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March 3, 2010

Mr. Christopher Carey
Kansas Department of Health and Environment
1000 SW Jackson St., Suite 410
Topeka, KS 66612-1367

Subject: *Final Work Plan: Indoor Air and Ambient Air Sampling near the Former CCC/USDA Grain Storage Facility in Everest, Kansas*, ANL/EVS/AGEM/CHRON-1341

Dear Mr. Carey:

Attached, at the request of Caroline Roe of the Commodity Credit Corporation, U.S. Department of Agriculture, is the document *Final Work Plan: Indoor Air and Ambient Air Sampling near the Former CCC/USDA Grain Storage Facility in Everest, Kansas*. The attached document incorporates the duplicate sampling requested in your letter of March 2; it replaces the earlier version dated February 19.

As you requested in your letter of March 2, we are developing our own standard operating procedure for indoor air sampling. We will be submitting that procedure shortly.

Please direct questions to Ms. Roe.

Sincerely,

Lorraine M. LaFreniere

LML:rs

Attachment: *Final Work Plan: Indoor Air and Ambient Air Sampling near the Former CCC/USDA Grain Storage Facility in Everest, Kansas*

cc (with attachment):
C. Roe, CCC/USDA
G. Fremerman, CCC/USDA
cc (no attachment):
S. Gilmore, CCC/USDA
D. Steck, CCC/USDA
Chron 1341

bcc (with attachment):

L. LaFreniere
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L. Culbert

# Final Work Plan: Indoor Air and Ambient Air Sampling near the Former CCC/USDA Grain Storage Facility in Everest, Kansas

The Commodity Credit Corporation of the U.S. Department of Agriculture (CCC/USDA) operated a grain storage facility at the western edge of Everest, Kansas, from the early 1950s to the early 1970s. Sampling by the Kansas Department of Health and Environment (KDHE) in 1997 resulted in the detection of carbon tetrachloride in one domestic well (the Nigh well) northwest of the former facility. On behalf of the CCC/USDA, Argonne National Laboratory subsequently conducted a series of investigations to characterize the contamination (Argonne 2003, 2006a,b,c).

Automatic, continuous monitoring of groundwater levels began in 2002 and is ongoing at six locations. The results have consistently indicated groundwater flow toward the north-northwest from the former CCC/USDA property to the Nigh property, then west-southwest from the Nigh property to the intermittent creek.

Sitewide periodic groundwater and surface water sampling with analysis for volatile organic compounds (VOCs) began in 2008. Argonne's combined data indicate no significant downgradient extension of contamination since 2000. At present, the sampling is annual, as approved by the KDHE (2009) in response to a plan developed for the CCC/USDA (Argonne 2009).

This document presents a plan for collecting indoor air samples in homes located along and adjacent to the defined extent of the carbon tetrachloride contamination. The plan was requested by the KDHE. Ambient air samples to represent the conditions along this pathway will also be taken.

## *Project Objective*

The purpose of the proposed work is to satisfy KDHE requirements and to collect additional data for assessing the risk to human health due to the potential upward migration of carbon tetrachloride and its primary degradation product (chloroform) into homes located in close proximity to the former grain storage facility, as well as along and within 100 ft laterally from the currently defined plume emanating from the former Everest facility. Investigation of the indoor air environment was not a defined objective during the previous investigations of the Everest site (Argonne 2003, 2006a,b,c) as they predated the more recent regulatory concern regarding potential health risks associated with the vapor contaminant pathway.

## *Proposed Work: Collection of Indoor Air and Ambient Air Samples*

*Sampling Procedure*. Indoor air samples will be collected at the designated homes. In addition, representative ambient air samples will be collected. All collection protocols will be in compliance with the KDHE (2007) vapor intrusion guidance and KDHE standard operating procedure (SOP) BER-33 (attached). Dr. Blayne Hartman (Hartman Environmental Geoscience, Solana Beach, California), a recognized expert in the field of vapor intrusion, will advise Argonne staff as to specific protocols prior to the sampling event. He will also collaborate with

Argonne and the CCC/USDA, as well as the KDHE, in interpretation of the results of the vapor intrusion investigation.

Figure 1 illustrates the current interpreted configuration of the carbon tetrachloride plume (April 2008) at and emanating from the former CCC/USDA site (Argonne 2008). Figure 2 provides a detailed view with the addresses of the homes to be sampled. Table 1 is a list of owner names and address for these residences.

Currently, 10 homes (Table 1) are proposed for sampling, on the basis of screening criteria defined in KDHE (2007) guidance. As defined in the guidance document, buildings of concern are those within 100 ft (for chlorinated VOCs) laterally or 40 ft vertically of the contamination. Figure 3 illustrates the 100-ft lateral boundary from the currently designated carbon tetrachloride plume. With the exception of the Nigh property on Prairie Road, the affected homes are located in close proximity to and directly downgradient from the former facility, along Main Street, as well as along Hickory Circle and Chestnut Street to the north. The plume, as currently constrained, trends to the northwest from the former facility and across agricultural fields with no residences, until it turns to the west in the vicinity of the Nigh property. The plume then trends to the west again across agricultural fields with no residences, toward an undifferentiated creek. The number of homes potentially affected by the shallow plume is limited, as it primarily underlies non-residential agricultural land. On the basis of groundwater level depths measured manually during sampling in April 2008, the depth to the contaminated groundwater is generally < 40 ft BGL; all measured depths were < 50 ft BGL.

*Sample Location.* Samplers will be placed in the basement and on the first floor of each residence, in a location of common occupancy (as allowed by the residents). Samples will be collected as close to the center of the room as possible, away from heating system registers, and at a height of 3-7 ft above the floor (in the breathing zone). Samples will be collected in Summa canisters, individually certified clean, for a period of 24 hr. Meteorological conditions will be noted and recorded. Page 1 of the KDHE Field Data Air Sampling Form (in the attached SOP BER-33) will be completed.

*Ambient Air Sample.* To be representative of the site, ambient air samples will be collected in an upwind location, away from obvious sources of VOCs, over the same collection period as the indoor air samples. Additional canisters will be placed to test ambient air conditions at several points along the lateral extent of the contamination.

*Duplicate Air Samples.* Duplicate air samples will be collected at the rate of at least one duplicate per 20 primary samples.

*Sample Analysis*. Air samples will be shipped to a laboratory certified for method TO-15 analysis. The samples will be analyzed for carbon tetrachloride and chloroform by method TO-15, at a detection level at or below the allowable risk-based indoor air level for each compound.

*Report Deliverable*

A report containing all of the data, all relevant quality assurance/quality control information, and an interpretation of the vapor intrusion risk will be submitted following completion of the fieldwork and analytical reviews.

*Schedule of Field Work*

After approval of this plan, the KDHE will have the opportunity to inform the community of the sampling plan. Argonne will make further contact, through its community relations staff, to coordinate the sampling effort with the aim of minimizing disruption to the residents and the community.

The work is tentatively scheduled for mid March 2010. The KDHE will be informed as to the finalized dates when residences are available for testing, to allow the agency to arrange oversight and the retrieval of duplicate samples.

The CCC/USDA intends to offer radon sampling to the residents of homes potentially affected by carbon tetrachloride, to be conducted at the same time. The radon kits used, as approved for sampling in Hanover, Kansas (KDHE 2010), will be obtained from the county office. The kits (charcoal canisters or pouches) will be used as directed and will be left in place for 3-4 days, then returned (after exposure) to National Radon Program Services at Kansas State University (133 Ward Hall, Manhattan, KS 66506-2508). The results will be reported to the KDHE when available.

*References*

Argonne, 2003, *Final Phase II Report: QuickSite® Investigation, Everest, Kansas*, ANL/ER/TR-03/003, prepared for the Commodity Credit Corporation, U.S. Department of Agriculture, Washington, D.C., by Argonne National Laboratory, Argonne, Illinois, September.

Argonne, 2006a, *Final Report: Phase III Targeted Investigation, Everest, Kansas*, ANL/ER/TR-04/004, prepared for the Commodity Credit Corporation, U.S. Department of Agriculture, Washington, D.C., by Argonne National Laboratory, Argonne, Illinois, January.

Argonne, 2006b, *2005 Cross Section Analysis and Recommendations for Further Studies at Everest, Kansas*, ANL/EVS/AGEM/TR-05-02, prepared for the Commodity Credit Corporation, U.S. Department of Agriculture, Washington, D.C., by Argonne National Laboratory, Argonne, Illinois, January.

Argonne, 2006c, *Final Report: Results of Aquifer Pumping and Groundwater Sampling at Everest, Kansas*, in January-March 2006, ANL/EVS/AGEM/TR-06-05, prepared for the Commodity Credit Corporation, U.S. Department of Agriculture, Washington, D.C., by Argonne National Laboratory, Argonne, Illinois, September.

Argonne, 2008, *Results of Groundwater Monitoring at Everest, Kansas, in April 2008*, ANL/EVS/AGEM/TR-08-16, prepared for the Commodity Credit Corporation, U.S. Department of Agriculture, Washington, D.C., by Argonne National Laboratory, Argonne, Illinois, September.

Argonne, 2009, *Monitoring Plan for Everest, Kansas*, ANL/EVS/AGEM/CHRON-1260, prepared for the Commodity Credit Corporation, U.S. Department of Agriculture, Washington, D.C., by Argonne National Laboratory, Argonne, Illinois, March 23.

KDHE, 2007, *Kansas Vapor Intrusion Guidance: Chemical Vapor Intrusion and Residential Indoor Air*, Bureau of Environmental Remediation, Kansas Department of Health and Environment, Topeka, Kansas, June (http://www.kdheks.gov/ber/download/Ks_VI_Guidance.pdf).

KDHE, 2009, letter from E. Finzer (Bureau of Environmental Remediation, Kansas Department of Health and Environment, Topeka, Kansas) to C. Roe (Commodity Credit Corporation, U.S. Department of Agriculture, Washington, D.C.), regarding *Monitoring Plan for Everest, Kansas*, May 12.

KDHE, 2010, electronic mail message from C. Carey (Bureau of Environmental Remediation, Kansas Department of Health and Environment, Topeka, Kansas) to L. LaFreniere (Argonne National Laboratory, Argonne, Illinois), January 21.

TABLE 1 Contact information for Everest residences to be sampled.

| No. | Name | Street Address | City, State, Zip | Telephone |
|---|---|---|---|---|
| 1 | Nigh, Donald | 1191 Prairie Road | Everest, KS 66424-9095 | 785-548-7582 |
| 2 | Winters, John J. | 1120 Main Street | Everest, KS 66424-9134 | None |
| 3 | Smith, Jimmy P. | 1044 Main Street | Everest, KS 66424-9098 | 785-548-7780 |
| 4 | Chriss, Gary R. | 605 Hickory Circle | Everest, KS 66424-9099 | 785-548-7659 |
| 5 | Lane, Harold | 620 Hickory Circle | Everest, KS 66424-9099 | 785-548-7573 |
| 6 | Scott, Corey P. | 636 Hickory Circle | Everest, KS 66424-9099 | 785-548-7614 |
| 7 | Knudson, Roger L. | 900 Main Street | Everest, KS 66424-9100 | 785-548-7559 |
| 8 | Moulder, Oaks | 828 Main Street | Everest, KS 66424-9101 | 785-548-7797 |
| 9 | Opal, III, Eugene L. | 837 Main Street | Everest, KS 66424-9101 | None |
| 10 | Ambler, Charlotte | 829 Chestnut | Everest, KS 66424-9160 | 785-548-7544 |

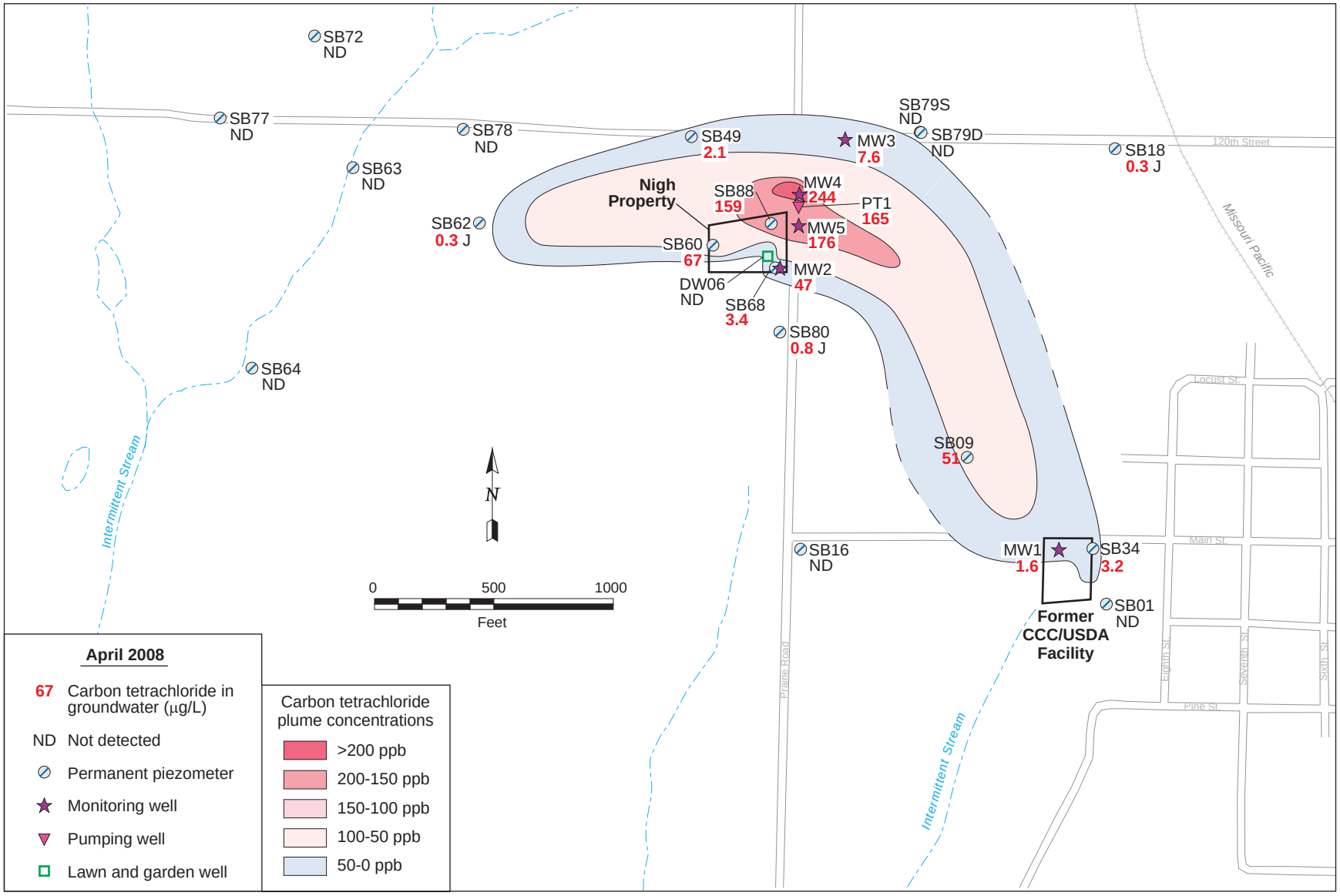

SB72
ND
SB77
ND
SB78
ND
SB63
ND
SB64
ND
SB62
0.3 J
SB49
2.1
SB79S
ND
MW3
7.6
SB79D
ND
SB18
0.3 J
120th Street
Nigh
Property
SB88
159
MW4
244
PT1
165
MW5
176
SB60
67
MW2
47
DW06
ND
SB68
3.4
SB80
0.8 J
Missouri Pacific
Intermittent Stream
SB09
51
Locust St.
Main St.
Pine St.
SB16
ND
MW1
1.6
SB34
3.2
SB01
ND
Former
CCC/USDA
Facility
Prairie Road
Eighth St.
Seventh St.
Sixth St.
Intermittent Stream
N
0
500
1000
Feet
April 2008
67 Carbon tetrachloride in groundwater (µg/L)
ND Not detected
Permanent piezometer
Monitoring well
Pumping well
Lawn and garden well
Carbon tetrachloride plume concentrations
>200 ppb
200-150 ppb
150-100 ppb
100-50 ppb
50-0 ppb

FIGURE 1


Everest, KS
2008 Aerial Photo
1191
Prairie St.
Chestnut
8th St.
636
829
620
1120
1044
605
Hickory
900
828
Main St.
837
Former
CCC/USDA
Facility
N
0
500
1,000
feet

FIGURE 2

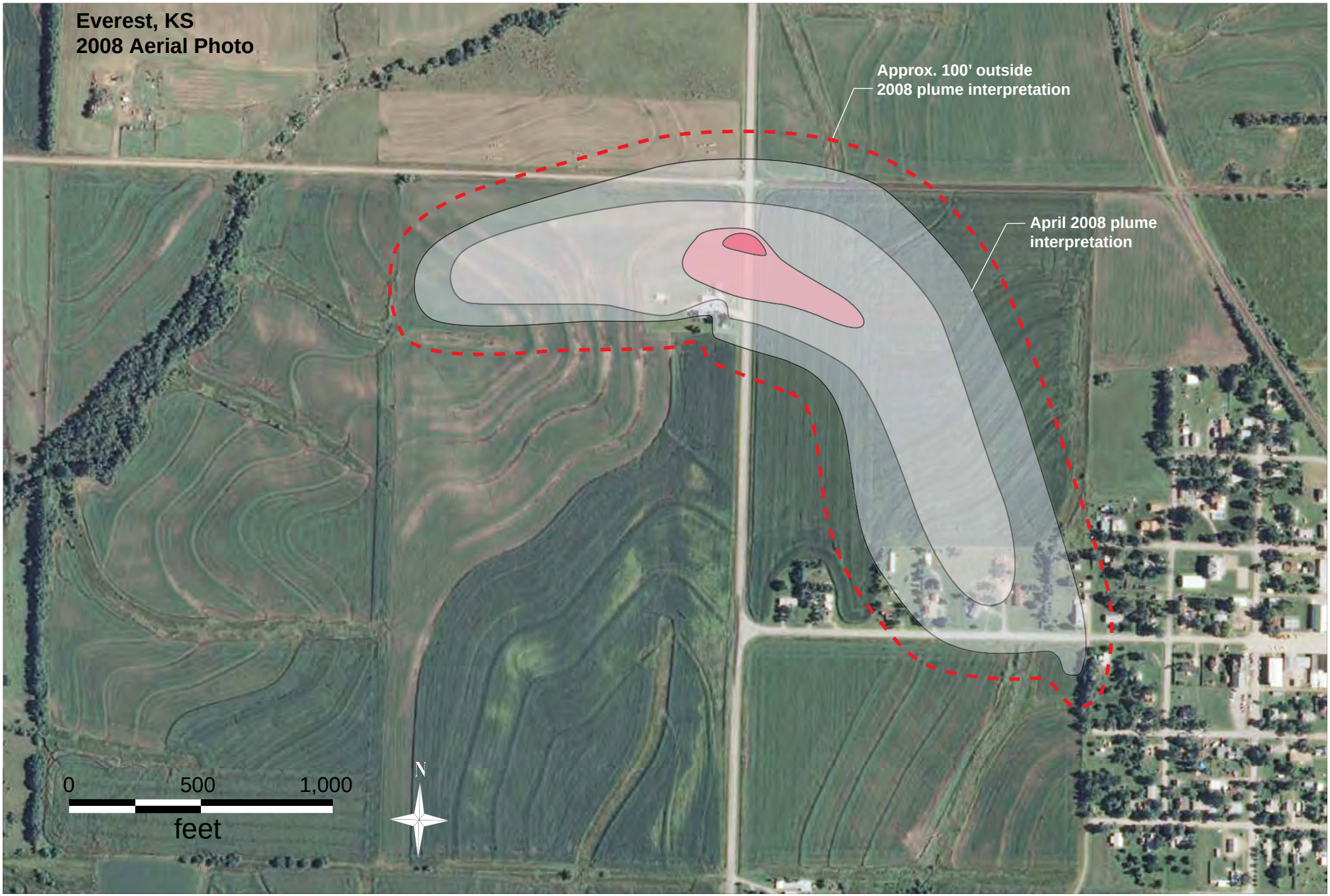

Everest, KS
2008 Aerial Photo
Approx. 100' outside
2008 plume interpretation
April 2008 plume
interpretation
0
500
1,000
feet
N

FIGURE 3

# APPENDIX A

# STANDARD OPERATING PROCEDURE BER-33

# PROCEDURES FOR SAMPLING AND ANALYSIS OF INDOOR AIR SAMPLES

TABLE OF CONTENTS

## 1. INTRODUCTION

This procedure describes field protocols for sampling and analytical methods to determine the presence of VOCs in ambient, indoor, or workplace atmospheres. This method establishes standard operating procedures for the collection of air samples in passivated (inert) stainless-steel canisters.

## 2. SAMPLING EQUIPMENT

Indoor air samples will be collected in specially prepared six liter stainless-steel spheres. The laboratory will provide either SUMMA canisters or SilcoCans for the sampling. Air flow into the canister is regulated by a sampling valve (fixed orifice) or a pneumatic flow controller, attached to an in-line particulate filter. The sampling valve is typically used for short duration grab samples; however, the valve can be set for longer duration sampling. A flow controller can be preset to regulate flow for sample collection times of 1-hour, 3-hours, 8-hours, 12-hours or 24 hours. Larger canisters are available for sampling periods in excess of 24-hours. The desired sampling rate is pre-set either by the canister manufacturer or the laboratory. Canisters will be cleaned and certified by the laboratory as per EPA Method TO-14A or TO-15 guidelines.

A pressure/vacuum gauge is utilized to measure and record the initial canister pressure. This item is not typically supplied by the laboratory but is available upon request. The canister pressure should be approximately 22 - 25 psig. If the initial pressure is less than 20 psig, the canister should be rejected and returned to the laboratory.

Stainless-steel or Teflon tubing can be attached to the inline filter to obtain samples from the breathing zone or a remote location. If only adults occupy the residence, the inlet manifold is placed in the breathing zone at approximately five feet above grade. The manifold may not be required for representative air sample in a residence with children. The laboratory will supply this material upon request.

## 3. BACKGROUND REVIEW

An adequate background review must be conducted to obtain information on each structure from which a sample is collected. Conduct a survey of each structure to ascertain basement, crawl space or slab on-grade building configuration. Determine if sumps, wells, or cisterns are associated with each structure. Evaluate the condition of the floors and walls, furnace use (fuel type) and building ventilation. These features may act as conduits that will facilitate the migration of VOCs from the soil and/or groundwater plume. An attached garage may store products that can contribute to contaminant impacts.

Interviews should be conducted to assess the use of potential contaminants, frequency of use, storage, as well as methods of handling and disposal. Additional information that is vital to adequately evaluate potential health risks include the following: the length of occupant residency; the ages of the adults and children that live in the structure; if the occupants smoke and how often. Any hobbies that use paints or solvents should be noted. The data referenced in this section should be entered on the Field Data Air Sampling Form in Attachment One.

## 4. PRELIMINARY SCREENING

Primary sampling areas will be in basements and/or the lowest potential living level, near sumps or other potential source areas. Preliminary screening of the sampling area may be conducted through use of photoionization detectors (PID) or colorimetric tubes. Screening, and subsequent sampling, will be conducted in the center of the room away from obstructions in the breathing zone, near potential sources, basements and crawl spaces. PIDs will be checked and calibrated according to manufacturers directions. Additional preliminary factors to be documented will include indoor and outdoor temperature, wind speed/ direction, and barometric pressure.

Preliminary screening and subsequent sampling can also be conducted in buildings or residences outside the area of concern to evaluate background levels of various constituents that may impact data interpretation. The data referenced in this section should be entered on the Field Data Air Sampling Form in Attachment One.

## 5. SAMPLING PROCEDURES

Laboratory prepared sampling apparatus configurations may vary. Specific instructions and/or diagrams for system assembly, if any, should be obtained from the laboratory suppling the canister(s). Canisters should not be placed in areas of high humidity (bathroom/laundry room), near windows, or heat registers. Record the local outdoor temperature, relative humidity and barometric pressure on the Field Data Air Sampling Form in Attachment One.

Sampling equipment apparatus may be assembled as follows: connect the flow controller, with attached in-line filter and vacuum/ pressure gauge, to the canister utilizing a compression fitting; connect a sampling tube to the sample inlet on the filter; place the canister in the predetermined location and begin sampling by turning the canister valve counter-clockwise one full turn or as specified; after sampling is complete, record the canister pressure and close the canister valve. Do not over-tighten the valves or compression fittings.

The final canister pressure should be less than atmospheric to ensure that a constant flow rate was used for the entire sampling period. Attach an identification tag that indicates the canister serial

number, sample number, location, and date to the canister for transport to the laboratory. The canisters will be shipped under proper chain-of-custody protocol. Canisters must be returned to the laboratory from which they were rented for analysis. A copy of sampling instructions for canisters with pneumatic flow controllers is in Attachment Two.

## 6. SAMPLE ANALYSIS

The canisters provide storage stability for many VOCs for a period of up to 30 days. Collected samples will be submitted for laboratory analysis by either EPA Method TO-14A (EPA, January, 1997) or EPA Method TO-15 (EPA, January, 1997). EPA Method TO-14A is the more recognized method for analysis of unknown trace VOCs and is more sensitive. This method can analyze up to 41 of 187 hazardous air pollutants listed in the Title III Clean Air Act Amendment (CAAA). EPA Method TO-14A uses single or multiple detectors which are generally less desirable than the mass spectrometry detector utilized by EPA Method TO-15.

The mass spectrometry utilized for EPA Method TO-15 is a more scientifically defensible detector scheme that has a more definitive identification technique for VOC analysis than TO-14A. Therefore, EPA Method TO-15 can be applied with a higher confidence which reduces uncertainty in risk assessments that evaluate VOCs. A larger number of Title III CAAA compounds can be analyzed (97 of 187) by EPA Method TO-15. Detection limits for the various analytes, with either EPA method, range from 0.2 ppbv - 25 ppbv.

A relatively limited number of laboratories conduct air sampling analysis. The referenced lab methods can be located on the world wide web at the following addresses: www.epa.gov/ttnamtil/files/ambient/airtox/to-14a.pdf or www.epa.gov/ttnamtil/files/ambient/airtox/to-15.pdf.

References:

Method TO-14A - Determination of Volatile Organic Compounds (VOCs) in Ambient Air Using Specially Prepared Canisters with Subsequent Analysis by Gas Chromatography, EPA, January, 1997

Method TO-15 - Determination of Volatile Organic Compounds (VOCs) in Air Collected in Specially-Prepared Canisters and Analyzed by Gas Chromatography/Mass Spectrometry, EPA, January, 1997

**ATTACHMENT ONE**

**FIELD DATA AIR SAMPLING FORM**

# FIELD DATA AIR SAMPLING FORM

Site Name:_____

Sample Identification:_____/_____ Date Sampled:_____

Sample Location(s):_____
_____

Sampler:_____ Canister Serial #:_____/_____

## Environmental Conditions

Outdoor Temperature:_____ Barometric Pressure:_____ Wind Speed/Direction:_____

Relative Humidity:_____ Comments:_____

## Preliminary Screening

Instrumentation:_____ Calibration Date:_____ Time:_____ am/pm

Field Reading(s):_____(ppm)/_____(ppm)/_____(ppm)/_____(ppm)

Location(s):_____
_____
_____
_____

## Air Sampling

| | Time | Pressure | Controller Flow |
|---|---|---|---|
| Start: | _____am/pm | _____psig | _____ |
| Stop: | _____am/pm | _____psig | _____ |

==========

| | | | |
|---|---|---|---|
| Start: | _____am/pm | _____psig | _____ |
| Stop: | _____am/pm | _____psig | _____ |

# FIELD DATA AIR SAMPLING FORM

## Residential Questionnaire

Tenant's Name(s):_____ Age:_____ Tenure:_____
_____ _____ _____
_____ _____ _____
_____ _____ _____
_____ _____ _____

Address:_____

Smoker(s): Y/N Product (Cigars, Pipe, Cigarettes):_____ Number Smoked/Day:_____

Basement/Crawl Space: Y/N Ventilated: Y/N Living Quarters: Y/N
Basement Activities:_____

Private Well: Y/N Sump: Y/N Cistern: Y/N In Use/Plugged: Y/N

Recent Remodeling: Y/N Activities (painting, new carpet, new cabinets): Y/N
_____

VOC sources (hobbies, paints, solvents, gasoline, etc.):_____
_____

Cleaning Products and Storage:_____

Attached Garage: Y/N Garage Storage (cars, lawn mover, etc.):_____

Furnace Type (Oil, Natural Gas, Propane):_____ Furnace Intake: Inside/Outside

Additional Heating Sources (space heater, etc):_____ Fuel Type:_____

Comments:_____
_____
_____
_____
_____

# ATTACHMENT TWO

# SAMPLING INSTRUCTIONS FOR CANISTERS WITH PNEUMATIC FLOW CONTROLLERS

# Sampling Instructions for Canisters With Pneumatic Flow Controllers

1. Inspect your canister shipment upon arrival. Compare the contents with the packing slip and notify the lab of any discrepancy or damage.

2. Familiarize yourself with this diagram and the equipment that you received. The flow controller will be set for the appropriate sampling rate in the laboratory and should not require adjustment.

3. Remove the brass caps from the flow controller and canister. Connect the flow controller to the canister by inserting the "canister connection" into the "canister inlet" and hand tighten the swagelock nut being careful not to cross the threads. Using two open end wrenches (1/2" & 9/16") tighten the nut no more than 1/8 turn past finger tight. DO NOT use adjustable wrenches or pliers.

4. The fittings are swagelock compression fittings. Do not use teflon tape or other sealants, they are not necessary. DO NOT over-tighten any connection. Over-tightening causes leaks, not fixes them.

5. The canister and controller are now ready for ambient air sampling. If you intend to sample a remote location or source, you will need to attach a sampling line. This should be 1/4" O.D. tubing of virgin Teflon or cleaned stainless steel.

6. If arranged with your canister order, the lab will provide a swagelock nut and set of nylon ferrules for connecting line. Slide the nut, the back ferrule, then the front ferrule onto the tubing. Insert the tubing into the sample inlet and slide the ferrules into the fitting. Secure the nut being careful not to cross the threads. When using nylon ferrules, a snug finger tight should be sufficient for a leak free connection.

7. To begin sampling, simply open the canister valve by turning clockwise. One full turn is sufficient. Note the vacuum gauge reading. The vacuum gauge reading should be near the barometric pressure.

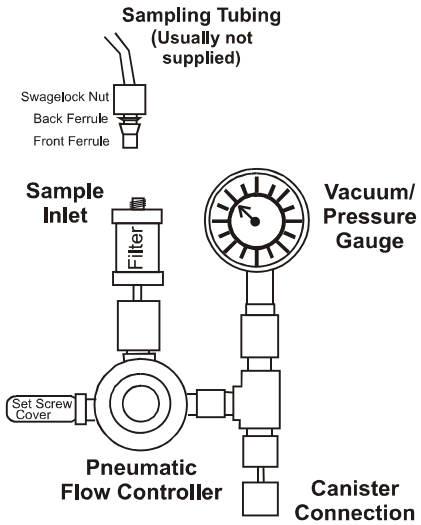
8. You can watch the decline in the vacuum to gauge the sampling rate. A one hour sample should drop in vacuum at a rate of 0.5" Hg per minute (i.e. 30"/60 min). Remember this is a rough estimate. The sampling rate is normally set in the laboratory. Occasionally the controller will lose calibration in shipment. If necessary contact the lab for assistance.

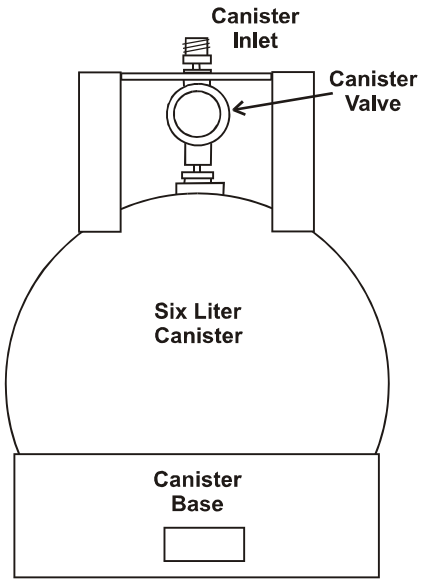
9. After sampling is complete, close the canister valve by turning clockwise until finger tight. DO NOT over-tighten as this WILL damage a very expensive valve.

10. Disassemble the components in reverse order of the above assembly instructions. Return all components to the original shipping containers and package them as received.

11. Verify that all parts are packed for return by referencing the packing slip. The project will be charged for all missing or damaged components.

12. Complete a Chain-of-Custody Record and return the sample to the laboratory for analyses.




Teflon will sometimes have very low level freon contamination.