Groundwater and PFAS: State of Knowledge and Practice

Risk Communication

Section 7

One of eight sections prepared by National Ground Water Association volunteers. Each section was prepared to stand independently, or to be integrated with the other seven sections.

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Risk Communication

WHY IS RISK COMMUNICATION IMPORTANT?

According to the United States Environmental Protection Agency (USEPA)'s Risk Communication Guidance, the overall purpose of risk communication is *to assist affected communities [to] understand the processes of risk assessment and management, to form scientifically valid perceptions of the likely hazards, and to participate in making decisions about how risk should be managed* (USEPA 2007). Risk is the relationship between the probability of harm associated with an activity and vulnerability of people or the environment (Slovic 1987, 2003; UN-ISDR 2002).

Risk communication is the process of informing stakeholders about health or environmental risks, risk assessment results, and proposed risk management strategies. Stakeholders can consist of any organization, group, or individual who takes an interest in a project and can influence project outcomes (Cundy et al. 2013).

In the context of PFAS sites, stakeholders primarily include regulators, impacted water users, and responsible parties. Risk communication should be performed as a two-way conversation in which all stakeholders are informed of each other's needs and project objectives are identified to meet them (Cundy et al. 2013; USEPA 2007).

When performing risk communication, it is important to consider stakeholder context and to identify vulnerable subpopulations within the impacted community:

- *Stakeholder context* is defined by community demographics; sociocultural factors (e.g., views on environmental stewardship and cleanup activities); psychosocial factors (e.g., diversity in individuals' beliefs, attitudes, values, and inhibitions, including trust of authorities); knowledge base (e.g., understanding of PFAS exposure and "safe levels"); and the presence of limitations on mobility that may hinder adequate involvement in community outreach events (e.g., public meetings).
- *Vulnerable subpopulations* may include non-native speakers, low income groups, and sensitive populations such as children and the elderly (Government of Canada 2005; USEPA 2007). For example, Emmett and Desai (2010) observed the distribution of blood serum PFOA was age-dependent, with significantly higher values in children aged 5 or under, and in those over 60.

Consideration of stakeholder context can assist remedial professionals to identify factors contributing to community skepticism. Heightened community concern and skepticism at the PFOA site in Little Hocking, Washington County, Ohio (herein referred to as the "Little Hocking Site") was likely caused in part from distrust due to the initial lack of communication of PFOA detections in tap water and differences among recommended "safe level" concentrations (Emmett et al. 2009).

Emmett et al. (2009) state that "Collectively these developments eroded the credibility of both government and the fluoropolymer facility in the affected community." While engaging all stakeholders meaningfully can be a complex process, when undertaken successfully, effective risk communication can streamline projects, enhance transparency, and alleviate stakeholder concerns (Government of Canada 2005; Harclerode et al. 2015; USEPA 2007).

RESPONDING TO STAKEHOLDER QUESTIONS AND CONCERNS

Environmental and public health regulatory agencies have prepared information documents to assist professionals in performing effective risk communication for PFAS sites. Based on a review of supporting materials and experience of NGWA's technical professionals, additional frequently asked questions were identified. These questions and recommended responses are presented below:

1. *Question:* Why are laboratory methods not available to determine whether PFAS are not present (i.e., the detection limit is zero)?
   Answer: There is no technology that is sensitive enough to analyze down to a "zero" concentration (i.e., not a single molecule is present) for any chemical. However, there are USEPA-approved methods that are sensitive enough to detect PFOS and PFOA at levels lower than the current health advisory of 70 parts per trillion (ppt). Therefore, public health can be protected.
2. *Question:* Does the presence of other pollutants and/or by-products exacerbate the effects of exposure to PFASs on human and environmental health?
   Answer: The USEPA has developed an approach to evaluate the potential effects of exposure to multiple chemicals. However, each situation is different, and depends on the amount and type(s) of chemicals that may be present as well as whether the chemicals contact humans or the environment. In addition, there are no known combinations of PFAS with other chemicals that exacerbate the risks associated with exposure.
3. *Question:* How do my blood level results compare to others?
   Answer: Certain state public health agencies, including the Minnesota Department of Health, have published results of biomonitoring performed in their state as well as information from the entire U.S. population (https://apps.health.state.mn.us/mndata/biomonitoring_pfc#longterm). An internet search using "biomonitoring", "PFCs", "public health", and your state agency as keywords can assist with finding informative material. In addition, you can contact your county or state health department for information.

In addition to fact sheets, a communication plan can be developed to assist with engaging and disseminating information to stakeholders. As showcased by the Little Hocking Site, development of a comprehensive stakeholder outreach strategy can address and potentially overcome distrust present between community members and decision-makers (such as regulatory authorities and responsible parties). The communication plan developed for the Little Hocking Site was comprised of the following, presented in chronological order (Emmett et al. 2009):

1. *Notifications to Participants and Authorities.* Next-day-delivery mailings of results were sent to individual study participants, with the individual's blood PFOA and biomarker levels. Comparative information on PFOA levels was included, and a toll-free telephone number to contact a study physician with any questions. Letters were sent simultaneously to identified authorities and Community Advisory Committee (CAC) members, to ensure recipients would be able to respond appropriately to inquiries from the public.
2. *Initial Press Release and Briefing.* Key local and regional media were identified and informed of the communication plan around the date the participant letters were sent. An initial press release and briefing were made the second day after the mailing to ensure participants did not first learn of the issue through the press, while still providing investigators an opportunity to be the primary source of information to the press. Identified media representatives and national news outlets were invited to the news briefing.
3. *Closed Rehearsal of Community Presentation.* A strictly closed to the public, full rehearsal presentation was made to the CAC on the night preceding the community meeting. CAC members provided feedback on the order of the agenda, comprehensibility of slides, choice of wordings, structure of the presentation, and dealing with likely questions.
4. *Community Meeting.* Detailed study results were presented at the community meeting, approximately three weeks after the initial participant letter. The CAC requested a presentation that was careful and simple to understand, incorporating a clear visual map so that residents could locate their residences with respect to the study results. The presentation made it clear this was not the

be-all and end-all of studies, but part of a continuum of information.

5. *Publication of Results and Information.* Following the community meeting, a newsletter with test result summaries was issued. A website with meeting presentation slides, test results, and frequently asked questions was also developed.

OVERCOMING RISK COMMUNICATION CHALLENGES

Performing effective risk communication is not without its challenges, especially in contentious settings when exposure routes and human health impacts have been identified. These potential challenges include: (1) uncertainty/variability in regulatory cleanup criteria and policies; (2) misperception of proposed risk management strategies; (3) inability to provide effective risk communication to vulnerable subpopulations; and (4) difficulty managing stakeholder expectations. The following subsections present a discussion of these terms and concepts, and provide stakeholder engagement methods that can be utilized to address these challenges and facilitate meaningful risk communication.

Uncertainty/Variability in Regulatory Cleanup Criteria and Policies

One of the purposes of risk communication is to assist stakeholders in understanding the process of risk assessment and risk management. Due to the nature of emerging contaminants such as PFAS and the number and complexity of PFAS compounds, current regulatory cleanup criteria and policies issued by federal and state agencies can be in conflict. Policies and criteria are also subject to change based on developing sampling methodologies, analytical procedures, and risk assessment evaluations. For example, USEPA recommended a PFOS Provisional Health Advisory of 0.2 micrograms per liter (µg/L) in January 2009, which was subsequently replaced in 2016 with a Health Advisory of 70 parts per trillion (ppt).

In the context of risk communication, it is important to communicate these uncertainties and variabilities while maintaining stakeholder trust and meeting their needs (USEPA 2005, 2007). In addition to relying on cleanup criteria as a primary risk management performance metric, secondary risk management performance metrics can be used to communicate and evaluate success of a proposed PFAS risk management strategy, thus alleviating perceived uncertainty and associated risks (e.g., failure to gain acceptance and delays due to antagonistic relationships among the community and decision makers) (Cundy et al. 2013; Harclerode et al. 2016a; REVIT 2007; RESCUE 2005). Examples of secondary performance metrics may include source/plume containment, establishing the PFAS is not bioavailable and/or mobile, and there are no complete exposure pathways associated with the site. Evaluation tools such as exposure scenario evaluation, Use Attainability Analysis (UAA), and contaminant concentration and/or loadings can be used to assess and communicate performance of site-specific secondary risk management objectives (Harclerode et al. 2016a).

Misperception of Proposed Risk Management Strategies

Effective risk communication is dependent upon the decision makers' ability to assist affected stakeholders in forming scientifically valid perceptions of their risk to PFAS. Risk perception refers to the difference between expert and layman perception (see the landmark report by Pidgeon et al. 1992, p. 89). As the public is exposed to hazards, the community and broader society reacts, and in turn directly influences stakeholders' perceived risk of those hazards.

A phenomenon termed "risk attenuation" occurs when experts judge hazards as relatively serious, while impacted parties do not perceive the risk as serious and provide comparatively little attention to that risk. Under this scenario, risk perception creates a challenge in engaging stakeholder participation in prevention and mitigation activities (i.e., installing a residential water treatment system or obtaining an alternate water source).

In contrast, "risk amplification" occurs when experts assess a hazard as carrying some degree of risk (e.g., low or moderate) and the community—and sometimes broader society—perceives it as a major concern. This scenario often results in barriers to stakeholder acceptance of proposed risk management strategies and contention among stakeholder groups (e.g., the regulatory authority and impacted community).

The degree of risk attenuation or risk amplification influences how stakeholders view the legitimacy of experts and their compliance with policies and protective measures (Botzen et al. 2009; Lewis and Tyshenko 2009; Kasperson and Kasperson 1996).

Stakeholders' risk perception is shaped by a wide variety of factors including demographics, direct experiences, sense of trustworthiness with authorities, and an individual's ability to bring about change (Bickerstaff 2004; Botzen et al. 2009; Glatron and Beck 2008). These risk perception factors can be identified to assist environmental professionals refine education outreach activities and can also help to identify the mode of delivery that can most effectively communicate actual risk and overcome barriers associated with perceived risk. Risk perception factors can be identified by performing surveys, interviews, and conducting focus groups (Bickerstaff 2004; Botzen et al. 2009; Burger and Gochfeld 1991; Chappells et al. 2014; Gerber and Neeley 2005; Harclerode et al. 2015, 2016b; Palma-Oliveira and Gaspar 2004; Tam and McDaniels 2013; Weber et al. 2001; Vandermoere 2008). In addition, understanding site-specific risk perception factors and barriers to acceptance can assist in identifying applicable secondary risk management performance metrics to be used during risk communication.

Risk perception factors utilized by the Little Hockings Site community outreach team were residents' knowledge of PFOA results and associated illnesses, ability to access a physician, presence of vulnerable subpopulations (i.e., higher PFOA levels in children and the elderly), proximity of individual residences to study results (i.e., sense of a safe place), and possible interactions of elevated PFOA levels and particular medical conditions. Various behavioral changes by residents, including perception of risk to consumption of contaminated water, were observed after implementation of the Little Hocking Communication Plan. Approximately 95 percent of the study participants had made a change in their water source, primarily the use of bottled water, which subsequently led to a median reduction of 26 percent in blood serum PFOA levels. Subsequently, trust with authorities was regained due to active, transparent, and continuous community involvement that was scientifically credible and independent of decision-makers. This process, defined as Community-First Communication, resulted in overcoming risk perception barriers, community empowerment, and meeting stakeholder needs (Emmett and Desai 2010).

Inability to Provide Effective Risk Communication to Vulnerable Subpopulations

One of the primary purposes of risk communication is to engage affected stakeholders in the risk management decision-making process. Communities vulnerable to environmental and health risks are often concentrated in low-income, underserved, disenfranchised, ethnically diverse, and marginalized communities (Bickerstaff 2004; Bullard 1990; Coughlin 1996; Slovic 1987, 2003). Understanding the perspective of these vulnerable subpopulations is essential in performing effective risk communication. Therefore, decision-makers should consider the following: (Covello and Allen 1998; Government of Canada 2005; Pope et al. 2004; USEPA 2007):

- Accept and involve the public as a partner.
- Plan carefully and evaluate the outcome of the communication efforts. Different goals, audiences, and media require different actions.
- Listen to the public's concerns. People often care more about trust, credibility, competence, fairness, and empathy than about statistics and details.
- Work with other credible sources. Conflicts and disagreements among organizations make communication with the public much more difficult.
- Meet the needs of the media.
- Speak clearly and with compassion.
- Resolve mobility and information access issues to ensure adequate involvement.
- Communicate in nontechnical, appropriate terms.
- Understand demographic and sociocultural factors.

Several methods from the social sciences are available to assist environmental professionals determine if the heterogeneity of the community is represented and vulnerable subpopulations are identified during risk communication activities. The most basic method is to assess demographic data collected during stakeholder engagement events to evaluate if a representative sample of the community's population is participating. If a select subpopulation is not participating in risk communication activities, an alternate mode of information transfer may be required to meet the needs of that demographic group (Bickerstaff 2004; Wester-Herber and Warg 2004; USEPA 2005). More complex stakeholder engagement methods such as actor-linkage mapping and interest-influence matrices can be performed to understand relationships and trust among stakeholder groups and their relative interest and influence on project outcomes (Alexandrescu et al. 2016; Harclerode et al. 2015; Reed 2009). The more complex engagement methods can be beneficial in scenarios where affected stakeholders are in conflict with decision-makers, as well as to address challenges posed to effective risk communication activities.

Difficulty Managing Community Expectations

It is not uncommon for risk communication activities to involve a diverse group of stakeholders with opposing sets of views, knowledge, or beliefs. Thus obtaining unbiased, collective agreements that are representative within and between groups is challenging, but can offer significant benefits to the project and community. Therefore, risk management performance metrics should be in alignment with stakeholder needs and should address site-specific concerns. Stakeholder needs can be identified via public meetings, interviews, focus groups, and surveys. Additional stakeholder engagement methods can be conducted to evaluate, prioritize, and communicate multiple conflicting needs, including multi-criteria decision analysis and rating and scoring system evaluations (Harclerode et al. 2015). Retreats and interactive workshops also provide opportunities to facilitate trust-building and collectively gain a common understanding of the problem from which to formulate solutions.

At the Little Hocking Site, a list of General Principles and Principal Targets were developed by the CAC to aid the communication process and manage community expectations (Emmett et al. 2009):

General Principles for Communications:

- Results should be released promptly, but not before the investigators are comfortable in doing so.
- Individual participants should receive their results first, to avoid participants first learning study results from the press, neighbors, or friends.
- The press should be informed in a manner that is both timely and allowed the investigators to control the message as much as possible.
- The study must remain a credible source of information.
- Communications should maximize constructive responses to the findings.
- Communications should minimize pointless concern.

Principal Targets:

- The community, i.e., residents of the water district
- Community Advisory Committee
- Relevant authorities and representatives (county and state health departments, state department of environment, local water authorities, state and federal elected government representatives for the area, local townships, sheriff's departments, USEPA)
- Local medical providers
- Local media
- National media as necessary.

SUMMARY

Effective risk communication engages stakeholders in the process of risk assessment and management, communicates actual risk, and facilitates participation during the risk management decision-making process. Supporting materials to facilitate risk communication are publicly available from a wide range of public health and environmental agencies to assist professionals in communicating potential risks of PFAS exposures to affected parties. In addition, stakeholder engagement techniques and expertise are available from consulting companies, regulatory agencies, private organizations, and academia. As shown in the Little Hocking Site, these resources can be used to overcome challenges associated with questions concerning the legitimacy of risk management guidelines, unacceptance of the proposed risk management strategy, and effective risk communication for vulnerable subpopulations. Performance of successful risk communication throughout a project's life cycle raises the community's awareness of environmental hazards, leads to community empowerment through participation in risk reduction measures, and helps increase the quality of life for the community impacted by contamination and related risk management activities (Harclerode et al. 2016b; USEPA 2007).

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