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Memorandum

Date:	May 30, 2022
To:	Matthew J. Ohl (United States Environmental Protection Agency)
From:	Julie Konzuk and Gary Wealthall, Geosyntec Consultants
Copies to:	Norman Bernstein, Peter Racher, Thomas Krueger, Douglas Petroff, William Clabaugh, Erin Hauber, Corey Knox, Jennifer Grimm, Katie Neighbors, Andrew Gremos
Subject:	Work Plan for the Third Site DNAPL Cell Phase 3 Supplemental Sampling (Revision 1)

1 INTRODUCTION

This memorandum outlines our proposed work plan to address the additional investigation needed to evaluate the extent of groundwater impacts related to the dense non aqueous phase (DNAPL) material detected within the DNAPL cell approximately 12 feet below the top of the Lower Till. This investigation is required prior to reinitiating treatment of the DNAPL Cell as the extent of groundwater impacts in the Lower Till have not yet been defined. Once the distribution of impacts has been better delineated, a proposed plan of remedial actions can be finalized.

This updated *Work Plan for the Third Site DNAPL Cell Phase 3 Supplemental Sampling (Revision 1)* memo (Rev 1 Work Plan) builds on previous investigation work conducted in the DNAPL cell and presented in the Supplemental Sampling Report (Geosyntec *Third Site DNAPL Containment Area Supplemental Sampling Report*, *Revision 1*, dated November 30, 2020) which presented the results of the Phase 1 and Phase 2 sampling activities. The previous work plans were presented in the *Phase 1 Supplemental Sampling Work Plan* (submitted to the United States Environmental Protection Agency [USEPA] on May 15, 2020) and the *Phase 2 Supplemental Sampling Work Plan - Revised* (submitted to the USEPA on June 10, 2020).

The *Work Plan for the Third Site Dense, Non-Aqueous Phase Liquid (DNAPL) Cell Phase 3 Supplemental Sampling* (Work Plan) was submitted to the Environmental Protection Agency (EPA) for review on February 25, 2022. Comments on this Work Plan were received from EPA on April 8, 2022 and this memo has been updated to address these comments as described in the

Response to EPA Comments on the Work Plan for the Third Site DNAPL Cell Phase 3 Supplemental Sampling (Geosyntec, 2022a).

2 OBJECTIVES

The objectives of the Phase 3 supplemental sampling work are to refine our current understanding of contaminant distribution within the Lower Till underlying the DNAPL containment area following electrical resistivity heating (ERH). Specific objectives include:

- Assess the current lateral and vertical distribution of contaminants in the Lower Till (40 to 55 feet below ground surface [ft bgs]) in the DNAPL containment area and assess whether the elevated total volatile organic compound (VOC) groundwater concentrations in this sand stringer extend beyond PSGS-15 in a westerly and south-southwesterly direction towards the sheet pile wall and to the southeast beyond PSGS-16; and

- Evaluate the extent of the sand stringer(s) in the Lower Till (encountered between 44 to 46 ft bgs) and estimate the permeability of the Lower Till unit within this sand stringer.

3 PROPOSED APPROACH

3.1 Planned Activities

Phase 3 supplemental sampling will involve the following activities:

- ***Soil coring:*** Five additional soil borings will be installed, two co-located with previous investigation borings (PSGS-15R and PSGS-16R) and three installed approximately 30 feet (ft) away from PSGS-11 in a west, south-southwest, and south-southeast direction from PSGS-11 (PSGS-18, PSGS-19 and PSGS-20; see attached **Figure 1**). In a similar manner as that employed during the program completed in August 2020 (see our *Third Site DNAPL Containment Area Supplemental Sampling Report*, *Revision 1*, dated November 30, 2020), soil cores will be collected down to a maximum depth of 55 ft bgs using a sonic rig. Soil cores will be screened with a photoionization detector (PID). If the soil core at 55 ft bgs continues to exhibit elevated PID detections, then deeper drilling may be considered. Soil samples will be collected on 2-foot (ft) spacings between 40 ft bgs and up to a maximum of 55 ft bgs at each location and analyzed for VOCs. In each 2-ft interval, the soil sample will be collected at the depth with the highest PID reading with a focus on samples from the sand stringers. Soil cores will be logged to confirm the presence and identify the depth of the sand stringer (if present).

- ***Groundwater Grab Sampling***: If additional deeper sand stringers and/or elevated PID readings are observed on soil cores collected below 46 ft bgs, then a temporary monitoring

well will be installed and a groundwater grab sample will be collected from below 46 ft bgs and submitted for analysis of VOCs. PSGS-16R will then be grouted up to ground surface after soil and groundwater sampling are complete.

- ***Permanent Well Installations:*** Installation of four additional permanent monitoring wells in the soil borings PSGS-15R, PSGS-18, PSGS-19, and PSGS-20 (see attached **Figure 1**). Five-foot well screens will be installed across depth intervals targeting the sand stringer identified at PSGS-15 and PSGS-11 (if present) and/or depths of highest soil PID readings. The lower portion of the boring at each location will be grouted up to seal the borehole below the selected screen depth interval. At PSGS-15R, the target screened depth will be 41 to 46 ft bgs to capture the sand stringer. Each well will be constructed of 2-inch PVC casings and screens.

- ***Synoptic water level survey:*** A synoptic water level survey of existing monitoring points installed in the DNAPL Cell and screened below 40 ft bgs, shallower monitoring wells in the DNAPL Cell P-1, P-2, P-3 and the sump, and MW-27R outside the DNAPL Cell will be completed after drilling and well installations are complete to assess the predominant groundwater flow direction in the Lower Till and vertical hydraulic gradients between the Lower Till and the Upper Sand and Gravel Unit within the DNAPL Cell. If the additional contingency well(s) described in Section 3.2 are installed, then they will also be included in the synoptic water level survey.

- ***Hydraulic tests***: Slug tests will be conducted in wells PSGS-10, PSGS-15R, PSGS-18, PSGS-19, and PSGS-20 to evaluate the hydraulic conductivity of the sand stringer in the Lower Till Unit. If the sand stringer is not encountered in any of PSGS-18, PSGS-19, or PSGS-20, then slug testing will be completed in PSGS-16 in their stead.

- ***Groundwater sampling:*** PSGS-15R, PSGS-18, PSGS-19, and PSGS-20 will be sampled using low-flow sampling techniques and samples will be analyzed for VOCs. Duplicates will be collected for VOC analysis from one well (PSGS-18).

3.2 Potential Contingency Actions

A number of contingency actions are proposed to avoid delays in completing the investigation program due to the need to obtain regulatory approval for changes if unexpected findings are observed.

1) The VOC contamination in the sand stringer at 44-46 ft bgs identified in the DNAPL Cell does not extend as far as PSGS-18, PSGS-19, or PSGS-20:

In lieu of more closely spacing and additional contingency sampling points within the DNAPL Cell requested by EPA between PSGS-15R/PSGS-16 and PSGS-18/PSGS-19/PSGS-20, should PSGS-18, PSGS-19, and PSGS-20 not contain elevated VOC concentrations and the sand stringer is not observed to be present in the 40 to 46 ft bgs target depth interval, then the proposed future bioremediation program (see Geosyntec, 2022b) will expand and include one to two additional injection wells to encompass the area between PSGS-15/PSGS-16 and PSGS-18 to PSGS-20 (see attached **Figure 1**) to provide treatment of the area that is not characterized on a ten-foot spacing.

2) ***VOC-impacted groundwater in the sand stringer at 44-46 ft bgs is observed to extend as far as PSGS-18, PSGS-19, or PSGS-20:***

If VOCs are detected in the groundwater samples collected from wells installed at PSGS-18, PSGS-19, or PSGS-20, then the newly installed wells will be sampled an additional two times on a quarterly basis to confirm VOC detects and assess stability in concentration trends.

3) ***VOC-impacted groundwater in any of PSGS-18, PSGS-19, or PSGS-20 continues to be observed with subsequent repeat sampling:***

If any of PSGS-18 to PSGS-20 continue to have VOC detections after the two additional quarterly sampling events have been completed, then a 4-inch diameter temporary extraction well (TEW-1) will be installed outside of the DNAPL Cell to the south (see **Figure 1**). The exact location of this contingency well will be determined after review of the VOC concentration data available from within the DNAPL Cell (with the intent of placing it along the groundwater flow path to the extent possible). The 4-inch extraction well will be installed with no more than a 10-ft long screen (shorter screens may be considered if the Upper Sand and Gravel Unit is thinner than 10 ft), with the bottom of the screen placed at the base of the Upper Sand and Gravel Unit. This temporary extraction well may be used to conduct a pumping test (see below) and evaluate the extent to which the Upper Sand and Gravel Unit is impacted with VOCs outside of the DNAPL Cell and downgradient of the former MW-27R ERH treatment area.

A soil boring (PSGS-21) will be advanced adjacent to this temporary extraction well outside the DNAPL Cell and soil samples will be collected as described in Section 3.1 down into the Lower Till to a depth of 50-55 ft bgs. The soil core will be screened using a PID and visually logged, and if a sand stringer with VOC detections is identified, then a well will be installed in the Lower Till as described in Section 3.1 above and screened to capture the VOC detections.

The new contingency well(s) will then be sampled for VOCs. If VOCs are detected at elevated concentrations, then a pumping test will be conducted by extracting groundwater from TEW-1 and monitoring pressure responses using pressure transducers and periodic manual water level measurements in piezometer P-3, various deep wells installed in the DNAPL Cell (PSGS-10,

PSGS-15R, PSGS-16, PSGS-18, PSGS-19, PSGS-20), and surrounding monitoring wells outside of the DNAPL Cell screened both in the Upper Sand and Gravel Unit (MW-20) and the Upper Till (MW-25R and MW-27R). The pumping test will be conducted for up to 48 hours at a rate determined by a set of step drawdown tests conducted prior to the pumping test to evaluate the sustainable well yield. Groundwater VOC samples will be collected from the extraction well at 0, 12, 24, and 48 hours after the pumping test is started.

3.3 Order of Implementation of Work

In order to allow for decision making in the field (adaptive management) using data collected from a single mobilization of the drill rig, the order of implementation will be the following:

- Begin with soil coring at PSGS-18, PSGS-19 and PSGS-20 and submit soil samples and grab groundwater samples (if any) for VOC analysis
- Install wells in PSGS-18, PSGS-19 and PSGS-20 and develop wells
- Core and sample PSGS-15R and PSGS-16R and submit soil and/or groundwater samples (as applicable)
- Install and develop well in PSGS-15R, grout PSGS-16R to surface and demobilize drill rig
- After at least 24 hours, collect groundwater samples in PSGS-15R, PSGS-18, PSGS-19, and PSGS-20
- If groundwater or soil samples from any of PSGS-18, PSGS-19 or PSGS-20 indicate elevated VOC concentrations in the sand stringer in the Lower Till:
    - Collect additional groundwater samples on a quarterly basis from the impacted well two additional times to confirm whether VOCs remain
- If groundwater samples from PSGS-18, PSGS-19 or PSGS-20 (as applicable) indicated continued presence of elevated VOC concentrations after completion of quarterly sampling events:
    - Remobilize the drill rig back to the site outside the DNAPL cell to install the temporary extraction well
    - Collect soil cores and grab groundwater samples at PSGS-21
    - Install a well screened in the Lower Till in the PSGS-21 borehole, if warranted

  - Develop wells installed outside the DNAPL Cell and demobilize the drill rig

- Complete synoptic water level survey
- Collect groundwater samples from the remainder of the newly installed wells, and
- Complete pumping test if an extraction well is installed outside the DNAPL Cell.

4 IMPLEMENTATION SCHEDULE

The program will be initiated in June 2022, subject to EPA approval and contractor availability. The Phase 3 program, including baseline sampling, is anticipated to require 3 to 4 weeks to complete, conditional on drilling contractor availability.

5 REPORTING TO EPA

A final report will be issued to EPA upon completion of the Phase 3 investigation activities that also presents a proposed plan of next steps for remedial actions.

6 REFERENCES

Geosyntec 2020a. *Third Site DNAPL Containment Area Sampling Work Plan. May 15, 2020.*

Geosyntec, 2020b. *Phase 2 Supplemental Sampling Work Plan - Revised* June 10, 2020.

Geosyntec, 2020c. *Third Site DNAPL Containment Area Supplemental Sampling Report*, Revision 1, dated November 30, 2020.

Geosyntec, 2022a. *Response to EPA Comments on the Work Plan for the Third Site DNAPL Cell Phase 3 Supplemental Sampling*, May 4, 2022.

Geosyntec, 2022b. Letter re: *Comparison of Lifecycle Costs between Electrical Resistive Heating (ERH) and Bioremediation Treatment of Residual DNAPL in the DNAPL Cell at Third Site, Zionsville, Indiana*, April 28, 2022.

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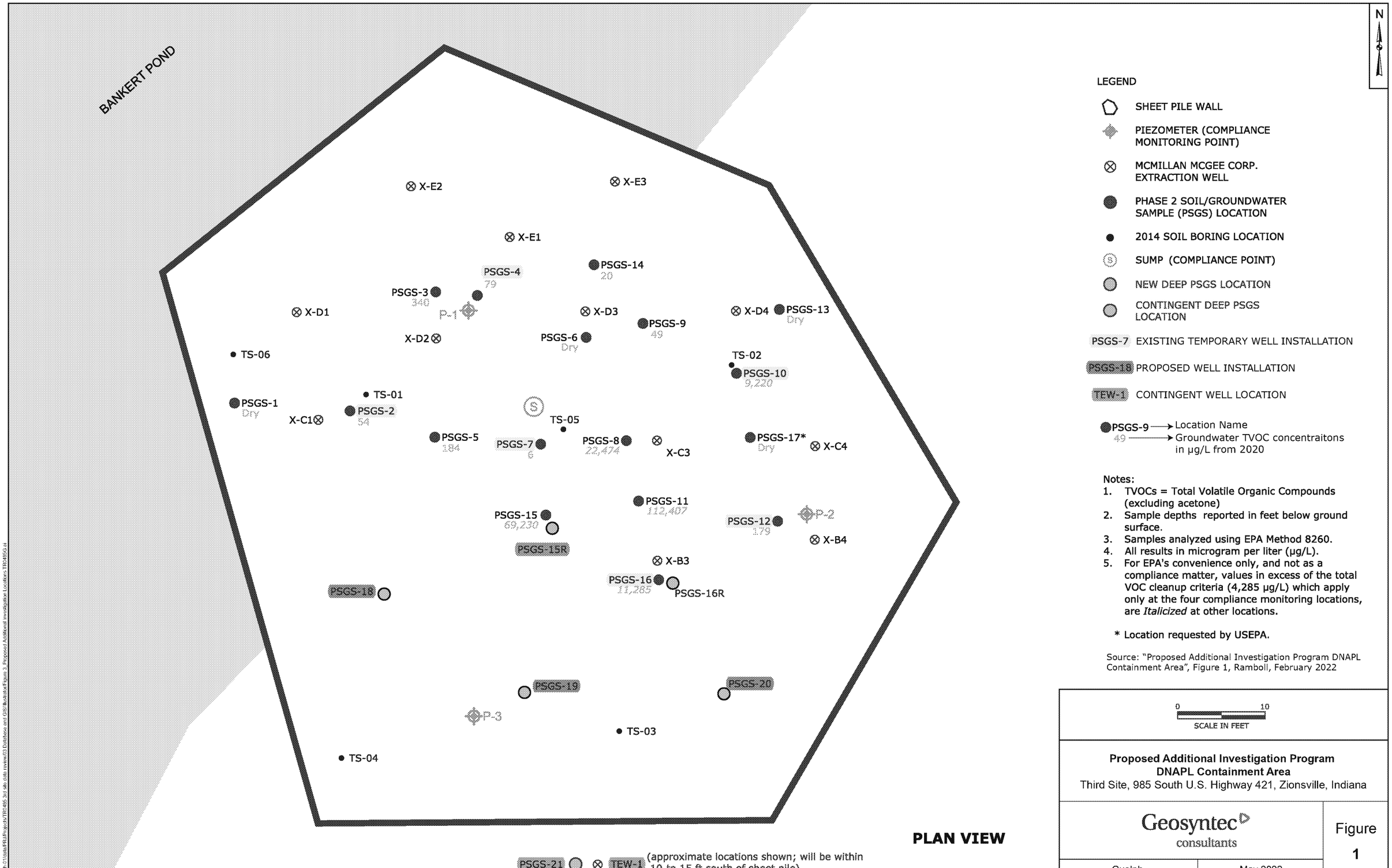
BANKERT POND
X-E2
X-E3
X-E1
PSGS-14
20
PSGS-4
79
PSGS-3
340
P-1
X-D1
X-D3
X-D4
PSGS-13
Dry
PSGS-9
49
X-D2
PSGS-6
Dry
TS-06
TS-02
PSGS-10
9,220
TS-01
PSGS-1
Dry
X-C1
PSGS-2
54
S
TS-05
PSGS-5
184
PSGS-7
6
PSGS-8
22,474
X-C3
PSGS-17*
Dry
X-C4
PSGS-11
112,407
PSGS-15
69,230
PSGS-12
179
P-2
X-B4
PSGS-15R
X-B3
PSGS-16
11,285
PSGS-16R
PSGS-18
PSGS-19
PSGS-20
P-3
TS-03
TS-04
PSGS-21
TEW-1
(approximate locations shown; will be within 10 to 15 ft south of sheet pile)
PLAN VIEW
N
LEGEND
SHEET PILE WALL
PIEZOMETER (COMPLIANCE MONITORING POINT)
MCMILLAN MCGEE CORP. EXTRACTION WELL
PHASE 2 SOIL/GROUNDWATER SAMPLE (PSGS) LOCATION
2014 SOIL BORING LOCATION
SUMP (COMPLIANCE POINT)
NEW DEEP PSGS LOCATION
CONTINGENT DEEP PSGS LOCATION
PSGS-7 EXISTING TEMPORARY WELL INSTALLATION
PSGS-18 PROPOSED WELL INSTALLATION
TEW-1 CONTINGENT WELL LOCATION
PSGS-9 → Location Name
49 → Groundwater TVOC concentraitons in µg/L from 2020
Notes:
1. TVOCs = Total Volatile Organic Compounds (excluding acetone)
2. Sample depths reported in feet below ground surface.
3. Samples analyzed using EPA Method 8260.
4. All results in microgram per liter (µg/L).
5. For EPA's convenience only, and not as a compliance matter, values in excess of the total VOC cleanup criteria (4,285 µg/L) which apply only at the four compliance monitoring locations, are Italicized at other locations.
* Location requested by USEPA.
Source: "Proposed Additional Investigation Program DNAPL Containment Area", Figure 1, Ramboll, February 2022
0
10
SCALE IN FEET
Proposed Additional Investigation Program
DNAPL Containment Area
Third Site, 985 South U.S. Highway 421, Zionsville, Indiana
Geosyntec consultants
Figure
1
Guelph
May 2022