

Appendix S



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A Division of GZA

- GEOTECHNICAL
- ENVIRONMENTAL
- ECOLOGICAL
- WATER
- CONSTRUCTION MANAGEMENT

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GSi STATEMENT OF WORK North Kent Study Area

January 31, 2020
 File No. 16.0062335.60

PREPARED FOR:
 Wolverine World Wide, Inc.
 Rockford, Michigan

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1.0 INTRODUCTION

On behalf of Wolverine World Wide, Inc. (Wolverine), Rose & Westra, a Division of GZA GeoEnvironmental, Inc. (R&W/GZA), prepared this Statement of Work (SOW) summarizing the approach and rationale for the proposed groundwater-surface water interface (GSI) assessment set forth in the Consent Decree (CD). The purpose of this SOW is to propose piezometers, staff gauges, and pore water sampling to investigate GSI under Part 201 of the Michigan Natural Resources and Environmental Protection Act ("Part 201").

2.0 GENERAL APPROACH

The piezometer, staff gauge, and pore water sampling locations were proposed after evaluating the extent of PFAS and their potential transport in groundwater. The following data was compiled and evaluated:

- The estimated extent of perfluorooctane sulfonic acid (PFOS) exceeding the Part 201 groundwater-surface interface (GSI) criterion (12 nano-grams per liter [ng/L]), based on the test results for the residential drinking water wells, the vertical aquifer profiling samples, and the groundwater monitoring well samples.
- The extent of perfluorooctanoic acid (PFOA) exceeding the GSI criterion (12,000 ng/L) was also reviewed. In comparison, the extent of PFOS exceeding the GSI criterion is the controlling parameter for GSI exceedance, due to the stringent PFOS GSI criterion.
- The estimated extent of PFOA+PFOS exceeding 10 ng/L and seven PFAS compounds greater than the proposed maximum contaminant levels (MCLs) for those compounds was also reviewed to evaluate PFOA+PFOS migration in groundwater.
- Soil boring logs for the vertical aquifer profiling locations and available residential water well logs.
- Groundwater contours and interpreted groundwater flow direction based on the August 2019 static water levels measured at groundwater monitoring wells and the staff gauges installed in the Rogue River.
- Isoconcentration maps for total PFAS interpolated from the residential water well and the groundwater monitoring data.

The proposed GSI monitoring network generally consists of pore water sampling in the riverbed, staff gauges to measure the surface water elevation, and GSI piezometers along the river. The GSI piezometers will be used to collect static water levels which will be compared to staff gauges in the surface water body to demonstrate groundwater flow is toward the surface water and to evaluate groundwater flow pattern near the GSI. The piezometers will be constructed with all metal parts (screens, drive points, and riser.) Staff gauges will be metal rods or similar devices hand driven into the surface water body or affixed to structures (such as bridges.) A Michigan-licensed surveyor will measure reference points on the piezometers and staff gauges. The pore water samples will be collected from probes pushed into the riverbed in the groundwater discharge zone (utilizing the same protocol used during prior pore water sampling events near the former tannery.) Static water level measurements at the pore water sampling probe will be recorded and compared to the surface water level collected at a nearby monitoring point (stilling well). If the water level in the pore water sampling probe is higher than that of the surface water and the groundwater elevation in nearby piezometers is greater than the nearby staff gauge, then groundwater discharging to the surface water is confirmed, and a pore water sample will be collected from the sampling probe. In addition, pH, temperature, conductivity, dissolved oxygen and oxidation-reduction potential (ORP) readings will be collected and reviewed with those collected from GSI groundwater



piezometers. Pore water sample data is considered representative of groundwater quality in the groundwater discharge zone.

3.0 BACKGROUND AND PROPOSED INVESTIGATION

The following provides a brief summary of the background of each of the areas included in this SOW and the associated piezometer, staff gauge, pore water sampling locations.

PLUME MIGRATION FROM SOUTH OF 10 MILE ROAD

PFAS have migrated with the predominant groundwater flow to the southeast toward the Rogue River. As the plume crosses Belmont Avenue, a portion of the plume appears to migrate southerly toward the confluence of the Rogue River and Grand River while the main plume continues southeasterly. While groundwater predominantly flows to the southeast, the groundwater contours indicate that a small fraction of groundwater flow passing through the House Street Site flows to the northwest toward the Freska Lake area, which explains the relatively low concentrations of PFOA+PFOS in a few individual locations in that area.

Based on the groundwater flow, analytical data, and our evaluation, the following pore water sampling and GSI piezometer locations are proposed:

- Nine pore water sampling locations (HS-PW-1 through HS-PW-9) and five GSI piezometer locations (HS-GSI-1 through HS-GSI-5) are proposed downgradient of the primary House Street plume, along the Rogue River, to monitor potential PFOA+PFOS venting to the surface water.
- Three GSI piezometer locations (HS-GSI-6 through HS-GSI-8) are proposed downgradient of the primary House Street plume, along the Grand River to monitor potential PFOA+PFOS venting to the surface water.
- Two pore water sampling locations (HS-PW-10 and HS-PW-11) and one GSI piezometer location (HS-GSI-9) are proposed northwest of the House Street Site, downgradient of the Freska Lake area, along the Rogue River to monitor potential PFOA+PFOS venting to the surface water.
- In addition, existing well cluster, HS-MW-19S/D and HS-MW-29A, are located hydraulically downgradient of the primary House Street plume, also considered to be GSI monitoring points to monitor potential PFOA+PFOS venting to the Rogue River.

PLUME MIGRATION FROM NORTH OF 10 MILE ROAD

PFOS + PFOA were detected in the Wellington Ridge neighborhood, located between 10 Mile and 11 Mile Road, west of Wolven Avenue. In addition, PFOA+PFOS were also detected in the groundwater monitoring wells near the North Kent Landfill area. As shown in Figure 1, the detected PFOS concentrations in the Wellington Ridge area are greater than the GSI criterion of 12 ng/L. Based on the groundwater contours, there appears to be mounding near 11 Mile Road and Wolven Avenue. There also appears to be a second groundwater mound near the North Kent Landfill area, south of 10 Mile Road. Groundwater appears to flow radially from the groundwater mounds. With the presence of fine-grained soil in the Wolven-Jewell area, the transport of PFOA+PFOS plume was generally limited to pathways where relatively permeable soils are present. The groundwater monitoring data and residential well data indicated three flow paths to the following areas: northeast (Area 19 plume), the northwest (Wolven Northwest plume), and southeast (Wolven-Childsdale Area plume). PFOS concentrations exceeding the GSI criteria are present in these three downgradient areas.



- Seven pore water sampling locations (Area19-PW-1 through Area19-PW-7) are proposed downgradient/northeast of the Area 19 plume within the Rogue River to monitor potential PFOS & PFOA venting to the surface water. These pore water sample locations are located hydraulically downgradient of Wellington Ridge where elevated PFOA+PFOS concentrations were detected, immediately downgradient of the apparent extent of PFOA+PFOS exceeding 10 ng/L.
- Three GSI piezometer locations (Area19-GSI-1 through Area19-GSI-3) are proposed downgradient of the Area 19 plume to the northeast. Staff gauges in the river will be paired with these piezometer locations. These locations along the Rogue River will be used to measure and compare the groundwater elevations to the pore water and surface water elevations. In addition, these locations will to be used to monitor potential PFOA+PFOS venting to the surface water at the north and south edges of this portion of the plume along with the center of the plume. Additionally, one existing well installed by EGLE is also considered to be a GSI monitoring point. The purpose of these piezometers is to detect constituent concentrations near the groundwater-surface interface, prior to venting to the Rogue River.
- Four pore water sampling locations (WVNW-PW-1 through WVNW-PW-4) and two GSI piezometer locations (WVNW-GSI-1 through WVNW-GSI-2) are proposed immediately downgradient of the Woven Northwest plume, along the Rogue River to monitor potential PFOS + PFOA venting to the surface water. Two staff gauges in the river will be paired with these two piezometer locations.
- Six pore water sampling locations (WV/CH-PW-1 through WV/CH-PW-6) and two GSI piezometer locations (WV/CH-GSI-1 through WV/CH-GSI-2) are proposed immediately downgradient/southeast of the Woven-Childsdale plume, along the Rogue River to monitor potential PFOS + PFOA venting to the surface water. The existing staff gages in this segment of the Rogue River will be utilized for water level comparison and groundwater flow evaluation.

Actual piezometer and pore water sampling locations may vary slightly from the proposed locations of Figure 1 during installation. While the target locations are shown, limitations for access on private properties, river bank conditions, and utilities may require moving piezometer locations.

4.0 METHODOLOGY

Pore water sampling will be performed using the same techniques previously used at the former tannery. Therefore, two-weeks of piezometer and staff gauge measurements will be made to establish groundwater flows to the surface water before any pore water samples will be collected. Piezometer and staff gauge measurements will be made Monday, Wednesday and Friday of each week. If these measurements do not demonstrate groundwater flow to the River, the two-week monitoring will be repeated until it does.

Relevant tasks completed under this SOW will be completed in accordance with the *Quality Assurance Project Plan, Former Wolverine Tannery, House Street Disposal Area, and Woven/Jewell Area, Per- and Polyfluoroalkyl Substances Investigation Program, Revision 2 (QAPP)* prepared for Wolverine World Wide, Inc. by R&W/GZA and dated November 1, 2018.

5.0 MONITORING POINT INSTALLATION PROCEDURES

The proposed piezometers will be hand-driven into the groundwater on the river bank. The top of the piezometer will be installed above the estimated flood elevation based on observations of vegetation and deposition.



The piezometer will be finished with a 1-foot thick bentonite seal, followed by a 2-inch concrete pad at the surface.

After demonstrating the groundwater is flowing to the River, pore water samples will be collected using a temporary well point (i.e., stainless-steel probe) driven to discrete depths within the river bottom. A shroud may be used if river bottom conditions allow to further minimize any short-circuiting during pore water sampling. The pore water will be attempted at 6-inch(in) intervals beginning at 12 inches below the surface of the bottom sediment. Two pore water samples will be attempted following procedures similar to that described below. R&W/GZA's experience indicates that pore water sampling methodology can vary from sampling location to location given physical conditions of the stream bed, etc. As such, the following is proposed only as a guide.

- A 6-ft (or appropriate length) stainless steel probe with a 6-inch screen will be advanced to the desired depth. The top of the screen in the shallowest depth interval will be about 12 inches below the surface of the sediment in the river bottom. Screen intervals are expected to be: 12-18 inches and 18-24 inches.
- A peristaltic pump with dedicated tubing will be used to purge the screen at a flow rate less than 100 milliliters per minute (ml/min).
- R&W/GZA will measure pH, temperature, conductivity, dissolved oxygen and oxidation-redox potential (ORP) from the pore water interval and will compare it to measurements collected concurrently from the river. Both readings will be documented on a field data sheet.
- Once the field readings from the pore water have stabilized and the pore water readings are distinguishable from the river readings (i.e., >10% difference for parameters except for temperature), the pore water will be sampled.
- Pore water will be pumped directly into laboratory-preserved sampling containers maintaining the flow rate of less than 100 ml/min. R&W/GZA will submit samples to Shealy Environmental, Inc. of Columbia, South Carolina for analysis for PFAS analysis using the DOD QSM (which includes isotope dilution.)

6.0 INVESTIGATION DERIVED WASTE

Pore water pumped during the sampling will be discharged back to the surface water body after the PFAS aliquot is collected.

7.0 ANTICIPATED SCHEDULE

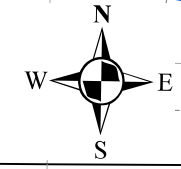
A formal Response Activity Plan will be prepared for this SOW in accordance with the CD and submitted to EGLE no later than 60 days following the Effective Date of the CD between EGLE and Wolverine.

The schedule for piezometer installation will highly depend on R&W/GZA's ability to procure access to the desired locations. Piezometers will be installed and developed prior to collecting the two weeks of piezometer and staff gage measurements. After demonstrating groundwater flow toward the River, the pore water sampling will be conducted. Assuming access for all piezometers and river access is obtained expeditiously, R&W/GZA intends to collect pore water samples during summer 2020 low flow conditions (usually July through early September).

R&W/GZA will summarize the findings from this investigation and submit a letter proposing permanent monitoring well locations needed for GSI monitoring within 90 days following receipt of all analytical data.



FIGURE



Legend

Proposed Monitoring Location

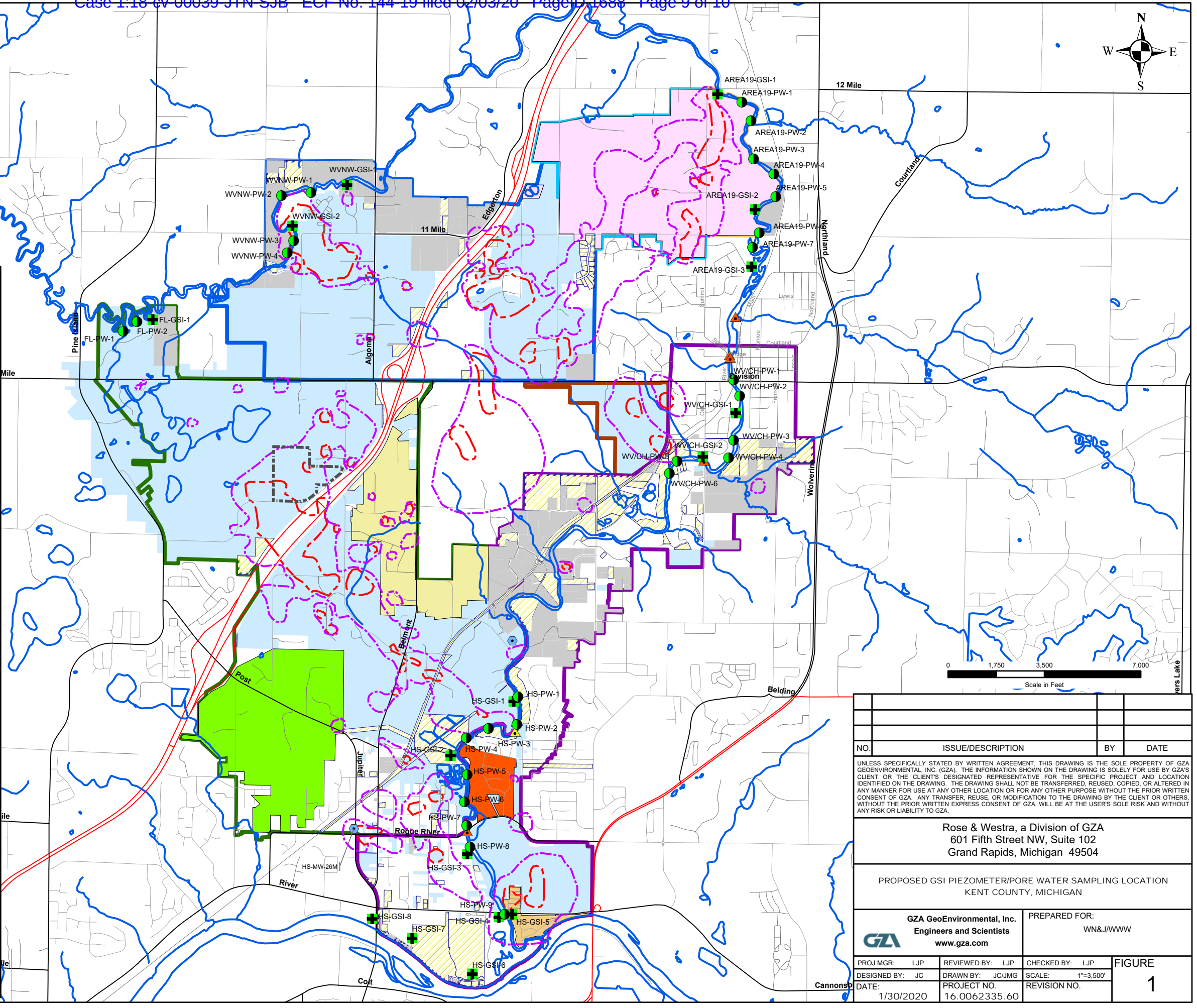
- GSI Piezometer
- Pore Water Sampling
- ▲ Staff Gage
- ▲ USGS Gage
- APPROXIMATE HOUSE ST SITE BOUNDARY
- Extent of PFOS and PFOA Concentrations > 10 ng/L
- Estimated Extent of PFOS Concentrations > 12 ng/L
- SURFACE WATER

Filter Area

- Area 5
- Area 6
- Areas 11
- Area 12
- Area 19
- Other Filter Area - Occupied
- Other Filter Area - Vacant

North Kent Study Area

- 12 Mile & Summit
- House Street
- North Childsdale/10 Mile
- Rogue River
- Wolven/Jewell
- Wolven Northeast
- Areas Selected for Municipal Water



NO.	ISSUE/DESCRIPTION	BY	DATE
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PROPOSED GSI PIEZOMETER/PORE WATER SAMPLING LOCATION KENT COUNTY, MICHIGAN			
GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com		PREPARED FOR: WN&J/WWW	
PROJ MGR: LJP DESIGNED BY: JC DATE: 1/30/2020	REVIEWED BY: LJP DRAWN BY: JC/JMG PROJECT NO.: 16.0062335.60	CHECKED BY: LJP SCALE: 1"=3,500' REVISION NO.:	FIGURE 1

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