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A Division of GZA

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June 8, 2018  
File No. 16.0062335.52

Ms. Abigail Hendershott  
Acting District Supervisor – Remediation and Redevelopment Division  
Michigan Department of Environmental Quality  
350 Ottawa Avenue NW #10  
Grand Rapids, MI 49503

Re: Source Investigation Work Plan (SIWP)  
Former House Street Site  
1885 House Street, Plainfield Township, Kent County, Michigan

Dear Ms. Hendershott:

On behalf of Wolverine World Wide, Inc. (Wolverine), Rose & Westra, a Division of GZA GeoEnvironmental, Inc. (R&W/GZA), prepared this Source Investigation Work Plan (SIWP) related to per- and poly-fluoroalkyl substances (PFAS) at the Former House Street Site (Site). The SIWP and attached documents were prepared in response to certain requests included in MDEQ's May 31, 2018 letter<sup>1</sup> to Wolverine and Wolverine's ongoing investigation.

The SIWP is focused on evaluating the vertical and lateral extent of perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA). The proposed investigation is based on and supplements the US EPA Extent of Contamination Study Removal Work Plan (RWP dated May 29, 2018; enclosed), our experience at the Site, and experience at other PFAS-related sites. (Note, item 2a in your May 31 letter requests the May 18, 2018 version of the RWP which the enclosed supersedes.)

The following generally summarizes the sections of the RWP that address the sampling strategy at the Site.

### **RWP SECTION 3.2: BIASED SAMPLING AT THE AREAS OBSERVED WITH WASTE**

R&W/GZA interpreted historical aerial photographs, licensing information, and existing topography to identify potential disposal areas at the Site. Sixteen soil borings, identified as WB-1 through WB-16, were installed to assess the presence of the waste materials, and waste materials were observed in five (WB-1, WB-2, WB-4, WB-11, and WB-14) of the sixteen (16) borings. A square sampling grid of 25 ft by 25 ft will be overlaid and centered around each of the five locations (Tier 1). If waste is encountered borings will step out one grid interval outside of the Tier 1 grid stations, so-called Tier 2 grid stations. These are illustrated on **RWP Figures B, C, and D**. This process will be followed/expanded until the extent of waste is determined.

<sup>1</sup> Letter by MDEQ titled "House Street Disposal Area – Wolverine World Wide, Inc. (Wolverine) Per- and Polyfluoroalkyl Substances (PFAS) Response to "Draft Removal Work Plan for House Street Disposal Area, Plainfield Township, Kent County, Michigan: Approval with Significant Modifications dated April 19, 2018" hereafter named "Extent of Contamination Study Removal Work Plan, House Street Disposal Area, Plainfield Township, Kent County, Michigan" dated May 18, 2018"



Once the extent of waste materials is determined, the perimeter soil borings will be sampled for laboratory analyses to confirm the delineation. At least two samples will be collected from each of the perimeter boring locations, one at the interval where waste material is observed, or the greatest response detected by the XRF or PID, and another within 1 to 2 feet below it. If no waste material is observed, the depth interval of the samples will be based on the intervals in the adjacent borings where waste was observed and/or XRF or PID readings. Additional soil samples from these borings may be collected at the discretion of R&W/GZA or under the direction of agency supervising personnel in the field.

An aliquot of the above-described samples will also be collected at each discrete location for PFAS analysis in accordance with the methods described in the QAPP.

It is projected 96 soil samples will be collected based on this sampling scheme.

In addition, perched groundwater, if encountered, will be documented on soil boring logs, and soil sample collection will be continued for XRF and PID screening and visual observation as discussed above. If sufficient groundwater is present in the perched zone, a temporary well will be installed, and a groundwater sample will be collected from the temporary well. An initial sample will be collected prior to groundwater purging, and if the temporary well yields sufficient groundwater volume, the purging and sampling will be performed following the “Low Stress (low flow) Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells,” by U.S. EPA, Region I, Revision 4, dated September 19, 2017 (EPA Region I, 2017) (EPA Region I, 2017). If the well is purged dry and volume allows, an aliquot of the initial sample will be submitted for PFAS analysis in accordance with the methods described in the QAPP.

### **RWP SECTION 3.3: BIASED SAMPLING AT THE REMAINING POTENTIAL DISPOSAL AREAS**

Soil borings were previously performed at the remaining disposal areas, but soil samples were not collected for laboratory analysis because waste materials were not observed in the soil. To confirm the absence of waste materials, five soil borings will be installed at each of the seven remaining areas to collect soil samples for laboratory analysis. See **RWP Figure E** for the proposed sampling locations, HT-PWB2-1 through HT-PWB2-35. The boring locations may be adjusted in the field, based on site access and field observation. Additional soil borings may be performed at the discretion of R&W/GZA or under the direction of agency supervising personnel in the field.

A drilling contractor will use a direct-push drill rig for the soil borings; soil samples will be collected continuously for field screening of metals using a portable XRF instrument and organic compounds using a MiniRAE 2000 PID at 1-foot increments and observed for the presence of waste materials. The soil samples will also be visually classified and logged. Generally, three soil samples will be collected from each boring. The borehole will be advanced until the XRF readings, PID readings and visual observation indicate no contamination or to a depth of 20 feet below grade, whichever is deeper. If waste materials are observed at a boring location, then one sample will be collected from the upper portion of the waste, one from the lower portion of the waste, and one soil sample will be collected 1 to 2 feet below the observed waste material. If no waste materials are observed at a boring location, the soil sample intervals will be based on visual, olfactory evidence, XRF measurements or PID screening results, and the intervals at the adjacent borings where waste materials were observed. Additional soil samples may be collected at the discretion of R&W/GZA or under the direction of agency supervising personnel in the field.

An aliquot of the above-described samples will also be collected at each discrete location for PFAS analysis in accordance with the methods described in the QAPP.

It is projected 105 soil samples will be collected based on this sampling scheme.

In addition, if perched groundwater is encountered, the sampling approach described in RWP Section 3.2 will be used.



### **RWP SECTION 3.4: SYSTEMATIC SAMPLING ACROSS THE SITE**

To evaluate the potential presence of PFOA+PFOS resulting from surface disposal or other potential disposal areas at the Site, a systematic sampling strategy is proposed. The systematic sampling locations, combined with the biased sampling locations, will also be used to evaluate Site geology, and the potential presence of perched groundwater.

A 400-foot by 400-foot square grid (Grid Block) will be overlaid onto the Site area, as shown in **RWP Figure F**. To improve the randomness, the Grid Block cells are sub-divided into 100-foot by 100-foot sub-grid cells, and a random number generator was used to select the sample location within the Grid Block. As shown in Figure F, sub-grid cell No. 11 is randomly chosen, and soil borings will be positioned at sub-grid cell No. 11 for all the Grid Blocks located on the Site. If sub-grid cell No. 11 is overlapped with the proposed biased sampling locations, the proposed soil boring location is removed. If sub-grid cell No. 11 is located outside of the property boundary, the boring location is arbitrarily relocated inside of the Site boundary.

A drilling contractor will use a direct-push drill rig for the soil borings; soil samples will be collected continuously for field screening of metals using a portable XRF instrument and organic compounds using a MiniRAE 2000 PID and observed for the presence of waste materials. The soil samples will also be visually classified and logged. Two-foot intervals will be used for XRF and PID screening unless visual evidence of waste is present. In such case, the screening interval will be increased to one foot. Generally, two soil samples will be collected from each boring. The borehole will be advanced until the XRF readings, PID readings, and visual observation indicate no contamination or to a depth of 20 feet below grade, whichever is deeper. If waste materials are observed at a boring location, then one sample will be collected from the waste and another soil sample will be collected from 1 to 2 feet below the observed waste material. If no waste materials are observed at a boring location, the soil sample intervals will be based on visual, olfactory evidence, XRF measurements or PID screening results, and the intervals at the adjacent borings where waste materials were observed.

An aliquot of the above-described samples will also be collected at each discrete location for PFAS analysis in accordance with the methods described in the QAPP.

It is projected 52 soil samples will be collected based on this sampling scheme.

In addition, if perched groundwater is encountered, the sampling approach described in RWP Section 3.2 will be utilized.

### **RWP SECTION 3.5: MONITORING WELL SAMPLING**

Two rounds of groundwater monitoring well sampling events will be performed to evaluate the potential presence of contaminants in groundwater. The following groundwater monitoring wells, located at the Site and on MDOT property, will be sampled:

- MW-1S
- MW-1D
- MW-2S
- MW-3P
- MW-3S
- MW-4S
- MW-5P
- MW-5S
- MW-5D
- MW-6S
- MW-6D
- MW-7S
- MW-8
- MW-9S
- MW-9M
- MW-9D
- MW-10S
- MW-10M
- MW-10D
- MW-11S
- MW-11M
- MW-11D

R&W /GZA will collect groundwater samples following the “Low Stress (low flow) Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells,” by U.S. EPA, Region I, Revision 4, dated September 19, 2017 (EPA Region I, 2017) (EPA Region I, 2017). For the monitoring wells screened in the perched zone, which are expected to have relatively low recharge rate, an initial sample will be collected prior to groundwater purging. If the well is purged



dry and volume allows, an aliquot of the initial sample will be submitted for laboratory analysis. Each groundwater sample will be submitted for PFAS analysis in accordance with the methods described in the QAPP.

It is projected 44 groundwater samples will be collected based on this sampling scheme.

### **RWP SECTION 3.6: SOIL GAS SAMPLING**

Based on the low volatility of PFAS, no soil gas sampling is proposed to investigate the potential vapor intrusion pathway at the Site and adjoining residential properties.

### **ADDITIONAL SUPPORTING DOCUMENTATION**

At your request (item 2b), R&W/GZA has included the following additional supporting documentation as it pertains to the PFAS data available for the Site.

- Table A: Summary of Site Soil Analytical Data - PFAS
- Table B: Summary of Site Groundwater Analytical Data - PFAS
- Figure 1: Site Wells – PFOS & PFOA Concentrations
- Figure 2: Site Wells – Total PFAS Concentrations
- Figure 3: Site Borings – PFOS & PFOA Concentrations
- Figure 4: Site Borings – Total PFAS Concentrations

### **SCHEDULE**

This SIWP will be implemented in conjunction with the EPA RWP. The projected schedule is included in RWP Appendix B. Generally, the work commenced on June 4, 2018 with the first phase taking approximately 6 to 8 weeks to complete.

Requested items 2b (cross sections), 2c (PFAS isoconcentration map), and “other relevant PFAS information...” (item 2d) will be provided by the June 30, 2018 deadline.

R&W/GZA trust this letter and attachments are responsive to MDEQ requests referenced herein. Should you have any questions, please do not hesitate to contact the undersigned.

Very truly yours,

Rose & Westra, a Division of GZA GeoEnvironmental, Inc.

Mark A. Westra  
Associate Principal

Loretta J. Powers  
Senior Project Manager

Enclosures: EPA RWP, Dated May 29, 2018  
Previously Listed Tables and Figures

**TABLE A**  
SUMMARY OF SITE SOIL ANALYTICAL DATA - PFAS  
FORMER HOUSE STREET DISPOSAL SITE  
PLAINFIELD TOWNSHIP, MICHIGAN

FIELDID	MDEQ Proposed Part 201 Residential Soil Cleanup Criteria Protective of Groundwater for Drinking Water Uses	MDEQ Proposed Part 201 Residential Soil Cleanup Criteria - Direct Contact	WB-11A	WB-11B	WB-14A	WB-14B	WB-1A	WB-1B	WB-2A
DepthInt			2.8 - 5.6	9 - 9.6	7.3 - 10.6	15 - 16	4.6 - 14.3	16.3 - 17.9	7.1 - 10.7
Sample_ID			K1712986-001	K1712986-002	K1712986-011	K1712986-012	K1712986-007	K1712986-008	K1712986-005
SAMPDATE			11/27/2017	11/27/2017	12/01/2017	12/01/2017	11/30/2017	11/30/2017	11/30/2017
Parameter (ng/Kg)									
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	NA	NA	<840	<980	<870	<980	<970	<920	<950
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	NA	NA	<840	<980	<870	<980	<970	<920	<950
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	NA	NA	1900	<980	1500000	<980	72000	<920	<950
N-Ethyl perfluorooctane sulfonamidoethanol	NA	NA	<840	<980	120000	<980	2200	<920	<950
N-Methyl perfluorooctane sulfonamide (MeFOSA)	NA	NA	<840	<980	<870	<980	<970	<920	<950
N-Methyl perfluorooctane sulfonamidoethanol	NA	NA	<840	<980	<870	<980	<970	<920	<950
Perfluorobutane sulfonic acid (PFBS)	NA	NA	<840	<980	<870	<980	<970	<920	<950
Perfluorobutanoic acid (PFBA)	NA	NA	<840	<980	<870	<980	<970	<920	<950
Perfluorodecane sulfonic acid (PFDS)	NA	NA	14000	<980	730000	<980	16000	<920	<950
Perfluorodecanoic acid (PFDA)	NA	NA	510000	1000	4500	<980	20000	<920	<950
Perfluorododecanoic acid (PFDoDA)	NA	NA	160000	<980	5500	<980	8500	<920	<950
Perfluoroheptane sulfonic acid (PFHps)	NA	NA	5200	<980	45000	2200	<970	2100	<950
Perfluoroheptanoic acid (PFHpA)	NA	NA	<840	<980	2200	<980	<970	<920	<950
Perfluorohexane sulfonic acid (PFHxS)	NA	NA	2000	2600	17000	<980	<970	9600	2100
Perfluorohexanoic acid (PFHxA)	NA	NA	<840	<980	1000	<980	<970	<920	<950
Perfluorononanoic acid (PFNA)	NA	NA	71000	5700	1800	<980	32000	3700	1400
Perfluorooctane sulfonamide (FOSA)	NA	NA	64000	<980	34000	<980	2800	<920	<950
<b>Perfluorooctane sulfonic acid (PFOS)</b>	1,400	2,100,000	<b>2,200,000</b>	<b>7,800</b>	<b>18,000,000</b>	<b>100,000</b>	<b>270,000</b>	<b>59,000</b>	<950
<b>Perfluorooctanoic acid (PFOA)</b>	59,000	2,100,000	16,000	6,300	59,000	2,800	2,600	14,000	2,900
Perfluoropentanoic acid (PFPeA)	NA	NA	<840	<980	<870	<980	<970	<920	<950
Perfluorotetradecanoic acid (PFTeDA)	NA	NA	34000	<980	<870	<980	<970	<920	<950
Perfluorotridecanoic acid (PFTrDA)	NA	NA	4700000	2300	150000	<980	350000	<920	<950
Perfluoroundecanoic acid (PFUnDA)	NA	NA	5500000	2700	560000	<980	900000	970	<950

**TABLE A**  
SUMMARY OF SITE SOIL ANALYTICAL DATA - PFAS  
FORMER HOUSE STREET DISPOSAL SITE  
PLAINFIELD TOWNSHIP, MICHIGAN

FIELDID	MDEQ Proposed Part 201 Residential Soil Cleanup Criteria Protective of Groundwater for Drinking Water Uses	MDEQ Proposed Part 201 Residential Soil Cleanup Criteria - Direct Contact	WB-2B	WB-4A	WB-4B
DepthInt			14 - 15.8	8.3 - 10.7	14 - 15.8
Sample_ID			K1712986-006	K1712986-003	K1712986-004
SAMPDATE			11/30/2017	11/29/2017	11/29/2017
Parameter (ng/Kg)					
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	NA	NA	<9700	<9400	<970
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	NA	NA	<9700	<9400	<970
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	NA	NA	590000	5600000	<970
N-Ethyl perfluorooctane sulfonamidoethanol	NA	NA	82000	30000	<970
N-Methyl perfluorooctane sulfonamide (MeFOSA)	NA	NA	13000	99000	<970
N-Methyl perfluorooctane sulfonamidoethanol	NA	NA	<9700	15000	<970
Perfluorobutane sulfonic acid (PFBS)	NA	NA	<9700	<9400	<970
Perfluorobutanoic acid (PFBA)	NA	NA	<9700	<9400	<970
Perfluorodecane sulfonic acid (PFDS)	NA	NA	93000	510000	<970
Perfluorodecanoic acid (PFDA)	NA	NA	1000000	160000	<970
Perfluorododecanoic acid (PFDoDA)	NA	NA	320000	60000	<970
Perfluoroheptane sulfonic acid (PFHpS)	NA	NA	44000	370000	16000
Perfluoroheptanoic acid (PFHpA)	NA	NA	20000	10000	1100
Perfluorohexane sulfonic acid (PFHxS)	NA	NA	73000	160000	9400
Perfluorohexanoic acid (PFHxA)	NA	NA	<9700	<9400	<970
Perfluorononanoic acid (PFNA)	NA	NA	840000	96000	1900
Perfluorooctane sulfonamide (FOSA)	NA	NA	35000	110000	<970
<b>Perfluorooctane sulfonic acid (PFOS)</b>	1,400	2,100,000	<b>6,900,000</b>	<b>79,000,000</b>	<b>33,000</b>
<b>Perfluorooctanoic acid (PFOA)</b>	59,000	2,100,000	<b>130,000</b>	<b>240,000</b>	23,000
Perfluoropentanoic acid (PFPeA)	NA	NA	<9700	<9400	<970
Perfluorotetradecanoic acid (PFTeDA)	NA	NA	78000	16000	<970
Perfluorotridecanoic acid (PFTrDA)	NA	NA	11000000	2000000	<970
Perfluoroundecanoic acid (PFUnDA)	NA	NA	17000000	6600000	<970

**TABLE A**  
SUMMARY OF SITE SOIL ANALYTICAL DATA - PFAS  
FORMER HOUSE STREET DISPOSAL SITE  
PLAINFIELD TOWNSHIP, MICHIGAN

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Page 3 of 3

6/5/2018

NOTES:

1. Concentration and criteria units are nano-grams per kilogram or parts per trillion; "< RL" indicates the compound was analyzed for but not detected above the method detection limit; RL = Reporting Limit
  
2. Bold indicates that compound was detected above the RL. Italic number with thick line border or italic chemical indicates that compound was detected above one of the listed cleanup criteria.
  
3. MDEQ Proposed Part 201 Residential Cleanup Criteria were based on the Proposed Part 201 Cleanup Criteria Rules August 2017.

**TABLE B**  
SUMMARY OF SITE GROUNDWATER ANALYTICAL DATA - PFAS  
FORMER HOUSE STREET DISPOSAL SITE  
PLAINFIELD TOWNSHIP, MICHIGAN

WELL/SAMPLE NAME	PART 201 RESIDENTIAL GROUNDWATER CLEANUP CRITERIA - DRINKING WATER USES	MW-1D	MW-1S	MW-2	MW-3S	MW-4S	MW-4S	MW-5D	MW-5S
LABORATORY ID		K1711117-004	K1711117-003	K1711117-005	K1711250-001	K1711250-002	K1713964-002	K1800647-004	K1711250-003
SAMPLE DATE		10/12/2017	10/12/2017	10/12/2017	10/13/2017	10/13/2017	12/28/2017	01/22/2018	10/13/2017
Parameter (ng/L)									
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	NA	<4.2	<4.2	<4.2	<4.3	<4.3	<4.2	<4.2	<4.2
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	NA	<4.2	<4.2	<4.2	<4.3	<4.3	<4.2	<4.2	<4.2
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	NA	<4.2	<4.2	<4.2	<4.3	<4.3	<4.2	<4.2	<4.2
N-Ethyl perfluorooctane sulfonamidoethanol	NA	<4.2	<4.2	<4.2	<4.3	<4.3	<4.2	<4.2	<4.2
N-Methyl perfluorooctane sulfonamide (MeFOSA)	NA	<4.2	<4.2	<4.2	<4.3	<4.3	<4.2	<4.2	<4.2
N-Methyl perfluorooctane sulfonamidoethanol	NA	<4.2	<4.2	<4.2	<4.3	<4.3	<4.2	<4.2	<4.2
Perfluorobutane sulfonic acid (PFBS)	NA	<4.2	18	<4.2	370	93	170	5.4	570
Perfluorobutanoic acid (PFBA)	NA	<8.3	<8.3	<8.3	91	160	290	<8.3	140
Perfluorodecane sulfonic acid (PFDS)	NA	<4.2	<4.2	<4.2	<4.3	<4.3	<4.2	<4.2	<4.2
Perfluorodecanoic acid (PFDA)	NA	<4.2	<4.2	<4.2	<4.3	<4.3	<4.2	<4.2	<4.2
Perfluorododecanoic acid (PFDoDA)	NA	<4.2	<4.2	<4.2	<4.3	<4.3	<4.2	<4.2	<4.2
Perfluoroheptane sulfonic acid (PFHpS)	NA	<4.2	<4.2	<4.2	32	550	950	<4.2	1100
Perfluoroheptanoic acid (PFHpA)	NA	<4.2	12	<4.2	180	320	560	<4.2	710
Perfluorohexane sulfonic acid (PFHxS)	NA	<4.2	26	<4.2	930	1600	3200	13	1900
Perfluorohexanoic acid (PFHxA)	NA	<4.2	16	<4.2	390	420	730	7.7	450
Perfluorononanoic acid (PFNA)	NA	<4.2	<4.2	<4.2	<4.3	<4.3	6	<4.2	18
Perfluorooctane sulfonamide (FOSA)	NA	<4.2	<4.2	<4.2	<4.3	<4.3	<4.2	<4.2	<4.2
<b>Perfluorooctane sulfonic acid (PFOS)</b>	70	<4.2	<4.2	<4.2	22	<b>2000</b>	<b>3600</b>	26	<b>44000</b>
<b>Perfluorooctanoic acid (PFOA)</b>	70	<1.7	4.2	<1.7	<b>380</b>	<b>830</b>	<b>1500</b>	8.9	<b>2800</b>
Perfluoropentanoic acid (PFPeA)	NA	<4.2	<4.2	<4.2	130	170	330	<4.2	190
Perfluorotetradecanoic acid (PFTeDA)	NA	<4.2	<4.2	<4.2	<4.3	<4.3	<4.2	<4.2	<4.2
Perfluorotridecanoic acid (PFTrDA)	NA	<4.2	<4.2	<4.2	<4.3	<4.3	<4.2	<4.2	<4.2
Perfluoroundecanoic acid (PFUnDA)	NA	<4.2	<4.2	<4.2	<4.3	<4.3	<4.2	<4.2	<4.2



**TABLE B**  
SUMMARY OF SITE GROUNDWATER ANALYTICAL DATA - PFAS  
FORMER HOUSE STREET DISPOSAL SITE  
PLAINFIELD TOWNSHIP, MICHIGAN

WELL/SAMPLE NAME	PART 201 RESIDENTIAL GROUNDWATER CLEANUP CRITERIA - DRINKING WATER USES	MW-5S	MW-6D	MW-6S	MW-7S
LABORATORY ID		K1713964-001	K1713273-007	K1711250-004	K1711250-005
SAMPLE DATE		12/28/2017	12/07/2017	10/16/2017	10/16/2017
Parameter (ng/L)					
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	NA	<30	<4.3	<4.2	<4.2
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	NA	<30	<4.3	<4.2	<4.2
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	NA	<30	<4.3	<4.2	<4.2
N-Ethyl perfluorooctane sulfonamidoethanol	NA	<30	<4.3	<4.2	<4.2
N-Methyl perfluorooctane sulfonamide (MeFOSA)	NA	<30	<4.3	<4.2	<4.2
N-Methyl perfluorooctane sulfonamidoethanol	NA	<30	<4.3	<4.2	<4.2
Perfluorobutane sulfonic acid (PFBS)	NA	1600	<4.3	<4.2	<4.2
Perfluorobutanoic acid (PFBA)	NA	360	<8.6	<8.3	<8.3
Perfluorodecane sulfonic acid (PFDS)	NA	<30	<4.3	<4.2	<4.2
Perfluorodecanoic acid (PFDA)	NA	<30	<4.3	<4.2	<4.2
Perfluorododecanoic acid (PFDoDA)	NA	<30	<4.3	<4.2	<4.2
Perfluoroheptane sulfonic acid (PFHpS)	NA	2200	<4.3	<4.2	<4.2
Perfluoroheptanoic acid (PFHpA)	NA	1900	<4.3	<4.2	<4.2
Perfluorohexane sulfonic acid (PFHxS)	NA	8200	<4.3	14	6.9
Perfluorohexanoic acid (PFHxA)	NA	1300	<4.3	<4.2	<4.2
Perfluorononanoic acid (PFNA)	NA	30	<4.3	<4.2	<4.2
Perfluorooctane sulfonamide (FOSA)	NA	<30	<4.3	<4.2	<4.2
<b>Perfluorooctane sulfonic acid (PFOS)</b>	70	<b>41000</b>	<4.3	<4.2	4.7
<b>Perfluorooctanoic acid (PFOA)</b>	70	<b>7400</b>	<1.7	9.8	3.3
Perfluoropentanoic acid (PFPeA)	NA	510	<4.3	<4.2	<4.2
Perfluorotetradecanoic acid (PFTeDA)	NA	<30	<4.3	<4.2	<4.2
Perfluorotridecanoic acid (PFTrDA)	NA	<30	<4.3	<4.2	<4.2
Perfluoroundecanoic acid (PFUnDA)	NA	<30	<4.3	<4.2	<4.2

**TABLE B**  
SUMMARY OF SITE GROUNDWATER ANALYTICAL DATA - PFAS  
FORMER HOUSE STREET DISPOSAL SITE  
PLAINFIELD TOWNSHIP, MICHIGAN

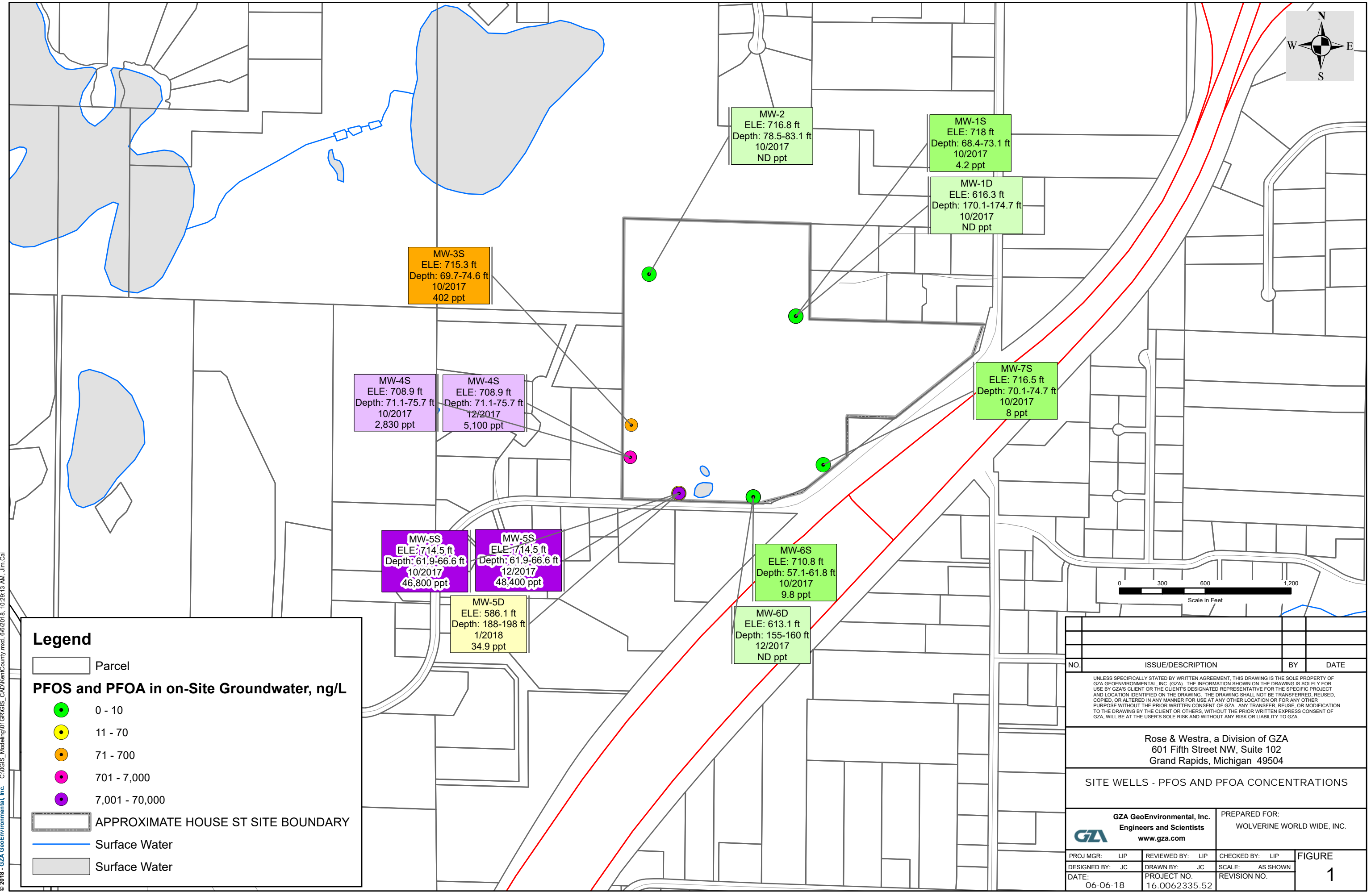
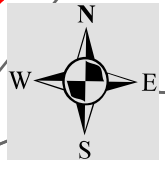
16.0062335.52

Page 3 of 3

6/5/2018

NOTES:

1. Concentration and criteria units are nano-grams per liter (ng/L) or parts per trillion (ppt); "< RL" indicates the compound was analyzed for but not detected above the method detection limit; RL = Reporting Limit
  
2. Bold indicates that compound was detected above the RL. Italic number with thick line border or italic chemical indicates that compound was detected above the USEPA Health Advisory for Drinking Water Uses.
  
3. Michigan Part 201 groundwater cleanup criteria protective of drinking water uses were based on USEPA Health Advisory Level obtained from USEPA Fact Sheets EPA 822-R-16-004 and -005, dated May 2016 (per Part 201 criteria tables, note JJ).
  
4. The cleanup criteria of 70 ppt was established for the combined concentrations of PFOA and PFOS.



MW-3S  
ELE: 715.3 ft  
Depth: 69.7-74.6 ft  
10/2017  
402 ppt

MW-2  
ELE: 716.8 ft  
Depth: 78.5-83.1 ft  
10/2017  
ND ppt

MW-1S  
ELE: 718 ft  
Depth: 68.4-73.1 ft  
10/2017  
4.2 ppt

MW-1D  
ELE: 616.3 ft  
Depth: 170.1-174.7 ft  
10/2017  
ND ppt

MW-4S  
ELE: 708.9 ft  
Depth: 71.1-75.7 ft  
10/2017  
2,830 ppt

MW-4S  
ELE: 708.9 ft  
Depth: 71.1-75.7 ft  
12/2017  
5,100 ppt

MW-7S  
ELE: 716.5 ft  
Depth: 70.1-74.7 ft  
10/2017  
8 ppt

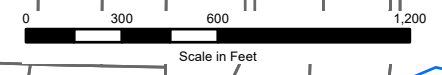
MW-5S  
ELE: 714.5 ft  
Depth: 61.9-66.6 ft  
10/2017  
46,800 ppt

MW-5S  
ELE: 714.5 ft  
Depth: 61.9-66.6 ft  
12/2017  
48,400 ppt

MW-6S  
ELE: 710.8 ft  
Depth: 57.1-61.8 ft  
10/2017  
9.8 ppt

MW-5D  
ELE: 586.1 ft  
Depth: 188-198 ft  
1/2018  
34.9 ppt

MW-6D  
ELE: 613.1 ft  
Depth: 155-160 ft  
12/2017  
ND ppt



**Legend**

Parcel

**PFOS and PFOA in on-Site Groundwater, ng/L**

- 0 - 10
- 11 - 70
- 71 - 700
- 701 - 7,000
- 7,001 - 70,000

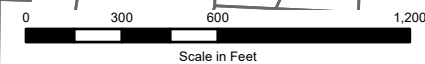
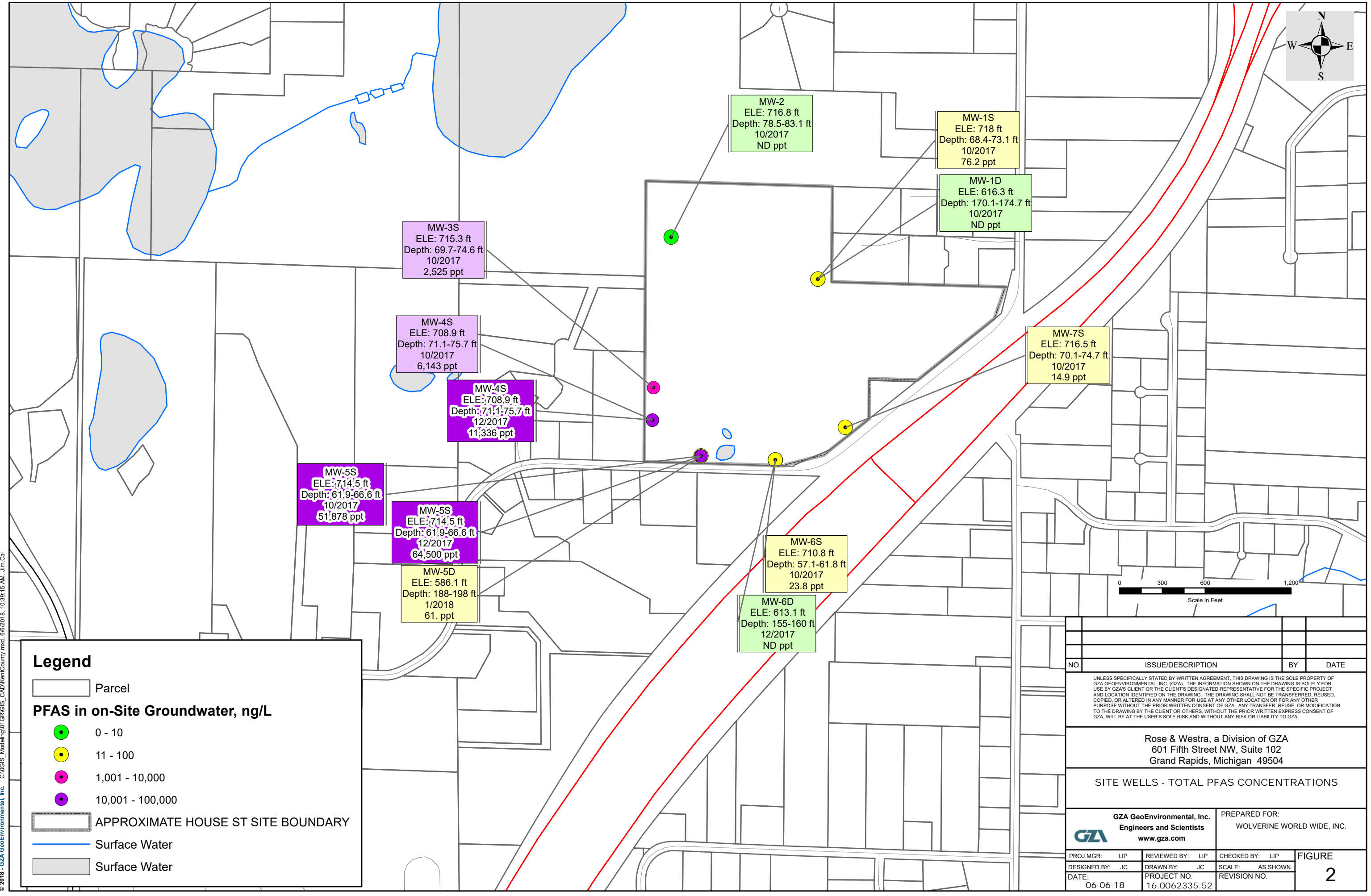
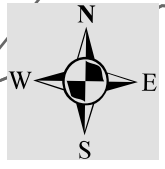
APPROXIMATE HOUSE ST SITE BOUNDARY

Surface Water

Surface Water

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<b>SITE WELLS - PFOS AND PFOA CONCENTRATIONS</b>			
<b>GZA GeoEnvironmental, Inc.</b> Engineers and Scientists www.gza.com		PREPARED FOR: WOLVERINE WORLD WIDE, INC.	
PROJ MGR: LIP	REVIEWED BY: LIP	CHECKED BY: LIP	<b>FIGURE</b>  <b>1</b>
DESIGNED BY: JC	DRAWN BY: JC	SCALE: AS SHOWN	
DATE: 06-06-18	PROJECT NO: 16.0062335.52	REVISION NO.	

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**Legend**

- Parcel
- PFAS in on-Site Groundwater, ng/L**
- 0 - 10
- 11 - 100
- 1,001 - 10,000
- 10,001 - 100,000
- APPROXIMATE HOUSE ST SITE BOUNDARY
- Surface Water
- Surface Water

NO.	ISSUE/DESCRIPTION	BY	DATE
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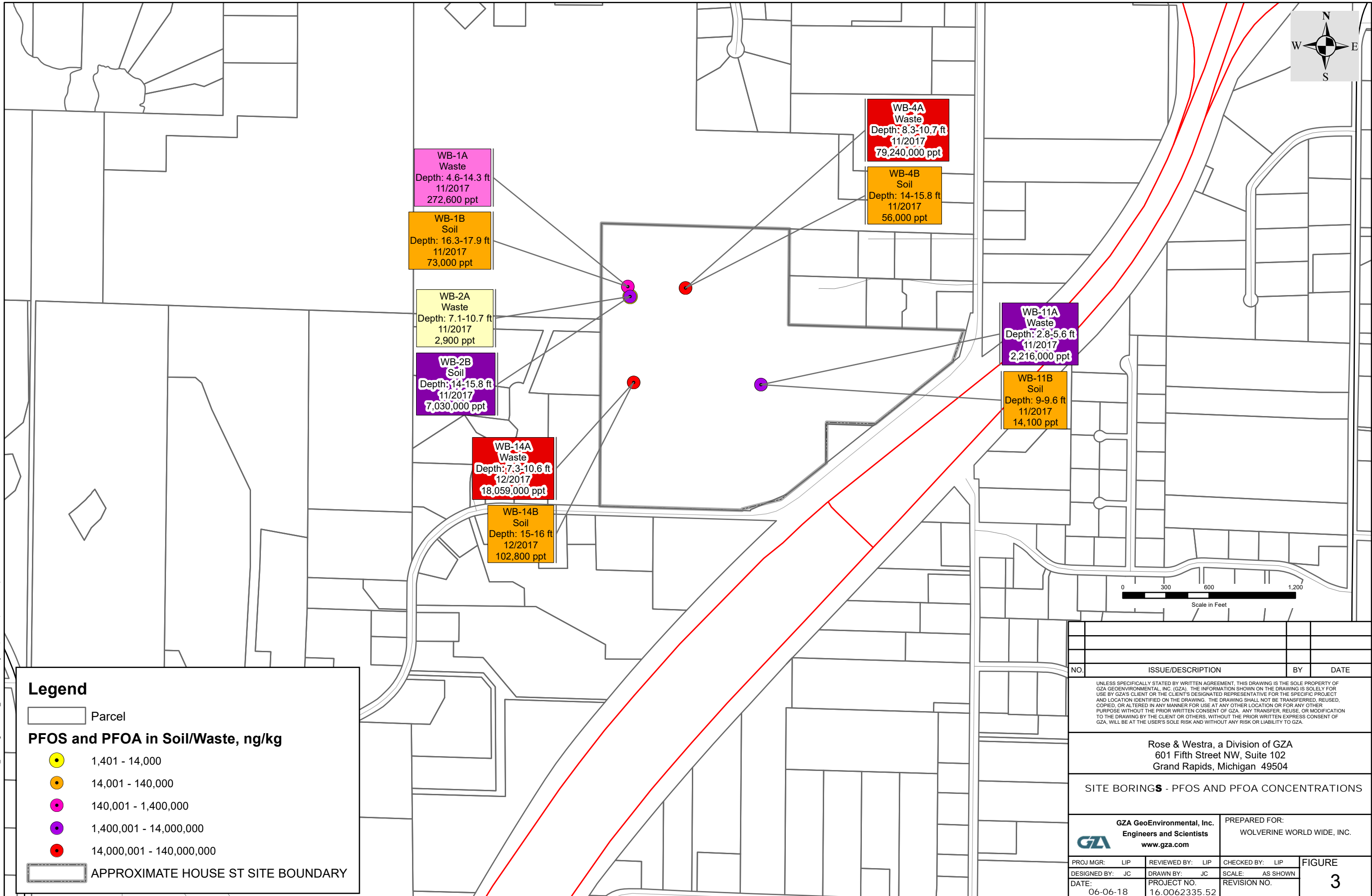
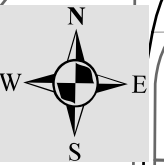
Rose & Westra, a Division of GZA  
 601 Fifth Street NW, Suite 102  
 Grand Rapids, Michigan 49504

**SITE WELLS - TOTAL PFAS CONCENTRATIONS**

GZA GeoEnvironmental, Inc.  
 Engineers and Scientists  
 www.gza.com

PREPARED FOR:  
 WOLVERINE WORLD WIDE, INC.

PROJ MGR: LIP	REVIEWED BY: LIP	CHECKED BY: LIP	FIGURE <b>2</b>
DESIGNED BY: JC	DRAWN BY: JC	SCALE: AS SHOWN	
DATE: 06-06-18	PROJECT NO. 16.0062335.52	REVISION NO.	



WB-1A  
Waste  
Depth: 4.6-14.3 ft  
11/2017  
272,600 ppt

WB-1B  
Soil  
Depth: 16.3-17.9 ft  
11/2017  
73,000 ppt

WB-2A  
Waste  
Depth: 7.1-10.7 ft  
11/2017  
2,900 ppt

WB-2B  
Soil  
Depth: 14-15.8 ft  
11/2017  
7,030,000 ppt

WB-14A  
Waste  
Depth: 7.3-10.6 ft  
12/2017  
18,059,000 ppt

WB-14B  
Soil  
Depth: 15-16 ft  
12/2017  
102,800 ppt

WB-4A  
Waste  
Depth: 8.3-10.7 ft  
11/2017  
79,240,000 ppt

WB-4B  
Soil  
Depth: 14-15.8 ft  
11/2017  
56,000 ppt

WB-11A  
Waste  
Depth: 2.8-5.6 ft  
11/2017  
2,216,000 ppt

WB-11B  
Soil  
Depth: 9-9.6 ft  
11/2017  
14,100 ppt

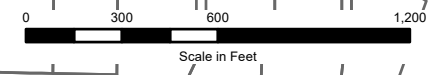
**Legend**

Parcel

**PFOS and PFOA in Soil/Waste, ng/kg**

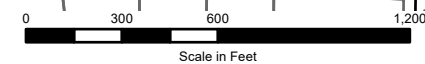
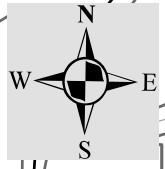
- 1,401 - 14,000
- 14,001 - 140,000
- 140,001 - 1,400,000
- 1,400,001 - 14,000,000
- 14,000,001 - 140,000,000

APPROXIMATE HOUSE ST SITE BOUNDARY



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<b>SITE BORINGS - PFOS AND PFOA CONCENTRATIONS</b>			
<b>GZA GeoEnvironmental, Inc.</b> Engineers and Scientists www.gza.com		PREPARED FOR: WOLVERINE WORLD WIDE, INC.	
PROJ MGR: LIP	REVIEWED BY: LIP	CHECKED BY: LIP	<b>FIGURE</b>  <b>3</b>
DESIGNED BY: JC	DRAWN BY: JC	SCALE: AS SHOWN	
DATE: 06-06-18	PROJECT NO: 16.0062335.52	REVISION NO.	

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WB-1A  
Waste  
Depth: 4.6-14.3 ft  
11/2017  
1,676,100 ppt

WB-1B  
Soil  
Depth: 16.3-17.9 ft  
11/2017  
89,370 ppt

WB-2A  
Waste  
Depth: 7.1-10.7 ft  
11/2017  
6,400 ppt

WB-2B  
Soil  
Depth: 14-15.8 ft  
11/2017  
38,218,000 ppt

WB-14A  
Waste  
Depth: 7.3-10.6 ft  
12/2017  
21,230,000 ppt

WB-14B  
Soil  
Depth: 15-16 ft  
12/2017  
105,000 ppt

WB-4A  
Waste  
Depth: 8.3-10.7 ft  
11/2017  
95,076,000 ppt

WB-4B  
Soil  
Depth: 14-15.8 ft  
11/2017  
84,400 ppt

WB-11A  
Waste  
Depth: 2.8-5.6 ft  
11/2017  
13,278,100 ppt

WB-11B  
Soil  
Depth: 9-9.6 ft  
11/2017  
28,400 ppt

**Legend**

Parcel

**PFAS in Soil/Waste, ng/kg**

- 0 - 10,000
- 10,001 - 100,000
- 100,001 - 1,000,000
- 1,000,001 - 10,000,000
- 10,000,001 - 100,000,000

APPROXIMATE HOUSE ST SITE BOUNDARY

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SITE BORINGS - TOTAL PFAS CONCENTRATIONS			
GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com		PREPARED FOR: WOLVERINE WORLD WIDE, INC.	
PROJ MGR: LIP	REVIEWED BY: LIP	CHECKED BY: LIP	<b>FIGURE</b> <b>4</b>
DESIGNED BY: JC	DRAWN BY: JC	SCALE: AS SHOWN	
DATE: 06-06-18	PROJECT NO. 16.0062335.52	REVISION NO.	

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