LFAS and SVE Temporary Shut-Down Interim Assessment Report

Hagen Farm Superfund Site
Dane County, Wisconsin

Prepared for:

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1.0 INTRODUCTION

On behalf of Waste Management of Wisconsin, Inc. (WMWI), and in accordance with the work plan dated December 9, 2020, SCS Engineers (SCS) has prepared this technical memorandum to present and evaluate the quarterly groundwater data since the soil vapor extraction (SVE) and low flow air sparge (LFAS) systems at the Hagen Farm site (Site) in Stoughton, Wisconsin were temporarily shut-down to assess the potential for rebound of contaminant concentrations in September 2019. This technical memorandum specifically includes review of 9 quarters of data, from November 2019 to November 2021, to determine if sufficient information is available to support proceeding with the long-term shut-down of the remedial systems at the Site, if the temporary shut-down test should continue, or if one or both of the remedial systems should be partially or totally restarted.

The SVE system was installed and operated as a component of the source control remedial action at the Site. The LFAS system was installed and operated as a component of the groundwater control remedial action at the Site. These systems were designed to address concentrations of volatile organic compounds (VOCs), primarily tetrahydrofuran (THF) and vinyl chloride, which are the primary Contaminants of Concern (COCs) at the Site. WMWI had operated and maintained the SVE system at Site for more than 20 years, and implemented active groundwater remediation, including pump and treat and/or LFAS for more than 15 years. Operation of the SVE system and groundwater remedial measures during that period resulted in a general decrease in the concentration of THF and vinyl chloride in groundwater over time in the vicinity of the Site.

As further described herein, SCS concludes that the temporary shut-down of the SVE and LFAS systems at the Site has not had an adverse impact on concentrations of COCs in groundwater at the Site and that the temporary shut-down test should continue for an additional period of approximately two years, after which time another technical memorandum to assess the groundwater conditions at that time should be prepared. The data from the test period(s) could be utilized to support a change in the remedy at the Site in the future, where monitored natural attenuation (MNA) would replace the operation of the LFAS and SVE systems at the Site.

WMWI also presents an evaluation of groundwater quality in the annual reports for the Site, and identifies contaminant concentrations above the State of Wisconsin groundwater quality criteria in Chapter NR 140, Wis. Adm. Code in its' quarterly data submittals to the agencies. The quarterly agency submittals also include a preliminary assessment of the status of the temporary shut-down test, with regard to potential increases in concentrations of COCs, which would indicate that the shut-down test should be discontinued.

2.0 PERFORMANCE MONITORING

SCS believes that the current groundwater monitoring program, that includes quarterly sampling at 12 monitoring wells in the vicinity of the waste mass at the Site where VOCs have been identified in the past, is sufficient to assess the potential rebound in COCs that could occur due to the temporary shut-down of the SVE and LFAS systems at the Site. The potential increase in COC concentrations would be identified before any adverse impacts to groundwater occurred outside of WMWI's property. The quarterly groundwater sampling events are supplemented by data from semi-annual and annual sampling events that include analysis of samples from additional monitoring wells at the Site.

In accordance with the approved groundwater monitoring program, quarterly groundwater quality monitoring was performed during the period of November 2019 to November 2021 at 12 groundwater monitoring wells generally located either within or downgradient of the waste mass at the Site. The samples from 10 of those wells are analyzed for a variety of field parameters, indicators, metals and VOCs. Additionally, samples from wells MW7 and P26B are analyzed for VOCs. The 12 groundwater monitoring wells that are sampled quarterly include: MW7, MW22, OBS1A, OBS1B, OBS1C, OBS2C, OB8M, P17B, P17C, P22B, P26B, and P32B. The locations of wells OB8M and P32B are shown on **Figure 1**; the locations of the other wells are shown on **Figure 2**.

The semi-annual event consists of groundwater sampling in February at 20 groundwater monitoring wells. Groundwater elevations are collected at an additional 13 wells. The samples were analyzed for VOCs, select dissolved metals, indicator parameters, and field parameters. The semi-annual dissolved metals analysis includes four additional metals (i.e., barium, arsenic, lead, and mercury) not included in the quarterly analysis.

The annual event consists of groundwater sampling in August or September at 33 groundwater monitoring wells. The samples are analyzed for VOCs, select dissolved metals, indicator parameters, and field parameters.

A summary of the groundwater monitoring program, including a list of wells and parameters for each quarterly sampling event at the Site, is included as **Appendix B**. A summary of the VOCs identified at concentrations above the criteria in Chapter NR 140 Wis. Adm. Code, from analysis of the samples collected during the period November 2019 to November 2021, is provided as **Table 1**.

2.1 RESULTS

As shown on **Table 1**, there were a total of 4 VOCs reported at 8 wells where concentrations were above the Preventive Action Limit (PAL) or Enforcement Standard (ES) in Chapter NR 140 Wis. Adm. Code in the data from analysis of the quarterly samples from November 2019 to November 2021. Those VOCs include tetrachloroethylene, THF, vinyl chloride, and dichloromethane.

2.1.1 Laboratory Data

2.1.1.1 Tetrachloroethylene

Tetrachloroethylene, also known as perchloroethylene or PCE, was identified in each of the 4 semi-annual samples collected from one groundwater monitoring well at the Site (IG04) at a concentration above the PAL (0.5 µg/L), but below the ES (5 µg/L) during this period. Concentrations ranged from 1.5 – 2.3 µg/L during this period. IG04 is an upgradient well, with regard to the waste mass at the Site, thus concentrations of this VOC at this well are not expected to be affected by the operation of the SVE or LFAS systems at the Site.

It should be noted that the concentrations of PCE at this well are stable, and not increasing over time as shown on **Figure 3.**

2.1.1.2 Tetrahydrofuran

Tetrahydrofuran (THF) was identified in 4 of the 9 quarterly samples at one groundwater monitoring well at the Site (MW22) at a concentration above the PAL (i.e., 10 µg/L), but below the ES (i.e., 50 µg/L). Concentrations of THF at MW22 ranged from 7.3 – 18 µg/L during this period. THF was not reported in analysis of the samples collected at MW22 in August 2019 – February 2020 and

November 2021. MW22 is a shallow well, located within the waste mass at the Site. As shown on **Figure 4**, concentrations of THF have been higher in the past at this well, thus some increase after shut-down of the SVE system was anticipated. The identified concentrations are not consistent or increasing over time, thus are not likely associated with significant contaminant mass and are expected to attenuate in close proximity to the waste mass.

2.1.1.3 Vinyl Chloride

Vinyl chloride was identified in samples from 6 groundwater monitoring wells at concentrations above the PAL (i.e., 0.02 µg/L) or the ES (i.e., 0.2 µg/L). The highest concentration during this period was 0.52 µg/L; that concentration was reported from analysis of the sample collected in November 2021 at well MW22. There were no concentrations of vinyl chloride in excess of the federal Maximum Contaminant Level (MCL) of 2 µg/L.

Vinyl chloride was reported at a concentration above the PAL, but not the ES, in one (2021) of the two annual samples from MW23 during this period. The concentration (0.053 µg/L) was relatively low (i.e., < ES) and not consistent, thus is not likely associated with significant contaminant mass and is expected to attenuate in close proximity to the waste mass. This well is located adjacent to the western edge of the waste mass. The identified result is the second reported concentration of vinyl chloride at this well since 2008; the last quantified result was 0.03 µg/L in August 2009.

Vinyl chloride was reported at a concentration above the PAL or ES in 6 of the 9 quarterly samples from MW22, and 7 of the 9 quarterly samples from P22B. Vinyl chloride was reported in analysis of the last 6 quarterly samples (August 2020 – November 2021) collected at well MW22 at concentrations ranging from 0.06 to 0.52 µg/L. Vinyl chloride was reported in analysis of the last seven quarterly samples collected at well P22B at concentrations ranging from 0.03 to 0.39 µg/L (May 2020 – November 2021). MW22 and P22B are located within the waste mass at the Site. As shown on **Figure 6**, concentrations of vinyl chloride have been higher in the past at these wells, thus some increase after shut-down of the SVE system is not unexpected. The identified concentrations are not consistently increasing over time, thus are not likely associated with significant contaminant mass and are expected to attenuate in close proximity to the waste mass.

Prior to initiation of the temporary shut-down, vinyl chloride was last reported in analysis of the sample collected at MW22 in August 2013. The vinyl chloride results from analysis of samples from P22B are more variable over time, with that compound routinely quantified in samples prior to 2019. In both cases, the current concentrations at these wells are lower than those reported in the past.

Vinyl chloride was reported at a concentration above the PAL or ES in each of the 9 quarterly samples from OB8M. The concentration of vinyl chloride ranged from 0.15 – 0.38 µg/L. As shown on **Figure 7**, the vinyl chloride concentration at well OB8M is stable and not increasing over time. In fact, the concentrations appear to be decreasing over time since 2015. Groundwater monitoring well OB8M is located approximately 1,900 feet downgradient of the waste mass, thus is not expected to be directly affected by the temporary shut-down of the remedial systems.

Vinyl chloride was reported at a concentration above the PAL or ES in each of the 9 quarterly samples from P17C. The concentration of vinyl chloride ranged from 0.087 to 0.25 µg/L. As shown on **Figure 8**, the vinyl chloride concentration at well P17C is decreasing over time. Groundwater monitoring well P17C is located on the downgradient edge of the property, approximately 300 feet from the edge of the waste mass. The results for vinyl chloride at P17C have not exceeded the NR 140 ES since November 2019 and the result for vinyl chloride in November 2021 (i.e., 0.087 µg/L) is the lowest reported concentration at that well. As also shown on **Figure 8**, the vinyl chloride concentrations at a nearby shallower well (P17B), and downgradient wells OBS1A, OBS1B, and OBS1C, have decreased over time such that the current concentrations remain below the PAL.

Vinyl chloride was reported at a concentration above the PAL or ES in each of the 9 quarterly samples from well P26B. Vinyl chloride concentrations ranged from 0.20 to 0.29 µg/L. As shown on **Figure 8**, the vinyl chloride concentration at P26B is stable and not increasing over time since 2011. Prior to 2011, there was a decrease in the concentration of vinyl chloride over time. Groundwater monitoring well P26B is located on the downgradient edge of the property, approximately 200 feet from the edge of the waste mass.

2.1.1.4 Dichloromethane

Dichloromethane, also known as methylene chloride, was identified in 1 of the 9 quarterly samples at two groundwater monitoring wells at the Site (P26B and P32B) at a concentration above the PAL (i.e., 0.5 µg/L), but below the ES (i.e., 5 µg/L). Both concentrations are associated with the November 2019 sampling event.

Dichloromethane is a common laboratory contaminant. In that the reported concentrations are low (i.e., < ES) and not consistent, the results are likely anomalies and not related to the Site.

2.1.2 Field Data

2.1.2.1 Dissolved Oxygen and Oxidation Reduction Potential

Dissolved oxygen (DO) and oxidation reduction potential (ORP) data was collected on groundwater samples using field meters. These results from analysis of samples collected from February 2019 to November 2021 are summarized in **Tables 2** and **2a** and **Table 3** and **3a**. The data in **Tables 2a** and **3a** is sorted by date; the data in **Tables 2** and **3** is sorted by sampling event to assess the effects of natural seasonal fluctuations.

Overall, DO concentrations in groundwater samples from monitoring points in the vicinity of the LFAS points are variable, but showed no consistent change during the approximate 2-year period of the rebound test. The decrease in the number of lower DO values through the year appears to be seasonal as the average annual DO concentration during the period 2019 to 2021, as indicated in **Table 2**, was consistent (5.8 milligrams per liter [mg/L], 4.8 mg/L and 5.1 mg/L, respectively). DO concentrations remain at levels (> 1 mg/L) that are expected to promote natural attenuation under aerobic conditions at all monitoring points.

Review of the ORP data from the period February 2019 to November 2021 yielded similar conclusions. Generally lower or negative ORP values are consistent with a reducing environment, while positive ORP values are associated with an aerobic environment. The majority of negative values are reported from analysis of samples collected in February and May; with fewer or no negative values reported in samples collected during subsequent sampling periods in August/September or November. This is likely due to seasonal fluctuation or other factors related to precipitation, recharge, temperature, etc. Over time, the total number of negative ORP values/year decreased from 2019 to 2020 and was stable from 2020 to 2021. Thus, the temporary shut-down of the LFAS system at the Site in September 2019 has not resulted in an increase in the number of negative ORP values at the identified sample points over time.

The consistent DO concentrations indicating aerobic conditions (> 1 mg/L), and decrease in negative ORP values over time, since the temporary shut-down test was begun is notable but there is not enough data to confirm that the effects of prior operation of the LFAS system are no longer present in groundwater at the Site.

2.1.2.2 Gas Probes

The gas probes at the Site were installed to assess the effectiveness of the SVE system at the Site. As such, the probes include closely spaced multi-level monitoring points within the waste mass and just outside the limits of the multi-layer soil cap atop the waste, to assess the radius of influence of the vacuum applied at the extraction wells. When the blower is in operation, the influence of the extraction wells is generally observed as a negative pressure or vacuum at the probes. None of the probes are installed to assess landfill gas concentrations at the property boundary, as the waste at the Site does not have significant organic content and off-site migration of landfill gas is not an issue.

The gas probes were monitored annually by SCS personnel in 2019, 2020 and 2021 for field parameters including pressure, methane, carbon dioxide, oxygen. The results are summarized in Tables 3, 4, and 5, respectively. The 2019 gas probe monitoring occurred on August 30, 2019 just prior to initiation of the SVE shut-down. During that monitoring event, methane was reported at concentrations above the lower explosive limit (LEL, 5% by volume) at eight of the 86 gas probes located at the Site. Each of the eight gas probes were located within the waste mass. Methane was above the LEL at a total of 40 of the 86 gas probes at the time of the 2020 monitoring event, and a total of 44 of the probes at the time of the 2021 sampling event. Without applied vacuum, the gas quality at probes within waste is typically relatively high methane concentrations (above the LEL), higher concentrations of carbon dioxide, and lower concentrations of oxygen with little to no associated pressure. The changes of those conditions are exhibited in the data from before the shut-down test (2019), and the subsequent data from 2020 and 2021. As expected, the post shut-down data is relatively consistent.

In 2020 and 2021, methane at concentrations above the LEL was noted at only two of the three probes at one location outside the limits of waste (GP29). The methane concentration decreased with depth and was not associated with positive pressure, in fact, most of the pressure measurements were negative indicating a vacuum. This data is consistent with the conclusion that landfill gas migration is not an issue at the Site.

3.0 DATA EVALUATION

As described in Section 2.0, the approximate two years of data subsequent to the temporary shut-down of the SVE and LFAS systems at the Hagen Farm Site do not indicate that either or both of the remedial systems need to be restarted. There was no immediate or short term significant increase in concentrations of COCs during the temporary shut-down that would be indicative of a remaining source or mass of contaminants at the Site.

Concentrations of the two primary COCs at the Site, THF and vinyl chloride, are stable or continue to decrease over time at monitoring points downgradient of the waste mass at the Site. The data does not indicate that concentrations of those VOCs are increasing over time at any of the groundwater monitoring points downgradient of the waste mass.

Review of the field data associated with the groundwater does not indicate a significant change in the subsurface or groundwater quality (DO or ORP) over the approximate 2-year duration of the shut-down test. Although subject to seasonal fluctuation, the groundwater data indicates that subsurface conditions in the vicinity of the Site remain aerobic which would continue to promote degradation of the primary COCs at the Site. The data from annual sampling of the gas probes during this 2-year period is typical of gas quality within waste and is consistent with the conclusion that landfill gas migration is not a significant concern at the Site. Concentrations of methane are consistent with an anaerobic environment within the waste that would also promote degradation of some COCs.

Some rebound of THF and vinyl chloride concentrations at monitoring wells located within the waste mass (i.e., MW22 and P22B) is expected. The current results are below the concentrations reported from analysis of prior samples from these wells and the recent concentrations are not consistently increasing at a rate that would present a concern in that those concentrations might represent a significant mass/source or not be attenuated in close proximity to the waste mass. The Site conditions, including the local geology/hydrogeology, are favorable for natural attenuation of the identified concentrations of COCs.

The groundwater monitoring program at the Site is sufficient to identify potential increases in concentrations of COCs before they would adversely impact off-property groundwater. For example, given the observed reductions in COCs over time at wells OBS1A, B and C in the past (**Figures 5** and **8**), it is logical to assume that any "rebound" of contaminant concentrations in downgradient groundwater would be observed there. If any unacceptable concentrations of COCs are confirmed there, since these wells are located within approximately 150 feet downgradient of the waste mass and between the initial and supplemental sparge points, the LFAS could be restarted prior to those potential concentrations reaching the edge of the property.

4.0 DATA QUALITY

Data quality is evaluated in the quarterly agency submittals and in the annual reports. There were no significant data quality issues associated with the VOC data summarized in this technical memorandum. The data is complete and useable for the purposes of this evaluation. The data is sufficient to evaluate progress toward groundwater clean-up criteria as part of a performance monitoring program.

USEPA, in its correspondence dated January 6, 2021 and August 19, 2021, relayed that an updated quality assurance project plan (QAPP) was expected and necessary as a component of the Work Plan. A copy of these letters and the Work Plan are included for reference in **Appendix A.** SCS and WMWI believe that the data generated as a result of the current monitoring program is sufficient to evaluate the progress of the remedial efforts toward clean-up criteria. Substantive items typically included in a QAPP are already addressed by the State of Wisconsin and WDNR requirements. The laboratory methods utilized are current and approved by the State of Wisconsin. As a licensed solid waste facility in Wisconsin, WMWI is required to utilize specific methods and laboratories approved by WDNR. Standard data reporting methodology including reporting limits and data qualifiers is prescribed by the WDNR, and WDNR audits those laboratories. Data from approved laboratories is required to be input to the State Groundwater and Environmental Monitoring System (GEMS), so that the data is available to the public. As such, it's not practical or necessary to maintain an updated QAPP in accordance with USEPA guidance where a State program is already in place to assure consistent data quality.

While the preparation of an updated QAPP for this Site is not warranted to support the ongoing performance monitoring program at the Site, we acknowledge that a QAPP and Sampling and Analysis Plan (SAP) may be warranted to support a special sampling event(s) to document conditions in groundwater at a specific time for the administrative record. This data from the special sampling event would supplement the performance monitoring data for the Site, to support a change in remedy or Site closure, if and when warranted.

5.0 RECOMENDATIONS

- SCS recommends that the rebound test be continued for approximately two more years to assess additional potential contaminant rebound and the contribution of natural attenuation with regard to the remaining VOC concentrations. During that period, data will continue to be generated through the routine performance monitoring program at the Site. That data is expected to be sufficient to verify that VOC concentrations in groundwater continue to not significantly increase as the remedial systems remain shut-down and to assess the contribution of natural attenuation in the observed reductions in contaminant concentrations over time in groundwater at the Site.

- WMWI should continue to conduct preliminary assessments of the data generated in the quarterly agency submittals and annual reports to identify result(s) that could indicate a potentially unacceptable increase in concentration related to the temporary shut-down of the SVE and/or LFAS systems at the Site.

- After review of the data from this second two year period, WMWI should submit another technical memorandum to assess the conditions at the Site. The technical memorandum will assess if sufficient information is available to support proceeding with the shut-down of the remedial systems at the Site, if the temporary shut-down test should continue, or if one or both of the remedial systems (SVE and/or LFAS) should be partially or totally restarted.

- WMWI, USEPA, and WDNR should discuss the current groundwater clean-up criteria and point of standards application for the Site. As we understand, the current practice is to designate the ES as the clean-up criteria for groundwater, with the PAL being the clean-up goal, since the ES is associated with potential health or welfare concerns, while the PAL is intended to be an alert level (% of the ES) so that concentrations do not increase to the ES. Given the past work and existing conditions at the Site, the ES is likely the appropriate clean-up criteria for groundwater at the Site. That approach may not be consistent with the documents associated with the federal remedial action at the Site. State regulations in NR 140.22 Wis. Adm. Code establishes a point of standards application for design and compliance for a variety of facilities. Discussions regarding the design management zone (DMZ) and point of standards for the Site should be initiated as part of the next Five Year Review (5YR) for the Site in 2025, so that the conclusions could be included in the 5YR report in July 2026 and in evaluation of potential future remedy modifications.

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Tables

Table 1. November 2019 - November 2021 Groundwater VOC Exceedance Summary - Sort by Well
Groundwater Monitoring Program, Hagen Farms Landfill / SCS Project #25212002.00
Town of Dunn, Dane County, Wisconsin

Sample Date	Sample Point	Analyte Name	Units	Result	Qualifier	PAL	ES	Exceedance Type	LOD	LOQ	Method Number
2/27/2020	IG04	Tetrachloroethylene	µg/L	2		0.5	5	P	0.36	1.2	8260C
8/12/2020	IG04	Tetrachloroethylene	µg/L	2.3		0.5	5	P	0.36	1.2	8260C
2/3/2021	IG04	Tetrachloroethylene	µg/L	2.3		0.5	5	P	0.36	1.2	8260C
9/8/2021	IG04	Tetrachloroethylene	µg/L	2.2		0.5	5	P	0.36	1.2	8260C
8/12/2020	MW22	Tetrahydrofuran	µg/L	18		10	50	P	1.3	4.2	8260C
11/23/2020	MW22	Tetrahydrofuran	µg/L	18		10	50	P	1.3	4.2	8260C
2/2/2021	MW22	Tetrahydrofuran	µg/L	10		10	50	P	1.3	4.2	8260C
9/7/2021	MW22	Tetrahydrofuran	µg/L	15		10	50	P	1.3	4.2	8260C
8/12/2020	MW22	Vinyl Chloride	µg/L	0.06		0.02	0.2	P	0.004	0.013	8260C_SIM
11/23/2020	MW22	Vinyl Chloride	µg/L	0.21		0.02	0.2	P*	0.004	0.013	8260C_SIM
2/2/2021	MW22	Vinyl Chloride	µg/L	0.24		0.02	0.2	P*	0.004	0.013	8260C_SIM
5/13/2021	MW22	Vinyl Chloride	µg/L	0.073		0.02	0.2	P	0.004	0.013	8260C_SIM
9/7/2021	MW22	Vinyl Chloride	µg/L	0.24		0.02	0.2	P*	0.004	0.013	8260C_SIM
11/17/2021	MW22	Vinyl Chloride	µg/L	0.52		0.02	0.2	P*	0.004	0.013	8260C_SIM
9/7/2021	MW23	Vinyl Chloride	µg/L	0.053		0.02	0.2	P	0.004	0.013	8260C_SIM
11/20/2019	OB8M	Vinyl Chloride	µg/L	0.38		0.02	0.2	E	0.004	0.013	8260C_SIM
2/27/2020	OB8M	Vinyl Chloride	µg/L	0.26		0.02	0.2	E	0.004	0.013	8260C_SIM
5/27/2020	OB8M	Vinyl Chloride	µg/L	0.33		0.02	0.2	E	0.004	0.013	8260C_SIM
8/11/2020	OB8M	Vinyl Chloride	µg/L	0.21		0.02	0.2	E	0.004	0.013	8260C_SIM
11/23/2020	OB8M	Vinyl Chloride	µg/L	0.38		0.02	0.2	E	0.004	0.013	8260C_SIM
2/2/2021	OB8M	Vinyl Chloride	µg/L	0.26		0.02	0.2	E	0.004	0.013	8260C_SIM
5/13/2021	OB8M	Vinyl Chloride	µg/L	0.34		0.02	0.2	E	0.004	0.013	8260C_SIM
9/8/2021	OB8M	Vinyl Chloride	µg/L	0.34		0.02	0.2	E	0.004	0.013	8260C_SIM
11/17/2021	OB8M	Vinyl Chloride	µg/L	0.15		0.02	0.2	P	0.004	0.013	8260C_SIM
11/20/2019	P17C	Vinyl Chloride	µg/L	0.25		0.02	0.2	P*	0.004	0.013	8260C_SIM
2/26/2020	P17C	Vinyl Chloride	µg/L	0.14		0.02	0.2	P	0.004	0.013	8260C_SIM
5/27/2020	P17C	Vinyl Chloride	µg/L	0.15		0.02	0.2	P	0.004	0.013	8260C_SIM
8/12/2020	P17C	Vinyl Chloride	µg/L	0.12		0.02	0.2	P	0.004	0.013	8260C_SIM
11/23/2020	P17C	Vinyl Chloride	µg/L	0.12		0.02	0.2	P	0.004	0.013	8260C_SIM
2/2/2021	P17C	Vinyl Chloride	µg/L	0.1		0.02	0.2	P	0.004	0.013	8260C_SIM
5/13/2021	P17C	Vinyl Chloride	µg/L	0.11		0.02	0.2	P	0.004	0.013	8260C_SIM
9/7/2021	P17C	Vinyl Chloride	µg/L	0.15		0.02	0.2	P	0.004	0.013	8260C_SIM
11/17/2021	P17C	Vinyl Chloride	µg/L	0.087		0.02	0.2	P	0.004	0.013	8260C_SIM
5/27/2020	P22B	Vinyl Chloride	µg/L	0.03		0.02	0.2	P	0.004	0.013	8260C_SIM
8/12/2020	P22B	Vinyl Chloride	µg/L	0.036		0.02	0.2	P	0.004	0.013	8260C_SIM
11/23/2020	P22B	Vinyl Chloride	µg/L	0.2		0.02	0.2	P*	0.004	0.013	8260C_SIM
2/2/2021	P22B	Vinyl Chloride	µg/L	0.35		0.02	0.2	P*	0.004	0.013	8260C_SIM
5/13/2021	P22B	Vinyl Chloride	µg/L	0.35		0.02	0.2	P*	0.004	0.013	8260C_SIM
9/7/2021	P22B	Vinyl Chloride	µg/L	0.39		0.02	0.2	P*	0.004	0.013	8260C_SIM
11/17/2021	P22B	Vinyl Chloride	µg/L	0.25		0.02	0.2	P*	0.004	0.013	8260C_SIM
11/20/2019	P26B	Dichloromethane	µg/L	0.51	J	0.5	5	P	0.44	1.5	8260C
11/20/2019	P26B	Vinyl Chloride	µg/L	0.29		0.02	0.2	P*	0.004	0.013	8260C_SIM
2/26/2020	P26B	Vinyl Chloride	µg/L	0.23		0.02	0.2	P*	0.004	0.013	8260C_SIM
5/27/2020	P26B	Vinyl Chloride	µg/L	0.22		0.02	0.2	P*	0.004	0.013	8260C_SIM
8/12/2020	P26B	Vinyl Chloride	µg/L	0.39		0.02	0.2	P*	0.004	0.013	8260C_SIM
11/23/2020	P26B	Vinyl Chloride	µg/L	0.26		0.02	0.2	P*	0.004	0.013	8260C_SIM
2/3/2021	P26B	Vinyl Chloride	µg/L	0.24		0.02	0.2	P*	0.004	0.013	8260C_SIM
5/13/2021	P26B	Vinyl Chloride	µg/L	0.24		0.02	0.2	P*	0.004	0.013	8260C_SIM
9/7/2021	P26B	Vinyl Chloride	µg/L	0.29		0.02	0.2	P*	0.004	0.013	8260C_SIM
12/9/2021	P26B	Vinyl Chloride	µg/L	0.2		0.02	0.2	P*	0.004	0.013	8260C_SIM
11/20/2019	P32B	Dichloromethane	µg/L	1.5		0.5	5	P	0.44	1.5	8260C

Abbreviations:
PAL - Preventative Action Limit
ES - Enforcement Standard
LOD- Limit of Detection
J - Sample result is between the limit of detection (LOD) and the limit of quantitation (LOQ)

µg/L - micrograms per liter
P - PAL Exceedance
P* - ES does not apply. Well inside Design Management Zone
E - ES Exceedance

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st revision by: ZTW   Date: 1/26/2022
Checked by: MP   Date: 1/28/2022

Table 2. Dissolved Oxygen Results in Groundwater - 2019 - 2021 Seasonal Comparison
Hagen Farm Site, Town of Dunkirk, Dane County, WI / SCS Engineers Project #25212002.00

Well Identification	Well Type	Sampling Period and Dissolved Oxygen Result (mg/L)											
		February			May			August			November		
		2019	2020	2021	2019	2020	2021	2019	2020	2021*	2019	2020	2021
IG04	WT	5.5	5.8	6.7				6.4	5.1	6.3			
MW100	WT							6.5	5.2	7.8			
MW22	WT	4.0	2.6	13.2	5.3	1.6	3.4	6.2	2.7	2.6	4.8	2.3	1.8
MW23	WT							3.5	2.9	2.7			
MW26	WT	3.6	3.2	2.9				4.2	2.9	3.9			
MW27	WT	2.4	1.7	3.4				3.6	1.9	2.5			
MW29	WT							6.9	6.3	9.1			
MW30	WT							2.7	1.9	2.4			
MW32	WT							3.6	3.8	4.3			
MW33	WT	2.6	3.8	4.0				3.7	3.1	3.1			
MW7	WT	5.9	4.4	3.6	9.0	5.1	7.5	6.1	3.5	3.6	7.0	5.7	4.4
OB11M	PZ(USD)	2.0	3.7	1.5				4.3	2.8	3.8			
OB8M	PZ(BD)	3.8	5.9	6.7	5.6	4.7	1.7	5.9	6.6	6.7	8.7	4.9	8.5
OBS1A	WT	3.9	4.1	2.0	5.2	3.4	4.6	5.6	4.1	4.2	4.1	14.3	2.8
OBS1B	PZ(BD)	9.4	10.0	8.4	11.0	10.7	6.7	11.3	9.1	7.0	16.8	6.5	6.2
OBS1C	PZ(BD)	8.0	7.8	8.2	11.1	7.4	6.2	11.2	9.2	7.3	12.4	10.5	3.4
OBS2C	PZ(BD)	8.8	8.1	10.3	10.9	8.2	8.6	10.9	7.2	9.7	14.4	12.5	7.8
P17B	PZ(USD)	3.9	5.5	4.7	6.2	4.0	4.8	6.3	4.2	4.5	7.3	7.5	1.3
P17C	PZ(BD)	1.4	2.5	2.1	2.0	2.0	1.3	5.7	2.7	3.3	4.0	3.8	3.5
P17DR	PZ(BD)	10.7	9.4	12.9				14.3	11.5	14.7			
P22B	PZ(USD)	1.6	2.1	2.1	2.8	1.1	3.9	2.8	2.6	2.0	3.0	2.8	2.1
P26B	PZ(USD)	2.7	3.7	2.4	5.5	3.7	3.1	4.1	3.5	3.3	5.8	6.0	2.5
P27B	PZ(USD)	1.3	1.9	1.9				2.8	1.9	2.0			
P28B	PZ(USD)	1.6	2.4	1.6				2.4	3.1	2.9			
P28C	PZ(BD)							5.1	5.0	6.0			
P29B	PZ(USD)							5.9	4.2	6.3			
P29C	PZ(BD)							6.7	5.4	7.4			
P30B	PZ(USD)							4.8	14.1	3.6			
P30C	PZ(BD)							5.7	5.1	6.1			
P32B	PZ(BD)	1.8	2.9	1.5	3.4	2.0	1.6	2.5	2.4	1.5	3.1	2.8	1.3
P33B	PZ(BD)							5.7	4.8	4.8			
P35B	PZ(BD)							5.7	4.0	3.2			
P40D	PZ(BD)							6.7	6.2	8.1			
Average		4.2	4.6	5.0	6.5	4.5	4.5	5.8	4.8	5.1	7.6	6.6	3.8

Abbreviations:
PZ(BD) = Piezometer screened in bedrock
PZ(USD) = Deep piezometer screened in unconsolidated sediment
WT = Shallow piezometer screened in unconsolidated sediment
mg/L = milligrams per liter
LFAS = Low Flow Air Sparge System

Notes:
1) Dissolved oxygen (DO) data were collected in the field by SCS Engineers.
2) The LFAS was temporarily shut-down on September 4, 2019.
3) The Third Quarter 2021 sampling event occurred on September 7-8, 2021.

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Z:\Projects\25212002.00\Reports\Annual Reports\2021\Tables\[Table 2 - Dissolved Oxygen Results 2019 v 2020 v 2021.xls]Table 2

Table 2a. Dissolved Oxygen Results in Groundwater - 2019 - 2021
Hagen Farm Site, Town of Dunkirk, Dane County, WI / SCS Engineers Project #25212002.00

Well Identification	Well Type	Sampling Period and Dissolved Oxygen Result (mg/L)											
		February 2019	May 2019	August 2019	November 2019	February 2020	May 2020	August 2020	November 2020	February 2021	May 2021	September 2021	November 2021
IG04	WT	5.5		6.4		5.8		5.1		6.7		6.3	
MW100	WT			6.5				5.2				7.8	
MW22	WT	4.0	5.3	6.2	4.8	2.6	1.6	2.7	2.3	13.2	3.4	2.6	1.8
MW23	WT			3.5				2.9				2.7	
MW26	WT	3.6		4.2		3.2		2.9		2.9		3.9	
MW27	WT	2.4		3.6		1.7		1.9		3.4		2.5	
MW29	WT			6.9				6.3				9.1	
MW30	WT			2.7				1.9				2.4	
MW32	WT			3.6				3.8				4.3	
MW33	WT	2.6		3.7		3.8		3.1		4.0		3.1	
MW7	WT	5.9	9.0	6.1	7.0	4.4	5.1	3.5	5.7	3.6	7.5	3.6	4.4
OB11M	PZ(USD)	2.0		4.3		3.7		2.8		1.5		3.8	
OB8M	PZ(BD)	3.8	5.6	5.9	8.7	5.9	4.7	6.6	4.9	6.7	1.7	6.7	8.5
OBS1A	WT	3.9	5.2	5.6	4.1	4.1	3.4	4.1	14.3	2.0	4.6	4.2	2.8
OBS1B	PZ(BD)	9.4	11.0	11.3	16.8	10.0	10.7	9.1	6.5	8.4	6.7	7.0	6.2
OBS1C	PZ(BD)	8.0	11.1	11.2	12.4	7.8	7.4	9.2	10.5	8.2	6.2	7.3	3.4
OBS2C	PZ(BD)	8.8	10.9	10.9	14.4	8.1	8.2	7.2	12.5	10.3	8.6	9.7	7.8
P17B	PZ(USD)	3.9	6.2	6.3	7.3	5.5	4.0	4.2	7.5	4.7	4.8	4.5	1.3
P17C	PZ(BD)	1.4	2.0	5.7	4.0	2.5	2.0	2.7	3.8	2.1	1.3	3.3	3.5
P17DR	PZ(BD)	10.7		14.3		9.4		11.5		12.9		14.7	
P22B	PZ(USD)	1.6	2.8	2.8	3.0	2.1	1.1	2.6	2.8	2.1	3.9	2.0	2.1
P26B	PZ(USD)	2.7	5.5	4.1	5.8	3.7	3.7	3.5	6.0	2.4	3.1	3.3	2.5
P27B	PZ(USD)	1.3		2.8		1.9		1.9		1.9		2.0	
P28B	PZ(USD)	1.6		2.4		2.4		3.1		1.6		2.9	
P28C	PZ(BD)			5.1				5.0				6.0	
P29B	PZ(USD)			5.9				4.2				6.3	
P29C	PZ(BD)			6.7				5.4				7.4	
P30B	PZ(USD)			4.8				14.1				3.6	
P30C	PZ(BD)			5.7				5.1				6.1	
P32B	PZ(BD)	1.8	3.4	2.5	3.1	2.9	2.0	2.4	2.8	1.5	1.6	1.5	1.3
P33B	PZ(BD)			5.7				4.8				4.8	
P35B	PZ(BD)			5.7				4.0				3.2	
P40D	PZ(BD)			6.7				6.2				8.1	
Average		4.2	6.5	5.8	7.6	4.6	4.5	4.8	6.6	5.0	4.5	5.1	3.8

Abbreviations:
PZ(BD) = Piezometer screened in bedrock
PZ(USD) = Deep piezometer screened in unconsolidated sediment
WT = Shallow piezometer screened in unconsolidated sediment
mg/L = milligrams per liter
LFAS = Low Flow Air Sparge System

Notes:
1) Dissolved oxygen (DO) data were collected in the field by SCS Engineers.
2) The LFAS was temporarily shut-down on September 4, 2019.

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Z:\Projects\25212002.00\Reports\Annual Reports\2021\Tables\[Table 2a - Dissolved Oxygen Results 2019 - 2021.xls]Table 2a

Table 3. Oxidation Reduction Potential Results in Groundwater - 2019 - 2021 Seasonal Comparison
Hagen Farm Site, Town of Dunkirk, Dane County, WI / SCS Engineers Project #25212002.00

Well Identification	Well Type	Sampling Period and Oxidation Reduction Potential Result (millivolts)											
		February			May			August			November		
		2019	2020	2021	2019	2020	2021	2019	2020	2021*	2019	2020	2021
IG04	WT	114	220	89				158	106	296			
MW100	WT							153	79	71			
MW22	WT	136	12	99	-24	-20	-50	186	112	72	156	23	40
MW23	WT							158	107	101			
MW26	WT	106	60	48				178	106	322			
MW27	WT	-43	41	95				176	77	78			
MW29	WT							184	143	402			
MW30	WT							183	122	304			
MW32	WT							175	93	62			
MW33	WT	26	129	115				138	81	364			
MW7	WT	24	210	105	55	64	96	181	106	293	283	30	297
OB11M	PZ(USD)	109	215	19				175	88	197			
OB8M	PZ(BD)	44	177	103	95	33	-25	176	92	183	212	34	225
OBS1A	WT	123	93	95	147	65	148	120	105	340	220	24	209
OBS1B	PZ(BD)	113	83	94	134	88	155	115	103	315	270	24	260
OBS1C	PZ(BD)	131	165	109	49	89	157	119	103	246	240	25	295
OBS2C	PZ(BD)	120	133	95	111	103	166	181	77	395	280	40	390
P17B	PZ(USD)	14	87	93	25	14	137	181	105	373	283	27	83
P17C	PZ(BD)	-35	-45	91	-19	-35	-77	180	104	92	50	24	327
P17DR	PZ(BD)	104	182	23				180	101	333			
P22B	PZ(USD)	-33	-9	114	-61	-33	-57	185	126	81	21	17	40
P26B	PZ(USD)	29	36	6	138	106	99	178	104	285	148	39	175
P27B	PZ(USD)	-71	36	106				180	83	-19			
P28B	PZ(USD)	-10	135	5				174	88	238			
P28C	PZ(BD)							176	97	313			
P29B	PZ(USD)							183	31	382			
P29C	PZ(BD)							184	88	390			
P30B	PZ(USD)							186	125	333			
P30C	PZ(BD)							182	115	308			
P32B	PZ(BD)	-14	211	94	94	62	77	176	78	110	213	38	255
P33B	PZ(BD)							139	71	394			
P35B	PZ(BD)							173	87	198			
P40D	PZ(BD)							175	105	258			
Average		49	109	80	62	45	69	169	97	246	198	29	216

Abbreviations:
PZ(BD) = Piezometer screened in bedrock
PZ(USD) = Deep piezometer screened in unconsolidated sediment
WT = Shallow piezometer screened in unconsolidated sediment
LFAS = Low Flow Air Sparge System

Notes:
1) Oxidation Reduction Potential (ORP) data were collected in the field by SCS Engineers.
2) The LFAS was temporarily shut-down on September 4, 2019.
3) The Third Quarter 2021 sampling event occurred on September 7-8, 2021.

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Z:\Projects\25212002.00\Reports\Annual Reports\2021\Tables\[Table 3 - ORP Results 2019 v 2020 v 2021.xls]Table 3

Table 3a. Oxidation Reduction Potential Results in Groundwater - 2019 - 2021
Hagen Farm Site, Town of Dunkirk, Dane County, WI / SCS Engineers Project #25212002.00

Well Identification	Well Type	Sampling Period and Oxidation Reduction Potential Result (millivolts)											
		February 2019	May 2019	August 2019	November 2019	February 2020	May 2020	August 2020	November 2020	February 2021	May 2021	September 2021	November 2021
IG04	WT	114		158		220		106		89		296	
MW100	WT			153				79				71	
MW22	WT	136	-24	186	156	12	-20	112	23	99	-50	72	40
MW23	WT			158				107				101	
MW26	WT	106		178		60		106		48		322	
MW27	WT	-43		176		41		77		95		78	
MW29	WT			184				143				402	
MW30	WT			183				122				304	
MW32	WT			175				93				62	
MW33	WT	26		138		129		81		115		364	
MW7	WT	24	55	181	283	210	64	106	30	105	96	293	297
OB11M	PZ(USD)	109		175		215		88		19		197	
OB8M	PZ(BD)	44	95	176	212	177	33	92	34	103	-25	183	225
OBS1A	WT	123	147	120	220	93	65	105	24	95	148	340	209
OBS1B	PZ(BD)	113	134	115	270	83	88	103	24	94	155	315	260
OBS1C	PZ(BD)	131	49	119	240	165	89	103	25	109	157	246	295
OBS2C	PZ(BD)	120	111	181	280	133	103	77	40	95	166	395	390
P17B	PZ(USD)	14	25	181	283	87	14	105	27	93	137	373	83
P17C	PZ(BD)	-35	-19	180	50	-45	-35	104	24	91	-77	92	327
P17DR	PZ(BD)	104		180		182		101		23		333	
P22B	PZ(USD)	-33	-61	185	21	-9	-33	126	17	114	-57	81	40
P26B	PZ(USD)	29	138	178	148	36	106	104	39	6	99	285	175
P27B	PZ(USD)	-71		180		36		83		106		-19	
P28B	PZ(USD)	-10		174		135		88		5		238	
P28C	PZ(BD)			176				97				313	
P29B	PZ(USD)			183				31				382	
P29C	PZ(BD)			184				88				390	
P30B	PZ(USD)			186				125				333	
P30C	PZ(BD)			182				115				308	
P32B	PZ(BD)	-14	94	176	213	211	62	78	38	94	77	110	255
P33B	PZ(BD)			139				71				394	
P35B	PZ(BD)			173				87				198	
P40D	PZ(BD)			175				105				258	
Average		49	62	169	198	109	45	97	29	80	69	246	216

Abbreviations:
PZ(BD) = Piezometer screened in bedrock
PZ(USD) = Deep piezometer screened in unconsolidated sediment
WT = Shallow piezometer screened in unconsolidated sediment
LFAS = Low Flow Air Sparge System

Notes:
1) Oxidation Reduction Potential (ORP) data were collected in the field by SCS Engineers.
2) The LFAS was temporarily shut-down on September 4, 2019.

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Table 4. 2019 Probe Data - In Situ Vapor Extraction System
Hagen Farm Site, Town of Dunkirk, Dane County, WI / SCS Engineers Project #25212002.00

Probe	Pressure (inches of water)	Methane (%)	Carbon Dioxide (%)	Oxygen (%)	Probe	Pressure (inches of water)	Methane (%)	Carbon Dioxide (%)	Oxygen (%)
GP01S	0.02	0.0	1.3	20.2	**GP15M**	-0.44	9.2	9.2	10.9
GP01M	-0.22	0.2	1.7	18.2	**GP15D**	0.00	0.0	0.6	20.5
GP01D	-1.74	0.0	0.2	20.5	**GP16S**	-0.07	0.0	0.0	20.9
GP02S	-0.38	0.0	0.0	20.9	**GP16M**	-0.08	0.0	0.0	20.8
GP02M	-0.45	0.0	0.0	20.9	**GP16D**	-0.17	0.0	0.0	20.9
GP02D	0.02	0.0	0.0	20.8	**GP17S**	-0.18	0.0	0.0	20.6
GP03S	-0.32	0.0	0.0	20.9	**GP17M**	-0.20	7.4	6.6	14.2
GP03M	-0.40	0.0	0.0	20.9	**GP17D**	-0.02	0.0	1.0	20.1
GP03D	0.11	0.0	0.0	20.8	**GP18S**	0.00	0.0	9.7	2.7
GP04S	-0.23	0.0	0.0	20.9	**GP18M**	-0.39	0.0	0.3	20.7
GP04M	-0.24	2.0	6.9	8.2	**GP18D**	-0.05	0.0	0.1	20.8
GP04D	-0.49	0.0	0.6	20.5	**GP19S**	-0.12	0.0	0.0	20.9
GP05S	0.05	0.0	13.8	15.5	**GP19M**	-0.19	1.4	1.4	17.5
GP05M	-0.25	0.0	0.3	20.7	**GP19D**	-0.07	0.0	0.3	20.7
GP05D	0.00	0.0	0.0	20.9	**GP20S**	-0.01	0.0	0.0	20.5
GP06S	-0.35	39.2	35.9	0.0	**GP20M**	-0.08	0.0	0.0	20.2
GP06M	-0.36	6.7	6.2	14.7	**GP20D**	-0.13	0.0	0.1	20.2
GP06D	-0.02	0.0	0.3	20.7	**GP21S**	0.00	0.0	0.0	20.3
GP07S	-0.34	3.7	0.7	17.6	**GP21D**	0.00	0.0	0.0	20.0
GP07M	-0.36	5.3	2.3	16.8	**GP22S**	0.00	0.0	4.9	13.7
GP07D	-0.18	23.6	26.5	10.4	**GP22M**	0.00	0.0	1.3	16.2
GP08S	-0.20	0.0	0.1	20.8	**GP22D**	-0.02	0.0	0.4	20.5
GP08M	-0.28	0.0	0.0	20.9	**GP23S**	0.00	0.0	0.6	17.6
GP08D	-0.03	0.0	0.0	20.8	**GP23M**	0.00	0.0	1.0	18.5
GP09S	-0.11	0.0	0.0	19.5	**GP23D**	-2.07	0.0	0.4	20.5
GP09M	-0.13	0.0	0.8	19.3	**GP24S**	0.00	0.0	0.2	19.5
GP09D	-0.01	0.0	0.8	19.5	**GP24M**	0.00	0.0	0.6	19.4
GP10S	-0.25	13.6	20.9	4.8	**GP24D**	0.00	0.0	0.9	18.4
GP10M	-0.34	21.6	10.8	12.6	**GP25S**	0.00	0.0	0.0	20.9
GP10D	-1.17	0.0	6.0	17.0	**GP25M**	-0.01	0.0	2.6	16.4
GP11S	-0.60	0.0	0.0	20.9	**GP25D**	-0.01	0.0	0.2	20.8
GP11M	-1.06	0.0	0.0	20.9	**GP26S**	0.00	0.0	0.2	19.8
GP11D	-0.01	0.2	0.0	20.5	**GP26M**	0.00	0.0	1.1	18.5
GP12S	-0.49	0.0	0.0	20.9	**GP26D**	0.00	0.0	0.4	20.7
GP12M	-0.63	0.0	0.0	20.9	**GP27S**	0.00	0.0	4.5	10.8
GP12D	0.01	0.3	0.0	20.4	**GP27M**	0.00	0.0	0.3	20.5
GP13S	-0.34	0.0	0.1	20.2	**GP27D**	0.12	0.0	0.0	20.5
GP13M	-0.39	0.0	0.5	19.6	**GP28S**	0.00	0.0	0.0	20.4
GP13D	-0.39	0.0	0.5	20.7	**GP28M**	-0.05	0.0	0.0	19.7
GP14S	-0.37	0.0	0.0	20.9	**GP28D**	0.00	0.0	0.0	20.4
GP14M	-0.39	0.0	0.0	20.0	**GP29S**	-0.06	0.0	0.0	20.7
GP14D	0.01	0.0	0.0	20.9	**GP29M**	-0.06	0.0	0.0	20.3
GP15S	-0.35	0.1	4.3	11.1	**GP29D**	-0.04	0.0	0.1	19.2

Notes:
1) Probe data collected by SCS personnel on August 30, 2019.

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Table 5. 2020 Probe Data - In Situ Vapor Extraction System
Hagen Farm Site, Town of Dunkirk, Dane County, WI / SCS Engineers Project #25212002.00

Probe	Pressure (inches of water)	Methane (%)	Carbon Dioxide (%)	Oxygen (%)	Probe	Pressure (inches of water)	Methane (%)	Carbon Dioxide (%)	Oxygen (%)
GP01S	0.07	0.0	0.2	21.1	**GP15M**	0.13	59.2	33.8	0.0
GP01M	0.08	37.0	22.2	7.2	**GP15D**	0.09	59.9	33.2	0.1
GP01D	0.04	0.1	0.3	20.9	**GP16S**	-0.08	0.0	3.5	17.0
GP02S	0.14	48.4	31.3	0.0	**GP16M**	-0.07	0.0	3.2	17.0
GP02M	0.18	60.4	33.8	0.7	**GP16D**	-0.13	0.0	0.1	20.4
GP02D	0.14	3.4	1.6	19.4	**GP17S**	0.09	58.4	34.8	0.1
GP03S	0.14	46.3	27.3	1.8	**GP17M**	0.02	59.3	35.7	0.1
GP03M	0.09	51.0	23.5	2.3	**GP17D**	-0.08	0.1	0.7	20.0
GP03D	0.48	0.5	0.3	20.8	**GP18S**	0.01	7.3	12.1	2.6
GP04S	0.07	36.5	21.5	0.2	**GP18M**	0.02	54.6	35.1	0.1
GP04M	0.03	28.3	15.0	4.2	**GP18D**	0.05	7.8	3.2	16.0
GP04D	0.02	0.0	0.1	21.1	**GP19S**	0.02	17.7	13.0	12.9
GP05S	-0.08	0.1	9.2	17.4	**GP19M**	0.05	38.0	31.3	1.6
GP05M	0.12	49.3	34.7	2.2	**GP19D**	0.05	0.0	0.3	20.2
GP05D	0.02	0.0	0.1	20.9	**GP20S**	-0.12	0.0	5.3	13.4
GP06S	0.18	47.2	31.2	1.8	**GP20M**	-0.11	0.0	1.1	19.1
GP06M	0.06	45.4	28.3	4.0	**GP20D**	-0.14	0.0	0.7	18.6
GP06D	0.06	0.0	0.1	20.8	**GP21S**	-0.09	0.0	2.0	19.1
GP07S	0.09	1.6	9.1	13.0	**GP21D**	-0.08	0.0	0.4	20.1
GP07M	0.19	43.9	27.3	4.0	**GP22S**	-0.04	0.0	8.3	14.0
GP07D	0.17	32.5	31.0	7.1	**GP22M**	-0.05	0.0	4.2	12.4
GP08S	0.15	32.8	25.1	0.5	**GP22D**	0.00	0.0	0.1	20.4
GP08M	0.10	47.4	27.8	3.5	**GP23S**	-0.02	0.0	5.4	15.6
GP08D	0.13	0.4	0.3	20.6	**GP23M**	0.00	0.0	4.3	16.5
GP09S	0.03	55.1	29.0	1.2	**GP23D**	-0.02	0.0	0.8	19.7
GP09M	0.09	48.3	25.5	0.4	**GP24S**	0.00	0.0	3.8	17.1
GP09D	0.02	0.2	0.7	20.3	**GP24M**	-0.03	0.0	4.8	15.8
GP10S	-0.11	0.5	6.0	16.4	**GP24D**	0.04	0.0	6.0	14.8
GP10M	0.20	46.5	29.4	4.0	**GP25S**	0.03	0.0	5.9	15.3
GP10D	0.06	12.1	14.9	11.3	**GP25M**	-0.01	0.0	10.2	10.0
GP11S	0.02	43.1	21.2	1.7	**GP25D**	-0.04	0.0	0.6	19.8
GP11M	0.01	37.3	17.9	0.7	**GP26S**	-0.06	0.0	5.5	15.1
GP11D	0.11	5.7	3.2	18.0	**GP26M**	-0.05	0.0	8.9	11.1
GP12S	0.06	50.6	24.9	2.1	**GP26D**	-0.04	0.0	0.8	19.5
GP12M	-0.03	0.0	5.2	18.3	**GP27S**	-0.06	0.0	6.9	14.6
GP12D	-0.05	0.1	0.2	20.6	**GP27M**	-0.07	0.0	2.4	16.0
GP13S	0.08	54.9	29.5	0.0	**GP27D**	-0.01	0.0	0.7	18.8
GP13M	0.00	47.5	27.5	0.7	**GP28S**	0.02	0.0	4.3	12.9
GP13D	0.01	46.9	23.7	3.6	**GP28M**	-0.03	0.0	2.3	18.2
GP14S	0.03	54.2	28.0	0.6	**GP28D**	-0.09	0.0	0.5	19.7
GP14M	0.05	57.8	32.8	0.0	**GP29S**	-0.04	11.1	7.8	7.0
GP14D	0.05	61.0	30.7	0.0	**GP29M**	-0.09	12.9	7.5	5.0
GP15S	0.07	54.9	28.6	0.0	**GP29D**	-0.02	0.9	0.7	16.5

Notes: .
1) Probe data collected by SCS personnel on September 1, 2020

Created by: ZTW Date: 2/6/2019
Revised by: ZTW Date: 12/17/2020
Checked by: MCK Date: 12/23/2020

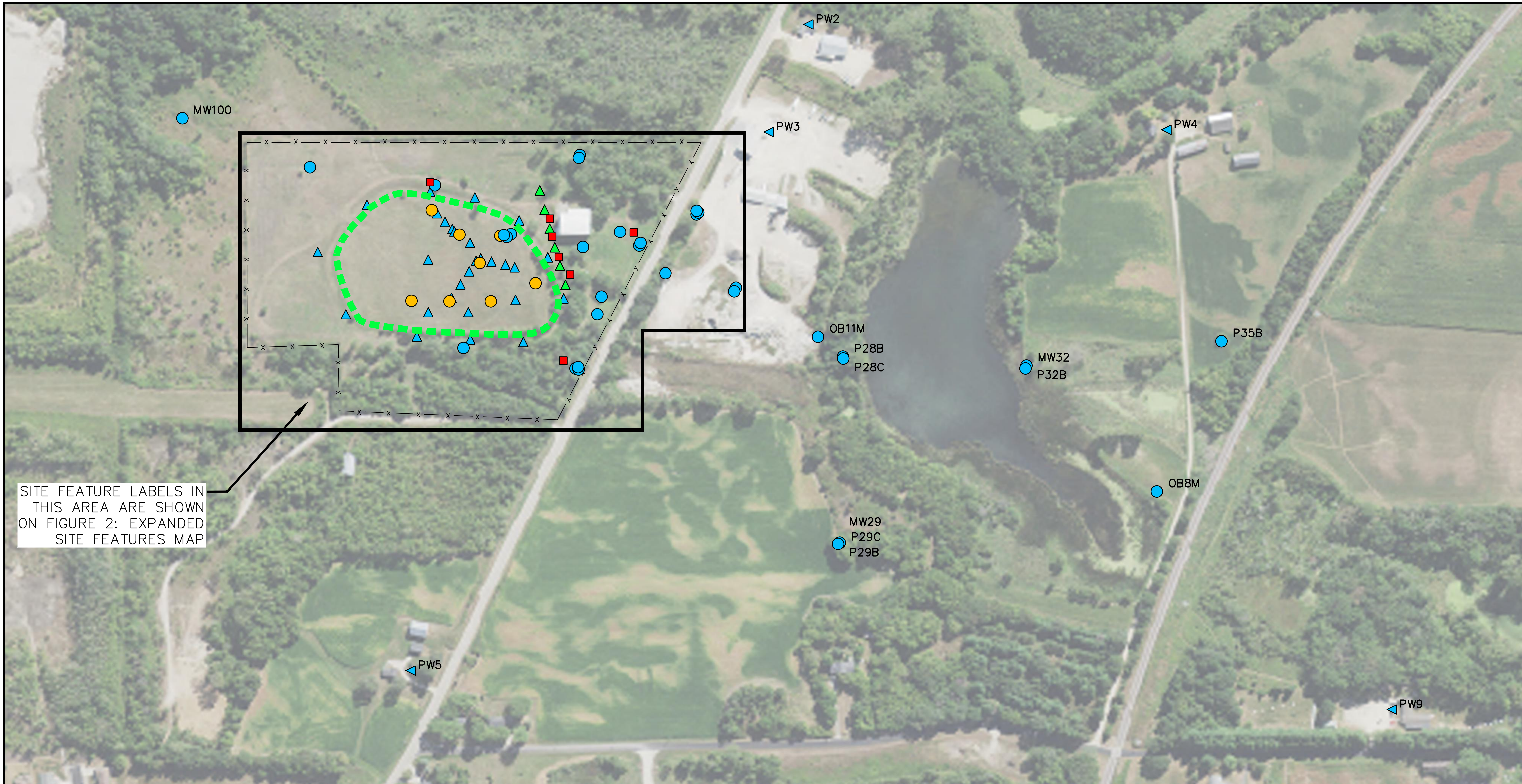
Table 6. 2021 Probe Data - In Situ Vapor Extraction System
Hagen Farm Site, Town of Dunkirk, Dane County, WI / SCS Engineers Project #25212002.00

Probe	Pressure (inches of water)	Methane (%)	Carbon Dioxide (%)	Oxygen (%)	Probe	Pressure (inches of water)	Methane (%)	Carbon Dioxide (%)	Oxygen (%)
GP01S	0.09	50.6	35.3	1.2	**GP15M**	0.13	47.9	29.5	3.3
GP01M	0.06	34.0	22.2	7.7	**GP15D**	0.08	40.4	26.5	5.5
GP01D	0.12	2.0	1.4	19.3	**GP16S**	-0.04	0.0	4.8	14.6
GP02S	0.09	45.7	28.9	3.1	**GP16M**	0.00	0.0	4.3	15.3
GP02M	0.07	57.1	36.0	0.8	**GP16D**	-0.08	0.0	0.1	20.2
GP02D	0.11	0.9	0.9	19.5	**GP17S**	0.08	51.7	37.2	0.7
GP03S	0.06	45.7	28.0	1.7	**GP17M**	0.08	40.0	29.1	4.1
GP03M	0.06	52.7	27.4	1.3	**GP17D**	0.10	1.9	2.0	18.5
GP03D	0.09	0.6	0.4	19.7	**GP18S**	0.06	38.4	26.1	1.9
GP04S	0.11	40.3	23.4	0.3	**GP18M**	0.14	43.3	31.6	3.8
GP04M	0.02	32.1	17.1	4.1	**GP18D**	0.06	40.6	26.0	4.4
GP04D	0.10	0.4	0.3	19.9	**GP19S**	0.17	33.1	23.0	7.5
GP05S	0.11	46.0	31.9	1.9	**GP19M**	0.19	33.8	26.7	4.1
GP05M	0.14	49.2	37.3	1.8	**GP19D**	0.02	0.0	0.3	20.1
GP05D	0.06	0.0	0.1	20.6	**GP20S**	-0.07	0.0	8.1	9.4
GP06S	0.33	49.9	33.1	1.7	**GP20M**	-0.09	0.0	1.4	18.5
GP06M	0.14	43.9	29.3	4.4	**GP20D**	0.02	0.0	1.3	18.8
GP06D	0.14	0.1	0.1	20.8	**GP21S**	-0.01	0.0	2.6	18.0
GP07S	0.18	50.9	27.9	1.1	**GP21D**	-0.03	0.0	0.6	19.6
GP07M	0.19	34.3	22.7	7.5	**GP22S**	0.17	0.0	5.6	15.0
GP07D	0.17	29.5	26.7	7.7	**GP22M**	0.15	0.0	5.1	12.4
GP08S	0.17	43.1	21.9	2.7	**GP22D**	0.21	0.0	0.2	19.9
GP08M	0.22	58.6	33.6	0.5	**GP23S**	0.02	0.0	6.9	13.8
GP08D	0.44	0.5	0.3	20.3	**GP23M**	-0.02	0.0	8.8	11.7
GP09S	0.21	58.9	33.1	0.2	**GP23D**	0.09	0.0	0.9	19.0
GP09M	0.17	46.7	27.6	0.4	**GP24S**	0.01	0.0	5.1	14.7
GP09D	0.19	1.5	4.2	14.5	**GP24M**	0.24	0.0	5.2	14.6
GP10S	0.13	1.7	9.0	12.7	**GP24D**	-0.05	0.0	7.8	12.0
GP10M	0.23	46.3	30.7	3.6	**GP25S**	0.06	0.0	7.9	12.1
GP10D	0.23	54.8	33.7	0.2	**GP25M**	-0.02	0.0	11.7	8.0
GP11S	0.15	42.9	22.8	1.6	**GP25D**	0.03	0.0	1.7	17.8
GP11M	0.18	34.5	19.1	2.1	**GP26S**	0.02	0.0	1.4	17.9
GP11D	0.19	14.7	8.2	11.3	**GP26M**	0.03	0.0	10.1	9.1
GP12S	0.15	45.9	23.9	2.6	**GP26D**	0.02	0.0	3.4	15.9
GP12M	0.14	2.2	8.4	9.9	**GP27S**	0.01	0.0	5.9	12.8
GP12D	0.18	27.6	13.8	5.4	**GP27M**	0.08	0.0	1.3	17.3
GP13S	0.16	45.6	26.5	2.4	**GP27D**	0.00	0.0	4.6	11.4
GP13M	0.16	43.3	25.2	3.2	**GP28S**	-0.05	0.0	6.6	11.2
GP13D	0.19	39.5	22.0	5.6	**GP28M**	0.02	0.0	4.6	13.3
GP14S	0.19	55.4	28.2	1.4	**GP28D**	0.08	0.0	0.7	19.2
GP14M	0.20	44.1	26.7	4.5	**GP29S**	0.00	33.5	15.7	0.8
GP14D	0.14	42.9	23.9	5.6	**GP29M**	-0.01	22.2	12.3	3.6
GP15S	0.16	40.8	22.5	4.5	**GP29D**	0.02	0.2	0.4	17.5

Notes: .
1) Probe data collected by SCS personnel on September 27, 2021.
2) Barometric Pressure and Trend: 28.83 inches of Mercury, Steady.

Created by: ZTW Date: 2/6/2019
Revised by: ZTW Date: 1/6/2022
Checked by: MCK Date: 1/12/2022

Figures



BASE IMAGE: NAIP DIGITAL ORTHOPHOTO, 2020.

LEGEND

(green dashed line)	APPROXIMATE LIMITS OF WASTE
— x — x —	FENCE
MW29	MONITORING WELL/PIEZOMETER
PW9	PRIVATE WELL
(orange circle)	GAS EXTRACTION WELL
(blue triangle)	GAS PROBE
(green triangle)	SHALLOW AIR SPARGE WELL
(red square)	DEEP AIR SPARGE WELL

N

300 0 300

SCALE: 1" = 300'

PROJECT NO.	25212002.00	DRAWN BY:	KP
DRAWN:	11/09/2012	CHECKED BY:	ZTW
REVISED:	01/11/2022	APPROVED BY:	MP

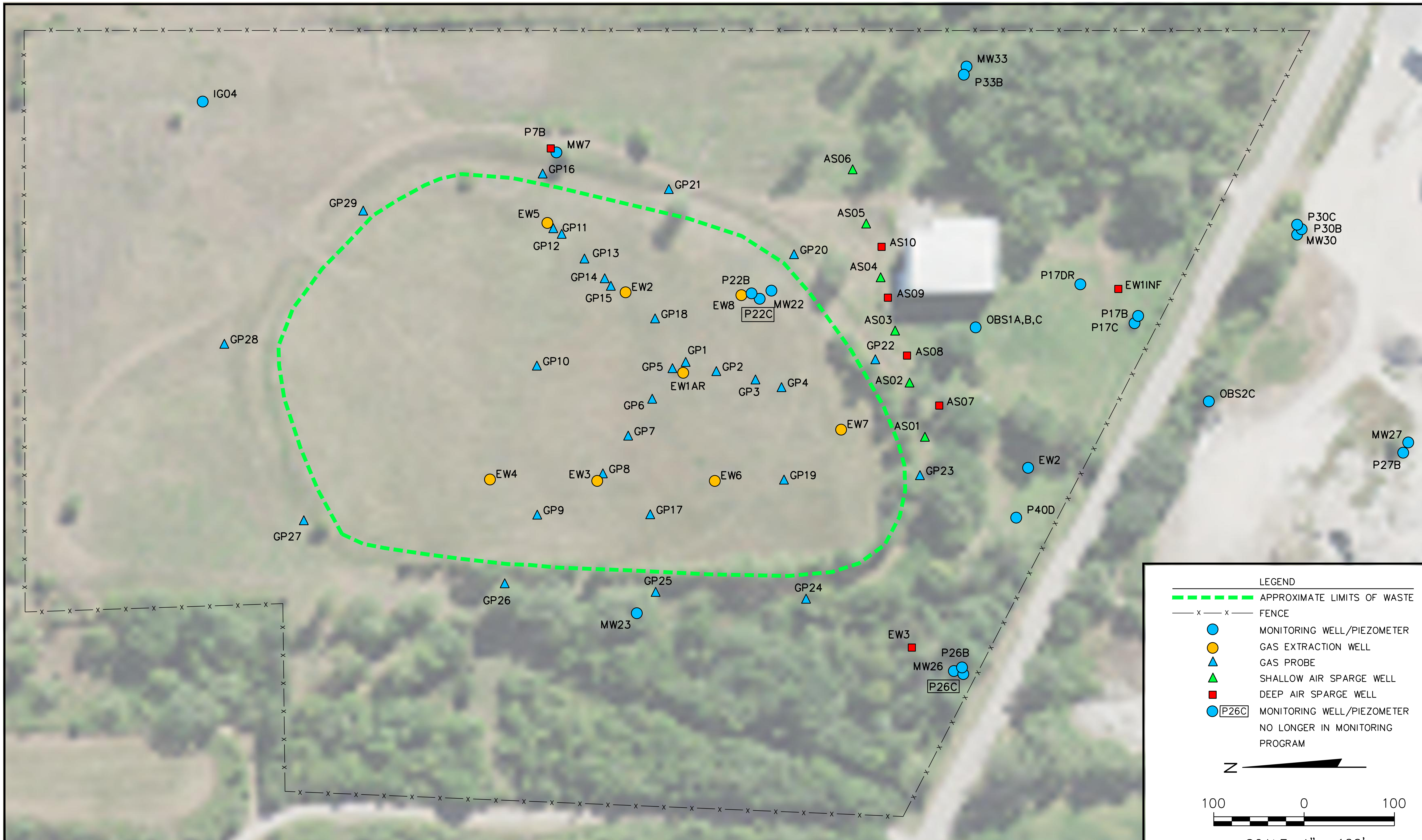
ENGINEER: SCS ENGINEERS
2830 DAIRY DRIVE MADISON, WI 53718-6751
PHONE: (608) 224-2830

CLIENT: WASTE MANAGEMENT

SITE: HAGEN FARM SITE
TOWN OF DUNKIRK, DANE COUNTY
WISCONSIN

SITE FEATURES MAP

FIGURE 1



BASE IMAGE: NAIP DIGITAL ORTHOPHOTO, 2020.

PROJECT NO.	25212002.00	DRAWN BY:	AHB
DRAWN:	02/11/2013	CHECKED BY:	ZTW
REVISED:	01/11/2022	APPROVED BY:	MP

ENGINEER: SCS ENGINEERS
2830 DAIRY DRIVE MADISON, WI 53718-6751
PHONE: (608) 224-2830

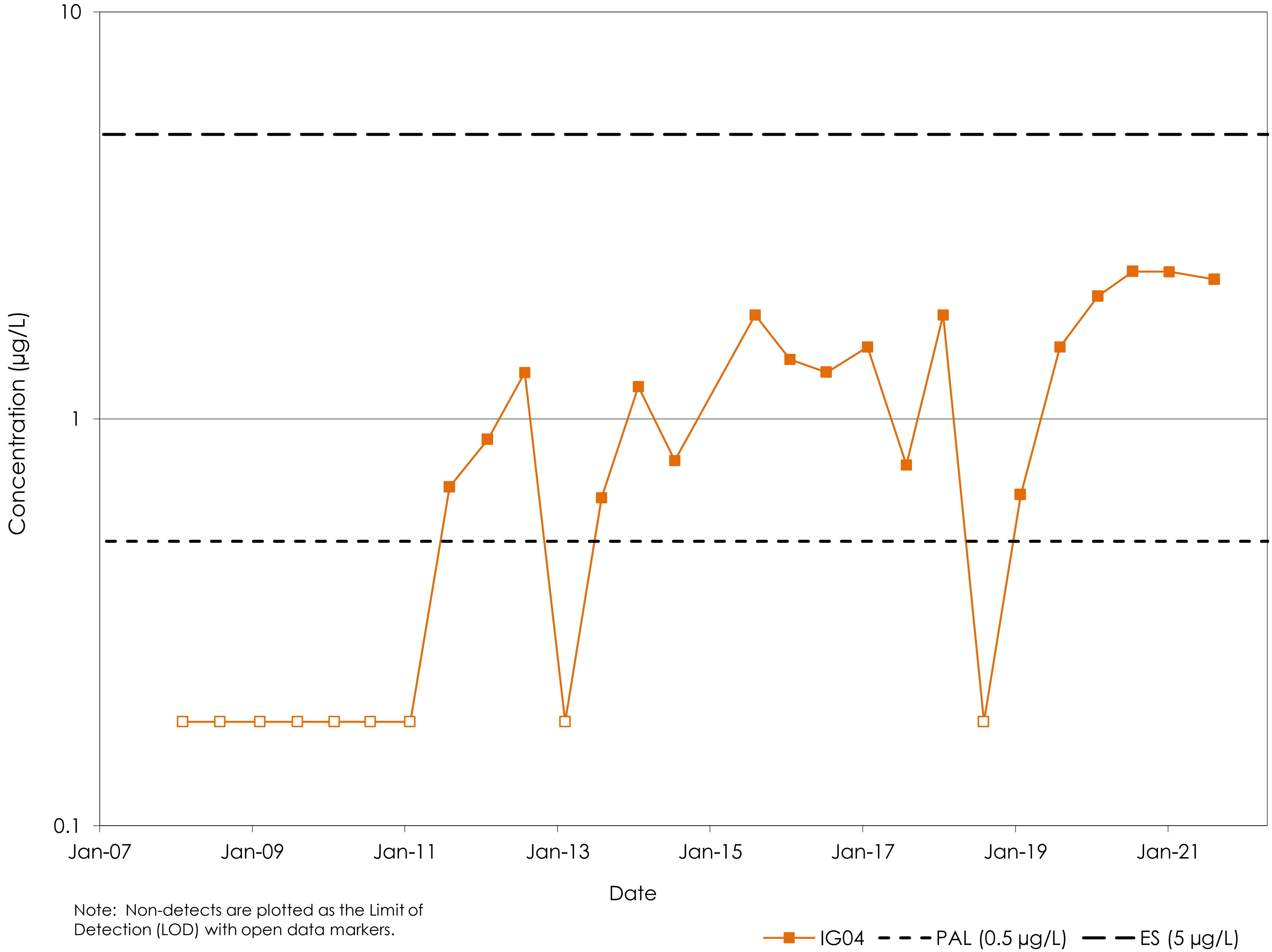
CLIENT: WASTE MANAGEMENT

SITE: HAGEN FARM SITE
TOWN OF DUNKIRK, DANE COUNTY
WISCONSIN

EXPANDED SITE FEATURES MAP

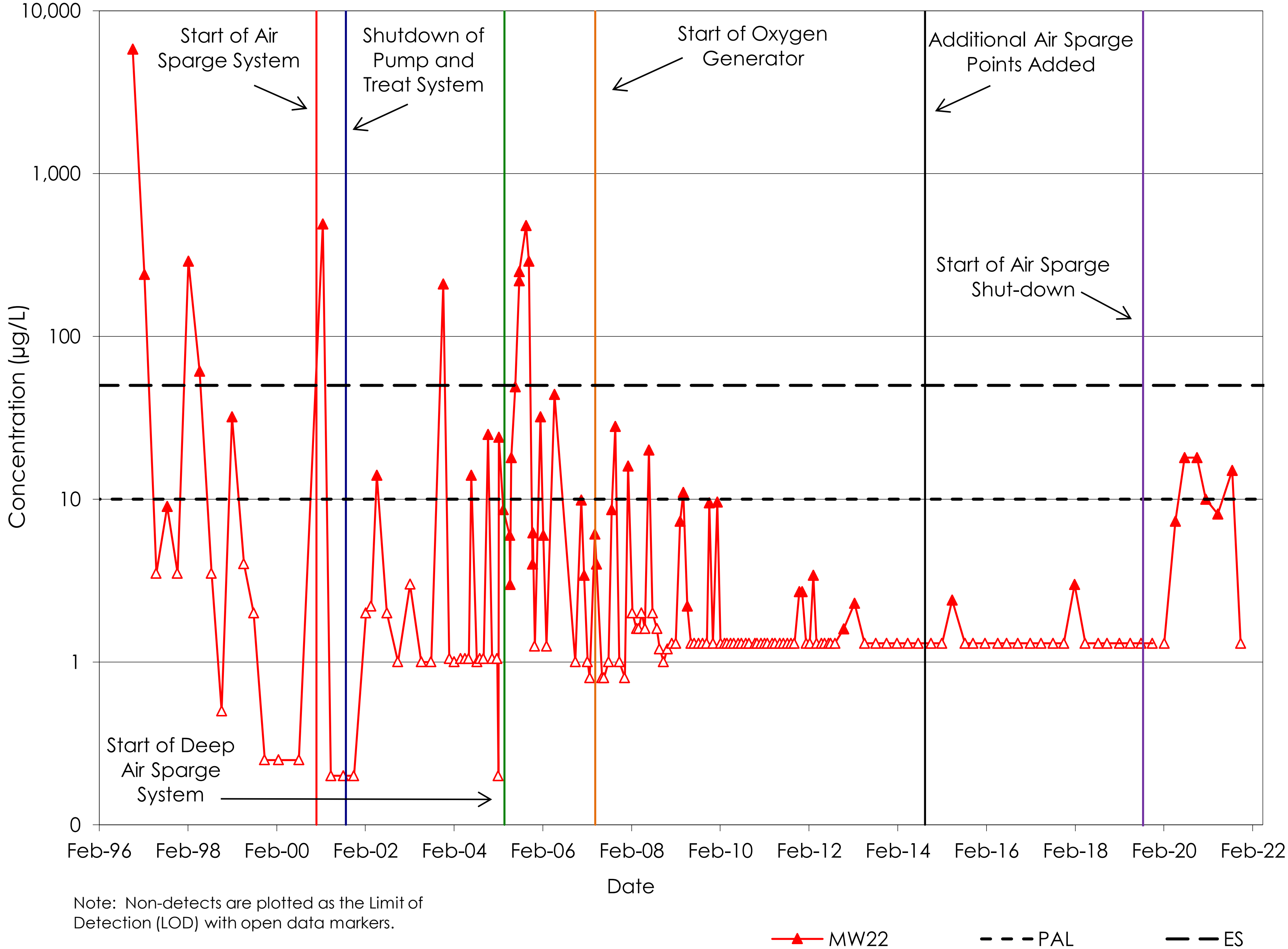
FIGURE
2

Figure 3
Tetrachloroethylene
IG04- Hagen Farm Site



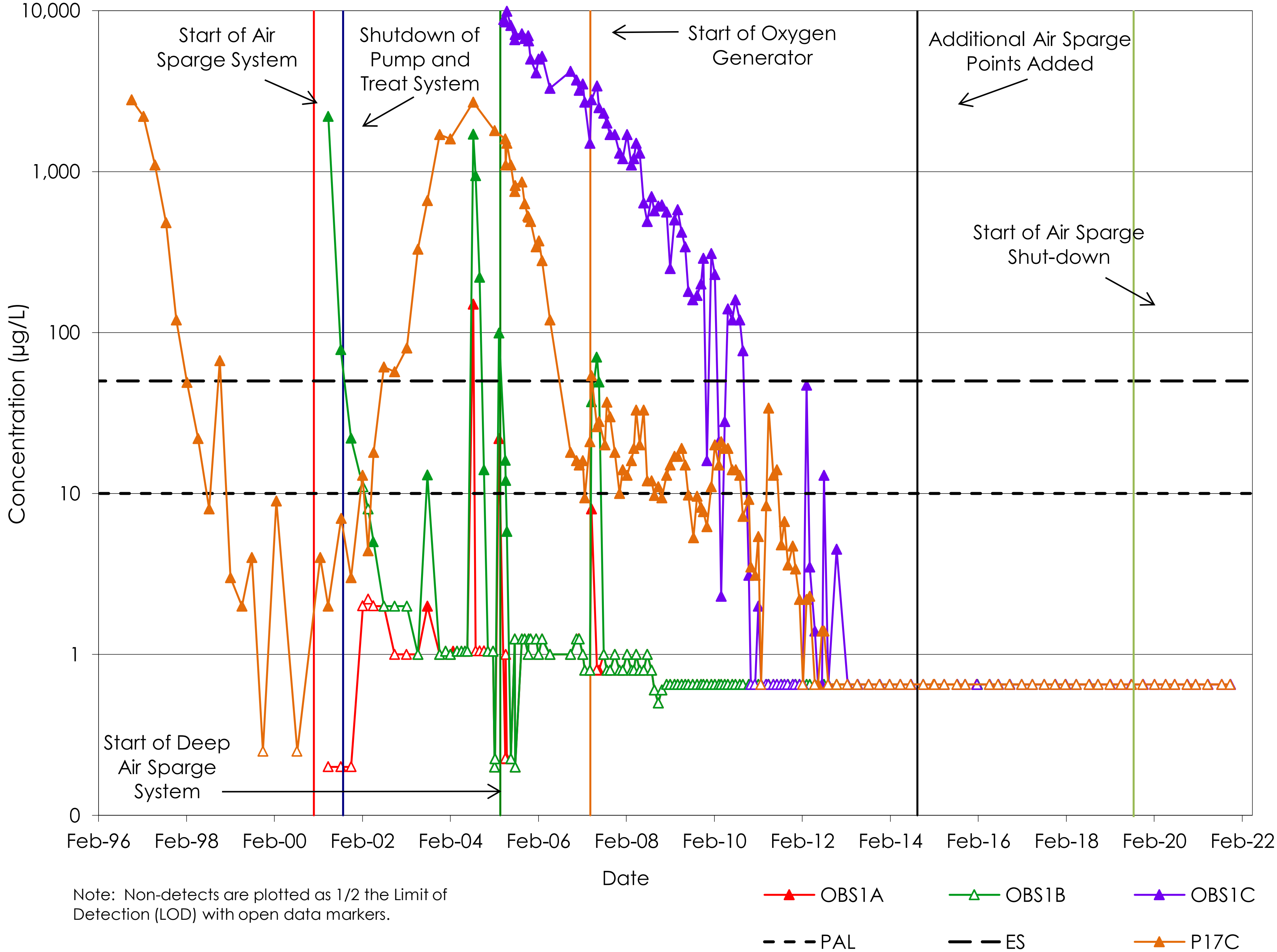
Note: Non-detects are plotted as the Limit of Detection (LOD) with open data markers.

Figure 4
Tetrahydrofuran
Source Well - Hagen Farm Site



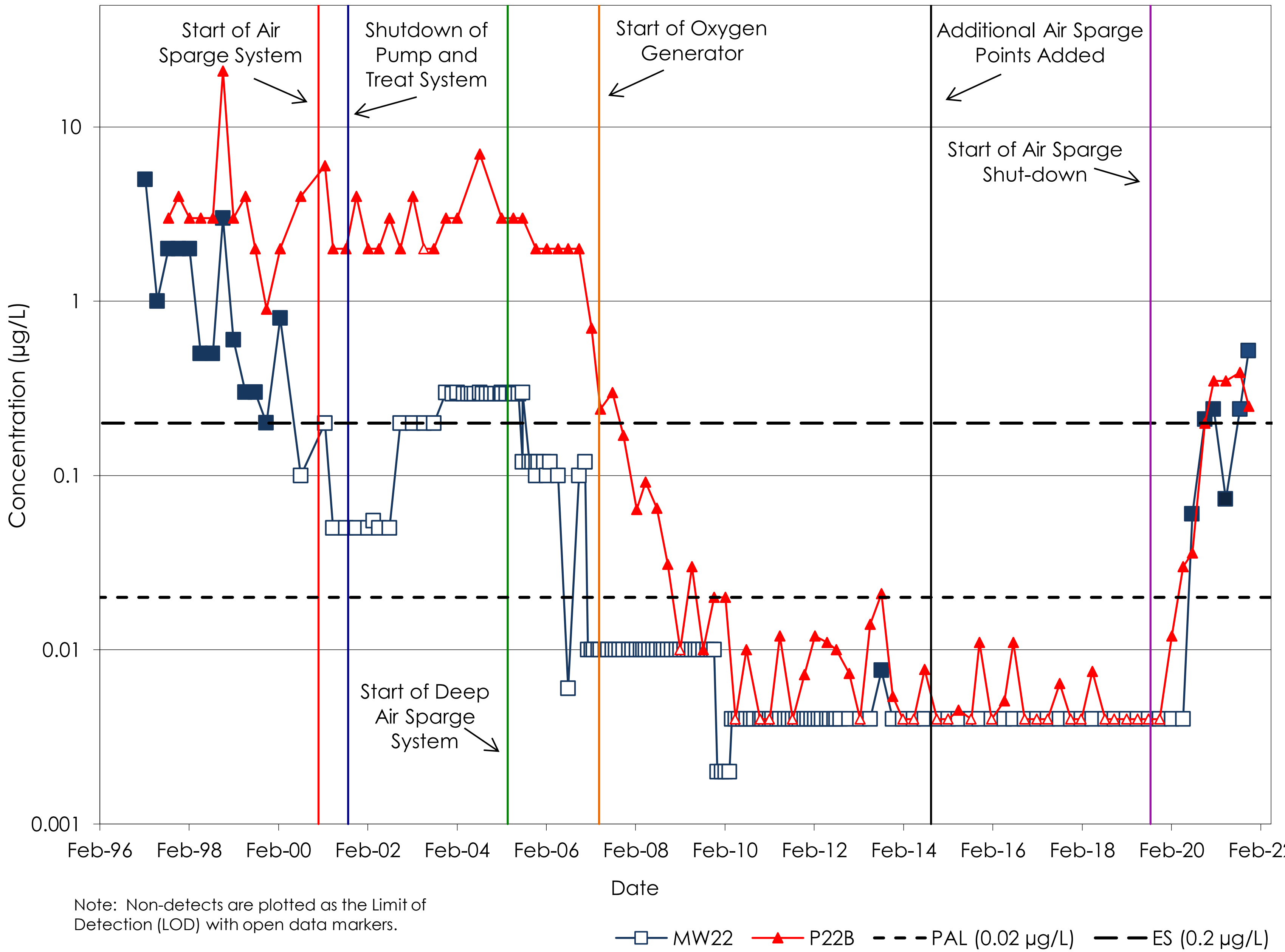
Note: Non-detects are plotted as the Limit of Detection (LOD) with open data markers.

Figure 5
Tetrahydrofuran
On-Property Wells - Hagen Farm Site

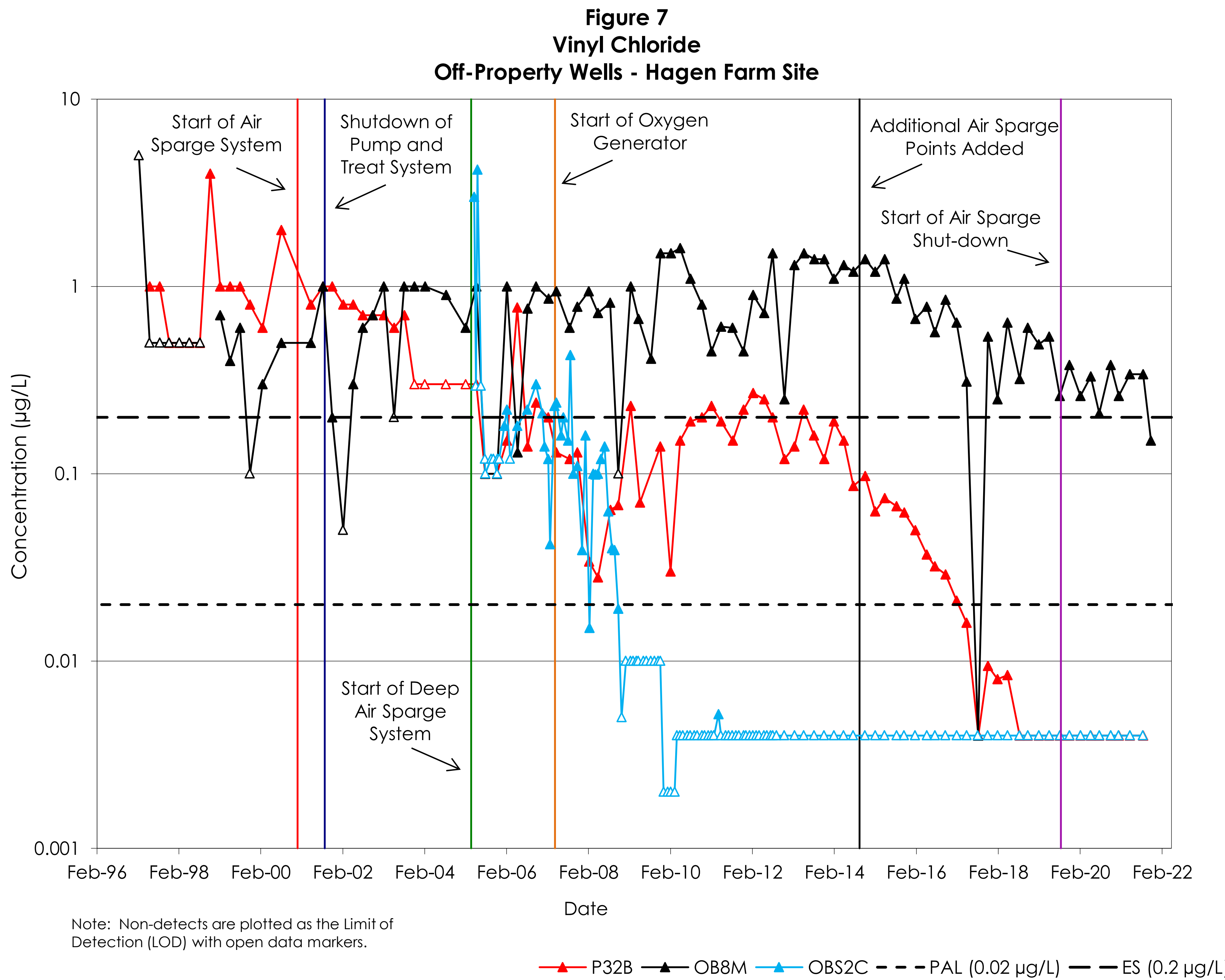


Note: Non-detects are plotted as 1/2 the Limit of Detection (LOD) with open data markers.

Figure 6
Vinyl Chloride
P22B and MW22 - Hagen Farm Site

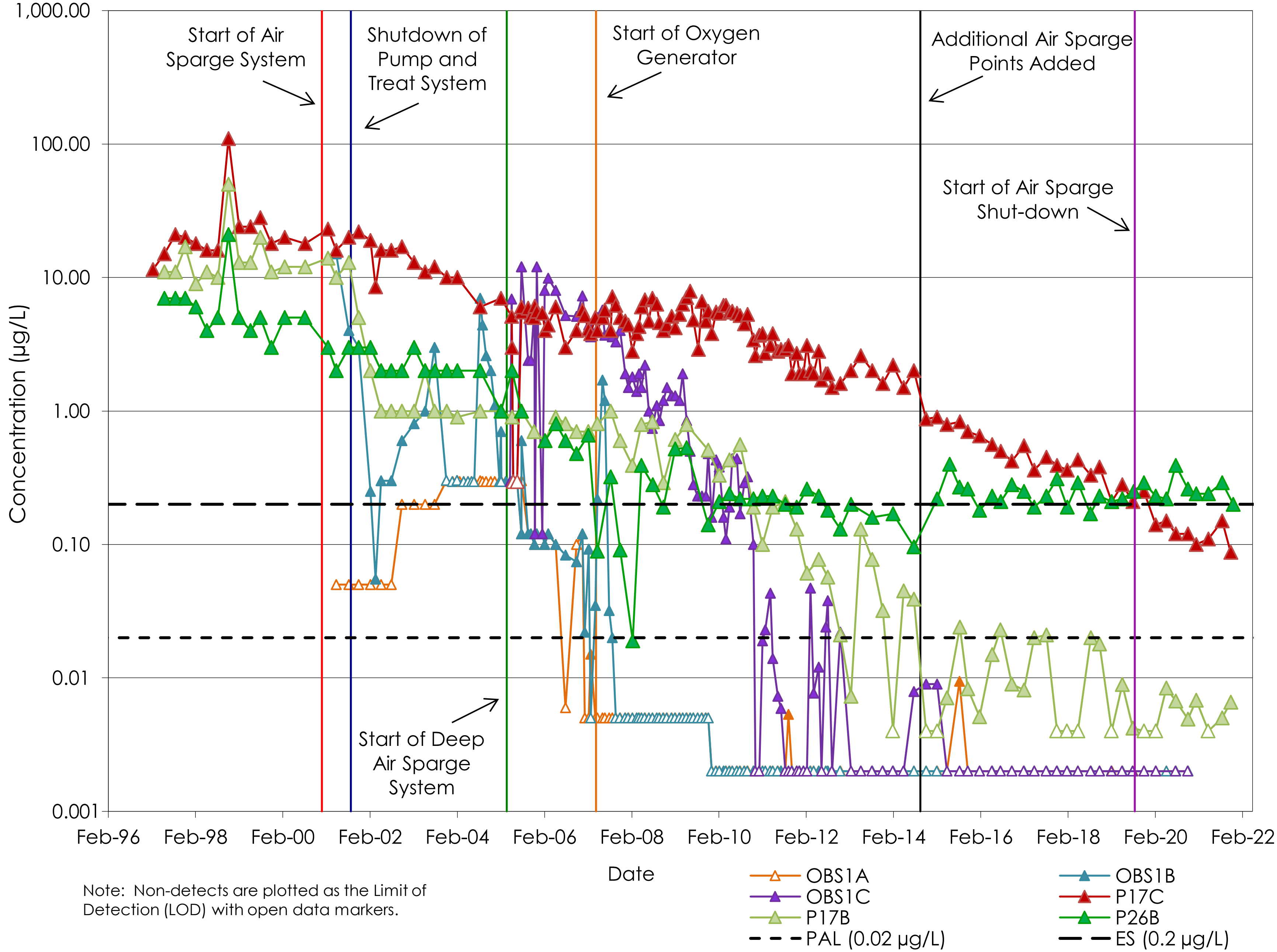


Note: Non-detects are plotted as the Limit of Detection (LOD) with open data markers.



Note: Non-detects are plotted as the Limit of Detection (LOD) with open data markers.

Figure 8
Vinyl Chloride
On-Property Wells - Hagen Farm Site



Note: Non-detects are plotted as the Limit of Detection (LOD) with open data markers.

Appendix A

Correspondence

December 9, 2020
File No. 25212002.20

Transmittal by Electronic Mail

Ms. Sheila A. Sullivan, Remedial Projects Manager
U.S. Environmental Protection Agency - Region 5
Waste Management Division
77 West Jackson Boulevard, HSRL-6J
Chicago, Illinois 60604

Subject: Hagen Farm Superfund Site
Work Plan for Rebound Test - GCOU and SCOU Remedies
Dane County, Wisconsin

Dear Ms. Sullivan:

On behalf of Waste Management of Wisconsin, Inc. (WMWI), SCS Engineers (SCS) has prepared the attached Work Plan for a rebound test/temporary shut-down of the soil vapor extraction (SVE) system and low flow air sparge (LFAS) systems at the Hagen Farm site (Site) in Stoughton, Wisconsin. The SVE system was installed and operated as a component of the source control remedial action at the Site. The LFAS system was installed and operated as a component of the groundwater control remedial action at the Site.

As further described in the work plan, WMWI has operated and maintained the SVE system at Site for more than 20 years, and implemented active groundwater remediation, including pump and treat and/or LFAS for more than 15 years. Operation of the SVE system and groundwater remedial measures during that period resulted in a decrease in concentration of volatile organic compounds (VOCs), including tetrahydrofuran (THF) and vinyl chloride, in groundwater in the vicinity of the Site.

SCS believes that a rebound test is necessary at this time to assess the potential for a remaining contaminant mass and the contribution of natural attenuation in the observed reductions in contaminant concentrations over time in groundwater at the Site. Given the identified existing conditions at the Site, the rebound test can be conducted without the risk of significant adverse impacts to groundwater. The data from the test period could be utilized to support a change in the remedy at the Site in the future, where monitored natural attenuation (MNA) would replace the operation of the LFAS and SVE systems at the Site.

We look forward to implementing this work plan at the Hagen Farm Site.

If you have any questions, please feel free to contact Mike Peterson of WMWI at mpeterso2@wm.com or (262) 509-5638.

Sincerely,

Michael J. Prattke
Division Leader
SCS Engineers

Tom Karwoski, PG
Senior Project Manager
SCS Engineers

MJP/AJR/TK

cc: Trevor Bannister, WDNR (by e-mail)
Jim Forney
Michelle Gale
Michael L. Peterson, Waste Management of Wisconsin, Inc.

Encl. Work Plan for Rebound Test - GCOU and SCOU Remedies

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Work Plan for Rebound Test GCOU and SCOU Remedies

Hagen Farm Superfund Site
Dane County, Wisconsin

Prepared for:

Waste Management of Wisconsin, Inc.
W124N9355 Boundary Road
Menomonee Falls, Wisconsin 53051
262-509-5638

SCS ENGINEERS

25212002.20 | December 9, 2020

N84 W13540 Leon Rd.
Menomonee Falls, WI 53051
262-345-1220

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Appendices

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1.0 INTRODUCTION

Tetrahydrofuran (THF) was historically the primary contaminant of concern (COC) at the site, as it was present in groundwater at the highest concentrations. The decline in THF concentrations in groundwater over time is well documented. As of September 2019, THF had not been identified at concentrations greater than 10 micrograms/liter (µg/L), the Preventive Action Limit (PAL) in NR140 Wis. Adm. Code, in any of the groundwater samples collected since November 2014. The decline in THF concentrations over time at on-site monitoring wells is evident from review of Figure 5 from the 2019 Annual Report, a copy of which is provided for reference in **Appendix A**. The concentrations of vinyl chloride, another volatile organic compound (VOC) and COC, are stable or decreasing over time at the site monitoring wells. As shown on Figures 7 and 9 from the 2019 Annual Report, copies of which are provided for reference in **Appendix A**, the decline in vinyl chloride concentrations over time is notable at both wells located within Waste Management of Wisconsin's (WMWI's) property (P17B, P17C, OBS-1A, OBS-1B, OBS-1C) and off-site monitoring wells (OBS-2C). There are sample points (i.e., groundwater monitoring wells) where vinyl chloride remains at concentrations above the state PAL (0.02 µg/L) or Enforcement Standard (ES) of 0.2 µg/L, but no concentrations (on-site or off-site) have exceeded the federal Maximum Contaminant Level (MCL) of 2 µg/L since August 2014.

Based on the decreases in concentrations of contaminants of concern described above, SCS and WMWI believed that a rebound test was necessary to assess the status of the remedial efforts and a logical step in the remediation of this Site. In accordance with the July 9, 2019 correspondence, WMWI temporarily ceased operation of the low flow air sparge (LFAS) system on September 4, 2019, and soil vapor extraction (SVE) system on September 12, 2019. The shut downs were described in the 2019 Annual Report for the Site dated March 16, 2020, and in the quarterly groundwater data submittals beginning with the third quarter 2019 (dated October 28, 2019). The quarterly data submittals also include a preliminary assessment of the status of the rebound test to identify if conditions are present that would indicate that the test should be terminated and the remedial systems restarted. As expected, those quarterly preliminary assessments have not indicated conditions that would warrant a partial or total restart of one or both of the remedial systems (SVE or LFAS) at the Site. Since the active remediation systems had been in operation for a relatively long period, it is unlikely that a short term shut-down of the LFAS and SVE systems will result in a significant adverse impact to groundwater quality.

Responses to the specific items in your letter of September 30, 2020, are addressed as warranted in this Work Plan and are also included in **Appendix B** to this Work Plan.

2.0 PROPOSED ACTIVITIES

SCS Engineers (SCS) believes that a minimum of 2 years will be necessary to evaluate the results of the rebound test (i.e., temporary shut-down of the remedial systems) at the Hagen Farm Site. During that period, data will continue to be generated through the routine performance monitoring program at the Site. That data is expected to be sufficient to verify that VOC concentrations in groundwater do not significantly increase when the remedial systems are shut-down and to assess the contribution of natural attenuation in the observed reductions in contaminant concentrations over time in groundwater at the Site.

After review of the data from the initial 2-year period, WMWI will submit a technical memorandum to assess the conditions at the Site. The technical memorandum will assess if sufficient information is available to support proceeding with the shut-down of the remedial systems at the Site, if the temporary shut-down test should continue, or if one or both of the remedial systems should be partially or totally restarted.

3.0 PERFORMANCE MONITORING

Groundwater quality monitoring will continue on a quarterly basis during the temporary shut-down. In accordance with the approved groundwater monitoring program, 10 groundwater monitoring wells generally located either within or downgradient of the waste mass are sampled quarterly and the samples analyzed for a variety of field parameters, indicators, metals and VOCs. Additionally, samples from wells MW7 and P26B are collected quarterly and analyzed for VOCs. Thus, groundwater monitoring wells that are sampled quarterly include: MW7, MW22, OBS-1A, OBS-1B, OBS-1C, OBS-2C, OB8M, P17B, P17C, P22B, P26B, and P32B. With the exception of wells OB8M and P32B, which are located further downgradient of the waste mass at the Site, the locations of these wells are shown on Figure 2 from the 2019 Annual Report, a copy of which is included for reference in **Appendix A**. These and additional wells are also included as part of the semi-annual (February) or annual (August) sampling events at the Site. The samples from the February and August events are also analyzed for additional parameters. A summary of the groundwater monitoring program, including a list of wells and parameters for each quarterly sampling event at the Site, is included as **Appendix C** to this Work Plan.

The data from the first year of the rebound test is consistent with our expectations. There were no significant increases in VOC concentrations (i.e., THF or vinyl chloride) in analysis of samples from groundwater monitoring wells located downgradient of the waste mass at the Site.

Groundwater monitoring well P17C is located on the downgradient edge of the property, approximately 300 feet from the edge of the waste mass. As described in the 2019 Annual Report, vinyl chloride was reported at P17C at concentrations ranging from 0.21 to 0.28 μg/L in the four samples collected in 2019. The three quarterly vinyl chloride results to date in 2020 (February, May, and August) ranged from 0.12 μg/L in August to 0.15 μg/L in May. It should be noted that the vinyl chloride was also reported in analysis of two of the four quarterly samples at another nearby well - P17B in 2019. The concentrations there were lower than at P17C and ranged from 0.0042 to 0.0089 μg/L. Vinyl chloride was identified in two of the three quarterly samples from P17B in 2020, at concentrations ranging from 0.0067 in August to 0.0084 μg/L in May. Groundwater monitoring well P26B is also located on the downgradient edge of the property, approximately 200 feet from the edge of the waste mass. As described in the 2019 Annual Report, vinyl chloride was reported at concentrations ranging from 0.21 to 0.29 μg/L in the four samples collected in 2019. The three quarterly vinyl chloride results to date in 2020 (February, May, and August) ranged from 0.22 μg/L in May to 0.39 μg/L in August.

As previously stated, none of the vinyl chloride concentrations in any of the data since August 2014 are greater than the federal MCL of 2 μg/L. The highest concentration of vinyl chloride identified in analysis of samples from 2019 was in the May sample from well OB8M (0.54 μg/L); the two subsequent quarterly results in 2019 were lower. The three quarterly vinyl chloride results to date in 2020 (February, May, and August) ranged from 0.21 μg/L in August to 0.33 μg/L in May. Groundwater monitoring well OB8M is located approximately 1,900 feet downgradient of the waste mass, thus is not expected to be directly affected by the temporary shut-down of the remedial systems.

Thus, the initial data appears to confirm that the remedial measures have been successful in decreasing the mass of VOCs in the vicinity of the Site. SCS believes that the rebound test should continue to assess the contribution of natural attenuation with regard to the remaining VOC concentrations.

4.0 INTERIM DATA EVALUATION

SCS expected that the potential for a direct rebound (i.e., immediate increase in contaminant concentrations) due to the presence of residual contaminant mass in proximity to the groundwater monitoring points would be apparent within 12 months (i.e. four quarterly sampling events) of shutting down the remedial systems at the Site. As described in **Section 3.0**, that immediate increase in COC concentrations has not occurred. Collection of data to evaluate the effectiveness of natural attenuation is expected to take longer.

The data from the quarterly sampling events will continue to be reviewed periodically to verify that the temporary shut-down does not result in an unacceptable increase in the concentration of any COC over time. The data review will also include assessment of the results from analysis of samples for other field and laboratory parameters, as warranted. The current groundwater monitoring program is sufficient, with regard to sampling points, parameters and frequency, to identify potential unacceptable increases in COCs within the property boundaries, before adverse impacts occur in groundwater downgradient of the Site. No modifications to the current groundwater monitoring program (frequency, monitoring points, or parameters) are anticipated to be necessary to assess the trial shut-down.

WMWI will continue to assess the periodic (i.e., quarterly, semi-annual or annual) groundwater data to verify that an unacceptable increase in COC (i.e., VOC) concentrations at a well or wells located outside the waste mass at the Site does not occur. An unacceptable increase would be where a VOC result at a well or wells outside of waste and within the treatment zone of the remedial systems (i.e., wells OBS-1A, OBS-1B, OBS-1C, P17B, and P17C) consistently increased over two or more consecutive quarters and was above the groundwater cleanup goal (i.e., MCL or ES). This is appropriate in that the LFAS system was designed to directly address groundwater downgradient of the waste mass within the property, which is expected to work with natural processes to result in a reduction of contaminant concentrations further downgradient in off-site groundwater. Any potential increase in concentration of a COC over time should be present over a minimum of two consecutive sampling events in that a number of the current concentrations are low (less than 1 μg/L) and variable. The VOC results from analysis of samples from groundwater monitoring wells located further downgradient from the waste mass during the trial shut-down period are anticipated to be consistent with results from samples collected in the past (i.e., prior to the shut-down) and not consistently increasing over time.

If VOC concentrations consistently increase over time at a well or wells located outside and downgradient of the waste mass, and within the treatment zone of the remedial systems (i.e., one or more of the wells identified above), one or both of the remedial systems (i.e., LFAS and SVE) may be partially or fully restarted. The determination of which of the existing remedial systems at the site, or portions of the systems, will be restarted will be made primarily with regard to the location of the well(s), contaminant(s) identified, and its concentration.

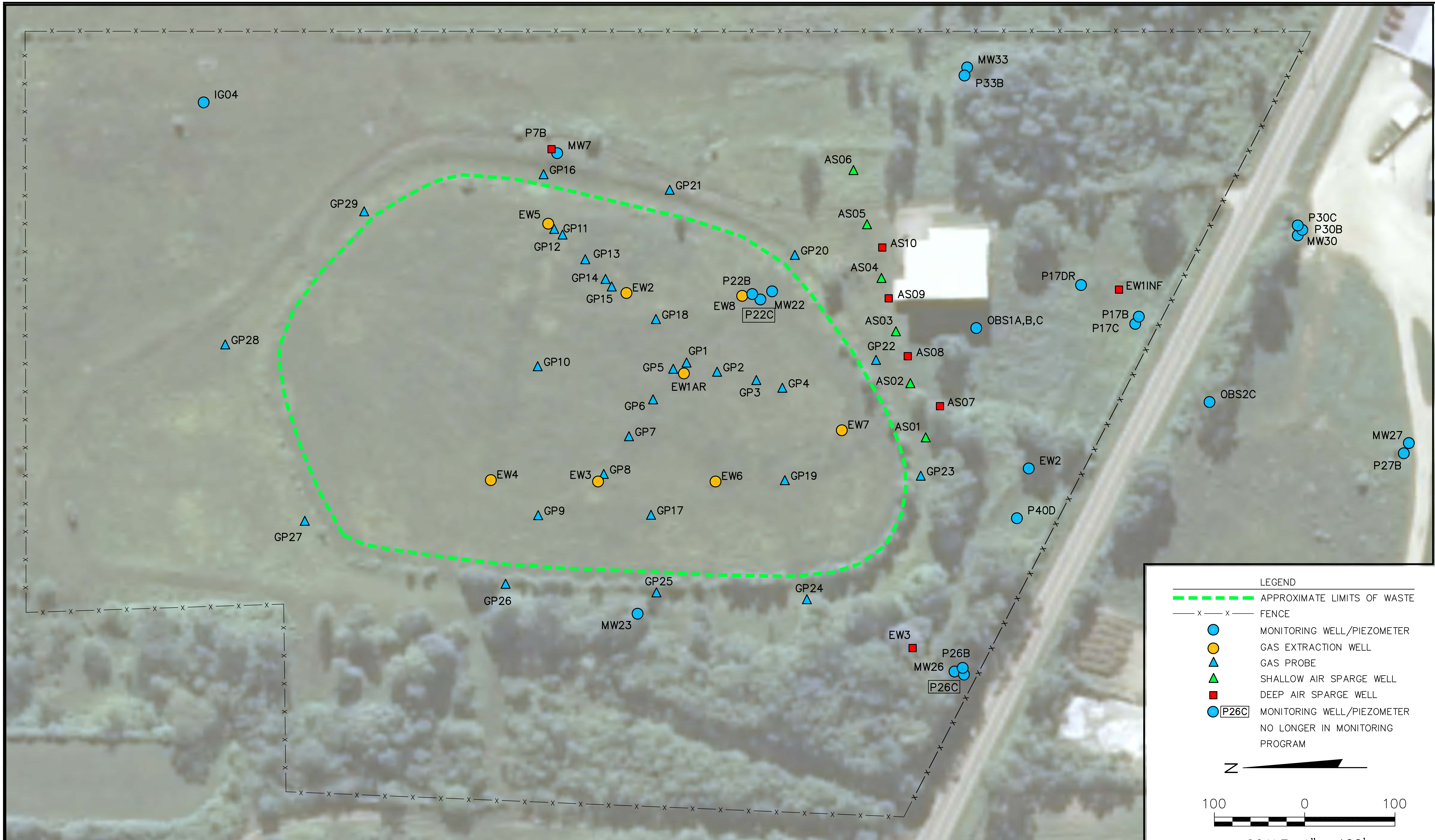
5.0 FUTURE ACTIVITIES

WMWI will notify USEPA if it believes that the rebound test should be terminated prior to the end of 2021, otherwise, WMWI will submit a technical memorandum in late 2021 after review of the data from the August 2021 sampling event. The technical memorandum will assess if sufficient information is available to support proceeding with the long-term shut-down of the remedial systems at the Site, if the temporary shut-down test should continue, or if one or both of the remedial systems should be partially or totally restarted.

If the concentrations of the identified COCs continue to be stable or declining over time, WMWI may include a formal request to modify the SCOU and GWOU remedial actions to a monitored natural attenuation (MNA) remedy and that the LFAS and SVE systems be permanently shut-down and decommissioned at the Site.

Appendix A

Referenced Figures from 2019 Annual Report (SCS, March 2020)



BASE IMAGE: USGS DIGITAL ORTHOPHOTO, 2010.

PROJECT NO.	25212002.00	DRAWN BY:	AHB
DRAWN:	02/11/13	CHECKED BY:	ZTW
REVISED:	02/06/19	APPROVED BY:	GS

ENGINEER: SCS ENGINEERS
2830 DAIRY DRIVE MADISON, WI 53718-6751
PHONE: (608) 224-2830

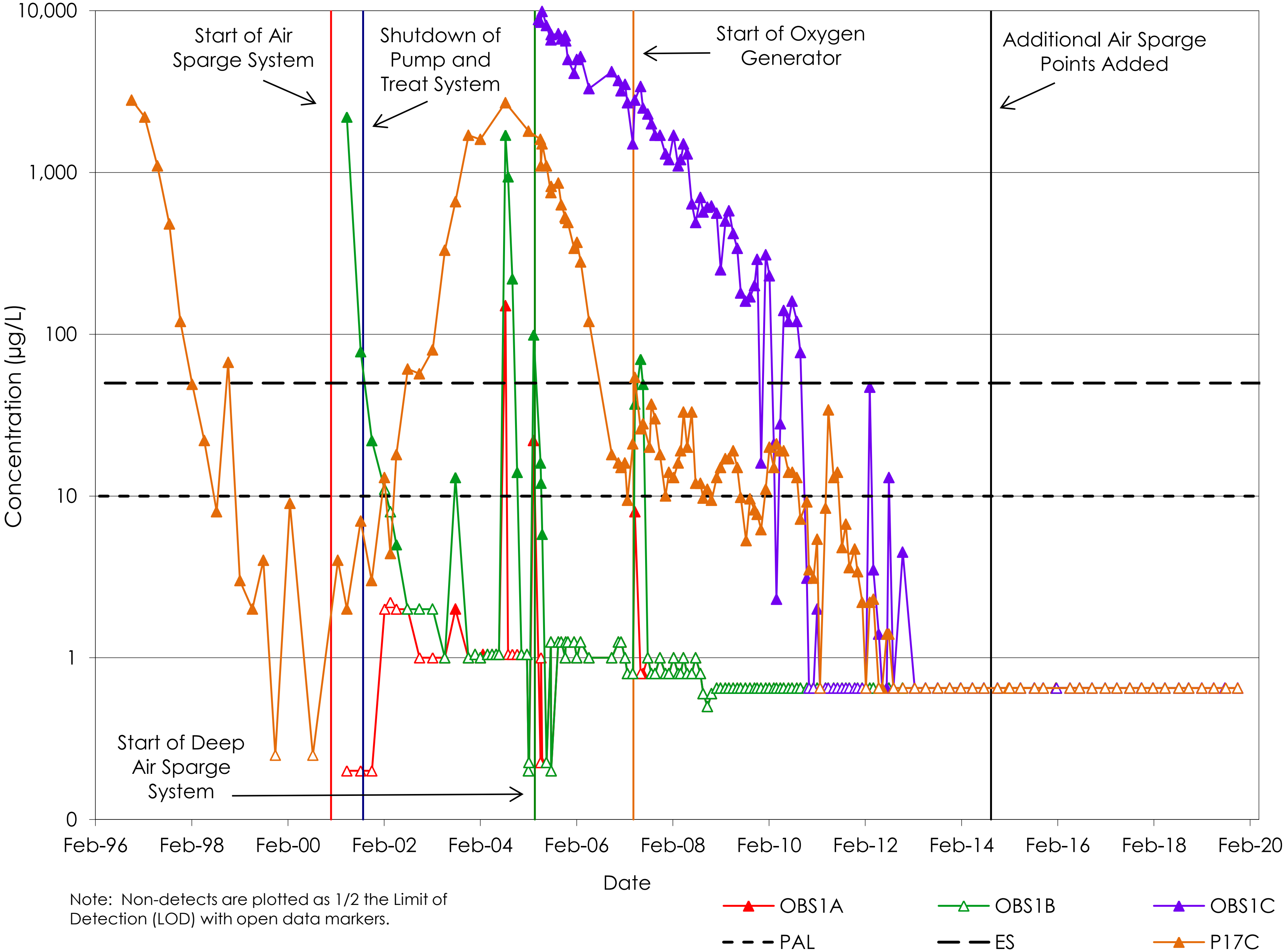
CLIENT: WASTE MANAGEMENT

SITE: HAGEN FARM SITE
TOWN OF DUNKIRK, DANE COUNTY
WISCONSIN

EXPANDED SITE FEATURES MAP

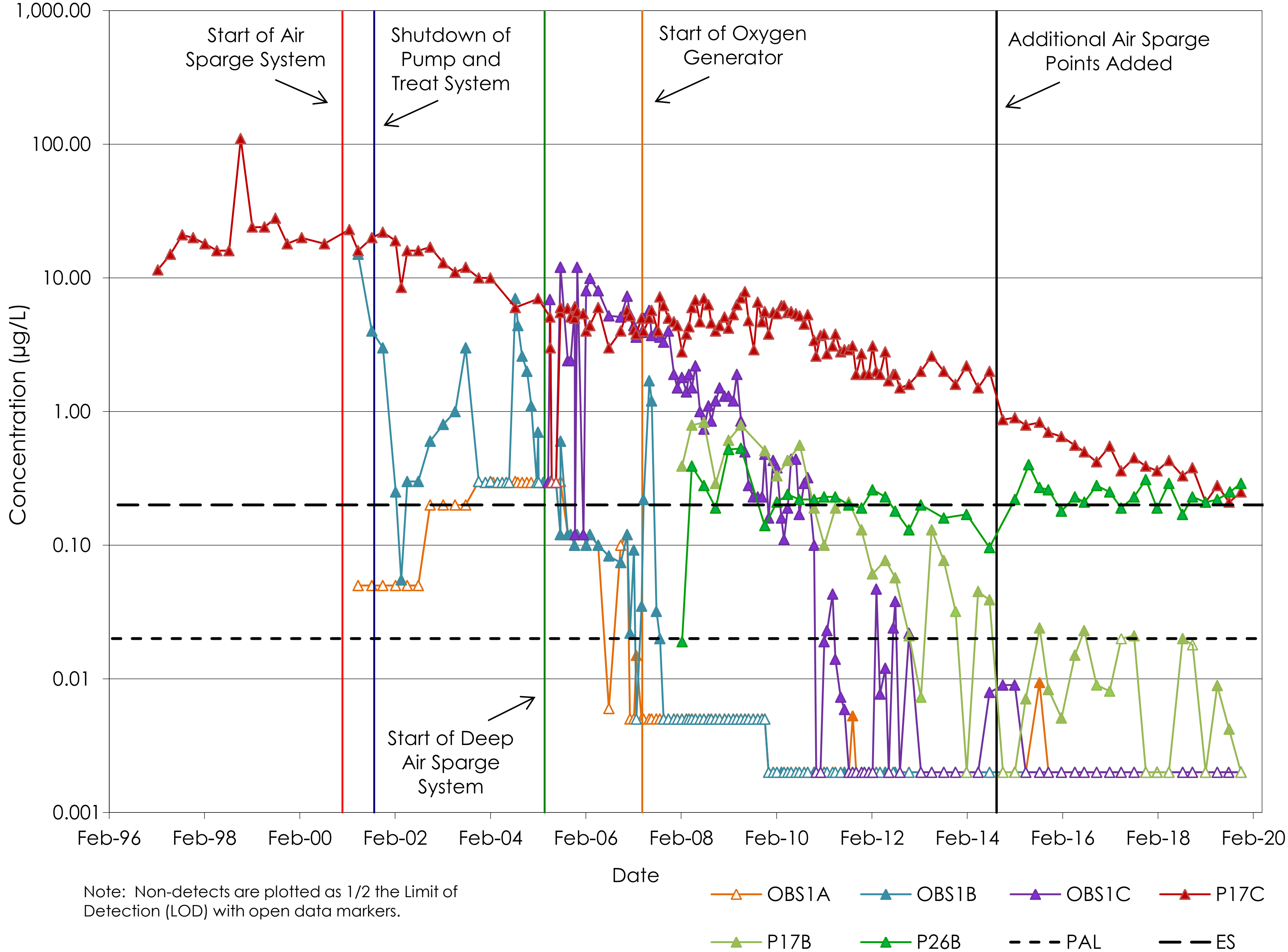
FIGURE
2

Figure 5
Tetrahydrofuran
On-Property Wells - Hagen Farm Site



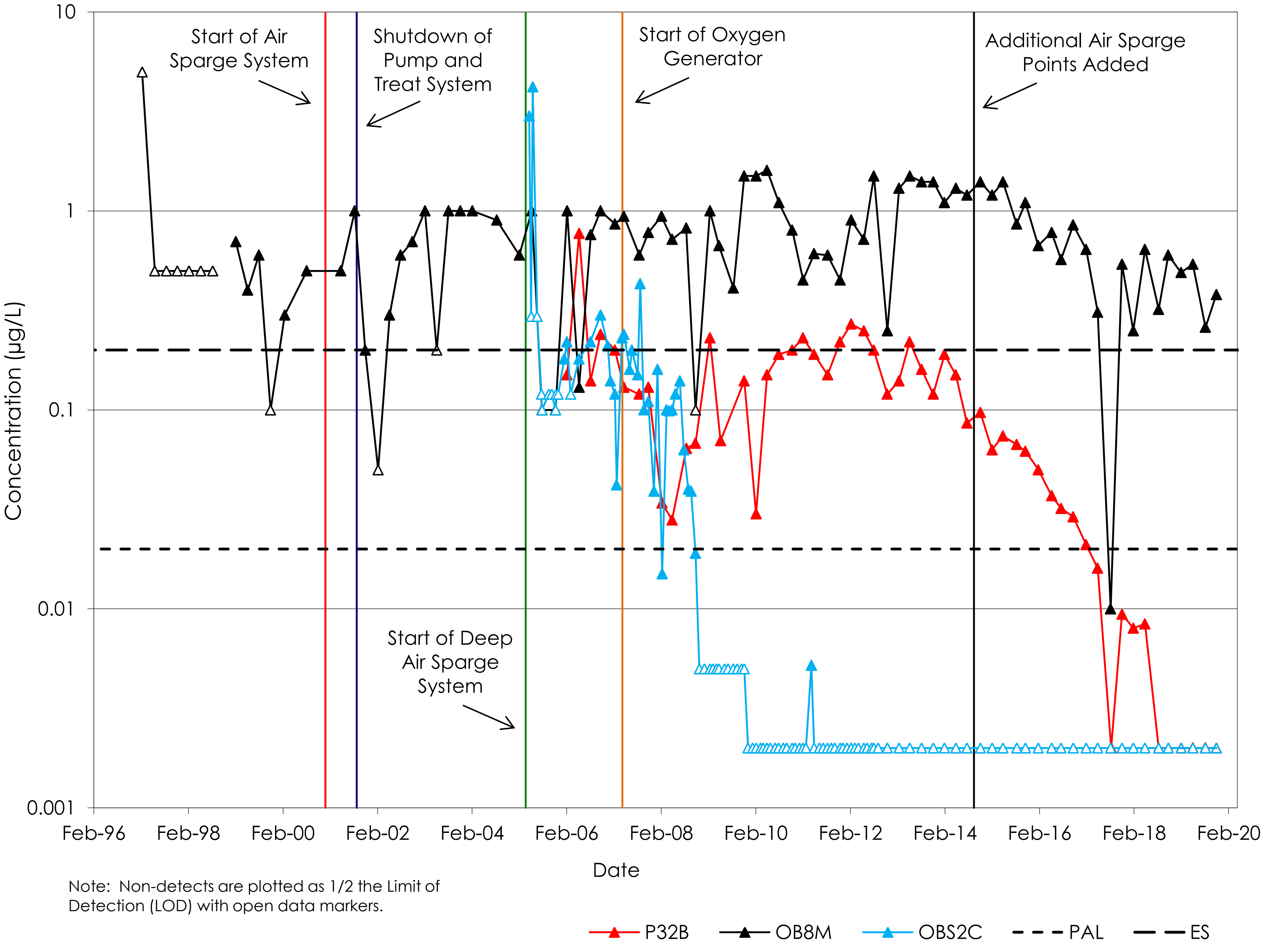
Note: Non-detects are plotted as 1/2 the Limit of Detection (LOD) with open data markers.

Figure 7
Vinyl Chloride
On-Property Wells - Hagen Farm Site



Note: Non-detects are plotted as 1/2 the Limit of Detection (LOD) with open data markers.

Figure 9
Vinyl Chloride
Off-Property Wells - Hagen Farm Site



Note: Non-detects are plotted as 1/2 the Limit of Detection (LOD) with open data markers.

Appendix B

Response to Comments (September 30, 2020)

1. What are the "identified COCs"? Will any other parameters be part of the study (e.g., dissolved oxygen)? What spatial monitoring locations will be included in the study?

As described in WMWI's July 9, 2019 correspondence, the identified contaminant of concern (COCs) are two volatile organic compounds (VOCs) – tetrahydrofuran (THF) and vinyl chloride. These VOCs have been or are currently quantified in laboratory analysis of periodic groundwater samples at the Site.

WMWI, and its consultant, will review all the data from implementation of the periodic (i.e., quarterly) groundwater monitoring program at the Site during the trial shutdown period. The data generally includes VOCs, metals, indicators and field parameters. The field parameters include dissolved oxygen. The data will be compared to historical data where warranted.

The current groundwater monitoring program includes wells located within or beneath the waste mass, at the edge of the waste mass, and further downgradient. The duration of the temporary shutdown test takes into account the annual sampling event of all wells in August.

2. Provide specific discussions regarding OB8M, P17C, and P26B.

Groundwater monitoring well OB8M (a.k.a. OB-08M) is located approximately 1,900 feet downgradient of the waste mass. As described in the 2019 Annual Report, vinyl chloride was reported at concentrations ranging from 0.26 to 0.54 µg/L in the four samples collected in 2019. The May result was 0.54 µg/L; the two subsequent quarterly results in 2019 were lower. The three quarterly vinyl chloride results to date in 2020 (February, May, and August) ranged from 0.21 µg/L in August to 0.33 µg/L in May.

Groundwater monitoring well P17C is located on the downgradient edge of the property, approximately 300 feet from the edge of the waste mass. The LFAS system was expanded in 2014 to include a former extraction well (EW1INF) in the vicinity of P17C and P17B. As described in the 2019 Annual Report, vinyl chloride was reported at P17C at concentrations ranging from 0.21 to 0.28 µg/L in the four samples collected in 2019. The three quarterly vinyl chloride results to date in 2020 (February, May, and August) ranged from 0.12 µg/L in August to 0.15 µg/L in May. It should be noted that the vinyl chloride was also reported in analysis of two of the four quarterly samples at another nearby well - P17B in 2019. The concentrations there were lower and ranged from 0.0042 to 0.0089 µg/L. Vinyl chloride was identified in two of the three quarterly samples from P17B, at concentrations ranging from 0.0067 in August to 0.0084 µg/L in May.

Groundwater monitoring well P26B is also located on the downgradient edge of the property, approximately 200 feet from the edge of the waste mass. The LFAS system was expanded in 2014 to include a former extraction well (EW3) in the vicinity of P26B. As described in the 2019 Annual Report, vinyl chloride was reported at concentrations ranging from 0.21 to 0.29 µg/L in the four samples collected in 2019. The three quarterly vinyl chloride results to date in 2020 (February, May, and August) ranged from 0.22 µg/L in May to 0.39 µg/L in August.

It should be noted that the expansion of the LFAS in 2014 also included well P7B which is located in close proximity to the waste mass. The addition of that point to the LFAS system has resulted in a reduction and decrease in the frequency of concentrations of THF at the other well at that nest – MW7. THF has not been quantified at concentrations above the PAL at MW7 during the first 12 months of the trial shutdown.

As noted in the 2019 Annual Report, THF was historically the COC with the highest concentrations in the vicinity of the waste mass. The concentrations have decreased over time, to the extent that there were no concentrations in the data from 2019 that exceeded the Preventive Action Limit or PAL (10 µg/L) in NR 140 Wis. Adm. Code. The decrease in THF concentration over time is evident in the data from wells OBS1C and P17C. It should be noted that there was only one concentration that exceeded that PAL in the quarterly data since the temporary shutdown was initiated. That concentration (18 µg/L) was above the PAL, but below the Enforcement Standard (ES) in Chapter NR 140 Wis. Adm. Code. There is no federal Maximum Contaminant Level (MCL) for THF. The concentration was identified in the sample from well MW22 which is a shallow well located within the waste mass at the Site. The THF concentration at MW22 is relatively low, less than the ES, and THF is not present in samples from wells located further downgradient of the waste mass.

3. Discuss PALs vs. ESs vs. MCLs both generally, and for the COCs.

None of the vinyl chloride concentrations summarized in the response to #2 above or in any of the data since August 2014 are greater than the federal MCL of 2 µg/L. The highest concentration of vinyl chloride identified in analysis of samples from 2019 was in the May sample from OB-08M (0.54 µg/L); the two subsequent quarterly results in 2019 were lower. Given the distance of this well from the waste mass at the Site, the temporary shutdown is not likely to have a direct impact on the results from that well.

As previously stated, there is no MCL for THF. The State of Wisconsin in Chapter NR140 of the Wis. Adm. Code established a PAL and ES for THF of 10 and 50 µg/L, respectively. As previously stated, no concentrations prior to or subsequent to the temporary shutdown have exceeded the ES.

4. Add discussion regarding the concentrations of VC in the offsite wells. Further, there is no discussion of VC concentrations in OB8M. How and when is this VC concentration expected to decrease, or is another approach going to be proposed for this location?

The only off-site well where vinyl chloride is present above state/WDNR groundwater criteria is OB8M. As previously indicated, given the distance of this well from the waste mass at the Site, the temporary shutdown is not likely to have a direct impact on the results from that well. As indicated on Figure 9 from the 2019 Annual Report, the vinyl chloride concentrations at that well have remained stable over time. This is likely due to natural attenuation. WMWI expects that natural attenuation will remain an appropriate remedial action for the concentrations of vinyl chloride identified at that well.

5. In reference to Page 1, Par 3 last sentence of both letters, please identify the “sample points” by name.

The sample points where vinyl chloride has been identified in samples are identified in the data screening tables included in the quarterly and annual reports. In 2019, vinyl chloride was identified at concentrations above the PAL or ES in samples from a total of three wells at the Site including OB-08M, P17C and P26B.

The data from the first three quarters in 2020 indicate vinyl chloride at concentrations above the PAL or ES in samples from a total of five wells including OB8M, P17C, P26B, MW22 and P22B. As previously discussed, wells MW22 and P22B are located within the waste mass at the Site. The concentrations at each of those wells (MW22 and P22B) in 2020 were above the PAL, but below the concentration established as the ES. No concentrations are greater than the MCL (2 µg/L).

6. How will WMWI determine that the rebound test has run sufficiently long to evaluate long- term MNA, as distinct from the residual impacts of long-term LFAS operation? Is there sufficient evidence to demonstrate that the impacts of the November 2014 expansion of the LFAS system can be separated from the impacts of the trial shutdown?

WMWI expects that the potential for a direct rebound (i.e., immediate increase in contaminant concentrations) due to the presence of residual contaminant mass in proximity to the groundwater monitoring points would be apparent within 12 months (i.e. four quarterly sampling events) of shutting down the remedial systems at the Site. Collection of data to evaluate the effectiveness of natural attenuation will likely take longer. WMWI is proposing to submit a technical memorandum after review of the data from the initial 24-month period to assess the conditions at the Site. The Technical Memorandum will assess if sufficient information is available to support proceeding with the shutdown of the remedial systems at the Site, or if the temporary shutdown test should continue.

7. The top paragraph on page 2 of both letters suggests that because there has been a "relatively long period" of operation, a short-term trial shutdown would likely have little impact on groundwater quality. How, then, would the impact of MNA processes be separated from the residual effect of the long-term active operation?

WMWI expects that the operation of the remedial systems at the Site have addressed the contaminant mass in the immediate vicinity of the treatment points (SVE or LFAS), but data is needed to confirm that expectation. Given the Site conditions, it is acceptable to shut down the remedial systems to obtain this data now. A component of the operation of the LFAS system was to treat groundwater downgradient of the waste mass, to reduce the mass of contaminants dissolved in groundwater that is expected to dissipate in groundwater as it flows downgradient. By monitoring downgradient groundwater over time, without the remedial systems in operation, WMWI believes that data will be obtained to assess how much of the contaminant mass was addressed by operation of the remedial systems and what mass was addressed by natural attenuation.

8. How will data be assessed and how will decisions based on the data be made? These should be established. The key decision points proposed in the next-to-last paragraph of page 2 in both letters would need to be incorporated into such an extended discussion.

As previously presented, a preliminary evaluation of the data will be included with the quarterly groundwater data submittals. A more detailed evaluation will be included in the annual reports and in the technical memorandum described above.

9. The premise and the conclusion are not complete—what happens if eight quarters of data are ambiguous or contain residual effects from long-term operation? What if a well does not clearly show stable or decreasing concentrations over the course of the eight (or more) quarters? What methods for evaluating MNA will be used? How, if at all, does a reasonable time-to-cleanup fit into the decision?

The goal of the temporary shutdown is to attempt to distinguish between the effects of operation of the remedial systems at the Site and natural processes (i.e., natural attenuation). WMWI proposed review of eight quarters of data as an initial evaluation. More time may be necessary. That should become clear as the data is generated. If concentrations begin to increase at wells outside the waste mass, one or both of the remedial systems may need to be restarted. No adverse residual effects are anticipated from long-term operation of the SVE or LFAS systems. Both systems only supplemented the natural oxygen concentrations in the subsurface while in operation.

As previously described, the remedial systems at the Site have been operated for a relatively long period of time. Their effectiveness, with regard to impact on “time-to-cleanup,” has likely decreased over time, thus we don’t expect this evaluation to significantly affect the time it would take for groundwater to be remediated to meet cleanup goals. As previously described, the operation of the remedial systems at the Site have resulted in a general decrease in concentrations of COCs in groundwater, in that concentrations of COCs are currently below cleanup criteria except at three wells (OB8M, P17C and P26B).

10. As stated in the last paragraph in the July 2019 letter, if increases of COC concentrations over two consecutive quarters are identified and evaluated, how will you determine which of the alternatives “including partial or total restart of the SVE and LFAS systems” will be employed?

The criteria of an increase over two consecutive quarters is relevant because a number of the concentrations are low (less than 1 µg/L). The magnitude of the change in concentration and relation to any groundwater quality criteria will also be assessed. The data will also be evaluated with regard to locational criteria in that some rebound is expected at wells located within the waste mass at the Site.

The determination of which of the existing remedial systems at the site will be restarted will be made primarily with regard to the location of the well(s), contaminant(s) identified, and its concentration.

11. We agree that sampling data should be presented in annual reports for the site, since this study would span multiple years. However, the evaluation of "… the contribution of natural attenuation in the observed reductions in contaminant concentrations in groundwater at the site" (see page 1, par. 4, sentence 2) should be presented in a stand-alone document assessing the effectiveness of MNA as the potential remedy.

WMWI anticipates that a technical memorandum will be prepared after review of the data from the first eight quarters of data are available. It is possible that the recommendation of that evaluation would be to extend the demonstration period beyond 24 months, especially if no adverse impacts to groundwater are observed.

12. Please note that the groundwater remedy would still need to address an Institutional Controls component, in addition to MNA.

As described in the annual reports for the Site, a number of institutional controls are already in place on WMWI's property at the Site. Based on the existing conditions at the Site, additional ICs to address property owned by others is not necessary. There is only one off-property well where concentrations are above state/WDNR cleanup goals – OB8M. There is only one contaminant typically identified in samples from that well – vinyl chloride. The vinyl chloride concentrations at that well are stable or decreasing over time and are not in excess of the MCL.

WMWI has established a process to periodically assess the effectiveness of the existing ICs in that any nearby development is identified and presented in the annual reports. If there is no change in the existing land use, there is no reason to implement additional ICs on the offsite property.

Appendix C

Groundwater Monitoring Program

Groundwater Monitoring Program
February 2013
Hagen Farm / SCS Engineers Project #25212002.00

Well ID	Well Type	Sampling Frequency and Parameter Set		
		May/November (Quarterly)	February (Semi-annual)	August (Annual)
IG04	WT		X	X
MW100	WT	(1)	(1)	X
MW7	WT		X	X
MW22	WT	X	X	X
MW23	WT		(1)	X
MW26	WT		X	X
MW27	WT		X	X
MW29	WT		(1)	X
MW30	WT	(1)	(1)	X
MW32	WT	(1)	(1)	X
MW33	WT	(1)	X	X
OBS1A	WT	X	X	X
OBS1B	PZ(BD)	X	X	X
OBS1C	PZ(BD)	X	X	X
OBS2C	PZ(BD)	X	X	X
OB8M	PZ(BD)	X	X	X
OB11M	PZ(USD)		X	X
P17B	PZ(USD)	X	X	X
P17C	PZ(BD)	X	X	X
P17DR	PZ(BD)	(1)	X	X
P22B	PZ(USD)	X	X	X
P26B	PZ(USD)		X	X
P27B	PZ(USD)		X	X
P28B	PZ(USD)		X	X
P28C	PZ(BD)		(1)	X
P29B	PZ(USD)		(1)	X
P29C	PZ(BD)		(1)	X
P30B	PZ(USD)		(1)	X
P30C	PZ(BD)		(1)	X
P32B	PZ(BD)	X	X	X
P33B	PZ(BD)		(1)	X
P35B	PZ(BD)		(1)	X
P40D	PZ(BD)		(1)	X
PW2	PW			X
PW3	PW			X
PW4	PW			X
PW5	PW			X
PW9	PW			X

Abbreviations:
(1) = Water Level Only
X = Monitoring well proposed to be sampled
PW = Private Well
PZ(BD) = Piezometer screened in bedrock
PZ(USD) = Deep piezometer screened in unconsolidated sediment
WT = Shallow piezometer screened in unconsolidated sediment

Notes:
1) Water elevations are not measured at private wells.
2) Private well samples are not filtered.

Groundwater Monitoring Program
February 2013
Hagen Farm / SCS Engineers Project #25212002.00

Groundwater Parameter List		
Annual	**Semiannual**	**Quarterly**
Indicator Parameters		
Hardness-Total As $CaCO_3$ (Filtered)	Sulfate-Dissolved	Sulfate-Dissolved
Total Dissolved Solids (TDS)	Alkalinity, Filtered	Alkalinity, Filtered
Total Suspended Solids (TSS)	Nitrate+Nitrite-Dissolved	Nitrate+Nitrite-Dissolved
Chloride-Dissolved		
Sulfate-Dissolved		
Alkalinity, Filtered		
Cyanide - Soluble		
Ammonia - Dissolved		
Soluble Total Kjeldahl Nitrogen		
Nitrate+Nitrite-Dissolved		
Chemical Oxygen Demand-Dissolved		
Phosphorous-Dissolved		
Field Parameters		
pH (Field)	pH (Field)	pH (Field)
Temperature (Field Test)	Temperature (Field Test)	Temperature (Field Test)
Electrical Conductance (Field)	Electrical Conductance (Field)	Electrical Conductance (Field)
Field EH/ORP	Field EH/ORP	Field EH/ORP
Color	Color	Color
Dissolved Oxygen (DO) (Field Test)	Dissolved Oxygen (DO) (Field Test)	Dissolved Oxygen (DO) (Field Test)
Odor	Odor	Odor
Turbidity	Turbidity	Turbidity
Water Elevation	Water Elevation	Water Elevation
Metals		
Aluminum, Dissolved	Barium, Dissolved	Iron, Dissolved
Barium, Dissolved	Iron, Dissolved	Manganese, Dissolved
Calcium, Dissolved	Manganese, Dissolved	
Chromium, Dissolved	Arsenic, Dissolved	
Cobalt, Dissolved	Lead, Dissolved	
Copper, Dissolved	Mercury, Dissolved	
Iron, Dissolved		
Magnesium, Dissolved		
Manganese, Dissolved		
Nickel, Dissolved		
Potassium, Dissolved		
Silver, Dissolved		
Sodium, Dissolved		
Vanadium, Dissolved		
Zinc, Dissolved		
Antimony, Dissolved		
Arsenic, Dissolved		
Beryllium, Dissolved		
Cadmium, Dissolved		
Selenium, Dissolved		
Thallium, Dissolved		
Mercury, Dissolved		
VOCs		
See Attached List of Compounds (8260C)	**See Attached List of Compounds (8260C)**	**See Attached List of Compounds (8260C)**
Vinyl Chloride (SIM)	**Vinyl Chloride (SIM)**	**Vinyl Chloride (SIM)**

Abbreviations:
SIM = Select Ion Methodology

Notes:
1) Water elevations are not measured at private wells.
2) Private well samples are not filtered.

Groundwater Monitoring Program
February 2013
Hagen Farm / SCS Engineers Project #25212002.00

Volatile Organic Compounds		
1,1,1-Trichloroethane	Bromoform	Methyl Ethyl Ketone
1,1,2,2-Tetrachloroethane	Bromomethane	Methyl Isobutyl Ketone
1,1,2-Trichloroethane	Carbon Disulfide	Methylene chloride
1,1-Dichloroethane	Carbon Tetrachloride	Methyl-t-Butyl Ether (MTBE)
1,1-Dichloroethene	Chlorobenzene	Naphthalene
1,2,4-Trichlorobenzene	Chloroethane	Styrene
1,2-Dibromo-3-Chloropropane DBCP	Chloroform	Tetrachloroethene
1,2-Dibromoethane (EDB)	Chloromethane	Tetrahydrofuran
1,2-Dichlorobenzene	cis-1,2-Dichloroethene	Toluene
1,2-Dichloroethane	cis-1,3-Dichloropropene	Total Xylenes
1,2-Dichloropropane	Dibromochloromethane	trans-1,2-Dichloroethene
1,3-Dichlorobenzene	Dibromomethane	trans-1,3-Dichloropropene
1,4-Dichlorobenzene	Dichlorobromomethane	Trichloroethene
2-Hexanone	Dichlorodifluoromethane	Trichlorofluoromethane
Acetone	Ethylbenzene	Vinyl chloride
Benzene		

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD (SR-6J)
CHICAGO, ILLINOIS 60604-3590

REPLY TO THE ATTENTION OF: SR-6J

January 6, 2021

Michael L. Peterson, P.E.
Waste Management
Closed Sites Management Group
Waste Management, Inc.
W124N9355 Boundary Road
Menomonee Falls, Wisconsin 53051

VIA ELECTRONIC MAIL

Re: Work Plan for Rebound Test GCOU and SCOU Remedies at the Hagen Farm Superfund Site, Dane County, WI (Dec 9, 2020) and Related Quality Assurance

Dear Mike,

I have had a chance to take a cursory look at the Work Plan for Rebound Test GCOU and SCOU Remedies dated Dec 9, 2020. One thing I noted is that the body of the Work Plan should incorporate EPA's comments, which are currently provided in Appendix B of the Work Plan. It is difficult for the reader to flip back and forth from the main document to Appendix B to get all of the information—it should be integrated. I was also reviewing the performance/groundwater quality monitoring and interim data evaluation sections. These sections do not reference any typical work plan and QAPP operational documents, and there is no list of references provided. As with another long-standing groundwater site I have worked on, various workplans that modify the remedy or that use original groundwater monitoring QAPPs from the 1980s and 1990s must be updated to reflect the current practices.

A common misconception about QAPPs in the Superfund program is that they are required to be resubmitted to our QA chemists for review and approval every 5 years. This is not correct: EPA QA/R-5, EPA Requirements for Quality Assurance Project Plans, (March 2001, reissued May 2006), states the following:

"For programs or projects of long duration, such as multi-year monitoring programs or projects using a generic QA Project Plan, the QA Project Plans shall be reviewed at least annually by the EPA Project Manager (or authorized representative). When revisions are necessary, the QA Project Plan must be revised and resubmitted for review and approval."

An authorized representative can include contractors and PRP technical consultants if appropriate. As we enter a new phase of this project, it is critical that this task be performed.

Documentation is necessary to show that a review was completed, and that either no changes are warranted, or a revision is necessary. A revision is necessary "When changes affect the scope, implementation, or assessment of the outcome, the plan is revised to keep project information current." Examples of changes that would require a revision would be a change in laboratories, reporting limits, laboratory SOPs, parameters analyzed, changes in contractors, etc. If a QAPP is revised, it needs to be reviewed and approved by a Superfund Division QA Chemist.

Because this project qualifies as a long duration or multi-year monitoring, it is important to start this review process immediately, in order to support the results of the pilot study as well as potential future MNA remedy. Most of the QA activities preceded my involvement (and possibly yours) at the site. The most relevant documents I found include:

- Groundwater Monitoring Plan, Groundwater Control Operable Unit, (Warzyn, July 1993)
- LFAS Implementation and Monitoring Plan (Montgomery Watson; Jan 1, 2000).
- Air Sparging System Performance Assessment (Montgomery Watson, Oct 27, 2004)
- Air sparging System Performance Assessment and Workplan (Montgomery Watson, Jan 1, 2005). This document included the Jan 1, 2000 LFAS Implementation and Monitoring Plan as Appendix A. Section 3 of this document references QAPP and FSP amendments, which were updated SOPs in Appendix C.

It is difficult to trace the lineage of these work plan/QAPP documents as they are included as appendices and attachments to multiple documents. I have been trying to identify the most recent QAPP-related documents to determine if any changes have occurred regarding groundwater monitoring-- the only relevant sampling activity at this site. It is important for us to sort through this material to make these determinations, as this information would also need to be referenced in a ROD and be included as supporting documents. Please let me know if you have any questions.

Sincerely,

Sheila A. Sullivan

Sheila A. Sullivan
Remedial Project Manager
Superfund & Emergency Management Division
U.S. EPA Region 5
Tel: (312) 886-5251
Email: sullivan.sheila@epa.gov

cc: Trevor Bannister, WDNR
Mike Prattke, SCS Engineers

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD (SR-6J)
CHICAGO, ILLINOIS 60604-3590

REPLY TO THE ATTENTION OF: SR-6J

August 19, 2021

Michael L. Peterson, P.E.
Waste Management
Closed Sites Management Group
Waste Management, Inc.
W124 N9355 Boundary Road
Menomonee Falls, Wisconsin 53051

VIA ELECTRONIC MAIL

Re: Required Information and Documentation to Support Pilot Shutdown of Active Remediation Systems at the Hagen Farm Site, Stoughton, WI

Dear Mr. Peterson,

With the sixth five-year review behind us, I would like to focus on the pilot shutdown which involves rebound testing of the active remediation systems—low-flow air sparge (LFAS) and soil vapor extraction (SVE) at the Hagen Farm site. Waste Management of Wisconsin, Inc. (WMWI) plans to use the data collected under the pilot shutdown to support a future remedy change from active remediation to monitored natural attenuation (MNA).

In July 2019, WMWI indicated to the U.S. Environmental Protection Agency (EPA) via a letter/scope of work that it would be undertaking a pilot shutdown of the active remediation systems in order to conduct a rebound study. The study commenced in September 2019. EPA provided comments detailing revisions to the scope of work which would result in an acceptable workplan in September 2020. A revised workplan was submitted by WMWI in December 2020. In January 2021, EPA requested additional revisions to the workplan and that the Quality Assurance Project Plan (QAPP) be updated as required. EPA is awaiting these revised documents. For your convenience, I have attached the January 2021 letter from EPA which provides more detail.

The two-year pilot test is scheduled to end in September 2021. As you have indicated, WMWI plans to request approval to continue the pilot study based on the rebound test data collected so far. EPA is in the process of reviewing this data. When we have completed our assessment, we will be able to determine how well the data support continuing the pilot shutdown as well as some indication of the potential effectiveness of MNA as a final remedy. However, continuation of the pilot study is also contingent upon a final approved workplan and updated QAPP documents. A Record of Decision (ROD) Amendment cannot be supported without all of the necessary foundational documents.

WMWI is ultimately proposing to request a change to the selected remedy from SVE and LFAS for the source control and groundwater control operable units, respectively, to MNA. For EPA to make and defend such a decision, there must be clear lines of evidence demonstrated by the monitoring data from the rebound testing, as well as sufficient documentation to support an MNA ROD Amendment. The workplan and updated QAPP will ensure that the necessary and appropriate information is provided (e.g., rationale, methods, procedures, etc,) and that the current and future data produced under this pilot study are defensible and can support a change from the current remedy. Upon receipt of these documents, I will make every effort to expedite the review process.

I hope this letter clarifies EPA's expectations. If you have any questions, please do not hesitate to contact me.

Best regards,

Sheila A. Sullivan

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Attachment

cc: B.J. LeRoy, WDNR
Mike Prattke, SCS Engineers
Jeffrey Cahn, ORC

Appendix B

Groundwater Monitoring Program

Groundwater Monitoring Program
February 2013
Hagen Farm / SCS Engineers Project #25212002.00

Well ID	Well Type	Sampling Frequency and Parameter Set		
		May/November (Quarterly)	February (Semi-annual)	August (Annual)
IG04	WT		X	X
MW100	WT	(1)	(1)	X
MW7	WT		X	X
MW22	WT	X	X	X
MW23	WT		(1)	X
MW26	WT		X	X
MW27	WT		X	X
MW29	WT		(1)	X
MW30	WT	(1)	(1)	X
MW32	WT	(1)	(1)	X
MW33	WT	(1)	X	X
OBS1A	WT	X	X	X
OBS1B	PZ(BD)	X	X	X
OBS1C	PZ(BD)	X	X	X
OBS2C	PZ(BD)	X	X	X
OB8M	PZ(BD)	X	X	X
OB11M	PZ(USD)		X	X
P17B	PZ(USD)	X	X	X
P17C	PZ(BD)	X	X	X
P17DR	PZ(BD)	(1)	X	X
P22B	PZ(USD)	X	X	X
P26B	PZ(USD)		X	X
P27B	PZ(USD)		X	X
P28B	PZ(USD)		X	X
P28C	PZ(BD)		(1)	X
P29B	PZ(USD)		(1)	X
P29C	PZ(BD)		(1)	X
P30B	PZ(USD)		(1)	X
P30C	PZ(BD)		(1)	X
P32B	PZ(BD)	X	X	X
P33B	PZ(BD)		(1)	X
P35B	PZ(BD)		(1)	X
P40D	PZ(BD)		(1)	X
PW2	PW			X
PW3	PW			X
PW4	PW			X
PW5	PW			X
PW9	PW			X

Abbreviations:
(1) = Water Level Only
X = Monitoring well proposed to be sampled
PW = Private Well
PZ(BD) = Piezometer screened in bedrock
PZ(USD) = Deep piezometer screened in unconsolidated sediment
WT = Shallow piezometer screened in unconsolidated sediment

Notes:
1) Water elevations are not measured at private wells.
2) Private well samples are not filtered.

Groundwater Monitoring Program
February 2013
Hagen Farm / SCS Engineers Project #25212002.00

Groundwater Parameter List		
Annual	**Semiannual**	**Quarterly**
Indicator Parameters		
Hardness-Total As $CaCO_3$ (Filtered)	Sulfate-Dissolved	Sulfate-Dissolved
Total Dissolved Solids (TDS)	Alkalinity, Filtered	Alkalinity, Filtered
Total Suspended Solids (TSS)	Nitrate+Nitrite-Dissolved	Nitrate+Nitrite-Dissolved
Chloride-Dissolved		
Sulfate-Dissolved		
Alkalinity, Filtered		
Cyanide - Soluble		
Ammonia - Dissolved		
Soluble Total Kjeldahl Nitrogen		
Nitrate+Nitrite-Dissolved		
Chemical Oxygen Demand-Dissolved		
Phosphorous-Dissolved		
Field Parameters		
pH (Field)	pH (Field)	pH (Field)
Temperature (Field Test)	Temperature (Field Test)	Temperature (Field Test)
Electrical Conductance (Field)	Electrical Conductance (Field)	Electrical Conductance (Field)
Field EH/ORP	Field EH/ORP	Field EH/ORP
Color	Color	Color
Dissolved Oxygen (DO) (Field Test)	Dissolved Oxygen (DO) (Field Test)	Dissolved Oxygen (DO) (Field Test)
Odor	Odor	Odor
Turbidity	Turbidity	Turbidity
Water Elevation	Water Elevation	Water Elevation
Metals		
Aluminum, Dissolved	Barium, Dissolved	Iron, Dissolved
Barium, Dissolved	Iron, Dissolved	Manganese, Dissolved
Calcium, Dissolved	Manganese, Dissolved	
Chromium, Dissolved	Arsenic, Dissolved	
Cobalt, Dissolved	Lead, Dissolved	
Copper, Dissolved	Mercury, Dissolved	
Iron, Dissolved		
Magnesium, Dissolved		
Manganese, Dissolved		
Nickel, Dissolved		
Potassium, Dissolved		
Silver, Dissolved		
Sodium, Dissolved		
Vanadium, Dissolved		
Zinc, Dissolved		
Antimony, Dissolved		
Arsenic, Dissolved		
Beryllium, Dissolved		
Cadmium, Dissolved		
Selenium, Dissolved		
Thallium, Dissolved		
Mercury, Dissolved		
VOCs		
See Attached List of Compounds (8260C)	**See Attached List of Compounds (8260C)**	**See Attached List of Compounds (8260C)**
Vinyl Chloride (SIM)	**Vinyl Chloride (SIM)**	**Vinyl Chloride (SIM)**

Abbreviations:
SIM = Select Ion Methodology

Notes:
1) Water elevations are not measured at private wells.
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Volatile Organic Compounds		
1,1,1-Trichloroethane	Bromoform	Methyl Ethyl Ketone
1,1,2,2-Tetrachloroethane	Bromomethane	Methyl Isobutyl Ketone
1,1,2-Trichloroethane	Carbon Disulfide	Methylene chloride
1,1-Dichloroethane	Carbon Tetrachloride	Methyl-t-Butyl Ether (MTBE)
1,1-Dichloroethene	Chlorobenzene	Naphthalene
1,2,4-Trichlorobenzene	Chloroethane	Styrene
1,2-Dibromo-3-Chloropropane DBCP	Chloroform	Tetrachloroethene
1,2-Dibromoethane (EDB)	Chloromethane	Tetrahydrofuran
1,2-Dichlorobenzene	cis-1,2-Dichloroethene	Toluene
1,2-Dichloroethane	cis-1,3-Dichloropropene	Total Xylenes
1,2-Dichloropropane	Dibromochloromethane	trans-1,2-Dichloroethene
1,3-Dichlorobenzene	Dibromomethane	trans-1,3-Dichloropropene
1,4-Dichlorobenzene	Dichlorobromomethane	Trichloroethene
2-Hexanone	Dichlorodifluoromethane	Trichlorofluoromethane
Acetone	Ethylbenzene	Vinyl chloride
Benzene		