Technical Guide No. 374

Water System Vulnerability Assessments

Approved for public release; distribution unlimited.

November 2020

APHC

The use of trademarked names does not imply endorsement by the U.S. Army but is intended only to assist in the identification of a specific product.

TABLE OF CONTENTS

TABLES

APPENDICES

U.S. Army Public Health Center
Technical Guide No. 374
Water System Vulnerability Assessments

1.0 REFERENCES

Appendix A lists the references cited within this technical guide.

2.0 BACKGROUND

2.1 Definition

What is a water system vulnerability assessment (WSVA)? The definition has changed somewhat since the onset of this assessment program. When first initiated (based on the 2002 amendment to the *Safe Drinking Water Act* (SDWA) (U.S.C. 2002), described below), the program's primary goals were to 1) detect water supply systems' potential vulnerabilities to intentional acts of destruction or contamination which would put consumers and commercial/industrial users at risk and 2) develop mitigation measures against such acts. During the subsequent years, it has become evident that there are many other causes of potential water system disruption that are just as threatening as the intentional circumstances initially considered. In the U.S., interruptions of this critical infrastructure have been caused by natural disasters, technological breakdowns, and material weakening and breakage caused by age, corrosive water conditions, and natural wear. As a result, the current approach for WSVAs is an "All-Hazards" approach; that is, identifying any/all circumstances which may cause contamination of the water supply or a disruption of water supply services. The technical considerations and potential mitigation measures for all such disruptions are similar, making the assessments of installation water supply systems straightforward and applicable to all conditions.

2.2 Legislation, Regulation, and Policy

2.2.1 *Safe Drinking Water Act* (SDWA)

The SDWA was amended by the June 2002 *Public Health Security and Bioterrorism Response Act* (U.S.C. 2002) to require regulated community water systems (CWS) (serving more than 3,300 consumers) to conduct a WSVA and update or develop their water system emergency response plan (WSERP). This was a one-time requirement for affected Department of Defense (DOD) water systems and was funded through DOD Environmental Compliance requirements. The SDWA defines a WSVA as a mechanism for evaluating a water system's susceptibility to adversarial actions; the Act also provides a prioritized approach for reducing or mitigating the risks associated with those identified adverse actions. As stated in the SDWA, a WSVA must include "a review of pipes and constructed conveyances; physical barriers; water collection, pretreatment, treatment, storage and distribution facilities; electronic, computer or other automated systems which are utilized by the public water systems; the use, storage or handling of various chemicals; and the operation and maintenance of such systems" (U.S.C. 2002, p. 682). WSERPs must include "plans, procedures and identification of equipment that can be implemented or utilized in the event of a terrorist or other intentional attack" as well as "actions,

procedures and identification of equipment which can obviate or significantly lessen the impact of terrorist attacks or other intentional actions" (U.S.C. 2002, p. 684).

In 2003, the DOD significantly expanded the SDWA WSVA and WSERP requirements to apply to all DOD public water systems, both stateside and overseas (DOD 2003). Subsequently, the Army identified timelines for meeting the WSVA and WSERP requirements; all affected Army water systems were to have met the one-time WSVA and WSERP requirements by 1 July 2010. Because of concerns related to these nonrecurring requirements, the Army developed a policy memorandum (ACSIM 2008) that linked the WSVA and WSERP requirements to existing DOD Antiterrorism/Force Protection and Army recurring vulnerability assessments. Additionally, DOD Instruction (DODI) O-2000.16 (DOD 2016), DODI 6055.17 (DOD 2016), and Army Regulation (AR) 525–13 (DA 2017) require annual internal vulnerability assessments and triennial higher headquarters external evaluations of critical nodes. The 2008 ACSIM memorandum identified drinking water as a critical node and directed the inclusion of WSVA and WSERP requirements into existing recurring vulnerability assessment requirements.

2.2.2 U.S. Army Public Health Center/Regional Public Health Command Support

The Office of The Surgeon General (OTSG) must provide technical support and resources to installation commanders (ICs) for vulnerability assessments of food and water supplies, as mandated in AR 525–13. The U.S. Army Public Health Center (APHC) provided technical expertise and resources for OTSG and, therefore, was tasked to fulfill this role for the ICs. Initially, installations hired the APHC to provide the original WSVAs and WSERPs, which were submitted to the respective state regulatory authorities. Subsequent to the enactment of the policies and regulations described above, it was determined that the performance of the WSVAs was part of the APHC mission and would be covered by Defense Health Programs funding provided by the U.S. Army Medical Command (MEDCOM).

In Fiscal Year 2012 (FY12), the then-U.S. Army Public Health Command (now the APHC) began supporting the U.S. Army Installation Management Command (IMCOM) and U.S. Army Materiel Command (AMC) by conducting the water assessment portion of the Higher Headquarters Assessment as well as updating the installation WSVA. Updating the installation WSVA assists Army installations in meeting the recurring WSVA review and updating requirements contained in DOD and Army policy. The regional public health commands (PHCs) perform comprehensive, technical reviews (i.e., WSVAs) of water systems once every 3 years in conjunction with the Higher Headquarters Assessments. (Note: The PHCs were originally part of the APHC and were involved in the initial installation assessments. Since the PHCs have assumed responsibility for all installation support within their respective geographic areas of responsibility (AOR) for OTSG and MEDCOM, subsequent to MEDCOM restructuring, the WSVAs have become a primary mission requirement for the PHCs.) This requirement is spelled out in paragraph 8-15.d.(2) of Department of Army Pamphlet (DA Pam) 40–11 (DA 2020). The remaining annual WSVA reviews and updates are to be accomplished internally by installation personnel. The responsibility for conducting the annual water system review is to be shared between the installation Directorate of Public Works (DPW) and installation public health (PH) program, per DA Pam 40–11 (paragraph 8-15.c.). APHC/PHC support does not include an

update to the WSERP unless the installation specifically requests and funds it, although identifying potential vulnerabilities and developing alternative mitigation measures go “hand-in-hand” with WSERP development.

2.2.3 Applicable Guidance

To facilitate the consistent assessment of installations and fulfill the tenets of AR 525–13, the U.S. Army Center for Health Promotion and Preventive Medicine (now the APHC) published Technical Guide (TG) 188 (USACHPPM 2008), which addressed both food and water vulnerability assessments. It quickly became evident that the Veterinary Services personnel performed the food defense and vulnerability assessments much differently than the APHC/PHC project officers who conducted the WSVAs. Subsequently, the Veterinary Services authorities within MEDCOM developed TG 355 (USAPHC 2012) for food defense and will develop a tri-Service Military Handbook addressing food defense and vulnerability assessments. TG 374 supersedes the portion of TG 188 that addresses WSVAs; therefore, TG 188 will be obsolete upon the publication of TG 374.

3.0 WORKPLAN DEVELOPMENT

3.1 Selection of Installations

Per regulation, each Army installation is to receive a Higher Headquarters Assessment and a WSVA every 3 years. Both the IMCOM and AMC select a group of their installations to receive these assessments each year, ensuring that all installations are assessed within the 3-year period. Upon completion of the assessments, the lists of installations are recycled to repeat the process over the subsequent 3 years. Specific installations may be addressed out of sequence under special circumstances (e.g., significant deployment/redeployment schedules), but they are incorporated into the program as close to the original timeframe as possible to facilitate the 3-year schedule.

3.2 Water System Vulnerability Assessment Costs

The list of installations to be assessed in each FY is forwarded to the APHC Project Manager for action. Initially, this individual develops a cost estimate for travel and per diem for the FY and provides this data to the Business Operations Office within the APHC and MEDCOM and to the MEDCOM Antiterrorism Officer (ATO). They, in turn, request Operations and Maintenance Activities funding (identified as “VTER” funding) from the DA. Once the funding is obtained and disseminated to the APHC, a work breakout structure (WBS) for the WSVA is developed and provided to all regional PHCs, each of which must develop a separate labor WBS through its respective regional health center. Currently, labor costs are attributed to Operations and Maintenance funding provided by the MEDCOM through the regional health centers.

3.3 U.S. Army Public Health Center/Regional Public Health Command Coordination

Concurrent with the development of VTER cost estimates, installations are segregated by the regional PHC’s AOR. The APHC project manager provides a list of installations due to receive Higher Headquarters Assessments and WSVAs for the upcoming FY to the Environmental Health Engineering (EHE) division chiefs and primary project officers historically supporting such services. It is incumbent upon the respective EHE division chiefs to assign knowledgeable

and experienced project officers to conduct the WSVAs. The IMCOM and AMC authorities and the Higher Headquarters Assessment team chiefs routinely communicate through the APHC project manager, who immediately passes along pertinent information to the assigned project officers and EHE division chiefs. Further, the APHC project manager is available to answer questions or provide guidance to the project officers.

4.0 WATER SYSTEM VULNERABILITY ASSESSMENT PROJECT PERSONNEL

4.1 Number of Personnel

A WSVA may be conducted by one or two project officers. The project officers will be either Environmental Science/Engineering Officers or DA civilians assigned to the PHCs or APHC. They will, therefore, have a science or engineering degree from an accredited university and possess experience pertaining to the operation and maintenance of water supply systems. The number of personnel required may be predicated on the size of the installation and/or the complexity of the water supply system. No more than two project officer personnel will participate in WSVAs except where project officer training occurs and funding is not an issue. The regional PHC must pay all travel and per diem expenses to send additional personnel to an installation site visit. Periodically, APHC personnel may accompany regional PHC project officers to perform a quality assurance visit. The costs incurred by these personnel are incorporated into the VTER estimates.

4.2 Personnel Experience

4.2.1 Lead Assessor

A lead assessor must have a thorough understanding of the design and operation of water supply systems to discern how the water system “works,” identify problem areas, and develop potential mitigation measures within the few days onsite. This individual must understand how the water system supports the mission(s) of garrison and tenant activities and must effectively communicate with senior installation leadership and Higher Headquarters Assessment team members. At a minimum, a regional PHC lead assessor should meet the following criteria:

- Been involved in the execution of at least two WSVAs, assuming increasingly more responsibility with each subsequent WSVA and culminating in a lead role accompanied by an APHC or regional PHC WSVA lead assessor.
- Conducted at least two other drinking water-related projects. Examples of project experience include sanitary surveys, water system performance evaluations, and flushing projects using hydraulic modeling. Drinking water sampling missions do not satisfy this criterion.
- Successfully completed at least one drinking water-related course that includes basic hydraulic and water treatment theory, design, and/or operation. Examples of acceptable drinking water-related courses include engineering design and theory courses (e.g., hydraulics, water treatment unit processes) and courses in water system operation and maintenance (e.g., operator certification-related correspondence courses).

4.2.2 Basic Assessor

For assessments attended by a second individual, this person, referred to as a “basic assessor,” may be initially less familiar with water supply systems and WSVAs and will assist the lead assessor. However, the basic assessor should have a fundamental understanding of drinking water systems and be thoroughly familiar with how to conduct a WSVA. It is highly recommended that a basic assessor have or plan to obtain drinking water-related education and project work experience prior to supporting a Higher Headquarters Assessment or WSVA alone. The basic assessor should be paired with an experienced lead assessor who can spend sufficient time training the basic assessor.

4.2.3 Additional Personnel

Ideally, no more than two PHC personnel (i.e., a WSVA lead assessor and a basic assessor) will support a WSVA at an installation. This staffing may be amended, based on the size and location of the installation, complexity of the water system, status of the previous WSVA, and activities occurring at the installation.

5.0 PRE-VISIT PLANNING AND PREPARATION

5.1 Travel

Travelers are responsible for making their own travel reservations and arrangements. For travel in the Continental United States, initiate travel orders/authorizations through the Defense Travel Service (DTS) 4–6 weeks in advance of the scheduled trip. Most rental car and hotel arrangements can be made through DTS, as well. Higher Headquarters Assessment team leaders for IMCOM and AMC will identify quarters where the team will be billeted during the site visit. This projection can be used as a consideration during the selection of billeting locations for each trip. It would be beneficial if team members are scheduled for similar arrival times and billeting to facilitate sharing a rental car while onsite.

5.2 Points of Contact

It is critical to identify several pertinent points of contact (POCs) for the purpose of exchanging requisite information and arranging meetings during the site visit. Many of the required POCs are included in the operations order or project description package provided by the Higher Headquarters Assessment team leader several weeks prior to the site visit. Alternatively, the APHC project manager will contact the IMCOM or AMC liaison to obtain the name and email of the installation ATO. Routinely, the roles of the APHC and PHC work detail are explained, as is the WSVA team’s interaction with the Higher Headquarters Assessment team. Assessment efforts are undertaken to support the installation. To this end, the final report is submitted to the ATO (for the IC) for dissemination and action, not directly to the IMCOM or AMC.

Obtain the contact information for the DPW Chief and personnel responsible for water system operations on the installation (Government or contractor) from the Higher Headquarters Assessment team leader. Contact each of these individuals and explain the APHC/PHC role and methodologies. Explain that the project officer will spend time with the water foreman/personnel and will view all facilities and operations. Identify a time and place to meet once the team is onsite. Since these assessments occur during a brief time frame, it is important

to coordinate the visits in advance to allow personnel to schedule their time with the project officer(s) and avoid scheduling conflicts (e.g., other meetings or leave).

If an installation purchases water from an adjacent utility (municipality, county, or community), that utility's POC information must also be acquired. The DPW Chief or water system foreman should provide the names and telephone numbers for the local utility representatives so that the project officer(s) can discuss their operations, monitoring, data transfer/submission, interconnection access, and responsiveness to installation needs during emergency situations.

5.3 Visit Request

The POC for the installation Security Office should be included in the information obtained from the ATO during initial discussions. In addition, the installation Security Management Office code must be acquired. Technically, IC briefings detailing potential installation vulnerabilities are often classified as SECRET. Therefore, all personnel in attendance must possess such a security clearance from the Army/DOD. Also, Mission Essential Vulnerable Activities lists and other necessary information may be categorized as classified information that would be useful for the project officer(s) to review. It is critical for the project officer(s) to officially request that their security office forward the participant's security classification to the installation to be visited. This is accomplished by completing and submitting a Visit Request form requesting that the individual's security information be sent to the named Security Office via the Joint Personnel Adjudication System.

5.4 Document Review

Prior to an upcoming WSVA, the site visit team would benefit from reviewing past water system consultations for the respective installations. At best, such reviews would include a previous WSVA report or a recent Sanitary Survey. This information can prove very useful for the project officer(s), who should—

- Determine the source of the water supply and its treatment. Is the water supply a Government-owned and operated system, a Government-owned, contractor-operated system, a privatized system, or a system purchased from a neighboring utility?
- Discern past water quality and/or maintenance problems that should be investigated on site.
- Review findings of the past WSVA and determine whether the project officer(s) has ensured that identified issues have been addressed during the past several years.

6.0 WATER SYSTEM VULNERABILITY ASSESSMENT SITE VISIT

6.1 Higher Headquarters Assessment Team Interaction

Even though the WSVA project officers will conduct the majority of their assessment independent of the Higher Headquarters Assessment Team, there are some advantages to interacting with the IMCOM or AMC team regarding the official in-brief and exit brief presented to the IC. All of the major decision-makers, including the IC, are present and can observe that the PHC/APHC personnel have provided a comprehensive assessment of the water supply system. Further, if there are any noted issues or observations that should be addressed, these authorities are in a position to direct the resources to ensure that the work is accomplished.

Significant issues and observations will be included in the Higher Headquarters Assessment team's slides and notes for follow-up by the IMCOM or AMC authorities.
The project officer(s) should plan to travel to the site on Sunday to be present early on Monday for the command in-brief. This is often the first opportunity for the project officer(s) to meet the DPW and Engineering authorities, as well as the water operations personnel with whom they will work during most of the site visit. Generally, there is no need for the project officer(s) to attend the daily "hot-washes" conducted by the Higher Headquarters Assessment team unless an issue of significant importance has been noted and needs to be brought to the attention of the Higher Headquarters Assessment team leader and IC. Otherwise, the project officer(s) should acquire the appropriate format for the exit briefing slides and limit their input to one or two slides.

6.2 Installation Activities Interviewed

As previously mentioned, the vast majority of time spent onsite at an installation will involve working with the water operations personnel, observing infrastructure operations and maintenance, and asking questions of the water operations personnel. It is important that the project officer(s) also interact briefly with the following personnel who have an interest in the water supply system.

6.2.1 Antiterrorism Officer

The ATO can provide input regarding the classification and dissemination of the report, as well as the annual reviews. The project officer(s) should offer assistance in establishing a group of "stakeholders" in the water system who can provide the requisite annual review of the WSVA and any noted observations/changes to the ATO.

6.2.2 Installation Fire Department

Installation fire department authorities should be interviewed to ascertain their concerns or observations regarding water pressure and flow, storage/water availability, condition of hydrants and valves, etc.

6.2.3 Physical Security Office

Authorities from the physical security office can offer insight regarding unauthorized access to isolated wells and pumps or treatment and storage facilities on the installation.

6.2.4 Installation Master Planner

The Installation Master Planner can provide insight regarding the construction of new buildings as well as any additions to the water system piping network, including hydrants, valves, and backflow prevention devices; and any storage facilities that must be added to the system maintenance program.

6.2.5 Public Health Program

The installation public health (PH) program must participate in the review of all monitoring data and sampling plan development, as well as assist in operational monitoring throughout the supply system (e.g., disinfectant residual and bacteriology concentrations). The PH program

should also provide the project officer(s) and installation water authorities with timely information regarding the water supply system, based on annual Sanitary Surveys. The project officer(s) should request that the PH program representative be present during reviews of the physical source and treatment facilities to ensure the PH program is familiar with the system and understands it.

6.3 Assessment Activities

The major facilities and activities to be evaluated during a WSVA are described in the following subparagraphs. An abbreviated checklist for each facility/activity is provided to afford the project officer(s) a better understanding of water system operations and maintenance, and, in turn, better discernment of potential vulnerabilities to system/mission disruption.

6.3.1 Security

Even though the emphasis on vulnerability assessments has expanded from the initial goal of precluding/minimizing the possibility of intentional destruction or contamination of the water supply system, the security of facilities remains an important concept. Actions must be taken to minimize unauthorized access to control valves and meters, chemicals, and facilities at all times. Frequently, a facility is operated by only one person who may also be responsible for several activities on the installation, thus allowing intruders to roam unobserved. All facilities, chemicals, and equipment, as well as access to altitude and control valves under elevated storage tanks, should be contained within fenced areas, with gates locked at all times. Ready access points (e.g., under fences, over fences via trees, or open gates) should be noted and reported to water operations, the DPW, and physical security authorities. Such issues should also be identified during the Command exit briefing.

6.3.2 Water Sources

- What sources of water (surface and groundwater) are available to the installation, and which sources are being used?
- If multiple sources are available, when is each used, and for what areas or purposes (industrial, training areas, back-up)?
- If a surface water source is present, is the intake structure protected? Are there multiple intake zones? Are limited activities (boating, etc.) allowed on the water source?
- For groundwater sources, is a wellhead protection zone/program in place?
- Is onsite emergency power available for wells and pumps? How are generators accessed and fueled?
- Are interconnections with purchased supplies controlled and secured?

6.3.3 Water Treatment

- What treatment processes are employed?
- Where is treatment provided (e.g., at the well, a central water treatment plant (WTP), or in-line)?
- What are the purposes of the treatment processes used?
- What is the efficacy of the treatment used? (Does finished water meet all quality standards?)
- What is the schedule of treatment operations (e.g., 16 hours/day, 8 hours/day)?

- How many operators are employed, and what is their certification?
- Are operators focused on water treatment or multi-tasked to undertake several responsibilities (e.g., water system maintenance, wastewater treatment operations, maintaining pump stations)?
- Are treatment processes and operators secured? Is there no unauthorized access to facilities?
- Is emergency power available, secured, and well-supplied?

6.3.4 Chemicals Injected

- What chemicals are used for water treatment/conditioning?
- Where are these chemicals injected?
- How are they used, and in what form?
- How and where are concentrations monitored?
- Are there constraints regarding chemical usage (e.g., maximum fluoride)?
- How are chemicals delivered and stored onsite? Are different materials stored separately? What security measures are in place?

6.3.5 Distribution System

- What is the type of piping used (generally), and the size(s) of the piping used?
- Is sizing based on fire suppression requirements, industrial needs, or consumer needs?
- What is the general condition of the piping network? Are there frequent or seasonal breaks?
- Does the DPW/contractor have a standard operating procedure (SOP) for the repair of main leaks and breaks? If so, does the SOP encompass flushing, disinfection, microbiological sampling, and analysis? Is the PH program involved?
- Are multiple distribution systems present? How are they segregated and marked?
- Is a sequential hydrant flushing program completed annually? Is each hydrant flushed? Who conducts this work? Is it documented?
- Is an annual valve exercise program performed? Are all control valves addressed? What is the condition of the valves? Is there documentation of condition, location, the number of turns required, and in which direction? Who is responsible?
- Is there a cross-connection control program, where all backflow prevention devices are documented, inspected annually, and maintained or replaced, if warranted? Who performs these actions? Are these individuals certified, and if so, by whom?
- Are new buildings, boilers, and/or equipment added to the program as they are installed?

6.3.6 Water Storage

- What are the size, construction type, and location(s) of potable-water tanks?
- Are the tanks integrated into the water supply system, or do they serve a specific purpose (e.g., industrial area, fire suppression)?
- Do steel tanks possess cathodic protection?
- Document the security of the storage tanks. Are they located within fences and locked gates? Are access (equipment storage, antennae) and key control measures in place?

- How are under-tank altitude valves and meters secured? Are they locked? Are ladders locked up?
- Are tanks emptied and physically inspected every 3–5 years, per the applicable Unified Facilities Criteria ?

6.3.7 Water Monitoring

- Who is responsible for sampling and analyzing water throughout the installation?
- Are data submitted regularly to the state regulatory authority for review?
- Who interacts with the regulators as the installation representative (Environmental Coordinator)?
- Is this individual the “one voice” for the installation? (Avoid conflicting information.)
- If certain installations do not submit data to their respective states, who is responsible for assessing water quality and potability? What is their authority?
- Are data transmitted to the PH program monthly for review? Is there routine interaction between the PH program and water system operations personnel?

6.3.8 Supervisory Control and Data Acquisition (SCADA)

- Do water operations personnel utilize a SCADA system?
- Who has access to the system?
- Can it be accessed at the WTP, remotely via internet, a local area network (LAN)-based system, or by other means?
- Can equipment be controlled using SCADA, or only monitored? What functions are monitored (water levels, chemical concentrations, etc.)?
- Who assesses system security (e.g., Installation Network Enterprise Center or contractor) and how often (frequency)?

6.3.9 Water System Emergency Response Plan (WSERP)

- Are potential vulnerabilities noted in the WSERP?
- Does the WSERP delineate all actions and equipment necessary to remediate potential disruptions noted?
- Are alternative water supplies and mitigation measures identified? (This listing should include arrangements/contracts to procure bottled water.)
- Does the WSERP contain a comprehensive listing of all POCs to mitigate water system disruptions and obtain interim water supplies?
- Is the WSERP updated annually?

6.3.10 Installation PH Program

- Is the PH program actively involved in water system monitoring and review?
- Does the PH program routinely interact with the DPW/contractors responsible for the treatment and purveyance of water supplies?
- Is the PH program familiar with water system facilities and operations?
- Does the PH program assist with water system monitoring (minimum of disinfection residuals and bacteriological analysis)?
- Does the PH program assist with the repair and monitoring of system breaks/leaks?

- Does the PH program help with the assessment of water potability?
- Does the PH program assist all installations within its AOR?
- Does the PH program receive and review copies of all water data developed and reported?

7.0 ASSESSMENT OF COMPOSITE RISK

All WSVA personnel must have a basic understanding of risk assessment in the context of the potential impact a damaged or contaminated water supply system, or one rendered unresponsive due to physical or cyber damage, would have on the installation mission(s). A revised composite risk management approach is used to evaluate such events. This evaluation requires the project officer(s) to identify possible actions which could disrupt water system operations, estimate the likelihood (or probability) of such occurrences, and provide a relative severity of the disruption to the mission(s) or installation caused. A risk determination matrix categorizes the risks in terms that the IC and Staff can use to manage fiscal and manpower resources for mitigation. Tables 1–3 are provided to assist in the determination of probability, severity, and relative risk for each finding, respectively; examples are included.

7.1 Risk Probability

Use the information in Table 1 to determine a probability of risk..

Table 1. Probability of Occurrence

Probability	Criteria	Example
Probable	Water supply and equipment easily accessed; no significant security to preclude access by unauthorized personnel; no specialized training or equipment needed	Unsecured treatment or storage equipment/facilities located outside installation fence; locks broken or absent; no inspection or maintenance of backflow prevention devices in high-risk (industrial) areas
Likely	Water supply or control equipment accessible with some knowledge or determination; specific equipment or materials required but easily acquired; limited security	Easy access to altitude valves under elevated storage tanks; unsecured interconnection points external to installation boundaries; chlorine cylinders outside secured area at WTP; weak password control and/or unprotected internet access of SCADA system
Possible	Existing measures in place but inadequate to deter someone with knowledge, training, or persistence; specialized equipment may be needed (e.g., chemical feed pumps, injection quills, pipe-tapping equipment)	Single source of potable water for installation; locks and gates in place but equipment not under observation; no lights or cameras; potential bacteriological contamination of water in storage due to persons/birds/animals
Unlikely	Access to water supply and equipment deterred; existing control measures in place and protective of water supply, e.g., lights, cameras, fences, gates, and locks in place; proper backflow prevention devices; key access/control	Well-observed, secured, and contained water system and equipment; multiple/redundant sources of potable water for installation; SCADA fully compliant with Army/DOD cyber security requirements

7.2. Risk Severity

Use the information in Table 2 to determine the relative severity of risk.

Table 2. Severity of Occurrence

Severity	Criteria	Example
Catastrophic	Causes widespread/significant illness or disruption of water operations or availability, which results in complete or extended loss to perform installation mission-critical functions; current response measures/capabilities nonexistent or would be ineffective; water supply operations curtailed for a week or longer	Flooding or destruction of WTP; destruction of well or intake structure; significant contamination of water source (e.g., oil, paint, chemicals, etc.) that cannot be readily mitigated; destruction of unique equipment, with no backup, that is not available commercially or that would have to be ordered or fabricated, causing a long delay
Significant	Causes illness or impacts to water operations or availability, resulting in relatively minor or brief disruption of mission-critical activities; current response measures/capabilities are adequate to mitigate impacts to water operations but may take time to fully implement (e.g., 2–5 days' interruption)	A break in large supply main; isolated chemical or bacteriological contamination in supply system; unprotected cross-connection in industrial operation or at hydrant (e.g., filling pest control chemical tanks); intentional chemical overdose (e.g., fluoride); or disruption of flow caused by hacked SCADA system
Minimal	Causes localized or very limited illness or disruption of operations; does not meet documented standards but poses no threat to operations; no disruption of overall installation mission-critical activities; current response measures/capabilities can be quickly implemented to effectively mitigate disruption in water operations	Isolate and repair smaller pipe break within hours of identification; mitigate discovery of bacterial aftergrowths in distribution system network; secure access portals to valves and chemicals; lack of public health participation in water system operations and monitoring; no increase in monitoring with upgraded threat
Negligible	Occurrence of event would not cause illness or disrupt the installation mission to any extent from customer perspective	Lack of annual review of WSVA by staff or archival of documentation by ATO, despite regulations; generally a well-operated and -maintained system

7.3 Risk Management

Three categories of risk are reported to the IC and staff:

- Observations – Issues that may not fully meet standards, or are not fully developed, but pose no serious threat to installation personnel or mission(s)
- Concerns – Issues which pose a threat to personnel illness or system operations that may have a significant impact to installation mission(s)
- Vulnerabilities – Issues which pose a serious or long-lasting effect on installation mission(s) due to resulting illness or debilitation of system operations

Positive points, including obvious highlights and kudos for the installation, are also reported to encourage similar future actions.

Table 3 presents the composite risk management matrix (based on Field Manual 3-19).

Table 3. Composite Risk Management Matrix

	Probability/Likelihood of Risk			
Severity/Consequences	Probable	Likely	Possible	Unlikely
Catastrophic	Vulnerability	Vulnerability	Concern	Concern
Significant	Concern	Concern	Observation	Observation
Minimal	Observation	Observation	Observation	Observation
Negligible			Observation	Observation

8.0 IMPLEMENTATION OF *AMERICA'S WATER INFRASTRUCTURE ACT 0F 2018*

8.1 General

America's Water Infrastructure Act of 2018 (AWIA) (Public Law, 2018) went into effect and was promulgated in January 2018. One of the major issues addressed in this Public Law involved the "risk and resilience" of CWS serving populations of more than 3,300 people throughout the U.S. This law replaces a portion of the SDWA to mandate that all applicable water supply systems conduct risk and resilience assessments, update their WSERPs, and submit certifications of accomplishment of these actions to the U.S. Environmental Protection Agency (EPA) by specified deadlines based on the number of persons served by each system. Table 4 provides the initial dates identified for certification of the risk and resilience assessment.

Table 4. Certification Due Dates for Risk and Resilience Plans

Population Served	Date of Initial Certification
>100,000	31 March 2020
50,000–99,999	31 December 2020
3,300–49,999	30 June 2021

This law requires that these assessments and certifications be updated every 5 years. Certification for the development and institution of viable WSERPs for each system must occur within 6 months of the risk and resilience assessment's certification date.

8.2 Correlation between the AWIA and WSVA

For the purposes of supporting Army installations, the WSVAs performed routinely would serve as the assessment of risk and resilience, as defined by Congress and the EPA. The risk and resilience assessments must address risks from malevolent acts (such as intentional contamination or destruction; sabotage; terrorism) and natural hazards encompassed in the "All-Hazards" approach taken to perform the WSVAs. The assessments include the operation and maintenance associated with all pipes/conveyances, source water, water collection/intake, pretreatment, treatment, storage and distribution, electronic, computer, or other automated systems (including security), as described in this guidance document. The assessments performed for the WSVAs include several issues which must now be specifically incorporated into the reports to meet AWIA risk and resilience requirements. These issues include water system monitoring practices, the storage and handling of chemicals, and the availability and certification of operations personnel.

8.3 Water System Monitoring

When conducting a WSVA, the project officers always check to ensure that all sampling and system monitoring are being performed, as required. This information should now be discussed in the WSVA report. Identify who performs the sampling and analysis of the parameters required for compliance with the respective state and local regulatory authorities. This sampling and analysis may be performed by installation personnel or contractors, or by the certified laboratory providing the analytical data to the installation. Further, identify the installation personnel responsible for overseeing this monitoring program and submitting the data to the regulators for review. Provide a brief evaluation of the compliance status of the installation water system, and note whether the regulatory authorities have provided any additional guidance or notices.

If the system is not directly accountable to a regulatory authority (which may be the case due to its size or its inclusion in a larger, regional system), define who is responsible for reviewing the water quality at the installation, such as the installation medical authority or PH program. Identify who performs this task and whether any anomalies in quality have been noted. In addition, delineate the operational monitoring performed routinely. This monitoring is generally accomplished by the water system operations personnel to support treatment or maintenance activities. Involve the installation PH program personnel in collecting and analyzing bacteriological samples from critical areas throughout the water supply system. (These areas include clinics, healthcare facilities, schools, daycare activities, areas experiencing low flow or low use, etc.) Overall, identify who performs what type of water system monitoring and whether any problematic issues have been discerned.

8.4 Handling, Storage, and Use of Chemicals

Another issue that project officers commonly address that has not been specifically delineated in the reports in the past is the acceptance, handling, and use of chemicals. Often, these materials are reviewed as part of the treatment operations. Approved chemical distributors are allowed into the installation where the materials are delivered. Frequently, these materials are accepted by operations supervisors and are stored at the water treatment plant, where they are to be used. They are secured within the fence surrounding the location to preclude access by unauthorized personnel. Some materials, such as chlorine cylinders, may be segregated in a locked area containing alarms and/or materials used for personnel warning or protection. The siting and security of chemical storage areas should now be described within the WSVA report.

8.5 Operator Certification and System Operations

The project officers report whether the operators on duty are certified to perform the duties for which they are assigned at each installation. Traditionally, the operators present their certificates to verify that they have passed courses provided/approved by the respective states for water treatment and/or distribution and storage system operations. Check to ensure that the operators meet the necessary criteria. Further, check the operational schedule of the water system. Denote the number of shifts for which the system is operational, ensure that the number of available operators is sufficient to meet the operational and maintenance needs of the system, and explain how water is provided to the installation during shifts when the system is not actively providing water (i.e., water is pumped into the system from available storage overnight and re-filled during the following day).

8.6 Cyber Operations and Security

The project officers representing the PHCs are not expected to be experts regarding cybersecurity or be in a position to judge the security and operation of the installation’s SCADA system. However, they should report how the SCADA is accessed by operations personnel (via the internet or a LAN system), who maintains such access, and how it is accessed (e.g., only from the water treatment plant, from a remote location, etc.). If possible, identify the organization that oversees the cybersecurity operations, how frequently those operations are reviewed, and whether any “hacking” or interference has been reported.

8.7 Financial Infrastructure

The final additional issue addressed in the AWIA is the water system’s ability to cover the costs of the risk and resilience assessment and provide for the implementation of measures necessary to harden the system from potential vulnerabilities. This issue can be both quite important and difficult for civilian systems. For Army installations, however, the financial infrastructure can be explained by the installation’s use of its normal Program Objective Memoranda funding process to address upgrades or equipment and operational needs. Funding is provided by the DOD and DA (through the G-4, Operations) for most actions. The direct use of operation and maintenance funding received is controlled by the IC, who acts on the advice and prioritization of his or her staff.

8.8 Certification of Accomplishment

The installation certifies completion of the risk and resilience assessment and the WSERP development in a letter submitted to the EPA Administrator. This action can be accomplished via email, postal mail, or an electronic portal. The latter option is preferred, as it is much faster than the other two and ensures that the EPA database receives the notification. Examples of wording needed for the certifications are provided on the EPA website. The WSVA, with the above amendments, can readily serve as the risk and resilience assessment for an Army installation. The frequency of the WSVA is every 3 years, and the AWIA input occurs every 5 years. Installations should use the latest WSVA to serve as the basis for the risk and resilience certification.

9.0 DELIVERABLES

9.1 Summary of Observations

As previously mentioned, the project officer(s) should summarize water system observations in no more than two slides to be presented during the official Higher Headquarters Assessment/Command exit briefing. These slides should be developed using a format consistent with that identified by the Higher Headquarters Assessment team leader. Positive aspects of water system operations and maintenance, as well as potential problem areas and recommended mitigation measures, may be presented. This briefing may serve as an interim report to the IC and staff.

9.2 Travel Voucher

The project officer(s) should complete a travel voucher, accounting for all official costs and claims, within 5 working days of returning to his or her duty station. Completing this requirement and submitting the signed voucher will ensure that the VTER travel fund is utilized and the project officer(s) receive payment in a timely fashion.

9.3 Final Report

A final report should be developed, reviewed internally, signed, and submitted to the ATO or IC within 60 days of the project officer(s)' completing the site visit and returning to the duty station. This document will be sent to the respective installation ATO for archiving and dissemination. If directed by the ATO, the project officer(s) may also submit copies to the DPW/operating contractor and PH program. Copies of ALL reports shall also be sent to the APHC Project Manager. The classification of all reports should be "Controlled Unclassified Information (CUI)" to allow access by contractors, Local Nationals, and other water operations personnel (who are responsible for reviewing the document and undertaking the recommended actions documented). The only exception to this classification standard is a finding which poses a high risk to the installation mission(s), or a true "vulnerability" according to the revised composite risk approach described herein. Under these circumstances, the report should be classified SECRET (according to Defense Threat Reduction Agency guidelines), and submitted to the ATO and APHC Project Manager via the Secret Internet Protocol Router Network.

APPENDIX A
REFERENCES

Department of the Army (DA). 2020. Pamphlet 40–11, *Army Public Health Program,* https://armypubs.army.mil

DA. 2017. Regulation 525–13, *Antiterrorism,* https://armypubs.army.mil

DA. 2008. U.S. Army Assistant Chief of Staff for Installation Management (ACSIM) Memorandum, Subject: Water System Vulnerability Assessments (WSVA) and Emergency Response Plan Requirements for Water Systems. Washington, D.C.

DA. 2006. Field Manual 3–19, *Composite Risk Management,* https://armypubs.army.mil

Department of Defense (DOD). 2016 (Change 3, June 12, 2019). Instruction 6055.17, *DoD Emergency Management (EM) Program.* https://www.esd.whs.mil

DOD. 2016 (Change 2, November 20, 2019). Instruction O-2000.16, Volume 1. *DoD Antiterrorism (AT) Program Implementation: DoD AT Standards.* https://www.esd.whs.mil

DOD. 2016 (Change 1, May 8, 2017). Instruction O-2000.16, Volume 2. *DoD Antiterrorism (AT) Program Implementation: DoD AT Standards. DoD Force Protection Condition (FPCON) System.* 7. https://www.esd.whs.mil

DOD. 2003. Under Secretary of Defense for Acquisition, Technology, and Logistics Memorandum, *DOD Policy on Drinking Water Vulnerability Assessments and Emergency Response Plans.* Washington, D.C.

Public Law 115-270. Title II–Drinking Water System Improvement. 2018. *America's Water Infrastructure Act of 2018.* https://www.congress.gov

United States Code (U.S.C.). 2002. Title 42, sec 262a. *Public Health Security and Bioterrorism Response Act of 2002* (68 FR 27555) https://www.federalregister.gov

U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM). 2008. Technical Guide (TG) 188, *U.S. Army Food and Water Vulnerability Assessment Guide.* Aberdeen Proving Ground, Maryland.

U.S. Army Public Health Command (USAPHC). 2012. TG 355, *Installation Food Vulnerability Assessment Program Handbook.* Aberdeen Proving Ground, Maryland.

GLOSSARY

AMC
U.S. Army Materiel Command

AOR
area of responsibility

APHC
U.S. Army Public Health Center

AR
Army regulation

ATO
antiterrorism officer

AWIA
America's Water Infrastructure Act

CWS
community water system(s)

DA
Department of the Army

DOD
Department of Defense

DODI
DOD Instruction

DPW
Directorate of Public Works

DTS
Defense Travel System

EHE
Environmental Health Engineering

EPA
U.S. Environmental Protection Agency

FY
fiscal year

IC
installation commander

IMCOM
U.S. Army Installation Management Command

LAN
local area network

MEDCOM
U.S. Army Medical Command

OTSG
Office of The Surgeon General

PH
public health

PHC
public health command

POC
point of contact

SCADA
supervisory control and data acquisition

SDWA
Safe Drinking Water Act

SOP
standard operating procedure

TG
technical guide

USACHPPM
U.S. Army Center for Health Promotion and Preventive Medicine

USAPHC
U.S. Army Public Health Command

U.S.C.
United States Code

WBS
work breakout structure

WSERP
water system emergency response plan

WSVA
water system vulnerability assessment

WTP
water treatment plant