PFAS 環境調査　質問票

Ｑ１．EPA のプレスリリース「EPA Issues Guidance to States to Reduce Harmful PFAS Pollution | US EPA」によると、貴州では「地方自治体の廃水処理施設と提携して、PFAS の上流発生源を特定するためのモニタリング手法を開発している。」とのことである。

　そのモニタリング手法によって特定できている発生源は、具体的にはどのような施設や設備なのか。

【回答】

モニタリングを通じて特定された産業発生源については、下記で議論されているのでご参照ください。

資料①：「ミシガン州産業前処理プログラムプログラム（IPP）PFAS イニシアティブ（2020 年８月）」

下記資料の２ページ目の「2.　背景」には、主な発生源が記されている。

資料②：「ミシガン州の廃水処理プラント（WWTPs）における流入水、流出水、および残渣における PFAS の評価（2021 年４月）」

MPART（Michigan PFAS Action Response Team）のエグゼクティブディレクターである Abigail Hendershott 氏への聞き取り結果は下記のとおり。

「多くの汚染物質が泡消火剤から発生し、この泡消火剤は、空港、軍事基地、および消防署で石油系火災の鎮火に使用されており、訓練にも使用されている。これは「Class B AFFF」として分類されている。

野外および家屋の火災に使用される「Class A AFFF」には PFAS は含まれていない。」

詳細情報は次の URL「泡消火剤と PFAS」のとおり。

https://www.michigan.gov/pfasresponse/investigations/firefighting-foam

Ｑ２．特定できている発生源の中には、軍関係施設も含まれているのか。

【回答】

次の資料の２ページ目の表において、2022 年に観察対象となっている軍事施設が 12 か所あり、その数の多さは５番目であることが示されている。

資料③「MPART　2022年度のアップデート」

しかしながら、MPARTはこれらの施設のモニタリングは実施しておらず、軍は自身の施設内（現地）でのモニタリングと改善を行い、一方MPARTは基地外（現地外）の地域でのモニタリングを担当している。ミシガン州軍退役軍人局が仲介役となり、両者の間には一定の調整がなされているが、Abigail氏によれば、その協力関係は「あまり良くはない」とのこと。

ただし、ミシガン州の最近の発表によると、空軍にWurtsmith基地の汚染除去に同意させることに成功したとのこと。詳細は次のURL「ウィトマー州知事、汚染と闘う長年の努力の結果、Wurtsmith基地でのPFAS浄化を祝う」のとおり。

https://www.michigan.gov/pfasresponse/about/news/2023/08/17/gov-whitmer-celebrates-pfas-clean-up-at-wurtsmith-base

Ｑ３．各施設に対し、具体的にどのようなモニタリングを行っているのか、例を示していただきたい（モニタリングの中では、どのようなデータを取得し、どのように分析しているのか）。

【回答】

以下の化学物質に関するデータが収集されている。

- **HFPO-DA** (Hexafluoropropylene oxide-dimer acid，通称"GenX")は、ミシガン州で規制されている物質で、MCL（Maximum Contaminant Level（最大汚染物質レベル））は370 ppt。
- **PFBS** (Perfluorobutane sulfonic acid)は、ミシガン州で規制されている物質で、MCLは420 ppt。
- **PFHxA** (perfluorohexanoic acid)は、ミシガン州で規制されている物質で、MCLは400,000 ppt。
- **PFHxS** (perfluorohexane sulfonic acid)は、ミシガン州で規制されている物質で、MCLは51 ppt。
- **PFNA** (perfluorononanoic acid)は、ミシガン州で規制されている物質で、MCLは6 ppt。

- **PFOA** (perfluorooctanoic acid) は、ミシガン州で規制されている物質で、MCL は 8 ppt。
- **PFOS** (perfluorooctane sulfonic acid) は、ミシガン州で規制されている物質で、MCL は 16 ppt。
- **11Cl-PF3OUdS** (11-chloroeicosafluoro-3-oxaundecane-1-sulfonic Acid) は現在、ミシガン州で規制されていない物質。
- **9Cl-PF3ONS** (9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid) は現在、ミシガン州で規制されていない物質。
- **ADONA** (4,8-dioxa-3H-perfluorononanoic acid) は現在、ミシガン州で規制されていない物質。
- **NEtFOSAA** (2-(N-ethylperfluorooctanesulfonamido) acetic acid) は現在、ミシガン州で規制されていない物質。
- **NMeFOSAA** (2-(N-methylperfluorooctanesulfonamido) acetic acid) は現在、ミシガン州で規制されていない物質。
- **PFDA** (perfluorodecanoic acid) は現在、ミシガン州で規制されていない物質。
- **PFDoA** (perfluorododecanoic acid) は現在、ミシガン州で規制されていない物質。
- **PFHpA** (perfluoroheptanoic acid) は現在、ミシガン州で規制されていない物質。
- **PFTA** (perfluorotetradecanoic acid) は現在、ミシガン州で規制されていない物質。
- **PFTrDA** (perfluorotridecanoic acid) は現在、ミシガン州で規制されていない物質。
- **PFUnA** (perfluoroundecanoic acid) は現在、ミシガン州で規制されていない物質。

公共水道および水源のテストは、以下のように実施されてきた。

· 全州の PFAS 調査の第 I 段階では、独自の水源を持つ地域給水および自家井戸を備えた学校が最初に含まれた。後に、このリストは、自家井戸を持つ保育施設およびミシガンヘッドスタートプログラムも含むように拡大された。

· 全州 PFAS 調査の第 II 段階では、感受性の高い人々を対象とする非共同給水もサンプリングリストに追加された。

· 全州調査の第 I および第 II フェーズで約 80 の公共水道が、合計テスト PFAS 濃度が 10 ppt を超える結果を示した。これらの給水システムは、ミシガン州環境・五大湖・

エネルギー局（EGLE）によって、2019年から2020年まで四半期ごとのサンプリング・スケジュールのもとに置かれ、これらの給水システムのPFAS濃度が時間とともに変化するかどうかを判断し、優先順位付けと推奨事項の指示、およびさらなる措置の方向性を提供するのに役立った。

- 第Iフェーズでサンプリングされた約70の公共水道は、表流水を水源として使用している。これらの給水システムは、2019年には月次で、2021年には隔月でサンプリングされ、ミシガン州の地表水水源におけるPFAS濃度が時間とともに変化するかどうかを評価した。2022年には追加のサンプリングが計画されている。

MPARTは私有水源（井戸）の検査は実施していないが、私有水源の検査を希望する住宅所有者のための手引きを提供している。

詳細は次のURL「ホームサンプリング手引き」のとおり。

https://www.michigan.gov/pfasresponse/drinking-water/sampling

（参考）

○「バーチャル会議の案内」※EGLE が12月5日から7日の間で、2023年五大湖PFASサミットを開催する。一般参加は登録および35ドルの参加料が必要。

下記URLに詳細が記載されている。

Virtual Conference

EGLE (which MPART is a part of) will hold the 2023 Great Lakes PFAS Summit from December 5 to 7. General participation requires registration and a $35 fee:

https://egle.idloom.events/2023-PFAS-Summit

資料①：「ミシガン州産業前処理プログラムプログラム（IPP）
PFASイニシアティブ（2020年8月）」

MICHIGAN DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY

MICHIGAN INDUSTRIAL PRETREATMENT PROGRAM (IPP) PFAS INITIATIVE

Identified Industrial Sources of PFOS to Municipal Wastewater Treatment Plants

August 2020

EGLE, WATER RESOURCES DIVISION

800-662-9278 | Michigan.gov/EGLE

CONTENTS

INTRODUCTION

IPP PFAS INITIATIVE

As a special effort under the National Pollutant Discharge Elimination System (NPDES) program, the Michigan Department of Environment, Great Lakes, and Energy (EGLE), Water Resources Division (WRD), launched the Industrial Pretreatment Program (IPP), Per- and Polyfluoroalkyl Substances (PFAS) Initiative in February 2018. This initiative aims to reduce and eliminate certain PFAS from industrial sources that may pass through municipal wastewater treatment plants (WWTP) and enter lakes and streams, potentially causing fish consumption advisories or polluting public drinking water supplies. The program was developed after EGLE identified a WWTP passing through perfluorooctane sulfonic acid (PFOS) from an industrial user discharging to their system to the Flint River at concentrations far exceeding the state's water quality standard (see discussion below on *PFAS Regulation in Michigan Surface Waters*) in June 2017. This effort is just one part of a comprehensive, multi-media approach by the State of Michigan to address PFAS in the environment. For more information on the larger program, visit Michigan.gov/PFASResponse.

PFAS REGULATION IN MICHIGAN SURFACE WATERS

EGLE determines the concentration of substances in surface waters that would not be expected to cause adverse effects to human health, aquatic life, and wildlife using the methodology described in Michigan's state laws and rules, Rule 323.1057 ("Rule 57") of the Part 4, Water Quality Standards (WQS), administrative rules promulgated pursuant to Part 31, Water Resources Protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. Due to limited studies and data on PFAS, the only PFAS that have Michigan Rule 57 values are PFOS and perfluorooctanoic acid (PFOA) as listed below in Table 1. These values were established in March 2014 and May 2011, respectively. The most stringent values are the human noncancer values, which are based on human fish and water consumption. Values for protection of aquatic life (the other three values) are much less restrictive. An explanation of the Rule 57 process is available at Michigan.gov/WaterQuality under "Laws, Rules, and Standards."

Table 1: Michigan Rule 57 Values for PFOS and PFOA

PFAS, ng/l or ppt*	Human Noncancer Value (nondrinking water source)	Human Noncancer Value (drinking water source)	Final Chronic Value	Final Acute Value	Aquatic Maximum Value
PFOS	12	11	140,000	1,600,000	780,000
PFOA	12,000	420	880,000	15,000,000	7,700,000

*ng/l=nanograms per liter, ppt=parts per trillion. These units are considered equivalent

To date, effluent sampling has determined that 31 WWTPs in Michigan have exceeded Michigan's WQS for PFOS. Only one WWTP has exceeded the 420 ppt WQS for PFOA. No WWTPs have been found to exceed the 12,000 ppt for PFOA. EGLE is using the WQS as screening levels in absence of effluent limits. EGLE has therefore focused its efforts on reducing PFOS in WWTP effluent.

IPP PFAS INITIATIVE IMPLEMENTATION

To date, EGLE has required 95 WWTPs with required IPPs to evaluate their industrial users as potential sources of PFOS and PFOA. It should be noted that in Michigan, municipalities act as IPP Control Authorities, even for WWTPs of less than five million gallons per day (MGD) in design flow, meaning that IPP compliance and enforcement is implemented locally. EGLE began the IPP PFAS Initiative with a series of regional meetings and a webinar for municipal WWTP staff to inform them about PFAS, suggest potential sources for evaluation, and outline EGLE's expectations for actions under the initiative (to learn more, see the IPP PFAS Information web page at Michigan.gov/IPP).

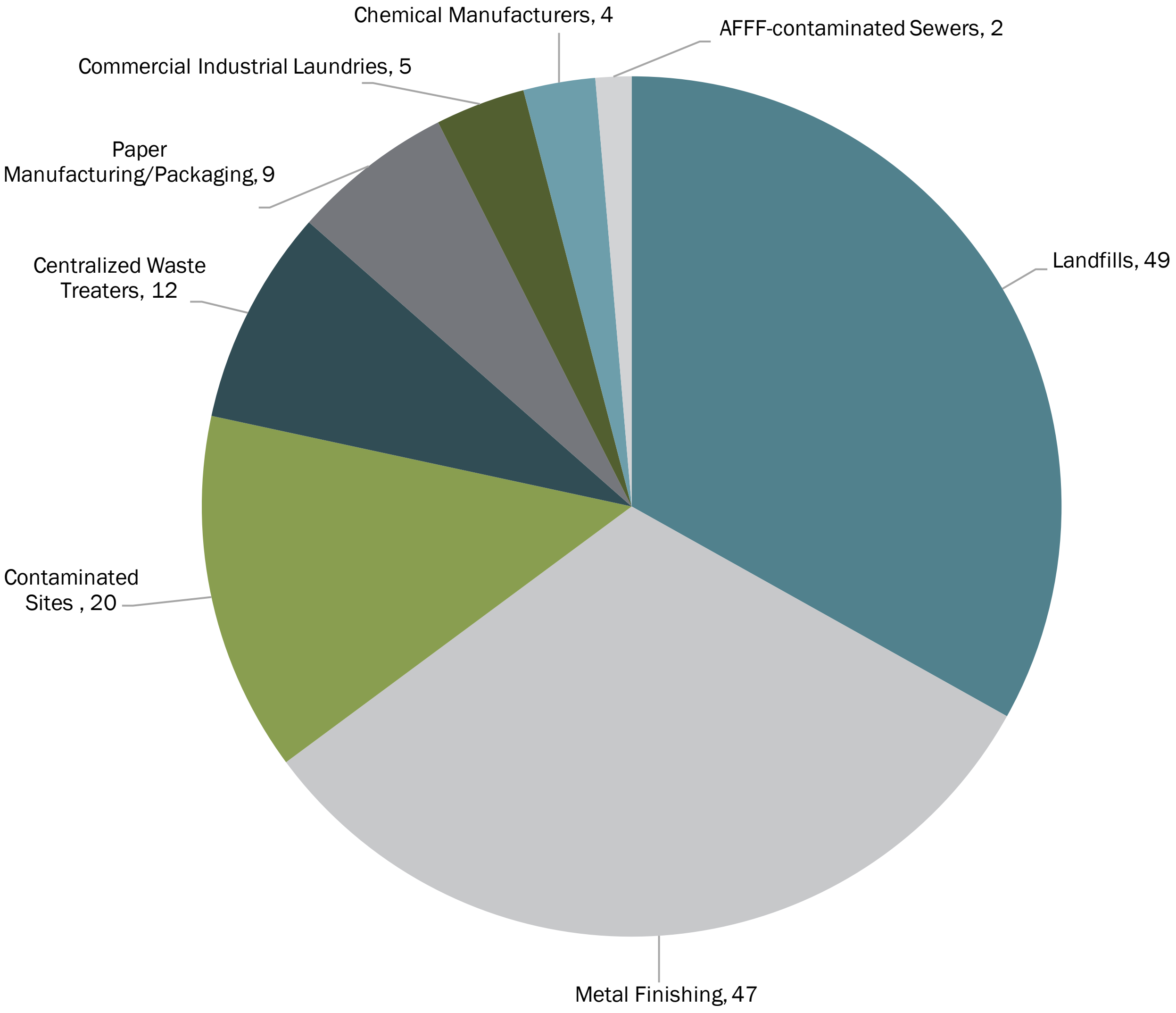
Based on literature reviews and knowledge of Michigan, EGLE highlighted the following industrial categories as potential sources of PFOS and/or PFOA to WWTPs: metal finishers and electroplaters utilizing fume suppressants, tanneries, leather and fabric treaters, paper and packaging manufacturers, landfill leachate, centralized waste treaters, and sites where aqueous film forming foam (AFFF) was used. WWTP staff were asked to evaluate these potential sources via records review and interviews with industry staff and then sample the effluent of those industries that were likely to have used PFOS and/or PFOA in the past or were currently using some type of PFAS-containing chemical in their processes.

FINDINGS: SIGNIFICANT AND OTHER SOURCES AND VARIABLE IMPACTS

SIGNIFICANT SOURCES

Sources of PFOS identified in the IPP PFAS Initiative were similar to those identified in literature reviews. EGLE's WRD defined *sources* as those industrial users with discharges greater than 12 ppt PFOS, which was used as a screening level. The majority of significant PFOS sources to WWTPs were landfills that accepted industrial wastes containing PFOS, metal finishers, and contaminated sites associated with industries or activities with PFOS usage. Other sources found included centralized waste treaters (CWTs), paper manufacturing/packaging, commercial industrial laundries, chemical manufacturers, and sewers contaminated with AFFF. It should be noted that there were industries in all these categories that discharged PFOS at concentrations less than the PFOS screening level. Some potential sources suggested by literature were likely absent since those industries are not prevalent in Michigan. Figure 1 shows source types by number in each category. Note that this simple count does not indicate concentrations of PFOS in effluent or impact on WWTP effluent. It also should be noted that several sources were found by other means than the IPP PFAS Initiative, i.e. other reports or communications.

Figure 1. Sources of PFOS, Number by Type



Effluent discharged by municipal WWTPs without significant industrial sources met WQS, leading EGLE to conclude that general consumer use of products with PFAS coatings and/or ingredients (residential laundering, cleaning carpets, etc.) is not a significant source of PFOS to WWTPs. The effluent of WWTPs without significant sources of PFOS ranged from two to seven ppt, which appears to be the anthropogenic background concentration for sanitary sewage in Michigan.

Sources of PFOS to WWTPs in Michigan are shown in Table 2, which lists general industry categories found to be sources, numbers of industries per category and subcategory, percentages of industries discharging PFOS in each source type and subtype, and ranges of concentrations found in wastewater discharged to sanitary sewers above the IPP PFAS Initiative screening level of 12 ng/l. The concentrations shown are those prior to pretreatment or reduction efforts. The percentages by source type relate to the same line of the table. For example, 49 of the 56 landfills or 88 percent of all landfills evaluated were found to be sources of PFOS, with 100 percent of active Type II landfills and 83 percent of closed Type II landfills found to be sources.

Table 2: Sources of PFOS to WWTPs in Michigan

Industry/Category/Type	Total Number Evaluated[1]	Number (%) Sources of PFOS by Type[2]	Range Effluent PFOS exceeding screening level of 12 ppt
Landfills	56	49 (88%)	13-5,000
• Type II Sanitary Landfills	48	44 (92%)	20-5,000
○ Active	25	25 (100%)	29-5,000
○ Closed	23	19 (83%)	20-420
• Type III Sanitary Landfills	7	4 (57%)	13-4,000
○ Active	3	1 (33%)	33-100
○ Closed	4	3 (75%)	13-4,000
• Hazardous Waste Landfill	1	1 (100%)	60
Metal Finishing	320	47 (15%)	20-240,000
• Chrome Plating	50	33 (66%)	24-240,000
• Chromate Conversion Coating[3]	23	9 (39%)	16-9,950
• Other or Unknown	247	5 (2%)	20-250
Contaminated Sites	40	20 (50%)	14-34,000
• Metal Finishers	11	6 (55%)	20-8,000
• Miscellaneous Sources	12	3 (25%)	14-37.51
• Mixed Manufacturing	4	3 (75%)	86-34,000
• Former Landfills	6	2 (33%)	18-42
• Paper Manufacturing	3	2 (66%)	24-240
• Paint Manufacturing	2	2 (100%)	360-6,047
• Leather Tannery	1	1 (100%)	19-514
• AFFF Infiltration	1	1 (100%)	82-456
Centralized Waste Treaters (CWTs)	16	12 (75%)	13-8,400
Paper Manufacturing, Packaging	14	9 (64%)	16-410
Commercial Industrial Laundry Facilities	12	5 (42%)	24-69
Chemical Manufacturers	17	4 (24%)	18-4,600,000
AFFF-contaminated Sewers	2	2 (100%)	240-45,000

[1] Estimated based on 2018 WWTP IPP Annual Report data for total metal finishers; others estimated based on industries surveyed and/or sampled during the IPP PFAS Initiative. Number of types per subcategory may be low since sewer users that did not meet local screening criteria may not have been sampled. The information presented in this document has been compiled from many sources including, but not limited to, compliance submittals, laboratory reports, voluntary surveys, emails, internet searches and personal communications. These sources contained variable levels of detail. This document represents our best effort to compile, organize, and summarize this information at this point in time.

[2] *Sources* are those exceeding the screening level of 12 ppt PFOS at least once.

[3] Excludes chromate conversion coaters that also perform chrome plating

VARIABLE IMPACTS ON WWTPS AND RECEIVING STREAMS

Since both WWTPs and industrial sources of PFOS vary in size, some WWTPs with sources have been able to meet Michigan's WQS while others have not. The highest concentrations of PFOS in WWTP effluent, indicative of significant pass through of pollutants from industrial users, were found primarily in small to medium-sized (0.19 to 2 MGD) WWTPs with one or more industrial sources discharging PFOS-contaminated process wastewater that made up a significant portion (around five percent) of WWTP flow. Loading is important; lower concentrations at higher flows may also cause or contribute to pass through of pollutants. Pass through from WWTPs is sometimes intermittent when sources discharge low volume but high strength batches, especially for smaller WWTPs.

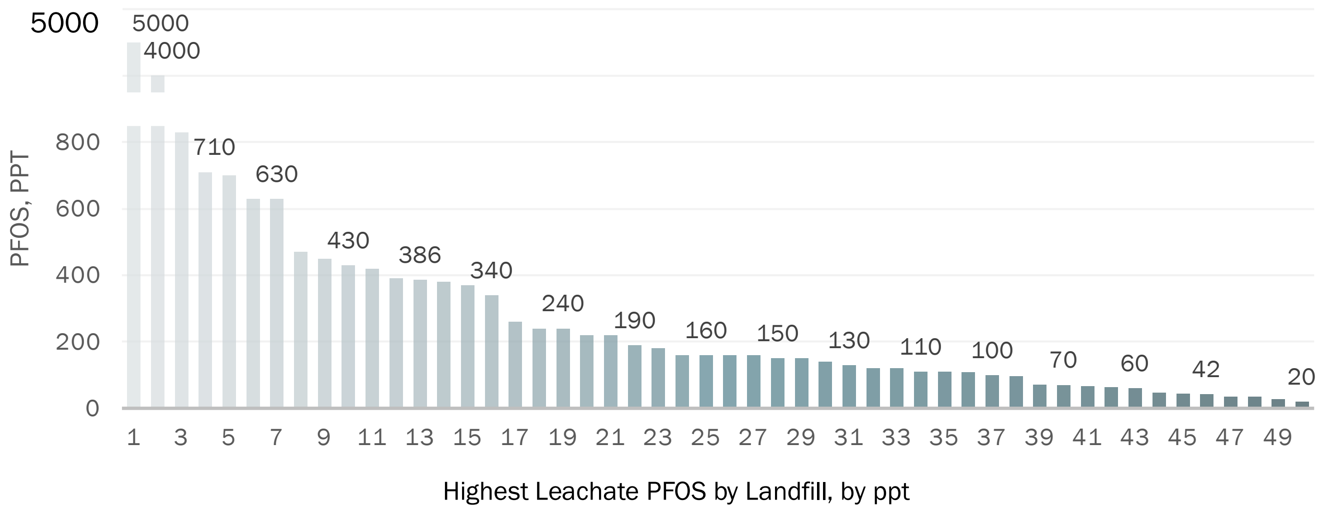
Similarly, EGLE has found that in-stream PFAS concentrations may vary widely due to the intermittent nature of some source discharges (i.e. point sources as well as storm water and groundwater discharges from contaminated sites, some of which may not yet be identified) as well as seasonal stream flow variation and size of the receiving stream. Early indications are that accumulations of PFOS found in fish tissue may be the best indication of long-term average concentrations in lakes and streams. Fish tissue sampling resulted in more restrictive fish consumption advisories downstream from two WWTPs that were found to be passing through PFOS from significant industrial sources.

DISCUSSION OF SOURCES

LANDFILL LEACHATE

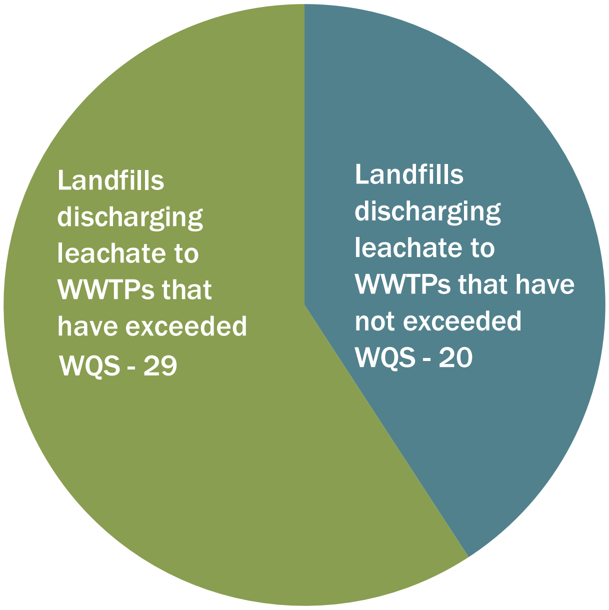
Sanitary landfills and Hazardous Waste landfills that accept or have accepted industrial wastes containing PFOS and discharge leachate, or truck leachate, to WWTPs are a significant source. In Michigan, sanitary landfills are classified as either Type II or Type III landfills. A Type II landfill is a municipal solid waste landfill which receives household waste but may also receive other types of nonhazardous wastes such as commercial solid waste, nonhazardous sludge, conditionally exempt small quantity generator waste, and industrial nonhazardous solid waste. A Type III landfill is any landfill that is not a municipal solid waste landfill or hazardous waste landfill and includes all of the following: construction and demolition waste landfill; industrial waste landfill; a landfill that accepts waste other than household waste, municipal solid waste incinerator ash, or hazardous waste from conditionally exempt small quantity generators; coal ash landfill; and an existing coal ash impoundment that is closed or is actively being closed as a landfill. Hazardous waste landfills receive non-liquid hazardous waste. Leachate from 44 Type II sanitary landfills, four Type III sanitary landfills, and one hazardous waste landfill have been identified as significant sources, with concentrations ranging from 13 to 5,000 ppt PFOS as shown below in Figure 2. Only two of the 49 landfills, or 8 percent, were discharging PFOS concentrations greater than 1000 ppt. Included in the number of active Type II landfills counted in Table 2 is a facility that receives leachate from three separate landfills.

Figure 2. Landfill Leachate Sources of PFOS to WWTPS, Highest Concentrations in ppt



The impact to a WWTP from leachate is dependent on the amount of leachate received, the concentration of PFOS in the leachate, and the overall volume of sanitary sewage treated by the WWTP. As noted in the *Findings* section above, sanitary sewage is generally low in PFOS. Municipal WWTPs are not designed to remove PFOS from wastewater, but if the leachate volume is small compared to the volume of sanitary sewage received by the WWTP, the acceptance of leachate may not result in PFOS passing through at concentrations above the WQS. The range of volume of leachate discharged or hauled daily to WWTPs can be from the thousands to the hundreds of thousands of gallons. For this reason, smaller WWTPs are more likely to pass through PFOS when receiving landfill leachate. There are WWTPs in Michigan where landfill leachate is their primary source of PFOS. Of the 49 landfills with leachate exceeding the screening level of 12 ppt PFOS, 29 landfills (59 percent) discharge to WWTPs that have exceeded the WQS for PFOS while 20 (41 percent) discharge to WWTPs that have not exceeded WQS (See Figure 3 below).

Figure 3: Landfills with Leachate Greater than Screening Levels and Impact on WWTPs



Some WWTPs have restricted the volume of landfill leachate accepted rather than require pretreatment to meet WQS. It is unclear if this approach will be successful over the long term. EGLE has recommended that maximum allowable headworks loading studies or similar mass balance calculations be performed to determine allowable loadings of leachate to WWTPs that will not result in the pass through of PFOS and/or PFOA.

In 2018, the Michigan Waste and Recycling Association conducted a statewide study to determine levels of PFOS and PFOA in leachate of 32 active municipal solid waste landfills. All the leachate samples collected had detectable levels of PFOS and PFOA. The concentration range of PFOS and PFOA identified in the study align with the findings of the IPP PFAS Initiative.

METAL FINISHING

Facilities that conduct metal finishing (including electroplaters) are a significant PFOS source for many WWTPs in Michigan. They are categorized by federal regulation according to specific core processes that change the surface of an object to improve its appearance and/or durability. The majority of sources at six of the ten WWTPs discharging at 50 ppt or greater PFOS were metal finishers. Five of those six WWTPs had a single chrome plating metal finisher source and were WWTPs of medium size (less than 2.5 MGD discharge). The remaining WWTP was larger (43 MGD) and had multiple sources, the majority of which were chrome plating metal finishers.

This finding aligns with known uses of PFAS. The United States Environmental Protection Agency (USEPA) allowed for use of PFOS-based fume suppressants as a control technology for hexavalent chromium emissions under the National Emissions Standards for Hazardous Air Pollutants (NESHAP) for chromium electroplating in 1995. Hexavalent chromium is a known hazardous compound and human studies have established that inhaled hexavalent chromium is a human carcinogen, resulting in an increased risk of lung cancer. Adding fume suppressants to the plating bath reduces the surface tension and, subsequently, the ability for hexavalent chromium to form bubbles. Fume suppressants are widely used across the industry due to their effectiveness in reducing hexavalent chromium emissions and their relative costs compared to other available control technologies. The USEPA did not ban the use of PFOS-based fume suppressants in chrome electroplating tanks until 2015.

The following discussion about types of metal finishers is based on information gleaned from WWTP investigations, surveys, IPP submittals, and company Web pages. Of the approximately 320 metal finishers discharging to WWTPs in Michigan, the effluent of 226 was sampled at least once as part of the IPP PFAS Initiative. Metal finishers sampled included those conducting one or more of the following processes: chrome plating (both hexavalent and trivalent chromium and decorative and hard chrome plating), chromate conversion coating, aluminum anodizing, copper plating, phosphate coating, passivating, and powder coating. Not all metal finishers were able to be tallied by type. A number of metal finishers were sampled but the specific processes used were not reported to EGLE. Other metal finishers were not sampled because they did not meet screening criteria to be considered a likely source of PFOS.

In general, metal finishers that had a history of using fume suppressants were found to discharge PFOS. Of the approximately 320 metal finishers discharging to WWTPs, only 47 (15 percent) were found to be discharging PFOS greater than the screening criteria, with 16 (5 percent) discharging greater than 1,000 ppt PFOS. All but five of the 47 metal finishers discharging PFOS above screening criteria (12 ppt PFOS) used hexavalent chromium and/or trivalent chromium in their current or past processes. Those five reported no known chromium use or information was not available.

Decorative chrome plating, hard chrome plating, and chromate conversion coating, all using hexavalent chromium in their process, appear to be the predominant types of metal finishing that are sources of PFOS to WWTPs. Chrome platers either using or previously using hexavalent chromium were the most significant source of PFOS among metal finishers. Chrome plating involves electroplating a thin layer of chromium to provide corrosion resistance, increase surface hardness and/or provide a decorative finish. Hard chrome plating is used to improve corrosion and abrasion resistance and is generally a thicker plating than decorative chrome plating, which is generally thinner and used for cosmetic purposes, such as plating plastic with a shiny chrome surface. Decorative chrome plating deposits a 0.003-2.5 micron chrome layer in less than five minutes with an electrical current range of 540-2,4000 amperes; hard chrome plating deposits a 1.3-760 micron layer in 20 minutes to 36 hours with an electrical current range of 1,600-6,500 amperes.

In either type of chrome plating, the electrical current generates chromium fumes. Temperature of chromic acid etch tanks and chrome plating tanks is also a factor. These tanks are heated (up to approximately 160 degrees Fahrenheit for some applications) and water constantly evaporates and must be replenished. In addition, chromium fumes may be generated from aeration of chrome plating and chromic acid etch tanks conducted to prevent settling of chromium in the bottom of the tanks.

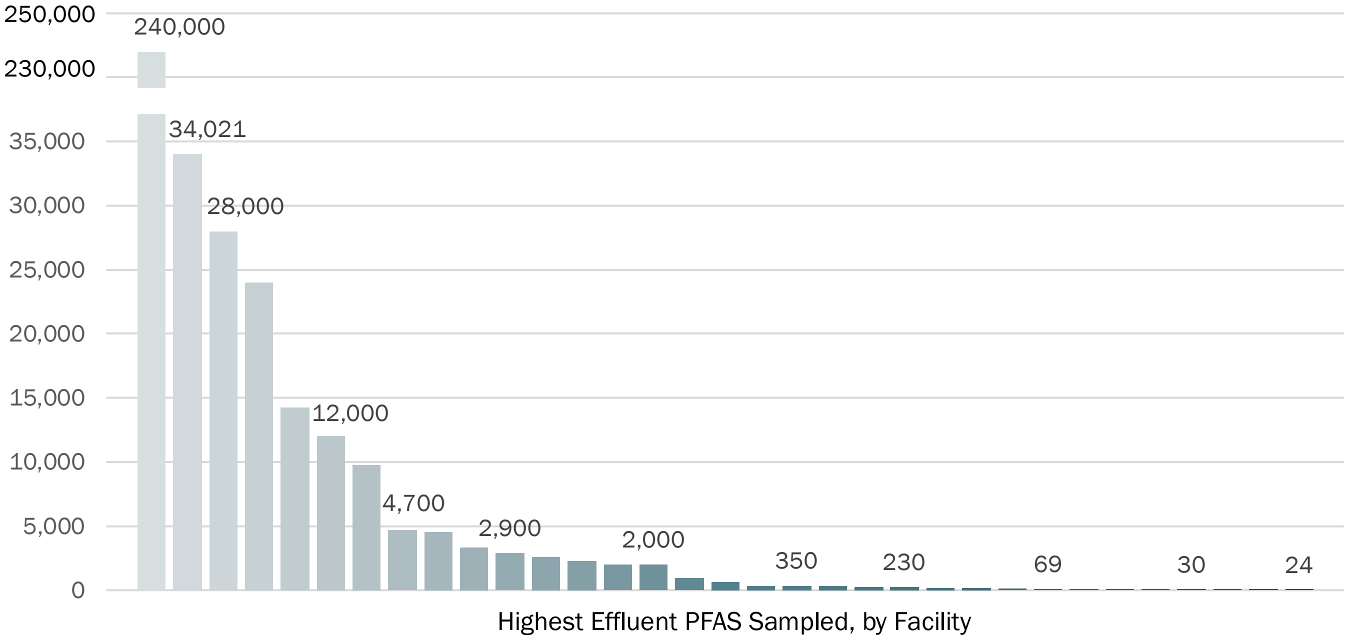
Decorative chrome platers that plate on plastic typically etch plastic parts with chromic acid, which is hexavalent chromium, to prepare them for plating. Several of the decorative chrome platers used chromic acid etch baths and fume suppressants to control associated air emissions. Plating on plastics (also referred to as POPs) is a growing sector of the industry. Plating on plastic allows for both lower costs for raw materials and provides products which are lower weight and may be attractive to certain industrial customers.

Of the approximately 50 chrome platers in Michigan that discharge to a WWTP, 33 (66 percent) were found to be sources of PFOS. Almost all (47 or 94 percent) of the chrome platers either use or used hexavalent chromium, although many use trivalent chromium as well. Due to employee safety concerns, environmental hazards and the associated increased costs, there has been a movement to replace hexavalent chrome with trivalent chrome in decorative chrome plating. Trivalent chromium has a relative inability to cross cell membranes compared to hexavalent chromium (USEPA, August 1998). Therefore, it is considered significantly less toxic and makes it subject to both less regulations and costs than hexavalent chromium. However, trivalent chromium generally cannot be used for hard chrome plating because there are limits to the thickness that can be achieved. There are also differences in the plating color as well as increased costs (equipment, chemicals, testing, and maintenance) for manufacturers (TURI, 2012).

The 34 percent of chrome platers that were not found to be sources of PFOS most likely chose mechanical controls (such as enclosed lines, air jet systems, etc. along with large capacity scrubbers) to manage hexavalent chromium rather than chemicals containing PFAS (typically used in conjunction with scrubbers). In at least one case, a decorative chrome plating facility was built after the 2015 PFOS ban and PFOS-based fume suppressants were never used at that facility, although fume suppressants containing PFAS, specifically 6:2 fluorotelomer sulphonic acid (FtS), are used..

Discharges of PFOS from chrome platers found to be sources of PFOS varied widely, but concentrations at some were significant. See Figure 4 to see the range of highest effluent PFOS results prior to pretreatment. A number of chrome platers have installed pretreatment since these samples were taken and their effluent PFOS either meets local screening concentrations or shows significant reductions.

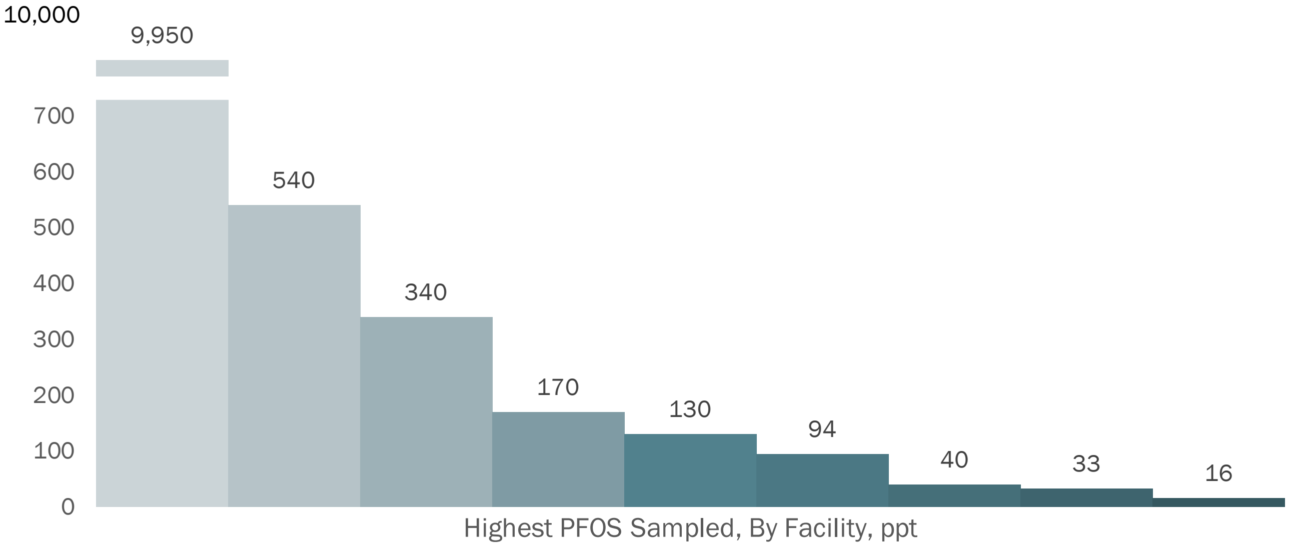
Figure 4. Chrome Plater Sources, Highest Effluent PFOS Sampled, ppt



Nine metal finishers that conduct chromate conversion coating were found to be sources of PFOS to WWTPs, but concentrations of PFOS were generally much lower than those for chrome platers. Chromate conversion coating is an extra step used to inhibit corrosion, act as a primer, or provide a decorative finish. The process uses chromate, which is hexavalent chromium, to create a micro-coating from a chemical reaction with the base metal. See Figure 5 below for highest effluent results for nine factories conducting chromate conversion coating that exceeded screening levels.

Many of these PFOS sources have reduced effluent concentrations over time. Some have eliminated source lines or conducted cleaning and at least one has installed pretreatment. At least two of these facilities also conduct chrome plating and another trivalent chromium passivation. Two chrome platers that also conduct chromate conversion coating were excluded from Figure 5 since concentrations of PFOS are likely associated with chrome plating rather than chromate conversion coating.

Figure 5. Chromate Conversion Coating Sources, Highest PFOS Effluent Sampled, ppt



Based on data we have seen from a range of sources, it appears that the PFOS found in chrome plating (and a lesser extent chromate conversion coating) wastewater originates from historical use of fume suppressants (also called demisters, defoamers, surfactants, mist suppressants, etc.). These chemicals were lawful to use until September 2015 and were used to protect worker health and safety as well as contribute to product quality. After September 2015, PFOS-based fume suppressants were prohibited from being added to chromium electroplating and anodizing tanks under the 2012 revisions of the NESHAP (40 CFR Part 63, Subpart N). These rules define PFOS-based fume suppressants as those containing one percent or greater PFOS by weight.

The NESHAP revision was developed concurrently with a national effort to phase out the manufacture and use of long-chain PFAS, including PFOS and PFOA, under the USEPA's *2010/2015 PFOA Stewardship Program* due to concerns about the impact of PFOA and long-chain PFAS on human health and the environment. The NESHAP regulation does not prohibit PFOS-based fume suppressants for chromate conversion coating, but these products are generally not available due to the stewardship program phase out.

The conclusion that PFOS currently found in wastewater is from historical use of PFOS-containing chemical products is supported by the findings of a recent study requested by EGLE, in coordination with USEPA Region V, and conducted by EGLE and the USEPA Office of Research and Development (ORD) to research the question of whether chemicals currently used by chrome platers might be contributing to PFOS concentrations observed in their effluent. EGLE sampled nine different fume suppressant products and effluent (prior to pretreatment for PFOS) from 11 chrome platers and sent samples to the USEPA ORD for detailed analysis. USEPA researchers did not find PFOS or PFOS precursors in currently used fume suppressants, although most contained PFAS, primarily 6:2 FTS. However, PFOS was found in chrome plater effluent, leading EGLE to conclude that PFOS originates from historical use of PFOS-containing fume suppressants. For more information about this study, **Targeted and Non-Targeted Analysis of PFAS in Fume Suppressant Products at Chrome Plating Facilities**, refer to **www.michigan.gov/documents/egle/wrd-ep-pfas-chrome-plating_693686_7.pdf**.

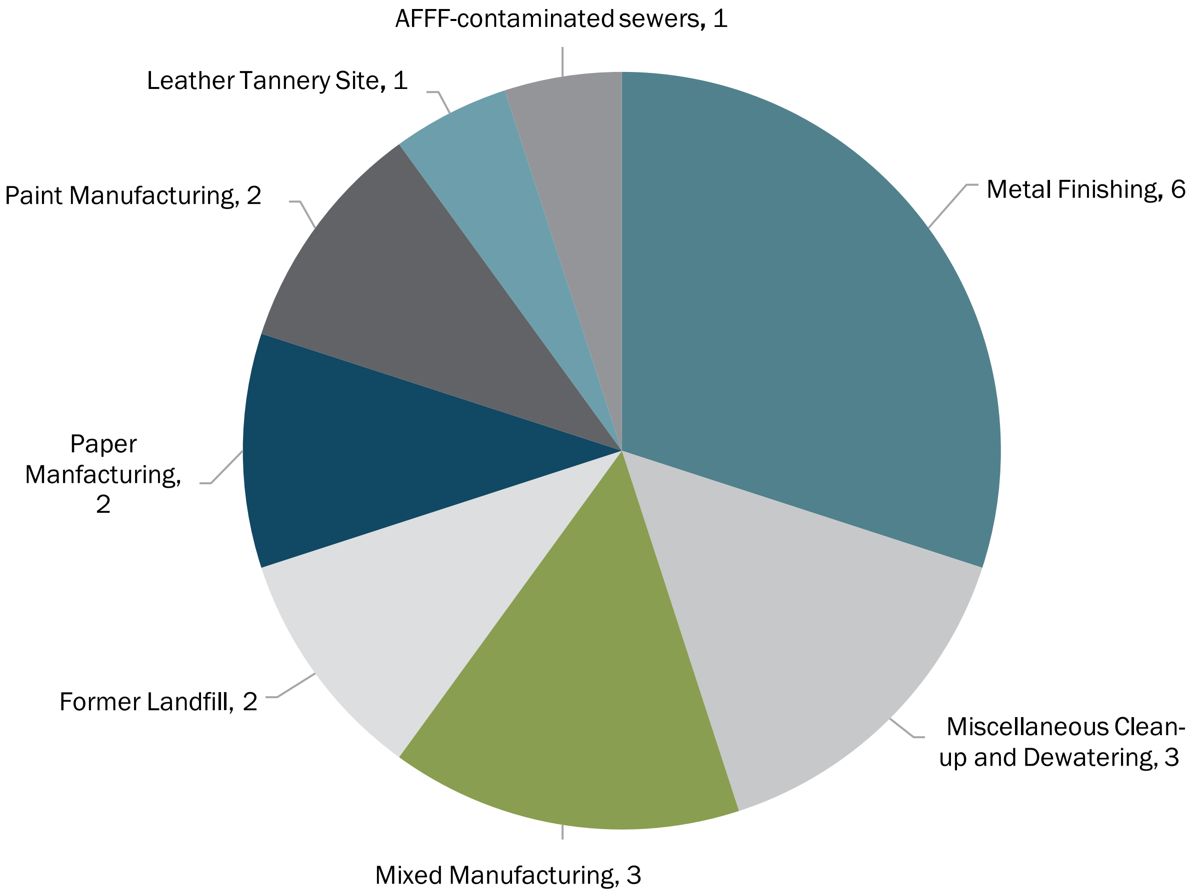
It should be emphasized that some chrome platers did not use PFOS-containing chemicals to control fumes and have not been found to be sources of PFOS to WWTPs. In 2018 EGLE's Air Quality Division (AQD) inspected all 58 chrome platers then subject to regulation under 40 CFR Part 63, Subpart N. This rule limits the addition of PFOS-based fume suppressants after September 2015. The AQD did not find any chrome platers in violation of this federal requirement. About half of the inspected sources subject to Subpart N were found to still use PFAS-based fume suppressants, likely 6:2 FTS as discussed above and in the USEPA/EGLE study *Targeted and Non-Targeted Analysis of PFAS in Fume Suppressant Products and Effluent Samples*.

PFAS-based fume suppressants are not the sole mechanism for complying with the NESHAP. In an EGLE survey, nearly half of the chrome platers regulated under the NESHAP utilized mechanisms other than chemical fume suppression. These include enclosures and physical controls such as scrubbers and composite mesh pad scrubbers; physical fume suppression via plastic balls; and non-PFAS based chemicals. Some platers have substituted trivalent chromium, which has lower toxicity, for hexavalent chromium or have avoided chromium altogether.

CONTAMINATED SITES

Forty contaminated sites were evaluated for PFOS by WWTPs. The sites were contaminated by a wide range of industrial activities. The 20 confirmed sources included contaminated groundwater from former metal finishers (six), mixed manufacturing sites (three), closed landfills (two), former paint manufacturers (two), former paper manufacturing sites (two), a former leather tannery, and a site where AFFF infiltrated into the sanitary sewers. Table 2 includes a miscellaneous category with 12 difficult to categorize sites that were evaluated by WWTPs. Three of the 12 miscellaneous sites were confirmed as sources: a construction dewatering site, a groundwater clean-up at chemical wholesaler, and contamination from a manufacturer of gages. Investigations into the sources of PFOS at these sites are ongoing. Also included in the miscellaneous category are four WWTPs that conducted sanitary sewer monitoring to evaluate potential PFOS/PFOA infiltration due to general concerns about contaminated sites but did not confirm any sources. The general types of contaminated sites found to be sources of PFOS are shown below in Figure 6.

Figure 6. Number of Contaminated Sites by Type that are Sources of PFOS to WWTPs



Contaminated sites evaluated included sites that actively pump treated and untreated groundwater into sanitary sewers as well as sites where contaminated groundwater reached the sanitary sewers via infiltration or inflow. Of 40 contaminated sites evaluated, 27 pumped treated or untreated groundwater into sanitary sewers while the remaining 13 were suspected infiltration/inflow sites. Of the 27 sites pumping groundwater, all 27 were sampled and 13 were confirmed PFOS sources. Thirteen infiltration/inflow sites were sampled and seven were confirmed as sources.

Pumped Groundwater Sites

Thirteen contaminated sites that actively pump treated or untreated groundwater to WWTPs have been identified as significant sources of PFOS. To date, these contaminated sites are associated with mixed manufacturing, metal finishers, paint manufacturers, paper manufacturers, and a few miscellaneous clean-ups including construction dewatering as listed above in Table 2. Since being identified as sources, several of these sites have installed granular activated carbon to remove PFOS. Active remediation projects occurring at a chemical manufacturing site and a former foundry were also evaluated but not found to be sources of PFOS.

Inflow and Infiltration of Contaminated Groundwater

Seven sites were found to be sources of PFOS via infiltration/inflow of contaminated groundwater into sanitary sewers. Infiltration/inflow of PFOS into sanitary sewers from sites contaminated by chrome plating, leather tanning, landfill operations, paper manufacturing, an AFFF site and a miscellaneous clean-up site have been confirmed as PFOS sources by WWTPs as part of the IPP PFAS Initiative. For example, one WWTP receives PFOS when groundwater contaminated by leather tannery waste enters sanitary sewers located in the zone of contamination through cracks in the sewers. PFOS loadings to the WWTP are especially high during seasonal high groundwater periods. A former air force base with contaminated soils and groundwater from repeated training exercises using AFFF has been found to be a source of PFOS to the sanitary sewers in another community, with 82 to 456 ppt PFOS found in nearby sanitary sewers. Contaminated groundwater from the former air force base has migrated off-site and also impacted residential wells and surface waters. In addition, AFFF was used on several fires in the area, creating additional contaminated areas.

Some contaminated sites in Michigan have a complicated history and the origins of PFOS discharges are unclear and may stem from multiple sources. One example is a 413-acre former manufacturing complex operated from 1904 to 2010. PFAS contamination has been documented at the site in the last few years, including PFOS at 27,580 ppt infiltrating into the sanitary sewer. Since significant amounts of groundwater infiltrate into the sanitary sewers at the site, the site contributes significant loadings of pollutants. It is the primary known source of PFOS to the WWTP. Various former operations that may be contributing PFOS to sanitary sewers include metal finishing and associated pretreatment of wastewater, fire-fighting training, and paint/enameling operations. Although not the focus of this discussion, it should be noted that PFAS contaminates soils, groundwater, and storm water runoff at this site.

Drinking Water Source Contamination

Contaminated sites can also impact WWTPs when PFAS contaminates the drinking water source that, following use, is discharged into the sanitary sewers as municipal, commercial, and industrial wastewater. For example, a WWTP eliminated a significant source of PFOS when a municipal well was found to be contaminated by a former paper manufacturer using a 3M product for coating paper. The municipality was able to switch to an alternative source and this resulted in a significant reduction of PFOS loading to the sanitary sewers. Another community uses treated river water as its drinking water source. A WWTP located upstream was found to be passing through PFOS from a chrome plater and the community later attributed PFOS in WWTP effluent to elevated PFOS in its drinking water. Treatment at the upstream WWTP's plater has led to reduced PFOS in the downstream WWTP's effluent and the river as a result.

Combined Sewer Inflow of Contaminated Storm Water

WWTPs can also receive PFOS via inflow of contaminated storm water run-off into sanitary sewers. WWTPs with combined sanitary and storm water systems could be impacted by storm water contaminated by PFOS. A WWTP is receiving storm water contaminated with PFOS due to a petroleum refinery's use of AFFF in a fire training area. This facility is located within a section of combined sewers that discharge to the WWTP. The AFFF usage contaminated the surrounding ground and entered an on-site drainage ditch.

CENTRALIZED WASTE TREATERS

CWTs treat wastewater and industrial process by-products that come from other industries. These facilities receive a wide variety of hazardous and non-hazardous industrial waste for treatment. If a CWT receives waste from sources of PFOS such as landfill leachate, plating waste, and/or paper sludge, PFOS may be discharged to the receiving WWTP if adequate treatment is not used. Most CWTs in Michigan discharge to larger WWTPs. As indicated above, municipal WWTPs are not designed to remove PFOS; however, larger WWTPs typically receive larger volumes of sanitary sewage, which is typically low in PFOS. This may reduce PFOS concentrations in WWTP effluent, thereby lessening a CWT's potential impact on surface waters.

PAPER, CARDBOARD AND PACKAGING MANUFACTURERS

Manufacturers of paper, cardboard and packaging products have been found to discharge low to moderate concentrations of PFOS under the IPP PFAS Initiative. Of ten sources evaluated, nine were found to have discharges of PFOS above the screening level. At the time of this report, most paper/cardboard manufacturers under the IPP PFAS Initiative were still attempting to identify PFOS sources; however, in one case the PFOS source is believed to be recycled paper used in the manufacturing process. While not discovered under the IPP PFAS Initiative, a paper mill in Michigan that makes its product from 100 percent recycled paper stock and discharges process wastewater to the groundwater is being investigated by EGLE as the source of nearby drinking water well contamination. Internal sampling of process wastewater at this mill identified PFOS ranging from 68 to 420 ppt. This finding may support recycled paper as a PFOS source.

In other paper manufacturing cases, it is believed that previously used paper coatings contained PFOS. Previous use of PFOS-containing coatings is a "legacy" issue similar to the chrome plating industry's use of fume suppressants containing PFOS. Residual PFOS contamination from previous use is still impacting current discharges of PFOS. These findings are consistent with recent literature on PFAS in paper manufacturing. One paper making facility used a PFOS process chemical from 3M in combination with a starch during the paper making process from 1980 to 1989. The process wastewater along with any unused or excess product was discharged to the sanitary sewer system. The facility ceased discharging process wastewater to the WWTP in 1989 and has only been discharging sanitary wastewater. However, due to the 1980s-era process wastewater discharge, residual PFOS has remained in the sewer lines resulting in PFOS from the facility's sanitary wastewater discharging to the WWTP.

Some paper manufacturing companies have operated their own landfills for their waste products. These landfills produce leachate containing PFOS that is often discharged to WWTPs. The on-site landfill at one former paper manufacturing facility which discharged to a WWTP, counted as a closed Type III landfill, had PFOS concentrations ranging from 13 to 62 ppt.

COMMERCIAL INDUSTRIAL LAUNDRIES

Commercial Industrial laundry facilities were found to discharge low concentrations of PFOS under the IPP PFAS Initiative. These facilities were laundering articles of clothing that were likely treated with a PFAS-based stain and/or dirt resistant coating. After discontinuing the practice of laundering those articles of clothing, the level of PFOS in the effluent decreased to below PFOS screening levels. At least one facility was laundering items used by manufacturers that were sources of PFOS. These items are now dry cleaned and PFOS concentrations so far have been below screening levels.

CHEMICAL MANUFACTURERS

A small percentage of chemical manufacturers sampled had levels of PFOS above the screening levels. Three out of the four facilities with levels of PFOS above the screening levels in their discharge manufacture chemical compounds that are used by the metal finishing industry. The fourth facility manufactures synthetic lubricating oils and greases and uses a synthetic fluoropolymer of tetrafluoroethylene in the manufacturing process.

AFF SANITARY SEWER CONTAMINATION

Sometimes floor drains, sanitary sewer lines, and pump stations have become contaminated by AFFF, causing discharges of PFOS above screening levels to sanitary sewers. At least one WWTP is receiving PFOS from a fire station where a floor drain and sanitary sewer were contaminated by a firetruck containing AFFF that had a leaky valve. Although the valve was fixed and AFFF and contaminated fire truck water disposed of off-site, it appears that sanitary sewer lines contain residual PFOS that continue to discharge PFOS to the WWTP. This community plans to clean the drain and sanitary sewer to reduce PFOS.

The historical and current use of AFFF at military installations is a source of PFOS to WWTPs. At one facility, when the fire suppression system (which contained AFFF) was tested, the foam would then be discharged to the sanitary sewer system. Over time, this practice has contaminated the sanitary lines. The facility does discharge a small volume of process wastewater; however, most of the discharge is sanitary wastewater. It is believed that the source of PFOS to the WWTP as this site is due to the AFFF contaminated sewer lines.

PFOS REDUCTION

As discussed in the Metal Finishing section above, five WWTPs had single industrial sources that were chrome platers. All five WWTPs have required the industrial sources to install pretreatment, and as of the date of this report all five sources have installed pretreatment and have either reduced discharges below 12 ppt or made significant reductions in PFOS discharges. Likewise, there has also been corresponding reductions in PFOS concentration in biosolids although these improvements clearly lag the improvements seen in effluent. Recent biosolids/sludge sample results at two of these facilities show reductions of nearly an order of magnitude. Pretreatment has been installed at the source for discharges ranging in volume from 5,000 gallons discharged twice a week to 400,000 gallons per day. See Table 3 for highlights in source reduction under the IPP PFAS Initiative.

All effective treatment has been conducted at the source rather than at the municipal WWTP. At least one WWTP tried to augment its treatment for PFOS by increasing virgin carbon dosing from 4,460 lbs/day to 7,400 lbs/day but the effort was not determined to significantly reduce effluent PFOS. As of the date of this report, all source pretreatment has used granulated activated carbon (GAC) in series, sometimes followed by resin for polishing. Changeout of GAC media is needed frequently and there have been issues with media fouling due to other pollutants in wastewater, such as iron, and interference with other treatment chemicals used, such as polymers used as coagulants.

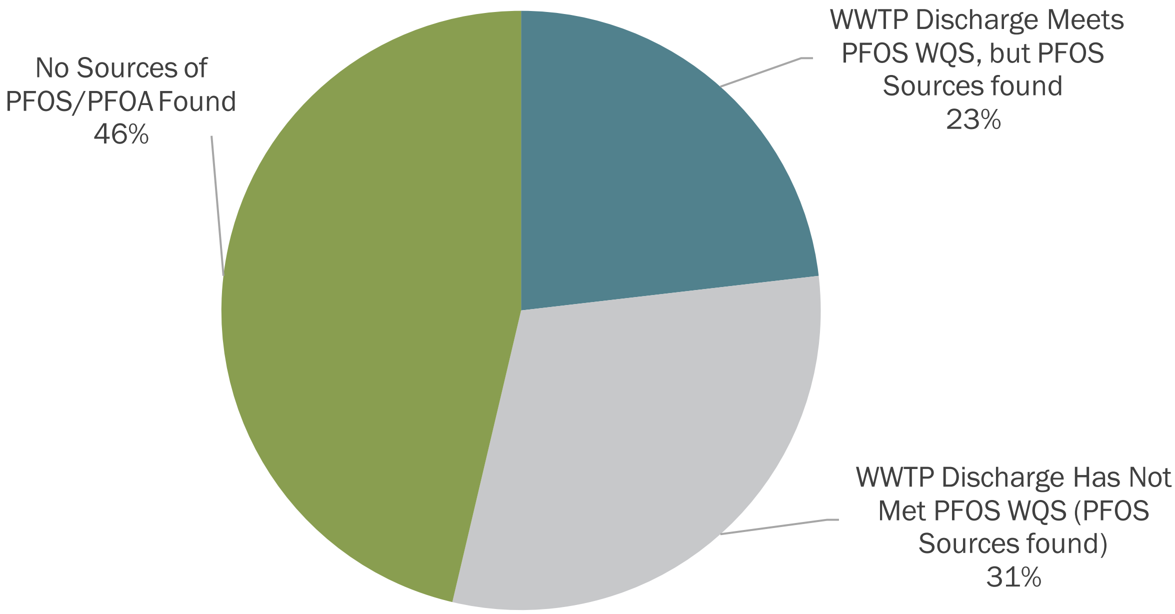
Two chrome platers conducted extensive cleaning of tanks, pits, and equipment associated with their plating lines. Both efforts resulted in some PFOS reduction, but pretreatment remained necessary prior to discharge. Cleaning may be problematic at industries since PFOS may be found in etch tanks, plating tanks, rinse tanks, secondary containment pits, parts racks, air pollution control equipment (which may return contaminated liquids to plating tanks and/or pretreatment systems), and associated pipes, ducts, and valves. In addition, cleaning may not reduce PFOS to acceptable levels, and equipment and surfaces may require replacement. It is expensive to clean or replace all affected equipment.

CONCLUSION AND NEXT STEPS

EFFECTIVENESS

Through the IPP PFAS Initiative, EGLE has successfully identified WWTPs that received PFOS from industrial dischargers. EGLE has effectively worked with WWTPs that have exceeded the PFOS water quality values to implement source reduction to decrease the PFOS concentrations in the influent, effluent, and biosolids/sludge. Thirty-one percent of WWTPs reported effluent that exceeded water quality values at some point in time (Figure 7).

Figure 7: PFAS Compliance Status, 95 WWTPs with IPPs (as of June 26, 2020)



Two years into implementation, there is significant evidence to support that utilizing the established authorities under the IPP to identify and control industrial sources of PFAS (specifically PFOS) to WWTPs is highly effective at reducing the discharge of this pollutant into the environment. Source reduction efforts have resulted in substantial drops in PFOS concentrations being discharged at the WWTPs as shown in Table 3. Likewise, there have been corresponding reductions in PFOS concentrations in biosolids, although these improvements clearly lag the improvements seen in effluent.

Table 3: Substantial Reductions in PFOS concentrations at WWTPs

Municipal WWTP	PFOS, Effluent (ppt, most recent**)	PFOS Reduction in Effluent (highest to most recent)	Actions Taken to Reduce PFOS
Lapeer	<18*	99%	Treatment (GAC) at source (1)
Wixom	17*	99%	Treatment (GAC) at source (1)
Port Huron	15*	99%	Elimination of PFOS source (2)
Howell	4	97%	Treatment (GAC/resin) at source (1)
Bronson	12	97%	Treatment (GAC) at source (1)
Ionia	25*	95%	Treatment (GAC) at source (1)
Kalamazoo	5	88%	Treatment (GAC) at sources (2), change water supply
K I Sawyer	13*	95%	Eliminate leak AFFF, some cleaning
GLWA (Detroit)	37*	23%	Treatment (GAC) at sources (9)

*Greater than Michigan's Water Quality Standard of 12 ppt

**Data (rounded) received as of June 26, 2020

NPDES PERMITTING STRATEGY

Moving forward, EGLE developed a Municipal NPDES Permitting Strategy for PFOS and PFOA. The goal of the strategy is to continue to identify, reduce, and remove PFOS and PFOA at WWTPs. This strategy includes requirements for ongoing monitoring and regulation of PFOS and PFOA at WWTPs. Read more about the *Municipal NPDES Permitting Strategy for PFOS and PFOA* from EGLE at the following link: www.michigan.gov/documents/pfasresponse/Municipal_NPDES_Permitting_Strategy_for_PFOS_and_PFOA_WRD_092019_668823_7.pdf.

ONGOING STUDIES OF WWTP WASTEWATER AND SLUDGE/BIOSOLIDS

EGLE identified WWTPs with industrially impacted biosolids during the IPP PFAS Initiative and prevented further land application of biosolids from those facilities until sources of PFOS could be controlled. The WRD launched a second initiative in the fall of 2018, conducting a study of 42 municipal WWTPs to evaluate the presence of PFAS in influents, effluents, and associated residuals (sludge/biosolids) generated at the facilities. As part of this initiative, screening of 22 land application sites was conducted to further understand the potential impacts to the environment from land-applied biosolids.

For this study, the WRD contracted with a consulting firm, AECOM Technical Services, Inc., to perform sampling at the WWTPs and land application field sites. Samples were analyzed for 24 PFAS compounds. Initial findings from the study found that PFAS were frequently detected in municipal wastewater, residuals, and at land application sites where biosolids were applied. Concentrations in residuals were similar or lower than concentrations identified in previous studies in the United States and other countries with industrial sources.

Through implementation of the IPP PFAS Initiative and the statewide study, the WRD was able to identify six WWTPs with high PFOS concentrations in their WWTP discharge and biosolids/sludge and temporarily restrict land application from those facilities until sources of PFOS are controlled and concentrations in the residuals decrease. Screening of agricultural fields that received biosolids applications found significantly lower PFAS concentrations in various environmental matrices (soils, surface waters, etc.) associated with WWTPs with lower levels of PFAS in their biosolids as compared to those with elevated levels.

EGLE published a brief summary of the status and findings of these two initiatives in the ***Summary Report: Initiatives to Evaluate the Presence of PFAS in Municipal Wastewater and Associated Residuals (Sludge/Biosolids) in Michigan***, which is available at **www.Michigan.gov/documents/egle/wrd-pfas-initiatives_691391_7.pdf**. A more comprehensive report that provides additional information and analysis of the initiatives and results from the field screening is expected to be released later in 2020 and will be posted on the **Michigan PFAS Action Response Team WWTP/IPP Webpage** at **Michigan.gov/PFASResponse** under “Testing,”

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資料②：「ミシガン州の廃水処理プラント（WWTPs）における流入水、流出水、および
残渣におけるPFASの評価（2021年４月）」

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Evaluation of PFAS in Influent, Effluent, and Residuals of Wastewater Treatment Plants (WWTPs) in Michigan

Project Number: 60588767

Prepared in association with
Michigan Department of Environment, Great Lakes, and Energy

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1. Introduction

Per- and polyfluoroalkyl substances (PFAS) are an emerging contaminant class of human-made chemicals that were first developed in the late 1930s and started to be used in commercial products in the late 1940s and early 1950s. The term PFAS is attributed to a large class of chemicals composed of many families that have vastly different physical and chemical properties (Buck, 2011). A recent survey reported more than 4,700 PFAS identified (OECD, 2018). PFAS production increased as these chemicals were incorporated into components of inks, varnishes, waxes, firefighting foams, metal plating, cleaning solutions, coating formulations due to their unique chemical properties as lubricants, water, and oil repellents, paper, and textiles (Paul, 2009). Examples of industries using PFAS include automotive, aviation, aerospace and defense, biocides, cable and wiring, construction, electronics, energy, firefighting, food processing, household products, oil, and mining production, metal plating, medical articles, paper and packaging, semiconductors, textiles, leather goods, and apparel (OECD, 2013, UNEP, 2013).

Many PFAS are highly persistent, bioaccumulative, and toxic and have been detected ubiquitously throughout the environment. Some PFAS undergo partial biotic or abiotic degradation to stable PFAS end-compounds that are highly persistent in the environment (Wang, 2017). Perfluoroalkyl carboxylates (PFCAs) and perfluoroalkyl sulfonates (PFSAs) [collectively known as perfluoroalkyl acids (PFAAs)] are known to be resistant to degradation. Because of the strength of the carbon-fluorine bond, PFAAs are persistent and resistant to biological and thermal degradation; the transformation of PFAAs in Wastewater Treatment Plant (WWTP) processes is not known to occur. By comparison, polyfluorinated compounds, for which some, but not all, carbons are fluorinated, could undergo biotic and abiotic transformation into terminal PFAAs. As a result, these human-made chemicals are expected to be detected for decades in the environment.

Varying concentrations of perfluorooctane sulfonic acid (PFOS), perfluorooctanoic acid (PFOA), and other PFAS have been measured in surface waters in Michigan and biota worldwide in areas remote from known or suspected sources, including in Polar Regions where contamination could occur only through long-range environmental transport (Kannan, 2001; Giesy, 2001; Houde, 2011; Ye, 2008; Stahl, 2014; Custer, 2016; Williams, 2016).

Widespread use of fluorinated chemistry at various manufacturing and industrial facilities in conjunction with extreme resistance to degradation has resulted in the presence of PFAS in the environment and at WWTPs. While WWTPs are not the source of PFAS, they are a central point of collection and could serve as a key location to control and potentially mitigate their release into the environment. Effluents discharged from WWTPs and biosolids applied to the agricultural land for beneficial reuse have been identified as potential PFAS release pathways into the environment by the Interstate Technology and Regulatory Council (ITRC) (ITRC, 2017).

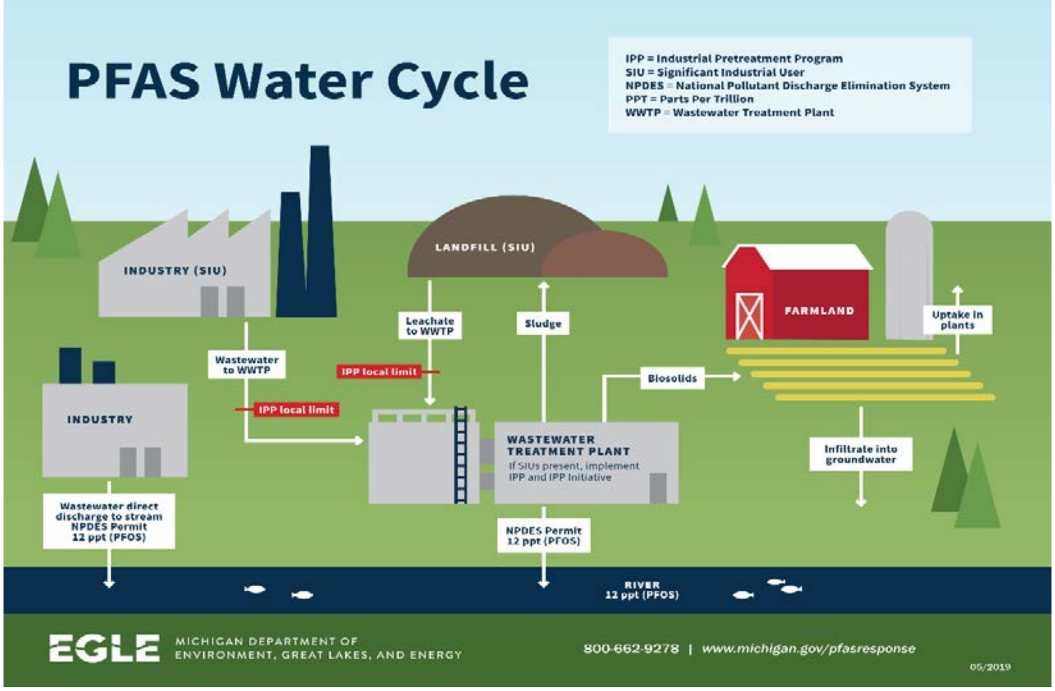
PFAS have been identified in WWTPs since the early 2000s during the 3M-sponsored Multi-City Study from Alabama, Tennessee, Georgia, and Florida. PFAS were also later identified in WWTPs from Minnesota, Iowa, California, Illinois, New York, Kentucky, Georgia, and Michigan (Boulanger, 2005; Higgins, 2005; Schultz, 2006; Sinclair, 2006; Loganathan, 2007; Sepulvado, 2011; Houtz, 2016). Some of the most frequently detected PFAS were PFAAs. This makes WWTPs important in managing and mitigating the environmental spread of PFAAs and a key participant in protecting both human and environmental health.

2. Background

As is often the case with PFAS, while the concept of evaluating the fate and transport seems straightforward, many unanticipated factors may impact both. An example of a PFAS water cycle conceptual infographic provided by the Michigan Department of Environment, Great Lakes, and Energy (EGLE) is presented in **Figure 1**. The occurrence of PFAS in WWTPs may be affected by (EGLE, 2020a):

- Geographical location.
- Rural or urban location.
- The type and number of industrial dischargers within the sewershed or acceptance of trucked waste at WWTPs.
- Past or ongoing PFAS releases into the groundwater or atmosphere that enter the WWTP during wet weather events or high groundwater periods via inflow and infiltration.

Figure 1. PFAS Water Cycle (EGLE, 2020a)



Due to the widespread use of PFAS in many industries and consumer products, industrial discharges are expected to be the primary sources of PFAS to WWTPs. Examples of industrial discharges that could be PFAS sources to WWTPs include (EGLE, 2020a):

- Electroplating & Metals Finishing Facilities
- Landfills
- Centralized Waste Management Facilities
- Airfields – Commercial, Private and Military
- Department of Defense (DoD) Facilities
- Fire Department Training Facilities
- Petroleum or Petrochemical Manufacturers and Storage Facilities
- Commercial Industrial Laundries
- Chemical Manufacturers
- Plastics Manufacturers
- Textile & Leather Facilities
- Paint Manufacturers
- Pulp & Paper Facilities

Analysis of archived biosolids samples (collected in 2001), which represented 94 WWTPs from 32 different US states and the District of Columbia, indicated that PFOS was the most abundant PFAS detected with an average concentration of 402 micrograms per kilogram (µg/kg) dry weight (Min: 308, Max: 618) followed by PFOA at 34 µg/kg dry weight (Min: 12, Max: 70) (Venkatesan, 2013). Solids concentrations from 20 United States WWTPs were also collected in 2004 and 2007. The mean concentration for PFOS was not statistically significantly different for the samples from 2004 and 2007 compared to those from 2001. However, the concentration range was more extensive, for PFOS between 7 to 2,600 µg/kg and PFOS between 4 to 200 µg/kg. PFOA concentrations were also similar for the biosolids samples collected in 2001 and 2004 and 2007, with a concentration range for the samples collected in 2004 and 2007 of 8 to 241 µg/kg. PFOS concentrations in the solids from WWTPs from Switzerland and Australia ranged from 5 to 2,440 µg/kg with a median and mean of 76.5 and 182 µg/kg, respectively (Alder, 2015; Gallen, 2016).

Sources of PFAS in WWTPs from Switzerland were identified from industries and products such as textile, carpet, paper coatings, aqueous film-forming foams (AFFFs), electroplating, and semiconductor industries (Alder, 2015). A strong correlation of PFAS with WWTPs that received industrial discharges was also observed in Germany, Thailand, and other countries (Kunacheva, 2011; Alder, 2015). As a result, there is evidence that PFAS can be correlated with industrial discharges, which resulted in EGLE focusing its study on the WWTPs that are part of the Industrial Pretreatment Program (IPP). The WWTPs required to implement an IPP were expected to be more heavily impacted by PFAS.

3. Industrial Pretreatment Program (IPP) in Michigan

The discharge of pollutants from industrial wastewaters to publicly owned treatment works (POTWs) is regulated in Michigan through the IPP. It should be noted that a POTW is a municipal WWTP along with its collection system (system of sanitary sewers that transport wastewater to the WWTP). For this document's purposes, we use the terms "WWTPs" and "POTWs" interchangeably. The IPP is a significant part of the Federal Clean Water Act’s (CWA) National Pollutant Discharge Elimination System (NPDES). In Michigan, municipalities act as IPP Control Authorities, even for WWTPs of less than five million gallons per day (MGD) in the design flow, meaning that IPP compliance and enforcement is implemented locally. The purpose of the IPP is to:

- Regulate the disposal of industrial wastewater into the sanitary wastewater collection system.
- Protect the physical structures and safety of operation and maintenance personnel of the wastewater collection and treatment system.
- Protect the health and safety of the public and the environment.
- Comply with pretreatment regulations as required under Federal General Pretreatment Regulations and Categorical Standards, state laws and regulations, and local sewer use ordinances.

Generally, industrial users are prohibited from discharging pollutants to WWTPs if these pollutants would:

- Pass through the WWTPs inadequately treated and/or
- Interfere with the operation or performance of the WWTPs, including the management of biosolids.

WWTPs establish site-specific technically-based local limits to achieve these goals.

Eight specific prohibitions apply to pollutants from industrial dischargers to WWTPs, most of which are not directly related to PFAS but provide context as to how industrial discharges are regulated under the IPP:

- Pollutants that create a fire or explosion hazard in the WWTP's sewer system or at the treatment plant.
- Pollutants that are corrosive, including any discharge with a pH lower than 5.0.
- Solid or viscous pollutants in amounts that would obstruct flow in the collection system and treatment plant, resulting in interference with operations.
- Any pollutant, including oxygen demanding pollutants, is released in a discharge at a flow rate and/or concentration, which would cause interference.
- Heat in amounts that would inhibit biological activity in the WWTP, resulting in interference.
- Pollutants resulting in toxic gases, vapors, or fumes in a quantity that may cause acute worker health and safety problems.
- Petroleum oil, non-biodegradable cutting oil, or products of mineral oil origin in amounts that will cause pass through or interference.
- Trucked or hauled pollutants, except at discharge points designated by the POTW.

3.1 Michigan IPP PFAS Initiative

The United States Environmental Protection Agency (USEPA) has classified PFAS as an emerging contaminant that is regulated by EGLE under Part 201, Environmental Remediation, and Part 31, Water Resources Protection, of the Natural Resources and Environmental Protection Act, Act 451 of 1994, as amended and their respective administrative rules, specifically Rule 299.44-299.50 (Generic Cleanup Criteria) and Rule 323.1057 (Rule 57) (Toxic Substances) of the Michigan Administrative Code. The Michigan Rule 57 Water Quality Standards are surface water criteria developed to protect humans, wildlife, and aquatic life. The applicable (most stringent) Water Quality Standards (WQS) for PFOS and PFOA are noncancer human values, as presented in **Table 1**. Due to limited studies and data on PFAS, only PFOA and PFOS have Rule 57 values established in 2011 and 2014.

Table 1. Michigan Rule 57 Surface Water Values for PFOA and PFOS

PFAS	Human Noncancer Value (nondrinking water source)	Human Noncancer Value (drinking water source)	Final Chronic Value	Final Acute Value	Aquatic Maximum Value
PFOS[1]	12	11	140,000	1,600,000	780,000
PFOA[1]	12,000	420	880,000	15,000,000	7,700,000

[1]Units are in nanograms per liter (ng/L) or parts per trillion (ppt). These units are considered equivalent.

Municipal NPDES Permits require permittees to prohibit discharges that cause their POTWs to pass through pollutants greater than WQS to surface waters. The permits further prohibit

NPDES permittees from accepting discharges that restrict, in whole or part, their management of biosolids.

In June 2017, EGLE identified a WWTP passing through PFOS received from an industrial user (i.e., chrome plater) discharging into their collection system. The effluent from the WWTP discharged to the Flint River was at concentrations far exceeding Michigan's WQS for PFOS of 12 ng/L. Downstream elevated levels of PFOS in fish caused the issuance of restrictive fish consumption advisories. In response, EGLE initiated the IPP PFAS Initiative in February 2018 to reduce and/or eliminate PFOA and PFOS from industrial sources that may pass through WWTPs and enter lakes and streams, potentially causing fish consumption advisories or contaminating public drinking water supplies. This effort is one part of a comprehensive, multi-media approach by the State of Michigan to address PFAS in the environment.

The IPP PFAS Initiative required all 95 WWTPs with IPPs to evaluate if PFOA and/or PFOS may be passing through their treatment systems to surface waters and reduce or eliminate any source(s) if found. The WWTPs were required to:

- Identify industrial users discharging to their system that were potential sources of PFOA and PFOS. Based on literature reviews and knowledge of Michigan, EGLE highlighted the following industrial categories as potential sources of PFOA and/or PFOS to WWTPs: metal finishers and electroplaters utilizing fume suppressants, tanneries, leather and fabric treaters, paper and packaging manufacturers, landfill leachate, centralized waste treaters, and sites where aqueous film-forming foam (AFFF) was used. WWTP staff was asked to evaluate these potential sources via surveys, records reviews, and industry staff interviews.
- Sample the effluent of those sources that were likely to have used PFOA and/or PFOS in the past or were currently using some type of PFAS-containing chemical in their processes.
- Sample the WWTP discharge (i.e., effluent) if sources were found to be discharging above a screening level, which EGLE recommended be set conservatively at the WQS for PFOA and PFOS.
- Require PFOA and PFOS reduction at confirmed sources through pollutant minimization plans, equipment/tank change out/cleanouts, product replacements, and treatment installation to remove PFOS before discharge (i.e., pretreatment).
- Recommend WWTPs develop technically-based local limits to determine PFOS and/or PFOA concentrations that can be discharged to the WWTP without passing through at levels exceeding WQS or interfering with the WWTP operation.
- Monitor the progress of industrial users reducing PFOA and PFOS.
- Submit reports and monitoring results as required by EGLE's Water Resources Division (WRD).

In September 2019, EGLE, WRD, published its Municipal NPDES Permitting Strategy for PFOA and PFOS. This permitting strategy is based on the IPP PFAS Initiative.

For WWTPs identified under the IPP PFAS Initiative as having sources of PFOA and PFOS, as NPDES permits are reissued, these will include:

1. PFOS and PFOA WWTP effluent monitoring requirements.
2. Specific analytical methods and quantification levels for PFOA and PFOS.
3. Option to request monitoring frequency reductions for PFOA and PFOS.
4. Pollutant Minimization and Source Evaluation Program for PFOA and PFOS and related reporting requirements for those WWTPs whose effluent exceeds WQS.

5. For WWTPs with IPPs and WWTPs without IPPs categorized as majors (i.e., design flows greater than one million gallons per day), even those where no sources have been found, as NPDES permits are reissued, these will include: PFOA and PFOS monitoring at least four times over the five-year permit cycle.

Also, NPDES Permits issued after October 1, 2021, may contain limits for PFOA and/or PFOS if a WWTP's calculated potential effluent quality exceeds WQS.

The complete NPDES PFAS Permitting Strategy for WWTPs may be found on the MPART Web page through the "Testing and Treatment" tab under "Wastewater Treatment Plants/Industrial Pretreatment Program," or at the following link: https://www.michigan.gov/documents/pfasresponse/Municipal_NPDES_Permitting_Strategy_for_PFOS_and_PFOA_WRD_092019_668823_7.pdf

3.2 Michigan IPP PFAS Initiative Results

PFOA and PFOS have been used for many products and industries, and higher PFOA or PFOS concentrations have been correlated with industrial discharges. As a result, out of approximately 400 WWTPs operating in Michigan, EGLE focused on the 95 WWTPs receiving industrial wastewater regulated under the IPP. The 95 WWTPs with IPPs were expected to have the highest PFOA or PFOS concentrations. All 95 WWTPs evaluated the potential for their industries to discharge PFOA or PFOS using surveys, interviews, records reviews, and other means. A total of 80 effluent sample locations from 75 WWTPs with IPPs were sampled, with five (5) of the WWTPs having two (2) separate effluent sample locations. A total of 54 influent sample locations from 47 WWTPs with IPPs were sampled from WWTPs that were determined to have PFOA and/or PFOS in their effluents, with three (3) WWTPs having two (2) separate influent sample locations and two (2) WWTPs having three (3) separate influent sample locations. The majority of the samples were collected after implementing the Michigan IPP PFAS Initiative in February 2018. However, PFAS samples were collected as early as August 2016 from WWTP #54, with additional facilities sampled in 2017, which will be discussed in more detail in **Section 3.5**. The current report presents the tabulated data for the IPP PFAS Initiative up to July 2020, with a total of seven (7) WWTPs discussed in **Section 3.5**, for which the data were updated up to January 2021. The 95 WWTPs evaluated during the Michigan IPP PFAS Initiative and additional 15 WWTPs without IPPs (i.e., Non-IPP WWTPs) that were also sampled for PFAS are presented in **Table 2** and **Figure 2**. The PFAS results for the Non-IPP WWTPs' will be discussed in **Section 3.7**. The PFOA and PFOS results from all the WWTP's influents and effluents are provided in **Table 3**.

3.3 PFOA and PFOS Influent IPP PFAS Initiative Results

The total number of WWTPs with PFOA and PFOS influent detections and detection frequency is provided in **Table 4**. The influent detection frequency was 76% for both PFOA and PFOS and as high as 81% for detecting either PFOA or PFOS. The influent concentrations for WWTPs with IPPs for PFOA and PFOS are presented in **Figures 3** and **4**, respectively. A statistical summary of the influent PFOA and PFOS minimum concentration, 25th, 50th, 75th percentiles, average, and maximum concentrations for all WWTPs and the statistical summary for three primary data sets: **Recent**, **Average**, and **Maximum** is presented in **Table 5**. The Recent dataset's statistical summary was obtained using recent results (up to July 2020) for the WWTPs, which were sampled multiple times. The statistical summary for the **Average** dataset was obtained using the average results for the WWTPs sampled multiple times up to July 2020 and a limited number of seven (7) WWTPs up to January 2021. Finally, the Maximum dataset's statistical summary was obtained using the maximum concentration ever recorded for each WWTP that was sampled multiple times. The WWTPs, which were only sampled once, used the same sample results for all three statistical datasets **Recent**, **Average**, and **Maximum**.

Industrially impacted WWTPs greatly influenced the average, 75th Percentile, and maximum concentrations resulting in a higher bias, especially for the **Maximum** dataset category compared to the other two categories. For example, the PFOS average concentrations for the **Maximum** dataset category were 96 nanograms per liter (ng/L) compared to the average concentrations of 25 ng/L and 29 ng/L for the **Recent Average** dataset categories, respectively. This indicates that a small number of industrially impacted WWTPs with very high concentrations could lead to a high biased average result even when many WWTPs are sampled.

The concentration ranges for PFOS were higher than those for PFOA. PFOS has a lower WQS than PFOA and was determined to be the regulatory driver for the WWTPs. PFOS was many times higher than those of PFOA in the influent samples. The influent concentrations are not representative of the effluent concentrations of the WWTPs. While the WQS are only applicable to the effluent concentrations, they were used to compare the influent concentrations. All of the PFOA concentrations were lower than even the most stringent WQS criterion of 420 ng/L. In contrast, 24 out of 41 WWTPs (58%) had PFOS influent concentrations above both WQS criteria of 11 and 12 ng/L.

Table 4. Influent Detection Frequency for PFOA and PFOS in WWTPs[1]

PFAS	WWTPs Sampled	Total Non-Detect	Total Detections	Percent Detection
PFOA	54	13	41	76%
PFOS	54	13	41	76%
PFOA or PFOS	54	10	44	81%

[1] A total of 3 IPP WWTPs had 2 separate influents, and 2 IPP WWTPs had a total of 3 separate influents.

Table 5. Statistical Summary for PFOA and PFOS Influent Concentrations in WWTPs[1]

	PFOA Recent	PFOA Average	PFOA Maximum	PFOS Recent	PFOS Average	PFOS Maximum
Minimum	2	2	2	4	2	2
25th Percentile	4	4	5	6	7	8
50th Percentile	5	5	6	11	12	17
75th Percentile	8	9	12	20	30	55
Average	10	8	20	25	29	96
Maximum	71	52	330	204	356	1,200

[1] WWTPs with multiple results used the following data sets for statistical analysis: **Recent** = The most recent available data for each WWTP was used; **Average** = Average concentration of the entire dataset available for each WWTP was used, and **Maximum** = The highest recorded concentration for each WWTP was used. **Units**: ng/L or ppt.

Figure 3. Influent PFOA Concentrations in WWTPs

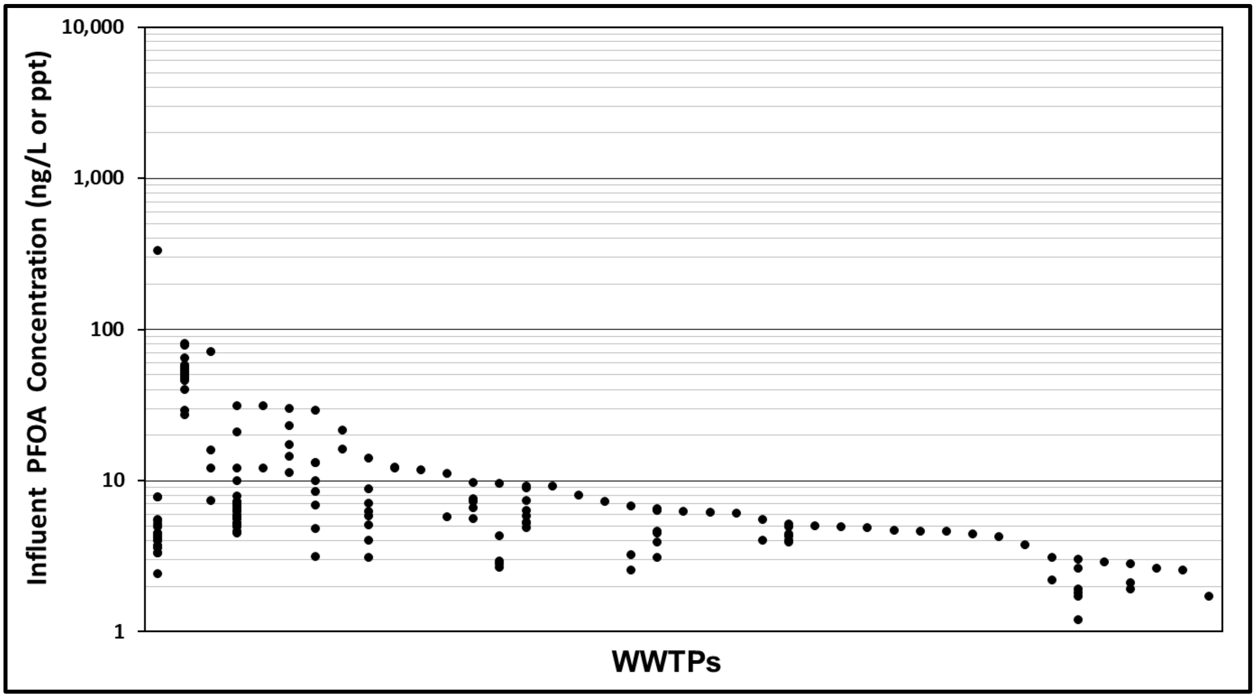
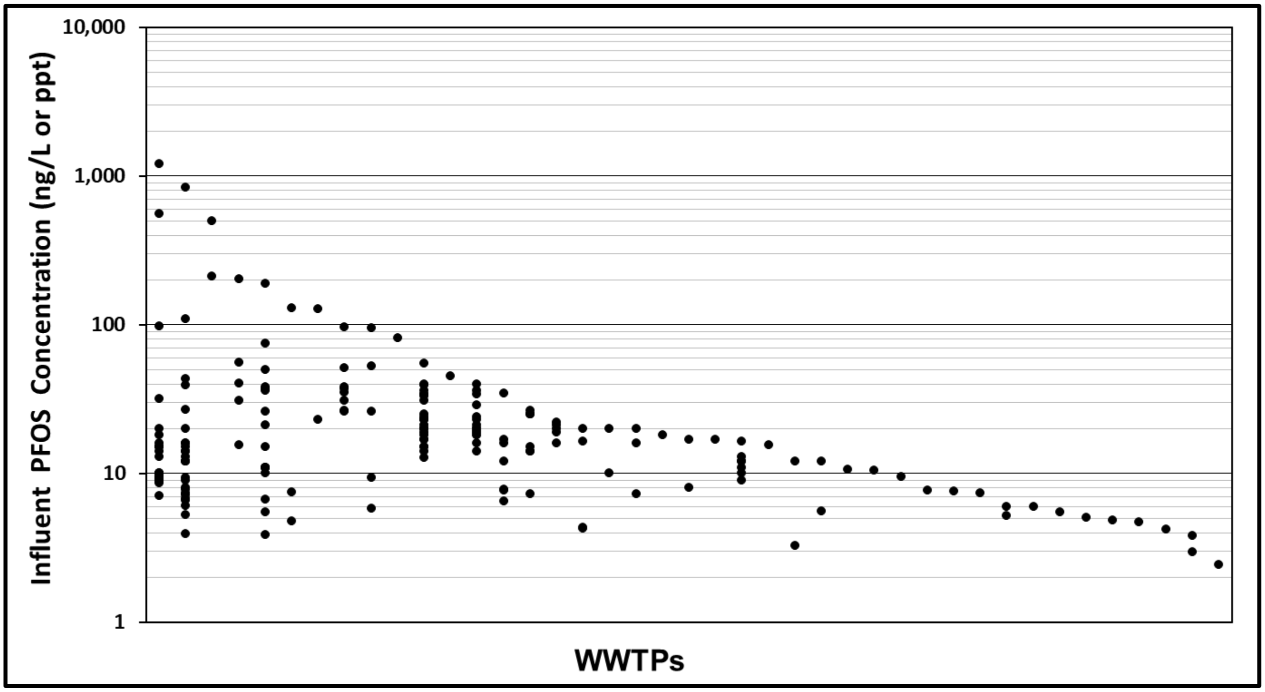


Figure 4. Influent PFOS Concentrations in WWTPs



3.4 PFOA and PFOS Effluent IPP PFAS Initiative Results

There are limited studies on many other PFAS, and only PFOA and PFOS have WQS standards established in 2011 and 2014, respectively. As a result, the IPP PFAS Initiative's focus was on PFOA and PFOS, emphasizing PFOS, which was identified as the regulatory driver. The total number of WWTPs with PFOA and PFOS effluent detections and detection frequency is provided in **Table 6**. The influent detection frequency for PFOA was 94%, PFOS was 88%, and finally 94% for detecting either PFOA or PFOS.

Table 6. Effluent Detection Frequency for PFOA and PFOS in WWTPs[1]

PFAS	WWTPs Sampled	Total Non-Detect	Total Detections	Percent Detection
PFOA	80	5	75	94%
PFOS	80	10	70	88%
PFOA or PFOS	80	5	75	94%

[1] A total of 5 IPP WWTPs had 2 separate effluents. PFOA was detected in all these effluents.

Depending on the PFOS effluent concentrations, some WWTPs were required to sample multiple times, as presented in **Table 7**. A small number of WWTPs identified industrial discharges of PFOS that significantly impacted the WWTP effluent and sludge/biosolids. The effluent concentrations in these industrially impacted WWTPs resulted in effluent PFOS concentrations above 50 ng/L and as high as 4,800 ng/L. The industrially impacted WWTPs and EGLE are working together to reduce the PFOS concentrations in the industrial discharges to the WWTPs. As a result, some of the WWTPs had a significant drop in their effluent PFOS concentrations, which can be seen in the PFOS concentration ranges at those WWTPs presented in **Figure 6** and discussed in detail in **Section 3.5**.

Table 7. Effluent Monitoring Frequency and Criteria for WWTPs[1]

Monitoring Frequency	Sources Present	PFOS Effluent > WQS	PFOS Effluent Data (ng/L)
Monthly	Yes	Yes	>50
Quarterly	Yes	Yes	13 to 50
Twice Annual	Yes	No	≤ 12
Four times per 5-year Permit Cycle[2]	No	No	≤ 12

[1] An industrial discharge was considered a source if the concentration of PFOS > 12 ng/L in the industrial effluent.

[2] WWTPs in the last category include locations that did not sample their effluent because industrial discharges were not associated with typical sources of PFOA and PFOS.

The effluent concentrations for WWTPs with IPPs for PFOA and PFOS are presented in **Figures 5** and **6**, respectively. A statistical summary of the effluent PFOA and PFOS minimum concentration, 25th, 50th, 75th percentiles, average, and maximum concentrations for all WWTPs is presented in **Table 8**. **Table 8** presents the statistical summary for three primary data sets: **Recent**, **Average,** and **Maximum**. The **Recent** dataset's statistical summary was obtained using recent results (up to July 2020) for the WWTPs, which were sampled multiple times. The statistical summary for the **Average** dataset was obtained using the average results for the WWTPs sampled multiple times up to July 2020. Finally, the **Maximum** dataset's statistical summary was obtained using the maximum concentration ever recorded for each WWTP that was sampled multiple times. The WWTPs, which were only sampled, used the same sample results for all three statistical datasets **Recent**, **Average**, and **Maximum**.

As stated previously, industrially impacted WWTPs greatly influenced the average, 75th Percentile, and maximum concentrations resulting in a higher bias, especially for the **Maximum** dataset category compared to the other two categories. For example, the PFOS average concentrations for the **Maximum** dataset category was 160 ng/L compared to the average concentrations of 15 ng/L and 16 ng/L for the **Recent** and **Average** dataset category, respectively. This indicates that a small number of industrially impacted WWTPs with very high concentrations could lead to an average high biased result even when many WWTPs are sampled.

The highest concentration and overall concentration ranges for PFOS were higher than those for PFOA. PFOS has a lower WQS than PFOA and was identified as the compound of primary interest at the WWTPs, with many of the results above the WQS criteria of 11 and 12 ng/L. Only one WWTP had a PFOA concentration higher than the most stringent WQS criterion of 420 ng/L during February through April 2019, with the highest PFOA concentration of 660 ng/L. However, additional sampling showed significantly lower concentrations with a sample from July 29, 2020, having a PFOA concentration of 37 ng/L. In contrast, 33 out of 70 PFOS detections in WWTPs (47%) from 80 WWTPs sampled had PFOS concentrations above both WQS criteria of 11 and 12 ng/L for at least one of the effluent samples, including those that were sampled multiple times.

Table 8. Statistical Summary for PFOA and PFOS Effluent Concentrations in WWTPs[1]

	PFOA Recent	PFOA Average	PFOA Maximum	PFOS Recent	PFOS Average	PFOS Maximum
Minimum	1	2	2	2	1	1
25th Percentile	6	5	7	5	5	5
50th Percentile	9	9	11	8	8	11
75th Percentile	15	13	20	15	16	30
Average	12	13	28	29	26	160
Maximum	82	124	660	440	371	4,800

[1] WWTPs with multiple results used the following data sets for statistical analysis: **Recent** = The most recent available data for each WWTP was used; **Average** = Average concentration of the entire dataset available for each WWTP was used, and **Maximum** = The highest recorded concentration for each WWTP was used. **Units**: ng/L or ppt.

Figure 5. Effluent PFOA Concentrations in WWTPs

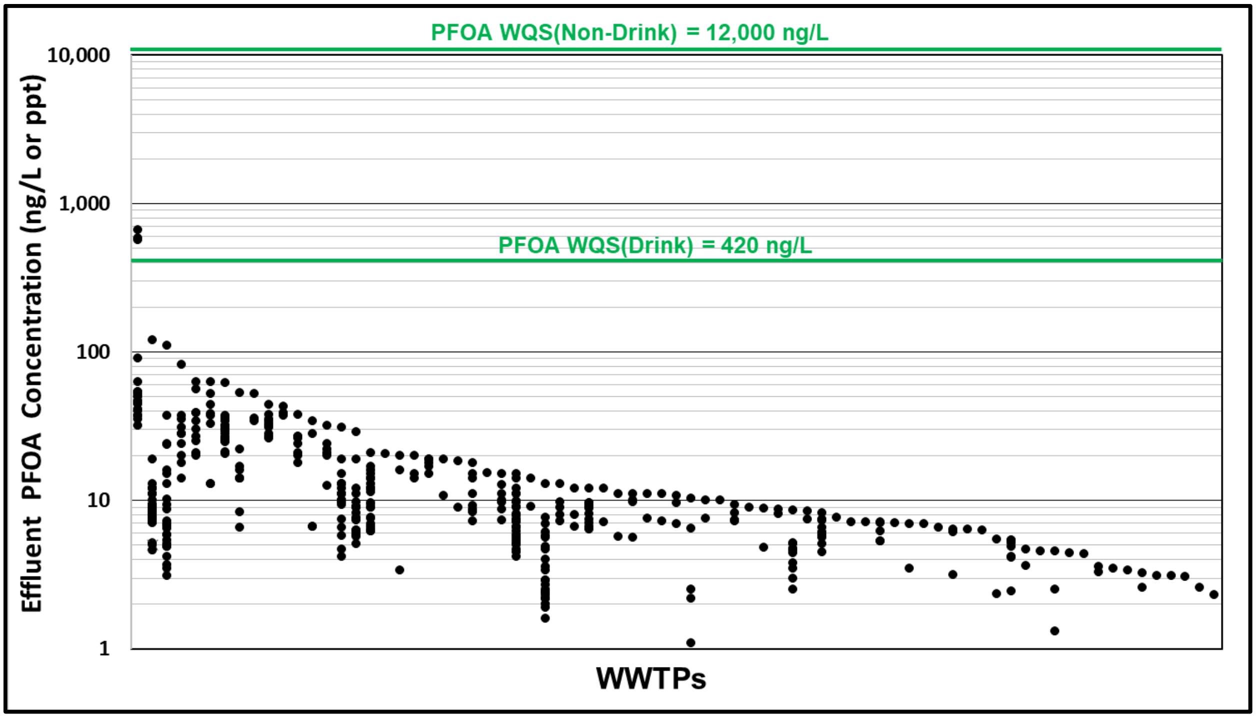
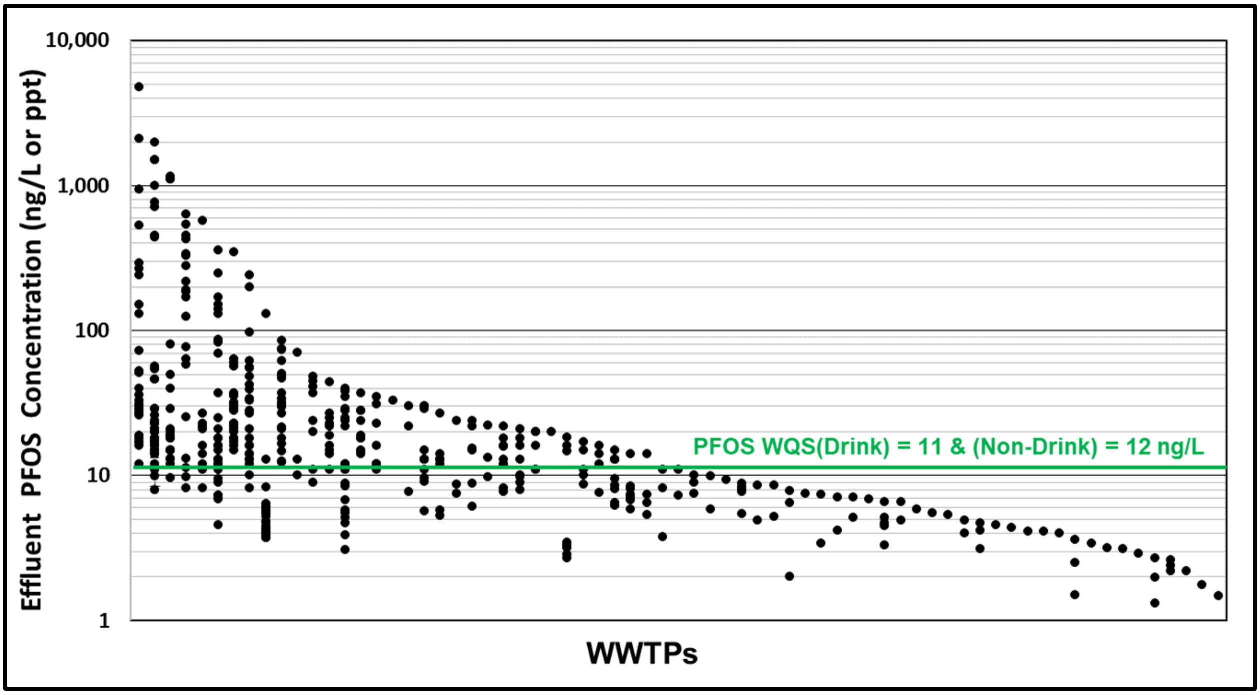


Figure 6. Effluent PFOS Concentrations in WWTPs



3.5 IPP Source Reduction

EGLE has worked closely with the WWTPs and industrial users to reduce the PFOS discharges to the WWTPs. The PFOA effluent concentrations were always below the WQS, except for one WWTP (i.e., WWTP #74) for a limited time from February through April 2019, where three results between 570 and 660 ng/L were above the PFOA WQS. However, after these higher detections, PFOA concentrations have ranged between 32 to 61 ng/L. As a result, PFOS was the main regulatory compound of interest and regulatory driver. For a subset of WWTPs, a total PFOS reduction between 88% to 99% was achieved through source reduction efforts (**Table 9**). Metal finishers (e.g., chrome platers) were identified as one of the main industrial dischargers that contributed the most significant mass of PFOS to the WWTPs. Some WWTPs have only one metal finisher discharging to the WWTP. As a result, in some instances, installing a single pretreatment system on the discharge from the one metal finisher resulted in a significant drop in the PFOS effluent concentrations at the WWTP.

Following source reduction actions, reductions in PFOA and PFOS concentrations in effluent and sludge/biosolids were measured at seven (7) WWTPs (i.e., #14, 49, 50, 53, 54, 57, and 92). PFOA and PFOS concentrations before and after source reduction actions were implemented are presented in **Figures 7** through **13**. Because PFOA was relatively low in the final effluent and well below the most stringent WQS criterion of 420 ng/L at all WWTPs, except for WWTP #74, it was not a pretreatment target. However, source reduction efforts for PFOS are also expected to result in decreasing concentrations for PFOA. Due to large differences in the PFOA and PFOS concentrations between the biosolids and effluent, the figures use two (2) Y-Axes, with the left Y-Axis representing concentrations for the effluent samples as ng/L and the right Y-axis representing biosolids concentrations as µg/Kg. Most WWTPs showed a significant drop in PFOS concentrations in the effluent after the source reduction efforts. The majority of the WWTPs presented in **Table 9** were land-applying biosolids. EGLE determined the biosolids from six (6) WWTPs (i.e., #14, #50, #54, #57, #69, and #92) were above the EGLE PFOS threshold of 150 µg/Kg for biosolids to be considered industrially impacted. The PFOS threshold value of 150 µg/Kg is not a risk-based number. As more information about the fate and transport of PFOS becomes available, including the field study results, the PFOS threshold will be reevaluated as necessary. EGLE temporarily rescinded authorization to land apply biosolids for WWTPs #14, #50, #54, and #57. WWTP #92 stopped land applying biosolids in 2018, and WWTP #69 has never land applied biosolids. After the source reduction implementation, the PFOS concentrations in the effluent dropped significantly, and many of these WWTPs did not frequently sample their sludge or biosolids.

Bronson WWTP (WWTP #14) initially sampled the influent and effluent for PFAS in May 2018, which identified a PFOS concentration of 12 ng/L in the influent and 150 ng/L in the effluent. The biosolids were first sampled for PFAS in August 2018 and identified a PFOS concentration of 970 µg/Kg. Additional effluent samples collected until December 2018 had PFOS concentrations ranging from 37 to 360 ng/L, with an additional biosolids sample collected in October 2018 with a PFOS concentration of 1,060 µg/Kg. Source reduction efforts were performed in November 2018. As a result, the effluent PFOS concentrations started to drop significantly in 2019, with a PFOS concentration of 4.5 ng/L reported in December 2020. An unusually high PFOS concentration in the biosolids was recorded in April 2019 as 6,500 µg/Kg. The biosolids were only sampled again in 2020, with PFOS concentrations ranging between 72 to 390 µg/Kg. In early 2020, the impacted biosolids were segregated into geotubes for dewatering and offsite disposal.

Howell WWTP (WWTP #49) initially sampled the influent in August 2018 and effluent in May 2018 for PFAS, which identified a PFOS concentration of 10 ng/L in the influent and 13 ng/L in the effluent. Source reduction efforts were made in August 2018, and the final treated solids were sampled once in November of 2018 and identified a PFOS concentration of 21 µg/Kg. The highest PFOS concentration of 130 ng/L in the effluent was recorded before the source reduction efforts. After source reduction implementation, the PFOS concentration in the effluent remained below the PFOS WQS of 12 ng/L, with a result of 4.8 ng/L reported in November 2020.

Ionia WWTP (WWTP #50) initially sampled the influent in October 2018 and effluent in May 2018 for PFAS, which identified a PFOS concentration of 499 ng/L in the influent and 280 ng/L in the effluent. The biosolids were first sampled in August 2018 and identified a PFOS concentration of 1,000 µg/Kg. Before the source reduction efforts, PFOS concentrations in the effluent ranged from 59 to 635 ng/L. The biosolids were sampled again in November 2018 and had a PFOS concentration of 983 µg/Kg. Source reduction efforts were implemented in May 2019, after which the effluent PFOS concentrations ranged between 8.16 and 169 ng/L in 2019 and below the detection limit of 6.04 ng/L in August 2020. The PFOS concentrations in the biosolids also declined to 120 µg/Kg in 2019, with a PFOS concentration of 81 µg/Kg in May 2020.

Kalamazoo WWTP (WWTP #53) initially sampled the influent and effluent for PFAS in May 2018, which identified a PFOS concentration of 38 ng/L in the influent and 38 ng/L in the effluent. The biosolids were sampled only once in October 2018 and identified a PFOS concentration of 6.5 µg/Kg. Source reduction efforts were first implemented in July 2018 by installing GAC on a discharge of contaminated groundwater. Additional source reduction was performed in August 2018 when the source for the drinking water for the City of Parchment was switched due to the PFAS impacts identified on the initial drinking water source. After source reduction efforts from July and August 2018, the effluent PFOS concentrations dropped below the PFOS WQS of 12 ng/L by August 2018 and remained below five (5) ng/L since September 2018.

KI Sawyer WWTP-Marquette Co. (WWTP #54) initially sampled the influent and effluent for PFAS in August 2016, which identified a PFOS concentration of 67 ng/L in the influent and 98 ng/L in the effluent. WWTP #54 is near and receives waste from a former Air Force Base. Initial sampling was conducted as part of ongoing environmental investigations at current and former Department of Defense (DoD) sites where aqueous film-forming foam (AFFF) containing PFAS was used for fire-fighting. The biosolids were sampled initially in August 2018 and identified a PFOS concentration of 78 µg/Kg. Source reduction efforts were implemented in December 2018, where a leaking tank of AFFF was repaired. Before the source reduction efforts, the highest PFOS concentration in the effluent was 240 ng/L. After source reduction efforts, the highest PFOS concentration in the effluent was 56 ng/L, with a result of 9.1 ng/L in December 2020. Multiple biosolids samples were collected with the highest PFOS concentration of 3,600 µg/Kg. The PFOS concentrations of more recent biosolids concentrations sampled in 2020 ranged between 85 to 160 µg/Kg.

Lapeer WWTP (WWTP #57) initially sampled the influent in September 2017 and effluent in May 2017 for PFAS, which identified a PFOS concentration of 560 ng/L in the influent and 440 ng/L in the effluent. Initial sampling in 2017 occurred as part of a PFOS source tracking investigation in the South Branch of the Flint River. The biosolids were initially sampled in August 2017 and identified a PFOS concentration of 2,100 µg/Kg. The highest PFOS concentration in the WWTP effluent before source reduction efforts was 2,000 ng/L PFAS reduction efforts were implemented in November 2017 to install granular activated carbon (GAC) at the industrial source. This treatment was later improved with a modified GAC treatment system designed for the specific industry. PFOS concentrations in the WWTP effluent dropped significantly after March 2018, with the highest concentration of 54 ng/L in May 2018 and 7.9 ng/L on January 14, 2021. Two separate biosolids streams were sampled from different storage locations. One set of samples was collected from the former digester tanks, including the sample collected in May 2018 from the drying bed, and are representative of the biosolids collected in 2017 (red triangles from **Figure 12**). PFOS concentrations from the first set of samples ranged from 1,680 to 2,100 ug/kg. The samples collected later in 2020 from the former digestors had PFOS concentrations ranged between 72 to 120 µg/Kg. The second set of biosolids samples were collected from the north and south storage tanks beginning November 2019 (brown diamonds from **Figure 12**). PFOS concentrations from the second set ranged between 83 and 160 µg/Kg. Please note that recent biosolids samples collected from both storage locations were similar.

Wixom WWTP (WWTP #92) initially sampled the influent in November 2017 and effluent in June 2017 for PFAS, which identified a PFOS concentration of 128 ng/L in the influent and 290 ng/L in the effluent. Source reduction efforts were implemented in October 2018. PFOS concentrations in the effluent before the source reduction implementation was as high as 4,900 ng/L. The PFOS concentrations in the effluent after the source reduction efforts ranged from 17 to 269 ng/L, with a PFOS concentration of 21 ng/L in November 2020. The biosolids were initially sampled from the storage tank for land application and the cake from the belt filter press in August 2018. They identified a PFOS concentration of 3,100 and 8,600 µg/Kg, respectively. Both locations were resampled in November 2018, and the PFOS concentrations were 2,150 and 1,200 µg/Kg, respectively. No other biosolids samples were collected as WWTP #92 ceased to perform land applications in 2018.

The highest PFOA concentrations in the biosolids for the seven (7) WWTPs where significant source reduction efforts were made were 25 µg/Kg for WWTP #54 and 11 µg/Kg for WWTP #69. The PFOA concentrations were significantly lower than those of PFOS in the biosolids for the same WWTPs of 387 and 160 µg/Kg, respectively. Source reduction implementation sometimes took a period of time, and some fluctuations in the PFOS concentrations were observed in the influent, effluent, and/or biosolids even after source reduction implementation. For WWTPs that collected a limited number of biosolids samples, sometimes only before the source reduction implementation or a very short time after it, the data does not show a significant drop in PFOS concentrations in the biosolids. However, based on the analytical data from WWTPs, where multiple samples were collected, the PFOS concentrations in the biosolids did drop significantly, like the concentrations in the effluent.

Table 9. Substantial PFOS Reduction at WWTPs with Exceedances

Municipal WWTP	Recent PFOS, Effluent* (ng/L)	PFOS Reduction (highest to most recent)	Actions Taken to Reduce PFOS
Bronson WWTP	5	99%	Treatment (GAC) at source (1)
Howell WWTP	5	96%	Treatment (GAC/Resin) at source (1)
Ionia WWTP	<6	99%	Treatment (GAC) at source (1)
Kalamazoo WWTP	5	90%	Treatment (GAC) at source (2), change of water supply
KI Sawyer WWTP	9	96%	Eliminated leak of AFFF
Lapeer WWTP	8.2	99%	Treatment (GAC) at source (1)
Wixom WWTP	34	99%	Treatment (GAC) at source (1)

*Data received as of December 31, 2020

Figure 7. Temporal PFOA and PFOS Effluent and Biosolids Concentrations in Bronson WWTP

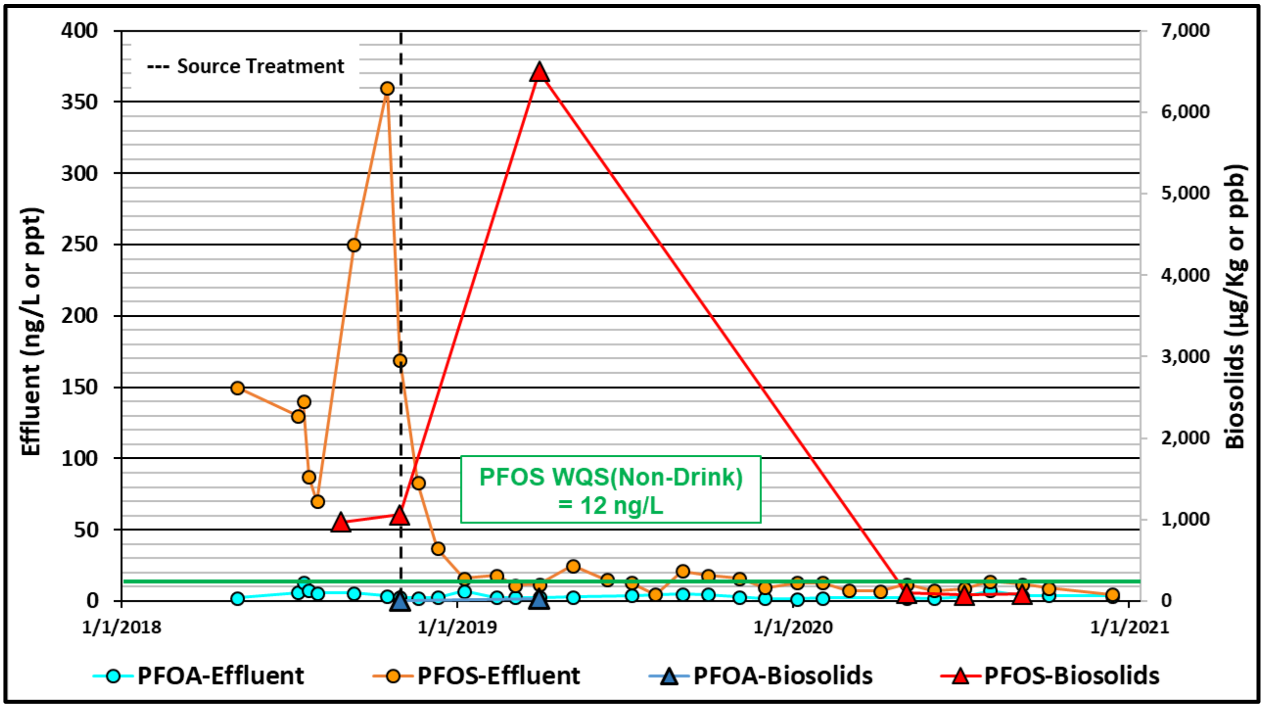


Figure 8. Temporal PFOA and PFOS Effluent and Biosolids Concentrations in Howell WWTP

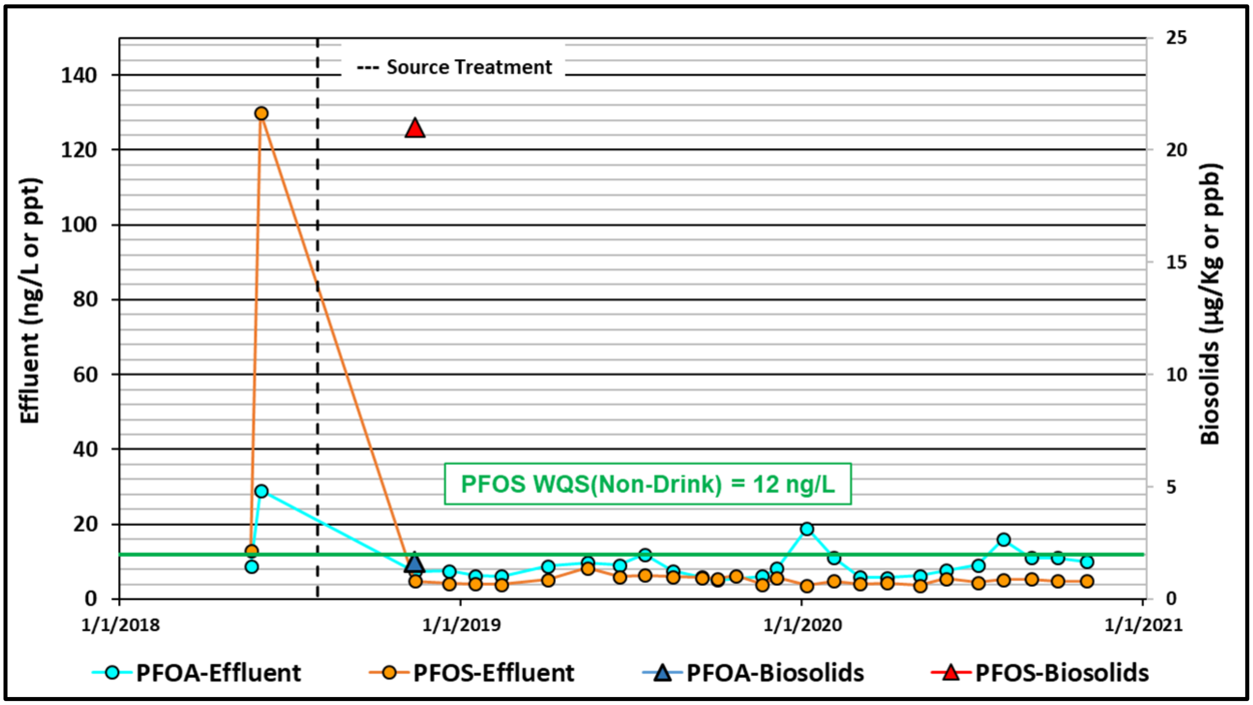


Figure 9. Temporal PFOA and PFOS Effluent and Biosolids Concentrations in Ionia WWTP

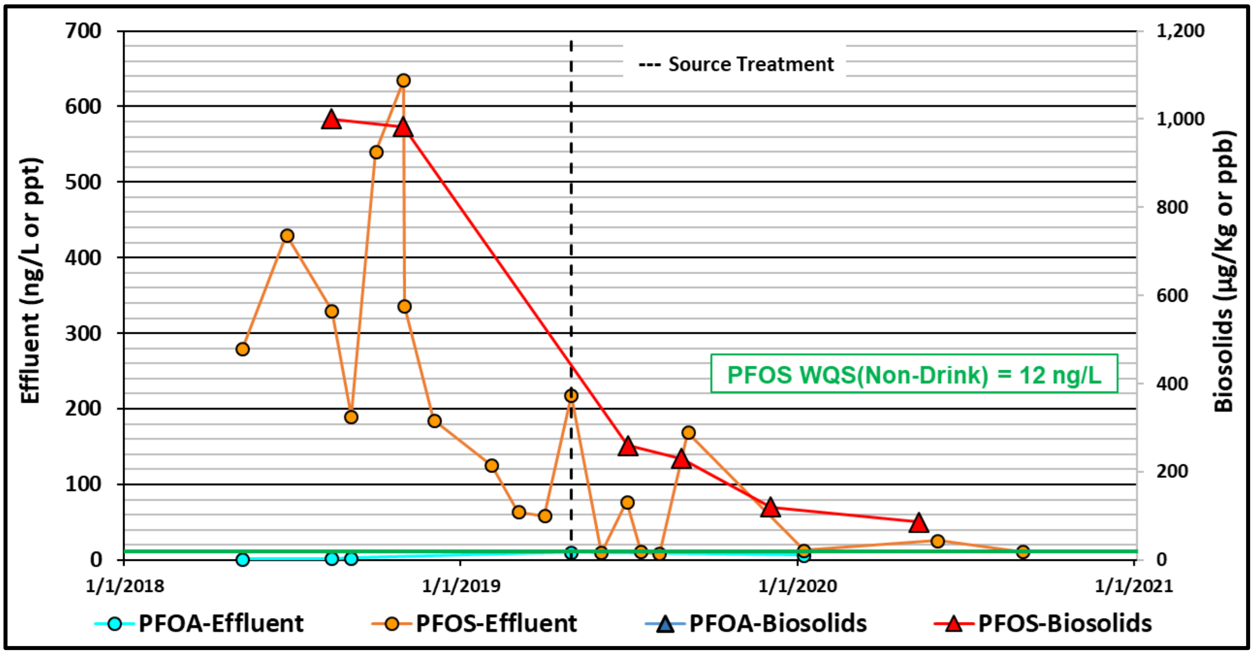


Figure 10. Temporal PFOA and PFOS Effluent and Biosolids Concentrations in Kalamazoo WWTP

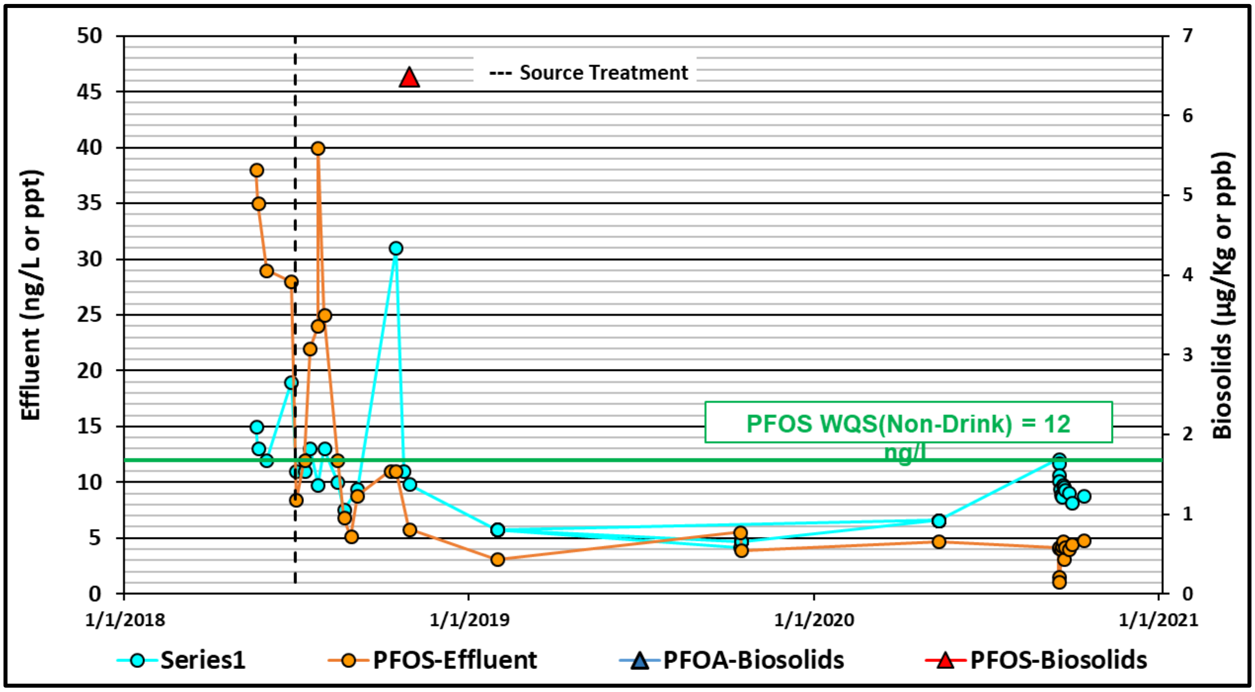


Figure 11. Temporal PFOA and PFOS Effluent and Biosolids Concentrations in KI Sawyer WWTP

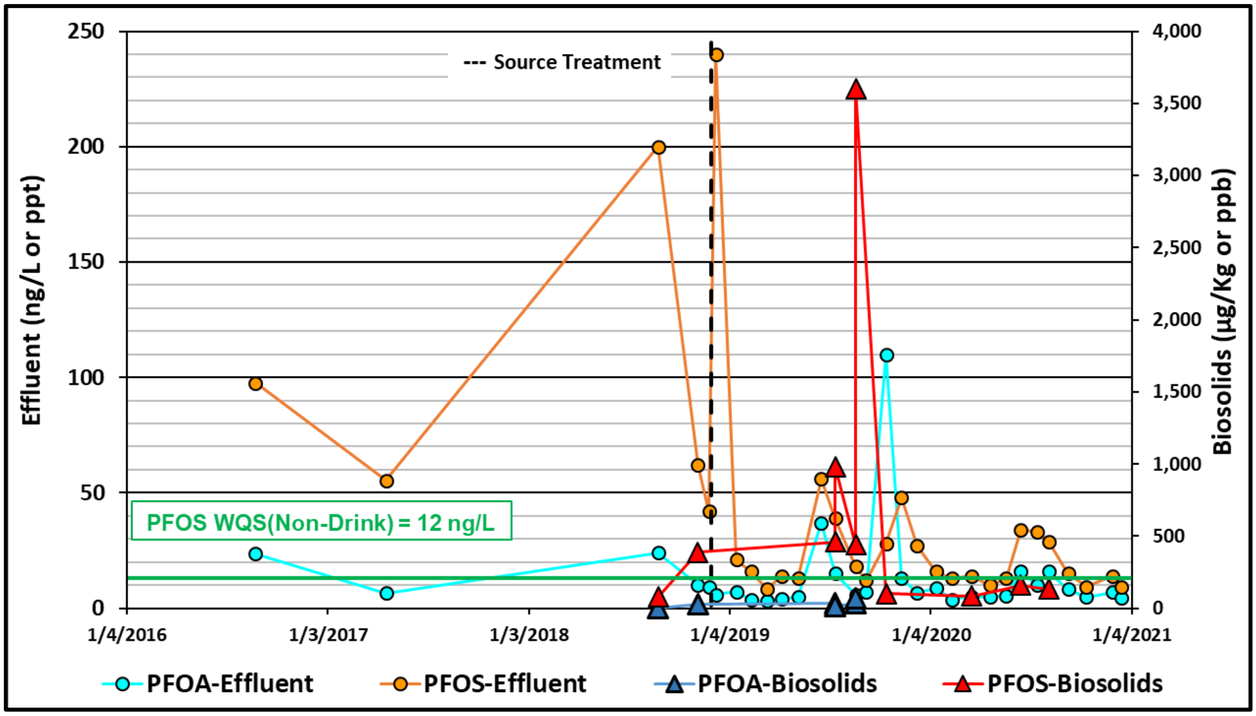


Figure 12. Temporal PFOA and PFOS Effluent and Biosolids Concentrations in Lapeer WWTP

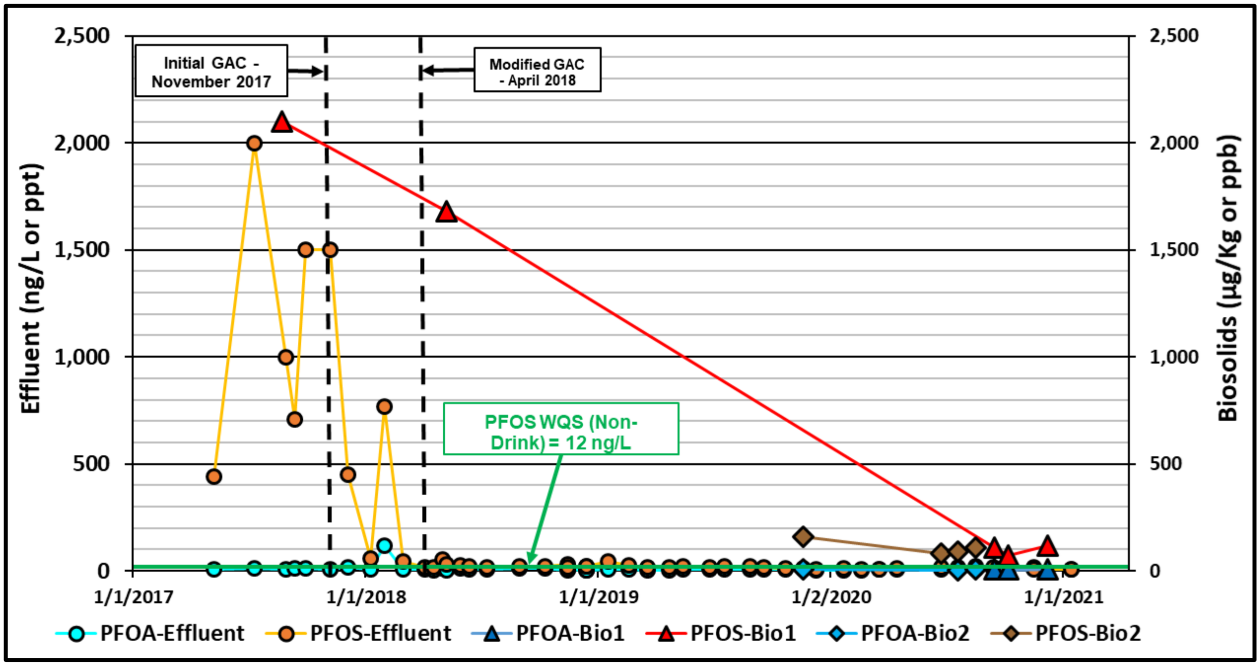
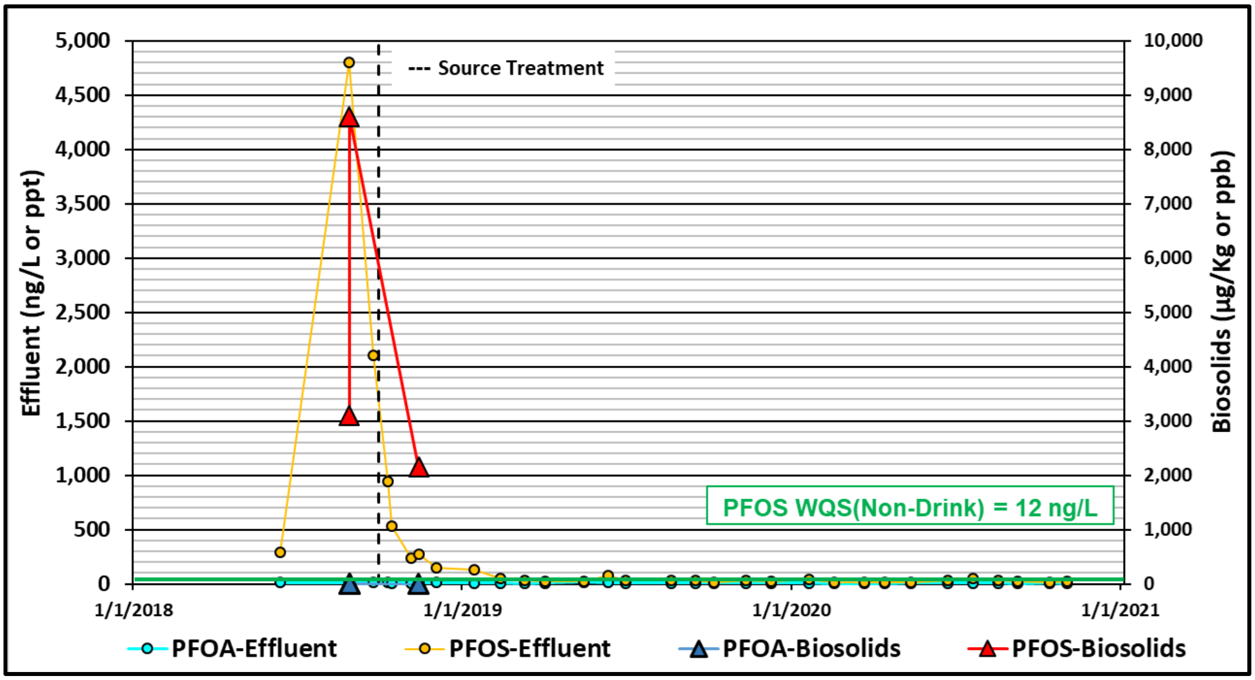


Figure 13. Temporal PFOA and PFOS Effluent and Biosolids Concentrations in Wixom WWTP



3.6 Non-IPP WWTP PFAS Investigation Results

A limited number of WWTPs that do not receive industrial discharges regulated under the IPP (i.e., Non-IPP WWTPs) were also sampled, with a total of 7 influent and 15 effluent samples collected. The sampling of Non-IPP WWTPs was done to document possible PFOS secondary sources within the sanitary sewer, to provide the study with WWTPs without any significant industrial discharges, and to evaluate specific treatment processes and their effect on PFAS fate and transport within WWTPs. The number of Non-IPP WWTPs sampled was significantly lower than those of IPP WWTPs, therefore comparing the two categories is limited. Since PFOA and PFOS have been strongly correlated to industrial discharges, the effluents from IPP WWTPs are expected to have higher PFOA and PFOS concentrations.

For non-IPP WWTPs, the effluent detection frequency was 100% for PFOA and PFOS, with lower detection frequencies in the influent for both PFOA and PFOS (**Table 10**). The higher detection frequency in the effluent could be attributed to WWTP processes and recirculation of treatment streams (i.e., Returned Activated Sludge (RAS), filtrate, or centrate) or possible degradation of other PFAS that are known to degrade to PFOA and PFOS partially, referred to as precursors (Schultz, 2006; Houtz, 2018).

Table 10. Influent and Effluent Detection Frequency for PFOA and PFOS in Non-IPP WWTPs

PFAS	Sample Type	WWTPs Sampled	Total Non-Detect	Total Detections	Percent Detection
PFOA	Influent	7	1	6	86%
	Effluent	15	0	15	100%
PFOS	Influent	7	2	5	71%
	Effluent	15	0	15	100%

The PFOA and PFOS results for the IPP and Non-IPP WWTPs influent and effluent samples are provided in **Figures 14**, **15**, **16**, and **17,** as well as **Table 3**. The highest PFOA and PFOS concentrations were present in the IPP WWTPs determined to have industrial users with elevated concentrations of PFOS in their discharge. However, some Non-IPP WWTPs had higher PFOA and PFOS influent or effluent concentrations than some of the IPP WWTPs. The Non-IPP WWTPs may still have industrial or commercial PFAS discharges that impact the WWTP. This indicates that PFOA and PFOS may be present in non-industrial or industrial (but not categorically regulated) wastewater, including discharges from contaminated sites.

Most of the PFOA and PFOS detections in the Non-IPP WWTPs ranged from 10 to 20 ng/L or lower. All the PFOS effluent concentrations for the Non-IPP WWTPs were below the PFOS WQS except for one WWTP, which also had the highest concentrations in both the influent and effluent samples. The source of PFOA and PFOS to this WWTP is potentially from infiltration into the sanitary sewer and contamination of the sanitary sewer from past releases of products that contained PFAS such as AFFF.

Figure 14. Influent PFOA Concentrations in IPP and Non-IPP WWTPs

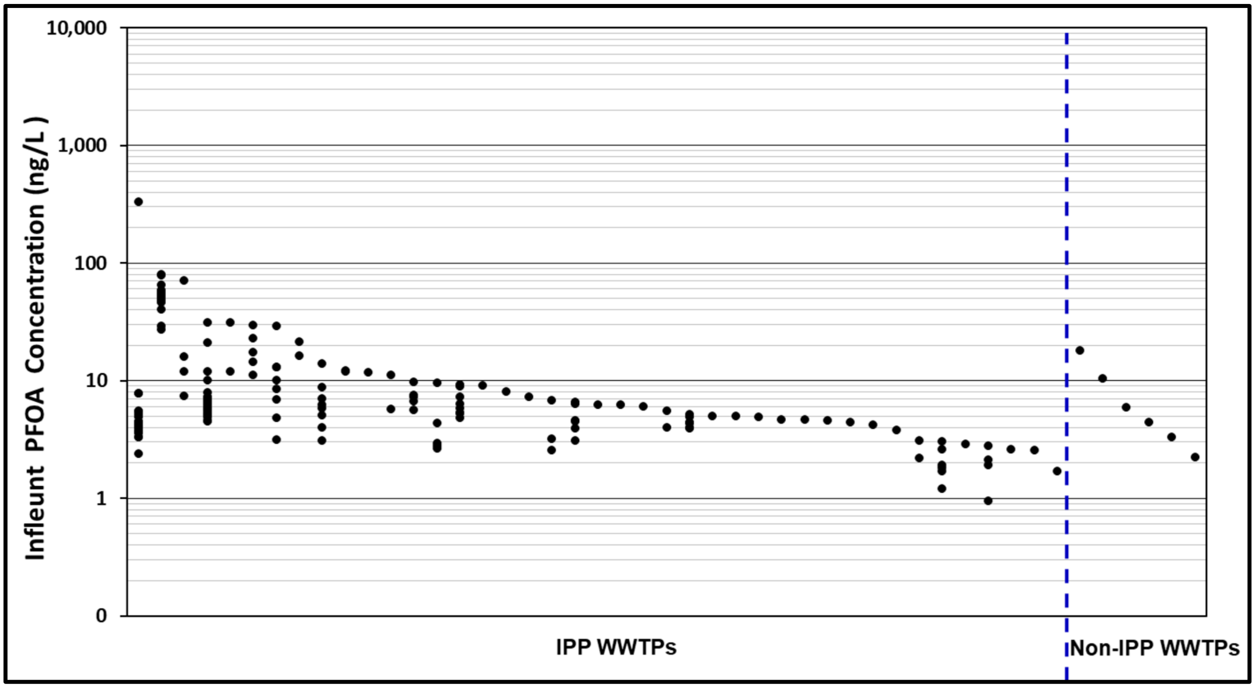


Figure 15. Effluent PFOA Concentrations in IPP and Non-IPP WWTPs

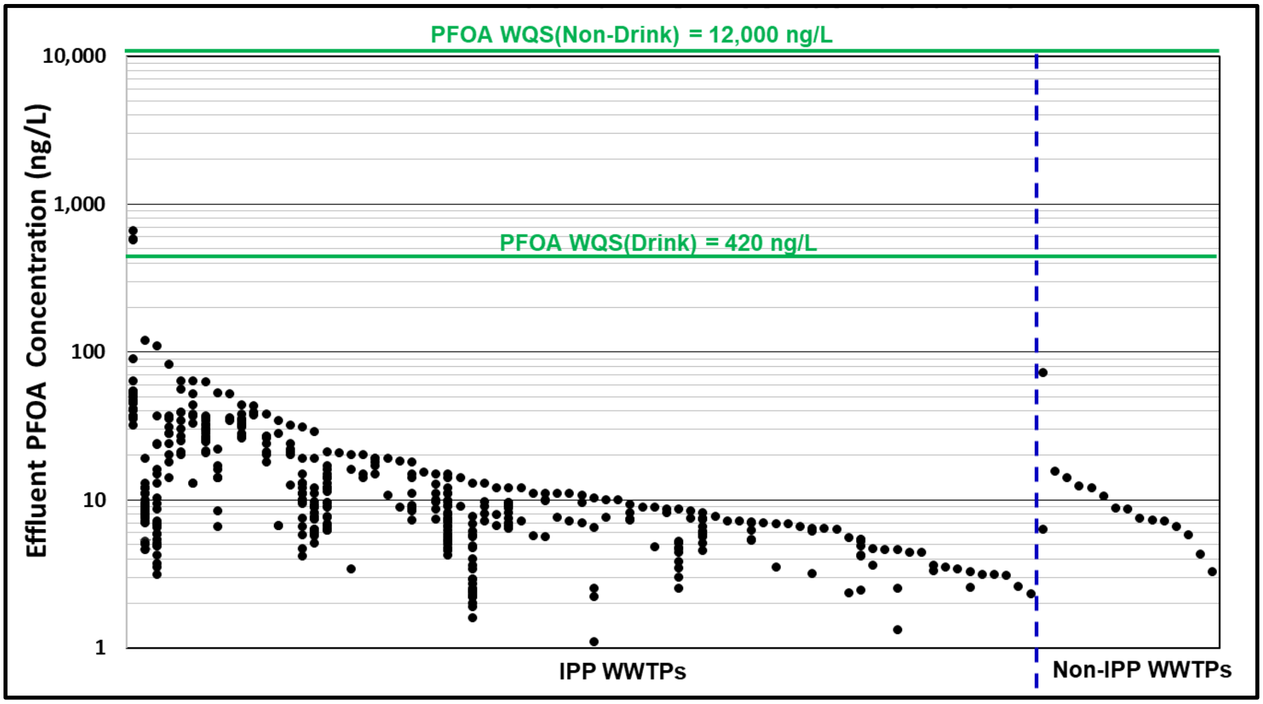


Figure 16. Influent PFOS Concentrations in IPP and Non-IPP WWTPs

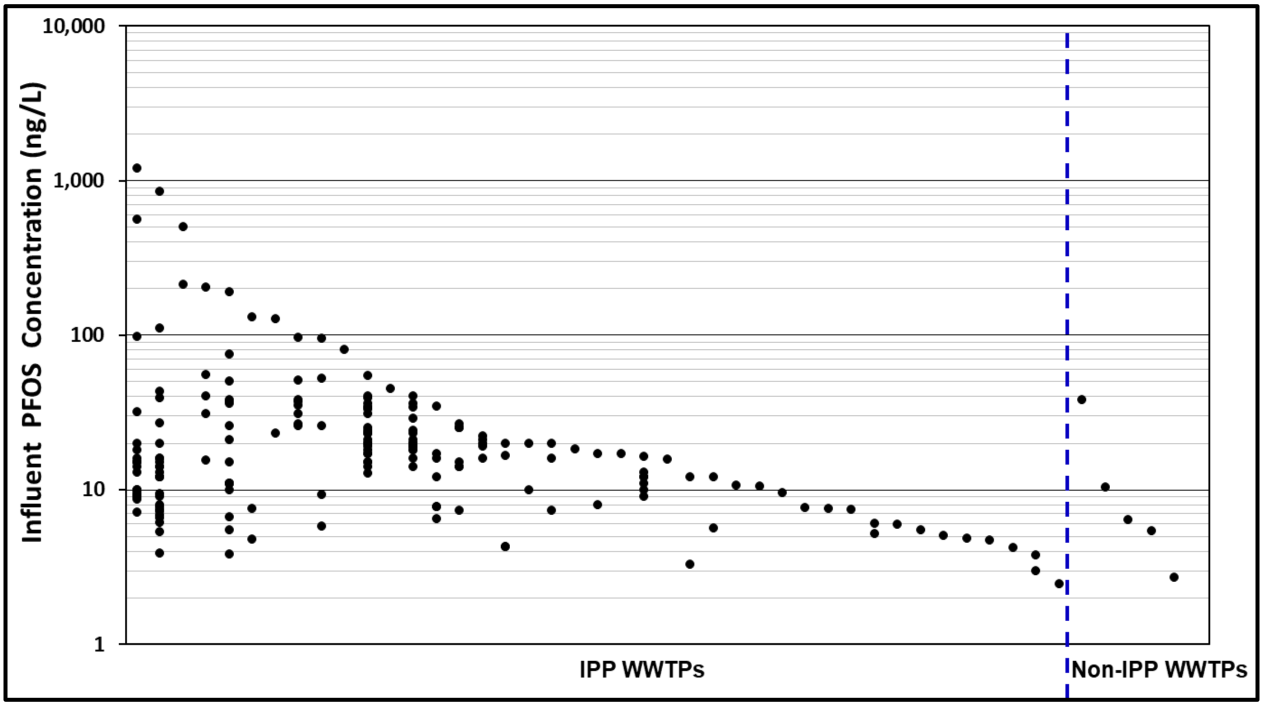
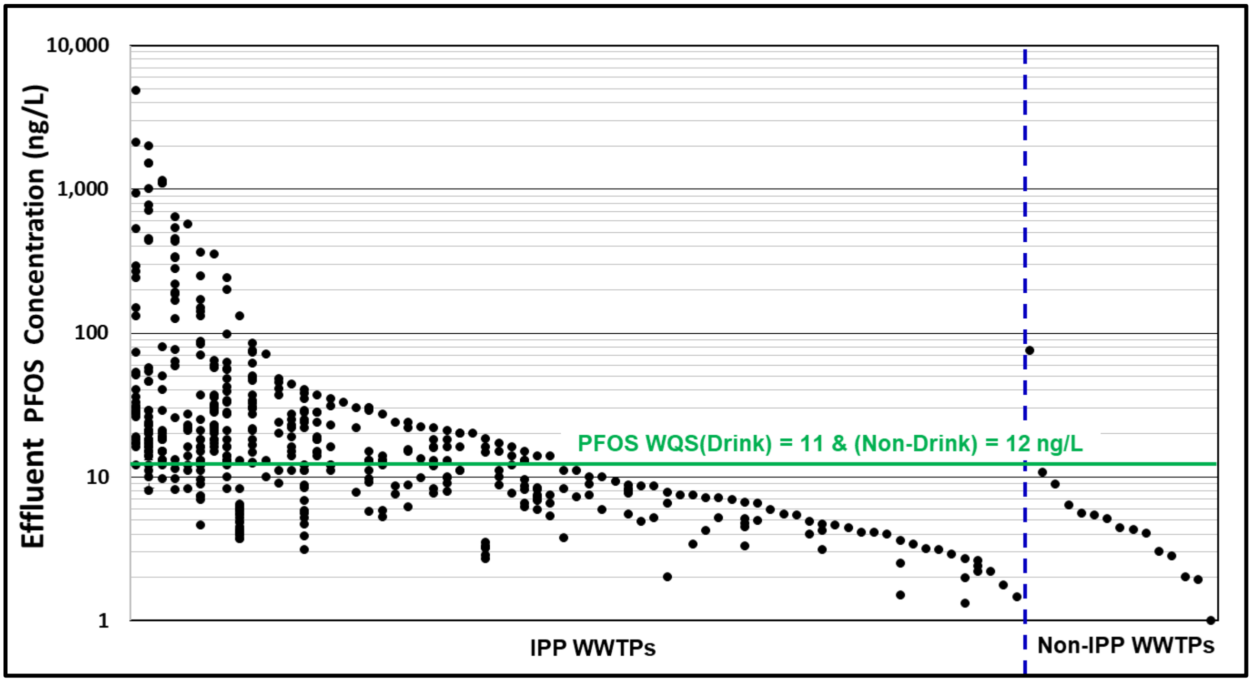


Figure 17. Effluent PFOS Concentrations in IPP and Non-IPP WWTPs



3.7 Industrial Sources Results

With the historical and widespread use of PFAS in many industries, industrial discharges are expected to be the primary sources of PFAS to WWTPs, as presented in **Section 2**. Potential sources of PFAS in WWTPs from Switzerland, Germany, and Thailand were identified from industrial discharges of textile, carpet, and paper coatings, AFFFs, electroplating, and semiconductor industries (Kunacheva, 2011; Alder, 2015). In Michigan, many of the IPP WWTPs were identified as having a higher likelihood of discharging PFAS because they accept industrial wastewaters. To address this potential issue, EGLE, WRD implemented the Michigan IPP PFAS Initiative. Under this initiative, WWTPs were asked to evaluate potential sources of PFAS via surveys, records reviews, and interviews with industry staff and to sample the effluent of those industries that were likely to have used PFOS and/or PFOA in the past or were currently using some type of PFAS containing chemical in their processes. Sources of PFAS identified by POTWs under the initiative were generally the industry types identified in previous studies and literature reviews. A detailed discussion of PFAS sources, including source effluent ranges, percentages of confirmed sources by type, and other observations and conclusions found by the IPP PFAS Initiative and related WRD efforts, can be found in the report titled, "Michigan Industrial Pretreatment Program (IPP) PFAS Initiative - Identified Industrial Sources of PFOS to Municipal Wastewater Treatment Plants" (EGLE, 2020b)

Approximately 2,000 samples from 574 industrial dischargers were reported to EGLE. Some industrial dischargers were sampled multiple times. A small number of industrial users installed additional pretreatment to reduce the PFOS concentrations discharging to the IPP WWTPs, as discussed in **Section 3.5**. The final effluent from the industrial facilities that installed additional pretreatment, which in many cases was granular activated carbon (GAC), showed a significant drop in PFOS concentrations when the final treated waste stream was sampled.

To summarize and correlate the PFOA and PFOS detections with various industrial discharges, the information for each Industrial User (IU), Significant Industrial User (SIU), and Categorical Industrial User (CIU) as described in the pretreatment regulations under Title 40 of the Code of Federal Regulations (CFR) 403 were compiled and evaluated. The industrial discharges were divided into two (2) main categories for better characterization and evaluation. The IUs and SIUs were combined into one category, and the CIU results were separated into a second category. While the WQS values of 420 and 12,000 ng/L for PFOA and 11 and 12 ng/L for PFOS are only applicable to the WWTP effluent concentrations, the WQS are used as a screening level for the industrial effluents.

3.7.1 CIU PFAS Evaluation

A total of 430 individual CIUs representing 18 different 40 CFR categories were evaluated for the need for PFAS sampling, out of which 310 CIUs were sampled with a total of 1,293 samples collected. A summary of PFAS results arranged by category is presented in **Table 11** and **Figures 18** and **19**. The total number of samples, minimum and maximum concentrations for PFOA and PFOS for all sampled CIU facilities, is presented in **Table 12**. A large portion of the CIUs evaluated and sampled were categories 413 (Electroplating) and 433 (Metal Finishing), a prevalent industry type in Michigan. EGLE identified these categories as one of the most likely potential sources of PFAS due to the historical use of PFOS-containing fume suppressants by chrome platers. The large number of CIUs sampled associated with categories 413 and 433 (82% of all CIUs) made it difficult to compare results with less represented categories. A total of 13 categories had ten (10) or fewer Michigan facilities, with five (5) or less of them sampled for PFAS. Seven categories had only one facility sampled. There were not enough facilities in these categories to establish any correlation with potential PFAS impacts. Also, most of the facilities sampled had low PFAS detections or were non-detect.

There were a few categories for which only a minimal number of samples were collected, likely due to a small number of industries in that category located in Michigan. However, the PFAS concentrations indicate that these CIUs may be a source of PFOS due to the high concentrations detected in their effluent and their potential use of products known to contain PFOS. It is recommended that more data from additional similar facilities be analyzed in the future for a better understanding. For example, category 419 (Petroleum Refining) had only one representative industry sampled multiple times, with the highest PFOA concentration of 710 ng/L and PFOS of 800 ng/L. A potential source of PFAS in the petroleum refining industry is AFFF, which was developed as a firefighting foam for Class B fires of flammable liquids, combustible liquids, petroleum greases, tars, oils, oil-based paints, solvents, lacquers, alcohols, and flammable gases. AFFFs have been used by the Department of Defense, airports, fire stations, and many industrial manufacturing facilities where Class B fires could occur. AFFF is a known product for which many formulations contain PFOA and PFOS, or other PFAS precursors known to degrade to PFOA and PFOS. AFFFs stored and used by industries where Class B fires could occur are often the source of PFAS at these facilities and not the raw materials and products manufactured at the facility. Other categories that may be PFAS sources for which few samples were collected that had high PFOA or PFOS concentrations were 430 (Pulp, Paper, and Paperboard), 442 (Transportation Equipment Cleaning), 446 (Paint Formulating), 463 (Plastics Molding and Forming), and 467 (Aluminum Forming).

Category 437 (Centralized Waste Treatment) had PFOA, or PFOS detected in all the samples (PFOA detection was 100% and PFOS detection was 93%), with 86% of the samples being above the PFOS WQS. Category 437 is considered a PFAS source based on the detection frequency for PFOA and PFOS and those above the PFOS WQS. Because centralized waste treaters typically accept wastewater from industries such as metal finishers, groundwater cleanups, and landfills, it is expected that centralized waste treatment will be a source of PFAS.

Two (2) categories, 413 (Electroplating) and 433 (Metal Finishing) were identified as the most prevalent PFOS source categories. The source of PFAS was determined to be from previously used fume suppressants that had very high PFOS concentrations. In general, facilities that never used the older generation of fume suppressants with high PFOS concentrations were found not to discharge PFOS. Current fume suppressants contain high concentrations of other PFAS, primarily 6:2 Fluorotelomer Sulfonic Acid (6:2 FTSA), as the main ingredient. For more information about currently-used fume suppressants, see the report titled “Targeted and Nontargeted Analysis of PFAS in Fume Suppressant Products at Chrome Plating Facilities” (EGLE, 2020c). The PFOS detection frequency for the sampled facilities was 33% and 66% for 433 and 413 categories, respectively. A total of 96% of the 413 categories were sampled, and 75% of the 433 categories.

Old fume suppressants that contained PFOS were most prevalent in chrome plating operations using hexavalent chromium. A detailed discussion about fume suppressant use based on the facility process type can be found in the *Identified Industrial Sources of PFOS to Municipal Wastewater Treatment Plants* (EGLE, 2020b). In conclusion, the two categories, 413 and 433, show very strong correlations of potentially being PFOS sources. Very few facilities of the concentrations exceeded the screening level for PFOA from **Categories 419**, **433**, and **437** (**Figure 18**). The regulatory driver was determined to be PFOS, with many of the CIU samples being above the screening level set at the WQS for PFOS (**Figure 19**).

Table 11. CIU PFAS Summary Results[1]

Category Description	40 CFR Part	Total CIU	Number and (%) of CIU Sampled	PFOA Number and (%) of Detections	PFOA Minimum (Min) (ng/L)	PFOA Maximum (Max) (ng/L)	PFOS Number and (%) of Detections	PFOS Number and (%) of Sources (>WQS)	PFOS Minimum (Min) (ng/L)	PFOS Maximum (Max) (ng/L)
Textile Mills	**410**	1	1 (100%)	1 (100%)	7	114	1 (100%)	1 (100%)	2	36
Electroplating	**413**	46	44 (96%)	15 (34%)	1.6	19	29 (66%)	19 (66%)	0.4	50,000
Organic Chemicals, Plastics, and Synthetic Fibers	**414**	8	4 (50%)	2 (50%)	3	7	2 (50%)	0 (0%)	4	5
Soap and Detergent Manufacturing	**417**	6	1 (17%)	0 (0%)	---	---	0 (0%)	0 (0%)	---	---
Petroleum Refining	**419**	1	1 (100%)	1 (100%)	4	710	1 (100%)	1 (100%)	7	800
Iron and Steel Manufacturing	**420**	12	8 (67%)	3 (38%)	1.9	43	2 (25%)	0 (0%)	1.4	4
Steam Electric Power Generating	**423**	7	1 (14%)	0 (0%)	---	---	0 (0%)	0 (0%)	---	---
Leather Tanning and Finishing	**425**	1	1 (100%)	0 (0%)	---	---	1 (100%)	1 (100%)	10.0	14
Pulp, Paper, and Paperboard	**430**	4	4 (100%)	4 (100%)	13	110	4 (100%)	4 (100%)	2	190
Metal Finishing	**433**	281	212 (75%)	67 (32%)	0.3	740	71 (33%)	32 (15%)	0.7	240,000
Centralized Waste Treatment	**437**	17	14 (82%)	14 (100%)	0.5	3,000	13 (93%)	12 (86%)	1.1	53,000
Pharmaceutical Manufacturing	**439**	16	5 (31%)	0 (0%)	---	---	1 (20%)	0 (0%)	3	3
Transportation Equipment Cleaning	**442**	8	3 (38%)	3 (100%)	33	280	2 (67%)	1 (33%)	11	640
Paint Formulating	**446**	1	1 (100%)	1 (100%)	20	56	1 (100%)	1 (100%)	60	120
Plastics Molding and Forming	**463**	5	2 (40%)	1 (50%)	16	16	2 (100%)	1 (50%)	3	61
Aluminum Forming	**467**	10	5 (50%)	4 (80%)	1.5	5	5 (100%)	2 (40%)	1.7	5,200
Copper Forming	**468**	4	2 (50%)	0 (0%)	---	---	0 (0%)	0 (0%)	---	---
Electrical and Electronic Components	**469**	2	1 (50%)	1 (100%)	23	23	1 (100%)	0 (0%)	10	10
	Total CIUs	**430**	**310 (72%)**							

[1]Units are in nanograms per liter (ng/L) or parts per trillion (ppt)

Figure 18. PFOA Concentrations for Sampled 40 CFR Categories

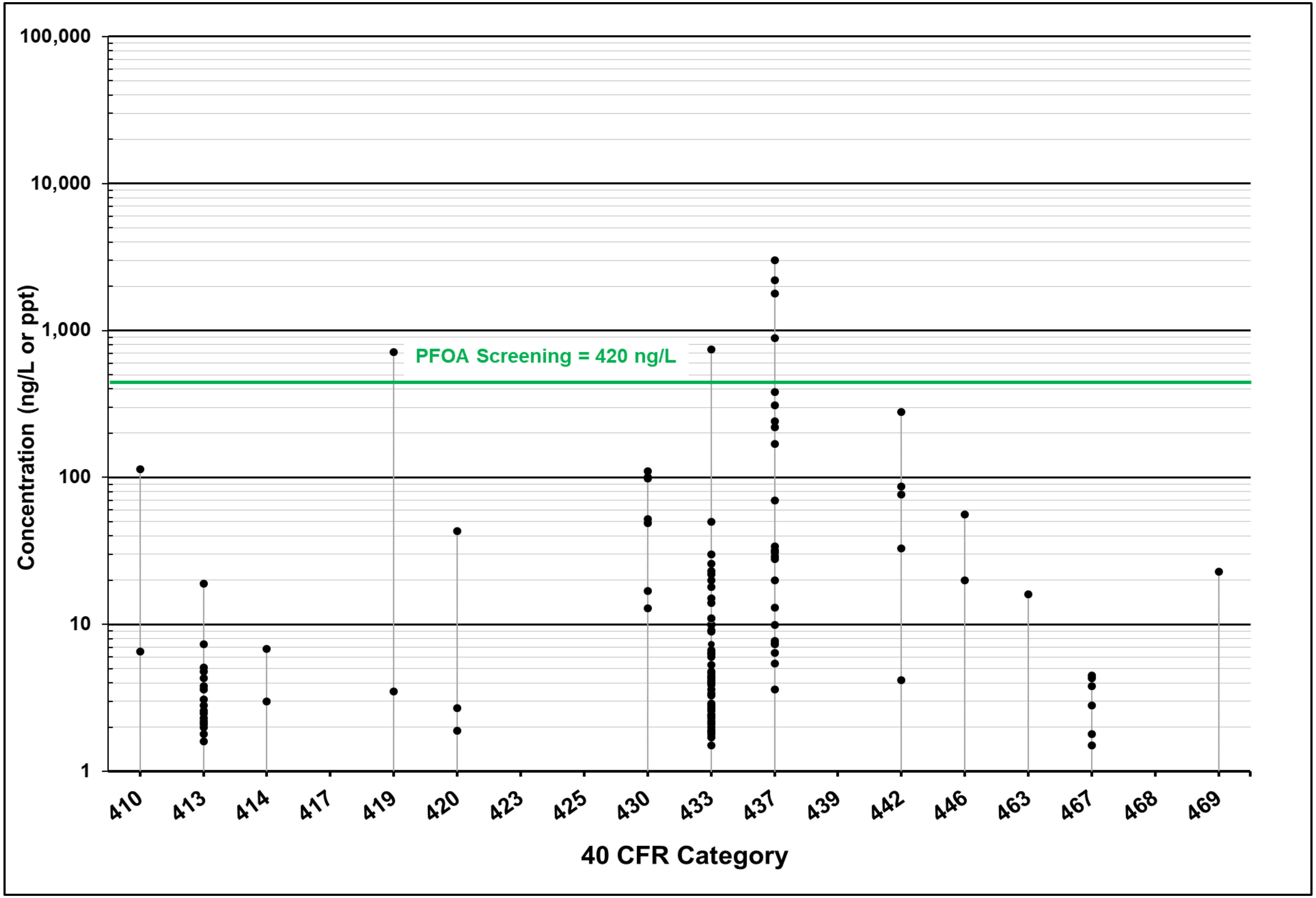
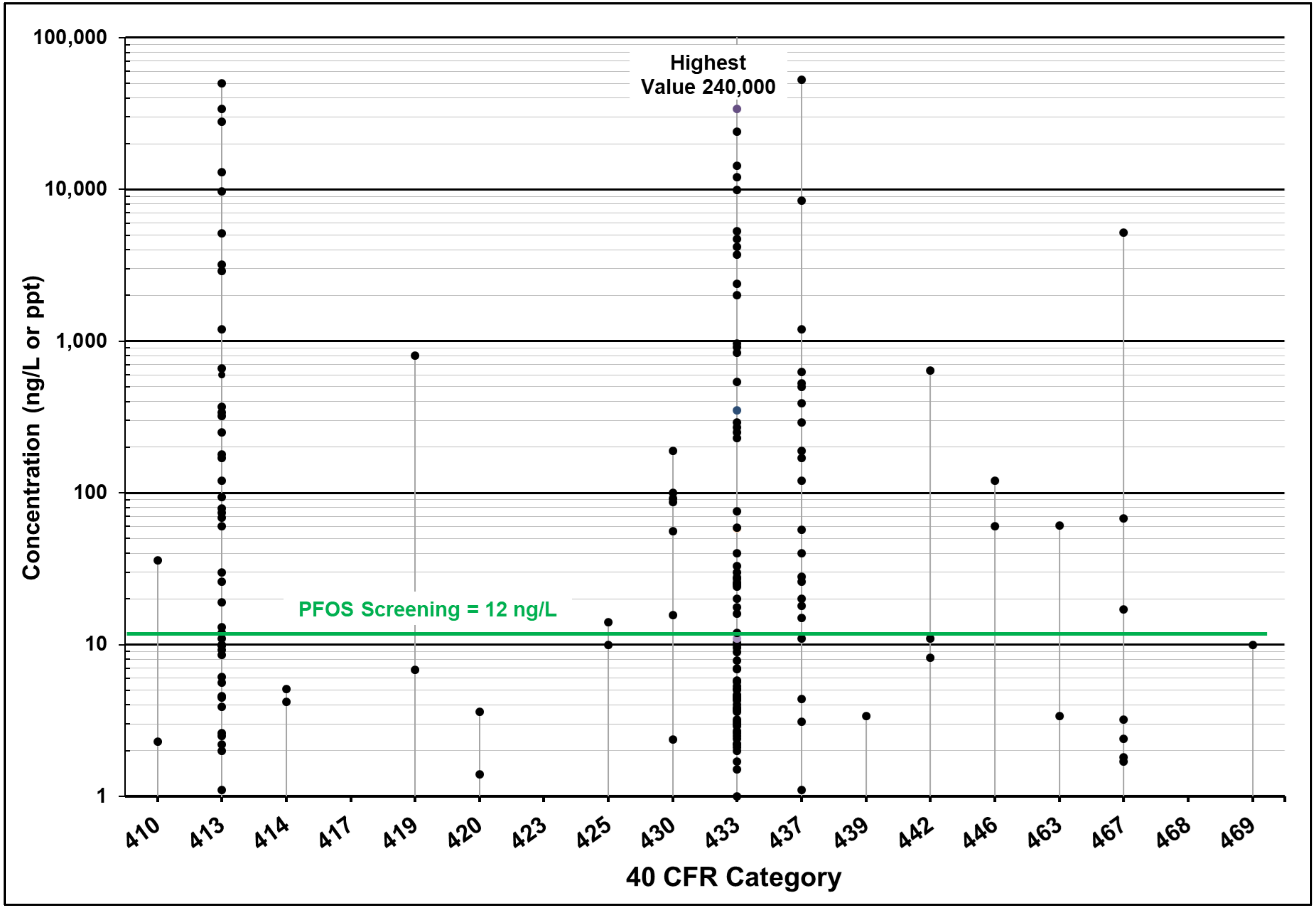


Figure 19. PFOS Concentrations for Sampled 40 CFR Categories



3.7.2 IU and SIU PFAS Evaluation

A total of 656 samples were collected from 256 individual IUs and SIUs representing seven (7) industry types. The summary of PFAS results for all IUs and SIUs sampled are presented in **Table 13** and **Figures 20** and **21**. The total number of samples, minimum and maximum concentrations for PFOA and PFOS for all sampled IU and SIU facilities, is presented in **Table 14**. The seven (7) IU and SIU industry types evaluated are presented below:

1. Chemical Manufacturing,
2. Paper Manufacturing, Packaging,
3. AFFF Residual Sewer,
4. Commercial Industrial Laundry Facilities,
5. Various Contaminated Sites,
6. Landfills, and
7. Miscellaneous Sources.

Out of over 656 samples collected from IUs and SIUs from seven (7) distinct groups, only one sample was above the PFOA screening value. Many more samples were detected above the PFOS screening value. PFOA and PFOS were used more widely and at higher volumes in the past, and recent concentrations are therefore expected to be lower than those in the past. Due to its relative abundance and more stringent water quality standard in Michigan, PFOS was the regulatory driver when managing PFOA and PFOS impacts to WWTPs from industrial discharges.

The first two groups, Chemical Manufacturing, and Paper Manufacturing and Packaging are also listed as CIUs under **Categories 414** and **430**. For this study, IUs and SIUs are included that conduct similar activities but do not have the industrial processes that would require them to be regulated as CIUs. The concentrations were either similar or sometimes higher for the IU and SIU facilities than those categorized as CIUs. This may indicate that the regulated processes that require an industrial facility to be listed as a CIU may not significantly affect the potential PFAS use. A facility could be a PFAS source under these two general industrial categories regardless of whether they are listed as an SIU, IU, or CIU.

The AFFF Residual Sewer category represents IU and SIU discharges that are believed to be impacted by PFAS due to past release of AFFF and/or disposal in the sanitary sewer. The past releases of AFFF could impact various matrices (e.g. soil, groundwater, surface water runoff, or various wastewaters from the industrial facilities) that could infiltrate or discharge to the sewers. Due to the high concentrations of PFAS in AFFF, the sanitary sewer could become a PFAS residual source. Meaning that while the sewers are not a source of PFAS themselves, AFFF residues in the sewers or potential infiltration of contaminated groundwater to the sanitary sewers from past AFFF use may result in the ongoing release of PFAS within the sanitary sewer.

PFAS was detected in about 55% of the sampled Commercial Industrial Laundry Facility category, likely due to the use of PFAS as stain-resistant coatings on some materials and residues from industrial processes. PFOS concentrations above the screening value of 12 ng/L were detected at 42% of facilities; however, many facilities had low detections. Information from the IUs and SIUs indicates that PFAS detections are very dependent on each facility's type of materials, and that concentrations of PFAS could vary significantly from one facility to another.

A total of eight (8) different types under the Various Contaminated Sites category were identified as sources of PFOS. The number of facilities sampled under the Various Contaminated Sites category was low, with six (6) out of eight (8) types having less than six (6) facilities sampled. Many of the sites were associated with former sources identified under the CIU section (e.g., 413, 430, and 433 categories) or listed under other IU and SIU categories in **Table 13** (e.g., former landfills, impacted groundwater by AFFF). There was no apparent difference observed between the IU and SIU facilities under the Various Contaminated Sites category. However, the dataset sampled was not very large, and there was a wide range of concentrations observed.

Landfills were identified as a potential source of PFOS to WWTPs. PFOA and PFOS were detected in almost all the leachate samples, indicating a strong correlation between PFOA and PFOS detections and landfill leachate. However, the impact on the WWTPs will depend on the volume of leachate discharging to the WWTP and the PFOA and PFOS concentrations in the leachate. When the volume of leachate is low compared to the WWTP flow, even when PFAS are present in the leachate, the impact on the WWTP could be insignificant. Multiple facilities were above the PFOA screening value of 420 ng/L, with most of them being landfill leachate. Most of the facilities were above the PFOS screening value of 12 ng/L. No apparent difference was observed in the samples collected from Type 2 or 3, active or closed, or hazardous landfills. It is expected that landfills that receive industrial wastes will have higher PFAS concentrations in their leachate.

There were 123 Miscellaneous Sources composed of IU (50 samples), and SIU (73 samples) discharges sampled for PFOA and PFOS that were not classified due to limited information. All the results for IU samples were below the PFOA and PFOS screening values of 420 ng/L and 12 ng/l, respectively. The detection frequency for IU samples was 30% for PFOA and 32% for PFOS. The SIU samples had only one sample above the PFOS screening value, and all the samples were below the PFOA screening value. The detection frequency for the SIU samples was 37% for PFOA and 39% for PFOS. There was no significant difference in PFOA or PFOS detection frequency and overall concentration ranges observed between IUs and SIUs facilities. The detection of PFOA and PFOS in the wide variety of industrial discharges shows that PFOA and PFOS use was widespread. However, PFAS use was not typically in quantities that lead to discharge concentrations above the screening values that resulted in significant impacts to the WWTP effluents.

Table 13. IU and SIU PFAS Summary Results[1]

Industry/Category/Type		Graph ID	Total Facilities Sampled	PFOA Number and (%) of Detections	PFOA Minimum (Min) (ng/L)	PFOA Maximum (Max) (ng/L)	PFOS Number and (%) of Detections	PFOS Number and (%) of Sources (>WQS)	PFOS Minimum (Min) (ng/L)	PFOS Maximum (Max) (ng/L)
Chemical Manufacturing										
CIU		**CHEM:C**	4	1 (25%)	3.0	3.0	1 (25%)	1 (25%)	4.2	4.2
SIU		**CHEM:S**	12	3 (25%)	2.5	1,100	4 (33%)	3 (25%)	5	4,600,000
IU		**CHEM:I**	1	1 (100%)	20	20	1 (100%)	1 (100%)	18	30
Paper Manufacturing, Packaging										
CIU		PMFG:C	4	4 (100%)	12.9	110	4 (100%)	4 (100%)	2	190
SIU		PMFG:S	8	3 (38%)	3.8	89	4 (50%)	4 (50%)	2.1	210
IU		**PMFG:I**	3	3 (100%)	2.0	680	3 (100%)	2 (67%)	6.6	410
AFFF Residual Sewer										
SIU		**AFFF-Sewer:S**	3	3 (100%)	3.5	140	3 (100%)	3 (100%)	5.1	3,500
IU		**AFFF-Sewer:I**	2	2 (100%)	42	410	2 (100%)	2 (100%)	4,700	45,000
Commercial Industrial Laundry Facilities										
SIU		**LDRY:S**	12	7 (58%)	1.9	84	6 (50%)	5 (42%)	5.7	69
Contaminated Sites										
AFFF Impacted Groundwater	IU	**CONT-AFFF:I**	1	0 (0%)	---	---	1 (100%)	1 (100%)	82	456
Leather Tannery	IU	**CONT-TAN:I**	1	1 (100%)	6.3	135	1 (100%)	1 (100%)	5.73	514
Former Landfills	SIU	**CONT-LNDF:S**	3	2 (67%)	53	120	2 (67%)	1 (33%)	11	4,000
	IU	**CONT-LNDF:I**	3	1 (33%)	4	4	2 (67%)	1 (33%)	10	18
Former Metal Finishers	SIU	**CONT-MF:S**	8	5 (63%)	2.0	15	6 (75%)	4 (50%)	1.6	8,000
	IU	**CONT-MF:I**	3	2 (67%)	2.1	2.9	1 (33%)	1 (33%)	23	32
Miscellaneous Sources	SIU	**CONT-MISC:S**	1	1 (100%)	4.6	4.6	1 (100%)	0 (0%)	7.2	7.2
	IU	**CONT-MISC:I**	7	6 (86%)	1.3	58	6 (86%)	4 (57%)	2.1	37.51
Mixed Manufacturing	SIU	**CONT-MMF:S**	1	1 (100%)	20	30	1 (100%)	1 (100%)	270	430
	IU	**CONT-MMF:I**	3	2 (67%)	1.9	2,280	2 (67%)	2 (67%)	1.9	34,000
Paint Manufacturing	SIU	**CONT-PAINT:S**	1	1 (100%)	74	74	1 (100%)	1 (100%)	4.0	6,047
	IU	**CONT-PAINT:I**	1	1 (100%)	32	120	1 (100%)	1 (100%)	360	2,900
Former Paper Manufacturing	SIU	**CONT-PMFG:S**	2	2 (100%)	0.4	27	1 (50%)	1 (50%)	0.5	140
	IU	**CONT-PMFG:I**	1	1 (100%)	6	12	1 (100%)	1 (100%)	10	28.2

Table 13. IU and SIU PFAS Summary Results[1]

Industry/Category/Type		Graph ID	Total Facilities Sampled	PFOA Number and (%) of Detections	PFOA Minimum (Min) (ng/L)	PFOA Maximum (Max) (ng/L)	PFOS Number and (%) of Detections	PFOS Number and (%) of Sources (>WQS)	PFOS Minimum (Min) (ng/L)	PFOS Maximum (Max) (ng/L)
Landfills										
Hazardous Waste Landfill	SIU	**LNDF-HAZ:S**	1	1 (100%)	1.6	40	1 (100%)	1 (100%)	7.0	60
Type II Sanitary – Active	SIU	**LNDF-T2-ACT:S**	22	22 (100%)	2.3	43,425	22 (100%)	22 (100%)	8.5	5,000
	IU	**LNDF-T2-ACT:I**	3	3 (100%)	330	1,500	3 (100%)	3 (100%)	50	240
Type II Sanitary – Closed	SIU	**LNDF-T2-CLS:S**	13	13 (100%)	5.0	2,660	12 (92%)	11 (85%)	6.4	641
	IU	**LNDF-T2-CLS:I**	10	10 (100%)	4.3	2,000	10 (100%)	9 (90%)	9.3	460
Type III Sanitary - Active	SIU	**LNDF-T3-ACT:S**	3	2 (67%)	26	58	3 (100%)	1 (33%)	3.79	100
Type III Sanitary – Closed	SIU	**LNDF-T3-CLS:S**	3	3 (100%)	4.3	53	3 (100%)	2 (67%)	6.0	4,000
	IU	**LNDF-T3-CLS:I**	1	1 (100%)	200	410	1 (100%)	1 (100%)	13	61
Miscellaneous Sources										
SIU		**MISC:S**	73	27 (37%)	1.3	120	19 (26%)	1 (1%)	0.98	85
IU		**MISC:I**	50	15 (30%)	1.8	710	16 (32%)	0 (0%)	2	10

[1] Units are in nanograms per liter (ng/L) or parts per trillion (ppt)

Figure 20. PFOA Concentrations for IU and SIU Sample Types

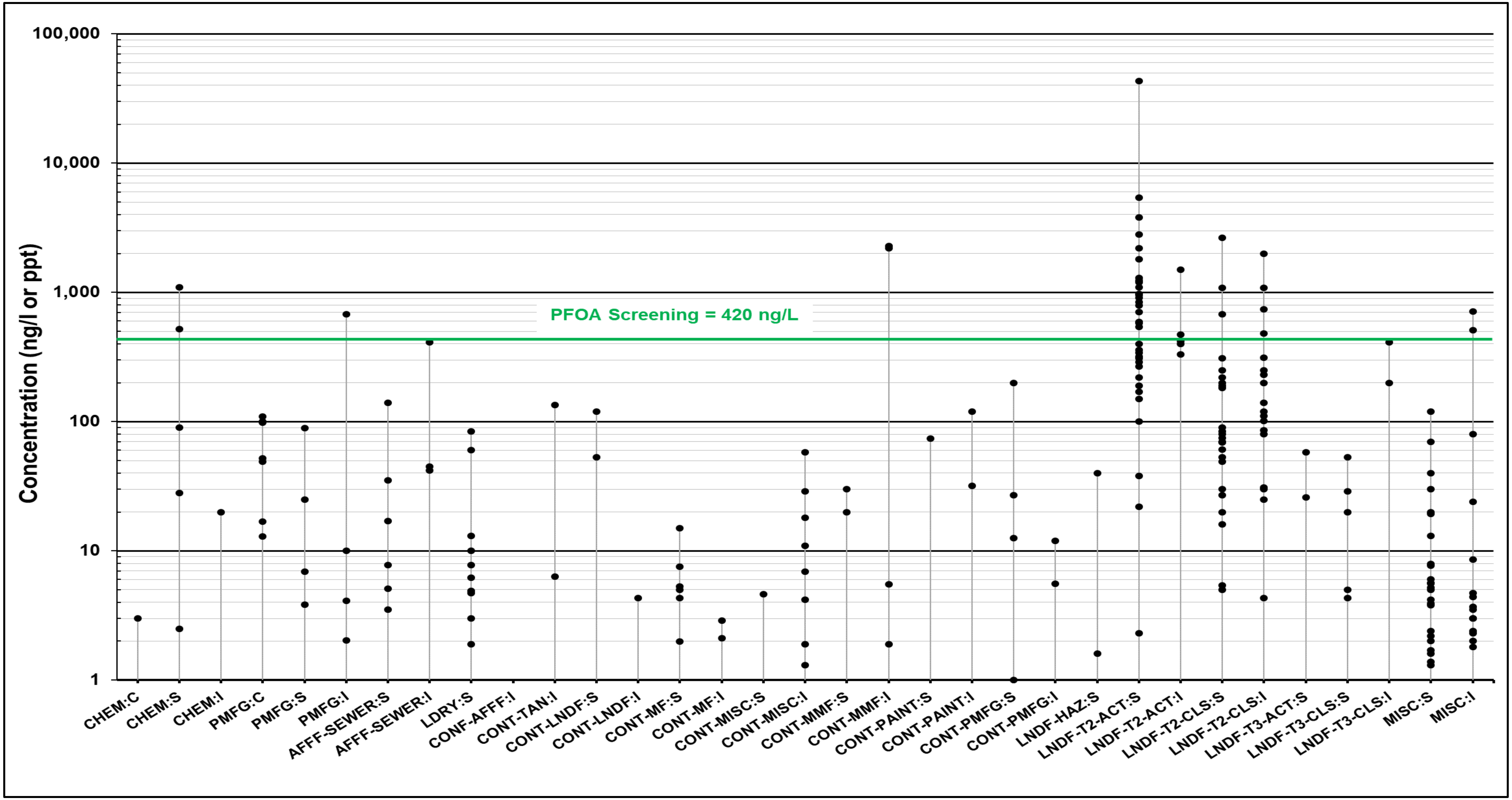
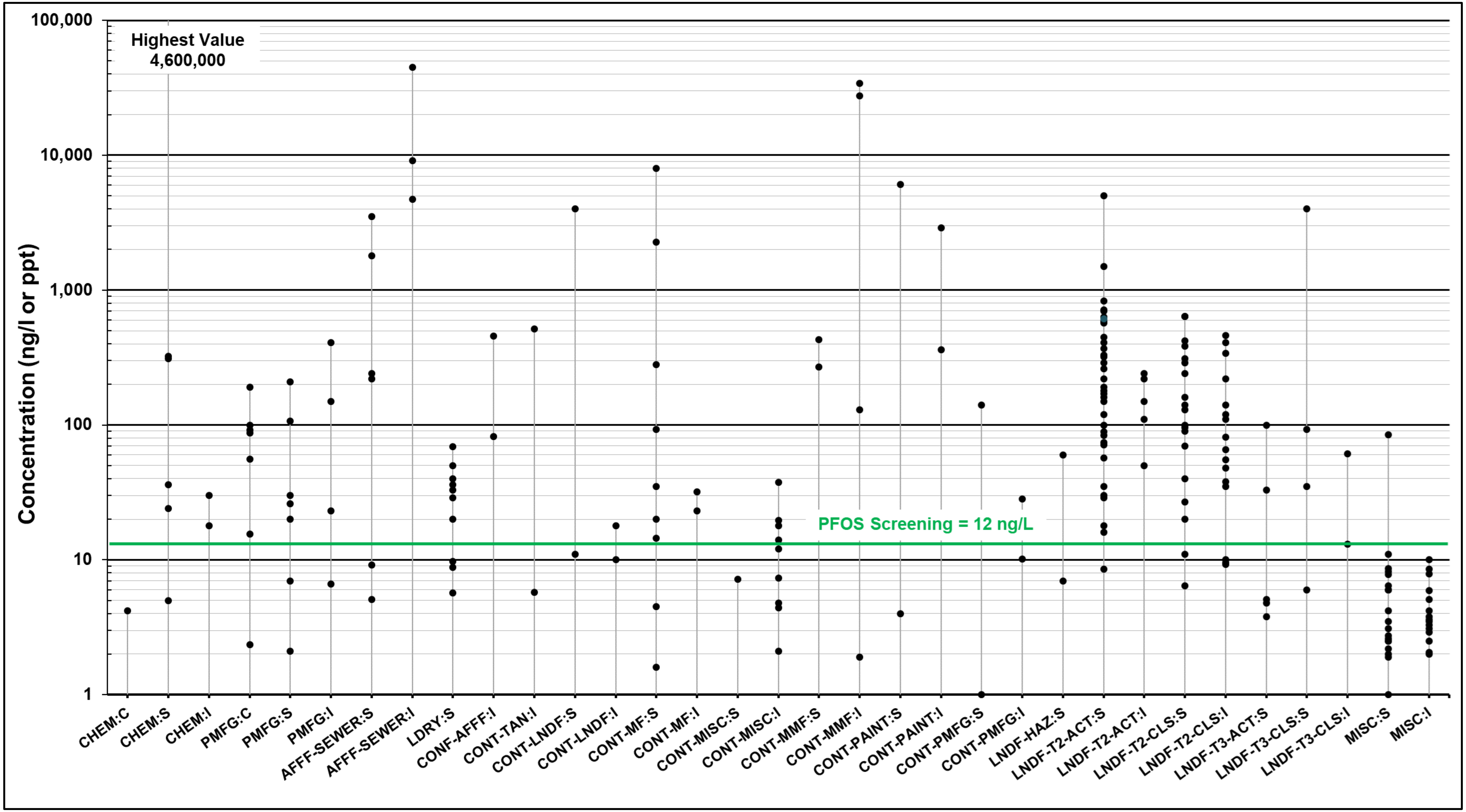


Figure 21. PFOS Concentrations for IU and SIU Sample Types



3.7.3 PFAS Industrial Sources Summary

PFOA and PFOS were detected in about 40% of all CIUs, and 55% of SIUs and IUs sampled. It should be noted that specific industries were targeted based on a literature review on PFOA and PFOS sources. There was a wide range of concentrations, even within the same category of industrial discharges. Few products have been identified to date that could be the source of PFOA and PFOS in industrial discharges. AFFF and fume suppressants used by metal finishers are two products that have been identified as PFOA and PFOS sources. However, PFOS was identified as the primary regulatory driver that impacted multiple WWTPs with PFOS concentrations in the effluent above the PFOS WQS. PFOS sources are often related to past industrial activities when higher concentrations of PFOS were present in products, and there were significantly fewer regulatory criteria and analysis capabilities. AFFF usage and storage have resulted in releases at facilities where there was a potential of Class B fires during various manufacturing processes. Other identified sources have been in paper manufacturing coatings, tanneries, and commercial laundries, where PFOA and PFOS have been used as stain-resistant coatings for various materials.

As mentioned above, PFOS was identified as the driver from a regulatory point of view in Michigan, with many IU, SIU, and CIU discharges exceeding the PFOS WQS of 12 ng/L. A total of 36% of the IUs and SIUs and 24% of the CIUs had discharges above the PFOS WQS of 12 ng/L, used as source screening criteria under the IPP PFAS Initiative.

Another classification system used for industry sectors is the North American Industry Classification System (NAICS). NAICS was developed by the United States Office of Management and Budget and is used to classify business establishments, replacing the Standard Industrial Classification (SIC) system in 1998. Each NAICS Sector (2-digit) was divided into Subsectors (3-digit), Industry Groups (4-digit), and Industries by 5-digit and 6-digit codes. A review of the NAICS codes was performed. There was a weak correlation between the NAICS codes' descriptions and those under the 40 CFR categories or information about the facilities. The NAICS codes provided by the industrial facility many times represented historical processes performed at a facility and did not correctly describe current operations. However, a couple of NACIS codes appear to correlate well with the 40 CFR categories as facility descriptions, as presented in **Table 15** below. Category 413 for electroplaters was more closely correlated with the NAICS code 332813, and category 433 was correlated with NACIS code 332812 for metal finishers. The industry group 5622 – Waste Treatment and Disposal, which has various 6-digit NAICS industries such as 562211, 562212, and 562219, were correlated well with Category 437 or facilities listed as Type 2 or 3 sanitary landfills.

Table 15. Industrial Discharges for NAICS, IU, SIU, and CIU 40 CFR Categories

NAICS (6-Digit)	NAICS Industry Description	40 CFR Category / IU & SIU Type	40 CFR Category / IU & SIU Type Description
332812	Metal Coating, Engraving (except Jewelry and Silverware), and Allied Services to Manufacturers	433	Metal Finishing
332813	Electroplating, Plating, Polishing, Anodizing, and Coloring	413	Electroplating
562211	Hazardous waste treatment and disposal	437 / Landfills	Centralized Waste Treatment / Type 2 and 3 Landfills
562212	Solid waste landfill	Landfills	Type 2 and 3 Landfills
562219	Other nonhazardous waste disposals	437 / Landfills	Centralized Waste Treatment / Type 2 Landfills

4. Statewide PFAS Assessment of 42 WWTPs

In the fall of 2018, EGLE's WRD launched a second statewide PFAS initiative with the assessment of 42 municipal WWTPs to better understand the occurrence of PFAS by sampling the influent, effluent, and associated residuals (i.e., final treated solids such as sludge or biosolids). The influent and effluent samples were collected as grab samples at a short time after one another, and the hydraulic retention time was not considered. At select WWTPs, additional aqueous and solid samples from various treatment processes were collected further to evaluate the fate of PFAS within the WWTPs.

The study included the 20 largest WWTPs in Michigan and an additional 22 WWTPs based on USEPA's 2012 Clean Water Needs Survey List. The additional 22 WWTPs were selected from three (3) main groups based on flows of 0.2 to 0.4 million gallons per day (MGD), 0.5 to 3 MGD, and 3 to 9 MGD with various treatment processes. The 42 WWTPs sampled during the study are presented in **Table 16,** and the locations are presented in **Figure 22**. The 134 aqueous sample locations are presented in **Table 17** with the PFAS results in **Table 18**. A total of 20 sludge and biosolids samples with very low solids percentage (i.e., ~5% or lower) were centrifuged, and the aqueous portion was analyzed separately for these solids. The 71 solids sample locations are presented in **Table 19** with the PFAS results in **Table 20**. The summary for PFOA, PFOS, and Total PFAS for the influent, effluent, and final treated solids are presented in **Table 21**.

The study assessed the occurrence of 24 PFAS presented in **Table 22**, which was the minimum analyte list recommended by EGLE for analysis at all PFAS sites in 2018. This statewide PFAS sampling study provides a robust evaluation of potential additional PFAS impacts, beyond PFOA and PFOS, to the WWTPs in Michigan.

PFAS was detected in all 134 aqueous samples and 69 out of 71 solids samples. The only two solids samples where PFAS were non-detect were ash samples from two (2) WWTPs that process final solids through a furnace. The percent detection for all 24 PFAS for the influent, effluent, and final treated solids for all 42 WWTPs is presented in **Figure 23**. The high detection frequency of many PFAS in the WWTP samples indicates that PFAS are likely to present in many industrial, commercial, or even residential discharges.

Figure 23. Percent Detection of PFAS for 42 WWTPs Assessment

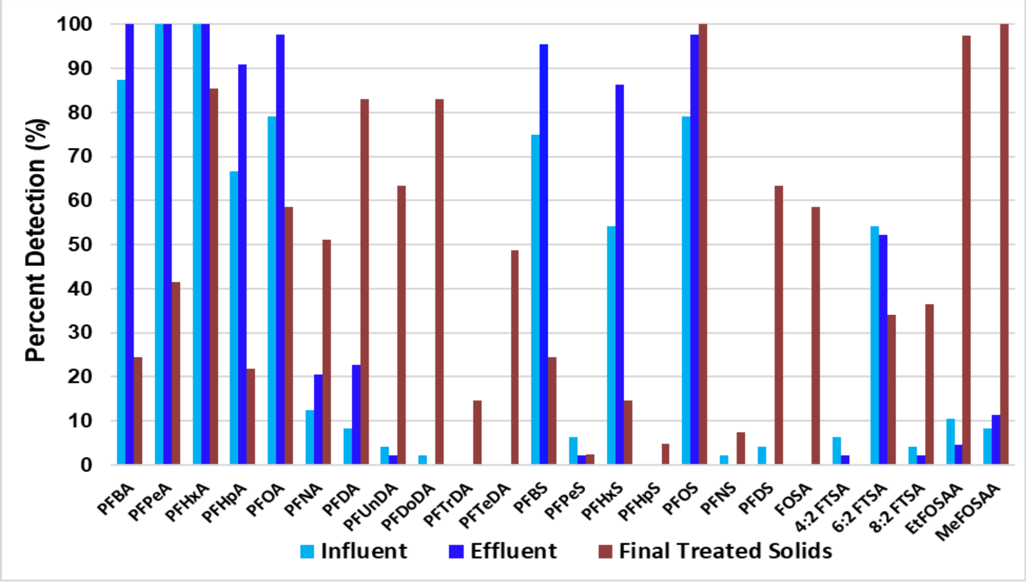


Table 22. PFAS Analyte List - Statewide PFAS Assessment of 42 WWTPs

PFAS Name	Carbon Chain length (C#)	Acronym	CAS #
Perfluorobutanoic Acid[1]	C4	PFBA	375-22-4
Perfluoropentanoic Acid[1]	C5	PFPeA	2706-90-3
Perfluorohexanoic Acid[1]	C6	PFHxA	307-24-4
Perfluoroheptanoic Acid[1]	C7	PFHpA	375-85-9
Perfluorooctanoic Acid[1]	C8	PFOA	335-67-1
Perfluorononanoic Acid[1]	C9	PFNA	375-95-1
Perfluorodecanoic Acid[1]	C10	PFDA	335-76-2
Perfluoroundecanoic Acid[1]	C11	PFUnDA	2058-94-8
Perfluorododecanoic Acid[1]	C12	PFDoDA	307-55-1
Perfluorotridecanoic Acid[1]	C13	PFTrDA	72629-94-8
Perfluorotetradecanoic Acid[1]	C14	PFTeDA	376-06-7
Perfluorobutane Sulfonic Acid[2]	C4	PFBS	375-73-5
Perfluoropentane Sulfonic Acid[2]	C5	PFPeS	2706-91-4
Perfluorohexane Sulfonic Acid[2]	C6	PFHxS	355-46-4
Perfluoroheptane Sulfonic Acid[2]	C7	PFHpS	375-92-8
Perfluorooctane Sulfonic Acid[2]	C8	PFOS	1763-23-1
Perfluorononane Sulfonic Acid[2]	C9	PFNS	474511-07-4
Perfluorodecane Sulfonic Acid[2]	C10	PFDS	335-77-3

Table 22. PFAS Analyte List - Statewide PFAS Assessment of 42 WWTPs

PFAS Name	Carbon Chain length (C#)	Acronym	CAS #
Perfluorooctane Sulfonamide[3]	C8	FOSA	754-91-6
4:2 Fluorotelomer Sulfonic Acid[4]	C4	4:2 FTSA	757124-72-4
6:2 Fluorotelomer Sulfonic Acid[4]	C6	6:2 FTSA	27619-97-2
8:2 Fluorotelomer Sulfonic Acid[4]	C8	8:2 FTSA	39108-34-4
N-Ethyl Perfluorooctane Sulfonamidoacetic Acid[5]	C8	EtFOSAA	2991-50-6
N-Methyl Perfluorooctane Sulfonamidoacetic Acid[6]	C8	MeFOSAA	2355-31-9

[1] Perfluoroalkyl Carboxylic Acids (PFCAs) Family is composed of the following PFAS: PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFNA, PFDA, PFUnDA, PFDoDA, PFTrDA, PFTeDA

[2] Perfluoroalkane Sulfonic Acids (PFSAs) Family is composed of the following PFAS: PFBS, PFPeS, PFHxS, PFHpS, PFOS, PFNS, PFDS

[3] Perfluoroalkane Sulfonamides (FASAs) Family is composed of the following PFAS: FOSA

[4] (n:2) Fluorotelomer Sulfonic Acids (FTSAs) Family is composed of the following PFAS: 4:2 FTSA, 6:2 FTSA, 8:2 FTSA

[5] N-Ethyl Perfluoroalkane Sulfonamidoacetic Acids (EtFASAAs) Family is composed of the following PFAS: EtFOSAA

[6] N-Methyl Perfluoroalkane Sulfonamidoacetic Acids (MeFASAAs) Family is composed of the following PFAS: MeFOSAA

The list of 24 PFAS included 6 PFAS families Perfluoroalkyl Carboxylic Acids (PFCAs), Perfluoroalkane Sulfonic Acids (PFSAs), Perfluoroalkane Sulfonamides (FASAs), Fluorotelomer Sulfonic Acids (FTSAs), N-Ethyl Perfluoroalkane Sulfonamidoacetic Acids (EtFASAAs), and N-Methyl Perfluoroalkane Sulfonamidoacetic Acids (MeFASAAs). Four (4) of these families (i.e., FASA, FTSA, EtFASAA, and MeFASAA) are referred to as precursors because they could undergo a partial abiotic, biotic transformation in the environment to highly stable and persistent end products such as compounds from the PFCA and PFSA families. The FASA, EtFASAA, and MeFASAA families transform to PFSAs. The FTSA family transforms into PFCAs.

PFAS that contains a shorter carbon chain length is referred to as short-chain. Those PFAS with longer carbon chain lengths are referred to as long-chain. A total of eight (8) short-chain PFAS and 16 long-chain PFAS were analyzed as part of the 24 PFAS. All three (3) PFAS analyzed from the FASA, EtFASAA, and MeFASAA families were long-chain. There were seven (7) long-chain compounds in the PFCA family and one (1) long-chain compound in the FTSA family. PFAS with a carbon chain length of eight (C8) or longer from the PFCA and FTSA families is considered long-chain. For the PFSA family, a carbon chain length of six (C6) or longer is considered long-chain. The short-chain PFAS from various PFAS families were more frequently detected in the aqueous samples (e.g., influent and effluent). The long-chain PFAS were detected more frequently in the solids samples (i.e., sludge or biosolids), which indicates a higher affinity to the solids for long-chain compounds.

The PFOA and PFOS concentrations in both the influent and effluent samples at the 42 WWTPs are presented in **Figures 24** and **25**, respectively. A total of 36 out of 42 effluent PFOA concentrations were higher than the influent, indicating the possible transformation of precursors and/or, at least in part, the recirculation of various treatment streams (e.g., waste activated sludge, centrate, filtrate) during WWTP operations. A total of 19 out of 42 effluent PFOS concentrations were higher than the influent, with a total of 24 effluent concentrations being within +/- 5 ng/L of the influent concentration. PFOS is known to adsorb to solids more strongly than PFOA, and the detection frequency of PFOS was also higher than PFOA in the solids, as presented in **Figure 23**. Similar to PFOA, the increase in PFOS concentrations in the effluent or accumulation in the solids could be due to possible transformation of precursors or could be attributed to the recirculation of various treatment streams (e.g., waste activated sludge, centrate, filtrate) during WWTP operations. Also, some variability would be expected since grab samples were collected to minimize the potential for cross-contamination.

All of the PFOA concentrations in both the influent and effluent samples were well below the PFOA WQS of 420 ng/L. However, 15 influent and 14 effluent samples had PFOS concentrations above the PFOS WQS of 12 ng/L. As a result, PFOS was the main driver for regulatory compliance applied to the final effluent. The PFAS concentrations for all 24 compounds were also plotted as a box plot, including color-coding for each PFAS family, increasing chain length from left to right. The box plots also included whiskers for the minimum and maximum concentrations and 25th, 50th, and 75th percentiles, including the mean concentrations (**Figure 26**).

Figure 24. PFOA Influent and Effluent Concentrations for the 42 WWTPs Assessment

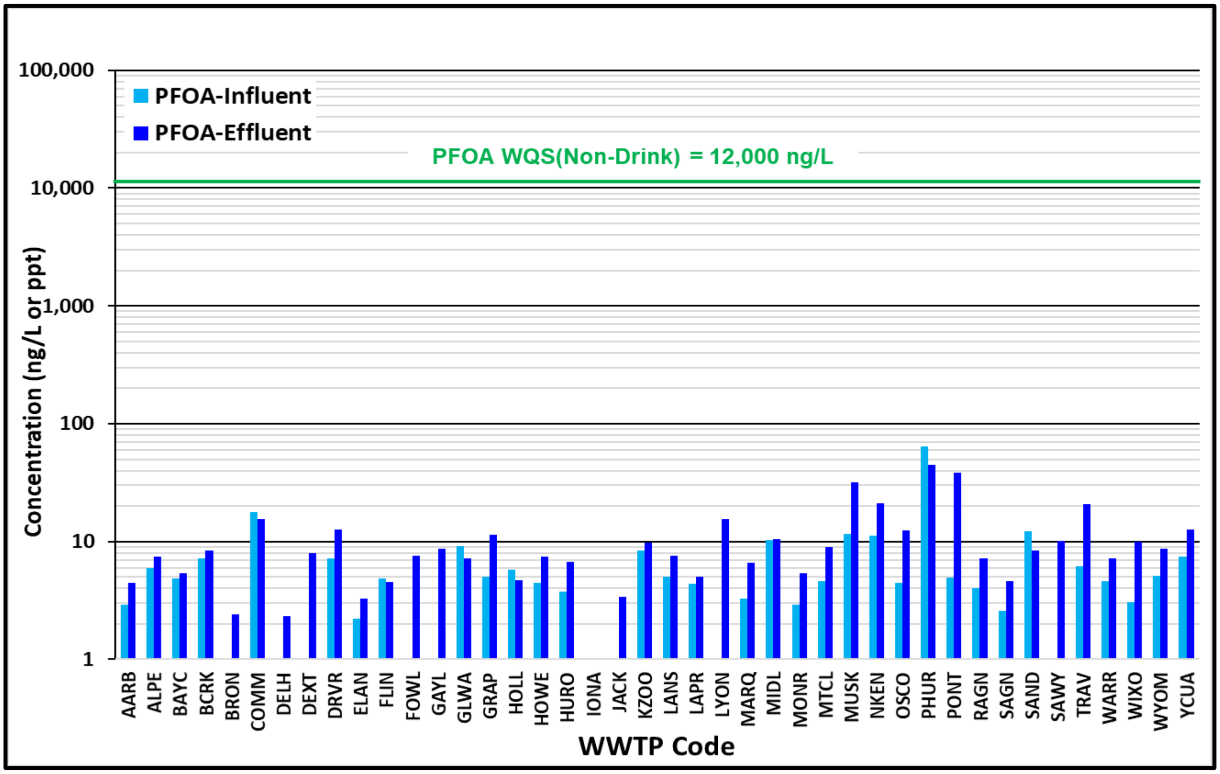


Figure 25. PFOS Influent and Effluent Concentrations for the 42 WWTPs Assessment

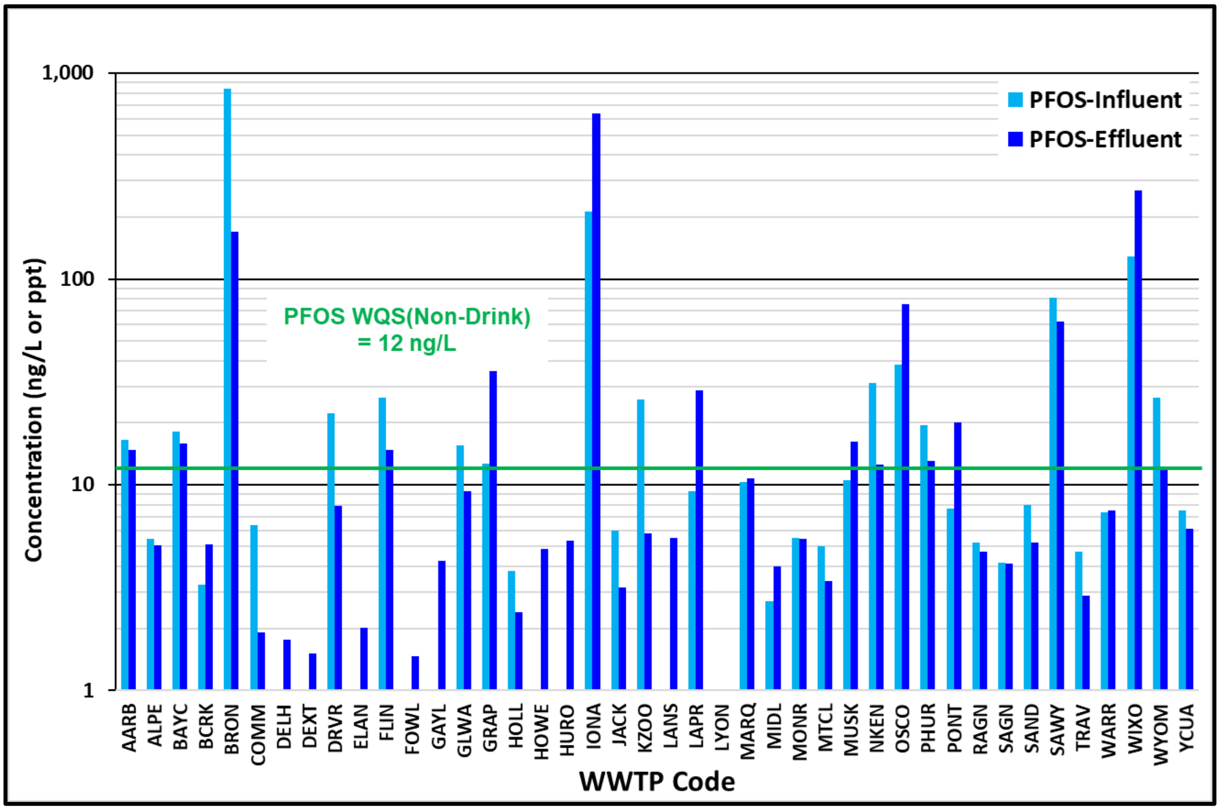
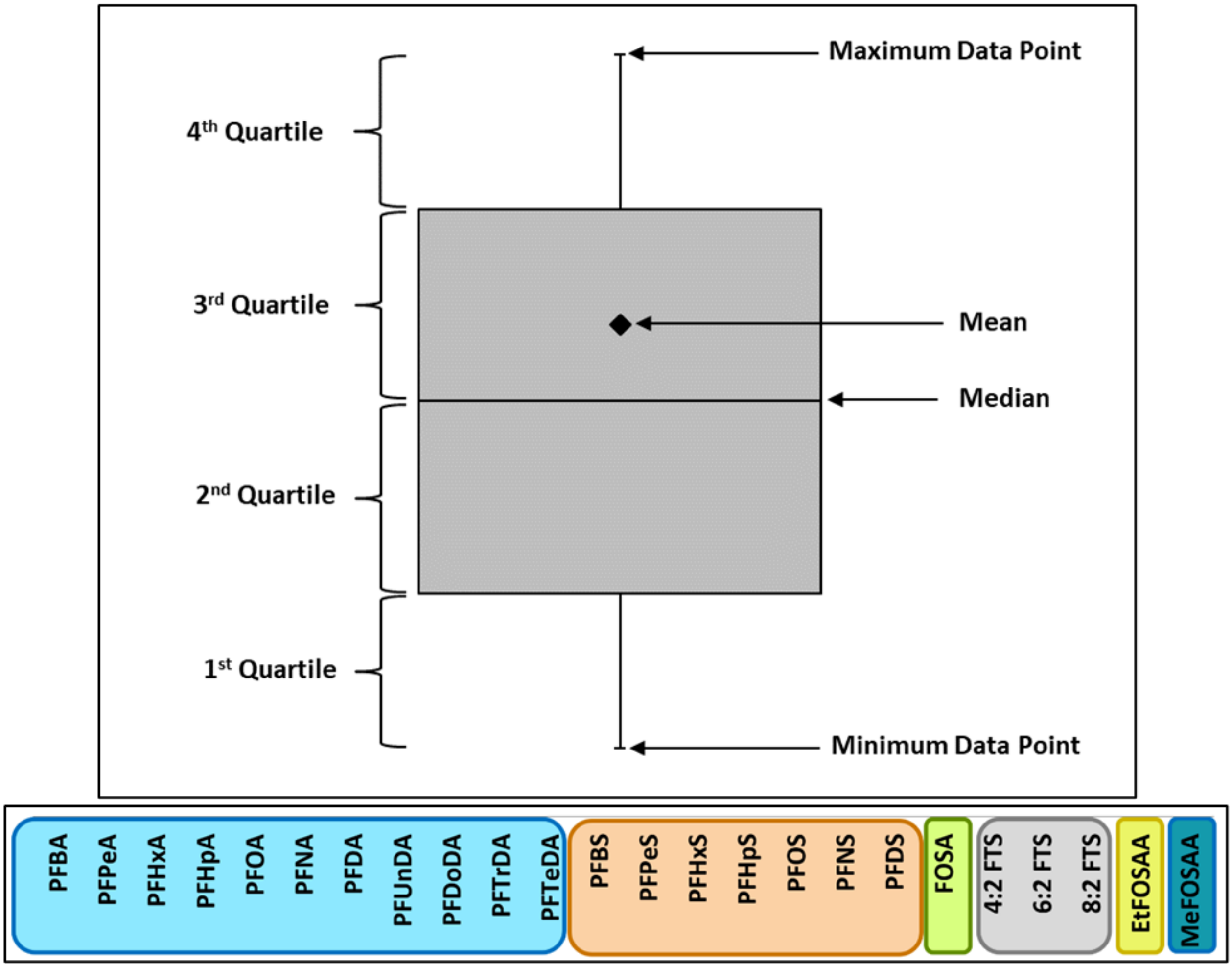


Figure 26. Legend for Box Plot Figures with PFAS Analyte List Grouped by Families



The box and dot plot graphs for the influent are presented in **Figures 27** and **28,** with the effluent presented in **Figures 29** and **30**, and the final treated solids (sludge and biosolids) presented in **Figures 31** and **32**. A wide range of concentrations was detected for most PFAS in influent, effluent, and final treated solids, which resulted in high biased mean concentrations. A total of 45 final treated solids samples were collected from 40 WWTPs. There were no final treated solids samples collected from two (2) WWTPs. Some of the final treated solids were collected from WWTPs that never have land-applied biosolids and have always utilized a landfill for disposal. However, the results for final treated solids from WWTPs currently land applying biosolids or that have land applied in the past, and WWTPs that have never land applied were presented to show current and potential biosolids concentrations. An extra sample of the final treated solids was collected from five (5) WWTPs, with one of the samples being pellets from WWTP #38. The remaining four (4) samples taken from storage tanks or drying beds may not be representative of solids being generated currently at the WWTP were as follows: an alkaline stabilized solids sample from a sludge cell of unknown age at WWTP #77; alkaline stabilized biosolids between two to six months old from WWTP #56; a drying bed solids sample from WWTP #52, which has not performed any land application in last two years; and aerobically stabilized biosolids six months old from a storage tank from WWTP #92.

The final treated solids average PFOS concentration for all 45 samples was 184 µg/kg, while the median concentration was 13 µg/kg (**Figure 33**). PFOS was detected in 43 out of 45 final treated solids samples. The detection limit of one (1) µg/kg was used for the two facilities that were non-detect in the average and median calculations. A total of seven (7) final treated solids samples from six (6) WWTPs were above the 150 µg/kg threshold that EGLE has chosen for characterizing e biosolids as “industrially impacted” (EGLE, 2020a). The threshold value of 150 µg/kg is not a risk-based number. It is a threshold to identify biosolids that contain significantly higher PFOS concentrations than those found in typical non-impacted biosolids. These seven (7) samples were from six (6) small to mid-sized POTWs with a flow of 0.2 to 3.8 MGD and all of which identified elevated discharges of PFOS to their collection system from industrial sources. As WWTPs with high PFOS concentrations are identified and source reductions are implemented, it is expected that lower concentrations in solids on average will be observed in Michigan WWTPs moving forward. For example, by removing the seven (7) industrially impacted samples, the recalculated average biosolids concentration lowers to 18 from 184 µg/kg, and the median lowers to 11 from 13 µg/kg (**Figures 33** and **34**).

An analysis of archived biosolids samples (collected in 2001) by USEPA represents 94 wastewater treatment facilities from 32 different states, and the District of Columbia sampled for 13 PFAS. The study identified PFOS as the most abundant PFAS analyte detected with an average concentration of 402 µg/kg dry weight (minimum: 308 and maximum: 618 µg/kg) followed by PFOA at 34 µg/kg dry weight (minimum: 12 and maximum: 70 µg/kg) (Venkatesana and Halden, 2013). The PFOS concentrations in the final treated solids (i.e., sludge or biosolids) identified during the 2018 EGLE’s Statewide PFAS Initiative were similar to the concentration ranges reported in the literature for WWTPs that receive industrial discharges from Switzerland (Alder, 2015), Australia (Gallen, 2016), and parts of the United States (Higgins, 2005) (**Figure 35**). The concentrations were significantly higher than those reported in WWTPs from Kenya (Chirikona , 2015), where only one (1) out of nine (9) WWTPs had some industrial discharges. The results indicate that PFOS concentrations are strongly correlated with industrial discharges and many times with chrome or metal finishers. Many WWTPs that reported high concentrations of PFOS received industrial discharges from chrome platers or metal finishers at many WWTPs sampled from other countries. Many of those industries currently use fume suppressants with high 6:2 FTSA concentrations, while many of the fume suppressants used before 2015 had high PFOS concentrations.

Figure 27. Influent PFAS Detection Frequency and Concentrations for 42 WWTPs – Box Plot

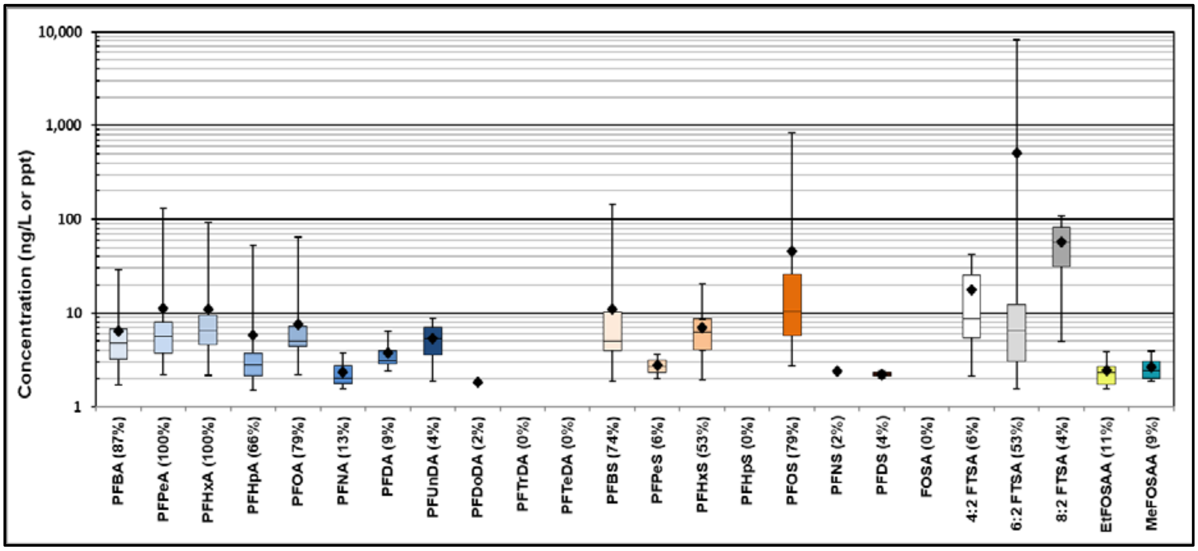


Figure 28. Influent PFAS Detection Frequency and Concentrations for 42 WWTPs – Dot Plot

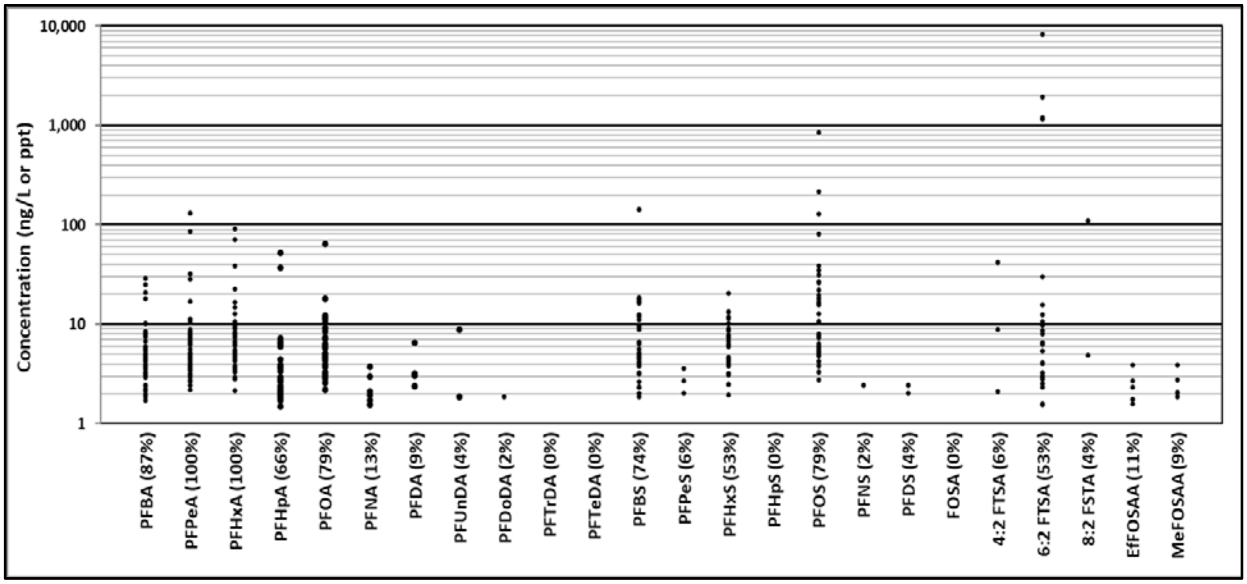


Figure 29. Effluent PFAS Detection Frequency and Concentrations for 42 WWTPs – Box Plot

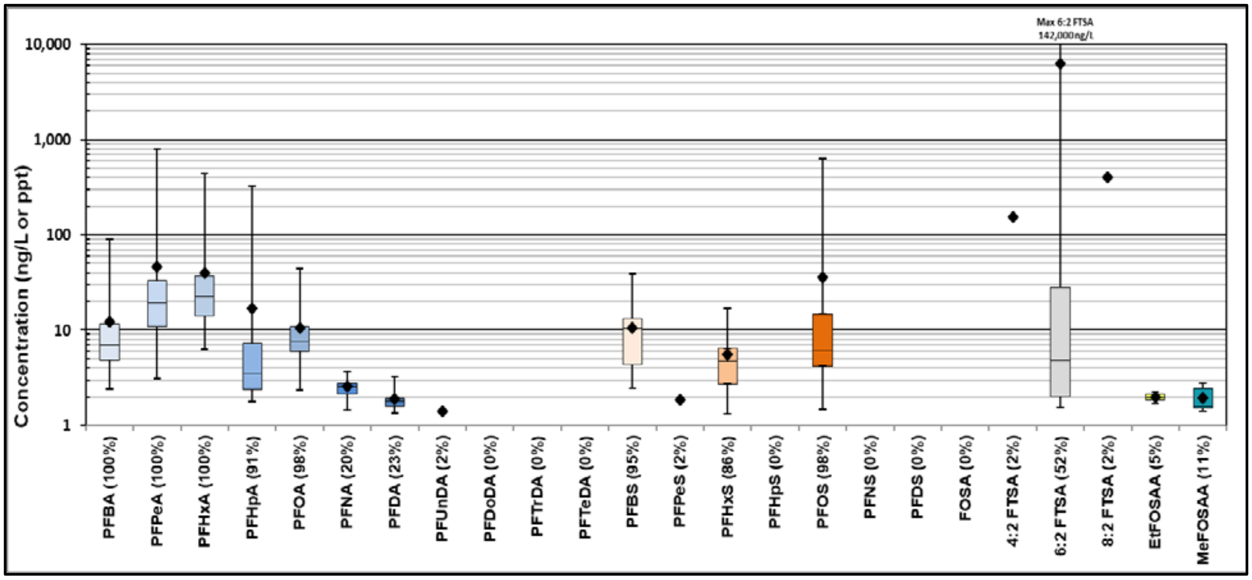


Figure 30. Effluent PFAS Detection Frequency and Concentrations for 42 WWTPs – Box Plot

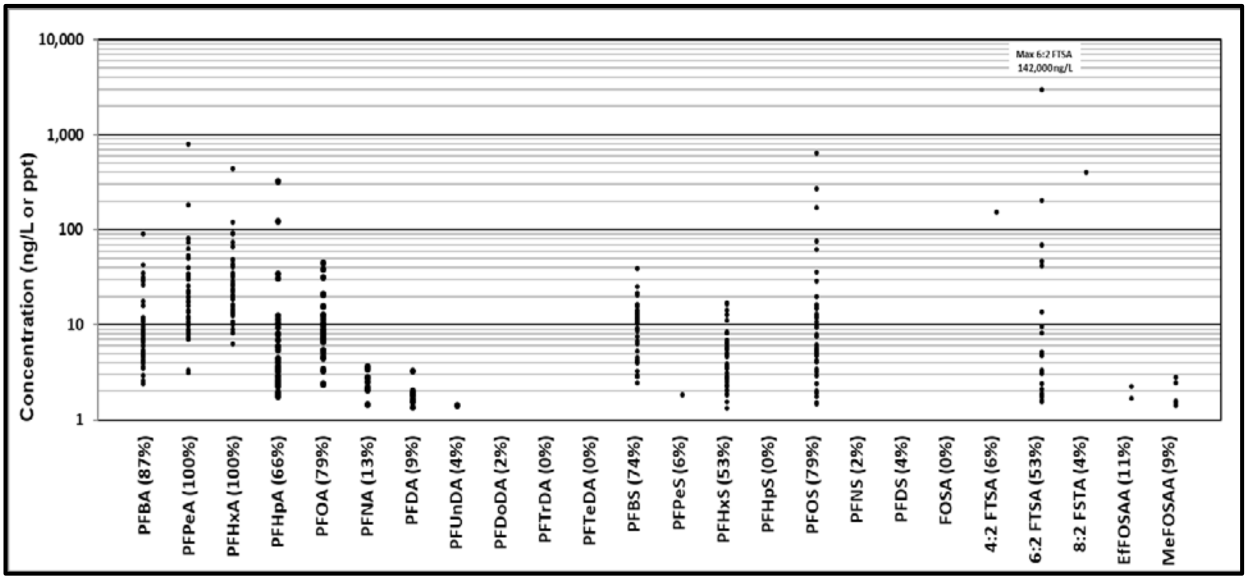


Figure 31. Final Treated Solids (Sludge and Biosolids) PFAS Detection Frequency and Concentrations for 42 WWTPs – Box Plot

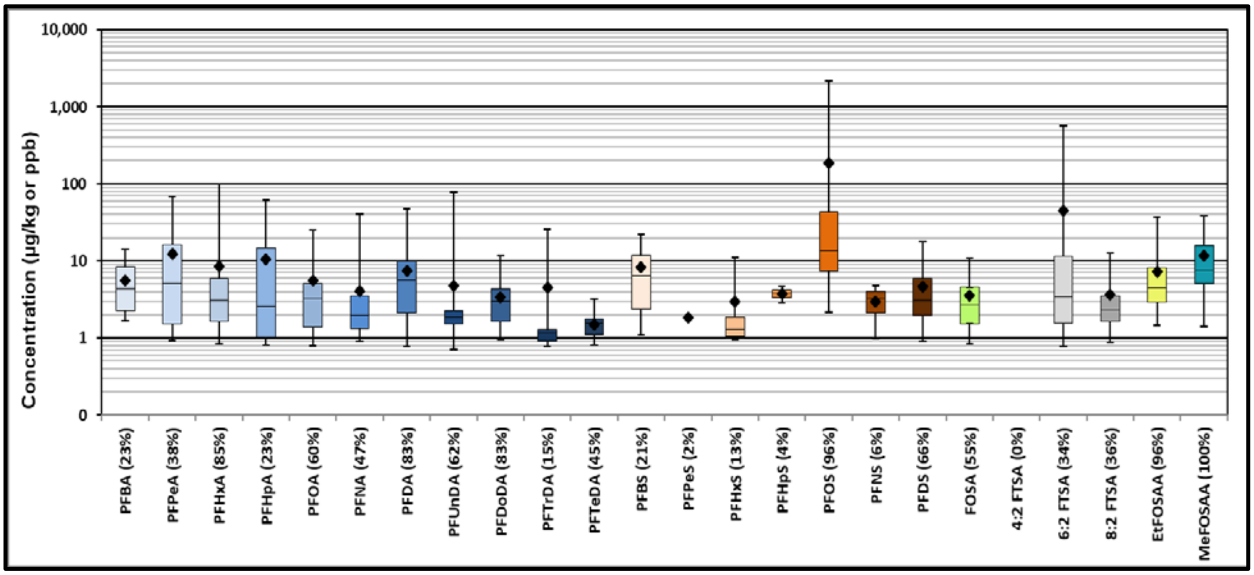


Figure 32. Final Treated Solids (Sludge and Biosolids) PFAS Concentrations for 42 WWTPs – Dot Plot

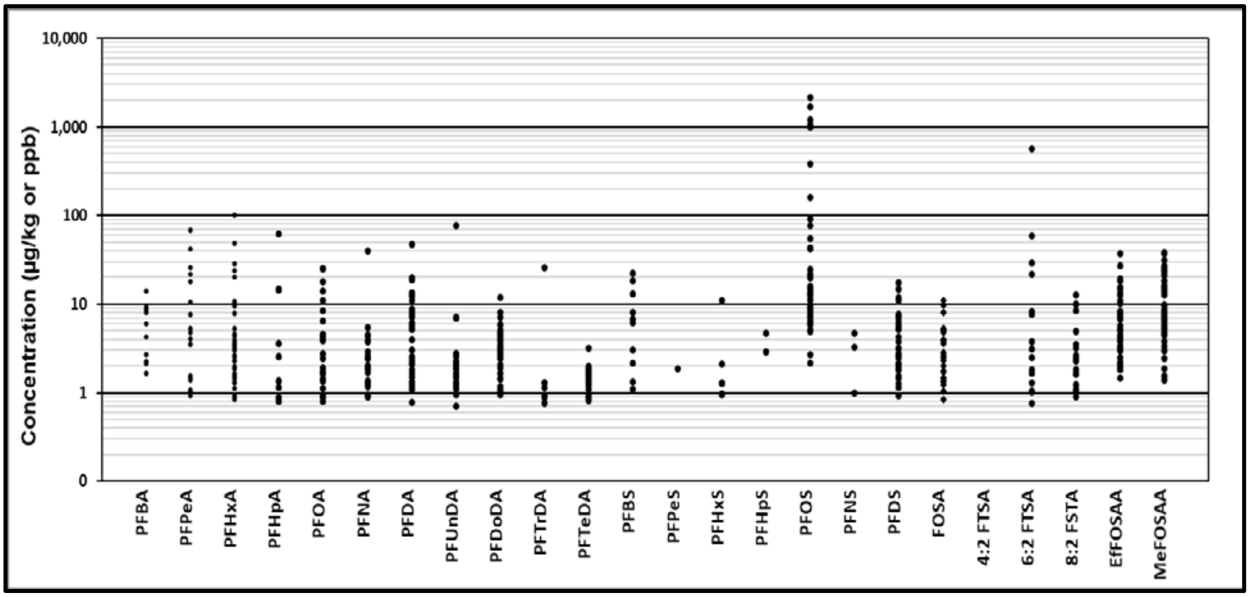


Figure 33. Final Treated Solids (Sludge and Biosolids) PFOS Concentrations for 42 WWTPs

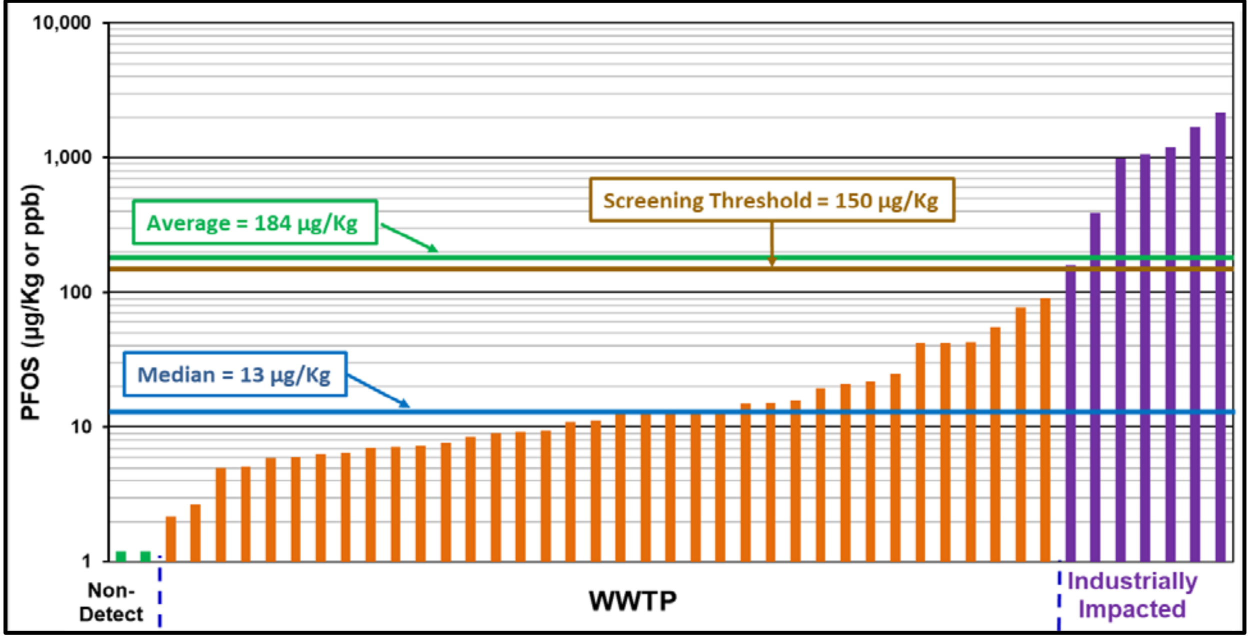


Figure 34. Final Treated Solids (Sludge and Biosolids) Excluding Industrially Impacted PFOS Concentrations for 42 WWTPs

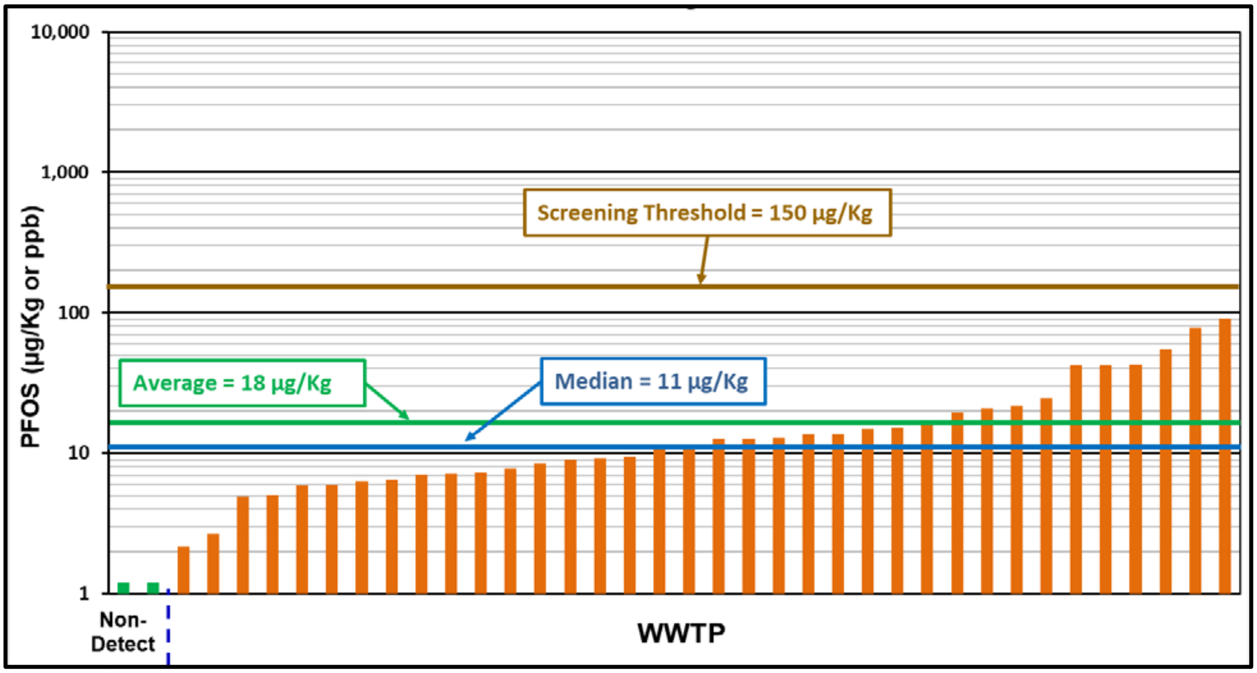
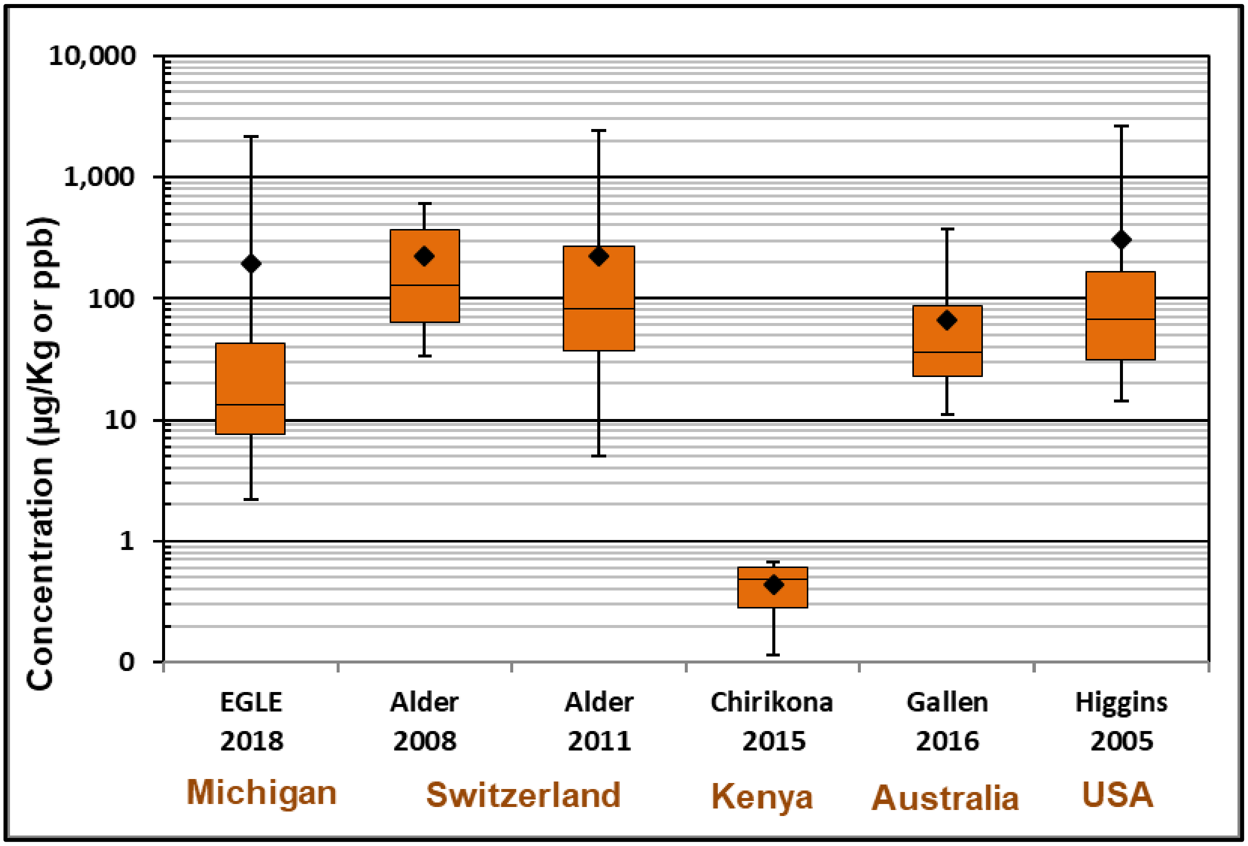


Figure 35. Final Treated Solids (Biosolids/Sludge) PFOS Concentrations from Michigan and Biosolids Published Literature Values



4.1 Solid and Aqueous Partition Evaluation

At select WWTPs, additional solids samples with very low solids percentage (i.e., ~5% or lower) from various treatment processes were collected to evaluate the PFAS partition into the aqueous and solid phase. A total of 20 sludge and biosolids samples were centrifuged, and the aqueous and solid portions were analyzed separately. The current partition evaluation was also used to guide the sampling and reporting of PFAS results (especially PFOA and PFOS) for solids with low solids percentage. Representative results for alkaline, anaerobically, and aerobically digested stabilized biosolids are provided in **Figures 36**, **37**, and **38**, respectively. The affinity of long-chain PFAS compounds to solids observed earlier and presented in **Figure 23** was also observed in the 20 samples. The short-chain compounds were more strongly associated with the aqueous phase, while the long-chain compounds were strongly associated with the solid phase, where the highest percentage of long-chain was detected. In some instances, the concentrations of the short-chain compounds were below the detection limit in the solid phase but still detected in the aqueous phase, which indicates that analyzing only the solid phase may show the absence of short-chain compounds, but they could still be present. The main reason for the difference of detections in the solid and aqueous phases is that the detection limits for solids are in low µg/Kg or ppb that is significantly higher than the aqueous detection limit phase is low ng/L or ppt. For the long-chain PFAS, especially PFOS, analyzing only the solid phase without the aqueous phase would report most of the mass present in the whole solids samples. As a result, the following recommendations were provided for Michigan's Biosolids and Sludge PFAS Sampling Guidance: "*All biosolids and sludge samples, including those with low solids content, should be analyzed as solids and reported on a dry weight basis. This dry weight basis reporting requirement should be specified on the chain-of-custody sent to the laboratory. Biosolids and sludge samples with a high aqueous content can be centrifuged, and only the solids portion of the sample can be analyzed as a solid. If density differences preclude centrifugation from separating representative solids, a representative well-mixed subsample may be mixed with a drying agent and treated like a soil by the laboratory.*"

Figure 36. Aqueous and Solid PFAS Concentrations for Alkaline Stabilized Solids at WWTPs #4(a), #77(b), and #74(c)

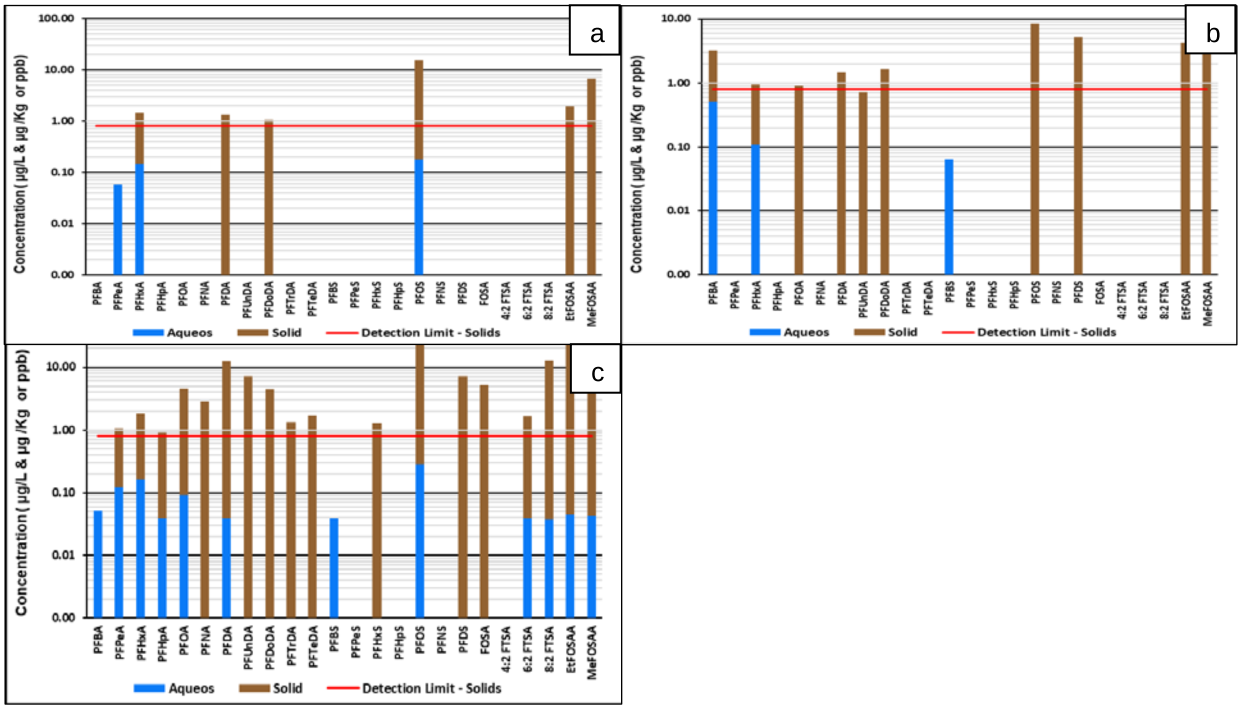


Figure 37. Aqueous and Solid PFAS Concentrations for Anaerobic Digested Solids at WWTPs #81(a), #50(b), and #52(c)

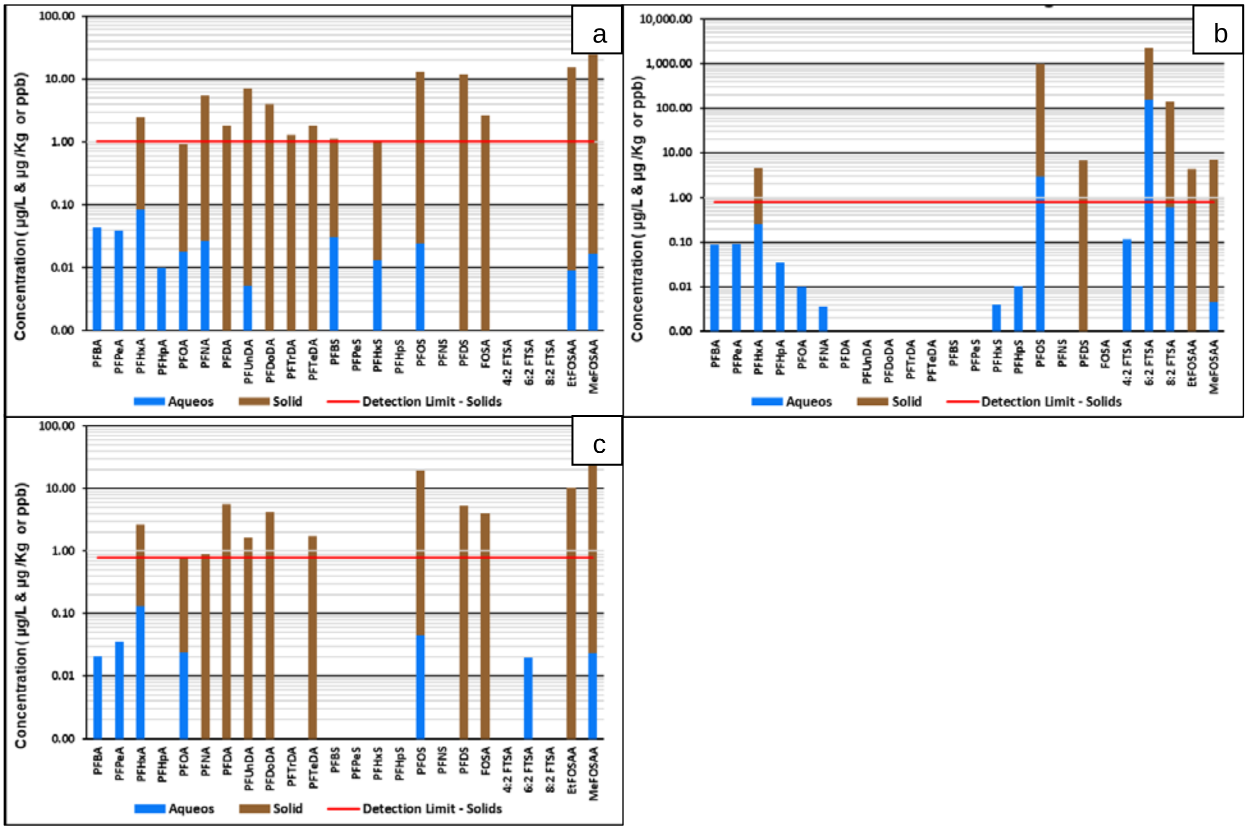
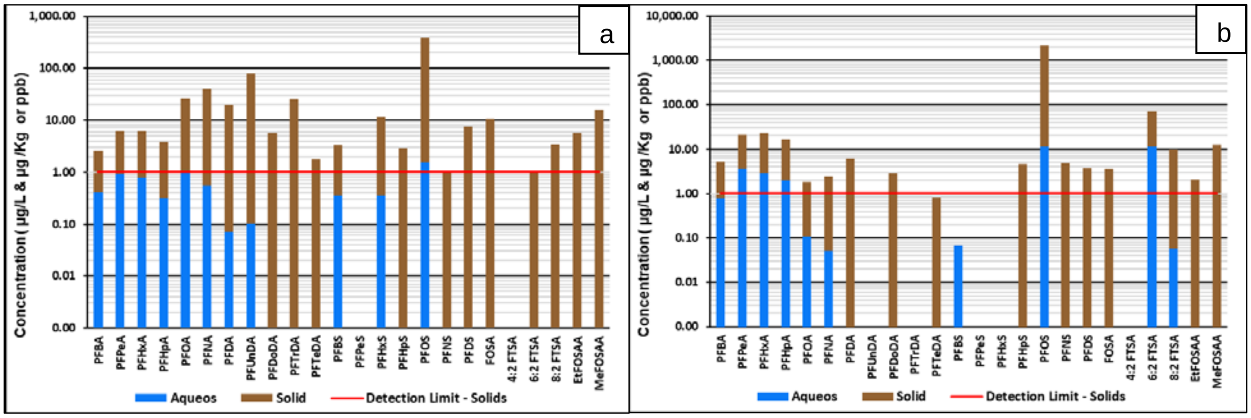


Figure 38. Aqueous and Solid PFAS Concentrations for Aerobically Digested Solids at WWTPs #54(a) and #92(b)



4.2 Treatment Process Evaluation

At select WWTPs, additional aqueous and solids samples were collected from various treatment processes to evaluate any potential trends between treatment processes and PFAS concentrations. The aqueous and solids samples between two different treatment process stages at five (5) WWTPs are provided in **Figures 39** through **43**. The primary purpose of collecting the samples was to evaluate potential trends in PFAS concentrations for both the aqueous and solid process treatment flows. The aqueous results for the aerobic and alkaline digestion solids samples were the aqueous phase of solids samples with a low solids percentage (i.e., <5%) discussed in **Section 4.1**. A trend was observed of increasing PFAS concentrations for most of the PFAS in all the WWTPs, further down the treatment process for both the aqueous and solids treatment process flows. An increase in PFOA and PFOS concentrations in the effluent than the influent was observed in many WWTPs. While the increase in the concentrations could at least partially result from expected fluctuations in concentrations over time, the fact that higher concentrations in the effluent than the influent was observed for multiple compounds at various WWTPs may indicate that regular fluctuations do not fully explain the increase in concentrations further down the treatment process. The increase further down the treatment process for both the aqueous and solid phases was observed between the primary and secondary treatment processes (**Figure 39**), secondary treatment vs. aerobic digestion (**Figures 40** and **43**), primary and secondary treatment vs. alkaline digestion (**Figures 41** and **42**).

The higher concentrations further down the treatment process could be attributed to WWTP processes and recirculation of treatment streams (i.e., Returned Activated Sludge (RAS), filtrate or centrate) or possible degradation of other PFAS that are known to partially degrade to PFCAs and PFSAs (i.e., PFOA and PFOS), referred to as precursors (Schultz, 2006; Houtz, 2018). The same trend of increasing PFAS concentrations further down the treatment process for both aqueous and solid treatment process flows was also reported for a study of 19 WWTPs from Australia (Coggan, 2019).

Figure 39. Aqueous(a) and Solid(b) PFAS Concentrations for Primary and Secondary Treatment Processes at GLWA WRRF (WWTP #38)

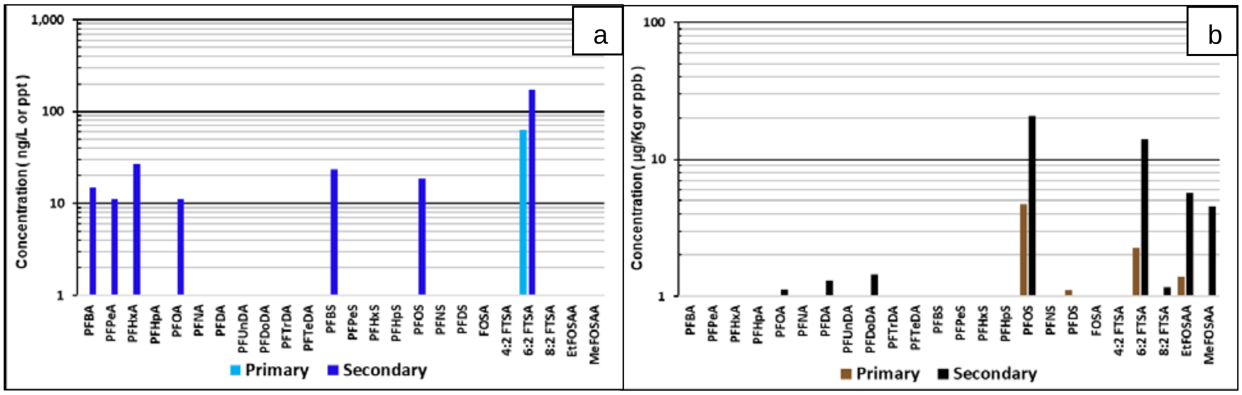


Figure 40. Aqueous(a) and Solid(b) PFAS Concentrations for Secondary and Aerobic Digestion Treatment Processes at KI Sawyer WWTP-Marquette Co. (WWTP #54)

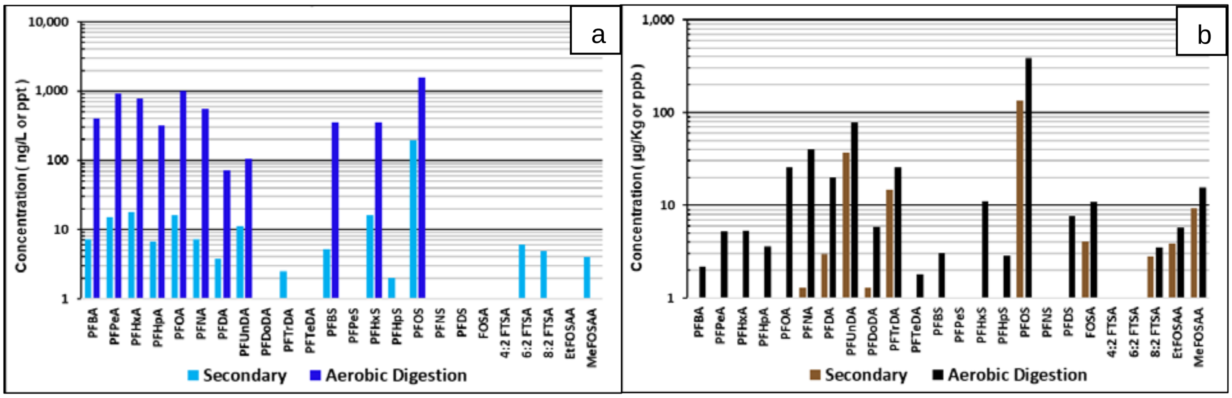


Figure 41. Aqueous(a) and Solid(b) PFAS Concentrations for Primary & Secondary and Alkaline Digestion Treatment Processes at Port Huron WWTP (WWTP #74)

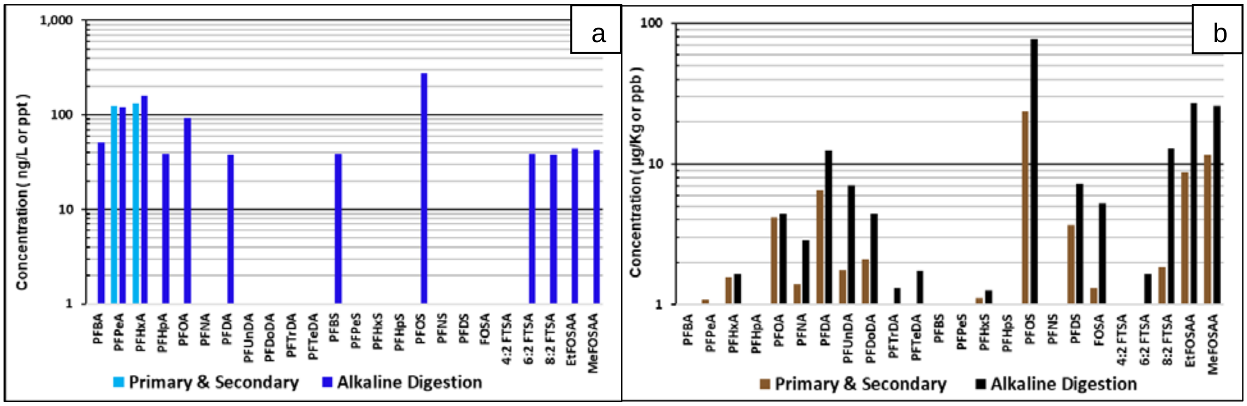


Figure 42. Aqueous(a) and Solid(b) PFAS Concentrations for Primary & Secondary and Alkaline Digestion Treatment Processes at S. Huron Valley UA WWTP (WWTP #77)

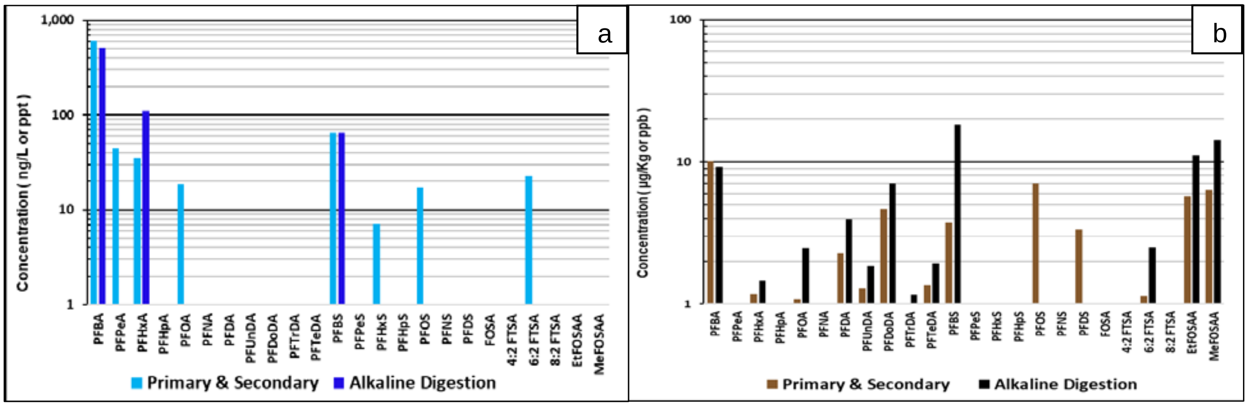
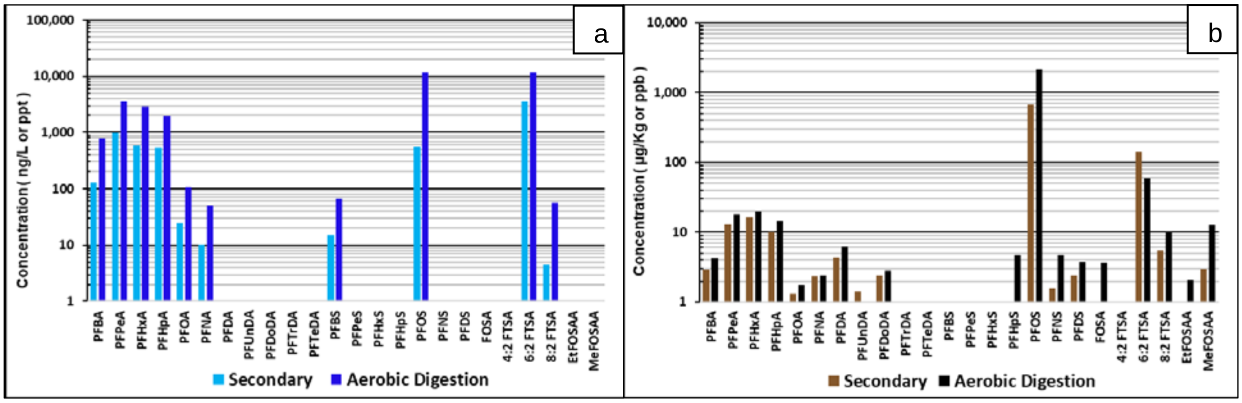


Figure 43. Aqueous(a) and Solid(b) PFAS Concentrations for Secondary and Aerobic Digestion Treatment Processes at Wixom WWTP (WWTP #92)



4.3 Evaluation of PFAS Fate Within WWTPs

Influent, effluent and final treated solids were collected at all 42 WWTPs; however, at select WWTPs, additional aqueous and solid grab samples from various treatment processes were collected further to evaluate the fate of PFAS within the WWTPs. Since the samples were collected as grabs, small differences in the concentrations could be due to typical fluctuations in the PFAS concentrations. **Section 4.1** and **4.2** provided a discussion about some of these additional samples. To better understand the fate of PFAS within WWTPs, a process flow diagram (PFD) for eight (8) WWTPs is provided in **Figures 44** through **51,** along with the results of all aqueous and solid samples collected from each WWTP. The focus of the evaluation was on PFOA and PFOS, as well as total PFAS concentrations. For a limited number of solids samples with a low solid percentage (i.e., < 5%), the aqueous and solid portions were analyzed separately with some of the results discussed in **Section 4.1**. The flows of various waste streams were not available; thus, a mass balance could not be performed. The aqueous concentrations are reported as ng/L or parts per trillion (ppt), and solids concentration are reported as µg/Kg or parts per billion (ppb), with 1,000 ppt being equal to one (1) ppb.

A total of six (6) aqueous samples and two (2) solids samples were collected from Bay City WWTP (WWTP #7). The aqueous and solid portions were analyzed separately for the influent on the screw press solids sample. The total PFAS, PFOA, and PFOS concentrations were very similar in all the aqueous samples for the influent, primary treatment, trickling filters, secondary clarifiers, and spent granular activated carbon (GAC) filter effluents and ranged between 69 to 76, 5 to 6, and 16 to 18 ng/L, respectively. The GAC was 16 years old and installed to remove PCBs. It has been exhausted and was not expected to remove PFAS. Results indicated that no significant removal of PFAS, including PFOA and PFOS, occurred within the aqueous treatment process flow. The total PFAS, PFOA, and PFOS concentrations in the filtrate from the screw press had 60, 4, and 6 ng/L, respectively. These concentrations were within the same range as the rest of the aqueous samples and the aqueous portion of the solid's influent to the screw press except for PFOS, which was 44 ng/L in the aqueous portion of the solids for the screw press. There were not enough samples to understand if these differences can be attributed to PFAS fluctuations in the concentrations or other factors. The concentrations in both of the solid's samples before and after screw press were very similar for total PFAS at 16 and 19 µg/Kg. PFOA was non-detect in both samples, and PFOS was 7 and 9 µg/Kg. There was no PFAS removal observed within the aqueous treatment process flow. The PFOS concentration of 9 µg/Kg in the final treated solids was well below EGLE's industrially-impacted 150 µg/Kg threshold. The effluent PFOS concentration of 16 ng/L was above the PFOS WQS of 12 ng/L, with a PFOS concentration of 22 ng/L collected in June 2019.

Three (3) aqueous samples and three (3) solids samples were collected from Downriver WWTP (WWTP #27). The total PFAS and PFOA concentrations were very similar in the influent and effluent at 84 and 7 ng/L and 88 and 13 ng/L, respectively. The PFOS concentration of 8 ng/L in the effluent was lower than that of 22 ng/L in the influent. Other than possible fluctuations in the PFOS concentrations in the WWTP, the decrease in the effluent is at least partially because PFOS has a higher affinity to the solids accumulated during primary and secondary treatment. The PFAS concentrations in the centrate from the centrifuge were within the same range as in the influent and effluent. The total PFAS, PFOA, and PFOS concentrations increased in the solids further down the treatment process flow with higher concentrations in the secondary treatment sludge of 72, 2, and 41 µg/Kg compared to the primary treatment sludge of 46, non-detect (<0.903), and 28 µg/Kg, respectively. The PFOS concentrations in both sludge samples were higher than PFOA since PFOS has a higher affinity to solids. The final treated solids, a combination of both primary and secondary treatment sludge, as dewatered, had the same PFAS range with total PFAS, PFOA, and PFOS concentrations of 82, 4, and 43 µg/Kg, respectively. The PFOS concentration of 43 µg/Kg in the final treated solids was well below

EGLE's industrially-impacted 150 µg/Kg threshold. The effluent PFOS concentration of 8 ng/L was below the PFOS WQS of 12 ng/L, with a concentration of 21 ng/L collected in January 2020.

A total of 10 aqueous samples and six (6) solids samples were collected from GLWA WRRF (WWTP #38). A total of two (2) aqueous samples were analyzed for the aqueous phase of solids samples with low solid content for the primary and secondary treatment sludges. Solids samples also included the ash from an incinerator that operates at 1,300 ^{0}F and generates pellets from the sludge. The aqueous PFAS concentrations in the effluent were within the same range but slightly higher than those in the influent. The typical fluctuations in the PFAS concentrations and the recirculating waste streams, such as return activated sludge, would explain the slightly higher PFAS concentrations in the effluent. Like in other WWTPs, high concentrations were observed in the secondary treatment sludge in both the solids and aqueous samples compared to those in the primary treatment sludge. The concentration after the blending of both the primary and secondary sludge was within the ranges expected from mixing both sludge streams. The PFOS concentrations in the ash were non-detect (<0.870 µg/Kg), with 7 µg/Kg in the cake from the belt filter press, and pellets were 9 µg/Kg. These concentrations were well below EGLE's industrially-impacted threshold of 150 µg/Kg. The effluent PFOS concentration of 9 ng/L was below the PFOS WQS of 12 ng/L, with a concentration of 28 ng/L collected in January 2020.

Three (3) aqueous samples and three (3) solids samples were collected from Grand Rapids WRRF (WWTP #40). The Total PFAS, PFOA, and PFOS concentrations of 403, 11, and 36 ng/L were higher in the effluent than the influent concentrations of 72, 5, and 13 ng/L, respectively. The only other aqueous sample collected at WWTP #40 was the centrate from the centrifuge from the dewaters primary and secondary treatment sludges. The Total PFAS concentration in the centrate effluent was higher than the WWTP effluent with a concentration of 619 ng/L compared to 403 ng/L. The concentrations for PFOA and PFOS in the centrate effluent of 8 and 27 ng/L were above the influent but slightly lower than that of the WWTP effluent concentrations of 11 and 36 ng/L, respectively. There were not enough samples collected from the WWTP to fully understand the fate of PFAS within the WWTP. However, the large difference between the WWTP effluent and influent concentrations indicates that potential fluctuations in the influent to the WWTP could not fully explain the difference in concentrations. Like other WWTPs in this study, there was an accumulation of PFAS in the primary and secondary treatment sludge with Total PFAS, PFOA, and PFOS concentrations of 162, 8, and 26 and 155, 4, 44 µg/Kg, respectively. The primary and secondary treatment sludge concentration was within the same range, with PFOS being slightly higher in the secondary treatment sludge. The final dewatered sludge was composed of both primary and secondary treated sludges and had concentrations of Total PFAS, PFOA, and PFOS of 74,1, and 22 µg/Kg. This indicates that there may be significant fluctuations in the PFAS concentrations. However, the recirculation of centrate and return activated sludge (RAS) may also contribute to the higher concentrations in the effluent than the influent. The PFOS concentration of 22 µg/Kg in the final treated solids was well below EGLE's industrially-impacted 150 µg/Kg threshold. The effluent PFOS concentration of 36 ng/L was above the PFOS WQS of 12 ng/L, with a concentration of 16 ng/L collected in February 2020.

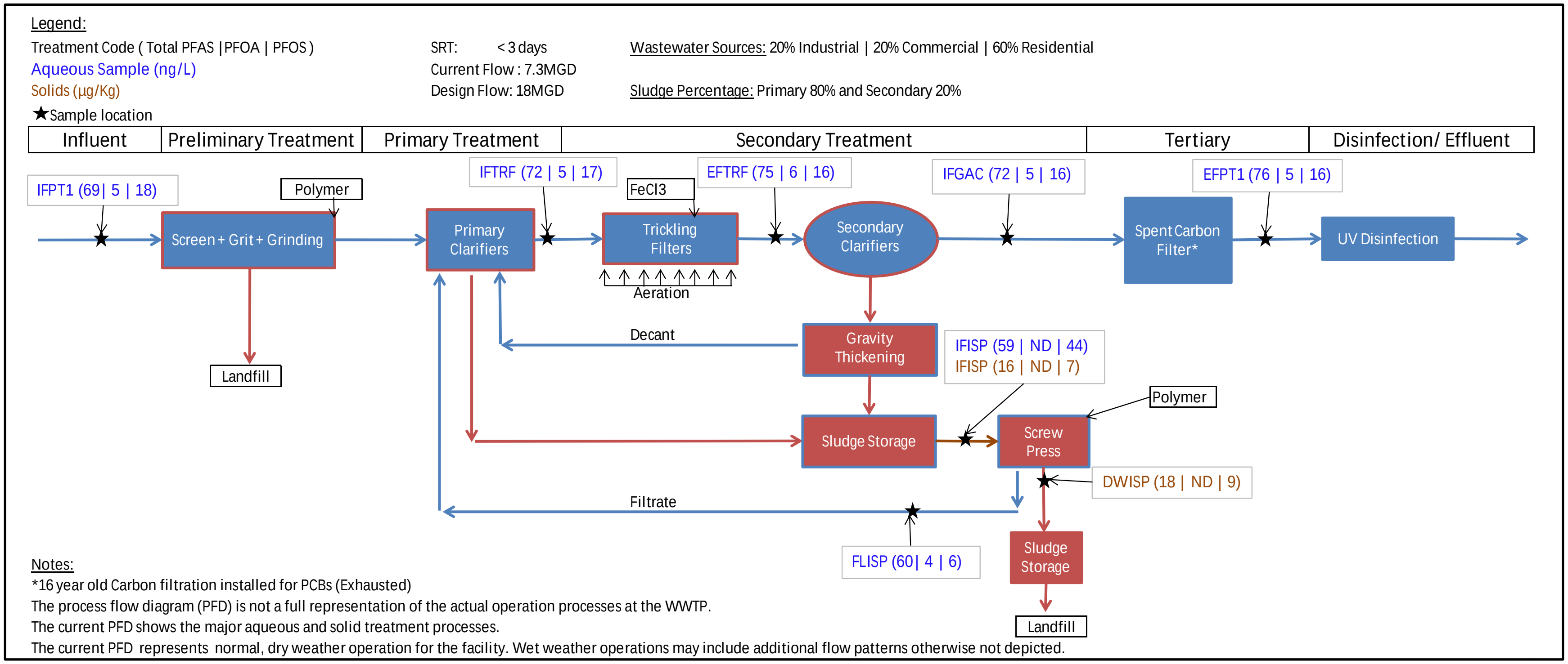
A total of two (2) aqueous samples and three (3) solids samples were collected from Kalamazoo WWTP (WWTP #53). The Total PFAS and PFOA concentrations in the influent of 83 and 8 ng/L were similar to the effluent concentrations of 86 and 10 ng/L, respectively. The concentration of PFOS in the effluent was 6 ng/L compared to the influent concentration of 26 ng/L. The reduction of PFOS from the influent to the effluent could be explained by the affinity of PFOS to the solids and the accumulation of PFOS in the sludge. Like the other WWTPs in this study, increased PFAS concentrations were detected in the solids. The PFOS increased further along in the treatment process with higher concentrations in the secondary treatment sludge than those in the primary treatment sludge. The PFAS concentrations in the dewatered cake, which included primary and secondary treatment sludges, were within the concentrations expected from the mixing of both sludge treatment processes. The PFOS concentration in all three sludge solids was well below EGLE's industrially-impacted 150 µg/Kg threshold. The effluent PFOS concentration before the sand filters and disinfection of 6 ng/L was below the PFOS WQS of 12 ng/L, with a concentration of 4.84 ng/L collected on October 2020.

Four (4) aqueous samples and four (4) solids samples were collected from Port Huron WWTP (WWTP #74). A total of two (2) aqueous samples were analyzed as the aqueous portion of solid samples with low solid content for the gravity thickened combined primary and secondary treatment sludges and from the final biosolids storage tank. The aqueous PFOA and PFOS concentrations in the effluent of 45 and 13 ng/L were within the same range but lower than those in the influent of 65 and 20 ng/L, respectively. There was an accumulation of PFOA and PFOS in the final alkaline stabilized biosolids from the final storage tank with 92 and 277 ng/L concentrations, respectively. Decant from the final biosolids storage tank is recirculated within the WWTP, but the flow is much lower than the influent flow to the WWTP. However, if the decant discharge is not continuous and done as batches, there could be an effect on the PFAS concentrations in aqueous treatment train for short periods. The difference between the gravity thickened sludges and that from the final rotary drum after polymer and line addition for Total PFAS, PFOA, and PFOS of 72, 4, and 24 µg/Kg compared to 53, 3, and 21 µg/Kg can be most likely attributed to typical fluctuations in the PFAS concentrations. However, the concentrations from the final biosolids storage tank that was 2 months old were higher for Total PFAS of 196 µg/Kg and PFOS at 78 µg/Kg with PFOA being similar at 4 µg/Kg. These differences may not be the result of typical fluctuations in the PFAS concentrations. Still, the degradation of precursors and residence time allows PFAS with higher affinity for solids, such as PFOS, to accumulate further to the solids. The PFOS concentrations in the final biosolids of 78 µg/Kg were below the industrially-impacted 150 µg/Kg threshold. The effluent PFOS concentration of 13 ng/L was just above the PFOS WQS of 12 ng/L, with a concentration of 21 ng/L collected in July 2020.

A total of five (5) aqueous samples and three (3) solids samples were collected from S. Huron Valley UA WWTP (WWTP #77). A total of two (2) aqueous samples were analyzed as the aqueous portion of solid samples with low solid content for the gravity thickened combined primary and secondary treatment sludges and from the recent alkaline biosolids. The aqueous PFOA and PFOS concentrations in the effluent of 7 and 5 ng/L were within the same range but higher than those in the influent of 4 and non-detect (i.e., < 2) ng/L, respectively. The Total PFAS concentration in the effluent of 102 ng/L was significantly higher than those in the influent of 18 ng/L. The concentrations were also higher in the aqueous phases of the solids, and cell decants from the sludge cells with a Total PFAS range between 685 and 818 ng/L, PFOA at 19 ng/L, and PFOS at 17 ng/L. Due to matrix interference, the detection limit for PFOA and PFOS in the alkaline stabilized biosolids was 70 ng/L, and both compounds were non-detect. There was an accumulation of PFAS in the solids similar to the rest of WWTP with Total PFAS, PFOA, and PFOS concentrations of 50, 1, and 7 µg/Kg in the gravity thickened combined primary and secondary sludge as well as in the final recently stabilized biosolids of 32, 1, and 8 µg/Kg, respectively. Some differences were observed in the recently stabilized biosolids and the 24-hour old stabilized biosolids, which is most likely attributed to the typical fluctuations in the PFAS concentrations. Still, more data is needed to understand the variation in PFAS concentrations further. The increase in PFAS in the solid and aqueous concentrations at the WWTP could not be solely attributed to typical fluctuations in PFAS concentrations and is most likely due to the degradation of precursors and recirculation of various waste streams. The PFOS concentrations in the final biosolids of 8 µg/Kg were below the industrially-impacted 150 µg/Kg threshold. The effluent PFOS concentration of 5 ng/L was below the PFOS WQS of 12 ng/L, with a concentration of 7.4 ng/L collected in October 2019.

A total of seven (7) aqueous samples and three (3) solids samples were collected from Wixom WWTP (WWTP #92). A total of three (3) aqueous samples were analyzed as the aqueous phases of solids samples with low solid content for the waste activated sludge right from the effluent and biological storage and a sludge tank that was six (6) months old. The six (6) months-old biosolids storage tanks were aerobically digested biosolids. The Total PFAS, PFOA, and PFOS concentrations from the secondary treatment clarifier were within the same range as the final UV disinfected effluent with concentrations of 4,712, 9, and 218 ng/L compared to 4,950, 10, and 269 ng/L, respectively. However, these aqueous samples further down the treatment process were significantly higher than those in the influent, especially for Total PFAS and PFOS, with influent concentrations for Total PFAS, PFOA, and PFOS of 2,329, 3, and 128 ng/L, respectively. The aqueous concentrations in the waste activated sludge, influent to the screw press, and the filtrate from the screw press were significantly higher than those of the influent. The Total PFAS, PFOA, and PFOS concentrations in the filtrate were 13,754, 29, and 8,080 ng/L, respectively. A high accumulation of Total PFAS, PFOA, and PFOS in the solids was observed with ranges between 877 to 1,510 µg/Kg, 1 to 5 µg/Kg, and 666 to 1,200 µg/Kg, respectively. As a result, the most likely reason for these increases in the aqueous concentrations could be partially attributed to the recirculation of waste streams in the WWTP. The increase was even higher in the six (6) months old aerobically stabilized biosolids collected from the storage tank with Total PFAS, PFOA, and PFOS concentrations of 32,663, 108, and 11,700 ng/L in the aqueous portion and 2,324, 2, and 2,150 µg/Kg in the solids phase. The PFOA concentration in the solids was similar between the recent sludge and aerobically digested biosolids. There is not enough information to fully understand the higher concentrations in the old aerobically stabilized biosolids. Still, it is most likely due to multiple reasons such as recent source reduction efforts, degradation of precursors, and longer residence time that could have facilitated more accumulation in the solids for long-chain PFAS such as PFOS. The PFOS concentrations in the recently treated solids and old biosolids were well above the 150 µg/Kg industrially-impacted threshold, with PFOS concentrations of 1,200 and 2,150 µg/Kg, respectively. The effluent PFOS concentration of 269 ng/L was above the PFOS WQS of 12 ng/L, with a concentration of 27 ng/L collected in November 2020. The significant decrease in the PFOS concentrations in the effluent results from source reduction efforts taken at the WWTP and removing the digestion treatment process that most likely reduced the PFAS concentrations in recirculated waste streams further down the treatment process.

Figure 44. PFAS Results and Process Flow Diagram for Bay City WWTP



Notes:

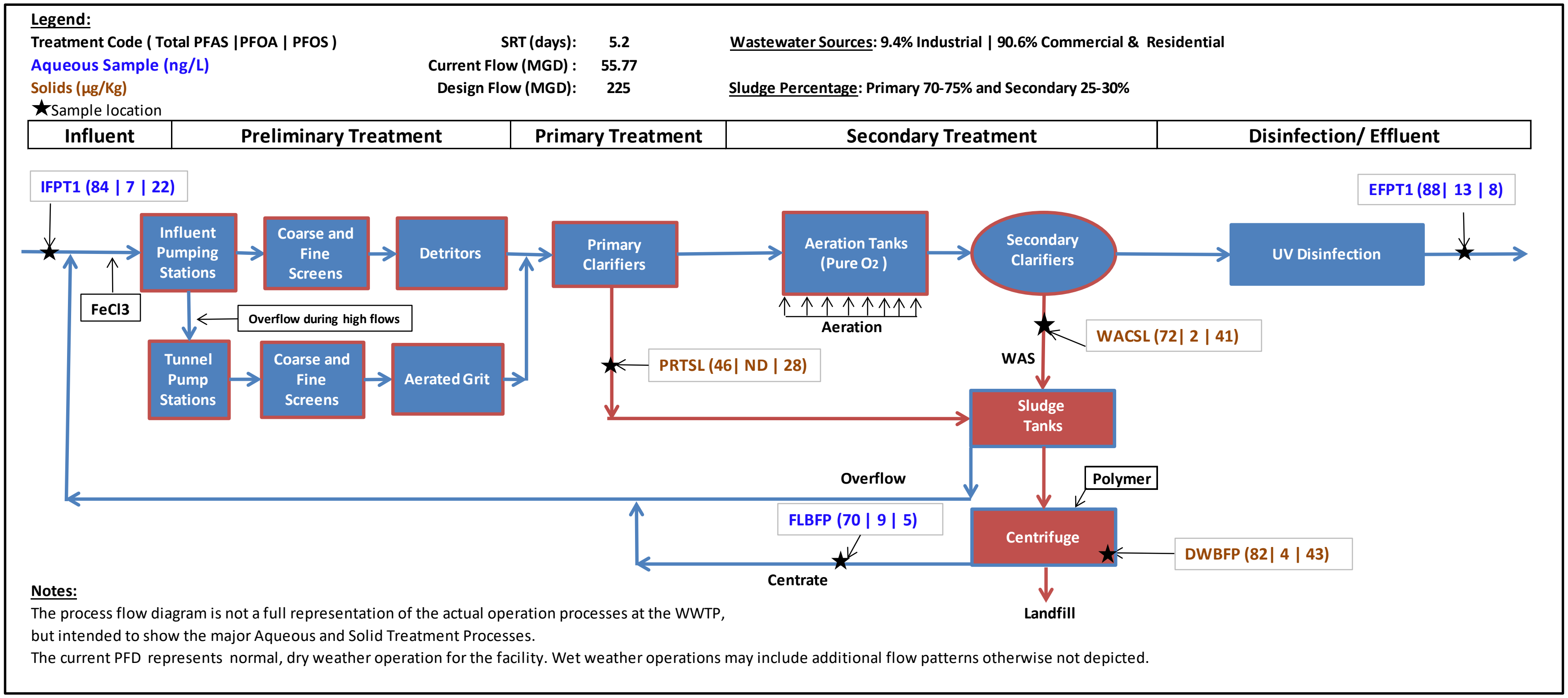
*16 year old Carbon filtration installed for PCBs (Exhausted)

The process flow diagram (PFD) is not a full representation of the actual operation processes at the WWTP.

The current PFD shows the major aqueous and solid treatment processes.

The current PFD represents normal, dry weather operation for the facility. Wet weather operations may include additional flow patterns otherwise not depicted.

Figure 45. PFAS Results and Process Flow Diagram for Downriver WWTP



Legend:

Treatment Code (Total PFAS |PFOA | PFOS)

Aqueous Sample (ng/L)

Solids (µg/Kg)

★Sample location

SRT (days): 5.2

Current Flow (MGD) : 55.77

Design Flow (MGD): 225

Wastewater Sources: 9.4% Industrial | 90.6% Commercial & Residential

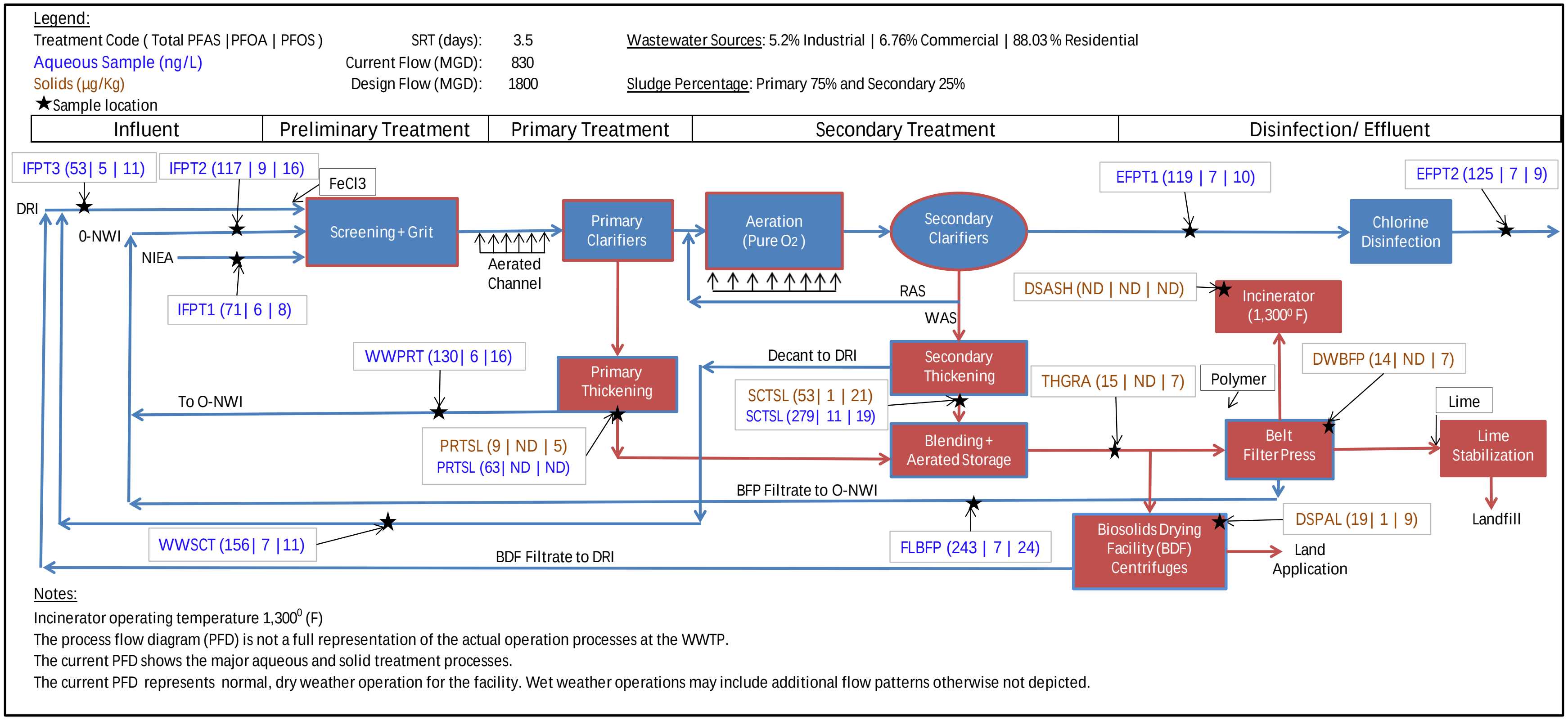
Sludge Percentage: Primary 70-75% and Secondary 25-30%

Notes:

The process flow diagram is not a full representation of the actual operation processes at the WWTP, but intended to show the major Aqueous and Solid Treatment Processes.

The current PFD represents normal, dry weather operation for the facility. Wet weather operations may include additional flow patterns otherwise not depicted.

Figure 46. PFAS Results and Process Flow Diagram for GLWA WRRF



Legend:
Treatment Code (Total PFAS | PFOA | PFOS)
Aqueous Sample (ng/L)
Solids (µg/Kg)
★Sample location

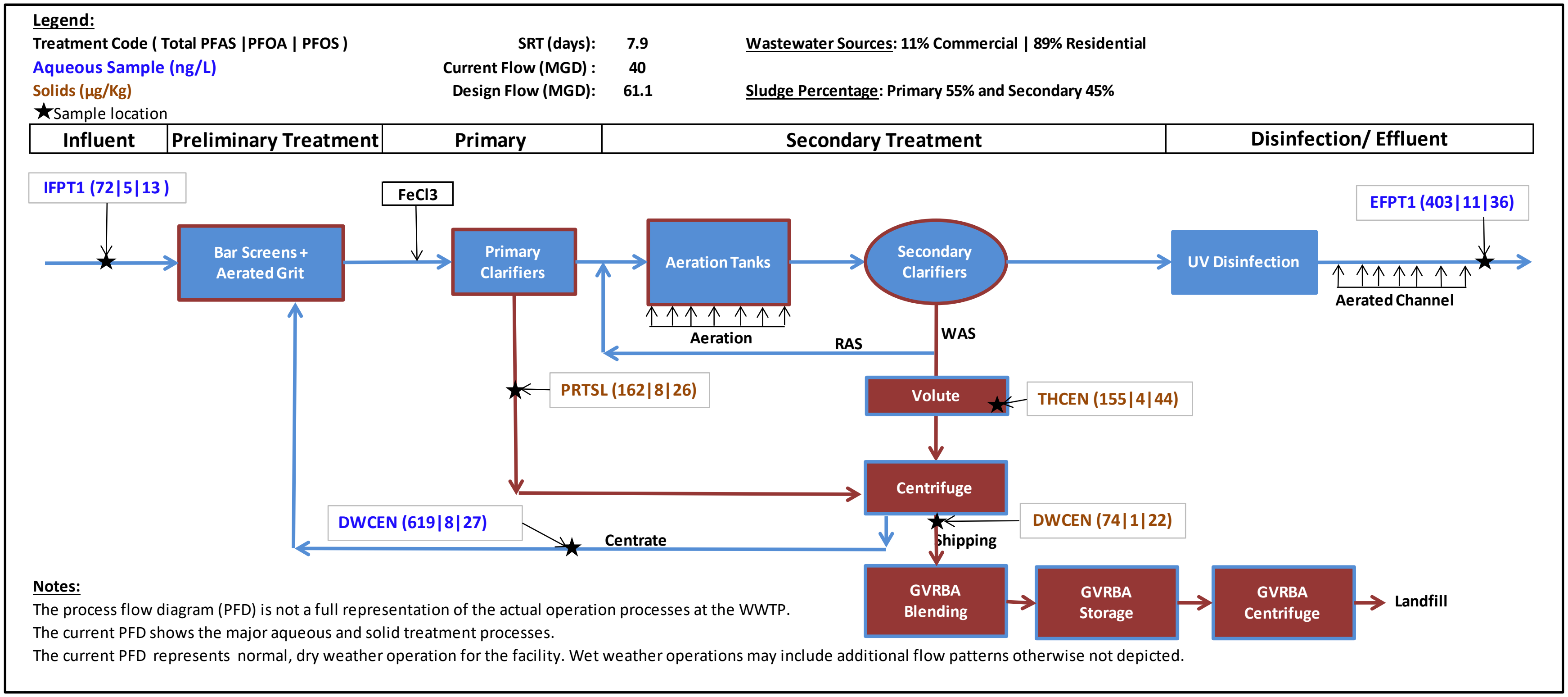
SRT (days): 3.5
Current Flow (MGD): 830
Design Flow (MGD): 1800

Wastewater Sources: 5.2% Industrial | 6.76% Commercial | 88.03 % Residential

Sludge Percentage: Primary 75% and Secondary 25%

Notes:
Incinerator operating temperature 1,300⁰ (F)
The process flow diagram (PFD) is not a full representation of the actual operation processes at the WWTP.
The current PFD shows the major aqueous and solid treatment processes.
The current PFD represents normal, dry weather operation for the facility. Wet weather operations may include additional flow patterns otherwise not depicted.

Figure 47. PFAS Results and Process Flow Diagram for Grand Rapids WRRF



Legend:

Treatment Code (Total PFAS |PFOA | PFOS)
Aqueous Sample (ng/L)
Solids (µg/Kg)
★Sample location

SRT (days):	7.9
Current Flow (MGD) :	40
Design Flow (MGD):	61.1

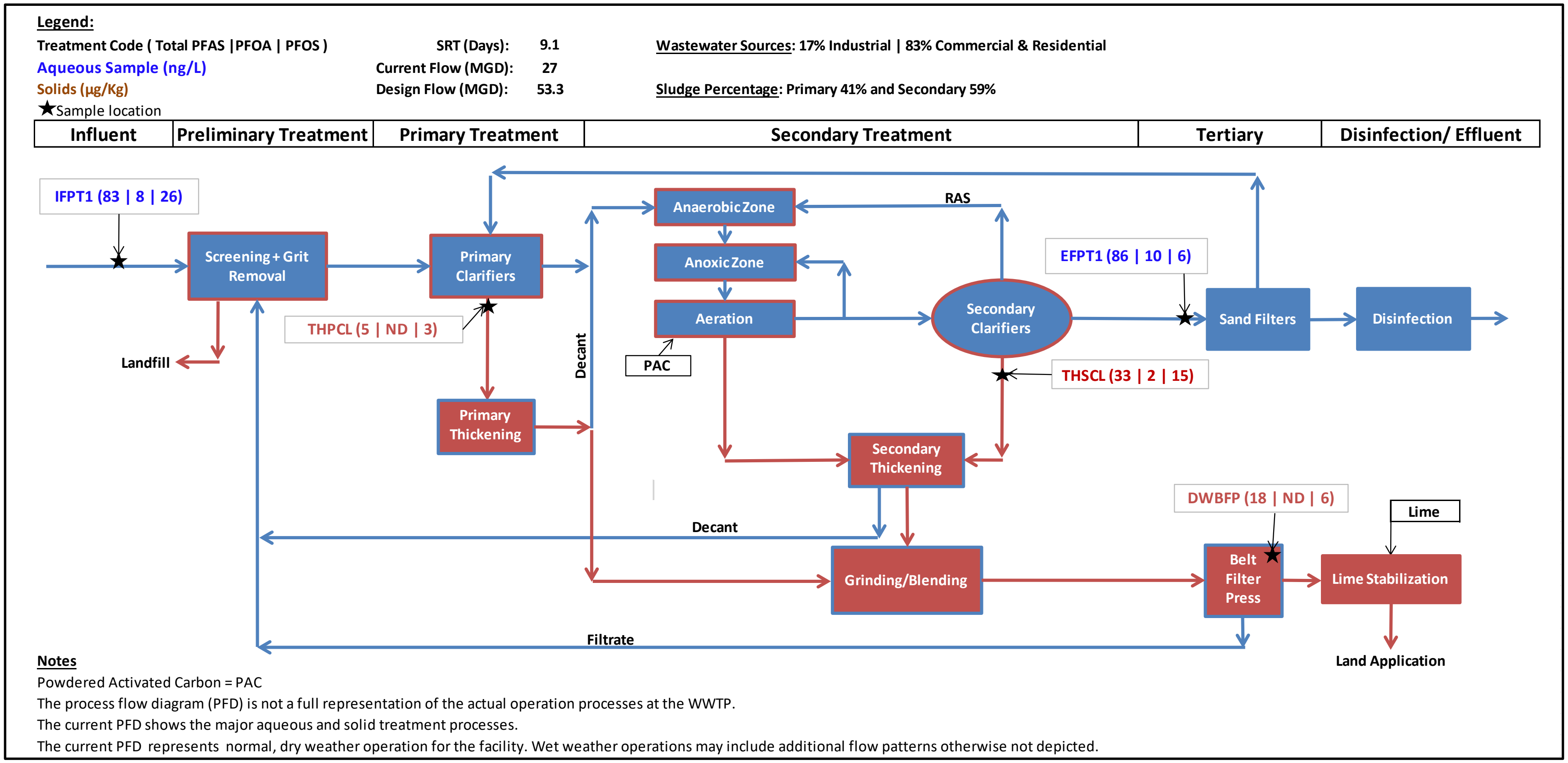
Wastewater Sources: 11% Commercial | 89% Residential

Sludge Percentage: Primary 55% and Secondary 45%

Notes:

The process flow diagram (PFD) is not a full representation of the actual operation processes at the WWTP.
The current PFD shows the major aqueous and solid treatment processes.
The current PFD represents normal, dry weather operation for the facility. Wet weather operations may include additional flow patterns otherwise not depicted.

Figure 48. PFAS Results and Process Flow Diagram for Kalamazoo WWTP



Legend:

Treatment Code (Total PFAS |PFOA | PFOS)

Aqueous Sample (ng/L)

Solids (µg/Kg)

★Sample location

SRT (Days): 9.1

Current Flow (MGD): 27

Design Flow (MGD): 53.3

Wastewater Sources: 17% Industrial | 83% Commercial & Residential

Sludge Percentage: Primary 41% and Secondary 59%

Notes

Powdered Activated Carbon = PAC

The process flow diagram (PFD) is not a full representation of the actual operation processes at the WWTP.

The current PFD shows the major aqueous and solid treatment processes.

The current PFD represents normal, dry weather operation for the facility. Wet weather operations may include additional flow patterns otherwise not depicted.

Figure 49. PFAS Results and Process Flow Diagram for Port Huron WWTP

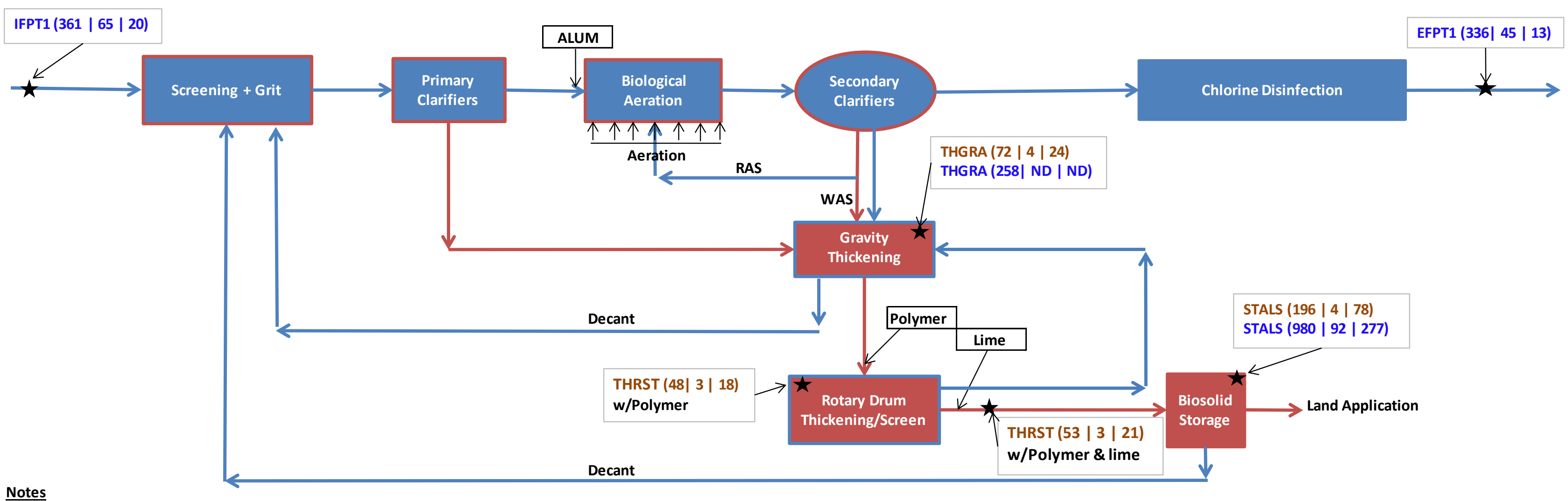
Legend:

Treatment Code (Total PFAS |PFOA | PFOS)
Aqueous Sample (ng/L)
Solids (µg/Kg)
★Sample location

SRT: varies
Current Flow (MGD): 10
Design Flow (MGD): 20

Wastewater Sources: 3.5% Industrial | 8.11% Commercial |88.39% Residential

Sludge Percentage: Primary 86.11% and Secondary 13.89 %



Notes

Biosolids estimated storage of two months
The process flow diagram (PFD) is not a full representation of the actual operation processes at the WWTP.
The current PFD shows the major aqueous and solid treatment processes.
The current PFD represents normal, dry weather operation for the facility. Wet weather operations may include additional flow patterns otherwise not depicted.

Figure 50. PFAS Results and Process Flow Diagram for S Huron Valley UA WWTP

Legend:

Treatment Code (Total PFAS |PFOA| PFOS)

Aqueous Sample (ng/L)

Solids (µg/Kg)

★Sample location

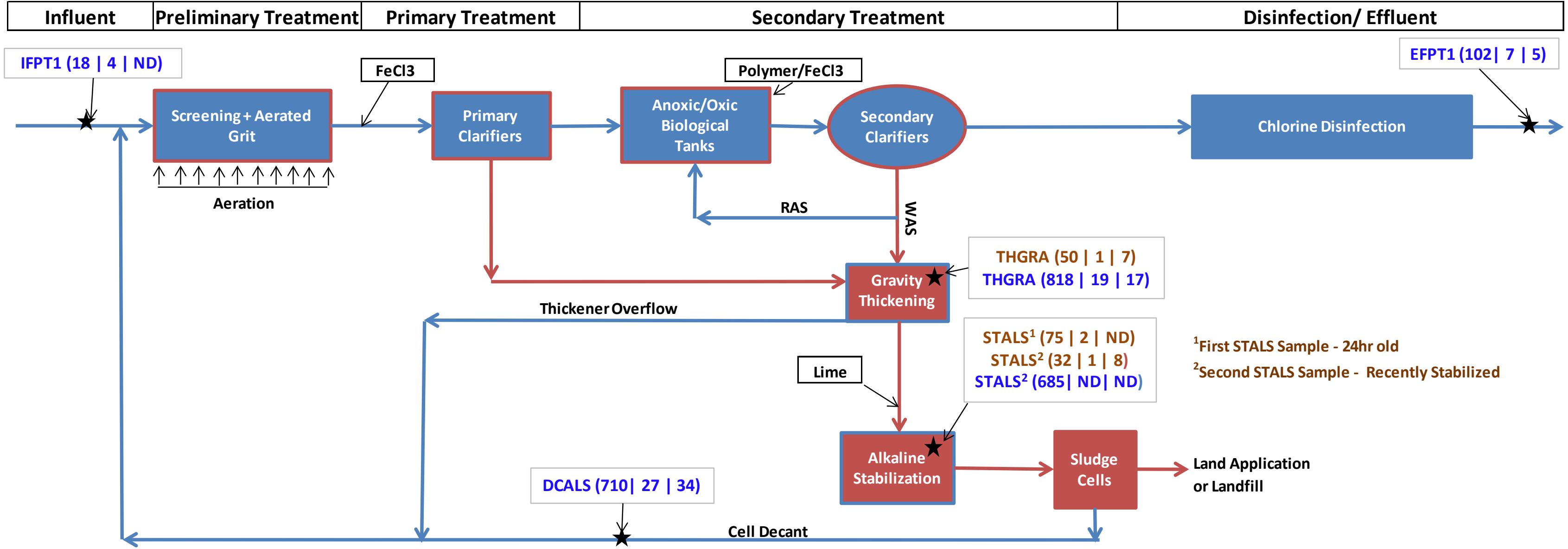
SRT: 11 days

Current Flow : 9.57

Design Flow: 24

Wastewater Sources: 9% Industrial | 14% Commercial | 77% Residential

Sludge Percentage: Primary 39% and Secondary 61 %



Notes

*EQ Basin indicated in 2011 NOT on field form

*Aerated grit chamber indicated in plant documentation

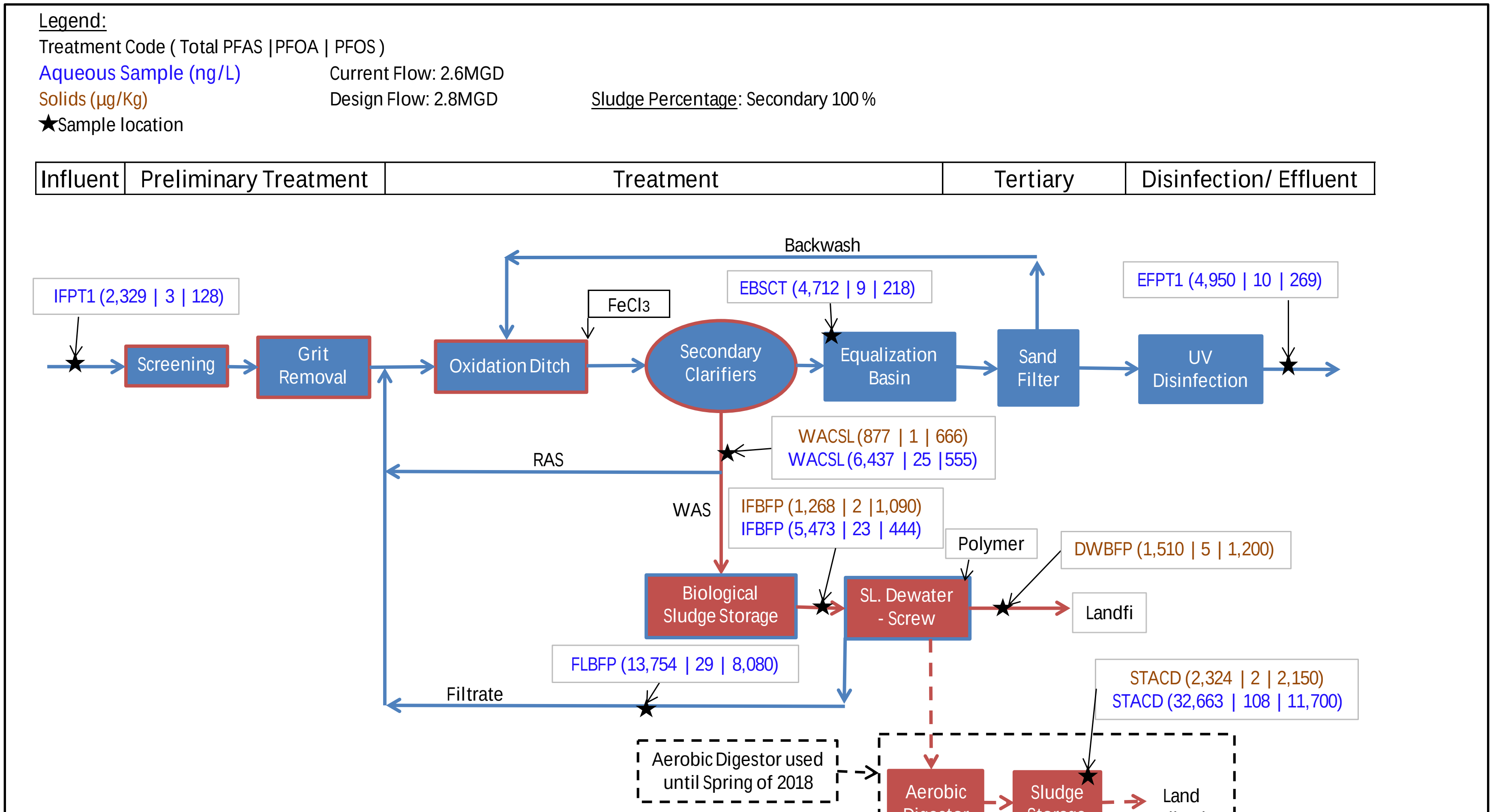
Landfill has not occurred since 2017

The process flow diagram (PFD) is not a full representation of the actual operation processes at the WWTP.

The current PFD shows the major aqueous and solid treatment processes.

The current PFD represents normal, dry weather operation for the facility. Wet weather operations may include additional flow patterns otherwise not depicted.

Figure 51. PFAS Results and Process Flow Diagram for Wixom WWTP



Notes

The process flow diagram (PFD) is not a full representation of the actual operation processes at the WWTP.
The current PFD shows the major aqueous and solid treatment processes.
The current PFD represents normal, dry weather operation for the facility. Wet weather operations may include additional flow patterns otherwise not depicted.

5. Discussion and Conclusions

PFAS is a large class of chemicals composed of many families with vastly different physical and chemical properties, which were developed in the late 1930s and started to be used in commercial products in the late 1940s and early 1950s. Widespread use of PFAS in various manufacturing and industrial facilities in conjunction with extreme resistance to degradation has resulted in the presence of PFAS in the environment and at WWTPs. While WWTPs are not the source of PFAS, they are a central point of collection. Effluents discharged from WWTPs and biosolids applied to the agricultural land for beneficial reuse have been identified as potential PFAS release pathways into the environment. PFAS have been identified in WWTPs since the early 2000s in Alabama, Tennessee, Georgia, and Florida. PFAS were also later identified in WWTPs from Minnesota, Iowa, California, Illinois, New York, Kentucky, Georgia, and Michigan.

Analysis of archived biosolids samples collected in 2001, which represented 94 WWTPs from 32 different US states and the District of Columbia, were analyzed for a total of 13 PFAS and identified that PFOS and PFOA had the highest and second-highest average concentrations of 402 and 34 µg/kg, respectively. Sources of PFAS in WWTPs from Switzerland were identified from industries and products such as textile, carpet, paper coatings, aqueous film-forming foams (AFFFs), electroplating, and semiconductor industries. A strong correlation of PFAS with WWTPs that received industrial discharges was also observed in Germany, Thailand, and other countries.

Because PFAS was correlated with industrial discharges in research publications, EGLE focused on the WWTPs that are part of the Industrial Pretreatment Program (IPP) (i.e., IPP WWTPs). The WWTPs required to implement an IPP were expected to be more heavily impacted by PFAS. Due to limited studies and data on PFAS, only PFOA and PFOS have Water Quality Standards (WQS), established in 2011 and 2014, respectively. EGLE's focus was to screen, monitor, and reduce PFOA and PFOS impacts to the WWTPs and ultimately reduce the concentrations in the effluent and final treated solids, including biosolids.

5.1 Conclusions from the Michigan IPP PFAS Initiative

EGLE is working closely with the WWTPs and industrial users to reduce the PFOS discharges to the WWTPs. In many cases, the reduction efforts for PFOS also reduce PFOA concentrations. While source reduction efforts have been conducted at multiple industrial facilities whose discharges affect multiple WWTPs, a detailed discussion is provided for the source reduction efforts at seven (7) WWTPs in **Section 3.5**. A PFOS reduction between 90 to 99 % in the effluent (**Table 7**) with a significant drop in PFOS concentrations in the final treated solids was achieved through source reduction efforts being implemented by only one industrial source for most of the WWTPs (**Figures 7** through **13**). The significant and rapid drop in PFOS concentrations at WWTPs following source reduction indicates that the source reduction approach is highly effective. Treating PFOS at WWTPs is likely to be difficult and costly because sanitary sewage is a complex waste stream, larger flows would have to be treated, and treatment technologies are not yet sufficiently developed. The current remedial technologies that have been used in limited cases for water treatment with a less complex matrix (e.g., drinking water or contaminated groundwater) are costly. However, a limited number of pilot tests are currently being conducted for PFAS removal from wastewater and final treated solids.

As part of source reduction efforts, WWTPs with IPPs implemented a sampling screening program to identify the sources of PFOA and PFOS to the WWTP, including targeted sampling of IU, SIU, and CIU facilities. A total of 431 individual CIUs representing 18 different 40 CFR categories were evaluated for the need for PFAS sampling, out of which 310 CIUs were sampled with a total of 1,293 samples collected. A total of 656 samples were collected from 256 individual IUs and SIUs representing seven (7) industry types. While the WQS of 420 ng/L for PFOA and 12 ng/L for PFOS are only applicable to discharges to surface waters of the state, the WQS was used by the IPP WWTPs as a screening tool for the industrial effluents to categorize industrial sources of PFOA and PFOS. A detailed discussion is provided in **Section 3.7**.

While there were multiple industrial dischargers identified to be significant sources of PFOS to IPP WWTPs in Michigan, a high number of facilities under Categories 413 – Electroplating and 433 – Metal Finishing that used fume suppressants in the past, which contained high PFOS concentrations, showed high detection frequency and PFOS concentrations in their discharges to the IPP WWTPs. Old fume suppressants that contained PFOS were most prevalent in chrome plating operations using hexavalent chromium. Facilities that never used the older generation of fume suppressants with high PFOS concentrations were found not to be discharging PFOS. Current fume suppressants contain high concentrations of other PFAS, primarily 6:2 Fluorotelomer Sulfonic Acid (6:2 FTSA), as the main ingredient. Another category that had several facilities sampled and showed a high detection frequency and PFOS concentrations in their discharges to the IPP WWTPs was Category 437 – Centralized Waste Treatment. Also, landfills were identified as PFAS sources to WWTPs. The actual PFOS impact to the WWTPs from the industrial discharge depended on the size of the WWTP and what percentage of the total flow was attributed to the industrial discharge.

5.2 Conclusions from the Statewide PFAS Assessment of 42 WWTPs

In the fall of 2018, EGLE launched a second statewide PFAS initiative with the assessment of 42 municipal WWTPs to better understand the occurrence of 24 PFAS by sampling the influent, effluent, and associated residuals (i.e., final treated solids such as sludge or biosolids). At select WWTPs, additional aqueous and solid samples from various treatment processes were collected to further evaluate the fate of PFAS within the WWTPs. The study included the 20 largest WWTPs in Michigan and an additional 22 WWTPs selected from three (3) main groups based on flows of 0.2 to 0.4 million gallons per day (MGD), 0.5 to 3 MGD, and 3 to 9 MGD with various treatment processes. A detailed discussion is provided in **Section 4**. A total of 134 aqueous and 71 solids samples were collected during this study.

PFAS was detected in all 134 aqueous samples and 69 out of 71 solids samples. The only two solids samples where PFAS were non-detect were ash samples from two (2) WWTPs that processes the final solids through a furnace. The high detection frequency of many PFAS in the WWTP samples indicates that PFAS are likely to be present in many industrial, commercial, or even residential discharges. The short-chain PFAS from various PFAS families were more frequently detected in the aqueous samples (e.g., influent and effluent). The long-chain PFAS were detected more frequently in the solids samples (e.g., sludge or biosolids), which indicates a higher affinity to the solids for long-chain compounds. A total of 36 out of 42 effluent PFOA concentrations were higher than the influent, indicating the possible transformation of precursors and, at least in part, the recirculation of various treatment streams (e.g., waste activated sludge, centrate, filtrate) during WWTP operations. A total of 19 out of 42 effluent PFOS concentrations were higher than the influent, with a total of 24 effluent concentrations being within +/- 5 ng/L of the influent concentration. PFOS is known to adsorb to solids more strongly than PFOA, and the detection frequency of PFOS was also higher than PFOA in the solids. Like PFOA, the increase in PFOS concentrations in the effluent or accumulation in the solids could be due to possible transformation of precursors or could be attributed to the recirculation of various treatment streams (e.g., waste activated sludge, centrate, filtrate) during WWTP operations. Also, some variability would be expected since grab samples were collected to minimize the potential for cross-contamination.

All the PFOA concentrations in both the influent and effluent samples were well below the lowest PFOA WQS for drinking water sources of 420 ng/L. However, 15 influent and 14 effluent samples had PFOS concentrations above the PFOS both the WQS as the drinking water source of 11 ng/L or non-drinking water source of 12 ng/L. As a result, PFOS was the main driver for regulatory compliance applied to the final effluent. PFOS was detected in 43 out of 45 final treated solids samples and had an average PFOS concentration of 184 µg/kg, while the median concentration was 13 µg/kg. A total of seven (7) final treated solids samples from six (6) WWTPs were above the 150 µg/kg threshold that EGLE has chosen for characterizing biosolids as “industrially impacted.” The threshold value of 150 µg/kg is not a risk-based number. When removing the seven (7) industrially impacted samples, the recalculated average biosolids PFOS concentration lowers to 18 from 184 µg/kg, and the median lowers to 11 from 13 µg/kg. The PFOS concentrations in the final treated solids (e.g., sludge or biosolids) identified during the study were like the concentration ranges reported in the literature for WWTPs that receive industrial discharges from Switzerland, Australia, and parts of the United States in the past.

A total of 20 sludge and biosolids (e.g., alkaline, anaerobically, and aerobically digested) samples with very low solids percentage (i.e., ~5% or lower) were centrifuged, and the aqueous portion was analyzed separately for these solids. A detailed discussion of the PFAS partition study is presented in **Section 4.1**. The short-chain compounds were more strongly associated with the aqueous phase, while the long-chain compounds were strongly associated with the solid phase, where the highest percentage of long-chain compounds were detected. In some instances, the concentrations of the short-chain compounds were below the detection limit in the solid phase but still detected in the aqueous phase, which indicates that analyzing only the solid phase may show the absence of short-chain compounds, but they could still be present. For the long-chain PFAS, especially PFOS, analyzing only the solid phase without the aqueous phase would report most of the mass present in the whole solids’ samples.

At select WWTPs, additional aqueous and solids samples were collected from various treatment processes to evaluate potential trends between treatment processes and PFAS concentrations. The aqueous and solids samples between two different treatment process stages at five (5) WWTPs are discussed in detail in **Section 4.2**. The primary purpose of collecting the samples was to evaluate potential trends in PFAS concentrations for both the aqueous and solid process treatment flows. The study showed increasing PFAS concentrations further down the treatment process for both aqueous, and solids treatment process flows for most of the PFAS in all the WWTPs. While the increase in the concentrations could at least partially result from expected fluctuations in concentrations over time, the fact that higher concentrations in the effluent than the influent were observed for multiple compounds at various WWTPs may indicate that regular fluctuations do not fully explain these increases. The increases further down the treatment process for both the aqueous and solid phases were observed between the 1) primary and secondary treatment processes, 2) secondary treatment and aerobic digestion, and 3) primary and secondary treatment and alkaline digestion. The higher concentrations further down the treatment process could be attributed to WWTP processes and recirculation of treatment streams (i.e., Returned Activated Sludge (RAS), filtrate or centrate) or possible degradation of other PFAS that are known to partially degrade to PFCAs and PFSAs (i.e., PFOA and PFOS), referred to as precursors (Schultz, 2006; Houtz, 2018). The same trend of increasing PFAS concentrations further down the treatment process for both aqueous and solid treatment process flows was also reported in a study of nineteen (19) WWTPs from Australia.

At select WWTPs, additional aqueous and solid grab samples from various treatment processes were collected to further evaluate the fate of PFAS within the WWTPs with detailed results discussed in **Section 4.3**. Since the samples were collected as grabs, small differences in the concentrations could be due to typical fluctuations in the PFAS concentrations. To better understand the fate of PFAS within WWTPs, a process flow diagram (PFD) for eight (8) WWTPs is provided in **Figures 44** through **51**, along with the results of all aqueous and solid samples collected from each WWTP. The evaluation showed that wastewater treatment processes could not remove PFAS such as PFOA and PFOS, which passes through the WWTP, accumulates in the final treated solids, and is recirculated within the WWTP through various treatment streams.

5.3 Conclusions from the Combination of Data from the IPP Initiative and Statewide WWTP Assessment

A comprehensive evaluation of PFAS impacts and sources to the WWTPs in Michigan was obtained through the implementation of the two sampling programs, the Michigan IPP PFAS Initiative and Statewide PFAS Assessment of 42 WWTPs. A total of 95 WWTP effluents and 61 influents were sampled for PFAS. The detection frequency of PFOA and PFOS in 54 influents of IPP WWTPs was 76% for both compounds. The concentration ranges in the influents for PFOA were between 2 to 330 ng/L and for PFOS were between 2 to 1,200 ng/L. The detection frequency in 80 effluents of IPP WWTPs was 94% for PFOA and 88% for PFOS. The concentration ranges in the effluents for PFOA were between 1 to 660 ng/L, and for PFOS were between 1 to 4,800 ng/L.

PFAS has also been widely used in many consumer products, therefore PFAS detection in WWTPs that are not part of the IPP (i.e., Non-IPP WWTPs) was also expected. Further, PFAS could be used in various products used by industries and commercial facilities that are not required to be monitored under the IPP. As a result, a limited number of Non-IPP WWTPs were also sampled, with a total of 7 influent and 15 effluent samples collected. The detection frequency in 7 influents of Non-IPP WWTPs was 86% for PFOA and 71% for PFOS. The detection frequency in 15 effluents of Non-IPP WWTPs was 100% for both PFOA and PFOS. Most of the PFOA and PFOS detections in the Non-IPP WWTPs ranged from 10 to 20 ng/L or lower. All the effluent PFOS concentrations for the Non-IPP WWTPs were below the PFOS WQS, except for the Oscoda Township WWTP (WWTP #107), which had the highest concentrations for Non-IPP WWTPs in both the influent and effluent samples. PFOA and PFOS have been identified within various parts of the sanitary sewer system. Historical AFFF releases are believed to be the main source of PFOS in the effluent.

While the number of Non-IPP WWTPs evaluated was lower than the IPP WWTPs, based on this initial dataset, it shows higher potential for IPP WWTPs to be more significantly impacted by PFOA, especially PFOS, than Non-IPP WWTPs. This conclusion supports the findings reported in the published research literature that show correlations between IPP WWTPs and PFAS detections.

PFOS has a lower WQS of 11 and 12 ng/L than PFOA of 420 and 12,000 ng/L for surface water bodies used as a drinking water source or not used as a drinking water source, respectively. The effluent concentration ranges for PFOS were higher than those for PFOA, with many of the results above the WQS of 12 ng/L. Only one WWTP had an effluent PFOA concentration higher than the most stringent WQS of 420 ng/L during February through April 2019, with the highest effluent PFOA concentration of 660 ng/L. However, additional sampling showed significantly lower concentrations with a sample from July 29, 2020, having a PFOA concentration of 37 ng/L. In contrast, 33 out of 70 PFOS detections in WWTPs (47%) from 80 WWTPs sampled had PFOS concentrations above both WQS of 11 and 12 ng/L for at least one of the effluent samples collected from the 70 WWTPs, including those that were sampled multiple times. As a result, PFOS was identified as the regulatory driver.

5.4 EGLE Ongoing Efforts and Planned Next Steps

The WWTPs with industrially impacted biosolids and EGLE will continue to work together to reduce the PFOS concentrations in the industrial discharges and other sources to the WWTPs. EGLE has a municipal PFAS permitting strategy which requires effluent sampling for PFOS and PFOA at all WWTPs with a design flow of 1 million gallons per day or greater and all WWTPs with IPPs. In 2021, EGLE is proposing to implement an interim strategy that will require sampling of final treated solids (biosolids) before land application. Also, in 2021, EGLE will perform resampling of a limited number of IPP and Non-IPP WWTPs to assess source reduction efforts and to monitor PFAS concentrations at the WWTPs. These efforts are expected to result in an overall reduction in PFAS concentrations to the WWTPs, and especially PFOS, resulting in effluent PFOS concentrations below the WQS and lower PFOS concentrations in the final treated solids, including biosolids.

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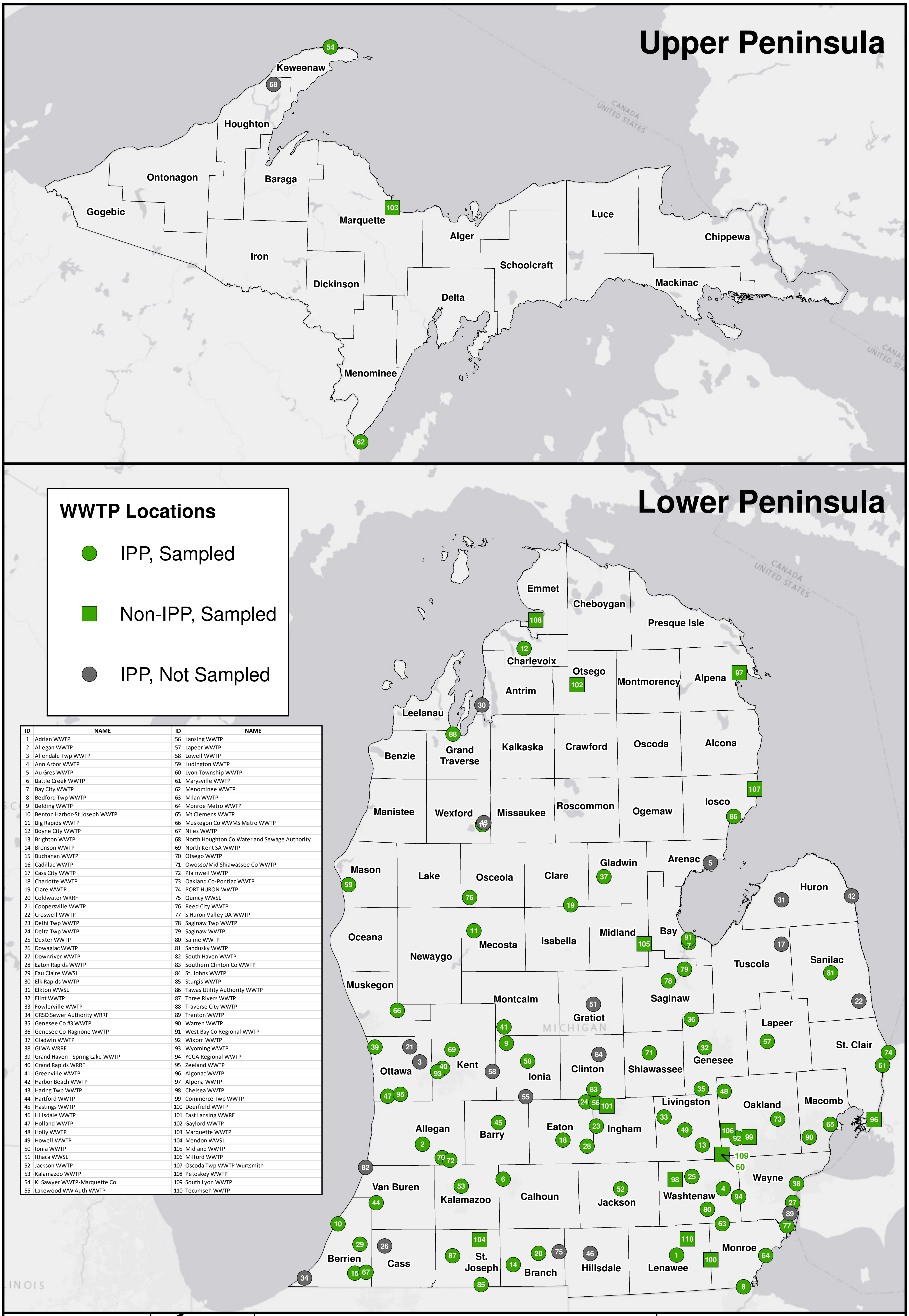
Figures

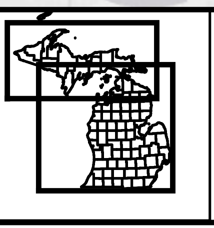


ID	NAME	ID	NAME
1	Adrian WWTP	56	Lansing WWTP
2	Allegan WWTP	57	Lapeer WWTP
3	Allendale Twp WWTP	58	Lowell WWTP
4	Ann Arbor WWTP	59	Ludington WWTP
5	Au Gres WWTP	60	Lyon Township WWTP
6	Battle Creek WWTP	61	Marysville WWTP
7	Bay City WWTP	62	Menominee WWTP
8	Bedford Twp WWTP	63	Milan WWTP
9	Belding WWTP	64	Monroe Metro WWTP
10	Benton Harbor-St Joseph WWTP	65	Mt Clemens WWTP
11	Big Rapids WWTP	66	Muskegon Co WWMS Metro WWTP
12	Boyne City WWTP	67	Niles WWTP
13	Brighton WWTP	68	North Houghton Co Water and Sewage Authority
14	Bronson WWTP	69	North Kent SA WWTP
15	Buchanan WWTP	70	Otsego WWTP
16	Cadillac WWTP	71	Owosso/Mid Shiawassee Co WWTP
17	Cass City WWTP	72	Plainwell WWTP
18	Charlotte WWTP	73	Oakland Co-Pontiac WWTP
19	Clare WWTP	74	PORT HURON WWTP
20	Coldwater WRRF	75	Quincy WWSL
21	Coopersville WWTP	76	Reed City WWTP
22	Croswell WWTP	77	S Huron Valley UA WWTP
23	Delhi Twp WWTP	78	Saginaw Twp WWTP
24	Delta Twp WWTP	79	Saginaw WWTP
25	Dexter WWTP	80	Saline WWTP
26	Dowagiac WWTP	81	Sandusky WWTP
27	Downriver WWTP	82	South Haven WWTP
28	Eaton Rapids WWTP	83	Southern Clinton Co WWTP
29	Eau Claire WWSL	84	St. Johns WWTP
30	Elk Rapids WWTP	85	Sturgis WWTP
31	Elkton WWSL	86	Tawas Utility Authority WWTP
32	Flint WWTP	87	Three Rivers WWTP
33	Fowlerville WWTP	88	Traverse City WWTP
34	GRSD Sewer Authority WRRF	89	Trenton WWTP
35	Genesee Co #3 WWTP	90	Warren WWTP
36	Genesee Co-Ragnone WWTP	91	West Bay Co Regional WWTP
37	Gladwin WWTP	92	Wixom WWTP
38	GLWA WRRF	93	Wyoming WWTP
39	Grand Haven - Spring Lake WWTP	94	YCUA Regional WWTP
40	Grand Rapids WRRF	95	Zeeland WWTP
41	Greenville WWTP	96	Algonac WWTP
42	Harbor Beach WWTP	97	Alpena WWTP
43	Haring Twp WWTP	98	Chelsea WWTP
44	Hartford WWTP	99	Commerce Twp WWTP
45	Hastings WWTP	100	Deerfield WWTP
46	Hillsdale WWTP	101	East Lansing WWRF
47	Holland WWTP	102	Gaylord WWTP
48	Holly WWTP	103	Marquette WWTP
49	Howell WWTP	104	Mendon WWSL
50	Ionia WWTP	105	Midland WWTP
51	Ithaca WWSL	106	Milford WWTP
52	Jackson WWTP	107	Oscoda Twp WWTP Wurtsmith
53	Kalamazoo WWTP	108	Petoskey WWTP
54	KI Sawyer WWTP-Marquette Co	109	South Lyon WWTP
55	Lakewood WW Auth WWTP	110	Tecumseh WWTP

Drawn: JS 12/4/2020

Approved: DB 12/4/2020

Project #: 60588767



☐ Michigan Counties

0 25 50 100 Miles

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FIGURE 2

LOCATIONS OF WASTEWATER TREATMENT PLANTS EVALUATED

MICHIGAN IPP PFAS INITIATIVE

Source: ESRI USA Topo Maps

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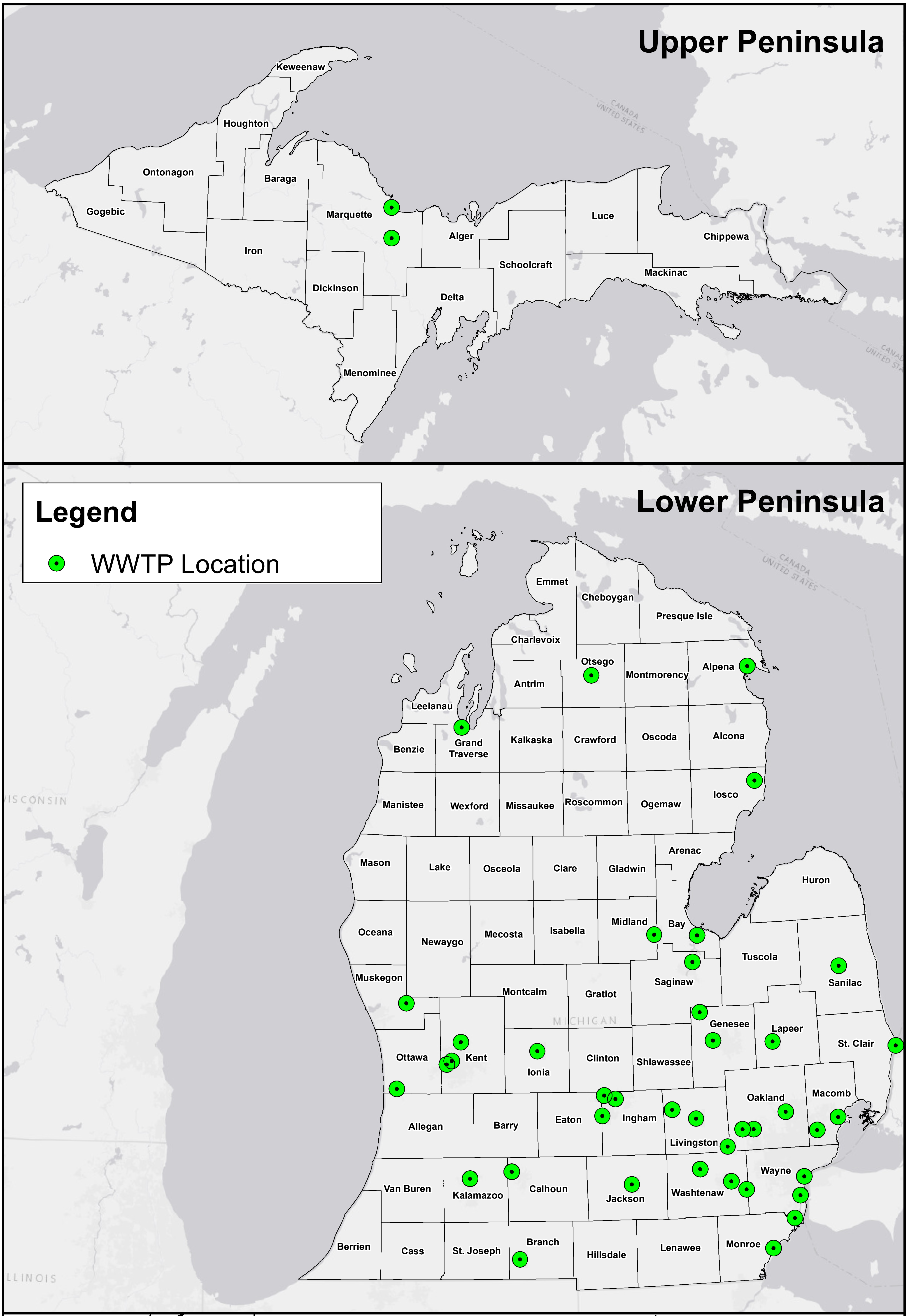

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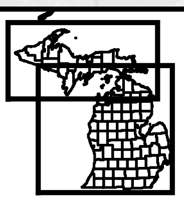

☐ Michigan Counties

0 25 50 100 Miles

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FIGURE 22

LOCATIONS OF 42 WASTEWATER TREATMENT PLANTS EVALUATED

MICHIGAN IPP PFAS INITIATIVE

Source: ESRI USA Topo Maps

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Tables

Table 2
Wastewater Treatment Plants Evaluated
Michigan IPP PFAS Initiative

WWTP Nr.	WWTP Code	WWTP Name	Sampled for PFAS? (Yes/No)	IPP? (Yes/No)	Permit #	Address
1	ADRI	Adrian WWTP	Yes	Yes	MI0022152	1001 Oakwood Rd, Adrian, MI 49221
2	ALGN	Allegan WWTP	Yes	Yes	MI0020532	350 North St, Allegan, MI 49010
3	ALLE	Allendale Twp WWTP	No	Yes	MI0057679	11624 40th Avenue, Allendale, MI 49401
4	AARB	Ann Arbor WWTP	Yes	Yes	MI0022217	49 Dixboro Road, Ann Arbor, MI 48105
5	AUGR	Au Gres WWTP	No	Yes	MI0058794	2750 South Street, AuGres, MI 48703
6	BCRK	Battle Creek WWTP	Yes	Yes	MI0022276	2000 RIVER RD W, BATTLE CREEK, MI 49037
7	BAYC	Bay City WWTP	Yes	Yes	MI0022284	2905 N Water St, Bay City, MI 48708
8	BEDF	Bedford Twp WWTP	Yes	Yes	MI0020761	335 Lavoy Road, Erie, MI 48133
9	BELD	Belding WWTP	Yes	Yes	MI0020851	1500 Wells Street, Belding, MI 48809
10	BHSJ	Benton Harbor-St Joseph WWTP	Yes	Yes	MI0022322	269 ANCHORS WAY, Saint Joseph, MI 49085
11	BRAP	Big Rapids WWTP	Yes	Yes	MI0022381	531 River Street, Big Rapids, MI 49307
12	BOYN	Boyne City WWTP	Yes	Yes	MI0021474	1261 Lagoon Drive, Boyne City, MI 49712
13	BRIT	Brighton WWTP	Yes	Yes	MI0020877	6570 Hamburg Rd, Brighton, MI 48116
14	BRON	Bronson WWTP	Yes	Yes	MI0020729	408 Mill Street, Bronson, MI 49028
15	BUCH	Buchanan WWTP	Yes	Yes	MI0022489	502 River Street, Buchanan, MI 49107
16	CADI	Cadillac WWTP	Yes	Yes	MI0020257	1121 Plett Rd., Cadillac, MI 49601
17	CASS	Cass City WWTP	No	Yes	MI0022594	3998 Doerr Road, Cass City, MI 48726
18	CHAR	Charlotte WWTP	Yes	Yes	MI0020788	1005 PAINE DR, CHARLOTTE, MI 48813
19	CLAR	Clare WWTP	Yes	Yes	MI0020176	11175 South Eberhart, Clare, MI 48617
20	COLD	Coldwater WRRF	Yes	Yes	MI0020117	100 Jay St., Coldwater, MI 49036
21	COOP	Coopersville WWTP	No	Yes	MI0022730	5497 GARFIELD ST, COOPERSVILLE, MI 49404
22	CROS	Croswell WWTP	No	Yes	MI0021083	5580 Lancaster, Croswell, MI 48422
23	DELH	Delhi Twp WWTP	Yes	Yes	MI0022781	5961 McCue, Holt, MI 48842
24	DELT	Delta Twp WWTP	Yes	Yes	MI0022799	7000 West Willow Highway, Lansing, MI 48917
25	DEXT	Dexter WWTP	Yes	Yes	MI0022829	8360 Huron St., Dexter, MI 48130
26	DOWG	Dowagiac WWTP	No	Yes	MI0022837	29250 M62 West, Dowagiac, MI 49047
27	DRVR	Downriver WWTP	Yes	Yes	MI0021156	797 CENTRAL ST, WYANDOTTE, MI 48192
28	EATN	Eaton Rapids WWTP	Yes	Yes	MI0022861	301 Market St., Eaton Rapids, MI 48827
29	EAUC	Eau Claire WWSL	Yes	Yes	MI0058687	Between 6890 Old Pipestone Road and 6860 Hochberger Road, Eau Claire MI 49111
30	ELKR	Elk Rapids WWTP	No	Yes	MI0059296	8228 Herman Road, Elk Rapids, MI 49629

Table 2
Wastewater Treatment Plants Evaluated
Michigan IPP PFAS Initiative

WWTP Nr.	WWTP Code	WWTP Name	Sampled for PFAS? (Yes/No)	IPP? (Yes/No)	Permit #	Address
31	ELKT	Elkton WWSL	No	Yes	MI0057466	Ewald and Richardson Road, Elkton, MI 48731
32	FLIN	Flint WWTP	Yes	Yes	MI0022926	G4652 Beecher Road, Flint, MI 48532
33	FOWL	Fowlerville WWTP	Yes	Yes	MI0020664	8610 West Grand River, Fowlerville, MI 48836
34	GRSD	GRSD Sewer Authority WRRF	No	Yes	MI0027987	10831 Kruger Road, New Buffalo, MI 49117
35	GENE	Genesee Co #3 WWTP	Yes	Yes	MI0022993	6450 Silver Lake Rd, Linden, MI 48451
36	RAGN	Genesee Co-Ragnone WWTP	Yes	Yes	MI0022977	9290 Farrand Road, Montrose, MI 48457
37	GLAD	Gladwin WWTP	Yes	Yes	MI0023001	501 Chatterton Avenue, Gladwin, MI 48624
38	GLWA	GLWA WRRF	Yes	Yes	MI0022802	9300 W JEFFERSON AVE, DETROIT, MI 48209
39	GHSL	Grand Haven - Spring Lake WWTP	Yes	Yes	MI0021245	1525 WASHINGTON AVE, GRAND HAVEN, MI 49417
40	GRAP	Grand Rapids WRRF	Yes	Yes	MI0026069	1300 MARKET AVE SW, GRAND RAPIDS, MI 49503
41	GREE	Greenville WWTP	Yes	Yes	MI0020397	205 East Fairplains Street, Greenville, MI 48838
42	HARB	Harbor Beach WWTP	No	Yes	MI0020672	861 South Lake Shore Road, Harbor Beach, MI 48441
43	HARI	Haring Twp WWTP	No	Yes	MI0059076	9494 East 34 Road, Cadillac, MI 49601
44	HART	Hartford WWTP	Yes	Yes	MI0023094	66460 56th Avenue, Hartford, MI 49057
45	HAST	Hastings WWTP	Yes	Yes	MI0020575	225 N CASS ST, HASTINGS, MI 49058
46	HILL	Hillsdale WWTP	No	Yes	MI0022136	101 Galloway, Hillsdale, MI 49242
47	HOLL	Holland WWTP	Yes	Yes	MI0023108	42 S River Ave, Holland, MI 49423
48	HLLY	Holly WWTP	Yes	Yes	MI0020184	402 AIRPORT DR, HOLLY, MI 48442
49	HOWE	Howell WWTP	Yes	Yes	MI0021113	1191 S MICHIGAN AVE, HOWELL, MI 48843
50	IONA	Ionia WWTP	Yes	Yes	MI0021041	720 Wells Street, Ionia, MI 48846
51	ITHA	Ithaca WWSL	No	Yes	MI0056928	129 W Emerson, Ithaca, MI 48847
52	JACK	Jackson WWTP	Yes	Yes	MI0023256	2995 Lansing Avenue, Jackson, MI 49202
53	KZOO	Kalamazoo WWTP	Yes	Yes	MI0023299	1415 North Harrison, Kalamazoo, MI 49007
54	SAWY	KI Sawyer WWTP-Marquette Co	Yes	Yes	MI0021423	1080 M-94, Gwinn, MI 49841
55	LKWD	Lakewood WW Auth WWTP	No	Yes	MI0042978	13751 Harwood Road, Lake Odessa, MI 48849
56	LANS	Lansing WWTP	Yes	Yes	MI0023400	1625 Sunset Avenue, Lansing, MI 48917
57	LAPR	Lapeer WWTP	Yes	Yes	MI0020460	1264 Industrial Drive, Lapeer, MI 48446
58	LOWE	Lowell WWTP	No	Yes	MI0020311	300 Bowes Road, Lowell, MI 49331
59	LUDG	Ludington WWTP	Yes	Yes	MI0021334	5160 W 6th St, Ludington, MI 49431
60	LYON	Lyon Township WWTP	Yes	Yes	GW1810078	53656 Ten Mile Road, New Hudson, MI 48178
61	MARY	Marysville WWTP	Yes	Yes	MI0020656	980 E Huron Blvd, Marysville, MI 48040

Table 2

Wastewater Treatment Plants Evaluated

Michigan IPP PFAS Initiative

WWTP Nr.	WWTP Code	WWTP Name	Sampled for PFAS? (Yes/No)	IPP? (Yes/No)	Permit #	Address
62	MENO	Menominee WWTP	Yes	Yes	MI0025631	1301 5th Ave., Menominee, MI 49858
63	MILN	Milan WWTP	Yes	Yes	MI0021571	75 Gump Lake Road, Milan, MI 48160
64	MONR	Monroe Metro WWTP	Yes	Yes	MI0028401	2205 East Front Street, Monroe, MI 48161
65	MTCL	Mt Clemens WWTP	Yes	Yes	MI0023647	1750 Clara Street, Mount Clemens, MI 48043
66	MUSK	Muskegon Co WWMS Metro WWTP	Yes	Yes	MI0027391	698 N. Maple Island Road, Muskegon, MI 49442
67	NILE	Niles WWTP	Yes	Yes	MI0023701	21 Marmont Street, Niles, MI 49120
68	HOUG	North Houghton Co Water and Sewage Authority	No	Yes	MI0043982	25880 Red Jacket Road, Calumet, MI 49913
69	NKEN	North Kent SA WWTP	Yes	Yes	MI0057419	4775 Coit Avenue NE, Grand Rapids, MI 49525
70	OTSE	Otsego WWTP	Yes	Yes	MI0060260	210 North Grant Street, Otsego, MI 49078
71	OWOS	Owosso/Mid Shiawassee Co WWTP	Yes	Yes	MI0023752	1410 Chippewa Trail, Owosso, MI 48867
72	PLAI	Plainwell WWTP	Yes	Yes	MI0020494	129 Fairlane St., Plainwell, MI 4908
73	PONT	Oakland Co-Pontiac WWTP	Yes	Yes	MI0023825	155 N OPDYKE RD, PONTIAC, MI 48342
74	PHUR	Port Huron WWTP	Yes	Yes	MI0023833	100 Merchant Street, Port Huron, MI 48060
75	QUIN	Quincy WWSL	No	Yes	MI0055751	1073 East Chicago Rd., Quincy, MI 49082
76	REED	Reed City WWTP	Yes	Yes	MI0020036	700 Commerce Drive, Reed City, MI 49677
77	HURO	S Huron Valley UA WWTP	Yes	Yes	MI0043800	34001 W JEFFERSON AVE, BROWNSTWN TWP, MI 48173
78	SGTW	Saginaw Twp WWTP	Yes	Yes	MI0023973	2406 VETERANS MEMORIAL PKWY, SAGINAW, MI 48601
79	SAGN	Saginaw WWTP	Yes	Yes	MI0025577	2406 VETERANS MEMORIAL PKWY, SAGINAW, MI 48601
80	SALN	Saline WWTP	Yes	Yes	MI0024023	247 Monroe Street, Saline, MI 48176
81	SAND	Sandusky WWTP	Yes	Yes	MI0020222	103 South Campbell Street, Sandusky, MI 48471
82	SHAV	South Haven WWTP	No	Yes	MI0020320	625 East Wells Street, South Haven, MI 49090
83	SCLN	Southern Clinton Co WWTP	Yes	Yes	MI0021008	3671 West Herbison Road, DeWitt, MI 48820
84	STJN	St. Johns WWTP	No	Yes	MI0026468	950 N. US 27, Saint Johns, MI 48879
85	STUR	Sturgis WWTP	Yes	Yes	MI0020451	2101 TREATMENT PLANT RD, STURGIS, MI 49091
86	TAWS	Tawas Utility Authority WWTP	Yes	Yes	MI0021091	810 West Franklin Street, East Tawas, MI 48730
87	TRIV	Three Rivers WWTP	Yes	Yes	MI0020991	409 Wolf Road, Three Rivers, MI 49093
88	TRAV	Traverse City WWTP	Yes	Yes	MI0027481	606 Hannah Avenue, Traverse City, MI 49686
89	TREN	Trenton WWTP	No	Yes	MI0021164	1801 Van Horn, Trenton MI 48183

Table 2
Wastewater Treatment Plants Evaluated
Michigan IPP PFAS Initiative

WWTP Nr.	WWTP Code	WWTP Name	Sampled for PFAS? (Yes/No)	IPP? (Yes/No)	Permit #	Address
90	WARR	Warren WWTP	Yes	Yes	MI0024295	32360 Warkop Ave, Warren, MI 48093
91	WBAY	West Bay Co Regional WWTP	Yes	Yes	MI0042439	3933 Patterson Road, Bay City, MI 48706
92	WIXO	Wixom WWTP	Yes	Yes	MI0024384	2059 Charms Road, Wixom, MI 48393
93	WYOM	Wyoming WWTP	Yes	Yes	MI0024392	2350 Ivanrest Ave, Wyoming, MI 49418
94	YCUA	YCUA Regional WWTP	Yes	Yes	MI0042676	2777 STATE ST, YPSILANTI, MI 48198
95	ZEEL	Zeeland WWTP	Yes	Yes	MI0020524	350 Rich Ave., Zeeland, MI 49464
96	ALGO	Algonac WWTP	Yes	No	MI0020389	451 STATE ST, ALGONAC, MI 48001
97	ALPE	Alpena WWTP	Yes	No	MI0022195	210 Harbor Drive, Alpena, MI 49707
98	CHEL	Chelsea WWTP	Yes	No	MI0020737	680 McKinley Street, Chelsea, MI 48118
99	COMM	Commerce Twp WWTP	Yes	No	MI0025071	649 Welch Road, Commerce Township, MI 48390
100	DEER	Deerfield WWTP	Yes	No	MIG570216	20899 Taft Rd., Deerfield, MI 49238
101	ELAN	East Lansing WWRF	Yes	No	MI0022853	1700 TROWBRIDGE RD, EAST LANSING, MI 48823
102	GAYL	Gaylord WWTP	Yes	No	GW1810128	500 East Seventh Street, Gaylord, MI 49735
103	MARQ	Marquette WWTP	Yes	No	MI0023531	300 W. Baraga, Marquette, MI 49855
104	MEND	Mendon WWSL	Yes	No	MIG580101	Kirby Rd., Mendon, MI 49072
105	MIDL	Midland WWTP	Yes	No	MI0023582	2125 Austin, Midland, MI 48642
106	MILF	Milford WWTP	Yes	No	MI0023604	1000 GENERAL MOTORS RD, MILFORD, MI 48381
107	OSCO	Oscoda Twp WWTP Wurtsmith	Yes	No	MI0055778	2998 Hunt, Oscoda, MI 48750
108	PETO	Petoskey WWTP	Yes	No	MI0023787	1000 West Lake Street, Petoskey, MI 49770
109	SLYN	South Lyon WWTP	Yes	No	MI0020273	23500 N. Dixboro Rd, South Lyon, MI 48178
110	TECU	Tecumseh WWTP	Yes	No	MI0020583	710 E. Chicago Blvd., Tecumseh, MI 49286

Table 3

WWTPs PFAS Results
Michigan IPP PFAS Initiative

Nr.	WWTP Nr.	WWTP Code	WWTP Name	Sample Type	Sample Date	PFOA (ng/L)	PFOS (ng/L)
1	1	ADRI	Adrian WWTP	Effluent-1	7/31/2018	**3.6**	**7.1**
2	1	ADRI	Adrian WWTP	Effluent-1	10/24/2019	**3.3**	**4.2**
3	2	ALGN	Allegan WWTP	Effluent-1	5/14/2019	**6.9**	ND
4	4	AARB	Ann Arbor WWTP	Effluent-1	11/2/2018	**5.1**	**16**
5	4	AARB	Ann Arbor WWTP	Effluent-1	11/2/2018	**4.42**	**14.8**
6	4	AARB	Ann Arbor WWTP	Effluent-1	2/6/2019	**2.5**	**2.7**
7	4	AARB	Ann Arbor WWTP	Effluent-1	4/10/2019	**3.8**	ND
8	4	AARB	Ann Arbor WWTP	Effluent-1	7/10/2019	**8.62**	**18.3**
9	4	AARB	Ann Arbor WWTP	Effluent-1	8/27/2019	**5.20**	**3.30**
10	4	AARB	Ann Arbor WWTP	Effluent-1	8/28/2019	**4.64**	**3.18**
11	4	AARB	Ann Arbor WWTP	Effluent-1	8/29/2019	**4.74**	**2.84**
12	4	AARB	Ann Arbor WWTP	Effluent-1	10/8/2019	**3.46**	**3.48**
13	4	AARB	Ann Arbor WWTP	Effluent-1	1/14/2020	**3.0**	**3.2**
14	4	AARB	Ann Arbor WWTP	Influent-1	11/2/2018	**4.3**	**20**
15	4	AARB	Ann Arbor WWTP	Influent-1	11/2/2018	**2.91**	**16.5**
16	4	AARB	Ann Arbor WWTP	Influent-1	2/5/2019	ND	ND
17	4	AARB	Ann Arbor WWTP	Influent-1	4/9/2019	ND	ND
18	4	AARB	Ann Arbor WWTP	Influent-1	7/9/2019	**9.52**	**4.26**
19	4	AARB	Ann Arbor WWTP	Influent-1	8/28/2019	**2.65**	ND
20	4	AARB	Ann Arbor WWTP	Influent-1	10/8/2019	ND	ND
21	4	AARB	Ann Arbor WWTP	Influent-1	1/14/2020	**2.8**	**4.3**
22	6	BCRK	Battle Creek WWTP	Effluent-1	5/8/2018	ND	ND
23	6	BCRK	Battle Creek WWTP	Effluent-1	9/18/2018	ND	ND
24	6	BCRK	Battle Creek WWTP	Effluent-1	10/31/2018	**8.43**	**5.14**
25	6	BCRK	Battle Creek WWTP	Effluent-1	4/30/2019	**7.5**	**7.1**
26	6	BCRK	Battle Creek WWTP	Effluent-1	10/24/2019	ND	ND
27	6	BCRK	Battle Creek WWTP	Influent-1	5/8/2018	ND	**12**
28	6	BCRK	Battle Creek WWTP	Influent-1	9/17/2018	ND	ND
29	6	BCRK	Battle Creek WWTP	Influent-1	10/31/2018	**7.25**	**3.28**
30	6	BCRK	Battle Creek WWTP	Influent-1	10/23/2019	ND	ND
31	7	BAYC	Bay City WWTP	Effluent-1	11/8/2018	**2.46**	**11.89**
32	7	BAYC	Bay City WWTP	Effluent-1	11/19/2018	**5.39**	**15.8**
33	7	BAYC	Bay City WWTP	Effluent-1	2/14/2019	**4.15**	**16.0**
34	7	BAYC	Bay City WWTP	Effluent-1	3/14/2019	ND	**7.71**
35	7	BAYC	Bay City WWTP	Effluent-1	6/12/2019	ND	**12**
36	7	BAYC	Bay City WWTP	Effluent-1	7/30/2019	**5.4**	**13**
37	7	BAYC	Bay City WWTP	Effluent-1	7/30/2019	**5.2**	**8.2**
38	7	BAYC	Bay City WWTP	Effluent-1	10/30/2019	**4.2**	**22**
39	7	BAYC	Bay City WWTP	Effluent-1	11/12/2019	**4.9**	**18**
40	7	BAYC	Bay City WWTP	Effluent-2	2/14/2019	**4.39**	**7.74**
41	7	BAYC	Bay City WWTP	Effluent-2	3/14/2019	ND	**30.29**
42	7	BAYC	Bay City WWTP	Effluent-2	6/12/2019	ND	**22**
43	7	BAYC	Bay City WWTP	Influent-1	11/19/2018	**4.87**	**18.2**
44	8	BEDF	Bedford Twp WWTP	Effluent-1	10/16/2019	**11**	**4.0**
45	8	BEDF	Bedford Twp WWTP	Effluent-1	12/10/2019	**5.7**	**4.9**
46	9	BELD	Belding WWTP	Effluent-1	5/9/2018	**24**	**6.9**
47	9	BELD	Belding WWTP	Effluent-1	7/31/2018	**38**	**14**
48	9	BELD	Belding WWTP	Effluent-1	3/7/2019	**27**	**8.4**
49	9	BELD	Belding WWTP	Effluent-1	5/21/2019	**27**	**6.8**

Table 3

WWTPs PFAS Results
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Nr.	WWTP Nr.	WWTP Code	WWTP Name	Sample Type	Sample Date	PFOA (ng/L)	PFOS (ng/L)
50	9	BELD	Belding WWTP	Effluent-1	7/25/2019	**21**	**7.2**
51	9	BELD	Belding WWTP	Effluent-1	10/9/2019	**18**	**8.1**
52	9	BELD	Belding WWTP	Effluent-1	11/8/2019	**20**	**7.4**
53	9	BELD	Belding WWTP	Effluent-1	2/5/2020	**26**	**5.9**
54	9	BELD	Belding WWTP	Influent-1	7/31/2018	ND	ND
55	10	BHSJ	Benton Harbor - St. Joseph WWTP	Effluent-1	10/11/2018	**6.1**	**8.2**
56	10	BHSJ	Benton Harbor - St. Joseph WWTP	Effluent-1	11/20/2018	**3.17**	**3.78**
57	10	BHSJ	Benton Harbor - St. Joseph WWTP	Effluent-1	8/29/2019	**6.4**	**11**
58	11	BRAP	Big Rapids WWTP	Effluent-1	8/13/2019	ND	ND
59	12	BOYN	Boyne City WWTP	Effluent-1	7/26/2017	**6.3**	**4.1**
60	13	BRIT	Brighton WWTP	Effluent-1	3/20/2019	**19**	**11**
61	13	BRIT	Brighton WWTP	Effluent-1	5/15/2019	**17.9**	**16.1**
62	13	BRIT	Brighton WWTP	Effluent-1	8/16/2019	**19**	**20**
63	13	BRIT	Brighton WWTP	Effluent-1	11/14/2019	**17**	**20**
64	13	BRIT	Brighton WWTP	Effluent-1	2/13/2020	**15**	**11**
65	13	BRIT	Brighton WWTP	Influent-1	8/16/2019	**1.7**	**9.5**
66	13	BRIT	Brighton WWTP	Influent-1	2/13/2020	ND	ND
67	14	BRON	Bronson WWTP	Effluent-1	5/7/2018	**2.2**	**150**
68	14	BRON	Bronson WWTP	Effluent-1	7/12/2018	**6.1**	**130**
69	14	BRON	Bronson WWTP	Effluent-1	7/18/2018	**13**	**140**
70	14	BRON	Bronson WWTP	Effluent-1	7/24/2018	**7.7**	**87**
71	14	BRON	Bronson WWTP	Effluent-1	8/2/2018	**5.6**	**70**
72	14	BRON	Bronson WWTP	Effluent-1	9/11/2018	**5.8**	**250**
73	14	BRON	Bronson WWTP	Effluent-1	10/17/2018	**3.6**	**360**
74	14	BRON	Bronson WWTP	Effluent-1	10/31/2018	**2.40**	**169**
75	14	BRON	Bronson WWTP	Effluent-1	11/20/2018	**2.3**	**83**
76	14	BRON	Bronson WWTP	Effluent-1	12/11/2018	**2.5**	**37**
77	14	BRON	Bronson WWTP	Effluent-1	1/9/2019	**6.9**	**16**
78	14	BRON	Bronson WWTP	Effluent-1	2/13/2019	**2.4**	**18**
79	14	BRON	Bronson WWTP	Effluent-1	3/5/2019	**2.7**	**11**
80	14	BRON	Bronson WWTP	Effluent-1	4/1/2019	**2.4**	**12**
81	14	BRON	Bronson WWTP	Effluent-1	5/7/2019	**2.9**	**25**
82	14	BRON	Bronson WWTP	Effluent-1	6/13/2019	ND	**15**
83	14	BRON	Bronson WWTP	Effluent-1	7/10/2019	**4.0**	**13**
84	14	BRON	Bronson WWTP	Effluent-1	8/5/2019	ND	**4.6**
85	14	BRON	Bronson WWTP	Effluent-1	9/3/2019	**4.9**	**21**
86	14	BRON	Bronson WWTP	Effluent-1	10/1/2019	**4.7**	**18**
87	14	BRON	Bronson WWTP	Effluent-1	11/4/2019	**2.9**	**16**
88	14	BRON	Bronson WWTP	Effluent-1	12/2/2019	**2.0**	**9.5**
89	14	BRON	Bronson WWTP	Effluent-1	1/6/2020	**1.6**	**13**
90	14	BRON	Bronson WWTP	Effluent-1	2/3/2020	**2.2**	**13**
91	14	BRON	Bronson WWTP	Effluent-1	3/2/2020	ND	**7.3**
92	14	BRON	Bronson WWTP	Effluent-1	4/6/2020	ND	**6.9**
93	14	BRON	Bronson WWTP	Effluent-1	5/4/2020	**2.2**	**12**
94	14	BRON	Bronson WWTP	Effluent-1	6/3/2020	**1.9**	**7.3**
95	14	BRON	Bronson WWTP	Effluent-1	7/6/2020	**3.4**	**8.9**
96	14	BRON	Bronson WWTP	Effluent-1	8/3/2020	**7.3**	**14**
97	14	BRON	Bronson WWTP	Effluent-1	9/7/2020	**3.5**	**12**
98	14	BRON	Bronson WWTP	Effluent-1	10/6/2020	**4.0**	**9.2**

Table 3

WWTPs PFAS Results
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Nr.	WWTP Nr.	WWTP Code	WWTP Name	Sample Type	Sample Date	PFOA (ng/L)	PFOS (ng/L)
99	14	BRON	Bronson WWTP	Effluent-1	11/9/2020	**9.1**	**10**
100	14	BRON	Bronson WWTP	Effluent-1	12/14/2020	**3.7**	**4.5**
101	14	BRON	Bronson WWTP	Influent-1	5/7/2018	ND	**12**
102	14	BRON	Bronson WWTP	Influent-1	7/12/2018	ND	**12**
103	14	BRON	Bronson WWTP	Influent-1	7/18/2018	ND	**16**
104	14	BRON	Bronson WWTP	Influent-1	7/24/2018	ND	**8.0**
105	14	BRON	Bronson WWTP	Influent-1	8/2/2018	ND	**14**
106	14	BRON	Bronson WWTP	Influent-1	10/31/2018	ND	**843**
107	14	BRON	Bronson WWTP	Influent-1	12/11/2018	ND	**39**
108	14	BRON	Bronson WWTP	Influent-1	1/9/2019	**1.2**	**3.9**
109	14	BRON	Bronson WWTP	Influent-1	2/13/2019	ND	**27**
110	14	BRON	Bronson WWTP	Influent-1	3/5/2019	ND	**7.2**
111	14	BRON	Bronson WWTP	Influent-1	4/1/2019	ND	**6.1**
112	14	BRON	Bronson WWTP	Influent-1	5/7/2019	ND	**12**
113	14	BRON	Bronson WWTP	Influent-1	6/13/2019	ND	**43**
114	14	BRON	Bronson WWTP	Influent-1	7/10/2019	**3.0**	**13**
115	14	BRON	Bronson WWTP	Influent-1	8/5/2019	**2.6**	**7.8**
116	14	BRON	Bronson WWTP	Influent-1	9/3/2019	ND	**15**
117	14	BRON	Bronson WWTP	Influent-1	10/1/2019	ND	**110**
118	14	BRON	Bronson WWTP	Influent-1	11/4/2019	ND	**14**
119	14	BRON	Bronson WWTP	Influent-1	12/2/2019	ND	**7.4**
120	14	BRON	Bronson WWTP	Influent-1	1/6/2020	ND	**9.4**
121	14	BRON	Bronson WWTP	Influent-1	2/3/2020	ND	**6.8**
122	14	BRON	Bronson WWTP	Influent-1	3/2/2020	ND	**5.3**
123	14	BRON	Bronson WWTP	Influent-1	4/6/2020	**1.9**	**9.0**
124	14	BRON	Bronson WWTP	Influent-1	5/4/2020	ND	**6.6**
125	14	BRON	Bronson WWTP	Influent-1	6/3/2020	**1.8**	**16**
126	14	BRON	Bronson WWTP	Influent-1	7/6/2020	**1.7**	**20**
127	14	BRON	Bronson WWTP	Influent-1	8/3/2020	**2.3**	**28**
128	14	BRON	Bronson WWTP	Influent-1	9/7/2020	**2.3**	**64**
129	14	BRON	Bronson WWTP	Influent-1	10/6/2020	ND	**61**
130	15	BUCH	Buchanan WWTP	Effluent-1	11/9/2018	**35.5**	ND
131	15	BUCH	Buchanan WWTP	Effluent-1	1/24/2019	**34.3**	ND
132	15	BUCH	Buchanan WWTP	Effluent-1	10/16/2019	**52**	ND
133	16	CADI	Cadillac WWTP	Effluent-1	11/5/2018	**20**	**6.5**
134	16	CADI	Cadillac WWTP	Effluent-1	6/4/2019	**16**	**7.8**
135	16	CADI	Cadillac WWTP	Effluent-1	10/22/2019	**3.4**	**2.0**
136	18	CHAR	Charlotte WWTP	Effluent-1	7/12/2018	**2.3**	**5.4**
137	18	CHAR	Charlotte WWTP	Effluent-1	2/28/2019	ND	ND
138	18	CHAR	Charlotte WWTP	Effluent-1	6/6/2019	ND	ND
139	18	CHAR	Charlotte WWTP	Effluent-1	10/14/2019	ND	ND
140	19	CLAR	Clare WWTP	Effluent-1	6/20/2018	**8.1**	**10**
141	19	CLAR	Clare WWTP	Effluent-1	6/6/2019	ND	**8.9**
142	19	CLAR	Clare WWTP	Effluent-1	10/31/2019	**8.7**	**7.5**
143	19	CLAR	Clare WWTP	Influent-1	9/20/2018	**8.0**	**45**
144	20	COLD	Coldwater WRRF	Effluent-1	5/14/2019	ND	ND
145	20	COLD	Coldwater WRRF	Effluent-1	10/3/2019	**2.60**	ND
146	23	DELH	Delhi Twp WWTP	Effluent-1	11/1/2018	**2.33**	**1.76**
147	23	DELH	Delhi Twp WWTP	Effluent-1	8/28/2019	**5.5**	ND

Table 3

WWTPs PFAS Results
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Nr.	WWTP Nr.	WWTP Code	WWTP Name	Sample Type	Sample Date	PFOA (ng/L)	PFOS (ng/L)
148	23	DELH	Delhi Twp WWTP	Influent-1	11/1/2018	ND	ND
149	23	DELH	Delhi Twp WWTP	Influent-1	8/28/2019	ND	ND
150	24	DELT	Delta Twp WWTP	Effluent-1	7/15/2019	ND	**24**
151	24	DELT	Delta Twp WWTP	Effluent-1	11/5/2019	**3.26**	**8.66**
152	24	DELT	Delta Twp WWTP	Effluent-1	1/28/2020	**2.57**	**7.51**
153	25	DEXT	Dexter WWTP	Effluent-1	8/14/2018	**12**	**3.6**
154	25	DEXT	Dexter WWTP	Effluent-1	11/2/2018	**7.97**	**1.51**
155	25	DEXT	Dexter WWTP	Effluent-1	5/30/2019	ND	ND
156	25	DEXT	Dexter WWTP	Effluent-1	11/25/2019	**6.7**	**2.5**
157	25	DEXT	Dexter WWTP	Influent-1	11/2/2018	ND	ND
158	27	DRVR	Downriver WWTP	Effluent-1	7/24/2018	**10**	**9.0**
159	27	DRVR	Downriver WWTP	Effluent-1	11/12/2018	**15**	**10**
160	27	DRVR	Downriver WWTP	Effluent-1	11/20/2018	**12.7**	**7.93**
161	27	DRVR	Downriver WWTP	Effluent-1	4/2/2019	**11**	**9.8**
162	27	DRVR	Downriver WWTP	Effluent-1	7/24/2019	**8.7**	**13**
163	27	DRVR	Downriver WWTP	Effluent-1	9/11/2019	**9.7**	**16**
164	27	DRVR	Downriver WWTP	Effluent-1	10/15/2019	**7.4**	**18**
165	27	DRVR	Downriver WWTP	Effluent-1	1/9/2020	**9.7**	**21**
166	27	DRVR	Downriver WWTP	Influent-1	9/19/2018	**5.6**	**21**
167	27	DRVR	Downriver WWTP	Influent-1	11/20/2018	**7.20**	**22.2**
168	27	DRVR	Downriver WWTP	Influent-1	4/2/2019	**7.5**	**20**
169	27	DRVR	Downriver WWTP	Influent-1	7/24/2019	**6.6**	**19**
170	27	DRVR	Downriver WWTP	Influent-1	1/9/2020	**9.7**	**16**
171	28	EATN	Eaton Rapids WWTP	Effluent-1	10/4/2017	**4.4**	**2.2**
172	29	EAUC	Eau Claire WWSL	Effluent-1	10/11/2018	**8.9**	**4.4**
173	32	FLIN	Flint WWTP	Effluent-1	5/9/2017	**7.5**	**28**
174	32	FLIN	Flint WWTP	Effluent-1	10/31/2017	**7.4**	**19**
175	32	FLIN	Flint WWTP	Effluent-1	6/18/2018	**6.1**	**24**
176	32	FLIN	Flint WWTP	Effluent-1	11/5/2018	**4.50**	**14.8**
177	32	FLIN	Flint WWTP	Effluent-1	11/13/2018	**5.6**	**15**
178	32	FLIN	Flint WWTP	Effluent-1	2/18/2019	**5.1**	**14**
179	32	FLIN	Flint WWTP	Effluent-1	4/8/2019	**6.6**	**18**
180	32	FLIN	Flint WWTP	Effluent-1	7/2/2019	**7.4**	**28**
181	32	FLIN	Flint WWTP	Effluent-1	10/7/2019	**8.2**	**37**
182	32	FLIN	Flint WWTP	Effluent-1	1/7/2020	**5.9**	**18**
183	32	FLIN	Flint WWTP	Influent-1	10/31/2017	**6.3**	**26**
184	32	FLIN	Flint WWTP	Influent-1	11/5/2018	**4.83**	**26.6**
185	32	FLIN	Flint WWTP	Influent-1	11/13/2018	**5.2**	**37**
186	32	FLIN	Flint WWTP	Influent-1	2/18/2019	**5.3**	**35**
187	32	FLIN	Flint WWTP	Influent-1	4/8/2019	**8.9**	**31**
188	32	FLIN	Flint WWTP	Influent-1	7/2/2019	**7.3**	**51**
189	32	FLIN	Flint WWTP	Influent-1	10/7/2019	**9.2**	**96**
190	32	FLIN	Flint WWTP	Influent-1	1/7/2020	**5.8**	**38**
191	32	FLIN	Flint WWTP	Influent-2	11/5/2018	**6.35**	**34.8**
192	32	FLIN	Flint WWTP	Influent-2	11/13/2018	**3.9**	**7.7**
193	32	FLIN	Flint WWTP	Influent-2	2/18/2019	**3.1**	**6.5**
194	32	FLIN	Flint WWTP	Influent-2	4/8/2019	**6.5**	**16**
195	32	FLIN	Flint WWTP	Influent-2	7/2/2019	**4.6**	**12**
196	32	FLIN	Flint WWTP	Influent-2	10/7/2019	**6.4**	**17**
197	32	FLIN	Flint WWTP	Influent-2	1/7/2020	**4.5**	**7.8**

Table 3

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Nr.	WWTP Nr.	WWTP Code	WWTP Name	Sample Type	Sample Date	PFOA (ng/L)	PFOS (ng/L)
198	32	FLIN	Flint WWTP	Influent-3	11/5/2018	**4.41**	**16.4**
199	32	FLIN	Flint WWTP	Influent-3	11/13/2018	**4.3**	**9.0**
200	32	FLIN	Flint WWTP	Influent-3	2/18/2019	**3.9**	**12**
201	32	FLIN	Flint WWTP	Influent-3	4/8/2019	**4.3**	**11**
202	32	FLIN	Flint WWTP	Influent-3	7/2/2019	**4.9**	**12**
203	32	FLIN	Flint WWTP	Influent-3	10/7/2019	**5.1**	**13**
204	32	FLIN	Flint WWTP	Influent-3	1/7/2020	**4.0**	**10**
205	33	FOWL	Fowlerville WWTP	Effluent-1	6/14/2018	**10**	ND
206	33	FOWL	Fowlerville WWTP	Effluent-1	11/13/2018	**7.6**	**1.47**
207	33	FOWL	Fowlerville WWTP	Influent-1	11/13/2018	ND	ND
208	35	GENE	Genesee Co #3 WWTP	Effluent-1	6/27/2018	**9.8**	**4.2**
209	35	GENE	Genesee Co #3 WWTP	Effluent-1	8/24/2018	**10**	**3.1**
210	35	GENE	Genesee Co #3 WWTP	Effluent-1	3/13/2019	**5.6**	ND
211	35	GENE	Genesee Co #3 WWTP	Effluent-1	10/17/2019	**11**	**4.7**
212	35	GENE	Genesee Co #3 WWTP	Influent-1	8/23/2018	**2.6**	ND
213	36	RAGN	Genesee Co-Ragnone WWTP	Effluent-1	4/11/2017	**7.4**	**5.1**
214	36	RAGN	Genesee Co-Ragnone WWTP	Effluent-1	5/9/2017	**7.4**	**3.3**
215	36	RAGN	Genesee Co-Ragnone WWTP	Effluent-1	5/9/2017	**8.2**	**6.6**
216	36	RAGN	Genesee Co-Ragnone WWTP	Effluent-1	11/5/2018	**7.23**	**4.72**
217	36	RAGN	Genesee Co-Ragnone WWTP	Effluent-1	5/16/2019	ND	ND
218	36	RAGN	Genesee Co-Ragnone WWTP	Effluent-1	10/17/2019	**9.3**	**4.5**
219	36	RAGN	Genesee Co-Ragnone WWTP	Influent-1	4/11/2017	**5.5**	**6.0**
220	36	RAGN	Genesee Co-Ragnone WWTP	Influent-1	11/5/2018	**4.00**	**5.22**
221	37	GLAD	Gladwin WWTP	Effluent-1	8/15/2017	**7.7**	**5.9**
222	38	GLWA	GLWA WRRF (Detroit)	Effluent-1	4/17/2018	**7.5**	**15**
223	38	GLWA	GLWA WRRF (Detroit)	Effluent-1	9/14/2018	**12**	**13**
224	38	GLWA	GLWA WRRF (Detroit)	Effluent-1	10/16/2018	**9.6**	**13**
225	38	GLWA	GLWA WRRF (Detroit)	Effluent-1	11/16/2018	**6.70**	**9.68**
226	38	GLWA	GLWA WRRF (Detroit)	Effluent-1	1/3/2019	**7.0**	**9.1**
227	38	GLWA	GLWA WRRF (Detroit)	Effluent-1	4/3/2019	**9.6**	**13**
228	38	GLWA	GLWA WRRF (Detroit)	Effluent-1	4/16/2019	**9.2**	**11**
229	38	GLWA	GLWA WRRF (Detroit)	Effluent-1	7/2/2019	**6.4**	**5.7**
230	38	GLWA	GLWA WRRF (Detroit)	Effluent-1	10/7/2019	**8.8**	**30**
231	38	GLWA	GLWA WRRF (Detroit)	Effluent-1	11/26/2019	**9.1**	**29**
232	38	GLWA	GLWA WRRF (Detroit)	Effluent-1	1/9/2020	**8.1**	**30**
233	38	GLWA	GLWA WRRF (Detroit)	Effluent-2	11/16/2018	**7.18**	**9.31**
234	38	GLWA	GLWA WRRF (Detroit)	Influent-1	11/16/2018	**6.02**	**7.54**
235	38	GLWA	GLWA WRRF (Detroit)	Influent-2	11/16/2018	**9.10**	**15.6**
236	38	GLWA	GLWA WRRF (Detroit)	Influent-3	11/16/2018	**4.64**	**10.7**
237	39	GHSL	Grand Haven - Spring Lake WWTP	Effluent-1	8/8/2018	**6.91**	**5.87**
238	39	GHSL	Grand Haven - Spring Lake WWTP	Effluent-1	5/5/2019	**3.49**	**9.94**
239	39	GHSL	Grand Haven - Spring Lake WWTP	Effluent-1	10/29/2019	ND	ND
240	40	GRAP	Grand Rapids WRRF	Effluent-1	9/12/2018	**17**	**60**
241	40	GRAP	Grand Rapids WRRF	Effluent-1	10/29/2018	**11.4**	**35.6**
242	40	GRAP	Grand Rapids WRRF	Effluent-1	11/19/2018	**7.6**	**36**
243	40	GRAP	Grand Rapids WRRF	Effluent-1	11/20/2018	**12**	**31**
244	40	GRAP	Grand Rapids WRRF	Effluent-1	11/21/2018	**13**	**28**
245	40	GRAP	Grand Rapids WRRF	Effluent-1	12/10/2018	**6.4**	**20**
246	40	GRAP	Grand Rapids WRRF	Effluent-1	12/11/2018	**14**	**36**

Table 3

WWTPs PFAS Results
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Nr.	WWTP Nr.	WWTP Code	WWTP Name	Sample Type	Sample Date	PFOA (ng/L)	PFOS (ng/L)
247	40	GRAP	Grand Rapids WRRF	Effluent-1	12/12/2018	**14**	**64**
248	40	GRAP	Grand Rapids WRRF	Effluent-1	12/13/2018	**14**	**30**
249	40	GRAP	Grand Rapids WRRF	Effluent-1	12/14/2018	**12**	**29**
250	40	GRAP	Grand Rapids WRRF	Effluent-1	1/14/2019	**7.7**	**21**
251	40	GRAP	Grand Rapids WRRF	Effluent-1	2/1/2019	**6.2**	**36**
252	40	GRAP	Grand Rapids WRRF	Effluent-1	3/1/2019	**15**	**32**
253	40	GRAP	Grand Rapids WRRF	Effluent-1	4/3/2019	**16**	**57**
254	40	GRAP	Grand Rapids WRRF	Effluent-1	5/3/2019	**9.6**	**23**
255	40	GRAP	Grand Rapids WRRF	Effluent-1	6/10/2019	**6.2**	**22**
256	40	GRAP	Grand Rapids WRRF	Effluent-1	7/3/2019	**12**	**23**
257	40	GRAP	Grand Rapids WRRF	Effluent-1	8/1/2019	**21**	**350**
258	40	GRAP	Grand Rapids WRRF	Effluent-1	9/9/2019	**6.7**	**37**
259	40	GRAP	Grand Rapids WRRF	Effluent-1	10/14/2019	**12**	**18**
260	40	GRAP	Grand Rapids WRRF	Effluent-1	11/4/2019	**9.0**	**17**
261	40	GRAP	Grand Rapids WRRF	Effluent-1	12/2/2019	**8.9**	**18**
262	40	GRAP	Grand Rapids WRRF	Effluent-1	1/2/2020	**9.5**	**15**
263	40	GRAP	Grand Rapids WRRF	Effluent-1	2/3/2020	**6.9**	**16**
264	40	GRAP	Grand Rapids WRRF	Influent-1	5/10/2018	**6.2**	**55**
265	40	GRAP	Grand Rapids WRRF	Influent-1	9/12/2018	**7.1**	**36**
266	40	GRAP	Grand Rapids WRRF	Influent-1	10/29/2018	**5.06**	**12.7**
267	40	GRAP	Grand Rapids WRRF	Influent-1	11/19/2018	**5.2**	**18**
268	40	GRAP	Grand Rapids WRRF	Influent-1	11/20/2018	**10**	**17**
269	40	GRAP	Grand Rapids WRRF	Influent-1	11/21/2018	**5.2**	**15**
270	40	GRAP	Grand Rapids WRRF	Influent-1	12/10/2018	**5.9**	**34**
271	40	GRAP	Grand Rapids WRRF	Influent-1	12/11/2018	**7.2**	**20**
272	40	GRAP	Grand Rapids WRRF	Influent-1	12/12/2018	**5.7**	**23**
273	40	GRAP	Grand Rapids WRRF	Influent-1	12/13/2018	**31**	**33**
274	40	GRAP	Grand Rapids WRRF	Influent-1	12/14/2018	**5.1**	**20**
275	40	GRAP	Grand Rapids WRRF	Influent-1	1/14/2019	**12**	**39**
276	40	GRAP	Grand Rapids WRRF	Influent-1	2/1/2019	**4.6**	**15**
277	40	GRAP	Grand Rapids WRRF	Influent-1	3/1/2019	**5.6**	**19**
278	40	GRAP	Grand Rapids WRRF	Influent-1	4/3/2019	**5.7**	**25**
279	40	GRAP	Grand Rapids WRRF	Influent-1	5/3/2019	**7.1**	**17**
280	40	GRAP	Grand Rapids WRRF	Influent-1	6/10/2019	**21**	**31**
281	40	GRAP	Grand Rapids WRRF	Influent-1	7/3/2019	**6.7**	**20**
282	40	GRAP	Grand Rapids WRRF	Influent-1	8/1/2019	**7.9**	**24**
283	40	GRAP	Grand Rapids WRRF	Influent-1	9/9/2019	**6.4**	**40**
284	40	GRAP	Grand Rapids WRRF	Influent-1	10/14/2019	**6.9**	**34**
285	40	GRAP	Grand Rapids WRRF	Influent-1	11/4/2019	**5.6**	**23**
286	40	GRAP	Grand Rapids WRRF	Influent-1	12/2/2019	**4.5**	**23**
287	40	GRAP	Grand Rapids WRRF	Influent-1	1/2/2020	**5.8**	**14**
288	40	GRAP	Grand Rapids WRRF	Influent-1	2/3/2020	**4.9**	**21**
289	41	GREE	Greenville WWTP	Effluent-1	8/21/2018	**3.1**	**3.1**
290	41	GREE	Greenville WWTP	Effluent-1	6/27/2019	ND	ND
291	44	HART	Hartford WWTP	Effluent-1	6/21/2018	**3.5**	**4.0**
292	45	HAST	Hastings WWTP	Effluent-1	3/28/2018	**19**	**4.9**
293	45	HAST	Hastings WWTP	Effluent-1	10/22/2019	**10.79**	**8.60**
294	47	HOLL	Holland WWTP	Effluent-1	8/6/2018	ND	**2.61**
295	47	HOLL	Holland WWTP	Effluent-1	10/30/2018	**3.61**	**2.19**
296	47	HOLL	Holland WWTP	Effluent-1	10/30/2018	**4.67**	**2.41**

Table 3

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Nr.	WWTP Nr.	WWTP Code	WWTP Name	Sample Type	Sample Date	PFOA (ng/L)	PFOS (ng/L)
297	47	HOLL	Holland WWTP	Effluent-1	4/11/2019	ND	ND
298	47	HOLL	Holland WWTP	Effluent-1	10/7/2019	ND	ND
299	47	HOLL	Holland WWTP	Effluent-2	10/30/2018	**3.07**	ND
300	47	HOLL	Holland WWTP	Influent-1	8/6/2018	**6.73**	ND
301	47	HOLL	Holland WWTP	Influent-1	8/7/2018	**2.55**	**2.44**
302	47	HOLL	Holland WWTP	Influent-1	10/30/2018	ND	ND
303	47	HOLL	Holland WWTP	Influent-1	10/30/2018	**3.20**	ND
304	47	HOLL	Holland WWTP	Influent-2	8/7/2018	**11.13**	**2.96**
305	47	HOLL	Holland WWTP	Influent-2	10/30/2018	**5.73**	**3.79**
306	48	HLLY	Holly WWTP	Effluent-1	5/7/2018	**7.0**	**4.6**
307	49	HOWE	Howell WWTP	Effluent-1	5/22/2018	**8.9**	**13**
308	49	HOWE	Howell WWTP	Effluent-1	6/1/2018	**29**	**130**
309	49	HOWE	Howell WWTP	Effluent-1	8/28/2018	ND	ND
310	49	HOWE	Howell WWTP	Effluent-1	8/28/2018	ND	ND
311	49	HOWE	Howell WWTP	Effluent-1	9/19/2018	ND	ND
312	49	HOWE	Howell WWTP	Effluent-1	10/29/2018	ND	ND
313	49	HOWE	Howell WWTP	Effluent-1	11/13/2018	**7.39**	**4.87**
314	49	HOWE	Howell WWTP	Effluent-1	11/13/2018	ND	ND
315	49	HOWE	Howell WWTP	Effluent-1	12/20/2018	**7.5**	**4.2**
316	49	HOWE	Howell WWTP	Effluent-1	1/17/2019	**6.3**	**4.1**
317	49	HOWE	Howell WWTP	Effluent-1	2/14/2019	**6.2**	**4.0**
318	49	HOWE	Howell WWTP	Effluent-1	4/5/2019	**8.9**	**5.2**
319	49	HOWE	Howell WWTP	Effluent-1	5/17/2019	**9.7**	**8.3**
320	49	HOWE	Howell WWTP	Effluent-1	6/20/2019	**9.1**	**6.0**
321	49	HOWE	Howell WWTP	Effluent-1	7/17/2019	**12**	**6.4**
322	49	HOWE	Howell WWTP	Effluent-1	8/16/2019	**7.5**	**6.0**
323	49	HOWE	Howell WWTP	Effluent-1	9/17/2019	**5.9**	**5.8**
324	49	HOWE	Howell WWTP	Effluent-1	10/3/2019	**5.1**	**5.5**
325	49	HOWE	Howell WWTP	Effluent-1	10/23/2019	ND	**6.3**
326	49	HOWE	Howell WWTP	Effluent-1	11/20/2019	**6.2**	**3.9**
327	49	HOWE	Howell WWTP	Effluent-1	12/6/2019	**8.2**	**5.8**
328	49	HOWE	Howell WWTP	Effluent-1	1/7/2020	**19**	**3.7**
329	49	HOWE	Howell WWTP	Effluent-1	2/5/2020	**11**	**4.8**
330	49	HOWE	Howell WWTP	Effluent-1	3/4/2020	**5.9**	**4.1**
331	49	HOWE	Howell WWTP	Effluent-1	4/2/2020	**5.7**	**4.3**
332	49	HOWE	Howell WWTP	Effluent-1	5/7/2020	**6.3**	**3.7**
333	49	HOWE	Howell WWTP	Effluent-1	6/4/2020	**7.7**	**5.5**
334	49	HOWE	Howell WWTP	Effluent-1	7/8/2020	**9.1**	**4.5**
335	49	HOWE	Howell WWTP	Effluent-1	8/4/2020	**16**	**5.2**
336	49	HOWE	Howell WWTP	Effluent-1	9/3/2020	**11**	**5.3**
337	49	HOWE	Howell WWTP	Effluent-1	10/1/2020	**11**	**4.9**
338	49	HOWE	Howell WWTP	Effluent-1	11/2/2020	**10**	**4.8**
339	49	HOWE	Howell WWTP	Influent-1	8/28/2018	ND	**10**
340	49	HOWE	Howell WWTP	Influent-1	8/28/2018	ND	**20**
341	49	HOWE	Howell WWTP	Influent-1	11/13/2018	**4.42**	ND
342	49	HOWE	Howell WWTP	Influent-1	11/13/2018	ND	ND
343	50	IONA	Ionia WWTP	Effluent-1	5/9/2018	**1.1**	**280**
344	50	IONA	Ionia WWTP	Effluent-1	6/26/2018	ND	**430**
345	50	IONA	Ionia WWTP	Effluent-1	8/14/2018	**2.2**	**330**
346	50	IONA	Ionia WWTP	Effluent-1	9/4/2018	**2.5**	**190**

Table 3

WWTPs PFAS Results
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Nr.	WWTP Nr.	WWTP Code	WWTP Name	Sample Type	Sample Date	PFOA (ng/L)	PFOS (ng/L)
347	50	IONA	Ionia WWTP	Effluent-1	10/1/2018	ND	**540**
348	50	IONA	Ionia WWTP	Effluent-1	10/31/2018	ND	**451.83**
349	50	IONA	Ionia WWTP	Effluent-1	10/31/2018	ND	**635**
350	50	IONA	Ionia WWTP	Effluent-1	11/1/2018	ND	**335.73**
351	50	IONA	Ionia WWTP	Effluent-1	12/3/2018	ND	**185.10**
352	50	IONA	Ionia WWTP	Effluent-1	1/2/2019	ND	ND
353	50	IONA	Ionia WWTP	Effluent-1	2/4/2019	ND	**125.09**
354	50	IONA	Ionia WWTP	Effluent-1	3/5/2019	ND	**63.35**
355	50	IONA	Ionia WWTP	Effluent-1	4/2/2019	ND	**58.71**
356	50	IONA	Ionia WWTP	Effluent-1	5/1/2019	**10.25**	**217.43**
357	50	IONA	Ionia WWTP	Effluent-1	6/3/2019	ND	**9.71**
358	50	IONA	Ionia WWTP	Effluent-1	7/1/2019	ND	**76.83**
359	50	IONA	Ionia WWTP	Effluent-1	7/16/2019	ND	**11.28**
360	50	IONA	Ionia WWTP	Effluent-1	8/5/2019	ND	**8.16**
361	50	IONA	Ionia WWTP	Effluent-1	9/5/2019	ND	**168.85**
362	50	IONA	Ionia WWTP	Effluent-1	10/1/2019	ND	ND
363	50	IONA	Ionia WWTP	Effluent-1	11/1/2019	ND	ND
364	50	IONA	Ionia WWTP	Effluent-1	12/1/2019	ND	ND
365	50	IONA	Ionia WWTP	Effluent-1	1/9/2020	**6.45**	**13.18**
366	50	IONA	Ionia WWTP	Effluent-1	2/3/2020	ND	ND
367	50	IONA	Ionia WWTP	Effluent-1	3/9/2020	ND	ND
368	50	IONA	Ionia WWTP	Effluent-1	4/4/2020	ND	ND
369	50	IONA	Ionia WWTP	Effluent-1	5/6/2020	ND	ND
370	50	IONA	Ionia WWTP	Effluent-1	6/2/2020	ND	**25.48**
371	50	IONA	Ionia WWTP	Effluent-1	7/8/2020	ND	ND
372	50	IONA	Ionia WWTP	Effluent-1	8/5/2020	ND	ND
373	50	IONA	Ionia WWTP	Effluent-1	9/3/2020	ND	**11.23**
374	50	IONA	Ionia WWTP	Effluent-1	10/5/2020	ND	ND
375	50	IONA	Ionia WWTP	Effluent-1	11/2/2020	ND	ND
376	50	IONA	Ionia WWTP	Effluent-1	12/3/2020	ND	ND
377	50	IONA	Ionia WWTP	Influent-1	10/31/2018	ND	**499.36**
378	50	IONA	Ionia WWTP	Influent-1	10/31/2018	ND	**213**
379	50	IONA	Ionia WWTP	Influent-1	10/1/2019	ND	ND
380	52	JACK	Jackson WWTP	Effluent-1	8/28/2018	ND	ND
381	52	JACK	Jackson WWTP	Effluent-1	11/5/2018	**3.38**	**3.17**
382	52	JACK	Jackson WWTP	Effluent-1	5/16/2019	ND	ND
383	52	JACK	Jackson WWTP	Effluent-1	9/16/2019	ND	ND
384	52	JACK	Jackson WWTP	Influent-1	11/5/2018	ND	**5.98**
385	53	KZOO	Kalamazoo WWTP	Effluent-1	5/21/2018	**15**	**38**
386	53	KZOO	Kalamazoo WWTP	Effluent-1	5/23/2018	**13**	**35**
387	53	KZOO	Kalamazoo WWTP	Effluent-1	6/1/2018	**12**	**29**
388	53	KZOO	Kalamazoo WWTP	Effluent-1	6/27/2018	**19**	**28**
389	53	KZOO	Kalamazoo WWTP	Effluent-1	7/2/2018	**11**	**8.4**
390	53	KZOO	Kalamazoo WWTP	Effluent-1	7/11/2018	**11**	**12**
391	53	KZOO	Kalamazoo WWTP	Effluent-1	7/17/2018	**13**	**22**
392	53	KZOO	Kalamazoo WWTP	Effluent-1	7/25/2018	**9.8**	**24**
393	53	KZOO	Kalamazoo WWTP	Effluent-1	7/25/2018	ND	**40**
394	53	KZOO	Kalamazoo WWTP	Effluent-1	8/1/2018	**13**	**25**
395	53	KZOO	Kalamazoo WWTP	Effluent-1	8/7/2018	ND	ND
396	53	KZOO	Kalamazoo WWTP	Effluent-1	8/15/2018	**10**	**12**

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Nr.	WWTP Nr.	WWTP Code	WWTP Name	Sample Type	Sample Date	PFOA (ng/L)	PFOS (ng/L)
397	53	KZOO	Kalamazoo WWTP	Effluent-1	8/22/2018	**7.5**	**6.8**
398	53	KZOO	Kalamazoo WWTP	Effluent-1	8/29/2018	ND	ND
399	53	KZOO	Kalamazoo WWTP	Effluent-1	8/29/2018	ND	ND
400	53	KZOO	Kalamazoo WWTP	Effluent-1	8/29/2018	ND	**5.15**
401	53	KZOO	Kalamazoo WWTP	Effluent-1	9/5/2018	**9.4**	**8.8**
402	53	KZOO	Kalamazoo WWTP	Effluent-1	9/12/2018	ND	ND
403	53	KZOO	Kalamazoo WWTP	Effluent-1	9/18/2018	ND	ND
404	53	KZOO	Kalamazoo WWTP	Effluent-1	9/26/2018	ND	ND
405	53	KZOO	Kalamazoo WWTP	Effluent-1	10/3/2018	ND	ND
406	53	KZOO	Kalamazoo WWTP	Effluent-1	10/10/2018	ND	**11**
407	53	KZOO	Kalamazoo WWTP	Effluent-1	10/16/2018	**31**	**11**
408	53	KZOO	Kalamazoo WWTP	Effluent-1	10/24/2018	**11**	ND
409	53	KZOO	Kalamazoo WWTP	Effluent-1	10/30/2018	**9.81**	**5.79**
410	53	KZOO	Kalamazoo WWTP	Effluent-1	10/31/2018	ND	ND
411	53	KZOO	Kalamazoo WWTP	Effluent-1	11/15/2018	ND	ND
412	53	KZOO	Kalamazoo WWTP	Effluent-1	11/21/2018	ND	ND
413	53	KZOO	Kalamazoo WWTP	Effluent-1	11/28/2018	ND	ND
414	53	KZOO	Kalamazoo WWTP	Effluent-1	12/5/2018	ND	ND
415	53	KZOO	Kalamazoo WWTP	Effluent-1	12/12/2018	ND	ND
416	53	KZOO	Kalamazoo WWTP	Effluent-1	12/19/2018	ND	ND
417	53	KZOO	Kalamazoo WWTP	Effluent-1	12/27/2018	ND	ND
418	53	KZOO	Kalamazoo WWTP	Effluent-1	1/31/2019	**5.77**	**3.09**
419	53	KZOO	Kalamazoo WWTP	Effluent-1	10/16/2019	**4.16**	**5.53**
420	53	KZOO	Kalamazoo WWTP	Effluent-1	10/17/2019	**4.69**	**3.89**
421	53	KZOO	Kalamazoo WWTP	Effluent-1	5/13/2020	**6.60**	**4.68**
422	53	KZOO	Kalamazoo WWTP	Effluent-1	9/17/2020	**12.1**	**4.1**
423	53	KZOO	Kalamazoo WWTP	Effluent-1	9/17/2020	**11.7**	**1.54**
424	53	KZOO	Kalamazoo WWTP	Effluent-1	9/18/2020	**10.6**	**4.17**
425	53	KZOO	Kalamazoo WWTP	Effluent-1	9/18/2020	**10.1**	**1.04**
426	53	KZOO	Kalamazoo WWTP	Effluent-1	9/19/2020	**9.42**	ND
427	53	KZOO	Kalamazoo WWTP	Effluent-1	9/20/2020	**8.88**	**3.97**
428	53	KZOO	Kalamazoo WWTP	Effluent-1	9/21/2020	**8.66**	**4.26**
429	53	KZOO	Kalamazoo WWTP	Effluent-1	9/22/2020	**9.75**	**4.75**
430	53	KZOO	Kalamazoo WWTP	Effluent-1	9/23/2020	**9.61**	**3.11**
431	53	KZOO	Kalamazoo WWTP	Effluent-1	9/24/2020	**9.28**	**4.15**
432	53	KZOO	Kalamazoo WWTP	Effluent-1	9/28/2020	**9.03**	**3.96**
433	53	KZOO	Kalamazoo WWTP	Effluent-1	10/1/2020	**8.12**	**4.46**
434	53	KZOO	Kalamazoo WWTP	Effluent-1	10/14/2020	**8.74**	**4.84**
435	53	KZOO	Kalamazoo WWTP	Effluent-2	6/27/2018	**10**	**20**
436	53	KZOO	Kalamazoo WWTP	Influent-1	5/20/2018	**10**	**38**
437	53	KZOO	Kalamazoo WWTP	Influent-1	5/22/2018	**13**	**37**
438	53	KZOO	Kalamazoo WWTP	Influent-1	5/31/2018	ND	**50**
439	53	KZOO	Kalamazoo WWTP	Influent-1	6/26/2018	ND	ND
440	53	KZOO	Kalamazoo WWTP	Influent-1	7/2/2018	ND	**15**
441	53	KZOO	Kalamazoo WWTP	Influent-1	7/10/2018	ND	**11**
442	53	KZOO	Kalamazoo WWTP	Influent-1	7/16/2018	ND	**36**
443	53	KZOO	Kalamazoo WWTP	Influent-1	7/24/2018	ND	ND
444	53	KZOO	Kalamazoo WWTP	Influent-1	7/31/2018	ND	**190**
445	53	KZOO	Kalamazoo WWTP	Influent-1	8/7/2018	ND	ND

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Nr.	WWTP Nr.	WWTP Code	WWTP Name	Sample Type	Sample Date	PFOA (ng/L)	PFOS (ng/L)
446	53	KZOO	Kalamazoo WWTP	Influent-1	8/14/2018	ND	ND
447	53	KZOO	Kalamazoo WWTP	Influent-1	8/21/2018	ND	ND
448	53	KZOO	Kalamazoo WWTP	Influent-1	8/28/2018	**29**	**21**
449	53	KZOO	Kalamazoo WWTP	Influent-1	9/4/2018	ND	ND
450	53	KZOO	Kalamazoo WWTP	Influent-1	9/11/2018	ND	ND
451	53	KZOO	Kalamazoo WWTP	Influent-1	9/18/2018	ND	**75**
452	53	KZOO	Kalamazoo WWTP	Influent-1	9/25/2018	ND	ND
453	53	KZOO	Kalamazoo WWTP	Influent-1	10/2/2018	ND	**11**
454	53	KZOO	Kalamazoo WWTP	Influent-1	10/10/2018	**13**	**11**
455	53	KZOO	Kalamazoo WWTP	Influent-1	10/16/2018	ND	**11**
456	53	KZOO	Kalamazoo WWTP	Influent-1	10/23/2018	ND	ND
457	53	KZOO	Kalamazoo WWTP	Influent-1	10/30/2018	**8.43**	**26.0**
458	53	KZOO	Kalamazoo WWTP	Influent-1	10/30/2018	ND	ND
459	53	KZOO	Kalamazoo WWTP	Influent-1	11/6/2018	ND	ND
460	53	KZOO	Kalamazoo WWTP	Influent-1	11/14/2018	ND	ND
461	53	KZOO	Kalamazoo WWTP	Influent-1	11/20/2018	ND	ND
462	53	KZOO	Kalamazoo WWTP	Influent-1	11/27/2018	ND	ND
463	53	KZOO	Kalamazoo WWTP	Influent-1	12/4/2018	ND	**10.0**
464	53	KZOO	Kalamazoo WWTP	Influent-1	12/11/2018	ND	**11**
465	53	KZOO	Kalamazoo WWTP	Influent-1	12/18/2018	ND	ND
466	53	KZOO	Kalamazoo WWTP	Influent-1	12/26/2018	ND	ND
467	53	KZOO	Kalamazoo WWTP	Influent-1	1/30/2019	**6.89**	**3.84**
468	53	KZOO	Kalamazoo WWTP	Influent-1	10/16/2019	**3.15**	**5.47**
469	53	KZOO	Kalamazoo WWTP	Influent-1	5/12/2020	**4.82**	**6.65**
470	53	KZOO	Kalamazoo WWTP	Influent-1	9/16/2020	**10.4**	**3.33**
471	53	KZOO	Kalamazoo WWTP	Influent-1	9/16/2020	**12.0**	**6.31**
472	53	KZOO	Kalamazoo WWTP	Influent-1	9/17/2020	**7.20**	**5.79**
473	53	KZOO	Kalamazoo WWTP	Influent-1	9/17/2020	**5.84**	**3.12**
474	53	KZOO	Kalamazoo WWTP	Influent-1	9/18/2020	**20.0**	**9.53**
475	53	KZOO	Kalamazoo WWTP	Influent-1	9/19/2020	**7.06**	**7.41**
476	53	KZOO	Kalamazoo WWTP	Influent-1	9/20/2020	**4.91**	**2.73**
477	53	KZOO	Kalamazoo WWTP	Influent-1	9/21/2020	**3.67**	**8.04**
478	53	KZOO	Kalamazoo WWTP	Influent-1	9/22/2020	**7.04**	**8.29**
479	53	KZOO	Kalamazoo WWTP	Influent-1	9/23/2020	**5.68**	**9.02**
480	53	KZOO	Kalamazoo WWTP	Influent-1	10/13/2020	**8.27**	**10.4**
481	53	KZOO	Kalamazoo WWTP	Influent-2	10/16/2019	**4.21**	**4.86**
482	54	SAWY	KI Sawyer WWTP - Marquette Co	Effluent-1	8/24/2016	**23.6**	**97.7**
483	54	SAWY	KI Sawyer WWTP - Marquette Co	Effluent-1	4/19/2017	**6.50**	**55.3**
484	54	SAWY	KI Sawyer WWTP - Marquette Co	Effluent-1	8/27/2018	**24**	**200**
485	54	SAWY	KI Sawyer WWTP - Marquette Co	Effluent-1	11/7/2018	**10.2**	**62.0**
486	54	SAWY	KI Sawyer WWTP - Marquette Co	Effluent-1	11/27/2018	**9.4**	**42**
487	54	SAWY	KI Sawyer WWTP - Marquette Co	Effluent-1	12/10/2018	**5.9**	**240**
488	54	SAWY	KI Sawyer WWTP - Marquette Co	Effluent-1	1/16/2019	**7.2**	**21**
489	54	SAWY	KI Sawyer WWTP - Marquette Co	Effluent-1	2/12/2019	**3.5**	**16**
490	54	SAWY	KI Sawyer WWTP - Marquette Co	Effluent-1	3/13/2019	**3.1**	**8.2**
491	54	SAWY	KI Sawyer WWTP - Marquette Co	Effluent-1	4/8/2019	**4.2**	**14**
492	54	SAWY	KI Sawyer WWTP - Marquette Co	Effluent-1	5/8/2019	**4.9**	**13**
493	54	SAWY	KI Sawyer WWTP - Marquette Co	Effluent-1	6/19/2019	**37**	**56**
494	54	SAWY	KI Sawyer WWTP - Marquette Co	Effluent-1	7/15/2019	**15**	**39**

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Nr.	WWTP Nr.	WWTP Code	WWTP Name	Sample Type	Sample Date	PFOA (ng/L)	PFOS (ng/L)
495	54	SAWY	KI Sawyer WWTP - Marquette Co	Effluent-1	8/21/2019	**5.9**	**18**
496	54	SAWY	KI Sawyer WWTP - Marquette Co	Effluent-1	9/9/2019	**6.9**	**12**
497	54	SAWY	KI Sawyer WWTP - Marquette Co	Effluent-1	10/15/2019	**110**	**28**
498	54	SAWY	KI Sawyer WWTP - Marquette Co	Effluent-1	11/12/2019	**13**	**48**
499	54	SAWY	KI Sawyer WWTP - Marquette Co	Effluent-1	12/10/2019	**6.8**	**27**
500	54	SAWY	KI Sawyer WWTP - Marquette Co	Effluent-1	1/14/2020	**8.7**	**16**
501	54	SAWY	KI Sawyer WWTP - Marquette Co	Effluent-1	2/12/2020	**3.7**	**13**
502	54	SAWY	KI Sawyer WWTP - Marquette Co	Effluent-1	3/18/2020	**5.1**	**14**
503	54	SAWY	KI Sawyer WWTP - Marquette Co	Effluent-1	4/21/2020	**4.9**	**10**
504	54	SAWY	KI Sawyer WWTP - Marquette Co	Effluent-1	5/20/2020	**5.4**	**13**
505	54	SAWY	KI Sawyer WWTP - Marquette Co	Effluent-1	6/16/2020	**16**	**34**
506	54	SAWY	KI Sawyer WWTP - Marquette Co	Effluent-1	7/16/2020	**10**	**33**
507	54	SAWY	KI Sawyer WWTP - Marquette Co	Effluent-1	8/6/2020	**16**	**29**
508	54	SAWY	KI Sawyer WWTP - Marquette Co	Effluent-1	9/10/2020	**8.3**	**15**
509	54	SAWY	KI Sawyer WWTP - Marquette Co	Effluent-1	10/13/2020	**4.8**	**9.3**
510	54	SAWY	KI Sawyer WWTP - Marquette Co	Effluent-1	11/30/2020	**6.9**	**14**
511	54	SAWY	KI Sawyer WWTP - Marquette Co	Effluent-1	12/16/2020	**4.5**	**9.1**
512	54	SAWY	KI Sawyer WWTP - Marquette Co	Influent-1	8/24/2016	ND	ND
513	54	SAWY	KI Sawyer WWTP - Marquette Co	Influent-1	4/19/2017	**0.944**	**52.6**
514	54	SAWY	KI Sawyer WWTP - Marquette Co	Influent-1	8/27/2018	**2.8**	**26**
515	54	SAWY	KI Sawyer WWTP - Marquette Co	Influent-1	11/7/2018	ND	**5.77**
516	54	SAWY	KI Sawyer WWTP - Marquette Co	Influent-1	11/27/2018	**1.9**	**95**
517	54	SAWY	KI Sawyer WWTP - Marquette Co	Influent-1	6/19/2019	**2.1**	**9.3**
518	54	SAWY	KI Sawyer WWTP - Marquette Co	Influent-1	5/20/2020	ND	ND
519	54	SAWY	KI Sawyer WWTP - Marquette Co	Influent-1	9/10/2020	**1.1**	**5.4**
520	54	SAWY	KI Sawyer WWTP - Marquette Co	Influent-1	10/13/2020	**46**	**210**
521	54	SAWY	KI Sawyer WWTP - Marquette Co	Influent-2	11/7/2018	ND	**81.0**
522	56	LANS	Lansing WWTP	Effluent-1	7/27/2018	ND	ND
523	56	LANS	Lansing WWTP	Effluent-1	11/1/2018	**7.58**	**5.51**
524	56	LANS	Lansing WWTP	Effluent-1	5/22/2019	**11**	ND
525	56	LANS	Lansing WWTP	Effluent-1	9/5/2019	ND	ND
526	56	LANS	Lansing WWTP	Influent-1	11/1/2018	**4.98**	ND
527	57	LAPR	Lapeer WWTP	Effluent-1	5/9/2017	**6.4**	**440**
528	57	LAPR	Lapeer WWTP	Effluent-1	7/11/2017	**12**	**2000**
529	57	LAPR	Lapeer WWTP	Effluent-1	8/30/2017	**9.4**	**1000**
530	57	LAPR	Lapeer WWTP	Effluent-1	9/13/2017	**11**	**710**
531	57	LAPR	Lapeer WWTP	Effluent-1	9/29/2017	**12**	**1500**
532	57	LAPR	Lapeer WWTP	Effluent-1	11/7/2017	**9.3**	**1500**
533	57	LAPR	Lapeer WWTP	Effluent-1	12/5/2017	**19**	**450**
534	57	LAPR	Lapeer WWTP	Effluent-1	1/9/2018	**7.0**	**57**
535	57	LAPR	Lapeer WWTP	Effluent-1	2/1/2018	**120**	**770**
536	57	LAPR	Lapeer WWTP	Effluent-1	3/1/2018	**9.4**	**46**
537	57	LAPR	Lapeer WWTP	Effluent-1	4/5/2018	**8.4**	**18**
538	57	LAPR	Lapeer WWTP	Effluent-1	4/19/2018	**5.4**	**15**
539	57	LAPR	Lapeer WWTP	Effluent-1	5/3/2018	**13**	**54**

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Nr.	WWTP Nr.	WWTP Code	WWTP Name	Sample Type	Sample Date	PFOA (ng/L)	PFOS (ng/L)
540	57	LAPR	Lapeer WWTP	Effluent-1	5/9/2018	**5.03**	**28.7**
541	57	LAPR	Lapeer WWTP	Effluent-1	5/31/2018	**11**	**26**
542	57	LAPR	Lapeer WWTP	Effluent-1	6/14/2018	**10**	**20**
543	57	LAPR	Lapeer WWTP	Effluent-1	7/11/2018	**7.5**	**18**
544	57	LAPR	Lapeer WWTP	Effluent-1	8/31/2018	**11**	**23**
545	57	LAPR	Lapeer WWTP	Effluent-1	10/10/2018	**12**	**23**
546	57	LAPR	Lapeer WWTP	Effluent-1	11/15/2018	**4.0**	**29**
547	57	LAPR	Lapeer WWTP	Effluent-1	11/16/2018	**7.8**	**16**
548	57	LAPR	Lapeer WWTP	Effluent-1	12/14/2018	**5.0**	**21**
549	57	LAPR	Lapeer WWTP	Effluent-1	12/14/2018	**5.0**	**21**
550	57	LAPR	Lapeer WWTP	Effluent-1	1/17/2019	**7.1**	**46**
551	57	LAPR	Lapeer WWTP	Effluent-1	2/20/2019	**8.0**	**24**
552	57	LAPR	Lapeer WWTP	Effluent-1	3/20/2019	**5.2**	**17**
553	57	LAPR	Lapeer WWTP	Effluent-1	4/24/2019	**5.1**	**16**
554	57	LAPR	Lapeer WWTP	Effluent-1	5/15/2019	**9.1**	**20**
555	57	LAPR	Lapeer WWTP	Effluent-1	6/26/2019	**8.8**	**18**
556	57	LAPR	Lapeer WWTP	Effluent-1	7/19/2019	**7.9**	**21**
557	57	LAPR	Lapeer WWTP	Effluent-1	8/28/2019	**7.7**	**20**
558	57	LAPR	Lapeer WWTP	Effluent-1	9/20/2019	**7.1**	**15**
559	57	LAPR	Lapeer WWTP	Effluent-1	10/24/2019	**8.7**	**14**
560	57	LAPR	Lapeer WWTP	Effluent-1	10/24/2019	**8.7**	**14**
561	57	LAPR	Lapeer WWTP	Effluent-1	11/21/2019	**7.1**	**14**
562	57	LAPR	Lapeer WWTP	Effluent-1	12/11/2019	**5.4**	**9.9**
563	57	LAPR	Lapeer WWTP	Effluent-1	1/23/2020	**5.0**	**11**
564	57	LAPR	Lapeer WWTP	Effluent-1	2/20/2020	**4.6**	**8.0**
565	57	LAPR	Lapeer WWTP	Effluent-1	3/19/2020	**5.7**	**8.4**
566	57	LAPR	Lapeer WWTP	Effluent-1	4/16/2020	**8.2**	**12**
567	57	LAPR	Lapeer WWTP	Effluent-1	5/21/2020	ND	ND
568	57	LAPR	Lapeer WWTP	Effluent-1	6/24/2020	**8.2**	**17**
569	57	LAPR	Lapeer WWTP	Effluent-1	7/21/2020	**8.4**	**15**
570	57	LAPR	Lapeer WWTP	Effluent-1	8/18/2020	**8.7**	**22**
571	57	LAPR	Lapeer WWTP	Effluent-1	9/14/2020	**7.7**	**15**
572	57	LAPR	Lapeer WWTP	Effluent-1	10/8/2020	**8.4**	**17**
573	57	LAPR	Lapeer WWTP	Effluent-1	11/17/2020	**18**	**9.2**
574	57	LAPR	Lapeer WWTP	Effluent-1	1/14/2021	**6.5**	**7.9**
575	57	LAPR	Lapeer WWTP	Influent-1	9/12/2017	**4.3**	**560**
576	57	LAPR	Lapeer WWTP	Influent-1	2/1/2018	**330**	**1200**
577	57	LAPR	Lapeer WWTP	Influent-1	3/1/2018	**4.2**	**8.6**
578	57	LAPR	Lapeer WWTP	Influent-1	4/5/2018	**3.7**	**10**
579	57	LAPR	Lapeer WWTP	Influent-1	12/13/2018	**4.4**	**9.3**
580	57	LAPR	Lapeer WWTP	Influent-1	12/13/2018	**4.4**	**9.3**
581	57	LAPR	Lapeer WWTP	Influent-1	1/16/2019	**4.0**	**98**
582	57	LAPR	Lapeer WWTP	Influent-1	2/19/2019	**3.6**	**32**
583	57	LAPR	Lapeer WWTP	Influent-1	3/19/2019	**4.4**	**13**
584	57	LAPR	Lapeer WWTP	Influent-1	4/26/2019	**5.1**	**18**
585	57	LAPR	Lapeer WWTP	Influent-1	5/14/2019	**5.4**	**9.1**
586	57	LAPR	Lapeer WWTP	Influent-1	6/25/2019	**5.5**	**15**
587	57	LAPR	Lapeer WWTP	Influent-1	7/18/2019	**4.9**	**14**
588	57	LAPR	Lapeer WWTP	Influent-1	8/28/2019	**4.5**	**10**

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Nr.	WWTP Nr.	WWTP Code	WWTP Name	Sample Type	Sample Date	PFOA (ng/L)	PFOS (ng/L)
589	57	LAPR	Lapeer WWTP	Influent-1	9/19/2019	**3.6**	ND
590	57	LAPR	Lapeer WWTP	Influent-1	10/24/2019	**7.8**	**15**
591	57	LAPR	Lapeer WWTP	Influent-1	10/24/2019	**7.8**	**15**
592	57	LAPR	Lapeer WWTP	Influent-1	11/20/2019	**3.7**	**9.3**
593	57	LAPR	Lapeer WWTP	Influent-1	12/10/2019	**4.0**	**9.8**
594	57	LAPR	Lapeer WWTP	Influent-1	1/22/2020	**4.3**	**7.1**
595	57	LAPR	Lapeer WWTP	Influent-1	2/19/2020	**4.3**	**10**
596	57	LAPR	Lapeer WWTP	Influent-1	3/18/2020	ND	ND
597	57	LAPR	Lapeer WWTP	Influent-1	4/15/2020	**3.3**	**16**
598	57	LAPR	Lapeer WWTP	Influent-1	5/21/2020	ND	ND
599	57	LAPR	Lapeer WWTP	Influent-1	6/24/2020	**3.3**	**8.9**
600	57	LAPR	Lapeer WWTP	Influent-1	7/21/2020	**2.4**	**20**
601	57	LAPR	Lapeer WWTP	Influent-1	8/18/2020	**3.6**	**21**
602	57	LAPR	Lapeer WWTP	Influent-1	9/14/2020	**5.5**	**19**
603	57	LAPR	Lapeer WWTP	Influent-1	10/7/2020	**3.4**	**6.5**
604	57	LAPR	Lapeer WWTP	Influent-1	11/16/2020	**3.3**	**10**
605	57	LAPR	Lapeer WWTP	Influent-1	1/13/2021	**3.1**	**6.5**
606	59	LUDG	Ludington WWTP	Effluent-1	10/29/2018	**4.82**	**4.92**
607	59	LUDG	Ludington WWTP	Effluent-1	6/20/2019	**8.88**	**6.57**
608	59	LUDG	Ludington WWTP	Effluent-1	12/19/2019	ND	ND
609	60	LYON	Lyon Township WWTP	Effluent-1	11/13/2018	**15.4**	ND
610	60	LYON	Lyon Township WWTP	Influent-1	11/13/2018	ND	ND
611	61	MARY	Marysville WWTP	Effluent-1	6/21/2018	**20**	**14**
612	61	MARY	Marysville WWTP	Effluent-1	9/6/2018	**21**	**23**
613	61	MARY	Marysville WWTP	Effluent-1	12/3/2018	**34**	**16**
614	61	MARY	Marysville WWTP	Effluent-1	1/15/2019	**30**	**8.2**
615	61	MARY	Marysville WWTP	Effluent-1	1/28/2019	**27**	**12**
616	61	MARY	Marysville WWTP	Effluent-1	4/10/2019	**63**	**21**
617	61	MARY	Marysville WWTP	Effluent-1	7/10/2019	**56**	**570**
618	61	MARY	Marysville WWTP	Effluent-1	7/22/2019	**25**	**27**
619	61	MARY	Marysville WWTP	Effluent-1	10/9/2019	**39**	**22**
620	61	MARY	Marysville WWTP	Effluent-1	1/21/2020	**39**	**11**
621	62	MENO	Menominee WWTP	Effluent-1	9/20/2017	**82**	**13**
622	62	MENO	Menominee WWTP	Effluent-1	1/9/2019	**28**	**6.5**
623	62	MENO	Menominee WWTP	Effluent-1	5/15/2019	**18**	ND
624	62	MENO	Menominee WWTP	Effluent-1	7/31/2019	**28.0**	**12.9**
625	62	MENO	Menominee WWTP	Effluent-1	8/21/2019	**37**	**13**
626	62	MENO	Menominee WWTP	Effluent-1	8/21/2019	**35**	**15**
627	62	MENO	Menominee WWTP	Effluent-1	11/6/2019	**20**	**9.5**
628	62	MENO	Menominee WWTP	Effluent-1	11/29/2019	**31**	**6.2**
629	62	MENO	Menominee WWTP	Effluent-1	12/2/2019	**14**	**8.6**
630	62	MENO	Menominee WWTP	Effluent-1	1/14/2020	**24**	**8.1**
631	62	MENO	Menominee WWTP	Influent-1	11/28/2018	**12**	**5.6**
632	62	MENO	Menominee WWTP	Influent-1	8/21/2019	**31**	**12**
633	63	MILN	Milan WWTP	Effluent-1	10/16/2018	**7.19**	**7.27**
634	63	MILN	Milan WWTP	Effluent-1	5/21/2019	ND	ND
635	63	MILN	Milan WWTP	Effluent-1	10/29/2019	**12**	**11**
636	64	MONR	Monroe Metro WWTP	Effluent-1	9/4/2018	**7.0**	**8.0**
637	64	MONR	Monroe Metro WWTP	Effluent-1	10/1/2018	**7.1**	**8.3**

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Nr.	WWTP Nr.	WWTP Code	WWTP Name	Sample Type	Sample Date	PFOA (ng/L)	PFOS (ng/L)
638	64	MONR	Monroe Metro WWTP	Effluent-1	11/20/2018	**5.35**	**5.46**
639	64	MONR	Monroe Metro WWTP	Effluent-1	5/16/2019	**5.3**	**7.7**
640	64	MONR	Monroe Metro WWTP	Effluent-1	10/24/2019	**6.2**	**8.8**
641	64	MONR	Monroe Metro WWTP	Influent-1	11/20/2018	**2.89**	**5.5**
642	65	MTCL	Mt Clemens WWTP	Effluent-1	10/26/2017	**14**	**7.4**
643	65	MTCL	Mt Clemens WWTP	Effluent-1	11/15/2018	**9.03**	**3.40**
644	65	MTCL	Mt Clemens WWTP	Influent-1	11/15/2018	**4.60**	**5.02**
645	66	MUSK	Muskegon Co WWTMS Metro WWTP	Effluent-1	4/3/2018	**28**	**11**
646	66	MUSK	Muskegon Co WWTMS Metro WWTP	Effluent-1	7/10/2018	**35**	**19**
647	66	MUSK	Muskegon Co WWTMS Metro WWTP	Effluent-1	8/30/2018	**44**	**44**
648	66	MUSK	Muskegon Co WWTMS Metro WWTP	Effluent-1	10/15/2018	**38**	**22**
649	66	MUSK	Muskegon Co WWTMS Metro WWTP	Effluent-1	10/30/2018	**31.7**	**16.2**
650	66	MUSK	Muskegon Co WWTMS Metro WWTP	Effluent-1	1/23/2019	**34**	**25**
651	66	MUSK	Muskegon Co WWTMS Metro WWTP	Effluent-1	4/16/2019	**26**	**15**
652	66	MUSK	Muskegon Co WWTMS Metro WWTP	Effluent-1	8/1/2019	**31**	**23**
653	66	MUSK	Muskegon Co WWTMS Metro WWTP	Effluent-1	10/25/2019	**33**	**27**
654	66	MUSK	Muskegon Co WWTMS Metro WWTP	Effluent-1	2/10/2020	**27**	**14**
655	66	MUSK	Muskegon Co WWTMS Metro WWTP	Influent-1	10/30/2018	**11.7**	**10.5**
656	67	NILE	Niles WWTP	Effluent-1	1/8/2019	ND	ND
657	67	NILE	Niles WWTP	Influent-1	1/8/2019	ND	ND
658	69	NKEN	North Kent SA WWTP	Effluent-1	6/4/2018	**25**	**27**
659	69	NKEN	North Kent SA WWTP	Effluent-1	7/11/2018	**26.6**	**20.8**
660	69	NKEN	North Kent SA WWTP	Effluent-1	9/11/2018	**37.0**	**37.0**
661	69	NKEN	North Kent SA WWTP	Effluent-1	10/11/2018	**25.0**	**18.2**
662	69	NKEN	North Kent SA WWTP	Effluent-1	10/29/2018	**21.2**	**12.5**
663	69	NKEN	North Kent SA WWTP	Effluent-1	11/9/2018	**30.1**	**12.4**
664	69	NKEN	North Kent SA WWTP	Effluent-1	12/11/2018	**25.6**	**33.9**
665	69	NKEN	North Kent SA WWTP	Effluent-1	1/7/2019	**25.4**	**29.6**
666	69	NKEN	North Kent SA WWTP	Effluent-1	2/11/2019	**26.1**	**46.6**
667	69	NKEN	North Kent SA WWTP	Effluent-1	3/19/2019	**29.3**	**32.2**
668	69	NKEN	North Kent SA WWTP	Effluent-1	4/11/2019	**30.0**	**75.2**
669	69	NKEN	North Kent SA WWTP	Effluent-1	5/8/2019	**32.0**	**50.2**
670	69	NKEN	North Kent SA WWTP	Effluent-1	6/13/2019	**27.9**	**48.9**
671	69	NKEN	North Kent SA WWTP	Effluent-1	7/9/2019	**20.7**	**30.7**
672	69	NKEN	North Kent SA WWTP	Effluent-1	8/1/2019	**26.5**	**85.2**
673	69	NKEN	North Kent SA WWTP	Effluent-1	9/4/2019	**24.7**	**61.6**
674	69	NKEN	North Kent SA WWTP	Effluent-1	10/2/2019	**25.5**	**14.8**
675	69	NKEN	North Kent SA WWTP	Effluent-1	11/6/2019	**62.3**	**21.4**
676	69	NKEN	North Kent SA WWTP	Effluent-1	12/2/2019	**34.3**	**16.5**
677	69	NKEN	North Kent SA WWTP	Effluent-1	1/7/2020	**32.1**	**30.2**
678	69	NKEN	North Kent SA WWTP	Effluent-1	2/6/2020	**35.6**	**73.3**
679	69	NKEN	North Kent SA WWTP	Influent-1	7/11/2018	**14.4**	**15.5**
680	69	NKEN	North Kent SA WWTP	Influent-1	10/29/2018	**11.2**	**31.1**
681	69	NKEN	North Kent SA WWTP	Influent-1	5/8/2019	**17.2**	**40.5**
682	69	NKEN	North Kent SA WWTP	Influent-1	12/2/2019	**29.7**	**55.6**
683	69	NKEN	North Kent SA WWTP	Influent-1	2/6/2020	**22.9**	**204**
684	70	OTSE	Otsego WWTP	Effluent-1	11/9/2018	ND	ND
685	70	OTSE	Otsego WWTP	Effluent-1	5/15/2019	ND	ND

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Nr.	WWTP Nr.	WWTP Code	WWTP Name	Sample Type	Sample Date	PFOA (ng/L)	PFOS (ng/L)
686	70	OTSE	Otsego WWTP	Influent-1	8/17/2018	ND	ND
687	71	OWOS	Owosso - Mid Shiawassee Co WWTP	Effluent-1	1/22/2019	2.5	2.7
688	71	OWOS	Owosso - Mid Shiawassee Co WWTP	Effluent-1	5/15/2019	4.57	1.98
689	71	OWOS	Owosso - Mid Shiawassee Co WWTP	Effluent-1	10/15/2019	1.32	1.32
690	72	PLAI	Plainwell WWTP	Effluent-1	5/15/2019	ND	ND
691	73	PONT	Pontiac WWTP - Oakland Co.	Effluent-1	10/26/2017	13	9.0
692	73	PONT	Pontiac WWTP - Oakland Co.	Effluent-1	11/6/2018	44	37
693	73	PONT	Pontiac WWTP - Oakland Co.	Effluent-1	11/14/2018	38.1	20
694	73	PONT	Pontiac WWTP - Oakland Co.	Effluent-1	2/27/2019	33	24
695	73	PONT	Pontiac WWTP - Oakland Co.	Effluent-1	5/17/2019	37	41
696	73	PONT	Pontiac WWTP - Oakland Co.	Effluent-1	8/9/2019	52	48
697	73	PONT	Pontiac WWTP - Oakland Co.	Effluent-1	10/2/2019	63	45
698	73	PONT	Pontiac WWTP - Oakland Co.	Effluent-1	1/15/2020	13	11
699	73	PONT	Pontiac WWTP - Oakland Co.	Influent-1	11/14/2018	4.94	7.68
700	74	PHUR	Port Huron WWTP	Effluent-1	6/11/2018	40	40
701	74	PHUR	Port Huron WWTP	Effluent-1	8/27/2018	50	50
702	74	PHUR	Port Huron WWTP	Effluent-1	11/12/2018	90	80
703	74	PHUR	Port Huron WWTP	Effluent-1	11/15/2018	44.8	13.1
704	74	PHUR	Port Huron WWTP	Effluent-1	12/10/2018	50	20
705	74	PHUR	Port Huron WWTP	Effluent-1	2/19/2019	570	1,150
706	74	PHUR	Port Huron WWTP	Effluent-1	3/19/2019	660	1100
707	74	PHUR	Port Huron WWTP	Effluent-1	4/24/2019	580	1100
708	74	PHUR	Port Huron WWTP	Effluent-1	5/8/2019	63	15
709	74	PHUR	Port Huron WWTP	Effluent-1	6/27/2019	47	19
710	74	PHUR	Port Huron WWTP	Effluent-1	7/24/2019	41	18
711	74	PHUR	Port Huron WWTP	Effluent-1	8/15/2019	35	19
712	74	PHUR	Port Huron WWTP	Effluent-1	9/10/2019	32	18
713	74	PHUR	Port Huron WWTP	Effluent-1	10/9/2019	53	29
714	74	PHUR	Port Huron WWTP	Effluent-1	11/25/2019	54	15
715	74	PHUR	Port Huron WWTP	Effluent-1	12/3/2019	53	15
716	74	PHUR	Port Huron WWTP	Effluent-1	1/7/2020	46	12
717	74	PHUR	Port Huron WWTP	Effluent-1	3/25/2020	46	9.7
718	74	PHUR	Port Huron WWTP	Effluent-1	4/8/2020	45	13
719	74	PHUR	Port Huron WWTP	Effluent-1	5/21/2020	54	15
720	74	PHUR	Port Huron WWTP	Effluent-1	6/9/2020	37	15
721	74	PHUR	Port Huron WWTP	Effluent-1	7/28/2020	37	21
722	74	PHUR	Port Huron WWTP	Influent-1	6/11/2018	40	40
723	74	PHUR	Port Huron WWTP	Influent-1	11/15/2018	64.6	19.5
724	74	PHUR	Port Huron WWTP	Influent-1	3/19/2019	52	36
725	74	PHUR	Port Huron WWTP	Influent-1	3/19/2019	53	21
726	74	PHUR	Port Huron WWTP	Influent-1	4/24/2019	78	18
727	74	PHUR	Port Huron WWTP	Influent-1	5/8/2019	80	20
728	74	PHUR	Port Huron WWTP	Influent-1	6/27/2019	48	24
729	74	PHUR	Port Huron WWTP	Influent-1	7/24/2019	50	19
730	74	PHUR	Port Huron WWTP	Influent-1	8/15/2019	29	23
731	74	PHUR	Port Huron WWTP	Influent-1	9/10/2019	27	18
732	74	PHUR	Port Huron WWTP	Influent-1	10/9/2019	56	34
733	74	PHUR	Port Huron WWTP	Influent-1	11/25/2019	57	16
734	74	PHUR	Port Huron WWTP	Influent-1	12/3/2019	54	20

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Nr.	WWTP Nr.	WWTP Code	WWTP Name	Sample Type	Sample Date	PFOA (ng/L)	PFOS (ng/L)
735	74	PHUR	Port Huron WWTP	Influent-1	1/7/2020	**47**	**20**
736	74	PHUR	Port Huron WWTP	Influent-1	3/25/2020	**46**	**19**
737	74	PHUR	Port Huron WWTP	Influent-1	4/8/2020	**58**	**19**
738	74	PHUR	Port Huron WWTP	Influent-1	5/21/2020	**55**	**14**
739	74	PHUR	Port Huron WWTP	Influent-1	6/9/2020	**48**	**29**
740	76	REED	Reed City	Effluent-1	8/24/2018	ND	ND
741	76	REED	Reed City	Effluent-1	6/6/2019	ND	ND
742	76	REED	Reed City WWTP	Effluent-1	12/2/2019	ND	ND
743	77	HURO	S Huron Valley UA WWTP	Effluent-1	11/20/2018	**6.69**	**5.33**
744	77	HURO	S Huron Valley UA WWTP	Effluent-1	3/26/2019	ND	ND
745	77	HURO	S Huron Valley UA WWTP	Effluent-1	5/10/2019	**28**	**14**
746	77	HURO	S Huron Valley UA WWTP	Effluent-1	7/11/2019	**34**	**6.5**
747	77	HURO	S Huron Valley UA WWTP	Effluent-1	10/4/2019	**6.7**	**7.4**
748	77	HURO	S Huron Valley UA WWTP	Influent-1	11/20/2018	**3.76**	ND
749	78	SGTW	Saginaw Twp WWTP	Effluent-1	8/20/2018	**18.3**	**8.60**
750	78	SGTW	Saginaw Twp WWTP	Effluent-1	6/4/2019	ND	ND
751	78	SGTW	Saginaw Twp WWTP	Effluent-1	12/4/2019	**8.9**	**5.2**
752	78	SGTW	Saginaw Twp WWTP	Influent-1	6/4/2019	ND	ND
753	79	SAGN	Saginaw WWTP	Effluent-1	11/19/2018	**4.58**	**4.13**
754	79	SAGN	Saginaw WWTP	Influent-1	11/19/2018	**2.56**	**4.19**
755	80	SALN	Saline WWTP	Effluent-1	7/31/2018	**6.4**	**33**
756	80	SALN	Saline WWTP	Effluent-1	4/26/2019	ND	ND
757	80	SALN	Saline WWTP	Effluent-1	5/3/2019	ND	ND
758	80	SALN	Saline WWTP	Effluent-1	5/8/2019	ND	ND
759	80	SALN	Saline WWTP	Effluent-1	5/9/2019	ND	ND
760	80	SALN	Saline WWTP	Effluent-1	5/13/2019	ND	ND
761	80	SALN	Saline WWTP	Effluent-1	5/14/2019	ND	ND
762	80	SALN	Saline WWTP	Effluent-1	8/1/2019	ND	ND
763	80	SALN	Saline WWTP	Effluent-1	12/17/2019	ND	ND
764	80	SALN	Saline WWTP	Influent-1	4/26/2019	ND	ND
765	80	SALN	Saline WWTP	Influent-1	5/3/2019	ND	ND
766	80	SALN	Saline WWTP	Influent-1	5/8/2019	ND	ND
767	80	SALN	Saline WWTP	Influent-1	5/9/2019	ND	ND
768	80	SALN	Saline WWTP	Influent-1	5/13/2019	ND	ND
769	80	SALN	Saline WWTP	Influent-1	5/14/2019	ND	ND
770	81	SAND	Sandusky WWTP	Effluent-1	6/28/2017	**14**	**27**
771	81	SAND	Sandusky WWTP	Effluent-1	9/20/2017	**17**	**13**
772	81	SAND	Sandusky WWTP	Effluent-1	10/29/2018	**6.59**	ND
773	81	SAND	Sandusky WWTP	Effluent-1	11/16/2018	**8.39**	**5.26**
774	81	SAND	Sandusky WWTP	Effluent-1	2/19/2019	**16**	**5.8**
775	81	SAND	Sandusky WWTP	Effluent-1	4/23/2019	**14**	**13**
776	81	SAND	Sandusky WWTP	Effluent-1	7/19/2019	**53**	**14**
777	81	SAND	Sandusky WWTP	Effluent-1	10/24/2019	**22**	**12**
778	81	SAND	Sandusky WWTP	Effluent-1	1/15/2020	**14**	**13**
779	81	SAND	Sandusky WWTP	Influent-1	11/16/2018	**12.2**	**7.98**
780	81	SAND	Sandusky WWTP	Influent-1	1/15/2020	**12**	**17**
781	83	SCLN	Southern Clinton Co WWTP	Effluent-1	3/1/2019	**20**	**10**
782	83	SCLN	Southern Clinton Co WWTP	Effluent-1	5/21/2019	**14**	**13**
783	83	SCLN	Southern Clinton Co WWTP	Effluent-1	8/29/2019	**15**	**71**
784	83	SCLN	Southern Clinton Co WWTP	Effluent-1	9/13/2019	ND	ND

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Nr.	WWTP Nr.	WWTP Code	WWTP Name	Sample Type	Sample Date	PFOA (ng/L)	PFOS (ng/L)
785	83	SCLN	Southern Clinton Co WWTP	Effluent-1	11/6/2019	ND	ND
786	83	SCLN	Southern Clinton Co WWTP	Effluent-1	12/27/2019	ND	ND
787	83	SCLN	Southern Clinton Co WWTP	Effluent-1	1/22/2020	ND	ND
788	83	SCLN	Southern Clinton Co WWTP	Effluent-1	2/21/2020	ND	ND
789	83	SCLN	Southern Clinton Co WWTP	Influent-1	8/29/2019	ND	ND
790	83	SCLN	Southern Clinton Co WWTP	Influent-1	9/13/2019	ND	ND
791	83	SCLN	Southern Clinton Co WWTP	Influent-1	11/6/2019	ND	ND
792	83	SCLN	Southern Clinton Co WWTP	Influent-1	12/27/2019	ND	ND
793	83	SCLN	Southern Clinton Co WWTP	Influent-1	1/22/2020	ND	ND
794	83	SCLN	Southern Clinton Co WWTP	Influent-1	2/21/2020	ND	ND
795	85	STUR	Sturgis WWTP	Effluent-1	10/11/2018	**3.1**	**3.4**
796	86	TAWS	Tawas Utility Authority WWTP	Effluent-1	9/19/2018	**9.0**	**17**
797	86	TAWS	Tawas Utility Authority WWTP	Effluent-1	1/15/2019	**7.2**	**8.7**
798	86	TAWS	Tawas Utility Authority WWTP	Effluent-1	6/6/2019	**13**	**15**
799	86	TAWS	Tawas Utility Authority WWTP	Effluent-1	8/6/2019	**9.7**	**11**
800	86	TAWS	Tawas Utility Authority WWTP	Effluent-1	10/22/2019	**8.0**	**10**
801	86	TAWS	Tawas Utility Authority WWTP	Influent-1	9/19/2018	**6.2**	**17**
802	87	TRIV	Three Rivers WWTP	Effluent-1	9/13/2018	**37.36**	**9.76**
803	87	TRIV	Three Rivers WWTP	Effluent-1	6/7/2019	**38.81**	**22.33**
804	87	TRIV	Three Rivers WWTP	Effluent-1	9/13/2019	**42.78**	**13.32**
805	87	TRIV	Three Rivers WWTP	Influent-1	8/2/2018	**21.44**	**7.39**
806	87	TRIV	Three Rivers WWTP	Influent-1	9/13/2018	**16.08**	ND
807	87	TRIV	Three Rivers WWTP	Influent-1	6/7/2019	ND	ND
808	88	TRAV	Traverse City WWTP	Effluent-1	11/8/2018	**20.7**	**2.90**
809	88	TRAV	Traverse City WWTP	Influent-1	11/8/2018	**6.17**	**4.73**
810	90	WARR	Warren WWTP	Effluent-1	10/26/2017	**11**	**14**
811	90	WARR	Warren WWTP	Effluent-1	9/14/2018	ND	ND
812	90	WARR	Warren WWTP	Effluent-1	11/15/2018	**7.21**	**7.64**
813	90	WARR	Warren WWTP	Effluent-1	11/29/2018	ND	ND
814	90	WARR	Warren WWTP	Effluent-1	2/14/2019	ND	ND
815	90	WARR	Warren WWTP	Effluent-1	5/24/2019	ND	ND
816	90	WARR	Warren WWTP	Effluent-1	9/16/2019	ND	**16**
817	90	WARR	Warren WWTP	Effluent-1	11/15/2019	ND	**12**
818	90	WARR	Warren WWTP	Effluent-1	1/29/2020	ND	ND
819	90	WARR	Warren WWTP	Effluent-2	11/15/2018	**7.19**	**7.48**
820	90	WARR	Warren WWTP	Influent-1	11/15/2018	**4.61**	**7.31**
821	90	WARR	Warren WWTP	Influent-1	11/29/2018	ND	**20**
822	90	WARR	Warren WWTP	Influent-1	2/14/2019	ND	ND
823	90	WARR	Warren WWTP	Influent-1	5/24/2019	ND	ND
824	90	WARR	Warren WWTP	Influent-1	9/16/2019	ND	**16**
825	90	WARR	Warren WWTP	Influent-1	11/15/2019	ND	ND
826	90	WARR	Warren WWTP	Influent-1	1/29/2020	ND	ND
827	91	WBAY	West Bay Co Regional WWTP	Effluent-1	8/23/2018	**6.6**	**6.9**
828	92	WIXO	Wixom WWTP	Effluent-1	6/14/2018	**9.7**	**290**
829	92	WIXO	Wixom WWTP	Effluent-1	8/29/2018	**12**	**4800**
830	92	WIXO	Wixom WWTP	Effluent-1	9/25/2018	**14**	**2,100**
831	92	WIXO	Wixom WWTP	Effluent-1	10/11/2018	**11**	**940**

Table 3

WWTPs PFAS Results

Michigan IPP PFAS Initiative

Nr.	WWTP Nr.	WWTP Code	WWTP Name	Sample Type	Sample Date	PFOA (ng/L)	PFOS (ng/L)
832	92	WIXO	Wixom WWTP	Effluent-1	10/15/2018	7.1	530
833	92	WIXO	Wixom WWTP	Effluent-1	11/6/2018	6.2	240
834	92	WIXO	Wixom WWTP	Effluent-1	11/14/2018	9.89	269
835	92	WIXO	Wixom WWTP	Effluent-1	12/4/2018	9.8	150
836	92	WIXO	Wixom WWTP	Effluent-1	1/15/2019	7.2	130
837	92	WIXO	Wixom WWTP	Effluent-1	2/13/2019	7.4	53
838	92	WIXO	Wixom WWTP	Effluent-1	3/12/2019	4.5	30
839	92	WIXO	Wixom WWTP	Effluent-1	4/3/2019	5.2	19
840	92	WIXO	Wixom WWTP	Effluent-1	5/17/2019	15	27
841	92	WIXO	Wixom WWTP	Effluent-1	6/12/2019	11	73
842	92	WIXO	Wixom WWTP	Effluent-1	7/2/2019	9.1	31
843	92	WIXO	Wixom WWTP	Effluent-1	8/21/2019	7.9	36
844	92	WIXO	Wixom WWTP	Effluent-1	9/17/2019	6.7	33
845	92	WIXO	Wixom WWTP	Effluent-1	10/8/2019	5.6	17
846	92	WIXO	Wixom WWTP	Effluent-1	11/12/2019	5.9	28
847	92	WIXO	Wixom WWTP	Effluent-1	12/10/2019	6.6	26
848	92	WIXO	Wixom WWTP	Effluent-1	1/21/2020	7.5	40
849	92	WIXO	Wixom WWTP	Effluent-1	2/18/2020	4.2	18
850	92	WIXO	Wixom WWTP	Effluent-1	3/23/2020	5.0	16
851	92	WIXO	Wixom WWTP	Effluent-1	4/14/2020	4.7	12
852	92	WIXO	Wixom WWTP	Effluent-1	5/13/2020	9.0	17
853	92	WIXO	Wixom WWTP	Effluent-1	6/23/2020	5.4	29
854	92	WIXO	Wixom WWTP	Effluent-1	7/21/2020	8.1	51
855	92	WIXO	Wixom WWTP	Effluent-1	8/18/2020	5.8	31
856	92	WIXO	Wixom WWTP	Effluent-1	9/9/2020	4.8	24
857	92	WIXO	Wixom WWTP	Effluent-1	10/15/2020	5.5	16
858	92	WIXO	Wixom WWTP	Effluent-1	11/3/2020	4.0	21
859	92	WIXO	Wixom WWTP	Effluent-1	11/5/2020	3.8	27
860	92	WIXO	Wixom WWTP	Influent-1	11/14/2018	3.07	128
861	92	WIXO	Wixom WWTP	Influent-1	3/12/2019	2.2	23
862	92	WIXO	Wixom WWTP	Influent-1	5/17/2019	ND	ND
863	93	WYOM	Wyoming WWTP	Effluent-1	5/7/2018	14	12
864	93	WYOM	Wyoming WWTP	Effluent-1	9/26/2018	11	12
865	93	WYOM	Wyoming WWTP	Effluent-1	10/29/2018	8.74	12
866	93	WYOM	Wyoming WWTP	Effluent-1	3/14/2019	15	35
867	93	WYOM	Wyoming WWTP	Effluent-1	6/18/2019	9.2	23
868	93	WYOM	Wyoming WWTP	Effluent-1	9/19/2019	8.4	16
869	93	WYOM	Wyoming WWTP	Effluent-1	11/19/2019	7.3	11
870	93	WYOM	Wyoming WWTP	Effluent-1	1/9/2020	18	31
871	93	WYOM	Wyoming WWTP	Influent-1	5/7/2018	14	25
872	93	WYOM	Wyoming WWTP	Influent-1	9/26/2018	6.2	25
873	93	WYOM	Wyoming WWTP	Influent-1	10/29/2018	5.08	26.4
874	93	WYOM	Wyoming WWTP	Influent-1	3/14/2019	8.8	25
875	93	WYOM	Wyoming WWTP	Influent-1	6/18/2019	3.1	14
876	93	WYOM	Wyoming WWTP	Influent-1	9/19/2019	5.8	7.3

Table 3

WWTPs PFAS Results
Michigan IPP PFAS Initiative

Nr.	WWTP Nr.	WWTP Code	WWTP Name	Sample Type	Sample Date	PFOA (ng/L)	PFOS (ng/L)
877	93	WYOM	Wyoming WWTP	Influent-1	11/19/2019	**4.0**	**15**
878	93	WYOM	Wyoming WWTP	Influent-1	1/9/2020	**7.0**	**14**
879	94	YCUA	YCUA Regional WWTP	Effluent-1	8/16/2018	**21**	**8.8**
880	94	YCUA	YCUA Regional WWTP	Effluent-1	11/2/2018	**24**	**22**
881	94	YCUA	YCUA Regional WWTP	Effluent-1	11/2/2018	**12.6**	**6.12**
882	94	YCUA	YCUA Regional WWTP	Effluent-1	5/15/2019	**20.1**	**15.4**
883	94	YCUA	YCUA Regional WWTP	Effluent-1	8/5/2019	**22**	**15**
884	94	YCUA	YCUA Regional WWTP	Effluent-1	10/11/2019	**32**	**24**
885	94	YCUA	YCUA Regional WWTP	Influent-1	8/15/2018	**12**	**4.8**
886	94	YCUA	YCUA Regional WWTP	Influent-1	11/2/2018	**7.39**	**7.51**
887	94	YCUA	YCUA Regional WWTP	Influent-1	5/14/2019	**15.9**	ND
888	94	YCUA	YCUA Regional WWTP	Influent-1	10/10/2019	**71**	**130**
889	95	ZEEL	Zeeland WWTP	Effluent-1	4/24/2018	**9.6**	**3.8**
890	95	ZEEL	Zeeland WWTP	Effluent-1	5/8/2019	**10.71**	**6.85**
891	95	ZEEL	Zeeland WWTP	Effluent-1	11/18/2019	**6.98**	ND
892	96	ALGO	Algonac WWTP	Effluent-1	7/19/2017	**8.6**	**5.6**
893	97	ALPE	Alpena WWTP	Effluent-1	11/9/2018	**7.49**	**5.07**
894	97	ALPE	Alpena WWTP	Influent-1	11/9/2018	**5.94**	**5.44**
895	98	CHEL	Chelsea WWTP	Effluent-1	3/20/2019	**4.3**	**1.0**
896	99	COMM	Commerce Twp WWTP	Effluent-1	11/14/2018	**15.5**	**1.92**
897	99	COMM	Commerce Twp WWTP	Influent-1	11/14/2018	**17.9**	**6.38**
898	100	DEER	Deerfield WWTP	Effluent-1	7/31/2018	**5.8**	**5.4**
899	101	ELAN	East Lansing WWRF	Effluent-1	11/1/2018	**3.28**	**2.01**
900	101	ELAN	East Lansing WWRF	Influent-1	11/1/2018	**2.21**	ND
901	102	GAYL	Gaylord WWTP	Effluent-1	11/8/2018	**8.72**	**4.26**
902	102	GAYL	Gaylord WWTP	Influent-1	11/8/2018	ND	ND
903	103	MARQ	Marquette WWTP	Effluent-1	11/7/2018	**6.56**	**10.7**
904	103	MARQ	Marquette WWTP	Influent-1	11/7/2018	**3.27**	**10.3**
905	104	MEND	Mendon WWSL	Effluent-1	10/3/2019	**7.24**	**6.37**
906	105	MIDL	Midland WWTP	Effluent-1	11/19/2018	**10.5**	**4.03**
907	105	MIDL	Midland WWTP	Influent-1	11/19/2018	**10.3**	**2.72**
908	106	MILF	Milford WWTP	Effluent-1	8/14/2018	**12**	**3.0**
909	107	OSCO	Oscoda Twp WWTP Wurtsmith	Effluent-1	11/9/2018	**12.4**	**75.8**
910	107	OSCO	Oscoda Twp WWTP Wurtsmith	Influent-1	11/9/2018	**4.42**	**38.2**
911	108	PETO	Petoskey WWTP	Effluent-1	8/27/2018	**7.2**	**8.9**
912	109	SLYN	South Lyon WWTP	Effluent-1	8/14/2018	**72**	**4.4**
913	109	SLYN	South Lyon WWTP	Effluent-1	3/20/2019	**6.3**	**0.99**
914	110	TECU	Tecumseh WWTP	Effluent-1	7/31/2018	**14**	**2.8**

Notes:

ND = Non-Detect (Typical detection limits were between 2-10 ng/L)

Table 12

CIU PFAS Results
Michigan IPP PFAS Initiative

Nr.	WWTP Nr.	WWTP Code	WWTP Name	40 CFR Category	No. of Samples	PFOA (ng/L)		PFOS (ng/L)	
						Minimum (Min)	Maximum (Max)	Minimum (Min)	Maximum (Max)
1	1	ADRI	Adrian WWTP	414	1	ND	ND	ND	ND
2	1	ADRI	Adrian WWTP	433	1	ND	ND	ND	ND
3	4	AARB	Ann Arbor WWTP	469	1	22.9	22.9	10	10
4	5	AUGR	Au Gres WWTP	433	1	ND	ND	ND	ND
5	6	BCRK	Battle Creek WWTP	430	4	48.82	98	56	100
6	6	BCRK	Battle Creek WWTP	430	4	51.88	100	87	92
7	6	BCRK	Battle Creek WWTP	433	2	ND	ND	ND	ND
8	9	BELD	Belding WWTP	433	1	ND	ND	ND	ND
9	9	BELD	Belding WWTP	468	1	ND	ND	ND	ND
10	10	BHSJ	Benton Harbor-St Joseph WWTP	413	1	ND	ND	ND	ND
11	10	BHSJ	Benton Harbor-St Joseph WWTP	433	2	ND	ND	ND	ND
12	10	BHSJ	Benton Harbor-St Joseph WWTP	433	2	ND	ND	5.31	5.31
13	10	BHSJ	Benton Harbor-St Joseph WWTP	433	2	ND	ND	5.07	27.65
14	11	BRAP	Big Rapids WWTP	433	1	ND	ND	ND	ND
15	13	BRIT	Brighton WWTP	433	1	ND	ND	ND	ND
16	14	BRON	Bronson WWTP	433	19	0.25	4.3	4	240,000
17	17	CASS	Cass City WWTP	433	1	0.86	0.86	ND	ND
18	18	CHAR	Charlotte WWTP	433	5	ND	ND	ND	ND
19	18	CHAR	Charlotte WWTP	433	6	ND	ND	ND	ND
20	19	CLAR	Clare WWTP	433	2	ND	ND	ND	ND
21	24	DELT	Delta Twp WWTP	433	1	ND	ND	ND	ND
22	25	DEXT	Dexter WWTP	433	2	10.9	15	17.6	33
23	27	DRVR	Downriver WWTP	420	1	ND	ND	ND	ND
24	27	DRVR	Downriver WWTP	420	1	ND	ND	ND	ND
25	27	DRVR	Downriver WWTP	433	1	4.8	4.8	4.7	4.7
26	27	DRVR	Downriver WWTP	433	1	ND	ND	2.7	2.7
27	27	DRVR	Downriver WWTP	433	1	3.4	3.4	5.7	5.7
28	27	DRVR	Downriver WWTP	433	2	22	23	ND	ND
29	27	DRVR	Downriver WWTP	433	1	ND	ND	ND	ND
30	27	DRVR	Downriver WWTP	433	1	ND	ND	ND	ND
31	27	DRVR	Downriver WWTP	433	4	2.4	3.9	840	3700
32	27	DRVR	Downriver WWTP	433	1	ND	ND	ND	ND
33	27	DRVR	Downriver WWTP	468	1	ND	ND	ND	ND
34	29	EAUC	Eau Claire WWSL	433	1	ND	ND	ND	ND
35	31	ELKT	Elkton WWSL	433	2	ND	ND	ND	ND
36	32	FLIN	Flint WWTP	433	1	4.8	4.8	2	2
37	32	FLIN	Flint WWTP	433	1	2.3	2.3	ND	ND
38	34	GRSD	GRSD Sewer Authority WRRF	433	1	ND	ND	ND	ND
39	35	GENE	Genesee Co #3 WWTP	433	1	ND	ND	ND	ND
40	35	GENE	Genesee Co #3 WWTP	433	1	ND	ND	ND	ND
41	36	RAGN	Genesee Co-Ragnone WWTP	433	1	ND	ND	ND	ND
42	36	RAGN	Genesee Co-Ragnone WWTP	433	1	10	10	ND	ND
43	36	RAGN	Genesee Co-Ragnone WWTP	433	1	ND	ND	ND	ND
44	38	GLWA	GLWA WRRF	413	2	ND	ND	ND	ND
45	38	GLWA	GLWA WRRF	413	1	ND	ND	ND	ND
46	38	GLWA	GLWA WRRF	413	1	ND	ND	ND	ND
47	38	GLWA	GLWA WRRF	413	6	ND	ND	6.1	69
48	38	GLWA	GLWA WRRF	413	5	ND	ND	9.8	180
49	38	GLWA	GLWA WRRF	413	16	4.3	4.3	12	50,000
50	38	GLWA	GLWA WRRF	413	1	ND	ND	ND	ND
51	38	GLWA	GLWA WRRF	413	9	ND	ND	19	9,750
52	38	GLWA	GLWA WRRF	413	4	ND	ND	2.2	370
53	38	GLWA	GLWA WRRF	413	2	ND	ND	ND	ND
54	38	GLWA	GLWA WRRF	413	1	ND	ND	ND	ND
55	38	GLWA	GLWA WRRF	413	1	ND	ND	10	10
56	38	GLWA	GLWA WRRF	413	1	ND	ND	ND	ND
57	38	GLWA	GLWA WRRF	413	6	ND	ND	13	30
58	38	GLWA	GLWA WRRF	413	1	ND	ND	94	94
59	38	GLWA	GLWA WRRF	413	2	ND	ND	ND	ND
60	38	GLWA	GLWA WRRF	413	1	ND	ND	ND	ND
61	38	GLWA	GLWA WRRF	413	1	ND	ND	ND	ND
62	38	GLWA	GLWA WRRF	413	1	ND	ND	ND	ND
63	38	GLWA	GLWA WRRF	413	6	2	5.1	4.6	60
64	38	GLWA	GLWA WRRF	414	1	ND	ND	ND	ND
65	38	GLWA	GLWA WRRF	419	42	3.5	710	6.8	800
66	38	GLWA	GLWA WRRF	420	1	ND	ND	ND	ND
67	38	GLWA	GLWA WRRF	420	1	43	43	ND	ND
68	38	GLWA	GLWA WRRF	420	2	ND	ND	ND	ND
69	38	GLWA	GLWA WRRF	420	1	ND	ND	ND	ND
70	38	GLWA	GLWA WRRF	425	3	ND	ND	10	14
71	38	GLWA	GLWA WRRF	433	5	1.87	7.3	58.2	350
72	38	GLWA	GLWA WRRF	433	1	ND	ND	ND	ND

Table 12

CIU PFAS Results
Michigan IPP PFAS Initiative

Nr.	WWTP Nr.	WWTP Code	WWTP Name	40 CFR Category	No. of Samples	PFOA (ng/L)		PFOS (ng/L)	
						Minimum (Min)	Maximum (Max)	Minimum (Min)	Maximu m (Max)
73	38	GLWA	GLWA WRRF	433	1	ND	ND	ND	ND
74	38	GLWA	GLWA WRRF	433	1	ND	ND	ND	ND
75	38	GLWA	GLWA WRRF	433	1	ND	ND	ND	ND
76	38	GLWA	GLWA WRRF	433	2	ND	ND	11	11
77	38	GLWA	GLWA WRRF	433	4	ND	ND	27	250
78	38	GLWA	GLWA WRRF	433	4	ND	ND	25	230
79	38	GLWA	GLWA WRRF	433	1	ND	ND	20	20
80	38	GLWA	GLWA WRRF	433	1	ND	ND	ND	ND
81	38	GLWA	GLWA WRRF	433	2	ND	ND	ND	ND
82	38	GLWA	GLWA WRRF	433	2	20	20	ND	ND
83	38	GLWA	GLWA WRRF	433	1	ND	ND	ND	ND
84	38	GLWA	GLWA WRRF	433	1	ND	ND	ND	ND
85	38	GLWA	GLWA WRRF	433	2	ND	ND	10	10
86	38	GLWA	GLWA WRRF	433	1	ND	ND	ND	ND
87	38	GLWA	GLWA WRRF	433	8	ND	ND	ND	ND
88	38	GLWA	GLWA WRRF	433	1	ND	ND	ND	ND
89	38	GLWA	GLWA WRRF	433	1	ND	ND	ND	ND
90	38	GLWA	GLWA WRRF	433	1	ND	ND	ND	ND
91	38	GLWA	GLWA WRRF	433	1	ND	ND	ND	ND
92	38	GLWA	GLWA WRRF	433	1	ND	ND	ND	ND
93	38	GLWA	GLWA WRRF	433	1	ND	ND	ND	ND
94	38	GLWA	GLWA WRRF	433	8	2.8	30	2.5	230
95	38	GLWA	GLWA WRRF	433	1	ND	ND	ND	ND
96	38	GLWA	GLWA WRRF	433	1	ND	ND	10	10
97	38	GLWA	GLWA WRRF	433	1	ND	ND	ND	ND
98	38	GLWA	GLWA WRRF	433	2	14	14	ND	ND
99	38	GLWA	GLWA WRRF	433	11	ND	ND	ND	ND
100	38	GLWA	GLWA WRRF	433	2	ND	ND	ND	ND
101	38	GLWA	GLWA WRRF	433	1	ND	ND	ND	ND
102	38	GLWA	GLWA WRRF	433	1	ND	ND	ND	ND
103	38	GLWA	GLWA WRRF	433	1	ND	ND	ND	ND
104	38	GLWA	GLWA WRRF	433	1	ND	ND	ND	ND
105	38	GLWA	GLWA WRRF	433	1	50	50	ND	ND
106	38	GLWA	GLWA WRRF	433	3	ND	ND	6.9	20
107	38	GLWA	GLWA WRRF	433	1	ND	ND	ND	ND
108	38	GLWA	GLWA WRRF	433	1	ND	ND	ND	ND
109	38	GLWA	GLWA WRRF	433	1	ND	ND	ND	ND
110	38	GLWA	GLWA WRRF	433	1	ND	ND	ND	ND
111	38	GLWA	GLWA WRRF	433	1	ND	ND	ND	ND
112	38	GLWA	GLWA WRRF	433	13	ND	ND	16	30
113	38	GLWA	GLWA WRRF	433	1	ND	ND	ND	ND
114	38	GLWA	GLWA WRRF	433	1	ND	ND	ND	ND
115	38	GLWA	GLWA WRRF	433	1	ND	ND	ND	ND
116	38	GLWA	GLWA WRRF	433	1	ND	ND	ND	ND
117	38	GLWA	GLWA WRRF	433	1	ND	ND	ND	ND
118	38	GLWA	GLWA WRRF	433	2	10	10	ND	ND
119	38	GLWA	GLWA WRRF	433	2	ND	ND	ND	ND
120	38	GLWA	GLWA WRRF	433	1	ND	ND	ND	ND
121	38	GLWA	GLWA WRRF	433	1	ND	ND	ND	ND
122	38	GLWA	GLWA WRRF	433	1	ND	ND	ND	ND
123	38	GLWA	GLWA WRRF	433	1	ND	ND	ND	ND
124	38	GLWA	GLWA WRRF	433	1	ND	ND	ND	ND
125	38	GLWA	GLWA WRRF	433	1	ND	ND	ND	ND
126	38	GLWA	GLWA WRRF	433	1	ND	ND	ND	ND
127	38	GLWA	GLWA WRRF	433	1	ND	ND	ND	ND
128	38	GLWA	GLWA WRRF	433	1	ND	ND	ND	ND
129	38	GLWA	GLWA WRRF	433	1	ND	ND	ND	ND
130	38	GLWA	GLWA WRRF	433	1	ND	ND	ND	ND
131	38	GLWA	GLWA WRRF	437	16	3.6	170	4.4	8,400
132	38	GLWA	GLWA WRRF	437	22	32	1,790	ND	630
133	38	GLWA	GLWA WRRF	437	17	70	380	40	170
134	38	GLWA	GLWA WRRF	437	33	13	2,200	28	53,000
135	38	GLWA	GLWA WRRF	437	20	6.4	220	20	530
136	38	GLWA	GLWA WRRF	437	16	29	310	26	390
137	38	GLWA	GLWA WRRF	437	14	ND	890	ND	500
138	38	GLWA	GLWA WRRF	437	35	7.4	3,000	11	1,200
139	38	GLWA	GLWA WRRF	439	1	ND	ND	ND	ND
140	38	GLWA	GLWA WRRF	442	10	33	280	11	640
141	38	GLWA	GLWA WRRF	446	4	20	56	60	120
142	38	GLWA	GLWA WRRF	467	1	ND	ND	ND	ND
143	39	GHSL	Grand Haven - Spring Lake WWTP	433	1	4.7	4.7	ND	ND
144	39	GHSL	Grand Haven - Spring Lake WWTP	433	3	ND	ND	11	40

Table 12

CIU PFAS Results

Michigan IPP PFAS Initiative

Nr.	WWTP Nr.	WWTP Code	WWTP Name	40 CFR Category	No. of Samples	PFOA (ng/L)		PFOS (ng/L)	
						Minimum (Min)	Maximum (Max)	Minimum (Min)	Maximu m (Max)
145	39	GHSL	Grand Haven - Spring Lake WWTP	433	1	ND	ND	ND	ND
146	39	GHSL	Grand Haven - Spring Lake WWTP	433	1	ND	ND	ND	ND
147	40	GRAP	Grand Rapids WRRF	410	5	6.51	114	2.3	36.07
148	40	GRAP	Grand Rapids WRRF	413	5	ND	ND	ND	ND
149	40	GRAP	Grand Rapids WRRF	413	6	2.8	2.8	320	34,020
150	40	GRAP	Grand Rapids WRRF	413	1	2.47	2.47	5.59	5.59
151	40	GRAP	Grand Rapids WRRF	413	1	3.8	3.8	660	660
152	40	GRAP	Grand Rapids WRRF	417	1	ND	ND	ND	ND
153	40	GRAP	Grand Rapids WRRF	433	3	ND	ND	7.9	7.9
154	40	GRAP	Grand Rapids WRRF	433	1	ND	ND	ND	ND
155	40	GRAP	Grand Rapids WRRF	433	2	2.2	2.2	269	970
156	40	GRAP	Grand Rapids WRRF	433	1	5.31	5.31	ND	ND
157	40	GRAP	Grand Rapids WRRF	433	1	2.4	2.4	4.7	4.7
158	40	GRAP	Grand Rapids WRRF	433	1	ND	ND	ND	ND
159	40	GRAP	Grand Rapids WRRF	433	1	ND	ND	ND	ND
160	40	GRAP	Grand Rapids WRRF	433	1	2.3	2.3	2.6	2.6
161	40	GRAP	Grand Rapids WRRF	433	3	ND	ND	ND	ND
162	40	GRAP	Grand Rapids WRRF	433	1	ND	ND	ND	ND
163	40	GRAP	Grand Rapids WRRF	433	2	ND	ND	ND	ND
164	40	GRAP	Grand Rapids WRRF	433	1	1.8	1.8	5.1	5.1
165	40	GRAP	Grand Rapids WRRF	433	1	ND	ND	ND	ND
166	40	GRAP	Grand Rapids WRRF	433	5	4.4	4.4	2.4	4700
167	40	GRAP	Grand Rapids WRRF	433	1	20	20	12,000	12,000
168	40	GRAP	Grand Rapids WRRF	433	1	ND	ND	2,000	2,000
169	40	GRAP	Grand Rapids WRRF	433	1	ND	ND	24	24
170	40	GRAP	Grand Rapids WRRF	433	1	ND	ND	7.89	7.89
171	40	GRAP	Grand Rapids WRRF	433	1	ND	ND	ND	ND
172	40	GRAP	Grand Rapids WRRF	433	1	ND	ND	ND	ND
173	40	GRAP	Grand Rapids WRRF	433	1	4.05	4.05	ND	ND
174	40	GRAP	Grand Rapids WRRF	433	1	3.4	3.4	4.5	4.5
175	40	GRAP	Grand Rapids WRRF	433	1	ND	ND	ND	ND
176	40	GRAP	Grand Rapids WRRF	433	2	2	2	ND	ND
177	40	GRAP	Grand Rapids WRRF	433	1	2.4	2.4	3.2	3.2
178	40	GRAP	Grand Rapids WRRF	433	1	6.4	6.4	4	4
179	40	GRAP	Grand Rapids WRRF	433	1	6.26	6.26	ND	ND
180	40	GRAP	Grand Rapids WRRF	433	1	ND	ND	ND	ND
181	40	GRAP	Grand Rapids WRRF	439	1	ND	ND	ND	ND
182	41	GREE	Greenville WWTP	433	3	ND	ND	ND	ND
183	44	HART	Hartford WWTP	433	1	ND	ND	ND	ND
184	45	HAST	Hastings WWTP	433	1	ND	ND	ND	ND
185	46	HILL	Hillsdale WWTP	433	1	ND	ND	ND	ND
186	47	HOLL	Holland WWTP	433	1	ND	ND	ND	ND
187	47	HOLL	Holland WWTP	433	1	ND	ND	ND	ND
188	47	HOLL	Holland WWTP	433	1	ND	ND	2.22	2.22
189	47	HOLL	Holland WWTP	433	1	ND	ND	ND	ND
190	47	HOLL	Holland WWTP	433	1	ND	ND	2.19	2.19
191	47	HOLL	Holland WWTP	433	1	2.43	2.43	3.8	3.8
192	47	HOLL	Holland WWTP	433	1	2.7	2.7	ND	ND
193	47	HOLL	Holland WWTP	437	13	7.32	242	57.06	57.06
194	48	HLLY	Holly WWTP	433	1	6.7	6.7	ND	ND
195	49	HOWE	Howell WWTP	433	11	ND	ND	1.5	2,000
196	50	IONA	Ionia WWTP	433	73	ND	9.15	ND	5,324
197	51	ITHA	Ithaca WWSL	433	1	ND	ND	ND	ND
198	52	JACK	Jackson WWTP	413	1	ND	ND	ND	ND
199	52	JACK	Jackson WWTP	413	1	ND	ND	ND	ND
200	52	JACK	Jackson WWTP	423	2	ND	ND	ND	ND
201	52	JACK	Jackson WWTP	433	1	ND	ND	ND	ND
202	52	JACK	Jackson WWTP	433	8	ND	ND	40	9,950
203	52	JACK	Jackson WWTP	433	1	ND	ND	ND	ND
204	52	JACK	Jackson WWTP	433	1	ND	ND	ND	ND
205	52	JACK	Jackson WWTP	433	1	ND	ND	ND	ND
206	52	JACK	Jackson WWTP	433	1	ND	ND	ND	ND
207	52	JACK	Jackson WWTP	433	1	ND	ND	ND	ND
208	52	JACK	Jackson WWTP	433	1	ND	ND	ND	ND
209	52	JACK	Jackson WWTP	433	1	ND	ND	ND	ND
210	52	JACK	Jackson WWTP	433	1	ND	ND	ND	ND
211	52	JACK	Jackson WWTP	433	1	ND	ND	ND	ND
212	53	KZOO	Kalamazoo WWTP	414	1	ND	ND	ND	ND
213	53	KZOO	Kalamazoo WWTP	430	22	16.9	110	2.36	190
214	53	KZOO	Kalamazoo WWTP	433	1	ND	ND	ND	ND
215	53	KZOO	Kalamazoo WWTP	433	1	ND	ND	3.7	3.7
216	53	KZOO	Kalamazoo WWTP	433	1	ND	ND	ND	ND

Table 12

CIU PFAS Results

Michigan IPP PFAS Initiative

Nr.	WWTP Nr.	WWTP Code	WWTP Name	40 CFR Category	No. of Samples	PFOA (ng/L)		PFOS (ng/L)	
						Minimum (Min)	Maximum (Max)	Minimum (Min)	Maximu m (Max)
217	53	KZOO	Kalamazoo WWTP	433	2	ND	ND	2.1	3.6
218	53	KZOO	Kalamazoo WWTP	433	1	3.3	3.3	ND	ND
219	53	KZOO	Kalamazoo WWTP	433	1	2.7	2.7	ND	ND
220	53	KZOO	Kalamazoo WWTP	433	1	ND	ND	ND	ND
221	53	KZOO	Kalamazoo WWTP	433	4	1.71	1.71	3	4.27
222	53	KZOO	Kalamazoo WWTP	433	1	ND	ND	ND	ND
223	53	KZOO	Kalamazoo WWTP	433	1	ND	ND	ND	ND
224	53	KZOO	Kalamazoo WWTP	433	5	ND	ND	25.1	76
225	53	KZOO	Kalamazoo WWTP	433	1	ND	ND	ND	ND
226	53	KZOO	Kalamazoo WWTP	439	1	ND	ND	3.4	3.4
227	53	KZOO	Kalamazoo WWTP	439	1	ND	ND	ND	ND
228	53	KZOO	Kalamazoo WWTP	439	1	ND	ND	ND	ND
229	53	KZOO	Kalamazoo WWTP	467	6	4.5	4.5	2.4	17
230	54	SAWY	KI Sawyer WWTP-Marquette Co	463	1	ND	ND	61	61
231	54	SAWY	KI Sawyer WWTP-Marquette Co	467	1	ND	ND	3.2	3.2
232	56	LANS	Lansing WWTP	413	1	ND	ND	340	340
233	56	LANS	Lansing WWTP	433	1	ND	ND	ND	ND
234	56	LANS	Lansing WWTP	433	1	ND	ND	ND	ND
235	56	LANS	Lansing WWTP	433	1	ND	ND	ND	ND
236	56	LANS	Lansing WWTP	433	1	ND	ND	ND	ND
237	56	LANS	Lansing WWTP	433	1	ND	ND	ND	ND
238	56	LANS	Lansing WWTP	437	1	20	20	ND	ND
239	57	LAPR	Lapeer WWTP	433	301	ND	7.3	ND	34,000
240	60	LYON	Lyon Township WWTP	433	2	ND	ND	ND	ND
241	61	MARY	Marysville WWTP	420	1	1.9	1.9	1.4	1.4
242	61	MARY	Marysville WWTP	433	3	2	4.4	2.9	2.9
243	61	MARY	Marysville WWTP	433	3	2	2	ND	ND
244	61	MARY	Marysville WWTP	467	8	1.8	4.3	1.7	1.8
245	62	MENO	Menominee WWTP	433	1	ND	ND	ND	ND
246	63	MILN	Milan WWTP	433	1	ND	ND	ND	ND
247	64	MONR	Monroe Metro WWTP	420	1	2.7	2.7	3.6	3.6
248	64	MONR	Monroe Metro WWTP	433	3	9.9	9.9	12	16
249	65	MTCL	Mt Clemens WWTP	433	2	1.9	2.1	ND	ND
250	66	MUSK	Muskegon Co WWMS Metro WWTP	413	2	3.6	7.3	1,200	2,900
251	66	MUSK	Muskegon Co WWMS Metro WWTP	414	1	3	3	4.2	4.2
252	66	MUSK	Muskegon Co WWMS Metro WWTP	433	1	2	2	ND	ND
253	66	MUSK	Muskegon Co WWMS Metro WWTP	433	4	2.3	26	3.82	540
254	66	MUSK	Muskegon Co WWMS Metro WWTP	433	1	2.9	2.9	8.9	8.9
255	66	MUSK	Muskegon Co WWMS Metro WWTP	433	1	4	4	7	7
256	66	MUSK	Muskegon Co WWMS Metro WWTP	433	1	4.4	4.4	ND	ND
257	66	MUSK	Muskegon Co WWMS Metro WWTP	437	3	9.9	31	18	290
258	68	HOUG	North Houghton Co Water and Sewage Authority	433	1	ND	ND	ND	ND
259	69	NKEN	North Kent SA WWTP	433	1	4.44	4.44	5.83	5.83
260	69	NKEN	North Kent SA WWTP	433	2	4.13	4.13	10.3	58.8
261	70	OTSE	Otsego WWTP	433	1	ND	ND	ND	ND
262	71	OWOS	Owosso/Mid Shiawassee Co WWTP	433	1	1.5	1.5	0.66	0.66
263	74	PHUR	PORT HURON WWTP	433	11	2.1	2.1	290	14,250
264	74	PHUR	PORT HURON WWTP	433	1	ND	ND	ND	ND
265	77	HURO	S Huron Valley UA WWTP	433	1	ND	ND	11	11
266	77	HURO	S Huron Valley UA WWTP	433	2	ND	ND	ND	ND
267	77	HURO	S Huron Valley UA WWTP	433	1	8.9	8.9	ND	ND
268	77	HURO	S Huron Valley UA WWTP	442	2	77	87	ND	ND
269	78	SGTW	Saginaw Twp WWTP	433	1	ND	ND	ND	ND
270	79	SAGN	Saginaw WWTP	413	1	2.3	2.3	3.9	3.9
271	79	SAGN	Saginaw WWTP	433	1	ND	ND	ND	ND
272	80	SALN	Saline WWTP	433	1	ND	ND	ND	ND
273	84	STJN	St. Johns WWTP	433	1	ND	ND	ND	ND
274	86	TAWS	Tawas Utility Authority WWTP	433	2	2.6	6	4.4	4.4
275	87	TRIV	Three Rivers WWTP	430	1	12.9	12.9	15.6	15.6
276	87	TRIV	Three Rivers WWTP	433	2	ND	ND	ND	ND
277	90	WARR	Warren WWTP	413	6	ND	ND	74	3,200
278	90	WARR	Warren WWTP	413	1	ND	ND	ND	ND
279	90	WARR	Warren WWTP	413	8	ND	ND	8.6	250
280	90	WARR	Warren WWTP	413	7	1.8	19	9.9	600
281	90	WARR	Warren WWTP	413	10	3.1	19	11	13,000
282	90	WARR	Warren WWTP	433	1	ND	ND	ND	ND
283	90	WARR	Warren WWTP	433	1	ND	ND	ND	ND
284	90	WARR	Warren WWTP	433	6	15	740	4.6	2,400
285	92	WIXO	Wixom WWTP	413	27	ND	ND	0.44	28,000
286	92	WIXO	Wixom WWTP	413	25	ND	ND	1.1	9.2
287	92	WIXO	Wixom WWTP	413	4	2	2	2	2.2
288	93	WYOM	Wyoming WWTP	413	1	ND	ND	4.5	4.5

Table 12

CIU PFAS Results
Michigan IPP PFAS Initiative

Nr.	WWTP Nr.	WWTP Code	WWTP Name	40 CFR Category	No. of Samples	PFOA (ng/L)		PFOS (ng/L)	
						Minimum (Min)	Maximum (Max)	Minimum (Min)	Maximum (Max)
289	93	WYOM	Wyoming WWTP	413	5	2.2	4.8	79	5,100
290	93	WYOM	Wyoming WWTP	413	2	2.1	2.1	2.6	120
292	93	WYOM	Wyoming WWTP	433	5	6.4	18	910	24,000
293	93	WYOM	Wyoming WWTP	433	1	11	11	ND	ND
294	93	WYOM	Wyoming WWTP	433	1	2.6	2.6	3.1	3.1
295	93	WYOM	Wyoming WWTP	433	1	ND	ND	ND	ND
296	93	WYOM	Wyoming WWTP	433	1	ND	ND	7	7
297	93	WYOM	Wyoming WWTP	433	1	4.3	4.3	ND	ND
298	93	WYOM	Wyoming WWTP	433	1	1.5	1.5	1	1
299	93	WYOM	Wyoming WWTP	437	1	0.53	0.53	1.1	1.1
300	93	WYOM	Wyoming WWTP	437	5	7.7	34	15	120
291	93	WYOM	Wyoming WWTP	442	1	4.2	4.2	8.2	8.2
301	93	WYOM	Wyoming WWTP	467	5	1.5	3.8	68	5,200
302	94	YCUA	YCUA Regional WWTP	413	1	1.8	1.8	4.6	4.6
303	94	YCUA	YCUA Regional WWTP	413	6	1.6	2.6	26	170
304	94	YCUA	YCUA Regional WWTP	413	2	1.8	1.8	2.5	2.5
305	94	YCUA	YCUA Regional WWTP	433	1	ND	ND	ND	ND
306	94	YCUA	YCUA Regional WWTP	433	1	18	18	2.6	2.6
307	94	YCUA	YCUA Regional WWTP	433	1	ND	ND	1.7	1.7
308	94	YCUA	YCUA Regional WWTP	437	7	5.4	28	3.1	190
309	94	YCUA	YCUA Regional WWTP	463	1	16	16	3.4	3.4
310	95	ZEEL	Zeeland WWTP	433	1	ND	ND	ND	ND

Notes:
CIU = Categorical Industrial User
ND = Non-Detect (Typical detection limits were between 2-10 ng/L)

Table 14

IU and SIU PFAS Results
Michigan IPP PFAS Initiative

Nr.	WWTP Nr.	WWTP Code	WWTP Name	Graph ID	Industrial User Type (SIU/CIU)	No. of Samples	PFOA (ng/L)		PFOS (ng/L)	
							Minimum (Min)	Maximum (Max)	Minimum (Min)	Maximum (Max)
1	4	AARB	Ann Arbor WWTP	LNDF-T2-CLS:S	SIU	5	5.4	250	6.4	6.4
2	4	AARB	Ann Arbor WWTP	MISC:I	IU	1	ND	ND	ND	ND
3	4	AARB	Ann Arbor WWTP	MISC:S	SIU	1	ND	ND	ND	ND
4	4	AARB	Ann Arbor WWTP	MISC:S	SIU	1	ND	ND	ND	ND
5	4	AARB	Ann Arbor WWTP	MISC:S	SIU	1	ND	ND	ND	ND
6	6	BCRK	Battle Creek WWTP	LDRY:S	SIU	1	ND	ND	ND	ND
7	6	BCRK	Battle Creek WWTP	MISC:I	IU	2	ND	ND	ND	ND
8	6	BCRK	Battle Creek WWTP	MISC:I	IU	1	ND	ND	ND	ND
9	6	BCRK	Battle Creek WWTP	MISC:I	IU	1	ND	ND	ND	ND
10	6	BCRK	Battle Creek WWTP	MISC:I	IU	1	ND	ND	ND	ND
11	6	BCRK	Battle Creek WWTP	MISC:I	IU	1	3.5	710	ND	ND
12	6	BCRK	Battle Creek WWTP	MISC:I	IU	1	ND	ND	ND	ND
13	6	BCRK	Battle Creek WWTP	MISC:I	IU	1	ND	ND	ND	ND
14	6	BCRK	Battle Creek WWTP	MISC:I	IU	1	ND	ND	ND	ND
15	6	BCRK	Battle Creek WWTP	MISC:I	IU	1	ND	ND	ND	ND
16	6	BCRK	Battle Creek WWTP	MISC:S	SIU	1	ND	ND	ND	ND
17	7	BAYC	Bay City WWTP	CONT-MMF:I	IU	1	ND	ND	ND	ND
18	7	BAYC	Bay City WWTP	LNDF-T2-CLS:I	IU	1	199	199	66	66
19	7	BAYC	Bay City WWTP	MISC:S	SIU	1	ND	ND	ND	ND
20	7	BAYC	Bay City WWTP	MISC:S	SIU	1	1.38	1.38	1.9	1.9
21	9	BELD	Belding WWTP	LNDF-T2-ACT:S	SIU	2	790	970	150	170
22	9	BELD	Belding WWTP	MISC:I	IU	1	ND	ND	2.9	2.9
23	10	BHSJ	Benton Harbor-St Joseph WWTP	CONT-MF:I	IU	1	ND	ND	ND	ND
24	10	BHSJ	Benton Harbor-St Joseph WWTP	MISC:S	SIU	1	ND	ND	ND	ND
25	11	BRAP	Big Rapids WWTP	MISC:I	IU	1	ND	ND	3.8	3.8
26	11	BRAP	Big Rapids WWTP	MISC:I	IU	1	ND	ND	ND	ND
27	11	BRAP	Big Rapids WWTP	MISC:I	IU	1	ND	ND	ND	ND
28	11	BRAP	Big Rapids WWTP	MISC:I	IU	1	ND	ND	ND	ND
29	15	BUCH	Buchanan WWTP	LNDF-T2-ACT:S	SIU	4	290	708	29	71.5
30	16	CADI	Cadillac WWTP	LNDF-T2-ACT:S	SIU	1	590	590	120	120
31	19	CLAR	Clare WWTP	CONT-LNDF:I	IU	2	4.3	4.3	10	10
32	19	CLAR	Clare WWTP	LNDF-T2-CLS:I	IU	2	4.3	4.3	10	10
33	19	CLAR	Clare WWTP	MISC:I	IU	1	ND	ND	ND	ND
34	20	COLD	Coldwater WRRF	MISC:I	IU	1	ND	ND	ND	ND
35	20	COLD	Coldwater WRRF	MISC:I	IU	1	ND	ND	ND	ND
36	24	DELT	Delta Twp WWTP	MISC:I	IU	1	ND	ND	ND	ND
37	25	DEXT	Dexter WWTP	MISC:I	IU	1	ND	ND	7.9	7.9
38	25	DEXT	Dexter WWTP	MISC:I	IU	1	ND	ND	2.5	2.5
39	27	DRVR	Downriver WWTP	AFFF-SEWER:S	SIU	7	3.5	17	5.1	1800
40	27	DRVR	Downriver WWTP	CONT-LNDF:I	IU	1	ND	ND	18	18
41	27	DRVR	Downriver WWTP	CONT-MISC:I	IU	2	6.9	58	4.8	12
42	27	DRVR	Downriver WWTP	LDRY:S	SIU	5	4.9	6.2	8.8	29
43	27	DRVR	Downriver WWTP	LDRY:S	SIU	6	4.7	7.8	5.7	36
44	27	DRVR	Downriver WWTP	LNDF-T2-ACT:S	SIU	13	38	2800	8.5	710
45	27	DRVR	Downriver WWTP	LNDF-T3-ACT:S	SIU	2	58	58	4.8	4.8
46	27	DRVR	Downriver WWTP	MISC:S	SIU	1	7.7	7.7	2.6	2.6
47	27	DRVR	Downriver WWTP	MISC:S	SIU	1	2.2	2.2	2.2	2.2
48	27	DRVR	Downriver WWTP	MISC:S	SIU	1	ND	ND	ND	ND
49	32	FLIN	Flint WWTP	CHEM:S	SIU	1	2.5	2.5	5	5
50	32	FLIN	Flint WWTP	CONT-LNDF:S	SIU	6	53	53	4,000	4,000
51	32	FLIN	Flint WWTP	CONT-MF:S	SIU	1	15	15	4.5	4.5
52	32	FLIN	Flint WWTP	CONT-MF:S	SIU	1	15	15	4.5	4.5
53	32	FLIN	Flint WWTP	CONT-MMF:I	IU	2	2,200	2,280	27,580	34,000
54	32	FLIN	Flint WWTP	LNDF-T3-CLS:S	SIU	6	53	53	4,000	4,000
55	36	RAGN	Genesee Co-Ragnone WWTP	LNDF-T2-ACT:S	SIU	4	2.3	170	30	30
56	36	RAGN	Genesee Co-Ragnone WWTP	LNDF-T2-ACT:S	SIU	4	910	43,425	190	1500
57	36	RAGN	Genesee Co-Ragnone WWTP	LNDF-T2-ACT:S	SIU	1	1,100	1,100	180	180
58	36	RAGN	Genesee Co-Ragnone WWTP	LNDF-T2-CLS:I	IU	4	1,090	2,000	220	460
59	36	RAGN	Genesee Co-Ragnone WWTP	LNDF-T2-CLS:S	SIU	3	190	220	70	90
60	36	RAGN	Genesee Co-Ragnone WWTP	MISC:I	IU	1	510	510	8.5	8.5
61	36	RAGN	Genesee Co-Ragnone WWTP	MISC:I	IU	1	ND	ND	ND	ND
62	36	RAGN	Genesee Co-Ragnone WWTP	MISC:I	IU	1	ND	ND	ND	ND
63	38	GLWA	GLWA WRRF	AFFF-SEWER:S	SIU	4	7.8	35	240	3,500
64	38	GLWA	GLWA WRRF	AFFF-SEWER:S	SIU	12	5.1	140	9.2	220
65	38	GLWA	GLWA WRRF	CHEM:S	SIU	1	ND	ND	ND	ND
66	38	GLWA	GLWA WRRF	CHEM:S	SIU	1	ND	ND	ND	ND

Table 14

IU and SIU PFAS Results
Michigan IPP PFAS Initiative

Nr.	WWTP Nr.	WWTP Code	WWTP Name	Graph ID	Industrial User Type (SIU/CIU)	No. of Samples	PFOA (ng/L)		PFOS (ng/L)	
							Minimum (Min)	Maximum (Max)	Minimum (Min)	Maximum (Max)
67	38	GLWA	GLWA WRRF	CHEM:S	SIU	1	ND	ND	ND	ND
68	38	GLWA	GLWA WRRF	CHEM:S	SIU	1	ND	ND	ND	ND
69	38	GLWA	GLWA WRRF	CHEM:S	SIU	10	28	520	36	4,600,000
70	38	GLWA	GLWA WRRF	CHEM:S	SIU	4	90	1,100	24	310
71	38	GLWA	GLWA WRRF	CHEM:S	SIU	1	ND	ND	ND	ND
72	38	GLWA	GLWA WRRF	CONT-MISC:I	IU	2	29	29	14	14
73	38	GLWA	GLWA WRRF	CONT-MMF:I	IU	14	1.9	5.5	1.9	130
74	38	GLWA	GLWA WRRF	LDRY:S	SIU	2	ND	ND	40	40
75	38	GLWA	GLWA WRRF	LDRY:S	SIU	5	13	84	33	69
76	38	GLWA	GLWA WRRF	LDRY:S	SIU	1	ND	ND	ND	ND
77	38	GLWA	GLWA WRRF	LNDF-T2-ACT:S	SIU	12	22	340	35	570
78	38	GLWA	GLWA WRRF	LNDF-T2-ACT:S	SIU	4	1,200	1,800	290	590
79	38	GLWA	GLWA WRRF	LNDF-T2-ACT:S	SIU	6	320	1,300	89	330
80	38	GLWA	GLWA WRRF	LNDF-T2-ACT:S	SIU	5	150	3,800	57	630
81	38	GLWA	GLWA WRRF	LNDF-T2-CLS:S	SIU	4	200	310	160	240
82	38	GLWA	GLWA WRRF	LNDF-T2-CLS:S	SIU	2	20	20	20	140
83	38	GLWA	GLWA WRRF	LNDF-T2-CLS:S	SIU	5	30	61	20	130
84	38	GLWA	GLWA WRRF	LNDF-T2-CLS:S	SIU	6	27	49	40	130
85	38	GLWA	GLWA WRRF	LNDF-T2-CLS:S	SIU	10	16	680	11	640
86	38	GLWA	GLWA WRRF	LNDF-T3-ACT:S	SIU	5	26	58	33	100
87	38	GLWA	GLWA WRRF	MISC:S	SIU	1	ND	ND	6.4	6.4
88	38	GLWA	GLWA WRRF	MISC:S	SIU	1	5.62	5.62	3.49	3.49
89	38	GLWA	GLWA WRRF	MISC:S	SIU	1	ND	ND	ND	ND
90	38	GLWA	GLWA WRRF	MISC:S	SIU	1	40	40	ND	ND
91	38	GLWA	GLWA WRRF	MISC:S	SIU	1	ND	ND	ND	ND
92	38	GLWA	GLWA WRRF	MISC:S	SIU	2	ND	ND	ND	ND
93	38	GLWA	GLWA WRRF	MISC:S	SIU	1	ND	ND	ND	ND
94	38	GLWA	GLWA WRRF	MISC:S	SIU	1	1.7	1.7	ND	ND
95	38	GLWA	GLWA WRRF	MISC:S	SIU	1	ND	ND	ND	ND
96	38	GLWA	GLWA WRRF	MISC:S	SIU	1	ND	ND	ND	ND
97	38	GLWA	GLWA WRRF	MISC:S	SIU	1	ND	ND	ND	ND
98	38	GLWA	GLWA WRRF	PMFG:S	SIU	1	ND	ND	ND	ND
99	40	GRAP	Grand Rapids WRRF	CHEM:S	SIU	1	ND	ND	324	324
100	40	GRAP	Grand Rapids WRRF	CHEM:S	SIU	1	ND	ND	ND	ND
101	40	GRAP	Grand Rapids WRRF	CHEM:S	SIU	1	ND	ND	ND	ND
102	40	GRAP	Grand Rapids WRRF	CONT-MF:S	SIU	16	1.99	7.54	1.6	2,260
103	40	GRAP	Grand Rapids WRRF	LDRY:S	SIU	1	3	3	ND	ND
104	40	GRAP	Grand Rapids WRRF	LNDF-T2-ACT:S	SIU	1	1,233	1,233	449	449
105	40	GRAP	Grand Rapids WRRF	MISC:S	SIU	1	6	6	6	6
106	40	GRAP	Grand Rapids WRRF	MISC:S	SIU	1	5	5	6	6
107	40	GRAP	Grand Rapids WRRF	MISC:S	SIU	1	2.4	2.4	2.5	2.5
108	40	GRAP	Grand Rapids WRRF	MISC:S	SIU	1	7.9	7.9	85	85
109	40	GRAP	Grand Rapids WRRF	MISC:S	SIU	1	ND	ND	ND	ND
110	40	GRAP	Grand Rapids WRRF	MISC:S	SIU	1	ND	ND	ND	ND
111	40	GRAP	Grand Rapids WRRF	MISC:S	SIU	1	ND	ND	ND	ND
112	45	HAST	Hastings WWTP	LNDF-T2-ACT:S	SIU	3	401.2	960	219.4	410
113	45	HAST	Hastings WWTP	MISC:I	IU	1	ND	ND	ND	ND
114	45	HAST	Hastings WWTP	MISC:I	IU	1	ND	ND	ND	ND
115	45	HAST	Hastings WWTP	MISC:S	SIU	1	ND	ND	ND	ND
116	47	HOLL	Holland WWTP	CONT-MISC:I	IU	3	ND	ND	19.7	37.51
117	47	HOLL	Holland WWTP	CONT-PAINT:S	SIU	38	74.07	74.07	3.98	6047
118	47	HOLL	Holland WWTP	LDRY:S	SIU	1	ND	ND	9.7	9.7
119	47	HOLL	Holland WWTP	MISC:I	IU	1	ND	ND	2.06	2.06
120	47	HOLL	Holland WWTP	MISC:S	SIU	1	19.3	19.3	2.74	2.74
121	47	HOLL	Holland WWTP	MISC:S	SIU	1	5.65	5.65	ND	ND
122	47	HOLL	Holland WWTP	MISC:S	SIU	1	ND	ND	ND	ND
123	47	HOLL	Holland WWTP	PMFG:S	SIU	5	3.82	3.82	107	107
124	51	ITHA	Ithaca WWSL	MISC:S	SIU	1	40	40	ND	ND
125	52	JACK	Jackson WWTP	LDRY:S	SIU	3	10	10	20	50
126	52	JACK	Jackson WWTP	MISC:S	SIU	1	ND	ND	ND	ND
127	52	JACK	Jackson WWTP	MISC:S	SIU	4	20	20	ND	ND
128	52	JACK	Jackson WWTP	MISC:S	SIU	2	ND	ND	ND	ND
129	52	JACK	Jackson WWTP	MISC:S	SIU	2	ND	ND	ND	ND
130	52	JACK	Jackson WWTP	MISC:S	SIU	2	ND	ND	ND	ND
131	52	JACK	Jackson WWTP	MISC:S	SIU	1	ND	ND	ND	ND
132	52	JACK	Jackson WWTP	MISC:S	SIU	1	ND	ND	ND	ND

Table 14

IU and SIU PFAS Results

Michigan IPP PFAS Initiative

Nr.	WWTP Nr.	WWTP Code	WWTP Name	Graph ID	Industrial User Type (SIU/CIU)	No. of Samples	PFOA (ng/L)		PFOS (ng/L)	
							Minimum (Min)	Maximum (Max)	Minimum (Min)	Maximum (Max)
133	52	JACK	Jackson WWTP	MISC:S	SIU	1	ND	ND	ND	ND
134	53	KZOO	Kalamazoo WWTP	CONT-MF:S	SIU	7	ND	ND	14.5	8,000
135	53	KZOO	Kalamazoo WWTP	CONT-PMFG:I	IU	3	5.57	12	10.1	28.2
136	53	KZOO	Kalamazoo WWTP	CONT-PMFG:S	SIU	13	0.39	200	0.52	140
137	53	KZOO	Kalamazoo WWTP	LDRY:S	SIU	1	ND	ND	ND	ND
138	53	KZOO	Kalamazoo WWTP	LDRY:S	SIU	1	60	60	ND	ND
139	53	KZOO	Kalamazoo WWTP	LNDF-T2-CLS:I	IU	8	101	250	55	410
140	53	KZOO	Kalamazoo WWTP	LNDF-T3-CLS:I	IU	7	200	410	13.1	61
141	53	KZOO	Kalamazoo WWTP	MISC:I	IU	1	ND	ND	10	10
142	53	KZOO	Kalamazoo WWTP	MISC:I	IU	1	ND	ND	ND	ND
143	53	KZOO	Kalamazoo WWTP	MISC:I	IU	1	ND	ND	ND	ND
144	53	KZOO	Kalamazoo WWTP	MISC:I	IU	1	ND	ND	ND	ND
145	53	KZOO	Kalamazoo WWTP	MISC:I	IU	1	ND	ND	ND	ND
146	53	KZOO	Kalamazoo WWTP	MISC:I	IU	1	24	24	ND	ND
147	53	KZOO	Kalamazoo WWTP	MISC:S	SIU	1	ND	ND	ND	ND
148	53	KZOO	Kalamazoo WWTP	MISC:S	SIU	1	ND	ND	ND	ND
149	53	KZOO	Kalamazoo WWTP	MISC:S	SIU	3	ND	ND	ND	ND
150	53	KZOO	Kalamazoo WWTP	PMFG:S	SIU	5	ND	ND	6.96	20
151	54	SAWY	KI Sawyer WWTP-Marquette Co	AFFF-SEWER:I	IU	3	45	410	4,700	45,000
152	56	LANS	Lansing WWTP	CONT-LNDF:I	IU	1	ND	ND	ND	ND
153	56	LANS	Lansing WWTP	LNDF-T2-ACT:I	IU	1	470	470	110	110
154	57	LAPR	Lapeer WWTP	LDRY:S	SIU	1	1.9	1.9	ND	ND
155	57	LAPR	Lapeer WWTP	MISC:I	IU	1	2	2	ND	ND
156	57	LAPR	Lapeer WWTP	MISC:I	IU	1	8.6	8.6	ND	ND
157	57	LAPR	Lapeer WWTP	MISC:S	SIU	1	ND	ND	ND	ND
158	59	LUDG	Ludington WWTP	CONT-MF:I	IU	2	2.1	2.1	ND	ND
159	59	LUDG	Ludington WWTP	LNDF-T2-ACT:I	IU	2	400	420	150	220
160	59	LUDG	Ludington WWTP	LNDF-T2-CLS:I	IU	4	111	312	38.07	81.2
161	61	MARY	Marysville WWTP	MISC:S	SIU	1	5.2	5.2	7.8	7.8
162	61	MARY	Marysville WWTP	MISC:S	SIU	2	ND	ND	ND	ND
163	62	MENO	Menominee WWTP	CONT-LNDF:S	SIU	1	120	120	11	11
164	62	MENO	Menominee WWTP	LNDF-T2-ACT:S	SIU	10	150	580	18	160
165	62	MENO	Menominee WWTP	MISC:S	SIU	1	120	120	11	11
166	62	MENO	Menominee WWTP	PMFG:S	SIU	2	6.9	6.9	2.1	26
167	63	MILN	Milan WWTP	PMFG:S	SIU	1	ND	ND	ND	ND
168	64	MONR	Monroe Metro WWTP	CONT-MF:S	SIU	4	4.3	5	35	93
169	64	MONR	Monroe Metro WWTP	LNDF-T3-CLS:S	SIU	4	4.3	5	35	93
170	64	MONR	Monroe Metro WWTP	PMFG:I	IU	1	4.1	4.1	6.6	6.6
171	65	MTCL	Mt Clemens WWTP	MISC:S	SIU	1	ND	ND	ND	ND
172	66	MUSK	Muskegon Co WWMS Metro WWTP	CONT-MF:I	IU	2	2.9	2.9	23	32
173	66	MUSK	Muskegon Co WWMS Metro WWTP	CONT-MISC:S	SIU	1	4.6	4.6	7.2	7.2
174	66	MUSK	Muskegon Co WWMS Metro WWTP	CONT-PMFG:S	SIU	4	12.6	27	ND	ND
175	66	MUSK	Muskegon Co WWMS Metro WWTP	LNDF-T2-ACT:I	IU	10	330	1,500	50	240
176	66	MUSK	Muskegon Co WWMS Metro WWTP	LNDF-T2-CLS:I	IU	2	230	480	48	120
177	69	NKEN	North Kent SA WWTP	CONT-TAN:I	IU	10	6.3	135	5.73	514
178	69	NKEN	North Kent SA WWTP	LNDF-T2-CLS:S	SIU	3	1,080	2,660	309	641
179	69	NKEN	North Kent SA WWTP	LNDF-T2-CLS:S	SIU	4	69.1	182	95.9	386
180	70	OTSE	Otsego WWTP	MISC:S	SIU	1	ND	ND	ND	ND
181	71	OWOS	Owosso/Mid Shiawassee Co WWTP	PMFG:I	IU	3	2.03	2.03	23	23
182	73	PONT	Oakland Co-Pontiac WWTP	AFFF-SEWER:I	IU	1	42	42	9,100	9,100
183	73	PONT	Oakland Co-Pontiac WWTP	LNDF-T2-ACT:S	SIU	2	310	840	74	700
184	73	PONT	Oakland Co-Pontiac WWTP	LNDF-T2-CLS:S	SIU	3	53	75	11	27
185	74	PHUR	PORT HURON WWTP	CHEM:I	IU	2	20	20	18	30
186	74	PHUR	PORT HURON WWTP	LNDF-T2-ACT:S	SIU	5	267	1,300	100	370
187	74	PHUR	PORT HURON WWTP	LNDF-T2-CLS:I	IU	3	30	80	140	220
188	74	PHUR	PORT HURON WWTP	MISC:I	IU	1	80	80	10	10
189	74	PHUR	PORT HURON WWTP	MISC:I	IU	1	ND	ND	ND	ND
190	74	PHUR	PORT HURON WWTP	PMFG:I	IU	7	10	680	150	410
191	74	PHUR	PORT HURON WWTP	PMFG:S	SIU	5	25	89	30	210
192	75	QUIN	Quincy WWSL	MISC:S	SIU	2	ND	ND	ND	ND
193	76	REED	Reed City WWTP	CONT-MISC:I	IU	1	1.9	1.9	2.1	2.1
194	76	REED	Reed City WWTP	LNDF-T2-CLS:I	IU	2	86	140	35	35
195	76	REED	Reed City WWTP	MISC:I	IU	1	1.8	1.8	4.2	4.2
196	77	HURO	S Huron Valley UA WWTP	LNDF-HAZ:S	SIU	3	1.6	40	7	60
197	77	HURO	S Huron Valley UA WWTP	LNDF-T2-CLS:S	SIU	2	70	90	100	140
198	77	HURO	S Huron Valley UA WWTP	LNDF-T2-CLS:S	SIU	2	80	84	290	420

Table 14

IU and SIU PFAS Results
Michigan IPP PFAS Initiative

Nr.	WWTP Nr.	WWTP Code	WWTP Name	Graph ID	Industrial User Type (SIU/CIU)	No. of Samples	PFOA (ng/L)		PFOS (ng/L)	
							Minimum (Min)	Maximum (Max)	Minimum (Min)	Maximum (Max)
199	77	HURO	S Huron Valley UA WWTP	LNDF-T2-CLS:S	SIU	2	5	5	ND	ND
200	77	HURO	S Huron Valley UA WWTP	LNDF-T3-CLS:S	SIU	2	20	29	6	6
201	77	HURO	S Huron Valley UA WWTP	MISC:S	SIU	2	4.2	4.2	4.2	4.2
202	77	HURO	S Huron Valley UA WWTP	MISC:S	SIU	1	ND	ND	ND	ND
203	77	HURO	S Huron Valley UA WWTP	MISC:S	SIU	1	ND	ND	ND	ND
204	78	SGTW	Saginaw Twp WWTP	MISC:S	SIU	1	ND	ND	ND	ND
205	79	SAGN	Saginaw WWTP	CONT-LNDF:S	SIU	1	ND	ND	ND	ND
206	79	SAGN	Saginaw WWTP	CONT-MF:S	SIU	1	ND	ND	ND	ND
207	79	SAGN	Saginaw WWTP	LNDF-T3-ACT:S	SIU	3	ND	ND	3.79	5.08
208	80	SALN	Saline WWTP	CONT-MF:S	SIU	3	ND	ND	20	280
209	80	SALN	Saline WWTP	MISC:S	SIU	1	ND	ND	ND	ND
210	81	SAND	Sandusky WWTP	LNDF-T2-ACT:S	SIU	6	543	1,300	83.5	260
211	81	SAND	Sandusky WWTP	MISC:S	SIU	2	ND	ND	ND	ND
212	83	SCLN	Southern Clinton Co WWTP	LNDF-T2-ACT:S	SIU	3	220	360	120	160
213	83	SCLN	Southern Clinton Co WWTP	MISC:S	SIU	1	30	30	ND	ND
214	83	SCLN	Southern Clinton Co WWTP	MISC:S	SIU	1	30	30	ND	ND
215	86	TAWS	Tawas Utility Authority WWTP	MISC:I	IU	1	ND	ND	ND	ND
216	87	TRIV	Three Rivers WWTP	LNDF-T2-ACT:S	SIU	1	1,300	1,300	160	160
217	87	TRIV	Three Rivers WWTP	MISC:I	IU	1	ND	ND	ND	ND
218	87	TRIV	Three Rivers WWTP	PMFG:S	SIU	2	ND	ND	ND	ND
219	87	TRIV	Three Rivers WWTP	PMFG:S	SIU	1	ND	ND	ND	ND
220	90	WARR	Warren WWTP	CHEM:S	SIU	1	ND	ND	ND	ND
221	90	WARR	Warren WWTP	MISC:I	IU	1	ND	ND	ND	ND
222	90	WARR	Warren WWTP	MISC:S	SIU	1	ND	ND	ND	ND
223	91	WBAY	West Bay Co Regional WWTP	CONT-MISC:I	IU	2	18	18	7.3	7.3
224	91	WBAY	West Bay Co Regional WWTP	LNDF-T2-CLS:I	IU	2	25	31	9.3	9.5
225	92	WIXO	Wixom WWTP	MISC:S	SIU	1	ND	ND	ND	ND
226	93	WYOM	Wyoming WWTP	CONT-MF:S	SIU	2	5.3	5.3	ND	ND
227	93	WYOM	Wyoming WWTP	CONT-MISC:I	IU	1	1.3	1.3	ND	ND
228	93	WYOM	Wyoming WWTP	CONT-MISC:I	IU	5	4.2	11	4.4	18
229	93	WYOM	Wyoming WWTP	CONT-PAINT:I	IU	4	32	120	360	2,900
230	93	WYOM	Wyoming WWTP	LNDF-T2-ACT:S	SIU	9	100	1,200	16	830
231	93	WYOM	Wyoming WWTP	LNDF-T2-CLS:I	IU	5	120	740	110	340
232	93	WYOM	Wyoming WWTP	MISC:I	IU	1	3.7	3.7	5.9	5.9
233	93	WYOM	Wyoming WWTP	MISC:I	IU	1	3.5	3.5	5.1	5.1
234	93	WYOM	Wyoming WWTP	MISC:I	IU	1	2.4	2.4	3.6	3.6
235	93	WYOM	Wyoming WWTP	MISC:I	IU	1	4.7	4.7	3.5	3.5
236	93	WYOM	Wyoming WWTP	MISC:I	IU	1	4.4	4.4	3.3	3.3
237	93	WYOM	Wyoming WWTP	MISC:I	IU	1	3	3	3.1	3.1
238	93	WYOM	Wyoming WWTP	MISC:I	IU	1	2.3	2.3	2	2
239	93	WYOM	Wyoming WWTP	MISC:I	IU	1	3	3	ND	ND
240	93	WYOM	Wyoming WWTP	MISC:I	IU	1	ND	ND	ND	ND
241	93	WYOM	Wyoming WWTP	MISC:S	SIU	1	13	13	8.2	8.2
242	93	WYOM	Wyoming WWTP	MISC:S	SIU	1	2.2	2.2	2.5	2.5
243	93	WYOM	Wyoming WWTP	MISC:S	SIU	1	1.3	1.3	ND	ND
244	93	WYOM	Wyoming WWTP	MISC:S	SIU	1	2	2	ND	ND
245	93	WYOM	Wyoming WWTP	MISC:S	SIU	1	1.6	1.6	ND	ND
246	94	YCUA	YCUA Regional WWTP	CONT-MMF:S	SIU	5	20	30	270	430
247	94	YCUA	YCUA Regional WWTP	LNDF-T2-ACT:S	SIU	7	2,200	5,400	320	5,000
248	94	YCUA	YCUA Regional WWTP	LNDF-T2-ACT:S	SIU	8	190	2,800	30	610
249	94	YCUA	YCUA Regional WWTP	MISC:S	SIU	1	70	70	8.6	8.6
250	94	YCUA	YCUA Regional WWTP	MISC:S	SIU	1	ND	ND	3.1	3.1
251	94	YCUA	YCUA Regional WWTP	MISC:S	SIU	1	3.8	3.8	2	2
252	94	YCUA	YCUA Regional WWTP	MISC:S	SIU	1	3.9	3.9	0.98	0.98
253	94	YCUA	YCUA Regional WWTP	MISC:S	SIU	1	ND	ND	ND	ND
254	94	YCUA	YCUA Regional WWTP	MISC:S	SIU	1	ND	ND	ND	ND
255	94	YCUA	YCUA Regional WWTP	MISC:S	SIU	1	ND	ND	ND	ND
256	107	OSCO	Oscoda Twp WWTP Wurtsmith	CONT-AFFF:I	IU	2	ND	ND	81.8	456

Notes:

IU = Industrial User
SIU = Significant Industrial User
ND = Non-Detect (Typical detection limits were between 2-10 ng/L)

Table 16

Statewide PFAS Assessment of 42 WWTPs Evaluated
Michigan IPP PFAS Initiative

WWTP Nr.	WWTP Code	WWTP Name	IPP? (Yes/No)	Permit #	Address
4	AARB	Ann Arbor WWTP	Yes	MI0022217	49 Dixboro Road, Ann Arbor, MI 48105
6	BCRK	Battle Creek WWTP	Yes	MI0022276	2000 RIVER RD W, BATTLE CREEK, MI 49037
7	BAYC	Bay City WWTP	Yes	MI0022284	2905 N Water St, Bay City, MI 48708
14	BRON	Bronson WWTP	Yes	MI0020729	408 Mill Street, Bronson, MI 49028
23	DELH	Delhi Twp WWTP	Yes	MI0022781	5961 McCue, Holt, MI 48842
25	DEXT	Dexter WWTP	Yes	MI0022829	8360 Huron St., Dexter, MI 48130
27	DRVR	Downriver WWTP	Yes	MI0021156	797 CENTRAL ST, WYANDOTTE, MI 48192
32	FLIN	Flint WWTP	Yes	MI0022926	G4652 Beecher Road, Flint, MI 48532
33	FOWL	Fowlerville WWTP	Yes	MI0020664	8610 West Grand River, Fowlerville, MI 48836
36	RAGN	Genesee Co-Ragnone WWTP	Yes	MI0022977	9290 Farrand Road, Montrose, MI 48457
38	GLWA	GLWA WRRF	Yes	MI0022802	9300 W JEFFERSON AVE, DETROIT, MI 48209
40	GRAP	Grand Rapids WRRF	Yes	MI0026069	1300 MARKET AVE SW, GRAND RAPIDS, MI 49503
47	HOLL	Holland WWTP	Yes	MI0023108	42 S River Ave, Holland, MI 49423
49	HOWE	Howell WWTP	Yes	MI0021113	1191 S MICHIGAN AVE, HOWELL, MI 48843
50	IONA	Ionia WWTP	Yes	MI0021041	720 Wells Street, Ionia, MI 48846
52	JACK	Jackson WWTP	Yes	MI0023256	2995 Lansing Avenue, Jackson, MI 49202
53	KZOO	Kalamazoo WWTP	Yes	MI0023299	1415 North Harrison, Kalamazoo, MI 49007
54	SAWY	KI Sawyer WWTP-Marquette Co	Yes	MI0021423	1080 M-94, Gwinn, MI 49841
56	LANS	Lansing WWTP	Yes	MI0023400	1625 Sunset Avenue, Lansing, MI 48917
57	LAPR	Lapeer WWTP	Yes	MI0020460	1264 Industrial Drive, Lapeer, MI 48446
60	LYON	Lyon Township WWTP	Yes	GW1810078	53656 Ten Mile Road, New Hudson, MI 48178
64	MONR	Monroe Metro WWTP	Yes	MI0028401	2205 East Front Street, Monroe, MI 48161
65	MTCL	Mt Clemens WWTP	Yes	MI0023647	1750 Clara Street, Mount Clemens, MI 48043
66	MUSK	Muskegon Co WWMS Metro WWTP	Yes	MI0027391	698 N. Maple Island Road, Muskegon, MI 49442
69	NKEN	North Kent SA WWTP	Yes	MI0057419	4775 Coit Avenue NE, Grand Rapids, MI 49525
73	PONT	Oakland Co-Pontiac WWTP	Yes	MI0023825	155 N OPDYKE RD, PONTIAC, MI 48342
74	PHUR	Port Huron WWTP	Yes	MI0023833	100 Merchant Street, Port Huron, MI 48060
77	HURO	S Huron Valley UA WWTP	Yes	MI0043800	34001 W JEFFERSON AVE, BROWNSTWN TWP, MI 48173
79	SAGN	Saginaw WWTP	Yes	MI0025577	2406 VETERANS MEMORIAL PKWY, SAGINAW, MI 48601
81	SAND	Sandusky WWTP	Yes	MI0020222	103 South Campbell Street, Sandusky, MI 48471
88	TRAV	Traverse City WWTP	Yes	MI0027481	606 Hannah Avenue, Traverse City, MI 49686
90	WARR	Warren WWTP	Yes	MI0024295	32360 Warkop Ave, Warren, MI 48093
92	WIXO	Wixom WWTP	Yes	MI0024384	2059 Charms Road, Wixom, MI 48393
93	WYOM	Wyoming WWTP	Yes	MI0024392	2350 Ivanrest Ave, Wyoming, MI 49418
94	YCUA	YCUA Regional WWTP	Yes	MI0042676	2777 STATE ST, YPSILANTI, MI 48198
97	ALPE	Alpena WWTP	No	MI0022195	210 Harbor Drive, Alpena, MI 49707
99	COMM	Commerce Twp WWTP	No	MI0025071	649 Welch Road, Commerce Township, MI 48390
101	ELAN	East Lansing WWRF	No	MI0022853	1700 TROWBRIDGE RD, EAST LANSING, MI 48823
102	GAYL	Gaylord WWTP	No	GW1810128	500 East Seventh Street, Gaylord, MI 49735
103	MARQ	Marquette WWTP	No	MI0023531	300 W. Baraga, Marquette, MI 49855
105	MIDL	Midland WWTP	No	MI0023582	2125 Austin, Midland, MI 48642
107	OSCO	Oscoda Twp WWTP Wurtsmith	No	MI0055778	2998 Hunt, Oscoda, MI 48750

Table 17

Aqueous Sample Locations
Statewide PFAS Assessment of 42 WWTPs

Nr.	WWTP Nr.	WWTP Code	Facility	Sample ID	Sample Location	Treatment Code	Sample Description
1	97	ALPE	Alpena WWTP	WW1811090810GSC	ALPE-MI0022195-EFPT1	EFF-CL	Final WWTP Effluent
2	97	ALPE	Alpena WWTP	WW1811090835GSC	ALPE-MI0022195-IFPT1	INF	WWTP Influent
3	4	AARB	Ann Arbor WWTP	WW1811021030GSC	AARB-MI0022217-EFPT1	EFF-UV	Final WWTP Effluent
4	4	AARB	Ann Arbor WWTP	WW1811021100GSC	AARB-MI0022217-IFPT1	INF	Combined influent noted
5	4	AARB	Ann Arbor WWTP	BS1811021130GSC-A	AARB-MI0022217-STALS	A-STALS	Aqueous portion of biosolids (stabilized for 2 days)
6	6	BCRK	Battle Creek WWTP	WW1810311100GC	BCRK-MI0022276-EFPT1	EFF-CL	Final WWTP Effluent
7	6	BCRK	Battle Creek WWTP	WW1810311115GC	BCRK-MI0022276-IFPT1	INF	WWTP Influent
8	7	BAYC	Bay City WWTP	WW1811191145GSC	BAYC-MI0022284-EFPT1	TER-EFF	Effluent after the GAC Filter, which was spent 16 years old, installed for PCBs removal
9	7	BAYC	Bay City WWTP	WW1811191230GSC	BAYC-MI0022284-EFTRF	SCT-EFF	Trickling filter and aeration effluent
10	7	BAYC	Bay City WWTP	WW1811191315GSC	BAYC-MI0022284-FLISP	WW-THPST	Screw-press filtrate from primary and secondary sludge
11	7	BAYC	Bay City WWTP	WW1811191200GSC	BAYC-MI0022284-IFGAC	SCT-EFF	Secondary treatment clarifiers effluent
12	7	BAYC	Bay City WWTP	SL1811191300GSC-A	BAYC-MI0022284-IFISP	A-THPST	Aqueous portion of primary and secondary sludge
13	7	BAYC	Bay City WWTP	WW1811191245GSC	BAYC-MI0022284-IFPT1	INF	WWTP Influent
14	7	BAYC	Bay City WWTP	WW1811191215GSC	BAYC-MI0022284-IFTRF	PRT-EFF	Primary Clarifier effluent
15	14	BRON	Bronson WWTP	WW1810311430GC	BRON-MI0020729-EFPT1	EFF-UV	Final WWTP Effluent
16	14	BRON	Bronson WWTP	WW1810311500GC	BRON-MI0020729-IFPT1	INF	WWTP Influent
17	99	COMM	Commerce Twp WWTP	WW1811141115GSC	COMM-MI0025071-EFPT1	EFF-UV	Final WWTP Effluent
18	99	COMM	Commerce Twp WWTP	WW1811141100GSC	COMM-MI0025071-IFPT1	INF	WWTP Influent
19	23	DELH	Delhi Twp WWTP	WW1811011045GSC	DELH-MI0022781-EFPT1	EFF-CL	Discharge from polishing lagoon (tertiary treatment). Chlorinated prior to discharge to the river.
20	23	DELH	Delhi Twp WWTP	WW1811011115GSC	DELH-MI0022781-IFPT1	INF	WWTP Influent
21	25	DEXT	Dexter WWTP	WW1811021330GSC	DEXT-MI0022829-EFPT1	EFF-CL	Final WWTP Effluent
22	25	DEXT	Dexter WWTP	WW1811021300GSC	DEXT-MI0022829-IFPT1	INF	WWTP Influent
23	25	DEXT	Dexter WWTP	BS1811021245GSC-A	DEXT-MI0022829-STAND	A-STAND	Aqueous portion of biosolids anaerobically digested 93 degrees (F) for 30 days
24	27	DRVR	Downriver WTF	WW1811200800GSC	DRVR-MI0021156-EFPT1	EFF-UV	Final WWTP Effluent
25	27	DRVR	Downriver WTF	WW1811200930GSC	DRVR-MI0021156-FLBFP	WW-DWPST	Belt-filter filtrate from primary and secondary sludge
26	27	DRVR	Downriver WTF	WW1811200830GSC	DRVR-MI0021156-IFPT1	INF	WWTP Influent
27	101	ELAN	East Lansing WRRF	WW1811010920GSC	ELAN-MI0022853-EFPT1	EFF-UV	Final WWTP Effluent after tertiary treatment (sand filter)
28	101	ELAN	East Lansing WRRF	WW1811010810GSC	ELAN-MI0022853-IFPT1	INF	WWTP Influent
29	101	ELAN	East Lansing WRRF	WW1811010850GSC	ELAN-MI0022853-IFSDF	SCT-EFF	Secondary effluent prior to sand-filter
30	32	FLIN	Flint WWTP	WW1811051215GSC	FLIN-MI0022926-EFPT1	EFF-CL	Final WWTP Effluent
31	32	FLIN	Flint WWTP	WW1811051230GSC	FLIN-MI0022926-IFPT1	INF	WWTP Influent from East Pump Station
32	32	FLIN	Flint WWTP	WW1811051315GSC	FLIN-MI0022926-IFPT2	INF	WWTP Influent from from NW Pump has recycled plant water
33	32	FLIN	Flint WWTP	WW1811051245GSC	FLIN-MI0022926-IFPT3	INF	WWTP Influent from B Grit building both influents together
34	32	FLIN	Flint WWTP	SL1811051145GSC-A	FLIN-MI0022926-PSTSL	A-PSTSL	Aqueous portion of primary and secondary sludge
35	33	FOWL	Fowlerville WWTP	WW1811130920GSC	FOWL-MI0020664-EFPT1	EFF-UV	Final WWTP Effluent
36	33	FOWL	Fowlerville WWTP	WW1811130900GSC	FOWL-MI0020664-IFPT1	INF	WWTP Influent
37	33	FOWL	Fowlerville WWTP	WW1811131005GSC	FOWL-MI0020664-WWLAG	LAG-EFF	Sampled 3-ft below water surface of lagoon after secondary treatment
38	102	GAYL	Gaylord WWTP	WW1811080915GSC	GAYL-GW1810128-EFPT1	EFF	Final WWTP Effluent. Sampled polishing ponds discharging into drainage fields. No disinfection indicated
39	102	GAYL	Gaylord WWTP	WW1811080900GSC	GAYL-GW1810128-IFPT1	INF	WWTP Influent
40	38	GLWA	GLWA WRRF	WW1811161550GSC	GLWA-MI0022802-EFPT1	EFF	Final WWTP Effluent before disinfection
41	38	GLWA	GLWA WRRF	WW1811161635GSC	GLWA-MI0022802-EFPT2	EFF-CL	Cl, SO2, NaOCl and NaHSO4
42	38	GLWA	GLWA WRRF	WW1811161400GSC	GLWA-MI0022802-FLBFP	WW-DWPST	Filtrate from belt filter press primary and secondary thickened sludge combined.
43	38	GLWA	GLWA WRRF	WW1811161600GSC	GLWA-MI0022802-IFPT1	INF	WWTP Influent - NIEA
44	38	GLWA	GLWA WRRF	WW1811161440GSC	GLWA-MI0022802-IFPT2	INF	WWTP Influent - Oakwood
45	38	GLWA	GLWA WRRF	WW1811161540GSC	GLWA-MI0022802-IFPT3	INF	WWTP Influent - Jefferson
46	38	GLWA	GLWA WRRF	SL1811161450GSC-A	GLWA-MI0022802-THPRT	A-THPRT	Aqueous portion of primary treatment sludge
47	38	GLWA	GLWA WRRF	SL1811161520GSC-A	GLWA-MI0022802-THSCT	A-THSCT	Aqueous portion of secondary treatment sludge
48	38	GLWA	GLWA WRRF	WW1811161500GSC	GLWA-MI0022802-WWPRT	WW-THPRT	Primary thickener decant
49	38	GLWA	GLWA WRRF	WW1811161515GSC	GLWA-MI0022802-WWSCT	WW-THSCT	Secondary thickener decant
50	40	GRAP	Grand Rapids WRRF	WW1810291500GC	GRAP-MI0026069-DWCEN	WW-DWPST	Thicken/centrifuge filtrate of primary and secondary sludge
51	40	GRAP	Grand Rapids WRRF	WW1810291430GC	GRAP-MI0026069-EFPT1	EFF-UV	Final WWTP Effluent
52	40	GRAP	Grand Rapids WRRF	WW1810291400GC	GRAP-MI0026069-IFPT1	INF	WWTP Influent
53	47	HOLL	Holland WWTP	WW1810301240GC	HOLL-MI0023108-EFPT1	EFF-CL	Final WWTP Effluent
54	47	HOLL	Holland WWTP	WW1810301310GC	HOLL-MI0023108-IFPT1	INF	WWTP Influent - north
55	47	HOLL	Holland WWTP	WW1810301330GC	HOLL-MI0023108-IFPT2	INF	WWTP Influent - south
56	49	HOWE	Howell WWTP	WW1811131105GSC	HOWE-MI0021113-EFPT1	EFF-UV	Final WWTP Effluent
57	49	HOWE	Howell WWTP	WW1811131150GSC	HOWE-MI0021113-IFPT1	INF	WWTP Influent
58	49	HOWE	Howell WWTP	SL1811131125GSC-A	HOWE-MI0021113-PRTSL	A-PRTSL	Aqueous portion of primary treatment sludge
59	77	HURO	S Huron Valley UA WWTP	WW1811201200GSC	HURO-MI0043800-DCALS	WW-STALS	Filtrate from belt filter press and sludge cells from dewatered alkaline stabilized biosolids
60	77	HURO	S Huron Valley UA WWTP	WW1811201100GSC	HURO-MI0043800-EFPT1	EFF-CL	Final WWTP Effluent
61	77	HURO	S Huron Valley UA WWTP	WW1811201115GSC	HURO-MI0043800-IFPT1	INF	WWTP Influent
62	77	HURO	S Huron Valley UA WWTP	BS1811201215GSC-A	HURO-MI0043800-STALS	A-STALS	Aqueous portion of alkaline stabilized biosolids
63	77	HURO	S Huron Valley UA WWTP	SL1811201130GSC-A	HURO-MI0043800-THGRA	A-PSTSL	Aqueous portion of combined primary and secondary thickened sludge
64	50	IONA	Ionia WWTP	WW1810310815GC	IONA-MI0021041-EFPT1	EFF-CL	Final WWTP Effluent
65	50	IONA	Ionia WWTP	WW1810310800GC	IONA-MI0021041-IFPT1	INF	WWTP Influent
66	50	IONA	Ionia WWTP	BS1810310830GC-A	IONA-MI0021041-STAND	A-STAND	Aqueous portion of anaerobic stabilized biosolids
67	52	JACK	Jackson WWTP	WW1811050830GSC	JACK-MI0023256-EFPT1	EFF-CL	Final WWTP Effluent
68	52	JACK	Jackson WWTP	WW1811050800GSC	JACK-MI0023256-IFPT1	INF	WWTP Influent
69	52	JACK	Jackson WWTP	BS1811050900GSC-A	JACK-MI0023256-STAND	A-STAND	Anaerobic digestor constantly mixed for a week prior to storage

Table 17

Aqueous Sample Locations
Statewide PFAS Assessment of 42 WWTPs

Nr.	WWTP Nr.	WWTP Code	Facility	Sample ID	Sample Location	Treatment Code	Sample Description
70	53	KZOO	Kalamazoo WWTP	WW1810301610GC	KZOO-MI0023299-EFPT1	EFF	Final WWTP Effluent before tertiary treatment (sand beds) and disinfection
71	53	KZOO	Kalamazoo WWTP	WW1810301530GC	KZOO-MI0023299-IFPT1	INF	WWTP Influent
72	54	SAWY	KI Sawyer WWTP	WW1811071045GSC	SAWY-MI0021423-EFPT1	EFF-CL	Final WWTP Effluent
73	54	SAWY	KI Sawyer WWTP	WW1811071150GSC	SAWY-MI0021423-IFPT1	INF	WWTP Residential influent
74	54	SAWY	KI Sawyer WWTP	WW1811071215GSC	SAWY-MI0021423-IFPT2	INF	WWTP Industrial influent (Industry and Airport)
75	54	SAWY	KI Sawyer WWTP	BS1811071100GSC-A	SAWY-MI0021423-STAED	A-STAED	Aqueous portion of Aerobic stabilized biosolids (estimated 2 weeks of storage)
76	54	SAWY	KI Sawyer WWTP	SL1811071140GSC-A	SAWY-MI0021423-WACSL	A-PSTSL	Aqueous portion of combined primary and secondary waste activated sludge
77	56	LANS	Lansing WWTP	WW1811011250GSC	LANS-MI0023400-EFPT1	EFF-UV	WWTP Effluent outfall 001 to Grand River
78	56	LANS	Lansing WWTP	WW1811011430GSC	LANS-MI0023400-IFPT1	INF	WWTP Influent combined from multiple sources
79	57	LAPR	Lapeer WWTP	BS1805091545SK-A	LAPR-MI0020460-DWCEN	A-STAED	Aqueous portion of aerobically digested biosolids
80	57	LAPR	Lapeer WWTP	WW1805091615SK	LAPR-MI0020460-DWCEN	WW-STAED	Centrate from aerobic digester
81	57	LAPR	Lapeer WWTP	WW1805091630SK	LAPR-MI0020460-DWDRB	WW-STDRB	Filtrate from old drying beds.
82	57	LAPR	Lapeer WWTP	WW1805091505SK	LAPR-MI0020460-EFPT1	EFF-CL	Final WWTP Effluent
83	60	LYON	Lyon Twp WWTP	WW1811131505GSC	LYON-GW1810078-EFPT1	EFF	WWTP Effluent to rapid infiltration beds
84	60	LYON	Lyon Twp WWTP	WW1811131515GSC	LYON-GW1810078-IFPT1	INF	WWTP Influent
85	103	MARQ	Marquette WWTP	WW1811070915GSC	MARQ-MI0023531-EFPT1	EFF-CL	Final WWTP Effluent
86	103	MARQ	Marquette WWTP	WW1811070930GSC	MARQ-MI0023531-IFPT1	INF	WWTP Influent
87	105	MIDL	Midland WWTP	WW1811190915GSC	MIDL-MI0023582-EFPT1	EFF-CL	Final WWTP Effluent
88	105	MIDL	Midland WWTP	WW1811190930GSC	MIDL-MI0023582-IFPT1	INF	WWTP Influent (Two individual treatment trains)
89	64	MONR	Monroe WWTP	WW1811201445GSC	MONR-MI0028401-EFPT1	EFF-UV	Final WWTP Effluent (Chlorine utilized in addition to UV during high flows)
90	64	MONR	Monroe WWTP	WW1811201500GSC	MONR-MI0028401-FLISP	WW-DWPST	Screw-press filtrate from primary and secondary sludge
91	64	MONR	Monroe WWTP	WW1811201430GSC	MONR-MI0028401-IFPT1	INF	WWTP Influent
92	65	MTCL	Mt Clemens WWTP	WW1811151215GSC	MTCL-MI0023647-EFPT1	EFF-UV	Final WWTP Effluent
93	65	MTCL	Mt Clemens WWTP	WW1811151200GSC	MTCL-MI0023647-IFPT1	INF	WWTP Influent
94	66	MUSK	Muskegon Co WWMS Metro WWTP	WW1810300930GC	MUSK-MI0027391-EFMAC	PRT-EFF	Fully mixed aeration cell discharge primary treatment
95	66	MUSK	Muskegon Co WWMS Metro WWTP	WW1810301010GC	MUSK-MI0027391-EFPT1	EFF	No disinfection Muskegon River Outfall 001, Tertiary Treatment Effluent
96	66	MUSK	Muskegon Co WWMS Metro WWTP	WW1810300950GC	MUSK-MI0027391-ELAGN	LAG-EFF	Eastern lagoon surface water (12-16 month storage capacity)
97	66	MUSK	Muskegon Co WWMS Metro WWTP	WW1810300830GC	MUSK-MI0027391-IFPT1	INF	WWTP Influent (Domestic)
98	66	MUSK	Muskegon Co WWMS Metro WWTP	WW1810300910GC	MUSK-MI0027391-IFSDF	SCT-EFF	Effluent from interception ditch prior to Rapid Infiltration Basins (tertiary treatment)
99	69	NKEN	North Kent S A WWTP	WW1810290930GC	NKEN-MI0057419-EFPT1	EFF-UV	Final WWTP Effluent
100	69	NKEN	North Kent S A WWTP	WW1810290900GC	NKEN-MI0057419-IFPT1	INF	WWTP Influent
101	107	OSCO	Oscoda Twp WWTP Wurtsmith	WW1811091215GSC	OSCO-GW1810213-EFPT1	LAG-EFF	No disinfection employed (Aerated lagoon discharging to Rapid Infiltration Basins as final WWTP effluent)
102	107	OSCO	Oscoda Twp WWTP Wurtsmith	WW1811091200GSC	OSCO-GW1810213-IFPT1	INF	WWTP Influent
103	107	OSCO	Oscoda Twp WWTP Wurtsmith	WW1811091230GSC	OSCO-GW1810213-MPLAG	SCT-EFF	Midpoint between lagoon cells (No primary/tertiary treatment employed)
104	73	PONT	Clinton River WRRF - Pontiac WWTP	WW1811141410GSC	PONT-MI0023825-EFPT1	EFF-CL	Final WWTP Effluent
105	73	PONT	Clinton River WRRF - Pontiac WWTP	WW1811141510GSC	PONT-MI0023825-FLBFP	WW-DWPST	Filtrate from belt filter primary and secondary sludge combined (Anaerobic digestors prior are offline)
106	73	PONT	Clinton River WRRF - Pontiac WWTP	WW1811141520GSC	PONT-MI0023825-IFPT1	INF	WWTP Influent (combined source influent at Auburn intake)
107	74	PHUR	Port Huron WWTP	WW1811150905GSC	PHUR-MI0023833-EFPT1	EFF-CL	Final WWTP Effluent
108	74	PHUR	Port Huron WWTP	WW1811150840GSC	PHUR-MI0023833-IFPT1	INF	WWTP Influent
109	74	PHUR	Port Huron WWTP	BS1811151015GSC-A	PHUR-MI0023833-STALS	A-STALS	Aqueous portion of alkaline stabilized biosolids (2 moths old)
110	74	PHUR	Port Huron WWTP	SL1811150940GSC-A	PHUR-MI0023833-THGRA	A-PSTSL	Aqueous portion of combined gravity thickened sludge (primary and secondary)
111	36	RAGN	Genesee Co-Ragnone WWTP	WW1811051500GSC	RAGN-MI0022977-EFPT1	EFF-CL	WWTP Effluent
112	36	RAGN	Genesee Co-Ragnone WWTP	WW1811051515GSC	RAGN-MI0022977-IFPT1	INF	WWTP Influent
113	79	SAGN	Saginaw WWTP	WW1811191630GSC	SAGI-MI0025577-EFPT1	EFF-CL	Final WWTP Effluent
114	79	SAGN	Saginaw WWTP	WW1811191500GSC	SAGI-MI0025577-IFPT1	INF	WWTP Influent
115	81	SAND	Sandusky WWTP	WW1811160840GSC	SAND-MI0020222-EFPT1	EFF-UV	Final WWTP Effluent after UV and cloth media filter (tertiary)
116	81	SAND	Sandusky WWTP	WW1811160825GSC	SAND-MI0020222-IFCMF	SCT-EFF	Secondary treatment clarifiers effluent
117	81	SAND	Sandusky WWTP	WW1811160815GSC	SAND-MI0020222-IFPT1	INF	WWTP Influent
118	81	SAND	Sandusky WWTP	BS1811160850GSC-A	SAND-MI0020222-STAND	A-STAND	Aqueous portion of Anaerobic stabilized biosolids
119	88	TRAV	Traverse City WWTP	WW1811081300GSC	TRAV-MI0027481-EFPT1	EFF-UV	Final WWTP Effluent
120	88	TRAV	Traverse City WWTP	WW1811081350GSC	TRAV-MI0027481-IFPT1	INF	WWTP Influent
121	90	WARR	Warren WWTP	WW1811151545GSC	WARR-MI0024295-EFSDF	TER-EFF	Eefluent after sand filter (tertiary)
122	90	WARR	Warren WWTP	WW1811151600GSC	WARR-MI0024295-EFPT1	EFF-UV	Final WWTP Effluent after sand filter (tertiary) and UV
123	90	WARR	Warren WWTP	WW1811151450GSC	WARR-MI0024295-IFPT1	INF	WWTP Influent
124	92	WIXO	Wixom WWTP	WW1811140915GSC	WIXO-MI0024384-EBSCT	SCT-EFF	Secondary clarifier effluent sampled from equalization basin
125	92	WIXO	Wixom WWTP	WW1811140845GSC	WIXO-MI0024384-EFPT1	EFF-UV	UV Disinfection
126	92	WIXO	Wixom WWTP	WW1811140950GSC	WIXO-MI0024384-FLBFP	WW-DWPST	Filtrate from belt filter primary and secondary sludge combined.
127	92	WIXO	Wixom WWTP	SL1811140945GSC-A	WIXO-MI0024384-IFBFP	A-PSTSL	Aqueous portion of combined primary and secondary sludge (screw press influent)

Table 17

Aqueous Sample Locations
Statewide PFAS Assessment of 42 WWTPs

Nr.	WWTP Nr.	WWTP Code	Facility	Sample ID	Sample Location	Treatment Code	Sample Description
128	92	WIXO	Wixom WWTP	WW1811141000GSC	WIXO-MI0024384-IFPT1	INF	WWTP Influent
129	92	WIXO	Wixom WWTP	BS1811140830GSC-A	WIXO-MI0024384-STACD	A-STAED	Aqueous portion of Aerobic stabilized biosolids (estimated 6 months of storage)
130	92	WIXO	Wixom WWTP	SL1811140905GSC-A	WIXO-MI0024384-WACSL	A-PSTSL	Aqueous portion of primary and secondary sludge
131	93	WYOM	Wyoming WWTP	WW1810291130GC	WYOM-MI0024392-EFPT1	EFF-CL	Final WWTP Effluent
132	93	WYOM	Wyoming WWTP	WW1810291045GC	WYOM-MI0024392-IFPT1	INF	WWTP Influent
133	94	YCUA	YCUA Regional WWTP	WW1811020900GSC	YCUA-MI0042676-EFPT1	EFF-UV	Final WWTP Effluent
134	94	YCUA	YCUA Regional WWTP	WW1811020910GSC	YCUA-MI0042676-IFPT1	INF	WWTP Influent

Legend:

Aqueous Treatment Process	Treatment Code	Treatment Process Description
	WWTP Effluents	
Effluent	**EFF**	Effluent Prior to / No or Unknown Disinfection
	EFF-CL	Effluent with Chlorine Disinfection
	EFF-UV	Effluent with UV Disinfection
Influent	**WWTP Influent**	
	INF	Influent of WWTP
Aqueous	**Aqueous portion of sludge or biosolids**	
Primary	**A-PRTSL**	Aqueous portion of primary treatment sludge
Primary	**A-THPRT**	Aqueous portion of primary treatment thickened sludge
Secondary	**A-SCTSL**	Aqueous portion of secondary treatment sludge
Secondary	**A-THSCT**	Aqueous portion of secondary treatment sludge
Combined	**A-PSTSL**	Aqueous portion of primary treatment sludge
Combined	**A-DWPST**	Aqueous portion for dewatered combined primary and secondary sludge
Stabilized - Alkaline	**A-STALS**	Aqueous portion of alkaline stabilized biosolids
Stabilized-Anaerobically	**A-STAND**	Aqueous portion of anaerobically stabilized biosolids.
Stabilized - Aerobically	**A-STAED**	Aqueous portion of aerobically stabilized biosolids.
Wastewater	**Wastewater - Aqueous Process Flow**	
Primary	**PRT-EFF**	Primary treatment effluent
Secondary	**SCT-EFF**	Secondary treatment effluent (could be from clarifier or other treatments)
Tertiary	**TER-EFF**	Tertiary Treatment effluent
Stabilized - Lagoon	**LAG-EFF**	Wastewater from lagoon with stabilized biosolids
Primary	**WW-THPRT**	Decant primary treatment thickened sludge
Secondary	**WW-THSCT**	Decant secondary treatment thickened sludge
Combined	**WW-THPST**	Filtrate or Centrate from combined primary and secondary treatment thickened sludge
Combined	**WW-DWPST**	Filtrate or Centrate from dewatered primary and secondary treatment combined sludge
Stabilized - Alkaline	**WW-STALS**	Filtrate or Centrate from alkaline stabilized biosolids
Stabilized-Anaerobically	**WW-STAED**	Filtrate or Centrate from aerobically stabilized biosolids
Stabilized - Aerobically	**WW-STDRB**	Filtrate from stabilized biosolids form drying beds

Table 18

Aqueous PFAS Sample Results
Statewide PFAS Assessment of 42 WWTPs

Nr.	WWTP Nr.	WWTP Code	Sample Location	Sample ID	Sample Date	Report	Units	Total PFAS	PFBA	PFPeA	PFHxA	PFHpA	PFOA	PFNA	PFDA	PFUnDA	PFDoDA	PFTrDA	PFTeDA	PFBS	PFPeS	PFHxS	PFHpS	PFOS	PFNS	PFDS	FOSA	4:2 FTSA	6:2 FTSA	8:2 FTSA	EtFOSAA	MeFOSAA
1	97	ALPE	ALPE-MI0022195-EFPT1	WW1811090810GSC	11/9/2018	1803704	ng/L	73	6.08	15.8	19.6	3.39	7.49	< 1.94	1.79	< 1.94	< 1.94	< 1.94	< 1.94	9.12	< 1.94	5.05	< 1.94	5.07	< 1.94	< 1.94	< 1.94	< 1.94	< 1.94	< 1.94	< 1.94	< 1.94
2	97	ALPE	ALPE-MI0022195-IFPT1	WW1811090835GSC	11/9/2018	1803704	ng/L	51	4.53	7.95	8.1	2.94	5.94	< 1.99	< 1.99	< 1.99	< 1.99	< 1.99	< 1.99	9.34	< 1.99	6.81	< 1.99	5.44	< 1.99	< 1.99	< 1.99	< 1.99	< 1.99	< 1.99	< 1.99	< 1.99
3	4	AARB	AARB-MI0022217-EFPT1	WW1811021030GSC	11/2/2018	1803610	ng/L	113	8.61	33.2	33.5	6.92	4.42	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	6.7	< 2.00	3.1	< 2.00	14.8	< 2.00	< 2.00	< 2.00	< 2.00	1.6	< 2.00	< 2.00	< 2.00
4	4	AARB	AARB-MI0022217-IFPT1	WW1811021100GSC	11/2/2018	1803610	ng/L	89	8.55	28.1	16.5	6.68	2.91	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	6.34	< 2.07	3.18	< 2.07	16.5	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07
5	4	AARB	AARB-MI0022217-STALS	BS1811021130GSC-A	11/2/2018	1803610	ng/L	381	< 27.8	58.6	144	< 27.8	< 27.8	< 27.8	< 27.8	< 27.8	< 27.8	< 27.8	< 27.8	< 27.8	< 27.8	< 27.8	< 27.8	178	< 27.8	< 27.8	< 27.8	< 27.8	< 27.8	< 27.8	< 27.8	< 27.8
6	6	BCRK	BCRK-MI0022276-EFPT1	WW1810311100GC	10/31/2018	1803581	ng/L	72	7.69	10.8	27.1	3.19	8.43	2.79	< 2.09	< 2.09	< 2.09	< 2.09	< 2.09	2.92	< 2.09	2.28	< 2.09	5.14	< 2.09	< 2.09	< 2.09	< 2.09	1.76	< 2.09	< 2.09	< 2.09
7	6	BCRK	BCRK-MI0022276-IFPT1	WW1810311115GC	10/31/2018	1803581	ng/L	47	7.75	5.17	10	3.87	7.25	2.97	< 2.51	< 2.51	< 2.51	< 2.51	< 2.51	< 2.51	< 2.51	< 2.51	< 2.51	3.28	< 2.51	< 2.51	< 2.51	< 2.51	6.49	< 2.51	< 2.51	< 2.51
8	7	BAYC	BAYC-MI0022284-EFPT1	WW1811191145GSC	11/19/2018	1803773	ng/L	76	5.31	7.5	8.88	2.34	5.39	< 2.16	< 2.16	< 2.16	< 2.16	< 2.16	< 2.16	12	< 2.16	14.2	< 2.16	15.8	< 2.16	< 2.16	< 2.16	< 2.16	3.06	< 2.16	< 2.16	1.52
9	7	BAYC	BAYC-MI0022284-EFTRF	WW1811191230GSC	11/19/2018	1803773	ng/L	75	4.83	7.76	8.38	2.44	6.09	< 2.24	< 2.24	< 2.24	< 2.24	< 2.24	< 2.24	13.9	< 2.24	10.8	< 2.24	15.8	< 2.24	< 2.24	< 2.24	< 2.24	3.32	< 2.24	< 2.24	1.86
10	7	BAYC	BAYC-MI0022284-FLISP	WW1811191315GSC	11/19/2018	1803773	ng/L	60	< 2.12	6.63	7.42	2.3	3.54	< 2.12	< 2.12	< 2.12	< 2.12	< 2.12	< 2.12	20.9	< 2.12	6.27	< 2.12	6.06	< 2.12	< 2.12	< 2.12	< 2.12	2.42	< 2.12	4.35	< 2.12
11	7	BAYC	BAYC-MI0022284-IFGAC	WW1811191200GSC	11/19/2018	1803773	ng/L	72	4.82	6.76	7.85	2.38	5.45	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	11.9	< 2.07	12.6	< 2.07	15.5	< 2.07	< 2.07	< 2.07	< 2.07	2.55	< 2.07	< 2.07	1.88
12	7	BAYC	BAYC-MI0022284-IFISP	SL1811191300GSC-A	11/19/2018	1803773	ng/L	59	< 21.8	< 21.8	< 21.8	< 21.8	< 21.8	< 21.8	< 21.8	< 21.8	< 21.8	< 21.8	< 21.8	< 21.8	< 21.8	< 21.8	< 21.8	44	< 21.8	< 21.8	< 21.8	< 21.8	< 21.8	< 21.8	15.3	< 21.8
13	7	BAYC	BAYC-MI0022284-IFPT1	WW1811191245GSC	11/19/2018	1803773	ng/L	69	4.33	5.06	6.24	1.87	4.87	< 2.17	< 2.17	< 2.17	< 2.17	< 2.17	< 2.17	9.57	2.68	13.4	< 2.17	18.2	< 2.17	< 2.17	< 2.17	< 2.17	2.97	< 2.17	< 2.17	< 2.17
14	7	BAYC	BAYC-MI0022284-IFTRF	WW1811191215GSC	11/19/2018	1803773	ng/L	72	5.19	6.16	7.46	2.54	5.19	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	12.1	< 2.07	11	< 2.07	17.3	< 2.07	< 2.07	< 2.07	< 2.07	3.33	< 2.07	< 2.07	1.79
15	14	BRON	BRON-MI0020729-EFPT1	WW1810311430GC	10/31/2018	1803576	ng/L	290	2.92	7.14	10.7	2.89	2.4	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	25.1	< 2.00	< 2.00	< 2.00	169	< 2.00	< 2.00	< 2.00	< 2.00	69.4	< 2.00	< 2.00	< 2.00
16	14	BRON	BRON-MI0020729-IFPT1	WW1810311500GC	10/31/2018	1803576	ng/L	2,219	3.79	4.65	4.52	< 2.22	< 2.22	< 2.22	< 2.22	< 2.22	< 2.22	< 2.22	< 2.22	144	< 2.22	< 2.22	< 2.22	843	< 2.22	< 2.22	< 2.22	8.78	1210	< 2.22	< 2.22	< 2.22
17	99	COMM	COMM-MI0025071-EFPT1	WW1811141115GSC	11/14/2018	1803710	ng/L	146	8.03	63.6	41.3	2.25	15.5	< 2.27	< 2.27	< 2.27	< 2.27	< 2.27	< 2.27	11	< 2.27	2.29	< 2.27	1.92	< 2.27	< 2.27	< 2.27	< 2.27	< 2.27	< 2.27	< 2.27	< 2.27
18	99	COMM	COMM-MI0025071-IFPT1	WW1811141100GSC	11/14/2018	1803710	ng/L	104	5.91	31.8	22.8	2.21	17.9	< 2.35	6.51	< 2.35	1.85	< 2.35	< 2.35	5.6	< 2.35	< 2.35	< 2.35	6.38	< 2.35	< 2.35	< 2.35	< 2.35	< 2.35	< 2.35	< 2.35	2.75
19	23	DELH	DELH-MI0022781-EFPT1	WW1811011045GSC	11/1/2018	1803608	ng/L	21	2.55	3.33	10.6	< 2.07	2.33	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	1.76	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07
20	23	DELH	DELH-MI0022781-IFPT1	WW1811011115GSC	11/1/2018	1803608	ng/L	5	< 2.13	2.95	2.17	< 2.13	< 2.13	< 2.13	< 2.13	< 2.13	< 2.13	< 2.13	< 2.13	< 2.13	< 2.13	< 2.13	< 2.13	< 2.13	< 2.13	< 2.13	< 2.13	< 2.13	< 2.13	< 2.13	< 2.13	< 2.13
21	25	DEXT	DEXT-MI0022829-EFPT1	WW1811021330GSC	11/2/2018	1803611	ng/L	105	7.23	39.8	43.8	1.78	7.97	< 2.03	< 2.03	< 2.03	< 2.03	< 2.03	< 2.03	2.83	< 2.03	< 2.03	< 2.03	1.51	< 2.03	< 2.03	< 2.03	< 2.03	< 2.03	< 2.03	< 2.03	< 2.03
22	25	DEXT	DEXT-MI0022829-IFPT1	WW1811021300GSC	11/2/2018	1803611	ng/L	12	1.72	3.65	3.85	< 2.11	< 2.11	< 2.11	< 2.11	< 2.11	< 2.11	< 2.11	< 2.11	2.31	< 2.11	< 2.11	< 2.11	< 2.11	< 2.11	< 2.11	< 2.11	< 2.11	< 2.11	< 2.11	< 2.11	< 2.11
23	25	DEXT	DEXT-MI0022829-STAND	BS1811021245GSC-A	11/2/2018	1803611	ng/L	234	< 37.6	28	206	< 37.6	< 37.6	< 37.6	< 37.6	< 37.6	< 37.6	< 37.6	< 37.6	< 37.6	< 37.6	< 37.6	< 37.6	< 37.6	< 37.6	< 37.6	< 37.6	< 37.6	< 37.6	< 37.6	< 37.6	< 37.6
24	27	DRVR	DRVR-MI0021156-EFPT1	WW1811200800GSC	11/20/2018	1803767	ng/L	88	4.97	9.78	13.3	4.43	12.7	< 2.06	1.53	< 2.06	< 2.06	< 2.06	< 2.06	11.5	< 2.06	8.17	< 2.06	7.93	< 2.06	< 2.06	< 2.06	< 2.06	13.5	< 2.06	< 2.06	< 2.06
25	27	DRVR	DRVR-MI0021156-FLBFP	WW1811200930GSC	11/20/2018	1803767	ng/L	70	5.4	8.59	17.3	4.24	8.56	< 2.18	< 2.18	< 2.18	< 2.18	< 2.18	< 2.18	7.07	< 2.18	6.78	< 2.18	4.66	< 2.18	< 2.18	< 2.18	< 2.18	7.16	< 2.18	< 2.18	< 2.18
26	27	DRVR	DRVR-MI0021156-IFPT1	WW1811200830GSC	11/20/2018	1803767	ng/L	84	4.83	7.85	9.62	3.65	7.2	< 2.17	3.02	< 2.17	< 2.17	< 2.17	< 2.17	8.83	< 2.17	6.29	< 2.17	22.2	< 2.17	< 2.17	< 2.17	< 2.17	8.01	< 2.17	< 2.17	2.08
27	101	ELAN	ELAN-MI0022853-EFPT1	WW1811010920GSC	11/1/2018	1803606	ng/L	38	3.48	11.6	6.25	8.03	3.28	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	2.88	< 2.07	< 2.07	< 2.07	2.01	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07
28	101	ELAN	ELAN-MI0022853-IFPT1	WW1811010810GSC	11/1/2018	1803606	ng/L	18	2.23	3.69	3.53	1.93	2.21	1.72	< 2.16	< 2.16	< 2.16	< 2.16	< 2.16	2.64	< 2.16	< 2.16	< 2.16	< 2.16	< 2.16	< 2.16	< 2.16	< 2.16	< 2.16	< 2.16	< 2.16	< 2.16
29	101	ELAN	ELAN-MI0022853-IFSDF	WW1811010850GSC	11/1/2018	1803606	ng/L	38	3.53	11.5	6.68	7.42	3.26	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	3.02	< 2.07	< 2.07	< 2.07	2.62	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07
30	32	FLIN	FLIN-MI0022926-EFPT1	WW1811051215GSC	11/5/2018	1803698	ng/L	96	4.86	17.5	12.6	12.5	4.5	< 2.02	< 2.02	< 2.02	< 2.02	< 2.02	< 2.02	12	< 2.02	12.7	< 2.02	14.8	< 2.02	< 2.02	< 2.02	< 2.02	4.79	< 2.02	< 2.02	< 2.02
31	32	FLIN	FLIN-MI0022926-IFPT1	WW1811051230GSC	11/5/2018	1803698	ng/L	77	3.21	4.94	6.57	2.15	4.83	1.94	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	4.59	2.01	20.6	< 2.07	26.6	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07
32	32	FLIN	FLIN-MI0022926-IFPT2	WW1811051315GSC	11/5/2018	1803698	ng/L	97	< 2.01	8.14	12.7	6.03	6.35	2.12	3.14	1.86	< 2.01	< 2.01	< 2.01	< 2.01	< 2.01	5.93	< 2.01	34.8	< 2.01	< 2.01	< 2.01	< 2.01	10.7	< 2.01	1.57	3.9
33	32	FLIN	FLIN-MI0022926-IFPT3	WW1811051245GSC	11/5/2018	1803698	ng/L	52	3.08	4.72	5.55	2	4.41	< 2.19	< 2.19	< 2.19	< 2.19	< 2.19	< 2.19	4.95	< 2.19	8.68	< 2.19	16.4	< 2.19	< 2.19	< 2.19	< 2.19	2.35	< 2.19	< 2.19	< 2.19
34	32	FLIN	FLIN-MI0022926-PSTSL	SL1811051145GSC-A	11/5/2018	1803698	ng/L	182	< 21.1	15.4	35.9	< 21.1	< 21.1	< 21.1	< 21.1	< 21.1	< 21.1	< 21.1	< 21.1	< 21.1	< 21.1	17.4	< 21.1	43.3	< 21.1	< 21.1	< 21.1	< 21.1	70	< 21.1	< 21.1	< 21.1
35	33	FOWL	FOWL-MI0020664-EFPT1	WW1811130920GSC	11/13/2018	1803706	ng/L	62	2.38	21.6	23.1	1.83	7.6	< 2.09	< 2.09	< 2.09	< 2.09	< 2.09	< 2.09	4.13	< 2.09	< 2.09	< 2.09	1.47	< 2.09	< 2.09	< 2.09	< 2.09	< 2.09	< 2.09	< 2.09	< 2.09
36	33	FOWL	FOWL-MI0020664-IFPT1	WW1811130900GSC	11/13/2018	1803706	ng/L	7	< 2.03	3.09	3.69	< 2.03	< 2.03	< 2.03	< 2.03	< 2.03	< 2.03	< 2.03	< 2.03	< 2.03	< 2.03	< 2.03	< 2.03	< 2.03	< 2.03	< 2.03	< 2.03	< 2.03	< 2.03	< 2.03	< 2.03	< 2.03
37	33	FOWL	FOWL-MI0020664-WWLAG	WW1811131005GSC	11/13/2018	1803706	ng/L	1,161	86	161	163	84	231	130	95.2	14.9	5.2	< 2.00	< 2.00	12.4	< 2.00	3.25	< 2.00	94.1	< 2.00	< 2.00	5.42	< 2.00	< 2.00	< 2.00	60.7	14.9
38	102	GAYL	GAYL-GW1810128-EFPT1	WW1811080915GSC	11/8/2018	1803702	ng/L	161	6.71	80.2	42.3	1.96	8.72	< 1.96	< 1.96	< 1.96	< 1.96	< 1.96	< 1.96	15.4	< 1.96	1.9	< 1.96	4.26	< 1.96	< 1.96	< 1.96	< 1.96	< 1.96	< 1.96	< 1.96	< 1.96
39	102	GAYL	GAYL-GW1810128-IFPT1	WW1811080900GSC	11/8/2018	1803702	ng/L	17	< 2.02	7.72	6.1	< 2.02	< 2.02	< 2.02	< 2.02	< 2.02	< 2.02	< 2.02	< 2.02	< 2.02	< 2.02	< 2.02	< 2.02	< 2.02	< 2.02	< 2.02	< 2.02	< 2.02	3.01	< 2.02	< 2.02	< 2.02
40	38	GLWA	GLWA-MI0022802-EFPT1	WW1811161550GSC	11/16/2018	1803716	ng/L	119	11.6	8.89	14.2	3.7	6.7	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	13.4	< 2.07	8.41	< 2.07	9.68	< 2.07	< 2.07	< 2.07	< 2.07	42.2	< 2.07	< 2.07	< 2.07
41	38	GLWA	GLWA-MI0022802-EFPT2	WW1811161635GSC	11/16/2018	1803716	ng/L	125	11.5	8.85	18.7	3.57	7.18	< 2.12	< 2.12	< 2.12	< 2.12	< 2.12	< 2.12	13.2	< 2.12	5.7	< 2.12	9.31	< 2.12	< 2.12	< 2.12	< 2.12	46.7	< 2.12	< 2.12	< 2.12
42	38	GLWA	GLWA-MI0022802-FLBFP	WW1811161400GSC	11/16/2018	1803716	ng/L	243	11.6	10.3	17	4.29	7.2	< 2.40	< 2.40	< 2.40	< 2.40	< 2.40	< 2.40	20.8	< 2.40	7.1	< 2.40	23.6	< 2.40	< 2.40	< 2.40	< 2.40	141	< 2.40	< 2.40	< 2.40
43	38	GLWA	GLWA-MI0022802-IFPT1	WW1811161600GSC	11/16/2018	1803716	ng/L	71	7.99	6.97	9.26	2.77	6.02	< 2.09	< 2.09	< 2.09	< 2.09	< 2.09	< 2.09	17.4	< 2.09	4.61	< 2.09	7.54	< 2.09	< 2.09	< 2.09	< 2.09	8.68	< 2.09	< 2.09	< 2.09
44	38	GLWA	GLWA-MI0022802-IFPT2	WW1811161440GSC	11/16/2018	1803716	ng/L	117	18.1	11.2	14.7	4.44	9.1	< 2.11	< 2.11	< 2.11	< 2.11	< 2.11	< 2.11	18.1	< 2.11	10.2	< 2.11	15.6	< 2.11	< 2.11	< 2.11	< 2.11	12.4	< 2.11	2.71	< 2.11
45	38	GLWA	GLWA-MI0022802-IFPT3	WW1811161540GSC	11/16/2018	1803716	ng/L	53	5.53	8.05	7.3	2.4	4.64	< 2.04	< 2.04	< 2.04	< 2.04	< 2.04	< 2.04	4.91	< 2.04	3.1	< 2.04	10.7	< 2.04	< 2.04	< 2.04	< 2.04	6.5	< 2.04	< 2.04	< 2.04
46	38	GLWA	GLWA-MI0022802-THPRT	SL1811161450GSC-A	11/16/2018	1803716	ng/L	63	< 48.1	< 48.1	< 48.1	< 48.1	< 48.1	< 48.1	< 48.1	< 48.1	< 48.1	< 48.1	< 48.1	< 48.1	< 48.1	< 48.1	< 48.1	< 48.1	< 48.1	< 48.1	< 48.1	< 48.1	63.2	< 48.1	< 48.1	< 48.1
47	38	GLWA	GLWA-MI0022802-THSCT	SL1811161520GSC-A	11/16/2018	1803716	ng/L	279	14.9	11.1	27.1	< 14.1	11.2	< 14.1	< 14.1	< 14.1	< 14.1	< 14.1	< 14.1	23.4	< 14.1	< 14.1	< 14.1	18.6	< 14.1	< 14.1	< 14.1	< 14.1	173	< 14.1	< 14.1	< 14.1
48	38	GLWA	GLWA-MI0022802-WWPRT	WW1811161500GSC	11/16/2018	1803716	ng/L	130	10.8	8.45	10.7	3.49	6.22	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	13.6	< 2.07	4.76	< 2.07	15.5	< 2.07	< 2.07	< 2.07	< 2.07	56.5	< 2.07	< 2.07	< 2.07
49	38	GLWA	GLWA-MI0022802-WWSCT	WW1811161515GSC	11/16/2018	1803716	ng/L	156	12	8.6	15.3	3.64	7.35	< 2.05	< 2.05	< 2.05	< 2.05	< 2.05	< 2.05	13.2	< 2.05	4.82	< 2.05	11.2	< 2.05	< 2.05	< 2.05	< 2.05	78.3	< 2.05	< 2.05	2.04
50	40	GRAP	GRAP-MI0026069-DWCEN	WW1810291500GC	10/29/2018	1803553	ng/L	619	16	60	41.2	4.8	7.74	< 2.13	< 2.13	< 2.13	< 2.13	< 2.13	< 2.13	18.6	< 2.13	4.1	< 2.13	26.5	< 2.13	< 2.13	< 2.13	< 2.13	429	1.77	3.65	5.86
51	40	GRAP	GRAP-MI0026069-EFPT1	WW1810291430GC	10/29/2018	1803553	ng/L	403	15.9	49.9	48.5	11.4	11.4	< 2.08	1.56	< 2.08	< 2.08	< 2.08	< 2.08	16.4	< 2.08	5.86	< 2.08	35.6	< 2.08	< 2.08	< 2.08	< 2.08	202	< 2.08	2.26	2.45
52	40	GRAP	GRAP-MI0026069-IFPT1	WW1810291400GC	10/29/2018	1803553	ng/L	72	4.19	6.56	6.57	1.7	5.06	< 2.10	< 2.10	< 2.10	< 2.10	< 2.10	< 2.10	4.96	< 2.10	< 2.10	< 2.10	12.7	< 2.10	< 2.10	< 2.10	< 2.10	30.4	< 2.10	< 2.10	< 2.10
53	47	HOLL	HOLL-MI0023108-EFPT1	WW1810301240GC	10/30/2018	1803578	ng/L	43	4.89	3.13	14.5	1.91	4.67	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	1.55	< 2.07	2.41	< 2.07	< 2.07	< 2.07	< 2.07	9.65	< 2.07	< 2.07	< 2.07
54	47	HOLL	HOLL-MI0023108-IFPT1	WW1810301310GC	10/30/2018	1803578	ng/L	16	3.24	2.43	2.78	< 2.19	3.2	< 2.19	< 2.19	< 2.19	< 2.19	< 2.19	< 2.19	< 2.19	< 2.19	< 2.19	< 2.19	< 2.19	< 2.19	< 2.19	< 2.19	< 2.19	4.08	< 2.19	< 2.19	< 2.19
55	47	HOLL	HOLL-MI0023108-IFPT2	WW1810301330GC	10/30/2018	1803578	ng/L	37	6.73	3.73	6.71	2.81	5.73	< 2.01	< 2.01	< 2.01	< 2.01	< 2.01	< 2.01	4.1	< 2.01	< 2.01	< 2.01	3.79	< 2.01	< 2.01	< 2.01	< 2.01	3.25	< 2.01	< 2.01	< 2.01
56	49	HOWE	HOWE-MI0021113-EFPT1	WW1811131105GSC	11/13/2018	1803707	ng/L	71	3.65	17.7	26.6	1.85	7.39	< 2.05	< 2.05	< 2.05	< 2.05	< 2.05	< 2.05	6.25	< 2.05	2.3	< 2.05	4.87	< 2.05	< 2.05	< 2.05	< 2.05	< 2.05	< 2.05	< 2.05	< 2.05
57	49	HOWE	HOWE-MI0021113-IFPT1	WW1811131150GSC	11/13/2018	1803707	ng/L	13	< 2.07	3.69	4.78	< 2.07	4.42	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07
58	49	HOWE	HOWE-MI0021113-PRTSL	SL1811131125GSC-A	11/13/2018	1803707	ng/L	64	< 61.6	< 61.6	< 61.6	< 61.6	< 61.6	< 61.6	< 61.6	< 61.6	< 61.6	< 61.6	< 61.6	< 61.6	< 61.6	< 61.6	< 61.6	63.9	< 61.6	< 61.6	< 61.6	< 61.6	< 61.6	< 61.6	< 61.6	< 61.6
59	77	HURO	HURO-MI0043800-DCALS	WW1811201200GSC	11/20/2018	1803768	ng/L	710	398	35.4	81.9	5.63	26.8	4.06	8.79	2.89	7.54	< 2.16	< 2.16	36.9	< 2.16	10.2	< 2.16	34.1	< 2.16	< 2.16	< 2.16	< 2.16	18.2	2.16	13.8	23.6
60	77	HURO	HURO-MI0043800-EFPT1	WW1811201100GSC	11/20/2018	1803768	ng/L	102	42.6	8.31	13.4	2.27	6.69	< 2.16	< 2.16	< 2.16	< 2.16	< 2.16	< 2.16	20.9	< 2.16	2.52	< 2.16	5.33	< 2.16	< 2.16	< 2.16	< 2.16	< 2.16	< 2.16	< 2.16	< 2.16
61	77	HURO	HURO-MI0043800-IFPT1	WW1811201115GSC	11/20/2018	1803768	ng/L	18	5.7	3.99	4.27	< 2.14	3.76	< 2.14	< 2.14	< 2.14	< 2.14	< 2.14	< 2.14	< 2.14	< 2.14	< 2.14	< 2.14	< 2.14	< 2.14	< 2.14	< 2.14	< 2.14	< 2.14	< 2.14	< 2.14	< 2.14
62	77	HURO	HURO-MI0043800-STALS	BS1811201215GSC-A	11/20/2018	1803768	ng/L	685	510	< 70.2	110	< 70.2	< 70.2	< 70.2	< 70.2	< 70.2	< 70.2	< 70.2	< 70.2	64.5	< 70.2	< 70.2	< 70.2	< 70.2	< 70.2	< 70.2	< 70.2	< 70.2	< 70.2	< 70.2	< 70.2	< 70.2
63	77	HURO	HURO-MI0043800-THGRA	SL1811201130GSC-A	11/20/2018	1803768	ng/L	818	608	44.6	35.3	< 8.99	18.7	< 8.99	< 8.99	< 8.99	< 8.99	< 8.99	< 8.99	64.5	< 8.99	7.02	< 8.99	17.2	< 8.99	< 8.99	< 8.99	< 8.99	22.8	< 8.99	< 8.99	< 8.99
64	50	IONA	IONA-MI0021041-EFPT1	WW1810310815GC	10/31/2018	1803583	ng/L	143,360	34.9	31.3	66	34	< 2.15	< 2.15	< 2.15	< 2.15	< 2.15	< 2.15	< 2.15	2.43	< 2.15	2.05	< 2.15	635	< 2.15	< 2.15	< 2.15	154	142000	400	< 2.15	< 2.15
65	50	IONA	IONA-MI0021041-IFPT1	WW1810310800GC	10/31/2018	1803583	ng/L	8,667	5.09	4.27	5.16	6.34	< 2.23	< 2.23	< 2.23	< 2.23	< 2.23	< 2.23	< 2.23	2.03	< 2.23	< 2.23	< 2.23	213	< 2.23	< 2.23	< 2.23	42.2	8280	109	< 2.23	< 2.23
66	50	IONA	IONA-MI0021041-STAND	BS1810310830GC-A	10/31/2018	1803583	ng/L	158,137	87.8	89.9	251	34.7	10.1	3.66	< 4.13	< 4.13	< 4.13	< 4.13	< 4.13	< 4.13	< 4.13	3.91	10.6	2920	< 4.13	< 4.13	< 4.13	116	154000	605	< 4.13	4.54
67	52	JACK	JACK-MI0023256-EFPT1	WW1811050830GSC	11/5/2018	1803697	ng/L	60	6.59	22.4	20.1	< 2.02	3.38	< 2.02	< 2.02	< 2.02	< 2.02	< 2.02	< 2.02	2.9	< 2.02	1.84	< 2.02	3.17	< 2.02	< 2.02	< 2.02	< 2.02	< 2.02	< 2.02	< 2.02	< 2.02
68	52	JACK	JACK-MI0023256-IFPT1	WW1811050800GSC	11/5/2018	1803697	ng/L	16	2.43	2.7	2.82	< 2.28	< 2.28	< 2.28	< 2.28	< 2.28	< 2.28	< 2.28	< 2.28	1.87	< 2.28	< 2.28	< 2.28	5.98	< 2.28	< 2.28	< 2.28	< 2.28	< 2.28	< 2.28	< 2.28	< 2.28
69	52	JACK	JACK-MI0023256-STAND	BS1811050900GSC-A	11/5/2018	1803697	ng/L	300	20.6	35.4	132	< 24.6	23.9	< 24.6	< 24.6	< 24.6	< 24.6	< 24.6	< 24.6	< 24.6	< 24.6	< 24.6	< 24.6	45.1	< 24.6	< 24.6	< 24.6	< 24.6	19.4	< 24.6	< 24.6	23.2
70	53	KZOO	KZOO-MI0023299-EFPT1	WW1810301610GC	10/30/2018	1803577	ng/L	86	11.9	31.8	18.9	< 2.00	9.81	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	4.24	< 2.00	3.49	< 2.00	5.79	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00
71	53	KZOO	KZOO-MI0023299-IFPT1	WW1810301530GC	10/30/2018	1803577	ng/L	88	10.1	8.88	10.6	3.34	8.43	1.56	< 2.26	< 2.26	< 2.26	< 2.26	< 2.26	4.87	< 2.26	4.54	< 2.26	26	< 2.26	< 2.26	< 2.26	< 2.26	9.74	< 2.26	< 2.26	< 2.26
72	54	SAWY	SAWY-MI0021423-EFPT1	WW1811071045GSC	11/7/2018	1803701	ng/L	133	3.97	12	15.7	5.88	10.2	3.66	< 1.99	1.42	< 1.99	< 1.99	< 1.99	4.51	< 1.99	11.2	< 1.99	62	< 1.99	< 1.99	< 1.99	< 1.99	2.1	< 1.99	< 1.99	< 1.99
73	54	SAWY	SAWY-MI0021423-IFPT1	WW1811071150GSC	11/7/2018	1803701	ng/L	23	< 2.04	3.18	2.92	< 2.04	< 2.04	< 2.04	< 2.04	< 2.04	< 2.04	< 2.04	< 2.04	< 2.04	< 2.04	11.4	< 2.04	5.77	< 2.04	< 2.04	< 2.04	< 2.04	< 2.04	< 2.04	< 2.04	< 2.04
74	54	SAWY	SAWY-MI0021423-IFPT2	WW1811071215GSC	11/7/2018	1803701	ng/L	116	1.88	3.79	5.08	< 2.09	< 2.09	< 2.09	< 2.09	8.82	< 2.09	< 2.09	< 2.09	2.34	< 2.09	8.59	< 2.09	81	< 2.09	< 2.09	< 2.09	< 2.09	4.07	< 2.09	< 2.09	< 2.09
75	54	SAWY	SAWY-MI0021423-STAED	BS1811071100GSC-A	11/7/2018	1803701	ng/L	6,408	403	918	772	314	1000	558	70.4	103	< 57.3	< 57.3	< 57.3	355	< 57.3	355	< 57.3	1560	< 57.3	< 57.3	< 57.3	< 57.3	< 57.3	< 57.3	< 57.3	< 57.3
76	54	SAWY	SAWY-MI0021423-WACSL	SL1811071140GSC-A	11/7/2018	1803701	ng/L	322	7.2	15.1	18.2	6.68	15.8	7.31	3.78	11	< 2.54	2.52	< 2.54	5.14	< 2.54	15.8	2	197	< 2.54	< 2.54	< 2.54	< 2.54	6.07	4.83	< 2.54	4.05
77	56	LANS	LANS-MI0023400-EFPT1	WW1811011250GSC	11/1/2018	1803607	ng/L	107	8.32	33	28.6	3.55	7.58	2.21	< 2.03	< 2.03	< 2.03	< 2.03	< 2.03	14.1	< 2.03	2.76	< 2.03	5.51	< 2.03	< 2.03	< 2.03	< 2.03	1.84	< 2.03	< 2.03	< 2.03
78	56	LANS	LANS-MI0023400-IFPT1	WW1811011430GSC	11/1/2018	1803607	ng/L	35	4.51	6.18	7.72	2.17	4.98	< 2.16	< 2.16	< 2.16	< 2.16	< 2.16	< 2.16	< 2.16	< 2.16	< 2.16	< 2.16	< 2.16	< 2.16	2.42	< 2.16	< 2.16	5.37	< 2.16	1.74	< 2.16
79	57	LAPR	LAPR-MI0020460-DWCEN	BS1805091545SK-A	5/9/2018	1800935	ng/L	1,645	141	275	462	415	55.7	< 9.39	< 9.39	< 9.39	< 9.39	< 9.39	< 9.39	12.1	< 9.39	< 9.39	< 9.39	182	< 9.39	< 9.39	< 9.39	< 9.39	102	< 9.39	< 9.39	< 9.39
80	57	LAPR	LAPR-MI0020460-DWCEN	WW1805091615SK	5/9/2018	1800935	ng/L	866	39.5	134	204	171	< 17.0	< 17.0	< 17.0	< 17.0	< 17.0	< 17.0	< 17.0	< 17.0	< 17.0	< 17.0	< 17.0	48.4	< 17.0	< 17.0	< 17.0	< 17.0	269	< 17.0	< 17.0	< 17.0
81	57	LAPR	LAPR-MI0020460-DWDRB	WW1805091630SK	5/9/2018	1800935	ng/L	8,686	294	959	1400	757	91.6	< 17.0	17.1	< 17.0	< 17.0	< 17.0	< 17.0	18.2	< 17.0	17.7	< 17.0	3180	< 17.0	41	< 17.0	< 17.0	1910	< 17.0	< 17.0	< 17.0
82	57	LAPR	LAPR-MI0020460-EFPT1	WW1805091505SK	5/9/2018	1800935	ng/L	374	29.3	81.4	90.8	122	5.03	< 1.32	< 1.32	< 1.32	< 1.32	< 1.32	< 1.32	7.46	< 1.32	1.32	< 1.32	28.7	< 1.32	< 1.32	< 1.32	< 1.32	8.13	< 1.32	< 1.32	< 1.32
83	60	LYON	LYON-GW1810078-EFPT1	WW1811131505GSC	11/13/2018	1803708	ng/L	111	4.78	53.1	22.6	2.49	15.4	< 2.01	1.91	< 2.01	< 2.01	< 2.01	< 2.01	10.4	< 2.01	< 2.01	< 2.01	< 2.01	< 2.01	< 2.01	< 2.01	< 2.01	< 2.01	< 2.01	< 2.01	< 2.01
84	60	LYON	LYON-GW1810078-IFPT1	WW1811131515GSC	11/13/2018	1803708	ng/L	8	2	2.2	3.3	< 2.28	< 2.28	< 2.28	< 2.28	< 2.28	< 2.28	< 2.28	< 2.28	< 2.28	< 2.28	< 2.28	< 2.28	< 2.28	< 2.28	< 2.28	< 2.28	< 2.28	< 2.28	< 2.28	< 2.28	< 2.28
85	103	MARQ	MARQ-MI0023531-EFPT1	WW1811070915GSC	11/7/2018	1803700	ng/L	86	4.16	22.6	26.2	1.86	6.56	< 1.98	1.89	< 1.98	< 1.98	< 1.98	< 1.98	4.04	< 1.98	8.16	< 1.98	10.7	< 1.98	< 1.98	< 1.98	< 1.98	< 1.98	< 1.98	< 1.98	< 1.98
86	103	MARQ	MARQ-MI0023531-IFPT1	WW1811070930GSC	11/7/2018	1803700	ng/L	39	2.13	3.43	4.27	< 2.10	3.27	< 2.10	< 2.10	< 2.10	< 2.10	< 2.10	< 2.10	3.82	< 2.10	9	< 2.10	10.3	2.41	< 2.10	< 2.10	< 2.10	< 2.10	< 2.10	< 2.10	< 2.10

Table 18

Aqueous PFAS Sample Results

Statewide PFAS Assessment of 42 WWTPs

Nr.	WWTP Nr.	WWTP Code	Sample Location	Sample ID	Sample Date	Report	Units	Total PFAS	PFBA	PFPeA	PFHxA	PFHpA	PFOA	PFNA	PFDA	PFUnDA	PFDoDA	PFTrDA	PFTeDA	PFBS	PFPeS	PFHxS	PFHpS	PFOS	PFNS	PFDS	FOSA	4:2 FTSA	6:2 FTSA	8:2 FTSA	EtFOSAA	MeFOSAA
87	105	MIDL	MIDL-MI0023582-EFPT1	WW1811190915GSC	11/19/2018	1803772	ng/L	79	9.56	12.1	16.2	4.02	10.5	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	16.1	< 2.07	6.51	< 2.07	4.03	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07
88	105	MIDL	MIDL-MI0023582-IFPT1	WW1811190930GSC	11/19/2018	1803772	ng/L	70	8.06	7.22	10.3	3.64	10.3	< 2.16	< 2.16	< 2.16	< 2.16	< 2.16	< 2.16	16.4	< 2.16	7.4	< 2.16	2.72	< 2.16	< 2.16	< 2.16	< 2.16	1.57	< 2.16	2.31	< 2.16
89	64	MONR	MONR-MI0028401-EFPT1	WW1811201445GSC	11/20/2018	1803771	ng/L	50	3.99	13.5	8.16	1.81	5.35	< 2.02	< 2.02	< 2.02	< 2.02	< 2.02	< 2.02	9.2	< 2.02	2.84	< 2.02	5.46	< 2.02	< 2.02	< 2.02	< 2.02	< 2.02	< 2.02	< 2.02	< 2.02
90	64	MONR	MONR-MI0028401-FLISP	WW1811201500GSC	11/20/2018	1803771	ng/L	35	5.47	7.94	8.1	< 2.16	2.73	< 2.16	< 2.16	< 2.16	< 2.16	< 2.16	< 2.16	< 2.16	< 2.16	2.14	< 2.16	6.22	< 2.16	< 2.16	< 2.16	< 2.16	1.94	< 2.16	< 2.16	< 2.16
91	64	MONR	MONR-MI0028401-IFPT1	WW1811201430GSC	11/20/2018	1803771	ng/L	33	3.52	4.5	5.52	1.5	2.89	< 2.13	< 2.13	< 2.13	< 2.13	< 2.13	< 2.13	4.05	< 2.13	3.18	< 2.13	5.5	< 2.13	< 2.13	< 2.13	< 2.13	2.51	< 2.13	< 2.13	< 2.13
92	65	MTCL	MTCL-MI0023647-EFPT1	WW1811151215GSC	11/15/2018	1803713	ng/L	92	5.42	34.1	22.6	2.87	9.03	< 2.08	< 2.08	< 2.08	< 2.08	< 2.08	< 2.08	10.9	< 2.08	3.89	< 2.08	3.4	< 2.08	< 2.08	< 2.08	< 2.08	< 2.08	< 2.08	< 2.08	< 2.08
93	65	MTCL	MTCL-MI0023647-IFPT1	WW1811151200GSC	11/15/2018	1803713	ng/L	41	3.87	7.55	8	2.11	4.6	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	5.18	< 2.07	4.29	< 2.07	5.02	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07
94	66	MUSK	MUSK-MI0027391-EFMAC	WW1810300930GC	10/30/2018	1803575	ng/L	55	4.34	3.23	8.98	< 2.29	10.1	< 2.29	< 2.29	< 2.29	< 2.29	< 2.29	< 2.29	2.55	< 2.29	6.07	< 2.29	9.58	< 2.29	< 2.29	< 2.29	< 2.29	3.09	< 2.29	1.95	5.37
95	66	MUSK	MUSK-MI0027391-EFPT1	WW1810301010GC	10/30/2018	1803575	ng/L	125	10.6	14.2	22.4	10.4	31.7	2.04	< 2.25	< 2.25	< 2.25	< 2.25	< 2.25	10.6	< 2.25	6.37	< 2.25	16.2	< 2.25	< 2.25	< 2.25	< 2.25	< 2.25	< 2.25	< 2.25	< 2.25
96	66	MUSK	MUSK-MI0027391-ELAGN	WW1810300950GC	10/30/2018	1803575	ng/L	234	12.4	16	38.4	9.65	34.3	11.3	18.6	1.43	< 2.02	< 2.02	< 2.02	8.89	< 2.02	6.69	< 2.02	26.1	< 2.02	< 2.02	< 2.02	< 2.02	10.2	< 2.02	14.1	26.3
97	66	MUSK	MUSK-MI0027391-IFPT1	WW1810300830GC	10/30/2018	1803575	ng/L	49	2.94	4.08	5.13	< 2.48	11.7	< 2.48	< 2.48	< 2.48	< 2.48	< 2.48	< 2.48	4.56	3.62	< 2.48	< 2.48	10.5	< 2.48	< 2.48	< 2.48	< 2.48	6.29	< 2.48	< 2.48	< 2.48
98	66	MUSK	MUSK-MI0027391-IFSDF	WW1810300910GC	10/30/2018	1803575	ng/L	153	11.2	19.4	26.3	11.1	36.9	2.35	< 2.27	< 2.27	< 2.27	< 2.27	< 2.27	8.18	< 2.27	6.91	< 2.27	24.3	< 2.27	< 2.27	< 2.27	< 2.27	4.38	< 2.27	1.95	< 2.27
99	69	NKEN	NKEN-MI0057419-EFPT1	WW1810290930GC	10/29/2018	1803551	ng/L	389	26.6	182	121	9.34	21.2	< 2.10	< 2.10	< 2.10	< 2.10	< 2.10	< 2.10	10.4	< 2.10	5.68	< 2.10	12.5	< 2.10	< 2.10	< 2.10	< 2.10	< 2.10	< 2.10	< 2.10	< 2.10
100	69	NKEN	NKEN-MI0057419-IFPT1	WW1810290900GC	10/29/2018	1803551	ng/L	80	6.01	10.5	10.3	2.93	11.2	< 2.11	< 2.11	< 2.11	< 2.11	< 2.11	< 2.11	4.5	< 2.11	< 2.11	< 2.11	31.1	< 2.11	< 2.11	< 2.11	< 2.11	< 2.11	< 2.11	3.87	< 2.11
101	107	OSCO	OSCO-GW1810213-EFPT1	WW1811091215GSC	11/9/2018	1803705	ng/L	153	5.14	7.09	20.7	3.29	12.4	2.12	1.35	< 1.96	< 1.96	< 1.96	< 1.96	3.29	1.85	16.8	< 1.96	75.8	< 1.96	< 1.96	< 1.96	< 1.96	1.88	< 1.96	< 1.96	1.42
102	107	OSCO	OSCO-GW1810213-IFPT1	WW1811091200GSC	11/9/2018	1803705	ng/L	62	4.87	2.7	4.67	< 2.10	4.42	< 2.10	< 2.10	< 2.10	< 2.10	< 2.10	< 2.10	< 2.10	< 2.10	7.35	< 2.10	38.2	< 2.10	< 2.10	< 2.10	< 2.10	< 2.10	< 2.10	< 2.10	< 2.10
103	107	OSCO	OSCO-GW1810213-MPLAG	WW1811091230GSC	11/9/2018	1803705	ng/L	125	< 2.06	4.72	14.4	2.46	8.77	1.61	1.43	< 2.06	< 2.06	< 2.06	< 2.06	2.64	< 2.06	12.7	< 2.06	71	< 2.06	< 2.06	< 2.06	< 2.06	< 2.06	< 2.06	< 2.06	5.62
104	73	PONT	PONT-MI0023825-EFPT1	WW1811141410GSC	11/14/2018	1803711	ng/L	169	9.03	22.5	35.3	7.92	38.1	2.52	3.25	< 2.15	< 2.15	< 2.15	< 2.15	4.1	< 2.15	16.5	< 2.15	20	< 2.15	< 2.15	< 2.15	< 2.15	4.86	< 2.15	1.69	2.82
105	73	PONT	PONT-MI0023825-FLBFP	WW1811141510GSC	11/14/2018	1803711	ng/L	88	6.65	10.6	23.6	2.77	9.41	< 3.25	3.49	< 3.25	< 3.25	< 3.25	< 3.25	< 3.25	< 3.25	3.38	< 3.25	17.8	< 3.25	< 3.25	< 3.25	< 3.25	3.72	< 3.25	3.66	3.19
106	73	PONT	PONT-MI0023825-IFPT1	WW1811141520GSC	11/14/2018	1803711	ng/L	42	5.66	6.47	8.24	2.19	4.94	< 2.22	< 2.22	< 2.22	< 2.22	< 2.22	< 2.22	3.22	< 2.22	4.03	< 2.22	7.68	< 2.22	< 2.22	< 2.22	< 2.22	< 2.22	< 2.22	< 2.22	< 2.22
107	74	PHUR	PHUR-MI0023833-EFPT1	WW1811150905GSC	11/15/2018	1803712	ng/L	336	28.5	74.6	92	30.5	44.8	2.72	1.65	< 2.05	< 2.05	< 2.05	< 2.05	39.1	< 2.05	6.92	< 2.05	13.1	< 2.05	< 2.05	< 2.05	< 2.05	2.4	< 2.05	< 2.05	< 2.05
108	74	PHUR	PHUR-MI0023833-IFPT1	WW1811150840GSC	11/15/2018	1803712	ng/L	361	29.1	84.8	91.8	37.2	64.6	3.77	2.39	< 2.08	< 2.08	< 2.08	< 2.08	16.6	< 2.08	7.88	< 2.08	19.5	< 2.08	< 2.08	< 2.08	< 2.08	1.56	< 2.08	< 2.08	1.88
109	74	PHUR	PHUR-MI0023833-STALS	BS1811151015GSC-A	11/15/2018	1803712	ng/L	980	51	121	161	38.6	92.1	< 28.9	38	< 28.9	< 28.9	< 28.9	< 28.9	38.6	< 28.9	< 28.9	< 28.9	277	< 28.9	< 28.9	< 28.9	< 28.9	38.9	37.8	44.1	42
110	74	PHUR	PHUR-MI0023833-THGRA	SL1811150940GSC-A	11/15/2018	1803712	ng/L	258	< 129	125	133	< 129	< 129	< 129	< 129	< 129	< 129	< 129	< 129	< 129	< 129	< 129	< 129	< 129	< 129	< 129	< 129	< 129	< 129	< 129	< 129	< 129
111	36	RAGN	RAGN-MI0022977-EFPT1	WW1811051500GSC	11/5/2018	1803699	ng/L	74	7.04	10.7	23.8	2.41	7.23	< 2.25	< 2.25	< 2.25	< 2.25	< 2.25	< 2.25	14	< 2.25	3.74	< 2.25	4.72	< 2.25	< 2.25	< 2.25	< 2.25	< 2.25	< 2.25	< 2.25	< 2.25
112	36	RAGN	RAGN-MI0022977-IFPT1	WW1811051515GSC	11/5/2018	1803699	ng/L	46	4.78	6.34	8.2	2.06	4	< 2.17	< 2.17	< 2.17	< 2.17	< 2.17	< 2.17	12.5	< 2.17	< 2.17	< 2.17	5.22	< 2.17	< 2.17	< 2.17	< 2.17	2.78	< 2.17	< 2.17	< 2.17
113	79	SAGN	SAGI-MI0025577-EFPT1	WW1811191630GSC	11/19/2018	1803774	ng/L	42	4.53	8.04	9.93	< 2.15	4.58	< 2.15	< 2.15	< 2.15	< 2.15	< 2.15	< 2.15	8.51	< 2.15	2.7	< 2.15	4.13	< 2.15	< 2.15	< 2.15	< 2.15	< 2.15	< 2.15	< 2.15	< 2.15
114	79	SAGN	SAGI-MI0025577-IFPT1	WW1811191500GSC	11/19/2018	1803774	ng/L	26	3.08	3.42	3.55	< 2.03	2.56	< 2.03	< 2.03	< 2.03	< 2.03	< 2.03	< 2.03	6.66	< 2.03	2.47	< 2.03	4.19	< 2.03	< 2.03	< 2.03	< 2.03	< 2.03	< 2.03	< 2.03	< 2.03
115	81	SAND	SAND-MI0020222-EFPT1	WW1811160840GSC	11/16/2018	1803715	ng/L	154	31.7	25.7	48.1	5.94	8.39	1.44	< 2.10	< 2.10	< 2.10	< 2.10	< 2.10	21.5	< 2.10	4.88	< 2.10	5.26	< 2.10	< 2.10	< 2.10	< 2.10	< 2.10	< 2.10	< 2.10	1.58
116	81	SAND	SAND-MI0020222-IFCMF	WW1811160825GSC	11/16/2018	1803715	ng/L	155	31.8	24.4	46.4	4.96	8.37	1.78	< 2.02	< 2.02	< 2.02	< 2.02	< 2.02	21.1	< 2.02	6.14	< 2.02	7.59	< 2.02	< 2.02	< 2.02	< 2.02	< 2.02	< 2.02	< 2.02	2.11
117	81	SAND	SAND-MI0020222-IFPT1	WW1811160815GSC	11/16/2018	1803715	ng/L	138	24.9	17.1	38.2	7.15	12.2	< 2.12	< 2.12	< 2.12	< 2.12	< 2.12	< 2.12	18.6	< 2.12	11.8	< 2.12	7.98	< 2.12	< 2.12	< 2.12	< 2.12	< 2.12	< 2.12	< 2.12	< 2.12
118	81	SAND	SAND-MI0020222-STAND	BS1811160850GSC-A	11/16/2018	1803715	ng/L	322	43.9	38.9	84.3	9.98	17.6	26.9	< 6.39	5.22	< 6.39	< 6.39	< 6.39	30.8	< 6.39	13.5	< 6.39	24.7	< 6.39	< 6.39	< 6.39	< 6.39	< 6.39	< 6.39	9.13	16.8
119	88	TRAV	TRAV-MI0027481-EFPT1	WW1811081300GSC	11/8/2018	1803703	ng/L	154	4.25	34.6	74.1	3.42	20.7	< 2.02	1.84	< 2.02	< 2.02	< 2.02	< 2.02	5.28	< 2.02	3.67	< 2.02	2.9	< 2.02	< 2.02	< 2.02	< 2.02	3.16	< 2.02	< 2.02	< 2.02
120	88	TRAV	TRAV-MI0027481-IFPT1	WW1811081350GSC	11/8/2018	1803703	ng/L	38	3.64	8.25	8.95	2.89	6.17	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	3.82	< 2.07	< 2.07	< 2.07	4.73	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07	< 2.07
121	90	WARR	WARR-MI0024295-EFSDF	WW1811151545GSC	11/15/2018	1803714	ng/L	76	5.07	19.6	13.7	2.57	7.21	< 2.02	< 2.02	< 2.02	< 2.02	< 2.02	< 2.02	12.7	< 2.02	5.59	< 2.02	7.64	< 2.02	< 2.02	< 2.02	< 2.02	1.54	< 2.02	< 2.02	< 2.02
122	90	WARR	WARR-MI0024295-EFPT1	WW1811151600GSC	11/15/2018	1803714	ng/L	74	5.31	19.4	12.9	2.62	7.19	< 1.92	< 1.92	< 1.92	< 1.92	< 1.92	< 1.92	12	< 1.92	4.75	< 1.92	7.48	< 1.92	< 1.92	< 1.92	< 1.92	1.89	< 1.92	< 1.92	< 1.92
123	90	WARR	WARR-MI0024295-IFPT1	WW1811151450GSC	11/15/2018	1803714	ng/L	59	3.19	5.6	6.07	1.82	4.61	< 2.09	< 2.09	< 2.09	< 2.09	< 2.09	< 2.09	11.1	< 2.09	3.84	< 2.09	7.31	< 2.09	< 2.09	< 2.09	< 2.09	15.5	< 2.09	< 2.09	< 2.09
124	92	WIXO	WIXO-MI0024384-EBSCT	WW1811140915GSC	11/14/2018	1803709	ng/L	4,712	85.7	804	446	341	9.12	3.13	< 2.05	< 2.05	< 2.05	< 2.05	< 2.05	13.4	< 2.05	1.45	< 2.05	218	< 2.05	< 2.05	< 2.05	< 2.05	2790	< 2.05	< 2.05	< 2.05
125	92	WIXO	WIXO-MI0024384-EFPT1	WW1811140845GSC	11/14/2018	1803709	ng/L	4,950	89.7	794	442	326	9.89	3.44	< 2.24	< 2.24	< 2.24	< 2.24	< 2.24	13.1	< 2.24	2.81	< 2.24	269	< 2.24	< 2.24	< 2.24	< 2.24	3000	< 2.24	< 2.24	< 2.24
126	92	WIXO	WIXO-MI0024384-FLBFP	WW1811140950GSC	11/14/2018	1803709	ng/L	13,754	288	1720	992	727	28.6	17.6	13.7	2.39	3.02	< 2.48	< 2.48	31.3	< 2.48	3.35	9.86	8080	4.25	< 2.48	< 2.48	< 2.48	1820	6.26	1.76	4.48
127	92	WIXO	WIXO-MI0024384-IFBFP	SL1811140945GSC-A	11/14/2018	1803709	ng/L	5,473	239	1490	809	608	22.6	8.46	2.51	< 2.31	< 2.31	< 2.31	< 2.31	24.3	< 2.31	1.8	< 2.31	444	< 2.31	< 2.31	< 2.31	< 2.31	1820	3.21	< 2.31	< 2.31
128	92	WIXO	WIXO-MI0024384-IFPT1	WW1811141000GSC	11/14/2018	1803709	ng/L	2,329	20.7	131	71	52.6	3.07	< 2.30	< 2.30	< 2.30	< 2.30	< 2.30	< 2.30	4.13	< 2.30	1.93	< 2.30	128	< 2.30	< 2.30	< 2.30	2.1	1910	4.89	< 2.30	< 2.30
129	92	WIXO	WIXO-MI0024384-STACD	BS1811140830GSC-A	11/14/2018	1803709	ng/L	32,663	791	3540	2870	1980	108	50.4	< 63.4	< 63.4	< 63.4	< 63.4	< 63.4	66.2	< 63.4	< 63.4	< 63.4	11700	< 63.4	< 63.4	< 63.4	< 63.4	11500	56.9	< 63.4	< 63.4
130	92	WIXO	WIXO-MI0024384-WACSL	SL1811140905GSC-A	11/14/2018	1803709	ng/L	6,437	130	995	588	535	24.6	10.3	< 5.52	< 5.52	< 5.52	< 5.52	< 5.52	15	< 5.52	< 5.52	< 5.52	555	< 5.52	< 5.52	< 5.52	< 5.52	3580	4.52	< 5.52	< 5.52
131	93	WYOM	WYOM-MI0024392-EFPT1	WW1810291130GC	10/29/2018	1803552	ng/L	113	11.2	29.9	32.1	5.38	8.74	< 2.11	< 2.11	< 2.11	< 2.11	< 2.11	< 2.11	3.95	< 2.11	4.6	< 2.11	12	< 2.11	< 2.11	< 2.11	< 2.11	5.15	< 2.11	< 2.11	< 2.11
132	93	WYOM	WYOM-MI0024392-IFPT1	WW1810291045GC	10/29/2018	1803552	ng/L	1,208	5.53	6.23	9.15	2.39	5.08	< 2.08	< 2.08	< 2.08	< 2.08	< 2.08	< 2.08	3.18	< 2.08	< 2.08	< 2.08	26.4	< 2.08	< 2.08	< 2.08	< 2.08	1150	< 2.08	< 2.08	< 2.08
133	94	YCUA	YCUA-MI0042676-EFPT1	WW1811020900GSC	11/2/2018	1803609	ng/L	109	17.8	17.7	26	4.37	12.6	< 2.16	2.03	< 2.16	< 2.16	< 2.16	< 2.16	13.1	< 2.16	6.39	< 2.16	6.12	< 2.16	< 2.16	< 2.16	< 2.16	3.36	< 2.16	< 2.16	< 2.16
134	94	YCUA	YCUA-MI0042676-IFPT1	WW1811020910GSC	11/2/2018	1803609	ng/L	61	7.44	8.07	9.21	2.65	7.39	< 2.25	< 2.25	< 2.25	< 2.25	< 2.25	< 2.25	12.1	< 2.25	4.56	< 2.25	7.51	< 2.25	2.02	< 2.25	< 2.25	< 2.25	< 2.25	< 2.25	< 2.25

Notes:

"**< #**" = Values Below the Detection Limit (**DL**)

🟦 Perfluoroalkyl Carboxylic Acids (**PFCAs**)
🟧 Perfluoroalkane Sulfonic Acids (**PFSAs**)
⬜ Perfluoroalkane Sulfonamides (**FASAs**)
🟩 Fluorotelomer Sulfonic Acids (**FTSAs**)
🟫 N-Ethyl Perfluoroalkane Sulfonamidoacetic Acids (**EtFASAAs**)
🟪 N-Methyl Perfluoroalkane Sulfonamidoacetic Acids (**MeFASAAs**)

PFBA = Perfluorobutanoic acid
PFPeA = Perfluoropentanoic acid
PFHxA = Perfluorohexanoic acid
PFHpA = Perfluoroheptanoic acid
PFOA = Perfluorooctanoic acid
PFNA = Perfluorononanoic acid

PFDA = Perfluorodecanoic acid
PFUnDA = Perfluoroundecanoic acid
PFDoDA = Perfluorododecanoic acid
PFTrDA = Perfluorotridecanoic acid
PFTeDA = Perfluorotetradecanoic acid
PFBS = Perfluorobutane sulfonic acid

PFPeS = Perfluoropentane sulfonic acid
PFHxS = Perfluorohexane sulfonic acid
PFHpS = Perfluoroheptane sulfonic acid
PFOS = Perfluorooctane sulfonic acid
PFNS = Perfluorononane sulfonic acid
PFDS = Perfluorodecane sulfonic acid

FOSA = Perfluorooctane sulfonamide
4:2 FTSA = 4:2 Fluorotelomer sulfonic acid
6:2 FTSA = 4:2 Fluorotelomer sulfonic acid
8:2 FTSA = 4:2 Fluorotelomer sulfonic acid
EtFOSAA = N-Ethyl perfluorooctane sulfonamidoacetic acid
MeFOSAA = N-Methyl perfluorooctane sulfonamidoacetic acid

Table 19

Solids Sample Locations

Statewide PFAS Assessment of 42 WWTPs

Nr.	WWTP Nr.	WWTP Code	Facility	Sample Location	Sample ID	Solid_Type	Solid Treatment Process	Treatment Code	Sample Description	Final Treated Solids	Disposal Methods
1	97	ALPE	Alpena WWTP	ALPE-MI0022195-STAND	BS1811090820GSC	Biosolids	Stabilization	STAND	Sampled anaerobically digestor outflow prior to storage	Yes	Land App
2	4	AARB	Ann Arbor WWTP	AARB-MI0022217-STALS	BS1811021130GSC-S	Biosolids	Stabilization	STALS	Alkaline stabilized biosolids (2 days after stabilization)	Yes	Land App/Landfill
3	6	BCRK	Battle Creek WWTP	BCRK-MI0022276-STALS	BS1810311220GC	Biosolids	Stabilization	STALS	Alkaline stabilized biosolids (2 hours of stabilization at pH 12)	Yes	Land App/Landfill
4	6	BCRK	Battle Creek WWTP	BCRK-MI0022276-THCEN	SL1810311230GC	Sludge	Combined	THPST	Combined primary and secondary sludge sampled from centrifuge	No	Land App/Landfill
5	7	BAYC	Bay City WWTP	BAYC-MI0022284-DWISP	SL1811191330GSC	Sludge	Combined	DWPST	Dewatered combined primary and thickened secondary, effluent of screw press	Yes	Landfill
6	7	BAYC	Bay City WWTP	BAYC-MI0022284-IFISP	SL1811191300GSC-S	Sludge	Secondary	THPST	Combined primary and thickened secondary, influent to screw press (post-storage)	No	Landfill
7	14	BRON	Bronson WWTP	BRON-MI0020729-STAND	BS1810311445GC	Biosolids	Stabilization	STAND	Anaerobic stabilized biosolids	Yes	Land App/Landfill
8	99	COMM	Commerce Twp WWTP	COMM-MI0025071-DWBFP	SL1811141130GSC	Sludge	Combined	DWPST	Combined primary and secondary cake from BFP	Yes	Landfill
9	23	DELH	Delhi Twp WWTP	DELH-MI0022781-STAND	BS1811011030GSC	Biosolids	Stabilization	STAND	Anaerobic digestor effluent sample	Yes	Land App
10	25	DEXT	Dexter WWTP	DEXT-MI0022829-STAND	BS1811021245GSC-S	Biosolids	Stabilization	STAND	Heated, anaerobically digested biosolids sample (93 F for 30 days)	Yes	Land App/Landfill
11	27	DRVR	Downriver WTF	DRVR-MI0021156-DWBFP	SL1811200945GSC	Sludge	Combined	DWPST	Combined primary and secondary cake from BFP	Yes	Landfill
12	27	DRVR	Downriver WTF	DRVR-MI0021156-PRTSL	SL1811200915GSC	Sludge	Primary	PRTSL	Sludge from primary clarifiers	No	Landfill
13	27	DRVR	Downriver WTF	DRVR-MI0021156-WACSL	SL1811200900GSC	Sludge	Secondary	SCTSL	WAS from secondary clarifiers	No	Landfill
14	101	ELAN	East Lansing WRRF	ELAN-MI0022853-DWBFP	SL1811010800GSC	Sludge	Combined	DWPST	Combined primary and secondary sludge from BFP	Yes	Landfill
15	32	FLIN	Flint WWTP	FLIN-MI0022926-PSTSL	SL1811051145GSC-S	Sludge	Combined	PSTSL	Combined primary and secondary sludge from storage tank before BFP.	Yes	Landfill
16	32	FLIN	Flint WWTP	FLIN-MI0022926-DWBFP	SL1811051130GSC	Sludge	Combined	DWPST	Combined primary and secondary sludge from BFP after being dewatered	No	Landfill
17	102	GAYL	Gaylord WWTP	GAYL-GW1810128-STAED	BS1811080930GSC	Biosolids	Stabilization	STAED	Sampled from aerobic storage tanks	Yes	Land App
18	38	GLWA	GLWA WRRF	GLWA-MI0022802-DWBFP	SL1811161350GSC	Sludge	Combined	DWPST	Combined primary and secondary sludge sampled from BFP and centrifuge	Yes	Land App/Landfill/Incineration
19	38	GLWA	GLWA WRRF	GLWA-MI0022802-DSASH	SL1811161410GSC	Sludge	Disposal Ash	DSASH	Ash, 1300 deg. (F) Incinerator	No	Incinerator
20	38	GLWA	GLWA WRRF	GLWA-MI0022802-DSPAL	SL1811161615GSC	Sludge	Disposal Pallets	STALS	Pellets from biosolids drying facility (BDF)	Yes	Land App
21	38	GLWA	GLWA WRRF	GLWA-MI0022802-THPR	SL1811161450GSC-S	Sludge	Primary	THPRT	Sludge sampled from primary thickener #3	No	Land App/Landfill/Incineration
22	38	GLWA	GLWA WRRF	GLWA-MI0022802-THSCT	SL1811161520GSC-S	Sludge	Secondary	THSCT	Sludge sampled from secondary thickener #12	No	Land App/Landfill/Incineration
23	38	GLWA	GLWA WRRF	GLWA-MI0022802-THPST	SL1811161355GSC	Sludge	Combined	THPST	Combined primary and secondary sludge post-blending and aeration after thickening	No	Land App/Landfill/Incineration
24	40	GRAP	Grand Rapids WRRF	GRAP-MI0026069-DWCEN	SL1810291445GC	Sludge	Combined	THPST	Combined primary and secondary sample from effluent of thickener. Sludge sent to off-site facility for processing.	Yes	Landfill
25	40	GRAP	Grand Rapids WRRF	GRAP-MI0026069-PRTSL	SL1810291530GC	Sludge	Primary	PRTSL	Sludge from primary clarifier	No	Landfill
26	40	GRAP	Grand Rapids WRRF	GRAP-MI0026069-THCEN	SL1810291600GC	Sludge	Secondary	SCTSL	Activated sludge	No	Landfill
27	47	HOLL	Holland WWTP	HOLL-MI0023108-STALS	BS1810301350GC	Biosolids	Stabilization	STALS	Alkaline stabilized biosolids	Yes	Land App/Landfill
28	49	HOWE	Howell WWTP	HOWE-MI0021113-DWBFP	SL1811131115GSC	Sludge	Combined	DWPST	Combined primary and secondary cake from BFP	Yes	Landfill
29	49	HOWE	Howell WWTP	HOWE-MI0021113-PRTSL	SL1811131125GSC-S	Sludge	Primary	PRTSL	Sludge from primary clarifiers	No	Landfill
30	77	HURO	S Huron Valley UA WWTP	HURO-MI0043800-STALS	BS1811201145GSC	Biosolids	Stabilization	STALS	Alkaline stabilization sampled after 1 day of stabilization	Yes	Land App
31	77	HURO	S Huron Valley UA WWTP	HURO-MI0043800-STALS	BS1811201215GSC-S	Biosolids	Stabilization	STALS	Alkaline stabilized biosolids sampled from sludge cell (15 ft total depth)	No	Land App
32	77	HURO	S Huron Valley UA WWTP	HURO-MI0043800-THGRA	SL1811201130GSC-S	Sludge	Combined	THPST	Combined primary and secondary thickened sludge	No	Land App
33	50	IONA	Ionia WWTP	IONA-MI0021041-STAND	BS1810310830GC-S	Biosolids	Stabilization	STAND	Anaerobic stabilized biosolids	Yes	Land App
34	52	JACK	Jackson WWTP	JACK-MI0023256-STAND	BS1811050900GSC-S	Biosolids	Stabilization	STAND	Anaerobic digestors sampled (constantly blended, 1 week old)	Yes	Land App/Landfill
35	52	JACK	Jackson WWTP	JACK-MI0023256-DWDRB	BS1811050930GSC	Biosolids	Stabilization	DWAND	Sampled drying beds. No land app in last 2 years	No	Land App/Landfill
36	53	KZOO	Kalamazoo WWTP	KZOO-MI0023299-DWBFP	SL1810301620GC	Sludge	Combined	DWPST	Combined primary and secondary sample from BFP	Yes	Land App/Landfill
37	53	KZOO	Kalamazoo WWTP	KZOO-MI0023299-THPCL	SL1810301640GC	Sludge	Primary	PRTSL	Sludge from primary clarifiers	No	Land App/Landfill
38	53	KZOO	Kalamazoo WWTP	KZOO-MI0023299-THSCL	SL1810301650GC	Sludge	Secondary	SCTSL	Sludge from secondary clarifiers	No	Land App/Landfill
39	54	SAWY	KI Sawyer WWTP	SAWY-MI0021423-STAED	BS1811071100GSC-S	Biosolids	Stabilization	STAED	Aerobic stabilized biosolids (estimated 2 weeks of storage)	Yes	Land App
40	54	SAWY	KI Sawyer WWTP	SAWY-MI0021423-WACSL	SL1811071140GSC-S	Sludge	Secondary	SCTSL	Reactivated Sludge (RAS) taken after secondary clarifiers	No	Land App
41	56	LANS	Lansing WWTP	LANS-MI0023400-STALS	BS1811011400GSC	Biosolids	Stabilization	STALS	Sampled stabilized biosolids tank (2-6 months of storage)	Yes	Land App
42	56	LANS	Lansing WWTP	LANS-MI0023400-DWBFP	SL1811011315GSC	Sludge	Combined	DWPST	Combined primary and secondary sludge cake from BFP	Yes	Landfill
43	57	LAPR	Lapeer WWTP	LAPR-MI0020460-DWDRB	BS1805091705SK	Biosolids	Stabilization	STAED	Stabilized aerobically biosolids collected from drying beds.	Yes	Land App
44	57	LAPR	Lapeer WWTP	LAPR-MI0020460-DWCEN	BS1805091545SK-S	Biosolids	Secondary	THSCT	Thickened activate sludge	No	Land App
45	60	LYON	Lyon Twp WWTP	LYON-GW1810078-STAED	BS1811131545GSC	Biosolids	Stabilization	STAED	Well-mixed biosolids storage tank sampled	Yes	Land App
46	103	MARQ	Marquette WWTP	MARQ-MI0023531-DWBFP	BS1811070945GSC	Biosolids	Stabilization	DWAND	Anaerobic stabilized biosolids cake from BFP.	Yes	Land App
47	105	MIDL	Midland WWTP	MIDL-MI0023582-STAND	BS1811190945GSC	Biosolids	Stabilization	STAND	Anaerobic stabilized biosolids	Yes	Land App/Landfill
48	64	MONR	Monroe WWTP	MONR-MI0028401-DWISP	SL1811201510GSC	Sludge	Combined	DWPST	Combined primary and secondary sludge cake from screw-press	Yes	Landfill
49	65	MTCL	Mt Clemens WWTP	MTCL-MI0023647-STAED	BS1811151230GSC	Biosolids	Stabilization	STAED	Biosolids sampled from sludge tank (1 week old)	Yes	Land App
50	66	MUSK	Muskegon Co WWMS Metro WWTP	MUSK-MI0027391-DWDRB	SL1810301040GC	Sludge	Stabilization	STLAG	Biosolids drying beds sampled (composite sample) stabilized by lagoons	Yes	Landfill
51	69	NKEN	North Kent S A WWTP	NKEN-MI0057419-DWISP	SL1810290940GC	Sludge	Stabilization	DWAED	Sampled stabilized sludge from inclined screw press after aerobic digestion	Yes	Landfill
52	107	OSCO	Oscoda Twp WWTP Wurtsmith	OSCO-GW1810213-DWDRB	SO1811091245GSC	Soil	Soil	Soil	Sampled Soil from Rapid Infiltration Bed #8	No	Land App
53	73	PONT	Clinton River WRRF - Pontiac WWTP	PONT-MI0023825-DWBFP	BS1811141455GSC	Biosolids	Stabilization	DWAND	Sludge cake from belt-filter press after anaerobic digestion	Yes	Land App/Landfill
54	74	PHUR	Port Huron WWTP	PHUR-MI0023833-STALS	BS1811151015GSC-S	Biosolids	Stabilization	STALS	Alkaline stabilized biosolids (estimated 2 months of storage)	Yes	Land App
55	74	PHUR	Port Huron WWTP	PHUR-MI0023833-THGRA	SL1811150940GSC-S	Sludge	Combined	THPST	Combined primary and secondary sludge sampled from gravity thickener, no lime and no polymer addition.	No	Land App
56	74	PHUR	Port Huron WWTP	PHUR-MI0023833-THRST	SL1811150945GSC	Sludge	Combined	THPST	Combined primary and secondary sludge. No lime addition, post-polymer addition influent of rotary drum thicker	No	Land App
57	74	PHUR	Port Huron WWTP	PHUR-MI0023833-THRST	SL1811151000GSC	Sludge	Combined	THPST	Combined primary and secondary sludge, sampled immediately after lime and polymer addition. Collected from auger	No	Land App
58	36	RAGN	Genesee Co-Ragnone WWTP	RAGN-MI0022977-STALS	BS1811051445GSC	Biosolids	Stabilization	STALS	Alkaline stabilized biosolids sampled immediately before transfer into truck.	Yes	Land App/Landfill
59	79	SAGN	Saginaw WWTP	SAGI-MI0025577-STALS	BS1811191600GSC	Biosolids	Stabilization	STALS	Anaerobic stabilized biosolids (estimated 6 month storage)	Yes	Land App
60	79	SAGN	Saginaw WWTP	SAGI-MI0025577-PRTSL	SL1811191515GSC	Sludge	Primary	PRTSL	Sludge sampled from primary clarifier	No	Land App
61	79	SAGN	Saginaw WWTP	SAGI-MI0025577-SCTSL	SL1811191530GSC	Sludge	Secondary	SCTSL	Sludge sampled from secondary clarifier	No	Land App
62	81	SAND	Sandusky WWTP	SAND-MI0020222-STAND	SL1811160850GSC-S	Sludge	Stabilization	STAND	Anaerobic stabilized sludge.	Yes	Landfill
63	88	TRAV	Traverse City WWTP	TRAV-MI0027481-STAND	BS1811081315GSC	Biosolids	Stabilization	STAND	Sampled anaerobic digestor outflow	Yes	Land App
64	90	WARR	Warren WWTP	WARR-MI0024295-DWBFP	SL1811151620GSC	Sludge	Combined	DWPST	Combined primary and secondary sludge influent to BFP	Yes	Incinerator
65	90	WARR	Warren WWTP	WARR-MI0024295-DSASH	SL1811151530GSC	Sludge	Ash	DSASH	Ash Lagoon/dry	No	Incinerator

Table 19

Solids Sample Locations

Statewide PFAS Assessment of 42 WWTPs

Nr.	WWTP Nr.	WWTP Code	Facility	Sample Location	Sample ID	Solid_Type	Solid Treatment Process	Treatment Code	Sample Description	Final Treated Solids	Disposal Methods
66	92	WIXO	Wixom WWTP	WIXO-MI0024384-DWBFP	SL1811140930GSC	Sludge	Secondary	DWSCT	Dewatered final treated solids from screw press and polymer addition. No primary sludge generated at Wixom.	Yes	Land App/Landfill
67	92	WIXO	Wixom WWTP	WIXO-MI0024384-IFBFP	SL1811140945GSC-S	Sludge	Secondary	SCTSL	Secondary influent to screw press with no polymer. No primary sludge generated at Wixom.	No	Land App/Landfill
68	92	WIXO	Wixom WWTP	WIXO-MI0024384-STAED	BS1811140830GSC-S	Biosolids	Stabilization	STAED	Aerobic stabilized biosolids (estimated 6 months of storage)	Yes	Land App/Landfill
69	92	WIXO	Wixom WWTP	WIXO-MI0024384-WACSL	SL1811140905GS	Sludge	Secondary	SCTSL	Waste activated sludge (WAS) sampled prior to biological sludge storage	No	Land App/Landfill
70	93	WYOM	Wyoming WWTP	WYOM-MI0024392-STALS	BS1810291030GC	Biosolids	Stabilization	STALS	Alkaline stabilized biosolids after thickening by centrifugation.	Yes	Land App/Landfill
71	94	YCUA	YCUA Regional WWTP	YCUA-MI0042676-DWBFP	SL1811020930GSC	Sludge	Combined	DWPST	Combined primary and secondary sample from gravity belt prior to incineration	Yes	Incinerator/Landfill

Legend:

Solid Treatment Process	Treatment Code	Treatment Process Description
Primary	**PRTSL**	Primary treatment sludge
Primary	**THPRT**	Primary treatment thickened sludge
Secondary	**SCTSL**	Secondary treatment sludge
Secondary	**THSCT**	Secondary treatment thickened sludge
Secondary	**DWSCT**	Dewatered secondary treatment sludge.
Combined	**PSTSL**	Primary and secondary treatment combined sludge
Combined	**THPST**	Primary and secondary treatment thickened sludge
Combined	**DWPST**	Dewatered primary and secondary treatment
Combined	**DWPST**	Dewatered primary and secondary treatment

Solid Treatment Process	Treatment Code	Treatment Process Description
Stabilized - Alkaline	**STALS**	Alkaline stabilized biosolids
Stabilized-Anaerobically	**STAND**	Anaerobically stabilized biosolids
Stabilized-Anaerobically	**DWAND**	Dewatered anaerobically stabilized biosolids
Stabilized - Aerobically	**STAED**	Aerobically stabilized biosolids.
Stabilized - Aerobically	**DWAED**	Dewatered aerobically stabilized biosolids
Stabilized - Lagoon	**STLAG**	Stabilized biosolids in lagoons
Incineration - ASH	**DSASH**	Ash from Incineration
Soil	**SOIL**	Soil impacted with irrigation wastewater rapid infiltration beds

Land Application Group:	Final treated solids from WWTPs that today are considered either biosolids or sludge that might be applied on agricultural fields or have been applied in the past.

Table 20

Solids PFAS Sample Results

Statewide PFAS Assessment of 42 WWTPs

Nr.	WWTP Nr.	WWTP Code	Sample Location	Sample ID	Sample Date	Report	Units	Total PFAS	PFBA	PFPeA	PFHxA	PFHpA	PFOA	PFNA	PFDA	PFUnDA	PFDoDA	PFTrDA	PFTeDA	PFBS	PFPeS	PFHxS	PFHpS	PFOS	PFNS	PFDS	FOSA	4:2 FTSA	6:2 FTSA	8:2 FTSA	EtFOSAA	MeFOSAA
1	97	ALPE	ALPE-MI0022195-STAND	BS1811090820GSC	11/9/2018	1803704	µg/Kg	137	< 0.863	< 0.863	1.86	< 0.863	1.36	1.27	11.1	2.72	5.8	0.767	1.38	< 0.863	< 0.863	< 0.863	< 0.863	42.1	< 1.29	1.46	7.96	< 0.863	< 0.863	2.64	18.2	37.9
2	4	AARB	AARB-MI0022217-STALS	BS1811021130GSC-S	11/2/2018	1803610	µg/Kg	27	< 0.801	< 0.801	1.31	< 0.801	< 0.801	< 0.801	1.33	< 0.801	1.05	< 0.801	< 0.801	< 0.801	< 0.801	< 0.801	< 0.801	15.2	< 1.20	< 0.801	< 0.801	< 0.801	< 0.801	< 0.801	1.92	6.66
3	6	BCRK	BCRK-MI0022276-STALS	BS1810311220GC	10/31/2018	1803581	µg/Kg	8	< 0.965	< 0.965	1.94	< 0.965	< 0.965	0.935	< 0.965	0.937	< 0.965	< 0.965	0.886	< 0.965	< 0.965	< 0.965	< 0.965	< 0.965	< 1.45	< 0.965	< 0.965	< 0.965	< 0.965	< 0.965	1.81	1.86
4	6	BCRK	BCRK-MI0022276-THCEN	SL1810311230GC	10/31/2018	1803581	µg/Kg	16	< 0.995	< 0.995	1.45	< 0.995	< 0.995	1.06	1.05	1.02	0.999	< 0.995	< 0.995	< 0.995	< 0.995	< 0.995	< 0.995	3.18	< 1.49	0.844	< 0.995	< 0.995	< 0.995	< 0.995	2.76	3.41
5	7	BAYC	BAYC-MI0022284-DWISP	SL1811191330GSC	11/19/2018	1803773	µg/Kg	18	< 0.934	< 0.934	< 0.934	< 0.934	< 0.934	< 0.934	< 0.934	< 0.934	1.15	< 0.934	< 0.934	< 0.934	1.86	< 0.934	< 0.934	8.95	< 1.40	0.91	< 0.934	< 0.934	< 0.934	< 0.934	2.5	2.41
6	7	BAYC	BAYC-MI0022284-IFISP	SL1811191300GSC-S	11/19/2018	1803773	µg/Kg	16	< 0.691	< 0.691	< 0.691	< 0.691	< 0.691	< 0.691	< 0.691	< 0.691	1.14	< 0.691	< 0.691	< 0.691	< 0.691	< 0.691	< 0.691	7.16	< 1.04	3.14	< 0.691	< 0.691	< 0.691	< 0.691	2.15	1.94
7	14	BRON	BRON-MI0020729-STAND	BS1810311445GC	10/31/2018	1803576	µg/Kg	1,173	1.66	4.07	7.91	0.885	3.86	1.18	13.3	1.97	7.97	< 0.981	1.94	1.32	< 0.981	< 0.981	< 0.981	1060	< 1.47	17.6	5.03	< 0.981	8.17	3.21	8.26	24.7
8	99	COMM	COMM-MI0025071-DWBFP	SL1811141130GSC	11/14/2018	1803710	µg/Kg	102	2.15	10.4	10.7	1.15	14.1	1.92	18.9	1.9	4.85	0.934	1.54	6.14	< 0.987	< 0.987	< 0.987	12.7	< 1.48	1.83	2.02	< 0.987	< 0.987	< 0.987	2.96	8.12
9	23	DELH	DELH-MI0022781-STAND	BS1811011030GSC	11/1/2018	1803608	µg/Kg	34	< 1.00	< 1.00	0.916	< 1.00	< 1.00	< 1.00	1.08	< 1.00	1.43	< 1.00	< 1.00	13	< 1.00	< 1.00	< 1.00	2.68	< 1.50	2.08	< 1.00	< 1.00	< 1.00	< 1.00	4.92	7.98
10	25	DEXT	DEXT-MI0022829-STAND	BS1811021245GSC-S	11/2/2018	1803611	µg/Kg	59	< 0.944	< 0.944	3.88	< 0.944	< 0.944	1.3	5.32	1.91	4.74	< 0.944	1.43	< 0.944	< 0.944	< 0.944	< 0.944	5.95	< 1.42	11.1	2.5	< 0.944	< 0.944	< 0.944	6.77	14.1
11	27	DRVR	DRVR-MI0021156-DWBFP	SL1811200945GSC	11/20/2018	1803767	µg/Kg	82	< 0.980	3.49	3.34	< 0.980	3.94	< 0.980	7.65	1.32	3.53	< 0.980	0.923	< 0.980	< 0.980	1.3	< 0.980	42.5	< 1.47	1.55	< 0.980	< 0.980	< 0.980	1.83	4.25	6.84
12	27	DRVR	DRVR-MI0021156-PRTSL	SL1811200915GSC	11/20/2018	1803767	µg/Kg	46	< 0.903	< 0.903	0.828	< 0.903	< 0.903	< 0.903	3.83	1.07	3.08	< 0.903	0.78	< 0.903	< 0.903	< 0.903	< 0.903	27.8	< 1.35	1.57	< 0.903	< 0.903	< 0.903	1.12	2.72	3.47
13	27	DRVR	DRVR-MI0021156-WACSL	SL1811200900GSC	11/20/2018	1803767	µg/Kg	72	< 0.951	< 0.951	1.37	< 0.951	1.88	< 0.951	7.51	1.35	3.1	< 0.951	0.948	< 0.951	< 0.951	1.35	< 0.951	41	< 1.43	< 0.951	< 0.951	< 0.951	0.922	2.28	4.07	5.81
14	101	ELAN	ELAN-MI0022853-DWBFP	SL1811010800GSC	11/1/2018	1803606	µg/Kg	21	< 0.997	< 0.997	2.24	< 0.997	0.886	< 0.997	2.26	< 0.997	1.08	< 0.997	< 0.997	< 0.997	< 0.997	< 0.997	< 0.997	4.94	< 1.50	1.26	< 0.997	< 0.997	< 0.997	< 0.997	3.3	4.98
15	32	FLIN	FLIN-MI0022926-PSTSL	SL1811051145GSC-S	11/5/2018	1803698	µg/Kg	39	< 0.946	< 0.946	< 0.946	< 0.946	< 0.946	< 0.946	0.929	1.99	2.03	< 0.946	0.895	< 0.946	< 0.946	1.88	< 0.946	11.6	< 1.42	13.2	< 0.946	< 0.946	< 0.946	< 0.946	3.17	3.27
16	32	FLIN	FLIN-MI0022926-DWBFP	SL1811051130GSC	11/5/2018	1803698	µg/Kg	44	< 0.976	< 0.976	0.905	< 0.976	< 0.976	< 0.976	1.09	2.24	2.41	< 0.976	0.928	< 0.976	< 0.976	< 0.976	< 0.976	13.5	< 1.46	14.8	0.83	< 0.976	1.05	< 0.976	3.38	3.32
17	102	GAYL	GAYL-GW1810128-STAED	BS1811080930GSC	11/8/2018	1803702	µg/Kg	215	5.95	21.5	28.4	2.55	17.7	3.89	19.7	1.88	5.08	< 1.00	1.97	22.2	< 1.00	0.974	< 1.00	55	< 1.50	< 1.00	9.72	< 1.00	1.82	1.24	5.14	9.81
18	38	GLWA	GLWA-MI0022802-DWBFP	SL1811161350GSC	11/16/2018	1803716	µg/Kg	14	< 0.958	< 0.958	< 0.958	< 0.958	< 0.958	< 0.958	< 0.958	< 0.958	< 0.958	< 0.958	< 0.958	< 0.958	< 0.958	< 0.958	< 0.958	7.07	< 1.44	< 0.958	< 0.958	< 0.958	3.8	< 0.958	1.93	1.4
19	38	GLWA	GLWA-MI0022802-DSASH	SL1811161410GSC	11/16/2018	1803716	µg/Kg	ND	< 0.870	< 0.870	< 0.870	< 0.870	< 0.870	< 0.870	< 0.870	< 0.870	< 0.870	< 0.870	< 0.870	< 0.870	< 0.870	< 0.870	< 0.870	< 0.870	< 1.30	< 0.870	< 0.870	< 0.870	< 0.870	< 0.870	< 0.870	< 0.870
20	38	GLWA	GLWA-MI0022802-DSPAL	SL1811161615GSC	11/16/2018	1803716	µg/Kg	19	< 0.875	< 0.875	1.46	< 0.875	1.12	< 0.875	0.776	< 0.875	0.953	< 0.875	< 0.875	< 0.875	< 0.875	< 0.875	< 0.875	9.44	< 1.31	1.15	< 0.875	< 0.875	< 0.875	< 0.875	2.13	1.53
21	38	GLWA	GLWA-MI0022802-THPR	SL1811161450GSC-S	11/16/2018	1803716	µg/Kg	9	< 0.919	< 0.919	< 0.919	< 0.919	< 0.919	< 0.919	< 0.919	< 0.919	< 0.919	< 0.919	< 0.919	< 0.919	< 0.919	< 0.919	< 0.919	4.7	< 1.38	1.11	< 0.919	< 0.919	2.27	< 0.919	1.4	< 0.919
22	38	GLWA	GLWA-MI0022802-THSCT	SL1811161520GSC-S	11/16/2018	1803716	µg/Kg	53	< 0.957	< 0.957	0.938	< 0.957	1.12	< 0.957	1.3	< 0.957	1.44	< 0.957	0.811	< 0.957	< 0.957	< 0.957	< 0.957	20.7	< 1.44	0.908	< 0.957	< 0.957	14.1	1.17	5.69	4.52
23	38	GLWA	GLWA-MI0022802-THPST	SL1811161355GSC	11/16/2018	1803716	µg/Kg	16	< 0.975	< 0.975	< 0.975	< 0.975	< 0.975	< 0.975	< 0.975	< 0.975	< 0.975	< 0.975	< 0.975	< 0.975	< 0.975	< 0.975	< 0.975	6.61	< 1.46	2.1	< 0.975	< 0.975	4.36	< 0.975	1.55	1.06
24	40	GRAP	GRAP-MI0026069-DWCEN	SL1810291445GC	10/29/2018	1803553	µg/Kg	74	< 1.00	< 1.00	3.52	< 1.00	0.922	< 1.00	1.67	< 1.00	1	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	21.8	< 1.50	< 1.00	< 1.00	< 1.00	29.4	1.63	7.03	7.13
25	40	GRAP	GRAP-MI0026069-PRTSL	SL1810291530GC	10/29/2018	1803553	µg/Kg	162	< 0.981	1.04	1.85	< 0.981	8.34	< 0.981	< 0.981	< 0.981	< 0.981	< 0.981	< 0.981	< 0.981	< 0.981	< 0.981	< 0.981	25.9	< 1.47	< 0.981	< 0.981	< 0.981	114	2.17	4.43	4.75
26	40	GRAP	GRAP-MI0026069-THCEN	SL1810291600GC	10/29/2018	1803553	µg/Kg	155	3	29.7	24.1	1.69	3.87	< 1.24	4.78	< 1.24	2.51	< 1.24	< 1.24	2.72	< 1.24	< 1.24	< 1.24	43.6	< 1.85	< 1.24	< 1.24	< 1.24	6.23	2.76	13.9	15.8
27	47	HOLL	HOLL-MI0023108-STALS	BS1810301350GC	10/30/2018	1803578	µg/Kg	22	< 0.988	< 0.988	3.02	< 0.988	< 0.988	< 0.988	< 0.988	< 0.988	< 0.988	< 0.988	< 0.988	< 0.988	< 0.988	< 0.988	< 0.988	5.89	< 1.48	< 0.988	< 0.988	< 0.988	7.61	< 0.988	1.84	3.8
28	49	HOWE	HOWE-MI0021113-DWBFP	SL1811131115GSC	11/13/2018	1803707	µg/Kg	52	< 0.979	1.07	3.37	< 0.979	1.67	< 0.979	5.13	1.1	2.77	< 0.979	< 0.979	< 0.979	< 0.979	2.09	< 0.979	21	< 1.47	1.92	1.24	< 0.979	3.09	< 0.979	3.13	4.69
29	49	HOWE	HOWE-MI0021113-PRTSL	SL1811131125GSC-S	11/13/2018	1803707	µg/Kg	10	< 0.653	< 0.653	< 0.653	< 0.653	< 0.653	< 0.653	1.19	< 0.653	0.593	< 0.653	< 0.653	< 0.653	< 0.653	< 0.653	< 0.653	5.24	< 0.980	0.982	< 0.653	< 0.653	< 0.653	< 0.653	0.813	0.789
30	77	HURO	HURO-MI0043800-STALS	BS1811201145GSC	11/20/2018	1803768	µg/Kg	75	9.29	< 0.987	1.45	< 0.987	2.46	< 0.987	3.95	1.86	7.06	1.16	1.94	18.3	< 0.987	< 0.987	< 0.987	< 0.987	< 1.48	< 0.987	< 0.987	< 0.987	2.5	< 0.987	11.1	14.2
31	77	HURO	HURO-MI0043800-STALS	BS1811201215GSC-S	11/20/2018	1803768	µg/Kg	32	2.67	< 0.761	0.828	< 0.761	0.913	< 0.761	1.48	0.711	1.65	< 0.761	< 0.761	< 0.761	< 0.761	< 0.761	< 0.761	8.47	< 1.14	5.19	< 0.761	< 0.761	< 0.761	< 0.761	4.26	6.2
32	77	HURO	HURO-MI0043800-THGRA	SL1811201130GSC-S	11/20/2018	1803768	µg/Kg	50	10.1	0.782	1.18	< 0.904	1.09	< 0.904	2.28	1.29	4.62	< 0.904	1.36	3.76	< 0.904	< 0.904	< 0.904	7.05	< 1.36	3.34	< 0.904	< 0.904	1.14	< 0.904	5.75	6.33
33	50	IONA	IONA-MI0021041-STAND	BS1810310830GC-S	10/31/2018	1803583	µg/Kg	1,006	< 0.990	< 0.990	4.36	< 0.990	< 0.990	< 0.990	< 0.990	< 0.990	< 0.990	< 0.990	< 0.990	< 0.990	< 0.990	< 0.990	< 0.990	983	< 1.49	6.91	< 0.990	< 0.990	2,050	136	4.44	7.07
34	52	JACK	JACK-MI0023256-STAND	BS1811050900GSC-S	11/5/2018	1803697	µg/Kg	88	< 0.928	< 0.928	2.54	< 0.928	0.797	0.907	5.64	1.66	4.26	< 0.928	1.74	< 0.928	< 0.928	< 0.928	< 0.928	19.5	< 1.39	5.3	3.99	< 0.928	< 0.928	< 0.928	10.3	31.2
35	52	JACK	JACK-MI0023256-DWDRB	BS1811050930GSC	11/5/2018	1803697	µg/Kg	155	< 0.713	< 0.713	3.07	0.805	4.41	2.01	8.17	2.25	4.73	0.884	1.63	< 0.713	< 0.713	< 0.713	< 0.713	90.6	< 1.07	2.04	2.85	< 0.713	0.765	2.25	7.48	21.2
36	53	KZOO	KZOO-MI0023299-DWBFP	BS1810301620GC	10/30/2018	1803577	µg/Kg	18	< 1.00	4.79	< 1.00	< 1.00	< 1.00	< 1.00	1.28	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	6.49	< 1.50	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	2.18	2.94
37	53	KZOO	KZOO-MI0023299-THPCL	SL1810301640GC	10/30/2018	1803577	µg/Kg	5	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	3.04	< 1.50	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	1.18	0.945
38	53	KZOO	KZOO-MI0023299-THSCL	SL1810301650GC	10/30/2018	1803577	µg/Kg	33	< 0.944	< 0.944	1.32	< 0.944	1.81	0.981	3.11	< 0.944	0.92	< 0.944	< 0.944	< 0.944	< 0.944	< 0.944	< 0.944	15.2	< 1.42	< 0.944	< 0.944	< 0.944	< 0.944	< 0.944	3.69	6.21
39	54	SAWY	SAWY-MI0021423-STAED	BS1811071100GSC-S	11/7/2018	1803701	µg/Kg	662	2.18	5.28	5.34	3.56	25.4	39.9	19.7	78	5.85	25.6	1.79	3	< 0.626	11	2.87	387	0.981	7.65	10.9	< 0.626	1.02	3.49	5.74	15.6
40	54	SAWY	SAWY-MI0021423-WACSL	SL1811071140GSC-S	11/7/2018	1803701	µg/Kg	211	< 0.990	< 0.990	< 0.990	< 0.990	< 0.990	1.27	2.97	37.2	1.28	14.7	< 0.990	< 0.990	< 0.990	0.856	< 0.990	133	< 1.48	< 0.990	4.02	< 0.990	< 0.990	2.82	3.88	9.31
41	56	LANS	LANMI0023400-STALS	BS1811011400GSC	11/1/2018	1803607	µg/Kg	28	< 0.998	< 0.998	1.56	< 0.998	< 0.998	< 0.998	3.03	1.51	3.04	< 0.998	< 0.998	< 0.998	< 0.998	< 0.998	< 0.998	5.08	< 1.50	< 0.998	1.46	< 0.998	< 0.998	< 0.998	4.42	7.65
42	56	LANS	LANMI0023400-DWBFP	SL1811011315GSC	11/1/2018	1803607	µg/Kg	40	< 1.00	< 1.00	10.4	< 1.00	< 1.00	< 1.00	2.58	1.51	2.44	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	7.18	< 1.50	1.81	1.77	< 1.00	< 1.00	1.67	3.35	7.47
43	57	LAPR	LAPR-MI0020460-DWDRB	BS1805091705SK	5/9/2018	1800935	µg/Kg	2,358	8.73	26	48	14.8	< 5.58	< 5.58	< 5.58	< 5.58	< 5.58	< 5.58	< 5.58	< 5.58	< 5.58	< 5.58	< 5.58	1680	< 9.45	< 5.58	< 5.58	< 5.58	562	8.51	< 5.58	9.86
44	57	LAPR	LAPR-MI0020460-DWCEN	BS1805091545SK-S	5/9/2018	1800935	µg/Kg	217	< 3.51	5.82	13.2	15.4	4.34	< 3.51	3.94	< 3.51	< 3.51	< 3.51	< 3.51	< 3.51	< 3.51	< 3.51	< 3.51	161	< 5.95	< 3.51	< 3.51	< 3.51	7.41	< 3.51	< 3.51	5.89
45	60	LYON	LYON-GW1810078-STAED	BS1811131545GSC	11/13/2018	1803708	µg/Kg	133	2.26	7.59	4.6	< 0.955	25.1	2.62	47.7	1.66	11.7	< 0.955	3.22	8.12	< 0.955	< 0.955	< 0.955	6.35	< 1.43	< 0.955	1.34	< 0.955	< 0.955	< 0.955	3.74	6.77
46	103	MARQ	MARQ-MI0023531-DWBFP	BS1811070945GSC	11/7/2018	1803700	µg/Kg	104	< 0.997	1.55	9.58	< 0.997	2.72	2.46	7.1	2.53	3	< 0.997	1.09	< 0.997	< 0.997	< 0.997	< 0.997	43	< 1.50	4.27	3.85	< 0.997	< 0.997	< 0.997	7.52	15.5
47	105	MIDL	MIDL-MI0023582-STAND	BS1811190945GSC	11/19/2018	1803772	µg/Kg	92	< 0.840	< 0.840	3.6	< 0.840	1.93	1.37	6.15	1.19	3.18	< 0.840	1.56	< 0.840	< 0.840	< 0.840	< 0.840	12.7	< 1.26	6.22	2.32	< 0.840	< 0.840	1.09	12.8	37.5
48	64	MONR	MONR-MI0028401-DWISP	SL1811201510GSC	11/20/2018	1803771	µg/Kg	34	< 0.958	1.39	< 0.958	< 0.958	< 0.958	< 0.958	2.48	1.27	2.05	< 0.958	< 0.958	< 0.958	< 0.958	< 0.958	< 0.958	10.9	< 1.44	3.16	1.35	< 0.958	< 0.958	< 0.958	5.29	5.65
49	65	MTCL	MTCL-MI0023647-STAED	BS1811151230GSC	11/15/2018	1803713	µg/Kg	95	< 0.998	1.49	1.96	< 0.998	6.43	1.85	12.3	1.87	3.91	< 0.998	1.3	< 0.998	< 0.998	< 0.998	< 0.998	24.7	< 1.50	2.5	5.23	< 0.998	< 0.998	< 0.998	14.7	16.4
50	66	MUSK	MUSK-MI0027391-DWDRB	SL1810301040GC	10/30/2018	1803575	µg/Kg	87	< 0.994	< 0.994	0.867	1.36	8.42	4.46	8.74	2.75	2.62	< 0.994	< 0.994	< 0.994	< 0.994	< 0.994	< 0.994	11.3	< 1.49	3.1	< 0.994	< 0.994	< 0.994	2.51	13.4	27.1
51	69	NKEN	NKEN-MI0057419-DWISP	SL1810290940GC	10/29/2018	1803551	µg/Kg	332	8.1	41.9	24.2	< 1.74	11	1.93	12.3	< 1.74	3.27	< 1.74	< 1.74	6.82	< 1.74	< 1.74	< 1.74	160	< 2.61	< 1.74	4.77	< 1.74	< 1.74	< 1.74	37	21.2
52	107	OSCO	OSCO-GW1810213-DWDRB	SO1811091245GSC	11/9/2018	1803705	µg/Kg	6	< 0.994	< 0.994	< 0.994	< 0.994	< 0.994	< 0.994	< 0.994	< 0.994	< 0.994	< 0.994	< 0.994	< 0.994	< 0.994	< 0.994	< 0.994	2.93	< 1.49	< 0.994	< 0.994	< 0.994	2.98	< 0.994	< 0.994	< 0.994
53	73	PONT	PONT-MI0023825-DWBFP	BS1811141455GSC	11/14/2018	1803711	µg/Kg	29	< 1.00	< 1.00	1.13	< 1.00	< 1.00	< 1.00	2.17	< 1.00	1.43	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	7.31	< 1.50	2.73	1.68	< 1.00	< 1.00	< 1.00	7.61	5.29
54	74	PHUR	PHUR-MI0023833-STALS	BS1811151015GSC-S	11/15/2018	1803712	µg/Kg	196	< 0.918	0.918	1.64	0.877	4.42	2.88	12.5	7.09	4.39	1.31	1.73	< 0.918	< 0.918	1.27	< 0.918	77.6	< 1.38	7.21	5.26	< 0.918	1.64	12.8	27.1	25.7
55	74	PHUR	PHUR-MI0023833-THGRA	SL1811150940GSC-S	11/15/2018	1803712	µg/Kg	72	< 0.830	1.09	1.56	0.914	4.18	1.4	6.53	1.75	2.11	< 0.830	0.881	< 0.830	< 0.830	1.11	< 0.830	23.6	< 1.24	3.68	1.31	< 0.830	< 0.830	1.84	8.73	11.6
56	74	PHUR	PHUR-MI0023833-THRST	SL1811150945GSC	11/15/2018	1803712	µg/Kg	48	< 0.822	0.758	1.05	< 0.822	2.81	0.966	4.54	1.15	1.58	< 0.822	< 0.822	< 0.822	< 0.822	< 0.822	< 0.822	17.7	< 1.23	2.08	< 0.822	< 0.822	< 0.822	1.34	6.13	7.85
57	74	PHUR	PHUR-MI0023833-THRST	SL1811151000GSC	11/15/2018	1803712	µg/Kg	53	< 0.958	0.977	1.93	< 0.958	3.23	1.52	4.82	1.4	1.61	< 0.958	0.838	< 0.958	< 0.958	< 0.958	< 0.958	20.5	< 1.44	< 0.958	< 0.958	< 0.958	< 0.958	1.4	7.44	7.76
58	36	RAGN	RAGN-MI0022977-STALS	BS1811051445GSC	11/5/2018	1803699	µg/Kg	83	< 0.999	< 0.999	2.59	< 0.999	1.66	3.74	5.61	2.03	3.08	< 0.999	< 0.999	< 0.999	< 0.999	< 0.999	< 0.999	15.7	< 1.50	2.57	2.82	< 0.999	< 0.999	0.888	19.1	23.6
59	79	SAGN	SAGI-MI0025577-STALS	BS1811191600GSC	11/19/2018	1803774	µg/Kg	13	< 1.72	< 1.72	< 1.72	< 1.72	< 1.72	< 1.72	< 1.72	< 1.72	< 1.72	< 1.72	< 1.72	< 1.72	< 1.72	< 1.72	< 1.72	2.18	< 2.58	2.59	< 1.72	< 1.72	< 1.72	< 1.72	3.17	4.56
60	79	SAGN	SAGI-MI0025577-PRTSL	SL1811191515GSC	11/19/2018	1803774	µg/Kg	21	< 0.788	< 0.788	< 0.788	< 0.788	< 0.788	< 0.788	0.891	< 0.788	1.55	< 0.788	< 0.788	< 0.788	< 0.788	< 0.788	< 0.788	4.78	< 1.18	3.18	< 0.788	< 0.788	< 0.788	< 0.788	4.76	5.68
61	79	SAGN	SAGI-MI0025577-SCTSL	SL1811191530GSC	11/19/2018	1803774	µg/Kg	49	< 1.10	0.972	0.957	< 1.10	< 1.10	< 1.10	3.89	1.46	2.7	< 1.10	< 1.10	< 1.10	< 1.10	< 1.10	< 1.10	10.7	< 1.66	2.24	2.4	< 1.10	< 1.10	< 1.10	9.63	14.1
62	81	SAND	SAND-MI0020222-STAND	SL1811160850GSC-S	11/16/2018	1803715	µg/Kg	94	< 0.964	< 0.964	2.32	< 0.964	0.902	5.43	1.82	6.97	4	1.28	1.81	1.09	< 0.964	0.944	< 0.964	12.8	< 1.45	11.7	2.61	< 0.964	< 0.964	< 0.964	15.4	24.5
63	88	TRAV	TRAV-MI0027481-STAND	BS1811081315GSC	11/8/2018	1803703	µg/Kg	79	< 0.997	1.03	3.32	< 0.997	4.16	1.68	13.5	1.62	3.24	< 0.997	0.879	< 0.997	< 0.997	< 0.997	< 0.997	13.6	< 1.49	2.15	3.92	< 0.997	1.29	2.3	8.14	18.4
64	90	WARR	WARR-MI0024295-DWBFP	SL1811151620GSC	11/15/2018	1803714	µg/Kg	22	< 0.997	< 0.997	< 0.997	< 0.997	< 0.997	< 0.997	2.12	< 0.997	1.65	< 0.997	< 0.997	< 0.997	< 0.997	< 0.997	< 0.997	9.19	< 1.50	< 0.997	< 0.997	< 0.997	< 0.997	< 0.997	4.14	5.39
65	90	WARR	WARR-MI0024295-DSASH	SL1811151530GSC	11/15/2018	1803714	µg/Kg	ND	< 0.992	< 0.992	< 0.992	< 0.992	< 0.992	< 0.992	< 0.992	< 0.992	< 0.992	< 0.992	< 0.992	< 0.992	< 0.992	< 0.992	< 0.992	< 0.992	< 1.49	< 0.992	< 0.992	< 0.992	< 0.992	< 0.992	< 0.992	< 0.992
66	92	WIXO	WIXO-MI0024384-DWBFP	SL1811140930GSC	11/14/2018	1803709	µg/Kg	1,510	14	67.6	99.6	61.3	4.58	4.38	7.28	1.91	3.17	< 0.963	1.2	2.18	< 0.963	< 0.963	< 0.963	1200	3.28	5.65	1.47	< 0.963	21.8	4.88	1.45	4.52
67	92	WIXO	WIXO-MI0024384-IFBFP	SL1811140945GSC-S	11/14/2018	1803709	µg/Kg	1,268	4.58	23.6	19.8	15.5	1.72	2.75	5.17	1.33	2.22	< 0.971	1.05	0.828	< 0.971	< 0.971	< 0.971	1090	2.25	2.46	1.66	< 0.971	83.5	4.14	1.12	4.64
68	92	WIXO	WIXO-MI0024384-STAED	BS1811140830GSC-S	11/14/2018	1803709	µg/Kg	2,324	4.3	18.1	20.1	14.4	1.73	2.41	6.21	2.1	2.86	< 0.914	0.809	< 0.914	< 0.914	< 0.914	4.65	2150	4.74	3.75	3.61	< 0.914	59.5	10	2.08	12.6
69	92	WIXO	WIXO-MI0024384-WACSL	SL1811140905GS-S	11/14/2018	1803709	µg/Kg	733	2.91	12.9	16.2	10.1	1.33	2.34	4.32	1.41	2.41	< 0.974	< 0.974	< 0.974	< 0.974	< 0.974	< 0.974	666	1.59	2.46	< 0.974	< 0.974	144	5.52	0.978	2.98
70	93	WYOM	WYOM-MI0024392-STALS	BS1810291030GC	10/29/2018	1803552	µg/Kg	32	< 1.00	< 1.00	2.59	< 1.00	< 1.00	< 1.00	1.19	< 1.00	1.18	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	15	< 1.50	< 1.00	1.03	< 1.00	< 1.00	1.04	2.2	7.87
71	94	YCUA	YCUA-MI0042676-DWBFP	SL1811020930GSC	11/2/2018	1803609	µg/Kg	33	< 0.998	< 0.998	1.3	< 0.998	1.41	0.9	5.83	1.18	1.92	< 0.998	< 0.998	< 0.998	< 0.998	< 0.998	< 0.998	7.75	< 1.50	< 0.998	< 0.998	< 0.998	< 0.998	< 0.998	3.84	8.73

Notes:

"**< #** " = Values Below the Detection Limit (**DL**)

Perfluoroalkyl Carboxylic Acids (**PFCAs**)
Perfluoroalkane Sulfonic Acids (**PFSAs**)
Perfluoroalkane Sulfonamides (**FASAs**)
Fluorotelomer Sulfonic Acids (**FTSAs**)
N-Ethyl Perfluoroalkane Sulfonamidoacetic Acids (**EtFASAAs**)
N-Methyl Perfluoroalkane Sulfonamidoacetic Acids (**MeFASAAs**)

PFBA = Perfluorobutanoic acid
PFPeA = Perfluoropentanoic acid
PFHxA = Perfluorohexanoic acid
PFHpA = Perfluoroheptanoic acid
PFOA = Perfluorooctanoic acid
PFNA = Perfluorononanoic acid

PFDA = Perfluorodecanoic acid
PFUnDA = Perfluoroundecanoic acid
PFDoDA = Perfluorododecanoic acid
PFTrDA = Perfluorotridecanoic acid
PFTeDA = Perfluorotetradecanoic acid
PFBS = Perfluorobutane sulfonic acid

PFPeS = Perfluoropentane sulfonic acid
PFHxS = Perfluorohexane sulfonic acid
PFHpS = Perfluoroheptane sulfonic acid
PFOS = Perfluorooctane sulfonic acid
PFNS = Perfluorononane sulfonic acid
PFDS = Perfluorodecane sulfonic acid

FOSA = Perfluorooctane sulfonamide
4:2 FTSA = 4:2 Fluorotelomer sulfonic acid
6:2 FTSA = 4:2 Fluorotelomer sulfonic acid
8:2 FTSA = 4:2 Fluorotelomer sulfonic acid
EtFOSAA = N-Ethyl perfluorooctane sulfonamidoacetic acid
MeFOSAA = N-Methyl perfluorooctane sulfonamidoacetic acid

Table 21

PFOA, PFOS, and Total PFAS Summary Results for Influent, Effluent, and Final Treated Solids

Statewide PFAS Assessment of 42 WWTPs

Nr.	WWTP #	Facility Name	Influent			Effluent			Sludge/Biosolids				Sample Date	Additional Comments
			PFOA (ng/l)	PFOS (ng/l)	Total PFAS (ng/l)	PFOA (ng/l)	PFOS (ng/l)	Total PFAS (ng/l)	PFOA (µg/Kg)	PFOS (µg/Kg)	Total PFAS (µg/Kg)	Final Treated Solids Sample Location		
1	97	Alpena WWTP	5.94	5.44	51.05	7.49	5.07	73.39	1.36	42.1	136	Anaerobic Digestor	11/9/2018	
2	4	Ann Arbor WWTP	2.91	16.5	88.76	4.42	14.8	112.85	<0.801	15.2	27.47	Lime Stabilized Solids*	11/2/2018	*2 days after stabilization
3	6	Battle Creek WWTP	7.25	3.28	46.78	8.43	5.14	72.10	<0.97	<0.97	8.37	Lime Stabilized Solids*	10/31/2018	*2 hours of stabilization
4	7	Bay City WWTP	4.87	18.20	69.19	5.39*	15.80*	76*	<0.93[1]	8.951	17.781	Inclined Screw Press Effluent (Primary and Secondary)	11/19/2018	* Effluent after GAC tank, before UV | [1]Dewatered solids after polymer
5	14	Bronson WWTP	<2.22	843	2,219	2.4	169	290	3.86	1,060	1,173	Anaerobic Digestor	10/31/2018	
6	99	Commerce Twp. WWTP	17.9	6.38	104	15.5	1.92	146	14.10	12.70	102	Belt Filter Press*	11/14/2018	*Primary and Secondary Treatment
7	23	Delhi Twp. WWTP	<2.13	<2.13	5.12	2.33	1.76	20.57	<1.00	2.68	34.09	Anaerobic Digestor	11/1/2018	
8	25	Dexter WWTP	<2.11	<2.11	11.53	7.97	1.51	105	<0.94	5.95	59.00	Anaerobic Digestor	11/2/2018	
9	27	Downriver WTF	7.20	22.20	83.58	12.70	7.93	87.81	3.94	42.50	82.46	Belt Filter Press*	11/20/2018	
10	101	East Lansing WRRF	2.21	<2.16	17.95	3.28	2.01	37.53	0.89	4.94	20.95	Belt Filter Press*	11/1/2018	*Primary and Secondary Treatment
11	32	Flint WWTP	4.83/6.35[1]	26.6/34.8[1]	77.44/97.24[1]	4.50	14.80	96.25	<0.98	13.50	44.45	Belt Filter Press[2]	11/5/2018	[1]Without/with return flow | [2]Primary and Secondary Treatment
12	33	Fowlerville WWTP	<2.03	<2.03	6.78	7.6	1.47	62.11	*	*	*	*	11/5/2018	*Did not collect solids
13	102	Gaylord WWTP	<2.02	<2.02	16.83	8.72	4.26	161	17.70	55.00	214	Aerobic Digestor	11/13/2018	
14	38	GLWA WRRF	6.02[1]/9.1[2]/4.64[3]	7.54[1]/15.6[2]/10.7[3]	71.24[1]/117[2]/53.13[3]	6.7[4]/7.18[5]	9.68[4]/9.31[5]	119[4]/125[5]	<0.87[6]/1.12[7]/<0.96[8]	<0.87[6]/9.44[7]/7.07[8]	ND[6]/18.56[7]/14.2[8]	see notes	11/16/2018	[1]NIEA, [2]Oakwood, [3]Jefferson, [4]049B in Plant, [5]049F Zug Island, [6]Ash from Incinerator, [7]Pellets, [8]Cake from Belt Filter Press - primary and secondary
15	40	Grand Rapids WRRF	5.06	12.70	72.14	11.40	35.60	403	0.92	21.80	74.10	Dewatered Solids*	11/16/2018	*Primary and Secondary Treatment
16	47	Holland WWTP	5.73/3.20[1]	3.79/<2.19[1]	36.85/15.73[1]	4.67	2.41	42.71	< 0.98	5.89	22.16	Lime Stabilized Solids[2]	10/30/2018	[1]North Influent/South Influent | [2]Collected from the sludge tank
17	49	Howell WWTP	4.42	<2.07	12.89	7.39	4.87	70.61	1.67	21.00	52.27	Belt Filter Press*	11/13/2018	*Primary and Secondary Treatment
18	77	S. Huron Valley UA WWTP	3.76	<2.14	17.72	6.69	5.33	102	2.46/0.913[1]	<0.987/8.47[1]	75.27/32.37[1]	Lime Stabilized Solids	11/20/2018	[1]One(1) day of stabilization/Sludge cell (15 ft total depth)
19	50	Ionia WWTP	<2.23	213	8,667	<2.15	635	143,360	<0.99	983	1,006	Anaerobic Digestor	10/31/2018	
20	52	Jackson WWTP	<2.28	5.98	15.80	3.38	3.17	60.38	0.80/4.41[1]	19.50/90.60[1]	87.83/155[1]	Anaerobic Digestor/Drying Bed[1]	11/5/2018	[1]One (1) week old constantly blend/No land application in the last 2 years
21	53	Kalamazoo WWTP	8.43	26	88.06	9.81	5.79	85.93	<1.00	6.49	17.68	Belt Filter Press*	10/30/2018	*Primary and Secondary Treatment
22	54	KI Sawyer WWTP	<2.04/<2.09[1]	5.77/81.00[1]	23.27/156[1]	10.20	62.00	132.64	25.40	387	662	Aerobic Stabilized - Storage Tank[2]	11/7/2018	[1]Residential/Industrial | [2]Estimated to be 2 weeks old
23	56	Lansing WWTP	4.98	<2.16	35.09	7.58	5.51	107	<1.00/<1.00[1]	5.08/7.18[1]	27.75/40.18[1]	Lime Stabilized Solids/ Belt Filter Press[1]	11/1/2018	[1]Estimated to be 2-6 months old/Primary and secondary treatment
24	57	Lapeer	*	*	*	5.03	28.70	374	<5.58	1680.00	2358.00	Drying Beds[1]	5/9/2018	*Not sampled during initial sampling period [1]Dewatered biosolids collected from drying beds.
25	60	Lyon Twp. WWTP	<2.28	<2.28	7.50	15.40	<2.01	111	25.10	6.35	133	Biosolids Storage Tank	11/13/2018	
26	103	Marquette WWTP	3.27	10.30	38.63	6.56	10.70	86.17	2.72	43.00	104	Belt Filter Press*	11/7/2018	*Anaerobic stabilized biosolids cake from BFP.
27	105	Midland WWTP	10.30	2.72	69.92	10.50	4.03	79.02	1.93	12.70	91.61	Storage Tank*	11/19/2018	*Anaerobic stabilized sludge
28	64	Monroe WWTP	2.89	5.50	33.17	5.35	5.46	50.31	<0.958	10.90	33.54	Screw Press*	11/20/2018	*Primary and Secondary Treatment
29	65	Mt. Clemens WWTP	4.60	5.02	40.62	9.03	3.40	92.21	6.43	24.70	93.21	Storage Tank*	11/15/2018	*Biosolids were 1 week old
30	66	Muskegon Co WWMS Metro WWTP	11.7	10.5	48.82	31.70	16.20	124	8.42	11.30	86.63	Drying Beds*	10/30/2018	*Biosolids stabilized using lagoons
31	69	North Kent S A WWTP	11.2	31.1	80.41	21.2	12.5	389	11.00	160	332	Screw Press*	11/29/2018	*Aerobic digested solids
32	107	Oscoda Twp. WWTP Wurtsmith	4.42	38.20	62.21	12.40	75.80	153	*	*	*	*	11/9/2018	*Did not collect treated solids only soil
33	73	Pontiac WWTP - Oakland Co.	4.94	7.68	42.43	38.10	20.00	169	<1.00	7.31	29.35	Belt Filter Press*	11/14/2018	*Dewatered biosolids after anaerobic digestion
34	74	Port Huron WWTP	64.60	19.50	361	44.80	13.10	336	4.42	77.60	196	Lime Stabilized Solids*	11/15/2018	*Storage tank about 2 months old
35	36	Genesee Co-Ragnone WWTP	4.00	5.22	45.88	7.23	4.72	73.64	1.66	15.70	83.39	Lime Stabilized Solids*	11/5/2018	*Sampled before transfer into truck
36	79	Saginaw WWTP	2.56	4.19	25.93	4.58	4.13	42.42	< 1.72	2.18	12.50	Anaerobic Stabilized Solids*	11/19/2018	*Sampled from storage tank 6 months old
37	81	Sandusky WWTP	12.2	7.98	138	8.39	5.26	154	0.90	12.80	93.58	Anaerobic Digester	11/16/2018	
38	88	Traverse City WWTP	6.17	4.73	38.45	20.70	2.90	154	4.16	13.60	77.61	Anaerobic Digester	11/8/2018	
39	90	Warren WWTP	4.61	7.31	59.04	7.19/7.21[1]	7.48/7.64[1]	73.54/75.62[1]	<0.997/<0.992	9.19/<0.992	22.49/ND	Belt Filter Press/Ash[2]	11/15/2018	[1]Efluent after UV/Effluent after sand filter | [2]Primary and Secondary Treatment / Incinerator ash lagoon
40	92	Wixom WWTP	3.07	128	2,329	9.89	269	4,950	1.73/4.58*	2,150/1,200*	2,324/1,510*	Aerobic Stabilized Biosolids/Screw Press*	11/14/2018	*Storage tank 6 months old/Dewatered final treated solids
41	93	Wyoming WWTP	5.08	26.6	1,208	8.74	12.00	113	<1.00	15.00	32.10	Lime Stabilized Solids*	10/29/2018	*Sampled from the storage tank
42	94	YCUA Regional WWTP	7.39	7.51	60.95	12.6	6.12	109	1.41	7.75	32.68	Belt Filter Press*	11/2/2018	*Primary and Secondary Treatment

Note: ND = Non-detect with detection limits typical about 1 µg/Kg or parts per billion (ppb)

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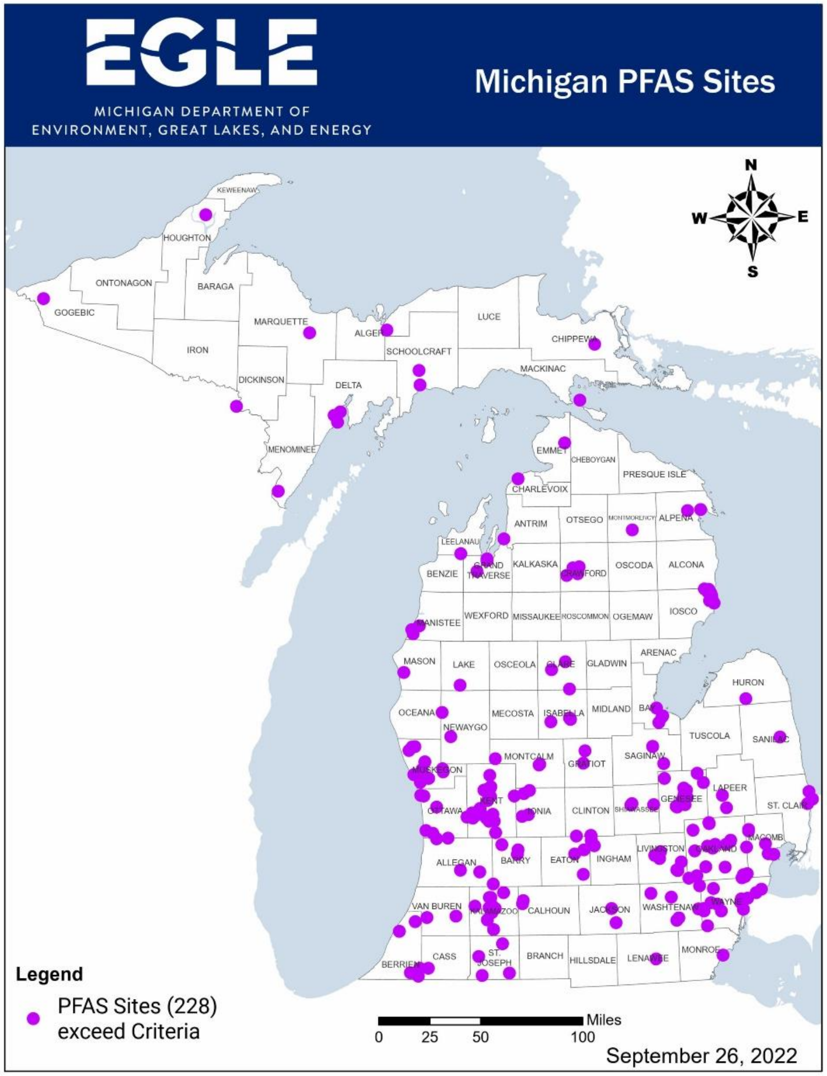
資料③：
「MPART 2022年度のアップデート」

Michigan's PFAS Action Response Team
Fiscal Year 2022 Update

In fiscal year (FY) 2022, the Michigan legislature supported the PFAS response by appropriating funding across the seven state agencies that make up the Michigan PFAS Action Response Team (MPART). This funding allowed MPART to continue to be a national leader in addressing PFAS.

As of the end of FY 2022, MPART had identified **228 MPART PFAS Sites** where PFAS contamination has been found in groundwater above Michigan's criteria.



For Every New Site:
Drinking Water Exposure is Evaluated

MPART works with the local health departments to:

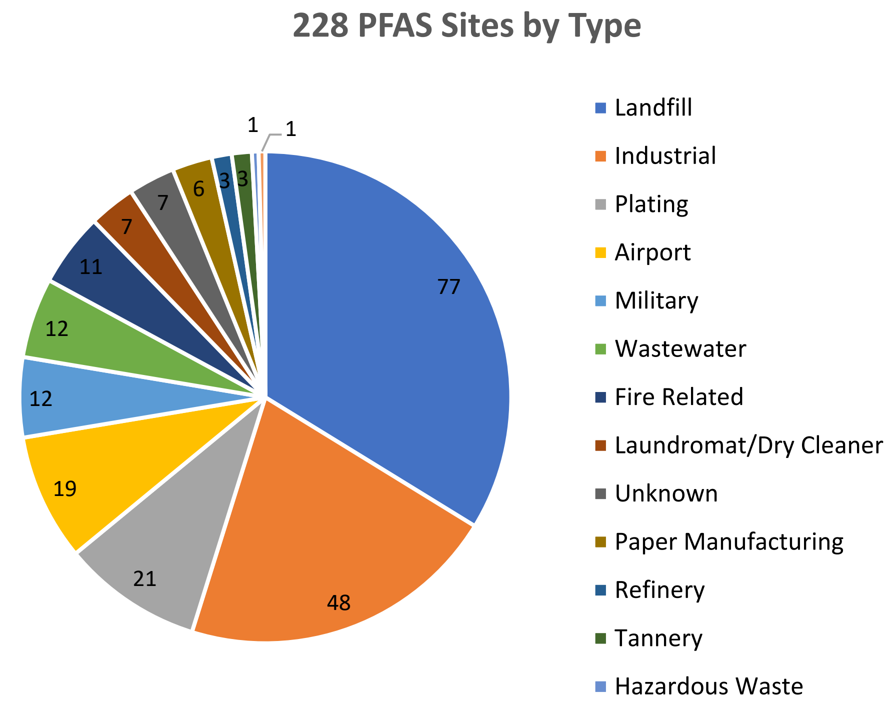
- Determine if there are residential/private drinking water wells nearby.
- Review well records.
- Access property and conduct water sampling if there are wells deemed to be potentially impacted by PFAS contamination.
- Share results with well owners and among agencies, and filters are provided if necessary.
- Expand sampling areas if results indicate additional potential impact.

Outreach

In addition to contacting local health departments and informing potentially impacted private well owners, MPART does public outreach to ensure awareness of:

- Local officials
- Legislators
- Tribal governments
- Weekly MPART Update GovDelivery emails to **over 4,000 subscribers**

The chart below shows PFAS sites by type from sampling done by regulated industry, environmental assessments conducted during property transactions, MPART’s PFAS monitoring activities, and focused studies.

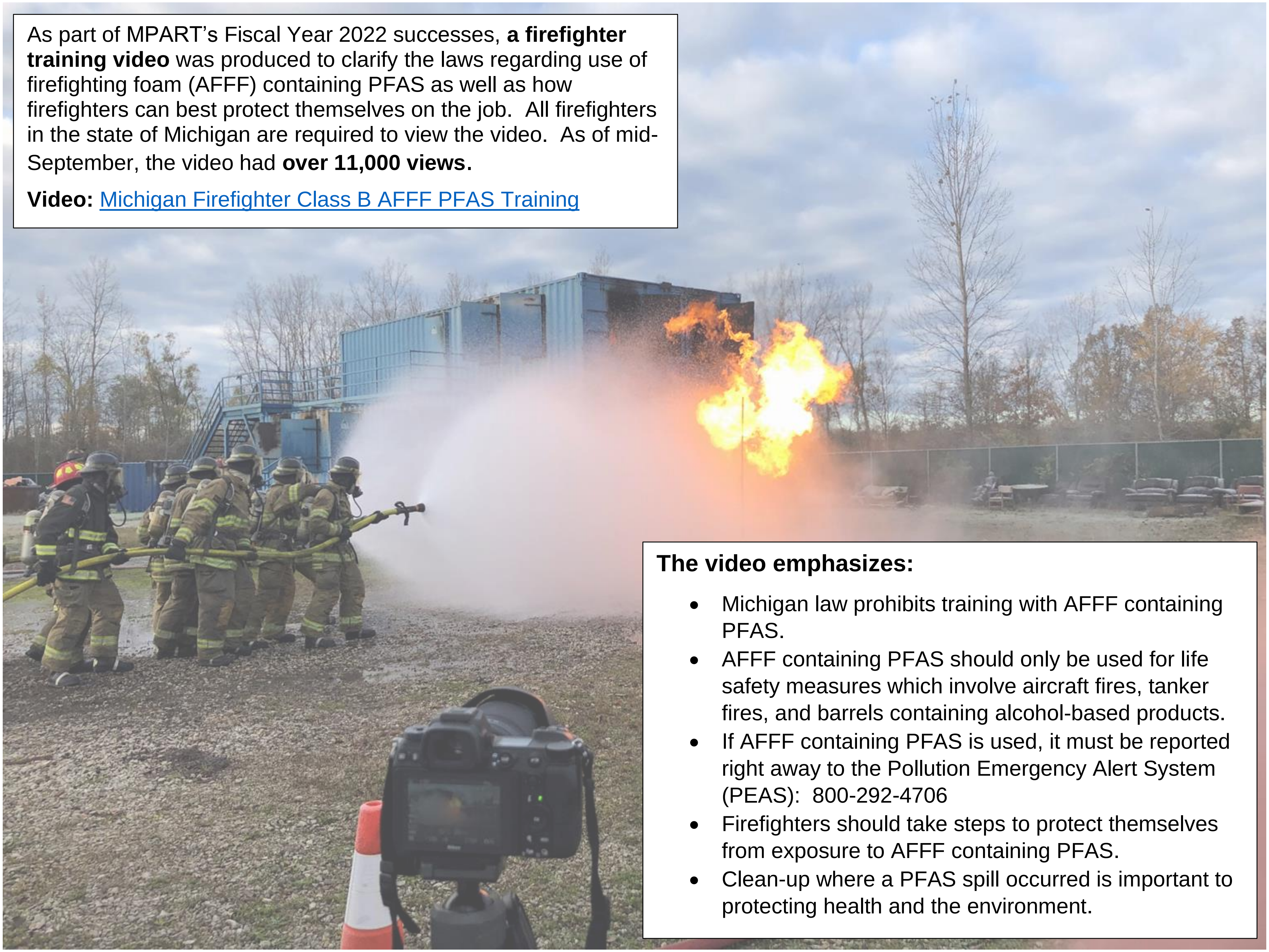

228 PFAS Sites by Type

Transparency and Communicating with the Public:

- **Citizen Advisory Workgroup (CAWG)** members met 10 times with MPART, in addition to meetings of four subcommittee groups: Engaging the Public; Web Review; Preventative Measures; and Membership.
- Launched the **MPART Geographic Information System** online, which provides PFAS sites, surface water data, and public water supply data on an interactive online map.
- MPART hosted the December 2021 **Great Lakes PFAS Summit – 1,649 registrants** from **42 states** and **9 countries**.
- MPART leaders testified at two Congressional Hearings and presented to various associations, local governments, and other stakeholder groups.

As part of MPART's Fiscal Year 2022 successes, **a firefighter training video** was produced to clarify the laws regarding use of firefighting foam (AFFF) containing PFAS as well as how firefighters can best protect themselves on the job. All firefighters in the state of Michigan are required to view the video. As of mid-September, the video had **over 11,000 views.**

Video: [Michigan Firefighter Class B AFFF PFAS Training]



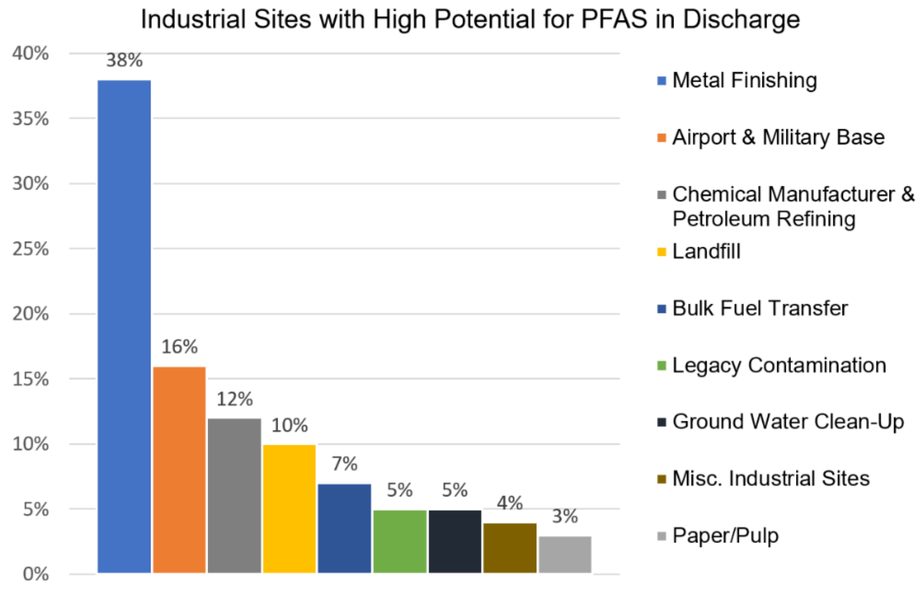
The video emphasizes:

- Michigan law prohibits training with AFFF containing PFAS.
- AFFF containing PFAS should only be used for life safety measures which involve aircraft fires, tanker fires, and barrels containing alcohol-based products.
- If AFFF containing PFAS is used, it must be reported right away to the Pollution Emergency Alert System (PEAS): 800-292-4706
- Firefighters should take steps to protect themselves from exposure to AFFF containing PFAS.
- Clean-up where a PFAS spill occurred is important to protecting health and the environment.

Monitoring PFAS Around Michigan:

- **18 grants** that supported PFAS **testing and monitoring at airports** were completed.
- Collected **835 fish** from **42 different water bodies** to determine the need for fish consumption advisories.
- Updated the 2022 **Eat Safe Fish Guide to** include **over 240 new or updated** fish consumption guidelines, which includes over **60 based on PFOS**.
    - **A section of the Huron River Do Not Eat Advisory was updated to reflect guidelines that vary by fish species.**
- **Collected 523 water samples from lakes and streams** from **38 different watersheds**.
- Finalized a Compliance Strategy for addressing PFAS from permitted **public and private municipal groundwater discharges**.
- Continued to address PFOS, PFOA, and PFBS, from **Industrial Dischargers** – currently investigating potential discharges of PFAS to surface water at **105 industrial sites**.

Staff collecting a sample from a river.



Staff electrofishing at Bush Lake in Oakland County.

- Updated the **Land Application of Biosolids Containing PFAS Interim Strategy** which, as of July 1, 2022, decreased the industrially impacted biosolids concentration threshold from 150 parts per billion (ppb) to 125 ppb. All Wastewater Treatment Plants (WWTPs) are still required to sample for PFAS prior to land application.
- Continued to review **legacy land applications** in Michigan.
- A total of 121 NPDES **municipal WWTPs** are routinely monitoring for PFOS and PFOA on a monthly, quarterly, or bi-annual basis.
- Reviewed **50 foam sightings** on Michigan lakes and streams. Reports are used to help guide future lake and stream sampling efforts.
- **Re-evaluated Surface Water Quality Values**: PFOA was lowered, PFBS was added, PFOS stayed the same. These are values used to hold facilities that discharge into our lakes and streams to, and for tracking down PFAS sources.

Surface Water Quality Values in Parts Per Trillion (ppt)					
PFOS if waterbody is a Drinking Water Source	PFOS if waterbody is *not* a drinking water source	PFOA if waterbody is a drinking water source	PFOA if waterbody is *not* a drinking water source	PFBS if waterbody is a drinking water source	PFBS if waterbody is *not* a drinking water source
11 ppt	12 ppt	66 ppt	170 ppt	8,300 ppt	670,000 ppt

PFAS Studies:

- Partnered on a PFAS **air monitoring study**. MPART installed passive air samplers at 27 locations around the state in September 2021 and left them in place for one month. The University of Rhode Island analyzed the samples, which showed low levels of some PFAS compounds in the air at a few locations similar to other outdoor semi-urban areas, and at concentrations lower than recently reported indoor air samples.
- Completed a **rain bucket "proof of concept" study**. MPART put out inexpensive, PFAS-free rain buckets at five locations and collected two to four rain events. Results showed very low levels of a few PFAS compounds in rain and that it is possible to collect PFAS rain samples inexpensively.

September 2021 - Air Monitor

Protecting Drinking Water:

- **Infrastructure Projects:**
  $29 million in grants were awarded to address PFAS contamination in drinking water. Projects included:
  - Watermain extensions to **connect ~973 homes to existing municipal drinking water systems**.
  - A $819,000 grant to the **Village of Pellston** for determining the feasibility of developing a community water supply.
  - A $674,490 grant to the **City of Wyandotte** to treat PFAS.
  - A $292,125 grant to **Central Montcalm Public Schools** to install a replacement well for **school drinking water**.

Photos provided by Prein&Newhof of Plainfield Township – Water System Extension

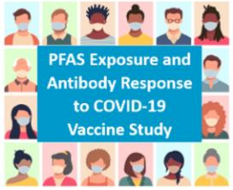
- **Filters and Residential Well Sampling:**
  - Provided more than **130 PFAS-reducing filters** to impacted residents.
  - Provided more than **880 replacement cartridges** for PFAS-reducing filters.
  - Sampled more than **300 drinking water wells** that had not been previously sampled.
  - Re-sampled more than **1,670 drinking water wells** that had been sampled in previous years.

- **Other Grants:**
  - $1.7M added onto a grant with Michigan Geologic Survey to fix errant records in **Wellogic**, a well log database used by state agencies, health departments, researchers, and residents. This database is used to help determine which drinking water wells might need to be sampled.

Health: Research and Biomonitoring:

Over 1,300 people enrolled in the first phase of the Michigan PFAS Exposure & Health Study (MiPEHS) between Dec 2020 and July 2021. Participants learned their blood PFAS levels and results of their health tests and are encouraged to participate in the next phases of data collection.

Michiganders are joining others from around the US in the first national PFAS health study with ATSDR/CDC's Multi-site Health Study. As part of this nationwide PFAS health study, participants will continue to enroll through early 2023. Participants learn their blood PFAS levels and results of their health tests.



Over 250 people have participated in leading edge research on the effects of PFAS exposure and antibody response to COVID-19 vaccines. Participants learned their blood PFAS levels.

The PFAS in Firefighters of Michigan Surveillance project is a statewide initiative with the primary goal of determining blood concentrations of PFAS in Michigan firefighters. The findings will help inform decisions about how to minimize firefighters' exposure to PFAS. Enrolled participants will learn their personal blood PFAS concentrations. The project started enrollment in 2021 and aims to enroll over 900 firefighters.

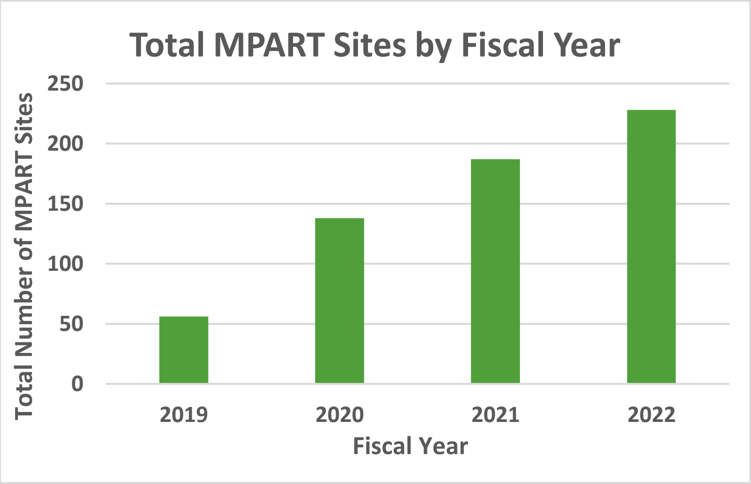
The Michigan Chemical Exposure Monitoring project is the first statewide effort to gather data on the amount of certain chemicals in the blood and urine of Michiganders, including lead, mercury, and PFAS. This project will help MDHHS understand more about exposures to chemicals, including PFAS, of Michigan residents. Recruitment started September 2022 and the project will enroll over 1,000 Michiganders over the next several years.

The Oscoda Area Exposure Assessment is investigation to understand exposure to environmental chemicals, including PFAS, among residents of the Oscoda area. The project will measure the Oscoda area population's exposure to environmental chemicals and compare the findings to statewide average levels of exposure as measured by the MiChEM project and national average levels of exposure as measured by the CDC. Recruitment activities began in September 2022 and the is still enrolling participants.

Current information on MDHHS' studies can be found at Michigan.gov/DEHBio

Looking Forward to FY2023 MPART Will:

- Coordinate with youth fishing event coordinators in **environmental justice areas** to collect fish in 20 areas heavily fished by youth. This will inform fish consumption advisories.
- Collect and analyze **blood samples from birds** that live in the Lake Huron watershed and eat fish. Also collect and **analyze herring gull eggs**.
- Analyze **mallard duck tissue** collected in 2022 and share those results with the public.
- Continue evaluating, prioritizing, and reducing or eliminating PFAS at permitted **public and private wastewater treatment plants** that discharge to groundwaters, such as mobile home communities, condominiums, campgrounds, schools, and rest areas.
- Implement proactive sampling where firefighters conducted **fire training** using AFFF, including testing nearby residential wells.
- Continue the **AFFF pickup and disposal program** to remove AFFF from fire departments and airports.
- Work with more communities to apply for and implement. **infrastructure projects**, such as connecting more residents to municipal water supplies.
- Continue to **identify sources** of PFAS and hold responsible parties accountable for investigation at sites.
- Continue to **sample drinking water wells** near sources of PFAS.
- Continue to conduct **residential resampling** around select contaminated PFAS sites.
- Continue **implementation of health studies** and roll out the MDHHS mobile lab.
- A second request for proposals for additional testing and monitoring at airport was issued in FY2022 and the grants will be implemented in 2023-2024.



Needs:

- Funding to help MPART be **more proactive** in **sampling types of sources** in a coordinated approach, such as remaining plating facilities, priority landfills and dumps, paper manufacturers, other types of sources, and to evaluate the nearby residential wells that could be contaminated by these sources. Without additional resources, it will take many, many years to identify sites in Michigan.
- Funding and resources to focus on **informing and educating the public** about PFAS.
- Funding **to support municipalities** with contaminated site clean-up identified in their communities.