# REMEDIAL ACTION OPTIONS AND DESIGN REPORT

**FORMER PETER'S DRY CLEANERS**
**5094 WEST COLLEGE AVENUE**
**GREENDALE, WISCONSIN 53129**
**WDNR BRRTS# 02-30-552186**

August 6, 2021

*Prepared For:*

Mr. Richard Peters
Former Peter's Dry Cleaners
5094 West College Avenue
Greendale, Wisconsin 53129

*Prepared By:*

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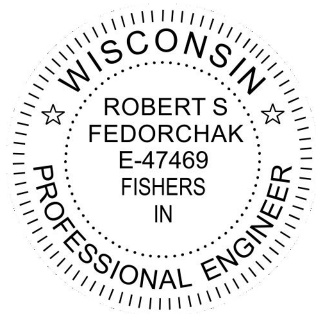
## CERTIFICATIONS

I, Robert Fedorchak hereby certify that I am a registered professional engineer in the State of Wisconsin, registered in accordance with the requirements of ch. A-E 4, Wis. Adm. Code; that this document has been prepared in accordance with the Rules of Professional Conduct in ch. A-E 8, Wis. Adm. Code; and that, to the best of my knowledge, all 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, title and P.E. Number




I, Robert Hoverman, 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.

Senior Project Manager 8/6/2021

Signature and title Date

**EXECUTIVE SUMMARY**

EnviroForensics, LLC (EnviroForensics) has prepared this Remedial Action Options and Design Report on behalf of Richard Peters, for the Peter's Dry Cleaners (Peter's) facility located at 5094 West College Avenue, Greendale, Wisconsin (Site). The Site is currently utilized as a drop off location for off-Site dry cleaning operations. A kitchen for a delicatessen and convenience store occupies the western portion of the building. The eastern portion of the building is a laundromat.

Environmental impacts were initially detected in soil and groundwater at the off-Site, adjacent College Square Apartments property during a Phase II Environmental Site Assessment conducted by Giles Engineering Associates, Inc. (Giles). Site investigation activities were conducted by previous consultants Giles and Key Environmental during 2001 and 2002. The collection of soil, groundwater, soil gas, sub-slab vapor, and indoor air samples, have been collected by EnviroForensics during 2014, 2015, 2017, and 2020. The primary contaminants of concern at this Site are chlorinated volatile organic compounds (CVOCs).

CVOCs were detected at concentrations exceeding the applicable risk-based standards in soil on the Site. A groundwater plume containing CVOCs at concentrations above the groundwater enforcement standards (ES) is defined within the Site boundary.

The extent of contamination in all subsurface media has been defined. The area containing the highest CVOCs impact is near the Site building nearest to the former dry cleaning machine location, as exhibited in soil and sub-slab vapor samples. At the Site, the highest concentrations of CVOCs in groundwater were detected in MW-9. However, historically, off-site well MW-8 has generally maintained highest concentrations of CVOCs in groundwater. The elevated concentrations of the CVOC tetrachloroethene (PCE) and daughter products observed in downgradient monitoring wells indicate that natural attenuation is occurring.

Potential exposure pathways consist of direct contact with soil and groundwater or inhalation of vapors. Direct contact exposure to soil and groundwater impacts is currently prevented by surface cover materials (i.e., asphalt, concrete, and buildings) and vapor intrusion does not appear to be occurring on- or off-Site. The nature and extent of the impacts associated with the CVOC release has been adequately defined in sub-surface media, and exposure pathways have been assessed. Therefore, the Site investigation appears to be complete.

Likely remedial actions were identified through an initial screening of technologies. Likely actions were further evaluated considering technical and economic feasibility to develop three (3) alternative remedial options for the Site. The recommended alternative relies on a combination of risk management strategies and remediation, including excavation with amending the backfill with a remediation chemical, to bring the Site to regulatory closure.

This excavation would likely remove the majority of the CVOC mass in the source area, the source of continued vapor and groundwater impacts. The excavated soils would then be hauled off-site for disposal in a permitted facility. We propose to add an ISCR reagent to the excavation backfill to aid in breaking down additional contaminants within the subsurface as it is not possible to remove the entire source area. This recommended remedial option minimizes Site disruptions, potentially eliminates the need for long-term operation and maintenance of any vapor mitigation systems; and provides the most benefit with respect to overall costs of implementation. We are requesting your approval of the proposed work scope and costs under the Dry Cleaner Environmental Response Fund (DERF).

# 1.0 BACKGROUND

EnviroForensics has prepared this Remedial Action Options Report (RAOR) on behalf of Richard Peters, d/b/a Peter's Dry Cleaners for the former Peter's Dry Cleaners (Peters) facility located at 5094 West College Avenue in Greendale, Wisconsin (Site). This RAOR follows guidelines for selecting remedial actions set forth in the Wisconsin Administrative Code (WAC) Chapter NR 722 and other associated Chapter NR 700 series rules. This Report is being submitted after the Site Investigation Report approval in a letter from the WDNR dated June 12, 2020.

The Site is located at 5094 West College Avenue in Greendale, Wisconsin. The general layout of the Site and surrounding area, including Site features, is depicted on **Figure 2**. The Site encompasses approximately 0.51 acres and contains a single slab-on-grade building occupying approximately 6,088 square ft. The Site is situated at the northeast corner of West College Avenue and South 51st Street.

Utilities noted during the Site reconnaissance include water, sewer, natural gas, telephone, and electrical lines. **Figure 2** presents a detailed Site plan. An asphalt driveway and roadway surround the Site building on the south, west, and north portions of the Site. A maintained grass area lies east of the Site. The Site is bound by West College Avenue to the south, South 51st Street to the west, and residential apartments to the north and east. Land use surrounding the Site is primarily residential with parkland and a church to the west and northwest.

The Site is a three-unit, slab on grade commercial building that was constructed around 1970. In 1972 Richard Peters rented and managed the middle and east units of the strip center. The middle portion was used as a plant-on-premises dry cleaning facility and the east side was used as a coin laundromat. The western unit operated as the White Hen Pantry until 1977 when Richard Peters purchased the building. The dry cleaning operations ceased in 1993 but the laundromat and deli operations continue today. The facility originally operated as Peter's Dry Cleaners. Currently the Peters cleaners is only drop off for cleaning done elsewhere off-Site as shown on **Figure 2**. PCE solvent was utilized for dry cleaning during the entire period of active operations. The PCE dry cleaning machine was in the north central portion of the building (labeled "DCM" on **Figure 2**). Bulk PCE was stored in a small, wall-mounted container next to the door on the north side of the building, near the dry cleaning machine.

## 1.1 Site Hydrogeology

Unconsolidated glacial sediment overlies bedrock in southeastern Wisconsin. Niagara Dolomite is expected to be encountered at 50 to 150 feet (ft) below ground surface (bgs).

Data collected from borings advanced on-Site reveal approximately 50 feet of brown to gray, low to high plasticity clays. Discontinuous lenses of coarse-grained material, up to 1 foot thick, have been identified on-Site at between 5 and 15 ft bgs.

A water lateral for the Site building runs east to west at a depth of approximately 4 feet, under the asphalt loading area north of the Site building. It appears that the trench for the water line was backfilled with the native Site soils. This disturbed material is expected to have lower-permeability than the surrounding lithology.

Lake Michigan is the source of drinking water and groundwater is not used as a drinking water source. Groundwater is encountered at depths ranging from approximately 2.12 to 12.9 ft bgs at the Site. The hydraulic gradient measured indicates the direction of shallow groundwater flow is toward the west and north. The local topography controls groundwater flow on-Site to some extent, with the areas immediately surrounding the site representing a topographic high and the creek to the north representing the low. The most recent groundwater elevation data are shown in **Table 1** and **Figure 3** shows the most recent groundwater potentiometric surface map.

## 1.2 Nature and Extent of Contamination

The nature and extent of contamination associated with release(s) at the Site is detailed in the Site Investigation and Supplemental Site Investigation Reports, with chlorinated volatile organic compounds (CVOCs) from the historical dry cleaning process identified in Site soil, vapor, and groundwater. After these reports were submitted, EnviroForensics advanced additional soil borings in the vicinity of the former dry cleaning machine to further define the nature and extent of the source area impacts, and to inform the remediation decision-making process. **Figures 4 and 5** depict the extent of soil and groundwater impacts. **Figure 6** presents the extent of groundwater impacts by constituent. **Tables 2**, **3, and 4** present the soil and groundwater results from investigation borings and monitoring wells.

## 1.3 Summary of Investigation and Exposure Assessment

Direct-contact exposure to soil within Site boundaries is currently prevented by surface cover materials (i.e., asphalt, concrete, and buildings). At off-Site locations, the concentrations of VOCs in soil are less than direct contact RCLs.

As documented in the April 28, 2016, Site Investigation Report, sub-slab vapor impacts were identified beneath the Site building at concentrations below the WDNR's Vapor Risk Screening Levels (VRSLs) for small commercial buildings. The results of a vapor intrusion assessment conducted at the College Square Apartments indicate vapor intrusion from Site CVOCs is not occurring at this property.

Groundwater impacts exceed Public Health Enforcement Standards (ESs) on-Site and under South 51st Street west of the Site, but do not exceed ESs on the adjacent properties north and west of the Site. On-Site water use is from the municipal supply, and no direct contact with groundwater impacts or ingestion is occurring.

Potential exposure pathways consist of direct contact with soil, ingestion of groundwater, or inhalation of vapors. Direct contact exposure to soil and groundwater impacts is currently prevented by surface cover materials (i.e., asphalt, concrete, and buildings) and vapor intrusion does not appear to be occurring on- or off-Site. The nature and extent of the impacts associated with the VOC release has been adequately defined in sub-surface media, and exposure pathways have been assessed. Therefore, the Site investigation is completed to the extent practical. Upon completion of your review, we request a meeting to discuss the findings and the next steps.

## 2.0 IDENTIFICATION OF REMEDIAL ACTION OPTIONS

This section presents the remedial action options identified for control, removal, containment, and/or treatment of impacted media at the Site. The initial identification and screening of remedial action options is based on information generated during site investigation activities, including the nature and extent of contamination and the hydrogeological conditions at the Site and surrounding areas. Remediation of contaminants in soil and groundwater to levels that no longer migrate or pose a risk of vapor intrusion to nearby occupied structures drive the remedial options evaluation. Initial screening for remedial technologies under general remedial response actions was completed as discussed below.

The following general responses were considered:

1. No Action
2. Risk Management
3. Treatment Action
4. Removal Action

### 2.1 Remediation Objectives

The objective of Site remediation is to adequately and cost-effectively mitigate exposure risk stemming from the release of chlorinated solvents at the Site during historical dry cleaning operations. Exposure risk is currently being mitigated due to the nature of the Site configuration and activities, as described above. Although the release occurred over 30 years ago, the tight clayey soils are preventing further migration. However, potential for future exposure has been identified for the following three (3) exposure routes:

1. Groundwater ingestion
2. Soil dermal contact
3. Residential vapor inhalation

Mitigating the potential exposure vapor route drives the remedial options evaluation. Should it be possible to mitigate exposure pathways prior to the initialization of the full remedial plan, a request for closure would then be requested from the WDNR.

## 2.2 Screening of Remedial Action Options

An initial screening of remedial actions options was completed as summarized in **Table 5.** The technologies were screened against the conceptual site model to identify whether they would be: 1) protective of human health and the environment; and 2) appropriate for the Site, considering applicability for Site conditions, reasonably anticipated future land uses, and other factors which would pre-emptively preclude the alternative from further evaluation, as well as relevance to site-specific exposure pathways.

Alternatives which passed both initial screening criteria were carried forward for further evaluation. The following remedial technologies were removed from further evaluation:

- No Action – No Action
- No Action – Monitored Natural Attenuation
- Engineering Controls – Structural Vapor Barrier
- In-Situ Remediation – In-Situ Chemical Oxidation
- In-Situ Remediation – Injection: Air Sparging
- In-Situ Remediation – Injection: Ozone Sparging
- In-Situ Remediation – Injection: Enhanced Aerobic Bioremediation
- In-Situ Remediation – Soil Mixing: In-Situ Chemical Oxidation
- In-Situ Remediation – Soil Mixing: Solidification and Stabilization
- In-Situ Remediation – Phytoremediation
- Removal – Pump-and-Treat
- Evapotransporation cap see table 5

## 2.3 Likely Remedial Action Options

Under the response action scenarios, the following remedial technologies were considered applicable for Site remediation and selected for further evaluation:

- Institutional Controls – Environmental Land Use Restriction
- Institutional/Engineering Controls – Vapor Mitigation System
- Institutional/Engineering Controls – Low Permeability Infiltration Cap
- *In-Situ* Remediation – Thermal Desorption
- *In-Situ* Remediation – Injection: Colloidal Activated Carbon

- *In-Situ* Remediation – Injection: *In-Situ* Chemical Reduction (ISCR) with Enhanced Reductive Dechlorination (ERD)
- Removal – Excavation and Disposal

## 3.0 EVALUATION OF REMEDIAL ACTION OPTIONS

The potentially feasible remedial technologies were evaluated associated with each technology. The evaluation was documented and quantified using a ranking matrix, presented in **Table 6**, to identify the most suitable technology or combination of technologies for remediation at the Site.

Each remedial alternative was evaluated for the following performance metrics:

- Technical Feasibility
    - Short-Term Effectiveness,
    - Long-Term Effectiveness,
    - Ability to Implement, and
    - Restoration Time Frame.

- Economic Feasibility
    - Capital Costs,
    - Initial Cost,
    - Annual Operation and Maintenance, and
    - Future Liability.

Each remedial alternative was evaluated against the above criteria considering the Site setting, hydrogeology, distribution of impacts, and anticipated future use of the Site. A score was assigned for each category of each alternative and the scores were summed across all categories to produce a metric for comparison of the remedial alternatives.

Additionally, the need for continuing obligations after completion of a remedial action, such as maintenance of an engineering control, was considered.

### 3.1 Technical Feasibility

The feasibility of a technology to remediate impacted areas at any specific site is evaluated regarding the following specific considerations:

- Proven technology: when a technology is fully developed and historical success case histories are available;

- Emerging technology: when a technology is not fully developed and may not be reliable;
- Inappropriate technology: when Site conditions are not technically suitable for the application of the technology; and
- Potential additional liability: whether the treatment technology may add additional liability.

#### *3.1.1 Effectiveness*

The key aspect of the technical feasibility evaluation is the effectiveness of each remedial action in protecting human health and the environment. Each potential remedial action is evaluated as to its effectiveness in providing protection and the reductions in toxicity, mobility, or volume of contamination that it would achieve. Both short- and long-term components of effectiveness are evaluated; short-term referring to the construction and implementation period until case closure, and long-term referring to the period after remediation is complete. Reduction of toxicity, mobility, or volume refers to changes in one or more characteristics of the contaminated media using treatment that decreases the inherent risks. Any remedial action option under consideration should minimize adverse impacts to Site workers, visitors, the surrounding population, and the environment. Community impact is also important and the technology is considered a disadvantage if the application of the technology could be perceived as negatively impacting the local community or environment.

#### *3.1.2 Ability to Implement*

The ability to implement is a measure of both the technical and administrative feasibility of constructing, operating, and maintaining a remedial action option, and is used to evaluate combinations of remedial actions with respect to conditions at a specific site. The determination that an option is not readily implementable would usually preclude it from further consideration unless steps can be taken to change the conditions responsible for the determination.

The technical aspects related to the ability to implement refers to the ability to construct, reliably operate, and meet technology-specific regulations for remedial actions until remediation is complete; it also includes operation, maintenance, replacement, and monitoring of technical components of an action, if required, into the future after the remedial action is complete. Administrative feasibility considers the ability to obtain approvals and permitting from other offices and agencies, the availability of treatment, storage, and disposal services and capacity, and the requirements for, and availability of, specific equipment and technical specialists.

#### *3.1.3 Restoration Timeframe*

The estimated time for completion of a remedial action and restoration of the environment is based on the information available from vendor(s) with experience in remediating similar sites, and EnviroForensics' experience using technologies in similar settings. Contaminant degradation rates, both naturally and under treatment conditions, are assumed based on experience to estimate the duration of remedial actions. If necessary, the time frame for continuing obligations is also considered.

### 3.2 Economic Feasibility

The cost to implement various options is not an exact cost but represents a combination of typical contractor costs and consultant efforts coupled with the estimated time to achieve remedial endpoints. This is inherent because uncertainties associated with the definition of options often remain, and it may not be possible or practical to collect all the data needed to refine costs better than a reliability level of +50% to -30%.

The focus is on comparative estimates of costs between options so that if costs go up or down during the remedial process, they remain relative. The following cost factors are considered during the evaluation of options:

- Initial costs: those costs incurred for design and testing of the remedial action;
- Capital costs: the cost to construct, install, or otherwise implement the remedial action;
- Operation and maintenance (O&M) costs: the costs to operate and maintain the remedial system or technology. The evaluation includes those O&M costs that would be incurred for as long as necessary, even after the initial remedial action is complete; and
- Future liability: includes potential additional remedial action costs and costs for property re-development are considered during evaluation to the extent they can be estimated.

### 3.3 Continuing Obligations

The involvement of continuing obligations in the closure strategy is considered in the evaluation process. Post-closure obligations may include activities such as annual cover inspections, and operation, maintenance, and inspections of vapor mitigation systems. These activities may be required for an indefinite period following case closure. A remedial action is considered more advantageous if the resulting need for continuing obligations is reduced.

### 3.4 Remedial Action Options Discussion

As indicated by the Cumulative Points category on **Table 6**, the top three (3) options, or groups of options, are:

1. Institutional and/or Engineering Controls, ranking highest among all categories;
2. Excavation and Disposal, ranking highest among treatment/removal actions; and
3. In-situ chemical reduction (ISCR).

Institutional and/or Engineering Controls rank high because they are effective immediately, are relatively inexpensive, and are easy to implement. However, they also require continuing obligations and present continued risk of exposure due to contamination left in place. Due to these characteristics along with the fact the contaminant concentrations significantly exceed screening levels and multiple potential exposure pathways exist (groundwater ingestion, residential vapor exposure, and soil direct contact exposure), contaminant treatment and/or removal is recommended to adequately mitigate exposure risk at the Site.

Soil treatment and removal options are limited to two (2) alternatives: Excavation and Disposal and Thermal Desorption. Both are considered highly effective with a quick restoration timeframe, but Thermal Desorption is considerably more expensive and poses many logistical and permitting challenges to implement. Injection options were considered but are not viable for treatment of the source area impacts due to the magnitude of contaminant concentrations and ineffectiveness at treating vadose zone soils.

Because the contamination source is primarily in soil and groundwater bearing zones are limited, effectively remediating groundwater is not feasible. Indirect groundwater treatment will occur by soil source treatment and natural attenuation and diffusion. Adding an ISCR reagent to the excavation backfill, however, is a highly cost effective method of delivering additional soil and groundwater treatment. The reagent can interact directly with desorbed VOCs and groundwater with this method.

## 4.0 RECOMMENDED CLOSURE STRATEGY

A combination of options is recommended to achieve Site cleanup objectives, specifically Excavation and Disposal for source area remediation combined with an Infiltration Cap to prevent continued recontamination of groundwater. Additional Institutional and/or Engineering Controls will be applied as needed to address remaining impacts, depending upon the levels of post-remediation confirmation sampling results.

The cost of Excavation and Disposal is a potential limiting factor but, if adequate funding can be secured, Excavation and Disposal is the recommended option for source remediation due to its high degree of efficacy and lower cost than Thermal Desorption. As described above, source removal is recommended due to the magnitude of impact in this area, and injections are not capable of adequately treating the observed impacts. Additionally, plume treatment downgradient of the source area would be ineffective without source removal, as the treatment agent would be overwhelmed by continued migration of impacts from the source area.

Given the length of time since the release of CVOCs, contaminant migration to groundwater has been minimal. Amending the backfill with an engineered ISCR product is the recommended option for supplemental soil and groundwater treatment because it is a proven technology anticipated to be effective for the given site conditions and is relatively inexpensive compared with alternative treatment options. While the potential for vapor intrusion was not identified on-Site, a horizontal vapor mitigation passive system will be installed should vapors or methane generation become an issue post remediation. The excavation and ISCR amendment approach may be ineffective if residual shallow soil impacts outside the excavation area were to migrate to groundwater. To address this issue, the use of an Infiltration Cap, in this case the Site building, is recommended as described above.

### 4.1 Remedial Design

The following sections detail the design components of the selected remedial option.

#### *4.1.1 Excavation Design*

Excavation will be performed under the accessible portions of the building where concentrations exceed range from 2,000 µg/kg to 2,800,000 µg/kg, as depicted on **Figure 7**. The excavation areas encompass the majority of the CVOC impacts in the vadose zone. **Figure 7** shows the area for excavation. The excavation under the building will be advanced to between 6 and 9 feet, with restrictions considered for sloping from building foundations and equipment operating space. The clayey soils will be evaluated with a penetrometer to evaluate the strength and stability of the side walls. Depending on encountered conditions, a geotechnical engineer may be contracted to evaluate the stability of the excavation. Temporary modifications to the building will be needed to access the source area, including the relocation of equipment and supplies, removal of interior partitions, and removal of a portion of the concrete floor. Most of the excavated soil will be disposed of off-Site as hazardous waste, with the remainder disposed of in a RCRA Subtitle D landfill pending manifest approval. Approximately 20 tons of soil are proposed for excavation and off-Site disposal as hazardous waste.

### *4.1.2 ISCR Amendment Design*

Due to the small treatment area and tight clayey soils, a traditional ISCR injection is not feasible. However, upon completion of the excavation the ISCR reagent Provect-IR® will be mixed and added to the backfill as an amendment to treat residual source area impacts and shallow groundwater by diffusion. The selected reagent contains an anti-methanogenic component to reduce the risk of methane generation beneath the building. The remediation activity will initiate hydrolysis (ISCR), whereby any solvent in contact with the reagent will be physically destroyed. The hydrolysis will be followed by ERD made possible by the reducing conditions caused by components of the reagent. The reagent should fill a significant amount of the pore space within the saturated portion of the excavation scar. The former excavation will act as a tank of reduced groundwater that will advect to downgradient locations.

Provect-IR is delivered as a dry powder in 50-pound bags. It is non-hazardous and safe to handle. The reagent will be mixed with water to form a low viscous slurry and mixed with the backfill material concurrently during backfilling.

- The treatment area is 67.5 square feet.
- Groundwater depth in treatment area is 5-6 ft bgs.
- With an expect porosity of the pea gravel at 36%.
- Provect-IR will be applied as 20-30% by volume slurry.

Upon approval of this remedial action, an application will be made for a WDNR WPDES General Permit per WPDES NR 205.08(3), Wis. Adm. Code, and 40 CFR Part 127

#### *4.1.3 Vapor Mitigation and Methane Monitoring*

To date, sub-slab vapors have not exceeded the vapor risk screening levels for small commercial buildings. As a pre-emptive step prior to completing the concrete slab restoration, a perforated horizontal pipe will be installed and piped through the exterior north wall. The piping will act as a passive vapor mitigation system should errant CVOC vapor be produced post excavation or for minor methane production during the VOC breakdown from the ISCR amendment.

While Provect-IR is antimethanogenic, the addition of the reagent into the subsurface may cause the production of methane, which is combustible and may pose a vapor intrusion hazard t. As the treatment area is situated directly beneath the Site building, to be conservative and protective of human health, the best practice will be to monitor for methane production from the sub-slab monitoring points installed during previous vapor intrusion assessments. If significant methane production occurs, an in-line intrinsically-safe blower to mitigate combustion hazards would be added.

#### *4.1.4 Infiltration Cap*

The Infiltration Cap will be the site building. Because the building will be the infiltration cap, a maintenance plan will not be provided in the closure request keeping the Site building will be a continuing obligation. The building footprint is depicted on **Figure 4** relative to the extent of soil contamination.

### 4.2 Schedule

Waste characterization sampling has been completed. The source area excavation and amending backfill will take approximately one (1) month to complete, including building modifications. Actions to be completed after the excavation include the following:

- Remedial documentation reporting,
- Bi-monthly methane monitoring for one (1) year;
- Groundwater monitoring (four events post remedy);
- Closure Documentation; and
- Well abandonment and Site restoration.

### 4.4 Restoration Time Frame

The estimated duration of the recommended remedial actions for soil is approximately one month, followed by post-remediation sampling/monitoring to confirm that groundwater concentrations remain stable. The post-remediation monitoring timeframe for groundwater is proposed to be at least two (2) years.

### 4.5 Performance Monitoring

The performance of the remedial action would be measured via a groundwater monitoring program. Monitoring is proposed semi-annually for two (2) years following remediation for closure consideration. Samples for VOC analysis will be collected as follows:

| 1st Event | 2nd Event | 3rd Event | 4th Event |
|---|---|---|---|
| MW-5, MW-8, MW-9, MW-10, MW-11, MW-12, and PZ-1 | MW-5, MW-8, MW-9, and MW-11 | MW-5, MW-8, MW-9, MW-10, MW-11, MW-12, and PZ-1 | All Wells and Piezometers |

### 4.6 Cost Estimate

The estimated total cost for the selected remedial action is approximately **$94,23** and includes:

- Planning, coordination, contracting, and permitting;
- Excavation and off-site disposal of contaminated soil;
- Backfilling with ISCR amendment;
- Building restoration (i.e., concrete and flooring replacement);
- Remediation Completion Report;
- Groundwater and methane monitoring; and
- Semi-annual performance monitoring reports.

Approval of the proposed remedial action and associated costs will be requested under the Dry Cleaner Environmental Response Fund (DERF). The DERF budget tracking sheet and EnviroForensics budget detail are provided separately.

**TABLES**

# TABLE 1
## GROUNDWATER ELEVATION DATA
Former Peters Dry Cleaners
5094 College Avenue, Greendale, Wisconsin

| Well ID | Date | TOC Elevation (AMSL) | Depth to Water (feet below TOC) | Groundwater Elevation (AMSL) |
|---|---|---|---|---|
| MW-1 | 4/10/2014 | 778.32 | 7.86 | 770.46 |
| | 11/7/2014 | | 4.20 | 774.12 |
| | 12/15/2014 | | 4.73 | 773.59 |
| | 8/13/2015 | | 4.25 | 774.07 |
| | 11/8/2016 | | Abandoned | |
| MW-2 | 4/10/2014 | 776.71 | 1.32 | 775.39 |
| | 11/7/2014 | | 2.71 | 774.00 |
| | 12/15/2014 | | 2.49 | 774.22 |
| | 8/13/2015 | | 3.01 | 773.70 |
| | 11/8/2016 | | Abandoned | |
| MW-3 | 4/10/2014 | 776.46 | 1.97 | 774.49 |
| | 11/7/2014 | | 2.51 | 773.95 |
| | 12/15/2014 | | 0.53 | 775.93 |
| | 8/13/2015 | | 2.20 | 774.26 |
| | 11/8/2016 | | Abandoned | |
| MW-4 | 4/10/2014 | 777.25 | 1.88 | 775.37 |
| | 11/7/2014 | | 2.13 | 775.12 |
| | 12/15/2014 | | 2.20 | 775.05 |
| | 8/13/2015 | | 2.20 | 775.05 |
| | 11/8/2016 | | Abandoned | |
| MW-5 | 11/7/2014 | 777.09 | 12.70 | 764.39 |
| | 12/15/2014 | | 2.12 | 774.97 |
| | 8/13/2015 | | 2.78 | 774.31 |
| | 1/28/2016 | | 4.96 | 772.13 |
| | 1/4/2017 | | 2.56 | 774.53 |
| | 1/23/2017 | | 2.28 | 774.81 |
| | 6/22/2017 | | 2.24 | 774.85 |
| | 9/21/2017 | | 3.82 | 773.27 |
| | 12/2/9/17 | | 1.50 | 775.59 |
| | 1/2/2020 | | 1.55 | 775.54 |
| MW-6 | 11/7/2014 | 778.28 | 14.70 | 763.58 |
| | 12/15/2014 | | 9.59 | 768.69 |
| | 8/13/2015 | | 6.71 | 771.57 |
| | 1/28/2016 | | 2.82 | 775.46 |
| | 6/22/2017 | | 4.51 | 773.77 |
| | 9/21/2017 | | 7.87 | 770.41 |
| | 12/29/2017 | | 5.07 | 773.21 |
| | 1/2/2020 | | 0.83 | 777.45 |
| MW-7 | 11/7/2014 | 778.20 | 12.90 | 765.30 |
| | 12/15/2014 | | 2.41 | 775.79 |
| | 8/13/2015 | | 5.19 | 773.01 |
| | 1/28/2016 | | 4.08 | 774.12 |
| | 6/22/2017 | | 2.65 | 775.55 |
| | 9/21/2017 | | 6.18 | 772.02 |
| | 12/29/2017 | | 5.40 | 772.80 |
| | 1/2/2020 | | 0.80 | 777.40 |
| MW-8 | 8/13/2015 | 774.13 | 11.26 | 762.87 |
| | 1/28/2016 | | 15.40 | 758.73 |
| | 1/4/2017 | | 10.37 | 763.76 |
| | 6/22/2017 | | 7.13 | 767.00 |
| | 9/21/2017 | | 11.36 | 762.77 |
| | 12/29/2017 | | 11.00 | 763.13 |
| | 1/2/2020 | | 5.62 | 768.51 |
| MW-9 | 8/13/2015 | 775.11 | 8.74 | 766.37 |
| | 1/28/2016 | | 7.03 | 768.08 |
| | 1/4/2017 | | 8.11 | 767.00 |
| | 6/22/2017 | | 6.09 | 769.02 |
| | 9/21/2017 | | 8.79 | 766.32 |
| | 12/29/2017 | | 8.94 | 766.17 |
| | 1/2/2020 | | 4.29 | 770.82 |
| MW-10 | 1/28/2016 | 774.11 | 9.15 | 764.96 |
| | 6/22/2017 | | 1.35 | 772.76 |
| | 9/21/2017 | | 4.40 | 769.71 |
| | 12/29/2017 | | 1.70 | 772.41 |
| | 1/2/2020 | | 0.85 | 773.26 |
| MW-11 | 1/28/2016 | 771.94 | 9.61 | 762.33 |
| | 1/4/2017 | | 9.23 | 762.71 |
| | 6/22/2017 | | 7.95 | 763.99 |
| | 9/21/2017 | | 11.48 | 760.46 |
| | 12/29/2017 | | 11.24 | 760.70 |
| | 1/2/2020 | | 4.70 | 767.24 |
| MW-12 | 1/2/2020 | 763.90 | 0.33 | 763.57 |
| PZ-1 | 1/2/2020 | 776.75 | 5.01 | 771.74 |

**Notes:** TOC = Top of Casing
AMSL = Above Mean Sea Level

# TABLE 2
## SOIL ANALYTICAL RESULTS
Former Peters Dry Cleaners
5094 College Avenue Greendale, Wisconsin

| Boring Identification | Sample Depth (feet bgs) | Sample Date | Tetrachloroethene | Trichloroethene | cis-1,2-Dichloroethene | trans-1,2-Dichloroethene | Vinyl Chloride |
|---|---|---|---|---|---|---|---|
| **Industrial Direct-Contact RCL (0-4 feet only)** | | | **145,000** | **8,410** | **2,340,000** | **1,850,000** | **2,080** |
| **Non-Industrial Direct Contact RCL (0-4 feet only)** | | | **33,000** | **1,300** | **156,000** | **1,560,000** | **67** |
| **Residual Contaminant Level - Soil to Groundwater** | | | **4.5** | **3.6** | **41.2** | **62.6** | **0.1** |
| B1 | 6-8 | 9/29/2001 | ND | ND | **80.4** | ND | ND |
| B2 | 4-6 | 9/29/2001 | ND | ND | ND | ND | ND |
| B3 | 6-8 | 9/29/2001 | ND | ND | ND | ND | ND |
| GP-1 | 6-8 | 11/16/2001 | **21,700** | **1,150** | ND | ND | ND |
| GP-2 | NA | 11/16/2001 | NA | NA | NA | NA | NA |
| B-1 | 2.5-4.5 | 5/14/2002 | ND | ND | ND | ND | ND |
| | 7.5-9.5 | 5/14/2002 | ND | ND | ND | ND | ND |
| B-2 | 7.5-9.5 | 5/14/2002 | ND | ND | ND | ND | ND |
| B-3 | 2.5-4.5 | 5/14/2002 | ND | ND | ND | ND | ND |
| | 10-12 | 5/14/2002 | ND | ND | ND | ND | ND |
| DP-1 | 2 | 4/10/2014 | **156 J** | <28 | <24 | <29 | <21 |
| DP-2 | 2 | 4/10/2014 | <49 | <28 | **279** | <29 | <21 |
| DP-3 | 2 | 4/10/2014 | <49 | <28 | <24 | <29 | <21 |
| DP-4 | 2 | 4/10/2014 | <49 | <28 | <24 | <29 | <21 |
| DP-5 | 2 | 4/10/2014 | <49 | <28 | <24 | <29 | <21 |
| DP-6 | 2 | 4/10/2014 | <49 | <28 | <24 | <29 | <21 |
| DP-7 | 2-4* | 3/16/2015 | **2,870** | <42 | <21 | <24 | <10 |
| | 6 | 11/5/2014 | **10,000** | **110** | <35 | <35 | <35 |
| | 9 | 11/5/2014 | **2,600** | **94** | <34 | <34 | <34 |
| | 10-12* | 3/16/2015 | <54 | <42 | <21 | <24 | <10 |
| DP-8 | 5 | 11/5/2104 | <34 | <34 | **160** | <34 | <34 |
| | 11 | 11/5/2014 | <35 | <35 | <35 | <35 | <35 |
| DP-9 | 6 | 11/5/2014 | <34 | <34 | <34 | <34 | <34 |
| | 10 | 11/5/2014 | <34 | <34 | <34 | <34 | <34 |
| | 12 | 11/5/2014 | <35 | <35 | <35 | <35 | <35 |
| DP-10 | 6 | 11/5/2014 | **220** | <35 | <35 | <35 | <35 |
| | 15 | 11/5/2014 | <36 | <36 | <36 | <36 | <36 |
| DP-11 | 6 | 11/5/2014 | <35 | <35 | <35 | <35 | <35 |
| | 12 | 11/5/2014 | <37 | <37 | <37 | <37 | <37 |
| DP-15 | 2-4 | 3/16/2015 | **55 J** | <42 | **42 J** | <24 | <10 |
| | 4-6 | 3/16/2015 | **108 J** | **500 J** | **2.39 J** | <24 | <10 |
| DP-16 | 2-4 | 8/7/2015 | <54 | <42 | **34 J** | <24 | <10 |
| | 4-6 | 8/7/2015 | **226** | **58 J** | **42 J** | <24 | <10 |
| | 6-8 | 8/7/2015 | <54 | **46 J** | **39 J** | <24 | <10 |
| DP-17 | 4-6 | 8/7/2015 | **117 J** | <42 | **25.5 J** | <24 | <10 |
| | 6-8 | 8/7/2015 | **297** | **88 J** | **62 J** | <24 | <10 |
| | 18-20 | 8/7/2015 | <54 | <42 | <21 | <24 | <10 |
| DP-18 | 14-15 | 11/25/2015 | <54 | <42 | <21 | <24 | <10 |
| DP-19 | 10-12 | 11/25/2015 | <54 | <42 | <21 | <24 | <10 |
| DP-20r | 11-12* | 1/22/2016 | <54 | <42 | <21 | <24 | <10 |
| DP-20 | 14-15 | 11/25/2015 | **216** | **159** | <21 | <24 | <10 |
| DP-20r | 19-20* | 1/22/2016 | <54 | <42 | <21 | <24 | <10 |
| DP-21 | 10-12 | 11/25/2015 | <54 | <42 | <21 | <24 | <10 |
| DP-22 | 14-15 | 11/25/2015 | <54 | <42 | **47 J** | <24 | <10 |
| DP-23 | 12-14 | 1/22/2016 | <54 | <42 | <21 | <24 | <10 |
| DP-24 | 8-10 | 1/22/2016 | <54 | <42 | <21 | <24 | <10 |
| HA-1 | 3-4 | 7/13/2016 | **10,600** | <42 | <21 | <24 | <10 |
| | 5-6 | 7/13/2016 | **6,400** | **400** | **108** | <24 | <10 |
| HA-2 | 3-4 | 7/13/2016 | **2,570** | <42 | <21 | <24 | <10 |
| | 4-5 | 7/13/2016 | **9,100** | **112 J** | <21 | <24 | <10 |
| | 5-6 | 7/13/2016 | **128 J** | <42 | **44 J** | <24 | <10 |
| DP-25 | 1-3 | 7/14/2016 | **2,770** | **161** | **95** | <24 | <10 |
| | 3-5 | 7/14/2016 | **5,000** | **316** | **320** | <24 | <10 |
| DP-26 | 1-3 | 7/14/2016 | **1,110** | <42 | <21 | <24 | <10 |
| | 3-5 | 7/14/2016 | **2,600** | **63 J** | <21 | <24 | <10 |
| DP-27 | 1-3 | 7/14/2016 | **530** | <42 | <21 | <24 | <10 |
| | 3-5 | 7/14/2016 | <54 | <42 | <21 | <24 | <10 |
| DP-29 | 4-5 | 7/14/2016 | <54 | <42 | <21 | <24 | <10 |

## TABLE 2
### SOIL ANALYTICAL RESULTS
Former Peters Dry Cleaners
5094 College Avenue Greendale, Wisconsin

| Boring Identification | Sample Depth (feet bgs) | Sample Date | Tetrachloroethene | Trichloroethene | cis-1,2-Dichloroethene | trans-1,2-Dichloroethene | Vinyl Chloride |
|---|---|---|---|---|---|---|---|
| **Industrial Direct-Contact RCL (0-4 feet only)** | | | **145,000** | **8,410** | **2,340,000** | **1,850,000** | **2,080** |
| **Non-Industrial Direct Contact RCL (0-4 feet only)** | | | **33,000** | **1,300** | **156,000** | **1,560,000** | **67** |
| **Residual Contaminant Level - Soil to Groundwater** | | | **4.5** | **3.6** | **41.2** | **62.6** | **0.1** |
| DP-31 | 0-2 | 12/28/2016 | **530** | <42 | <21 | <24 | <10 |
| DP-32 | 4-6 | 12/28/2016 | **740** | **215** | **185** | <24 | <10 |
| DP-33 | 2-4 | 12/28/2016 | **17,400** | <210 | <105 | <120 | <50 |
| | 4-6 | 12/28/2016 | **171,000** | **171** | **22.5 J** | <24 | <10 |
| | 6-8 | 12/28/2016 | **23,200** | **650** | **31.5 J** | <24 | <10 |
| DP-34 | 4-6 | 12/28/2016 | **9,300** | **820** | **196** | <24 | <10 |
| | 6-7 | 12/28/2016 | **18,600** | **1,040** | **253** | <48 | <20 |
| | 7-9 | 12/28/2016 | **72,000** | **370** | <21 | <24 | <10 |
| DP-35 | 4-6 | 12/28/2016 | **42,000** | **1,460** | **420** | <24 | <10 |
| | 6-8 | 12/28/2016 | **3,300** | **900** | **272** | <24 | <10 |
| | 8-9 | 12/28/2016 | **4,700** | **307** | **58 J** | <24 | <10 |
| DP-36 | 4-6 | 12/28/2016 | **241,000** | **154** | <21 | <24 | <10 |
| | 8-9 | 12/28/2016 | **2,880,000** | **274** | **25.5 J** | <24 | <10 |
| DP-37 | 2-4 | 12/28/2016 | **1,190** | <42 | <21 | <24 | <10 |
| | 8-9 | 12/28/2016 | **25,000** | **223** | **119** | <24 | <10 |
| DP-38 | 41-43 | 6/16/2017 | <32 | <41 | <32 | <28 | <19 |
| DP-39 | 44-44.5 | 6/16/2017 | <32 | <41 | <32 | <28 | <19 |
| MW-12 | 10-12 | 12/13/2019 | <32 | <41 | <32 | <28 | <19 |
| | 14-15 | 12/13/2019 | <32 | <41 | <32 | <28 | <19 |
| PZ-1 | 18-20 | 12/13/2019 | <32 | <41 | <32 | <28 | <19 |
| | 20-22 | 12/13/2019 | <32 | <41 | <32 | <28 | <19 |
| | 24-26 | 12/13/2019 | <32 | <41 | <32 | <28 | <19 |

**Notes:**

Only chlorinated volatile organic compounds are reported on this table
Residual Contaminant Levels are based on USEPA Soil Screening Levels (November 2013).
Samples analyzed using EPA SW-846 Method 8260 with Prep Method 5030B
All concentrations reported in units of micrograms per kilogram (μg/kg)
**Bolded** and Shaded orange values exceed WDNR generic Industrial Direct Contact Residual Contaminant Levels
**Bolded** and Shaded green values exceed WDNR generic Non-Industrial Direct Contact Residual Contaminant Levels
**Bolded** and Shaded blue values exceed WDNR generic Soil to Groundwater Residual Contaminant Levels
**Bolded** values are above detection limits
VOCs = Volatile Organic Compounds
J = Concentration is less than the reporting limit but greater than the method detection limit.
ND = Not Detected
NA = Not Analyzed or Not Available
Direct contact RCLs evaluated for samples less than 4 feet bgs

# TABLE 3

## GRAB GROUNDWATER ANALYTICAL RESULTS

Former Peters Dry Cleaners

5094 College Avenue, Greendale, Wisconsin

| Sample ID | Sample Date | Depth | Tetrachloroethene | Trichloroethene | cis-1,2-Dichloroethene | trans-1,2-Dichloroethene | Vinyl Chloride |
|---|---|---|---|---|---|---|---|
| **Enforcement Standard** | | | **5** | **5** | **70** | **100** | **0.2** |
| **Preventative Action Limit** | | | **0.5** | **0.5** | **7** | **20** | **0.02** |
| B1 | 9/29/2001 | unknown | ND | **1.69** | **20.2** | ND | ND |
| B5 | 12/19/2013 | 2-14' | <0.47 | <0.36 | <0.42 | <0.37 | <0.18 |
| B6 | 12/19/2013 | 2.5-15' | <0.47 | <0.36 | <0.42 | <0.37 | <0.18 |
| DP-1-(9-19'w) | 4/11/2014 | 9-19' | <0.33 | <0.33 | **0.43 J** | <0.35 | <0.18 |
| DUP-2 | | | <0.33 | <0.33 | **0.39 J** | <0.35 | <0.18 |
| DP-2-(8-13'w) | 4/11/2014 | 8-13' | **8.7 J** | **6.1 J** | **510** | **6.9 J** | **119** |
| DP-3-(4-9'w) | 4/11/2014 | 4-9' | <0.33 | <0.33 | <0.38 | <0.35 | <0.18 |
| DP-4-(4-14'w) | 4/11/2014 | 4-14' | <0.33 | <0.33 | <0.38 | <0.35 | <0.18 |
| DP-5-(4-14'w) | 4/11/2014 | 4-14' | <0.33 | <0.33 | <0.38 | <0.35 | <0.18 |
| DP-6-(4-14'w) | 4/11/2014 | 4-14' | <0.33 | <0.33 | <0.38 | <0.35 | <0.18 |
| DP-7w | 3/17/2015 | 6-16' | **8.8** | <0.47 | <0.45 | <0.54 | <0.17 |
| DP-12w | 3/17/2015 | 6-16' | **42** | **5.5** | **4.5** | <0.54 | <0.17 |
| DP-13w | 3/17/2015 | 6-16' | **24.8** | **7.6** | **10.5** | <0.54 | <0.17 |
| DP-14w | 3/17/2015 | 6-16' | <0.74 | <0.47 | <0.45 | <0.54 | <0.17 |
| DP-15w | 3/17/2015 | 6-16' | **5.9** | **11.2** | **19.6** | <0.54 | <0.17 |
| DP-18w | 11/25/2015 | 3'-13' | <0.49 | <0.47 | <0.45 | <0.54 | <0.17 |
| DP-19w | 11/25/2015 | 5'-15' | <0.49 | <0.47 | <0.45 | <0.54 | <0.17 |
| DP-20w | 11/25/2015 | 5'-15' | <0.49 | **0.50 J** | **35** | **2.19** | **0.20 J** |
| DP-21w | 11/25/2015 | 5'-15' | <0.49 | <0.47 | <0.45 | <0.54 | <0.17 |
| DP-22w | 11/25/2015 | 5'-15' | <0.49 | <0.47 | **1.56** | <0.54 | **0.26 J** |
| DP-28w | 7/15/2016 | 5'-15' | <0.49 | <0.47 | <0.45 | <0.54 | <0.17 |
| DP-29w | 7/15/2016 | 5'-15' | <0.49 | <0.47 | <0.45 | <0.54 | <0.17 |
| DP-38 | 6/23/2017 | 36.6'-46.6 | <48 | <0.45 | <0.41 | <0.35 | <0.19 |
| DP-39 | 6/23/2017 | 32.3'-42.3' | <48 | <0.45 | <0.41 | <0.35 | <0.19 |

**Notes:**

µg/L = micrograms per liter

Samples analyzed using EPA SW-846 Method 8260

VOCs = Volatile Organic Compounds

**Bolded** and blue shaded values are above Public Health Enforcement Standards

**Bolded** and orange shaded values are above Public Health Preventive Action Limits

**Bolded** values are above detection limits

Samples/constituents not shown are below laboratory reporting limits

J = Analyte concentration detected between the laboratory Reporting Limit and the laboratory Method Detection Limit

ND = Not Detected

**TABLE 4**
**MONITORING WELL SAMPLE ANALYTICAL RESULTS**
Former Peters Dry Cleaners
5094 College Avenue, Greendale, Wisconsin

| Monitoring Well ID | Date Sampled | Tetrachloroethene | Trichloroethene | cis-1,2-Dichloroethene | trans-1,2-Dichloroethene | Vinyl Chloride |
|---|---|---|---|---|---|---|
| **Enforcement Standard** | | **5** | **5** | **70** | **100** | **0.2** |
| **Preventative Action Limit** | | **0.5** | **0.5** | **7** | **20** | **0.02** |
| MW-1 | 12/4/2013 | <0.17 | <0.19 | <0.28 | <0.28 | <0.1 |
| | 4/10/2014 | <0.33 | <0.33 | <0.38 | <0.35 | <0.18 |
| | 8/13/2015 | <0.49 | <0.47 | <0.45 | <0.54 | <0.17 |
| MW-2 | 6/21/2002 | **1.81** | **3.33** | **5.35** | ND | ND |
| | 12/4/2013 | <0.17 | <0.19 | <0.12 | <0.25 | <0.1 |
| | 4/10/2014 | <0.33 | <0.33 | **0.90 J** | <0.35 | <0.18 |
| | 8/13/2015 | <0.49 | <0.47 | **6.1** | <0.54 | <0.17 |
| MW-3 | 6/21/2002 | ND | ND | ND | ND | ND |
| | 4/10/2014 | **2.67** | <0.33 | <0.38 | <0.35 | <0.18 |
| | 8/13/2015 | **1.7** | <0.47 | <0.45 | <0.54 | <0.17 |
| | 8/5/2016 | **1.35 J** | <0.47 | <0.45 | <0.54 | <0.17 |
| MW-4 | 6/21/2002 | ND | ND | ND | ND | ND |
| | 4/10/2014 | <0.33 | <0.33 | <0.38 | <0.35 | <0.18 |
| | 8/13/2015 | <0.49 | <0.47 | <0.45 | <0.54 | <0.17 |
| MW-5 | 11/7/2014 | <1.0 | <1.0 | **1.8** | <1.0 | <1.0 |
| | 8/13/2015 | **0.99 J** | **3.4** | **79** | **4.8** | **4.3** |
| | 10/2/2015 | **1.96** | **7.8** | **76** | **5.0** | **6.9** |
| | 1/28/2016 | **0.63 J** | **3.2** | **45** | **2.8** | **4.8** |
| | 11/8/2016 | <0.49 | **3.14** | **33** | **2.59** | <0.17 |
| | 1/5/2017 | **110** | **72** | **184** | **7.10** | **16.6** |
| | 1/23/2017 | **16.8** | **16.4** | **66** | **4.0** | **0.51 J** |
| | 6/23/2017 | **12.8** | **15.9** | **83** | **10.5** | **0.36** |
| | 9/21/2017 | **13** | **20.7** | **113** | **5.0** | **6.3** |
| | 12/29/2017 | **4.6** | **9.6** | **80** | **3.3** | **1.81** |
| | 1/2/2020 | **1.51** | **2.9** | **29** | **1.1** | <0.2 |
| MW-6 | 12/3/2014 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 8/13/2015 | <0.49 | <0.47 | <0.45 | <0.54 | <0.17 |
| | 1/28/2016 | <0.49 | <0.47 | <0.45 | <0.54 | <0.17 |
| | 6/22/2017 | <0.48 | <0.45 | <0.41 | <0.35 | <0.19 |
| | 1/2/2020 | <0.38 | <0.3 | <0.37 | <0.34 | <0.2 |
| MW-7 | 11/7/2014 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 8/13/2015 | <0.49 | <0.47 | <0.45 | <0.54 | <0.17 |
| | 1/28/2016 | <0.49 | <0.47 | <0.45 | <0.54 | <0.17 |
| | 6/22/2017 | <0.48 | <0.45 | <0.41 | <0.35 | <0.19 |
| | 1/2/2020 | <0.38 | <0.3 | <0.37 | <0.34 | <0.2 |
| MW-8 | 8/13/2015 | **49** | **14.8** | **80** | **5.9** | **5.1** |
| | 10/2/2015 | **43** | **15.7** | **70** | **5.4** | **4.0** |
| | 1/28/2016 | **17.9** | **7.4** | **33** | **2.53** | **2.0** |
| | 8/5/2016 | **32** | **11.8** | **61** | **4.0** | **3.5** |
| | 11/8/2016 | **36** | **12.4** | **55** | **5.2** | **2.48** |
| | 1/5/2017 | **24.4** | **10.3** | **50** | **3.8** | **1.45** |
| | 6/23/2017 | **13.1** | **7.7** | **37** | **5.1** | **1.55** |
| | 9/21/2017 | **24.2** | **10.5** | **50** | **3.8** | **2.29** |
| | 12/29/2017 | **19.8** | **9.3** | **47** | **3.3** | **1.86** |
| | 1/2/2020 | **7.0** | **5.4** | **26** | **1.6** | **0.44 J** |
| MW-9 | 8/13/2015 | **0.76 J** | **0.60 J** | **1.13 J** | <0.54 | **0.20 J** |
| | 10/2/2015 | <0.49 | <0.47 | **2.99** | <0.54 | <0.17 |
| | 1/28/2016 | **3.7** | **3.02** | **13.2** | **0.77 J** | **1.35** |
| | 8/5/2016 | **14.2** | **9.9** | **47.0** | **2.35** | **4.5** |
| | 11/8/2016 | **5.2** | **2.12** | **7.6** | <0.54 | <0.17 |
| | 1/5/2017 | **9.2** | **5.8** | **24.2** | **1.49 J** | **0.70** |
| | 6/22/2017 | **16.4** | **9.2** | **22.1** | **2.85** | **0.98** |
| | 9/21/2017 | **18.8** | **11.9** | **53** | **3.14** | **3.8** |
| | 12/29/2017 | **21** | **9.8** | **38** | **2.05** | **0.86** |
| | 1/2/2020 | **15.3** | **7.5** | **27** | **1.38** | **1.97** |

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# TABLE 4
## MONITORING WELL SAMPLE ANALYTICAL RESULTS
Former Peters Dry Cleaners

5094 College Avenue, Greendale, Wisconsin

| Monitoring Well ID | Date Sampled | Tetrachloroethene | Trichloroethene | cis-1,2-Dichloroethene | trans-1,2-Dichloroethene | Vinyl Chloride |
|---|---|---|---|---|---|---|
| **Enforcement Standard** | | **5** | **5** | **70** | **100** | **0.2** |
| **Preventative Action Limit** | | **0.5** | **0.5** | **7** | **20** | **0.02** |
| MW-10 | 1/28/2016 | <0.49 | <0.47 | <0.45 | <0.54 | <0.17 |
| | 6/22/2017 | <0.48 | <0.45 | <0.41 | <0.35 | <0.19 |
| | 1/2/2020 | <0.38 | <0.3 | <0.37 | <0.34 | <0.2 |
| MW-11 | 1/28/2016 | **17.4** | **11.3** | **50** | **2.97** | **3.13** |
| | 7/7/2016 | **4.2** | **2.06** | **9** | **0.55 J** | **0.92** |
| | 8/5/2016 | **16.1** | **8.7** | **46** | **2.89** | **4.7** |
| | 11/8/2016 | **15.3** | **7.7** | **39** | **3.06** | **2.71** |
| | 1/5/2017 | **7.9** | **5.0** | **28** | **1.66 J** | **1.7** |
| | 6/23/2017 | **10.6** | **5.7** | **20** | **2.34** | **1.47** |
| | 9/21/2017 | **19.6** | **11.1** | **6.1** | **3.5** | **4.9** |
| | 12/29/2017 | **11.8** | **6.9** | **39** | **2.38** | **2.68** |
| | 1/2/2020 | **6.0** | **3.1** | **14** | **1.09** | **0.85** |
| MW-12 | 1/2/2020 | <0.38 | <0.3 | <0.37 | <0.34 | <0.2 |
| PZ-1 | 1/2/2020 | <0.38 | <0.3 | <0.37 | <0.34 | <0.2 |

**Notes:**

Only chlorinated volatile organic compounds are reported on this table

µg/L = micrograms per liter

Samples analyzed using EPA SW-846 Method 8260

VOCs = Volatile Organic Compounds

**Bolded** values are above detection limits

**Bolded** and blue shaded values are above Public Health Enforcement Standards

**Bolded** and orange shaded values are above Public Health Preventive Action Limits

Samples/constiuents not shown are below laboratory reporting limits

J = Analyte concentration detected between the laboratory Reporting Limit and Method Detection Limit

ND = Not Detected

# TABLE 5

**INITIAL REMEDIAL ALTERNATIVES EVALUATION**

***Remedial Action Options***

Peter's Dry Cleaners
5094 West College Avenue
Greendale, Wisconsin

| General Response Action | Remedial Approach | Description | Applicable and Appropriate? | Further Evaluation Warranted |
|---|---|---|---|---|
| No Remediation | No Action | No further action | No | No. This option is not appropriate due to potential exposure pathways for soil direct contact, groundwater direct contact, and vapor intrusion. |
| | Monitored Natural Attenuation | Monitor to confirm adequate attenuation of contaminant concentrations is occurring and screen for potential changes in exposure potential. | No | No. This option is not suitable because the magnitude of soil concentrations indicate that notable attenuation will not occur in the foreseeable future. |
| Institutional Controls | Environmental Land Use Restriction | Record the site in the Wisconsin Remediation and Redevelopment Program's GIS Registry. May include restrictions to residential occupancy, restrictions to groundwater extraction, restrictions to excavation activities, and/or continuing obligation requirements. | Yes | Yes, in conjunction with other options. |
| Engineering Controls | Vapor Mitigation System | Installation and operation of vapor mitigation systems at affected properties. | Yes | Yes, in conjunction with source remediation |
| | Structural Vapor Barrier | Construction of vapor barrier to mitigate vapor intrusion concerns in structures. | No | No. This option is not suitable for the existing building. |
| | Low Permeability Cap | Installation of a low permeability cap to mitigate further contaminant migration from the unsaturated zone to groundwater by reducing precipitation infiltration. | Yes | Yes, in conjunction with a corresponding Environmental Land Use Restriction. |
| | Evapotranspiration Cap | Installation of vegetative cover to mitigate further contaminant migration from the unsaturated zone to groundwater by reducing precipitation infiltration. | No | No. This option is not applicable due to the commerical nature |
| *In-Situ* Remediation | Soil Vapor Extraction | Volatilization of contaminant mass in unsaturated zone and removal via vacuum extraction. | No | No. This option is not suitable due to the effects of low soil permeability at the Site on vapor transport and recovery rates. |
| | Multi-Phase Extraction | Removal of contaminants in liquid and vapor phases via vacuum extraction. | No | No. This option is not suitable due to the effects of low soil permeability at the Site and site constraints. |
| | Thermal Desorption | Removal of contaminants in aqueous, liquid, and sorbed phases by heating and volatilization, with subsequent vacuum extraction. | Yes | Yes |
| | Injection: *In-Situ* Chemical Oxidation | Injection of chemically oxidative groundwater additives such as hydrogen peroxide, potassium permanganate, or persulfates to destroy contaminants. | No | No. This option is not suitable due to the poor accessibility of target contaminants for direct contact of the ISCO reagents due to a combination of low soil permeability and lack of access to the site building interior for injection. |
| | Injection: Colloidal Activated Carbon | Injection of colloidal organic carbon in the saturated zone via direct-push methods to sequester organic contaminants and promote biodegradation of the contaminants via reductive processes. | Yes | Yes |
| | Injection: *In-Situ* Chemical Reduction | Injection of chemically reductive additives such as zero-valent iron to promote biodegradation of contaminants via reductive processes. | Yes | Yes |
| | Injection: Enhanced Reductive Dechlorination | Injection of an organic substrate to stimulate the growth of dehalogenating bacteria and, by extension, stimulate the degradation of chlorinated compounds via reductive dechlorination. | Yes | Yes |
| | Injection: Bioaugmentation | Injection of microorganisms to promote degradation of contaminants through direct or indirect biological processes. | Yes | Yes |
| | Injection: Air Sparging | Injection of air into the subsurface to promote volatilization and subsequent removal of contaminants via vapor extraction. | No | No. This option is not suitable due to the low soil permeability at the Site. |
| | Injection: Ozone Sparging | Combines air sparging with in-situ chemical oxidation. Ozone is added to air sparging injection stream to facilitate oxidative destruction of contaminants. | No | No. This option is not suitable due to the low soil permeability at the Site. |
| | Injection: Enhanced Aerobic Bioremediation | Application of nutrients and/or oxygen to the subsurface to accelerate naturally-occurring breakdown of contaminants via aerobic bacteria. | No | No. This option is not suitable due to the poor suitability of the technique for remediating the targeted COCs. |
| | Soil Mixing: *In-Situ* Chemical Oxidation | Involves the addition of oxidation reagents to a contaminated material (e.g. soil or sludge) to facilitate oxidative destruction of contaminants. Mixing of is performed using heavy equipment such as augers or specialized soil mixing tools. | No | No. This option is not suitable due lack of access to the site building for the equipment required to mix the soils. |
| | Soil Mixing: Solidification and Stabilization | Stabilization involves the addition of reagents to a contaminated material (e.g. soil or sludge) to produce more chemically stable constituents. Solidification involves the addition of reagents to a contaminated material to impart physical/dimensional stability to contain contaminants in a solid product and reduce access by external agents (e.g. air, rainfall). Mixing of is performed using heavy equipment such as augers or specialized soil mixing tools. | No | No. This option is not suitable due lack of access to the site building for the equipment required to mix the soils. |
| | Phytoremediation | Use of plants to remove, contain, and/or degrade contaminants. | No | No. This option is not applicable due to the restriction to site use that this option would impose. |
| Removal Action | Pump-and-Treat | Removal of contaminated groundwater via pumping and subsequent treatment. | No | No. This option is not suitable due to the low soil permeability at the Site. |
| | Excavation and Disposal | Removal of contaminated soil using excavation equipment. | Yes | Yes |

*Note:*
Highlighted boxes indicate that this technology will move forward in the screening process

## TABLE 6

### REMEDIAL ACTIONS OPTIONS EVALUATION MATRIX

***Remedial Action Options***

Peter's Dry Cleaners
5094 West College Avenue
Greendale, Wisconsin

| General Response Action | Remedial Approach | Description | Effectiveness | Ability to Implement | Restoration Timeframe | Economic Feasibility | Cumulative Points |
|---|---|---|---|---|---|---|---|
| **Institutional and/or Engineering Controls*** | Environmental Land Use Restriction | Record the site in the WISCONSIN REMEDIATION AND REDEVELOPMENT DATABASE (WRRD) to prohibit groundwater use, restrict residential use of the property due to vapor intrusion risk, and notify excavation workers of residual contamination. | 2 | 5 | 0 | 5 | **12** |
| | Vapor Mitigation System | Installation and operation of vapor mitigation systems at the site. This option would be paired with recording the site on the WISCONSIN REMEDIATION AND REDEVELOPMENT DATABASE (WRRD) to stipulate vapor mitigation system operation and maintenance as a continuing obligation. | 1 | 5 | 1 | 5 | **12** |
| | Low Permeability Cap | Installation of a low permeability cap. This option could be paired with recording the site on the WISCONSIN REMEDIATION AND REDEVELOPMENT DATABASE (WRRD) and other remedial options to stipulate inspection and maintenance of the cap as a continuing obligation. | 3 | 5 | 3 | 4 | **15** |
| ***In-Situ* Remediation** | Thermal Desorption | Removal of contaminants in aqueous, liquid, and sorbed phases by heating and volatilization, with subsequent vacuum extraction. This option would be applied to the source area beneath the building. | 5 | 1 | 5 | 1 | **12** |
| | Injection: Colloidal Activated Carbon | Injection of colloidal organic carbon in the saturated zone via direct-push methods to sequester organic contaminants and promote biodegradation of the contaminants via reductive processes. This option would be applied to the groundwater plume, downgradient of the source area. | 3 | 2 | 4 | 3 | **12** |
| | Injection: *In-Situ Chemical reduction, ERD, and bioaugmentation* | Injection of chemically reductive additives such as zero-valent iron to promote degradation of contaminants via reductive processes. This option would be used in conjunction with ERD and bioaugmentation. This option would be applied to the groundwater plume, downgradient of the source area. | 4 | 3 | 3 | 4 | **14** |
| **Removal Action** | Excavation and Disposal | Removal of contaminated soil from the source area beneath the building using excavation equipment. | 5 | 3 | 5 | 4 | **17** |

**Notes:**

* Institutional controls and/or engineering controls, if selected, will be implemented in conjunction with a source remediation option. See Remedial Action Options Report text for details.
Scores assigned represent the relative suitability of the process option for the given criteria, with 1 representing the lowest suitability and 5 representing the highest suitability.
Relative Ranking (all criteria but cost): 0 = Very low to none; 1 = Low; 2 = Low to moderate; 3 = Moderate; 4 = Moderate to high; 5 = High
Relative Ranking for Cost: 0 = High; 1 = Moderate to high; 2 = Moderate; 3 = Low to moderate; 4 = Low; 5 = Very low to none

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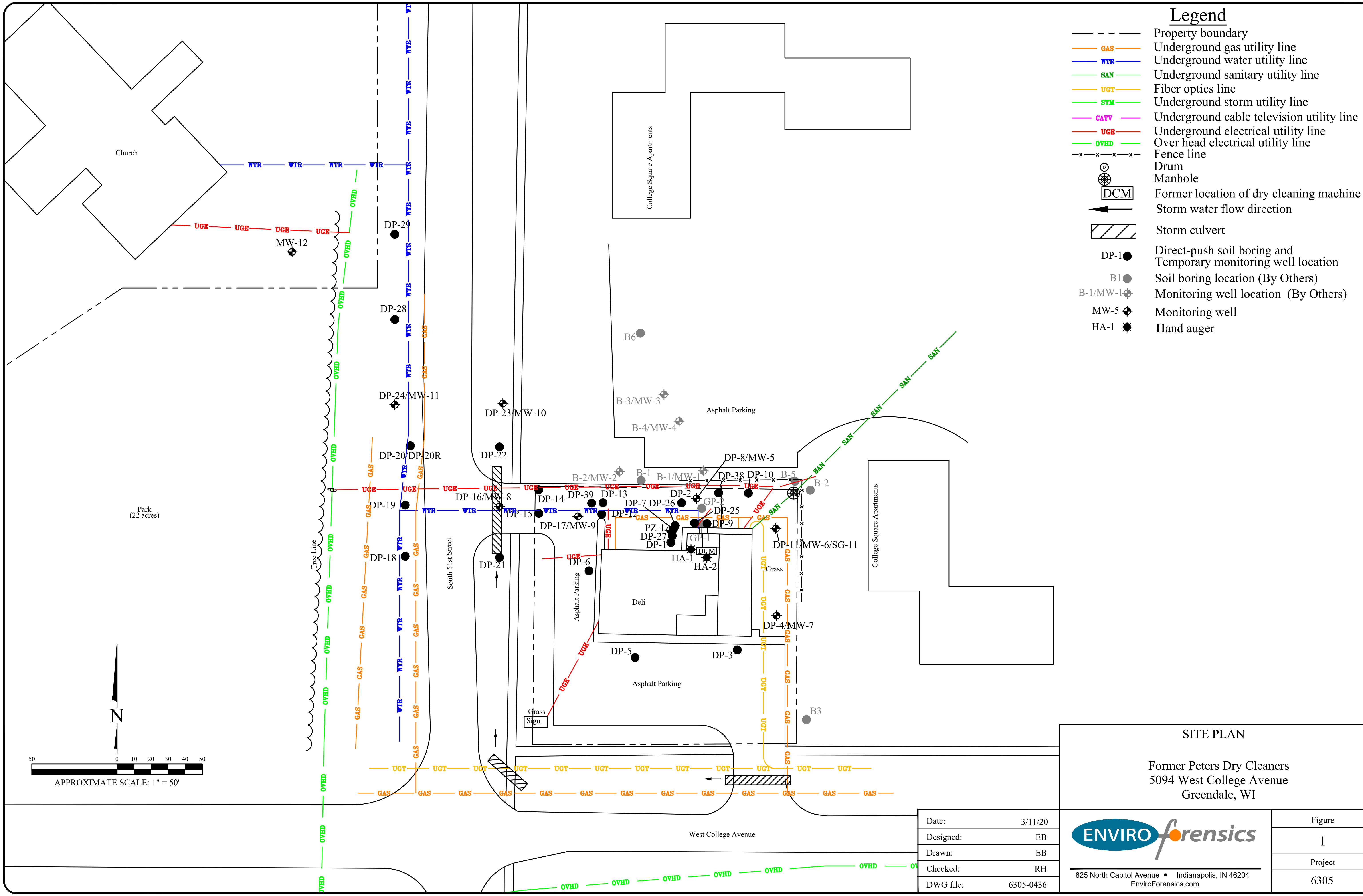
FIGURES




SITE PLAN

Former Peters Dry Cleaners
5094 West College Avenue
Greendale, WI

| | |
|---|---|
| Date: | 3/11/20 |
| Designed: | EB |
| Drawn: | EB |
| Checked: | RH |
| DWG file: | 6305-0436 |

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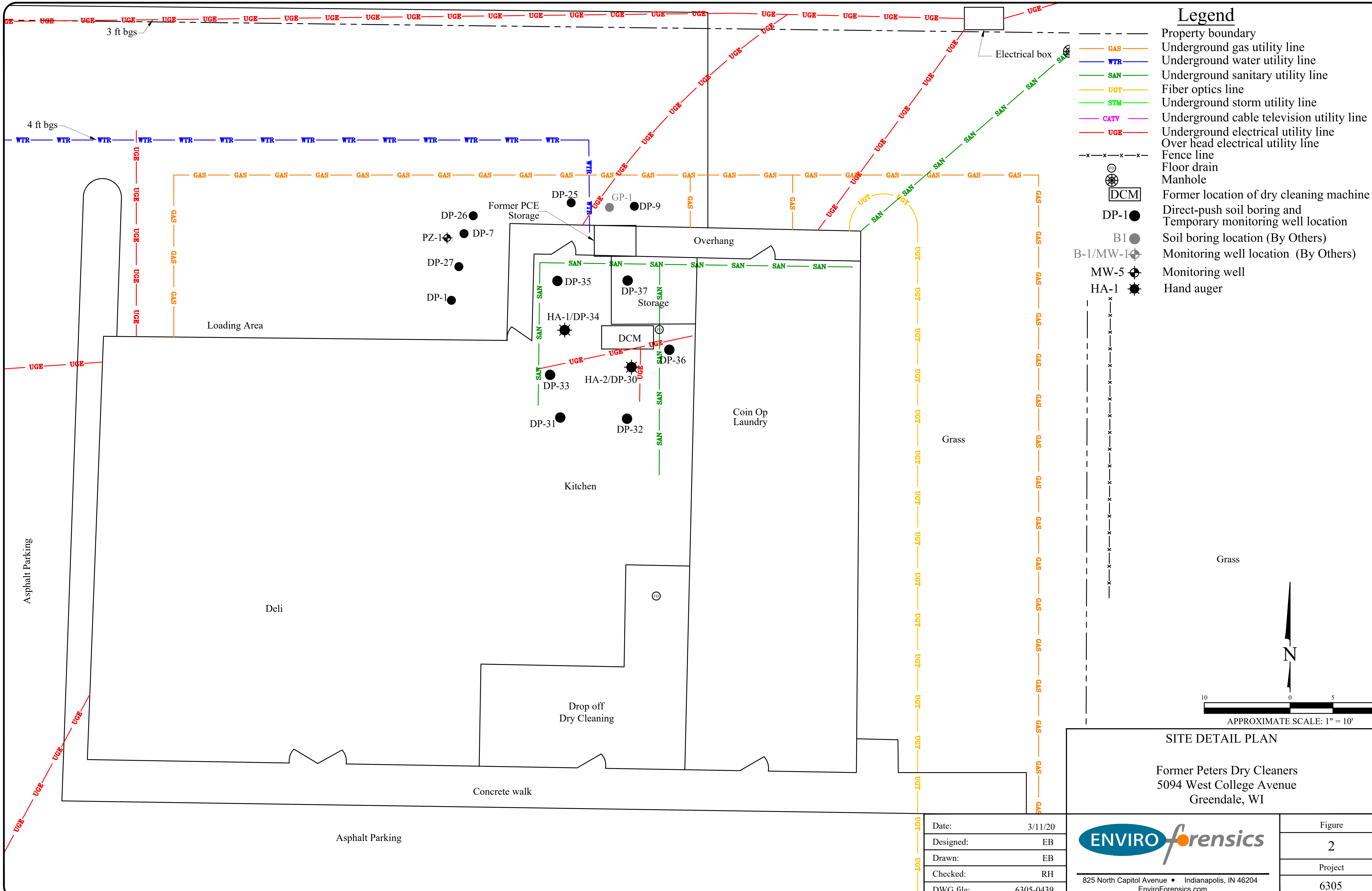
| | |
|---|---|
| Figure | 1 |
| Project | 6305 |



Legend
Property boundary
Underground gas utility line
Underground water utility line
Underground sanitary utility line
Fiber optics line
Underground storm utility line
Underground cable television utility line
Underground electrical utility line
Over head electrical utility line
Fence line
Floor drain
Manhole
Former location of dry cleaning machine
Direct-push soil boring and Temporary monitoring well location
Soil boring location (By Others)
Monitoring well location (By Others)
Monitoring well
Hand auger
3 ft bgs
4 ft bgs
Electrical box
Former PCE Storage
Overhang
Storage
DCM
Loading Area
Kitchen
Coin Op Laundry
Grass
Deli
Drop off Dry Cleaning
Concrete walk
Asphalt Parking
DP-25
GP-1
DP-9
DP-26
DP-7
PZ-1
DP-27
DP-35
DP-37
DP-1
HA-1/DP-34
DP-36
DP-33
HA-2/DP-30
DP-31
DP-32
N
APPROXIMATE SCALE: 1" = 10'
SITE DETAIL PLAN
Former Peters Dry Cleaners
5094 West College Avenue
Greendale, WI
Date: 3/11/20
Designed: EB
Drawn: EB
Checked: RH
DWG file: 6305-0439
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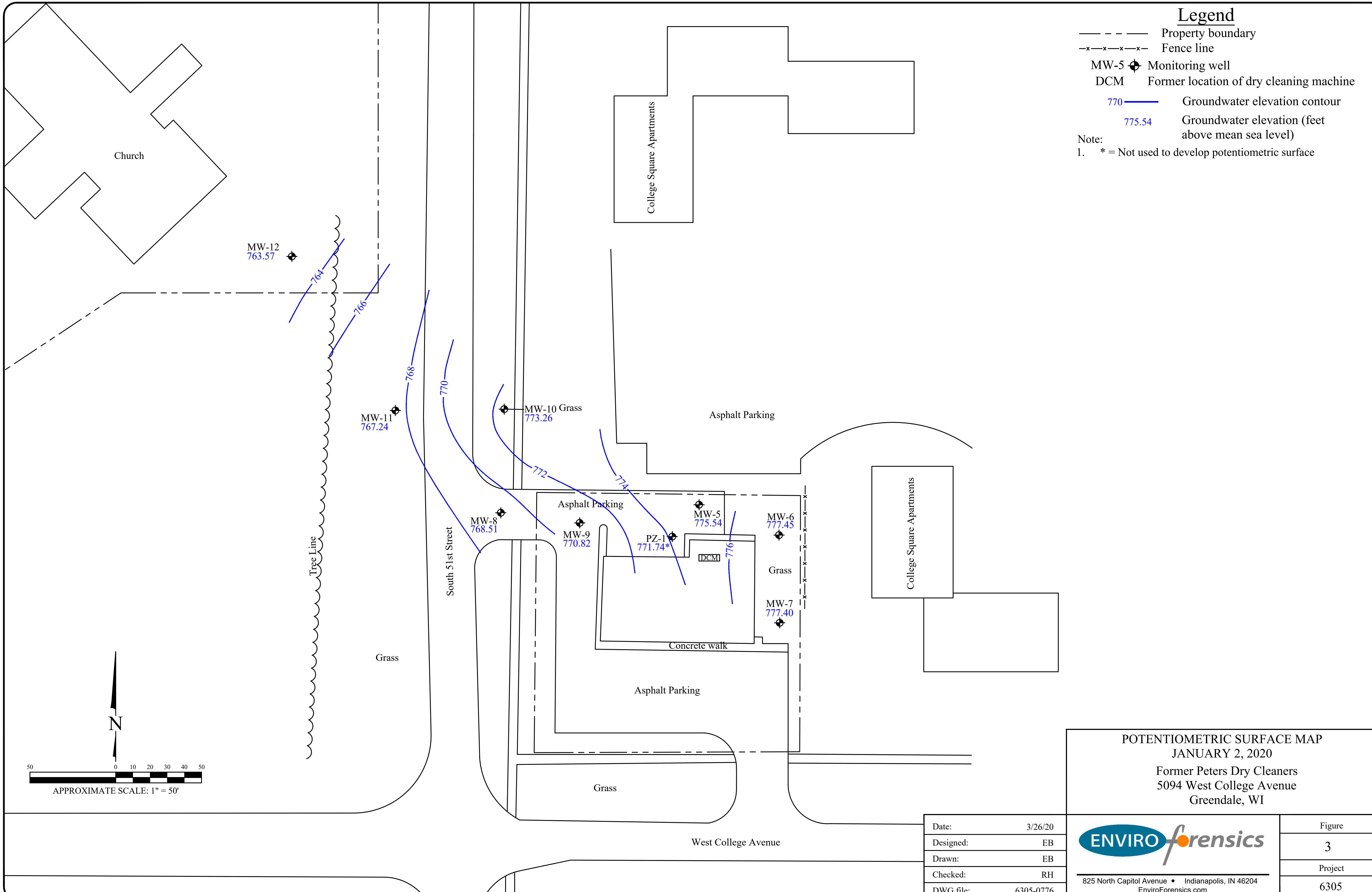
Figure 2
Project 6305



Legend
Property boundary
Fence line
MW-5 Monitoring well
DCM Former location of dry cleaning machine
770 Groundwater elevation contour
775.54 Groundwater elevation (feet above mean sea level)
Note:
1. * = Not used to develop potentiometric surface
Church
College Square Apartments
MW-12
763.57
764
766
768
770
772
774
776
MW-11
767.24
MW-10 Grass
773.26
Asphalt Parking
MW-8
768.51
MW-9
770.82
MW-5
775.54
PZ-1
771.74*
DCM
MW-6
777.45
MW-7
777.40
Grass
Concrete walk
Tree Line
South 51st Street
West College Avenue
N
50 0 10 20 30 40 50
APPROXIMATE SCALE: 1" = 50'
POTENTIOMETRIC SURFACE MAP
JANUARY 2, 2020
Former Peters Dry Cleaners
5094 West College Avenue
Greendale, WI
Date: 3/26/20
Designed: EB
Drawn: EB
Checked: RH
DWG file: 6305-0776
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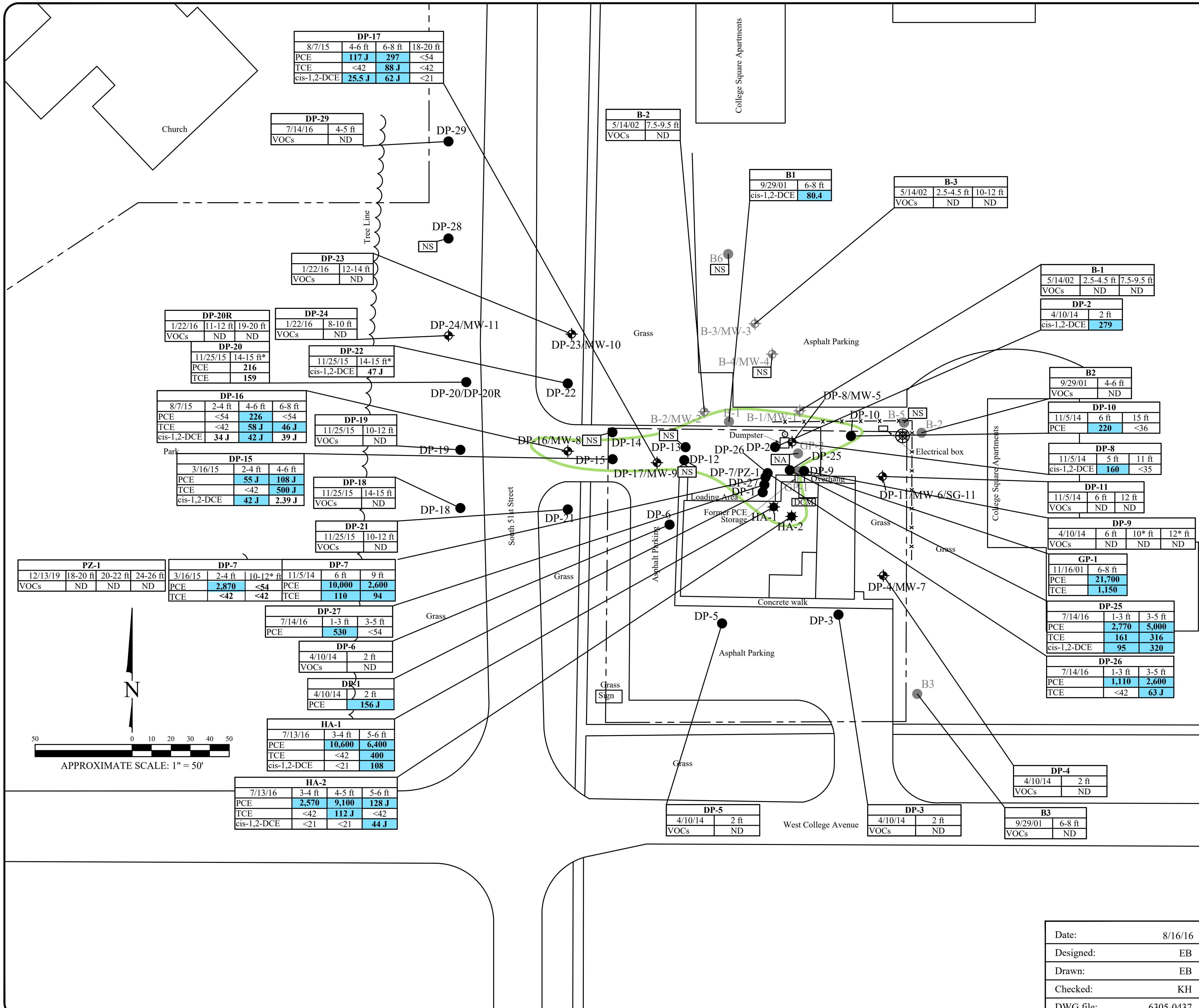
Figure
3
Project
6305




| DP-17 | | | |
|---|---|---|---|
| 8/7/15 | 4-6 ft | 6-8 ft | 18-20 ft |
| PCE | **117 J** | **297** | <54 |
| TCE | <42 | **88 J** | <42 |
| cis-1,2-DCE | **25.5 J** | **62 J** | <21 |

| DP-29 | |
|---|---|
| 7/14/16 | 4-5 ft |
| VOCs | ND |

| DP-23 | |
|---|---|
| 1/22/16 | 12-14 ft |
| VOCs | ND |

| DP-20R | | |
|---|---|---|
| 1/22/16 | 11-12 ft | 19-20 ft |
| VOCs | ND | ND |

| DP-20 | |
|---|---|
| 11/25/15 | 14-15 ft* |
| PCE | **216** |
| TCE | **159** |

| DP-24 | |
|---|---|
| 1/22/16 | 8-10 ft |
| VOCs | ND |

| DP-22 | |
|---|---|
| 11/25/15 | 14-15 ft* |
| cis-1,2-DCE | **47 J** |

| DP-16 | | | |
|---|---|---|---|
| 8/7/15 | 2-4 ft | 4-6 ft | 6-8 ft |
| PCE | <54 | **226** | <54 |
| TCE | <42 | **58 J** | **46 J** |
| cis-1,2-DCE | **34 J** | **42 J** | **39 J** |

| DP-19 | |
|---|---|
| 11/25/15 | 10-12 ft |
| VOCs | ND |

| DP-15 | | |
|---|---|---|
| 3/16/15 | 2-4 ft | 4-6 ft |
| PCE | **55 J** | **108 J** |
| TCE | <42 | **500 J** |
| cis-1,2-DCE | **42 J** | **2.39 J** |

| DP-18 | |
|---|---|
| 11/25/15 | 14-15 ft |
| VOCs | ND |

| DP-21 | |
|---|---|
| 11/25/15 | 10-12 ft |
| VOCs | ND |

| PZ-1 | | | |
|---|---|---|---|
| 12/13/19 | 18-20 ft | 20-22 ft | 24-26 ft |
| VOCs | ND | ND | ND |

| DP-7 | | | | | |
|---|---|---|---|---|---|
| 3/16/15 | 2-4 ft | 10-12* ft | 11/5/14 | 6 ft | 9 ft |
| PCE | **2,870** | **<54** | PCE | **10,000** | **2,600** |
| TCE | **<42** | **<42** | TCE | **110** | **94** |

| DP-27 | | |
|---|---|---|
| 7/14/16 | 1-3 ft | 3-5 ft |
| PCE | **530** | <54 |

| DP-6 | |
|---|---|
| 4/10/14 | 2 ft |
| VOCs | ND |

| DP-1 | |
|---|---|
| 4/10/14 | 2 ft |
| PCE | **156 J** |

| HA-1 | | |
|---|---|---|
| 7/13/16 | 3-4 ft | 5-6 ft |
| PCE | **10,600** | **6,400** |
| TCE | <42 | **400** |
| cis-1,2-DCE | <21 | **108** |

| HA-2 | | | |
|---|---|---|---|
| 7/13/16 | 3-4 ft | 4-5 ft | 5-6 ft |
| PCE | **2,570** | **9,100** | **128 J** |
| TCE | <42 | **112 J** | <42 |
| cis-1,2-DCE | <21 | <21 | **44 J** |

| B-2 | |
|---|---|
| 5/14/02 | 7.5-9.5 ft |
| VOCs | ND |

| B1 | |
|---|---|
| 9/29/01 | 6-8 ft |
| cis-1,2-DCE | **80.4** |

| B-3 | | |
|---|---|---|
| 5/14/02 | 2.5-4.5 ft | 10-12 ft |
| VOCs | ND | ND |

| B-1 | | |
|---|---|---|
| 5/14/02 | 2.5-4.5 ft | 7.5-9.5 ft |
| VOCs | ND | ND |

| DP-2 | |
|---|---|
| 4/10/14 | 2 ft |
| cis-1,2-DCE | **279** |

| B2 | |
|---|---|
| 9/29/01 | 4-6 ft |
| VOCs | ND |

| DP-10 | | |
|---|---|---|
| 11/5/14 | 6 ft | 15 ft |
| PCE | **220** | <36 |

| DP-8 | | |
|---|---|---|
| 11/5/14 | 5 ft | 11 ft |
| cis-1,2-DCE | **160** | <35 |

| DP-11 | | |
|---|---|---|
| 11/5/14 | 6 ft | 12 ft |
| VOCs | ND | ND |

| DP-9 | | | |
|---|---|---|---|
| 4/10/14 | 6 ft | 10* ft | 12* ft |
| VOCs | ND | ND | ND |

| GP-1 | |
|---|---|
| 11/16/01 | 6-8 ft |
| PCE | **21,700** |
| TCE | **1,150** |

| DP-25 | | |
|---|---|---|
| 7/14/16 | 1-3 ft | 3-5 ft |
| PCE | **2,770** | **5,000** |
| TCE | **161** | **316** |
| cis-1,2-DCE | **95** | **320** |

| DP-26 | | |
|---|---|---|
| 7/14/16 | 1-3 ft | 3-5 ft |
| PCE | **1,110** | **2,600** |
| TCE | <42 | **63 J** |

| DP-4 | |
|---|---|
| 4/10/14 | 2 ft |
| VOCs | ND |

| DP-5 | |
|---|---|
| 4/10/14 | 2 ft |
| VOCs | ND |

| DP-3 | |
|---|---|
| 4/10/14 | 2 ft |
| VOCs | ND |

| B3 | |
|---|---|
| 9/29/01 | 6-8 ft |
| VOCs | ND |

## Legend

- Property boundary
- Fence line
- DCM — Former location of dry cleaning machine
- DP-1 — Direct-push soil boring and Temporary monitoring well location
- B1 — Soil boring location (By Others)
- B-1/MW-1 — Monitoring well location (By Others)
- MW-5 — Monitoring well
- HA-1 — Hand auger

| Analyte | Soil to Groundwater (RCL | Industrial Direct Contact (RCL) |
|---|---|---|
| PCE | 4.5 | 145,000 |
| TCE | 3.6 | 8,410 |
| cis-1,2-DCE | 41.2 | 2,340,000 |
| trans-1,2-DCE | 62.6 | 1,850,000 |
| Vinyl Chloride | 0.1 | 2,080 |

Note:
1. Bolded and blue shaded values exceed the Soil to Groundwater Residual Contaminant Level (RCL)
2. Bolded values are above detection limits
3. J = Analyte concentration less that laboratory detection limits
4. Samples analyzed using EPA SW-846 Method 8260
5. All results reported in units of micrograms per kilogram (µg/kg)
6. PCE = Tetrachloroethene
7. TCE = Trichloroethene
8. cis-1,2-DCE = cis-1,2-Dichlotoethene
9. trans-1,2-DCE = trans-1,2-Dichloroethene
10. ND = Not detected
11. ND = Not sampled
12. VOCs = Volatile Organic Compounds
13. * = Saturated soil sample
14. Non-target compound detected in DP-10 but not shown

Extent of impacts above Soil to Groundwater Residual Contaminate Level

# EXTENT OF SOIL IMPACTS

Former Peters Dry Cleaners
5094 West College Avenue
Greendale, WI

| | |
|---|---|
| Date: | 8/16/16 |
| Designed: | EB |
| Drawn: | EB |
| Checked: | KH |
| DWG file: | 6305-0437 |

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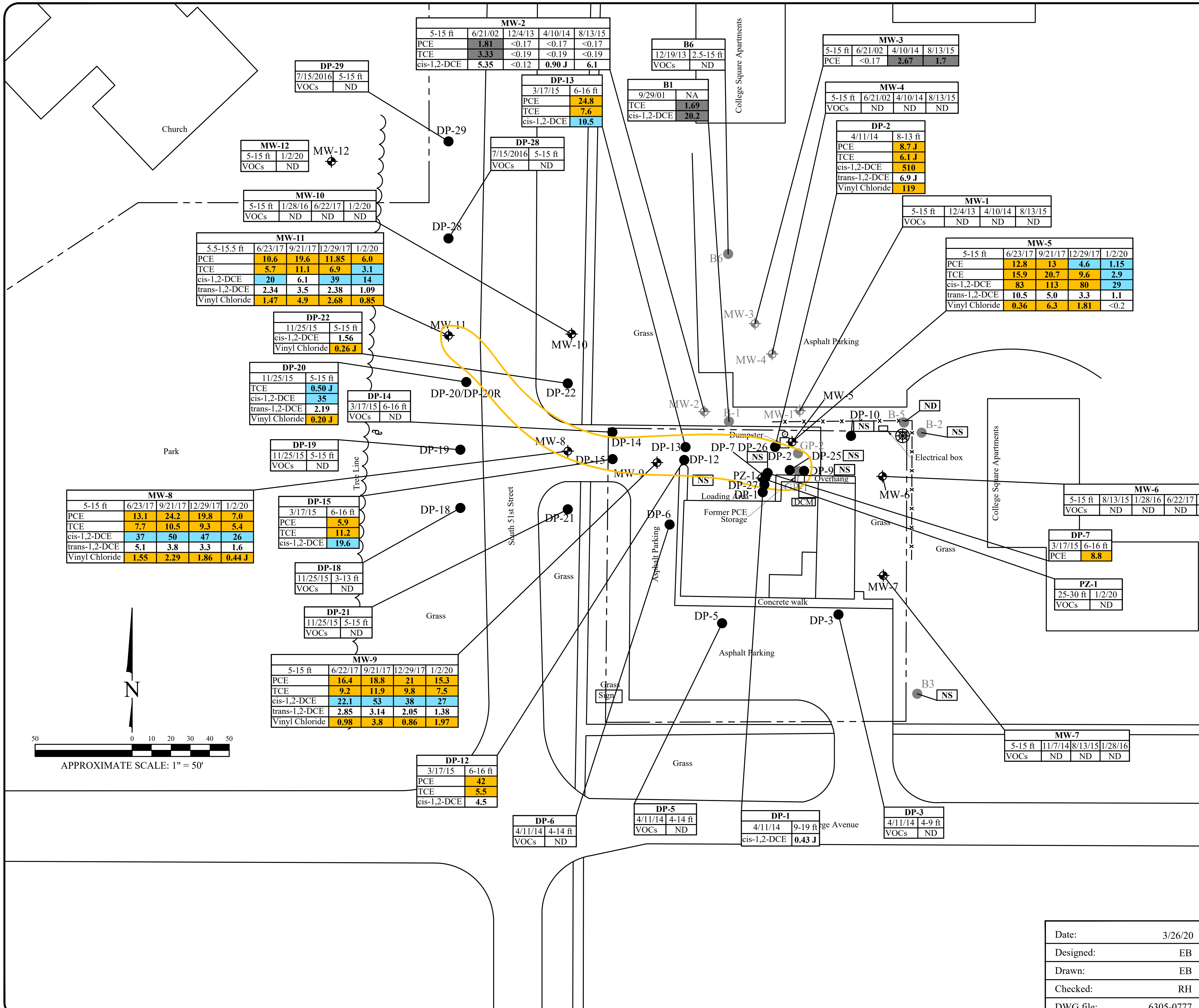
Figure 4

Project 6305




| MW-2 | | | | |
|---|---|---|---|---|
| 5-15 ft | 6/21/02 | 12/4/13 | 4/10/14 | 8/13/15 |
| PCE | 1.81 | <0.17 | <0.17 | <0.17 |
| TCE | 3.33 | <0.19 | <0.19 | <0.19 |
| cis-1,2-DCE | 5.35 | <0.12 | 0.90 J | 6.1 |

| B6 | |
|---|---|
| 12/19/13 | 2.5-15 ft |
| VOCs | ND |

| B1 | |
|---|---|
| 9/29/01 | NA |
| TCE | 1.69 |
| cis-1,2-DCE | 20.2 |

| DP-29 | |
|---|---|
| 7/15/2016 | 5-15 ft |
| VOCs | ND |

| DP-13 | |
|---|---|
| 3/17/15 | 6-16 ft |
| PCE | 24.8 |
| TCE | 7.6 |
| cis-1,2-DCE | 10.5 |

| DP-28 | |
|---|---|
| 7/15/2016 | 5-15 ft |
| VOCs | ND |

| MW-3 | | | |
|---|---|---|---|
| 5-15 ft | 6/21/02 | 4/10/14 | 8/13/15 |
| PCE | <0.17 | 2.67 | 1.7 |

| MW-4 | | | |
|---|---|---|---|
| 5-15 ft | 6/21/02 | 4/10/14 | 8/13/15 |
| VOCs | ND | ND | ND |

| DP-2 | |
|---|---|
| 4/11/14 | 8-13 ft |
| PCE | 8.7 J |
| TCE | 6.1 J |
| cis-1,2-DCE | 510 |
| trans-1,2-DCE | 6.9 J |
| Vinyl Chloride | 119 |

| MW-1 | | | |
|---|---|---|---|
| 5-15 ft | 12/4/13 | 4/10/14 | 8/13/15 |
| VOCs | ND | ND | ND |

| MW-5 | | | | |
|---|---|---|---|---|
| 5-15 ft | 6/23/17 | 9/21/17 | 12/29/17 | 1/2/20 |
| PCE | 12.8 | 13 | 4.6 | 1.15 |
| TCE | 15.9 | 20.7 | 9.6 | 2.9 |
| cis-1,2-DCE | 83 | 113 | 80 | 29 |
| trans-1,2-DCE | 10.5 | 5.0 | 3.3 | 1.1 |
| Vinyl Chloride | 0.36 | 6.3 | 1.81 | <0.2 |

| MW-12 | |
|---|---|
| 5-15 ft | 1/2/20 |
| VOCs | ND |

| MW-10 | | | |
|---|---|---|---|
| 5-15 ft | 1/28/16 | 6/22/17 | 1/2/20 |
| VOCs | ND | ND | ND |

| MW-11 | | | | |
|---|---|---|---|---|
| 5.5-15.5 ft | 6/23/17 | 9/21/17 | 12/29/17 | 1/2/20 |
| PCE | 10.6 | 19.6 | 11.85 | 6.0 |
| TCE | 5.7 | 11.1 | 6.9 | 3.1 |
| cis-1,2-DCE | 20 | 6.1 | 39 | 14 |
| trans-1,2-DCE | 2.34 | 3.5 | 2.38 | 1.09 |
| Vinyl Chloride | 1.47 | 4.9 | 2.68 | 0.85 |

| DP-22 | |
|---|---|
| 11/25/15 | 5-15 ft |
| cis-1,2-DCE | 1.56 |
| Vinyl Chloride | 0.26 J |

| DP-20 | |
|---|---|
| 11/25/15 | 5-15 ft |
| TCE | 0.50 J |
| cis-1,2-DCE | 35 |
| trans-1,2-DCE | 2.19 |
| Vinyl Chloride | 0.20 J |

| DP-14 | |
|---|---|
| 3/17/15 | 6-16 ft |
| VOCs | ND |

| DP-19 | |
|---|---|
| 11/25/15 | 5-15 ft |
| VOCs | ND |

| MW-8 | | | | |
|---|---|---|---|---|
| 5-15 ft | 6/23/17 | 9/21/17 | 12/29/17 | 1/2/20 |
| PCE | 13.1 | 24.2 | 19.8 | 7.0 |
| TCE | 7.7 | 10.5 | 9.3 | 5.4 |
| cis-1,2-DCE | 37 | 50 | 47 | 26 |
| trans-1,2-DCE | 5.1 | 3.8 | 3.3 | 1.6 |
| Vinyl Chloride | 1.55 | 2.29 | 1.86 | 0.44 J |

| DP-15 | |
|---|---|
| 3/17/15 | 6-16 ft |
| PCE | 5.9 |
| TCE | 11.2 |
| cis-1,2-DCE | 19.6 |

| DP-18 | |
|---|---|
| 11/25/15 | 3-13 ft |
| VOCs | ND |

| DP-21 | |
|---|---|
| 11/25/15 | 5-15 ft |
| VOCs | ND |

| MW-9 | | | | |
|---|---|---|---|---|
| 5-15 ft | 6/22/17 | 9/21/17 | 12/29/17 | 1/2/20 |
| PCE | 16.4 | 18.8 | 21 | 15.3 |
| TCE | 9.2 | 11.9 | 9.8 | 7.5 |
| cis-1,2-DCE | 22.1 | 53 | 38 | 27 |
| trans-1,2-DCE | 2.85 | 3.14 | 2.05 | 1.38 |
| Vinyl Chloride | 0.98 | 3.8 | 0.86 | 1.97 |

| DP-12 | |
|---|---|
| 3/17/15 | 6-16 ft |
| PCE | 42 |
| TCE | 5.5 |
| cis-1,2-DCE | 4.5 |

| DP-6 | |
|---|---|
| 4/11/14 | 4-14 ft |
| VOCs | ND |

| DP-5 | |
|---|---|
| 4/11/14 | 4-14 ft |
| VOCs | ND |

| DP-1 | |
|---|---|
| 4/11/14 | 9-19 ft |
| cis-1,2-DCE | 0.43 J |

| DP-3 | |
|---|---|
| 4/11/14 | 4-9 ft |
| VOCs | ND |

| MW-7 | | | |
|---|---|---|---|
| 5-15 ft | 11/7/14 | 8/13/15 | 1/28/16 |
| VOCs | ND | ND | ND |

| MW-6 | | | | |
|---|---|---|---|---|
| 5-15 ft | 8/13/15 | 1/28/16 | 6/22/17 | 1/ |
| VOCs | ND | ND | ND | [illegible] |

| DP-7 | |
|---|---|
| 3/17/15 | 6-16 ft |
| PCE | 8.8 |

| PZ-1 | |
|---|---|
| 25-30 ft | 1/2/20 |
| VOCs | ND |

## Legend

- Property boundary
- Fence line
- DCM — Former location of dry cleaning machine
- DP-1 — Direct-push soil boring and Temporary monitoring well location
- B1 — Soil boring location (By Others)
- MW-1 — Monitoring well location (By Others)
- MW-5 — Monitoring well
- PCE above ES

| Analyte | Public Health Preventive Action Limit | Public Health Enforcement Standard |
|---|---|---|
| PCE | 0.5 | 5 |
| TCE | 0.5 | 5 |
| cis-1,2-DCE | 7 | 70 |
| trans-1,2-DCE | 20 | 100 |
| Vinyl Chloride | 0.02 | 0.2 |

Notes:

1. Gray shaded locations represent grab-groundwater sample or abandoned monitoring well sample locations at off-site properties where no further action is needed.
2. Bolded and orange shaded values exceed the Public Health Enforcement Standard
3. Bolded and blue shaded values exceed the Public Health Preventive Action Limit
4. Bolded values are above detection limits
5. J = Analyte concentration less that laboratory detection limits
6. Samples analyzed using EPA SW-846 Method 8260
7. All results reported in units of micrograms per liter (ug/L)
8. PCE = Tetrachloroethene
9. TCE = Trichloroethene
10. cis-1,2-DCE = cis-1,2-Dichloroethene
11. trans-1,2-DCE = trans-1,2-Dichloroethene
12. ND = Not detected
13. NS = Not Sampled
14. VOCs = Volatile Organic Compounds
15. Non-target compound detected in MW-1, MW-5, and MW-7 but not shown
16. ES = Public Health Enforcement Standard

# EXTENT OF GROUNDWATER IMPACTS

Former Peters Dry Cleaners
5094 West College Avenue
Greendale, WI

| | |
|---|---|
| Date: | 3/26/20 |
| Designed: | EB |
| Drawn: | EB |
| Checked: | RH |
| DWG file: | 6305-0777 |

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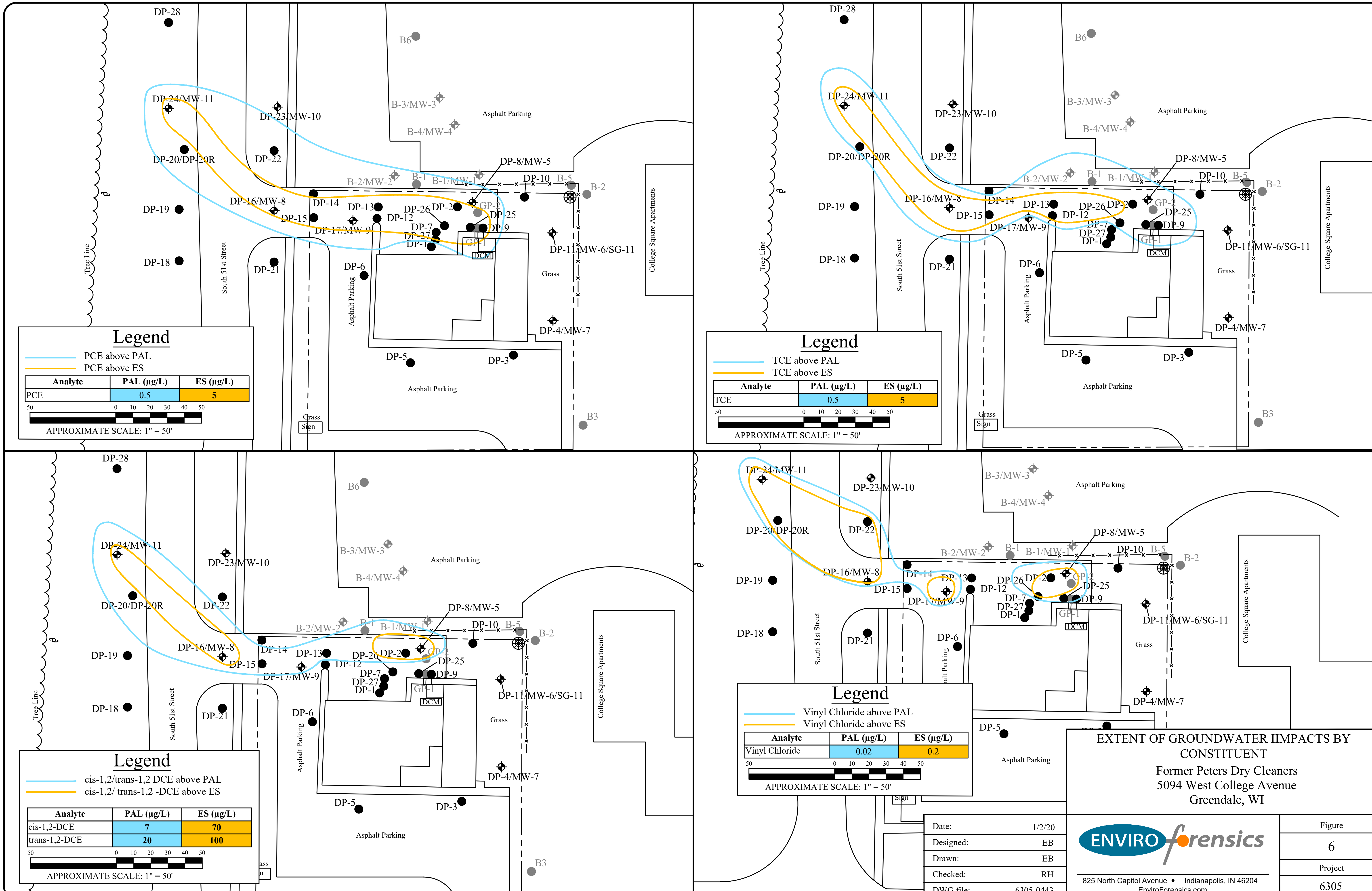
825 North Capitol Avenue • Indianapolis, IN 46204
EnviroForensics.com

Figure
5

Project
6305




| Analyte | PAL (µg/L) | ES (µg/L) |
|---|---|---|
| PCE | 0.5 | 5 |

| Analyte | PAL (µg/L) | ES (µg/L) |
|---|---|---|
| TCE | 0.5 | 5 |

| Analyte | PAL (µg/L) | ES (µg/L) |
|---|---|---|
| cis-1,2-DCE | 7 | 70 |
| trans-1,2-DCE | 20 | 100 |

| Analyte | PAL (µg/L) | ES (µg/L) |
|---|---|---|
| Vinyl Chloride | 0.02 | 0.2 |

EXTENT OF GROUNDWATER IIMPACTS BY CONSTITUENT

Former Peters Dry Cleaners
5094 West College Avenue
Greendale, WI

| | |
|---|---|
| Date: | 1/2/20 |
| Designed: | EB |
| Drawn: | EB |
| Checked: | RH |
| DWG file: | 6305-0443 |

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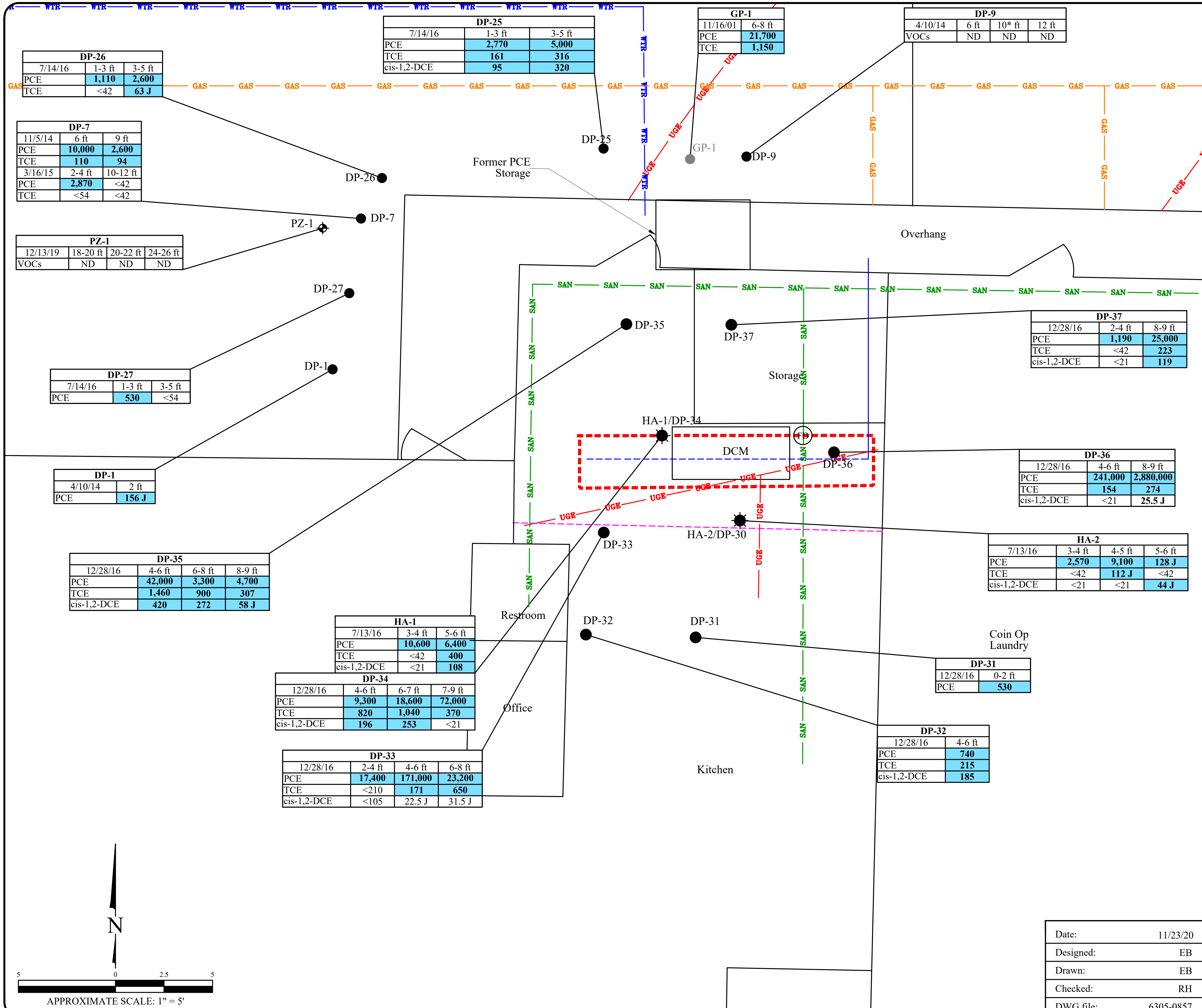
Figure
6

Project
6305




| DP-26 | | |
|---|---|---|
| 7/14/16 | 1-3 ft | 3-5 ft |
| PCE | **1,110** | **2,600** |
| TCE | <42 | **63 J** |

| DP-7 | | |
|---|---|---|
| 11/5/14 | 6 ft | 9 ft |
| PCE | **10,000** | **2,600** |
| TCE | **110** | **94** |
| 3/16/15 | 2-4 ft | 10-12 ft |
| PCE | **2,870** | <42 |
| TCE | <54 | <42 |

| PZ-1 | | | |
|---|---|---|---|
| 12/13/19 | 18-20 ft | 20-22 ft | 24-26 ft |
| VOCs | ND | ND | ND |

| DP-27 | | |
|---|---|---|
| 7/14/16 | 1-3 ft | 3-5 ft |
| PCE | **530** | <54 |

| DP-1 | |
|---|---|
| 4/10/14 | 2 ft |
| PCE | **156 J** |

| DP-25 | | |
|---|---|---|
| 7/14/16 | 1-3 ft | 3-5 ft |
| PCE | **2,770** | **5,000** |
| TCE | **161** | **316** |
| cis-1,2-DCE | **95** | **320** |

| GP-1 | |
|---|---|
| 11/16/01 | 6-8 ft |
| PCE | **21,700** |
| TCE | **1,150** |

| DP-9 | | | |
|---|---|---|---|
| 4/10/14 | 6 ft | 10* ft | 12 ft |
| VOCs | ND | ND | ND |

| DP-37 | | |
|---|---|---|
| 12/28/16 | 2-4 ft | 8-9 ft |
| PCE | **1,190** | **25,000** |
| TCE | <42 | **223** |
| cis-1,2-DCE | <21 | **119** |

| DP-35 | | | |
|---|---|---|---|
| 12/28/16 | 4-6 ft | 6-8 ft | 8-9 ft |
| PCE | **42,000** | **3,300** | **4,700** |
| TCE | **1,460** | **900** | **307** |
| cis-1,2-DCE | **420** | **272** | **58 J** |

| HA-1 | | |
|---|---|---|
| 7/13/16 | 3-4 ft | 5-6 ft |
| PCE | **10,600** | **6,400** |
| TCE | <42 | **400** |
| cis-1,2-DCE | <21 | **108** |

| DP-34 | | | |
|---|---|---|---|
| 12/28/16 | 4-6 ft | 6-7 ft | 7-9 ft |
| PCE | **9,300** | **18,600** | **72,000** |
| TCE | **820** | **1,040** | **370** |
| cis-1,2-DCE | **196** | **253** | <21 |

| DP-33 | | | |
|---|---|---|---|
| 12/28/16 | 2-4 ft | 4-6 ft | 6-8 ft |
| PCE | **17,400** | **171,000** | **23,200** |
| TCE | <210 | **171** | **650** |
| cis-1,2-DCE | <105 | 22.5 J | 31.5 J |

| DP-36 | | |
|---|---|---|
| 12/28/16 | 4-6 ft | 8-9 ft |
| PCE | **241,000** | **2,880,000** |
| TCE | **154** | **274** |
| cis-1,2-DCE | <21 | **25.5 J** |

| HA-2 | | | |
|---|---|---|---|
| 7/13/16 | 3-4 ft | 4-5 ft | 5-6 ft |
| PCE | **2,570** | **9,100** | **128 J** |
| TCE | <42 | **112 J** | <42 |
| cis-1,2-DCE | <21 | <21 | **44 J** |

| DP-31 | |
|---|---|
| 12/28/16 | 0-2 ft |
| PCE | **530** |

| DP-32 | |
|---|---|
| 12/28/16 | 4-6 ft |
| PCE | **740** |
| TCE | **215** |
| cis-1,2-DCE | **185** |

## Legend

- DCM — Former location of dry cleaning machine
- PCE — Former location of PCE wall storage
- DP-1 — Direct-push soil boring location
- B1 — Soil boring location (By Others)
- HA-1 — Hand auger
- Floor Drain
- UGE — Underground electrical utility line
- GAS — Underground gas utility line
- WTR — Underground water utility line
- SAN — Underground sanitary utility line (estimated locations due to depth)
- UGT — Fiber optics line

| Analyte | Soil to Groundwater (RCL) | Industrial Direct Contact (RCL) |
|---|---|---|
| PCE | **4.5** | **145,000** |
| TCE | **3.6** | **8,410** |
| cis-1,2-DCE | **41.2** | **2,340,000** |
| trans-1,2-DCE | **62.6** | **1,850,000** |
| Vinyl Chloride | **0.1** | **2,080** |

Note:
1. Bolded and blue shaded values exceed the Soil to Groundwater Residual Contaminant Level (RCL)
2. Bolded and orange shaded values exceed the Industrial Direct Cotact RCL
3. Bolded values are above detection limits
4. J = Analyte concentration less that laboratory detection limits
5. Samples analyzed using EPA SW-846 Method 8260
6. All results reported in units of micrograms per kilogram (µg/kg)
7. PCE = Tetrachloroethene
8. TCE = Trichloroethene
9. cis-1,2-DCE = cis-1,2-Dichlotoethene
10. trans-1,2-DCE = trans-1,2-Dichloroethene
11. ND = Not detected
12. VOCs = Violate Organic Compounds
13. * = Saturated soil sample

- Proposed excavation
- Proposed passive vapor mitigation system
- Proposed temporary plastic sheeting wall

# PROPOSED SOIL EXCAVATION

Former Peters Dry Cleaners
5094 West College Avenue
Greendale, WI

| | |
|---|---|
| Date: | 11/23/20 |
| Designed: | EB |
| Drawn: | EB |
| Checked: | RH |
| DWG file: | 6305-0857 |

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Figure 7

Project 6305