2022 Annual Report

Hagen Farm
Town of Dunkirk
Dane County, Wisconsin

Prepared for:

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1.0 INTRODUCTION

This annual progress report (Report) summarizes the operation and maintenance (O&M) activities performed by Waste Management of Wisconsin, Inc. (WMWI) at the Hagen Farm site (Site) during the period January 1, 2022, through December 31, 2022. The Report is prepared in accordance with Section X, Reporting Requirements, of the Consent Decree dated August 2, 2007, between the U.S. Environmental Protection Agency (USEPA) and WMWI. As required by that document, the Report includes a summary of all results of sampling during 2022 and describes the actions taken during the year to achieve compliance with the Consent Decree.

Included are summaries of the following:

- Annual O&M of the source control operable unit (SCOU)
- Annual O&M of the groundwater control operable unit (GCOU)
- Results from periodic analysis of groundwater samples collected during this reporting period

The USEPA, in consultation with the Wisconsin Department of Natural Resources (WDNR), completed the sixth 5-year review (FYR) for the Site in 2021; the document was dated July 15, 2021. Thus, the seventh FYR is expected to occur in 2026.

Annual O&M of the GCOU includes periodic (i.e., quarterly) submittals of the groundwater data to the Groundwater and Environmental Monitoring System (GEMS) maintained by the WDNR. Complete copies of those submittals are provided to USEPA. The data in GEMS are available to the public on the internet. The dates of the transmittals for those quarterly submittals during this reporting period were March 31, 2022; July 19, 2022; October 21, 2022; and January 26, 2023.

An electronic copy of the 2021 annual report was transmitted to USEPA and WDNR on February 17, 2022; WMWI transmitted hard copies of the report, and electronic copies on compact disc (CD), by transmittal dated February 18, 2022.

WMWI transmitted a letter to USEPA dated January 4, 2016, proposing a temporary shutdown of the remedial systems at the Site to verify that O&M of those systems had been sufficiently effective over time so that contaminant concentrations in downgradient groundwater would not increase to unacceptable levels over time (i.e., rebound test) when those systems were not in operation. WMWI sent a follow-up letter to USEPA dated July 9, 2019, and subsequent email notification on September 3, 2019, indicating its intent to initiate the temporary shutdown in September 2019. As further described herein, the in situ vapor extraction (ISVE) system at the Site was shut down on September 12, 2019. The enhanced low flow air sparge (LFAS) system at the Site was shut down on September 4, 2019. USEPA approved the temporary shutdown by letter dated September 30, 2020, but requested that a work plan be submitted that addressed a number of specific points identified in the correspondence. A work plan was prepared by SCS Engineers (SCS) and electronically submitted to USEPA and WDNR on December 9, 2020. USEPA responded in letters dated January 6, 2021, and August 19, 2021. WMWI periodically evaluates the data from analysis of quarterly groundwater samples from select Site monitoring wells during the trial shutdown/rebound test to verify that concentrations of contaminants of concern (COCs), particularly volatile organic compounds (VOCs), do not increase to unacceptable concentrations.

As described in the work plan, the data from approximately 2 years after the systems were shut down was to be compiled in an interim assessment of groundwater quality. An electronic copy of the

report entitled LFAS and SVE Temporary Shutdown Interim Assessment Report was transmitted to the USEPA and WDNR by SCS on February 17, 2022; WMWI transmitted hard copies of the report, and electronic copies on compact disc (CD), by letter dated February 18, 2022. That report concluded that groundwater data to date has not identified an unacceptable increase in VOC concentrations in groundwater downgradient of the waste mass at the Site; thus, the temporary shutdown should continue for an additional two-year period. During that two-year period, preliminary assessments of the data would continue to be presented in the quarterly agency submittals and annual reports to identify any result(s) that could indicate a potentially unacceptable increase in concentration related to the temporary shutdown of the SVE and/or LFAS systems at the Site. After review of the data from the second two-year period, WMWI proposed to submit a subsequent (second) interim assessment report to evaluate if sufficient information is available to support proceeding with the shutdown of the remedial systems at the Site, if the temporary shutdown test should continue, or if one or both of the remedial systems (SVE and/or LFAS) should be partially or totally restarted. If the remedial systems were permanently shut down, the groundwater remedy at the Site would likely need to be formally modified to monitored natural attenuation (MNA).

USEPA's review of the LFAS and SVE Temporary Shutdown Interim Assessment Report and 2021 Annual Report were transmitted in a letter dated June 9, 2022. The comments in that document were discussed in a conference call/meeting with WMWI and SCS, USEPA and its consultant, and WDNR on July 22, 2022. During that meeting, WMWI/SCS presented updated time-concentration plots that included quarterly data obtained after the initial interim assessment report was submitted to demonstrate that a second two-year period interim assessment period was warranted, and that revisions to the initial interim report or 2021 Annual Report were not necessary at this time. WDNR's representative, Bruce LeRoy, indicated that he would follow up regarding the potential applicability of the current State of Wisconsin solid waste rules (NR 500 Wisconsin Administrative Code [Wis. Adm. Code]) to the data from the vapor/gas monitoring probes at the Site. The Hagen Farms Landfill is a licensed solid waste disposal site in Wisconsin.

USEPA transmitted two letters dated December 23, 2022, by electronic mail notifying WMWI of a change in the Remedial Project Manager (RPM) for the Site, effective January 1, 2023, and requesting an updated Quality Assurance Project Plan (QAPP) for the Site in accordance with current USEPA guidance documents. Mr. Jeff Thomas would be the interim contact for the Site, replacing Ms. Sheila Sullivan, who has retired from the USEPA, until a new RPM is assigned. A conference call was convened on January 13, 2023, with Mr. Thomas, WMWI, and SCS for purposes of introduction and to discuss the request for an updated QAPP. Mr. Thomas agreed that the requirement for an updated QAPP was tolled until inconsistencies between the data quality program requirements for a licensed solid waste facility in Wisconsin and current USEPA guidance documents for a QAPP are resolved. The data quality components of the WDNR Solid Waste program, under which the data in this submittal was obtained, are further described in this Report. Those specified components include sampling procedures; use of an approved laboratory that is subject to periodic audit; use of only approved laboratory methods; data quality qualifiers; and data screening, compilation, and reporting requirements.

There were no other plans or project deliverables completed or submitted to the USEPA or WDNR during 2022.

2.0 SCOU – ANNUAL O&M REPORTING

The SCOU O&M activities performed at the Site during the period January 1, 2022, through December 31, 2022, are summarized below. The remedial components of the SCOU include the cap

constructed atop the waste mass, the ISVE system constructed in the waste, and the institutional and access controls at the Site. The Site features are shown on **Figures 1** and **2**.

The landfill cap, which is approximately 6 acres in total area, consists of 24 inches of clay, a 12-inch drainage layer, a non-woven geotextile fabric, 18 inches of rooting zone soil, and 6 inches of topsoil suitable to support grassy vegetation.

The ISVE system consists of eight vertical vapor extraction wells, which are screened from the bottom of the waste through the sub-waste soils and down to groundwater, and a blower to generate vacuum at the wells. The exhaust from the blower discharges directly to the air in compliance with the substantive requirements of a Wisconsin air use permit (i.e., Ch. NR 445, Wis. Adm. Code - Control of Hazardous Pollutants). The ISVE system began operation in January 1994. The ISVE system was temporarily shut down on September 12, 2019, as part of the rebound test, and did not operate during the 2022 reporting period.

The institutional and access controls include a variety of mechanisms to provide notice of the Site to the public and address potential risks from direct contact with contaminated media. The institutional controls include a variety of multiple governmental and proprietary controls and informational devices. An Institutional Control Implementation and Assurance Plan (ICIAP) was prepared for the Site in June 2021. The access controls include the Site perimeter fencing. A summary of the institutional controls is included in the ICIAP (June 2021) and in **Section 2.1** of this Report. The annual monitoring activities associated with the existing institutional controls, and described in the ICIAP, are also presented in this Report.

2.1 PROGRESS MADE DURING THIS REPORTING PERIOD

Maintenance of the landfill cap continued in 2022. The vegetation atop the cap was mowed in July/August 2022 to control the growth of woody plant species. The annual Site inspection was performed on July 27, 2022, in accordance with the requirements of the Consent Decree. A copy of the Site inspection report prepared by WMWI for that event is included in **Appendix A.**

At the time of the annual inspection in July 2022, it was noted that the pipe on an ISVE well (EW5) had broken off at the soil surface. That well was repaired in August 2022 by SCS personnel who installed a Schedule 40 slip coupling with solvent to reconnect the sections of the 4-inch Schedule 40 PVC pipe.

Although the ISVE system was not operated during the 2022 reporting period, SCS personnel monitored the vapor/gas probes that were installed to assess the operation of the ISVE system on November 16, 2022. A summary of the results from that sampling event is presented in **Table 1**.

As the ISVE system was not operated during this reporting period, samples from the extraction wells and blower exhaust were not collected in 2022.

As further described in the ICIAP (June 2021), there is a variety of institutional controls in place to prevent exposure to contaminants in the vicinity of the Site including:

Institutional Controls

- Governmental controls
  - Local zoning is generally Farmland Preservation and implemented by the Town of Dunkirk and Dane County. This minimizes the potential for new residential development in the vicinity of the Site.

  - Local ordinances (i.e., Town of Dunkirk) that limit residential development in the area of the Site.
  - State Statues (NR 812.08(4) Wis. Adm. Code) that requires WDNR review of potable wells installed within 1,200 feet of a landfill.

- Proprietary controls
  - Deed restrictions on the WMWI property parcels where waste is present, and also nearby parcels that WMWI previously owned.

- Informational devices
  - The Site is identified on the state registry of contaminated properties (i.e., Bureau for Remediation and Redevelopment Tracking System [BRRTs]).
  - Site information is available through the USEPA website.
  - There is a notice on the deeds (i.e., deed notice) on the WMWI parcels where waste is present and also nearby parcels that WMWI previously owned.
  - Signs are posted on access points to WMWI property that identify the presence of the Site and USEPA contact information.
  - Groundwater results from the Site are available to the public in GEMS.

- Access controls
  - Perimeter fencing and controlled access points (i.e., locked gates).

WMWI implemented deed restrictions on the property that it currently owns, or has owned in the past, at the Site. Those deed restrictions are recorded and run with the land. In June 2006, WMWI submitted an Institutional Control (IC) Study providing evidence that the ICs are functioning as intended. There was no evidence identified during this reporting period that the deed restrictions are not effective. There were no new developments or changes to land use or ownership of the owned portion of the Site during this reporting period.

Routine inspections of the perimeter fencing and access controls (i.e., gates) did not identify any issues with regard to potential trespassing during this reporting period. The fencing and access gates were maintained as needed in accordance with the O&M plan for the Site.

In addition to notice signs posted on the access points (i.e., gates), there are several other mechanisms that provide notice regarding the presence of and conditions at the Site. The notice signs include the phone number for the USEPA Site contact (i.e., Remedial Project Manager). It is expected that these notices would minimize the potential for undesirable actions in the vicinity of the Site. The Site is currently identified in WDNR's BRRTs, Remediation and Redevelopment sites map, and is also in the State Geographical Information System (GIS) Registry. Groundwater data generated as part of the monitoring program at the Site are available from the WDNR GEMS website. Site information is also available on the USEPA website. Each of these information sources also identifies an agency (USEPA or WDNR) contact for the Site.

Governmental controls include a variety of local and state regulations that would affect potential development in the area of the Site. In addition to the local zoning and ordinances previously described, State of Wisconsin regulations (NR 812.08(4) Wis. Adm. Code) continue to prohibit installation of a potable well within 1,200 feet of a landfill without WDNR review and approval. This regulation is implemented through a requirement imposed on licensed well drillers. Well drillers in Wisconsin are required to assess potential drilling sites, relative to this requirement, prior to work. Well drillers are also required to submit logs of new installations and abandonments.

As part of the review of the effectiveness of these institutional and access controls, SCS reviewed the WDNR Well Construction Report and WDNR Water Well and Well Filling and Sealing Report System (WARs) databases. A search was performed to identify any new wells that were recently installed within approximately 1 mile of the edge of waste at the Site. The Well Construction Report database includes well construction reports submitted to WDNR through March 1, 2023. The WARs database is reportedly updated as information is submitted to the WDNR, and was reviewed by SCS on March 1, 2023. Review of these databases identified no newly constructed wells and no recently abandoned wells within 1 mile of the Site during the 2022 reporting period.

Thus, we conclude that the existing institutional and access controls at the Site have been effective in minimizing undesirable development, including that with the potential for exposure to the waste mass and associated contaminants of concern at the Site, during this reporting period.

2.2 SCOU DATA/REPORTS TRANSMITTED WITH REPORT

The results from sampling of the probes installed to assess the operation of the ISVE system on November 16, 2022, are summarized in **Table 1**.

2.3 DATA EVALUATION

As previously described, SCS personnel sampled the vapor/gas probes installed to evaluate the operation of the ISVE system on November 16, 2022. The results from that sampling event are summarized in **Table 1**. The locations of the gas probes are shown on **Figure 2**.

The waste mass at the Site is of limited area (less than 6 acres) and volume and does not include the organic content of typical municipal solid waste (MSW). The waste mass has been in place for more than 30 years, and was subject to operation of the ISVE system during most of that period; thus, the majority of the organic content in the waste has likely decomposed over time. As such, the rate of landfill gas generation is anticipated to be low, with little or no pressure to result in migration, and vapor composition (i.e., methane, oxygen, and carbon dioxide) data is likely to be variable depending on the location of probe(s). Relatively high methane concentrations at probes within waste when the ISVE system is not in operation are expected. Review of prior operational data does not show a direct correlation between methane concentrations and the concentrations of COCs (i.e., VOCs) at the Site.

Methane was identified at concentrations above the lower explosive limit (LEL) (or 5 percent by volume) at 47 of the 86 probes sampled. Only two of those probes (GP29S and GP29M), at one location (GP29), are located outside of the limits of the waste. The methane concentration at GP29 was higher in the shallow and intermediate probes; the methane concentration at the deep probe was below the LEL. It should also be noted that the pressure at each of the probes outside waste was low. The pressure was zero or negative at 17 of the 32 points located outside waste. The highest pressure noted at the probes outside of the waste was 0.18 inches water (GP28D). The highest pressure noted at the probes within the waste was 0.04 inches water (GP11M and GP13S). It should be noted that the pressure measurement at GP28D was not associated with an elevated methane concentration; thus, the results at GP28D do not suggest that pressure is directly related to the methane migration. The pressure was less than 0.1 inch water at all of the probes located within waste and all of the points located outside the waste, except for GP28D. These pressure measurements are not consistent with significant methane migration.

Oxygen was reported at concentrations greater than 10 percent by volume (i.e., approximately 50 percent of the atmospheric concentration of 20.9 percent) at 35 of the 86 probes sampled. This

observation is consistent with a well degraded waste mass, which is not producing significant volumes of landfill gas or actively depleting the available oxygen in the subsurface.

The results summarized above are consistent with a mature, well degraded waste mass. The methane concentrations identified in the shallow and intermediate probes at GP29 are not likely to indicate a significant methane migration issue since the higher concentrations are not present at depth, there is limited pressure (i.e., less than 0.05 inches of water) at those points, there are no areas in the vicinity of the waste mass where vegetative stress is noted, and there are no nearby structures. GP29 is located more than 500 feet from the nearest property boundary. There are multiple monitoring points between GP29 and the current property boundaries where no methane is present to conclude that that the extent of methane at GP29 is limited and not migrating beyond the property boundary. As previously described, the gas probes were installed to assess the performance of the ISVE system; thus, the presence of methane at concentrations in excess of the LEL at one location (i.e., GP29) outside waste when the ISVE system is not in operation is not significant. The data are not indicative of landfill gas migration beyond WMWI's property.

2.4 PROJECTED ACTIVITIES

- The temporary shutdown of the ISVE system, associated with the rebound test, is expected to continue in 2023. Preliminary periodic analysis of the groundwater data to date has not identified an unacceptable increase in VOC concentrations in groundwater downgradient of the waste mass at the Site.

- Maintenance of the other SCOU components (i.e., landfill cap) will continue in 2023. The USEPA contact identified on the signs at access points will be updated when the RPM assignment for the Site is finalized.

- WMWI will monitor the gas probes once in 2023 for field parameters.

- The next annual progress report will be prepared for the period of January 1 through December 31, 2023.

2.5 SUMMARY OF MEETINGS

As previously described, USEPA's review of the LFAS and SVE Temporary Shutdown Interim Assessment Report and 2021 Annual Report were transmitted in a letter dated June 9, 2022. The comments in that document were discussed in a conference call/meeting with WMWI and SCS, USEPA and its consultant, and WDNR on July 22, 2022. During that meeting, WMWI/SCS presented updated time-concentration plots that included quarterly data obtained after the initial interim assessment report was submitted to demonstrate that a second two-year period interim assessment period was warranted, and that revisions to the initial interim report or 2021 Annual Report were not necessary at this time. WDNR's representative, Bruce LeRoy, indicated that he would follow up regarding the potential applicability of the current State of Wisconsin solid waste rules (NR 500 Wis. Adm. Code) to the data from the vapor/gas monitoring probes at the Site. The Hagen Farms Landfill is a licensed solid waste disposal site in Wisconsin.

A conference call was convened on January 13, 2023, with Mr. Thomas, WMWI, and SCS for purposes of introduction and to discuss the request for an updated QAPP. Mr. Thomas agreed that the requirement for an updated QAPP was tolled until inconsistencies between the data quality program requirements for a licensed solid waste facility in Wisconsin and current USEPA guidance documents for a QAPP are resolved. The data quality components of the WDNR Solid Waste program,

under which the data in this submittal were obtained, are further described in this Report. Those specified components include sampling procedures; use of an approved laboratory that is subject to periodic audit; use of only approved laboratory methods; data quality qualifiers; and data screening, compilation, and reporting requirements.

2.6 CONCLUSIONS

The landfill cap was maintained as needed during this reporting period.

The existing institutional and access controls at the Site continue to be effective in minimizing undesirable development, including that with the potential for exposure to the waste mass and associated contaminants of concern at the Site, during this reporting period.

The results from the gas probe sampling event at the Site in 2022, without the ISVE system in operation, are consistent with a mature, well degraded waste mass. The methane concentrations identified at one location outside waste in excess of the LEL, in the shallow and/or intermediate probes at GP29, are not indicative of a significant methane migration issue since the higher concentrations are not present at depth or associated with pressure, and there are no nearby structures.

2.7 RECOMMENDATIONS

- Continue the temporary shutdown of the ISVE system, and cessation of the associated periodic monitoring, through 2023 to further assess the potential for rebound of contaminant concentrations in groundwater.

- Continue the periodic maintenance of the landfill cap. Update the USEPA contact identified on the signs at access points after the RPM assignment for the Site is finalized.

- Continue annual assessments of the effectiveness of the institutional and access controls as presented herein. In accordance with the ICIAP, those assessments will be included in future annual reports for the Site.

3.0 GCOU – ANNUAL O&M REPORT

Air sparging was the primary treatment method for contaminated groundwater at the Site from September 2001 until the system was temporarily shut down in September 2019.

For reference, the shallow LFAS system, which consists of six points, had been in operation since January 2001. In March 2005, four additional deeper sparge points were installed at the Site. The operation of the expanded LFAS system was enhanced in May 2007 with the installation of an oxygen concentrator and air dryer. In October 2014, one existing groundwater monitoring well (i.e., P7B) and two former groundwater extraction wells (i.e., EW1INF and EW3) were reconfigured as air sparge points and added to the existing sparge system; such that the current LFAS system is typically referred to as the enhanced or expanded LFAS system. The six points included in the shallow LFAS system and four additional deeper points were located in a line downgradient of the waste mass, perpendicular to the direction of groundwater flow at the Site. The three points installed in 2014 were located to address specific areas of residual VOC contamination in the vicinity of the Site. P7B is now the most northerly sparge point, where EW1INF and EW3 are the most southerly and westerly sparge points, respectively.

The locations of the 13 sparge points that comprised the expanded/enhanced LFAS system are shown on Figure 2.

Natural attenuation is a factor in remediation of contaminated groundwater at the Site. While dissolved oxygen (DO) and oxidation reduction potential (ORP) can provide useful data to evaluate if conditions in groundwater are suitable for natural attenuation, the progress toward established cleanup goals, in terms of remediation of COCs, is primarily evaluated through review of groundwater quality data, which is presented in Section 4.0 of this Report.

The discussion in this section of the Report includes a preliminary evaluation of DO and ORP levels in groundwater in the vicinity of the Site. The DO and ORP data were collected as a field measurement at the time the groundwater samples were collected. Previously, DO and ORP concentrations were used in an evaluation of the effectiveness of the LFAS system in promoting aerobic conditions in groundwater. An aerobic environment (i.e., DO concentration greater than 1 milligram/liter) is expected to promote degradation of the current concentrations of COCs in support of natural attenuation in the vicinity of the Site. In this Report, the data are evaluated with regard to where aerobic conditions exist in groundwater, but also to assess potential changes over time as a result of the temporary shutdown of the LFAS system at the Site.

3.1 PROGRESS MADE DURING THIS REPORTING PERIOD

The expanded LFAS system was not operated during the 2022 reporting period.

3.2 GCOU DATA/REPORTS TRANSMITTED WITH REPORT

The DO and ORP data from this reporting period are included in the laboratory reports in Appendix B. The results from 2019 to 2022 are summarized by sampling period in Tables 2 and 3 to evaluate potential seasonal changes over time. The same data are presented chronologically in Tables 2a and 3a.

3.3 DATA EVALUATION

Tables 2 and 3, and Tables 2a and 3a, include the DO and ORP results from 2019 to 2022 to assess the current DO and ORP levels in local groundwater and as a basis of comparison to evaluate the potential changes in results after the LFAS system was shutdown in September 2019. Significant decreases in DO and/or ORP results after the LFAS was shutdown may indicate areas of higher biologic activity and/or potential contaminant concentrations in groundwater.

The evaluation of changes in DO concentration over time is complicated by changes in background concentrations and seasonal fluctuations. As shown on Tables 2 and 2a, the DO concentration in upgradient groundwater (i.e., background), as identified by results from analysis of samples from monitoring wells IG04 and MW100, ranges from 4.0 to 7.7 mg/L in 2022, but the wells are sampled in February and August; thus, the values may not represent the full range of seasonal variations. As also shown in Tables 2 and 2a, the DO values range from 0.47 to 16.8 mg/L during the period 2019 to 2022, and the average DO generally increases seasonally from February to November. Only one DO result from this reporting period (OB11M in August 2022 - 0.47 mg/L) was below 1 milligram per liter (mg/L). OB11M is located approximately 750 feet downgradient of the waste mass at the Site. The groundwater at nearby wells or wells located closer to the waste mass at the Site is generally consistently aerobic (DO > 1 mg/L). The DO concentration at OB11M at the time of the prior (February 2022) sampling event was 2.9 mg/L; thus, the DO did not increase seasonally over time as expected, but there is also no apparent cause for the DO to decrease in that no concentrations of

VOCs were identified in the sample from OB11M in August. DO concentrations at nearby wells (P28B and P28C) were higher (2.0 and 4.4. mg/L, respectively) at the time of the August sampling event. DO concentrations at wells near the waste mass generally ranged from 1.1 to 4.4 mg/L during this reporting period.

As shown on **Table 2a**, there were a total of five DO results in 2019, six results in 2020, 11 results in 2021, and 21 results in 2022 that were below 2 mg/L, which is consistent with a decrease in the DO concentration in groundwater over time. That decrease is likely due to the temporary shutdown of the LFAS system in that oxygen is no longer artificially being injected into the subsurface. Where four results are available during this reporting period (2022) for a well, the DO concentrations are above 1.0 mg/L and generally increase throughout the year. Although the DO concentrations may have decreased at some wells since the operation of the LFAS has ceased, there is no evidence of a significant decrease in DO in an area of the Site that would be indicative of an area of higher biologic activity or a subsequent potential increase in COCs. The prevalence of DO values below background is consistent with natural or seasonal variation in DO concentrations across the Site.

In addition to the measurements for DO, ORP data are collected in the field on groundwater samples to assess groundwater conditions (i.e., redox state) relative to the potential for natural attenuation. As a field measurement, these readings typically have a wider range of precision and may be less accurate than laboratory analysis for natural attenuation indicator parameters that can also be used to evaluate the redox state of groundwater. As such, there is no established screening criterion for ORP. Generally lower or negative ORP values are consistent with a reducing environment, while positive ORP values are associated with an aerobic environment.

The ORP data from this reporting period are summarized in **Table 3**. The ORP data at the individual wells vary over time during the reporting period, and there is no apparent consistent seasonal variation in the ORP results. As shown in that table, the majority of ORP measurements in 2022 are positive. In fact, there is only one negative value associated with the sample from MW22 in May. The other three ORP results at MW22 in 2022 are positive, and range up to 273 millivolts (mV).

As shown on **Table 3a**, the total number of negative ORP results has decreased over the period of 2019 to 2022. There were a total of nine negative ORP results in 2019, five (each) in 2020 and 2021, and only one in 2022. Thus, the temporary shutdown 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.

When comparing the ORP and DO data, samples with a higher positive ORP result should also have a higher DO concentration, and samples with a lower or negative ORP result should have a lower DO concentration. This correlation is generally present in the data from the Site. It should be noted that the expected correlation was not present in the sample from OB11M in August 2022. Although the DO value was low (0.5 mg/L), the corresponding ORP measurement was positive (217 mV); thus, the DO concentration is an anomaly.

The generally consistent DO concentrations indicating aerobic conditions (greater than 1 mg/L), and the decrease in negative ORP values over time, since the temporary shutdown 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.

3.4 PROJECTED ACTIVITIES

- The temporary shutdown of the enhanced LFAS system, associated with the rebound test, is expected to continue in 2023. Preliminary periodic analysis of the groundwater data to date has not identified an unacceptable increase in VOC concentrations in groundwater downgradient of the waste mass at the Site.

- The associated periodic monitoring of operational criteria (i.e., pressure) at the sparge points will be discontinued, until the shutdown test is concluded.

- The next annual progress report will be prepared for the period of January 1 through December 31, 2023.

3.5 SUMMARY OF MEETINGS

As previously described, USEPA's review of the LFAS and SVE Temporary Shutdown Interim Assessment Report and 2021 Annual Report were transmitted in a letter dated June 9, 2022. The comments in that document were discussed in a conference call/meeting with WMWI and SCS, USEPA and its consultant, and WDNR on July 22, 2022. During that meeting, WMWI/SCS presented updated time-concentration plots that included quarterly data obtained after the initial interim assessment report was submitted to demonstrate that a second two-year period interim assessment period was warranted, and that revisions to the initial interim report or 2021 Annual Report were not necessary at this time. WDNR's representative, Bruce LeRoy, indicated that he would follow up regarding the potential applicability of the current State of Wisconsin solid waste rules (NR 500 Wis. Adm. Code) to the data from the vapor/gas monitoring probes at the Site. The Hagen Farms Landfill is a licensed solid waste disposal site in Wisconsin.

A conference call was convened on January 13, 2023, with Mr. Thomas, WMWI, and SCS for purposes of introduction and to discuss the request for an updated QAPP. Mr. Thomas agreed that the requirement for an updated QAPP was tolled until inconsistencies between the data quality program requirements for a licensed solid waste facility in Wisconsin and current USEPA guidance documents for a QAPP are resolved. The data quality components of the WDNR Solid Waste program, under which the data in this submittal was obtained, are further described in this Report. Those specified components include sampling procedures; use of an approved laboratory that is subject to periodic audit; use of only approved laboratory methods; data quality qualifiers; and data screening, compilation, and reporting requirements.

3.6 CONCLUSIONS

The DO and ORP data from 2022 do not indicate any significant adverse changes in groundwater quality since the enhanced LFAS was shut down in September 2019.

3.7 RECOMMENDATIONS

- Continue the temporary shutdown of the LFAS system to assess the potential for rebound of contaminant concentrations in groundwater and associated effects of natural attenuation at the Site.

4.0 GROUNDWATER MONITORING RESULTS

This section presents a summary and analysis of the groundwater monitoring data that were generated from analysis of samples collected from monitoring wells and private wells in 2022, in accordance with the approved groundwater monitoring program for the Site. A copy of the approved monitoring program is provided for reference in **Appendix C**. The groundwater monitoring program includes quarterly sampling of select wells in the vicinity of the waste mass at the Site to assess the effects of the temporary shutdown of the ISVE and enhanced LFAS systems at the Site.

Analytical methods consistent with WDNR data quality requirements for licensed solid waste disposal facilities, and laboratories approved by WDNR to perform analyses using those methods, are utilized to generate quality data that are required to be submitted to the WDNR database (GEMS).

4.1 GROUNDWATER POINTS SAMPLED

During 2022, the groundwater monitoring program at the Site consisted of an annual event, a semi-annual event, and two quarterly events. Supplemental sampling for VOCs (i.e., quarterly) was performed at two additional wells, MW7 and P26B, to assess the potential benefits of the three sparge points added in 2014 (i.e., P7B, EW1INF, and EW3) and provide data to support the temporary shutdown test.

The annual event consisted of groundwater sampling in August at 33 groundwater monitoring wells. The annual sampling event was completed in August, but one of the shipment containers was mishandled by the overnight courier and the samples associated with four wells (MW100, OBS2C, P17B, and P17C) were discarded due to the samples arriving at the laboratory at an unacceptable temperature; thus, SCS resampled the four wells on August 29, 2022. The samples were analyzed for VOCs using EPA method 8260C; general chemistry/indicator parameters using EPA methods SM2340B (calcium and magnesium hardness), 300.0 (chloride & sulfate), 310.2 (alkalinity), 335.4 (cyanide), 350.1 (ammonia), 351.2 (Total Kjeldahl Nitrogen [TKN]), 353.2 (nitrate + nitrite), 410.4 (COD), SM2540C (TDS), SM2540D (TSS), and SM4500-PE (phosphorus); select dissolved metals using EPA methods 6010C, 6020A, and 7470A (mercury); and field parameters (i.e., pH, temperature, DO, ORP, depth to water, total depth, odor, color, and turbidity). Analysis for vinyl chloride, a VOC, is also performed using a second analytical method; EPA Method 8260C select ion methodology (SIM). The annual event also included sampling of five private water supply wells that are located within approximately 1 mile of the Site. The private well samples are analyzed for the same list of parameters described above for the annual groundwater monitoring well samples. A summary of the sample locations and parameters analyzed during each event is provided in **Appendix C**.

The semi-annual event consisted 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 as part of the quarterly analysis.

The quarterly events consisted of groundwater sampling in May and November at 10 groundwater monitoring wells, not including the two additional wells sampled for VOCs (i.e., MW7 and P26B). Additionally, groundwater elevations are measured at five wells.

4.2 MAINTENANCE ACTIVITIES

No well maintenance items were identified as a result of the annual inspection that was completed in conjunction with the annual sampling event in August 2022.

During the subsequent sampling event on November 16-17, 2022, the protective casing associated with one monitoring well (MW22) was observed to be loose and, upon further inspection, the protective casing and 2-inch PVC well pipe were separated from the rest of the well approximately 3 feet below the ground surface. The observed damage was likely due to contact with the equipment used to mow the vegetation on the landfill cap. That well was subsequently repaired by SCS personnel and sampled on November 28, 2022. The repair was performed after hand excavation to expose the break. A new deep socket coupling was installed without solvent to reconnect the loose section of 2-inch PVC pipe; the former PVC slip coupling had broken. After reconnecting the section of 2-inch PVC well, a new length of aluminum protective casing was connected to the existing stub using a section of smaller diameter aluminum pipe that was fastened using pop rivets to both lengths of pipe. A flexible rubber coupling (i.e., Fernco) was affixed above and below the seam of the protective casing to seal the repair. The depth to groundwater measurement prior to the repair is utilized in this report. As the original section of PVC pipe was able to be reconnected, future measurements using the former top of casing elevation are expected to be accurate.

4.3 GROUNDWATER FLOW

The groundwater elevation data from the wells sampled during the quarterly events in 2022, including the semi-annual and annual wells, are summarized and presented in **Table 4**. The data from the annual sampling event (i.e., August 2022) were utilized to create shallow (i.e., water table) and deep piezometric surface maps that are presented as **Figures 3** and **4**, respectively. The general trends and features of the shallow water table and deep piezometric surfaces in 2022 are consistent with prior interpretations of historical data in that groundwater flow is generally to the south.

Annual precipitation during this reporting period, as recorded in Stoughton, Wisconsin, by the National Weather Service Cooperative Observer Network #478229, was 37.29 inches. Additionally, annual precipitation during this reporting period, as recorded at the Dane County Regional Airport in Madison, Wisconsin (National Weather Service Cooperative Observer Network #474961), was 37.38 inches. The City of Stoughton and the Dane County Regional Airport are located approximately 1.3 miles west and 17.7 miles northwest of the Site, respectively. The average annual precipitation in Stoughton and at the Dane County Regional Airport from 1994 to 2022 was 38.28 and 36.51 inches, respectively. The total annual precipitation at the Site in 2022 was approximately average based on the data from the City of Stoughton and the Dane County airport.

Vertical groundwater flow between the three defined units at the Site (i.e., sand and gravel, unconsolidated sediment, and bedrock) was assessed using groundwater elevation data from the quarterly sampling events (i.e., February, May, September, and November) at nested monitoring wells during 2022. Those elevations are presented in **Table 4**. The well nests consist of shallow water table wells (i.e., wells screened across or slightly below the water table, in unconsolidated sand and gravel) and piezometers (i.e., wells screened deeper in unconsolidated sediment or in bedrock).

The conclusions presented below are based on evaluation of data from:

- Water table wells and shallow piezometers screened in unconsolidated sediment
  - On-Site pairs include: MW22/P22B and MW26/P26B

  - Off-Site pairs include: MW27/P27B and MW30/P30B

- Piezometers screened in unconsolidated sediment and in bedrock
  - On-Site pairs include: P17B/P17C
  - Off-Site pairs include: P28B/P28C, P29B/P29C, and P30B/P30C

The calculated vertical gradients at those wells are presented in **Table 4a**. With regard to water table wells and shallow piezometers screened in unconsolidated sediment, the vertical gradients were slight (i.e., less than 0.057 ft/ft) and variable during this reporting period across the Site. Downward gradients were calculated at well nests MW26/P26B and MW27/P27B in February and September. Upward gradients were calculated at MW22/P22B in May, September, and November, and at MW30/P30B in February and September. No vertical gradient was present at MW22/P22B in February. These observations are consistent with observations from prior reporting periods.

With regard to flow between the unconsolidated sediment and bedrock well nests, the calculated vertical gradients were variable and lower than the gradients between the water table wells and piezometers screened in the unconsolidated sediment (i.e., less than 0.011 ft/ft) during this reporting period. Downward gradients were calculated at P28B/P28C and P29B/P29C in February and September, and at P17B/P17C in February, May, September, and November. A slight upward gradient was calculated at P30B/P30C in February and a slight downward gradient was calculated at P30B/P30C in September.

There are no apparent spatial or seasonal patterns associated with the variation in vertical gradients in the vicinity of the Site. The average precipitation during this reporting period (2022) is consistent with the prevalence of typical vertical gradients during this reporting period.

4.4 NATURE AND EXTENT OF CONTAMINATION

The nature and extent of groundwater contamination at the Site has been presented in numerous reports that have been submitted to the USEPA and WDNR. This section presents a summary and evaluation of the data generated from groundwater sampling and analysis performed in 2022. While the analysis presented herein may include comparison of select 2022 data to historical values, the evaluation is not intended to be a complete review of historical data (i.e., prior to 2022). The goal of this evaluation is to identify and assess key data from this reporting period, and to identify data from 2022 that may be inconsistent with past results, and may present an issue that needs to be further evaluated. The data is also evaluated with regard to potential rebound of contaminant concentrations due to the ongoing temporary shutdown of the ISVE and enhanced LFAS systems at the Site. The data from analysis of groundwater samples collected in 2022 are presented in reports prepared by the laboratory. Electronic copies of the laboratory reports for the samples analyzed in 2022 from the Site are included in **Appendix B** of this Report.

To evaluate the groundwater data, the results from samples collected in 2022 were screened using the concentrations established as the preventive action limit (PAL) and enforcement standard (ES) as identified in Chapter NR 140, Groundwater Quality, of the Wis. Adm. Code. The parameters that exceeded these values in samples from groundwater monitoring wells are summarized in the tables that are included in **Appendix D**. These tables were previously included in the quarterly data submittals to USEPA and WDNR. The evaluation in this Report does not consider the point of standards application in section NR 140.22 of the Wis. Adm. Code.

The data generated from analysis of samples collected from groundwater monitoring wells in 2022 met or exceeded the screening values (i.e., PAL or ES) for the following compounds:

VOCs	Metals	Indicators
Tetrachloroethylene Tetrahydrofuran Vinyl Chloride	Aluminum Arsenic Cobalt Iron Manganese Nickel Lead Vanadium Zinc	Nitrite + Nitrate Nitrogen - Ammonia

4.5 DATA EVALUATION

Evaluation of data from analysis of samples from groundwater monitoring wells and private wells are presented in separate sections of this Report. The locations of the groundwater monitoring points discussed below are shown on **Figures 1** and **2**. Data quality is evaluated in detail as part of the quarterly data submittals for the Site. A summary of the quarterly data quality reviews is provided in **Section 4.5.2**.

4.5.1 Groundwater Monitoring Wells

4.5.1.1 VOCs

Tetrachloroethylene

Tetrachloroethylene (PCE) was reported at concentrations that exceeded the PAL (0.5 micrograms per liter [µg/L]), but not the ES (5 µg/L), in the samples collected from one groundwater monitoring well (IG04) during the February and September sampling events. IG04 is an upgradient well. The concentrations reported from analysis of the samples in 2022 were 1.9 µg/L and 1.7 µg/L in February and September, respectively. The PCE concentration over time is shown on **Figure 10**. Review of **Figure 10** indicates that, although PCE was not reported in samples from IG04 prior to February 2011, the PCE concentration at IG04 is currently stable and not increasing over time. In that IG04 is an upgradient well, the concentrations of PCE are not likely related to the Site or the temporary shutdown test of the ISVE and enhanced LFAS systems at the Site. As such, continued periodic monitoring is appropriate.

Tetrahydrofuran

Tetrahydrofuran (THF) was reported at a concentration that exceeded the PAL (10 µg/L), but not the ES (50 µg/L), in only one sample collected from one groundwater monitoring well (MW22) during this reporting period (2022). That THF concentration (17 µg/L) was reported from analysis of the sample collected from MW22 in November.

MW22 is located within and monitors groundwater immediately below the waste mass at the Site; thus, low concentrations of THF at MW22 were anticipated as part of the rebound test. As shown on **Figure 6**, it should be noted that the current THF concentrations at MW22 are significantly lower than concentrations prior to and after the start-up of the remedial systems at the Site. The relatively low and inconsistent THF concentrations at MW22 do not represent a significant source or mass of contamination, and are expected to be attenuated in groundwater in the immediate vicinity of the

waste mass at the Site. The results from future quarterly sampling events at MW22 in 2023 will be evaluated as part of the temporary shutdown of the ISVE and LFAS systems.

As shown on Figure 5, THF was present at higher concentrations in the past at several downgradient monitoring points of the waste mass including wells OBS1B, OBS1C, and P17C; THF was not quantified in any of the samples from these wells during this reporting period (2022). Thus, the relatively low and inconsistent concentration of THF at a shallow well within the waste mass (MW22) is not likely significant.

Vinyl Chloride

Analysis of groundwater samples for vinyl chloride is performed using two methods: 8260C gas chromatograph/mass spectrometry (GC/MS) and 8260C SIM. The SIM method appears to provide better quantification at very low concentrations; thus, the review presented in this section is based on data using that method. In some cases in the past, the concentrations exceeded the quantitative range of the SIM method (i.e., "E" Flagged), and then the results from analysis by method 8260C were evaluated. No vinyl chloride results were "E" Flagged by the laboratory during this reporting period. The results from analysis by method 8260C may also be qualified, as low concentrations between the limit of detection (LOD) and limit of quantitation (LOQ) are flagged as estimated concentrations (i.e., "J" Flagged). Values reported by the laboratory that are "E" Flagged or "J" Flagged may not be accurate. It should also be noted that the laboratory does not translate "E" data qualifiers into an existing Quality Assurance/Quality Control (QA/QC) flag in the WDNR GEMS database; thus, "E" qualifiers are not evaluated with the data submitted to WDNR. Historical data from analysis of samples from well OB8M showing the difference in reported concentrations between the GC/MS and SIM methods, with the data qualifiers, is presented in Table 5. Vinyl chloride has not been quantified by GC/MS analysis at concentrations greater than 0.9 µg/L, the typical method detection limit, in samples from OB8M since November 2015.

It should be noted that there are a number of factors that could impact quantification of VOCs, including vinyl chloride, at low concentrations (i.e., less than 1 µg/L) and thus affect analysis of potential trends. Variability could originate from changes over time in a number of natural factors such as precipitation and groundwater elevation, or as a result of variables that occur during sample collection and/or laboratory analysis.

Vinyl chloride was quantified in laboratory analysis of samples from a total of six groundwater monitoring wells (OB8M, P17C, MW22, P22B, P26B, and MW23) at concentrations above the PAL (i.e., 0.02 µg/L) or the ES (i.e., 0.2 µg/L) during this reporting period (2022). The highest concentration during this period was 0.94 µg/L; that concentration was reported from laboratory analysis of the sample collected in November 2022 at MW22. Thus, there were no concentrations of vinyl chloride in excess of the federal Maximum Contaminant Level (MCL) of 2 µg/L.

Vinyl chloride was reported in each of the quarterly samples collected at wells P17C, MW22, OB8M, P22B, and P26B during this reporting period. Each of the vinyl chloride results from analysis of samples from P17C and OB8M during this reporting period were above the concentration established as the PAL (i.e., 0.02 µg/L), but below the concentration established as the ES (i.e., 0.2 µg/L). The vinyl chloride concentrations at MW22, P22B, and P26B during this reporting period vary in that concentrations range from those in excess of the value established as the PAL to those in excess of the ES. Given the small differences in the PAL and ES for vinyl chloride, and that all results are less than 1 µg/L, the data from this reporting period are consistent at these wells.

P17C and P26B are both on-property wells, located approximately 300 feet and 150 feet, respectively, downgradient of the waste mass at the Site. As shown on **Figure 7**, the vinyl chloride concentration at monitoring wells P17C and P26B appears to have decreased in the past, but is currently stable and not increasing over time. As also shown on **Figure 7**, vinyl chloride concentrations at other on-property wells including P17B, OBS1A, OBS1B and OBS1C, have been higher in the past, but remain at concentrations below the PAL.

As shown on **Figure 8**, vinyl chloride concentrations at wells installed through the waste at the Site, MW22 and P22B, have increased since the start of the temporary shutdown test, but those concentrations are less than concentrations prior to implementation of the remedial systems at the Site. These wells monitor groundwater immediately below the waste mass at the Site; thus, low concentrations of vinyl chloride were anticipated as part of the rebound test. The relatively low and variable concentrations at MW22 and P22B do not represent a significant source or mass of contamination, and are expected to be attenuated in groundwater in the immediate vicinity of the waste mass at the Site.

Vinyl chloride was reported at a concentration (0.091 µg/L) above the PAL, but not the ES, in laboratory analysis of the sample collected in August from MW23. This well is located adjacent to the western edge of the waste mass. Although quantified in the prior (August 2021) annual sample at 0.053 µg/L, vinyl chloride was not consistently reported in analysis of prior samples from this well. The concentration from this period is also relatively low (i.e., less than the ES); thus, it is not likely associated with significant contaminant mass and is expected to attenuate in close proximity to the waste mass.

As shown on **Figure 9**, vinyl chloride concentrations at a number of off-property wells including P32B, OB8M, and OBS2C have decreased over time. The concentration of vinyl chloride at wells P32B and OBS2C has decreased over time such that the current concentrations are now below the screening criteria (i.e., PAL). As described above, each of the quarterly vinyl chloride results from analysis of samples from OB8M during this reporting period were above the concentration established as the PAL, but below the concentration established as the ES.

The vinyl chloride concentrations reported from laboratory analysis of each of the quarterly samples collected at OB8M in 2022 were consistent and range from 0.15 µg/L in August to 0.16 µg/L in February, May, and November. As shown on **Figure 9**, the concentration of vinyl chloride at monitoring well OB8M appears to be stable or decreasing over time. The decrease in concentration over time is notable since 2015. Well OB8M is an off-property well, located approximately 1,900 feet downgradient of the waste mass; thus, it is not expected to be directly affected by the temporary shutdown of the remedial systems at the Site.

4.5.1.2 Metals

Concentrations of aluminum, arsenic, cobalt, iron, manganese, nickel, lead, vanadium, and zinc exceeded the screening criteria (i.e., PAL or ES) in laboratory analysis of samples collected from a number of groundwater monitoring wells during this sampling period. The laboratory is provided with samples for metals analysis that are filtered in the field and preserved with nitric acid; thus, the results are typically referred to as dissolved, not total. A list of the specific wells and associated concentrations is provided in the tables that are included in **Appendix D**. Metals are naturally present in local soils and likely to contribute to background water quality; thus, are not expected to be COCs at the Site.

Aluminum

The aluminum result reported from analysis of the sample from MW26 during this reporting period (83.8 µg/L) exceeded the concentration established as the PAL (40 µg/L), but not the ES (200 µg/L). While MW26 is located approximately 150 feet downgradient of the waste mass at the Site, there are no other samples from this reporting period where aluminum concentrations are in excess of the screening criteria (i.e., PAL) and no other compounds at concentrations in excess of the screening criteria at MW26; thus, the aluminum result at MW26 is not likely related to the Site. It should be noted that the result was qualified by the laboratory as an estimated (i.e., J-Flagged) concentration. Concentrations in excess of the PAL, but not the ES, in samples from nine wells in 2021 (not including MW26) were not confirmed by the data from this reporting period; thus, aluminum concentrations above the PAL are not likely related to the Site.

Arsenic

Arsenic concentrations exceeded the screening criteria (i.e., PAL = 1 µg/L, and/or ES = 10 µg/L) during this reporting period in samples collected from 14 wells (i.e., IG04, MW100, OBS1B, OBS1C, OB8M, P17C, MW22, P22B, MW27, P27B, MW7, MW23, P26B, and MW29). The reported arsenic concentrations exceeded the concentration established as the ES (10 µg/L) in laboratory analysis of samples from two of those wells (MW22 and P22B). The highest arsenic concentration (19.2 µg/L) identified during this reporting period was from analysis of the sample collected in August at monitoring well P22B. The presence of arsenic at a concentration in excess of the PAL at both upgradient wells (i.e., MW100 and IG04) suggests a natural contribution to local groundwater quality; thus, it is unlikely that concentrations of arsenic are solely related to the Site. According to a paper entitled "Naturally Occurring Arsenic in Well Water in Wisconsin" (Riewe, Weissbach, Heinen, and Stoll) from the June 2000 issue of the Water Well Journal, "naturally occurring arsenic has been found in the groundwater of almost every aquifer in Wisconsin, extending through the entire geologic column." Thus, arsenic is also naturally present in the subsurface and likely to contribute to background water quality.

Cobalt, Nickel, and Zinc

The results for cobalt, nickel, and zinc exceeded the concentration established as the PAL, but not the ES, during this reporting period in laboratory analysis of the sample from one well (MW7). The zinc result was qualified by the laboratory, but each of the results are not typical of recent prior data. In fact, these were the only concentrations of these metals in excess of the PAL during this reporting period; thus, the concentrations in excess of the PAL are not likely related to the Site. The results from analysis of future annual samples from MW7 will be reviewed to further assess the significance of the metals data from this reporting period.

Iron and Manganese

Iron and manganese are present at many on-site and downgradient groundwater monitoring locations. These elements originate from native soil and are sensitive to the level of oxygen in groundwater. Both these parameters have public welfare groundwater standards established in Chapter NR 140, Wis. Adm. Code. These standards are based on welfare issues (i.e., taste, odor, and staining), and concentrations above the standards are not a public health concern. In January 2011, the WDNR also added a PAL (60 µg/L) and ES (300 µg/L) for manganese to Table 1 of Chapter NR 140, which includes public health parameters. The manganese data from this reporting period are evaluated using both criteria.

Data presented in the Groundwater Quality Atlas of Wisconsin, Information Circular 39, prepared by the U.S. Department of the Interior Geological Survey in cooperation with the University of Wisconsin - Extension Geological and Natural History Survey, indicate a large range of iron and manganese concentrations in groundwater. Iron concentrations ranged up to 21,000 µg/L (21 mg/L) and 11,500 µg/L (11.5 mg/L) in groundwater in Dane County, in the unconsolidated (i.e., sand and gravel) and bedrock (i.e., sandstone) aquifers, respectively. Manganese concentrations ranged up to 570 µg/L and 1,406 µg/L in groundwater in Dane County, in the unconsolidated (i.e., sand and gravel) and bedrock (i.e., sandstone) aquifers, respectively. These data indicate that these metals are naturally present in the subsurface and are likely to contribute to background water quality.

Iron was reported in samples from 13 monitoring wells (i.e., P17C, MW22, P22B, MW7, IG04, MW100, OB8M, MW27, P27B, MW23, P26B, MW32, and OBS1C) at concentrations in excess of the PAL (i.e., 0.15 mg/L) during this reporting period. The highest iron concentration (13.4 mg/L) identified during this reporting period was from analysis of the sample collected in August at monitoring well MW22. The results from analysis of the samples from eight of those wells (i.e., P17C, MW22, P22B, P27B, OB8M, MW7, MW32, and MW100) exceeded the concentration established as the ES (0.3 mg/L) during this reporting period. The presence of iron at a concentration in excess of the ES at an upgradient well (i.e., MW100) suggests a natural contribution to local groundwater quality; thus, it is unlikely that concentrations of iron are solely related to the Site.

Manganese was reported at a range of concentrations from analysis of samples from the groundwater monitoring wells in the vicinity of the Site during this reporting period. In total, results from 16 of the 33 groundwater monitoring wells sampled during this reporting period exceeded the most conservative screening criteria (i.e., Table 2/Public Welfare PAL = 25 micrograms per liter [µg/L]). Results from 11 of those 16 wells during this reporting period also exceeded the value established as the Table 2/Public Welfare ES (50 µg/L) and the Table 1 PAL (60 µg/L). The maximum concentration during this reporting period (629 µg/L) was from analysis of the sample from well MW22 in February 2022. The manganese concentrations at several upgradient monitoring wells (i.e., MW100 = 146 µg/L and IG04 = 49.3 µg/L) during this reporting period are consistent with a background contribution of manganese to local groundwater. The results from two wells (MW22 and MW7) exceeded the value established as the Table 1/Public Health ES (300 µg/L) during this reporting period. It should be noted that the manganese concentration at MW22 generally decreased during this reporting period, from 629 µg/L in February to 533 µg/L in November.

Lead

The lead concentrations reported from laboratory analysis of the samples from two wells (MW7 and MW33) exceeded the PAL (1.5 µg/L), but not the ES (15 µg/L). The highest concentration from this reporting period was 2.2 µg/L (February - MW7). Lead has been quantified in laboratory analysis of prior samples from these wells. The results from analysis of future annual samples will be reviewed to further assess the significance of the results from this reporting period.

Vanadium

The concentration of vanadium reported from analysis of the annual sample collected in August at monitoring well OBS1C exceeded the concentration established as the PAL (6 µg/L), but not the ES (i.e., 30 µg/L). The concentration from this reporting period (6.6 µg/L) is consistent with the results from analysis of prior samples from this well.

4.5.1.3 Indicators

Concentrations of indicator parameters including nitrate + nitrite and nitrogen-ammonia exceeded the screening criteria (i.e., PAL or ES) in laboratory analysis of samples from a number of groundwater monitoring wells collected during this sampling period. The laboratory is provided with samples for these analysis that are filtered in the field and preserved; thus, the results are typically referred to as dissolved, not total. A list of the specific wells and associated concentrations is provided in the tables that are included in **Appendix D**. The concentrations of these indicator parameters are typically related to application of fertilizer for agricultural land use, thus are not expected to be COCs at the Site.

Nitrite + Nitrate

Nitrite + nitrate results were greater than the most conservative screening criteria (i.e., PAL = 2 mg/L) in samples from eight wells (i.e., OBS2C, P17DR, MW22, MW27, P30C, P33B, P40D, and P17B) during this reporting period. No results exceeded the value established as the ES (10 mg/L). The nitrogen (i.e., nitrate + nitrite) concentrations in groundwater are likely related to application of fertilizer associated with agricultural land use in the vicinity of the Site.

Nitrogen - Ammonia

The nitrogen - ammonia result was above the screening criteria (i.e., PAL = 0.97 mg/L), but below the ES (9.7 mg/L), in laboratory analysis of the sample from one well (i.e., MW32) during this reporting period. The concentration reported from laboratory analysis of the annual sample collected at MW32 in August was 1.7 mg/L. The reported concentration is consistent with prior results and the observation that the well (MW32) is located near an off-property area actively utilized for agriculture.

4.5.2 Data Quality

To assure acceptable data quality, four groundwater samples (MW100, OBS2C, P17B, and P17C) collected by SCS in association with the initial annual sampling event in August were discarded due to unanticipated shipping delays, which resulted in those samples arriving at the laboratory at an unacceptable high temperature. SCS resampled those wells after receipt of new sample containers from the laboratory on August 29, 2022. The data from analysis of those samples from August 29, 2022, is included in this Report. As previously described, sampling of MW22 in November was postponed until repairs to the well were completed.

Groundwater samples from the Site were collected by SCS personnel in February, May, August, and November 2022. The samples were shipped to Eurofins-Buffalo (Eurofins) for laboratory analysis for the parameters indicated in the approved monitoring plan. Eurofins is a certified laboratory for analysis of samples from licensed landfill sites in Wisconsin under Chapter NR 149 Wis. Adm. Code. Upon arrival at Eurofins, samples are checked and logged in, and an acknowledgement form is sent to confirm that samples have reached the laboratory in good condition and within the required method hold time(s).

Except for the item above that was addressed through resampling of the wells, review of the laboratory information associated with the samples from the 2022 reporting period for the Site indicated that all samples were received intact, at acceptable temperatures, and in a timely manner such that analysis was expected to be performed within the required method hold time(s). It should be noted that Eurofins diluted a number of samples prior to analysis. The reporting limits were adjusted appropriately. In those cases, the results from the diluted samples are reported. The

laboratory also reanalyzed a number of samples for results that were inconsistent with recent results. In general, the reanalysis confirmed the initial result, and the original results are reported with the data from this sampling period.

The methods utilized for laboratory analysis of samples are current, authorized for use in the State of Wisconsin, and provide data of acceptable quality to evaluate progress toward established cleanup goals at the Site.

The laboratory quality control information is reviewed to qualify data where appropriate. Various data qualifiers are utilized by the laboratory. These qualifiers are presented in a uniform format by the laboratory when submitting data to the WDNR GEMS. The available WDNR qualifiers are QC Flag 1 (i.e., analyte detected in a laboratory method, trip, or field blank) above the specified criteria; QC Flag 2 (i.e., sample failed preservation and holding time criteria); and QC Flag 3 (i.e., sample failed laboratory QC standards).

QC Flag 1

No results from the May and November sampling events were qualified by the laboratory as failing the WDNR QC Flag 1 criteria due to identification of analytes in the associated laboratory method, trip or field blanks associated with the batch in which the specific samples were reported at a concentration above the specified criteria.

Two vinyl chloride results, reported from analysis using the SIM method for samples from P17B and P17C in February, were qualified by the laboratory as failing the WDNR QC Flag 1 criteria due to identification of the compound in the method blank associated with the batch in which the specific samples were reported at a concentration above the specified criteria. The qualified vinyl chloride results are consistent with data from analysis of recent prior samples from these wells; thus, the qualified results are not likely to affect the evaluation of the data for this reporting period.

Twenty-six results associated with the August sampling event were qualified by the laboratory as failing the WDNR QC Flag 1 criteria due to identification of analytes in the laboratory method, trip or field blanks associated with the batch in which the specific samples were reported at a concentration above the specified criteria. The qualified results are associated with laboratory analysis of samples from 16 wells and for three parameters: cyanide, potassium, and zinc. None of the qualified results were in excess of screening criteria (i.e., PAL) where established; thus, the qualified data is not likely to affect the overall evaluation of the data from this reporting period.

QC Flag 2

No results from analysis of samples collected from the February or May sampling events during this reporting period were qualified by the laboratory as failing WDNR QC Flag 2, in that those samples met preservation and holding time criteria.

Five results associated with the August sampling event were qualified by the laboratory as failing the WDNR QC Flag 2 criteria. The qualified results are associated with laboratory analysis of samples from five wells and for two parameters: Total Dissolved Solids (TDS) and Total Suspended Solids (TSS). The TDS results from laboratory analysis of samples from four wells (P17B, P17C, OBS2C, and MW100), and TSS result from one well (P28C), were qualified by the laboratory as the samples were analyzed outside of analytical holding time due to laboratory error. Given the limited number of qualified results, and that neither TDS nor TSS have groundwater quality criteria in NR140, the qualified results are not likely to affect the overall evaluation of the data.

Nine alkalinity results associated with the November sampling event and wells OBS1A, OBS1B, OBS1C, OBS2C, P17B, P17C, P22B, OB8M, and P32B were qualified by the laboratory as failing the WDNR QC Flag 2 criteria in that the samples were not analyzed within the specified holding time. The analysis was not performed timely due to laboratory error. As alkalinity is an indicator parameter, without a specified PAL or ES, and the qualified results are within the range of past data at the individual wells, the qualified results are not likely to affect the overall evaluation of the data from this reporting period.

QC Flag 3

A total of 52 results associated with the February sampling event were qualified by the laboratory as failing the WDNR QC Flag 3 criteria for laboratory quality control standards. The specific parameters and associated number of results (in parenthesis) include barium (3), iron (14), manganese (20), methyl ethyl ketone (9), and vinyl chloride (6). The qualified vinyl chloride results were from analysis of samples by SIM. The barium results were flagged due to the recovery of the continuing calibration verification sample being outside of the acceptance limits. The analysis of the laboratory control sample exceeded the acceptance limits for methyl ethyl ketone. Vinyl chloride, manganese, and iron were reported at concentrations above the method detection limit (MDL) in the method blank. Although these parameters were quantified at concentrations above regulatory criteria (i.e. PAL or ES) in analysis of samples from the February sampling event, the results for vinyl chloride and manganese are consistent with results from analysis of recent prior samples. Several qualified iron results from this sampling period are higher than concentrations reported from analysis of recent prior samples from the individual wells. Barium and methyl ethyl ketone were not quantified by the laboratory in analysis of the groundwater samples from this sampling period, thus the concentrations are below regulatory criteria (i.e., PAL or ES). Given the limited number of qualified results and affected parameters, established regulatory/screening criteria, and general consistency with recent prior results generated as a result of the periodic performance monitoring program at the Site, the qualified results are not expected to affect the overall evaluation of the data.

Except for vinyl chloride analysis by SIM, most of the VOC results from analysis of three samples (OBS1A, P22B, and P32B) associated with the May sampling event were qualified by the laboratory as failing the WDNR QC Flag 3 criteria in that the data failed to meet laboratory quality control standards. The recovery of a number of VOCs in analysis of several laboratory control samples (LCS) was higher than established limits, thus indicating a potential high bias. As the associated samples were non-detect for the analytes, the results were reported and qualified. Additionally, all but two (OB8M and MW22) of the 1,1-dichloroethylene results were qualified as that compound was biased low in the continuing calibration verification (CCV) sample. The data is reported and qualified, as a low level standard check was run and the compound was not detected in the samples. The nitrate-nitrite result from laboratory analysis of one sample (P17C) associated with the May sampling event was qualified by the laboratory as failing the WDNR QC Flag 3 criteria in that the matrix spike (MS) recovery exceeded the laboratory control limits. The results from the May sampling event are generally consistent with data from prior reporting periods; thus, the qualified results are not likely to affect the overall evaluation of the data.

With regard to the September sampling event, a total of 108 results associated with 23 parameters were qualified by the laboratory as failing the WDNR QC Flag 3 criteria in that the data failed to meet laboratory quality control standards. Most of the qualified results (79) are associated with a total of 11 inorganic parameters or metals; a fewer number of qualified results (29) were associated with analysis for 12 VOCs. Of the qualified inorganic and metals results, most of the qualified results (66) are associated with five parameters: cyanide, manganese, potassium, zinc, and ammonia. Those qualified results are generally low concentrations and those parameters are not COCs at the Site.

With regard to the qualified metals results, the method blank contained dissolved potassium, manganese, and zinc at concentrations above the MDL and less than the reporting limit (RL). The qualified VOC data includes tetrahydrofuran (THF) and VC results from analysis of samples from three wells (MW23, MW30, and MW32), and one result for vinyl chloride by SIM (P17C). None of the qualified THF results were quantified in excess of the LOQ. The qualified vinyl chloride results by Method 8260 (GC/MS) are supported by SIM analysis, thus are not likely to affect the evaluation of data from this reporting period. The qualified vinyl chloride result from analysis of the sample at P17C by SIM (0.12 µg/L) is between the PAL (0.02 µg/L) and ES (0.2 µg/L) and is generally consistent with data from prior reporting periods; thus, the QC3 qualified results are not likely to affect the overall evaluation of the data.

With regard to the November sampling event, the alkalinity and manganese results from analysis of the samples from nine wells (OBS1A, OBS1B, OBS1C, OBS2C, P17B, P17C, P22B, OB8M, and P32B), the nitrite+nitrate results from analysis of samples from two wells (OBS2C and P22B), and the vinyl chloride result from analysis of the sample from P32B were qualified by the laboratory as failing the WDNR QC Flag 3 criteria in that the data failed to meet laboratory quality control standards. Alkalinity is an indicator parameter, without a specified PAL or ES, and the qualified results are within the range of past data at the individual wells. The qualified nitrite+nitrate results are consistent with recent past data at those wells and below the established PAL. The qualified vinyl chloride result is consistent with recent prior data in that the compound is not typically quantified in samples from P32B; thus, the qualified results are not likely to affect the overall evaluation of the data.

The number of qualifiers associated with the results from this reporting period should not be construed as a data QC issue. WDNR, during a routine audit of the laboratory, reportedly requested that Eurofins modify the electronic data deliverable (EDD) files for submittal to the GEMS to capture the report narrative comments. The EDD itself is not flexible to include narrative language, so the only option was to use one of the three "QC" qualifier fields in GEMS. Specifically, Eurofins modified its laboratory information management system (LIMS) to produce EDDs that tie the narrative language to the WDNR QC 3 field. This results in an apparent increase in the total number of results qualified by the WDNR QC 3 Flag. The information associated with the "new" qualifiers was considered in analysis of prior samples and the associated reports, but was not captured in the EDD. The additional WDNR QC 3 qualifiers generally do not impact the results, but are informational regarding decisions made regarding batch QC; thus, the data from this reporting period is consistent with results from prior reporting periods and is acceptable for use in the performance monitoring program at the Site.

Overall, the identified data qualifiers from the 2022 reporting period do not indicate any potential consistent or significant data quality issues that would impact evaluation of the data or assessment of progress toward cleanup goals at the Site.

Quality Control Samples

A trip blank (TB) is created in the laboratory and accompanies the sample containers from the lab, to the field, and back to the lab. The purpose of a TB is to assess whether samples were potentially exposed to contaminants (i.e., VOCs) during sampling or shipping procedures. A field blank (FB) is created in the field using the existing sampling equipment and a known clean water source, and accompanies the samples to the laboratory. Analysis of FBs can help assess potential impacts from sampling procedures and sampling equipment. These samples are analyzed in addition to those prescribed by the standard analytical methods by the laboratory.

The laboratory analyzed one TB and one FB that were prepared in association with the February sampling event to assess data quality. No VOCs were quantified in analysis of the TB. Manganese was reported at a low concentration in laboratory analysis of the FB. The results from analysis of the FB for other field and laboratory parameters are typical of deionized water that was used to prepare the sample; thus, the results are not likely indicative of a significant data quality issue, especially since dedicated sampling equipment is utilized at the site.

The laboratory analyzed two TBs and one FB that were prepared in association with the May sampling event to assess data quality. No VOCs were quantified by the laboratory in analysis of the TBs. Only one parameter (manganese) was quantified in laboratory analysis of the FB. The reported concentration (0.48 µg/L) was below the lowest NR140 standard (Table 2 PAL = 25 µg/L) and qualified by the laboratory as an estimated concentration (i.e., J-Flagged). The results from analysis of the FB for other field and laboratory parameters are typical of deionized water that was used to prepare the sample; thus, the results are not likely indicative of a significant data quality issue, especially since dedicated sampling equipment is utilized at the site.

The laboratory analyzed one TB and FB prepared in association with the August sampling event to assess data quality. No VOCs were quantified in laboratory analysis of the TB. Several inorganic parameters and metals including cyanide, manganese, nitrite/nitrate, total Kjeldahl nitrogen (TKN), phosphorus, and TDS were quantified at low concentrations in laboratory analysis of the FB. Each of the concentrations was below the associated PAL, where established. Dichloromethane (i.e., methylene chloride) was the only VOC quantified in analysis of the FB. The reported concentration (1.9 µg/L) is above the PAL (0.5 µg/L), but below the ES (5 µg/L). Methylene chloride is widely utilized in the laboratory and is a common laboratory artifact; thus. the reported concentration is not considered significant. The results from analysis of the FB for field parameters are typical of deionized water that was used to prepare the sample; thus, the results are not likely indicative of a significant data quality issue, especially since dedicated sampling equipment is utilized at the site.

The laboratory analyzed two TBs and one FB prepared in association with the November sampling event to assess data quality. No VOCs were quantified in laboratory analysis of the TBs. One organic compound (dichloromethane/methylene chloride) and two inorganic parameters (alkalinity and manganese) were quantified by the laboratory in analysis of the FB. The reported concentration of dichloromethane (21 µg/L) is above the ES (5 µg/L). Methylene chloride is widely utilized in the laboratory and is a common laboratory artifact. The potential impact on samples from this reporting period is not apparent, as dichloromethane was not quantified in laboratory analysis of the samples from the monitoring wells. The concentrations of the inorganic parameters in the FB are relatively low compared to typical concentrations in groundwater at the Site; thus, the reported concentrations are not expected to be significant. The results from analysis of the FB for field parameters are typical of deionized water that was used to prepare the sample; thus, the results are not likely indicative of a significant data quality issue, especially since dedicated sampling equipment is utilized at the site.

The data from analysis of the TBs and FBs during this reporting period do not indicate any significant or consistent issues with regard to potential contamination of samples.

4.5.3 Private Wells

Annual samples were collected in August from five private water supply wells in the vicinity of the Site. The locations of the wells are shown on **Figure 1**. Compounds that exceeded the screening criteria during this reporting period are summarized in **Table 6**. During this reporting period, concentrations in excess of the screening criteria (i.e., PAL or ES) were identified in laboratory analysis of samples from four of the five private wells sampled.

There were no VOCs reported at concentrations in excess of the screening criteria (i.e., PAL or ES) from analysis of any of the private well samples during this reporting period.

4.5.3.1 Indicator Parameters

Results from laboratory analysis of samples from two private wells (i.e., PW02 and PW04) collected during this reporting period were above the concentration established as the ES for nitrite + nitrate (10 mg/L). The concentrations are consistent with prior results from laboratory analysis of recent samples collected at these wells and are consistent with the use of fertilizer associated with agricultural land use in the vicinity of the Site.

Chloride was quantified in laboratory analysis of the sample collected from PW03 at a concentration (160 mg/L) that exceeds the PAL (125 mg/L), but is below the ES (250 mg/L). The PAL and ES for chloride are public welfare groundwater standards, as identified in Table 2 of Chapter NR 140 Wis. Adm. Code. As such, the standards are based on welfare issues (i.e., taste, odor, and staining), and concentrations above those standards are not a concern with regard to public health. The result from this reporting period is higher than recent prior results; the cause not clear. Road salt used for ice/snow control on roadways can contribute chloride to groundwater. Results from analysis of future samples will be reviewed to further assess the cause and significance of the result from this reporting period.

4.5.3.2 Metals

The arsenic result from laboratory analysis of the sample collected at PW09 (1.6 µg/L) during this reporting period exceeded the concentration established as the PAL (1 µg/L), but not the ES (10 µg/L). Arsenic has been reported at concentrations in excess of the PAL, but below the ES, in a number of recent samples from PW09. The results are likely related to background concentrations of arsenic in local soils and groundwater.

Concentrations of aluminum above the PAL, but below the ES, in samples from two private wells (PW04 and PW05) in 2021 were not confirmed by analysis of samples from this reporting period.

The iron result from laboratory analysis of one sample (i.e., PW03) collected during this reporting period was above the concentration established as the ES (0.3 mg/L). Iron was identified at a concentration of 1.9 mg/L in laboratory analysis of the sample collected from PW03. The iron result is consistent with results from analysis of recent prior samples from this well. The PAL and ES for iron are public welfare groundwater standards, as identified in Table 2 of Chapter NR 140 Wis. Adm. Code. As such, the standards are based on welfare issues (i.e., taste, odor, and staining), and concentrations above those standards are not a concern with regard to public health.

The manganese concentration identified in the sample collected from PW03 during this reporting period (137 µg/L) exceeded both the PAL (25 µg/L) and the ES (50 µg/L) identified in Table 2 of Chapter NR 140 Wis. Adm. Code. The PAL and ES for manganese are public welfare groundwater standards established in Table 2 of Chapter NR 140, Wis. Adm. Code; thus, concentrations exceeding this ES may present a welfare issue (i.e., taste, odor, and staining), but are not a concern with regard to public health. In January 2011, the WDNR also added a PAL (60 µg/L) and ES (300 µg/L) for manganese in Table 1 of Chapter NR 140, which includes public health parameters. The identified manganese concentration (137 µg/L) also exceeds the Table 1 PAL, but not the ES (300 µg/L). The manganese concentration at PW03 during this reporting period is consistent with results from analysis of prior samples collected at this well.

4.6 PROJECTED ACTIVITIES

Groundwater sampling and analysis will continue to be performed in accordance with the monitoring program that is included as Appendix C.

4.7 SUMMARY OF MEETINGS

As previously described, USEPA's review of the LFAS and SVE Temporary Shutdown Interim Assessment Report and 2021 Annual Report were transmitted in a letter dated June 9, 2022. The comments in that document were discussed in a conference call/meeting with WMWI and SCS, USEPA and its consultant, and WDNR on July 22, 2022. During that meeting, WMWI/SCS presented updated time-concentration plots that included quarterly data obtained after the initial interim assessment report was submitted to demonstrate that a second two-year period interim assessment period was warranted, and that revisions to the initial interim report or 2021 Annual Report were not necessary at this time. WDNR's representative, Bruce LeRoy, indicated that he would follow-up regarding the potential applicability of the current State of Wisconsin solid waste rules (NR 500 Wis. Adm. Code) to the data from the vapor/gas monitoring probes at the Site. The Hagen Farms Landfill is a licensed solid waste disposal site in Wisconsin.

A conference call was convened on January 13, 2023, with Mr. Thomas, WMWI, and SCS for purposes of introduction and to discuss the request for an updated QAPP. Mr. Thomas agreed that the requirement for an updated QAPP was tolled until inconsistencies between the data quality program requirements for a licensed solid waste facility in Wisconsin and current USEPA guidance documents for a QAPP are resolved. The data quality components of the WDNR Solid Waste program, under which the data in this submittal was obtained, are further described in this Report. Those specified components include sampling procedures; use of an approved laboratory that is subject to periodic audit; use of only approved laboratory methods; data quality qualifiers; and data screening, compilation, and reporting requirements.

4.8 CONCLUSIONS

- The review of the groundwater monitoring data from this reporting period indicates that the temporary shutdown of the ISVE and LFAS systems at the Site in September 2019 has not resulted in a significant or unanticipated adverse change in groundwater in 2022. The temporary shutdown should continue unless unanticipated conditions are identified upon review of the periodic groundwater data.

- Potential rebound of contaminants, specifically vinyl chloride and THF, at low concentrations at monitoring wells located within the waste mass (i.e., MW22 and P22B) was anticipated as part of the temporary shutdown/rebound test. These concentrations are apparently not associated with a significant contaminant mass, thus are expected to be attenuated in groundwater in the immediate vicinity of the waste mass at the Site. The concentrations of vinyl chloride and THF at wells MW22 and P22B, from analysis of quarterly samples, will continue to be evaluated as part of the temporary shutdown of the ISVE and LFAS systems.

- THF, reported at relatively high concentrations (greater than 5,000 µg/L) in the past at several on-property wells (i.e., OBS1B, OBS1C, P17C) is not quantified in laboratory analysis of samples collected during this reporting period; thus, the relatively low and inconsistent concentration of THF at a shallow well within the waste mass (i.e., MW22) is not likely significant.

- Concentrations of contaminants in groundwater, as identified by periodic samples from monitoring wells outside the limits of waste, continue to be stable or decrease over time. The reductions in vinyl chloride over time at wells located within WMWI's property (i.e., OBS1B, OBS1C, P17B, and P17C), and outside of WMWI's property (P32B and OB8M) are notable. There is only one groundwater monitoring well (P26B) located outside the limits of waste where the concentration of vinyl chloride was greater than the value established as the ES in Chapter NR 140 Wis. Adm. Code (0.2 µg/L) during this reporting period. The highest vinyl chloride concentration in groundwater (on or off-property) during this reporting period (2022) is 0.94 ug/L (MW22/November); thus, no concentrations in groundwater from this reporting period are greater than the federal drinking water standard established as the MCL of 2 µg/L.

- The decreases in vinyl chloride concentrations at off-property wells OB8M and P32B during the last 5 years are notable. The vinyl chloride concentrations over time at P32B have decreased such that the current concentrations are below the concentration established as the PAL. The vinyl chloride concentration at OB8M, although still above the concentration established as the PAL, is below the concentration established as the ES for the last five consecutive sampling events.

- No rebound in contaminant concentrations related to the temporary shutdown of the remedial systems was observed at monitoring wells outside of the waste mass during the 2022 reporting period. Concentrations of vinyl chloride continue to decrease over time at a number of downgradient on-property (i.e., P17B, P17C) monitoring wells. No VOCs were quantified in analysis of samples from other downgradient on-property wells located between the waste mass and property line including wells OBS1A, OBS1B, OBS1C, MW7, MW26, MW33, and P33B. These wells are expected to act as sentry wells to identify any potential adverse impacts to groundwater related to the shutdown test before it leaves the property; thus, there is no evidence of a rebound of contaminant concentrations in downgradient groundwater outside the limits of waste in the approximate 36 months since operation of the remedial systems ceased in September 2019.

- Groundwater elevations at the monitoring wells during this reporting period were consistent with prior data and the observation that annual precipitation in 2022 was average. Although some variation was noted during prior reporting periods, the groundwater flow pattern is consistent in that groundwater flow continues to be generally to the south in the shallow and deep groundwater zones.

- The data screening included in this annual report, using the PAL and ES established in Chapter NR 140 Wis. Adm. Code, did not identify any results from this reporting period that are materially inconsistent with past data at this Site and need to be further evaluated as a potential significant adverse change in conditions.

- Data quality was evaluated in preparation of the quarterly data submittals for the Site and summarized in this Report. There were no significant or consistent data quality issues identified upon review of the results from analysis of samples collected in 2022.

4.9 RECOMMENDATIONS

- The temporary shutdown of the ISVE and LFAS systems should continue to evaluate the potential for rebound in contaminant concentrations in groundwater and to assess the effectiveness of monitored natural attenuation at the Site. If there is not an unacceptable increase in concentrations of THF and vinyl chloride over time, monitored natural attenuation alone would be an appropriate remedy for groundwater at the Site.

- Continue to implement the groundwater monitoring program included in **Appendix C** during 2023. That program was previously transmitted as an attachment to WMWI's correspondence to USEPA dated February 11, 2013.

- Continue to collect quarterly samples for VOC analysis at wells P26B and MW7 as part of the temporary shutdown/rebound test. The frequency of VOC analysis was increased at these wells to evaluate the effectiveness of the supplemental sparge points (P7B, EW1INF, and EW3) installed in October 2014. As expected, operation of the supplemental sparge points as part of the enhanced LFAS system from 2014 to 2019 was effective in reducing contaminant concentrations over time in the vicinity of these wells. The sampling frequency for these wells originally established in the monitoring program can resume upon completion of the temporary shutdown/rebound test.

- Prepare a second interim data review, including the results from 2022 and 2023, to evaluate the potential for rebound in contaminant concentrations in groundwater and to assess the effectiveness of monitored natural attenuation at the Site. This report would be submitted in early-mid 2024.

5.0 COMMUNITY RELATIONS

The Site is in routine O&M. Monitoring data were collected and submitted to the USEPA and WDNR in the quarterly submittals. WMWI's contractor, SCS, contacted the private well owners and collected the annual groundwater samples in August. The results from analysis of those samples were subsequently transmitted by WMWI to the residents or owners. The USEPA and WDNR received copies of those transmittals.

6.0 2023 ACTIVITIES

Projected activities associated with the SCOU and GCOU were discussed individually as recommendations in **Sections 2.7**, **3.7**, and **4.9** of this Report.

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Tables

Table 1. 2022 Gas 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	0.01	56.4	40.3	0.6	**GP15M**	-0.02	49.8	34.8	3.4
GP01M	0.02	33.2	27.6	8.2	**GP15D**	-0.00	44.0	33.3	4.9
GP01D	-0.02	1.2	1.7	19.8	**GP16S**	0.03	0.0	5.3	14.9
GP02S	-0.02	56.0	35.3	1.6	**GP16M**	0.00	0.0	4.5	16.3
GP02M	-0.03	56.0	43.0	0.9	**GP16D**	0.00	0.0	0.1	20.9
GP02D	-0.04	0.2	1.0	20.2	**GP17S**	-0.03	48.2	40.5	1.5
GP03S	0.03	55.1	30.4	0.3	**GP17M**	0.01	44.4	37.6	3.0
GP03M	-0.01	53.9	34.8	1.3	**GP17D**	0.01	1.4	2.4	19.9
GP03D	-0.04	0.1	0.3	20.8	**GP18S**	0.00	36.6	26.6	1.5
GP04S	0.01	42.4	27.7	0.2	**GP18M**	0.03	44.4	37.2	4.0
GP04M	-0.02	32.6	22.1	4.7	**GP18D**	-0.01	43.3	32.4	4.2
GP04D	-0.02	0.0	0.2	21.0	**GP19S**	-0.03	39.5	30.8	6.0
GP05S	-0.01	54.4	37.5	1.6	**GP19M**	-0.01	32.6	29.9	6.0
GP05M	-0.02	51.6	44.9	1.1	**GP19D**	-0.01	0.0	0.5	20.9
GP05D	-0.04	0.0	0.2	20.6	**GP20S**	-0.05	0.0	8.1	10.4
GP06S	-0.02	52.3	37.3	1.6	**GP20M**	-0.03	0.0	1.9	18.4
GP06M	-0.02	45.6	40.7	0.1	**GP20D**	-0.03	0.0	0.2	20.9
GP06D	-0.03	1.7	2.1	19.5	**GP21S**	-0.05	0.0	1.1	20.4
GP07S	-0.02	51.2	30.0	3.0	**GP21D**	0.00	0.0	0.2	21.2
GP07M	-0.03	36.1	29.3	7.1	**GP22S**	-0.04	0.0	6.1	16.3
GP07D	-0.03	34.5	33.2	7.0	**GP22M**	0.00	0.0	6.5	14.7
GP08S	-0.03	57.2	25.6	0.8	**GP22D**	-0.01	0.0	0.1	20.7
GP08M	0.03	60.1	39.9	0.1	**GP23S**	-0.04	0.0	6.8	14.8
GP08D	-0.06	0.0	0.3	20.1	**GP23M**	0.02	0.0	3.4	18.3
GP09S	-0.02	60.8	39.0	0.2	**GP23D**	0.01	0.0	0.3	20.9
GP09M	0.04	49.0	36.0	0.1	**GP24S**	0.02	0.0	10.5	10.3
GP09D	0.01	43.6	32.7	2.0	**GP24M**	0.02	2.2	11.5	10.2
GP10S	-0.02	10.0	22.7	6.4	**GP24D**	-0.01	2.3	12.9	3.7
GP10M	0.02	49.3	38.8	2.9	**GP25S**	-0.01	0.0	10.6	9.9
GP10D	0.01	56.8	40.8	0.4	**GP25M**	-0.02	0.0	18.0	2.9
GP11S	-0.01	43.8	28.0	1.2	**GP25D**	0.01	0.7	13.5	7.4
GP11M	0.04	36.0	25.7	0.8	**GP26S**	-0.01	0.0	8.5	12.7
GP11D	0.01	17.4	13.1	10.5	**GP26M**	0.00	0.5	14.5	7.2
GP12S	0.03	49.3	29.4	1.3	**GP26D**	0.01	0.5	5.7	15.6
GP12M	-0.02	26.9	21.3	5.1	**GP27S**	0.02	0.5	5.5	13.1
GP12D	-0.01	26.7	19.2	5.7	**GP27M**	0.04	0.0	0.9	19.5
GP13S	0.04	48.7	30.8	2.7	**GP27D**	0.01	0.0	5.6	11.5
GP13M	0.00	45.1	29.9	3.4	**GP28S**	0.04	0.0	5.7	12.2
GP13D	0.00	35.2	24.5	7.2	**GP28M**	0.05	0.0	4.6	13.2
GP14S	-0.00	59.3	32.4	1.0	**GP28D**	0.18	0.0	0.9	20.3
GP14M	-0.01	43.4	30.9	5.3	**GP29S**	0.00	28.3	19.5	0.3
GP14D	-0.01	51.1	33.3	3.5	**GP29M**	0.01	24.9	18.5	0.5
GP15S	-0.02	35.5	25.4	4.5	**GP29D**	0.06	4.8	3.6	16.9

Notes: .
1) Probe data collected by SCS personnel on November 16, 2022.
2) Barometric Pressure and Trend: 28.83 inches of Mercury, Steady.

Created by: ZTW Date: 2/6/2019
Revised by: ACL Date: 3/7/2023
Checked by: MP Date: 3/7/2023

Z:\Projects\25212002.00\Reports\Annual Reports\2022\Tables\[Table 1 - Probe Data.xls]Table 1

Table 2. Dissolved Oxygen Results in Groundwater - 2019 - 2022 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	2022	2019	2020	2021	2022	2019	2020	2021[3]	2022	2019	2020	2021	2022
IG04	WT	5.5	5.8	6.7	4.0					6.4	5.1	6.3	5.5				
MW100	WT									6.5	5.2	7.8	7.7				
MW22	WT	4.0	2.6	13.2	2.0	5.3	1.6	3.4	1.5	6.2	2.7	2.6	1.1	4.8	2.3	1.8	4.0
MW23	WT									3.5	2.9	2.7	1.1				
MW26	WT	3.6	3.2	2.9	3.3					4.2	2.9	3.9	3.4				
MW27	WT	2.4	1.7	3.4	1.7					3.6	1.9	2.5	3.3				
MW29	WT									6.9	6.3	9.1	5.9				
MW30	WT									2.7	1.9	2.4	1.1				
MW32	WT									3.6	3.8	4.3	3.4				
MW33	WT	2.6	3.8	4.0	2.6					3.7	3.1	3.1	3.5				
MW7	WT	5.9	4.4	3.6	2.0	9.0	5.1	7.5	3.4	6.1	3.5	3.6	4.2	7.0	5.7	4.4	4.4
OB11M	PZ(USD)	2.0	3.7	1.5	2.9					4.3	2.8	3.8	0.47				
OB8M	PZ(BD)	3.8	5.9	6.7	4.1	5.6	4.7	1.7	7.4	5.9	6.6	6.7	6.6	8.7	4.9	8.5	10.7
OBS1A	WT	3.9	4.1	2.0	2.0	5.2	3.4	4.6	4.8	5.6	4.1	4.2	4.6	4.1	14.3	2.8	4.2
OBS1B	PZ(BD)	9.4	10.0	8.4	5.0	11.0	10.7	6.7	5.6	11.3	9.1	7.0	5.2	16.8	6.5	6.2	6.1
OBS1C	PZ(BD)	8.0	7.8	8.2	3.2	11.1	7.4	6.2	2.2	11.2	9.2	7.3	1.6	12.4	10.5	3.4	1.8
OBS2C	PZ(BD)	8.8	8.1	10.3	5.5	10.9	8.2	8.6	7.4	10.9	7.2	9.7	7.7	14.4	12.5	7.8	8.9
P17B	PZ(USD)	3.9	5.5	4.7	2.6	6.2	4.0	4.8	3.4	6.3	4.2	4.5	5.3	7.3	7.5	1.3	3.8
P17C	PZ(BD)	1.4	2.5	2.1	1.4	2.0	2.0	1.3	1.7	5.7	2.7	3.3	1.4	4.0	3.8	3.5	1.5
P17DR	PZ(BD)	10.7	9.4	12.9	7.0					14.3	11.5	14.7	9.7				
P22B	PZ(USD)	1.6	2.1	2.1	1.5	2.8	1.1	3.9	1.6	2.8	2.6	2.0	2.3	3.0	2.8	2.1	2.9
P26B	PZ(USD)	2.7	3.7	2.4	2.0	5.5	3.7	3.1	3.4	4.1	3.5	3.3	1.9	5.8	6.0	2.5	2.9
P27B	PZ(USD)	1.3	1.9	1.9	1.4					2.8	1.9	2.0	2.9				
P28B	PZ(USD)	1.6	2.4	1.6	1.3					2.4	3.1	2.9	2.0				
P28C	PZ(BD)									5.1	5.0	6.0	4.4				
P29B	PZ(USD)									5.9	4.2	6.3	5.0				
P29C	PZ(BD)									6.7	5.4	7.4	5.3				
P30B	PZ(USD)									4.8	14.1	3.6	2.0				
P30C	PZ(BD)									5.7	5.1	6.1	9.8				
P32B	PZ(BD)	1.8	2.9	1.5	1.8	3.4	2.0	1.6	1.0	2.5	2.4	1.5	1.7	3.1	2.8	1.3	1.2
P33B	PZ(BD)									5.7	4.8	4.8	4.1				
P35B	PZ(BD)									5.7	4.0	3.2	6.8				
P40D	PZ(BD)									6.7	6.2	8.1	5.6				
Average		4.2	4.6	5.0	2.9	6.5	4.5	4.5	3.6	5.8	4.8	5.1	4.1	7.6	6.6	3.8	4.4

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\2022\Tables\[Table 2 - Dissolved Oxygen Results 2019 v 2020 v 2021 v 2022.xls]Table 2

Table 2a. Dissolved Oxygen Results in Groundwater - 2019 - 2022
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	February 2022	May 2022	August 2022	November 2022
IG04	WT	5.5		6.4		5.8		5.1		6.7		6.3		4.0		5.5	
MW100	WT			6.5				5.2				7.8				7.7	
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	2.0	1.5	1.1	4.0
MW23	WT			3.5				2.9				2.7				1.1	
MW26	WT	3.6		4.2		3.2		2.9		2.9		3.9		3.3		3.4	
MW27	WT	2.4		3.6		1.7		1.9		3.4		2.5		1.7		3.3	
MW29	WT			6.9				6.3				9.1				5.9	
MW30	WT			2.7				1.9				2.4				1.1	
MW32	WT			3.6				3.8				4.3				3.4	
MW33	WT	2.6		3.7		3.8		3.1		4.0		3.1		2.6		3.5	
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	2.0	3.4	4.2	4.4
OB11M	PZ(USD)	2.0		4.3		3.7		2.8		1.5		3.8		2.9		0.47	
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	4.1	7.4	6.6	10.7
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	2.0	4.8	4.6	4.2
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	5.0	5.6	5.2	6.1
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	3.2	2.2	1.6	1.8
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	5.5	7.4	7.7	8.9
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	2.6	3.4	5.3	3.8
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	1.4	1.7	1.4	1.5
P17DR	PZ(BD)	10.7		14.3		9.4		11.5		12.9		14.7		7.0		9.7	
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	1.5	1.6	2.3	2.9
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	2.0	3.4	1.9	2.9
P27B	PZ(USD)	1.3		2.8		1.9		1.9		1.9		2.0		1.4		2.9	
P28B	PZ(USD)	1.6		2.4		2.4		3.1		1.6		2.9		1.3		2.0	
P28C	PZ(BD)			5.1				5.0				6.0				4.4	
P29B	PZ(USD)			5.9				4.2				6.3				5.0	
P29C	PZ(BD)			6.7				5.4				7.4				5.3	
P30B	PZ(USD)			4.8				14.1				3.6				2.0	
P30C	PZ(BD)			5.7				5.1				6.1				9.8	
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	1.8	1.0	1.7	1.2
P33B	PZ(BD)			5.7				4.8				4.8				4.1	
P35B	PZ(BD)			5.7				4.0				3.2				6.8	
P40D	PZ(BD)			6.7				6.2				8.1				5.6	
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	2.9	3.6	4.1	4.4

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\2022\Tables\[Table 2a - Dissolved Oxygen Results 2019 - 2022.xls]Table 2a

Table 3. Oxidation Reduction Potential Results in Groundwater - 2019 - 2022 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	2022	2019	2020	2021	2022	2019	2020	2021*	2022	2019	2020	2021	2022
IG04	WT	114	220	89	580					158	106	296	344				
MW100	WT									153	79	71	136				
MW22	WT	136	12	99	230	-24	-20	-50	-16	186	112	72	57	156	23	40	273
MW23	WT									158	107	101	237				
MW26	WT	106	60	48	568					178	106	322	399				
MW27	WT	-43	41	95	359					176	77	78	247				
MW29	WT									184	143	402	415				
MW30	WT									183	122	304	326				
MW32	WT									175	93	62	183				
MW33	WT	26	129	115	565					138	81	364	332				
MW7	WT	24	210	105	551	55	64	96	299	181	106	293	482	283	30	297	404
OB11M	PZ(USD)	109	215	19	485					175	88	197	374				
OB8M	PZ(BD)	44	177	103	368	95	33	-25	301	176	92	183	217	212	34	225	381
OBS1A	WT	123	93	95	458	147	65	148	326	120	105	340	386	220	24	209	374
OBS1B	PZ(BD)	113	83	94	548	134	88	155	232	115	103	315	414	270	24	260	355
OBS1C	PZ(BD)	131	165	109	590	49	89	157	209	119	103	246	416	240	25	295	372
OBS2C	PZ(BD)	120	133	95	548	111	103	166	301	181	77	395	358	280	40	390	304
P17B	PZ(USD)	14	87	93	612	25	14	137	175	181	105	373	347	283	27	83	418
P17C	PZ(BD)	-35	-45	91	368	-19	-35	-77	94	180	104	92	126	50	24	327	259
P17DR	PZ(BD)	104	182	23	499					180	101	333	338				
P22B	PZ(USD)	-33	-9	114	214	-61	-33	-57	44	185	126	81	81	21	17	40	260
P26B	PZ(USD)	29	36	6	401	138	106	99	197	178	104	285	276	148	39	175	224
P27B	PZ(USD)	-71	36	106	298					180	83	-19	169				
P28B	PZ(USD)	-10	135	5	469					174	88	238	354				
P28C	PZ(BD)									176	97	313	408				
P29B	PZ(USD)									183	31	382	428				
P29C	PZ(BD)									184	88	390	419				
P30B	PZ(USD)									186	125	333	360				
P30C	PZ(BD)									182	115	308	376				
P32B	PZ(BD)	-14	211	94	533	94	62	77	299	176	78	110	360	213	38	255	372
P33B	PZ(BD)									139	71	394	366				
P35B	PZ(BD)									173	87	198	336				
P40D	PZ(BD)									175	105	258	320				
Average		49	109	80	462	62	45	69	205	169	97	246	315	198	29	216	333

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\2022\Tables\[Table 3 - ORP Results 2019 v 2020 v 2021 v 2022.xls]Table 3

Table 3a. Oxidation Reduction Potential Results in Groundwater - 2019 - 2022
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	February 2022	May 2022	August 2022	November 2022
IG04	WT	114		158		220		106		89		296		580		344	
MW100	WT			153				79				71				136	
MW22	WT	136	-24	186	156	12	-20	112	23	99	-50	72	40	230	-16	57	273
MW23	WT			158				107				101				237	
MW26	WT	106		178		60		106		48		322		568		399	
MW27	WT	-43		176		41		77		95		78		359		247	
MW29	WT			184				143				402				415	
MW30	WT			183				122				304				326	
MW32	WT			175				93				62				183	
MW33	WT	26		138		129		81		115		364		565		332	
MW7	WT	24	55	181	283	210	64	106	30	105	96	293	297	551	299	482	404
OB11M	PZ(USD)	109		175		215		88		19		197		485		374	
OB8M	PZ(BD)	44	95	176	212	177	33	92	34	103	-25	183	225	368	301	217	381
OBS1A	WT	123	147	120	220	93	65	105	24	95	148	340	209	458	326	386	374
OBS1B	PZ(BD)	113	134	115	270	83	88	103	24	94	155	315	260	548	232	414	355
OBS1C	PZ(BD)	131	49	119	240	165	89	103	25	109	157	246	295	590	209	416	372
OBS2C	PZ(BD)	120	111	181	280	133	103	77	40	95	166	395	390	548	301	358	304
P17B	PZ(USD)	14	25	181	283	87	14	105	27	93	137	373	83	612	175	347	418
P17C	PZ(BD)	-35	-19	180	50	-45	-35	104	24	91	-77	92	327	368	94	126	259
P17DR	PZ(BD)	104		180		182		101		23		333		499		338	
P22B	PZ(USD)	-33	-61	185	21	-9	-33	126	17	114	-57	81	40	214	44	81	260
P26B	PZ(USD)	29	138	178	148	36	106	104	39	6	99	285	175	401	197	276	224
P27B	PZ(USD)	-71		180		36		83		106		-19		298		169	
P28B	PZ(USD)	-10		174		135		88		5		238		469		354	
P28C	PZ(BD)			176				97				313				408	
P29B	PZ(USD)			183				31				382				428	
P29C	PZ(BD)			184				88				390				419	
P30B	PZ(USD)			186				125				333				360	
P30C	PZ(BD)			182				115				308				376	
P32B	PZ(BD)	-14	94	176	213	211	62	78	38	94	77	110	255	533	299	360	372
P33B	PZ(BD)			139				71				394				366	
P35B	PZ(BD)			173				87				198				336	
P40D	PZ(BD)			175				105				258				321	
Average		49	62	169	198	109	45	97	29	80	69	246	216	462	205	315	333

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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Z:\Projects\25212002.00\Reports\Annual Reports\2022\Tables\[Table 3a - ORP Results 2019 - 2022.xls]Table 3a

Table 4. Groundwater Elevation Summary - 2022
Hagen Farm Site, Town of Dunkirk, Dane County, WI / SCS Engineers Project #25212002.00

Well Identification	Well Type	Sampling Period and Groundwater Elevations (famsl)			
		February (Semi-annual)	May (Quarterly)	August (Annual)	November (Quarterly)
IG04	WT	859.00		859.33	
MW7	WT	858.06	859.44	858.38	859.12
MW22	WT	857.92	858.67	857.74	858.29
MW23	WT	(-)		(-)	
MW26	WT	858.18		859.29	
MW27	WT	856.66		857.08	
MW29	WT	855.78		856.15	
MW30	WT	856.84	858.08	857.20	857.75
MW32	WT	854.86	856.20	855.18	855.82
MW33	WT	857.20	858.39	857.49	858.18
MW100	WT	862.10	860.92	860.04	860.55
OBS1A	WT	856.91	858.14	857.25	857.87
OBS1B	PZ(BD)	857.15	858.39	857.52	858.11
OBS1C	PZ(BD)	857.11	858.38	857.52	858.06
OBS2C	PZ(BD)	856.92	858.19	857.28	857.88
OB8M	PZ(BD)	856.24	853.98	853.14	853.73
OB11M	PZ(USD)	852.84		856.54	
P17B	PZ(USD)	856.78	857.99	857.16	857.72
P17C	PZ(BD)	856.72	857.94	857.04	857.64
P17DR	PZ(BD)	855.35	856.45	855.79	856.10
P22B	PZ(USD)	857.92	859.19	858.32	858.89
P26B	PZ(USD)	857.95	859.45	858.53	858.83
P27B	PZ(USD)	856.57		856.96	
P28B	PZ(USD)	856.23		856.59	
P28C	PZ(BD)	855.89		856.23	
P29B	PZ(USD)	855.62		855.96	
P29C	PZ(BD)	855.48		855.81	
P30B	PZ(USD)	856.89		857.27	
P30C	PZ(BD)	856.90		857.25	
P32B	PZ(BD)	855.18	859.44	855.52	856.08
P33B	PZ(BD)	857.17		857.53	
P35B	PZ(BD)	853.46		853.68	
P40D	PZ(BD)	857.24		860.13	

Abbreviations:
PZ(BD) = Piezometer screened in bedrock
PZ(USD) = Deep piezometer screened in unconsolidated sediment
WT = Shallow piezometer screened in unconsolidated sediment
famsl = Feet Above Mean Sea Level
(-) - water level below top of dedicated sampling pump

Notes:
1) Groundwater elevations were collected in the field by SCS Engineers and are reported in feet above mean sea level.

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Table 4a. Vertical Groundwater Gradients - 2022
Hagen Farm Site, Town of Dunkirk, Dane County, WI / SCS Engineers Project #25212002.00

Well Nest	February (foot/foot)	May (foot/foot)	September (foot/foot)	November (foot/foot)
MW22/P22B	0.000	-0.028	-0.032	-0.033
MW26/P26B	0.017		0.057	
MW27/P27B	0.004		0.005	
MW30/P30B	-0.002		-0.003	
P17B/P17C	0.005	0.004	0.011	0.007
P28B/P28C	0.006		0.006	
P29B/P29C	0.005		0.005	
P30B/P30C	-0.0002		0.0003	

Notes:
1) Vertical gradient is calculated by dividing the difference in groundwater elevation by the difference in total depth.
2) A negative value indicates an upward vertical gradient. A positive value indicates a downward vertical gradient.

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Z:\Projects\25212002.00\Reports\Annual Reports\2022\Tables\[Table 4 - Groundwater Elevation Summary.xls]Table 4a

Table 5. Vinyl Chloride Concentrations at OB8M
Hagen Farm Site, Town of Dunkirk, Dane County, WI / SCS Engineers Project #25212002.00

Well Identification	Sample Date	Compound	Analytical Method			
			8260 (µg/L)	Laboratory Qualifier	8260 SIM (µg/L)	Laboratory Qualifier
OB8M	2/15/2006	Vinyl Chloride	1.0		1.0	E
OB8M	5/19/2006	Vinyl Chloride	1.0		0.1	
OB8M	8/17/2006	Vinyl Chloride	1.0		0.8	
OB8M	11/1/2006	Vinyl Chloride	1.0		1.2	E
OB8M	2/20/2007	Vinyl Chloride	0.9		0.86	
OB8M	5/1/2007	Vinyl Chloride	1.0		0.9	
OB8M	8/27/2007	Vinyl Chloride	1.0		0.6	
OB8M	11/6/2007	Vinyl Chloride	0.9		0.78	
OB8M	2/15/2008	Vinyl Chloride	1.0		0.9	
OB8M	5/8/2008	Vinyl Chloride	1.0		0.7	B
OB8M	8/25/2008	Vinyl Chloride	1.0		0.8	
OB8M	11/5/2008	Vinyl Chloride	1.0	U	1.2	BE
OB8M	2/25/2009	Vinyl Chloride	1.0		1.00	
OB8M	5/5/2009	Vinyl Chloride	0.9		0.67	B
OB8M	11/17/2009	Vinyl Chloride	1.5		1.8	E
OB8M	2/17/2010	Vinyl Chloride	1.5		1.1	E
OB8M	5/12/2010	Vinyl Chloride	1.6		1.4	E
OB8M	8/12/2010	Vinyl Chloride	1.6		1.1	
OB8M	11/23/2010	Vinyl Chloride	0.9	U	0.80	
OB8M	2/15/2011	Vinyl Chloride	1.0	U	0.5	
OB8M	5/12/2011	Vinyl Chloride	1.0	U	0.6	
OB8M	8/24/2011	Vinyl Chloride	1.0	U	0.6	
OB8M	11/29/2011	Vinyl Chloride	1.0	U	1.6	E
OB8M	2/23/2012	Vinyl Chloride	1.0	U	0.9	
OB8M	5/30/2012	Vinyl Chloride	1.0	U	0.7	
OB8M	8/16/2012	Vinyl Chloride	1.5	J	1.5	E
OB8M	11/29/2012	Vinyl Chloride	1.0	U	0.3	
OB8M	2/27/2013	Vinyl Chloride	1.3	J	1.1	E
OB8M	5/21/2013	Vinyl Chloride	1.5	J	1.6	E
OB8M	8/21/2013	Vinyl Chloride	1.4	J	1.5	E
OB8M	11/20/2013	Vinyl Chloride	1.4	J	1.4	E
OB8M	2/13/2014	Vinyl Chloride	1.1	J	2.0	E
OB8M	5/13/2014	Vinyl Chloride	1.3	J	1.6	E
OB8M	8/7/2014	Vinyl Chloride	1.2	J	1.9	E
OB8M	11/19/2014	Vinyl Chloride	1.1	J	1.4	E
OB8M	2/18/2015	Vinyl Chloride	0.9	J	1.2	
OB8M	5/13/2015	Vinyl Chloride	1.1	J	1.4	
OB8M	8/27/2015	Vinyl Chloride	1.0	U	0.9	
OB8M	11/3/2015	Vinyl Chloride	0.9	J	1.1	
OB8M	2/10/2016	Vinyl Chloride	1.0	U	0.67	
OB8M	5/24/2016	Vinyl Chloride	1.0	U	0.78	
OB8M	8/5/2016	Vinyl Chloride	1.0	U	0.57	
OB8M	11/7/2016	Vinyl Chloride	1.0	U	0.85	
OB8M	2/15/2017	Vinyl Chloride	1.0	U	0.64	B
OB8M	5/15/2017	Vinyl Chloride	1.0	U	0.31	
OB8M	8/23/2017	Vinyl Chloride	1.0	U	0.02	U
OB8M	11/20/2017	Vinyl Chloride	1.0	U	0.54	
OB8M	2/14/2018	Vinyl Chloride	1.0	U	0.25	
OB8M	5/16/2018	Vinyl Chloride	1.0	U	0.64	
OB8M	8/30/2018	Vinyl Chloride	1.0	U	0.32	
OB8M	11/13/2018	Vinyl Chloride	1.0	U	0.60	

Table 5. Vinyl Chloride Concentrations at OB8M
Hagen Farm Site, Town of Dunkirk, Dane County, WI / SCS Engineers Project #25212002.00

Well Identification	Sample Date	Compound	Analytical Method			
			8260 (µg/L)	Laboratory Qualifier	8260 SIM (µg/L)	Laboratory Qualifier
OB8M	2/20/2019	Vinyl Chloride	1.0	U	0.49	
OB8M	5/22/2019	Vinyl Chloride	1.0	U	0.54	
OB8M	8/27/2019	Vinyl Chloride	1.0	U	0.26	
OB8M	11/20/2019	Vinyl Chloride	1.0	U	0.38	
OB8M	2/27/2020	Vinyl Chloride	1.0	U	0.26	
OB8M	5/27/2020	Vinyl Chloride	1.0	U	0.33	
OB8M	8/11/2020	Vinyl Chloride	1.0	U	0.21	
OB8M	11/23/2020	Vinyl Chloride	1.0	U	0.38	
OB8M	2/2/2021	Vinyl Chloride	0.9	U	0.26	
OB8M	5/13/2021	Vinyl Chloride	0.9	U	0.34	
OB8M	9/8/2021	Vinyl Chloride	0.9	U	0.34	
OB8M	11/17/2021	Vinyl Chloride	0.9	U	0.15	
OB8M	2/14/2022	Vinyl Chloride	0.9	U	0.16	
OB8M	5/26/2022	Vinyl Chloride	0.9	U	0.16	
OB8M	8/15/2022	Vinyl Chloride	0.9	U	0.15	
OB8M	11/17/2022	Vinyl Chloride	0.9	U	0.16	

Abbreviations:
U = The compound was analyzed for, but not detected
E = Results exceeded calibration range
B = Compound was found in the blank and sample
J = Reported value was between the limit of detection and the limit of quantitation

Created by: ZTW Date: 3/6/2015
Last revision by: ACL Date: 2/23/2023
Checked by: WCO Date: 3/1/2023

Z:\Projects\25212002.00\Reports\Annual Reports\2022\Tables\[Table 5 - OB8M Vinyl Chloride Concentration.xlsx]Table 5

Table 6. Summary of Exceedances in Private Well Samples - 2022
Hagen Farm Site, Town of Dunkirk, Dane County, WI / SCS Engineers Project #25212002.00

Well ID / Parameter	Concentration	NR 140 PAL	NR 140 ES	Laboratory Qualifier	Type of Exceedance
PW02					
Nitrite+Nitrate-as N (mg/L as N)	13.7	2	10		ES[1]
PW03					
Chloride (mg/L)	160	125	250		PAL[2]
Iron-Total as Fe (mg/L)	1.9	0.15	0.3		ES[2]
Manganese-Total as Mn (µg/L)	137	60[1], 25[2]	300[1], 50[2]	B	PAL[1], ES[2]
PW04					
Nitrite+Nitrate-as N (mg/L as N)	11.1	2	10		ES[1]
PW09					
Arsenic-Total as As	1.6	1	10		PAL[1]

Abbreviations:
PAL = Preventive Action Limit
ES = Enforcement Standard
µg/L = micrograms per liter
mg/L = milligrams per liter
mg/L as N = milligrams per liter as nitrogen
B = Analyte was detected in the associated Method Blank.
J = Reported Value was between the limit of detection and the limit of quantitation

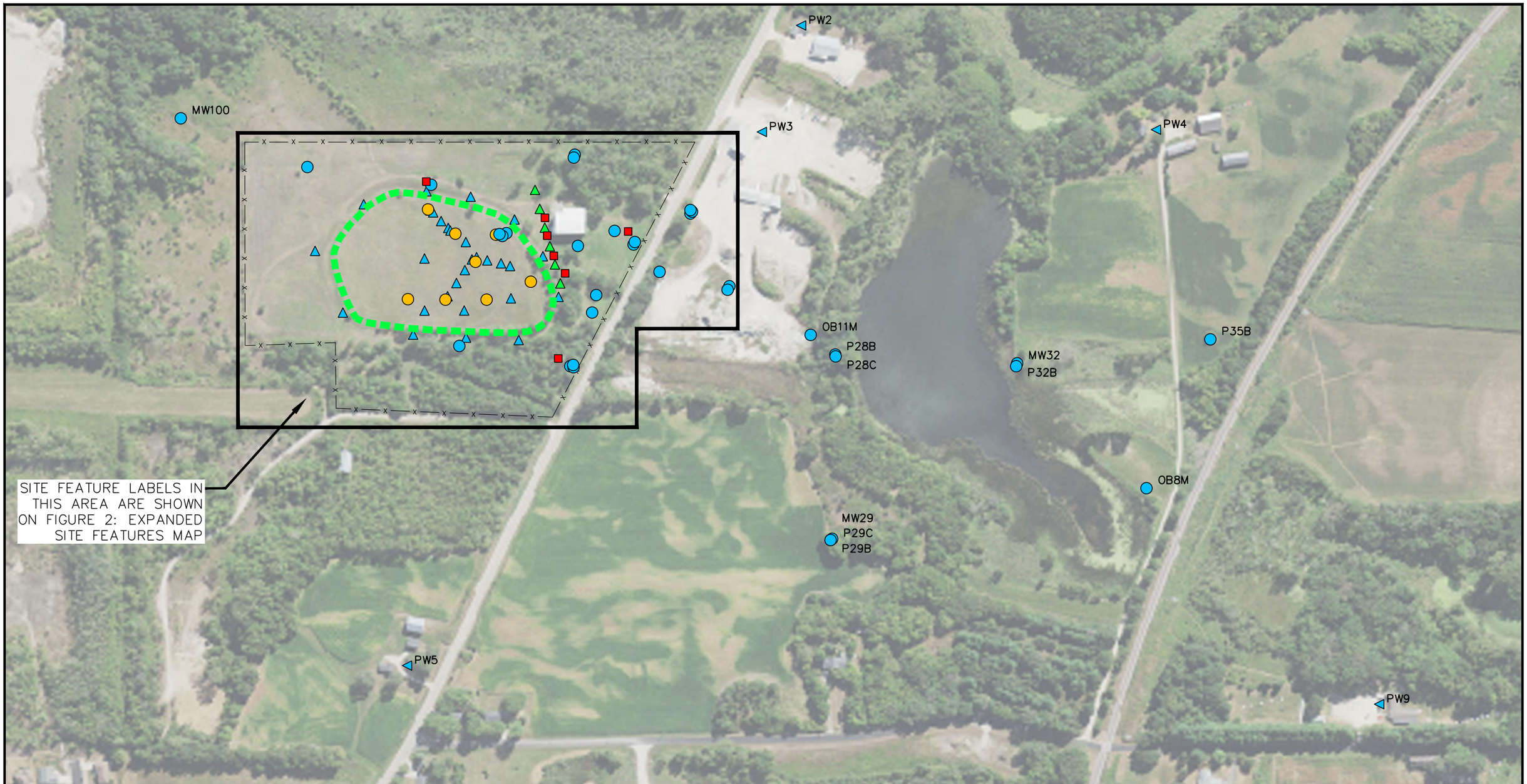
Notes:
1) Private wells samples were collected by SCS Engineers on August 16, 2022.

Superscript Description:
[1] NR140 Table 1 Public Health Groundwater Quality Standards
[2] NR140 Table 2 Public Welfare Groundwater Quality Standards

Created by: ZTW Date: 1/29/2020
Last revision by: ACL Date: 3/7/2023
Checked by: MP Date: 3/7/2023

Z:\Projects\25212002.00\Reports\Annual Reports\2022\Tables\[Table 6 - Private Well Exceedances.xls]Table 6

Figures



BASE IMAGE: NAIP DIGITAL ORTHOPHOTO, 2020.

LEGEND

- APPROXIMATE LIMITS OF WASTE
- FENCE
- MW29 MONITORING WELL/PIEZOMETER
- PW9 PRIVATE WELL
- GAS EXTRACTION WELL
- GAS PROBE
- SHALLOW AIR SPARGE WELL
- 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

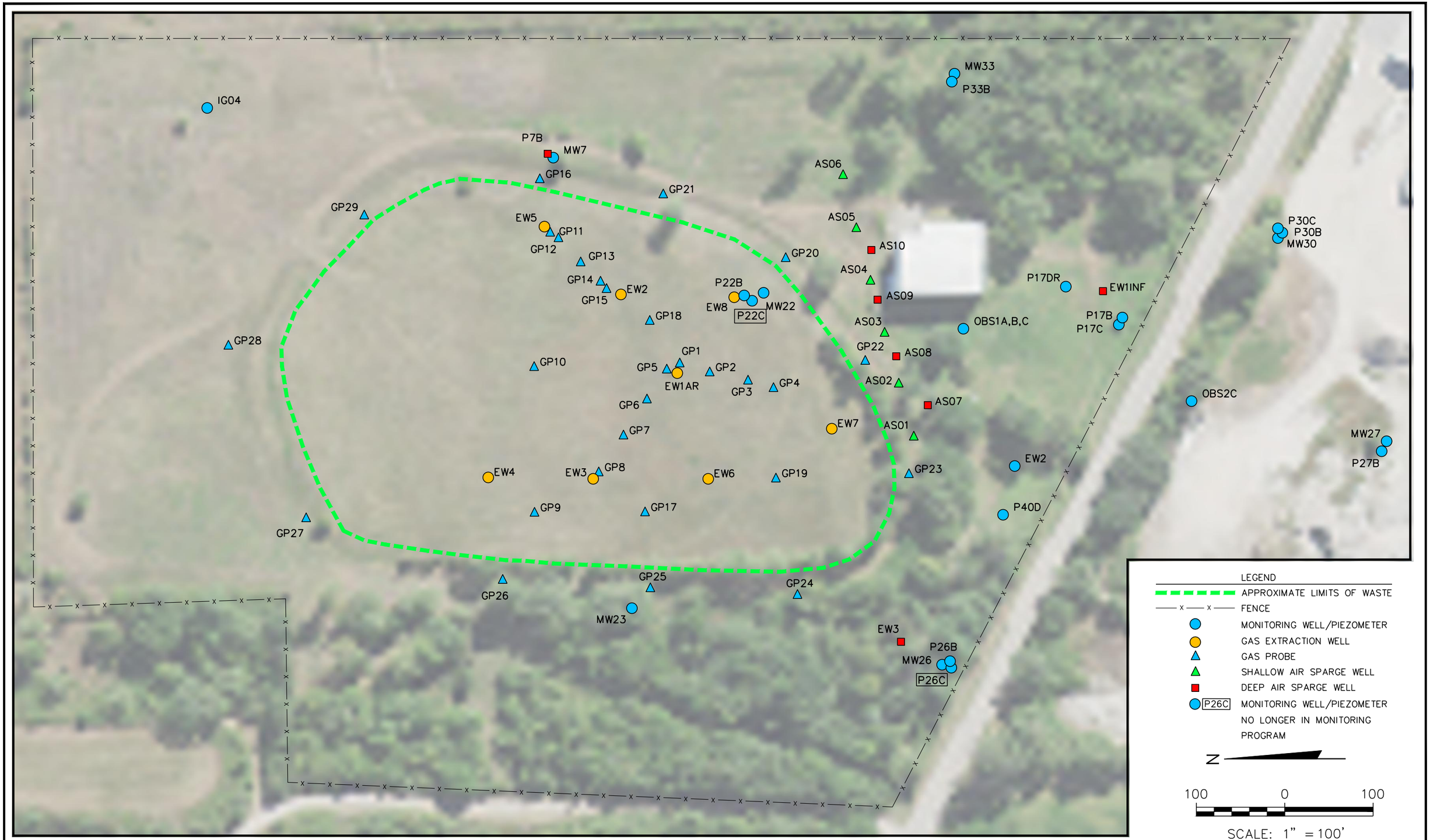
ENGINEER: SCS ENGINEERS
2830 DAIRY DRIVE MADISON, WI 53718-6751
PHONE: (608) 224-2830

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

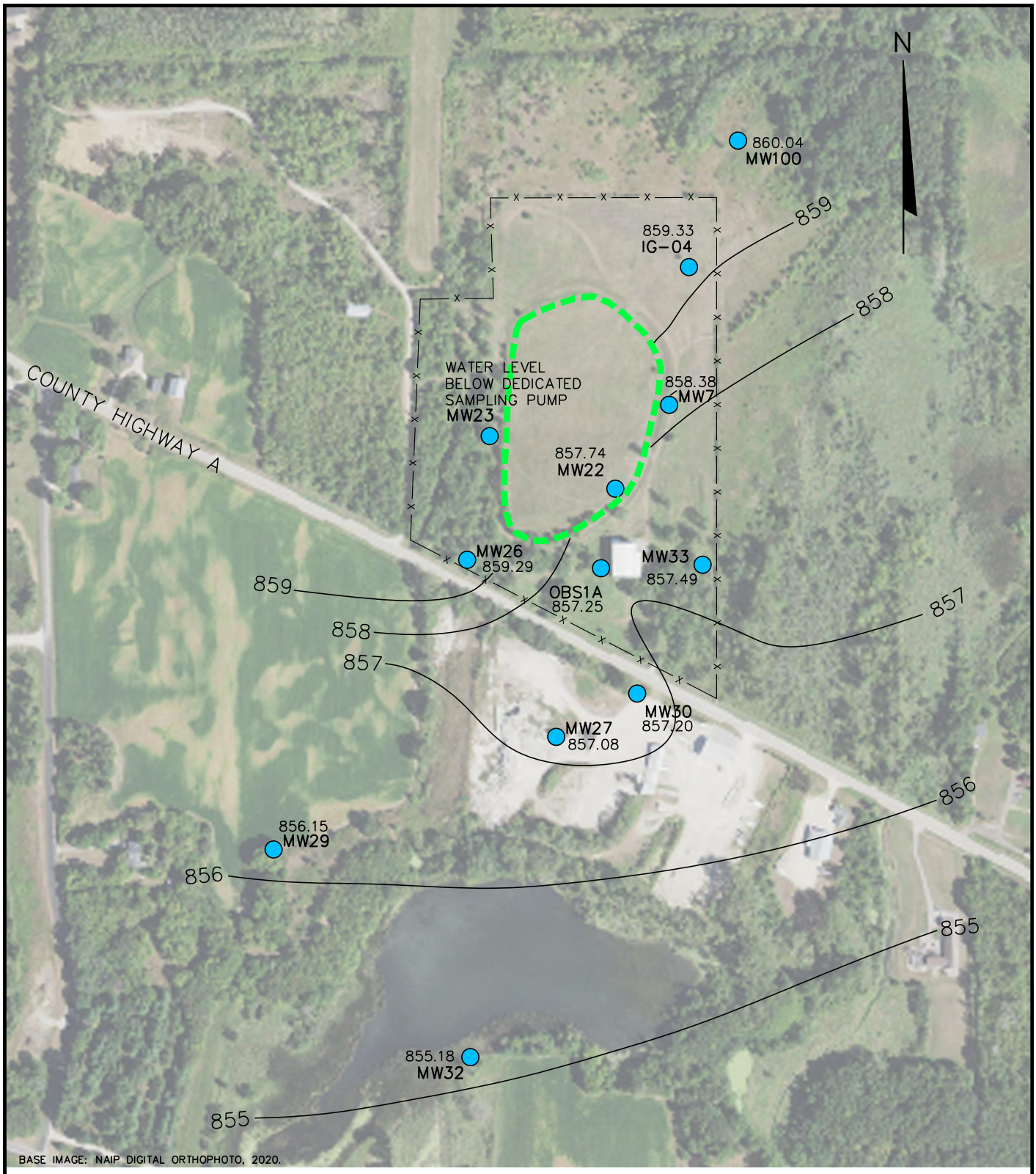
ENGINEER: SCS ENGINEERS
2830 DAIRY DRIVE MADISON, WI 53718-6751
PHONE: (608) 224-2830

CLIENT: WASTE MANAGEMENT

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

EXPANDED SITE FEATURES MAP

FIGURE 2



LEGEND

APPROXIMATE LIMITS OF WASTE	857.27	WATER ELEVATION
FENCE		WATER TABLE SURFACE
MONITORING WELL		CONTOUR SEPTEMBER 8, 2021

400 0 400

SCALE: 1" = 400'

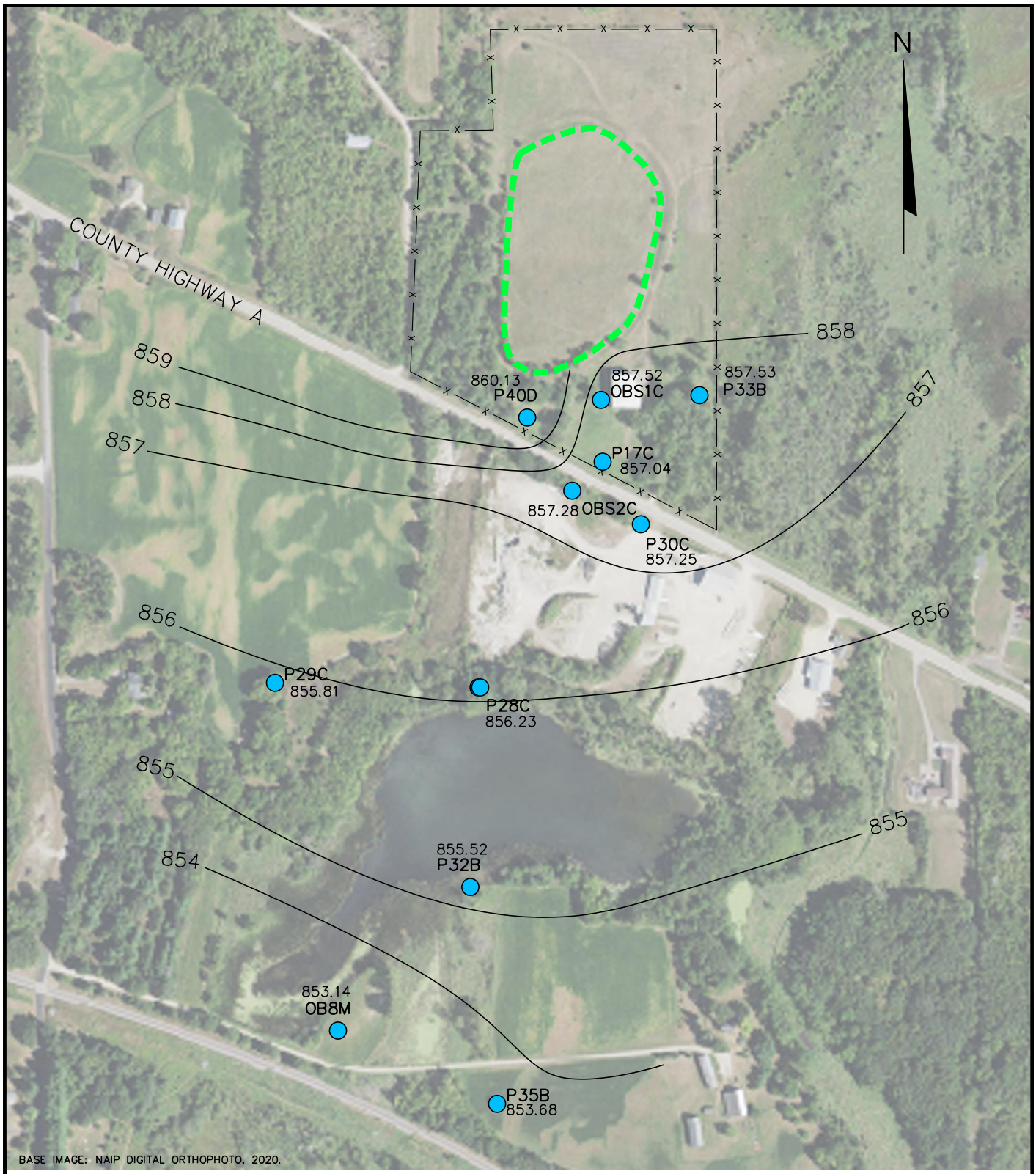
CLIENT	WASTE MANAGEMENT	SITE	HAGEN FARM SITE TOWN OF DUNKIRK, DANE COUNTY WISCONSIN

WATER TABLE SURFACE MAP
AUGUST 2022

PROJECT NO.	25212002.00	DRAWN BY:	KP
DRAWN:	02/11/2013	CHECKED BY:	ACL
REVISED:	03/07/2023	APPROVED BY:	MCK

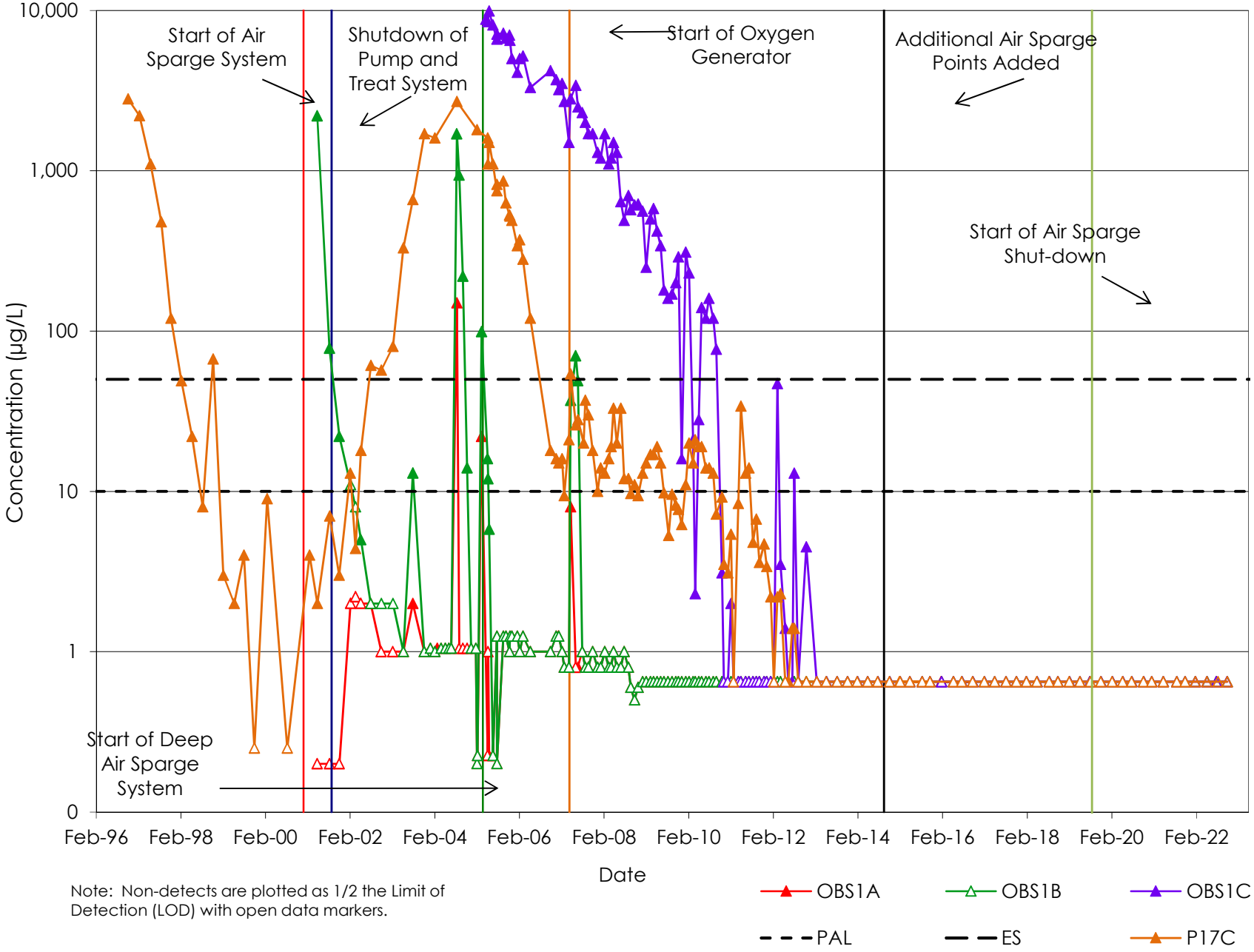
ENGINEER
SCS ENGINEERS
2830 DAIRY DRIVE MADISON, WI 53718-6751
PHONE: (608) 224-2830

FIGURE
3



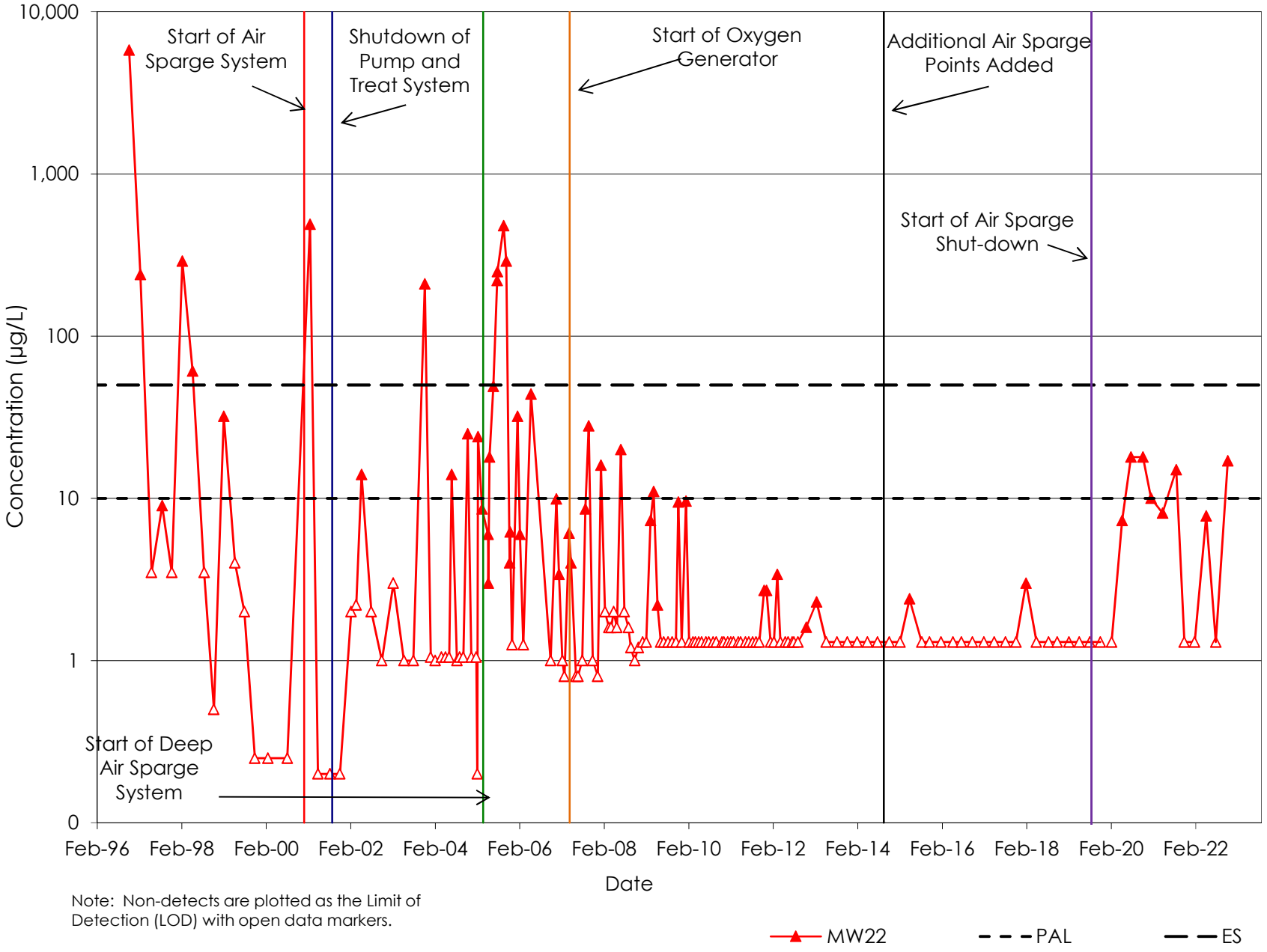
CLIENT: WASTE MANAGEMENT	SITE: HAGEN FARM SITE TOWN OF DUNKIRK, DANE COUNTY WISCONSIN	BEDROCK PIEZOMETRIC SURFACE MAP AUGUST 2022	
PROJECT NO. 25212002.00	DRAWN BY: KP	ENGINEER: SCS ENGINEERS 2830 DAIRY DRIVE MADISON, WI 53718-6751 PHONE: (608) 224-2830	FIGURE 4
DRAWN: 02/11/2013	CHECKED BY: ACL		
REVISED: 03/07/2023	APPROVED BY: MCK		

Figure 5
Tetrahydrofuran
On-Property Wells - Hagen Farm Site



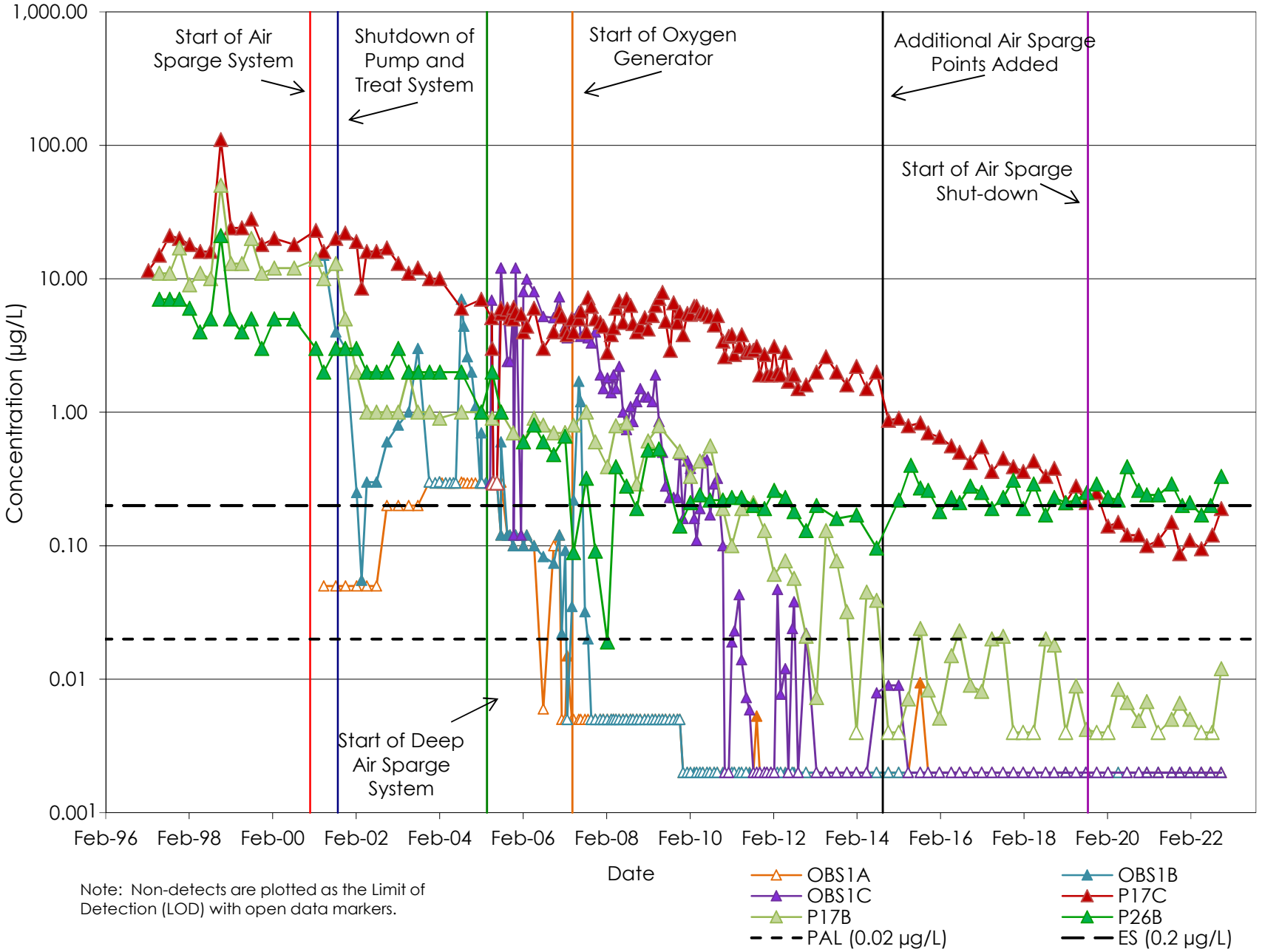
Note: Non-detects are plotted as 1/2 the Limit of Detection (LOD) with open data markers.

Figure 6
Tetrahydrofuran
Source Well - Hagen Farm Site



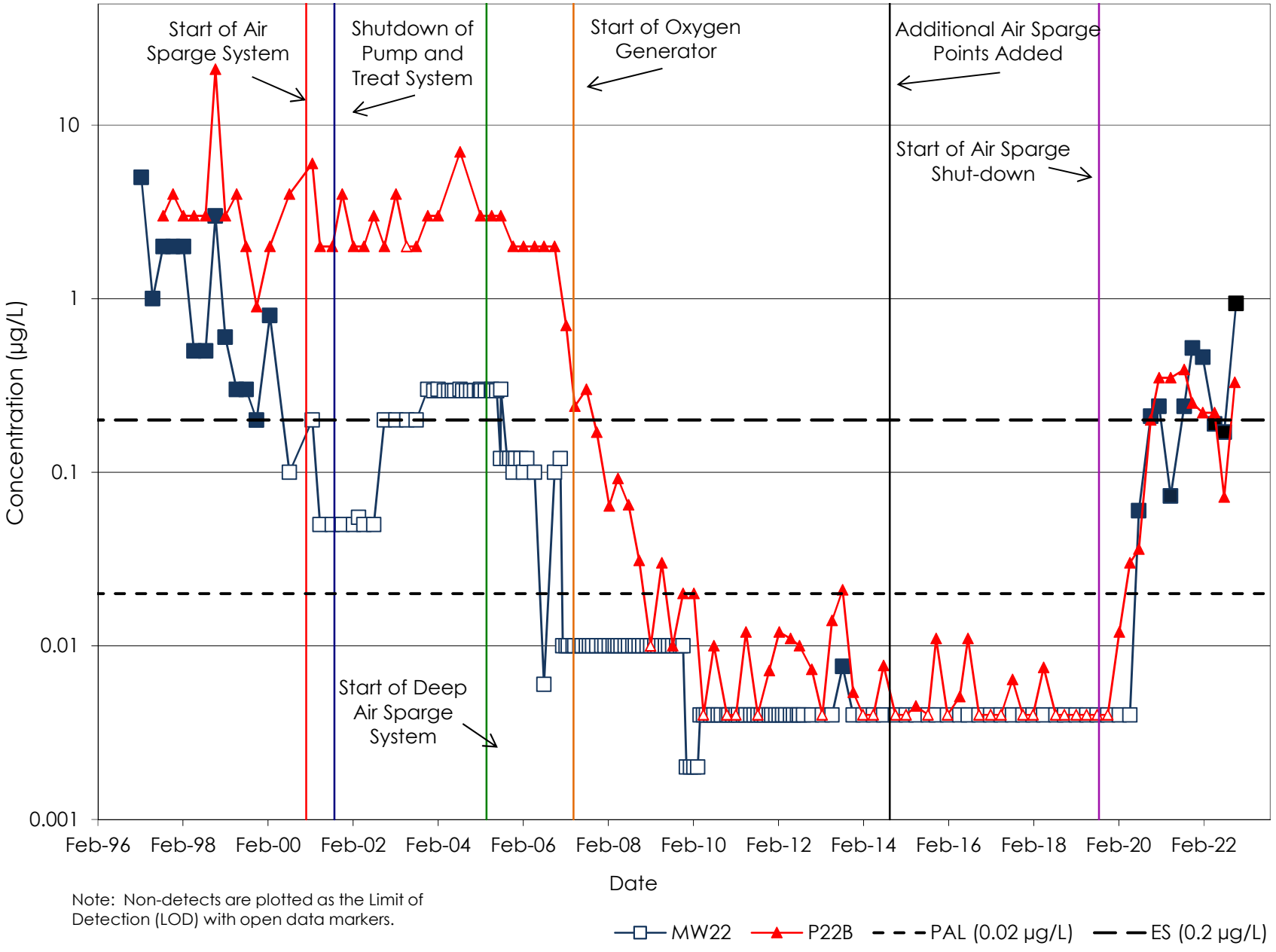
Note: Non-detects are plotted as the Limit of Detection (LOD) with open data markers.

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



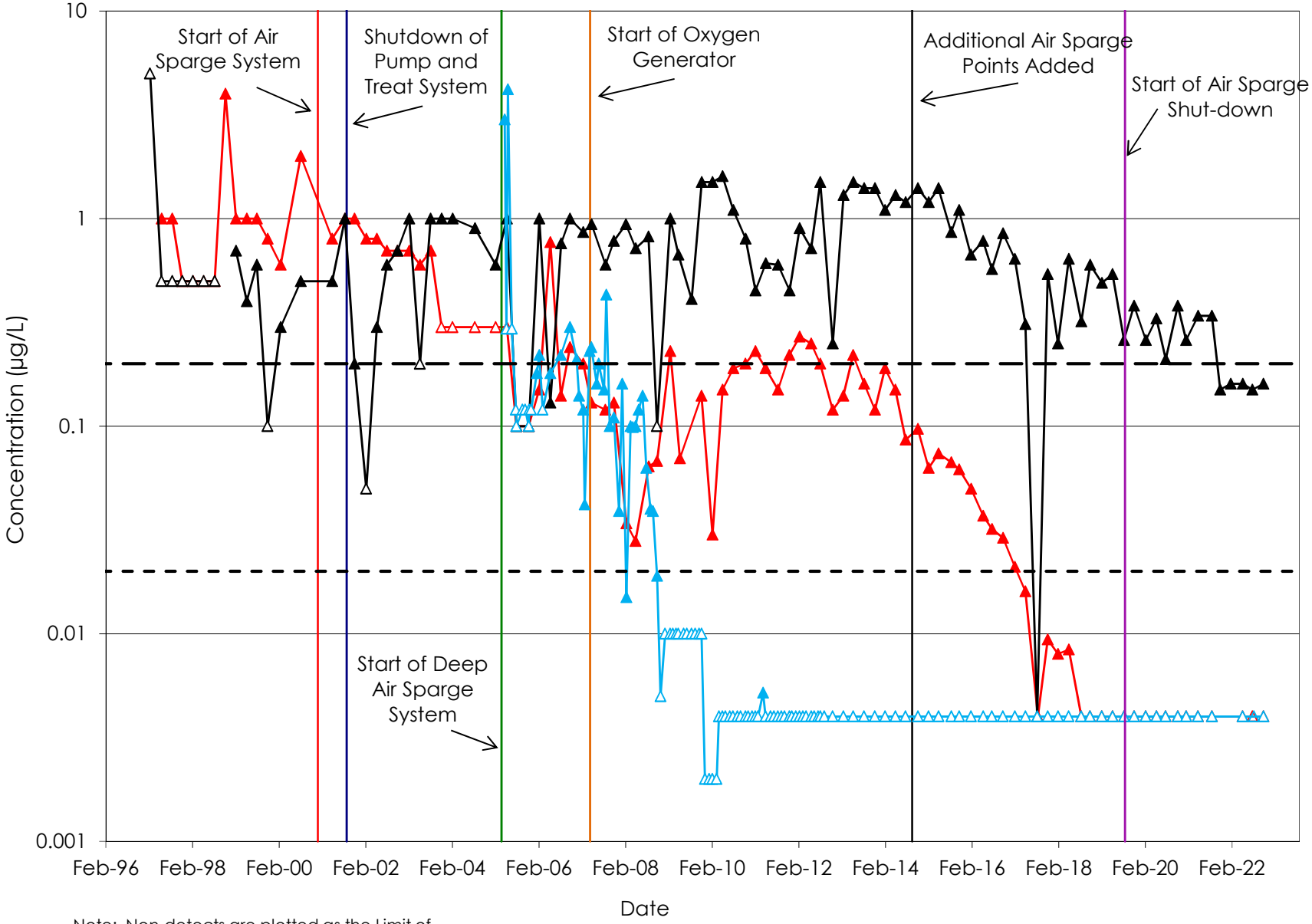
Note: Non-detects are plotted as the Limit of Detection (LOD) with open data markers.

Figure 8
Vinyl Chloride
P22B and MW22 - Hagen Farm Site



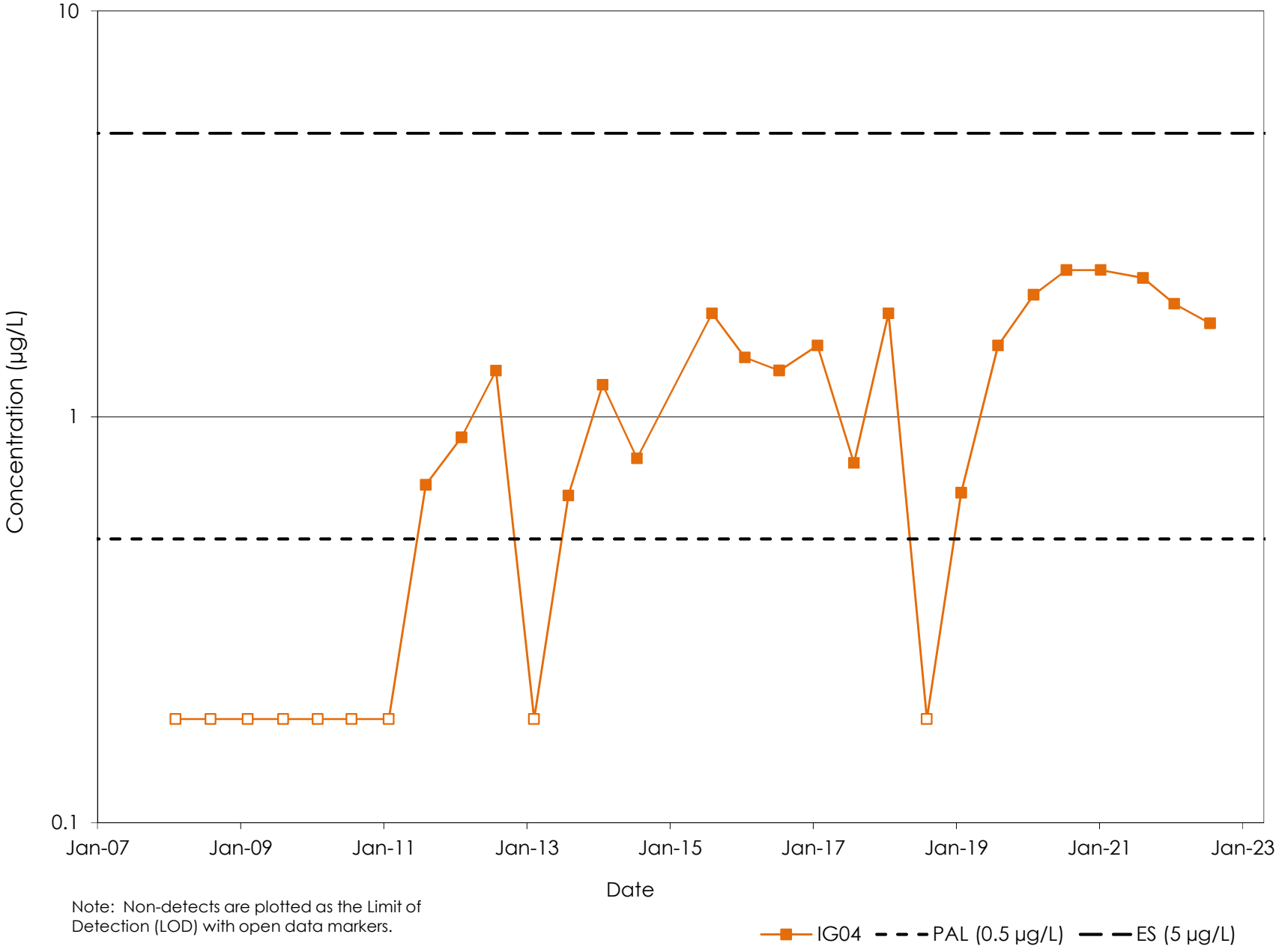
Note: Non-detects are plotted as the Limit of Detection (LOD) with open data markers.

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



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

Figure 10
Tetrachloroethylene
IG04- Hagen Farm Site



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

Appendix A

Site Inspection Report – July 27, 2022

WASTE MANAGEMENT, INC.

CLOSED LANDFILL ENVIRONMENTAL INSPECTION FORM

FACILITY NAME: HAGEN FARM 7/27/22

LOCATION (PHYSICAL ADDRESS - NO P.O. BOX №.): 2318 COUNTY HIGHWAY A

CITY: STOUGHTON **STATE:** WI **ZIP CODE:** 53589

TOTAL ACREAGE: 28 **FILLED ACREAGE:** 10

DATE FACILITY STOPPED RECEIVING WASTE: 8/1/66

OWNER STATUS: OWNED **DATE OF LAST WMI INSPECTION:**

IS THIS FACILITY ON THE NATIONAL PRIORITIES LIST (NPL)? [X] YES [ ] NO

IF YES, DATE LISTED ON THE NPL: 6/10/87

IF NO, IS THIS FACILITY ON CERCLIS: [ ] YES [ ] NO [ ] N/A

IF THIS FACILITY IS ON CERCLIS, DATE OF LISTING:

WEATHER (DURING INSPECTION): **TEMPERATURE:** 82° **CONDITIONS:** Partly Cloudy 5-10 / W-NW

SIGNATURES

THE FINDINGS OF THIS INSPECTION WERE DISCUSSED WITH APPROPRIATE PERSONNEL, CORRECTIVE ACTIONS WERE IDENTIFIED AND AN IMPLEMENTATION SCHEDULE WAS MUTUALLY AGREED UPON;

EVALUATOR: Michael L. Peterson **DATE:** 7/27/22

PROJECT MANAGER: **DATE:**

GROUP DIRECTOR: **DATE:**

NEXT SCHEDULED INSPECTION DATE:

		Y	N	N/A	A
	SECURITY & ACCESS				
1.	ACCESS CONTROLLED BY PERIMETER FENCING?	X			
2.	"NO TRESPASSING" SIGNS POSTED IN APPROPRIATE LANGUAGES?	X			
3.	NO EVIDENCE OF TRESPASSING?	X			
	COVER & VEGETATION				
4.	FINAL COVER IN ACCEPTABLE CONDITION? (PROVIDE DOCUMENTATION REFERENCE IN COMMENTS SECTION).	X			
5.	TOP SLOPE IN ACCEPTABLE CONDITION? (GOOD DRAINAGE, MINIMAL EROSION)	X			
6.	SIDE SLOPE IN ACCEPTABLE CONDITION? (GOOD DRAINAGE, MINIMAL EROSION)	X			
7.	ACCEPTABLE VEGETATION? (QUALITY & DENSITY)	X			
8.	NO DAMAGE TO GAS & LEACHATE SYSTEMS?	X			
9.	NO EXPOSED WASTE?	X			
	DRAINAGE				
10.	APPROPRIATE RUNOFF CONTROLS IN PLACE?	X			
11.	SLOPE DRAINS IN ACCEPTABLE CONDITION?	X			
12.	PERIMETER DITCHES IN ACCEPTABLE CONDITION?	X			
13.	DETENTION/RETENTION PONDS IN ACCEPTABLE CONDITION?	X			
14.	OUTLET STRUCTURES IN ACCEPTABLE CONDITION?	X			
15.	POINT DISCHARGE PERMITTED?			X	
16.	FACILITY IS VOID OF STANDING WATER WHERE UNWANTED WETLANDS MAY DEVELOP?	X			

WASTE MANAGEMENT, INC.
CLOSED LANDFILL ENVIRONMENTAL INSPECTION FORM

	Y	N	N/A	A
LEACHATE & GAS CONTROL SYSTEMS				
17. COLLECTION MANHOLES SECURE & IN ACCEPTABLE CONDITION?	☐	☐	☒	☐
18. RISER & CLEANOUTS SECURE & IN ACCEPTABLE CONDITION?	☐	☐	☒	☐
19. APPROVED LEACHATE MANAGEMENT PLAN BEING IMPLEMENTED?	☐	☐	☒	☐
20. STORAGE TANKS OR PONDS IN ACCEPTABLE CONDITION & OPERATED IN COMPLIANCE WITH REQUIREMENTS?	☒	☐	☐	☐
21. SEWER DISCHARGE PIPE OR METER SECURE & IN GOOD CONDITION?	☐	☐	☒	☐
22. GAS FLARES, VENTS & GAS WELLS SECURE & IN GOOD CONDITION?	☒	☐	☐	☐
23. NO ODOR MIGRATION OFF SITE?	☒	☐	☐	☐
24. NO GAS MIGRATION OFF SITE?	☒	☐	☐	☐
25. PROBES/DETECTION SYSTEM CALIBRATED & IN GOOD WORKING CONDITION?	☒	☐	☐	☐
COVER & VEGETATION				
26. DOCUMENTATION OF WELL INSTALLATION IS AVAILABLE?	☒	☐	☐	☐
27. CURRENT GROUNDWATER MONITORING WELL INSPECTION FILED?	☒	☐	☐	☐

ADDITIONAL FACILITY INFORMATION

Site being mowed during inspection

COMMENTS:

ITEM #

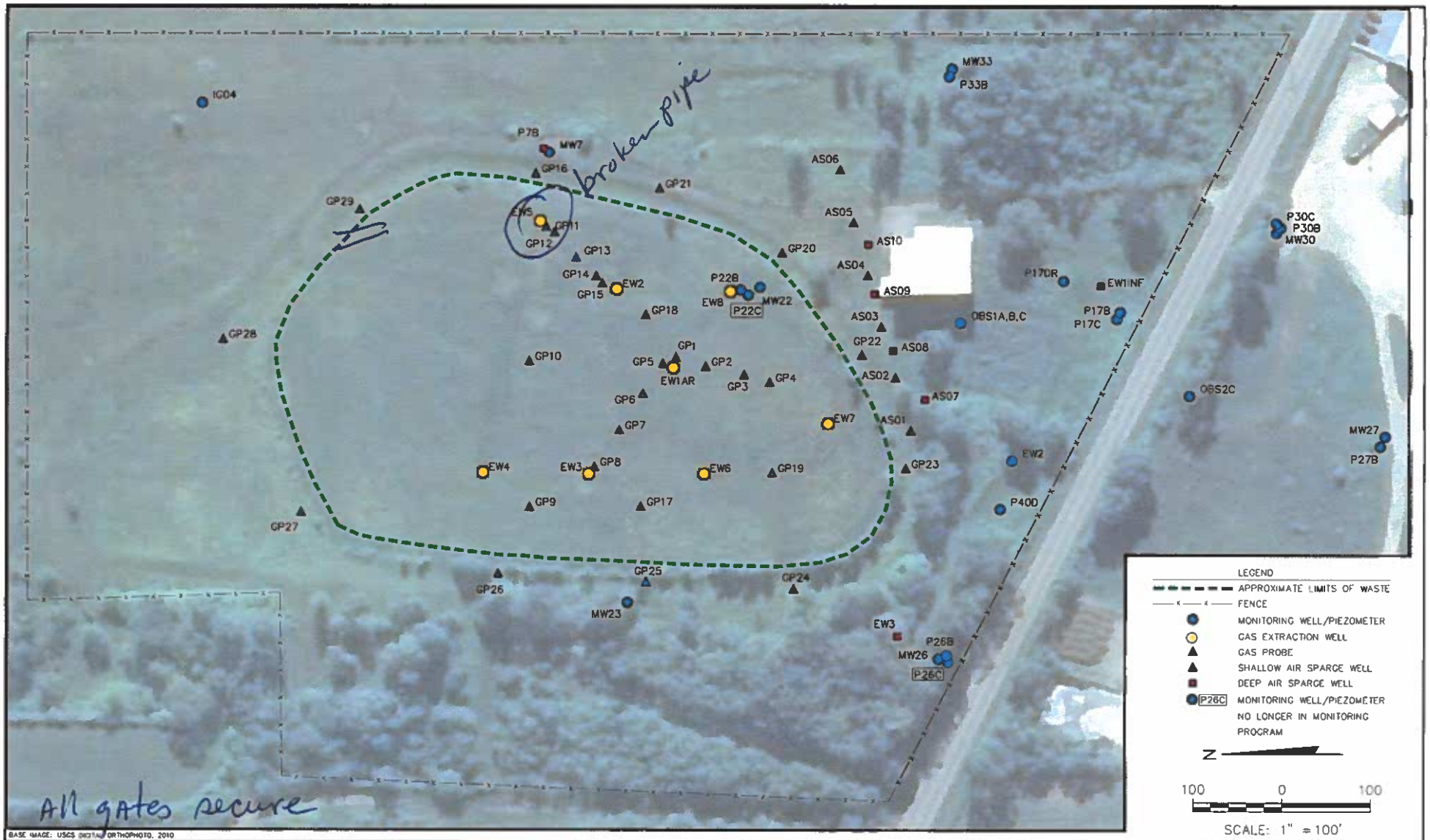
Note — EW 5 prc pipe is broke needs to be sleeved.

NOTES:

[1] RESPONSE BOX LEGEND:

- **Y** = YES
- **N** = NO (A NEGATIVE MUST BE IDENTIFIED AS AN "A" UNLESS A COMMENT IS MADE THAT DEMONSTRATES COMPLIANCE.)
- **NA** = NOT APPLICABLE
- **A** = REQUIRES ATTENTION

[2] SHADES BOXES INDICATE THAT AN ISSUE AND APPROPRIATE CORRECTION ACTION MUST BE DETERMINED.



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 3

Hagen FARM Site Inspection (ANNUAL)
6/27/22
82° Partly cloudy Winds W-NW 5-10

Site currently being mowed
Vegetation - thick.
South Gate intact

Pic #1 SVE Building
#2 Sed/Ret. Pond
#3 SVE piping
#4 Compressors
#5 GP 29
#6 WEST GATE locked
#7 East Gate locked
#8 EW5 Broken pipe
#9
#10


#1
07/27/2022 14:00


#2 Pond
07/27/2022 14:02


#3
07/27/2022 14:36


07/27/2022 14:37


#5
07/27/2022 14:40


#6
07/27/2022 14:44


#7
07/27/2022 14:49


EW5
07/27/2022 14:56

Appendix B

Laboratory Analytical Reports:
Groundwater Monitoring Wells and Private Wells

(on CD-Rom)

Appendix C

Groundwater Monitoring Schedule and Parameter Lists

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		

Appendix D

Compounds Identified in Analysis of Samples from Groundwater Monitoring Wells in Excess of NR 140 Standards (i.e., Identification of NR 140 Exceedances)

Hagen Farm Landfill

Attachment A
First Quarter 2022

Identification of NR 140 Exceedances

License Number: 02981
Facility ID Number: 113176030

Well	Sample Date	Parameter	Sample Result	NR140 Standards PAL	NR140 Standards ES	Units	Type of Standard	Type of Exceedance	Qualifier	RL	LOD	LOQ
IG04	220215	ARSENIC-DISSOLVED AS AS	1.2	1	10	UG/L	Table 1	P		1.0	0.27	0.90
OBS1B	220214	ARSENIC-DISSOLVED AS AS	1.2	1	10	UG/L	Table 1	P		1.0	0.27	0.90
OBS1C	220214	ARSENIC-DISSOLVED AS AS	4.9	1	10	UG/L	Table 1	P		1.0	0.27	0.90
OB8M	220214	ARSENIC-DISSOLVED AS AS	1.1	1	10	UG/L	Table 1	P		1.0	0.27	0.90
P17C	220215	ARSENIC-DISSOLVED AS AS	1.8	1	10	UG/L	Table 1	P		1.0	0.27	0.90
MW22	220214	ARSENIC-DISSOLVED AS AS	6.1	1	10	UG/L	Table 1	P		1.0	0.27	0.90
P22B	220214	ARSENIC-DISSOLVED AS AS	18.9	1	10	UG/L	Table 1	P*		1.0	0.27	0.90
MW27	220215	ARSENIC-DISSOLVED AS AS	1.8	1	10	UG/L	Table 1	P		1.0	0.27	0.90
P27B	220215	ARSENIC-DISSOLVED AS AS	8.9	1	10	UG/L	Table 1	P		1.0	0.27	0.90
IG04	220215	IRON-DISSOLVED AS FE	0.25	0.15	0.3	MG/L	Table 2	P		0.030	0.019	0.064
MW7	220215	IRON-DISSOLVED AS FE	0.43	0.15	0.3	MG/L	Table 2	P*		0.030	0.019	0.064
OB8M	220214	IRON-DISSOLVED AS FE	0.61	0.15	0.3	MG/L	Table 2	E		0.030	0.019	0.064
P17C	220215	IRON-DISSOLVED AS FE	2.4	0.15	0.3	MG/L	Table 2	P*		0.030	0.019	0.064
MW22	220214	IRON-DISSOLVED AS FE	12.7	0.15	0.3	MG/L	Table 2	P*		0.030	0.019	0.064
P22B	220214	IRON-DISSOLVED AS FE	3.6	0.15	0.3	MG/L	Table 2	P*		0.030	0.019	0.064
MW27	220215	IRON-DISSOLVED AS FE	0.25	0.15	0.3	MG/L	Table 2	P		0.030	0.019	0.064
P27B	220215	IRON-DISSOLVED AS FE	1.6	0.15	0.3	MG/L	Table 2	E		0.030	0.019	0.064
MW7	220215	LEAD-DISSOLVED AS PB	2.2	1.5	15	UG/L	Table 1	P		1.5	0.17	0.57
MW33	220214	LEAD-DISSOLVED AS PB	1.7	1.5	15	UG/L	Table 1	P		1.5	0.17	0.57
MW7	220215	MANGANESE-DISSOLVED AS MN	34.7	25	50	UG/L	Table 2	P		10.0	0.40	1.3
OB8M	220214	MANGANESE-DISSOLVED AS MN	147	60	300	UG/L	Table 1	P		10.0	0.40	1.3
OB8M	220214	MANGANESE-DISSOLVED AS MN	147	25	50	UG/L	Table 2	E		10.0	0.40	1.3
OB11M	220214	MANGANESE-DISSOLVED AS MN	84.7	60	300	UG/L	Table 1	P		10.0	0.40	1.3
OB11M	220214	MANGANESE-DISSOLVED AS MN	84.7	25	50	UG/L	Table 2	E		10.0	0.40	1.3
P17C	220215	MANGANESE-DISSOLVED AS MN	228	60	300	UG/L	Table 1	P		10.0	0.40	1.3
P17C	220215	MANGANESE-DISSOLVED AS MN	228	25	50	UG/L	Table 2	P*		10.0	0.40	1.3
MW22	220214	MANGANESE-DISSOLVED AS MN	629	60	300	UG/L	Table 1	P*		10.0	0.40	1.3
MW22	220214	MANGANESE-DISSOLVED AS MN	629	25	50	UG/L	Table 2	P*		10.0	0.40	1.3
P22B	220214	MANGANESE-DISSOLVED AS MN	194	60	300	UG/L	Table 1	P		10.0	0.40	1.3
P22B	220214	MANGANESE-DISSOLVED AS MN	194	25	50	UG/L	Table 2	P*		10.0	0.40	1.3
P26B	220214	MANGANESE-DISSOLVED AS MN	147	60	300	UG/L	Table 1	P		10.0	0.40	1.3

Hagen Farm Landfill

Attachment A
First Quarter 2022

Identification of NR 140 Exceedances

License Number: 02981
Facility ID Number: 113176030

Well	Sample Date	Parameter	Sample Result	NR140 Standards PAL	NR140 Standards ES	Units	Type of Standard	Type of Exceedance	Qualifier	RL	LOD	LOQ
P26B	220214	MANGANESE-DISSOLVED AS MN	147	25	50	UG/L	Table 2	P*		10.0	0.40	1.3
MW27	220215	MANGANESE-DISSOLVED AS MN	46.3	25	50	UG/L	Table 2	P		10.0	0.40	1.3
P27B	220215	MANGANESE-DISSOLVED AS MN	194	60	300	UG/L	Table 1	P		10.0	0.40	1.3
P27B	220215	MANGANESE-DISSOLVED AS MN	194	25	50	UG/L	Table 2	E		10.0	0.40	1.3
P28B	220215	MANGANESE-DISSOLVED AS MN	166	60	300	UG/L	Table 1	P		10.0	0.40	1.3
P28B	220215	MANGANESE-DISSOLVED AS MN	166	25	50	UG/L	Table 2	E		10.0	0.40	1.3
P32B	220214	MANGANESE-DISSOLVED AS MN	26.2	25	50	UG/L	Table 2	P		10.0	0.40	1.3
MW33	220214	MANGANESE-DISSOLVED AS MN	124	60	300	UG/L	Table 1	P		10.0	0.40	1.3
MW33	220214	MANGANESE-DISSOLVED AS MN	124	25	50	UG/L	Table 2	P*		10.0	0.40	1.3
OBS2C	220215	NITRITE PLUS NITRATE-DISSOLVED AS N	4.0	2	10	MG/L	Table 1	P		0.25	0.10	0.33
P17B	220215	NITRITE PLUS NITRATE-DISSOLVED AS N	2.0	2	10	MG/L	Table 1	P		0.050	0.020	0.067
P17DR	220214	NITRITE PLUS NITRATE-DISSOLVED AS N	4.4	2	10	MG/L	Table 1	P		0.25	0.10	0.33
IG04	220215	TETRACHLOROETHYLENE	1.9	0.5	5	UG/L	Table 1	P		1.0	0.36	1.2
OB8M	220214	VINYL CHLORIDE	0.16	0.02	0.2	UG/L	Table 1	P		0.020	0.004	0.013
P17C	220215	VINYL CHLORIDE	0.11	0.02	0.2	UG/L	Table 1	P		0.020	0.004	0.013
MW22	220214	VINYL CHLORIDE	0.46	0.02	0.2	UG/L	Table 1	P*		0.020	0.004	0.013
P22B	220214	VINYL CHLORIDE	0.22	0.02	0.2	UG/L	Table 1	P*		0.020	0.004	0.013
P26B	220214	VINYL CHLORIDE	0.21	0.02	0.2	UG/L	Table 1	P*		0.020	0.004	0.013

P* = Well is located within the Design Management Zone (DMZ) and property boundary, thus the Enforcement Standard does not apply
P = NR 140 Preventive Action Limit or NR 500 Alternate Concentration Limit exceedance
E = NR 140 Enforcement Standard exceedance
J = Sample result is between the Limit of Detection (LOD) and the Limit of Quantitation (LOQ)
EX = NR 140.28 (NR 508.19) Exemptions granted for exceedance

Special Note:
J-Qualifier (Flag) indicates an estimated concentration of an analyte between the Limit of Detection (LOD) and the Limit of Quantitation (LOQ), thus the values are not quantifiable numbers and do not constitute exceedances. However, these values are reported in compliance with NR 507.26 (3)(b) and NR 140.16(5).

Vinyl chloride is analyzed by EPA Method 8260C and by Selective Ion Monitoring. The data from the two analytical methods is evaluated independently in that if both results exceeded a groundwater standard, two exceedances are reported even though the results are from the same sample.

Hagen Farm Landfill

Attachment A
Second Quarter 2022

Identification of NR 140 Exceedances

License Number: 02981
Facility ID Number: 113176030

Well	Sample Date	Parameter	Sample Result	NR140 Standards PAL	NR140 Standards ES	Units	Type of Standard	Type of Exceedance	Qualifier	RL	LOD	LOQ
P17C	220526	IRON-DISSOLVED AS FE	0.85	0.15	0.3	MG/L	Table 2	P*		0.030	0.019	0.064
MW22	220526	IRON-DISSOLVED AS FE	7.5	0.15	0.3	MG/L	Table 2	P*		0.030	0.019	0.064
P22B	220526	IRON-DISSOLVED AS FE	1.5	0.15	0.3	MG/L	Table 2	P*		0.030	0.019	0.064
OB8M	220526	MANGANESE-DISSOLVED AS MN	154	60	300	UG/L	Table 1	P		2.0	0.40	1.3
OB8M	220526	MANGANESE-DISSOLVED AS MN	154	25	50	UG/L	Table 2	E		2.0	0.40	1.3
P17B	220526	MANGANESE-DISSOLVED AS MN	36.1	25	50	UG/L	Table 2	P		2.0	0.40	1.3
P17C	220526	MANGANESE-DISSOLVED AS MN	226	60	300	UG/L	Table 1	P		2.0	0.40	1.3
P17C	220526	MANGANESE-DISSOLVED AS MN	226	25	50	UG/L	Table 2	P*		2.0	0.40	1.3
MW22	220526	MANGANESE-DISSOLVED AS MN	464	60	300	UG/L	Table 1	P*		2.0	0.40	1.3
MW22	220526	MANGANESE-DISSOLVED AS MN	464	25	50	UG/L	Table 2	P*		2.0	0.40	1.3
P22B	220526	MANGANESE-DISSOLVED AS MN	198	60	300	UG/L	Table 1	P		2.0	0.40	1.3
P22B	220526	MANGANESE-DISSOLVED AS MN	198	25	50	UG/L	Table 2	P*		2.0	0.40	1.3
P32B	220526	MANGANESE-DISSOLVED AS MN	31.0	25	50	UG/L	Table 2	P		2.0	0.40	1.3
OBS2C	220526	NITRITE PLUS NITRATE-DISSOLVED AS N	3.2	2	10	MG/L AS N	Table 1	P		0.25	0.10	0.33
P17B	220526	NITRITE PLUS NITRATE-DISSOLVED AS N	2.3	2	10	MG/L AS N	Table 1	P		0.050	0.020	0.067
OB8M	220526	VINYL CHLORIDE	0.16	0.02	0.2	UG/L	Table 1	P		0.020	0.004	0.013
P17C	220526	VINYL CHLORIDE	0.095	0.02	0.2	UG/L	Table 1	P		0.020	0.004	0.013
MW22	220526	VINYL CHLORIDE	0.19	0.02	0.2	UG/L	Table 1	P		0.020	0.004	0.013
P22B	220526	VINYL CHLORIDE	0.22	0.02	0.2	UG/L	Table 1	P*		0.020	0.004	0.013
P26B	220526	VINYL CHLORIDE	0.17	0.02	0.2	UG/L	Table 1	P		0.020	0.004	0.013

Hagen Farm Landfill

Attachment A
Second Quarter 2022

Identification of NR 140 Exceedances

License Number: 02981
Facility ID Number: 113176030

Well	Sample Date	Parameter	Sample Result	NR140 Standards PAL	NR140 Standards ES	Units	Type of Standard	Type of Exceedance	Qualifier	RL	LOD	LOQ

P* = Well is located within the Design Management Zone (DMZ) and property boundary, thus the Enforcement Standard does not apply
P = NR 140 Preventive Action Limit or NR 500 Alternate Concentration Limit exceedance
E = NR 140 Enforcement Standard exceedance
J = Sample result is between the Limit of Detection (LOD) and the Limit of Quantitation (LOQ)
EX = NR 140.28 (NR 508.19) Exemptions granted for exceedance

Special Note:
J-Qualifier (Flag) indicates an estimated concentration of an analyte between the Limit of Detection (LOD) and the Limit of Quantitation (LOQ), thus the values are not quantifiable numbers and do not constitute exceedances. However, these values are reported in compliance with NR 507.26 (3)(b) and NR 140.16(5).

Vinyl chloride is analyzed by EPA Method 8260C and by Selective Ion Monitoring. The data from the two analytical methods is evaluated independently in that if both results exceeded a groundwater standard, two exceedances are reported even though the results are from the same sample.

Hagen Farm Landfill

Attachment A
Third Quarter 2022

Identification of NR 140 Exceedances

License Number: 02981
Facility ID Number: 113176030

Well	Sample Date	Parameter	Sample Result	NR140 Standards PAL	NR140 Standards ES	Units	Type of Standard	Type of Exceedance	Qualifier	RL	LOD	LOQ
MW26	220816	ALUMINUM-DISSOLVED AS AL	83.8	40	200	UG/L	Table 1	P	J	200	60.0	200
IG04	220817	ARSENIC-DISSOLVED AS AS	1.1	1	10	UG/L	Table 1	P		1.0	0.27	0.90
0BS1B	220815	ARSENIC-DISSOLVED AS AS	1.2	1	10	UG/L	Table 1	P		1.0	0.27	0.90
0BS1C	220815	ARSENIC-DISSOLVED AS AS	4.8	1	10	UG/L	Table 1	P		1.0	0.27	0.90
MW7	220817	ARSENIC-DISSOLVED AS AS	1.5	1	10	UG/L	Table 1	P		1.0	0.27	0.90
P17C	220829	ARSENIC-DISSOLVED AS AS	1.3	1	10	UG/L	Table 1	P		1.0	0.27	0.90
MW22	220817	ARSENIC-DISSOLVED AS AS	10.5	1	10	UG/L	Table 1	P*		1.0	0.27	0.90
P22B	220817	ARSENIC-DISSOLVED AS AS	19.2	1	10	UG/L	Table 1	P*		1.0	0.27	0.90
MW23	220815	ARSENIC-DISSOLVED AS AS	1.6	1	10	UG/L	Table 1	P		1.0	0.27	0.90
P26B	220816	ARSENIC-DISSOLVED AS AS	1.0	1	10	UG/L	Table 1	P		1.0	0.27	0.90
P27B	220815	ARSENIC-DISSOLVED AS AS	9.4	1	10	UG/L	Table 1	P		1.0	0.27	0.90
MW29	220816	ARSENIC-DISSOLVED AS AS	1.0	1	10	UG/L	Table 1	P		1.0	0.27	0.90
MW100	220829	ARSENIC-DISSOLVED AS AS	6.8	1	10	UG/L	Table 1	P		1.0	0.27	0.90
MW7	220817	COBALT-DISSOLVED AS CO	15.1	8	40	UG/L	Table 1	P		20.0	0.63	2.1
P17C	220829	IRON-DISSOLVED AS FE	0.94	0.15	0.3	MG/L	Table 2	P*		0.20	0.019	0.064
MW22	220817	IRON-DISSOLVED AS FE	13.4	0.15	0.3	MG/L	Table 2	P*		0.20	0.019	0.064
P22B	220817	IRON-DISSOLVED AS FE	3.2	0.15	0.3	MG/L	Table 2	P*		0.20	0.019	0.064
MW23	220815	IRON-DISSOLVED AS FE	0.29	0.15	0.3	MG/L	Table 2	P		0.20	0.019	0.064
P26B	220816	IRON-DISSOLVED AS FE	0.17	0.15	0.3	MG/L	Table 2	P		0.20	0.019	0.064
P27B	220815	IRON-DISSOLVED AS FE	0.75	0.15	0.3	MG/L	Table 2	E		0.20	0.019	0.064
MW32	220815	IRON-DISSOLVED AS FE	1.2	0.15	0.3	MG/L	Table 2	E		0.20	0.019	0.064
MW100	220829	IRON-DISSOLVED AS FE	3.8	0.15	0.3	MG/L	Table 2	E		0.20	0.019	0.064
IG04	220817	MANGANESE-DISSOLVED AS MN	49.3	25	50	UG/L	Table 2	P		10.0	0.40	1.3
MW7	220817	MANGANESE-DISSOLVED AS MN	493	60	300	UG/L	Table 1	P*		10.0	0.40	1.3
MW7	220817	MANGANESE-DISSOLVED AS MN	493	25	50	UG/L	Table 2	P*		10.0	0.40	1.3
0B8M	220815	MANGANESE-DISSOLVED AS MN	141	60	300	UG/L	Table 1	P		10.0	0.40	1.3
0B8M	220815	MANGANESE-DISSOLVED AS MN	141	25	50	UG/L	Table 2	E		10.0	0.40	1.3
0B11M	220817	MANGANESE-DISSOLVED AS MN	97.4	60	300	UG/L	Table 1	P		10.0	0.40	1.3
0B11M	220817	MANGANESE-DISSOLVED AS MN	97.4	25	50	UG/L	Table 2	E		10.0	0.40	1.3
P17C	220829	MANGANESE-DISSOLVED AS MN	241	60	300	UG/L	Table 1	P		10.0	0.40	1.3
P17C	220829	MANGANESE-DISSOLVED AS MN	241	25	50	UG/L	Table 2	P*		10.0	0.40	1.3

Hagen Farm Landfill

Attachment A
Third Quarter 2022

Identification of NR 140 Exceedances

License Number: 02981
Facility ID Number: 113176030

Well	Sample Date	Parameter	Sample Result	NR140 Standards PAL	NR140 Standards ES	Units	Type of Standard	Type of Exceedance	Qualifier	RL	LOD	LOQ
MW22	220817	MANGANESE-DISSOLVED AS MN	407	60	300	UG/L	Table 1	P*		10.0	0.40	1.3
MW22	220817	MANGANESE-DISSOLVED AS MN	407	25	50	UG/L	Table 2	P*		10.0	0.40	1.3
P22B	220817	MANGANESE-DISSOLVED AS MN	179	60	300	UG/L	Table 1	P		10.0	0.40	1.3
P22B	220817	MANGANESE-DISSOLVED AS MN	179	25	50	UG/L	Table 2	P*		10.0	0.40	1.3
MW23	220815	MANGANESE-DISSOLVED AS MN	51.1	25	50	UG/L	Table 2	P*		10.0	0.40	1.3
P26B	220816	MANGANESE-DISSOLVED AS MN	290	60	300	UG/L	Table 1	P		10.0	0.40	1.3
P26B	220816	MANGANESE-DISSOLVED AS MN	290	25	50	UG/L	Table 2	P*		10.0	0.40	1.3
P27B	220815	MANGANESE-DISSOLVED AS MN	152	60	300	UG/L	Table 1	P		10.0	0.40	1.3
P27B	220815	MANGANESE-DISSOLVED AS MN	152	25	50	UG/L	Table 2	E		10.0	0.40	1.3
P28B	220816	MANGANESE-DISSOLVED AS MN	190	60	300	UG/L	Table 1	P		10.0	0.40	1.3
P28B	220816	MANGANESE-DISSOLVED AS MN	190	25	50	UG/L	Table 2	E		10.0	0.40	1.3
MW30	220815	MANGANESE-DISSOLVED AS MN	195	60	300	UG/L	Table 1	P		10.0	0.40	1.3
MW30	220815	MANGANESE-DISSOLVED AS MN	195	25	50	UG/L	Table 2	E		10.0	0.40	1.3
MW32	220815	MANGANESE-DISSOLVED AS MN	287	60	300	UG/L	Table 1	P		10.0	0.40	1.3
MW32	220815	MANGANESE-DISSOLVED AS MN	287	25	50	UG/L	Table 2	E		10.0	0.40	1.3
P32B	220815	MANGANESE-DISSOLVED AS MN	33.5	25	50	UG/L	Table 2	P		10.0	0.40	1.3
MW33	220815	MANGANESE-DISSOLVED AS MN	28.5	25	50	UG/L	Table 2	P		10.0	0.40	1.3
MW100	220829	MANGANESE-DISSOLVED AS MN	146	60	300	UG/L	Table 1	P		10.0	0.40	1.3
MW100	220829	MANGANESE-DISSOLVED AS MN	146	25	50	UG/L	Table 2	E		10.0	0.40	1.3
MW7	220817	NICKEL-DISSOLVED AS NI	34.3	20	100	UG/L	Table 1	P		20.0	1.3	4.2
0BS2C	220829	NITRITE PLUS NITRATE-DISSOLVED AS N	2.3	2	10	MG/L AS N	Table 1	P		0.10	0.040	0.13
P17DR	220815	NITRITE PLUS NITRATE-DISSOLVED AS N	3.5	2	10	MG/L AS N	Table 1	P		0.10	0.040	0.13
MW22	220817	NITRITE PLUS NITRATE-DISSOLVED AS N	2.1	2	10	MG/L AS N	Table 1	P		0.050	0.020	0.067
MW27	220815	NITRITE PLUS NITRATE-DISSOLVED AS N	2.8	2	10	MG/L AS N	Table 1	P		0.10	0.040	0.13
P30C	220815	NITRITE PLUS NITRATE-DISSOLVED AS N	8.8	2	10	MG/L AS N	Table 1	P		0.50	0.20	0.67
P33B	220815	NITRITE PLUS NITRATE-DISSOLVED AS N	7.8	2	10	MG/L AS N	Table 1	P		0.25	0.10	0.33
P40D	220817	NITRITE PLUS NITRATE-DISSOLVED AS N	9.5	2	10	MG/L AS N	Table 1	P		0.50	0.20	0.67
MW32	220815	NITROGEN-AMMONIA DISSOLVED AS N	1.7	0.97	9.7	MG/L	Table 1	P		0.20	0.10	0.33
IG04	220817	TETRACHLOROETHYLENE	1.7	0.5	5	UG/L	Table 1	P		1.0	0.36	1.2
0BS1C	220815	VANADIUM-DISSOLVED AS V	6.6	6	30	UG/L	Table 1	P		50.0	1.5	5.0
0B8M	220815	VINYL CHLORIDE	0.15	0.02	0.2	UG/L	Table 1	P		0.020	0.004	0.013

Hagen Farm Landfill

Attachment A
Third Quarter 2022

Identification of NR 140 Exceedances

License Number: 02981
Facility ID Number: 113176030

Well	Sample Date	Parameter	Sample Result	NR140 Standards PAL	NR140 Standards ES	Units	Type of Standard	Type of Exceedance	Qualifier	RL	LOD	LOQ
P17C	220829	VINYL CHLORIDE	0.12	0.02	0.2	UG/L	Table 1	P		0.020	0.004	0.013
MW22	220817	VINYL CHLORIDE	0.17	0.02	0.2	UG/L	Table 1	P		0.020	0.004	0.013
P22B	220817	VINYL CHLORIDE	0.072	0.02	0.2	UG/L	Table 1	P		0.020	0.004	0.013
MW23	220815	VINYL CHLORIDE	0.091	0.02	0.2	UG/L	Table 1	P		0.020	0.004	0.013
P26B	220816	VINYL CHLORIDE	0.20	0.02	0.2	UG/L	Table 1	P*		0.020	0.004	0.013
MW7	220817	ZINC-DISSOLVED AS ZN	2500	2500	5000	UG/L	Table 2	P		20.0	1.5	5.0

P* = Well is located within the Design Management Zone (DMZ) and property boundary, thus the Enforcement Standard does not apply
P = NR 140 Preventive Action Limit or NR 500 Alternate Concentration Limit exceedance
E = NR 140 Enforcement Standard exceedance
J = Sample result is between the Limit of Detection (LOD) and the Limit of Quantitation (LOQ)
EX = NR 140.28 (NR 508.19) Exemptions granted for exceedance

Special Note:
J-Qualifier (Flag) indicates an estimated concentration of an analyte between the Limit of Detection (LOD) and the Limit of Quantitation (LOQ), thus the values are not quantifiable numbers and do not constitute exceedances. However, these values are reported in compliance with NR 507.26 (3)(b) and NR 140.16(5).

Vinyl chloride is analyzed by EPA Method 8260C and by Selective Ion Monitoring. The data from the two analytical methods is evaluated independently in that if both results exceeded a groundwater standard, two exceedances are reported even though the results are from the same sample.

Hagen Farm Landfill

Attachment A
Fourth Quarter 2022

Identification of NR 140 Exceedances

License Number: 02981
Facility ID Number: 113176030

Well	Sample Date	Parameter	Sample Result	NR140 Standards PAL	NR140 Standards ES	Units	Type of Standard	Type of Exceedance	Qualifier	RL	LOD	LOQ
OBS1C	221116	IRON-DISSOLVED AS FE	0.22	0.15	0.3	MG/L	Table 2	P		0.030	0.019	0.064
OB8M	221117	IRON-DISSOLVED AS FE	0.15	0.15	0.3	MG/L	Table 2	P		0.030	0.019	0.064
P17C	221117	IRON-DISSOLVED AS FE	0.72	0.15	0.3	MG/L	Table 2	P*		0.030	0.019	0.064
MW22	221128	IRON-DISSOLVED AS FE	16.2	0.15	0.3	MG/L	Table 2	P*		0.030	0.019	0.064
P22B	221117	IRON-DISSOLVED AS FE	0.61	0.15	0.3	MG/L	Table 2	P*		0.030	0.019	0.064
OB8M	221117	MANGANESE-DISSOLVED AS MN	149	60	300	UG/L	Table 1	P		2.0	0.40	1.3
P17C	221117	MANGANESE-DISSOLVED AS MN	244	60	300	UG/L	Table 1	P		2.0	0.40	1.3
MW22	221128	MANGANESE-DISSOLVED AS MN	533	60	300	UG/L	Table 1	P*		2.0	0.40	1.3
P22B	221117	MANGANESE-DISSOLVED AS MN	209	60	300	UG/L	Table 1	P		2.0	0.40	1.3
MW22	221128	TETRAHYDROFURAN	17	10	50	UG/L	Table 1	P		5.0	1.3	4.2
OB8M	221117	VINYL CHLORIDE	0.16	0.02	0.2	UG/L	Table 1	P		0.020	0.004	0.013
P17C	221117	VINYL CHLORIDE	0.19	0.02	0.2	UG/L	Table 1	P		0.020	0.004	0.013
MW22	221128	VINYL CHLORIDE	0.94	0.02	0.2	UG/L	Table 1	P*		0.020	0.004	0.013
P22B	221117	VINYL CHLORIDE	0.33	0.02	0.2	UG/L	Table 1	P*		0.020	0.004	0.013
P26B	221117	VINYL CHLORIDE	0.33	0.02	0.2	UG/L	Table 1	P*		0.020	0.004	0.013

P* = Well is located within the Design Management Zone (DMZ) and property boundary, thus the Enforcement Standard does not apply
P = NR 140 Preventive Action Limit or NR 500 Alternate Concentration Limit exceedance
E = NR 140 Enforcement Standard exceedance
J = Sample result is between the Limit of Detection (LOD) and the Limit of Quantitation (LOQ)
EX = NR 140.28 (NR 508.19) Exemptions granted for exceedance

Special Note:
J-Qualifier (Flag) indicates an estimated concentration of an analyte between the Limit of Detection (LOD) and the Limit of Quantitation (LOQ), thus the values are not quantifiable numbers and do not constitute exceedances. However, these values are reported in compliance with NR 507.26 (3)(b) and NR 140.16(5).

Vinyl chloride is analyzed by EPA Method 8260C and by Selective Ion Monitoring. The data from the two analytical methods is evaluated independently in that if both results exceeded a groundwater standard, two exceedances are reported even though the results are from the same sample.