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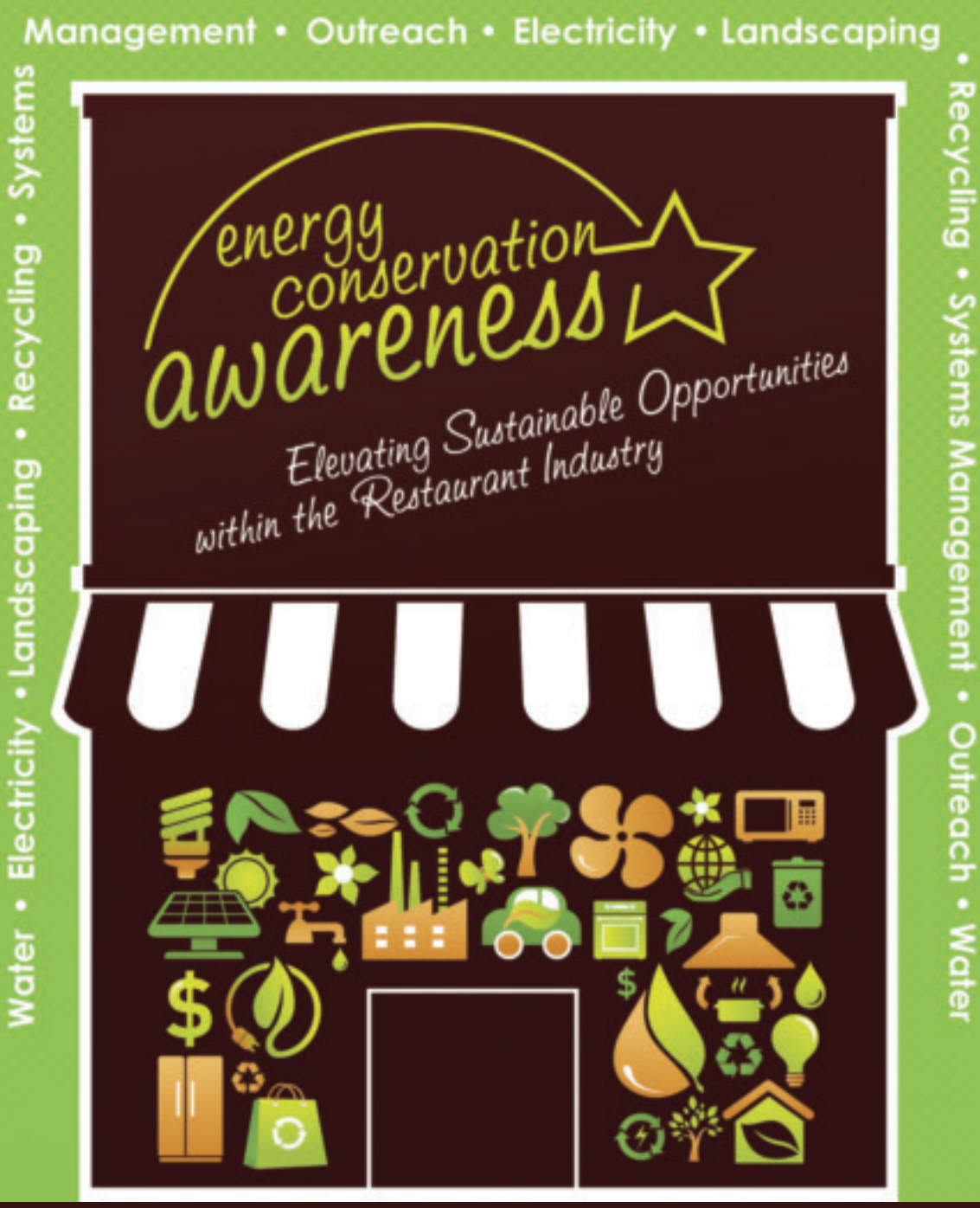


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JOURNAL OF
# Environmental Health
Dedicated to the advancement of the environmental health professional
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## ABOUT THE COVER

Recognizing the need to measure awareness and use of energy conservation practices in restaurants as part of the push for sustainability and reduction of greenhouse gases, the authors of our cover feature this month, "Energy Conservation Awareness and Practice in Restaurants of Hennepin County, Minnesota," surveyed restaurant owners about their energy saving practices and knowledge. They found that the owners were often aware of ways to save energy but implemented them much less often. The authors point to a significant opportunity to conduct outreach to restaurant owners to close this gap between awareness and use, thus increasing sustainability and reducing carbon footprints.

*See page 8.*

*Cover Illustration by Cognition Studio*

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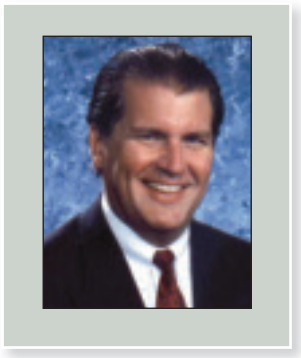


Brian Collins,
MS, REHS, DAAS

# NEHA Chooses to Lead

As 2012 draws to a close, I caught myself reflecting on the many fields of practice embodied within environmental health. I was contemplating this because the NEHA board of directors has asked an elite team of members to review the colloquial definition of "environmental health" and "environmental health professional" for modernization. During this thought process, it occurred to me that NEHA, with limited capacity but inexhaustible resourcefulness, not only touches the many fields of practice embodied within environmental health, but NEHA also chooses to lead outcomes beneficial to the profession in many fields of practice. Let me provide an example.

In the last five years and particularly the last 12 months, I have been witness to, and a participant in, epic change that is underway in our nation's food and feed safety system. NEHA leadership, with strategic prowess and acumen, deployed staff, board members, and membership with subject-matter expertise to all points of contact important to the success of the Food and Drug Administration's (FDA's) Partnership for Food Protection (PFP). The PFP initiative brings together federal, state, local, tribal, and territorial regulatory and public health stakeholders to work on projects that enhance food and feed safety in the U.S. including imported and exported products. Various staff, board members, and membership recognized the critical role local environmental health plays in the initiative and as a result exercised leadership options in many work groups in addition to facilitating "charges" resulting from PFP objectives. The greater mission remained facilitating a nationally Integrated Food Safety System (IFSS).

*NEHA is about leadership and leadership is a choice!*

After two meetings of the PFP, one in St. Louis (2008) and the other in Denver (2010), and subsequent to President Obama signing the Food Safety Modernization Act (FSMA) in January 2011, NEHA found itself more entrenched than ever in a national initiative intended to create prevention-oriented food and feed safety standards, to create capacity to respond quickly and effectively to foodborne incidents, and to "optimize all system resources." Deliverables contained in FSMA were subsumed into PFP charges and the vision for IFSS became even more focused (Figure 1).

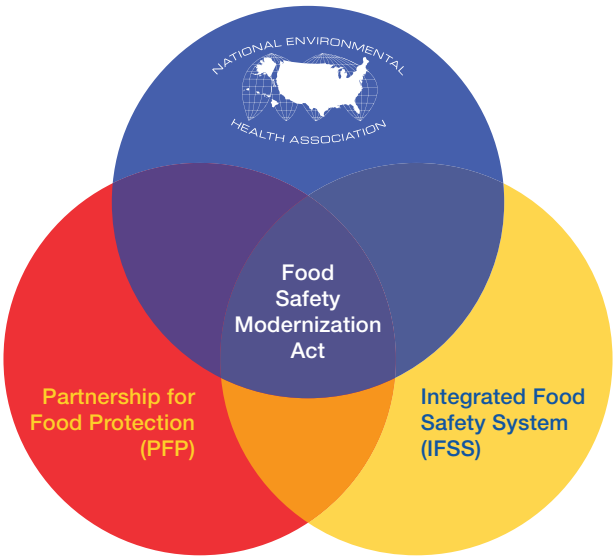
At the last PFP meeting, convened in Nashville in August, local environmental health led by NEHA asserted prominence as a critical stakeholder in the nation's food safety system. The PFP initiative had momentum fueled by FSMA and through natural selection and process evolution, the time for local environmental health to take the stage arrived (*carpe diem!*).

NEHA leadership, collaborating with other local environmental health nongovernmental organizations, communicated to high-level facilitators of PFP and FSMA within FDA, Centers for Disease Control and Prevention (CDC), Department of Homeland Security (DHS), U.S. Environmental Protection Agency (U.S. EPA), and U.S. Department of Agriculture (USDA) to reinforce and elaborate the role "local" plays in the larger food and feed safety scheme. The message resounded as speaker after speaker and work group after work group included "local" into vernacular formerly limited to "federal and state." NEHA and NEHA participation also carried enough influence to garner a private meeting with FDA Deputy Commissioner for Foods Michael Taylor and his senior PFP/FSMA advisory and implementation staff. Also attending the meeting were senior U.S. EPA, DHS, USDA, and CDC officials and stakeholders. This was NEHA leadership and alignment at its best! The objective was engagement and involvement of local environmental health as stakeholders and partners in attaining PFP and FSMA deliverables within the IFSS vision!

Less than a month after the Nashville meeting, I was contacted by Jeff Farrar, FDA associate commissioner for food protection, and Joe Reardon, FDA senior advisor and former director of state and federal relations. As the local environmental health and NEHA lead, I was asked to provide feedback as to "next steps" and how "to understand and develop the process for locals." On behalf of NEHA and local environmental health, a work group comprised of "locals" who participated at the PFP Nashville meeting was suggested. The plan is for "locals" to back map FSMA deliverables to PFP objectives creating the roadmap

FIGURE **1**

**NEHA's Involvement With the Food Safety Modernization Act, Partnership for Food Protection, and Integrated Food Safety System**




and fit for "locals" in the national IFSS schema—cross jurisdictionally, vertically, horizontally, and as equal partners! The process was endorsed! Now it is time to produce!!!!

By the time you read this article the work group will have been convened and epic movement will be fueled. Liftoff! A national initiative with national public health at its core and with local environmental health led by NEHA as the linchpin to success.…Wow!

Leadership involves identifying need for change and successful change demands leadership! Keeping an ear to the ground and an eye on the broad view has positioned NEHA to lead. Finally, leadership is about attention to desired outcomes and empowering voices within the network! NEHA is about leadership and leadership is a choice! What a privilege! I'm jazzed—can you tell?

brianc@plano.gov

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# Energy Conservation Awareness and Practice in Restaurants of Hennepin County, Minnesota

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Abstract **Greenhouse gases result mainly from the combustion of fossil fuels in energy use. Restaurants use large amounts of energy in their operation but systematically gathered information about such use is lacking. Hennepin County Human Services and Public Health Department surveyed owners of licensed restaurants to assess their energy use and awareness of energy conservation measures. Of 434 owners surveyed, 276 (63.6%) returned completed surveys. Responses indicated that large pluralities or majorities of restaurant owners often were aware of energy-efficient methods of operation and the means to achieve greater efficiency but used such means much less frequently. For example, 57% of respondents were familiar with the U.S. Environmental Protection Agency's Energy Star® program, but only 33% of this group actually used Energy Star® appliances. Given the gap between awareness and practice, opportunities for consultation and outreach to restaurant owners about energy-efficient business operation are manifold.**

## Introduction

In the U.S., greenhouse gases—carbon dioxide, methane, and others—result mainly from the combustion of fossil fuels in energy use (U.S. Department of Energy, 2011). Restaurants use large amounts of energy in their operations (Madison [Wisconsin] Gas & Electric, 2011) and are therefore significant contributors to greenhouse gas levels. Energy efficiency and conservation go hand in hand with reduction of greenhouse gas emissions (GHGE) and their effects on climate change.

The U.S. Environmental Protection Agency (U.S. EPA) has studied energy use in restaurants, hotels, retail food stores, and convenience stores and found significant reduction in energy demand by employing energy efficient appliances recommended in their Energy Star® program (www.energystar.gov/). Private industry has also been active in promoting the benefits of energy efficiency (e.g., National Restaurant Association [http://conserve.restaurant.org/]). Systematically gathered information about energy conservation awareness and energy consumption and its mitigation among retailers, however, is lacking.

The environmental health unit of the Hennepin County Human Services and Public Health Department (HSPHD) built upon its regulatory relationship with restaurants, hotels and lodging facilities, and retail food stores to help these establishments identify sources of and means to reduce GHGE. Reducing energy use in this high-energy industry will help mitigate effects on public health. In Hennepin County, by far the largest industry within this group is restaurants (86.5%), which is the focus of this article.

The information obtained in our study will augment available information and can be used to guide educational and outreach efforts geared toward energy conservation, GHGE reduction, and cost savings for businesses.

## Methods

### Source Material

The purpose of our study was to determine if licensed restaurants in Hennepin County were attempting to limit fuel consumption and consequent GHGE and if so, how. Also of interest was the level of knowledge among restaurant owners of methods available to them to conserve energy and the fiscal advantages of doing so. A survey was the method of choice to investigate these questions.

Material for the survey was obtained from multiple sources and designed to cover a wide range of issues. The Web site of U.S. EPA contains information about the agency's Energy Star® and WaterSense® programs (www.epa.gov/watersense/). These programs test and rate the efficient use of electricity and water, respectively, by appliances and fixtures. The Energy Star® Web site also provided information on the availability of federal tax credits for energy-efficient construction methods and appliance use (U.S. Environmental Protection Agency [U.S. EPA], 2011a). Another major source of information was the Madison (Wisconsin) Gas and Electric Company's study of energy use by lodging facilities, retail food stores, and restaurants (Madison Gas and Electric, 2011).

Other sources included the Centers for Disease Control and Prevention (www.cdc.gov/climatechange/), U.S. Department of Agriculture (www.usda.gov/oce/climate_change/index.htm), and U.S. Department of Energy (www.eia.doe.gov/oiaf/1605/ggccebro/chapter1.html). The environmental health unit of HSPHD also received valuable feedback from experts in the fields of energy conservation and alternative energy production.

A draft of the survey was pilot tested by two restaurant owners and their recommendations were incorporated into the final versions.

### Survey Design and Distribution

Previous research suggested that preliminary informational postcards, multiple survey mail outs, clarity and simplicity of message, and personalized cover letters enhance mail-out survey response (Denton, Tsai, & Chevrette, 1988; Dillman, Smith, & Christian, 2009; Filip, Ming, Levy, Hoffstad, & Margolis, 2004; Fox, Crask, & Kim, 1988; Rea & Parker, 2005). In addition to employing these methods, the survey was kept brief (three pages/six sides) while obtaining the desired information (appendix available upon request).

The range of topics included owner familiarity with utility-sponsored rebates and energy-efficient electric light distribution programs and owner familiarity with local and federal energy-based tax rebates and tax-favored policies. Topics specific to energy use and conservation included use and maintenance of low-energy illumination and appliances, recycling programs, use of appliances to reduce water consumption, whether water was served to customers only on request, and the maintenance of appliances and the facility itself. Topics related to the facility included policy on employee commuting, telecommuting, and remote access; age of the facility; and the average number of customers per month seen at the facility.

Environmental health staff suggested that Internet access was unlikely to be available at most restaurants, particularly the single-owner, smaller ones that made up the bulk of licensees (Vashé Research, 2011). Therefore, a mail survey was used. The environmental health unit licenses restaurants and maintains a database containing their names, addresses, owner names, owner addresses, and ownership type (single or multiple within HSPHD's jurisdiction). To prevent owners of multiple facilities from receiving more than one survey, one facility per owner was randomly selected from within owner strata.

To apprise restaurants of this project, the environmental health unit mailed them informational postcards on September 17, 2009. The card briefly described the study and provided a phone number for owners or operators to call with questions or comments. Mailings were then sent on October 15, November 7, and December 1, 2009. Each mailing consisted of a copy of the survey, a cover letter signed by the project director, and a postage-paid return envelope.

The mail-out data were stored in Excel and fields were added to the file for each mail out to indicate response, refusal, ineligibility, and nonresponse. Survey data were entered in an Access database with allowable data values and ranges set. Responses were evaluated for logical errors and inconsistencies. When these occurred, the correct response was imputed or, if this was not possible, a nonresponse was recorded.

### Analysis

Using SPSS v. 17.0, odds ratios (*OR*) and 95% confidence intervals (*CI*) were calculated to evaluate the statistical significance of differences in proportions. Differences in median values were tested by the Mann-Whitney U test. Unconditional multiple logistic regression (MLR) was used to model which variables significantly predicted "yes" responses to survey questions. To limit uncertainty and facilitate analysis, responses were dichotomized to "yes" or "no," excluding "don't know" responses and nonresponses.

## Results

From 758 restaurants in the licensed facility database in September 2009, 451 separate owners were identified, 366 of single facilities and 85 of two or more facilities. Seventeen owners were excluded for the following reasons: two participated in the pilot test, seven owned restaurants that closed before the first mailing, three owned seasonal businesses with operations different from their year-round counterparts, and five surveys were returned as undeliverable. This left a total of 434 owners, 276 (63.6%) of whom returned surveys. Three (0.6%) refused to participate.

### Responses to Survey Questions

The two restaurant owners who pilot tested the survey averaged eight minutes to completion. Responses to 15 questions are found in Table 1. Responses to the remaining survey questions are described below.

Of the 17 Energy Star® appliances listed (Question 4b), the five most frequently owned were hot water heater (9%) and ice machine, reach-in refrigerator, reach-in freezer, and under-counter freezer (4% each).

Two hundred twenty-one (80%) respondents reported having a regular maintenance schedule (Question 5). Large majorities of this subgroup included in that schedule cleaning refrigerator condenser coils (93%); ensuring refrigerator and cabinet doors closed properly (90%); repairing or replacing damaged gaskets on refrigerators and other appliances (91%); repairing leaks (86%), e.g., of toilets, faucets, windows; and performing preventive maintenance (90%). Only 35%, however, provided employee training in maintenance and energy conservation, and 30% checked the integrity of the energy curtain in their freezer room (Question 5a).

Fixtures or appliances designed for reduced water consumption (e.g., those certified by U.S. EPA's WaterSense® program) were used only by a minority of restaurant owners. Only 66 (24%) reported using low-volume, high-efficiency toilets; 62 (22%) used aerated faucets; 32 (12%) used low-volume, high-efficiency urinals; and six (2%) used variable-speed water-pump controls (Question 7).

Question 9 asked, "What type(s) of lighting does your facility use?" A large majority (72%) reported using compact fluorescent lighting (CFL); 55% reported incandescent light use; 13% reported light-emitting diode (LED) use; 12% reported "other" type of lighting; and 7% didn't know.

Question 10 asked about other devices used to reduce electricity consumption when lights or other electrical appliances were not in use. Timers were utilized by 37%; dimmers, 30%; photocells, 21%; occupancy sensors or motion detectors, 14%; "other" devices, 9%; and 15% didn't know.

One hundred eighty-seven respondents answered "yes" to Question 11a (Does your facility reset its thermostat at night or at other times of reduced occupancy?). Of these, 126 (67.4%) indicated by how many degrees Fahrenheit they did so. Some misreading or misinterpretation of the question likely occurred, however, since eight values were reported in the 55°F–68°F range. Respondents may have interpreted the question

as asking what temperature the thermostat was set to, and we imputed these responses as missing. If the respondent gave a range of values (e.g., "3–5 degrees"), we used the lowest value, underestimating the true median reported reset. The median reset of the remaining 118 values was 10°F (range: 2°F–30°F).

To Question 11b (Does your facility reset its thermostat to adjust for seasonal changes?), 183 respondents answered "yes," and 107 of these (58.5%) provided reset figures. Two missing responses were imputed. The median reset was 6°F (range: 1°F–30°F) for the remaining 105.

Only 2% of owners reported using a waste heat recovery system (Question 12), 1% had photovoltaic cells or solar water heaters, and only one owner had installed a windmill generator. Somewhat higher proportions employed passive means to reduce insulation and save energy, e.g., 13% had planted trees or other vegetation for shade, 8% had light-colored roofing, and 4% had light-colored paving.

Seven percent to 30% answered "yes" to expressing interest in a sliding scale for "green" permits, tax credits, property tax rebates, low interest loans, or municipal financing for incorporating energy efficiency into their businesses, while 21%–38% answered "no," 20%–30% answered "I need more information," and 19%–32% did not respond at all (Question 16).

Cardboard recycling (Question 17) was practiced by 76% of owners; however, other forms of recycling were much less frequent. Only 34% recycled glass; 31% recycled plastic; 21% recycled food (directly or as compost); and 7% practiced "other" forms of recycling.

The median number of customers per month reported by 192 (69.2%) respondents was 3,000 (range: 16–70,000) (Question 21). Restaurant age was reported by 236 (85.5%) respondents. Two responses numbered in the thousands, probably because the respondent accidentally wrote number of customers per month (the preceding question) in the space for age; missing responses were imputed for these. The median age for the remaining 234 was 14.0 years (range: 0.08–133 years) (Question 22).

Owners of more than one restaurant within HSPHD's jurisdiction were significantly more likely than owners of a single restaurant ever to have used the U.S. EPA's Portfolio Manager® (*OR* = 10.3, 95% *CI* = 1.8–57.9); to be familiar with their Energy Star® program (*OR* = 3.5, 95% *CI* = 1.6–7.7); to be aware that their utility uses renewable energy source(s) (*OR* = 3.3, 95% *CI* = 1.1–9.5); and that their utility offered rebates or credits (*OR* = 3.3, 95% *CI* = 1.3–7.1). They were less likely to encourage their employees to car pool (*OR* = 0.1, 95% *CI* = 0.0–0.7) or walk to work (*OR* = 0.2, 95% *CI* = 0.1–0.9).

TABLE **1**

**Responses of Participating Restaurants* to Energy Conservation Awareness and Practices Survey**

| Question | Response | | | |
|---|---|---|---|---|
| | Yes *n* (%) | No *n* (%) | Don't Know *n* (%) | No Response *n* (%) |
| 1. Have you ever done an energy audit? | 36 (13) | 160 (58) | 79 (29) | 1 (0) |
| 2. Do you track monthly energy use? | 106 (38) | 134 (49) | 35 (13) | 1 (0) |
| 3. Have you ever used U.S. EPA's Portfolio Manager® to track energy/water use? | 6 (2) | 246 (89) | 24 (9) | 1(0) |
| 4. Are you familiar with U.S. EPA's Energy Star® program? | 157 (57) | 108 (39) | 11 (4) | 0 (0) |
| 4a. If yes to the question above, do you use Energy Star® appliances?# | 52 (33) | 61 (39) | 39 (25) | 5 (3) |
| 5. Do you have a regular maintenance schedule? | 221 (80) | 44 (16) | 7 (3) | 4 (1) |
| 6. Do you serve water to customers only if they request it? | 198 (72) | 67 (24) | 5 (2) | 6 (2) |
| 8. Do you use energy-efficient skylights/ windows/other natural light sources? | 118 (43) | 138 (50) | 12 (4) | 8 (3) |
| 11a. Do you reset the thermostat at night or when occupancy is reduced? | 187 (68) | 64 (23) | 20 (7) | 5 (2) |
| 11b. Do you reset the thermostat to adjust for seasonal change? | 183 (66) | 45 (16) | 28 (10) | 20 (7) |
| 13. Does your utility offer a renewable source of electricity, e.g., wind? | 20 (7) | 106 (38) | 141 (51) | 9 (3) |
| 14. Do you receive utility rebates/credits for using energy-efficient equipment? | 32 (12) | 163 (59) | 67 (24) | 14 (5) |
| 15. Do you receive federal or state energy tax credits? | 1 (0) | 185 (69) | 83 (30) | 7 (2) |
| 18. Have you reduced staff's need to travel through telecommunications or remote access devices? | 54 (20) | 189 (68) | 22 (8) | 11(4) |
| 19. Do you own fuel-efficient motor vehicle(s) (25+ mpg) for business? | 42 (15) | 199 (72) | 25 (9) | 10 (4) |

*Based on 276 restaurants that returned questionnaires.
#Based on 157 "yes" responses to the preceding question.

### Predictors of Survey Responses

In addition to the information described above, the environmental health unit wanted to know if information in the licensing database or returned surveys might predict positive ("yes") responses to survey questions. A formal analysis was conducted using five available predictor variables: information on multiple facility ownership, ownership in Minnesota, and ownership in Hennepin County from the database; and the reported number of customers per month and facility age from the surveys.

MLR predicted a positive response for Question 4 (Are you familiar with U.S. EPA's Energy Star® program?). Owning more than one facility (*OR* = 2.9, 95% *CI* = 2.0–7.0) and the natural logarithm of the number of customers per month (*OR* = 1.2, 95% *CI* = 1.2–1.3) were significantly associated with a "yes" answer. The $R^2$ value for this model,

however, was only .089. This value was actually exceeded ($R^2$ = .185) by a univariate logistic model for Question 17c (Does your facility have cardboard recycling?), in which the natural logarithm of the number of customers was positively associated with a "yes" response (*OR* = 1.81, 95% *CI* = 1.6–2.1 ).

## Discussion

Respondents appear to have considered the survey form generally readable, as suggested by the high response rate.

Answers to certain questions showed that many respondents were aware of energy efficiency through the availability of passive devices, energy-efficient appliances, or recycling programs. For example, 43% of respondents used passive means of lighting in their facilities to enhance illumination, 38% indicated that they tracked their energy use, and 66%–68% adjusted their thermostats on the basis of facility occupancy or season. Fifty-seven percent indicated that they were familiar with U.S. EPA's Energy Star® program, but only one-third of these actually used Energy Star® appliances and reported use of individual appliances was entirely in single digits (Table 1). Fully 76% of facilities had cardboard recycling programs in place, although only minorities had other forms of recycling. Also, a high proportion had regular maintenance schedules and served water to customers only if it was requested, but comparatively few used fixtures or appliances designed for reduced water consumption.

It was surprising to find that only 13% had ever done an energy audit of their businesses, as this is relatively simple and inexpensive and can lead to considerable cost and energy savings over time (U.S. EPA, 2011b). It came as no surprise, however, that almost no one used more advanced—and generally more expensive—alternative energy-generating and -storing devices like photovoltaic panels, wind generators, and solar water heaters. Similarly, few (2%) had ever used the U.S. EPA's web-based Portfolio Manager® to track and assess energy use and water consumption in their building(s).

Respondents knew comparatively little about information dealing with energy efficiency that was not immediately related to their business activity. For example, only 7% reported knowing whether their electric utility offered electricity from renewable sources, 12% had taken advantage of rebates or credits from the utility for more energy efficient appliances, and essentially none reported taking advantage of federal or state energy tax credit programs. They also evinced little interest in suggestions of programs/means intended to help finance more energy-efficient operations within their facilities.

Some limitations of this study are immediately obvious. The survey information is self-reported and, given the limited funding and scope of this preliminary effort, no information was independently measured or validated by HSPHD staff. Even the excellent response rate of nearly 64% still falls short of a minimally representative population sample (67%), leaving open the possibility of substantial bias in the data. Based on the proportion of multiple ownership, however, respondents were not significantly different from nonrespondents (17.1% vs. 21.8%, *OR* = 0.7 [0.5–1.2]), although respondents were significantly more likely to be based in Minnesota (91.3% vs. 79.5%, *OR* = 2.7, 95% *CI* = 1.5–4.8) or Hennepin County (76.4% vs. 62.8%, *OR* = 1.9, 95% *CI* = 1.2–2.9) than nonrespondents.

Notwithstanding the potential for bias, it is possible to make some inferences with reasonable confidence. In Table 1, for example, 13% report having done an energy audit. Even in the extremely unlikely event that every nonrespondent and refusal had checked "yes" and submitted a survey, only 45% (197/434) of participants would have answered "yes." Thus we can feel somewhat reassured that a minority of the study population had done an energy audit at the time of survey.

The response "don't know" was particularly frequent for some questions (1, 4a, 13–15) and evident elsewhere as well. Again using Question 1 as an example, the high proportion of "don't know" responses (29%) highlights a possible shortcoming of the environmental health unit's licensing database. The database listed as owner the person or agency/institution that paid the license fee. The person actually issuing the check for the license may or may not have worked on-site at the restaurant in question. He or she may have been an office worker or owner at an entirely different location—even out of state—with little or no day-to-day contact with facility operations. Other possible reasons for a high proportion of "don't know" responses are inexperience by a new on-site employee filling out the document; unfamiliarity of the respondent with the content of the questions being asked; and indifference to the purpose of the survey.

## Conclusion

This survey has provided HSPHD with valuable information at a comparatively low cost with which to confront the issues of energy conservation, GHGE emissions, and climate change. Given the generally low proportion of "yes" responses and the often high proportion of "don't know" responses to these surveys, the opportunities for consultation and outreach to facility owners about energy-efficient business operation are manifold. We have successfully used minor variations of this survey with smaller numbers of hotels and retail food stores, so it is probable that it may be modified and used in other settings where energy use and efficiency may become concerns, e.g., schools or day care centers.

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# Arsenic and Lead in Juice: Apple, Citrus, and Apple-Base

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**Abstract** **Exposure limits for arsenic and lead in drinking water have long been established by the U.S. Environmental Protection Agency and new regulations regarding the presence of these contaminants in bottled water went into effect in California in 2009. No comparable exposure limits or regulations are available, however, for juices and other beverages that may contain arsenic and lead. In the study described in this article, 20 apple juices (or ciders), 15 apple-containing juices, one grape, and one citrus juice were analyzed for arsenic and lead. Arsenic was detected in all juices while lead was detected in more than 94% of juices analyzed. Twelve samples (32%) demonstrated arsenic levels nearly at or above the drinking water exposure limit of 10 parts per billion. No juices contained lead above drinking water exposure limits. Expanding drinking water limits to include juices (and other frequently consumed beverages) would better protect consumers while regular testing of these juices would better inform consumers of the risks posed by specific juices and brands.**

## Introduction

In 2002, the average person in the U.S. consumed 42.8 L of juice per year (Euromonitor, 2002). In contrast, the average American consumes about 115 L of bottled water every year, a little over twice their juice consumption (Gleick, 2010). Children (6–11 years) consume approximately 1.6 L of fluid per day with about 0.46 L coming from plain water and 0.23 L coming from fruits juices, "-ades," or drinks (Kant & Graubard, 2010; Storey, Forshee, & Anderson, 2006). Furthermore, orange juice dominated juice consumption patterns 50 years ago but has been overtaken by apple juice in recent years (Dennison, 1996). Apple juice is a primary ingredient not only in apple juices, ciders, and cocktails but also in a broad range of other juices and fruit drinks including grape, berry, and other juice blends. At a global level, 1.26 million metric tons (approximately 1.2 billion L) of apple juice are produced every year. China is the top producer of apple juice, followed by Poland. The U.S., Argentina, Hungary, Germany, Italy, Chile, and Spain are also significant suppliers of apple juice to meet worldwide demand (U.S. Department of Agriculture, 2006).

While consumption of juice is competitive with that of bottled water, exposure limits and recent regulations both fail to cover consumption of juice. The U.S. Environmental Protection Agency (U.S. EPA) has long established exposure limits of arsenic and lead in drinking water of 10 parts per billion (ppb) and 15 ppb, respectively (U.S. EPA, 2010, 2011), yet no similar limit has been established for juices. Likewise, as of 2009 regulations have gone into effect in California to control arsenic and lead in bottled water (Sullivan, 2009) yet no such regulations are in effect or scheduled to be developed for juices.

Apple juice is especially vulnerable to arsenic and lead contamination because lead-arsenate pesticides were a popular pesticide for apple and other fruit orchards used in a wide range of countries including Canada, the U.S., New Zealand, and Australia (Peryea, 1998a). Apple trees and other tree fruit crops have the highest uptake of arsenic from originating soil compared to shrub and herbaceous fruit (Morgan, De Búrca, Martin, & Cowie, 2009), ranging between 1.8 X $10^{-3}$ and 7.1 X $10^{-4}$ conversion rates from mg/kg of dry weight of soil to mg/kg of fresh weight of fruit (Peryea, 1998b; Peryea, 2002). Although many countries including the U.S. (U.S. EPA, 1986) have made illegal the use of lead-arsenate and arsenic-based pesticides, arsenic and lead typically persist in old orchard soil for many years (Yokel & Delistraty, 2003), producing contamination in produce grown from these soils long after the source of contamination is eliminated.

Recent studies of apple and related juices have demonstrated the risk imposed by historical use of arsenic-based pesticides in apple orchards. In a 2009 study, arsenic levels in five apple juices and two apple ciders ranged between 5.4 ppb and 29.5 ppb (Roberge, Abalos, Skinner, Kopplin, & Harris, 2009). In a follow-up study 18 juice samples were analyzed and it was found that seven of

the 18 samples exceeded the U.S. EPA drinking water exposure limit of 10 ppb (Marshall, 2010). A more extensive study again confirmed arsenic levels in apple juices and ciders, both of organic and conventional origin, above 10 ppb for most of the 20 juices tested (Coming Alongside, 2010). In comparison, the analysis of bottled water in a recent study by Sullivan and Leavy (2011) demonstrated the maximum amount of arsenic detected in drinking water to be 2 ppb.

While these studies clearly speak to the threat of arsenic in juice as a significant health concern, a wide range of apple juices and apple-based juices has not been studied and examined using U.S. EPA–approved laboratory techniques. The Roberge and co-authors study (2009) used U.S. EPA–approved inductively coupled plasma-mass spectrometry (ICP-MS) techniques but only for a limited range of apple juices and ciders. The Marshall and Coming Alongside studies, while more extensive in the number and type of juices studied, either did not disclose their testing technique or used field tests that are not U.S. EPA approved.

Our study seeks to complement these existing studies by analyzing both arsenic and lead (to assess impact of arsenic-based pesticide as well as lead arsenate in particular) and doing so using U.S. EPA–approved laboratory techniques for a wide range of juices covering apple juices, blends, and citrus juices from a broad sampling of countries of origin, juice concentration, and primary flavors (apple, cranberry, etc.). Results for arsenic and lead tests from each of 37 juices are presented. Recommendations for regulating and reporting arsenic and lead contamination in juices are also discussed.

## Methods

### Sample Procurement

Several local grocery stores served as purchasing locations for the juices tested in our study. The juices studied were bottled under national brand labels (Apple & Eve, Bolthouse Farms, Capri Sun, Dole, Hansens, Langers, Martinellis, Minute Maid, Motts, Naked, Nestle, Northland, Ocean Spray, Odwalla, Old Orchard, R.W. Knudsen, Trader Joes, Treetop, and Welches), local or store brand labels (e.g., Safeway), and generic brands (e.g., Private Selection). A range of juice types were also selected including apple ciders, apple juices, apple juice blends, and other juice blends (whose primary ingredient was apple juice). Two non-apple juices (grapefruit and grape) were also tested for comparison. Fruit concentrates used to make these juices came from several countries, predominantly the U.S., China, and Argentina, but also from Austria, Brazil, Chile, Germany, New Zealand, and Turkey. Numerous frozen juice concentrates were also purchased and diluted according to package directions prior to testing. Batch numbers and date of bottling were recorded for all juices, as available. A total volume of at least 400 mL was purchased for each juice. One hundred mL of juice were used for laboratory testing and 300 mL for complementary field testing.

### Sample Preparation

A total of seven samples of each of the 37 juices, for a total of 259 samples, were prepared for analysis. One hundred mL of each sample were poured from the manufacturer's package into 100-mL glass bottles and refrigerated until analysis by AmTest environmental laboratories. An additional six 50-mL samples were poured from the manufacturer's package into field-safe plastic test bottles and were analyzed for inorganic arsenic content using field tests. For brands sold in small packages (such as juice boxes), multiple containers from the same batch were used to fill all seven sample bottles. This process resulted in identical samples (batch and composition) being analyzed for all 37 juices. All sample bottles were given a random number (by juice) that was recorded along with manufacturer, type of juice, primary ingredient juices, batch, date of bottling, country of origin, label photographs, and other relevant information. Samples were delivered to the laboratory within three hours of being transferred from the manufacturer's (sealed) package.

### Analytical

Each juice sample was analyzed in two different ways: (a) for (total) arsenic and lead using U.S. EPA Methods 200.8, ICP-MS (U.S. EPA, 1994) and (b) for inorganic arsenic using low concentration field tests. The method detection limits (MDL) for arsenic and lead using U.S. EPA Methods 200.8 are 0.10 and 0.05 ppb for arsenic and lead, respectively. Significant interference from some components of the tested juices created a need to assess arsenic concentration in each laboratory sample using multiple standard additions. Only a single sample for each juice was analyzed for arsenic and lead content using U.S. EPA Methods 200.8.

Accuracy of results for those samples whose arsenic or lead content approached or exceeded exposure limits was checked using multiple (at least six per sample) field tests. Low concentration field tests allow for semi-quantitative detection of arsenic with adequate reduction of interferents to verify the repeatability of laboratory-based tests. For field tests, experimental results are semi-quantitative with a minimum detection limit of 0–10 ppb and additional result ranges at 10–30 ppb and 30–50 ppb (for arsenic only). In all cases, six field tests were conducted for each laboratory test (for each sample) to ensure repeatability of results; field interference from sulfur was quantified and eliminated (using additional reagent as appropriate to juice) so that the field tests confirmed the accuracy and repeatability of the single laboratory samples.

Statistical means and variances were not evaluated for laboratory tests because of the limited numbers of samples. Results were confirmed, however, using field tests to ensure that no erroneous (outlier) results were included in the results.

### Comparison Criteria

Detected concentrations of arsenic and lead were evaluated in comparison to three exposure criteria for arsenic and two exposure criteria for lead. The three criteria for arsenic are the U.S. EPA exposure limit for drinking water, the state of California maximum contaminant level (MCL) for drinking water, and the Agency for Toxic Substances and Disease Registry (ATSDR) minimal risk level (MRL) for total arsenic ingested (from all sources) per day as a function of body weight (ATSDR, 2007a). The two criteria used for lead are the U.S. EPA exposure limit for drinking water and the state of California MCL for drinking water. These comparison criteria are summarized in Table 1 along with the MDL for arsenic and lead using ICP-MS in this analysis. As of this writing, juice contaminant levels are not required to meet these exposure standards.

## Results

Arsenic was detected in all of the juices studied, ranging from a minimum of 3.5 ppb to a maximum of 24.8 ppb. Lead was detected in all but two of the juices studied, ranging from a minimum of 0.2 ppb to a maximum of 13.4 ppb. Table 2 presents a summary of results for apple juices and ciders, and Table 3 presents similar results for apple-containing juices as well as one citrus (grapefruit) and one grape juice.

Arsenic was detected in all 20 apple juice (or cider) samples studied. A quarter or 25% (shown in bold in Table 2) of the apple juice (or cider) samples contained arsenic at levels of 9 ppb or higher (near or above the U.S. EPA drinking water exposure limit of 10 ppb). On average, the apple juices (and ciders) tested contained 7.9 ppb of arsenic ($\sigma$ = 2.9). No brand, whether a name brand, store brand, or generic brand tested as arsenic free. In contrast, two of the 21 apple juices (or ciders) tested contained no lead (nondetectable). In the remaining juices, lead was detected between 0.2 to 10.2 ppb, with an average level across all juices tested of 3.2 ppb ($\sigma$ = 3.3).

Arsenic was detected in a variety of other juices tested, including those containing apple juice as a primary ingredient (Table 3). Arsenic was detected in all 17 apple-containing and juice-blend samples studied, ranging from 3.5 to 24.8 ppb. Unlike the apple juices, nearly half (47%) of these other juice samples contained arsenic at levels near or above the U.S. EPA drinking water exposure limit of 10 ppb. On average, these other juices tested contained 9.5 ppb of arsenic ($\sigma$ = 5.7). No brand tested as arsenic free. Only one of the 17 other juices tested contained no lead (nondetectable). In the remaining 16 juices, lead was detected between 0.2 to 13.4 ppb, with an average level across all juices tested of 5.0 ppb ($\sigma$ = 4.0). No juice samples tested above the U.S. EPA exposure limit for lead in drinking water (15 ppb).

By a wide margin, juice contains more arsenic and lead than any of the major brands of bottled water recently studied by Sullivan and Leavy (2011) (Figure 1). Apple juices, on average, contained over 26 more times arsenic and over 16 times more lead than bottled waters. Apple-containing juices contained over 31 more times arsenic and 25 times more lead than bottled waters.

TABLE **1**

**Comparison Criteria and Experimental Detection Limits**

| Comparison Values | Agency | Media | As | Pb |
|---|---|---|---|---|
| Maximum contaminant level in ppb[a] | U.S. Environmental Protection Agency (2010, 2011) | Drinking water | 10 | 15 |
| Minimal risk level in µg per kg of body weight per day | Agency for Toxic Substances and Disease Registry | All food and beverages | 0.3 | N/A |
| Method detection limit in ppb | AmTest | Water and juices | 0.1 | 0.05 |

[a]ppb = parts per billion.

TABLE **2**

**Arsenic and Lead Levels (ppb[a]) in Apple Juice and Apple Cider**

| Brand | Country of Origin | Concentrate | % Juice | As | Pb |
|---|---|---|---|---|---|
| Apple and Eve (juice) | New Zealand | Yes | 100 | 7 | 5.7 |
| **Fred Meyer (juice)** | **U.S., China** | **Yes** | **100** | **12.9** | **0.5** |
| Hansens (juice) | U.S., China | Yes | 100 | 4.6 | 0.3 |
| Langers (juice) | U.S. (WA, CA) | No | 100 | 3.7 | 4.9 |
| Martinellis (juice) | U.S. | No | 100 | 5.8 | 1.7 |
| Martinellis (unfiltered juice) | U.S. | No | 100 | 4.5 | 4.3 |
| **Minute Maid (juice)** | **U.S., Argentina, Austria, Chile, China, Germany, Turkey** | **Yes** | **100** | **11** | **10.2** |
| Motts (juice) | Not indicated* | Yes | 100 | 7.7 | 6.7 |
| Motts for Tots (juice) | U.S. | Yes | 54 | 8.4 | 0.2 |
| Nestle (juice) | Brazil | Yes | 100 | 4.2 | 0.4 |
| Organics (juice) | U.S. | Yes | 100 | 7.4 | 4 |
| **Organics (unfiltered juice)** | **U.S.** | **No** | **100** | **9.4** | **3.7** |
| Private Selection Organic (juice) | Argentina | Yes | 100 | 7.2 | 5.1 |
| R.W. Knudsen Organic (juice) | U.S. | Yes | 100 | 5.6 | ND[b] |
| Safeway (juice) | Argentina, China | Yes | 100 | 6.4 | 0.7 |
| Safeway (juice cocktail) | Not indicated* | Yes | 50 | 8.1 | 3.2 |
| **Trader Joe's (juice)** | **U.S.** | **No** | **100** | **9.9** | **3** |
| Treetop (juice) | U.S. | No | 100 | 6.6 | ND |
| **Treetop (cider)** | **U.S.** | **No** | **100** | **9.1** | **0.7** |
| **Western Family (juice)** | **China, Argentina** | **Yes** | **100** | **12.2** | **ND** |

*Note.* Bold indicates samples contained arsenic at levels of 9 ppb or higher (near or above the U.S. Environmental Protection Agency drinking water exposure limit of 10 ppb).
[a]ppb = parts per billion.
[b]ND = not detected.
*No explicit indication of country of origin; presumed to be U.S. by labeling guidelines.

TABLE **3**

**Arsenic and Lead Levels (ppb[a]) in Other Juices**

| Type of Juice (Label Designation) | Country of Origin | Brand | % Juice | As | Pb |
|---|---|---|---|---|---|
| Apple raspberry | U.S., Brazil, China, Mexico | Hansens | 35 | 3.5 | 0.2 |
| Apple, banana, blueberry, blackberry (blue machine) | U.S. | Naked | 100 | 6.2 | 3.4 |
| Apple, grape, orange, pineapple (fruit punch) | Not indicated* | Capri Sun | 10 | 6.1 | 10.6 |
| **Grape** | **U.S. (WA)** | **Langers** | **100** | **24.8** | **7.1** |
| **Apple, blueberry, cranberry (blueberry cranberry)** | **U.S.** | **Langers** | **27** | **11.2** | **3.2** |
| Grape, pineapple, pear, apple (fruit punch) | Canada | Minute Maid | 5 | 4.2 | 0.2 |
| **Apple, cranberry, pear, grape, blackberry (cranberry blackberry)** | **Not indicated*** | **Northland** | **100** | **11.2** | **3.6** |
| Grapefruit | U.S. (FL) | Ocean Spray | 100 | 4.2 | 9.5 |
| Apple, cranberry, raspberry, grape, carrot (cran-raspberry) | U.S., China | Ocean Spray | 15 | 7.7 | 3.2 |
| Cranberry, apple, carrot (cran-apple) | U.S., China | Ocean Spray | 15 | 6.6 | 3.1 |
| Apple, peach, mango, strawberry, banana (superfood fruit juice) | Not indicated* | Odwalla | 100 | 8.2 | 1.1 |
| **Apple, grape, plum, cranberry (Apple cranberry frozen)** | **Not indicated*** | **Old Orchard** | **100** | **13** | **11** |
| **Apple, blueberry (organic blueberry)** | **U.S.** | **R.W. Knudsen** | **100** | **19.6** | **13.4** |
| Mango, apple, orange, banana, lemon (mango juice) | U.S. | Trader Joe's | 100 | 7.8 | 3.2 |
| **Apple, mango, pineapple, banana, kiwi (very green juice)** | **U.S.** | **Trader Joe's** | **100** | **9.9** | **3** |
| **Grape, apple, pear, cherry (cherry concord grape)** | **U.S.** | **Welches** | **100** | **12.6** | **4.7** |
| **Apple, grape, cherry (cherry cider blend)** | **Not indicated*** | **Naturally Preferred** | **100** | **10.7** | **1.9** |

*Note.* Bold indicates samples contained arsenic at levels above 9 ppb (near or above the U.S. Environmental Protection Agency drinking water exposure limit of 10 ppb).
[a]ppb = parts per billion.
*No explicit indication of country of origin; presumed to be U.S. by labeling guidelines.

### Comparison Between Arsenic and Lead Contamination

By a wide margin, arsenic was present in more samples and in greater quantities across all types of juices tested in our study than lead. Although both metals would be expected from apples grown in soils previously or presently exposed to lead-arsenate-based pesticide, relatively high arsenic conversion rates by tree fruits and relative concentrations of arsenic compared to lead in lead-arsenate pesticides were likely responsible for this large difference. On average, arsenic and lead levels tended to be similar in apple juices compared to other juices, with two notable exceptions. The single citrus juice tested demonstrated very low levels of arsenic (4.2 ppb). This value is consistent with multiple field tests performed with other citrus juices (orange and grapefruit) that are not reported here but consistently demonstrated less than 10 ppb arsenic levels. On the other end of the spectrum, certain juices that were not purely apple showed unusually high concentrations of arsenic. These juices were blueberry and grape juice (both 100% juice), which contain 19.6 and 24.8 ppb of arsenic, respectively. By contrast, lead tends to vary widely across all juices, whether apple, citrus, or another, with no obvious patterns of contamination.

### Evaluation by Country of Origin

Country of origin did play a role in some arsenic and lead concentrations in the juices tested. The most common countries of origin for both types of juices were the U.S. and China. Average arsenic concentrations for juices were similar at 7 ppb for those originating in the U.S. and from the U.S./China at 8.75 ppb. In contrast, for apple-containing juices, juices derived from U.S. apples had an average arsenic concentration of 13 ppb while U.S./China blends contained only 7 ppb. For lead, U.S. fruit generated an average of 3.2 ppb (apple juices) and 5.4 ppb (apple-containing juices) while U.S./China blends contained less, at 0.4 ppb and 2.4 ppb for apple juices and apple-containing juices, respectively.

### Data Quality

Laboratory quality assurance/quality control samples were all reported to be within acceptable ranges for lead detection in the samples tested (using ICP-MS, U.S. EPA Methods 200.8). Impurities in many juices tested required them to be retested for arsenic using multiple standard additions. These impurities interacted with arsenic to change ICP-MS response and were compensated (corrected) by the addition of known concentrations of arsenic in two steps. These matrix spikes eliminated the impact of impurities and enabled the accurate calibration of arsenic concentration to the juices, regardless of their impurities. Due to limited

resources for testing, each sample was tested using U.S. EPA Methods 200.8 (by an external laboratory) only once, but results were confirmed using low-range semiquantitative field tests. At least six of these low-range field tests were performed on each sample to confirm that the laboratory result fell within the range of the field tests (to eliminate the possibility of outlying data or significant errors in the laboratory tests).

## Discussion

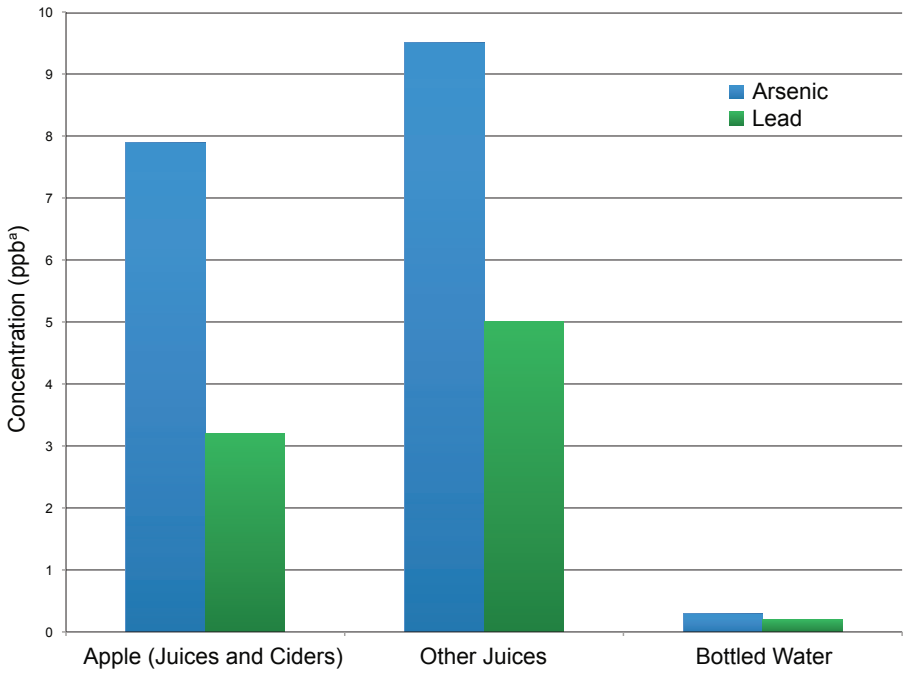
Unlike drinking water, which has exposure standards explicitly set by U.S. EPA at 10 ppb for arsenic and 15 ppb for lead, no exposure limits exist specifically for juices of any kind. The ATSDR MRL, however, addresses the issue of overall arsenic ingestion (ATSDR, 2007a); no comparable MRLs for lead have been established due to complexity of health effects at a wide range of concentrations (ATSDR, 2007b). The ATSDR MRL for total arsenic consumption in any given day is 0.3 µg/kg of body weight.

The impact of arsenic in juice, especially for children, can be assessed by considering this MRL in the context of juice consumption by age. Typical juice consumption patterns for a typical eight-year-old child (boy or girl) are used to calculate typical arsenic consumption (based on results of our study) in Table 4. The fact that, on average, children are consuming about 25% of their daily allowable arsenic through juice (or "-ades" and fruit drinks) suggests that arsenic contamination in apple and apple-containing juices is exceeding allowable amounts for some children and in turn may be resulting in chronic arsenic poisoning for those children. The children at risk are those who (a) are younger and drink more beverages as a percentage of overall body weight; (b) drink more juice than their peers on average—some children drink over twice the average consumption shown in Table 4 (Dennison, 1996); (c) are African-American; (d) regularly consume juices of well-above-average arsenic contamination (several juices in our study tested at 2–3 times higher than the average arsenic contamination used to calculate exposures in Table 4).

Chronic arsenic exposure is known to lower IQ in children and in the long term to cause skin, lung, liver, and bladder cancers (ATSDR, 2007a). In juice, arsenic levels

FIGURE **1**

**Arsenic and Lead Content in Juice (This Study) and Water (Sullivan, 2011)**




[a]ppb = parts per billion.

are consistently higher than for lead. The health impacts of lead, however, even when present below existing exposure levels, are still mixed and controversial; thus, the risk imposed by lead contamination in juice may still be significant. While information regarding arsenic and lead overruns (beyond exposure limits) in drinking water is required in public water quality reports and must be disclosed on request for bottled water, no such requirements exist for juice.

The results of our study are consistent with those published by Consumer Reports during the review period of this article (Consumer Reports, 2012). Combined with the Consumer Reports results, the testing conducted in our study suggests that for apple juice, no clear implications by country of origin, by organic vs. conventional, or by generic vs. name brand can be made regarding trends in arsenic contamination of these juices.

Our study, however, does amplify the concern that it is juice blends, particularly those blends that contain both apple and grape juice that may be the most highly contaminated of juices. Although limited testing was done on citrus juices in our study, no cause for concern has emerged for orange and grapefruit-based juices, either based on this study, on other similar studies, or based on uptake rates of arsenic by citrus trees.

For all major studies conducted on arsenic in juice, no convincing and consistent evidence exists that arsenic consumption exceeds ATSDR MRLs (the only available exposure limit for nonwater sources of arsenic) even for heavy juice drinkers who consume juice contaminated by arsenic at maximum levels found in our study. The possibility of arsenic consumption from other food or beverages in combination with that consumed in juice is what makes the presence of arsenic in juice a continuing concern for both children and adults. It is exactly this possibility of multiple sources of arsenic exposure in combination with the wide range of juices available across the U.S. and the equally broad variety of food

TABLE **4**

**Arsenic Exposure by % of Minimal Risk Level (MRL) for an Average Eight-Year-Old Child**

| Gender | Ethnicity | Daily Juice* Consumed (g) | Daily Arsenic** Consumed (µg) | Average*** Weight (kg) | Arsenic Exposure (% of MRL) |
|---|---|---|---|---|---|
| Boys | All | 232 | 2.02 | 26 kg | 25.90 |
| | White | 229 | 1.99 | | 25.50 |
| | Mexican-American | 255 | 2.22 | | 28.50 |
| | African-American | 300 | 2.61 | | 33.50 |
| Girls | All | 205 | 1.79 | | 22.90 |
| | White | 186 | 1.62 | | 20.70 |
| | Mexican-American | 213 | 1.85 | | 23.72 |
| | African-American | 275 | 2.62 | | 30.70 |

*Average daily juice consumed from fruit juices, "-ades," and drinks (Storey, Forshee, & Anderson, 2006).
**Based on average arsenic contamination of all juices tested in our study (8.7 parts per billion).
***Average weight of an eight-year-old boy or girl.

and beverage consumption patterns that limit the usefulness of our study and similar studies in terms of determining which specific populations of children or adults are at most risk.

While these types of studies may be limited in identifying particular populations at risk for chronic arsenic poisoning, they nevertheless highlight the problem of suggesting or promoting that manufactured beverages and foods should be regulated (by the Food and Drug Administration or similar governmental organizations) in similar ways and at similar levels to drinking water. Many juice manufacturers use multiple and changing sources of fruit to make juices, making the amount of testing required to ensure the safety of these juices within any reasonable statistical significance untenable given current and (likely) future governmental resources.

On a much broader scale, ensuring at a federal level that the diet of any particular individual does not exceed arsenic MRL is impossible given individual variations in diet and the multiple origins of at-risk foods and beverages. Thus, in order to reduce the risk for chronic arsenic poisoning (and harmful effects from similar contaminants), environmental health policy should reflect the underlying diffuse and variable nature of the contaminant itself. Ultimately, the only way to understand if an individual is at risk for chronic arsenic poisoning is to evaluate the problem both locally and nationally. Our study and other national and regional studies highlight apple, grape, and apple juice blends as a source of concern, but distilling these results to the level of protecting and improving public health involves complementing these types of studies with local impetus to test individuals with high-risk diets. Many developed countries regularly test those with high risk diets for cholesterol; given the risk and uncertainty of arsenic poisoning, little reason exists why children cannot be tested for total arsenic levels in the body as part of regular preventative health screens. Considering that lead-arsenate pesticides have a long half-life in soil and in the food chain, arsenic contamination and the corresponding need to understand and change diets for certain segments of the population will remain an issue for decades to come. As is evidenced in our study and similar studies, even organic foods and beverages are not immune to arsenic contamination because of the long-term persistence of lead-arsenate pesticides in soils.

## Conclusion

Clearly, it is necessary to consider establishing exposure limits for apple and apple-containing juices and to regulate the arsenic (and potentially the lead) contamination present in these juices. The wide variation in arsenic and lead content in juices is compounded by contamination in other beverages (including milk) and food and makes arsenic contamination through ingestion a serious concern, especially for children. Juices should be assessed using the same comparison criteria as drinking water and bottled water. For reporting, a more transparent process that allows the consumer to quickly and easily access total arsenic exposure (through beverages) should be developed. For example, juice labels could contain phone number or contact information (including a Web address) where testing results (for both arsenic and lead) could be readily accessed. Public water quality and bottled water manufacturers are presently required to provide this information. Juice manufacturers are a logical next step in providing this information to the consumer so that consumers can actively and readily monitor and control the arsenic and lead consumed by their families and children.

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# The Evolution of Septic Systems Practices in Ohio

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Abstract **Regulations that address management of wastewater in rural areas in Ohio are in the process of being updated. The study described in this article reviewed the legal and regulatory process that occurred in the past decade. Thirty percent of septic systems in Ohio are failing due to installation in shallow soils. The adoption of alternative treatment systems, however, is not widespread. Alternative systems are expensive and in many cases require larger surface areas to build and operate. The establishment of a technical advisory committee provided an avenue to approve new and innovative treatment systems that differ from the existing regulations while the countdown towards the proposed new regulations approached. A survey of county health officials in Ohio highlighted the need for training of regulators and delineation of responsibilities to avoid conflicts of interest. Adequate training of regulators will make the regulatory transition a successful venture.**

## Introduction

Soil-based septic systems serve 20%–25% of the households in the U.S. (U.S. Census Bureau, 2007; U.S. Environmental Protection Agency [U.S. EPA], 2008) and about one million homes in Ohio. This translates to about 480 million gallons of treated effluent per day throughout Ohio (Ohio Department of Health, 2008). In its report to the U.S. Congress, however, the U.S. Environmental Protection Agency (U.S. EPA) stated that onsite septic systems constitute the third most common source of groundwater contamination and that these systems fail due to inappropriate siting, poor design, or inadequate maintenance (U.S. EPA, 1996a). The discharge of partially treated sewage from malfunctioning onsite systems was identified by U.S. EPA as a contributor to excess nutrients in ponds, lakes, and coastal estuaries; contamination of drinking water and groundwater sources; and a cause of several viral and bacterial illnesses through consumption of drinking water contaminated by failing septic systems (U.S. EPA, 1996b, 2000).

In a follow-up report to Congress, U.S. EPA (1997) stated that "adequately managed decentralized wastewater systems are a cost-effective and long-term option for meeting public health and water quality goals, particularly in less densely populated areas." Some communities have successfully utilized onsite systems for wastewater management. Mancl (2002) presented four such success stories from the states of Iowa, Colorado, and California to build the case for adopting onsite systems in rural areas.

The objective of our study was to determine if coordination of laws and regulations, educational programs, and advances in technology can provide homeowners with effective and affordable wastewater treatment systems that protect the public health. To meet this objective, our study worked to deconstruct the formulation of current onsite wastewater treatment policy in Ohio. As of now, Ohio has the oldest sewage rules in the U.S. (Ohio Department of Health, 2008) based on the Ohio Administrative Code (Household Sewage Disposal Systems, 1977).

## Materials and Methods

Our study utilized a triangulated inquiry to gather information about the policies governing septic systems in Ohio and the current practices and attitudes of the regulators. Public records of the Ohio legislature and the Ohio Department of Health were primary sources of information. News sources were accessed to verify conflicting information. Further, county health departments in Ohio were surveyed in 2005 about existing practices, attitudes, and educational needs.

The survey questionnaire was prepared using the procedure described by Dillman (1978). The questionnaire booklet consisted of a front cover illustration and seven pages of multiple-choice and fill-in-the-blank questions. Prior to distribution, the questionnaire was tested by three experts to ensure that the questions were clear and appropriate. The complete questionnaire is available in Hacker (2007) and can be obtained from the authors. Following Dillman's technique, the questionnaires were distributed to all 88 counties through a four-part mailing process. The first mailing contained a personally addressed and signed cover letter, the questionnaire booklet, and a preaddressed and stamped return envelope. After two weeks, a reminder postcard was sent to all the counties. Two weeks later a second letter, the questionnaire

TABLE **1**

**Timeline of Ohio's Septic Systems Regulatory Process**

| Date | Rule or Regulatory Agency | Description |
|---|---|---|
| July 1, 1974 | Chapter 63701-29 of the Ohio Administrative Code | Governs household and small flow sewage treatment in Ohio. Later modified with effect from July 1, 1977. |
| December 1, 2004 | Sub. H.B. 231 | 125th Ohio General Assembly passed a bill later signed by the governor that provided for comprehensive regulation of sewage systems in Ohio. |
| May 5, 2005 | Chapter 3718 of the Ohio Revised Code | A result of Sub H.B. 231, this rule created authority for the Ohio Department of Health to establish standards for the proper siting, design, installation, monitoring, operation and maintenance, and abandonment of sewage treatment systems. |
| April 2005 | Sewage Advisory Committee | The Ohio Department of Health created this committee composed of various stakeholders to identify decision points and draft rules, which were accepted by the Public Health Council in May 2006. |
| May 6, 2005 | Sewage Treatment System Technical Advisory Committee | Chapter 3718.03 of the Ohio Revised Code created this committee to recommend approval or disapproval of sewage treatment systems that differ in design and function from those authorized for use in the Ohio Administrative Code 3701-29. |
| January 1, 2007 | Public Health Council | After minor revisions in October 2006, the Public Health Council adopted rules with an effective date of January 1, 2007, greatly expanding the use of different system technologies in Ohio. |
| July 1, 2007 | Am. Sub. H.B. 119 | With effect from July 1, 2007, the 127th Ohio General Assembly suspended the state sewage law and the 1977 rules were readopted. |
| July 1, 2009 | Home Sewage and Small Flow Onsite Sewage Treatment System Study Commission | As directed by Am. Sub. H.B. 119, the commission was required to recommend effective options to treat sewage to guarantee public health protection with minimal economic impacts. |
| June 18, 2010 | Sub S.B. 110 | Signed by the governor after passing the Ohio Senate and House, this law required new statewide rules to be adopted no sooner than January 1, 2012. |

booklet, and a return envelope were sent to those who did not respond. Finally, two weeks later, a second reminder postcard was sent to the remaining nonrespondents.

## Results

### Ohio's Septic Systems Regulations

Onsite sewage systems in Ohio are regulated through state law and state rules. Local health districts, however, can adopt more stringent regulations depending on their requirements. Chapter 3718 of the Ohio Revised Code (Sewage Treatments Systems, 2006) and chapter 3701-29 of the Ohio Administrative Code (OAC) (Household Sewage Disposal Systems, 1977) govern household and small flow sewage disposal systems in Ohio. These rules first went into effect on July 1, 1974, and were later modified, becoming effective on July 1, 1977. Chapter 3701-29 of the OAC dictates rules for the design, construction, installation, location, maintenance, and operation of household sewage **disposal** systems.

On December 1, 2004, the 125th Ohio General Assembly passed Sub. H.B. 231 "Household Sewage Treatment Regulation" and on May 5, 2005, enacted chapter 3718 of the Ohio Revised Code, creating authority for the Ohio Department of Health to establish standards for the proper siting, design, installation, monitoring, operation and maintenance, and abandonment of sewage **treatment** systems. To facilitate this process and to incorporate inputs from industry, academia, state agencies, and other stakeholders, the Ohio Department of Health established the Sewage Advisory Committee, which submitted a draft of new rules to the Public Health Council in April 2006. The Public Health Council adopted the rules in May 2006 that became effective on January 1, 2007, greatly expanding the use of different system technologies in Ohio.

Concerns relating to the cost of new and replacement systems under the new law were raised. As a result, effective July 1, 2007, the 127th Ohio General Assembly suspended the state sewage law and rescinded the sewage treatment system rules. Am. Sub. H.B. 119 authorized the Ohio Department of Health to readopt the 1977 Household Sewage Disposal Rules as statewide interim rules providing minimum standards for sewage treatment systems in Ohio.

In June 2010, Sub. S.B. 110 was passed by the Ohio Senate and House of Representatives and signed into law on June 18, 2010. The law became effective on September 17, 2010, and required that new statewide rules be drafted and adopted no sooner than January 1, 2012. Until the new rules are adopted, the current state minimum rules, as stipulated in OAC chapter 3701-29 and stricter regulations adopted by local health districts, remain in effect. The law also required the Home Sewage and Small Flow Onsite Sewage Treatment Study Commission to recommend effective options to treat sewage to guarantee public health protection with minimal economic impacts. Table 1 presents a timeline of Ohio's septic systems regulatory process.

### Septic System Technologies

The statewide survey of county health departments achieved an 87.5% response rate (77 out of the 88 counties). The response rate is similar to that obtained in earlier such surveys conducted in 1986–87 (Mancl, 1990) and 1995 (Mancl, 1999). All the counties in the state permit traditional leach field systems. Use of advanced systems varies by county, however. The survey revealed that 68 counties (88%) permit the use of aerobic systems, down from 96% in 1986 (Mancl, 1990).

Sand filters are permitted in 60 counties (78%), up from 63% in 1986 (Mancl, 1990).

In Ohio, two types of mound systems are used. One is an evapotranspiration (ET) mound and the other is a Wisconsin-style treatment mound. Wisconsin-style treatment mound systems were reported to be in use in 40 counties (52%). Earlier studies reported lower usage: 21 counties (26%) in 1986 and 25 counties (31%) 1995. Both treatment mounds and ET mounds were reported in the 1986 and 1997 surveys. If ET mounds are excluded from those numbers, the use of Wisconsin-style treatment mounds has increased significantly in the last 20 years in Ohio. Table 2 lists the number of counties that permit each of these advanced treatment systems and compares the numbers to those reported in earlier studies.

The Ohio Department of Health conducted a survey of county health districts in 2011 to assess the use of linear loading and hydraulic loading rate estimates in the design of wastewater treatment systems (R. Fugitt, personal communication, August 8, 2011). Tyler (2001) designed a table to estimate the design infiltration loading and hydraulic linear loading rates for soil-based onsite wastewater systems. Sixty counties responded to the survey request, and 44 counties (73%) reported using linear and hydraulic loading as the standard for designing systems.

Because the Ohio onsite sewage disposal rules predate the development of advanced onsite wastewater treatment technologies, a mechanism was created in Sub. H.B. 231 to evaluate and recommend the use of "experimental systems" in Ohio. A Sewage Treatment System Technical Advisory Committee (TAC) was established in May 2005 under Section 3718.03 of the Ohio Revised Code. The TAC is a mechanism to recommend approval or disapproval of sewage treatment systems that differ in design and function from those authorized for use in the Ohio Administrative Code 3701-29. The TAC works in conjunction with the Ohio Department of Health and reports to the director of health. The TAC also supports research and development of innovative and cost-effective household sewage treatment system components, including conducting pilot projects to assess the effectiveness of such components.

To date, the TAC has approved septic tanks, pretreatment systems, and special devices for household wastewater treatment (Ohio Department of Health, 2012). Twenty-one pretreatment devices have been approved including two peat biofilters, one textile and one foam biofilter, two ultraviolet light systems, and 14 aerobic units. Nine special devices have been approved including sand mound systems with pressure distribution, sand bioreactors that are either time-dosed or use siphons, and drip distribution systems.

TABLE **2**

**Alternative Treatment Systems Permitted by Ohio Counties**

| Treatment System | Permitted in Ohio Counties | | |
|---|---|---|---|
| | 1986 | 1997 | 2005 |
| Aerobic system | 79 (96%) | – | 66 (86%) |
| Sand filter | 52 (63%) | – | 60 (78%) |
| Mound | 21 (26%) | 25 (31%) | 40 (52%) |

*Note.* The 2005 numbers were collected with a statewide survey. The corresponding numbers for 1986 and 1997 were obtained from Mancl (1990) and Mancl (1999), respectively.

### Septic System Installations

The Ohio Department of Health was directed by the Ohio legislature to prepare a comprehensive analysis on the types of alternative waste treatment systems and their costs and economic factors. Information on permits for treatment systems installed between July 1, 2007, and November 30, 2007, revealed that new household systems accounted for 70% of all systems installed, while replacement and alterations were 18% and 12% of the total, respectively. Additionally, 72% of all systems installed were septic systems with traditional leach lines, 10% were mound systems, 3% were drip irrigation systems, 6% were National Pollutant Discharge Elimination System–approved discharging systems (replacements of existing discharging systems), while the remaining 9% were other systems or systems with no information. Since advanced systems are only now beginning to be adopted at higher rates, it can be hypothesized that leach fields form an even higher proportion of the existing septic systems. Based on the information presented in Ohio Department of Health (2008), the average estimated cost of installing these systems is

- $7,250 for septic systems with leach fields,
- $14,150 for mound systems, and
- $19,750 for drip irrigation systems.

Approximately 25% of Ohio's households are served by some type of sewage system located on the property, with an estimated one million systems in use today. The Ohio Department of Health estimates that 480 gallons of wastewater per household are released in the environment every day, based on the assumption that sewage systems generate 120 gallons per day of wastewater per bedroom and an average home size of four bedrooms. Using the land area calculations for the design of leach fields (Mancl, 2009), mound systems (Chen & Mancl, 2004), and spray irrigation systems (Rowan, Mancl, & Caldwell, 2004) on the statewide distribution of onsite systems and the design wastewater volume for a four-bedroom home as suggested by the Ohio Department of Health, the total land area in Ohio under onsite treatment systems was estimated to be 71,183 acres, which is 0.25% of the state's area.

Seasonal saturation in the soils and the presence of shallow bedrock are two common conditions that threaten the public health (Ohio Department of Health, 2008). Mancl and Slater (2001) found that only 6.4% of Ohio's land area is suited for septic system leach fields. They have identified 215 soil series that have less than one foot of soil depth to seasonal high water tables or other limiting conditions. The Ohio Department of Health (2008) reported a septic system failure rate of 30%. This figure is higher than previous studies showing estimated failure rates of 13%–20% (Tumeo & Newland, 2009), 20%–25% (Maumee River Remedial Action Plan, 2004), and 27% (Mancl, 1990; Ohio Environmental Protection Agency, 1995). Assuming a conservative failure rate of 25%, approximately 120 million gallons of untreated or partially treated wastewater are discharged daily to

TABLE **3**

**Ohio Regulator Knowledge About Wastewater Issues Gained From Various Sources**

| Topic | Formal Coursework % | State Agency Workshops % | Professional Organization Workshops % | The Ohio State University Extension Workshops % | Coworker Knowledge % | Self-Taught % | Other % |
|---|---|---|---|---|---|---|---|
| Permitting | 5.8 | 23.5 | 21.9 | 21.6 | 12.3 | 12.6 | 2.3 |
| Design | 4.6 | 21.5 | 20.5 | 20.5 | 14.9 | 12.8 | 5.1 |
| Inspection | 3.1 | 22.3 | 24.4 | 18.1 | 14.6 | 13.6 | 3.8 |
| Site and soil evaluation | 5.5 | 22.8 | 22.5 | 17.3 | 13.5 | 11.4 | 6.9 |

surface water and groundwater. The failure of septic systems has been attributed to various causes, primarily inadequate soil quality, underdesign, age of the system (DeWalle, 1981; Mancl & Slater, 2000), and soil clogging due to failure to remove excess sludge from the septic tank (Mancl & Slater, 2000).

### Regulator Education

The primary role of regulators is issuing permits for onsite wastewater treatment systems. Often, regulators also deal with aspects of designing, installing, and operating these onsite systems. Mancl (1990) reported that Ohio regulators issued approximately 13,000 permits in 1986. Given that regulators are responsible for issuing a large number of permits each year, it becomes critical for them to be familiar with the latest technologies and regulations governing the onsite wastewater industry. To effectively educate Ohio regulators on onsite wastewater treatment, it is important to understand the different tasks performed by regulators and the skills associated with these tasks.

To determine necessary skills, knowledge, and abilities, respondents were asked to indicate three of the most common skills and practices used to accomplish daily tasks. The top three responses ($n$ = 66) were soil-related information (30.8%), general knowledge (17.5%), and communication (16.6%). Responses stating soil evaluation, interpreting soil maps, soil identification, percolations tests, etc., were grouped under soil-related information. Skills pertaining to general knowledge included knowledge of regulations, wastewater treatment subject matter, and industry norms; common sense; and use of mathematics. Skills pertaining to communication included verbal and written communication; conflict resolution; communication among regulators, contractors, designers, and the public; and diplomacy and delivering notification of violations.

When respondents were asked to indicate areas where they lacked preparedness ($n$ = 70), homeowner concerns (24.3%), issues involving zoning (14.3%), drainage-related issues (11.4%), and design (10%) were the most important areas indicated in the responses. Twenty percent of the respondents felt well equipped in their daily tasks. According to the regulators, areas for improvement ($n$ = 73) included more education (31.5%), issues related to funding (23.3%), and state regulations (17.8%). Comments on education included increase in research on onsite wastewater management and education of the public, designers, contractors, and regulators. Respondents also commented on funding issues such as financial assistance for low-income households as well as state and federal money allocated to health districts to undertake system repairs and educational programs. Comments regarding the state regulations varied from support for the existing rules and the expectation of simpler rules in the future to criticism about the role of health departments in the regulatory process.

Many educational programs are available to meet regulators' educational needs, with some of them utilized more than others. Educational programs are offered by state agencies such as the Department of Health and the Department of Natural Resources, professional organizations such as the Ohio Onsite Wastewater Association and National Onsite Water Recycling Association, and The Ohio State University through its extension programs. Respondents were asked to indicate the source of their knowledge on various topics such as permitting, design and inspection of wastewater treatment systems, and site and soil evaluations as seen in Table 3. Workshops conducted by state agencies, professional organizations, and The Ohio State University Extension are the most common educational sources for regulators.

### Site Modification

Rules regarding regulation and management of septic systems in Ohio are governed by the Ohio Administrative Code (Household Sewage Disposal Systems, 1977). Since the enactment of these rules, changes have occurred in the technology used for treatment of wastewater as well as growth patterns of urban and rural communities. The first major legislative action to update the rules was in 2004, when Sub. H.B. 231 was approved in 125th Ohio General Assembly. One major change included in Sub. H.B. 231 was the elimination of curtain drains, which were to be replaced with engineered interceptor drains, gradient drains, or not having a drain. A curtain drain, as defined in Chapter 3701-29 of the Ohio Administrative Code (Household Sewage Disposal Systems, 1977), is any subsoil drain used to prevent the entrance of groundwater into the area occupied by the household sewage disposal system. Curtain drains do not treat wastewater, however, but merely allow subsurface movement of untreated wastewater, discharging pollutants and nutrients to surface waters. When the statewide survey was conducted in 2005, 13 counties (17%) required curtain drains on all systems and 58 counties (75%) required them under certain conditions such as seasonally high or perched water tables, runoff towards septic system, and poorly drained soils. Only six counties (8%) did not require curtain drains in their jurisdiction at

the time. Although the use of curtain drains has increased in the recent past (Vedachalam, Hitzhusen, & Mancl, 2012), their effectiveness in protecting groundwater quality has not been established (Dumouchelle, 2006).

## Discussion

The study undertaken by the Ohio Department of Health (2008) indicates that septic system failures appear to be higher than estimated earlier. The study reported the failure rate of septic systems to be around 30%, higher than the earlier documented rates that ranged from 13% to 27%. At this rate, approximately 120 million gallons of untreated or partially treated wastewater is discharged daily to surface and ground water. While failure of individual septic systems is difficult to monitor, large-scale system failures may result in enforcement action from the Ohio Environmental Protection Agency (OEPA). Records from OEPA show that during 1986–2007, over 240 communities were under enforcement or identified as having significant impacts from failing systems (Ohio Department of Health, 2008). As a result, the survey of county health departments across the state shows that the use of discharging aerobic systems has decreased over a 20-year period, while sand filters and mound treatment systems are permitted in more counties than before.

At an individual level, failing systems may result in significant costs such as negative health effects and a resulting cost of illness leading to a reduced quality of life. In addition, an individual may also incur higher maintenance and repair costs for poorly designed systems and a loss of property valuation. Vedachalam and co-authors (2012) reported that properties with septic systems sited on unsuitable soils were likely to be valued 6.2% to 6.8% lower than comparable properties on suitable soils based on a study conducted in Licking County, Ohio. Vedachalam (2011) proposed a survey instrument to measure the cost of illness from failing septic systems by interviewing homeowners on the status of their septic systems and obtaining a rough measure of the health costs due to the septic systems.

Officials in the county health departments are tasked with issuing permits and overseeing installation, design, and operation of onsite systems. A survey of regulators in Ohio highlighted needs in soil evaluation and improved communication skills. Survey respondents indicated education as an area for improvement including research on onsite wastewater management and education of public, designers, contractors, and regulators. A variety of educational programs are offered by state agencies, professional organizations, and The Ohio State University Extension. Respondents attributed their knowledge on issues related to wastewater management to workshops conducted by these agencies over more than 20 years (Mancl, 1999). These educational programs will be even more important when new rules take effect after January 2012.

## Conclusion

Because most of Ohio's soils are not suited for traditional leach fields that require deep unsaturated soils for complete treatment of the wastewater, advanced technologies are needed to properly treat wastewater for rural homes. Even with the oldest rules in the U.S., the TAC established by state law has enabled Ohio to carefully evaluate the scientific merit of proposed technologies and introduce them into the market. Cost studies conducted by the Ohio Department of Health have found that while septic system leach fields are the least expensive wastewater treatment systems, technologies such as treatment mounds and drip irrigation systems that are capable of treating wastewater on sites with shallower soils cost less than $20,000 to install.

County health officials are tasked with issuing permits for new onsite treatment systems. Health officials, however, often also deal with aspects of installing, designing, and operating these onsite systems. Delineation of regulatory tasks will likely avoid potential conflict of interests. Improving the competency of the regulators; strengthening research and development efforts on new and innovative sewage treatment systems; and educating contractors, designers, and the general public could be some of the outcomes expected from the regulatory transition process.

Regulators need to be trained in the permitting, design, and installation of onsite systems along with the advances in treatment technologies. The various workshops offered by state agencies, professional organizations, and The Ohio State University Extension are the primary sources of training for regulators. In light of the proposed new regulations in 2012, workshops and educational programs targeted at regulators will help the counties and local districts transition to the new rules. Pilot studies conducted in selected counties after the implementation of the proposed new rules could help analyze the impact of the regulations and the effectiveness of training programs for regulators.

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GUEST COMMENTARY

# Environmental Health in the South Pacific

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Sometimes in a career, a "once in a lifetime opportunity" presents itself, an opportunity that will afford you an experience unlike any you have known. My once in a lifetime opportunity presented itself in the form of Pacific Partnership 2009 (PP 09). The original environmental health officer (EHO) scheduled to deploy on this mission had to cancel two weeks prior to deployment and a call was put out to EHOs in the U.S. Public Health Service (USPHS) asking for a volunteer. Additionally, the original mission had to be scaled down due to an outbreak of H1N1 on the ship that was to be used. A smaller ship, the dry cargo ship U.S. Navy Ship (USNS) Richard E. Byrd, was to be used. She was a much smaller ship, which meant less staff, less room for supplies, closer quarters, and a condensed, more focused mission had to be put together at the last minute. The ship was built in 2007 and was staffed and operated by U.S. Navy's Military Sealift Command, part of the Naval Fleet Auxiliary Force.

After some deliberations with my supervisor and calendar, I jumped at the chance to go. The chance to fly halfway around the world, to get out from behind a desk for a month, and to practice grassroots environmental health in a far-off land was intriguing and exciting to me. It was an opportunity and I simply couldn't pass it up.

Pacific Partnership is the U.S. Navy's humanitarian and civic assistance mission conducted with partner nations, nongovernmental organizations (NGOs), and other U.S. government agencies to execute a variety of health care programs. Originally conceived following the 2004 Indian Ocean earthquake and tsunami, this now-annual event targets at-need countries from around the world. PP 09 visited the Oceanic nations of Kiribati, the Republic of the Marshall Islands, Samoa, the Solomon Islands, and Tonga. In support of U.S. government diplomacy initiatives, the USPHS Commissioned Corps participated with the U.S. Navy, other Department of Defense service partners, and NGOs on missions both aboard and off ship. Missions were designed to project health diplomacy, increase the operation capacity of U.S. personnel to deliver humanitarian assistance, provide direct care to indigenous peoples, conduct public health infrastructure assessments and repairs, and provide health care training and subject-matter expert exchanges to and with indigenous health workers.

Having deployed several times in response to natural disasters and for national interest events such as the presidential inauguration with the Office of Force Readiness and Deployment, I thought I had an idea of what to expect. The usual major deployments mostly happen after a catastrophic event, recently in the form of Hurricanes Katrina and Rita striking the Gulf Coast of the U.S. Having had the opportunity to be able to directly help people after the hurricanes of 2005, I felt confident that I knew what to expect. I didn't realize that I was blindly jumping at an opportunity that turned out to be a true character and skill-set builder. As far as logistics and character building, upon arrival I lost my luggage to its own New Zealand adventure.

Since this was a "humanitarian public health mission," however, the aspects of environmental health would be a little different and more challenging. It would be more remote and have its own logistical issues and cultural barriers. I was traveling to Samoa and Tonga located in the South Pacific, not the usual places where I have practiced environmental health, and a long way from my comfort zone. I might as well just go ahead and accept the fact that nothing I had experienced up until this point could prepare me for what to expect. It was at that moment that I decided to "go with the flow" and have fun during this adventure. I used it as a time to reflect on and enhance my own environmental health skills.

After flying to Apia, Samoa, I met the USNS Richard E. Byrd. I could see her from the shore. She was positioned approximately three miles off the coast of Samoa, which at the time didn't seem too far. But after having to tender in slightly choppy waters and having to climb a Jacob's ladder for the first time to get onboard, I soon realized this would be an adventure. The ship was filled with doctors, engineers, military personnel, veterinarians, support staff, and lots of other personnel from all over the world. After getting my bearings and trying my best to deal with jet lag, we were off and working the very next day. Apia, Samoa, and Ha'api, Tonga, are located in the South Pacific, very close to the International Dateline and a world away from my usual general environmental health duties. There was something intriguing and challenging about being in this situation.

Being attached to a mobile preventative medicine team was a blessing in disguise as we were able to roam about the islands and "go where we were needed." Our missions included working in villages, towns, schools, hospitals, and medical clinics. We were hosted by and worked closely with the local Ministries of Health. Our team provided general environmental health assistance and subject matter expertise including food safety, water safety and quality, general sanitation, pesticide application, proper chemical storage, vector control, disease control and surveillance, and solid waste management. Almost every class that I took while studying environmental health science at Eastern Kentucky University came into use.

We were assigned trucks and traveled extensively across both islands. As you can imagine, it turns out that there are bugs in the South Pacific, lots of bugs (mosquitoes, ants, roaches, flies, spiders, etc.). Our preventative medicine team consisted of a medical entomologist, an environmental engineer, and a navy hospital corpsman. Having a diverse team composed of public health officials made vector control and teamwork easier, more effective, and educational. Samoa is home to the famous Robert Lewis Stevenson Museum, which was selected as the location for the July 4th celebration and many local dignitaries were scheduled to attend. Being a major island event, we were tasked with identifying potential mosquito breeding areas and treating the grounds before the celebration. Islands typically get a lot of rainfall so there were plenty of opportunities for mosquito breeding. We quickly spread out in an attempt to locate standing water. We soon found that discarded coconut shells at the edge of manicured lawns were the perfect breeding ground. It was recommended that all shells be collected, emptied, and disposed of. The grounds were sprayed and based on the feedback, the celebration was a huge, bugless success.

We conducted raw water sampling for the U.S. Army, tested numerous community wells and water catchments (almost all were positive for coliforms, some were positive for *E. coli* and almost all lacked the proper amount of chlorine), installed individual slow sand filter water treatment systems, set rat traps at a local hospital and provided education for integrated pest management, provided information and education about solid waste management, investigated a possible foodborne outbreak at a local flea market, and assisted with the repair of a community fogger used for mosquito control.

We inspected, identified, and treated roaches that had taken refuge at a local bed and breakfast. We worked with USNS Byrd–based civilian electricians to repair a water systems solar power generator at a municipal well site. This system served approximately 4,000 people. One of the simplest and most gratifying things that I accomplished was to assist with the installation of individual slow sand filter water treatment systems at the Koulo Government Primary School. This provided safe drinking water for over 200 children. All of this was done in support of the local Ministry of Health.

One last unique situation included treating medical waste in Ha'api, Tonga. When we arrived, the current medical waste disposal practice consisted of an open burn pile without any enclosures. This practice was adopted because the donated wood-fueled incinerator became inoperable overtime. This led to sharps, trash, bottles, medicines, and all other hospital waste being burned in an open and unsecured pit. We worked closely with PP 09 Australian engineers to repair the incinerator by replacing buried electrical lines and building a surround wall for enclosure of the area. We provided training to the local hospital personnel on proper medical waste incineration, disposal, and what to do if the incinerator again broke down.

This humanitarian public health mission was unlike any adventure I have had so far in my career. The standard of living is different in the South Pacific. One simply cannot compare the standard of living in the U.S. to Samoa or Tonga. It is something that must be experienced firsthand to truly appreciate how different it is. I had mentally prepared for general environmental health issues, such as food safety, water problems, and general education of the public prior to my deployment. What I found was that items we have in the U.S. considered to be basic for good hygiene, such as hand soap and hot water, were at a premium. Almost every bathroom I used or inspected had only cold running water, no hand soap, and no towels. Cultural differences (no working on Sundays, none!) forced us to adapt from our usual environment and become creative. You always walk a fine line when you are invited into another country and how you deal and adapt to the situation can determine your success. All of the trying times have faded into good and positive memories; I am very thankful for having had the opportunity to visit this part of the world and understand what type of environmental health issues the people there encounter. I am very glad that I did not let my "once in a lifetime" opportunity pass me by.

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## DIRECT FROM ATSDR

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Kathryn Leann Lemley Bing

# Agency for Toxic Substances and Disease Registry Brownfields/ Land-Reuse Site Tool

**Editor's Note:** **As part of our continuing effort to highlight innovative approaches to improving the health and environment of communities, the *Journal* is pleased to bring back the bimonthly column from the U.S. Agency for Toxic Substances and Disease Registry (ATSDR). The ATSDR, based in Atlanta, Georgia, is a federal public health agency of the U.S. Department of Health and Human Services and shares a common office of the Director with the National Center for Environmental Health at the Centers for Disease Control and Prevention (CDC). ATSDR serves the public by using the best science, taking responsive public health actions, and providing trusted health information to prevent harmful exposures and diseases related to toxic substances.**

**The purpose of this column is to inform readers of ATSDR's activities and initiatives to better understand the relationship between exposure to hazardous substances in the environment and their impact on human health and how to protect public health. We believe that the column will provide a valuable resource to our readership by helping to make known the considerable resources and expertise that ATSDR has available to assist communities, states, and others to assure good environmental health practice for all is served.**

**The conclusions of this article are those of the author(s) and do not necessarily represent the views of ATSDR, CDC, or the U.S. Department of Health and Human Services.**

**Gary D. Perlman is an environmental health scientist for ATSDR. He is a commissioned officer with the U.S. Public Health Service and has been deployed in support of numerous environmental disasters including hurricanes Katrina, Rita, Isabelle, and Irene, as well as the Deepwater Horizon oil spill. Laurel Berman is the national brownfields coordinator with ATSDR. She coordinates the ATSDR Brownfields/Land-Reuse Health Initiative. Kathryn Leann Lemley Bing is an environmental health scientist and an ATSDR regional representative in Atlanta. She has specialized expertise working in brownfield/land-reuse communities.**

## Introduction

The Agency for Toxic Substances and Disease Registry (ATSDR) Brownfields/ Land-Reuse Site Tool ("ATSDR Site Tool") was developed to meet the needs of local health departments' request for a tool with rapid site inventory capabilities, including site history, proposed use, contaminants, and future use. This tool was the result of a local public health department survey and includes a robust set of features such as a site inventory, site visit, citizen concerns call log, multiple chemical dose calculator, and document repository. This tool enhances what is available and it is free, cost-effective, and helps protects public health (Figure 1).

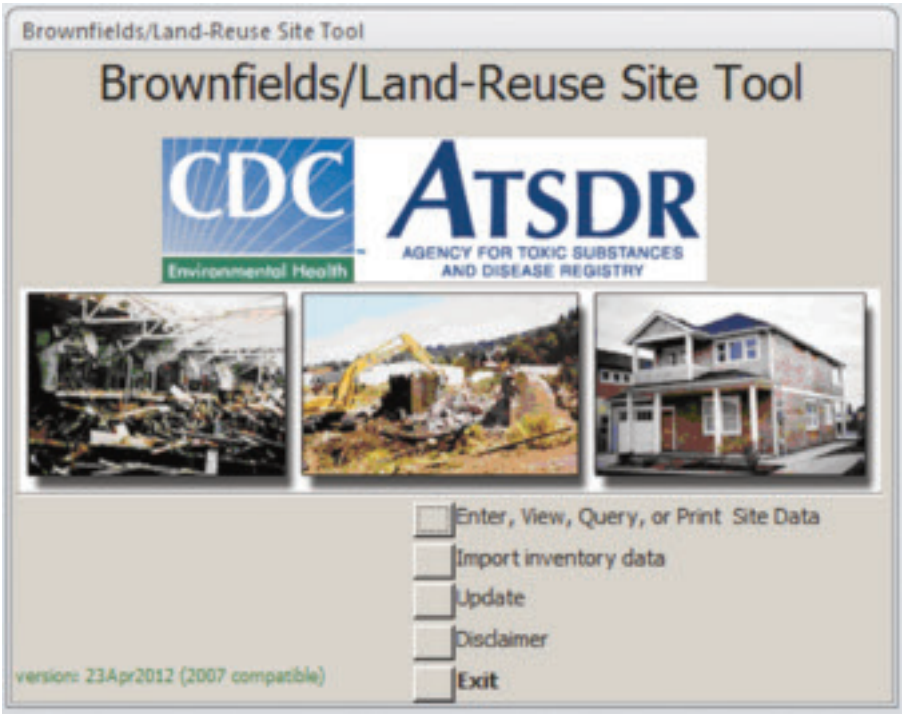
This tool is designed to be used on platforms independent of the Internet. Users may use it virtually anywhere. Moreover, since the data are stored locally, users have full access control to site information. The information may be entered in the field using laptops and shared with other computers by directly importing data from other versions.

Many robust features are included that allow a wide range of data to be collected about a site. Advanced users who have environmental contamination analytical results can process those data quickly through the multichemical dose calculator module and use the resulting public health information to prioritize sites.

Local, state, and tribal governments are currently using this system to enhance their capacity to respond to public health requests related to sites of any kind. This tool emerged out of the brownfields environment; however, its capabilities may be applied to virtually any site where real or perceived contamination exists.

FIGURE **1**

**Brownfields/Land-Reuse Site Tool**




## What Are Brownfields and Land-Reuse Sites?

Brownfield sites are "real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant (U.S. Environmental Protection Agency [U.S. EPA], 2012)." ATSDR defines land-reuse sites as any sites slated for redevelopment. This broader definition encompasses Brownfield sites, former Superfund sites, industrial facilities, and any property slated for redevelopment.

## Public Health Role in Land-Reuse Sites

Some brownfield sites contain significant physical or chemical health hazards. Physical hazards include open holes, unstable structures, and sharp objects. Past industrial activities often leave behind chemical contamination. Many times these types of sites do not have adequate security to prevent people from entering and being exposed to site hazards. While most adults may show little interest in entering these properties, children and adolescents often view brownfields as playgrounds and places to explore, thereby increasing their risks from exposure.

Public health agencies are an important resource to communities who are either concerned about current health impacts or are considering redevelopment of these properties. Local public health agencies can assist communities in assessing potential health impacts, addressing health concerns, communicating risks, and supporting appropriate actions to protect the health of the community.

## Our Public Health Department Survey

On the basis of a formal internal review of ATSDR activities, it is apparent that early intervention and collaboration by state or local health departments (LHD) involved with redevelopment of potentially contaminated sites are essential for success. Interventions may reduce the amount of emergency response activities, increase trust among communities involved in the redevelopment process, and eliminate or reduce harmful exposures to contaminants.

Land-reuse decisions involving local public health departments appear to be minimal. In 2005, the National Association of County and City Health Officials (NACCHO) surveyed over 3,000 local U.S. health agencies. Results described LHD infrastructure and practice (NACCHO, 2006). Less than one in six LHDs reported involvement in land use planning. To that end, ATSDR developed a local health department survey to assess their capacity to work on land-reuse issues.

The pool of potential health departments to survey was obtained from a NACCHO database (Valerie Rogers, personal communication, November 21, 2011). Local health departments identified for inclusion were located in the same county or jurisdiction that received U.S. Environmental Protection Agency (U.S. EPA) brownfields funds in the U.S. EPA Region 5 (Illinois, Indiana, Michigan, Minnesota, Ohio, Wisconsin, and 35 Tribal Nations). ATSDR selected eight (three large and five medium) local health departments for the survey. Seven were located within jurisdictions that received brownfield grant funds. One was located in a jurisdiction that included only limited brownfields involvement activities, mostly from their state brownfields program.

The general characteristics of the eight health departments interviewed varied widely. The average amount of time spent on brownfields/land-reuse site issues was not related to either the population size served or the number of environmental employees. One survey question most applicable to this article was stated as follows: "What tools and training could enhance relevant local health department skills?" The respondents favorably ranked (3.6/5) developing a tool with rapid site inventory capabilities, including site history, contaminants, and proposed future use (Berman et al., 2007).

## Our Site Tool Components

One of the main components is the inventory checklist. This includes a series of data screens prompting the user for information for the following topics:

- basic site information;
- type of site;
- type of data available about the site;
- federal, state, local, or tribal involvement;
- proposed future property use;
- distance to sensitive populations (daycare centers, schools);
- chemicals associated with the site;

- community concerns;
- description of known or suspected trespassing; and
- important tribal considerations such as whether subsistence resources are impacted (Figure 2).

Some sites are first identified by concerned community members contacting a government entity. In order to provide assistance with these interactions, the tool has a community concern call log component for collecting these concerns.

Site visits often provide invaluable information when first discovering a site or reevaluating exposure conditions. When visiting a site, it is important to identify contamination and physical hazards, as well was evidence of trespasser activity and proximity to sensitive populations. Coordinating site visits with members of the community and other contacts is an important means of obtaining relevant documents and gathering additional information (Agency for Toxic Substances and Disease Registry, 2005). As a site visit aide, a detailed check list and data collection section is devoted to a site visit. This assists in collecting information to develop a detailed understanding of current site conditions (Figure 3).

Important site-related documents such as reports, photographs, and diagrams are easily imported into the document archival component. These documents become part of one unified location to maintain site files.

Trespassers accessing a site with chemical or radiological contamination may be adversely impacted by exposures to toxic substances. The ability to determine the magnitude of these impacts, especially when faced with multiple sites, is important when prioritizing public health needs and resources. Environmental contamination sampling results enable exposure assessments for potential cancer and noncancer health hazards. Our tool includes an enhanced module for users to establish exposure parameters (e.g., surface area of skin exposed, quantity of contaminant ingested, age and body weight of exposed individual, and duration of exposure). Once the parameters and environmental sampling data are in a spreadsheet format, the tool will quickly calculate exposure doses and possible health risks for numerous chemicals detected in air, soil, water, and fish tissue (Figure 4).

Frequently, environmental sampling results contain wide variability. This tool provides several common approaches for statistical representations of data including maximum, geometric average, arithmetic average, and 95% upper confidence limit (UCL). The 95% UCL is a parameter that provides statistical confidence that the actual site average will not be underestimated. One additional statistical parameters that is often used when considering

FIGURE **2**

**Data Entry Screen**

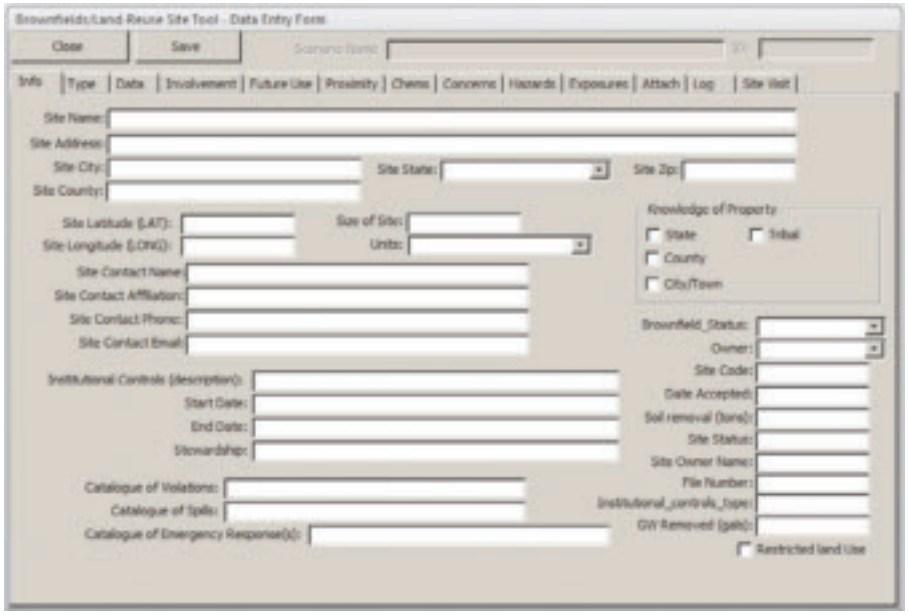



FIGURE **3**

**Site Visit Information**

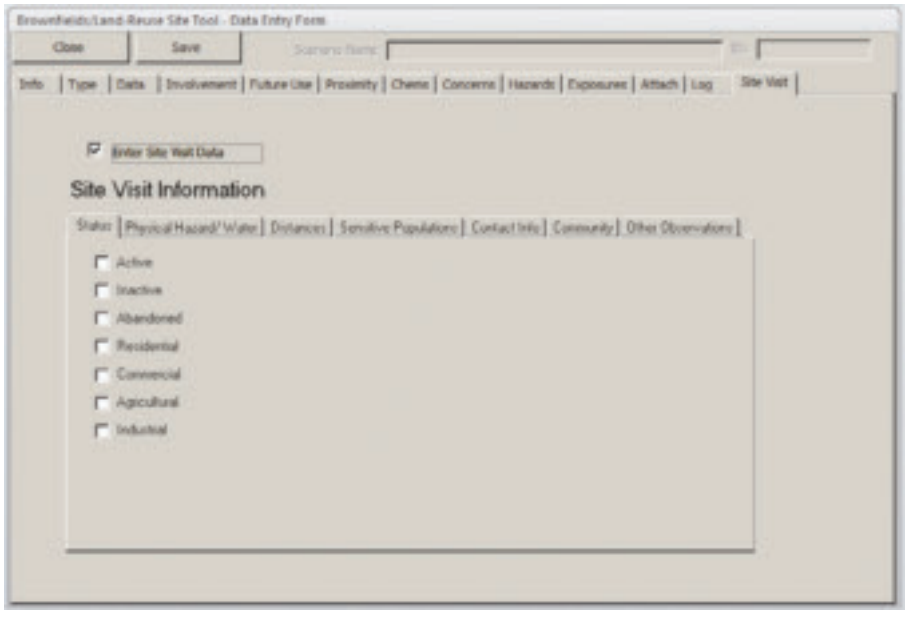


FIGURE **4**

**Exposure Parameters Module**

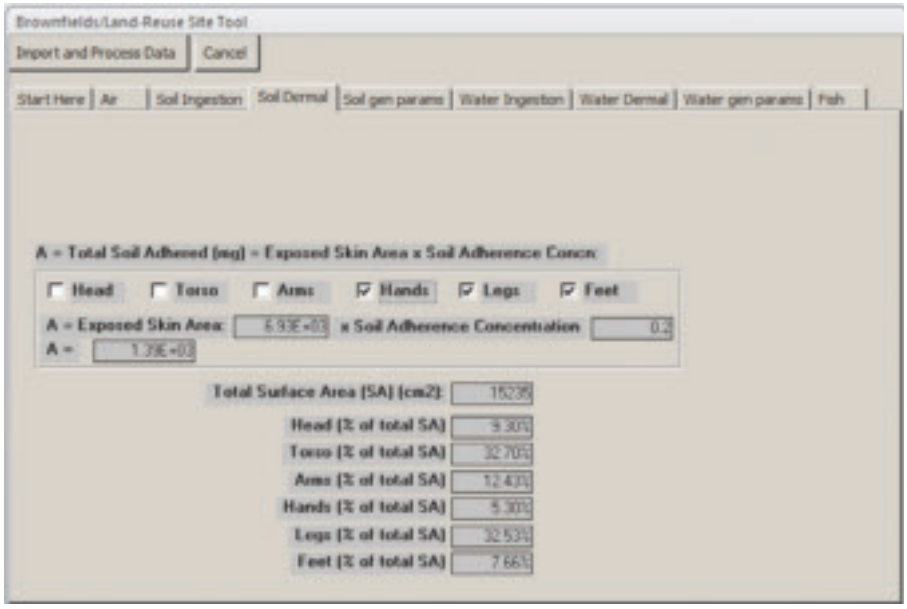



TABLE **1**

**Requestors' Affiliations**

| Requestors | % of Requestor Types |
|---|---|
| Academia | 4.5 |
| ATSDR[a] | 8.3 |
| City/County | 18.5 |
| Community | 5.7 |
| Community group | 1.9 |
| Environmental contractors | 12.7 |
| Federal | 8.9 |
| Health | 5.7 |
| International | 2.5 |
| State | 17.8 |
| Tribal | 13.4 |

[a]ATSDR = Agency for Toxic Substances and Disease Registry.

the use of a 95% UCL is how the data are distributed (i.e., do the data follow the typical bell curve). This tool determines whether the data are normally or log-normally distributed. The data are tested for normality using the Wilk-Shapiro normal test. The log-normality is tested using the same test, except the data are first transformed (Beasley & Springer, 1977; Hill, 1973; Royston, 1995; Taylor, 1970).

When site environmental investigations only contain a limited amount of data or wide variability in values exists, the 95% UCL can be above the highest measured concentration. The maximum value should be considered in that case (U.S. EPA, 1992).

ATSDR has derived cancer and noncancer comparison values for contaminants. They are defined as estimates of an individual's daily exposure to a contaminant that are likely to be without an appreciable risk of deleterious effects. This includes sensitive subpopulations such as children. Such guidelines are not thresholds for toxicity, but are useful for screening to determine whether more detailed evaluations are necessary. These comparison values include Environmental Media Evaluation Guides, the Cancer Risk Evaluation Guide for $10^{-6}$ (i.e., one in a million) Excess Cancer Risks, and Reference Dose Media Evaluation Guides.

The dose calculation results provide a wealth of information. Five results tables show the maximum, geometric mean, arithmetic mean, 95% UCL, and 95% UCL of log transformed data. In addition, the following parameters are listed for each contaminant:

- chemical-specific comparison value;
- number of sample points exceeding the comparison value;
- number of sample points where the contaminant was not detected;
- number of times the detection limit exceeds the comparison value;
- contaminant concentrations;
- ingestion doses;
- dermal;
- inhalation;
- ingestion cancer; and
- dermal cancer risk.

If all contaminants are detected at concentrations below their respective comparison values, then the contaminations listed can be considered to be below a level of concern. This conclusion can only be drawn for the sampling results provided and the exposure parameters used. If the exposure parameters do not appear to reflect actual conditions, then a reevaluation should be considered.

Carcinogenic risk calculations are produced for contaminants that have cancer slope factors (or inhalation unit risk factors). Combined cancer risk estimation is listed at the end of the results printout (listed separately for ingestion and dermal exposures; as relevant). No assessment is conducted that combined contaminants based on their target end-point toxicity. This conservative approach may overestimate cancer risk since it could combine contaminants that produce unrelated cancer types.

This tool requires a Microsoft Windows®–based computer that has Microsoft Office® 2003 or later. Free hard disk space should be at least 100 MB. A mouse or other pointing device is strongly recommended, though most navigation can be conducted from the keyboard. Screen resolution of 800 by 600 pixels is the minimum resolution. The database is shipped on CD with a tour guide and sample data.

The user has the ability to import existing site data directly into the database. The data import module requires the user to identify the variables in the source file and assign them to the most appropriate field in the tool. Conversely, the data can also be exported to a text file that includes each field (exclusive of attached files). The fields are separated by a comma (commonly known as a CSV or comma-separated value file).

The ATSDR Site Tool is updated on a regular basis. The main deciding factor for up-

dates is either updated comparison values or user suggestions. The updated database file will include an option to import data from a previous version. Updates are available by request on CD and are produced generally after new functionality is added or new comparison values are incorporated, whichever is first. We are exploring the migration of this tool to other platforms including handheld tablet devices and smartphones.

Today, the ATSDR Brownfields/Land-Reuse Site Tool is used in the U.S. and four foreign countries (Romania, Trinidad, United Kingdom, and Canada). Table 1 illustrates the percentage of requestors' affiliation. To request our site tool or future updates, visit our Web site (www.atsdr.cdc.gov/sites/brownfields/index.html) or e-mail us at atsdr.landreuse@cdc.gov.

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**DIRECT FROM CDC** ENVIRONMENTAL HEALTH SERVICES BRANCH


# *Emergency Water Supply Planning Guide for Hospitals and Health Care Facilities* Available Online

**Editor's Note: NEHA strives to provide up-to-date and relevant information on environmental health and to build partnerships in the profession. In pursuit of these goals, we feature a column from the Environmental Health Services Branch (EHSB) of the Centers for Disease Control and Prevention (CDC) in every issue of the *Journal*.**

**In this column, EHSB and guest authors from across CDC will highlight a variety of concerns, opportunities, challenges, and successes that we all share in environmental public health. EHSB's objective is to strengthen the role of state, local, and national environmental health programs and professionals to anticipate, identify, and respond to adverse environmental exposures and the consequences of these exposures for human health. The services being developed through EHSB include access to topical, relevant, and scientific information; consultation; and assistance to environmental health specialists, sanitarians, and environmental health professionals and practitioners.**

**This month's column features an excerpt from the *Emergency Water Supply Planning Guide for Hospitals and Health Care Facilities*. This planning guide was recently published as a collaborative effort among CDC, U.S. Environmental Protection Agency, and American Water Works Association.**

In order to maintain daily operations and patient care services, health care facilities need to develop an emergency water supply plan (EWSP) to prepare for, respond to, and recover from a total or partial interruption of the facilities' normal water supply. Water supply interruption can be caused by several types of events such as natural disaster, a failure of the community water system, construction damage, or even an act of terrorism. The following are a few actual examples of water supply interruptions at some health care facilities:

- A hospital in Florida lost water service for five hours due to a nearby water main break.
- A hospital in Nevada lost water service for 12 hours because of a break in its main supply line.
- A hospital in West Virginia lost service for 12 hours and 30 hours during two separate incidents because of nearby water main breaks.
- A hospital in Mississippi lost service for 18 hours as a result of Hurricane Katrina.
- A hospital in Texas lost water service for 48 hours due to an ice storm that caused a citywide power outage that included the water treatment plant.
- A nursing home in Florida lost its water service for more than 48 hours as a result of Hurricane Ivan.

Because water supplies can and do fail, it is imperative to understand and address how patient safety, quality of care, and the operations of a facility will be impacted. Below are a few examples of critical water usage in a health care facility that could be impacted by a water outage. Water may not be available for

- hand washing and hygiene;
- drinking at faucets and fountains;
- food preparation;
- flushing toilets and bathing patients;
- laundry and other services provided by central services (e.g., cleaning and sterilization of surgical instruments);
- reprocessing of medical equipment, including that typically performed by special services (e.g., bronchoscopy, gastroenterology);
- patient care (e.g., hemodialysis, hemofiltration, extracorporeal membrane oxygenation, hydrotherapy);
- radiology;
- fire suppression sprinkler systems;
- water-cooled medical gas and suction compressors (a safety issue for patients on ventilation);
- heating, ventilation, and air conditioning; and
- decontamination/hazmat response.

A health care facility must be able to respond to and recover from a water supply

interruption. Standards of the Joint Commission (formerly the Joint Commission on Accreditation of Healthcare Organizations) require hospitals to address the provision of water as part of the facility's Emergency Operations Plan (EOP). The Center for Medicare and Medicaid Services (CMS) Conditions for Participation/Conditions for Coverage (42 CFR 482.41) also requires that health care facilities make provisions in their preparedness plans for situations in which utility outages (e.g., gas, electric, water) may occur. A robust EWSP can provide a road map for response and recovery by providing the guidance to assess water usage, response capabilities, and water alternatives.

The objective of this planning guide is to help health care facilities develop a robust EWSP as part of its overall facility EOP and to meet the published standards set forth by the Joint Commission and the CMS. The guide is intended for use by any health care facility regardless of its size or patient capacity. The guide provides a four-step process for the development of an EWSP:

1. Assemble the appropriate EWSP Team and the necessary background documents for your facility.
2. Understand your water usage by performing a water use audit.
3. Analyze your emergency water supply alternatives.
4. Develop and exercise your EWSP.

The EWSP will vary from facility to facility based on site-specific conditions, but will likely include a variety of emergency water supply alternatives evaluated in step #3 above. How the EWSP is developed for a health care facility will depend on the size of the facility. For a small facility, one individual may perform multiple functions, and the process may be relatively simple with a single individual preparing an EWSP of only a few pages. For a large regional hospital, however, multiple parties will need to work together to develop an EWSP. In this case the process and the plan would be more complex.

Regardless of size, however, a health care facility must have a robust EWSP to be prepared to ensure patient safety and quality of care while responding to and recovering from a water emergency.

For more information and to download the guide and other resources, visit www.cdc.gov/healthywater/emergency/drinking_water_advisory/index.html.

DEMYSTIFYING THE FUTURE

Thomas Frey

# Driverless Highways: Creating Cars That Talk to the Roads

**Editor's Note: Significant and fast-paced change is occurring across society in general and our profession in particular. With so much confusion in the air, NEHA is looking for a way to help our profession better understand what the future is likely to look like. The clearer our sense for the future is, the more able we are to both understand and take advantage of trends working their way through virtually every aspect of our lives today. To help us see what these trends are and where they appear to be taking us, NEHA has made arrangements to publish the critical thinking of the highly regarded futurist, Thomas Frey.**

**The opinions expressed in this column are solely that of the author and do not in any way reflect the policies and positions of NEHA and the *Journal of Environmental Health*.**

**Thomas Frey is Google's top-rated futurist speaker and the executive director of the DaVinci Institute®. At the Institute, he has developed original research studies enabling him to speak on unusual topics, translating trends into unique opportunities. Frey continually pushes the envelope of understanding, creating fascinating images of the world to come. His talks on futurist topics have captivated people ranging from high-level government officials to executives in Fortune 500 companies. He has also authored the book *Communicating with the Future*. Frey is a powerful visionary who is revolutionizing our thinking about the future.**

Recently I had the privilege of speaking at a conference on the "Future of Mobility" in Shanghai, China. The event was produced by the very forward-thinking people at Lanxess, a German-based chemical company that broke ground the day before on a new facility to expand its already significant base of operation in Shanghai.

As the world's leading producer of synthetic rubber for the automotive industry, Lanxess is very interested in positioning itself at the forefront of our mobile future. One of the biggest trends for this industry is the push to make vehicles driverless.

While most people have been focusing on the driverless technology inside the vehicle itself, where noteworthy accomplishments seem to be happening on a daily basis, the shift will also cause huge changes to occur in areas like insurance, public policy, parking, delivery services, and especially highway engineering.

Even though the art of road building has been continually improving since the Roman Empire first decided to make roads a permanent part of their infrastructure, highways today remain as little more than dumb surfaces with virtually no data flowing between the vehicles and the road itself. That is about to change, and here's why.

## China's Car Market

The number of cars in the U.S. works out to 800 for 1,000 people. In Japan, that number is 600 per 1,000 and South Korea it is slightly under 400. But in Shanghai, the car-per-person ratio currently stands at 169 cars per 1,000.

While the people of China own a smaller percentage of vehicles than other countries, their wealth is increasing rapidly and more cars will soon add additional layers of complication to their already crowded streets.

But the Chinese government is acutely aware of this problem. Restrictions are already in place to limit the number of vehicles that can be licensed inside some of the larger cities like Shanghai and Beijing.

So where does that leave people who wish to become part of this emerging mobile lifestyle? Going driverless may hold some exciting new options.

## Going Driverless

Driverless technology will initially require a driver, and it will creep into everyday use much

as airbags did. It will first be an expensive option for luxury cars, but it will eventually become a safety feature required by governments.

The greatest benefits of this kind of automation won't be realized until the driver's hands are off the wheel. With over two million people involved in car accidents every year in the U.S., it won't take long for legislators to be convinced that driverless cars are a safer option.

The privilege of driving is about to be redefined.

Many aspects of driverless cars are overwhelmingly positive, such as saving lives and giving additional years of mobility to the aging senior population. It will also, however, be a very disruptive technology.

Driverless technologies will be blamed for destroying countless jobs—truck drivers, taxi drivers, bus drivers, limo drivers, traffic cops, parking lot attendants, ambulance drivers, first responders, doctors, and nurses will all see their careers impacted.

If done correctly, driverless vehicles may even deal a fatal blow to the auto insurance industry.

## Creating Cars That Talk to the Roads

As cars become equipped with driverless technology, important things begin to happen. To compensate for the loss of a driver, vehicles will need to become more aware of their surroundings.

Working with cameras and other sensors, an onboard computer will log information over 10 times per second from short-range transmitters on surrounding road conditions, including where other cars are and what they are doing. This constant flow of data will give the vehicle a rudimentary sense of awareness.

With this continuous flow of sensory information, vehicles will begin to form a symbiotic relationship of sorts with their environment, a relationship that is far different from the current human-to-road relationship, which is largely emotion based.

For this reason, it would be foolish for highway engineers to ignore the opportunity to build roads as intelligent as the vehicles that drive on them.

An intelligent car coupled with an intelligent road is a powerful force. Together they will accelerate our mobility as a society, and do it in a stellar fashion.

- **Lane compression**—Highway lanes need only be as wide as the vehicles themselves. Narrow vehicles can be in very narrow lanes, and with varying sizes and shapes of vehicles, an intelligent road system will have the ability to shift lane widths on the fly.
- **Distance compression**—With machine-controlled vehicles, the distance between bumpers can be compressed from multiple car lengths to mere inches.
- **Time compression**—Smart roads are fast roads. Travel speed will be increased at the same time safety is improved.

In the driverless era, intelligent highways will be able to accommodate 10–20 times as many vehicles as they do today. Counter to traditional thinking about vehicle safety, the higher the speeds, the fewer the number of vehicles on the roads at any given moment.

As we compress the time and space requirements of every vehicle, we will be able to achieve a far higher yield of passenger benefits per square foot of road resources.

In addition to the benefits passengers receive, the road itself can greatly benefit from this technology. With cars constantly monitoring road conditions, the road itself can call for its own repair.

Rather than waiting until a road becomes a serious hazard, as is currently the case, and repair crews disrupt traffic for hours, days, or longer, micro repairs can happen on a daily, sometimes hourly, basis. High-speed coatings and surface repairs can even be developed for in-traffic application.

Even treacherous snow and ice conditions will have little effect if deicer is applied immediately and traffic is relentless enough.

## On-Demand Transportation

In the same way people hail a cab, people in the future will use their mobile devices to summon a driverless vehicle whenever they need to travel. Without the cost of drivers, this type of transportation will be infinitely more affordable; for most, it will be less than the cost of vehicle ownership.

So rather than buying a car and taking on all the liabilities of maintenance, upkeep, and insurance, consumers will simply purchase transportation whenever they need it.

As the transition is made to driverless vehicles, the number of vehicles sold to individuals will begin to decline, and a growing percentage will be sold to large fleet operators offering the new "transportation on demand" service.

In response to declining car sales, the automotive industry will adopt a "selling transportation" model where, rather than "selling" cars to fleet operators, car companies will begin charging a nominal per-mile charge.

Fleet operators will love the arrangement because there will be no large up-front purchase price, but instead, only a small monthly fee based on the number of miles driven.

As the sale of cars begins to decline, the automobile industry will start to design and manufacture cars capable of driving over one million miles. By collecting a small per-mile fee over the life of a million-mile car, automobile manufacturers will have the potential of earning 10 times as much, per vehicle, as they do today.

This will mean all car parts and components will need to be designed to be more durable and longer lasting than ever before. Both quality and design standards will be pushed to new levels.

## Shifting From the "Driver" Experience to the "Rider" Experience

Car designers today spend the vast majority of their time trying to optimize the driver experience. After all, the driver is the most important part of the ownership equation. But that will soon change.

In the "driverless era," the focus will shift to passenger comfort and passenger experience. Fancy dashboards displaying dazzling amounts of information will become a thing of the past as riders obsess more over the on-board movie, music, and massage interfaces.

Some cars' operations will be more conversational in nature, pairing socially compatible riders in a way to maximize the conversational benefits of like-minded individuals. Others will stress the benefits of alone time, offering a peaceful Zen-like experience for those wishing to escape the hustle and bustle of work life.

## The China Advantage

China doesn't need more cars; it needs more transportation.

They already understand time compression, using high-speed rail systems to reduce

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# CAREER **OPPORTUNITIES**

## Food Safety Inspector

Everclean Services is the leader in the restaurant inspections market. We offer opportunities throughout the country. We currently have openings for professionals to conduct Q.A. audits of restaurants.

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Past or current food safety inspecting is required.
Interested applicants can send their resume to: Bill Flynn at Fax: 818-865-0465. E-mail: bflynn@evercleanservices.com.

## Assistant/Associate Professor

**Environmental & Occupational Health (EOH)**
**Tenure Track**
**California State University, Northridge**

**Effective Date of Appointment:** August 21, 2013

**General Information:** The Department of EOH is one of the oldest accredited programs of its kind in the nation and is widely known for its commitment to academic excellence and practical career training.

**Qualifications and Responsibilities:** Doctoral degree in EOH or a closely related field is required for tenure. ABD candidates will be considered, but must have completed the doctorate by August 21, 2013. REHS, CIH, or CSP strongly preferred. Teaching and professional experience are criteria in evaluating candidates. Experience in student advisement is desirable.

**Teaching areas may include**: Environmental microbiology, global environmental health, risk analysis, air quality, water quality, safety, hazardous materials management, administration, research design, graduate research seminars, and industrial hygiene.

**Inquiries and applications:** To apply: http://www.csun.edu/facultyaffairs/openings/hhd/ or for more information contact Dr. Peter Bellin, chair of the Search and Screen Committee, at 818- 677-4719 or peter.bellin@csun.edu. Department website: http://www.csun.edu/hhd/eoh/



**Demystifying the Future**
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the travel time on the Beijing-Tianjin Intercity Railway from 70 to 30 minutes.

Similarly, the Beijing-Shanghai high-speed railway that opened in June 2011 reduced the 819-mile distance between the two largest cities in China to under five hours.

With the coming turnover in infrastructure, more in the next 20 years than in all human history, countries that can make decisions fastest, and perform quickest, will have a huge advantage.

China has demonstrated time and again that they can make things happen quickly.

## Final Thoughts

We are all terminally human, and human fallibility lies at the heart of the transportation conundrum. We all love to drive, but humans are the inconsistent variable in this demanding area of responsibility. Driving requires constant vigilance, constant alertness, and constant involvement.

Once we take the driver out of the equation, however, we solve far more problems than the wasted time and energy needed to pilot the vehicle.

But vehicle design is only part of the equation. Without reimagining the way we design and maintain highways, driverless cars will only achieve a fraction of their true potential.

Combining smart cars (driverless) with smart highways (also driverless), we can begin to envision a far brighter future ahead.

In the end, we will be driving towards a far safer and more resilient society, but we still have a few bumpy roads to go down in the meantime.

Interested in sharing your thoughts? Go to www.FuturistSpeaker.com.

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# EH CALENDAR

## UPCOMING NEHA CONFERENCES

**July 9–11, 2013: Hyatt Regency Crystal City at Reagan National Airport, Washington, DC, Area.** For more information, visit www.neha2013aec.org.

## NEHA AFFILIATE AND REGIONAL LISTINGS

**Arizona**
**March 21, 2013: AZEHA Spring Conference**, sponsored by the Arizona Environmental Health Association, Arizona State University, Tempe, AZ. For more information, visit www.azeha.org.

**California**
**April 1–4, 2013: 62nd Annual Educational Symposium**, sponsored by the California Environmental Health Association, Sheraton Hotel at Universal Studios, Universal City, CA. For more information, visit www.ceha.org.

**Idaho**
**March 13–14, 2013: IEHA Annual Education Conference**, sponsored by the Idaho Environmental Health Association, Boise State University, Boise, ID. For more information, visit www.ieha.wildapricot.org.

**Michigan**
**March 20–22, 2013: MEHA Annual Educational Conference**, sponsored by the Michigan Environmental Health Association, Royal Park Hotel, Rochester, MI. For more information, visit www.meha.net/aec/.

**Nevada**
**January 30–31, 2013: 2013 Southwest Environmental Health Conference**, hosted by the Arizona County Directors of Environmental Health Services Association, Riverside Resort Hotel and Casino, Laughlin, NV. For more information, visit www.southwestconference.net.

**North Carolina**
**December 5–6, 2012: Ninth "One Medicine" Symposium**, hosted by the North Carolina Departments of Health & Human Services and Agriculture & Consumer Services, Durham, NC. For more information, contact Stephanie Westbrook at stephanie.westbrook@ncagr.gov.

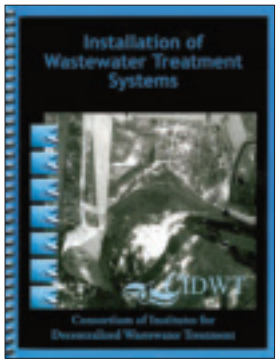
# RESOURCE CORNER

*Resource Corner highlights different resources that NEHA has available to meet your education and training needs. These timely resources provide you with information and knowledge to advance your professional development. Visit NEHA's online Bookstore for additional information about these, and many other, pertinent resources!*

NEHA BOOKSTORE
www.neha.org/store

## Installation of Wastewater Treatment Systems

*Consortium of Institutes for Decentralized Wastewater Treatment (2009)*

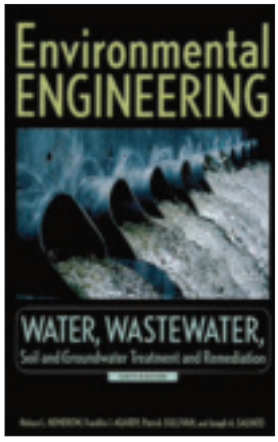



This manual is the definitive source for information on installing decentralized wastewater treatment systems. Developed by a team of experts, this manual provides installers with training materials geared specifically to address installation—one of the many vital aspects of programs for managing decentralized wastewater treatment systems. Installers, regulators, and designers of onsite wastewater treatment systems will gain a better understanding of the activities related to proper installation and startup to maximize system efficiency, longevity, and performance. This manual is a recommended study reference for NEHA's Certified Installer of Onsite Wastewater Treatment Systems (CIOWTS) credential.

*454 pages / Spiral-bound paperback / Catalog #1125*
*Member: $68 / Nonmember: $79*

## Environmental Engineering: Water, Wastewater, Soil and Groundwater Treatment and Remediation (Sixth Edition)

*Edited by Nelson L. Nemerow, PhD; Franklin J. Agardy, PhD; Patrick Sullivan, PhD; and Joseph A. Salvato (2009)*

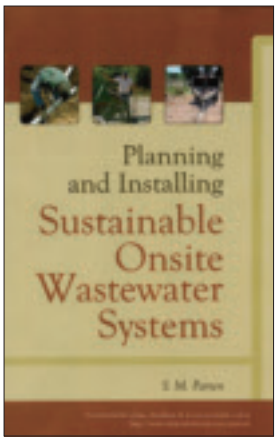



First published in 1958, Salvato's *Environmental Engineering* has long been the definitive reference for generations of sanitation and environmental engineers. This new edition has been completely rewritten by leading experts in the field and offers succinct new case studies, new process and plant design examples, and added coverage of such subjects as urban and rural systems. This volume covers water and wastewater treatment, water supply, soil and groundwater remediation and protection, and industrial waste management. Study reference for NEHA's REHS/RS exam.

*384 pages / Hardback / Catalog #709*
*Member: $130 / Nonmember: $140*

## Planning and Installing Sustainable Onsite Wastewater Systems

*S.M. Parten (2010)*

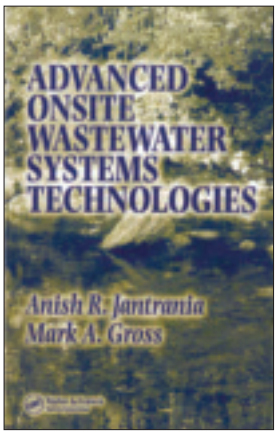



Covering technical principles and practical applications, this comprehensive resource explains how to design and construct sound and sustainable decentralized wastewater systems of varying sizes and in different geophysical conditions. This book covers state-of-the-art techniques, materials, and industry practices, and provides detailed explanations for why certain approaches result in more sustainable projects. In-depth design and construction information highlights nonproprietary methods proven to be very sustainable and cost effective on a long-term basis for many geographic settings.

*412 pages / Hardback / Catalog #1084*
*Member: $69 / Nonmember: $73*

## Advanced Onsite Wastewater Systems Technologies

*Anish R. Jantrania and Mark A. Gross (2006)*




This book discusses a regulatory and management infrastructure for ensuring long-term, reliable applications of onsite systems for wastewater management. It provides an overview of advanced onsite systems technologies and compares them to conventional onsite systems and centralized wastewater systems. Key concepts for decentralized wastewater solutions and information on advanced onsite wastewater treatment and effluent dispersal technologies currently available are presented. The book delineates a management, regulatory, and planning framework for adopting the use of advanced onsite systems technologies as alternatives to conventional septic systems and centralized collection and treatment plants.

*261 pages / Hardback / Catalog #487*
*Member: $103 / Nonmember: $108*

# neha.org



**Information and opportunities abound behind the research and development button on NEHA's homepage. Visit neha.org/research to obtain the latest on the following NEHA federally funded programs, many of which include free or low-cost training and educational opportunities:**

- Biology and Control of Vectors and Public Health Pests Program
- Environmental Public Health Tracking Program
- Epi-Ready Team Training Program
- Food Safe Schools Program
- Industry-Foodborne Illness Investigation Training (I-FIIT) Program
- Land Use Planning and Design Program
- Onsite Wastewater Treatment Systems Program
- Radon/Indoor Air Quality Program
- Workforce Development Program

# *JEH* QUIZ

## FEATURED ARTICLE QUIZ #3

### Arsenic and Lead in Juice: Apple, Citrus, and Apple-Base

Available to those holding an Individual NEHA membership only, the *JEH* Quiz, offered six times per calendar year through the *Journal of Environmental Health,* is a convenient tool for self-assessment and an easily accessible means to accumulate continuing-education (CE) credits toward maintaining your NEHA credentials.

1. Read the featured article carefully.
2. Select the correct answer to each *JEH* Quiz question.
3. a) Complete the online quiz at www.neha.org (click on "Continuing Education"),
   b) Fax the quiz to (303) 691-9490, or
   c) Mail the completed quiz to
   *JEH* Quiz, NEHA
   720 S. Colorado Blvd., Suite 1000-N
   Denver, CO 80246.
   Be sure to include your name and membership number!
4. One CE credit will be applied to your account with an effective date of December 1, 2012 (first day of issue).
5. Check your continuing education account online at www.neha.org.
6. You're on your way to earning CE hours!

**Quiz Registration**

Name

NEHA member number

Home phone

Work phone

E-mail

**→ Quiz deadline: March 1, 2013**

1. The U.S. Environmental Protection Agency (U.S. EPA) has established exposure limits of arsenic and lead in drinking water of __ parts per billion (ppb) and __ ppb, respectively.
   a. 10; 5
   b. 10; 15
   c. 15; 10
   d. 15; 5

2. The top two producers of apple juice are
   a. China and the U.S.
   b. the U.S. and Canada.
   c. China and Poland.
   d. the U.S. and Mexico.

3. Children consume about 1.6 L of fluid per day with approximately __ coming from fruit juices, "-ades," or drinks.
   a. 14%
   b. 23%
   c. 29%
   d. 50%

4. U.S. EPA 200.8 method detection limits for lead and arsenic are __ and __, respectively.
   a. 0.05 ppb; 0.10 ppb
   b. 0.10 ppb; 0.05 ppb
   c. 0.5 ppb; 1.0 ppb
   d. 1.0 ppb; 0.5 ppb

5. Lead was detected in all of the juices studied.
   a. True.
   b. False.

6. The arsenic levels detected in the study's juice samples ranged from a minimum of __ to a maximum of __.
   a. 0.2 ppb; 13.4 ppb
   b. 0.2 ppb; 24.8 ppb
   c. 3.5 ppb; 13.4 ppb
   d. 3.5 ppb; 24.8 ppb

7. If detected, the lead levels in the study's juice samples ranged from a minimum of __ to a maximum of __.
   a. 0.2 ppb; 13.4 ppb
   b. 0.2 ppb; 24.8 ppb
   c. 3.5 ppb; 13.4 ppb
   d. 3.5 ppb; 24.8 ppb

8. Nearly __ of the apple-containing and juice-blend samples studied contained arsenic levels near or above the U.S. EPA drinking water exposure limit.
   a. all
   b. three-quarters
   c. half
   d. a quarter

9. __ of the apple juice (or cider) samples contained arsenic at levels of 9 ppb or higher.
   a. Ten percent
   b. Twenty-five percent
   c. Forty-seven percent
   d. None

10. No juice samples tested above the U.S. EPA exposure limit for lead in drinking water.
    a. True.
    b. False.

11. On average, children consume about __ of their daily allowable arsenic through juice.
    a. 15%
    b. 20%
    c. 25%
    d. 40%

12. The study highlights the concern that juice blends may be the most highly contaminated of juices.
    a. True.
    b. False.

**_JEH_ Quiz #1 Answers**
**July/August 2012**

| | | | |
|---|---|---|---|
| 1. a | 4. e | 7. c | 10. d |
| 2. d | 5. b | 8. d | 11. c |
| 3. a | 6. b | 9. a | 12. c |

Association of Environmental Health Academic Programs *Announces*

# The 2013 AEHAP/NCEH Student Research Competition

for undergraduate and graduate students enrolled in an EHAC-accredited program or an environmental health program that is an institutional member of AEHAP

## *Win* A $500 AWARD

**and up to $1,000 in travel expenses**

Students will be selected to present a 20-minute platform presentation at the National Environmental Health Association's Annual Educational Conference & Exhibition in Washington, DC, July 9–11, 2013.

**Entries must be submitted by April 8, 2013,** to
Dr. David Gilkey
Colorado State University
146 EH Building
Fort Collins, CO 80523-1681
E-mail: dgilkey@colostate.edu

**For additional information and research submission guidelines, please visit www.aehap.org.**

AEHAP gratefully acknowledges the support of the National Center for Environmental Health, U.S. Centers for Disease Control and Prevention, for this competition.

# Opportunity for Students

## From EHAC-Accredited Environmental Health Degree Programs to Win a $3,500 PAID INTERNSHIP

The Association of Environmental Health Academic Programs (AEHAP), in partnership with NSF International, is offering a paid internship project to students from National Environmental Health Science and Protection Accreditation Council (EHAC)-accredited programs. The NSF International Scholarship Program is a great opportunity for an undergraduate student to gain valuable experience in the environmental health field. The NSF Scholar will be selected by AEHAP and will spend 8–10 weeks (March–May 2013) working on a research project identified by NSF International.

**Project Description**
The applicant shall work with a professor from their degree program who will serve as a mentor/supervisor and agree to providing a host location from which to do the research. The research project involves administering a survey of the 50 states to determine how they have responded to the 2009 FDA *Model Food Code*. This project is a continuation of a research project started by the 2009 NSF Scholar.

**Application deadline: January 18, 2013**

For more details and information on how to apply please go to www.aehap.org/resources/student-resources/aehap-scholarships/nsf-paid-summer-internship-opportunity-for-students

For more information, contact info@aehap.org or call 206-522-5272.

NSF

AEHAP
ASSOCIATION OF ENVIRONMENTAL HEALTH ACADEMIC PROGRAMS

# SUPPORT THE NEHA ENDOWMENT FOUNDATION

The NEHA Endowment Foundation was established to enable NEHA to do more for the environmental health profession than its annual budget might allow. Special projects and programs supported by the foundation will be carried out for the sole purpose of advancing the profession and its practitioners.

Individuals who have contributed to the foundation are listed below by club category. These listings are based on what people have actually donated to the foundation—not what they have pledged. Names will be published under the appropriate category for one year; additional contributions will move individuals to a different category in the following year(s). For each of the categories, there are a number of ways NEHA recognizes and thanks contributors to the foundation. If you are interested in contributing to the Endowment Foundation, please fill out the pledge card or call NEHA at 303.756.9090.

*Thank you.*

## DELEGATE CLUB ($25-$99)

*Name in the* Journal *for one year and endowment pin.*

## HONORARY MEMBERS CLUB

($100-$499)

*Letter from the NEHA president, name in the* Journal *for one year, and endowment pin.*

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Huntington Beach, CA

**Scott M. Golden, RS, MSEH**
Grove City, OH

**Bette J. Packer, REHS**
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Falls Church, VA

## 21st CENTURY CLUB ($500-$999)

*Name in AEC program book, name submitted in drawing for a free one-year NEHA membership, name in the* Journal *for one year, and endowment pin.*

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Metairie, LA

## SUSTAINING MEMBER CLUB

($1,000-$2,499)

*Name in AEC program book, name submitted in drawing for a free two-year NEHA membership, name in the* Journal *for one year, and endowment pin.*

## AFFILIATES CLUB

($2,500-$4,999)

*Name in AEC program book, name submitted in drawing for a free AEC registration, name in the* Journal *for one year, and endowment pin.*

## EXECUTIVE CLUB AND ABOVE

($5,000-$100,000)

*Name in AEC program book, special invitation to the AEC President's Reception, name in the* Journal *for one year, and endowment pin.*

## NEHA ENDOWMENT FOUNDATION PLEDGE CARD

**I pledge to be a NEHA Endowment Foundation Contributor in the following category:**

- ❍ Delegate Club ($25)
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- ❍ Endowment Trustee Society ($25,000)
- ❍ Visionary Society ($50,000)
- ❍ Futurists Society ($100,000)
- ❍ **You have my permission to disclose the fact and amount (by category) of my contribution and pledge.**

I plan to make annual contributions to attain the club level of _____ over the next _____ years.

Signature _____ Print Name _____

Organization _____ Phone _____

Street Address _____ City _____ State _____ Zip _____

❍ Enclosed is my check in the amount of $_____ payable to **NEHA Endowment Foundation**.

❍ Please bill my: MasterCard/Visa Card #_____ Exp. Date _____

Signature _____

**MAIL TO: NEHA, 720 S. Colorado Blvd., Suite 1000-N, Denver, CO 80246, or FAX to: 303.691.9490.** 1212JEHEND

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**Evansville in Water & Sewer Utility**
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jmerrick@ewsu.com

**FDA Food Defense Oversight Team**
Jason Bashura
www.fda.gov/Food/FoodDefense/default.htm

**Food Safety News**
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# ANNOUNCING THE

77th National Environmental Health Association (NEHA)
Annual Educational Conference (AEC) & Exhibition

## July 9-11, 2013 ♦ Washington, DC




neha2013aec.org

The NEHA AEC is the premier event for environmental health training, education, networking, advancement, and more!

# REASONS WHY

## Attending the NEHA AEC Is a Wise Investment for You and Your Organization

Difficult times make it more important than ever that you NOT miss the skills, knowledge, and expertise that can be derived from the NEHA AEC, which can help you and your organization build for a better tomorrow.

1. The NEHA AEC is a unique opportunity for you to gain the skills, knowledge, and expertise needed to help solve your environmental health organization's daily and strategic challenges, and to make recommendations to help improve your bottom-line results.
2. NEHA's AEC is the most comprehensive training and education investment your organization can make all year.
3. Your attendance at the NEHA AEC is a solid investment in your organization that will result in immediate and longer-term benefits.
4. You can earn Continuing Education (CE) credit to maintain your professional credential(s).
5. NEHA provides a return on the investment made for you to attend the AEC.

### Need additional reasons why you should attend?

Check out the videos on neha2013aec.org to hear what other environmental health professionals are saying about the NEHA AEC.

# WASHINGTON, DC, IN JULY

## The Perfect Destination to Mix Business and Pleasure



### Reserve Your Hotel Room Today

The 4th of July holiday is only a few days before the start of the NEHA 2013 AEC. So why not mix business and pleasure in Washington, DC? Hotel rooms will be available to you at the NEHA group discounted rate prior to the conference. So secure your hotel room for July 4–11 and enjoy the 4th of July holiday in Washington, DC, before attending the NEHA AEC! Reserve today as hotel rooms at this discounted group rate are limited.

### Experience Washington, DC

Though the NEHA 2013 AEC venue is technically in Arlington, Virginia, you will be just a few short minutes away from all that Washington, DC, has to offer. In Washington, DC, you'll enjoy access to fascinating, FREE attractions and historic sights. Touch a moon rock, marvel at the Hope Diamond, view Dorothy's Ruby Red slippers, or explore Native American culture at the Smithsonian Institution's 15 Washington, DC, area facilities. Discover treasures like the Gutenberg Bible at the Library of Congress, the only da Vinci painting in North America at the National Gallery of Art, and historic documents like the Declaration of Independence at the National Archives.

Away from these celebrated federal sites, Washington, DC, unwinds into a fascinating network of neighborhoods where visitors discover trendy boutiques, hip bars and restaurants, plus art galleries, historic homes, and lush parks and gardens. Shoppers love the store-lined streets of Georgetown, while jazz music fans won't want to miss a trip to U Street, where Duke Ellington played his first notes. The city's international character shines through in its Adams Morgan and Dupont Circle neighborhoods, two prime destinations for eclectic dining and nightlife and the historic center of the city's embassy community.

DC is also earning new recognition as a thriving performing arts town, with 65 professional theatre companies based in the metropolitan area presenting edgy world premieres and celebrated Broadway musicals throughout the year.

Thanks to DC's pedestrian-friendly streets and its safe, efficient public transportation system—including Metrorail and the hip, new Circulator bus—it's easy to get to Washington, DC's attractions.

**For more information, visit neha2013aec.org and click the "Destination" tab.**


## AEC Venue & Hotel

### Hyatt Regency Crystal City at Reagan National Airport

2799 Jefferson Davis Highway
Arlington, Virginia, USA 22202

# NEHA 2013 AEC
# PRELIMINARY SCHEDULE

| Sunday // July 7 | Monday // July 8 | Tuesday // July 9 | Wednesday // July 10 | Thursday // July 11 |
|---|---|---|---|---|
| Pre-Conference Workshops | Pre-Conference Workshops | 1st Time Attendee Workshop | Town Hall Assembly | Educational Sessions |
| Credential Review Courses | Credential Review Courses | Educational Sessions | Exhibition Open | Networking Luncheon |
| | Credential Exams | Awards Ceremony & Keynote Address | Poster Session | President's Banquet |
| | Golf Tournament | Exhibition Grand Opening & Party | Silent Auction | |
| | Community Volunteer Event | | Student Research Presentations | |
| | Annual UL Event | | Educational Sessions | |

## Registration

Registration information is available at neha2013aec.org. For personal assistance, contact Customer Service toll free at 866.956.2258 (303.756.9090 local), extension 0.

| | Member | Non-Member |
|---|---|---|
| Full Conference Registration | $565 | $725 |
| One Day Registration | $305 | $355 |
| Student/Retired Registration | $155 | $225 |

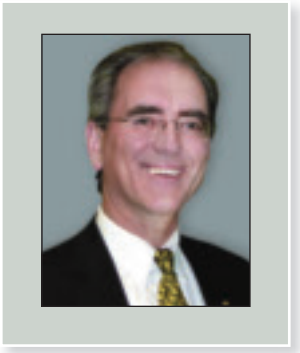
**neha2013aec.org**

### Save $50

Stay at the designated AEC hotel—Hyatt Regency Crystal City—and receive a $50 food voucher to use toward your meal purchases.

*Certain terms and conditions apply.*

## MANAGING EDITOR'S DESK



Nelson Fabian, MS

# You Don't Get What You Wish For; You Get What You Work For!

One of the benefits that come with the position I hold is that I am able to travel to the meetings of many of our affiliates. These visits enable me to better understand and appreciate the many truly wonderful people who practice in this profession. That in turn helps me to better do my job in managing the association that both represents and serves you.

When I attend an affiliate conference, I always try to get to their board meeting so that I can both answer questions about NEHA and at the same time learn more about the concerns and issues that our affiliates are facing. I also try to get to the networking functions at these meetings. Invariably, the discussions at these mixers draw me into the everyday work lives of our people. I become an excited student again as I listen and learn about the challenges and triumphs that define your daily agendas.

As refreshing and invigorating as these experiences are, my favorite activity is to attend award ceremonies. It is here that I see many of the leaders, pioneers, champions, and role models of this great profession. This one event is (almost!) always an inspiring experience.

I had precisely such an experience when just recently I had the opportunity to participate in the Yankee Conference, which is an annual conference built and cosponsored by our affiliates in New England.

Hoping to make my point by writing less than more, let me very quickly note my takeaway from the awards ceremony at this particular Yankee Conference.

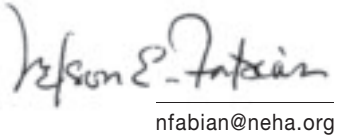
Mr. Trent Joseph won the Yankee Conference Scholarship. He is an MPH student. He is involved in a wide variety of pastimes that range from Pop Warner assistant coaching to radio hosting to volunteer work in New Haven and so on. He also holds several academic achievement awards. In addition, he recently completed an internship in environmental health at the Norwalk Health Department. For such a young person, this was impressive enough. But my story doesn't end there.

In accepting this award, this young and surprisingly wise man shared that for years he has displayed a short little quote wherever he works that keeps his mind focused. That quote reads, *You don't get what you wish for; you get what you work for!*

As I was listening, I found myself hurriedly writing his words of wisdom down as I knew at the time that I couldn't wait to share this with the membership.

As I travel throughout the environmental health world, I too often see signs of despair. Many environmental health programs are enduring through reductions and are fighting to survive. Not surprisingly, I hear our people talk of how they "wished" that things were different.

In future columns I'll continue to share more about what NEHA is "working" on to make things different and better. But for now, I just want Mr. Joseph's powerful words to settle in. For my money, he provided his audience in Connecticut with a moving lesson in both philosophy and psychology. Wishing for something is not a strategy. Working for something is. I hope that his audience there and mine here take to heart the message that drives his success story and can drive all of ours, as well.



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# Decade is Connected...

# To your world.

Our philosophy is to sustain the organizations shaping policy and procedures in environmental health. It keeps us well informed and our software relevant—so that we can provide solutions that anticipate regulatory changes. This makes life easier for our clients and steadily increases the system's value.

Whether it's a short-term project, a request for technical advice, or developing product changes, Decade partners with organizations to advocate for best practices and shared knowledge between agencies.

Next time you attend meetings with these groups and others, you'll see us shoulder-to-shoulder working to improve environmental health through better data management.

- National Environmental Health Association (NEHA)
- Conference for Food Protection (CFP)
- California Conference of Directors of Environmental Health (CCDEH)
- California Retail Food Safety Coalition
- CUPA Forum
- California Environmental Protection Agency (Cal/EPA)
- Colorado Environmental Health Association

**To learn more about our advocacy role in environmental health visit decadesoftware.com/advocacy.**

**Decade understands the work you do.**

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