Site Investigation Work Plan

Former Adleman's Dry Cleaner
1502 Bellinger Street
Eau Claire, Wisconsin
BRRTS #02-18-258807

Prepared for:

Mayo Clinic Health System
1221 Whipple Street
PO Box 4105
Eau Claire, WI 54702-4105

October 2018

HireSmart®

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Former Adleman's Dry Cleaning
1502 Bellinger Street
Eau Claire, Wisconsin
BRRTS #02-18-258807

This report prepared by:
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1.0 Introduction

Mayo Clinic Health System (MCHS) has retained Ayres Associates to conduct supplemental Site Investigation at the Former Adleman's Dry Cleaner Environmental Repair Program (ERP) site in Eau Claire, Wisconsin (subject property). This work plan discusses the site background, site history and setting, potential contamination sources, and the scope of the proposed site investigation. The work plan was prepared and is organized in accordance with the requirements listed in Wisconsin Administrative Code NR 716.07 and 716.09 and other guidance provided by the Wisconsin Department of Natural Resources (WDNR).

1.1 Site Address and Location

The subject property located in the Southeast ¼ of the Southeast ¼ of Section 18, Township 27 North, Range 9 West, in the City of Eau Claire, Eau Claire County, Wisconsin (Figure 1 in Appendix A). The address is 1502 Bellinger Street, Eau Claire, Wisconsin, and the City of Eau Claire Parcel Number is 090074. Latitude and longitude are 44.8148183, -91.5115958.

1.2 Responsible Party and Project Consultant

The project contacts for this site are as follows:

Client/Property Owner/Responsible Party:	Mayo Clinic Health System 1221 Whipple Street PO Box 4105 Eau Claire, Wisconsin 54702-4105 Gordon Howie E-mail: howie.gordon@mayo.edu
Environmental Consultant:	Ayres Associates Inc 3433 Oakwood Hills Pkwy Eau Claire, WI 54701 Lori Rosemore, PG E-mail: RosemoreL@AyresAssociates.com Mitchell Banach E-mail: BanachM@AyresAssociates.com Phone: 715.834.3161

2.0 Site Investigation Scoping

Ayres Associates has reviewed applicable items in NR 716.09 to assist in developing an appropriate work plan for this site. This section summarizes the findings of that review.

2.1 Site History, Potential Contamination, and Media Affected

The following information was primarily obtained from a WDNR Liability Clarification Letter dated September 20, 2000:

The Property was historically used by Adleman Dry Cleaning as a commercial laundry and dry-cleaning facility; currently the Property is a vacant parking lot. A Phase II site assessment was completed in March 3, 2000, and a limited environmental site investigation, dated August 16, 2000, was also completed to evaluate the potential for soil and/or groundwater contamination at the Property.

The Phase II site assessment involved completing three soil borings to below the water table and constructing three temporary groundwater monitoring wells. Soil was screened for the presence of volatile organic compounds (VOCs) using a photoionization detector, screening detections were not found from that testing. Moreover, soil samples were not submitted for laboratory analysis. Three groundwater samples, one from each of the three temporary wells, were collected and submitted for laboratory analysis. The temporary monitoring wells were then abandoned after sample collection. The results from monitoring wells MW1 and MW3 indicated that no detections of VOCs were present in groundwater at those locations. However, one water sample result collected from MW2, located on the southeast comer of the property, indicated the presence of 5 ug/L of tetrachloroethylene (PCE) in groundwater. The Wis. Adm. Code ch. NR140, groundwater enforcement standard (ES) for PCE is 5 ug/L.

Subsequent limited site assessment activities involved completing three additional soil borings to below the water table and constructing three NR 141 compliant groundwater monitoring wells. Five soil samples were collected from the borings and submitted for laboratory analysis. The analytical results indicate three of the soil samples contained no detectable levels of VOCs, although one sample indicated low levels of methylene chloride present (which is likely a laboratory contaminant), and one sample found that 0.32 mg/kg of PCE was present. This sample with PCE was collected from 5-7 ft below ground surface (bgs). A second sample taken from the same boring, at 35-37 ft bgs, did not contain detectable levels of PCE.

The water table below the site is located approximately 35 to 40 ft bgs. Groundwater samples collected from the three NR 141 compliant groundwater monitoring wells indicated the presence of bromodichloromethane at 0.148 ug/L, chloroform at levels ranging from 0.395 to 1.39 ug/L, and PCE at levels ranging from 0.26-4.15 ug/L. None of the VOCs detected were found to exceed their respective NR 140 groundwater enforcement standards during this sampling.

2.2 Proximity to Other Sources of Contamination

The subject property is located within 500 feet of several closed leaking underground storage tank (LUST) sites including Mac's Service Center Former (BRRTS # 03-18-000559), SuperAmerica Store #4522 (BRRTS # 03-18-144277), and Direct Oil Co Main Office (BRRTS # 03-18-269549). However, these sites were closed without residual contamination subject to continuing obligations, and there are no sites with an open regulatory status in proximity to the subject property.

2.3 Access to Site and Surrounding Area

Ayres Associates has obtained permission from MCHS to access the site. Permission from the City of Eau Claire will need to be obtained to drill within the right-of-way.

2.4 Potential Impacts to Public and Private Receptors

At this time, known impacts above NR 720 RCLs or NR 140 ESs are present at the subject property and adjoining City of Eau Claire right-of-way. Potential impacts to other public or private receptors are not anticipated at this time.

2.5 Potential Impacts to Sensitive Species or Habitats

The subject property is in a developed urban area and is not located proximal to known sensitive species or habitats.

2.6 Potential or Current Interim and Remedial Actions

Interim or planned remedial actions are not anticipated at this time. However, residual contamination at the time of case closure may be subject to continuing obligations including engineering and/or institutional controls. Currently there is an asphalt cap on the property providing an effective barrier from a direct contact threat.

2.7 Other Conditions That May Affect the Scope

Proposed sampling within the City of Eau Claire right-of-way is dependent on the City's permitting process for work within the right-of-way. Alternative sample locations may be selected if permission to drill within the right-of-way is not granted.

3.0 Site Setting

This section describes the physical, geological, and hydrogeological settings of the site that we considered in selecting the appropriate sampling methods and locations for the site investigation.

3.1 Topography

The subject property is located approximately 1,000 feet west of the Chippewa River and 1,000 feet east of Half Moon Lake, an oxbow lake formed by the Chippewa River. Surface topography is relatively flat and dips gently to the east.

3.2 Surface Water Drainage

The subject property is located in the Chippewa River watershed. All surface water on the subject property is presumed to drain south to the Chippewa River.

3.3 Surficial Soils

Shallow fill materials, such as sand and/or gravel, are likely to be present beneath the asphalt pavement. Underlying native soils are anticipated to be comprised of medium- to coarse-grained, poorly-sorted sand.

3.4 Geology

Maps published by the United States Geological Survey (1972) indicate the sites are in an area of glacial unpitted outwash deposits that consist of stratified sand that overlay Cambrian age sandstone. The thickness of the outwash deposits over bedrock is approximately 50 to 100 feet in the area of the subject property. Bedrock has not been encountered during previous investigation activities at either site.

3.5 Hydrogeology

Previous investigation indicates that groundwater is located at an approximate depth between 35 feet and 40 feet below ground surface with a southeast flow direction toward the Chippewa River.

3.6 Potential Migration Pathways

The groundwater pathway is one potential pathway for contaminant migration. Groundwater impacts have already been confirmed at the subject property. However, the last groundwater sampling event was approximately 18 years ago, and natural attenuation may have decreased contaminant concentrations.

The soil vapor pathway is also a potential concern due to the presence of PCE and contamination in the right-of-way, which commonly contains utility corridors.

4.0 Site Investigation Strategy

The objective of this site investigation is to assess the current degree of contamination at the site, including soil vapor. This section describes our proposed scope of services for this site investigation. Our scope of services is based on the information about the site and the requirements for site investigations listed in NR 716.11 and NR 716.13. Field procedures for soil, groundwater, and vapor sampling are provided in Appendix B.

4.1 Temporary Well Installation and Soil Sampling and Analysis

The proposed site investigation plan includes the installation two temporary groundwater monitoring wells, in the location of former monitoring wells MW-2 and MW-3. The wells will be set with 10-foot screens intersecting the water table and are anticipated to be set at a depth of 40 feet below ground surface depending on the groundwater depth observed during drilling.

An additional four probes will be advanced to a depth of 12 feet to assess soil contamination in or near the former building footprint, and an additional three probes will be advanced to a depth of 12 feet for soil sampling and then converted to soil gas wells for field screening of organic vapors.

During installation, Ayres Associates personnel will be on site to log the soil borings/probes, classify soils, collect soil samples, and conduct organic vapor screening. Soil samples will be collected continuously (i.e. every two feet) from each boring. Continuous sampling from soil borings will involve placing soil into plastic bags and qualitatively screening soil for organic vapors using a flame ionization detector (FID) and/or photo ionization detector (PID). Based on those screening results, Ayres Associates will collect representative samples for laboratory analysis. Samples will be collected from probe terminus and the interval with the highest field screening reading. The locations of proposed sample locations are depicted on Figure 2 in Appendix A.

All soil samples will be analyzed by a certified laboratory for VOCs using EPA Method 8260.

4.2 Groundwater Sampling & Analysis

Groundwater grab samples will be collected from each of the soil borings using disposable bailers to prevent cross-contamination.

All groundwater samples will be analyzed by a certified laboratory for VOCs using EPA Method 8260.

4.3 Soil Vapor Sampling & Analysis

As discussed in Section 4.1 above, three probes will be converted to soil gas wells for vapor field screening with a PID/FID.

Additionally, three soil vapor pins will be installed in site pavement. Two will be installed along the north property line to assess vapor migration. The third one will be installed near MW-2, where PCE was previously detected at 5 to 7 feet bgs.

The three soil vapor samples will be collected using a laboratory-provided Summa canister to be analyzed for a reduced list of VOCs to include PCE by EPA Method TO-14M/TO-15.

4.4 Quality Control and Assurance Procedures

Ayres Associates will follow the quality control and quality assurance procedures in accordance with NR 716.13. These procedures include but are not limited to the following:

- Analyzing one replicate groundwater sample for every 10 or less samples.
- Analyzing one trip blank for each shipping container with volatile groundwater samples.
- Leak testing vapor pin seals by creating a water dam with putty around the pin hole and observing for leakage prior to vapor sampling.
- Using WDNR chain-of-custody form, Form 4400-151 or equivalent, to accompany samples from collection to receipt by the analytical laboratory.
- Shipping soil and groundwater samples on ice to the analytical laboratory so that samples are received at a temperature no greater than 4°C.
- Using disposable bailers, tubing, or other sampling equipment to prevent cross-contamination or other unintended contamination of samples. Reusable vapor pins will be decontaminated before/after use with Alconox detergent and clean water.

4.5 Procedures to Prevent Cross-Contamination

Disposable bailers will be used to collect groundwater samples. Disposable tubing will be used to connect Summa cannisters to vapor pins. Reusable vapor pins will be decontaminated before/after use with Alconox detergent and clean water. Additionally, disposable Nitrile gloves will be worn during collection of all samples, with fresh gloves donned between each sample.

4.6 Investigative Waste Handling

Site soil was found to contain PCE from a known dry cleaning site may be classified as listed hazardous waste. However, investigative-derived waste (IDW) containing a listed hazardous waste can be managed as solid waste if a “contained-out” determination demonstrates that the hazardous constituents in the waste are below health-based levels, pursuant to USEPA guidance and WDNR Guidance RR-705. Specifically, hazardous constituents in the waste must be below NR 720 residual contaminant levels for direct contact in an industrial setting to be considered solid waste. The contained-out determination process for soil containing PCE, trichloroethene (TCE), and vinyl chloride (VC) is also explained in WDNR Publication RR-969.

Investigative waste soil with elevated field screening results will be containerized, labeled, sampled and analyzed for VOCs, and left in the possession of the generator until laboratory analytical results for the waste are received and proper disposal method can be determined. The IDW will be managed and disposed of as hazardous waste if it is found to contain PCE, TCE, or VC at or exceeding industrial direct contact RCLs. If these analytes are present at concentrations below industrial direct contact RCLs, the soil will be managed and disposed of as solid waste.

Soil that does not yield elevated field screening results or other obvious indicators of contamination will be thinspread on vegetated areas of the site or disposed of as solid waste.

4.7 Site Investigation Reporting

Ayres Associates will review the laboratory analytical results to determine the current degree and extent of the contamination. A site investigation report will be prepared in accordance with NR 716.15 and delivered to the site owner and WDNR within 60 days of receipt of laboratory results.

The report will include the following:

- Executive summary giving a brief narrative of investigation results, conclusions, and recommendations for further actions
- General information about the site, including name and address of the responsible parties, name and address of the consultant, location description of the site, and site location map
- Site background information, including the history of use and previous hazardous substance discharges and response actions, if any
- Description of the methods used for this site investigation
- Description of the results of the site investigation, including tables showing laboratory analytical results and contamination plume map(s)
- Soil boring logs, well development forms, and borehole abandonment forms (if applicable)
- Conclusions about the site investigation and recommendations for remediation, if needed

5.0 Site Management

Boreholes will be abandoned in accordance with NR 141.25 upon completion of soil, groundwater, and vapor sampling, and topped with cold patch asphalt, concrete, or similar material appropriate for site restoration. Boreholes within City of Eau Claire right-of-way may be subject to more specific restoration requirements. Additional site management measures are not anticipated to be necessary for erosion control or repair of structural, soil, or ground disturbance.

6.0 Schedule

Ayres Associates will submit this work plan to the WDNR and proceed with site investigation activities within 90 days of plan submittal. Field work is anticipated to begin in November. This work plan may be revised or amended upon WDNR request.

7.0 NR 712.09 Submittal Certification

"I, Mitchell Banach, hereby certify that I am a scientist as that term is defined in s. NR 712.03(3), Wis. Adm. Code, and that, to the best of my knowledge, all of the information contained in this document is correct and the document was prepared in compliance with all applicable requirements in chs. NR 700 to 726, Wis. Adm. Code."

Signature

October 25, 2018
Date

"I, Lori A. Rosemore, hereby certify that I am a hydrogeologist as that term is defined in s. NR 712.03(1), Wis. Adm. Code, am registered in accordance with the requirements of ch. GHSS 2, Wis. Adm. Code, or licensed in accordance with the requirements of ch. GHSS 3, Wis. Adm. Code, and that, to the best of my knowledge, all of the information contained in this document is correct and the document was prepared in compliance with all applicable requirements in chs. NR 700 to 726, Wis. Adm. Code."

Signature

October 25, 2018
Date

8.0 References

Midwest Engineering Services, Inc. Project Update, Groundwater Sampling Activities, Former Adleman Dry Cleaning Site, 1502 Bellinger Street, Eau Claire, Wisconsin. March 3, 2000.

United States Geological Society, 1972*, Water Resources of Wisconsin, Chippewa River Basin, Hydrologic Investigations Atlas,* Publication HA-386.

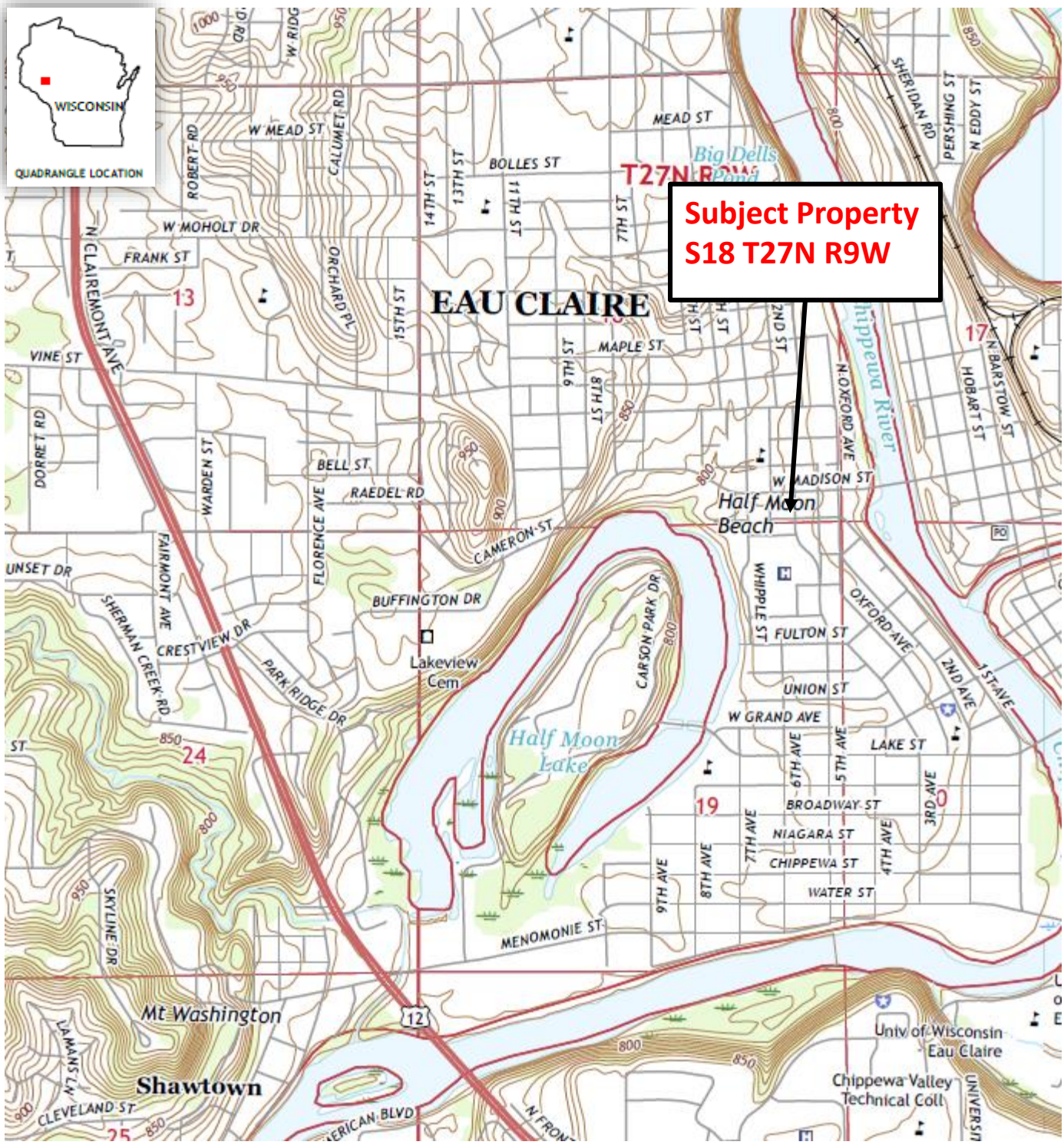
Wisconsin Department of Natural Resources. Clarification of Environmental Liability and Present Environmental Status of the Former Adelman Dry Cleaner Property Located at 1502 Bellinger Street, Eau Claire, Wisconsin. September 20, 2000.

Wisconsin Department of Natural Resources. "Contained-Out" Values for PCE, TCE and Vinyl Chloride. Publication RR-969. December 2013.

Wisconsin Department of Natural Resources. Guidance for Hazardous Waste Remediation. Publication RR-705. January 2014.

Appendix A

Figures



Source: USGS 7.5-Minute Series Topographic Quadrangle, Eau Claire West, Wisconsin, 2015

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Figure 1 – Location Map
Former Adleman's Dry Cleaner
1502 Bellinger Street
Eau Claire, Wisconsin
October 2018

51-0317.00

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Source: City of Eau Claire WGXtreme Mapping, 2013 photo

Figure 2 – Proposed Sample Location Map
Former Adleman's Dry Cleaner
1502 Bellinger Street
Eau Claire, Wisconsin
October 2018 51-0317.00

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Appendix B

Sampling Procedures

Field Procedures

This appendix describes field work procedures for this project. Where applicable, these procedures are performed in accordance with Wisconsin Department of Natural Resources (WDNR), Wisconsin Administrative Code requirements, American Society for Testing and Materials (ASTM) standards, or accepted engineering or geologic standards.

Soil Probe Installation

Soil probes are installed by the contractor, in accordance the procedures described in Wisconsin Administrative Code, Chapter NR 141. Soil probe sampling consists of installing a hydraulically-driven steel 2-inch-diameter rod. The steel sampling device at the end of the rods is 4 feet long and is assembled with a disposable plastic liner for sample collection. Samples are collected continuously using the following method:

> When the rod is positioned at the top of the desired sampling interval, the piston stop pin is removed, and the sampler is driven the desired sample interval to encase the soil sample in the plastic liner. The rods are then retracted from the hole and brought to the surface. The plastic liner is removed from the sample rod that contains the undisturbed soil sample. The liner is split open with a clean utility knife and the soil is classified and then transferred to laboratory and field screening containers as described in the soil sample collection section in this appendix.

Solid stem auger borings are also performed with a soil probe that rotates 8.25-inch diameter steel augers. The auger sections are also attached in 4-ft sections as the boring is advanced.

An Ayres Associates representative is present during the field work to establish soil probe locations, determine soil sample intervals, classify soils using the Unified Soil Classification System (USCS), log soil probes, and collect and screen soil samples. Soil classification information is recorded on the soil boring logs (WDNR Form 4400-122), and copies are included in the site investigation report.

Disposable sampling equipment is used to prevent cross-contamination. All probe equipment is decontaminated by the drilling contractor before reuse. Plastic liners are disposable, and are not reused.

When the sampling is completed, soil probe holes are filled with bentonite and the surface material restored. Soil probe abandonment details are described on WDNR Form 3300-005, and copies are included in the site investigation report. Soil cuttings generated during drilling are containerized in 5-gallon buckets on site and are labeled with the date and the soil's origin. Because of the small quantity, these cuttings are typically disposed of in a dumpster.

Soil Sample Collection

Ayres Associates personnel retrieve soil samples from the sampling equipment using a clean wooden spatula or a clean 20- to 30-milliliter polyethylene syringe, and avoid collecting slough materials.

At each sampling point, we collect two groups of soil samples: head space samples and samples for potential laboratory analysis. We place samples for head space screening in clean plastic bags. We use the head space screening results to determine which soil samples should be preserved and/or sent to the laboratory. Soil collection methods used are in accordance with WDNR's *Leaking Underground Storage Tank and Petroleum Analytical and Quality Assurance Guidance*, July 1993, PUBL SW-130 93.

During collection of laboratory grade samples, we place the required amount of soil in the laboratory provided container. We then place the selected laboratory samples on ice in a cooler immediately after collection, and keep samples cool until analysis by the laboratory.

The specific collection method, including the size and type of containers used, are dependent on the type of analysis to be conducted, and are provided by a WDNR-certified laboratory.

Ayres Associates initiates a chain-of-custody log, WDNR Form 4400-151 or equivalent, when the samples are collected. We record the project name and number, sampler's name(s), sample location and depth, sample number, date and time of collection, type of sample, method of sample collection, number of containers, type of preservation, type of chemical analyses to be performed, field screening results (soils only), and additional remarks about the sample if needed on the chain-of-custody log. The individual(s) handling the samples signs and dates the log. Shipment arrangements are made so the samples arrive within the appropriate shipping time allowed by WDNR guidance.

Headspace Screening (PID)

Headspace screening samples are qualitatively screened for organic vapors using a photo ionization detector (PID) equipped with a 10.6 eV lamp. Before we use the PID, we calibrate it using 100 ppm isobutylene gas.

After allowing the soil sample to equilibrate in accordance with WDNR guidance, we screen the total organic vapors in the jar by piercing the lid and then immediately inserting the PID probe. Meter responses are recorded as instrument units (i.u.s) isobutylene gas equivalents. The highest meter response is recorded in the field notes and/or on the soil boring logs. The PID responses are a relative indication of total ionizable volatile organic compounds present in the atmosphere surrounding the sample and do not necessarily represent the concentration of any specific compound.

Ground Water Sample Collection From Soil Probes

Ayres Associates personnel conducts ground water sampling in accordance with the procedures described in the *Groundwater Sampling Field Manual* (PUBL-DG-038 96) and the *Groundwater Sampling Desk Reference* (PUBL-DG-037 96).

Following soil probe installation, a slotted PVC well screen is placed in the probe hole the water table. Disposable vinyl tubing is used with a peristaltic pump to collect water samples. Water samples for dissolved metals are filtered and preserved in the Ayres Associates laboratory.

Samples are collected for analysis of the following parameters:

- volatile organic compound (VOC)—Fill a 4-milliliter vial with cap that has a septum and preserve with 0.5 milliliter of dilute 1:1 hydrochloric acid.

We place the samples on ice in a cooler; enclose a completed WDNR chain-of-custody record, Form 4400-151 or equivalent; and ship the cooler to the laboratory so it arrives within the shipping time allowed by WDNR.

Borehole Abandonment

In accordance with the procedures described in NR 141 requirements, each borehole is abandoned with bentonite in accordance with NR 141.25. The completed WDNR Abandonment Form 3300-005 is included in the site investigation report.

AYRES ASSOCIATES
STANDARD OPERATING PROCEDURE

TITLE: Sub-Slab Soil-Gas Sampling with Canisters
SOP NUMBER: 230
EFFECTIVE DATE: March 2012

1.0 PURPOSE

The purpose of this standard operating procedure is to designate a procedure for sub-slab soil-gas sampling with canisters. Included in this SOP is a list of necessary equipment to carry out the procedure.

2.0 SCOPE

This SOP describes the procedures for proper sub-slab soil-gas sampling with canisters preparation, field personnel responsibilities, equipment needed, safety, operating procedures, and quality control.

SOPs providing additional related guidance;

- SOP 210 – Total VOC Soil Vapor Field Screening
- SOP 510 – Sampling Equipment Decontamination Procedures
- SOP 610 – Chain-of-Custody Form Procedures

3.0 CHANGES FROM LAST REVISION

January 2018 - Updated for use with the Pace EZ-Can.

4.0 RESPONSIBILITIES

It is the responsibility of the field personnel to follow these procedures as closely as possible. Deviation from the procedures or inconsistency in the repetitive use of the procedures may yield field data of low integrity. It is extremely important that field personnel follow the procedures consistently to achieve representative estimates of VOC concentrations in air.

5.0 EQUIPMENT NEEDED

- Field book
- Gloves
- Paper towels or kimwipes
- Decontamination equipment
- Chain-of-custody forms supplied by laboratory (COC)
- Sample labels
- Pace EZ-Can with laboratory calibrated flow controller (or equivalent)
- Vapor PIN® (brass pins with silicone sleeves or equivalent)
- Silicone soft tubing (food or laboratory grade) 3/16” ID – 3/8” OD
- Watch or timer
- Rotary hammer drill
- 5/8-inch x 22-inch diameter concrete drill bit

- 1 ½-inch x 12-inch diameter concrete drill bit
- ¾-inch bottle brush
- Wet/dry vacuum
- Vapor PIN® installation/extraction tool
- Dead blow hammer
- Vapor PIN® flush mount cover, if needed
- Vapor PIN® drilling guide, if needed
- Vapor PIN® protective cap, if needed
- VOC-free hole patching material
- Putty knife or trowel
- 1-gal distilled water
- Utility knife
- 9/16-inch open end wrench
- Adjustable wrench
- Extension cord with GFI adapter
- Gas powered generator, if needed
- Tape measurer
- Safety equipment (e.g., first aid kit, eye wash, 20lb fire extinguisher, etc.)
- Shipping supplies (e.g., UN boxes, shipping labels, hazard labels, packing tape)

6.0 SAFETY

Safety concerns related to work at the site will be addressed in the site-specific Health and Safety Plan (HASP).

7.0 OPERATING PROCEDURE

7.1 Preliminary to Operation

- Review project work plan for site-specific sampling requirements and procedures.
- Field instrumentation should be cleaned and checked for defects and any possible need for repair.
- Access has been granted for the building in question for the period necessary for installation
- Perform daily safety meeting, reviewing weather, procedures, and location concerns (access, animals, etc.)
- Mobilize equipment into the location, minimizing re-entries.
- Follow Confined Space Safety Plan/Permit, if applicable.
- Perform walk through assessment survey.
- Choose sampling locations related to the purpose of the work plan. Ensure that each location for the sample media and equipment is available so as to reduce potential harm to the sample or personal injury to building occupants or field personnel.

7.2 Planning and preparation

1. Determine the require number of samples using WDNR guidance document RR-800 and RR-986.
    a. Single family homes: One sub-slab probe near the center of the foundation is usually acceptable. Two probes should be placed in homes with a building footprint greater than 1,500 ft^2.
    b. Commercial and small industrial buildings: Three sub-slab probes are recommended for a footprint of 5,000 ft^2 with one probe for each additional 2,000 ft^2.
2. To choose the sample locations divide the structure into a grid and evenly distribute the sample locations throughout the building.
3. If sampling for a due diligence screen select the locations based on evidence of recognized environmental conditions (RECs).
4. Request building plans from the owner of the building to check for buried obstacles (pipes and electric lines).
5. Check the availability of power within the building. If none is available bring a small generator capable of powering the hammer drill.
6. Determine if future sampling will be required. If so, plan to install flush mount style probes fitted with stainless steel covers.

7.3 Sub-Slab Preparation

1. Mark sub-slab sample locations with masking tape, chalk, or another non-VOC containing marker. DO NOT use a sharpie or paint.

2. Clear the work area around each probe. Make space to maneuver equipment around each probe location.
3. Record each sampling location on a site map with reference measurements to three stationary nearby points. (i.e. walls, mounted equipment, corners)
4. Drill a 1 ½-inch diameter hole at least 1 ¾-inches into the slab. Use the drilling guide if needed.
5. Clear concrete dust from the hole with a wet/dry vacuum and brush.
6. Using a 5/8-inch diameter drill bit, continue drilling the hole through the slab and approximately 1-inch into the underlying soil to create a void. It is recommended to use a drilling guide to keep the hole perpendicular to the slab.
7. Remove the concrete drill dust from the hole with the bottle brush and remove the loose dust with the wet/dry vacuum.
8. Slide a silicone sleeve over the barbed end of the brass vapor pin.
9. Insert the vapor pin into the hole with sleeved end facing down. Cover the top of the pin with the hollow end of the vapor pin extraction tool handle.
10. Use the dead blow hammer to strike the other side of the handle driving the pin into place. The silicone sleeve will bulge between the slab and neck of the vapor pin.
11. After the vapor pin is installed perform a leak test by filling the 1 ½-inch diameter portion of the hole around the neck of the pin with water flush to the slab surface.
12. Allow the water to sit in the hole for 5-minutes. If there is no change in the water level then the seal between the pin and slab is adequate. If the water level changes remove the pin by screwing the treaded end of the extraction handle onto the top of pin and pull if from the hole. Patch the hole, off-set several feet and repeat steps 1 through 12.
13. If the vapor pin passes the leak test, vacuum the water from the hole. DO NOT leave water in the hole. It will damage the destroy the sample and canister if it is sucked in during the sampling procedure.
14. Allow the capped pin to rest for one to two hours to equilibrate. While waiting, repeat steps 1 through 13 at the other sampling locations.
15. Record all measurements in the project logbook, including:
    a. Slab thickness
    b. Borehole diameter
    c. Time when vapor pin was installed
    d. Rest time for equilibration

7.4 Sub-Slab Sampling

1. Perform canister vacuum check and set up canister following the EZ-Can instructions that are shipped with the canisters.
2. The canister flow controller is pre-set by the laboratory. A 6-liter (L) can with a 30-minute collection time will intake 200-millileters (mL) per minute. To calculate other collections times, divide the volume of the canister by the pre-set flow rate of the controller. (e.g. 6,000-mL (6-L) can ÷ 200-mL flow rate = 30 minutes)
3. With the brass valve cap secured on the end of the flow controller turn on the canister by flipping the toggle switch up. Record the reading (-inches Hg) from the vacuum gauge on the COC**. Then immediately turn the canister off. If the vacuum is less the 25 inches Hg contact the laboratory for assistance.**
4. Remove the brass cap from the flow controller using a 9/16-inch wrench and connect the nylon tubing to the end of the valve using the swag lock connecters. Tighten the connector using the wrench about ½ turn past hand

tight. The connector should feel secure but be careful not to damage the connecter by over tightening. (tubing and connectors are included in the Pace EZ-Can kit)

5. Install a dust trap at the end of the nylon tubing. (supplied in the kit – check the laboratory instructions to determine which side of the filter faces away from the can)
6. Remove the temporary cap from the vapor pin.
7. Connect the dust trap to the vapor pin with a length of silicone tubing. (make the tubing as short as possible while allowing the can to remain upright)
8. Flip the toggle switch on to start sampling and record the time in a field log book.
9. Check the vacuum reading periodically. The decline in vacuum should be proportional to the collection time.
10. Leave the canister on for the time determined in step 2. Check the vacuum reading at the end of the collection time. If there is vacuum remaining in the can allow it to continue sampling until the vacuum is less than 4 inches Hg.
11. Stop sample collection by switching the toggle valve off. Record the final vacuum on the COC and in a field log along with the stop time.
12. Remove the swag lock connectors from the flow control valve and reattach the brass cap.
13. Disassemble the tubing and disconnect it from the vapor pin.
14. Record the sample information on the can's paper label. Make sure each can has a unique sample ID that is on the label and COC. Each can also has a unique ID number that should be recorded on the COC.
15. Repack the canister and complete the shipping and COC documents.
16. If no future sampling is required at this point remove the pin and patch the hole as described in step 12 of section 7.3. If future sampling is required, place a cap on the probe and thread on the stainless steel flush mount cover.
17. Remove the silicone sleeve from the pin with and discard. Decontaminate the pin with alconox and water before placing back into the sampling kit.

8.0 Quality Control

Quality control procedures for this SOP have been developed to verify equipment integrity, sample quality, and sample repeatability.

8.1 Field Duplicates

Collect duplicate samples as require by the sampling program. Field duplicates are collected by attaching a T-fitting to the end of the tubing prior to the flow controller. A canister with a flow controller is attached to each end of the T-fitting. For sampling, both canister valves are opened and closed simultaneously. Use the procedure described above to collect samples.

9.0 RECORDS

Data collected during field activities will be recorded in field logs or daily report forms. Entries will include the following details:

- Date
- Project title
- Purpose and description of field activities
- Field personnel
- Equipment

- Unique field sample number
- Sample date and time
- Specific sample location description
- Field screening readings
- Name and signature of field personnel

Upon completion of field activities, copies of forms and field activity logs will be submitted to the project manager. Original forms will be filed in the project file.

10.0 CORRECTIVE ACTION

Significant problems or deviations from the SOP or work plan will be reported to the project manager as soon as possible. Deviation in procedures or actions that are required to correct a problem will be documented.

11.0 REFERENCES

Pace Analytical Services Air Lab. Sampling Instruction for EZ-Cans. Preassembled Air Canisters. 2010.

Wisconsin Department of Natural Resources. "Addressing Vapor Intrusion at Remediation and Redevelopment Sites in Wisconsin," PUB-RR-800, December 2010

VaporPin. Standard Operating Procedure. Installation and Extraction of the Vapor Pin. Updated September 9, 2016.