Impact of Septic Tanks on Wellhead Protection Efforts

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The purpose of a watershed protection program is to reduce the potential for contaminants to leach into groundwater and threaten the quality and treatability of the water supply, as well as to identify and manage recharge areas specific to the wellfield. Watershed protection programs can range from simple regulations concerning location of facilities in the vicinity of wells to extensive land purchases and comprehensive land use restrictions, such as have occurred in the Seattle and upper New York City water supply areas.

For groundwater systems, watershed protection takes the form of a wellhead protection program. The process of identifying the protection requirements of a wellhead protection program begins with understanding the hydrogeology, hydrology and land use activities of a given area. This information, along with monitoring data, establish the base for locating contaminants of concern, where wells should not be constructed, and where concerns may exist about current activities.

Regulatory Environment

Watershed and water source protection efforts have recently gained significant momentum because of changes in Congress, not because of the desire of Congress to be more involved in source protection, but because Congress is currently attempting to weaken some of the standards of the Clean Water Act, especially through private property rights legislation. This trend has also been reflected in activities of some state legislatures, including Florida's legislature.

Because of the potential for relaxation of the Clean Water Act, utilities have scrambled to put into place programs to protect water resources previously thought to have been protected by current legislation. In Florida, for example, such efforts may include zoning modifications, use restrictions, and easement reservations, all of which are limitations on land use that may conflict with the private property rights bill approved by the Florida Legislature in 1995. This legislation states that if a property sustains damage amounting to more than 10% of the property's original value, the regulating agency must compensate the landowner for the loss. This could be a significant impediment for utilities, and it makes careful selection of property of easements and wells important.

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The state regulates wellhead protection under Chapter 62-521 of the FAC ("Wellhead Protection"). The scope and intention of this rule is that since groundwater resources are the primary source of drinking water for over 90% of all public supplies in the state, protection from contamination must be created for all potable wells; such protection is also needed to avoid replacement of wells or restoration of the aquifer because of contamination. Criteria for delineating wellhead protection areas, permitting, and minimum criteria for recognizing local government's wellhead protection programs was established under Chapter 163, Florida Statutes, and Chapter 9J-5 FAC. The intention of the legislation is to encourage and support local government efforts in this area. However, the rule is basically a set of definitions and the promise of a set of procedures for delineating wellhead protection areas to be developed over the next five years. The only specific criterion is that a primary wellhead protection zone, a 500-foot diameter setback, must be established for all potable wells. Groundwater travel times and adequacy determinations are to follow by 1998. The rule does prohibit new unlined wastewater ponds, basins, and similar facilities to prevent seepage into wellfield areas, but at the same time prevents reuse and land application projects unless they are permitted under Part III of Chapter 62-610, FAC. In a number of areas of the state, there are moves to utilize reclaimed water as an indirect form of recharge, and this rule would tend to frustrate that effort. Underground storage tanks and other applications mentioned in the rules are prohibited except under specific guidelines.

Concerns in Defining a Wellfield Protection Program

One of the most important concerns in attempting to develop a wellhead protection program is the determination of the types of contaminants that may exist in the vicinity of wells. EPA estimates that 50% of community water wells and at least 57% of domestic water wells in the United States contain nitrates, which have few natural sources. Fertilizer application, inadequate maintenance of septic tanks, unlined wastewater holding ponds, and improper sludge or manure application sites are the major contributors to nitrate contamination.

Nitrates are only a small portion of the problem. Over 63,000 synthetic chemicals are in common commercial and industrial use in the United States, a number that continues to grow every year. More than 200 of these chemical substances have been found in groundwater, but only where someone has checked. Others may occur in groundwater where wells are not currently being drilled or investigation has not occurred. Typically, the issue does not arise until it shows up in someone's potable supply. Organic chemicals have become a pervasive contaminant in groundwater supplies. In fact, the finding in 1969 that over 25% of all wells have some form of organic contamination led directly to the Safe Drinking Water Act of 1974.

While groundwater systems are just as susceptible to contamination as surface waters, they may retain contamination for much longer periods of time due to the slow moving nature of the water. Soil and rock trap contaminants within the groundwater reserves, many of which have existed for hundreds of years. Treatment and removal of contaminants are difficult and lengthy; abandonment of wells in a contaminated aquifer is the normal response. Groundwater-related disease outbreaks and associated illnesses have risen as a result of contamination from both chemical and biological concerns.

Two other problems may create concerns in groundwater systems: layers of rock previously thought to be highly confining have been found to contain fractures or man-made intrusions (wells) that create pathways for contaminants to move into underlying aquifers, and there is often a lack of historical memory about the location of buried underground tanks or old landfills.

Delineation of a wellhead protection area is typically done through the use of computer modeling efforts based on travel time and pollutant transport. These models can be complex and can create large areas where many land uses are prohibited, which conflicts with private property rights. For example, in the city of Hollywood, the Broward County Department of Natural Resource Protection has modeled the city's wellfield protection zone. An outline of the modeling indicates significant portions of the city exist within the Zone 3, or 210-day groundwater travel time zone. While the modeling is at least 15 years old and does not reflect current withdrawal conditions, the area is extensive and has a significant amount of commercial activity, and the use of septic systems exists within the Hollywood wellfield protection zone. These activities conflict with the use of a semi-confined surficial aquifer system and indicates that the city needs to monitor raw water data in the vicinity of the wellfields and look at additional wellhead protection measures.

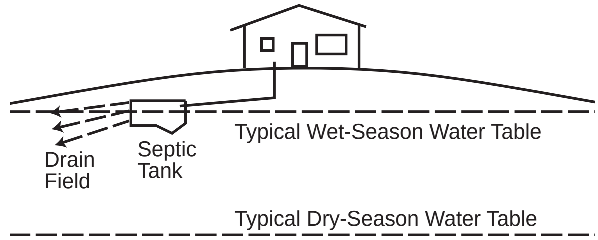
The Problem of Septic Tanks

Perhaps the biggest concern within the wellfield protection zone regulations is septic tanks. Throughout Florida, septic tanks permitted by the state's Department of Health through local health departments have proven to be problematic from a groundwater protection/water resource standpoint in coastal areas and in areas of high concentrations of septic tanks.

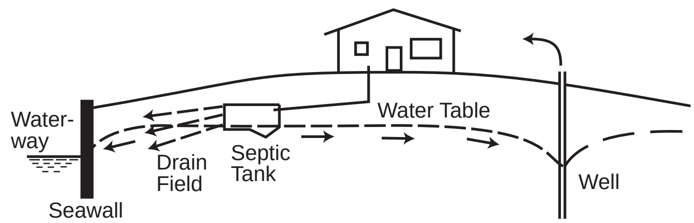
The basic operation of a septic tank is that wastewater is flushed into a 1,000-gallon concrete tank to be broken down by bacteria. The effluent is discharged through an outlet to a series of perforated underground pipes (drainfield). The detention time within a septic tank is between three and seven days, depending on the wastewater generated.

Some degree of treatment occurs, depending on septic tank loading and detention time. In addition, the amount of area available for attenuation of the leachate from the drainfield improves performance (which is why septic systems close together do not work well). However, no pathogen removal occurs in the septic tank or drainfield; it is assumed that the soil will provide pathogen removal.

In South Florida older septic tanks have some operational problems that generally go unnoticed until rainfall recharges the water table aquifer from the summer rains. There is a 2- to 4-foot fluctuation in the groundwater table between the summer rainy season and late spring. During the winter and spring, the effluent piping from the septic tanks is totally above the water table and the wastewater filters through the drainfield pipes into the water table. However, during the summer months when the water table is raised, many septic tanks do not operate properly because the water table is above the drainage pipes and the drainage pipes cannot release the effluent from the septic tank. This circumstance may go unnoticed because of a large number of residents are not in Florida during those months and usage is light by the remaining residents.



The problem is compounded in areas where people have irrigation wells in their yards. Any well that is installed in the surficial aquifer system will cause a drawdown. The sink that is formed causes water to move more rapidly towards the well, and where septic tanks are not more than 75 feet from the wells



they are clearly within the cone of influence of the wells. As a result, the tendency is for the septic tank effluent to go into the groundwater table and immediately go to the well where it is recycled and sprinkled on top of the ground. This is extraordinarily problematic where there is the potential for people to drink the water from the well.

Many areas in Florida have contaminated water bodies as a result of groundwater movement through septic tank areas. A brief study conducted on Marco Island several years ago indicated a perfect correlation between areas that had sanitary sewers and minimal fecal coliform counts in the adjoining waterways (less than 2 colony-forming units/100 m[(CFU/100 ml)), versus areas with septic tanks that consistently had bacterial counts classified as “too numerous to count.” Similarly, the Naples Conservancy produced a report in the early 1980s that pointed to the high concentration of septic tanks in East Naples as the source of degradation and fecal coliforms in Naples Bay. This report subsequently led to Collier County installing sewer systems for over 10,000 units in East and South Naples.

The movement of contaminants from septic tanks to groundwater is of great concern in coastal areas where municipal water supply wells are surrounded by areas where septic tanks are present. Despite appropriate setback distances being utilized, the general flow direction of the aquifer usually passes through areas with septic tanks before it gets to the wells. The saving grace for utilities is that there is often a semi-confining layer between the surficial system and the aquifer layer that potable withdrawals come from that may retard the fecal coliforms (it should be noted that the Hollywood sampling does not show fecal coliforms in any of the raw water from its wells). However, in residential potable and irrigation wells, which are typically only 3040 foot deep, there would clearly be a tendency for fecal coliforms, creating a potential health hazard in the long term. Several incidents such as this can be found in many communities throughout South Florida.

Conclusions

Wellfield protection efforts throughout South Florida have focused on industrial and commercial activity, much of which has grown up around the wells through the years. Some of these activities can clearly be identified as a concern to water supplies for utilities. However, septic tanks are often ignored because of the cost of retrofitting existing neighborhoods, the political backlash from the imposition of assessments to pay for the improvements, and the initial sources of funds to pay for the improvements; all of which create significant problems for the location of new or replacement wells in the surficial aquifer system.

Concentrations of poorly designed, improperly installed, or inadequately maintained septic tanks over the years have been shown to be a problem in many areas of the state. First alert wells should be used by any utility with septic tanks in their vicinity to monitor water quality. Ongoing efforts to understand if irrigation (or private water supply) wells are impacting the public, or if waterway systems are being degraded, should also be monitored through periodic sampling and cooperation with local physicians. As a result, future wellfield protection zones should be reviewed to understand the current situation, and avoid future property rights arguments.

In contrast, there have been health concerns raised in South Florida about the use of reclaimed wastewater effluent. Yet this water undergoes secondary treatment, filtration, and high-level disinfection prior to application, and has a requirement to show zero fecal coliforms, which is not the case with septic systems. The potential for utility water supplies to be impacted with concentrated septic systems or other surface activities is much higher that any impact from reclaimed water. ■

Hazardous Chemicals at Treatment Facilities - Complying with OSHA and EPA Rules

Tom Helgeson

Accidental releases of hazardous chemicals, particularly in the chemical production industry, have occurred with relative frequency for many years. Several incidents during the 1980s and early 1990s resulted in a focused evaluation of the efficacy of existing rules and regulations with respect to chemical hazards. These incidents included Bhopal, India (1984 - more than 2,000 deaths); Institute, West Virginia (1985 - 135 injuries); Phillips 66 (1989 - 23 deaths and 350 injuries); ARCO Chemical (1990 - 17 deaths); BASF (1990 - 2 deaths and 41 injuries); and IMC (1991 - 8 deaths and 128 injuries). These major incidents created a higher level of public awareness towards the risk associated with the handling and processing of hazardous chemicals.

As part of the massive Clean Air Act Amendments of 1990 (CAAA), Congress instituted section 112(r), which directed the Department of Labor (through OSHA) and the EPA to develop necessary regulations to enhance the level of safety of workers, the general public, and environmental resources that could be exposed to hazard as the result of an accidental release of a listed hazardous chemical. OSHA and EPA were directed to coordinate their efforts in order to reduce conflicts and double compliance issues between the resulting regulations.

OSHA responded by releasing Process Safety Management of Highly Hazardous Chemicals (29 CFR 1910.119) (PSM) in February 1992. EPA's Chemical Accident Prevention Provisions (40 CFR 68) (ARP) was not codified until June 1996 under court order. Under the regulations, owners and operators of processes storing or using any of the listed chemicals in excess of stated threshold quantities were required to be in compliance with all OSHA requirements by May 26, 1997, and the EPA requirements by June 21, 1999.

The PSM and ARP regulations are similar in terms of requirements, except that, depending on site-specific variables, the PSM standard can be more rigorous.

Interrelationship of PSM and ARP Rules

While the overall objectives of the OSHA and EPA regulations are consistent with each other, they each reflect the originating agency's focus. Broadly speaking, the focus of PSM is on the workers and employees ("inside the fence"), while ARP is directed toward the protection of the general public and environmental receptors ("outside the fence"). This difference in focus can lead to a given facility being required to comply with one but not both of the regulations because of differences in chemicals listed and staffing conditions. Most Florida water and wastewater facilities would seem to fall under the compliance requirements of both rules.

The chemicals listed by each regulation differ somewhat in terms of the actual chemicals and the threshold quantities that trigger compliance. Chemicals that may be encountered at water and wastewater facilities and the threshold quantities for each rule are shown in the accompanying table. This is not a complete listing since each regulation lists approximately 140 toxic and flammable substances.

Since the PSM regulation is centered on employee safety, those facilities that are not manned full time (defined as eight hours per day and five days per week) are exempt from PSM compliance. This represents a significant exclusion of Florida facilities because many water and wastewater plants are subject to minimal man-hour requirements. The ARP regulation, however, makes no distinction based on facility operation; rather, it is driven by proximity to human and environmental receptors.

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Threshold Quantities (in pounds)

Chemical	PSM	ARP
Ammonia[a]	10,000	10,000
Ammonia[b]	15,000 (> 44%)	20,000 (> 20%)
Chlorine	1,500	2,500
Chlorine Dioxide	1,000	1,000
Hydrochloric Acid[a]	5,000	5,000
Hydrochloric Acid[b]	N / A	15,000 (> 37%)
Hydrogen Peroxide	7,500 (> 52%)	N / A
Ozone	100	N / A
Sulfur Dioxide	1,000	5,000

a - Anhydrous
b - Solutions - strength threshold as shown (by weight)

Potentially the most significant difference between the PSM and ARP rules is the burden of proof placed on owners and operators of covered processes. OSHA regulations, in large part, do not require formal submittal of compliance documentation by covered parties. It is OSHA's assumption that a facility complies with all of the regulations until determined otherwise (generally determined during field investigations following an accident). This aspect of OSHA enforcement has given rise to the high levels of uncertainty experienced by facility managers when trying to determine their compliance with workplace regulations. On the other hand, EPA typically requires documentation that certifies compliance with the applicable regulation before an incident occurs. The ARP regulation is no exception, requiring significant documentation and reporting by affected facilities.

One result of this difference in approach is that many facilities that have not fully complied with the PSM standard may find themselves revisiting many issues when compiling ARP documentation. Those utilities that undertook PSM compliance with their eyes towards ARP compliance have, as a result, lessened their overall level of effort towards compliance.

Compliance Requirements

The balance of this article is directed towards ARP compliance, since it is assumed that facilities have met their PSM obligations, if any. Some investigation has, however, determined that there may be many utilities that have inadequately addressed their PSM obligations where they exist. In these cases, a thoughtful approach towards ARP compliance can "tighten-up" a utility's PSM program.

Applicability

In part, 40 CFR 68.10 states:

"An owner or operator of a stationary source that has more than a threshold quantity of a regulated substance in a process ...shall comply...no later than the latest of the following dates: June 21, 1999; three years after the date on which a regulated substance is first listed...; or the date on which a regulated substance is first present above a threshold quantity in a process."

Those persons responsible for design and construction of new facilities should take note that the third requirement above clearly obligates the owner and by extension its consultant to ensure ARP compliance before a new facility goes into service. Ideally, this requirement leads to more holistic design and more efficient construction of new facilities that will be handling or storing a listed chemical.

The above citation requires an understanding of the key definition of a stationary source. A stationary source is defined by the ARP regulation as "...any buildings, structures, equipment, installations, or substance-emitting stationary activities (a) which belong to the same industrial group; (b) which are located on one or more contiguous properties; (c) which are under the control of the same [entity]; and (d) from which an accidental release may occur." A stationary source is not, therefore, any transportation or transportation-related activity (which are covered under DOT regulations), except that a transportation container (e.g., a chlorine container) used for storage or connected to a process is considered part of a stationary source.

Terms and Definitions

The ARP regulation introduces several concepts and terms to the vocabulary of a treatment plant. These terms include (40 CFR 68.3):

Risk Management Plan (RMP) — The document produced as a result of complying with the various requirements of the ARP regulation. The level of detail varies according to the compliance level dictated by ARP.

Toxic Endpoint — The point at which the hazardous chemical reaches a concentration equal to a value published in Appendix A to 40 CFR 68. These concentrations are typically very low relative to acknowledged health hazard concentrations. Concentrations for the predominant chemicals for water and wastewater treatment are chlorine - 0.0087 mg/L, sulfur dioxide - 0.0078 mg/L, and ammonia - 0.14 mg/L.

Worst-Case Release — The release of the largest quantity of a regulated substance from a vessel or process line failure that results in the greatest distance to the appropriate endpoint. Generally considered to be a full release of the largest stored quantity over a ten-minute period. A worst-case release also assumes that no active mitigation efforts (scrubbers, etc.) are successful but passive mitigation (walls, doors, berms, etc.) can be considered.

Process — Any activity involving a regulated substance including use, storage, manufacturing, handling, or on-site movement of such substances, or combination of these activities.

Public Receptor — Offsite residences, institutions (e.g., schools, hospitals), industrial, commercial, and office building, parks, or recreational areas inhabited or occupied by the public at any time without restriction by the stationary source.

Environmental Receptor — Natural areas such as national or state parks, forests, or monuments; officially designated wildlife sanctuaries, preserves, refuges, or areas; and federal wilderness areas that could be exposed at any time to toxic concentrations...as a result of an accidental release.

Program Level Eligibility

During formulation of the ARP rule, EPA realized that different facilities represented different levels of risk to the general public. The ARP regulation makes allowances for these differences through the concept of program levels, which places differing compliance burdens on facilities based on the potential of individual processes for offsite consequences, accident history, and compliance with PSM. The levels are: Program 1 — Least stringent requirements; Program 2 — Default Program; and Program 3 — Most stringent requirements.

It is possible that, within a stationary source, processes coexist and fall under different program levels. In this case, a single RMP would be submitted for the entire stationary source, but different processes would have different supporting details.

To be eligible for Program 1, a process must meet all three of the following requirements:

- Accidental Release History: if, for an accidental release in the last five years, exposure to the substance, reaction products, explosion overpressure, or radiant heat effects did not result in death, injury, or response/restoration activities at an environmental receptor.
- That an analysis of the worst-case release determined that the nearest public receptor is beyond the distance to the toxic endpoint.
- Ensure that response actions have been coordinated with local emergency planning and response agencies.

Any stationary source not falling under the requirements of Programs 1 or 3 is automatically eligible for Program Level 2. This would seem to include the vast majority of Florida water and wastewater facilities not subject to PSM since there are few, if any, treatment facilities remote enough from their service areas to be eligible for Program 1.

Processes falling under Program 3 include all processes present at facilities of specifically named industries with a preponderance of risk elements and all processes subject to PSM. Because of the level of effort expended and information gathered by those facilities required to follow the PSM standard, EPA wanted to minimize the potential for double compliance or duplicative efforts.

Program 3 qualification for water and wastewater treatment processes can, therefore, represent a minimal additional compliance effort relative to PSM. If, however, the requirements of PSM have not been adequately met, the facility will have a larger burden for timely compliance with the ARP regulation.

Having determined the appropriate Program Level for covered processes, the owner or operator must implement a program to comply with 40 CFR 68 and develop the RMP.

Program Level Compliance

All RMPs submitted by the stationary source must include the following elements: (1) an executive summary; (2) a comprehensive registration form for all processes falling under this rule present at the stationary source; (3) one worst-case analysis scenario and results (release scenarios and modeling are discussed later in this article); (4) a five-year accident history; and (5) a discussion outlining the stationary source's emergency response program.

If a covered process is eligible for inclusion in Program 1, the submitted RMP will include a certification (using statutory language) signed by the owner or operator. It uses binding language which should be well understood before it is signed.

A Program 2 process must include the following elements in the submitted RMP: (1) an alternative release scenario and results for each regulated toxic substance and for all regulated flammable substances held above the threshold quantity; and (2)information regarding the stationary source's prevention program, which must include information on the most recent review of the facility's process safety information, process hazards (and completion dates of changes resulting from the review), operating procedures, training programs, and maintenance procedures. The discussion must also address dates and results of the most recent equipment inspections, internal compliance audits, incident investigations (and completion dates of changes resulting from the investigation), and the date of the most recent change leading to internal review of safety information, reviews, procedures, or training.

A certification attesting to the truth, accuracy, and completeness of the information must also be included in the RMP.

For each Program 3 process, the following comprehensive elements must be included in the RMP:

The alternative release scenarios as described under Program Level 2.

A more rigid prevention program, modeled on the PSM standard, which includes the following components:

- The date on which the most recent process safety information review occurred. A process safety information review considers all applicable federal and state regulations or industry-specific design codes and standards.
- The date and method used for the most recent process hazard analysis (PHA). This discussion must include the date of completion of required changes, major hazards identified, process controls in use, mitigation systems in use, monitoring and detection systems in use, and changes since the last PHA. The PHA procedure is discussed later in this article.
- The date of the latest review or revision of training programs. This discussion shall identify the training methods used and the type of competency testing used.
- The date of the most recent review or revision of maintenance or testing procedures and the equipment tested.
- The date of the most recent change giving rise to implementation of "management of change" procedures and the most recent review or revision of "management of change" procedures.
- The date and results of the most recent pre-startup review. The pre-startup review is a comprehensive analysis of a process prior to re-start or initial start-up. Note that this element is required before placing newly constructed facilities in service.
- The date of the most recent internal compliance audit and the expected completion date of resulting changes.
- The date of the most recent incident investigation and the expected completion date of changes resulting from the investigation.
- The date of the latest review or revision of employee participation plans.
- The date of the latest review or revision of hot work permit procedures. Hot work is defined as any work involving electric or gas welding, cutting, brazing, or similar flame- or spark-producing operations.
- The date of the most recent review or revision of contractor safety procedures and evaluation of contractor safety performance.
- A certification attesting to the truth, accuracy, and completeness of the information included in the RMP.

For those utilities that have undertaken a valid PSM program, the work completed under PSM fulfills the requirements of the Program Level 3 prevention program.

Public Availability of RMP Information

It is stated in 40 CFR 68.210 that RMP information submitted to EPA shall be made available under the requirements of 42 U.S.C. 7414(c) (The Freedom of Information Act). It is generally assumed that once the information is available the general public will learn about the risks associated with the operation of water or wastewater treatment plants near their homes, schools, hospitals, etc.

EPA has announced its intention to make facility RMPs available for general access via the Internet. Questions as to security and potential terrorist access to this information may yet alter this intent.

EPA does not require the owner or operator of a stationary source to conduct public education efforts, but some utilities may wish to take a proactive approach to public education to control information dissemination (i.e., bill stuffers or public meetings vs. a "surprise" article or news spot in the local media).

Reporting Requirements

EPA requires that RMPs be filed in accordance with the dates shown earlier (basically, June 21, 1999) in a form and format that has not been finalized by the EPA. It is generally assumed that the filing will be via electronic application over the Internet. Production of a guidance document for water plant RMPs has been authorized by EPA, but its released was delayed.

It is critical that utilities do not wait for finalization of form or format prior to commencing their ARP compliance efforts. Such utilities will inevitably be confronted with excessively tight schedules for compiling information and changing existing procedures to meet the RMP requirements.

Release Scenarios

Under each program level, the owner or operator of the stationary source must conduct one or more release scenarios to include, at a minimum, a worst-case scenario. Program 2 and 3 processes must also include an alternative release scenario for each of the regulated toxics present. Alternative releases consider possibly more realistic situations and allow the consideration of active mitigation efforts (e.g., a chlorine scrubber). Each of the scenarios is intended to develop the distance to the toxic or flammable endpoints.

EPA does not require extensive or computer modeling of release scenarios. Lookup tables are available for estimating distances to endpoints but are constructed based on very conservative assumptions. As an example, for one utility, the difference between the distances predicted by the lookup tables and a publicdomain dense gas dispersion computer model for a chlorine release was 1.0 mile (2.0 miles by lookup table vs. 1.0 miles by the computer model). When evaluating the time and cost associated with the release modeling decision, the owner should consider the public information aspects of showing a larger potential impact area. Additionally, the impact on the RMP of discussing a larger area of potential effect should be considered.

Process Hazard Analysis

The PHA is a rigorous procedure with the intent of thoroughly, objectively, and systematically evaluating a process and procedures involving the use of hazardous chemicals. The PHA is an element required of Program Level 3 participants and is defined within the PSM standard. OSHA recommends a team approach to this procedure. The team should include members with both engineering and operation expertise in the process being evaluated. At least one member of the PHA team must have experience in the evaluation method being used. The PSM standard allows the following PHA methods to be used (the methods are described in various references):

- What-If
- Checklist
- What-If / Checklist
- Hazard and Operability Study (HAZOP)
- Failure Mode and Effect Analysis (FMEA)
- Fault Tree Analysis

Different processes require differing levels of intensity with respect to the PHA method used. For water and wastewater treatment facilities, the utility may wish to consider an in-depth PHA method for the initial PHA and less intensive methods for subsequent reviews and revisions.

Compliance Strategy

Experience has shown that most of the affected water and wastewater facilities in Florida will be required to comply under Program Level 3. Since this is the most comprehensive level of compliance under the ARP regulation, the owner or operator of the facilities must consider an appropriate strategy for compliance.

An effective compliance strategy will make use of all the resources available to the utility owner or operator, including the personnel exposed on a daily basis, plant supervisory staff, and consultants. Operating personnel often provide the most valid, reasonable, and feasible solutions to chemical handling issues. This fact is well reflected in OSHA's employee involvement requirement in the PSM standard. Plant supervisory staff are able to envision and implement changes and modifications while keeping the utility's overall operating strategy in mind. Consultants provide required technical expertise in the areas of process engineering, air dispersion modeling, PHA methodology, and a possibly better understanding of the interrelationships of local, state and federal regulations.

Evaluation of the operations at several utilities shows that the procedures, policies, training, emergency response issues, and other elements already exist,at least in a rudimentary form. It is entirely reasonable for the utility to conduct its own review and revision of procedures as they relate to hazardous chemicals. Often, the review will show that existing information requires slight updating and the need to be placed under the responsibility of a single person.

The contracting of a consultant to facilitate coordination of the myriad requirements of the PSM and ARP regulations has proven helpful to several utilities in complying with these requirements.

Above all, utility owners or operators must undertake their compliance efforts under these regulations as soon as practical. June 21, 1999 is approaching sooner than any of us expects! ■