Final Phase II Comprehensive Site Assessment

Cape Cod Gateway Airport
Hyannis, Massachusetts

RTN 4-26347

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Prepared for:
Cape Cod Gateway Airport
480 Barnstable Road Hyannis,
MA 02840

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1.0 INTRODUCTION

The Horsley Witten Group, Inc. (HW) has been retained by the Cape Cod Gateway Airport (the "Airport") to prepare the Final Phase II Comprehensive Site Assessment (Phase II) for its property located at 480 Barnstable Road, Hyannis, Massachusetts (Figure 1). The Phase II focuses on the release of Per- and Poly-Fluoroalkyl Substances (PFAS) in soil and groundwater and 1,4-dioxane in groundwater.

The nature and extent of the release has been assessed. Based on a Method 1 Risk Characterization a condition of no significant risk <u>has not</u> been achieved due to the presence of the following:

- PFAS in soil greater that the applicable Method 1 S-1/GW-1 standards; and
- PFAS and 1,4-dioxane in groundwater greater than the applicable Method 1 GW-1 standards.

HW has prepared this Phase II in accordance with the Massachusetts Contingency Plan 310 CMR 40.0000 (MCP). The Phase II has also been prepared consistent with the Final Public Involvement Plan for the Airport dated September 16, 2019 (the "Final PIP"). Consistent with the Final PIP, all persons identified on Table 1, Community Notification List, have been notified on the availability of the Phase II. The Airport previously provided a 21-day review period to allow for comments from the public. Public comments were only received by Mr. Tom Cambareri on behalf of the Town of Barnstable Department of Public Works. Where appropriate, Mr. Cambareri' s comments have been incorporated into this Final Phase II. A copy of Mr. Cambareri's comments are included in Appendix A.

For the purpose of this report, the term "Airport" specifically refers to the Cape Cod Gateway Airport property located at 480 Barnstable Road, as set forth above, and the term "Disposal Site" refers to the area impacted by the release of oil and/or hazardous material (OHM) subject to Release Tracking Number (RTN) 4-26347. A Site Locus Map and the Disposal Site Map are provided as Figures 1 and 2.

2.0 EXECUTIVE SUMMARY

The Airport has completed the Phase II consistent with the MCP requirements set forth in 310 CMR 40.08333. The Phase II is based on the collection and laboratory analysis of the following:

  - 121 soil samples for laboratory analysis of PFAS;

- Three surface water samples for laboratory analysis of PFAS;
- 101 groundwater samples for laboratory analysis of PFAS;
- 41 groundwater samples for laboratory analysis of 1,4-dioxane;
- 8 fire truck spray water samples;
- 13 groundwater and one surface water samples for Stable Isotope Analysis; and
- One aqueous film-forming foam ("AFFF") sample.

As documented in the fact sheet titled "*Interim Guidance on Sampling and Analysis for PFAS at Disposal Sites Regulated Under the Massachusetts Contingency Plan"* prepared by the MassDEP and dated October 21, 2020, the following six PFAS analytes are currently regulated:

- Perfluorodecanoic Acid (PFDA)
- Perfluoroheptanoic Acid (PFHpA)
- Perfluorohexanesulfonic Acid (PFHxS)
- Perfluorooctanoic Acid (PFOA)
- Perfluorooctanesulfonic Acid (PFOS)
- Perfluorononanoic Acid (PFNA)

Although MassDEP is currently regulating the six PFAS analytes described above, it does recommend that the 14 analytes included in EPA Method 537.1.1 be evaluated to determine if other PFAS analytes may be present. MassDEP has not provided toxicity information sufficient for the purposes of conducting a MCP risk assessment beyond the six PFAS analytes documented above (refer to the Technical Support Document titled "*Per-and polyfluoroalkly Substances (PFAS): An Updated Subgroup Approach to Groundwater to Groundwater and Drinking Water Values*" prepared by the MassDEP and dated December 26, 2019).

The Airport has gone beyond the list of 14 PFAS analytes included in EPA 537.1.1 and is currently evaluating the PFAS release using approximately 20 to 24 compounds that are reported by the laboratory. The sum of all 20 to 24 compounds is used to determine "Total PFAS" present in soil, groundwater and surface water. The term "Total PFAS" does not include the over 4,000 other PFAS analytes that are not reported in the current analytical testing method. This term is also different from the "Sum of Six" which is the sum of the MassDEP six regulated PFAS analytes (PFDA, PFHpA, PFHxS, PFOA, PFOS and PFNA).

Based on interviews with Airport staff who have worked at the Airport since the 1980s, AFFF was only intentionally sprayed at the Airport during tri-annual drills (1991, 1994, 1997, 2000, 2003, 2006, 2009 and 2012), during an Airport Emergency (1981 and 2016 aircraft crash) and once per year between 2004 and 2015 as part of the Federal Aviation Administration ("FAA") annual foam testing requirement (14 CRF 139). With the exception of the 1991 tri-annual drill, all drills have been conducted at the unpaved Deployment Area located adjacent to the East Ramp at the Airport. With the exception of the events detailed above, AFFF was not intentionally sprayed due to cost and limited supply of AFFF. Historical Airport purchase records indicate that a fluorotelomer-based AFFF (Chem-Guard 3% mil spec) has been purchased by the Airport over the last twenty years and interviews with staff indicated that this type of foam was also purchased as early as the 1980s.

In addition to the tests and training usage with AFFF, daily (approximately 5 gallons) and monthly (100 gallons) testing of the fire apparatus is conducted with just water. The test is conducted to verify that the fire apparatus pumps are operational. No foam is intentionally sprayed during these tests. The spray water from the fire trucks were tested for PFAS in 2019 to verify that the valve mechanism that segregates the AFFF was working properly. The analytical results indicated that AFFF was being mixed with the water unintentionally (no visible foam generation) from the internal AFFF holding tanks at the resulting spray water had a concentration of PFAS above the MassDEP Sum of 6 GW-1 standard. It was determined that the valve that segregates the AFFF was faulty and was the cause of the unintentional mixing. The faulty valve was replaced, and a maintenance schedule has been initiated to prevent the unintentional mixing. Subsequent testing of the spray water indicates that PFAS levels are less than the current GW-1 standard, although PFAS is still detected. The combination of tri-annual drills and the annual AFFF testing and to a lesser extent the daily and monthly spraying of water have contributed to the AFFF related PFAS impacts in the Deployment Area. The Airport stopped using AFFF in the tri-annual training drills in 2015 and purchased an ecological cart in 2016 to stop spraying AFFF as part of the annual FAA testing requirement.

The extent of the PFAS plume in the vicinity of the Deployment Area is indicated on Figure 2. The plume location is based on analytical data, environmental forensics (to distinguish PFAS sources in co-mingled plumes) and PFAS related fate and transport mechanisms of the MassDEP Sum of 6. The plume does not appear to have impacted the Maher Wells with the MassDEP Sum of 6 PFAS analytes. Additionally, the plume is likely smaller than depicted on Figure 2 and additional monitoring well installation is expected in the future (between HW-S and OW-19) to further refine the downgradient and lateral extent of the plume.

The Airport Rescue and Firefighting/Snow Removal Equipment (ARFF/SRE) Building was constructed in 1996 and PFAS is assumed to have been released in this area through what is assumed to be incidental spillage, hanging of fire house apparatus and cleaning of equipment in the event of accidentally engaging the foam pump button. Interior floor drains within the ARFF/SRE building historically discharged to the adjacent grass area that was capped in the fall of 2020 to reduce infiltration of stormwater. In the event the foam pump was accidentally engaged, equipment was rinsed by pumping water through it and discharging it to the adjacent grass area that was recently capped. Stormwater in the vicinity of the recently capped area also historically infiltrated into this area including both the building’s roof and surrounding paved surface are. The interior floor drains historically discharged to this area but were closed and connected to a permitted discharge to the Barnstable Wastewater Treatment Plant. As part of the cap installed in 2020, stormwater was redirected away from this area and is infiltrated beyond the PFAS impacted soil areas. The extent of the PFAS plume in the vicinity of the ARFF/SRE Area is indicated on Figure 2. The plume location is based on analytical data, environmental forensics (to distinguish PFAS sources in co-mingled plumes) and PFAS related fate and transport mechanisms of the MassDEP Sum of 6. The plume does not appear to have impacted the Maher Wells with the MassDEP Sum of 6 PFAS analytes.

During the assessment to delineate the nature and extent of PFAS relating to the Airport's use of fluorotelomer-based AFFF, PFAS in groundwater above the MassDEP Sum of 6 was identified entering the Airport from several upgradient locations. Forensic techniques including data normalization and the preparation of Radar Plots for the purpose of distinguishing PFAS sources was necessary to distinguish the Airport's PFAS source from other off-site sources. Radar plots were generated for each of the groundwater monitoring wells tested both on and off Airport property, from the fire truck spray water and from AFFF concentrate. The data normalization used all laboratory reported PFAS and their contribution to the "Total PFAS" concentration detected in groundwater. The Radar Plots are considered a PFAS fingerprint. The PFAS fingerprint was used to determine plume migration relating to the Airport PFAS release as well as contributions from other off-site non-Airport related sources.

As indicated on Figure 2, PFAS impacted groundwater is migrating onto the Airport from upgradient sources that are not consistent with the PFAS plume associated with Airport. Additionally, as indicated on Figure 2, the PFAS plume associated with the Airport does not appear to have migrated to the Maher Wells. Additional testing of soil and groundwater is planned as part of ongoing IRA activates to further support the Conceptual Site Model, aid with any proposed remedial design and refine the forensic approach for source delineation. It is also understood that the Airport's PFAS Plume is migrating toward the Maher Wells.

The Airport has also controlled a majority of the sources of PFAS in soil and groundwater relating to the historic deployment of AFFF by the installation of two non-permeable caps as indicated on Figure 3). The cap installations were completed in the fall of 2020 and additional details are included in the report titled "Immediate Response Action Plan Status Report 8 dated October 2020 and available for direct download from the MassDEP Searchable Sites Database using RTN 4-26347.

1,4-dioxane is also a contaminate of concern at the Airport. It has been detected in one deep monitoring well (HW-L [d]) on the Airport and within several monitoring wells located off-Airport property both hydraulically upgradient and downgradient of the Airport. A potential source of 1,4-dioxane at the Airport is a historic release of 1,1,1-trichloroethane (1,1,1-TCA, RTN 4-00823) from an oil/water separator associated with a floor drain in the former Provincetown Boston Airlines hangar (currently leased to Cape Air) and from the use of aircraft deicing fluids. Multiple groundwater samples collected from the former 1,1,1-TCA release area in the North Ramp did not detect 1,4-dioxane above the laboratory reporting limit. Aircraft deicing fluids are not discharged to the unpaved surface and are currently directly discharged to the municipal sewer under an approved connection. Historic deicing (pre-2015) was conducted on the paved surface and was vacuumed up and directly discharged to the municipal sewer system under an approved discharge. Two of the deicing locations are located upgradient of HW-L(d) and groundwater testing downgradient of these locations did not identify 1,4-dioxane above the laboratory reporting limit. The third deicing location was historically located approximately 1,500 feet cross-gradient to HW-L and does not have a hydraulic connection to this area. Considering the depth at which the 1,4-dioxane has been detected at the Airport and Maher Wells (70 to 123 feet below grade), the 1,4-dioxane appears to be from an off-Airport source located more than 6,000 feet hydraulically upgradient. The location of the current and former deicing areas is shown on Figure 2. The estimated extent of the 1,4-dioxane plume is depicted on Figure 2.

3.0 DISPOSAL SITE INFORMATION

Pursuant to 310 CMR 40.0835(4)(a), (b) and (c), a Phase II Comprehensive Site Assessment shall include the following Disposal Site information.

3.1 Disposal Site Name and Location

Pursuant to 310 CMR 40.0835(4) (a) the Disposal Site name and location are set forth below.

Cape Cod Gateway Airport
480 Barnstable Road
Hyannis, Massachusetts 02601

3.2 Disposal Site Map

Pursuant to 310 CMR 40.0835(4)(b), Figure 2 provides a detailed Disposal Site Map depicting all investigatory sampling points relevant to the Phase II and the boundaries of the Disposal Site.

3.3 Disposal Site History

Pursuant to 310 CMR 40.0835(4)(c), the Disposal Site History is set forth below.

3.3.1 General Airport Description

The Airport is located in Hyannis, Massachusetts, and provides scheduled airline service, general aviation services and other aviation related activities. The Airport is owned by the Town of Barnstable and is managed through the Barnstable Municipal Airport Commission (“BMAC”). The Airport began as a private airport consisting of a single grass runway before being given to the Town of Barnstable in the 1930’s. With the outbreak of World War II, the Airport was taken over by the federal government for wartime training and defense purposes. During the 1940’s, the United States Navy used the Airport and expanded the airfield to include three runways. In 1946, the Airport was returned to a two-runway municipal airport (each runway has a designation at each end, being 15-33 and 6-24). In 1948, the Airport was conveyed by the United States government (pursuant to the Surplus Property Act of 1944) to the Town of Barnstable, acting by and through its Airport Commission.

The Airport is comprised of approximately 645 acres of land, with approximately 140 acres that are impervious (e.g., paved areas such as parking lots, runways, taxiways, aircraft parking aprons, concrete walkways, and building rooftops). The Airport's structures include the main terminal and the Air Traffic Control Tower ("ATCT"), which are located south of the runways and taxiways, as well as several hangars used for general aviation and operations services. In addition, the ARFF/SRE Building is located in the southeast corner of the property. The Airport is located in an area of Hyannis zoned for Business and Industrial uses. A topographic map with the Airport property boundary outlined is attached as Figure 1 and the area impacted by the release of PFAS and 1,4-Dioxane is indicated on Figure 2.

3.3.2 General Regulatory History

The evaluation for 1,4-dioxane at the Airport began in July 2015 when the MassDEP requested samples be collected from existing monitoring wells to evaluate the presence or absence of this compound on Airport property. The request was related to the detection of 1,4-dioxane at the Maher Well field and the potential for the detection to be attributed to historic releases from a floor drain at the former Provincetown Boston Airlines hangar (currently leased to Cape Air). The historic release had been known to contain 1,1,1-TCA. 1,1,1-TCA is a product known to potentially contain 1,4-dioxane.

In August 2016, the Airport conducted an initial round of groundwater sampling to evaluate the presence of PFAS compounds, also at the request of MassDEP. Subsequently, a Notice of Responsibility (NOR), dated November 10, 2016, was issued to the Airport by the MassDEP. The NOR requested that the Airport conduct additional field investigations to evaluate:

- The source(s) of PFAS including PFOS and PFOA detected in groundwater at the Airport;
- The source(s) of 1,4-dioxane detected in a monitoring well downgradient of the Airport on the Maher wellfield property; and
- To identify potential impacts to public water supply wells operated by the Hyannis Water District at the Mary Dunn and Maher wellfields.

A proposed Immediate Response Action (IRA) plan was submitted to the MassDEP for approval in response to the NOR. Subsequently, a meeting was held by MassDEP at the Airport that included other stakeholders including the Barnstable Department of Public Works, the Hyannis Water District and Barnstable County representatives (representing the Fire Training Academy). At the meeting, IRA plans were coordinated between the Airport and Fire Training Academy including sampling locations, type of analysis, groundwater modeling, goals and next steps. The IRA plan served as the guide for the soil and groundwater testing conducted since November 2016 to follow up on the results of the previous analyses.

In June 2019, the MassDEP issued a Request for Modified Immediate Response Action Plan/Interim Deadline dated June 18, 2019 (the "Modified IRA Request") to the Airport. The Modified IRA Request asked that the Airport propose response actions to *"reduce infiltration of* *precipitation through PFAS-impacted soil, such as temporarily capping the source areas; excavating and properly disposing of the PFAS-impacted soil; or some equivalent approach".* The Airport's response is documented in the report titled *Final Immediate Response Action Plan Modification,* prepared by HW and dated December 2019 (the "IRA Modification"). The IRA Modification included details for the installation of a cap in two select areas to reduce precipitation infiltration. The two areas are identified as the Deployment Area and the ARFF/SRE Area. The two capped areas total approximately 94,100-square feet and represent a majority of the known PFAS source areas at the time of the report relating to the historic use of AFFF. The caps were completed in September 2020 and are documented in the report titled *Immediate Response Action Plan Status Report 8.* The surficial extent of the two capped areas is indicated on Figure 3.

3.3.3 Sources of PFAS at the Airport

The source of PFAS related to Airport operations is from the use of AFFF for training and emergencies. Personnel working at the Airport since 1980 were consulted to determine when AFFF use occurred for training purposes or during an actual aircraft accident. Details concerning AFFF usage is set forth below.

<u>AFFF Usage for Testing and Training</u>

- Historical Airport purchase records indicate that a fluorotelomer-based AFFF (Chem-Guard 3% mil spec) has been purchased by the Airport over the last twenty years and interviews with staff indicated that this type of foam was also purchased as early as the 1980s. With the exception of the events detailed below, AFFF was not intentionally sprayed due to cost and limited supply of AFFF.
- FAA regulations require a Tri-Annual Drill which is a full-scale live exercise that simulates a major airport disaster to test the emergency coordination and response skills of the Airport and other first responders. With the exception of the drill in 1991 as shown on the Figure 2, all drills occurred at the unpaved Deployment Area as indicated on Figure 2. The tri-annual drills occurred as follows:
    - July 17, 1991
    - Nov. 16, 1994
    - Nov. 17, 1997
    - Nov. 2, 2000
    - Oct. 18, 2003
    - Oct. 25, 2006
    - Oct. 22, 2009
    - Oct. 11, 2012
    - Oct. 28, 2015 (No AFFF used during this drill – just water)

  - Sept 5, 2018 (No AFFF used during this drill – just water)

- Beginning in 2004, annual testing of the AFFF mixture became a Federal Aviation Administration ("FAA") requirement. The test was conducted to ensure that the foam used by the Airport consists of the appropriate AFFF to water mixture (3%). Historically, the test consisted of shooting the mixture of AFFF from the fire rescue vehicle at a small square target. Adjustments were then made, if needed, to allow for proper spray coverage consistent with the FAA regulations. According to Airport personnel, testing of the foam consistency prior to 2004 was not completed due to the cost and supply of AFFF.
  - Approximately 80 gallons of 3-percent AFFF concentrate was historically used annually beginning in 2004 to conduct the test (see table below).
  - All testing has been conducted in the same unpaved location on the Airport since 2004 (Deployment Area).
  - The Airport purchased an Ecological Cart in 2016 so that the AFFF mixture could be verified without using or spraying foam. The Airport has not used AFFF for testing purposes since 2016. The Ecological Cart was the first unit purchased by a Massachusetts airport and well before FAA approval for universal airport usage.

- FAA regulations require a supply of AFFF concentrate on hand to resupply two trucks. This is approximately 407 gallons of the 3-percent AFFF concentrate. The concentrate is stored in the ARFF/SRE Building located in the ARFF/SRE Area as indicated on Figure 2. As of October 2020, the Airport has 862 gallons of AFFF concentrate on hand. This includes 455 gallons within containers and 407 gallons within the fire trucks.
- The Airport removes expired AFFF that is no longer useable. The expired AFFF is removed by Global Remediation, a licensed waste disposal company. As indicated on the manifests in Appendix B, Global Remediation removed 100-gallons of AFFF concentrate on June 13, 2019 and 50-gallons on March 4, 2020.

The ARFF/SRE Building was constructed in 1996 and PFAS is assumed to have been released in this area through what is assumed to be incidental spillage, hanging of fire house apparatus and cleaning of equipment in the event of accidentally engaging the foam pump button. Interior floor drains within the ARFF/SRE building historically discharged to the adjacent grass area that was capped in the fall of 2020 to reduce infiltration of stormwater. In the event the foam pump was accidentally engaged, equipment was rinsed by pumping water through it and discharging it to the adjacent grass area that was recently capped. Stormwater in the vicinity of the recently capped area also historically infiltrated into this area including both the building's roof and surrounding paved surface are. The interior floor drains historically discharged to this area but were closed and connected to a permitted discharge to the Barnstable Wastewater Treatment Plant. As part of the cap installed in 2020, stormwater was redirected away from this area and is infiltrated beyond the PFAS impacted soil areas. The oil/water separator is inspected quarterly by Airport staff and then pumped, cleaned and serviced by Global Remediation as needed. As indicated on the manifest in Appendix B, 1,290-gallons of the oil/water separator liquid was pumped on October 29, 2017. The oil/water separator is located within the extent of the PFAS plume at the location indicated on Figure 2.

AFFF Usage for Emergencies

- Personnel working at the Airport since 1980 were consulted to determine when AFFF use occurred during an actual aircraft accident and only two instances were identified. Please note that AFFF is NOT used during an incident unless there is a spark of fire. The majority of accidents do not result in the use of AFFF. Airport personnel identified the following aircraft emergencies where AFFF was used:
  - 1981 crash of a Beech 18 aircraft east of runway 24 between Yarmouth Road and the Airport (off-Airport property).
  - 2016 crash of a Cirrus aircraft in the parking lot of the rental car facility west of the terminal building. Approximately 10 gallons of the 3-percent AFFF concentrate was used during the crash response. 100% of this AFFF liquid was contained within a solid bottom manhole and was removed by Global Remediation during response actions. A copy of the waste disposal manifests is included in Appendix B.

AFFF Purchase Quantity and Usage

Historical Airport purchase records indicate that a fluorotelomer-based AFFF (Chem-Guard 3% mil spec) has been purchased by the Airport over the last twenty years and interviews with staff indicated that this type of foam was also purchased as early as the 1980s. According to Airport available purchase, the following quantities of AFFF concentrate have been purchased and used by the Airport since 2000:

Year	AFFF Type	AFFF 3% Concentrate Purchased	Approximate AFFF 3% Concentrate Used for Training	Approximate AFFF 3% Concentrate Used for Tri-Annual Drill	Approximate AFFF 3% Concentrate Used for Annual Testing	Approximate Total AFFF Concentrate Used Annually	Approximate Total AFFF Concentrate and Water Mix	Approximate AFFF Stockpiled Based on Use*
		(Gal.)	(Gal.)	(Gal.)	(Gal.)	(Gal.)	(Gal.)	(Gal.)
2000	Chem-Guard 3% mil-spec foam	200	0	40	0	40	1333	485
2001	None purchased	0	0	0	0	0	0	485

Year	AFFF Type	AFFF 3% Concentrate Purchased	Approximate AFFF 3% Concentrate Used for Training	Approximate AFFF 3% Concentrate Used for Tri-Annual Drill	Approximate AFFF 3% Concentrate Used for Annual Testing	Approximate Total AFFF Concentrate Used Annually	Approximate Total AFFF Concentrate and Water Mix	Approximate AFFF Stockpiled Based on Use*
		(Gal.)	(Gal.)	(Gal.)	(Gal.)	(Gal.)	(Gal.)	(Gal.)
2002	Chem-Guard 3% mil-spec foam	30	0	0	0	0	0	515
2003	Chem-Guard 3% mil-spec foam	40	0	40	0	80	2667	475
2004	Chem-Guard 3% mil-spec foam	40	0	0	80	80	2667	435
2005	None purchased	0	0	0	80	80	2667	355
2006	Chem-Guard 3% mil-spec foam	220	0	40	80	120	4000	455
2007	Chem-Guard 3% mil-spec foam	25	0	0	80	80	2667	400
2008	Chem-Guard 3% mil-spec foam	90	0	0	80	80	2667	410
2009	Chem-Guard 3% mil-spec foam	90	0	40	80	120	4000	380
2010	Chem-Guard 3% mil-spec foam	100	0	0	80	80	2667	400
2011	Chem-Guard 3% mil-spec foam	180	0	0	80	80	2667	500

Year	AFFF Type	AFFF 3% Concentrate Purchased	Approximate AFFF 3% Concentrate Used for Training	Approximate AFFF 3% Concentrate Used for Tri-Annual Drill	Approximate AFFF 3% Concentrate Used for Annual Testing	Approximate Total AFFF Concentrate Used Annually	Approximate Total AFFF Concentrate and Water Mix	Approximate AFFF Stockpiled Based on Use*
		(Gal.)	(Gal.)	(Gal.)	(Gal.)	(Gal.)	(Gal.)	(Gal.)
2012	None purchased	0	0	40	80	120	4000	380
2013	None purchased	0	0	0	80	80	2667	300
2014	Chem-Guard 3% mil-spec foam	180	0	0	80	80	2667	400
2015	Chem-Guard 3% mil-spec foam	265	80	0	80	160	5333	505
2016**	Chem-Guard 3% mil-spec foam	250	0	0	0	0	0	755
2017	None purchased	0	0	0	0	0	0	755
2018	None purchased	0	0	0	0	0	0	755
2019	Chem-Guard 3% mil-spec foam	105	0	0	0	0	0	860
2020	None purchased	0	0	0	0	0	0	860***
Total Quantity Between 2000-2020		1,815	80	200	960	1,280	42,667	Not Applicable

Notes:

* The Airport is required by FAA regulations to have enough stockpiled AFFF on hand to resupply two (2) trucks. This is approximately 407 gallons of the 3% AFFF concentrate.

** In May 2016, the Airport transitioned to the new formulation of Chemguard (a modern fluorotelomer AFFF).

*** The total on-hand AFFF quantity as of October 2020 is 862 gallons. This includes 455 gallons within containers and 407 gallons within the fire trucks.

<u>PFAS from Non-Airport Related Sources</u>

Analytical testing of several wells located hydraulically upgradient and off Airport property have detected PFAS above the MassDEP Sum of 6 are entering the Airport from different areas. The additional PFAS plumes are unrelated to the Airport's AFFF PFAS plume. These plumes may also be impacting the Maher Well field. These plumes appear to be originating from the Barnstable Fire Training Academy PFAS Release Site (RTN 4-26179) and other unknown upgradient locations located upgradient of the Airport. Radar plots (Appendix C) were used to help distinguish the Airports PFAS AFFF plume from other non-Airport related PFAS sources. The Radar plot from HW-I (s) is a good representation of the Airport's plume relating to AFFF which is recognizable by a high percentage of 6:2 FTS and low percentage of PFOS. Additionally, 6:2 FTS does not degrade into PFOS or PFHxS (*Fact Sheet on C6 Fluorinated Surfactants, Dr. Jan-Erik Jonsson)* and it migrates faster (additional details below) in groundwater than any of the regulated MassDEP Sum of 6. Groundwater monitoring studies have shown that the predominant degradation product of fluorotelomer based AFFF is 6:2 FTS (*Fact Sheet on C6 Fluorinated Surfactants, Dr. Jan-Erik Jonsson).*

A Radar Plot is a graphical representation of analytical data that is used to create a distinguishable fingerprint. To generate a Radar Plot, each PFAS groundwater sample was statistically normalized to the individual total PFAS concentration. The Total PFAS concentration is the sum of all laboratory reported PFAS analytes in a sample. Each PFAS analyte was then divided by Total PFAS to calculate the percent each analyte contributed to the Total PFAS concentration. These percentages were then plotted for each sampling location and the graphical representation of the data set was compared.

The Airport's PFAS fingerprint was calculated from the Radar Plots of the fire truck spray water, groundwater analytical data collected in the two known source areas (Deployment and ARFF/SRE Area) and from areas hydraulically downgradient. Historical Airport purchase records indicate that a fluorotelomer-based AFFF (Chem-Guard 3% mil spec) has been purchased by the Airport over the last twenty years and interviews with staff indicated that this type of foam was also purchased as early as the 1980s.

Refer to Figure 2 for a depiction of the Airport AFFF Plume and other non-airport related PFAS plumes. Cross-sections including Radar Plots also document the extent of the Airport and other PFAS plumes. Refer to Figures 4 through 10 for select cross-sections depicting the vertical and horizontal extent of the AFFF plumes.

3.3.4 Sources of 1,4-Dioxane

1,4-dioxane is a synthetic chemical that is completely mixable in water. It has been detected in one deep monitoring well (HW-L [d]) located at the Airport and within several off-Airport monitoring wells located hydraulically upgradient and downgradient of the Airport. A potential source of 1,4-dioxane at the Airport is a historic release of 1,1,1-TCA (RTN 4-00823) from an oil/water separator associated with a floor drain in the former Provincetown Boston Airlines hangar (currently leased to Cape Air). 1,4-dioxane is also known to be an ingredient in aircraft deicing fluids. The Airport installed a centralized deicing and aircraft washing pad in 2015 which directs de-icing fluids (Type I propylene glycol based) and fluids used in aircraft washing to the Barnstable Water Pollution Control Facility. Prior to 2015, deicing activates were conducted at the South Ramp, Rectrix Aerodrome and East Ramp. Following application of deicing fluids prior to 2015, Airport maintenance personnel recovered residual deicing fluid on the asphalt pavement utilizing a TYMCO™ Model 600 vacuum recovery unit mounted on a Freightliner™ FC 80 chassis. Prior to deicing activities, magnetic catch basin covers were placed over storm drains in proximity. Recovered deicing fluid was subsequently discharged to the Barnstable municipal sewer system under an agreement with the Town of Barnstable. According to Airport personnel, the quantity of deicing fluid used at the Airport averages approximately 700 gallons per year. The location of the current and former deicing pads is indicated on Figure 2. An MSDS sheet (Appendix D) provided by the Airport indicate that the deicing fluid is propylene glycol based and contains less than 5 parts per billion (ppb) of 1,4-dioxane. The deicing activities are conducted consistent with an EPA Stormwater Permit and Stormwater Pollution Prevention Plan prepared by a professional engineer. The current and historic deicing areas are indicated on Figure 2.

Multiple groundwater samples collected from the former 1,1,1-TCA release area (HW-1, HW-5, HW-12, HW-29, OW-6, HW-4m, HW-4d, HW-207s, HW-207d, HW-19d and HW-204) in the North Ramp did not detect 1,4-dioxane above the laboratory reporting limit. As indicated above, Aircraft deicing fluids are not discharged to the unpaved surface and have been discharged to the municipal sewer under an approved connection/approved discharge. Historic deicing (pre-2015) was conducted on the paved surface and was vacuumed up and directly discharged to the municipal sewer system under an approved discharge.

The location of the current and historic deicing areas is indicated on Figure 2. Groundwater testing downgradient of two of these locations (HW-L[s], HW-L[m], and HW-19d) did not identify 1,4-dioxane above the laboratory reporting limit. The third deicing location is located approximately 1,500 feet cross-gradient to HW-L (d) and does not have a hydraulic connection to this area. Considering the depth at which the 1,4-dioxane has been detected at the Airport and Maher Wells (70 to 123 feet below grade) and that the particle tracking model detailed below, the 1,4-dioxane appears to be from a source located more than 6,000 feet hydraulically upgradient and off-Airport property. 1,4-dioxane has also been detected in two wells located (HW-V[m] and HW-U[d]) hydraulically upgradient and off-Airport Property at depths consistent with the particle tracking model detailed below supporting the Conceptual Site Model that the detection of 1,4-dioxane in HW-L9d) and the Maher Well field is related to an off-Airport release.

All floor drains within the hangers and businesses located on the airfield have either been closed, connected to a tight tank and/or connected to the sanitary sewer to meet the EPA and MassDEP discharge requirements.

According to the EPA document titled *Technical Fact Sheet – 1,4-dioxane* dated November 2017, sources of 1,4-dioxane include:

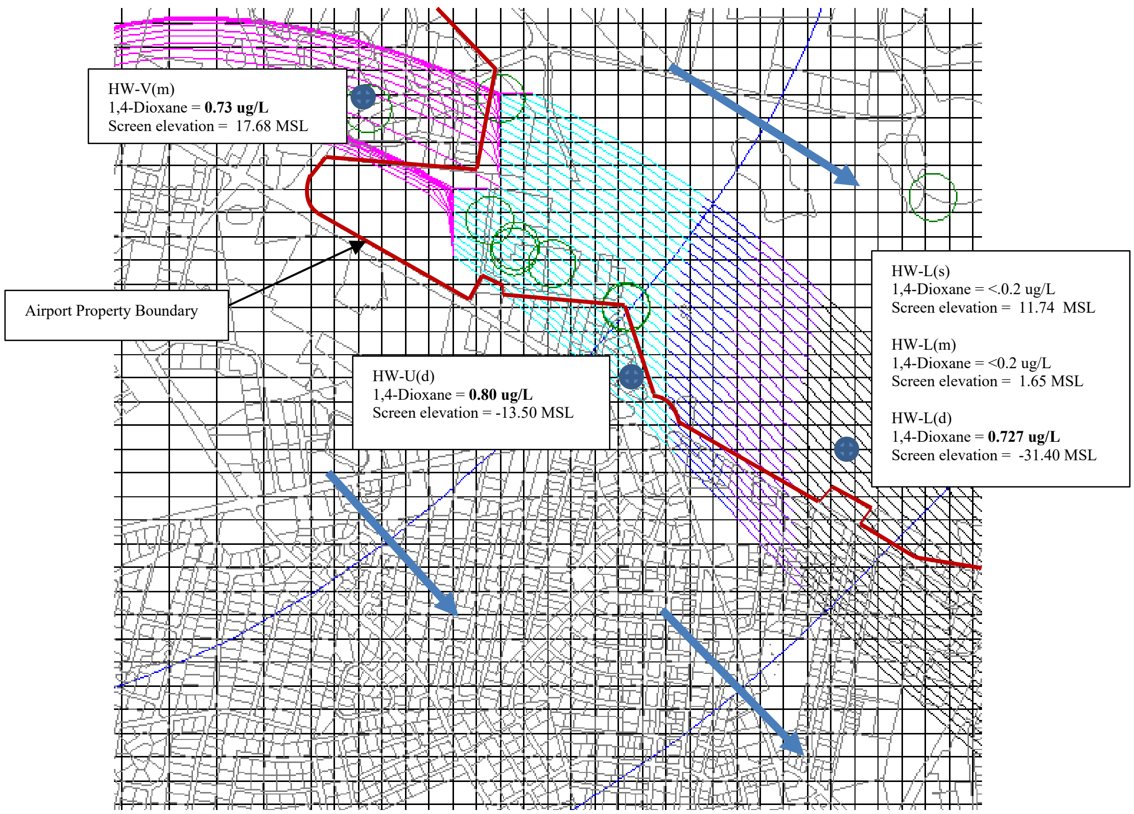
- **Solvent Stabilizer** – historically, 90% of 1,4-dioxane use was to stabilize chlorinated solvents such as 1,1,1-TCA. Use of 1,4-dioxane as a solvent stabilizer was phased out under the 1995 Montreal Protocol.
- **Consumer Products** - 1,4-dioxane has been found as a by-product in paint strippers, dyes, greases, anti-freeze and aircraft deicing fluids, and in some consumer products such as deodorants, shampoos, and cosmetics.
- **Pharmaceuticals and Plastic Manufacture** - 1,4-dioxane is used in the manufacture of pharmaceuticals as a purifying agent and is a by-product in the manufacture of polyethylene terephthalate plastic.
- **Food** - 1,4-dioxane may be present in some food supplements, food containing residues from packaging adhesives or on food crops treated with pesticides that contain 1,4-dioxane.

Some examples of how these materials can be released to the environment include:

- Releases to the ground surface, groundwater and/or surface water from industrial/commercial facilities where spills of materials containing 1,4-dioxane have occurred;
- Releases to groundwater and/or surface water from wastewater treatment plants where wastewater treatment methods were not designed to remove 1,4-dioxane compounds from the waste stream;
- Releases to groundwater and surface water from residential septic systems where 1,4-dioxane compounds were used in the household;
- Releases to the ground surface, groundwater and/or surface water from industrial facilities where polyethylene terephthalate plastic was manufactured; and
- Releases to groundwater and/or surface water from landfills were 1,4-dioxane wastes were disposed of.

Considering the depth of the 1,4-dioxane impacts, it is likely that the detection is related to an off-site source. To determine if the source of 1,4-dioxane detected in HW-L(d) and the Maher Well field was related to an off-site source, HW advanced monitoring wells HW-U(d) and HW-V(m) at locations off-Airport property and hydraulically upgradient of the Airport (Figure 11).

The well screen depths for these locations were chosen based on groundwater model particle tracks that simulate how groundwater migrates in the aquifer below the Airport. The particle tracks indicated that the depth of the 1,4-dioxane detected at the Airport and the Maher Well field was likely related to a release site located more than 6,000 feet upgradient of the Airport. The particle tracking model uses annualized average pumping rates for 2004-2008 from the Maher Wells, Mary Dun Wells and the Airport Well. The particle tracking is shown below, and arrows depict the groundwater flow path:



The model above shows how a particle of 1,4-dioxane migrated onto the Airport property from off-site upgradient locations HW-V(m) and HW-U(d). The particle flow path colors corresponding to the falling depth of the particle. The model was created by working backwards from HW-L(d) to depict the 1,4-dioxane flow path and particle depth during migration. The model was then used to pick the location and screen depth for monitoring wells HW-V(m) and HW-U(d). The model predicted that if 1,4-dioxane was detected at a depth between -27 and -32 feet below mean sea level (MSL) in HW-L(d), the potential source of the release was located more than 6,000 feet away (off-Airport property). The model suggested that 1,4-dioxane would be located within the cyan colored hatching (HW-U[d] location) at a depth of -8 to -13 feet below MSL and within the magenta-colored hatching at a screen depth of 12 to 17 feet above MSL. HW subsequently installed monitoring well locations HW-V(m) and HW-U(d) to the corresponding depth predicted by the model. 1,4-dioxane was detected in both new monitoring well locations (HW-V(m) at 0.8 ug/l and HW-U(d) at 0.73 ug/l) at concentrations consistent with that detected downgradient and on Airport Property (HW-L(d) at 0.75 ug/L).

Based on the results of the modeling and laboratory data, it appears that the detection of 1,4-dioxane at the Airport and the Maher Wells is likely related to an unknown off-site source located more than 6,000 feet upgradient of the Airport. A graphical representation of the 1,4-dioxane plume is indicated on Figure 7 and the location of HW-V(m), HW-U9d) and HW-L(d) in relation to the Airport property boundary is included on Figure 11.

4.0 DISPOSAL SITE HYDROGEOLOGICAL CHARACTERISTICS

Pursuant to 310 CMR 40.0835(4)(d), the Site hydrogeological characteristics including details of subsurface investigation and hydrogeologic conditions are set forth below.

4.1 Subsurface Investigations and Assessments Conducted

Pursuant to 310 CMR 40.0835(4)(d)1, a description of all relevant geologic, hydrologic, geophysical and other subsurface investigations conducted at the Disposal Site are set forth below. Refer to Tables 2 through 6 for tabulated analytical results and laboratory reports not previously submitted to the MassDEP are attached in Appendix E.

- An initial round of three soil samples were collected on December 9, 2016. One sample was taken from each location where it was determined that AFFF had been used at the Airport. The areas included the MCI Drill Area, the Deployment Area, and the 1991 Drill Location. Refer to Table 2 for tabulated PFAS in soil results.
- The installation of groundwater monitoring wells at six locations in April 2017: in the vicinity of potential sources of PFAS at the ARFF/SRE Area, at the Deployment Area and at upgradient locations outside of the Airport to evaluate potential off-site sources of PFAS and 1,4-dioxane. Refer to Table 3 and 4 for tabulated groundwater results.
- Groundwater from the new wells was initially sampled for PFAS and 1,4-dioxane in April 2017. Additional groundwater samples and one surface water sample were collected for analysis of PFAS on June 20, 2017. Refer to Table 3 and 4 for tabulated groundwater results.
- A second round of soil samples were collected on June 20, 2017 adjacent to the ARFF/SRE Building and within the Deployment Area to begin to determine the extent of PFAS within the surface soils. Based on the results of these analyses, a third round of samples from these two locations were collected on September 26, 2017. The third round of sampling was designed to further delineate the extent of PFAS in soils both horizontally and vertically, with samples taken at the ground surface and at two and four feet below ground surface (BGS). Refer to Table 2 for tabulated soil results.
- One sample of AFFF concentrate was analyzed for PFAS compounds to evaluate the foam. The analysis was inconclusive (only 225.5 ug/l of total PFAS was detected) and it

is assumed that the sample was not homogeneous (i.e., had separated in the foam bucket) and that the addition of water to the concentrated may affect how precursor PFAS analytes transform into various other detectable PFAS compounds. Refer to Table 5 for tabulated AFFF results.

- Six PFAS soil samples were also analyzed for leaching potential using a synthetic precipitation leaching procedure (SPLP) test between September and October 2017. The chosen samples included four samples from within the boundaries of the PFAS sites at the Airport and two samples from runway reconstruction soils stockpiled at the Airport. Refer to Table 6 for tabulated SPLP results.
- In October 2017, 20 surface samples were collected both on and off Airport property to determine the background concentration of PFAS in the area not related to the application of AFFF. Refer to Table 7 for soil results.
- In October 2017, three composite soil samples were taken from piles of soil associated with the redevelopment of Runway 15/33. These piles were located on Airport property at the site of the former Mildred's Restaurant and were analyzed for PFAS compounds to evaluate if soil removed from the Airport as part of this redevelopment contained PFAS. Refer to Table 7 for tabulated soil results.
- On August 14, 2018, 24 PFAS surface soil samples were collected in proximity to the ARFF/SRE Building Area and the Deployment Area. PFAS compounds were previously detected in these areas and additional samples were collected to determine the vertical extent of PFAS impacts in soil and to refine the soil disposal site boundary at the Airport. Refer to Table 2 for soil results.
- In October 2018, three soil borings (DL11, DL14 and HW-F) were advanced in the Deployment Area. One soil boring (ARFF3) was advanced, and one surface soil sample (HW-3) was collected near the ARFF/SRE Building in order to further delineate the extent of PFAS in soils both horizontally and vertically. All soil borings were advanced using direct push methods. Refer to Table 2 for soil results.
- In October 2018, six monitoring wells were installed at the Airport. A cluster of three wells (HW-G(s), HW-G(m), and HW-G(d)) was installed at an upgradient location to evaluate potential off-site sources of PFAS. Three additional wells (HW-H, HW-I, and HW-J) were installed southeast of the Deployment Area adjacent to the East Ramp. Refer to Table 3 for groundwater results.
- In November 2018, six groundwater samples were collected to evaluate PFAS concentrations in the Deployment Area. Four groundwater samples and one surface water sample from Mary Dunn Pond were also collected for analysis of oxygen and hydrogen isotopes to determine the contribution of pond water from Mary Dunn Pond to the four downgradient monitoring wells. The analysis was inconclusive in tracing the contribution of pond water in the downgradient monitoring wells. Refer to Tables 3, 8 and 9 for groundwater and surface water results.

- In December 2018, two soil samples were collected from the 1991 Drill Location to determine if PFAS detected in the area are related to background conditions. Refer to Table 2 for soil results.
- In December 2018, 12 groundwater samples were collected for analysis of PFAS and 13 groundwater samples were collected for analysis of oxygen and hydrogen isotopes to determine the contribution of pond water from Mary Dunn Pond to the 13 downgradient wells. Groundwater samples were also collected from four monitoring wells in the Maher Wellfield for analysis of 1,4-dioxane. Refer to Tables 3, 4 and 9 for groundwater and surface water results.
- In February 2019, three additional surface soil samples were collected to further delineate the soil Disposal Site boundary around the ARFF/SRE building. Refer to Table 2 for soil results.
- In May and June 2019, HW installed nine groundwater monitoring wells to delineate the vertical and horizontal extent of PFAS and 1,4-dioxane at the Airport and on adjacent hydraulically upgradient properties. Refer to Tables 3 and 4 for groundwater results.
- In June 2019, eight groundwater samples were collected from newly installed groundwater monitoring wells HW-L, HW-K, HW-I (m), HW-I (d), HW-M, HW-D(d), HW-D (dd), and HW-N for PFAS. Refer to Table 3 for groundwater results.
- In July 2019, one groundwater sample was collected from the newly installed groundwater monitoring wells HW-O for PFAS. One groundwater sample was collected from HW-L for 1,4-dioxane. Refer to Tables 3 and 4 for groundwater results.
- In July 2019, two surface water samples were collected from Upper Gate and Lewis Ponds for PFAS analysis. Refer to Table 8 for surface water results.
- In August 2019, four groundwater samples were collected from monitoring wells HW-N, HW-A(d), HW-O, and HW-1 to evaluate potential sources of 1,4-dioxane entering the Airport from unknown upgradient sources(s). One groundwater sample was also collected from groundwater monitoring well HW-E for PFAS. Refer to Tables 3 and 4 for groundwater results.
- In August 2019, soil sample DL 11 (0-1) was collected from the Deployment Area. Refer to Tables 2 and 3 for groundwater results.
- In August 2019, six spray water samples were collected from discharge locations on a fire truck at the Airport. The samples were collected to verify that the valve mechanism that controls the mixing of AFFF with water was working appropriately. PFAS should not be detected in the spray water. PFAS was detected in each of the six samples collected above the GW-1 standard. Refer to Tables 10 for spray water results.
- On September 27, 2019, HW collected groundwater samples from six monitoring wells located on the Airport for 1,4-dioxane analysis. Refer to Table 4 for groundwater results.

- In November 2019, the Airport replaced the valve mechanism in the fire truck to ensure that AFFF was no longer mixing with the water despite the mechanism not being engaged. In December 2019, HW resampled the six discharge locations from the fire truck at the Airport. PFAS was detected at various concentrations at each location but all were below the GW-1 standard. Refer to Tables 10 for spray water results.
- Between May 5th and May 21st, 2020 HW collected 16 groundwater samples PFAS analysis. Refer to Table 3 for groundwater results.
- Between May 5th and May 13th, 2020 HW collected groundwater samples from four monitoring wells for 1,4-dioxane analysis. Refer to Table 4 for groundwater results.
- Between September 14th and September 24th, HW and Desmond Well Drilling installed 13 monitoring wells.
- On September 17, 2020 HW collected groundwater samples from the three Maher Wells (ME-1 through ME-3) for PFAS analysis. Refer to Table 3 for groundwater results.
- Between September 14th and September 30th, 2020 HW collected 21 soil samples for PFAS analysis. Refer to Table 2 for soil results.
- Between October 1 and October 7, HW collected groundwater samples from 16 monitoring wells for PFAS. Refer to Table 3 for groundwater results.
- On October 2 and 7, 2020 HW collected groundwater samples from four monitoring wells for 1,4-dioxane analysis. Refer to Table 4 for groundwater results.
- On November 9, 2020 HW collected four samples for PFAS analysis. Refer to Table 3 for groundwater results.
- On November 20, 2020 HW collected groundwater samples from two wells for PFAS analysis. Refer to Table 3 for groundwater results.
- On February 18 and 19th, 2021 HW conducted hydraulic conductivity testing at three monitoring locations. Refer to Section 4.3.1 for additional details.

PFAS and/or 1,4-dioxane sampling locations are indicated on Figures 3 and 11 through 14. Tabulated analytical data is included on Tables 2 through 10.

4.2 Soil Boring and Monitoring Well Construction Logs

Pursuant to 310 CMR 40.0835(4)(d)2, copies of soil boring and monitoring well logs completed by HW and others are included in Appendix F. It should be noted that some of the boring logs are not available due to the age of installation (pre-2000’s). Additionally, soil boring logs were not created for shallow surface samples due to the consistency of the soil through the Airport.

4.3 Geologic and Hydrogeologic Conditions

Pursuant to 310 CMR 40.0835(4)(d)3, a characterization of all geologic and hydrogeologic conditions at the Disposal Site is set forth below.

4.3.1 Groundwater Characteristics

Pursuant to 310 CMR 40.0835(4)(d)3a, a discussion of groundwater potentiometric surface, gradient, flow rate and flow direction is set forth below.

As indicated on Figure 2, groundwater is estimated to flow generally in a southeasterly direction. Based upon the groundwater elevations, the estimated hydraulic gradient is set forth below.

Start (Well ID)	End (Well ID)	Distance (Feet)	Change in Groundwater Elevation (feet)	Hydraulic Gradient (Feet per foot)	Well Start Location	Well End Location
HW-1	HW-23	1,477	2.7	0.0018	North Ramp	North Ramp
HW-1	HW-4M	325	0.66	0.0020	North Ramp	North Ramp
HW-23	HW-L(d)	3,175	9.42	0.0029	North Ramp	ARFF/SRE Area
HW-302	OW-9(s)	1,201	6.57	0.0054	Steamship Parking Lot	Maher Well Field
HW-E	HW-I(s)	507	1.57	0.0030	Deployment Area	Deployment Area
Average Hydraulic Gradient				0.00302		

To determine the hydraulic conductivity, HW completed a series of drawdown pump tests using a submersible pump and a transducer capable of logging the fluctuation of the water level in hundredths of a foot in 0.5-second intervals. In general, the tests were completed over a 30-minite period at a pumping rate of 0.25 to 0.33-cubic feet per minute. Details from the pump test are indicated below.

Well ID	Well Location	Depth to Water	Total Well Depth	Screen Length	Maximum Drawdown	Pump Rate (cubic feet per minute)	Calculated Hydraulic Conductivity
HW-I(s)	Deployment Area	18.410	25.09	10	18.732	0.33	117 feet per day
HW-F	Deployment Area	20.242	26.82	10	20.483	0.25	114 feet per day
OW-19(m)	Maher Well Field	26.942	76.14	10	27.417	0.33	78 feet per day
Average Hydraulic Conductivity							103 feet per day

Groundwater velocity at the Site is estimated by the following equation:

$$\text{Velocity (ft/d)} = \frac{\text{Hydraulic Conductivity (ft/d) x Hydraulic Gradient (ft/ft)}}{\text{Effective Porosity}}$$

ft/d = feet per day
ft/ft = feet per foot

Based on experience in the area effective porosity is assumed to be 33 percent (25-50 percent, Freeze and Cherry, 1979). Therefore, the average groundwater velocity is estimated to be 0.94 feet per day or 344 feet per year.

To determine the potential migration velocity of the MassDEP Sum of 6 and 6:2 FTS, the groundwater velocity was divided by a PFAS retardation factor using the following equation:
$R = 1 + (\rho b/\Theta)\,(K_d)$

ρb= dry bulk mass density of the soil (M/L^3; gm/cm^3)

Θ =volumetric moisture content of the soil (dimensionless)

K_d = distribution coefficient for the solute with the soil (L^3/M; mL/g)

Retardation Factor using TOC = 200 ppm

PFAS	Koc (mL/g)*	Kd** (mL/G)	ρb/Θ (g/cm^3)	Retardation Factor
PFHpA	2110	0.422	1.5	2.92
PFHxS	2300	0.46		3.09
PFOA	1160	0.232		2.05
PFNA	2830	0.566		3.57
PFOS	1460	0.292		2.33
PFDA	397	0.0794		1.36
6:2FTS***	947	0.1894		1.86

*Values from EPA Comp Toolbox
** = KOC value multiplied by percent organic carbon
*** = Analyte is representative of the Airports AFFF Plume

Retardation Factor using TOC = 0.2 percent (2,000 ppm)

PFAS	Koc (mL/g)*	Kd** (mL/g)	ρb/Θ (g/cm^3)	Retardation Factor
PFHpA	2110	4.22	1.5	20.18
PFHxS	2300	4.6		21.91
PFOA	1160	2.32		11.55
PFNA	2830	5.66		26.73
PFOS	1460	2.92		14.27
PFDA	397	0.794		4.61

PFAS	Koc (mL/g)*	Kd** (mL/g)	ρb/Θ (g/cm^3)	Retardation Factor
6:2FTS	947	1.894	1.5	9.61

*Values from EPA Comp Toolbox
** = KOC value multiplied by percent organic carbon
*** = Analyte is representative of the Airports AFFF Plume

The TOC values are based on the average TOC detected at the adjacent Barnstable Fire Training (212 ppm) and from the EPA recommended default value used in the preparation of the soil screening values (2,000 ppm). The Airport anticipates collecting site specific TOC values in the near future as part of ongoing response actions.

Considering that PFDA has not been non-detect at the Maher Wells or in the Deployment Area, the Retardation Factor for second fastest moving PFAS analyte (6:2 FTS) was applied to track the migration of the Airport's PFAS plume. Based on the calculations above, the PFAS plume is estimated to move at a velocity of 36 to 185 feet per year. Based forensics and fate and transport mechanisms, the PFAS plume in the Deployment Area has migrated a maximum of 2,250 feet as indicated on Figure 2. As indicated above, the Airport first applied AFFF in the Deployment Area in 1994. Based on 34 years of migration time and the estimated plume migration of 2,250 feet, the plume migrated at approximately 66 feet per year. This value is within the estimated plume velocity of 36 to 185 feet per year.

Based forensics and fate and transport mechanisms, the PFAS plume in the ARFF/SRE Area has migrated a maximum of 1,000 feet as indicated on Figure 2. AFFF related compounds in the vicinity of the ARFF/SRE Building were released at some point in time after 1996 (ARFF/SRE Building was constructed in 1996). Assuming the plume migrates at a velocity consistent with the Deployment Area Plume (66 feet per year), the release(s) likely first occurred approximately 15 years ago.

4.3.2 Soil Characteristics

Pursuant to 310 CMR 40.0835(4)(d)3b, a discussion of soil type(s), stratigraphy and permeability is set forth below.

In general, soils at the Airport in proximity to the Deployment Area and ARFF/SRE Area consisted of fine to medium sand, with some coarse sand, gravel and cobbles down to a depth of approximately 70 feet below ground surface. Below 70 feet, a layer consisting of gray silt and clay exists. The materials encountered during the soil borings are consistent with those described by the USGS for Barnstable Outwash Plain Deposits (Oldale, 1974). Bedrock was not encountered in any of the soil borings. The location of the soil borings and monitoring wells are indicated on Figures 3, 11 and 13. Soil boring logs are included in Appendix B. It should be noted that soil boring logs were not completed for shallow soil samples and that some of the monitoring well logs from pre-2000 are not available. Analytical data suggests that soil within the two capped areas contains PFAS impacts in soil exceeding the current MassDEP S1/GW-1 standard extend to at least 16 feet below grade and detectable PFAS concentrations below the MassDEP S1/GW-1 Standard at the soil/groundwater interface.

4.3.3 Bedrock Characteristics

Pursuant to 310 CMR 40.0835(4)(d)3c, a discussion of bedrock type and characteristics, depths and contours is set forth below.

As indicated above, bedrock was not encountered in any of the soil borings and is expected to be located at a depth greater than 125 feet below grade.

4.3.4 Potential for Flooding

Pursuant to 310 CMR 40.0835(4)(d)3d, an evaluation and description of the potential for flooding is set forth below.
According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map, the Airport is within Zone X, an area of minimal flood hazard determined to be outside the 500-year flood (Figure 15). The Airport property is not at a high risk for flooding. A small amount of forested area near Mary Dunn Pond, within the Airport property boundary, is within an area with a 0.2% annual chance of flood hazard. Refer to Figure 15 for a depiction of FEMA flood zones at and within proximity to the Airport. HW is unaware of any flooding that has taken place at the Airport. As such, it is unlikely that flooding will impact the extent of soil impacts at the Airport.

5.0 ENVIRONMENTAL FATE AND TRANSPORT

Pursuant to 310 CMR 40.0835(4)(e), environmental fate and transport of OHM detected at the Disposal Site is set forth below.

5.1 Fate and Transport Characteristics

Pursuant to 310 CMR 40.0835(4)(e)1, an evaluation of the environmental fate and transport characterizes of the OHM identified at the Disposal Site, including, without limitation, mobility, stability, volatility, persistence and bioaccumulation potential of the OHM is set forth below. The OHM includes details on all six PFAS compounds regulated by the MassDEP, 6:2 FTS and potential degradation products and 1,4-dioxane.

5.1.1 AFFF Usage, Release and Degradation Potential

Based on interviews with Airport staff who have worked at the Airport since the 1980s, AFFF was only intentionally sprayed at the Airport during tri-annual drills (1991, 1994, 1997, 2000, 2003, 2006, 2009 and 2012), during an Airport Emergency (1981 and 12016 aircraft crash) and once per year between 2004 and 2015 as part of the FAA annual foam testing requirement (14 CRF 139). Airport personnel also indicated that fluorotelomer-based AFFF had been used at the Airport since at least 1980 when foam usage was limited to 35-gallons for use in one fire rescue vehicle. With the exception of the events detailed above, AFFF was not intentionally sprayed due to cost and limited supply of AFFF. With the exception of the 1991 drill, all drills and AFFF testing have been conducted at the unpaved Deployment Area.

In addition to the tests and training usage with AFFF, daily (approximately 5 gallons) and monthly (100 gallons) testing of the fire apparatus is conducted with just water. The test is conducted to verify that the fire apparatus pumps are operational. No foam is intentionally sprayed during these tests. The spray water from the fire trucks were tested for PFAS in 2019 to verify that the valve mechanism that segregated the AFFF was working properly. The analytical results indicated that AFFF was being mixed with the water unintentionally from the internal AFFF holding tanks. It was determined that the valve that segregates the AFFF was faulty and was the cause of the unintentional mixing. The faulty valve was replaced, and a maintenance schedule has been initiated. Subsequent testing of the spray water indicates that PFAS levels are less than the current GW-1 standard. The combination of tri-annual drills and the annual AFFF testing and to a lesser extent the daily and monthly spraying of water have contributed to the AFFF related PFAS impacts in the Deployment Area. The Airport stopped using AFFF in the tri-annual training drills in 2015 and purchased an ecological cart in 2016 to stop spraying AFFF as part of the annual FAA testing requirement. Refer to Table 10 for tabulated analytical data from the spray testing.

The Airport Rescue and Firefighting/Snow Removal Equipment (ARFF/SRE) Building was constructed in 1996 and PFAS is assumed to have been released in this area through what is assumed to be incidental spillage, hanging of fire house apparatus and cleaning of equipment in the event of accidentally engaging the foam pump button. Interior floor drains within the ARFF/SRE building historically discharged to the adjacent grass area that was capped in the fall of 2020 to reduce infiltration of stormwater. In the event the foam pump was accidentally engaged, equipment was rinsed by pumping water through it and discharging it to the adjacent grass area that was recently capped. Stormwater in the vicinity of the recently capped area also historically infiltrated into this area including both the building's roof and surrounding paved surface are. The interior floor drains historically discharged to this area but were closed and connected to a permitted discharge to the Barnstable Wastewater Treatment Plant. As part of the cap installed in 2020, stormwater was redirected away from this area and is infiltrated beyond the PFAS impacted soil areas.

According to the document titled Aqueous Film-Forming Foam prepared by the Interstate Technology ITRC, legacy fluorotelomer-based AFFF (1970s to 2016) have historically contained predominantly short-chain (C6) PFAS with formulations ranging from about 50–98% shortchains and the balance as long-chain PFAS. Additionally, the long-chain PFAS content of these foams has the potential to break down in the environment to PFOA and other PFCAs, but not to PFOS or other PFSAs (Weiner et al. 2013).

According to the article titled *Quantitative Determination of Fluorotelomer Sulfonates in Groundwater by LC MS/MS*, "groundwater monitoring studies have shown the predominant breakdown product of the short-chain C6 fluorosurfactants contained in telomerbased AFFF to be 6:2 fluorotelomer sulfonate (6:2 FTS)". Among the analytes included in the PFAS analysis completed by the Airport, data normalization showed that upwards of 83 percent of the total PFAS detected in the well with the highest concentration of Total PFAS (HW-I[s]) was related to 6:2 FTS. This well was tested in November 2018 (82.4%) and then again in May 2020 (83.7%). The detection of this analyte at such a high percentage is representative of studies that indicate that telomerbased AFFF short chain PFAS transform into 6:2 FTS. Additionally, spray water samples collected from the fire hose spray water before the valve mechanism was fixed contained 6:2 FTS at 79 percent.

According to the article titled Biotransformation potential of 6:2 Fluorotelomer Sulfonate (6:2 FTSA) in aerobic and anaerobic sediment prepared by Shu Zhang, Xiaoxia Lu, Ning Wang, and Robert Buck, *"6:2 FTSA-based or related products, when released to the aerobic environment after their end of life cycle, may be a potential source of 5:3 Acid and the short-chain PFCAs such as PFPeA and PFHxA. On the other hand, 6:2 FTSA was virtually not biotransformed in anaerobic sediment over 100 d, indicating that 6:2 FTSA formed from its potential precursors such as fluoroalkylthioamido sulfonates, fluoroalkylthiobetaine, and other related AFFF products may be persistent in anaerobic environments".* Considering that 6:2 FTS has been detected in HW-S(s) which is located approximately 700 feet downgradient of HW-I(s) at very similar percentages (76 and 83.7 percent, respectively), significant biotranformation of 6:2 FTS is not occurring and the 6:2 FTS analyte appears to be stable.

According to the chart below obtained from the document titled "*Naming Conventions for Per and Polyfluoroalkyl Substance*" and prepared by ITRC, short chain PFCAs include PFBA, PFPeA, PFHxA, and PFHpA. MassDEP currently regulates the short chain PFCA compound PFHpA.

Number of Carbons	4	5	6	7	8	9	10	11	12
PFCAs	Short-chain PFCAs				Long-chain PFCAs				
	PFBA	PFPeA	PFHxA	PFHpA	PFOA	PFNA	PFDA	PFUnA	PFDoA
PFSAs	PFBS	PFPeS	PFHxS	PFHpS	PFOS	PFNS	PFDS	PFUnS	PFDoS
	Short-chain PFSAs		Long-chain PFSAs						

To further document that 6:2 FTS is stable and that significant degradation of 6:2 FTS is not occurring, HW evaluated the groundwater data collected from the Deployment Area source (HW-I[s]) and 700 feet downgradient of the Deployment Area source (HW-S[s]). The concentration of Total PFAS, 6:2FTS, PFOA, PFOS and the short chain PFCAs are indicated below in ug/l.

Analyte	HW-I(s) 5/8/2020	HW-S(s) 10/1/2020	HW-19(m) 10/1/2020
Total PFAS	15.5358	4.8958	0.37335
6:2 FTS	13.0	3.7	0.00095
PFBA	0.021	0.086	0.033
PFPeA	0.81	0.42	0.13
PFHxA	0.51	0.25	0.027
PFHpA	0.54	0.11	0.03
PFOA	0.29	0.062	0.011
PFOS	0.04	0.1	0.047

Based on the table above, the 6:2 FTS appears to be relatively stable and is a helpful analyte to monitor the AFFF plume movement. Additionally, as discussed in later sections of this report, 6:2 FTS moves faster in groundwater than the MassDEP Sum of Six regulated analytes. As such, 6:2 FTS is helpful in tracking the extent of the Airport AFFF plume. The extent of the AFFF plume in the vicinity of the Deployment Area is based on forensics, analytical results and PFAS fate and transport mechanisms. As a conservative measure, the Deployment Area Plume has been depicted on Figure 2 as being slightly upgradient of OW-19 which does not appear to have PFAS impacts consistent with the Airport AFFF plume. A distance of approximately 1,100 feet exists between HW-S(s) and OW-19. To further refine the extent of the AFFF Plume in this Area, the Airport plans to install one or monitoring wells between HW-S(s) and OW-19 as part of on-going IRA activities.

Considering that the source in the ARFF/SRE Area is related to incidental spillage and/or a single release event, it is not a chronic source like the Deployment Area. This is evident when reviewing the concentration (in ug/L) of 6:2FTS, PFOA, PFOS and the short chain PFCAs throughout the ARFF/SRE plume as indicated below.

Analyte	HW-P(s) 10/1/2020	HW-302 12/3/2018	HW-3 5/5/2020	RB-1(s) 5/8/2020	RB-1(m) 5/8/2020
Total PFAS	0.2458	0.3427	0.96981	0.08008	0.2015
6:2 FTS	0.011	0.13	0.13	ND	0.038
PFBA	0.041	0.014	0.0056	0.0033	0.01
PFPeA	0.1	0.042	0.33	0.0078	0.041
PFHxA	0.045	0.027	0.21	0.0058	0.021
PFHpA	0.026	0.015	0.1	0.0042	0.011
PFOA	0.0084	0.030	0.054	0.007	0.013
PFOS	0.00097	0.031	0.1	0.038	0.049

Considering the stability of 6:2 FTS and the fact that it migrates faster than any of the MassDEP Sum of 6, it appears that AFFF related compounds were released at some point in time after 1996 (ARFF/SRE Building was constructed in 1996) in the vicinity of HW-P. Based on forensics, analytical results and PFAS fate and transport mechanisms, the AFFF plume in the vicinity of ARFF/SRE Building has migrated approximately 900 to 1,000 feet. The Maher Wells are located an additional 1,000 feet downgradient of the Airport's AFFF plume. The extent of the Airport's AFFF plume is indicated on Figure 2.

As indicated on Figure 2, PFAS impacted groundwater is migrating onto the Airport from off-Airport upgradient sources that are not consistent with the PFAS plume associated with Airport. Additionally, as indicated on Figure 2, the PFAS plume associated with the Airport does not appear to have migrated to the Maher Wells. Additional testing including soil and groundwater is planned as part of ongoing IRA activates to further support the Conceptual Site Model and refine the forensic approach for source delineation. It is also understood that the Airport's PFAS Plume is migrating toward the Maher Wells. TOC samples will also be collected as part of the ongoing IRA to further refine the plume migration velocity.

The Airport has controlled a majority of the sources of PFAS in soil and groundwater relating to the historic deployment of AFFF by the installation of two non-permeable caps. The cap installations were completed in September 2020 and additional details are included in the report titled "Immediate Response Action Plan Status Report 8 dated October 2020 and available for direct download from the MassDEP Searchable Sites Database using RTN 4-26347. Considering that PFAS have been detected in soil in both areas down to groundwater, the cap will prevent the further vertical migration of PFAS in soil.

5.1.2 Vapor Pressure

Vapor pressure is a measurement of the tendency of a material to change into the gaseous or vapor state. The higher the vapor the pressure, the more volatile a substance is. According to the EPA CompTox Chemical Database Experimental/Predicted Average ("EPA Comp Tox"), the following vapor pressures are applicable to the six PFAS compounds regulated by MassDEP, 6:2 FTS and 1,4-dioxane:

Analyte	Vapor Pressure (millimeters of mercury)
Perfluorodecanoic Acid (PFDA)	1.53×10^{-3}
Perfluoroheptanoic Acid (PFHpA)	0.229
Perfluorohexanesulfonic Acid (PFHxS)	8.10×10^{-9}
Perfluorooctanoic Acid (PFOA)	0.952
Perfluorooctanesulfonic Acid (PFOS)	2.48×10^{-6}
Perfluorononanoic Acid (PFNA)	8.72×10^{-3}
6:2 fluorotelomer sulfonate (6:2 FTS)	8.24×10^{-7}
1,4-dioxane	38.1

5.1.3 Henry's Law Constant

The Henry's Law Constant describes the air-water partitioning of a gas dissolved in a liquid. Compounds with high Henry's Law Constants prefer to exist in the vapor phase rather than the dissolved phase. According to the EPA CompTox, the following Henry's Law Constants are applicable to the six PFAS compounds regulated by MassDEP, 6:2 FTS and 1,4-dioxane:

Analyte	Henry's Law Constant (atm-m^3/mole)
PFDA	1.50×10^{-10}
PFHpA	2.09×10^{-10}
PFHxS	1.94×10^{-10}
PFOA	1.92×10^{-10}
PFOS	1.80×10^{-11}
PFNA	1.18×10^{-9}
6:2 FTS	1.83×10^{-10}
1,4-dioxane	4.80×10^{-6}

5.1.4 Solubility

The solubility of a substance is the degree to which the substance (the solute) will dissolve into a solvent (i.e., water). The higher the solubility, the more solute will dissolve into the solvent. According to the EPA CompTox, the following solubility are applicable to the six PFAS compounds regulated by MassDEP, 6:2 FTS and 1,4-dioxane:

Analyte	Solubility (moles per liter)
PFDA	5.25×10^{-3}
PFHpA	0.324
PFHxS	6.08×10^{-4}
PFOA	1.37×10^{-2}
PFOS	1.13×10^{-3}
PFNA	2.80×10^{-3}
6:2 FTS	0.669
1,4-dioxane	11.42

5.1.5 Persistence

The persistence of a chemical is the length of time that a chemical can exist in the environment before being destroyed or transformed by natural processes. According to the EPA, a chemical is characterized as persistent if it has a half-life greater than two days. According to the EPA CompTox, the following biodegradation half-life is applicable to the six PFAS compounds regulated by MassDEP, 6.2 FTS and 1,4-dioxane:

Analyte	Biodegradation Half Life (days)
PFDA	4.94
PFHpA	4.47
PFHxS	4.45
PFOA	4.94
PFOS	4.92
PFNA	4.94
6:2 FTS	4.95
1,4-dioxane	9.36

5.1.6 Bioaccumulation Potential

The bioaccumulation factor (“BCF”) is an indication of the potential for a compound to bioaccumulate in the environment. The higher the BCF, the more likely it is to bioaccumulate. According to the EPA, a chemical is characterized as bioaccumulative if it has a BCF factor greater than 1,000. A chemical with a BCF greater than 5,000 is considered very bioaccumulative.

Analyte	Bioaccumulation Factor (unitless)
PFDA	49.3
PFHpA	92.2
PFHxS	175
PFOA	7,670
PFOS	1,900
PFNA	165
6:2 FTS	188
1,4-dioxane	0.925

5.2 Migration Pathways

Pursuant to 310 CMR 40.0835(4)(e)2, identification and characterization of existing and potential migration pathways of the OHM at and from the Disposal Site, including, as appropriate, air, soil, groundwater, soil gas, preferential migration pathways such as subsurface utility lines and other subsurface void spaces, surface water, sediment, and food chain pathways are set forth below.

5.2.1 Soil Migration

Based on the concentration of PFAS detected in soil (Table 2), none of the six regulated PFAS compounds exceed the proposed Upper Concentration Limit in soil of 4,000 ug/kg.

Additionally, the Airport stopped all AFFF foam testing in 2015. AFFF use will only occur at the Airport in the event of an emergency. Also, as indicated on Figure 3, two impermeable caps were installed in September 2020 over a majority of the known PFAS in soil source area to reduce the potential for infiltration and migration. As indicated above, 1,4-Dioxane does not appear to be attributed to the Airport based on groundwater analytical data and particle tracking.

5.2.2 Groundwater Migration

Based on the concentration of PFAS detected in groundwater (Table 3), none of the six regulated PFAS compounds exceed the proposed Upper Concentration Limit in groundwater of 5,000 to 100,000 ug/L. Additionally, as indicated above, two impermeable caps were installed in Fall 2020 over a majority of the known PFAS in soil source area to reduce the potential for infiltration and migration of PFAS in groundwater. Stormwater management systems were alco constructed in these areas to allow for stormwater to infiltrate outside of the known PFAS in soil source areas. Also, the Airport stopped all AFFF foam testing in 2015. AFFF use will only occur at the Airport in the event of an emergency.
The extent of the PFAS plume related to the use of AFFF at the Airport is indicated on Figure 2 along with the estimated extent of two other non-Airport related PFAS plumes. The vertical and horizontal extent of the PFAS plumes is also indicated on Figures 5 through 9. These figures also document that the 1,4-dioxane plume is migrating onto the Airport from an unknown source. 1,4-dioxane concentrations detected in groundwater are included on Table 4 and as indicated above, the Airport does not appear to be the source of 1,4-dioxane in groundwater.

5.2.3 Preferential Migration Pathways

No subsurface utilities or other preferential pathways are located within the Disposal Site.

5.2.4 Air and Soil Vapor Migration

Considering the depth of groundwater (greater than 15 feet), the concentration of OHM in soil and groundwater and the vapor pressures of the OHM, vapor phase migration is unlikely.

5.2.5 Surface Water and Sediment Migration Pathways

As indicated on Figure 13, surface water samples were collected from Upper Gate Pond, Lewis Pond and from a stormwater drainage basin located adjacent to the K-Mart Plaza. All results (Table 8) were below the laboratory reporting limit and/or below the Method 1 GW-1 and GW-3 Standard for the six regulated PFAS analytes. There is currently no surface water standard for PFAS. Additionally, based on the extent of the Airport's PFAS plume as indicated on Figure 13, surface water and sediments are unlikely to be impacted by the Airport AFFF release.

5.3 Potential for Groundwater to Impact Indoor Air

Pursuant to 310 CMR 40.0835(4) (e) 3, an evaluation of the potential for soil, groundwater, or NAPL to be a source of vapors of OHM to indoor air of occupied structures is set forth below.

Considering the depth of groundwater (greater than 15 feet), the concentration of OHM in soil and groundwater and the vapor pressures of the OHM, vapor phase migration into indoor air is unlikely.

6.0 NATURE AND EXTENT OF OHM IMPACT

Pursuant to 310 CMR 40.0835(4) (f), a discussion of the nature and extent of OHM impact at the disposal site is set forth below.

6.1 Characterization of Source and Nature of OHM Impact

Pursuant to 310 CMR 40.0835(4)(f), a characterization of the nature, and vertical and horizontal extent of OHM-impacts at the Disposal Site, including any and all source(s), the presence, distribution and stability of any non-aqueous phase liquid (NAPL), tabulation of analytical testing results, and, where appropriate, a characterization of background concentrations of OHM is set forth below.

As indicated above, the Disposal Site is the location of a release of PFAS compounds to soil and groundwater associated with the historic use of AFFF. The source of PFAS related to Airport operations is from the use of AFFF for training and emergencies and incidental spillage. Annual testing per FAA regulations is required to ensure that there is the appropriate AFFF to water mixture. Historically, the test consisted of essentially shooting the mixture of AFFF from the fire rescue vehicle at a small square target. The Airport has since purchased an ecological unit to test to the AFFF mixture without the need of physically mixing or spraying the foam. AFFF usage at the Airport is limited to emergencies only and most of the known sources within the Deployment Area and ARFF/SRE Building Area were capped in September 2020.

6.2 Extent of OHM Impact

Pursuant to 310 CMR 40.0835(4)(f), a characterization of the vertical and horizontal extent of OHM impact at the Disposal Site is indicated on Figures 2 through 14 and Tables 2 through 10. Additional details are set forth below.

The estimated horizontal extent of OHM impacts at the Airport is indicated on Figures 2 and 11 through 13. Based on the spatial distribution and extent of PFAS impacted soil and groundwater, the vertical extent of PFAS impacted media is estimated to be from the ground surface to approximately 56 feet below grade. A graphical representation of the vertical and horizontal extent of PFAS is set forth on Figure 5 through 10. As indicated on Figure 2, the Airport is also being impacted with 1,4-dioxane and PFAS plumes from off-site sources.

6.3 Characterization of Background Conditions

Pursuant to 310 CMR 40.0835(4)(f), a characterization of background concentrations of OHM impact at the disposal site is set forth below.

Background levels of PFAS in soil have been detected at the Airport as well as throughout the Town of Barnstable. To determine background levels at the Airport and surrounding area, HW collected 20 soil samples (7 soil on-Airport and 13 off-airport) at the locations indicated on Figure 14. Total PFAS concentrations ranged from less than the laboratory reporting limit to 5.45 ug/kg. One of the background samples collected at the Airport exceeded the applicable Method 1 standard for PFOS while eight of the background samples collected off Airport property exceeded the applicable Method 1 soil standards for various PFAS analytes including PFOS. Tabulated analytical data is included on Table 7. It should be noted that the single exceedance from the 1991 Drill Area (1991B [0-1]) and in proximity to the Steamship Parking Lot (A10) is consistent with background and do not appear to be related to the AFFF release associated with Airport operations.

7.0 EXPOSURE ASSESSMENT

Pursuant to 310 CMR 40.0835(4) (g), an exposure assessment, including the identification and characterization of all potential human and environmental receptors that could be impacted by OHM at or migrating from the Disposal Site, and, as appropriate, the quantification of exposure of OHM-impact at the Disposal Site is set forth below.

7.1 Potential Human Receptors

Pursuant to 310 CMR 40.0835(4) (f), potential human receptors are identified and characterized below.

Human Receptors Exposed to Soil

The two PFAs release areas at the Airport (the ARFF/SRE Area and the Deployment Area) are located within restricted and secured areas where the public are not allowed access. A majority of the PFAS source areas have also been capped with either asphalt or 30-mil geomembrane. Additionally, the highest concentration of one of the six regulated PFAS compounds (100 ug/kg) detected in Airport soils is less than the proposed Method 2 S-1 soil category (300 ug/kg) which is protective of a direct contact exposure. As indicated above, with the exception of HW-L(d), 1,4-dioxane has not been detected in any of the groundwater wells tested at the Airport. As such, 1,4-dioxane is presumed to not be located in site soils at the Airport.

Human Receptors Exposed to Groundwater

The Airport is located within a current drinking water source area, designated as Zone II's to various public drinking water supply wells. As documented in the Phase I Report, the Airport and downgradient residential properties were confirmed to have municipally supplied drinking water. No private drinking water wells at the Airport or downgradient properties were identified by HW or the Town of Barnstable Department of Public Works, Water Supply Division, and the Town of Yarmouth Health Department. Additionally, the municipal water supplier is aware that public water supply wells have been impacted with PFAS and 1,4-dioxane. The water supplier is treating the drinking water accordingly to continue to provide drinking water to the residents that meets regulatory drinking water standards. A majority of the PFAS detected in the vicinity of the public drinking water supply wells appears to be from other non-Airport related sources including the Barnstable Fire Training Academy. As indicated above, 1,4-dioxane does not appear to be associated with a release from the Airport.

7.2 Potential Environmental Receptors

Pursuant to 310 CMR 40.0835(4) (f), potential environmental receptors are identified and characterized below.

Surface water samples collected from Upper Gate and Lewis Pond were all below the laboratory reporting limits for the six regulated PFAS analytes. The laboratory reporting limit is also less than the proposed Method 1 GW-1. No evidence of fish kills, or stressed vegetation have been detected in surface water at the Airport. Also, a majority of the PFAS source areas have been caped and access to these areas are restricted with a fence. Fishing and hunting are not allowed at the Airport. As indicated above, the release of 1,4-dioxane does not appear to be associated with the Airport.

8.0 RISK CHARACTERIZATION

Pursuant to 310 CMR 40.0900, the characterization of risk of harm to health, safety, public welfare and the environment is set forth below.

8.1 Soil Classification

Pursuant to 310 CMR 40.0933, the applicable soil category is selected based upon the frequency, intensity of use, and accessibility of the Disposal Site by adults and children. Pursuant to 310 CMR 40.0923, risk characterization shall consider current and reasonably foreseeable Disposal Site activities.

8.1.1 Frequency of Use

Frequency of use indicates how often a receptor makes use of, or has access to, the Disposal Site. The frequency is classified as either "High," "Low," or "Not Present" based on the criteria set forth in 310 CMR 40.0933(4)(a).

The Disposal Site is located within a restricted area of the Airport where access to adults is provided for work related activities. Therefore, the frequency of use for adults is considered "high".

8.1.2 Intensity of Use

The intensity of use is based on the kind of activities and uses that occur at a Disposal Site and are classified as either "High" or "Low." Pursuant to 310 CMR 40.0933(4)(b)(1), Site activities and uses which have potential to disturb soil and thus result in either direct contact with the soil itself or inhalation of soil-derived dust shall be characterized as high intensity use.

Based upon the current use, passive activities which do not disturb the soil, such as walking and driving, are likely to occur in the area. As such, the intensity of use would be considered "low".

8.1.3 Accessibility

Soils are classified as "Accessible," "Potentially Accessible" and "Isolated" based upon the depth to OHM impact and the presence of impervious material, if any. Pursuant to 310 CMR 40.0933(4)(c) impacted soils located within the first three feet of the surface in unpaved areas would be considered "Accessible." Soils from three to 15 feet below grade in unpaved areas, or soils from less than fifteen feet below grade in paved areas, would be considered "Potentially Accessible." Soils greater than 15 feet below grade or beneath the footprint of a building would be considered as "Isolated". Therefore, soils at the Disposal Site are considered "accessible".

8.1.4 Disposal Site Specific Soil Classification

Pursuant to 310 CMR 40.0933(9), the appropriate soil classification for a Disposal Site with "high" frequency and "low" intensity of use for adults (foreseeable future uses) and where impacted soils are "Accessible" soils are classified as S-2. However, as a conservative measure, soils at the Airport will be compared to the S-1 standards.

8.2 Groundwater Classification

Pursuant to 40.0932, groundwater classification is based on several factors including the current and potential use as a drinking water source, proximity to buildings and ecological risks. Groundwater is organized into three categories: GW-1, GW-2 and GW-3.

1. The GW-1 classification applies to groundwater located within a current or potential drinking water source area. The Method 1 GW-1 Standards address potential exposure to drinking impacted groundwater.
2. The GW-2 classification applies to groundwater located within 30 feet of an existing or planned building and where the average annual depth to groundwater is 15 feet or less. The Method 1 GW-2 Standards address potential exposure to vapors collecting in buildings above or adjacent to impacted groundwater.
3. The GW-3 classification applies to all groundwater that can potentially impact surface water bodies. Pursuant to 310 CMR 40.0932(2), all groundwater is considered a potential source of discharge to a surface water body. Therefore, the GW-3 classification applies to all groundwater within the boundaries of the Commonwealth of Massachusetts.

8.2.1 Disposal Site Specific Groundwater Classification

- As set forth above, the Disposal Site is located within a drinking water source area. Therefore, the GW-1 groundwater classification is applicable to groundwater at the Disposal Site.
- As indicated on Table 3, groundwater in the vicinity of structures at the Airport are located at a depth greater than 15 feet below grade. Therefore, the GW-2 classification is not applicable to the Disposal Site.
- As set forth above, the GW-3 classification is applicable to all the groundwater located within the boundaries of the Commonwealth of Massachusetts. Therefore, the GW-3 groundwater classification is also applicable to the Disposal Site.

8.3 Method 1 Risk Characterization

Pursuant to 310 CMR 40.0973(7), a condition of *No Significant Risk* ("NSR") of harm to health, safety, public welfare and the environment exists if no soil or groundwater Exposure Point Concentration ("EPC") is greater than the applicable MCP Method 1 Soil and Groundwater Standards. A Method 1 Risk Characterization was conducted to assess risk to human health, safety, public welfare and the environment associated with the release of OHM at the Airport as set forth below.

8.3.1 Risk Posed by OHM Impacted Soil

As set forth in in Table 2, concentrations of PFAS were reported above applicable Method 1 S-1 Soil Standards. No compounds were detected in soil in excess of upper concentration limits ("UCLs"). Therefore, a level of NSR has not been achieved at the Disposal Site with respect to OHM-impacted soil.

8.3.2 Risk Posed by OHM Impacted Groundwater

As set forth in Tables 3 and 4, concentrations of PFAS and 1,4-dioxane were reported above the applicable Method 1 GW-1 Groundwater Standards. No compounds were detected in groundwater in excess of the GW-3 Standard or UCLs. Therefore, a level of NSR has not been achieved for the Disposal Site with respect to OHM-impacted groundwater.

9.0 CONCEPTUAL SITE MODEL

- The Disposal Site is located within a MassDEP designated Zone II to the Maher municipal drinking water wells and within a Medium-Yield Sole Source Aquifer. Due to development of the surrounding areas, a large portion of the Zone II that the Airport is located within is also designated as a non-potential drinking water source area (NPDWSA) as indicated on Figure 16.
- Based on interviews with Airport staff who have worked at the Airport since the 1980s, AFFF was only intentionally sprayed at the Airport during tri-annual drills (1991, 1994, 1997, 2000, 2003, 2006, 2009 and 2012), during an Airport Emergency (1981-off Airport property and 2016 aircraft crash) and once per year between 2004 and 2015 as part of the FAA annual foam testing requirement (14 CRF 139). Airport personnel also indicated that fluorotelomer-based AFFF had been used at the Airport since at least 1980 when foam usage was limited to 35-gallons for use in one fire rescue vehicle. With the exception of the events detailed above, AFFF was not intentionally sprayed due to cost and limited supply of AFFF. With the exception of the 1991 drill, all drills and AFFF testing have been conducted at the unpaved Deployment Area.
- The 2016 crash of a Cirrus aircraft occurred in the parking lot of the rental car facility west of the terminal building. Approximately 335 gallons of AFFF (10 gallons of the 3-percent AFFF concentrate and 325-gallons of water) was used during the crash response. 100% of this AFFF liquid was contained within a solid bottom manhole and was removed and disposed of by Global Remediation during response actions.
- The exact quantity of AFFF mixture usage during the drills varied but was likely between 700 and 1,400 gallons (approximately 20 to 40 gallons AFFF concentrate) followed by 3,000 to 4,000 gallons of water to clean the AFFF out the fire apparatus. AFFF usage during the tri- annual drills was limited to only one fire rescue vehicle.
- In addition to the tests and training usage with AFFF, daily (approximately 5 gallons) and monthly (100 gallons) testing of the fire apparatus is conducted with just water. The test is conducted to verify that the fire apparatus pumps are operational. No foam is intentionally sprayed during these tests. The spray water from the fire trucks were tested for PFAS in 2019 to verify that the valve mechanism that segregated the AFFF was working properly. The analytical results indicated that AFFF was being mixed with the water unintentionally from the internal AFFF holding tanks. It was determined that the valve that segregates the AFFF was faulty and was the cause of the unintentional mixing. The faulty valve was replaced, and a maintenance schedule has been initiated.

Subsequent testing of the spray water indicates that PFAS levels are less than the current GW-1 standard. The combination of tri-annual drills and the annual AFFF testing and to a lesser extent the daily and monthly spraying of water have contributed to the AFFF related PFAS impacts in the Deployment Area. The Airport stopped using AFFF in the tri-annual training drills in 2015 and purchased an ecological cart in 2016 to stop spraying foam as part of the annual FAA testing requirement.

- AFFF was introduced to the ARFF/SRE Area through what is assumed to be incidental spillage, hanging of fire house apparatus and cleaning of equipment in the event of an accidental foam discharge. Interior floor drains within the building historically discharged to the adjacent grass area that was recently capped in 2020 to reduce infiltration of stormwater. In the event of accidental foam discharge, equipment was also rinsed by pumping water through it and discharging it to the adjacent grass area that was recently capped. Stormwater in the vicinity of the recently capped area also historically infiltrated into this area including both the building's roof and surrounding paved surface are. The interior floor drains historically discharged to this area but were closed and connected to a permitted discharge to the Barnstable Wastewater Treatment Plant. As part of the cap installed in 2020, stormwater was redirected away from this area and is infiltrated beyond the PFAS impacted soil areas.
- During the assessment to delineate the nature and extent of PFAS relating to the Airport's use of fluorotelomer-based AFFF, PFAS in groundwater was identified entering the Airport from several upgradient locations. Forensic techniques including data normalization and the preparation of Radar Plots for the purpose of distinguishing PFAS sources was necessary to distinguish the Airport's PFAS source from other off-site sources. Radar plots were generated for each of the groundwater monitoring wells tested both on and off Airport property, from the fire truck spray water and from AFFF concentrate. The data normalization used all laboratory reported PFAS and their contribution to the "Total PFAS" concentration detected in groundwater. The Radar Plots are considered a PFAS fingerprint. The PFAS fingerprint was used to determine plume migration relating to the Airport PFAS release as well as contributions from other off-site non-Airport related sources.
- The Airport's PFAS fingerprint was calculated from the fire truck spray water, groundwater analytical data collected in the two known source areas (Deployment and ARFF/SRE Area) and from areas hydraulically downgradient. Historical Airport purchase records indicate that a fluorotelomer-based AFFF (Chem-Guard 3% mil spec) has been purchased by the Airport over the last twenty years and interviews with staff indicated that this type of foam was also purchased as early as the 1980s. The testing of the AFFF Foam did not provide conclusive data and future testing will be conducted.
- According to the document titled *Aqueous Film-Forming Foam prepared by the Interstate Technology ITRC*, legacy fluorotelomer-based AFFF (1970s to 2016) have historically contained predominantly short-chain (C6) PFAS with formulations ranging from about 50–98% shortchains and the balance as long-chain PFAS. The long-chain PFAS content of these foams has the potential to break down in the environment to

PFOA and other PFCAs, but not to PFOS or other PFSA (Weiner et al. 2013). Additionally, the long-chain PFAS content of these foams has the potential to break down in the environment to PFOA and other PFCAs, but not to PFOS or other PFSAs (Weiner et al. 2013).

- According to the article titled *Quantitative Determination of Fluorotelomer Sulfonates in Groundwater by LC MS/MS*, "groundwater monitoring studies have shown the predominant breakdown product of the short-chain C6 fluorosurfactants contained in telomerbased AFFF to be 6:2 fluorotelomer sulfonate (6:2 FTS)". Among the analytes included in the PFAS analysis completed by the Airport, data normalization showed that upwards of 83 percent of the total PFAS detected in the well with the highest concentration of Total PFAS (HW-I[s]) was related to 6:2 FTS. This well was tested in November 2018 (82.4%) and then again in May 2020 (83.7%). The detection of this analyte at such a high percentage is representative of studies that indicate that telomerbased AFFF short chain PFAS transform into 6:2 FTS. Additionally, spray water samples collected from the fire hose spray water before the valve mechanism was fixed contained 6:2 FTS at 79 percent of the Total PFAS concentration.
- According to the article titled Biotransformation potential of 6:2 Fluorotelomer Sulfonate (6:2 FTSA) in aerobic and anaerobic sediment prepared by Shu Zhang, Xiaoxia Lu, Ning Wang, and Robert Buck, *"6:2 FTSA-based or related products, when released to the aerobic environment after their end of life cycle, may be a potential source of 5:3 Acid and the short-chain PFCAs such as PFPeA and PFHxA. On the other hand, 6:2 FTSA was virtually not biotransformed in anaerobic sediment over 100 d, indicating that 6:2 FTSA formed from its potential precursors such as fluoroalkylthioamido sulfonates, fluoroalkylthiobetaine, and other related AFFF products may be persistent in anaerobic environments".* Considering that 6:2 FTS has been detected in HW-S(s) which is located approximately 700 feet downgradient of HW-I(s) at very similar percentages (76 and 83.7 percent, respectively). This indicates that significant biotranformation of 6:2 FTS is not occurring.
- To further document that 6:2 FTS is stable and that significant degradation of 6:2 FTS is not occurring, HW evaluated the groundwater data collected from the Deployment Area source (HW-I[s]) and 700 feet downgradient of the Deployment Area source (HW-S[s]). The concentration of Total PFAS, 6:2FTS, PFOA, PFOS and the short chain PFCAs are indicated below in ug/l.

Analyte	HW-I(s) 5/8/2020	HW-S(s) 10/1/2020	HW-19(m) 10/1/2020
Total PFAS	15.5358	4.8958	0.37335
6:2 FTS	13.0	3.7	0.00095
PFBA	0.021	0.086	0.033
PFPeA	0.81	0.42	0.13
PFHxA	0.51	0.25	0.027
PFHpA	0.54	0.11	0.03
PFOA	0.29	0.062	0.011
PFOS	0.04	0.1	0.047

Based on the table above, the 6:2 FTS appears to be relatively stable and is a helpful analyte to monitor the AFFF plume movement. 6:2 FTS moves faster in groundwater than the MassDEP Sum of Six regulated analytes. As such, 6:2 FTS is helpful in tracking the extent of the Airport AFFF plume. The extent of the AFFF plume in the vicinity of the Deployment Area is based on forensics, analytical results and PFAS fate and transport mechanisms. To be conservative the Deployment Area Plume has been depicted on Figure 2 as being slightly upgradient of OW-19 which does not appear to have PFAS impacts consistent with the Airport AFFF plume. A distance of approximately 1,100 feet exists between HW-S(s) and OW-19. To further refine the extent of the AFFF Plume in this Area, the Airport plans to install one or monitoring wells between HW-S(s) and OW-19 as part of on-going IRA activities. The horizontal extent of the Airport's AFFF plume is indicated on Figure 2 and the vertical extent is indicated on Figures 5. As indicated on Figure 13, PFAS has been detected above the MassDEP Sum of 6 in multiple off-Airport property wells that are located hydraulically upgradient of the Airport.

- Considering that the source in the ARFF/SRE Area is related to incidental spillage and/or a single release event, it is not a chronic source like the Deployment Area. This is evident when reviewing the concentration (in ug/L) of 6:2FTS, PFOA, PFOS and the short chain PFCAs throughout the ARFF/SRE plume as indicated below.

Analyte	HW-P(s) 10/1/2020	HW-302 12/3/2018	HW-3 5/5/2020	RB-1(s) 5/8/2020	RB-1(m) 5/8/2020
Total PFAS	0.2458	0.3427	0.96981	0.08008	0.2015
6:2 FTS	0.011	0.13	0.13	ND	0.038

Analyte	HW-P(s) 10/1/2020	HW-302 12/3/2018	HW-3 5/5/2020	RB-1(s) 5/8/2020	RB-1(m) 5/8/2020
PFBA	0.041	0.014	0.0056	0.0033	0.01
PFPeA	0.1	0.042	0.33	0.0078	0.041
PFHxA	0.045	0.027	0.21	0.0058	0.021
PFHpA	0.026	0.015	0.1	0.0042	0.011
PFOA	0.0084	0.030	0.054	0.007	0.013
PFOS	0.00097	0.031	0.1	0.038	0.049

Considering the stability of 6:2 FTS and the fact that it migrates faster than any of the MassDEP Sum of 6, it appears that AFFF related compounds were released at some point in time after 1996 (ARFF/SRE Building was constructed in 1996) in the vicinity of HW-P. Based on forensics, analytical results and PFAS fate and transport mechanisms, the AFFF plume in the vicinity of ARFF/SRE Building has migrated approximately 900 to 1,000 feet. The Maher Wells are located an additional 1,000 feet downgradient of the Airport's AFFF plume. The horizontal extent of the Airport's AFFF plume is indicated on Figure 2 and the vertical extent is indicated on Figure 3. It should be noted that the detection of 6:2 FTS in RB-1(m) is likely related to an off-Airport source (6:2 FTS in HW-U(d) [0.0012 ug/L], HW-L(m) [0.022 ug/L] and HW-L(d) [0.0021 ug/L]). As indicated on Figure 13, PFAS has been detected above the MassDEP Sum of 6 in multiple off-Airport property wells that are located hydraulically upgradient of the Airport.

- Considering that PFDA has not been non-detect at the Maher Wells or in the Deployment Area, the Retardation Factor for the second fastest moving PFAS analyte (6:2 FTS) was applied to track the migration of the Airport's PFAS plume. Based on the calculations described above, the PFAS plume is estimated to move at a velocity of 36 to 185 feet per year. The Airport intends to collect TOC data as part of future IRA activities to refine the PFAS plume velocity.

- As indicated on Figure 2, PFAS impacted groundwater is migrating onto the Airport from upgradient sources that are not consistent with the PFAS plume associated with Airport. Additionally, as indicated on Figure 2, the PFAS plume associated with the Airport does not appear to have migrated to the Maher Wells. Additional testing including soil and groundwater is planned as part of ongoing IRA activates to further support the Conceptual Site Model and refine the forensic approach for source delineation. It is also understood that the Airport's PFAS Plume is migrating toward the Maher Wells.

- The Airport has controlled a majority of the sources of PFAS in soil and groundwater relating to the historic deployment of AFFF by the installation of two non-permeable caps. The cap installations were completed in September 2020 and additional details are included in the report titled “Immediate Response Action Plan Status Report 8 dated October 2020 and available for direct download from the MassDEP Searchable Sites Database using RTN 4-26347. Considering that PFAS have been detected in soil in both areas down to groundwater, the cap will prevent the further vertical migration of PFAS in soil.

- Considering that 1,4-dioxane was not detected in any of the wells installed in the vicinity of the historic solvent release and downgradient of the deicing areas that could potentially impact the Maher Wells, and that aircraft deicing fluid has either been directly discharged to the municipal sewer system or vacuumed from the pavement and then discharged to the municipal sewer system, the source of 1,4-dioxane detected at the Airport and Maher well field is likely related to a source upgradient of the Airport.
- To determine if the source of 1,4-dioxane detected in HW-L(d) and the Maher Well field was related to an off-site source, HW advanced monitoring wells HW-U(d) and HW-V(m) at locations off-Airport property and hydraulically upgradient of the Airport (Figure 11). The well screen depths for these locations were chosen based on particle tracking (see sections above) which indicated that the depth of the 1,4-dioxane detected at the Airport and the Maher Well field was likely related to a release site located more than 6,000 feet upgradient of the Airport.

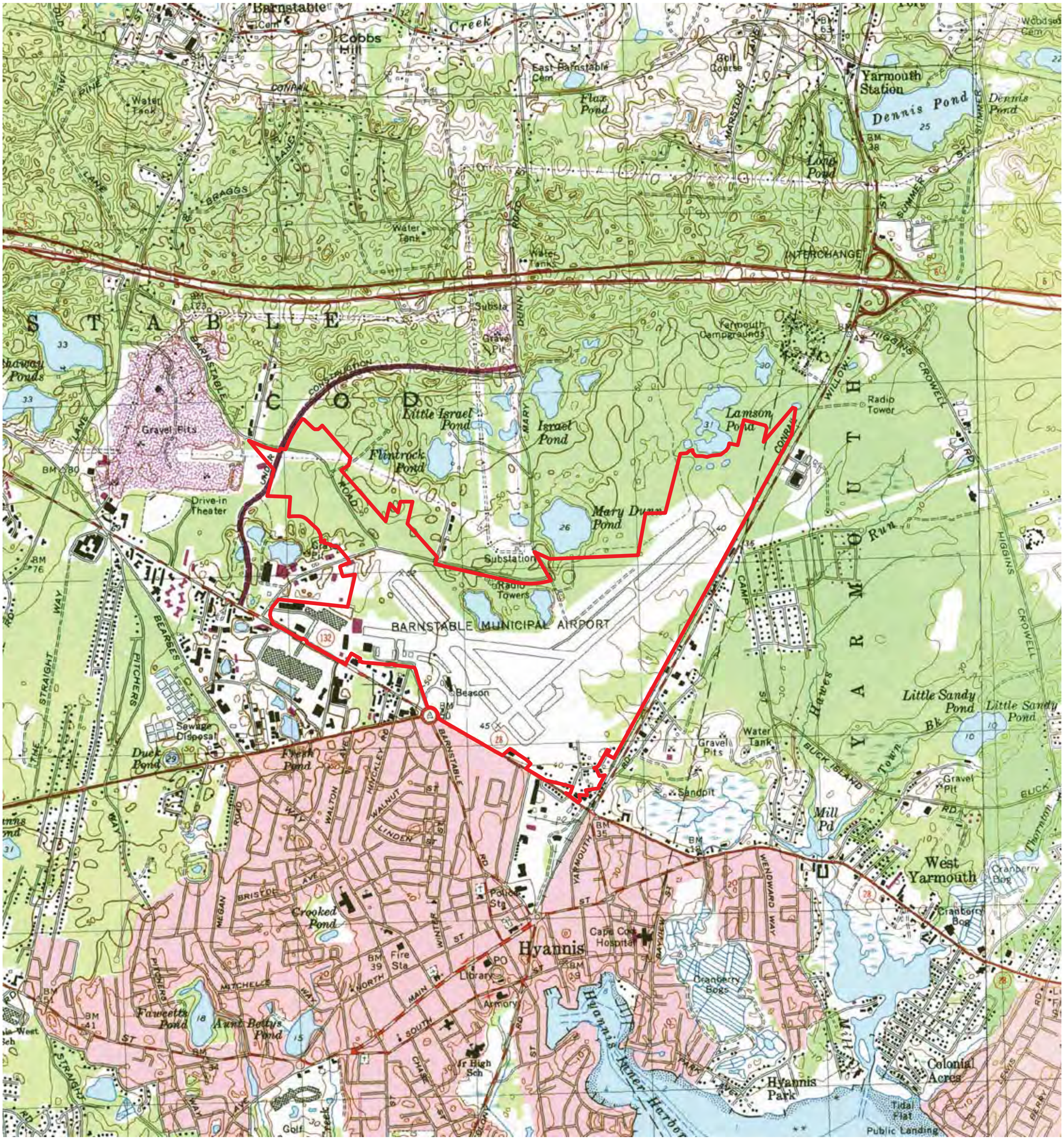
10.0 PUBLIC INVOLVEMENT

Pursuant to 310 CMR 40.1403 and the Final PIP dated September 16, 2019, notification of the Phase II will be provided to all individuals on Table 1. This includes the Chief Municipal Officer and the Board of Health for both Barnstable and Yarmouth.

References

1. *Biotransformation potential of 6:2 fluorotelomer sulfonate (6:2 FTSA) in aerobic and anaerobic sediment*, chemosphere April 2016, Shu Zhang, Xiaoxia Lu, Ning Wang, and Robert C. Buck.
2. *FAQs Regarding PFASs Associated with AFFF Use at U.S. Military Sites,* Ugust 2017, Dr. Jennifer Field, Dr. Christopher Higgins, Dr. Rula Deeb, and Dr. Jason Conder.
3. *Fact Sheet on C6 Fluorinated Surfactants*, Dr. Jan-Erik Jonsson, Fomtech.
4. *Per-and Polyfluoroalkyl Substances (PFAS*), September 2020, Interstate Technology and Reglutory Council.
5. *Naming Conventions for Per-and Polyfluoroalkyl Substances (PFAS*), August 2020, Interstate Technology and Reglutory Council.
6. *Aqueous Film-Forming Foam (AFFF)*, April2020, Interstate Technology and Reglutory Council.
7. *History and Use of Per- and Polyfluoroalkyl Substances (PFAS),* April 2020, Interstate Technology and Reglutory Council.
8. *Fact Sheet on AFFF Fire Fighting Agents*, 2017, Fire Fighting Foam Coalition.
9. *Quantitative Determination of Fluorotelomer Sulfonates in Groundwater by LC MS/MS*, Environmental Science and Technology 2004, Melissa M. Schultz, Douglas F. Barofsky and Jennifer A. Field.
10. *CompTox Chemicals Dashboard,* Environemtnal Prtection Agency, https://comptox.epa.gov/dashboard

FIGURES



Document Path: H:\Projects\HYA\11072 (697 Barnstable Airport)\GIS_Maps\Maps\USGS_Locus_20130815.mxd

*Hyannis Topographic Quadrangle

Legend

Airport Property Line

N

0.5 Miles

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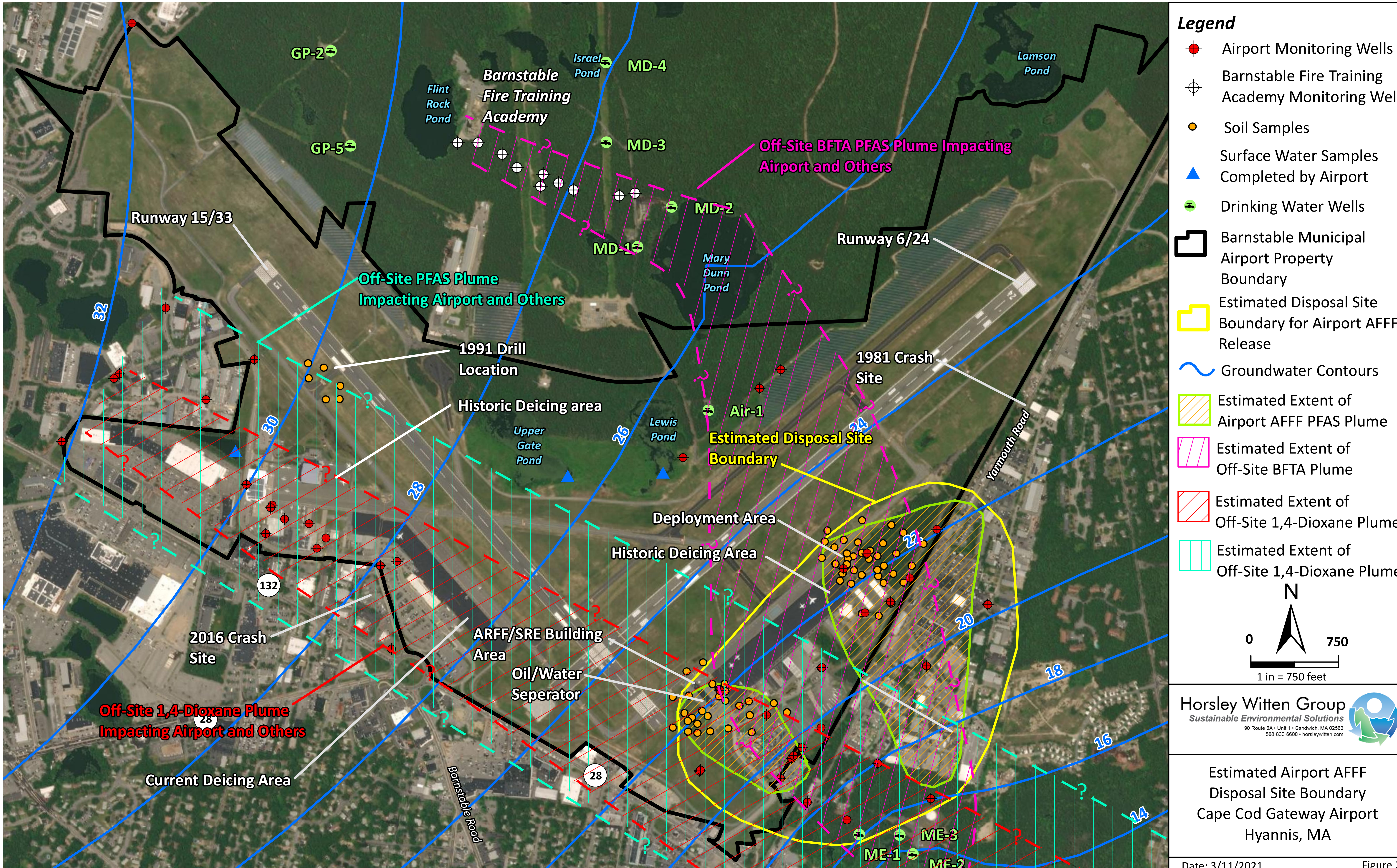
USGS Locus
Cape Cod Gateway Airport
Hyannis, MA

Date: 4/17/2018

Figure 1



* Cape Cod Commission (CCC) Groundwater Contours

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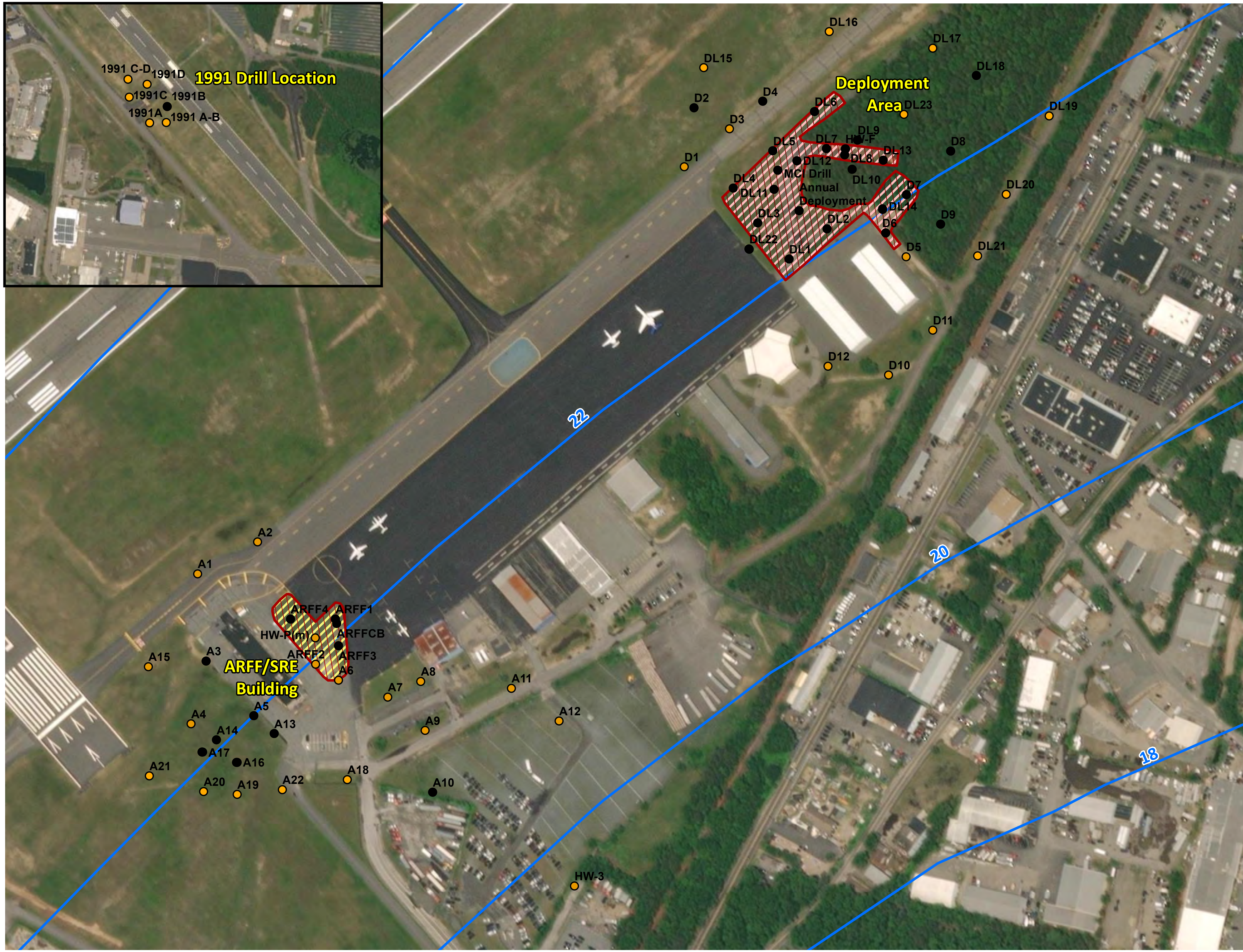

Legend

Groundwater Contours*

Deployment Area Liner Cap

ARFF Asphalt Cap

Soil Sample Location Below Method 1 S-1/GW-1 Standard for all Six PFAS Compounds

Soil Sample Exceeds Method 1 S-1/GW-1 Standard for at least one of the six PFAS compounds

Method 1 S-1/GW-1 Standard
PFHpA = 0.5 ug/kg
PFHxS = 0.3 ug/kg
PFOA = 0.72 ug/kg
PFNA = 0.32 ug/kg
PFOS = 2 ug/kg
PFDA = 0.3 ug/kg

N

0 225

1 in = 225 feet

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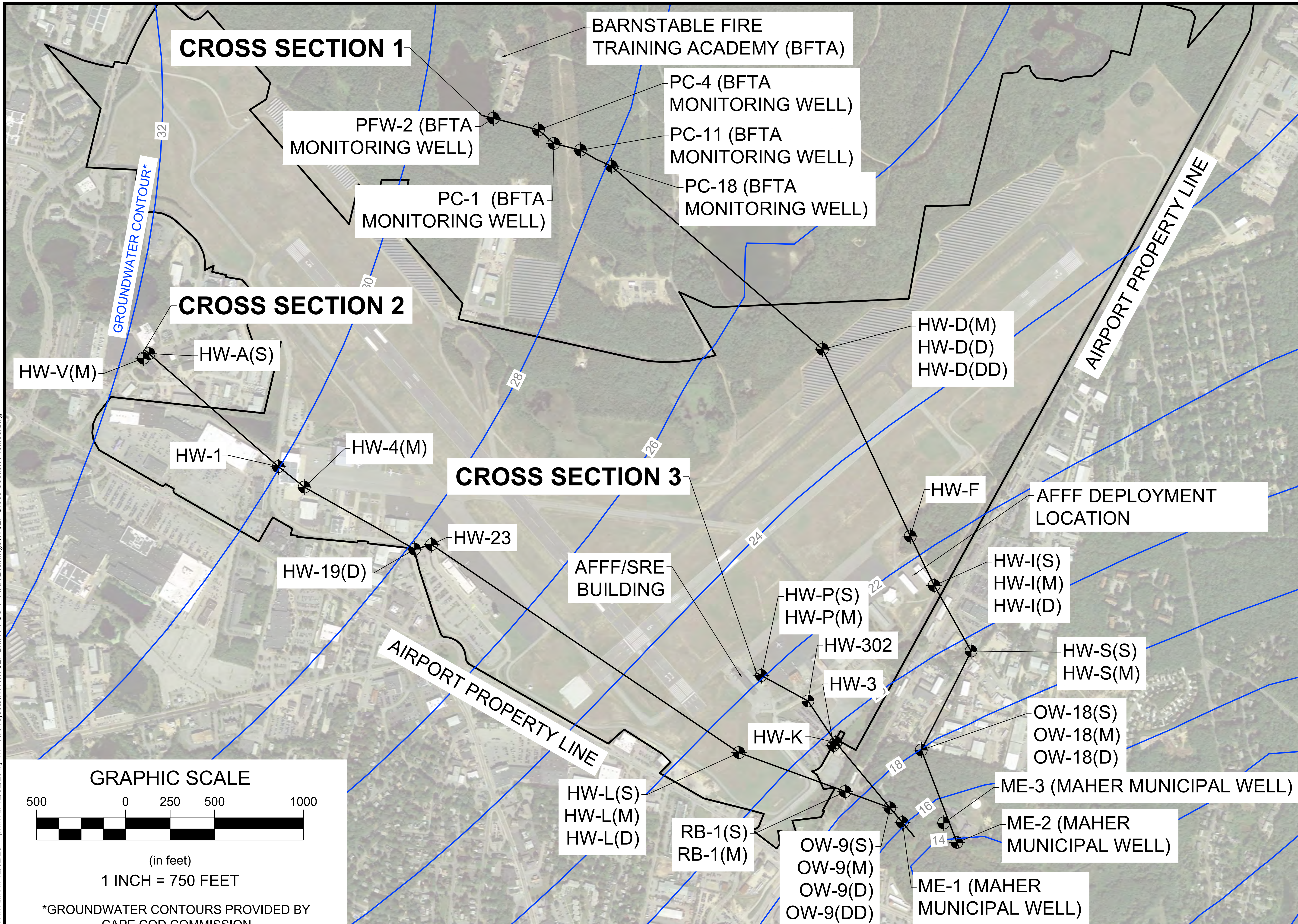
Soil Sample Locations
Cape Cod Gateway Airport
Hyannis, MA

Date: 11/18/2020 Figure 3

* Cape Cod Commission (CCC) Groundwater Contours



Revisions

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Checked By: BJM
Drawn By: EWH
Design By: N/A
Date: DEC 2020

Plan Set:
HYDROLOGIC CROSS SECTION
CAPE COD GATEWAY AIRPORT
HYANNIS, MASSACHUSETTS

Plan Title:
PLAN - FIGURE 4

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BARNSTABLE MUNICIPAL AIRPORT
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Fax: ----

Registration:

Project Number: 17027

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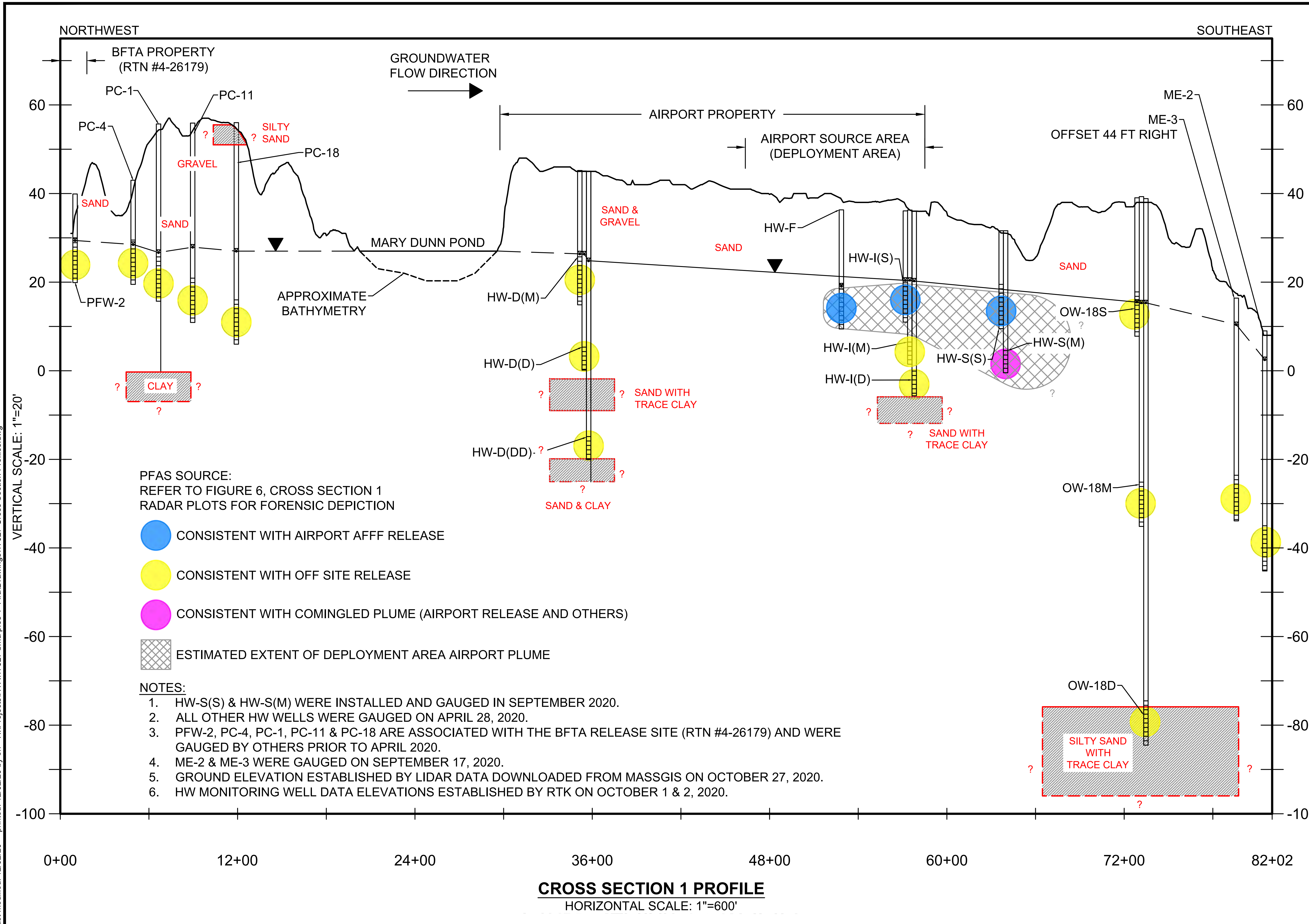

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Plan Title:
CROSS SECTION 1 - FIGURE 5

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HYANNIS, MA 02601

Registration:

Project Number: 17027

PFW-2
(3/30/2016)

PFAS DETECTION RELATED TO BFTA RELEASE

PC-4
(3/8/2016)

PFAS DETECTION RELATED TO BFTA RELEASE

PC-1
(3/3/2016)

PFAS DETECTION RELATED TO BFTA RELEASE

PC-11
(5/12/2016)

PFAS DETECTION RELATED TO BFTA RELEASE

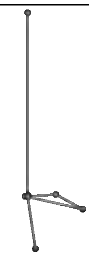
PC-18
(6/17/2015)

PFAS DETECTION RELATED TO BFTA RELEASE

HW-D(M)
(5/13/2020)

PFAS DETECTION CONSISTENT WITH BFTA RELEASE

HW-F
(5/5/2020)



PFAS DETECTION CONSISTENT WITH AIRPORT RELEASE

HW-I(S)
(5/8/2020)

PFAS DETECTION CONSISTENT WITH AIRPORT RELEASE

HW-S(S)
(10/1/2020)

PFAS DETECTION CONSISTENT WITH AIRPORT RELEASE

OW-18(S)
(5/8/2020)

PFAS DETECTION NOT CONSISTENT WITH AIRPORT RELEASE

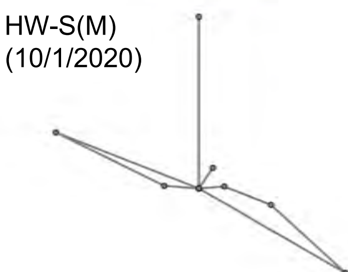
HW-D(D)
(5/13/2020)

PFAS DETECTION CONSISTENT WITH BFTA RELEASE

HW-I(M)
(5/8/2020)

PFAS DETECTION CONSISTENT WITH BFTA RELEASE

HW-S(M)
(10/1/2020)



PFAS DETECTION CONSISTENT WITH COMINGLED PLUME

OW-18(M)
(5/8/2020)

PFAS DETECTION NOT CONSISTENT WITH AIRPORT RELEASE

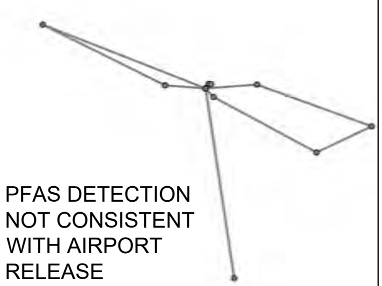
HW-D(DD)
(5/13/2020)

PFAS DETECTION CONSISTENT WITH BFTA RELEASE

HW-I(D)
(5/8/2020)

PFAS DETECTION CONSISTENT WITH BFTA RELEASE

OW-18(D)
(5/13/2020)



PFAS DETECTION NOT CONSISTENT WITH AIRPORT RELEASE

ME-3
(9/17/2020)

PFAS DETECTION CONSISTENT WITH BFTA RELEASE

ME-2
(9/17/2020)

PFAS DETECTION CONSISTENT WITH BFTA RELEASE

NOTE:

REFER TO APPEDIX A FOR RADAR PLOTS WITH ANALYTICS AND NORMALIZED PFAS DATA.

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Plan Set:
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CROSS SECTION 1 RADAR PLOTS - FIGURE 6

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Project Number:
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3 of 7

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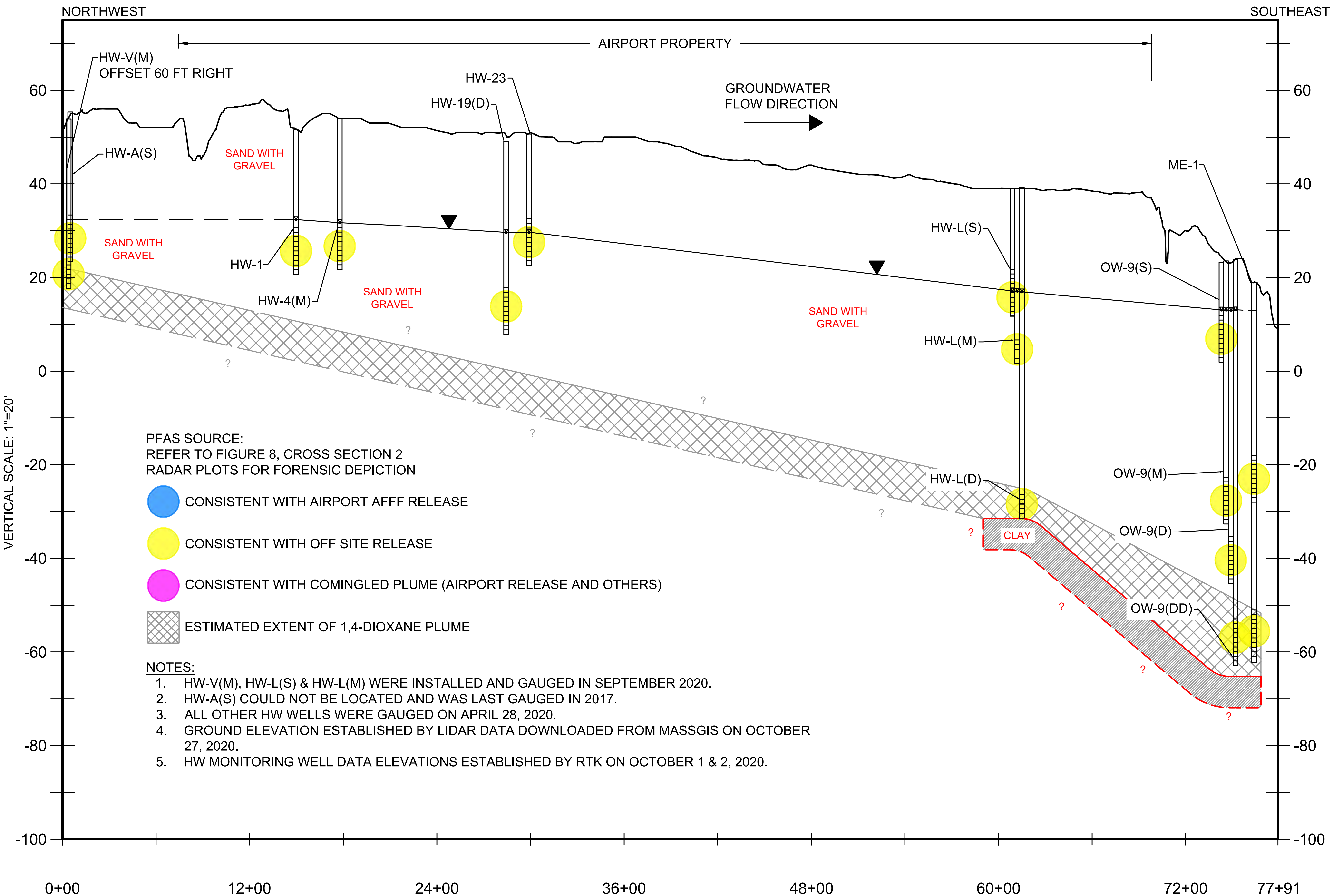

CROSS SECTION 2 PROFILE

HORIZONTAL SCALE: 1"=600'

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Plan Title: CROSS SECTION 2 - FIGURE 7

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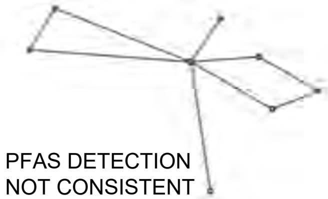
HW-V(M)
(10/2/2020)

PFAS DETECTION
NOT CONSISTENT
WITH AIRPORT
RELEASE

HW-A(s)
(4/7/2017)

PFAS DETECTION
NOT CONSISTENT
WITH AIRPORT
RELEASE

HW-1
(11/1/2018)



PFAS DETECTION
NOT CONSISTENT
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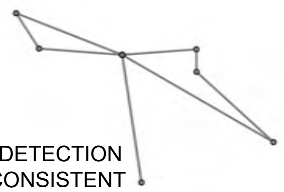
HW-4(M)
(4/5/2017)

PFAS DETECTION
NOT CONSISTENT
WITH AIRPORT
RELEASE

HW-19(D)
(11/7/2018)

PFAS DETECTION
NOT CONSISTENT
WITH AIRPORT
RELEASE

HW-23
(11/1/2018)



PFAS DETECTION
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WITH AIRPORT
RELEASE

HW-L(S)
(10/7/2020)

PFAS DETECTION
NOT CONSISTENT
WITH AIRPORT
RELEASE

OW-9(S)
(5/8/2020)

PFAS DETECTION
NOT CONSISTENT
WITH AIRPORT
RELEASE

ME-1
(9/17/2020)

PFAS DETECTION
NOT CONSISTENT
WITH AIRPORT
RELEASE

HW-L(M)
(10/7/2020)

PFAS DETECTION
NOT CONSISTENT
WITH AIRPORT
RELEASE

OW-9(M)
(5/8/2020)

PFAS DETECTION
NOT CONSISTENT
WITH AIRPORT
RELEASE

HW-L(D)
(10/7/2020)

PFAS DETECTION
NOT CONSISTENT
WITH AIRPORT
RELEASE

OW-9(D)
(5/5/2020)

PFAS DETECTION
NOT CONSISTENT
WITH AIRPORT
RELEASE

OW-9(DD)
(10/2/2020)

PFAS DETECTION
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NOTE:

REFER TO APPEDIX A FOR RADAR PLOTS WITH ANALYTICS AND NORMALIZED PFAS DATA.

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Plan Title:
CROSS SECTION 2 RADAR PLOTS - FIGURE 8

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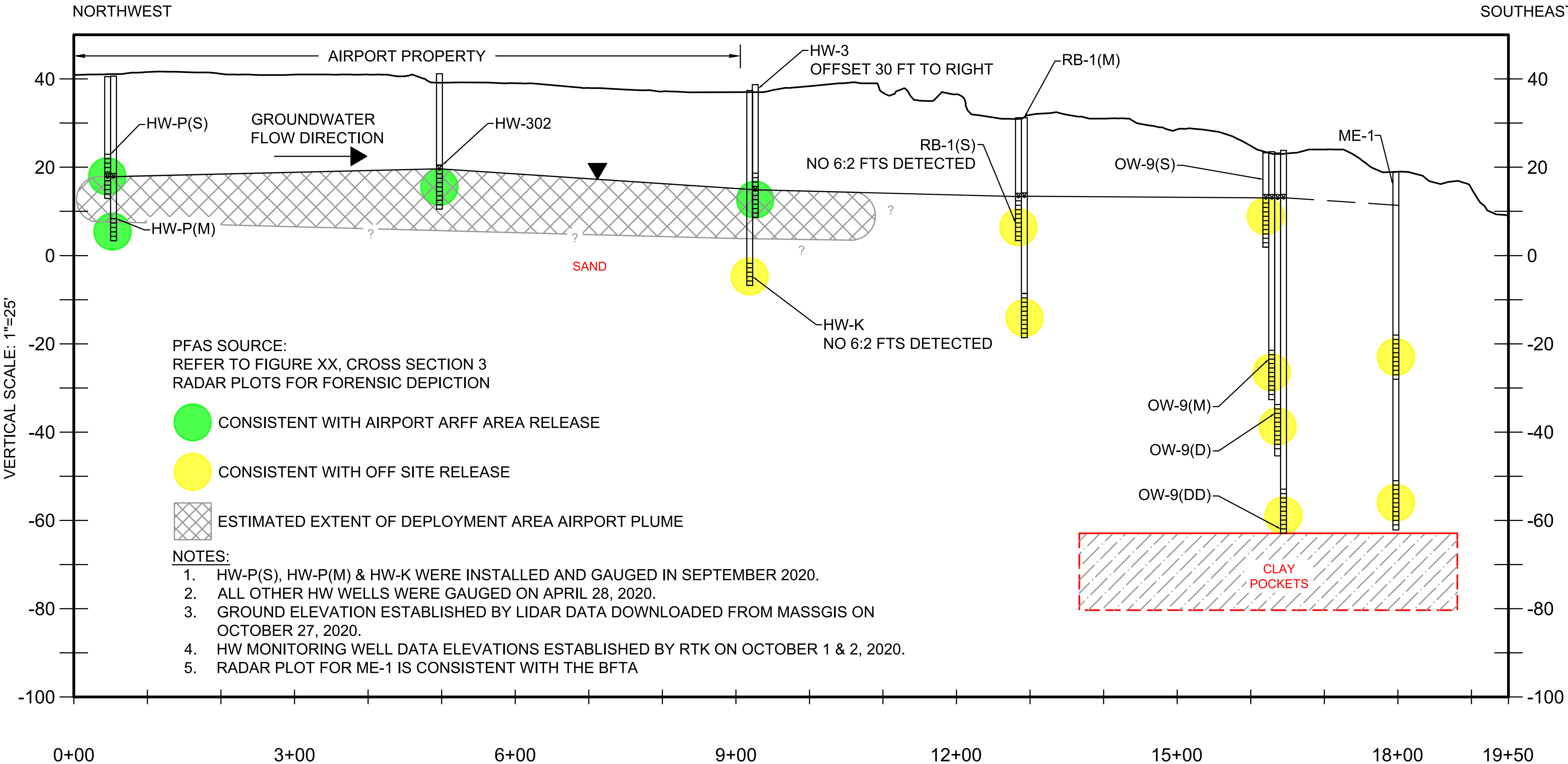

PFAS SOURCE:
REFER TO FIGURE XX, CROSS SECTION 3
RADAR PLOTS FOR FORENSIC DEPICTION

- CONSISTENT WITH AIRPORT ARFF AREA RELEASE
- CONSISTENT WITH OFF SITE RELEASE
- ESTIMATED EXTENT OF DEPLOYMENT AREA AIRPORT PLUME

NOTES:
1. HW-P(S), HW-P(M) & HW-K WERE INSTALLED AND GAUGED IN SEPTEMBER 2020.
2. ALL OTHER HW WELLS WERE GAUGED ON APRIL 28, 2020.
3. GROUND ELEVATION ESTABLISHED BY LIDAR DATA DOWNLOADED FROM MASSGIS ON OCTOBER 27, 2020.
4. HW MONITORING WELL DATA ELEVATIONS ESTABLISHED BY RTK ON OCTOBER 1 & 2, 2020.
5. RADAR PLOT FOR ME-1 IS CONSISTENT WITH THE BFTA

CROSS SECTION 3 PROFILE

HORIZONTAL SCALE: 1"=150'

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Plan Set: HYDROLOGIC CROSS SECTION CAPE COD GATEWAY AIRPORT HYANNIS, MASSACHUSETTS

Plan Title: CROSS SECTION 3 - FIGURE 9

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Registration:

Project Number: 17027

Sheet Number: 6 of 7

HW-P(S)
(10/1/2020)

PFAS DETECTION NOT CONSISTENT WITH AIRPORT RELEASE

HW-302
(12/3/2018)

PFAS DETECTION CONSISTENT WITH COMINGLED PLUME

HW-K
(5/21/2020)

PFAS DETECTION NOT CONSISTENT WITH AIRPORT RELEASE

HW-3
(5/5/2020)

PFAS DETECTION CONSISTENT WITH COMINGLED PLUME

RB-1(S)
(11/5/2020)

PFAS DETECTION NOT CONSISTENT WITH AIRPORT RELEASE

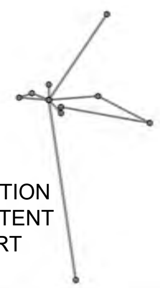
OW-9(S)
(5/8/2020)

PFAS DETECTION NOT CONSISTENT WITH AIRPORT RELEASE

ME-1
(9/17/2020)

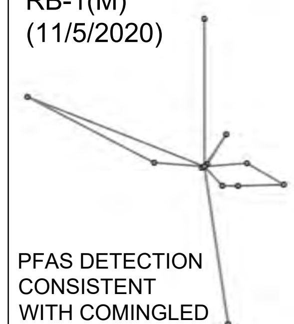
PFAS DETECTION NOT CONSISTENT WITH AIRPORT RELEASE

HW-P(M)
(10/1/2020)



PFAS DETECTION NOT CONSISTENT WITH AIRPORT RELEASE

RB-1(M)
(11/5/2020)



PFAS DETECTION CONSISTENT WITH COMINGLED PLUME

OW-9(M)
(5/8/2020)

PFAS DETECTION NOT CONSISTENT WITH AIRPORT RELEASE

OW-9(D)
(5/5/2020)

PFAS DETECTION NOT CONSISTENT WITH AIRPORT RELEASE

OW-9(DD)
(10/2/2020)

PFAS DETECTION NOT CONSISTENT WITH AIRPORT RELEASE

NOTE:

REFER TO APPEDIX A FOR RADAR PLOTS WITH ANALYTICS AND NORMALIZED PFAS DATA.

Revisions

Rev.	Date	By	Appr.	Description

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Checked By: BJM
Drawn By: EWH
Design By: N/A
Date: DEC 2020

Plan Set:
HYDROLOGIC CROSS SECTION
CAPE COD GATEWAY AIRPORT
HYANNIS, MASSACHUSETTS

Plan Title:
CROSS SECTION 3 RADAR PLOTS - FIGURE 10

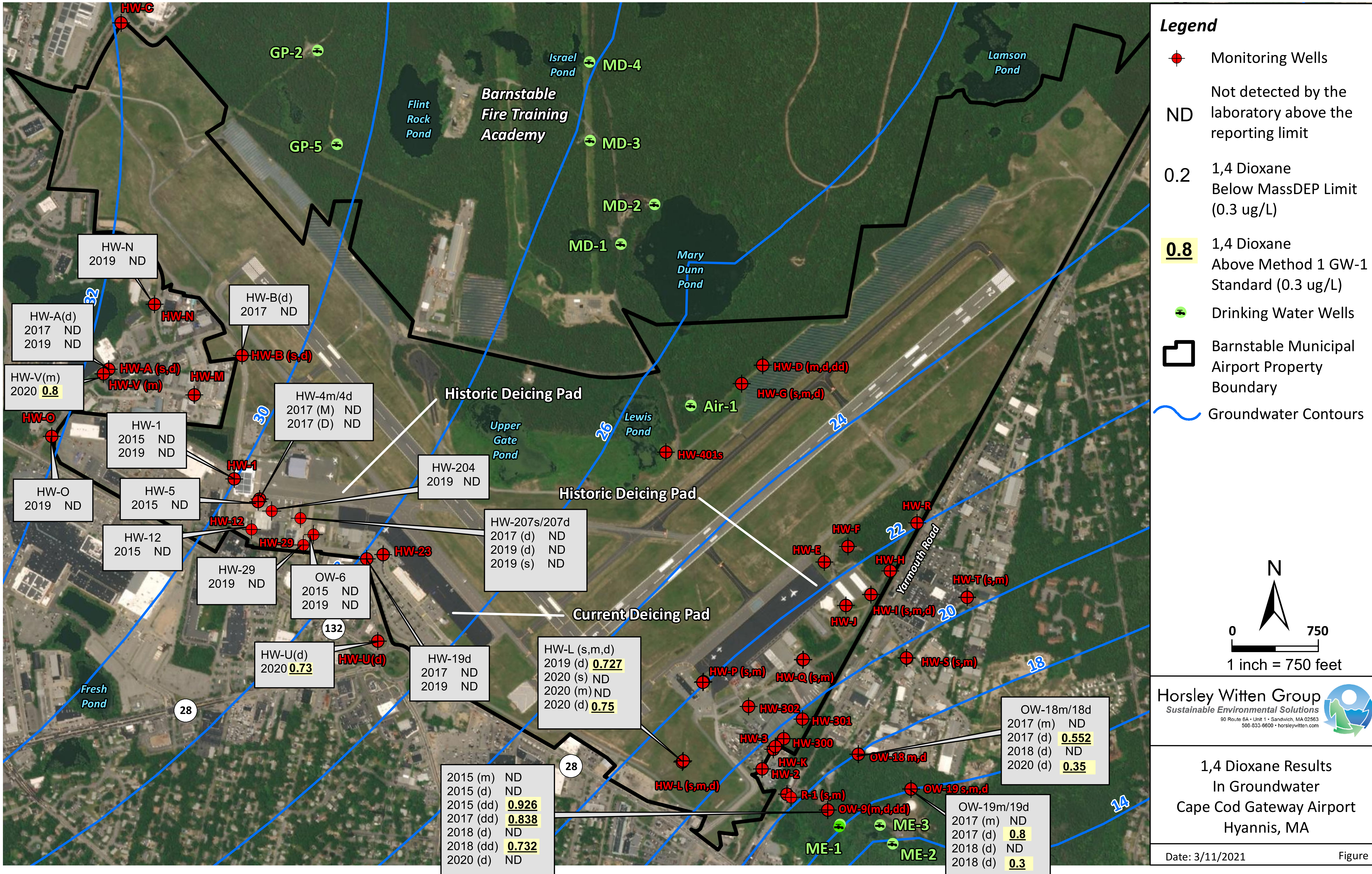
Prepared For:
BARNSTABLE MUNICIPAL AIRPORT
480 BARNSTABLE ROAD
HYANNIS, MA 02601

Registration:

Project Number:
17027

Sheet Number:
7 of 7

last modified: 12/02/20 printed: 12/02/20 by eh H:\Projects\HYA\17027 BMA PFOS 1-4 IRA\Drawings\17027 Cross Section Profiles.dwg



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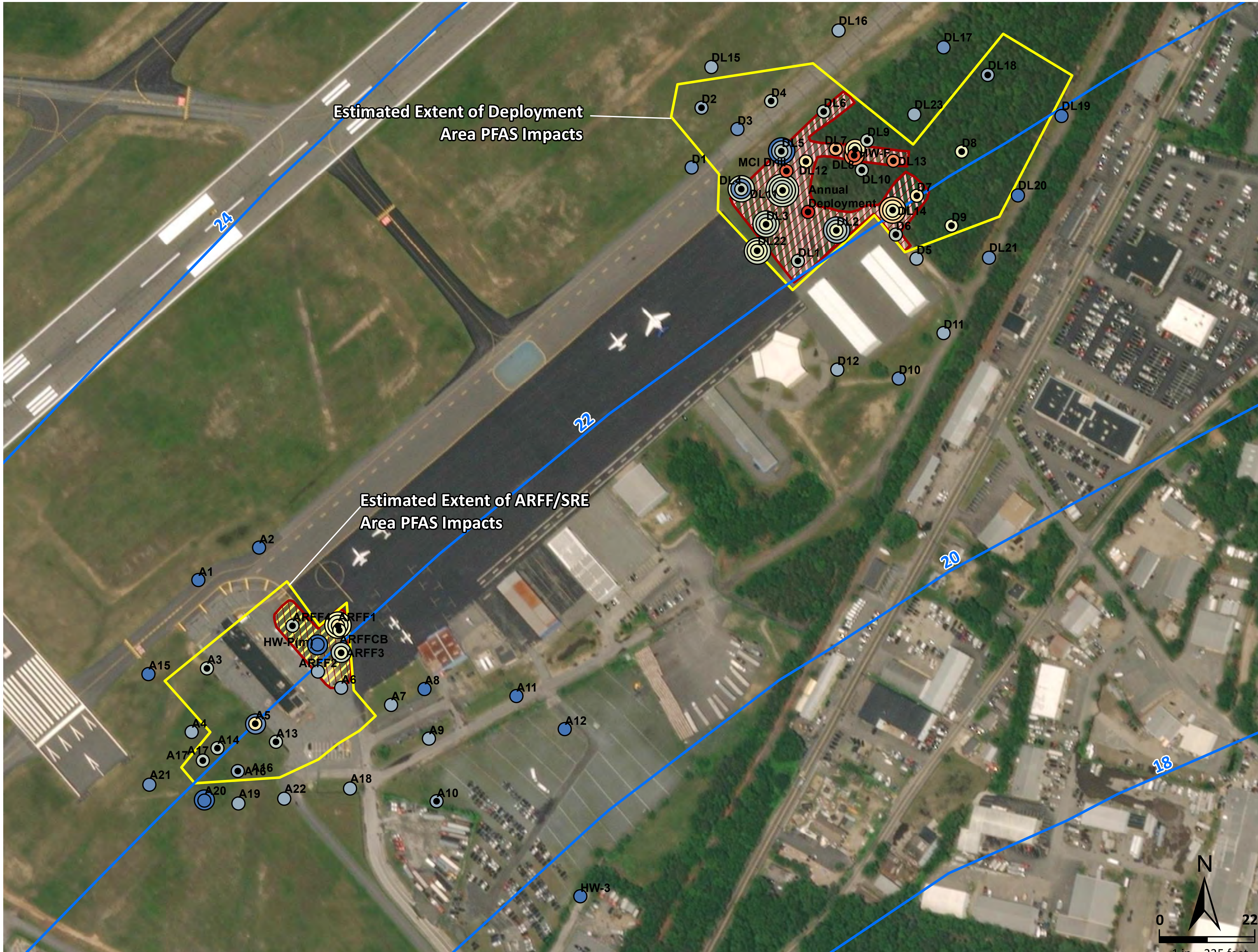


* Cape Cod Commission (CCC) Groundwater Contours

Legend

- Groundwater Contours*
- Samples exceeding MassDEP S-1/GW-1 Standard
- ARFF Asphalt Cap
- Deployment Area Liner Cap

Maximum Concentration of Total PFAS Detected in Soil (ug/kg)

- 0 - 0.5
- 0.5 - 1
- 1 - 5
- 5 - 20
- 20 - 100
- 100 - 200
- 200 - 500
- 500 - 1000
- 1000 - 2000
- 2000 - 6000

Notes:
1. Multiple circles indicates samples at different depths. The larger the circle, the deeper the sample.

2. Total PFAS is the sum of all laboratory reported PFAS analytes.

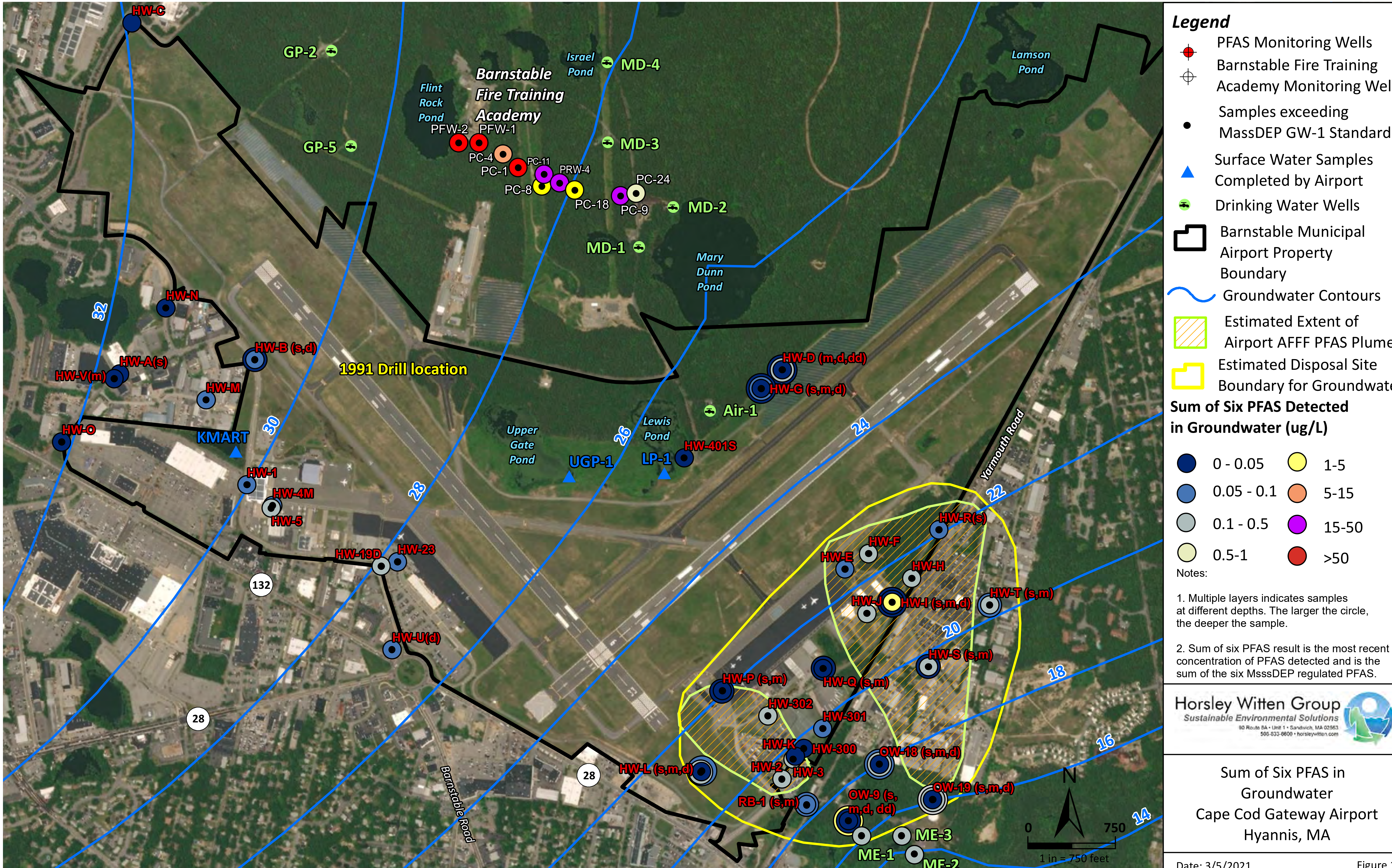
Horsley Witten Group
Sustainable Environmental Solutions

Estimated Disposal Site
Boundary for Soil
Cape Cod Gateway Airport
Hyannis, MA

Date: 11/30/2020

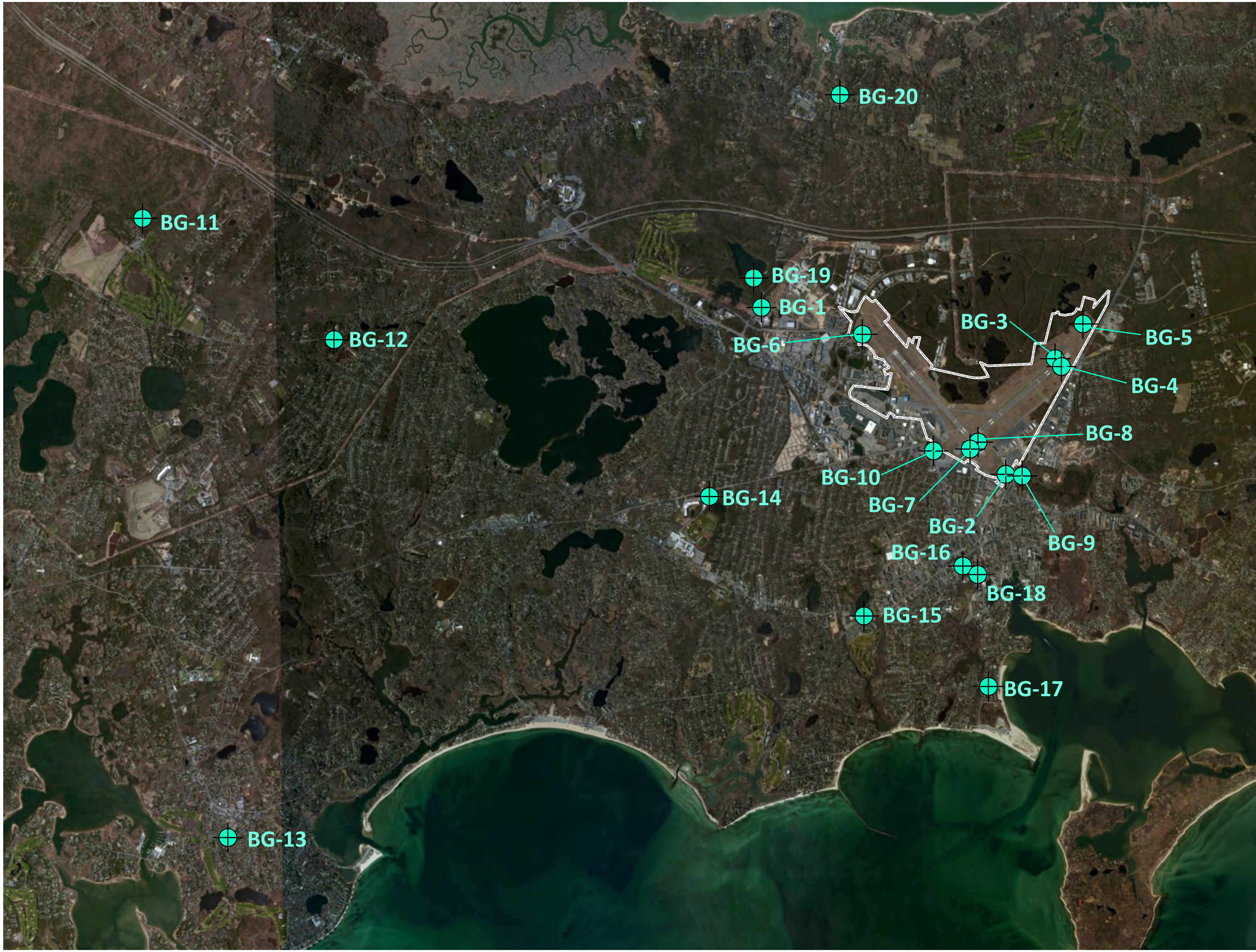
Figure 12

Path: K:\Projects\HYA\17027 BMA PFOS 1-4 IRA\GIS\Maps\201030_SoilPFASTotalZoom.mxd



* Cape Cod Commission (CCC) Groundwater Contours

Path: K:\Projects\HYA\17027 BMA PFOS 1-4 IRA\GIS\Maps\201103_GWPFASrecentSoS.mxd



Legend

Background PFAS sample locations

Barnstable Municipal Airport Property Boundary

Horsley Witten Group
Sustainable Environmental Solutions
90 Route 6A • Unit 1 • Sandwich, MA 02563
508-833-6600 • horsleywitten.com

Background
PFAS Sample Locations
Cape Cod Gateway Airport
Hyannis, MA

Date: 11/25/2020 | Figure 14

Path: H:\Projects\HYA\17027 BMA PFOS 1-4 IRA\GIS\Maps\180110_PFOS_BackgroundSampleLocations.mxd

Horsley Witten Group
Sustainable Environmental Solutions

FEMA's National Flood Hazard Layer
Cape Cod Gateway Airport
Hyannis, MA

Date: 12/10/2019

Figure 15

*Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services *2016 NAIP imagery service

Document Path: H:\Projects\HYA\19122 HYA Master Plan Update\GIS\Maps\191118_FEMA.mxd

MassDEP - Bureau of Waste Site Cleanup

Phase 1 Site Assessment Map: 500 feet & 0.5 Mile Radii

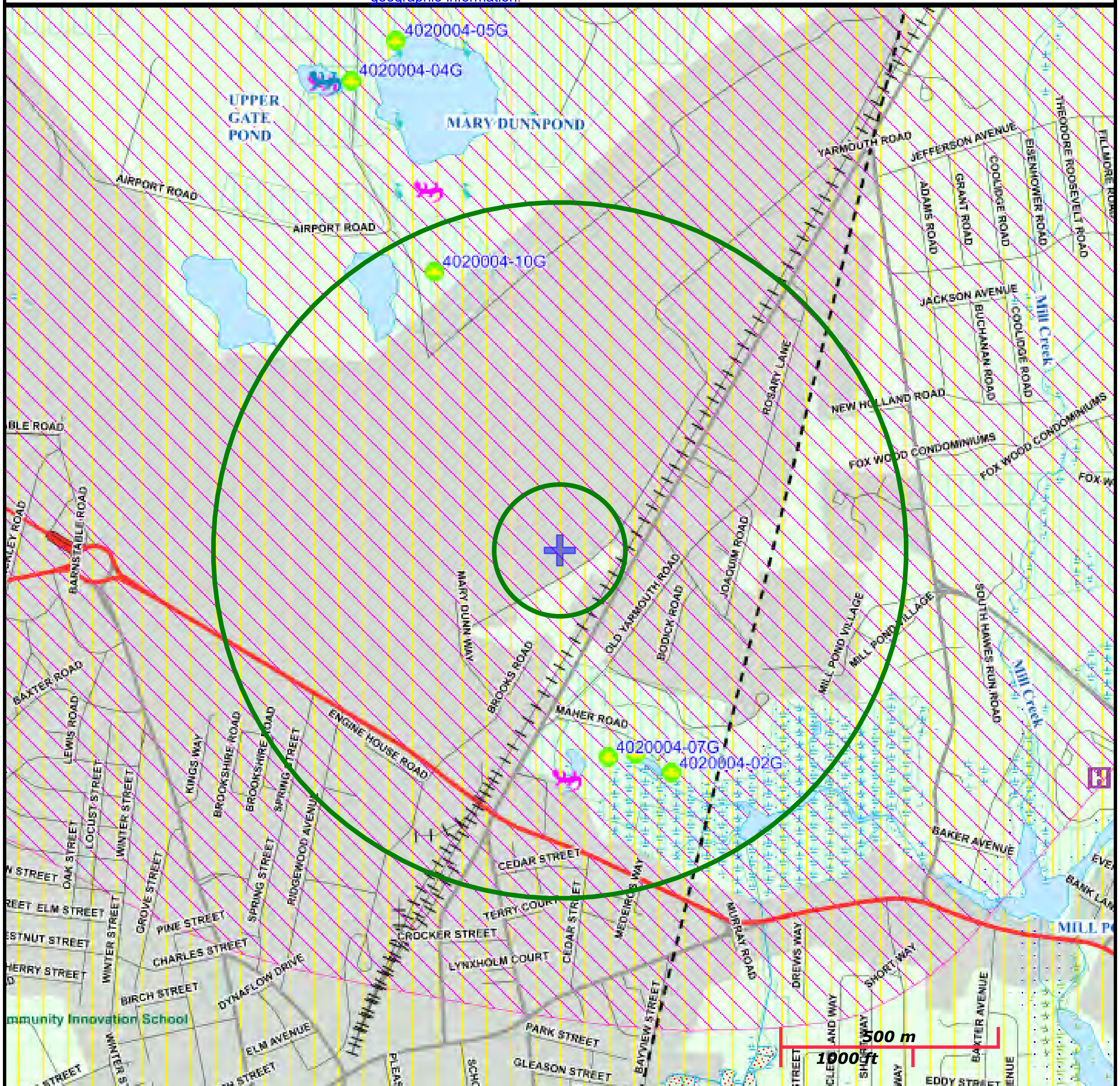
Site Information:

480 BARNSTABLE ROAD BARNSTABLE, MA

NAD83 UTM Meters:
4613410mN , 393907mE (Zone: 19)
November 25, 2020

The information shown is the best available at the date of printing. However, it may be incomplete. The responsible party and LSP are ultimately responsible for ascertaining the true conditions surrounding the site. Metadata for data layers shown on this map can be found at:
https://www.mass.gov/orgs/massgis-bureau-of-geographic-information.

MassDEP
Commonwealth of Massachusetts
Department of Environmental Protection



Roads: Limited Access, Divided, Other Hwy, Major Road, Minor Road, Track, Trail

Boundaries: Town, County, DEP Region; Train; Powerline; Pipeline; Aqueduct

Basins: Major, PWS; Streams: Perennial, Intermittent, Man Made Shore, Dam

Aquifers: Medium Yield, High Yield, EPA Sole Source

Non Potential Drinking Water Source Area: Medium, High (Yield)

PWS Protection Areas: Zone II, IWPA, Zone A

Hydrography: Open Water, PWS Reservoir, Tidal Flat

Wetlands: Freshwater, Saltwater, Cranberry Bog

FEMA 100yr Floodplain; Protected Open Space; ACEC

Est. Rare Wetland Wildlife Hab; Vernal Pool: Cert., Potential

Solid Waste Landfill; PWS: Com.GW,SW, Emerg., Non-Com.

Figure 16 - Priority Resource Map

Table 1

Community Notification List
Barnstable Municipal Airport

NAME	ADDRESS
Brad Schiff	bschiff@pierce-cote.com
Bronwen Walsh	bwalsh@barnstablepatriot.com
Chanda Beaty	chanda123@yahoo.com
David Dow	ddow420@comcast.net
Geoff Spillane	gspillane@capecodonline.com
Gerard Martin	gerard.martin@mass.gov
Gordon Starr	gordon.m.starr@gmail.com
Keith Lewison	keith.lewison@gmail.com
Lisa Connors	lconnors@pierce-cote.com
Paul Neary	nearyprecinct6@gmail.com
Steve Seymour	steveseymour@comcast.net
Tom Cambareri	tomcambareri@gmail.com
Sue Phelan	suephelan@comcast.net
Amanda Rose	504 Pitchers Way Hyannis, MA 02601
Angela Gallagher	MassDEP Southeast Regional Office Bureau of Waste Site Cleanup 20 Riverside Drive Lakeville, MA 02347
Anthony Alva	184 Mockingbird Lane Marstons Mills, MA 02646
Araceli Alcantara	67 Coolidge Road West Yarmouth, MA 02673
Arthur Beatty	699 Cotuit Road Marstons Mills, MA 02648
Bruce Murphy	Health Department Town of Yarmouth 1146 Route 28 South Yarmouth, MA 02664
Charlie Bloom	29 Oak Street Hyannis, MA 02601
Cheryl Osimo	MBCC PO Box 202 Franklin, MA 02038
Christian Cook	37 Maple Avenue Hyannis, MA 02601
Daniel Knapik	Town Administrator Town of Yarmouth 424 Rte. 28 West Yarmouth, MA 02673
Daniel Santos	Department of Public Works Town of Barnstable 397 Main Street Hyannis, MA 02601
Sylvia Laselva	358 Sea Street Hyannis, MA 02673

NAME	ADDRESS
Darcy Karie	Conservation Commission Town of Barnstable 397 Main Street Hyannis, MA 02601
David Beaty	137 Harbor Bluff Road Hyannis, MA 02601
Eric Kristofferson	Hyannis Fire Department 95 High School Road Ext. Hyannis, MA 02601
Hans Keijser	Department of Public Works Town of Barnstable 397 Main Street
Janine Voiles	67 Coolidge Road West Yarmouth, MA 02673
Jeanny Fichter	1640 Old Stage Rd. West Barnstable, MA 02668
Karl Von Hone	Yarmouth Natural Resources Town of Yarmouth 424 Route 28 West Yarmouth, MA 02673
Luiz Gonzaga	92 High School Rd. Hyannis, MA 02601
M. Curley	39 Oak Ridge Road Osterville, MA 02655
Maia Fitzstevens	Silent Spring Institute 320 Nevada Street, Suite 302 Newton, MA 02460
Vilson Kote	106 Betty's Path West Yarmouth, MA 02673
Mainur Kote	106 Betty's Path West Yarmouth, MA 02673
Margo Pisacano	73 Harbor Bluff Road Hyannis, MA 02601
Mark Ells	Town Manager Town of Barnstable 397 Main Street Hyannis, MA 02601
Mark Forest	Board of Selectmen c/o Town Administrator's Office 1146 Route 28 South Yarmouth, MA 02664
Michael Gorenstein	Department of Public Works Town of Barnstable 397 Main Street
Nancy Wentzel-Johnson	PO Box 342 Hyannis, MA 02601
Peter Burke	Hyannis Fire Department 95 High School Road Ext. Hyannis, MA 02602
Richard A. Zoino	92 High School Road Hyannis, MA 02601
Richard Rougeau	306 Longbeach Road Centerville, MA 02632
Ronald Beaty	245 Parker Rd. West Barnstable, MA 02668
Rong Jian Liu	5 Fishing Brook Road Yarmouth, MA 02664
Scott Beaty	29 Washington Avenue West Yarmouth, MA 02673
Sue Phelan	Green Cape - PO Box 631 West Barnstable, MA 02668
Thomas McKean	Board of Health Town of Barnstable 397 Main Street Hyannis, MA 02601

Table 2. Soil Results for PFAS ug/kg

Sample Location	Method 1 Standard		ARFF Building																
Sample ID			ARFF1 (0-1')	ARFF1 (2')	ARFF1 (4')	ARFF2 (0-1')	ARFF3 (0-1')	ARFF3 (10-12)	ARFF4 (0-1')	ARFFCB (0-1)	A1 (0-1')	A2 (0-1')	A3 (0-1')	A4 (0-1')	A5 (0-1')	A5 (2-4')	A6 (0-1')	A7 (0-1')	A8 (0-1')	A9 (0-1')	A10 (0-1')
Sample Date	S-1/GW-1	S-1/GW-3	6/20/2017	9/26/2017	9/26/2017	6/20/2017	9/26/2017	10/9/2018	9/26/2017	9/26/2017	8/14/2018	8/14/2018	8/14/2018	8/14/2018	8/14/2018	9/24/2020	8/14/2018	8/14/2018	8/14/2018	8/14/2018	8/14/2018
Perfluoroheptanoic acid (PFHpA)	0.5	300	**0.82 J**	**1.8**	**0.66 J**	0.17 U	**0.60 J**	0.32 J	**0.75 J**	**0.60 J**	0.19 U	0.19 U	0.38 J	0.19 U	**1.1**	0.089 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
Perfluorohexanesulfonic acid (PFHxS)	0.3	300	0.23 U	0.23 U	0.23 U	0.23 U	**0.64 J**	0.24 U	0.23 U	0.23 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.12 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
Perfluorooctanoic acid (PFOA)	0.72	300	**0.75 J**	**2.6**	**0.75 J**	0.26 U	**0.78 J**	**1.9**	**0.97 J**	**0.90 J**	0.25 U	0.25 U	0.37 J	0.30 J	**1.9**	0.228 J	0.25 U	0.25 U	0.25 U	0.34 J	0.25 U
Perfluorononanoic acid (PFNA)	0.32	300	**2.5**	**5.7**	**1.4**	0.20 J	**0.91 J**	**3.1**	**2.9**	0.17 U	0.22 U	0.22 U	**0.51 J**	0.22 U	**0.87 J**	0.148 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Perfluorooctane sulfonate (PFOS)	2	300	**4.5**	**2.7**	1.1	0.29 J	**4.4**	1.1	1.0	1.1	0.26 U	0.26 U	0.29 J	0.26 U	0.26 U	0.257 U	0.26 U	0.38 J	0.26 U	0.85 J	0.26 U
Perfluorodecanoic Acid (PFDA)	0.3	300	**4.4**	**1.2**	**0.62 J**	0.13 U	**1.6**	0.28 U	**0.85 J**	0.13 U	0.28 U	0.28 U	**0.42 J**	0.28 U	**1.4**	0.133 U	0.28 U	0.28 U	0.28 U	0.28 U	**0.33 J**
6:2 Fluorotelomer sulfonate (6:2 FTS)	NA	NA	0.93 J	0.74 J	1.0	0.23 U	0.61 J	4.2	0.65 J	2.2	0.26 U	0.26 U	0.26 U	0.26 U	18	0.355 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
Sum of Laboratory Reported PFAS (Total PFAS) and Sum of Si																					
Total PFAS	NA	NA	120.06	41.75	46.85	1.16	23.72	11.03	11.9	95.43	0	0	6.2	1.14	161.07	0.613	1.5	1.35	0.48	1.92	1.1
Sum of Six (PFHpA,PFHxS,PFOA, PFOS, PFNA, and PFDA)	NA	NA	12.97	14	4.53	0.49	8.93	6.42	6.47	2.6	0	0	1.97	0.3	5.27	0.228	0	0.38	0	1.19	0.33

Sample Location (cont.)																			
Sample ID	A11 (0-1')	A12 (0-1')	A13 (0-1')	A13 (0-1')	A14 (0-1')	A14 (0-1')	A15 (0-1')	A15 (0-1')	A16 (0-1')	A17 (0-1')	A18 (0-1)	A19 (0-1)	A20 (0-1)	A20 (2-4)	A21 (0-1)	A22 (0-1)	HW-P(M) [8-10]	HW-P(M) [18-20]	DL1(0-1')
Sample Date	8/14/2018	8/14/2018	2/27/2019	9/29/2020	2/27/2019	5/13/2020	2/27/2019	5/13/2020	9/17/2020	9/17/2020	9/29/2020	9/24/2020	9/24/2020	9/24/2020	9/24/2020	9/29/2020	9/18/2020	9/18/2020	6/20/2017
Perfluoroheptanoic acid (PFHpA)	0.19 U	0.19 U	**<2.0**	0.396 J	**<1.9**	**0.51 J**	**<2.0**	0.21 U	0.067 J	**1.07**	0.076 J	0.101 J	0.09 U	0.09 U	0.045 U	0.096 J	0.044 U	0.043 U	0.30 J
Perfluorohexanesulfonic acid (PFHxS)	0.24 U	0.24 U	**<2.0**	0.058 U	**<1.9**	0.24 U	**<2.0**	0.21 U	0.085 J	0.058 U	0.054 U	0.059 U	0.121 U	0.121 U	0.06 U	0.055 U	0.059 U	0.058 U	0.23 U
Perfluorooctanoic acid (PFOA)	0.25 U	0.25 U	**<2.0**	0.67 J	**<1.9**	0.68 J	**<2.0**	0.14 U	0.088 J	**0.989**	0.111 J	0.129 J	0.196 J	0.147 J	0.042 U	0.069 J	0.089 J	0.046 J	0.26 U
Perfluorononanoic acid (PFNA)	0.22 U	0.22 U	**<2.0**	**1.2**	**<1.9**	**0.54 J**	**<2.0**	0.15 U	0.119 J	**0.774 J**	0.281 J	0.246 J	0.15 U	0.15 U	0.075 U	0.11 J	0.073 U	0.072 U	0.17 U
Perfluorooctane sulfonate (PFOS)	0.26 U	0.26 U	<2.0	1.3	<1.9	0.32 J	<2.0	0.29 J	**2.02**	0.573 J	1.15	0.611 J	0.259 U	0.26 U	0.276 J	0.559 J	0.0127 U	0.0124 U	0.40 J
Perfluorodecanoic Acid (PFDA)	0.28 U	0.28 U	**<2.0**	**0.34 J**	**<1.9**	**0.95 J**	**<2.0**	0.15 U	0.074 J	0.147 J	0.146 J	0.066 U	0.134 U	0.134 U	0.067 U	0.119 J	0.065 U	0.064 U	**0.63 J**
6:2 Fluorotelomer sulfonate (6:2 FTS)	0.26 U	0.26 U	<2.0	0.173 U	<1.9	0.25 U	<2.0	0.22 U	0.17 U	0.172 U	0.161 U	0.175 U	0.358 U	0.359 U	0.179 U	0.164 U	0.221 J	0.172 U	0.39 J
Total PFAS	0.43	0	0.0	5.2	0	13.15	0.0	0.45	3.131	11.267	2.652	1.409	0.316	0.147	0.571	1.412	0.411	0.09	11.14
Sum of Six (PFHpA,PFHxS,PFOA, PFOS, PFNA, and PFDA)	0	0	0	3.916	0	3	0	0.29	2.453	3.553	1.764	1.087	0.196	0.147	0.276	0.953	0.089	0.046	1.33

Sample Location	Method 1 Standard		Deployment Area																
Sample ID			DL2 (0-1')	DL2 2'	DL2 4'	DL3 (0-1')	DL3 2'	DL3 4'	DL4 (0-1')	DL4 2'	DL4 4'	DL5 (0-1')	DL5 2'	DL5 4'	DL6 (0-1')	DL7 (0-1')	DL8 (2')	DL8 (4')	DL9 (0-1')	DL10 (0-1')	DL 11 (0-1')
Sample Date	S-1/GW-1	S-1/GW-3	6/20/2017	9/26/2017	9/26/2017	6/20/2017	9/26/2017	9/26/2017	6/20/2017	9/26/2017	9/26/2017	6/20/2017	9/26/2017	9/26/2017	6/20/2017	6/20/2017	6/20/2017	9/26/2017	6/20/2017	6/20/2017	9/26/2017
Perfluoroheptanoic acid (PFHpA)	0.5	300	**1.9**	**1.2**	0.48 J	**0.84 J**	0.17 U	0.17 U	0.31 J	0.17 U	0.17 U	**2.5**	0.40 J	0.50 J	**5.0**	**2.5 J**	**2.9 J**	**4.7 J**	**0.66 J**	**1.3**	**2.1**
Perfluorohexanesulfonic acid (PFHxS)	0.3	300	**1.8**	**1.3**	**0.59 J**	**0.34 J**	0.23 U	0.23 U	0.23 U	0.23 U	0.23 U	**0.49 J**	**0.49 J**	0.23 U	0.23 U	**2.3 U**	**2.3 U**	**2.3 U**	**0.35 J**	**0.94 J**	**0.82 J**
Perfluorooctanoic acid (PFOA)	0.72	300	**1.6**	**4.1**	**0.74 J**	**0.80 J**	0.26 U	0.26 U	**0.83 J**	0.26 U	0.26 U	**3.7**	**1.6**	0.26 U	0.26 U	**4.2 J**	**25**	**22**	0.68 J	**1.7**	**4.7**
Perfluorononanoic acid (PFNA)	0.32	300	**0.81 J**	**2.5**	0.17 U	**0.55 J**	0.17 U	0.17 U	**2.7**	0.17 U	**3.7**	0.19 J	0.17 U	0.17 U	0.19 J	**9.6 J**	**46**	**1.7 U**	0.22 J	0.17 U	**16**
Perfluorooctane sulfonate (PFOS)	2	300	**12**	1.5	0.21 U	0.51 J	0.21 U	0.21 U	2.0	0.21 U	0.50 J	0.21 U	0.21 U	0.21 U	0.21 U	**3.9 J**	**14**	**2.1 U**	0.38 J	0.26 J	**29**
Perfluorodecanoic Acid (PFDA)	0.3	300	0.13 U	0.13 U	0.13 U	**1.4**	0.13 U	0.13 U	**1.3**	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	**1.3 U**	**1.3 U**	**1.3 U**	0.13 U	0.13 U	**1.8**
6:2 Fluorotelomer sulfonate (6:2 FTS)	NA	NA	0.23 U	0.23 U	0.57 J	3.1	1.5	1.0	0.24 J	0.23 U	1.7	0.23 U	0.23 U	0.23 U	2.0	290	1600	900	0.23 U	0.23 U	7.8
Sum of Laboratory Reported PFAS (Total PFAS) and Sum of Si																					
Total PFAS	NA	NA	24.41	12.17	2.38	84.86	9.56	13.81	9.6	0.88	5.9	11.03	2.49	0.5	18.59	404.4	1727.2	949.6	6.38	9.1	85.22
Sum of Six (PFHpA,PFHxS,PFOA, PFOS, PFNA, and PFDA)	NA	NA	18.11	10.6	1.81	4.44	0	0	7.14	0	4.2	6.88	2.49	0.5	5.19	20.2	87.9	26.7	2.29	4.2	54.42

Sample Location (cont.)																			
Sample ID	DL 11 (0-1')	DL11 (4-6')	DL11 (10-12')	DL11 (14-16')	DL12 (0-1')	DL13 (0-1')	DL14 (0-1')	DL14 (4-6')	DL14 (10-12')	DL14 (14-16')	DL15 (0-1)	DL16 (0-1)	DL17 (0-1)	DL18 (0-1)	DL19 (0-1)	DL20 (0-1)	DL21 (0-1)	DL22 (2-4)	DL22 (6-8)
Sample Date	8/20/2019	10/4/2018	10/4/2018	10/4/2018	9/26/2017	9/26/2017	9/26/2017	10/4/2018	10/4/2018	10/4/2018	9/30/2020	9/30/2020	9/25/2020	9/25/2020	9/25/2020	9/25/2020	9/25/2020	9/25/2020	9/25/2020
Perfluoroheptanoic acid (PFHpA)	**1.8**	**1.3**	0.31 J	0.23 J	**1.2**	**1.6**	**4.9**	0.36 J	0.19 U	**1.4**	0.175 U	0.138 J	0.167 U	0.319 J	0.145 U	0.157 U	0.158 U	0.109 J	0.481 J
Perfluorohexanesulfonic acid (PFHxS)	**<0.9**	0.24 U	0.24 U	0.24 U	0.23 U	0.23 U	**0.71 J**	0.24 U	0.24 U	**0.74 J**	0.235 U	0.057 U	0.224 U	0.159 J	0.194 U	0.21 U	0.212 U	0.057 U	0.07 J
Perfluorooctanoic acid (PFOA)	**5.2**	**2.9**	**1.9**	0.50 J	**4.6**	**2.4**	**23**	0.58 J	0.32 J	**2.9**	0.334 J	0.223 J	0.166 J	**0.979 J**	0.135 U	0.146 U	0.159 J	0.447 J	**1.32**
Perfluorononanoic acid (PFNA)	**2.4**	**2.5**	0.22 U	0.22 U	**7.3**	**1.5**	**10**	0.22 U	0.22 U	**10**	0.292 U	0.285 J	0.277 U	0.296 J	0.241 U	0.261 U	0.263 U	**5.46**	**2.66**
Perfluorooctane sulfonate (PFOS)	1.5	0.26 U	0.26 U	0.26 U	**23**	0.66 J	**7.6**	0.26 U	0.26 U	**2.3**	0.505 U	0.575 J	0.481 U	1.05 J	0.418 U	0.452 U	0.456 U	**20.3**	**8.85**
Perfluorodecanoic Acid (PFDA)	**8.7**	0.28 U	0.28 U	0.28 U	**0.66 J**	**7.4**	**9.6**	0.28 U	0.28 U	0.28 U	0.26 U	0.181 J	0.248 U	0.167 J	0.215 U	0.233 U	0.235 U	**0.834 J**	**0.383 J**
6:2 Fluorotelomer sulfonate (6:2 FTS)	30	4.1	4.4	6.7	62	320	230	0.67 J	0.30 J	64	0.698 U	0.168 U	0.664 U	0.19 U	0.577 U	0.625 U	0.629 U	7.49	11.7
Total PFAS	91.5	11.07	6.82	7.63	108.56	521.26	598.24	50.11	21.22	116.64	4.523	2.269	0.628	4.84	0	0	0.68	66.813	41.988
Sum of Six (PFHpA,PFHxS,PFOA, PFOS, PFNA, and PFDA)	19.6	6.7	2.21	0.73	36.76	13.56	55.81	0.94	0.32	17.34	0.334	1.402	0.166	2.97	0	0	0.159	27.15	13.764

Sample Location	Method 1 Standard		Deployment Area																
Sample ID			DL22 (18-20)	DL23 (0-1)	D1 (0-1')	D2 (0-1')	D3 (0-1')	D4 (0-1')	D5 (0-1')	D6 (0-1')	D7 (0-1')	D8 (0-1')	D9 (0-1')	D10 (0-1')	D11 (0-1')	D12 (0-1')	HW-F (10-12')	HW-F (14-16')	HW-3 (0-1')	MCI Drill (0-1)	Annual Deployment (0-1)
Sample Date	S-1/GW-1	S-1/GW-3	9/25/2020	9/29/2020	8/14/2018	8/14/2018	8/14/2018	8/14/2018	8/14/2018	8/14/2018	8/14/2018	8/14/2018	8/14/2018	8/14/2018	8/14/2018	8/14/2018	10/4/2018	10/4/2018	10/9/2018	12/9/2016	12/9/2016
Perfluoroheptanoic acid (PFHpA)	0.5	300	0.073 J	0.24 J	0.19 U	0.21 J	0.19 U	**0.95 J**	0.22 J	0.25 J	**7.8**	**1.0**	**2.7**	0.19 U	0.19 U	0.19 U	0.32 J	**1.3**	0.19 U	**8.4**	**20**
Perfluorohexanesulfonic acid (PFHxS)	0.3	300	0.059 U	0.134 J	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	**0.31 J**	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	**0.5 J**	**4 U**
Perfluorooctanoic acid (PFOA)	0.72	300	0.176 J	0.471 J	0.25 U	0.33 J	0.25 U	**1.1**	0.25 U	0.28 J	**14**	**2.2**	**3**	0.25 U	0.25 U	0.25 U	0.25 U	**1.4**	0.25 U	**23**	**100**
Perfluorononanoic acid (PFNA)	0.32	300	**0.476 J**	0.176 J	0.22 U	**0.67 J**	0.22 U	**0.98 J**	0.22 U	0.22 U	**10**	**0.59 J**	**0.83 J**	0.22 U	0.22 U	0.32 J	0.22 U	0.22 U	0.22 U	**14**	**31**
Perfluorooctane sulfonate (PFOS)	2	300	1.18	0.725 J	0.26 U	0.66 J	0.38 J	**2.9**	0.26 U	0.26 U	**3.4**	**2.1**	0.67 J	0.54 J	0.91 J	0.44 J	0.26 U	0.26 U	0.26 U	**24**	1.9 J
Perfluorodecanoic Acid (PFDA)	0.3	300	0.065 U	0.266 J	0.28 U	0.28 U	0.28 U	**0.40 J**	0.28 U	**0.66 J**	**8.6**	**1.3**	**1.6**	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	**20**	**69**
6:2 Fluorotelomer sulfonate (6:2 FTS)	NA	NA	2.67	0.181 U	0.26 U	0.26 U	0.26 U	0.26 U	0.78 J	1.2	12	0.26 U	6.6	0.26 U	0.26 U	0.26 U	24	140	0.26 U	270	4300
Sum of Laboratory Reported PFAS (Total PFAS) and Sum of Si																					
Total PFAS	NA	NA	11.352	4.053	0.74	1.87	0.94	11.42	3.01	9.06	151.24	24.61	43.41	0.83	1.62	1.47	25.27	146.5	0	1,524	5,972.9
Sum of Six (PFHpA,PFHxS,PFOA, PFOS, PFNA, and PFDA)	NA	NA	1.905	2.012	0	1.87	0.38	6.33	0.22	1.19	43.8	7.5	8.8	0.54	0.91	0.76	0.32	2.7	0	89.9	221.9

Sample Location	Method 1 Standard		1991 Drill Location					
Sample ID			1991A (0-1')	1991B (0-1')	1991C (0-1')	1991D (0-1')	1991A-B (3-4')	1991C-D (2-3')
Sample Date	S-1/GW-1	S-1/GW-3	8/14/2018	8/14/2018	8/14/2018	8/14/2018	12/14/2018	12/14/2018
Perfluoroheptanoic acid (PFHpA)	0.5	300	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
Perfluorohexanesulfonic acid (PFHxS)	0.3	300	0.24 U	**0.66 J**	0.24 U	0.24 U	0.24 U	0.24 U
Perfluorooctanoic acid (PFOA)	0.72	300	0.25 U	0.26 J	0.25 U	0.25 U	0.25 U	0.25 U
Perfluorononanoic acid (PFNA)	0.32	300	0.22 U	0.22 U	0.22 U	0.30 J	0.22 U	0.22 U
Perfluorooctane sulfonate (PFOS)	2	300	0.49 J	1.1	0.55 J	0.36 J	0.30 J	0.42 J
Perfluorodecanoic Acid (PFDA)	0.3	300	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U
6:2 Fluorotelomer sulfonate (6:2 FTS)	NA	NA	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
Sum of Laboratory Reported PFAS (Total PFAS) and Sum of Si								
Total PFAS	NA	NA	0.49	3.18	0.55	0.66	0.3	0.42
Sum of Six (PFHpA,PFHxS,PFOA, PFOS, PFNA, and PFDA)	NA	NA	0.49	2.02	0.55	0.66	0.3	0.42

Notes:
< = Not detected by the laboratory above the reporting limit. Reporting limit shown.
J = Estimated concentration between the method detection limit and reporting limit.
Results in ug/kg, micrograms per kilogram.
U= Not detected by the Laboratory above the method detection limit. Method detection limit shown.
Bold results above the proposed Method 1 S-1/GW-1 standard.
Total PFAS is the sum of all laboratory detected PFAS analytes including estimated values and does not include non-detects (U or <).
Sum of six includes estimated values and does not include non-detects (U or <).

Table 3. Groundwater Results for PFAS ug/L

Sample Location	North Ramp											Lewis Pond Area
Sample ID	HW-1	HW-1	HW-1	HW-4M	HW-5	HW-5	HW-5	HW-23	HW-23	HW-19D	HW-19D	HW-401S
Sample Date	7/1/2016	6/20/2017	11/1/2018	4/5/2017	7/1/2016	4/7/2017	11/1/2018	6/20/2017	11/1/2018	6/20/2017	11/7/2018	4/7/2017
TOC Elevation	51.51	51.51	51.51	54.02	54.98	54.98	54.98	50.65	50.65	49.10	49.10	41.58
Depth to Groundwater	21.63	25.00	21.83	26.20	24.94	26.75	25.27	22.70	24.01	21.29	22.19	17.95
Groundwater Elevation	29.88	26.51	29.68	27.82	30.04	28.23	29.71	27.95	26.64	27.81	26.91	23.63
Total Well Depth	30.84	30.84	30.84	32.32	27.80	27.80	27.80	28.11	28.11	41.30	41.30	23.60
Perfluoroheptanoic acid (PFHpA)	0.01	0.0042 J	0.013 J	0.007 J	0.0041	0.0084 J	0.0074 U	0.0045J	0.0098 J	0.0052 J	0.0080 J	0.0043 J
Perfluorohexanesulfonic acid (PFHxS)	0.018	0.065	0.018 J	0.02	0.011	0.018 J	0.0056 U	0.021	0.023	0.046	0.045	0.011 J
Perfluorononanoic acid (PFNA)	<0.002	0.0057 J	0.0087 U	0.0046 U	<0.002	0.0046 U	0.0088 J	0.0038 U	0.0087 U	0.0065 J	0.0087 U	0.0046 U
Perfluorooctanoic acid (PFOA)	0.017	0.022	0.031	0.011 J	0.12	0.020 J	0.011 J	0.0046 U	0.011 J	0.017 J	0.014 J	0.0046 U
Perfluorooctane sulfonate (PFOS)	0.033	0.24	0.028	0.043	0.031	0.052	0.12	0.0079 J	0.015 J	0.061	0.069	0.012 J
Perfluorodecanoic Acid (PFDA)	NA	0.0040 U	0.0061 U	0.0040 U	NA	0.0040 U	0.0061 U	0.0040 U	0.0061 U	0.0040 U	0.0061 U	0.0040 U
6:2 Fluorotelomer sulfonate (6:2 FTS)	NA	0.0032 U	0.0066 U	0.0038 J	NA	0.0037 J	0.0066 U	0.0032 U	0.0066 U	0.0032 U	0.0066 U	0.004 J
Sum of Laboratory Reported PFAS (Total PFAS) and Sum of Six												
Total PFAS	0.078	0.4247	0.15	0.1162	0.1661	3.0021	0.1507	0.0745	0.0858	0.1758	0.16	0.0313
Sum of Six (PFHpA,PFHxS,PFOA, PFOS, PFNA, and PFDA)	**0.078**	**0.3369**	**0.09**	**0.081**	**0.1661**	**0.0984**	**0.1398**	**0.0334**	**0.0588**	**0.1357**	**0.136**	**0.0273**

Sample Location	Airport Road/Iyannough Road Area									
Sample ID	HW-A(S)	HW-B(S)	HW-B(S)	HW-B(D)	HW-C	HW-M	HW-N	HW-O	HW-U(d)	HW-V(m)
Sample Date	4/7/2017	4/7/2017	10/26/2018	10/26/2018	4/7/2017	6/24/2019	6/24/2019	7/2/2019	10/2/2020	10/2/2020
TOC Elevation	55.34	51.84	51.84	51.95	69.25	53.69	49.49	43.46	48.80	53.83
Depth to Groundwater	24.62	22.26	21.59	21.66	38.50	20.32	15.48	3.62	24.66	22.90
Groundwater Elevation	30.72	29.58	30.25	30.29	30.75	33.37	34.01	39.84	24.14	30.93
Total Well Depth	32.00	30.23	30.23	57.20	42.15	26.92	22.33	14.10	62.30	36.15
Perfluoroheptanoic acid (PFHpA)	0.0048 J	0.049	0.012 J	0.0074 U	0.0033 U	0.007	0.0034	<0.002	0.01	0.0033
Perfluorohexanesulfonic acid (PFHxS)	0.0079 J	0.044	0.047	0.0056 U	0.0034 U	0.016	0.033	0.0043	0.018	0.0032
Perfluorononanoic acid (PFNA)	0.0046 U	0.0046 U	0.0087 U	0.0087 U	0.0046 U	<0.002	<0.002	<0.002	0.0016 J	0.0017 J
Perfluorooctanoic acid (PFOA)	0.0026 U	0.0094 J	0.020 J	0.012 J	0.0026 U	0.027	0.0088	0.0039	0.01	0.0063
Perfluorooctane sulfonate (PFOS)	0.0046 U	0.026	0.019 J	0.010 J	0.0046 U	0.0074	0.004	0.017	0.023	0.0059
Perfluorodecanoic Acid (PFDA)	0.0040 U	0.0040 U	0.0061 U	0.0061 U	0.0040 U	<0.002	<0.002	0.0021	<0.002	<0.002
6:2 Fluorotelomer sulfonate (6:2 FTS)	0.0032 U	0.0032 U	0.0066 U	0.0066 U	0.0034 J	0.002 U	0.002 U	0.002 U	0.0012	0.00039 U
Total PFAS	0.0779	0.4561	0.186	0.0465	0.0034	0.0927	0.0727	0.0585	0.0889	0.0543
Sum of Six (PFHpA,PFHxS,PFOA, PFOS, PFNA, and PFDA)	0.0127	**0.1284**	**0.098**	**0.022**	<0.0046	**0.0574**	**0.0492**	**0.0273**	**0.0588**	**0.0204**

Sample Location	ARFF Building Area								
Sample ID	HW-L (s)	HW-L (m)	HW-L (d)	HW-L (d)	HW-P (s)	HW-P (m)	HW-Q (s)	HW-Q (s)	HW-Q (m)
Sample Date	10/7/2020	10/7/2020	6/19/2019	10/7/2020	10/1/2020	10/1/2020	10/1/2020	11/6/2020	10/1/2020
TOC Elevation	39.07	38.98	39.15	39.15	40.51	40.64	37.89	37.89	37.90
Depth to Groundwater	21.96	21.88	19.40	22.22	22.69	22.80	21.45	22.04	21.41
Groundwater Elevation	17.11	17.10	19.75	16.93	17.82	17.84	16.44	15.85	16.49
Total Well Depth	27.33	37.33	70.55	70.55	27.60	38.30	26.60	26.60	36.79
Perfluoroheptanoic acid (PFHpA)	0.00053 U	0.0064	0.0078	0.0065	0.026	0.003	0.0018 J	0.0021	<0.002
Perfluorohexanesulfonic acid (PFHxS)	0.0013	0.023	0.033	0.015	0.0018 J	0.00085	0.013	0.0087	0.0019 J
Perfluorononanoic acid (PFNA)	0.00063 U	0.0025	0.0033	0.0022	0.0061	0.0011 J	<0.002	<0.002	0.00075 J
Perfluorooctanoic acid (PFOA)	0.00071 U	0.01	0.025	0.018	0.0084	0.0018 J	0.0049	0.0062	0.00095 J
Perfluorooctane sulfonate (PFOS)	0.0014	0.07	0.049	0.039	0.00097	0.0011 J	0.0041	0.0075	0.0049
Perfluorodecanoic Acid (PFDA)	0.00062 U	0.00062 U	<0.002	0.0019	0.00085	<0.002	<0.002	<0.002	<0.002
6:2 Fluorotelomer sulfonate (6:2 FTS)	0.00039 U	0.022	0.0021	0.00078	0.011	0.00092	0.00039 U	0.00039 U	0.00039 U
Total PFAS	0.0027	0.18375	0.1823	0.12348	0.2478	0.02967	0.0307	0.0346	0.00944
Sum of Six (PFHpA,PFHxS,PFOA, PFOS, PFNA, and PFDA)	0.0027	**0.1119**	**0.1181**	**0.0826**	**0.04412**	0.00785	**0.0238**	**0.0245**	0.0085

Sample Location	Solar Field								
Sample ID	HW-D (m)	HW-D (m)	HW-D (d)	HW-D (d)	HW-D (dd)	HW-D (dd)	HW-G(S)	HW-G(M)	HW-G(D)
Sample Date	4/7/2017	5/13/2020	6/24/2019	5/13/2020	6/24/2019	5/13/2020	12/3/2018	12/3/2018	12/3/2018
TOC Elevation	45.20	45.20	45.08	45.08	45.05	45.05	44.99	45.11	44.93
Depth to Groundwater	18.83	18.34	18.99	18.23	20.60	19.97	20.69	20.75	20.71
Groundwater Elevation	26.37	26.86	26.09	26.85	24.45	25.08	24.30	24.36	24.22
Total Well Depth	30.32	30.32	44.94	44.94	65.05	65.05	28.45	38.25	48.28
Perfluoroheptanoic acid (PFHpA)	0.0033 U	<0.002	0.021	0.017	<0.002	<0.002	0.0074 U	0.0074 U	0.0074 U
Perfluorohexanesulfonic acid (PFHxS)	0.0089 J	<0.002	0.062	0.039	0.0092	0.008	0.0056 U	0.012 J	0.0056 U
Perfluorononanoic acid (PFNA)	0.0046 U	<0.002	0.015	0.019	0.0041	0.0029	0.0087 U	0.011 J	0.0087 U
Perfluorooctanoic acid (PFOA)	0.0046 U	<0.002	0.0088	0.0076	<0.002	<0.002	0.0033 U	0.0033 U	0.0033 U
Perfluorooctane sulfonate (PFOS)	0.022	0.0011	0.095	0.12	0.013	0.013	0.0060 U	0.036	0.0060 U
Perfluorodecanoic Acid (PFDA)	0.0040 U	<0.002	<0.002	<0.002	<0.002	<0.002	0.0061 U	0.0061 U	0.0061 U
6:2 Fluorotelomer sulfonate (6:2 FTS)	0.0032 U	0.00039 U	0.0022	0.00039 U	0.002 U	0.00039 U	0.0066 U	0.0066 U	0.0066 U
Total PFAS	0.0309	0.0011	0.2768	0.24993	0.0263	0.02444	0	0.059	0
Sum of Six (PFHpA,PFHxS,PFOA, PFOS, PFNA, and PFDA)	**0.0309**	0.0011	**0.2018**	**0.2026**	**0.0263**	**0.0239**	0.0087 U	**0.059**	0.0087 U

Sample Location	Deployment Area										
Sample ID	HW-I (s)	HW-I (s)	HW-I (m)	HW-I (m)	HW-I (d)	HW-I (d)	HW-J	HW-E	HW-E	HW-E	HW-E
Sample Date	11/7/2018	5/8/2020	6/24/2019	5/8/2020	6/24/2019	5/8/2020	11/7/2018	4/5/2017	11/7/2018	8/19/2019	5/5/2020
TOC Elevation	36.08	36.08	36.27	36.27	36.02	36.02	37.10	38.45	38.45	38.45	38.45
Depth to Groundwater	18.35	15.39	16.33	15.61	16.20	15.49	19.18	19.05	19.38	17.82	16.16
Groundwater Elevation	17.73	20.69	19.94	20.66	19.82	20.53	17.92	19.40	19.07	20.63	22.29
Total Well Depth	25.10	25.10	34.80	34.80	41.67	41.67	24.30	26.22	26.22	26.22	26.22
Perfluoroheptanoic acid (PFHpA)	0.2	0.54	0.0032	0.0012	0.0053	0.0046	0.025	0.15	0.0074 U	0.0053	0.044
Perfluorohexanesulfonic acid (PFHxS)	0.18	0.22	0.019	0.0091	0.057	0.018	0.0056 U	0.042	0.0056 U	0.0021	0.011
Perfluorononanoic acid (PFNA)	0.16	0.082	<0.002	0.00078	<0.002	<0.002	0.028	0.0087 J	0.0087 U	<0.002	0.0052
Perfluorooctanoic acid (PFOA)	0.26	0.29	0.0061	0.0018	0.0047	0.0028	0.026	0.053	0.0033 U	0.0047	0.027
Perfluorooctane sulfonate (PFOS)	0.066	0.04	0.014	0.014	0.012	0.02	0.13	0.047	0.0060 U	<0.002	0.0037
Perfluorodecanoic Acid (PFDA)	0.012 U	<0.002	<0.002	<0.002	<0.002	<0.002	0.0061 U	0.0040 U	0.0061 U	<0.002	<0.002
6:2 Fluorotelomer sulfonate (6:2 FTS)	11	13	0.002 U	0.00039 U	0.002 U	0.0016	0.68	2	0.0066 U	0.069	0.86
Sum of Laboratory Reported PFAS (Total PFAS) and Sum of Six											
Total PFAS	13.346	15.5383	0.0718	0.03308	0.1367	0.08985	1.074	3.2257	0	0.14	1.04526
Sum of Six (PFHpA,PFHxS,PFOA, PFOS, PFNA, and PFDA)	**0.866**	**1.172**	**0.0423**	**0.02688**	**0.079**	**0.0454**	**0.209**	**0.3007**	0.0087 U	0.0121	**0.0909**

Sample Location	Deployment Area									
Sample ID	HW-F	HW-F	HW-F	HW-H	HW-H	HW-R	HW-S (s)	HW-S (m)	HW-T (s)	HW-T (m)
Sample Date	4/5/2017	11/7/2018	5/5/2020	11/7/2018	5/8/2020	10/1/2020	10/1/2020	10/1/2020	10/1/2020	10/1/2020
TOC Elevation	36.32	36.32	36.32	38.47	38.47	35.72	31.60	31.59	28.97	29.11
Depth to Groundwater	19.60	20.08	16.82	20.39	17.37	18.33	16.88	17.01	13.41	13.58
Groundwater Elevation	16.72	16.24	19.50	18.08	21.10	17.39	14.72	14.58	15.56	15.53
Total Well Depth	26.89	26.89	26.89	27.09	27.09	23.56	22.10	32.04	18.54	28.96
Perfluoroheptanoic acid (PFHpA)	0.34	0.0074 U	0.23	0.077	0.28	0.021	0.11	0.00096 J	0.0039	0.022
Perfluorohexanesulfonic acid (PFHxS)	0.019J	0.0056 U	0.005	0.0056 U	0.0031	0.02	0.055	0.0064	0.17	0.019
Perfluorononanoic acid (PFNA)	0.0046 U	0.0087 U	0.00081	0.0087 U	<0.002	0.0031	0.1	<0.002	0.00074 J	0.0032
Perfluorooctanoic acid (PFOA)	0.075	0.0033 U	0.02	0.0050 J	0.002	0.014	0.062	0.0013 J	0.0067	0.011
Perfluorooctane sulfonate (PFOS)	0.0026 U	0.0060 U	0.00086	0.0060 U	<0.002	0.016	0.1	0.0058	0.21	0.025
Perfluorodecanoic Acid (PFDA)	0.0040 U	0.0061 U	<0.002	0.0061 U	<0.002	<0.002	<0.002	<0.002	<0.002	0.0014
6:2 Fluorotelomer sulfonate (6:2 FTS)	5.7	0.0066 U	1.5	1.5	0.13	0.037	3.7	0.0065	0.00039 U	0.00039 U
Total PFAS	12.96	0.084	2.65637	4.452	1.26666	0.2171	4.8958	0.02471	0.44114	0.3254
Sum of Six (PFHpA,PFHxS,PFOA, PFOS, PFNA, and PFDA)	**0.434**	0.0087 U	**0.25667**	**0.082**	**0.2851**	**0.0741**	**0.427**	0.01446	**0.39134**	**0.0816**

Sample Location	Maher Wells													Yarmouth Road	
Sample ID	OW-9S	OW-9S	OW-9S	OW-9M	OW-9M	OW-9D	OW-9D	OW-9D	OW-9DD	OW-9DD	OW-9DD	ME-1*	ME-2**	ME-3***	RB-1 (s)	RB-1 (m)
Sample Date	7/5/2016	12/3/2018	5/8/2020	12/3/2018	5/8/2020	7/5/2016	12/3/2018	5/5/2020	4/11/2017	12/3/2018	10/2/2020	9/17/2020	9/17/2020	9/17/2020	11/5/2020	11/5/2020
TOC Elevation	23.25	23.25	23.25	23.53	23.53	23.22	23.22	23.22	23.81	23.81	23.81	NA	NA	NA	NA	NA
Depth to Groundwater	12.23	10.80	10.14	11.11	10.45	12.48	10.82	10.15	12.10	11.30	13.04	3.60	6.50	6.00	17.87	17.79
Groundwater Elevation	11.02	12.45	13.11	12.42	13.08	10.74	12.40	13.07	11.71	12.51	10.77	NA	NA	NA	NA	NA
Total Well Depth	21.35	21.35	21.35	56.20	56.20	68.63	68.63	68.63	86.75	86.75	86.75	81.20	54.20	50.30	27.83	49.85
Perfluoroheptanoic acid (PFHpA)	0.014	0.048	0.0064	0.11	0.0061	0.0028	0.033	0.044	0.034	0.015 J	0.0085	0.011	0.0055	0.0036	0.0042	0.011
Perfluorohexanesulfonic acid (PFHxS)	<0.003	0.023	0.011	0.0056 U	0.0033	0.012	0.12	0.18	0.12	0.042	0.019	0.03	0.04	0.018	0.0084	0.01
Perfluorononanoic acid (PFNA)	0.0077	0.0087 U	0.0033	0.044	0.0037	0.0036	0.1	0.15	0.059	0.038	0.018	0.017	0.003	0.004	0.0047	0.0068
Perfluorooctanoic acid (PFOA)	0.0074	0.032	0.0043	0.052	0.0035	0.041	0.057	0.088	0.055	0.020 J	0.01	0.016	0.0077	0.012	0.007	0.013
Perfluorooctane sulfonate (PFOS)	0.007	0.024	0.0058	0.0081 J	0.01	0.0052	0.52	0.72	0.5	0.14	0.049	0.11	0.095	0.072	0.038	0.049
Perfluorodecanoic Acid (PFDA)	NA	0.0061 U	<0.002	0.0061 U	<0.002	NA	0.0061 U	<0.002	0.0040 U	0.0061 U	<0.002	<0.002	<0.002	<0.002	<0.002	0.00075 J
6:2 Fluorotelomer sulfonate (6:2 FTS)	NA	0.0066 U	0.00039 U	0.64	0.0049	NA	0.19	0.23	0.13	0.062	0.02	0.034	0.00039 U	0.0071	0.00039 U	0.038
Total PFAS	0.0361	0.618	0.06678	1.7141	0.0816	0.0646	1.217	1.5845	1.02	0.39	0.169	0.2873	0.2009	0.14005	0.08008	0.2015
Sum of Six (PFHpA,PFHxS,PFOA, PFOS, PFNA, and PFDA)	**0.0361**	**0.127**	**0.0308**	**0.2141**	**0.0266**	**0.0646**	**0.83**	**1.182**	**0.768**	**0.255**	**0.1045**	**0.184**	**0.1512**	**0.1096**	**0.0623**	**0.09055**

Sample Location	Maher Wells														
Sample ID	OW-18S	OW-18S	OW-18S	OW-18M	OW-18M	OW-18M	OW-18D	OW-18D Duplicate	OW-18D	OW-18D	OW-18D	OW-19(S)	OW-19(M)	OW-19D	OW-19D
Sample Date	7/5/2016	12/7/2018	5/8/2020	7/5/2016	12/7/2018	5/8/2020	7/5/2016	7/5/2016	4/11/2017	12/7/2018	5/13/2020	11/6/2020	11/6/2020	4/11/2017	5/13/2020
TOC Elevation	39.03	39.03	39.03	39.30	39.30	39.30	38.84	38.84	38.84	38.84	38.84	NA	NA	39.06	39.06
Depth to Groundwater	24.40	24.29	23.45	25.82	24.72	23.93	25.95	25.95	25.55	24.28	23.47	27.38	27.57	26.73	25.64
Groundwater Elevation	14.63	14.74	15.58	13.48	14.58	15.37	12.89	12.89	13.29	14.56	15.37	NA	NA	12.33	13.42
Total Well Depth	31.23	31.23	31.23	74.44	74.44	74.44	123.36	123.36	123.36	123.36	123.36	34.56	76.28	110.42	110.42
Perfluoroheptanoic acid (PFHpA)	0.0071	0.0074 U	0.0039	0.0029	0.0074 U	0.0074	0.0071	0.0063	0.015J	0.014 J	0.012	0.0042	0.03	0.0051 J	0.011
Perfluorohexanesulfonic acid (PFHxS)	0.0068	0.0056 U	0.0085	0.016	0.073	0.07	0.01	0.011	0.13	0.13	0.03	0.0031	0.027	0.029	0.12
Perfluorononanoic acid (PFNA)	<0.002	0.0087 U	0.0032	0.0076	0.0087 U	0.0027	0.0065	0.0058	0.0046 U	0.0087 U	0.0028	0.0024	0.002	0.006 J	0.0017
Perfluorooctanoic acid (PFOA)	0.0083	0.012 J	0.01	0.044	0.0060 J	0.0096	0.018	0.019	0.025	0.019 J	0.0095	0.011	0.011	0.0046 U	0.023
Perfluorooctane sulfonate (PFOS)	0.018	0.028	0.016	0.0058	0.24	0.18	0.0059	0.0059	0.22	0.32	0.041	0.025	0.047	0.029	0.31
Perfluorodecanoic Acid (PFDA)	NA	0.0061 U	<0.002	NA	0.0061 U	<0.002	NA	NA	0.0040 U	0.0061 U	<0.002	0.0027	<0.002	0.0040 U	<0.002
6:2 Fluorotelomer sulfonate (6:2 FTS)	NA	0.0066 U	0.00039 U	NA	0.0066 U	0.00039 U	NA	NA	0.0032 U	0.0066 U	0.00039 U	0.00039 U	0.00095	0.0032 U	0.00039 U
Sum of Laboratory Reported PFAS (Total PFAS) and Sum of Six															
Total PFAS	0.0402	0.0573	0.05953	0.0763	0.3891	0.4357	0.0475	NA	0.506	0.5504	0.1832	0.0707	0.37335	0.0936	0.5463
Sum of Six (PFHpA,PFHxS,PFOA, PFOS, PFNA, and PFDA)	**0.0402**	**0.04**	**0.0416**	**0.0763**	**0.319**	**0.2697**	**0.0475**	**0.048**	**0.39**	**0.483**	**0.0953**	**0.0484**	**0.117**	**0.0691**	**0.4657**

Sample Location	Steamship Parking Lot											
Sample ID	HW-2	HW-2	HW-3	HW-3	HW-3	HW-3	HW-300	HW-301	HW-302	HW-302	HW-K	HW-K
Sample Date	7/1/2016	5/5/2020	7/1/2016	4/5/2017	10/26/2018	5/5/2020	7/1/2016	7/1/2016	7/1/2016	12/3/2018	6/19/2019	5/21/2020
TOC Elevation	40.41	40.41	38.74	38.74	38.74	38.74	36.09	39.46	41.17	41.17	37.70	37.70
Depth to Groundwater	27.48	25.33	25.81	25.70	26.06	23.64	22.52	25.05	23.52	22.65	20.88	20.56
Groundwater Elevation	12.93	15.08	12.93	13.04	12.68	15.10	13.57	14.41	17.65	18.52	16.82	17.14
Total Well Depth	32.01	32.01	30.08	30.08	30.08	30.08	30.33	30.42	30.45	30.45	44.18	44.18
Perfluoroheptanoic acid (PFHpA)	0.0071	0.035	0.016	0.1	0.10	0.1	0.0096	0.002	0.019	0.015 J	0.0051	0.0028
Perfluorohexanesulfonic acid (PFHxS)	0.0035	0.0066	0.0043	0.020 J	0.012 J	0.0087	0.012	0.038	0.0063	0.016 J	<0.002	0.001
Perfluorononanoic acid (PFNA)	<0.002	0.016	0.0063	0.027	0.023	0.021	<0.002	<0.002	0.054	0.0097 J	<0.002	0.0012
Perfluorooctanoic acid (PFOA)	0.012	0.039	0.084	0.065	0.057	0.054	0.017	0.011	0.014	0.03	0.0041	0.0019
Perfluorooctane sulfonate (PFOS)	0.0063	0.053	0.0091	0.15	0.053	0.1	0.0052	0.0037	0.033	0.031	<0.002	0.0016
Perfluorodecanoic Acid (PFDA)	NA	<0.002	NA	0.0040 U	0.0061 U	0.0014	NA	NA	NA	0.0061 U	<0.002	<0.002
6:2 Fluorotelomer sulfonate (6:2 FTS)	NA	0.15	NA	0.47	0.12	0.13	NA	NA	NA	0.13	0.002 U	0.00039 U
Total PFAS	0.0289	0.42678	0.1197	1.603	0.952	0.96981	0.0438	0.0547	0.1263	0.3427	0.0348	0.0275
Sum of Six (PFHpA,PFHxS,PFOA, PFOS, PFNA, and PFDA)	**0.0289**	**0.1496**	**0.1197**	**0.362**	**0.245**	**0.2851**	**0.0438**	**0.0547**	**0.1263**	**0.1017**	0.0092	0.0085

Notes:

< = Not detected by the laboratory above the reporting limit. Reporting limit shown.
J = Estimated concentration between the method detection limit and reporting limit
Results in ug/L, micrograms per liter.
U= Not detected by the Laboratory above the method detection limit. Method detection limit shown.
Bold results above Method 1 GW-1 standard (0.02 ug/L).
Sum of six includes estimated values and does not include non-detects (U or <).
Total PFAS is the sum of all laboratory detected PFAS analytes including estimated values and does not include non-detects (U or <).
NA = Not Applicable.
* = ME-1 is screened from 37 to 47 and 70 to 80 feet below grade.
** = ME-2 is screened from 44 to 54 feet below grade.
*** = ME-3 is screened from 40 to 50 feet below grade.
The Method 1 GW-3 Standard for the individual analytes in the Sum of Six ranges from 500 to 40,000 ug/l

Table 4 - Groundwater Results for 1,4 Dioxane ug/L

Sample Location	North Ramp															Airport Road/Iyannough Road Area							ARFF Building			
Sample ID	**HW-1**	**HW-1**	**HW-5**	**HW-12**	**OW-6**	**OW-6**	**HW-4M**	**HW-4D**	**HW-204**	**HW-29**	**HW-207S**	**HW-207D**	**HW-207D**	**HW-19D**	**HW-19D**	**HW-A(D)**	**HW-A(D)**	**HW-B(D)**	**HW-N**	**HW-O**	**HW-U(d)**	**HW-V(m)**	**HW-L(s)**	**HW-L(m)**	**HW-L(d)**	**HW-L(d)**
Sample Date	**5/7/2015**	**8/5/2019**	**5/7/2015**	**5/7/2015**	**5/7/2015**	**9/27/2019**	**4/5/2017**	**4/5/2017**	**9/27/2019**	**9/27/2019**	**9/27/2019**	**4/5/2017**	**9/27/2019**	**4/5/2017**	**9/27/2019**	**4/5/2017**	**8/5/2019**	**4/5/2017**	**8/5/2019**	**8/5/2019**	**10/2/2020**	**10/2/2020**	**10/7/2020**	**10/7/2020**	**7/2/2019**	**5/13/2020**
1,4-Dioxane	<0.152	<0.25	<0.150	<0.150	<0.150	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	**0.73**	**0.8**	<0.2	<0.2	**0.727**	**0.75**

Sample Location	**Maher Well Field**														
Sample ID	**OW-9M**	**OW-9D**	**OW-9D**	**OW-9D**	**OW-9DD**	**OW-9DD**	**OW-9DD**	**OW-18M**	**OW-18D**	**OW-18D**	**OW-18D**	**OW-19M**	**OW-19D**	**OW-19D**	**OW-19D**
Sample Date	**5/28/2015**	**5/28/2015**	**12/3/2018**	**5/5/2020**	**5/28/2015**	**4/11/2017**	**12/3/2018**	**4/11/2017**	**4/11/2017**	**12/7/2018**	**5/13/2020**	**4/11/2017**	**4/11/2017**	**12/7/2018**	**5/13/2020**
1,4-Dioxane	<0.141	<0.141	<0.25	<0.19	**0.926**	**0.838**	**0.732**	<0.25	**0.552**	<0.25	**0.35**	<0.25	**0.800**	<0.25	**0.3**

Notes:
Results in ug/L, micrograms per liter.
< = Not detected by the laboratory above the reporting limit. Reporting limit shown.
Bold results above Method 1 GW-1 standard (0.3 ug/L).
The Method 1 GW-2 standard for 1,4-dioxane is 6,000 ug/l.
The Method 1 GW-3 standard for 1,4-dioxane is 50,000 ug/l.

Table 5. ARFF Concentrate Analytical Results ug/L

Sample ID	Foam Mix	
Sample Date	12/9/2016	
Perfluoroheptanoic acid (PFHpA)	3.4	J
Perfluorohexanesulfonic acid (PFHxS)	2.1	J
Perfluorononanoic acid (PFNA)	93	
Perfluorooctanoic acid (PFOA)	19	
Perfluorooctane sulfonate (PFOS)	5	U
Perfluorodecanoic Acid (PFDA)	2.8	J
6:2 FTS	33	
Total PFAS	222.5	
Sum of Six (PFHpA,PFHxS,PFOA, PFOS, PFNA, and PFDA)	120.3	

Notes:

1. U = Not detected by the laboratory above the Method Detection Limit. Method Detection Limit shown.
2. Results in ug/L, micrograms per liter.
3. Total PFAS is the sum of all laboratory detected PFAS analytes including estimated values and does not include non-detects (U).
4. Sample is AFFF concentrate.
5. J = Estimated concentration between the Method Detection Limit and the Laboratory Reporting Limit.

Table 6. SPLP Results ug/L

Sample ID	DL4 4'	DL5 2'	DL8 (4')	DL14(0-1')	Stockpile West	Stockpile East
Sample Date	9/26/2017	9/26/2017	9/26/2017	9/26/2017	10/10/2017	10/10/2017
Perfluoroheptanoic acid (PFHpA)	0.011 U	0.011 U	0.065 J	0.17	0.011 U	0.011 U
Perfluorohexanesulfonic acid (PFHxS)	0.0072 U	0.0072 U	0.036 U	0.01 J	0.0072 U	0.0072 U
Perfluorononanoic acid (PFNA)	0.16	0.0032 U	0.052 J	0.37	0.0032 U	0.0032 U
Perfluorooctanoic acid (PFOA)	0.012 J	0.042	0.6	0.87	0.0037 U	0.0037 U
Perfluorooctane sulfonate (PFOS)	0.013 J	0.0072 U	0.036 U	0.19	0.0072 U	0.0072 U
Perfluorodecanoic Acid (PFDA)	0.0052 U	0.0052 U	0.026 U	0.34	0.0052 U	0.0052 U
6:2 FTS	0.067	0.0072 U	25	7.13	0.034 J	0.024 J
Total PFAS	0.195	0.042	26.25	20.195	0.034	0.024
Sum of Six (PFHpA,PFHxS,PFOA, PFOS, PFNA, and PFDA)	0.185	0.042	0.717	1.95	0.011 U	0.011 U

Notes:

1. U = Not detected by the laboratory above the Method Detection Limit. Method Detection Limit shown.
2. Results in ug/L, micrograms per liter.
3. Total PFAS is the sum of all laboratory detected PFAS analytes including estimated values and does not include non-detects (U).
4. J = Estimated value between laboratory Method Detection Limit and Reporting Limit.

Table 7: Background PFAS Levels in Soil and Soil Stock Pile Samples

			Background Sample Locations																						
Sample ID	Method 1 Standard		Stockpile West	Stockpile East	Loam Pile	BG-1 0-1'	BG-2 0-1'	BG-3 0-1'	BG-4 0-1'	BG-5 0-1'	BG-6 0-1'	BG-7 0-1'	BG-8 0-1'	BG-9 0-1'	BG-10 0-1'	BG-11 0-1'	BG-12 0-1'	BG-13 0-1'	BG-14 0-1'	BG-15 0-1'	BG-16 0-1'	BG-17 0-1'	BG-18 0-1'	BG-19 0-1'	BG-20 0-1'
Sample Date	S-1/GW-1	S-1/GW-3	10/10/2017	10/10/2017	10/10/2017	10/26/2017	10/26/2017	10/26/2017	10/26/2017	10/26/2017	10/26/2017	10/26/2017	10/26/2017	10/26/2017	10/26/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017
Sample Location			On-Airport	On-Airport	On-Airport	Off-Airport	On-Airport	On-Airport	On-Airport	On-Airport	On-Airport	On-Airport	On-Airport	Off-Airport	Off-Airport	Off-Airport	Off-Airport	Off-Airport	Off-Airport	Off-Airport	Off-Airport	Off-Airport	Off-Airport	Off-Airport	Off-Airport
Perfluoroheptanoic acid (PFHpA)	0.5	300	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.18 J	0.17 U	0.18 J	0.17 U	0.17 U	0.23 J	0.17 U	0.17 U	0.19 U	0.19 U	0.19 U	0.19 U	0.44 J	0.19 U	0.19 U	0.35 J	0.19 U	0.46 J
Perfluorohexanesulfonic acid (PFHxS)	0.3	300	0.23 U	0.23 U	0.23 U	0.23 U	0.23 U	0.23 U	0.23 U	0.23 U	0.23 U	0.23 U	0.23 U	0.23 U	0.23 U	0.24 U	**0.39 J**	0.24 U	0.24 U	**0.57 J**	**0.47 J**	0.24 U	**0.49 J**	0.24 U	0.24 U
Perfluorooctanoic acid (PFOA)	0.72	300	0.26 U	0.26 U	0.26 U	0.58 J	0.26 U	0.26 U	0.16 U	0.47 J	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	**0.75 J**	0.67 J	0.33 J	0.25 U	0.46 J	0.37 J	0.36 J	0.5 J	0.25 U	**0.86 J**
Perfluorononanoic acid (PFNA)	0.32	300	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.22 U	0.29 J	0.22 U	0.22 U	**0.53 J**	0.22	**0.67 J**	**0.41 J**	0.22 U	0.22 U
Perfluorooctane sulfonate (PFOS)	2	300	0.38 J	0.39 J	0.81 J	0.21 U	0.7 J	0.38 J	**2.3**	0.41 J	0.32 J	0.33 J	0.31 J	1.3	0.62 J	0.41 J	0.76 J	0.99	0.26 U	**3.1**	2	0.36 J	**2.3**	0.41 J	0.44 J
Perfluorodecanoic Acid (PFDA)	0.3	300	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.28 U	0.28 U	**0.36 J**	0.28 U	**0.31 J**	**0.41 J**	0.28 U	**0.41 J**	0.28 U	0.28 U
										Sum of Laboratory Reported PFAS (Total PFAS) and Sum of Six															
Total PFAS	NA	NA	1.78	0.91	0.81	1.47	0.7	0.56	3.21	1.31	0.32	0.3	0.84	1.3	0.62	1.16	2.73	1.68	0	6.79	3.77	5.09	5.45	0.41	2.43
Sum of Six (PFHpA,PFHxS,PFOA, PFOS, PFNA, and PFDA)	NA	NA	0.38	0.39	0.81	0.58	0.7	0.56	2.3	1.06	0.32	0.33	0.54	1.3	0.62	1.16	2.11	1.68	0	5.41	3.47	1.39	4.46	0.41	1.76

Notes:

J = Estimated concentration between the method detection limit and reporting limit.

Results in ug/kg, micrograms per kilogram.

U= Not detected by the Laboratory above the method detection limit. Method detection limit shown.

Bold results above the proposed Method 1 S-1/GW-1 standard.

Total PFAS is the sum of all laboratory detected PFAS analytes including estimated values and does not include non-detects (U or <).

Sum of six includes estimated values and does not include non-detects (U or <).

Table 8. Surface Water Results for PFAS ug/L

	Surface Water		
Sample ID	Kmart	LP-1	UGP-1
Sample Date	6/20/2017	7/11/19	7/11/19
Perfluoroheptanoic acid (PFHpA)	0.0033 U	<0.01	<0.02
Perfluorohexanesulfonic acid (PFHxS)	0.0034 U	<0.01	<0.02
Perfluorononanoic acid (PFNA)	0.0043 J	<0.01	<0.02
Perfluorooctanoic acid (PFOA)	0.0026 U	<0.01	<0.02
Perfluorooctane sulfonate (PFOS)	0.0046 U	<0.01	<0.02
Perfluorodecanoic Acid (PFDA)	0.0040 U	<0.01	<0.02
Sum of Laboratory Reported PFAS (Total PFAS) and Sum of Six			
Total PFAS	0.0174	0.018	0.047
Sum of Six (PFHpA,PFHxS,PFOA, PFOS, PFNA, and PFDA)	0.0043	<0.01	<0.02

Notes:

< = Not detected by the laboratory above the reporting limit. Reporting limit shown.

J = Estimated concentration between the method detection limit and reporting limit.

Results in ug/L, micrograms per liter.

U= Not detected by the laboratory above the method detection limit. Method detection limit shown.

Sum of six includes estimated values and does not include non-detects (U or <).

Total PFAS is the sum of all laboratory detected PFAS analytes including estimated values and does not include non-detects (U or <).

Currently MassDEP has not issued a surface water standard for PFAS.

The Method 1 GW-1 Standard for the Sum of Six is 0.02 ug/l.

The Method 1 GW-3 Standard for the individual analytes in the Sum of Six range from 500 to 40,000 ug/l.

Table 9: Ratio of Stable Isotopes Oxygen-18 and Hydrogen-2 Laboratory Results

Sample Date	Lab Sample ID	HW Sample ID	Stable Isotope Oxygen-18			Stable Isotope Hydrogen-2		
			δ18O (V-SMOW)	Atm %	Expected Values	δ18O (V-SMOW)	Atm %	Expected Values
11/7/2018	1811299-2	HW-I	-6.92	0.20	-	-40.41	0.01494	-
			-6.77	0.20	-	-40.17	0.01495	-
	1811299-4	HW-E	-6.79	0.20	-	-38.56	0.01497	-
			-6.85	0.20	-	-38.87	0.01497	-
	1811299-5	HW-F	-6.9	0.20	-	-38.28	0.01498	-
			-6.88	0.20	-	-38.15	0.01498	-
	1811299-7	SW-2	-2.67	0.20	-	-18.65	0.01528	-
			-2.61	0.20	-	-20.42	0.01526	-
						-23.04	0.01521	-
12/3/2018	1812198-1	HW-G(S)	-6.74	0.20	-	-38.19	0.01498	-
			-6.93	0.20	-	-37.87	0.01498	-
	1812198-2	HW-G(M)	-7.53	0.20	-	-44.34	0.01498	-
			-7.57	0.20	-	-44.39	0.01498	-
	1812198-3	HW-G(D)	-7.18	0.20	-	-44.15	0.01489	-
			-7.45	0.20	-	-44.56	0.01488	-
	1812198-4	OW-9S	-7.29	0.20	-	-41.86	0.01492	-
			-7.41	0.20	-	-42.94	0.0149	-
	1812198-5	OW-9D	-7.76	0.20	-	-47.91	0.01483	-
			-7.71	0.20	-	-46.82	0.01484	-
					-	-47.20	0.01484	-
	1812198-6	OW-9DD	-7.52	0.20	-	-45.58	0.01486	-
			-7.57	0.20	-	-45.48	0.01487	-
	1812198-7	OW-9M	-7.13	0.20	-	-41.44	0.01493	-
			-7.24	0.20	-	-43.40	0.0149	-
12/7/2018	1812232-1	OW-18S	-7.58	0.20	-	-49.29	0.01481	-
			-7.54	0.20	-	-49.66	0.0148	-
	1812232-2	OW-18M	-6.95	0.20	-	-42.64	0.01491	-
			-6.89	0.20	-	-42.57	0.01491	-
	1812232-3	OW-18D	-7.28	0.20	-	-44.76	0.01488	*
			-7.36	0.20	-	-41.61	0.01493	*
QA/QC	IAEA OH-14	-	-5.64	0.20	-5.6	-37.45	0.01499	-37.70
	IAEA OH-15	-	-9.59	0.20	-9.41	-77.89	0.01436	-78
	IAEA OH-16	-	-15.72	0.20	-15.41	-	-	-113.8
	Antarc IC	-	-29.83	0.19	-30	-	-	-239.69

Table 10. Fire Truck Spray Water PFAS Results ug/L

	Fire Truck Spray Water Spray											
Sample ID	Hose		Roof		Bumper		Officer Side Handline		Driver side-Rear		Officer side-Rear	
Sample Date	8/22/2019	11/12/2019	8/22/2019	11/12/2019	8/22/2019	11/12/2019	8/22/2019	11/12/2019	8/22/2019	11/12/2019	8/22/2019	11/12/2019
Perfluoroheptanoic acid (PFHpA)	0.073	<0.002	0.0045	<0.002	0.0039	<0.002	0.027	<0.002	0.0055	<0.002	0.081	0.0021
Perfluorohexanesulfonic acid (PFHxS)	0.0059	<0.002	0.0033	<0.002	0.0039	<0.002	0.004	<0.002	0.0048	<0.002	0.0043	<0.002
Perfluorononanoic acid (PFNA)	0.011	<0.002	0.0026	<0.002	0.0031	<0.002	0.013	<0.002	0.003	<0.002	0.016	<0.002
Perfluorooctanoic acid (PFOA)	0.088	0.0062	0.0087	<0.002	0.01	<0.002	0.039	<0.002	0.011	<0.002	0.076	0.0041
Perfluorooctane sulfonate (PFOS)	0.009	0.0021	0.0068	<0.002	0.006	<0.002	0.0087	<0.002	0.0093	<0.002	0.0086	<0.002
Perfluorodecanoic Acid (PFDA)	0.014	<0.002	0.004	<0.002	0.0045	<0.002	0.032	<0.002	0.0049	<0.002	0.032	<0.002
Total PFAS	5.7017	0.3391	0.9195	0.0205	0.7817	0.0167	4.1098	0.0481	0.8302	0.0087	5.4701	0.086
Sum of Six (PFHpA,PFHxS,PFOA, PFOS, PFNA, and PFDA)	**0.2009**	0.0083	**0.0299**	<0.002	**0.0314**	<0.002	**0.1237**	<0.002	**0.0385**	<0.002	**0.2179**	0.0041

Notes:

< = Not detected by the laboratory above the reporting limit. Reporting limit shown.

Results in ug/L, micrograms per liter.

Bold results above proposed MassDEP GW-1 standard (0.02 ug/L)

Total PFAS is the sum of all laboratory detected PFAS analytes including estimated values and does not include non-detects (U or <).

APPENDIX A
PUBLIC COMMENTS

Hydrogeological Tech Memo #10

To: Dan Santos Director, Barnstable DPW
From: Tom Cambareri, Sole Source Consulting LLC
Re: **Review of Barnstable Municipal Airport-Draft Phase II Comprehensive Site Assessment (Phase II) DEP RTN # 4-26347**
Date: January 8, 2020

The following is a review of the Barnstable Municipal Airport-Draft Phase II Comprehensive Site Assessment (CSA) (Phase II).

The CSA describes a significant effort of investigation and forensic approaches to assess liability to other parties, but falls short in using the wealth of data for describing the actual extent and nature of contamination to determine the next steps for remedial action.

The CSA identifies a single PFAS compound; the 6:2 Fluorotelomer Sulfonic Acid (6:2 FTS), as a distinguishing analyte to determine if the PFAS impacted groundwater at the Airport was related to the Airport's AFFF usage or from another off-site source. While the radar plots and cross sections to evaluate different compositions is a novel idea for these relatively new PFAS contaminates, the use of a single analyte minimizes the use of a number of other factors to better describe conditions at the site and surrounding area.

Release

The CSA indicates that the Chemguard brand of AFFF comprised of 6:2 FTS was the only one use by the Airport since 2000. Historic photos and video from the 1950's to present indicate that numerous local fire departments from across the Cape would gather at the Airport for the Tri-Annual training events. Given that many departments would test and train using their own equipment, it follows that significantly more AFFF could have been used and that formulations different from that used by the Airport staff were used. It is likely that the historic use of AFFF formulations prior to 2000 included earlier and widespread AFFF formulations containing other PFAS compounds like PFOS.

Conversion

The CSA indicates that the 6:2 FTS compound does not breakdown into PFOS (8-chain sulfonic acid) and PFHxS (6-chain sulfonic acid) which it associates with the BCFTA. However, research has identified that the 6:2 FTS does breakdown under aerobic conditions (which exists in the permeable aquifer matrix of the Barnstable Outwash) into several other types of PFAS known as Per and Poly Fluoroalkyl Carboxylates (PFCAs) (Avendaño, 2013, Hees,P.V. 2019, IRTC, 2020, Zhang, 2016). Breakdown PFCAs include PFHxA (6-chain carboxylate), PFHpA (7-chain carboxylate, and PFPeA (5-chain carboxylate). Also, the manufacturing process of AFFF has been found to result in some inclusion of other PFCA compounds like PFOA like PFDA. The Airport CSA has detected these other PFCA compounds in groundwater associated with the identified on-site source areas.

My Review uses only the most recent concentrations.

Normalized Percentages vs Reportable Concentrations

The CSA makes extensive use of radar plots normalized for total PFAS to calculate the percent of each compound in the sample. However, when making comparisons to evaluate sources it is important to consider the actual concentrations of the components.

The radar plots of percent composition of extremely high concentrations samples can look similar to very low concentrations sample. e.g.The three radar plots, from upgradient monitoring cluster HW-D that identifies off-site contamination from the BCFTA, look similar but, the concentrations range from 1.1 ng/l in groundwater from the shallow well to 250 ng/l at the deep well. The concentration increase with depth indicates a stronger further upgradient source than the shallow well which is capturing lower concentration contaminates flowing from Mary Dunn Pond.

Under normal circumstances the high concentrations occur near the source and low concentrations are found further downgradient of the source as compounds degrade or transform. In addition, chronic sources (every 6 -months) like the BFTA has high concentrations of Total-PFAS in the source area (160,000 ng/l) as compared to occasional (every 3- year) sources like the Deployment Area (15,583 ng/l).

Airport Source Area Characterization

<u>Deployment Area Cross Section</u>

The CSA identifies the Deployment Area as an Airport source area with monitoring wells HW-F, HW-Is and HW-Ss. Groundwater in well H-Ss has 4,895 ng/l total PFAS. While the 6:2 FTS dominates the radar plot at nearly 80%, PFOS and PFHxS are present at 100 ng/l and 55 ng/l respectively. HW-Is has 15,583 ng/l of total PFAS. Again, while the 6:2 FTS dominates the radar plot at over 80%, PFOS and PFHxS are present at 40 ng/l and 220 ng/l respectively. The detections of PFOS and PFHxS in these shallow well source areas indicates that using the 6:2 FTS as the single distinguishing analyte of Airport activities is too constrained.

The inclusion of the other Per and Poly Fluoroalkyl Carboxyl Acids (PFCAs) as distinguishing analytes also needs to be considered. HW-F has 2,656 ng/l of total PFAS. While the 6:2 FTS dominates the radar plot at nearly 60%, The compound PFHpA is at 230 ng/l making 10% of the composition. The concentration of the other PFCA products; PFHxA and PFPeA have concentrations of 460 and 430 ng/l respectively. The other Deployment Area source wells mentioned above HW-Is and HW-Ss have the following detections of PFCA.

	Total PFAS	PFPHxA	PFPeA	PFHpA	PFOA	PFOS	PFHxS
HW-Is	15,583	510	810	540	290	40	220
HW-F	2656.4	460	430	230	20	5	0.8
HW-Ss	4895	250	420	110	62	55	100

(all values in ng/l)

The detections of PFOS and PFHxS and the other PFCAs in groundwater from identified source area wells demonstrate that the use of 6:2 FTS as the single distinguishing analyte constrains the identification of Airport PFAS sources. Dispersion and intermittent vertical gradients may be a cause of the significant decrease of PFAS in the intermediate and deep wells beneath the source areas, particularly at the relatively intermediate wells < 30 ft deep.

ARFF Cross Section

Cross-Section 3 through the ARFF Source indicates 3 shallow wells HW-P, HW-302 and HW-3 at the water table are comingled with off-site sources. The Total PFAS detected in groundwater from these wells is 342.7, 342.7 and 969.8, respectively. Given the depression of groundwater flow as it migrates downgradient particularly with the steep gradient along this section, it is not clear how PFAS from other sources would be found at the water table at the Airport rather than deeper from upgradient sources. While HW-3 has the highest concentration of the 6:2 FTS, the occurrence of the other PFCAs is consistent in groundwater through the section. So, expanding the distinguishing analytes to these compounds makes physical as well as chemical sense. PFOS is also a minor constituent in these wells.

Soils and the Runways

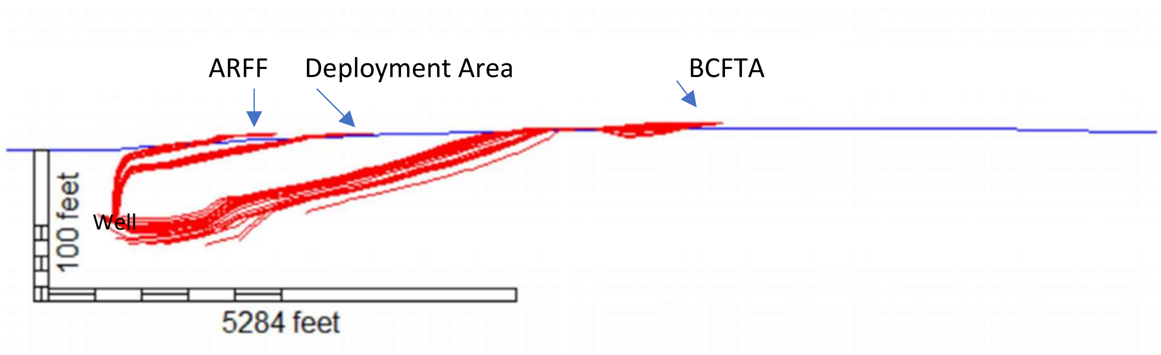
The CSA presents a collection of background soil samples. The detection of PFAS in Airport and off-site locations indicate that the occurrence of these compounds is ubiquitous and may come from atmospheric or other dilute sources. However, several of the soil samples BG3, BG4 and BG5 are taken from the northeast runway. They contain 380 to 2,300 ug/kg of PFOS which at those concentrations can leach appreciably into groundwater. Therefore, the dismissal of groundwater samples with PFOS from coming from the Airport is too strict.

Although testing of soils from 1991 training area were by and large below the detection limit the occurrence of PFAS of 3,180 ng/kg from one of the samples and the detection of PFAS in groundwater at HW-L, the only well along the groundwater flow line that runs parallel to the run way, raises the consideration to test un-investigated areas along that NE-SW alignment of the run-way.

Hydrogeology

The Maher Wells are downgradient of the Airport source areas. Groundwater flow velocities of 5.6 to 111 feet/day presented in the CSA used textbook aquifer values of 2.38 and 23.8 ft/d and measured hydraulic gradients. The reported calculated travel times are excessively high and the selected hydraulic conductivity values exceptionally low. Typical hydraulic conductivities calculated from pump tests and used in groundwater models for the Barnstable Outwash are 200 to 350 feet/day which results in typical groundwater flow velocities of 1.1 to 5.7 feet per day.

The steep hydraulic gradient from HW-320 to OW-9 is closest to the Maher Well resulting in the fastest velocity of 5.6 ft/d. The high velocity caused by active pumping results in a steep vertical gradient component that draws shallow groundwater to the deep levels and the well. Groundwater modeling and particle tracking are tools to evaluate fate and transport. An evaluation of particle paths from the BCFTA, Deployment and ARFF was prepared for the DPW and a cross sectional output is shown below (Cambareri, 2019). Modeling of particles upgradient of the wellfield shows that groundwater and the contaminants it carries are drawn into the wells whether it is deep (BCFTA) or shallow (Airport) in the aquifer.



Groundwater flows at approximately 1 ft /d across the source areas. Groundwater modeling indicates travel times of approximately 5 years for contaminates to migrate from the Deployment Area to the Maher Wells and 3 years from the ARFF. The travel time from the BCFTA is on the order of 20 years. It has been demonstrated that PFAS in soils will continue to leach into groundwater for decades thus deserving of the moniker "forever compounds." Given the historic use of AFFF and groundwater flow velocity, it is probable for the BCFTA to be contributing PFAS to the Maher Wells. The deep well at well cluster HW-Dd and Ddd are proof that the BCFTA PFAS has crossed beneath the Airport. The HW-I m and HW-Id may show evidence of comingled sources. HW-Sm appears to be too shallow for comingling and the relatively low PFOS concentration could be part of the more historic Airport use . It is unfortunate that the County has not pursued a more detailed delineation of its PFAS impact downgradient of the Mary Dunn Pond. Particle tracking indicates that the width of impact from the BCFTA includes flow further east to discharge into Mill Creek across the Yarmouth line which was sampled by Harvard and detected 104 ng/l of PFAS6. In addition, chronic training and episodes of high precipitation likely result in slugs of high concentrations within the area of impact.

Fate and Transport

It is not clear how the CSA applies the chemical detections and hydrogeologic principles to the fate and transport of the contaminants. PFAS concentrations at the source area of the BCFTA plume is extremely high at 167,000 ng/l. It is comprised of a mixture of AFFF used at the site from the early 60s to October 2015, when last observed on the site. The BCFTA PFAS plume comprised of a mixture of AFFF with both PFOS (66%) and 6:2 FTS (9%) related contaminants that decrease to a concentration of approximately 1,000 ng/l as they migrate towards the Mary Dunn Wells. The Total-PFAS composition changes with decreasing PFOS as it converts to PFHxS and other lower carbon chain sulfonates and 6:2 FTS to lower carbon chain PFCAs. The CSA identified likely BCFTA PFAS at HW-D cluster with concentrations ranging from 244 to 250 ng/l indicating even more "dilution" as it travels downgradient.

In a similar fashion, the contaminants detected at the Airport inclusive of other types of AFFF leach to groundwater and undergo transformations as they migrate downgradient. At the Airport however, the introduction is more infrequent as mentioned earlier. Therefore, the transformations and movement of contaminates is not uniform, with slugs of high PFAS concentrations interspersed with more uniform low concentrations. We know from investigations at the JBCC, that releases of PFAS in the 1990's is being found still at the source areas and in groundwater and private wells 1000s of feet downgradient.

<u>The Maher Wells</u>
The CSA does not present the data of PFAS detected in groundwater on a map or cross sections nor are the statistics of their occurrence tabulated. The CSA indicates that based upon the chemical characterization and use of the 6:2 FTS as the distinguishing analyte, it does not appear that the Airport has contaminated the Maher Wells.

Groundwater samples from the two identified source areas have high concentrations of PFAS. Total PFAS in the Deployment Area source monitoring wells range from 2,656 ng/l to 15,583 ng/l comprised mostly of PFCAs and 6:2 FTS but also lower amounts of PFOS. Total PFAS in the ARFF source monitoring wells range from 342 to 970 ng/l. The CSA delineated PFAS plumes emanating from the two Airport source areas are inexplicably truncated before reaching the Maher wells (CSA-Figure 2).

The Maher Wells were shut down in 2016 due to the presence of PFAS and new Health Advisory. Water from the wells is now treated through a $12 million treatment plant that was just completed in 2020. The Maher wells are located along a line that is perpendicular to groundwater flow. This means groundwater flow to ME-2 on the east end is different from ME-1 on the west with the sources mixed in the middle at ME-3. The Barnstable DPW Water Supply Division sampled the Maher wells in November. The concentration of Total PFAS in groundwater from the Maher wells ranges from 467 ng/l in ME-1 to 248 ng/l in ME-2. The percentage of PFOS ranges from 30% to 43% in the Maher wells. The percentage of the 6:2 FTS is 15% in ME-1 and 3% in ME-3 with none detected in ME-2. The ME-1 sample also has the highest concentrations of the other Perfluoroalkyl Carboxylates. The CSA radar plots from an earlier September Maher well sample set has the same distribution of PFAS concentrations with the highest PFAS, 6:2 FTS, and PFCA concentrations detected in groundwater from ME-1 on the west end, that is closest to, and first downgradient well to, the Airport.   The consistent presence of these high PFAs compounds at ME-1 is evidence of Airport contribution.

There are several monitoring well sets in the Maher Wellfield between the wells and the Airport. Groundwater from Maher monitoring wells OW-18M, OW-18D and OW-9D have high

Total PFAS concentrations of 4,357 ng/l, 1,832 ng/l, and 1,584 ng/l respectively. The high concentrations indicate that a source with high concentrations is close. The Deployment area has Total PFAS concentrations of 15,583 to 2,656 ng/l. The ARFF has PFAS detections of 970 to 342 ng/l. PFAS concentrations that are associated with outside sources to the west and the BCFTA coming across the Airport boundary range from 244 ng/l at HW-Dd beneath the Deployment Area and 160ng/l at HW-19d beneath the ARFF, are not nearly as high as found in the Maher monitoring wells.

<u>1-4 Dioxane Cross Section 2</u>

The CSA indicates that 1-4 dioxane has not been found on the site but only in deep groundwater monitoring wells and in the Maher wells. Investigation into surface source areas have not identified existing sources. While the pursuit of up and cross gradient sources off-site from the Airport has merit, it is also possible that source areas have been depleted since unlike PFAS the 1-4 dioxane does not last as long. That being said the relative persistence of 1-4 dioxane in the deep wells requires a persistent source. Additional work to depict the 1-4 dioxane concentrations is needed to set the stage for further investigation in the area.

Summary

Based upon the source locations, groundwater flow, hydrogeology, detections, concentrations, and composition of PFAS detected in soil and groundwater it is evident that the Airport contributes PFAS that are detected in the Maher Wells. The CSA demonstrates that other sources also contribute but without a better depiction of actual concentrations and taking groundwater flow and fate and transport issues it is difficult to assign relative amounts to the different sources.

The CSA should include a better description of the distribution of PFAS and 1-4 Dioxane with actual concentrations and taking groundwater flow and fate and transport issues to focus on those areas with significant concentrations.

Additional regional work is required to further account for the different sources in the Hyannis area.

References

-Avendaño, L.J., 2013., Microbial degradation of polyfluoroalkyl chemicals in the environment: A review., Env. Int. 61, 98–114
-Cambareri, 2019., Hydrogeologic Tech Memo #4, Prepared for Barnstable DPW.
-Hees,P.V. 2019, Analysis of the unknown pool of PFAS: Total Oxidizable Precursors (TOP), PFOS Precursor (PreFOS) and Telomer Degradation, Eurofins Environment Testing Sweden AB and Man-Technology, Environment Research Centre, Örebro University
-ITRC, 2020 https://pfas-1.itrcweb.org/3-firefighting-foams/#3
-Zhang, S., Lu, X., Wang N., Buck, R. C. Biotransformation potential of 6:2 fluorotelomer sulfonate (6:2 FTSA) in aerobic and anaerobic sediment. Chemosphere 2016, 154, 224-230

APPENDIX B

WASTE DISPOSAL RECORDS

Global Remediation Services Inc.

700 Richmond Street

Invoice

DATE	INVOICE #
3/25/2020	18300

BILL TO
Barnstable Municipal Airport Attn: Mary McDonald 480 Barnstable Road Hyannis, MA 02601

P.O. NO.	TERMS	DUE DATE	REP
200001	Net 30	4/24/2020	HA

ITEM	DESCRIPTION	QTY	RATE	AMOUNT
	DRUM DISPOSAL SERVICES Job 20094			
	Wednesday, March 4, 2020			
Disposal	Disposal of Waste Jet A Liquid	1	[redacted]	[redacted]
Disposal	Disposal of Jet Fuel Contaminated Debris	1		
Disposal	Disposal of AFFF	1		
Materials	55-gallon Open Top Replacement Drum	1		
Materials	55-gallon Closed Top Replacement Drum	1		
Trans	Transportation	1		
MHWTF-drum	MA Hazardous Waste Transportation Fee	2		
E-Manifest Fee	EPA E-Manifest Fee	1		
			Total	[redacted]

Please Make Checks Payable to Global Remediation Services Inc.

Phone #
(508) 828-1005

MA103470

Please print or type.

Form Approved. OMB No. 2050-0039

UNIFORM HAZARDOUS WASTE MANIFEST	1. Generator ID Number MAC300009198	2. Page 1 of 1	3. Emergency Response Phone 908-354-0210	4. Manifest Tracking Number 020352130 JJK

5. Generator's Name and Mailing Address
BARNSTABLE MUNICIPAL AIRPORT
480 BARNSTABLE ROAD GATE F
HYANNIS, MA 02601
Generator's Phone: 508-778-7770

Generator's Site Address (if different than mailing address)

6. Transporter 1 Company Name
ACV ENVIRONMENTAL SERVICES, INC
U.S. EPA ID Number NJD003812047

7. Transporter 2 Company Name
U.S. EPA ID Number

8. Designated Facility Name and Site Address
CYCLE CHEM, INC.
217 SOUTH FIRST STREET
ELIZABETH, NJ 07206
Facility's Phone: 908-355-5800
U.S. EPA ID Number NJD002200046

9a. HM	9b. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))	10. Containers No.	10. Containers Type	11. Total Quantity	12. Unit Wt./Vol.	13. Waste Codes		
X	1. RQ, UN1863, Waste Fuel, aviation, turbine engine, 3 , II	XXX1	DM	25	G	D001	D018	
X	2. RQ, NA3077, Hazardous waste, solid, n.o.s. (Benzene), 9 , III	XXX 1	DM	35	P	D018		
	3. NON ~~DOT~~ RCRA DOT REGULATED MATERIAL (AQUEOUS FILM FORMING MATERIAL / AAFF)	XXX1	DF	50	G	MA99	72	
	4.							

14. Special Handling Instructions and Additional Information
D45196 SO 46244 LDR on FileSFSO#MA102470
1)Profile#46406 JET FUEL 1x55 2)Profile#74216 ABSORBENTS W/JET FUEL 1x55 3) Profile # 74368 Aqueous film forming (AAAF) 1x55

15. **GENERATOR'S/OFFEROR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. If export shipment and I am the Primary Exporter, I certify that the contents of this consignment conform to the terms of the attached EPA Acknowledgment of Consent.
I certify that the waste minimization statement identified in 40 CFR 262.27(a) (if I am a large quantity generator) or (b) (if I am a small quantity generator) is true.

Generator's/Offeror's Printed/Typed Name: Ed Longo
Signature: Ed Longo
Month 3 Day 4 Year 20

16. International Shipments ☐ Import to U.S. ☐ Export from U.S. Port of entry/exit:
Transporter signature (for exports only): Date leaving U.S.:

17. Transporter Acknowledgment of Receipt of Materials
Transporter 1 Printed/Typed Name: Kevin E. Dillon
Signature: [signature]
Month 03 Day 04 Year 20
Transporter 2 Printed/Typed Name
Signature
Month Day Year

18. Discrepancy
18a. Discrepancy Indication Space ☐ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection
Manifest Reference Number:
18b. Alternate Facility (or Generator)
U.S. EPA ID Number
Facility's Phone:
18c. Signature of Alternate Facility (or Generator)
Month Day Year

19. Hazardous Waste Report Management Method Codes (i.e., codes for hazardous waste treatment, disposal, and recycling systems)

1. H061	2. H141	3.	4.

20. Designated Facility Owner or Operator: Certification of receipt of hazardous materials covered by the manifest except as noted in Item 18a
Printed/Typed Name
Signature
Month Day Year

GENERATOR — INT'L — TRANSPORTER — DESIGNATED FACILITY

Global Remediation Services Inc.
700 Richmond Street
East Taunton, MA 02718

Invoice

DATE	INVOICE #
9/16/2016	14866

BILL TO
Dr. Basia Ann McAnaw 56 Sea Medow Circle Centerville, MA 02632

P.O. NO.	TERMS	DUE DATE	REP
	Net 30	10/16/2016	HA

ITEM	DESCRIPTION	QTY	RATE	AMOUNT
	Wednesday, August 31, 2016 DRUM DISPOSAL SERVICES CLAIM # 1601000256			
Disposal	Disposal of speedi-dry/sand/Avgas	4	[redacted]	[redacted]
Disposal	Disposal of water firefighting foam/Avgas	5		
Trans	Transportation to licensed disposal facility	1		
Field Service	Loading Demurrage	1		
MHWTF-drum	MA Hazardous Waste Transportation Fee	9		
	cc: Barnstable Municipal Airport Daniel R. Armstrong, Jr, Regional Claims Manager			
			Total	[redacted]

Please Make Checks Payable to Global Remediation Services Inc.

Phone #
(508) 828-1005

Please print or type. (Form designed for use on elite (12-pitch) typewriter.)

Form Approved. OMB No. 2050-0039

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator ID Number: MAC300009198
2. Page 1 of: 1
3. Emergency Response Phone: (508) 872-5000
4. Manifest Tracking Number: 014393126 JJK

5. Generator's Name and Mailing Address: BARNSTABLE MUNICIPAL AIRPORT 480 BARNSTABLE ROAD HYANNIS, MA 02601

Generator's Phone: (508) 778-7770

Generator's Site Address (if different than mailing address): 480 BARNSTABLE ROAD GATE F HYANNIS MA 02601

6. Transporter 1 Company Name: CLEAN VENTURE, INC. — U.S. EPA ID Number: NJ0000027193

7. Transporter 2 Company Name: — U.S. EPA ID Number:

8. Designated Facility Name and Site Address: CYCLE CHEM INC. 217 SOUTH FIRST STREET ELIZABETH, NJ 07206 — U.S. EPA ID Number: NJD002200046

Facility's Phone: (908) 355-5800

9a. HM	9b. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))	10. Containers No.	Type	11. Total Quantity	12. Unit Wt./Vol.	13. Waste Codes
RQ	1. UN3175 , WASTE, SOLIDS CONTAINING FLAMMABLE LIQUID, N.O.S. (ACETONE,AVIATION GASOLINE) 4.1 PG II (RQ D001 100#) ERG# 133	xx4	DM	2000	P	D001
	2.					
	3.					
	4.					

14. Special Handling Instructions and Additional Information: LDR On File 806546/800082/77232/42176/MA6136 (1)R02-9 SPEEDI DRY/SAND/ AVGAS

(1) 4X55

15. GENERATOR'S/OFFEROR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. If export shipment and I am the Primary Exporter, I certify that the contents of this consignment conform to the terms of the attached EPA Acknowledgment of Consent. I certify that the waste minimization statement identified in 40 CFR 262.27(a) (if I am a large quantity generator) or (b) (if I am a small quantity generator) is true.

Generator's/Offeror's Printed/Typed Name: Katie Servis — Signature: Katie Servis — Month 8 Day 31 Year 16

16. International Shipments ☐ Import to U.S. ☐ Export from U.S. Port of entry/exit:

Transporter signature (for exports only): Date leaving U.S.:

17. Transporter Acknowledgment of Receipt of Materials

Transporter 1 Printed/Typed Name: Josh Richardson — Signature — Month 8 Day 31 Year 16

Transporter 2 Printed/Typed Name — Signature — Month Day Year

18. Discrepancy

18a. Discrepancy Indication Space ☐ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection

Manifest Reference Number:

18b. Alternate Facility (or Generator) — U.S. EPA ID Number

Facility's Phone:

18c. Signature of Alternate Facility (or Generator) — Month Day Year

19. Hazardous Waste Report Management Method Codes (i.e., codes for hazardous waste treatment, disposal, and recycling systems)

1.	2.	3.	4.
H141			

20. Designated Facility Owner or Operator: Certification of receipt of hazardous materials covered by the manifest except as noted in Item 18a

Printed/Typed Name — Signature — Month Day Year

GENERATOR / TRANSPORTER / INT'L / DESIGNATED FACILITY

EPA Form 8700-22 (Rev. 3-05) Previous editions are obsolete.

DESIGNATED FACILITY TO DESTINATION STATE (IF REQUIRED)

Please print or type. (Form designed for use on elite (12-pitch) typewriter.)

Form Approved. OMB No. 2050-0039

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator ID Number: MAC300009198
2. Page 1 of: 1
3. Emergency Response Phone: (508) 872-5000
4. Manifest Tracking Number: 014393127 JJK

5. Generator's Name and Mailing Address: BARNSTABLE MUNICIPAL AIRPORT 480 BARNSTABLE ROAD HYANNIS, MA 02601

Generator's Site Address (if different than mailing address): 480 BARNSTABLE ROAD GATE F HYANNIS MA 02601

Generator's Phone: (508) 778-7770

6. Transporter 1 Company Name: CLEAN VENTURE, INC. — U.S. EPA ID Number: NJ0000027193

7. Transporter 2 Company Name: — U.S. EPA ID Number:

8. Designated Facility Name and Site Address: NORLITE, LLC 628 SOUTH SARATOGA STREET COHOES, NY 12047 — U.S. EPA ID Number: NYD080469935

Facility's Phone: (518) 235-0401

9a. HM	9b. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))	10. Containers No.	10. Containers Type	11. Total Quantity	12. Unit Wt./Vol.	13. Waste Codes
RQ	1. UN1993 , WASTE FLAMMABLE LIQUIDS, N.O.S. (AVIATION GASOLINE) 3 PG II (RQ D001 100#) ERG# 128	XX5	DM	275	G	D001
	2.					
	3.					
	4.					

14. Special Handling Instructions and Additional Information: 806546/800082/77232/42177/MA6136 (1)ID-8 1000130737LF WATER FIREFIGHTING FOAM/AVGAS

(1) 5X55

PO# 183759

15. **GENERATOR'S/OFFEROR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. If export shipment and I am the Primary Exporter, I certify that the contents of this consignment conform to the terms of the attached EPA Acknowledgment of Consent. I certify that the waste minimization statement identified in 40 CFR 262.27(a) (if I am a large quantity generator) or (b) (if I am a small quantity generator) is true.

Generator's/Offeror's Printed/Typed Name: Katie Servis — Signature: Katie Servis — Month 8 Day 31 Year 16

16. International Shipments ☐ Import to U.S. ☐ Export from U.S. Port of entry/exit: Date leaving U.S.:

Transporter signature (for exports only):

17. Transporter Acknowledgment of Receipt of Materials

Transporter 1 Printed/Typed Name: JOSH Richardson — Signature — Month 8 Day 31 Year 16

Transporter 2 Printed/Typed Name — Signature — Month Day Year

18. Discrepancy

18a. Discrepancy Indication Space ☐ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection

Manifest Reference Number:

18b. Alternate Facility (or Generator) — U.S. EPA ID Number

Facility's Phone:

18c. Signature of Alternate Facility (or Generator) — Month Day Year

19. Hazardous Waste Report Management Method Codes (i.e., codes for hazardous waste treatment, disposal, and recycling systems)

1. 2. 3. 4.

20. Designated Facility Owner or Operator: Certification of receipt of hazardous materials covered by the manifest except as noted in Item 18a

Printed/Typed Name — Signature — Month Day Year

GENERATOR / INT'L / TRANSPORTER / DESIGNATED FACILITY

MA10152

Please print or type.

Form Approved. OMB No. 2050-0039

UNIFORM HAZARDOUS WASTE MANIFEST	1. Generator ID Number MAC300009188	2. Page 1 of 1	3. Emergency Response Phone 908-354-0210	4. Manifest Tracking Number 019915614 JJK

GENERATOR

5. Generator's Name and Mailing Address
BARNSTABLE MUNICIPAL AIRPORT
480 BARNSTABLE ROAD GATE F
HYANNIS, MA 02601
Generator's Phone: 508-778-7770

Generator's Site Address (if different than mailing address)

6. Transporter 1 Company Name
ALLSTATE POWER VAC. INC.
U.S. EPA ID Number NJD003812047

7. Transporter 2 Company Name
U.S. EPA ID Number

8. Designated Facility Name and Site Address
CYCLE CHEM, INC.
217 SOUTH FIRST STREET
ELIZABETH, NJ 07206
Facility's Phone: 908-355-5800
U.S. EPA ID Number NJD002200046

9a. HM	9b. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))	10. Containers No.	10. Containers Type	11. Total Quantity	12. Unit Wt./Vol.	13. Waste Codes		
X	1. RQ, UN1863, Waste Fuel, aviation, turbine engine, 3, II	1	DM	50	G	D001	D018	
	2. RQ, NA3077, Hazardous waste, solid, n.o.s. (Benzene), 9, III	1	DM	300	P	D018		
	3. NON RCRA NON DOT REGULATED MATERIAL (DRAINED OIL FILTERS)	1	DM	100	P	27	MA99	
	4. NON RCRA NON DOT REGULATED MATERIAL (AQUEOUS FILM FORMING FOAM / AFFF)	2	DF	100	G	72	MA99	

14. Special Handling Instructions and Additional Information Document D22773 Sales Order 22611
1X55 1X55 1X55
1) 46406 JET FUEL 2) 74216 ABSORBENTS W/JET FUEL 3) 74221 USED OIL FILTERS 4) 74358 AQUEOUS FILM FORMING FOAM (AFFF)

15. GENERATOR'S/OFFEROR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. If export shipment and I am the Primary Exporter, I certify that the contents of this consignment conform to the terms of the attached EPA Acknowledgment of Consent.
I certify that the waste minimization statement identified in 40 CFR 262.27(a) (if I am a large quantity generator) or (b) (if I am a small quantity generator) is true.

Generator's/Offeror's Printed/Typed Name: Hildebrando Rios   Signature: [signature]   Month 06 Day 13 Year 19

INT'L

16. International Shipments ☐ Import to U.S. ☐ Export from U.S.   Port of entry/exit:
Transporter signature (for exports only):   Date leaving U.S.:

TRANSPORTER

17. Transporter Acknowledgment of Receipt of Materials
Transporter 1 Printed/Typed Name: Jerin E. Dingne   Signature: [signature]   Month 06 Day 13 Year 19
Transporter 2 Printed/Typed Name   Signature   Month Day Year

DESIGNATED FACILITY

18. Discrepancy
18a. Discrepancy Indication Space ☐ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection
Manifest Reference Number:
18b. Alternate Facility (or Generator)   U.S. EPA ID Number
Facility's Phone:
18c. Signature of Alternate Facility (or Generator)   Month Day Year

19. Hazardous Waste Report Management Method Codes (i.e., codes for hazardous waste treatment, disposal, and recycling systems)

1.	2.	3.	4.
H061	H141	H141	H141

20. Designated Facility Owner or Operator: Certification of receipt of hazardous materials covered by the manifest except as noted in Item 18a
Printed/Typed Name   Signature   Month Day Year

EPA Form 8700-22 (Rev. 12-17) Previous editions are obsolete.

DESIGNATED FACILITY TO EPA's e-MANIFEST SYSTEM

Global Remediation Services Inc.

700 Richmond Street
East Taunton, MA 02718

Invoice

DATE	INVOICE #
9/29/2017	15949

BILL TO
Barnstable Municipal Airport Attn: Mary McDonald 480 Barnstable Road Hyannis, MA 02601

18004433

P.O. NO.	TERMS	DUE DATE	REP
	Net 30	10/29/2017	HA

ITEM	DESCRIPTION	QTY	RATE	AMOUNT
	Thursday, September 21, ~~1997~~ 2017 VACUUM TRUCK SERVICES site: 125 Mary Dunn Rd - Gate A Hyannis, MA			
Field Tech	Field Tech	6.5	[redacted]	[redacted]
3,000-gal vacuum ...	3,000-gal vacuum truck w/driver	8		
3,000-gal vac truc...	3,000-gal vac truck w/driver (overtime)	2		
Disposal	Disposal of oil/water	1,290		
			Total	[redacted]

'17 OCT 10 12:10PM
BARNSTABLE AIRPORT

Please Make Checks Payable to Global Remediation Services Inc.

Phone #
(508) 828-1005

Please print or type. (Form designed for use on elite (12-pitch) typewriter.)

Form Approved. OMB No. 2050-0039

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator ID Number: MAC300009199
2. Page 1 of
3. Emergency Response Phone: 508-828-1005
4. Manifest Tracking Number: 003078610 GBF

5. Generator's Name and Mailing Address:
Barnstable Municipal Airport
480 Barnstable Road
Hyannis, MA 02601-2900

Generator's Site Address (if different than mailing address):
125 Mary Dunn Road - Gate A
Hyannis, MA 02601-2900

Generator's Phone: 508-778-7770

6. Transporter 1 Company Name: Global Remediation Services Inc.
U.S. EPA ID Number: MAC300012903

7. Transporter 2 Company Name:
U.S. EPA ID Number:

8. Designated Facility Name and Site Address:
Tradebe Treatment & Recycling of Stoughton, L
441R Canton St.
Stoughton, MA 02072 USA

U.S. EPA ID Number: MAD062179890

Facility's Phone: 781-297-3630

GENERATOR

9a. HM	9b. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))	10. Containers No.	10. Containers Type	11. Total Quantity	12. Unit Wt./Vol.	13. Waste Codes			
X	1. NA1270, Petroleum Oil, 3, PGII	001	TT	1290	G	MA98			
	2.								
	3.								
	4.								

14. Special Handling Instructions and Additional Information
1. Profile: 4445CLH oil/water ERG#128

DNS L(??) ??
MA ??? H151A

15. **GENERATOR'S/OFFEROR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. If export shipment and I am the Primary Exporter, I certify that the contents of this consignment conform to the terms of the attached EPA Acknowledgment of Consent.
I certify that the waste minimization statement identified in 40 CFR 262.27(a) (if I am a large quantity generator) or (b) (if I am a small quantity generator) is true.

Generator's/Offeror's Printed/Typed Name: Chris Daniels
Signature: [signature]
Month Day Year: 09 21 17

INT'L

16. International Shipments ☐ Import to U.S. ☐ Export from U.S.
Port of entry/exit:
Transporter signature (for exports only):
Date leaving U.S.:

TRANSPORTER

17. Transporter Acknowledgment of Receipt of Materials
Transporter 1 Printed/Typed Name: Alt Pelleault
Signature: [signature]
Month Day Year: 09 21 17

Transporter 2 Printed/Typed Name:
Signature:
Month Day Year:

DESIGNATED FACILITY

18. Discrepancy

18a. Discrepancy Indication Space ☐ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection

Manifest Reference Number:

18b. Alternate Facility (or Generator)
U.S. EPA ID Number:
Facility's Phone:

18c. Signature of Alternate Facility (or Generator)
Month Day Year:

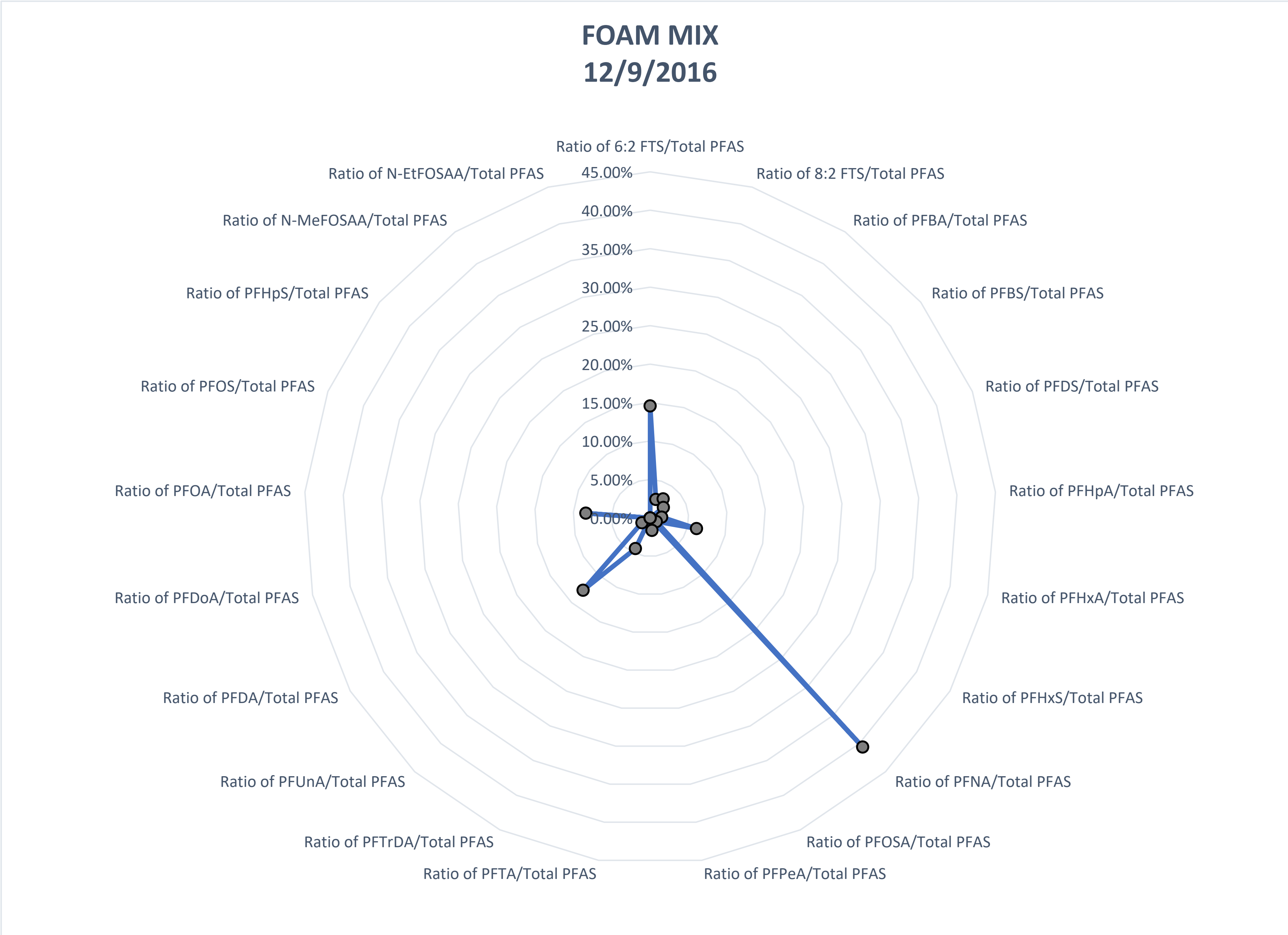
19. Hazardous Waste Report Management Method Codes (i.e., codes for hazardous waste treatment, disposal, and recycling systems)

1.	2.	3.	4.
H135			

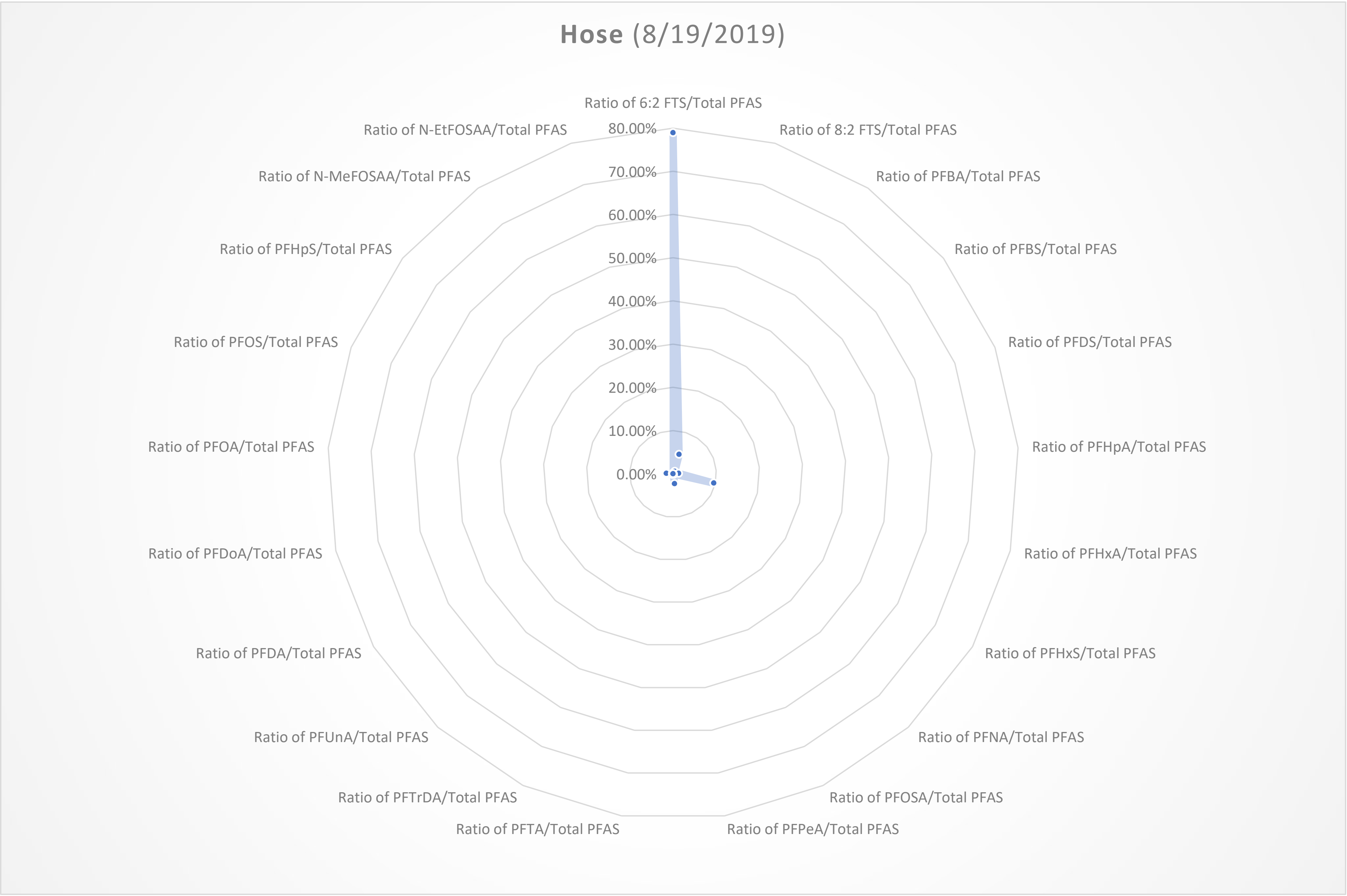
20. Designated Facility Owner or Operator: Certification of receipt of hazardous materials covered by the manifest except as noted in Item 18a
Printed/Typed Name: Kristen Marinelli
Signature: [signature]
Month Day Year: 9 21 17

APPENDIX C

PFAS RADAR PLOTS



FOAM MIX
12/9/2016
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
45.00%
40.00%
35.00%
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%



Hose (8/19/2019)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
80.00%
70.00%
60.00%
50.00%
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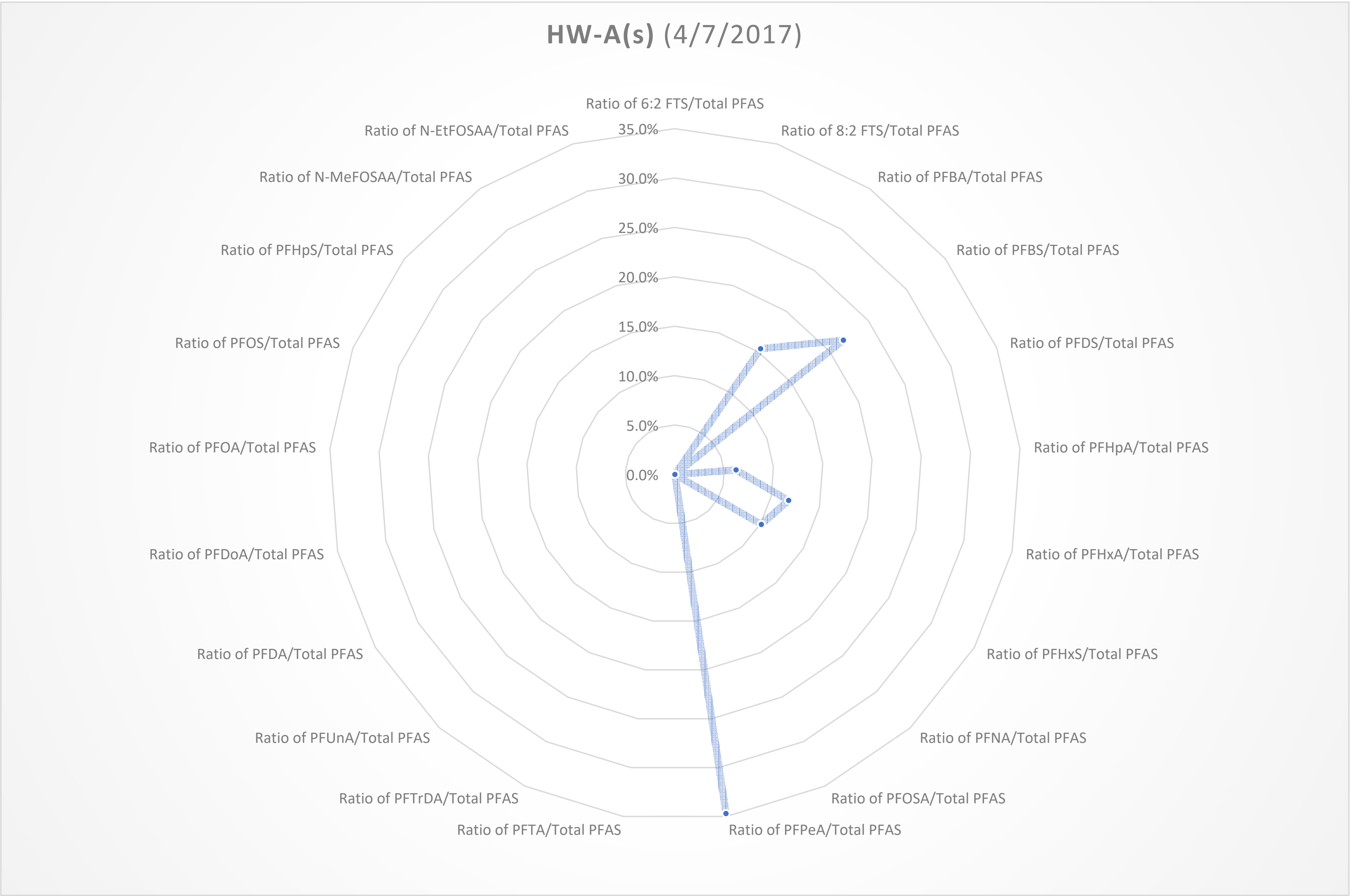
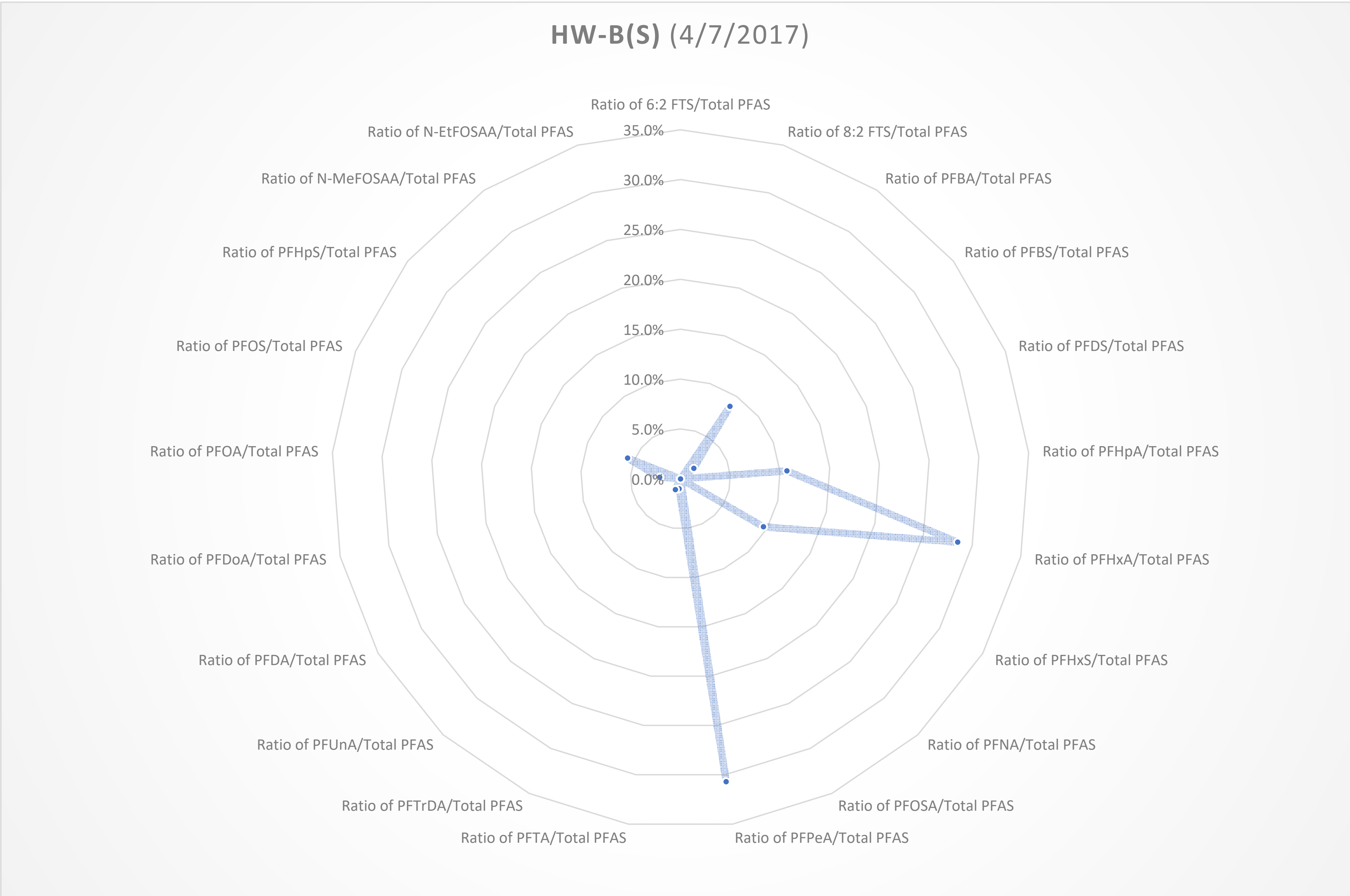
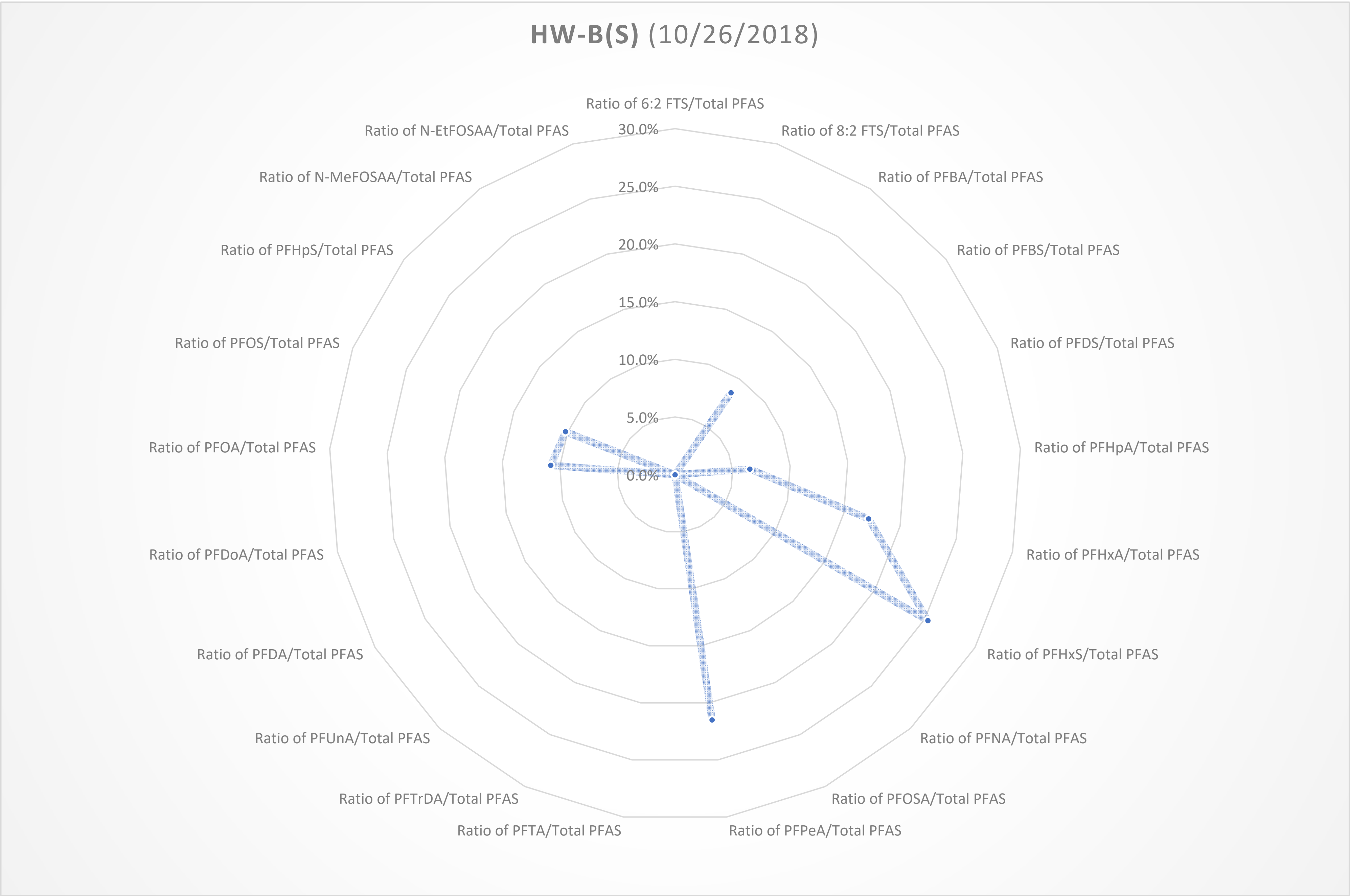
10.00%
0.00%

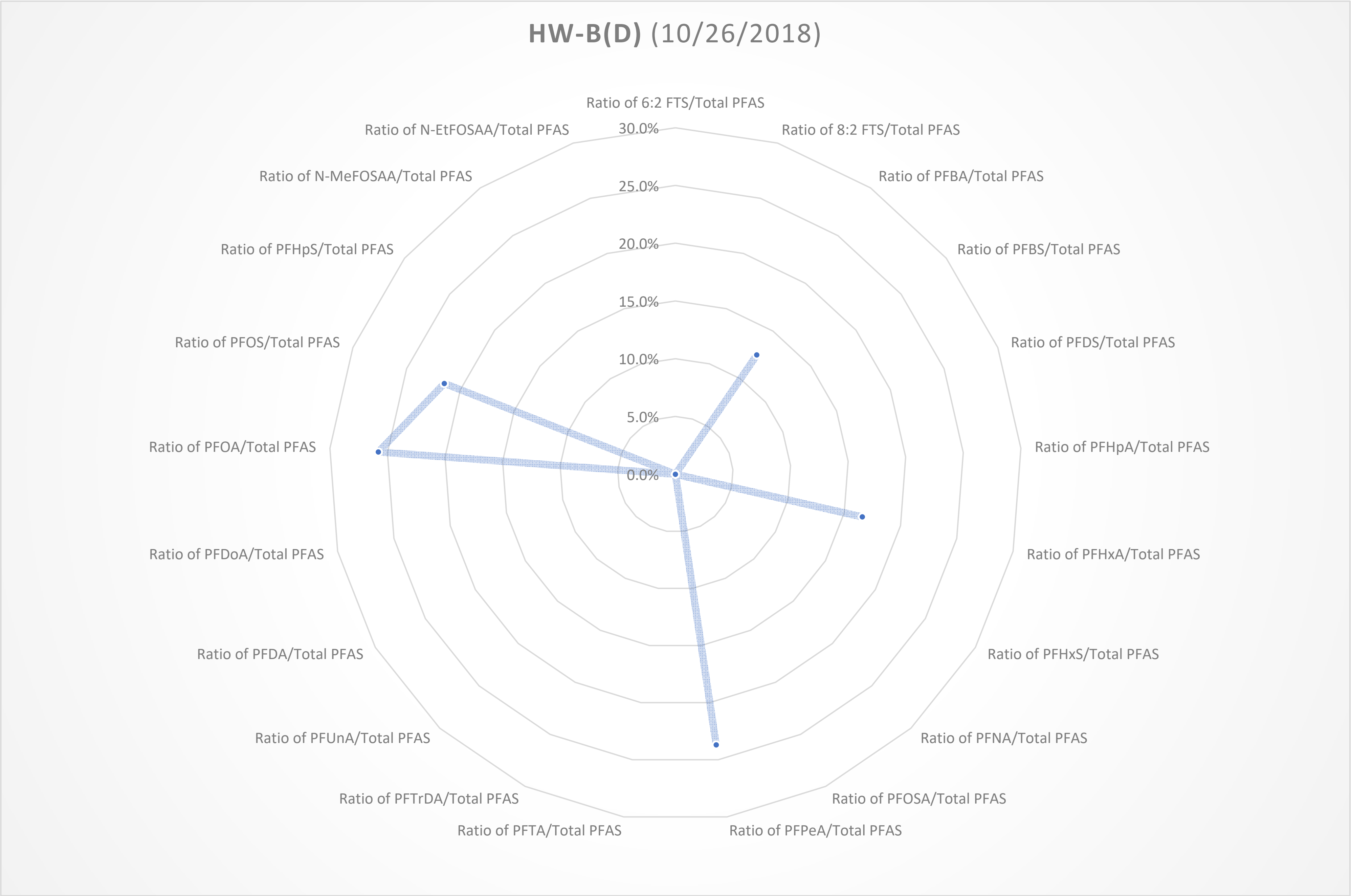

HW-A(s) (4/7/2017)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%



HW-B(S) (4/7/2017)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%



HW-B(S) (10/26/2018)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%


HW-B(D) (10/26/2018)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
30.0%
25.0%
20.0%
15.0%
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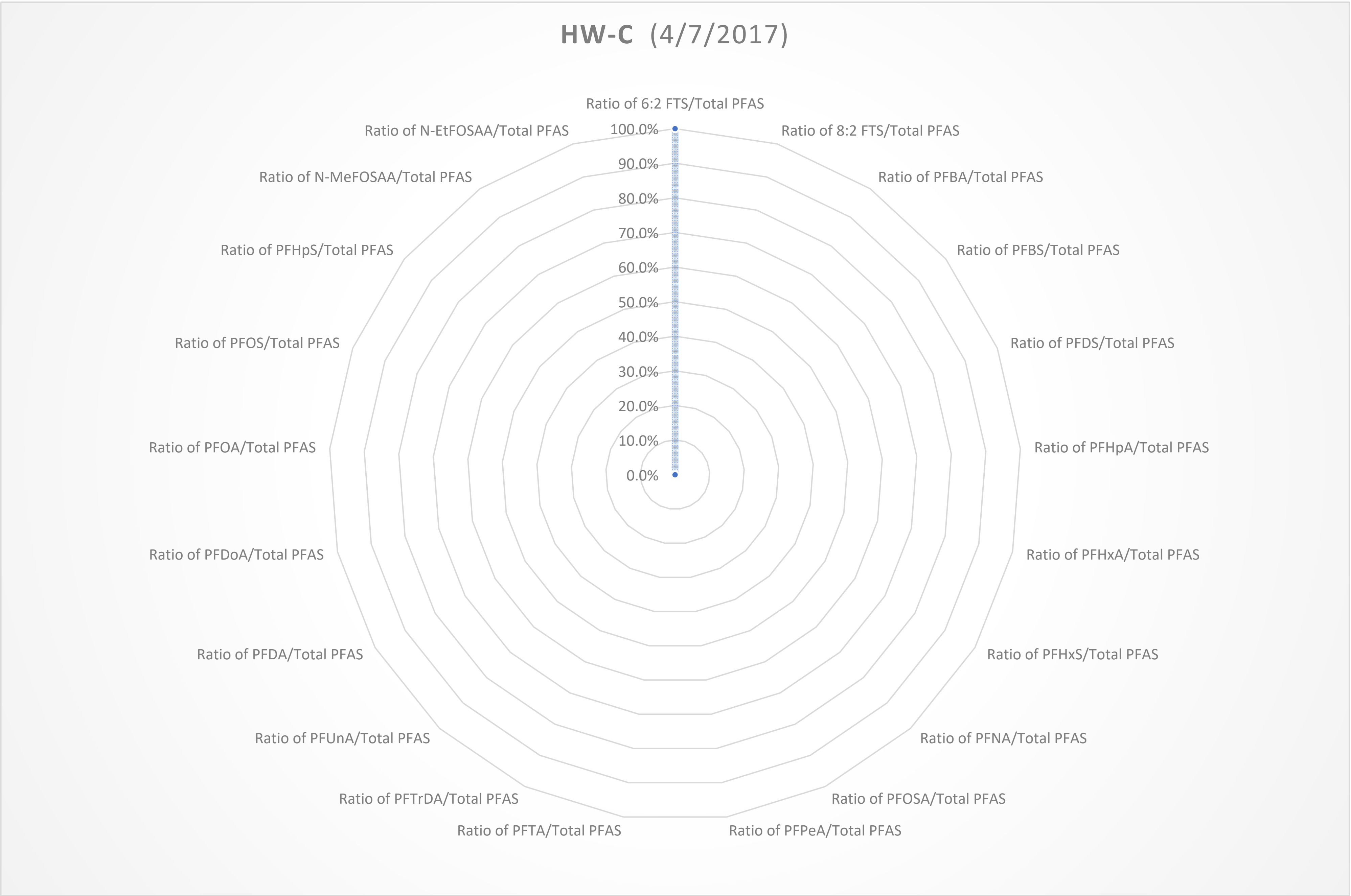
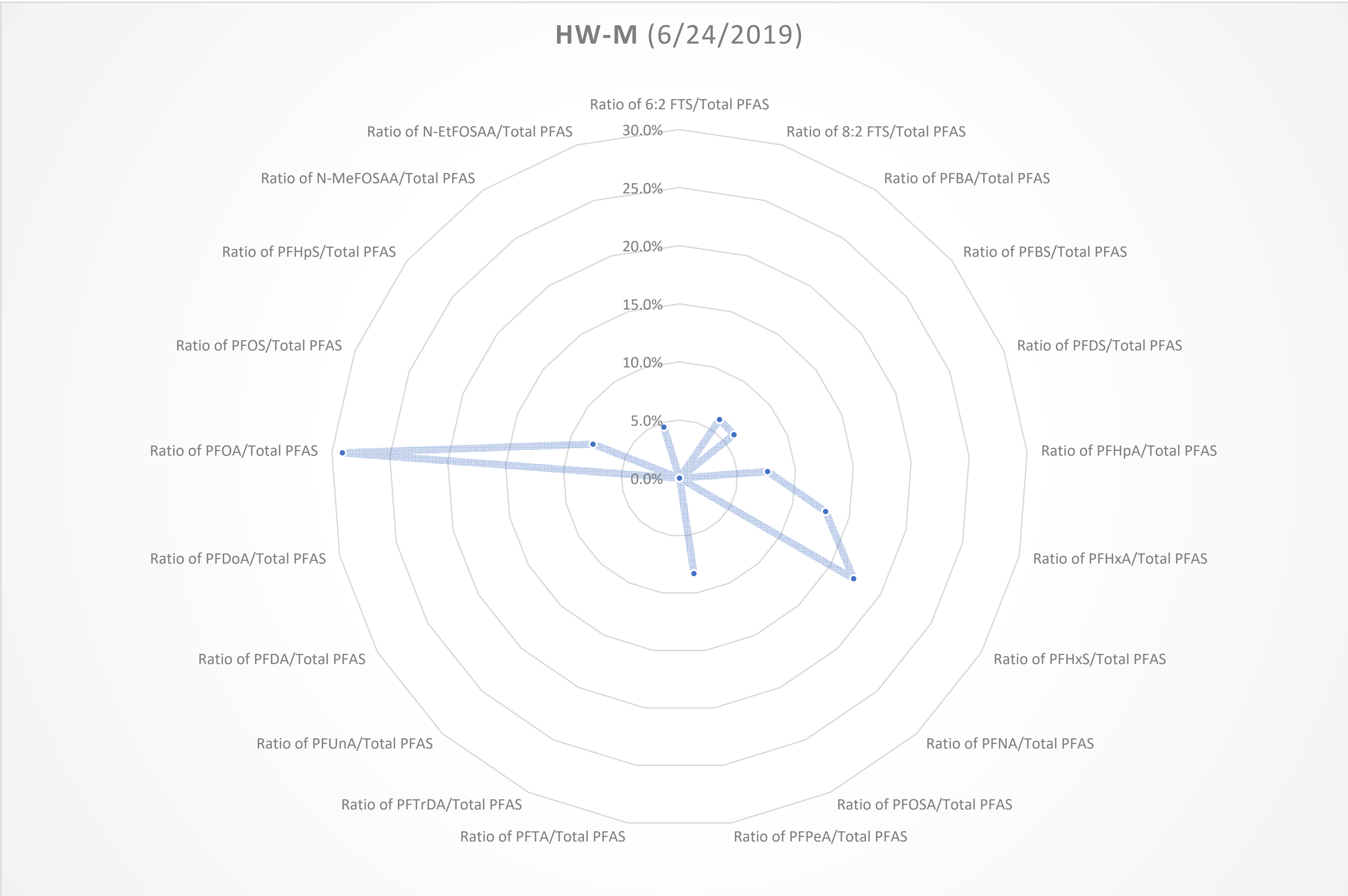
5.0%
0.0%


HW-C (4/7/2017)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%



HW-M (6/24/2019)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
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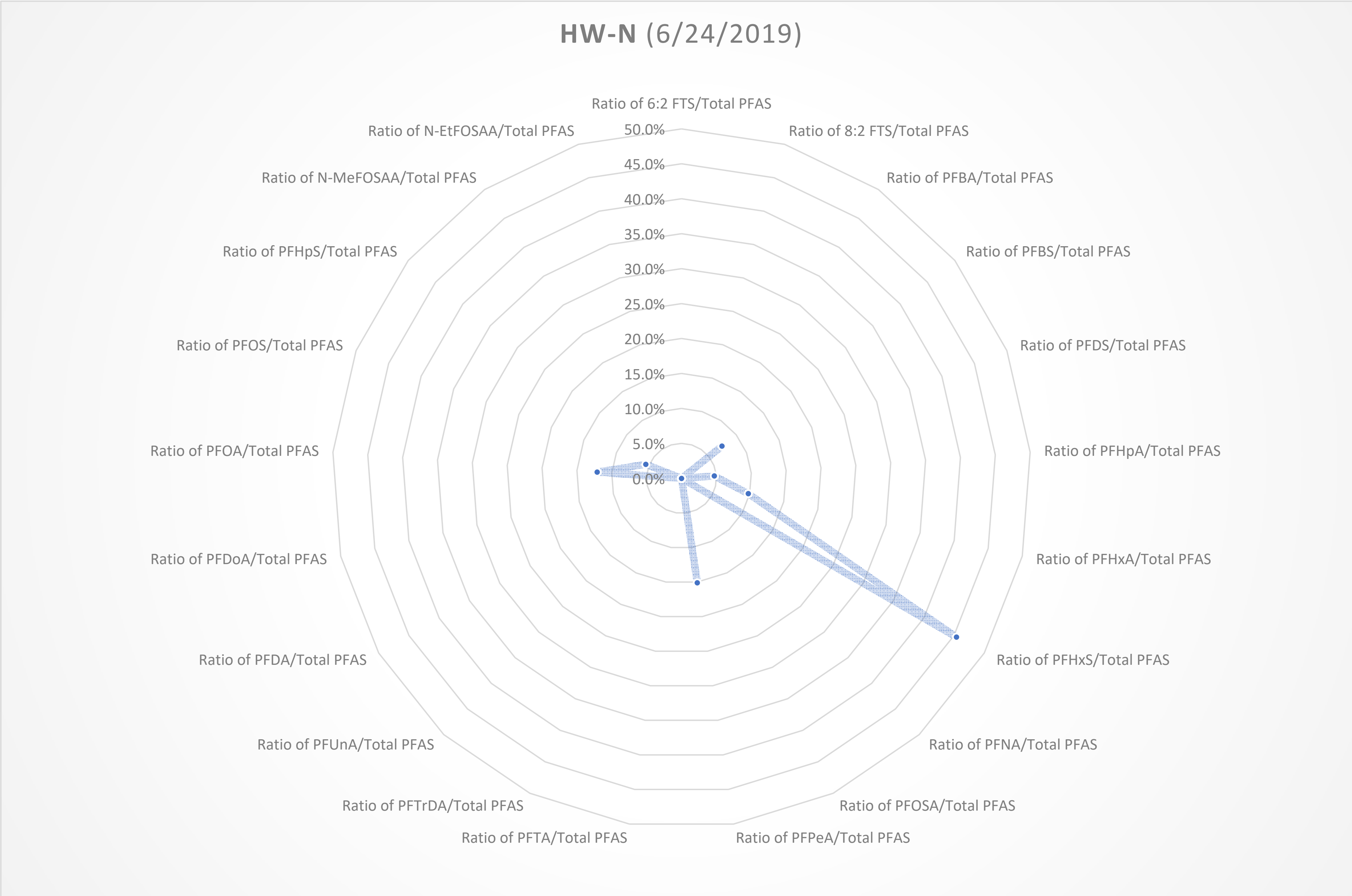
HW-N (6/24/2019)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
50.0%
45.0%
40.0%
35.0%
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25.0%
20.0%
15.0%
10.0%
5.0%
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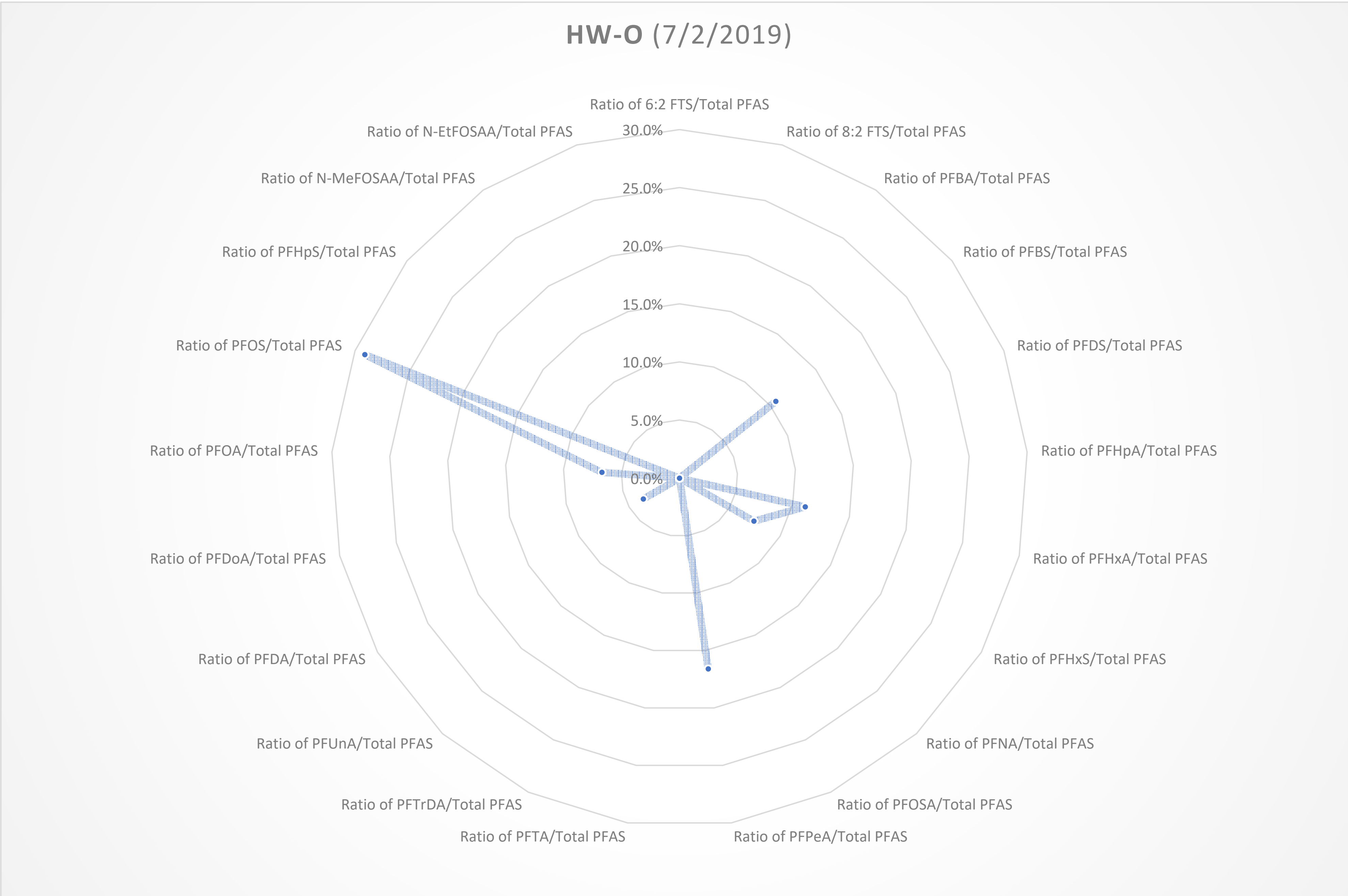
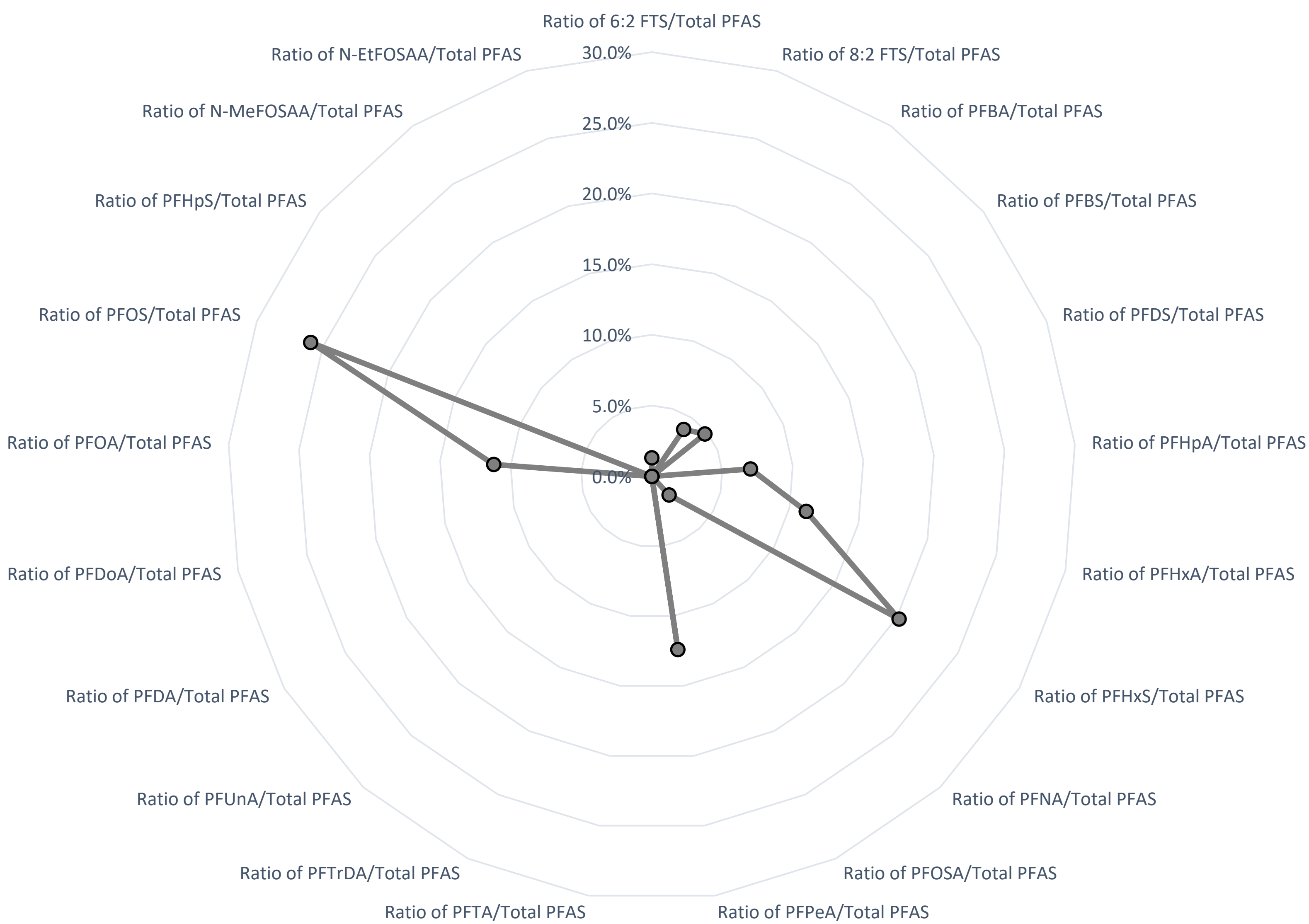
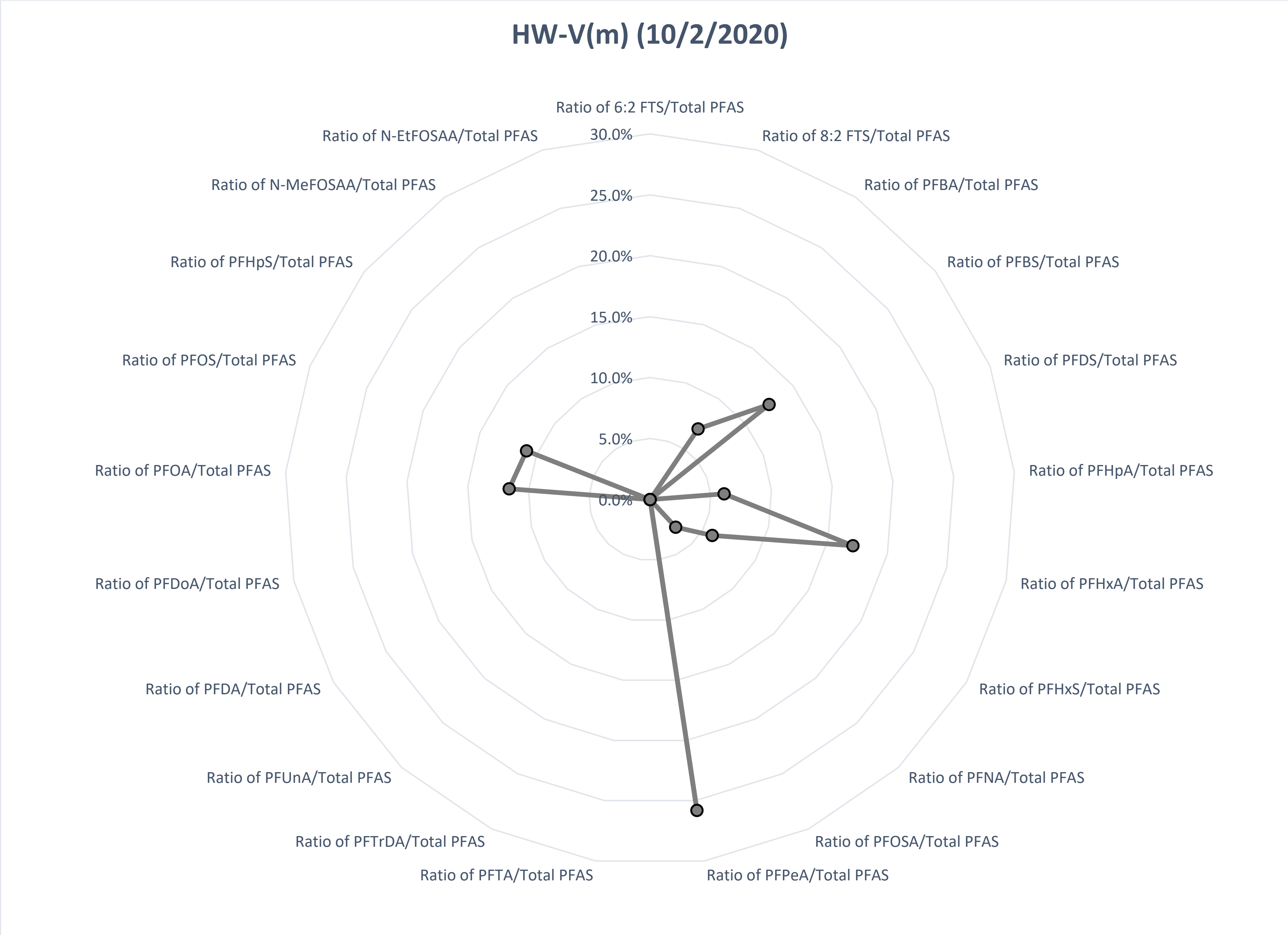


HW-O (7/2/2019)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%

HW-U(d) (10/1/2020)





HW-V(m) (10/2/2020)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
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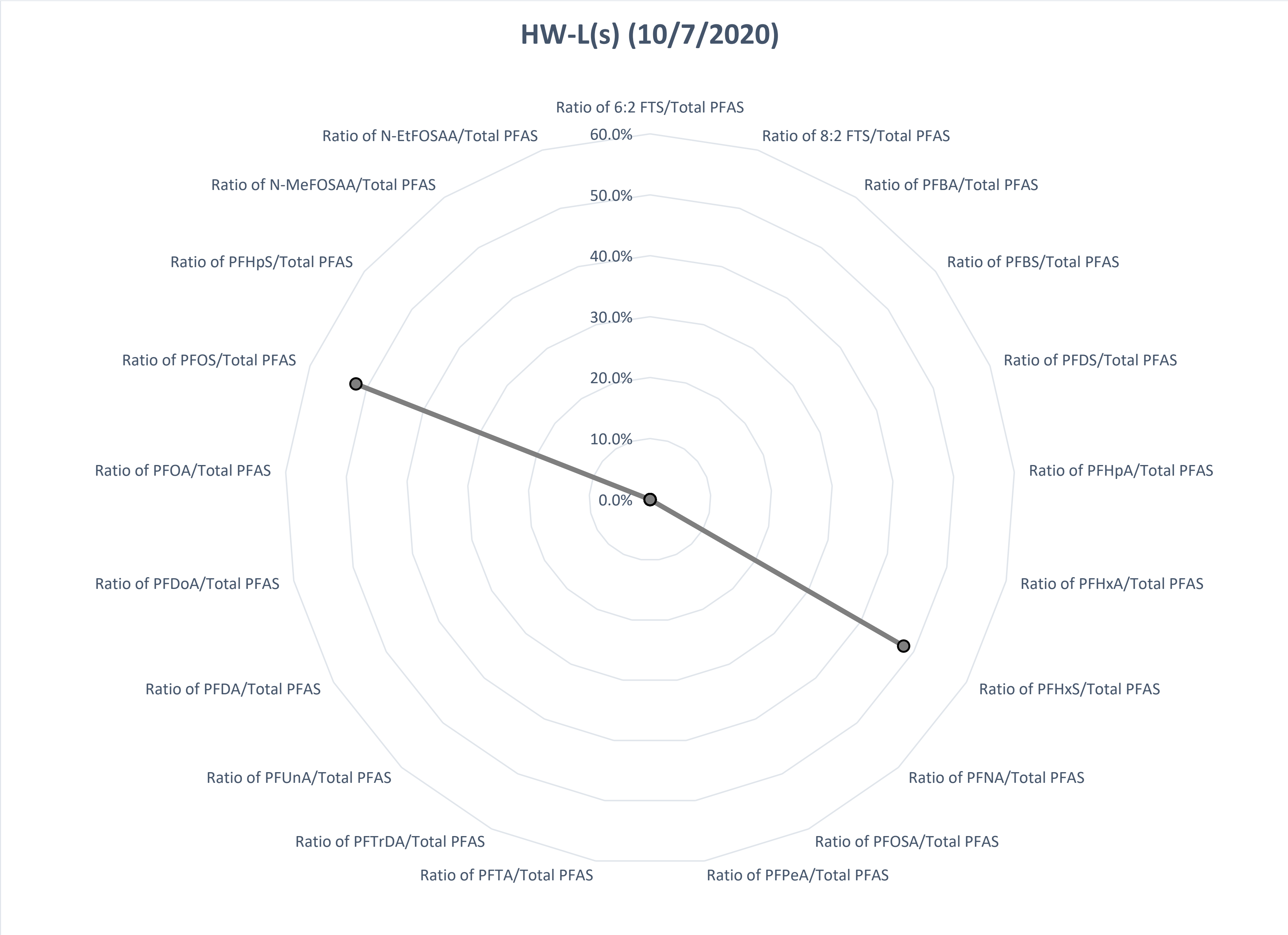
20.0%
15.0%
10.0%
5.0%
0.0%


HW-L(s) (10/7/2020)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
60.0%
50.0%
40.0%
30.0%
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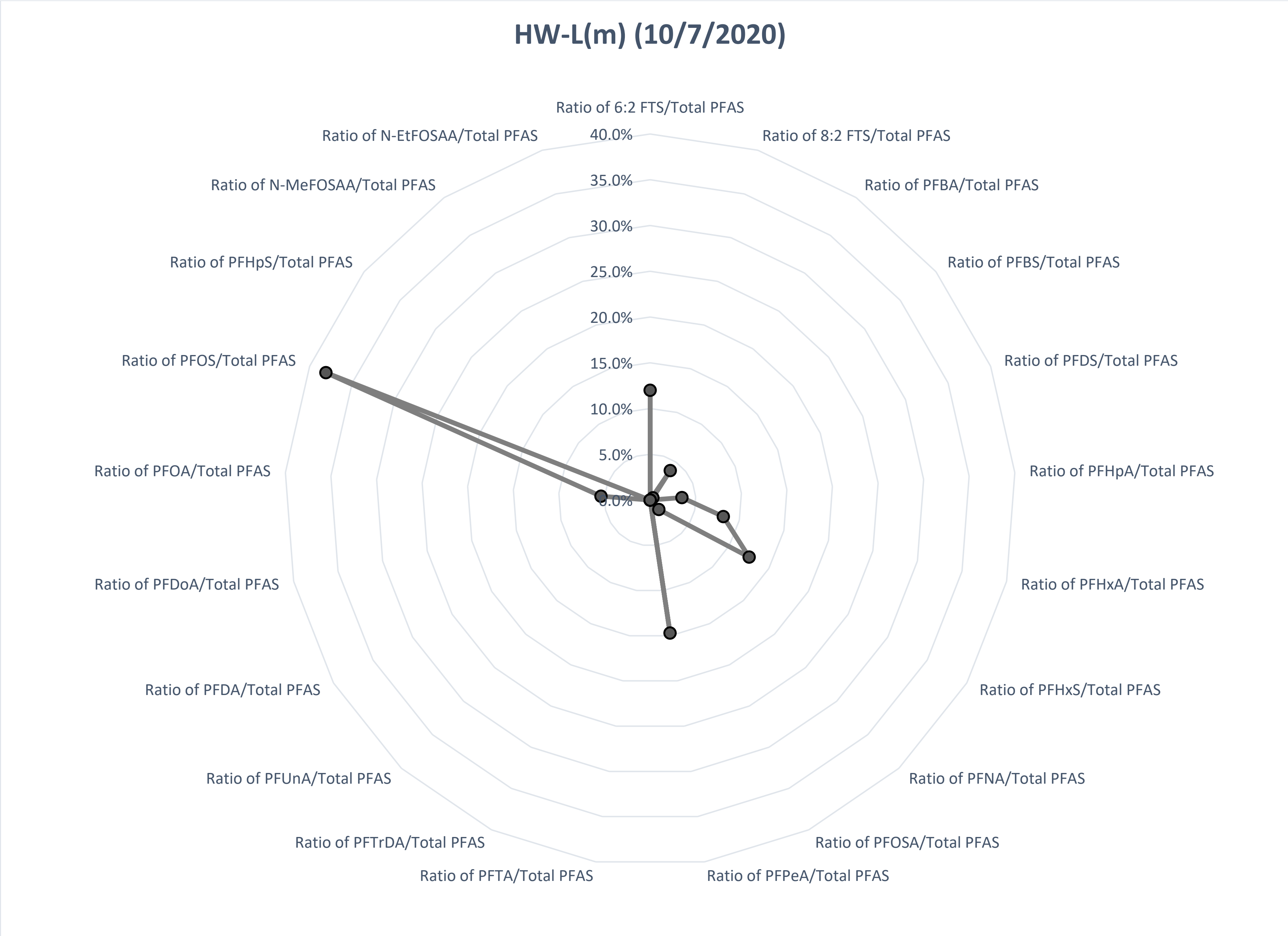
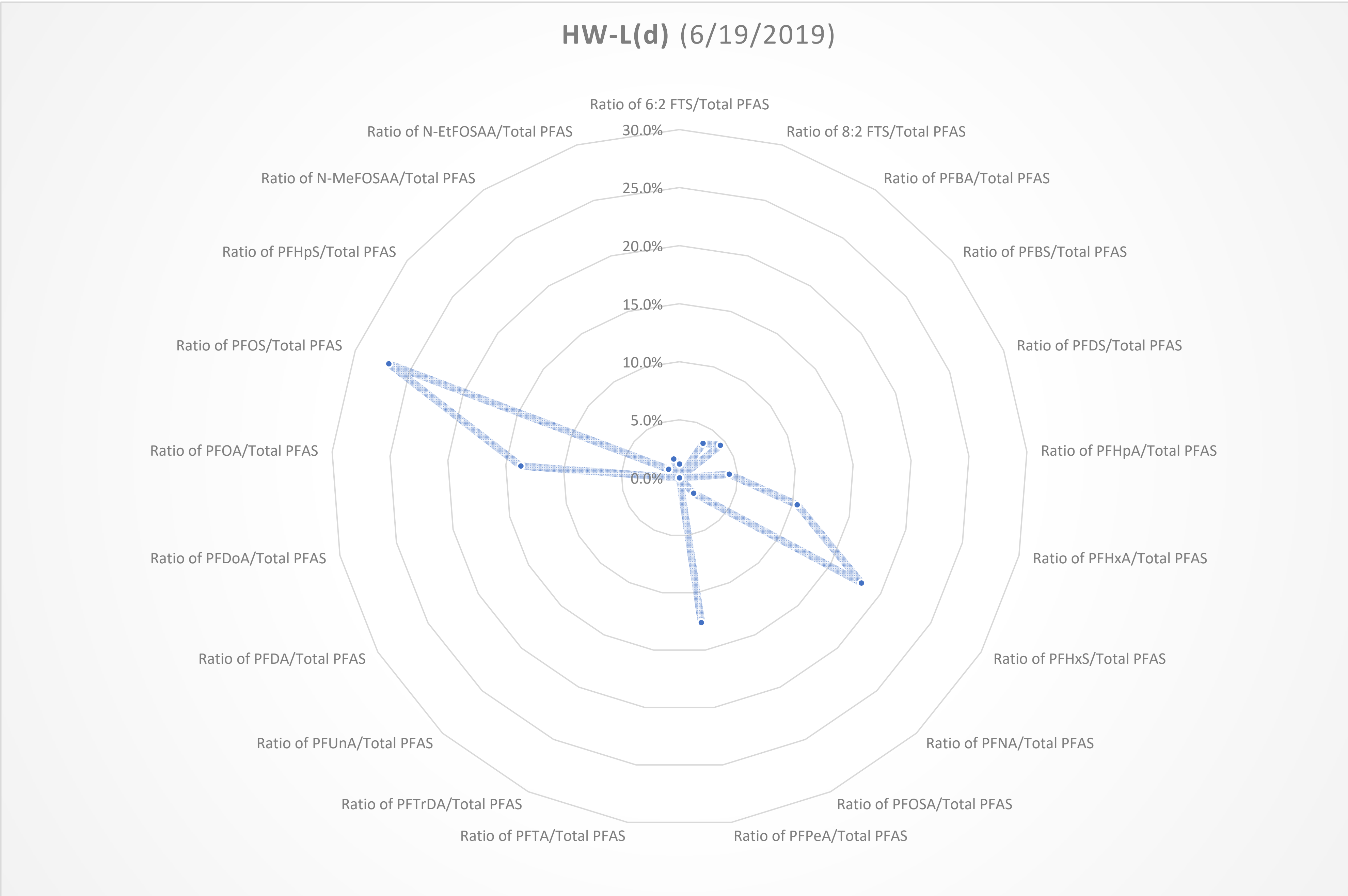
10.0%
0.0%


HW-L(m) (10/7/2020)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%



HW-L(d) (6/19/2019)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
30.0%
25.0%
20.0%
15.0%
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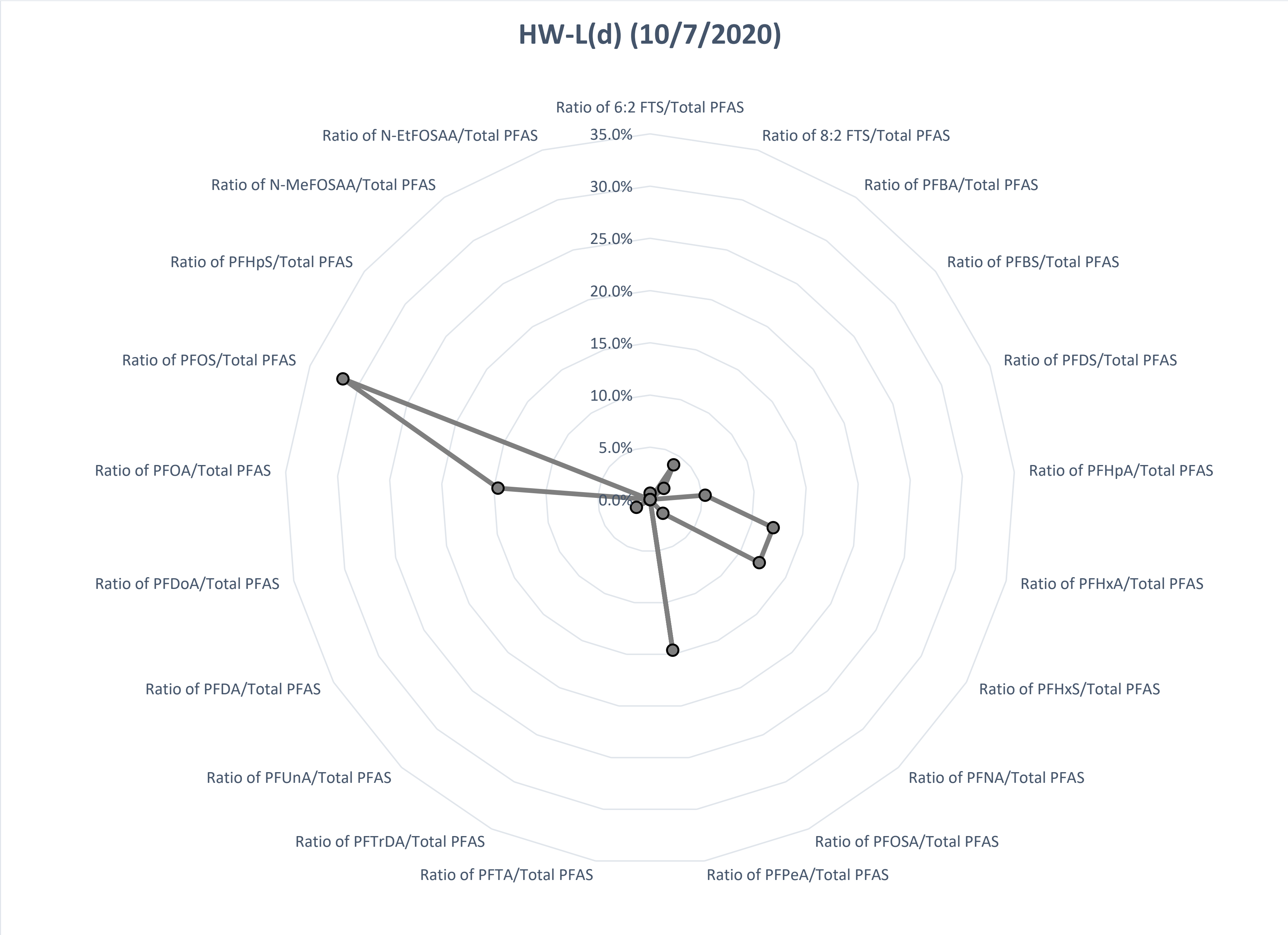
5.0%
0.0%


HW-L(d) (10/7/2020)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
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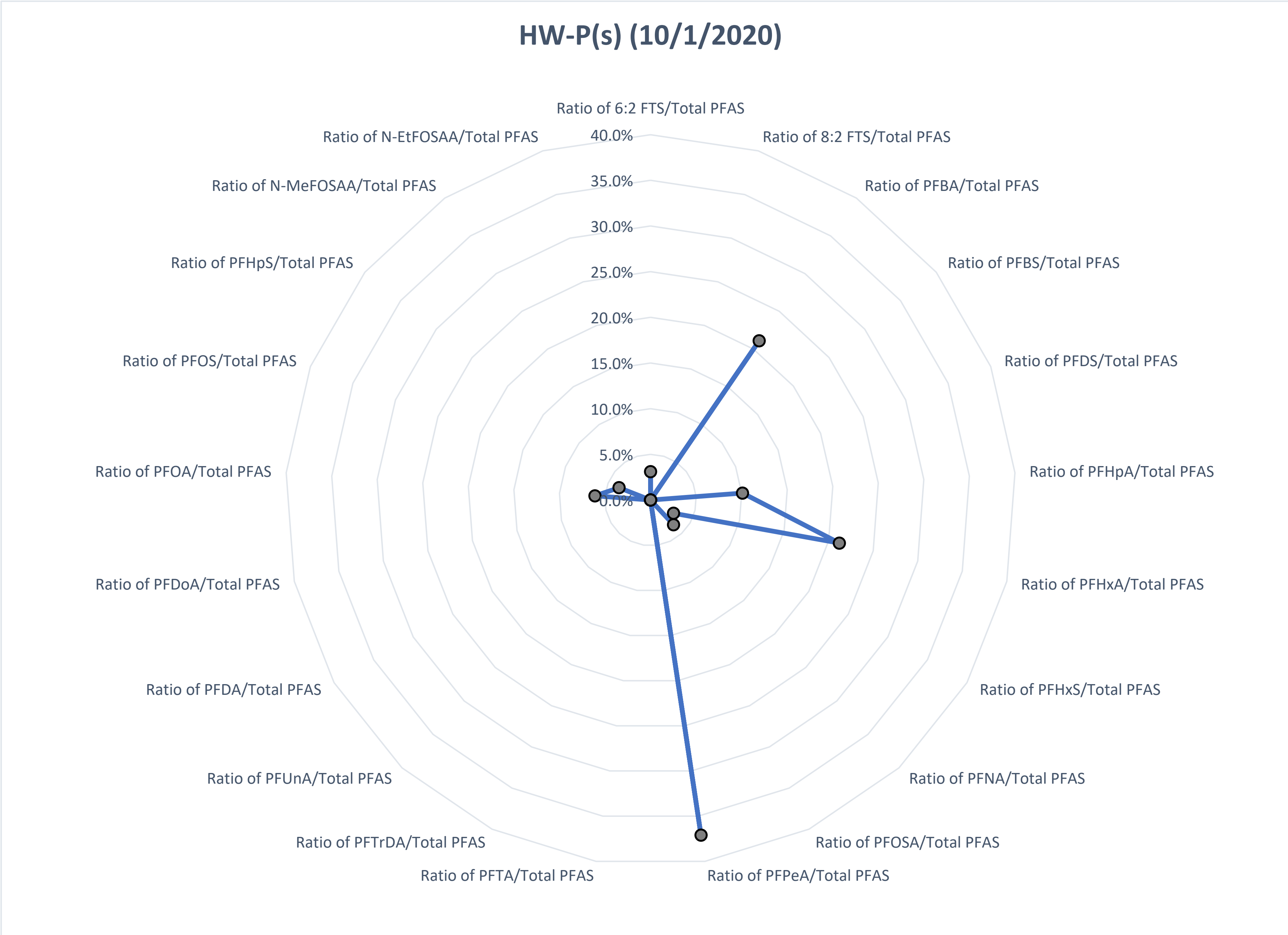
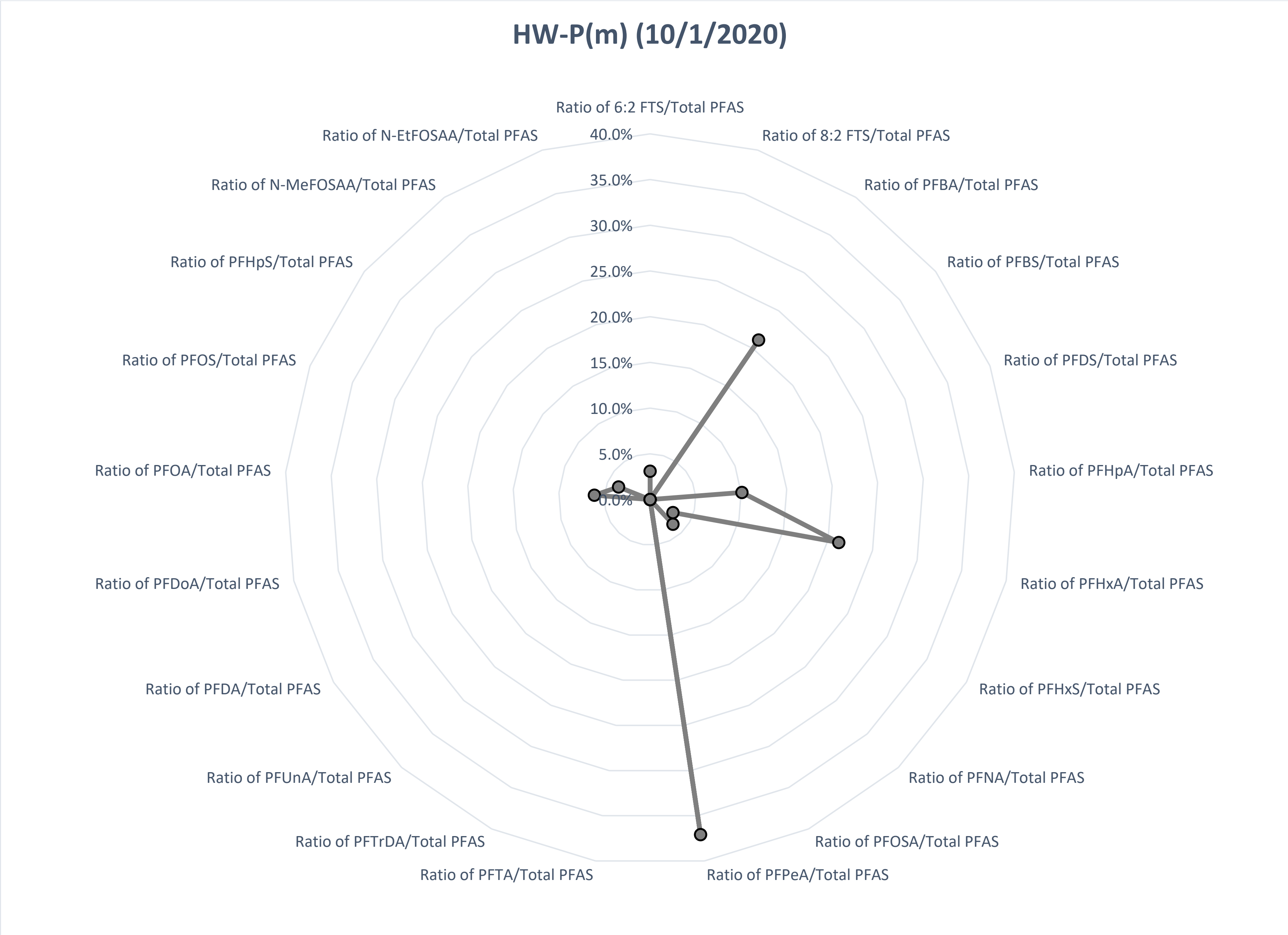
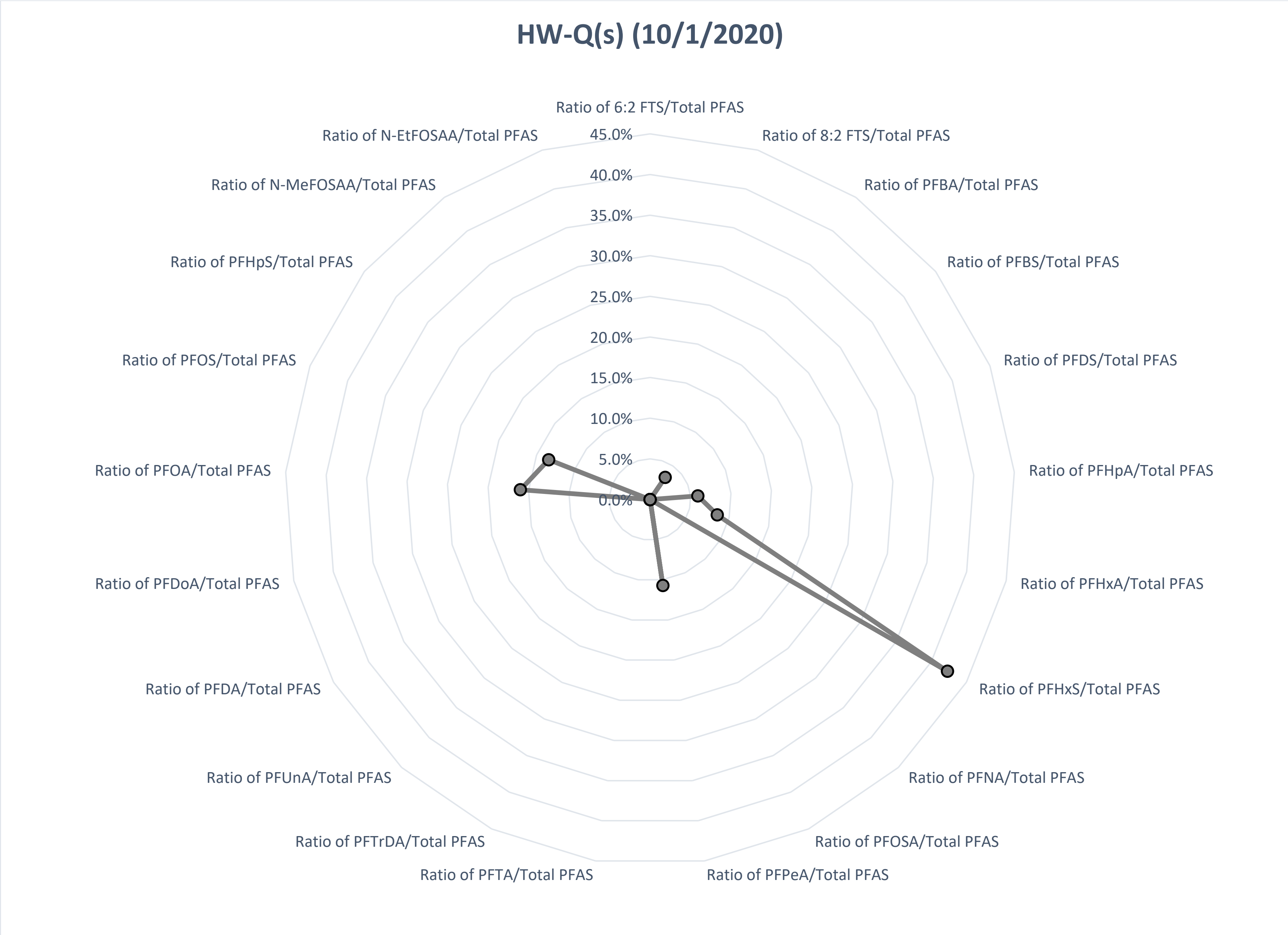
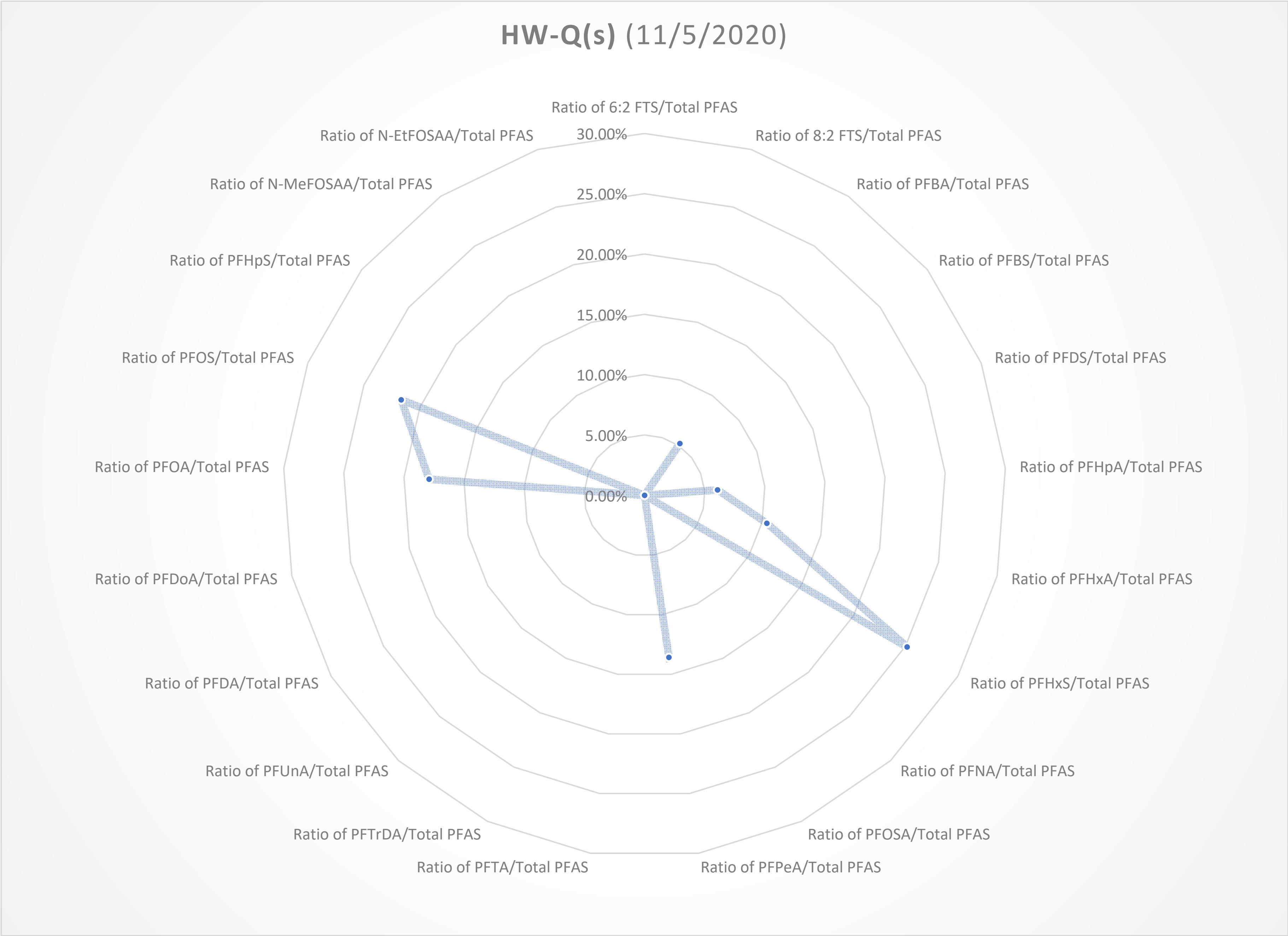
10.0%
5.0%
0.0%


HW-P(s) (10/1/2020)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%


HW-P(m) (10/1/2020)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%


HW-Q(s) (10/1/2020)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%



HW-Q(s) (11/5/2020)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
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25.00%
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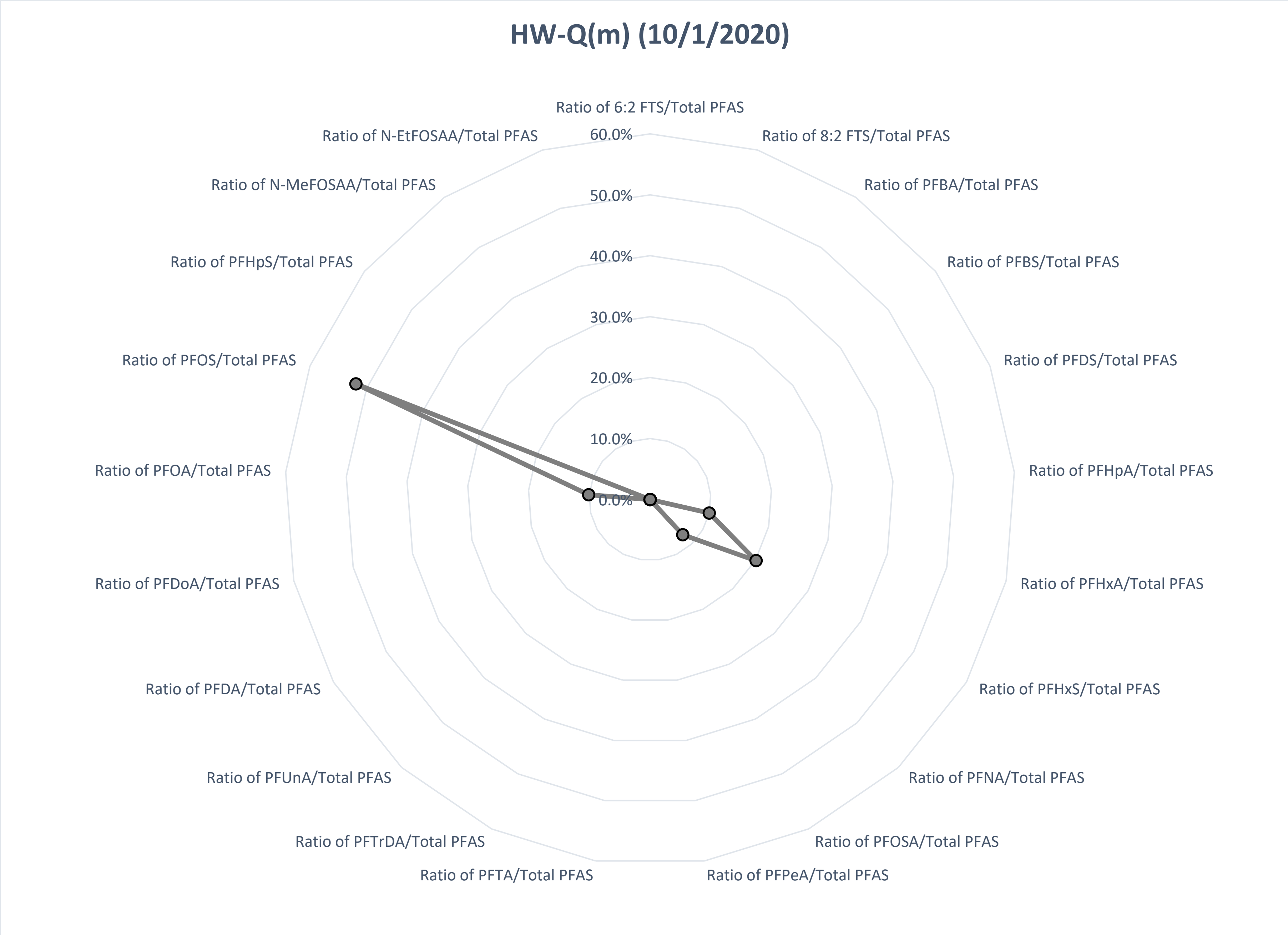
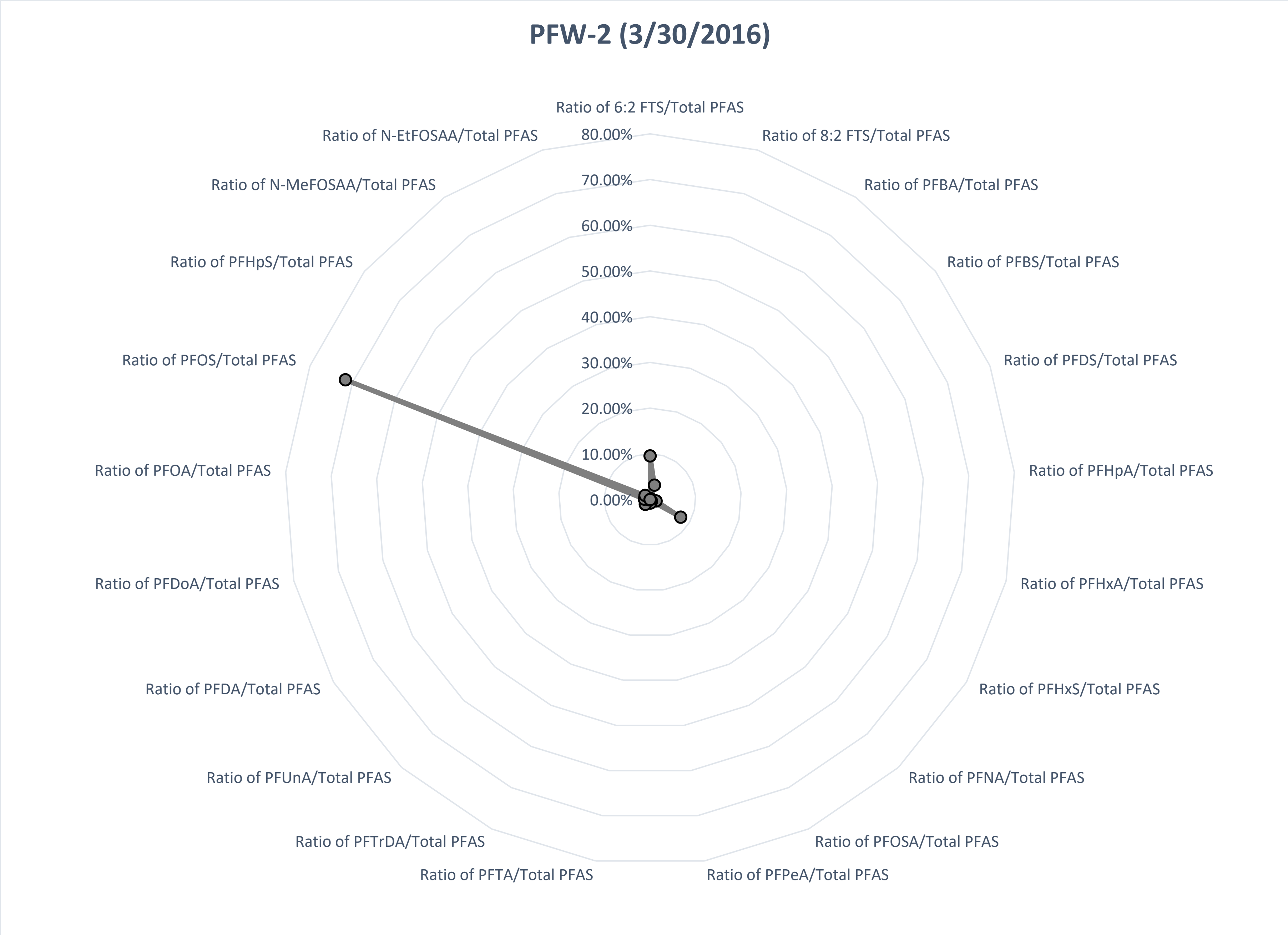
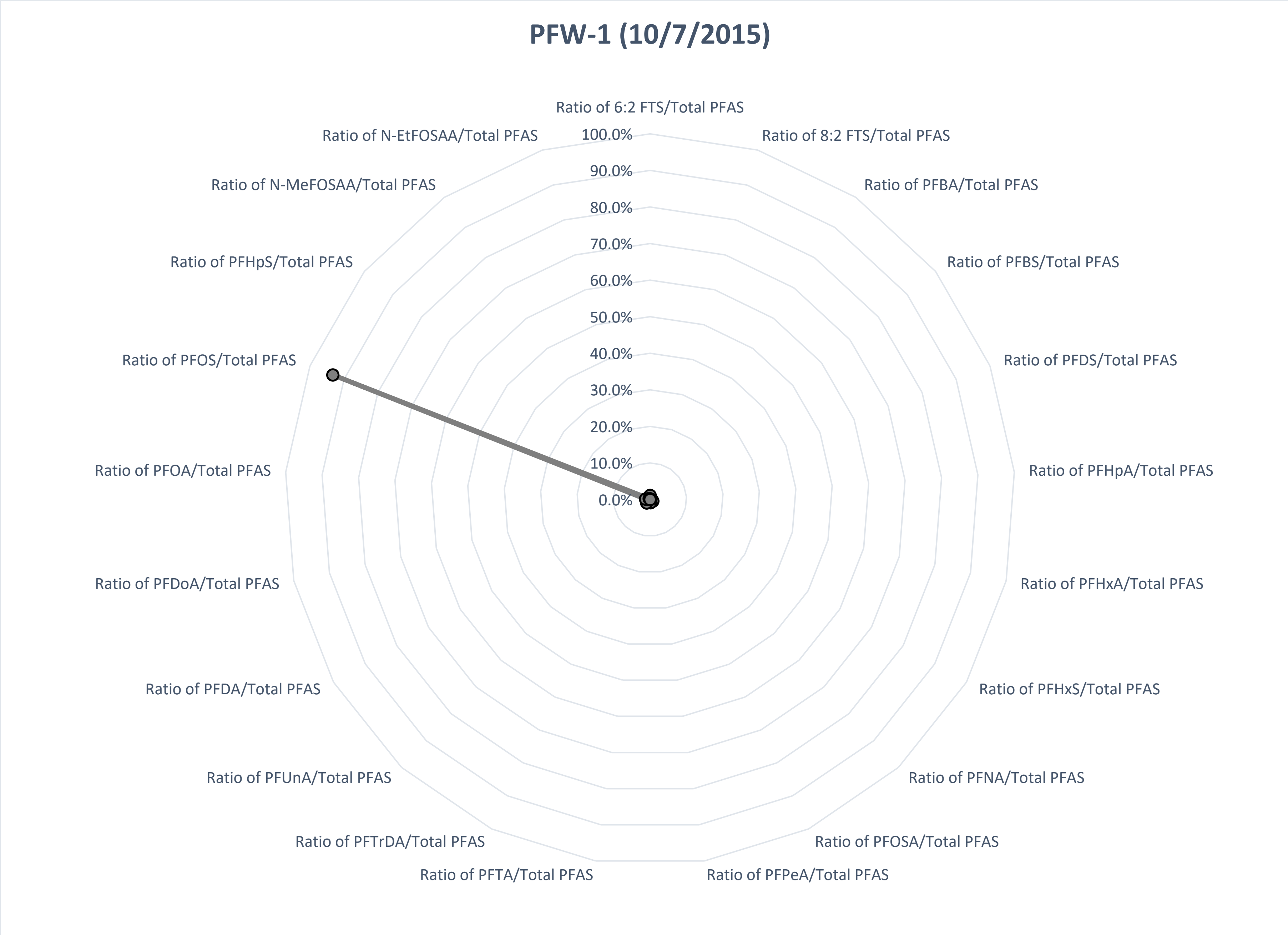
5.00%
0.00%

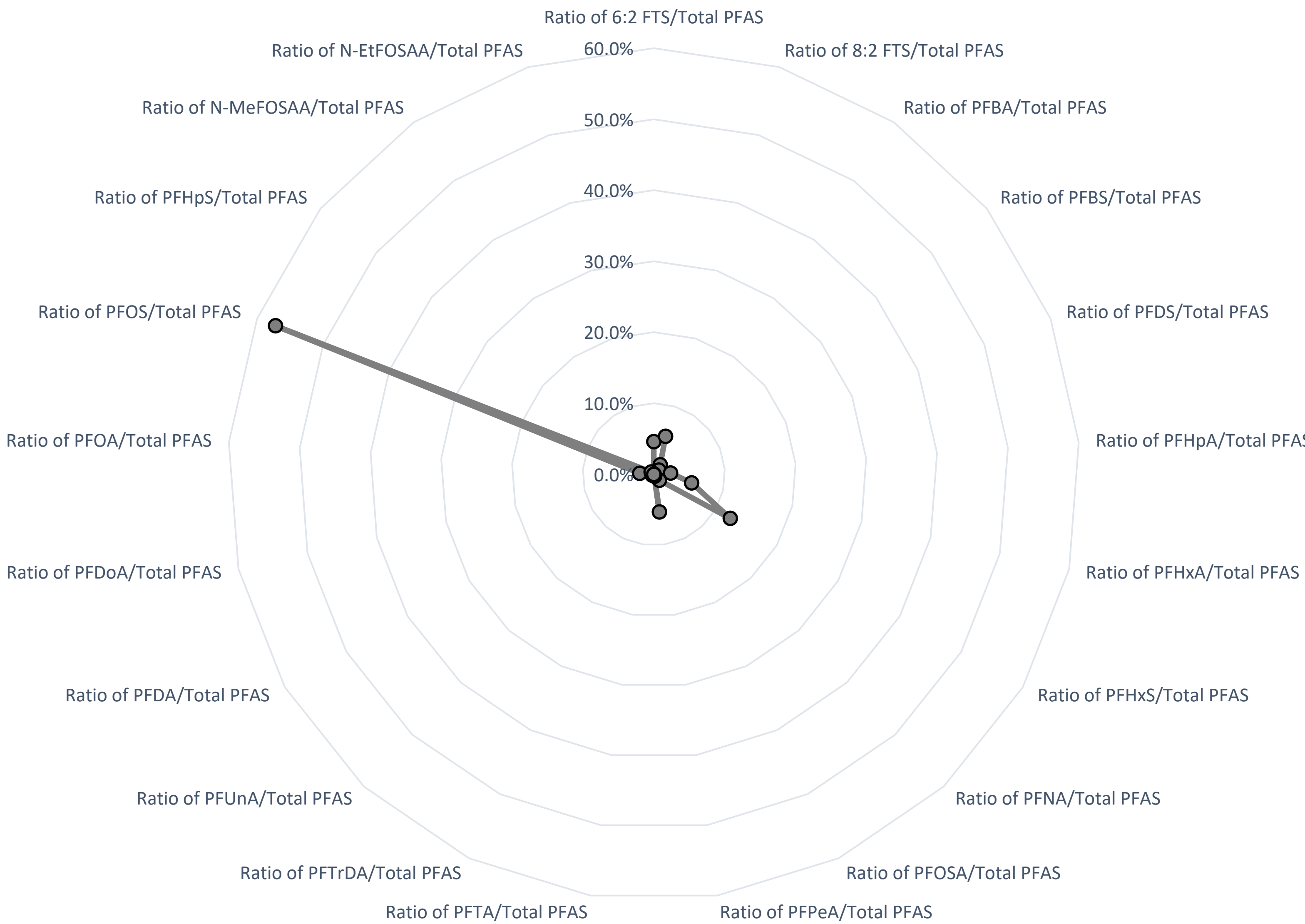

HW-Q(m) (10/1/2020)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%



PFW-2 (3/30/2016)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%


PFW-1 (10/7/2015)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%

PC-4 (3/8/2016)


Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
60.0%
50.0%
40.0%
30.0%
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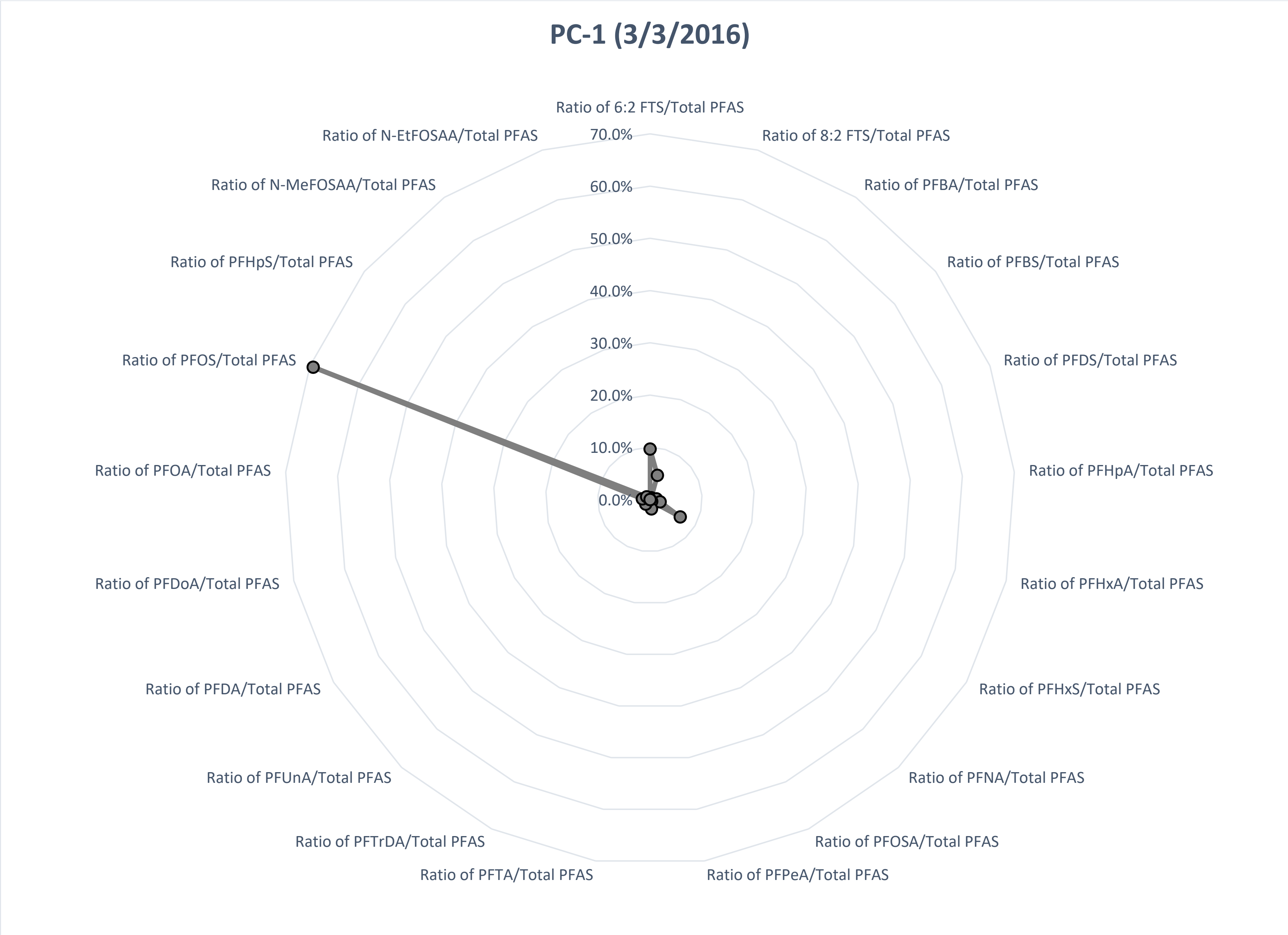
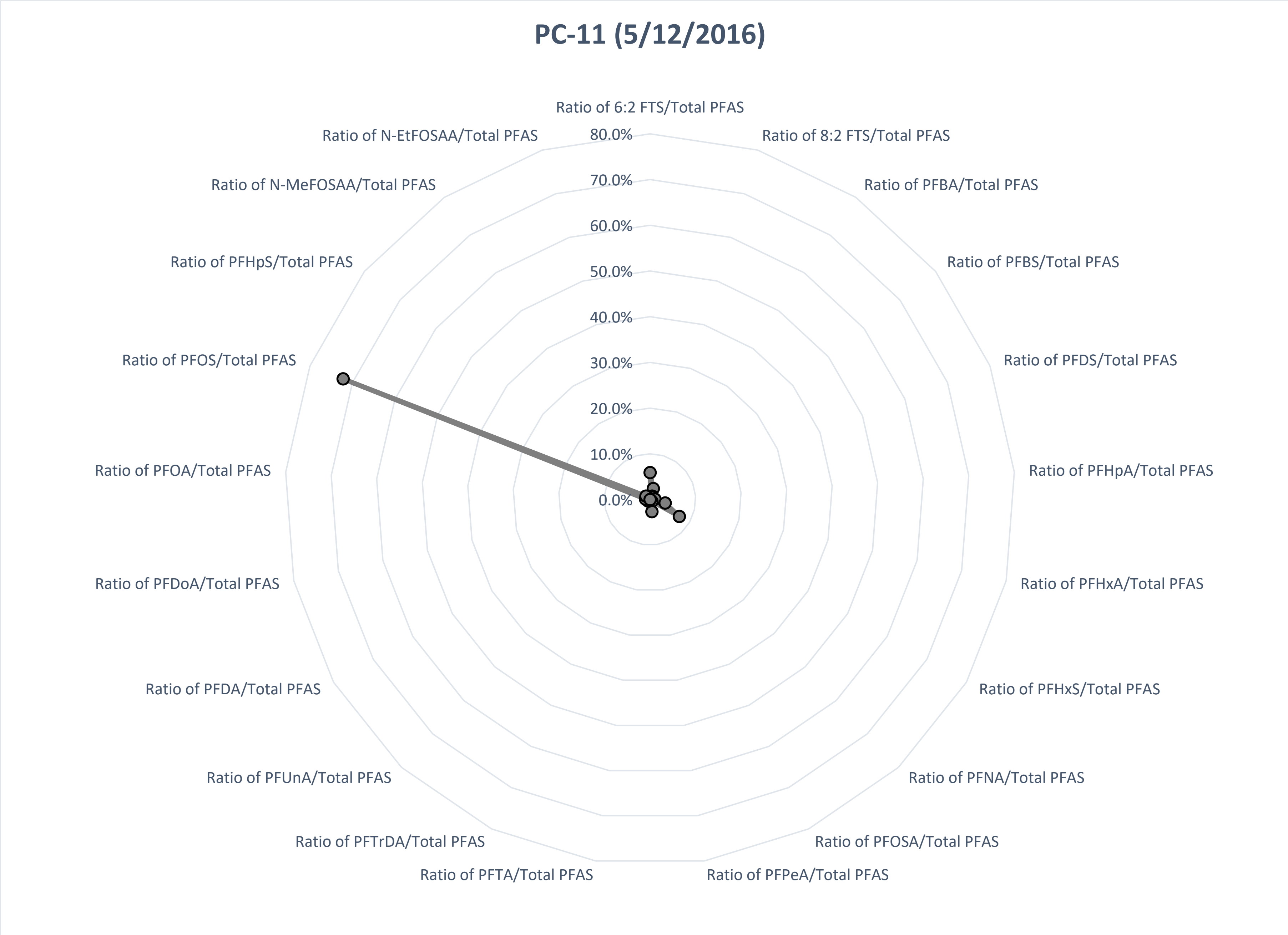
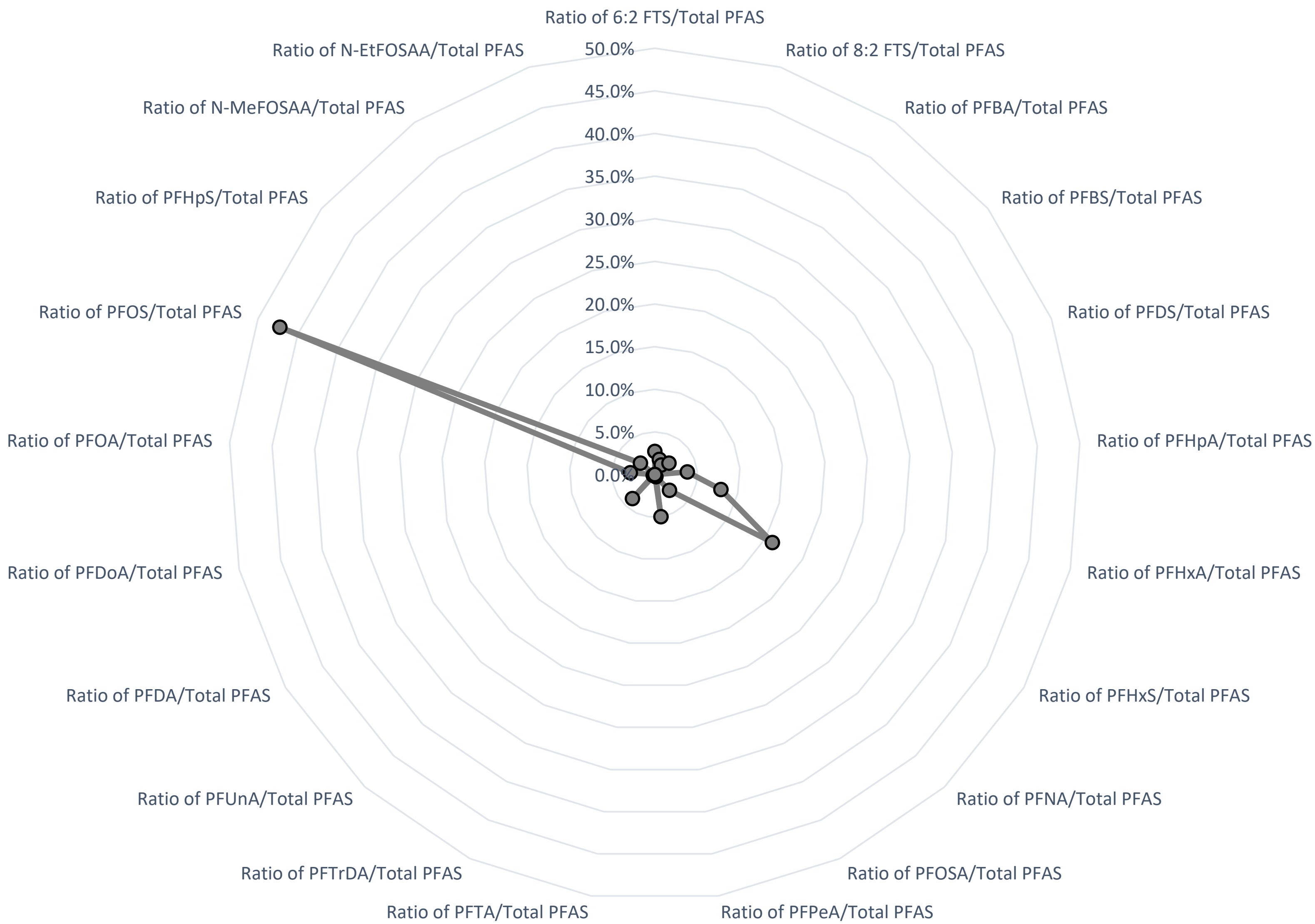
10.0%
0.0%



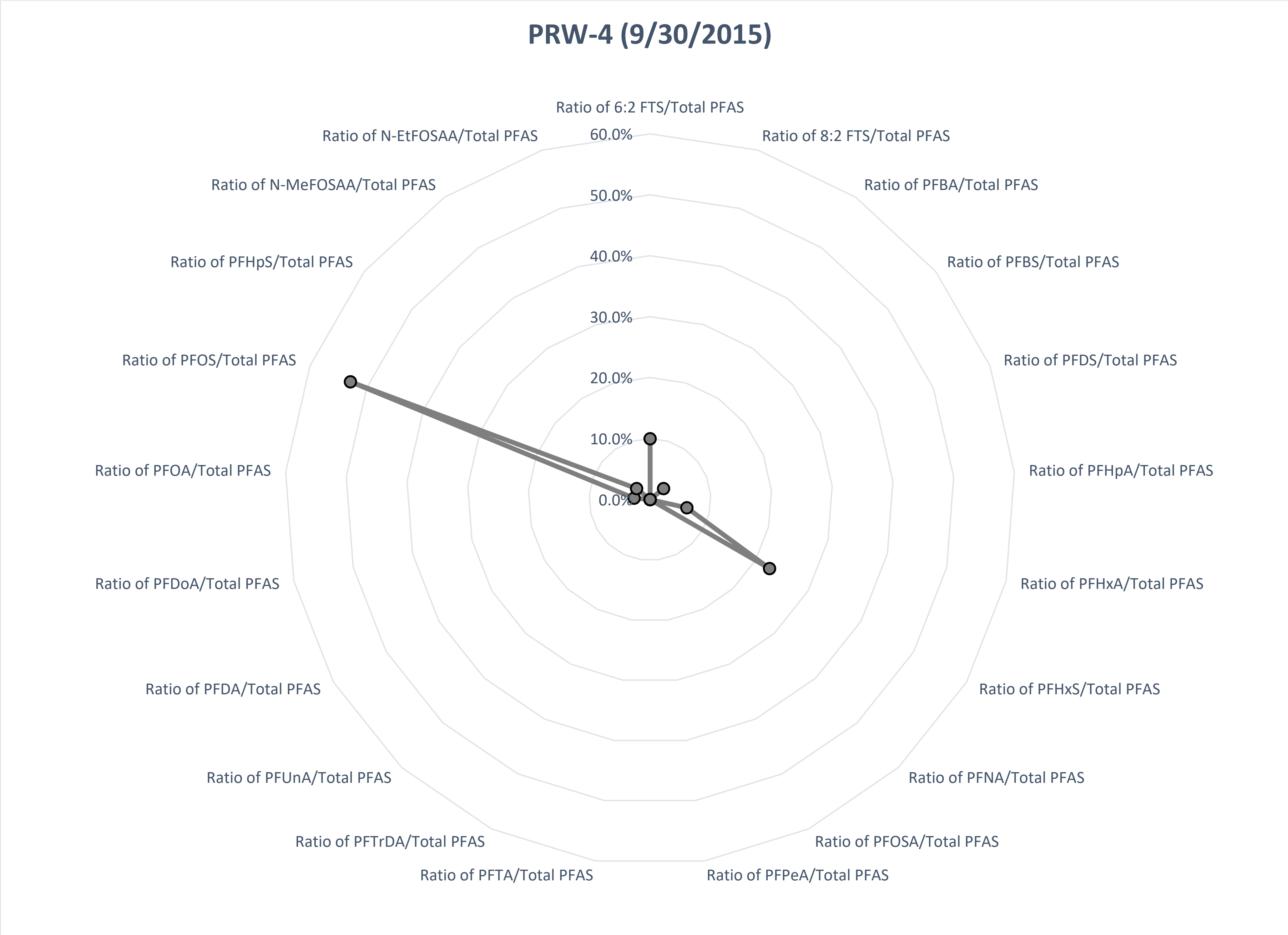
PC-1 (3/3/2016)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%

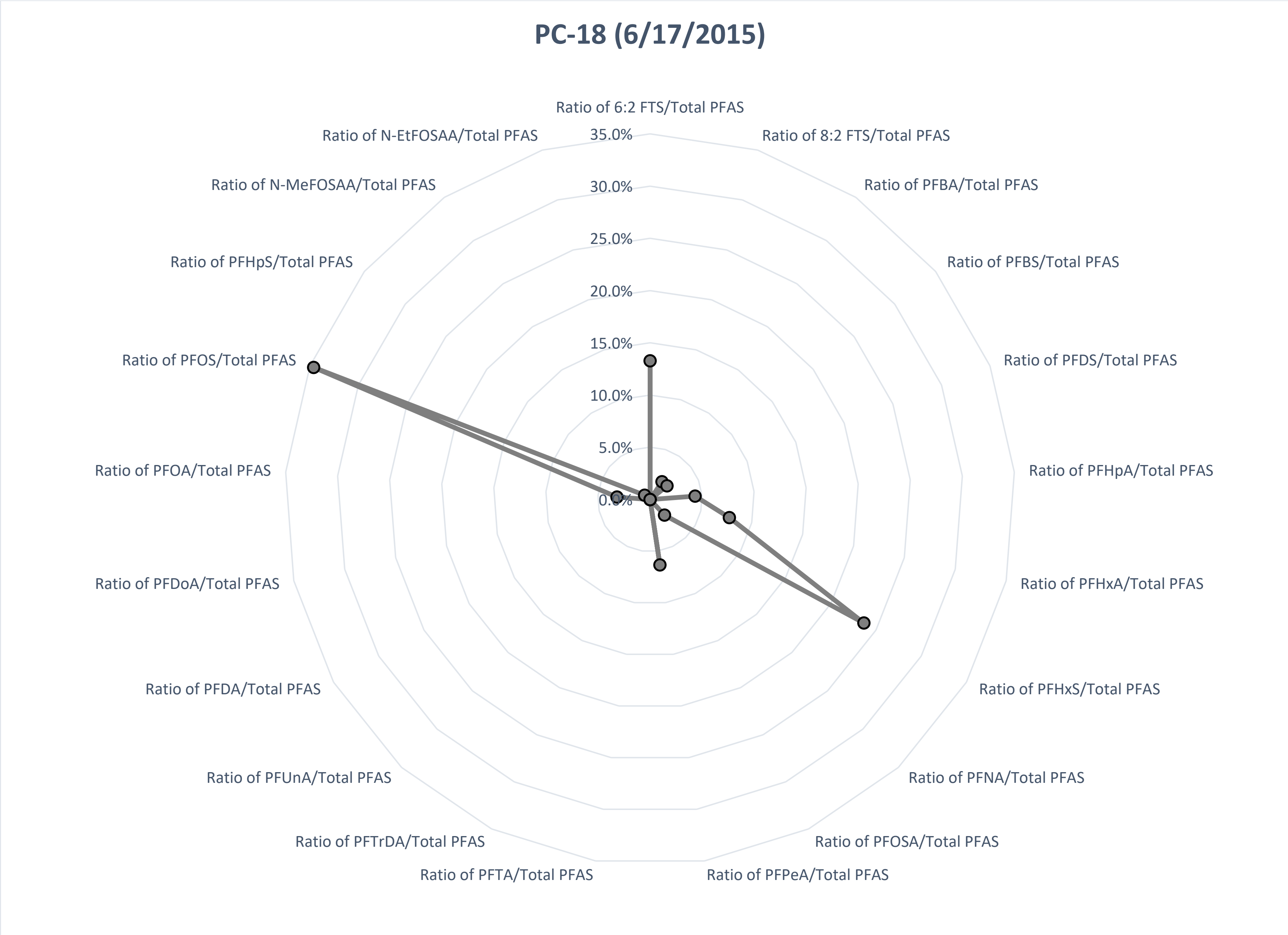

PC-11 (5/12/2016)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%

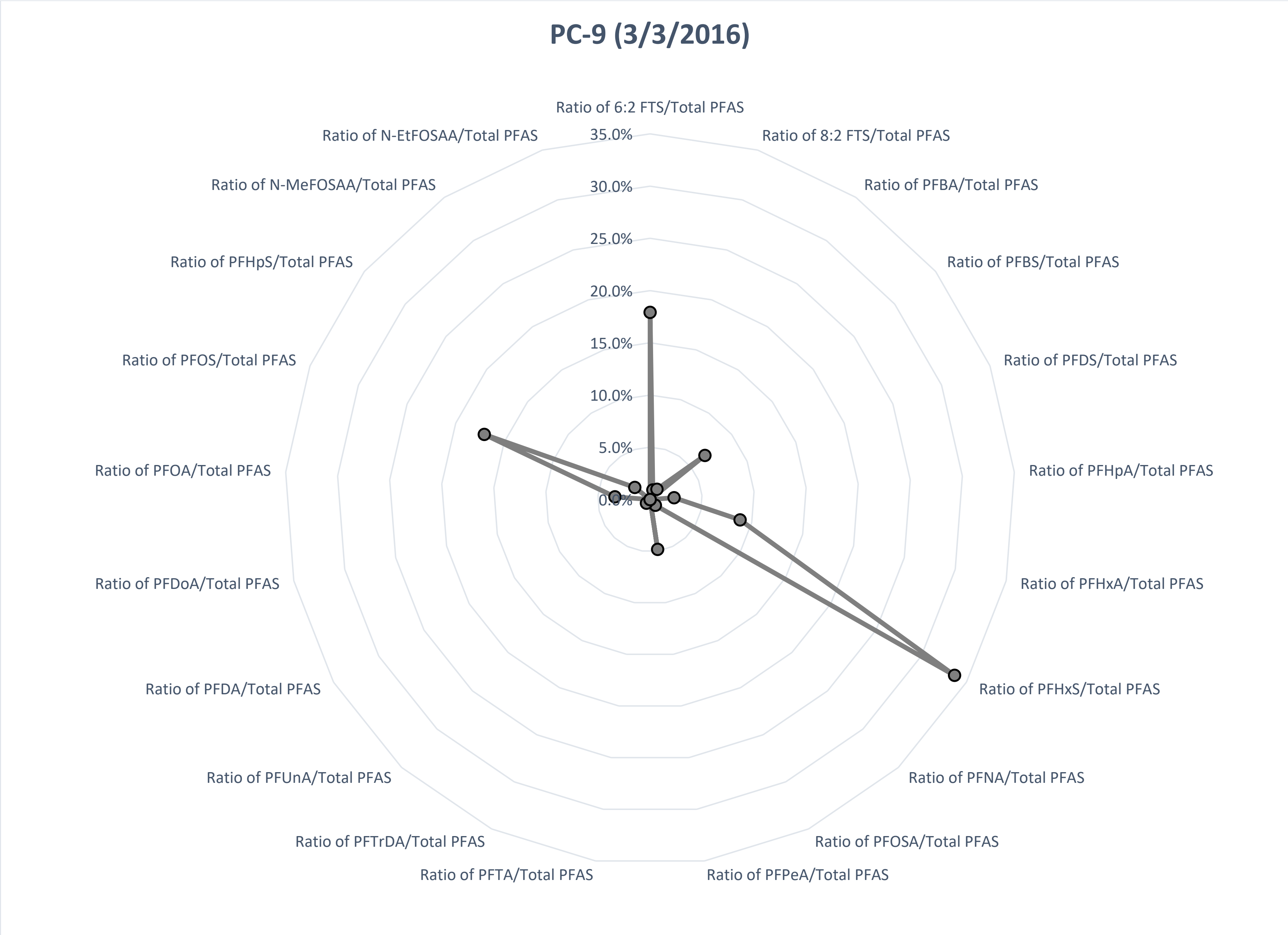
PC-8 (3/8/2016)



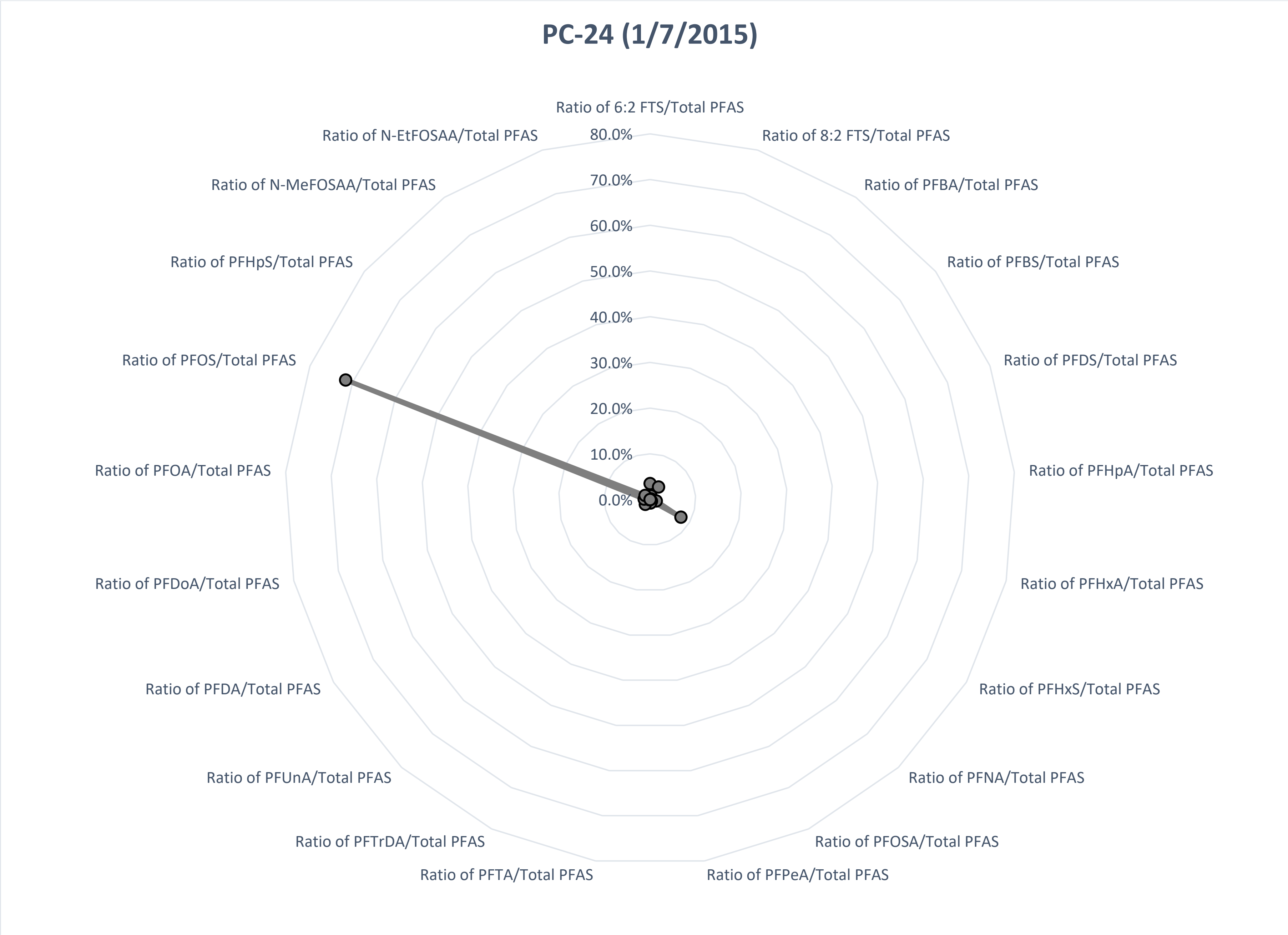
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
50.0%
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%


PRW-4 (9/30/2015)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%


PC-18 (6/17/2015)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%



PC-9 (3/3/2016)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%


PC-24 (1/7/2015)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
80.0%
70.0%
60.0%
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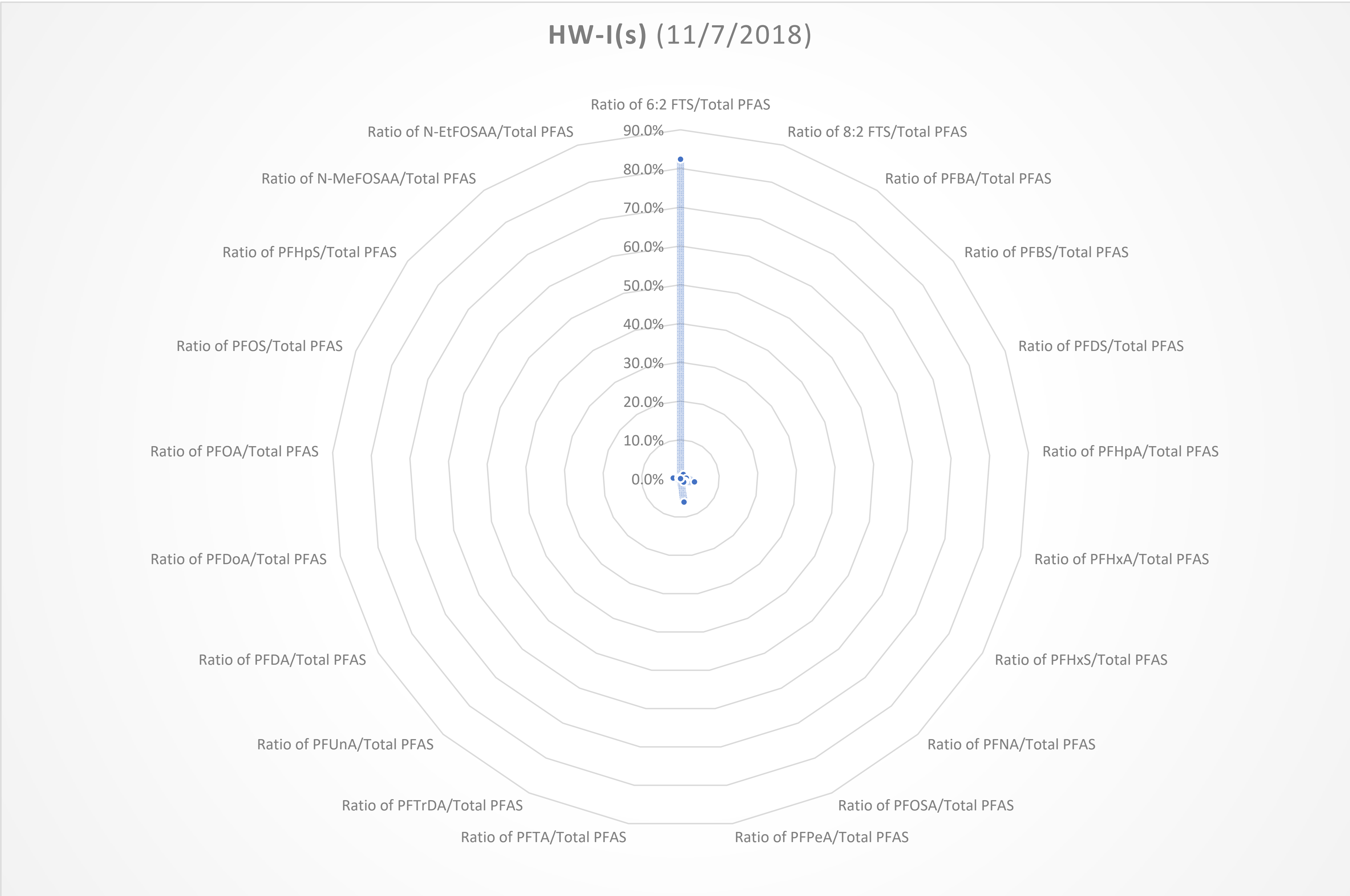
HW-I(s) (11/7/2018)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
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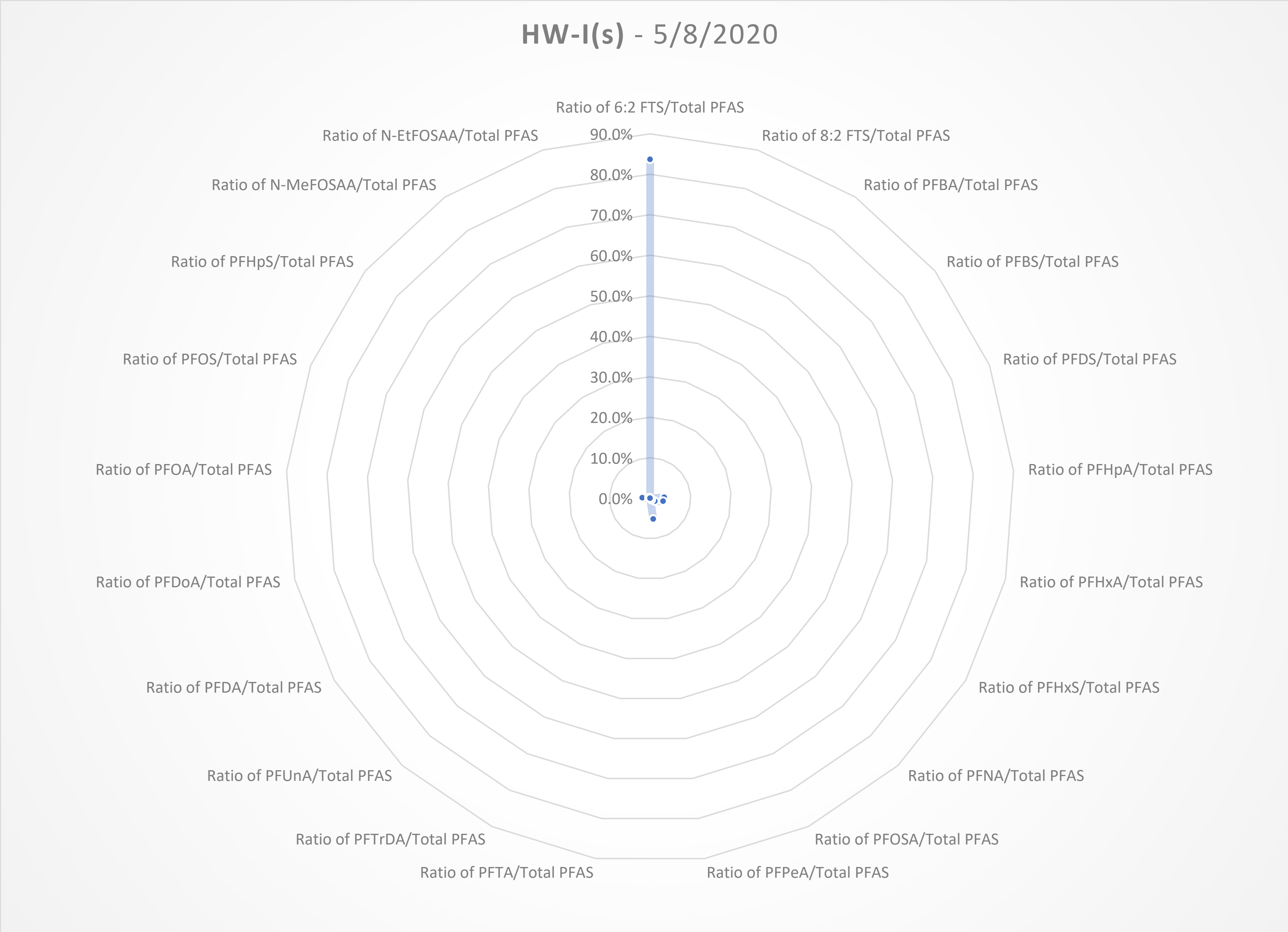

HW-I(s) - 5/8/2020
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
90.0%
80.0%
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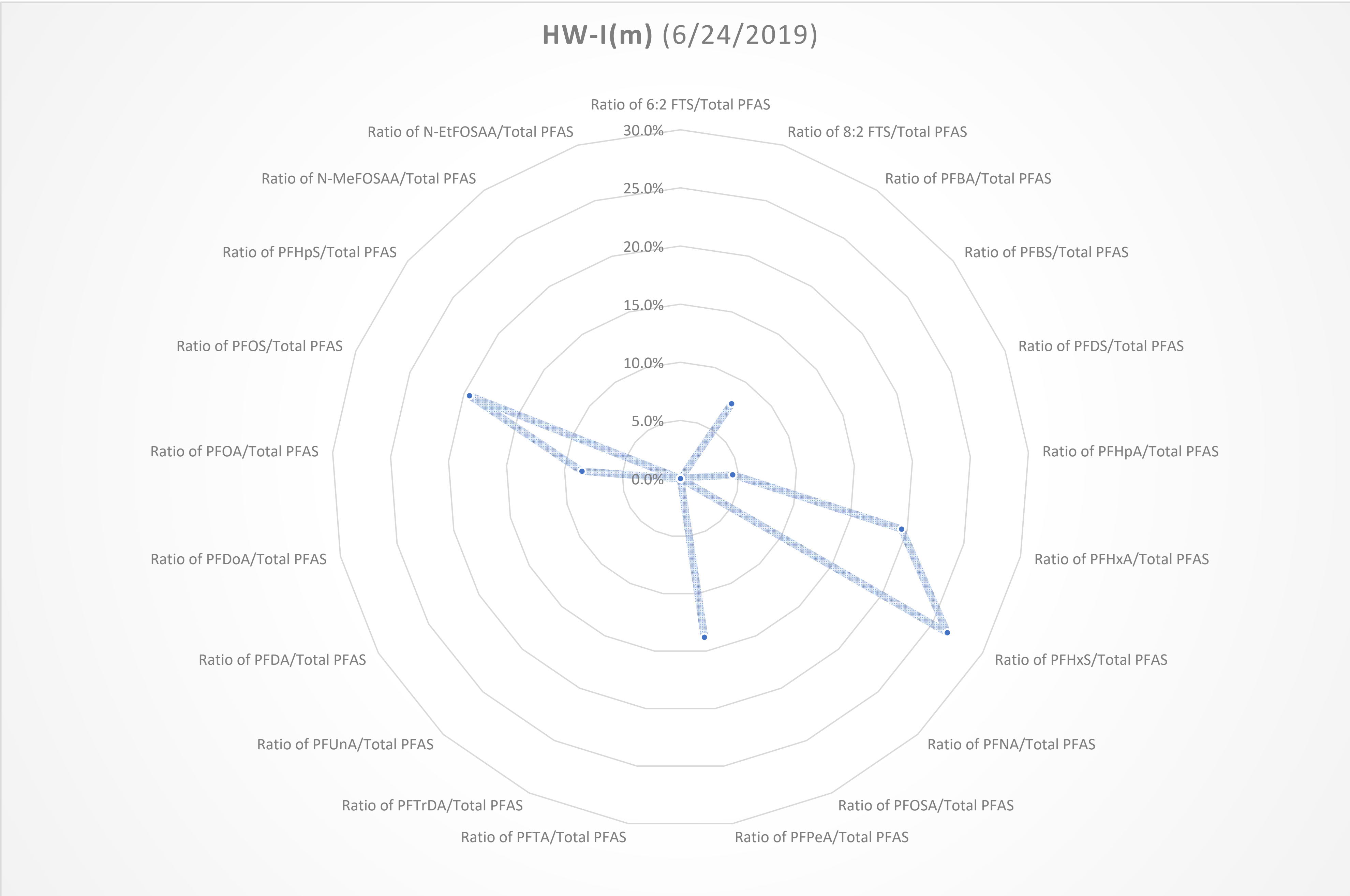
HW-I(m) (6/24/2019)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
30.0%
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15.0%
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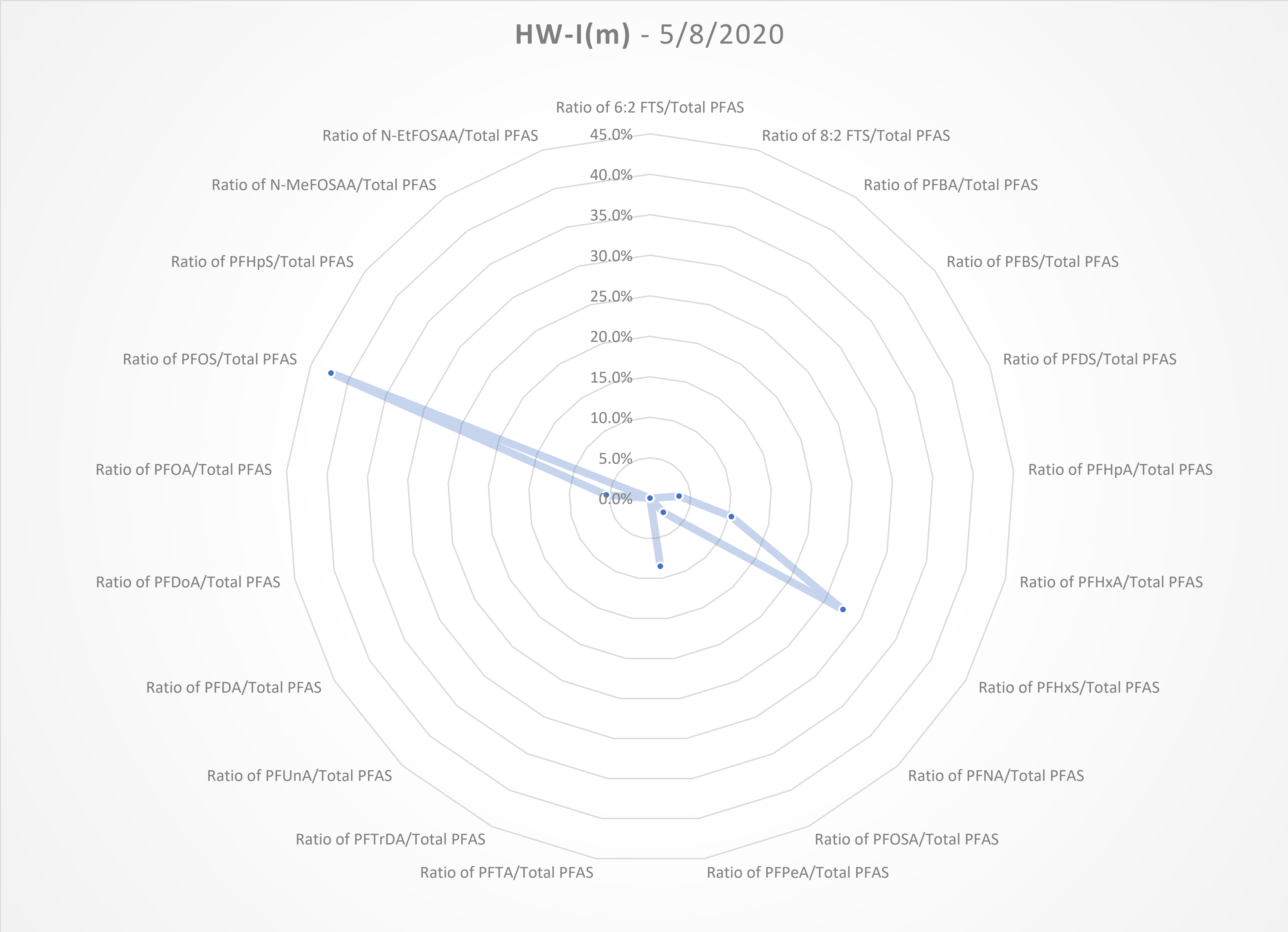
HW-I(m) - 5/8/2020
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
45.0%
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30.0%
25.0%
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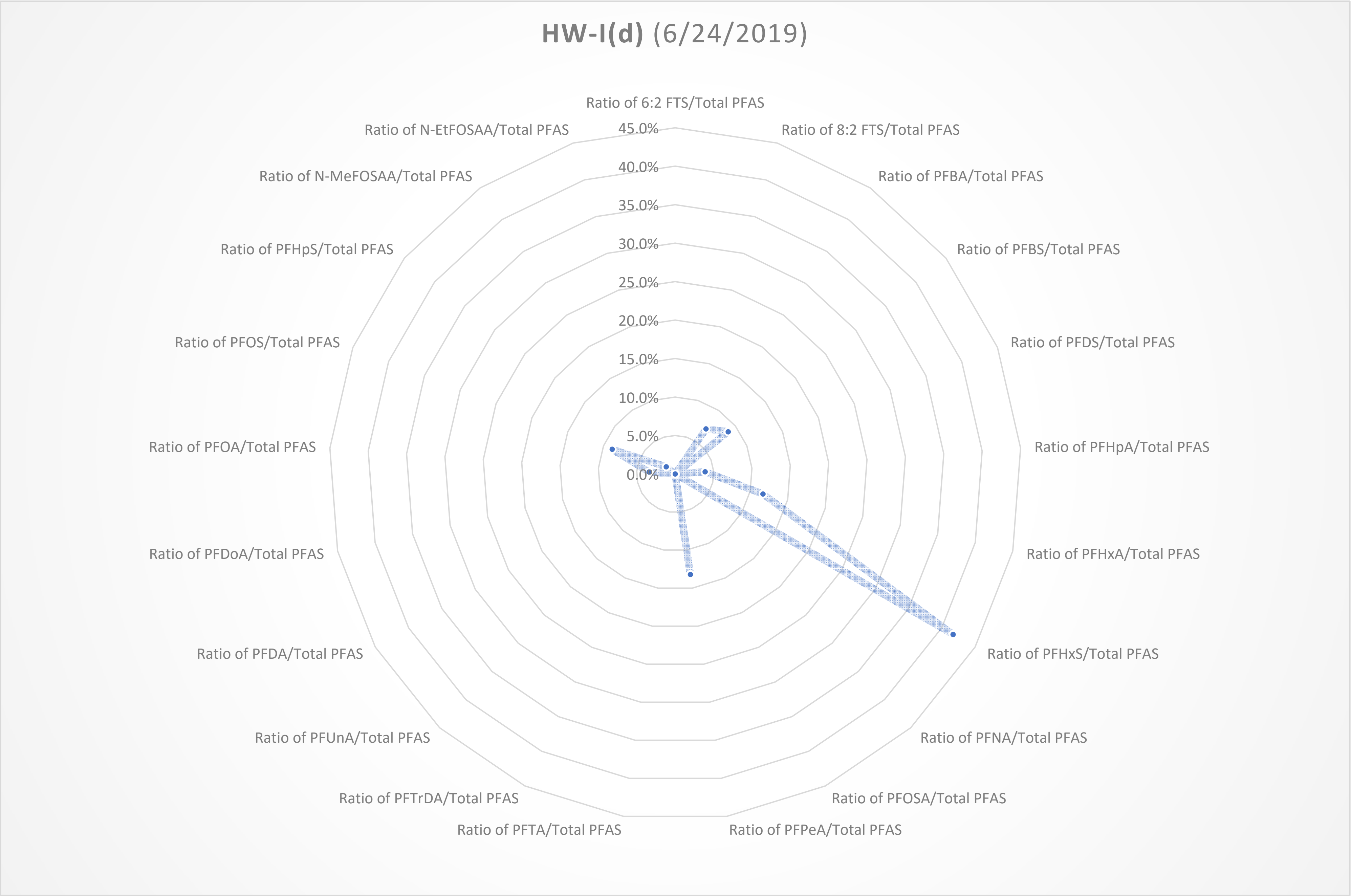
HW-I(d) (6/24/2019)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
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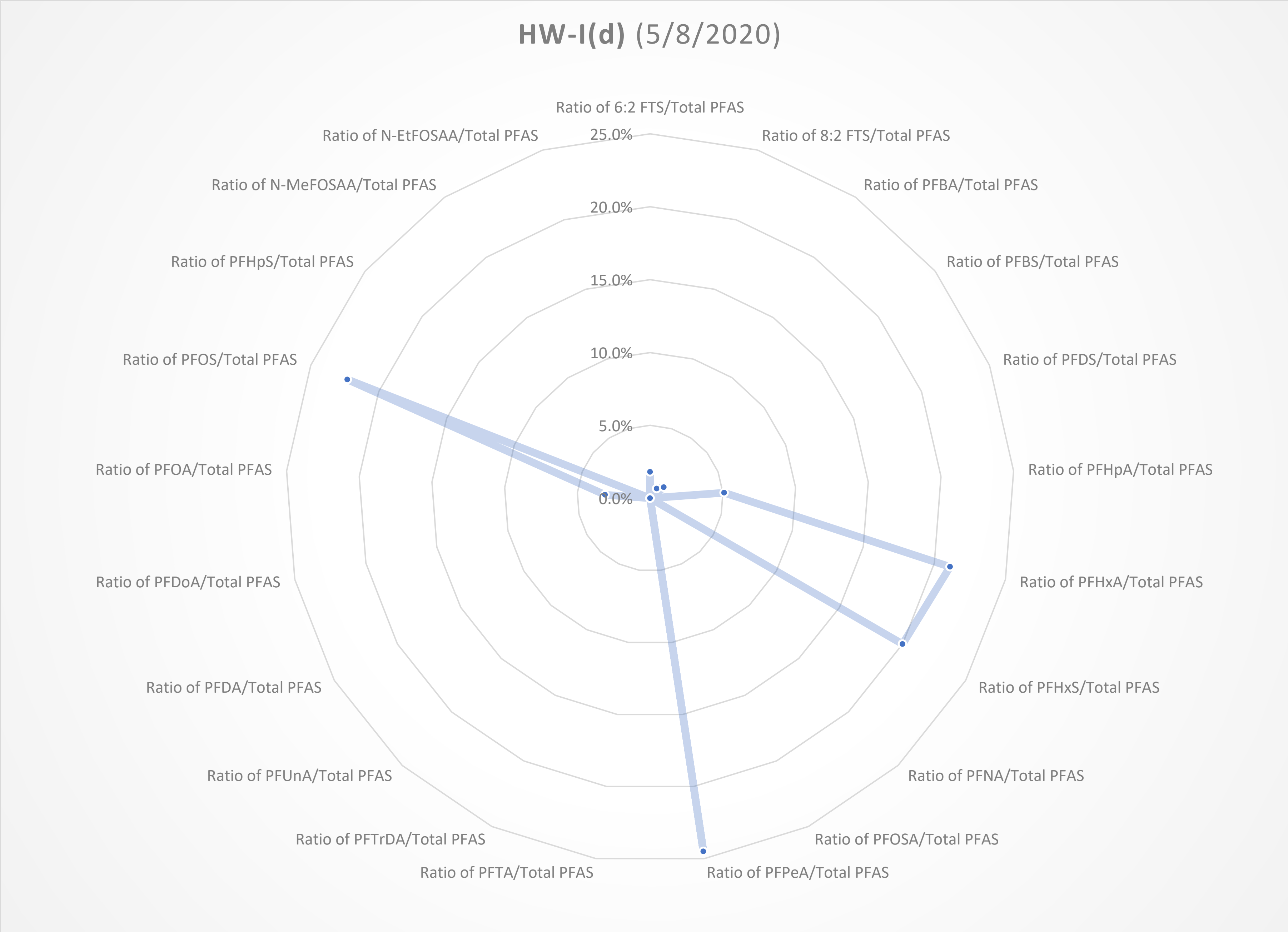
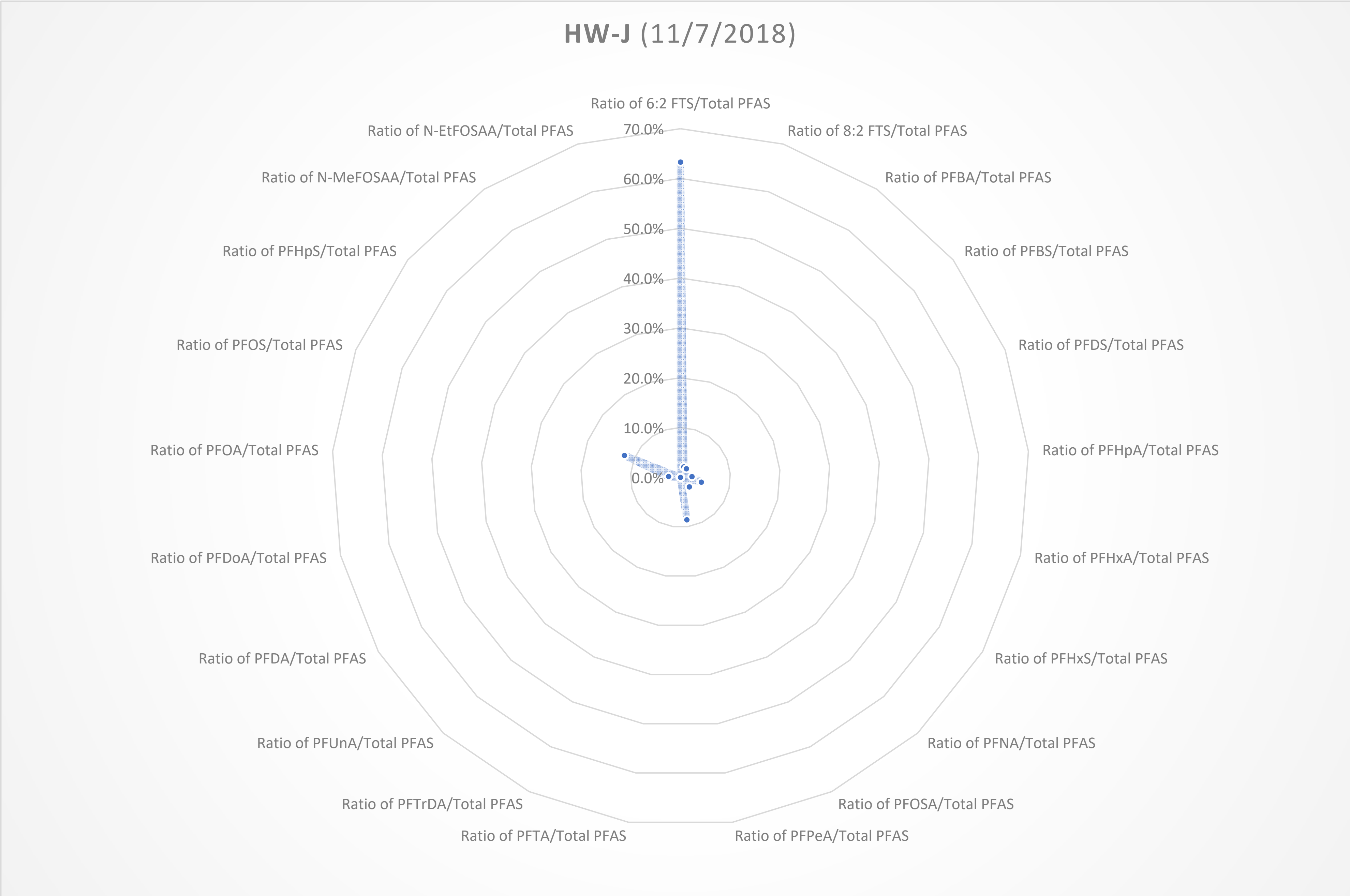


HW-I(d) (5/8/2020)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%


HW-J (11/7/2018)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
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Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
70.0%
60.0%
50.0%
40.0%
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10.0%
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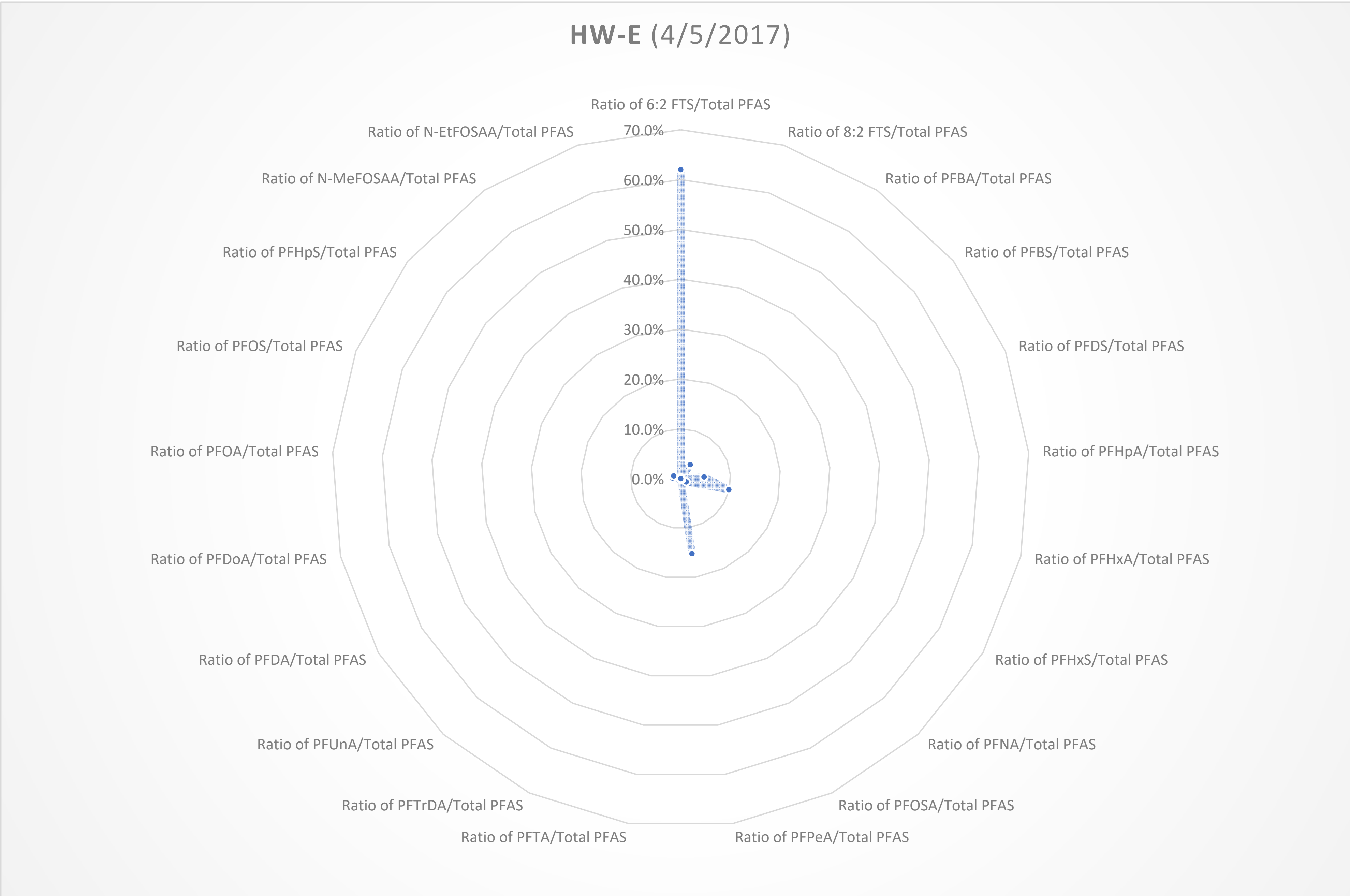
HW-E (4/5/2017)
Ratio of 6:2 FTS/Total PFAS
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Ratio of PFBS/Total PFAS
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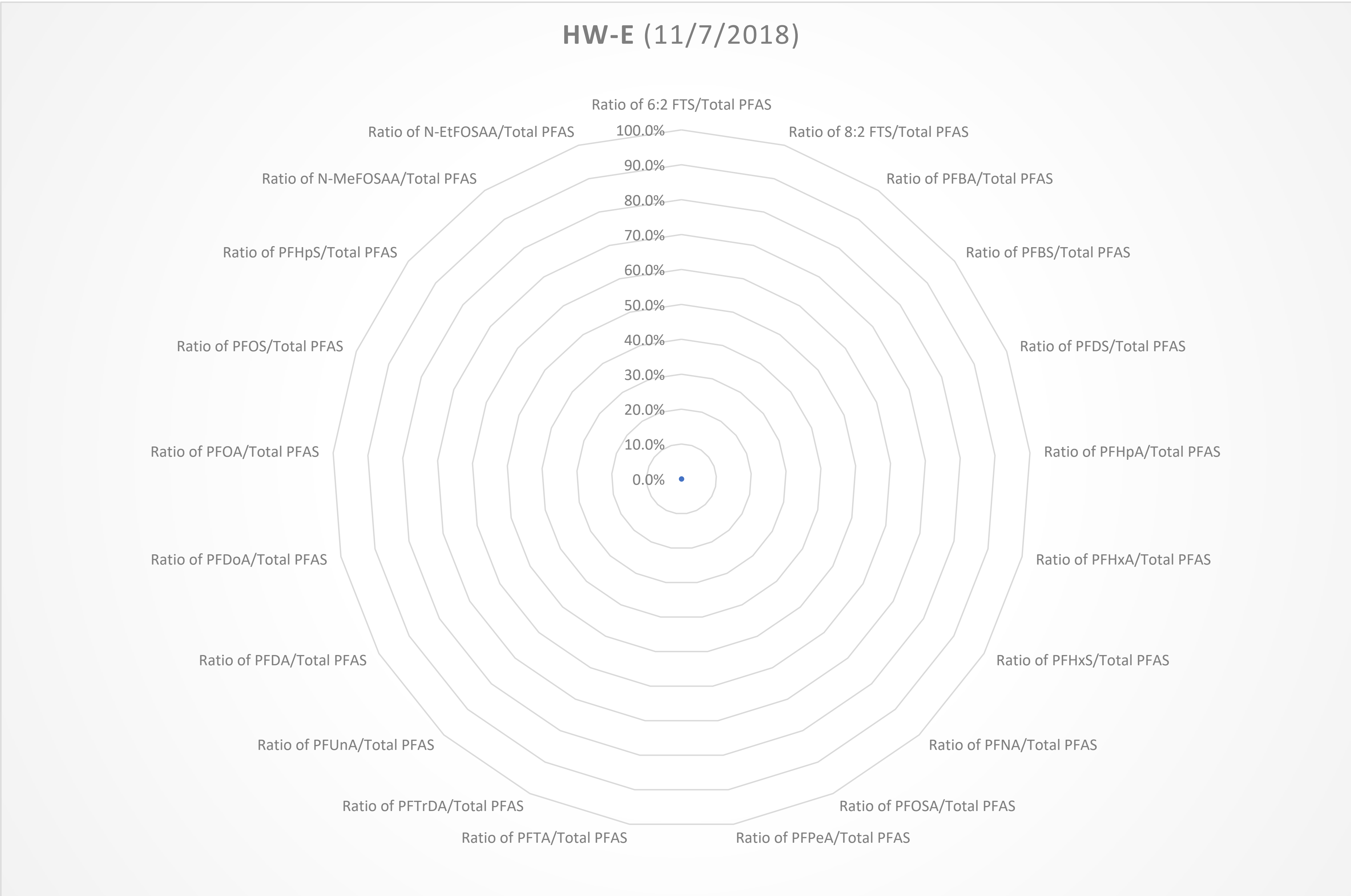
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%


HW-E (11/7/2018)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
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Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
100.0%
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70.0%
60.0%
50.0%
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30.0%
20.0%
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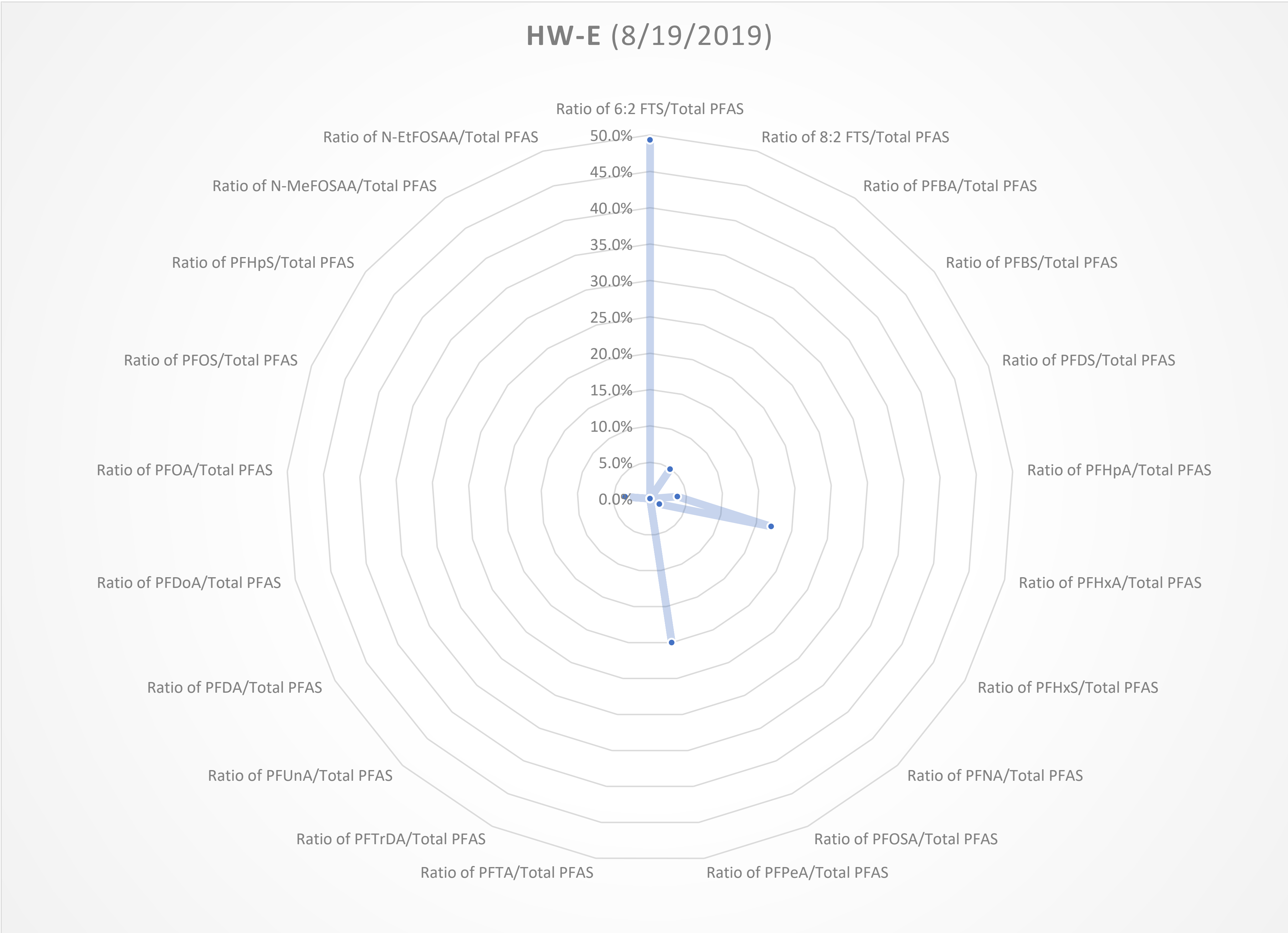

HW-E (8/19/2019)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
50.0%
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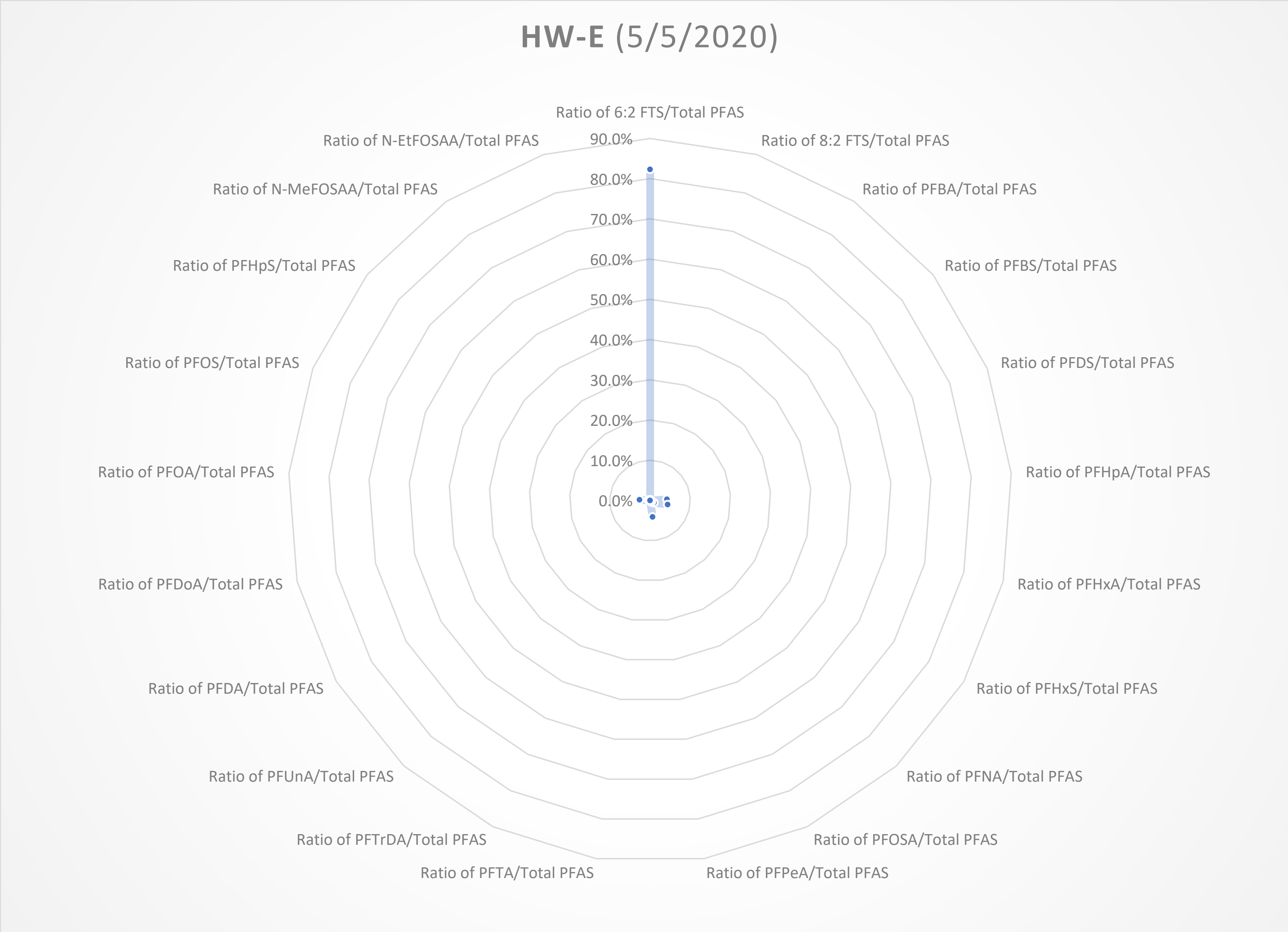
HW-E (5/5/2020)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
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Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
90.0%
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60.0%
50.0%
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30.0%
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10.0%
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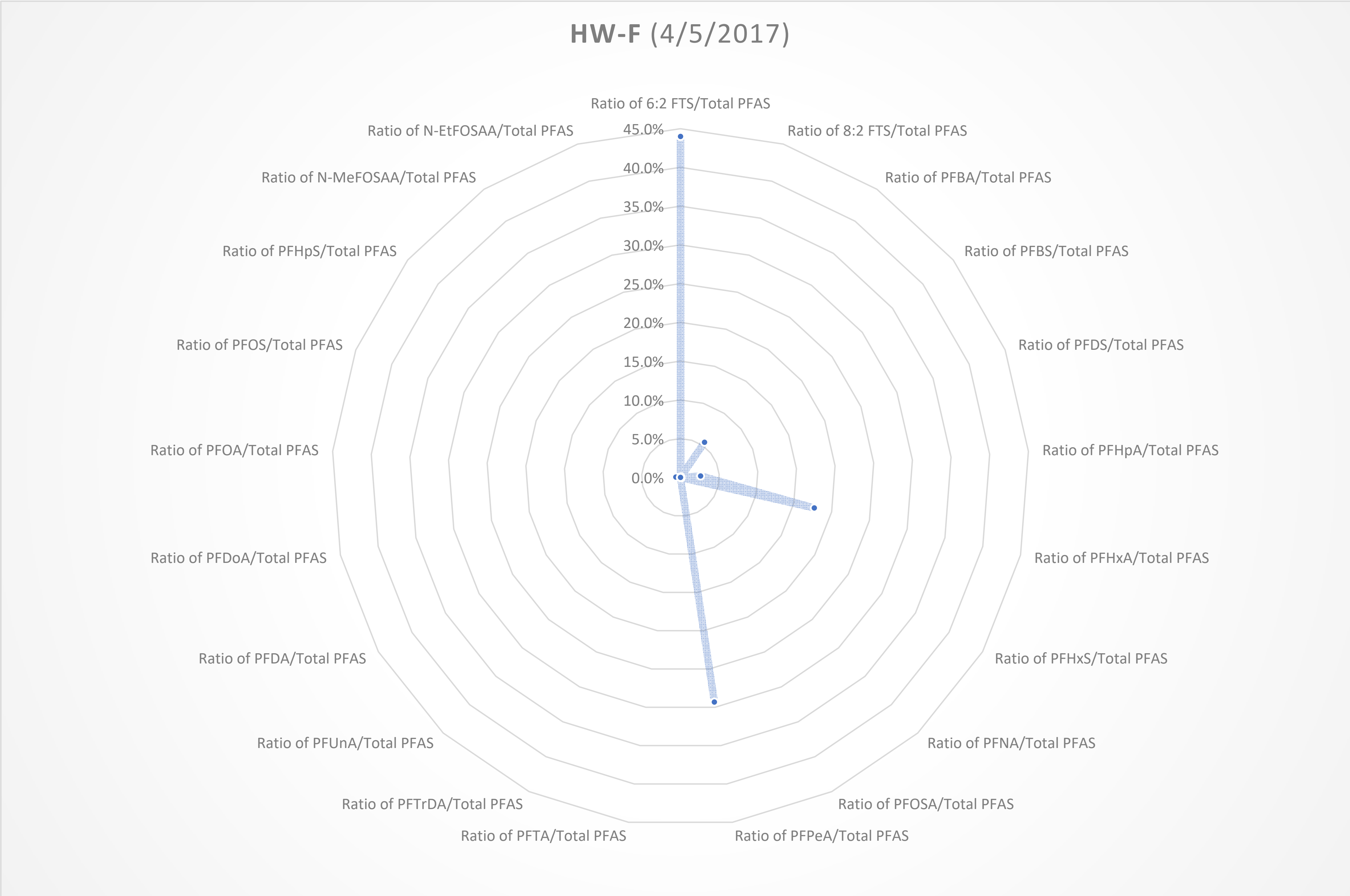
HW-F (4/5/2017)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
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Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
45.0%
40.0%
35.0%
30.0%
25.0%
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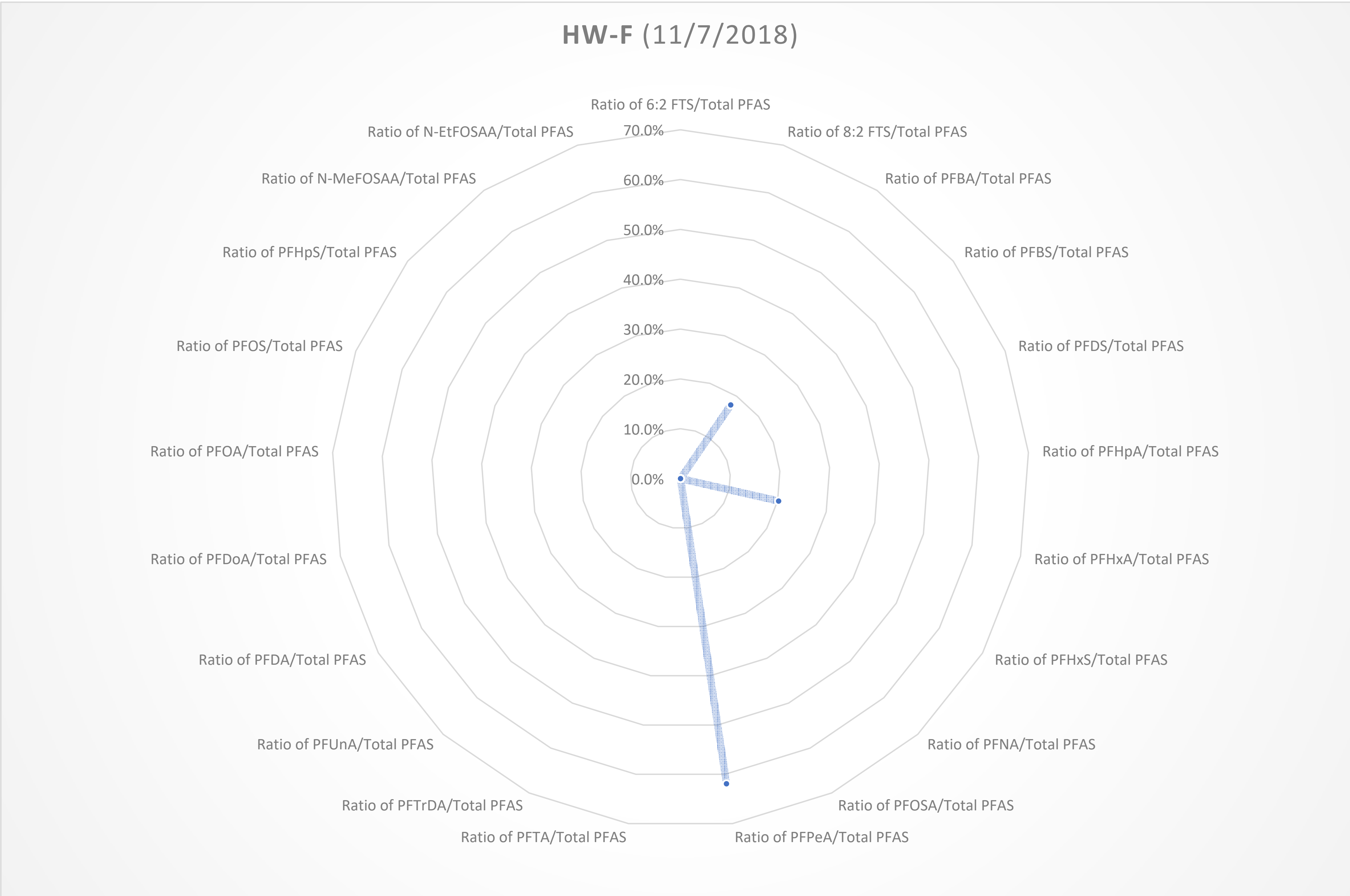

HW-F (11/7/2018)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
70.0%
60.0%
50.0%
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30.0%
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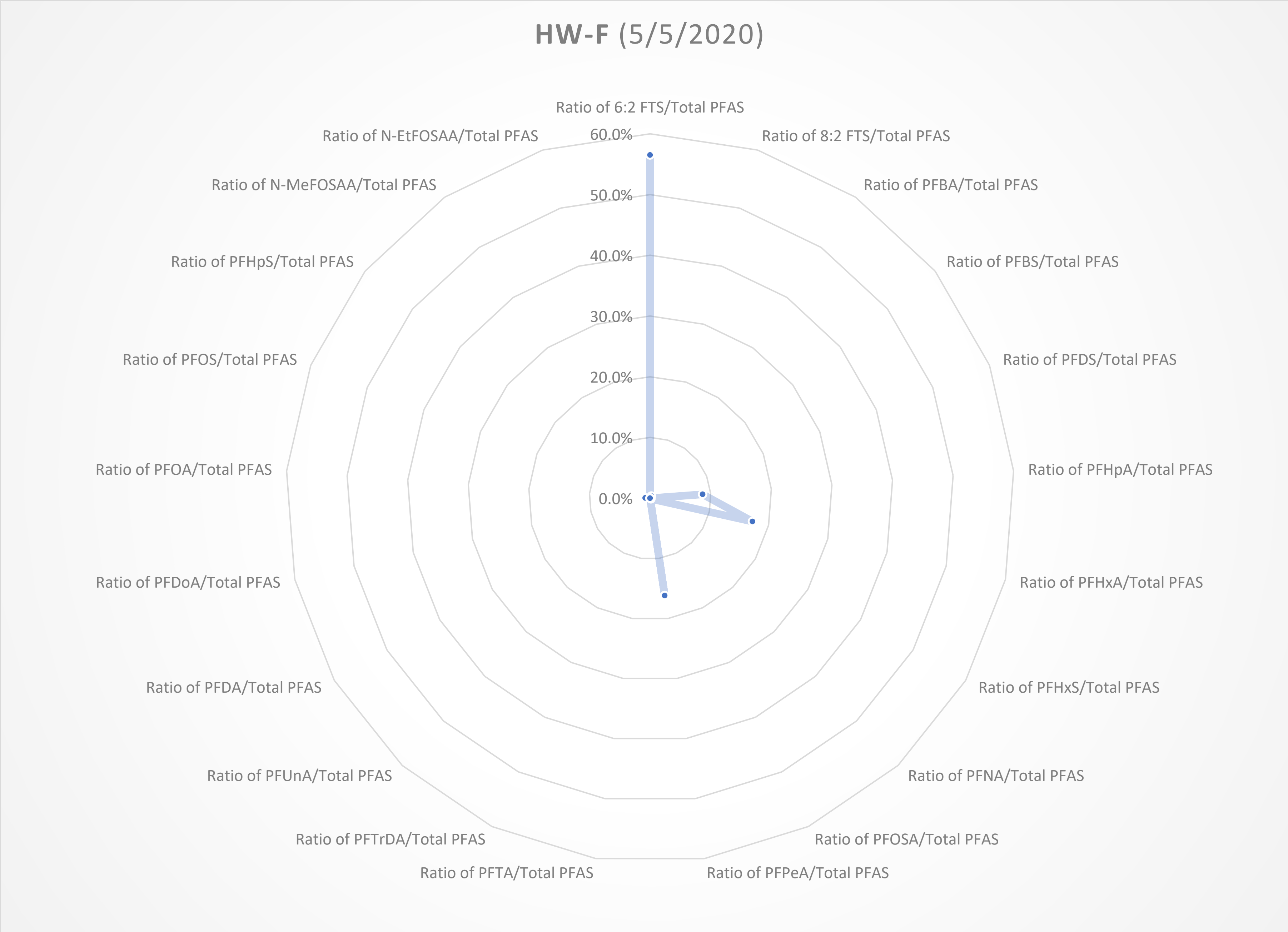
10.0%
0.0%


HW-F (5/5/2020)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
60.0%
50.0%
40.0%
30.0%
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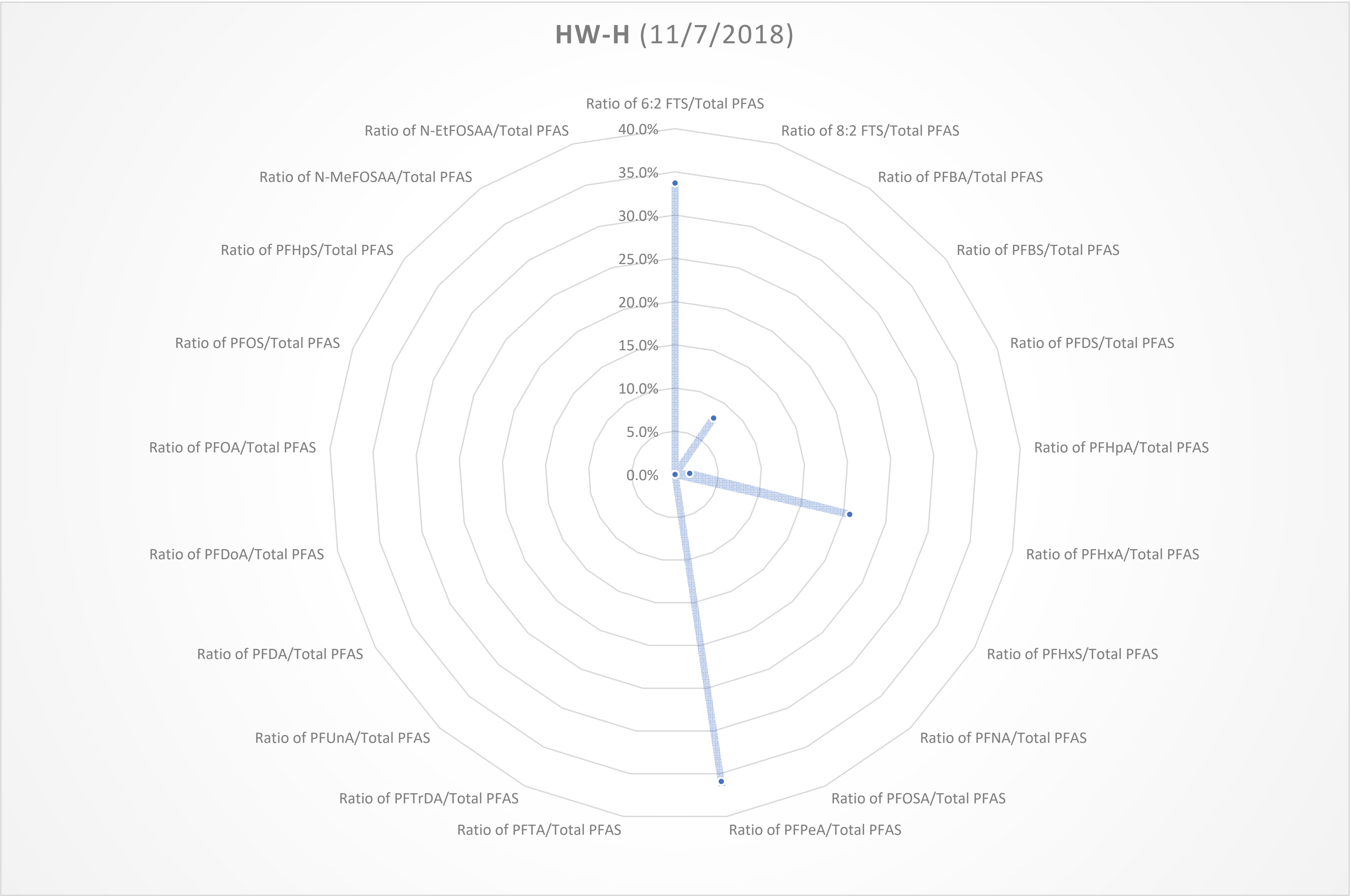
0.0%


HW-H (11/7/2018)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
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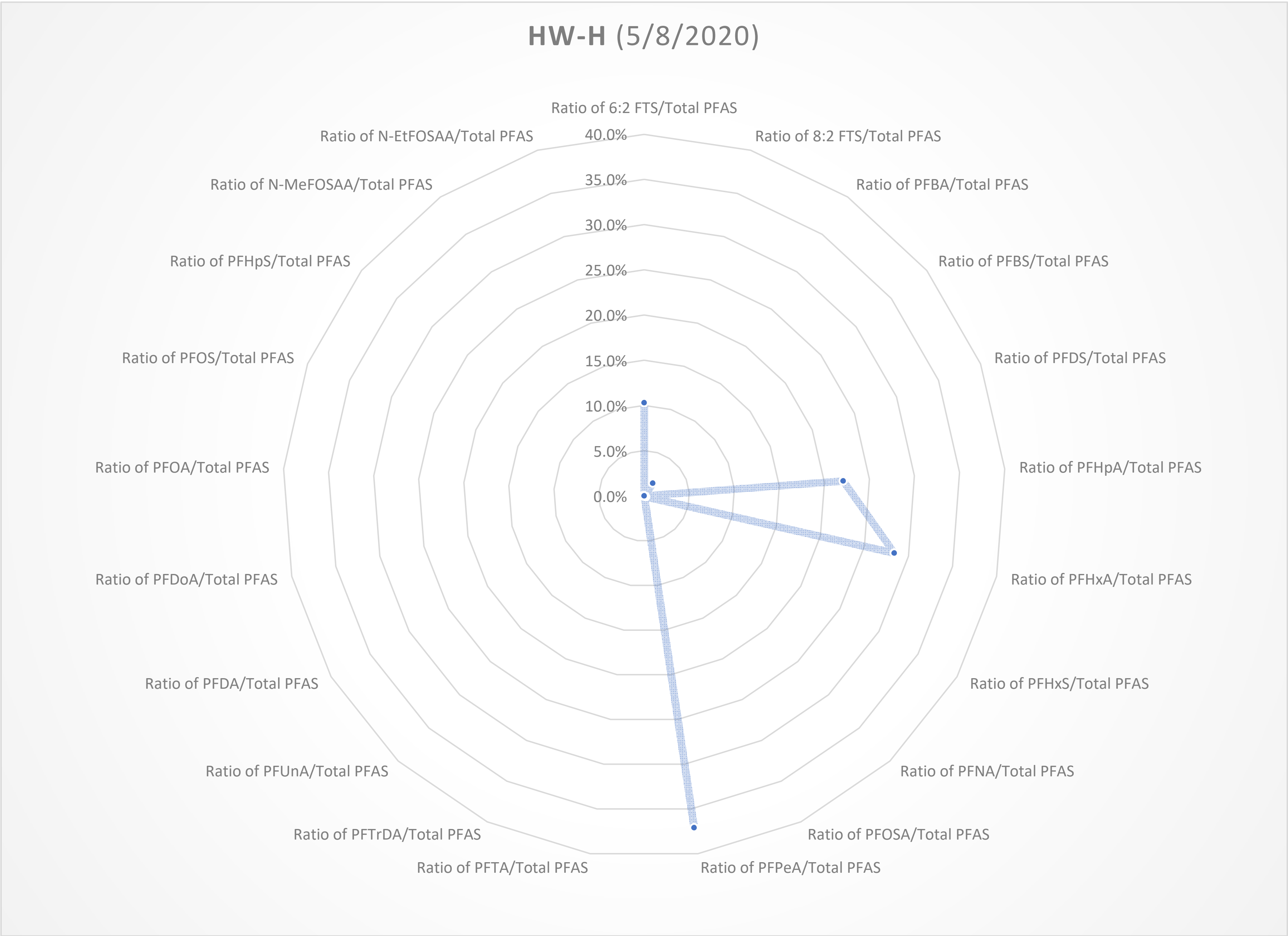
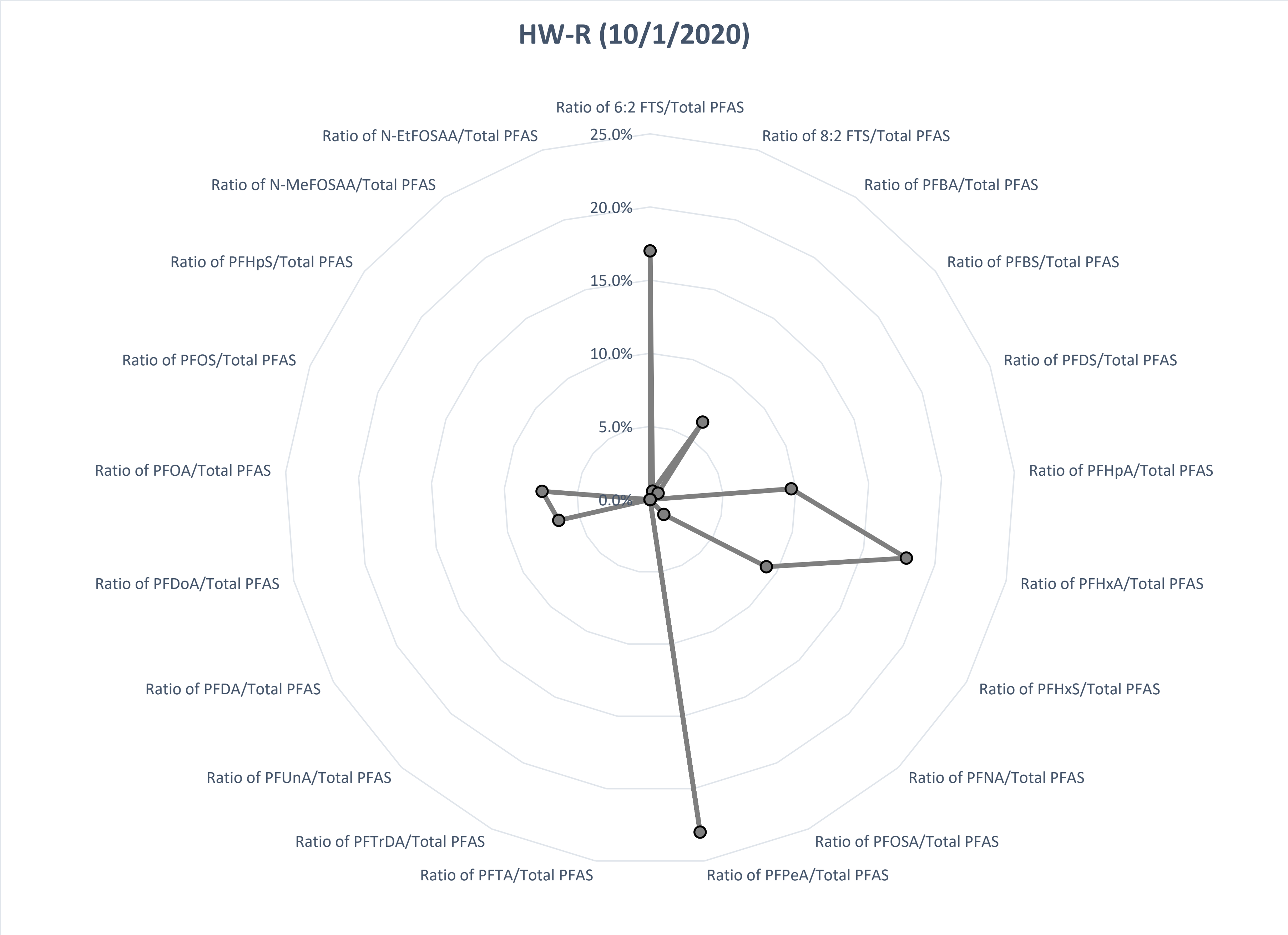
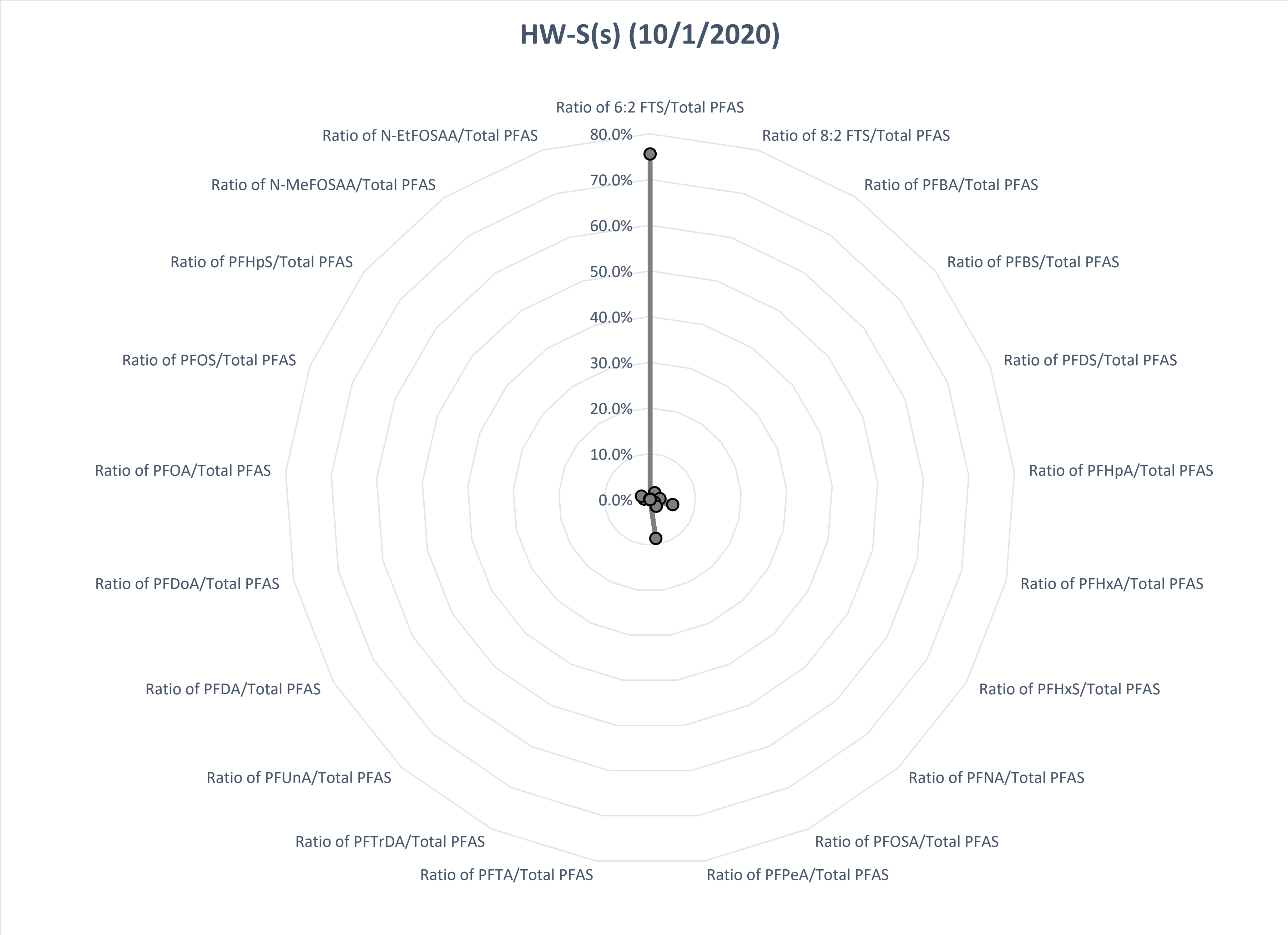
5.0%
0.0%


HW-H (5/8/2020)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%



HW-R (10/1/2020)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%



HW-S(s) (10/1/2020)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
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70.0%
60.0%
50.0%
40.0%
30.0%
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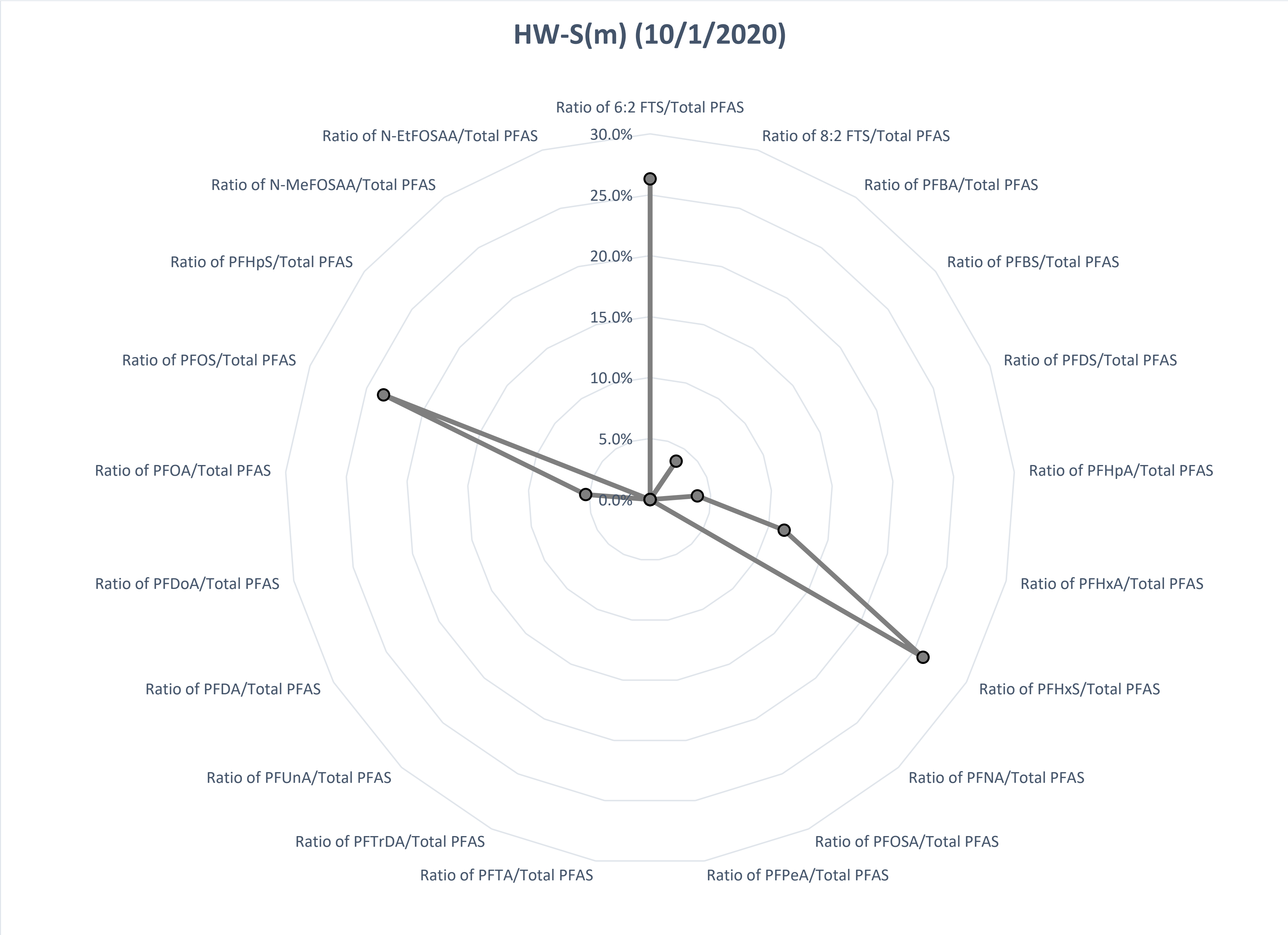
10.0%
0.0%


HW-S(m) (10/1/2020)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
30.0%
25.0%
20.0%
15.0%
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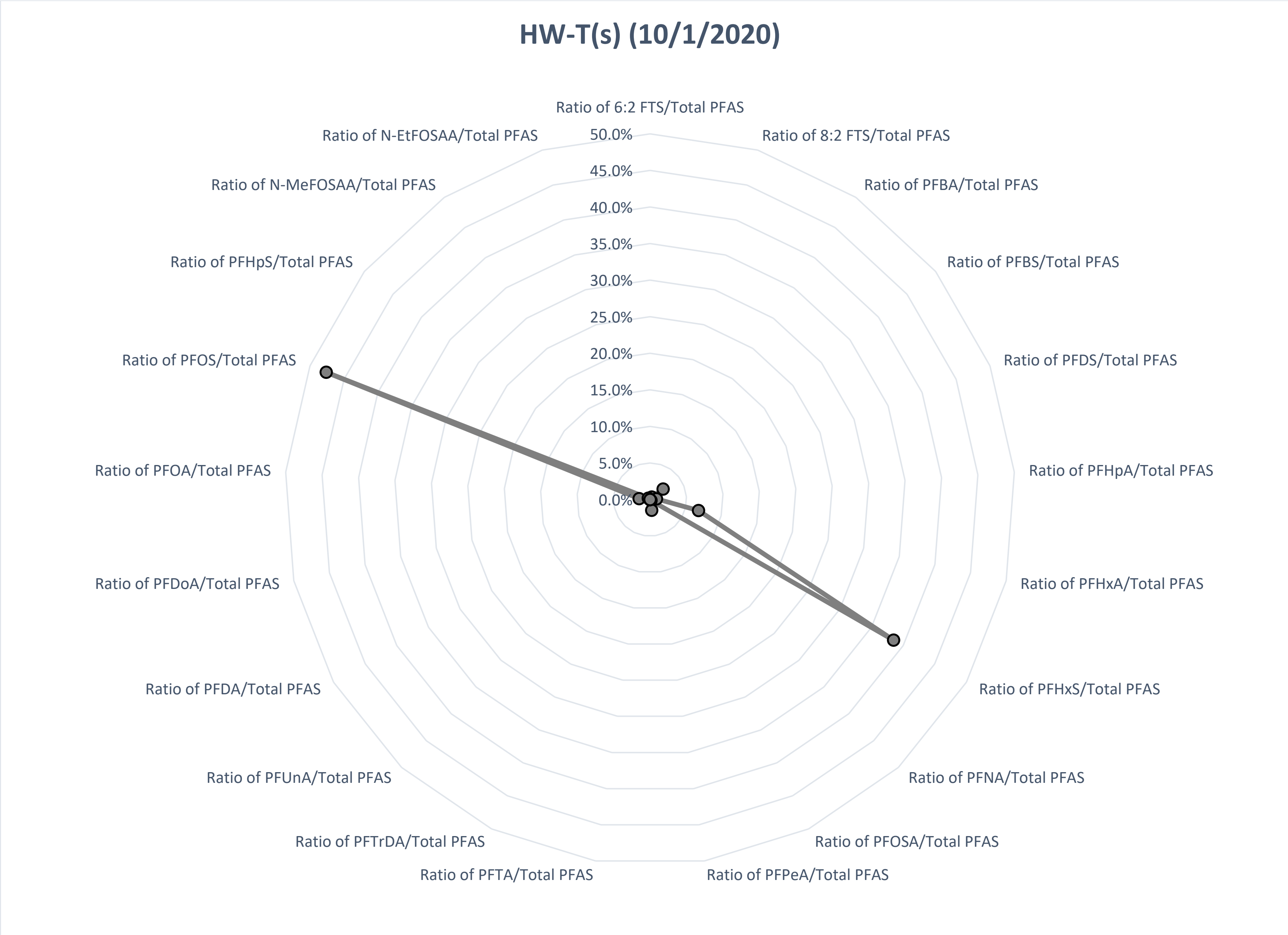
5.0%
0.0%


HW-T(s) (10/1/2020)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
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Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
50.0%
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
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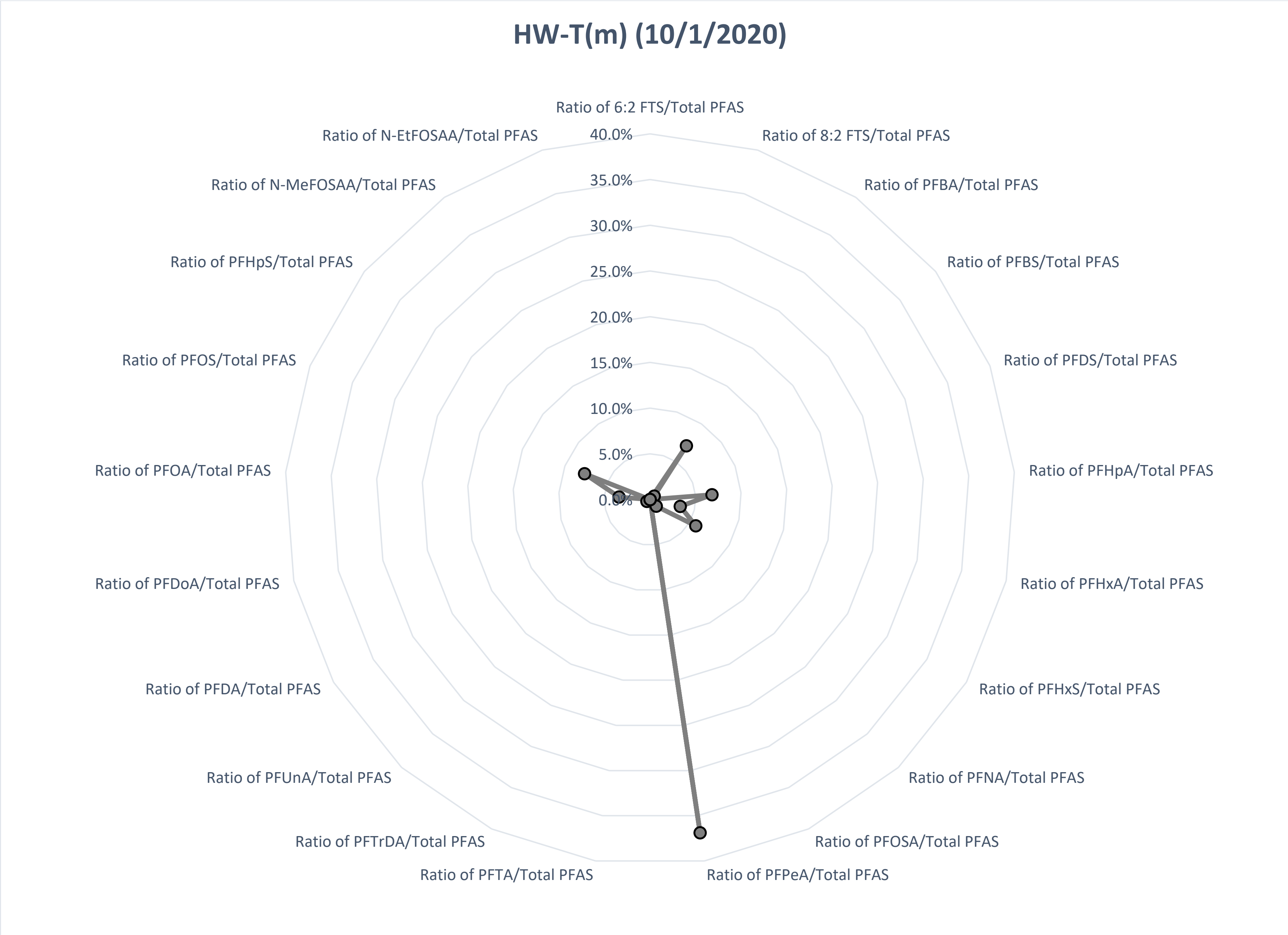

HW-T(m) (10/1/2020)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
40.0%
35.0%
30.0%
25.0%
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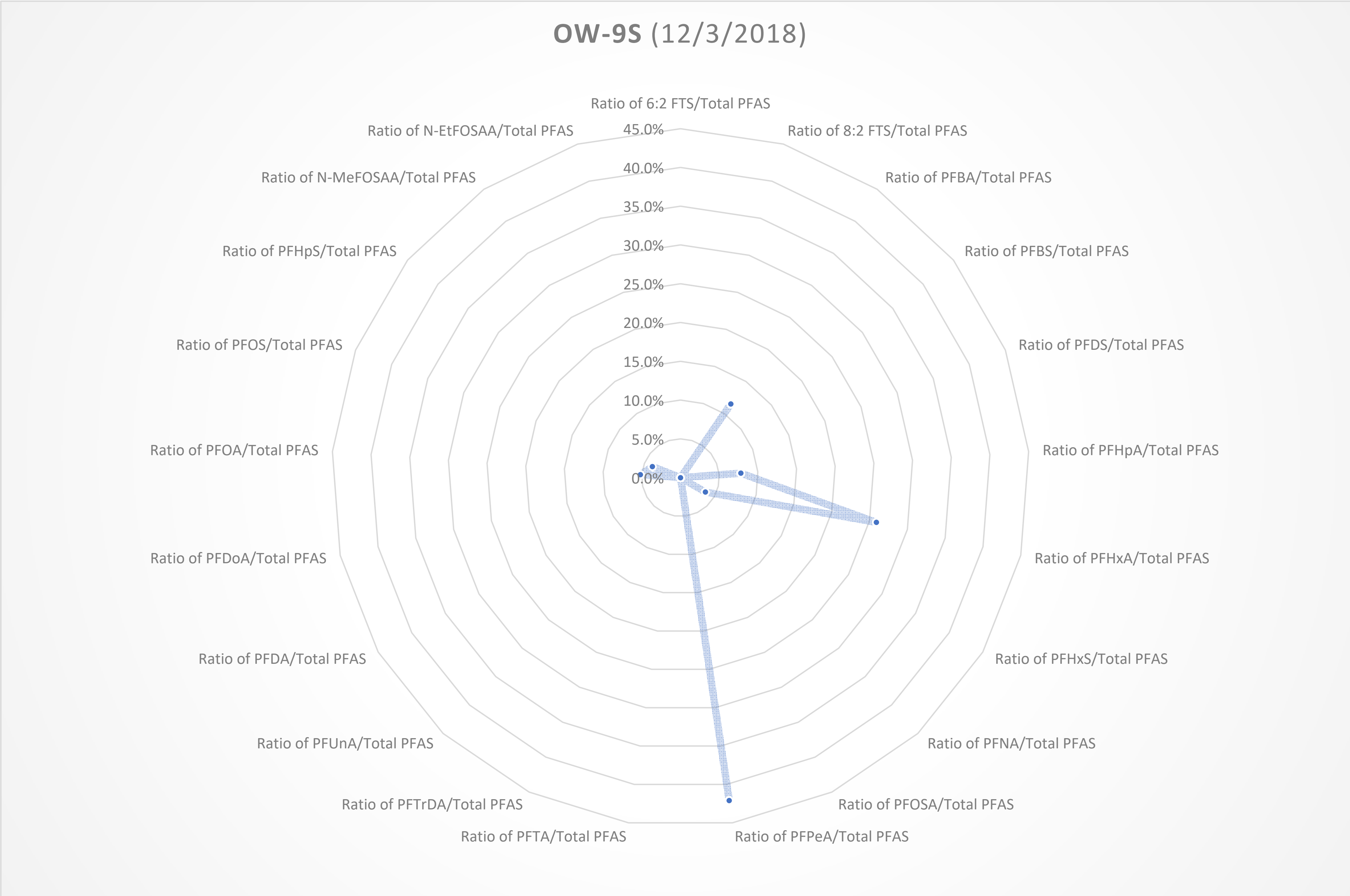
5.0%
0.0%


OW-9S (12/3/2018)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
45.0%
40.0%
35.0%
30.0%
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5.0%
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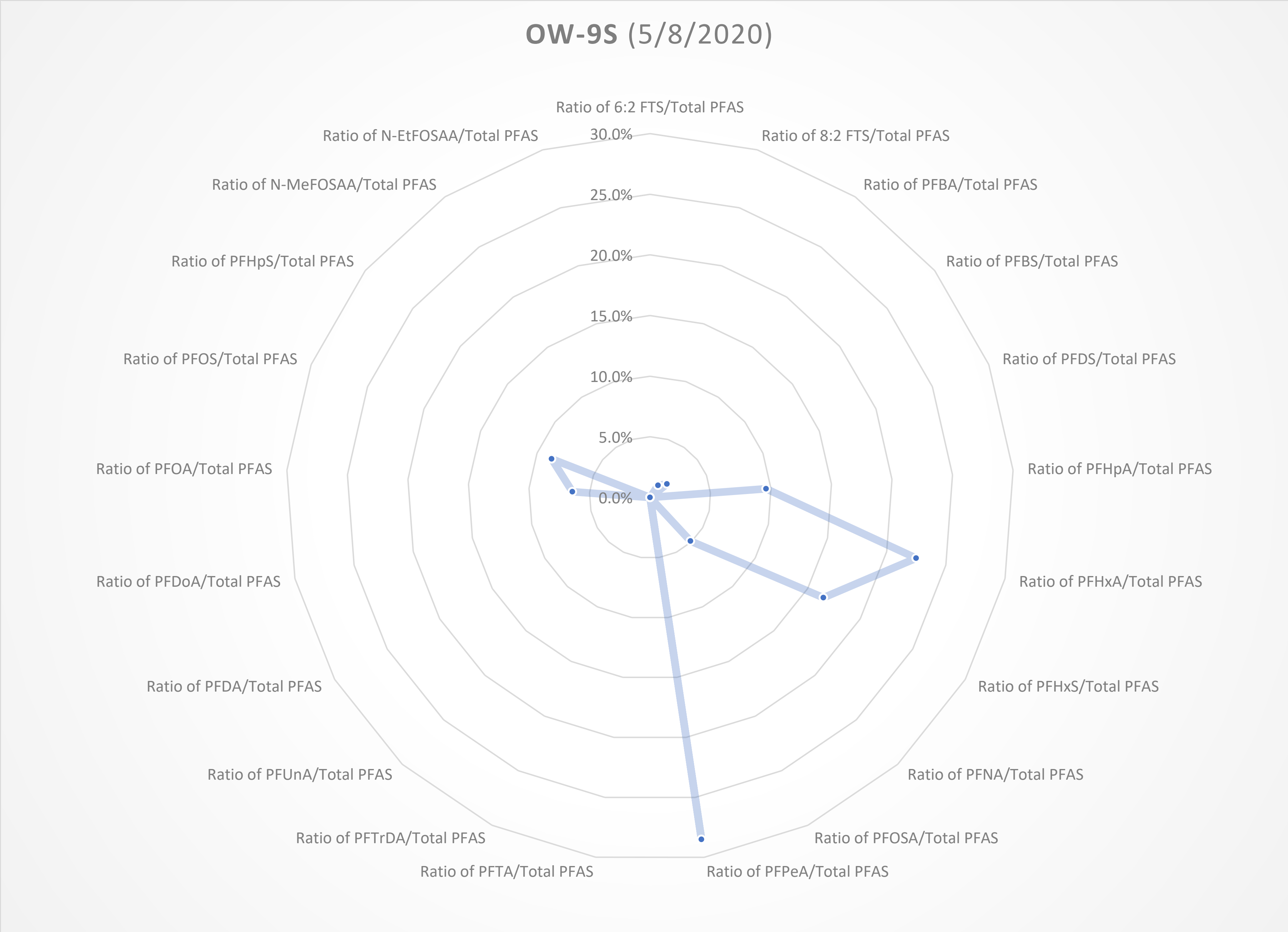

OW-9S (5/8/2020)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
30.0%
25.0%
20.0%
15.0%
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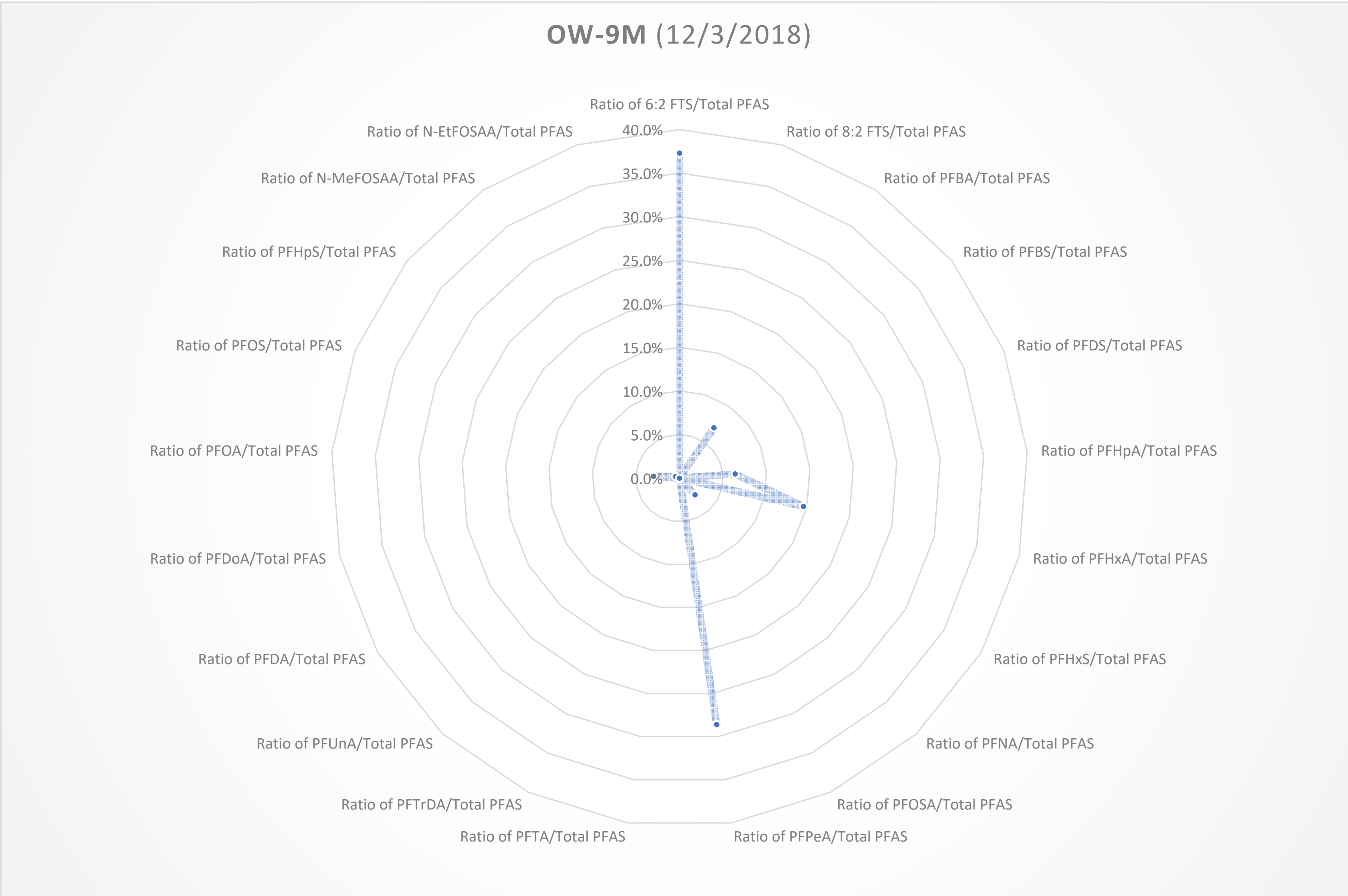
5.0%
0.0%



OW-9M (12/3/2018)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
40.0%
35.0%
30.0%
25.0%
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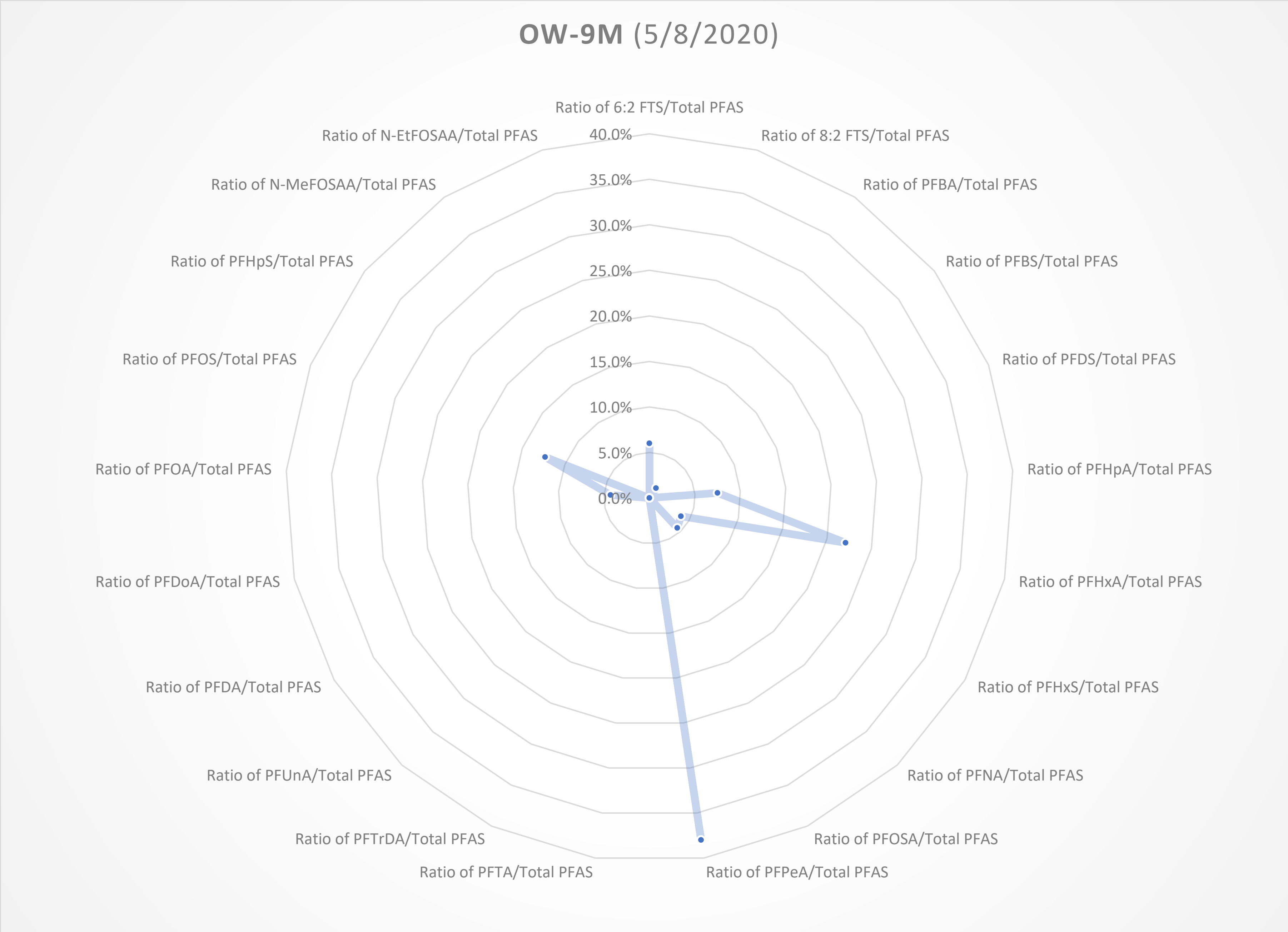
5.0%
0.0%


OW-9M (5/8/2020)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
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Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
40.0%
35.0%
30.0%
25.0%
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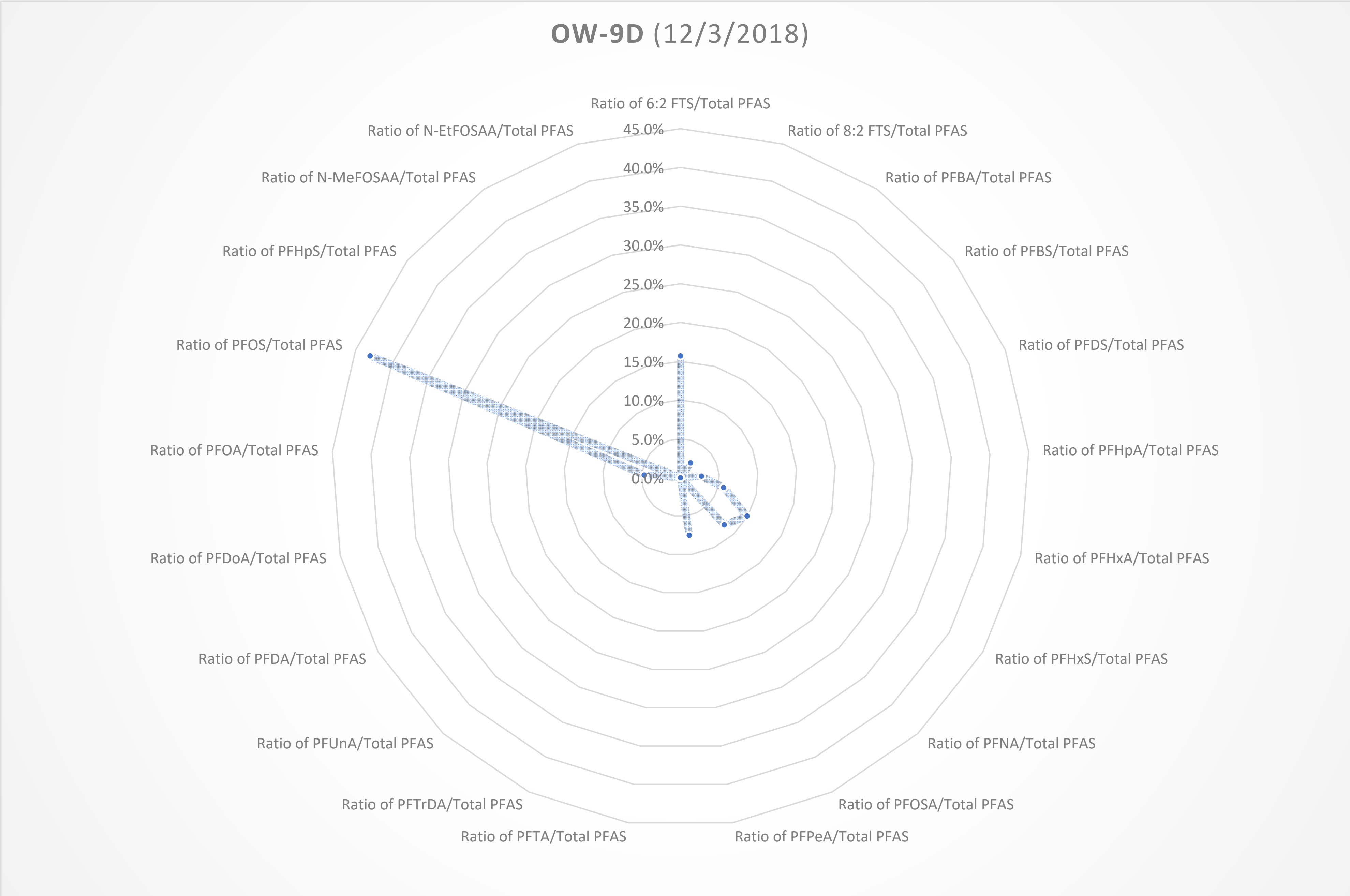
5.0%
0.0%



OW-9D (12/3/2018)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
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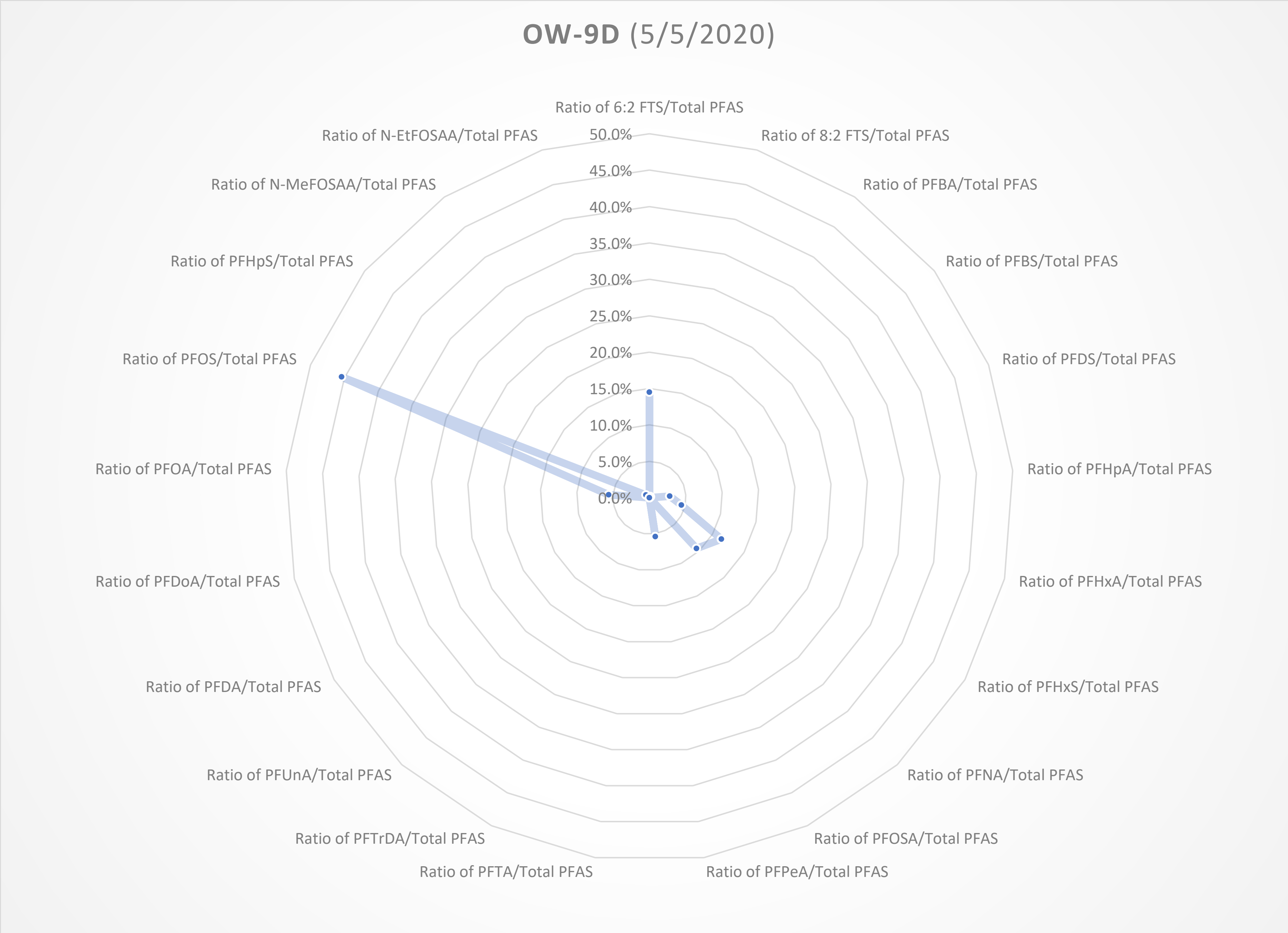
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%


OW-9D (5/5/2020)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
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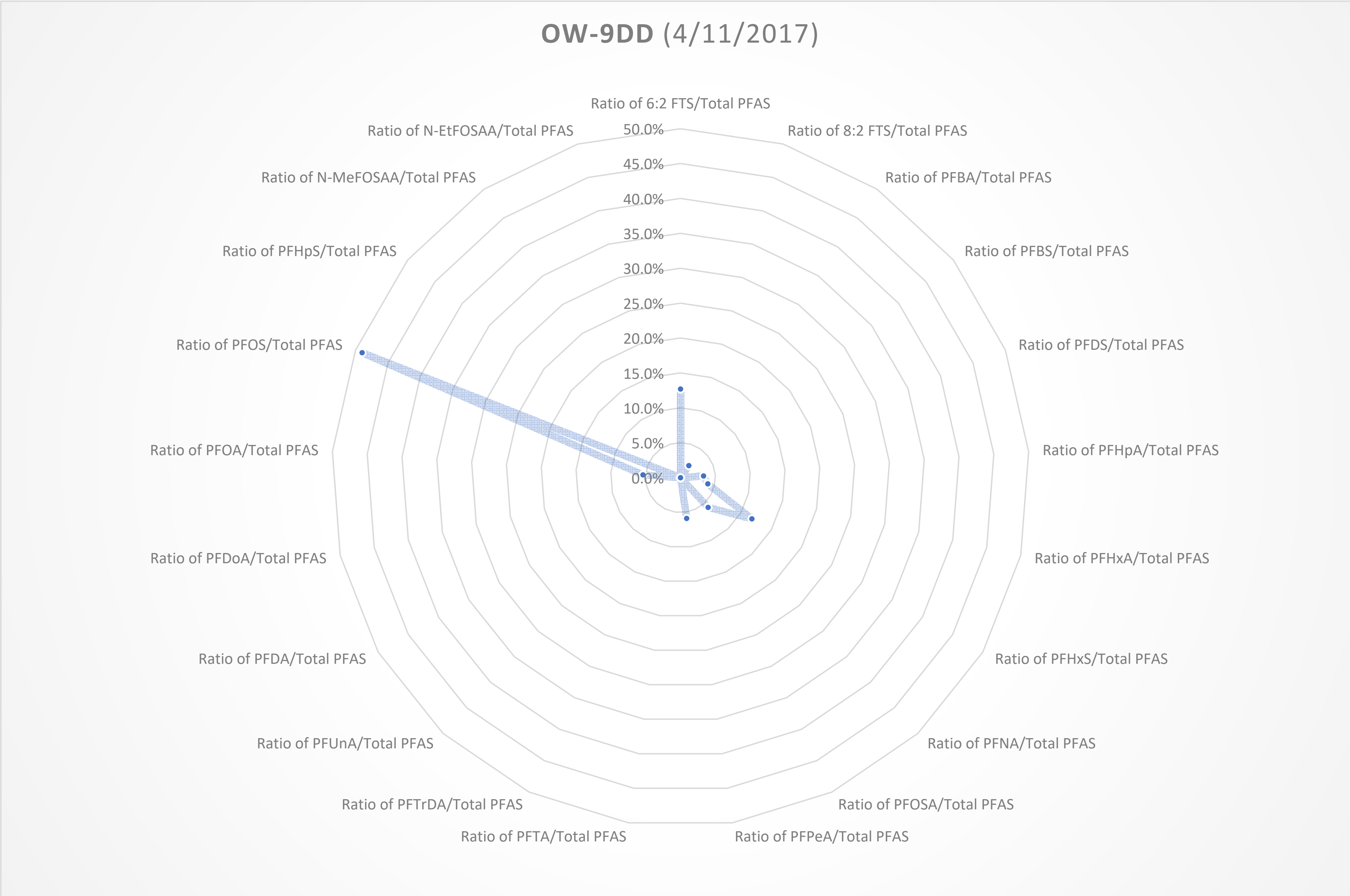
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
50.0%
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%


OW-9DD (4/11/2017)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
50.0%
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
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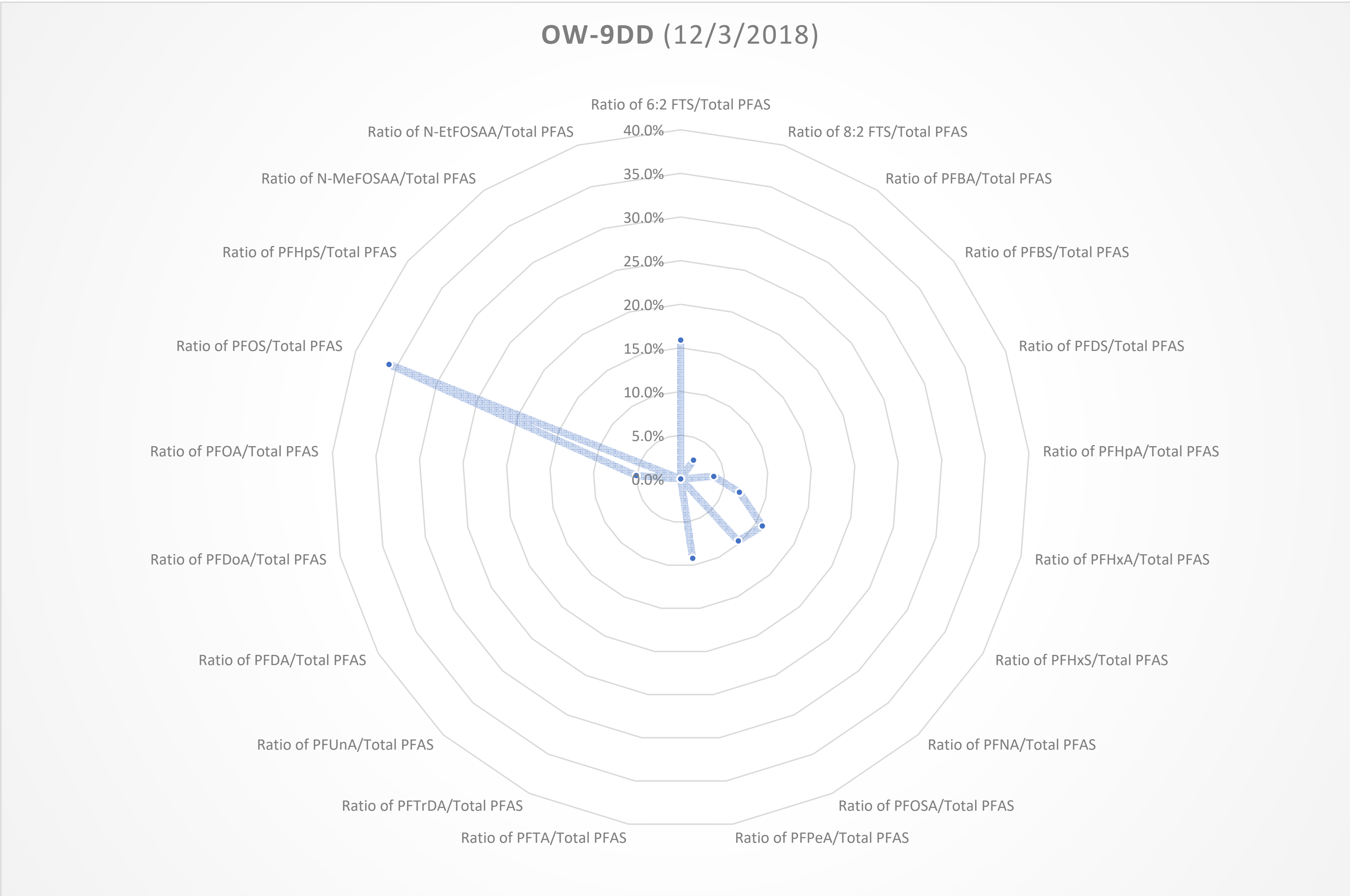

OW-9DD (12/3/2018)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
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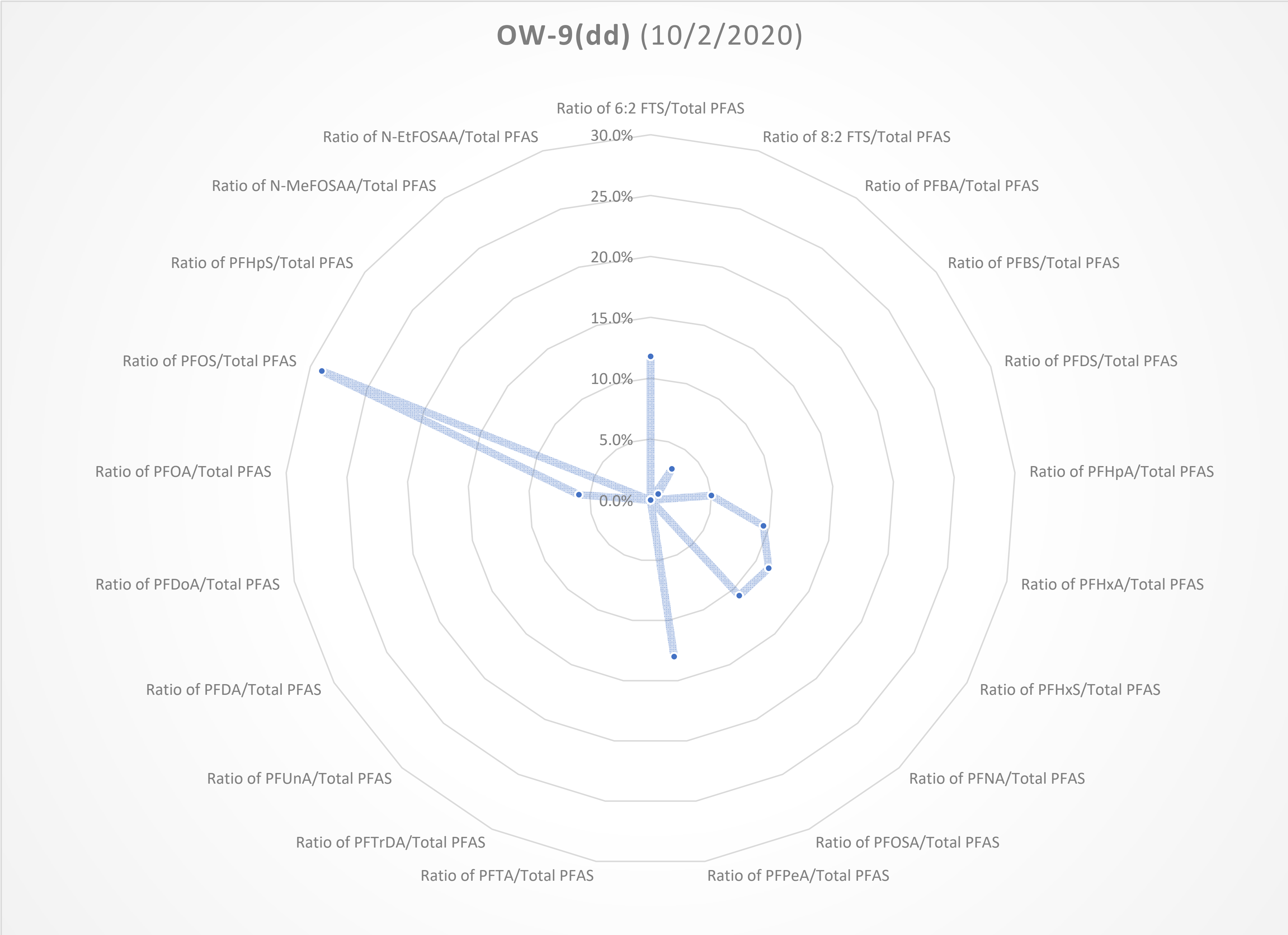
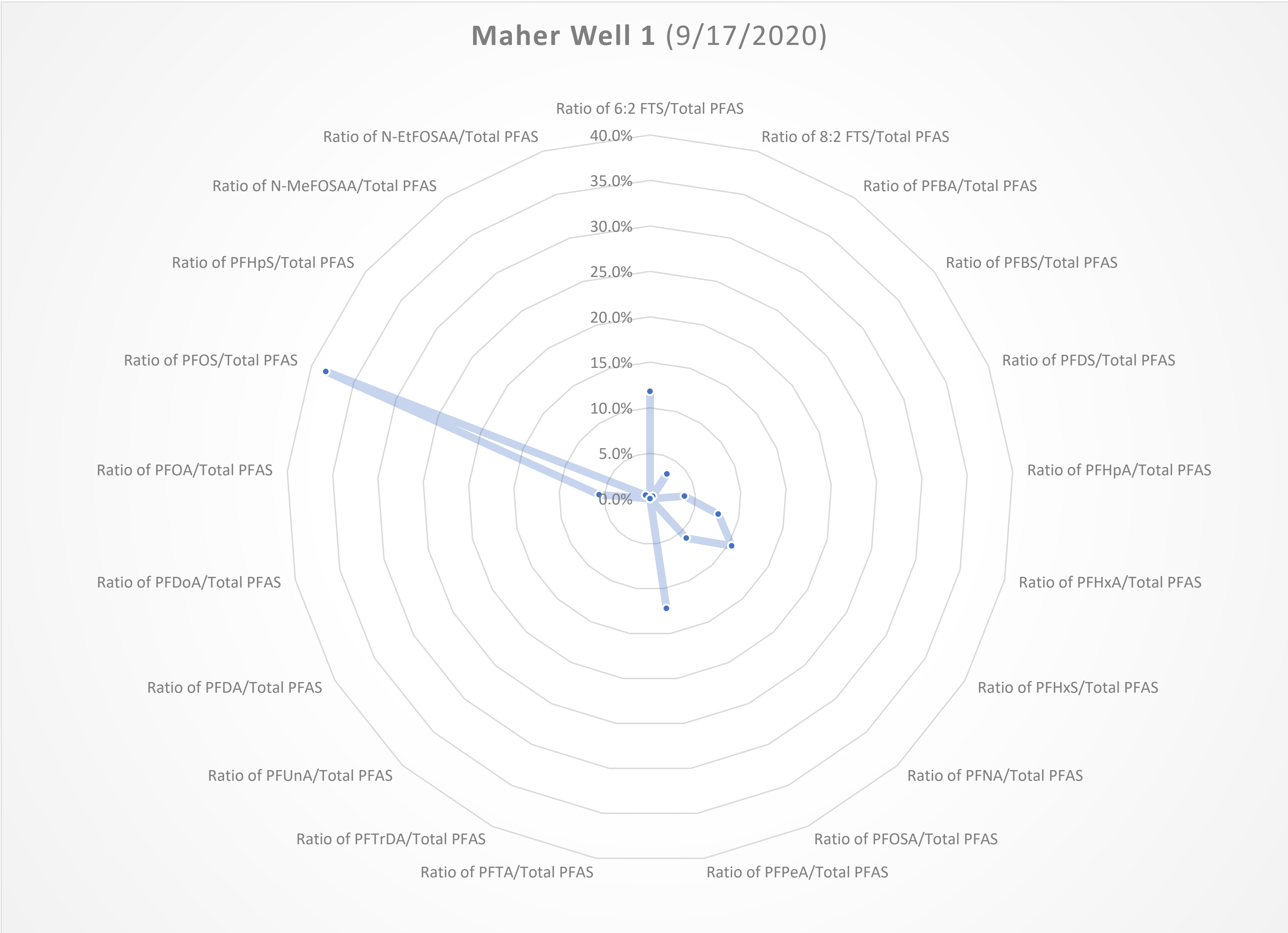
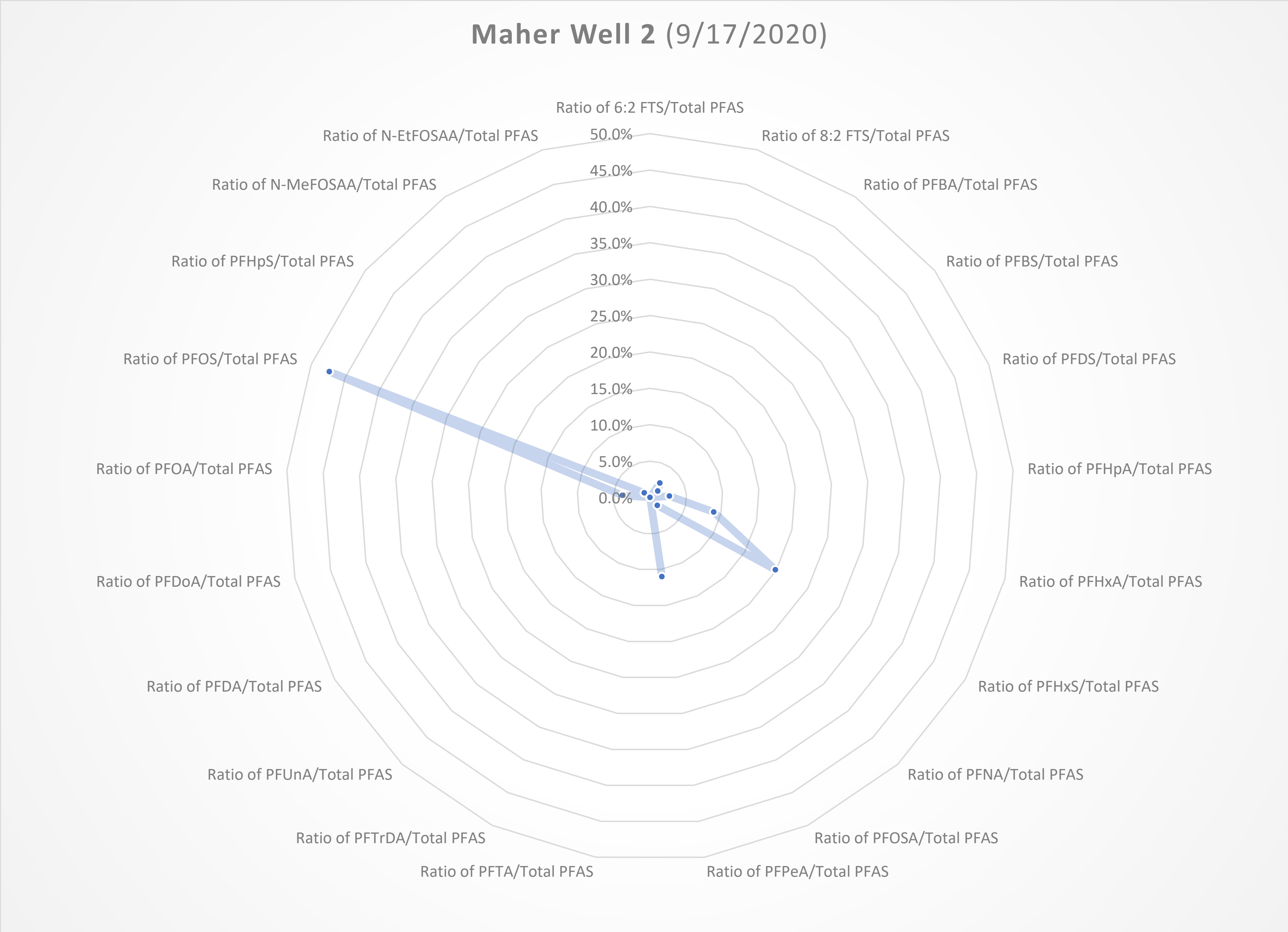
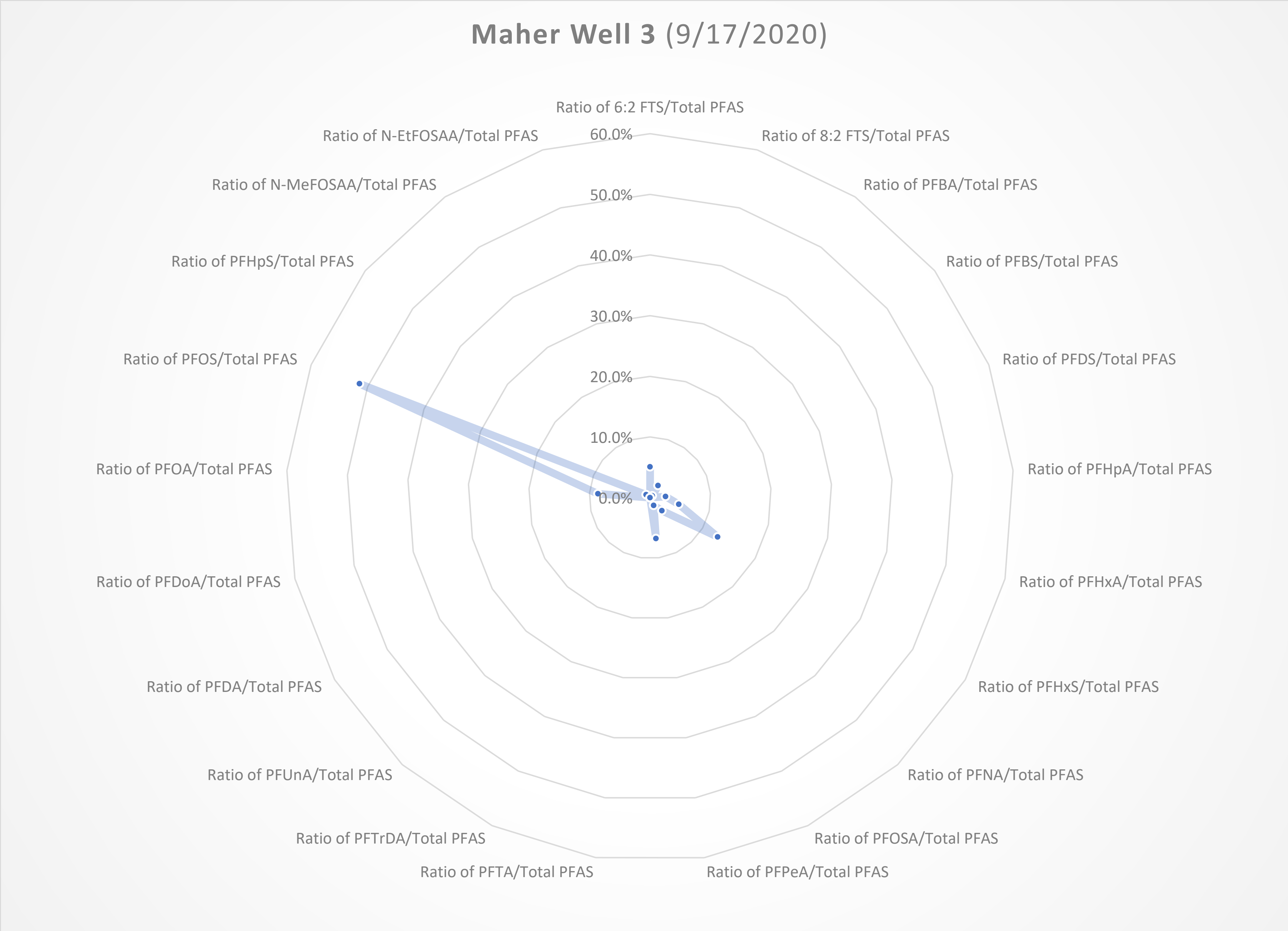
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%

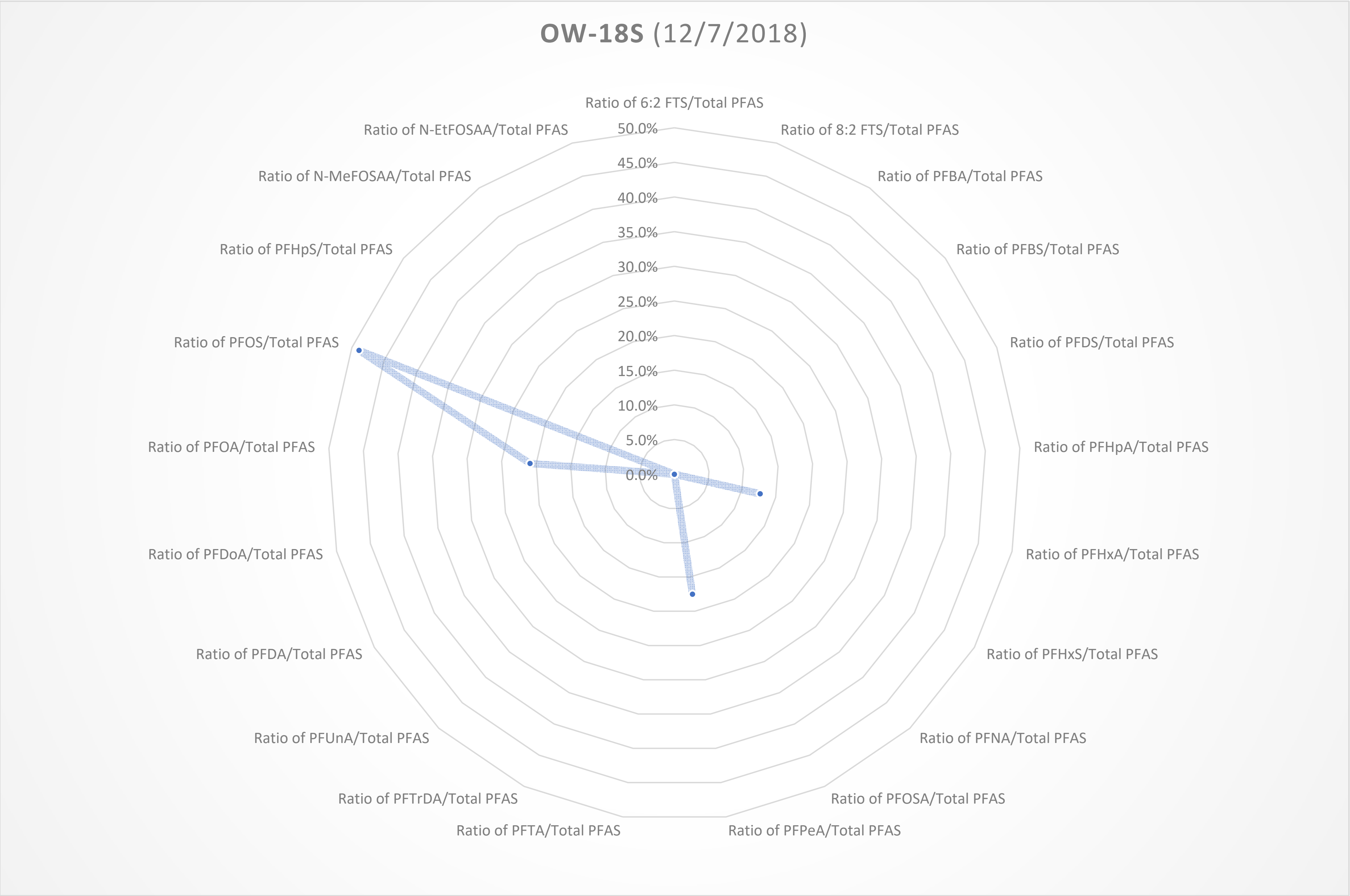

OW-9(dd) (10/2/2020)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%


Maher Well 1 (9/17/2020)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%

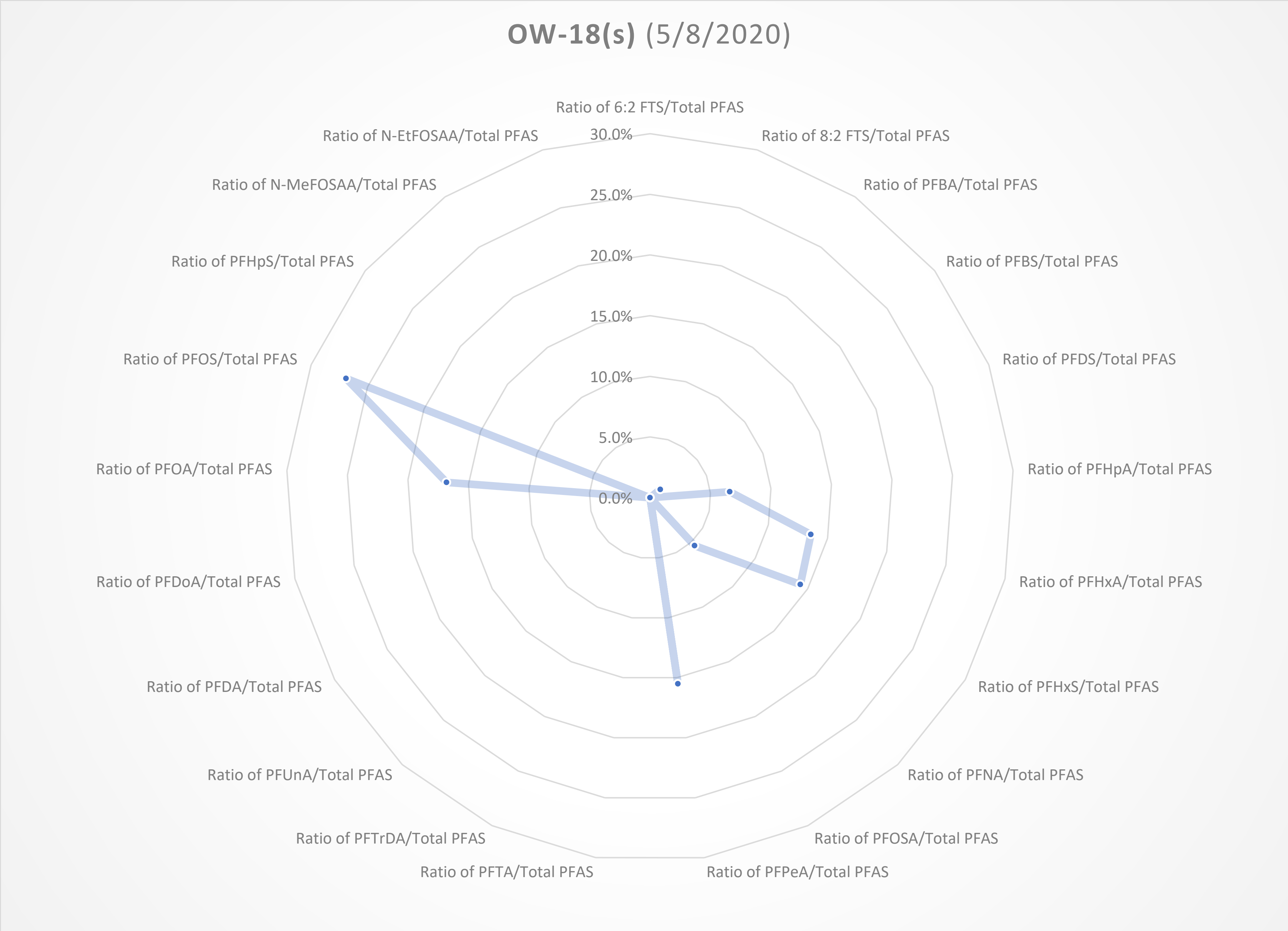

Maher Well 2 (9/17/2020)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
50.0%
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%

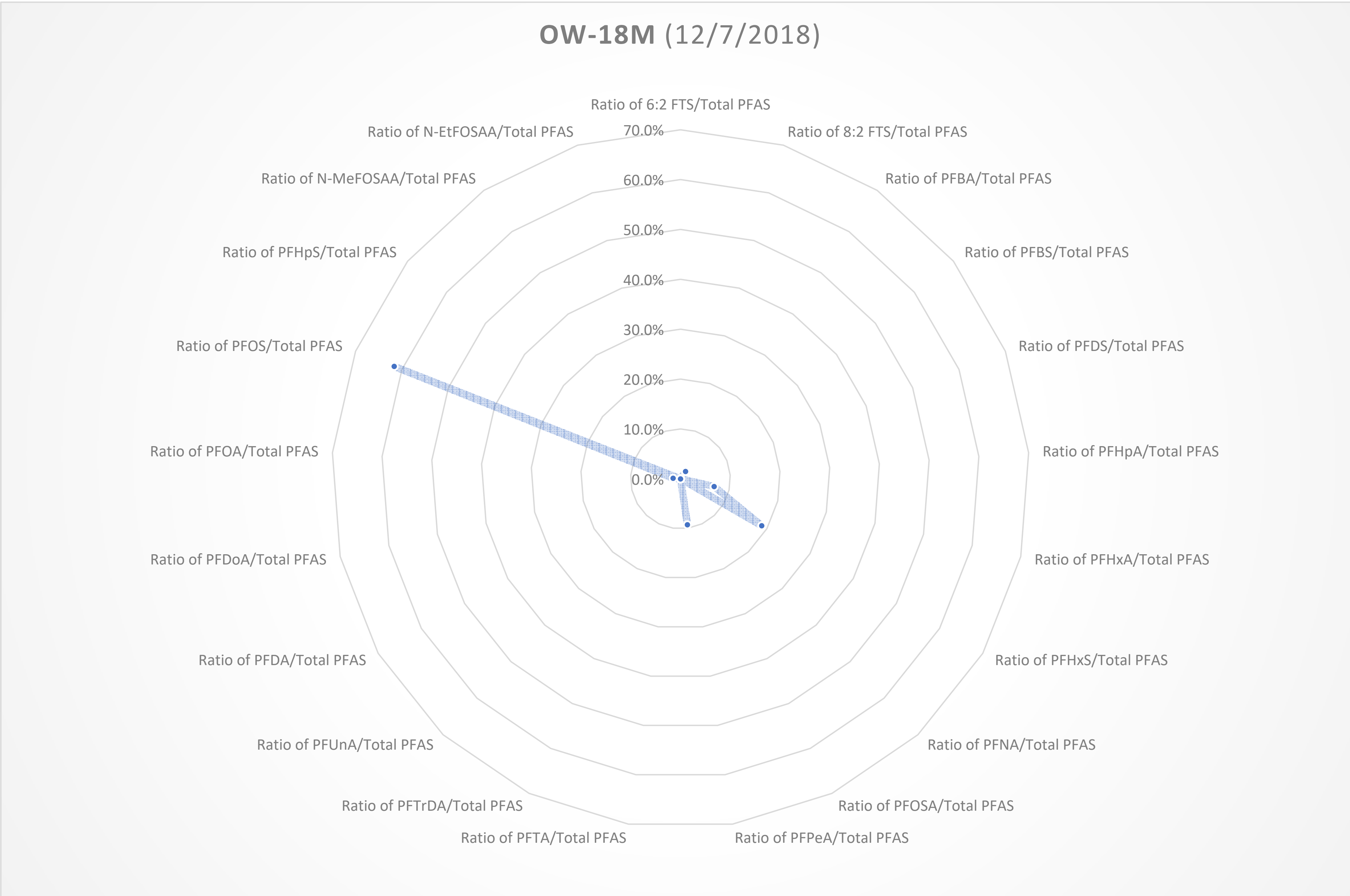


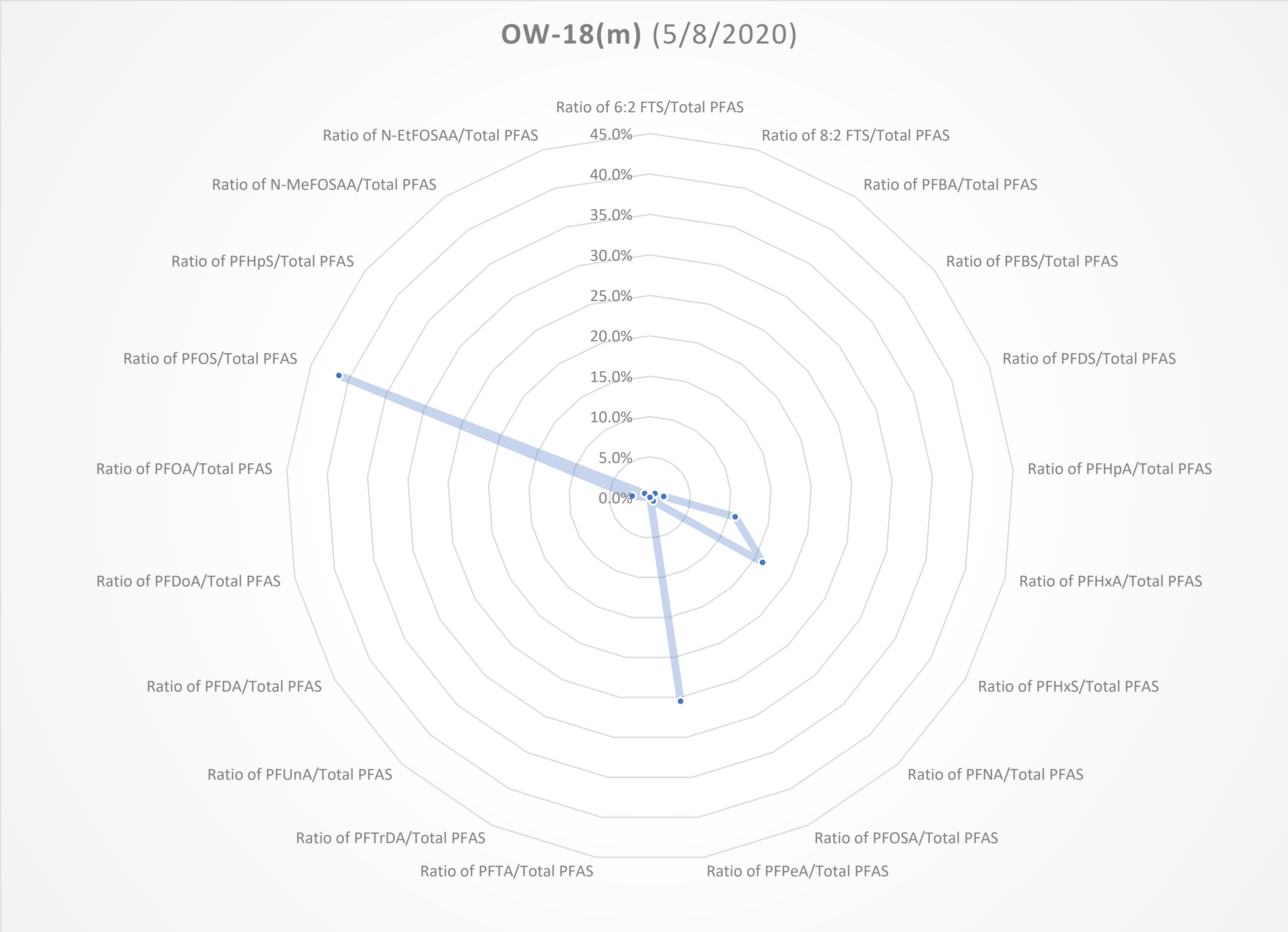
Maher Well 3 (9/17/2020)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%

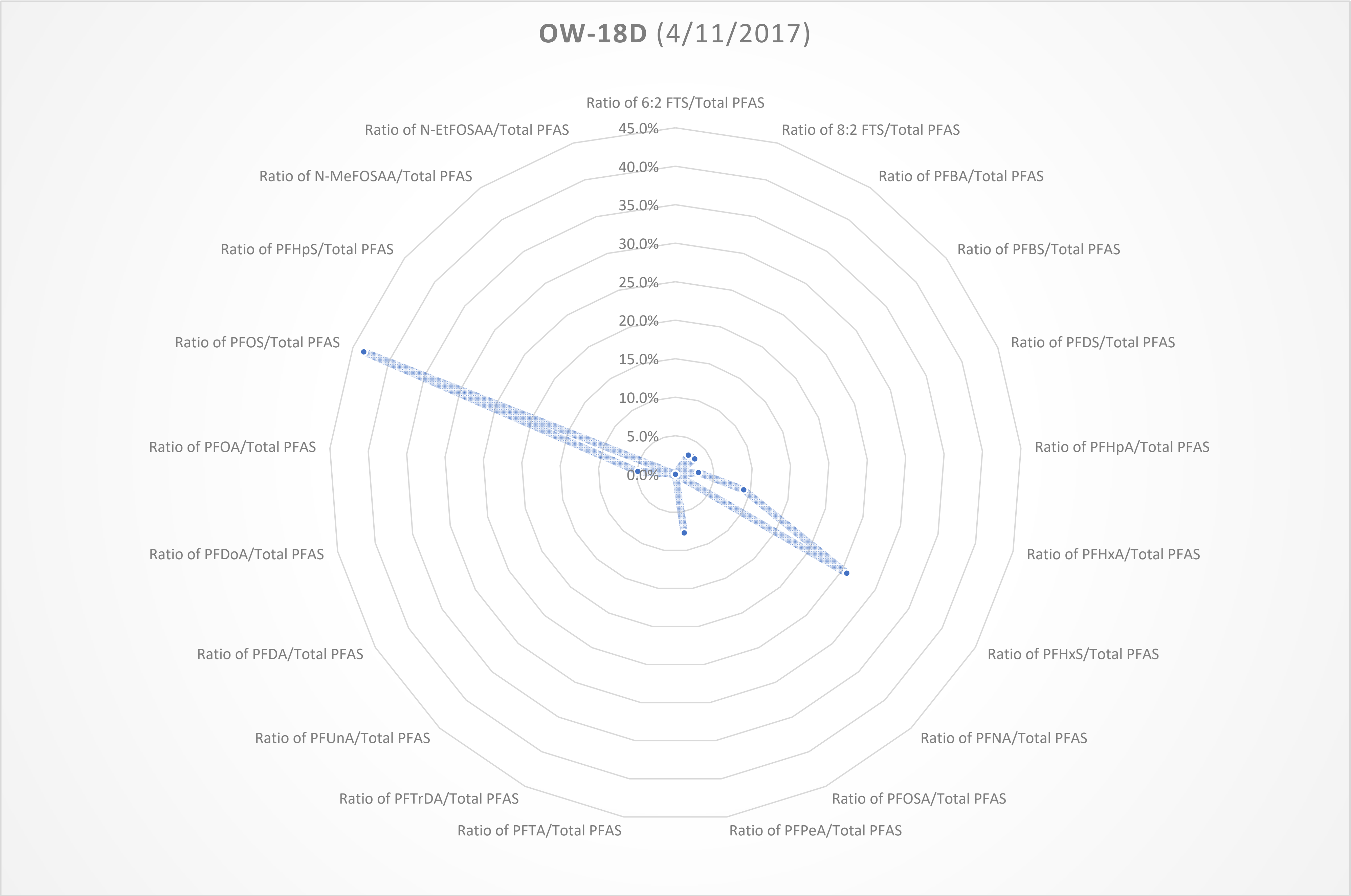


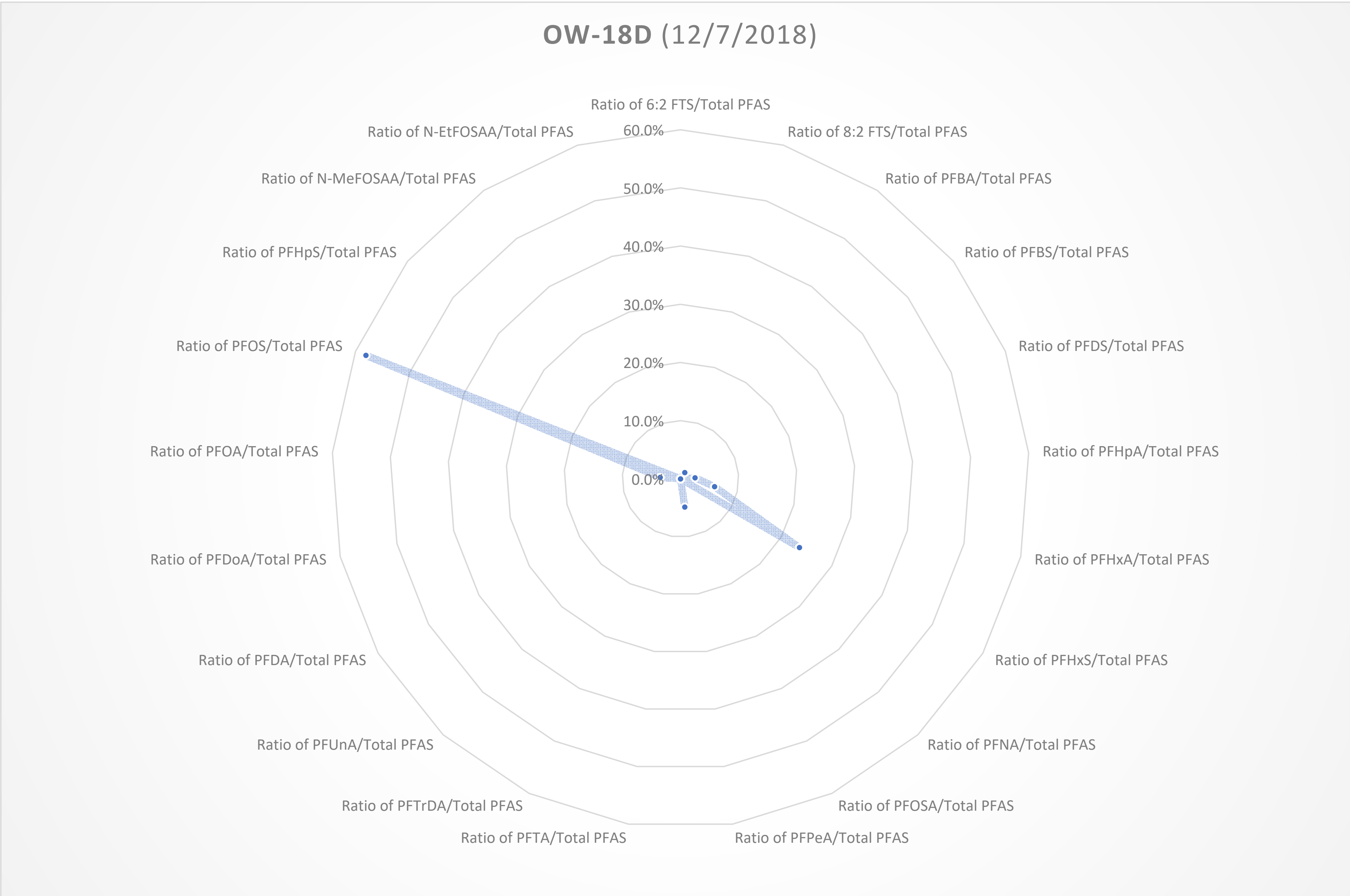
OW-18S (12/7/2018)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
50.0%
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%

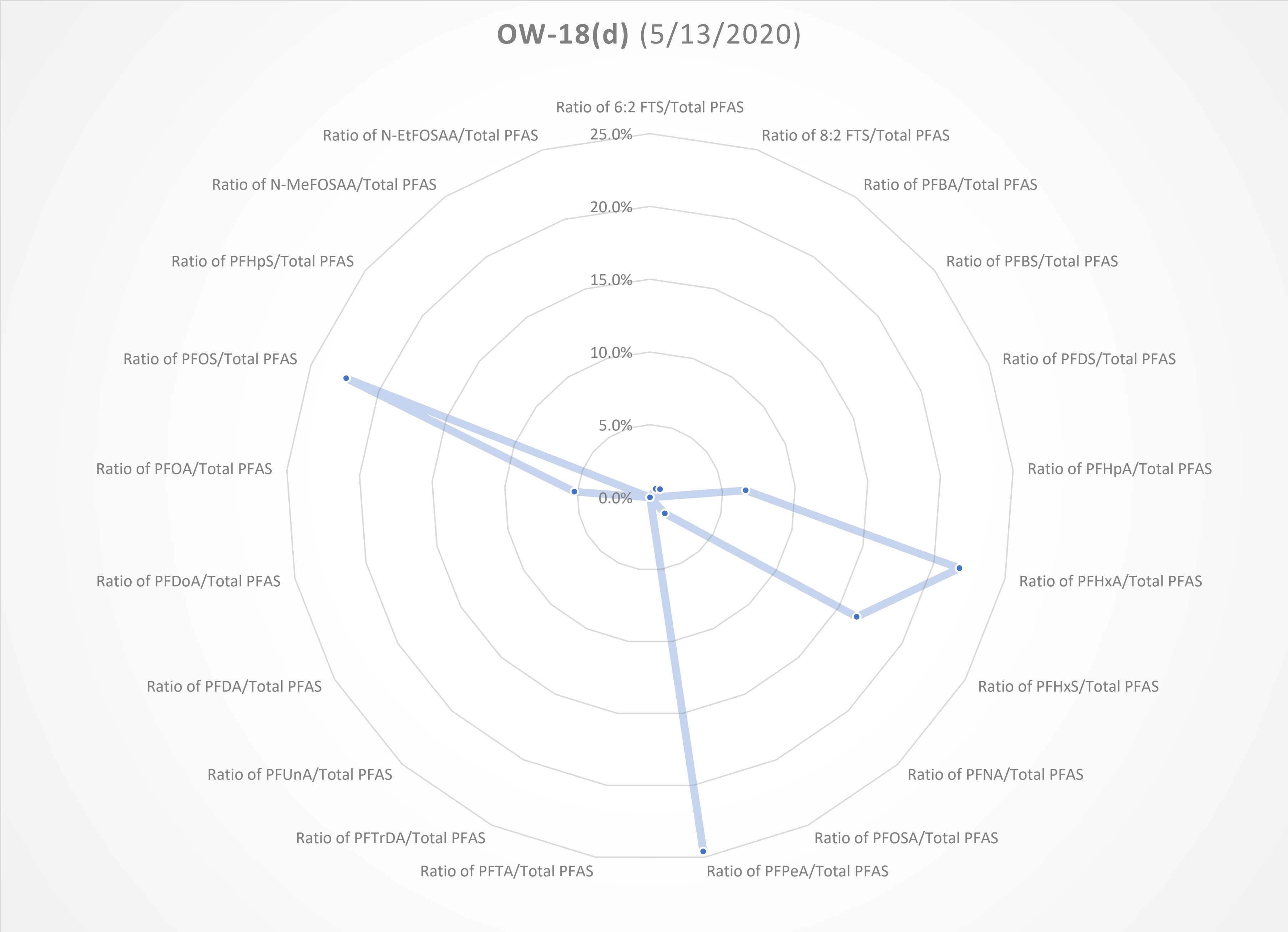

OW-18(s) (5/8/2020)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%

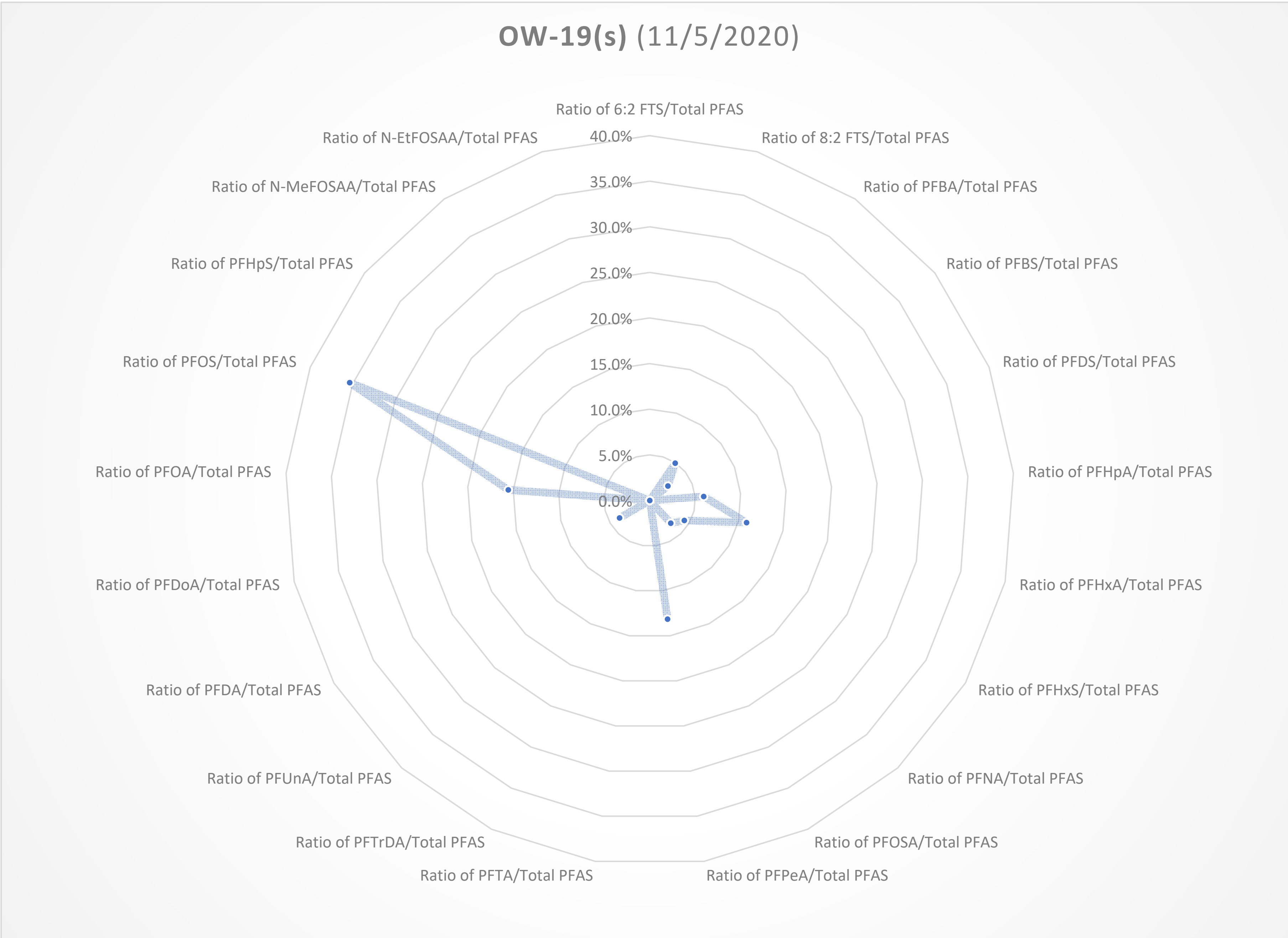

OW-18M (12/7/2018)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%


OW-18(m) (5/8/2020)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%


OW-18D (4/11/2017)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%


OW-18D (12/7/2018)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%


OW-18(d) (5/13/2020)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%


OW-19(s) (11/5/2020)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
40.0%
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30.0%
25.0%
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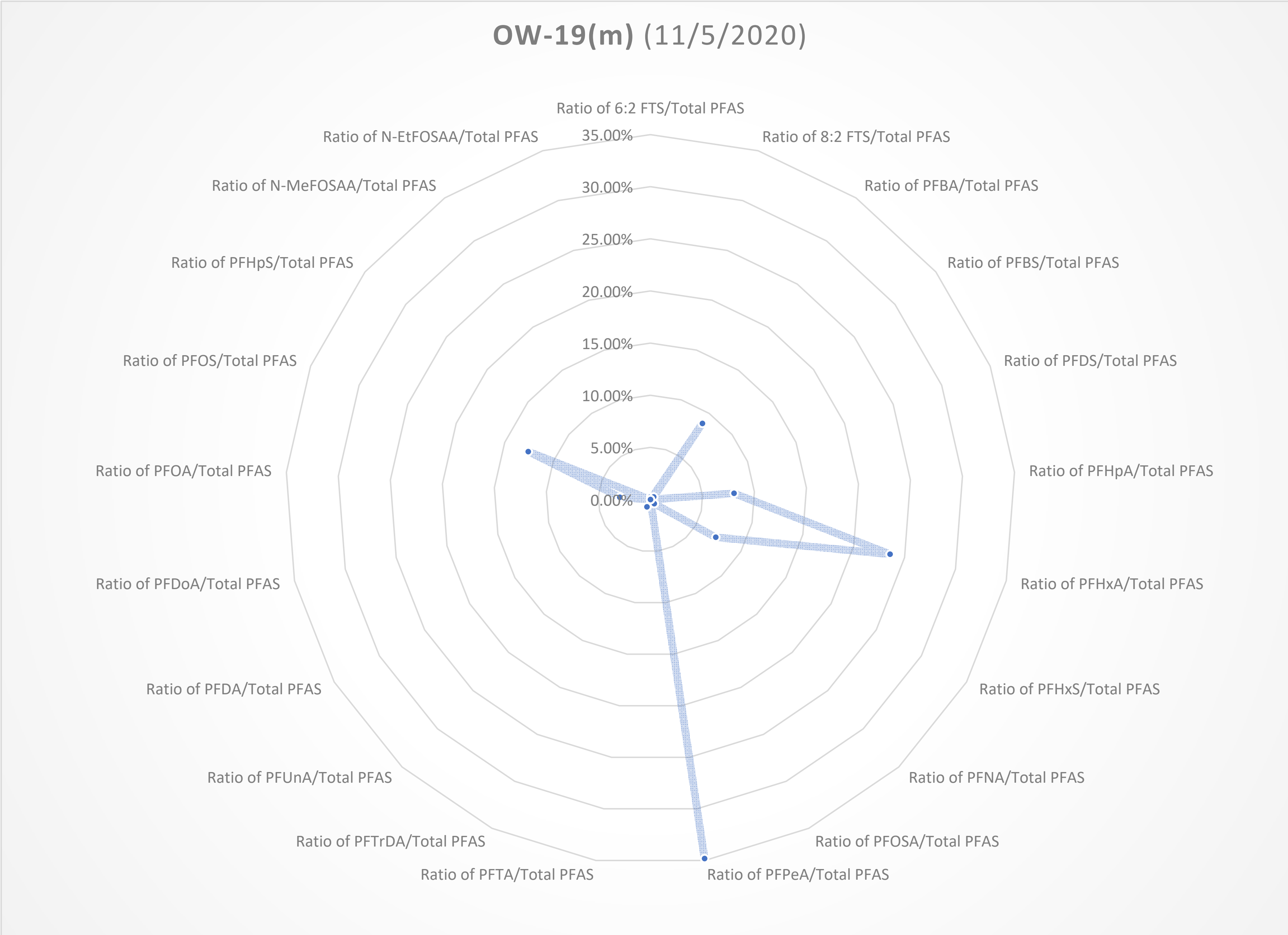
OW-19(m) (11/5/2020)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
35.00%
30.00%
25.00%
20.00%
15.00%
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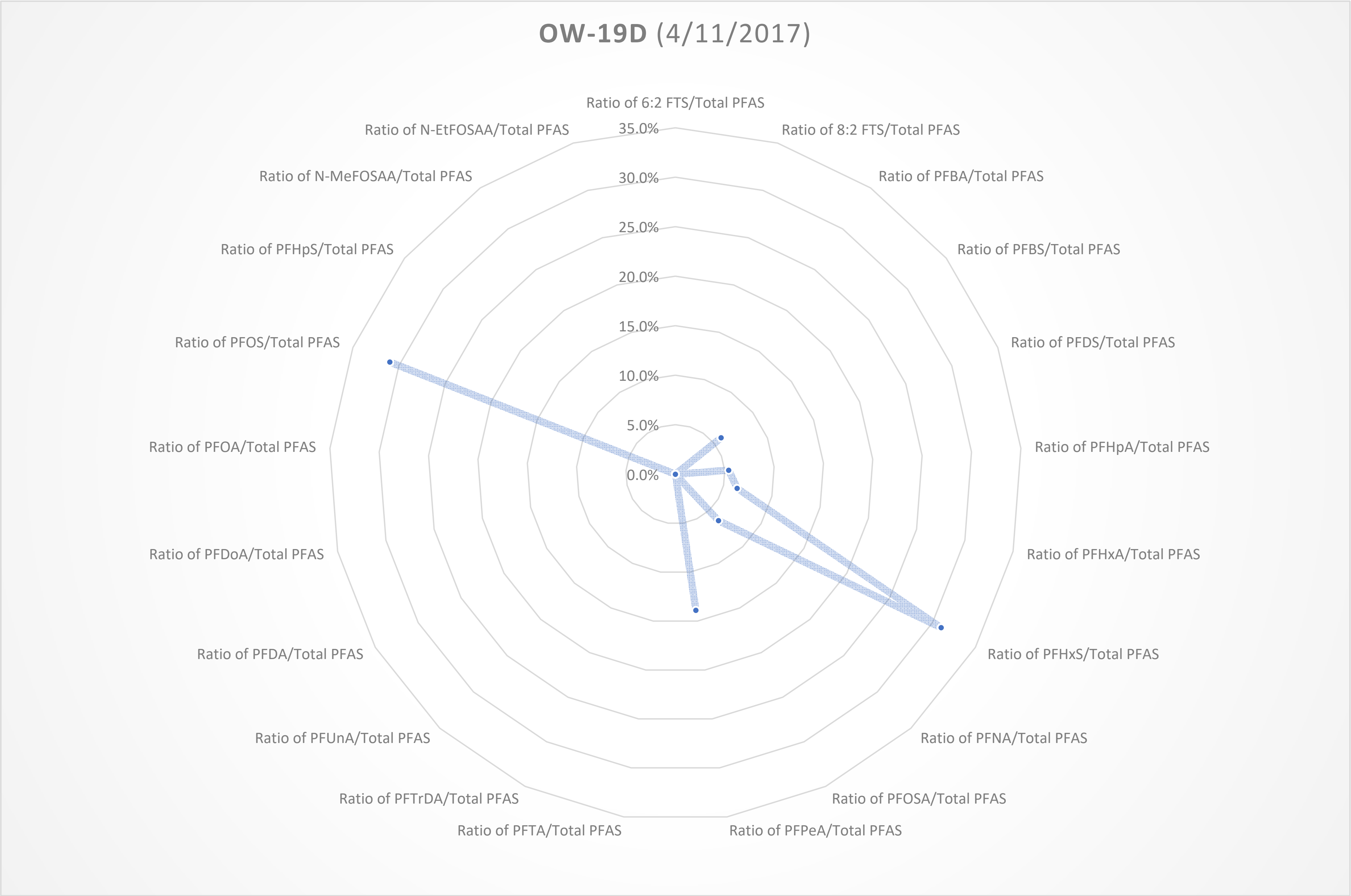
5.00%
0.00%


OW-19D (4/11/2017)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
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Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
35.0%
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25.0%
20.0%
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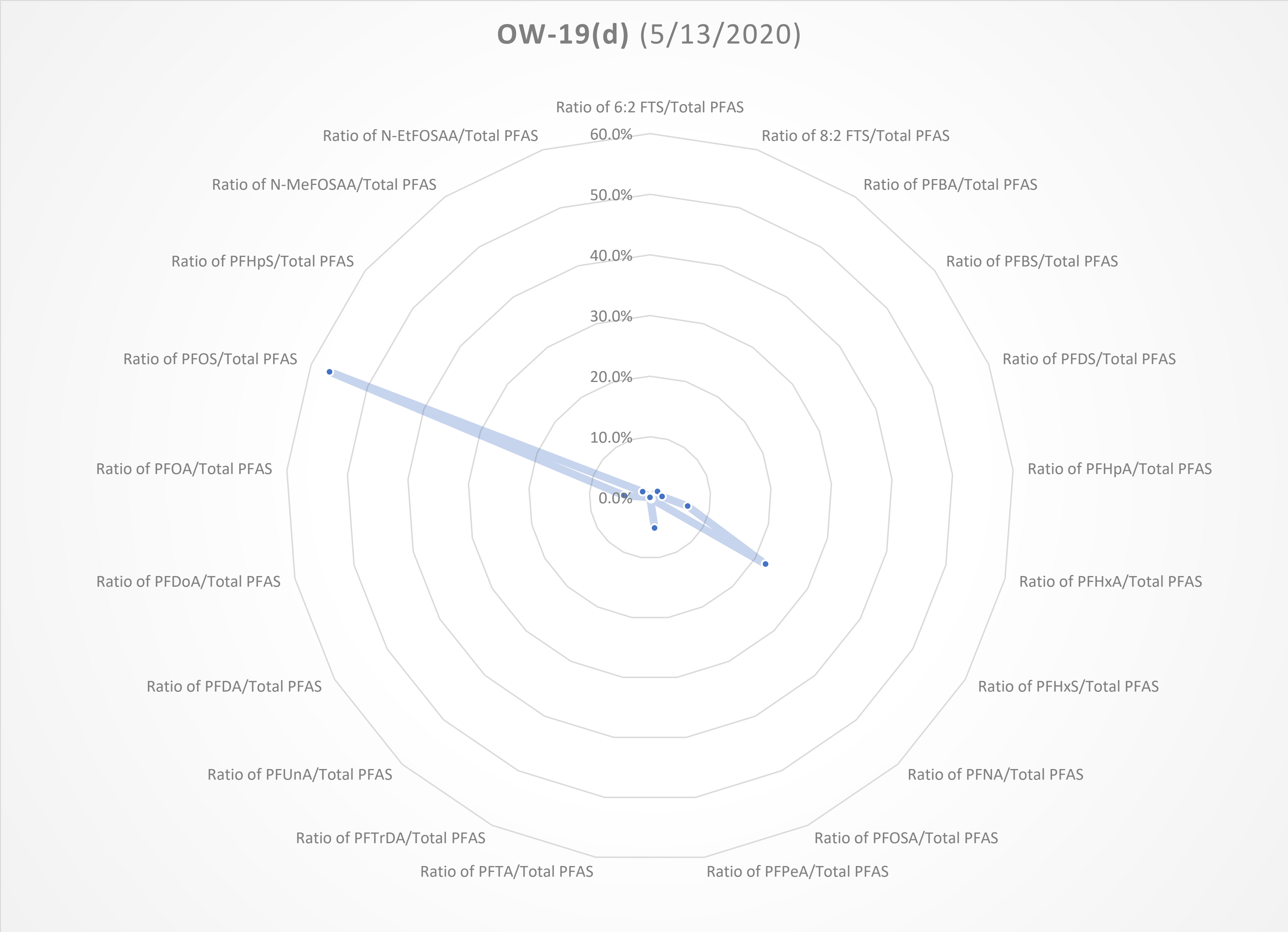
OW-19(d) (5/13/2020)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
60.0%
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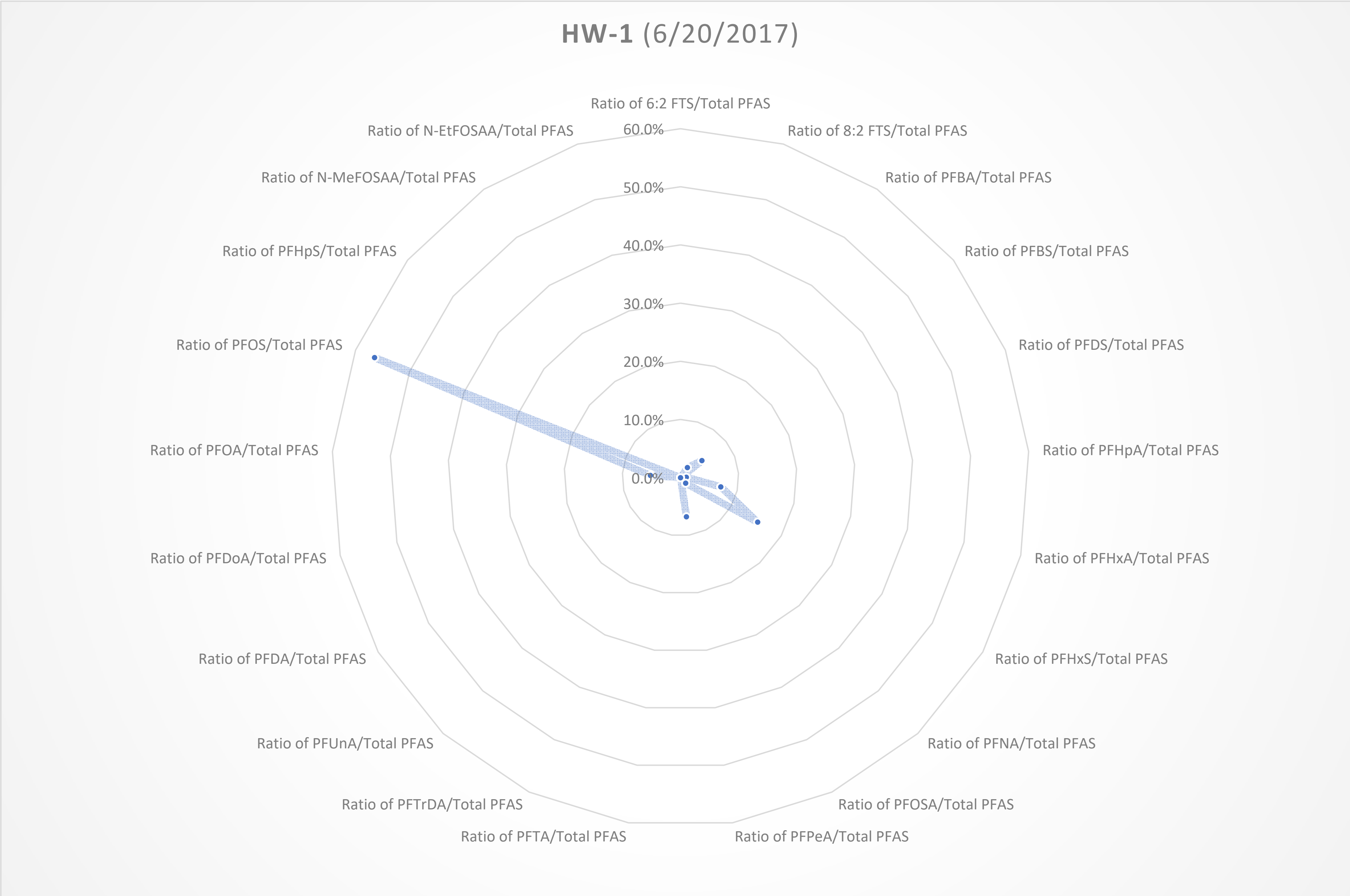
HW-1 (6/20/2017)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
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Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
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30.0%
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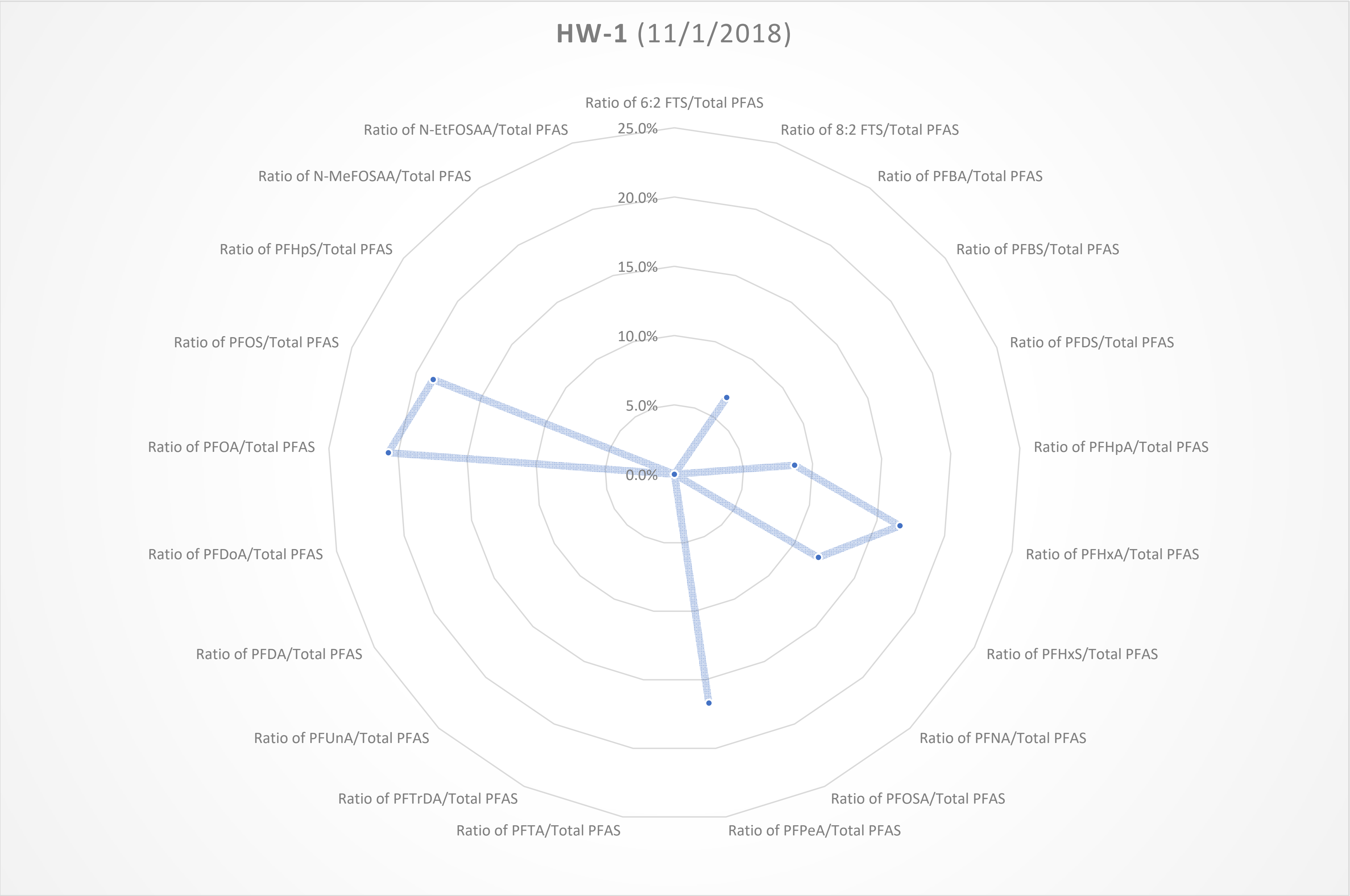
0.0%


HW-1 (11/1/2018)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
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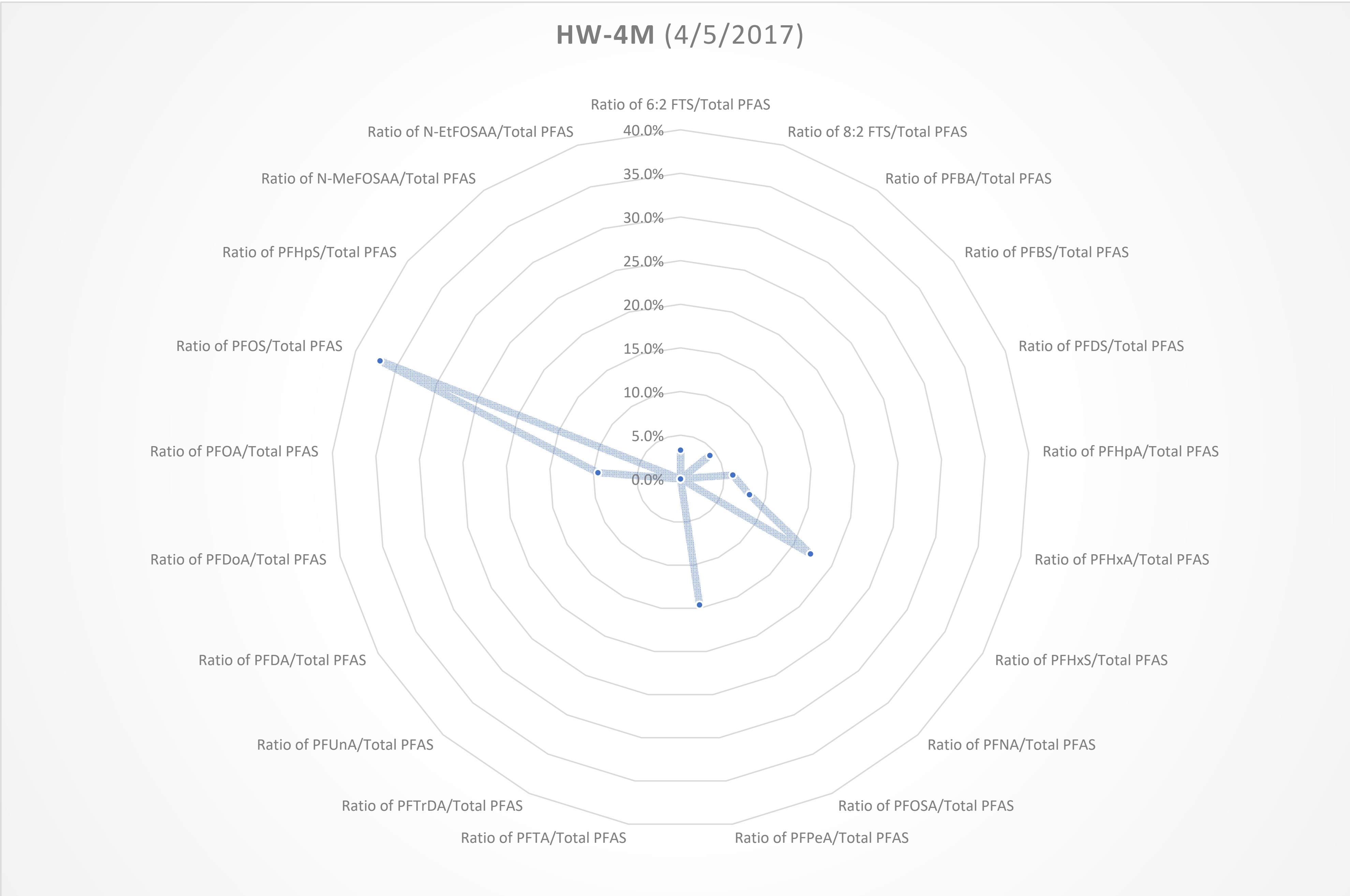
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%


HW-4M (4/5/2017)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
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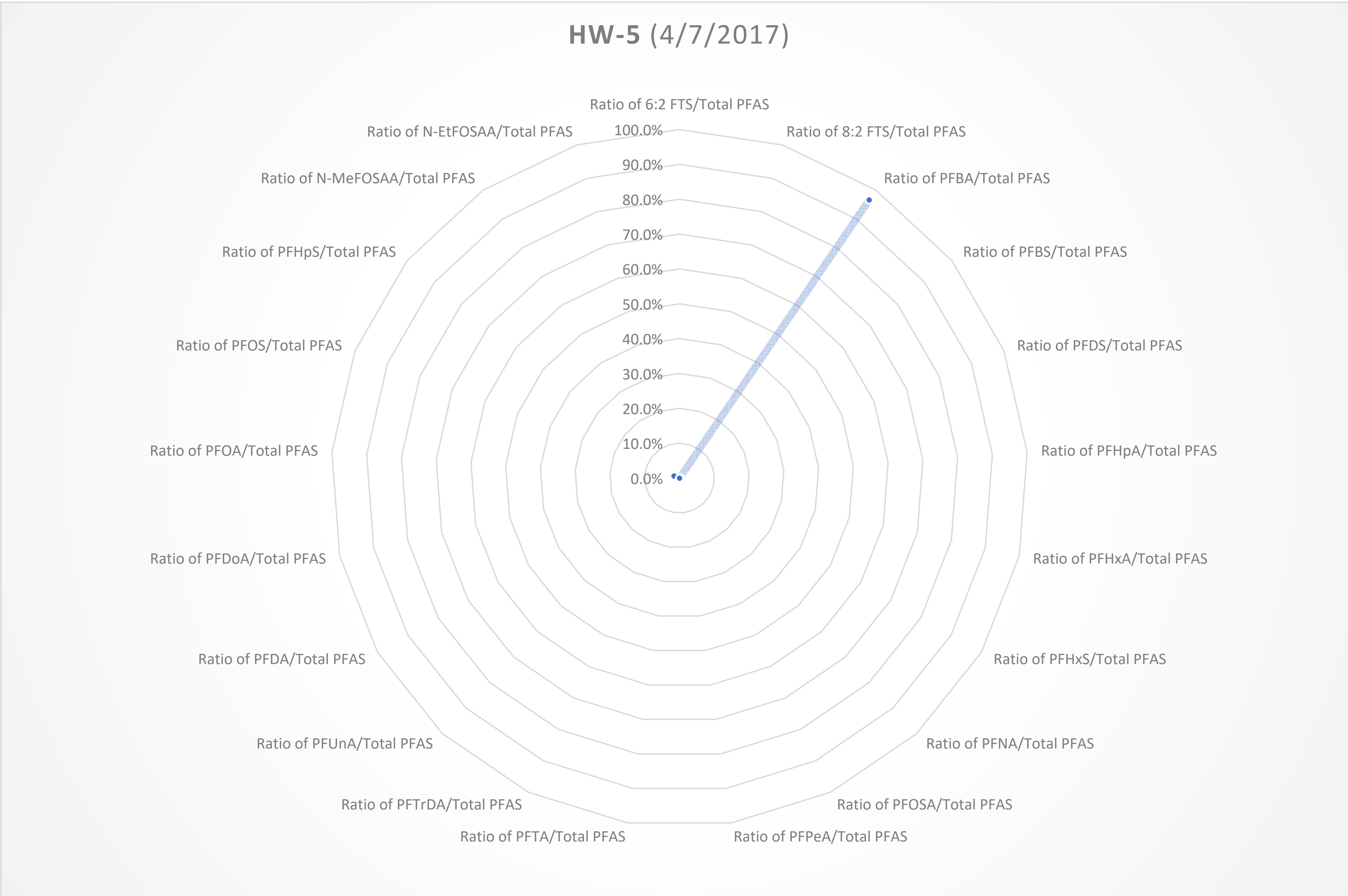
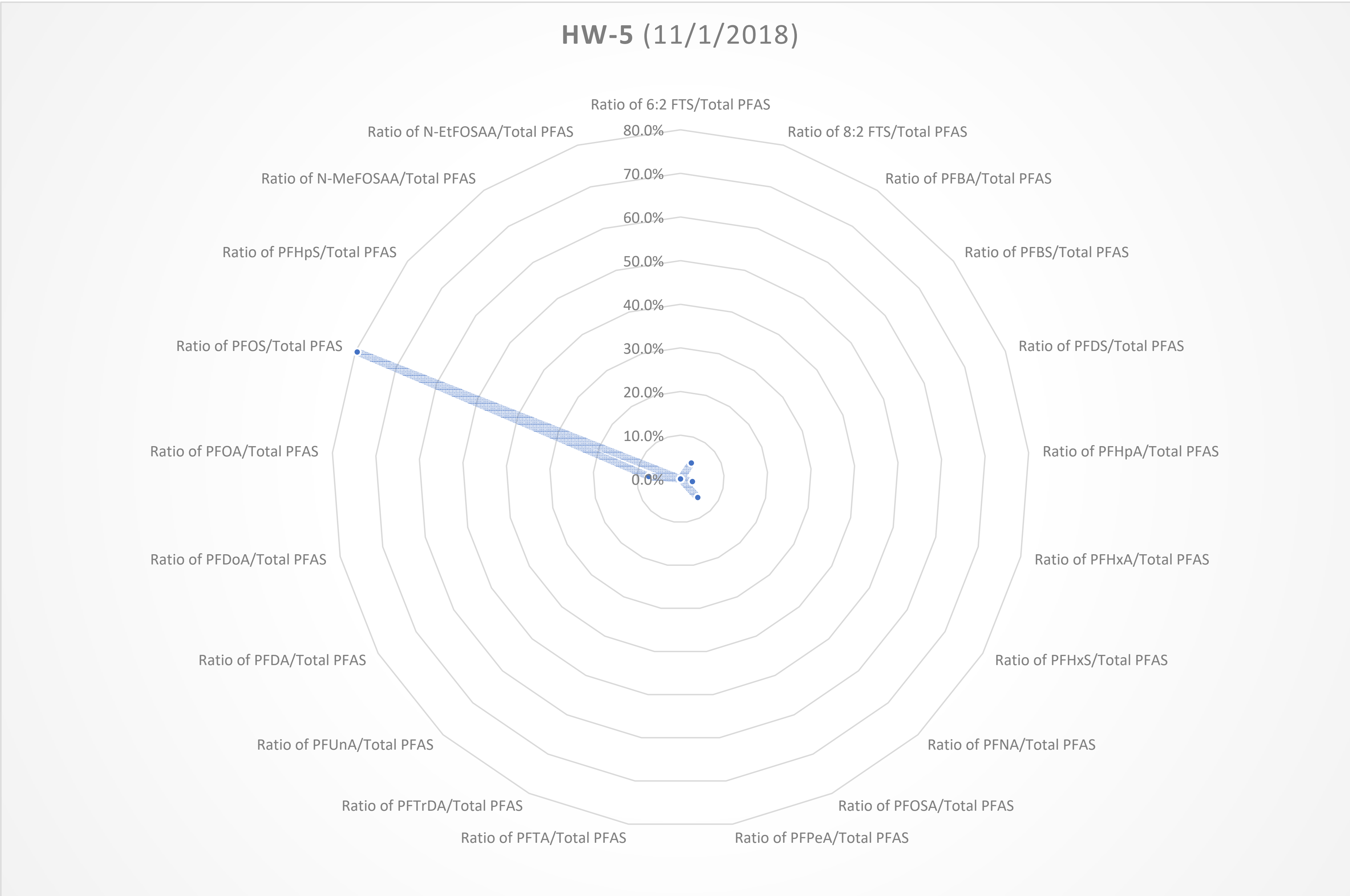
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%



HW-5 (4/7/2017)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%


HW-5 (11/1/2018)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
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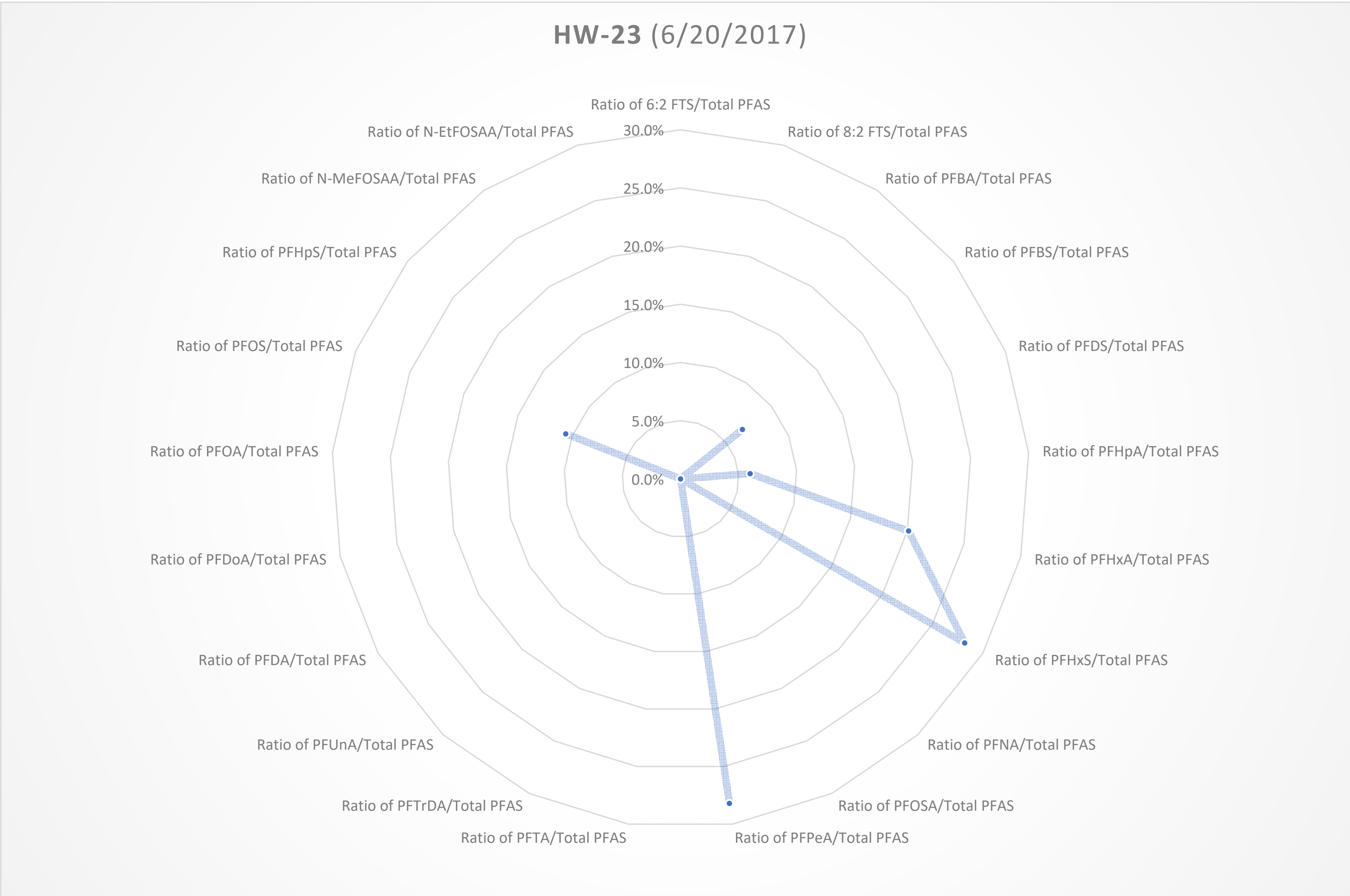
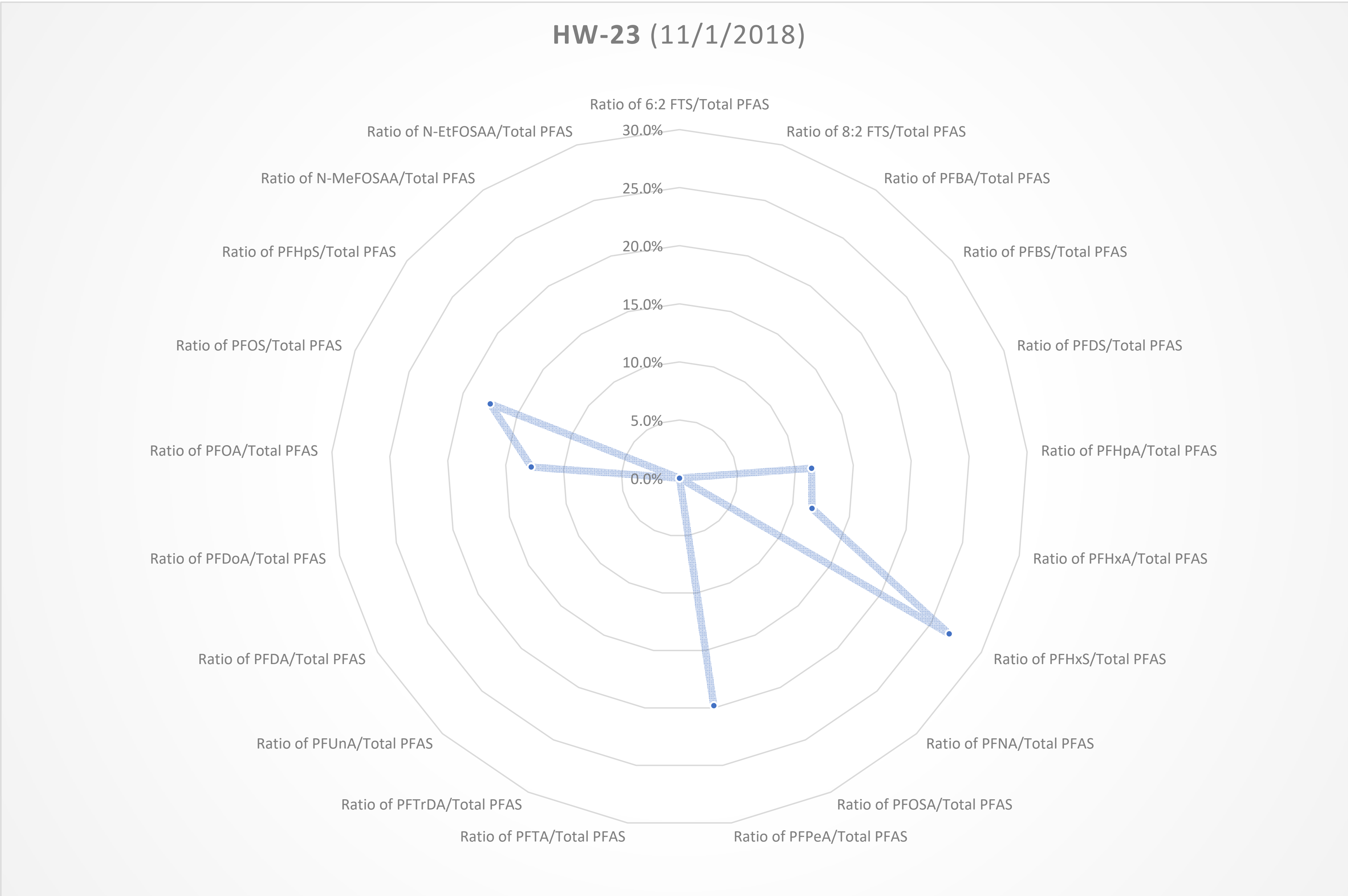
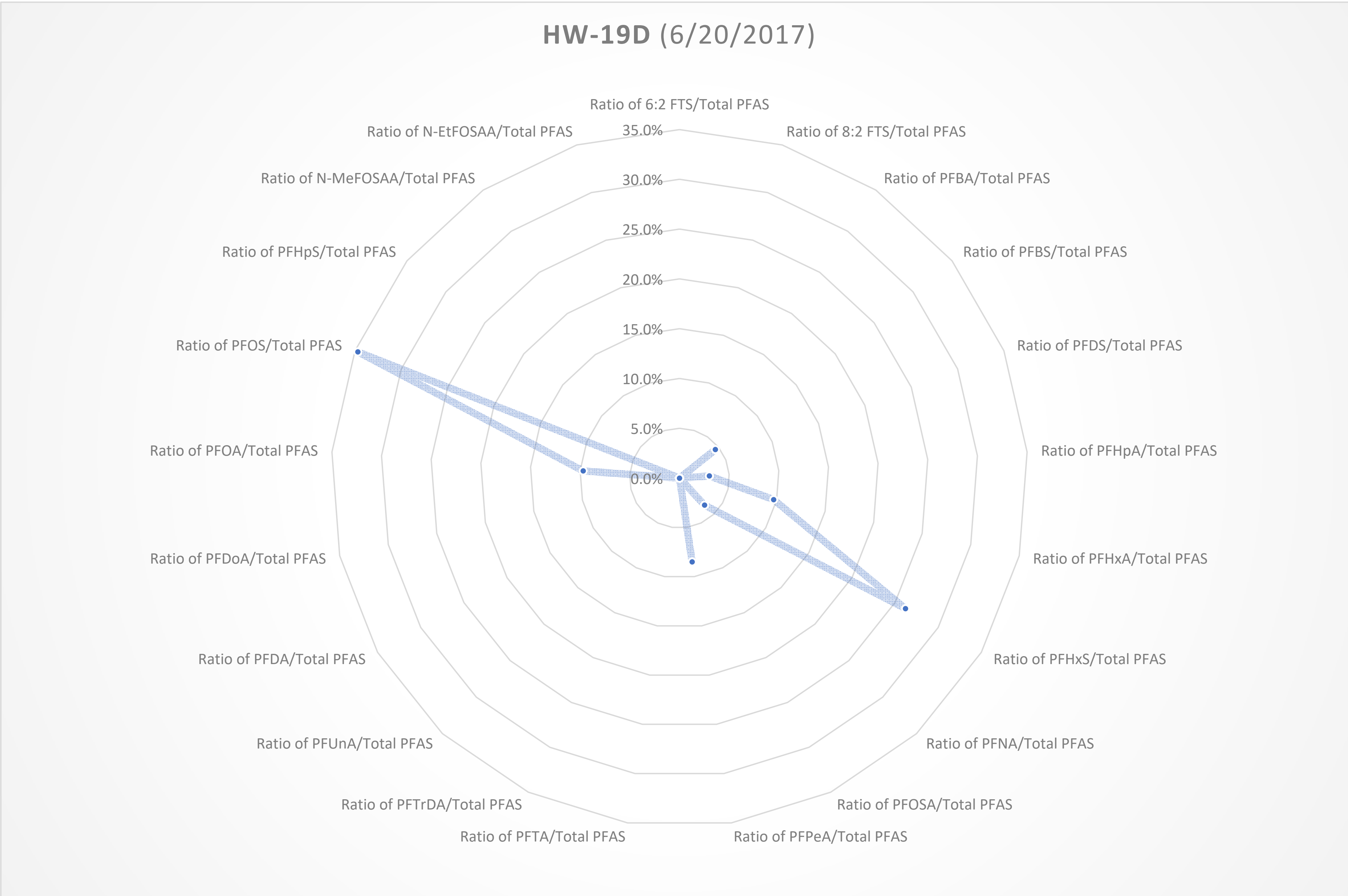

HW-23 (6/20/2017)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%


HW-23 (11/1/2018)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%


HW-19D (6/20/2017)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
35.0%
30.0%
25.0%
20.0%
15.0%
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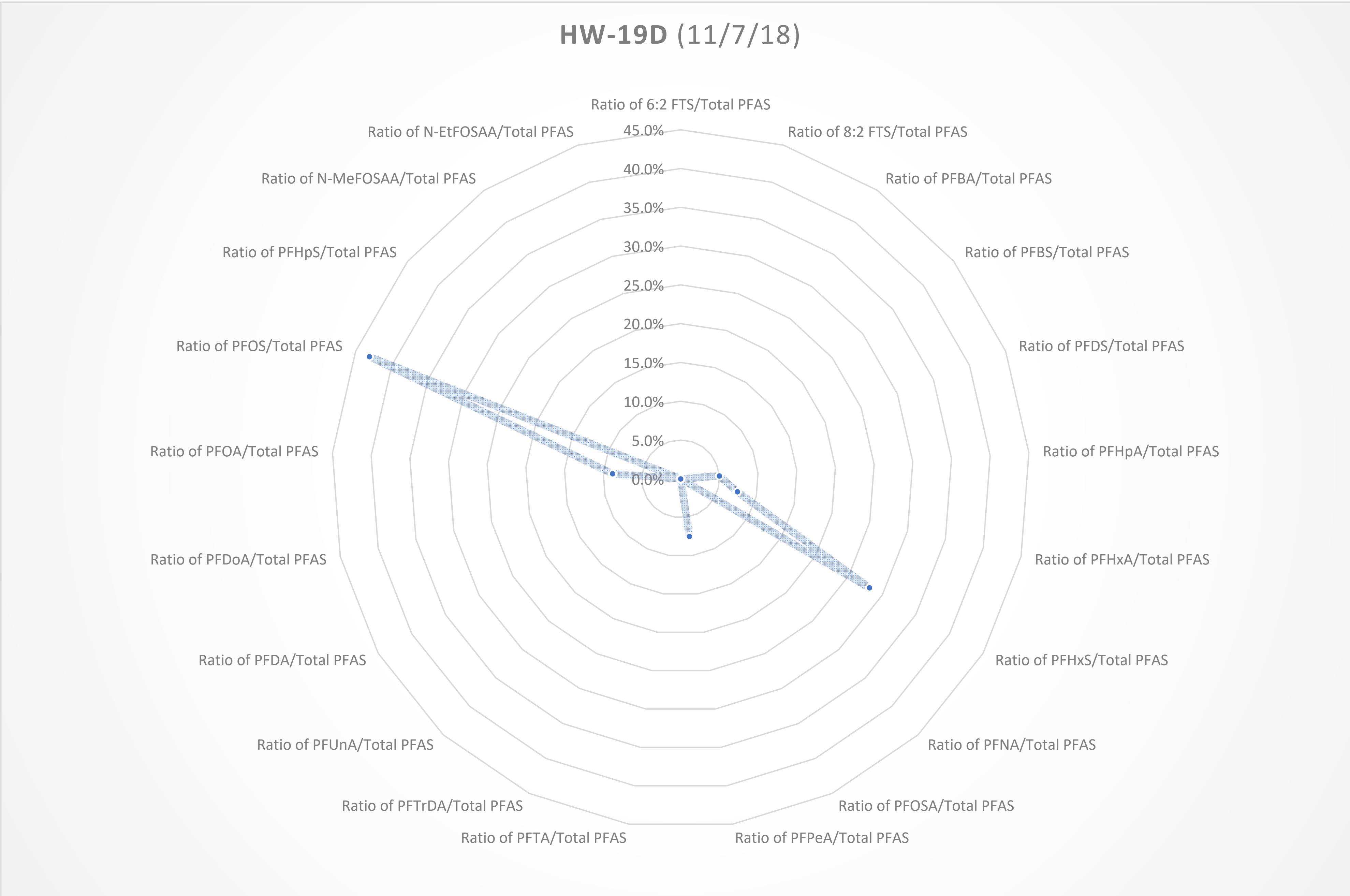
5.0%
0.0%


HW-19D (11/7/18)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
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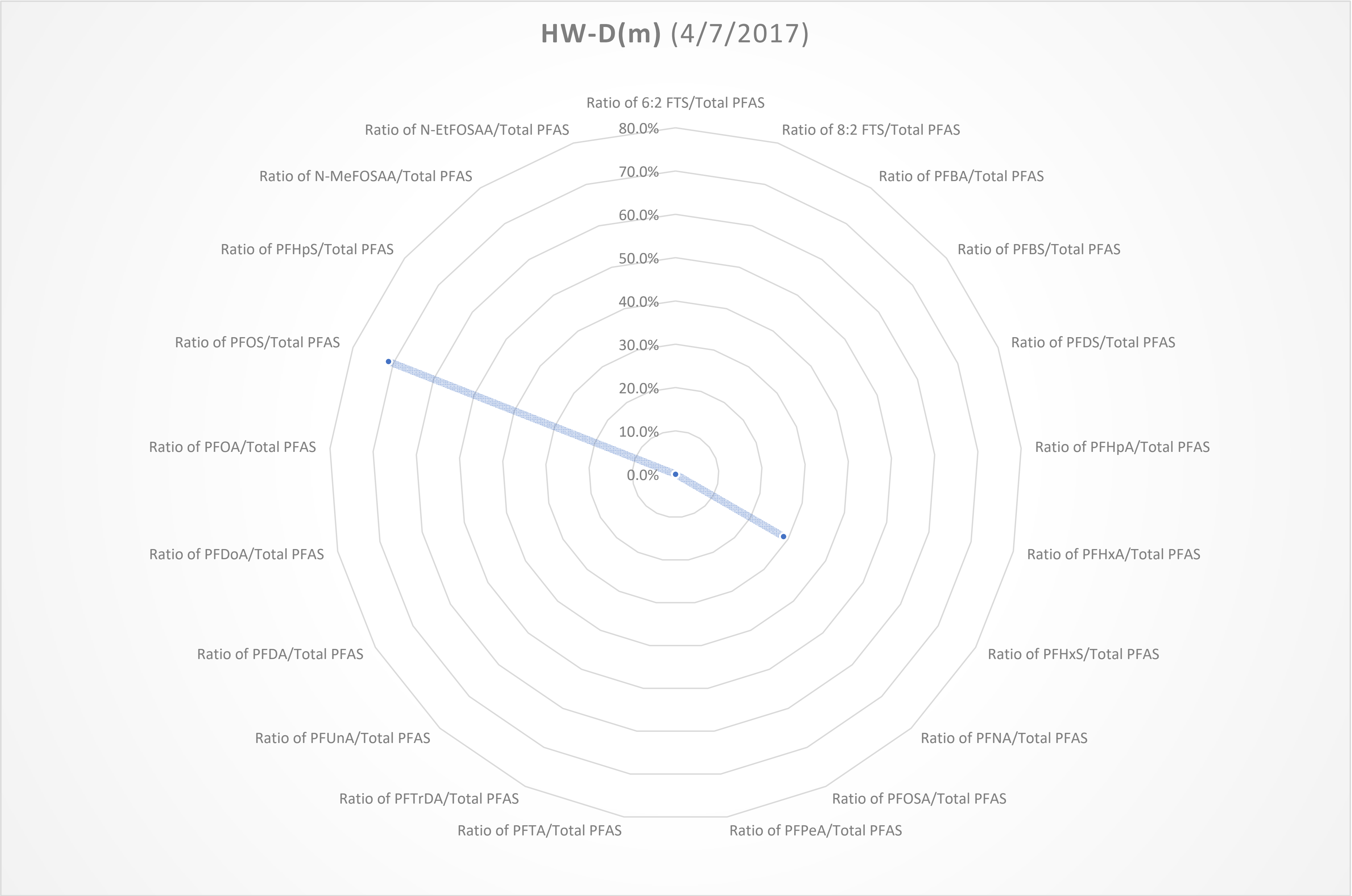
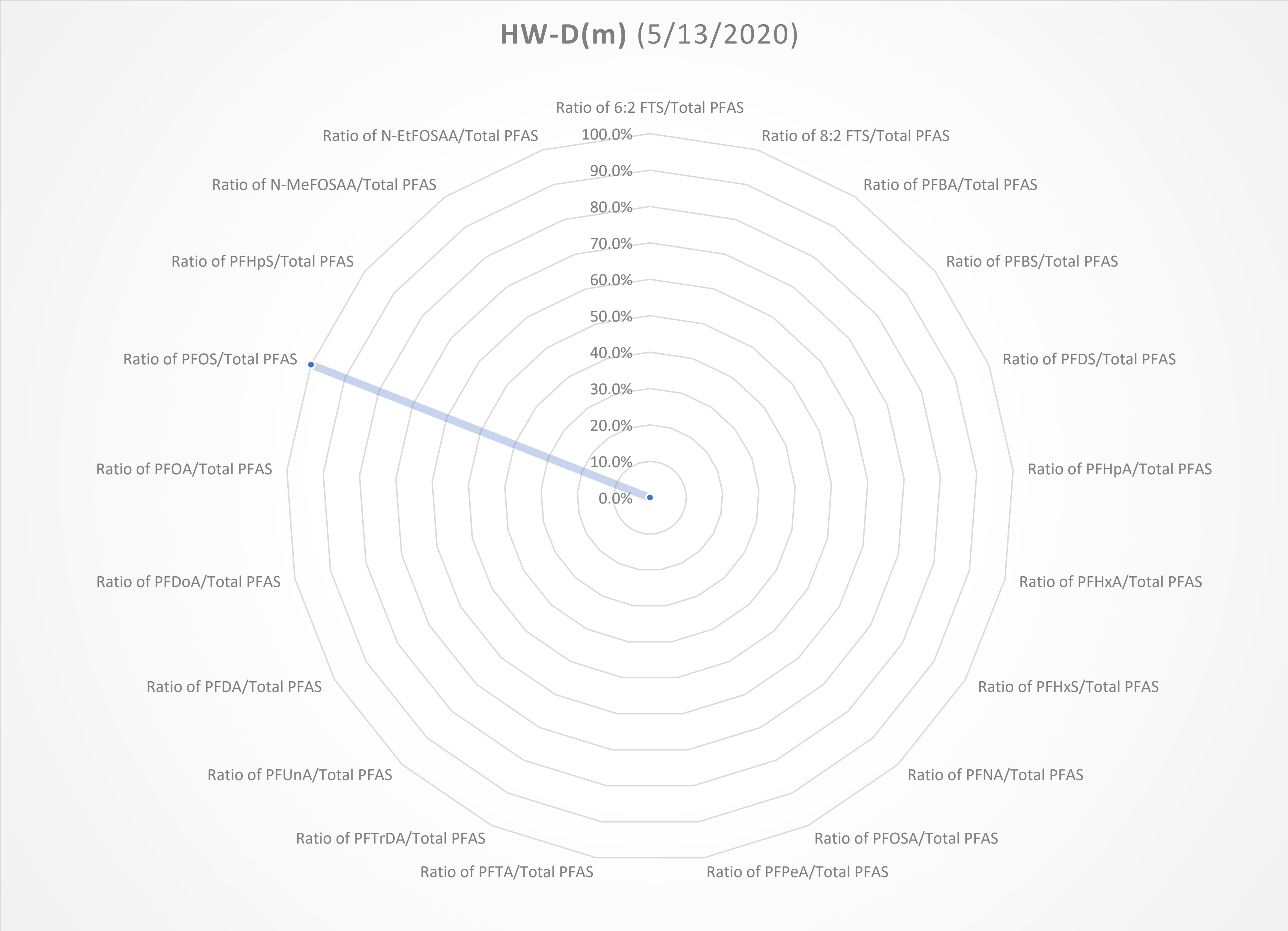
0.0%



HW-D(m) (4/7/2017)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%


HW-D(m) (5/13/2020)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
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30.0%
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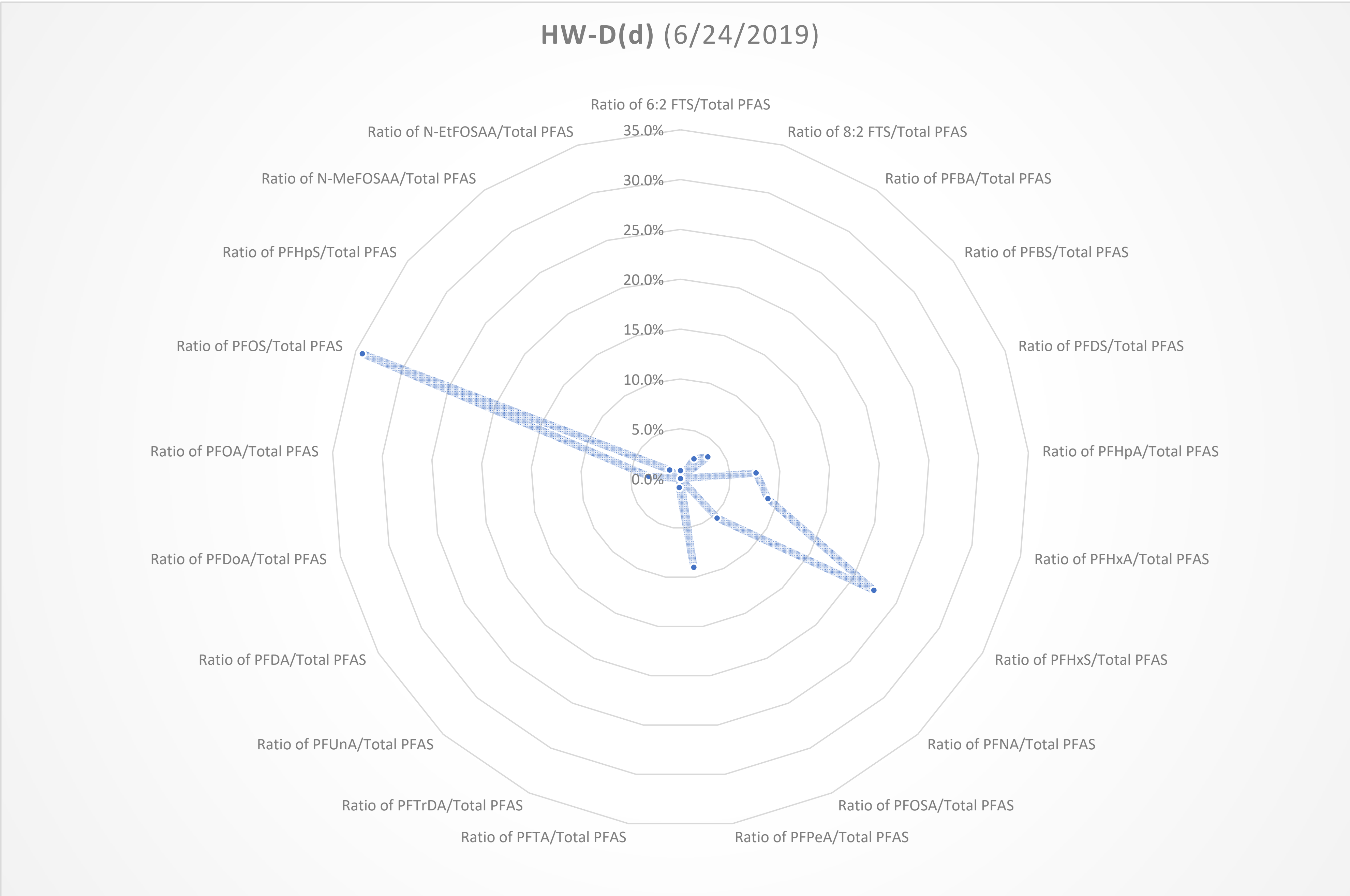

HW-D(d) (6/24/2019)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
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30.0%
25.0%
20.0%
15.0%
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5.0%
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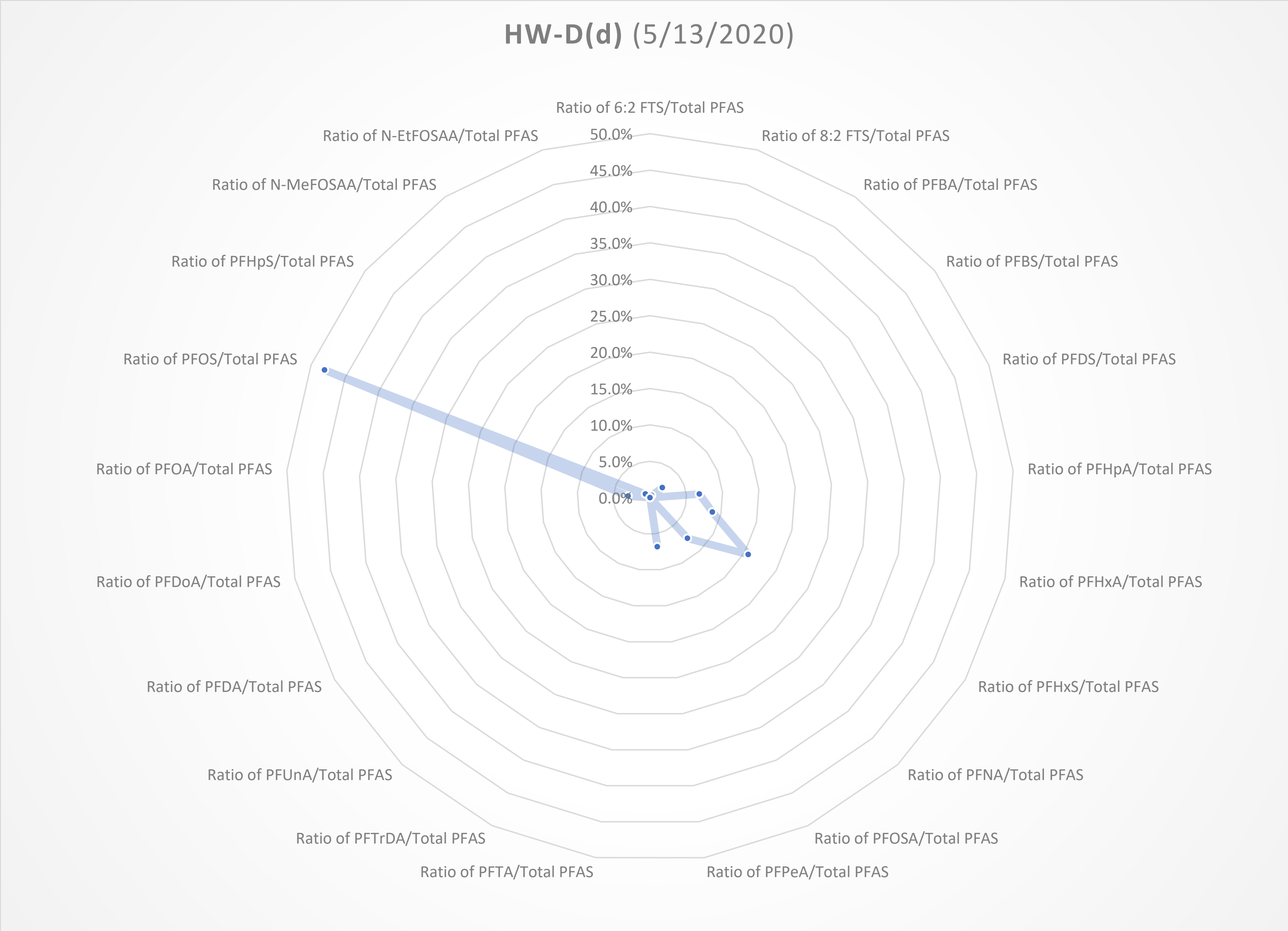

HW-D(d) (5/13/2020)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
50.0%
45.0%
40.0%
35.0%
30.0%
25.0%
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15.0%
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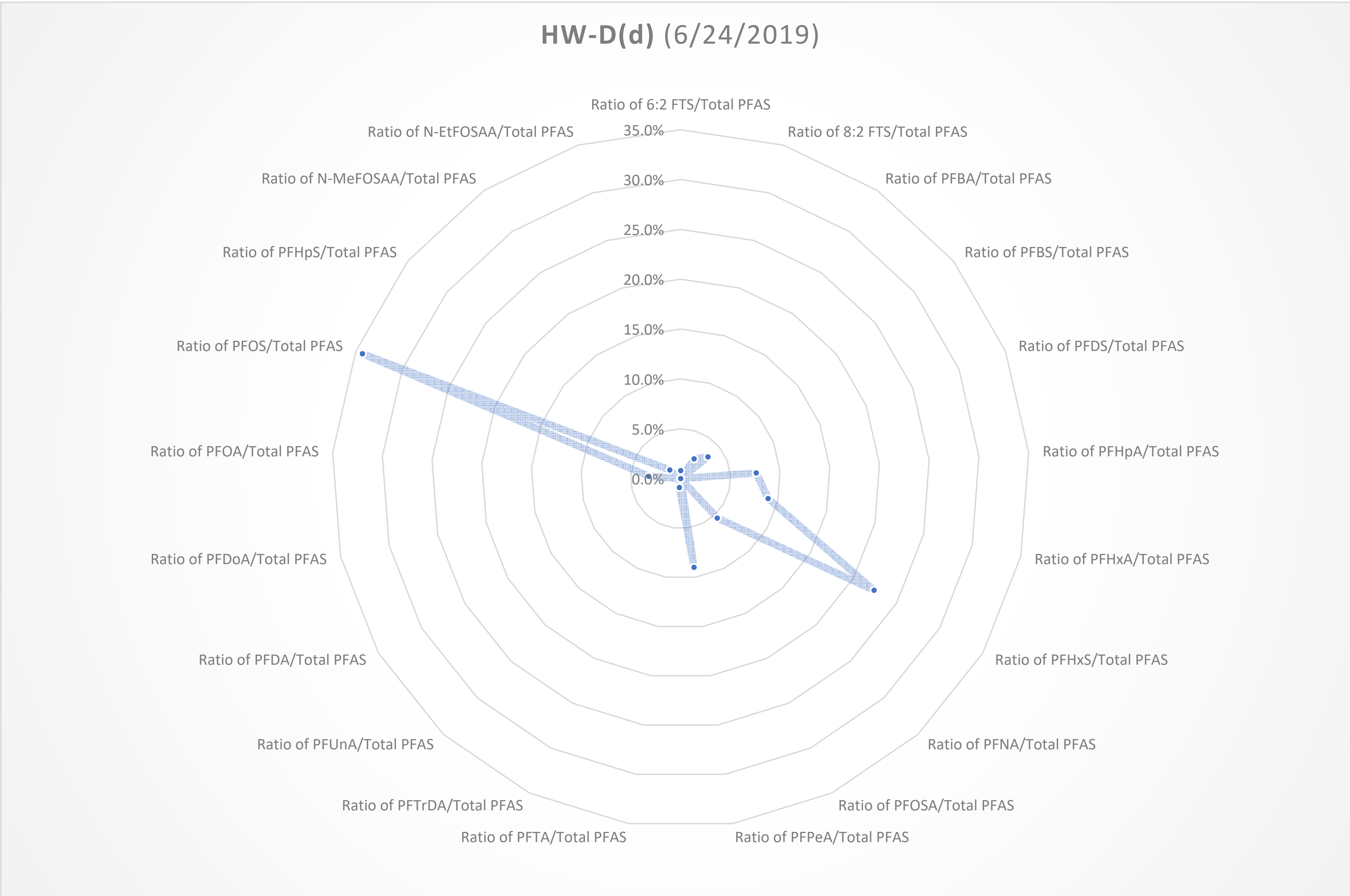
0.0%



HW-D(d) (6/24/2019)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
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Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
35.0%
30.0%
25.0%
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15.0%
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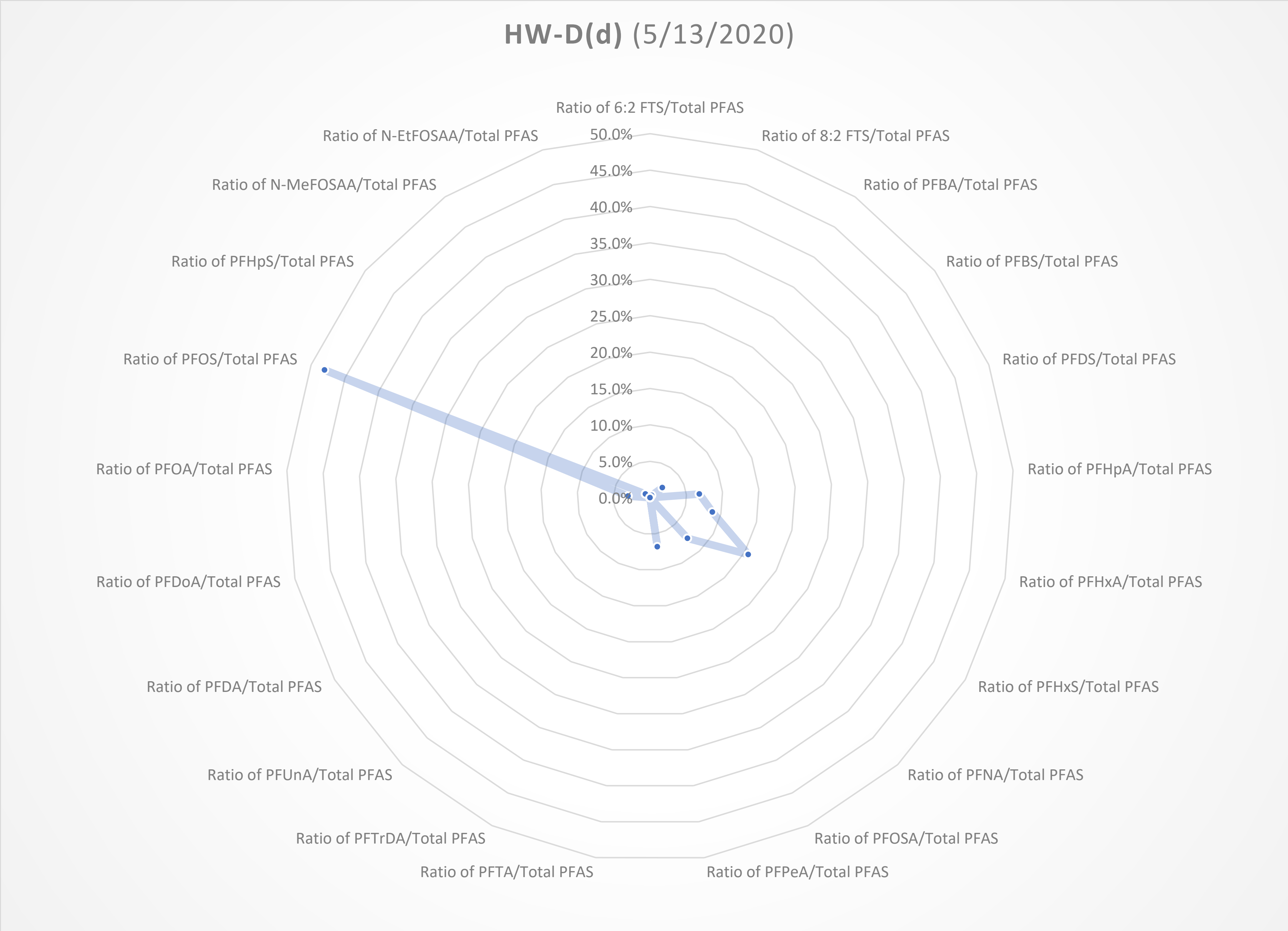
HW-D(d) (5/13/2020)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
50.0%
45.0%
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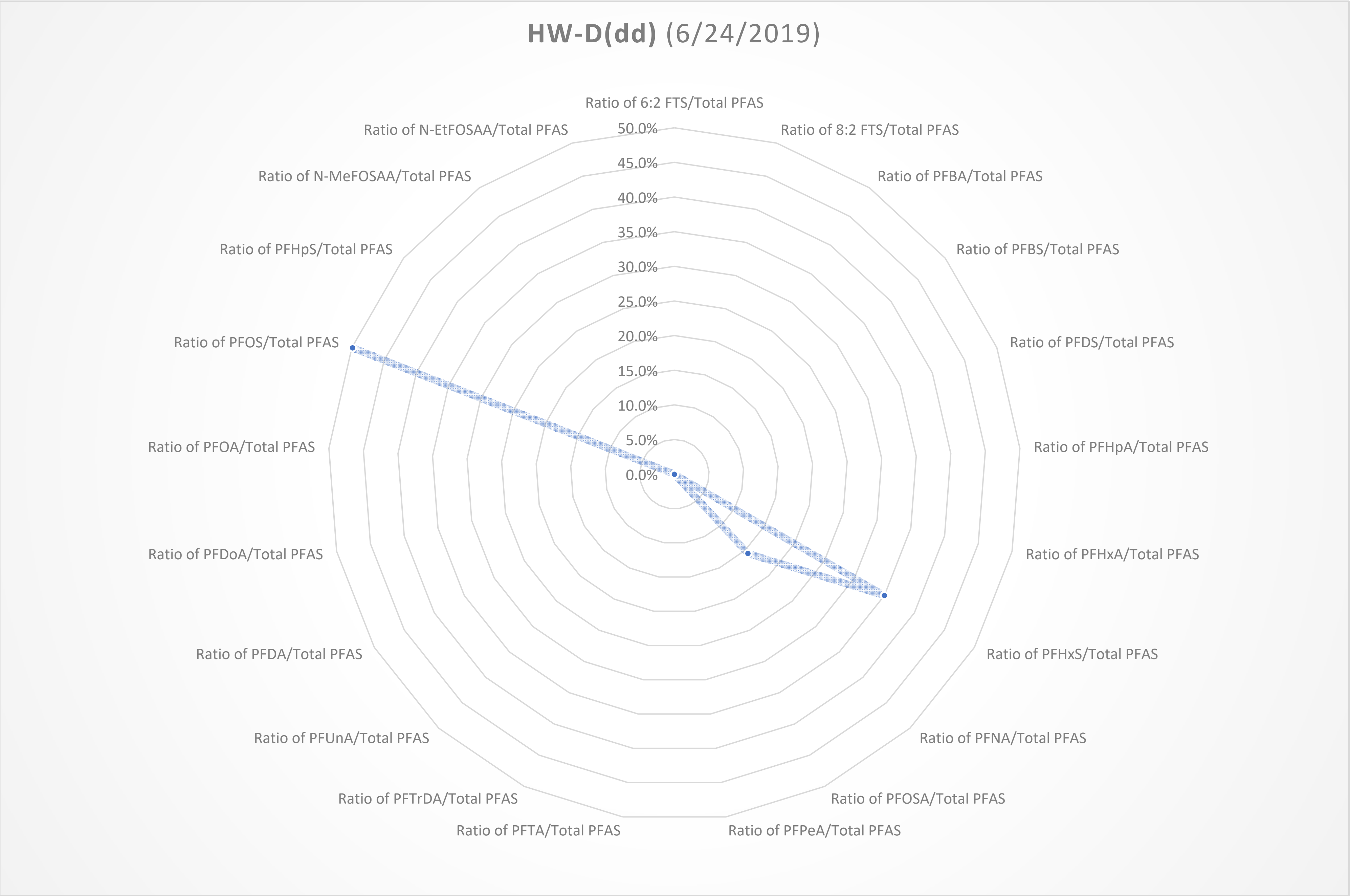
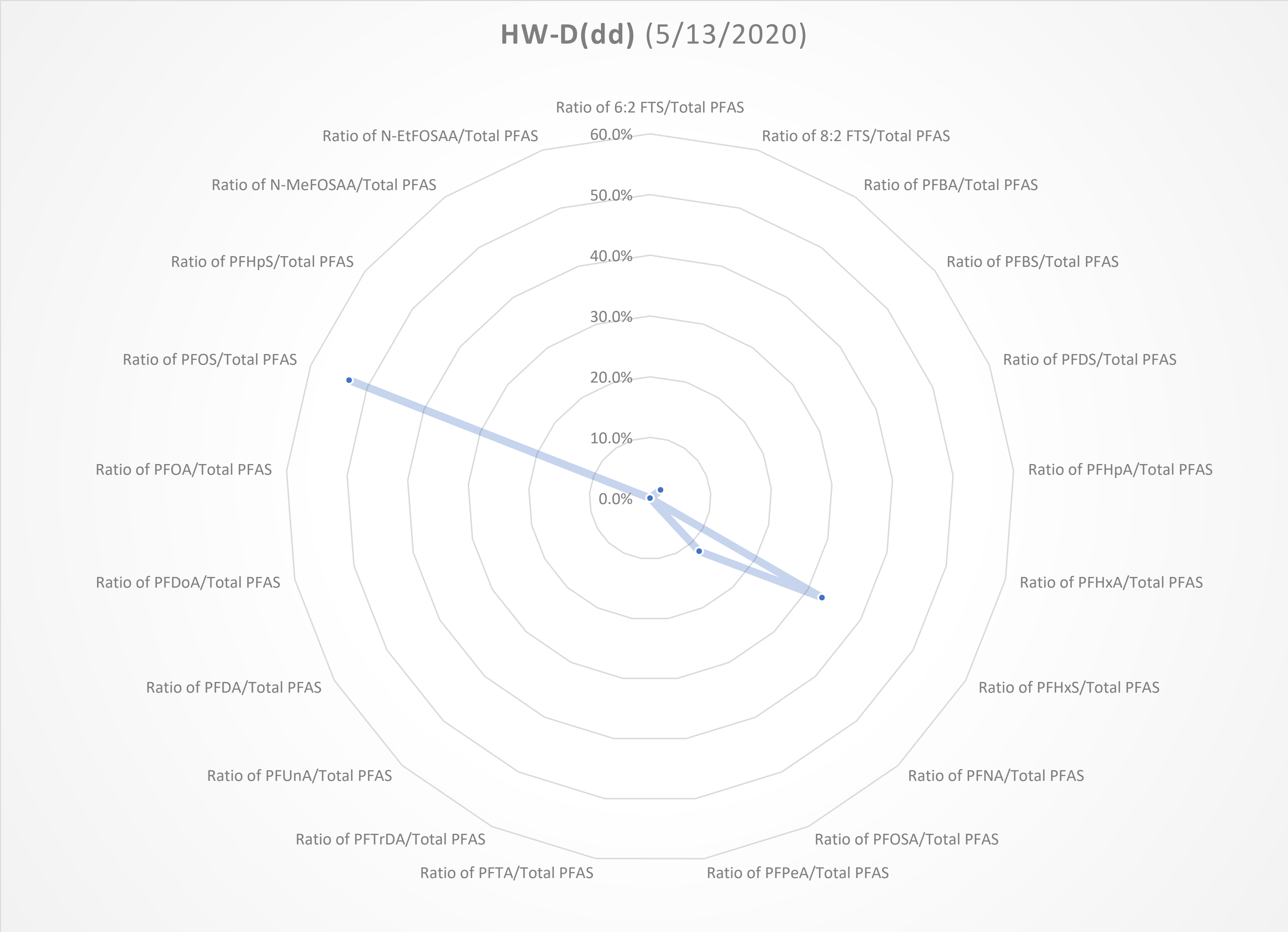
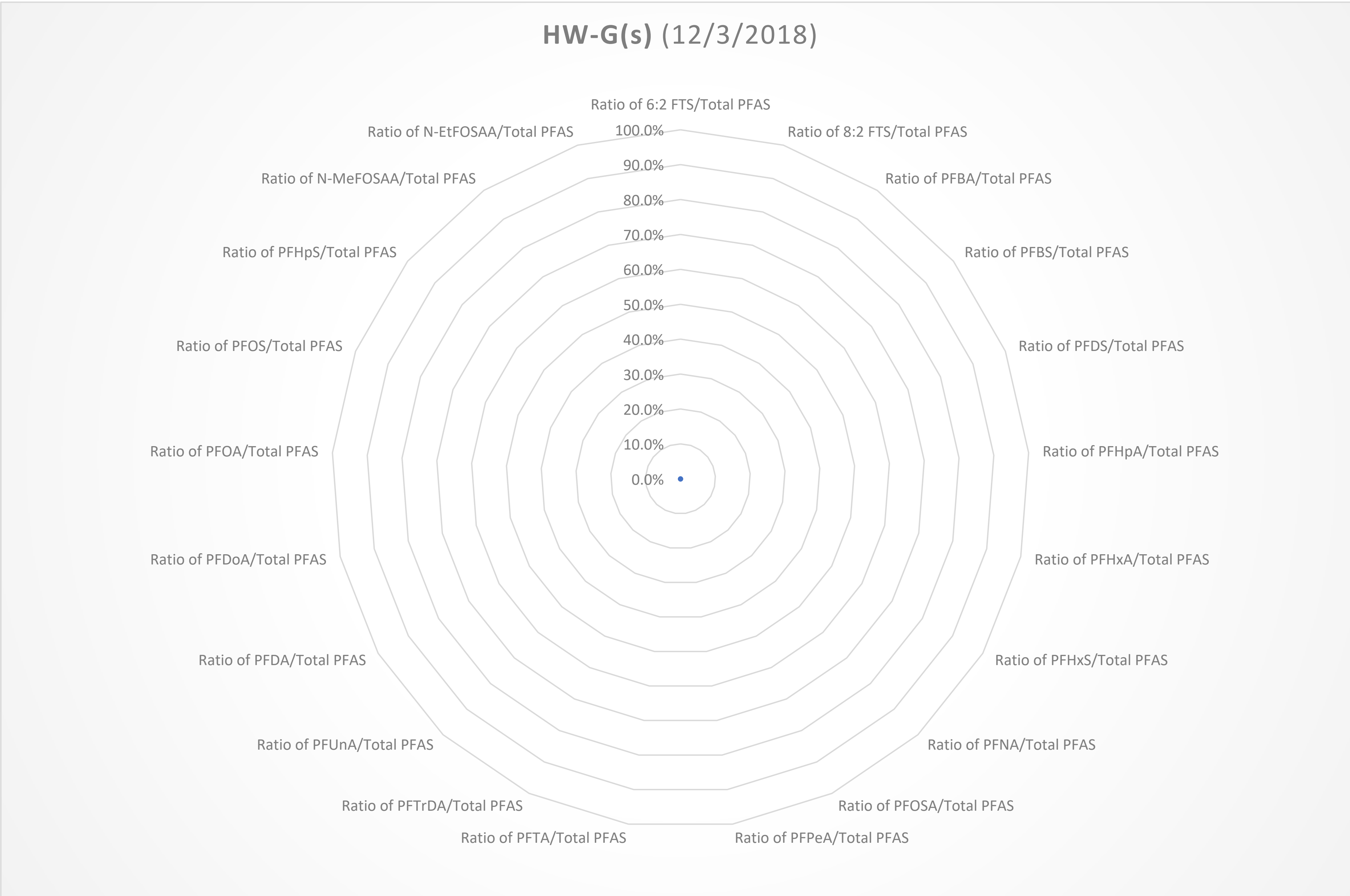
0.0%



HW-D(dd) (6/24/2019)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
50.0%
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%


HW-D(dd) (5/13/2020)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%



HW-G(s) (12/3/2018)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
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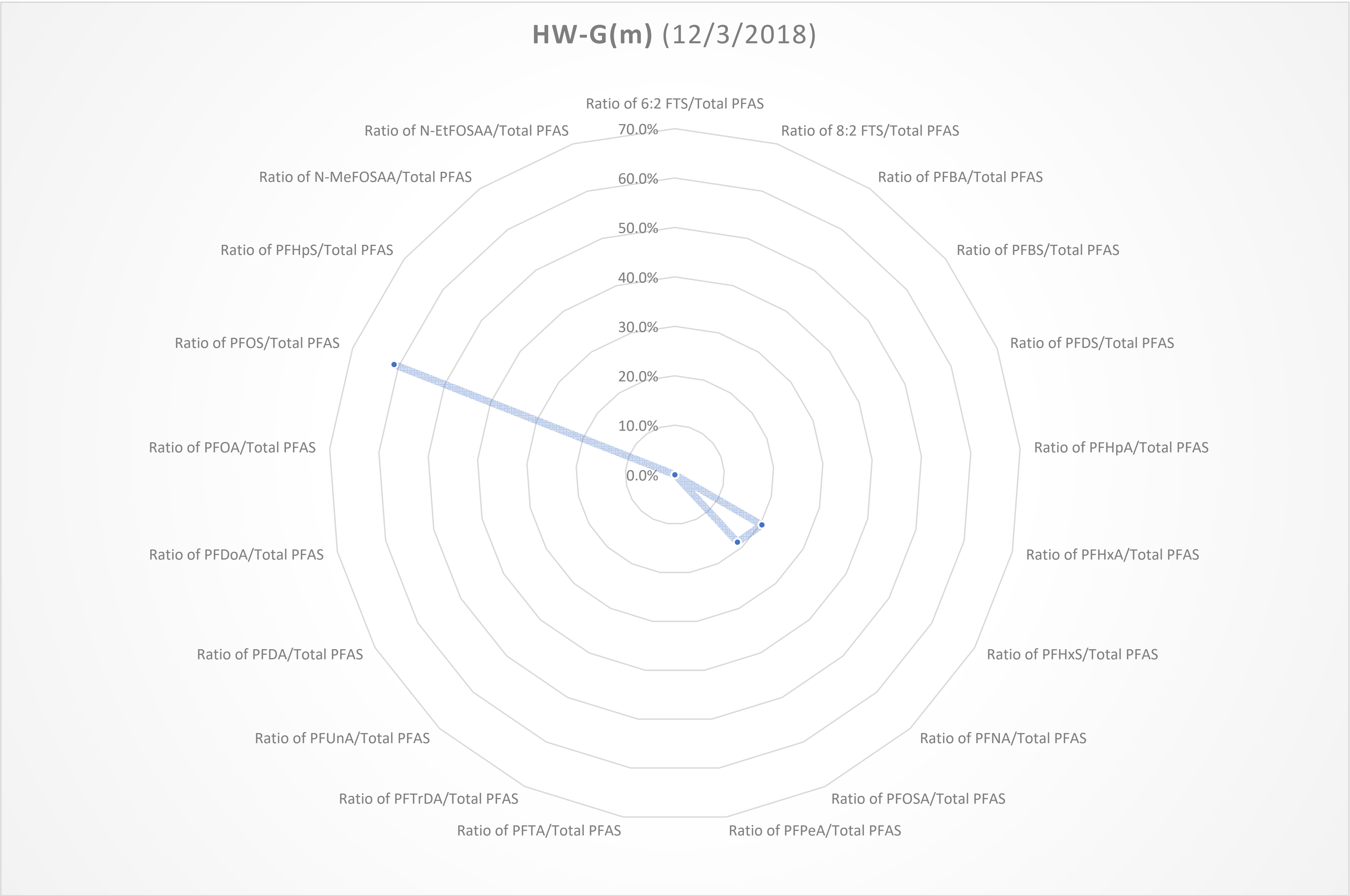

HW-G(m) (12/3/2018)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
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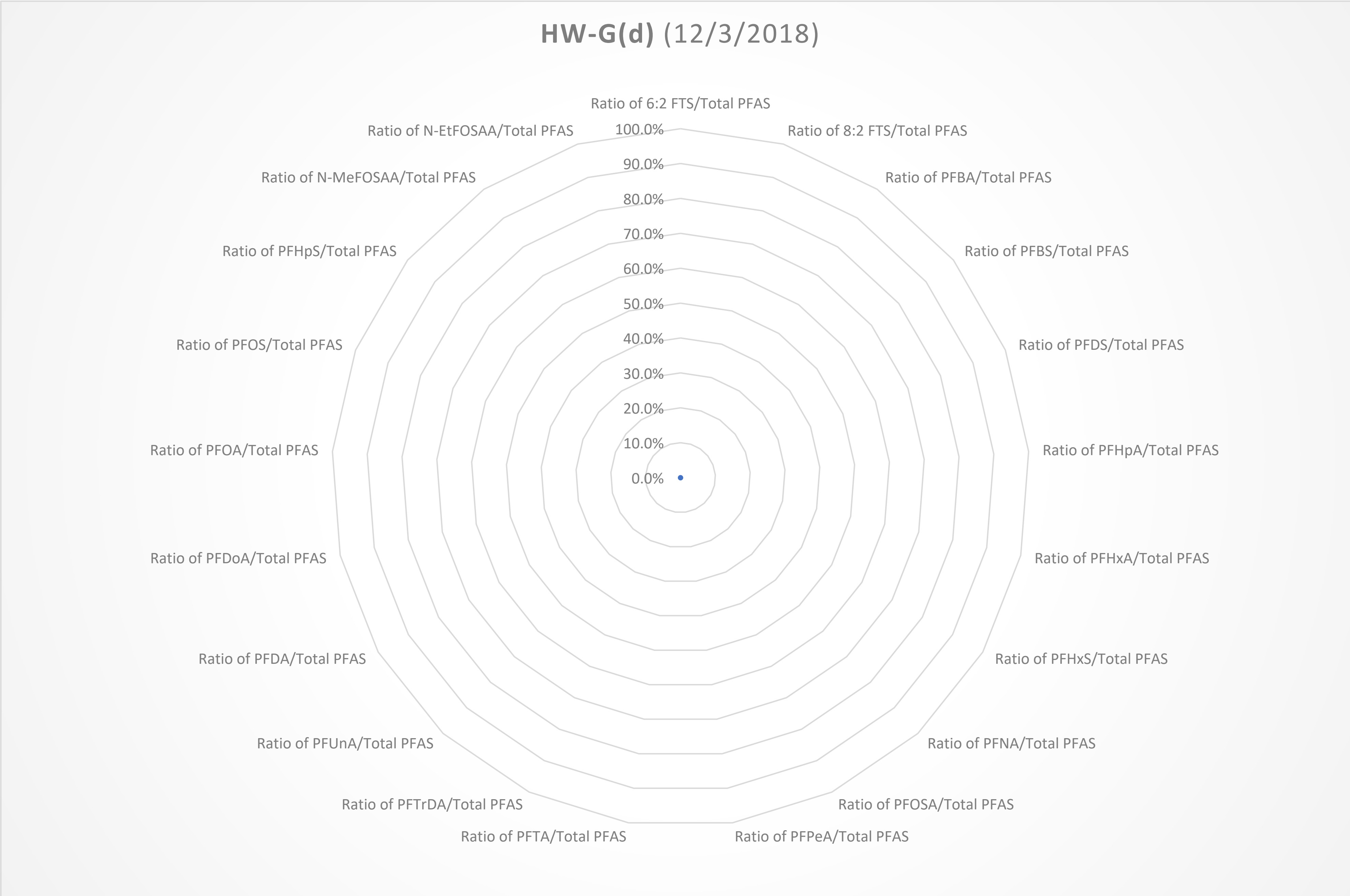
HW-G(d) (12/3/2018)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
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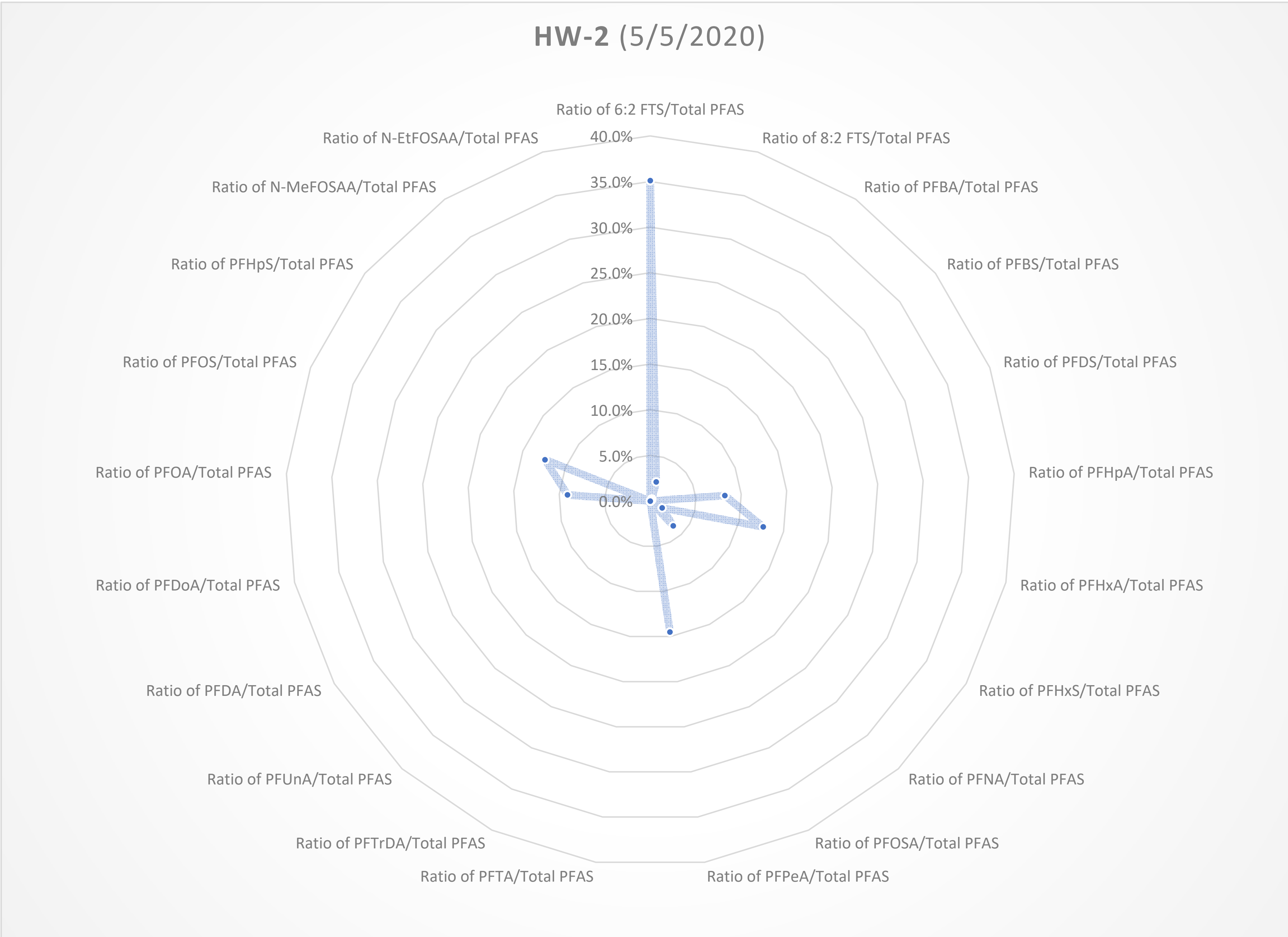

HW-2 (5/5/2020)
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Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
40.0%
35.0%
30.0%
25.0%
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15.0%
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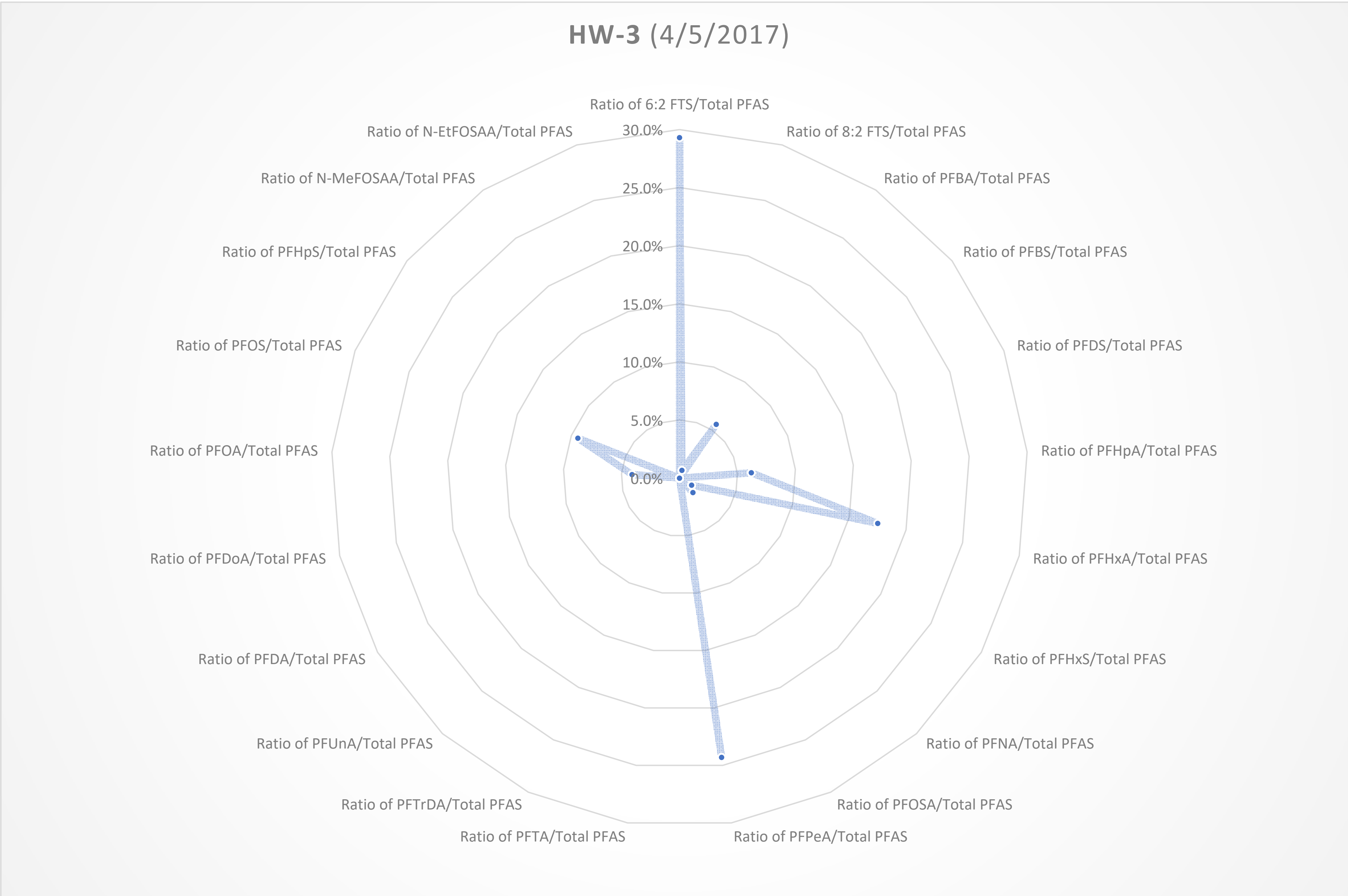
HW-3 (4/5/2017)
Ratio of 6:2 FTS/Total PFAS
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Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
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Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
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15.0%
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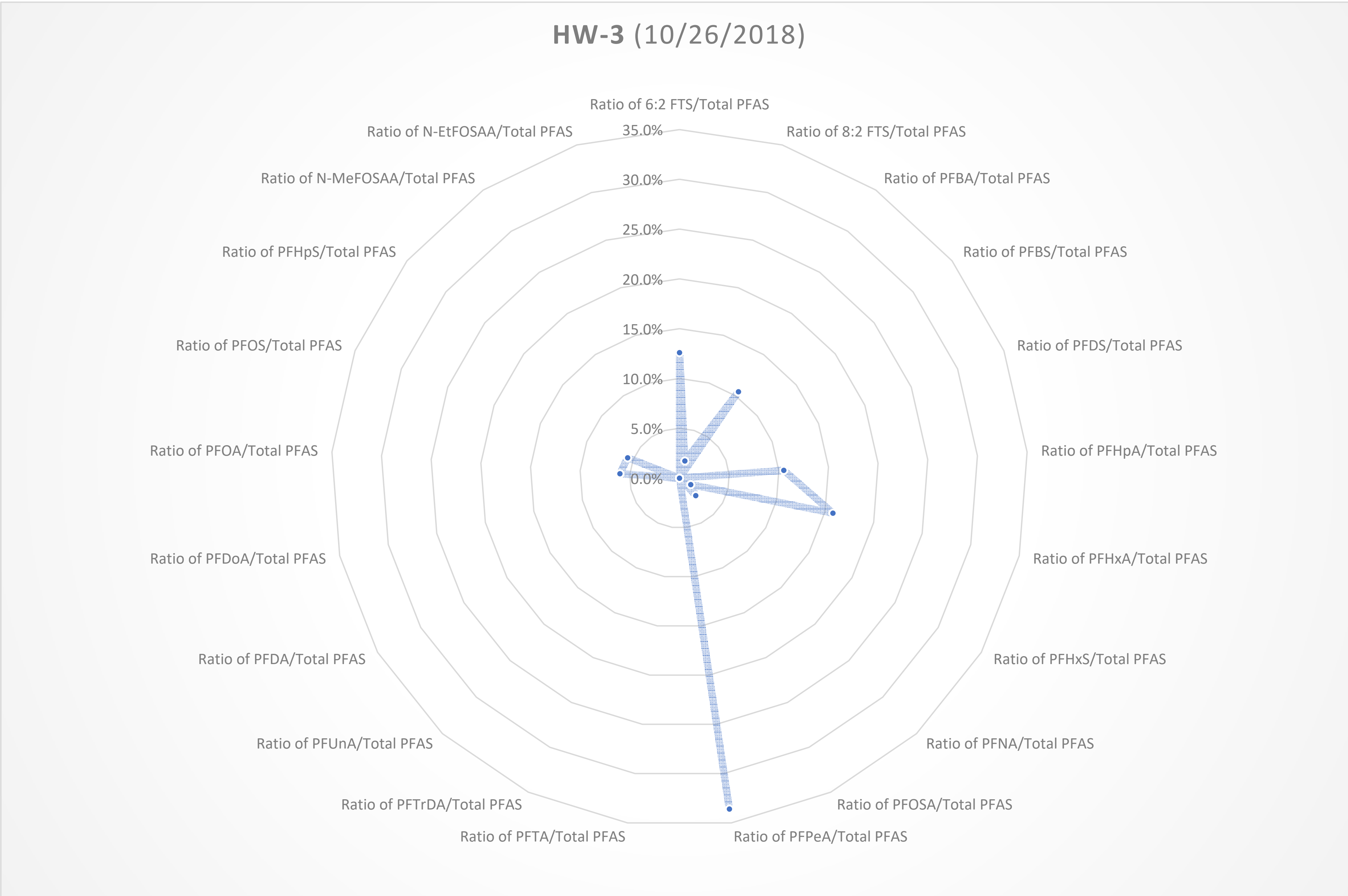
HW-3 (10/26/2018)
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Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
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Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
35.0%
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20.0%
15.0%
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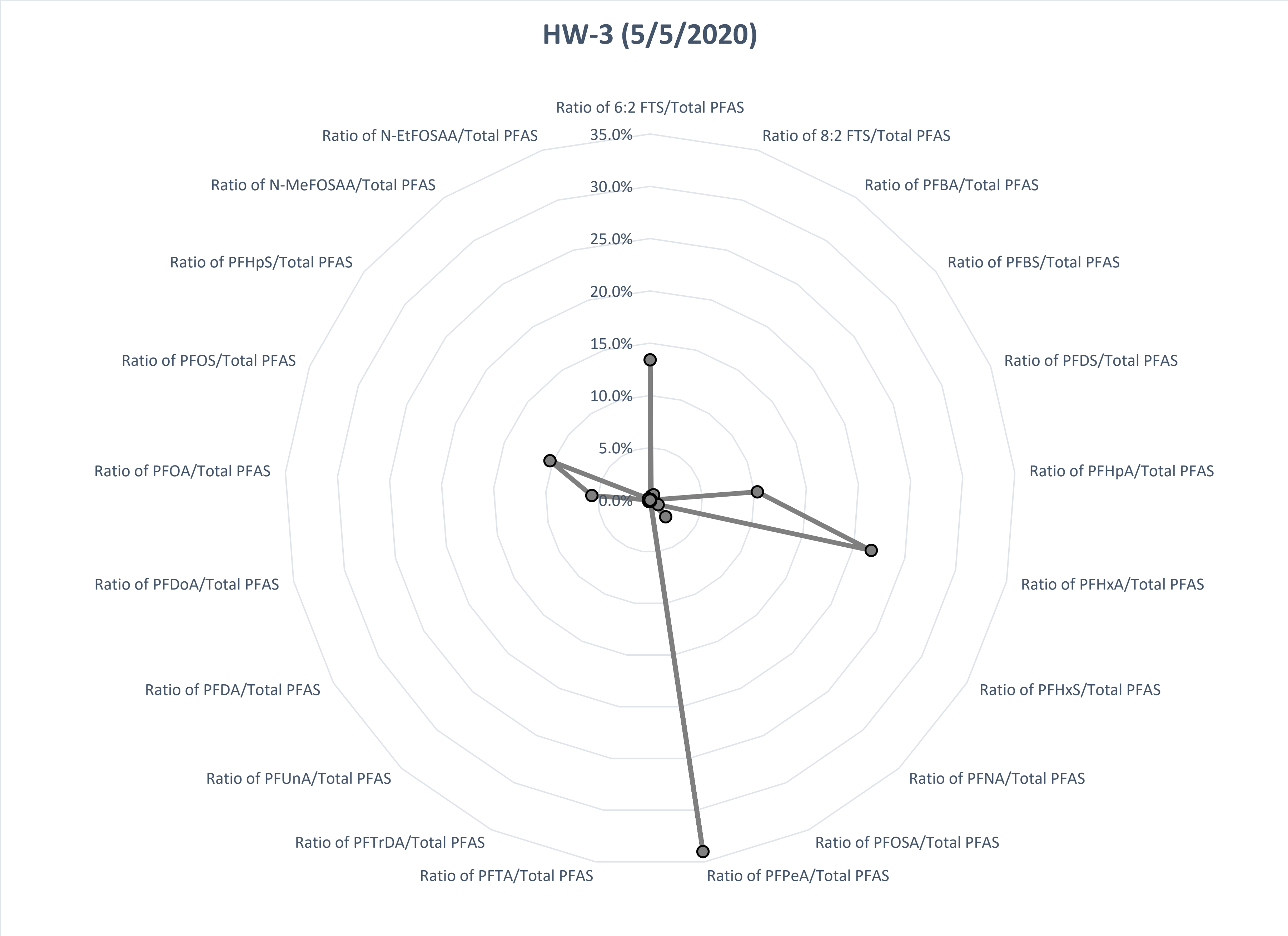
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Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
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15.0%
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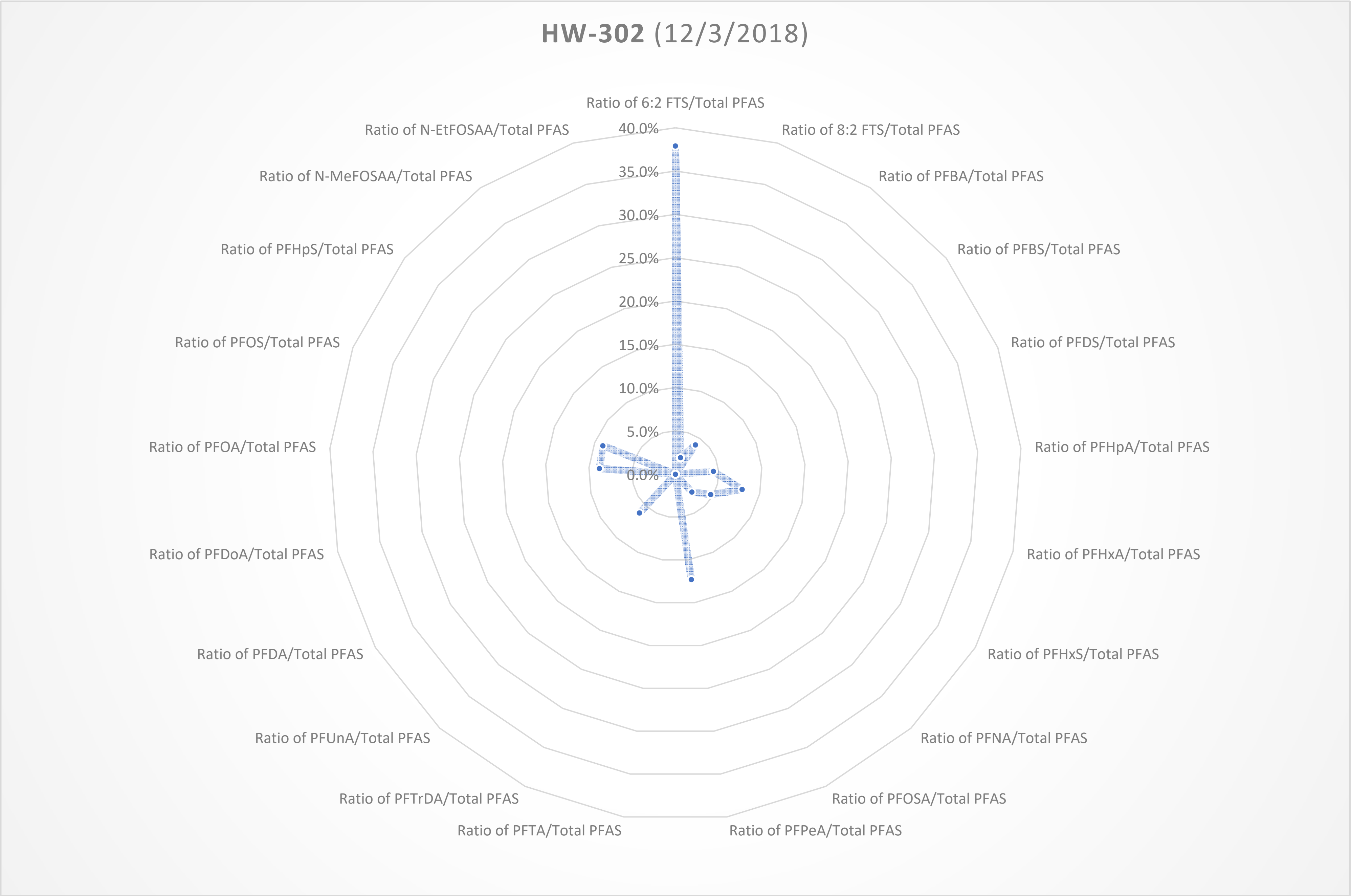

HW-302 (12/3/2018)
Ratio of 6:2 FTS/Total PFAS
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Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
40.0%
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30.0%
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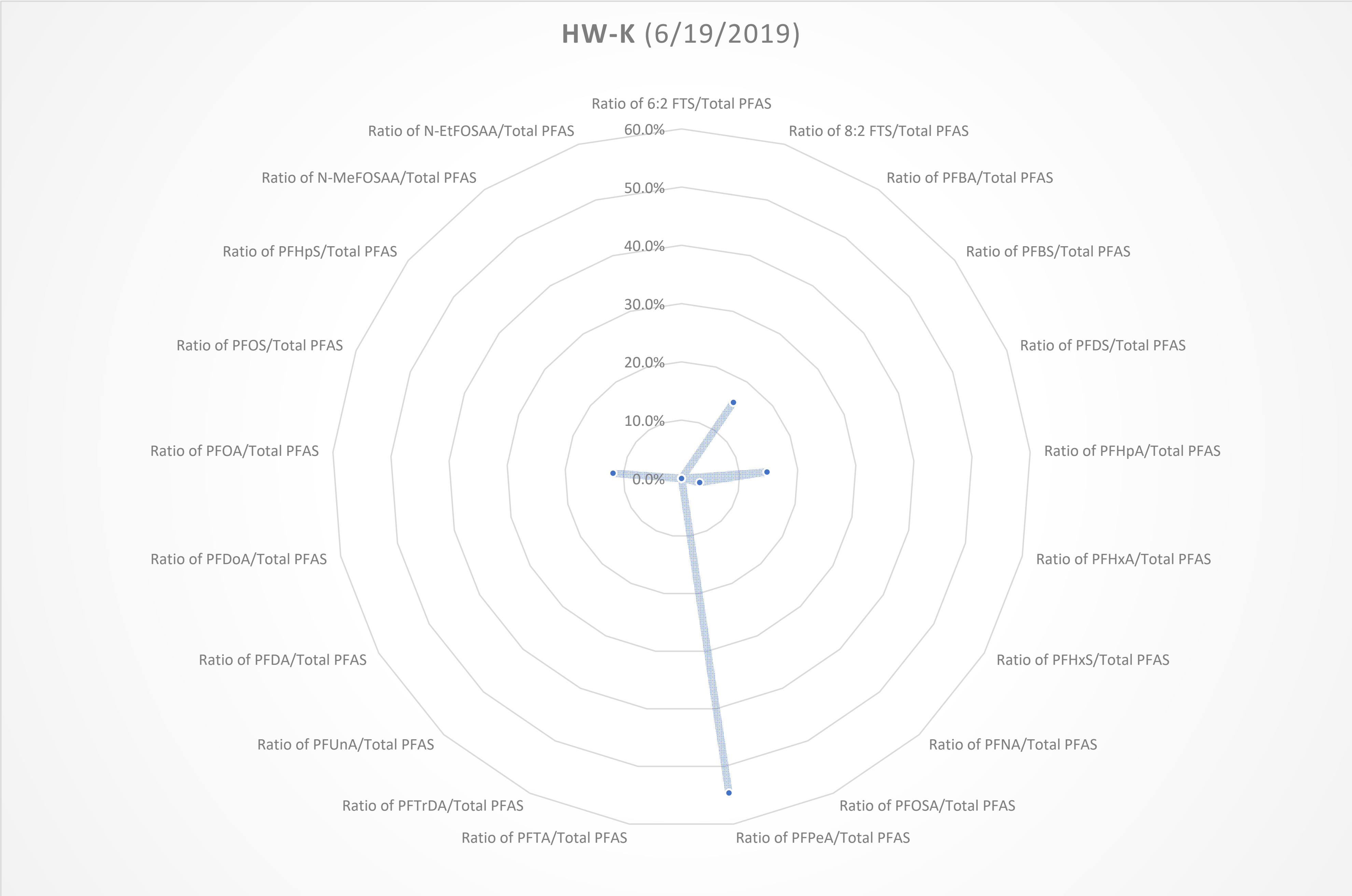

HW-K (6/19/2019)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
60.0%
50.0%
40.0%
30.0%
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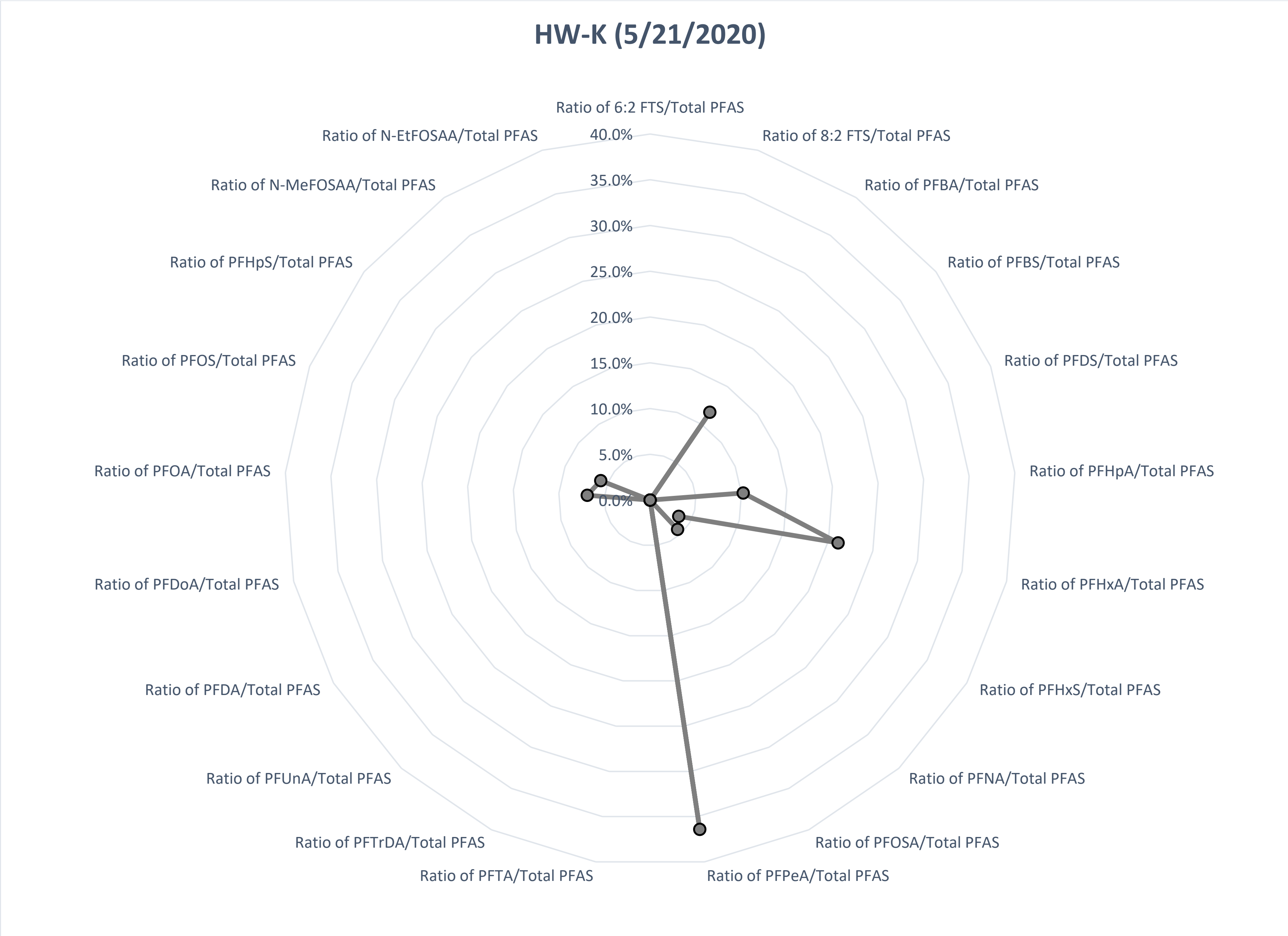
0.0%



HW-K (5/21/2020)
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Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
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Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
40.0%
35.0%
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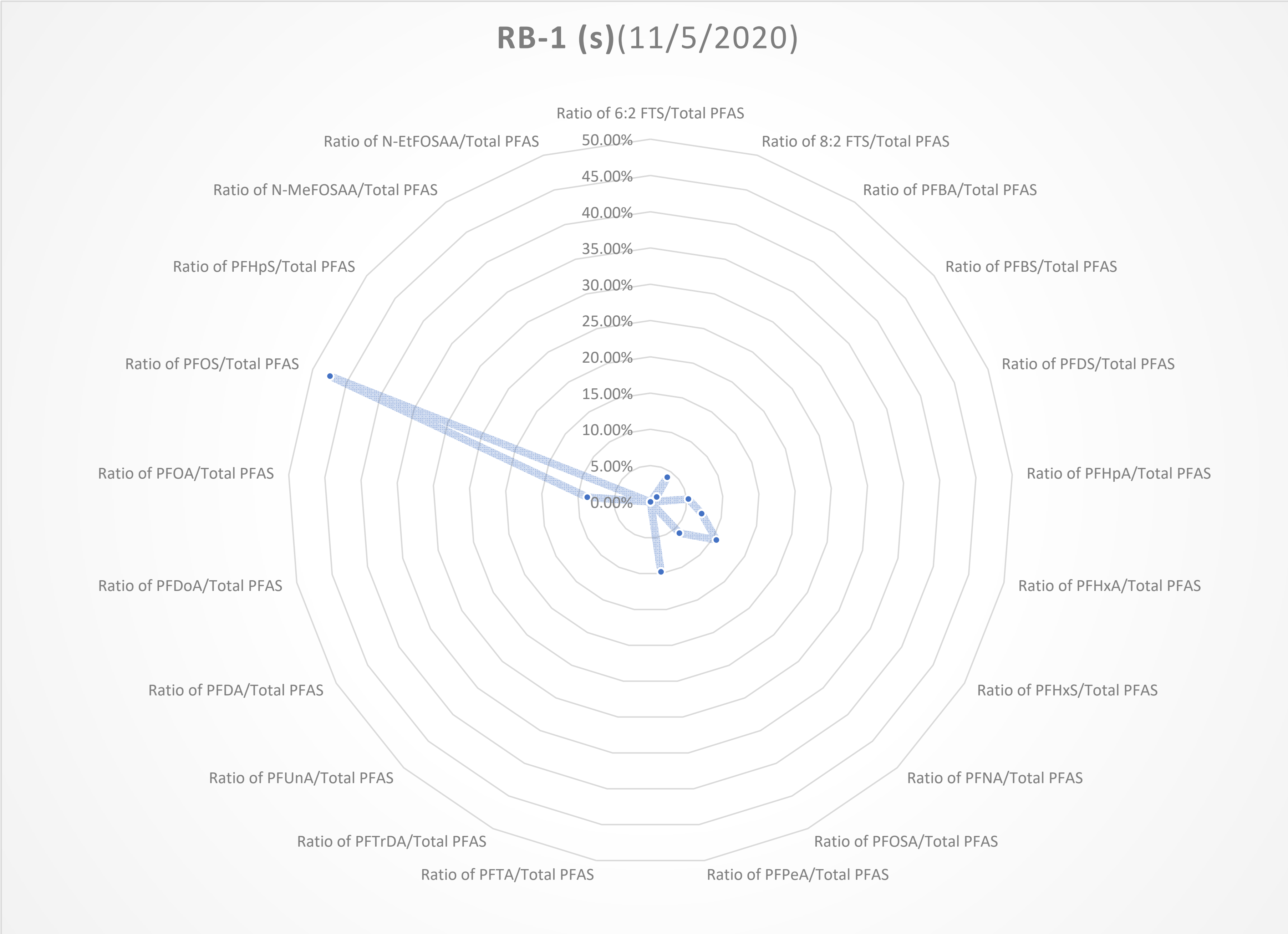
RB-1 (s)(11/5/2020)
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Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
50.00%
45.00%
40.00%
35.00%
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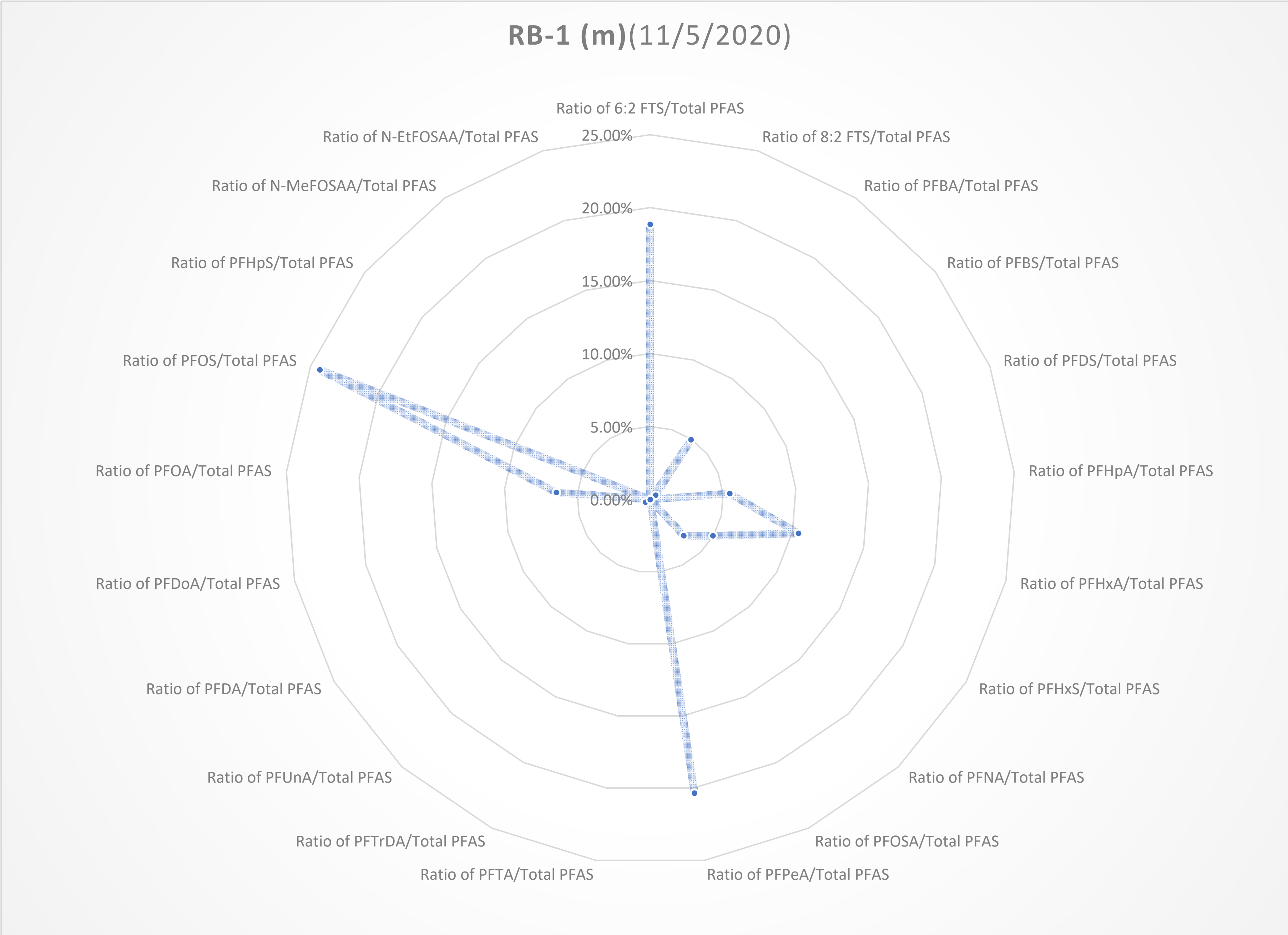
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%


RB-1 (m)(11/5/2020)
Ratio of 6:2 FTS/Total PFAS
Ratio of 8:2 FTS/Total PFAS
Ratio of PFBA/Total PFAS
Ratio of PFBS/Total PFAS
Ratio of PFDS/Total PFAS
Ratio of PFHpA/Total PFAS
Ratio of PFHxA/Total PFAS
Ratio of PFHxS/Total PFAS
Ratio of PFNA/Total PFAS
Ratio of PFOSA/Total PFAS
Ratio of PFPeA/Total PFAS
Ratio of PFTA/Total PFAS
Ratio of PFTrDA/Total PFAS
Ratio of PFUnA/Total PFAS
Ratio of PFDA/Total PFAS
Ratio of PFDoA/Total PFAS
Ratio of PFOA/Total PFAS
Ratio of PFOS/Total PFAS
Ratio of PFHpS/Total PFAS
Ratio of N-MeFOSAA/Total PFAS
Ratio of N-EtFOSAA/Total PFAS
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%

APPENDIX D

SAFETY DATA SHEETS

DATA SHEET

CHEMGUARD

CHEMGUARD C306-MS 3% AFFF Concentrate

Description

CHEMGUARD C306-MS 3% AFFF (Aqueous Film-Forming Foam) Concentrate combines fluoro- and hydrocarbon-surfactant technology to provide superior fire and vapor suppression for Class B hydrocarbon fuel fires. This synthetic foam concentrate is intended for firefighting applications at 3% solution in fresh, salt, or hard water.

CHEMGUARD C306-MS foam solution utilizes three suppression mechanisms for rapid fire knockdown and enhanced burnback resistance:

- The foam blanket blocks oxygen supply to the fuel.
- Liquid drains from the foam blanket and forms an aqueous film that suppresses fuel vapor and seals the fuel surface.
- The water content of the foam solution produces a cooling effect for additional fire suppression.

TYPICAL PHYSIOCHEMICAL PROPERTIES AT 77 °F (25 °C)

Appearance	Pale yellow liquid
Density	1.02 ± 0.02 g/ml
pH	7.0 – 8.5
Refractive Index	1.3655 ± 0.0020
Viscosity	3.25 ± 1.0 cSt*
Spreading Coefficient	3.0 minimum at 3%
Pour Point	27 °F (-3 °C)
Freeze Point	27 °F (-3 °C)

*Cannon-Fenske viscometer at 25 °C

Application

CHEMGUARD C306-MS 3% AFFF Concentrate is intended for use on Class B hydrocarbon fuel fires having low water solubility such as crude oils, gasolines, diesel fuels, and aviation fuels. It is not suitable for use on polar fuels having appreciable water solubility, such as methyl and ethyl alcohol, acetone, and methyl ethyl ketone.

The concentrate has excellent wetting properties that can effectively combat Class A fires as well. It may also be used in conjunction with dry chemical agents to provide even greater fire suppression performance.

CHEMGUARD C306-MS Concentrate is ideal for fixed and emergency response firefighting systems designed to protect naval and aviation assets. Typical applications include:

- Military and civilian aircraft facilities
- Crash fire rescue (per US DOT FAA AC No. 150/5210-6D)
- On-board marine/naval fire suppression systems
- Storage tanks
- Docks/marine tankers

009787

Approvals, Listings, and Standards

CHEMGUARD C306-MS 3% AFFF Concentrate is approved, listed, qualified under, or meets the requirements of the following specifications and standards:

- US Department of Defense Military Specification
  - MIL-F-24385F: Fire Extinguishing Agent, Aqueous Film-Forming Foam (AFFF) Liquid Concentrate for Fresh and Sea Water.
- Underwriters Laboratories Inc. (UL)
  - UL Standard 162, Foam Liquid Concentrates
  - Fresh and Sea Water
- National Fire Protection Association (NFPA)
  - NFPA 403, Standard for Aircraft Rescue and Fire-Fighting Services at Airports
  - NFPA 409, Standard on Aircraft Hangars
  - NFPA 412, Standard for Evaluating Aircraft Rescue and Fire-Fighting Foam Fire Equipment
  - NFPA 414, Standard for Aircraft Rescue and Fire-Fighting Vehicles
  - NFPA 418, Standard for Heliports

Please contact Tyco Fire Protection Products Technical Services and/or refer to listing agency for current product and compatible hardware listings.

The environmentally-mindful CHEMGUARD C306-MS Concentrate formulation contains short-chain, C-6 fluoro-chemicals manufactured using a telomer-based process. The telomer process produces no PFOS, and these C-6 materials do not breakdown to yield PFOA. The fluorochemicals used in the concentrate meet the goals of the U.S. Environmental Protection Agency 2010/15 PFOA Stewardship Program.

ENVIRO-MINDED FORMULA C6

Foaming Properties

CHEMGUARD C306-MS 3% AFFF Concentrate may be effectively applied using most conventional foam discharge equipment at 3% dilution with fresh, salt, or hard water. For optimum performance, water hardness should not exceed 500 ppm expressed as calcium and magnesium.

Because of the low energy required to create foam with CHEMGUARD C306-MS Concentrate, the foam solution may be applied with aspirating and non-aspirating discharge devices. Aspirating discharge devices typically produce expansion ratios from 3.5:1 to 10:1, depending on the type of device and the flow rate. Non-aspirating devices, such as handline water fog/stream nozzles or standard sprinkler heads, typically produce expansion ratios from 2:1 to 4:1. Medium-expansion discharge devices typically produce expansion ratios from 20:1 to 60:1.

TYPICAL FOAM CHARACTERISTICS (Fresh and Sea Water)**

Proportioning Rate	3%
Expansion Ratio LE	9.5
25% Drain Time (min:sec)	3:30
50% Drain Time (min:sec)	5:45

**per EN 1568-3, 2008 protocol

Proportioning

CHEMGUARD C306-MS 3% AFFF Concentrate can be correctly proportioned using most conventional, properly calibrated, in-line proportioning equipment such as:

- Balanced and in-line balanced pressure pump proportioners
- Balanced pressure bladder tanks and ratio flow controllers
- Around-the-pump type proportioners
- Fixed or portable in-line venturi type proportioners
- Handline nozzles with fixed eductor/pick-up tubes

For immediate use: The concentrate may also be diluted with fresh or sea water to a 3% pre-mix solution.

For delayed use: Consult Technical Services for guidance regarding suitability of a pre-mix solution (fresh water only).

Materials of Construction Compatibility

CHEMGUARD C306-MS Concentrate compatibility with HDPE has been successfully evaluated using ASTM D1693-70 protocol under UL-162 standard. Concentrate corrosion studies with cold-rolled carbon steel (UNS G10100), 90-10 copper-nickel (UNS C70600), 70-30 nickel-copper (UNC N04400), bronze (UNS C90500), and CRES steel (UNS S30400) have been successfully completed per ASTM E527 protocol under MIL-F-24385F specification.

To avoid corrosion, galvanized pipe and fittings should never be used in contact with undiluted concentrate. Please refer to Technical Bulletin No. 59 for recommendations and guidance regarding compatibility of CHEMGUARD concentrates with common materials of construction in the firefighting foam industry.

Storage and Handling

CHEMGUARD C306-MS 3% AFFF Concentrate should be stored in the original supplied package (HDPE totes, drums, or pails) or in the foam system equipment recommended by Technical Services. The product should be maintained within the recommended 35 °F to 120 °F (2 °C to 49 °C) operational temperature range. If the concentrate freezes during transport or storage, full product serviceability can be restored upon thaw with gentle re-mixing.

Factors affecting the foam concentrate long-term effectiveness include temperature exposure and cycling, storage container, air exposure, evaporation, dilution, and contamination. The effective life of CHEMGUARD C306-MS Concentrate can be maximized through optimal storage conditions and proper handling.

CHEMGUARD foam concentrates have demonstrated effective firefighting performance with contents stored in the original package under proper conditions for more than 10 years.

CHEMGUARD C306-MS 3% AFFF Concentrate has been successfully evaluated by the US Naval Sea Systems Command for prolonged compatibility with other 3% AFFF concentrates qualified under MIL-F-24385F specification.

- Mixing with foam concentrates not vetted by MIL-F-24385F is not recommended.
- For immediate incident response, it is appropriate to use the concentrate in conjunction with comparable 3% AFFF products.

Inspection

CHEMGUARD C306-MS 3% AFFF Concentrate should be inspected periodically per NFPA 11 “Standard for Low-, Medium-, and High-Expansion Foam,” EN 13565-2 “Foam System Standard,” or other relevant standard. A representative concentrate sample should be sent to Tyco Fire Protection Products Foam Analytical Services or other qualified laboratory for quality analysis per the applicable standard. An annual inspection and sample analysis is typically sufficient, unless the product has been exposed to unusual conditions.

Ordering Information

Concentrate is available in commercial packaging only under CHEMGUARD C306-MS-C product designation and is not available for direct, contract government acquisition (per MIL-F-24385F packaging provision). Concentrate is available in pails, drums, totes or bulk shipment, with pail and drum containers being UL-162 compliant.

Part No.	Description	Shipping Weight	Cube
770809	Pail 5 gal (19 L)	45 lb (20.4 kg)	1.25 ft^3 (0.0353 m^3)
770810	Drum 55 gal (208 L)	495 lb (224.5 kg)	11.83 ft^3 (0.3350 m^3)
770811	Tote 265 gal (1000 L)	2463 lb (1117 kg)	50.05 ft^3 (1.42 m^3)

Safety Data Sheet (SDS) available at www.chemguard.com

Note: The converted metric values in this document are provided for dimensional reference only and do not reflect an actual measurement.

Chemguard Specialty Chemical and Fire Suppression Products

An Environmental Statement

Fluorine-containing organic surfactants, or fluorosurfactants, are used in everyday consumer and industrial products such as paints, waxes, cleaners, polishes, adhesives, inks and, notably, fire-fighting foams. There are no known substitutes that have the same functionality and outstanding performance characteristics. Often, fluorosurfactant products are misunderstood to be made from perfluorooctanoic acid (PFOA) or perfluorooctane sulfonate (PFOS), when in fact there are a large number of different types of fluorosurfactants in use.

Chemguard Specialty Chemical and Fire Suppression Products contain no significant levels of PFOA or PFOS. Neither PFOA nor PFOS is an intentional ingredient in any Chemguard products.

Over the past decade or so, there has been increasing concern about products that contain PFOA or PFOS. Both are thought to be persistent in the environment, bioaccumulative, and potentially toxic. The US Environmental Protection Agency became aware in the late 1990's that PFOS was found at very low levels in blood samples representing the general population.[1] However, studies show that blood levels have been declining in the past decades.[2] PFOA and PFOS are produced by the electrochemical fluorination (ECF) process practiced by several companies within the US and abroad, although, this production process is in decline. As a business decision based on precaution, 3M ceased commercial production of PFOS in 2002.[3]

However, given the scientific uncertainties regarding exposure routes and human health effects, the EPA does not believe there is any reason for consumers to stop using any consumer or industrial related products because of concerns about PFOA.[1] The limited, but still existing, stocks of such products are still allowed for use until supplies are exhausted.[4] Despite the low risks, the precautionary principle (i.e., caution due to uncertainty) requires that action be taken to further minimize any potential adverse effects these substances may pose. In 2006, the EPA initiated its "2010/15 PFOA Stewardship Program" in which industrial participants agree, in summary, to (1) reduce by 95% the product content and emissions of PFOA and precursor materials by 2010, and (2) eliminate such by 2015.

To distinguish PFOA and PFOS from fluorosurfactants that are in common use, it is necessary to have a sense of the chemical structures involved. Both PFOA and PFOS molecules contain a chain of 8 carbon atoms in which all the typical hydrogen atoms bonded to the carbons are substituted with fluorine atoms.[5] This chemical group is generally referred to as a "C8 perfluoroalkyl chain," or simply as "C8". The fluorine-carbon bond, also found in Teflon®[6]

products, is very strong, making the molecule resistant to degradation and adhesion. The C8 chain length has been preferred for fluorosurfactants because it gives optimum performance to a large number of product properties. Due to its common use, it has also received the most scrutiny, as mentioned above. The response by manufacturers, driven by EPA and other such regulatory authorities, has been to shift production to C6-based substances, which cannot degrade to C8. The EPA's 2010/15 PFOA Stewardship Program applies to all potential PFOA precursors, which includes C8 and longer chain lengths.

Furthermore, fluorosurfactants today are based on an entirely different production process, known as telomerization, as opposed to the ECF process mentioned above. Telomerization chemistry does not use or produce PFOS, however trace levels of PFOA may result as a byproduct. As a class, however, telomerization products have been shown in EPA studies to be neither toxic nor bioaccumulative.[7] Fluorosurfactants based on C6 telomerization chemistry cannot degrade into PFOA or PFOS.[8]

All Chemguard fluorosurfactants are derived from the telomerization process and are therefore substantially free of both PFOA and PFOS. Only trace levels of PFOA are present, and these originate as minor impurities in the raw materials that Chemguard relies on, as mentioned. At present, Chemguard Specialty Chemical products typically contain less than 5 ppm PFOA. As a practice, fluorosurfactant use in Fire Suppression foams is minimized by synergistic formulation with non-fluorinated surfactants and other components to provide maximum effectiveness. Therefore, Chemguard Fire Suppression foams typically contain less than 1 ppm PFOA. Chemguard is a participant in the EPA 2010/15 PFOA Stewardship Program and dedicated to ultimately eliminating C8 and longer chain chemistry from all products. As our conversion proceeds toward C6 chemistry, the PFOA level in our products is expected to fall well below 1 ppm, approaching the lower ppb level.

Chemguard is a conscientious and technology-driven company with a dedication to safety and product stewardship. We share the environmental concerns expressed by our customers and support the progressing regulatory environment in which we operate. We have the research, production and sales capabilities to respond with superior products that meet or exceed both our customers' expectations and our environmental responsibilities.

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1 Source: www.epa.gov/oppt/pfoa/pubs/pfoainfo.htm.
2 (a) Environmental Health Perspectives, v. 113, n. 5, May 2005,
(b) Source: www.cdc.gov/exposurereport/perfluorinated_compounds2.htm.
3 Source: solutions.3m.com/wps/portal/3M/en_US/PFOS/PFOA/Information/Action.
4 EU and Canada regulations specify deadlines for use.
5 PFOA contains a 7 carbon perfluoroalkyl group, with the organic acid functionality representing the 8th carbon.
6 Registered trademark of DuPont.
7 Industrial Fire Journal, Sept. 2007, p. 26.
8 International Fire Protection, August 2008, p. 29.

Material Safety Data Sheet
The Dow Chemical Company

Product Name: UCAR(TM) PG Aircraft Deicing Fluid Concentrate **Issue Date:** 10/19/2009
Print Date: 03 Jan 2011

The Dow Chemical Company encourages and expects you to read and understand the entire (M)SDS, as there is important information throughout the document. We expect you to follow the precautions identified in this document unless your use conditions would necessitate other appropriate methods or actions.

1. Product and Company Identification

Product Name
UCAR(TM) PG Aircraft Deicing Fluid Concentrate

COMPANY IDENTIFICATION
The Dow Chemical Company
2030 Willard H. Dow Center
Midland, MI 48674
USA

Customer Information Number: 800-258-2436
SDSQuestion@dow.com

EMERGENCY TELEPHONE NUMBER
24-Hour Emergency Contact: 989-636-4400
Local Emergency Contact: 989-636-4400

2. Hazards Identification

Emergency Overview
Color: Orange
Physical State: Liquid.
Odor: Sweet
Hazards of product:

No significant immediate hazards for emergency response are known.

OSHA Hazard Communication Standard
This product is not a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

Potential Health Effects
Eye Contact: May cause slight temporary eye irritation. Corneal injury is unlikely.
Skin Contact: Prolonged contact is essentially nonirritating to skin. Repeated contact may cause flaking and softening of skin. Material may be handled at elevated temperatures; contact with heated material may cause thermal burns.
Skin Absorption: Prolonged skin contact is unlikely to result in absorption of harmful amounts.

Inhalation: At room temperature, exposure to vapor is minimal due to low volatility; vapor from heated material or mist may cause respiratory irritation and other effects.
Ingestion: Very low toxicity if swallowed. Harmful effects not anticipated from swallowing small amounts.
Effects of Repeated Exposure: In rare cases, repeated excessive exposure to propylene glycol may cause central nervous system effects.

3. Composition Information

Component	CAS #	Amount
Propylene glycol	57-55-6	88.0 %
Water	7732-18-5	11.4 %

4. First-aid measures

Eye Contact: Flush eyes thoroughly with water for several minutes. Remove contact lenses after the initial 1-2 minutes and continue flushing for several additional minutes. If effects occur, consult a physician, preferably an ophthalmologist.
Skin Contact: Wash skin with plenty of water.
Inhalation: Move person to fresh air; if effects occur, consult a physician.
Ingestion: No emergency medical treatment necessary.
Notes to Physician: If burn is present, treat as any thermal burn, after decontamination. No specific antidote. Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient.
Medical Conditions Aggravated by Exposure: Skin contact may aggravate preexisting dermatitis.
Emergency Personnel Protection: First Aid responders should pay attention to self-protection and use the recommended protective clothing (chemical resistant gloves, splash protection). If potential for exposure exists refer to Section 8 for specific personal protective equipment.

5. Fire Fighting Measures

Extinguishing Media: To extinguish combustible residues of this product use water fog, carbon dioxide, dry chemical or foam.
Fire Fighting Procedures: Keep people away. Isolate fire and deny unnecessary entry. Use water spray to cool fire exposed containers and fire affected zone until fire is out and danger of reignition has passed. To extinguish combustible residues of this product use water fog, carbon dioxide, dry chemical or foam.
Special Protective Equipment for Firefighters: Wear positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, trousers, boots, and gloves). If protective equipment is not available or not used, fight fire from a protected location or safe distance.
Unusual Fire and Explosion Hazards: This material will not burn until the water has evaporated. Residue can burn.
Hazardous Combustion Products: Under fire conditions some components of this product may decompose. The smoke may contain unidentified toxic and/or irritating compounds.

6. Accidental Release Measures

Steps to be Taken if Material is Released or Spilled: Small spills: Absorb with materials such as: Cat litter. Sawdust. Vermiculite. Zorb-all®. Collect in suitable and properly labeled containers. Large spills: Dike area to contain spill. Recover spilled material if possible. Contain spilled material if possible. See Section 13, Disposal Considerations, for additional information.

Personal Precautions: Keep unnecessary and unprotected personnel from entering the area. Use appropriate safety equipment. For additional information, refer to Section 8, Exposure Controls and Personal Protection.
Environmental Precautions: Prevent from entering into soil, ditches, sewers, waterways and/or groundwater. See Section 12, Ecological Information.

7. Handling and Storage

Handling
General Handling: Product shipped/handled hot can cause thermal burns. Spills of these organic materials on hot fibrous insulations may lead to lowering of the autoignition temperatures possibly resulting in spontaneous combustion. See Section 8, EXPOSURE CONTROLS AND PERSONAL PROTECTION.

Storage
Store in accordance with good manufacturing practices.

8. Exposure Controls / Personal Protection

Exposure Limits

Component	List	Type	Value
Propylene glycol	WEEL	TWA Aerosol.	10 mg/m3

Personal Protection
Eye/Face Protection: Use safety glasses (with side shields). When handling hot material: Use chemical goggles. Wear a face-shield which allows use of chemical goggles, or wear a full-face respirator, to protect face and eyes when there is any likelihood of splashes. Eye wash fountain should be located in immediate work area.
Skin Protection: Wear clean, body-covering clothing. When handling hot material, protect skin from thermal burns. Selection of specific items will depend on the operation. When handling hot material, a safety shower should be located in the immediate work area.

Hand protection: Use gloves chemically resistant to this material when prolonged or frequently repeated contact could occur. Use gloves with insulation for thermal protection, when needed. Examples of preferred glove barrier materials include: Butyl rubber. Natural rubber ("latex"). Neoprene. Nitrile/butadiene rubber ("nitrile" or "NBR"). Polyethylene. Ethyl vinyl alcohol laminate ("EVAL"). Polyvinyl chloride ("PVC" or "vinyl"). Avoid gloves made of: Polyvinyl alcohol ("PVA"). NOTICE: The selection of a specific glove for a particular application and duration of use in a workplace should also take into account all relevant workplace factors such as, but not limited to: Other chemicals which may be handled, physical requirements (cut/puncture protection, dexterity, thermal protection), potential body reactions to glove materials, as well as the instructions/specifications provided by the glove supplier.

Respiratory Protection: Atmospheric levels should be maintained below the exposure guideline. When airborne exposure guidelines and/or comfort levels may be exceeded, use an approved air-purifying respirator. The following should be effective types of air-purifying respirators: Organic vapor cartridge with a particulate pre-filter.
Ingestion: Use good personal hygiene. Do not consume or store food in the work area. Wash hands before smoking or eating.

Engineering Controls
Ventilation: Use local exhaust ventilation, or other engineering controls to maintain airborne levels below exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, general ventilation should be sufficient for most operations. Local exhaust ventilation may be necessary for some operations.

9. Physical and Chemical Properties

Physical State	Liquid.
Color	Orange
Odor	Sweet
Flash Point - Closed Cup	*ASTM D93* none to 100°C (212 °F)
Flammable Limits In Air	**Lower**: No test data available **Upper**: No test data available
Autoignition Temperature	No test data available
Vapor Pressure	6.7 mmHg @ 20 °C
Boiling Point (760 mmHg)	125 °C (257 °F) *Literature* .
Vapor Density (air = 1)	1.9 *Literature*
Specific Gravity (H2O = 1)	1.045 *Literature*
Freezing Point	< -30 °C (< -22 °F) *ASTM D1177*
Melting Point	Not applicable to liquids
Solubility in water (by weight)	100 % @ 20 °C
pH	7 - 9 *ASTM E70*
Decomposition Temperature	No test data available
Evaporation Rate (Butyl Acetate = 1)	0.6

10. Stability and Reactivity

Stability/Instability

Thermally stable at recommended temperatures and pressures.
Conditions to Avoid: Some components of this product can decompose at elevated temperatures. Generation of gas during decomposition can cause pressure in closed systems.

Incompatible Materials: Avoid contact with: Strong acids. Strong bases. Strong oxidizers.

Hazardous Polymerization

Will not occur.

Thermal Decomposition

Decomposition products depend upon temperature, air supply and the presence of other materials. Decomposition products can include and are not limited to: Aldehydes. Ethers. Alcohols. Organic acids.

11. Toxicological Information

Acute Toxicity

Ingestion

For component(s) tested. LD50, Rat 20,000 - 34,000 mg/kg

Skin Absorption

For component(s) tested. LD50, Rabbit > 20,000 mg/kg

Inhalation

For component(s) tested. LC50, 8 h, Vapor, Rat > 1,314 ppm
No deaths occurred following exposure to a saturated atmosphere.

Repeated Dose Toxicity

In rare cases, repeated excessive exposure to propylene glycol may cause central nervous system effects.

Chronic Toxicity and Carcinogenicity

Contains component(s) which did not cause cancer in laboratory animals.

Developmental Toxicity

Contains component(s) which did not cause birth defects or any other fetal effects in lab animals.

Reproductive Toxicity

Contains component(s) which did not interfere with reproduction in animal studies. Contains component(s) which did not interfere with fertility in animal studies.

Genetic Toxicology

In vitro genetic toxicity studies were negative for component(s) tested. Genetic toxicity studies in animals were negative for component(s) tested.

12. Ecological Information

ENVIRONMENTAL FATE

Data for Component: **Propylene glycol**

Movement & Partitioning

Bioconcentration potential is low (BCF less than 100 or log Pow less than 3). Potential for mobility in soil is very high (Koc between 0 and 50). Given its very low Henry's constant, volatilization from natural bodies of water or moist soil is not expected to be an important fate process.

Henry's Law Constant (H): 1.2E-08 atm*m3/mole Measured

Partition coefficient, n-octanol/water (log Pow): -0.92 Measured

Partition coefficient, soil organic carbon/water (Koc): < 1 Estimated.

Persistence and Degradability

Material is readily biodegradable. Passes OECD test(s) for ready biodegradability. Biodegradation may occur under anaerobic conditions (in the absence of oxygen).

Indirect Photodegradation with OH Radicals

Rate Constant	Atmospheric Half-life	Method
1.28E-11 cm3/s	10 h	Estimated.

OECD Biodegradation Tests:

Biodegradation	Exposure Time	Method
81 %	28 d	OECD 301F Test
96 %	64 d	OECD 306 Test

Biological oxygen demand (BOD):

BOD 5	BOD 10	BOD 20	BOD 28
69 %	70 %	86 %	

Chemical Oxygen Demand: 1.53 mg/mg

Theoretical Oxygen Demand: 1.68 mg/mg

ECOTOXICITY

Typical for this family of materials. Material is practically non-toxic to aquatic organisms on an acute basis (LC50/EC50/EL50/LL50 >100 mg/L in the most sensitive species tested).

13. Disposal Considerations

All disposal practices must be in compliance with all Federal, State/Provincial and local laws and regulations. Regulations may vary in different locations. Waste characterizations and compliance with applicable laws are the responsibility solely of the waste generator. AS YOUR SUPPLIER, WE HAVE NO CONTROL OVER THE MANAGEMENT PRACTICES OR MANUFACTURING PROCESSES OF PARTIES HANDLING OR USING THIS MATERIAL. THE INFORMATION PRESENTED HERE PERTAINS ONLY TO THE PRODUCT AS SHIPPED IN ITS INTENDED CONDITION AS DESCRIBED IN MSDS SECTION: Composition Information. FOR UNUSED & UNCONTAMINATED PRODUCT, the preferred options include sending to a licensed, permitted: Reclaimer. Incinerator or other thermal destruction device.

14. Transport Information

DOT Non-Bulk
NOT REGULATED

DOT Bulk
NOT REGULATED

IMDG
NOT REGULATED

ICAO/IATA
NOT REGULATED

This information is not intended to convey all specific regulatory or operational requirements/information relating to this product. Additional transportation system information can be obtained through an authorized sales or customer service representative. It is the responsibility of the transporting organization to follow all applicable laws, regulations and rules relating to the transportation of the material.

15. Regulatory Information

OSHA Hazard Communication Standard

This product is not a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right-to-Know Act of 1986) Sections 311 and 312

Immediate (Acute) Health Hazard	No
Delayed (Chronic) Health Hazard	No
Fire Hazard	No
Reactive Hazard	No
Sudden Release of Pressure Hazard	No

Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right-to-Know Act of 1986) Section 313
To the best of our knowledge, this product does not contain chemicals at levels which require reporting under this statute.

Pennsylvania (Worker and Community Right-To-Know Act): Pennsylvania Hazardous Substances List and/or Pennsylvania Environmental Hazardous Substance List:
The following product components are cited in the Pennsylvania Hazardous Substance List and/or the Pennsylvania Environmental Substance List, and are present at levels which require reporting.

Component	CAS #	Amount
Propylene glycol	57-55-6	88.0%

Pennsylvania (Worker and Community Right-To-Know Act): Pennsylvania Special Hazardous Substances List:
To the best of our knowledge, this product does not contain chemicals at levels which require reporting under this statute.

California Proposition 65 (Safe Drinking Water and Toxic Enforcement Act of 1986)
WARNING: This product contains a chemical(s) known to the State of California to cause cancer.

Component	CAS #	Amount
Ethylene oxide	75-21-8	<= 0.02 PPM
Acetaldehyde	75-07-0	<= 6.0 PPB

Formaldehyde	50-00-0	<= 4.0 PPB
1,4-Dioxane	123-91-1	<= 5.0 PPB

California Proposition 65 (Safe Drinking Water and Toxic Enforcement Act of 1986)
WARNING: This product contains a chemical(s) known to the State of California to cause birth defects or other reproductive harm.

Component	CAS #	Amount
Ethylene oxide	75-21-8	<= 0.02 PPM

US. Toxic Substances Control Act
All components of this product are on the TSCA Inventory or are exempt from TSCA Inventory requirements under 40 CFR 720.30

CEPA - Domestic Substances List (DSL)
All substances contained in this product are listed on the Canadian Domestic Substances List (DSL) or are not required to be listed.

16. Other Information

Hazard Rating System

NFPA	Health	Fire	Reactivity
	1	1	0

Recommended Uses and Restrictions
Aircraft deicing fluid We recommend that you use this product in a manner consistent with the listed use. If your intended use is not consistent with the stated use, please contact your sales or technical service representative.

Revision
Identification Number: 40431 / 1001 / Issue Date 10/19/2009 / Version: 3.0
Most recent revision(s) are noted by the bold, double bars in left-hand margin throughout this document.

Legend

N/A	Not available
W/W	Weight/Weight
OEL	Occupational Exposure Limit
STEL	Short Term Exposure Limit
TWA	Time Weighted Average
ACGIH	American Conference of Governmental Industrial Hygienists, Inc.
DOW IHG	Dow Industrial Hygiene Guideline
WEEL	Workplace Environmental Exposure Level
HAZ_DES	Hazard Designation
Action Level	A value set by OSHA that is lower than the PEL which will trigger the need for activities such as exposure monitoring and medical surveillance if exceeded.

The Dow Chemical Company urges each customer or recipient of this (M)SDS to study it carefully and consult appropriate expertise, as necessary or appropriate, to become aware of and understand the data contained in this (M)SDS and any hazards associated with the product. The information herein is provided in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ between various locations. It is the buyer's/user's responsibility to ensure that his activities comply with all federal, state, provincial or local laws. The information presented here pertains only to the product as shipped. Since conditions for use of the product are not under the control of the manufacturer, it is the buyer's/user's duty to determine the conditions necessary for the safe use of this product. Due to the proliferation of sources for information such as manufacturer-specific (M)SDSs, we are not and cannot be responsible for (M)SDSs obtained from any source other than ourselves. If you have *obtained an (M)SDS from another source or if you are not sure that the (M)SDS you have is current, please contact us for the most current version.*

APPENDIX E

RECIENT LABORATORY ANALYSIS REPORTS (OCTOBER AND NOVEMBER 2020)

con-test® ANALYTICAL LABORATORY

39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

October 2, 2020

Bryan Massa
Horsley Witten Group
90 Route 6A Unit #1
Sandwich, MA 02563

Project Location: Barnstable Municipal Airport
Client Job Number:
Project Number: 19128
Laboratory Work Order Number: 20I1016

Enclosed are results of analyses for samples received by the laboratory on September 18, 2020. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Raymond J. McCarthy
Project Manager

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con-test®
ANALYTICAL LABORATORY

39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Horsley Witten Group
90 Route 6A Unit #1
Sandwich, MA 02563
ATTN: Bryan Massa

REPORT DATE: 10/2/2020

PURCHASE ORDER NUMBER:

PROJECT NUMBER: 19128

ANALYTICAL SUMMARY

WORK ORDER NUMBER: 20I1016

The results of analyses performed on the following samples submitted to the CON-TEST Analytical Laboratory are found in this report.

PROJECT LOCATION: Barnstable Municipal Airport

FIELD SAMPLE #	LAB ID:	MATRIX	SAMPLE DESCRIPTION	TEST	SUB LAB
ME-1	20I1016-01	Ground Water		SOP 434-PFAAS	
ME-2	20I1016-02	Ground Water		SOP 434-PFAAS	
ME-3	20I1016-03	Ground Water		SOP 434-PFAAS	
BMA-Trip Blank	20I1016-04	Trip Blank Water		SOP 434-PFAAS	

39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

CASE NARRATIVE SUMMARY

All reported results are within defined laboratory quality control objectives unless listed below or otherwise qualified in this report.

The results of analyses reported only relate to samples submitted to the Con-Test Analytical Laboratory for testing.
I certify that the analyses listed above, unless specifically listed as subcontracted, if any, were performed under my direction according to the approved methodologies listed in this document, and that based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

Lisa A. Worthington
Technical Representative

39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Barnstable Municipal Airport   Sample Description: Work Order: 20I1016

Date Received: 9/18/2020

Field Sample #: ME-1   Sampled: 9/17/2020 09:05

Sample ID: 20I1016-01

Sample Matrix: Ground Water

Semivolatile Organic Compounds by - LC/MS-MS

Analyte	Results	RL	DL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Perfluorobutanoic acid (PFBA)	9.4	2.0	0.64	ng/L	1		SOP 434-PFAAS	9/29/20	10/2/20 2:42	JFC
Perfluorobutanesulfonic acid (PFBS)	1.2	2.0	0.50	ng/L	1		SOP 434-PFAAS	9/29/20	10/2/20 2:42	JFC
Perfluoropentanoic acid (PFPeA)	35	2.0	0.42	ng/L	1		SOP 434-PFAAS	9/29/20	10/2/20 2:42	JFC
Perfluorohexanoic acid (PFHxA)	22	2.0	0.51	ng/L	1		SOP 434-PFAAS	9/29/20	10/2/20 2:42	JFC
Perfluorohexanesulfonic acid (PFHxS)	30	2.0	0.77	ng/L	1		SOP 434-PFAAS	9/29/20	10/2/20 2:42	JFC
Perfluoroheptanoic acid (PFHpA)	11	2.0	0.53	ng/L	1		SOP 434-PFAAS	9/29/20	10/2/20 2:42	JFC
Perfluoroheptanesulfonic acid (PFHpS)	1.7	2.0	1.0	ng/L	1		SOP 434-PFAAS	9/29/20	10/2/20 2:42	JFC
Perfluorooctanoic acid (PFOA)	16	2.0	0.71	ng/L	1		SOP 434-PFAAS	9/29/20	10/2/20 2:42	JFC
Perfluorooctanesulfonic acid (PFOS)	110	2.0	0.68	ng/L	1		SOP 434-PFAAS	9/29/20	10/2/20 2:42	JFC
Perfluorooctanesulfonamide (FOSA)	ND	2.0	0.83	ng/L	1	U	SOP 434-PFAAS	9/29/20	10/2/20 2:42	JFC
6:2 Fluorotelomersulfonic acid (6:2FTS A)	34	2.0	0.39	ng/L	1		SOP 434-PFAAS	9/29/20	10/2/20 2:42	JFC
Perfluorononanoic acid (PFNA)	17	2.0	0.63	ng/L	1		SOP 434-PFAAS	9/29/20	10/2/20 2:42	JFC
Perfluorodecanoic acid (PFDA)	ND	2.0	0.62	ng/L	1	U	SOP 434-PFAAS	9/29/20	10/2/20 2:42	JFC
Perfluorodecanesulfonic acid (PFDS)	ND	2.0	0.51	ng/L	1	U	SOP 434-PFAAS	9/29/20	10/2/20 2:42	JFC
N-EtFOSAA	ND	2.0	0.70	ng/L	1	U	SOP 434-PFAAS	9/29/20	10/2/20 2:42	JFC
8:2 Fluorotelomersulfonic acid (8:2FTS A)	ND	2.0	1.1	ng/L	1	U	SOP 434-PFAAS	9/29/20	10/2/20 2:42	JFC
Perfluoroundecanoic acid (PFUnA)	ND	2.0	0.49	ng/L	1	U	SOP 434-PFAAS	9/29/20	10/2/20 2:42	JFC
N-MeFOSAA	ND	2.0	0.62	ng/L	1	U	SOP 434-PFAAS	9/29/20	10/2/20 2:42	JFC
Perfluorododecanoic acid (PFDoA)	ND	2.0	0.50	ng/L	1	U	SOP 434-PFAAS	9/29/20	10/2/20 2:42	JFC
Perfluorotridecanoic acid (PFTrDA)	ND	2.0	0.67	ng/L	1	U	SOP 434-PFAAS	9/29/20	10/2/20 2:42	JFC
Perfluorotetradecanoic acid (PFTA)	ND	2.0	0.50	ng/L	1	U	SOP 434-PFAAS	9/29/20	10/2/20 2:42	JFC

Surrogates	% Recovery	Recovery Limits	Flag/Qual	Date/Time Analyzed
13C-PFHxA	70.1	70-130		10/2/20 2:42
13C-PFDA	72.7	70-130		10/2/20 2:42
d5-NEtFOSAA	80.2	70-130		10/2/20 2:42

con-test® ANALYTICAL LABORATORY

39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Barnstable Municipal Airport   Sample Description: Work Order: 20I1016

Date Received: 9/18/2020

Field Sample #: ME-2   Sampled: 9/17/2020 08:55

Sample ID: 20I1016-02

Sample Matrix: Ground Water

Semivolatile Organic Compounds by - LC/MS-MS

Analyte	Results	RL	DL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Perfluorobutanoic acid (PFBA)	4.9	2.0	0.64	ng/L	1		SOP 434-PFAAS	9/29/20	10/2/20 3:03	JFC
Perfluorobutanesulfonic acid (PFBS)	2.8	2.0	0.50	ng/L	1		SOP 434-PFAAS	9/29/20	10/2/20 3:03	JFC
Perfluoropentanoic acid (PFPeA)	22	2.0	0.42	ng/L	1		SOP 434-PFAAS	9/29/20	10/2/20 3:03	JFC
Perfluorohexanoic acid (PFHxA)	18	2.0	0.51	ng/L	1		SOP 434-PFAAS	9/29/20	10/2/20 3:03	JFC
Perfluorohexanesulfonic acid (PFHxS)	40	2.0	0.77	ng/L	1		SOP 434-PFAAS	9/29/20	10/2/20 3:03	JFC
Perfluoroheptanoic acid (PFHpA)	5.5	2.0	0.53	ng/L	1		SOP 434-PFAAS	9/29/20	10/2/20 3:03	JFC
Perfluoroheptanesulfonic acid (PFHpS)	2.0	2.0	1.0	ng/L	1		SOP 434-PFAAS	9/29/20	10/2/20 3:03	JFC
Perfluorooctanoic acid (PFOA)	7.7	2.0	0.71	ng/L	1		SOP 434-PFAAS	9/29/20	10/2/20 3:03	JFC
Perfluorooctanesulfonic acid (PFOS)	95	2.0	0.68	ng/L	1		SOP 434-PFAAS	9/29/20	10/2/20 3:03	JFC
Perfluorooctanesulfonamide (FOSA)	ND	2.0	0.83	ng/L	1	U	SOP 434-PFAAS	9/29/20	10/2/20 3:03	JFC
6:2 Fluorotelomersulfonic acid (6:2FTS A)	ND	2.0	0.39	ng/L	1	U	SOP 434-PFAAS	9/29/20	10/2/20 3:03	JFC
Perfluorononanoic acid (PFNA)	3.0	2.0	0.63	ng/L	1		SOP 434-PFAAS	9/29/20	10/2/20 3:03	JFC
Perfluorodecanoic acid (PFDA)	ND	2.0	0.62	ng/L	1	U	SOP 434-PFAAS	9/29/20	10/2/20 3:03	JFC
Perfluorodecanesulfonic acid (PFDS)	ND	2.0	0.51	ng/L	1	U	SOP 434-PFAAS	9/29/20	10/2/20 3:03	JFC
N-EtFOSAA	ND	2.0	0.70	ng/L	1	U	SOP 434-PFAAS	9/29/20	10/2/20 3:03	JFC
8:2 Fluorotelomersulfonic acid (8:2FTS A)	ND	2.0	1.1	ng/L	1	U	SOP 434-PFAAS	9/29/20	10/2/20 3:03	JFC
Perfluoroundecanoic acid (PFUnA)	ND	2.0	0.49	ng/L	1	U	SOP 434-PFAAS	9/29/20	10/2/20 3:03	JFC
N-MeFOSAA	ND	2.0	0.62	ng/L	1	U	SOP 434-PFAAS	9/29/20	10/2/20 3:03	JFC
Perfluorododecanoic acid (PFDoA)	ND	2.0	0.50	ng/L	1	U	SOP 434-PFAAS	9/29/20	10/2/20 3:03	JFC
Perfluorotridecanoic acid (PFTrDA)	ND	2.0	0.67	ng/L	1	U	SOP 434-PFAAS	9/29/20	10/2/20 3:03	JFC
Perfluorotetradecanoic acid (PFTA)	ND	2.0	0.50	ng/L	1	U	SOP 434-PFAAS	9/29/20	10/2/20 3:03	JFC

Surrogates	% Recovery	Recovery Limits	Flag/Qual	Date/Time Analyzed
13C-PFHxA	71.9	70-130		10/2/20 3:03
13C-PFDA	73.3	70-130		10/2/20 3:03
d5-NEtFOSAA	80.5	70-130		10/2/20 3:03

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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Barnstable Municipal Airport   Sample Description: Work Order: 20I1016

Date Received: 9/18/2020

Field Sample #: ME-3   Sampled: 9/17/2020 08:45

Sample ID: 20I1016-03

Sample Matrix: Ground Water

Semivolatile Organic Compounds by - LC/MS-MS

Analyte	Results	RL	DL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Perfluorobutanoic acid (PFBA)	3.3	2.0	0.64	ng/L	1		SOP 434-PFAAS	9/29/20	10/2/20 3:25	JFC
Perfluorobutanesulfonic acid (PFBS)	0.65	2.0	0.50	ng/L	1		SOP 434-PFAAS	9/29/20	10/2/20 3:25	JFC
Perfluoropentanoic acid (PFPeA)	9.5	2.0	0.42	ng/L	1		SOP 434-PFAAS	9/29/20	10/2/20 3:25	JFC
Perfluorohexanoic acid (PFHxA)	6.8	2.0	0.51	ng/L	1		SOP 434-PFAAS	9/29/20	10/2/20 3:25	JFC
Perfluorohexanesulfonic acid (PFHxS)	18	2.0	0.77	ng/L	1		SOP 434-PFAAS	9/29/20	10/2/20 3:25	JFC
Perfluoroheptanoic acid (PFHpA)	3.6	2.0	0.53	ng/L	1		SOP 434-PFAAS	9/29/20	10/2/20 3:25	JFC
Perfluoroheptanesulfonic acid (PFHpS)	1.1	2.0	1.0	ng/L	1		SOP 434-PFAAS	9/29/20	10/2/20 3:25	JFC
Perfluorooctanoic acid (PFOA)	12	2.0	0.71	ng/L	1		SOP 434-PFAAS	9/29/20	10/2/20 3:25	JFC
Perfluorooctanesulfonic acid (PFOS)	72	2.0	0.68	ng/L	1		SOP 434-PFAAS	9/29/20	10/2/20 3:25	JFC
Perfluorooctanesulfonamide (FOSA)	2.0	2.0	0.83	ng/L	1		SOP 434-PFAAS	9/29/20	10/2/20 3:25	JFC
6:2 Fluorotelomersulfonic acid (6:2FTS A)	7.1	2.0	0.39	ng/L	1		SOP 434-PFAAS	9/29/20	10/2/20 3:25	JFC
Perfluorononanoic acid (PFNA)	4.0	2.0	0.63	ng/L	1		SOP 434-PFAAS	9/29/20	10/2/20 3:25	JFC
Perfluorodecanoic acid (PFDA)	ND	2.0	0.62	ng/L	1	U	SOP 434-PFAAS	9/29/20	10/2/20 3:25	JFC
Perfluorodecanesulfonic acid (PFDS)	ND	2.0	0.51	ng/L	1	U	SOP 434-PFAAS	9/29/20	10/2/20 3:25	JFC
N-EtFOSAA	ND	2.0	0.70	ng/L	1	U	SOP 434-PFAAS	9/29/20	10/2/20 3:25	JFC
8:2 Fluorotelomersulfonic acid (8:2FTS A)	ND	2.0	1.1	ng/L	1	U	SOP 434-PFAAS	9/29/20	10/2/20 3:25	JFC
Perfluoroundecanoic acid (PFUnA)	ND	2.0	0.49	ng/L	1	U	SOP 434-PFAAS	9/29/20	10/2/20 3:25	JFC
N-MeFOSAA	ND	2.0	0.62	ng/L	1	U	SOP 434-PFAAS	9/29/20	10/2/20 3:25	JFC
Perfluorododecanoic acid (PFDoA)	ND	2.0	0.50	ng/L	1	U	SOP 434-PFAAS	9/29/20	10/2/20 3:25	JFC
Perfluorotridecanoic acid (PFTrDA)	ND	2.0	0.67	ng/L	1	U	SOP 434-PFAAS	9/29/20	10/2/20 3:25	JFC
Perfluorotetradecanoic acid (PFTA)	ND	2.0	0.50	ng/L	1	U	SOP 434-PFAAS	9/29/20	10/2/20 3:25	JFC

Surrogates	% Recovery	Recovery Limits	Flag/Qual	
13C-PFHxA	71.3	70-130		10/2/20 3:25
13C-PFDA	73.7	70-130		10/2/20 3:25
d5-NEtFOSAA	79.3	70-130		10/2/20 3:25

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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Barnstable Municipal Airport Sample Description: Work Order: 20I1016

Date Received: 9/18/2020

Field Sample #: BMA-Trip Blank Sampled: 9/17/2020 09:20

Sample ID: 20I1016-04

Sample Matrix: Trip Blank Water

Semivolatile Organic Compounds by - LC/MS-MS

Analyte	Results	RL	DL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Perfluorobutanoic acid (PFBA)	ND	2.0	0.64	ng/L	1	U	SOP 434-PFAAS	9/29/20	10/2/20 3:46	JFC
Perfluorobutanesulfonic acid (PFBS)	ND	2.0	0.50	ng/L	1	U	SOP 434-PFAAS	9/29/20	10/2/20 3:46	JFC
Perfluoropentanoic acid (PFPeA)	ND	2.0	0.42	ng/L	1	U	SOP 434-PFAAS	9/29/20	10/2/20 3:46	JFC
Perfluorohexanoic acid (PFHxA)	ND	2.0	0.51	ng/L	1	U	SOP 434-PFAAS	9/29/20	10/2/20 3:46	JFC
Perfluorohexanesulfonic acid (PFHxS)	ND	2.0	0.77	ng/L	1	U	SOP 434-PFAAS	9/29/20	10/2/20 3:46	JFC
Perfluoroheptanoic acid (PFHpA)	ND	2.0	0.53	ng/L	1	U	SOP 434-PFAAS	9/29/20	10/2/20 3:46	JFC
Perfluoroheptanesulfonic acid (PFHpS)	ND	2.0	1.0	ng/L	1	U	SOP 434-PFAAS	9/29/20	10/2/20 3:46	JFC
Perfluorooctanoic acid (PFOA)	ND	2.0	0.71	ng/L	1	U	SOP 434-PFAAS	9/29/20	10/2/20 3:46	JFC
Perfluorooctanesulfonic acid (PFOS)	ND	2.0	0.68	ng/L	1	U	SOP 434-PFAAS	9/29/20	10/2/20 3:46	JFC
Perfluorooctanesulfonamide (FOSA)	ND	2.0	0.83	ng/L	1	U	SOP 434-PFAAS	9/29/20	10/2/20 3:46	JFC
6:2 Fluorotelomersulfonic acid (6:2FTS A)	ND	2.0	0.39	ng/L	1	U	SOP 434-PFAAS	9/29/20	10/2/20 3:46	JFC
Perfluorononanoic acid (PFNA)	ND	2.0	0.63	ng/L	1	U	SOP 434-PFAAS	9/29/20	10/2/20 3:46	JFC
Perfluorodecanoic acid (PFDA)	ND	2.0	0.62	ng/L	1	U	SOP 434-PFAAS	9/29/20	10/2/20 3:46	JFC
Perfluorodecanesulfonic acid (PFDS)	ND	2.0	0.51	ng/L	1	U	SOP 434-PFAAS	9/29/20	10/2/20 3:46	JFC
N-EtFOSAA	ND	2.0	0.70	ng/L	1	U	SOP 434-PFAAS	9/29/20	10/2/20 3:46	JFC
8:2 Fluorotelomersulfonic acid (8:2FTS A)	ND	2.0	1.1	ng/L	1	U	SOP 434-PFAAS	9/29/20	10/2/20 3:46	JFC
Perfluoroundecanoic acid (PFUnA)	ND	2.0	0.49	ng/L	1	U	SOP 434-PFAAS	9/29/20	10/2/20 3:46	JFC
N-MeFOSAA	ND	2.0	0.62	ng/L	1	U	SOP 434-PFAAS	9/29/20	10/2/20 3:46	JFC
Perfluorododecanoic acid (PFDoA)	ND	2.0	0.50	ng/L	1	U	SOP 434-PFAAS	9/29/20	10/2/20 3:46	JFC
Perfluorotridecanoic acid (PFTrDA)	ND	2.0	0.67	ng/L	1	U	SOP 434-PFAAS	9/29/20	10/2/20 3:46	JFC
Perfluorotetradecanoic acid (PFTA)	ND	2.0	0.50	ng/L	1	U	SOP 434-PFAAS	9/29/20	10/2/20 3:46	JFC

Surrogates	% Recovery	Recovery Limits	Flag/Qual	Date/Time Analyzed
13C-PFHxA	74.5	70-130		10/2/20 3:46
13C-PFDA	79.7	70-130		10/2/20 3:46
d5-NEtFOSAA	80.6	70-130		10/2/20 3:46

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Sample Extraction Data

Prep Method: SOP 434-PFAAS **Analytical Method: SOP 434-PFAAS**

Lab Number [Field ID]	Batch	Initial [mL]	Final [mL]	Date
20I1016-01 [ME-1]	B267483	250	1.00	09/29/20
20I1016-02 [ME-2]	B267483	250	1.00	09/29/20
20I1016-03 [ME-3]	B267483	250	1.00	09/29/20
20I1016-04 [BMA-Trip Blank]	B267483	250	1.00	09/29/20

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QUALITY CONTROL

Semivolatile Organic Compounds by - LC/MS-MS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B267483 - SOP 434-PFAAS										
Blank (B267483-BLK1)				Prepared: 09/29/20 Analyzed: 10/02/20						
Perfluorobutanoic acid (PFBA)	ND	2.0	ng/L							U
Perfluorobutanesulfonic acid (PFBS)	ND	2.0	ng/L							U
Perfluoropentanoic acid (PFPeA)	ND	2.0	ng/L							U
Perfluorohexanoic acid (PFHxA)	ND	2.0	ng/L							U
Perfluorohexanesulfonic acid (PFHxS)	ND	2.0	ng/L							U
Perfluoroheptanoic acid (PFHpA)	ND	2.0	ng/L							U
Perfluoroheptanesulfonic acid (PFHpS)	ND	2.0	ng/L							U
Perfluorooctanoic acid (PFOA)	ND	2.0	ng/L							U
Perfluorooctanesulfonic acid (PFOS)	ND	2.0	ng/L							U
Perfluorooctanesulfonamide (FOSA)	ND	2.0	ng/L							U
6:2 Fluorotelomersulfonic acid (6:2FTS A)	ND	2.0	ng/L							U
Perfluorononanoic acid (PFNA)	ND	2.0	ng/L							U
Perfluorodecanoic acid (PFDA)	ND	2.0	ng/L							U
Perfluorodecanesulfonic acid (PFDS)	ND	2.0	ng/L							U
N-EtFOSAA	ND	2.0	ng/L							U
8:2 Fluorotelomersulfonic acid (8:2FTS A)	ND	2.0	ng/L							U
Perfluoroundecanoic acid (PFUnA)	ND	2.0	ng/L							U
N-MeFOSAA	ND	2.0	ng/L							U
Perfluorododecanoic acid (PFDoA)	ND	2.0	ng/L							U
Perfluorotridecanoic acid (PFTrDA)	ND	2.0	ng/L							U
Perfluorotetradecanoic acid (PFTA)	ND	2.0	ng/L							U
Surrogate: 13C-PFHxA	*29.9*		ng/L	40.0		74.8	70-130			
Surrogate: 13C-PFDA	*31.7*		ng/L	40.0		79.4	70-130			
Surrogate: d5-NEtFOSAA	*131*		ng/L	160		81.9	70-130			
LCS (B267483-BS1)				Prepared: 09/29/20 Analyzed: 10/02/20						
Perfluorobutanoic acid (PFBA)	16.0	2.0	ng/L	20.0		79.8	70-130			
Perfluorobutanesulfonic acid (PFBS)	15.1	2.0	ng/L	17.7		85.5	70-130			
Perfluoropentanoic acid (PFPeA)	18.2	2.0	ng/L	20.0		91.2	70-130			
Perfluorohexanoic acid (PFHxA)	17.1	2.0	ng/L	20.0		85.6	70-130			
Perfluorohexanesulfonic acid (PFHxS)	15.0	2.0	ng/L	18.2		82.4	70-130			
Perfluoroheptanoic acid (PFHpA)	16.7	2.0	ng/L	20.0		83.5	70-130			
Perfluoroheptanesulfonic acid (PFHpS)	17.0	2.0	ng/L	19.0		89.7	70-130			
Perfluorooctanoic acid (PFOA)	18.4	2.0	ng/L	20.0		92.0	70-130			
Perfluorooctanesulfonic acid (PFOS)	17.5	2.0	ng/L	18.5		94.5	70-130			
Perfluorooctanesulfonamide (FOSA)	15.9	2.0	ng/L	20.0		79.3	70-130			
6:2 Fluorotelomersulfonic acid (6:2FTS A)	18.6	2.0	ng/L	19.0		97.8	70-130			
Perfluorononanoic acid (PFNA)	20.5	2.0	ng/L	20.0		102	70-130			
Perfluorodecanoic acid (PFDA)	18.8	2.0	ng/L	20.0		94.0	70-130			
Perfluorodecanesulfonic acid (PFDS)	16.5	2.0	ng/L	19.3		85.7	70-130			
N-EtFOSAA	20.7	2.0	ng/L	20.0		103	70-130			
8:2 Fluorotelomersulfonic acid (8:2FTS A)	19.9	2.0	ng/L	19.2		104	70-130			
Perfluoroundecanoic acid (PFUnA)	18.3	2.0	ng/L	20.0		91.6	70-130			
N-MeFOSAA	19.2	2.0	ng/L	20.0		95.8	70-130			
Perfluorododecanoic acid (PFDoA)	16.3	2.0	ng/L	20.0		81.6	70-130			
Perfluorotridecanoic acid (PFTrDA)	16.8	2.0	ng/L	20.0		83.8	70-130			
Perfluorotetradecanoic acid (PFTA)	15.6	2.0	ng/L	20.0		78.2	70-130			
Surrogate: 13C-PFHxA	*29.4*		ng/L	40.0		73.4	70-130			
Surrogate: 13C-PFDA	*31.3*		ng/L	40.0		78.3	70-130			
Surrogate: d5-NEtFOSAA	*125*		ng/L	160		78.1	70-130			

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FLAG/QUALIFIER SUMMARY

*	QC result is outside of established limits.
†	Wide recovery limits established for difficult compound.
‡	Wide RPD limits established for difficult compound.
#	Data exceeded client recommended or regulatory level
ND	Not Detected
RL	Reporting Limit is at the level of quantitation (LOQ)
DL	Detection Limit is the lower limit of detection determined by the MDL study
MCL	Maximum Contaminant Level

Percent recoveries and relative percent differences (RPDs) are determined by the software using values in the calculation which have not been rounded.

No results have been blank subtracted unless specified in the case narrative section.

U	Analyte included in the analysis, but not detected

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CERTIFICATIONS

Certified Analyses included in this Report

Analyte	Certifications
SOP 434-PFAAS in Water	
Perfluorobutanoic acid (PFBA)	NH-P
Perfluorobutanesulfonic acid (PFBS)	NH-P
Perfluoropentanoic acid (PFPeA)	NH-P
Perfluorohexanoic acid (PFHxA)	NH-P
Perfluorohexanesulfonic acid (PFHxS)	NH-P
Perfluoroheptanoic acid (PFHpA)	NH-P
Perfluorooctanoic acid (PFOA)	NH-P
Perfluorooctanesulfonic acid (PFOS)	NH-P
6:2 Fluorotelomersulfonic acid (6:2FTS A)	NH-P
Perfluorononanoic acid (PFNA)	NH-P
Perfluorodecanoic acid (PFDA)	NH-P
N-EtFOSAA	NH-P
8:2 Fluorotelomersulfonic acid (8:2FTS A)	NH-P
Perfluoroundecanoic acid (PFUnA)	NH-P
N-MeFOSAA	NH-P
Perfluorododecanoic acid (PFDoA)	NH-P
Perfluorotridecanoic acid (PFTrDA)	NH-P
Perfluorotetradecanoic acid (PFTA)	NH-P

The CON-TEST Environmental Laboratory operates under the following certifications and accreditations:

Code	Description	Number	Expires
AIHA	AIHA-LAP, LLC - ISO17025:2017	100033	03/1/2022
MA	Massachusetts DEP	M-MA100	06/30/2021
CT	Connecticut Department of Publilc Health	PH-0567	09/30/2021
NY	New York State Department of Health	10899 NELAP	04/1/2021
NH-S	New Hampshire Environmental Lab	2516 NELAP	02/5/2021
RI	Rhode Island Department of Health	LAO00112	12/30/2020
NC	North Carolina Div. of Water Quality	652	12/31/2020
NJ	New Jersey DEP	MA007 NELAP	06/30/2021
FL	Florida Department of Health	E871027 NELAP	06/30/2021
VT	Vermont Department of Health Lead Laboratory	LL015036	07/30/2021
ME	State of Maine	2011028	06/9/2021
VA	Commonwealth of Virginia	460217	12/14/2020
NH-P	New Hampshire Environmental Lab	2557 NELAP	09/6/2021
VT-DW	Vermont Department of Health Drinking Water	VT-255716	06/12/2021
NC-DW	North Carolina Department of Health	25703	07/31/2021
PA	Commonwealth of Pennsylvania DEP	68-05812	06/30/2021
MI	Dept. of Env, Great Lakes, and Energy	9100	09/6/2021

20I1016

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Email: info@contestlabs.com

http://www.contestlabs.com

CHAIN OF CUSTODY RECORD

39 Spruce Street
East Longmeadow, MA 01028

Doc # 381 Rev 2_06262019

Company Name:	Horsley Witten Group
Address:	90 Rt 6A, SANDWICH MA
Phone:	508 833 6600
Project Name:	PFAS Investigation
Project Location:	Barnstable municipal Airport
Project Number:	20102
Project Manager:	Bryan Massa
Con-Test Quote Name/Number:	
Invoice Recipient:	
Sampled By:	HW-MD

Requested Turnaround Time: 7-Day ☐; 10-Day ☐; PFAS 10-Day (std) X; Due Date:

Rush-Approval Required: 1-Day ☐; 3-Day ☐; 2-Day ☐; 4-Day ☐

Dissolved Metals Samples: ○ Field Filtered; ○ Lab to Filter

Orthophosphate Samples: ○ Field Filtered; ○ Lab to Filter

Data Delivery: Format: PDF X; EXCEL X
Other:
CLP Like Data Pkg Required: ☐
Email To: mdemanche@horsleywitten.com
Fax To #: Bmassa@horsleywitten.com

ANALYSIS REQUESTED

Con-Test Work Order#	Client Sample ID / Description	Beginning Date/Time	Ending Date/Time	COMP/GRAB	Matrix Code[1]	Conc Code	VIALS	GLASS	PLASTIC	BACTERIA	ENCORE	PFAS By Isotope Dilution	Extract and Hold Only
1	ME-1	0905	0905	Grab	GW	U			2			X	
2	ME-2	0855	0855	Grab	GW	U			2			X	
3	ME-3	0845	0845	Grab	GW	U			2			X	
4	BMA-Trip Blank	0920	0920						2				X

[2] Preservation Code

Courier Use Only
Total Number Of:
VIALS
GLASS
PLASTIC 8
BACTERIA
ENCORE

Glassware in the fridge? Y / N
Glassware in freezer? Y / N
Prepackaged Cooler? Y / N
*Contest is not responsible for missing samples from prepacked coolers

Relinquished by: (signature)	Date/Time: 9/18/20 1340	
Received by: (signature) Paul Chastany	Date/Time: 9-18-20 1340	
Relinquished by: (signature) Paul Chastany	Date/Time: 9-18-20 1740	
Received by: (signature)	Date/Time: 9/18/20 1740	
Relinquished by: (signature)	Date/Time: 9/18/20 1850	
Received by: (signature)	Date/Time: 9/18/20 1850	
Relinquished by: (signature)	Date/Time:	
Received by: (signature)	Date/Time:	

Client Comments:
BMA Trip Blank sample contains lab-provided PFAS-free water.

Detection Limit Requirements
MA: MCP GW-1
CT:
Other:

Special Requirements
X MA MCP Required
MCP Certification Form Required
☐ CT RCP Required
RCP Certification Form Required
☐ MA State DW Required
PWSID #

Please use the following codes to indicate possible sample concentration within the Conc Code column above:
H - High; M - Medium; L - Low; C - Clean; U - Unknown

NELAC and AIHA-LAP, LLC Accredited

[1] **Matrix Codes:**
GW = Ground Water
WW = Waste Water
DW = Drinking Water
A = Air
S = Soil
SL = Sludge
SOL = Solid
O = Other (please define)

[2] **Preservation Codes:**
I = Iced
H = HCL
M = Methanol
N = Nitric Acid
S = Sulfuric Acid
B = Sodium Bisulfate
X = Sodium Hydroxide
T = Sodium Thiosulfate
O = Other (please define)

Project Entity
Government ☐ Federal ☐ City ☐
Municipality ☐ 21 J ☐ Brownfield ☐
MWRA ☐ School ☐ MBTA ☐
WRTA ☐

Other
☐ Chromatogram
☐ AIHA-LAP,LLC

PCB ONLY
☐ Soxhlet
☐ Non Soxhlet

Comments:

Disclaimer: Con-Test Labs is not responsible for any omitted information on the Chain of Custody. The Chain of Custody is a legal document that must be complete and accurate and is used to determine what analyses the laboratory will perform. Any missing information is not the laboratory's responsibility. Con Test values your partnership on each project and will try to assist with missing information, but will not b held accountable.

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I Have Not Confirmed Sample Container Numbers With Lab Staff Before Relinquishing Over Samples______________

con-test ANALYTICAL LABORATORY

Doc# 277 Rev 5 2017

Login Sample Receipt Checklist - (Rejection Criteria Listing - Using Acceptance Policy) Any False Statement will be brought to the attention of the Client - State True or False

Client Horsley Witten Group

Received By [illegible] Date 9/18/20 Time 1850

How were the samples received? In Cooler T No Cooler ____ On Ice T No Ice ____
Direct from Sampling ____ Ambient ____ Melted Ice ____

Were samples within Temperature? 2-6°C T By Gun # 4 Actual Temp - 4.6
By Blank # ____ Actual Temp - ____

Was Custody Seal Intact? N/A Were Samples Tampered with? N/A
Was COC Relinquished ? T Does Chain Agree With Samples? T
Are there broken/leaking/loose caps on any samples? F
Is COC in ink/ Legible? T Were samples received within holding time? T
Did COC include all pertinent Information? Client T Analysis T Sampler Name T
Project T ID's T Collection Dates/Times ~~T~~ F
Are Sample labels filled out and legible? T
Are there Lab to Filters? F Who was notified? ____
Are there Rushes? F Who was notified? ____
Are there Short Holds? F Who was notified? ____
Is there enough Volume? T
Is there Headspace where applicable? F MS/MSD? F
Proper Media/Containers Used? T Is splitting samples required? F
Were trip blanks received? T On COC? T
Do all samples have the proper pH? N/A Acid ____ Base ____

Vials	#	Containers:	#		#		#
Unp-		1 Liter Amb.		1 Liter Plastic		16 oz Amb.	
HCL-		500 mL Amb.		500 mL Plastic		8oz Amb/Clear	
Meoh-		250 mL Amb.		250 mL Plastic	8	4oz Amb/Clear	
Bisulfate-		Flashpoint		Col./Bacteria		2oz Amb/Clear	
DI-		Other Glass		Other Plastic		Encore	
Thiosulfate-		SOC Kit		Plastic Bag		Frozen:	
Sulfuric-		Perchlorate		Ziplock			

Unused Media

Vials	#	Containers:	#		#		#
Unp-		1 Liter Amb.		1 Liter Plastic		16 oz Amb.	
HCL-		500 mL Amb.		500 mL Plastic		8oz Amb/Clear	
Meoh-		250 mL Amb.		250 mL Plastic		4oz Amb/Clear	
Bisulfate-		Col./Bacteria		Flashpoint		2oz Amb/Clear	
DI-		Other Plastic		Other Glass		Encore	
Thiosulfate-		SOC Kit		Plastic Bag		Frozen:	
Sulfuric-		Perchlorate		Ziplock			

Comments:

No collection dates on COC - went by sample labels.

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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

November 24, 2020

Bryan Massa
Horsley Witten Group
90 Route 6A Unit #1
Sandwich, MA 02563

Project Location: Hyannis, MA
Client Job Number:
Project Number: 20102
Laboratory Work Order Number: 20K0392

Enclosed are results of analyses for samples received by the laboratory on November 9, 2020. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Raymond J. McCarthy
Project Manager

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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Horsley Witten Group
90 Route 6A Unit #1
Sandwich, MA 02563
ATTN: Bryan Massa

REPORT DATE: 11/24/2020

PURCHASE ORDER NUMBER:

PROJECT NUMBER: 20102

ANALYTICAL SUMMARY

WORK ORDER NUMBER: 20K0392

The results of analyses performed on the following samples submitted to the CON-TEST Analytical Laboratory are found in this report.

PROJECT LOCATION: Hyannis, MA

FIELD SAMPLE #	LAB ID:	MATRIX	SAMPLE DESCRIPTION	TEST	SUB LAB
RB-1 (m)	20K0392-01	Ground Water		SOP 434-PFAAS	
RB-1 (s)	20K0392-02	Ground Water		SOP 434-PFAAS	
OW-19 (m)	20K0392-03	Ground Water		SOP 434-PFAAS	
OW-19 (s)	20K0392-04	Ground Water		SOP 434-PFAAS	
HW-Q (s)	20K0392-05	Ground Water		SOP 434-PFAAS	

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CASE NARRATIVE SUMMARY

All reported results are within defined laboratory quality control objectives unless listed below or otherwise qualified in this report.

SOP 434-PFAAS

Qualifications:

S-01

The surrogate recovery for this sample is not available due to sample dilution below the surrogate reporting limit required from high analyte concentration and/or matrix interferences.

Analyte & Samples(s) Qualified:

13C-PFDA
20K0392-03RE1[OW-19 (m)]

13C-PFHxA
20K0392-03RE1[OW-19 (m)]

d5-NEtFOSAA
20K0392-03RE1[OW-19 (m)]

The results of analyses reported only relate to samples submitted to the Con-Test Analytical Laboratory for testing.
I certify that the analyses listed above, unless specifically listed as subcontracted, if any, were performed under my direction according to the approved methodologies listed in this document, and that based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

Lisa A. Worthington

Technical Representative

39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Hyannis, MA   Sample Description: Work Order: 20K0392

Date Received: 11/9/2020

Field Sample #: RB-1 (m)   Sampled: 11/5/2020 10:00

Sample ID: 20K0392-01

Sample Matrix: Ground Water

Semivolatile Organic Compounds by - LC/MS-MS

Analyte	Results	RL	DL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Perfluorobutanoic acid (PFBA)	10	2.0	0.64	ng/L	1		SOP 434-PFAAS	11/16/20	11/23/20 22:50	JFC
Perfluorobutanesulfonic acid (PFBS)	0.95	2.0	0.50	ng/L	1		SOP 434-PFAAS	11/16/20	11/23/20 22:50	JFC
Perfluoropentanoic acid (PFPeA)	41	2.0	0.42	ng/L	1		SOP 434-PFAAS	11/16/20	11/23/20 22:50	JFC
Perfluorohexanoic acid (PFHxA)	21	2.0	0.51	ng/L	1		SOP 434-PFAAS	11/16/20	11/23/20 22:50	JFC
Perfluorohexanesulfonic acid (PFHxS)	10	2.0	0.77	ng/L	1		SOP 434-PFAAS	11/16/20	11/23/20 22:50	JFC
Perfluoroheptanoic acid (PFHpA)	11	2.0	0.53	ng/L	1		SOP 434-PFAAS	11/16/20	11/23/20 22:50	JFC
Perfluoroheptanesulfonic acid (PFHpS)	ND	2.0	1.0	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/23/20 22:50	JFC
Perfluorooctanoic acid (PFOA)	13	2.0	0.71	ng/L	1		SOP 434-PFAAS	11/16/20	11/23/20 22:50	JFC
Perfluorooctanesulfonic acid (PFOS)	49	2.0	0.68	ng/L	1		SOP 434-PFAAS	11/16/20	11/23/20 22:50	JFC
Perfluorooctanesulfonamide (FOSA)	ND	2.0	0.83	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/23/20 22:50	JFC
6:2 Fluorotelomersulfonic acid (6:2FTS A)	38	2.0	0.39	ng/L	1		SOP 434-PFAAS	11/16/20	11/23/20 22:50	JFC
Perfluorononanoic acid (PFNA)	6.8	2.0	0.63	ng/L	1		SOP 434-PFAAS	11/16/20	11/23/20 22:50	JFC
Perfluorodecanoic acid (PFDA)	0.75	2.0	0.62	ng/L	1		SOP 434-PFAAS	11/16/20	11/23/20 22:50	JFC
Perfluorodecanesulfonic acid (PFDS)	ND	2.0	0.51	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/23/20 22:50	JFC
N-EtFOSAA	ND	2.0	0.70	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/23/20 22:50	JFC
8:2 Fluorotelomersulfonic acid (8:2FTS A)	ND	2.0	1.1	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/23/20 22:50	JFC
Perfluoroundecanoic acid (PFUnA)	ND	2.0	0.49	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/23/20 22:50	JFC
N-MeFOSAA	ND	2.0	0.62	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/23/20 22:50	JFC
Perfluorododecanoic acid (PFDoA)	ND	2.0	0.50	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/23/20 22:50	JFC
Perfluorotridecanoic acid (PFTrDA)	ND	2.0	0.67	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/23/20 22:50	JFC
Perfluorotetradecanoic acid (PFTA)	ND	2.0	0.50	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/23/20 22:50	JFC

Surrogates	% Recovery	Recovery Limits	Flag/Qual	Date/Time Analyzed
13C-PFHxA	86.8	70-130		11/23/20 22:50
13C-PFDA	105	70-130		11/23/20 22:50
d5-NEtFOSAA	99.8	70-130		11/23/20 22:50

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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Hyannis, MA
Sample Description:
Work Order: 20K0392

Date Received: 11/9/2020

Field Sample #: RB-1 (s)
Sampled: 11/5/2020 10:35

Sample ID: 20K0392-02

Sample Matrix: Ground Water

Semivolatile Organic Compounds by - LC/MS-MS

Analyte	Results	RL	DL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Perfluorobutanoic acid (PFBA)	3.3	2.0	0.64	ng/L	1		SOP 434-PFAAS	11/16/20	11/23/20 23:12	JFC
Perfluorobutanesulfonic acid (PFBS)	0.88	2.0	0.50	ng/L	1		SOP 434-PFAAS	11/16/20	11/23/20 23:12	JFC
Perfluoropentanoic acid (PFPeA)	7.8	2.0	0.42	ng/L	1		SOP 434-PFAAS	11/16/20	11/23/20 23:12	JFC
Perfluorohexanoic acid (PFHxA)	5.8	2.0	0.51	ng/L	1		SOP 434-PFAAS	11/16/20	11/23/20 23:12	JFC
Perfluorohexanesulfonic acid (PFHxS)	8.4	2.0	0.77	ng/L	1		SOP 434-PFAAS	11/16/20	11/23/20 23:12	JFC
Perfluoroheptanoic acid (PFHpA)	4.2	2.0	0.53	ng/L	1		SOP 434-PFAAS	11/16/20	11/23/20 23:12	JFC
Perfluoroheptanesulfonic acid (PFHpS)	ND	2.0	1.0	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/23/20 23:12	JFC
Perfluorooctanoic acid (PFOA)	7.0	2.0	0.71	ng/L	1		SOP 434-PFAAS	11/16/20	11/23/20 23:12	JFC
Perfluorooctanesulfonic acid (PFOS)	38	2.0	0.68	ng/L	1		SOP 434-PFAAS	11/16/20	11/23/20 23:12	JFC
Perfluorooctanesulfonamide (FOSA)	ND	2.0	0.83	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/23/20 23:12	JFC
6:2 Fluorotelomersulfonic acid (6:2FTS A)	ND	2.0	0.39	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/23/20 23:12	JFC
Perfluorononanoic acid (PFNA)	4.7	2.0	0.63	ng/L	1		SOP 434-PFAAS	11/16/20	11/23/20 23:12	JFC
Perfluorodecanoic acid (PFDA)	ND	2.0	0.62	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/23/20 23:12	JFC
Perfluorodecanesulfonic acid (PFDS)	ND	2.0	0.51	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/23/20 23:12	JFC
N-EtFOSAA	ND	2.0	0.70	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/23/20 23:12	JFC
8:2 Fluorotelomersulfonic acid (8:2FTS A)	ND	2.0	1.1	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/23/20 23:12	JFC
Perfluoroundecanoic acid (PFUnA)	ND	2.0	0.49	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/23/20 23:12	JFC
N-MeFOSAA	ND	2.0	0.62	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/23/20 23:12	JFC
Perfluorododecanoic acid (PFDoA)	ND	2.0	0.50	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/23/20 23:12	JFC
Perfluorotridecanoic acid (PFTrDA)	ND	2.0	0.67	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/23/20 23:12	JFC
Perfluorotetradecanoic acid (PFTA)	ND	2.0	0.50	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/23/20 23:12	JFC

Surrogates	% Recovery	Recovery Limits	Flag/Qual	Date/Time Analyzed
13C-PFHxA	85.2	70-130		11/23/20 23:12
13C-PFDA	102	70-130		11/23/20 23:12
d5-NEtFOSAA	106	70-130		11/23/20 23:12

39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Hyannis, MA | Sample Description: | Work Order: 20K0392

Date Received: 11/9/2020

Field Sample #: OW-19 (m) | Sampled: 11/6/2020 11:20

Sample ID: 20K0392-03

Sample Matrix: Ground Water

Semivolatile Organic Compounds by - LC/MS-MS

Analyte	Results	RL	DL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Perfluorobutanoic acid (PFBA)	33	2.0	0.64	ng/L	1		SOP 434-PFAAS	11/16/20	11/24/20 11:10	JFC
Perfluorobutanesulfonic acid (PFBS)	1.5	2.0	0.50	ng/L	1		SOP 434-PFAAS	11/16/20	11/24/20 11:10	JFC
Perfluoropentanoic acid (PFPeA)	130	20	4.2	ng/L	10		SOP 434-PFAAS	11/16/20	11/24/20 12:53	JFC
Perfluorohexanoic acid (PFHxA)	88	2.0	0.51	ng/L	1		SOP 434-PFAAS	11/16/20	11/24/20 11:10	JFC
Perfluorohexanesulfonic acid (PFHxS)	27	2.0	0.77	ng/L	1		SOP 434-PFAAS	11/16/20	11/24/20 11:10	JFC
Perfluoroheptanoic acid (PFHpA)	30	2.0	0.53	ng/L	1		SOP 434-PFAAS	11/16/20	11/24/20 11:10	JFC
Perfluoroheptanesulfonic acid (PFHpS)	ND	2.0	1.0	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/24/20 11:10	JFC
Perfluorooctanoic acid (PFOA)	11	2.0	0.71	ng/L	1		SOP 434-PFAAS	11/16/20	11/24/20 11:10	JFC
Perfluorooctanesulfonic acid (PFOS)	47	2.0	0.68	ng/L	1		SOP 434-PFAAS	11/16/20	11/24/20 11:10	JFC
Perfluorooctanesulfonamide (FOSA)	ND	2.0	0.83	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/24/20 11:10	JFC
6:2 Fluorotelomersulfonic acid (6:2FTS A)	0.95	2.0	0.39	ng/L	1		SOP 434-PFAAS	11/16/20	11/24/20 11:10	JFC
Perfluorononanoic acid (PFNA)	2.0	2.0	0.63	ng/L	1		SOP 434-PFAAS	11/16/20	11/24/20 11:10	JFC
Perfluorodecanoic acid (PFDA)	ND	2.0	0.62	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/24/20 11:10	JFC
Perfluorodecanesulfonic acid (PFDS)	ND	2.0	0.51	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/24/20 11:10	JFC
N-EtFOSAA	ND	2.0	0.70	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/24/20 11:10	JFC
8:2 Fluorotelomersulfonic acid (8:2FTS A)	ND	2.0	1.1	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/24/20 11:10	JFC
Perfluoroundecanoic acid (PFUnA)	ND	2.0	0.49	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/24/20 11:10	JFC
N-MeFOSAA	ND	2.0	0.62	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/24/20 11:10	JFC
Perfluorododecanoic acid (PFDoA)	ND	2.0	0.50	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/24/20 11:10	JFC
Perfluorotridecanoic acid (PFTrDA)	2.9	2.0	0.67	ng/L	1		SOP 434-PFAAS	11/16/20	11/24/20 11:10	JFC
Perfluorotetradecanoic acid (PFTA)	ND	2.0	0.50	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/24/20 11:10	JFC

Surrogates	% Recovery	Recovery Limits	Flag/Qual	
13C-PFHxA	106	70-130		11/24/20 11:10
13C-PFHxA	*	70-130	S-01, U	11/24/20 12:53
13C-PFDA	115	70-130		11/24/20 11:10
13C-PFDA	*	70-130	S-01, U	11/24/20 12:53
d5-NEtFOSAA	104	70-130		11/24/20 11:10
d5-NEtFOSAA	*	70-130	S-01, U	11/24/20 12:53

39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Hyannis, MA | Sample Description: | Work Order: 20K0392

Date Received: 11/9/2020

Field Sample #: OW-19 (s) | Sampled: 11/6/2020 12:05

Sample ID: 20K0392-04

Sample Matrix: Ground Water

Semivolatile Organic Compounds by - LC/MS-MS

Analyte	Results	RL	DL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Perfluorobutanoic acid (PFBA)	3.5	2.0	0.64	ng/L	1		SOP 434-PFAAS	11/16/20	11/24/20 11:32	JFC
Perfluorobutanesulfonic acid (PFBS)	1.8	2.0	0.50	ng/L	1		SOP 434-PFAAS	11/16/20	11/24/20 11:32	JFC
Perfluoropentanoic acid (PFPeA)	9.3	2.0	0.42	ng/L	1		SOP 434-PFAAS	11/16/20	11/24/20 11:32	JFC
Perfluorohexanoic acid (PFHxA)	7.7	2.0	0.51	ng/L	1		SOP 434-PFAAS	11/16/20	11/24/20 11:32	JFC
Perfluorohexanesulfonic acid (PFHxS)	3.1	2.0	0.77	ng/L	1		SOP 434-PFAAS	11/16/20	11/24/20 11:32	JFC
Perfluoroheptanoic acid (PFHpA)	4.2	2.0	0.53	ng/L	1		SOP 434-PFAAS	11/16/20	11/24/20 11:32	JFC
Perfluoroheptanesulfonic acid (PFHpS)	ND	2.0	1.0	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/24/20 11:32	JFC
Perfluorooctanoic acid (PFOA)	11	2.0	0.71	ng/L	1		SOP 434-PFAAS	11/16/20	11/24/20 11:32	JFC
Perfluorooctanesulfonic acid (PFOS)	25	2.0	0.68	ng/L	1		SOP 434-PFAAS	11/16/20	11/24/20 11:32	JFC
Perfluorooctanesulfonamide (FOSA)	ND	2.0	0.83	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/24/20 11:32	JFC
6:2 Fluorotelomersulfonic acid (6:2FTS A)	ND	2.0	0.39	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/24/20 11:32	JFC
Perfluorononanoic acid (PFNA)	2.4	2.0	0.63	ng/L	1		SOP 434-PFAAS	11/16/20	11/24/20 11:32	JFC
Perfluorodecanoic acid (PFDA)	2.7	2.0	0.62	ng/L	1		SOP 434-PFAAS	11/16/20	11/24/20 11:32	JFC
Perfluorodecanesulfonic acid (PFDS)	ND	2.0	0.51	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/24/20 11:32	JFC
N-EtFOSAA	ND	2.0	0.70	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/24/20 11:32	JFC
8:2 Fluorotelomersulfonic acid (8:2FTS A)	ND	2.0	1.1	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/24/20 11:32	JFC
Perfluoroundecanoic acid (PFUnA)	ND	2.0	0.49	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/24/20 11:32	JFC
N-MeFOSAA	ND	2.0	0.62	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/24/20 11:32	JFC
Perfluorododecanoic acid (PFDoA)	ND	2.0	0.50	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/24/20 11:32	JFC
Perfluorotridecanoic acid (PFTrDA)	ND	2.0	0.67	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/24/20 11:32	JFC
Perfluorotetradecanoic acid (PFTA)	ND	2.0	0.50	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/24/20 11:32	JFC

Surrogates	% Recovery	Recovery Limits	Flag/Qual	
13C-PFHxA	102	70-130		11/24/20 11:32
13C-PFDA	120	70-130		11/24/20 11:32
d5-NEtFOSAA	119	70-130		11/24/20 11:32

39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Hyannis, MA | Sample Description: | Work Order: 20K0392

Date Received: 11/9/2020

Field Sample #: HW-Q (s) | Sampled: 11/6/2020 14:00

Sample ID: 20K0392-05

Sample Matrix: Ground Water

Semivolatile Organic Compounds by - LC/MS-MS

Analyte	Results	RL	DL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Perfluorobutanoic acid (PFBA)	1.8	2.0	0.64	ng/L	1		SOP 434-PFAAS	11/16/20	11/24/20 11:53	JFC
Perfluorobutanesulfonic acid (PFBS)	ND	2.0	0.50	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/24/20 11:53	JFC
Perfluoropentanoic acid (PFPeA)	4.7	2.0	0.42	ng/L	1		SOP 434-PFAAS	11/16/20	11/24/20 11:53	JFC
Perfluorohexanoic acid (PFHxA)	3.6	2.0	0.51	ng/L	1		SOP 434-PFAAS	11/16/20	11/24/20 11:53	JFC
Perfluorohexanesulfonic acid (PFHxS)	8.7	2.0	0.77	ng/L	1		SOP 434-PFAAS	11/16/20	11/24/20 11:53	JFC
Perfluoroheptanoic acid (PFHpA)	2.1	2.0	0.53	ng/L	1		SOP 434-PFAAS	11/16/20	11/24/20 11:53	JFC
Perfluoroheptanesulfonic acid (PFHpS)	ND	2.0	1.0	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/24/20 11:53	JFC
Perfluorooctanoic acid (PFOA)	6.2	2.0	0.71	ng/L	1		SOP 434-PFAAS	11/16/20	11/24/20 11:53	JFC
Perfluorooctanesulfonic acid (PFOS)	7.5	2.0	0.68	ng/L	1		SOP 434-PFAAS	11/16/20	11/24/20 11:53	JFC
Perfluorooctanesulfonamide (FOSA)	ND	2.0	0.83	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/24/20 11:53	JFC
6:2 Fluorotelomersulfonic acid (6:2FTS A)	ND	2.0	0.39	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/24/20 11:53	JFC
Perfluorononanoic acid (PFNA)	ND	2.0	0.63	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/24/20 11:53	JFC
Perfluorodecanoic acid (PFDA)	ND	2.0	0.62	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/24/20 11:53	JFC
Perfluorodecanesulfonic acid (PFDS)	ND	2.0	0.51	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/24/20 11:53	JFC
N-EtFOSAA	ND	2.0	0.70	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/24/20 11:53	JFC
8:2 Fluorotelomersulfonic acid (8:2FTS A)	ND	2.0	1.1	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/24/20 11:53	JFC
Perfluoroundecanoic acid (PFUnA)	ND	2.0	0.49	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/24/20 11:53	JFC
N-MeFOSAA	ND	2.0	0.62	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/24/20 11:53	JFC
Perfluorododecanoic acid (PFDoA)	ND	2.0	0.50	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/24/20 11:53	JFC
Perfluorotridecanoic acid (PFTrDA)	ND	2.0	0.67	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/24/20 11:53	JFC
Perfluorotetradecanoic acid (PFTA)	ND	2.0	0.50	ng/L	1	U	SOP 434-PFAAS	11/16/20	11/24/20 11:53	JFC

Surrogates	% Recovery	Recovery Limits	Flag/Qual	
13C-PFHxA	99.2	70-130		11/24/20 11:53
13C-PFDA	109	70-130		11/24/20 11:53
d5-NEtFOSAA	112	70-130		11/24/20 11:53

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Sample Extraction Data

Prep Method: SOP 434-PFAAS **Analytical Method: SOP 434-PFAAS**

Lab Number [Field ID]	Batch	Initial [mL]	Final [mL]	Date
20K0392-01 [RB-1 (m)]	B270970	250	1.00	11/16/20
20K0392-02 [RB-1 (s)]	B270970	250	1.00	11/16/20
20K0392-03 [OW-19 (m)]	B270970	250	1.00	11/16/20
20K0392-03RE1 [OW-19 (m)]	B270970	250	1.00	11/16/20
20K0392-04 [OW-19 (s)]	B270970	250	1.00	11/16/20
20K0392-05 [HW-Q (s)]	B270970	250	1.00	11/16/20

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QUALITY CONTROL

Semivolatile Organic Compounds by - LC/MS-MS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B270970 - SOP 434-PFAAS										
Blank (B270970-BLK1)				Prepared: 11/16/20 Analyzed: 11/23/20						
Perfluorobutanoic acid (PFBA)	ND	2.0	ng/L							U
Perfluorobutanesulfonic acid (PFBS)	ND	2.0	ng/L							U
Perfluoropentanoic acid (PFPeA)	ND	2.0	ng/L							U
Perfluorohexanoic acid (PFHxA)	ND	2.0	ng/L							U
Perfluorohexanesulfonic acid (PFHxS)	ND	2.0	ng/L							U
Perfluoroheptanoic acid (PFHpA)	ND	2.0	ng/L							U
Perfluoroheptanesulfonic acid (PFHpS)	ND	2.0	ng/L							U
Perfluorooctanoic acid (PFOA)	ND	2.0	ng/L							U
Perfluorooctanesulfonic acid (PFOS)	ND	2.0	ng/L							U
Perfluorooctanesulfonamide (FOSA)	ND	2.0	ng/L							U
6:2 Fluorotelomersulfonic acid (6:2FTS A)	ND	2.0	ng/L							U
Perfluorononanoic acid (PFNA)	ND	2.0	ng/L							U
Perfluorodecanoic acid (PFDA)	ND	2.0	ng/L							U
Perfluorodecanesulfonic acid (PFDS)	ND	2.0	ng/L							U
N-EtFOSAA	ND	2.0	ng/L							U
8:2 Fluorotelomersulfonic acid (8:2FTS A)	ND	2.0	ng/L							U
Perfluoroundecanoic acid (PFUnA)	ND	2.0	ng/L							U
N-MeFOSAA	ND	2.0	ng/L							U
Perfluorododecanoic acid (PFDoA)	ND	2.0	ng/L							U
Perfluorotridecanoic acid (PFTrDA)	ND	2.0	ng/L							U
Perfluorotetradecanoic acid (PFTA)	ND	2.0	ng/L							U
Surrogate: 13C-PFHxA	*35.6*		ng/L	40.0		89.0	70-130			
Surrogate: 13C-PFDA	*40.8*		ng/L	40.0		102	70-130			
Surrogate: d5-NEtFOSAA	*158*		ng/L	160		98.9	70-130			
LCS (B270970-BS1)				Prepared: 11/16/20 Analyzed: 11/23/20						
Perfluorobutanoic acid (PFBA)	9.51	2.0	ng/L	10.0		95.1	70-130			
Perfluorobutanesulfonic acid (PFBS)	8.77	2.0	ng/L	8.85		99.1	70-130			
Perfluoropentanoic acid (PFPeA)	10.2	2.0	ng/L	10.0		102	70-130			
Perfluorohexanoic acid (PFHxA)	9.07	2.0	ng/L	10.0		90.7	70-130			
Perfluorohexanesulfonic acid (PFHxS)	8.94	2.0	ng/L	9.10		98.3	70-130			
Perfluoroheptanoic acid (PFHpA)	9.48	2.0	ng/L	10.0		94.8	70-130			
Perfluoroheptanesulfonic acid (PFHpS)	9.80	2.0	ng/L	9.50		103	70-130			
Perfluorooctanoic acid (PFOA)	11.1	2.0	ng/L	10.0		111	70-130			
Perfluorooctanesulfonic acid (PFOS)	8.99	2.0	ng/L	9.25		97.2	70-130			
Perfluorooctanesulfonamide (FOSA)	10.6	2.0	ng/L	10.0		106	70-130			
6:2 Fluorotelomersulfonic acid (6:2FTS A)	9.78	2.0	ng/L	9.50		103	70-130			
Perfluorononanoic acid (PFNA)	11.9	2.0	ng/L	10.0		119	70-130			
Perfluorodecanoic acid (PFDA)	11.2	2.0	ng/L	10.0		112	70-130			
Perfluorodecanesulfonic acid (PFDS)	8.69	2.0	ng/L	9.65		90.1	70-130			
N-EtFOSAA	12.7	2.0	ng/L	10.0		127	70-130			
8:2 Fluorotelomersulfonic acid (8:2FTS A)	11.5	2.0	ng/L	9.60		120	70-130			
Perfluoroundecanoic acid (PFUnA)	11.9	2.0	ng/L	10.0		119	70-130			
N-MeFOSAA	10.1	2.0	ng/L	10.0		101	70-130			
Perfluorododecanoic acid (PFDoA)	10.5	2.0	ng/L	10.0		105	70-130			
Perfluorotridecanoic acid (PFTrDA)	10.8	2.0	ng/L	10.0		108	70-130			
Perfluorotetradecanoic acid (PFTA)	10.4	2.0	ng/L	10.0		104	70-130			
Surrogate: 13C-PFHxA	*39.2*		ng/L	40.0		98.0	70-130			
Surrogate: 13C-PFDA	*45.6*		ng/L	40.0		114	70-130			
Surrogate: d5-NEtFOSAA	*178*		ng/L	160		111	70-130			

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FLAG/QUALIFIER SUMMARY

*	QC result is outside of established limits.
†	Wide recovery limits established for difficult compound.
‡	Wide RPD limits established for difficult compound.
#	Data exceeded client recommended or regulatory level
ND	Not Detected
RL	Reporting Limit is at the level of quantitation (LOQ)
DL	Detection Limit is the lower limit of detection determined by the MDL study
MCL	Maximum Contaminant Level

Percent recoveries and relative percent differences (RPDs) are determined by the software using values in the calculation which have not been rounded.

No results have been blank subtracted unless specified in the case narrative section.

S-01	The surrogate recovery for this sample is not available due to sample dilution below the surrogate reporting limit required from high analyte concentration and/or matrix interferences.
U	Analyte included in the analysis, but not detected

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CERTIFICATIONS

Certified Analyses included in this Report

Analyte	Certifications
SOP 434-PFAAS in Water	
Perfluorobutanoic acid (PFBA)	NH-P
Perfluorobutanesulfonic acid (PFBS)	NH-P
Perfluoropentanoic acid (PFPeA)	NH-P
Perfluorohexanoic acid (PFHxA)	NH-P
Perfluorohexanesulfonic acid (PFHxS)	NH-P
Perfluoroheptanoic acid (PFHpA)	NH-P
Perfluorooctanoic acid (PFOA)	NH-P
Perfluorooctanesulfonic acid (PFOS)	NH-P
6:2 Fluorotelomersulfonic acid (6:2FTS A)	NH-P
Perfluorononanoic acid (PFNA)	NH-P
Perfluorodecanoic acid (PFDA)	NH-P
N-EtFOSAA	NH-P
8:2 Fluorotelomersulfonic acid (8:2FTS A)	NH-P
Perfluoroundecanoic acid (PFUnA)	NH-P
N-MeFOSAA	NH-P
Perfluorododecanoic acid (PFDoA)	NH-P
Perfluorotridecanoic acid (PFTrDA)	NH-P
Perfluorotetradecanoic acid (PFTA)	NH-P

The CON-TEST Environmental Laboratory operates under the following certifications and accreditations:

Code	Description	Number	Expires
AIHA	AIHA-LAP, LLC - ISO17025:2017	100033	03/1/2022
MA	Massachusetts DEP	M-MA100	06/30/2021
CT	Connecticut Department of Publilc Health	PH-0567	09/30/2021
NY	New York State Department of Health	10899 NELAP	04/1/2021
NH-S	New Hampshire Environmental Lab	2516 NELAP	02/5/2021
RI	Rhode Island Department of Health	LAO00112	12/30/2020
NC	North Carolina Div. of Water Quality	652	12/31/2020
NJ	New Jersey DEP	MA007 NELAP	06/30/2021
FL	Florida Department of Health	E871027 NELAP	06/30/2021
VT	Vermont Department of Health Lead Laboratory	LL015036	07/30/2021
ME	State of Maine	2011028	06/9/2021
VA	Commonwealth of Virginia	460217	12/14/2020
NH-P	New Hampshire Environmental Lab	2557 NELAP	09/6/2021
VT-DW	Vermont Department of Health Drinking Water	VT-255716	06/12/2021
NC-DW	North Carolina Department of Health	25703	07/31/2021
PA	Commonwealth of Pennsylvania DEP	68-05812	06/30/2021
MI	Dept. of Env, Great Lakes, and Energy	9100	09/6/2021

20K0392

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Phone: 413-525-2332
Fax: 413-525-6405
Email: info@contestlabs.com

http://www.contestlabs.com

CHAIN OF CUSTODY RECORD

39 Spruce Street
East Longmeadow, MA 01028

Doc # 381 Rev 2_06262019

Company Name: Horsley Witten Group
Address: 90 Rte 6A Sandwich MA 02563
Phone: (508) 833-6600
Project Name:
Project Location: Hyannis, MA
Project Number: 20102
Project Manager: Bryan Massa
Con-Test Quote Name/Number:
Invoice Recipient:
Sampled By: HW

Requested Turnaround Time
7-Day ☐ 10-Day ☐
PFAS 10-Day (std) ✓ Due Date:

Rush-Approval Required
1-Day ☐ 3-Day ☐
2-Day ☐ 4-Day ☐

Dissolved Metals Samples
○ Field Filtered
○ Lab to Filter

Orthophosphate Samples
○ Field Filtered
○ Lab to Filter

Data Delivery
Format: PDF ✓ EXCEL ✓
Other:
CLP Like Data Pkg Required: ☐
Email To: bmassa@horsleywitten.com
Fax To #:

ANALYSIS REQUESTED

Con-Test Work Order#	Client Sample ID / Description	Beginning Date/Time	Ending Date/Time	COMP/GRAB	[1]Matrix Code	Conc Code	VIALS	GLASS	PLASTIC	BACTERIA	ENCORE	PFAS - All
1	RB-1(m)	11/5/20	10:00	Grab	GW				✓			✓
2	RB-1(s)	11/5/20	10:35	Grab	GW				✓			✓
3	OW-19(m)	11/6/20	11:20	Grab	GW				✓			✓
4	OW-19(s)	11/6/20	12:05	Grab	GW				✓			✓
5	HW-Q(s)	11/6/20	14:00	Grab	GW				✓			✓

Signature	Date/Time
Relinquished by: (signature) Sarah Bartlett	11/9/20 14:25
Received by: (signature) Paul Chartenay	11-9-20 1425
Relinquished by: (signature) Paul Chartenay	11-9-20 1655
Received by: (signature) [illegible]	11/9/20 1700
Relinquished by: (signature) [illegible]	11/9/20 1925
Received by: (signature) [illegible] 3.8	11/9/20 1925
Relinquished by: (signature)	Date/Time:
Received by: (signature)	Date/Time:

Client Comments:

Detection Limit Requirements
MA: GW1
CT:
Other:

Special Requirements
✓ MA MCP Required
MCP Certification Form Required
☐ CT RCP Required
RCP Certification Form Required
☐ MA State DW Required
PWSID #

Please use the following codes to indicate possible sample concentration within the Conc Code column above:
H - High; M - Medium; L - Low; C - Clean; U - Unknown

NELAC and AIHA-LAP, LLC Accredited

Project Entity
Government ☐ Municipality ☐ MWRA ☐ WRTA ☐
Federal ☐ 21 J ☐ School ☐
City ☐ Brownfield ☐ MBTA ☐

Other
☐ Chromatogram
☐ AIHA-LAP,LLC

[2] Preservation Code

Courier Use Only
Total Number Of:
VIALS____
GLASS____
PLASTIC 10
BACTERIA____
ENCORE____

Glassware in the fridge? Y / N
Glassware in freezer? Y / N
Prepackaged Cooler? Y / N

*Contest is not responsible for missing samples from prepacked coolers

[1] Matrix Codes:
GW = Ground Water
WW = Waste Water
DW = Drinking Water
A = Air
S = Soil
SL = Sludge
SOL = Solid
O = Other (please define)

[2] Preservation Codes:
I = Iced
H = HCL
M = Methanol
N = Nitric Acid
S = Sulfuric Acid
B = Sodium Bisulfate
X = Sodium Hydroxide
T = Sodium Thiosulfate
O = Other (please define)

PCB ONLY
☐ Soxhlet
☐ Non Soxhlet

Comments:

Disclaimer: Con-Test Labs is not responsible for any omitted information on the Chain of Custody. The Chain of Custody is a legal document that must be complete and accurate and is used to determine what analyses the laboratory will perform. Any missing information is not the laboratory's responsibility. Con-Test values your partnership on each project and will try to assist with missing information, but will not be held accountable.

I Have Not Confirmed Sample Container Numbers With Lab Staff Before Relinquishing Over Samples______________

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Doc# 277 Rev 5 2017

Login Sample Receipt Checklist - (Rejection Criteria Listing - Using Acceptance Policy) Any False Statement will be brought to the attention of the Client - State True or False

Client Horsley Witten

Received By [signature] Date 11/4/20 Time 1925

How were the samples received? In Cooler T No Cooler ____ On Ice T No Ice ____

Direct from Sampling ____ Ambient ____ Melted Ice ____

Were samples within Temperature? 2-6°C T By Gun # 3 Actual Temp - 3.8

By Blank # ____ Actual Temp - ____

Was Custody Seal Intact? n/a Were Samples Tampered with? n/a

Was COC Relinquished ? T Does Chain Agree With Samples? T

Are there broken/leaking/loose caps on any samples? F

Is COC in ink/ Legible? T Were samples received within holding time? T

Did COC include all pertinent Information? Client T Analysis T Sampler Name T

Project T ID's T Collection Dates/Times T

Are Sample labels filled out and legible? T

Are there Lab to Filters? F Who was notified? ____

Are there Rushes? F Who was notified? ____

Are there Short Holds? F Who was notified? ____

Is there enough Volume? T

Is there Headspace where applicable? n/a MS/MSD? F

Proper Media/Containers Used? T Is splitting samples required? F

Were trip blanks received? F On COC? F

Do all samples have the proper pH? Acid n/a Base n/a

Vials	#	Containers:	#		#		#
Unp-		1 Liter Amb.		1 Liter Plastic		16 oz Amb.	
HCL-		500 mL Amb.		500 mL Plastic		8oz Amb/Clear	
Meoh-		250 mL Amb.		250 mL Plastic	10	4oz Amb/Clear	
Bisulfate-		Flashpoint		Col./Bacteria		2oz Amb/Clear	
DI-		Other Glass		Other Plastic		Encore	
Thiosulfate-		SOC Kit		Plastic Bag		Frozen:	
Sulfuric-		Perchlorate		Ziplock			

Unused Media

Vials	#	Containers:	#		#		#
Unp-		1 Liter Amb.		1 Liter Plastic		16 oz Amb.	
HCL-		500 mL Amb.		500 mL Plastic		8oz Amb/Clear	
Meoh-		250 mL Amb.		250 mL Plastic		4oz Amb/Clear	
Bisulfate-		Col./Bacteria		Flashpoint		2oz Amb/Clear	
DI-		Other Plastic		Other Glass		Encore	
Thiosulfate-		SOC Kit		Plastic Bag		Frozen:	
Sulfuric-		Perchlorate		Ziplock			

Comments:

ANALYTICAL REPORT

Lab Number:	L2043919
Client:	Horseley & Witten, Inc. Sextant Hill Office Park 90 Route 6A Sandwich, MA 02563
ATTN:	Brian Massa
Phone:	(508) 833-6600
Project Name:	BARNSTABLE AIRPORT
Project Number:	20102
Report Date:	10/27/20

Certifications & Approvals: MA (M-MA086), NH NELAP (2064), CT (PH-0574), IL (200077), ME (MA00086), MD (348), NJ (MA935), NY (11148), NC (25700/666), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #P330-17-00196).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

Project Name: BARNSTABLE AIRPORT
Project Number: 20102

Lab Number: L2043919
Report Date: 10/27/20

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L2043919-01	DL22(6-8)	SOIL	HYANNIS MA	09/25/20 12:51	09/28/20
L2043919-02	DL22(18-20)	SOIL	HYANNIS MA	09/25/20 12:57	09/28/20

Project Name: BARNSTABLE AIRPORT **Lab Number:** L2043919
Project Number: 20102 **Report Date:** 10/27/20

MADEP MCP Response Action Analytical Report Certification

This form provides certifications for all samples performed by MCP methods. Please refer to the Sample Results and Container Information sections of this report for specification of MCP methods used for each analysis. The following questions pertain only to MCP Analytical Methods.

An affirmative response to questions A through F is required for "Presumptive Certainty" status		
A	Were all samples received in a condition consistent with those described on the Chain-of-Custody, properly preserved (including temperature) in the field or laboratory, and prepared/analyzed within method holding times?	YES
B	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	N/A
C	Were all required corrective actions and analytical response actions specified in the selected CAM protocol(s) implemented for all identified performance standard non-conformances?	N/A
D	Does the laboratory report comply with all the reporting requirements specified in CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data?"	YES
E a.	VPH, EPH, and APH Methods only: Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications).	N/A
E b.	APH and TO-15 Methods only: Was the complete analyte list reported for each method?	N/A
F	Were all applicable CAM protocol QC and performance standard non-conformances identified and evaluated in a laboratory narrative (including all "No" responses to Questions A through E)?	N/A

A response to questions G, H and I is required for "Presumptive Certainty" status		
G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocol(s)?	N/A
H	Were all QC performance standards specified in the CAM protocol(s) achieved?	N/A
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	N/A

For any questions answered "No", please refer to the case narrative section on the following page(s).

Please note that sample matrix information is located in the Sample Results section of this report.

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

Case Narrative (continued)

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

MCP Related Narratives

All MCP required questions were answered with affirmative responses where applicable; therefore, there are no relevant protocol-specific QC and/or performance standard non-conformances to report.

Non-MCP Related Narratives

Perfluorinated Alkyl Acids by Isotope Dilution

L2043919-01, -02 and -02RE: Extracted Internal Standard recoveries were outside the acceptance criteria for individual analytes. Please refer to the surrogate section of the report for details.

L2043919-02RE: The sample has elevated detection limits due to the limited sample volume utilized during extraction, as required by the sample matrix.

L2043919-02: The surrogate recoveries were outside the acceptance criteria for n-deuteriomethylperfluoro-1-octanesulfonamidoacetic acid (d3-nmefosaa) (0%); however, the criteria were achieved upon re-extraction outside of holding time. The results of both extractions are reported; however, all associated compounds are considered to have a potential bias.

WG1426973-1: The sample was re-analyzed due to QC failures in the original analysis. The results of the re-analysis are reported.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Elizabeth Porta

Title: Technical Director/Representative Date: 10/27/20

QC OUTLIER SUMMARY REPORT

Project Name: BARNSTABLE AIRPORT
Project Number: 20102

Lab Number: L2043919
Report Date: 10/27/20

Method	Client ID (Native ID)	Lab ID	Parameter	QC Type	Recovery/RPD (%)	QC Limits (%)	Associated Samples	Data Quality Assessment

ORGANICS

SEMIVOLATILES

Project Name: BARNSTABLE AIRPORT **Lab Number:** L2043919

Project Number: 20102 **Report Date:** 10/27/20

SAMPLE RESULTS

Lab ID:	L2043919-01	Date Collected:	09/25/20 12:51
Client ID:	DL22(6-8)	Date Received:	09/28/20
Sample Location:	HYANNIS MA	Field Prep:	Not Specified
Sample Depth:			
Matrix:	Soil	Extraction Method:	ALPHA 23528
Analytical Method:	134,LCMSMS-ID	Extraction Date:	10/05/20 12:45
Analytical Date:	10/08/20 15:16		
Analyst:	SG		
Percent Solids:	97%		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	0.031	J	ng/g	1.00	0.023	1
Perfluoropentanoic Acid (PFPeA)	0.118	J	ng/g	1.00	0.046	1
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/g	1.00	0.039	1
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/g	1.00	0.065	1
Perfluorohexanoic Acid (PFHxA)	0.104	J	ng/g	1.00	0.053	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/g	1.00	0.084	1
Perfluoroheptanoic Acid (PFHpA)	0.481	J	ng/g	1.00	0.045	1
Perfluorohexanesulfonic Acid (PFHxS)	0.070	J	ng/g	1.00	0.061	1
Perfluorooctanoic Acid (PFOA)	1.32		ng/g	1.00	0.042	1
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	11.7		ng/g	1.00	0.180	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/g	1.00	0.136	1
Perfluorononanoic Acid (PFNA)	2.66		ng/g	1.00	0.075	1
Perfluorooctanesulfonic Acid (PFOS)	8.85		ng/g	1.00	0.130	1
Perfluorodecanoic Acid (PFDA)	0.383	J	ng/g	1.00	0.067	1
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	15.3		ng/g	1.00	0.287	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/g	1.00	0.299	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/g	1.00	0.202	1
Perfluoroundecanoic Acid (PFUnA)	0.971	J	ng/g	1.00	0.047	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/g	1.00	0.153	1
Perfluorooctanesulfonamide (FOSA)	ND		ng/g	1.00	0.098	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/g	1.00	0.085	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/g	1.00	0.070	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/g	1.00	0.204	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/g	1.00	0.054	1

Project Name: BARNSTABLE AIRPORT **Lab Number:** L2043919
Project Number: 20102 **Report Date:** 10/27/20

SAMPLE RESULTS

Lab ID: L2043919-01
Client ID: DL22(6-8)
Sample Location: HYANNIS MA
Date Collected: 09/25/20 12:51
Date Received: 09/28/20
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor

Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	82		60-153
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	87		65-182
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	98		70-151
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	95		56-138
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	81		61-147
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	86		62-149
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	107		63-166
Perfluoro[13C8]Octanoic Acid (M8PFOA)	84		62-152
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	82		32-182
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	89		61-154
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	98		65-151
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	88		65-150
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	91		25-186
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	**10**	Q	45-137
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	94		64-158
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	44		1-125
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	**5**	Q	42-136
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	84		56-148
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	46		26-160

Project Name: BARNSTABLE AIRPORT
Lab Number: L2043919
Project Number: 20102
Report Date: 10/27/20

SAMPLE RESULTS

Lab ID: L2043919-02
Client ID: DL22(18-20)
Sample Location: HYANNIS MA
Date Collected: 09/25/20 12:57
Date Received: 09/28/20
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Analytical Method: 134,LCMSMS-ID
Analytical Date: 10/08/20 15:34
Analyst: SG
Percent Solids: 98%
Extraction Method: ALPHA 23528
Extraction Date: 10/05/20 12:45

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	ND		ng/g	0.977	0.022	1
Perfluoropentanoic Acid (PFPeA)	0.049	J	ng/g	0.977	0.045	1
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/g	0.977	0.038	1
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/g	0.977	0.063	1
Perfluorohexanoic Acid (PFHxA)	0.074	J	ng/g	0.977	0.051	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/g	0.977	0.082	1
Perfluoroheptanoic Acid (PFHpA)	0.073	J	ng/g	0.977	0.044	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/g	0.977	0.059	1
Perfluorooctanoic Acid (PFOA)	0.176	J	ng/g	0.977	0.041	1
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	2.67		ng/g	0.977	0.175	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/g	0.977	0.133	1
Perfluorononanoic Acid (PFNA)	0.476	J	ng/g	0.977	0.073	1
Perfluorooctanesulfonic Acid (PFOS)	1.18		ng/g	0.977	0.127	1
Perfluorodecanoic Acid (PFDA)	ND		ng/g	0.977	0.065	1
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	6.39		ng/g	0.977	0.280	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/g	0.977	0.292	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/g	0.977	0.197	1
Perfluoroundecanoic Acid (PFUnA)	0.264	J	ng/g	0.977	0.046	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/g	0.977	0.149	1
Perfluorooctanesulfonamide (FOSA)	ND		ng/g	0.977	0.096	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/g	0.977	0.083	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/g	0.977	0.068	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/g	0.977	0.200	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/g	0.977	0.053	1

Project Name: BARNSTABLE AIRPORT **Lab Number:** L2043919
Project Number: 20102 **Report Date:** 10/27/20

SAMPLE RESULTS

Lab ID:	L2043919-02	Date Collected:	09/25/20 12:57
Client ID:	DL22(18-20)	Date Received:	09/28/20
Sample Location:	HYANNIS MA	Field Prep:	Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor

Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	96		60-153
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	105		65-182
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	104		70-151
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	117		56-138
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	91		61-147
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	99		62-149
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	123		63-166
Perfluoro[13C8]Octanoic Acid (M8PFOA)	97		62-152
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	90		32-182
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	99		61-154
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	107		65-151
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	103		65-150
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	89		25-186
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	**0**	Q	45-137
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	115		64-158
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	25		1-125
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	**6**	Q	42-136
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	99		56-148
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	57		26-160

Project Name: BARNSTABLE AIRPORT **Lab Number:** L2043919

Project Number: 20102 **Report Date:** 10/27/20

SAMPLE RESULTS

Lab ID: L2043919-02 RE
Client ID: DL22(18-20)
Sample Location: HYANNIS MA

Date Collected: 09/25/20 12:57
Date Received: 09/28/20
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Analytical Method: 134,LCMSMS-ID
Analytical Date: 10/27/20 15:14
Analyst: RS
Percent Solids: 98%

Extraction Method: ALPHA 23528
Extraction Date: 10/27/20 10:00

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	ND		ng/g	3.60	0.082	1
Perfluoropentanoic Acid (PFPeA)	ND		ng/g	3.60	0.166	1
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/g	3.60	0.140	1
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/g	3.60	0.232	1
Perfluorohexanoic Acid (PFHxA)	ND		ng/g	3.60	0.189	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/g	3.60	0.301	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/g	3.60	0.162	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/g	3.60	0.218	1
Perfluorooctanoic Acid (PFOA)	0.186	J	ng/g	3.60	0.151	1
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	2.86	J	ng/g	3.60	0.647	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/g	3.60	0.492	1
Perfluorononanoic Acid (PFNA)	0.490	J	ng/g	3.60	0.270	1
Perfluorooctanesulfonic Acid (PFOS)	1.23	J	ng/g	3.60	0.469	1
Perfluorodecanoic Acid (PFDA)	ND		ng/g	3.60	0.242	1
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	6.10		ng/g	3.60	1.03	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/g	3.60	1.08	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/g	3.60	0.726	1
Perfluoroundecanoic Acid (PFUnA)	0.292	JF	ng/g	3.60	0.169	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/g	3.60	0.552	1
Perfluorooctanesulfonamide (FOSA)	ND		ng/g	3.60	0.353	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/g	3.60	0.304	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/g	3.60	0.252	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/g	3.60	0.737	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/g	3.60	0.195	1

Project Name: BARNSTABLE AIRPORT **Lab Number:** L2043919

Project Number: 20102 **Report Date:** 10/27/20

SAMPLE RESULTS

Lab ID: L2043919-02 RE
Client ID: DL22(18-20)
Sample Location: HYANNIS MA

Date Collected: 09/25/20 12:57
Date Received: 09/28/20
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	103		60-153
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	114		65-182
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	94		70-151
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	78		56-138
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	84		61-147
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	95		62-149
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	88		63-166
Perfluoro[13C8]Octanoic Acid (M8PFOA)	102		62-152
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	72		32-182
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	117		61-154
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	112		65-151
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	99		65-150
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	107		25-186
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	**21**	Q	45-137
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	132		64-158
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	14		1-125
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	**34**	Q	42-136
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	126		56-148
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	114		26-160

Project Name: BARNSTABLE AIRPORT **Lab Number:** L2043919
Project Number: 20102 **Report Date:** 10/27/20

Method Blank Analysis
Batch Quality Control

Analytical Method: 134,LCMSMS-ID
Analytical Date: 10/08/20 13:29
Analyst: SG

Extraction Method: ALPHA 23528
Extraction Date: 10/05/20 12:45

Parameter	Result	Qualifier	Units	RL	MDL
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab for sample(s): 01-02 Batch: WG1418146-1					
Perfluorobutanoic Acid (PFBA)	ND		ng/g	1.00	0.023
Perfluoropentanoic Acid (PFPeA)	ND		ng/g	1.00	0.046
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/g	1.00	0.039
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/g	1.00	0.065
Perfluorohexanoic Acid (PFHxA)	ND		ng/g	1.00	0.053
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/g	1.00	0.084
Perfluoroheptanoic Acid (PFHpA)	ND		ng/g	1.00	0.045
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/g	1.00	0.061
Perfluorooctanoic Acid (PFOA)	ND		ng/g	1.00	0.042
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/g	1.00	0.180
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/g	1.00	0.136
Perfluorononanoic Acid (PFNA)	ND		ng/g	1.00	0.075
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/g	1.00	0.130
Perfluorodecanoic Acid (PFDA)	ND		ng/g	1.00	0.067
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/g	1.00	0.287
Perfluorononanesulfonic Acid (PFNS)	ND		ng/g	1.00	0.299
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/g	1.00	0.202
Perfluoroundecanoic Acid (PFUnA)	ND		ng/g	1.00	0.047
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/g	1.00	0.153
Perfluorooctanesulfonamide (FOSA)	ND		ng/g	1.00	0.098
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/g	1.00	0.085
Perfluorododecanoic Acid (PFDoA)	ND		ng/g	1.00	0.070
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/g	1.00	0.204
Perfluorotetradecanoic Acid (PFTA)	ND		ng/g	1.00	0.054

Project Name: BARNSTABLE AIRPORT | **Lab Number:** L2043919

Project Number: 20102 | **Report Date:** 10/27/20

Method Blank Analysis
Batch Quality Control

Analytical Method: 134,LCMSMS-ID
Analytical Date: 10/08/20 13:29
Analyst: SG

Extraction Method: ALPHA 23528
Extraction Date: 10/05/20 12:45

Parameter	Result	Qualifier	Units	RL	MDL
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab for sample(s): 01-02 Batch: WG1418146-1					

Surrogate (Extracted Internal Standard)	%Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	106		60-153
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	119		65-182
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	112		70-151
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	121		56-138
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	102		61-147
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	107		62-149
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	116		63-166
Perfluoro[13C8]Octanoic Acid (M8PFOA)	107		62-152
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	99		32-182
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	111		61-154
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	114		65-151
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	108		65-150
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	115		25-186
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	86		45-137
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	125		64-158
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	1		1-125
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	95		42-136
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	122		56-148
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	104		26-160

Project Name: BARNSTABLE AIRPORT
Lab Number: L2043919
Project Number: 20102
Report Date: 10/27/20

Method Blank Analysis
Batch Quality Control

Analytical Method: 134,LCMSMS-ID
Analytical Date: 10/27/20 16:08
Analyst: RS

Extraction Method: ALPHA 23528
Extraction Date: 10/27/20 10:00

Parameter	Result	Qualifier	Units	RL	MDL
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab for sample(s): 02 Batch: WG1426973-1 R					
Perfluorobutanoic Acid (PFBA)	ND		ng/g	1.00	0.023
Perfluoropentanoic Acid (PFPeA)	ND		ng/g	1.00	0.046
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/g	1.00	0.039
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/g	1.00	0.065
Perfluorohexanoic Acid (PFHxA)	ND		ng/g	1.00	0.053
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/g	1.00	0.084
Perfluoroheptanoic Acid (PFHpA)	ND		ng/g	1.00	0.045
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/g	1.00	0.061
Perfluorooctanoic Acid (PFOA)	ND		ng/g	1.00	0.042
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/g	1.00	0.180
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/g	1.00	0.136
Perfluorononanoic Acid (PFNA)	ND		ng/g	1.00	0.075
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/g	1.00	0.130
Perfluorodecanoic Acid (PFDA)	ND		ng/g	1.00	0.067
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/g	1.00	0.287
Perfluorononanesulfonic Acid (PFNS)	ND		ng/g	1.00	0.299
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/g	1.00	0.202
Perfluoroundecanoic Acid (PFUnA)	ND		ng/g	1.00	0.047
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/g	1.00	0.153
Perfluorooctanesulfonamide (FOSA)	ND		ng/g	1.00	0.098
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/g	1.00	0.085
Perfluorododecanoic Acid (PFDoA)	ND		ng/g	1.00	0.070
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/g	1.00	0.204
Perfluorotetradecanoic Acid (PFTA)	ND		ng/g	1.00	0.054

Project Name: BARNSTABLE AIRPORT
Project Number: 20102

Lab Number: L2043919
Report Date: 10/27/20

Method Blank Analysis
Batch Quality Control

Analytical Method: 134,LCMSMS-ID
Analytical Date: 10/27/20 16:08
Analyst: RS

Extraction Method: ALPHA 23528
Extraction Date: 10/27/20 10:00

Parameter	Result	Qualifier	Units	RL	MDL
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab for sample(s): 02 Batch: WG1426973-1 R					

Surrogate (Extracted Internal Standard)	%Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	112		60-153
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	124		65-182
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	99		70-151
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	78		56-138
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	92		61-147
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	105		62-149
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	104		63-166
Perfluoro[13C8]Octanoic Acid (M8PFOA)	112		62-152
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	71		32-182
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	123		61-154
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	116		65-151
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	109		65-150
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	116		25-186
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	100		45-137
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	140		64-158
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	39		1-125
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	102		42-136
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	133		56-148
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	124		26-160

Lab Control Sample Analysis
Batch Quality Control

Project Name: BARNSTABLE AIRPORT
Project Number: 20102
Lab Number: L2043919
Report Date: 10/27/20

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 01-02 Batch: WG1418146-2 WG1418146-3								
Perfluorobutanoic Acid (PFBA)	100		100		71-135	0		30
Perfluoropentanoic Acid (PFPeA)	100		102		69-132	2		30
Perfluorobutanesulfonic Acid (PFBS)	100		100		72-128	0		30
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	114		115		62-145	1		30
Perfluorohexanoic Acid (PFHxA)	104		105		70-132	1		30
Perfluoropentanesulfonic Acid (PFPeS)	93		97		73-123	4		30
Perfluoroheptanoic Acid (PFHpA)	101		100		71-131	1		30
Perfluorohexanesulfonic Acid (PFHxS)	80		85		67-130	6		30
Perfluorooctanoic Acid (PFOA)	102		103		69-133	1		30
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	107		104		64-140	3		30
Perfluoroheptanesulfonic Acid (PFHpS)	96		96		70-132	0		30
Perfluorononanoic Acid (PFNA)	100		101		72-129	1		30
Perfluorooctanesulfonic Acid (PFOS)	100		100		68-136	0		30
Perfluorodecanoic Acid (PFDA)	109		102		69-133	7		30
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	108		109		65-137	1		30
Perfluorononanesulfonic Acid (PFNS)	107		101		69-125	6		30
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	119		130		63-144	9		30
Perfluoroundecanoic Acid (PFUnA)	97		99		64-136	2		30
Perfluorodecanesulfonic Acid (PFDS)	106		103		59-134	3		30
Perfluorooctanesulfonamide (FOSA)	106		80		67-137	28		30
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	114		108		61-139	5		30
Perfluorododecanoic Acid (PFDoA)	89		90		69-135	1		30

Lab Control Sample Analysis
Batch Quality Control

Project Name: BARNSTABLE AIRPORT
Project Number: 20102

Lab Number: L2043919
Report Date: 10/27/20

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 01-02 Batch: WG1418146-2 WG1418146-3								
Perfluorotridecanoic Acid (PFTrDA)	104		109		66-139	5		30
Perfluorotetradecanoic Acid (PFTA)	102		99		69-133	3		30

Surrogate (Extracted Internal Standard)	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	109		106		60-153
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	120		117		65-182
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	108		106		70-151
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	116		114		56-138
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	102		98		61-147
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	109		104		62-149
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	114		107		63-166
Perfluoro[13C8]Octanoic Acid (M8PFOA)	109		106		62-152
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	99		101		32-182
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	112		108		61-154
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	111		112		65-151
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	107		108		65-150
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	98		108		25-186
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	82		79		45-137
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	125		125		64-158
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	26		3		1-125
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	91		98		42-136
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	115		112		56-148
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	104		104		26-160

Lab Control Sample Analysis
Batch Quality Control

Project Name: BARNSTABLE AIRPORT

Project Number: 20102

Lab Number: L2043919

Report Date: 10/27/20

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 02 Batch: WG1426973-2 WG1426973-3								
Perfluorobutanoic Acid (PFBA)	95		95		71-135	0		30
Perfluoropentanoic Acid (PFPeA)	96		95		69-132	1		30
Perfluorobutanesulfonic Acid (PFBS)	93		94		72-128	1		30
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	106		103		62-145	3		30
Perfluorohexanoic Acid (PFHxA)	96		96		70-132	0		30
Perfluoropentanesulfonic Acid (PFPeS)	80		88		73-123	10		30
Perfluoroheptanoic Acid (PFHpA)	94		93		71-131	1		30
Perfluorohexanesulfonic Acid (PFHxS)	74		81		67-130	9		30
Perfluorooctanoic Acid (PFOA)	95		97		69-133	2		30
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	98		97		64-140	1		30
Perfluoroheptanesulfonic Acid (PFHpS)	88		84		70-132	5		30
Perfluorononanoic Acid (PFNA)	95		94		72-129	1		30
Perfluorooctanesulfonic Acid (PFOS)	94		95		68-136	1		30
Perfluorodecanoic Acid (PFDA)	97		97		69-133	0		30
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	119		109		65-137	9		30
Perfluorononanesulfonic Acid (PFNS)	107		102		69-125	5		30
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	96		105		63-144	9		30
Perfluoroundecanoic Acid (PFUnA)	92		93		64-136	1		30
Perfluorodecanesulfonic Acid (PFDS)	106		102		59-134	4		30
Perfluorooctanesulfonamide (FOSA)	90		88		67-137	2		30
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	108		108		61-139	0		30
Perfluorododecanoic Acid (PFDoA)	91		86		69-135	6		30

Lab Control Sample Analysis
Batch Quality Control

Project Name: BARNSTABLE AIRPORT
Lab Number: L2043919
Project Number: 20102
Report Date: 10/27/20

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 02 Batch: WG1426973-2 WG1426973-3								
Perfluorotridecanoic Acid (PFTrDA)	102		98		66-139	4		30
Perfluorotetradecanoic Acid (PFTA)	97		94		69-133	3		30

Surrogate (Extracted Internal Standard)	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	110		116		60-153
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	121		129		65-182
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	95		102		70-151
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	84		88		56-138
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	88		94		61-147
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	99		107		62-149
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	109		105		63-166
Perfluoro[13C8]Octanoic Acid (M8PFOA)	109		113		62-152
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	77		78		32-182
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	121		125		61-154
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	113		121		65-151
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	105		112		65-150
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	108		110		25-186
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	91		84		45-137
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	131		134		64-158
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	21		53		1-125
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	96		97		42-136
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	125		131		56-148
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	109		117		26-160

INORGANICS
&
MISCELLANEOUS

Project Name: BARNSTABLE AIRPORT

Project Number: 20102

Lab Number: L2043919

Report Date: 10/27/20

SAMPLE RESULTS

Lab ID: L2043919-01

Client ID: DL22(6-8)

Sample Location: HYANNIS MA

Date Collected: 09/25/20 12:51

Date Received: 09/28/20

Field Prep: Not Specified

Sample Depth:

Matrix: Soil

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Mansfield Lab										
Solids, Total	96.6		%	0.100	0.100	1	-	09/30/20 10:18	121,2540G	JW

Project Name: BARNSTABLE AIRPORT
Project Number: 20102

Lab Number: L2043919
Report Date: 10/27/20

SAMPLE RESULTS

Lab ID: L2043919-02
Client ID: DL22(18-20)
Sample Location: HYANNIS MA

Date Collected: 09/25/20 12:57
Date Received: 09/28/20
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Mansfield Lab										
Solids, Total	98.2		%	0.100	0.100	1	-	09/30/20 10:18	121,2540G	JW

PFAS PARAMETER SUMMARY

Parameter	Acronym	CAS Number
PERFLUOROALKYL CARBOXYLIC ACIDS (PFCAs)		
Perfluorooctadecanoic Acid	PFODA	16517-11-6
Perfluorohexadecanoic Acid	PFHxDA	67905-19-5
Perfluorotetradecanoic Acid	PFTA	376-06-7
Perfluorotridecanoic Acid	PFTrDA	72629-94-8
Perfluorododecanoic Acid	PFDoA	307-55-1
Perfluoroundecanoic Acid	PFUnA	2058-94-8
Perfluorodecanoic Acid	PFDA	335-76-2
Perfluorononanoic Acid	PFNA	375-95-1
Perfluorooctanoic Acid	PFOA	335-67-1
Perfluoroheptanoic Acid	PFHpA	375-85-9
Perfluorohexanoic Acid	PFHxA	307-24-4
Perfluoropentanoic Acid	PFPeA	2706-90-3
Perfluorobutanoic Acid	PFBA	375-22-4
PERFLUOROALKYL SULFONIC ACIDS (PFSAs)		
Perfluorododecanesulfonic Acid	PFDoDS	79780-39-5
Perfluorodecanesulfonic Acid	PFDS	335-77-3
Perfluorononanesulfonic Acid	PFNS	68259-12-1
Perfluorooctanesulfonic Acid	PFOS	1763-23-1
Perfluoroheptanesulfonic Acid	PFHpS	375-92-8
Perfluorohexanesulfonic Acid	PFHxS	355-46-4
Perfluoropentanesulfonic Acid	PFPeS	2706-91-4
Perfluorobutanesulfonic Acid	PFBS	375-73-5
FLUOROTELOMERS		
1H,1H,2H,2H-Perfluorododecanesulfonic Acid	10:2FTS	120226-60-0
1H,1H,2H,2H-Perfluorodecanesulfonic Acid	8:2FTS	39108-34-4
1H,1H,2H,2H-Perfluorooctanesulfonic Acid	6:2FTS	27619-97-2
1H,1H,2H,2H-Perfluorohexanesulfonic Acid	4:2FTS	757124-72-4
PERFLUOROALKANE SULFONAMIDES (FASAs)		
Perfluorooctanesulfonamide	FOSA	754-91-6
N-Ethyl Perfluorooctane Sulfonamide	NEtFOSA	4151-50-2
N-Methyl Perfluorooctane Sulfonamide	NMeFOSA	31506-32-8
PERFLUOROALKANE SULFONYL SUBSTANCES		
N-Ethyl Perfluorooctanesulfonamido Ethanol	NEtFOSE	1691-99-2
N-Methyl Perfluorooctanesulfonamido Ethanol	NMeFOSE	24448-09-7
N-Ethyl Perfluorooctanesulfonamidoacetic Acid	NEtFOSAA	2991-50-6
N-Methyl Perfluorooctanesulfonamidoacetic Acid	NMeFOSAA	2355-31-9
PER- and POLYFLUOROALKYL ETHER CARBOXYLIC ACIDS		
2,3,3,3-Tetrafluoro-2-[1,1,2,2,3,3,3-Heptafluoropropoxy]-Propanoic Acid	HFPO-DA	13252-13-6
4,8-Dioxa-3h-Perfluorononanoic Acid	ADONA	919005-14-4
CHLORO-PERFLUOROALKYL SULFONIC ACIDS		
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid	11Cl-PF3OUdS	763051-92-9
9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid	9Cl-PF3ONS	756426-58-1
PERFLUOROETHER SULFONIC ACIDS (PFESAs)		
Perfluoro(2-Ethoxyethane)Sulfonic Acid	PFEESA	113507-82-7
PERFLUOROETHER/POLYETHER CARBOXYLIC ACIDS (PFPCAs)		
Perfluoro-3-Methoxypropanoic Acid	PFMPA	377-73-1
Perfluoro-4-Methoxybutanoic Acid	PFMBA	863090-89-5
Nonafluoro-3,6-Dioxaheptanoic Acid	NFDHA	151772-58-6

GLOSSARY

Acronyms

DL - Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

EDL - Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).

EMPC - Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.

EPA - Environmental Protection Agency.

LCS - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LCSD - Laboratory Control Sample Duplicate: Refer to LCS.

LFB - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LOD - Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

LOQ - Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

MDL - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

MS - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.

MSD - Matrix Spike Sample Duplicate: Refer to MS.

NA - Not Applicable.

NC - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.

NDPA/DPA - N-Nitrosodiphenylamine/Diphenylamine.

NI - Not Ignitable.

NP - Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.

NR - No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests.

RL - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

RPD - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.

SRM - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.

STLP - Semi-dynamic Tank Leaching Procedure per EPA Method 1315.

TEF - Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.

TEQ - Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.

TIC - Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Report Format: DU Report with 'J' Qualifiers

Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. If a 'Total' result is requested, the results of its individual components will also be reported.

The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Data Qualifiers

A - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

F - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

ND - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where

Project Name: BARNSTABLE AIRPORT **Lab Number:** L2043919
Project Number: 20102 **Report Date:** 10/27/20

Data Qualifiers

the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

REFERENCES

121 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WEF. Standard Methods Online.

134 Determination of Selected Perfluorinated Alkyl Acids in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS) using Isotope Dilution. Alpha SOP 23528.

LIMITATION OF LIABILITIES

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 624/624.1: m/p-xylene, o-xylene, Naphthalene
EPA 8260C: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
SM4500: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

Mansfield Facility
SM 2540D: TSS
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
EPA TO-12 Non-methane organics
EPA 3C Fixed gases
Biological Tissue Matrix: EPA 3050B

The following analytes are included in our Massachusetts DEP Scope of Accreditation

Westborough Facility:

Drinking Water
EPA 300.0: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
EPA 332: Perchlorate; **EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

Non-Potable Water
SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH: Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N**, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
EPA 624.1: Volatile Halocarbons & Aromatics,
EPA 608.3: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625.1: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, EPA 1600, EPA 1603.**

Mansfield Facility:

Drinking Water
EPA 200.7: Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
EPA 522.

Non-Potable Water
EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
EPA 200.8: Al, Sb, As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
EPA 245.1 Hg.
SM2340B

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

L2043919 Rb 10/13/20

CHAIN OF CUSTODY

PAGE 1 OF 1

Date Rec'd in Lab: 9/28/20

ALPHA Job #: ~~L2043919~~

ALPHA ANALYTICAL
WESTBORO, MA TEL: 508-898-9220 FAX: 508-898-9193
MANSFIELD, MA TEL: 508-822-9300 FAX: 508-822-3288

Client Information

Client: Horsley Witten Group
Address: 90 Route 6A
Sandwich MA 02563
Phone: (508)
Fax:
Email: bmassa@horsleywitten.com

☐ These samples have been previously analyzed by Alpha

Project Information

Project Name: Barnstable Airport
Project Location: Hyannis MA
Project #: 20102
Project Manager: Bryan Massa
ALPHA Quote #:

Turn-Around Time

☑ Standard ☐ RUSH (only confirmed if pre-approved)

Date Due: Time:

Report Information - Data Deliverables

☐ FAX ☐ EMAIL
☐ ADEx ☐ Add'l Deliverables

Billing Information

☐ Same as Client info PO #:

Regulatory Requirements/Report Limits

State /Fed Program Criteria

Other Project Specific Requirements/Comments/Detection Limits:

ANALYSIS: PFAS Isotope Dilution; PFAS isotope Dilution extract hold

SAMPLE HANDLING
Filtration
☐ Done
☐ Not needed
☐ Lab to do
Preservation
☐ Lab to do
(Please specify below)

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler's Initials	PFAS Isotope Dilution	PFAS isotope Dilution extract hold	Sample Specific Comments	TOTAL # BOTTLES
~~40912-01~~	DL22 (2-4)	9/25/20	12:45	Soil	SB	/			
43919-01 -02	DL22 (6-8)	9/25/20	12:51	Soil	SB	x	✓		
-02 -03	DL22 (18-20)	9/25/20	12:57	Soil	SB	x	✓		
-04	DL19 (0-1)	9/25/20	13:27	Soil	SB	✓	✗ SB		
-05	DL20 (0-1)	9/25/20	13:34	Soil	SB	✓			
-06	DL21 (0-1)	9/25/20	13:40	Soil	SB	✓			
-07	DL18 (0-1)	9/25/20	15:10	Soil	SB	✓			
-08	DL17 (0-1)	9/25/20	15:15	Soil	SB	✓			

Container Type
Preservative

Relinquished By:	Date/Time	Received By:	Date/Time
Rachel Kattitos	9/28/20	Tecya AAL	9/28/20 1136
Tecya AAL	9/28/20 1740 13:36	[illegible signature]	9/28/20 1740
[illegible signature]	9/28/20 2050	[illegible signature]	9/28/20 2050
	9/28/20 2050	AKC - AAL	9/28/20 2050

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

FORM NO: 01-01 (rev. 14-OCT-07)

con-test® ANALYTICAL LABORATORY

39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

October 26, 2020

Bryan Massa
Horsley Witten Group
90 Route 6A Unit #1
Sandwich, MA 02563

Project Location: Hyannis, MA
Client Job Number:
Project Number: 19128
Laboratory Work Order Number: 20J0175

Enclosed are results of analyses for samples received by the laboratory on October 5, 2020. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Raymond J. McCarthy
Project Manager

Table of Contents

39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Horsley Witten Group
90 Route 6A Unit #1
Sandwich, MA 02563
ATTN: Bryan Massa

REPORT DATE: 10/26/2020

PURCHASE ORDER NUMBER:

PROJECT NUMBER: 19128

ANALYTICAL SUMMARY

WORK ORDER NUMBER: 20J0175

The results of analyses performed on the following samples submitted to the CON-TEST Analytical Laboratory are found in this report.

PROJECT LOCATION: Hyannis, MA

FIELD SAMPLE #	LAB ID:	MATRIX	SAMPLE DESCRIPTION	TEST	SUB LAB
HW-P(s)	20J0175-01	Water		SOP 434-PFAAS	
HW-P(m)	20J0175-02	Water		SOP 434-PFAAS	
HW-Q(S)	20J0175-03	Water		SOP 434-PFAAS	
HW-Q(m)	20J0175-04	Water		SOP 434-PFAAS	
HW-R	20J0175-05	Water		SOP 434-PFAAS	
HW-T(m)	20J0175-06	Water		SOP 434-PFAAS	
HW-T(s)	20J0175-07	Water		SOP 434-PFAAS	
HW-S(s)	20J0175-08	Water		SOP 434-PFAAS	
HW-S(m)	20J0175-09	Water		SOP 434-PFAAS	
HW-U(d)	20J0175-10	Water		SOP 434-PFAAS	
				SW-846 8270D-E	
HW-V(m)	20J0175-11	Water		SOP 434-PFAAS	
				SW-846 8270D-E	
OW-9(dd)	20J0175-12	Water		SOP 434-PFAAS	

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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

CASE NARRATIVE SUMMARY

All reported results are within defined laboratory quality control objectives unless listed below or otherwise qualified in this report.

SOP 434-PFAAS

Qualifications:

PF-01A

Surrogate recovery is outside of control limits. Sample not re-extracted past holding time.

Analyte & Samples(s) Qualified:

13C-PFDA

20J0175-05[HW-R]

d5-NEtFOSAA

20J0175-01[HW-P(s)], 20J0175-03[HW-Q(S)], 20J0175-04[HW-Q(m)], 20J0175-05[HW-R], 20J0175-08[HW-S(s)], 20J0175-11[HW-V(m)], 20J0175-12[OW-9(dd)]

S-01

The surrogate recovery for this sample is not available due to sample dilution below the surrogate reporting limit required from high analyte concentration and/or matrix interferences.

Analyte & Samples(s) Qualified:

13C-PFDA

20J0175-01RE1[HW-P(s)], 20J0175-06RE1[HW-T(m)], 20J0175-07RE1[HW-T(s)], 20J0175-08RE1[HW-S(s)]

13C-PFHxA

20J0175-01RE1[HW-P(s)], 20J0175-06RE1[HW-T(m)], 20J0175-07RE1[HW-T(s)], 20J0175-08RE1[HW-S(s)]

d5-NEtFOSAA

20J0175-01RE1[HW-P(s)], 20J0175-06RE1[HW-T(m)], 20J0175-07RE1[HW-T(s)], 20J0175-08RE1[HW-S(s)]

The results of analyses reported only relate to samples submitted to the Con-Test Analytical Laboratory for testing.
I certify that the analyses listed above, unless specifically listed as subcontracted, if any, were performed under my direction according to the approved methodologies listed in this document, and that based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

Lisa Worthington

Lisa A. Worthington
Technical Representative

39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Hyannis, MA   Sample Description: Work Order: 20J0175

Date Received: 10/5/2020

Field Sample #: HW-P(s)   Sampled: 10/1/2020 11:33

Sample ID: 20J0175-01

Sample Matrix: Water

Semivolatile Organic Compounds by - LC/MS-MS

Analyte	Results	RL	DL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Perfluorobutanoic acid (PFBA)	41	2.0	0.64	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 17:59	JFC
Perfluorobutanesulfonic acid (PFBS)	0.58	2.0	0.50	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 17:59	JFC
Perfluoropentanoic acid (PFPeA)	100	20	4.2	ng/L	10		SOP 434-PFAAS	10/15/20	10/22/20 19:54	JFC
Perfluorohexanoic acid (PFHxA)	45	2.0	0.51	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 17:59	JFC
Perfluorohexanesulfonic acid (PFHxS)	1.8	2.0	0.77	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 17:59	JFC
Perfluoroheptanoic acid (PFHpA)	26	2.0	0.53	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 17:59	JFC
Perfluoroheptanesulfonic acid (PFHpS)	ND	2.0	1.0	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 17:59	JFC
Perfluorooctanoic acid (PFOA)	8.4	2.0	0.71	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 17:59	JFC
Perfluorooctanesulfonic acid (PFOS)	0.97	2.0	0.68	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 17:59	JFC
Perfluorooctanesulfonamide (FOSA)	ND	2.0	0.83	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 17:59	JFC
6:2 Fluorotelomersulfonic acid (6:2FTS A)	11	2.0	0.39	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 17:59	JFC
Perfluorononanoic acid (PFNA)	6.1	2.0	0.63	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 17:59	JFC
Perfluorodecanoic acid (PFDA)	0.85	2.0	0.62	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 17:59	JFC
Perfluorodecanesulfonic acid (PFDS)	ND	2.0	0.51	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 17:59	JFC
N-EtFOSAA	ND	2.0	0.70	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 17:59	JFC
8:2 Fluorotelomersulfonic acid (8:2FTS A)	2.6	2.0	1.1	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 17:59	JFC
Perfluoroundecanoic acid (PFUnA)	1.5	2.0	0.49	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 17:59	JFC
N-MeFOSAA	ND	2.0	0.62	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 17:59	JFC
Perfluorododecanoic acid (PFDoA)	ND	2.0	0.50	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 17:59	JFC
Perfluorotridecanoic acid (PFTrDA)	ND	2.0	0.67	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 17:59	JFC
Perfluorotetradecanoic acid (PFTA)	ND	2.0	0.50	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 17:59	JFC

Surrogates	% Recovery		Recovery Limits	Flag/Qual	
13C-PFHxA	81.0		70-130		10/21/20 17:59
13C-PFHxA		*	70-130	S-01, U	10/22/20 19:54
13C-PFDA	74.0		70-130		10/21/20 17:59
13C-PFDA		*	70-130	S-01, U	10/22/20 19:54
d5-NEtFOSAA	**69.2**	*	70-130	PF-01A	10/21/20 17:59
d5-NEtFOSAA		*	70-130	S-01, U	10/22/20 19:54

39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Hyannis, MA

Sample Description:

Work Order: 20J0175

Date Received: 10/5/2020

Field Sample #: HW-P(m)

Sampled: 10/1/2020 11:35

Sample ID: 20J0175-02

Sample Matrix: Water

Semivolatile Organic Compounds by - LC/MS-MS

Analyte	Results	RL	DL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Perfluorobutanoic acid (PFBA)	3.6	2.0	0.64	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 18:20	JFC
Perfluorobutanesulfonic acid (PFBS)	ND	2.0	0.50	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 18:20	JFC
Perfluoropentanoic acid (PFPeA)	11	2.0	0.42	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 18:20	JFC
Perfluorohexanoic acid (PFHxA)	6.3	2.0	0.51	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 18:20	JFC
Perfluorohexanesulfonic acid (PFHxS)	0.85	2.0	0.77	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 18:20	JFC
Perfluoroheptanoic acid (PFHpA)	3.0	2.0	0.53	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 18:20	JFC
Perfluoroheptanesulfonic acid (PFHpS)	ND	2.0	1.0	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 18:20	JFC
Perfluorooctanoic acid (PFOA)	1.8	2.0	0.71	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 18:20	JFC
Perfluorooctanesulfonic acid (PFOS)	1.1	2.0	0.68	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 18:20	JFC
Perfluorooctanesulfonamide (FOSA)	ND	2.0	0.83	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 18:20	JFC
6:2 Fluorotelomersulfonic acid (6:2FTS A)	0.92	2.0	0.39	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 18:20	JFC
Perfluorononanoic acid (PFNA)	1.1	2.0	0.63	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 18:20	JFC
Perfluorodecanoic acid (PFDA)	ND	2.0	0.62	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 18:20	JFC
Perfluorodecanesulfonic acid (PFDS)	ND	2.0	0.51	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 18:20	JFC
N-EtFOSAA	ND	2.0	0.70	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 18:20	JFC
8:2 Fluorotelomersulfonic acid (8:2FTS A)	ND	2.0	1.1	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 18:20	JFC
Perfluoroundecanoic acid (PFUnA)	ND	2.0	0.49	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 18:20	JFC
N-MeFOSAA	ND	2.0	0.62	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 18:20	JFC
Perfluorododecanoic acid (PFDoA)	ND	2.0	0.50	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 18:20	JFC
Perfluorotridecanoic acid (PFTrDA)	ND	2.0	0.67	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 18:20	JFC
Perfluorotetradecanoic acid (PFTA)	ND	2.0	0.50	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 18:20	JFC

Surrogates	% Recovery	Recovery Limits	Flag/Qual	
13C-PFHxA	78.7	70-130		10/21/20 18:20
13C-PFDA	74.5	70-130		10/21/20 18:20
d5-NEtFOSAA	71.1	70-130		10/21/20 18:20

con-test® ANALYTICAL LABORATORY
39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Hyannis, MA   Sample Description: Work Order: 20J0175

Date Received: 10/5/2020

Field Sample #: HW-Q(S)   Sampled: 10/1/2020 13:12

Sample ID: 20J0175-03

Sample Matrix: Water

Semivolatile Organic Compounds by - LC/MS-MS

Analyte	Results	RL	DL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Perfluorobutanoic acid (PFBA)	1.0	2.0	0.64	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 18:42	JFC
Perfluorobutanesulfonic acid (PFBS)	ND	2.0	0.50	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 18:42	JFC
Perfluoropentanoic acid (PFPeA)	3.3	2.0	0.42	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 18:42	JFC
Perfluorohexanoic acid (PFHxA)	2.6	2.0	0.51	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 18:42	JFC
Perfluorohexanesulfonic acid (PFHxS)	13	2.0	0.77	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 18:42	JFC
Perfluoroheptanoic acid (PFHpA)	1.8	2.0	0.53	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 18:42	JFC
Perfluoroheptanesulfonic acid (PFHpS)	ND	2.0	1.0	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 18:42	JFC
Perfluorooctanoic acid (PFOA)	4.9	2.0	0.71	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 18:42	JFC
Perfluorooctanesulfonic acid (PFOS)	4.1	2.0	0.68	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 18:42	JFC
Perfluorooctanesulfonamide (FOSA)	ND	2.0	0.83	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 18:42	JFC
6:2 Fluorotelomersulfonic acid (6:2FTS A)	ND	2.0	0.39	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 18:42	JFC
Perfluorononanoic acid (PFNA)	ND	2.0	0.63	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 18:42	JFC
Perfluorodecanoic acid (PFDA)	ND	2.0	0.62	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 18:42	JFC
Perfluorodecanesulfonic acid (PFDS)	ND	2.0	0.51	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 18:42	JFC
N-EtFOSAA	ND	2.0	0.70	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 18:42	JFC
8:2 Fluorotelomersulfonic acid (8:2FTS A)	ND	2.0	1.1	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 18:42	JFC
Perfluoroundecanoic acid (PFUnA)	ND	2.0	0.49	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 18:42	JFC
N-MeFOSAA	ND	2.0	0.62	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 18:42	JFC
Perfluorododecanoic acid (PFDoA)	ND	2.0	0.50	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 18:42	JFC
Perfluorotridecanoic acid (PFTrDA)	ND	2.0	0.67	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 18:42	JFC
Perfluorotetradecanoic acid (PFTA)	ND	2.0	0.50	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 18:42	JFC

Surrogates	% Recovery		Recovery Limits	Flag/Qual	Date/Time Analyzed
13C-PFHxA	81.0		70-130		10/21/20 18:42
13C-PFDA	70.7		70-130		10/21/20 18:42
d5-NEtFOSAA	**64.6**	*	70-130	PF-01A	10/21/20 18:42

con-test® ANALYTICAL LABORATORY

39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Hyannis, MA   Sample Description: Work Order: 20J0175

Date Received: 10/5/2020

Field Sample #: HW-Q(m)   Sampled: 10/1/2020 13:10

Sample ID: 20J0175-04

Sample Matrix: Water

Semivolatile Organic Compounds by - LC/MS-MS

Analyte	Results	RL	DL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Perfluorobutanoic acid (PFBA)	ND	2.0	0.64	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 19:04	JFC
Perfluorobutanesulfonic acid (PFBS)	ND	2.0	0.50	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 19:04	JFC
Perfluoropentanoic acid (PFPeA)	ND	2.0	0.42	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 19:04	JFC
Perfluorohexanoic acid (PFHxA)	0.94	2.0	0.51	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 19:04	JFC
Perfluorohexanesulfonic acid (PFHxS)	1.9	2.0	0.77	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 19:04	JFC
Perfluoroheptanoic acid (PFHpA)	ND	2.0	0.53	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 19:04	JFC
Perfluoroheptanesulfonic acid (PFHpS)	ND	2.0	1.0	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 19:04	JFC
Perfluorooctanoic acid (PFOA)	0.95	2.0	0.71	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 19:04	JFC
Perfluorooctanesulfonic acid (PFOS)	4.9	2.0	0.68	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 19:04	JFC
Perfluorooctanesulfonamide (FOSA)	ND	2.0	0.83	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 19:04	JFC
6:2 Fluorotelomersulfonic acid (6:2FTS A)	ND	2.0	0.39	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 19:04	JFC
Perfluorononanoic acid (PFNA)	0.75	2.0	0.63	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 19:04	JFC
Perfluorodecanoic acid (PFDA)	ND	2.0	0.62	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 19:04	JFC
Perfluorodecanesulfonic acid (PFDS)	ND	2.0	0.51	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 19:04	JFC
N-EtFOSAA	ND	2.0	0.70	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 19:04	JFC
8:2 Fluorotelomersulfonic acid (8:2FTS A)	ND	2.0	1.1	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 19:04	JFC
Perfluoroundecanoic acid (PFUnA)	ND	2.0	0.49	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 19:04	JFC
N-MeFOSAA	ND	2.0	0.62	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 19:04	JFC
Perfluorododecanoic acid (PFDoA)	ND	2.0	0.50	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 19:04	JFC
Perfluorotridecanoic acid (PFTrDA)	ND	2.0	0.67	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 19:04	JFC
Perfluorotetradecanoic acid (PFTA)	ND	2.0	0.50	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 19:04	JFC

Surrogates	% Recovery		Recovery Limits	Flag/Qual	Analyzed
13C-PFHxA	79.2		70-130		10/21/20 19:04
13C-PFDA	71.2		70-130		10/21/20 19:04
d5-NEtFOSAA	**67.3**	*	70-130	PF-01A	10/21/20 19:04

39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Hyannis, MA | Sample Description: | Work Order: 20J0175

Date Received: 10/5/2020

Field Sample #: HW-R | Sampled: 10/1/2020 14:00

Sample ID: 20J0175-05

Sample Matrix: Water

Semivolatile Organic Compounds by - LC/MS-MS

Analyte	Results	RL	DL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Perfluorobutanoic acid (PFBA)	14	2.0	0.64	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 19:26	JFC
Perfluorobutanesulfonic acid (PFBS)	1.6	2.0	0.50	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 19:26	JFC
Perfluoropentanoic acid (PFPeA)	50	2.0	0.42	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 19:26	JFC
Perfluorohexanoic acid (PFHxA)	39	2.0	0.51	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 19:26	JFC
Perfluorohexanesulfonic acid (PFHxS)	20	2.0	0.77	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 19:26	JFC
Perfluoroheptanoic acid (PFHpA)	21	2.0	0.53	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 19:26	JFC
Perfluoroheptanesulfonic acid (PFHpS)	ND	2.0	1.0	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 19:26	JFC
Perfluorooctanoic acid (PFOA)	14	2.0	0.71	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 19:26	JFC
Perfluorooctanesulfonic acid (PFOS)	16	2.0	0.68	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 19:26	JFC
Perfluorooctanesulfonamide (FOSA)	ND	2.0	0.83	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 19:26	JFC
6:2 Fluorotelomersulfonic acid (6:2FTS A)	37	2.0	0.39	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 19:26	JFC
Perfluorononanoic acid (PFNA)	3.1	2.0	0.63	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 19:26	JFC
Perfluorodecanoic acid (PFDA)	ND	2.0	0.62	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 19:26	JFC
Perfluorodecanesulfonic acid (PFDS)	ND	2.0	0.51	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 19:26	JFC
N-EtFOSAA	ND	2.0	0.70	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 19:26	JFC
8:2 Fluorotelomersulfonic acid (8:2FTS A)	1.4	2.0	1.1	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 19:26	JFC
Perfluoroundecanoic acid (PFUnA)	ND	2.0	0.49	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 19:26	JFC
N-MeFOSAA	ND	2.0	0.62	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 19:26	JFC
Perfluorododecanoic acid (PFDoA)	ND	2.0	0.50	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 19:26	JFC
Perfluorotridecanoic acid (PFTrDA)	ND	2.0	0.67	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 19:26	JFC
Perfluorotetradecanoic acid (PFTA)	ND	2.0	0.50	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 19:26	JFC

Surrogates	% Recovery		Recovery Limits	Flag/Qual	Date/Time Analyzed
13C-PFHxA	81.1		70-130		10/21/20 19:26
13C-PFDA	**63.5**	*	70-130	PF-01A	10/21/20 19:26
d5-NEtFOSAA	**63.9**	*	70-130	PF-01A	10/21/20 19:26

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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Hyannis, MA   Sample Description: Work Order: 20J0175

Date Received: 10/5/2020

Field Sample #: HW-T(m)   Sampled: 10/1/2020 14:50

Sample ID: 20J0175-06

Sample Matrix: Water

Semivolatile Organic Compounds by - LC/MS-MS

Analyte	Results	RL	DL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Perfluorobutanoic acid (PFBA)	23	2.0	0.64	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 19:47	JFC
Perfluorobutanesulfonic acid (PFBS)	1.8	2.0	0.50	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 19:47	JFC
Perfluoropentanoic acid (PFPeA)	120	20	4.2	ng/L	10		SOP 434-PFAAS	10/15/20	10/22/20 20:16	JFC
Perfluorohexanoic acid (PFHxA)	99	2.0	0.51	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 19:47	JFC
Perfluorohexanesulfonic acid (PFHxS)	19	2.0	0.77	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 19:47	JFC
Perfluoroheptanoic acid (PFHpA)	22	2.0	0.53	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 19:47	JFC
Perfluoroheptanesulfonic acid (PFHpS)	ND	2.0	1.0	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 19:47	JFC
Perfluorooctanoic acid (PFOA)	11	2.0	0.71	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 19:47	JFC
Perfluorooctanesulfonic acid (PFOS)	25	2.0	0.68	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 19:47	JFC
Perfluorooctanesulfonamide (FOSA)	ND	2.0	0.83	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 19:47	JFC
6:2 Fluorotelomersulfonic acid (6:2FTS A)	ND	2.0	0.39	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 19:47	JFC
Perfluorononanoic acid (PFNA)	3.2	2.0	0.63	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 19:47	JFC
Perfluorodecanoic acid (PFDA)	1.4	2.0	0.62	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 19:47	JFC
Perfluorodecanesulfonic acid (PFDS)	ND	2.0	0.51	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 19:47	JFC
N-EtFOSAA	ND	2.0	0.70	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 19:47	JFC
8:2 Fluorotelomersulfonic acid (8:2FTS A)	ND	2.0	1.1	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 19:47	JFC
Perfluoroundecanoic acid (PFUnA)	ND	2.0	0.49	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 19:47	JFC
N-MeFOSAA	ND	2.0	0.62	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 19:47	JFC
Perfluorododecanoic acid (PFDoA)	ND	2.0	0.50	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 19:47	JFC
Perfluorotridecanoic acid (PFTrDA)	ND	2.0	0.67	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 19:47	JFC
Perfluorotetradecanoic acid (PFTA)	ND	2.0	0.50	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 19:47	JFC

Surrogates	% Recovery	Recovery Limits	Flag/Qual	Date/Time Analyzed
13C-PFHxA	73.8	70-130		10/21/20 19:47
13C-PFHxA	*	70-130	S-01, U	10/22/20 20:16
13C-PFDA	77.9	70-130		10/21/20 19:47
13C-PFDA	*	70-130	S-01, U	10/22/20 20:16
d5-NEtFOSAA	76.7	70-130		10/21/20 19:47
d5-NEtFOSAA	*	70-130	S-01, U	10/22/20 20:16

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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Hyannis, MA Sample Description: Work Order: 20J0175

Date Received: 10/5/2020

Field Sample #: HW-T(s) Sampled: 10/1/2020 15:00

Sample ID: 20J0175-07

Sample Matrix: Water

Semivolatile Organic Compounds by - LC/MS-MS

Analyte	Results	RL	DL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Perfluorobutanoic acid (PFBA)	1.9	2.0	0.64	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 20:09	JFC
Perfluorobutanesulfonic acid (PFBS)	10	2.0	0.50	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 20:09	JFC
Perfluoropentanoic acid (PFPeA)	6.4	2.0	0.42	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 20:09	JFC
Perfluorohexanoic acid (PFHxA)	30	2.0	0.51	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 20:09	JFC
Perfluorohexanesulfonic acid (PFHxS)	170	2.0	0.77	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 20:09	JFC
Perfluoroheptanoic acid (PFHpA)	3.9	2.0	0.53	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 20:09	JFC
Perfluoroheptanesulfonic acid (PFHpS)	1.5	2.0	1.0	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 20:09	JFC
Perfluorooctanoic acid (PFOA)	6.7	2.0	0.71	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 20:09	JFC
Perfluorooctanesulfonic acid (PFOS)	210	20	6.8	ng/L	10		SOP 434-PFAAS	10/15/20	10/24/20 20:06	JFC
Perfluorooctanesulfonamide (FOSA)	ND	2.0	0.83	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 20:09	JFC
6:2 Fluorotelomersulfonic acid (6:2FTS A)	ND	2.0	0.39	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 20:09	JFC
Perfluorononanoic acid (PFNA)	0.74	2.0	0.63	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 20:09	JFC
Perfluorodecanoic acid (PFDA)	ND	2.0	0.62	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 20:09	JFC
Perfluorodecanesulfonic acid (PFDS)	ND	2.0	0.51	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 20:09	JFC
N-EtFOSAA	ND	2.0	0.70	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 20:09	JFC
8:2 Fluorotelomersulfonic acid (8:2FTS A)	ND	2.0	1.1	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 20:09	JFC
Perfluoroundecanoic acid (PFUnA)	ND	2.0	0.49	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 20:09	JFC
N-MeFOSAA	ND	2.0	0.62	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 20:09	JFC
Perfluorododecanoic acid (PFDoA)	ND	2.0	0.50	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 20:09	JFC
Perfluorotridecanoic acid (PFTrDA)	ND	2.0	0.67	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 20:09	JFC
Perfluorotetradecanoic acid (PFTA)	ND	2.0	0.50	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 20:09	JFC

Surrogates	% Recovery	Recovery Limits	Flag/Qual	Date/Time Analyzed
13C-PFHxA	81.8	70-130		10/21/20 20:09
13C-PFHxA	*	70-130	S-01, U	10/24/20 20:06
13C-PFDA	77.6	70-130		10/21/20 20:09
13C-PFDA	*	70-130	S-01, U	10/24/20 20:06
d5-NEtFOSAA	75.5	70-130		10/21/20 20:09
d5-NEtFOSAA	*	70-130	S-01, U	10/24/20 20:06

39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Hyannis, MA   Sample Description: Work Order: 20J0175

Date Received: 10/5/2020

Field Sample #: HW-S(s)   Sampled: 10/1/2020 15:50

Sample ID: 20J0175-08

Sample Matrix: Water

Semivolatile Organic Compounds by - LC/MS-MS

Analyte	Results	RL	DL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Perfluorobutanoic acid (PFBA)	86	2.0	0.64	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 20:31	JFC
Perfluorobutanesulfonic acid (PFBS)	6.1	2.0	0.50	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 20:31	JFC
Perfluoropentanoic acid (PFPeA)	420	100	21	ng/L	50		SOP 434-PFAAS	10/15/20	10/22/20 20:37	JFC
Perfluorohexanoic acid (PFHxA)	250	100	25	ng/L	50		SOP 434-PFAAS	10/15/20	10/22/20 20:37	JFC
Perfluorohexanesulfonic acid (PFHxS)	55	2.0	0.77	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 20:31	JFC
Perfluoroheptanoic acid (PFHpA)	110	100	27	ng/L	50		SOP 434-PFAAS	10/15/20	10/22/20 20:37	JFC
Perfluoroheptanesulfonic acid (PFHpS)	6.7	2.0	1.0	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 20:31	JFC
Perfluorooctanoic acid (PFOA)	62	2.0	0.71	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 20:31	JFC
Perfluorooctanesulfonic acid (PFOS)	100	2.0	0.68	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 20:31	JFC
Perfluorooctanesulfonamide (FOSA)	ND	2.0	0.83	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 20:31	JFC
6:2 Fluorotelomersulfonic acid (6:2FTS A)	3700	100	20	ng/L	50		SOP 434-PFAAS	10/15/20	10/22/20 20:37	JFC
Perfluorononanoic acid (PFNA)	100	2.0	0.63	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 20:31	JFC
Perfluorodecanoic acid (PFDA)	ND	2.0	0.62	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 20:31	JFC
Perfluorodecanesulfonic acid (PFDS)	ND	2.0	0.51	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 20:31	JFC
N-EtFOSAA	ND	2.0	0.70	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 20:31	JFC
8:2 Fluorotelomersulfonic acid (8:2FTS A)	ND	2.0	1.1	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 20:31	JFC
Perfluoroundecanoic acid (PFUnA)	ND	2.0	0.49	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 20:31	JFC
N-MeFOSAA	ND	2.0	0.62	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 20:31	JFC
Perfluorododecanoic acid (PFDoA)	ND	2.0	0.50	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 20:31	JFC
Perfluorotridecanoic acid (PFTrDA)	ND	2.0	0.67	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 20:31	JFC
Perfluorotetradecanoic acid (PFTA)	ND	2.0	0.50	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 20:31	JFC

Surrogates	% Recovery		Recovery Limits	Flag/Qual	Date/Time Analyzed
13C-PFHxA	73.4		70-130		10/21/20 20:31
13C-PFHxA		*	70-130	S-01, U	10/22/20 20:37
13C-PFDA	79.6		70-130		10/21/20 20:31
13C-PFDA		*	70-130	S-01, U	10/22/20 20:37
d5-NEtFOSAA	**69.0**	*	70-130	PF-01A	10/21/20 20:31
d5-NEtFOSAA		*	70-130	S-01, U	10/22/20 20:37

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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Hyannis, MA   Sample Description: Work Order: 20J0175

Date Received: 10/5/2020

Field Sample #: HW-S(m)   Sampled: 10/1/2020 16:00

Sample ID: 20J0175-09

Sample Matrix: Water

Semivolatile Organic Compounds by - LC/MS-MS

Analyte	Results	RL	DL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Perfluorobutanoic acid (PFBA)	0.95	2.0	0.64	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 20:53	JFC
Perfluorobutanesulfonic acid (PFBS)	ND	2.0	0.50	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 20:53	JFC
Perfluoropentanoic acid (PFPeA)	ND	2.0	0.42	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 20:53	JFC
Perfluorohexanoic acid (PFHxA)	2.8	2.0	0.51	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 20:53	JFC
Perfluorohexanesulfonic acid (PFHxS)	6.4	2.0	0.77	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 20:53	JFC
Perfluoroheptanoic acid (PFHpA)	0.96	2.0	0.53	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 20:53	JFC
Perfluoroheptanesulfonic acid (PFHpS)	ND	2.0	1.0	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 20:53	JFC
Perfluorooctanoic acid (PFOA)	1.3	2.0	0.71	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 20:53	JFC
Perfluorooctanesulfonic acid (PFOS)	5.8	2.0	0.68	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 20:53	JFC
Perfluorooctanesulfonamide (FOSA)	ND	2.0	0.83	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 20:53	JFC
6:2 Fluorotelomersulfonic acid (6:2FTS A)	6.5	2.0	0.39	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 20:53	JFC
Perfluorononanoic acid (PFNA)	ND	2.0	0.63	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 20:53	JFC
Perfluorodecanoic acid (PFDA)	ND	2.0	0.62	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 20:53	JFC
Perfluorodecanesulfonic acid (PFDS)	ND	2.0	0.51	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 20:53	JFC
N-EtFOSAA	ND	2.0	0.70	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 20:53	JFC
8:2 Fluorotelomersulfonic acid (8:2FTS A)	ND	2.0	1.1	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 20:53	JFC
Perfluoroundecanoic acid (PFUnA)	ND	2.0	0.49	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 20:53	JFC
N-MeFOSAA	ND	2.0	0.62	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 20:53	JFC
Perfluorododecanoic acid (PFDoA)	ND	2.0	0.50	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 20:53	JFC
Perfluorotridecanoic acid (PFTrDA)	ND	2.0	0.67	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 20:53	JFC
Perfluorotetradecanoic acid (PFTA)	ND	2.0	0.50	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 20:53	JFC

Surrogates	% Recovery	Recovery Limits	Flag/Qual	Date/Time Analyzed
13C-PFHxA	77.2	70-130		10/21/20 20:53
13C-PFDA	76.9	70-130		10/21/20 20:53
d5-NEtFOSAA	71.5	70-130		10/21/20 20:53

39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Hyannis, MA
Sample Description:
Work Order: 20J0175

Date Received: 10/5/2020

Field Sample #: HW-U(d)
Sampled: 10/2/2020 10:24

Sample ID: 20J0175-10

Sample Matrix: Water

1,4-Dioxane by isotope dilution GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
1,4-Dioxane	0.73	0.20	µg/L	1		SW-846 8270D-E	10/9/20	10/13/20 17:28	CLA

Surrogates	% Recovery	Recovery Limits	Flag/Qual		
1,4-Dioxane-d8	20.4	15-110			10/13/20 17:28

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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Hyannis, MA | Sample Description: | Work Order: 20J0175

Date Received: 10/5/2020

Field Sample #: HW-U(d) | Sampled: 10/2/2020 10:24

Sample ID: 20J0175-10

Sample Matrix: Water

Semivolatile Organic Compounds by - LC/MS-MS

Analyte	Results	RL	DL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Perfluorobutanoic acid (PFBA)	3.6	2.0	0.64	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 21:14	JFC
Perfluorobutanesulfonic acid (PFBS)	4.3	2.0	0.50	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 21:14	JFC
Perfluoropentanoic acid (PFPeA)	11	2.0	0.42	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 21:14	JFC
Perfluorohexanoic acid (PFHxA)	10	2.0	0.51	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 21:14	JFC
Perfluorohexanesulfonic acid (PFHxS)	18	2.0	0.77	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 21:14	JFC
Perfluoroheptanoic acid (PFHpA)	6.2	2.0	0.53	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 21:14	JFC
Perfluoroheptanesulfonic acid (PFHpS)	ND	2.0	1.0	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 21:14	JFC
Perfluorooctanoic acid (PFOA)	10	2.0	0.71	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 21:14	JFC
Perfluorooctanesulfonic acid (PFOS)	23	2.0	0.68	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 21:14	JFC
Perfluorooctanesulfonamide (FOSA)	ND	2.0	0.83	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 21:14	JFC
6:2 Fluorotelomersulfonic acid (6:2FTS A)	1.2	2.0	0.39	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 21:14	JFC
Perfluorononanoic acid (PFNA)	1.6	2.0	0.63	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 21:14	JFC
Perfluorodecanoic acid (PFDA)	ND	2.0	0.62	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 21:14	JFC
Perfluorodecanesulfonic acid (PFDS)	ND	2.0	0.51	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 21:14	JFC
N-EtFOSAA	ND	2.0	0.70	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 21:14	JFC
8:2 Fluorotelomersulfonic acid (8:2FTS A)	ND	2.0	1.1	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 21:14	JFC
Perfluoroundecanoic acid (PFUnA)	ND	2.0	0.49	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 21:14	JFC
N-MeFOSAA	ND	2.0	0.62	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 21:14	JFC
Perfluorododecanoic acid (PFDoA)	ND	2.0	0.50	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 21:14	JFC
Perfluorotridecanoic acid (PFTrDA)	ND	2.0	0.67	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 21:14	JFC
Perfluorotetradecanoic acid (PFTA)	ND	2.0	0.50	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 21:14	JFC

Surrogates	% Recovery	Recovery Limits	Flag/Qual	
13C-PFHxA	84.2	70-130		10/21/20 21:14
13C-PFDA	81.5	70-130		10/21/20 21:14
d5-NEtFOSAA	74.0	70-130		10/21/20 21:14

39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Hyannis, MA   Sample Description: Work Order: 20J0175

Date Received: 10/5/2020

Field Sample #: HW-V(m)   Sampled: 10/2/2020 11:20

Sample ID: 20J0175-11

Sample Matrix: Water

1,4-Dioxane by isotope dilution GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
1,4-Dioxane	0.80	0.20	µg/L	1		SW-846 8270D-E	10/9/20	10/13/20 17:08	CLA

Surrogates	% Recovery	Recovery Limits	Flag/Qual	
1,4-Dioxane-d8	20.1	15-110		10/13/20 17:08

39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Hyannis, MA   Sample Description: Work Order: 20J0175

Date Received: 10/5/2020

Field Sample #: HW-V(m)   Sampled: 10/2/2020 11:20

Sample ID: 20J0175-11

Sample Matrix: Water

Semivolatile Organic Compounds by - LC/MS-MS

Analyte	Results	RL	DL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Perfluorobutanoic acid (PFBA)	3.8	2.0	0.64	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 21:58	JFC
Perfluorobutanesulfonic acid (PFBS)	6.8	2.0	0.50	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 21:58	JFC
Perfluoropentanoic acid (PFPeA)	14	2.0	0.42	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 21:58	JFC
Perfluorohexanoic acid (PFHxA)	9.3	2.0	0.51	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 21:58	JFC
Perfluorohexanesulfonic acid (PFHxS)	3.2	2.0	0.77	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 21:58	JFC
Perfluoroheptanoic acid (PFHpA)	3.3	2.0	0.53	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 21:58	JFC
Perfluoroheptanesulfonic acid (PFHpS)	ND	2.0	1.0	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 21:58	JFC
Perfluorooctanoic acid (PFOA)	6.3	2.0	0.71	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 21:58	JFC
Perfluorooctanesulfonic acid (PFOS)	5.9	2.0	0.68	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 21:58	JFC
Perfluorooctanesulfonamide (FOSA)	ND	2.0	0.83	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 21:58	JFC
6:2 Fluorotelomersulfonic acid (6:2FTS A)	ND	2.0	0.39	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 21:58	JFC
Perfluorononanoic acid (PFNA)	1.7	2.0	0.63	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 21:58	JFC
Perfluorodecanoic acid (PFDA)	ND	2.0	0.62	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 21:58	JFC
Perfluorodecanesulfonic acid (PFDS)	ND	2.0	0.51	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 21:58	JFC
N-EtFOSAA	ND	2.0	0.70	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 21:58	JFC
8:2 Fluorotelomersulfonic acid (8:2FTS A)	ND	2.0	1.1	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 21:58	JFC
Perfluoroundecanoic acid (PFUnA)	ND	2.0	0.49	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 21:58	JFC
N-MeFOSAA	ND	2.0	0.62	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 21:58	JFC
Perfluorododecanoic acid (PFDoA)	ND	2.0	0.50	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 21:58	JFC
Perfluorotridecanoic acid (PFTrDA)	ND	2.0	0.67	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 21:58	JFC
Perfluorotetradecanoic acid (PFTA)	ND	2.0	0.50	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 21:58	JFC

Surrogates	% Recovery		Recovery Limits	Flag/Qual	Date/Time Analyzed
13C-PFHxA	71.8		70-130		10/21/20 21:58
13C-PFDA	71.3		70-130		10/21/20 21:58
d5-NEtFOSAA	**59.1**	*	70-130	PF-01A	10/21/20 21:58

39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Hyannis, MA | Sample Description: | Work Order: 20J0175

Date Received: 10/5/2020

Field Sample #: OW-9(dd) | Sampled: 10/2/2020 15:38

Sample ID: 20J0175-12

Sample Matrix: Water

Semivolatile Organic Compounds by - LC/MS-MS

Analyte	Results	RL	DL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Perfluorobutanoic acid (PFBA)	5.2	2.0	0.64	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 22:20	JFC
Perfluorobutanesulfonic acid (PFBS)	1.3	2.0	0.50	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 22:20	JFC
Perfluoropentanoic acid (PFPeA)	22	2.0	0.42	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 22:20	JFC
Perfluorohexanoic acid (PFHxA)	16	2.0	0.51	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 22:20	JFC
Perfluorohexanesulfonic acid (PFHxS)	19	2.0	0.77	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 22:20	JFC
Perfluoroheptanoic acid (PFHpA)	8.5	2.0	0.53	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 22:20	JFC
Perfluoroheptanesulfonic acid (PFHpS)	ND	2.0	1.0	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 22:20	JFC
Perfluorooctanoic acid (PFOA)	10	2.0	0.71	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 22:20	JFC
Perfluorooctanesulfonic acid (PFOS)	49	2.0	0.68	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 22:20	JFC
Perfluorooctanesulfonamide (FOSA)	ND	2.0	0.83	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 22:20	JFC
6:2 Fluorotelomersulfonic acid (6:2FTS A)	20	2.0	0.39	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 22:20	JFC
Perfluorononanoic acid (PFNA)	18	2.0	0.63	ng/L	1		SOP 434-PFAAS	10/15/20	10/21/20 22:20	JFC
Perfluorodecanoic acid (PFDA)	ND	2.0	0.62	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 22:20	JFC
Perfluorodecanesulfonic acid (PFDS)	ND	2.0	0.51	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 22:20	JFC
N-EtFOSAA	ND	2.0	0.70	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 22:20	JFC
8:2 Fluorotelomersulfonic acid (8:2FTS A)	ND	2.0	1.1	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 22:20	JFC
Perfluoroundecanoic acid (PFUnA)	ND	2.0	0.49	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 22:20	JFC
N-MeFOSAA	ND	2.0	0.62	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 22:20	JFC
Perfluorododecanoic acid (PFDoA)	ND	2.0	0.50	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 22:20	JFC
Perfluorotridecanoic acid (PFTrDA)	ND	2.0	0.67	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 22:20	JFC
Perfluorotetradecanoic acid (PFTA)	ND	2.0	0.50	ng/L	1	U	SOP 434-PFAAS	10/15/20	10/21/20 22:20	JFC

Surrogates	% Recovery		Recovery Limits	Flag/Qual	Date/Time Analyzed
13C-PFHxA	79.7		70-130		10/21/20 22:20
13C-PFDA	73.7		70-130		10/21/20 22:20
d5-NEtFOSAA	**59.3**	*	70-130	PF-01A	10/21/20 22:20

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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Sample Extraction Data

Prep Method: SOP 434-PFAAS **Analytical Method: SOP 434-PFAAS**

Lab Number [Field ID]	Batch	Initial [mL]	Final [mL]	Date
20J0175-01 [HW-P(s)]	B268752	250	1.00	10/15/20
20J0175-01RE1 [HW-P(s)]	B268752	250	1.00	10/15/20
20J0175-02 [HW-P(m)]	B268752	250	1.00	10/15/20
20J0175-03 [HW-Q(S)]	B268752	250	1.00	10/15/20
20J0175-04 [HW-Q(m)]	B268752	250	1.00	10/15/20
20J0175-05 [HW-R]	B268752	250	1.00	10/15/20
20J0175-06 [HW-T(m)]	B268752	250	1.00	10/15/20
20J0175-06RE1 [HW-T(m)]	B268752	250	1.00	10/15/20
20J0175-07 [HW-T(s)]	B268752	250	1.00	10/15/20
20J0175-07RE1 [HW-T(s)]	B268752	250	1.00	10/15/20
20J0175-08 [HW-S(s)]	B268752	250	1.00	10/15/20
20J0175-08RE1 [HW-S(s)]	B268752	250	1.00	10/15/20
20J0175-09 [HW-S(m)]	B268752	250	1.00	10/15/20
20J0175-10 [HW-U(d)]	B268752	250	1.00	10/15/20
20J0175-11 [HW-V(m)]	B268752	250	1.00	10/15/20
20J0175-12 [OW-9(dd)]	B268752	250	1.00	10/15/20

Prep Method: SW-846 3510C **Analytical Method: SW-846 8270D-E**

Lab Number [Field ID]	Batch	Initial [mL]	Final [mL]	Date
20J0175-10 [HW-U(d)]	B268322	1020	1.00	10/09/20
20J0175-11 [HW-V(m)]	B268322	1000	1.00	10/09/20

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QUALITY CONTROL

1,4-Dioxane by isotope dilution GC/MS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B268322 - SW-846 3510C										
Blank (B268322-BLK1)				Prepared: 10/09/20 Analyzed: 10/13/20						
1,4-Dioxane	ND	0.20	µg/L							
Surrogate: 1,4-Dioxane-d8	*1.77*		µg/L	10.0		17.7	15-110			
LCS (B268322-BS1)				Prepared: 10/09/20 Analyzed: 10/13/20						
1,4-Dioxane	10.2	0.20	µg/L	10.0		102	40-140			
Surrogate: 1,4-Dioxane-d8	*2.12*		µg/L	10.0		21.2	15-110			
LCS Dup (B268322-BSD1)				Prepared: 10/09/20 Analyzed: 10/13/20						
1,4-Dioxane	10.5	0.20	µg/L	10.0		105	40-140	2.64	30	
Surrogate: 1,4-Dioxane-d8	*2.00*		µg/L	10.0		20.0	15-110			

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QUALITY CONTROL

Semivolatile Organic Compounds by - LC/MS-MS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B268752 - SOP 434-PFAAS										
Blank (B268752-BLK1)				Prepared: 10/15/20 Analyzed: 10/21/20						
Perfluorobutanoic acid (PFBA)	ND	2.0	ng/L							U
Perfluorobutanesulfonic acid (PFBS)	ND	2.0	ng/L							U
Perfluoropentanoic acid (PFPeA)	ND	2.0	ng/L							U
Perfluorohexanoic acid (PFHxA)	ND	2.0	ng/L							U
Perfluorohexanesulfonic acid (PFHxS)	ND	2.0	ng/L							U
Perfluoroheptanoic acid (PFHpA)	ND	2.0	ng/L							U
Perfluoroheptanesulfonic acid (PFHpS)	ND	2.0	ng/L							U
Perfluorooctanoic acid (PFOA)	ND	2.0	ng/L							U
Perfluorooctanesulfonic acid (PFOS)	ND	2.0	ng/L							U
Perfluorooctanesulfonamide (FOSA)	ND	2.0	ng/L							U
6:2 Fluorotelomersulfonic acid (6:2FTS A)	ND	2.0	ng/L							U
Perfluorononanoic acid (PFNA)	ND	2.0	ng/L							U
Perfluorodecanoic acid (PFDA)	ND	2.0	ng/L							U
Perfluorodecanesulfonic acid (PFDS)	ND	2.0	ng/L							U
N-EtFOSAA	ND	2.0	ng/L							U
8:2 Fluorotelomersulfonic acid (8:2FTS A)	ND	2.0	ng/L							U
Perfluoroundecanoic acid (PFUnA)	ND	2.0	ng/L							U
N-MeFOSAA	ND	2.0	ng/L							U
Perfluorododecanoic acid (PFDoA)	ND	2.0	ng/L							U
Perfluorotridecanoic acid (PFTrDA)	ND	2.0	ng/L							U
Perfluorotetradecanoic acid (PFTA)	ND	2.0	ng/L							U
Surrogate: 13C-PFHxA	*35.6*		ng/L	40.0		88.9	70-130			
Surrogate: 13C-PFDA	*35.6*		ng/L	40.0		89.0	70-130			
Surrogate: d5-NEtFOSAA	*145*		ng/L	160		90.4	70-130			
LCS (B268752-BS1)				Prepared: 10/15/20 Analyzed: 10/21/20						
Perfluorobutanoic acid (PFBA)	1.48	2.0	ng/L	2.00		73.9	50-150			
Perfluorobutanesulfonic acid (PFBS)	1.60	2.0	ng/L	1.77		90.6	50-150			
Perfluoropentanoic acid (PFPeA)	1.83	2.0	ng/L	2.00		91.4	50-150			
Perfluorohexanoic acid (PFHxA)	1.82	2.0	ng/L	2.00		90.8	50-150			
Perfluorohexanesulfonic acid (PFHxS)	1.51	2.0	ng/L	1.82		82.7	50-150			
Perfluoroheptanoic acid (PFHpA)	1.66	2.0	ng/L	2.00		82.9	50-150			
Perfluoroheptanesulfonic acid (PFHpS)	1.89	2.0	ng/L	1.90		99.5	50-150			
Perfluorooctanoic acid (PFOA)	1.75	2.0	ng/L	2.00		87.6	50-150			
Perfluorooctanesulfonic acid (PFOS)	1.70	2.0	ng/L	1.85		91.7	50-150			
Perfluorooctanesulfonamide (FOSA)	1.53	2.0	ng/L	2.00		76.5	50-150			
6:2 Fluorotelomersulfonic acid (6:2FTS A)	1.98	2.0	ng/L	1.90		104	50-150			
Perfluorononanoic acid (PFNA)	1.67	2.0	ng/L	2.00		83.7	50-150			
Perfluorodecanoic acid (PFDA)	1.39	2.0	ng/L	2.00		69.5	50-150			
Perfluorodecanesulfonic acid (PFDS)	1.69	2.0	ng/L	1.93		87.8	50-150			
N-EtFOSAA	1.85	2.0	ng/L	2.00		92.3	50-150			
8:2 Fluorotelomersulfonic acid (8:2FTS A)	1.85	2.0	ng/L	1.92		96.6	50-150			
Perfluoroundecanoic acid (PFUnA)	1.63	2.0	ng/L	2.00		81.4	50-150			
N-MeFOSAA	1.72	2.0	ng/L	2.00		86.1	50-150			
Perfluorododecanoic acid (PFDoA)	1.54	2.0	ng/L	2.00		76.9	50-150			
Perfluorotridecanoic acid (PFTrDA)	1.58	2.0	ng/L	2.00		78.9	50-150			
Perfluorotetradecanoic acid (PFTA)	1.31	2.0	ng/L	2.00		65.5	50-150			
Surrogate: 13C-PFHxA	*34.4*		ng/L	40.0		85.9	70-130			
Surrogate: 13C-PFDA	*34.5*		ng/L	40.0		86.3	70-130			
Surrogate: d5-NEtFOSAA	*136*		ng/L	160		84.9	70-130			

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FLAG/QUALIFIER SUMMARY

*	QC result is outside of established limits.
†	Wide recovery limits established for difficult compound.
‡	Wide RPD limits established for difficult compound.
#	Data exceeded client recommended or regulatory level
ND	Not Detected
RL	Reporting Limit is at the level of quantitation (LOQ)
DL	Detection Limit is the lower limit of detection determined by the MDL study
MCL	Maximum Contaminant Level

Percent recoveries and relative percent differences (RPDs) are determined by the software using values in the calculation which have not been rounded.

No results have been blank subtracted unless specified in the case narrative section.

PF-01A	Surrogate recovery is outside of control limits. Sample not re-extracted past holding time.
S-01	The surrogate recovery for this sample is not available due to sample dilution below the surrogate reporting limit required from high analyte concentration and/or matrix interferences.
U	Analyte included in the analysis, but not detected

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CERTIFICATIONS

Certified Analyses included in this Report

Analyte	Certifications
SOP 434-PFAAS in Water	
Perfluorobutanoic acid (PFBA)	NH-P
Perfluorobutanesulfonic acid (PFBS)	NH-P
Perfluoropentanoic acid (PFPeA)	NH-P
Perfluorohexanoic acid (PFHxA)	NH-P
Perfluorohexanesulfonic acid (PFHxS)	NH-P
Perfluoroheptanoic acid (PFHpA)	NH-P
Perfluorooctanoic acid (PFOA)	NH-P
Perfluorooctanesulfonic acid (PFOS)	NH-P
6:2 Fluorotelomersulfonic acid (6:2FTS A)	NH-P
Perfluorononanoic acid (PFNA)	NH-P
Perfluorodecanoic acid (PFDA)	NH-P
N-EtFOSAA	NH-P
8:2 Fluorotelomersulfonic acid (8:2FTS A)	NH-P
Perfluoroundecanoic acid (PFUnA)	NH-P
N-MeFOSAA	NH-P
Perfluorododecanoic acid (PFDoA)	NH-P
Perfluorotridecanoic acid (PFTrDA)	NH-P
Perfluorotetradecanoic acid (PFTA)	NH-P
SW-846 8270D-E in Water	
1,4-Dioxane	NY

The CON-TEST Environmental Laboratory operates under the following certifications and accreditations:

Code	Description	Number	Expires
AIHA	AIHA-LAP, LLC - ISO17025:2017	100033	03/1/2022
MA	Massachusetts DEP	M-MA100	06/30/2021
CT	Connecticut Department of Publilc Health	PH-0567	09/30/2021
NY	New York State Department of Health	10899 NELAP	04/1/2021
NH-S	New Hampshire Environmental Lab	2516 NELAP	02/5/2021
RI	Rhode Island Department of Health	LAO00112	12/30/2020
NC	North Carolina Div. of Water Quality	652	12/31/2020
NJ	New Jersey DEP	MA007 NELAP	06/30/2021
FL	Florida Department of Health	E871027 NELAP	06/30/2021
VT	Vermont Department of Health Lead Laboratory	LL015036	07/30/2021
ME	State of Maine	2011028	06/9/2021
VA	Commonwealth of Virginia	460217	12/14/2020
NH-P	New Hampshire Environmental Lab	2557 NELAP	09/6/2021
VT-DW	Vermont Department of Health Drinking Water	VT-255716	06/12/2021
NC-DW	North Carolina Department of Health	25703	07/31/2021
PA	Commonwealth of Pennsylvania DEP	68-05812	06/30/2021
MI	Dept. of Env, Great Lakes, and Energy	9100	09/6/2021

20J0175

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http://www.contestlabs.com
39 Spruce Street
East Longmeadow, MA 01028

CHAIN OF CUSTODY RECORD

Doc # 381 Rev 2_06262019

Page 1 of 2

Company Name: Horsley Witten Group
Address: 90 Rt 6A Sandwich MA 02563
Phone: (508) 833-6600
Project Name: Barnstable Municipal Airport
Project Location: Hyannis, MA
Project Number: 20102
Project Manager: Bryan Massa
Con-Test Quote Name/Number:
Invoice Recipient:
Sampled By: Sarah Bartlett + Mike Demanche

Requested Turnaround Time: 7-Day ☐ 10-Day ☐ PFAS 10-Day (std) ✓ Due Date:
Rush-Approval Required: 1-Day ☐ 3-Day ☐ 2-Day ☐ 4-Day ☐
Dissolved Metals Samples: ○ Field Filtered ○ Lab to Filter
Orthophosphate Samples: ○ Field Filtered ○ Lab to Filter
Data Delivery: Format: PDF ✓ EXCEL ✓
Other:
CLP Like Data Pkg Required: ☐
Email To: bmassa@horsleywitten.com
Fax To #:

ANALYSIS REQUESTED: PFAS - All

Con-Test Work Order#	Client Sample ID / Description	Beginning Date/Time	Ending Date/Time	COMP/GRAB	Matrix Code	Conc Code	VIALS	GLASS	PLASTIC	BACTERIA	ENCORE	PFAS - All
1	HW-P (S)	10/1/20	11:33	G	AQ				✓			✓
2	HW-P (m)	10/1/20	11:35	G	AQ				✓			✓
3	HW-Q (S)	10/1/20	13:12	G	AQ				✓			✓
4	HW-Q (m)	10/1/20	13:10	G	AQ				✓			✓
5	HW-R	10/1/20	14:00	G	AQ				✓			✓
6	HW-T (m)	10/1/20	14:50	G	AQ				✓			✓
7	HW-T (S)	10/1/20	15:00	G	AQ				✓			✓
8	HW-S (S)	10/1/20	15:50	G	AQ				✓			✓
9	HW-S (m)	10/1/20	16:00	G	AQ				✓			✓

Signature	Date/Time
Relinquished by: (signature) M. [illegible]	10/5/20 1135
Received by: (signature) Paul Chutney	10-5-20 1135
Relinquished by: (signature) Paul Chutney	10-5-20 1820
Received by: (signature) [illegible]	10/5/20 1822
Relinquished by: (signature) [illegible]	10/5/20 2000
Received by: (signature) [illegible] 2.0	10/5/20 2000
Relinquished by: (signature)	Date/Time:
Received by: (signature)	Date/Time:

Comments:

Client Comments:

Detection Limit Requirements
MA:
CT:
Other:

Special Requirements
✓ MA MCP Required
MCP Certification Form Required
☐ CT RCP Required
RCP Certification Form Required
☐ MA State DW Required
PWSID #

Project Entity
Government ☐ Federal ☐ City ☐
Municipality ☐ 21 J ☐ Brownfield ☐
MWRA ☐ School ☐ MBTA ☐
WRTA ☐

Please use the following codes to indicate possible sample concentration within the Conc Code column above:
H - High; M - Medium; L - Low; C - Clean; U - Unknown

NELAC and AIHA-LAP, LLC Accredited

Other
☐ Chromatogram
☐ AIHA-LAP,LLC

PCB ONLY
☐ Soxhlet
☐ Non Soxhlet

[2] Preservation Code

Courier Use Only
Total Number Of:
VIALS____
GLASS____
PLASTIC____
BACTERIA____
ENCORE____

Glassware in the fridge? Y / N
Glassware in freezer? Y / N
Prepackaged Cooler? Y / N
*Contest is not responsible for missing samples from prepacked coolers

[1] Matrix Codes:
GW = Ground Water
WW = Waste Water
DW = Drinking Water
A = Air
S = Soil
SL = Sludge
SOL = Solid
O = Other (please define)

[2] Preservation Codes:
I = Iced
H = HCL
M = Methanol
N = Nitric Acid
S = Sulfuric Acid
B = Sodium Bisulfate
X = Sodium Hydroxide
T = Sodium Thiosulfate
O = Other (please define)

Disclaimer: Con-Test Labs is not responsible for any omitted information on the Chain of Custody. The Chain of Custody is a legal document that must be complete and accurate and is used to determine what analyses the laboratory will perform. Any missing information is not the laboratory's responsibility. Con-Test values your partnership on each project and will try to assist with missing information, but will not b held accountable.

20J0175

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CHAIN OF CUSTODY RECORD

39 Spruce Street
East Longmeadow, MA 01028

Doc # 381 Rev 2_06262019

Page 2 of 2

Company Name: Horsley Witten Group
Address: 90 Route 6A Sandwich MA 02563
Phone: (508) 833-6600
Project Name: Barnstable Airport
Project Location: Hyannis MA
Project Number: 20102
Project Manager: Bryan Massa
Con-Test Quote Name/Number:
Invoice Recipient:
Sampled By: HW-SB + MO

Requested Turnaround Time
7-Day ☐ 10-Day ☐
PFAS 10-Day (std) ✓ Due Date:

Rush-Approval Required
1-Day ☐ 3-Day ☐
2-Day ☐ 4-Day ☐

Dissolved Metals Samples
○ Field Filtered
○ Lab to Filter

Orthophosphate Samples
○ Field Filtered
○ Lab to Filter

Data Delivery
Format: PDF ✓ EXCEL ✓
Other:
CLP Like Data Pkg Required: ☐
Email To: bmassa@horsleywitten.com
Fax To #:

ANALYSIS REQUESTED

Con-Test Work Order#	Client Sample ID / Description	Beginning Date/Time	Ending Date/Time	COMP/GRAB	[1]Matrix Code	Conc Code	VIALS	GLASS	PLASTIC	BACTERIA	ENCORE	PFAS-All	1,4-Dioxane
10	HW-U(d)	10/2/20	10:24	Grab	AQ			✓	✓			✓	✓
11	HW-V(m)	10/2/20	11:20	Grab	AQ			✓	✓			✓	✓
12	OW-9(dd)	10/2/20	13:38	Grab	AQ			~~✓~~	✓			✓	

Relinquished/Received	Date/Time
Relinquished by: (signature) M. Wenaden	10/5/20 1135
Received by: (signature) Paul Chastenay	10-5-20 11:35
Relinquished by: (signature) Paul Chastenay	10-5-20 18:20
Received by: (signature) [signature]	10/5/20 1823
Relinquished by: (signature) [signature]	10/5/20 2000
Received by: (signature) [signature]	10/5/20 2000
Relinquished by: (signature)	Date/Time:
Received by: (signature)	Date/Time:

Client Comments:

Detection Limit Requirements
MA
CT
Other:

Special Requirements
✓ MA MCP Required
MCP Certification Form Required
☐ CT RCP Required
RCP Certification Form Required
☐ MA State DW Required
PWSID #

Please use the following codes to indicate possible sample concentration within the Conc Code column above:
H - High; M - Medium; L - Low; C - Clean; U - Unknown

NELAC and AIHA-LAP, LLC Accredited

Project Entity
Government ☐ Municipality ☐ MWRA ☐ WRTA ☐
Federal ☐ 21 J ☐ School ☐
City ☐ Brownfield ☐ MBTA ☐

Other
☐ Chromatogram
☐ AIHA-LAP,LLC

PCB ONLY
☐ Soxhlet
☐ Non Soxhlet

[2] Preservation Code

Courier Use Only

Total Number Of:
VIALS____
GLASS____
PLASTIC____
BACTERIA____
ENCORE____

Glassware in the fridge? Y / N
Glassware in freezer? Y / N
Prepackaged Cooler? Y / N
*Contest is not responsible for missing samples from prepacked coolers

[1] **Matrix Codes:**
GW = Ground Water
WW = Waste Water
DW = Drinking Water
A = Air
S = Soil
SL = Sludge
SOL = Solid
O = Other (please define)

[2] **Preservation Codes:**
I = Iced
H = HCL
M = Methanol
N = Nitric Acid
S = Sulfuric Acid
B = Sodium Bisulfate
X = Sodium Hydroxide
T = Sodium Thiosulfate
O = Other (please define)

Comments:

Disclaimer: Con-Test Labs is not respon[sib]le for any omitted information on the Chain of Custody. The Chain of Custody is a legal document tha[t] must be complete and accurate and is used to determine wha[t] analyses the laboratory will perform. An[y] missing information is not the laboratory's responsibility. Co[n-]Test values your partnership on each pro[je]ct and will try to assist with missing information, but will not [be] held accountable.

I Have Not Confirmed Sample Container Numbers With Lab Staff Before Relinquishing Over Samples ______________

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Doc# 277 Rev 5 2017

Login Sample Receipt Checklist - (Rejection Criteria Listing - Using Acceptance Policy) Any False Statement will be brought to the attention of the Client - State True or False

Client Horsley Witten

Received By [signature] Date 10/5/20 Time 2000

How were the samples received? In Cooler T No Cooler ___ On Ice T No Ice ___
Direct from Sampling ___ Ambient ___ Melted Ice ___

Were samples within Temperature? 2-6°C T By Gun # 4 Actual Temp - 2.0
By Blank # ___ Actual Temp - ___

Was Custody Seal Intact? n/a Were Samples Tampered with? n/a
Was COC Relinquished ? T Does Chain Agree With Samples? T
Are there broken/leaking/loose caps on any samples? F
Is COC in ink/ Legible? T Were samples received within holding time? T
Did COC include all pertinent Information? Client T Analysis T Sampler Name T
Project T ID's T Collection Dates/Times T
Are Sample labels filled out and legible? T
Are there Lab to Filters? F Who was notified? ___
Are there Rushes? F Who was notified? ___
Are there Short Holds? F Who was notified? ___
Is there enough Volume? T
Is there Headspace where applicable? n/a MS/MSD? F
Proper Media/Containers Used? T Is splitting samples required? F
Were trip blanks received? F On COC? F
Do all samples have the proper pH? Acid n/a Base n/a

Vials	#	Containers:	#		#		#
Unp-		1 Liter Amb.	2	1 Liter Plastic		16 oz Amb.	
HCL-		500 mL Amb.		500 mL Plastic		8oz Amb/Clear	
Meoh-		250 mL Amb.		250 mL Plastic	24	4oz Amb/Clear	
Bisulfate-		Flashpoint		Col./Bacteria		2oz Amb/Clear	
DI-		Other Glass		Other Plastic		Encore	
Thiosulfate-		SOC Kit		Plastic Bag		Frozen:	
Sulfuric-		Perchlorate		Ziplock			

Unused Media

Vials	#	Containers:	#		#		#
Unp-		1 Liter Amb.		1 Liter Plastic		16 oz Amb.	
HCL-		500 mL Amb.		500 mL Plastic		8oz Amb/Clear	
Meoh-		250 mL Amb.		250 mL Plastic		4oz Amb/Clear	
Bisulfate-		Col./Bacteria		Flashpoint		2oz Amb/Clear	
DI-		Other Plastic		Other Glass		Encore	
Thiosulfate-		SOC Kit		Plastic Bag		Frozen:	
Sulfuric-		Perchlorate		Ziplock			

Comments:

MADEP MCP Analytical Method Report Certification Form

Laboratory Name: Con-Test Analytical Laboratory	Project #: 20J0175
Project Location: Hyannis, MA	RTN:

This Form provides certifications for the following data set: [list Laboratory Sample ID Number(s)]

20J0175-01 thru 20J0175-12

Matrices: Water

CAM Protocol (check all that below)

8260 VOC CAM II A ( )	7470/7471 Hg CAM IIIB ( )	MassDEP VPH CAM IV A ( )	8082 PCB CAM V A ( )	9014 Total Cyanide/PAC CAM VI A ( )	6860 Perchlorate CAM VIII B ( )
8270 SVOC CAM II B (X)	7010 Metals CAM III C ( )	MassDEP VPH CAM IV C ( )	8081 Pesticides CAM V B ( )	7196 Hex Cr CAM VI B ( )	MassDEP APH CAM IX A ( )
6010 Metals CAM III A ( )	6020 Metals CAM III D ( )	MassDEP EPH CAM IV B ( )	8151 Herbicides CAM V C ( )	8330 Explosives CAM VIII A ( )	TO-15 VOC CAM IX B ( )

Affirmative response to Questions A throughF is required for "Presumptive Certainty" status

A	Were all samples received in a condition consistent with those described on the Chain-of-Custody, properly preserved (including temperature) in the field or laboratory, and prepared/analyzed within method holding times?	☑ Yes ☐ No¹
B	Were the analytical method(s) and all associated QC requirements specificed in the selected CAM protocol(s) followed?	☑ Yes ☐ No¹
C	Were all required corrective actions and analytical response actions specified in the selected CAM protocol(s) implemented for all identified performance standard non-conformances?	☑ Yes ☐ No¹
D	Does the laboratory report comply with all the reporting requirements specified in CAM VII A, Quality Assurance and Quality Control Guidlines for the Acquisition and Reporting of Analytical Data?	☑ Yes ☐ No¹
E a	VPH, EPH, and APH Methods only: Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications).	☐ Yes ☐ No¹
E b	APH and TO-15 Methods only: Was the complete analyte list reported for each method?	☐ Yes ☐ No¹
F	Were all applicable CAM protocol QC and performance standard non-conformances identified and evaluated in a laboratory narrative (including all No responses to Qestions A through E)?	☑ Yes ☐ No¹

A response to questions G, H and I below is required for "Presumptive Certainty" status

G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocol(s)?	☑ Yes ☐ No¹

<u>Data User Note:</u> Data that achieve "Presumptive Certainty" status may not necessarily meet the data usability and representativeness requirements described in 310 CMR 40. 1056 (2)(k) and WSC-07-350.

H	Were all QC perfomance standards specified in the CAM protocol(s) achieved?	☑ Yes ☐ No¹
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	☑ Yes ☐ No¹

[1] *All Negative responses must be addressed in an attached Environmental Laboratory case narrative.*

I, the undersigned, attest under the pains and penalties of perjury that, based upon my personal inquiry of those responsible for obtaining the information, the material contained in this analytical report is, to the best of my knowledge and belief, accurate and complete.

Signature: Lisa Worthington Position: Technical Representative

Printed Name: Lisa A. Worthington Date: 10/26/20

con-test® ANALYTICAL LABORATORY

39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

October 21, 2020

Bryan Massa
Horsley Witten Group
90 Route 6A Unit #1
Sandwich, MA 02563

Project Location: Hyannis, MA
Client Job Number:
Project Number: 20102
Laboratory Work Order Number: 20J0491

Enclosed are results of analyses for samples received by the laboratory on October 8, 2020. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Raymond J. McCarthy
Project Manager

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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Horsley Witten Group
90 Route 6A Unit #1
Sandwich, MA 02563
ATTN: Bryan Massa

REPORT DATE: 10/21/2020

PURCHASE ORDER NUMBER:

PROJECT NUMBER: 20102

ANALYTICAL SUMMARY

WORK ORDER NUMBER: 20J0491

The results of analyses performed on the following samples submitted to the CON-TEST Analytical Laboratory are found in this report.

PROJECT LOCATION: Hyannis, MA

FIELD SAMPLE #	LAB ID:	MATRIX	SAMPLE DESCRIPTION	TEST	SUB LAB
HW-L(s)	20J0491-01	Ground Water		SOP 434-PFAAS	
				SW-846 8270D-E	
HW-L(m)	20J0491-02	Ground Water		SOP 434-PFAAS	
				SW-846 8270D-E	
HW-L(d)	20J0491-03	Ground Water		SOP 434-PFAAS	

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CASE NARRATIVE SUMMARY

All reported results are within defined laboratory quality control objectives unless listed below or otherwise qualified in this report.

SOP 434-PFAAS

Qualifications:

S-26

Surrogate outside of control limits.

Analyte & Samples(s) Qualified:

13C-PFDA
B268850-BS1

The results of analyses reported only relate to samples submitted to the Con-Test Analytical Laboratory for testing.
I certify that the analyses listed above, unless specifically listed as subcontracted, if any, were performed under my direction according to the approved methodologies listed in this document, and that based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

Lisa A. Worthington
Technical Representative

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Project Location: Hyannis, MA | Sample Description: | Work Order: 20J0491

Date Received: 10/8/2020

Field Sample #: HW-L(s) | Sampled: 10/7/2020 12:45

Sample ID: 20J0491-01

Sample Matrix: Ground Water

1,4-Dioxane by isotope dilution GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
1,4-Dioxane	ND	0.20	µg/L	1		SW-846 8270D-E	10/9/20	10/13/20 16:28	CLA

Surrogates	% Recovery	Recovery Limits	Flag/Qual	Date/Time Analyzed
1,4-Dioxane-d8	29.1	15-110		10/13/20 16:28

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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Hyannis, MA Sample Description: Work Order: 20J0491

Date Received: 10/8/2020

Field Sample #: HW-L(s) Sampled: 10/7/2020 12:45

Sample ID: 20J0491-01

Sample Matrix: Ground Water

Semivolatile Organic Compounds by - LC/MS-MS

Analyte	Results	RL	DL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Perfluorobutanoic acid (PFBA)	ND	2.0	0.64	ng/L	1	U	SOP 434-PFAAS	10/16/20	10/21/20 8:36	JFC
Perfluorobutanesulfonic acid (PFBS)	ND	2.0	0.50	ng/L	1	U	SOP 434-PFAAS	10/16/20	10/21/20 8:36	JFC
Perfluoropentanoic acid (PFPeA)	ND	2.0	0.42	ng/L	1	U	SOP 434-PFAAS	10/16/20	10/21/20 8:36	JFC
Perfluorohexanoic acid (PFHxA)	ND	2.0	0.51	ng/L	1	U	SOP 434-PFAAS	10/16/20	10/21/20 8:36	JFC
Perfluorohexanesulfonic acid (PFHxS)	1.3	2.0	0.77	ng/L	1		SOP 434-PFAAS	10/16/20	10/21/20 8:36	JFC
Perfluoroheptanoic acid (PFHpA)	ND	2.0	0.53	ng/L	1	U	SOP 434-PFAAS	10/16/20	10/21/20 8:36	JFC
Perfluoroheptanesulfonic acid (PFHpS)	ND	2.0	1.0	ng/L	1	U	SOP 434-PFAAS	10/16/20	10/21/20 8:36	JFC
Perfluorooctanoic acid (PFOA)	ND	2.0	0.71	ng/L	1	U	SOP 434-PFAAS	10/16/20	10/21/20 8:36	JFC
Perfluorooctanesulfonic acid (PFOS)	1.4	2.0	0.68	ng/L	1		SOP 434-PFAAS	10/16/20	10/21/20 8:36	JFC
Perfluorooctanesulfonamide (FOSA)	ND	2.0	0.83	ng/L	1	U	SOP 434-PFAAS	10/16/20	10/21/20 8:36	JFC
6:2 Fluorotelomersulfonic acid (6:2FTS A)	ND	2.0	0.39	ng/L	1	U	SOP 434-PFAAS	10/16/20	10/21/20 8:36	JFC
Perfluorononanoic acid (PFNA)	ND	2.0	0.63	ng/L	1	U	SOP 434-PFAAS	10/16/20	10/21/20 8:36	JFC
Perfluorodecanoic acid (PFDA)	ND	2.0	0.62	ng/L	1	U	SOP 434-PFAAS	10/16/20	10/21/20 8:36	JFC
Perfluorodecanesulfonic acid (PFDS)	ND	2.0	0.51	ng/L	1	U	SOP 434-PFAAS	10/16/20	10/21/20 8:36	JFC
N-EtFOSAA	ND	2.0	0.70	ng/L	1	U	SOP 434-PFAAS	10/16/20	10/21/20 8:36	JFC
8:2 Fluorotelomersulfonic acid (8:2FTS A)	ND	2.0	1.1	ng/L	1	U	SOP 434-PFAAS	10/16/20	10/21/20 8:36	JFC
Perfluoroundecanoic acid (PFUnA)	ND	2.0	0.49	ng/L	1	U	SOP 434-PFAAS	10/16/20	10/21/20 8:36	JFC
N-MeFOSAA	ND	2.0	0.62	ng/L	1	U	SOP 434-PFAAS	10/16/20	10/21/20 8:36	JFC
Perfluorododecanoic acid (PFDoA)	ND	2.0	0.50	ng/L	1	U	SOP 434-PFAAS	10/16/20	10/21/20 8:36	JFC
Perfluorotridecanoic acid (PFTrDA)	ND	2.0	0.67	ng/L	1	U	SOP 434-PFAAS	10/16/20	10/21/20 8:36	JFC
Perfluorotetradecanoic acid (PFTA)	ND	2.0	0.50	ng/L	1	U	SOP 434-PFAAS	10/16/20	10/21/20 8:36	JFC

Surrogates	% Recovery	Recovery Limits	Flag/Qual	
13C-PFHxA	86.6	70-130		10/21/20 8:36
13C-PFDA	83.3	70-130		10/21/20 8:36
d5-NEtFOSAA	78.5	70-130		10/21/20 8:36

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Project Location: Hyannis, MA   Sample Description: Work Order: 20J0491

Date Received: 10/8/2020

Field Sample #: HW-L(m)   Sampled: 10/7/2020 11:25

Sample ID: 20J0491-02

Sample Matrix: Ground Water

1,4-Dioxane by isotope dilution GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
1,4-Dioxane	ND	0.20	µg/L	1		SW-846 8270D-E	10/9/20	10/13/20 16:48	CLA

Surrogates	% Recovery	Recovery Limits	Flag/Qual	
1,4-Dioxane-d8	29.4	15-110		10/13/20 16:48

39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Hyannis, MA	Sample Description:	Work Order: 20J0491

Date Received: 10/8/2020

Field Sample #: HW-L(m)	Sampled: 10/7/2020 11:25

Sample ID: 20J0491-02

Sample Matrix: Ground Water

Semivolatile Organic Compounds by - LC/MS-MS

Analyte	Results	RL	DL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Perfluorobutanoic acid (PFBA)	7.1	2.0	0.64	ng/L	1		SOP 434-PFAAS	10/16/20	10/21/20 8:58	JFC
Perfluorobutanesulfonic acid (PFBS)	0.75	2.0	0.50	ng/L	1		SOP 434-PFAAS	10/16/20	10/21/20 8:58	JFC
Perfluoropentanoic acid (PFPeA)	27	2.0	0.42	ng/L	1		SOP 434-PFAAS	10/16/20	10/21/20 8:58	JFC
Perfluorohexanoic acid (PFHxA)	15	2.0	0.51	ng/L	1		SOP 434-PFAAS	10/16/20	10/21/20 8:58	JFC
Perfluorohexanesulfonic acid (PFHxS)	23	2.0	0.77	ng/L	1		SOP 434-PFAAS	10/16/20	10/21/20 8:58	JFC
Perfluoroheptanoic acid (PFHpA)	6.4	2.0	0.53	ng/L	1		SOP 434-PFAAS	10/16/20	10/21/20 8:58	JFC
Perfluoroheptanesulfonic acid (PFHpS)	ND	2.0	1.0	ng/L	1	U	SOP 434-PFAAS	10/16/20	10/21/20 8:58	JFC
Perfluorooctanoic acid (PFOA)	10	2.0	0.71	ng/L	1		SOP 434-PFAAS	10/16/20	10/21/20 8:58	JFC
Perfluorooctanesulfonic acid (PFOS)	70	2.0	0.68	ng/L	1		SOP 434-PFAAS	10/16/20	10/21/20 8:58	JFC
Perfluorooctanesulfonamide (FOSA)	ND	2.0	0.83	ng/L	1	U	SOP 434-PFAAS	10/16/20	10/21/20 8:58	JFC
6:2 Fluorotelomersulfonic acid (6:2FTS A)	22	2.0	0.39	ng/L	1		SOP 434-PFAAS	10/16/20	10/21/20 8:58	JFC
Perfluorononanoic acid (PFNA)	2.5	2.0	0.63	ng/L	1		SOP 434-PFAAS	10/16/20	10/21/20 8:58	JFC
Perfluorodecanoic acid (PFDA)	ND	2.0	0.62	ng/L	1	U	SOP 434-PFAAS	10/16/20	10/21/20 8:58	JFC
Perfluorodecanesulfonic acid (PFDS)	ND	2.0	0.51	ng/L	1	U	SOP 434-PFAAS	10/16/20	10/21/20 8:58	JFC
N-EtFOSAA	ND	2.0	0.70	ng/L	1	U	SOP 434-PFAAS	10/16/20	10/21/20 8:58	JFC
8:2 Fluorotelomersulfonic acid (8:2FTS A)	ND	2.0	1.1	ng/L	1	U	SOP 434-PFAAS	10/16/20	10/21/20 8:58	JFC
Perfluoroundecanoic acid (PFUnA)	ND	2.0	0.49	ng/L	1	U	SOP 434-PFAAS	10/16/20	10/21/20 8:58	JFC
N-MeFOSAA	ND	2.0	0.62	ng/L	1	U	SOP 434-PFAAS	10/16/20	10/21/20 8:58	JFC
Perfluorododecanoic acid (PFDoA)	ND	2.0	0.50	ng/L	1	U	SOP 434-PFAAS	10/16/20	10/21/20 8:58	JFC
Perfluorotridecanoic acid (PFTrDA)	ND	2.0	0.67	ng/L	1	U	SOP 434-PFAAS	10/16/20	10/21/20 8:58	JFC
Perfluorotetradecanoic acid (PFTA)	ND	2.0	0.50	ng/L	1	U	SOP 434-PFAAS	10/16/20	10/21/20 8:58	JFC

Surrogates	% Recovery	Recovery Limits	Flag/Qual	Date/Time Analyzed
13C-PFHxA	93.9	70-130		10/21/20 8:58
13C-PFDA	97.3	70-130		10/21/20 8:58
d5-NEtFOSAA	93.7	70-130		10/21/20 8:58

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Project Location: Hyannis, MA

Sample Description:

Work Order: 20J0491

Date Received: 10/8/2020

Field Sample #: HW-L(d)

Sampled: 10/7/2020 13:10

Sample ID: 20J0491-03

Sample Matrix: Ground Water

Semivolatile Organic Compounds by - LC/MS-MS

Analyte	Results	RL	DL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Perfluorobutanoic acid (PFBA)	5.0	2.0	0.64	ng/L	1		SOP 434-PFAAS	10/16/20	10/21/20 9:19	JFC
Perfluorobutanesulfonic acid (PFBS)	2.1	2.0	0.50	ng/L	1		SOP 434-PFAAS	10/16/20	10/21/20 9:19	JFC
Perfluoropentanoic acid (PFPeA)	18	2.0	0.42	ng/L	1		SOP 434-PFAAS	10/16/20	10/21/20 9:19	JFC
Perfluorohexanoic acid (PFHxA)	15	2.0	0.51	ng/L	1		SOP 434-PFAAS	10/16/20	10/21/20 9:19	JFC
Perfluorohexanesulfonic acid (PFHxS)	15	2.0	0.77	ng/L	1		SOP 434-PFAAS	10/16/20	10/21/20 9:19	JFC
Perfluoroheptanoic acid (PFHpA)	6.5	2.0	0.53	ng/L	1		SOP 434-PFAAS	10/16/20	10/21/20 9:19	JFC
Perfluoroheptanesulfonic acid (PFHpS)	ND	2.0	1.0	ng/L	1	U	SOP 434-PFAAS	10/16/20	10/21/20 9:19	JFC
Perfluorooctanoic acid (PFOA)	18	2.0	0.71	ng/L	1		SOP 434-PFAAS	10/16/20	10/21/20 9:19	JFC
Perfluorooctanesulfonic acid (PFOS)	39	2.0	0.68	ng/L	1		SOP 434-PFAAS	10/16/20	10/21/20 9:19	JFC
Perfluorooctanesulfonamide (FOSA)	ND	2.0	0.83	ng/L	1	U	SOP 434-PFAAS	10/16/20	10/21/20 9:19	JFC
6:2 Fluorotelomersulfonic acid (6:2FTS A)	0.78	2.0	0.39	ng/L	1		SOP 434-PFAAS	10/16/20	10/21/20 9:19	JFC
Perfluorononanoic acid (PFNA)	2.2	2.0	0.63	ng/L	1		SOP 434-PFAAS	10/16/20	10/21/20 9:19	JFC
Perfluorodecanoic acid (PFDA)	1.9	2.0	0.62	ng/L	1		SOP 434-PFAAS	10/16/20	10/21/20 9:19	JFC
Perfluorodecanesulfonic acid (PFDS)	ND	2.0	0.51	ng/L	1	U	SOP 434-PFAAS	10/16/20	10/21/20 9:19	JFC
N-EtFOSAA	ND	2.0	0.70	ng/L	1	U	SOP 434-PFAAS	10/16/20	10/21/20 9:19	JFC
8:2 Fluorotelomersulfonic acid (8:2FTS A)	ND	2.0	1.1	ng/L	1	U	SOP 434-PFAAS	10/16/20	10/21/20 9:19	JFC
Perfluoroundecanoic acid (PFUnA)	ND	2.0	0.49	ng/L	1	U	SOP 434-PFAAS	10/16/20	10/21/20 9:19	JFC
N-MeFOSAA	ND	2.0	0.62	ng/L	1	U	SOP 434-PFAAS	10/16/20	10/21/20 9:19	JFC
Perfluorododecanoic acid (PFDoA)	ND	2.0	0.50	ng/L	1	U	SOP 434-PFAAS	10/16/20	10/21/20 9:19	JFC
Perfluorotridecanoic acid (PFTrDA)	ND	2.0	0.67	ng/L	1	U	SOP 434-PFAAS	10/16/20	10/21/20 9:19	JFC
Perfluorotetradecanoic acid (PFTA)	ND	2.0	0.50	ng/L	1	U	SOP 434-PFAAS	10/16/20	10/21/20 9:19	JFC

Surrogates	% Recovery	Recovery Limits	Flag/Qual	
13C-PFHxA	92.6	70-130		10/21/20 9:19
13C-PFDA	95.1	70-130		10/21/20 9:19
d5-NEtFOSAA	91.8	70-130		10/21/20 9:19

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Sample Extraction Data

Prep Method: SOP 434-PFAAS **Analytical Method: SOP 434-PFAAS**

Lab Number [Field ID]	Batch	Initial [mL]	Final [mL]	Date
20J0491-01 [HW-L(s)]	B268850	250	1.00	10/16/20
20J0491-02 [HW-L(m)]	B268850	250	1.00	10/16/20
20J0491-03 [HW-L(d)]	B268850	250	1.00	10/16/20

Prep Method: SW-846 3510C **Analytical Method: SW-846 8270D-E**

Lab Number [Field ID]	Batch	Initial [mL]	Final [mL]	Date
20J0491-01 [HW-L(s)]	B268322	1000	1.00	10/09/20
20J0491-02 [HW-L(m)]	B268322	1010	1.00	10/09/20

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QUALITY CONTROL

1,4-Dioxane by isotope dilution GC/MS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B268322 - SW-846 3510C										
Blank (B268322-BLK1)				Prepared: 10/09/20 Analyzed: 10/13/20						
1,4-Dioxane	ND	0.20	µg/L							
Surrogate: 1,4-Dioxane-d8	*1.77*		µg/L	10.0		17.7	15-110			
LCS (B268322-BS1)				Prepared: 10/09/20 Analyzed: 10/13/20						
1,4-Dioxane	10.2	0.20	µg/L	10.0		102	40-140			
Surrogate: 1,4-Dioxane-d8	*2.12*		µg/L	10.0		21.2	15-110			
LCS Dup (B268322-BSD1)				Prepared: 10/09/20 Analyzed: 10/13/20						
1,4-Dioxane	10.5	0.20	µg/L	10.0		105	40-140	2.64	30	
Surrogate: 1,4-Dioxane-d8	*2.00*		µg/L	10.0		20.0	15-110			

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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

QUALITY CONTROL

Semivolatile Organic Compounds by - LC/MS-MS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC		%REC Limits	RPD	RPD Limit	Notes
Batch B268850 - SOP 434-PFAAS											
Blank (B268850-BLK1)				Prepared: 10/16/20 Analyzed: 10/21/20							
Perfluorobutanoic acid (PFBA)	ND	2.0	ng/L								U
Perfluorobutanesulfonic acid (PFBS)	ND	2.0	ng/L								U
Perfluoropentanoic acid (PFPeA)	ND	2.0	ng/L								U
Perfluorohexanoic acid (PFHxA)	ND	2.0	ng/L								U
Perfluorohexanesulfonic acid (PFHxS)	ND	2.0	ng/L								U
Perfluoroheptanoic acid (PFHpA)	ND	2.0	ng/L								U
Perfluoroheptanesulfonic acid (PFHpS)	ND	2.0	ng/L								U
Perfluorooctanoic acid (PFOA)	ND	2.0	ng/L								U
Perfluorooctanesulfonic acid (PFOS)	ND	2.0	ng/L								U
Perfluorooctanesulfonamide (FOSA)	ND	2.0	ng/L								U
6:2 Fluorotelomersulfonic acid (6:2FTS A)	ND	2.0	ng/L								U
Perfluorononanoic acid (PFNA)	ND	2.0	ng/L								U
Perfluorodecanoic acid (PFDA)	ND	2.0	ng/L								U
Perfluorodecanesulfonic acid (PFDS)	ND	2.0	ng/L								U
N-EtFOSAA	ND	2.0	ng/L								U
8:2 Fluorotelomersulfonic acid (8:2FTS A)	ND	2.0	ng/L								U
Perfluoroundecanoic acid (PFUnA)	ND	2.0	ng/L								U
N-MeFOSAA	ND	2.0	ng/L								U
Perfluorododecanoic acid (PFDoA)	ND	2.0	ng/L								U
Perfluorotridecanoic acid (PFTrDA)	ND	2.0	ng/L								U
Perfluorotetradecanoic acid (PFTA)	ND	2.0	ng/L								U
Surrogate: 13C-PFHxA	*34.6*		ng/L	40.0		86.4		70-130			
Surrogate: 13C-PFDA	*34.3*		ng/L	40.0		85.7		70-130			
Surrogate: d5-NEtFOSAA	*142*		ng/L	160		88.8		70-130			
LCS (B268850-BS1)				Prepared: 10/16/20 Analyzed: 10/21/20							
Perfluorobutanoic acid (PFBA)	7.73	2.0	ng/L	10.0		77.3		70-130			
Perfluorobutanesulfonic acid (PFBS)	8.90	2.0	ng/L	8.85		101		70-130			
Perfluoropentanoic acid (PFPeA)	10.6	2.0	ng/L	10.0		106		70-130			
Perfluorohexanoic acid (PFHxA)	9.40	2.0	ng/L	10.0		94.0		70-130			
Perfluorohexanesulfonic acid (PFHxS)	8.63	2.0	ng/L	9.10		94.8		70-130			
Perfluoroheptanoic acid (PFHpA)	9.58	2.0	ng/L	10.0		95.8		70-130			
Perfluoroheptanesulfonic acid (PFHpS)	8.67	2.0	ng/L	9.50		91.2		70-130			
Perfluorooctanoic acid (PFOA)	9.05	2.0	ng/L	10.0		90.5		70-130			
Perfluorooctanesulfonic acid (PFOS)	8.19	2.0	ng/L	9.25		88.5		70-130			
Perfluorooctanesulfonamide (FOSA)	7.77	2.0	ng/L	10.0		77.7		70-130			
6:2 Fluorotelomersulfonic acid (6:2FTS A)	12.1	2.0	ng/L	9.50		127		70-130			
Perfluorononanoic acid (PFNA)	8.68	2.0	ng/L	10.0		86.8		70-130			
Perfluorodecanoic acid (PFDA)	8.45	2.0	ng/L	10.0		84.5		70-130			
Perfluorodecanesulfonic acid (PFDS)	8.63	2.0	ng/L	9.65		89.5		70-130			
N-EtFOSAA	9.80	2.0	ng/L	10.0		98.0		70-130			
8:2 Fluorotelomersulfonic acid (8:2FTS A)	10.6	2.0	ng/L	9.60		111		70-130			
Perfluoroundecanoic acid (PFUnA)	8.46	2.0	ng/L	10.0		84.6		70-130			
N-MeFOSAA	10.6	2.0	ng/L	10.0		106		70-130			
Perfluorododecanoic acid (PFDoA)	8.32	2.0	ng/L	10.0		83.2		70-130			
Perfluorotridecanoic acid (PFTrDA)	8.21	2.0	ng/L	10.0		82.1		70-130			
Perfluorotetradecanoic acid (PFTA)	7.06	2.0	ng/L	10.0		70.6		70-130			
Surrogate: 13C-PFHxA	*33.3*		ng/L	40.0		83.4		70-130			
Surrogate: 13C-PFDA	*27.2*		ng/L	40.0		**67.9**	*	70-130			S-26
Surrogate: d5-NEtFOSAA	*119*		ng/L	160		74.3		70-130			

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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

FLAG/QUALIFIER SUMMARY

*	QC result is outside of established limits.
†	Wide recovery limits established for difficult compound.
‡	Wide RPD limits established for difficult compound.
#	Data exceeded client recommended or regulatory level
ND	Not Detected
RL	Reporting Limit is at the level of quantitation (LOQ)
DL	Detection Limit is the lower limit of detection determined by the MDL study
MCL	Maximum Contaminant Level

Percent recoveries and relative percent differences (RPDs) are determined by the software using values in the calculation which have not been rounded.

No results have been blank subtracted unless specified in the case narrative section.

S-26	Surrogate outside of control limits.
U	Analyte included in the analysis, but not detected

con-test® ANALYTICAL LABORATORY

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CERTIFICATIONS

Certified Analyses included in this Report

Analyte	Certifications
SOP 434-PFAAS in Water	
Perfluorobutanoic acid (PFBA)	NH-P
Perfluorobutanesulfonic acid (PFBS)	NH-P
Perfluoropentanoic acid (PFPeA)	NH-P
Perfluorohexanoic acid (PFHxA)	NH-P
Perfluorohexanesulfonic acid (PFHxS)	NH-P
Perfluoroheptanoic acid (PFHpA)	NH-P
Perfluorooctanoic acid (PFOA)	NH-P
Perfluorooctanesulfonic acid (PFOS)	NH-P
6:2 Fluorotelomersulfonic acid (6:2FTS A)	NH-P
Perfluorononanoic acid (PFNA)	NH-P
Perfluorodecanoic acid (PFDA)	NH-P
N-EtFOSAA	NH-P
8:2 Fluorotelomersulfonic acid (8:2FTS A)	NH-P
Perfluoroundecanoic acid (PFUnA)	NH-P
N-MeFOSAA	NH-P
Perfluorododecanoic acid (PFDoA)	NH-P
Perfluorotridecanoic acid (PFTrDA)	NH-P
Perfluorotetradecanoic acid (PFTA)	NH-P
SW-846 8270D-E in Water	
1,4-Dioxane	NY

The CON-TEST Environmental Laboratory operates under the following certifications and accreditations:

Code	Description	Number	Expires
AIHA	AIHA-LAP, LLC - ISO17025:2017	100033	03/1/2022
MA	Massachusetts DEP	M-MA100	06/30/2021
CT	Connecticut Department of Publilc Health	PH-0567	09/30/2021
NY	New York State Department of Health	10899 NELAP	04/1/2021
NH-S	New Hampshire Environmental Lab	2516 NELAP	02/5/2021
RI	Rhode Island Department of Health	LAO00112	12/30/2020
NC	North Carolina Div. of Water Quality	652	12/31/2020
NJ	New Jersey DEP	MA007 NELAP	06/30/2021
FL	Florida Department of Health	E871027 NELAP	06/30/2021
VT	Vermont Department of Health Lead Laboratory	LL015036	07/30/2021
ME	State of Maine	2011028	06/9/2021
VA	Commonwealth of Virginia	460217	12/14/2020
NH-P	New Hampshire Environmental Lab	2557 NELAP	09/6/2021
VT-DW	Vermont Department of Health Drinking Water	VT-255716	06/12/2021
NC-DW	North Carolina Department of Health	25703	07/31/2021
PA	Commonwealth of Pennsylvania DEP	68-05812	06/30/2021
MI	Dept. of Env, Great Lakes, and Energy	9100	09/6/2021

2050491

con-test ANALYTICAL LABORATORY

Phone: 413-525-2332
Fax: 413-525-6405
Email: info@contestlabs.com

http://www.contestlabs.com

CHAIN OF CUSTODY RECORD

39 Spruce Street
East Longmeadow, MA 01028

Doc # 381 Rev 2_06262019

Company Name: Horsley Witten Group
Address: 90 Rte 6A Sandwich MA 02563
Phone: (508) 833-6600
Project Name: Barnstable Municipal Airport
Project Location: Hyannis, MA
Project Number: 20102
Project Manager: Bryan Massa
Con-Test Quote Name/Number:
Invoice Recipient:
Sampled By: HW - SB + MD

Requested Turnaround Time
7-Day ☑ 10-Day ☐
PFAS 10-Day (std) ☐ Due Date:

Rush-Approval Required
1-Day ☐ 3-Day ☐
2-Day ☐ 4-Day ☐

Dissolved Metals Samples
○ Field Filtered
○ Lab to Filter

Orthophosphate Samples
○ Field Filtered
○ Lab to Filter

Data Delivery
Format: PDF ☑ EXCEL ☑
Other:
CLP Like Data Pkg Required: ☐
Email To: bmassa@horsleywitten.com
Fax To #:

ANALYSIS REQUESTED

Con-Test Work Order#	Client Sample ID / Description	Beginning Date/Time	Ending Date/Time	COMP/GRAB	[1]Matrix Code	Conc Code	VIALS	GLASS	PLASTIC	BACTERIA	ENCORE	PFAS. All	1,4-Dioxane
1	HW-L(s)	10/7/20	12:45	Grab	GW			✓	✓			✓	✓
2	HW-L(m)	10/7/20	11:25	Grab	GW			✓	✓			✓	✓
3	HW-L(d)	10/7/20	13:10	Grab	GW			.	✓			✓	

[2] Preservation Code

Courier Use Only
Total Number Of:
VIALS ___
GLASS 3
PLASTIC 6
BACTERIA ___
ENCORE ___

Glassware in the fridge? Y/N
Glassware in freezer? Y / N
Prepackaged Cooler? Y / N
*Contest is not responsible for missing samples from prepacked coolers

[1] **Matrix Codes:**
GW = Ground Water
WW = Waste Water
DW = Drinking Water
A = Air
S = Soil
SL = Sludge
SOL = Solid
O = Other (please define)

[2] **Preservation Codes:**
I = Iced
H = HCL
M = Methanol
N = Nitric Acid
S = Sulfuric Acid
B = Sodium Bisulfate
X = Sodium Hydroxide
T = Sodium Thiosulfate
O = Other (please define)

Relinquished/Received	Date/Time
Relinquished by: (signature) M. Wenner	10/8/20 1205
Received by: (signature) Paul Chartenay	10-8-20 1205
Relinquished by: (signature) Paul Chartenay	10-8-20 1605
Received by: (signature) [signature]	10/8/20 1825
Relinquished by: (signature) [signature]	10/8/20 1945
Received by: (signature) [signature] 2.5	10/8/20 1945
Relinquished by: (signature)	Date/Time:
Received by: (signature)	Date/Time:

Client Comments:

Detection Limit Requirements
MA: GW-1
CT:
Other:

Special Requirements
☑ MA MCP Required
MCP Certification Form Required
☐ CT RCP Required
RCP Certification Form Required
☐ MA State DW Required
PWSID #

Please use the following codes to indicate possible sample concentration within the Conc Code column above:
H - High; M - Medium; L - Low; C - Clean; U - Unknown

NELAC and AIHA-LAP, LLC Accredited

Project Entity
Government ☐ Municipality ☐ MWRA ☐ WRTA ☐
Federal ☐ 21 J ☐ School ☐
City ☐ Brownfield ☐ MBTA ☐

Other
☐ Chromatogram
☐ AIHA-LAP,LLC

PCB ONLY
☐ Soxhlet
☐ Non Soxhlet

Comments:

Disclaimer: Con-Test Labs is not responsible for any omitted information on the Chain of Custody. The Chain of Custody is a legal document that must be complete and accurate and is used to determine wh analyses the laboratory will perform. Any missing information is not the laboratory's responsibility. Co Test values your partnership on each project and will try to assist with missing information, but will not held accountable.

I Have Not Confirmed Sample Container Numbers With Lab Staff Before Relinquishing Over Samples______________

con-test®
ANALYTICAL LABORATORY

Doc# 277 Rev 5 2017

Login Sample Receipt Checklist - (Rejection Criteria Listing - Using Acceptance Policy) Any False Statement will be brought to the attention of the Client - State True or False

Client Horsley Witten

Received By [illegible] Date 10/8/20 Time 1945

How were the samples received? In Cooler T No Cooler ____ On Ice T No Ice ____
Direct from Sampling ____ Ambient ____ Melted Ice ____

Were samples within Temperature? 2-6°C T By Gun # 4 Actual Temp - 2.5
By Blank # ____ Actual Temp - ____

Was Custody Seal Intact? n/a Were Samples Tampered with? n/a
Was COC Relinquished ? T Does Chain Agree With Samples? T
Are there broken/leaking/loose caps on any samples? F
Is COC in ink/ Legible? T Were samples received within holding time? T
Did COC include all pertinent Information? Client T Analysis T Sampler Name T
Project T ID's T Collection Dates/Times T
Are Sample labels filled out and legible? T
Are there Lab to Filters? F Who was notified? ____
Are there Rushes? F Who was notified? ____
Are there Short Holds? F Who was notified? ____
Is there enough Volume? T
Is there Headspace where applicable? n/a MS/MSD? F
Proper Media/Containers Used? T Is splitting samples required? F
Were trip blanks received? F On COC? F
Do all samples have the proper pH? Acid n/a Base n/a

Vials	#	Containers:	#		#		#
Unp-		1 Liter Amb.		1 Liter Plastic		16 oz Amb.	
HCL-		500 mL Amb.		500 mL Plastic		8oz Amb/Clear	
Meoh-		250 mL Amb.		250 mL Plastic	6	4oz Amb/Clear	
Bisulfate-		Flashpoint		Col./Bacteria		2oz Amb/Clear	
DI-		Other Glass		Other Plastic		Encore	
Thiosulfate-		SOC Kit		Plastic Bag		Frozen:	
Sulfuric-		Perchlorate		Ziplock			

Unused Media

Vials	#	Containers:	#		#		#
Unp-		1 Liter Amb.		1 Liter Plastic		16 oz Amb.	
HCL-		500 mL Amb.		500 mL Plastic		8oz Amb/Clear	
Meoh-		250 mL Amb.		250 mL Plastic		4oz Amb/Clear	
Bisulfate-		Col./Bacteria		Flashpoint		2oz Amb/Clear	
DI-		Other Plastic		Other Glass		Encore	
Thiosulfate-		SOC Kit		Plastic Bag		Frozen:	
Sulfuric-		Perchlorate		Ziplock			

Comments:

MADEP MCP Analytical Method Report Certification Form

Laboratory Name: Con-Test Analytical Laboratory	Project #: 20J0491
Project Location: Hyannis, MA	RTN:

This Form provides certifications for the following data set: [list Laboratory Sample ID Number(s)]

20J0491-01 thru 20J0491-03

Matrices: Water

CAM Protocol (check all that below)

8260 VOC CAM II A ( )	7470/7471 Hg CAM IIIB ( )	MassDEP VPH CAM IV A ( )	8082 PCB CAM V A ( )	9014 Total Cyanide/PAC CAM VI A ( )	6860 Perchlorate CAM VIII B ( )
8270 SVOC CAM II B (X)	7010 Metals CAM III C ( )	MassDEP VPH CAM IV C ( )	8081 Pesticides CAM V B ( )	7196 Hex Cr CAM VI B ( )	MassDEP APH CAM IX A ( )
6010 Metals CAM III A ( )	6020 Metals CAM III D ( )	MassDEP EPH CAM IV B ( )	8151 Herbicides CAM V C ( )	8330 Explosives CAM VIII A ( )	TO-15 VOC CAM IX B ( )

Affirmative response to Questions A throughF is required for "Presumptive Certainty" status

A	Were all samples received in a condition consistent with those described on the Chain-of-Custody, properly preserved (including temperature) in the field or laboratory, and prepared/analyzed within method holding times?	☑ Yes ☐ No¹
B	Were the analytical method(s) and all associated QC requirements specificed in the selected CAM protocol(s) followed?	☑ Yes ☐ No¹
C	Were all required corrective actions and analytical response actions specified in the selected CAM protocol(s) implemented for all identified performance standard non-conformances?	☑ Yes ☐ No¹
D	Does the laboratory report comply with all the reporting requirements specified in CAM VII A, Quality Assurance and Quality Control Guidlines for the Acquisition and Reporting of Analytical Data?	☑ Yes ☐ No¹
E a	VPH, EPH, and APH Methods only: Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications).	☐ Yes ☐ No¹
E b	APH and TO-15 Methods only: Was the complete analyte list reported for each method?	☐ Yes ☐ No¹
F	Were all applicable CAM protocol QC and performance standard non-conformances identified and evaluated in a laboratory narrative (including all No responses to Qestions A through E)?	☑ Yes ☐ No¹

A response to questions G, H and I below is required for "Presumptive Certainty" status

G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocol(s)?	☑ Yes ☐ No¹

<u>Data User Note:</u> Data that achieve "Presumptive Certainty" status may not necessarily meet the data usability and representativeness requirements described in 310 CMR 40. 1056 (2)(k) and WSC-07-350.

H	Were all QC perfomance standards specified in the CAM protocol(s) achieved?	☑ Yes ☐ No¹
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	☑ Yes ☐ No¹

[1] *All Negative responses must be addressed in an attached Environmental Laboratory case narrative.*

I, the undersigned, attest under the pains and penalties of perjury that, based upon my personal inquiry of those responsible for obtaining the information, the material contained in this analytical report is, to the best of my knowledge and belief, accurate and complete.

Signature: Lisa Worthington　　Position: Technical Representative

Printed Name: Lisa A. Worthington　　Date: 10/21/20

ANALYTICAL REPORT

Lab Number:	L2041358
Client:	Horseley & Witten, Inc. Sextant Hill Office Park 90 Route 6A Sandwich, MA 02563
ATTN:	Brian Massa
Phone:	(508) 833-6600
Project Name:	BARNSTABLE AIRPORT
Project Number:	20102
Report Date:	10/14/20

Certifications & Approvals: MA (M-MA030), NH NELAP (2062), CT (PH-0141), DoD (L2474), FL (E87814), IL (200081), LA (85084), ME (MA00030), MD (350), NJ (MA015), NY (11627), NC (685), OH (CL106), PA (68-02089), RI (LAO00299), TX (T104704419), VT (VT-0015), VA (460194), WA (C954), US Army Corps of Engineers, USDA (Permit #P330-17-00150), USFWS (Permit #206964).

320 Forbes Boulevard, Mansfield, MA 02048-1806
508-822-9300 (Fax) 508-822-3288 800-624-9220 - www.alphalab.com

Project Name: BARNSTABLE AIRPORT
Project Number: 20102
Lab Number: L2041358
Report Date: 10/14/20

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L2041358-01	DL23(0-1)	SOIL	HYANNIS, MA	09/29/20 14:10	09/30/20
L2041358-02	A13(0-1)	SOIL	HYANNIS, MA	09/29/20 14:39	09/30/20
L2041358-03	A22(0-1)	SOIL	HYANNIS, MA	09/29/20 14:52	09/30/20
L2041358-04	A18(0-1)	SOIL	HYANNIS, MA	09/29/20 15:13	09/30/20
L2041358-05	DL15(0-1)	SOIL	HYANNIS, MA	09/30/20 11:22	09/30/20
L2041358-06	DL16(0-1)	SOIL	HYANNIS, MA	09/30/20 11:34	09/30/20

Project Name: BARNSTABLE AIRPORT **Lab Number:** L2041358
Project Number: 20102 **Report Date:** 10/14/20

MADEP MCP Response Action Analytical Report Certification

This form provides certifications for all samples performed by MCP methods. Please refer to the Sample Results and Container Information sections of this report for specification of MCP methods used for each analysis. The following questions pertain only to MCP Analytical Methods.

An affirmative response to questions A through F is required for "Presumptive Certainty" status		
A	Were all samples received in a condition consistent with those described on the Chain-of-Custody, properly preserved (including temperature) in the field or laboratory, and prepared/analyzed within method holding times?	YES
B	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	YES
C	Were all required corrective actions and analytical response actions specified in the selected CAM protocol(s) implemented for all identified performance standard non-conformances?	YES
D	Does the laboratory report comply with all the reporting requirements specified in CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data?"	YES
E a.	VPH, EPH, and APH Methods only: Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications).	N/A
E b.	APH and TO-15 Methods only: Was the complete analyte list reported for each method?	N/A
F	Were all applicable CAM protocol QC and performance standard non-conformances identified and evaluated in a laboratory narrative (including all "No" responses to Questions A through E)?	YES

A response to questions G, H and I is required for "Presumptive Certainty" status		
G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocol(s)?	YES
H	Were all QC performance standards specified in the CAM protocol(s) achieved?	YES
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	YES

For any questions answered "No", please refer to the case narrative section on the following page(s).

Please note that sample matrix information is located in the Sample Results section of this report.

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

Project Name: BARNSTABLE AIRPORT **Lab Number:** L2041358
Project Number: 20102 **Report Date:** 10/14/20

Case Narrative (continued)

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

MCP Related Narratives

Report Submission

All MCP required questions were answered with affirmative responses; therefore, there are no relevant protocol-specific QC and/or performance standard non-conformances to report.

Non-MCP Related Narratives

Perfluorinated Alkyl Acids by Isotope Dilution

L2041358-02, -03, -04, and -06: Extracted Internal Standard recoveries were outside the acceptance criteria for individual analytes. Please refer to the surrogate section of the report for details.

L2041358-05RE: The sample was re-extracted within holding time due to QC failures in the original extraction. The results of the re-extraction are reported. The sample has elevated detection limits due to the limited sample volume utilized during extraction, as required by the sample matrix. The reporting limit was elevated for NMeFOSAAdue to low recovery of the extracted internal standard d3-NMeFOSAA. The low recovery was attributed to the sample matrix. Extracted Internal Standard recoveries were outside the acceptance criteria for individual analytes. Please refer to the surrogate section of the report for details.

The WG1418580-2/-3 LCS/LCSD RPD, associated with L2041358-01, -02, -03, -04 and -06, are above the acceptance criteria for n-methyl perfluorooctanesulfonamidoacetic acid (nmefosaa) (42%).

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Susan E O'Neil Susan O' Neil

Title: Technical Director/Representative Date: 10/14/20

QC OUTLIER SUMMARY REPORT

Project Name: BARNSTABLE AIRPORT

Project Number: 20102

Lab Number: L2041358

Report Date: 10/14/20

Method	Client ID (Native ID)	Lab ID	Parameter	QC Type	Recovery/RPD (%)	QC Limits (%)	Associated Samples	Data Quality Assessment
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab								
LCMSMS-ID	Batch QC	WG1418580-3	N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	LCSD	42	30	01-04,06	non-directional bias

ORGANICS

SEMIVOLATILES

Project Name: BARNSTABLE AIRPORT **Lab Number:** L2041358
Project Number: 20102 **Report Date:** 10/14/20

SAMPLE RESULTS

Lab ID: L2041358-01
Client ID: DL23(0-1)
Sample Location: HYANNIS, MA

Date Collected: 09/29/20 14:10
Date Received: 09/30/20
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Analytical Method: 134,LCMSMS-ID
Analytical Date: 10/09/20 02:28
Analyst: SG
Percent Solids: 96%

Extraction Method: ALPHA 23528
Extraction Date: 10/06/20 11:45

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	0.480	J	ng/g	1.01	0.023	1
Perfluoropentanoic Acid (PFPeA)	0.841	J	ng/g	1.01	0.046	1
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/g	1.01	0.039	1
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/g	1.01	0.065	1
Perfluorohexanoic Acid (PFHxA)	0.480	J	ng/g	1.01	0.053	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/g	1.01	0.084	1
Perfluoroheptanoic Acid (PFHpA)	0.240	J	ng/g	1.01	0.046	1
Perfluorohexanesulfonic Acid (PFHxS)	0.134	J	ng/g	1.01	0.061	1
Perfluorooctanoic Acid (PFOA)	0.471	J	ng/g	1.01	0.042	1
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/g	1.01	0.181	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/g	1.01	0.138	1
Perfluorononanoic Acid (PFNA)	0.176	J	ng/g	1.01	0.076	1
Perfluorooctanesulfonic Acid (PFOS)	0.725	J	ng/g	1.01	0.131	1
Perfluorodecanoic Acid (PFDA)	0.266	J	ng/g	1.01	0.068	1
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/g	1.01	0.289	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/g	1.01	0.302	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/g	1.01	0.203	1
Perfluoroundecanoic Acid (PFUnA)	0.162	JF	ng/g	1.01	0.047	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/g	1.01	0.154	1
Perfluorooctanesulfonamide (FOSA)	ND		ng/g	1.01	0.099	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/g	1.01	0.085	1
Perfluorododecanoic Acid (PFDoA)	0.078	JF	ng/g	1.01	0.071	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/g	1.01	0.206	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/g	1.01	0.055	1

Project Name:	BARNSTABLE AIRPORT	**Lab Number:**	L2041358
Project Number:	20102	**Report Date:**	10/14/20

SAMPLE RESULTS

Lab ID:	L2041358-01	Date Collected:	09/29/20 14:10
Client ID:	DL23(0-1)	Date Received:	09/30/20
Sample Location:	HYANNIS, MA	Field Prep:	Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor

Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	83		60-153
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	92		65-182
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	99		70-151
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	114		56-138
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	78		61-147
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	81		62-149
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	91		63-166
Perfluoro[13C8]Octanoic Acid (M8PFOA)	85		62-152
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	96		32-182
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	90		61-154
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	98		65-151
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	82		65-150
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	108		25-186
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	97		45-137
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	98		64-158
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	63		1-125
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	91		42-136
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	94		56-148
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	88		26-160

Project Name: BARNSTABLE AIRPORT **Lab Number:** L2041358

Project Number: 20102 **Report Date:** 10/14/20

SAMPLE RESULTS

Lab ID:	L2041358-02	Date Collected:	09/29/20 14:39
Client ID:	A13(0-1)	Date Received:	09/30/20
Sample Location:	HYANNIS, MA	Field Prep:	Not Specified
Sample Depth:			
Matrix:	Soil	Extraction Method:	ALPHA 23528
Analytical Method:	134,LCMSMS-ID	Extraction Date:	10/06/20 11:45
Analytical Date:	10/09/20 02:45		
Analyst:	SG		
Percent Solids:	98%		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	0.279	J	ng/g	0.966	0.022	1
Perfluoropentanoic Acid (PFPeA)	0.614	J	ng/g	0.966	0.044	1
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/g	0.966	0.038	1
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/g	0.966	0.062	1
Perfluorohexanoic Acid (PFHxA)	0.352	J	ng/g	0.966	0.051	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/g	0.966	0.081	1
Perfluoroheptanoic Acid (PFHpA)	0.396	J	ng/g	0.966	0.044	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/g	0.966	0.058	1
Perfluorooctanoic Acid (PFOA)	0.670	J	ng/g	0.966	0.040	1
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/g	0.966	0.173	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/g	0.966	0.132	1
Perfluorononanoic Acid (PFNA)	1.19		ng/g	0.966	0.072	1
Perfluorooctanesulfonic Acid (PFOS)	1.32		ng/g	0.966	0.126	1
Perfluorodecanoic Acid (PFDA)	0.340	J	ng/g	0.966	0.065	1
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/g	0.966	0.277	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/g	0.966	0.289	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/g	0.966	0.194	1
Perfluoroundecanoic Acid (PFUnA)	0.082	J	ng/g	0.966	0.045	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/g	0.966	0.148	1
Perfluorooctanesulfonamide (FOSA)	ND		ng/g	0.966	0.095	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/g	0.966	0.082	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/g	0.966	0.068	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/g	0.966	0.197	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/g	0.966	0.052	1

Project Name: BARNSTABLE AIRPORT **Lab Number:** L2041358

Project Number: 20102 **Report Date:** 10/14/20

SAMPLE RESULTS

Lab ID:	L2041358-02	Date Collected:	09/29/20 14:39
Client ID:	A13(0-1)	Date Received:	09/30/20
Sample Location:	HYANNIS, MA	Field Prep:	Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor

Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	101		60-153
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	114		65-182
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	119		70-151
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	123		56-138
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	101		61-147
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	109		62-149
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	123		63-166
Perfluoro[13C8]Octanoic Acid (M8PFOA)	108		62-152
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	106		32-182
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	115		61-154
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	118		65-151
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	111		65-150
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	117		25-186
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	**27**	Q	45-137
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	130		64-158
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	17		1-125
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	**32**	Q	42-136
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	126		56-148
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	117		26-160

Project Name: BARNSTABLE AIRPORT

Lab Number: L2041358

Project Number: 20102

Report Date: 10/14/20

SAMPLE RESULTS

Lab ID:	L2041358-03	Date Collected:	09/29/20 14:52
Client ID:	A22(0-1)	Date Received:	09/30/20
Sample Location:	HYANNIS, MA	Field Prep:	Not Specified
Sample Depth:			
Matrix:	Soil	Extraction Method:	ALPHA 23528
Analytical Method:	134,LCMSMS-ID	Extraction Date:	10/06/20 11:45
Analytical Date:	10/09/20 03:01		
Analyst:	SG		
Percent Solids:	97%		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	0.068	J	ng/g	0.912	0.021	1
Perfluoropentanoic Acid (PFPeA)	0.186	J	ng/g	0.912	0.042	1
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/g	0.912	0.036	1
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/g	0.912	0.059	1
Perfluorohexanoic Acid (PFHxA)	0.113	J	ng/g	0.912	0.048	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/g	0.912	0.076	1
Perfluoroheptanoic Acid (PFHpA)	0.096	J	ng/g	0.912	0.041	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/g	0.912	0.055	1
Perfluorooctanoic Acid (PFOA)	0.069	JF	ng/g	0.912	0.038	1
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/g	0.912	0.164	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/g	0.912	0.124	1
Perfluorononanoic Acid (PFNA)	0.110	J	ng/g	0.912	0.068	1
Perfluorooctanesulfonic Acid (PFOS)	0.559	J	ng/g	0.912	0.119	1
Perfluorodecanoic Acid (PFDA)	0.119	J	ng/g	0.912	0.061	1
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/g	0.912	0.262	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/g	0.912	0.273	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/g	0.912	0.184	1
Perfluoroundecanoic Acid (PFUnA)	0.092	J	ng/g	0.912	0.043	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/g	0.912	0.140	1
Perfluorooctanesulfonamide (FOSA)	ND		ng/g	0.912	0.089	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/g	0.912	0.077	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/g	0.912	0.064	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/g	0.912	0.186	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/g	0.912	0.049	1

Project Name: BARNSTABLE AIRPORT **Lab Number:** L2041358

Project Number: 20102 **Report Date:** 10/14/20

SAMPLE RESULTS

Lab ID:	L2041358-03	Date Collected:	09/29/20 14:52
Client ID:	A22(0-1)	Date Received:	09/30/20
Sample Location:	HYANNIS, MA	Field Prep:	Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor

Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	**41**	Q	60-153
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	**53**	Q	65-182
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	106		70-151
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	105		56-138
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	**54**	Q	61-147
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	65		62-149
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	121		63-166
Perfluoro[13C8]Octanoic Acid (M8PFOA)	73		62-152
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	90		32-182
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	80		61-154
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	109		65-151
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	80		65-150
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	99		25-186
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	**20**	Q	45-137
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	94		64-158
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	10		1-125
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	**17**	Q	42-136
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	90		56-148
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	77		26-160

Project Name:	BARNSTABLE AIRPORT	**Lab Number:**	L2041358
Project Number:	20102	**Report Date:**	10/14/20

SAMPLE RESULTS

Lab ID:	L2041358-04	Date Collected:	09/29/20 15:13
Client ID:	A18(0-1)	Date Received:	09/30/20
Sample Location:	HYANNIS, MA	Field Prep:	Not Specified
Sample Depth:			
Matrix:	Soil	Extraction Method:	ALPHA 23528
Analytical Method:	134,LCMSMS-ID	Extraction Date:	10/06/20 11:45
Analytical Date:	10/09/20 03:18		
Analyst:	SG		
Percent Solids:	98%		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	0.218	J	ng/g	0.897	0.020	1
Perfluoropentanoic Acid (PFPeA)	0.332	J	ng/g	0.897	0.041	1
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/g	0.897	0.035	1
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/g	0.897	0.058	1
Perfluorohexanoic Acid (PFHxA)	0.134	J	ng/g	0.897	0.047	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/g	0.897	0.075	1
Perfluoroheptanoic Acid (PFHpA)	0.076	J	ng/g	0.897	0.040	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/g	0.897	0.054	1
Perfluorooctanoic Acid (PFOA)	0.111	J	ng/g	0.897	0.038	1
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/g	0.897	0.161	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/g	0.897	0.122	1
Perfluorononanoic Acid (PFNA)	0.281	J	ng/g	0.897	0.067	1
Perfluorooctanesulfonic Acid (PFOS)	1.15		ng/g	0.897	0.117	1
Perfluorodecanoic Acid (PFDA)	0.146	J	ng/g	0.897	0.060	1
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/g	0.897	0.257	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/g	0.897	0.268	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/g	0.897	0.181	1
Perfluoroundecanoic Acid (PFUnA)	0.204	J	ng/g	0.897	0.042	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/g	0.897	0.137	1
Perfluorooctanesulfonamide (FOSA)	ND		ng/g	0.897	0.088	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/g	0.897	0.076	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/g	0.897	0.063	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/g	0.897	0.183	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/g	0.897	0.048	1

Project Name: BARNSTABLE AIRPORT **Lab Number:** L2041358
Project Number: 20102 **Report Date:** 10/14/20

SAMPLE RESULTS

Lab ID:	L2041358-04	Date Collected:	09/29/20 15:13
Client ID:	A18(0-1)	Date Received:	09/30/20
Sample Location:	HYANNIS, MA	Field Prep:	Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor

Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	91		60-153
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	106		65-182
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	116		70-151
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	120		56-138
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	93		61-147
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	100		62-149
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	133		63-166
Perfluoro[13C8]Octanoic Acid (M8PFOA)	101		62-152
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	100		32-182
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	109		61-154
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	121		65-151
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	106		65-150
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	110		25-186
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	**24**	Q	45-137
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	129		64-158
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	27		1-125
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	**26**	Q	42-136
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	120		56-148
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	101		26-160

Project Name: BARNSTABLE AIRPORT **Lab Number:** L2041358
Project Number: 20102 **Report Date:** 10/14/20

SAMPLE RESULTS

Lab ID: L2041358-05 RE
Client ID: DL15(0-1)
Sample Location: HYANNIS, MA

Date Collected: 09/30/20 11:22
Date Received: 09/30/20
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Analytical Method: 134,LCMSMS-ID
Analytical Date: 10/14/20 12:12
Analyst: JW
Percent Solids: 94%

Extraction Method: ALPHA 23528
Extraction Date: 10/13/20 18:30

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	0.220	J	ng/g	3.89	0.088	1
Perfluoropentanoic Acid (PFPeA)	0.241	J	ng/g	3.89	0.179	1
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/g	3.89	0.152	1
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/g	3.89	0.251	1
Perfluorohexanoic Acid (PFHxA)	0.278	J	ng/g	3.89	0.204	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/g	3.89	0.324	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/g	3.89	0.175	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/g	3.89	0.235	1
Perfluorooctanoic Acid (PFOA)	0.334	J	ng/g	3.89	0.163	1
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/g	3.89	0.698	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/g	3.89	0.531	1
Perfluorononanoic Acid (PFNA)	ND		ng/g	3.89	0.292	1
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/g	3.89	0.505	1
Perfluorodecanoic Acid (PFDA)	ND		ng/g	3.89	0.260	1
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/g	3.89	1.12	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/g	3.89	1.16	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/g	38.9	0.783	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/g	3.89	0.182	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/g	3.89	0.595	1
Perfluorooctanesulfonamide (FOSA)	ND		ng/g	3.89	0.381	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	3.45	J	ng/g	3.89	0.328	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/g	3.89	0.272	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/g	3.89	0.795	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/g	3.89	0.210	1

Project Name: BARNSTABLE AIRPORT **Lab Number:** L2041358
Project Number: 20102 **Report Date:** 10/14/20

SAMPLE RESULTS

Lab ID:	L2041358-05	RE	Date Collected:	09/30/20 11:22
Client ID:	DL15(0-1)		Date Received:	09/30/20
Sample Location:	HYANNIS, MA		Field Prep:	Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor

Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	**36**	Q	60-153
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	**39**	Q	65-182
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	**69**	Q	70-151
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	**23**	Q	56-138
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	**42**	Q	61-147
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	**47**	Q	62-149
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	79		63-166
Perfluoro[13C8]Octanoic Acid (M8PFOA)	**50**	Q	62-152
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	**31**	Q	32-182
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	**55**	Q	61-154
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	78		65-151
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	**54**	Q	65-150
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	39		25-186
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	**0**	Q	45-137
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	**56**	Q	64-158
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	12		1-125
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	**1**	Q	42-136
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	**53**	Q	56-148
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	34		26-160

Project Name: BARNSTABLE AIRPORT **Lab Number:** L2041358

Project Number: 20102 **Report Date:** 10/14/20

SAMPLE RESULTS

Lab ID:	L2041358-06	Date Collected:	09/30/20 11:34
Client ID:	DL16(0-1)	Date Received:	09/30/20
Sample Location:	HYANNIS, MA	Field Prep:	Not Specified
Sample Depth:			
Matrix:	Soil	Extraction Method:	ALPHA 23528
Analytical Method:	134,LCMSMS-ID	Extraction Date:	10/06/20 11:45
Analytical Date:	10/09/20 03:53		
Analyst:	SG		
Percent Solids:	97%		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	0.252	J	ng/g	0.939	0.021	1
Perfluoropentanoic Acid (PFPeA)	0.313	J	ng/g	0.939	0.043	1
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/g	0.939	0.037	1
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/g	0.939	0.061	1
Perfluorohexanoic Acid (PFHxA)	0.184	J	ng/g	0.939	0.049	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/g	0.939	0.078	1
Perfluoroheptanoic Acid (PFHpA)	0.138	J	ng/g	0.939	0.042	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/g	0.939	0.057	1
Perfluorooctanoic Acid (PFOA)	0.223	J	ng/g	0.939	0.039	1
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/g	0.939	0.168	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/g	0.939	0.128	1
Perfluorononanoic Acid (PFNA)	0.285	J	ng/g	0.939	0.070	1
Perfluorooctanesulfonic Acid (PFOS)	0.575	J	ng/g	0.939	0.122	1
Perfluorodecanoic Acid (PFDA)	0.181	J	ng/g	0.939	0.063	1
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/g	0.939	0.270	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/g	0.939	0.281	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/g	0.939	0.189	1
Perfluoroundecanoic Acid (PFUnA)	0.118	J	ng/g	0.939	0.044	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/g	0.939	0.144	1
Perfluorooctanesulfonamide (FOSA)	ND		ng/g	0.939	0.092	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/g	0.939	0.079	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/g	0.939	0.066	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/g	0.939	0.192	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/g	0.939	0.051	1

Project Name: BARNSTABLE AIRPORT **Lab Number:** L2041358
Project Number: 20102 **Report Date:** 10/14/20

SAMPLE RESULTS

Lab ID:	L2041358-06	Date Collected:	09/30/20 11:34
Client ID:	DL16(0-1)	Date Received:	09/30/20
Sample Location:	HYANNIS, MA	Field Prep:	Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor

Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	63		60-153
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	74		65-182
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	109		70-151
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	85		56-138
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	69		61-147
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	78		62-149
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	124		63-166
Perfluoro[13C8]Octanoic Acid (M8PFOA)	79		62-152
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	78		32-182
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	89		61-154
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	115		65-151
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	88		65-150
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	100		25-186
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	**2**	Q	45-137
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	108		64-158
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	30		1-125
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	**4**	Q	42-136
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	100		56-148
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	104		26-160

Project Name: BARNSTABLE AIRPORT
Project Number: 20102

Lab Number: L2041358
Report Date: 10/14/20

Method Blank Analysis
Batch Quality Control

Analytical Method: 134,LCMSMS-ID
Analytical Date: 10/09/20 01:39
Analyst: SG

Extraction Method: ALPHA 23528
Extraction Date: 10/06/20 11:45

Parameter	Result	Qualifier	Units	RL	MDL
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab for sample(s): 01-04,06 Batch: WG1418580-1					
Perfluorobutanoic Acid (PFBA)	ND		ng/g	1.00	0.023
Perfluoropentanoic Acid (PFPeA)	ND		ng/g	1.00	0.046
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/g	1.00	0.039
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/g	1.00	0.065
Perfluorohexanoic Acid (PFHxA)	ND		ng/g	1.00	0.053
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/g	1.00	0.084
Perfluoroheptanoic Acid (PFHpA)	ND		ng/g	1.00	0.045
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/g	1.00	0.061
Perfluorooctanoic Acid (PFOA)	ND		ng/g	1.00	0.042
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/g	1.00	0.180
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/g	1.00	0.136
Perfluorononanoic Acid (PFNA)	ND		ng/g	1.00	0.075
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/g	1.00	0.130
Perfluorodecanoic Acid (PFDA)	ND		ng/g	1.00	0.067
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/g	1.00	0.287
Perfluorononanesulfonic Acid (PFNS)	ND		ng/g	1.00	0.299
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/g	1.00	0.202
Perfluoroundecanoic Acid (PFUnA)	ND		ng/g	1.00	0.047
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/g	1.00	0.153
Perfluorooctanesulfonamide (FOSA)	ND		ng/g	1.00	0.098
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/g	1.00	0.085
Perfluorododecanoic Acid (PFDoA)	ND		ng/g	1.00	0.070
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/g	1.00	0.204
Perfluorotetradecanoic Acid (PFTA)	ND		ng/g	1.00	0.054

Project Name: BARNSTABLE AIRPORT
Project Number: 20102

Lab Number: L2041358
Report Date: 10/14/20

Method Blank Analysis
Batch Quality Control

Analytical Method: 134,LCMSMS-ID
Analytical Date: 10/09/20 01:39
Analyst: SG

Extraction Method: ALPHA 23528
Extraction Date: 10/06/20 11:45

Parameter	Result	Qualifier	Units	RL	MDL
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab for sample(s): 01-04,06 Batch: WG1418580-1					

Surrogate (Extracted Internal Standard)	%Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	110		60-153
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	126		65-182
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	123		70-151
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	129		56-138
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	105		61-147
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	113		62-149
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	136		63-166
Perfluoro[13C8]Octanoic Acid (M8PFOA)	116		62-152
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	110		32-182
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	122		61-154
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	127		65-151
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	119		65-150
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	119		25-186
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	102		45-137
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	143		64-158
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	11		1-125
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	106		42-136
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	133		56-148
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	122		26-160

Project Name: BARNSTABLE AIRPORT
Lab Number: L2041358
Project Number: 20102
Report Date: 10/14/20

Method Blank Analysis
Batch Quality Control

Analytical Method: 134,LCMSMS-ID
Analytical Date: 10/14/20 10:49
Analyst: JW

Extraction Method: ALPHA 23528
Extraction Date: 10/13/20 18:30

Parameter	Result	Qualifier	Units	RL	MDL
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab for sample(s): 05 Batch: WG1421673-1					
Perfluorobutanoic Acid (PFBA)	ND		ng/g	1.00	0.023
Perfluoropentanoic Acid (PFPeA)	ND		ng/g	1.00	0.046
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/g	1.00	0.039
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/g	1.00	0.065
Perfluorohexanoic Acid (PFHxA)	ND		ng/g	1.00	0.053
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/g	1.00	0.084
Perfluoroheptanoic Acid (PFHpA)	ND		ng/g	1.00	0.045
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/g	1.00	0.061
Perfluorooctanoic Acid (PFOA)	ND		ng/g	1.00	0.042
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/g	1.00	0.180
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/g	1.00	0.136
Perfluorononanoic Acid (PFNA)	ND		ng/g	1.00	0.075
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/g	1.00	0.130
Perfluorodecanoic Acid (PFDA)	ND		ng/g	1.00	0.067
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/g	1.00	0.287
Perfluorononanesulfonic Acid (PFNS)	ND		ng/g	1.00	0.299
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/g	1.00	0.202
Perfluoroundecanoic Acid (PFUnA)	ND		ng/g	1.00	0.047
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/g	1.00	0.153
Perfluorooctanesulfonamide (FOSA)	ND		ng/g	1.00	0.098
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/g	1.00	0.085
Perfluorododecanoic Acid (PFDoA)	ND		ng/g	1.00	0.070
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/g	1.00	0.204
Perfluorotetradecanoic Acid (PFTA)	ND		ng/g	1.00	0.054

Project Name: BARNSTABLE AIRPORT
Project Number: 20102

Lab Number: L2041358
Report Date: 10/14/20

Method Blank Analysis
Batch Quality Control

Analytical Method: 134,LCMSMS-ID
Analytical Date: 10/14/20 10:49
Analyst: JW

Extraction Method: ALPHA 23528
Extraction Date: 10/13/20 18:30

Parameter	Result	Qualifier	Units	RL	MDL
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab for sample(s): 05 Batch: WG1421673-1					

Surrogate (Extracted Internal Standard)	%Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	94		60-153
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	94		65-182
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	97		70-151
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	60		56-138
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	94		61-147
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	98		62-149
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	106		63-166
Perfluoro[13C8]Octanoic Acid (M8PFOA)	100		62-152
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	70		32-182
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	108		61-154
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	100		65-151
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	97		65-150
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	78		25-186
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	62		45-137
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	101		64-158
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	8		1-125
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	67		42-136
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	97		56-148
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	72		26-160

Lab Control Sample Analysis
Batch Quality Control

Project Name: BARNSTABLE AIRPORT
Project Number: 20102

Lab Number: L2041358
Report Date: 10/14/20

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 01-04,06 Batch: WG1418580-2 WG1418580-3								
Perfluorobutanoic Acid (PFBA)	98		96		71-135	2		30
Perfluoropentanoic Acid (PFPeA)	100		97		69-132	3		30
Perfluorobutanesulfonic Acid (PFBS)	100		97		72-128	3		30
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	112		109		62-145	3		30
Perfluorohexanoic Acid (PFHxA)	100		102		70-132	2		30
Perfluoropentanesulfonic Acid (PFPeS)	89		91		73-123	2		30
Perfluoroheptanoic Acid (PFHpA)	97		97		71-131	0		30
Perfluorohexanesulfonic Acid (PFHxS)	75		79		67-130	5		30
Perfluorooctanoic Acid (PFOA)	101		100		69-133	1		30
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	103		101		64-140	2		30
Perfluoroheptanesulfonic Acid (PFHpS)	93		86		70-132	8		30
Perfluorononanoic Acid (PFNA)	100		94		72-129	6		30
Perfluorooctanesulfonic Acid (PFOS)	100		94		68-136	6		30
Perfluorodecanoic Acid (PFDA)	102		100		69-133	2		30
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	107		110		65-137	3		30
Perfluorononanesulfonic Acid (PFNS)	105		98		69-125	7		30
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	136		89		63-144	**42**	Q	30
Perfluoroundecanoic Acid (PFUnA)	102		95		64-136	7		30
Perfluorodecanesulfonic Acid (PFDS)	106		101		59-134	5		30
Perfluorooctanesulfonamide (FOSA)	94		116		67-137	21		30
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	104		110		61-139	6		30
Perfluorododecanoic Acid (PFDoA)	93		89		69-135	4		30

Lab Control Sample Analysis
Batch Quality Control

Project Name: BARNSTABLE AIRPORT
Lab Number: L2041358
Project Number: 20102
Report Date: 10/14/20

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 01-04,06 Batch: WG1418580-2 WG1418580-3								
Perfluorotridecanoic Acid (PFTrDA)	108		101		66-139	7		30
Perfluorotetradecanoic Acid (PFTA)	98		96		69-133	2		30

Surrogate (Extracted Internal Standard)	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	103		117		60-153
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	117		130		65-182
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	117		123		70-151
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	132		132		56-138
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	102		107		61-147
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	109		116		62-149
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	128		129		63-166
Perfluoro[13C8]Octanoic Acid (M8PFOA)	110		117		62-152
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	108		116		32-182
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	115		125		61-154
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	118		128		65-151
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	113		122		65-150
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	115		119		25-186
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	81		121		45-137
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	127		139		64-158
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	10		21		1-125
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	104		111		42-136
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	120		135		56-148
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	117		128		26-160

Lab Control Sample Analysis
Batch Quality Control

Project Name: BARNSTABLE AIRPORT **Lab Number:** L2041358
Project Number: 20102 **Report Date:** 10/14/20

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 05 Batch: WG1421673-2 WG1421673-3								
Perfluorobutanoic Acid (PFBA)	99		101		71-135	2		30
Perfluoropentanoic Acid (PFPeA)	98		100		69-132	2		30
Perfluorobutanesulfonic Acid (PFBS)	92		94		72-128	2		30
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	112		118		62-145	5		30
Perfluorohexanoic Acid (PFHxA)	100		101		70-132	1		30
Perfluoropentanesulfonic Acid (PFPeS)	88		92		73-123	4		30
Perfluoroheptanoic Acid (PFHpA)	97		100		71-131	3		30
Perfluorohexanesulfonic Acid (PFHxS)	94		100		67-130	6		30
Perfluorooctanoic Acid (PFOA)	97		97		69-133	0		30
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	108		108		64-140	0		30
Perfluoroheptanesulfonic Acid (PFHpS)	94		101		70-132	7		30
Perfluorononanoic Acid (PFNA)	98		98		72-129	0		30
Perfluorooctanesulfonic Acid (PFOS)	107		104		68-136	3		30
Perfluorodecanoic Acid (PFDA)	96		98		69-133	2		30
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	110		113		65-137	3		30
Perfluorononanesulfonic Acid (PFNS)	111		108		69-125	3		30
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	108		99		63-144	9		30
Perfluoroundecanoic Acid (PFUnA)	101		106		64-136	5		30
Perfluorodecanesulfonic Acid (PFDS)	117		123		59-134	5		30
Perfluorooctanesulfonamide (FOSA)	92		105		67-137	13		30
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	104		107		61-139	3		30
Perfluorododecanoic Acid (PFDoA)	99		104		69-135	5		30

Lab Control Sample Analysis
Batch Quality Control

Project Name: BARNSTABLE AIRPORT
Project Number: 20102

Lab Number: L2041358
Report Date: 10/14/20

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 05 Batch: WG1421673-2 WG1421673-3								
Perfluorotridecanoic Acid (PFTrDA)	99		103		66-139	4		30
Perfluorotetradecanoic Acid (PFTA)	108		109		69-133	1		30

Surrogate (Extracted Internal Standard)	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	95		94		60-153
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	94		93		65-182
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	94		95		70-151
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	64		64		56-138
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	93		93		61-147
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	97		96		62-149
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	104		103		63-166
Perfluoro[13C8]Octanoic Acid (M8PFOA)	101		100		62-152
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	73		70		32-182
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	109		108		61-154
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	99		100		65-151
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	98		99		65-150
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	77		77		25-186
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	59		67		45-137
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	104		101		64-158
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	9		4		1-125
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	71		70		42-136
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	99		97		56-148
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	74		72		26-160

INORGANICS
&
MISCELLANEOUS

Project Name: BARNSTABLE AIRPORT
Project Number: 20102

Lab Number: L2041358
Report Date: 10/14/20

SAMPLE RESULTS

Lab ID: L2041358-01
Client ID: DL23(0-1)
Sample Location: HYANNIS, MA

Date Collected: 09/29/20 14:10
Date Received: 09/30/20
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Mansfield Lab										
Solids, Total	95.8		%	0.100	0.100	1	-	10/01/20 10:33	121,2540G	JW

Project Name: BARNSTABLE AIRPORT
Project Number: 20102

Lab Number: L2041358
Report Date: 10/14/20

SAMPLE RESULTS

Lab ID: L2041358-02
Client ID: A13(0-1)
Sample Location: HYANNIS, MA

Date Collected: 09/29/20 14:39
Date Received: 09/30/20
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Mansfield Lab										
Solids, Total	97.7		%	0.100	0.100	1	-	10/01/20 10:33	121,2540G	JW

Project Name: BARNSTABLE AIRPORT
Lab Number: L2041358
Project Number: 20102
Report Date: 10/14/20

SAMPLE RESULTS

Lab ID: L2041358-03
Date Collected: 09/29/20 14:52
Client ID: A22(0-1)
Date Received: 09/30/20
Sample Location: HYANNIS, MA
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Mansfield Lab										
Solids, Total	97.2		%	0.100	0.100	1	-	10/01/20 10:33	121,2540G	JW

Project Name: BARNSTABLE AIRPORT
Lab Number: L2041358
Project Number: 20102
Report Date: 10/14/20

SAMPLE RESULTS

Lab ID: L2041358-04
Date Collected: 09/29/20 15:13
Client ID: A18(0-1)
Date Received: 09/30/20
Sample Location: HYANNIS, MA
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Mansfield Lab										
Solids, Total	97.8		%	0.100	0.100	1	-	10/01/20 10:33	121,2540G	JW

Project Name: BARNSTABLE AIRPORT | **Lab Number:** L2041358
Project Number: 20102 | **Report Date:** 10/14/20

SAMPLE RESULTS

Lab ID: L2041358-05 | Date Collected: 09/30/20 11:22
Client ID: DL15(0-1) | Date Received: 09/30/20
Sample Location: HYANNIS, MA | Field Prep: Not Specified

Sample Depth:
Matrix: Soil

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Mansfield Lab										
Solids, Total	94.4		%	0.100	0.100	1	-	10/01/20 10:33	121,2540G	JW

Project Name: BARNSTABLE AIRPORT
Project Number: 20102

Lab Number: L2041358
Report Date: 10/14/20

SAMPLE RESULTS

Lab ID: L2041358-06
Client ID: DL16(0-1)
Sample Location: HYANNIS, MA

Date Collected: 09/30/20 11:34
Date Received: 09/30/20
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Mansfield Lab										
Solids, Total	96.8		%	0.100	0.100	1	-	10/01/20 10:33	121,2540G	JW

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information

Cooler	Custody Seal
A	Absent

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2041358-01A	Plastic 8oz unpreserved	A	NA		5.5	Y	Absent		A2-537-ISOTOPE(14)
L2041358-01B	Plastic 2oz unpreserved for TS	A	NA		5.5	Y	Absent		A2-TS(7)
L2041358-02A	Plastic 8oz unpreserved	A	NA		5.5	Y	Absent		A2-537-ISOTOPE(14)
L2041358-02B	Plastic 2oz unpreserved for TS	A	NA		5.5	Y	Absent		A2-TS(7)
L2041358-03A	Plastic 8oz unpreserved	A	NA		5.5	Y	Absent		A2-537-ISOTOPE(14)
L2041358-03B	Plastic 2oz unpreserved for TS	A	NA		5.5	Y	Absent		A2-TS(7)
L2041358-04A	Plastic 8oz unpreserved	A	NA		5.5	Y	Absent		A2-537-ISOTOPE(14)
L2041358-04B	Plastic 2oz unpreserved for TS	A	NA		5.5	Y	Absent		A2-TS(7)
L2041358-05A	Plastic 8oz unpreserved	A	NA		5.5	Y	Absent		A2-537-ISOTOPE(14)
L2041358-05B	Plastic 2oz unpreserved for TS	A	NA		5.5	Y	Absent		A2-TS(7)
L2041358-06A	Plastic 8oz unpreserved	A	NA		5.5	Y	Absent		A2-537-ISOTOPE(14)
L2041358-06B	Plastic 2oz unpreserved for TS	A	NA		5.5	Y	Absent		A2-TS(7)

*Values in parentheses indicate holding time in days

PFAS PARAMETER SUMMARY

Parameter	Acronym	CAS Number
PERFLUOROALKYL CARBOXYLIC ACIDS (PFCAs)		
Perfluorooctadecanoic Acid	PFODA	16517-11-6
Perfluorohexadecanoic Acid	PFHxDA	67905-19-5
Perfluorotetradecanoic Acid	PFTA	376-06-7
Perfluorotridecanoic Acid	PFTrDA	72629-94-8
Perfluorododecanoic Acid	PFDoA	307-55-1
Perfluoroundecanoic Acid	PFUnA	2058-94-8
Perfluorodecanoic Acid	PFDA	335-76-2
Perfluorononanoic Acid	PFNA	375-95-1
Perfluorooctanoic Acid	PFOA	335-67-1
Perfluoroheptanoic Acid	PFHpA	375-85-9
Perfluorohexanoic Acid	PFHxA	307-24-4
Perfluoropentanoic Acid	PFPeA	2706-90-3
Perfluorobutanoic Acid	PFBA	375-22-4
PERFLUOROALKYL SULFONIC ACIDS (PFSAs)		
Perfluorododecanesulfonic Acid	PFDoDS	79780-39-5
Perfluorodecanesulfonic Acid	PFDS	335-77-3
Perfluorononanesulfonic Acid	PFNS	68259-12-1
Perfluorooctanesulfonic Acid	PFOS	1763-23-1
Perfluoroheptanesulfonic Acid	PFHpS	375-92-8
Perfluorohexanesulfonic Acid	PFHxS	355-46-4
Perfluoropentanesulfonic Acid	PFPeS	2706-91-4
Perfluorobutanesulfonic Acid	PFBS	375-73-5
FLUOROTELOMERS		
1H,1H,2H,2H-Perfluorododecanesulfonic Acid	10:2FTS	120226-60-0
1H,1H,2H,2H-Perfluorodecanesulfonic Acid	8:2FTS	39108-34-4
1H,1H,2H,2H-Perfluorooctanesulfonic Acid	6:2FTS	27619-97-2
1H,1H,2H,2H-Perfluorohexanesulfonic Acid	4:2FTS	757124-72-4
PERFLUOROALKANE SULFONAMIDES (FASAs)		
Perfluorooctanesulfonamide	FOSA	754-91-6
N-Ethyl Perfluorooctane Sulfonamide	NEtFOSA	4151-50-2
N-Methyl Perfluorooctane Sulfonamide	NMeFOSA	31506-32-8
PERFLUOROALKANE SULFONYL SUBSTANCES		
N-Ethyl Perfluorooctanesulfonamido Ethanol	NEtFOSE	1691-99-2
N-Methyl Perfluorooctanesulfonamido Ethanol	NMeFOSE	24448-09-7
N-Ethyl Perfluorooctanesulfonamidoacetic Acid	NEtFOSAA	2991-50-6
N-Methyl Perfluorooctanesulfonamidoacetic Acid	NMeFOSAA	2355-31-9
PER- and POLYFLUOROALKYL ETHER CARBOXYLIC ACIDS		
2,3,3,3-Tetrafluoro-2-[1,1,2,2,3,3,3-Heptafluoropropoxy]-Propanoic Acid	HFPO-DA	13252-13-6
4,8-Dioxa-3h-Perfluorononanoic Acid	ADONA	919005-14-4
CHLORO-PERFLUOROALKYL SULFONIC ACIDS		
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid	11Cl-PF3OUdS	763051-92-9
9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid	9Cl-PF3ONS	756426-58-1
PERFLUOROETHER SULFONIC ACIDS (PFESAs)		
Perfluoro(2-Ethoxyethane)Sulfonic Acid	PFEESA	113507-82-7
PERFLUOROETHER/POLYETHER CARBOXYLIC ACIDS (PFPCAs)		
Perfluoro-3-Methoxypropanoic Acid	PFMPA	377-73-1
Perfluoro-4-Methoxybutanoic Acid	PFMBA	863090-89-5
Nonafluoro-3,6-Dioxaheptanoic Acid	NFDHA	151772-58-6

GLOSSARY

Acronyms

DL	- Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EMPC	- Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LOD	- Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
LOQ	- Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NDPA/DPA	- N-Nitrosodiphenylamine/Diphenylamine.
NI	- Not Ignitable.
NP	- Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.
NR	- No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.
STLP	- Semi-dynamic Tank Leaching Procedure per EPA Method 1315.
TEF	- Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.
TEQ	- Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.
TIC	- Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Report Format: DU Report with 'J' Qualifiers

Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. If a 'Total' result is requested, the results of its individual components will also be reported.

The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Data Qualifiers

A - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

F - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

ND - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where

Data Qualifiers

the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

REFERENCES

121 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WEF. Standard Methods Online.

134 Determination of Selected Perfluorinated Alkyl Acids in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS) using Isotope Dilution. Alpha SOP 23528.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 624/624.1: m/p-xylene, o-xylene, Naphthalene
EPA 8260C: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
SM4500: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

Mansfield Facility
SM 2540D: TSS
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
EPA TO-12 Non-methane organics
EPA 3C Fixed gases
Biological Tissue Matrix: EPA 3050B

The following analytes are included in our Massachusetts DEP Scope of Accreditation

Westborough Facility:

Drinking Water
EPA 300.0: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
EPA 332: Perchlorate; **EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

Non-Potable Water
SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH: Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N**, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
EPA 624.1: Volatile Halocarbons & Aromatics,
EPA 608.3: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625.1: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, EPA 1600, EPA 1603.**

Mansfield Facility:

Drinking Water
EPA 200.7: Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
EPA 522.

Non-Potable Water
EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
EPA 200.8: Al, Sb, As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
EPA 245.1 Hg.
SM2340B

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

CHAIN OF CUSTODY

PAGE 1 OF 1

Date Rec'd in Lab: 9/30/20

ALPHA Job #: L2041358

ALPHA ANALYTICAL
WESTBORO, MA TEL: 508-898-9220 FAX: 508-898-9193
MANSFIELD, MA TEL: 508-822-9300 FAX: 508-822-3288

Client Information

Client: Horsley Witten Group
Address: 90 Route 6A Sandwich MA 02563
Phone: (508) 833-6600
Fax:
Email: bmassa@horsleywitten.com

☐ These samples have been previously analyzed by Alpha

Project Information

Project Name: Barnstable Airport
Project Location: Hyannis, MA
Project #: 20102
Project Manager: Bryan Massa
ALPHA Quote #:

Turn-Around Time

☑ Standard ☐ RUSH (only confirmed if pre-approved!)

Date Due: Time:

Report Information - Data Deliverables

☐ FAX ☐ EMAIL
☐ ADEx ☐ Add'l Deliverables

Billing Information

☐ Same as Client info PO #:

Regulatory Requirements/Report Limits

State /Fed Program | Criteria

Other Project Specific Requirements/Comments/Detection Limits:

ANALYSIS: PFAS isotope dilution

SAMPLE HANDLING
Filtration
☐ Done
☐ Not needed
☐ Lab to do
Preservation
☐ Lab to do
(Please specify below)

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler's Initials	PFAS isotope dilution	Sample Specific Comments	TOTAL # BOTTLES
41358-01	DL23 (0-1)	9/29/20	14:10	Soil	SB	✓		
-02	A13 (0-1)	9/29/20	14:39	Soil	SB	✓		
-03	A22 (0-1)	9/29/20	14:52	Soil	SB	✓		
-04	A18 (0-1)	9/29/20	15:13	Soil	SB	✓		
-05	DL15 (0-1)	9/30/20	11:22	Soil	SB	✓		
-06	DL16 (0-1)	9/30/20	11:34	Soil	SB	✓		

Container Type
Preservative

Relinquished By:	Date/Time	Received By:	Date/Time
Sarah Bartlett	9/30/20 1257	T Gregory AAC	9-30-20 1257
T Gregory AAC	9-30-20 1800	[illegible]	9-30-20 1800
[illegible]	9-30-20 1920	[illegible]	9/30/20 1920
[illegible]	9/30/20 2008	[illegible] AAL	9/30/20 2008

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

FORM NO: 01-01 (rev. 14-OCT-07)

ANALYTICAL REPORT

Lab Number:	L2040892
Client:	Horseley & Witten, Inc. Sextant Hill Office Park 90 Route 6A Sandwich, MA 02563
ATTN:	Brian Massa
Phone:	(508) 833-6600
Project Name:	BARNSTABLE AIRPORT
Project Number:	20102
Report Date:	10/12/20

Certifications & Approvals: MA (M-MA030), NH NELAP (2062), CT (PH-0141), DoD (L2474), FL (E87814), IL (200081), LA (85084), ME (MA00030), MD (350), NJ (MA015), NY (11627), NC (685), OH (CL106), PA (68-02089), RI (LAO00299), TX (T104704419), VT (VT-0015), VA (460194), WA (C954), US Army Corps of Engineers, USDA (Permit #P330-17-00150), USFWS (Permit #206964).

320 Forbes Boulevard, Mansfield, MA 02048-1806
508-822-9300 (Fax) 508-822-3288 800-624-9220 - www.alphalab.com

Project Name: BARNSTABLE AIRPORT
Project Number: 20102

Lab Number: L2040892
Report Date: 10/12/20

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L2040892-01	DL22(2-4)	SOIL	HYANNIS MA	09/25/20 12:45	09/28/20
L2040892-02	DL22(6-8)	SOIL	HYANNIS MA	09/25/20 12:51	09/28/20
L2040892-03	DL22(18-20)	SOIL	HYANNIS MA	09/25/20 12:57	09/28/20
L2040892-04	DL19(0-1)	SOIL	HYANNIS MA	09/25/20 13:27	09/28/20
L2040892-05	DL20(0-1)	SOIL	HYANNIS MA	09/25/20 13:34	09/28/20
L2040892-06	DL21(0-1)	SOIL	HYANNIS MA	09/25/20 13:40	09/28/20
L2040892-07	DL18(0-1)	SOIL	HYANNIS MA	09/25/20 15:00	09/28/20
L2040892-08	DL17(0-1)	SOIL	HYANNIS MA	09/25/20 15:15	09/28/20

Project Name: BARNSTABLE AIRPORT **Lab Number:** L2040892
Project Number: 20102 **Report Date:** 10/12/20

MADEP MCP Response Action Analytical Report Certification

This form provides certifications for all samples performed by MCP methods. Please refer to the Sample Results and Container Information sections of this report for specification of MCP methods used for each analysis. The following questions pertain only to MCP Analytical Methods.

An affirmative response to questions A through F is required for "Presumptive Certainty" status		
A	Were all samples received in a condition consistent with those described on the Chain-of-Custody, properly preserved (including temperature) in the field or laboratory, and prepared/analyzed within method holding times?	YES
B	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	YES
C	Were all required corrective actions and analytical response actions specified in the selected CAM protocol(s) implemented for all identified performance standard non-conformances?	YES
D	Does the laboratory report comply with all the reporting requirements specified in CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data?"	YES
E a.	VPH, EPH, and APH Methods only: Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications).	N/A
E b.	APH and TO-15 Methods only: Was the complete analyte list reported for each method?	N/A
F	Were all applicable CAM protocol QC and performance standard non-conformances identified and evaluated in a laboratory narrative (including all "No" responses to Questions A through E)?	YES

A response to questions G, H and I is required for "Presumptive Certainty" status		
G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocol(s)?	YES
H	Were all QC performance standards specified in the CAM protocol(s) achieved?	YES
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	YES

For any questions answered "No", please refer to the case narrative section on the following page(s).

Please note that sample matrix information is located in the Sample Results section of this report.

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

Case Narrative (continued)

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

MCP Related Narratives

Report Submission

All MCP required questions were answered with affirmative responses; therefore, there are no relevant protocol-specific QC and/or performance standard non-conformances to report.

Non-MCP Related Narratives

Perfluorinated Alkyl Acids by Isotope Dilution

L2040892-01 and -07: Extracted Internal Standard recoveries were outside the acceptance criteria for individual analytes. Please refer to the surrogate section of the report for details.

L2040892-04, -05, -06, and -08RE: Extracted Internal Standard recoveries were outside the acceptance criteria for individual analytes. Please refer to the surrogate section of the report for details.

L2040892-04, -05, -06, and -08RE: The sample was re-extracted within holding time due to QC failures in the original extraction. The results of the re-extraction are reported.

L2040892-04, -05, -06, and -08RE: The sample has elevated detection limits due to the limited sample volume utilized during extraction, as required by the sample matrix.

L2040892-05RE: The reporting limit was elevated for NMeFOSAA due to low EIS recovery of d3-NMeFOSAA. The low recovery was attributed to the sample matrix.

L2040892-06RE: The reporting limit was elevated for NMeFOSAA and NEtFOSAA, due to low EIS recovery of d3-NMeFOSAA and d5-NetFOSAA. The low recovery was attributed to the sample matrix.

L2040892-08RE: The reporting limit was elevated for NEtFOSAA, due to low EIS recovery of d5-NetFOSAA. The low recovery was attributed to the sample matrix.

WG1418146-4: Extracted Internal Standard recoveries were outside the acceptance criteria for individual analytes. Please refer to the surrogate section of the report for details.

Case Narrative (continued)

The WG1418146-4 MS recovey, performed on L2040892-01, is outside the acceptance criteria for 1h,1h,2h,2h-perfluorodecanesulfonic acid (8:2fts) (9%).

WG1420434-2 and WG1420434-3R: The sample was re-analyzed due to QC failures in the original analysis. The results of the re-analysis are reported.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Susan E O'Neil Susan O' Neil

Title: Technical Director/Representative Date: 10/12/20

QC OUTLIER SUMMARY REPORT

Project Name: BARNSTABLE AIRPORT
Project Number: 20102
Lab Number: L2040892
Report Date: 10/12/20

Method	Client ID (Native ID)	Lab ID	Parameter	QC Type	Recovery/RPD (%)	QC Limits (%)	Associated Samples	Data Quality Assessment
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab								
LCMSMS-ID	Batch QC (L2040892-01)	WG1418146-4	1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	MS	9	65-137	01,07	potential low bias

ORGANICS

SEMIVOLATILES

Project Name: BARNSTABLE AIRPORT **Lab Number:** L2040892

Project Number: 20102 **Report Date:** 10/12/20

SAMPLE RESULTS

Lab ID:	L2040892-01	Date Collected:	09/25/20 12:45
Client ID:	DL22(2-4)	Date Received:	09/28/20
Sample Location:	HYANNIS MA	Field Prep:	Not Specified
Sample Depth:			
Matrix:	Soil	Extraction Method:	ALPHA 23528
Analytical Method:	134,LCMSMS-ID	Extraction Date:	10/05/20 12:45
Analytical Date:	10/08/20 14:35		
Analyst:	SG		
Percent Solids:	98%		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	0.076	J	ng/g	0.946	0.022	1
Perfluoropentanoic Acid (PFPeA)	0.151	J	ng/g	0.946	0.044	1
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/g	0.946	0.037	1
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/g	0.946	0.061	1
Perfluorohexanoic Acid (PFHxA)	0.116	JF	ng/g	0.946	0.050	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/g	0.946	0.079	1
Perfluoroheptanoic Acid (PFHpA)	0.109	J	ng/g	0.946	0.043	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/g	0.946	0.057	1
Perfluorooctanoic Acid (PFOA)	0.447	J	ng/g	0.946	0.040	1
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	7.49		ng/g	0.946	0.170	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/g	0.946	0.129	1
Perfluorononanoic Acid (PFNA)	5.46		ng/g	0.946	0.071	1
Perfluorooctanesulfonic Acid (PFOS)	20.3		ng/g	0.946	0.123	1
Perfluorodecanoic Acid (PFDA)	0.834	J	ng/g	0.946	0.063	1
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	31.6		ng/g	0.946	0.272	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/g	0.946	0.283	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/g	0.946	0.191	1
Perfluoroundecanoic Acid (PFUnA)	0.230	J	ng/g	0.946	0.044	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/g	0.946	0.145	1
Perfluorooctanesulfonamide (FOSA)	ND		ng/g	0.946	0.093	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/g	0.946	0.080	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/g	0.946	0.066	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/g	0.946	0.193	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/g	0.946	0.051	1

Project Name: BARNSTABLE AIRPORT **Lab Number:** L2040892

Project Number: 20102 **Report Date:** 10/12/20

SAMPLE RESULTS

Lab ID:	L2040892-01	Date Collected:	09/25/20 12:45
Client ID:	DL22(2-4)	Date Received:	09/28/20
Sample Location:	HYANNIS MA	Field Prep:	Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	81		60-153
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	92		65-182
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	103		70-151
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	97		56-138
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	79		61-147
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	86		62-149
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	106		63-166
Perfluoro[13C8]Octanoic Acid (M8PFOA)	87		62-152
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	89		32-182
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	91		61-154
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	105		65-151
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	90		65-150
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	111		25-186
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	**4**	Q	45-137
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	104		64-158
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	29		1-125
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	**6**	Q	42-136
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	95		56-148
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	77		26-160

Project Name: BARNSTABLE AIRPORT **Lab Number:** L2040892
Project Number: 20102 **Report Date:** 10/12/20

SAMPLE RESULTS

Lab ID: L2040892-04 RE
Client ID: DL19(0-1)
Sample Location: HYANNIS MA

Date Collected: 09/25/20 13:27
Date Received: 09/28/20
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Analytical Method: 134,LCMSMS-ID
Analytical Date: 10/10/20 14:18
Analyst: SG
Percent Solids: 96%

Extraction Method: EPA 537(M)
Extraction Date: 10/09/20 19:30

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	ND		ng/g	3.22	0.073	1
Perfluoropentanoic Acid (PFPeA)	ND		ng/g	3.22	0.148	1
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/g	3.22	0.125	1
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/g	3.22	0.207	1
Perfluorohexanoic Acid (PFHxA)	ND		ng/g	3.22	0.169	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/g	3.22	0.268	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/g	3.22	0.145	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/g	3.22	0.194	1
Perfluorooctanoic Acid (PFOA)	ND		ng/g	3.22	0.135	1
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/g	3.22	0.577	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/g	3.22	0.439	1
Perfluorononanoic Acid (PFNA)	ND		ng/g	3.22	0.241	1
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/g	3.22	0.418	1
Perfluorodecanoic Acid (PFDA)	ND		ng/g	3.22	0.215	1
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/g	3.22	0.923	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/g	3.22	0.961	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/g	3.22	0.648	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/g	3.22	0.150	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/g	3.22	0.492	1
Perfluorooctanesulfonamide (FOSA)	ND		ng/g	3.22	0.315	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/g	3.22	0.272	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/g	3.22	0.225	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/g	3.22	0.658	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/g	3.22	0.174	1

Project Name: BARNSTABLE AIRPORT **Lab Number:** L2040892
Project Number: 20102 **Report Date:** 10/12/20

SAMPLE RESULTS

Lab ID: L2040892-04 RE
Client ID: DL19(0-1)
Sample Location: HYANNIS MA
Date Collected: 09/25/20 13:27
Date Received: 09/28/20
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	**41**	Q	60-153
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	**50**	Q	65-182
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	84		70-151
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	**39**	Q	56-138
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	**42**	Q	61-147
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	**48**	Q	62-149
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	95		63-166
Perfluoro[13C8]Octanoic Acid (M8PFOA)	**51**	Q	62-152
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	43		32-182
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	**55**	Q	61-154
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	94		65-151
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	**55**	Q	65-150
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	60		25-186
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	**3**	Q	45-137
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	64		64-158
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	40		1-125
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	**1**	Q	42-136
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	64		56-148
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	63		26-160

Project Name: BARNSTABLE AIRPORT
Lab Number: L2040892
Project Number: 20102
Report Date: 10/12/20

SAMPLE RESULTS

Lab ID: L2040892-05 RE
Date Collected: 09/25/20 13:34
Client ID: DL20(0-1)
Date Received: 09/28/20
Sample Location: HYANNIS MA
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Extraction Method: EPA 537(M)
Analytical Method: 134,LCMSMS-ID
Extraction Date: 10/09/20 19:30
Analytical Date: 10/10/20 14:35
Analyst: SG
Percent Solids: 95%

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	ND		ng/g	3.48	0.079	1
Perfluoropentanoic Acid (PFPeA)	ND		ng/g	3.48	0.160	1
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/g	3.48	0.136	1
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/g	3.48	0.224	1
Perfluorohexanoic Acid (PFHxA)	ND		ng/g	3.48	0.183	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/g	3.48	0.290	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/g	3.48	0.157	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/g	3.48	0.210	1
Perfluorooctanoic Acid (PFOA)	ND		ng/g	3.48	0.146	1
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/g	3.48	0.625	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/g	3.48	0.475	1
Perfluorononanoic Acid (PFNA)	ND		ng/g	3.48	0.261	1
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/g	3.48	0.452	1
Perfluorodecanoic Acid (PFDA)	ND		ng/g	3.48	0.233	1
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/g	3.48	0.999	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/g	3.48	1.04	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/g	34.8	0.701	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/g	3.48	0.163	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/g	3.48	0.532	1
Perfluorooctanesulfonamide (FOSA)	ND		ng/g	3.48	0.341	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/g	3.48	0.294	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/g	3.48	0.244	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/g	3.48	0.712	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/g	3.48	0.188	1

Project Name: BARNSTABLE AIRPORT **Lab Number:** L2040892
Project Number: 20102 **Report Date:** 10/12/20

SAMPLE RESULTS

Lab ID: L2040892-05 RE
Client ID: DL20(0-1)
Sample Location: HYANNIS MA

Date Collected: 09/25/20 13:34
Date Received: 09/28/20
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor

Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	63		60-153
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	77		65-182
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	102		70-151
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	62		56-138
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	66		61-147
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	74		62-149
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	115		63-166
Perfluoro[13C8]Octanoic Acid (M8PFOA)	80		62-152
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	71		32-182
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	86		61-154
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	111		65-151
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	83		65-150
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	102		25-186
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	**0**	Q	45-137
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	92		64-158
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	44		1-125
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	**1**	Q	42-136
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	95		56-148
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	95		26-160

Project Name: BARNSTABLE AIRPORT **Lab Number:** L2040892
Project Number: 20102 **Report Date:** 10/12/20

SAMPLE RESULTS

Lab ID:	L2040892-06 RE	Date Collected:	09/25/20 13:40
Client ID:	DL21(0-1)	Date Received:	09/28/20
Sample Location:	HYANNIS MA	Field Prep:	Not Specified
Sample Depth:			
Matrix:	Soil	Extraction Method:	EPA 537(M)
Analytical Method:	134,LCMSMS-ID	Extraction Date:	10/09/20 19:30
Analytical Date:	10/10/20 14:52		
Analyst:	SG		
Percent Solids:	95%		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	ND		ng/g	3.50	0.080	1
Perfluoropentanoic Acid (PFPeA)	0.256	J	ng/g	3.50	0.161	1
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/g	3.50	0.137	1
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/g	3.50	0.226	1
Perfluorohexanoic Acid (PFHxA)	0.265	JF	ng/g	3.50	0.184	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/g	3.50	0.293	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/g	3.50	0.158	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/g	3.50	0.212	1
Perfluorooctanoic Acid (PFOA)	0.159	J	ng/g	3.50	0.147	1
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/g	3.50	0.629	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/g	3.50	0.478	1
Perfluorononanoic Acid (PFNA)	ND		ng/g	3.50	0.263	1
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/g	3.50	0.456	1
Perfluorodecanoic Acid (PFDA)	ND		ng/g	3.50	0.235	1
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/g	3.50	1.00	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/g	3.50	1.05	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/g	35.0	0.706	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/g	3.50	0.164	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/g	3.50	0.536	1
Perfluorooctanesulfonamide (FOSA)	ND		ng/g	3.50	0.343	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/g	35.0	0.296	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/g	3.50	0.245	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/g	3.50	0.717	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/g	3.50	0.189	1

Project Name:	BARNSTABLE AIRPORT	**Lab Number:**	L2040892
Project Number:	20102	**Report Date:**	10/12/20

SAMPLE RESULTS

Lab ID:	L2040892-06	RE	Date Collected:	09/25/20 13:40
Client ID:	DL21(0-1)		Date Received:	09/28/20
Sample Location:	HYANNIS MA		Field Prep:	Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor

Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	**35**	Q	60-153
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	**43**	Q	65-182
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	89		70-151
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	**32**	Q	56-138
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	**37**	Q	61-147
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	**41**	Q	62-149
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	99		63-166
Perfluoro[13C8]Octanoic Acid (M8PFOA)	**45**	Q	62-152
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	40		32-182
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	**48**	Q	61-154
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	97		65-151
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	**49**	Q	65-150
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	61		25-186
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	**0**	Q	45-137
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	**57**	Q	64-158
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	33		1-125
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	**0**	Q	42-136
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	**50**	Q	56-148
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	55		26-160

Project Name: BARNSTABLE AIRPORT | **Lab Number:** L2040892
Project Number: 20102 | **Report Date:** 10/12/20

SAMPLE RESULTS

Lab ID: L2040892-07
Client ID: DL18(0-1)
Sample Location: HYANNIS MA
Date Collected: 09/25/20 15:00
Date Received: 09/28/20
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Analytical Method: 134,LCMSMS-ID
Analytical Date: 10/08/20 17:47
Analyst: SG
Percent Solids: 86%
Extraction Method: ALPHA 23528
Extraction Date: 10/05/20 12:45

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	0.597	J	ng/g	1.06	0.024	1
Perfluoropentanoic Acid (PFPeA)	0.693	J	ng/g	1.06	0.049	1
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/g	1.06	0.041	1
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/g	1.06	0.068	1
Perfluorohexanoic Acid (PFHxA)	0.461	J	ng/g	1.06	0.056	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/g	1.06	0.089	1
Perfluoroheptanoic Acid (PFHpA)	0.319	J	ng/g	1.06	0.048	1
Perfluorohexanesulfonic Acid (PFHxS)	0.159	J	ng/g	1.06	0.064	1
Perfluorooctanoic Acid (PFOA)	0.979	J	ng/g	1.06	0.044	1
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/g	1.06	0.190	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/g	1.06	0.145	1
Perfluorononanoic Acid (PFNA)	0.296	J	ng/g	1.06	0.080	1
Perfluorooctanesulfonic Acid (PFOS)	1.05	J	ng/g	1.06	0.138	1
Perfluorodecanoic Acid (PFDA)	0.167	JF	ng/g	1.06	0.071	1
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/g	1.06	0.304	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/g	1.06	0.317	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/g	1.06	0.213	1
Perfluoroundecanoic Acid (PFUnA)	0.119	J	ng/g	1.06	0.050	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/g	1.06	0.162	1
Perfluorooctanesulfonamide (FOSA)	ND		ng/g	1.06	0.104	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/g	1.06	0.090	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/g	1.06	0.074	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/g	1.06	0.217	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/g	1.06	0.057	1

Project Name: BARNSTABLE AIRPORT **Lab Number:** L2040892
Project Number: 20102 **Report Date:** 10/12/20

SAMPLE RESULTS

Lab ID:	L2040892-07	Date Collected:	09/25/20 15:00
Client ID:	DL18(0-1)	Date Received:	09/28/20
Sample Location:	HYANNIS MA	Field Prep:	Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor

Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	70		60-153
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	80		65-182
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	87		70-151
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	92		56-138
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	70		61-147
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	75		62-149
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	87		63-166
Perfluoro[13C8]Octanoic Acid (M8PFOA)	77		62-152
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	79		32-182
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	82		61-154
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	92		65-151
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	80		65-150
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	76		25-186
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	**39**	Q	45-137
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	98		64-158
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	7		1-125
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	52		42-136
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	84		56-148
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	71		26-160

Project Name: BARNSTABLE AIRPORT **Lab Number:** L2040892
Project Number: 20102 **Report Date:** 10/12/20

SAMPLE RESULTS

Lab ID: L2040892-08 RE
Client ID: DL17(0-1)
Sample Location: HYANNIS MA

Date Collected: 09/25/20 15:15
Date Received: 09/28/20
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Analytical Method: 134,LCMSMS-ID
Analytical Date: 10/10/20 15:08
Analyst: SG
Percent Solids: 96%

Extraction Method: EPA 537(M)
Extraction Date: 10/09/20 19:30

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	ND		ng/g	3.70	0.084	1
Perfluoropentanoic Acid (PFPeA)	0.214	J	ng/g	3.70	0.170	1
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/g	3.70	0.144	1
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/g	3.70	0.238	1
Perfluorohexanoic Acid (PFHxA)	0.248	J	ng/g	3.70	0.194	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/g	3.70	0.309	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/g	3.70	0.167	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/g	3.70	0.224	1
Perfluorooctanoic Acid (PFOA)	0.166	J	ng/g	3.70	0.155	1
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/g	3.70	0.664	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/g	3.70	0.505	1
Perfluorononanoic Acid (PFNA)	ND		ng/g	3.70	0.277	1
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/g	3.70	0.481	1
Perfluorodecanoic Acid (PFDA)	ND		ng/g	3.70	0.248	1
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/g	3.70	1.06	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/g	3.70	1.10	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/g	3.70	0.745	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/g	3.70	0.173	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/g	3.70	0.566	1
Perfluorooctanesulfonamide (FOSA)	ND		ng/g	3.70	0.362	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/g	37.0	0.312	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/g	3.70	0.259	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/g	3.70	0.756	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/g	3.70	0.200	1

Project Name: BARNSTABLE AIRPORT **Lab Number:** L2040892

Project Number: 20102 **Report Date:** 10/12/20

SAMPLE RESULTS

Lab ID:	L2040892-08	RE	Date Collected:	09/25/20 15:15
Client ID:	DL17(0-1)		Date Received:	09/28/20
Sample Location:	HYANNIS MA		Field Prep:	Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor

Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	**46**	Q	60-153
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	**56**	Q	65-182
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	87		70-151
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	**44**	Q	56-138
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	**49**	Q	61-147
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	**54**	Q	62-149
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	101		63-166
Perfluoro[13C8]Octanoic Acid (M8PFOA)	**59**	Q	62-152
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	50		32-182
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	65		61-154
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	96		65-151
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	65		65-150
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	64		25-186
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	**1**	Q	45-137
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	75		64-158
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	27		1-125
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	**0**	Q	42-136
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	79		56-148
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	75		26-160

Project Name: BARNSTABLE AIRPORT
Project Number: 20102

Lab Number: L2040892
Report Date: 10/12/20

Method Blank Analysis
Batch Quality Control

Analytical Method: 134,LCMSMS-ID
Analytical Date: 10/08/20 13:29
Analyst: SG

Extraction Method: ALPHA 23528
Extraction Date: 10/05/20 12:45

Parameter	Result	Qualifier	Units	RL	MDL
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab for sample(s): 01,07 Batch: WG1418146-1					
Perfluorobutanoic Acid (PFBA)	ND		ng/g	1.00	0.023
Perfluoropentanoic Acid (PFPeA)	ND		ng/g	1.00	0.046
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/g	1.00	0.039
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/g	1.00	0.065
Perfluorohexanoic Acid (PFHxA)	ND		ng/g	1.00	0.053
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/g	1.00	0.084
Perfluoroheptanoic Acid (PFHpA)	ND		ng/g	1.00	0.045
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/g	1.00	0.061
Perfluorooctanoic Acid (PFOA)	ND		ng/g	1.00	0.042
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/g	1.00	0.180
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/g	1.00	0.136
Perfluorononanoic Acid (PFNA)	ND		ng/g	1.00	0.075
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/g	1.00	0.130
Perfluorodecanoic Acid (PFDA)	ND		ng/g	1.00	0.067
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/g	1.00	0.287
Perfluorononanesulfonic Acid (PFNS)	ND		ng/g	1.00	0.299
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/g	1.00	0.202
Perfluoroundecanoic Acid (PFUnA)	ND		ng/g	1.00	0.047
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/g	1.00	0.153
Perfluorooctanesulfonamide (FOSA)	ND		ng/g	1.00	0.098
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/g	1.00	0.085
Perfluorododecanoic Acid (PFDoA)	ND		ng/g	1.00	0.070
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/g	1.00	0.204
Perfluorotetradecanoic Acid (PFTA)	ND		ng/g	1.00	0.054
PFOA/PFOS, Total	ND		ng/g	1.00	0.042
PFAS, Total (5)	ND		ng/g	1.00	0.042

Project Name: BARNSTABLE AIRPORT **Lab Number:** L2040892
Project Number: 20102 **Report Date:** 10/12/20

Method Blank Analysis
Batch Quality Control

Analytical Method: 134,LCMSMS-ID
Analytical Date: 10/08/20 13:29
Analyst: SG

Extraction Method: ALPHA 23528
Extraction Date: 10/05/20 12:45

Parameter	Result	Qualifier	Units	RL	MDL
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab for sample(s): 01,07 Batch: WG1418146-1					

Surrogate (Extracted Internal Standard)	%Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	106		60-153
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	119		65-182
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	112		70-151
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	121		56-138
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	102		61-147
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	107		62-149
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	116		63-166
Perfluoro[13C8]Octanoic Acid (M8PFOA)	107		62-152
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	99		32-182
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	111		61-154
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	114		65-151
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	108		65-150
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	115		25-186
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	86		45-137
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	125		64-158
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	1		1-125
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	95		42-136
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	122		56-148
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	104		26-160

Project Name: BARNSTABLE AIRPORT
Project Number: 20102

Lab Number: L2040892
Report Date: 10/12/20

Method Blank Analysis
Batch Quality Control

Analytical Method: 134,LCMSMS-ID
Analytical Date: 10/10/20 13:29
Analyst: SG

Extraction Method: EPA 537(M)
Extraction Date: 10/09/20 19:30

Parameter	Result	Qualifier	Units	RL	MDL
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab for sample(s): 04-06,08 Batch: WG1420434-1					
Perfluorobutanoic Acid (PFBA)	ND		ng/g	1.00	0.023
Perfluoropentanoic Acid (PFPeA)	ND		ng/g	1.00	0.046
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/g	1.00	0.039
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/g	1.00	0.065
Perfluorohexanoic Acid (PFHxA)	ND		ng/g	1.00	0.053
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/g	1.00	0.084
Perfluoroheptanoic Acid (PFHpA)	ND		ng/g	1.00	0.045
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/g	1.00	0.061
Perfluorooctanoic Acid (PFOA)	ND		ng/g	1.00	0.042
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/g	1.00	0.180
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/g	1.00	0.136
Perfluorononanoic Acid (PFNA)	ND		ng/g	1.00	0.075
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/g	1.00	0.130
Perfluorodecanoic Acid (PFDA)	ND		ng/g	1.00	0.067
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/g	1.00	0.287
Perfluorononanesulfonic Acid (PFNS)	ND		ng/g	1.00	0.299
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/g	1.00	0.202
Perfluoroundecanoic Acid (PFUnA)	ND		ng/g	1.00	0.047
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/g	1.00	0.153
Perfluorooctanesulfonamide (FOSA)	ND		ng/g	1.00	0.098
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/g	1.00	0.085
Perfluorododecanoic Acid (PFDoA)	ND		ng/g	1.00	0.070
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/g	1.00	0.204
Perfluorotetradecanoic Acid (PFTA)	ND		ng/g	1.00	0.054

Project Name: BARNSTABLE AIRPORT
Project Number: 20102

Lab Number: L2040892
Report Date: 10/12/20

Method Blank Analysis
Batch Quality Control

Analytical Method: 134,LCMSMS-ID
Analytical Date: 10/10/20 13:29
Analyst: SG

Extraction Method: EPA 537(M)
Extraction Date: 10/09/20 19:30

Parameter	Result	Qualifier	Units	RL	MDL
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab for sample(s): 04-06,08 Batch: WG1420434-1					

Surrogate (Extracted Internal Standard)	%Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	115		60-153
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	129		65-182
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	116		70-151
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	111		56-138
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	105		61-147
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	113		62-149
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	117		63-166
Perfluoro[13C8]Octanoic Acid (M8PFOA)	117		62-152
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	109		32-182
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	121		61-154
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	117		65-151
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	116		65-150
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	123		25-186
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	96		45-137
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	138		64-158
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	29		1-125
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	86		42-136
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	116		56-148
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	122		26-160

Lab Control Sample Analysis
Batch Quality Control

Project Name: BARNSTABLE AIRPORT
Project Number: 20102

Lab Number: L2040892
Report Date: 10/12/20

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 01,07 Batch: WG1418146-2 WG1418146-3								
Perfluorobutanoic Acid (PFBA)	100		100		71-135	0		30
Perfluoropentanoic Acid (PFPeA)	100		102		69-132	2		30
Perfluorobutanesulfonic Acid (PFBS)	100		100		72-128	0		30
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	114		115		62-145	1		30
Perfluorohexanoic Acid (PFHxA)	104		105		70-132	1		30
Perfluoropentanesulfonic Acid (PFPeS)	93		97		73-123	4		30
Perfluoroheptanoic Acid (PFHpA)	101		100		71-131	1		30
Perfluorohexanesulfonic Acid (PFHxS)	80		85		67-130	6		30
Perfluorooctanoic Acid (PFOA)	102		103		69-133	1		30
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	107		104		64-140	3		30
Perfluoroheptanesulfonic Acid (PFHpS)	96		96		70-132	0		30
Perfluorononanoic Acid (PFNA)	100		101		72-129	1		30
Perfluorooctanesulfonic Acid (PFOS)	100		100		68-136	0		30
Perfluorodecanoic Acid (PFDA)	109		102		69-133	7		30
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	108		109		65-137	1		30
Perfluorononanesulfonic Acid (PFNS)	107		101		69-125	6		30
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	119		130		63-144	9		30
Perfluoroundecanoic Acid (PFUnA)	97		99		64-136	2		30
Perfluorodecanesulfonic Acid (PFDS)	106		103		59-134	3		30
Perfluorooctanesulfonamide (FOSA)	106		80		67-137	28		30
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	114		108		61-139	5		30
Perfluorododecanoic Acid (PFDoA)	89		90		69-135	1		30

Lab Control Sample Analysis
Batch Quality Control

Project Name: BARNSTABLE AIRPORT
Project Number: 20102
Lab Number: L2040892
Report Date: 10/12/20

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 01,07 Batch: WG1418146-2 WG1418146-3								
Perfluorotridecanoic Acid (PFTrDA)	104		109		66-139	5		30
Perfluorotetradecanoic Acid (PFTA)	102		99		69-133	3		30

Surrogate (Extracted Internal Standard)	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	109		106		60-153
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	120		117		65-182
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	108		106		70-151
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	116		114		56-138
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	102		98		61-147
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	109		104		62-149
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	114		107		63-166
Perfluoro[13C8]Octanoic Acid (M8PFOA)	109		106		62-152
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	99		101		32-182
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	112		108		61-154
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	111		112		65-151
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	107		108		65-150
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	98		108		25-186
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	82		79		45-137
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	125		125		64-158
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	26		3		1-125
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	91		98		42-136
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	115		112		56-148
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	104		104		26-160

ALPHA ANALYTICAL

Lab Control Sample Analysis
Batch Quality Control

Project Name: BARNSTABLE AIRPORT
Project Number: 20102
Lab Number: L2040892
Report Date: 10/12/20

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 04-06,08 Batch: WG1420434-2 WG1420434-3								
Perfluorobutanoic Acid (PFBA)	100		100		71-135	0		30
Perfluoropentanoic Acid (PFPeA)	101		100		69-132	1		30
Perfluorobutanesulfonic Acid (PFBS)	96		95		72-128	1		30
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	109		114		62-145	4		30
Perfluorohexanoic Acid (PFHxA)	100		99		70-132	1		30
Perfluoropentanesulfonic Acid (PFPeS)	90		86		73-123	5		30
Perfluoroheptanoic Acid (PFHpA)	98		98		71-131	0		30
Perfluorohexanesulfonic Acid (PFHxS)	98		94		67-130	4		30
Perfluorooctanoic Acid (PFOA)	98		96		69-133	2		30
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	111		110		64-140	1		30
Perfluoroheptanesulfonic Acid (PFHpS)	99		102		70-132	3		30
Perfluorononanoic Acid (PFNA)	100		102		72-129	2		30
Perfluorooctanesulfonic Acid (PFOS)	102		105		68-136	3		30
Perfluorodecanoic Acid (PFDA)	97		96		69-133	1		30
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	106		101		65-137	5		30
Perfluorononanesulfonic Acid (PFNS)	114		113		69-125	1		30
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	88		90		63-144	2		30
Perfluoroundecanoic Acid (PFUnA)	104		102		64-136	2		30
Perfluorodecanesulfonic Acid (PFDS)	121		117		59-134	3		30
Perfluorooctanesulfonamide (FOSA)	99		97		67-137	2		30
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	97		101		61-139	4		30
Perfluorododecanoic Acid (PFDoA)	102		101		69-135	1		30

Lab Control Sample Analysis
Batch Quality Control

Project Name: BARNSTABLE AIRPORT
Project Number: 20102
Lab Number: L2040892
Report Date: 10/12/20

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 04-06,08 Batch: WG1420434-2 WG1420434-3								
Perfluorotridecanoic Acid (PFTrDA)	92		95		66-139	3		30
Perfluorotetradecanoic Acid (PFTA)	109		105		69-133	4		30

Surrogate (Extracted Internal Standard)	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	102		98		60-153
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	98		94		65-182
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	107		105		70-151
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	99		93		56-138
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	103		101		61-147
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	110		108		62-149
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	115		116		63-166
Perfluoro[13C8]Octanoic Acid (M8PFOA)	106		105		62-152
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	107		109		32-182
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	112		108		61-154
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	110		104		65-151
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	104		104		65-150
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	116		114		25-186
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	81		78		45-137
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	111		107		64-158
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	32		14		1-125
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	78		78		42-136
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	101		97		56-148
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	70		70		26-160

Matrix Spike Analysis

Batch Quality Control

Project Name: BARNSTABLE AIRPORT
Project Number: 20102

Lab Number: L2040892
Report Date: 10/12/20

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 01,07 QC Batch ID: WG1418146-4 QC Sample: L2040892-01 Client ID: DL22(2-4)												
Perfluorobutanoic Acid (PFBA)	0.076J	4.45	4.46	100		-	-		71-135	-		30
Perfluoropentanoic Acid (PFPeA)	0.151J	4.45	4.52	102		-	-		69-132	-		30
Perfluorobutanesulfonic Acid (PFBS)	ND	3.95	3.96	100		-	-		72-128	-		30
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND	4.17	4.30	103		-	-		62-145	-		30
Perfluorohexanoic Acid (PFHxA)	0.116JF	4.45	4.60	103		-	-		70-132	-		30
Perfluoropentanesulfonic Acid (PFPeS)	ND	4.18	3.82	91		-	-		73-123	-		30
Perfluoroheptanoic Acid (PFHpA)	0.109J	4.45	4.50	101		-	-		71-131	-		30
Perfluorohexanesulfonic Acid (PFHxS)	ND	4.07	3.33	82		-	-		67-130	-		30
Perfluorooctanoic Acid (PFOA)	0.447J	4.45	4.96	111		-	-		69-133	-		30
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	7.49	4.24	12.1	109		-	-		64-140	-		30
Perfluoroheptanesulfonic Acid (PFHpS)	ND	4.24	4.30	101		-	-		70-132	-		30
Perfluorononanoic Acid (PFNA)	5.46	4.45	9.98	102		-	-		72-129	-		30
Perfluorooctanesulfonic Acid (PFOS)	20.3	4.13	24.6	104		-	-		68-136	-		30
Perfluorodecanoic Acid (PFDA)	0.834J	4.45	5.50	124		-	-		69-133	-		30
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	31.6	4.27	32.0	**9**	Q	-	-		65-137	-		30
Perfluorononanesulfonic Acid (PFNS)	ND	4.28	4.48	105		-	-		69-125	-		30
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND	4.45	6.07	136		-	-		63-144	-		30
Perfluoroundecanoic Acid (PFUnA)	0.230J	4.45	4.71	106		-	-		64-136	-		30
Perfluorodecanesulfonic Acid (PFDS)	ND	4.29	4.40	103		-	-		59-134	-		30
Perfluorooctanesulfonamide (FOSA)	ND	4.45	4.35	98		-	-		67-137	-		30
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND	4.45	4.55	102		-	-		61-139	-		30
Perfluorododecanoic Acid (PFDoA)	ND	4.45	4.21	95		-	-		69-135	-		30

Matrix Spike Analysis
Batch Quality Control

Project Name: BARNSTABLE AIRPORT
Project Number: 20102
Lab Number: L2040892
Report Date: 10/12/20

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 01,07 QC Batch ID: WG1418146-4 QC Sample: L2040892-01 Client ID: DL22(2-4)												
Perfluorotridecanoic Acid (PFTrDA)	ND	4.45	4.26	96		-	-		66-139	-		30
Perfluorotetradecanoic Acid (PFTA)	ND	4.45	4.30	97		-	-		69-133	-		30

Surrogate (Extracted Internal Standard)	MS % Recovery	MS Qualifier	MSD % Recovery	MSD Qualifier	Acceptance Criteria
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	97				25-186
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	91				56-138
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	80				32-182
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	**6**	Q			42-136
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	**5**	Q			45-137
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	92				64-158
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	80				65-150
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	72				61-147
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	79				62-149
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	95				63-166
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	85				56-148
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	53				26-160
Perfluoro[13C4]Butanoic Acid (MPFBA)	76				60-153
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	87				65-182
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	22				1-125
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	90				65-151
Perfluoro[13C8]Octanoic Acid (M8PFOA)	80				62-152
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	81				61-154
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	90				70-151

INORGANICS
&
MISCELLANEOUS

Project Name: BARNSTABLE AIRPORT
Lab Number: L2040892
Project Number: 20102
Report Date: 10/12/20

SAMPLE RESULTS

Lab ID: L2040892-01
Client ID: DL22(2-4)
Sample Location: HYANNIS MA
Date Collected: 09/25/20 12:45
Date Received: 09/28/20
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Mansfield Lab										
Solids, Total	98.1		%	0.100	0.100	1	-	09/30/20 10:18	121,2540G	JW

Project Name: BARNSTABLE AIRPORT
Project Number: 20102

Lab Number: L2040892
Report Date: 10/12/20

SAMPLE RESULTS

Lab ID: L2040892-02
Client ID: DL22(6-8)
Sample Location: HYANNIS MA

Date Collected: 09/25/20 12:51
Date Received: 09/28/20
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Mansfield Lab										
Solids, Total	96.6		%	0.100	0.100	1	-	09/30/20 10:18	121,2540G	JW

Project Name:	BARNSTABLE AIRPORT	**Lab Number:**	L2040892
Project Number:	20102	**Report Date:**	10/12/20

SAMPLE RESULTS

Lab ID:	L2040892-03	Date Collected:	09/25/20 12:57
Client ID:	DL22(18-20)	Date Received:	09/28/20
Sample Location:	HYANNIS MA	Field Prep:	Not Specified
Sample Depth:			
Matrix:	Soil		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Mansfield Lab										
Solids, Total	98.2		%	0.100	0.100	1	-	09/30/20 10:18	121,2540G	JW

Project Name: BARNSTABLE AIRPORT
Lab Number: L2040892
Project Number: 20102
Report Date: 10/12/20

SAMPLE RESULTS

Lab ID: L2040892-04
Date Collected: 09/25/20 13:27
Client ID: DL19(0-1)
Date Received: 09/28/20
Sample Location: HYANNIS MA
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Mansfield Lab										
Solids, Total	95.7		%	0.100	0.100	1	-	09/30/20 10:18	121,2540G	JW

Project Name: BARNSTABLE AIRPORT
Project Number: 20102

Lab Number: L2040892
Report Date: 10/12/20

SAMPLE RESULTS

Lab ID: L2040892-05
Client ID: DL20(0-1)
Sample Location: HYANNIS MA

Date Collected: 09/25/20 13:34
Date Received: 09/28/20
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Mansfield Lab										
Solids, Total	95.0		%	0.100	0.100	1	-	09/30/20 10:18	121,2540G	JW

Project Name: BARNSTABLE AIRPORT
Lab Number: L2040892
Project Number: 20102
Report Date: 10/12/20

SAMPLE RESULTS

Lab ID: L2040892-06
Client ID: DL21(0-1)
Sample Location: HYANNIS MA
Date Collected: 09/25/20 13:40
Date Received: 09/28/20
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Mansfield Lab										
Solids, Total	95.1		%	0.100	0.100	1	-	09/30/20 10:18	121,2540G	JW

Project Name: BARNSTABLE AIRPORT
Lab Number: L2040892
Project Number: 20102
Report Date: 10/12/20

SAMPLE RESULTS

Lab ID: L2040892-07
Client ID: DL18(0-1)
Sample Location: HYANNIS MA
Date Collected: 09/25/20 15:00
Date Received: 09/28/20
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Mansfield Lab										
Solids, Total	86.0		%	0.100	0.100	1	-	09/30/20 10:18	121,2540G	JW

Project Name: BARNSTABLE AIRPORT
Lab Number: L2040892
Project Number: 20102
Report Date: 10/12/20

SAMPLE RESULTS

Lab ID: L2040892-08
Date Collected: 09/25/20 15:15
Client ID: DL17(0-1)
Date Received: 09/28/20
Sample Location: HYANNIS MA
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Mansfield Lab										
Solids, Total	95.7		%	0.100	0.100	1	-	09/30/20 10:18	121,2540G	JW

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information

Cooler	Custody Seal
A	Absent

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2040892-01A	Plastic 8oz unpreserved	A	NA		2.4	Y	Absent		A2-537-ISOTOPE(14)
L2040892-01B	Plastic 2oz unpreserved for TS	A	NA		2.4	Y	Absent		A2-TS(7)
L2040892-02A	Plastic 8oz unpreserved	A	NA		2.4	Y	Absent		A2-S-EXT-537(28)
L2040892-02B	Plastic 2oz unpreserved for TS	A	NA		2.4	Y	Absent		A2-TS(7)
L2040892-03A	Plastic 8oz unpreserved	A	NA		2.4	Y	Absent		A2-S-EXT-537(28)
L2040892-03B	Plastic 2oz unpreserved for TS	A	NA		2.4	Y	Absent		A2-TS(7)
L2040892-04A	Plastic 8oz unpreserved	A	NA		2.4	Y	Absent		A2-537-ISOTOPE(14)
L2040892-04B	Plastic 2oz unpreserved for TS	A	NA		2.4	Y	Absent		A2-TS(7)
L2040892-05A	Plastic 8oz unpreserved	A	NA		2.4	Y	Absent		A2-537-ISOTOPE(14)
L2040892-05B	Plastic 2oz unpreserved for TS	A	NA		2.4	Y	Absent		A2-TS(7)
L2040892-06A	Plastic 8oz unpreserved	A	NA		2.4	Y	Absent		A2-537-ISOTOPE(14)
L2040892-06B	Plastic 2oz unpreserved for TS	A	NA		2.4	Y	Absent		A2-TS(7)
L2040892-07A	Plastic 8oz unpreserved	A	NA		2.4	Y	Absent		A2-537-ISOTOPE(14)
L2040892-07B	Plastic 2oz unpreserved for TS	A	NA		2.4	Y	Absent		A2-TS(7)
L2040892-08A	Plastic 8oz unpreserved	A	NA		2.4	Y	Absent		A2-537-ISOTOPE(14)
L2040892-08B	Plastic 2oz unpreserved for TS	A	NA		2.4	Y	Absent		A2-TS(7)

*Values in parentheses indicate holding time in days

PFAS PARAMETER SUMMARY

Parameter	Acronym	CAS Number
PERFLUOROALKYL CARBOXYLIC ACIDS (PFCAs)		
Perfluorooctadecanoic Acid	PFODA	16517-11-6
Perfluorohexadecanoic Acid	PFHxDA	67905-19-5
Perfluorotetradecanoic Acid	PFTA	376-06-7
Perfluorotridecanoic Acid	PFTrDA	72629-94-8
Perfluorododecanoic Acid	PFDoA	307-55-1
Perfluoroundecanoic Acid	PFUnA	2058-94-8
Perfluorodecanoic Acid	PFDA	335-76-2
Perfluorononanoic Acid	PFNA	375-95-1
Perfluorooctanoic Acid	PFOA	335-67-1
Perfluoroheptanoic Acid	PFHpA	375-85-9
Perfluorohexanoic Acid	PFHxA	307-24-4
Perfluoropentanoic Acid	PFPeA	2706-90-3
Perfluorobutanoic Acid	PFBA	375-22-4
PERFLUOROALKYL SULFONIC ACIDS (PFSAs)		
Perfluorododecanesulfonic Acid	PFDoDS	79780-39-5
Perfluorodecanesulfonic Acid	PFDS	335-77-3
Perfluorononanesulfonic Acid	PFNS	68259-12-1
Perfluorooctanesulfonic Acid	PFOS	1763-23-1
Perfluoroheptanesulfonic Acid	PFHpS	375-92-8
Perfluorohexanesulfonic Acid	PFHxS	355-46-4
Perfluoropentanesulfonic Acid	PFPeS	2706-91-4
Perfluorobutanesulfonic Acid	PFBS	375-73-5
FLUOROTELOMERS		
1H,1H,2H,2H-Perfluorododecanesulfonic Acid	10:2FTS	120226-60-0
1H,1H,2H,2H-Perfluorodecanesulfonic Acid	8:2FTS	39108-34-4
1H,1H,2H,2H-Perfluorooctanesulfonic Acid	6:2FTS	27619-97-2
1H,1H,2H,2H-Perfluorohexanesulfonic Acid	4:2FTS	757124-72-4
PERFLUOROALKANE SULFONAMIDES (FASAs)		
Perfluorooctanesulfonamide	FOSA	754-91-6
N-Ethyl Perfluorooctane Sulfonamide	NEtFOSA	4151-50-2
N-Methyl Perfluorooctane Sulfonamide	NMeFOSA	31506-32-8
PERFLUOROALKANE SULFONYL SUBSTANCES		
N-Ethyl Perfluorooctanesulfonamido Ethanol	NEtFOSE	1691-99-2
N-Methyl Perfluorooctanesulfonamido Ethanol	NMeFOSE	24448-09-7
N-Ethyl Perfluorooctanesulfonamidoacetic Acid	NEtFOSAA	2991-50-6
N-Methyl Perfluorooctanesulfonamidoacetic Acid	NMeFOSAA	2355-31-9
PER- and POLYFLUOROALKYL ETHER CARBOXYLIC ACIDS		
2,3,3,3-Tetrafluoro-2-[1,1,2,2,3,3,3-Heptafluoropropoxy]-Propanoic Acid	HFPO-DA	13252-13-6
4,8-Dioxa-3h-Perfluorononanoic Acid	ADONA	919005-14-4
CHLORO-PERFLUOROALKYL SULFONIC ACIDS		
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid	11Cl-PF3OUdS	763051-92-9
9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid	9Cl-PF3ONS	756426-58-1
PERFLUOROETHER SULFONIC ACIDS (PFESAs)		
Perfluoro(2-Ethoxyethane)Sulfonic Acid	PFEESA	113507-82-7
PERFLUOROETHER/POLYETHER CARBOXYLIC ACIDS (PFPCAs)		
Perfluoro-3-Methoxypropanoic Acid	PFMPA	377-73-1
Perfluoro-4-Methoxybutanoic Acid	PFMBA	863090-89-5
Nonafluoro-3,6-Dioxaheptanoic Acid	NFDHA	151772-58-6

GLOSSARY

Acronyms

DL	- Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EMPC	- Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LOD	- Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
LOQ	- Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NDPA/DPA	- N-Nitrosodiphenylamine/Diphenylamine.
NI	- Not Ignitable.
NP	- Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.
NR	- No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.
STLP	- Semi-dynamic Tank Leaching Procedure per EPA Method 1315.
TEF	- Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.
TEQ	- Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.
TIC	- Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Report Format: DU Report with 'J' Qualifiers

Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. If a 'Total' result is requested, the results of its individual components will also be reported.

The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Data Qualifiers

A - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

F - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

ND - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where

Data Qualifiers

the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

REFERENCES

121 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WEF. Standard Methods Online.

134 Determination of Selected Perfluorinated Alkyl Acids in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS) using Isotope Dilution. Alpha SOP 23528.

LIMITATION OF LIABILITIES

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 624/624.1: m/p-xylene, o-xylene, Naphthalene
EPA 8260C: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
SM4500: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

Mansfield Facility
SM 2540D: TSS
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
EPA TO-12 Non-methane organics
EPA 3C Fixed gases
Biological Tissue Matrix: EPA 3050B

The following analytes are included in our Massachusetts DEP Scope of Accreditation

Westborough Facility:

Drinking Water
EPA 300.0: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
EPA 332: Perchlorate; **EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

Non-Potable Water
SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH: Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N**, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
EPA 624.1: Volatile Halocarbons & Aromatics,
EPA 608.3: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625.1: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, EPA 1600, EPA 1603.**

Mansfield Facility:

Drinking Water
EPA 200.7: Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
EPA 522.

Non-Potable Water
EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
EPA 200.8: Al, Sb, As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
EPA 245.1 Hg.
SM2340B

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

CHAIN OF CUSTODY

PAGE 1 OF 1

Date Rec'd in Lab: 9/28/20

ALPHA Job #: L2040892

ALPHA ANALYTICAL
WESTBORO, MA TEL: 508-898-9220 FAX: 508-898-9193
MANSFIELD, MA TEL: 508-822-9300 FAX: 508-822-3288

Client Information

Client: Horsley Witten Group
Address: 90 Route 6A
Sandwich MA 02563
Phone: (508)
Fax:
Email: bmassa@horsleywitten.com

☐ These samples have been previously analyzed by Alpha

Project Information

Project Name: Barnstable Airport
Project Location: Hyannis MA
Project #: 20102
Project Manager: Bryan Massa
ALPHA Quote #:

Turn-Around Time

☑ Standard ☐ RUSH (only confirmed if pre-approved!)

Date Due: Time:

Report Information - Data Deliverables

☐ FAX ☐ EMAIL
☐ ADEx ☐ Add'l Deliverables

Billing Information

☐ Same as Client info PO #:

Regulatory Requirements/Report Limits

State /Fed Program | Criteria

Other Project Specific Requirements/Comments/Detection Limits:

ANALYSIS: PFAS Isotope Dilution; PFAS isotope Dilution extract + hold

SAMPLE HANDLING
Filtration
☐ Done
☐ Not needed
☐ Lab to do
Preservation
☐ Lab to do
(Please specify below)

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler's Initials	PFAS Isotope Dilution	PFAS isotope Dilution extract + hold	Sample Specific Comments	TOTAL # BOTTLES
40892-01	DL22 (2-4)	9/25/20	12:45	Soil	SB				
-02	DL22 (6-8)	9/25/20	12:51	Soil	SB		✓		
-03	DL22 (18-20)	9/25/20	12:57	Soil	SB		✓		
-04	DL19 (0-1)	9/25/20	13:27	Soil	SB	✓	~~✓~~ SB		
-05	DL20 (0-1)	9/25/20	13:34	Soil	SB	✓			
-06	DL21 (0-1)	9/25/20	13:40	Soil	SB	✓			
-07	DL18 (0-1)	9/25/20	15:10	Soil	SB	✓			
-08	DL17 (0-1)	9/25/20	15:15	Soil	SB	✓			

Container Type
Preservative

Relinquished By:	Date/Time	Received By:	Date/Time
Sarah Bartlett	9/28/20 13:36	Tcg AAL	9/28/20 1336
TCG AAL	9/28/20 1744	[illegible]	9/28/20 1744
[illegible]	9/28/20 2050	[illegible]	9/28/20 2050
[illegible]	9/28/20 2050	AKC - AAL	9/28/20 2050

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

FORM NO: 01-01 (rev. 14-OCT-07)

ANALYTICAL REPORT

Lab Number:	L2040723
Client:	Horseley & Witten, Inc. Sextant Hill Office Park 90 Route 6A Sandwich, MA 02563
ATTN:	Brian Massa
Phone:	(508) 833-6600
Project Name:	BARNSTABLE AIRPORT
Project Number:	20102
Report Date:	10/08/20

Certifications & Approvals: MA (M-MA030), NH NELAP (2062), CT (PH-0141), DoD (L2474), FL (E87814), IL (200081), LA (85084), ME (MA00030), MD (350), NJ (MA015), NY (11627), NC (685), OH (CL106), PA (68-02089), RI (LAO00299), TX (T104704419), VT (VT-0015), VA (460194), WA (C954), US Army Corps of Engineers, USDA (Permit #P330-17-00150), USFWS (Permit #206964).

320 Forbes Boulevard, Mansfield, MA 02048-1806
508-822-9300 (Fax) 508-822-3288 800-624-9220 - www.alphalab.com

Project Name: BARNSTABLE AIRPORT
Project Number: 20102

Lab Number: L2040723
Report Date: 10/08/20

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L2040723-01	A5 (12-14)	SOIL	HYANNIS MA	09/24/20 09:46	09/25/20
L2040723-02	A5 (18-20)	SOIL	HYANNIS MA	09/24/20 09:57	09/25/20
L2040723-03	A20 (0-1)	SOIL	HYANNIS MA	09/24/20 11:05	09/25/20
L2040723-04	A20 (2-4)	SOIL	HYANNIS MA	09/24/20 11:11	09/25/20
L2040723-05	A21 (0-1)	SOIL	HYANNIS MA	09/24/20 11:20	09/25/20
L2040723-06	A19 (0-1)	SOIL	HYANNIS MA	09/24/20 11:35	09/25/20
L2040723-07	AS5 (2-4)	SOIL	HYANNIS MA	09/24/20 11:50	09/25/20

Project Name:	BARNSTABLE AIRPORT	**Lab Number:**	L2040723
Project Number:	20102	**Report Date:**	10/08/20

MADEP MCP Response Action Analytical Report Certification

This form provides certifications for all samples performed by MCP methods. Please refer to the Sample Results and Container Information sections of this report for specification of MCP methods used for each analysis. The following questions pertain only to MCP Analytical Methods.

An affirmative response to questions A through F is required for "Presumptive Certainty" status		
A	Were all samples received in a condition consistent with those described on the Chain-of-Custody, properly preserved (including temperature) in the field or laboratory, and prepared/analyzed within method holding times?	YES
B	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	N/A
C	Were all required corrective actions and analytical response actions specified in the selected CAM protocol(s) implemented for all identified performance standard non-conformances?	N/A
D	Does the laboratory report comply with all the reporting requirements specified in CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data?"	YES
E a.	VPH, EPH, and APH Methods only: Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications).	N/A
E b.	APH and TO-15 Methods only: Was the complete analyte list reported for each method?	N/A
F	Were all applicable CAM protocol QC and performance standard non-conformances identified and evaluated in a laboratory narrative (including all "No" responses to Questions A through E)?	YES

A response to questions G, H and I is required for "Presumptive Certainty" status		
G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocol(s)?	N/A
H	Were all QC performance standards specified in the CAM protocol(s) achieved?	N/A
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	N/A

For any questions answered "No", please refer to the case narrative section on the following page(s).

Please note that sample matrix information is located in the Sample Results section of this report.

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

Case Narrative (continued)

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

MCP Related Narratives

All MCP required questions were answered with affirmative responses where applicable; therefore, there are no relevant protocol-specific QC and/or performance standard non-conformances to report.

Non-MCP Related Narratives

Perfluorinated Alkyl Acids by Isotope Dilution

L2040723-03RE, -04RE, and -07RE: Extracted Internal Standard recoveries were outside the acceptance criteria for individual analytes. Please refer to the surrogate section of the report for details.

L2040723-03RE, -04RE, and -07RE: The samples were re-extracted within holding time due to QC failures in the original extraction. The results of the re-extraction are reported.

L2040723-03RE and -04RE: The reporting limit was elevated for NMeFOSAA and NEtFOSAA due to low recovery of the extracted internal standard d3.NMeFOSAA and d5-NEtFOSAA. The low recovery was attributed to the sample matrix.

L2040723-03RE, -04RE, and -07RE: The samples have elevated detection limits due to the limited sample volume utilized during extraction, as required by the sample matrix.

L2040723-05 and -06: Extracted Internal Standard recoveries were outside the acceptance criteria for individual analytes. Please refer to the surrogate section of the report for details.

L2040723-05 and -06: The reporting limit was elevated for NMeFOSAA and NEtFOSAA due to low recovery of the extracted internal standard d3-NMeFOSAA and d5-NEtFOSAA. The low recovery was attributed to the sample matrix.

L2040723-07RE: The reporting limit was elevated for NMeFOSAA and NEtFOSAA due to low recovery of the extracted internal standard d3-NMeFOSAA and d5-NEtFOSAA. The low recovery was attributed to the sample matrix.

Project Name: BARNSTABLE AIRPORT **Lab Number:** L2040723
Project Number: 20102 **Report Date:** 10/08/20

Case Narrative (continued)

WG1416277-1, WG1416277-2, WG1416277-3, WG1417013-1, WG1417013-2, and WG1417013-3: Extracted Internal Standard recoveries were outside the acceptance criteria for individual analytes. Please refer to the surrogate section of the report for details.

WG1416277-1: The reporting limit was elevated for Perfluorooctanesulfonamide (FOSA) due to low recovery of the extracted internal standard Perfluoro[13C8]Octanesulfonamide (M8FOSA). Please note that the Perfluorooctanesulfonamide (FOSA) reporting limit was also raised for all associated samples.

WG1417013-1: The reporting limit was elevated for Perfluorooctanesulfonamide (FOSA) due to low recovery of the extracted internal standard Perfluoro[13C8]Octanesulfonamide (M8FOSA). Please note that the Perfluorooctanesulfonamide (FOSA) reporting limit was also raised for all associated samples.

The WG1417013-2 LCS recovery, associated with L2040723-03, -04, and -07, is below the acceptance criteria for perfluorooctanesulfonamide (fosa) (19%); however, it has been identified as a "difficult" analyte. The results of the associated samples are reported.

The WG1417013-2/-3 LCS/LCSD RPD, associated with L2040723-03, -04, and -07, is above the acceptance criteria for perfluorooctanesulfonamide (fosa) (147%).

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Elizabeth Porta

Title: Technical Director/Representative Date: 10/08/20

Serial_No:10082016:12

QC OUTLIER SUMMARY REPORT

Project Name: BARNSTABLE AIRPORT
Project Number: 20102
Lab Number: L2040723
Report Date: 10/08/20

Method	Client ID (Native ID)	Lab ID	Parameter	QC Type	Recovery/RPD (%)	QC Limits (%)	Associated Samples	Data Quality Assessment
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab								
LCMSMS-ID	Batch QC	WG1417013-2	Perfluorooctanesulfonamide (FOSA)	LCS	19	67-137	03-04,07	potential low bias
LCMSMS-ID	Batch QC	WG1417013-3	Perfluorooctanesulfonamide (FOSA)	LCSD	147	30	03-04,07	non-directional bias

ORGANICS

SEMIVOLATILES

Project Name: BARNSTABLE AIRPORT **Lab Number:** L2040723

Project Number: 20102 **Report Date:** 10/08/20

SAMPLE RESULTS

Lab ID: L2040723-03 RE
Client ID: A20 (0-1)
Sample Location: HYANNIS MA

Date Collected: 09/24/20 11:05
Date Received: 09/25/20
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Analytical Method: 134,LCMSMS-ID
Analytical Date: 10/02/20 21:06
Analyst: JW
Percent Solids: 98%

Extraction Method: ALPHA 23528
Extraction Date: 10/01/20 17:00

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	ND		ng/g	2.00	0.045	1
Perfluoropentanoic Acid (PFPeA)	ND		ng/g	2.00	0.092	1
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/g	2.00	0.078	1
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/g	2.00	0.129	1
Perfluorohexanoic Acid (PFHxA)	0.120	J	ng/g	2.00	0.105	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/g	2.00	0.166	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/g	2.00	0.090	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/g	2.00	0.121	1
Perfluorooctanoic Acid (PFOA)	0.196	J	ng/g	2.00	0.084	1
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/g	2.00	0.358	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/g	2.00	0.272	1
Perfluorononanoic Acid (PFNA)	ND		ng/g	2.00	0.150	1
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/g	2.00	0.259	1
Perfluorodecanoic Acid (PFDA)	ND		ng/g	2.00	0.134	1
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/g	2.00	0.572	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/g	2.00	0.596	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/g	20.0	0.402	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/g	2.00	0.093	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/g	2.00	0.305	1
Perfluorooctanesulfonamide (FOSA)	ND		ng/g	20.0	0.196	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/g	20.0	0.168	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/g	2.00	0.140	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/g	2.00	0.408	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/g	2.00	0.108	1

Project Name:	BARNSTABLE AIRPORT	**Lab Number:**	L2040723
Project Number:	20102	**Report Date:**	10/08/20

SAMPLE RESULTS

Lab ID:	L2040723-03	RE	Date Collected:	09/24/20 11:05
Client ID:	A20 (0-1)		Date Received:	09/25/20
Sample Location:	HYANNIS MA		Field Prep:	Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor

Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	**24**	Q	60-153
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	**24**	Q	65-182
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	**36**	Q	70-151
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	**15**	Q	56-138
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	**25**	Q	61-147
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	**26**	Q	62-149
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	**38**	Q	63-166
Perfluoro[13C8]Octanoic Acid (M8PFOA)	**27**	Q	62-152
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	**20**	Q	32-182
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	**29**	Q	61-154
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	**38**	Q	65-151
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	**30**	Q	65-150
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	**21**	Q	25-186
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	**1**	Q	45-137
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	**30**	Q	64-158
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	2		1-125
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	**2**	Q	42-136
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	**28**	Q	56-148
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	**21**	Q	26-160

Project Name: BARNSTABLE AIRPORT **Lab Number:** L2040723
Project Number: 20102 **Report Date:** 10/08/20

SAMPLE RESULTS

Lab ID: L2040723-04 RE
Client ID: A20 (2-4)
Sample Location: HYANNIS MA

Date Collected: 09/24/20 11:11
Date Received: 09/25/20
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Analytical Method: 134,LCMSMS-ID
Analytical Date: 10/02/20 21:23
Analyst: JW
Percent Solids: 97%

Extraction Method: ALPHA 23528
Extraction Date: 10/01/20 17:00

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	ND		ng/g	2.00	0.045	1
Perfluoropentanoic Acid (PFPeA)	ND		ng/g	2.00	0.092	1
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/g	2.00	0.078	1
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/g	2.00	0.129	1
Perfluorohexanoic Acid (PFHxA)	ND		ng/g	2.00	0.105	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/g	2.00	0.167	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/g	2.00	0.090	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/g	2.00	0.121	1
Perfluorooctanoic Acid (PFOA)	0.147	J	ng/g	2.00	0.084	1
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/g	2.00	0.359	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/g	2.00	0.273	1
Perfluorononanoic Acid (PFNA)	ND		ng/g	2.00	0.150	1
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/g	2.00	0.260	1
Perfluorodecanoic Acid (PFDA)	ND		ng/g	2.00	0.134	1
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/g	2.00	0.574	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/g	2.00	0.597	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/g	20.0	0.403	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/g	2.00	0.094	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/g	2.00	0.306	1
Perfluorooctanesulfonamide (FOSA)	ND		ng/g	20.0	0.196	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/g	20.0	0.169	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/g	2.00	0.140	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/g	2.00	0.409	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/g	2.00	0.108	1

Project Name: BARNSTABLE AIRPORT **Lab Number:** L2040723
Project Number: 20102 **Report Date:** 10/08/20

SAMPLE RESULTS

Lab ID:	L2040723-04 RE	Date Collected:	09/24/20 11:11
Client ID:	A20 (2-4)	Date Received:	09/25/20
Sample Location:	HYANNIS MA	Field Prep:	Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor

Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	**32**	Q	60-153
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	**31**	Q	65-182
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	**47**	Q	70-151
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	**24**	Q	56-138
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	**34**	Q	61-147
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	**36**	Q	62-149
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	**52**	Q	63-166
Perfluoro[13C8]Octanoic Acid (M8PFOA)	**37**	Q	62-152
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	**30**	Q	32-182
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	**38**	Q	61-154
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	**51**	Q	65-151
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	**39**	Q	65-150
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	25		25-186
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	**2**	Q	45-137
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	**41**	Q	64-158
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	10		1-125
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	**3**	Q	42-136
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	**36**	Q	56-148
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	29		26-160

Project Name: BARNSTABLE AIRPORT **Lab Number:** L2040723
Project Number: 20102 **Report Date:** 10/08/20

SAMPLE RESULTS

Lab ID: L2040723-05
Client ID: A21 (0-1)
Sample Location: HYANNIS MA
Date Collected: 09/24/20 11:20
Date Received: 09/25/20
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Analytical Method: 134,LCMSMS-ID
Analytical Date: 10/01/20 00:43
Analyst: JW
Percent Solids: 98%
Extraction Method: ALPHA 23528
Extraction Date: 09/30/20 09:20

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	0.092	J	ng/g	0.997	0.023	1
Perfluoropentanoic Acid (PFPeA)	0.054	J	ng/g	0.997	0.046	1
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/g	0.997	0.039	1
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/g	0.997	0.064	1
Perfluorohexanoic Acid (PFHxA)	0.058	J	ng/g	0.997	0.052	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/g	0.997	0.083	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/g	0.997	0.045	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/g	0.997	0.060	1
Perfluorooctanoic Acid (PFOA)	ND		ng/g	0.997	0.042	1
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/g	0.997	0.179	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/g	0.997	0.136	1
Perfluorononanoic Acid (PFNA)	ND		ng/g	0.997	0.075	1
Perfluorooctanesulfonic Acid (PFOS)	0.276	J	ng/g	0.997	0.130	1
Perfluorodecanoic Acid (PFDA)	ND		ng/g	0.997	0.067	1
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/g	0.997	0.286	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/g	0.997	0.298	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/g	9.97	0.201	1
Perfluoroundecanoic Acid (PFUnA)	0.091	J	ng/g	0.997	0.047	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/g	0.997	0.152	1
Perfluorooctanesulfonamide (FOSA)	ND		ng/g	9.97	0.098	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/g	9.97	0.084	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/g	0.997	0.070	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/g	0.997	0.204	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/g	0.997	0.054	1

Project Name: BARNSTABLE AIRPORT **Lab Number:** L2040723

Project Number: 20102 **Report Date:** 10/08/20

SAMPLE RESULTS

Lab ID:	L2040723-05	Date Collected:	09/24/20 11:20
Client ID:	A21 (0-1)	Date Received:	09/25/20
Sample Location:	HYANNIS MA	Field Prep:	Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor

Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	**38**	Q	60-153
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	**38**	Q	65-182
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	70		70-151
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	**42**	Q	56-138
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	**43**	Q	61-147
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	**45**	Q	62-149
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	78		63-166
Perfluoro[13C8]Octanoic Acid (M8PFOA)	**48**	Q	62-152
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	51		32-182
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	**55**	Q	61-154
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	71		65-151
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	**54**	Q	65-150
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	45		25-186
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	**6**	Q	45-137
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	**54**	Q	64-158
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	21		1-125
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	**9**	Q	42-136
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	**47**	Q	56-148
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	30		26-160

Project Name:	BARNSTABLE AIRPORT	**Lab Number:**	L2040723
Project Number:	20102	**Report Date:**	10/08/20

SAMPLE RESULTS

Lab ID:	L2040723-06	Date Collected:	09/24/20 11:35
Client ID:	A19 (0-1)	Date Received:	09/25/20
Sample Location:	HYANNIS MA	Field Prep:	Not Specified
Sample Depth:			
Matrix:	Soil	Extraction Method:	ALPHA 23528
Analytical Method:	134,LCMSMS-ID	Extraction Date:	09/30/20 09:20
Analytical Date:	10/01/20 00:59		
Analyst:	JW		
Percent Solids:	97%		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	0.128	J	ng/g	0.977	0.022	1
Perfluoropentanoic Acid (PFPeA)	0.099	J	ng/g	0.977	0.045	1
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/g	0.977	0.038	1
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/g	0.977	0.063	1
Perfluorohexanoic Acid (PFHxA)	0.095	J	ng/g	0.977	0.051	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/g	0.977	0.082	1
Perfluoroheptanoic Acid (PFHpA)	0.101	J	ng/g	0.977	0.044	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/g	0.977	0.059	1
Perfluorooctanoic Acid (PFOA)	0.129	J	ng/g	0.977	0.041	1
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/g	0.977	0.175	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/g	0.977	0.133	1
Perfluorononanoic Acid (PFNA)	0.246	J	ng/g	0.977	0.073	1
Perfluorooctanesulfonic Acid (PFOS)	0.611	JF	ng/g	0.977	0.127	1
Perfluorodecanoic Acid (PFDA)	ND		ng/g	0.977	0.066	1
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/g	0.977	0.280	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/g	0.977	0.292	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/g	9.77	0.197	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/g	0.977	0.046	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/g	0.977	0.150	1
Perfluorooctanesulfonamide (FOSA)	ND		ng/g	9.77	0.096	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/g	9.77	0.083	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/g	0.977	0.068	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/g	0.977	0.200	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/g	0.977	0.053	1

Project Name: BARNSTABLE AIRPORT **Lab Number:** L2040723
Project Number: 20102 **Report Date:** 10/08/20

SAMPLE RESULTS

Lab ID:	L2040723-06	Date Collected:	09/24/20 11:35
Client ID:	A19 (0-1)	Date Received:	09/25/20
Sample Location:	HYANNIS MA	Field Prep:	Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor

Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	**50**	Q	60-153
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	**50**	Q	65-182
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	77		70-151
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	**31**	Q	56-138
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	**56**	Q	61-147
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	**58**	Q	62-149
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	84		63-166
Perfluoro[13C8]Octanoic Acid (M8PFOA)	**60**	Q	62-152
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	36		32-182
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	64		61-154
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	78		65-151
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	**62**	Q	65-150
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	39		25-186
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	**1**	Q	45-137
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	**59**	Q	64-158
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	8		1-125
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	**1**	Q	42-136
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	**50**	Q	56-148
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	**25**	Q	26-160

Project Name: BARNSTABLE AIRPORT **Lab Number:** L2040723
Project Number: 20102 **Report Date:** 10/08/20

SAMPLE RESULTS

Lab ID: L2040723-07 RE
Client ID: AS5 (2-4)
Sample Location: HYANNIS MA

Date Collected: 09/24/20 11:50
Date Received: 09/25/20
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Analytical Method: 134,LCMSMS-ID
Analytical Date: 10/02/20 21:39
Analyst: JW
Percent Solids: 97%

Extraction Method: ALPHA 23528
Extraction Date: 10/01/20 17:00

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	0.066	J	ng/g	1.98	0.045	1
Perfluoropentanoic Acid (PFPeA)	0.153	J	ng/g	1.98	0.091	1
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/g	1.98	0.077	1
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/g	1.98	0.128	1
Perfluorohexanoic Acid (PFHxA)	0.166	J	ng/g	1.98	0.104	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/g	1.98	0.165	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/g	1.98	0.089	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/g	1.98	0.120	1
Perfluorooctanoic Acid (PFOA)	0.228	J	ng/g	1.98	0.083	1
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/g	1.98	0.355	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/g	1.98	0.270	1
Perfluorononanoic Acid (PFNA)	ND		ng/g	1.98	0.148	1
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/g	1.98	0.257	1
Perfluorodecanoic Acid (PFDA)	ND		ng/g	1.98	0.133	1
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/g	1.98	0.568	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/g	1.98	0.592	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/g	19.8	0.399	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/g	1.98	0.093	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/g	1.98	0.303	1
Perfluorooctanesulfonamide (FOSA)	ND		ng/g	19.8	0.194	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/g	19.8	0.167	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/g	1.98	0.138	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/g	1.98	0.405	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/g	1.98	0.107	1

Project Name: BARNSTABLE AIRPORT **Lab Number:** L2040723

Project Number: 20102 **Report Date:** 10/08/20

SAMPLE RESULTS

Lab ID:	L2040723-07	RE	Date Collected:	09/24/20 11:50
Client ID:	AS5 (2-4)		Date Received:	09/25/20
Sample Location:	HYANNIS MA		Field Prep:	Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor

Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	**53**	Q	60-153
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	**52**	Q	65-182
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	72		70-151
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	**40**	Q	56-138
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	**57**	Q	61-147
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	**60**	Q	62-149
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	80		63-166
Perfluoro[13C8]Octanoic Acid (M8PFOA)	**61**	Q	62-152
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	44		32-182
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	64		61-154
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	78		65-151
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	**63**	Q	65-150
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	48		25-186
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	**3**	Q	45-137
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	65		64-158
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	2		1-125
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	**3**	Q	42-136
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	59		56-148
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	47		26-160

Project Name: BARNSTABLE AIRPORT **Lab Number:** L2040723
Project Number: 20102 **Report Date:** 10/08/20

Method Blank Analysis
Batch Quality Control

Analytical Method: 134,LCMSMS-ID
Analytical Date: 09/30/20 19:11
Analyst: JW

Extraction Method: ALPHA 23528
Extraction Date: 09/30/20 09:20

Parameter	Result	Qualifier	Units	RL	MDL
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab for sample(s): 05-06 Batch: WG1416277-1					
Perfluorobutanoic Acid (PFBA)	ND		ng/g	1.00	0.023
Perfluoropentanoic Acid (PFPeA)	ND		ng/g	1.00	0.046
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/g	1.00	0.039
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/g	1.00	0.065
Perfluorohexanoic Acid (PFHxA)	ND		ng/g	1.00	0.053
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/g	1.00	0.084
Perfluoroheptanoic Acid (PFHpA)	ND		ng/g	1.00	0.045
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/g	1.00	0.061
Perfluorooctanoic Acid (PFOA)	ND		ng/g	1.00	0.042
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/g	1.00	0.180
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/g	1.00	0.136
Perfluorononanoic Acid (PFNA)	ND		ng/g	1.00	0.075
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/g	1.00	0.130
Perfluorodecanoic Acid (PFDA)	ND		ng/g	1.00	0.067
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/g	1.00	0.287
Perfluorononanesulfonic Acid (PFNS)	ND		ng/g	1.00	0.299
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/g	1.00	0.202
Perfluoroundecanoic Acid (PFUnA)	ND		ng/g	1.00	0.047
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/g	1.00	0.153
Perfluorooctanesulfonamide (FOSA)	ND		ng/g	10.0	0.098
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/g	1.00	0.085
Perfluorododecanoic Acid (PFDoA)	ND		ng/g	1.00	0.070
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/g	1.00	0.204
Perfluorotetradecanoic Acid (PFTA)	ND		ng/g	1.00	0.054
PFOA/PFOS, Total	ND		ng/g	1.00	0.042
PFAS, Total (5)	ND		ng/g	1.00	0.042

Project Name: BARNSTABLE AIRPORT
Project Number: 20102

Lab Number: L2040723
Report Date: 10/08/20

Method Blank Analysis
Batch Quality Control

Analytical Method: 134,LCMSMS-ID
Analytical Date: 09/30/20 19:11
Analyst: JW

Extraction Method: ALPHA 23528
Extraction Date: 09/30/20 09:20

Parameter	Result	Qualifier	Units	RL	MDL
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab for sample(s): 05-06 Batch: WG1416277-1					

Surrogate (Extracted Internal Standard)	%Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	77		60-153
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	78		65-182
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	90		70-151
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	**50**	Q	56-138
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	80		61-147
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	82		62-149
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	97		63-166
Perfluoro[13C8]Octanoic Acid (M8PFOA)	85		62-152
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	62		32-182
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	95		61-154
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	95		65-151
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	88		65-150
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	64		25-186
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	53		45-137
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	87		64-158
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	**0**	Q	1-125
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	66		42-136
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	77		56-148
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	57		26-160

Project Name: BARNSTABLE AIRPORT **Lab Number:** L2040723
Project Number: 20102 **Report Date:** 10/08/20

Method Blank Analysis
Batch Quality Control

Analytical Method: 134,LCMSMS-ID
Analytical Date: 10/02/20 19:44
Analyst: JW

Extraction Method: ALPHA 23528
Extraction Date: 10/01/20 17:00

Parameter	Result	Qualifier	Units	RL	MDL
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab for sample(s): 03-04,07 Batch: WG1417013-1					
Perfluorobutanoic Acid (PFBA)	ND		ng/g	1.00	0.023
Perfluoropentanoic Acid (PFPeA)	ND		ng/g	1.00	0.046
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/g	1.00	0.039
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/g	1.00	0.065
Perfluorohexanoic Acid (PFHxA)	ND		ng/g	1.00	0.053
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/g	1.00	0.084
Perfluoroheptanoic Acid (PFHpA)	ND		ng/g	1.00	0.045
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/g	1.00	0.061
Perfluorooctanoic Acid (PFOA)	ND		ng/g	1.00	0.042
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/g	1.00	0.180
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/g	1.00	0.136
Perfluorononanoic Acid (PFNA)	ND		ng/g	1.00	0.075
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/g	1.00	0.130
Perfluorodecanoic Acid (PFDA)	ND		ng/g	1.00	0.067
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/g	1.00	0.287
Perfluorononanesulfonic Acid (PFNS)	ND		ng/g	1.00	0.299
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/g	1.00	0.202
Perfluoroundecanoic Acid (PFUnA)	ND		ng/g	1.00	0.047
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/g	1.00	0.153
Perfluorooctanesulfonamide (FOSA)	ND		ng/g	10.0	0.098
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/g	1.00	0.085
Perfluorododecanoic Acid (PFDoA)	ND		ng/g	1.00	0.070
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/g	1.00	0.204
Perfluorotetradecanoic Acid (PFTA)	ND		ng/g	1.00	0.054

Project Name: BARNSTABLE AIRPORT
Lab Number: L2040723
Project Number: 20102
Report Date: 10/08/20

Method Blank Analysis
Batch Quality Control

Analytical Method: 134,LCMSMS-ID
Analytical Date: 10/02/20 19:44
Analyst: JW

Extraction Method: ALPHA 23528
Extraction Date: 10/01/20 17:00

Parameter	Result	Qualifier	Units	RL	MDL
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab for sample(s): 03-04,07 Batch: WG1417013-1					

Surrogate (Extracted Internal Standard)	%Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	**49**	Q	60-153
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	**53**	Q	65-182
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	97		70-151
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	60		56-138
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	65		61-147
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	76		62-149
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	103		63-166
Perfluoro[13C8]Octanoic Acid (M8PFOA)	84		62-152
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	71		32-182
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	88		61-154
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	99		65-151
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	94		65-150
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	66		25-186
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	69		45-137
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	96		64-158
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	**0**	Q	1-125
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	74		42-136
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	84		56-148
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	65		26-160

Lab Control Sample Analysis
Batch Quality Control

Project Name: BARNSTABLE AIRPORT
Project Number: 20102
Lab Number: L2040723
Report Date: 10/08/20

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 05-06 Batch: WG1416277-2 WG1416277-3								
Perfluorobutanoic Acid (PFBA)	104		104		71-135	0		30
Perfluoropentanoic Acid (PFPeA)	102		102		69-132	0		30
Perfluorobutanesulfonic Acid (PFBS)	102		103		72-128	1		30
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	104		112		62-145	7		30
Perfluorohexanoic Acid (PFHxA)	105		106		70-132	1		30
Perfluoropentanesulfonic Acid (PFPeS)	92		91		73-123	1		30
Perfluoroheptanoic Acid (PFHpA)	106		103		71-131	3		30
Perfluorohexanesulfonic Acid (PFHxS)	101		100		67-130	1		30
Perfluorooctanoic Acid (PFOA)	103		104		69-133	1		30
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	116		114		64-140	2		30
Perfluoroheptanesulfonic Acid (PFHpS)	109		105		70-132	4		30
Perfluorononanoic Acid (PFNA)	100		99		72-129	1		30
Perfluorooctanesulfonic Acid (PFOS)	111		112		68-136	1		30
Perfluorodecanoic Acid (PFDA)	102		103		69-133	1		30
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	123		113		65-137	8		30
Perfluorononanesulfonic Acid (PFNS)	115		118		69-125	3		30
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	120		115		63-144	4		30
Perfluoroundecanoic Acid (PFUnA)	110		107		64-136	3		30
Perfluorodecanesulfonic Acid (PFDS)	126		119		59-134	6		30
Perfluorooctanesulfonamide (FOSA)	88		84		67-137	5		30
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	116		114		61-139	2		30
Perfluorododecanoic Acid (PFDoA)	110		111		69-135	1		30

Lab Control Sample Analysis
Batch Quality Control

Project Name: BARNSTABLE AIRPORT **Lab Number:** L2040723
Project Number: 20102 **Report Date:** 10/08/20

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 05-06 Batch: WG1416277-2 WG1416277-3								
Perfluorotridecanoic Acid (PFTrDA)	106		106		66-139	0		30
Perfluorotetradecanoic Acid (PFTA)	110		108		69-133	2		30

Surrogate (Extracted Internal Standard)	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	81		80		60-153
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	80		81		65-182
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	87		94		70-151
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	**53**	Q	**55**	Q	56-138
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	83		85		61-147
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	83		88		62-149
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	93		101		63-166
Perfluoro[13C8]Octanoic Acid (M8PFOA)	88		91		62-152
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	63		68		32-182
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	93		99		61-154
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	88		98		65-151
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	89		95		65-150
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	65		71		25-186
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	55		64		45-137
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	90		94		64-158
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	1		2		1-125
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	68		69		42-136
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	80		82		56-148
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	57		61		26-160

Lab Control Sample Analysis
Batch Quality Control

Project Name: BARNSTABLE AIRPORT
Project Number: 20102
Lab Number: L2040723
Report Date: 10/08/20

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 03-04,07 Batch: WG1417013-2 WG1417013-3								
Perfluorobutanoic Acid (PFBA)	105		104		71-135	1		30
Perfluoropentanoic Acid (PFPeA)	106		104		69-132	2		30
Perfluorobutanesulfonic Acid (PFBS)	99		98		72-128	1		30
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	114		112		62-145	2		30
Perfluorohexanoic Acid (PFHxA)	106		105		70-132	1		30
Perfluoropentanesulfonic Acid (PFPeS)	91		92		73-123	1		30
Perfluoroheptanoic Acid (PFHpA)	102		103		71-131	1		30
Perfluorohexanesulfonic Acid (PFHxS)	102		101		67-130	1		30
Perfluorooctanoic Acid (PFOA)	104		105		69-133	1		30
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	117		110		64-140	6		30
Perfluoroheptanesulfonic Acid (PFHpS)	103		108		70-132	5		30
Perfluorononanoic Acid (PFNA)	104		103		72-129	1		30
Perfluorooctanesulfonic Acid (PFOS)	111		106		68-136	5		30
Perfluorodecanoic Acid (PFDA)	100		102		69-133	2		30
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	106		116		65-137	9		30
Perfluorononanesulfonic Acid (PFNS)	119		121		69-125	2		30
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	118		98		63-144	19		30
Perfluoroundecanoic Acid (PFUnA)	108		104		64-136	4		30
Perfluorodecanesulfonic Acid (PFDS)	125		121		59-134	3		30
Perfluorooctanesulfonamide (FOSA)	**19**	Q	124		67-137	**147**	Q	30
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	106		115		61-139	8		30
Perfluorododecanoic Acid (PFDoA)	110		108		69-135	2		30

Lab Control Sample Analysis
Batch Quality Control

Project Name: BARNSTABLE AIRPORT
Project Number: 20102
Lab Number: L2040723
Report Date: 10/08/20

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 03-04,07 Batch: WG1417013-2 WG1417013-3								
Perfluorotridecanoic Acid (PFTrDA)	108		102		66-139	6		30
Perfluorotetradecanoic Acid (PFTA)	102		102		69-133	0		30

Surrogate (Extracted Internal Standard)	*LCS %Recovery*	*Qual*	*LCSD %Recovery*	*Qual*	*Acceptance Criteria*
Perfluoro[13C4]Butanoic Acid (MPFBA)	73		79		60-153
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	72		78		65-182
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	101		102		70-151
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	68		69		56-138
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	82		87		61-147
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	89		91		62-149
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	108		108		63-166
Perfluoro[13C8]Octanoic Acid (M8PFOA)	92		94		62-152
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	80		79		32-182
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	94		97		61-154
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	102		103		65-151
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	97		96		65-150
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	78		81		25-186
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	68		79		45-137
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	96		96		64-158
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	**0**	Q	**0**	Q	1-125
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	83		78		42-136
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	88		87		56-148
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	68		66		26-160

INORGANICS
&
MISCELLANEOUS

Project Name: BARNSTABLE AIRPORT
Lab Number: L2040723
Project Number: 20102
Report Date: 10/08/20

SAMPLE RESULTS

Lab ID: L2040723-01
Date Collected: 09/24/20 09:46
Client ID: A5 (12-14)
Date Received: 09/25/20
Sample Location: HYANNIS MA
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Mansfield Lab										
Solids, Total	79.8		%	0.100	0.100	1	-	09/27/20 11:46	121,2540G	JW

Project Name: BARNSTABLE AIRPORT
Project Number: 20102

Lab Number: L2040723
Report Date: 10/08/20

SAMPLE RESULTS

Lab ID: L2040723-02
Client ID: A5 (18-20)
Sample Location: HYANNIS MA

Date Collected: 09/24/20 09:57
Date Received: 09/25/20
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Mansfield Lab										
Solids, Total	97.8		%	0.100	0.100	1	-	09/27/20 11:46	121,2540G	JW

Project Name: BARNSTABLE AIRPORT
Project Number: 20102

Lab Number: L2040723
Report Date: 10/08/20

SAMPLE RESULTS

Lab ID: L2040723-03
Client ID: A20 (0-1)
Sample Location: HYANNIS MA

Date Collected: 09/24/20 11:05
Date Received: 09/25/20
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Mansfield Lab										
Solids, Total	97.8		%	0.100	0.100	1	-	09/27/20 11:46	121,2540G	JW

Project Name: BARNSTABLE AIRPORT
Lab Number: L2040723
Project Number: 20102
Report Date: 10/08/20

SAMPLE RESULTS

Lab ID: L2040723-04
Date Collected: 09/24/20 11:11
Client ID: A20 (2-4)
Date Received: 09/25/20
Sample Location: HYANNIS MA
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Mansfield Lab										
Solids, Total	96.7		%	0.100	0.100	1	-	09/27/20 11:46	121,2540G	JW

Project Name: BARNSTABLE AIRPORT **Lab Number:** L2040723
Project Number: 20102 **Report Date:** 10/08/20

SAMPLE RESULTS

Lab ID: L2040723-05
Client ID: A21 (0-1)
Sample Location: HYANNIS MA

Date Collected: 09/24/20 11:20
Date Received: 09/25/20
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Mansfield Lab										
Solids, Total	98.1		%	0.100	0.100	1	-	09/27/20 11:46	121,2540G	JW

Project Name: BARNSTABLE AIRPORT
Project Number: 20102

Lab Number: L2040723
Report Date: 10/08/20

SAMPLE RESULTS

Lab ID: L2040723-06
Client ID: A19 (0-1)
Sample Location: HYANNIS MA

Date Collected: 09/24/20 11:35
Date Received: 09/25/20
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Mansfield Lab										
Solids, Total	97.0		%	0.100	0.100	1	-	09/27/20 11:46	121,2540G	JW

Project Name: BARNSTABLE AIRPORT
Project Number: 20102

Lab Number: L2040723
Report Date: 10/08/20

SAMPLE RESULTS

Lab ID: L2040723-07
Client ID: AS5 (2-4)
Sample Location: HYANNIS MA

Date Collected: 09/24/20 11:50
Date Received: 09/25/20
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Mansfield Lab										
Solids, Total	96.7		%	0.100	0.100	1	-	09/27/20 11:46	121,2540G	JW

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information

Cooler	*Custody Seal*
A	Absent

Container Information

Container ID	*Container Type*	*Cooler*	*Initial pH*	*Final pH*	*Temp deg C*	*Pres*	*Seal*	*Frozen Date/Time*	*Analysis(*)*
L2040723-01A	Plastic 8oz unpreserved	A	NA		4.9	Y	Absent		A2-S-EXT-537(28)
L2040723-01B	Plastic 2oz unpreserved for TS	A	NA		4.9	Y	Absent		A2-TS(7)
L2040723-02A	Plastic 8oz unpreserved	A	NA		4.9	Y	Absent		A2-S-EXT-537(28)
L2040723-02B	Plastic 2oz unpreserved for TS	A	NA		4.9	Y	Absent		A2-TS(7)
L2040723-03A	Plastic 8oz unpreserved	A	NA		4.9	Y	Absent		A2-537-ISOTOPE(14)
L2040723-03B	Plastic 2oz unpreserved for TS	A	NA		4.9	Y	Absent		A2-TS(7)
L2040723-04A	Plastic 8oz unpreserved	A	NA		4.9	Y	Absent		A2-537-ISOTOPE(14)
L2040723-04B	Plastic 2oz unpreserved for TS	A	NA		4.9	Y	Absent		A2-TS(7)
L2040723-05A	Plastic 8oz unpreserved	A	NA		4.9	Y	Absent		A2-537-ISOTOPE(14)
L2040723-05B	Plastic 2oz unpreserved for TS	A	NA		4.9	Y	Absent		A2-TS(7)
L2040723-06A	Plastic 8oz unpreserved	A	NA		4.9	Y	Absent		A2-537-ISOTOPE(14)
L2040723-06B	Plastic 2oz unpreserved for TS	A	NA		4.9	Y	Absent		A2-TS(7)
L2040723-07A	Plastic 8oz unpreserved	A	NA		4.9	Y	Absent		A2-537-ISOTOPE(14)
L2040723-07B	Plastic 2oz unpreserved for TS	A	NA		4.9	Y	Absent		A2-TS(7)

*Values in parentheses indicate holding time in days

PFAS PARAMETER SUMMARY

Parameter	Acronym	CAS Number
PERFLUOROALKYL CARBOXYLIC ACIDS (PFCAs)		
Perfluorooctadecanoic Acid	PFODA	16517-11-6
Perfluorohexadecanoic Acid	PFHxDA	67905-19-5
Perfluorotetradecanoic Acid	PFTA	376-06-7
Perfluorotridecanoic Acid	PFTrDA	72629-94-8
Perfluorododecanoic Acid	PFDoA	307-55-1
Perfluoroundecanoic Acid	PFUnA	2058-94-8
Perfluorodecanoic Acid	PFDA	335-76-2
Perfluorononanoic Acid	PFNA	375-95-1
Perfluorooctanoic Acid	PFOA	335-67-1
Perfluoroheptanoic Acid	PFHpA	375-85-9
Perfluorohexanoic Acid	PFHxA	307-24-4
Perfluoropentanoic Acid	PFPeA	2706-90-3
Perfluorobutanoic Acid	PFBA	375-22-4
PERFLUOROALKYL SULFONIC ACIDS (PFSAs)		
Perfluorododecanesulfonic Acid	PFDoDS	79780-39-5
Perfluorodecanesulfonic Acid	PFDS	335-77-3
Perfluorononanesulfonic Acid	PFNS	68259-12-1
Perfluorooctanesulfonic Acid	PFOS	1763-23-1
Perfluoroheptanesulfonic Acid	PFHpS	375-92-8
Perfluorohexanesulfonic Acid	PFHxS	355-46-4
Perfluoropentanesulfonic Acid	PFPeS	2706-91-4
Perfluorobutanesulfonic Acid	PFBS	375-73-5
FLUOROTELOMERS		
1H,1H,2H,2H-Perfluorododecanesulfonic Acid	10:2FTS	120226-60-0
1H,1H,2H,2H-Perfluorodecanesulfonic Acid	8:2FTS	39108-34-4
1H,1H,2H,2H-Perfluorooctanesulfonic Acid	6:2FTS	27619-97-2
1H,1H,2H,2H-Perfluorohexanesulfonic Acid	4:2FTS	757124-72-4
PERFLUOROALKANE SULFONAMIDES (FASAs)		
Perfluorooctanesulfonamide	FOSA	754-91-6
N-Ethyl Perfluorooctane Sulfonamide	NEtFOSA	4151-50-2
N-Methyl Perfluorooctane Sulfonamide	NMeFOSA	31506-32-8
PERFLUOROALKANE SULFONYL SUBSTANCES		
N-Ethyl Perfluorooctanesulfonamido Ethanol	NEtFOSE	1691-99-2
N-Methyl Perfluorooctanesulfonamido Ethanol	NMeFOSE	24448-09-7
N-Ethyl Perfluorooctanesulfonamidoacetic Acid	NEtFOSAA	2991-50-6
N-Methyl Perfluorooctanesulfonamidoacetic Acid	NMeFOSAA	2355-31-9
PER- and POLYFLUOROALKYL ETHER CARBOXYLIC ACIDS		
2,3,3,3-Tetrafluoro-2-[1,1,2,2,3,3,3-Heptafluoropropoxy]-Propanoic Acid	HFPO-DA	13252-13-6
4,8-Dioxa-3h-Perfluorononanoic Acid	ADONA	919005-14-4
CHLORO-PERFLUOROALKYL SULFONIC ACIDS		
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid	11Cl-PF3OUdS	763051-92-9
9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid	9Cl-PF3ONS	756426-58-1
PERFLUOROETHER SULFONIC ACIDS (PFESAs)		
Perfluoro(2-Ethoxyethane)Sulfonic Acid	PFEESA	113507-82-7
PERFLUOROETHER/POLYETHER CARBOXYLIC ACIDS (PFPCAs)		
Perfluoro-3-Methoxypropanoic Acid	PFMPA	377-73-1
Perfluoro-4-Methoxybutanoic Acid	PFMBA	863090-89-5
Nonafluoro-3,6-Dioxaheptanoic Acid	NFDHA	151772-58-6

Project Name:	BARNSTABLE AIRPORT	**Lab Number:**	L2040723
Project Number:	20102	**Report Date:**	10/08/20

GLOSSARY

Acronyms

DL - Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

EDL - Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).

EMPC - Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.

EPA - Environmental Protection Agency.

LCS - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LCSD - Laboratory Control Sample Duplicate: Refer to LCS.

LFB - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LOD - Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

LOQ - Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

MDL - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

MS - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.

MSD - Matrix Spike Sample Duplicate: Refer to MS.

NA - Not Applicable.

NC - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.

NDPA/DPA - N-Nitrosodiphenylamine/Diphenylamine.

NI - Not Ignitable.

NP - Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.

NR - No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests.

RL - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

RPD - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.

SRM - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.

STLP - Semi-dynamic Tank Leaching Procedure per EPA Method 1315.

TEF - Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.

TEQ - Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.

TIC - Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Report Format: DU Report with 'J' Qualifiers

Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. If a 'Total' result is requested, the results of its individual components will also be reported.

The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Data Qualifiers

A - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

F - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

ND - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where

Data Qualifiers

the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

REFERENCES

121 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WEF. Standard Methods Online.

134 Determination of Selected Perfluorinated Alkyl Acids in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS) using Isotope Dilution. Alpha SOP 23528.

LIMITATION OF LIABILITIES

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 624/624.1: m/p-xylene, o-xylene, Naphthalene
EPA 8260C: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
SM4500: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

Mansfield Facility
SM 2540D: TSS
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
EPA TO-12 Non-methane organics
EPA 3C Fixed gases
Biological Tissue Matrix: EPA 3050B

The following analytes are included in our Massachusetts DEP Scope of Accreditation

Westborough Facility:

Drinking Water
EPA 300.0: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
EPA 332: Perchlorate; **EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

Non-Potable Water
SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH: Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N**, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
EPA 624.1: Volatile Halocarbons & Aromatics,
EPA 608.3: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625.1: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, EPA 1600, EPA 1603.**

Mansfield Facility:

Drinking Water
EPA 200.7: Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
EPA 522.

Non-Potable Water
EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
EPA 200.8: Al, Sb, As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
EPA 245.1 Hg.
SM2340B

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

CHAIN OF CUSTODY

PAGE 1 OF 1

Date Rec'd in Lab: 9/25/20

ALPHA Job #: L2040723

ALPHA ANALYTICAL
8 Walkup Drive, Westboro, MA 01581, Tel: 508-898-9220
320 Forbes Blvd, Mansfield, MA 02048, Tel: 508-822-9300

Project Information

Project Name: Barnstable Airport
Project Location: Hyannis MA
Project #: 20102
Project Manager: Bryan Massa
ALPHA Quote #:

Report Information - Data Deliverables

☐ ADEx ☐ EMAIL

Billing Information

☐ Same as Client info PO #:

Client Information

Client: Horsley Witten Group, Inc.
Address: 90 Route 6A Sandwich MA 02563
Phone: (508)833-6600
Email: bmassa@horsleywitten.com

Regulatory Requirements & Project Information Requirements

☐ Yes ☐ No MA MCP Analytical Methods
☐ Yes ☐ No CT RCP Analytical Methods
☐ Yes ☐ No Matrix Spike Required on this SDG? (Required for MCP Inorganics)
☐ Yes ☐ No GW1 Standards (Info Required for Metals & EPH with Targets)
☐ Yes ☐ No NPDES RGP
☐ Other State /Fed Program ______ Criteria ______

Turn-Around Time

☑ Standard ☐ RUSH (only confirmed if pre-approved)

Date Due:

Additional Project Information:

ANALYSIS: VOC: ☐ 8260 ☐ 624 ☐ 524.2; SVOC: ☐ ABN ☐ PAH; METALS: ☐ MCP 13 ☐ MCP 14 ☐ RCP 15; METALS: ☐ RCRA5 ☐ RCRA8 ☐ PP13; EPH: ☐ Ranges & Targets ☐ Ranges Only; VPH: ☐ Ranges & Targets ☐ Ranges Only; ☐ PCB ☐ PEST; TPH: ☐ Quant Only ☐ Fingerprint; A2-537-isotope-PFAS; PFAS isotope dilution - extract + hold

SAMPLE INFO: Filtration ☐ Field ☐ Lab to do; Preservation ☐ Lab to do

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler Initials	A2-537-isotope-PFAS	PFAS isotope dilution - extract + hold	Sample Comments	TOTAL # BOTTLES
40723-01	A5 (12-14)	9/25/20	9:46	Soil	SB	X	✓		
-02	A5 (18-20)	9/25/20	9:57	Soil	SB	X	✓		
-03	A20 (0-1)	9/25/20	11:05	Soil	SB	✓			
-04	A20 (2-4)	9/25/20	11:11	Soil	SB	✓			
-05	A21 (0-1)	9/25/20	11:20	Soil	SB	✓			
-06	A19 (0-1)	9/25/20	11:35	Soil	SB	✓			
-07	A5 (2-4)	9/25/20	11:50	Soil	SB	✓			

Container Type
Preservative

Container Type
P= Plastic
A= Amber glass
V= Vial
G= Glass
B= Bacteria cup
C= Cube
O= Other
E= Encore
D= BOD Bottle

Preservative
A= None
B= HCl
C= HNO_3
D= H_2SO_4
E= NaOH
F= MeOH
G= $NaHSO_4$
H = $Na_2S_2O_3$
I= Ascorbic Acid
J = NH_4Cl
K= Zn Acetate
O= Other

Relinquished By:	Date/Time	Received By:	Date/Time
[signature]	9/25/20 1230	[signature]	9/25/20 1230
[signature]	9/25/20 1730	[signature]	9/25/20 1730
[signature]	9/25/20 2000	[signature]	9/25/20 2000
[signature]	9/25/20 2034	[signature]	9/25/20 2034

FORM NO: 01-01 (rev. 12-Mar-2012)

APPENDIX F

SOIL BORING/MONITORING WELL LOGS

Cape Cod Test Boring 5 Rayber Road, Orleans, MA 02653 (508) 240-1000 div. Desmond Well Drilling, Inc.	Project Horsley Witten Group Barnstable, 480 Barnstable Road Hyannis, MA	Boring No. ARFF - 3 Sheet 1 of 1

Driller: Tommy Desmond	Boring location:
Helper: Sean Morgan	Ground Surface Elevation:
Inspector: Josephine Ibanez	Date start: 10/9/2018 Date end: 10/9/2018
Direct push sampler consists of 4' x 2 3/8" G3 dual tube direct push steel tooling with 4' x 1 1/2" PVC liner with 201 ft lb hydraulic hammer (percussion rate 2200 bpm)	Direct push steel tooling: 2 3/8" G3 dual tube

Depth	Sample				Sample Description
(FT)	NO	PEN/REC	DEPTH/FT	BLOWS 6"	
+2					
0	1	N/R	0 - 4	N/R	Loamy; F-M-C brown sand and F gravel. Dry.
2					
4	2		4 - 8		F-M-C brown sand and F-M gravel. Dry.
6					
8	3		8 - 12		F-M-C brown sand. Dry.
10					
12					
14					
16					
18					
20					
22					
24					
26					
28					
30					
32					
34					
36					
38					
40					
42					
44					
46					
48					
50					
52					
54					
56					
58					
60					End of probe: 12'
62					End of sample: 12'
64					
66					

Granular Soils		Cohesive Soils		Proportions Used	Well Installation Key
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY		
0 - 4	V. LOOSE	> 2	V. SOFT	Trace 0 - 10%	- CONCRETE
4 - 10	LOOSE	2 - 4	SOFT	Little 10 - 20%	- SAND PACK
10 - 30	M. DENSE	4 - 8	M. STIFF	Some 20 - 35%	Z - SOIL BACKFILL
30 - 50	DENSE	8 - 15	STIFF	And 35 - 50%	- BENTONITE
> 50	V. DENSE	15 - 30	V. STIFF		# - SCREEN
		> 30	HARD		- APPROX. WATER LEVEL

Cape Cod Test Boring	Project	Boring No. DL - 11
5 Rayber Road, Orleans, MA 02653	Horsley Witten Group	
(508) 240-1000	Barnstable, 480 Barnstable Road	Sheet 1 of 1
div. Desmond Well Drilling, Inc.	Hyannis, MA	

Driller: Tommy Desmond	Boring location:	
Helper: Sean Morgan	Ground Surface Elevation:	
Inspector: Josephine Ibanez	Date start: 10/3/2018	Date end: 10/3/2018

Direct push sampler consists of 4' x 2 3/8" G3 dual tube direct push steel tooling with 4' x 1 1/2" PVC liner with 201 ft lb hydraulic hammer (percussion rate 2200 bpm)	Direct push steel tooling: 2 3/8" G3 dual tube

Depth	Sample				Sample Description
(FT)	NO	PEN/REC	DEPTH/FT	BLOWS 6"	
	1	24/18	4 - 6		F-M-C brown sand; trace of cobble. Dry.
					Switched to Probe
0	1	N/R	0 - 4	N/R	Loamy material; F-M-C brown sand; trace F-M gravel. Dry.
2					
4	2		4 - 8		F-M-C brown sand; trace F-M gravel. Dry.
6					
8	3		8 - 12		F-M-C brown sand; trace very C brown sand. Dry.
10					
12	4		12 - 16		F-M-C brown sand; trace very C brown sand. Dry.
14					
16					
18					
20					
22					
24					
26					
28					
30					
32					
34					
36					
38					
40					
42					
44					
46					
48					
50					
52					
54					
56					End of probe: 16'
58					End of sample: 16'
60					
62					

Granular Soils		Cohesive Soils		Proportions Used	Well Installation Key
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY		- CONCRETE
0 - 4	V. LOOSE	> 2	V. SOFT	Trace 0 - 10%	- SAND PACK
4 - 10	LOOSE	2 - 4	SOFT	Little 10 - 20%	Z - SOIL BACKFILL
10 - 30	M. DENSE	4 - 8	M. STIFF	Some 20 - 35%	- BENTONITE
30 - 50	DENSE	8 - 15	STIFF	And 35 - 50%	# - SCREEN
> 50	V. DENSE	15 - 30	V. STIFF		- APPROX. WATER LEVEL
		> 30	HARD		

Cape Cod Test Boring	Project	Boring No. DL - 14
5 Rayber Road, Orleans, MA 02653	Horsley Witten Group	
(508) 240-1000	Barnstable, 480 Barnstable Road	Sheet 1 of 1
div. Desmond Well Drilling, Inc.	Hyannis, MA	

Driller: Tommy Desmond	Boring location:
Helper: Sean Morgan	Ground Surface Elevation:
Inspector: Josephine Ibanez	Date start: Date end:

Direct push sampler consists of 4' x 2 3/8" G3 dual tube direct push steel tooling with 4' x 1 1/2" PVC liner with 201 ft lb hydraulic hammer (percussion rate 2200 bpm)

Direct push steel tooling: 2 3/8" G3 dual tube

Depth	Sample				Sample Description
(FT)	NO	PEN/REC	DEPTH/FT	BLOWS 6"	
+2					
0	1	N/R	0 - 4	N/R	Subsurface road material. Loamy; silty sand; F-M-C brown sand;
2					trace F gravel. Dry.
4	2		4 - 8		F-M-C brown sand; some F-M gravel. Dry.
6					
8	3		8 - 12		F-M-C brown sand; trace F gravel. Dry.
10					
12	4		12 - 16		F-M-C brown sand. Dry.
14					
16					
18					
20					
22					
24					
26					
28					
30					
32					
34					
36					
38					
40					
42					
44					
46					
48					
50					
52					
54					
56					
58					
60					End of probe: 16'
62					End of sample: 16'
64					
66					

Granular Soils		Cohesive Soils		Proportions Used	Well Installation Key
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY		
0 - 4	V. LOOSE	> 2	V. SOFT	Trace 0 - 10%	- CONCRETE
4 - 10	LOOSE	2 - 4	SOFT	Little 10 - 20%	- SAND PACK
10 - 30	M. DENSE	4 - 8	M. STIFF	Some 20 - 35%	Z - SOIL BACKFILL
30 - 50	DENSE	8 - 15	STIFF	And 35 - 50%	- BENTONITE
> 50	V. DENSE	15 - 30	V. STIFF		# - SCREEN
		> 30	HARD		- APPROX. WATER LEVEL

BORING LOG

Boring No. HW-1
Sheet 1 of 1

Project: Barnstable Air Hangar
Client: Barnstable Municipal Airport
Boring Contractor: Desmond Well Drilling, Inc.
Boring Equipment: Hollow Stem Auger
Ground Water: Date / Depth, ft.
31-Aug-95 / 23 below land surface

Date: 31 August 1995
Completion Depth: 31 feet Below Land Surface
Elevation: N/A
Inspector: Howard Frank

Depth Feet	Description	Sample Number	Penetra./ Recovery	Blow Count	Comments	Well Details	Depth Feet
0					Locking Road Box		0
2					Cement Seal		2
4							4
6	M-C Br sand, rock frags pebbles in tip to 4"	HW-1.1	13"	9-23-13-12	Natural Backfill		6
8							8
10	VC Br sand and gravel	HW-1.2	14"	8-11-15-12	21 ft. of 2 inch of sch. 40 PVC riser		10
12							12
14							14
16	Br M-C sand, so gravel coarsening up to C-VC sand so. gravel	HW-1.3	15"	8-15-15-14			16
18					2 ft. Bentonite Seal approx. 2 ft above screen		18
20	Beige M-C sand	HW-1.4	16"	6-11-13-19			20
22	Water Table		Water Table		Water Table		22
24					Natural Backfill (coars sand)		24
26	Beige M-C sand	HW-1.5	13"	8-7-6-8			26
28					10 ft. of 2 in. .010 Slot threaded Shc. 40 PVC screen		28
30	Br VC-C sand, so M sand so gravel	HW-1.6	21"	7-7-9-10			30

Proportions Used:

trace (tr)	0 - 10%
little (li)	10 - 20%
some (so)	20 - 35%

Abbreviations:

Brown (Br)	Green = (Gr)	Fine = (F)	Fine to Coarse = F-C
Red (R)	Gray = (Gy)	Medium = (M)	Very = (V)
Orange (Or)	Blue = (Bl)	Coars = (C)	More/Less = (+/-)
Rust (Ru)	Light = (lt)	Dark = (dk)	

H&W, Inc.

BORING LOG

Boring No. HW- 2
Sheet 1 of 1

Project: Steamship Gravel Parking Lot
Client: WHMV + N Steamship Authority
Boring Contractor: Desmond Well Drilling
Boring Equipment: Hollow Stem Auger
Ground Water:

Date	Depth, ft.
2/18/1999	28.5

Date: 2/18/1999
Completion Depth: 35.15
Elevation:
Inspector: JEL

Depth Feet	Description	Sample Number	Penetra./ Recovery	Blow Count	USCS Code	USCS Color	PID (ppm)	Comments	Well Details	Depth Feet
0	grass									0
								Cement Seal		
2										2
	tan m-c SAND, some	S-1	24-Dec	14-19-23-27				Bentonite Seal		
4	m gravel, li f gravel									4
6										6
8	tan m-c SAND, li f gravel	S-2	14/24	5-6-7-10						8
10										10
12	graywacke stuck in spoon									12
	tan f-m SAND	S-3	14/24	6-8-12-16						
14	tan m-c SAND									14
	tan m SAND, so gravel									
16										16
18	tan f-m SAND, so f gravel	S-4	16/24	6-9-9-12						18
20										20
22										22
	tan m-c SAND, tr f gravel	S-5	16/24	5-7-9-12						
24	moist @ 25'									24
26								.010 slot pvc screen		26
28	tan f-m SAND and coarse		24/24	3-4-7-10						28
	sand, some f gravel							Water Table		
30										30
32										32
34										34
36										36

Proportions Used:

trace (tr)	0 - 10%
little (li)	10 - 20%
some (so)	20 - 35%
and	35 - 50%

Abbreviations:

Color		Angular	Misc.	Size	
Blue (Bl)	Green (Gr)	Round (rnd.)	Fragments (frag.)	Fine = (f)	Fine to Coarse = (f-c)
Red (R)	Gray (Gy)	Angular (ang.)	Cement (cem.)	Medium = (m)	Very = (v)
Light (lt)	Brown (Br)		Well-Graded Sand (SW)	Coarse = (c)	More/Less = (+/-)
Dark (dk)	Orange (Or)		Poorly-Graded Sand (SP)	Dark = (dk)	
			Well-Graded Gravel (GW)		
			Poorly-Graded Gravel (GP)		
Rust (Ru)	Black (Blk)		Below Land Surface (BLS)		
			Not Available (N/A)		

H&W, Inc.

BORING LOG

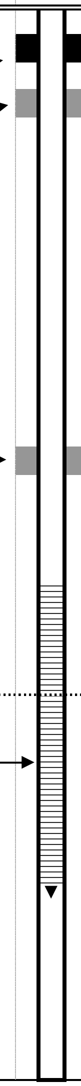
Boring No. HW- 3
Sheet 1 of 1

Project:	Steamship Gravel Parking Lot	**Date:**	24/24/99
Client:	WHMV + N Steamship Authority	**Completion Depth:**	37
Boring Contractor:	Desmond Well Drilling	**Elevation:**	
Boring Equipment:	Hollow Stem Auger	**Inspector:**	JEL

Ground Water:

Date	Depth, ft.
4/24/1999	23

Depth Feet	Description	Sample Number	Penetra./ Recovery	Blow Count	USCS Code	USCS Color	PID (ppm)	Comments	Well Details	Depth Feet
0										0
								Cement Seal		
2										2
	f-c GRAVEL,	S-1	24/15	12-23-28-26		Br		Bentonite Seal		
4	m-c Sand, tr f Sand									4
6										6
8	f-m SAND, tr c Sand,	S-2	24/15	7-9-10-11		Br				8
	tr f-c Gravel									
10										10
12										12
	f-m SAND, tr c Sand,	S-3	24/15	12-14-12-13		Br				
14	li f-c Gravel									14
								Bentonite Seal		
16										16
18	f-m SAND, tr c Sand,	S-4	24/13	5-9-11-12		Br				18
	tr f Gravel									
20										20
22										22
	f-m SAND, tr c Sand,	S-5	24/15	9-11-10-11		Br				
24	tr f Gravel							Water Table		24
26								.010 slot pvc screen		26
28	f-m SAND, tr c Sand,	S-6	24/14	3-3-5-9		Br				28
	tr f Gravel									
30										30
32										32
34										34
36										36



Proportions Used:

trace (tr)	0 - 10%
little (li)	10 - 20%
some (so)	20 - 35%
and	35 - 50%

Abbreviations:

Color		Angular	Misc.	Size	
Blue (Bl)	Green (Gr)	Round (rnd.)	Fragments (frag.)	Fine = (f)	Fine to Coarse = (f-c)
Red (R)	Gray (Gy)	Angular (ang.)	Cement (cem.)	Medium = (m)	Very = (v)
Light (lt)	Brown (Br)		Well-Graded Sand (SW)	Coarse = (c)	More/Less = (+/-)
Dark (dk)	Orange (Or)		Poorly-Graded Sand (SP)	Dark = (dk)	
			Well-Graded Gravel (GW)		
			Poorly-Graded Gravel (GP)		
Rust (Ru)	Black (Blk)		Below Land Surface (BLS)		
			Not Available (N/A)		

H&W, Inc.

BORING LOG

Boring No. HW-4m
Sheet 1 of 1

Project:	UST investigation	**Date:**	4/23/01
Client:	Barnstable Airport	**Completion Depth:**	32
Boring Contractor:	Desmond Well Drilling	**Elevation:**	
Boring Equipment:	Hollow Stem Auger	**Inspector:**	JEL
Ground Water:	Date: 4/23/01 — Depth, ft.: 26 — M.P.: pvc	**Notes:**	East of Cape Air Hangar next to HW-4s

Depth Feet	Description	Sample Number	Penetra./ Recovery	Blow Count	PID ppm	USCS Color	USGS Angularity	Comments	Well Details	Depth Feet
0										0
								Cement Seal		
2										2
								Bentonite Seal		
4	tan m-c SAND and f-m gravel bands of red-brown	S-1	24/17	7-17-19-15						4
6	gray-tan									6
8										8
	tan m-c SAND	S-2	24/19	4-8-9-12	0					
10										10
12										12
14	no recovery and fine to med gravel	S-3	24/0	7-6-7-6	0					14
16										16
18										18
	tan m SAND, some fine	S-4	24/20	1-2-2-2	0					
20	sand, trace fine gravel									20
22										22
24	tan/grey med SAND, trace fine gravel, trace fine sand	S-5	24/15	1-1-1-1	176					24
26	bottom 6" wet with petroleum odor							Water Table ▽		26
28										28
	cuttings are grey m sand							.010 slot		
30	with a heavy weathered oil odor							pvc screen		30
32								22-32 bgs		32
34										34
36										36

Proportions Used:

trace (tr)	0 - 10%
little (li)	10 - 20%
some (so)	20 - 35%
and	35 - 50%

Abbreviations:

Color		Angular	Misc.	Size	
Blue (Bl)	Green (Gr)	Round (rnd.)	Fragments (frag.)	Fine = (f)	Fine to Coarse = (f-c)
Red (R)	Gray (Gy)	Angular (ang.)	Cement (cem.)	Medium = (m)	Very = (v)
Light (lt)	Brown (Br)		Well-Graded Sand (SW)	Coarse = (c)	More/Less = (+/-)
Dark (dk)	Orange (Or)		Poorly-Graded Sand (SP)	Dark = (dk)	
			Well-Graded Gravel (GW)		
			Poorly-Graded Gravel (GP)		
Rust (Ru)	Black (Blk)		Below Land Surface (BLS)		
			Not Available (N/A)		

H&W, Inc.

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Projects \ HYA \ 11072 (697 Barnstable Airport) \ boring logs

BORING LOG

Boring No. HW-5
Sheet 1 of 1

Project: Barnstable Airport
Client: Ben Jones, Manager
Boring Contractor: Desmond Well Drilling, Inc.
Boring Equipment: Hollow Stem Auger
Ground Water: Date / Depth, ft.
6/24/96 — 25' below land surface

Date: 24 June 1996
Completion Depth: 28 feet bls
Elevation: N/A 54.98 *
Inspector: H. Frank

Depth Feet	Description	Sample Number	Penetra./ Recovery	Blow Count	USCS Code	USCS Color	USCS Angularity	Comments	Well Details	Depth Feet
0								Locking road box Cement seal		0
2								Bentonite seal		2
4	F-C poorly graded sand w/ >15% gravel, dry, no odor, no cement, 2" Br layer of silt PID: 0.0	HW-5.1	15"/24"	34-28-32-30	SP	Br	rnd-submd			4
6										6
8	F-M-C well graded sand w/ <15% gravel, dry, no cement no odor, PID: 0.0	HW-5.2	11.5"/24"	18-18-24-27	SW	Br-lt. Br-Beige	rnd-submd	Native backfill		8
10										10
12										12
14	F-VC poorly graded sand w/ >15% gravel, dry, no odor, no cement, PID: 0.0	HW-5.3	15"/24"	14-36-27-47	SP	Br-lt. Br-Beige	rnd-submd	23 ft. of sch. 40, threaded PVC riser		14
16										16
18	F-VC poorly graded sand w/ >15% gravel, dry, no odor, so rock frags, Fe stain layer no cement, PID: 0.0	HW-5.4	14"/24"	12-20-24-24	SP	Br-lt. Br-Beige	rnd-submd	Bentonite Seal		18
20								Native Backfill		20
22										22
24	F-M-C well graded sand w/ <15% gravel, dry, no odor, no cement, PID: 3.1	HW-5.5	15"/24"	6-8-10-14	SW	lt. Br Beige	rnd-submd	5 ft. of .010 slot, threaded PVC screen WATER TABLE		24
26										26
28	F-M-C well graded sand w/ <15% gravel, wet, no cement, strong petroleum odor, PID: 333 ppm	HW-5 6	17"/24"	1-1-1-1	SW	Gy	rnd-submd	BOTTOM OF HOLE		28
30										30
32										32
34										34
36										36

Proportions Used: / **Abbreviations:**

Proportions		Color		Angular	Misc.	Size	
trace (tr)	0 - 10%	Blue (Bl)	Green (Gr)	Round (rnd.)	Fragments (frag.)	Fine = (F)	Fine to Coarse = F-C
little (li)	10 - 20%	Red (R)	Gray (Gy)	Angular (ang.)	Cement (Cem.)	Medium = (M)	Very = (V)
some (so)	20 - 35%	Light (lt)	Brown (Br)		Well-Graded (W-G)	Coarse = (C)	More/Less = (+/-)
		Dark (dk)	Orange (Or)		Poorly-Graded (P-G)	Dark = (dk)	
		Rust (Ru)	Black (Blk)		Not Available (N/A)		

H&W, Inc.

BORING LOG

Boring No. HW-23
Sheet 1 of 1

Project: AS/SVE Installation
Client: Barnstable Airport
Boring Contractor: Desmond Well Drilling
Boring Equipment: Hollow Stem Auger
Ground Water:

Date	Depth, ft.	M.P.
5/11/99	23'	pvc

Date: 5/11/99
Completion Depth: 29
Elevation:
Inspector: JEL
Notes: Downgradient of downgradient as fence

Depth Feet	Description	Sample Number	Penetra./ Recovery	Blow Count	PID ppm	USCS Color	USGS Angularity	Comments	Well Details	Depth Feet
0	No samples taken							Cement Seal		0
2								Bentonite Seal		2
4										4
6										6
8										8
10										10
12										12
14										14
16										16
18										18
20										20
22								▽		22
24								Water Table		24
26								.010 slot pvc screen		26
28								19 - 29 bgs		28
30										30
32										32
34										34
36										36

Proportions Used:

trace (tr)	0 - 10%
little (li)	10 - 20%
some (so)	20 - 35%
and	35 - 50%

Abbreviations:

Color
Blue (Bl), Green (Gr), Red (R), Gray (Gy), Light (lt), Brown (Br), Dark (dk), Orange (Or), Rust (Ru), Black (Blk)

Angular
Round (rnd.)
Angular (ang.)

Misc.
Fragments (frag.)
Cement (cem.)
Well-Graded Sand (SW)
Poorly-Graded Sand (SP)
Well-Graded Gravel (GW)
Poorly-Graded Gravel (GP)
Below Land Surface (BLS)
Not Available (N/A)

Size
Fine = (f)
Medium = (m)
Coarse = (c)
Dark = (dk)
Fine to Coarse = (f-c)
Very = (v)
More/Less = (+/-)

H&W, Inc.

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HYA\11072 (697 Barnstable Airport)\ boring logs

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MONITORING WELL BORING LOG

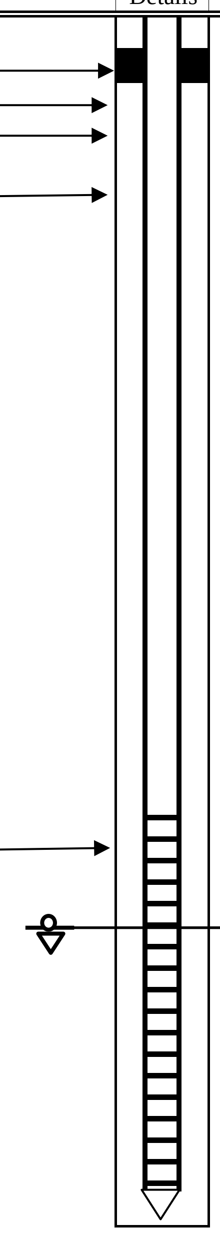
Boring No. HW-A(s) (cape gun works)

Project:	17027- Barnstable On-call #4	**Date:**	3/16/2017
Client:	Barnstable Minicipal Airport	**Completion Depth:**	32' bgs
Boring Contractor:	New england Goetech	**Elevation:**	
Boring Equipment:	Direct Push, 3" casing	**Inspector:**	JDB

Proportions Used: | **Abbreviations:**

Proportions Used		Color		Angular	Misc.	Size	
trace (tr)	0 - 10%	Blue (Bl)	Green (Gr)	Round (rnd.)	Fragments (frag.)	Fine = (f)	Fine to Coarse = (f-c)
little (li)	10 - 20%	Red (R)	Gray (Gy)	Angular (ang.)	Cement (cem.)	Medium = (m)	Very = (v)
some (so)	20 - 35%	Light (lt)	Brown (Br)		Well-Graded Sand (SW)	Coarse = (c)	More/Less = (+/-)
and	35 - 50%	Dark (dk)	Orange (Or)		Poorly-Graded Sand (SP)	Dark = (dk)	
		Rust (Ru)	Black (Blk)		Well-Graded Gravel (GW)		
					Poorly-Graded Gravel (GP)		
					Below Land Surface (BLS)		
					Not Available (N/A)		

Depth Feet	Description		Penetration	Recovery	USCS Code	USCS Color	PID (parts per million)	Comments	Well Details	Depth Feet
0	0"-4" asphalt							Cement		0
								#2 sand @ 6" bgs		
	0-5' bgs	Light Brown M-C sand, some F sand, little gravel		30"	ang	brn		Bontonite @ 2' bgs		
								#2 sand @ 4' bgs		
5										5
	5-10' bgs	Light Brown M-C sand, some F sand, little gravel; bottom 6" F white sand		43"	ang	brn				
10										10
	10-15' bgs	0-9"- Drk Br, M-C sand; some F sand; 9-32" - Lt Br, F-M sand; 22-26" - Drk Br, M-C sand; 32-48" - Lt Br, F-M sand		48"	ang	brn				
15										15
	15-20' bgs	0-27" - Lt Br, M-C sand, some F sand 27-43" - Drk Br, M-C sand; some F sand		43"	ang	brn				
20										20
	20-25' bgs	0-12" - Lt Br, M-C sand; 12+" - Drk Br, M-C sand, some gravel		48"	ang	brn		0.02 slot screen @ 22-32 ' bgs		
25								Groundwater @ 25.5' bgs		25
	25-30' bgs	0-24" - Lt Br, M-C sand, some F sand; 24+" - Drk Br, M-C sand; some F sand		43"	ang	brn				
30										30
35										
40										
45										
50										
55										



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MONITORING WELL BORING LOG

Boring No. HW-B(d)

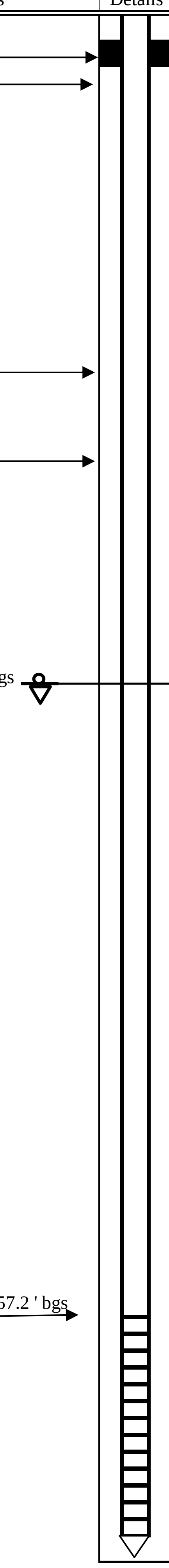
Project:	17027- Barnstable On-call #4	**Date:**	4/3/2017
Client:	Barnstable Minicipal Airport	**Completion Depth:**	57.2' bgs
Boring Contractor:	New england Goetech	**Elevation:**	
Boring Equipment:	Direct Push, 3" casing	**Inspector:**	JDB

Proportions Used: **Abbreviations:**

Proportions		Color		Angular	Misc.	Size	
trace (tr)	0 - 10%	Blue (Bl)	Green (Gr)	Round (rnd.)	Fragments (frag.)	Fine = (f)	Fine to Coarse = (f-c)
little (li)	10 - 20%	Red (R)	Gray (Gy)	Angular (ang.)	Cement (cem.)	Medium = (m)	Very = (v)
some (so)	20 - 35%	Light (lt)	Brown (Br)		Well-Graded Sand (SW)	Coarse = (c)	More/Less = (+/-)
and	35 - 50%	Dark (dk)	Orange (Or)		Poorly-Graded Sand (SP)	Dark = (dk)	
		Rust (Ru)	Black (Blk)		Well-Graded Gravel (GW)		
					Poorly-Graded Gravel (GP)		
					Below Land Surface (BLS)		
					Not Available (N/A)		

Depth Feet	Description		Penetration	Recovery	USCS Code	USCS Color	PID (parts per million)	Comments	Depth Feet
0								Cement	0
								#2 sand @ 9" bgs	
5									5
10									10
								Bentonite @ 12' bgs	
15								#2 sand @ 15' bgs	15
20									20
								Groundwater @ 22.75' bgs	
25									25
30									30
	30-35' bgs	0-16" - Lt Br, M sand, some C sand/gravel; 16-19" - Med Br, F sand, little gravel		19"	ang	brn			
35									35
	35-40' bgs	Lt brn, M sand, some C sand/silt.gravel		2"	ang	brn			
40									40
	40-45' bgs	Lt brn, M sand, some C sand/silt.gravel		2"	ang	brn			
45									45
	45-50' bgs	0-9" - Lt Br, M sand, some F/C sand; 9-12" - Lt Br, F sand, some silt, little gravel		12"	ang	brn		0.02 slot screen @ 47.2-57.2 ' bgs	
50									50
	50-55' bgs	NO RECOVERY		0"					
55									55
	55-60' bgs	Lt Br, well graded sand, some gravel		19"	ang	brn			
60									60

Well Details



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MONITORING WELL BORING LOG

Boring No. HW-B(s)

Project: 17027- Barnstable On-call #4
Client: Barnstable Minicipal Airport
Boring Contractor: New england Goetech
Boring Equipment: Direct Push, 3" casing

Date: 3/16/2017
Completion Depth: 30.5' bgs
Elevation:
Inspector: JDB

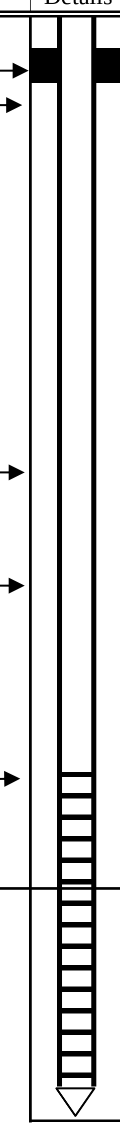
Proportions Used:

trace (tr)	0 - 10%
little (li)	10 - 20%
some (so)	20 - 35%
and	35 - 50%

Abbreviations:

Color		Angular	Misc.	Size	
Blue (Bl)	Green (Gr)	Round (rnd.)	Fragments (frag.)	Fine = (f)	Fine to Coarse = (f-c)
Red (R)	Gray (Gy)	Angular (ang.)	Cement (cem.)	Medium = (m)	Very = (v)
Light (lt)	Brown (Br)		Well-Graded Sand (SW)	Coarse = (c)	More/Less = (+/-)
Dark (dk)	Orange (Or)		Poorly-Graded Sand (SP)	Dark = (dk)	
Rust (Ru)	Black (Blk)		Well-Graded Gravel (GW)		
			Poorly-Graded Gravel (GP)		
			Below Land Surface (BLS)		
			Not Available (N/A)		

Depth Feet	Description		Penetration	Recovery	USCS Code	USCS Color	PID (parts per million)	Comments	Well Details	Depth Feet
0	0"-6" Organic							Cement		0
								#2 sand @ 9" bgs		
	0-5' bgs	0-6" - Lt Br, M-C sand, some F sand; 6-18" - Med Br, M-C sand, some F sand; 18+" - Drk Br, F-M sand, some C sand		50"	ang	brn				
5										5
	5-10' bgs	0-10" - Lt Br, F-M sand, some C sand 10+" - Med Br, M-C sand, some F sand		45"	ang	brn				
10										10
	10-15' bgs	0-12" - Med Br, M-C sand, some F sand/gravel; 12-36" - Lt Br, C sand, some F-M sand, little gravel; 36+" - Drk Br, F-M sand, some C/gravel		52"	ang	brn		Bentonite @ 12' bgs		
15								#2 sand @ 15' bgs		15
	15-20' bgs	0-20" - Lt Br, F-M sand; 20+" - F-M sand, some C sand, and large gravel		60"	ang	brn				
20										20
								0.02 slot screen @ 20.5-30.5 ' bgs		
	20-25' bgs	0-12" - Med Br, M-C sand, some F sand; 12-16" - Lt Br, F-M sand; 16-22" - Med Br, M-C sand, some F sand; 22+" - Lt Br, F-M sand		48"	ang	brn				
								Groundwater @ 23.5' bgs		
25										25
	25-30' bgs	M-C sand, some Fsand/gravel		36"	ang	brn				
30										30
35										
40										
45										
50										
55										



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MONITORING WELL BORING LOG

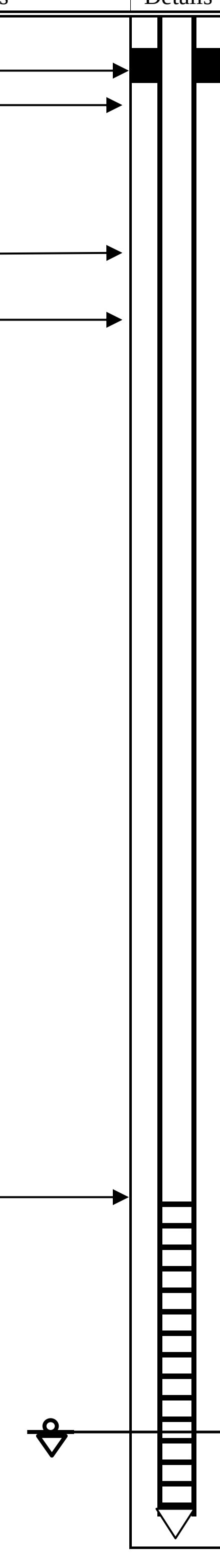
Boring No. HW-C

Project:	17027- Barnstable On-call #4	**Date:**	3/16/2017
Client:	Barnstable Minicipal Airport	**Completion Depth:**	42.5' bgs
Boring Contractor:	New england Goetech	**Elevation:**	
Boring Equipment:	Direct Push, 3" casing	**Inspector:**	JDB

Proportions Used: **Abbreviations:**

		Color		Angular	Misc.	Size	
trace (tr)	0 - 10%	Blue (Bl)	Green (Gr)	Round (rnd.)	Fragments (frag.)	Fine = (f)	Fine to Coarse = (f-c)
little (li)	10 - 20%	Red (R)	Gray (Gy)	Angular (ang.)	Cement (cem.)	Medium = (m)	Very = (v)
some (so)	20 - 35%	Light (lt)	Brown (Br)		Well-Graded Sand (SW)	Coarse = (c)	More/Less = (+/-)
and	35 - 50%	Dark (dk)	Orange (Or)		Poorly-Graded Sand (SP)	Dark = (dk)	
		Rust (Ru)	Black (Blk)		Well-Graded Gravel (GW)		
					Poorly-Graded Gravel (GP)		
					Below Land Surface (BLS)		
					Not Available (N/A)		

Depth Feet	Description		Penetration	Recovery	USCS Code	USCS Color	PID (parts per million)	Comments	Well Details	Depth Feet
0	0"-12" Organic							Cement		0
	0-5' bgs	0-8" - M-C sand, little gravel; 8-26" - Lt Br, F sand, some silt; 26-32" - Or Br, F-M sand; 32-44 - Organic		44"	ang	brn		#2 sand @ 9" bgs		
5										5
	5-10' bgs	0-16" - Drk Br, C sand, some Fsand/gravel; 16-30" - Med Br, M sand, some F sand/gravel; 30-34" - Lt Br, F sand; 34+" - Or Br, M-C sand, little Fsand/silt		44"	ang	brn		Bontonite @ 12' bgs #2 sand @ 7' bgs		
10										10
	10-15' bgs	Med Br, M-C sand, some F sand/large gravel (1"+);		45"	ang	brn				
15										15
	15-20' bgs	Med Br, M-C sand, some F sand		53"	ang	brn				
20										20
	20-25' bgs	0-6" - Or Br, M-C sand, some gravel; 6-12" - Lt Br, F-M sand, some gravel; 12-26" - Lt Br, F sand; 26+" - Med Br, M-C sand, little F sand, some gravel		55"	ang	brn				
25										25
	25-30' bgs	0-18" - Lt Br, F-M sand, little C sand; 18+" - Med Br, F sand, some M sand/gravel		36"	ang	brn				
30										30
	30-35' bgs	0-12" - Lt Br, F sand, little C sand; 12+" - Med Br, C sand, some F-M sand, little gravel		48"				0.02 slot screen @ 32.5-42.5 ' bgs		
35										
	35-42" bgs	NO SAMPLE COLLECTED		0"						
40								Groundwater @ 39.3' bgs		
45										
50										
55										



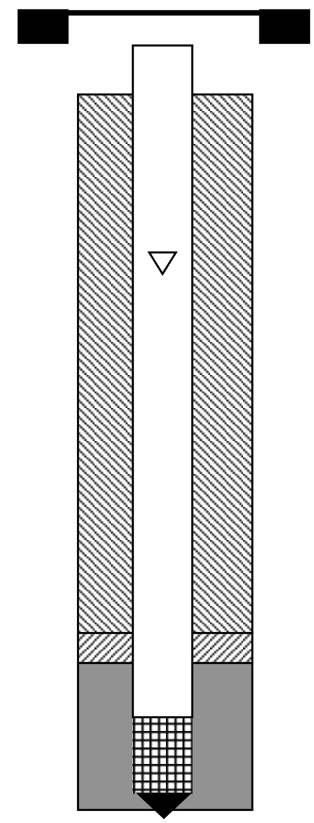
Cape Cod Test Boring	Project	Boring No.	HW-D (d)
5 Rayber Road, Orleans, MA 02653	Horsley Witten Group		
(508) 240-1000	Barnstable, 480 Barnstable Road	Sheet 1 of	1
div. Desmond Well Drilling, Inc.	Hyannis, MA		

Driller:	Tommy Desmond	Boring location:	Cluster by solar field (41.67230, -70.27519)	
Helper:	Sean Morgan	Ground Surface Elevation:		
Inspector:	Josephine Ibanez	Date start: 5/15/2019		Date end: 5/15/2019

Sampler consists of a two inch split spoon driven using a 140 lb. hammer falling thirty inches	Notes:	Auger Size: 6 1/4" x 4" H.S.A	
		Casing Size:	2"x39.75' SCH40 PVC FJT
		Screen Size:	2"x5'X.010 SCH40 PVC FJT

Depth (FT)	Sample NO	Sample PEN/REC	Sample DEPTH/FT	Sample Description
2				
0			0 - 15	F-M-C brown sand and gravel. Dry.
-2				
-4				
-6				
-8				
-10				
-12				
-14				
-16			15 - 45	F-M-C brown sand. Wet.
-18				
-20				
-22				
-24				
-26				
-28				
-30				
-32				
-34				
-36				
-38				
-40				
-42				
-44				
-46				
-48				
-50				
-52				
?				
-57				
-62				
-67				
-72				

Well Installation



Not to scale
Well Depth: 44.75'
Static: 18.25'
Well screen: 39.75' to 44.75'
Grout: 3' to 34'
Bentonite seal: 34' to 36'
Sand pack: 36' to 44.75'
End of boring: 45'
End of sample: N/A

Granular Soils BLOWS/FT	Granular Soils DENSITY	Cohesive Soils BLOWS/FT	Cohesive Soils DENSITY	Proportions Used
0 - 4	V. LOOSE	> 2	V. SOFT	Trace 0 - 10%
4 - 10	LOOSE	2 - 4	SOFT	Little 10 - 20%
10 - 30	M. DENSE	4 - 8	M. STIFF	Some 20 - 35%
30 - 50	DENSE	8 - 15	STIFF	And 35 - 50%
> 50	V. DENSE	15 - 30	V. STIFF	
		> 30	HARD	

Well Installation Key
- CONCRETE
- SAND PACK
- GROUT
- BENTONITE
- SCREEN
- APPROX. WATER LEVEL

CAPE COD TEST BORING **BORING NO. HW-D (d)**

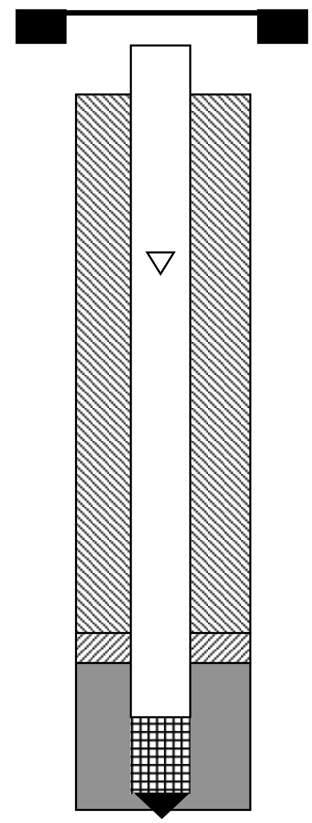
Cape Cod Test Boring	Project	Boring No. HW-D (dd)
5 Rayber Road, Orleans, MA 02653	Horsley Witten Group	
(508) 240-1000	Barnstable, 480 Barnstable Road	Sheet 1 of 1
div. Desmond Well Drilling, Inc.	Hyannis, MA	

Driller: Tommy Desmond	Boring location:	Cluster by solar field (41.67230, -70.27519)	
Helper: Sean Morgan	Ground Surface Elevation:		
Inspector: Josephine Ibanez	Date start: 5/14/2019		Date end: 5/14/2019

Sampler consists of a two inch split spoon driven using a 140 lb. hammer falling thirty inches	Notes:	Auger Size: 6 1/4" x 4" H.S.A Casing Size: Screen Size:	 2"x59.4' SCH40 PVC FJT 2"x5'X.010 SCH40 PVC FJT

Depth (FT)	Sample NO	PEN/REC	DEPTH/FT	Sample Description
2				
0				
-2				
-4				
-6				
-8				
-10				
-12				
-14				
-16				
-18				
-20				
-22				
-24				
-26				
-28	1	24/16	27 - 29	F-M-C brown sand; little gravel. Wet.
-30				
-32	2	24/24	32 -34	F-M-C light brown sand; trace gravel. Wet.
-34				
-36				
-38	3	24/0	37 - 39	No recovery.
-40				
-42	4	24/20	42 - 44	F-M-C light gray sand; trace gravel. Wet.
-44				
-46				
-48	5	24/21	47 - 49	F-M-C light gray sand; little clay. Wet.
-50				
-52	6	24/8	52 - 54	F-M-C dark brown silty sand; some clay. Wet.
?				
-57	7	24/17	57 - 59	F-M-C light brown sand; trace gravel. Wet.
-62	8	24/13	62 - 64	F-M-C light brown sand. Wet.
-67	9	24/13	67 - 69	F-M-C red/brown sand and clay. Wet.
-72				

Well Installation



Not to scale

Well Depth: 64.9'
Static: 19.95'
Well screen: 59.9' to 64.9'
Grout: 3' to 55'
Bentonite seal: 55' to 57'
Sand pack: 57' to 64.9'
End of boring: 67'
End of sample: 69'

Granular Soils BLOWS/FT	DENSITY	Cohesive Soils BLOWS/FT	DENSITY	Proportions Used
0 - 4	V. LOOSE	> 2	V. SOFT	Trace 0 - 10%
4 - 10	LOOSE	2 - 4	SOFT	Little 10 - 20%
10 - 30	M. DENSE	4 - 8	M. STIFF	Some 20 - 35%
30 - 50	DENSE	8 - 15	STIFF	And 35 - 50%
> 50	V. DENSE	15 - 30	V. STIFF	
		> 30	HARD	

Well Installation Key
- CONCRETE
- SAND PACK
- GROUT
- BENTONITE
- SCREEN
- APPROX. WATER LEVEL

CAPE COD TEST BORING **BORING NO. HW-D (dd)**

Horsley Witten Group
Sustainable Environmental Solutions
90 Route 6A • Sandwich, MA • 02563
Tel: 508-833-6600 • Fax: 508-833-3150 • www.horsleywitten.com

MONITORING WELL BORING LOG

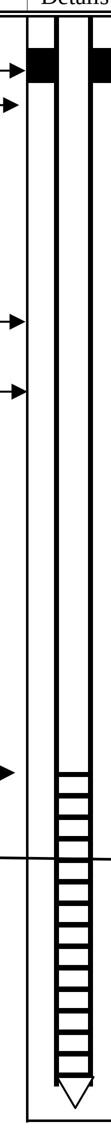
Boring No. HW-D

Project: 17027- Barnstable On-call #4
Client: Barnstable Minicipal Airport
Boring Contractor: New england Goetech
Boring Equipment: Direct Push, 3" casing

Date: 3/17/2017
Completion Depth: 29.5' bgs
Elevation:
Inspector: JDB

Proportions Used:			**Abbreviations:**				
		Color		**Angular**	**Misc.**	**Size**	
trace (tr)	0 - 10%	Blue (Bl)	Green (Gr)	Round (rnd.)	Fragments (frag.)	Fine = (f)	Fine to Coarse = (f-c)
little (li)	10 - 20%	Red (R)	Gray (Gy)	Angular (ang.)	Cement (cem.)	Medium = (m)	Very = (v)
some (so)	20 - 35%	Light (lt)	Brown (Br)		Well-Graded Sand (SW)	Coarse = (c)	More/Less = (+/-)
and	35 - 50%	Dark (dk)	Orange (Or)		Poorly-Graded Sand (SP)	Dark = (dk)	
		Rust (Ru)	Black (Blk)		Well-Graded Gravel (GW)		
					Poorly-Graded Gravel (GP)		
					Below Land Surface (BLS)		
					Not Available (N/A)		

Depth Feet	Description		Penetration	Recovery	USCS Code	USCS Color	PID (parts per million)	Comments	Well Details	Depth Feet
0	0"-6" Organic							Cement		0
	0-5' bgs	0-30" - Or Br, M sand, little F/C sand/gravel; 30-42" - F-M sand, some C sand/gravel; 42-48" - Organic		48"	ang	brn		#2 sand @ 1' bgs		
5										5
	5-10' bgs	0-16" - Med Br, C sand, little F-M sand/large gravel; 16-24" - Med Br, M sand, little F sand, some C sand/gravel; 24+" - Med Br, C sand, little F-M sand/large gravel		42"	ang	brn		Bontonite @ 7' bgs #2 sand @ 9' bgs		
10										10
	10-15' bgs	0-20" - Lt Br, M-C sand, some F sand/gravel; 20-43" - Lt Br, C sand, little F sand/gravel, some C sand; 43+" - F-M sand, some C sand/gravel		55"	ang	brn				
15										15
	15-20' bgs	0-15" - Med Br, M sand, some F/C sand/gravel; 15-25" - F-M sand, some C sand; 25+" - Drk Br, F-M sand, some C sand/gravel		40"	ang	brn				
20								0.02 slot screen @ 16.2-26.2 ' bgs		20
	20-25' bgs	0-20" - Lt Br, M sand, some C sand, littleF sand/gravel; 20+" - F-M sand, some C sand/gravel		38'	ang	brn		Groundwater @ 22.6' bgs		
25										25
	25-30' bgs	NO SAMPLE COLLECTED, SOIL SLUFFED OUT OF SLEEVE		0"						
30										30
35										
40										
45										
50										
55										



Horsley Witten Group
Sustainable Environmental Solutions
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Tel: 508-833-6600 • Fax: 508-833-3150 • www.horsleywitten.com

MONITORING WELL BORING LOG

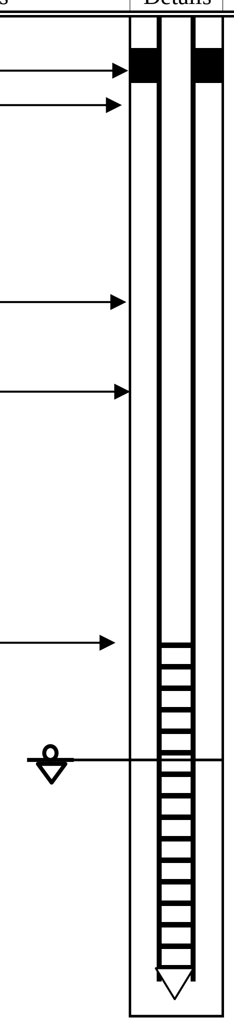
Boring No. HW-E

Project:	17027- Barnstable On-call #4	**Date:**	3/17/2017
Client:	Barnstable Minicipal Airport	**Completion Depth:**	26.5' bgs
Boring Contractor:	New england Goetech	**Elevation:**	
Boring Equipment:	Direct Push, 3" casing	**Inspector:**	JDB

Proportions Used: **Abbreviations:**

		Color		Angular	Misc.	Size	
trace (tr)	0 - 10%	Blue (Bl)	Green (Gr)	Round (rnd.)	Fragments (frag.)	Fine = (f)	Fine to Coarse = (f-c)
little (li)	10 - 20%	Red (R)	Gray (Gy)	Angular (ang.)	Cement (cem.)	Medium = (m)	Very = (v)
some (so)	20 - 35%	Light (lt)	Brown (Br)		Well-Graded Sand (SW)	Coarse = (c)	More/Less = (+/-)
and	35 - 50%	Dark (dk)	Orange (Or)		Poorly-Graded Sand (SP)	Dark = (dk)	
		Rust (Ru)	Black (Blk)		Well-Graded Gravel (GW)		
					Poorly-Graded Gravel (GP)		
					Below Land Surface (BLS)		
					Not Available (N/A)		

Depth Feet	Description		Penetration	Recovery	USCS Code	USCS Color	PID (parts per million)	Comments	Well Details	Depth Feet
0	0"-4" Organic							Cement		0
	0-5' bgs	0-12" - Med Br, M-C sand, some F sand, little gravel; 12-36" - Med Br, C sand, some F-M sand/gravel		40"	ang	brn		#2 sand @ 1' bgs		
5										5
	5-10' bgs	Med Br, C sand, little M-F sand/gravel		36"	ang	brn		Bontonite @ 6.5' bgs		
10								#2 sand @ 9' bgs		10
	10-15' bgs	0-12" - Lt Br, F sand; 12-24" - Lt Br, F-M sand, some C sand/gravel; 24-32" - Lt Br, F-M sand; 32+" - M-C sand, some F sand/gravel		60"	ang	brn				
15										15
	15-20' bgs	0-12" - Med Br, M-C sand, little F sand/gravel; 12-20" - F sand, some silt; 20+" - C sand, some F-M sand/gravel		58"	ang	brn		0.02 slot screen @ 16.2-26.2 ' bgs		
20								Groundwater @ 19.7' bgs		20
	20-25' bgs	Med Br, F sand, Little M-C sand/gravel ROCK IN SHOE		22"	ang	brn				
25										25
	25-30' bgs	Med Br, C sand, some M sand/gravel		24"	ang	brn				
30										30
35										
40										
45										
50										
55										



Horsley Witten Group
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90 Route 6A • Sandwich, MA • 02563
Tel: 508-833-6600 • Fax: 508-833-3150 • www.horsleywitten.com

MONITORING WELL BORING LOG

Boring No. HW-F

Project: 17027- Barnstable On-call #4
Client: Barnstable Minicipal Airport
Boring Contractor: New england Goetech
Boring Equipment: Direct Push, 3" casing

Date: 3/17/2017
Completion Depth: 27.2' bgs
Elevation:
Inspector: JDB

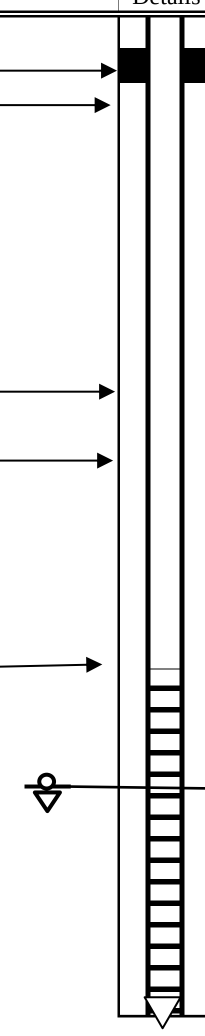
Proportions Used:

trace (tr)	0 - 10%
little (li)	10 - 20%
some (so)	20 - 35%
and	35 - 50%

Abbreviations:

Color		Angular	Misc.	Size	
Blue (Bl)	Green (Gr)	Round (rnd.)	Fragments (frag.)	Fine = (f)	Fine to Coarse = (f-c)
Red (R)	Gray (Gy)	Angular (ang.)	Cement (cem.)	Medium = (m)	Very = (v)
Light (lt)	Brown (Br)		Well-Graded Sand (SW)	Coarse = (c)	More/Less = (+/-)
Dark (dk)	Orange (Or)		Poorly-Graded Sand (SP)	Dark = (dk)	
Rust (Ru)	Black (Blk)		Well-Graded Gravel (GW)		
			Poorly-Graded Gravel (GP)		
			Below Land Surface (BLS)		
			Not Available (N/A)		

Depth Feet	Description		Penetration	Recovery	USCS Code	USCS Color	PID (parts per million)	Comments	Well Details	Depth Feet
0	0"-5" Organic							Cement		0
	0-5' bgs	0-12" - Med Br, M sand, liitle C sand; 12-32" - Drk Br, C sand, some M sand/gravel; 32-40" - Drk Br, F sand, Some M sand/gravel; 40+" - Organic		45"	ang	brn		#2 sand @ 1' bgs		
5										5
	5-10' bgs	C sand, some F-M sand, tr gravel		52"	ang	brn				
10								Bontonite @ 7' bgs		10
	10-15' bgs	0-16" - Lt Br, M sand, some C; 16-32" - Lt Br, F-M sand; 32-41" - Med Br, M sand, some C sand/gravel; 41+" F-M sand, tr gravel		56"	ang	brn		#2 sand @ 11' bgs		
15										15
	15-20' bgs	M-C sand, some F-M sand, little gravel		52"	ang	brn		0.02 slot screen @ 17.2-27.2 ' bgs		
20								Groundwater @ 22.6' bgs		20
	20-25' bgs	0-20" - Lt-Med Br, C sand, some F-M sand, little gravel; 20-28" - Gray, F-M sand, little C sand; 28+" - Drk Br, M-C sand, some Fsand/gravel		38'	ang	brn/gray				
25										25
	25-30' bgs	NO SAMPLE COLLECTED, SOIL SLUFFED OUT OF SLEEVE		0"						
30										30
35										
40										
45										
50										
55										



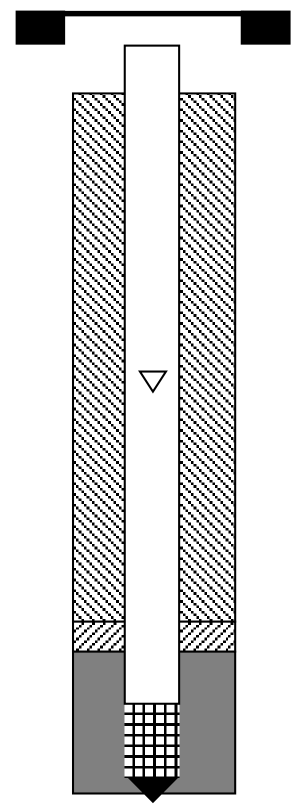
Cape Cod Test Boring 02653 (508) 240-1000 div. Desmond Well Drilling, Inc.	Project Horsley Witten Group Barnstable, 480 Barnstable Road Hyannis, MA	Boring No. Sheet 1 of	HW-G(d) 1

Driller:	Tommy Desmond	Boring location:	
Helper:	Sean Morgan	Ground Surface Elevation:	
Inspector:	Josephine Ibanez	Date start: 10/1/2018	Date end: 10/2/2018

Sampler consists of a two inch split spoon driven using a 140 lb. hammer falling thirty inches	Notes:	Auger Size: 6 1/4" x 4" H.S.A	
		Casing Size:	2"x43.3' SCH40 PVC FJT
		Screen Size:	2"x5'X.010 SCH40 PVC FJT

Depth (FT)	Sample NO	PEN/REC	DEPTH/FT	Sample Description
2				
0	1	24/14	0 - 2	Loamy sand. F-M-trace C brown sand. Dry.
-2	2	24/14	2 - 4	F-M-C brown sand; trace gravel. Dry.
-4	3	24/13	4 - 6	F-M-C brown sand; some cobble. Dry.
-6	4	24/15	6 - 8	F-M-C brown sand; trace cobble. Dry.
-8	5	24/14	8 - 10	F-M-C brown sand; some cobble. Dry.
-10	6	24/15	10 - 12	F-M-C brown sand; some cobble. Dry.
-12	7	24/14	12 - 14	F-M-C brown sand; trace cobble. Dry.
-14	8	24/17	14 - 16	F-M-C brown sand; trace gravel. Dry.
-16	9	24/17	16 - 18	F-M-C brown sand; trace gravel. Dry.
-18	10	24/17	18 - 20	F-M-C brown sand; trace gravel. Dry.
-20	11	24/17	20 - 22	F-M-C brown sand; trace gravel. Dry.
-22	12	24/13	22 - 24	F-M-C brown sand. Wet at 24'.
-24	13	24/3	24 - 26	Rock jammed in top of spoon.
-26	14	24/0	26 - 28	No recovery basket broke.
-28	15		28 - 30	F-M-C brown sand; trace gravel. Wet.
-30	16	24/11	30 - 32	F-M-C brown sand; trace gravel. Wet.
-32	17	24/13	32 -34	F-M-C brown sand; trace gravel. Wet.
-34	18	24/10	34 - 36	F-M-C brown sand; trace gravel. Wet.
-36	19	24/0	36 - 38	No recovery.
-38	20	24/12	38 - 40	F-M-C brown sand; trace silt, trace gravel. Wet.
-40	21	24/11	40 - 42	F-M-C brown sand; trace gravel. Wet.
-42	22	24/9	42 - 44	F-M-C brown sand; trace gravel. Wet.
-44	23	24/13	44 - 46	F-M-C light brown sand. Wet.
-46	24	24/12	46 - 48	F-M-C brown sand; trace silt. Wet.
-48	25	24/13	48 - 50	F-M-C brown sand; trace silt; trace clay. Wet.
-50	26	24/19	50 - 52	Blue clay. Wet.
-52				
-54				
-56				
-58				
-60				
-62				
-64				
-66				

Well Installation



Well Depth: 48.30'
Static: 22.30'
Well screen: 43.3' to 48.3'
Grout: 5' to 38'
Bentonite seal: 38' to 40'
Sand pack: 40' to 48.3'
End of boring: 50'
End of sample: 52'

Granular Soils BLOWS/FT	DENSITY	Cohesive Soils BLOWS/FT	DENSITY	Proportions Used
0 - 4	V. LOOSE	> 2	V. SOFT	Trace 0 - 10%
4 - 10	LOOSE	2 - 4	SOFT	Little 10 - 20%
10 - 30	M. DENSE	4 - 8	M. STIFF	Some 20 - 35%
30 - 50	DENSE	8 - 15	STIFF	And 35 - 50%
> 50	V. DENSE	15 - 30	V. STIFF	
		> 30	HARD	

Well Installation Key
- CONCRETE
- SAND PACK
- GROUT
- BENTONITE
- SCREEN
- APPROX. WATER LEVEL

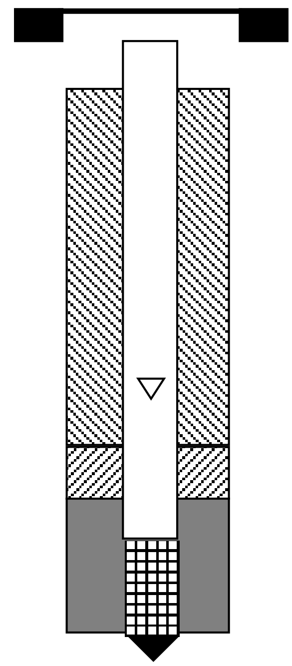
CAPE COD TEST BORING **BORING NO.** **GW - Deep well**

Cape Cod Test Boring	Project	Boring No. HW-G(m)
5 Rayber Road, Orleans, MA 02653	Horsley Witten Group	
(508) 240-1000	Barnstable, 480 Barnstable Road	Sheet 1 of 1
div. Desmond Well Drilling, Inc.	Hyannis, MA	

Driller: Tommy Desmond	Boring location:
Helper: Sean Morgan	Ground Surface Elevation:
Inspector: Josephine Ibanez	Date start: 10/3/2018 Date end: 10/3/2018

Sampler consists of a two inch split spoon driven using a 140 lb. hammer falling thirty inches	Notes: Middle	Auger Size: 6 1/4" x 4" H.S.A Casing Size: 2"x33.25' SCH40 PVC FJT Screen Size: 2"x5'X.010 SCH40 PVC FJT

Depth	Sample				Sample Description	Well Installation
(FT)	NO	PEN/REC	DEPTH/FT	BLOWS 6"		
2					Drilled straight with H.S.A.	
0			0 - 10		F-M-C brown sand; gravel. Dry.	
-2						
-4						
-6						
-8						
-10			10 - 40		F-M-C brown sand.	
-12					Water encountered at 22.35'.	
-14						
-16						
-18						
-20						
-22						
-24						
-26						
-28						
-30						
-32						
-34						
-36						
-38						
-40						
-42						
-44						
-46						
-48						
-50						
-52						Well Depth: 38.25'
-54						Static: 22.35'
-56						Well screen: 33.25' to 38.25'
-58						Grout: 5' to 27.25'
-60						Bentonite seal: 27.25' to 30.25'
-62						Sand pack: 30.25' to 38.25'
-64						End of boring: 40'
-66						End of sample: n/a



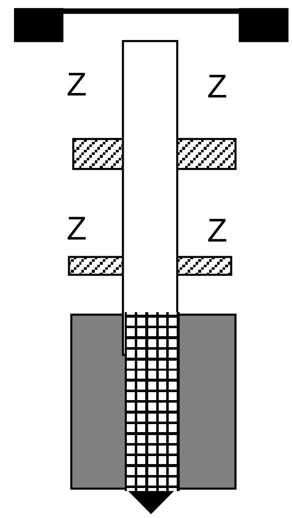
Granular Soils		Cohesive Soils		Proportions Used	Well Installation Key
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY		
0 - 4	V. LOOSE	> 2	V. SOFT	Trace 0 - 10%	- CONCRETE
4 - 10	LOOSE	2 - 4	SOFT	Little 10 - 20%	- SAND PACK
10 - 30	M. DENSE	4 - 8	M. STIFF	Some 20 - 35%	- GROUT
30 - 50	DENSE	8 - 15	STIFF	And 35 - 50%	- BENTONITE
> 50	V. DENSE	15 - 30	V. STIFF		- SCREEN
		> 30	HARD		- APPROX. WATER LEVEL

CAPE COD TEST BORING **BORING NO. GW - Middle well**

Cape Cod Test Boring	Project	Boring No.	HW-G(s)
5 Rayber Road, Orleans, MA 02653	Horsley Witten Group		
(508) 240-1000	Barnstable, 480 Barnstable Road	Sheet 1 of	1
div. Desmond Well Drilling, Inc.	Hyannis, MA		

Driller:	Tommy Desmond	Boring location:	
Helper:	Sean Morgan	Ground Surface Elevation:	
Inspector:	Josephine Ibanez	Date start: 10/3/2018	Date end: 10/3/2018

Sampler consists of a two inch split spoon driven using a 140 lb. hammer falling thirty inches	Notes: Shallow	Auger Size:	6 1/4" x 4" H.S.A
		Casing Size:	2"x18.45' SCH40 PVC FJT
		Screen Size:	2"x10'X.010 SCH40 PVC FJT

Depth	Sample				Sample Description	Well Installation
(FT)	NO	PEN/REC	DEPTH/FT	BLOWS 6"		
2					Drilled straight with H.S.A.	
0			0 -10		F-M-C brown sand; Gravel. Dry.	
-2						
-4						
-6						
-8						
-10			10 - 40		F-M-C brown sand.	
-12					Water encountered at 22.29'.	
-14						
-16						
-18						
-20						
-22						
-24						
-26						
-28						
-30						
-32						
-34						
-36						
-38						
-40						
-42						
-44						
-46						
-48						
-50						
-52						Well Depth: 28.45'
-54						Static: 22.29'
-56						Well screen: 18.45' to 28.45'
-58						Bentonite seal: 8' to 10'
-60						Bentonite seal: 15' to 16'
-62						Sand pack: 18.25' to 28.45'
-64						End of boring: 30'
-66						End of sample: n/a

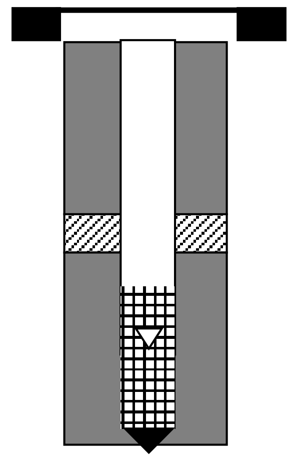
Granular Soils		Cohesive Soils		Proportions Used	Well Installation Key
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY		- CONCRETE
0 - 4	V. LOOSE	> 2	V. SOFT	Trace 0 - 10%	- SAND PACK
4 - 10	LOOSE	2 - 4	SOFT	Little 10 - 20%	Z - SOIL BACKFILL
10 - 30	M. DENSE	4 - 8	M. STIFF	Some 20 - 35%	- BENTONITE
30 - 50	DENSE	8 - 15	STIFF	And 35 - 50%	- SCREEN
> 50	V. DENSE	15 - 30	V. STIFF		- APPROX. WATER LEVEL
		> 30	HARD		

CAPE COD TEST BORING | **BORING NO. GW - Shallow well**

Cape Cod Test Boring	Project	Boring No.	HW - H
5 Rayber Road, Orleans, MA 02653	Horsley Witten Group		
(508) 240-1000	Barnstable, 480 Barnstable Road	Sheet 1 of	1
div. Desmond Well Drilling, Inc.	Hyannis, MA		

Driller:	Tommy Desmond	Boring location:	
Helper:	Sean Morgan	Ground Surface Elevation:	
Inspector:	Josephine Ibanez	Date start: 10/4/2018	Date end: 10/4/2018

Direct push sampler consists of 4' x 2 3/8" G3 dual tube direct push steel tooling with 4' x 1 1/2" PVC liner with 201 ft lb hydraulic hammer (percussion rate 2200 bpm)	Auger Size:	6 1/4" x 4" H.S.A
	Casing Size:	2"x17.11' SCH40 PVC FJT
	Screen Size:	2"x10'X.010 SCH40 PVC FJT

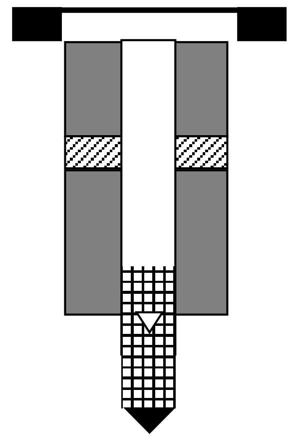
Depth	Sample				Sample Description	Well Installation
(FT)	NO	PEN/REC	DEPTH/FT	BLOWS 6"		
2						
0	1	N/R	0 - 4	N/R	Loamy; F-M brown sand; trace silt.	
-2					Dry.	
-4	2		4 - 8		F-M-C brown sand; little F-M	
-6					gravel. Dry.	
-8	3		8 - 12		F-M-C brown sand; trace F gravel.	
-10					Dry.	
-12	4		12 - 16		F-M-C brown sand. Dry.	
-14						
-16	5		16 - 20		F-M-C brown sand; trace F gravel.	
-18					Dry.	
-20	6		20 - 24		F-M-C brown sand. Wet.	
-22						
-24	7		24 - 28		F-M-C brown sand. Wet.	
-26						
-28						
-30						
-32						
-34						
-36						
-38						
-40						
-42						
-44						
-46						
-48						
-50						
-52						Well Depth: 27.11'
-54						Static: 20.68'
-56						Well screen: 17.11' to 27.11'
-58						Sand pack: 0' to 13'
-60						Bentonite seal: 13' to 15'
-62						Sand pack: 15' to 27.11'
-64						End of boring: 24'
-66						End of sample: 28'

Granular Soils		Cohesive Soils		Proportions Used	Well Installation Key
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY		- CONCRETE
0 - 4	V. LOOSE	> 2	V. SOFT	Trace 0 - 10%	- SAND PACK
4 - 10	LOOSE	2 - 4	SOFT	Little 10 - 20%	Z - SOIL BACKFILL
10 - 30	M. DENSE	4 - 8	M. STIFF	Some 20 - 35%	- BENTONITE
30 - 50	DENSE	8 - 15	STIFF	And 35 - 50%	- SCREEN
> 50	V. DENSE	15 - 30	V. STIFF		- APPROX. WATER LEVEL
		> 30	HARD		

Cape Cod Test Boring	Project	Boring No.	HW - I
5 Rayber Road, Orleans, MA 02653	Horsley Witten Group		
(508) 240-1000	Barnstable, 480 Barnstable Road	Sheet 1 of	1
div. Desmond Well Drilling, Inc.	Hyannis, MA		

Driller:	Tommy Desmond	Boring location:	
Helper:	Sean Morgan	Ground Surface Elevation:	
Inspector:	Josephine Ibanez	Date start: 10/4/2018	Date end: 10/4/2018

Direct push sampler consists of 4' x 2 3/8" G3 dual tube direct push steel tooling with 4' x 1 1/2" PVC liner with 201 ft lb hydraulic hammer (percussion rate 2200 bpm)	Auger Size: 6 1/4" x 4" H.S.A	
	Casing Size:	2"x15.1' SCH40 PVC FJT
	Screen Size:	2"x10'X.010 SCH40 PVC FJT

Depth (FT)	Sample NO	PEN/REC	DEPTH/FT	BLOWS 6"	Sample Description	Well Installation
2						
0	1	N/R	0 - 4	N/R	Loamy; silty sand; F-M gravel;	
-2					F-M-C brown sand. Dry.	
-4	2		4 - 8		F-M-C brown sand; trace F gravel.	
-6					Dry.	
-8	3		8 - 12		F-M-C brown sand. Dry.	
-10						
-12	4		12 - 16		F-M-C brown sand. Dry.	
-14						
-16	5		16 - 20		F-M-C brown sand; trace very C	
-18					brown sand; trace F gravel. Wet.	
-20	6		20 - 24		F-M-C brown sand. Wet.	
-22						
-24	7		24 - 28		F-M-C brown sand. Wet.	
-26						
-28						
-30						
-32						
-34						
-36						
-38						
-40						
-42						
-44						
-46						
-48						
-50						
-52						Well Depth: 25.10'
-54						Static: 18.62'
-56						Well screen: 15.1' to 25.1'
-58						Sand pack: 0' to 8'
-60						Bentonite seal: 8' to 10'
-62						Sand pack: 10' to 18.62'
-64						End of boring: 24'
-66						End of sample: 28'

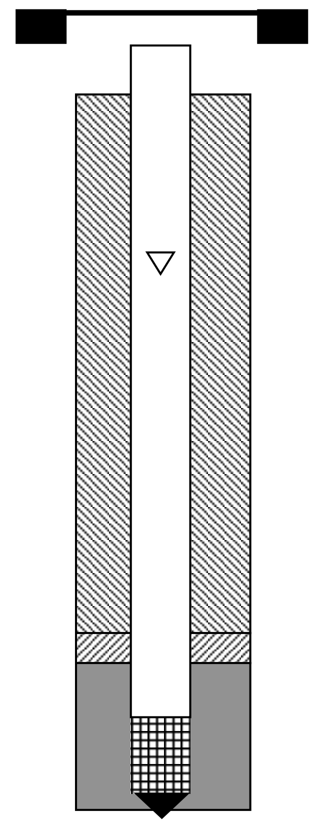
Granular Soils BLOWS/FT	Granular Soils DENSITY	Cohesive Soils BLOWS/FT	Cohesive Soils DENSITY	Proportions Used	Well Installation Key
0 - 4	V. LOOSE	> 2	V. SOFT	Trace 0 - 10%	- CONCRETE
4 - 10	LOOSE	2 - 4	SOFT	Little 10 - 20%	- SAND PACK
10 - 30	M. DENSE	4 - 8	M. STIFF	Some 20 - 35%	Z - SOIL BACKFILL
30 - 50	DENSE	8 - 15	STIFF	And 35 - 50%	- BENTONITE
> 50	V. DENSE	15 - 30	V. STIFF		- SCREEN
		> 30	HARD		- APPROX. WATER LEVEL

CAPE COD TEST BORING | **BORING NO. HW - I**

Cape Cod Test Boring 5 Rayber Road, Orleans, MA 02653 (508) 240-1000 div. Desmond Well Drilling, Inc.	Project Horsley Witten Group Barnstable, 480 Barnstable Road Hyannis, MA	Boring No. HW-I (d) Sheet 1 of 1
Driller: Tommy Desmond Helper: Sean Morgan Inspector: Josephine Ibanez	Boring location: Behind deployment (41.66662, -70.27212) Ground Surface Elevation: Date start: 5/16/2019	Date end: 5/16/2019
Sampler consists of a two inch split spoon driven using a 140 lb. hammer falling thirty inches	Notes:	Auger Size: 6 1/4" x 4" H.S.A Casing Size: 2"x36.5' SCH40 PVC FJT Screen Size: 2"x5'X.010 SCH40 PVC FJT

Depth (FT)	Sample NO	PEN/REC	DEPTH/FT	Sample Description
2				
0				
-2				
-4				
-6				
-8				
-10				
-12				
-14				
-16				
-18				
-20				
-22				
-24				
-26				
-28	1	24/20	27 - 29	F-M-C light brown sand; trace gravel. Wet.
-30				
-32	2	24/24	32 -34	F-M-C light brown sand. Wet.
-34				
-36				
-38	3	24/11	37 - 39	F-M-C light gray sand; trace gravel. Wet.
-40				
-42	4	24/15	42 - 44	F-M-C brown sand; trace red sand; trace clay. Wet.
-44				
-46				
-48				
-50				
-52				
?				
-57				
-62				
-67				
-72				

Well Installation



Not to scale

Well Depth: 41.5'

Static: 15.45'

Well screen: 36.1' to 41.5'

Grout: 3' to 27'

Bentonite seal: 27' to 30'

Sand pack: 30' to 41.5'

End of boring: 42'

End of sample: 44'

Granular Soils BLOWS/FT	DENSITY	Cohesive Soils BLOWS/FT	DENSITY	Proportions Used
0 - 4	V. LOOSE	> 2	V. SOFT	Trace 0 - 10%
4 - 10	LOOSE	2 - 4	SOFT	Little 10 - 20%
10 - 30	M. DENSE	4 - 8	M. STIFF	Some 20 - 35%
30 - 50	DENSE	8 - 15	STIFF	And 35 - 50%
> 50	V. DENSE	15 - 30	V. STIFF	
		> 30	HARD	

Well Installation Key
- CONCRETE
- SAND PACK
- GROUT
- BENTONITE
- SCREEN
- APPROX. WATER LEVEL

CAPE COD TEST BORING **BORING NO. HW-I (d)**

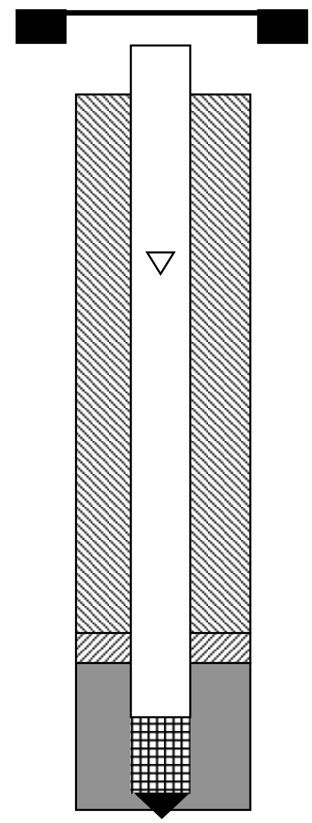
Cape Cod Test Boring	Project	Boring No.	HW-I (m)
5 Rayber Road, Orleans, MA 02653	Horsley Witten Group		
(508) 240-1000	Barnstable, 480 Barnstable Road	Sheet 1 of	1
div. Desmond Well Drilling, Inc.	Hyannis, MA		

Driller:	Tommy Desmond	Boring location:	Behind deployment (41.66662, -70.27212)
Helper:	Sean Morgan	Ground Surface Elevation:	
Inspector:	Josephine Ibanez	Date start: 5/16/2019	Date end: 5/16/2019

Sampler consists of a two inch split spoon driven using a 140 lb. hammer falling thirty inches	Notes:	Auger Size: 6 1/4" x 4" H.S.A	
		Casing Size:	2"x30' SCH40 PVC FJT
		Screen Size:	2"x5'X.010 SCH40 PVC FJT

Depth (FT)	Sample NO	Sample PEN/REC	Sample DEPTH/FT	Sample Description
2				
0			0 - 35	F-M-C light brown sand; trace gravel.
-2				
-4				
-6				
-8				
-10				
-12				
-14				
-16				
-18				
-20				
-22				
-24				
-26				
-28				
-30				
-32				
-34				
-36				
-38				
-40				
-42				
-44				
-46				
-48				
-50				
-52				
?				
-57				
-62				
-67				
-72				

Well Installation



Not to scale

Well Depth: 35'

Static: 16.4'

Well screen: 30' to 35'

Grout: 3' to 27'

Bentonite seal: 27' to 30'

Sand pack: 30' to 35'

End of boring: N/A

End of sample: N/A

Granular Soils BLOWS/FT	Granular Soils DENSITY	Cohesive Soils BLOWS/FT	Cohesive Soils DENSITY	Proportions Used
0 - 4	V. LOOSE	> 2	V. SOFT	Trace 0 - 10%
4 - 10	LOOSE	2 - 4	SOFT	Little 10 - 20%
10 - 30	M. DENSE	4 - 8	M. STIFF	Some 20 - 35%
30 - 50	DENSE	8 - 15	STIFF	And 35 - 50%
> 50	V. DENSE	15 - 30	V. STIFF	
		> 30	HARD	

Well Installation Key

- CONCRETE
- SAND PACK
- GROUT
- BENTONITE
- SCREEN
- APPROX. WATER LEVEL

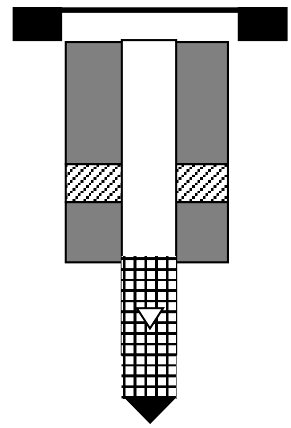
CAPE COD TEST BORING **BORING NO. HW-I (m)**

Cape Cod Test Boring	Project	Boring No. HW - J
5 Rayber Road, Orleans, MA 02653	Horsley Witten Group	
(508) 240-1000	Barnstable, 480 Barnstable Road	Sheet 1 of 1
div. Desmond Well Drilling, Inc.	Hyannis, MA	

Driller: Tommy Desmond	Boring location:
Helper: Sean Morgan	Ground Surface Elevation:
Inspector: Josephine Ibanez	Date start: 10/4/2018 Date end: 10/4/2018

Direct push sampler consists of 4' x 2 3/8" G3 dual tube direct push steel tooling with 4' x 1 1/2" PVC liner with 201 ft lb hydraulic hammer (percussion rate 2200 bpm)	Auger Size: 6 1/4" x 4" H.S.A Casing Size: 2"x___' SCH40 PVC FJT Screen Size: 2"x___'X.010 SCH40 PVC FJT

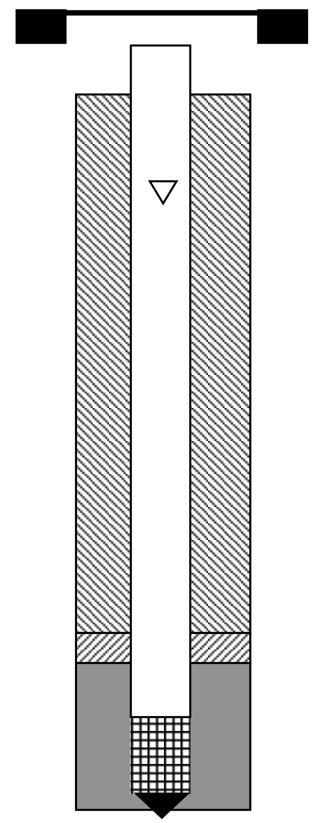
Depth (FT)	Sample NO	PEN/REC	DEPTH/FT	BLOWS 6"	Sample Description	Well Installation
2						
0	1	N/R	0 - 4	N/R	Loamy; F-M brown sand; F-M-C	
-2					brown sand; trace F gravel. Dry.	
-4	2		4 - 8		F-M-C brown sand. Dry.	
-6						
-8	3		8 - 12		F-M-C brown sand;	
-10					trace F gravel (lense). Dry.	
-12	4		12 - 16		F-M-C brown sand; trace F-M	
-14					gravel. Dry.	
-16	5		16 - 20		F-M-C brown sand; little F-M	
-18					gravel. Wet.	
-20	6		20 - 24		F-M-C brown sand. Wet.	
-22						
-24	7		24 - 28		F-M-C brown sand. Wet.	
-26						
-28						
-30						
-32						
-34						
-36						
-38						
-40						
-42						
-44						
-46						
-48						
-50						
-52						Well Depth: 24.35'
-54						Static: 19.56'
-56						Well screen: 14.35' to 24.35'
-58						Sand pack: 0' to 10'
-60						Bentonite seal: 10' to 12'
-62						Sand pack: 12' to 14.35'
-64						End of boring: 24'
-66						End of sample: 28'



Granular Soils BLOWS/FT	DENSITY	Cohesive Soils BLOWS/FT	DENSITY	Proportions Used	Well Installation Key
0 - 4	V. LOOSE	> 2	V. SOFT	Trace 0 - 10%	- CONCRETE
4 - 10	LOOSE	2 - 4	SOFT	Little 10 - 20%	- SAND PACK
10 - 30	M. DENSE	4 - 8	M. STIFF	Some 20 - 35%	Z - SOIL BACKFILL
30 - 50	DENSE	8 - 15	STIFF	And 35 - 50%	- BENTONITE
> 50	V. DENSE	15 - 30	V. STIFF		- SCREEN
		> 30	HARD		- APPROX. WATER LEVEL

CAPE COD TEST BORING	BORING NO. HW - J

Cape Cod Test Boring 5 Rayber Road, Orleans, MA 02653 (508) 240-1000 div. Desmond Well Drilling, Inc.	Project Horsley Witten Group Barnstable, 480 Barnstable Road Hyannis, MA	Boring No. HW-K Sheet 1 of 1
Driller: Tommy Desmond Helper: Sean Morgan Inspector: Josephine Ibanez	Boring location: Back of parking lot off site (41.66284, -70.27542) Ground Surface Elevation: Date start: 5/31/2019 Date end: 6/3/2019	
Sampler consists of a two inch split spoon driven using a 140 lb. hammer falling thirty inches	Notes:	Auger Size: 6 1/4" x 4" H.S.A Casing Size: 2"x39' SCH40 PVC FJT Screen Size: 2"x5'X.010 SCH40 PVC FJT

Depth	Sample			Sample Description	Well Installation
(FT)	NO	PEN/REC	DEPTH/FT		
2					
0					
-2					
-4					
-6	1	24/24	5 - 7	F-M-C brown sand; some gravel; some cobble. Dry.	
-8	2	24/10	7 - 9	F-M-C brown sand; trace cobble; trace gravel. Dry.	
-10					
-12	3	24/15	12 - 14	F-M-C brown sand; trace gravel. Dry.	
-14					
-16					
-18	4	24/15	17 - 19	F-M-C light brown sand; trace gravel. Dry.	
-20					
-22	5	24/15	22 - 24	F-M brown sand; trace silt. Wet at 22 ft.	
-24					
-26					
-28	6	24/8	27 - 29	F-M brown silty sand. Wet.	
-30					
-32	7	24/9	32 -34	F-M-C brown sand; trace silt. Wet.	
-34					
-36					
-38	8	24/9	37 - 39	F-M-C brown silty sand; trace gravel. Wet.	
-40					
-42	9	24/12	42 - 44	F-M-C brown sand; M-C brown/black sand. Wet.	
-44					
-46					
-48					
-50					*Not to scale*
-52					Well Depth: 44'
?					Static: 19.7'
-57					Well screen: 39' to 44'
-62					Grout: 3' to 34'
-67					Bentonite seal: 34' to 36'
-72					Sand pack: 36' to 44'
					End of boring: 44'
					End of sample: 44'

Granular Soils		Cohesive Soils		Proportions Used	Well Installation Key
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY		
0 - 4	V. LOOSE	> 2	V. SOFT	Trace 0 - 10%	- CONCRETE
4 - 10	LOOSE	2 - 4	SOFT	Little 10 - 20%	- SAND PACK
10 - 30	M. DENSE	4 - 8	M. STIFF	Some 20 - 35%	- GROUT
30 - 50	DENSE	8 - 15	STIFF	And 35 - 50%	- BENTONITE
> 50	V. DENSE	15 - 30	V. STIFF		- SCREEN
		> 30	HARD		- APPROX. WATER LEVEL

CAPE COD TEST BORING **BORING NO. HW-3(m)**

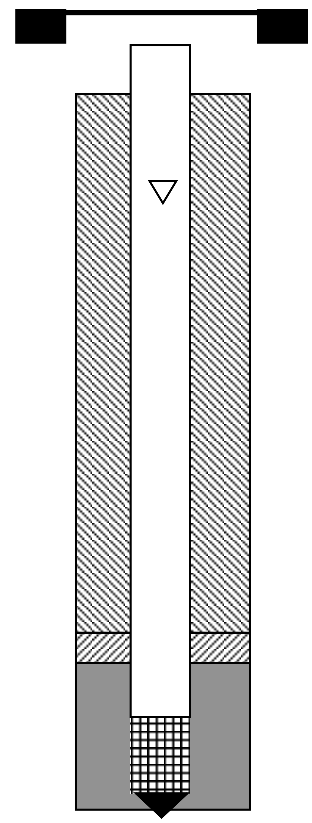
Cape Cod Test Boring	Project	Boring No.	HW-L(d)
5 Rayber Road, Orleans, MA 02653	Horsley Witten Group		
(508) 240-1000	Barnstable, 480 Barnstable Road	Sheet 1 of	1
div. Desmond Well Drilling, Inc.	Hyannis, MA		

Driller:	Tommy Desmond	Boring location:	End of runway 33 (41.66329, -70.27865)	
Helper:	Sean Morgan	Ground Surface Elevation:		
Inspector:	Josephine Ibanez	Date start: 5/13/2019		Date end: 5/13/2019

Sampler consists of a two inch split spoon driven using a 140 lb. hammer falling thirty inches	Notes:	Auger Size: 6 1/4" x 4" H.S.A	
		Casing Size:	2"x65.4' SCH40 PVC FJT
		Screen Size:	2"x5'X.010 SCH40 PVC FJT

Depth (FT)	Sample NO	PEN/REC	DEPTH/FT	Sample Description
2				
0	1	24/8	0 - 2	F-M-C brown sand; trace gravel. Dry.
-2	2	24/13	2 - 4	F-M-C brown sand; trace gravel. Dry.
-4				
-6				
-8	3	24/12	7 - 9	F-M-C light brown sand; trace gravel. Dry.
-10				
-12	4	24/8	12 - 14	F-M-C brown sand; some gravel. Dry.
-14				
-16				
-18	5	24/14	17 - 19	F-M-C light brown sand; trace gravel. Dry.
-20				
-22	6	24/12	22 - 24	F-M-C light brown sand. Wet.
-24				
-26				
-28	7	24/15	27 - 29	F-M-C light brown sand; trace gravel. Wet.
-30				
-32	8	24/19	32 -34	F-M-C light brown sand; trace gravel. Wet.
-34				
-36				
-38	9	24/24	37 - 39	F-M-C light brown sand; trace gravel. Wet.
-40				
-42	10	24/19	42 - 44	F-M-C light brown sand; little gravel. Wet.
-44				
-46				
-48	11	24/15	47 - 49	F-M-C light brown sand; little gravel. Wet.
-50				
-52	12	24/24	52 - 54	F-M-C light brown sand; little gravel. Wet.
?				
-57	13	24/12	57 - 59	F-M brown sand. Wet.
-62	14	24/15	62 - 64	F-M light brown sand. Wet.
-67	15	24/20	67 - 69	F-M brown sand. Wet.
-72	16	24/13	72 - 74	F gray clay. Wet.

Well Installation



Not to scale

Well Depth: 70.4'
Static: 19'
Well screen: 65.4' to 70.4'
Grout: 3' to 60'
Bentonite seal: 60' to 62'
Sand pack: 62' to 70.4'
End of boring: 72'
End of sample: 74'

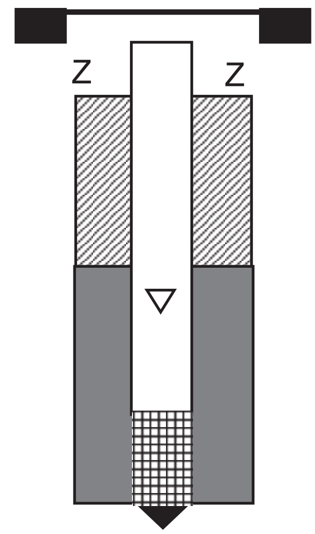
Granular Soils BLOWS/FT	DENSITY	Cohesive Soils BLOWS/FT	DENSITY	Proportions Used
0 - 4	V. LOOSE	> 2	V. SOFT	Trace 0 - 10%
4 - 10	LOOSE	2 - 4	SOFT	Little 10 - 20%
10 - 30	M. DENSE	4 - 8	M. STIFF	Some 20 - 35%
30 - 50	DENSE	8 - 15	STIFF	And 35 - 50%
> 50	V. DENSE	15 - 30	V. STIFF	
		> 30	HARD	

Well Installation Key
- CONCRETE
- SAND PACK
- GROUT
- BENTONITE
- SCREEN
- APPROX. WATER LEVEL

Cape Cod Test Boring 5 Rayber Road, Orleans, MA 02653 (508) 240-1000 div. Desmond Well Drilling, Inc.	Project Horsley Witten Group Barnstable, 480 Barnstable Road Hyannis, MA	Boring No. HW-L(M) Sheet 1 of 1

Driller:	Tommy Desmond	Boring location:	Runway (41.66277, -70.27842)
Helper:	Sean Morgan	Ground Surface Elevation:	
Inspector:	Sarah Bartlett	Date start: 9/17/2020	Date end: 9/17/2020

Sampler consists of a two inch split spoon driven using a 140 lb. hammer falling thirty inches	Notes:	Auger Size: 6 1/4" x 4" H.S.A Casing Size: 2"x32.33' SCH40 PVC FJT Screen Size: 2"x5'X.010 SCH40 PVC FJT

Depth (FT)	Sample NO	PEN/REC	DEPTH/FT	BLOWS 6"	Sample Description	Well Installation
2			0 - 5		Cleared with vacuum truck.	
0					F-M-C brown sand; some gravel. Dry.	
-2						
-4						
-6			5 - 38		F-M-C brown sand; some gravel. Dry.	
-8						
-10					Drilled with hollow stem augers to 38'	
-12					and set well as directed.	
-14						
-16						
-18						
-20						
-22						
-24						
-26						
-28						
-30						
-32						
-34						
-36						
-38						
-40						
-42						
-44						
-46						
-48						*Not to scale*
-50						Well Depth: 37.33'
-52						Static: 21.88'
-54						Well screen: 32.33' to 37.33'
-56						Native backfill: 0' to 5'
-58						Bentonite seal: 5' to 28'
-60						Bentonite grout slow: 28' to 32'
-62						Sand pack: 32' to 37'
-64						End of boring: 38'
-66						End of sample: n/a

Granular Soils BLOWS/FT	DENSITY	Cohesive Soils BLOWS/FT	DENSITY	Proportions Used
0 - 4	V. LOOSE	> 2	V. SOFT	Trace 0 - 10%
4 - 10	LOOSE	2 - 4	SOFT	Little 10 - 20%
10 - 30	M. DENSE	4 - 8	M. STIFF	Some 20 - 35%
30 - 50	DENSE	8 - 15	STIFF	And 35 - 50%
> 50	V. DENSE	15 - 30	V. STIFF	
		> 30	HARD	

Well Installation Key
- CONCRETE
- SAND PACK
Z - SOIL BACKFILL
- BENTONITE
- SCREEN
- APPROX. WATER LEVEL

CAPE COD TEST BORING **BORING NO. HW-L(M)**

Cape Cod Test Boring 5 Rayber Road, Orleans, MA 02653 (508) 240-1000 div. Desmond Well Drilling, Inc.	Project Horsley Witten Group Barnstable, 480 Barnstable Road Hyannis, MA	Boring No. HW-L(S) Sheet 1 of 1

Driller:	Tommy Desmond	Boring location:	Runway (41.66277, -70.27842)
Helper:	Sean Morgan	Ground Surface Elevation:	
Inspector:	Sarah Bartlett	Date start: 9/17/2020	Date end: 9/17/2020

Sampler consists of a two inch split spoon driven using a 140 lb. hammer falling thirty inches	Notes:	Auger Size: 6 1/4" x 4" H.S.A Casing Size: 2"x17.33' SCH40 PVC FJT Screen Size: 2"x10'X.010 SCH40 PVC FJT

Depth (FT)	Sample NO	PEN/REC	DEPTH/FT	BLOWS 6"	Sample Description
2			0 - 5		Cleared with vacuum truck.
0					F-M-C brown sand; some gravel. Dry.
-2					
-4					
-6			5 - 28		F-M-C brown sand. Dry.
-8					
-10					Drilled with hollow stem augers to 28'
-12					and set well as directed.
-14					
-16					
-18					
-20					
-22					
-24					
-26					
-28					
-30					
-32					
-34					
-36					
-38					
-40					
-42					
-44					
-46					
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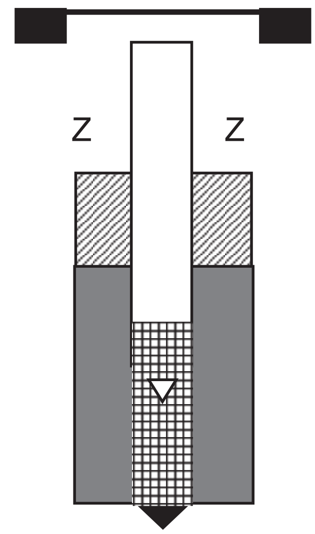
-52					
-54					
-56					
-58					
-60					
-62					
-64					
-66					

Well Installation



Not to scale
Well Depth: 27.33'
Static: 21.96'
Well screen: 17.33' to 27.33'
Native backfill: 0' to 10'
Bentonite seal: 10' to 14'
Sand pack: 14' to 27'
End of boring: 28'
End of sample: n/a

Granular Soils BLOWS/FT	DENSITY	Cohesive Soils BLOWS/FT	DENSITY	Proportions Used
0 - 4	V. LOOSE	> 2	V. SOFT	Trace 0 - 10%
4 - 10	LOOSE	2 - 4	SOFT	Little 10 - 20%
10 - 30	M. DENSE	4 - 8	M. STIFF	Some 20 - 35%
30 - 50	DENSE	8 - 15	STIFF	And 35 - 50%
> 50	V. DENSE	15 - 30	V. STIFF	
		> 30	HARD	

Well Installation Key
- CONCRETE
- SAND PACK
Z - SOIL BACKFILL
- BENTONITE
- SCREEN
- APPROX. WATER LEVEL

CAPE COD TEST BORING | **BORING NO. HW-L(S)**

Cape Cod Test Boring 5 Rayber Road, Orleans, MA 02653 (508) 240-1000 div. Desmond Well Drilling, Inc.	Project Horsley Witten Group Barnstable, 480 Barnstable Road Hyannis, MA	Boring No. HW-M Sheet 1 of 1

Driller:	Tommy Desmond	Boring location:	Cit Ave and Plant Road (41.67157, -70.29359)
Helper:	Sean Morgan	Ground Surface Elevation:	
Inspector:	Josephine Ibanez	Date start: 5/30/2019	Date end: 5/30/2019

Direct push sampler consists of 4' x 2 3/8" G3 dual tube direct push steel tooling with 4' x 1 1/2" PVC liner with 201 ft lb hydraulic hammer (percussion rate 2200 bpm)	Auger Size: 6 1/4" x 4" H.S.A	
	Casing Size:	2"x16.9' SCH40 PVC FJT
	Screen Size:	2"x10'X.010 SCH40 PVC FJT

Depth (FT)	Sample NO	PEN/REC	DEPTH/FT	BLOWS 6"	Sample Description
2					
0			0 - 5		Vacuum truck.
-2					
-4	1		5 - 8		F-M-C brown sand and gravel.
-6					Dry.
-8	2		8 - 12		F-M-C brown sand and gravel.
-10					Dry.
-12	3		12 - 16		F-M-C brown sand and gravel.
-14					Dry.
-16	4		16 - 20		F-M-C brown sand and gravel.
-18					Dry.
-20	5		20 - 24		F-M-C brown sand and gravel.
-22					Wet.
-24	6		24 - 28		F-M-C brown sand and gravel.
-26					Wet.
-28					
-30					
-32					
-34					
-36					
-38					
-40					
-42					
-44					
-46					
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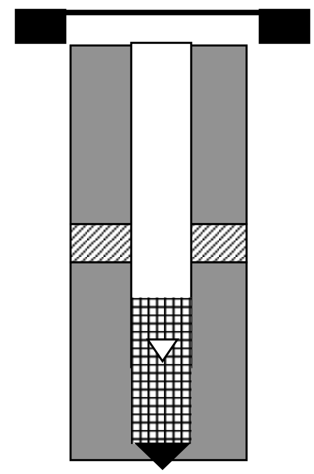
-52					
-54					
-56					
-58					
-60					
-62					
-64					
-66					

Well Installation



Well Depth: 26.90'
Static: 20.45'
Well screen: 16.9' to 26.9'
Native: 0' to 11'
Bentonite seal: 11' to 13'
Sand pack: 13' to 20.45'
End of boring: 28'
End of sample: 28'

Granular Soils BLOWS/FT	DENSITY	Cohesive Soils BLOWS/FT	DENSITY	Proportions Used
0 - 4	V. LOOSE	> 2	V. SOFT	Trace 0 - 10%
4 - 10	LOOSE	2 - 4	SOFT	Little 10 - 20%
10 - 30	M. DENSE	4 - 8	M. STIFF	Some 20 - 35%
30 - 50	DENSE	8 - 15	STIFF	And 35 - 50%
> 50	V. DENSE	15 - 30	V. STIFF	
		> 30	HARD	

Well Installation Key
- CONCRETE
- SAND PACK
Z - SOIL BACKFILL
- BENTONITE
- SCREEN
- APPROX. WATER LEVEL

Cape Cod Test Boring	Project	Boring No. HW-N
5 Rayber Road, Orleans, MA 02653	Horsley Witten Group	
(508) 240-1000	Barnstable, 480 Barnstable Road	Sheet 1 of 1
div. Desmond Well Drilling, Inc.	Hyannis, MA	

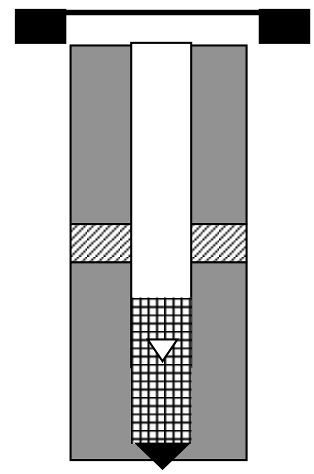
Driller:	Tommy Desmond	Boring location:	Attucks Lane (41.67372, -70.29490)
Helper:	Sean Morgan	Ground Surface Elevation:	
Inspector:	Josephine Ibanez	Date start: 5/31/2019	Date end: 5/31/2019

Direct push sampler consists of 4' x 2 3/8" G3 dual tube direct push steel tooling with 4' x 1 1/2" PVC liner with 201 ft lb hydraulic hammer (percussion rate 2200 bpm)

Auger Size: 6 1/4" x 4" H.S.A
Casing Size: 2"x16.9' SCH40 PVC FJT
Screen Size: 2"x10'X.010 SCH40 PVC FJT

Depth (FT)	Sample NO	PEN/REC	DEPTH/FT	BLOWS 6"	Sample Description
2					
0			0 - 5		Vacuum truck.
-2					
-4	1		5 - 8		F-M-C brown sand and gravel.
-6					Dry.
-8	2		8 - 12		F-M-C brown sand and gravel.
-10					Dry.
-12	3		12 - 16		F-M-C brown sand and gravel.
-14					Wet.
-16	4		16 - 20		F-M-C brown sand and gravel.
-18					Wet.
-20	5		20 - 24		F-M-C brown sand and gravel.
-22					Wet.
-24					
-26					
-28					
-30					
-32					
-34					
-36					
-38					
-40					
-42					
-44					
-46					
-48					
-50					
-52					
-54					
-56					
-58					
-60					
-62					
-64					
-66					

Well Installation



Well Depth: 22.3'
Static: 15.48'
Well screen: 12.3' to 22.3'
Native: 0' to 7'
Bentonite seal: 7' to 9'
Sand pack: 9' to 22.3'
End of boring: 24'
End of sample: 24'

Granular Soils BLOWS/FT	DENSITY	Cohesive Soils BLOWS/FT	DENSITY	Proportions Used
0 - 4	V. LOOSE	> 2	V. SOFT	Trace 0 - 10%
4 - 10	LOOSE	2 - 4	SOFT	Little 10 - 20%
10 - 30	M. DENSE	4 - 8	M. STIFF	Some 20 - 35%
30 - 50	DENSE	8 - 15	STIFF	And 35 - 50%
> 50	V. DENSE	15 - 30	V. STIFF	
		> 30	HARD	

Well Installation Key
- CONCRETE
- SAND PACK
Z - SOIL BACKFILL
- BENTONITE
- SCREEN
- APPROX. WATER LEVEL

CAPE COD TEST BORING **BORING NO. HW-N**

Cape Cod Test Boring 5 Rayber Road, Orleans, MA 02653 (508) 240-1000 div. Desmond Well Drilling, Inc.	Project Horsley Witten Group Barnstable, 480 Barnstable Road Hyannis, MA	Boring No. HW-O Sheet 1 of 1

Driller: Tommy Desmond Helper: Sean Morgan Inspector: Josephine Ibanez	Boring location: Airport Road (41.67054, -70.29819) Ground Surface Elevation: Date start: 5/31/2019 Date end: 5/31/2019
Direct push sampler consists of 4' x 2 3/8" G3 dual tube direct push steel tooling with 4' x 1 1/2" PVC liner with 201 ft lb hydraulic hammer (percussion rate 2200 bpm)	Auger Size: 6 1/4" x 4" H.S.A Casing Size: 2"x16.9' SCH40 PVC FJT Screen Size: 2"x10'X.010 SCH40 PVC FJT

Depth (FT)	Sample NO	PEN/REC	DEPTH/FT	BLOWS 6"	Sample Description
2					
0			0 - 5		Vacuum truck.
-2					
-4	1		5 - 8		F-M-C brown sand and gravel.
-6					Wet.
-8	2		8 - 12		F-M-C brown sand and gravel.
-10					Wet.
-12	3		12 - 16		F-M-C brown sand and gravel.
-14					Wet.
-16	4		16 - 20		F-M-C brown sand and gravel.
-18					Wet.
-20					
-22					
-24					
-26					
-28					
-30					
-32					
-34					
-36					
-38					
-40					
-42					
-44					
-46					
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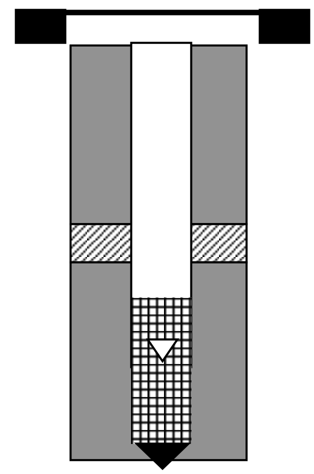
-64					
-66					

Well Installation



Well Depth: 14'
Static: 1.8'
Well screen: 4' to 14'
Native: 0' to 1'
Bentonite seal: 1' to 3'
Sand pack: 3' to 14'
End of boring: 20'
End of sample: 20'

Granular Soils BLOWS/FT	DENSITY	Cohesive Soils BLOWS/FT	DENSITY	Proportions Used
0 - 4	V. LOOSE	> 2	V. SOFT	Trace 0 - 10%
4 - 10	LOOSE	2 - 4	SOFT	Little 10 - 20%
10 - 30	M. DENSE	4 - 8	M. STIFF	Some 20 - 35%
30 - 50	DENSE	8 - 15	STIFF	And 35 - 50%
> 50	V. DENSE	15 - 30	V. STIFF	
		> 30	HARD	

Well Installation Key
- CONCRETE
- SAND PACK
Z - SOIL BACKFILL
- BENTONITE
- SCREEN
- APPROX. WATER LEVEL

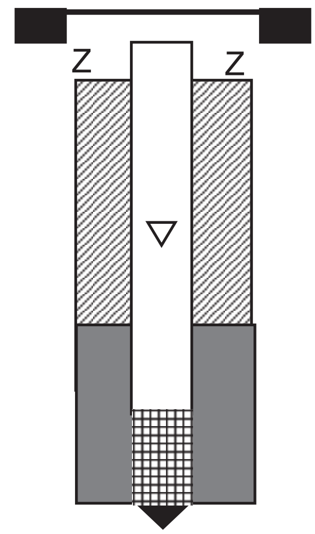
CAPE COD TEST BORING **BORING NO. HW-O**

Cape Cod Test Boring 5 Rayber Road, Orleans, MA 02653 (508) 240-1000 div. Desmond Well Drilling, Inc.	Project Horsley Witten Group Barnstable, 480 Barnstable Road Hyannis, MA	Boring No. HW-P(M) Sheet 1 of 1

Driller: Tommy Desmond Helper: Sean Morgan Inspector: Sarah Bartlett	Boring location: Deployment area (41.66458, -70.27720) Ground Surface Elevation: Date start: 9/18/2020	Date end: 9/18/2020
Sampler consists of a two inch split spoon driven using a 140 lb. hammer falling thirty inches	Notes:	Auger Size: 6 1/4" x 4" H.S.A Casing Size: 2"x33.3' SCH40 PVC FJT Screen Size: 2"x5'X.010 SCH40 PVC FJT

Depth (FT)	Sample NO	PEN/REC	DEPTH/FT	BLOWS 6"	Sample Description
2					
0					
-2					
-4	1	24/8	3 - 5	3-1-4-8	Fill; F-M-C brown sand and gravel.
-6					Dry.
-8	2	24/11	8 - 10	6-10-12-12	F-M-C brown sand. Dry.
-10					
-12					
-14	3	24/16	13 - 15	10-13-14-12	F-M-C brown sand and gravel. Dry.
-16					
-18	4	24/18	18 - 20	5-6-10-10	F-M-C brown sand; trace gravel. Dry.
-20					
-22					
-24	5	24/8	23 - 25	4-4-5-5	F-M-C brown sand. Wet.
-26					
-28	6	24/8	28 - 30	12-4-4-4	F-M-C brown sand; silty clay layer. Wet.
-30					
-32					
-34	7	24/15	33 - 35	1-3-4-5	F-M-C brown sand. Wet.
-36					
-38	8	24/22	38 - 40	6-9-11-15	F-M-C brown sand. Wet.
-40					
-42					
-44					
-46					
-48					
-50					
-52					
-54					
-56					
-58					
-60					
-62					
-64					
-66					

Well Installation



Not to scale

Well Depth: 38.3'
Static: 22.8'
Well screen: 33.3' to 38.3'
Native: 0' to 5'
Bentonite grout: 5' to 28'
Bentonite grout slow: 28' to 32'
Sand pack: 32' to 38'
End of boring: 38'
End of sample: 40'

Granular Soils BLOWS/FT	DENSITY	Cohesive Soils BLOWS/FT	DENSITY	Proportions Used
0 - 4	V. LOOSE	> 2	V. SOFT	Trace 0 - 10%
4 - 10	LOOSE	2 - 4	SOFT	Little 10 - 20%
10 - 30	M. DENSE	4 - 8	M. STIFF	Some 20 - 35%
30 - 50	DENSE	8 - 15	STIFF	And 35 - 50%
> 50	V. DENSE	15 - 30	V. STIFF	
		> 30	HARD	

Well Installation Key
- CONCRETE
- SAND PACK
Z - SOIL BACKFILL
- BENTONITE
- SCREEN
- APPROX. WATER LEVEL

CAPE COD TEST BORING | **BORING NO. HW-P(M)**

Cape Cod Test Boring 5 Rayber Road, Orleans, MA 02653 (508) 240-1000 div. Desmond Well Drilling, Inc.	Project Horsley Witten Group Barnstable, 480 Barnstable Road Hyannis, MA	Boring No. HW-P(S) Sheet 1 of 1

Driller: Tommy Desmond	Boring location: Deployment area (41.66458, -70.27720)
Helper: Sean Morgan	Ground Surface Elevation:
Inspector: Sarah Bartlett	Date start: 9/18/2020 Date end: 9/18/2020

Sampler consists of a two inch split spoon driven using a 140 lb. hammer falling thirty inches	Notes:	Auger Size: 6 1/4" x 4" H.S.A Casing Size: 2"x17.6' SCH40 PVC FJT Screen Size: 2"x10'X.010 SCH40 PVC FJT

Depth (FT)	Sample NO	PEN/REC	DEPTH/FT	BLOWS 6"	Sample Description
2			0 - 5		Cleared with vacuum truck.
0					F-M-C brown sand; some gravel. Dry.
-2					
-4					Drilled to 29 ft with hollow stem augers
-6					and set well as directed.
-8					
-10					
-12					
-14					
-16					
-18					
-20					
-22					
-24					
-26					
-28					
-30					
-32					
-34					
-36					
-38					
-40					
-42					
-44					
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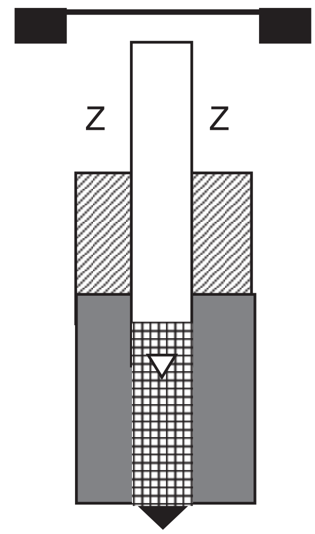
-60					
-62					
-64					
-66					

Well Installation



Not to scale
Well Depth: 27.6
Static: 22.69
Well screen: 17.6' to 27.6'
Native: 0' to 10'
Bentonite grout: 10' to 14'
Bentonite grout slow: n/a
Sand pack: 14' to 27'
End of boring: 29'
End of sample: n/a

Granular Soils BLOWS/FT	DENSITY	Cohesive Soils BLOWS/FT	DENSITY	Proportions Used
0 - 4	V. LOOSE	> 2	V. SOFT	Trace 0 - 10%
4 - 10	LOOSE	2 - 4	SOFT	Little 10 - 20%
10 - 30	M. DENSE	4 - 8	M. STIFF	Some 20 - 35%
30 - 50	DENSE	8 - 15	STIFF	And 35 - 50%
> 50	V. DENSE	15 - 30	V. STIFF	
		> 30	HARD	

Well Installation Key
- CONCRETE
- SAND PACK
Z - SOIL BACKFILL
- BENTONITE
- SCREEN
- APPROX. WATER LEVEL

CAPE COD TEST BORING **BORING NO. HW-P(S)**

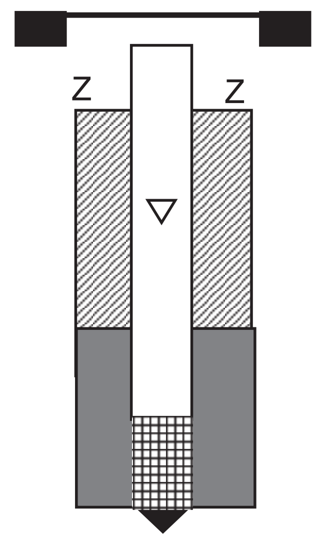
Cape Cod Test Boring 5 Rayber Road, Orleans, MA 02653 (508) 240-1000 div. Desmond Well Drilling, Inc.	Project Horsley Witten Group Barnstable, 480 Barnstable Road Hyannis, MA	Boring No. HW-Q(M) Sheet 1 of 1

Driller:	Tommy Desmond	Boring location:	Parking area - Gate M (41.66508, -70.27440)
Helper:	Sean Morgan	Ground Surface Elevation:	
Inspector:	Sarah Bartlett	Date start: 9/14/2020	Date end: 9/14/2020

Sampler consists of a two inch split spoon driven using a 140 lb. hammer falling thirty inches	Notes:	Auger Size: 6 1/4" x 4" H.S.A Casing Size: 2"x31.79' SCH40 PVC FJT Screen Size: 2"x5'X.010 SCH40 PVC FJT

Depth (FT)	Sample NO	PEN/REC	DEPTH/FT	BLOWS 6"	Sample Description
2					
0			0 - 5		Cleared with vacuum truck.
-2					
-4					
-6	1	24/17	5 - 7	7-12-18-25	F-M-C brown sand and gravel. Dry.
-8	2	24/21	8 - 10	6-7-8-9	F-M-C brown sand; trace gravel. Dry.
-10					
-12					
-14	3	24/20	13 - 15	8-16-21-15	F-M brown sand; F-M-C brown sand;
-16					some gravel. Dry.
-18	4	24/17	18 - 20	5-11-13-12	F-M-C brown sand. Dry.
-20					
-22					
-24	5	24/12	23 - 25	3-4-4-4	F-M-C brown sand; some gravel. Wet.
-26					around 23 to 25 ft.
-28	6	24/13	28 - 30	2-4-6-6	F-M-C silty brown sand; little gravel. Wet.
-30					
-32					
-34	7	24/0	33 - 35	2-6-7-11	No recovery.
-36					
-38	8	24/21	38 - 40	7-13-16-21	F-M brown sand; F-M-C brown sand;
-40					trace gravel. Wet.
-42					
-44					
-46					
-48					
-50					
-52					
-54					
-56					
-58					
-60					
-62					
-64					
-66					

Well Installation



Not to scale

Well Depth: 36.79'
Static: 21.41'
Well screen: 31.79' to 36.79'
Native: 0' to 3'
Bentonite grout: 3' to 24'
Bentonite grout slow: 24' to 27'
Sand pack: 27' to 36'
End of boring: 38'
End of sample: 40'

Granular Soils BLOWS/FT	DENSITY	Cohesive Soils BLOWS/FT	DENSITY	Proportions Used
0 - 4	V. LOOSE	> 2	V. SOFT	Trace 0 - 10%
4 - 10	LOOSE	2 - 4	SOFT	Little 10 - 20%
10 - 30	M. DENSE	4 - 8	M. STIFF	Some 20 - 35%
30 - 50	DENSE	8 - 15	STIFF	And 35 - 50%
> 50	V. DENSE	15 - 30	V. STIFF	
		> 30	HARD	

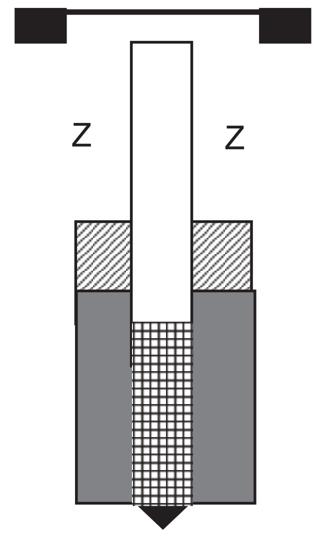
Well Installation Key
- CONCRETE
- SAND PACK
Z - SOIL BACKFILL
- BENTONITE
- SCREEN
- APPROX. WATER LEVEL

CAPE COD TEST BORING **BORING NO. HW-Q(M)**

Cape Cod Test Boring 5 Rayber Road, Orleans, MA 02653 (508) 240-1000 div. Desmond Well Drilling, Inc.	Project Horsley Witten Group Barnstable, 480 Barnstable Road Hyannis, MA	Boring No. HW-Q(S) Sheet 1 of 1

Driller:	Tommy Desmond	Boring location:	Parking area - Gate M (41.66508, -70.27440)
Helper:	Sean Morgan	Ground Surface Elevation:	
Inspector:	Sarah Bartlett	Date start: 9/15/2020	Date end: 9/15/2020

Sampler consists of a two inch split spoon driven using a 140 lb. hammer falling thirty inches	Notes:	Auger Size:	6 1/4" x 4" H.S.A
		Casing Size:	2"x16.6' SCH40 PVC FJT
		Screen Size:	2"x10'X.010 SCH40 PVC FJT

Depth	Sample				Sample Description	Well Installation
(FT)	NO	PEN/REC	DEPTH/FT	BLOWS 6"		
2					Drilled with hollow stem augers to 28'	
0					and set well as directed.	
-2						
-4						
-6						
-8						
-10						
-12						
-14						
-16						
-18						
-20						
-22						
-24						
-26						
-28						
-30						
-32						
-34						
-36						
-38						
-40						
-42						
-44						
-46						
-48						*Not to scale*
-50						Well Depth: 26.6'
-52						Static: 21.45'
-54						Well screen: 16.6' to 26.6'
-56						Native: 0' to 10'
-58						Bentonite grout: 10' to 13'
-60						Bentonite grout slow: n/a
-62						Sand pack: 13' to 26'
-64						End of boring: 28'
-66						End of sample: n/a

Granular Soils		Cohesive Soils		Proportions Used	Well Installation Key
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY		
0 - 4	V. LOOSE	> 2	V. SOFT	Trace 0 - 10%	- CONCRETE
4 - 10	LOOSE	2 - 4	SOFT	Little 10 - 20%	- SAND PACK
10 - 30	M. DENSE	4 - 8	M. STIFF	Some 20 - 35%	Z - SOIL BACKFILL
30 - 50	DENSE	8 - 15	STIFF	And 35 - 50%	- BENTONITE
> 50	V. DENSE	15 - 30	V. STIFF		- SCREEN
		> 30	HARD		- APPROX. WATER LEVEL

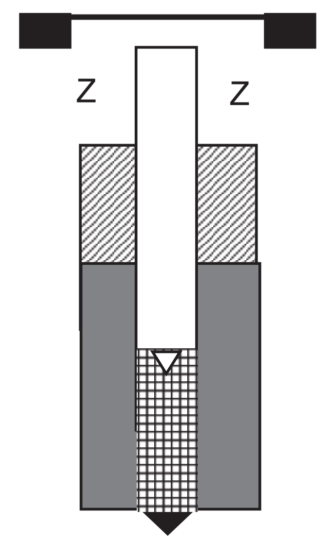
Cape Cod Test Boring 5 Rayber Road, Orleans, MA 02653 (508) 240-1000 div. Desmond Well Drilling, Inc.	Project Horsley Witten Group Barnstable, 480 Barnstable Road Hyannis, MA	Boring No. HW-R(S) Sheet 1 of 1

Driller: Tommy Desmond Helper: Sean Morgan Inspector: Sarah Bartlett/Bryan Massa	Boring location: Back road (41.66832, -70.27081) Ground Surface Elevation: Date start: 9/14/2020 Date end: 9/14/2020

Sampler consists of a two inch split spoon driven using a 140 lb. hammer falling thirty inches	Notes:	Auger Size: 6 1/4" x 4" H.S.A Casing Size: 2"x13.56' SCH40 PVC FJT Screen Size: 2"x10'X.010 SCH40 PVC FJT

Depth (FT)	Sample NO	PEN/REC	DEPTH/FT	BLOWS 6"	Sample Description
2			0 - 5		Cleared with vacuum truck.
0					
-2					
-4	1	24/13	5 - 7	5-6-6-6	F-M brown sand; trace gravel. Dry.
-6					
-8	2	24/17	8 - 10	8-3-4-5	F-M-C brown sand; some gravel. Dry.
-10					
-12					
-14	3	24/15	13 - 15	7-7-9-9	F-M-C brown sand; some gravel. Dry.
-16					
-18	4	24/18	18 - 20	5-10-10-8	F-M-C brown sand; some gravel. Wet.
-20					
-22					
-24					
-26					
-28					
-30					
-32					
-34					
-36					
-38					
-40					
-42					
-44					
-46					
-48					
-50					
-52					
-54					
-56					
-58					
-60					
-62					
-64					
-66					

Well Installation



Not to scale

Well Depth: 23.56'
Static: 18.33'
Well screen: 13.56' to 23.56'
Native: 0' to 5'
Bentonite grout: 5' to 9'
Bentonite grout slow: n/a
Sand pack: 9' to 23.56'
End of boring: 25'
End of sample: 20'

Granular Soils BLOWS/FT	DENSITY	Cohesive Soils BLOWS/FT	DENSITY	Proportions Used
0 - 4	V. LOOSE	> 2	V. SOFT	Trace 0 - 10%
4 - 10	LOOSE	2 - 4	SOFT	Little 10 - 20%
10 - 30	M. DENSE	4 - 8	M. STIFF	Some 20 - 35%
30 - 50	DENSE	8 - 15	STIFF	And 35 - 50%
> 50	V. DENSE	15 - 30	V. STIFF	
		> 30	HARD	

Well Installation Key
- CONCRETE
- SAND PACK
Z - SOIL BACKFILL
- BENTONITE
- SCREEN
- APPROX. WATER LEVEL

CAPE COD TEST BORING **BORING NO. HW-R(S)**

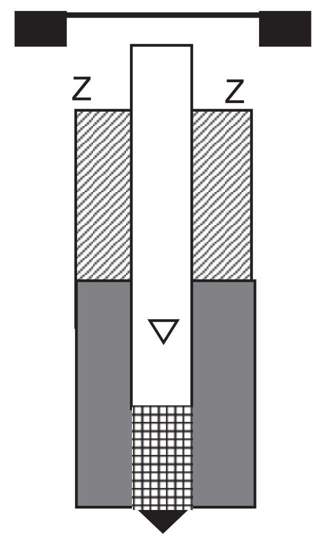
Cape Cod Test Boring 5 Rayber Road, Orleans, MA 02653 (508) 240-1000 div. Desmond Well Drilling, Inc.	Project Horsley Witten Group Barnstable, 480 Barnstable Road Hyannis, MA	Boring No. HW-S(M) Sheet 1 of 1

Driller:	Tommy Desmond	Boring location:	Ferndoc St. & Old Yarmouth Rd. (41.66511, -70.27112)
Helper:	Sean Morgan	Ground Surface Elevation:	
Inspector:	Sarah Bartlett	Date start: 9/16/2020	Date end: 9/16/2020

Sampler consists of a two inch split spoon driven using a 140 lb. hammer falling thirty inches	Notes:	Auger Size: 6 1/4" x 4" H.S.A Casing Size: 2"x27.04' SCH40 PVC FJT Screen Size: 2"x5'X.010 SCH40 PVC FJT

Depth (FT)	Sample NO	PEN/REC	DEPTH/FT	BLOWS 6"	Sample Description
2					
0					
-2					
-4					
-6	1	24/18	5 - 7	7-11-11-11	F-M-C brown sand; little gravel. Dry.
-8	2	24/21	8 - 10	3-5-4-5	F-M-C brown sand. Dry.
-10					
-12					
-14	3	24/16	13 - 15	2-9-6-8	F-M-C brown sand; some gravel. Dry.
-16					
-18	4	24/15	18 - 20	2-4-7-4	F-M-C brown sand; some gravel. Wet.
-20					
-22					
-24	5	24/16	23 - 25	2-3-3-4	F-M-C brown sand; trace gravel. Wet.
-26					
-28	6	24/14	28 - 30	1-3-3-4	F-M-C brown sand. Wet.
-30					
-32					
-34	7	24/18	33 - 35	2-5-4-7	F-M-C brown sand. Wet.
-36					
-38					
-40					
-42					
-44					
-46					
-48					
-50					
-52					
-54					
-56					
-58					
-60					
-62					
-64					
-66					

Well Installation



Not to scale
Well Depth: 32.04'
Static: 17.01'
Well screen: 27.04' to 32.04'
Native: 0' to 3'
Bentonite grout: 3' to 21'
Bentonite grout slow: 21' to 24'
Sand pack: 24' to 32.04'
End of boring: 35'
End of sample: 33'

Granular Soils BLOWS/FT	DENSITY	Cohesive Soils BLOWS/FT	DENSITY	Proportions Used
0 - 4	V. LOOSE	> 2	V. SOFT	Trace 0 - 10%
4 - 10	LOOSE	2 - 4	SOFT	Little 10 - 20%
10 - 30	M. DENSE	4 - 8	M. STIFF	Some 20 - 35%
30 - 50	DENSE	8 - 15	STIFF	And 35 - 50%
> 50	V. DENSE	15 - 30	V. STIFF	
		> 30	HARD	

Well Installation Key
- CONCRETE
- SAND PACK
Z - SOIL BACKFILL
- BENTONITE
- SCREEN
- APPROX. WATER LEVEL

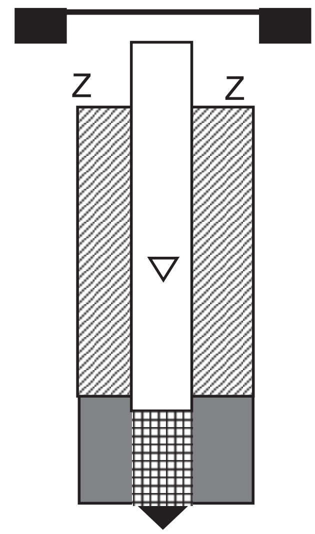
Cape Cod Test Boring	Project	Boring No. HW-B(M)
5 Rayber Road, Orleans, MA 02653	Horsley Witten Group	
(508) 240-1000	Barnstable, 480 Barnstable Road	Sheet 1 of 1
div. Desmond Well Drilling, Inc.	Hyannis, MA	

Driller:	Tommy Desmond	Boring location:	Cape Cod Gun Works (41.672148, -70.296514)
Helper:	Sean Morgan	Ground Surface Elevation:	
Inspector:	Sarah Bartlett	Date start: 9/24/2020	Date end: 9/24/2020

Sampler consists of a two inch split spoon driven using a 140 lb. hammer falling thirty inches	Notes:	Auger Size: 6 1/4" x 4" H.S.A Casing Size: 2"x31.15' SCH40 PVC FJT Screen Size: 2"x5'X.010 SCH40 PVC FJT

Depth (FT)	Sample NO	PEN/REC	DEPTH/FT	BLOWS 6"	Sample Description
2					
0					
-2					
-4	1	24/5	4 - 6	8-18-16-14	F-M-C brown; some gravel. Dry.
-6					
-8	2	24/12	8 - 10	3-9-6-7	F-M-C brown sand; some gravel. Dry.
-10					
-12					
-14	3	24/15	13 - 15	3-6-12-14	F-M-C brown sand and gravel. Dry.
-16					
-18	4	24/12	18 - 20	5-6-9-7	F-M brown sand. Dry.
-20					
-22					
-24	5	24/0	23 - 25	7-8-8-6	No recovery.
-26					
-28	6	24/6	28 - 30	4-8-12-10	F-M-C brown sand. Wet.
-30					
-32					
-34	7	24/12	33 - 35	2-4-5-5	F-M brown sand; F-M-C brown sand. Wet.
-36					
-38					
-40					
-42					
-44					
-46					
-48					
-50					
-52					
-54					
-56					
-58					
-60					
-62					
-64					
-66					

Well Installation



Not to scale
Well Depth: 36.15'
Static: 22.9'
Well screen: 31.15' to 36.15'
Native: 0' to 6'
Bentonite grout: 2' to 27'
Bentonite grout slow: 27' to 30'
Sand pack: 30' to 36'
End of boring: 36'
End of sample: 35'

Granular Soils BLOWS/FT	DENSITY	Cohesive Soils BLOWS/FT	DENSITY	Proportions Used
0 - 4	V. LOOSE	> 2	V. SOFT	Trace 0 - 10%
4 - 10	LOOSE	2 - 4	SOFT	Little 10 - 20%
10 - 30	M. DENSE	4 - 8	M. STIFF	Some 20 - 35%
30 - 50	DENSE	8 - 15	STIFF	And 35 - 50%
> 50	V. DENSE	15 - 30	V. STIFF	
		> 30	HARD	

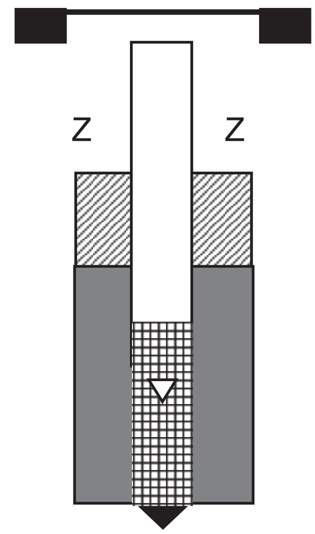
Well Installation Key
- CONCRETE
- SAND PACK
Z - SOIL BACKFILL
- BENTONITE
- SCREEN
- APPROX. WATER LEVEL

CAPE COD TEST BORING **BORING NO. HW-B(M)**

Cape Cod Test Boring 5 Rayber Road, Orleans, MA 02653 (508) 240-1000 div. Desmond Well Drilling, Inc.	Project Horsley Witten Group Barnstable, 480 Barnstable Road Hyannis, MA	Boring No. HW-L(S) Sheet 1 of 1

Driller:	Tommy Desmond	Boring location:	Runway (41.66277, -70.27842)
Helper:	Sean Morgan	Ground Surface Elevation:	
Inspector:	Sarah Bartlett	Date start: 9/17/2020	Date end: 9/17/2020

Sampler consists of a two inch split spoon driven using a 140 lb. hammer falling thirty inches	Notes:	Auger Size:	6 1/4" x 4" H.S.A
		Casing Size:	2"x17.33' SCH40 PVC FJT
		Screen Size:	2"x10'X.010 SCH40 PVC FJT

Depth (FT)	Sample NO	PEN/REC	DEPTH/FT	BLOWS 6"	Sample Description	Well Installation
2			0 - 5		Cleared with vacuum truck.	
0					F-M-C brown sand; some gravel. Dry.	
-2						
-4						
-6			5 - 28		F-M-C brown sand. Dry.	
-8						
-10					Drilled with hollow stem augers to 28'	
-12					and set well as directed.	
-14						
-16						
-18						
-20						
-22						
-24						
-26						
-28						
-30						
-32						
-34						
-36						
-38						
-40						
-42						
-44						
-46						
-48						
-50						*Not to scale*
-52						Well Depth: 27.33'
-54						Static: 21.96'
-56						Well screen: 17.33' to 27.33'
-58						Native backfill: 0' to 10'
-60						Bentonite seal: 10' to 14'
-62						Sand pack: 14' to 27'
-64						End of boring: 28'
-66						End of sample: n/a

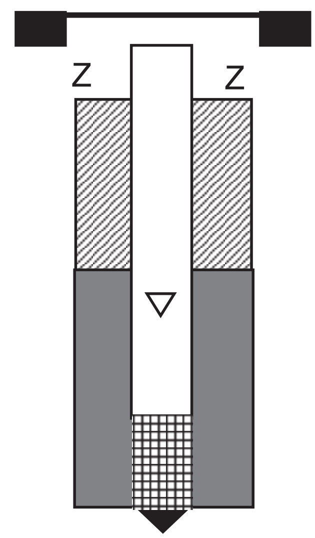
Granular Soils BLOWS/FT	DENSITY	Cohesive Soils BLOWS/FT	DENSITY	Proportions Used	Well Installation Key
0 - 4	V. LOOSE	> 2	V. SOFT	Trace 0 - 10%	- CONCRETE
4 - 10	LOOSE	2 - 4	SOFT	Little 10 - 20%	- SAND PACK
10 - 30	M. DENSE	4 - 8	M. STIFF	Some 20 - 35%	Z - SOIL BACKFILL
30 - 50	DENSE	8 - 15	STIFF	And 35 - 50%	- BENTONITE
> 50	V. DENSE	15 - 30	V. STIFF		- SCREEN
		> 30	HARD		- APPROX. WATER LEVEL

CAPE COD TEST BORING **BORING NO. HW-L(S)**

Cape Cod Test Boring 5 Rayber Road, Orleans, MA 02653 (508) 240-1000 div. Desmond Well Drilling, Inc.	Project Horsley Witten Group Barnstable, 480 Barnstable Road Hyannis, MA	Boring No. HW-L(M) Sheet 1 of 1

Driller:	Tommy Desmond	Boring location:	Runway (41.66277, -70.27842)
Helper:	Sean Morgan	Ground Surface Elevation:	
Inspector:	Sarah Bartlett	Date start: 9/17/2020	Date end: 9/17/2020

Sampler consists of a two inch split spoon driven using a 140 lb. hammer falling thirty inches	Notes:	Auger Size: 6 1/4" x 4" H.S.A Casing Size: 2"x32.33' SCH40 PVC FJT Screen Size: 2"x5'X.010 SCH40 PVC FJT



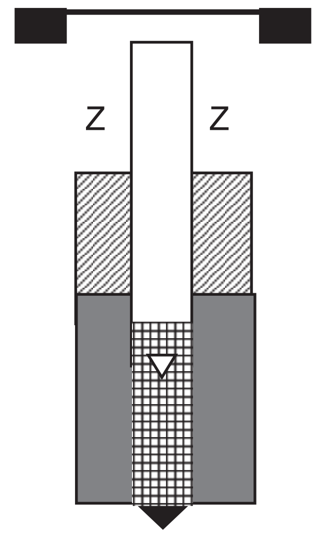
Depth (FT)	Sample NO	PEN/REC	DEPTH/FT	BLOWS 6"	Sample Description	Well Installation
2			0 - 5		Cleared with vacuum truck.	
0					F-M-C brown sand; some gravel. Dry.	
-2						
-4						
-6			5 - 38		F-M-C brown sand; some gravel. Dry.	
-8						
-10					Drilled with hollow stem augers to 38'	
-12					and set well as directed.	
-14						
-16						
-18						
-20						
-22						
-24						
-26						
-28						
-30						
-32						
-34						
-36						
-38						
-40						
-42						
-44						
-46						
-48						*Not to scale*
-50						Well Depth: 37.33'
-52						Static: 21.88'
-54						Well screen: 32.33' to 37.33'
-56						Native backfill: 0' to 5'
-58						Bentonite seal: 5' to 28'
-60						Bentonite grout slow: 28' to 32'
-62						Sand pack: 32' to 37'
-64						End of boring: 38'
-66						End of sample: n/a

Granular Soils BLOWS/FT	DENSITY	Cohesive Soils BLOWS/FT	DENSITY	Proportions Used	Well Installation Key
0 - 4	V. LOOSE	> 2	V. SOFT	Trace 0 - 10%	- CONCRETE
4 - 10	LOOSE	2 - 4	SOFT	Little 10 - 20%	- SAND PACK
10 - 30	M. DENSE	4 - 8	M. STIFF	Some 20 - 35%	Z - SOIL BACKFILL
30 - 50	DENSE	8 - 15	STIFF	And 35 - 50%	- BENTONITE
> 50	V. DENSE	15 - 30	V. STIFF		- SCREEN
		> 30	HARD		- APPROX. WATER LEVEL

Cape Cod Test Boring	Project	Boring No.	HW-P(S)
5 Rayber Road, Orleans, MA 02653	Horsley Witten Group		
(508) 240-1000	Barnstable, 480 Barnstable Road	Sheet 1 of	1
div. Desmond Well Drilling, Inc.	Hyannis, MA		

Driller:	Tommy Desmond	Boring location:	Deployment area (41.66458, -70.27720)
Helper:	Sean Morgan	Ground Surface Elevation:	
Inspector:	Sarah Bartlett	Date start: 9/18/2020	Date end: 9/18/2020

Sampler consists of a two inch split spoon driven using a 140 lb. hammer falling thirty inches	Notes:	Auger Size:	6 1/4" x 4" H.S.A
		Casing Size:	2"x17.6' SCH40 PVC FJT
		Screen Size:	2"x10'X.010 SCH40 PVC FJT

Depth (FT)	Sample NO	PEN/REC	DEPTH/FT	BLOWS 6"	Sample Description	Well Installation
2			0 - 5		Cleared with vacuum truck.	
0					F-M-C brown sand; some gravel. Dry.	
-2						
-4					Drilled to 29 ft with hollow stem augers	
-6					and set well as directed.	
-8						
-10						
-12						
-14						
-16						
-18						
-20						
-22						
-24						
-26						
-28						
-30						
-32						
-34						
-36						
-38						
-40						
-42						
-44						
-46						
-48						*Not to scale*
-50						Well Depth: 27.6
-52						Static: 22.69
-54						Well screen: 17.6' to 27.6'
-56						Native: 0' to 10'
-58						Bentonite grout: 10' to 14'
-60						Bentonite grout slow: n/a
-62						Sand pack: 14' to 27'
-64						End of boring: 29'
-66						End of sample: n/a

Granular Soils BLOWS/FT	DENSITY	Cohesive Soils BLOWS/FT	DENSITY	Proportions Used	Well Installation Key
0 - 4	V. LOOSE	> 2	V. SOFT	Trace 0 - 10%	- CONCRETE
4 - 10	LOOSE	2 - 4	SOFT	Little 10 - 20%	- SAND PACK
10 - 30	M. DENSE	4 - 8	M. STIFF	Some 20 - 35%	Z - SOIL BACKFILL
30 - 50	DENSE	8 - 15	STIFF	And 35 - 50%	- BENTONITE
> 50	V. DENSE	15 - 30	V. STIFF		- SCREEN
		> 30	HARD		- APPROX. WATER LEVEL

CAPE COD TEST BORING | **BORING NO. HW-P(S)**

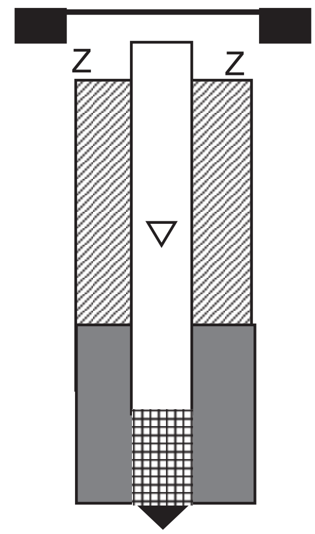
Cape Cod Test Boring 5 Rayber Road, Orleans, MA 02653 (508) 240-1000 div. Desmond Well Drilling, Inc.	Project Horsley Witten Group Barnstable, 480 Barnstable Road Hyannis, MA	Boring No.	HW-P(M)
		Sheet 1 of	1

Driller:	Tommy Desmond	Boring location:	Deployment area (41.66458, -70.27720)	
Helper:	Sean Morgan	Ground Surface Elevation:		
Inspector:	Sarah Bartlett	Date start: 9/18/2020		Date end: 9/18/2020

Sampler consists of a two inch split spoon driven using a 140 lb. hammer falling thirty inches	Notes:	Auger Size: 6 1/4" x 4" H.S.A	
		Casing Size:	2"x33.3' SCH40 PVC FJT
		Screen Size:	2"x5'X.010 SCH40 PVC FJT

Depth (FT)	Sample NO	PEN/REC	DEPTH/FT	BLOWS 6"	Sample Description
2					
0					
-2					
-4	1	24/8	3 - 5	3-1-4-8	Fill; F-M-C brown sand and gravel.
-6					Dry.
-8	2	24/11	8 - 10	6-10-12-12	F-M-C brown sand. Dry.
-10					
-12					
-14	3	24/16	13 - 15	10-13-14-12	F-M-C brown sand and gravel. Dry.
-16					
-18	4	24/18	18 - 20	5-6-10-10	F-M-C brown sand; trace gravel. Dry.
-20					
-22					
-24	5	24/8	23 - 25	4-4-5-5	F-M-C brown sand. Wet.
-26					
-28	6	24/8	28 - 30	12-4-4-4	F-M-C brown sand; silty clay layer. Wet.
-30					
-32					
-34	7	24/15	33 - 35	1-3-4-5	F-M-C brown sand. Wet.
-36					
-38	8	24/22	38 - 40	6-9-11-15	F-M-C brown sand. Wet.
-40					
-42					
-44					
-46					
-48					
-50					
-52					
-54					
-56					
-58					
-60					
-62					
-64					
-66					

Well Installation



Not to scale
Well Depth: 38.3'
Static: 22.8'
Well screen: 33.3' to 38.3'
Native: 0' to 5'
Bentonite grout: 5' to 28'
Bentonite grout slow: 28' to 32'
Sand pack: 32' to 38'
End of boring: 38'
End of sample: 40'

Granular Soils BLOWS/FT	DENSITY	Cohesive Soils BLOWS/FT	DENSITY	Proportions Used
0 - 4	V. LOOSE	> 2	V. SOFT	Trace 0 - 10%
4 - 10	LOOSE	2 - 4	SOFT	Little 10 - 20%
10 - 30	M. DENSE	4 - 8	M. STIFF	Some 20 - 35%
30 - 50	DENSE	8 - 15	STIFF	And 35 - 50%
> 50	V. DENSE	15 - 30	V. STIFF	
		> 30	HARD	

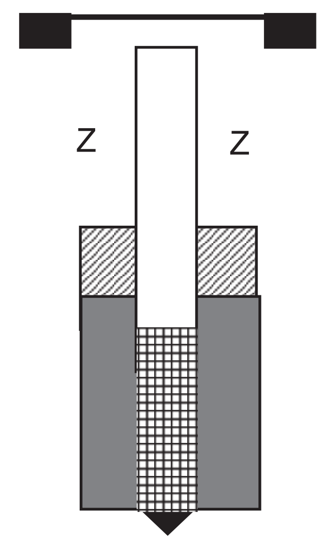
Well Installation Key
- CONCRETE
- SAND PACK
Z - SOIL BACKFILL
- BENTONITE
- SCREEN
- APPROX. WATER LEVEL

CAPE COD TEST BORING **BORING NO. HW-P(M)**

Cape Cod Test Boring 5 Rayber Road, Orleans, MA 02653 (508) 240-1000 div. Desmond Well Drilling, Inc.	Project Horsley Witten Group Barnstable, 480 Barnstable Road Hyannis, MA	Boring No. HW-Q(S) Sheet 1 of 1

Driller:	Tommy Desmond	Boring location:	Parking area - Gate M (41.66508, -70.27440)
Helper:	Sean Morgan	Ground Surface Elevation:	
Inspector:	Sarah Bartlett	Date start: 9/15/2020	Date end: 9/15/2020

Sampler consists of a two inch split spoon driven using a 140 lb. hammer falling thirty inches	Notes:	Auger Size:	6 1/4" x 4" H.S.A
		Casing Size:	2"x16.6' SCH40 PVC FJT
		Screen Size:	2"x10'X.010 SCH40 PVC FJT

Depth	Sample				Sample Description	Well Installation
(FT)	NO	PEN/REC	DEPTH/FT	BLOWS 6"		
2					Drilled with hollow stem augers to 28'	
0					and set well as directed.	
-2						
-4						
-6						
-8						
-10						
-12						
-14						
-16						
-18						
-20						
-22						
-24						
-26						
-28						
-30						
-32						
-34						
-36						
-38						
-40						
-42						
-44						
-46						
-48						*Not to scale*
-50						Well Depth: 26.6'
-52						Static: 21.45'
-54						Well screen: 16.6' to 26.6'
-56						Native: 0' to 10'
-58						Bentonite grout: 10' to 13'
-60						Bentonite grout slow: n/a
-62						Sand pack: 13' to 26'
-64						End of boring: 28'
-66						End of sample: n/a

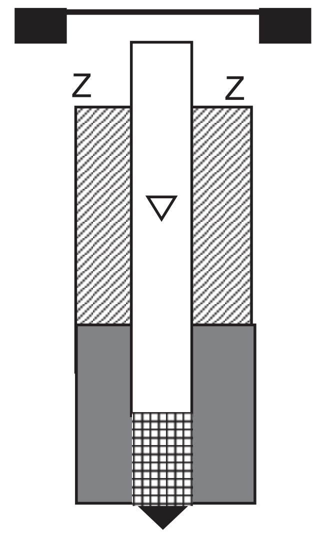
Granular Soils		Cohesive Soils		Proportions Used	Well Installation Key
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY		
0 - 4	V. LOOSE	> 2	V. SOFT	Trace 0 - 10%	- CONCRETE
4 - 10	LOOSE	2 - 4	SOFT	Little 10 - 20%	- SAND PACK
10 - 30	M. DENSE	4 - 8	M. STIFF	Some 20 - 35%	Z - SOIL BACKFILL
30 - 50	DENSE	8 - 15	STIFF	And 35 - 50%	- BENTONITE
> 50	V. DENSE	15 - 30	V. STIFF		- SCREEN
		> 30	HARD		- APPROX. WATER LEVEL

CAPE COD TEST BORING **BORING NO. HW-Q(S)**

Cape Cod Test Boring 5 Rayber Road, Orleans, MA 02653 (508) 240-1000 div. Desmond Well Drilling, Inc.	Project Horsley Witten Group Barnstable, 480 Barnstable Road Hyannis, MA	Boring No. HW-Q(M) Sheet 1 of 1
Driller: Tommy Desmond Helper: Sean Morgan Inspector: Sarah Bartlett		Boring location: Parking area - Gate M (41.66508, -70.27440) Ground Surface Elevation: Date start: 9/14/2020 Date end: 9/14/2020
Sampler consists of a two inch split spoon driven using a 140 lb. hammer falling thirty inches	Notes:	Auger Size: 6 1/4" x 4" H.S.A Casing Size: 2"x31.79' SCH40 PVC FJT Screen Size: 2"x5'X.010 SCH40 PVC FJT

Depth (FT)	Sample NO	PEN/REC	DEPTH/FT	BLOWS 6"	Sample Description
2					
0			0 - 5		Cleared with vacuum truck.
-2					
-4					
-6	1	24/17	5 - 7	7-12-18-25	F-M-C brown sand and gravel. Dry.
-8	2	24/21	8 - 10	6-7-8-9	F-M-C brown sand; trace gravel. Dry.
-10					
-12					
-14	3	24/20	13 - 15	8-16-21-15	F-M brown sand; F-M-C brown sand;
-16					some gravel. Dry.
-18	4	24/17	18 - 20	5-11-13-12	F-M-C brown sand. Dry.
-20					
-22					
-24	5	24/12	23 - 25	3-4-4-4	F-M-C brown sand; some gravel. Wet.
-26					around 23 to 25 ft.
-28	6	24/13	28 - 30	2-4-6-6	F-M-C silty brown sand; little gravel. Wet.
-30					
-32					
-34	7	24/0	33 - 35	2-6-7-11	No recovery.
-36					
-38	8	24/21	38 - 40	7-13-16-21	F-M brown sand; F-M-C brown sand;
-40					trace gravel. Wet.
-42					
-44					
-46					
-48					
-50					
-52					
-54					
-56					
-58					
-60					
-62					
-64					
-66					

Well Installation



Not to scale
Well Depth: 36.79'
Static: 21.41'
Well screen: 31.79' to 36.79'
Native: 0' to 3'
Bentonite grout: 3' to 24'
Bentonite grout slow: 24' to 27'
Sand pack: 27' to 36'
End of boring: 38'
End of sample: 40'

Granular Soils BLOWS/FT	DENSITY	Cohesive Soils BLOWS/FT	DENSITY	Proportions Used
0 - 4	V. LOOSE	> 2	V. SOFT	Trace 0 - 10%
4 - 10	LOOSE	2 - 4	SOFT	Little 10 - 20%
10 - 30	M. DENSE	4 - 8	M. STIFF	Some 20 - 35%
30 - 50	DENSE	8 - 15	STIFF	And 35 - 50%
> 50	V. DENSE	15 - 30	V. STIFF	
		> 30	HARD	

Well Installation Key
- CONCRETE
- SAND PACK
Z - SOIL BACKFILL
- BENTONITE
- SCREEN
- APPROX. WATER LEVEL

CAPE COD TEST BORING **BORING NO. HW-Q(M)**

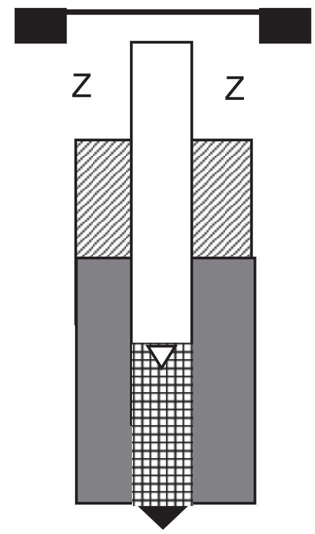
Cape Cod Test Boring	Project	Boring No.	HW-R(S)
5 Rayber Road, Orleans, MA 02653	Horsley Witten Group		
(508) 240-1000	Barnstable, 480 Barnstable Road	Sheet 1 of	1
div. Desmond Well Drilling, Inc.	Hyannis, MA		

Driller:	Tommy Desmond	Boring location:	Back road (41.66832, -70.27081)
Helper:	Sean Morgan	Ground Surface Elevation:	
Inspector:	Sarah Bartlett/Bryan Massa	Date start: 9/14/2020	Date end: 9/14/2020

Sampler consists of a two inch split spoon driven using a 140 lb. hammer falling thirty inches	Notes:	Auger Size:	6 1/4" x 4" H.S.A
		Casing Size:	2"x13.56' SCH40 PVC FJT
		Screen Size:	2"x10'X.010 SCH40 PVC FJT

Depth	Sample				Sample Description
(FT)	NO	PEN/REC	DEPTH/FT	BLOWS 6"	
2			0 - 5		Cleared with vacuum truck.
0					
-2					
-4	1	24/13	5 - 7	5-6-6-6	F-M brown sand; trace gravel. Dry.
-6					
-8	2	24/17	8 - 10	8-3-4-5	F-M-C brown sand; some gravel. Dry.
-10					
-12					
-14	3	24/15	13 - 15	7-7-9-9	F-M-C brown sand; some gravel. Dry.
-16					
-18	4	24/18	18 - 20	5-10-10-8	F-M-C brown sand; some gravel. Wet.
-20					
-22					
-24					
-26					
-28					
-30					
-32					
-34					
-36					
-38					
-40					
-42					
-44					
-46					
-48					
-50					
-52					
-54					
-56					
-58					
-60					
-62					
-64					
-66					

Well Installation



Not to scale
Well Depth: 23.56'
Static: 18.33'
Well screen: 13.56' to 23.56'
Native: 0' to 5'
Bentonite grout: 5' to 9'
Bentonite grout slow: n/a
Sand pack: 9' to 23.56'
End of boring: 25'
End of sample: 20'

Granular Soils		Cohesive Soils		Proportions Used
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY	
0 - 4	V. LOOSE	> 2	V. SOFT	Trace 0 - 10%
4 - 10	LOOSE	2 - 4	SOFT	Little 10 - 20%
10 - 30	M. DENSE	4 - 8	M. STIFF	Some 20 - 35%
30 - 50	DENSE	8 - 15	STIFF	And 35 - 50%
> 50	V. DENSE	15 - 30	V. STIFF	
		> 30	HARD	

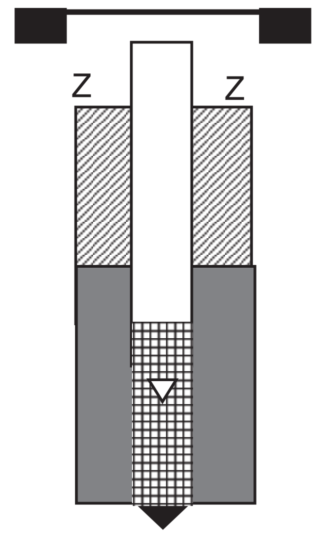
Well Installation Key
- CONCRETE
- SAND PACK
Z - SOIL BACKFILL
- BENTONITE
- SCREEN
- APPROX. WATER LEVEL

CAPE COD TEST BORING | **BORING NO. HW-R(S)**

Cape Cod Test Boring 5 Rayber Road, Orleans, MA 02653 (508) 240-1000 div. Desmond Well Drilling, Inc.	Project Horsley Witten Group Barnstable, 480 Barnstable Road Hyannis, MA	Boring No. HW-S(S) Sheet 1 of 1
Driller: Tommy Desmond Helper: Sean Morgan Inspector: Sarah Bartlett		Boring location: Ferndoc St. & Old Yarmouth Rd. (41.66511, -70.27112) Ground Surface Elevation: Date start: 9/16/2020 Date end: 9/16/2020
Sampler consists of a two inch split spoon driven using a 140 lb. hammer falling thirty inches	Notes:	Auger Size: 6 1/4" x 4" H.S.A Casing Size: 2"x12.1' SCH40 PVC FJT Screen Size: 2"x10'X.010 SCH40 PVC FJT

Depth (FT)	Sample NO	PEN/REC	DEPTH/FT	BLOWS 6"	Sample Description
2					Drilled with hollow stem augers to 23'
0					and set well as directed.
-2					
-4					
-6					
-8					
-10					
-12					
-14					
-16					
-18					
-20					
-22					
-24					
-26					
-28					
-30					
-32					
-34					
-36					
-38					
-40					
-42					
-44					
-46					
-48					
-50					
-52					
-54					
-56					
-58					
-60					
-62					
-64					
-66					

Well Installation



Not to scale
Well Depth: 22.1'
Static: 16.88
Well screen: 12.1' to 22.1'
Native: 0' to 6'
Bentonite grout: 6' to 9'
Bentonite grout slow: n/a
Sand pack: 9' to 22'
End of boring: 23'
End of sample: n/a

Granular Soils BLOWS/FT	DENSITY	Cohesive Soils BLOWS/FT	DENSITY	Proportions Used
0 - 4	V. LOOSE	> 2	V. SOFT	Trace 0 - 10%
4 - 10	LOOSE	2 - 4	SOFT	Little 10 - 20%
10 - 30	M. DENSE	4 - 8	M. STIFF	Some 20 - 35%
30 - 50	DENSE	8 - 15	STIFF	And 35 - 50%
> 50	V. DENSE	15 - 30	V. STIFF	
		> 30	HARD	

Well Installation Key
- CONCRETE
- SAND PACK
Z - SOIL BACKFILL
- BENTONITE
- SCREEN
- APPROX. WATER LEVEL

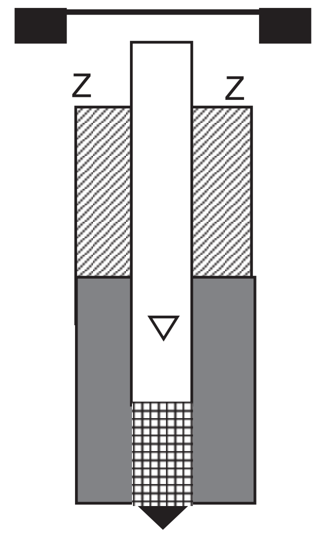
Cape Cod Test Boring 5 Rayber Road, Orleans, MA 02653 (508) 240-1000 div. Desmond Well Drilling, Inc.	Project Horsley Witten Group Barnstable, 480 Barnstable Road Hyannis, MA	Boring No. HW-S(M) Sheet 1 of 1

Driller:	Tommy Desmond	Boring location:	Ferndoc St. & Old Yarmouth Rd. (41.66511, -70.27112)
Helper:	Sean Morgan	Ground Surface Elevation:	
Inspector:	Sarah Bartlett	Date start: 9/16/2020	Date end: 9/16/2020

Sampler consists of a two inch split spoon driven using a 140 lb. hammer falling thirty inches	Notes:	Auger Size: 6 1/4" x 4" H.S.A Casing Size: 2"x27.04' SCH40 PVC FJT Screen Size: 2"x5'X.010 SCH40 PVC FJT

Depth (FT)	Sample NO	PEN/REC	DEPTH/FT	BLOWS 6"	Sample Description
2					
0					
-2					
-4					
-6	1	24/18	5 - 7	7-11-11-11	F-M-C brown sand; little gravel. Dry.
-8	2	24/21	8 - 10	3-5-4-5	F-M-C brown sand. Dry.
-10					
-12					
-14	3	24/16	13 - 15	2-9-6-8	F-M-C brown sand; some gravel. Dry.
-16					
-18	4	24/15	18 - 20	2-4-7-4	F-M-C brown sand; some gravel. Wet.
-20					
-22					
-24	5	24/16	23 - 25	2-3-3-4	F-M-C brown sand; trace gravel. Wet.
-26					
-28	6	24/14	28 - 30	1-3-3-4	F-M-C brown sand. Wet.
-30					
-32					
-34	7	24/18	33 - 35	2-5-4-7	F-M-C brown sand. Wet.
-36					
-38					
-40					
-42					
-44					
-46					
-48					
-50					
-52					
-54					
-56					
-58					
-60					
-62					
-64					
-66					

Well Installation



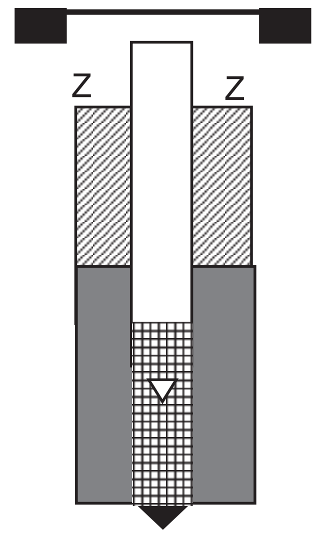
Not to scale
Well Depth: 32.04'
Static: 17.01'
Well screen: 27.04' to 32.04'
Native: 0' to 3'
Bentonite grout: 3' to 21'
Bentonite grout slow: 21' to 24'
Sand pack: 24' to 32.04'
End of boring: 35'
End of sample: 33'

Granular Soils BLOWS/FT	DENSITY	Cohesive Soils BLOWS/FT	DENSITY	Proportions Used
0 - 4	V. LOOSE	> 2	V. SOFT	Trace 0 - 10%
4 - 10	LOOSE	2 - 4	SOFT	Little 10 - 20%
10 - 30	M. DENSE	4 - 8	M. STIFF	Some 20 - 35%
30 - 50	DENSE	8 - 15	STIFF	And 35 - 50%
> 50	V. DENSE	15 - 30	V. STIFF	
		> 30	HARD	

Well Installation Key
- CONCRETE
- SAND PACK
Z - SOIL BACKFILL
- BENTONITE
- SCREEN
- APPROX. WATER LEVEL

CAPE COD TEST BORING **BORING NO. HW-S(M)**

Cape Cod Test Boring 5 Rayber Road, Orleans, MA 02653 (508) 240-1000 div. Desmond Well Drilling, Inc.	Project Horsley Witten Group Barnstable, 480 Barnstable Road Hyannis, MA	Boring No. HW-T(S) Sheet 1 of 1
Driller: Tommy Desmond Helper: Sean Morgan Inspector: Sarah Bartlett		Boring location: Across from 6 Joaquim Road (41.66648, -70.269207) Ground Surface Elevation: Date start: 9/21/2020 Date end: 9/21/2020
Sampler consists of a two inch split spoon driven using a 140 lb. hammer falling thirty inches	Notes:	Auger Size: 6 1/4" x 4" H.S.A Casing Size: 2"x8.54' SCH40 PVC FJT Screen Size: 2"x10'X.010 SCH40 PVC FJT

Depth	Sample				Sample Description	Well Installation
(FT)	NO	PEN/REC	DEPTH/FT	BLOWS 6"		
2			0 - 5		Cleared with vacuum truck.	
0					Drilled with hollow stem augers to 20'	
-2					and set well as directed.	
-4						
-6						
-8						
-10						
-12						
-14						
-16						
-18						
-20						
-22						
-24						
-26						
-28						
-30						
-32						
-34						
-36						
-38						
-40						
-42						
-44						
-46						
-48						
-50						*Not to scale*
-52						Well Depth: 18.54'
-54						Static: 13.41'
-56						Well screen: 8.54' to 18.54'
-58						Native backfill: 0' to 1'
-60						Bentonite seal: 1' to 5'
-62						Sand pack: 5' to 18'
-64						End of boring: 20'
-66						End of sample: n/a

Granular Soils		Cohesive Soils		Proportions Used	Well Installation Key
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY		
0 - 4	V. LOOSE	> 2	V. SOFT	Trace 0 - 10%	- CONCRETE
4 - 10	LOOSE	2 - 4	SOFT	Little 10 - 20%	- SAND PACK
10 - 30	M. DENSE	4 - 8	M. STIFF	Some 20 - 35%	Z - SOIL BACKFILL
30 - 50	DENSE	8 - 15	STIFF	And 35 - 50%	- BENTONITE
> 50	V. DENSE	15 - 30	V. STIFF		- SCREEN
		> 30	HARD		- APPROX. WATER LEVEL

CAPE COD TEST BORING **BORING NO. HW-T(S)**

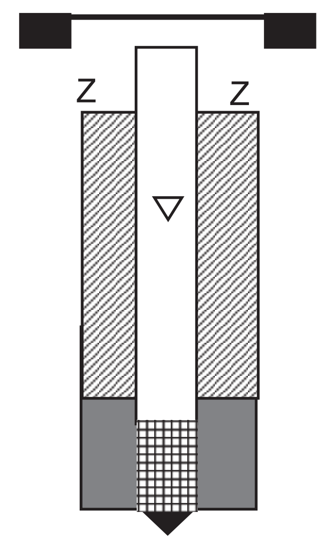
Cape Cod Test Boring 5 Rayber Road, Orleans, MA 02653 (508) 240-1000 div. Desmond Well Drilling, Inc.	Project Horsley Witten Group Barnstable, 480 Barnstable Road Hyannis, MA	Boring No. HW-T(M) Sheet 1 of 1

Driller:	Tommy Desmond	Boring location:	Across from Joaquim Rd. (41.66653, -70.26913)
Helper:	Sean Morgan	Ground Surface Elevation:	
Inspector:	Sarah Bartlett	Date start: 9/21/2020	Date end: 9/21/2020

Sampler consists of a two inch split spoon driven using a 140 lb. hammer falling thirty inches	Notes:	Auger Size:	6 1/4" x 4" H.S.A
		Casing Size:	2"x23.96' SCH40 PVC FJT
		Screen Size:	2"x5'X.010 SCH40 PVC FJT

Depth (FT)	Sample NO	PEN/REC	DEPTH/FT	BLOWS 6"	Sample Description
2			0 - 4		Cleared with vacuum truck.
0					
-2					
-4	1	24/15	4 - 6	1-10-18-20	F-M-C brown sand; some gravel. Dry.
-6					
-8	2	24/15	8 - 10	4-8-8-9	F-M-C brown sand; some gravel. Dry.
-10					
-12					
-14	3	24/16	13 - 15	4-5-8-9	F-M-C brown sand; some gravel. Wet.
-16					
-18	4	24/14	18 - 20	5-8-7-6	F-M-C brown sand; some gravel. Wet.
-20					
-22					
-24	5	24/14	23 - 25	2-4-5-7	F-M brown sand; F-M-C brown sand;
-26					trace gravel. Wet.
-28	6	24/15	28 - 30	3-5-8-6	F-M brown sand; F-M-C brown sand;
-30					trace gravel. Wet.
-32					
-34					
-36					
-38					
-40					
-42					
-44					
-46					
-48					
-50					
-52					
-54					
-56					
-58					
-60					
-62					
-64					
-66					

Well Installation



Not to scale
Well Depth: 28.96'
Static: 13.58'
Well screen: 23.96' to 28.96'
Native: 0' to 5'
Bentonite grout: 5' to 13'
Bentonite grout slow: 13' to 20'
Sand pack: 20' to 28.96'
End of boring: 28'
End of sample: 30'

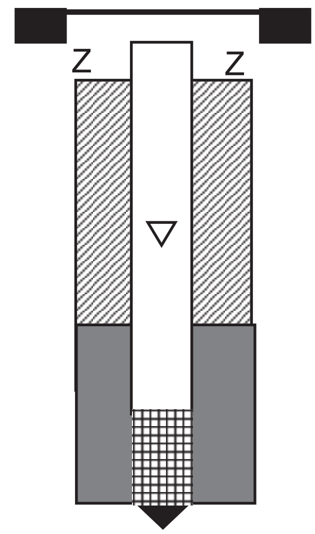
Granular Soils BLOWS/FT	DENSITY	Cohesive Soils BLOWS/FT	DENSITY	Proportions Used
0 - 4	V. LOOSE	> 2	V. SOFT	Trace 0 - 10%
4 - 10	LOOSE	2 - 4	SOFT	Little 10 - 20%
10 - 30	M. DENSE	4 - 8	M. STIFF	Some 20 - 35%
30 - 50	DENSE	8 - 15	STIFF	And 35 - 50%
> 50	V. DENSE	15 - 30	V. STIFF	
		> 30	HARD	

Well Installation Key
- CONCRETE
- SAND PACK
Z - SOIL BACKFILL
- BENTONITE
- SCREEN
- APPROX. WATER LEVEL

Cape Cod Test Boring 5 Rayber Road, Orleans, MA 02653 (508) 240-1000 div. Desmond Well Drilling, Inc.	Project Horsley Witten Group Barnstable, 480 Barnstable Road Hyannis, MA	Boring No. HW-U(D) Sheet 1 of 1

Driller: Tommy Desmond		Boring location:	Wendy's (41.66568, -70.207908)
Helper: Sean Morgan		Ground Surface Elevation:	
Inspector: Sarah Bartlett		Date start: 9/22/2020	Date end: 9/22/2020

Sampler consists of a two inch split spoon driven using a 140 lb. hammer falling thirty inches	Notes:	Auger Size: 6 1/4" x 4" H.S.A Casing Size: 2"x57.3' SCH40 PVC FJT Screen Size: 2"x5'X.010 SCH40 PVC FJT

Depth (FT)	Sample NO	PEN/REC	DEPTH/FT	BLOWS 6"	Sample Description	Well Installation
2						
0						
-2						
-4						
-6	1	24/12	5 - 7	3-3-4-4	F-M-C brown sand; trace gravel. Dry.	
-8	2	24/24	8 - 10	6-14-13-14	F-M-C brown sand and gravel. Dry.	
-10						
-12						
-14	3	24/17	13 - 15	7-15-23-17	F-M-C brown sand and gravel. Dry.	
-16						
-18	4	24/18	18 - 20	5-10-16-16	F-M-C brown sand and gravel. Dry.	
-20						
-22						
-24	5	24/14	23 - 25	5-6-8-8	F-M-C brown sand; some gravel. Wet.	
-26						
-28	6	24/7	28 - 30	4-5-5-5	F-M-C brown sand; trace gravel. Wet.	
-30						
-32						
-34	7	24/14	33 - 35	3-5-5-5	F-M gray sand; F-M-C gray sand. Wet.	
-36						
-38	8	24/5	38 - 40	3-4-5-5	F-M-C brown sand. Wet.	
-40						
-42	9	24/15	43 - 45	5-5-9-10	F-M-C brown sand; trace gravel. Wet.	
-44						
-46	10	24/16	48 - 50	3-3-6-8	F-M-C brown sand; trace gravel. Wet.	
-48						*Not to scale*
-50						Well Depth: 62.3'
-52						Static: 24.66'
-54	11	24/13	53 - 55	3-5-5-8	F-M gray sand; F-M-C gray sand. Wet.	Well screen: 57.3' to 62.3'
-56						Native: 0' to 5'
-58	12	24/15	58 - 60	3-5-9-11	F-M-C brown sand; trace gravel. Wet.	Bentonite grout: 5' to 48'
-60						Bentonite grout slow: 48' to 52'
-62						Sand pack: 52' to 62'
-64	13	24/16	63 - 65	4-7-10-12	F-M-C brown sand; trace gravel. Wet.	End of boring: 63'
-66						End of sample: 65'

Granular Soils BLOWS/FT	DENSITY	Cohesive Soils BLOWS/FT	DENSITY	Proportions Used	Well Installation Key
0 - 4	V. LOOSE	> 2	V. SOFT	Trace 0 - 10%	- CONCRETE
4 - 10	LOOSE	2 - 4	SOFT	Little 10 - 20%	- SAND PACK
10 - 30	M. DENSE	4 - 8	M. STIFF	Some 20 - 35%	Z - SOIL BACKFILL
30 - 50	DENSE	8 - 15	STIFF	And 35 - 50%	- BENTONITE
> 50	V. DENSE	15 - 30	V. STIFF		- SCREEN
		> 30	HARD		- APPROX. WATER LEVEL

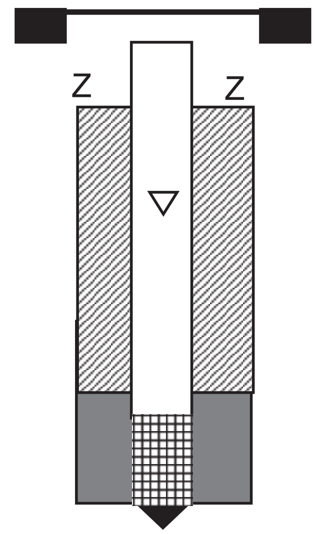
Cape Cod Test Boring 5 Rayber Road, Orleans, MA 02653 (508) 240-1000 div. Desmond Well Drilling, Inc.	Project Horsley Witten Group Barnstable, 480 Barnstable Road Hyannis, MA	Boring No. HW-T(M) Sheet 1 of 1

Driller: Tommy Desmond Helper: Sean Morgan Inspector: Sarah Bartlett	Boring location: Across from Joaquim Rd. (41.66653, -70.26913) Ground Surface Elevation: Date start: 9/21/2020 Date end: 9/21/2020

Sampler consists of a two inch split spoon driven using a 140 lb. hammer falling thirty inches	Notes:	Auger Size: 6 1/4" x 4" H.S.A Casing Size: 2"x23.96' SCH40 PVC FJT Screen Size: 2"x5'X.010 SCH40 PVC FJT

Depth (FT)	Sample NO	PEN/REC	DEPTH/FT	BLOWS 6"	Sample Description
2			0 - 4		Cleared with vacuum truck.
0					
-2					
-4	1	24/15	4 - 6	1-10-18-20	F-M-C brown sand; some gravel. Dry.
-6					
-8	2	24/15	8 - 10	4-8-8-9	F-M-C brown sand; some gravel. Dry.
-10					
-12					
-14	3	24/16	13 - 15	4-5-8-9	F-M-C brown sand; some gravel. Wet.
-16					
-18	4	24/14	18 - 20	5-8-7-6	F-M-C brown sand; some gravel. Wet.
-20					
-22					
-24	5	24/14	23 - 25	2-4-5-7	F-M brown sand; F-M-C brown sand;
-26					trace gravel. Wet.
-28	6	24/15	28 - 30	3-5-8-6	F-M brown sand; F-M-C brown sand;
-30					trace gravel. Wet.
-32					
-34					
-36					
-38					
-40					
-42					
-44					
-46					
-48					
-50					
-52					
-54					
-56					
-58					
-60					
-62					
-64					
-66					

Well Installation



Not to scale
Well Depth: 28.96'
Static: 13.58'
Well screen: 23.96' to 28.96'
Native: 0' to 5'
Bentonite grout: 5' to 13'
Bentonite grout slow: 13' to 20'
Sand pack: 20' to 28.96'
End of boring: 28'
End of sample: 30'

Granular Soils BLOWS/FT	DENSITY	Cohesive Soils BLOWS/FT	DENSITY	Proportions Used
0 - 4	V. LOOSE	> 2	V. SOFT	Trace 0 - 10%
4 - 10	LOOSE	2 - 4	SOFT	Little 10 - 20%
10 - 30	M. DENSE	4 - 8	M. STIFF	Some 20 - 35%
30 - 50	DENSE	8 - 15	STIFF	And 35 - 50%
> 50	V. DENSE	15 - 30	V. STIFF	
		> 30	HARD	

Well Installation Key
- CONCRETE
- SAND PACK
Z - SOIL BACKFILL
- BENTONITE
- SCREEN
- APPROX. WATER LEVEL

CAPE COD TEST BORING **BORING NO. HW-T(M)**

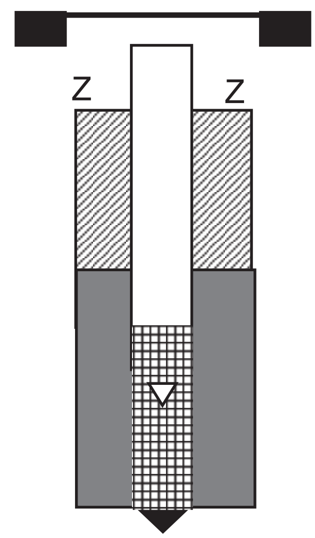
Cape Cod Test Boring 5 Rayber Road, Orleans, MA 02653 (508) 240-1000 div. Desmond Well Drilling, Inc.	Project Horsley Witten Group Barnstable, 480 Barnstable Road Hyannis, MA	Boring No. HW-T(S) Sheet 1 of 1

Driller: Tommy Desmond Helper: Sean Morgan Inspector: Sarah Bartlett	Boring location: Across from 6 Joaquim Road (41.66648, -70.269207) Ground Surface Elevation: Date start: 9/21/2020 Date end: 9/21/2020

Sampler consists of a two inch split spoon driven using a 140 lb. hammer falling thirty inches	Notes:	Auger Size: 6 1/4" x 4" H.S.A Casing Size: 2"x8.54' SCH40 PVC FJT Screen Size: 2"x10'X.010 SCH40 PVC FJT

Depth (FT)	Sample NO	PEN/REC	DEPTH/FT	BLOWS 6"	Sample Description
2			0 - 5		Cleared with vacuum truck.
0					Drilled with hollow stem augers to 20' and set well as directed.
-2					
-4					
-6					
-8					
-10					
-12					
-14					
-16					
-18					
-20					
-22					
-24					
-26					
-28					
-30					
-32					
-34					
-36					
-38					
-40					
-42					
-44					
-46					
-48					
-50					
-52					
-54					
-56					
-58					
-60					
-62					
-64					
-66					

Well Installation



Not to scale
Well Depth: 18.54'
Static: 13.41'
Well screen: 8.54' to 18.54'
Native backfill: 0' to 1'
Bentonite seal: 1' to 5'
Sand pack: 5' to 18'
End of boring: 20'
End of sample: n/a

Granular Soils BLOWS/FT	DENSITY	Cohesive Soils BLOWS/FT	DENSITY	Proportions Used
0 - 4	V. LOOSE	> 2	V. SOFT	Trace 0 - 10%
4 - 10	LOOSE	2 - 4	SOFT	Little 10 - 20%
10 - 30	M. DENSE	4 - 8	M. STIFF	Some 20 - 35%
30 - 50	DENSE	8 - 15	STIFF	And 35 - 50%
> 50	V. DENSE	15 - 30	V. STIFF	
		> 30	HARD	

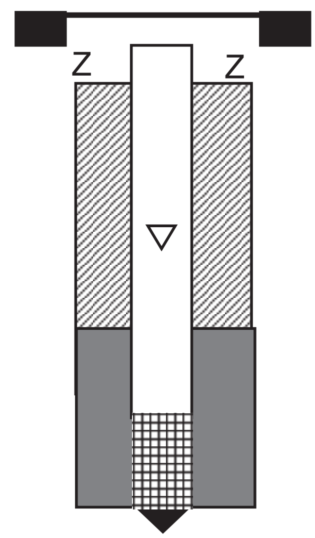
Well Installation Key
- CONCRETE
- SAND PACK
Z - SOIL BACKFILL
- BENTONITE
- SCREEN
- APPROX. WATER LEVEL

Cape Cod Test Boring 5 Rayber Road, Orleans, MA 02653 (508) 240-1000 div. Desmond Well Drilling, Inc.	Project Horsley Witten Group Barnstable, 480 Barnstable Road Hyannis, MA	Boring No. HW-U(D) Sheet 1 of 1

Driller: Tommy Desmond		Boring location:	Wendy's (41.66568, -70.207908)
Helper: Sean Morgan		Ground Surface Elevation:	
Inspector: Sarah Bartlett		Date start: 9/22/2020	Date end: 9/22/2020

Sampler consists of a two inch split spoon driven using a 140 lb. hammer falling thirty inches	Notes:	Auger Size: 6 1/4" x 4" H.S.A Casing Size: 2"x57.3' SCH40 PVC FJT Screen Size: 2"x5'X.010 SCH40 PVC FJT

Depth (FT)	Sample NO	PEN/REC	DEPTH/FT	BLOWS 6"	Sample Description	Well Installation
2						
0						
-2						
-4						
-6	1	24/12	5 - 7	3-3-4-4	F-M-C brown sand; trace gravel. Dry.	
-8	2	24/24	8 - 10	6-14-13-14	F-M-C brown sand and gravel. Dry.	
-10						
-12						
-14	3	24/17	13 - 15	7-15-23-17	F-M-C brown sand and gravel. Dry.	
-16						
-18	4	24/18	18 - 20	5-10-16-16	F-M-C brown sand and gravel. Dry.	
-20						
-22						
-24	5	24/14	23 - 25	5-6-8-8	F-M-C brown sand; some gravel. Wet.	
-26						
-28	6	24/7	28 - 30	4-5-5-5	F-M-C brown sand; trace gravel. Wet.	
-30						
-32						
-34	7	24/14	33 - 35	3-5-5-5	F-M gray sand; F-M-C gray sand. Wet.	
-36						
-38	8	24/5	38 - 40	3-4-5-5	F-M-C brown sand. Wet.	
-40						
-42	9	24/15	43 - 45	5-5-9-10	F-M-C brown sand; trace gravel. Wet.	
-44						
-46	10	24/16	48 - 50	3-3-6-8	F-M-C brown sand; trace gravel. Wet.	
-48						*Not to scale*
-50						Well Depth: 62.3'
-52						Static: 24.66'
-54	11	24/13	53 - 55	3-5-5-8	F-M gray sand; F-M-C gray sand. Wet.	Well screen: 57.3' to 62.3'
-56						Native: 0' to 5'
-58	12	24/15	58 - 60	3-5-9-11	F-M-C brown sand; trace gravel. Wet.	Bentonite grout: 5' to 48'
-60						Bentonite grout slow: 48' to 52'
-62						Sand pack: 52' to 62'
-64	13	24/16	63 - 65	4-7-10-12	F-M-C brown sand; trace gravel. Wet.	End of boring: 63'
-66						End of sample: 65'



Granular Soils BLOWS/FT	DENSITY	Cohesive Soils BLOWS/FT	DENSITY	Proportions Used
0 - 4	V. LOOSE	> 2	V. SOFT	Trace 0 - 10%
4 - 10	LOOSE	2 - 4	SOFT	Little 10 - 20%
10 - 30	M. DENSE	4 - 8	M. STIFF	Some 20 - 35%
30 - 50	DENSE	8 - 15	STIFF	And 35 - 50%
> 50	V. DENSE	15 - 30	V. STIFF	
		> 30	HARD	

Well Installation Key
- CONCRETE
- SAND PACK
Z - SOIL BACKFILL
- BENTONITE
- SCREEN
- APPROX. WATER LEVEL

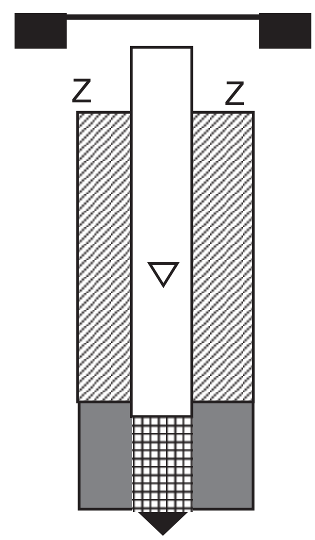
Cape Cod Test Boring 5 Rayber Road, Orleans, MA 02653 (508) 240-1000 div. Desmond Well Drilling, Inc.	Project Horsley Witten Group Barnstable, 480 Barnstable Road Hyannis, MA	Boring No. HW-V (M) Sheet 1 of 1

Driller: Tommy Desmond Helper: Sean Morgan Inspector: Sarah Bartlett	Boring location: Cape Cod Gun Works (41.672148, -70.296514) Ground Surface Elevation: Date start: 9/24/2020 Date end: 9/24/2020

Sampler consists of a two inch split spoon driven using a 140 lb. hammer falling thirty inches	Notes:	Auger Size: 6 1/4" x 4" H.S.A Casing Size: 2"x31.15' SCH40 PVC FJT Screen Size: 2"x5'X.010 SCH40 PVC FJT

Depth (FT)	Sample NO	PEN/REC	DEPTH/FT	BLOWS 6"	Sample Description
2					
0					
-2					
-4	1	24/5	4 - 6	8-18-16-14	F-M-C brown; some gravel. Dry.
-6					
-8	2	24/12	8 - 10	3-9-6-7	F-M-C brown sand; some gravel. Dry.
-10					
-12					
-14	3	24/15	13 - 15	3-6-12-14	F-M-C brown sand and gravel. Dry.
-16					
-18	4	24/12	18 - 20	5-6-9-7	F-M brown sand. Dry.
-20					
-22					
-24	5	24/0	23 - 25	7-8-8-6	No recovery.
-26					
-28	6	24/6	28 - 30	4-8-12-10	F-M-C brown sand. Wet.
-30					
-32					
-34	7	24/12	33 - 35	2-4-5-5	F-M brown sand; F-M-C brown sand. Wet.
-36					
-38					
-40					
-42					
-44					
-46					
-48					
-50					
-52					
-54					
-56					
-58					
-60					
-62					
-64					
-66					

Well Installation



Not to scale
Well Depth: 36.15'
Static: 22.9'
Well screen: 31.15' to 36.15'
Native: 0' to 6'
Bentonite grout: 2' to 27'
Bentonite grout slow: 27' to 30'
Sand pack: 30' to 36'
End of boring: 36'
End of sample: 35'

Granular Soils BLOWS/FT	DENSITY	Cohesive Soils BLOWS/FT	DENSITY	Proportions Used
0 - 4	V. LOOSE	> 2	V. SOFT	Trace 0 - 10%
4 - 10	LOOSE	2 - 4	SOFT	Little 10 - 20%
10 - 30	M. DENSE	4 - 8	M. STIFF	Some 20 - 35%
30 - 50	DENSE	8 - 15	STIFF	And 35 - 50%
> 50	V. DENSE	15 - 30	V. STIFF	
		> 30	HARD	

Well Installation Key
- CONCRETE
- SAND PACK
Z - SOIL BACKFILL
- BENTONITE
- SCREEN
- APPROX. WATER LEVEL

CAPE COD TEST BORING **BORING NO. HW-B(M)**

IEP Inc. BORING LOG

BORING NO. OW-9

SHEET 1 **OF** 2

PROJECT Barnstable Water Company	**PROJECT**
LOCATION Rte 28 + Yarmouth Road	**ELEVATION AND DATUM** 24.55(S) 24.76(m) 24.82(d) 24.86(dd)(msl)
BORING CONTRACTOR Desmond Well Drilling	**DATE** 21 July 87 / **COMPLETION DEPTH** 95'
BORING EQUIPMENT Hollow Stem Auger	**OBSERVED WATER LEVEL DATA** ~18'

ELEV.	DESCRIPTION	DEPTH SCALE	WELL DETAILS	SAMPLE NO.	REMARKS
	0-10' vf/m+ SAND and f/m+ gravel	5'			OW-9dd installed 18 Aug 87; cemented water boxes w/ clay seals; 2" diameter PVC risers
	brown m/c+ SAND, trace f gravel	10'		SS-1	3-4-6, R=12"
	~12-14' layer of m/c+ gravel; 14' back into dk br m/c+ sand	15'			gravel up to 4" diameter
	f/c+ SAND, trace f gravel	20'		SS-2	8-5-7, R=16"
		25'			10', 0.010 slot, sch. 40, flush joint + threaded PVC screen w/ point
	brown m/c+ SAND, some f gravel	30'		SS-3	4-8-8
		35'			
	brown f/c+ SAND, some f/m gravel	40'		SS-4	6-5-4; HNU (headspace in sample jar) 2ppm
	f/c+ SAND; some f gravel	45'		SS-5	4-7-13, R=1/2" (first attempt, 16-5-6, empty)
	NO recovery	50'		SS-6	4-6-11 R=0"; no change on auger flights
	brown f/c+ SAND, some f gravel	55'		SS-7	17-15-15, R=18"; HNU ~4ppm; red brown Fe staining,
	brown m/c+ SAND, some f gravel	60'		SS-8	2-8-9
	red brown m/c+ SAND, some f gravel	65'		SS-9	15-11-8

INSPECTOR: M. Nelson

IEP Inc. BORING LOG

BORING NO. OW-9

SHEET 2 **OF** 2

PROJECT Barnstable Water Company	PROJECT
LOCATION Rte 28 + Yarmouth Road	ELEVATION AND DATUM msl 24.55(s), 24.76(m), 24.82(d), 24.84(dd)
BORING CONTRACTOR Desmond Well Drilling	DATE 21 July 87 / COMPLETION DEPTH 95'
BORING EQUIPMENT Hollow Stem Auger	OBSERVED WATER LEVEL DATA ~18'

ELEV.	DESCRIPTION	DEPTH SCALE	WELL DETAILS	SAMPLE NO.	REMARKS
		70'			
	F/C+ SAND, some f gravel	75'		SS-10	21-12-12, R=18", HNU= 0ppm
		80'			
	same, brown	85'		SS-11	15-15-19 HNU= 0ppm
	pockets of brown and grey CLAY on last flight of auger	90'			10', 0.010 slot, schedule 40, flush joint threaded, PVC screens with point
	BOH 95'	95'			
		100'			
		105'			
		110'			

INSPECTOR: M. Nelson

BORING LOG

Boring No. OW-18
Sheet 1 of 2

Project: Water Quality Investigation
Client: Maher Wellfield Task Force
Boring Contractor: Desmond Well Drilling, Inc.
Boring Equipment: hollow stem auger
Ground Water: Date Depth, ft.

Date: 30 July 1990
Completion Depth: 125.5'
Elevation: 39.27 (s), 39.12 (m), 39.06 (d) msl
Inspector: M. Nelson, R. Lamb

Depth (feet)	Description	Sample Number	Penetra./ Recovery	Blow Count	Comments	Well Details
0	f/c SAND, m gravel				cemented water boxes with clay seals	
5						
10						
15					2" diameter, schedule 40, flush joint threaded, PVC risers	
20						
25	f/m+c SAND, some f/m gravel	ss-1		6-14-14	10', 0.010 slot, schedule 40, flush joint threaded, PVC screen with point set at 34'	
30	f/c SAND, trace gravel	ss-2	18"/6"	3-5-9		
35	f/m+c SAND	ss-3	18"/6"	3-4-8		
40	f/m+c SAND, trace f gravel	ss-4		9-14-25	dark color	
45	f/m+c SAND, some m gravel	ss-5	18"/12"	5-13-30		
50	f/c SAND	ss-6	18"/14"	6-13-28		
55	f/c SAND, trace f gravel	ss-7	18"/2"	5-4-8		
60	f/c+ SAND, trace f gravel	ss-8				
65	f+/m SAND	ss-9			10' heave	
70	f/m SAND; 2" c SAND and f/mgravel	ss-10			Fe stain	
75	f/c+ SAND	ss-11		10-20-9	10', 0.010 slot PVC screen (see above) set at 75'	
80	f/m+/c SAND, trace m gravel	ss-18	24"/24"		2.5' heave	

Proportions used:

trace (tr)	0-10%
little (li)	10-20%
some (so)	20-35%
and	35-50%

Abbreviations:

f = fine	f/c = fine to coarse
m = medium	v = very
c = coarse	+ = more
f/m = fine to medium	- = less

HWH, Inc.

BORING LOG

Boring No. OW-18
Sheet 2 of 2

Project: Water Quality Investigation
Client: Maher Wellfield Task Force
Boring Contractor: Desmond Well Drilling, Inc.
Boring Equipment: hollow stem auger
Ground Water: Date Depth, ft.

Date: 30 July 1990
Completion Depth: 125.5'
Elevation: 39.27 (s), 39.12 (m), 39.06 (d) msl
Inspector: M. Nelson, R. Lamb

Depth (feet)	Description	Sample Number	Penetra./ Recovery	Blow Count	Comments	Well Details
85	f/m+/c SAND, some f gravel	ss-13		7-4-8	small sample	
90	f/c+ SAND, some f/m gravel	ss-14	18"/18"	6-8-10		
95	f/c SAND	ss-15	18"/12"	4-7-8		
100	same	ss-16		3-7-17		
105	f/m+/c SAND	ss-17				
110	greyish f+/m SAND	ss-18	24"/24"		2.5' heave	
115	f/c SAND, trace blue silty sand	ss-19			1.5' heave 10', 0.010 slot, schedule 40, flush threaded PVC screen with point set at 125.5'	
120	f SAND, trace blue-grey silty sand	ss-20				
125	grey f/m SAND, m gravel, f silty sand, trace clay	ss-21				
130	BOH 125.5'					

Proportions used:
trace (tr) 0-10%
little (li) 10-20%
some (so) 20-35%
and 35-50%

Abbreviations:
f = fine
m = medium
c = coarse
f/m = fine to medium
f/c = fine to coarse
v = very
+ = more
- = less

HWH, Inc.

BORING LOG

Boring No. OW-19
Sheet 1 of 2

Project: Remidial Investigation
Client: Barnstable Water Company
Boring Contractor: Desmond Well Drilling, Inc.
Boring Equipment: hollow stem auger
Ground Water:

Date	Depth, ft.
6 Sept 90	~ 27.5

Date: 6 September 1990
Completion Depth: 111.5'
Elevation: 39.13 (s), 39.12 (m), 39.06 (d) msl
Inspector: Odiaga

Depth (feet)	Description	Sample Number	Penetra./ Recovery	Blow Count	Comments	Well Details
0					cemented water boxes with clay seals	
5	vf/v SAND, some gravel, trace coarse sand					
10	f/m+/c SAND, some to trace fine gravel					
15					2" diameter, schedule 40, flush joint threaded PVC risers	
20						
25	f/m+ SAND, trace f gravel	ss-1	18"/≥12"	7-14-15	10', 0.010 slot, PVC screen with point set at 33'	
30	same	ss-2	18"/≥12"	4-10-9		
35	f/c SAND	ss-3	18"/≥12"	5-12-23		
40	vf/c SAND	ss-4	18"/≥12"	4-6-11		
45	same	ss-5	18"/≥12"	3-5-6	dark brown stain at ~44'	
50	vf/f+/m+/c SAND	ss-6	18"/≥12"	3-7-11		
55	same	ss-7	18"/≥12"	6-13-23		
60	f/m+/c SAND, trace f gravel	ss-8	24"/≥12"	7-9-10-23		
65	f/m+/c SAND	ss-9	24"/3"	5-8-12-16		
70	f/c SAND, trace f gravel	ss-10	18"/≥ 12"	5-13-25		
75	vf/f SAND, tr m sand,f gravel	ss-11	18"/≥12"	12-47-46	10'. 0.010 slot, PVC screen with point set at 77'	
80	vf/f+/m+/c SAND, tr f gravel	ss-12	18"/≥12"	2-4-15		

Proportions used:

trace (tr)	0-10%
little (li)	10-20%
some (so)	20-35%
and	35-50%

Abbreviations:

f = fine	f/c = fine to coarse
m = medium	v = very
c = coarse	+ = more
f/m = fine to medium	- = less

HWH, Inc.

BORING LOG

Boring No. OW-19
Sheet 2 of 2

Project: Remidial Investigation
Client: Barnstable Water Company
Boring Contractor: Desmond Well Drilling, Inc.
Boring Equipment: hollow stem auger
Ground Water:

Date	Depth, ft.
6 Sept 90	~ 27.5

Date: 6 September 1990
Completion Depth: 111.5'
Elevation: 39.13 (s), 39.12 (m), 39.06 (d) msl
Inspector: Odiaga

Depth (feet)	Description	Sample Number	Penetra./ Recovery	Blow Count	Comments	Well Details
85	vf/vc SAND, trace f/m gravel	ss-13	18"/>12"	4-5-6		
90	f/c SAND, tr vf sand, vf gravel	ss-14	24"/≥12"	17-10-7-7	may not be a representative sample	
95	f/vc SAND, tr f/m gravel with a 1/16" lens of SILT, tr f/m gravel	ss-15	24"/≥12"	4-10-20-43	slight Fe stain 10', 0.010 slot, schedule 40,	
100	no recovery	NR	24"/0"	17-20-23/30	flush joint threadedPVC screenwith point at 110'	
105	vf/vc SAND and vf/f gravel	ss-16	24"/>12"	∞	approximately 300 blows	
	f/m+/c SAND, tr f gravel					
110	4" brown CLAY, some silt	ss-17	24"/>12"	∞	Fe stained; augered down 18"	
	f/m+/c SAND, tr f gravel	ss-18	24"/>12"	∞	some Fe stain	
115	BOH 111.5'					

Proportions used:

trace (tr)	0-10%
little (li)	10-20%
some (so)	20-35%
and	35-50%

Abbreviations:

f = fine	f/c = fine to coarse
m = medium	v = very
c = coarse	+ = more
f/m = fine to medium	- = less

HWH, Inc.