Expert Report
of
Lorne G. Everett, PhD, DSc
On Issues Related to Class Certification

L. Everett & Associates, LLC

In the matter of:

Karl Ebert and Carol Krauze, et al.

v.

General Mills, Inc.

March 14, 2014

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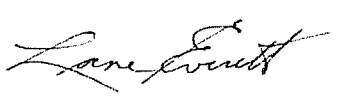
I declare under penalty of perjury that the following is true and correct, to the best of my information and belief. Executed on March 14, 2014 at Santa Barbara, California.



Lorne G. Everett, PhD, DSc
L. Everett & Associates, LLC

Section 1. Introduction and Methodology

I have been retained by the law firms of Varga Berger Ledsky Hayes & Casey, a professional corporation, The Collins Law Firm, P.C., Siegel Brill PA, and Zimmerman Reed P.L.L.P., on behalf of Karl Ebert and Carol Krauze, et al., to provide scientific input and expert opinions concerning soil, soil gas, groundwater and indoor air contamination in and around the former General Mills, Inc. (GMI) facility located at 2010 East Hennepin Avenue in Minneapolis, Minnesota ("the Facility").

In this report, I have described my opinions and the bases for these opinions. In arriving at the opinions expressed in this report, I have relied upon my education and more than 40 years of experience in environmental science, environmental engineering, hydrology, contaminant migration, and specifically, the vadose zone, the subsurface zone between the water table and land surface which is the key area of impact to the homeowners and residents in this case. I have also relied upon my personal inspection of the site and my review of data and documents commonly relied upon by experts in the field. The documents relied upon include those cited in this Report and were reviewed by myself or other staff at L. Everett & Associates, under my direction. We have reviewed thousands of pages of documents made publicly available by the Minnesota Pollution Control Agency (MPCA) and the Minnesota Department of Health (MDH).[1] Further, I have relied upon reference texts commonly accepted and held reliable by experts in the fields of environmental science, environmental engineering, and hydrogeology, as well as generally-accepted principles in those fields. I have considered multiple lines of evidence in my approach as is accepted environmental practice, and have also considered alternative theories and explanations in arriving at my conclusions. If additional relevant information becomes available, I reserve the right to revise my opinions. I may also provide supplemental opinions regarding this case, if requested. In addition to the exhibits included herein, figures, tables and maps included in references cited in this report may be used as trial exhibits. References cited in this report are not meant to be exhaustive but rather exemplary. There are other documents and data in the voluminous case file that also support the opinions offered herein. The opinions described in this report are made to a reasonable degree of scientific certainty, and were arrived at using the same methodology I employ in non-litigation projects.

[1] As of the date of this Report, I have not reviewed GMI's files. It's my understanding that limited portions of those files have only very recently been produced.

Background and Qualifications for Lorne G. Everett

I, Lorne G. Everett, PhD, DSc, PH, PH-GW, CGWP, have practiced environmental science for more than 40 years. The majority of my professional experience has involved the specific scientific issues involved in this case: contaminant migration in groundwater, soil gas and the vadose zone. I have held academic appointments at research universities, have been a senior level environmental consultant, and have led academic and governmental advisory boards. As set forth further below, I am the chairman of the committee for the professional association, American Society for Testing and Materials International (ASTM), which develops and writes the standards for scientific investigations which govern this field. I have been retained to provide opinions relative to the distribution of trichloroethene (TCE) and other volatile organic compounds (VOCs) in soil, soil gas, groundwater and vapor/air, vadose zone contaminant behavior, groundwater hydrology, hydrogeology, environmental investigations, site characterization and remediation. I have been qualified to testify as an expert in matters such as this one in State and Federal courts nationwide. A complete copy of my resume, which includes a list of all my expert testimony from the last four years, is submitted herewith as Attachment A to this Report. I have personal knowledge of the matters stated herein. If called as a witness, I could and would competently testify to the matters set forth in this report. Currently, I am Chief Scientist and CEO of L. Everett & Associates, LLC. Certain relevant aspects of my background and qualifications are summarized below.

Professional Experience Related to the Vadose Zone

For many years, a large part of my professional practice has focused on environmental aspects of the vadose zone. This includes conducting research and advising clients on methods for investigating the behavior of water and contaminants in the vadose zone and methods for conducting remediation of contamination in the vadose zone. My expertise in the vadose zone includes an expertise in the process of vapor intrusion. Vapor intrusion refers to the phenomenon in which contaminated soil vapor is created by the volatilization of subsurface VOC contamination (either in soil or groundwater or both). The soil vapor, in turn, migrates through the soil column and may enter into overlying structures such as the homes in the proposed Class Area of Minneapolis. Vapor intrusion can be a significant exposure pathway by which people become exposed to toxic subsurface contaminants.

For 18 years I have been the Charter Chairman of the ASTM task committee on Vadose Zone Monitoring (D18.21.02). I was a centennial member of the ASTM Board of Directors and received the ASTM Award of Merit, the highest honor bestowed by the society for writing national groundwater and vadose zone standards. As chairman of ASTM's Vadose Zone Task Committee, I was responsible for developing all of the current national ASTM D18.21.02 vadose zone standards. I have received ASTM Standards

Development Awards including an award for "Comparison of Field Methods for Determining Hydraulic Conductivity" and a Standards Development Award for the "Standard Guide for Pore-Liquid Sampling."

Of direct relevance to soil gas sampling and vapor intrusion issues in this case, as Chair of the ASTM committee noted above, I developed the following soil gas monitoring national standards:

- D5314-92 (2006) Standard Guide for Soil Gas Monitoring in the Vadose Zone
- D7758 (2011) Practice For Passive Soil Gas Sampling in the Vadose Zone for Source Identification, Spatial Variability Assessment, Monitoring, and Vapor Intrusion Evaluations
- D7648 (2012) Practice For Active Soil Gas Sampling for Direct Push or Manual-Driven Hand-Sampling Equipment
- D7663 (2012) Practice for Active Soil Gas Sampling in the Vadose Zone for Vapor Intrusion Evaluations

Further I organized and served as chairman of the January 2013 international ASTM symposium entitled, Continuous Soil Gas Measurements: Worst-Case Risk Parameters. This symposium is directly related to the vapor intrusion issues in this case, because it focused on the dynamic behavior of soil gas in the subsurface. I am co-editor of the volume of selected technical papers that arose from the symposium (Everett and Kram, editors, 2013, Continuous Soil Gas Measurements: Worst Case Risk Parameters, ASTM, Selected Technical Papers [STP] 1570).

Education and Work Experience

I am a retired Research Professor/Hydrologist (Level VII) in the Donald Bren School of Environmental Science and Management at the University of California at Santa Barbara. The University of California has reserved Level VII for "scholars of great distinction." I am the Past Director of the Vadose Zone Monitoring Laboratory at the University of California. For over 15 years I directed leading edge research on liquid and gaseous migration in both the saturated and unsaturated (vadose) zone.

From 2000 -2009 I was the Chancellor of Lakehead University in Thunder Bay, Ontario, Canada. For my contributions to Canada, I received the Gold Medal from the Governors General of Canada in 2002.

I have a Ph.D. in hydrology (1972) from the University of Arizona. In 1996, I received a Doctor of Science Degree (Honoris Causa) from Lakehead University in Canada for Distinguished Achievements in Hydrology. I am a registered hydrologist, #164, and a registered hydrogeologist #836, with the American Institute of Hydrology. In 2002 I received the C. V. Theis Award, the highest award given by the American Institute of Hydrology (AIH) for major contributions to groundwater hydrology. I received the

A. Ivan Johnson Outstanding Achievement Award in 1997 for "Outstanding and Significant Contributions" to the hydrogeologic understanding of soil and rock.

I have served on the Board of Registration for the American Institute of Hydrology. I am a Certified Groundwater Professional, #293, by the American Association of Groundwater Scientists and Engineers.

I am a Fellow of the American Society of Civil Engineers (ASCE), a Fellow of the American Water Resources Association (AWRA), and a Fellow of the American Society for Testing and Materials (ASTM). The title, "Fellow," recognizes the highest earned honor bestowed by a professional society.

I have authored, edited, and contributed chapters to 14 books, published over 150 professional papers and reports, hold several patents, and developed numerous standards on the subject of groundwater and vadose zone characterization and remediation. My book entitled "Groundwater Monitoring" was endorsed by the EPA as "establishing the State of the Art used by industry today" and was recommended by the World Health Organization for all developing countries. I was an invited Charter member of the Editorial Board of the journal, Environmental Forensics, a quarterly peer-reviewed scientific journal of national and international circulation. In this role, I evaluated the work of others through peer-review of manuscripts submitted for publication to the journal. I also participated in publication decisions, as well as establishing and maintaining the editorial direction of the journal.

For my contributions to the science of hydrogeology I was elected (No. 300-H3) to the Russian Academy of Natural Sciences. Based upon my original contributions to the science of hydrogeology, I received the Russian Academy's highest honor, known as the "Kapitsa Gold Medal." The Kapista Medal was presented by the Head of the Russian Academy's Water Problems Institute, on October 29, 1999 at the Beau Rivage Palace in Lausanne, Switzerland in front of an audience chaired by Nobel Laureates.

My book entitled "Subsurface Migration of Hazardous Waste" is widely used in contamination investigations. With the Russian Academy, I was the English editor of a 2002 book entitled Groundwater and the Environment--Applications for the Global Community. My book entitled "Vadose Zone Monitoring for Hazardous Waste Sites" has been sold out. My book entitled, "Handbook of Vadose Zone Characterization and Monitoring" has been deemed a best seller by Lewis Publishers. As a tribute, the United States Department of Energy (DOE) in 1999, asked me to endorse and write a Forward of their book entitled "Vadose Zone Science and Technology Solutions." My Forward frames the research needs addressed in the book. The second Forward was written by Dr. Paul A. Witherspoon of UC Berkeley. My endorsement appears on the back cover of the 1540 page, two-volume book.

Based upon my many years of experience, I have participated on the Executive Committee of the United States Department of Energy's DOE Complex-Wide Vadose Zone Science and Technology Roadmap. As a further part of my contributions to federal agencies, I was a charter member of the Science Advisory Board of the United States Department of Defense National Environmental Technology Test Site. For my contributions to the science advisory board on petroleum characterization and remediation, I received the United States Navy's Medal of Excellence in October 1999.

I was a member of the Lawrence Livermore National Laboratory (LLNL) "peer review" team for the LLNL investigation entitled: "Historical Case Analysis for Chlorinated Volatile Organic Compound Plumes." This was the largest database on chlorinated hydrocarbons ever assembled and analyzed.

I am a co- author of the Lawrence Livermore National Laboratory reports entitled; "California Leaking Underwater Fuel Tank (LUFT) Historical Case Analysis" and "Recommendations to Improve the Cleanup Process for California's Leaking Underground Fuel Tanks." This was the largest analysis of petroleum hydrocarbon migration characteristics that had ever been undertaken.

I was on the EPA/DOE/DOD/NASA Technical Advisory Board for the national evaluation of DNAPL[2] chlorinated hydrocarbon cleanup technologies held at Launch Complex 34 at the NASA Kennedy Space Center. The ten most promising DNAPL chlorinated hydrocarbon remediation technologies were evaluated for effectiveness and cost and three were demonstrated at Launch Complex 34. I was on the US Navy "Gatekeeper Review Panel" which evaluated the latest research on chlorinated hydrocarbon characterization and remediation.

At the request of UNESCO in Paris, I was the English editor of a Monograph entitled Groundwater Resources of the World and Their Use. The Monograph, published in 2004, looks at drinking water issues throughout the world and was distributed by UNESCO to every water resources research center in the world. The US National Association of Groundwater Scientists and Engineers published a second printing of the book in 2006. The book was translated into Russian and reprinted by the Russian Academy of Sciences in 2007.

On behalf of EPA, DOE and DuPont I co-edited a state-of-the-art book entitled: "Barrier Systems for Environmental Contaminant Containment and Treatment," that was released in 2006 by CRC press.

I am the Chairman of the World Federation of Scientists Pollution Panel. In this capacity, I have been invited for each of the past 24 years by Dr. Antonio Zichichi, Science Advisor to the Pope, to participate

[2] DNAPL refers to "dense non-aqueous phase liquid." Sites with DNAPL face special cleanup challenges. The significance of DNAPL with respect to this case will be discussed later in this report.

in Planetary Emergency meetings held in southern Italy. A second meeting is often held in the fall at the Pontifical Academy of Sciences in the Vatican.

For over three decades I have been involved in consulting and advising DOE on environmental issues. I have peer reviewed, visited, consulted, lectured, and been an advisor at the following DOE sites: Lawrence Livermore National Laboratory, Hanford Washington, Rocky Flats Colorado, Idaho National Engineering Laboratory, Fernald Ohio, Paducah, Kentucky, Savannah River, Argonne National Laboratory and DOE Headquarters in Washington DC. I have been on DOE Roadmap committees as a member and executive reviewer. I have been a DOE trainer and author of DOE supported environmental documents.

I have given invited court room training to the Environmental Protection Agency, Criminal Investigation Division. My Criminal Investigation Division award states: "For your invaluable support and notable contribution to the mission of the Criminal Investigation Division". I have given mock trial training programs to environmental lawyers at the invitation of Carmen Trutanich Esq., the former Los Angeles City Attorney.

For preparing this report, L. Everett & Associates invoices my time at the rate of $400/hour. For deposition and trial testimony my hourly rate is $800. My opinions are summarized below and discussed in more detail in Section 2 of this Expert Report.

Summary of Opinions

This is a case in which hazardous waste disposal and chemical handling practices at the Facility in Minneapolis, Minnesota have caused vapor contamination with harmful toxic chemicals, principally trichloroethene (TCE). General Mills has acknowledged that between at least 1947 and 1962 it discharged to the ground at the Facility some 15,000 gallons[3] of toxic chemicals, including TCE. This material was discharged into a makeshift dry well apparently consisting of three steel drums stacked end to end, extending 10 to 12 feet into the ground. Wastes were poured into the drums and were allowed to permeate into the ground. The chemicals were intentionally allowed to migrate into the subsurface, within a few feet of the shallow groundwater aquifer, referred to as the "Glacial Drift Aquifer."

I have reviewed available data regarding environmental investigations and remedial efforts for this site, including soil, groundwater and soil vapor data. This data analysis, combined with my understanding of

[3] Barr reported that General Mills disposed of roughly 1,000 gallons of waste per year for 15 years (1947 to 1962) for a total of roughly 15,000 gallons (Barr, September 30, 1981, Work Plan, Groundwater Investigation, Laboratory Waste Disposal Site, 2010 East Hennepin Avenue, p. 2).

the fate and transport of contaminants in the subsurface, is the basis of my opinion that the Facility is the source of the TCE groundwater and soil vapor problems in the proposed Class Area. The State agrees that the Facility is the cause of the TCE groundwater and soil vapor problems: "The source of the potential vapor intrusion in the several-block area is related to historic waste disposal activities at 2010 East Hennepin Avenue in Minneapolis, a site owned and operated by GMI from about 1930 until 1977."[4]

The proposed Class Area is defined as all residential properties overlying the TCE groundwater plume as depicted by MPCA (see Exhibit 1). Considering the contaminant transport mechanisms associated with this site, the migration of chemicals into the proposed Class Area would have begun shortly after General Mills started dumping the chemicals. For example, contaminated groundwater would have reached the immediately adjacent homes in a matter of weeks or months and contaminated vapors would have been threatening homes from the moment the groundwater contamination reached the homes. Considering an approximate shallow groundwater flow velocity of 300-3000 feet per year[5], contaminated groundwater would have extended across the Class Area within (at most) a few years of first becoming impacted. It has long been understood that the shallow groundwater flow direction is generally to the south-southwest, toward the Mississippi River, thus it should have been obvious to environmental practitioners that General Mills' toxic chemicals would migrate into the adjacent residential neighborhood, or at minimum that there was a serious risk of such migration.

Because this contamination was not adequately cleaned up, the contamination persists throughout the entirety of the proposed Class Area. Groundwater contamination has been documented by General Mills throughout the area since at least 1983 and the groundwater remains contaminated to this day. Toxic gas has infiltrated the soil on the properties in the area, is beneath the homes and other structures on those properties causing, and threatening to cause, contamination of indoor air through the process of vapor intrusion. Even though much of the dumping and spills that caused the current contamination occurred many decades ago, and even though the problem was first reported to regulators over 30 years ago (in 1981), an adequate investigation of the nature and extent of the contamination has still not been accomplished. Similarly, the remediation effort conducted by General Mills has obviously failed. The soil vapor problem was not confronted until after General Mills had successfully lobbied MPCA to actually suspend remediation activities, arguing that they had done enough. General Mills was content to walk away from the unacceptable levels of TCE and other VOCs in groundwater (which is the source of the soil vapor problem). General Mills had no curiosity about the potential for vapor intrusion posed by its contamination and argued that this process had already been adequately studied. Sadly, General Mills and

[4] MPCA, November 6, 2013 Letter to residents and property owners, p. 1.

[5] Barr, June 1983, Site Characterization Study and Remedial Action Plan, p. 12.

its consultants were terribly mistaken about the vapor intrusion risk posed by their subsurface contamination. Vapor intrusion is not a new phenomenon in the proposed Class Area: as long as General Mills chemicals have been in the underlying groundwater, soil vapor migration has been occurring and vapor intrusion or the threat of vapor intrusion has existed continuously. The threat has existed for decades; what is new is General Mills' admission that it is actually happening. It is disquieting that it took more than 30 years to address this problem.

The purpose of subsurface remediation is to protect human health and the environment. No one could claim that General Mills has achieved these fundamental goals. Those activities that have been conducted to date have been ineffective at identifying and removing the contamination buried by General Mills at the Facility and which has migrated off the Facility. The properties throughout the proposed Class Area are contaminated and threatened with the toxic chemicals from General Mills' activities. Residents in the proposed Class Area have been threatened for decades and they face the prospect of living with toxic chemicals under and in their homes for many years into the future. The net result of the delays and flaws in the environmental program is that, without aggressive and prompt cleanup activities, the residents will face many more years of potential exposure and other damages.

I am providing the following opinions regarding environmental conditions at the former General Mills Facility and in the proposed Class Area. Section 2 of this report provides supporting information and the bases for my opinions. These opinions are reinforcing of one another. Documents, data and supporting evidence cited in one opinion are generally also relevant to others and are hereby incorporated.

Opinion 1. General Mills' disposal of large quantities of toxic chemicals, including TCE, at the Facility has resulted in widespread soil vapor contamination at the General Mills Facility and throughout the entirety of the residential area immediately adjacent to the General Mills Facility and identified as the proposed Class Area on Exhibit 1.

Opinion 2. The vapor contamination in the proposed Class Area is sufficiently widespread and present in such high concentrations that interim action is required on all properties to prevent and mitigate infiltration of the toxic vapors into the residential structures in the proposed Class Area. Such action should include mitigation in the form of sealing of the basement floors and walls, installation of vapor mitigation systems, and/or other air purification measures. These interim measures will need to be operated and maintained continuously until such time as aggressive, scientifically-sound cleanup can be accomplished of the sources of the vapor threat.

Opinion 3. The interim remedies discussed in Opinion 2 do not constitute a cleanup program. While a well-designed and maintained interim remedy can protect residents from exposure to vapors in their homes, it does not eliminate the threats presented by these toxic vapors. It will not substantially reduce the concentration of contaminants in soil vapors and it will not reduce contaminant concentrations in groundwater. The vapor contamination is a symptom of the incompletely mitigated releases of these toxic chemicals buried by General Mills. Thus, the interim remedies are a stop-gap measure to provide temporary protection to occupants of the neighborhood during the time it will take to conduct an adequate groundwater remediation program. To accomplish a long term, permanent remedy of the vapor contamination, the contamination buried by General Mills must be located and removed. The contaminated groundwater which is carrying the chemicals and releasing the vapors must be removed or treated.

Opinion 4. Because General Mills has no comprehensive plan to complete the investigation or to clean up the contamination, and has failed to confront the complexity and challenges of remediating the widespread contamination it has caused, additional remedial measures are required to characterize the site and mitigate the imminent and substantial endangerment to human health and the environment.

Site Location and Description

The General Mills Facility is located northeast of downtown Minneapolis at 2010 East Hennepin Avenue. The Facility is situated in a mixed use neighborhood of commercial, light industrial and residential land use. The Facility was owned and operated as a research laboratory by General Mills between approximately 1930 and 1977.

Hydrogeologic Conditions

The vadose zone in this portion of Minneapolis consists of a complex mixture of glacial sediments, alluvial sediments and peat. Bedrock is encountered at depths ranging from 40 to 60 feet. The bedrock consists of marine sedimentary rocks. The shallowest bedrock unit is the Decorah Shale, which is mapped as being discontinuous in this area, thus is not always present. The Decorah Shale is underlain by the Platteville Limestone, Glenwood Shale and the St. Peter Sandstone. The deepest bedrock unit of interest in this environmental case is the dolomite of the Prairie du Chien Group, which also includes interbedded sandstone.

There are a number of distinct water-bearing units underlying the area. The Glacial Drift Aquifer is the shallowest aquifer and, as such, is the most important for the purposes of understanding vapor intrusion risk. The Glacial Drift Aquifer is named because it is found in the glacial sediments overlying bedrock.

The top of this unconfined aquifer (the water table) is found at depths between 15 and 25 feet. The depth of the water table varies due to topographic effects, variations in seasonal recharge and pumping. The Glacial Drift Aquifer flows south-southwest from the Facility to the Mississippi River. The highest concentrations of General Mills' VOCs have historically been measured in the Glacial Drift Aquifer.

Under the Glacial Drift Aquifer is a layer of generally fine-grained glacial till and the Decorah Shale (where present). These layers serve as an aquitard which impede vertical groundwater flow, but do not completely preclude groundwater flow into the deeper aquifers. This is important because gradual flow through these layers is one mechanism by which General Mills' chemicals spread vertically and contaminated deeper aquifers.

The Carimona Aquifer is found in a thin water-bearing zone (mapped as being 3-5 feet thick under the Facility; EPA, 1990, Case Study 7, General Mills, Inc., Minneapolis, Minnesota) of the Platteville Formation consisting of fractured and weathered micrite, which is a fine-grained form of limestone. The Magnolia Aquifer is found in another micrite layer in a deeper portion of the Platteville Formation. The Magnolia Aquifer is 8-9 feet thick in the vicinity of the General Mills Facility. The St. Peter Aquifer is found in the thick (150-170 feet thick) medium-grained sandstone of the St. Peter formation, separated from the Magnolia Aquifer by more than 20 feet of low-permeability bedrock. Finally, the Prairie du Chien Aquifer is found in the dolomite and sandstone of the Prairie du Chien formation. Both the St. Peter and Prairie du Chien Aquifers are used as sources for municipal water supply.

Section 2. Expert Opinions

OPINION 1. General Mills' disposal of large quantities of toxic chemicals, including TCE, at the Facility has resulted in widespread soil vapor contamination at the General Mills Facility and throughout the entirety of the proposed Class Area.

The vapor intrusion risk to the properties throughout the proposed Class Area is due to off-gassing of TCE and other VOCs from the contaminated groundwater. As detailed below, I have concluded that substantially all of this groundwater contamination originates from the General Mills Facility. The shallow groundwater (the Glacial Drift Aquifer) is within a few feet of the bottom of the stack of buried drums into which General Mills dumped chemicals. Thus, General Mills' disposal pit can be thought of as a very efficient means of rapidly polluting the groundwater. If the company had dumped directly onto the ground, it still would have been damaging, but at least then the waste would have been slowed in its migration to groundwater by the adsorptive capacity of the full soil column.

Scientific Data and Analysis Demonstrate that the General Mills Facility is the Source of the Groundwater and Soil Vapor Contamination in the Proposed Class Area

Because water in an aquifer flows, it is common for groundwater contamination to spread some distance from its source, forming a groundwater plume. This can sometimes make it difficult to identify the source of the contamination. That is not the case for the groundwater (and resulting soil vapor) plume in the proposed Class Area because, as the following analysis shows, General Mills is clearly the source. My 40 years of experience in environmental matters has taught me that for a site to be considered the source of contamination a number of criteria must be met:

- The site must have released chemicals to the environment;
- The releases must have reached the underlying groundwater;
- On-site groundwater impacts must be of the same or greater severity compared to downgradient impacts;
- The mixture of chemicals released at the site must match the chemicals subsequently found in groundwater,[6] and

[6] There are some complications to this rule because some chemicals undergo physical or microbial degradation in the subsurface and are transformed into so-called daughter products. In general, these reactions are well-known and can be taken into consideration. For example, it is well-known that under certain conditions, TCE and PCE degrade to cis-1,2-DCE and vinyl chloride, thus the presence of these daughter products is an indication of the release of one or both of the parent compounds. Some chemicals also degrade more rapidly than others in the subsurface. For example, in general, the low-molecular-weight petroleum hydrocarbon constituents of gasoline degrade faster than chlorinated solvents like TCE and PCE. As a result, it is common for concentrations of petroleum hydrocarbons to decline more with distance from a source and for TCE to decline less.

- The groundwater flow direction from the site must match the geometry and distribution of the plume.

The General Mills Facility meets all these criteria. In addition, I reviewed available data for many other MPCA sites in the vicinity of the proposed Class Area and, as detailed below, only the General Mills Facility meets all the criteria.

General Mills Released Chemicals to the Environment. Between approximately 1947 and 1962, General Mills disposed of laboratory chemicals to a disposal pit on the southeast corner of the Facility. Long-term employees also recalled possible burial of waste at other site locations.[7] According to a site drawing provided by General Mills in its 1981 Notification of Hazardous Waste, there were also drum storage, tank storage and solvent storage areas in the northwestern portion of the Facility. What appears to be an above-ground tank farm is also depicted in the northwestern portion of the Facility in Figure 2 of General Mills' 1983 Site Characterization Study and Remedial Action Plan (Barr Engineering Co., June 1983).

The disposal operation is described as consisting of three 55-gallon drums that were perforated, stacked one on top of another and buried in the ground. The bottom of the deepest drum would have been 10 to 12 feet below ground surface. A standpipe extended from the buried drum assemblage to the ground surface and spent laboratory chemicals were disposed of by pouring the liquids into the standpipe.[8] General Mills has estimated that it disposed of roughly 1,000 gallons of chemical waste per year from 1947 through 1962. MPCA has said that General Mills "disposed of wastes improperly on their own site(s) for many years."[9] According to General Mills, it mainly disposed of TCE. As set forth below, General Mills elected not to remove the contamination it buried at the Facility. In fact there is only anecdotal evidence about whether even the drums were removed:

> "The complaint states that General Mills used the area for chemical disposal years ago. Hinkle [sic] had done some soil borings in the area recently and was going to do some digging with a backhoe on Saturday (6-13-81) 'so the State wouldn't find out.' General Mills has apparently communicated with Hinkle [sic] regarding this area."[10]

A subsequent memo[11] describes more excavation being performed at the site "being done jointly by Henkel and General Mills." In spite of these unauthorized and undocumented activities, I have found no

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[7] General Mills, 1981, Notification of Hazardous Waste Site, Section I, "Description of Site."

[8] Barr, June 1983, Site Characterization Study and Remedial Action Plan, pp. 1-3.

[9] MPCA, August 21, 1981, News Release, "MPCA Investigating Three New Hazardous Waste Sites, p. 1.

[10] MPCA, June 12, 1981, Complaint Report.

[11] MPCA, June 20, 1981, Office Memorandum titled, "General Mills – Henkel Excavation, June 20, 1981.

definitive documentation that the drums were truly removed and it is entirely possible that they remain buried at the Facility to this day. When asked by MPCA to produce information about the excavation of the drums, Bill Bangsund of Barr Engineering responded: "If memory serves me, I don't think there was a formal plan, nor a formal report, and the information we now have is anecdotal."[12]

General Mills Releases Reached Groundwater. By 1983, additional investigations had revealed that the waste disposal practices had seriously impacted the quality of underlying groundwater. Groundwater samples from on-site well 106 (near the waste disposal pit) contained TCE at 7,200 ug/L. For context, the applicable federal standard for TCE is 5 ug/L, so this finding was more than a thousand times higher than what would typically be allowed. In addition to TCE, a variety of other toxic chemicals were detected at high concentrations:

• PCE	2,300 ug/L	(chlorinated compound)
• 1,1,1-TCA	2,800 ug/L	(chlorinated compound)
• Benzene	15,000 ug/L	(petroleum hydrocarbon)
• Toluene	62,000 ug/L	(petroleum hydrocarbon)
• Xylenes	18,000 ug/L	(petroleum hydrocarbon)
• Chloroform	15,000 ug/L	(chloromethane, also daughter product for carbon tetrachloride)

On-site groundwater impacts must be of the same or greater severity than downgradient impacts. A small release cannot be solely responsible for a large downgradient plume. As itemized above, the on-site groundwater impacts were quite severe and indicative of a release large enough to explain the extensive downgradient impact. Also, the highest concentrations of these chemicals were found on-site, with lower concentrations routinely detected downgradient. This is consistent with General Mills as the source because processes of dispersion, diffusion and degradation act to lower concentrations with distance from the source.[13] The most immediately downgradient well in the Glacial Drift Aquifer was well A, which contained:

• TCE	2,400 ug/L
• PCE	<36 ug/L[14]
• 1,1,1-TCA	72 ug/L
• Benzene	200 ug/L

[12] Barr, May 2, 2006 email from Bill Bangsund of Barr to Gary Krueger of MPCA and others.

[13] This trend of decreasing concentrations away from the source is nearly always found as a general pattern. On a smaller scale, there are often temporal or spatial deviations from the trend due to heterogeneities in the aquifer media, variations in groundwater flow due to paleo-channels and other preferential pathways and even lab and sampling errors.

[14] Compound reportedly co-eluted with another chemical, leading to elevated detection limit. Thus we don't know if PCE was present at a concentrations less than 36 ug/L.

- Toluene 180 ug/L
- Xylenes 52 ug/L
- Chloroform 70 ug/L

The mixture of chemicals released at the site must match the chemicals subsequently found in groundwater. The chemicals found in well A are the very same chemicals that were detected on-site, but at lower concentrations. This is exactly the pattern one would expect if the General Mills Facility was the source of the off-site contamination. The similarity in the chemical signatures persisted. For example, in 1993, groundwater from the near-source Glacial Drift pumping wells contained all of the compounds listed above as being associated with the source area, even chloroform, which is not a common groundwater contaminant compared to TCE.[15] Groundwater from the more downgradient Glacial Drift Pump-out wells contained the chlorinated compounds (plus the daughter product, cis-1,2-DCE) but not the BTX petroleum hydrocarbons[16], which is expected considering that these compounds have a greater propensity for microbial degradation in the subsurface environment, thus are frequently depleted in the leading edge of a mixed plume.

The groundwater flow direction from the site must match the geometry and distribution of the plume. The Glacial Drift Aquifer flows to the south-southwest and through the residential proposed Class Area immediately adjacent to the Facility. General Mills has repeatedly interpreted the flow direction for the Glacial Drift Aquifer as south-southwest, starting in 1983.[17] I have reviewed available groundwater elevation data for the Glacial Drift Aquifer and I have also concluded that shallow groundwater flows south-southwest.

If groundwater flows south-southwest, then a plume originating from the General Mills Facility should have a roughly oval shape and should be oriented along a south-southwest axis with the Facility at the upgradient apex. I have reviewed groundwater testing data and I have found that this is exactly the orientation of the TCE plume in the proposed Class Area, further supporting my conclusion that releases from General Mills are the source of the groundwater plume in the proposed Class Area. General Mills and its consultant, Barr, agree with my interpretation of plume orientation: an April 9, 1984 letter from Barr Engineering to General Mills (reproduced here as Exhibit 2) includes a map depicting a groundwater contaminant plume extending over 2,000 feet south-southwest of the Facility, under the residential areas of the proposed Class Area. The impacted area today is not much changed from the depiction in

[15] Barr, 1994, 1993 Annual Report, Table 14.

[16] Barr, 1994, 1993 Annual Report, Table 12. For some reason, General Mills did not analyze the downgradient wells for chloroform, so we don't know whether it was present or absent.

[17] Barr, 1983 Site Characterization Study and Remedial Action, Figure 7.

1984–illustrating the ineffectiveness of General Mills' remediation efforts over the intervening years (see Exhibit 3 which superimposes the 1984 plume map over a current map).

In summary, the environmental data collected over the years, combined with the history of chemical dumping at the General Mills Facility, demonstrate to a reasonable degree of scientific certainty that General Mills is the source of the subsurface contamination impacting groundwater and soil vapor in the proposed Class Area.

Soil Vapor Impacts in the Proposed Class Area are Caused by Underlying Groundwater Contamination

EPA defines vapor intrusion and describes the potential health risks as follows:

> "Vapor Intrusion is the migration of volatile chemicals from the subsurface into overlying buildings. Volatile chemicals in buried wastes and/or contaminated groundwater can emit vapors that may migrate through subsurface soils and into indoor air spaces of overlying buildings... In extreme cases, the vapors may accumulate in dwellings or occupied buildings to levels that may pose near-term safety hazards (e.g., explosion), acute health effects, or aesthetic problems (e.g., odors). Typically however, the chemical concentration levels are low or, depending on site-specific conditions, vapors may not be present at detectable concentrations. In residences with low concentrations, the main concern is whether the chemicals may pose an unacceptable risk of chronic health effects due to long-term exposure to these low levels.[18]

Although there are a number of chemicals found in the groundwater and soil vapor, TCE is generally the most abundant. TCE is a hazardous chemical.[19] Contaminated soil vapor and the threat of vapor intrusion into homes of the Class Area is a symptom of the underlying groundwater contamination that has persisted for at least 70 years. Once volatile chemicals reach the groundwater, they are carried in the

[18] EPA, 2002, Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance, pp. 4-5.

[19] TCE is a known human carcinogen. Long term exposures to TCE can increase the risk of kidney cancer in humans. There is also a growing appreciation of risk from short term exposure to TCE, especially to pregnant women and their fetuses. Minnesota Department of Health stressed to General Mills the importance of identifying higher-priority residents like pregnant women and directed General Mills that these people should have their homes sampled first (email from Fred Campbell of MPCA to Hans Neve and others, November 1, 2013, summarizing 10/31/13 meeting with General Mills). This would have been a prudent move but based on information available to me, I see no indication that General Mills actually followed through with this plan. There is also evidence that TCE exposure can increase the risk for non-Hodgkin's lymphoma and liver cancer (MDH, November 2013). The U.S. Environmental Protection Agency (EPA) has concluded that TCE poses a potential human health hazard for toxicity to the central nervous system, kidney, liver, immune system, male reproductive system, and developing fetus. Other chemicals that make up the chemical signature of General Mills releases are also hazardous: benzene is a known human carcinogen and PCE is a suspected human carcinogen.

direction of groundwater flow and spread laterally (and sometimes vertically) away from the point or points of release. By definition, volatile chemicals have a propensity to partition into the vapor phase, thus some of the groundwater contamination off-gasses into the overlying soil vapor.[20]

This relationship between General Mills' groundwater contamination and the soil vapor problem is confirmed by General Mills in its November 2013 report: "The purpose of the Phase 2E investigation was to further evaluate soil vapor conditions over the groundwater trichloroethylene (TCE) plume at the Site."[21]

If (or when) the groundwater can be cleaned up adequately, the vapor intrusion threat will subside. Conversely, *until* the groundwater is cleaned up adequately, the vapor intrusion threat will remain a serious problem.

MPCA Agrees that General Mills is the Source of Groundwater Contamination and Vapor Intrusion Risk

In his October 29, 2013 email to colleagues, MPCA scientist Hans Neve summarized the State's understanding of the situation by noting that General Mills began efforts to clean up the groundwater in 1985 but:

- "The remaining groundwater contamination is producing vapor contamination in the air between soil particles. This 'vapor phase' contamination has the potential to migrate and accumulate in homes and buildings creating a health risk from 'vapor intrusion'.
- Initial sampling of the soil vapor started in October 2011 and showed hotspots but not a consistent pattern[22]. The sampling continued in several phases. A more full scope of the vapor contamination was understood in September 2013.
- TCE contamination measured in the soil vapor is up to 100 times the screening level for soil vapor and 1000 times what would be safe in air inside a residential structure.
- The current estimate is up to 200 homes may be impacted."

[20] Above the water table (i.e. in the vadose zone) the pore spaces between soil grains are not generally fully-saturated with water. Instead the pore space is partly filled with water and partly filled with air. The term for the air filling soil pore space is "soil vapor" and it is into this air that volatile chemicals off-gas from contaminated soil or groundwater.

[21] Barr, November 11, 2013, Summary of Phase 2E Vapor Intrusion Evaluation Results, East Hennepin Avenue Site, Minneapolis, MN, p. 1.

[22] This is likely due to the temporal and spatial variability of soil vapor migration. As discussed below, this is the main reason that collecting just one or two samples from each home cannot fully characterize the impacts at each home, which fluctuate from day to day and season to season.

As further noted in its letter to residents of the Como neighborhood, MPCA believes that the source of vapor intrusion risk is the General Mills Facility:

> The source of the potential vapor intrusion in the several-block area is related to historic waste disposal activities at 2010 East Hennepin Avenue in Minneapolis, a site owned and operated by GMI from about 1930 until 1977. Beginning in the 1940s, until the early 1960s, solvents were disposed in a soil absorption pit located in the southeast portion of the property.[23]

MPCA does not identify any other sources or potential sources that may have contributed to this problem.

General Mills Agrees that it is the Source of Groundwater Contamination and Vapor Intrusion Risk

Starting in 1983, General Mills and its consultant, Barr Engineering, have consistently described the groundwater contamination as originating from the Facility:

> "The analyses of the groundwater samples indicate that three distinct zones of elevated solvent concentrations are present in the groundwater in the vicinity of the disposal site. These are the glacial drift groundwater directly below the site, a plume of elevated solvent concentrations in the glacial drift groundwater stretching to the southwest of the site, and groundwater in the Carimona Member of the Platteville primarily east of the site.[24] Much lower concentrations of solvents are present in the Magnolia Member of the Platteville."[25]

In addition, General Mills' interpretation of the groundwater data (see Exhibit 2) has consistently been depicted as a plume of contamination originating at the Facility and extending over 2,000 feet to the south-southwest, under the residential proposed Class Area. Dissolved contaminants in groundwater will migrate in the direction of groundwater flow and will spread laterally with increasing distance downgradient by the process of dispersion. Groundwater monitoring has routinely found that the Glacial Drift Aquifer flows toward the south-southwest (see Exhibit 4 which is a reproduction of Barr's map depicting water table elevations for the Glacial Drift Aquifer in 2011)[26]. Thus the shape of the plume

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[23] MPCA, November 6, 2013 Letter to residents and property owners, p. 1.

[24] This appears to be an inaccurate statement since Barr has interpreted the Carimona aquifer as flowing generally to the north, not east (Barr, 2012, Groundwater Pump-out System Shutdown Summary Report and 2011 Annual Report, Figures 6a and 6b).

[25] Barr, June 1983, Site Characterization Study and Remedial Action Plan, p. 30.

[26] This map depicts groundwater contours or lines of equal elevation of the water table for the Glacial Drift Aquifer. In all but very rare circumstances, the groundwater flow direction is perpendicular to the lines of equal elevation.

depicted by Barr is indicative of Barr and General Mills' interpretation that the downgradient groundwater contamination originated from the General Mills Facility.

It is notable that as the years went by, General Mills simply stopped drawing figures such as Exhibit 3. For example, in its Annual Report for 1993, it listed groundwater concentrations adjacent to the monitoring wells, but declined to interpret the data in the form of a plume map.[27] By 2010, General Mills and Barr stopped providing maps at all in their annual reports (for example, Barr, 2011, Annual Report, General Mills East Hennepin Avenue Site Minneapolis Minnesota does not contain any figures whatsoever). After MPCA complained about the lack of maps, General Mills reverted to posting numbers, but not interpreting the data and not drawing plume maps (see Exhibit 5 which is a reproduction of a figure prepared by Barr.[28]) By revising its maps of groundwater contamination to make them less useful (and sometimes withholding the maps entirely) General Mills obscured the otherwise obvious connection between its onsite releases and the extensive downgradient groundwater plume.

A toxic "vapor cloud"[29] is now present throughout the proposed Class Area. In September, 2013, GMI's consultant evaluated the extent of the vapor contamination by sampling gas concentrations in the soils throughout the area. The results of that investigation disclosed TCE contamination in soil vapor "up to 100 times the screening level for soil vapor and 1000 times what would be safe in air inside a residential structure." These results are summarized in Exhibit 6 which is a reproduction of Figure 1 of the Nov. 11, 2013 Report.[30]

As of early March 2014, General Mills had sampled subslab vapor under approximately 195 homes in the proposed Class Area (as reported in a March 6, 2014 tabular data summary compiled by MPCA). TCE was detected in subslab vapor immediately beneath 161 of the homes sampled, at levels as high as 15,300 ug/m^3. A map prepared by MPCA reporting the sampling results as of March 6, 2014 is included here as Exhibit 7. On MPCA's map, the full geographic extent of vapor impacts is not clear because many homes with detections of TCE are shaded green, thus a reader cannot tell if that home was non-detect for TCE or whether TCE was detected but just at a concentration below MPCA's screening level. To better show the full geographic extent of TCE vapor impacts, I have prepared Exhibit 8, in which each residential property where TCE has been detected in the sub slab sampling is shaded red. As can be seen, the "vapor

[27] Barr, 1994, 1993 Annual Report, East Hennepin Avenue Site Minneapolis Minnesota, Figure 17: Glacial Drift Aquifer Water Quality (TCE).

[28] Barr, 2012, Groundwater Pump-out System Shutdown Summary Report and 2011 Annual Report, Figure 11.

[29] To use words from a General Mills/Barr/MPCA, 2013 Presentation to MPCA, Slide 19.

[30] Barr, 2013, Summary of Phase 2E Vapor Intrusion Evaluation Results, East Hennepin Avenue Site, Minneapolis, MN.

cloud" from General Mills' activities has invaded the entire proposed Class Area. The presence of TCE in subslab vapor—at any concentration—is significant because it is a measure mere inches from the indoor space of homes. Considering the dynamics of soil vapor discussed in this report and the growing findings that virtually all unprotected floor slab and basement walls leak vapors, this is indicative of a completed exposure pathway for residents of these homes.

There is No Other Known Source of Vapor Contamination in the Proposed Class Area

I have considered the possibility that other sources contributed to the VOC groundwater plume in the Glacial Drift Aquifer and thus to the vapor intrusion problem in the proposed Class Area. I evaluated publically available information from MPCA for any sites with known chemical releases to soil or groundwater within one mile for state Superfund sites and ½ mile[31] for other release sites from the center of the General Mills TCE plume. I also reviewed data from some prominent sites that are even farther from the General Mills plume, which are discussed in more detail below. I used the same criteria discussed above to screen these sites for their potential to be a source of contamination now found in the proposed Class Area:

- The site must have released chemicals to the environment;
- The releases must have reached the underlying groundwater;
- On-site groundwater impacts must be of the same or greater severity compared to downgradient impacts;
- The mixture of chemicals released at the site must match the chemicals subsequently found in groundwater, and
- The groundwater flow direction from the site must match the geometry and distribution of the plume.

Just because some site somewhere in Minneapolis has a record of chemical releases, this does not mean the site is a potential contributor to the Como contamination. One important point of this analysis is that we can use our understanding of the science of hydrogeology and contaminant fate and transport to determine which sites (if any) could possibly have contributed to this problem. In particular, a site is a potential source of contamination in the proposed Class Area, only if all the criteria listed above are met. There are a number of nearby sites in the MPCA database although many are listed as small quantity hazardous waste generators or operators of underground storage tanks, but are not known to have releases to the environment. These sites do not satisfy the first criterion and are screened out of contention as potential contributors to the contamination in the proposed Class Area. Table 1 and Exhibit 9 provide a

[31] These are the search radii tabulated in ASTM Standard 1527-13: Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process, which I believe is an appropriate source for search radii in this instance.

summary of MPCA sites in the vicinity of the General Mills groundwater plume. The table also itemizes the findings of my review of each site and a comparison of the source criteria listed above. Briefly, none of the known environmental sites other than General Mills satisfy the source criteria listed above, thus none of these sites are a source for contamination in the proposed Class Area.

The former Glidden Paint facility at 1901 East Hennepin does have a history of releases to soil and groundwater. This site was first developed in the 1920s and operated as a paint and varnish manufacturer until approximately 1986.[32] The operation was not known to use chlorinated solvents and only low levels of TCE were detected in the subsurface at this site. MPCA concluded that the contaminants of concern in groundwater were petroleum hydrocarbons,[33] ethylbenzene, xylenes and toluene: these are chemicals commonly associated with paint manufacturing. Chlorinated compounds like TCE were not considered contaminants of concern for the Glidden facility. Sumps and USTs were removed and an SVE system was installed between 2000 and 2002.[34] There is no evidence that Glidden has released TCE, so Glidden is not a contributor of TCE to the VOC plume under the proposed Class Area.

The Bunge Grain Elevator is located at 901, 917, 932 and 941 13th Avenue Southeast, toward the southwest boundary of General Mills' TCE groundwater plume. Considering that the Bunge Grain Elevator is located at the downgradient edge of the TCE plume, it could not be responsible for any upgradient contamination. In 2007 and 2008, this site was purchased and part of the site was redeveloped with apartments. The new owners took on a voluntary cleanup program which entailed excavation of soil impacted with arsenic, lead and PAHs (which are high-molecular weight petroleum hydrocarbons). MPCA also required the developer to design and install vapor control systems in the new construction due to the presence of TCE in groundwater.[35] In 2008, MPCA granted the developer a "no further action" determination for soil and did not require any groundwater remediation because "the release originates off-site".[36] This site is a victim of General Mills' TCE plume, not a cause.

The Twin Cities Army Ammunition Plant (TCAAP) is a former military facility more than 6 miles north of the proposed Class Area. This facility does have a large TCE groundwater plume, which is being

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[32] ERM, 2002, Environmental Activities Conducted at the ICI Minneapolis, Minnesota Site up through August 2002, p. iii.

[33] MPCA, 1999, Minnesota Decision Document, p. 1.

[34] Golder Associates, 2003, Remedial Action Implementation Report, Glidden Paint and Varnish Facility, 1901 East Hennepin Avenue Minneapolis, Minnesota, p. 7.

[35] MPCA, May 8, 2006 letter to Sarah Larson of Project for Pride in Living, p. 2.

[36] MPCA, May 29, 2008 letter to Shalaunda Holms, Project for Pride in Living, p. 2.

addressed with a pump-and-treat remediation system. Low levels of TCE (14-21 ug/L)[37] have been observed as far south as Interstate 35W, approximately 4,000 feet north of the General Mills Facility. However, this southern extension of groundwater impacts attributed to TCAAP is only found in the deep Prairie du Chien and Jordan Sandstone (referred to as Unit 4 in TCAAP documents[38]) at least 200 feet deep in the proposed Class Area. In shallower, unconsolidated sediments (analogous to the Glacial Drift Aquifer at General Mills) the TCE impacts do not extend south of Interstate 694[39] approximately 5 miles north of the General Mills Facility. Although there is no direct evidence, there is a theoretical possibility of comingling of TCE from TCAAP and General Mills in the Prairie du Chien and deeper aquifers. However, these deep zones have no bearing on the current vapor intrusion problem (which is caused by groundwater contamination in the shallowest aquifer). There is no indication that TCAAP chemicals are contributing to the contamination in the shallow Glacial Drift Aquifer under the proposed Class Area.

MPCA is on record as interpreting General Mills as the source of TCE contamination in the Prairie du Chien and Jordan aquifers: "The report [General Mills 2006 Annual Report]...goes on to imply that the upgradient TCE source is TCAAP. This interpretation is tenuous at best. Given the history of solvent disposal at the General Mills site, it is not necessary or likely to infer an off-site upgradient source for the low-level TCE contamination in the PdCJ [Prairie du Chien/Jordan] aquifer."[40] I agree with this assessment particularly considering that the onsite water supply well, called the "Henkel Well" extends into the Prairie du Chien aquifer, thus is a potential preferential pathway for rapid flux of contamination into this deeper groundwater.

I also reviewed environmental documents for the Pulte Homes redevelopment project on Old Highway 8 in New Brighton, Minnesota. This 28-acre parcel is adjacent to TCAAP and was also the site of various service stations between the 1940s – 1970s and the former Trio Solvent Company in the 1970s. MPCA concluded that there was not sufficient groundwater impact to justify active remediation at this site.[41] I independently reviewed available groundwater data and found that in 2013, TCE was only detected in one well at a concentration of 0.44 ug/L (well below the typical cleanup standard of 5 ug/L). This low level of impact combined with the distance of several miles from General Mills makes me confident to a

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[37] Wenck Associates, 2009, Installation Restoration Program Twin Cities Army Ammunition Plant Five-Year Review Report of the Final Remedy for the New Brighton/Arden Hills Superfund Site, Figure 4-6.

[38] See Figure 3-3, Wenck Associates, 2009; Installation Restoration Program Twin Cities Army Ammunition Plant Five-Year Review Report of the Final Remedy for the New Brighton/Arden Hills Superfund Site.

[39] Wenck Associates, 2009, Installation Restoration Program Twin Cities Army Ammunition Plant Five-Year Review Report of the Final Remedy for the New Brighton/Arden Hills Superfund Site, Figure 4-4.

[40] MPCA, April 11, 2007, email from Fred Campbell of MPCA to Gary Krueger of MPCA.

[41] As cited on p. 4 of Arcadis, 2013, Response Action Plan, 1360, 1400 and 1430 Old Highway 8 NW, New Brighton, Minnesota, for Pulte Homes of Minnesota, LLC.

reasonable level of scientific certainty that the Pulte Homes Parcel is not a source of groundwater contamination now found in the proposed Class Area.

I also reviewed environmental documents for The Quarry commercial development just north of Interstate 35W. This site is a former quarry and the former Johnson Street Dump, thus it has had myriad environmental problems over the years. Excavation was conducted during commercial redevelopment and an SVE system has operated for many years, as has a methane recovery system. There have also been detections of PCB in soil and groundwater. Groundwater impacts were found to be limited and MPCA never required active groundwater remediation for this site. Prior to suspending groundwater monitoring in 2003 (with MPCA concurrence) nine monitoring wells were sampled and analyzed on a quarterly basis. In March 2003, TCE concentrations ranged between nondetect (less than 0.5 ug/L) to 2.6 ug/L[42], well below the drinking water standard (and typical cleanup standard) of 5 ug/L. In addition, shallow groundwater at this site is captured by a passive dewatering system installed by Minnesota Department of Transportation in 1972 as part of the Interstate 35W project.[43] The low concentrations of TCE in groundwater under The Quarry shopping area do not comingle with TCE from General Mills (which is approximately 2,500 feet south-southeast of The Quarry) because this groundwater is diverted into MNDOT's dewatering system. Even if the dewatering system did not exist, groundwater contamination from The Quarry would not reach the proposed Class Area due to the predominant south-southwesterly flow of the Glacial Till Aquifer, plus the TCE levels at this site are already below typical cleanup standards.

In summary, after reviewing all known cases in the vicinity of the General Mills Facility, I found no significant contributors to the TCE plume in the proposed Class Area other than the General Mills Facility itself. MPCA has agreed with me on this point since at least 1994. At that time, MPCA stated: "The issue of potential off-site sources was discussed. Although the site is located in an area that historically has been heavily industrialized, no off-site contributors to the groundwater contamination are known to exist."[44]

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[42] Liesch Associates, 2003, The Quarry West Site (MPCA 4554) Quarterly Environmental Monitoring Results for the Period of January 2003 through March 2003, Appendix B.

[43] MPCA, 2010, Case Study Information Study Sheet, NE Retail Development; NE Retail- Quarry East; and NE Retail – Quarry West; and related sites. For a map of the dewatering system see: Liesch Associates, 2003, The Quarry West Site (MPCA 4554) Quarterly Environmental Monitoring Results for the Period of January 2003 through March 2003, Appendix B, Figure 4.

[44] MPCA, December 28, 2004, Memorandum, Notes from December 13, 1994 Meeting with General Mills regarding Five-Year Review, page 2.

OPINION 2. The vapor contamination in the proposed Class Area is sufficiently widespread and present in such high concentrations that interim action is required on all properties to prevent and mitigate infiltration of the toxic vapors into the residential structures in the proposed Class Area. Such action should include mitigation in the form of sealing of the basement floors and walls, installation of vapor mitigation systems, and/or other air purification measures. These interim measures will need to be operated and maintained continuously until such time as aggressive, scientifically-sound cleanup can be accomplished of the sources of the vapor threat.

Vapor Intrusion and its Health Risks

The phrase "soil vapor intrusion" refers to the process by which volatile chemicals migrate from contaminated soil or groundwater in the subsurface into the indoor air of buildings. The first step of vapor intrusion is off-gassing of vapor from the contaminated soil or groundwater (Exhibit 10). This process will occur whenever the contaminant is sufficiently volatile and whenever the soil column is unsaturated (i.e., at least some of the pore spaces in the soil are filled with air, not water). The second step in vapor intrusion is for the contaminated soil vapor to migrate through the soil column in response to advective and diffusive forces. If there is a home or other structure over or near the contamination, then the third step of vapor intrusion can occur: penetration of the contaminated vapor into the home through cracks or perforations in slabs or basement floors and walls, and through openings around sump pumps or where pipes and electrical wires go through the foundation. Vapor intrusion is driven primarily by a difference between interior and exterior pressures, which is variable and is influenced not only by atmospheric pressure (i.e. weather conditions) but also by air handling practices in the building. For example, heating, ventilation or air-conditioning systems and/or the operation of large mechanical appliances (e.g., exhaust fans, dryers, etc.) may create a negative pressure that draws soil vapor into the building.

Once in the home, contaminated soil vapor mixes with indoor air and occupants of the home can be exposed. Inhalation is the primary route of exposure, or the manner in which the volatile chemicals, once in the indoor air, actually enter the body. Both current and potential exposures are considered when evaluating risks posed by soil vapor intrusion.

Dynamics of Vapor Intrusion and the Need for Comprehensive Testing

The degree and severity that vapor intrusion will occur in a home is not constant. Recent research (summarized below) has shown that contaminant concentrations in indoor air can vary from day-to-day and season-to-season by a factor of 1000 or more. These findings have important implications for environmental scientists and engineers trying to evaluate the risk of vapor intrusion at a particular site. Of principal importance is the recognition that one or two tests at or under a home are not sufficient for understanding the true risks. If a phenomenon is highly variable and highly complex, more testing is

needed to measure its full range of variability. Conversely, if a phenomenon is totally constant, then less testing is needed because there is no variability to measure. For example, if we collected a single temperature reading of 80° F. in Hawaii, this would be a reasonable approximation of average annual temperature because there is so little seasonal variation in Hawaii. However, if we collected a single temperature reading on a warm summer day in Alaska, it may be an accurate reading of the weather on that day but it would be a mistake to conclude that the weather in Alaska is always warm and sunny. More temperature readings are needed in Alaska in order to measure the extreme seasonal variability: the warm summers and the bitterly cold winters. In the same way, repeated testing for vapor intrusion is needed because the phenomenon is highly variable.

In addition to temporal variability, vapor intrusion exhibits large spatial variability. The spatial variability is due to variations in soil moisture, lithology and variable air entry rates due to uneven quality of the building slab. Even with the limited sampling conducted to date in the proposed Class Area, the temporal and spatial variability is clearly evident. For example, at 979 18th Avenue SE (the Miller residence) TCE was measured at 1,160 ug/m^3 at subslab sample location "A" but was 99 ug/m^3 at subslab sample location "B." Similarly, at 1820 Como Avenue SE (the Simon residence) TCE was measured as high as 6,740 ug/m^3 at subslab location "C", but was nearly 5,000 ug/m^3 less (1,400 ug/m^3) at location "A".[45] If the sampling program is not robust enough to measure the full degree of variability, then decisions about the severity of vapor intrusion and whether or not homes need mitigation are based on incomplete data. Many of the homes have just a single subslab sample location. The implication of this sparse sampling density becomes clearer by reviewing data from 2010 Como Avenue SE (the Johnson residence). One subslab sample (location "A") was nondetect for TCE but another sample (location "B") contained 33 ug/m^3 of TCE. If this home had just been sampled from one location (as is the case for many homes in the proposed Class Area) then the decision to install a mitigation system would have relied on the completely random chance of whether the sample was collected from location "A" (nondetect for TCE, so no mitigation system) or location "B" (greater than 20 ug/m^3, so a mitigation system would be installed). This is not a scientifically justified decision process because the Johnsons are breathing air from location "B" whether General Mills measures it or not.

In its 2009 review of the Draft Vapor Intrusion Guidance, EPA articulated the evolving understanding of temporal and spatial variability in vapor intrusion: "In summary, EPA's observations and experiences have indicated that ***there is greater complexity in the processes and number of variables that affect the migration and distribution of VOCs, and consequently, the potential for vapor intrusion than was***

[45] Subslab vapor data from MPCA spreadsheet: "2014 02 26 MPCA Progress Report.xlsx".

generally appreciated when EPA issued the 2002 Draft Vapor Intrusion Guidance" (p. 2, emphasis added).

In their analysis of an attenuation factor[46] database compiled by EPA, researchers at Brown University, found:

> "The database shows that the attenuation factors vary over many orders of magnitude and that no simple statistical fluctuation around any typical mean value exists. Thus far, no simple explanation of this phenomenon has been presented. This paper examines various possible contributing factors to the ***enormous range of observed values***, looking at which ones can plausibly contribute to explaining them."[47]

In an important research contribution, researchers from Arizona State University (including Dr. Paul Johnson, co-developer of the widely-used Johnson-Ettinger Vapor Intrusion Model) and the US Air Force collected indoor air measurements every few hours for 2.5 years at a house overlying a plume of TCE-contaminated groundwater. This study is particularly significant and applicable to this case for a number of reasons. Not only did it involve actual indoor air measurements in the home, but it also involved the same chemical as the General Mills plume (although at generally lower concentrations). Their findings included the following:

> "Indoor air concentrations varied by 3 orders of magnitude (<0.01−10 ppbv TCE) with two recurring behaviors. The VI-active behavior, which was prevalent in fall, winter, and spring involved time-varying impacts intermixed with sporadic periods of inactivity; the VI-dormant behavior, which was prevalent in the summer, involved long periods of inactivity with sporadic VI impacts. These data were used to study outcomes of three simple sparse data sampling plans; the probabilities of false-negative and false-positive decisions were dependent on the ratio of the (action level/true mean of the data), the number of exceedances needed, and the sampling strategy. The analysis also suggested a

[46] "Attenuation factor" is defined as the ratio of the indoor air concentration arising from vapor intrusion to the subsurface vapor concentration. It is a measure of the dilution that occurs from a variety of processes as vapor migrates from the subsurface, through floors and walls, and into a home.

[47] Yijun Yao, Rui Shen, Kelly G. Pennell, and Eric M. Suuberg, 2013, Examination of the Influence of Environmental Factors on Contaminant Vapor Concentration Attenuation Factors Using the U.S. EPA's Vapor Intrusion Database, *Environmental Science & Technology*, v 47, pp. 906−913; emphasis added.

> significant potential for poor characterization of long-term mean concentrations with sparse sampling plans."[48]

Not only did Dr. Johnson and coworkers confirm the large degree of temporal variability that has been described by EPA and others, they also showed that conventional sampling strategies (such as those being employed by General Mills in the Como neighborhood) of collecting just one or two samples carries a high probability of "false negatives." The term "false negative" refers to a situation in which a condition exists (such as the occurrence of TCE at 20 ug/m^3, the criterion for installing a vapor mitigation system) but poor design of the testing methodology fails to detect it. These findings are consistent with the research reported in my recent book about vapor intrusion and worst case risk parameters.[49]

Widespread Nature of Vapor Contamination

As shown in Exhibit 8, TCE in subslab vapor is present under homes across the entire proposed Class Area. This is not a surprise considering the presence of TCE in shallow groundwater (depth to the Glacial Drift Aquifer varies between 15-25 feet below ground surface, depending on surface topography and seasonal fluctuations) under the entire area at concentrations ranging from 230 ug/L near the former waste pit to 31 ug/L in the extreme downgradient portion of the plume (Well V near Van Cleve Park).[50] Some of the unshaded homes on Exhibit 8 are so depicted because they have not been sampled. Others have been sampled, but were found to be nondetect for TCE. Because of the extreme temporal and spatial variability of the phenomenon of vapor intrusion, I do not believe these nondetects represent the full range of TCE that actually enters into these homes, especially at different seasons, periods of different atmospheric pressure, and different soil moisture conditions. I have been studying vapor intrusion and soil vapor migration for nearly 40 years. In my experience, sparse sampling and reliance on modeling underestimates the true risk of exposure. The combination of an identical threat faced by every home (off-gassing from the groundwater plume) and the very large temporal and spatial variability discussed above leads me to conclude that all homes in the proposed Class Area are threatened by vapor intrusion.

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[48] Chase Holton, Hong Luo, Paul Dahlen, Kyle Gorder, Erik Dettenmaier, and Paul C. Johnson, 2013, Temporal Variability of Indoor Air Concentrations under Natural Conditions in a House Overlying a Dilute Chlorinated Solvent Groundwater Plume, Environmental Science & Technology, v 47, pp. 13,347-13354.

[49] Everett and Kram, editors, 2013, Continuous Soil Gas Measurements: Worst Case Risk Parameters, ASTM, Selected Technical Papers [STP] 1570.

[50] Barr, 2013, Annual Report for 2012.

One of General Mills' first soil vapor investigation activities was to collect vapor samples from existing monitoring wells. Notwithstanding that this is a highly nonstandard sampling methodology,[51] TCE was detected in vapor from every well[52] at concentrations of up to 2,600 ug/m^3. These are very high soil vapor concentrations. By comparison, at the time, MPCA was using a screening level of 30 ug/m^3 (later reduced to 20 ug/m^3) although EPA urged MPCA to use an even lower level in order to better insure protection of human health from vapor intrusion:

> "Minnesota Pollution Control Agency (MCPA) uses as trichloroethylene (TCE) soil gas screening level of 30 ug/m^3 based upon the 10 times residential indoor Intrusion Screening Value (ISV) of 3 ug/m^3. Based upon the 2011 toxicological report issued by the Integrated Risk Information System (IRIS) and the 2010 Region V Vapor intrusion guidance, US EPA uses a more protective concentration of 4.3 ug/m^3 for residential soil gas screening. It is recommended the US EPA screening value be used to evaluate soil gas samples at the General Mills site."[53]

General Mills also collected passive soil gas samples in July 2013 but found that they did not correlate with the previously-collected active soil gas samples.[54] Rather than recognize that this was a measure of variability in soil gas concentrations, General Mills essentially discarded the passive soil data. This was evidence (either ignored or unrecognized) that the program based on an assumption of static concentrations was flawed.

At first, General Mills and MPCA defined the area of concern for soil vapor contamination as the area encompassed by the 20 ug/L TCE groundwater contour, with an added 100-foot buffer zone (Barr, 2012, Summary of Phase 2B Soil Vapor Results and Path Forward, Figure 2). This corresponds to the proposed Class Area. Later, General Mills sought to reduce the area of concern to the area with soil vapor greater than 20 ug/m^3 as measured in 8-foot samples collected in the streets (see Exhibit 6 which is a reproduction of a map prepared by Barr.[55] These results defined what came to be called the "vapor

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[51] As noted by EPA: "Collecting soil gas samples from within the head space of existing monitoring wells is not appropriate." (EPA, February 9, 2012, Memorandum regarding Vapor Intrusion Sampling Plan for the 2B Phase of the General Mills Site, Minneapolis, Minnesota, p. 1).

[52] The exception was well 112 in which the well screen was submerged and it was not possible to collect a sample.

[53] EPA, February 29, 2012, Memorandum regarding Vapor Intrusion Sampling Plan for the 2B Phase of the General Mills Site, Minneapolis, Minnesota, p. 1.

[54] Barr, August 29, 2013, Letter to MPCA regarding: Vapor Intrusion Evaluation: Phase 2E Investigation Work Plan East Hennepin Avenue Site, Minneapolis, Minnesota, p. 1.

[55] Barr, November 11, 2013, Summary of Phase 2E Vapor Intrusion Evaluation Results, East Hennepin Avenue Site, Minneapolis, MN, Figure 1.

cloud"[56] (the region enclosed by the yellow dashed line on Exhibit 6). Because of spatial and temporal variability of soil vapor contamination, and because of variability in the physical processes that influence vapor intrusion, reducing the size of the study area based on a single round of sampling from widely-spaced sample locations is not sound science. In fact, later testing has found numerous instances of TCE in subslab vapor at homes outside of General Mills' proposed (smaller) study area (see Exhibit 7), proving my point that it was unwise to shrink the scope of the study area. Apparently in recognition of some of these failings, MPCA came to classify this region as the priority zone where the "first homes" were to be sampled,[57] not the only area where homes would be sampled.

We also note that the figure used to define the priority study area (see Exhibit 6) is misleading because General Mills and Barr omitted high detections of TCE if they were deeper than eight feet. For example, on Exhibit 6, the maximum result reported for location DP-002 is 9.4 ug/m^3 at 8-feet. General Mills omits the reading of 120 ug/m^3 from 14-feet, thus obscuring the fact that this location is problematic with respect to a risk of vapor intrusion. There are numerous other omissions on this figure:

- At sample location DP-014, the vapor highest concentration reported by General Mills is 45 ug/m^3 but 1,400 ug/m^3 of TCE was detected at 17-feet at this location;
- At sample location DP-001, the vapor highest concentration reported by General Mills is 4.6 ug/m^3 but 64 ug/m^3 of TCE was detected at 15-feet at this location;
- At sample location DP-009, the vapor highest concentration reported by General Mills is 3.8 ug/m^3 but 34 ug/m^3 of TCE was detected at 14-feet at this location;
- At sample location DP-013, the vapor highest concentration reported by General Mills is 72 ug/m^3 but 160 ug/m^3 of TCE was detected at 13-feet at this location.

General Mills omitted the deeper, high-concentration samples from this map, even though EPA is on record with an opinion that deeper soil vapor samples are preferable: "EPA believes that when delineating a vapor plume (as opposed to evaluating a specific structure), samples 2 ft above wt [water table] should be used, to better account for preferential pathways."[58] The sample results omitted by General Mills from this figure are closer to the water table than the samples they did report, thus discarding this data is contrary to EPA's advice.

Inadequacy of General Mills' Sampling Program

Over the decades of performing groundwater cleanup, General Mills neglected to evaluate the obvious threat to occupants of homes in the proposed Class Area. Prior to the current flurry of activity, the only

[56] General Mills/Barr/MPCA, 2013 Presentation to MPCA, Slide 19.

[57] General Mills/Barr/MPCA, 2013 Presentation to MPCA, Slide 19.

[58] Leah Evison of EPA, September 3, 2013 email to Fred Campbell re: General Mills/Henkel Corp. Case Study.

work on soil vapor was an on-site vapor risk assessment survey previously conducted at the Site in 1997.[59] The survey included measuring organic vapors, percent oxygen, and percent of the lower explosive limit (LEL) using field instruments at several sanitary sewer manhole locations surrounding the Site and in the basements and tunnels of the buildings on site, and an interview to ask the owner of the Site property about odors. The 1997 survey "indicated an absence of organic vapor or explosive vapor risk associated with the former source area on the Site." Considering the severity of the problem that we now know exists at this site, it is obvious that General Mills' conclusion in 1997 was completely wrong and the 1997 survey was entirely inadequate.

The subslab vapor sampling program undertaken in late 2013 and 2014 is based on an assumption that at most, two sampling events are sufficient to fully characterize the magnitude of the vapor intrusion risk at each home and to make a permanent decision as to who deserves a vapor mitigation system and who does not. There are at least two reasons this assumption is not valid. The first reason relates to the absence of indoor air data. General Mills is collecting subslab vapor samples from under the homes, but not indoor air samples. Subslab samples are collected by drilling through the basement floor and drawing a sample from soil or fill directly under the home. This is a reasonable first step, but since people breathe indoor air, the indoor air should also be sampled. From the very beginning of the vapor investigation, General Mills has avoided collecting indoor air data. MPCA recognized this maneuver, but did not correct it: "General Mills and Barr have decided to take a different investigative approach. *Instead of taking indoor air samples (as in a more typical investigation),* they are collecting soil gas (Summa canister) samples at basement (8 ft) depths in the public right of way."[60]

This protocol of not sampling indoor air is especially baffling considering that EPA is urging just the opposite: "However, experiences since 2002 illustrate the value of collecting indoor air samples earlier in investigations, including the more rapid and direct assessment of the quality of indoor air. Benefits can also include improved public relations and clearer communication of the results, both of which can improve the opportunities for meaningful public involvement."[61]

The second reason the sampling and decision protocol is not valid is the reliance on extrapolations based on subslab data and a theoretical, unvarying attenuation factor. The result is an assumption (without any proof that this is true for these particular homes in this particular subsurface environment) that indoor air concentrations are always at least 10 times less than subslab concentrations. We know now that this is an

[59] Barr, 1997, East Hennepin Avenue Site, Receptor Survey.
[60] Fred Campbell of MPCA, October 16, 2013 email to Dave Jaeger, emphasis added.
[61] EPA, 2009, Office of Solid Waste and Emergency Response Review of the Draft 2002 Vapor Intrusion Guidance.

unreliable assumption. Recent studies have shown that attenuation factors (measuring the ratio of the concentration of a chemical in subslab vapor compared to the concentration of the same chemical in indoor air) are not constant. As described by EPA:

"Within any one given site, the attenuation factors:

- between groundwater and indoor air typically vary 2 to 3 orders of magnitude and
- between external soil gas and indoor air typically vary 2 to 4 orders of magnitude.
- Subslab soil gas and indoor air typically vary 2 to 4 orders of magnitude.[62]

A consequence of this finding is that even a concentration of less than 20 ug/m^3 in subslab vapor can yield a concentration greater than 2 ug/m^3 in the homes.

Vapor Mitigation is Required for all Homes in the Proposed Class Area

General Mills has installed vapor mitigation systems in approximately 85 homes.[63] It is my opinion that selective installation of mitigation systems is insufficient. As explained below, I believe vapor mitigation systems are required for all homes in the proposed Class Area in order to protect against exposure to the toxic chemicals rising up from the TCE groundwater plume because (by definition of the Class Area) all homes in the Class Area overlie elevated levels of TCE in shallow groundwater and because the current testing program is inadequate to identify the full scale of the risk posed by vapor intrusion. As an example of the consequence of inadequate testing, at 1026 19th Avenue (the Thies residence) the maximum TCE measured in subslab vapor was 12.2 ug/m^3. Since General Mills only installs mitigation systems if vapor concentrations equal or exceed 20 ug/m^3, this home did not qualify. However, both of the Thies' next door neighbors *did* have TCE concentrations greater than 20 ug/m^3 in subslab vapor (26.7 at 1030 19th Ave. and 42.8 at 1022 19th Avenue). These homes are directly adjacent to one another. The magnitude of the groundwater contamination underlying all three homes is essentially the same, the lithology is essentially the same and obviously all three homes experience the same weather. There is no scientific reason that the middle home should somehow be safe while the next door neighbors are both found to need mitigation systems. Rather, I interpret these results to show how when taking sparse measurements of a widely varying parameter (TCE in subslab vapor) sometimes you will measure low concentrations and sometimes you will measure higher concentrations. General Mills is assuming that a single measurement (or just a small number of measurements) is the same as the average of a widely-varying parameter. There is simply no scientific justification for this assumption. In fact, as the studies summarized above show, it is dangerously wrong. In summary, if we went back to the Thies residence

[62] EPA, 2012, Fluctuation of Indoor Radon and VOC Concentrations Due to Seasonal Variations, EPA/600/R-12/673, p. 2-8.

[63] MPCA, 2014, General Mills/Henkel Corp. Superfund Site Study Area Sampling Status.

and performed continuous monitoring of subslab vapor, there would likely be TCE measurements above 20 ug/m^3, just as there are for the Thies' next-door neighbors. Due to the inadequate sampling program, the Thies' are currently being denied a mitigation system, basically due to dumb luck, not due to a scientifically defensible decision.

The rationale has been to install vapor mitigation if the TCE concentration in subslab vapor exceeds 20 ug/m^3, under the assumption that this level insures indoor air concentrations will always remain below the state standard of 2.0 ug/m^3 (by applying a theoretical and unvarying attenuation factor of 10). In my opinion, this protocol is not reliably protective because one or two sampling events at a home cannot capture the full temporal and spatial variability of soil vapor migration and vapor intrusion dynamics, thus decisions about whether or not to install mitigation systems are arbitrary, and are based on an incomplete characterization of risk. The decision is being based on a concentration that happened to be measured on a certain day, even though the next day, the concentration at the very same location could be 10 or even 100 times higher. As noted by Dr. Paul Johnson and his co-authors, sparse sampling programs run a very high risk of false negatives: missing periods of high vapor intrusion incursion due to its episodic behavior.[64]

EPA recognizes this issue: "These observations and experience with vapor intrusion investigations enabled the Agency to more fully appreciate the fact that the spatial and temporal distribution of VOC concentrations in the subsurface and in indoor air can be highly variable. Some of this variability can be attributed to vertical and horizontal differences in subsurface conditions, the differences in structural conditions (e.g., foundation cracks) and the air exchange rates from one building to another. Variation in weather conditions (e.g., rainfall, barometric pressure, wind) has also been observed to have a potentially significant impact on the distribution of VOCs in the environment near a building and the entry of VOCs into a building via the vapor intrusion pathway."[65]

All the homes in the Class Area require interim vapor mitigation until such time that the underlying groundwater can be fully cleaned up and the risk is truly mitigated. General Mills initial plan seemed to appreciate some of these concerns about temporal and spatial variability. According to MPCA: "Since General Mills approach is to evaluate the potential need for mitigation systems *in blocks rather than individual homes*, MPCA hereby approves the work plan."[66] (Emphasis added).

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[64] Chase Holton, Hong Luo, Paul Dahlen, Kyle Gorder, Erik Dettenmaier, and Paul C. Johnson, 2013, Temporal Variability of Indoor Air Concentrations under Natural Conditions in a House Overlying a Dilute Chlorinated Solvent Groundwater Plume, Environmental Science & Technology, v 47, pp. 13,347-13,354.

[65] EPA, 2009, Review of the Draft 2002 Subsurface Vapor Intrusion Guidance, p.2.

[66] Email from Fred Campbell of MPCA to Sara Ramsden of Barr, September 5, 2013.

Instead of installing mitigation systems in all homes in the impacted blocks, as previously promised, General Mills has reverted to a practice of evaluating sparse sampling results on a home-by-home basis. I have visited 12 homes in the proposed Class Area. These homes all contained basements (which reduces the vertical distance between contaminated groundwater and the interior of the house compared to homes without basements) and the condition of the basement floors and walls was highly variable, with many cracks, utility penetrations and even open exposure to the underlying soil. A problem with the vacuum systems being installed by General Mills is that much of the proposed Class Area is underlain by a layer of peat. Where it is near the surface, the peat is nearly (if not fully) saturated with water thus vacuum systems designed to draw subslab vapor cannot work. Similarly, weather events like rainstorms or melting snow can create transient water-saturated conditions in shallow soil. The vacuum systems depend on an unsaturated layer of soil or fill immediately under the floor of a home in order to redirect contaminated vapor into a collection system before it can seep into the home. If there is no unsaturated layer, the vacuum system cannot draw air, but there is nothing to prevent the TCE from evaporating and migrating directly into the home.

I believe homes with concrete basement floors and walls should be offered repairs to these surfaces to restore their integrity and a coating[67] should be applied to create an impermeable barrier against vapor flow. In addition, vacuum systems should be installed under each home and pressure measurements should be made periodically to insure that a vacuum field is maintained under the full footprint of each home.

OPINION 3. The interim remedies discussed in opinion 2 do not constitute a cleanup program. While a well-designed and maintained interim remedy can protect residents from exposure to vapors in their homes, it does not eliminate the threats presented by these toxic vapors. It will not substantially reduce the concentration of contaminants in soil vapors and it will not reduce contaminant concentrations in groundwater. The vapor contamination is a symptom of the incompletely mitigated releases of these toxic chemicals buried by General Mills. Thus, the interim remedies are a stop-gap measure to provide temporary protection to occupants of the neighborhood during the time it will take to conduct an adequate groundwater remediation program. To accomplish a long term, permanent remedy of the vapor contamination, the contamination buried by General Mills must be located and removed. The contaminated groundwater which is carrying the chemicals and releasing the vapors must be removed or treated.

The measures (vapor mitigation in all homes of the Class Area) recommended in Opinion 2 address a symptom, but do not provide a permanent solution. As long as the TCE and other VOCs persist in

[67] One example of coatings designed to provide a barrier against vapor intrusion is Retro-Coat from Land Science Technologies. This or a similar product should be employed at the Class Area homes.

groundwater under the Class Area, the residents will experience a continued threat of exposure to the toxic gases.

EPA clearly states its position that remediation of the underlying source of VOCs is the preferred response to vapor intrusion problems in order to achieve a permanent remedy. EPA also classifies vapor mitigation systems as interim measures that should be undertaken if the subsurface sources cannot be cleaned up quickly. EPA is clear that vapor mitigation is not a substitute for cleaning up the contaminated soil or groundwater that constitutes the source of a vapor intrusion condition.[68] This approach is reinforced in the EPA Engineering Issue Document, "Indoor Air Vapor Intrusion Mitigation Approaches" in which engineered controls for vapor mitigation are described as "interim remedial measures (p. 2).

There are many ways in which the interim mitigation systems can fail. As noted above, during periods of high soil moisture or in areas with shallow peat, the systems will not be able to achieve a complete vacuum under the entire footprint of a home. It is not sufficient for a vapor mitigation to capture the contaminated soil vapor from under half of the house: the systems must be comprehensive. The systems will obviously not work during power outages, nor if cold weather causes frozen pipes or other malfunctions.

The interim mitigation systems are necessary and (for most residents) likely preferable to the alternative of moving out of their homes for the years that will be needed to complete the groundwater cleanup. However, the interim mitigation systems are not a substitute for a durable and thorough remediation of the underlying cause of the problem, which is the TCE groundwater plume that extends under the entire Class Area.

EPA raised concern over the years that groundwater cleanup standards articulated in the 1984 Consent Order were not sufficiently protective and not consistent with modern science and policy:

> "EPA does not believe that the groundwater standards established in the Consent Order, as referenced above, are protective of human health and the environment, and

[68] EPA, 2013, OSWER Final Guidance for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Sources to Indoor Air (External Review Draft), pp. 92-93. This draft EPA report is due to be finalized shortly. EPA requested that the draft not be cited or quoted but since the final version of this report has not yet been published, (and since the previous edition of this guidance document is 14 years old) practitioners in environmental science have begun citing the draft. In fact, even EPA has begun citing the draft, in spite of the printed caution (see, for example, the December 3, 2013 letter from EPA Region 9 to California Department of Toxic Substances Control, which repeatedly cites the draft OSWER guidance document).

> recommends that MPCA and General Mills amend the Consent Order to establish 5 ug/L as the cleanup level for TCE."[69]

Of course, EPA was right and the residents of the proposed Class Area would be justified in wondering why EPA's advice was not taken 20 years ago, when it was first given. Unfortunately, EPA's advice was not taken and General Mills was able to actually suspend groundwater cleanup in 2010 based on (allegedly) meeting the 1984 Consent Order groundwater goals, i.e., 270 ug/L in the Glacial Drift Aquifer. Obviously, (considering the widespread soil vapor problem) the prevailing groundwater concentrations are not protective of human health, just as EPA pointed out 20 years ago. Until the TCE concentrations in the Glacial Drift Aquifer can be cleaned up to at least 5 ug/L across the entire plume, the specter of vapor intrusion and the threat of residents unwittingly breathing TCE in their own homes will remain a very real problem.

OPINION 4. Because General Mills has no comprehensive plan to complete the investigation or to clean up the contamination, and has failed to confront the complexity and challenges of remediating the widespread contamination it has caused, additional remedial measures are required to characterize the site and mitigate the imminent and substantial endangerment to human health and the environment.

Until it shut off its system in 2010, General Mills had engaged in active groundwater remediation for 25 years.[70] One reason this program failed was that General Mills never removed or treated the high levels of contamination in the immediate vicinity of the waste disposal pit, which (to this day) constitutes an ongoing source of contamination replenishing the groundwater plume. This inadequacy had long been identified and discussed, but never corrected. In the 1990 Case Study, EPA noted not only that soil around the waste pit had not been cleaned up, it also discussed the likely presence of DNAPL[71] (dense nonaqueous phase liquids):

> "The contaminated soils remained in place after closure of the pit…Based on the method of waste disposal at the site and the high concentrations of VOCs found in the soil, the presence of residual contamination in the form of nonaqueous phase liquids (NAPLs) could be expected. Because the chlorinated organic solvents are more dense than water, they would be expected to sink through the ground water and form pools in the low areas

[69] MPCA Memorandum, September 28, 1994, from John Seaberg, through Dagmar Romano, to General Mills File, Subject: General Mills Five Year Review.

[70] Barr, 2012, Groundwater Pump-out System Shutdown Summary Report and 2011 Annual Report, p. 2.

[71] DNAPL is the most chemically potent form of TCE. Sites with DNAPL are considered the most difficult and expensive to clean up (EPA, March 1991, Dense Non-aqueous Phase Liquids, Groundwater Issue). Thus the presence of DNAPL at the General Mills site would have significant implications for the cost, difficulty and duration of remediation.

> of the underlying low conductivity layers, if they were discharged to the pit in sufficient quantity. However, there has apparently been no effort to detect the presence of NAPLs at this site." (pp. 4-5).

In its 1991 review of the Case Study, MPCA noted:

> The discussions regarding remediation and NAPL-related issues (pages 10-13) are interesting and very good. The authors appear to be leaning towards some other type of remediation for the Site (e.g. soil removal). The text makes numerous references to the questionable effectiveness of the pump-and-treat system, and there are some very valid points made in that regard.[72]

When asked in 1991 by MPCA why the source area had not been cleaned up, Barr explained that soil excavation and other possible remedies had been considered in 1983 but these remedial options "were ultimately rejected because they were not 'cost-effective'".[73] Barr went on to claim that the "potential presence of DNAPL indicates that source area corrective actions will not eliminate the need for, or even significantly reduce the operating time for a groundwater pump-out system." There is such a thing as "technical impracticability" in which contamination is so severe and the subsurface environment is so complex that numerical cleanup standards cannot be met. However, neither EPA nor MPCA saw this site as being so hopeless. In addition, the remedy for technical impracticability is typically a containment strategy that is expected to operate essentially in perpetuity. What General Mills wanted was contrary to science: it wanted a determination of technical impracticability to avoid cleaning up the source area *and* it wanted to stop pumping contaminated groundwater. The residents of the proposed Class Area are now paying the price for this reckless strategy.

By 1994, MPCA was again pushing General Mills to focus on the source area:

> "He [Al Gebhard of Barr Engineering] suggested that perhaps another possibility would be to concentrate resources on remediating the source of the groundwater contamination. Dagmar [Dagmar Romano of MPCA] responded by saying that the MPCA had previously discussed the issue and is in full agreement with that approach. The MPCA may be willing to cut slack in an expansion of the pump-out system for a period of time if

[72] MPCA, February 15, 1991, Office Memorandum from Fred Campbell to Mark Schmitt.
[73] Barr, November 11, 1991 Letter to Mark Schmitt, MPCA, p. 2.

> General Mills took an aggressive approach to characterize and remediate the source of the groundwater contamination.[74]

In retrospect, it was penny wise and pound foolish for General Mills to pass on MPCA's offer because even after spending decades trying to remediate the groundwater plume, the job is far from complete. This is largely because they never cleaned up the source area, so chemicals continue to leach out of the soil and/or submerged DNAPL, replenishing the groundwater plume.

Again in 1999, MPCA noted: "No work has been done to date to address soil contamination associated with the Site…However, this issue will need to be addressed prior to closing out the Site." [75]

By 2000, MPCA expressed frustration at General Mills' inaction regarding the source area: "Despite several phone conversations with you requesting General Mills' response to our comments [regarding the unresolved issue of contaminated soils in the source area] we received no response to the comment above, nor to any of our other comments…MPCA staff consider it to be imperative to put closure to issues related to soil contamination there."[76]

There is a reference to some soil sampling in 2001,[77] but the results are not found in MPCA's file for this case and General Mills never did remediate the source. Other reasons the groundwater remediation program failed is that it was never intended to protect against the threat of vapor intrusion. The TCE cleanup standards established in the 1984 Consent Order were 270 ug/L in the Glacial Drift Aquifer and 27 ug/L in the deeper Carimona Aquifer. It is obvious from these cleanup goals that no one was thinking about vapor intrusion at the time because it makes no sense to have a more permissive cleanup standard in the shallowest aquifer, which poses the greatest threat for vapor intrusion. It is notable that EPA never accepted these cleanup standards and urged the parties to update the Consent Order to be more consistent with prevailing cleanup standards:

> "The cleanup levels for TCE established in the Consent Order (referenced above) shall be met before the Consent Orders to be terminated. Once this occurs *actions should be taken by MPCA or U.S. EPA to enforce the more protective groundwater cleanup standard of 5*

[74] MPCA, December 28, 2004, Memorandum, Notes from December 13, 1994 Meeting with General Mills regarding Five-Year Review, page 2.

[75] MPCA, 1999, Five-Year Review Report, General Mills/Henkel Corporation, p. 6.

[76] MPCA, April 17, 2000, Letter from Dagmar Romano to Lawrence Deeney of General Mills, p. 1.

[77] Barr, March 2002, 2001 Annual Report, East Hennepin Avenue Site, p. 2.

> *ppb for TCE, or whatever is the current standard* (MCL or HRL or whatever is lowest) at that time."[78]

If General Mills had cleaned up the groundwater plume to a more protective standard, then the vapor intrusion problem would have been resolved by now. It is also apparent that other portions of the Facility could be contributing to the groundwater problem but have never been adequately characterized. For example, the northwest portion of the Facility contained a drum storage area, tank storage and solvent storage area and what appears to be an above-ground tank farm.[79] We do not know how much soil contamination exists in the northwestern portion of the Facility and we do not know the degree that this poorly-characterized portion of the site is contributing to the downgradient groundwater plume.

As a matter of scientific fact, the entirety of the proposed Class Area identified in Exhibit 1 is presently contaminated, and will be contaminated for the foreseeable future, with high levels of highly volatile organic compounds, including the chlorinated solvent, TCE. These contaminants emanate from a shallow plume of contaminated groundwater which runs through the entire proposed Class Area. This conclusion is not subject to reasonable scientific dispute and General Mills' own interpretation of the environmental data agrees with my conclusion. There are multiple elements to the contamination that confronts the residents of the proposed Class Area. By addressing only interim vapor mitigation, General Mills ignores the multi-dimensional nature of the contamination in the proposed Class Area, and understates the contamination's significance and the dangers it poses to the residents. The unfortunate reality is that dangerous levels of the contamination emanating from the General Mills Facility have infiltrated the air under and inside the homes and are also prevalent in the groundwater flowing immediately beneath the homes, in the soil gas beneath the homes, and the air outside these homes. In other words, the contamination is pervasive in every dimension of the proposed Class Area.

This multi-dimensional contamination emanates from the wastes disposed of by General Mills, which subsequently contaminated the groundwater. This is a scientifically significant fact because, as the groundwater remediation will undoubtedly require a number of years to complete (evidence for this is General Mills' failed 25 year effort to clean up the groundwater), the multi-dimensional and dangerous contamination will confront residents of the proposed Class Area for a number of years into the future.

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[78] EPA, 1994, Five-Year Review Report General Mills/Henkel Corporation Minneapolis, Minnesota, p. 6, emphasis added.

[79] Depicted on Figure 2 of General Mills' 1983 Site Characterization Study and Remedial Action Plan, Barr Engineering Co., June 1983.

General Mills has no plan to complete the subsurface investigation or complete the cleanup of soil and groundwater contamination at the Facility or of the groundwater plume emanating from the Facility. On the contrary, General Mills has consistently resisted doing more work on this site. For example, in notes from a 1994 meeting with MPCA and EPA, Bill Taylor of General Mills complained that now MPCA was wanting more done and he wanted to know what happened.[80] In 1994, General Mills unilaterally stopped preparing annual reports, as required in the Consent Order. When MPCA pointed out that they needed to continue submitting reports, the 1994 report revealed that General Mills had stopped collecting groundwater samples from wells that were "among the most highly contaminated wells associated with the site."[81] In 1997, an MPCA staff member complained that "in some cases they [General Mills] present one sided argument while ignoring some very obvious circumstances assoc. with their site or by not presenting all info contained in technical sources which they quote."[82]

In 2010, General Mills suspended active groundwater remediation in spite of the fact that most of the Glacial Drift monitoring wells contained TCE well in excess of 5 ug/L, which EPA had been citing for years as the likely appropriate cleanup standard. In spite of the stark proof that groundwater has not been adequately cleaned up (in the form of soil vapor and subslab vapor TCE concentrations above state screening levels all across the Class Area), General Mills still has not resumed active groundwater remediation.

Needed Remedial Actions

As discussed above, significant further remedial actions are necessary to address contamination present throughout the entirety of the proposed Class Area. I reserve the right to provide further opinions in a later phase of this case, after I have been able to review documents and data not presently available, on the specific remedial actions General Mills should be compelled to implement. At this juncture, however, it is clear that the following categories will be needed to protect the residents in the proposed Class Area and the environment.

Interim Vapor Mitigation. As described above in Opinion 2, interim vapor intrusion mitigation measures are required on all properties in the proposed Class Area. Because the Class Area is defined by the footprint of the underlying TCE groundwater plume, all homes in the area are (by definition) threatened with vapor intrusion of TCE and other VOCs. This is the most urgent remedial action needed to better

[80] MPCA, December 28, 2004, Memorandum, Notes from December 13, 1994 Meeting with General Mills regarding Five-Year Review, page 1.

[81] MPCA, May 4, 1995 Memorandum from John Seaberg through Dagmar Romano to General Mills File, subject: Comments on Barr Engineering's March 1995, 1994 Annual Report.

[82] October 17, 1997 email from Mark Rys of MPCA to Dagmar Romano of MPCA.

protect the residents from exposure to TCE. I am pleased to see that MPCA and General Mills are moving promptly to install vapor mitigation systems although it is inexcusable that this obvious threat was ignored for so long and it is short-sighted and scientifically unsupported to install mitigation systems in only some of the homes in the proposed Class Area. All homes in the proposed Class Area will require regular maintenance for the vapor mitigations systems.

Onsite Source Characterization. A comprehensive site investigation is required for the General Mills Facility itself. Potential source areas of contaminated soil and/or DNAPL must be identified and removed or treated. It is scientifically-indefensible that this obvious step was never completed, in spite of discussions dating back 20 years that the on-site source area was not adequately characterized and cleaned up:

> "Because of the continued suspicion that residual sources of contamination may be present at the site, it appears unlikely that cleanup goals will be achieved in the foreseeable future in any of the contaminated aquifers." (EPA, 1990, Update of Case Study 7)

The source area investigation should extend offsite to evaluate the potential for DNAPL to have migrated laterally away from the site. This investigation will likely require dozens of soil borings, soil vapor sampling and groundwater sampling on a fine spatial scale. I would recommend that General Mills consult a pair of papers that I co-authored that summarize methods for characterizing DNAPL.[83]

Onsite Source Remediation. If the source area investigation finds impacts in predominantly shallow soil, then soil excavation may be an appropriate remedial strategy. If a large contaminant mass is found in deeper soil or aquifers, then thermal treatment is a good candidate for the remedial strategy. The actual technology or technologies to be employed for source-area remediation should be reviewed and selected based on a thorough Feasibility Study, as required of Superfund sites by the National Contingency Plan (NCP). As a Technical Advisor on the Interagency (DOE, DOD, NASA, EPA) DNAPL demonstration site at the Kennedy Space Center, I am very familiar with these cleanup technologies.

There is little point conducting aggressive groundwater remediation across the entire plume without also cleaning up the source areas. The source areas will continue to bleed contamination into the plume, erasing much of the benefit that a plume-wide program could achieve. This was one of the lessons that General Mills should have known all along, but certainly must appreciate now. Once the onsite source

[83] Kram, M., A. A. Keller, J. Rossabi and L. Everett, 2001, "DNAPL Characterization Methods and Approaches, Part 1: Performance Comparisons", Groundwater Monitoring and Remediation, v.21, no. 4 p.109-123; "Part 2: Cost Comparisons", 2002, Groundwater Monitoring and Remediation, v.22, p.46-61 2002.

areas have been characterized and cleaned up, a groundwater characterization and remediation program is needed that prioritizes reducing TCE concentrations across the entire plume.

Groundwater Characterization. I believe additional characterization is needed to better understand and better map out what appear to be hot spots in groundwater concentration (such as at Glacial Drift Aquifer Well S) that may represent part of a high-permeability paleo-channel or some other form of preferential pathway that allows rapid flux of contamination from the General Mills Facility. This program should include closely-spaced Geoprobe sampling along roadways and possibly residential yards, focusing on development of a better understanding of spatial patterns of VOC concentrations within the plume.

Groundwater Remediation. In addition to not cleaning up the source of the problem, the groundwater remediation system employed over the last 25 years was essentially a containment system designed to prevent the plume from expanding. It was not designed to aggressively reduce the size of the plume or to protect people from breathing the off-gassing vapors. There were two sets of pumping wells in the Glacial Drift Aquifer: one set of wells in the southern portion of the plume was designed to prevent the plume from migrating farther south. Of course, this was of no benefit to most residents of the proposed Class Area because they are upgradient of these wells. Another set of wells was on or near the General Mills Facility and was apparently intended to prevent contamination from flowing into the neighborhood to the south. This portion of the system obviously failed because contamination persisted for decades even though General Mills was pumping groundwater from these wells.

In the most recent annual report (Barr, 2013, Annual Report for 2012), TCE concentrations in the Glacial Drift Aquifer were up to 230 ug/L near the former waste pit and up to 31 ug/L in the extreme downgradient portion of the plume (Well V near Van Cleve Park). Assuming the TCE cleanup standard will be set at 5 ug/L, as is typical for sites around the country, then the entire plume will require active remediation.

One option could be subsurface permeable reactive barriers. I believe an appropriate design would include one near-source and one mid-plume barrier. One permeable reactive barrier would be parallel to the railroad tracks immediately south of the General Mills Facility. This would be a substantial structure, extending to the base of the Glacial Till Aquifer. There are a variety of treatment technologies that can be designed into a permeable reactive barrier, but one technology with proven effectiveness for TCE is zero-valent iron. As a rough approximation, the near-source permeable reactive barrier would need to be approximately 50-ft deep and would extend laterally the full length of the Facility, which is approximately 1,200 feet. The location and design of the mid-plume permeable reactive barrier would be finalized based on interpretation of the groundwater characterization work. Another option for

groundwater remediation includes in-situ bioremediation which is a process in which microbes and/or nutrients are injected into the aquifer in order to achieve microbial degradation of the contaminants in the aquifer. Another feasible remediation alternative is in-situ chemical oxidation which is similar to bioremediation in the method of application, but chemical oxidation relies on the physical destruction of organic contaminants in the aquifer.

It is also notable that TCE concentrations in the Carimona Aquifer are as high as 65 ug/L (Well 11, south of the General Mills Facility along Como Avenue) up to 15 ug/L in the Magnolia Aquifer (Barr, 2012, Annual Report for 2011, Figure 16) and up to 21 ug/L in the deeper aquifers (St. Peters Sandstone/Prairie du Chien/Jordan (Barr, 2012, Annual Report for 2011, Figure 18). The monitoring networks for these aquifers are very sparse, so actual maximum concentrations may differ significantly those reported. There will likely need to be active remediation in the Magnolia Aquifer and (depending on findings of a more thorough site investigation) possibly deeper aquifers, as well.

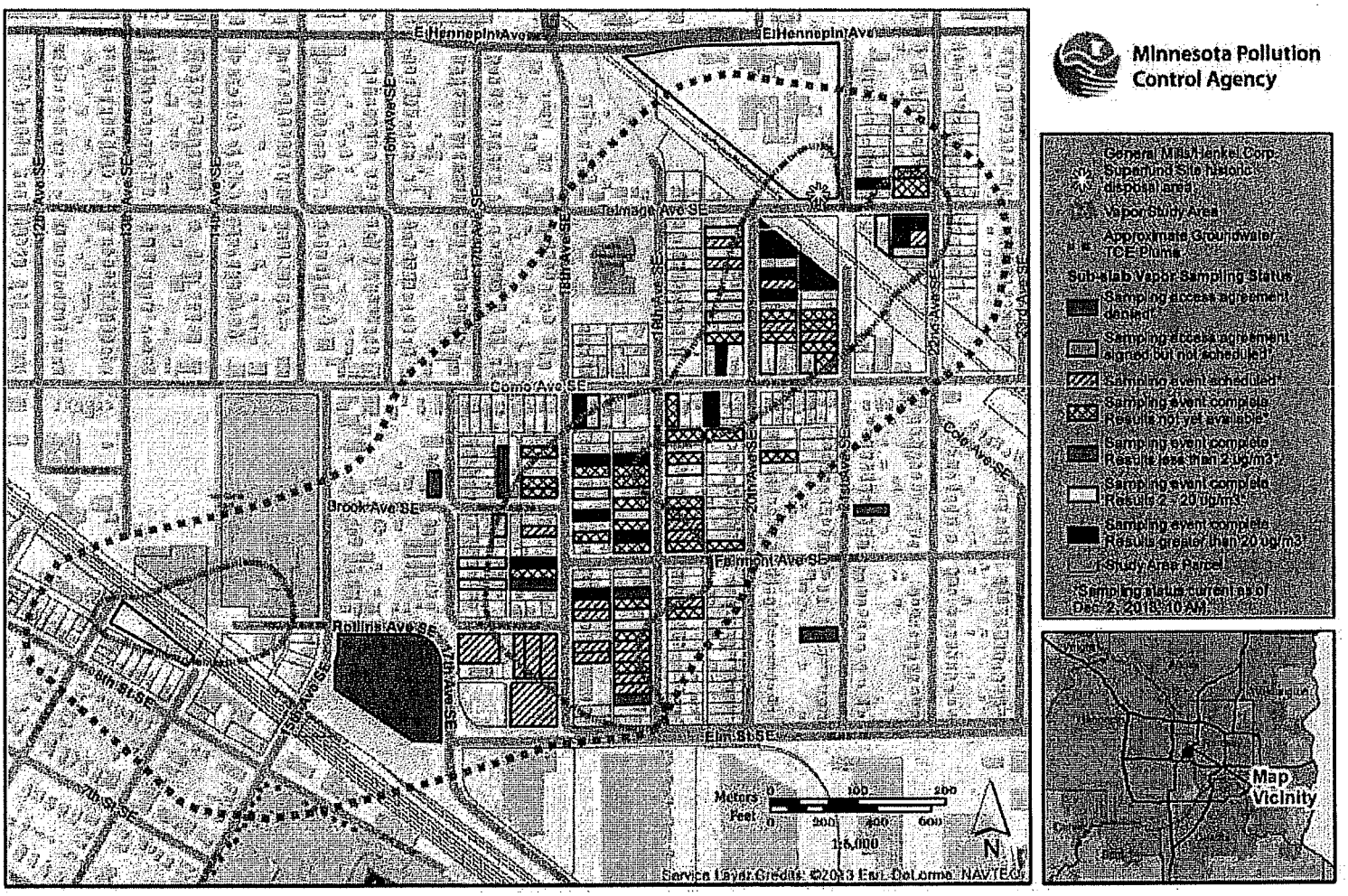
Remediation and Post-remediation Monitoring. A comprehensive monitoring program is another aspect of a responsible remediation program that was lacking during General Mills' earlier groundwater remediation effort. Obviously if General Mills had implemented a comprehensive remediation monitoring program, the vapor intrusion risk posed by this site would have been discovered long ago. The goal of a remediation/post-remediation monitoring program is to measure the progress of the remediation program and verify that the interim vapor mitigation systems are properly protective of human health. I highly recommend that the renewed remediation program include a comprehensive monitoring network, measuring progress in reducing groundwater, soil vapor, subslab vapor and indoor air concentrations. Cleanup standards will need to be established for all contaminated media to insure that there will not be a repeat of the premature decision to suspend the groundwater remediation.

To monitor the interim vapor mitigation systems, all homes will require periodic testing to insure that the systems are adequately protective. I recommend that a subset of homes be more thoroughly outfitted for a more comprehensive monitoring program (that could collect multiple rounds of data across different weather conditions) with multi-depth soil vapor sampling ports, subslab and indoor air monitoring equipment. This monitoring program will be extremely helpful for better understanding soil vapor behavior and for tracking the effect of the underlying groundwater remediation on vapor intrusion risk.

In order to evaluate the possibility of rebound, groundwater, soil vapor, subslab vapor and indoor air monitoring should continue for at least a year or two after cleanup goals are met and after remediation programs are suspended. The term, "rebound" refers to an increase in contaminant concentrations after suspension of active remediation. This is usually an indication of an incomplete remediation program and

often signals the need to restart and/or re-engineer the program. It generally results from an under-engineered remediation system such that the radii of influence around each remediation well do not overlap. This leads to a situation in which a portion of the aquifer (or soil or soil vapor) is cleaned up in the immediate vicinity of the remediation well, but there are pockets of untouched (or incompletely cleaned up) aquifer beyond the reach of the well. There is evidence of rebound at General Mills now that the groundwater pumping system has been shut off. For example, according to the 2012 Annual Report (Barr, 2013, Figure 14) TCE in Glacial Drift Well #110 has more than doubled from 100 ug/L in September 2010 (when the pumping ceased) to 230 ug/L in 2012.

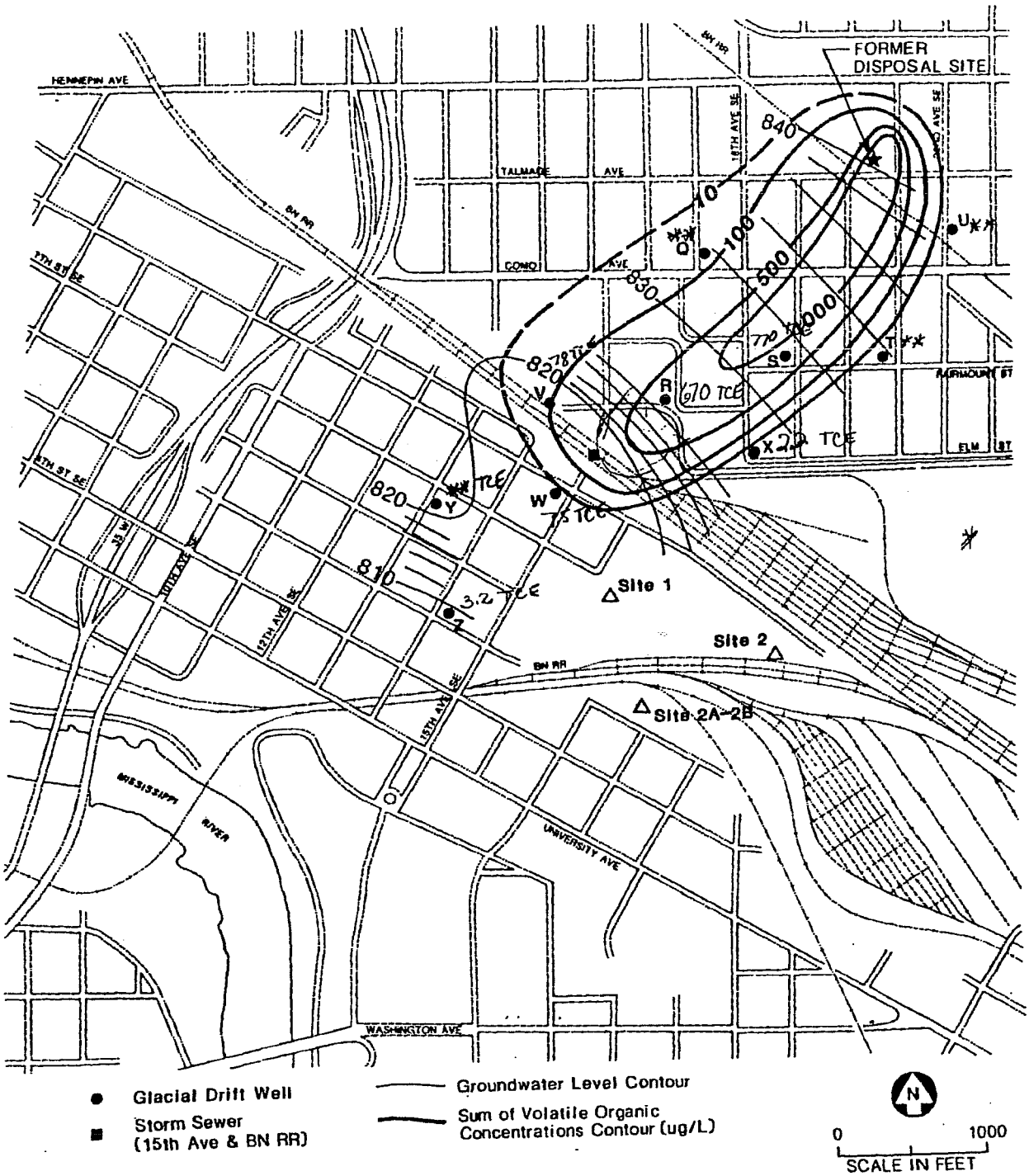
General Mills/Henkel Corp. Superfund Site Study Area Sampling Status



CLASS AREA MAP

(properties within the boundaries designated as
"Approximate Groundwater TCE Plume"
are in the Class Area)

Everett Expert Report, Exhibit 1



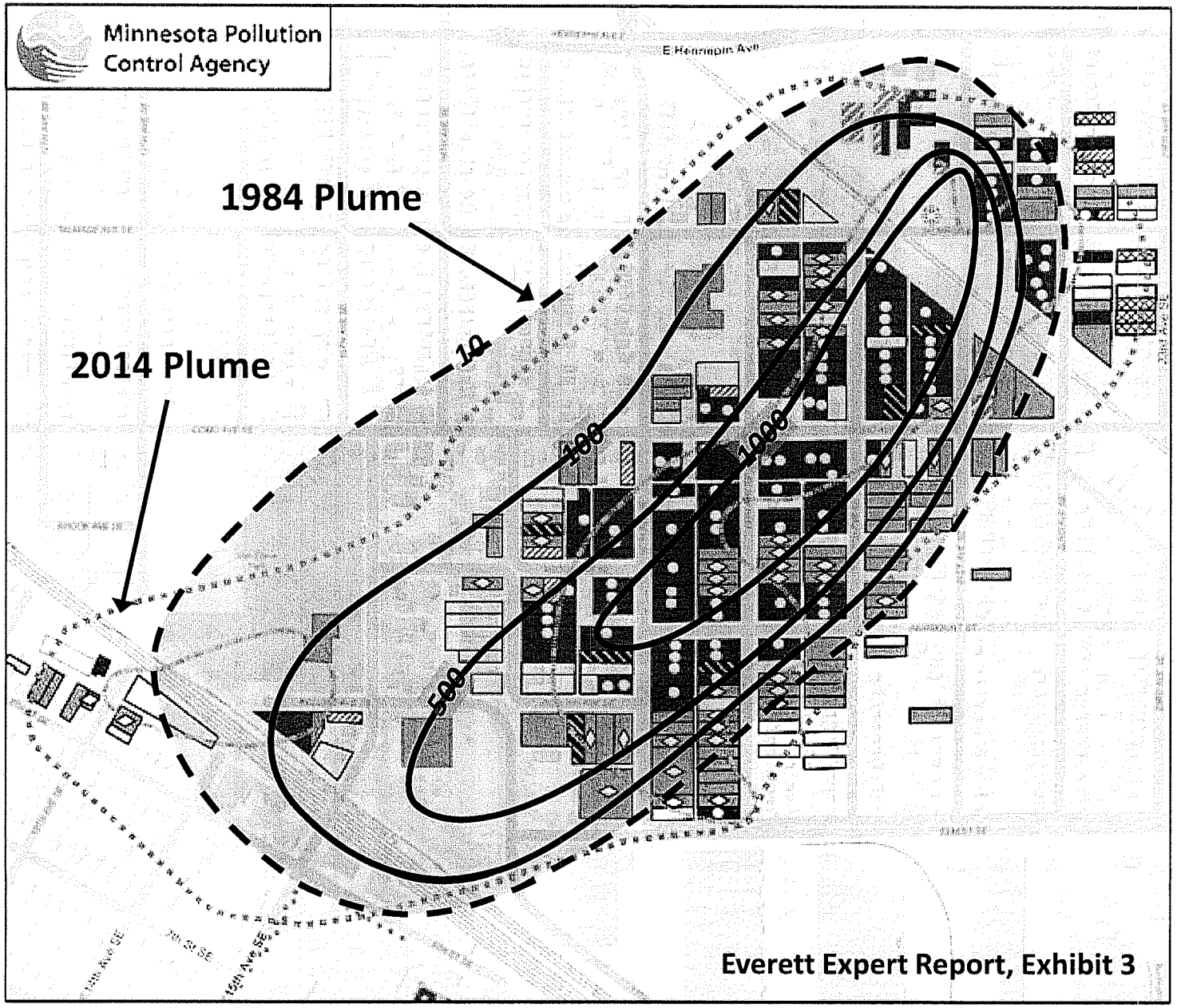
	Water El. (MSL) March 28, 1984	Sum of Volatile Organic Concentrations (µg/L)
Q	832.1	56
R	829.2	740
S	831.2	850
T	833.9	<1
U	838.9	1.3
V	818.1	100
W	818.3	11
X	829.0	2.2
Y	821.2	BMDL
Z	810.0	BMDL
Storm Sewer 15th Ave. & BNRR	816	6.4

BMDL means below detection limit

Figure 1

SHALLOW GLACIAL DRIFT AQUIFER LEVELS & QUALITY

General Mills/Henkel Corp. Superfund Site Study Area Sampling Status



General Mills/Henkel Corp. Superfund Site historic disposal area

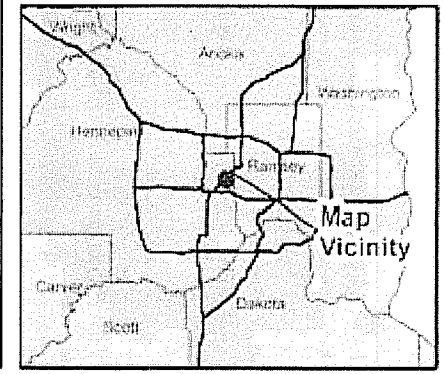
Vapor Study Area

Approximate Groundwater TCE Plume

Sub-slab Vapor Sampling Status

denied	*Sampling access agreement denied**
signed	*Sampling access agreement signed but not scheduled**
scheduled	*Sampling event scheduled**
complete	*Sampling event complete Results not yet available**
No mitigation required	*Sampling event complete Results less than 2 ug/m3 in first event or less than 20 ug/m3 in second event**
No mitigation required	*Sampling event complete Commercial/Industrial results less than 60 ug/m3*
Will Receive a second sampling event	*Sampling event complete Results 2 - 20 ug/m3* in first event sample*
Mitigation needed	*Sampling event complete Ventilation system needed*
	*Ventilation system installed or scheduled**
	First sample was 2-20 ug/m3 Second sample completed

*Sampling status current as of March 6, 2014, 6 AM.



Former Disposal Site

Glacial Drift Well

Glacial Drift Pump-Out Well

Water Surface Contour

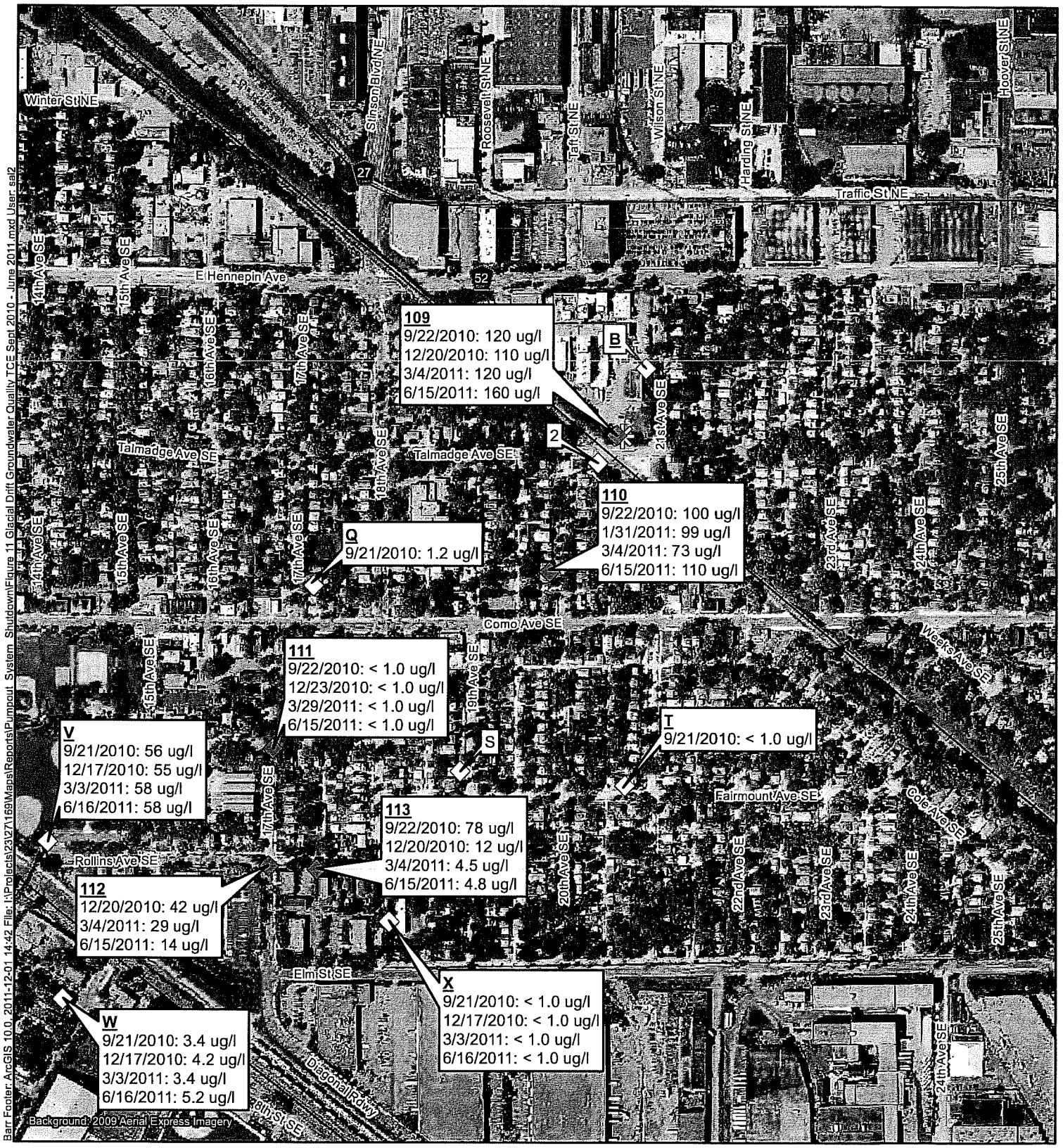
0 250 500 1,000

Feet

Figure 4b

GLACIAL DRIFT AQUIFER
WATER TABLE ELEVATIONS
JUNE 15, 2011
East Hennepin Avenue Site
Minneapolis, Minnesota

Everett Expert Report, Exhibit 4



Barr Footer: ArcGIS 10.0, 2011-12-01 14:42 File: I:\Projects\23\27169\Maps\Reports\Pumpout System Shutdown\Figure 11 Glacial Drift Groundwater Quality TCE Sept 2010 - June 2011.mxd User: sal2

Former Disposal Site

Glacial Drift Well

Site and Downgradient Glacial Drift Pump-Out Well

Note: Well 112 not sampled in September 2010 due to non-operational pump.

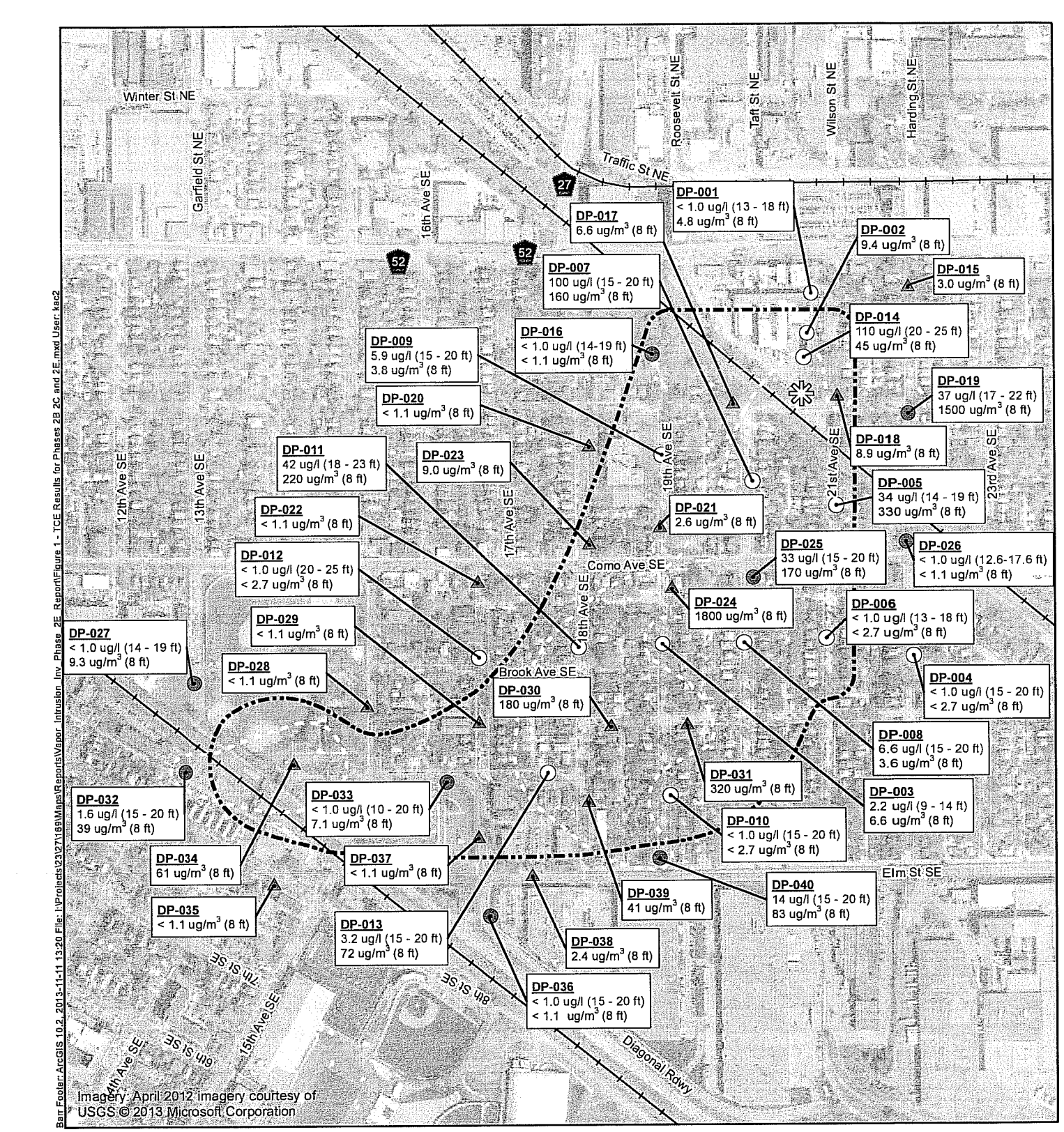
0 250 500 1,000

Feet

Figure 11

GLACIAL DRIFT GROUNDWATER QUALITY (TCE) - SEPTEMBER 2010 THROUGH JUNE 2011
East Hennepin Avenue Site
Minneapolis, Minnesota

Everett Expert Report, Exhibit 5



Barr Footer: ArcGIS 10.2, 2013-11-11 13:20 File: I:\Projects\23\27\189\Maps\Reports\Vapor Intrusion Inv Phase 2E Report\Figure 1 - TCE Results for Phases 2B 2C and 2E.mxd User: kac2

Former Disposal Site

Groundwater and Soil Gas Monitoring Point (Phase 2E)

Soil Gas Monitoring Point (Phase 2E)

Groundwater and/or Soil Gas Monitoring Point (Phase 2B and Phase 2C)

Soil Gas Concentration > 20.0 ug/m³ at 8 ft bgs

Original Study Area - 100-foot Setback from TCE Concentrations >20 ug/L (GW ISV) in Glacial Drift Monitoring Wells (2011)

Sample ID
TCE in groundwater (sampling interval)
TCE in soil gas at 8 ft

550 0 550
Feet

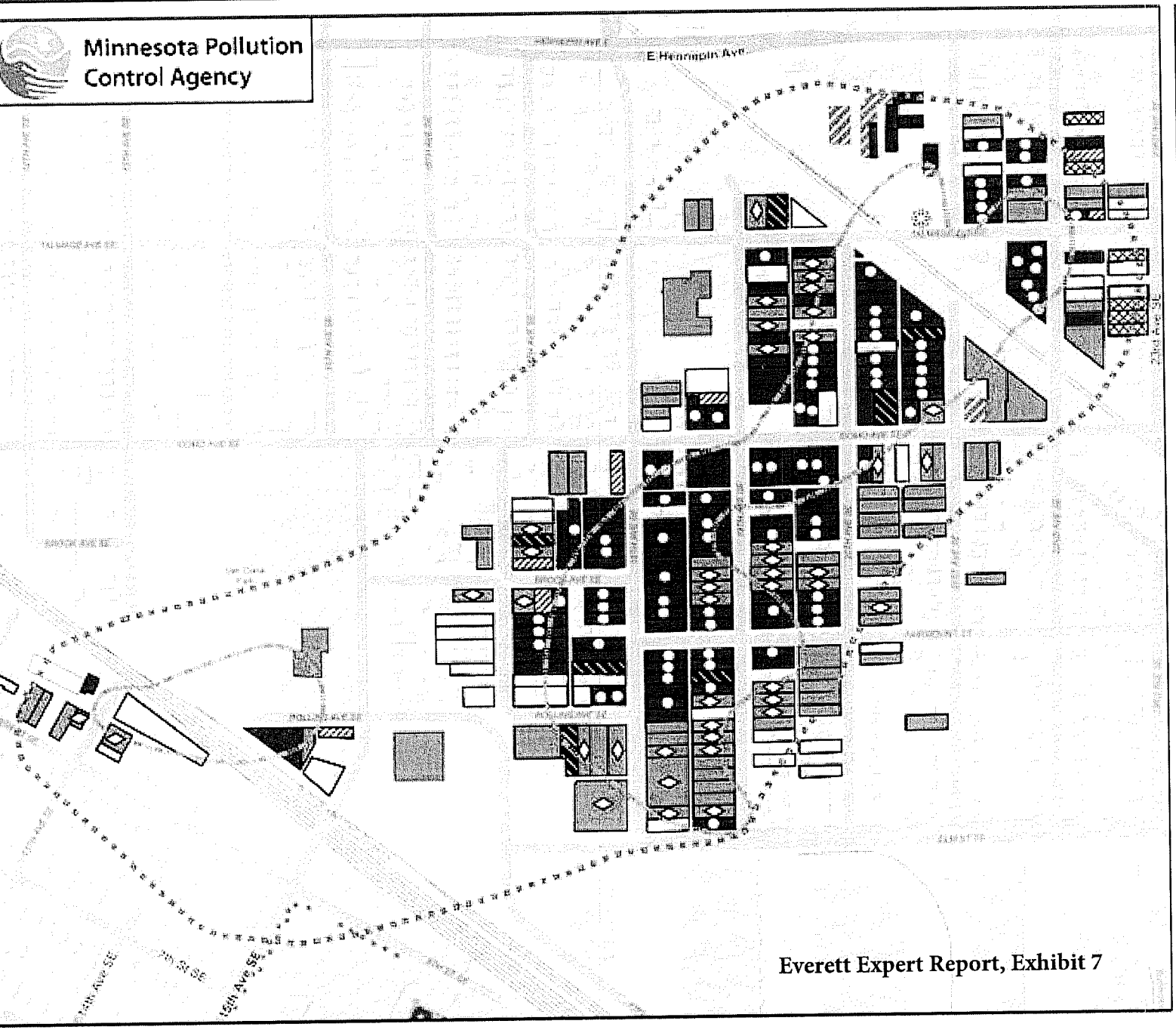
Figure 1

SOIL GAS AND GROUNDWATER TCE RESULTS - PHASES 2B, 2C, AND 2E
Vapor Intrusion Evaluation
East Hennepin Avenue Site
Minneapolis, Minnesota

Everett Expert Report, Exhibit 6

General Mills/Henkel Corp. Superfund Site Study Area Sampling Status

Minnesota Pollution Control Agency



General Mills/Henkel Corp. Superfund Site historic disposal area

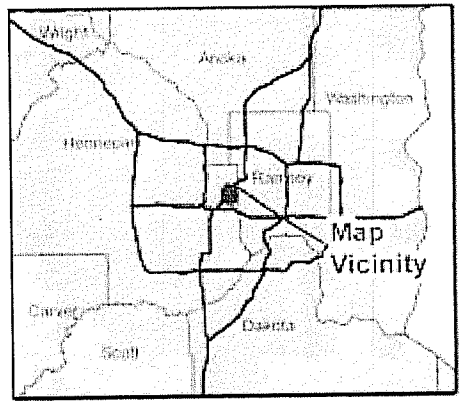
Vapor Study Area

Approximate Groundwater TCE Plume

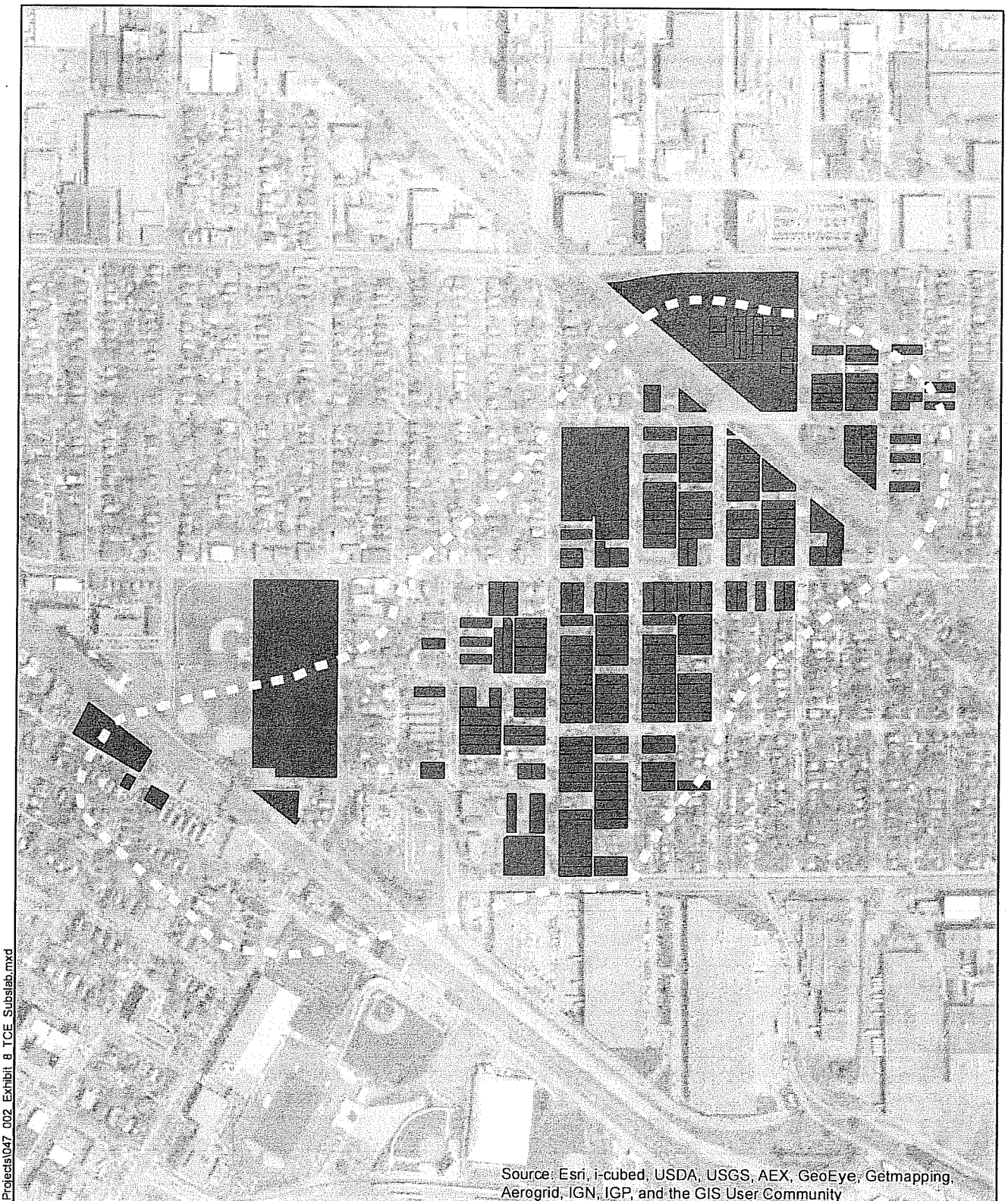
Sub-slab Vapor Sampling Status

denied	*Sampling access agreement denied**
signed	*Sampling access agreement signed but not scheduled**
scheduled	*Sampling event scheduled**
complete	*Sampling event complete Results not yet available**
No mitigation required	*Sampling event complete Results less than 2 ug/m3 in first event or less than 20 ug/m3 in second event**
No mitigation required	*Sampling event complete Commercial/Industrial results less than 60 ug/m3*
Will Receive a second sampling event	*Sampling event complete Results 2 - 20 ug/m3* in first event sample*
Mitigation needed	*Sampling event complete Ventilation system needed.*
	*Ventilation system installed or scheduled**
	First sample was 2-20 ug/m3 Second sample completed

*Sampling status current as of March 6, 2014, 8 AM.



Everett Expert Report, Exhibit 7



Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

Legend

Approximate Groundwater TCE Plume (Proposed Class Area)

TCE Impacted Parcel (Based on data made available by MPCA through 2/26/2014)

N
W E
S

0 300 600
FEET

LE&A

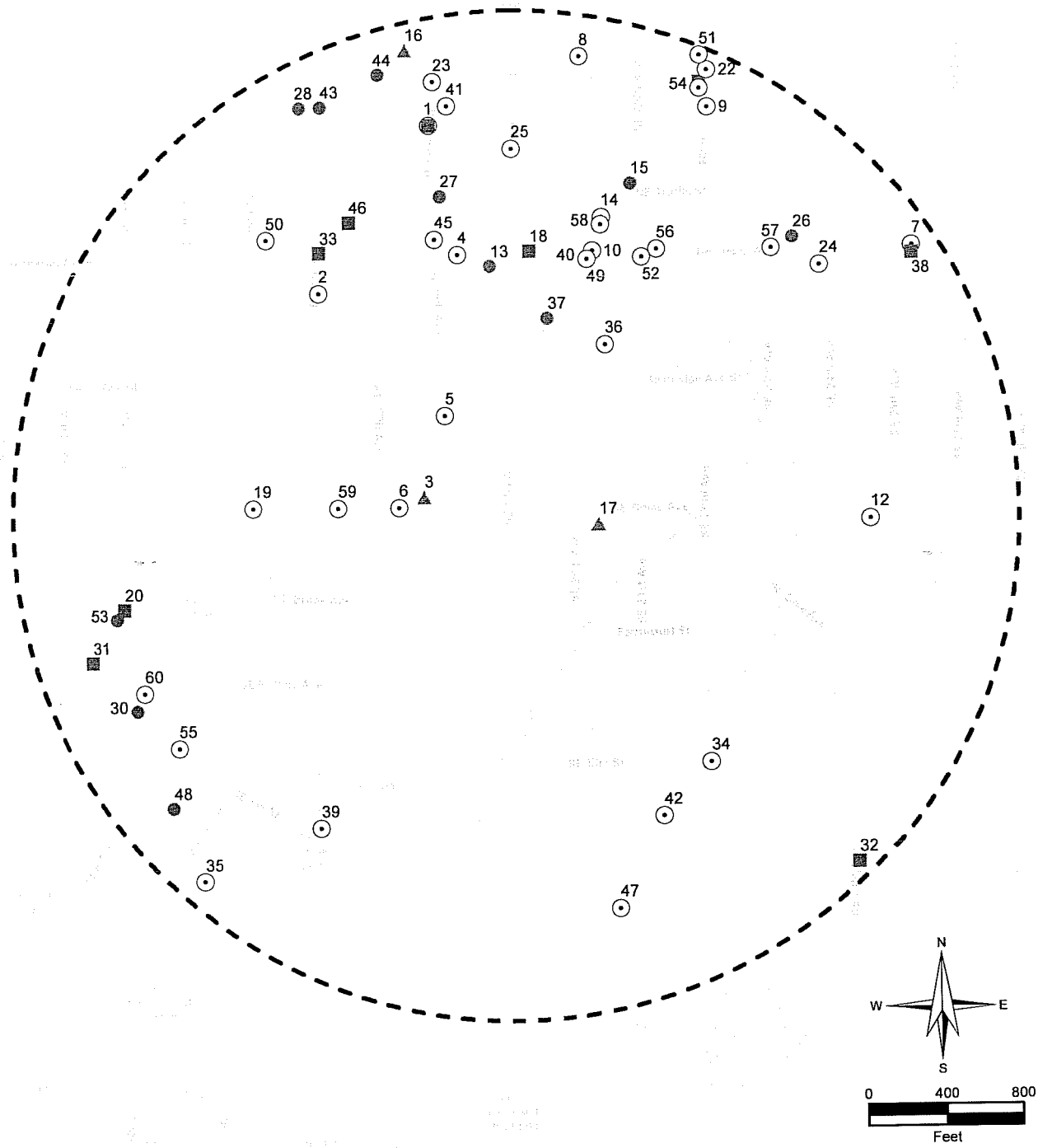
KARL EBERT AND CAROL KRAUZE, ET. AL. V. GENERAL MILLS, INC.
2010 E. HENNEPIN AVE.
MINNEAPOLIS, MN

TCE DETECTED IN SUBSLAB VAPOR SAMPLES

SCALE: AS SHOWN

EXHIBIT 8

S:\Projects\047_General_Mills\GIS\Map_Projects\047_002_Exhibit_8_TCE_Subslab.mxd



Legend

- Tank Site
- Leak Site
- Voluntary Investigation & Cleanup (VIC)
- Multiple Activities
- *Half-Mile Search Radius*
- Approximate Groundwater TCE Plume (Proposed Class Area)

Sources: Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, 2012

LE&A

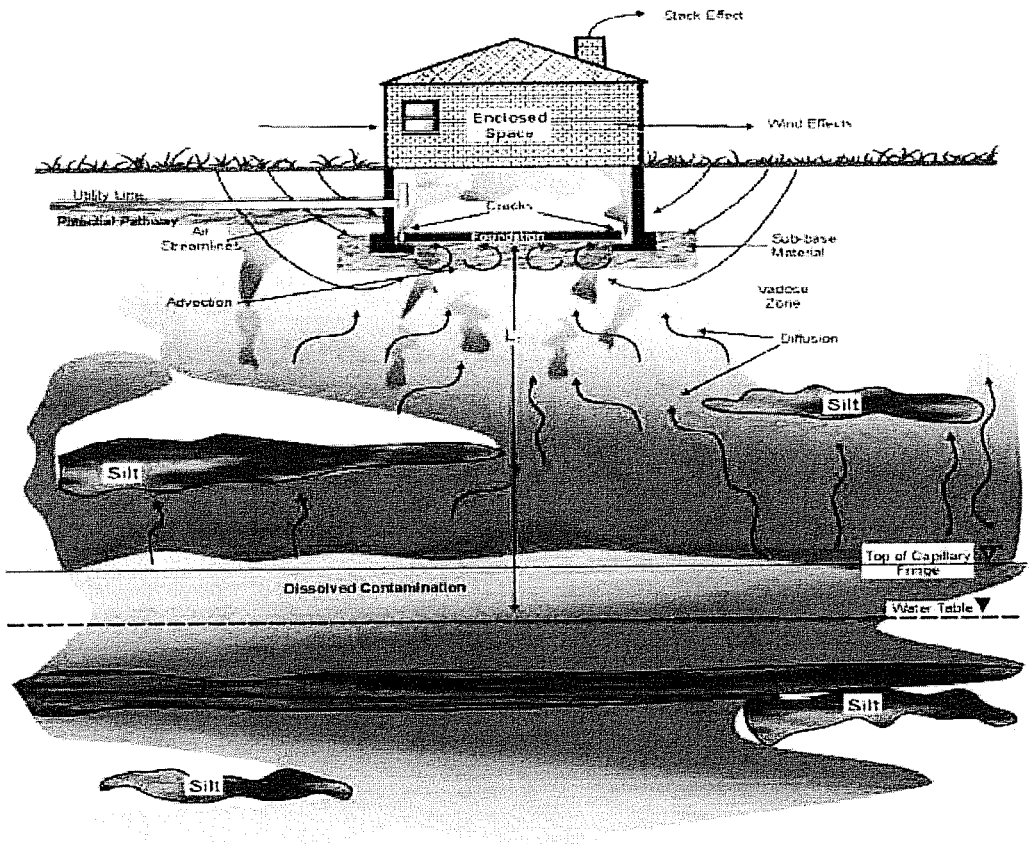
KARL EBERT AND CAROL KRAUZE, ET. AL. V. GENERAL MILLS, INC.
2010 E. HENNEPIN AVE.
MINNEAPOLIS, MN

MPCA CASES IN VICINITY OF PROPOSED CLASS AREA

SCALE: AS SHOWN

EXHIBIT 9

S:\Projects\047_General_Mills\GIS\Map_Projects\047_003_MPCA_Cases_Vicinity_Class_Area.mxd



Everett Expert Report Exhibit 10. An overview of vapor intrusion pathways and factors affecting indoor air concentrations. From: EPA, 2012, Fluctuation of Indoor Radon and VOC Concentrations Due to Seasonal Variations, EPA/600/R-12/673.

Table 1
MPCA Cases in Vicinity of Proposed Class Area

SITE ID	NAME	ADDRESS	AIR	HAZARDOUS WASTE GENERATOR	LEAK	TANK	STORM-WATER	VIC	CONCLUSIONS	REMARKS
1	400/500 Stinson Blvd	400 Stinson Blvd NE	√					√	Same property as Site 21. Related to possible petroleum impacts from tank described in Site 21.	Air Permit - 05301114; Voluntary Investigation & Cleanup (VIC) - VP26920, no association determination issued (3/2011), Environmental Investigation Report (2/2011), Phase I (1/2011)
2	Continental Loose Leaf - Mpls	1122 16th Ave SE	√	√			√		Operating permits only. No reported releases to soil or groundwater.	Air Permit - 05300853; Hazardous Waste, Small to Minimal QG - MNR000017988; Industrial Stormwater Permit - A00022857
3	Former Como Avenue Gas Station	1721 Como Ave SE			√				Petroleum-only site, no off-site contamination.	Leak Site - 17558, diesel leak, no off-site contamination
4	Skyway Event Services	1809 E Hennepin Ave	√	√					Operating permits only. No reported releases to soil or groundwater	Air Permit - 05301081; Hazardous Waste, Small to Minimal QG - MND000685990
5	Minneapolis Schools Tuttle	1042 18th Ave SE		√		√			Petroleum-only site. Operating permits only. No reported releases to soil or groundwater.	Hazardous Waste, Small to Minimal QG - MNR000022574; Tank Site - 2347, fuel oil underground tanks
6	Joe Baker Auto Service Inc	1733 Como Ave SE		√		√			Petroleum-only site. Operating permits only. No reported releases to soil or groundwater.	Hazardous Waste, Small to Minimal QG - MND151028370; Tank Site - 2439, used or waste oil, tanks removed
7	GO Fresh	2521 E Hennepin Ave		√			√		Operating permits only. No reported releases to soil or groundwater.	Hazardous Waste, Small to Minimal QG - MND022879696; Industrial Stormwater Permit - A00001063
8	Flexographic Technical Service	451 Taft St NE Ste 6		√			√		Operating permits only. No reported releases to soil or groundwater.	Hazardous Waste, Small to Minimal QG - MND985686682; Industrial Stormwater Permit - A00023316
9	Edgecomb Metals Corp	401 Harding St NE		√		√			Petroleum-only site. Operating permits only. No reported releases to soil or groundwater.	Hazardous Waste, Small to Minimal QG - MND985764703; Tank Site - 12806, fuel oil underground tanks, tanks removed
10	Osm & Associates	2021 E Hennepin Ave			√	√			Petroleum-only site. Operating permits only. No reported releases to soil or groundwater.	Leak Site - 5026, fuel oil 1 & 2, site closed; Tank Site - 16036, fuel oil underground tank
11	Stan Koch & Sons Trucking Inc	424 Harding St NE				√			Petroleum-only site. Operating permits only. No reported releases to soil or groundwater.	Tank Site - 1736, used or waste oil, motor oil, diesel, above ground and above ground tanks, active
12	Mannings Service	2404 Como Ave SE		√	√	√			Petroleum-only site, no off-site contamination.	Hazardous Waste, Small to Minimal QG - MND022917389; Leak Site - 17241, gasoline, no off-site contamination; Tank Site - 3059, gasoline and used or waste oil, tanks removed
13	Union Carbide	1809 Hennepin Ave						√	Residual metals contamination in soil. No TCE reported in groundwater. Case closed 10 years ago.	Voluntary Investigation & Cleanup (VIC) - VP1460, Limited no action letter sent (9/1991); Voluntary Investigation & Cleanup (VIC) - VP1461, no association determination issued (12/2002), no further action letter sent (10/2003 & 6/2004)
14	Glidden Paint	1901 E Hennepin Ave						√	Petroleum-only site. Operating permits only. No reported releases to soil or groundwater.	Superfund Project - SR92 - State Superfund project; Voluntary Investigation & Cleanup (VIC) - VP19200
15	Grothjan Site	1909-1917 Hennepin Ave E						√	Petroleum-only site. Determination by MPCA that groundwater contamination is from off-site source (Glidden).	Voluntary Investigation & Cleanup (VIC) - VP8110, Phase I (3/1997), no association determination issued (5/1997)
16	Flour City Packaging Co	2330 Kennedy St NE			√				Petroleum-only site, no groundwater contamination.	Leak Site - 13856, fuel oil 1 & 2 leak, no groundwater contamination, site closed
17	Giant Sequoia LLC Property	2008 Como Ave SE			√				Petroleum-only site, no groundwater contamination.	Leak Site - 17745, fuel oil 1 & 2 leak, no off-site contamination, no groundwater contamination, site closed

Table 1
MPCA Cases in Vicinity of Proposed Class Area

SITE ID	NAME	ADDRESS	AIR	HAZARDOUS WASTE GENERATOR	LEAK	TANK	STORM-WATER	VIC	CONCLUSIONS	REMARKS
18	The Glidden Co	1901 E Hennepin Ave				√			Tank permit. Same property as Site 14.	Tank Site - 123897, fuel oil, chemical other or unspecified, underground tanks, removed
19	Como Imports Service	1501 Como Ave SE		√		√			Petroleum site	Hazardous Waste, Small to Minimal QG - MND071757785; Tank Site - 122945, used or waste oil
20	Van Cleve Old Bunge Grain Elevator	917 13th Ave SE				√			Petroleum site	Tank Site - 124737, petroleum other, underground tank, removed
21	400 Stinson Office Building	400 Stinson Blvd NE				√			Petroleum-only site	Tank Site - 123910, fuel oil above ground tanks, active
22	Federal Abrasive Products Company	437 Harding St NE			√		√		Petroleum site, no off-site contamination	Industrial Stormwater Permit - 087254215; Leak Site - 6169, fuel oil 1 & 2, no off-site contamination
23	Flour City Packaging Corp	500 Stinson Blvd	√	√		√			Petroleum site	Air Permit - 05300866; Hazardous Waste, Small to Minimal QG - MND006477855; Tank Site - 123909, fuel oil, above ground tank, tank abandoned
24	Franks Auto Repair	2314 E Hennepin Ave			√				Petroleum site, no off-site contamination	Leak Site - 17726, fuel oil 1 & 2, no off-site contamination, site closed
25	Gopher Pattern Works Inc	422 Roosevelt St NE		√			√	√	Onsite data from GMI Glacial Drift Aquifer Well #1 shows no significant TCE entering site from upgradient.	Hazardous Waste, Small to Minimal QG - MND985696145; Industrial Stormwater Permit - MNRNE33QL; Voluntary Investigation & Cleanup (VIC) - VP26900, no association determination issued (3/2011), Phase I Environmental Site Assessment (1/2011), Environmental Investigation Report (2/2011)
26	Office/Warehouse - Traffic St.	2301 Traffic St						√	Onsite data from GMI Glacial Drift Aquifer Well #1 shows no significant TCE entering site from upgradient.	Voluntary Investigation & Cleanup (VIC) - VP27480, Phase I environmental site assessment (2011), Phase II subsurface site assessment (2011), no association determination issued (2011)
27	340 Stinson Blvd	340 Stinson Blvd						√	Site located cross-gradient to proposed Class Area and chlorinated hydrocarbons have not been detected in soils.	Voluntary Investigation & Cleanup (VIC) - VP8870, Phase I & Phase II (8/1997), Additional Assessment (8/1998), Retroactive No Association Determination Issued (10/1998); Voluntary Investigation & Cleanup (VIC) - VP8871, Phase I & Phase II (8/1997), Additional Assessment (8/1998), No Association Determination Issued (2/1999); Voluntary Investigation & Cleanup (VIC) - VP8872, Phase I (10/2001), Phase II (10/2001), No Association Determination Issued (6/1999 & 3/2002)
28	BNSF	1170 16th Ave SE						√	Site located cross-gradient to proposed Class Area and chlorinated hydrocarbons have not been detected in soils.	Voluntary Investigation & Cleanup (VIC) - VP10801, No Association Determination Issued (1/1999); Voluntary Investigation & Cleanup (VIC) - VP10802, Historical Review & Phase II Environmental Assessment (10/1998), No Association Determination Issued (6/1999); Voluntary Investigation & Cleanup (VIC) - VP10800, Historical Review & Phase II Environmental Assessment (10/1998), No Association Determination Issued (1/1999)
29	UIP - Phase III	See location description						√	Metals site.	Voluntary Investigation & Cleanup (VIC) - VP5812, Additional Phase II Environmental Site Assessment (1995), Lead Impacted Soil Response Action Plan (1996), Response Action Implementation for Lead Impacted Soil (1997), No Association Determination Issued (1998)
30	PPL Green Space LLC	See location description						√	Site located at downgradient edge of plume and soil contaminated with diesel range organics.	Voluntary Investigation & Cleanup (VIC) - VP25000, Response Action Plan Implementation Report (11/2009), Affidavit of Real Property Contaminated with Hazardous Substances (4/2010), No Association Determination Issued (10/2008), No Further Action Letter Sent (2/2010)
31	Apartment Building	815 13th Ave SE				√			Petroleum-only site.	Tank Site - 3233, fuel oil, underground tank, removed
32	Firestone Tire Center	740 24th Ave SE				√			Petroleum-only site.	Tank Site - 2883, diesel, underground tank, removed
33	Montgomery Elevator	1607 E Hennepin Ave S				√			Site located at downgradient edge of plume.	Tank Site - 52672, other substance, above ground tank, active
34	Padco Inc	2220 Elm St SE		√		√			Petroleum-only site.	Hazardous Waste, Small to Minimal QG - MND047252044; Tank Site - 124752, used or waste oil, antifreeze, above ground tanks
35	Bierman Field Athletic Building	516 15th Ave SE			√	√			Petroleum-only site, no off-site contamination.	Leak Site - 8317, fuel oil 1 & 2, no off-site contamination, site closed; Tank Site - 3179, fuel oil, underground tank, removed
36	General Mills	2010 E Hennepin Ave							SITE	CERCLIS Site - MND051441731; Superfund Project - SR3 - Federal and State Superfund project

Table 1
MPCA Cases in Vicinity of Proposed Class Area

SITE ID	NAME	ADDRESS	AIR	HAZARDOUS WASTE GENERATOR	LEAK	TANK	STORM-WATER	VIC	CONCLUSIONS	REMARKS
37	A1N0190 - SE 18th Street	2010 East Hennepin Ave						√	Permits related to cellphone tower at former General Mills Facility. No releases.	Voluntary Investigation & Cleanup (VIC) - VP25380, Limited Phase II Subsurface Site Assessment (11/2008), Soil Management Plan (4/2009), Implementation Report-Leak #00017545/VP25380, Telecommunications Tower and Equipment Installation (11/2009), Implementation Report Approval Letter (11/2009), No Association Determination Issued (4/2009)
38	Midwest Quick Print Sytems	2520 E Hennepin Ave				√			Petroleum-only site.	Tank Site - 2891, fuel oil, underground tank, removed
39	North Star Specialities	800 16th Ave SE		√		√		√	Located south and downgradient of proposed class area, petroleum-only site.	Hazardous Waste, Small to Minimal QG - MNR000029280; Voluntary Investigation & Cleanup (VIC) - VP13930, Phase I & II reports (12/2000); Voluntary Investigation & Cleanup (VIC) - VP13931, Phase I (9/2005), Phase II (12/2000), no association determination (12/2005); Petroleum Brownfield - 3284, no details available; Tank Site - 19527, other substance, underground tank, removed
40	Vitasyn	2010 E Hennepin Ave Ste 202		√					Operating permit for tenant at former General Mills Facility. No reported releases to soil or groundwater.	Hazardous Waste, Small to Minimal QG - MND051441731; RCRA Cleanup - MND051441731, Zytron Ltd Labs, groundwater releases controlled determination (9/2010), human exposure controlled (9/2010), corrective action process terminated (8/2006)
41	Rayvic Stinson	451 Stinson Blvd		√	√	√			Petroleum-only site.	Hazardous Waste, Small to Minimal QG - MND982205619; Leak Site - 16059, waste oil, site closed (2005); Leak Site - 7862, gasoline, no off-site contamination, site closed (1997); Tank Site - 1534, gasoline, diesel, used or waste oil, underground tanks, removed
42	Mackay Mitchell Envelope Co	2100 Elm St SE	√	√		√	√		Located south and downgradient of proposed Class Area.	Air Permit - 05301104; Hazardous Waste, Small to Minimal QG - MND006256317; Industrial Stormwater Permit - MNR0535TJ; Tank Site - 121793, other substance, above ground tanks, active
43	332 Stinson Blvd NE	332 Stinson Blvd NE						√	Site located cross-gradient to proposed Class Area and chlorinated hydrocarbons have not been detected in soils.	Voluntary Investigation & Cleanup (VIC) - VP21430, Phase I and Phase II Environmental Site Assessment (1997), Additional Subsurface Assessment Results (1998), Phase I Environmental Site Assessment (2005), No Association Determination Issued (2005); Voluntary Investigation & Cleanup (VIC) - VP21431, Phase I Environmental Site Assessment (1/2011), Environmental Investigation Report (2/2011), No Association Determination Issued (3/2011)
44	RR Right-Of-Way	See location description						√	Site located cross-gradient to proposed Class Area.	Voluntary Investigation & Cleanup (VIC) - VP11190, Railroad Right-of-Way, Phase I Environmental Site Assessment (1998), Phase II Environmental Site Assessment(1/1999), No Association Determination Issued (2/1999)
45	Fairview Data Center	323 Stinson Blvd	√			√	√	√	Petroleum-only site.	Air Permit - 05301222; Construction Stormwater Permit - C00025590; Voluntary Investigation & Cleanup (VIC) - VP26910, Phase I (2011), EIR (2011), Environmental Investigation Report (2/2011), Phase I (1/2011), no association determination issued (3/2011); Tank Site - 123908, diesel, above ground, removed; Tank Site - 124890, diesel, underground tanks
46	Quality Park Products	1621 E Hennepin				√			Petroleum-only site.	Tank Site - 1648, fuel oil, underground tank, active
47	CNW East Minneapolis Yard	2000 Elm St				√		√	Located south and downgradient of proposed Class Area, metals and petroleum site.	Voluntary Investigation & Cleanup (VIC) - VP5810, railroad site, Response Action Implementation for Lead Impacted Soil (1/1997); Voluntary Investigation & Cleanup (VIC) - VP5811, railroad site, Removal Action (9/1996), Phase II Approval Letter (1/1998); Tank Site - 52924, fuel oil, above ground tanks, removed; Tank Site - 123099, diesel, above ground tank
48	15th Avenue Student Housing	See location description						√	Site located at downgradient edge of plume and chlorinated hydrocarbons have not been detected in soil.	Voluntary Investigation & Cleanup (VIC) - VP30330, Student Housing, Phase I (4/2013), Phase II (5/2013), No Association Determination Issued (8/2013)
49	CFM Chemical	2010 E Hennepin Ave		√			√		Operating permits for tenant at former General Mills Facility. No reported releases to soil or groundwater.	Hazardous Waste, Small to Minimal QG - MNS000121228; Industrial Stormwater Permit - 626231971

Table 1
MPCA Cases in Vicinity of Proposed Class Area

SITE ID	NAME	ADDRESS	AIR	HAZARDOUS WASTE GENERATOR	LEAK	TANK	STORM-WATER	VIC	CONCLUSIONS	REMARKS
50	Rayvic Service Station	1501 E Hennepin Ave			√	√			Petroleum-only site, no off-site contamination.	Leak Site - 2490, diesel, no off-site contamination, site closed (1990); Leak Site - 17274, hydraulic fluid, site closed (2008); Tank Site - 1535, diesel, gasoline, used or waste oil, underground tanks, removed
51	Stan Koch & Sons Trucking Inc	450 Harding St NE			√		√		Petroleum-only site.	Industrial Stormwater Permit - MNR0537G9; Leak Site - 11953, used oil, site closed (1999)
52	East Hennepin Auto Service Inc	2100 E Hennepin Ave		√	√	√			Petroleum-only site, no off-site contamination.	Hazardous Waste, Small to Minimal QG - MND981534647; Leak Site - 2477, gasoline, no off-site contamination, site closed (1997); Tank Site - 3054, gasoline, diesel, used or waste oil, some tanks active and others removed
53	Van Cleve Court	See location description						√	Determination by MPCA that groundwater contamination originates off-site.	Voluntary Investigation & Cleanup (VIC) - VP21380, Phase I (2005), Phase II (3/2006), No Association Determination Issued (5/2006), Remedial Action (12/2007), VRAP Implementation Report (3/2008), No Further Action Letter Sent (5/2008)
54	D. R. Tool and Die Company	418/424 Harding Street Northeast						√	Petroleum-only site.	Voluntary Investigation & Cleanup (VIC) - VP22350, Phase II (2007), no other information; Petroleum Brownfield - 3642, under "Action" listed as "Closure" and status is "Inactive"
55	Gorshe Auto Service	800 14th Ave SE		√	√	√			Petroleum-only site, no off-site contamination.	Hazardous Waste, Small to Minimal QG - MND982204828; Leak Site - 13416, used oil, no off-site contamination, site closed (2003); Tank Site - 119723, used or waste oil, above ground (active) and underground (removed) tanks
56	Ymca	2125 E Hennepin Ave			√	√			Petroleum-only site.	Leak Site - 15701, fuel oil 1 & 2, no off-site contamination, site closed (2004); Tank Site - 123577, fuel oil, underground tank, removed
57	Dolan Dan Printing Inc	2301 E Hennepin Ave		√			√		Operating permits only. No reported releases to soil or groundwater.	Hazardous Waste, Small to Minimal QG - MND982204828; Industrial Stormwater Permit - MNRNE33FM
58	Hennepin Square	2021 E Hennepin Ave		√				√	Site received a no action letter in 1977. Site is not consider a source or significant source.	Hazardous Waste, Small to Minimal QG - MND985696772; Voluntary Investigation & Cleanup (VIC) - VP6700, no association determination issued (1997), no action letter sent (1997)
59	University Service Inc	1625 Como Ave SE		√	√	√			Petroleum site, no off-site contamination.	Hazardous Waste, Small to Minimal QG - MND059044727; Leak Site - 5327, gasoline, no off-site contamination, site closed (1994); Tank Site - 12692, gasoline, used or waste oil, E10 gasoline, fuel oil, underground tanks, some active and some removed tanks
60	Postcardbuilder	815 14th Ave SE		√				√	Site located at downgradient edge of plume and chlorinated hydrocarbons have not been detected in soil.	Hazardous Waste, Small to Minimal QG - MNR000008326; Voluntary Investigation & Cleanup (VIC) - VP30090, no association determination issued (9/2013), Phase I (3/2013), Phase II (4/2013), Remedial Action (12/2013), "Limited" no action letter sent (1/2014)

NOTES

AIR - facility generates air pollutants during operation of its business.

HAZARDOUS WASTE GENERATOR - small to minimal quantity (0 - 100 kilograms) of hazardous waste generated per calendar month.

LEAK - site where a release of petroleum products has occurred from a tank system.

STORMWATER - site issued a construction or industrial stormwater permit because stormwater may carry sediments or pollutants.

TANK - site with an underground or aboveground storage tank of a certain size on the premises.

VIC - Voluntary Investigation and Cleanup site.

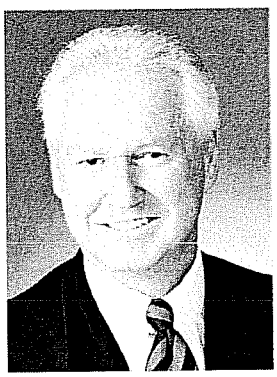
Attachment A

Resume of Lorne G. Everett, PhD, DSc

L. EVERETT & ASSOCIATES
ENVIRONMENTAL CONSULTANTS

LORNE G. EVERETT, Ph.D., D.SC., F.ASCE

President/CEO



Over 40 years experience in site characterization and remediation of soils and groundwater

L. Everett & Associates, LLC
3700 State Street, Suite 350
Santa Barbara, CA 93105
Phone: (805) 880-9300
e-mail:
leverett@everettassociates.net

Education

Ph.D., Univ. of Arizona, Hydrology, 1972
M.S. Univ. of Arizona, Limnology 1969
B.Sc., (Honors) Lakehead University, 1968
B.Sc., Lakehead University, 1966
Doctor of Science (Honoris Causa), Canada, 1996
Chancellor, Lakehead University, Ontario,
Canada, 2000-2009

Professional Registrations

Certified Groundwater Professional-AGWSE (Reg. #293)
American Society of Civil Engineers – M.ASCE 36724
Director, Vadose Zone Monitoring Laboratory, University of CA at Santa Barbara
Full Research Professor, University of California
GET, Rocky Flats, DOE
Member, Russian Academy of Sciences-No. 300-H3
NIOSH/OSHA/USGS/EPA Hazardous Waste Certified
Nuclear Regulatory Commission-Isotope Experimental Work, AR12, AEC, 10-24
RAD, Rocky Flats, DOE
Registered Laboratory Chemist
Registered Nuclear Soil Moisture and Density Gauges
Registered Professional Groundwater Hydrologist-AIH (Reg. #836)
Registered Professional Hydrologist-AIH (Reg #164)
ASTM-Fellow
AWRA-Fellow

Dr. Lorne G. Everett is the President and CEO of L. Everett & Associates. He is also a retired Professional Researcher in the Bren School of Environmental Science & Management at the University of California at Santa Barbara (UCSB) (Level VII) and a Past Director of the Vadose Zone Monitoring Laboratory at UCSB. The University of California describes full professor Level VII as "reserved for scholars of great distinction". He has a Ph.D. in Hydrology from the University of Arizona in Tucson and is a member of the Russian Academy of Natural Sciences. In 1996, he received a Doctor of Science Degree (Honoris Causa) from Lakehead University in Canada for Distinguished Achievement in Hydrology. Dr. Everett was the 6th Chancellor of Lakehead University in Canada from 2000-2009.

He is an internationally recognized expert who has conducted extensive research on subsurface characterization and remediation. He is Chairman of the ASTM Task Committee on Groundwater and Vadose Zone Monitoring (D18.21.02). He also chaired the Remediation Session of the First USSR/USA Conference on Environmental Hydrogeology (Leningrad, 1990). Dr. Everett has received numerous awards, published over 150 technical papers, holds several patents, developed 11 national ASTM Vadose Zone Monitoring standards and authored several books including: *Vadose Zone Monitoring for Hazardous Waste Sites, and Subsurface Migration of Hazardous Waste.* His book entitled *Handbook of Vadose Zone Characterization and Monitoring* is a "best seller". His book entitled *Groundwater Monitoring* was endorsed by the Environmental Protection Agency (EPA) as establishing "the state-of-the-art used by industry today" and is recommended by the World Health Organization for all developing countries.

Awards Dr. Everett has received include: the Ivan A. Johnston Award for Outstanding Contributions to hydrogeology (1997), the Kapitsa Gold Medal-the highest award given by the Russian Academy for original contributions to science (1999), the Medal of Excellence from the U.S. Navy and the Award of Merit-the highest award given by the American Society for Testing and Materials (ASTM) International (2000), the C. V. Theis Award-the highest award given by the American Institute of Hydrology for major contributions to groundwater hydrology (2002) and the Canadian Golden Jubilee Medal for "Significant Contributions to Canada" (2003).

Dr. Everett is editor of the Ann Arbor Press book series entitled *Professional Groundwater and Hazardous Waste Science Series.* He is co-editor of the Journal for Environmental Restoration Professionals entitled *Remediation Management* and co-editor of the *World Groundwater Map* published by United Nations Educational, Scientific and Cultural Organization (UNESCO).

Dr. Everett has made presentations before Congress on different occasions and participates on Blue Ribbon Peer Review panels for most Department of Energy (DOE) installations. He is a member of the UC/LLNL Petroleum Hydrocarbon Panel, the DOE/EPA Volatile Organic Compound (VOC) Expert Committee, the Interagency Dense Non-aqueous Phase Liquid (DNAPL) Consortium Science Advisory Board and a Scientific Advisor to the U.S. Navy's National Hydrocarbon Test Site Program. Dr Everett is a member of the DOE Executive Panel for both the Vadose Zone S & T Roadmap and the Long-Term Stewardship Roadmap.

Dr. Everett is an expert witness with an established track record in over 60 court cases involving over $2 billion dollars.

Professional Registrations, cont.

California Registered Environmental Assessor, Class 1-05268
California Registered Environmental Assessor II (Reg. #20240)
International Association of Hydrogeologists #89524

Professional Societies

American Academy of Environmental Engineers
American Institute of Professional Hydrologists
American Medical Laboratory Association
American Society of Civil Engineers
American Society for Testing and Materials
American Water Resources Association
Association of Ground Water Scientists and Engineers
International Water Resources Association
National Association of Underwater Instructors
National Ground Water Association
Russian Academy of Sciences
Science and Engineering Council (President and Chairman of the Board, 1983-1984)
UNESCO-IHP, France

Security Clearances

Secret DOD Clearance – Expired
Security Clearance Contractor – US Navy - Expired
Security Clearance Contractor – US DOE – Expired
FBI Secret Clearance – Renewal Approved

"Blue Ribbon" DOE Peer-Review Panels

Dr. Everett has served under contract as a remediation "peer reviewer" at the following Department of Energy Sites:

Oak Ridge National Lab
Interagency DNAPL Consortium
DOE Vadose Zone Steering Committee
DOE CMST CP Annual Peer Reviewer
DOE International Conference Advisor, 1999
OCUZ Review Working Group, INEEL, September 1997
Yucca Mountain, Nevada
Brookhaven National Lab, NY
Lawrence Livermore National Lab, CA
Hanford, Washington
Savannah River, Georgia
Rocky Flats, Colorado
Idaho National Engineering Lab, Idaho
Fernald, Ohio
Barrier Program, Washington D.C.
ASTM D18.21.02

National Meetings Chaired by Dr. Everett

1992 Jan. 26-31 New Orleans June 14-19 Louisville
1993 Jan. 17-22 San Antonio June 20-25 Atlanta
1994 Jan. 23-28 San Francisco June 19-24 Montreal
1995 Jan. 22-27 Phoenix June 18-23 Denver
1996 Jan. 28-31 Atlanta June 16-19 Orlando
2005 Jan 23-26 Atlanta June 12-15 Reno
2006 Feb 5-9 Phoenix June 11-15 Toronto
2007 Jan. 28-31 Anaheim June 24-17 Norfolk
2008 Jan 29 Tampa

In addition to the two ASTM standards awards mentioned earlier, Dr. Everett has been responsible for developing a number of new ASTM standards. Each one of these standards has to be approved unanimously by the 34,000 membership of ASTM. Each standard that has negative votes associated with it has to be technically argued by Dr. Everett to the satisfaction of the various ASTM committees. Some of his national standards have taken as much as six years to complete. Dr. Everett's standards include:

ASTM Vadose Zone Monitoring Standards

Test Method for Vadose Zone Borehole Flow Rate Capacity Test (Draft)

Contaminant Barrier Monitoring Standard (in development)

Environmental Decision Standard for Coastal Petroleum Facilities (in development)

Vadose Zone Terminology (Final)

Standard Guide for Soil Gas Monitoring in the Vadose Zone (D5314-92)

Practice For Passive Soil Gas Sampling in the Vadose Zone for Source Identification, Spatial Variability Assessment, Monitoring, and Vapor Intrusion Evaluations (D7758)

Practice for Active Soil Gas Sampling for Direct Push or Manual-Driven Hand-Sampling Equipment (WK23766)

Practice for Active Soil Gas Sampling in the Vadose Zone for Vapor Intrusion Evaluations (D7663)

Soil Pore-Liquid Monitoring (D 4696-92)

Soil Core Monitoring (D 4700-91)

Matric Potential Determination (D 3404-91)

Neutron Moderation (D 5220-92)

Flux Determination (Final)

Soil Gas Monitoring (D 5314-93)

Air Permeability Determination (Outline)

Hydraulic Conductivity (D 5126-90)

Field Screening (Final)

Soil Moisture Determination (Outline)

Thermalcouple Psychrometers (Outline)

Water Content Determination (Final)

Time Domain Reflectometry (Z6363z)

Frequency Domain Capacitance (Z4302z)

Horizontal Applications Of Neutron Moderation (Final)

Determining Unsaturated Hydraulic Conductivity In Porous Media By Open-Flow

Centrifugation (Z5651z)

Determination of Water (Moisture) Content of Soil & Rock (WK 14112)

Standard Guide for Active Soil Gas Sampling for Direct Push or Manual Driven Sampling Equipment (D 7648-12)

Standard Guide for Active Soil Gas Sampling in the Vadose Zone for Vapor Intrusion Evaluation (D 7663-12)

Standard Practice for Passive Soil Gas Sampling in the Vadose Zone for Source Identification, Spatial Variability, Monitoring, and Vapor Intrusion Evaluation (D 7758-11)

Standard Guide for Selection of Chemical Field Screening and Field Analytical Methods used in Vadose Zone Investigations (WK36302)

Standard Practice for Using Disposable Field Extraction Samplers for Sample Extraction and Storing Soil for Volatile Organic Analysis (WK37133)

Vadose Zone Borehole Flow Rate Capacity Test (Draft)

Dr. Everett has participated as an expert witness in over 100 million dollars in litigation. His participation in depositions, trial and litigation support are listed below. Because of Dr. Everett's extensive experience in measuring subsurface parameters based upon the work conducted in his Vadose Zone Monitoring Lab, he is highly sought after by trial attorneys to support hazardous waste litigation cases.

Professional Activities

Expert Witness

Depositions, Trial Appearances & Litigation Support in last four years:

2008-2013 Cindy Avila, et al., vs. CNH America, LLC, et al.

2009-2012 Picerne Military Housing, Inc. et al vs. American International Specialty Lines Insurance Company D

2009-2011 Susan and Patrick Stoll, Mary and Charles Bowles vs. Kraft Foods Global, Inc. D

2010 –2012 Remson et al vs. Verizon, et al D

2010-2013 KB Gardena Building, LLC vs. Whittaker Corporation, Brasscraft Manufacturing Co., Bog "B" Transportation, Alphonse Vanbastelaar

2010-2013 Hawker Pacific, Inc. vs. United States Environmental Protection Area 1 Superfund Site North Hollywood Operable Unit

2010-2012 Hinds Investments, L.P. and Thomas Hinds vs. Thu X. Hunyh and Ban T. Hunyh et al

2010-2012 Steadfast Insurance Company, et al. vs Terracon Consultants, Inc.et al. D

2011-2012 S. Beery & Tracy M. Johnson et al., vs. Prime Tanning Corp.et al. D

2011-201 Gerard DePascale, Liam Neville, and Joanne DePascale vs. Sylvania Electric Products Inc. et al. D T

2012-2013 Hescox-City of Colton v. American Promotional Events, Inc et al

2011-2013 Kathleen McHugh and Deanna Schneider, et al. vs. Madison-Kipp Corporation, et al.

2011-2013 Haskins vs. Cherokee

2012-present Blue Sky Condominiums Homeowners vs. VRC Development LLC, etc

2013-present Albin and Rainbow LLC v. Leu, et al.

2013 People of the State of CA vs International Chem. Systems, Inc.

2013-present Gavin Kirk et al. vs Varco International Inc, et al.

2013-present Enns Pontiac, Buick & GMC et al. vs Orelia Flores et al. D

2014-present Department of Toxic Substance Control vs Technichem Inc. et al.

Patents Held

U.S. Patent No. 5,272,910

UC Case No. 92-105

Wick Layer Enhanced Monitoring for Landfill Barriers

U.S. Patent No. (Pending Patent)

UC Case No. 90-077-1

Air Permeability Measurement Under Variable Capillary Pressures

U.S. Patent No. 4,754,136

Method of Detecting Underground Tank Leak

U.S. Patent No. 5,543,623

Method for Detecting and Mitigating Underground Organic Contamination

U.S. Patent No. 4,765,885

Method to Remove Bitumen from Tar Sands

U.S. Patent No. 4,891,131

Method to Use Sonication to Upgrade Crude Oil

U.S. Patent No. 5,017,281

Method to Separate Organic Matter from Solids

U.S. Patent No. (Pending Patent)

Serial No. 08/032,600

Soil Remediation

U.S. Patent No. (Pending Patent)

Serial No. 08/035,529

Surfactant Soil Remediation

Fields of Specialization

Vadose zone monitoring, instrumentation and remediation.

Soil moisture, LNAPL and DNAPL migration.

Regulatory guidance, training, expert witness and materials standards.

Methane Experience

For over 15 years Dr. Everett has been the Charter Chairman of The American Society for Testing and materials (ASTM) International's committee D18.21.02 dealing with vadose/soil zone monitoring. In this capacity, Dr. Everett has developed the only ASTM national soil gas/methane sampling standard in America. This standard is directly applicable to evaluating methane migration either from the water table or from vadose zone vegetation and contaminated soils. For 15 years, Dr. Everett was the Director of the Vadose/Soil Zone Monitoring Laboratory at the University of California where he focused on gas transport in the vadose zone. In particular, Dr. Everett was concerned with the migration of methane relative to its explosion liabilities. Dr. Everett has conducted numerous investigations associated with the presence of methane in response to contaminated groundwater and contamination sources in the vadose zone. Methane is often referred to as a swamp gas which indicates that can be naturally generated in response to dead and decaying organic matter. Dr. Everett has

been involved in characterizing sites for methane in terms of drilling technologies, pore liquid water sampling technologies, soil gas investigations, and has worked extensively on various remediation strategies for methane contamination sources. Dr, Everett has evaluated methane in terms of various kinds of fire and contamination insurance liability. He has studied the generation of methane from various source materials and is aware of the various forensic techniques to identify specific methane sources. Dr. Everett has conducted methane investigations relative to the anaerobic conditions and the oxidation reduction potential required to generate methane in addition to understanding the behavior of methanotropic bacteria which have a dramatic effect on the distribution of methane in the sub surface.

Pulp and Paper Mill Experience

Dr. Everett has had several years of first hand experience working in most areas associated with both a pulp and newsprint paper mill and high bleach finished paper plant. He is familiar with the waste stream associated with all aspects of the front and back end of paper making. In particular he has worked in the wood yard, grinding room, beater machines, binding machines, wet pulp end, dry end, finishing room, shipping room, and laboratory. Dr. Everett is familiar with the waste stream sampling protocols for both air and water. He has conducted wet chemistry tests on the majority of the effluence coming from pulp and paper mills. Further, he has conducted down gradient water surveys including both sampling protocols and analytical protocols for environmental impacts of pulp and paper mill operations.

PCB Experience

Dr. Everett has had extensive experience in the characterization and the selection of remediation technologies for PCB impacted sites. In trial he has been deposed in excess of 28 days on PCB sampling technologies. Further, he has extensively evaluated the characterization approaches and the pitfalls associated with PCB characterization. He has worked on the various groundwater filters used as a part of a PCB water sampling program. He has worked on developing water pumping rates and pump selection to be compatible with PCB sampling. PCB's are the proverbial "tar baby" and as such do not lend themselves to common decontamination procedures. Dr. Everett is familiar with the solubility and mobility issues associated with PCB's particularly in relation to PCB adsorption to colloids and the artificial agitation of colloids brought on by excessive pumping rates which results in artificially elevated PCB analytical results.

Short Courses and Professional Workshops

Participant in special training, the Los Angeles Soil Gas Forum held on March 4, 2008 at the Los Angeles Regional Water Quality Control Board, Carmel Room. The forum was lead by the DTSC and the Regional Board and focused on soil gas vapor intrusion issues.

The Devil is in the Details, paper presented in workshop No. 3 entitled "Remediation Retrospective: What can we Learn from Failed Remediation Efforts", presented at the Association for The Environmental Health and Sciences 18th Annual Meeting on Soils Sediments and Water, held March 11, 2208, San Diego, CA

Participant in Workshop No. 11 entitled "Specialty Seminar on US EPA/ITRC Vapor Intrusion guidance Update" held on March 13, 2008 as part of the 18th Annual AEHS meeting entitled "Soils, Sediments and Water", San Diego, CA, 2008

"Barrier Monitoring Strategies for Hazardous, Solid and Radioactive Waste", L.G. Everett, Ninth West Coast Conference on Contaminated Soils and Water, AEHS, Oxnard, California, March 8, 1999

"Summary, Critique, and Recommendations Nuclear Chemistry, Speciation, Safe End Transport of Radionuclieds in the Vadose Zone", Invited workshop, Warsaw 98 Symposium, Sept 14, 1998, Warsaw

"Technical and Regulatory Breakthroughs in Vadose Zone Hydrology", L.G. Everett, The Seventh West Coast Conference on Contaminated Soils and Groundwater, Association for the Environmental Health of Soils, Oxnard, California, March 12, 1997

"Barrier Emplacement Quality Assurance and Monitoring Strategies", L.G. Everett, et al., 1997 International Containment Technology Conference and Exhibition, Eight Hour Opening Workshop, St. Petersburg, FL, February 9, 1997

"Technical and Regulatory Breakthroughs in Vadose Zone Hydrology" L.G. Everett, The Sixth West Coast

Conference on Contaminated Soils and Groundwater, Association for the Environmental Health of Soils, Newport Beach, California, March 12, 1996

"Risk Estimation Limitations", World Laboratory, Erice-Trappini, Italy, October 1995.

"Vadose Zone Remediation", Lawrence Livermore National Laboratory, March 1995.

Rocky Flats Solar Evaporation Ponds, Phase I Remediation Program "RCRA Closure Case Study", The Third EG&G GoCo Environmental Conference, Nevada, May 10, 1994.

"Recent Engineering Breakthroughs in Contaminated Soil Investigations" UCLA Environmental Engineering, Februrary 4, 1994

"Impact of Subsurface Hydrology" Fuel Bioremediation Workshop, Naval Facilities Engineering Servcie Center, Port Hueneme, CA, January 26, 1994.

"Site Mitigation Workshop" Santa Barbara Environmental Health Services department, Solvang, CA, October 1993.

"Vadose Zone Workshop" California Department of Toxic Substances Control, Sacramento, CA, June 27, 1993.

"Hydro-Geochemical Transport and Monitoring of Contaminants in the Vadose Zone", UCLA Extension, March 3, 1993.

Selected Projects

Hydrogeology

Lead Expert Witness in multi-million dollar PCB case wherein site characterization resulted in substantial cross-contamination. Extensive exposure to well development issues, well construction, sampling, decontamination, sample filtering, etc. related to PCB investigation. Extensive exposure to State and Federal PCB regulatory requirements and remediation alternatives.

Participant on Lawrence Livermore National Lab Scientific Panel who wrote both reports on the subject of petroleum hydrocarbon migration. These two reports have resulted in approximately a $1 billion dollar savings to industry in California alone. The reports have revolutionized the way petroleum hydrocarbon sites are characterized, remediated, and evaluated through risk considerations including natural attenuation.

Participant on National EPA/DOE VOC Panel which will look at natural attenuation associated with VOCs at 400 sites across America. Historical review of these sites will determine the efficacy of natural attenuation and will demonstrate the value of any consistency in the behavior of VOCs across the sites. Bottom line to industry will be a substantial reduction in the amount of characterization and possibly remediation required as a part of a VOC investigation.

Member of EPA/DOE Executive Committee on the establishment of barrier technologies at hazardous waste sites. Barrier technologies include, caps, wall, floors, conical shapes, and permeable systems including funnel and gate systems. Responsible for developing training positions on quality assurance/quality control of barrier placement and life cycle monitoring of barrier systems.

One of five members selected internationally by the International Atomic Energy Commission in Vienna, Austria to develop characterization and remediation strategies for radio isotope sites. Only American selected to participate on panel. Invitation stems from participation at the majority of the DOE sites in America.

Co-author of forthcoming EPA/RCRA guidance document related to requiring early alert monitoring concepts at all hazardous waste sites. Guidance document, once accepted, will result in a substantial reduction in the groundwater monitoring requirements, water quality monitoring requirements, insurance requirements, bonding, etc. Document under review at EPA headquarters within the Office of Solid Waste in Washington, DC.

Participant on Department of Defense Expert Committee looking at risk assessment of petroleum hydrocarbons at Air Force, Army, and Naval bases in America. Expert committee will develop recommendations related to natural attenuation and risk criteria to be utilized at Department of Defense sites through the United States.

Project Officer to design a vadose zone characterization program and monitoring system at Operable Unit 4

located at the DOE Rocky Flats Plant in Rocky Flats, Colorado. Project work involved development and implementation of a field investigation to identify contaminant release sources, a conceptual model of the subsurface geology, mechanisms and pathways for contaminant migration, candidate remedial approaches, and viable monitoring approaches during closure and post closure.

Co-author of a national EPA guidance document under RCRA Subtitle C entitled "Vadose Zone Monitoring at Hazardous Waste Sites". The work will be a compilation of research efforts conducted at the VZML and is mandated by the EPA's strong position on the merit's of vadose zone monitoring as a realistic and rational approach to prevention of contaminant migration to the nation's groundwater resources (under RCRA, Subtitle C) from hazardous waste landfill sources.
Project manager of a pilot vapor extraction and vapor recovery test to facilitate the final design of a recovery system for 26,000 bbl of petroleum reformate contaminating the vadose zone at a major oil refinery in Central California.

Co-Manager of a cooperative agreement between UCSB, USEPA, the US Bureau of Reclamation, and the US Air Force Space Command to develop Geographic Information Systems (GIS) suitable for use in decision-making in groundwater and vadose zone characterization and remedial investigations.

Hosted the six-month stay in the USA of Dr. Igor Seminovich Zektster, Head of the Hydrogeological Division of the Russian National Academy of Sciences in Moscow, USSR. The purpose of the stay was to begin scientific collaboration between the USA and USSR on issues pertaining to groundwater pollution. During the period, two interpretive groundwater maps of California and two proposals for similar work pertaining to the entire USA were developed.

Full Research Professor and Director of the Vadose Zone Monitoring Laboratory of the Institute for Crustal Studies at the University of California at Santa Barbara.

Led a team of hydrogeologists, engineers, and chemists in site characterization, monitoring, and remediation of hazardous and solid waste landfills, refinery and industrial sites, underground storage tank sites, and dense non-aqueous phase liquid investigations. Extensive experience was developed in post-closure monitoring strategies.

Principal Investigator to evaluate groundwater and vadose zone contamination associated with a major municipal landfill.

Project Manager to develop vadose zone monitoring program demonstration at Class I site, California.

Project Manager to evaluate groundwater and vadose zone monitoring program at a Class I site for Hazardous Waste Disposal, California.

Program Manager to develop soil-gas, groundwater and vadose zone monitoring program for six solid waste sites under the Calderon Bill.

Numerous refinery companies throughout nation:
Project Manager to conduct Part B Permits, hydrocarbon removal and mitigation, landfill impoundment and landfarm closure, landfarm demonstrations, hydrocarbon migration investigations, soil venting and bacterial hydrocarbon degradation, and underground storage tank leakage evaluations.

Senior advisor for development of multistate hydrologic study covering long-term use of the Ogallala Formation

Program Manager for evaluation of hydrologic aspects of uranium mine permit requirements.

Responsible for developing ASTM National Standards for soil core monitoring, soil pore-liquid monitoring, hydraulic conductivity measurement, matric potential measurement, neutron moderation, soil gas monitoring, air permeability determination, soil moisture measurement, and field screening techniques.

Fortune 500 Industrial CERCLA site contaminated with chlorinated hydrocarbons. Technical Advisor in the site characterization, monitoring, remediation, and presentations to regulatory agencies. Technical Advisor on vadose zone remediation strategy and groundwater pump and treat strategy. Project costs estimated at $30 million.

Program Manager to evaluate Part B Permit and to develop groundwater and vadose zone monitoring program at Class I site, Oregon.

Hydrocarbons

Major oil company (confidential). Pipeline leak of 55,000 barrels of gasoline. Technical Advisor on site characterization, monitoring, and remediation program. Technical Advisor on major vapor extraction system for area 90 feet deep and 25 acres in size. Technical Advisor on major pump and treat bioremediation program estimated at $14 million.

Principal Investigator to develop a Guidance Document and videos relative to all aspects of underground storage tank site characterization, monitoring, testing, installation, abandonment, and remediation.

Conducts a major research program directed towards soil-gas migration, soil pore-liquid migration, underground tank monitoring system evaluation, hydrocarbon remediation, and sensor installation techniques.

United States Environmental Protection Agency

Co-Principal Investigator to evaluate the U-tube design for underground monitoring systems for soil vapor testing.

Co-Principal Investigator of underground tank vapor monitoring systems by tracer testing methods.

Project Manager of program to test groundwater monitoring equipment to be used at hazardous waste sites.

Project Manager of program to develop vadose zone monitoring programs for hazardous waste landfills, impoundments and land treatment units.

Project Manager of program to develop an unsaturated zone monitoring manual

Project Manager of $2.0-million contract to develop groundwater quality monitoring guidelines for all western coal strip mine activity and all four of the Federal oil shale tracts.

Project Manager for a conceptualization of unsaturated zone monitoring applicable to hazardous waste sites.

Project Manager for state of the art review of unsaturated zone monitoring techniques.

Project Manager of computer interactive system study to design groundwater quality monitoring programs.

Program Manager for groundwater quality monitoring guidelines for secondary impacts of western coal strip mining, potential sources of contamination.

Development of general methodology for groundwater quality monitoring.

Principal Investigator of Waste Load Allocation Study, Parker Strip, Colorado River.

United States Department of Defense

Scientific Advisor to major Naval installation covering inorganic hazardous waste hot spots, leaking underground storage tanks, dense phase organic solvents, and a RCRA landfill sitting on top of a Superfund site.

Scientific Advisor to major site investigation and remediation program associated with historic fuel and solvent releases and waste disposal practices.

Environmental Impact Statements

Dr. Everett was responsible for hydrologic research including both groundwater and surface water impacts for the following Environmental Impact Statements:

City of Los Angeles, California, Total Facilities Wastewater Plan (25-year Reclamation Plan)

Fort Calhoun Nuclear Generating Station Unit 2, Missouri

Omaha Public Power District, Nebraska City Fossil Fuel Power Plant

Texarkana Wastewater Treatment Facility, Texarkana, Texas

Texarkana Water Treatment Facility, Texarkana, Texas

Commerce Wastewater Treatment Facility, Commerce, Texas

Sanitary Sewage Collection System, Highland Village, Texas.

National Committees

Dr. Everett is a reviewer for reports prepared under the auspices of the National Research Councils Board on

Environmental Studies and Toxicology, National Research Council Washington DC 2005

National Environmental Technology Test Site, L.G. Everett, Petroleum Environmental Research Forum, December 2, 1998, Pt Hueneme, CA

Groundwater and Vadose Zone Monitoring, L.G. Everett, Chairman, ASTM, January 25-27, 1999, Memphis, TN

American Society for Testing and Materials, Board of Directors, April 26-27, 1999, West Conshohocken, PA

Groundwater and Vadose Zone Monitoring, L.G. Everett, Chairman, ASTM, June 29, 1999, Seattle, WA

American Society for Testing and Materials, Board of Directors Meeting, L.G. Everett, member Board of Directors, West Conshohocken, PA, October 11-12, 1999

National Environmental Technology Site Science Advisory Board Meeting, L.G. Everett, member Science Advisory Board, University of Massachusetts, Amherst, Massachusetts, October 18-19, 1999

Groundwater and Vadose Zone Monitoring, L.G. Everett, Committee Chairman, January 24-25, 2000 ASTM

Naval Hydrocarbon Test Site Science Advisory Board Meeting, March 20, 2000, United States Navy, San Diego, CA

American Society for Testing and Materials, Board of Directors Meeting, October 17-18, 2000, West Conshohocken, PA

Inter Agency DNAPL Consortium, Technical Advisory Group, October 25-26, 2000, Atlantic City

Groundwater and Vadose Zone Monitoring, L.G. Everett Chairman, ASTM, Reno, NV, January 23, 2001

Groundwater and Vadose Zone Monitoring, L.G. Everett, Chairman, American Society for Testing and Material Meetings, Norfolk, VA, June 26, 2001

Invited Member Scientific Advisory Committee International Conference on Advances in Groundwater Hydrology, Dedicated to C.V. Theis, American Institute of Hydrology, November 16-20, 1997, Tampa, FL

Member, DOE Executive Committee, for 1997 International Containment Technology Conference and Exhibition.

Session Chairman, Hazardous Materials Control Research Institute, National R&D Conference on Control of Hazardous Materials Soil Washing and Slurry Reactor Bioremediation, February 1992, Fairmont Hotel, San Francisco, California.

American Society for Testing Materials (1986-Present): Section Chairman D.18.21.02 entitled Vadose Zone Monitoring.

Invited Panel Member: Future of Environmental Cleanup in Developing Countries, International School of Innovative Technology for Cleaning the Environmental, Ettore, Majorana Center for Scientific Culture, Erice, Sicily, Italy, April 22-29, 1992.

Invited by Commission of the European Communities, Joint Research Center, to present Innovative Monitoring Strategies, September 21-25, 1992, ISPRA (Varese), Italy.

Recipient of Standards Development Award, American Society for Testing and Materials, January, 1992, New Orleans Annual Society Meeting.

Invited Session Chairman, ETEX 91, (Environmental Technology Exposition and Conference on Physical Remediation Technologies, Sands Expo and Convention Center, Las Vegas, Nevada, March 13-15, 1991.

Invited Session Chairman on Vadose Zone Investigation Methods in Symposium on Groundwater and Vadose Zone Investigations, sponsored by ASTM, The Sheraton Harbor Island Hotel, San Diego, California, January 30 - February 1, 1991.

Invited Chairman, symposium on Standards Development for Groundwater and Vadose Zone Monitoring Investigations, ASTM, January 27-29, 1988, Albuquerque, NM.

Elected Chairman of ASTM National Task Force to write Vadose Zone Monitoring Standards, ASTM, Tampa, Florida, February 1987.

Invited Panel Member for EPA Technology Transfer Symposium on Construction of Monitoring Wells and

Considerations for Collection of Groundwater Samples, UNLV, November 19, 1986.

Invited Panel Chairman by the California Department of Water Resources to review groundwater pollution detection techniques to be used in California over the next 25 years, San Diego, September 1985.

Invited Blue Ribbon Panel Member to oversee State of California Legislation to maintain integrity of state's water resources.

Recent International Activities

America's Illogical Monitoring Philosophy, L. G. Everett, World Laboratory, August, 1999, Erice, Italy

World Laboratory Meeting, Member Permanent Panel on Pollution, "The Science City", August 19, 1999, Erice, Italy

MTBE-The Mega City Public Health Debacle, L.G. Everett, International Seminar on Nuclear War and Planetary Emergencies, World Laboratory, E. Majorana, Center for Scientific Culture, August 19-24, 1999, Erice, Italy

Response prepared for Professor Anthony Zichichi, President of the Science Steering Committee for Italian Science to the President of Italy, presentation materials covered contamination associated with unleaded fuel, January 2000

Groundwater and Vadose Zone Monitoring, Committee Meeting, L.G. Everett, Chairman, June 20, 2000, Toronto, Ontario, Canada

World Federation of Scientist Meeting, Permanent Panel on Global Pollution, L.G. Everett, Panel Member, August 19, 2000, Erice, Italy

Invitation to the Scientist Jubilee on Planetary Emergencies, by the Chairman and Director of the World Federation of Scientists, to participate in the Black Sea Pollution Panel meetings, August 19-24, 2000, Erice, Italy

An Inquiry into the Problem of Waste Disposal; The Toronto and Kirkland Lake Case, report prepared by Lakehead University Engineering Technology, Project Advisor, L.G. Everett, Fall, 2000, Lakehead University, Ontario Canada

Hazardous Waste and Groundwater Monitoring, L.G. Everett, 39th Engineering and Technology Conference, Ontario Professional Engineers, November 3, 2000, Thunder Bay, Ontario, Canada

Invited peer reviewer, Ontario Brownfields Amendment Act and Contaminated Sites Guidelines, Association of Professional Geoscientists, Ontario, Canada, June 2001

Pulp and Paper Technical Association of Canada, Banquet Speaker, Thunder Bay, Canada, June 1, 2001

Executive Committee, 2001 International Containment and Remediation Technology Conference and Exhibition, June 10-13, 2001, Orlando FL

Chairman, Vadose Zone Issues Influencing Remediation II, Session 24, 2001 International Containment and Remediation Technology Conference and Exhibition, June 12 2001, Orlando FL

Scientific Advisory Board, 1st International Congress on Petroleum Contamination Soils, Sediments and Water, American Institute of Hydrology, Imperial College, August 2001, London, United Kingdom

Request from Dr. Andres Mako, Pate University of Agricultural Sciences, Deak Hungary, to spend six months sabbatical in my Vadose Zone monitoring lab in the Fall of 1999

Invited by DOE to be the moderator of the Vadose Zone Workshop for Warsaw '98 Symposium, September 14, 1998, Warsaw

Hosted Fullbright Scholar from the Russian Academy of Sciences, specifically Dr. Igor Zektser head of the Russian Academy, Water Problems Institute in Moscow, specifically requested an eight month approval to work in the Vadose Zone Monitoring Lab with Dr. Everett, June 1998.

Invited by Dr. Antonino Zichichi, President of the World Laboratory in Geneva, Switzerland to participate in World Laboratory Meetings on November 21-22, 1997 as a member of the World Federation of Scientist Monitoring Panel on Water and Pollution.

Invited by Dr. Don Clark, head of characterization and monitoring for the International Atomic Energy

Commission in Vienna, Austria, to participate on characterization panel for IAEC, 1997.

Elected Member, Russian Academy of Sciences (only eight Americans have been elected to the Russian Academy of Sciences since its founding by Peter the Great in 1725).

Invited by NATO to evaluate environmental problems at NATO bases in the Mediterranean Sea, 1996.

Member, Executive Committee, American Institute for Hydrology for International Symposium in Tashkent, Ubekistan, 1996.

Co-editor of World Groundwater Map developed for UNESCO, 1996.

Member, Editorial Board, UNESCO International Hydrological Program for International Monograph entitled "Groundwater Resources of the Earth", 1996.

Invited co-advisor on doctoral students at the Weisman Institute and the Ben Gurian University in Israel.

Invited Speaker at the Land and Ocean Interaction in the Coastal Zone (LOICZ) Workshops held in Holland and Moscow, 1996. The LOICZ International Core Project is headquartered in the Netherlands.

Recipient of Honorary Doctor of Science from Canadian University for Excellence in Hydrogeology, 1996.

Invited by the World Lab to give paper on the subject of "Weaknesses in Risk Calculations in the Vadose Zone" given in 1995 in Erice, Trapini, Sicily

Invited Speaker by the United Nations for International Workshop held in Costa Rica, 1994.

Invited by the European Community to give Environmental Monitoring presentations at Ispra, Italy, 1993.

Recipient distinguished alumni award Lakehead University, Canada, 1993.

Work Experience

L. Everett & Associates, LLC (2010-Present) President and CEO

Haley & Aldrich, Inc. (2005 to 2010) Chief Scientist and Sr. VP

Shaw Environmental & Infrastructure Inc. (2002 to 2005) Chief Scientist and Sr. VP

The IT Group (June 2000 - 2002) Chief Scientist & Sr. Vice President

Participate in development and implementation of a strategic vision and business plan to support the Santa Barbara office. Lead marketing and business development, identify and pursue strategies, acquisitions, and relationships for the IT Group. Participate in the senior management leadership team for C&T in the development and realization of a $100 million per year consulting business. Create and implement strategies for market penetration for federal high end consulting and R&D. Actively participate in DOD and DOE business development and key opportunities. Chairman of IT's National Practice Programs for air quality, risk assessment, natural resources, pollution prevention, subsurface characterization, and legal services. Lead the development and application of innovative remediation and other environmental technologies and application as chief scientist, mentor, and lead key technical staff.

Chairman Technology Exchange Program. The Exchange Program groups include: air quality, analytical methods, audit and compliance, dredging and contaminated sediment management, document production and publishing, ecological risk assessment, due diligence, engineering geology, environmental community relations, environmental contaminate, environmental statistics, fate and transport modeling, GIS, groundwater management, health physics, human health risk assessment, insitu and exsitu remediation, information technology, investigative methods, mining, next/rad waste, natural resources, pollution prevention, regulatory, strategic environmental management, thermal treatment, UXO technology review board, water/wastes water engineering and management, and web technology.

ARCADIS Geraghty & Miller (1992-2000)

Chief Research Hydrologist and Sr. Vice President
As Chief Research Hydrologist, Dr. Everett was responsible for developing technical solutions to

complex questions related to biological, chemical, radiological and hydrological problems throughout America.

As a Senior Advisor to the Pentagon, the U.S. Navy, DOE and NASA, Dr. Everett was responsible for making recommendations on innovative characterization, monitoring and remediation strategies.

As an expert witness, Dr. Everett led, back to back, billion dollar litigation cases related to contaminant migration in the subsurface. His expert witness activity was strongly supported by his development of over 10 ASTM Soil and Groundwater Standards.

Metcalf &Eddy (1989-1992):

Chief Scientist and Vice President

As Chief Scientist, Dr. Everett was involved in numerous complex CERCLA and RCRA activities involving over $300 million in fieldwork per year. As a key member of Metcalf & Eddy's Technical Advisory Teams, he was intimately involved with the technical issues related to site characterization, monitoring, and remediation. Selected examples of Dr. Everett's CERCLA and RCRA activity include:

Fortune 500 Industrial CERCLA site contaminated with chlorinated hydrocarbons. Technical Advisor in the site characterization, monitoring, remediation, and presentations to regulatory agencies. Technical Advisor on vadose zone remediation strategy and groundwater pump and treat strategy. Project costs estimated at $30 million.

Major oil company (confidential). Pipeline leak of 55,000 barrels of gasoline. Technical Advisor on site characterization, monitoring, and remediation program. Technical Advisor on major vapor extraction system for area 90 feet deep and 25 acres in size. Technical Advisor on major pump and treat bioremediation program estimated at $14 million.

Monitoring and Remediation Training Programs for UCSB, USC, USAF, USEPA, USNAVY, U.S. Corps of Eng., etc. Dr. Everett developed and presented training programs sponsored by the NWWA and ASTM on the subject of Vadose Zone (Early Alert) Monitoring for Hazardous and Solid Waste Sites.

Los Angeles Fire Department, Los Angeles, California: Principal Investigator to develop a Guidance Document and videos relative to all aspects of underground storage tank site characterization, monitoring, testing, installation, abandonment, and remediation.

U.S. Navy, Mare Island, California: Scientific Advisor to major Naval installation covering inorganic hazardous waste hot spots, leaking underground storage tanks, dense phase organic solvents, and a RCRA landfill sitting on top of a Superfund site.

American Society for Testing Materials (1986-Present):

Section Chairman D.18.21.02 entitled Vadose Zone Monitoring

Dr. Everett is responsible for developing ASTM National Standards for soil core monitoring, soil pore-liquid monitoring, hydraulic conductivity measurement, matric potential measurement, neutron moderation, soil gas monitoring, air permeability determination, soil moisture measurement, and field screening techniques.

University of California at Santa Barbara (1985-2002):

Research Hydrologist and Director of the Vadose Zone Monitoring Laboratory of the Institute for Crustal Studies

On a part-time basis, Dr. Everett conducts a major research program directed towards soil-gas migration, soil pore-liquid migration, underground tank monitoring system evaluation, hydrocarbon remediation, and sensor installation techniques.

Kaman Sciences (1984-1989):

Assistant Vice President

Dr. Everett led a team of hydro-geologists, engineers, and chemists insite characterization, monitoring, and remediation of hazardous and solid waste landfills, refinery and industrial sites, underground storage tank sites, and dense non-aqueous phase liquid investigations. Extensive experience was developed in post-closure monitoring strategies.

Natural Resources Program

Kaman Tempo (1978-1989): Manager,

Dr. Everett prepared RCRA Part B permits and Hazardous Waste Land Treatment Demonstrations for numerous clients including Texaco, Conoco, Amoco, Hunt Oil, Murphy Oil, Tosco, IMC Carbon, Bekin Oil, Golden Bear Refinery, and General Portland Cement (hazardous waste incinerator). He has conducted turn key monitoring programs at numerous solid waste landfills, hazardous waste disposal sites and underground storage tank leak sites. Dr. Everett participated as an expert panel chairman and panel member on many occasions. He testified before the U.S. Congress on different occasions and was an expert witness for the U.S. Department of Justice, Attorney General of California, etc. Dr. Everett was a specialist and advisor to the EPA Technical Assistance Team for Emergency Response Removal and Prevention. In addition, Dr. Everett was a Special Advisor to the GCA Corporation relative to dioxin monitoring at Superfund sites. Dr. Everett was selected on a sole-source basis to write guidance manuals and to present training programs for EPA, United States Navy Hazardous Waste Team, California Water Resources Control Board, California Department of Health Services, all 10 EPA Regional Headquarters, University of California at Davis and U.S. Naval Petroleum Reserve, Elk Hills, California: Scientific Advisor to the evaluation and cleanup of over 30 hazardous waste sites at Naval facilities.

Selected Project Listings with Kaman:

Project Title	**Client**
Groundwater Pollution	EPA
Unsaturated Zone Monitoring Manual	EPA
Environmental Assessment Review	Nerco Inc.
Alluvial Valley Floor Study	Northern Coal
Sand Wash Permit	Tosco Corp.
Agriculture Development Study	Yankton Sioux Tribe
Gold Tailings Study	Council of Energy Resources Tribe
Cumulative Hydrologic Impact	Radian/OSM
Maria Verde EIR	Human Environmental Resources Corp.
Antelope Mine Permitting Consulting	Nerco
Hydrologic Evaluations	Grand Mesa Coal Company
Hydrologic Impact	Flatiron Sand & Gravel
Water Well Development	L. Kavian
Reconnaissance of Alluvial Valley Floor Assessment and Spring Inventory	Powderhorn Coal Co.
Youngs Creek Mine Hydro/THE Investigation	Radian/OSM
Reclamation Strategies	Earth Resource Assoc.
Hydrologic Baseline Program	Dorchester Coal Co.
Agricultural Economic Analysis	Yankton Sioux Tribe
Agriculture Economic Development	Cheyenne River Sioux Tribe
AVF Applicability Study	ACZ Inc./Bookcliffs
General Requirements for AVFs	U.S. Depart. Of the Interior
PHC/CHIA Program	U.S. Department of the Interior
AVF Determination	Pittsburg & Midway Coal Mining Co.
Cumulative Hydrologic Impact Assessment	J.F. Sata & Associates
Hydrologic Evaluation	Sunedco
Cumulative Hydrologic Study	Nerco
Snowmass operating Permitting Assistance	Snowmass Coal Company
Hydrologic Assistance	Tosco Corp.
Technical Editing/Hydrologic Evaluation Services	Sunedco
Technical Assistance-San Juan	

Mine Plan Review	U.S. Dept of the Interior
Application to RWQCB	Tosco
Unsaturated Zone Training Program	TRW Energy Development
Ft. Belknap Indian Reservation Mining Activity Imp. Assessment	Earth Resources Associates
Technical Assistance-Surface Mining Control and Reclamation	Radian/OSM
Monitoring Wells Installation at Fruita Mine	Dorchester
Surface Hydrologic Evaluation/ Mine Drainage Plans	State of Colorado
Conduct Aquifer Test for Hazardous Waste Facility	MCI/Consulting Engineers Inc
Tower/Greenwood Irrigation System	Yankton Sioux Tribe
AVF Consulting Services	CONSOL
Environmental Compatibility of Coal Leasing	OTA
Water Resource Review of EIS	Council of Energy Tribes (CERT)
Geomorphic Evaluations	Empire Energy Corporations
Water Resource and Contamination Assessment Program	Tosco
Contamination Assessment Program Plan	IMC Industry Group
Montco Mine Permit Application	Northern Plains Res Council
Technical Assistance-Response to AVF Question	Consolidated Coal Company
Containment Assessment Program	Beacon Oil
CHIA Consultation	J.F. Sato & Associations
Assessment of Impacts on Water Resources-Crandon Project	CERT
Hydrologic Evaluation	Syntex Chemicals, Inc
Santa Monica Creek Water Diversion	Chevron
Regulatory Assistance to Rockcastle Coal Company	Intermountain Soils
Hydrologic assistance	CERT
Montana EIS	Intermountain Soils
Vadose Zone Monitoring/Permit Applications	General Portland
Neoshe Vadose Zone Monitoring	GCA Technology Division
CAP Support	IMC Industry Group
Texaco Louisiana Refinery	NUS Corporation
Aquifer Characterization Facility-Arlington, OR	Chem-Security Systems
Vadose Zone Monitoring	Chemical Waste Management, Inc.
Soil-Pore Moisture Samples	The University of Oklahoma
Evaluate Pollulert Fluid Detection Systems	Pollulert Systems (Mallory Components)
Evaluate Contamination for City of Hastings, Nebraska	Roy F. Weston, Inc.

Des Moines, Public Works Department, Des Moines, Iowa: Principal Investigator to evaluate groundwater and vadose zone contamination associated with major municipal landfill.

Major oil company: Scientific Advisor to major soil venting and bioremediation investigation covering a refinery spill of over 55,000 barrels. Location: Company Confidential. State: Company Confidential.

U.S. Environmental Protection Agency, Kansas City, Kansas: Co-Principal Investigator to evaluate the U-tube

design for underground monitoring systems for soil vapor testing.

U.S. Environmental Protection Agency, Suffolk County, New York: Co-Principal Investigator of underground tank vapor monitoring systems by tracer testing methods.

Mid-West Research Institute, San Jose, California: Co-Principal Investigator of diurnal variation and background fuel vapor concentrations in underground tank backfill.

U.S. Air Force, Edwards Air Force Base, California: Scientific Advisor to major site investigation and remediation program associated with historic fuel and solvent releases and waste disposal practices.

Hyatt Corporation: Principal Investigator to conduct major site characterization and remediation programs for proposed Hyatt Regency sites in Los Angeles, Santa Barbara, and San Francisco, California.

Chem-Waste Management: Program Manager to evaluate Part B Permit and to develop groundwater and vadose zone monitoring program at Class I site in Arlington, Oregon.

Chem-Waste Management: Project Manager to develop vadose zone monitoring program demonstration at Class I site, Kettleman Hills, California.

Santa Barbara County Department of Health: Project Manager to evaluate groundwater and vadose zone monitoring program at Casmalia Hazardous Waste Disposal Site (Class I), Casmalia, California.

Los Angeles County Sanitation District: Program Manager to develop soil-gas, groundwater and vadose zone monitoring program for six solid waste sites under the Calderon Bill.

Kern County Planning Department: Program Manager to develop hazardous waste siting element for County General Plan, Bakersfield, California.

(Confidential) Aerospace Corporation: Program Manager to evaluate TCE, heavy metal, and benzene, toluene, xylene contamination at sites in Connecticut.

Numerous refinery companies throughout nation: Project Manager to conduct Part B Permits, hydrocarbon removal and mitigation, landfill impoundment and landfarm closure, landfarm demonstrations, hydrocarbon migration investigations, soil venting and bacterial hydrocarbon degradation, and underground storage tank leakage evaluations.

IT Corporation: Prepared and presented extensive vadose zone monitoring training programs to hazardous waste staff, Los Angeles, California.

TRW Inc.: Project Manager of program to develop and present groundwater monitoring training program for hazardous waste sites at all 10 EPA regional offices.

Environmental Protection Agency: Project Manager of program to test groundwater monitoring equipment to be used at hazardous waste sites.

Environmental Protection Agency: Project Manager of program to develop vadose zone monitoring programs for hazardous waste landfills, impoundments and land treatment units.

Environmental Protection Agency: Project Manager of program to develop an unsaturated zone monitoring manual

Environmental Protection Agency: Project Manager of $2.0-million contract to develop groundwater quality monitoring guidelines for all western coal strip mine activity and all four of the Federal oil shale tracts

Environmental Protection Agency: Project Manager for a conceptualization of unsaturated zone monitoring applicable to hazardous waste sites

United States Congress: Invited testimony at hearings on the Draft Bill entitled,"Environmental Monitoring of Management Act of 1978," U.S. House of Representatives, 95th Congress, 2nd Session, 1978

Environmental Protection Agency: Project Manager for state-of-the-art review of unsaturated zone monitoring techniques

Environmental Protection Agency: Project Manager of computer interactive system study to design groundwater quality monitoring programs.

Crow Indian Tribe: Development of information system covering all coal resource data

Camp, Dresser & McKee: Senior advisor for development of multistate hydrologic study covering long-term use of the Ogallala Formation

Nuclear Regulatory Commission: Program Manager for evaluation of hydrologic aspects of uranium mine permit requirements.

General Electric TEMPO

(1976-1978): Manager, Water Resources Program
Environmental Protection Agency: Program Manager for groundwater quality monitoring guidelines for secondary impacts of western coal strip mining, potential sources of contamination

Department of Justice: Project Manager for quantification of surface water, groundwater, and water quality to support Indian water rights litigation.

General Electric TEMPO (1974-1976):

Hydrologist
Environmental Protection Agency: Development of general methodology for groundwater quality monitoring.

Consultant to:

CODECU International, Inc., Tucson, Arizona

Henningson, Durham & Richardson, Santa Barbara, California

Bell Engineering, Tucson, Arizona.

University of Arizona (1972-1974)

Assistant Professor, Department of Hydrology and Water Resources.
Principal investigator to:

Environmental Protection Agency: Principal Investigator of Waste Load Allocation Study, Parker Strip, Colorado River

Bureau of Reclamation, Arizona Water Commission: Principal Investigator of Water Quality Intake Studies for the Central Arizona Project

Arizona Water Resources Research Center: Principal Investigator of Salinity and Limnological Problems on the Lower Colorado River

National Park Service: Principal Investigator of Public Health Problems in Grand Canyon, Arizona

Bureau of Reclamation, Region III: Principal Investigator of Chemical and Biological Patterns in Lake Mead.

Great Lakes Paper Co., Ltd. (1966-1967): Water quality of effluent from paper mills.

Ontario Hydro Co., Ltd. (1963-1966): Watershed studies to predict reservoir levels behind dams.

Honors and Awards

Dr . Everett was invited by Professor Dr. Antonino Zichichi, President, World Federation of Scientists, and Macello Sanchez Sorondo, Chancellor, Pontifical Academy of Sciences to participate in the Official Celebration for the Ettore Majorana-Erice-Science for Peace Prize "2009". The ceremony was held in January 2011 at the Pontifical Academy of Sciences, in the Vatican (Rome).

Invited member of International Advisory Panel, Institute of Engineers, Malaysia, for Brownfields Asia 2008, October 21-23 2008, Kuala Lumpur, Malaysia.

Paper reviewer and member of the Editorial Board for the International Journal entitled "Soil & Sediment Contamination" published by Taylor and Francis, 2008.

"Devil in the Details" AEHS, San Diego, CA March 11, 2008

Presented the Pollution Annual Report of the Permanent Monitoring Panel to the World Federation of Scientists in Erice, Italy. Presentation was made as Co-Chair of the WFS Pollution Panel. August 24, 2007

Presented the Annual Report to the General Assembly of the World Federation of Scientists on August 23rd, Erice, Italy 2007.

Co-chaired workshop on pollution for the World Federation of Scientist, Erice, Italy, August 18, 2007.

Presented the Annual Report to the General Assembly of the World Federation of Scientists on August 23rd, Erice, Italy 2007.

Co-Chaired with R. Ragaini and Chairman A. Zichichi the Session #9 entitled "Global Monitoring of the Planet

Focus: The North Pole and Life Cycle Nuclear Energy Environmental Issues" Presented at the 38th Session of the Erice International Seminars in Erice, Italy. August 22, 2007

Co-Chaired with Dr. Richard Ragaini the Workshop on World Pollution in Erice, Italy. August 19, 2007

Voting member of ASTM Subcommittee E50-02 relative to the new "Practice for Assessment of Vapor Intrusion into Structures on Property Involved in Real Estate Transactions" WK12967, ASTM International, August 2007

Chaired the Vadose Zone Monitoring Task Committee meeting for D18.21.02, Norfolk, VA, June 24-27, 2007

Participated on the editorial board of the journal titled "Soil and Sediment Contamination, an International Journal", published by Taylor and Francis, 2007

Keynote luncheon speaker Brownfields University, Phoenix, AZ. "Emerging Environmental Issues". April 17, 2007

Chaired the Vadose Zone Monitoring Task Committee meeting for D18.21.02, Anaheim, CA, January 28-31, 2007

Member and Co-Author of the National Groundwater Association Subcommittee on Groundwater Monitoring (Field Practices Quality) Framework charged to develop and encourage implementation of a nationwide, long-term groundwater quantity and quality monitoring framework that would provide information necessary for the planning, management, and development of groundwater supplies to meet current and future water needs, and eco system requirements. This program was developed under the advisory committee on water information developed under the US Department of the Interior through the USGS Water resources discipline and created by the Office of Management and Budget memorandum number M92-01. This subcommittee was established in January 2007

Keynote address Brownfield Asia 2006, Kuahla Lumpur Malaysia, entitled "Groundwater Monitoring, a Brownfields Litigation Case Study". September 5-7, 2006

Co-chaired with F. vom Saal and Chairman A. Zichichi Session No. 6 on Pollution, Focus: Plastic Contaminants in Water. World Federation of Scientists, Erice, Italy, August 22, 2006

World Federation of Scientists, Permanent Monitoring Panel on Pollution, Dr. Lorne Everett, leader. World Federation of Scientist Task Force on Groundwater Vulnerability in Sicily. Presentations to the Flood and Pollution Monitoring Panels, Erice, Italy. August 19, 2006

Chaired the Vadose Zone Monitoring Task Committee meeting for D18.21.02, Toronto, Canada, June 11-15, 2006

Chaired the Vadose Zone Monitoring Task Committee meeting for D18.21.02, Phoenix, AZ, February 5-9, 2006

Presentation to Gallagher and Kennedy entitled "Vision Service", Phoenix, AZ, February 2006

Invited to membership in Canadian Who's Who, University of Toronto Press, Inc. Toronto, Ontario, Canada, 2006

"Long Term Stewardship of Radioactive and Hazardous Waste Sites", L.G. Everett, invited plenary platform presentation, the First International Conference on Environmental Science and technology, sponsored by the American Academy of Sciences, New Orleans, Jan 23-26, 2005

U-Plant area reviewer for the "U-Plant Surface Barrier Monitoring Data Quality Objectives" report for the US Department of Energy facility at Hanford, WA, February 2005

Invited reviewer for the National Research Council Review of the final report entitled "Superfund and Mining Mega Sites- Lessons from the Coeur d'Alene River Basin", February 2005

Received a "No Further Requirements" letter from the California Regional Water Quality Control Board relative to the Hawker Pacific Aerospace Facility in Sun Valley, CA, March 2005

Participated in the Shaw Environmental and Infrastructure 2005 Symposium for 19.5 professional development hours, Orlando, FL. April 14-16, 2005

Chaired the Shaw Environmental and Infrastructure 2005 Symposium session entitled "Emerging Contaminants", Orlando, FL. April 14-16, 2005

Chaired the Vadose Zone Monitoring Task Committee meeting for D18.21.02, Reno, NV, June 12-15, 2005

"Subsurface Laser Drilling Application", R. Parker and L. Everett, presented at the World Federation of Scientist meeting , Erice, Italy 2005

National Co-Chair, 40th Anniversary Executive Planning Committee, Lakehead University, Thunder Bay, Ontario, Canada, 2005

Invited manuscript reviewer, Journal of the Air and Waste Management Association, 2005

Invited representatives from Japan, Russia, England, Canada, America, etc. to meet in Science City in Italy to look at radioactive waste repository designs and innovative monitoring technologies, 2005

As a research professor successfully guided Dr. Mark Kram (former Senior Hydrogeologist, US Navy, Port Hueneme) to complete his Ph.D. dissertation. Dissertation focuses on the use of 6 different lasers which will optimize the fluorescent signature associated with different carbon ranges of hydrocarbon contamination. 2005

Invited by Professor Antonino Zichichii, President of the World Federation of Scientists, to participate in meetings at the Palazzol La Farnesina to celebrate Enrico Fermi's main achievements, the 50th Anniversary of CERN, the 25th Anniversary of the Revival of the Instituto Nazionale di Fisica Nucleare, and the World Federation of Scientists Multidisciplinary Core Group and the International Laboratory for Science, Engineering and Advanced Physical and Biomedical Technologies (ILSEAT), December, 2004

Participated as a member of Department of Energy's Executive Panel on document entitled "Long Term Stewardship- Science and Technology Roadmap. This Roadmap identifies the technologies and milestones needed to cleanup Department of Energy sites. 2004

Invited moderator in April 2004 for the joint workshop on Long Term Performance Monitoring of Metals and Radionuclide in the Subsurface: Strategies, Tools and Case Studies. Invited by USGS, DOE, EPA, and NASA to lead workshop and to provide the charge to the participants. 2004

Personally responsible for signing an indefinite time MOU between the United States Navy and the University of California. The MOU will result in the creation of a Permeable Reactive Barrier Institute and a program focusing on current and projected environmental support needs for the United States Navy. 2004

Hosted Fulbright Scholar Dr. Igor Simonovitch Zektser, Head of the Russian Academy of Sciences Water Problems Institute, in Santa Barbara for the last 8 months. Worked on identifying opportunities and developing the appropriate contacts for major remediation programs in the former USSR. 2004

Presented recommendations in new book entitled "International Seminar on Nuclear War and Planetary Emergencies-30th Session". Recommendations include the results of an international workshop orchestrated by Dr. Everett on the subject of Long Term Stewardship and Monitoring of Radio Active and Hazardous Waste in Erice, Italy August 18-26, 2003

General Advisor, First International Congress on Petroleum Contaminated Soil, Sediments, and Water, London, U.K. August 14-17, 2001

Invited Participant Workshop on Principles and Operational Strategies for Repository Staging Systems, the National Research Council Board on Radioactive Waste Management, Washington, D.C., September 5-6 2001

Member of the Editorial Board of the journal, Environmental Forensics, Academic Press, December 1999

Kapitsa Gold Metal, Russian Academies highest award for original research formally presented in Lousanne, Switzerland, October 1999

Elected to the Centennial Board of Directors of ASTM for the period 1998-2001 by 33,000 membership

Nominated by Dr. Henry T. Yang, Chancellor, as a candidate for the Tyler Prize.

"Recent Breakthrough Opportunities in Environmental and Civil Engineering", L.G. Everett, USC-School of Engineering, invited presentation from Dean of Engineering School, Los Angeles, California, March 26, 1999

Requested by Dr. Ken Brooks, Chairman, Board of Registration, American Institute of Hydrology, to annually submit questions for -State of Wisconsin Examination for Hydrologists, March 1999

"Decision Criteria Relative to Methane Generation", L.G. Everett, Invited Presentation, San Francisco Airport, San Francisco, California, March 1999

"Methane Contamination at DOD Sites" L.G. Everett, Hydrocarbon National Test Site (HNTS) Advisory Committee Meeting, Port Hueneme, California, March 8, 1999

Invited peer reviewer, ASME, to review remediation programs, Institute for Regulatory Science, Columbia, Maryland, February 19, 1999

"Recent Developments of the Livermore Hydrocarbon Reports", L.G. Everett, Society of American Military Engineers, Port Hueneme, California, November 10, 1998

"Groundwater Recirculation Well Technology Update", Hydrocarbon National Test Site Advisory Committee, October 19, 1998, Amherst, Massachusetts

"Weaknesses and Limitations of Vadose Zone Monitoring and Characterization", Vadose Zone Monitoring, Characterization and Barrier Technologies, Warsaw '98 Symposium, September, 1998, Warsaw

"DOE Site Specific Vadose Zone Issues", Vadose Zone Workshop for Warsaw '98 Symposium, September 14, 1998, Warsaw

Invited panel presentation, "Vadose Zone Characterization and Instrumentation Needs", Warsaw '98 Symposium, September 14, 1998, Warsaw

Invited panel presentation , "Monitoring Technologies for Deep Barrier Installations", Warsaw '98 Symposium. September 14, 1998, Warsaw

Member of the Editorial Board, Journal of Limnology and Oceanography, School of Oceanography, University of Washington, Seattle, Washington, June 5, 1998

Requested by Dr. James Clark, Chairman of the Board, Eckenselder Inc. and Chairman of the National Academy of Engineering Board on performance monitoring, to lead a tour of the Vadose Zone Monitoring Laboratory to the complete NAS Board on Performance Monitoring, April 28, 1998.

Invited member of Interagency DNAPL Consortium Technical Advisory Group, Cape Canaveral Florida, April 20-22 1998

Panel member with others, DoD LUFT Cleanup Demonstration Program, Association for the Environmental Health of Soils, March 9, 1998, Port Hueneme, California

Invited Member Arid Vadose Zone Alliance, DOE Hanford, INEEL, 1998

Marquis Publication Board, 1998-99

Ivan Johnson Outstanding Achievement Award, ASTM, June 1997

Green Thumb's Up Award, US Navy (highest civilian award), January, 1997, Director of Environmental Programs, US Navy

"The Lawrence Livermore Blue Ribbon Panel", L.G. Everett, U.S. National Academy of Sciences, Washington, D.C., December 1, 1997

"The Staggering Impacts of the Livermore Recommendations on Hydrocarbon Remediation in the Subsurface", L.G. Everett, UNOCAL, Los Angeles, November 5, 1997

"Environmental Litigation Issues" presented to the Port of Oakland, October 16, 1997, Oakland, California

Invited by the US Navy to make presentations before Rear Admiral Leonid Nikolkolaevic Ivanitski, August 8, 1997, Sea Coast, Port Hueneme, California 97

"Rationale and Precedent Supporting Relaxation of Clean-up Standards: Releases from Underground Storage Tank Systems in Ohio", L.G. Everett, Vadose

Research, Inc., Chamber of Commerce, Canton, Ohio, July 11, 1997

"Lawrence Livermore National Laboratory Hydrocarbon Reports will Result in Multi-Billion Dollar Reduction in Insurance Remediation Costs" L.G. Everett, Davidovitz & Yaron, Baltimore, Maryland, June 17, 1997

"Lawrence Livermore National Laboratory Perspective on MTBE", L.G. Everett, "The MTBE Controversy" Continuing Education Courses, Sunnyvale, California, May 29, 1997

"The Staggering Impacts of the Livermore Recommendations on Hydrocarbon Remediation in the Subsurface", L.G. Everett, Civil and Environmental Engineering Department, USC invited presentation, Los Angeles, California, May 27, 1997

"Improving the LUST Cleanup Process", L.G. Everett, Milwaukee Athletic Club, April 29, 1997

"Regulatory and Technical Breakthroughs in Hydrologic Monitoring with special emphasis on Vadose Zone Hydrology", L.G. Everett, Ecological Seminar Series, UCLA invited presentation, March 25, 1997

Order of Electronic Weasels (Warfare Guided Missile), Liton Industries, October 30, 1996

Invited panel discussion, "The Changing Landscape of Groundwater Protection and Cleanup Policy", 5th Annual Meeting, Groundwater Resources Association, Multi Disciplinary Solutions to California Groundwater Issues, Windham Garden Hotel, Costa Mesa, California, October 10-11, 1996

"Impacts of Lawrence Livermore National Laboratory Reports", L.G. Everett, Port of Long Beach, Los Angeles, CA April 16, 1996

"Impacts of Lawrence Livermore National Laboratory Reports", L.G. Everett, Long Beach Redevelopment Agency Presentation, West Long Beach Project Committee Office, Long Beach, California, March 13, 1996

"Weakness in Vadose Zone Risk Estimations", L.G. Everett, International School of Innovative Strategies Applied to Environmental Cleanup in Central & Eastern Europe, invited paper, World Laboratory, Erice-Sicily, November 24, 1995

"The Vadose Zone: Recent Breakthroughs Impacting Regulatory Changes & Remediation Strategies", L.G. Everett, Coast Geological Society, Keynote Address, Ventura, CA, June 3, 1995

Invited Chairman of Blue Ribbon Peer Review Panel, United States Department of Energy, Idaho National Engineering Lab, Idaho Falls, Idaho.

Invited Advisory Committee Panel, United States Department of the Navy, National Test Site, Naval Facilities Engineering Command, Alexandria, Virginia, December 1993.

Conference Co-Chairman, First National UST Conference, United States Navy, Naval Civil Engineering Laboratory, Port Hueneme, California, May 1993.

Chairman, Lakehead University Annual Alumni Campaign Fund, Ontario, Canada, 1993.

Invited co-editor, UNESCO Global Warming Project, World Groundwater Flow Map, Moscow, Russian National Academy of Sciences, December 1992.

Invited opening paper on Field Screening for Environmental Pollutants, Massachusetts Institute of Technology, Cambridge, MA, October 26-27, 1992.

Invited presentation by Dr. Mordeckai Margaritz, President, Weizmann Institute of Science, Rehovot, Israel, Invited Presentation on Solute Transport Phenomena, September 29, 1992.

Invited by Commission of the European Communities, Joint Research Center, to present Innovative Monitoring Strategies, September 21-25, 1992, ISPRA (Varese), Italy.

Invited by the American Academy of Environmental Engineers to write monograph on Soil Washing/Soil Flushing, AAEE Headquarters, Cincinnati, OH, June 30, 1992.

Recipient of Standards Development Award, American Society for Testing and Materials, June 1992, Louisville, KY.

Invited Panel Member: Future of Environmental Cleanup in Developing Countries, International School of Innovative Technology for Cleaning the Environmental, Ettore, Majorana Center for Scientific Culture, Erice, Sicily, Italy, April 22-29, 1992.

Invited Presentation, the World Lab, International School for Innovative Technology for Cleaning the Environmental, April 22-29, 1992, Erice-Italy.

Session Chairman, Hazardous Materials Control Research Institute, National R&D Conference on Control of Hazardous Materials Soil Washing and Slurry Reactor Bioremediation, February 1992, Fairmont Hotel, San Francisco, California.

Invited seminar, University of Southern California, Environmental Engineering Program, February 28, 1992, Los Angeles, California.

Recipient of Standards Development Award, American Society for Testing and Materials, January, 1992, New Orleans Annual Society Meeting.

Invited Session Chairman, ETEX 91, (Environmental Technology Exposition and Conference on Physical Remediation Technologies, Sands Expo and Convention Center, Las Vegas, Nevada, March 13-15, 1991.

Invited presentation, peer review of research conducted by Subsurface Monitoring Branch, Environmental Monitoring Systems Laboratory, United States Environmental Protection Agency, Las Vegas, Nevada, February 25-27, 1991.

Invited Session Chairman on Vadose Zone Investigation Methods in Symposium on Groundwater and Vadose Zone Investigations, sponsored by ASTM, The Sheraton Harbor Island Hotel, San Diego, California, January 30 - February 1, 1991.

Invited co-chairman (with Russian colleague) of Remediation Session in First USA/USSR Joint Conference on Environmental Hydrology and Hydrogeology, American Institute of Hydrology, Leningrad, USSR, June 18-21, 1990.

Selected by the University of California to testify during Congressional hearings on the EPA Superfund, January 10, 1990

Invited state-of-the-art review by the National Academy of Sciences, "Underground Tank Leak Detection Methods: A State-of-the-Art Review of Vadose Zone Monitoring", L.G. Everett, Dec. 12, 1988, Washington, D.C.

Invited moderator for Vadose Zone Investigations held at the Focus Conference on Southwestern Groundwater Issues, American Association for the Advancement of Science, Albuquerque, New Mexico, March 23-25, 1988.

Invited keynote speaker, Soil and Water Conservation Society of America, "Hazardous Waste: A Challenge for Soil and Water Scientists", January 28, 1988, California Polytechnic State University, San Luis Obispo, California.

Invited chairman, symposium on Standards Development for Groundwater and Vadose Zone Monitoring Investigations, ASTM, January 27-29, 1988, Albuquerque, New Mexico.

Invited Chairman on Use of Vadose Zone Monitoring Techniques in Groundwater Monitoring Investigations, Standards Development for Groundwater and Vadose Zone Monitoring Investigations, ASTM/USEPA, Mariott Center City, September 18, 1987 Minneapolis, Minnesota.

Invited member of expert panel overseeing the Midwest Research Institute Technical Support Contract for Underground Storage Tanks, May 1987-88.

Hazardous Waste Management and Groundwater Monitoring, presented to the Air Pollution Control Association, APCA Technical Meeting at the Hershey Corpus Christi Hotel, Corpus-Christi, Texas, April 23, 1987.

Course Lecturer for 25 seminars to be given throughout the United States in 1987, sponsored by the National Water Well Association.

Elected Chairman of ASTM National Task Force to write Vadose Zone Monitoring Standards, ASTM, Tampa, Florida, February 1987.

Invited Panel Member for EPA Technology Transfer Symposium on Construction of Monitoring Wells and

Considerations for Collection of Groundwater Samples, UNLV, November 19, 1986.

Invited Panel Chairman by the California Department of Water Resources to review groundwater pollution detection techniques to be used in California over the next 25 years, San Diego, September 1985.

Invited Blue Ribbon Panel Member to oversee State of California Legislation to maintain integrity of state's water resources.

Requested by U.S. Navy, California Department of Water Resources, University of California, California Environmental Health Association, to present training course on vadose zone monitoring at hazardous waste sites.

Elected President and Chairman of the Board of a California Corporation representing 85 high-technology corporations.

Selected on a sole-source basis to develop and present to all 10 EPA regional headquarters a groundwater monitoring training course for hazardous waste sites.

Invited Chairman for Technical Session for First National Symposium on Vadose Zone Monitoring, NWWA, Las Vegas, December 1983.

Invited Chairman for Technical Session on Vadose Zone Monitoring Equipment at First National Symposium on Groundwater Monitoring Equipment, NWWA, November 1982.

Invited Paper for FWPCA Annual Meeting in Reno Nevada, September 1983.

Invited member, international committee for UNESCO 1983 world meeting on Technical Advance in the Control and Detection of Groundwater Pollution.

Advisor, U.S. National Center for Ground Water Research, 1982.

Invited Chairman for Workshop on Monitoring in the Vadose Zone, First National Groundwater Monitoring Symposium, Columbus, Ohio, 1981.

Invited moderator, "Workshop on Unsaturated Zone Monitoring," First National Groundwater Monitoring Symposium, NWWA, Columbus, Ohio, May 1981.

Invited by directors of peer-reviewed journal, Groundwater Monitoring Review, to develop charter series of papers on groundwater monitoring, March 1981.

Invited lecturer, University of California, Santa Barbara, Department of Mechanical and Environmental Engineering, 1980.

Charter President, California Section, American Water Resources Association, 1979.

Invited panel member for American Chemical Society meetings on water pollution regulations, Dallas, Texas, October 1979.

Invited by the Subcommittee on the Environment and the Atmosphere to give testimony before the U.S. House of Representatives on the draft bill titled, "Environmental Monitoring Management Act of 1978," on July 21, 1978.

Technical Program Chairman of "Establishment of Water Quality Monitoring Programs," 17th Annual AWRA Symposium, San Francisco, California, June 1978.

Invited key note speaker for General Electric's "think tank" at Town Meeting III entitled: "Technology and Tomorrow's Lifestyle", General Electric Company, Fairmont Hotel, San Francisco, California, March 8, 1978.

Invited chairman of "Environmental Impacts of Fossil and Nuclear Fuels," Fourth Annual American Chemical Society Conference, New Orleans, November 1977.

Invited chairman of "Water and Energy,"13th Annual American Water Resources Association Conference, Tucson, Arizona, October 1977.

Invited chapter written for the American Association for the Advancement of Science (AAAS) Manual on "Environment Systems", used in all U.S. Universities with Environmental Programs, 1974.

Who's Who in the West, 1976

Hubert D'Autrement Award,1971

AT&T Fellowship, 1968

Northern Engineering Award,1968

Atkinson Foundation Award, 1967

Lakehead University President's Medal, 1966

Honors (Peer Comments)

"I trust you immensely with my life and my water." Neal Smithers, President, Access for Disabled Americans, 2010

This book "Submarine Groundwater" (English Editor/Co Author), provides the most advanced and up to dates methods and tools for the study and protection of coastal aquifers.... An indispensable reference and tool for the analysis of critical fresh water resources". Journal of the American Water Resources Association, August 2005

"Thank you again for your incredibly valuable insights." Basil Seggos, esq., Riverkeeper, Inc., New York, February 2005

"Produces more quality work than anybody that I have ever worked with." Ed Alperin, Senior Vice President, Science and Technology, The Shaw Group, Jan. 2005

"We are especially gratified by the strong support of Dr Lorne Everett. He has been the key senior advisor for our National Environmental Technology Test Site". Stephen E Eikenberry, Head Environmental Programs, NFESC US Navy. 2000

Dr. Everett, invited reviewer -"We have invited the best scientists and engineers in the country to help us assess the current program, and I look forward to your active participation and constructive criticism, Dr. Everett." Dr. Dolores M. Etter, Deputy under Secretary of Defense, February 1, 1999

"Dr. Everett is known in many countries including Russia as an outstanding scientist in the field of hydrology and hydrogeology. His monographs and scientific papers are devoted.....They are widely used by Russian specialists in scientific practical works. Dr Everett's name has wide authority over Russian scientists". Dr Igor Zektser, Head of Hydrogeology, Russian Academy of Sciences, 1999

"Your innovation and contribution to technological development are recognized within the firm and around the world." Richard E. Bartlett, P.E., Vice President, manager, Expert Services, Arcadis Geraghty & Miller, Inc. February, 1998

"Dr. Everett played a significant role, both personally and as part of the Hydrocarbon National Test Site advisory committee, in ensuring that our demonstration projects would result in complete and fully acceptable data that could transition into cost effective innovative technologies for the field" William A. Quade, Jr., Director of Environmental Programs, Naval Facilities Engineering Command, January 1997

"In short, he (Dr. Everett) is reputed to be the consummate expert in fuel contamination in the vadose zone and saturated zone of soils. Importantly, Dr. Everett is a primary author of the October 1995 "Recommendations to Improve the Cleanup Process of California's Leaking Underground Fuel Tanks" report published by Lawrence Livermore National Laboratory and submitted to the California State Water Resources Control board and the Senate Bill 1764 Leaking Underground Fuel Tank Advisory Committee." Board of Port Commissioners, Port of Oakland Executive Office recommendation, 1997

"The eleven other law firms involved in the litigation involving this matter have all consistently conceded that Dr. Everett's work provides as close to "bullet proof" analysis as can be reasonably contained in a case of this nature." J.R. DeLoretto, Attorney at Law, June 1997

"Dr. Everett brought a highly complicated site, involving commingled plumes to a swift and extremely beneficial (no action) closure and his forensic work resulted in a huge victory for my clients, and others as well, in an extremely significant matter"....Varga, Berger Ledsky and Hayes, Attorneys at Law, Chicago, July 1997

"EPA's consultants (Dr. Allen Freeze) were impressed with Hawker's consultants (Dr. Lorne Everett) and their analyses, and strongly advised the Enforcement team to settle with the hawker defendants." Maria M. Rongone, Assistant EPA Regional Counsel, December 1996

"Dr. Everett is the author of many useful and very important books. His name and his books are widely used throughout many countries, including the Soviet Union." Professor Igor S. Zekster, Head, Department of Hydrogeology, Academy of Sciences, U.S.S.R., September, 1991

"From the reactions and comments of people attending Dr. Everett's Vadose Zone Characterization course, it was a tremendous success. I would like to take this opportunity to express an endorsement for this course from Region II." Mr. Lawrence Rinaldo, Senior Hydrogeologist, U.S. Environmental Protection Agency, Region II, December, 1990

Subsurface Migration of Hazardous Wastes, authored by Everett et al, "is an excellent new text book which should be in everyone's hydrogeologic library,..." Groundwater Monitoring, Volume 27 #2 September, October 1989

Groundwater Monitoring, authored by Dr. Lorne G. Everett is a "reprint of a classic handbook which presents the first major methodology for designing monitoring programs for all sources of groundwater pollution," The American Institute of Hydrology, Vol. 7, No. 2, April 1989

"Thank you for your excellent teaching in our training course on Groundwater Quality." Bill Eichert, Director, The Hydrologic Engineering Center, Department of the Army Corps of Engineers.

American Association of Groundwater Scientists/Water Well Journal, May 1988, "heading the workshop will be the foremost expert on the subject of "vadose zone monitoring."

The Groundwater Newsletter/Geraghty & Miller, Inc., August 16, 1988, "the leading expert in the field, Dr. Lorne G. Everett, will share his considerable knowledge of instrumentation and state-of-the-art techniques for unsaturated zone investigations."

"The principal instructor for the course entitled 'Vadose Zone Monitoring and Sampling Techniques' is Dr. Lorne G. Everett, the leading expert in the field", The Association of Groundwater Scientists and Engineers, March 1988

"His reputation as an expert and prolific writer in this field has thrust him into a position of international prominence..." Jay H. Lehr, in his review "Groundwater Monitoring Handbook for Coal Oil Shale Development" March, 1986.

"We work closely with a nationally renowned expert on hazardous waste and groundwater monitoring, Dr. Lorne G. Everett. He has published numerous articles and texts on the subject and is currently active in developing U.S. EPA regulations for monitoring hazardous waste in the saturated and unsaturated zones." American Geotechnical National Offices.

Environmental Research Center, University of Nevada, Las Vegas, 1984, "...several excellent documents have been released in recent years that provide detailed and highly useable information on vadose zone sampler types (Everett, et al., 1982; Everett, et al. 1983). These sources are recommended as invaluable for field studies involving soil monitoring."

Colorado School of Mines Publications Department, April 1984, "the author (Dr. Everett) has written many of the classic manuals on monitoring methods."

Ground Water, December 1983, "Groundwater Monitoring is a 63-page contribution in the hydrology chapter, by Lorne G. Everett of Kaman Tempo in Santa Barbara, California, one of the top groundwater monitoring experts in the U.S."

Ground Water Monitoring Review, Spring 1981, Charter Series of Invited Papers by Dr. Everett "presented by one of the pioneers in the field of ground-water monitoring."

Chief Research Hydrologist, U.S. Environmental Protection Agency, October 1980, "(Dr. Everett's handbook) established the state-of-the-art used throughout the (hazardous waste) industry today."

Books Published

Continuous Soil Gas Measurements: Worse Case Risk Parameters, Everett L. and M. Kram, Editors, ASTM International, 2013, 156 pgs.

Submarine Groundwater, Zektser, I.S., Dzhamalov, R.G., L.G. Everett, English Editor, CRC Press, Boca Raton, FL, 2007. 428 pgs.

Conclusions, in Groundwater Resources of the World and their Use , Everett, L and I. Zektser, 2004, , HIP-VI, Series on Groundwater No. 6, UNESCO, Paris, 346 pgs.

Evaluation and Remediation of Low Permeability and Dual Porosity Environments, Everett, L. and M. Sara Editors, ASTM International, 2002, 186 pgs.

Groundwater and the Environment, Applications for the Global Community, Zektser, I. S., Chief Editor, L.G. Everett, English Editor, CRC Press, Boca Raton, FL, 2000. 175 pgs.

Liquid Extraction Technologies, Mann, M. J., Ayen, R.J., Everett, L. G., Gombert11,D., Mckee,C.R., Meckes,M., Traver, R. P., Walling,Jr, P.D., Way, S.C. American Academy of Environmental Engineers, Annapolis, MD, 1997

Vadose Zone Monitoring at RCRA, Subtitle C, Facilities (with S.J. Cullen). United States Environmental Protection Agency, Las Vegas, NV. 1996, 332 pages

Handbook of Vadose Zone Characterization and Monitoring, Wilson, L. G., Everett, L.G. and S.J. Cullen. CRC Press, Inc., 1995. 730 pages.

"Soil Washing/Soil Flushing Monograph" Mann, M.,J. Dahlstrom, D.,Esposito, P., Everett, L. G., Peterson, G., Traver, R.P., American Academy of Environmental Engineers, Cincinnati, OH, 1993

Innovative Technologies for Cleaning the Environment: Air, Water and Soil (with others), World Scientific 1060 Main Street, Suite 1B, River Edge, New Jersey 07661 (1993), 683 pages.

Innovative Site Remediation Technology, Soil Flushing/Soil Washing (with others), American Academy of Environmental Engineers, 130 Holiday Court, Suite 100, Annapolis, Maryland 21401, December (1993)

Subsurface Migration of Hazardous Waste (with others), Van Nostrand Reinhold, 115 5th Avenue, New York, New York, 10003 (1990), 387 pages.

Groundwater Monitoring Handbook for Coal and Oil Shale Development, Everett, L. G., Elsevier Publications, Amsterdam (1985), 303 pgs.

Vadose Zone Monitoring for Hazardous Waste Sites, Everett, L. G. Wilson, L. G. and E.W. Hoylman, Noyes Publications, (Nov. 1984) 358 pgs.

Groundwater Monitoring, Everett, L. G., Genium Publishing Corp., Schnectady, New York (August 1980) 440 pgs.

Establishment of Water Quality Monitoring Programs, Everett, L. G. and K.D. Schmidt, editors, American Water Resources Association 1979, 370 pgs.

Selected Publications, Reports and Presentations

"Highly Dynamic Subsurface Vapor Concentrations: Observations and Implications" M. Kram, P. Morris, L. Everett, C. Frescura, B. Kahl, and J. Showers. Mark L. Kram, Battelle Eighth International Conference on Remediation of Chlorinated and Recalcitrant Compounds, May 21–24, 2012

"Dynamic Subsurface Explosive Vapor Concentrations: Observations and Implications", M.L. Kram, P.M. Morris and L. G. Everett, Wiley Periodicals, Inc, wileyonlinelibrary.com, DOI:10.1002/rem.21299, 2011

Co-chaired with President A. Zichichi, Water and Pollution Focus, General Assembly session, Water Scarcity and Pollution, World Federation of Scientists, International Seminars on Planetary Emergencies, the Role of Science in the 3rd Millennium, Erice, Italy, August 21, 2011.

Co-Chaired with Dr. C. Difiglio and President A. Zichichi, General Assembly Session, "Energy and Pollution, Focus: Unconventional Natural Gas...Benefits and Risks , World Federation of Scientists, International Seminars on Planetary Emergencies, the Role of Science in the 3rd Millennium. Erice, Italy, August 21, 2011.

Co-Chaired with Dr. S. Parmigiani and Dr. Fred vom Saal with President A. Zichichi, General Assembly session, Water and Pollution, Focus on Contaminants of Emerging Concern (CEC), World Federation of Scientists, International Seminars on Planetary Emergencies, the Role of Science in the 3rd Millennium. Erice, Italy, August 22, 2011.

Chaired the World Federation of Scientists Permanent Monitoring Panel Meeting, Enrico Fermi Lecture Hall, World Federation of Scientists, International Seminars

on Planetary Emergencies, the Role of Science in the 3rd Millennium, Erice, Italy, August 19, 2011.

L. Everett, Defending Low Concentrations of Toxic Chemicals in Court, Water and Pollution Workshop entitled "Sources, Effects, and New Approaches to Contaminants of Emerging Concern, Enrico Fermi Lecture Hall, World Federation of Scientists, International Seminars on Planetary Emergencies, the Role of Science in the 3rd Millennium, Erice, Italy, August 24, 2011.

L. Everett, World Federation of Scientists Permanent Monitoring Panel Pollution Report to the General Assembly, World Federation of Scientists, International Seminars on Planetary Emergencies, the Role of Science in the 3rd Millennium. Erice, Italy, August 23, 2011.

"Resolving the Nuclear Waste Issue on the road to Sustainability", L.G. Everett and F. Parker, International Seminar on Nuclear War and Planetary Emergencies 40th Session; August 19-24, 2008, Centre for Scientific Culture, Erice, Italy

"Pollution PMP Annual Report", L.G. Everett, International Seminar on Nuclear War and Planetary Emergencies 40th Session; August 19-24, 2008, Centre for Scientific Culture, Erice, Italy

"Pollution Liability", L.G. Everett, P. Wielinski and G. Yaron, , Construction Defect Claims & Coverage Super Conference, Nov. 5, 2008, Las Vegas, NV

English Editor, monograph entitled "Groundwater Resources of the World and Their Use". Published by UNESCO in Paris. 2004

Co-edited new ASTM book entitled "Evaluation and Remediation of Low Permeability and Dual Porosity Environments". This state of the art book includes papers from international authors working on some of the most complex issues in hydrology. 2004

Study of Vadose Zone Monitoring at the Hanford Site, Task II, Potential Applications at the Central Plateau Remediation Project, U.S. Department of Energy, Richland Operations Office, Flour Hanford, 2003

Study of Vadose Zone Monitoring at the Hanford Site, Task1, Use in New Cells at the Environmental Restoration Disposal Facility, U.S. Department of Energy, Richland Operations Office, Flour Hanford, 2003

"DNAPL Characterization Methods and Approaches, Part 2: Cost Comparisons", Kram, M. , A. A. Keller, J. Rossabi and L. Everett, Groundwater Monitoring and Remediation, v.22, p.46-61 2002

"Science and Technology Monitoring Needs for Site Containment and Closure", L.G. Everett and Stephen J. Kowall, proceedings of SPECTRUM 2002, Reno, NV August, 2002

"Recent Technical and Regulatory Breakthroughs in Subsurface Contamination Investigations", The Frank L. Parker Distinguished Lecture Series, Vanderbilt University, February 25, 2001

"A National Roadmap for Vadose Zone Science and Technology", L.G. Everett, et.al., proceedings of Waste Management 2002, Tucson, AZ

"A 20 Year View of Vadose Zone Characterization, Monitoring and Modeling", American Institute of Hydrology, Bloomington, MN, October 16, 2001

"Principles and Operational Strategies for Repository Staging Systems", National Academy of Sciences, Washington, D.C., September 6, 2001

"DNAPL Characterization Methods and Approaches Cost Comparisons", L.G. Everett, et. al., National Groundwater Association, Journal of Groundwater Monitoring and Remediation, Sept, 2001

Vadose Zone Science and Technology Roadmap: A National Program of Research and Development, Forum for Federal and State Environment Agencies, Tribes and US DOE Supporting Science Organizations, Seattle, WA, June 6, 2001

"Getting the Most from Your Expert Witness", 2001 PBA Civil Litigation Section Retreat, Washington, D.C. April 19-22, 2001

"Recent Technical and Regulatory Breakthroughs", Exchange 2001, Philadelphia, PA, March 29-31, 2001

"Long Term Institutional and Regulatory Policy Issues Related to the Vadose Zone", L.G. Everett, Waste Management '01 Conference, February 25-March 1, 2001, Tucson, AZ

"DNAPL Characterization Methods and Approaches, Part 1: Performance Comparisons", Kram, M. , A. A. Keller, J. Rossabi and L. Everett, Groundwater Monitoring and Remediation, v.21, no. 4 p.109-123, 2001

"The DOE Complex-wide Vadose Zone Science and Technology Roadmap" L.G. Everett, et.al., proceedings of the Prague 2000 Fifth Symposium on Environmental Contamination, Prague, Czech Republic, October 2000.

"The Importance of Vapor Phase MTBE Releases", L.G. Everett and Aaron O'Brien, Conference on Petroleum Hydrocarbons and Organic Chemicals in Groundwater, NGWA, November 15-17, 2000, Anaheim, CA

"DOE Complex Wide Vadose Zone Science and Technology Roadmap; Characterization Modeling and Simulation of Subsurface Contaminant Fate and Transport", (with others), presented at the Special Panel Session of the Department of Energy Tie Conference, November 14-16, 2000, Augusta, GA

"DOE Complex Wide Vadose Zone Science and Technology Roadmap, Characterization Monitoring and Simulation of Subsurface Contamination Fate and Transport", (with others), United States Department of Energy, September, 2000.

"Recent Concerns with Methane Explosions Associated with Leaving Petroleum Hydrocarbons in Place", Los Angeles County Bar Association, Los Angeles, CA, June 8, 2000

"A National Strategy for Vadose Zone Science and Technology, Understanding Complexities in Subsurface Environment and Closing the Circle for the Hydrologic Cycle". S.J. Kowall, D.B. Stephens, D. Borings, D. Ellis, L. Everett, M. Th Van Genuchten, M. Graham, 2000

"DNAPL Characterization Methods and Approaches: Cost and Performance Comparisons", Kram, M., A. A. Keller and L. Everett, in Treating Dense Non-Aqueous-Phase Liquids, Remediation of Chlorinated and Recalcitrant Compounds, GB. Wickramanayake, A.R. Gavaskar, and N. Gupta, eds., pp. 59-68, 2000

"Breakthrough Technology Applications to Emerging Groundwater Issues", SERDP/ESTCP, Arlington, VA, December 2, 1999

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