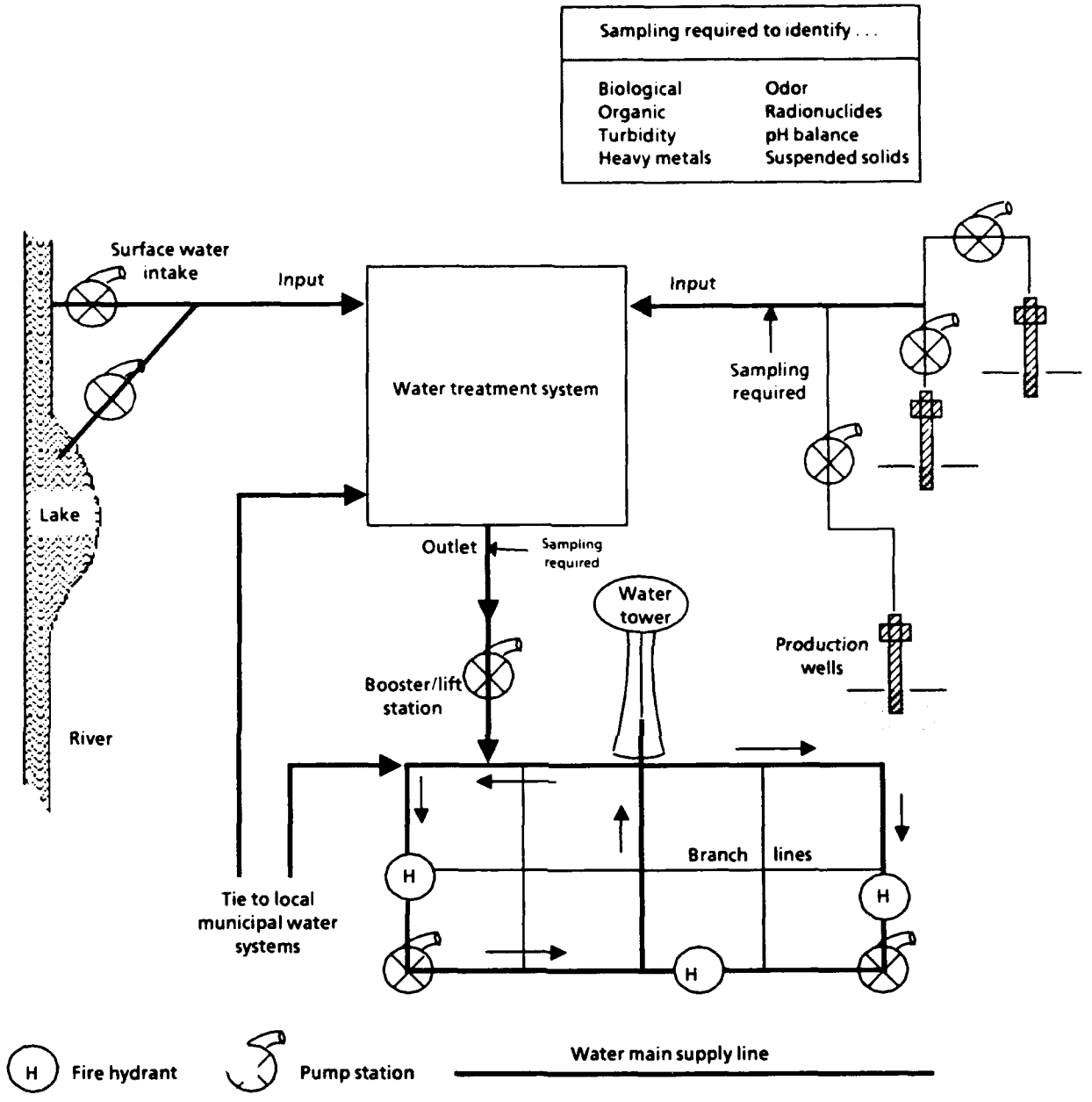

FIG. 1-1. SCHEMATIC OF A TYPICAL DRINKING WATER SYSTEM

Technical Standards

Two types of drinking water standards were established to limit the concentration of specific contaminants in drinking water: primary standards with an MCL to protect human health and secondary standards that address the color, taste, smell, and other physical characteristics of drinking water sources. The National

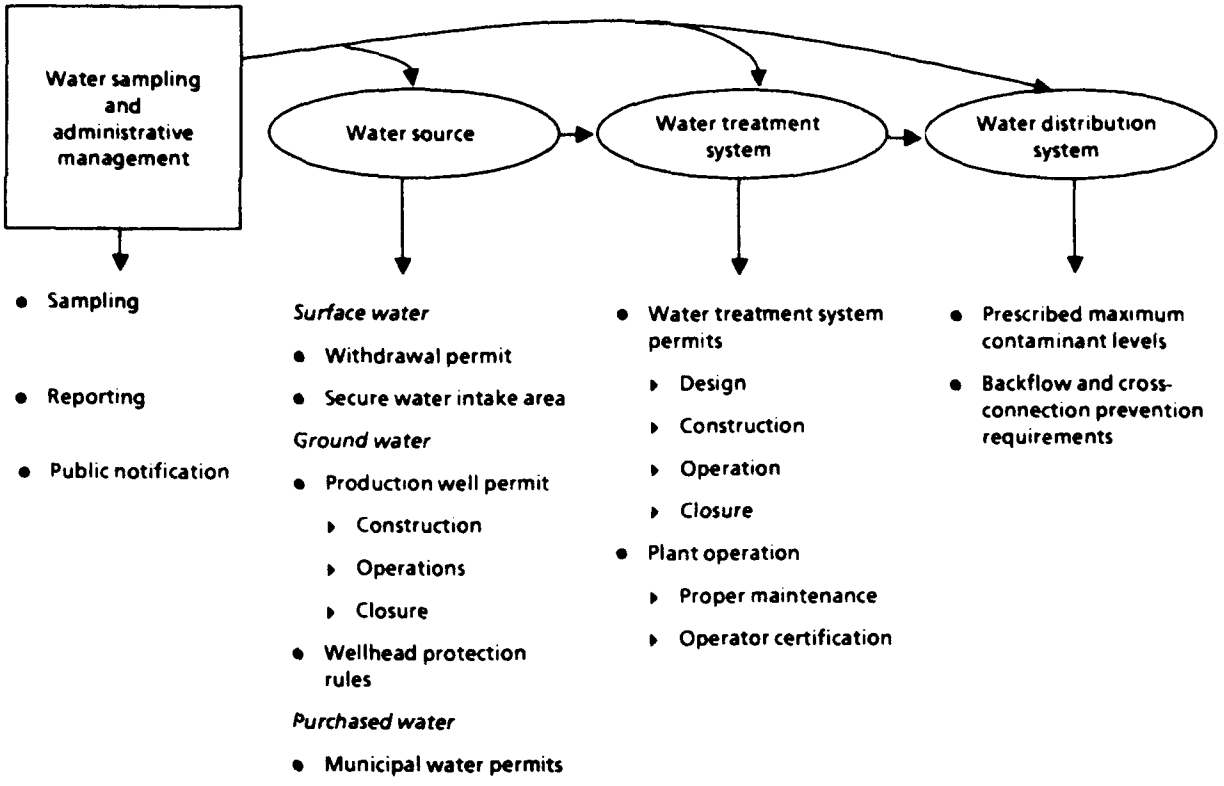

FIG. 1-2. SDWA REGULATORY REQUIREMENTS

Interim Primary Drinking Water Regulations promulgated in 1975 included MCLs for 23 contaminants.

Congress amended the SDWA in 1986 to address the development of standards for additional chemicals and to strengthen regulatory control over public drinking water supply systems. The law requires the EPA to develop both maximum contaminant level goals (MCLGs) and MCLs for each regulated contaminant. The MCLs are enforceable standards; the MCLGs are nonenforceable health goals that water systems should try to achieve.

A second major provision of the 1986 SDWA amendments is the protection of ground water through the regulation of underground injection of toxic chemicals. The regulations established five classes of underground injection wells to prevent the contamination of ground water from underground disposal of toxic and hazardous

materials. Under the regulations, states must adopt a program for wellhead protection.

The SDWA amendments also prohibit the use of lead, provide civil and criminal penalties for persons who tamper with public water systems, and strengthen state regulatory enforcement authority.

In response to the 1986 SDWA amendments, EPA will phase in regulations to develop new and revised standards for 112 contaminants over a 10-year period. Table 1-3 and Figure 1-3 summarize the schedule for promulgation of existing and future SDWA regulations with respect to the number of new and revised contaminants being regulated.

At present, no Army data system indicates the installations that may exceed the MCLs for newly regulated contaminants, although a 1988 Army Environmental Hygiene Agency (AEHA) study did conclude that almost all of the substances were experienced at some installations.[1]

Procedural Requirements

The 1986 SDWA amendments significantly increased the sampling and monitoring requirements for owners/operators of water treatment systems. Monitoring requirements are most stringent during the first year of each new regulatory phase, when regulations become effective in terms of the number of samples to be collected and analyzed and the frequency of sampling. In general, after the first year of compliance monitoring, sampling requirements are significantly reduced for water treatment systems that have consistently met the new regulatory standards. Water treatment systems that cannot meet the new standards may have to upgrade and retrofit system equipment to attain compliance. For example, if the standard for lead is exceeded, new or additional treatment components must be implemented and monitored.

Specific sampling requirements differ from state to state. In general, however, the requirement for operating plants (as opposed to newly constructed plants) is that samples are taken at various intervals. Turbidity is tested daily; coliforms are tested on a varying schedule depending on the size of the installation (but generally on a

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[1]U.S. Army Environmental Hygiene Agency, *The USAEHA Synthetic Organic Chemicals Survey (SOCS).* Undated (c. 1988).

TABLE 1-3

SUMMARY OF PROMULGATION FOR SDWA REGULATIONS SCHEDULE

Time period	Final regulations	Number of new contaminants regulated	Cumulative number of contaminants regulated
Pre-1986	National Interim Primary Drinking Water Standards	23	23
1986	Fluoride – revised	0	23
1987	Phase I Volatile organic chemicals	8	31
1988	None	0	31
1989	Total coliforms – revised Surface water treatment • 4 new parameters • 1 revised parameter	4	35
1990	Phase II Rule • 23 new chemicals • 11 revised chemicals • 11 deleted chemical	23	58
1991	Phase II Rule (continued) • 4 new chemicals • 1 revised chemical Copper (new standard) Lead – revised	5	63
1992	Phase V • 23 new chemicals • 1 revised chemical	23	86
1993	Phase III (Radionuclides) • 2 new chemicals • 4 revised chemicals	2	88
1994	None	0	88
1995	Phase VIA • 9 new chemicals • 1 revised chemical Phase VIB • 15 new chemicals Arsenic – revised	24	112

weekly basis); other constituents may be tested monthly, quarterly, or annually. These are single-specimen samples. Besides these samples, water plants are required to maintain mechanical real-time monitoring devices. In some states, a plant's laboratory may be tested using blind samples; in other states, periodic detailed

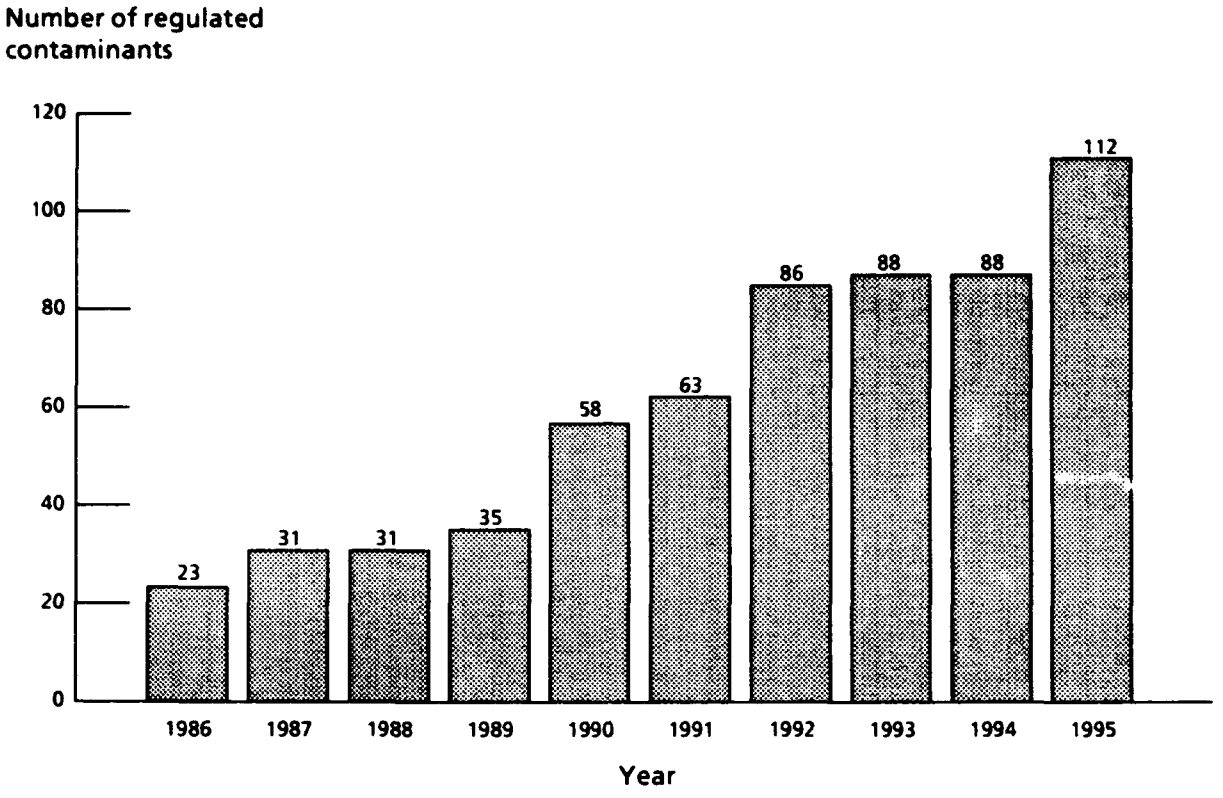


FIG. 1-3. CUMULATIVE NUMBER OF REGULATED CONTAMINANTS FOR MCL

samples (with split testing, blanks, etc.) must be performed by certified laboratories. The requirement to submit reports is the means of regulatory control on the sampling process.

REPORTING REQUIREMENTS

The regulations under the SDWA require owners/operators of public water systems (including the Army) to comply with the following reporting requirements:

- Any test measurement or analysis required to be performed must be submitted to the state within the first 10 days either following the month in which the results are received from the laboratory or following the end of the required monitoring period.
- If a water system fails to comply with *any* primary drinking water regulation (including monitoring requirements), it must be reported to the state within 48 hours. In addition, public notices of the potential health risk are required.

- Within 10 days of completing a public notification, the water system must submit to the state a copy of each type of notice distributed, published, or posted.

The failure of an Army installation to comply with these requirements on a timely and complete basis will most likely result in the receipt of an NOV from the state. The installation should contact the state agency to ensure that the correct standard forms required by the state for reporting this information are being used.

A water system does not have to report the results of test measurements and analyses if a state laboratory has performed those tests and submits the results to the appropriate state office.

Record Keeping

Owners/operators of drinking water systems must keep some specific records on the premises or at a convenient location near the premises for inspection by state regulators. The types of required records and the length of time that they must be retained are as follows:

- Bacteriological analyses, retained for no less than 5 years;
- Chemical analyses, retained for no less than 10 years;
- Records of actions taken to correct violations, retained for no less than 3 years after the last action was taken;
- Copies of written reports, summaries, and communications relating to sanitary surveys of the system, all retained for no less than 10 years after completion of the survey; and
- Records on a variance or exemption granted to the system, retained for no less than 5 years following expiration of the variance or exemption.

The failure to keep complete and accurate records can result in the receipt of an NOV from the state. Installations should keep copies of all of those records in one location so that they can be easily accessed.

CHAPTER 2

HISTORICAL DATA ABOUT VIOLATIONS

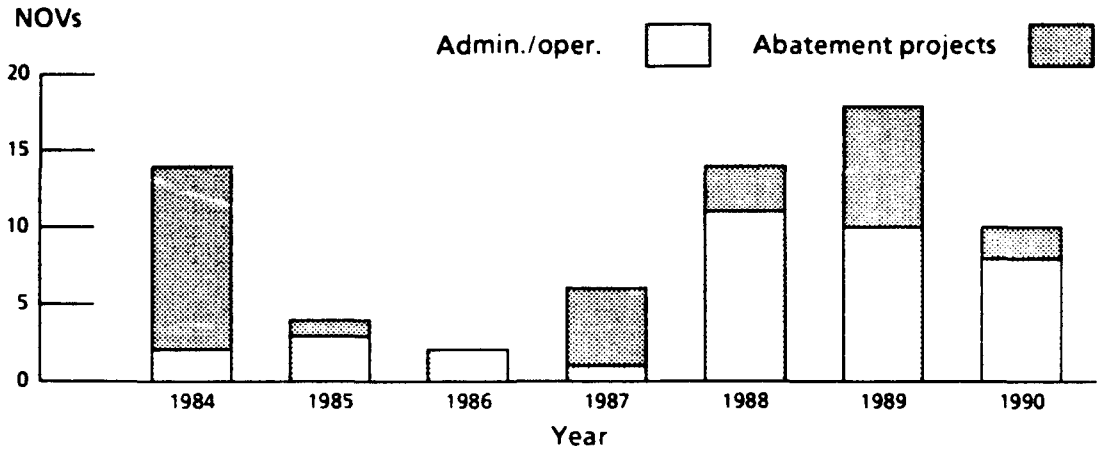
From 1984 to 1990, the Army used the *Defense Environmental Status Report* (DESR) to keep track of its environmental compliance efforts. Appendix A contains a copy of the DESR format for tracking SDWA compliance efforts. Appendix B displays the data from past DESR submittals from Major Commands (MACOMs).

STATUS OF THE ARMY'S SAFE DRINKING WATER PROGRAM

One of the biggest problems with the available data is that there is little baseline information. The data collection system only addresses SDWA issues in terms of violations. Data about the number and types of water sources and treatment facilities are inadequate. Therefore, our analysis is based on the very limited data set that was readily available. Because of the small number of installations receiving NOVs under the SDWA, we advise against attempts to draw "statistically significant" conclusions in comparing DESR data across MACOMs or over time. In Chapter 3, we analyze the specific NOVs on file at the Army Environmental Center during the past 3 years. In this chapter, we review the DESR data to provide background on the Army's safe drinking water program over the past 8 years.

Since 1986, the number of NOVs issued under the SDWA has steadily increased (see Figure 2-1). Also, the total number of Army installations operating drinking water treatment plants that exceed MCL standards has also increased (see Figure 2-2). The DESR classified NOVs as either administrative/operational (if the NOV could be resolved without capital projects) or as substantive (if the corrective action requires abatement projects). These classifications do not really represent the true picture of the severity or seriousness of violations. We cannot tell from the DESR why NOVs are being received.

The DESR data show that the total number of Army-owned water treatment systems subject to SDWA regulations is increasing (see Figure 2-3). Although we do



NOV solutions	1984	1985	1986	1987	1988	1989	1990
Admin./oper.	2	3	2	1	11	10	8
Abatement projects	12	1	0	5	3	8	2
Total NOVs received	14	4	2	6	14	18	10

FIG. 2-1. NOVs RECEIVED – SAFE DRINKING WATER PROGRAM

not know what factors are causing this trend, it shows that the Army is responsible for O&M at a very large number of water treatment plants, and those numbers are increasing. This trend indicates that the Army's existing policy[1] of phasing out Army-owned water treatment plants based on economic cost/benefit analysis (and instead using the water supplies of surrounding municipalities) has not been effective and will in no way reduce SDWA impacts. It will take a long time to phase out all 181 Army-operated treatment systems. In the meantime, the Army must ensure that those plants are operated and maintained to meet increasingly stringent SDWA standards.

There are a number of possible reasons for the unfavorable trends. They can be grouped into three major categories. The first possibility is that regulators are getting tougher; in part, this is reflected by NOVs issued for minor violations that

[1]Memorandum, Office of the Chief of Engineers, CEHSC-FU-S. Subject: *Army Policy for Obtaining Water Supply, Wastewater, Solid Waste, Heating, Electricity, and other Utility Services.* 5 September 1991.

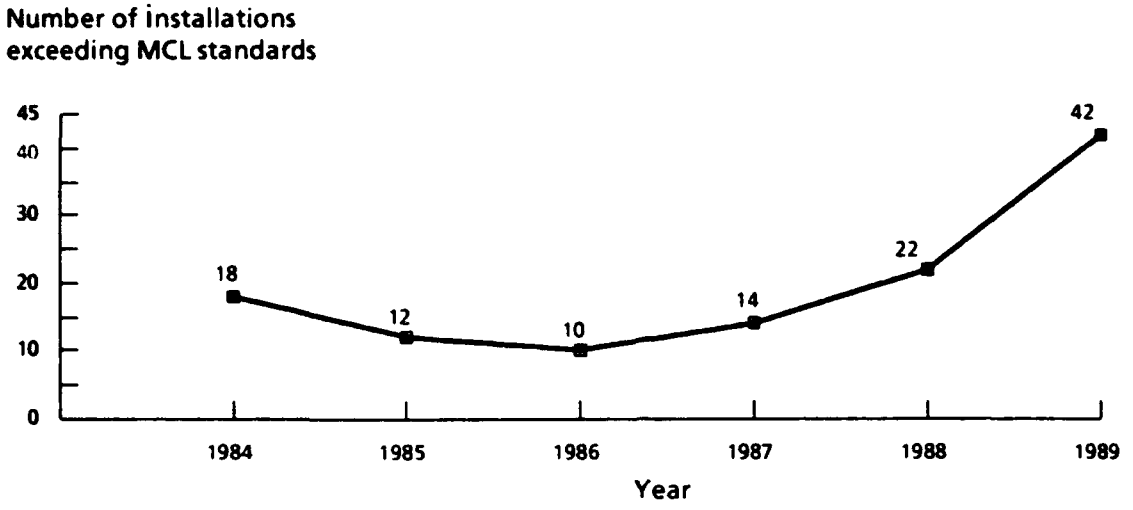


FIG. 2-2. SAFE DRINKING WATER PROGRAM – NUMBER OF INSTALLATIONS WHERE MCL STANDARDS WERE EXCEEDED

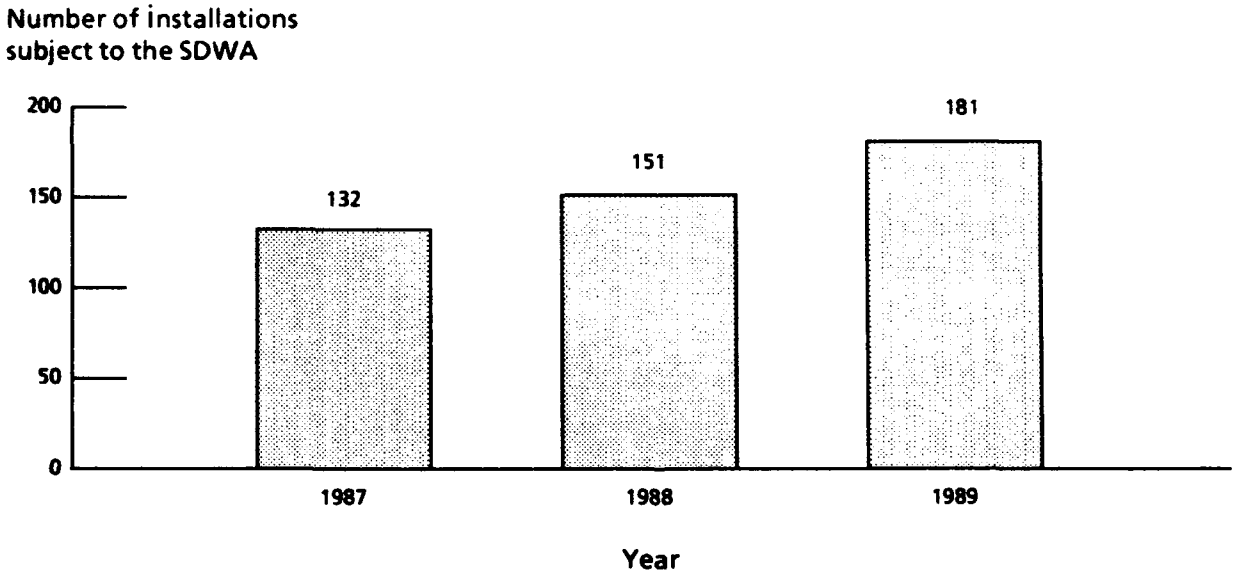


FIG. 2-3. SAFE DRINKING WATER PROGRAM – ARMY-OWNED WATER TREATMENT SYSTEMS

may not have triggered issuance of an NOV in the past. In addition, a greater number of contaminants are being regulated and regulators are conducting more frequent inspections. The second reason is that the Army's drinking water plants are getting old and they cannot meet the new standards because no modifications were

made due to a lack of funding. Third, Army installations do not devote adequate management attention or resources to achieve compliance.

The DESR data cannot provide information in any further detail to show why NOVs are being received by the Army. Instead, we used the 47 SDWA NOVs received at 20 Army installations during a recent 3-year period (i.e., 1989 through 1991 (that were reported to the Army Environmental Center). Details of the findings related to those NOVs are provided in Chapter 3.

Army installations that own water treatment plants should perform studies to determine whether their water plants can meet new SDWA standards that will come into effect in the future (see Table 1-3) and the cost of achieving compliance. The studies should also investigate the condition of each plant, the feasibility of connecting to municipal water sources, and the total life-cycle conversion cost for switching to municipal water systems. Since water systems will be subject to more regulations, the Army must ensure that it allocates the necessary funds to remain in compliance if the Army intends to maintain ownership.

DB1383 PROJECT BACKLOG

Analysis of current DB1383 project submittals[2] shows that Army installations are requesting over $200 million in additional funds to meet SDWA requirements. Table 2-1 shows the breakout of their funding requests by the components of a typical drinking water system. Figure 2-4 shows further breakdowns of where the Army's funds are to be spent.

[2]The DB1383 is the Army's data base that records all requirements for environmental projects.

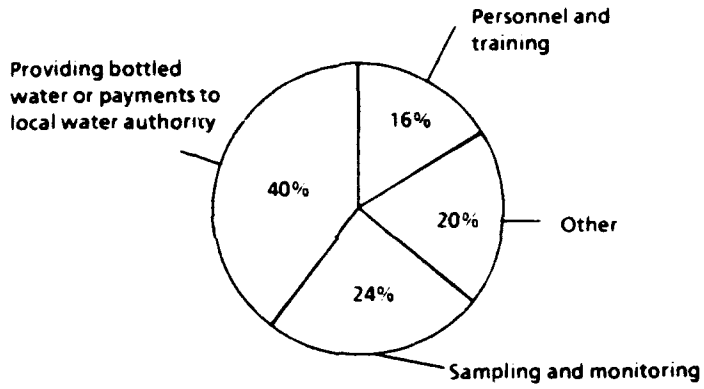
TABLE 2-1

DB1383 SDWA PROJECTS BREAKOUT BY SYSTEM COMPONENT

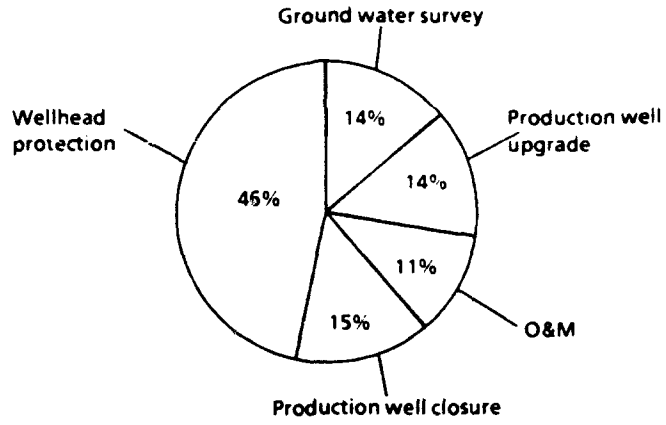
System component	Number of projects	Total project costs ($ millions)
Water sampling and administrative management	117	34.4
Water source	37	8.4
Water treatment system	45	37.6
Water distribution system	77	52.0
Total	276	132.4

Note: These projects only include CONUS Army installations.

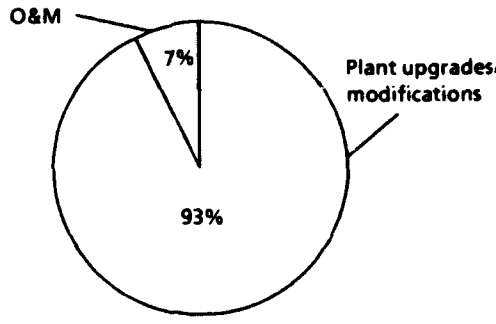
Water Sampling and Administrative Management



Production Well



Water Treatment Plant



Distribution System

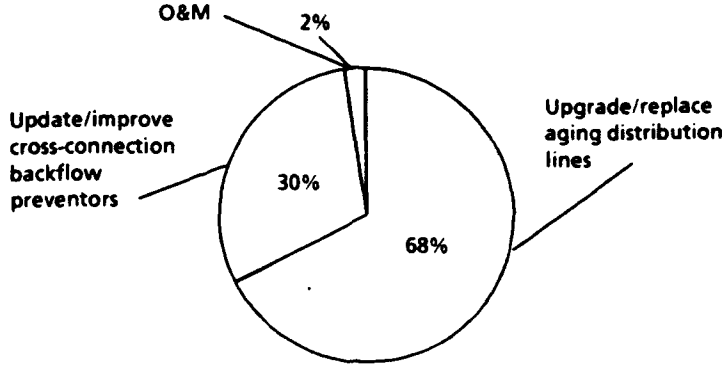


FIG. 2-4. PERCENTAGE DISTRIBUTION BY WORK CLASSIFICATION

CHAPTER 3

PROBLEMS THAT CAUSE VIOLATIONS

NOVs AND THEIR ROOT CAUSES

Since receipt of an NOV represents the symptom of a problem, by analyzing the circumstances for receiving the NOV we can make a better assessment of the potential root causes of the problem. Table 3-1 summarizes 46 NOVs issued to 20 Army installations during a recent 3-year period on a by-installation basis; Table 3-2 summarizes them by root cause. Appendix C describes the circumstances surrounding each NOV, and Appendix D lists the major root causes for each NOV.

After evaluating the NOVs, LMI identified seven consistent root causes for receiving the NOVs. These root causes are described below.

Lack of environmental knowledge: A lack of environmental knowledge may be due to no assigned environmental professionals, inexperienced and/or inadequately trained personnel, environmental staff's failure to maintain required regulatory knowledge base due to understaffing, poor record keeping/tracking, and other deficiencies for knowing compliance requirements.

Equipment failure/obsolete: Unexpected failure of equipment may occur even though the proper preventive maintenance has been performed; it may also be caused by obsolete equipment beyond the installation's ability to repair and by other unforeseen technical failures that are not the fault of the installation.

Regulator error/confusion: NOVs may be inadvertently issued, or issued because of regulators' mistakes, their incorrect advice, and/or their failure to provide timely advice.

Lack of resources/funding: Projects may go unfunded; other deficiencies may arise due to a lack of funds.

Contract problem: A contract problem may be due to poor contract management, a contractor's inability to satisfy contractual agreements, a poorly written statement of work, a contracting officer's lack of familiarity with

TABLE 3-1

ROOT CAUSES OF NOVs

Installations	Number of violations		Root causes	Impact on Army mission due to corrective measure
	Procedural/ administrative	Exceeding MCL standard		
A	2	1	R, K, L, E	No
B	1	1	T, K, L	No
C	5	0	K, L	No
D	0	1	R, T	No
E	2	0	C, K	No
F	1	1	K, L	No
G	1	0	K, L	No
H	9	0	K, L	No
I	1	0	L	No
J	1	0	K	No
K	1	0	R	No
L	1	0	K	No
M	1	0	K, C	No
N	3	0	K, L	No
O	2	1	C, K	No
P	2	0	R	No
Q	1	0	K, T	Yes
R	1	0	T	No
S	1	3	E, T, F	No
T	2	0	K	No
Total	38	8		

Note: C=contract problem; E=equipment failure/obsolete; F=lack of resources/funding; K=lack of environmental knowledge; L=lack of management attention/poor supervision; R=regulator error/confusion; T=lack of a technical solution.

environmental contracts, contract fraud where contractors did not perform the required work, lengthy or otherwise unresponsive Army contracting processes, and any other contract-related factors.

Lack of a technical solution: A technical solution simply may not be apparent, a problem may require study before developing acceptable solutions, a technically feasible solution may be unavailable, and/or technical review or direction from

regulators may be unavailable (even though they are required to provide that service).

Lack of management attention/poor supervision: Violations may be due to management's disinterest in, or the low priority accorded to, the prevention of violations. Poor worker discipline or work ethics and other failures of supervision may also be causative elements.

TABLE 3-2

SUMMARY OF ROOT CAUSES OF NOVs

Root causes	Frequency
Lack of environmental knowledge	14
Lack of management attention/poor supervision	8
Lack of a technical solution	5
Regulator error/confusion	4
Contract problem	3
Equipment failure/obsolete	2
Lack of resources/funding	1

Note: The 20 installations provided between 1 and 4 reasons why the NOVs occurred; some apply to multiple violations. Thus, the total frequency is 37 rather than 47 (the number of violations) or 20 (the number of installations).

A lack of environmental knowledge at the installation level is the dominant cause for receiving NOVs. However, installations' environmental staff members indicate that most of the NOVs are resolved quickly when new environmental staff members are hired or when violations are pointed out to environmental coordinators.

It is important to draw the distinction between one-time "resolution" of a specific NOV and permanent elimination of the type of violation that the NOV cites. The installations consistently stated that environmental staff members are overburdened and fail to keep track of minor regulatory changes since they are too busy with different compliance activities in other regulatory programs. As a result, "resolved" NOVs can and do recur.

Problems associated with a lack of management attention and poor supervision are quickly resolved when installations receive NOVs. In a way, these particular NOVs have served as "wake-up calls" for Army installations and their leadership to pay more attention to SDWA compliance issues. We believe the Army's top-down environmental awareness campaign to eliminate NOVs has been effective and that such management pressure should be continued.

A lack of available technical solutions when installations exceed MCLs is an ongoing area of concern. All installations with this problem have expressed some frustration at not being able to resolve technical problems. The Army should address this issue more closely because it owns 181 treatment plants and they will be subject to more regulatory scrutiny.

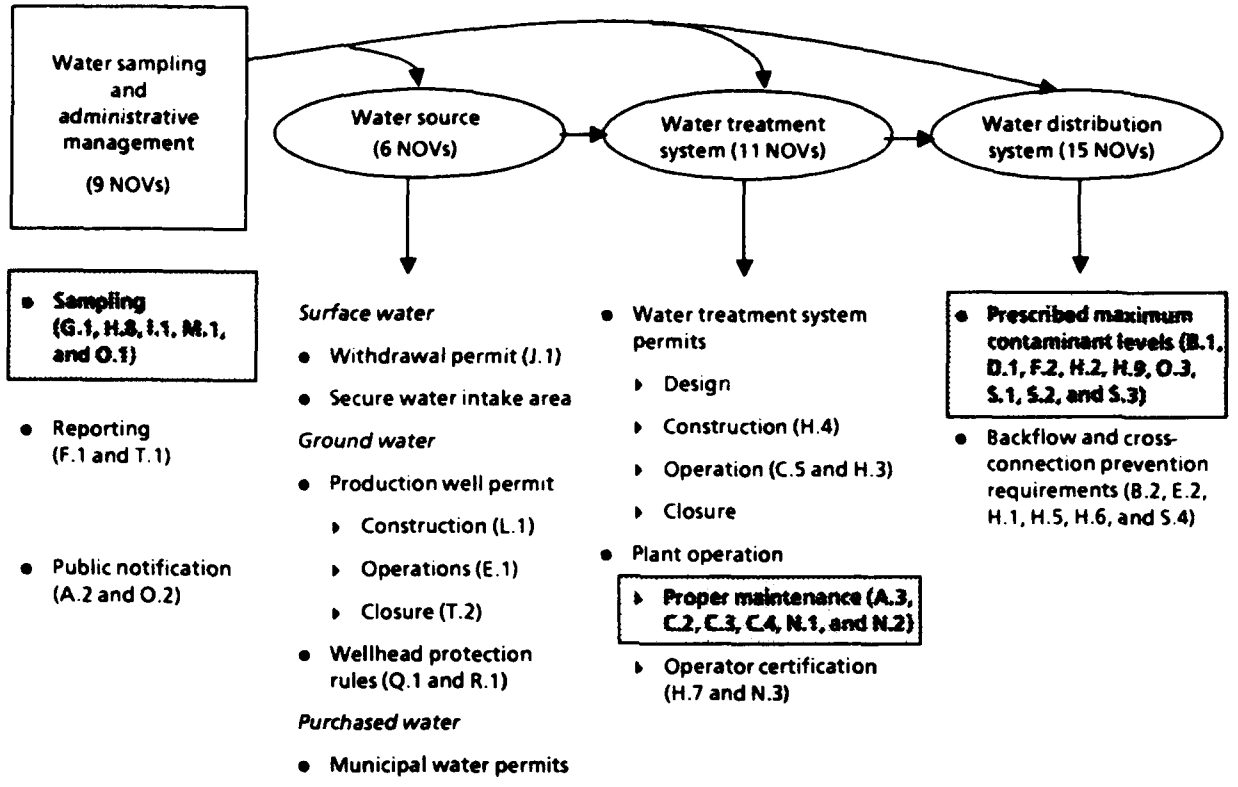
ANALYSIS OF NOVs AND SOLUTIONS

Figure 3-1 reproduces Figure 1-2, which portrays the interface of the physical water systems and the regulatory provisions. However, in Figure 3-1, we highlight the three areas accounting for most of the NOVs analyzed; clearly, these should be the areas of primary concern.

Various solutions can be developed to address the problems identified in Table 3-1. By targeting a specific problem with an appropriate solution, the cause-and-effect chain can be broken to eliminate further NOVs. This study does not address specific solutions to avoid specific violations. More detailed study is needed to make such recommendations. However, we do provide in Chapter 6 some specific programmatic recommendations that address the major and most consistent deficiencies; implementation of our recommendations should improve the overall program and cause the elimination of a substantial portion of the NOVs.

SAMPLING AND PROCEDURAL NOVs

The majority of violations, 41 of 46 NOVs (89 percent), are procedural violations that can be classified as administrative NOVs. The main causes for these NOVs are largely that the installation environmental staff does not know all procedural regulatory requirements. This lack of knowledge may result from inexperienced or overburdened staff who must deal with increasingly complex regulatory requirements. Even the most experienced environmental staff members can be



Note: Alphanumeric decimal codes indicate the installation code and the "finding number." (See Appendix C.)

FIG. 3-1. SDWA NOVs

caught off guard since the regulations are constantly changing and often difficult to understand.

In general, it can be argued truthfully that the administrative NOVs are incidental in nature (in that the regulatory requirements are simply overlooked); the violations did not pose serious threats to human health. However, administrative violations create an unfavorable image of the Army by implying that installation-level environmental professionals do not have adequate concern for the health risks associated with the SDWA. More importantly, administrative NOVs potentially can have a serious impact on human health if they continue persistently. To avoid continuing administrative NOVs, the most practical solution has been to hire fully qualified environmental professionals to monitor SDWA compliance.

Administrative NOVs are relatively easy to resolve once the environmental staff learns about the deficiencies. All installations cited took corrective measures soon after deficiencies were identified. Again, we must emphasize that one-time "resolution" of a specific violation is not the same as fixing the underlying systemic problem(s) that will likely cause that violation to recur.

Regulatory SDWA requirements are constantly changing and it is very difficult to avoid receiving administrative NOVs unless someone constantly keeps track of all applicable requirements for each installation and develops appropriate corrective actions. The implementation of the Environmental Compliance Assessment System (ECAS) auditing process will help to identify deficiencies before regulatory inspections find them; but because the ECAS audits are infrequent, installations must develop their own control capabilities. To eliminate administrative NOVs, the Army must develop an extensive research capability to perform analyses of all drinking water control regulations (Federal, state, and local) to stay current on all regulatory requirements that apply to Army installations. Either way, installation environmental staff members must stay on top of regulatory changes and identify and implement appropriate corrective action. Some continuing training efforts need to be organized to inform the installation-level environmental staff about regulatory changes and how to take the appropriate proactive or corrective actions.

SUBSTANDARD WATER TREATMENT SYSTEMS

Many installations have neglected the proper upkeep and maintenance of their drinking water systems. Although those systems are old, the equipment still must perform up to standard. If those installations had a good preventive maintenance program, most of these NOVs could have been avoided. Plant supervisors have the primary responsibility for proper O&M of the treatment systems.

It is an appealing shortcut for plant supervisors to reduce preventive maintenance when there is a shortage of available resources. It takes a long time before the lack of preventive maintenance causes the system to deteriorate to a point where it becomes a major problem. However, when that major problem occurs, it normally requires a very extensive capital investment. Environmental staff and plant supervisors must periodically inspect the systems to ensure that proper preventive maintenance is conducted.

VIOLATIONS EXCEEDING MCLs

The NOVs received for exceeding MCLs can have serious impacts on human health. Although only two installations actually received NOVs for exceeding MCL standards, the number of Army installations reporting themselves through the DESR system as exceeding MCL standards has increased as shown in Figure 2-2 (copied here as Figure 3-2 for convenience). This trend should be of concern to the Army. Since the DESR and the NOV data base do not provide sufficient information to determine the causes of this increase, and the case studies were able to consider installations only as individual cases, further study is needed to determine the causes.

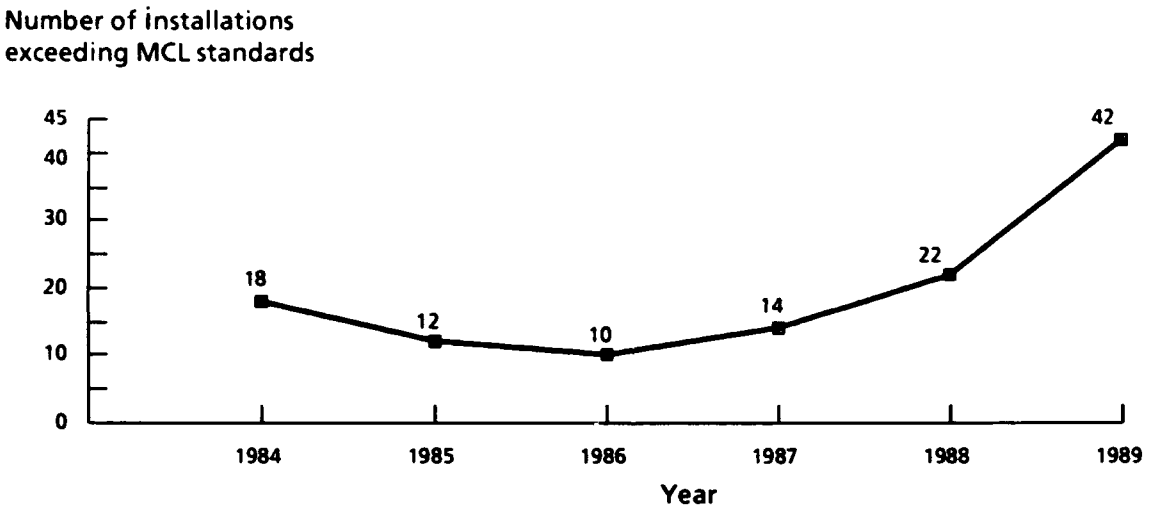


FIG. 3-2. SAFE DRINKING WATER PROGRAM – NUMBER OF INSTALLATIONS WHERE MCL STANDARDS WERE EXCEEDED

There could be many reasons for exceeding MCL limits: operator error, equipment failure, sampling error, and so forth. Often, installation staff members do not know why MCLs are being exceeded. Generally, however, exceedances are indicators of an inadequate capital facility [except for one-time incidents (i.e., bypasses or upsets)].

When an NOV is received for exceeding an MCL, an installation may be confused about who is responsible for implementing corrective measures. Often, the environmental office takes responsibility for immediately resolving NOVs with

regulatory agencies, but it must also implement the corrective action. Unlike an administrative violation, an NOV for exceeding MCL limits usually requires a technical solution. Normally, consulting engineering firms are hired to provide technical support. Depending on the reasons for exceeding MCLs, the development of appropriate technical solutions can be a very complex process. Where possible, the installation's sanitary engineers are brought in to develop an engineering solution. However, many installations do not have the engineers on their staffs.

Many installation environmental managers are concerned about aging water treatment facilities and equipment. Several violations can be attributed simply to the obsolescence of the water treatment systems. To sustain continual compliance and avoid future substantive violations, a coordinated effort among operators, water engineers, environmental staff members, and health hygiene professionals is needed. This coordination is critical in developing retrofit projects to resolve equipment deficiencies.

When more stringent or additional MCL standards are proposed, they are usually followed by some confusion and controversy about how to meet the new standards. Army installations must review their water systems to determine the measures that are required to satisfy the new standards. Although architectural-engineering (A-E) and environmental firms are hired to provide this technical support, the Army must develop internal expertise to ensure that the corrective measures taken are in the best interests of the Army and of the environment. Shortage of funding has not been a factor with respect to this area.

CONCLUSIONS

Army installations have received NOVs for a number of different reasons. Internal Army difficulties have been accompanied by stricter regulatory enforcements that include more frequent inspections, tougher interpretation of regulations, and increasing sampling and monitoring requirements. Although SDWA regulations are becoming increasingly stringent, the Army must correct any deficiency to ensure full compliance. Lack of maintenance for aging mechanical systems, inadequate or inexperienced environmental staff members, and contracting problems are major reasons for receiving NOVs. Resolving NOVs has been relatively simple for most of the installations; the impact on the Army's missions has been minimal to date.

The NOVs that we reviewed reveal some structural weaknesses within the Army's compliance programs. The Army does not have adequate environmental regulatory knowledge or the technical expertise to ensure that all Army-owned water treatment plants are in compliance. Also, there is no clear line of organizational responsibility for tasks among the various functional experts. Until these structural problems are addressed, Army installations will be forced to perform continual patchwork to resolve NOVs by the most expedient methods to relieve the regulatory pressure.

Although each Army installation has the flexibility to implement any feasible solution it deems appropriate, it will be very difficult for the Army to coordinate its compliance efforts. Some management structure is needed to ensure that good solutions at the installation level are shared with the rest of the Army. It is also true that overreaction at any one installation may set an unnecessarily expensive precedent for other Army installations. Installations need more detailed guidance, direction, and assistance for building their compliance efforts.

CHAPTER 4

SIGNIFICANT NOVs AND NON-COMPLIANCE CASES

This chapter is reserved (in the NOV series format) for a discussion of significant violations within the larger set of NOVs on file. In regulatory programs (such as The Clean Water Act) where more NOVs are issued, it will be impossible to conduct interviews on every NOV as we have done in this report. In such future reports, this chapter will provide analysis based on interviews to explore the details of a subset of the violations.

CHAPTER 5

FUTURE CHALLENGES IN SAFE DRINKING WATER REGULATION

A forecast of the future environmental program management challenges under the SDWA must be based on an understanding of the environmental activities being conducted and the specific attributes of those activities that are affected by the changing regulatory provisions. At present, the Army has no consolidated system for identifying and collecting such information. A number of specific research studies have been initiated, under diverse sponsorship, to address pieces of the puzzle. Within the scope of this study (in terms of time, resources, and desired output), we did not review those specific research studies.

This chapter addresses new SDWA regulations and identifies the data that would be required to complete an impact assessment. Unfortunately, none of that required information is readily available to Army environmental decision-makers.

REGULATORY CHANGES

Volatile Organic Chemicals

Volatile organic chemical (VOC) regulations were revised in 1991 to synchronize them with other VOC monitoring requirements in a new set of regulations called Phase II. The Phase II SDWA regulations set standards for 39 chemicals: standards for 27 new chemicals and revised standards for 12 existing chemicals. Phase II also deletes silver as a primary drinking water standard. Monitoring requirements became effective on 1 January 1993.

Also under the Phase II regulations is a one-time requirement to sample for 30 additional unregulated contaminants (i.e., there are no MCLs for these particular chemicals). Samples must be taken during the first year of compliance monitoring, effective 1 January 1993. If any of these 30 contaminants are detected, the state then will determine future sampling frequencies. Water systems with less than 150 service connections may request a waiver from the state to be exempt from these monitoring requirements.

The Phase II rule will significantly increase sampling and analysis requirements for all installation drinking water systems; some installations, unable to meet the MCLs, will have to invest in additional treatment technologies. It should be noted that compliance monitoring for new Phase II chemicals will not occur at the same time for all drinking water systems. States will determine when compliance monitoring is to begin for each water treatment system.

If a water system cannot consistently meet the MCL for any of the 39 primary Phase II contaminants, a treatment technology must be installed to bring the system into compliance. Deferrals for installing treatment technologies are allowed under some circumstances. Installation of treatment technologies may not be required for systems that develop a new drinking water source, join with another water system, or blend present supplies with water from other supplies.

Total Coliform Rule

Army drinking water systems that cannot consistently comply with total coliform MCL will have to institute improved treatment practices (e.g., disinfection). Because monitoring for total coliforms already has been required for 2 years, it should be relatively easy to identify those installations that are having problems complying with the MCLs. States may allow variances for systems with persistent total coliforms due to distribution system problems, but only those systems not at risk of fecal or pathogenic contamination are eligible.

Surface Water Treatment Rule

The Surface Water Treatment Rule (SWTR) became effective on 31 December 1990. This rule affects drinking water systems using surface waters and requires systems to install filtration equipment if the microbiological, turbidity, and other established standards are not met. All surface water treatment systems must disinfect their water supplies. Table 5-1 presents the specific compliance dates for meeting the water quality and treatment requirements of this rule. The more resource-intensive milestones begin in 1993.

Treatment is required to minimize or prevent the occurrence of identified microbiological contaminants in a drinking water supply. Systems that conduct filtration must ensure that filtration and disinfection processes are operating effectively.

TABLE 5-1

COMPLIANCE DATES FOR THE SURFACE WATER TREATMENT RULE

System type	Requirement	Date
SW-UF	Begin monitoring	12/31/90
SW-UF	Meet all criteria to avoid filtration	12/31/91
SW-UF	Install filtration if required to filter	6/29/93
SW-F	Perform and monitor filtration	6/29/93
GW-UDI	State must notify system that it is in UDI status	6/29/94

Note: SW-UF = surface water unfiltered; SW-F = surface water filtered; and GW-UDI = ground water under direct influence of surface water.

The impact of this rule on Army water systems will be greatest for those installations using surface water as their source and that do not currently have filtration equipment. Water systems without filtration should first determine if they can meet the criteria for unfiltered systems to avoid having to install new filtration equipment. Those systems that cannot comply with these criteria must implement and properly operate filtration equipment.

Lead and Copper Rule

Promulgated on 7 June 1991, the lead and copper rule requires treatment when lead and/or copper in drinking water exceeds the established standards. The monitoring requirements for this rule became effective on 7 December 1992. To determine where to conduct monitoring, water treatment systems must first conduct "materials evaluations" of their distribution systems to determine which residences/buildings are at high risk of lead and copper contamination. Each water system must collect samples from a specific number of sites depending on the size of the population served. If the concentration of lead or copper reaches specified levels, and if corrosion control and source water treatment do not remedy the problem, then replacement of service lines *must* be conducted.

Phase V – Regulations

The Phase V rule sets drinking water standards for 23 additional contaminants. This rule gives an MCL and an MCLG for each of the 23 regulated contaminants. Also addressed are requirements for monitoring, reporting, public notification, and Best Available Technologies (BATs) for water treatment. The frequency of monitoring is based on the type of contaminant and the source water. Water systems with 150 or more service connections (i.e., most Army systems) will initiate monitoring during the 1993 through 1995 period. States will determine when, within these 3-year monitoring periods, each water system must conduct its monitoring program.

Phase III – Radionuclide Regulations

The regulations for radionuclide contaminants are currently in the proposed stage. Final regulations were scheduled to be promulgated in April 1993. The proposed regulations set MCLs and MCLGs for four radionuclide contaminants (i.e., radium-226, radium-228, radon-222, and uranium) and two categories of radionuclides (i.e., adjusted gross alpha emitters and beta and photon emitters). The proposed rule also establishes requirements for monitoring frequency, analytical methods, BATs for compliance with the MCLs, public notification, reporting and recordkeeping, and unregulated contaminant monitoring for lead-210. Water systems using either ground water or surface water will be required to comply with these regulations. The first compliance monitoring period for these regulations is proposed to begin in January 1996. The frequency of monitoring will depend on the specific contaminant and the system's vulnerability to each contaminant. Systems that will not be able to comply with the MCLs must either implement an appropriate treatment technology or find an alternative water source that can meet the compliance requirements.

INFORMATION REQUIREMENTS

In order to track the potential impact of the drinking water regulations envisioned, Army managers must know the following:

- Source(s) of installation water;
- Installations where source water meets quality criteria;

- Installations with filtering systems;
- Treatment methodology at each installation;
- Number of service connections (or major/minor facility);
- Presence of MCL contaminants (by phase); and
- Presence of radionuclides.

REGULATORY IMPLICATIONS

Despite the lack of data to support more sophisticated analysis, the following observations seem evident from the trends seen in the regulations.

Taking one-time samples in advance to identify contaminants that will be regulated in the future would provide the maximum lead time to develop alternative solutions to costly capital facility upgrades. However, establishing the presence of compounds to be regulated in the future could result in a requirement to conduct extensive monitoring or corrective actions even in advance of the effective date of the regulatory provision. Therefore, the Army should be cautious about directing widespread sampling for presently unregulated materials. However, installations with existing data (e.g., from previous samples or corrective actions) should use this information to plan funding and activities in order to come into compliance as quickly as possible.

The changes in the SDWA have significantly increased the sampling and monitoring requirements for owners/operators of water treatment systems. Monitoring requirements will be most stringent during the first year of each new regulatory phase in terms of the numbers of samples to be collected and analyzed and the frequency of sampling. In general, after the first year of compliance monitoring, sampling requirements are significantly reduced for water treatment systems that have consistently met the new regulatory standards. Water treatment systems that cannot meet the new standards will generally have to upgrade and retrofit system equipment to attain compliance.

The numbers of SDWA violations that Army installations receive are expected to be greatest during the first year that new regulations become effective because some installations will fail to take the required samples, and some will be unable to meet MCL standards. Assuming that most installation water treatment systems can consistently meet the new compliance standards, the numbers of violations should

decrease to current levels. Again, effective training (as recommended in Chapter 3) can reduce the incidence of such NOVs.

To implement these additional requirements properly, the Army needs to increase management oversight and allocate more financial resources. Since each state has the authority to administer the SDWA program, the Army must monitor the additional requirements state-by-state as each state develops its own regulations. To implement these additional requirements in a timely manner, each Army installation's environmental staff member responsible for drinking water issues must be aware of new regulatory requirements and must obtain the necessary resources to achieve compliance.

CHAPTER 6

SAFE DRINKING WATER ACT PROGRAM FINDINGS AND RECOMMENDATIONS

The installations we surveyed have already begun to implement corrective actions to solve the problems highlighted by the NOVs that they received. Our intent was not to second-guess their actions. Instead, we considered whether a short-term correction is aimed at the symptom rather than the underlying problem. In this report, we have focused our analysis on the NOVs as a group rather than individually; we have identified some systemic problems. Those major types of deficiencies were addressed in Chapter 3. Those deficiencies are (1) the Army's installation-level environmental staff and/or plant managers are often unaware of regulatory requirements, (2) equipment and facilities are sometimes defective or obsolete, and/or inadequately maintained; and (3) administrative processes (such as contracting and funding) are unresponsive. In a very few cases, NOVs can be explained by circumstances beyond the Army's control (such as a regulator's error or the fact that a technical solution to a production problem simply does not exist).

In subsequent volumes, we will examine other regulatory programs. It is our belief that the same general systemic problems will emerge. If so, actions to resolve the problems experienced under the SDWA will simultaneously relieve problems in other programs. The remainder of this chapter discusses the need for general programs to eliminate these systemic problems.

KEEPING UP WITH THE REGULATORY TREADMILL

Maintaining an adequate understanding of regulatory requirements and ensuring that those requirements are met can be done only with careful attention to the Army's work force. The problems identified in this area are caused by an inadequate delineation of responsibilities, inadequate staffing, inadequate understanding of regulations, and a lack of environmental awareness at the funding authority level.

Most NOVs are received because the Army installation's personnel are not knowledgeable about the regulatory requirements and because no one is given clear responsibility and authority for ensuring compliance. Although some installations had an environmental professional assigned, they were constrained by time or they did not have the right qualifications to do the job properly. Since most Army installations now have hired environmental professionals, we believe that the Army can eliminate future NOVs in the SDWA area by carefully realigning and mainstreaming the additional environmental responsibilities among current personnel and improve their job effectiveness by clarifying their responsibilities.

Army installations have used a two-step approach to resolving these SDWA NOVs. The first step has been to increase the capability of environmental offices to monitor and achieve compliance by hiring additional environmental staff. This first step is expedient and a good short-term solution, and many of the most egregious NOVs have been eliminated. The second step is to integrate environmental responsibility into the entire organization by assigning additional environmental compliance responsibilities to existing organizations and to provide the appropriate training. This step is more difficult to implement, and installations *cannot do it alone.*

Assigning Responsibility

Army installations now have at least one full-time environmental professional; they are very much aware of their role in achieving full compliance. The next management issue is to determine who should be held accountable for environmental responsibilities and to allocate resources appropriately. Many installation environmental office staffs are growing rapidly and they are assuming more compliance responsibilities from other functional organizations such as the Directorate of Engineering and Housing (DEH) or installation preventive medicine offices. For example, water sampling and monitoring may be accomplished by environmental professionals rather than by the water treatment plant supervisor or by preventive medicine staff. Although it is expedient to assign corrective action responsibilities to environmental officers in the short term, it is counterproductive in that it relieves the facility operators of the responsibility to carry out their jobs properly.

Now the Army must choose one of two management philosophies: hold operating organizations responsible for the environmental requirements of their jobs or assign more environmental staff members to enforce compliance issues. Depending upon the management philosophy that the Army adopts, the resulting management strategies for achieving compliance are very different.

A widely held perception is that anything related to the environment is the responsibility of the environmental professional. Sometimes, construction projects are managed by environmental professionals rather than by installation civil engineers if those projects give rise to environmental compliance issues. As the environmental offices take on more tasks, the traditional lines of responsibility become more confusing. For example, it is often the environmental coordinator's job to resolve SDWA violations even though the installation's sanitary engineers are responsible for the proper operation and maintenance of drinking water treatment plants. Neither can be sure what their responsibilities are for achieving compliance. The challenge is to integrate the skills of these operational and engineering experts (i.e., civil and sanitary engineers) with the regulatory expertise obtained from environmental professionals.

Achieving full compliance with the SDWA requires properly designed plant facilities, a preventive maintenance program, appropriate and adequate equipment and operations procedures, sampling and monitoring programs, and certified plant operators. When different groups of people are responsible for specific tasks, no single person is in charge of achieving full compliance. Often, installation environmental professionals become, de facto, a focal point to ensure that the plant meets the environmental regulations without having the authority to take corrective actions. Better coordinated and aligned organizational responsibilities are needed.

The challenge is to properly align responsibilities with the existing capabilities of each functional group to ensure sustained, full compliance. Plant operators, sanitary engineers, and preventive maintenance staff must have a clear understanding of their responsibilities for sustaining full environmental compliance. Training strategies then can be developed for each group to enhance its job performance to carry out the given responsibilities.

Hiring qualified engineers is expensive; not all installations can generate enough work for such staff. Some centralized organizations can be established to serve as centers of expertise to provide technical assistance to installations. These organizations can become a part of the major command staff, Engineering and Housing Support Center (EHSC), USAEC, or the Army Environmental Hygiene Agency (AEHA). Further study should be undertaken to determine which organization is best suited to provide the required technical support.

Cadre of Qualified Professionals

Even though we recommend that plant operators (regardless of who they work for) be held responsible for proper performance of their duties, it is essential that an oversight capability (through the professional environmental staff) be maintained. A critical factor in avoiding NOVs and achieving compliance is having an adequate number of qualified staff members. Most of the NOVs reviewed were received by installations because they did not know the regulatory requirements. They did not know about the requirement because either the environmental coordinator did not know the regulatory compliance requirements existed or did not understand the impact of the new regulations on their drinking water treatment plants.

All Army installations that received NOVs and did not have environmental professionals to handle the issue have started the NOV resolution process by hiring qualified environmental professionals. At present, the Army has no way of identifying what an adequate staffing level is. The Army should consider developing a manpower model to determine the appropriate staff sizing given the workload.

Since the SDWA is administered primarily by the states, installations must keep track of their own state SDWA regulations and how those new regulations may impact their own drinking water systems. Therefore, installation environmental staff members are the critical link in understanding what the Army must do to achieve full compliance. They must monitor new state regulatory developments and develop the appropriate corrective actions to meet those new requirements.

Once the installations establish a capability to monitor regulations by hiring environmental professionals, they often require technical support in developing corrective actions to satisfy new requirements. Although environmental professionals understand regulatory requirements, they are often not knowledgeable about the proper operation and maintenance of water treatment systems. Civil and

sanitary engineering expertise are needed to formulate appropriate engineering solutions to retrofit deficient plants. In a number of cases, installations do not have facility engineers who can perform water-system design tasks. In such cases, most installations rely on A-E firms to perform the technical work required to develop corrective actions. But there is nobody who can validate the work of the contractor. A few installations have used the AEHA; again, the Army may need a cadre of experienced operator-environmental engineers available to provide Army-wide support.

Understanding Regulatory Requirements

Because regulations, standards, and procedures vary widely from one state to another, establishing formal Army-wide training (in the sense of formal programs of instruction) to teach installation environmental professionals about SDWA regulations will not be effective. The existence of dozens of different programs administered by the EPA regions and the states forces centrally driven training to be overly generic (and requires local supplementation). Most of the installation's professional environmental staff members have sufficient background training that with sufficient time, they can read the new regulations and find out what is required. Any question can be followed up with a phone call to regulatory agencies for clarification. However, the provision of adequate and continuing training appropriate to the needs of individual employees is vital. Again, there must be a clear distinction between the installation's responsibility of providing training and the Army staff's role in providing *for* training.

Since many environmental professionals are new to the Army, they are not familiar with how to get things done within the Army using established Army guidelines. Often, they are not sure about what their responsibilities are and the authority they have for delegating responsibility to other Army personnel to achieve compliance. Some basic organizational training must be provided to new environmental professionals so that they understand the division of responsibilities. Their understanding of how Army procedures work can help to quickly transfer their environmental knowledge into corrective action measures. Before these training programs can be developed, the Army must clearly delineate environmental responsibilities among all involved professional groups.

Once responsibilities have been properly assigned, ongoing training and seminars must be given to the appropriate personnel so that they remain current in their assigned regulatory fields and to allow them to develop a more complete professional understanding of the combination of environmental protection in all media and the practical requirements of operating within the Army's mission and procedures.

Local Personnel Policies

An alternative solution to hiring environmental staff members is to provide additional training for water treatment plant supervisors and assign new responsibility to them to monitor new regulations. This approach has been ruled out by most installations. Most water treatment plant supervisors are technicians and plant operators who worked their way through the ranks to obtain their current positions. They are not comfortable with, and often not qualified in, monitoring environmental regulations and determining what is required to achieve compliance. However, it is imperative that the necessary elements of any regulations be thoroughly instilled in those supervisors, because they are the critical link in ensuring that the plants are properly operated.

Only certified operators should be hired (or trained) to operate drinking water treatment plants, and failure to obtain such certification after training should be made grounds for termination. For example, the water treatment plant supervisor at one installation did not have a required state certification. As a result, the installation received an NOV. In another case, an installation was held in significant noncompliance as a result of the supervisor's lack of basic knowledge of water regulation.

A challenge for the Army is to ensure that its personnel management policies are not in direct conflict with its efforts to achieve full compliance. Federal employee union agreements, civilian personnel career management plans, and any plans addressing reduction-in-force contingencies should be reviewed to ensure that these agreements do not conflict with sound personnel management practices (especially certification requirements) needed to achieve full compliance with environmental regulation.

Environmental Awareness

The best efforts of the environmental staff office cannot overcome a lack of command interest in environmental compliance. As regulators identify continuing deficiencies that are not corrected because an installation chooses not to fund the needed work, it becomes clear to staff members that their efforts are fruitless. In addition, as the relationship with the regulator deteriorates, the volume of deficiencies cited will increase along with the requirement for funds to address them.

In a case where the responsibility for compliance has been severed from the responsibility for plant operation – as is frequently the case on Army installations – command emphasis becomes all the more important.

In general, obtaining command emphasis for drinking water issues should not be difficult in cases of potential health risks. In many cases, however, the deficiencies noted do not pose such a threat. Nonenvironmental personnel (such as commanders, facility engineers, and installation staffs) need to be aware that the dividing line between a risk situation and benign neglect is very narrow and not definable. Failures of sampling and reporting may indeed have no immediate pollution impact, but they do eliminate the only warning mechanisms that alert the installation to the fact of a health risk. Within the context of the SDWA, then, the challenge for the environmental staff is not only to compete for command attention with other staff agencies, but also to compete against other environmental requirements (such as "Superfund" work) that the commander feels are more immediate or pose a greater liability.

The U.S. Army Environmental Center is already working on identifying Army decision-makers who can affect the environmental program and ensuring that they receive appropriate awareness training. This effort should be fully supported.

OPERATIONS AND MAINTENANCE

Most installations now receive enough resources to resolve NOVs to achieve compliance. This has not been the case in the past. The Army must make resources available to achieve and sustain full compliance not only to resolve NOVs but to properly maintain and operate drinking water plants. More management attention and resources are needed to ensure that Army drinking water plants are continuously upgraded and properly maintained and operated.

The challenge is to identify and fund routine operations and maintenance (O&M) requirements that will result in receipt of NOVs if timely corrective measures are not taken. Army installations need a sound technical evaluation capability to identify these requirements and develop engineering solutions. Externally conducted ECAS audits must be supplemented with a self-inspection capability. Comprehensive audits, along with effective training for operators and environmental staff, should eliminate the majority of NOVs received due to a lack of environmental knowledge or of management attention.

UNRESPONSIVE ADMINISTRATIVE SYSTEMS

Even where a deficiency is known to exist and the remedy has been identified, corrective action cannot occur until all of the necessary administrative actions have been completed. Project approval may have to be obtained from the installation staff, from regulators, and sometimes from higher headquarters. Funding must be budgeted, allocated, and put into place for the project. In many cases, contracts must be developed, announced, competed, awarded, and put into operation. New personnel may have to be hired, in which case position descriptions must be written, positions approved, funds made available, announcements made, interviews conducted, and so forth. Beyond this, the new hire will require orientation before achieving full productivity. All of these events take time. The longer they take, the more frustrated all parties become; when regulators become frustrated, they issue more NOVs.

There is little that an installation, or even the Army, can do to eliminate the delays built into these processes that are caused by statute or by regulations. But certain things that can be accomplished by structuring the situation properly and by proper planning.

The first line of defense against failing to meet regulatory requirements is an effective compliance monitoring program to detect systemic deficiencies and technical problems. While the ECAS is a leap in that direction, it will apply to installations only every 3 years; additional audits must occur on the installation's initiative in the intervening years. In conjunction with compliance monitoring, continuing professional development is required to ensure that the staff are aware of the requirements.

Together, effective monitoring and professional development programs provide advance notice of problems. Then, effective use of the 1383 data system can help the installation identify its total environmental requirements and prioritize SDWA issues appropriately. Routine acceptance of the need for unspecified O&M costs provides a fund for small unanticipated requirements.

Contract lead times can be reduced through basic ordering agreements that provide for continuing services on an as needed basis. The relatively simple operating requirements of the SDWA make such agreements possible. Those agreements could be established for operating support, for compliance audits, and for miscellaneous design and management support tasks. In that way, as requirements arise that demand supplementation of the installation staff, the ordering agreements can be acted upon swiftly. Clearly, major procurements and construction projects would require specific authority and a full procurement process; but even those can be speeded up by having support available to initiate design and planning work.

Hiring can be simplified by the establishment of a common data base of environmental job descriptions to make development of position descriptions easier. Such a data base could also be linked to an expert system that could provide advice about the proper preparation of hiring documents and indicate how a position should be graded. Such a solution would require centralized activity under the Army Environmental Center or the Office of the Director of Environmental Protection.

At the installation level, personnel management can be more flexible. Positions should be coded for all appropriate career codes, not just the single code held by the previous occupant. When possible, job descriptions should be revised to reflect the duties actually performed; since those duties tend to expand over time, personnel can be rewarded by grade increases as appropriate. In addition, the requirement for technical or professional certification, as appropriate, should be implemented. At the same time, job descriptions (and the environmental organization) can be structured to reflect the realities of the employment market; where the necessary specialists are not available, contracting out a function or developing in-house personnel through internships or through training may be needed. This will not reduce the manager's workload – it may increase it until automated system assistance is available – but it will make the deployment of personnel, finances, and time more effective.

SUMMARY OF RECOMMENDATIONS

We have recommended that the Army develop initiatives to provide adequate numbers of adequately trained staff to ensure that routine operating costs are funded, and to reduce administrative delays in executing compliance actions.

Specific recommendations are as follows:

- Develop a manpower model to assess environmental staffing requirements.
- Ensure that the responsibility for proper operation of environmentally sensitive facilities is firmly fixed upon the plant operators and their supervisory chain.
- Require certification for all persons working on environmentally sensitive facilities.
- Provide for continuing professional training of environmental professionals and other personnel connected with the environmental mission.
- Provide a cadre of engineers with operating and environmental experience to provide Army-wide technical support.
- Conduct research to determine the appropriate level of O&M funding needed for permitted facilities; then ensure that such funding is included in installation budgets and supported at MACOM and Department of the Army levels.

In addition, we recommend that the Army review its data collection requirements in order to capture facility data that will permit Army environmental staff offices to provide key decision-makers with assessments of the Army's compliance status and the impact of proposed regulations.

APPENDIX A

"DEFENSE ENVIRONMENTAL STATUS REPORT" FORM FOR THE ARMY'S SAFE DRINKING WATER PROGRAM

TABLE 10

SAFE DRINKING WATER PROGRAM

PERIOD COVERED: FY_____ **COMPONENT**_____

PROGRAM DATA	AS OF LAST PERIOD	AS OF CURRENT PERIOD
1. NO. OF DOD-OWNED WATER TREATMENT SYSTEMS (NOTE 1)		
A. WHERE STANDARDS* WERE EXCEEDED DURING PERIOD		
B. WHERE PUBLIC NOTIFICATION* WAS MADE		
C. WHERE PROBLEM WAS CORRECTED		
D. WHERE GROUNDWATER IS A WATER SOURCE		
2. NO. OF PURCHASED WATER SUPPLIES (INCLUDING FEDERALLY SUPPORTED STATE OR LOCALLY OWNED)	XXXXXXXXXX XXXXXXXXXX XXXXXXXXXX	XXXXXXXXXX XXXXXXXXXX XXXXXXXXXX
A. WHERE STANDARDS WERE EXCEEDED DURING PERIOD		
B. WHERE PROBLEM WAS CORRECTED		
3. NOTICES OF VIOLATION (NOVs) (ONLY FOR DOD-OWNED SYSTEMS)	XXXXXXXXXX XXXXXXXXXX XXXXXXXXXX	XXXXXXXXXX XXXXXXXXXX XXXXXXXXXX
A. NO. OF NOVs UNRESOLVED AT START OF PERIOD (TOTAL)		
1. NOV's WHICH REQUIRE ADMINISTRATIVE OR OPERATIONAL CHANGES TO RESOLVE		
2. NOV's WHICH REQUIRE POLLUTION ABATEMENT PROJECT(s) TO RESOLVE[3]		
B. NO. OF NOVs RECEIVED DURING PERIOD (TOTAL)		
1. NOV's WHICH REQUIRE ADMINISTRATIVE OR OPERATIONAL CHANGES TO RESOLVE		
2. NOV's WHICH REQUIRE POLLUTION ABATEMENT PROJECT(s) TO RESOLVE[3]		
C. NO. OF NOVs RESOLVED DURING PERIOD (TOTAL)		
1. BY ADMINISTRATIVE OR OPERATIONAL METHODS		
2. BY POLLUTION ABATEMENT PROJECT(S)[3]		

NOTE 1: NARRATIVE: PROVIDE SEPARATE PAGE FOR EACH SYSTEM WITH PROBLEMS NOT CORRECTED. GIVE LOCATION, STANDARDS EXCEEDED, AND CORRECTIVE ACTION ATTEMPTED.

NOTE 2: TERMS UNDERLINED AND MARKED WITH AN ASTERISK ARE DEFINED IN THE GLOSSARY.

NOTE 3: PROVIDE A LIST OF A-106 (OR 1383) PROJECT NUMBERS FOR THESE PROJECTS.

APPENDIX B

SUMMARY OF MAJOR COMMAND "DEFENSE ENVIRONMENTAL STATUS REPORT" SUBMITTALS FROM 1984 TO 1990

SUMMARY OF MAJOR COMMAND "DEFENSE ENVIRONMENTAL STATUS REPORT" SUBMITTALS FROM 1984 TO 1990

The *Defense Environmental Status Report* (DESR) form (see Appendix A) is the only source of historical data that shows the Army's past environmental compliance status. Although the Safe Drinking Water Act (SDWA) portion of the DESR submittals had limited and possibly inaccurate data, trend analyses of the DESR provide some indicators for gauging the Army's past SDWA compliance efforts.

The DESR was compiled annually. Data elements were aggregated as the installations reported their program status through Major Commands to the Office of the Director of Environmental Protection. This appendix contains a table summarizing major command DESR submittals from 1984 to 1990. Starting in 1991, the Defense Environmental Management Information System replaced the DESR requirements. With that change, the Army is now developing more comprehensive data bases to better capture the SDWA program's status.

TABLE B-1

SAFE DRINKING WATER PROGRAM

(Summary of DESR trends by major commands)

Major commands	1984	1985	1986	1987	1988	1989	1990
DoD-Owned Water Treatment Systems							
WESTCOM	0	0	0	1	1	13	0
USMA	0	0	0	1	3	4	0
TRADOC	0	0	0	15	15	17	0
MTMC	0	0	0	0	0	0	0
MDW	0	0	0	0	1	0	0
ISC	0	0	0	2	2	2	0
INSCOM	0	0	0	0	0	0	0
HSC	0	0	0	1	1	1	0
FORSCOM	0	0	0	59	84	68	0
ARNG	13	0	0	11	0	13	0
AMC	0	0	0	42	44	70	0
Total (Data)	13	0	0	132	151	188	0
Total Army (Reported)	117	0	0	121	151	177	0
Installations Where Standards Were Exceeded							
WESTCOM	3	3	1	0	0	0	0
USMA	0	0	0	1	2	0	0
TRADOC	4	3	1	0	1	1	0
MTMC	1	0	0	0	0	0	0
MDW	0	0	0	0	1	0	0
ISC	0	0	0	0	0	0	0
INSCOM	0	0	0	0	0	0	0
HSC	0	0	0	0	0	0	0
FORSCOM	4	1	2	3	8	24	0
ARNG	3	0	1	2	0	1	0
AMC	6	5	5	8	10	16	0
Total (Data)	21	12	10	14	22	42	0
Total Army (Reported)	14	0	9	012	22	41	0

Note: "Total (Data)" reflects the sum of MACOM data; "Total Army (Reported)" is the figure the Army reported to OSD. "Table 10, Safe Drinking Water Program" is the title of the DESR form (shown in Appendix A).

TABLE B-1

SAFE DRINKING WATER PROGRAM (Continued)

(Summary of DESR trends by major commands)

Major commands	1984	1985	1986	1987	1988	1989	1990
Public Notification Made							
WESTCOM	2	3	1	0	0	0	0
USMA	0	0	0	1	2	0	0
TRADOC	1	0	0	0	0	1	0
MTMC	0	0	0	0	0	0	0
MDW	0	0	0	0	0	0	0
ISC	0	0	0	0	0	1	0
INSCOM	0	0	0	0	0	0	0
HSC	0	0	0	0	0	0	0
FORSCOM	3	1	2	2	5	3	0
ARNG	0	0	0	0	0	2	0
AMC	5	5	2	6	7	14	0
Total (Data)	11	9	5	9	14	21	0
Total Army (Reported)	9	0	5	9	14	19	0
Problem was Corrected							
WESTCOM	2	3	1	0	0	0	0
USMA	0	0	0	1	1	0	0
TRADOC	1	2	1	0	1	1	0
MTMC	0	0	0	0	0	0	0
MDW	0	0	0	0	0	0	0
ISC	0	0	0	0	0	0	0
INSCOM	0	0	0	0	0	0	0
HSC	0	0	0	0	0	0	0
FORSCOM	2	0	0	2	3	22	0
ARNG	3	0	0	2	13	0	0
AMC	6	5	2	5	5	8	0
Total (Data)	14	10	4	10	23	31	0
Total Army (Reported)	10	0	6	8	10	31	0

Note: "Total (Data)" reflects the sum of MACOM data; "Total Army (Reported)" is the figure the Army reported to OSD. "Table 10, Safe Drinking Water Program" is the title of the DESR form (shown in Appendix A).

TABLE B-1

SAFE DRINKING WATER PROGRAM (Continued)

(Summary of DESR trends by major commands)

Major commands	1984	1985	1986	1987	1988	1989	1990
Ground Water is a Water Source							
WESTCOM	0	0	0	0	1	5	0
USMA	0	0	0	0	0	0	0
TRADOC	0	0	0	9	7	11	0
MTMC	0	0	0	0	0	0	0
MDW	0	0	0	0	1	0	0
ISC	0	0	0	2	2	2	0
INSCOM	0	0	0	0	0	0	0
HSC	0	0	0	0	0	0	0
FORSCOM	0	0	0	40	77	59	0
ARNG	0	0	0	11	6	20	0
AMC	0	0	0	24	22	46	0
Total (Data)	0	0	0	86	116	143	0
Total Army (Reported)	0	0	0	73	110	124	0
Purchased Water Where Standards Were Exceeded							
WESTCOM	0	0	0	0	0	0	0
USMA	0	0	0	0	0	0	0
TRADOC	1	0	3	1	1	1	0
MTMC	0	0	0	0	0	0	0
MDW	0	0	0	0	3	2	0
ISC	0	0	0	0	0	0	0
INSCOM	0	0	0	0	0	0	0
HSC	0	0	0	0	0	0	0
FORSCOM	1	1	0	0	3	0	0
ARNG	5	0	9	78	6	256	0
AMC	2	1	2	2	2	5	0
Total (Data)	9	2	14	18	15	264	0
Total Army (Reported)	4	0	5	3	9	9	0

Note: "Total (Data)" reflects the sum of MACOM data; "Total Army (Reported)" is the figure the Army reported to OSD "Table 10, Safe Drinking Water Program" is the title of the DESR form (shown in Appendix A).

TABLE B-1

SAFE DRINKING WATER PROGRAM (Continued)

(Summary of DESR trends by major commands)

Major commands	1984	1985	1986	1987	1988	1989	1990
Purchased Water Where Problem was Corrected							
WESTCOM	0	0	0	0	0	0	0
USMA	0	0	0	0	0	0	0
TRADOC	1	0	3	1	1	1	0
MTMC	0	0	0	0	0	0	0
MDW	0	0	0	0	3	1	0
ISC	0	0	0	0	0	0	0
INSCOM	0	0	0	0	0	0	0
HSC	0	0	0	0	0	0	0
FORSCOM	1	1	0	0	0	0	0
ARNG	5	0	0	78	0	2	0
AMC	2	0	2	0	2	3	0
Total (Data)	9	1	5	79	6	7	0
Total Army (Reported)	4	0	5	1	6	5	0
NOVs Unresolved at Start of Period							
WESTCOM	0	0	0	0	0	0	0
USMA	0	0	0	0	0	0	0
TRADOC	0	0	1	0	0	0	0
MTMC	0	0	0	0	0	0	0
MDW	0	0	0	0	0	0	0
ISC	0	0	0	0	0	0	0
INSCOM	0	0	0	0	0	0	0
HSC	0	0	0	0	0	0	0
FORSCOM	0	1	0	0	1	3	0
ARNG	0	0	0	0	0	0	0
AMC	0	0	1	4	2	1	0
Total (Data)	0	1	2	4	3	4	0
Total Army (Reported)	0	0	2	4	3	4	0

Note: "Total (Data)" reflects the sum of MACOM data; "Total Army (Reported)" is the figure the Army reported to OSD. "Table 10, Safe Drinking Water Program" is the title of the DESR form (shown in Appendix A).

TABLE B-1

SAFE DRINKING WATER PROGRAM (Continued)

(Summary of DESR trends by major commands)

Major commands	1984	1985	1986	1987	1988	1989	1990
NOVs Requiring Admin. Changes to Resolve – Start							
WESTCOM	0	0	0	0	0	0	0
USMA	0	0	0	0	0	0	0
TRADOC	0	0	1	0	0	0	0
MTMC	0	0	0	0	0	0	0
MDW	0	0	0	0	0	0	0
ISC	0	0	0	0	0	0	0
INSCOM	0	0	0	0	0	0	0
HSC	0	0	0	0	0	0	0
FORSCOM	0	1	0	0	1	0	0
ARNG	0	0	0	0	0	0	0
AMC	0	0	1	0	1	1	0
Total (Data)	0	1	2	0	2	1	0
Total Army (Reported)	14	0	2	0	2	1	0
NOVs Requiring Abatement to Resolve – Start							
WESTCOM	0	0	0	0	0	0	0
USMA	0	0	0	0	0	0	0
TRADOC	0	0	0	0	0	0	0
MTMC	0	0	0	0	0	0	0
MDW	0	0	0	0	0	0	0
ISC	0	0	0	0	0	0	0
INSCOM	0	0	0	0	0	0	0
HSC	0	0	0	0	0	0	0
FORSCOM	0	0	0	0	0	3	0
ARNG	0	0	0	0	0	0	0
AMC	0	0	0	4	1	0	0
Total (Data)	0	0	0	4	1	3	0
Total Army (Reported)	11	0	0	4	1	3	0

Note: "Total (Data)" reflects the sum of MACOM data; "Total Army (Reported)" is the figure the Army reported to OSD "Table 10, Safe Drinking Water Program" is the title of the DESR form (shown in Appendix A).

TABLE B-1

SAFE DRINKING WATER PROGRAM (Continued)

(Summary of DESR trends by major commands)

Major commands	1984	1985	1986	1987	1988	1989	1990
NOVs Received During This Period (Totzl)							
WESTCOM	7	3	1	0	0	0	0
USMA	0	0	0	0	1	0	0
TRADOC	3	1	0	0	0	2	2
MTMC	0	0	0	0	0	0	1
MDW	0	0	0	0	0	2	0
ISC	0	0	0	0	0	0	0
INSCOM	0	0	0	0	0	0	0
HSC	0	0	0	0	0	0	0
FORSCOM	0	0	0	2	10	4	0
ARNG	0	0	0	0	0	1	3
AMC	4	0	1	4	3	9	4
Total (Data)	14	4	2	6	14	18	10
Total Army (Reported)	0	0	2	6	14	17	0
NOVs Received During This Period Req. Admin. Changes							
WESTCOM	0	3	1	0	0	0	0
USMA	0	0	0	0	0	0	0
TRADOC	2	0	0	0	0	2	2
MTMC	0	0	0	0	0	0	1
MDW	0	0	0	0	0	0	0
ISC	0	0	0	0	0	0	0
INSCOM	0	0	0	0	0	0	0
HSC	0	0	0	0	0	0	0
FORSCOM	0	0	0	1	8	4	0
ARNG	0	0	0	0	0	0	2
AMC	0	0	1	0	3	4	3
Total (Data)	2	3	2	1	11	10	8
Total Army (Reported)	0	0	2	1	11	10	0

Note: "Total (Data)" reflects the sum of MACOM data; "Total Army (Reported)" is the figure the Army reported to OSD. "Table 10, Safe Drinking Water Program" is the title of the DESR form (shown in Appendix A).

TABLE B-1

SAFE DRINKING WATER PROGRAM (Continued)

(Summary of DESR trends by major commands)

Major commands	1984	1985	1986	1987	1988	1989	1990
NOVs Received During This Period Req. Abatement							
WESTCOM	7	0	0	0	0	0	0
USMA	0	0	0	0	1	0	0
TRADOC	0	0	0	0	0	0	0
MTMC	0	0	0	0	0	0	0
MDW	0	0	0	0	0	2	0
ISC	0	0	0	0	0	0	0
INSCOM	0	0	0	0	0	0	0
HSC	0	0	0	0	0	0	0
FORSCOM	0	0	0	1	2	0	0
ARNG	0	0	0	0	0	1	1
AMC	0	0	0	4	0	5	1
Total (Data)	7	0	0	5	3	8	2
Total Army (Reported)	0	0	0	5	3	7	0
NOVs Resolved During This Period (Total)							
WESTCOM	7	3	1	0	0	0	0
USMA	0	0	0	0	0	0	0
TRADOC	2	0	0	0	0	2	3
MTMC	0	0	0	0	0	0	0
MDW	0	0	0	0	0	0	0
ISC	0	0	0	0	0	0	0
INSCOM	0	0	0	0	0	0	0
HSC	0	0	0	0	0	0	0
FORSCOM	0	0	0	0	9	4	0
ARNG	0	0	0	0	0	0	0
AMC	2	0	2	0	4	3	3
Total (Data)	11	3	3	0	13	9	6
Total Army (Reported)	0	0	3	0	13	9	0

Note: "Total (Data)" reflects the sum of MACOM data; "Total Army (Reported)" is the figure the Army reported to OSD. "Table 10, Safe Drinking Water Program" is the title of the DESR form (shown in Appendix A).

TABLE B-1

SAFE DRINKING WATER PROGRAM (Continued)

(Summary of DESR trends by major commands)

Major commands	1984	1985	1986	1987	1988	1989	1990
NOVs Resolved During This Period via Admin Changes							
WESTCOM	0	3	1	0	0	0	0
USMA	0	0	0	0	0	0	0
TRADOC	2	0	0	0	0	2	3
MTMC	0	0	0	0	0	0	0
MDW	0	0	0	0	0	0	0
ISC	0	0	0	0	0	0	0
INSCOM	0	0	0	0	0	0	0
HSC	0	0	0	0	0	0	0
FORSCOM	0	0	0	0	9	4	0
ARNG	0	0	0	0	0	0	0
AMC	0	0	2	0	3	3	2
Total (Data)	2	3	3	0	12	9	5
Total Army (Reported)	0	0	3	0	12	9	0
NOVs Resolved During This Period via Abatement							
WESTCOM	7	0	0	0	0	0	0
USMA	0	0	0	0	0	0	0
TRADOC	0	0	0	0	0	0	0
MTMC	0	0	0	0	0	0	0
MDW	0	0	0	0	0	0	0
ISC	0	0	0	0	0	0	0
INSCOM	0	0	0	0	0	0	0
HSC	0	0	0	0	0	0	0
FORSCOM	0	0	0	0	0	0	0
ARNG	0	0	0	0	0	0	0
AMC	0	0	0	0	1	0	1
Total (Data)	7	0	0	0	1	0	1
Total Army (Reported)	0	0	0	0	1	0	0

Note: "Total (Data)" reflects the sum of MACOM data; "Total Army (Reported)" is the figure the Army reported to OSD. "Table 10, Safe Drinking Water Program" is the title of the DESR form (shown in Appendix A).

APPENDIX C

CASE STUDIES: UNDERLYING REASONS FOR RECEIVING NOTICES OF VIOLATIONS

CASE STUDIES: UNDERLYING REASONS FOR RECEIVING NOTICES OF VIOLATIONS

The following cases describe the circumstances surrounding the notices of violations (NOVs) received by 20 installations.

CASE 1: INSTALLATION A

NOVs received: Improper monitoring procedure, public notification not performed, and drinking water treatment facilities do not meet state requirement.

The installation provided sampling results to the state regulatory office. However, the regulator lost the sampling report and issued an NOV for not performing the required periodic water samples. The regulator has a computer tracking system for monitoring water sampling reports. When sampling reports are missing or not properly recorded, the computer automatically prints a list of deficiencies. This list is sent out as an NOV. The state regulators acknowledged receipt of sampling data from the installation, but they failed to enter the data into their computer data base.

State regulation requires notification of the public whenever the installation receives an NOV for failing to take water samples. The installation environmental staff did not know this requirement and did not notify the public when they received the NOV that was issued as a result of the state losing the water sampling report.

The proper maintenance of the installation's water treatment plant had been long neglected. The installation's environmental official did not have the expertise to properly maintain and operate the post water treatment system. Also, there was a lack of project funding priorities for the system since no one knew about the state requirement nor advocated 'itional funding for the proper maintenance of the system. The water plant required installation of a new red warning light as a part of the maximum contaminant level (MCL) detection system and this specification was not part of the original design. Also, installation staff did not monitor for turbidity of drinking water and the system failed to meet the state standard for turbidity. The turbidity monitoring equipment had not been used for many years and it was broken.

The installation did not have knowledgeable environmental staff members to track state requirements and properly monitor the water treatment plant.

CASE 2: INSTALLATION B

NOVs received: Radium contamination in drinking water and water supply cross connections unacceptable.

The installation pumps its water from a deep well where radium contamination is naturally occurring up to 12 pica curie per liter. The surrounding municipal drinking water production wells experience the same radium contamination as the Army installation's water wells. In 1986, the installation's staff heard a rumor that the Environmental Protection Agency was proposing to establish a standard for regulating radium, and the MCL would be 20 picacuries per liter. However, when the regulation was proposed, the standard for radium concentration was set at 5 picacuries per liter. A public hearing on the new proposal was held and there was much opposition and controversy surrounding the new MCL limit. Under that confusion and uncertainty, the installation decided to wait until promulgation of the final regulation before taking corrective action to remove radium contamination.

After receiving an NOV, the installation developed a filtration process to remove radium from the water and sent the design to the state for approval. The installation was awaiting approval from the state before the actual implementation. The cause of the NOV was due to confusion about new standards and the installation's conscious decision to wait until the new MCL was established. The installation waited too long to make the decision.

The regulator issued a warning for not having a backflow prevention plan. An installation staff member asked an assistant from the Army Environmental Hygiene Agency (AEHA) to evaluate cross-connection and backflow problems. AEHA spent a week studying the issue and determined that the water system was satisfactory. However, when the regulators inspected the system, they issued an NOV for not having a backflow prevention plan. This plan is to be updated every 2 years. The installation's environmental staff did not know that the plan is required under the state regulation.

After receiving the NOV, an installation environmental staff member issued a directive to an operating contractor to conduct a study of the water distribution system and determine where backflow prevention devices were needed.

CASE 3: INSTALLATION C

NOVs received: Water intake is not marked, gauges need to be repaired, filter valve needs to be repaired, clarifiers need cleaning and repainting, and equipment is in service without approval or without application having been made.

It is physically impossible to mark the water intake. This NOV finding was canceled after an installation staff member pointed out to regulators that they could not mark the intake.

Preventive maintenance had been neglected for years. Maintenance should have been conducted on gauges, filter valves, and clarifiers. The operating contractor was issued a Government order to achieve environmental compliance and develop a proper preventive maintenance program. These NOV findings were resolved on the spot. However, a comprehensive preventive maintenance program was needed to avoid future NOVs.

The installation did not have documentation explaining how to use a chemical treatment procedure that used specific equipment, although the state regulators already knew about the installation using this procedure. This NOV was resolved after the installation documented (in a permit) the procedure used for water treatment. The installation environmental staff members did not know about the documentation requirement.

CASE 4: INSTALLATION D

NOV received: Exceeding MCL.

Although drinking water systems serving over 10,000 people have had trihalomethane regulated for several years, systems serving 1,000 people or less have not been regulated for trihalomethane until 1 January 1992. The MCL standard of 0.1mg/l was established for trihalomethane. The installation water samples had shown a concentration of 0.2mg/l in the past. Installation environmental staff members knew something had to be done to meet the new standard; they made some

modifications to the existing plant to reduce the concentration level before the deadline.

The installation obtained assistance from AEHA to conduct water sampling and received other technical support. The AEHA sample results show that the modifications did not lower the concentration sufficiently to meet the new standard. At about the same time, there was some confusion about the procedures that could be used to meet the new standard and how those procedures were to be regulated. Also, installation environmental staff members were monitoring new R&D efforts in treating trihalomethane. A decision was made to wait until the regulatory confusion was resolved; the requirement was promulgated in the final regulation.

When the final regulation was promulgated, the installation hired a contractor to study the best way to treat the trihalomethane problem. When the NOV was issued, corrective action was being implemented. Regulatory confusion and lack of technical expertise in the Army delayed implementation of corrective actions.

CASE 5: INSTALLATION E

NOVs received: Failure to meter water flow and lack of cross connection backflow prevention.

The installation had a project to upgrade their water production well that included, among other things, a flow metering instrument. However, a contractor went bankrupt before the completion of the project and a new contractor had to be hired. Although the installation knew about the metering requirement early enough to take corrective action, a contractual problem caused a work stoppage that resulted in an NOV.

The installation staff members did not know about cross connection and backflow prevention plan requirements. After an NOV was issued, they hired a architectural-engineering firm to complete a study and prepare a plan for cross connections. That study was funded and the plan was prepared.

CASE 6: INSTALLATION F

NOVs received: Sampling violation and exceeding lead MCL.

A laboratory clerk at the installation's preventive medicine laboratory sent the wrong sampling report to a state regulatory office. The report contained the water

sampling results from a swimming pool, from an ice machine, and from drinking water. Also, the clerk used an outdated sampling form to fill out the report. That outdated sampling form had been accepted by the state in the past. When a new regulator was assigned to oversee the installation's environmental compliance, he issued an NOV for using the wrong form to report sampling results. Then the clerk resolved the NOV by using the correct form. Lack of job knowledge by the laboratory clerk was the main cause for this NOV.

A water sample was taken near a booster station in the installation's drinking water system without flushing residue water in the pipe. This water sampling result showed a concentration of lead above the MCL. The regulator issued an NOV for exceeding the lead MCL and for failure to follow the proper sampling protocol of taking three follow-up samples after receiving an NOV. This NOV was resolved when the installation took followup water samples after flushing the pipe. Laboratory analysis of the new sample showed that the lead content was below the MCL. The installation environmental staff members did not know about the state requirement to take followup samples.

CASE 7: INSTALLATION G

NOV received: Failure to sample for trihalomethanes.

Installation environmental staff members did not know about the state's sampling frequency requirement. Trihalomethane samples were taken annually. The regulator issued an NOV for failure to take quarterly samples. Corrective actions were taken after an NOV was issued and the installation learned about the deficiency. Lack of environmental expertise at the installation was the main cause for the NOV. The installation hired an environmental staff person to conduct sampling and to monitor the water plant's operation.

CASE 8: INSTALLATION H

NOVs received: Failure to comply with primary drinking water standards, failure to provide a backflow prevention device, failure to provide a reliable supply of potable water, failure to submit a completed application for domestic water permit, failure to submit a technical permit as a part of permit application, failure to adopt an ordinance to implement a cross connection program, failure to conduct surveys to identify cross-connections, failure to retain at least one person trained in cross-

connection control, failure to conduct required bacteriological/chemical analyses, and failure to provide water monitoring reports for 2 months.

The installation's staff members did not know and they did not understand the SDWA requirements. Consequently, none of the SDWA regulatory procedures were followed. The installation had no professional environmental staff. No one in the installation was familiar with the regulatory environmental requirements. Also, the installation did not have a certified water plant operator. Corrective actions were taken when the installation learned of the violation. The installation hired an environmental professional and certified plant operators after receiving the NOVs.

CASE 9: INSTALLATION I

NOV received: Failure to provide water monitoring for 2 months.

The installation's preventive medicine laboratory had been responsible for performing drinking water sampling and sending the results to the regulator. However, the laboratory was closed as a part of the post's downsizing effort. The water plant supervisor did not know that the laboratory was closed and that they were no longer taking any water samples. This problem was caused by the lack of communication between the water plant supervisor and the water sampler. Sampling and monitoring resumed after the NOV was issued. The installation now conducts sampling and monitoring through a contract.

CASE 10: INSTALLATION J

NOV received: Failure to conform to condition of withdrawal permit.

This installation had been withdrawing 5 million gallons of water per day from the surface water sources – as far back as the current environmental staff could remember. The installation had been reporting this monthly water intake data to the regulator during the same time period. The regulator issued an NOV for withdrawing 5 million gallons of water per day. The violation was based on the original permit condition for withdrawal of 3.2 million gallons per day. The installation obtained a new permit for withdrawal of 5.2 million gallons per day. The NOV was resolved.

The installation staff failed to periodically review and update the conditions of their permit after the original permit was issued. The installation's environmental

coordinator concentrated his efforts on achieving compliance with the Resource Conservation and Recovery Act (RCRA); he did not have enough time for monitoring SDWA compliance.

The discrepancy was first noticed when the original permit came up for renewal. During an earlier personnel change, that permit information was not given to the new employee. Also, no management attention was given to keeping track of SDWA permit conditions.

CASE 11: INSTALLATION K

NOV received: Failure to submit plan for plant modification.

The state regulator issued a consent order for construction of a chlorine treatment plant. The regulators told the installation staff that the installation was discharging excessive amounts of chlorinated water into state waters. The installation staff did not agree with the regulator's assessment of the problem and they sent water samples to the regulator to show that the chlorine discharges were within the acceptable limits. However, the regulator insisted on the construction of a chlorine treatment plant.

The installation staff was conducting further studies to assess the chlorine problem. Frustrated by their lack of progress, the regulator issued a consent order for not meeting the deadline for construction of the chlorine treatment plant. After completion of the studies and a pilot project, the state regulator was convinced that the construction of the chlorine treatment plant was not required. The consent order was rescinded. The SDWA permit was modified to incorporate that change.

CASE 12: INSTALLATION L

NOV received: Construction of water piping without a permit.

The state regulator requires three separate permits for constructing a production well; one for drilling a hole into the ground, a second one for installing piping and pumping equipment, and the last one for testing and operating the production well. The second and third permits were to be issued only after the preceding work had been completed and inspected by the regulators. The new project officer failed to obtain the second permit.

A new project officer was assigned in the middle of the construction project. The previous project officer knew about the second permit requirement, but the new project officer did not know. Although the new project officer did not know about the second permit, he knew about the third one. Consequently, upon the completion of the well construction, he applied for the third permit and had the well tested for a state inspection. The regulator issued an NOV for failure to file for the second permit.

CASE 13: INSTALLATION M

NOV received: Failure to submit trihalomethane samples.

The installation staff decided to package all environmental sampling requirements under one contract bid that included sampling required for the RCRA, Clean Water Act (CWA), Clean Air Act (CAA), and SDWA. The contract was awarded to a minority-owned business that did not have a wide range of environmental expertise. The contractor did not have a certified water sampling expert on staff and did not perform the required water sampling under the SDWA. After receiving an NOV, the installation contracting officer notified the contractor of its failure to perform the sampling. Then the contractor hired a subcontractor who had a state certification to perform the sampling task. Some contractual problems existed between the two contractors; consequently, sampling was delayed. The installation received an NOV for failure to submit samples (because of the contract problem).

As part of the corrective action, the installation contracting officer delegated his contract monitoring responsibilities to an environmental specialist who is closely monitoring contractor performance.

CASE 14: INSTALLATION N

NOV received: Improper storage of chlorine cylinders, sanitary seal for well 5 is deteriorated, and drinking water plant supervisor does not have a valid state certification.

Sloppy housekeeping practices were observed during a no-notice inspection by regulators. The water plant had enough space for storage. Improper storage of

chlorine cylinders was caused by the water plant supervisor not knowing the regulatory requirement.

The plant supervisor did not perform the required preventive maintenance of the water treatment system. The plant supervisor did not develop an appropriate preventive maintenance program. The base environmental coordinator said "... he lacks the expertise and knowledge to properly manage a drinking water treatment plant."

The Deputy Facilities Engineer promoted and assigned an uncertified welder to be in charge of the drinking water plant. Under the existing union-labor management contract, a water plant operator does not require a state certification as a prerequisite for selection to the position. The incumbent is now studying for a certification test.

CASE 15: INSTALLATION O

NOVs received: Required samples were not taken following adverse coliform test results, failure to provide public notification, and MCL for total coliform was exceeded.

A contractor was hired to conduct water sampling. That contractor was not properly trained to do water sampling. Quality assurance/quality control (QA/QC) procedures were not followed. The contractor was notified of the results and the contract was modified to specify the use of these procedures. The installation was unaware of the public notification requirement.

The state ignored sample results since the proper QA/QC procedures were not taken. These NOVs were resolved when new samples were submitted.

CASE 16: INSTALLATION P

NOVs received: Failure to sample and analyze for coliform bacteria and failure to report sample results.

An NOV letter was mistakenly sent to this Army installation. Although the water system is located on the Army's property, the system was given to the local county more than 20 years ago. The county operates and maintains the system. The

regulator did not know that the county actually owned the system. The regulator apologized for the mistake and canceled the NOV.

CASE 17: INSTALLATION Q

NOV received: Use of Class V underground injection well, threatening underground sources of drinking water.

The installation received an NOV for discharging effluent from wash rack operations and grease drainage. Discharges from these points were piped into an oil/water separator and then discharged to a leachate bed. The EPA's regional office was particularly concerned about effluent discharges under this kind of circumstance and sent their contractor to investigate the installation. The EPA stated that oil/water separators alone are inadequate to treat the effluent and the use of a leachate field is not sufficient for protecting underground drinking water sources. In a stretch of the definition, the regulators portrayed the leachate bed as an underground injection well, and wrote up the violation under SDWA rather than as an unpermitted discharge under the Clean Water Act (CWA).

The installation's environmental staff resolved the NOV by shutting down the wash rack operation and plugging the drainage. This compliance action impacted the operation and impeded activities of operational units. The installation's strategy was to tie in wash rack drainage to the industrial water treatment system. For drainage lines that cannot be tied in, they plan to install holding tanks and then pump the effluent as the tanks are filled. The installation staff did not know about the regulatory requirement until the deficiencies were identified in the NOVs.

CASE 18: INSTALLATION R

NOV received: Improper operation of a Class V injection well.

This installation is located in a remote mountainous area. A self-contained, pre-manufactured waste water treatment system was installed to treat sewage before discharging it into mountain streams. The regulators denied a NPDES permit under the CWA for the discharges from this treatment plant, stating that the surrounding streams do not have sufficient water flow to dilute the effluent. Instead, the installation was required to construct a transpiration leachate bed for filtering the effluent. The construction consisted of digging trenches and filling them with sand and gravel. During the construction, the contractor found that too many rocks were

in the subsurface; a change order was made to relocate the transpiration leachate bed.

The new site for the transpiration leachate bed chosen was near a parking lot. During rainstorms, the transpiration leachate bed became saturated with surface water runoffs from the parking lot, thereby becoming ineffective. The NOV was issued for this discrepancy under the SDWA rather than the CWA, on the grounds that the trenches into which the effluent flowed were recharging the ground water, which served as a drinking water source. The installation is trying to solve the runoff problem by constructing a berm around the parking lot and diverting the runoff away from the transpiration leachate bed. The NOV has not yet been resolved and the installation is still experimenting with various alternatives.

The NOV was caused due to the original design deficiency. Also, there are limited alternatives available to treat effluent. A more thorough investigation of the subsurface condition during the design phase may have prevented issuance of an NOV.

CASE 19: INSTALLATION S

NOVs received: Exceeded primary maximum contamination level for bacteriological quality three separate times, failed to establish a cross-connection and backflow prevention program.

NOVs were received for high bacteria counts from water samples taken during the summer months. The installation environmental coordinator believes that these high bacteria counts are caused by some bio-growth on the old water main system. The installation has a maintenance contract to flush the entire system to eliminate the residual bacteria growing areas. A contractor was hired to study various options for treating bacteria.

The installation knew about the SDWA requirement to establish a cross connection and backflow prevention program. However, the installation senior leadership did not provide adequate resources to train technicians to inspect the water system for a cross connection problem. Since receiving an NOV, the installation has programmed the necessary resources to establish a cross-connection and backflow prevention program.

CASE 20: INSTALLATION T

NOVs received: Violation of the volatile organic chemical monitoring requirement and failure to take water samples or to perform hydrogeological studies.

The installation had been sending their water samples to another installation's laboratory for analysis. The state issued an NOV for not using the proper report format, which has been changed recently by the state. The installation's environmental staff members and the supporting laboratory technician did not know about the change and continued to use the old report format, which they have been using for many years. The NOV was resolved by using the correct format for reporting.

The installation recently switched its water source from its own production well to purchasing the water from the nearby county municipal water system. When the installation deactivated its production well, the installation's environmental staff thought that they were no longer required to monitor the production well and they stopped taking water samples. The state issued an NOV for not taking water samples and failure to perform hydrogeological studies required by the state even though the well was not being used. The installation took corrective action by hiring contractors to perform the hydrogeological studies and the required water sampling.

The installation staff did not take any corrective compliance measures since they did not know about the state requirements.

APPENDIX D

LIST OF NOTICES OF VIOLATION AND SUMMARY OF ROOT CAUSES

LIST OF NOTICES OF VIOLATION AND SUMMARY OF ROOT CAUSES

INSTALLATION A

NOV A.1: Improper monitoring procedure

Cause A.1.1: Regulator failed to record sampling report

Cause A.1.2: Regulator lost sampling report data

Cause A.1.3: Regulator has a poor report tracking system

NOV A.2: Public notification not performed

Cause A.2.1: Installation staff did not know about the requirement

Cause A.2.2: Installation staff lacked experience

NOV A.3: Drinking water treatment facilities do not meet state requirement

Cause A.3.1: Obsolete water treatment equipment

Cause A.3.2: Lack of compliance knowledge

Cause A.3.3: No environmental professional assigned

Cause A.3.4: Low management priorities for achieving full environmental compliance for water plant operation

INSTALLATION B

NOV B.1: Radium contamination in drinking water

Cause B.1.1: Lack of technical solutions

Cause B.1.2: Lack of technical expertise

Cause B.1.3: Contracting action took too long

Cause B.1.4: Lack of management priority

NOV B.2: Water supply cross-connection unacceptable

Cause B.2.1: Lack of compliance knowledge

Cause B.2.2: Poor technical guidance from the Army Environmental Hygiene Agency

INSTALLATION C

NOV C.1: Water intake not marked

Cause C.1.1: Regulator not familiar with installation

Cause C.1.2: Poor communication with regulator

Cause C.1.3: Lack of experience

NOV C.2: Gauge needed to be repaired

Cause C.2.1: Poor maintenance practice

Cause C.2.2: Lack of management attention

NOV C.3: Filter valve needs to be repaired

Cause C.3.1: Poor maintenance practice

Cause C.3.2: Lack of management attention

NOV C.4: Clarifiers need cleaning and painting

Cause C.4.1: Poor maintenance practice

Cause C.4.2: Lack of management attention

NOV C.5: Equipment in service without approval or application

Cause C.5.1: No documented record of the treatment equipment

Cause C.5.2: Lack of job knowledge

INSTALLATION D

NOV D.1: Exceeding maximum contamination level

Cause D.1.1: Lack of technical solutions

Cause D.1.2: Lack of clear regulatory guidance

INSTALLATION E

NOV E.1: Failure to meter water flow

Cause E.1.1: No meter was installed

Cause E.1.2: Contractor installing the meters went bankrupt before the completion of work

NOV E.2: Lack of cross-connection/backflow prevention

Cause E.2.1: Lack of compliance knowledge

INSTALLATION F

NOV F.1: Sampling violation for microbiological requirements

Cause F.1.1: Wrong sampling data were sent to state

Cause F.1.2: Inexperienced clerk

Cause F.1.3: Poor supervisory control

NOV F.2: Exceeding lead maximum contamination level

Cause F.2.1: Poor sampling protocol

Cause F.2.2: Lack of job knowledge

INSTALLATION G

NOV G.1: Failure to sample for trihalomethanes

Cause G.1.1: Installation did not know sampling requirement

Cause G.1.2: Lack of experience

INSTALLATION H

NOV H.1: Failure to provide backflow prevention device

Cause H.1.1: Lack of environmental expertise

Cause H.1.2: Low management priority

NOV H.2: Failure to provide reliable supply of potable water

Cause H.2.1: Lack of environmental expertise

Cause H.2.2: Low management priority

NOV H.3: Failure to submit completed application for domestic water permit

Cause H.3.1: Lack of environmental expertise

Cause H.3.2: Low management priority

NOV H.4: Failure to submit technical permit as a part of permit application

Cause H.4.1: Lack of environmental expertise

Cause H.4.2: Low management priority

NOV H.5: Failure to adopt ordinance to implement cross connections

Cause H.5.1: Lack of environmental expertise

Cause H.5.2: Low management priority

NOV H.6: Failure to conduct surveys to identify user was a premise for cross-connection

Cause H.6.1: Lack of environmental expertise

Cause H.6.2: Low management priority

NOV H.7: Failure to retain at least one person trained in cross-connection control

Cause H.7.1: Lack of environmental expertise

Cause H.7.2: Low management priority

NOV H.8: Failure to collect required bacteriological/chemical analyses

Cause H.8.1: Lack of environmental expertise

Cause H.8.2: Low management priority

NOV H.9: Failure to comply with drinking water standards

Cause H.9.1: Lack of environmental expertise

Cause H.9.2: Low management priority

INSTALLATION I

NOV I.1: Failure to provide water monitoring report

Cause I.1.1: No one was given clear responsibility for taking sampling

Cause I.1.2: Sampling results were not coordinated

Cause I.1.3: Lack of supervisory control

INSTALLATION J

NOV J.1: Failure to meet permit condition

Cause J.1.1: No one knew about permit condition

Cause J.1.2: Installation failed to review the water permit when it increased its water consumption.

Cause J.1.3: Lack of job knowledge

INSTALLATION K

NOV K.1: Failure to design for plant modification

Cause K.1.1: Regulator's lack of technical knowledge

Cause K.1.2: Lack of clear regulatory guidance

INSTALLATION L

NOV L.1: Construction of water piping without a permit

Cause L.1.1: Construction project officer did not know the requirement

Cause L.1.2: Inexperience of new project officer

INSTALLATION M

NOV M.1: Failure to submit trihalomethane samples

Cause M.1.1: Contractor lacked environmental expertise

Cause M.1.2: Poor contract management practice

INSTALLATION N

NOV N.1: Improper storage of chlorine cylinder

Cause N.1.1: Poor supervisory control over housekeeping practice

Cause N.1.2: Plant supervisor lacked basic compliance knowledge

NOV N.2: Sanitary well seal deteriorated

Cause N.2.1: Failure to perform the proper preventive maintenance

Cause N.2.2: Plant supervisor lacked the basic skill to operate and properly maintain the plant

NOV N.3: Water plant supervisor was not state certified

Cause N.3.1: Hiring of unqualified plant supervisor

Cause N.3.2: Established Army personnel hiring policies not publicized well

Cause N.3.3: Federal employee labor union contract was not consistent with the Army's environmental policies

INSTALLATION O

NOV O.1: Required sample not taken

Cause O.1.1: Contractor did not have environmental expertise

Cause O.1.2: Poor contract management practice

NOV O.2: Failure to provide public notification

Cause O.2.1: Lack of environmental expertise

NOV O.3: Exceeded MCL for coliform

Cause O.3.1: Poor sampling quality assurance/quality control protocol

Cause O.3.2: Lack of environmental knowledge

INSTALLATION P

NOV P.1: Failure to sample and analyze for coliform

Cause P.1.1: Regulator mistake

NOV P.2: Failure to report sample results

Cause P.2.1: Regulator mistake

INSTALLATION Q

NOV Q.1: Use of Class V unit identification code threatened underground sources of drinking water

Cause Q.1.1: Lack of environmental knowledge

Cause Q.1.2: Lack of available technical option

INSTALLATION R

NOV R.1: Improper operation of Class V injection well

Cause R.1.1: Unexpected construction problem

Cause R.1.2: Design deficiency

Cause R.1.3: Lack of technical solutions

INSTALLATION S

NOV S.1: Exceeded primary maximum contamination level for bacteriological quality

Cause S.1.1: Old and aging water main supply lines

Cause S.1.2: Lack of technical solution

NOV S.2: Exceeded PMCL for bacteriological quality

Cause S.2.1: Old and aging water main supply lines

Cause S.2.2: Lack of technical solution

NOV S.3: Exceeded PMCL for bacteriological quality

Cause S.3.1: Old and aging water main supply lines

Cause S.3.2: Lack of technical solution

NOV S.4: Failure to establish a backflow prevention program

Cause S.4.1: Low funding priorities

Cause S.4.2: Lack of management attention

INSTALLATION T

NOV T.1: Failure to monitor a volatile organic chemical requirement

Cause T.1.1: Use of the wrong report format

Cause T.1.2: Installation staff did not know about report format changes

NOV T.2: Failure to conduct hydrogeological study or take water samples

Cause T.2.1: Installation did not know the compliance requirement

Cause T.2.2: Lack of experience

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Douglas M. Brown, Linda McConnell, Sonny Oh

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
Logistics Management Institute
6400 Goldsboro Road
Bethesda, MD 20817-5886

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Mr. Paul Theis
Chief, Compliance Support Branch
U.S. Army Environmental Center
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13. ABSTRACT ***(Maximum 200 words)***

A major focus of the Army's environmental compliance program has been the reduction of notices of violation (NOV) or other legal citations. NOVs based on the Safe Drinking Water Act were selected as model cases. The total number of NOVs issued to the Army under the SDWA has been low, but they are of concern because of the health risks posed by substandard drinking water. We investigated 47 violations from 20 installations. The NOVs fell into three general groups: administrative/procedural, poor operations and maintenance (O&M), and exceeding maximum containment levels (MCLs). The most dominant cause for administrative/procedural violations is a lack of knowledge about regulatory requirements at the installation level. Often, installations are understaffed; as a result, they cannot effectively monitor changes in regulatory requirements and make the appropriate changes in their own procedures. The dominant cause for O&M violations is inadequate training of the water systems operators. Many installations express concern about their ability to meet continuously tightening MCL requirements over the next few years.

Achieving full compliance with the SDWA requires concerted efforts among three major functional groups (environmental staff members, plant operators, and facility engineers) to avoid future NOVs. The Army should hold environmental and functional managers accountable, while providing them with adequate staff to carry out their responsibilities. Professional certification and training programs should be instituted. And the Army needs to plan ahead for costly facility upgrade requirements.

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