ENGINEERING REPORT OLD OUTFALL 002 GAC PILOT STUDY RESULTS

CHEMOURS FAYETTEVILLE PLANT FAYETTEVILLE, NORTH CAROLINA

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ACRONYMS

Acronym	Definition / Description
BF-01A/02A	Cartridge Filters BF-01A and BF-02A
BL-001	Blower BL-001
Chemours	The Chemours Company FC, LLC
CO	Consent Order
DWR	(NCDEQ) Division of Water Resources
EPA	Environmental Protection Agency
F400	(Calgon) Filtrasorb 400
GAC	Granulated activated carbon
g/L	Gram(s) per liter
gpm	Gallon(s) per minute
HFPO-DA	Hexafluoropropylene oxide dimer acid
IEX	Ion exchange
L/min	Liter(s) per minute
µg/L	Microgram(s) per liter
µm	Micrometer
mg/L	Milligram(s) per liter
mL	Milliliter(s)
MMF	Multimedia filters
NCDEQ	North Carolina Department of Environmental Quality
NPDES	National Pollutant Discharge Elimination System
OOF2	Old Outfall 002
P-001	Dry-Mounted Centrifugal Pump 001 (also P-003A, P-003B)
P-004A	GAC Feed Pump P-004A
PFAS	Perfluoroalkyl and polyfluoroalkyl substances
PFD	Process flow diagram
PFMOAA	Perfluoro-2-methoxyacetic acid
PMPA	Perfluoromethoxypropionic acid
SU	Standard unit (pH)
T-001	Test Water Storage Tank
T-002	Batch Treatment Tank T-002
T-003A/003B	Batch Holding Tanks T-003A and T-003B
T-004	Treated Water Holding Tank 004
w/v	Weight by volume

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1.0 INTRODUCTION

On February 25, 2019, The Chemours Company FC, LLC (Chemours) entered a Consent Order (CO) with the State of North Carolina and Cape Fear River Watch to address perfluoroalkyl and polyfluoroalkyl substances (PFAS) at its Fayetteville Works site (the Site). Studies conducted at the Site have determined that groundwater containing PFAS constituents is discharging to a stormwater channel on the property referred to as the Old Outfall 002 (OOF2). The channel was historically used to discharge process wastewater but was abandoned when the current outfall was constructed. There is currently no wastewater discharge from the Site into this former outfall.

As required by paragraph 12.e of the CO, Parsons performed a pilot study demonstrating treatment for PFAS compounds in OOF2. The pilot study was conducted from June through September 2019 to provide at least three months of data demonstrating PFAS treatment as required by the CO. Parsons has prepared this report to present the results of the study.

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2.0 BACKGROUND

Paragraph 12.e of the CO specifies capture and treatment of water in OOF2 at the "Option B location (proposed dam)" by September 30, 2020. The CO further requires: "The treatment system shall meet such discharge standards as shall be set by DEQ[1], and shall, in addition and at a minimum, be at least 99% effective in controlling indicator parameters, Gen X and PFMOAA[2]." The CO also requires the completion of a pilot study, as follows: "by September 30, 2019, Chemours shall complete pilot scale testing of treatment equipment to determine its control efficiency for all PFAS identified in Old Outfall 002. The results of this pilot testing shall be supported by at least three (3) months of sampling data and submitted to DWR[3] for review and approval." This report serves as the required deliverable to the NCDEQ.

Preparations for implementing a treatment system to capture and treat water at OOF2 included the following elements:

- Bench-scale granular activated carbon (GAC) and ion exchange resin treatability studies
- National Pollutant Discharge Elimination System (NPDES) permit application, including:
  - Environmental Protection Agency (EPA) Form 1 and 2D preparation
  - Preparation of an Engineering Report on Treatment Testing summarizing bench-scale treatment results
- 401/404 permit application and associated submittals for capture of OOF2 flow.

2.1 OOF2 Treatment System Requirements

The requirements for treating captured flow from OOF2 are summarized below:

- Removal of PFAS compounds per Consent Order and NPDES permit criteria
- Removal of iron and solids to prevent fouling of the treatment process used for removing PFAS
- Management of solids generated during iron and solids removal

2.2 Bench-Scale Testing

Bench-scale testing was performed to evaluate the most efficient means for removing the target PFAS compounds from OOF2 flow. Isotherm adsorption tests were performed to determine the adsorption capacities of GAC and several ion exchange (IEX) resins for the range of PFAS compounds tracked at the Site. Testing was performed using water collected from the proposed treatment location at OOF2, thereby capturing matrix and competitive adsorption effects that will be present during treatment of this flow. Test procedures, results, and conclusions were presented in the Engineering Report on Wastewater Treatability submitted with the OOF2 NPDES Permit Application and Engineering Alternatives Assessment report in July 2019. The following summarizes the primary conclusions developed from this testing:

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[1] DEC – North Carolina Department of Environmental Quality (NCDEQ)
[2] PFMOAA – perfluoro-2-methoxyacetic acid
[3] DWR – NCDEQ Division of Water Resources

- Calgon Filtrasorb 400 (F400) GAC and IEX resins demonstrated effective removal of indicator PFAS compounds PFMOAA and HFPO-DA.
- F400 GAC provided generally better performance for other tracked and reported PFAS compounds as demonstrated by lower projected utilization rates for GAC versus IEX.
- PFMOAA governed utilization rates for both F400 GAC and IEX resins.

Estimated utilization rates of F400 GAC to provide 99% removal of the indicator compound PFMOAA would result in at least 99% removal of the total reported PFAS compounds.

2.3 OOF2 Treatment System Description

The full-scale treatment system will incorporate a series of individual treatment processes which results in effective removal of target constituents from captured OOF2 flow. The preliminary design of the full-scale treatment system will include the following individual treatment processes:

- Chemical precipitation.
- Flocculation.
- Clarification.
- Filtration.
- GAC Adsorption.
- Solids Management.
- Backwash Systems.

Chemical precipitation, flocculation, clarification, and filtration will be implemented to remove iron and solids which would otherwise cause fouling / plugging in the GAC adsorption process. The preliminary design of chemical precipitation treatment process includes aeration to oxidize iron (forming iron hydroxides) followed by pH adjustment to 7.5 – 8.0 to precipitate the iron at the minimum solubility of the iron hydroxides. Following chemical precipitation, polymer will be applied to cause influent and precipitated solids to agglomerate into larger “flocs” during the flocculation step. The agglomerated solids will then be allowed to settle during the clarification step. Following settling, the clarified “supernatant” will be pumped through the filtration step to remove fugitive solids ahead of GAC adsorption. The water will proceed through a series of GAC contact vessels arranged in series to remove PFAS compounds. The GAC adsorption process design will maximize the efficiency of GAC utilization while providing hydraulic loading rates in the range prescribed by sound engineering design for this application. The treated flow will then be discharged downstream of the capture dam.

Solids generated during chemical precipitation and captured in the clarification process will be pumped from the bottom of the clarification treatment process vessel to a sludge holding tank. The sludge will undergo thickening followed by dewatering, after which the dewatered solids cake will be transferred into hoppers and disposed off-site to a landfill certified to accept the solids. The GAC contact vessels will have backwash capability to allow periodic removal of any accumulated solid material. (The filtration treatment process will also include backwash capability if multimedia filters are used.) Backwash water will be transferred back into the treatment system prior to the flocculation treatment step.

2.4 Pilot Treatment System Design Description

The pilot treatment system incorporated batch pretreatment through the chemical precipitation, flocculation, clarification, and filtration processes to remove iron and solids; followed by continuous treatment of batch-treated effluent through granular activated carbon (GAC). A process flow diagram (PFD) and equipment general arrangement (GA) of the pilot treatment system is included in Appendix A. The following briefly describes each pilot treatment system component. The sequence of operations detailing specific equipment and process information is presented in Section 3 of this report.

Batch Pretreatment. Chemical precipitation was implemented by aeration using a rotary blower and diffusion grid to oxidize iron into iron hydroxides, followed by addition of 50% sodium hydroxide (NaOH) to adjust pH to 7.5 – 8.0. Polymer was mixed into the chemically-precipitated batch with the assistance of a tank-mounted mixer; latent mixing following shutoff of the mixer promoted flocculation of the solids into larger flocs. The batch then underwent a period of settling following flocculation to allow the agglomerated solids to settle, after which supernatant was pumped forward; settled solids were periodically pumped out to dedicated holding / thickening totes. Supernatant was pumped forward through two cartridge filters arranged in series to remove fugitive solids ahead of the GAC adsorption columns, and into treated batch holding tanks.

GAC Adsorption. Pretreated water was pumped continuously through four GAC columns arranged in series; the system included two separate GAC column trains (‘A’ and ‘B’) which allowed parallel evaluation of different GAC products from the same treated batches. Each column was constructed from 2” ID PVC pipe.

The pilot system was designed to treat 0.11 gallons per minute (gpm) or 0.42 liters per minute (L/min), providing a target hydraulic loading rate across the GAC columns of 5 gpm/ft^2. The use of smaller diameter columns in GAC column studies has been widely used over the past 50 years and is recommended by Calgon, the leader in manufacture of GAC adsorption systems. The average column-diameter to GAC-granule-diameter ratio for the pilot system was greater than 20:1 which ensures minimization of wall effects during the conduct of the pilot study. The hydraulic loading rate in the pilot system was similar to what would be used in a full-scale system. The length of the pilot GAC adsorption columns was sufficient to fully delineate the target solute breakthrough wave-front reflecting the progression of the mass-transfer zone. The results of the pilot study will be directly scalable to a full-sized GAC adsorption system.

Although a full-scale treatment system will incorporate a GAC backwash system, the implementation of backwash during pilot testing would disrupt the evolution of the solute wavefront. As such, backwashing during wave-front propagation was not performed.

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3.0 PILOT STUDY SEQUENCE OF OPERATIONS

The OOF2 GAC pilot treatment system was designed to reflect the overall treatment process (e.g., chemical precipitation, filtration, GAC adsorption, etc.) which would be present in a full-scale treatment system treating captured OOF2 flow. The pilot system design also provided for the ability to analyze one or two adsorbents in parallel and facilitated management of treatment testing residuals including treated effluent and solids generated during treatment. As such, the pilot treatment system encompassed the following unit treatment process:

- Influent storage
- Pretreatment for nuisance iron and solids, including:
    - Chemical precipitation and settling
    - Filtration
- GAC adsorption for PFAS compounds
- Treated water storage
- Sludge management

Since the proposed capture location at OOF2 is in a remote and wooded area with no existing utilities, the pilot system was located inside an unused warehouse within the active manufacturing area of the Site. The following briefly describes the pilot treatment system sequence of operations. Process flow diagram (PFD) and equipment general arrangement drawings are provided in Appendix A for reference.

3.1 Influent Storage

Water from the proposed capture location (just west of Bill Hall Road) was collected by field personnel and transported via truck to an 18,000-gallon FRAC tank (designated the Test Water Storage Tank [T-001]). This tank provided several weeks of sample volume from each fill, thereby providing a consistent quality of water to the pilot treatment system and reducing the frequency of trips required to collect the water from OOF2.

3.2 Chemical Precipitation

Raw water from T-001 was pretreated in batches in the Batch Treatment Tank (T-002). The total volume of T-002 was 1,550 gallons with a working volume of approximately 1,400 gallons. Batches of water were transferred from T-001 to T-002 by a dry-mounted centrifugal pump (P-001) operating at a flow rate of approximately 40 gpm. P-001 was switched off when T-002 was filled to its working volume. The batch treatment process consisted of the following steps:

- <u>Aeration</u>: The batch underwent aeration for approximately 30 minutes through operation of Blower BL-001, which supplied air through a field-fabricated diffuser assembly. BL-001 was switched off after aeration.
- <u>Mixing</u>: Tank mixer T-001 was switched on.
    - <u>pH Adjustment</u>: The pH in the batch was adjusted to a target of 8.0 standard units (SUs) with 50% (weight by volume [w/v]) sodium hydroxide to precipitate iron.

- Polymer Addition: After pH stabilized in the target range, anionic polymer was added at an applied dose of 0.5 to 1.0 milligram per liter (mg/L) to enhance flocculation of precipitated solids. Following addition of polymer solution to T-001, the batch underwent mixing for 15 minutes to ensure the polymer was completely mixed into the batch. The anionic polymer was pre-prepared from neat polymer (40% active polymer ingredient) with distilled water to an intermediate dosing solution concentration of 6.83 grams per liter (g/L) (2.73 g/L as active polymer ingredient) to allow the polymer to age. The polymer was then further diluted in approximately 3 gallons of distilled water to facilitate homogenization and stored in T-002.

- Flocculation and Settling: Mixer M-001 was turned off, and latent mixing momentum promoted agglomeration of floc particles followed by quiescent settling.

3.3 Filtration

Following the period of quiescent setting, supernatant from T-002 was pumped by dry-mounted centrifugal pump P-003A through two cartridge filters (BF-01A/-02A) installed in parallel, and into Batch Holding Tank T-003A. With two GAC column trains in operation, supernatant was pumped through BF-01A/02A to Batch Holding Tank T-003A using P-003A. Supernatant was also pumped through BF-01B/02B to Batch Holding Tank T 003B using P-003B through a separate suction line from T-002.

3.4 GAC Adsorption

Pre-treated water in Tank T-003A was pumped continuously by GAC Feed Pump P-004A through carbon columns GAC-1A, -2A, -3A, and -4A operating in series. The GAC columns contained Calgon F400 GAC installed in 2-inch-diameter polyvinyl chloride piping. P-004A was a programmable diaphragm metering pump which transferred water at a clean column flow rate of 0.11 gpm (0.42 L/min), providing a target hydraulic loading rate across the GAC columns of 5 gpm/ft^2. The empty bed contact time in each column at the clean column flow rate was 5 minutes. Each column contained 2.45 pounds of F400 based on these design conditions and the density of F400. The GAC in each column was held in place by glass wool supported by pea gravel. A three-way sampling valve was installed on GAC 1A to facilitate sampling of pretreated water from T-003A prior to flowing into the GAC columns and between each GAC column to facilitate sampling of water from GAC-1A through GAC-3A. GAC-4A was sampled from the effluent line which transferred column effluent to the Treated Water Holding Tank T-004.

The GAC adsorption process in the second treatment train (‘B’ Side) was operated identically to the first treatment train (‘A’ train) using the corresponding equipment as shown in the PFD. The second treatment train was used to test Calgon DSR-A, a regenerated GAC product which is used in industrial and remediation applications.

3.5 Treated Water Storage

GAC-treated water was transferred directly during treatment to the Treated Water Holding Tank T-004. The water in T-004 was periodically removed by Chemours site personnel for off-site disposal. T-004 provided the same working volume as Batch Treatment Tank T-002 to match overall batch processing rates.

3.6 Sludge Management

Supernatant in Tank T-002 was decanted down to the level at which the P-003A and P-003B suction lines were installed. The remaining volume in T-002 was transferred to the Sludge Storage Totes (T-006) to allow additional settling of solids and provide some reserve pretreated test volume. Sludge from each series of tests was harvested for analysis and follow-on sludge studies to assist with treatment system design.

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4.0 PILOT TREATMENT SYSTEM OPERATION

4.1 Test Water Collection

Water was collected from OOF2 using an MQ Model QP3TH 3-inch outlet diameter trash pump which was pumped to a 2,000-gallon Ford F750 water truck. The water was dispensed from the water truck to tank T-001 using a second trash pump through a 2-inch-diameter discharge hose. Prior to system startup, approximately 7,000 gallons of water were collected during the week of June 10th to supply water for the first phase of testing. A second FRAC tank was filled during the course of the study with approximately 16,000 gallons of water to supply water during the second phase of testing.

4.2 Startup and Operation

The first batch of OOF2 water was pumped over to Batch Treatment Tank T-002 on June 13, 2019. A jar test was performed in one-liter aliquots of water from Tank T-002 to determine the quantity of sodium hydroxide which would be required to achieve the target pH of 8 SUs and to determine the optimum dose of polymer to achieve efficient settling. Based on jar testing, approximately 450 milliliters (mL) of 50% (w/v) sodium hydroxide were required per 1,500-gallon batch of OOF2 water, and a polymer dose of 0.5 mg/L (as active polymer ingredient) was found to provide optimal settling. Pilot treatment started up on Friday, June 14th, when the first batch of OOF2 water underwent pretreatment including aeration, pH adjustment, polymer addition, and settling. Following settling, the pre-treated water was pumped through bag filters BF-01A/01B to Batch Holding Tank T-003. Pumping through the GAC columns was then initiated and the pumping rate adjusted to provide a target flow rate of 0.11 gpm (0.42 L/min).

Continuous pumping of water through the GAC columns was achieved by pre-treating and filtering batches of OOF2 water from T-001 to maintain a constant supply of pre-treated and filtered water in the batch holding tanks. The first phase of testing was performed using water from the first FRAC tank and maintaining continuous flow through the first train (‘A’ Train) through August 6, 2019. Calgon F400 GAC was tested in the carbon columns. The second phase of testing was initiated on August 7, 2019, using water inventoried in a second FRAC tank as described above. During the second phase of testing, batches of pretreated and filtered water were transferred in parallel to Batch Holding Tanks T-003A and T-003B for simultaneous treatment through the ‘A’ and ‘B’ series of carbon columns. During the second phase of testing, Calgon F400 was tested in the ‘A’ train, and Calgon DSR-A, a regenerated carbon, was tested in the ‘B’ train. This provided the opportunity to (1) provide a replicate study with F400; and (2) provide a direct comparison between F400 and an alternative GAC product using the same influent and pretreated water.

4.3 Monitoring and Maintenance

The pressure at the inlet to the first column along each operational treatment train was monitored daily, and the flow rate of effluent transferred to Treated Water Holding Tank T-004 was measured. Pressure was observed to build up due to the deposition of residual iron, other metal oxides (e.g., manganese oxide, aluminum oxide) and/ or formation of a biological growth within the first carbon column. In a full-scale treatment system, the buildup of material in a carbon column would be removed by backwashing the column; however, backwashing was not an option before the adsorption capacity was saturated since backwashing would disrupt the mass transfer zone. Therefore, as an alternative which alleviated most of the pressure, the buildup of fouling material was periodically removed by agitating the top few inches of the carbon column to liberate the material building up in the front end of the column. It was assumed that the top few inches would be saturated by the time this maintenance was required during testing. The liberated material was pumped out using a peristaltic pump. After maintenance, the pressure and flow rate were re-measured. All monitoring and maintenance information was recorded in a dedicated operations field book.

4.4 Sampling

Parsons developed a sampling schedule intended to (1) provide information on breakthrough of target constituents through the four columns; and (2) provide relevant pretreatment information including iron, total suspended solids (TSS), and total organic carbon (TOC) removal. In summary:

- Table 3+ samples (including HFPO-DA) were collected daily in the effluent from the first GAC column, at least three time a week from the second GAC column, and twice a week from the third and fourth GAC columns. Table 3+ samples were also collected weekly from the untreated stored influent (prior to pretreatment) and from each pretreated/filtered batch. Table 3+ samples were submitted to Chemours' on-site laboratory for analysis.
- EPA Mod 537 MAX samples were collected two to three times a week from each GAC column during the first phase of testing, and one to three times a week during the second phase of testing. EPA Mod 537 MAX samples were also collected weekly from the untreated influent (prior to pretreatment) and from each pretreated/filtered batch. EPA Mod 537 MAX samples were submitted to TestAmerica Laboratories in Sacramento, California.
- Field duplicates for Table 3+ and EPA Mod 537 MAX (including HFPO-DA) were collected periodically and submitted to TestAmerica Laboratories in Sacramento. Samples were collected at a frequency of at least one field duplicate per 20 samples in accordance with project Quality Assurance Plan. The frequency of field duplicates was increased during the second phase of testing.
- Samples for conventional parameters including TOC, total iron/metals, field-filtered iron/metals, and TSS were also collected.
    - TOC samples were generally collected from the columns at the same time as PFAS samples.
    - Total iron/metals and field-filtered iron/metals were collected approximately weekly from each column. TSS was collected approximately weekly (first phase of testing) and bi-weekly (second phase of testing).
    - Conventional parameters were also collected regularly from influent and from pretreated batches.

The sample points were identified as follows:

Sample Point #	Sample Point ID	Description
SP-1	INF	Untreated Stored Influent
SP-2	PRE-A	Pretreated/Filtered Batch (‘A’ Train)
SP-3	GAC 1A	Column 1 Effluent (‘A’ Train)
SP-4	GAC 2A	Column 2 Effluent (‘A’ Train)
SP-5	GAC 3A	Column 3 Effluent (‘A’ Train)
SP-6	GAC 4A	Column 4 Effluent (‘A’ Train)
SP-7	GAC B	Pretreated/Filtered Batch (‘B’ Train)
SP-8	GAC 1B	Column 1 Effluent (‘B’ Train)
SP-9	GAC 2B	Column 2 Effluent (‘B’ Train)
SP-10	GAC 3B	Column 3 Effluent (‘B’ Train)
SP-11	GAC 4B	Column 4 Effluent (‘B’ Train)

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5.0 RESULTS

Results available as of September 30, 2019 are summarized below and presented in the following appendices:

- Appendix B – Conventional parameter figures
- Appendix C – Comprehensive PFAS treatment results tables.
- Appendix D – Breakthrough curves for PFMOAA, HFPO-DA, and select additional parameters demonstrating progression of treatment through the GAC columns

5.1 Conventional Parameters

The figures in Appendix B show the removal of TOC, total iron, and soluble iron during pretreatment/filtration and GAC adsorption. Overall removal rates are summarized as follows:

Parameter	Pretreatment	Column 1	Column 2
TOC	< 5%	60%	> 71%
Total Iron	82%	95%	99%
Soluble Iron	> 98%	> 98%	> 98%

Most of the influent TOC remained following chemical precipitation, clarification, and settling, suggesting that most of the TOC was soluble and not amenable to removal by oxidation or coagulation by iron. There was no apparent trend of TOC breakthrough during GAC treatment which correlated with PFAS compound breakthrough. On average, around 60% of influent TOC was removed through the first GAC column, and treatment through the second column generally resulted in concentrations below the method detection limit.

Most iron was removed during chemical precipitation and filtration, although some remained (average of 18% of influent) going into the GAC columns. Changes in TSS between untreated and pretreated conditions demonstrated that some level of post-treatment oxidation occurred in the batch holding tanks just ahead of the GAC columns, and that sampling during transfer to the GAC columns may capture latent settling within these tanks. The ongoing buildup of material in the columns described above appears to reflect this effect. In a full-scale system, buildup of solid material in GAC vessels will be mitigated with a dedicated backwashing system.

5.2 PFMOAA

Pretreatment. Influent concentrations analyzed by the analytical laboratory were measured at an average of around 31 micrograms per liter (µg/L) in the first study and 25 µg/L in the second study. Pretreated and filtered flow concentrations decreased to around 22 µg/L in both studies, reflecting a decrease of around 12 to 32% during chemical precipitation and filtration. It should be noted that influent and pretreated samples showed considerable variability in analysis and, as such, any actual loss was inconclusive.

GAC Treatment and Breakthrough. PFMOAA started to break through F400 in Column 1 (GAC 1A) at around 8,000 liters treated and reached saturation in Column 1 at approximately 22,600 liters treated. The onset of breakthrough at around 8,000 liters was demonstrated in both Test 1 and Test 2A; demonstrating repeatability of treatment with F400 GAC.

PFMOAA broke through F400 in Column 2 (GAC 2A) at a concentration approaching 1% of influent concentration (reflecting 99% removal) at approximately 24,200 liters. Additional data are pending to determine if similar breakthrough occurs in the second column (GAC 2A) as in the first test. No breakthrough in Columns 3 and 4 was demonstrated within the duration of each study.

PFMOAA broke through DSR-A more rapidly than through F400; breakthrough was observed in all four columns, with effluent concentrations approaching influent levels observed in GAC 1B and GAC 2B even before any breakthrough was detected in the corresponding F400 GAC columns along the 'A' train.

Field Duplicates. A comparison of results provided by the on-site analytical laboratory to results of field duplicate samples collected at the same time and analyzed by Chemours' contract independent analytical laboratory is provided in Appendix E. The ratio of results for PFMOAA at the PRE-A and GAC 1A effluent sample locations in the 1st phase of the study is summarized as follows:

- PRE-A: 3.75
- GAC 1A: 4.13

However, while this issue requires further investigation, the low bias was consistently observed; therefore, comparisons of influent and effluent changes remain valid. The biased-low results observed in the samples analyzed by the on-site laboratory do not change the breakthrough profile of PFMOAA and the other compounds; the progression of breakthrough to saturation would be reflected when column effluent concentrations approached the pretreated concentrations entering each column train as long as these data were all derived from the same analytical data set. Calculations of mass loading onto the GAC do require the unbiased commercially-provided results; the analysis of field duplicates has allowed a bias factor to be estimated and applied to provide the estimated concentrations used in these calculations presented below. Commercial certified laboratory analyses were used for isotherm test results which provided initial estimates of GAC utilization.

Estimated GAC Utilization. Estimated GAC utilization was calculated using data from the 1st phase of the study by assuming replacement of the lead carbon vessel upon saturation with PFMOAA. This calculation takes into account the complete exhaustion of the GAC in the 1st column (GAC 1A) plus the additional utilization of GAC in the 2nd column (GAC 2A) attributed to the PFMOAA present in the effluent from GAC 1A over the same period. This calculation was performed as follows:

- Calculate the GAC utilization in the 1st Column (GAC 1A) at saturation;
- Calculate the additional GAC utilization in the 2nd Column (GAC 2A) over the same period.

The on-site analytical data was scaled using the bias factor for PRE-A and GAC 1A samples cited above. The GAC utilization calculations are summarized as follows:

- Volume treated until saturation: 22,605 L (6,016 gal)
- Mass of carbon in GAC 1A: 2.48 lb
- PFMOAA mass loading onto GAC 1A: 1,832 mg
- Mass loading ratio (x/m) = 1,832 mg/[(2.48 lb)*(453.6 g/lb)] = 1.63 mg per g GAC
- Design basis influent PFMOAA concentration: 85 µg/L
- GAC Usage Rate = (85 µg/L)*(1 mg/1000 µg)/(1.63 mg/g) = 0.052 g/L
- Carbon Utilization in 1st column @ 500 gpm:
  - (0.052 g/L)*(3.785 L/gal)*(500 gal/min)*(1440*365 min/yr) = 114,400 lb/yr
- PFMOAA mass loading onto 2nd column = 633 mg (due to PFMOAA in GAC 1A effluent during same period)
- Carbon utilization in 2nd column = (633 mg/1,832 mg)*(114,400 lb/yr) = 39,500 lb/yr
- Total GAC Utilization @ 500 gpm = 114,400 + 39,500 lb/yr = **154,000 lb/yr**
- Total GAC Utilization @ 1,000 gpm = (1,000/500)*153,900 = **308,000 lb/yr**

It should be noted that the pilot system consistently demonstrated treatment of > 99% removal of PFMOAA in the effluent from the downstream columns GAC 3A and 4A. A similar analysis using data for the 2nd phase of the study will be provided in an addendum to this report.

5.3 HFPO-DA and Other Compounds

HFPO-DA. HFPO-DA concentrations were generally consistent in Studies #1 and #2 at approximately 4.6 to 4.7 µg/L, with no appreciable decrease during pretreatment/filtration. In the first study using F400 in the carbon columns, HFPO-DA started to break through F400 in Column #1 at around 12,000 liters treated; no breakthrough was detected through the second column. As such, PFMOAA would drive utilization based on adsorption kinetics, and the estimated GAC utilization calculated for PFMOAA would be expected to provide at least the required level removal of HFPO-DA.

HFPO-DA demonstrated relatively rapid breakthrough when treated through DSR-A (second study, ‘B’ train), although the rate and degree of breakthrough was not nearly as pronounced as it was for PFMOAA. This notable difference in breakthrough rates demonstrates that the rapid breakthrough observed through the DSR-A GAC was not a result of short-circuiting but rather reflected limitations in adsorption kinetics.

Perfluoromethoxypropionic acid (PMPA). During pilot testing with F400 GAC, PMPA started to break through the first column after approximately 7,000 liters treated, which is somewhat earlier than breakthrough of PFMOAA; a similar result was observed in the 1st and 2nd phases of the study Saturation of PMPA was reached at approximately 20,000 liters treated. PMPA started to break through the second column at approximately 23,000 liters treated, also slightly sooner than PFMOAA.

Estimated GAC utilization for PMPA treatment was calculated similarly to PFMOAA treatment in the event PMPA were to drive utilization, using data from the 1st phase of the study. The utilization calculations for PMPA treatment used the following biasfactors based on a comparison of on-site analytical and contract laboratory field duplicate results for PMPA:

- PRE-A: 1.80
- GAC 1A: 1.75

The GAC utilization calculations for PMPA treatment are presented as follows:

- Volume treated until saturation: 19,802 L (5,232 gal)
- Mass of carbon in GAC 1A: 2.48 lb
- PMPA mass loading onto GAC 1A: 97.4 mg
- Mass loading ratio (x/m) = 97.4 mg/[(2.48 lb)*(453.6 g/lb)] = 0.087 mg per g GAC
- Design basis influent PMPA concentration: 5.4 µg/L
- GAC Usage Rate = (5.4 µg/L)*(1 mg/1000 µg)/(0.087 mg/g) = 0.062 g/L
- Carbon Utilization in 1st column @ 500 gpm:
    - (0.062 g/L)*(3.785 L/gal)*(500 gal/min)*(1440*365 min/yr) = 136,700 lb/yr
- PMPA mass loading onto 2nd column = 32.9 mg (due to PMPA in GAC 1A effluent during same period)
- Carbon utilization in 2nd column = (32.9 mg/97.4 mg)*(136,700 lb/yr) = 46,250 lb/yr
- Total GAC Utilization @ 500 gpm = 136,700 + 46,250 lb/yr = **183,000 lb/yr**
- Total GAC Utilization @ 1,000 gpm = (1,000/500)*182,950 = **366,000 lb/yr**

As with PFMOAA, PMPA was consistently removed by > 99% in the effluent from columns GAC 3A and 4A. It should be noted that influent concentrations of PMPA are over an order of magnitude lower than PFMOAA.

As with PFMOAA, PMPA demonstrated rapid breakthrough in DSR-A (second study, 'B' train).

Other Table 3+ PFAS Compounds. Breakthrough curves for other Table 3+ compounds which demonstrated breakthrough in F400 GAC including PFO2HxA, PFO3OA, PFO4DA, and PEPA are also presented in Appendix D. These compounds all started to break through Column 1 after approximately 12,000 to 20,000 liters treated, did not reach saturation in the first column, and did not show breakthrough in the second column during the study. Therefore, these compounds would undergo effective removal in a system whose GAC utilization was governed by PFMOAA treatment.

These other compounds also demonstrated more rapid breakthrough in DSR-A (second study, 'B' train) relative to F400. The varying rates between compounds provided evidence that the rapid breakthrough reflected adsorption kinetics limitations in the DSR-A and not short-circuiting.

Other PFAS Compounds (Method Mod 537 MAX). Other PFAS (Mod 537 MAX) compounds which showed some degree of breakthrough in the first column utilizing F400 GAC included PFBA, PFPeA, PFHxA, and PFHpA. Breakthrough curves of PFBA and PFPeA are presented for illustration. None of the Mod 537 MAX compounds were observed to break through the second column. It should also be noted that influent concentrations of these compounds were generally over two orders of magnitude lower than PFMOAA.

6.0 PILOT TREATMENT TEST CONCLUSIONS

The following conclusions were developed based on the pilot study.

- Chemical precipitation using oxidation and pH adjustment provided effective precipitation of native iron, which underwent nearly complete removal following polymer addition and filtration. Some residual iron oxidation and precipitation likely did occur which provided a degree of fouling in the GAC columns.
- DSR-A GAC did not demonstrate effective removal of the indicator and other PFAS compounds as evidenced by rapid breakthrough.
- F400 GAC demonstrated effective removal of the indicator compounds PFMOAA and HFPO-DA along with other tracked and reported PFAS compounds.
- Estimated F400 GAC utilization based on PFMOAA treatment was 154,000 to 308,000 pounds/year for a flow rate of 500 to 1,000 gpm.
- Estimated F400 GAC utilization based on PMPA treatment was 183,000 to 366,000 pounds/year based on a flow rate of 500 to 1,000 gpm.

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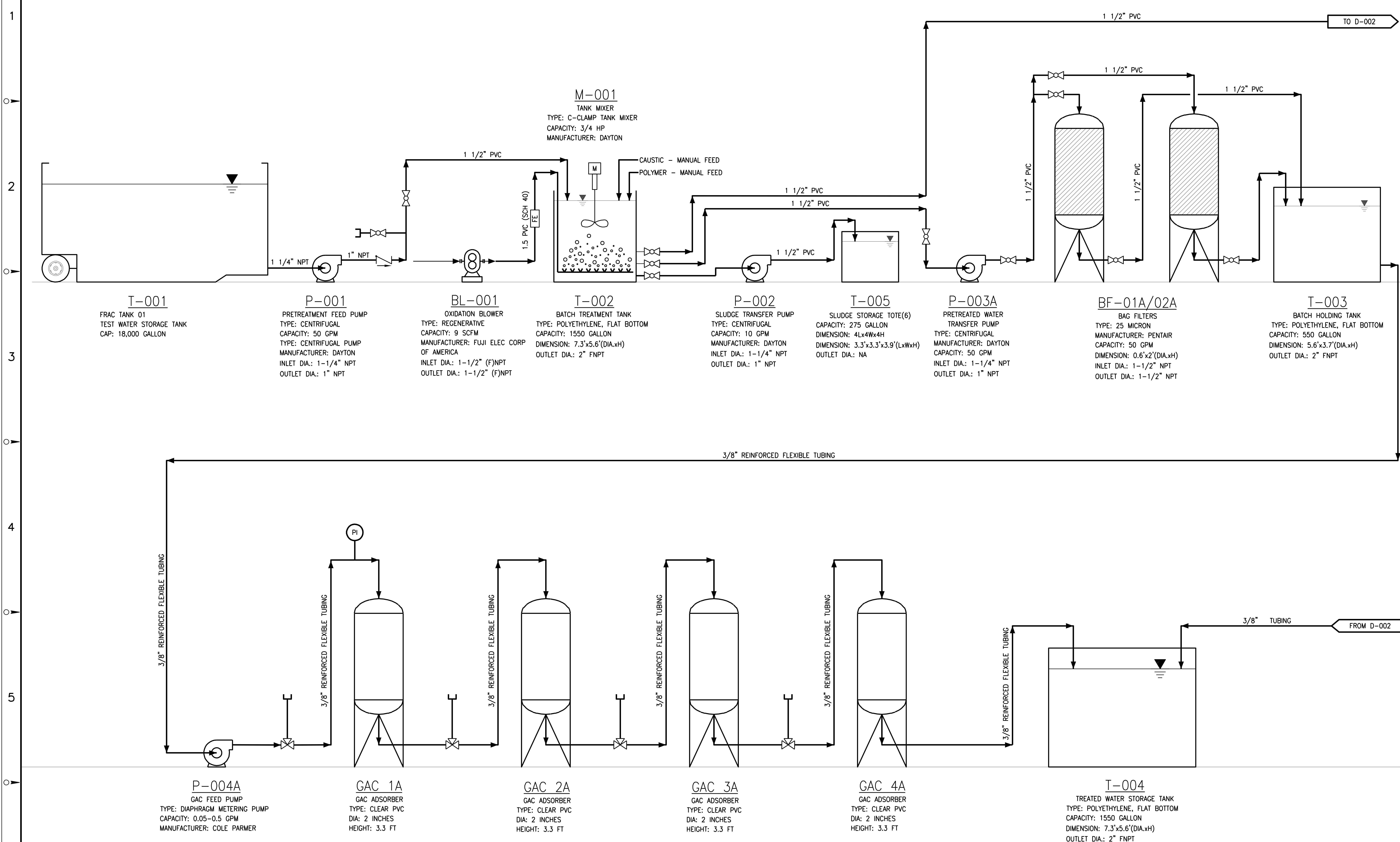
APPENDIX A
PILOT TREATMENT SYSTEM
PROCESS FLOW DIAGRAM AND
EQUIPMENT GENERAL ARRANGEMENT



NO.	DESCRIPTION	DATE	DRAWN	CHK'D	APPV'D
1	AS-BUILT	9/13/2019	JHG	KCK	THS

DRAWN BY: JHG — DATE: 5/14/19
CHECKED BY: KCK — DATE: 5/14/19
APPROVED BY: THS — DATE: 5/14/19
PROJECT MGR.: - — DATE: -
SEAL

PARSONS

OFFICE: 301 PLAINFIELD ROAD, SYRACUSE, NY 13212, (315) 451-9560
JOB: 449338
WBS: 01050

PROJECT TITLE:
CHEMOURS
OLD OUTFALL 002 PILOT STUDY

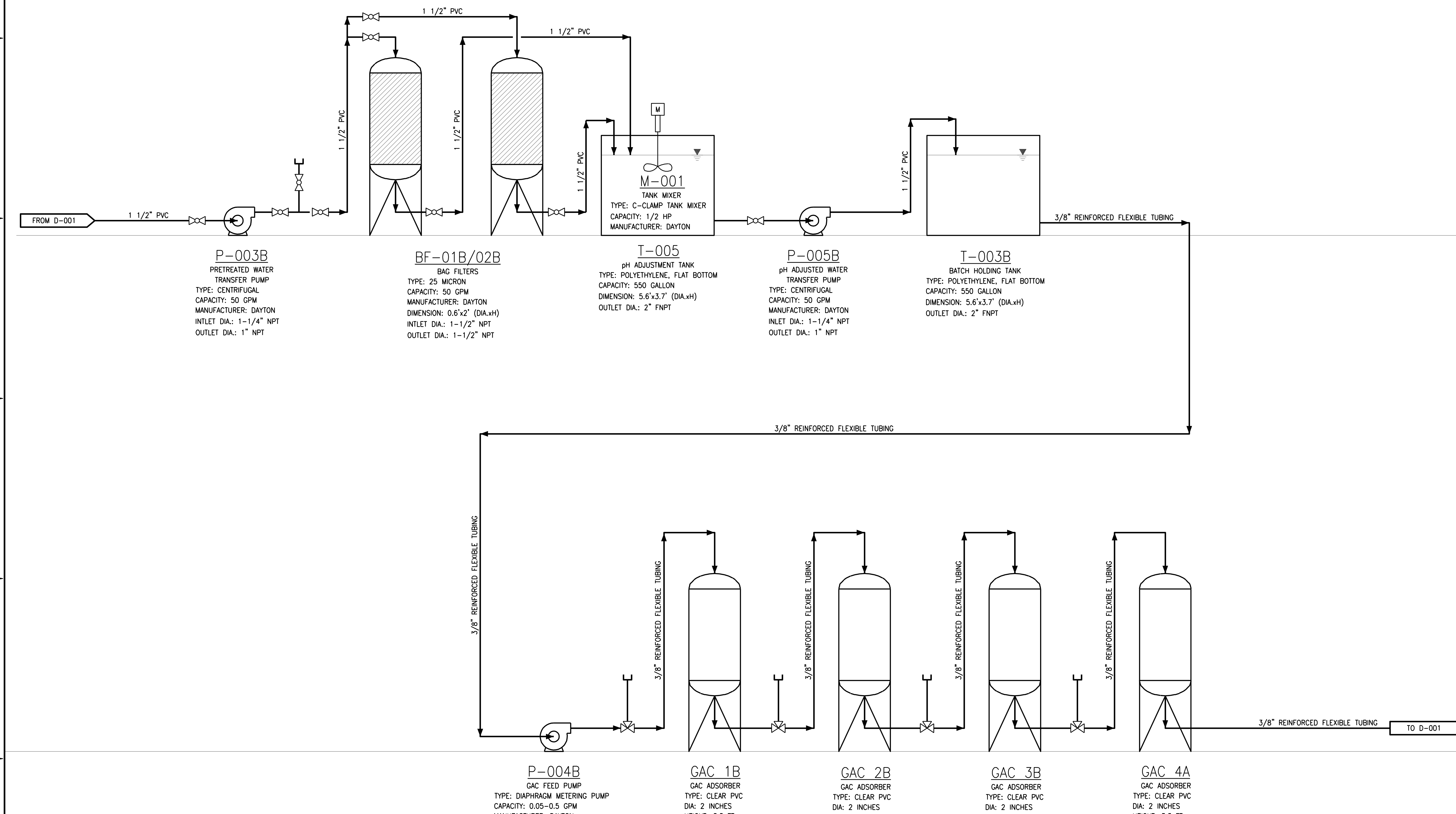
22828 NC-87
FAYETTEVILLE, NC 28306

DRAWING TITLE:
PROCESS
PILOT PLANT SCHEMATIC

SCALE: NO SCALE

DRAWING NO.: 449338-D-001 — REV.: 1

FILE NAME: P:\CHEMOURS PROGRAM\449338-FAYETTEVILE PILOT STUDY\ENGR\CAD\PFD\449338-D-001.DWG
PLOT DATE: 9/9/2019 4:30 PM PLOTTED BY: GOLDTHWAIT, JAMES



NO.	DESCRIPTION	DATE	DRAWN	CHK'D	APPV'D
1	AS-BUILT	9/13/2019	JHG	KCK	THS

DRAWN BY: JHG	DATE: 5/14/19	SEAL
CHECKED BY: KCK	DATE: 5/14/19	
APPROVED BY: THS	DATE: 5/14/19	
PROJECT MGR.: -	DATE: -	

PARSONS

OFFICE: 301 PLAINFIELD ROAD, SYRACUSE, NY 13212, (315) 451-9560

JOB: 449338

WBS: 01050

PROJECT TITLE:

CHEMOURS

OLD OUTFALL 002 PILOT STUDY

22828 NC-87
FAYETTEVILLE, NC 28306

DRAWING TITLE:

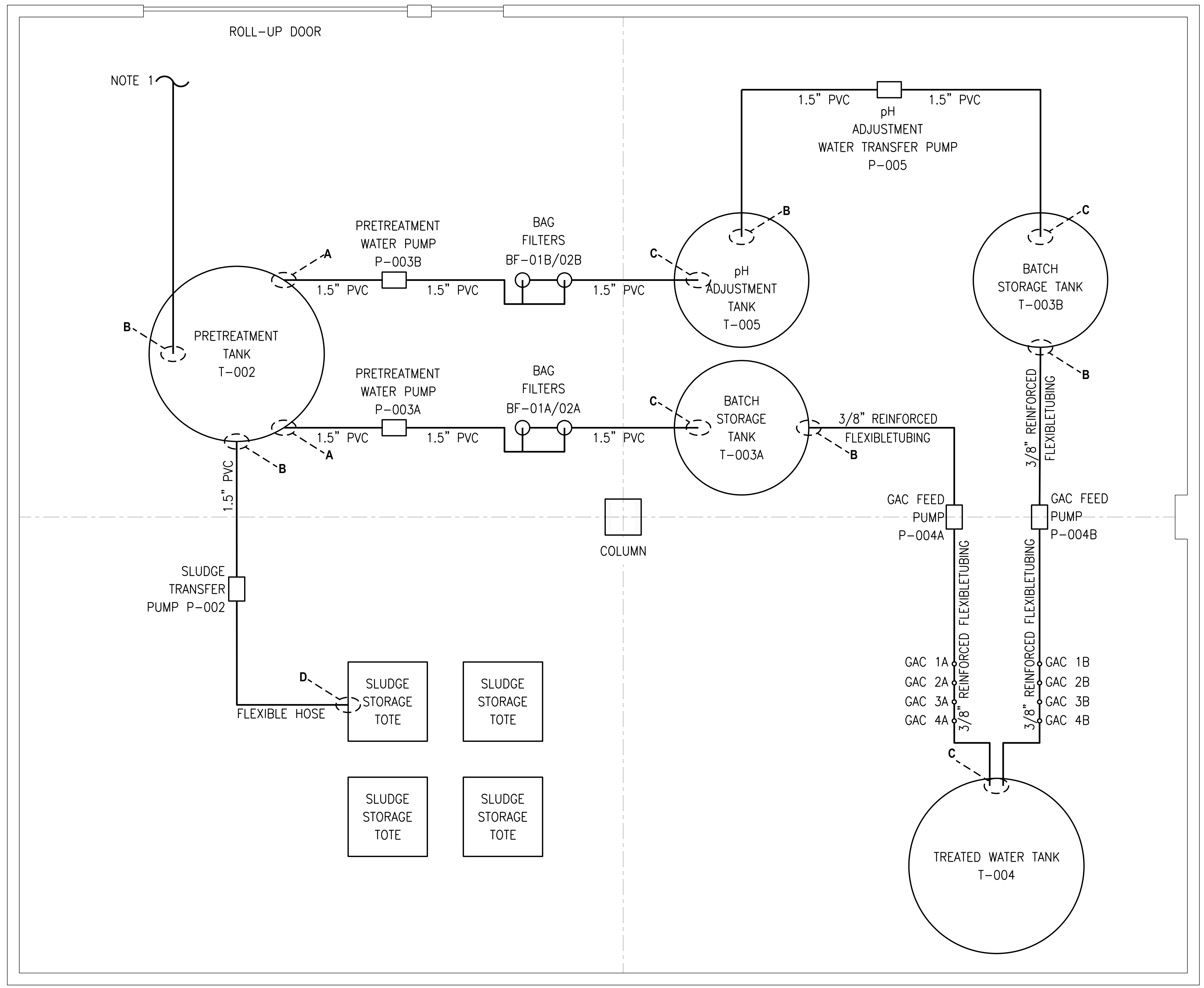
PROCESS PILOT PLANT SCHEMATIC

SCALE: NO SCALE

DRAWING NO.: 449338-D-002

REV.: 1

FILE NAME: P:\CHEMOURS PROGRAM\443938-FAYETTEVILE PILOT STUDY\ENGR\CAD\PFD\449338-D-002.DWG
PLOT DATE: 9/9/2019 4:27 PM PLOTTED BY: GOLDTHWAIT, JAMES



CONNECTION LEGEND:

A CONNECTION MADE VIA FIELD-INSTALLED 2" MNPT BULKHEAD FITTING.

B CONNECTION TO EXISTING 2" MNPT DRAIN ON TANK.

C DISCHARGE INTO EXISTING TANK OPENING.

D DISCHARGE INTO EXISTING TOTE OPENING.

NOTES:

1. THIS LINE CONNECTS TO PRETREATMENT FEED PUMP (P-001) LOCATED ADJACENT TO TEST WATER STORAGE TANK (T-001). LOCATION OF TANK TBD.

2 1 0 2 4

APPROXIMATE SCALE IN FEET

NOT FOR CONSTRUCTION

NO.	DESCRIPTION	DATE	DRAWN	CHK'D	APPV'D
0	ISSUED FOR REPORT	9/13/19	JHG	KCK	THS

DRAWN BY: JHG	DATE: 5/14/19	SEAL
CHECKED BY: KCK	DATE: 5/14/19	
APPROVED BY: THS	DATE: 5/14/19	
PROJECT MGR.: -	DATE: -	

PARSONS

OFFICE
301 PLAINFIELD ROAD
SYRACUSE, NY 13212
(315) 451-9560

JOB 449338

WBS 01050

PROJECT TITLE

CHEMOURS

OLD OUTFALL 002 PILOT STUDY

22828 NC-87
FAYETTEVILLE, NC 28306

DRAWING TITLE

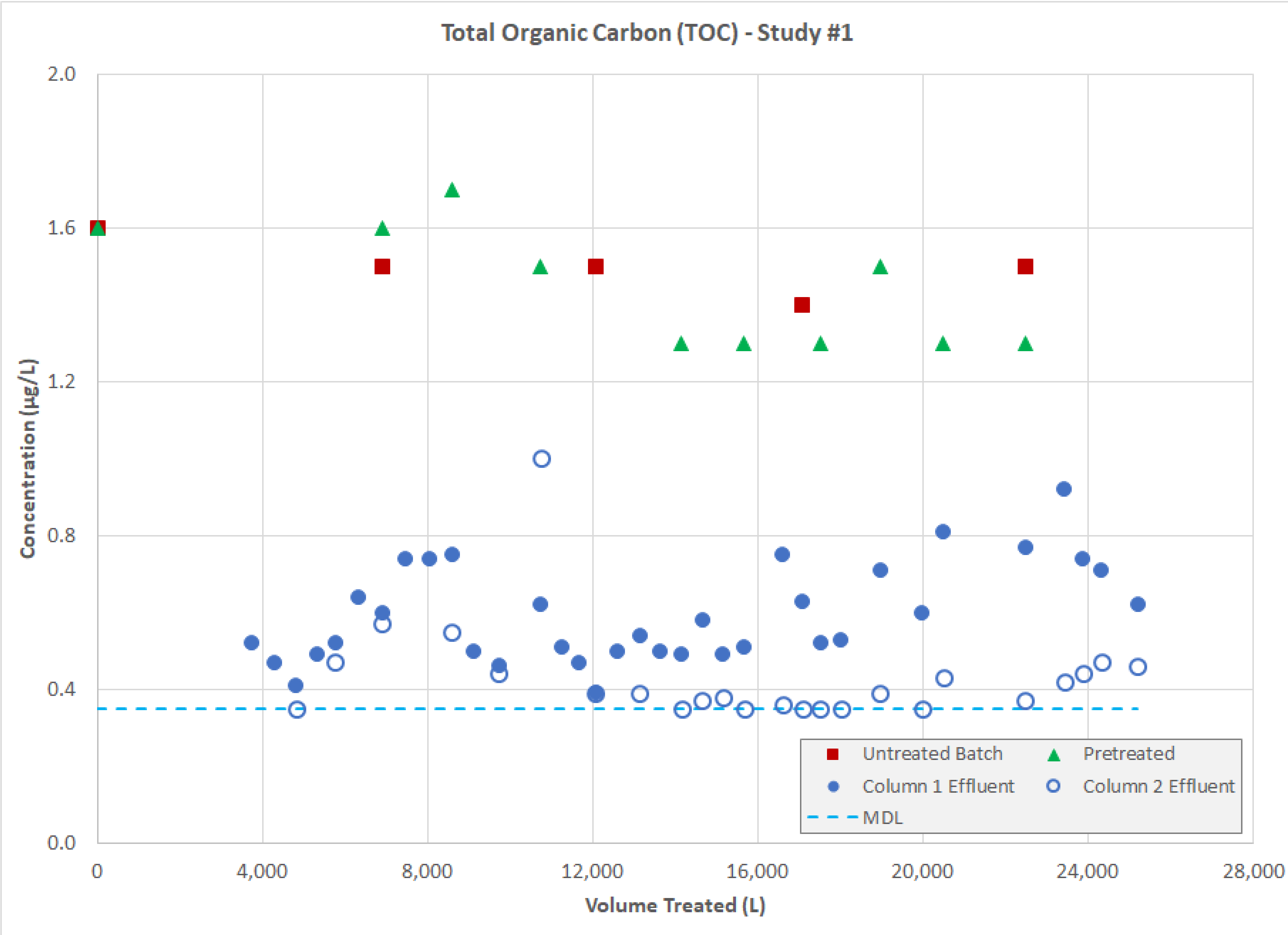
EQUIPMENT
GENERAL ARRANGEMENT

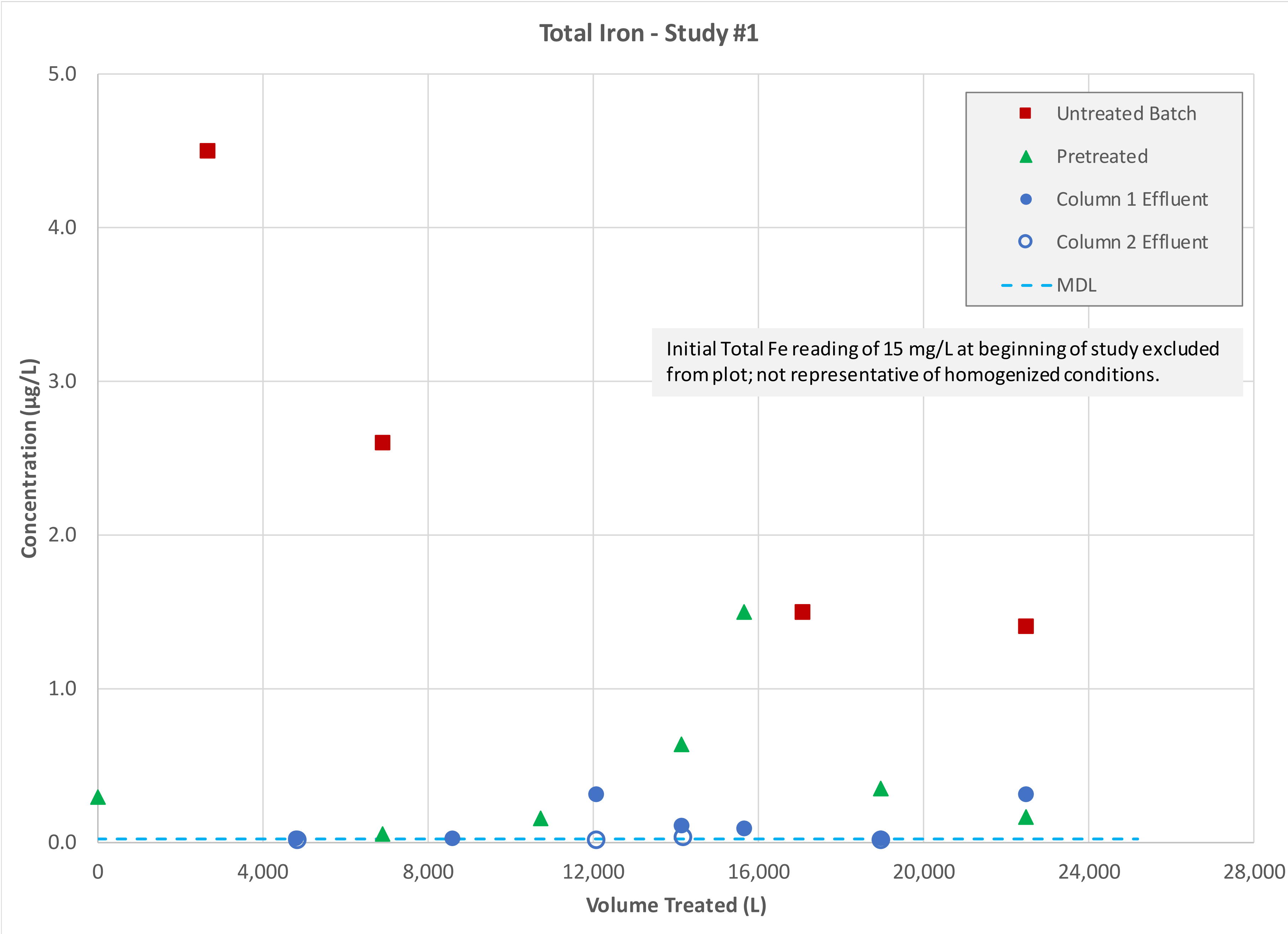
SCALE: AS SHOWN

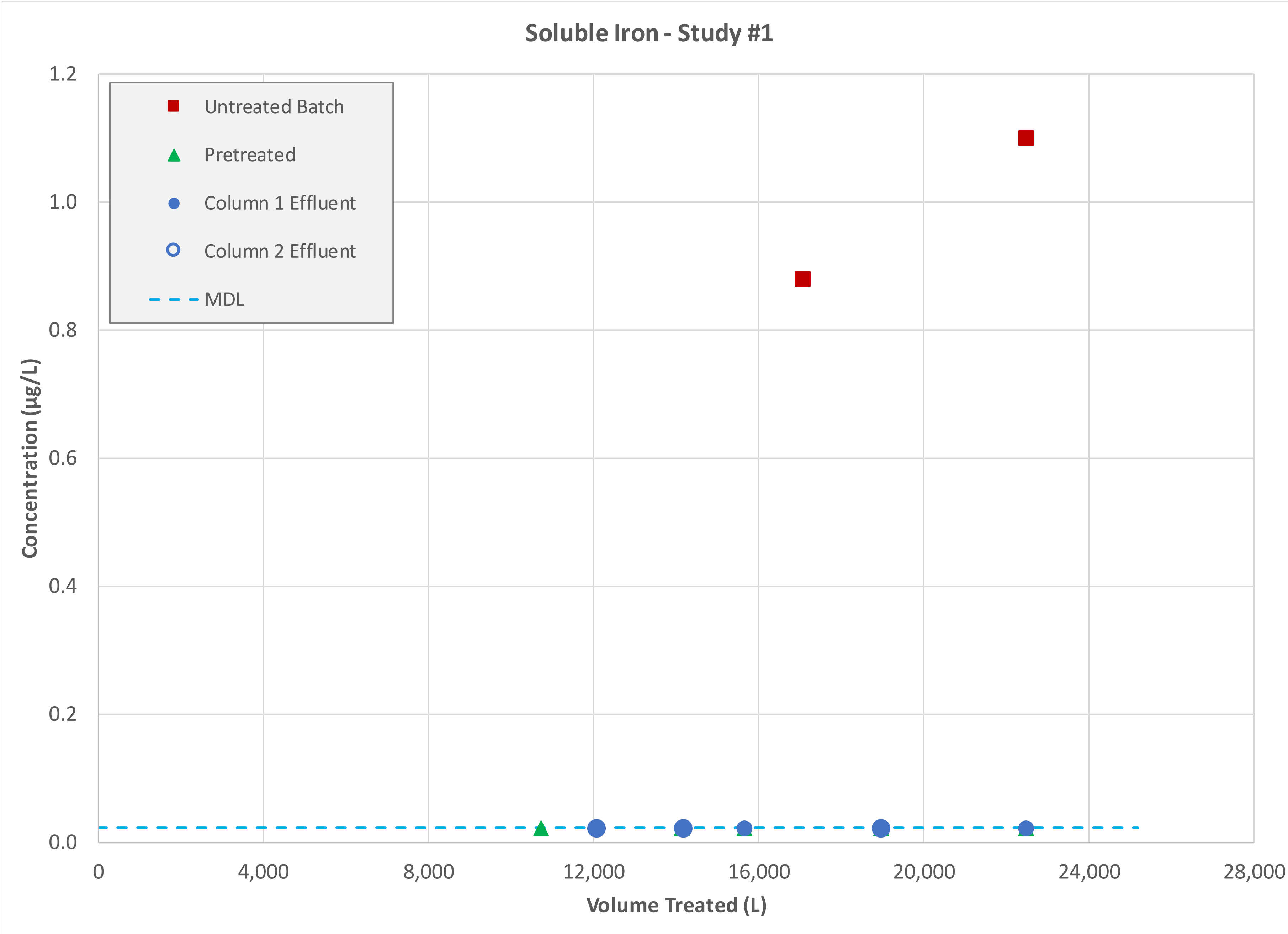
DRAWING NO. 449338-EA-001

REV. 0

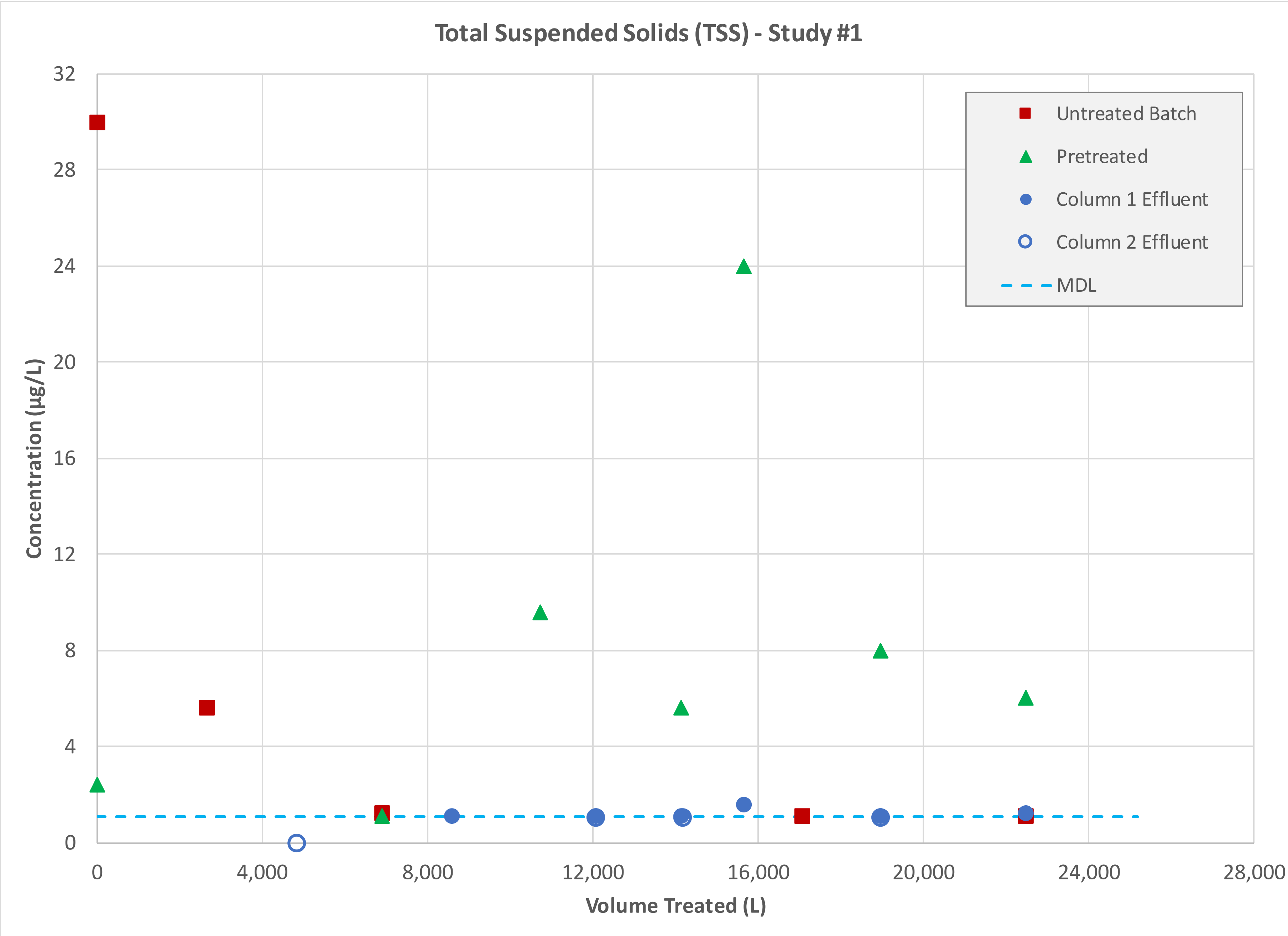
APPENDIX B
CONVENTIONAL PARAMETER FIGURES


Total Organic Carbon (TOC) - Study #1
Concentration (µg/L)
2.0
1.6
1.2
0.8
0.4
0.0
0
4,000
8,000
12,000
16,000
20,000
24,000
28,000
Volume Treated (L)
Untreated Batch
Pretreated
Column 1 Effluent
Column 2 Effluent
MDL

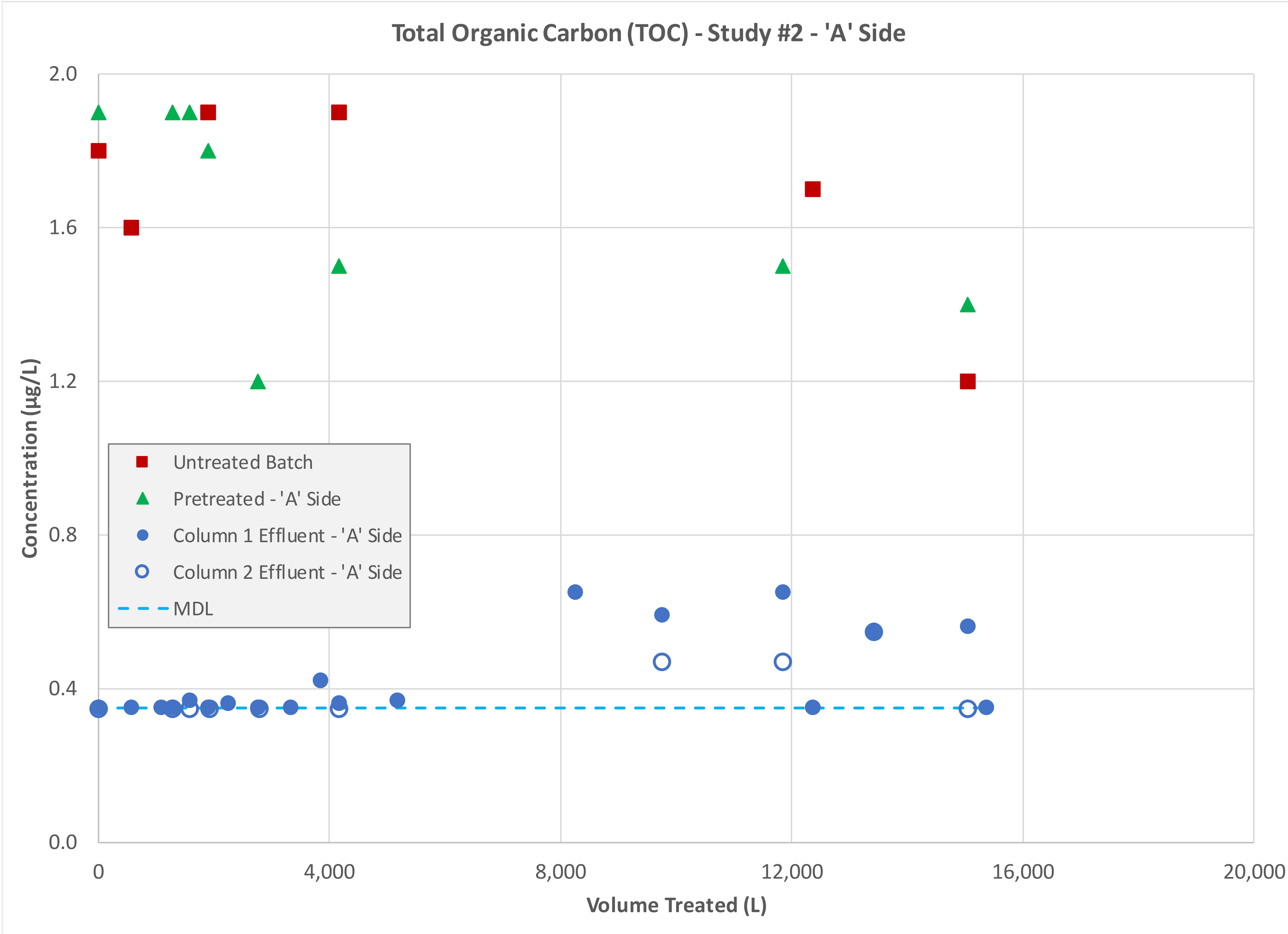

Total Iron - Study #1
Concentration (µg/L)
5.0
4.0
3.0
2.0
1.0
0.0
0
4,000
8,000
12,000
16,000
20,000
24,000
28,000
Volume Treated (L)
Untreated Batch
Pretreated
Column 1 Effluent
Column 2 Effluent
MDL
Initial Total Fe reading of 15 mg/L at beginning of study excluded from plot; not representative of homogenized conditions.



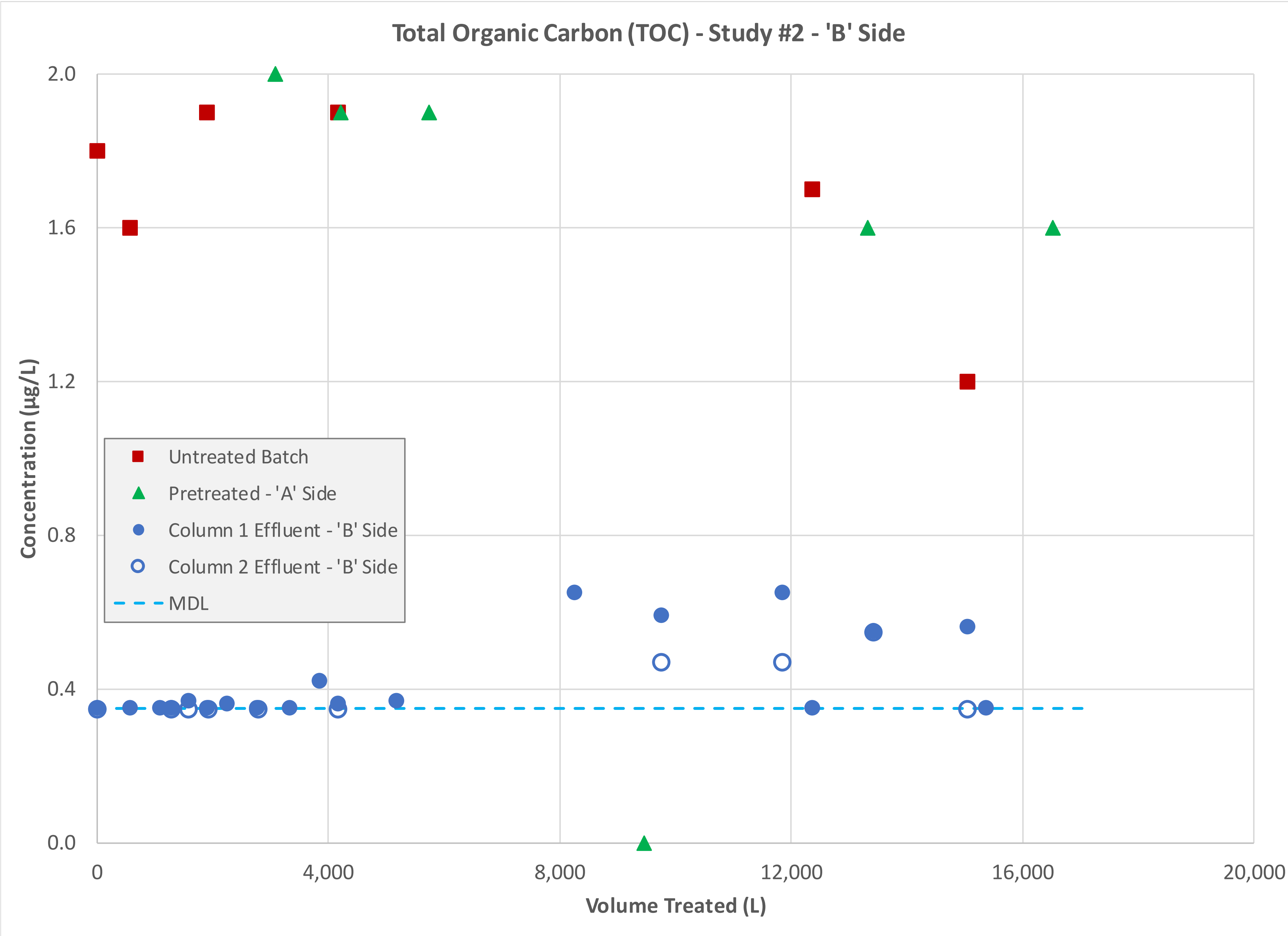
Soluble Iron - Study #1
Untreated Batch
Pretreated
Column 1 Effluent
Column 2 Effluent
MDL
Concentration (µg/L)
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0
4,000
8,000
12,000
16,000
20,000
24,000
28,000
Volume Treated (L)



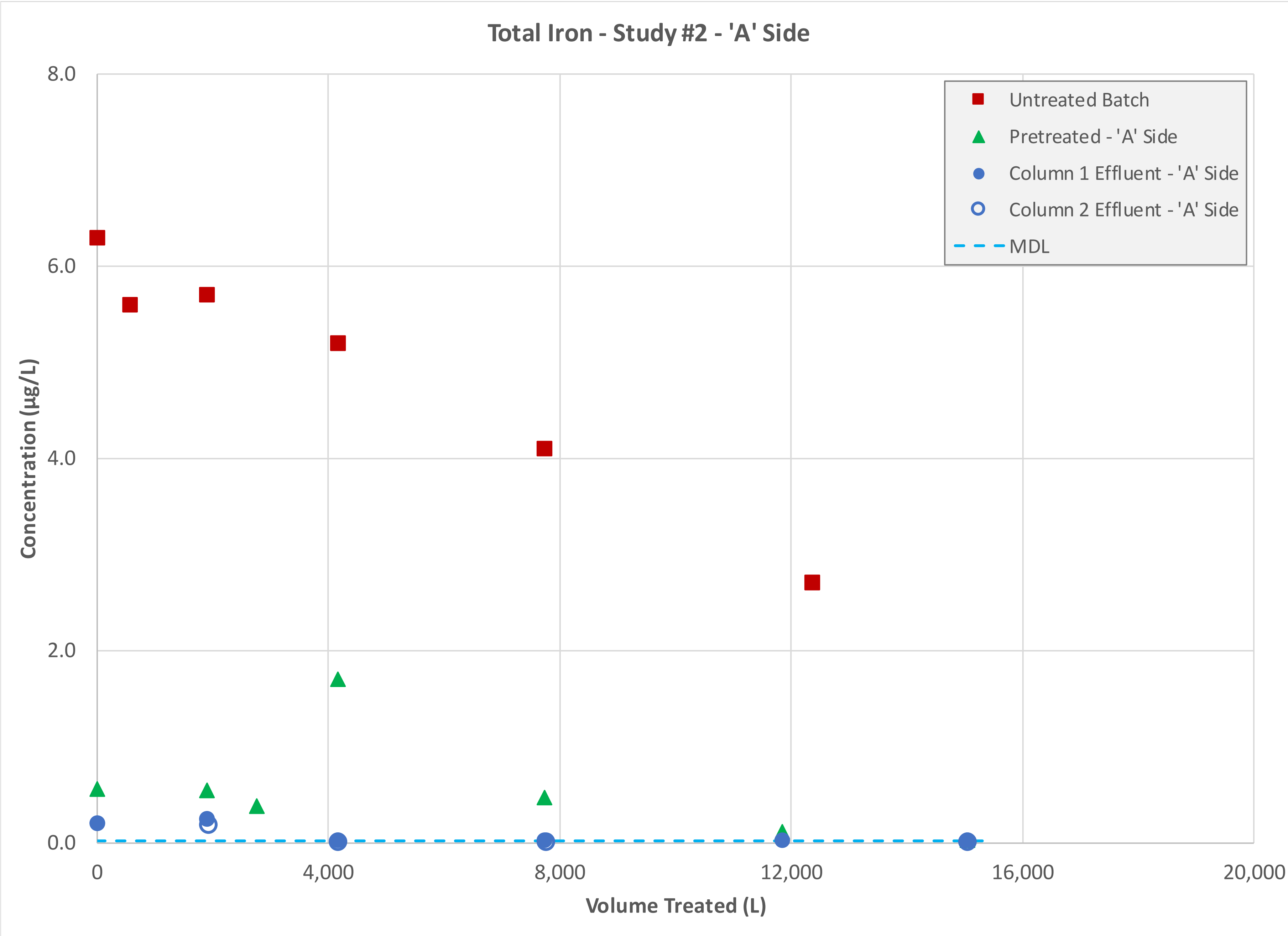
Total Suspended Solids (TSS) - Study #1
Concentration (µg/L)
Volume Treated (L)
0
4
8
12
16
20
24
28
32
0
4,000
8,000
12,000
16,000
20,000
24,000
28,000
Untreated Batch
Pretreated
Column 1 Effluent
Column 2 Effluent
MDL



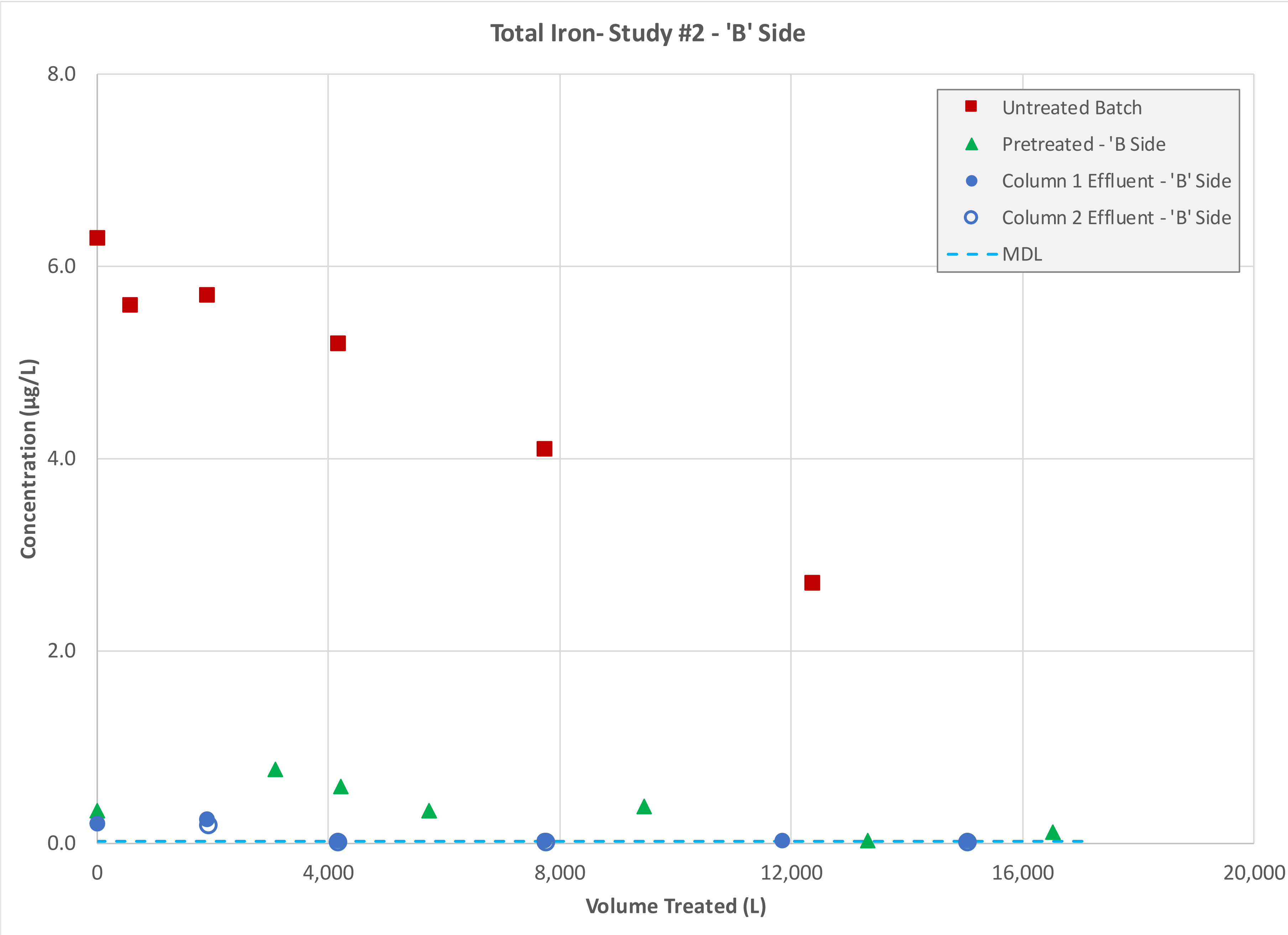
Total Organic Carbon (TOC) - Study #2 - 'A' Side
Concentration (µg/L)
Volume Treated (L)
2.0
1.6
1.2
0.8
0.4
0.0
0
4,000
8,000
12,000
16,000
20,000
Untreated Batch
Pretreated - 'A' Side
Column 1 Effluent - 'A' Side
Column 2 Effluent - 'A' Side
MDL



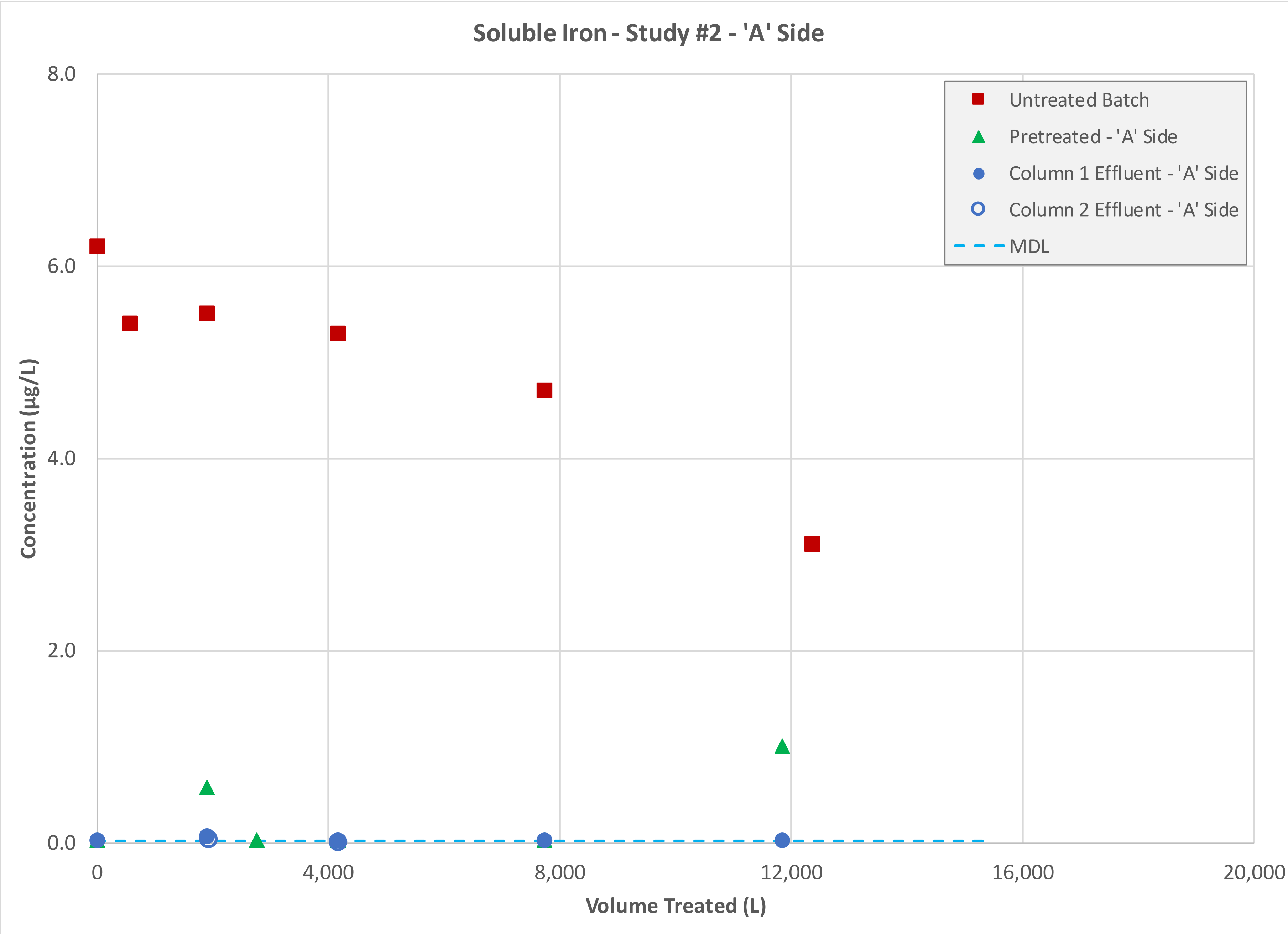
Total Organic Carbon (TOC) - Study #2 - 'B' Side
Concentration (µg/L)
2.0
1.6
1.2
0.8
0.4
0.0
0
4,000
8,000
12,000
16,000
20,000
Volume Treated (L)
Untreated Batch
Pretreated - 'A' Side
Column 1 Effluent - 'B' Side
Column 2 Effluent - 'B' Side
MDL



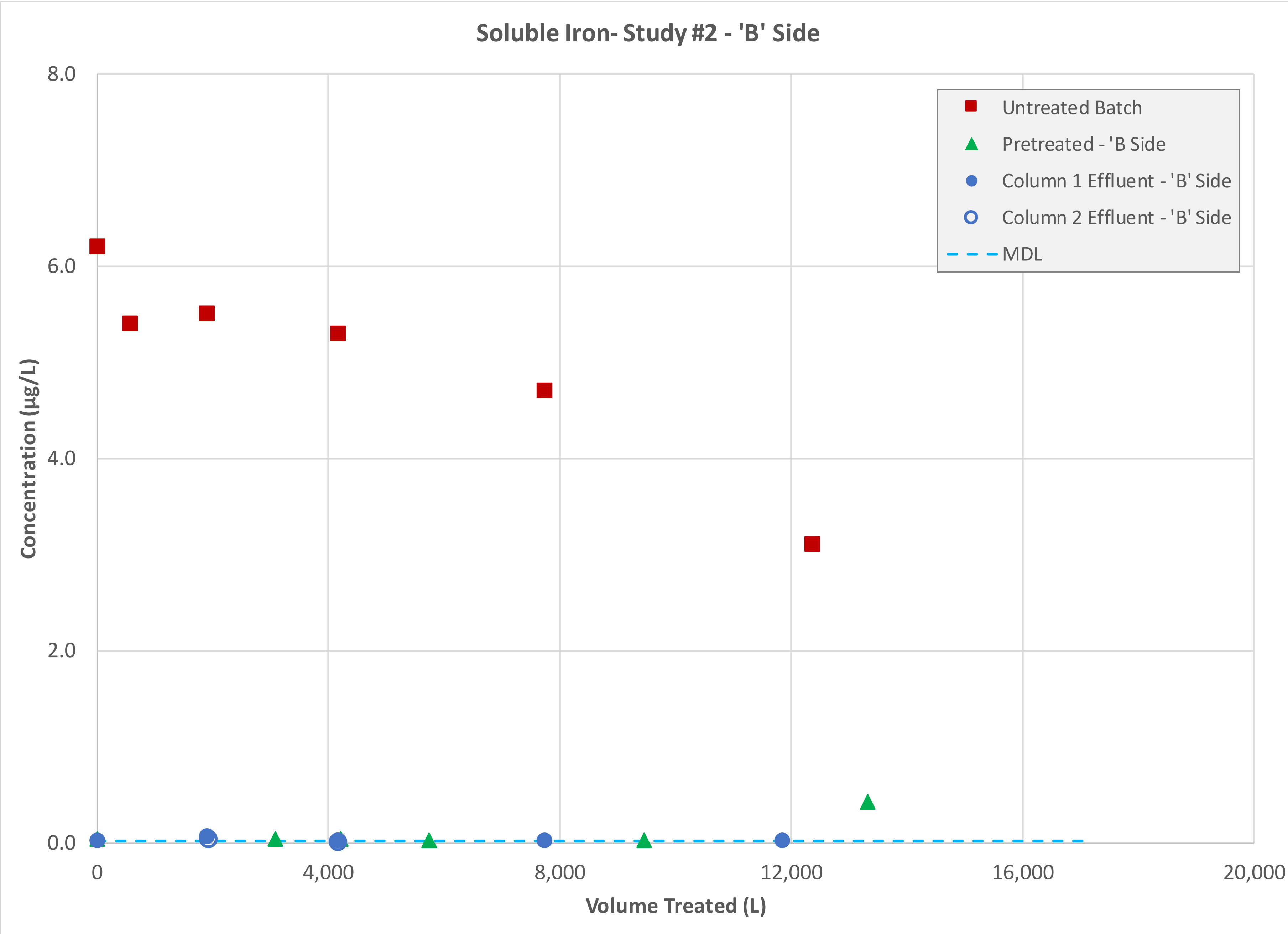
Total Iron - Study #2 - 'A' Side
Untreated Batch
Pretreated - 'A' Side
Column 1 Effluent - 'A' Side
Column 2 Effluent - 'A' Side
MDL
Concentration (µg/L)
8.0
6.0
4.0
2.0
0.0
0
4,000
8,000
12,000
16,000
20,000
Volume Treated (L)



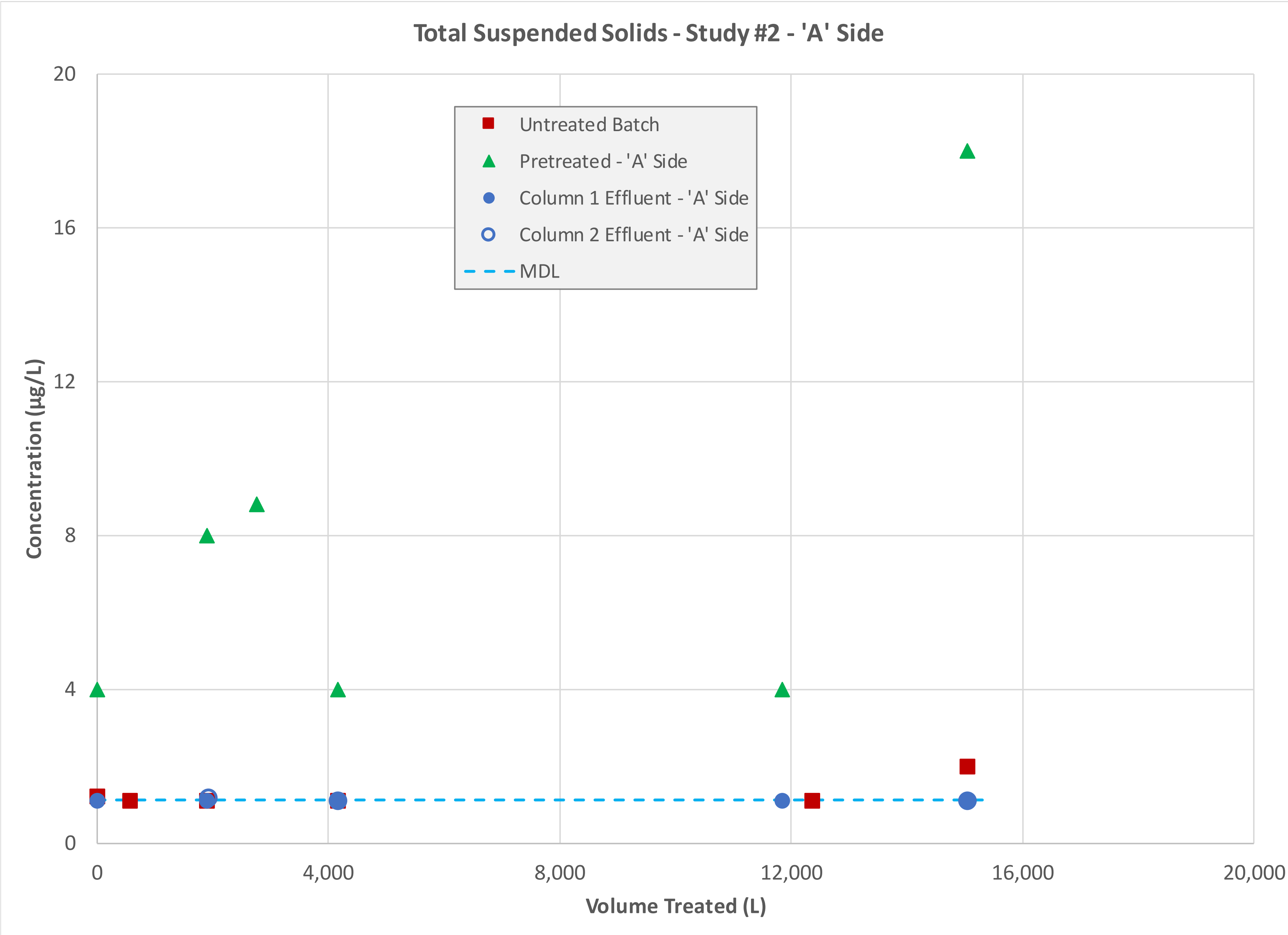
Total Iron- Study #2 - 'B' Side
8.0
6.0
4.0
2.0
0.0
Concentration (µg/L)
0
4,000
8,000
12,000
16,000
20,000
Volume Treated (L)
Untreated Batch
Pretreated - 'B Side
Column 1 Effluent - 'B' Side
Column 2 Effluent - 'B' Side
MDL

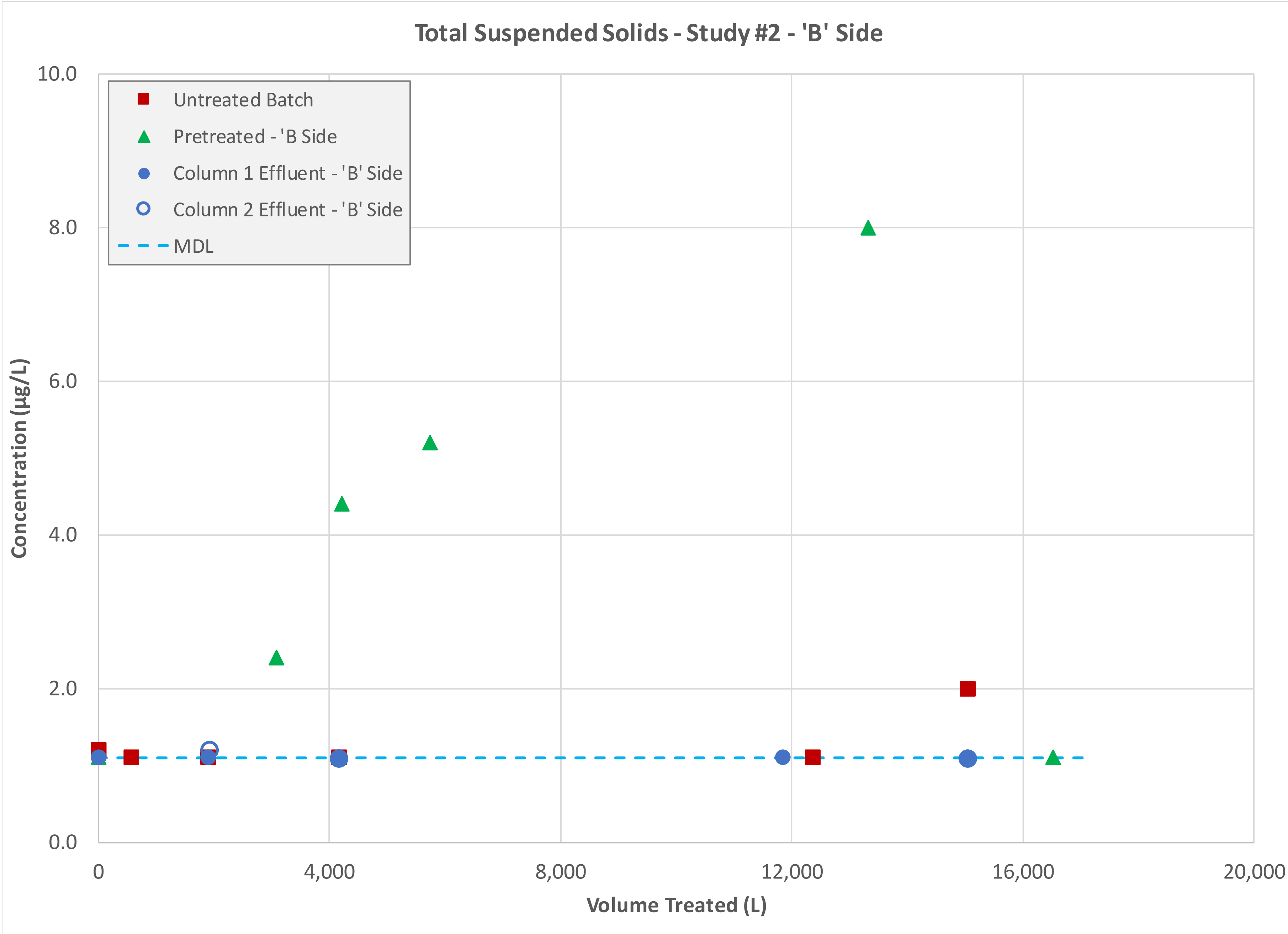


Soluble Iron - Study #2 - 'A' Side
8.0
6.0
4.0
2.0
0.0
Concentration (µg/L)
0
4,000
8,000
12,000
16,000
20,000
Volume Treated (L)
Untreated Batch
Pretreated - 'A' Side
Column 1 Effluent - 'A' Side
Column 2 Effluent - 'A' Side
MDL



Soluble Iron- Study #2 - 'B' Side
Concentration (µg/L)
8.0
6.0
4.0
2.0
0.0
0
4,000
8,000
12,000
16,000
20,000
Volume Treated (L)
Untreated Batch
Pretreated - 'B Side
Column 1 Effluent - 'B' Side
Column 2 Effluent - 'B' Side
MDL


Total Suspended Solids - Study #2 - 'A' Side
Untreated Batch
Pretreated - 'A' Side
Column 1 Effluent - 'A' Side
Column 2 Effluent - 'A' Side
MDL
Concentration (µg/L)
0
4
8
12
16
20
0
4,000
8,000
12,000
16,000
20,000
Volume Treated (L)



Total Suspended Solids - Study #2 - 'B' Side
Untreated Batch
Pretreated - 'B Side
Column 1 Effluent - 'B' Side
Column 2 Effluent - 'B' Side
MDL
Concentration (µg/L)
10.0
8.0
6.0
4.0
2.0
0.0
0
4,000
8,000
12,000
16,000
20,000
Volume Treated (L)

APPENDIX C
COMPREHENSIVE PFAS TREATMENT RESULTS

Table 1. Treated Flow Data – Study #1

Data	Elapsed Time		Cumulative Treated Flow		Empty Bed Contact Volumes			
	(Hr)	(d)	(L)	(Gal)	1 Column	2 Columns	3 Columns	4 Columns
6/14/2019	0	0	0	0	0	0	0	0
6/15/2019	21.5	1	498	132	241	121	80	60
6/16/2019	45.5	2	726	192	352	176	117	88
6/17/2019	69.5	3	1013	268	491	245	164	123
6/18/2019	93.5	4	1518	401	735	368	245	184
6/19/2019	117.5	5	2104	556	1019	510	340	255
6/20/2019	141.5	6	2673	706	1295	647	432	324
6/21/2019	165.5	7	3217	850	1558	779	519	390
6/22/2019	189.5	8	3745	989	1814	907	605	454
6/23/2019	213.5	9	4300	1136	2083	1041	694	521
6/24/2019	237.5	10	4817	1273	2333	1167	778	583
6/25/2019	261.5	11	5316	1405	2575	1288	858	644
6/26/2019	285.5	12	5760	1522	2790	1395	930	698
6/27/2019	309.5	13	6318	1669	3060	1530	1020	765
6/28/2019	333.5	14	6900	1823	3342	1671	1114	836
6/29/2019	357.5	15	7471	1974	3619	1810	1206	905
6/30/2019	381.5	16	8037	2124	3893	1947	1298	973
7/1/2019	405.5	17	8588	2269	4160	2080	1387	1040
7/2/2019	429.5	18	9116	2408	4416	2208	1472	1104
7/3/2019	453.5	19	9720	2568	4708	2354	1569	1177
7/5/2019	501.5	21	10741	2838	5203	2601	1734	1301
7/6/2019	525.5	22	11239	2969	5444	2722	1815	1361
7/7/2019	549.5	23	11659	3080	5647	2824	1882	1412
7/8/2019	573.5	24	12067	3188	5845	2923	1948	1461
7/9/2019	597.5	25	12599	3329	6103	3052	2034	1526

Table 1. Treated Flow Data – Study #1 (Continued)

Data	Elapsed Time		Cumulative Treated Flow		Empty Bed Contact Volumes			
	(Hr)	(d)	(L)	(Gal)	1 Column	2 Columns	3 Columns	4 Columns
7/10/2019	621.5	26	13134	3470	6362	3181	2121	1590
7/11/2019	645.5	27	13632	3602	6603	3302	2201	1651
7/12/2019	669.5	28	14155	3740	6857	3428	2286	1714
7/13/2019	693.5	29	14654	3872	7099	3549	2366	1775
7/14/2019	717.5	30	15152	4003	7340	3670	2447	1835
7/15/2019	741.5	31	15665	4139	7588	3794	2529	1897
7/16/2019	765.5	32	16132	4262	7815	3907	2605	1954
7/17/2019	789.5	33	16600	4386	8041	4020	2680	2010
7/18/2019	813.5	34	17075	4511	8271	4136	2757	2068
7/19/2019	837.5	35	17510	4626	8482	4241	2827	2120
7/20/2019	861.5	36	18012	4759	8725	4363	2908	2181
7/21/2019	885.5	37	18493	4886	8958	4479	2986	2239
7/22/2019	909.5	38	18948	5006	9178	4589	3059	2295
7/23/2019	933.5	39	19443	5137	9418	4709	3139	2355
7/24/2019	957.5	40	19967	5275	9672	4836	3224	2418
7/25/2019	981.5	41	20485	5412	9923	4961	3308	2481
7/26/2019	1005.5	42	20995	5547	10170	5085	3390	2543
7/27/2019	1029.5	43	21471	5673	10400	5200	3467	2600
7/28/2019	1053.5	44	21949	5799	10632	5316	3544	2658
7/30/2019	1101.5	46	22971	6069	11127	5564	3709	2782
8/1/2019	1149.5	48	23862	6304	11559	5779	3853	2890
8/2/2019	1173.5	49	24314	6424	11778	5889	3926	2944
8/5/2019	1245.5	52	25198	6657	12206	6103	4069	3051
8/6/2019	1267	53	25435	6720	12321	6160	4107	3080

Table 2. Untreated Batch (INF) Table 3+ Results – Study #1

Date	PFMOAA	R-EVE	Byproduct 5	Byproduct 4	PMPA	PFO2HxA	PEPA	NVHOS	PFECA_B	PFO3OA	HFPO-DA	PES	PFECA_G	PFO4DA	EVE Acid	Hydro EVE	Byproduct 6	Byproduct 2	PFO5DA	Byproduct 1
	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)
MRL	0.0106	0.0107	0.0067	0.0073	0.0048	0.0048	0.0235	0.0114	0.0035	0.0092	0.0117	0.0012	0.0062	0.0082	0.0052	0.0020	0.0012	0.0073	0.0070	0.0094
06/13/19	31.4834	0.1282	0.7991	0.4857	2.7169	13.8455	0.6571	0.6304	ND	2.4994	3.9129	0.0015	ND	0.7943	0.0135	0.1353	0.0090	0.1873	0.2304	0.1650
06/20/19	36.2241	0.1267	0.8827	0.5221	2.8461	14.9619	0.5427	0.6346	ND	2.4491	3.7694	ND	ND	0.7445	0.0166	0.1340	0.0098	0.1899	0.1705	0.1846
06/28/19	37.5090	0.1294	0.8893	0.4970	2.9591	15.4174	0.4730	0.6106	ND	2.3491	3.6638	0.0014	ND	0.7735	0.0142	0.1382	0.0096	0.2102	0.3230	0.1069
07/09/19	38.1470	0.0600	0.8290	0.4920	3.1170	15.4460	0.8050	0.6690	ND	2.9310	4.8810	ND	ND	0.9670	0.0170	0.1430	0.0100	0.2140	0.3120	0.1980
07/30/19	21.4372	0.3777	1.3068	1.8890	4.0922	17.0154	1.0729	0.6138	ND	4.6977	6.4714	0.0023	ND	1.6766	0.1880	0.0159	0.0116	0.2898	0.4751	0.2298
08/01/19	28.6394	0.4234	1.3256	2.0991	4.2026	17.6096	0.3957	0.3269	ND	4.2944	5.5795	0.0025	ND	1.3263	0.1568	0.0143	0.0109	0.2077	0.2964	0.1767
08/06/19	23.9793	0.3591	1.3318	1.4030	4.1844	18.9882	0.7832	0.5864	ND	3.8361	4.9646	0.0024	ND	0.7411	0.1093	0.0091	0.0057	0.0852	0.1190	0.0244
AVERAGE(1)	31.1	0.23	1.05	1.06	3.45	16.2	0.68	0.58	< 0.0035	3.29	4.75	0.0018	< 0.0062	1.00	0.074	0.083	0.011	0.24	0.23	0.16

(1) Concentrations below reporting limit taken as equal to the reporting limit for calculating averages.

Table 3. Pretreated (PRE-A) Table 3+ Results – Study #1

Date	PFMOAA	R-EVE	Byproduct 5	Byproduct 4	PMPA	PFO2HxA	PEPA	NVHOS	PFECA_B	PFO3OA	HFPO-DA	PES	PFECA_G	PFO4DA	EVE Acid	Hydro EVE	Byproduct 6	Byproduct 2	PFO5DA	Byproduct 1
	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)
MRL	0.0106	0.0107	0.0067	0.0073	0.0048	0.0048	0.0235	0.0114	0.0035	0.0092	0.0117	0.0012	0.0062	0.0082	0.0052	0.0020	0.0012	0.0073	0.0070	0.0094
06/14/19	28.2056	ND	0.4032	0.0836	2.4603	13.7532	0.61	0.6072	ND	2.4435	3.7580	ND	ND	0.7723	0.0156	0.1331	0.0092	0.1951	0.2118	0.1980
06/17/19	26.0079	ND	0.4326	0.0776	2.2804	13.7863	0.54	0.5982	ND	2.3351	3.5968	0.0014	ND	0.7365	0.0153	0.1296	0.0088	0.1940	0.1971	0.1904
06/21/19	21.6978	ND	0.4028	0.0655	2.4146	13.7723	0.41	0.5841	ND	2.2655	3.4487	0.0013	ND	0.7385	0.0154	0.1266	0.0096	0.1983	0.2276	0.2014
06/24/19	23.3385	ND	0.3993	0.0710	2.6208	14.5180	0.45	0.6027	ND	2.3721	3.5647	0.0014	ND	0.7389	0.0138	0.1312	0.0092	0.1946	0.1844	0.1982
06/28/19	23.4621	ND	0.4249	0.0682	2.6294	14.7435	0.44	0.5852	ND	2.4014	3.6436	0.0014	ND	0.7303	0.0154	0.1368	0.0096	0.1972	0.2354	0.1099
07/01/19	21.7973	ND	0.3462	0.0631	2.8217	14.8590	0.46	0.5943	ND	2.3854	3.6625	0.0014	ND	0.7600	0.0149	0.1392	0.0085	0.2065	0.2119	0.1009
07/05/19	21.1050	ND	0.1970	0.0540	3.0010	15.2130	0.93	0.6630	ND	3.2890	5.6100	0.0010	ND	1.0580	0.0180	0.1470	0.0100	0.2130	0.3410	0.2120
07/12/19	18.71	ND	0.0680	0.023	2.9080	15.802	0.86	0.681	ND	3.1960	5.260	ND	ND	1.061	0.0180	0.149	0.0100	0.208	0.306	0.2000
07/15/19	16.174	ND	0.0560	0.025	2.4750	16.037	0.68	0.644	ND	2.9100	4.676	ND	ND	0.963	0.0180	0.150	0.0100	0.207	0.269	0.2010
07/19/19	18.1642	ND	0.0665	0.0261	2.7059	16.7751	0.82	0.7039	ND	3.2955	4.9106	0.0014	ND	1.0157	0.1627	0.0204	0.0113	0.2678	0.2195	0.2008
07/22/19	18.5928	ND	0.0855	0.0405	2.3475	16.5134	0.68	0.7143	ND	3.0587	4.4220	ND	ND	0.9324	0.1618	0.0225	0.0102	0.2462	0.2175	0.2099
07/25/19	18.7048	ND	0.1146	0.0284	2.7686	15.9752	0.8593	0.7142	ND	3.2717	5.2034	0.0007	ND	1.0256	0.1539	0.0211	0.0099	0.3053	0.2159	0.2121
07/29/19	17.2566	ND	0.0870	0.0378	2.5670	16.4995	0.6934	0.7069	ND	3.0095	4.5871	0.0012	ND	0.9549	0.1516	0.0225	0.0108	0.2742	0.2165	0.2203
08/01/19	29.4107	0.4188	1.3458	2.1235	4.2440	17.7462	0.3282	0.3197	ND	4.2669	5.3694	0.0022	ND	1.2615	0.1581	0.0197	0.0100	0.2114	0.3286	0.1902
AVERAGE(1)	21.6	0.040	0.32	0.20	2.7	15.4	0.63	0.62	< 0.0035	2.9	4.4	0.0013	< 0.0062	0.91	0.067	0.096	0.0098	0.23	0.23	0.19

(1) Concentrations below reporting limit taken as equal to the reporting limit for calculating averages.

Table 4. Column 1 Effluent (GAC 1A) Table 3+ Results – Study #1

Date	PFMOAA	R-EVE	Byproduct 5	Byproduct 4	PMPA	PFO2HxA	PEPA	NVHOS	PFECA_B	PFO3OA	HFPO-DA	PES	PFECA_G	PFO4DA	EVE Acid	Hydro EVE	Byproduct 6	Byproduct 2	PFO5DA	Byproduct 1
	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)
MRL	0.0106	0.0107	0.0067	0.0073	0.0048	0.0048	0.0235	0.0114	0.0035	0.0092	0.0117	0.0012	0.0062	0.0082	0.0052	0.0020	0.0012	0.0073	0.0070	0.0094
06/14/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0013	ND	ND	ND
06/15/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0013	ND	ND	ND
06/16/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0013	ND	ND	ND
06/17/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0013	ND	ND	ND
06/18/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0012	ND	ND	ND
06/19/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0013	ND	ND	ND
06/20/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0012	ND	ND	ND
06/21/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0012	ND	ND	ND
06/22/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0013	ND	ND	ND
06/23/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0013	ND	ND	ND
06/24/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0013	ND	ND	ND
06/25/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0055	ND	0.0012	ND	ND	ND
06/26/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0014	ND	ND	ND
06/27/19	0.0269	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0013	ND	ND	ND
06/28/19	0.0735	ND	ND	ND	0.0263	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0012	ND	ND	0.0963
06/29/19	0.193	ND	ND	ND	0.0744	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0012	ND	ND	0.1009
06/30/19	0.393	ND	ND	ND	0.140	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0013	ND	ND	ND
07/01/19	0.656	ND	ND	ND	0.228	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0013	ND	ND	0.1017
07/02/19	0.889	ND	ND	ND	0.351	0.017	ND	ND	ND	ND	0.027	ND	ND	ND	ND	ND	ND	ND	ND	ND
07/03/19	2.920	ND	0.012	ND	0.800	0.203	0.057	ND	ND	0.034	0.19	ND	ND	0.012	ND	0.0030	0.0010	ND	ND	ND
07/05/19	3.522	ND	ND	ND	0.821	0.069	0.032	ND	ND	ND	0.048	ND	ND	ND	ND	ND	0.0010	ND	ND	ND
07/06/19	4.503	ND	ND	ND	1.028	0.117	0.051	ND	ND	ND	0.10	ND	ND	ND	ND	ND	0.0010	ND	ND	ND
07/07/19	5.021	ND	ND	ND	1.062	0.102	0.049	ND	ND	ND	0.081	ND	ND	ND	ND	ND	0.0010	ND	ND	ND
07/08/19	5.495	ND	ND	ND	1.042	0.047	ND	ND	ND	ND	0.020	ND	ND	ND	ND	ND	0.0010	ND	ND	ND
07/09/19	8.879	ND	0.0090	ND	1.428	0.304	0.097	ND	ND	0.027	0.246	ND	ND	ND	ND	0.004	0.0010	ND	ND	ND
07/10/19	7.587	ND	0.0070	ND	1.655	0.360	0.1370	ND	ND	0.031	0.295	ND	ND	ND	ND	0.005	0.0020	ND	ND	ND
07/11/19	8.902	ND	ND	ND	1.776	0.323	0.1300	0.0120	ND	0.026	0.265	ND	ND	ND	ND	0.003	0.0010	ND	ND	ND
07/12/19	8.798	ND	ND	ND	1.804	0.521	0.1540	0.0180	ND	0.049	0.381	ND	ND	0.01	ND	0.006	0.0010	ND	ND	ND
07/13/19	8.099	ND	ND	ND	1.663	0.423	0.1280	0.0140	ND	0.033	0.286	ND	ND	ND	ND	0.004	0.0010	ND	ND	ND
07/14/19	8.763	ND	ND	ND	1.710	0.477	0.1220	ND	ND	0.034	0.306	ND	ND	ND	ND	0.004	0.0010	ND	ND	ND
07/15/19	10.618	ND	ND	ND	1.931	0.730	0.1610	0.0220	ND	0.049	0.435	ND	ND	0.013	ND	0.006	0.0010	ND	ND	ND
07/17/19	12.267	ND	0.0080	ND	2.007	0.933	0.1700	0.0250	ND	0.063	0.503	ND	ND	0.012	ND	0.007	0.0010	ND	ND	ND
07/19/19	13.9456	ND	0.0109	ND	2.2643	1.4971	0.2841	0.0486	ND	0.1038	0.6766	ND	ND	0.0215	0.0091	ND	0.0015	ND	0.0076	ND
07/20/19	15.1532	ND	0.0153	ND	2.1519	1.9291	0.2874	0.0666	ND	0.1351	0.8309	ND	ND	0.0252	0.0124	ND	0.0018	ND	0.0092	ND
07/22/19	18.3652	ND	0.0123	ND	2.3131	1.9582	0.2865	0.0579	ND	0.1179	0.7711	ND	ND	0.0194	0.0113	ND	0.0015	ND	0.0076	ND
07/24/19	18.4492	ND	0.0218	0.0077	2.9059	3.1155	0.5485	0.1089	ND	0.2943	1.6048	ND	ND	0.0530	0.0185	0.0028	0.0022	ND	0.0152	0.0130
07/25/19	19.0097	ND	0.0211	ND	2.9709	3.6103	0.5065	0.1300	ND	0.3383	1.6123	ND	ND	0.0614	0.0230	0.0026	0.0024	0.0095	0.0191	0.0182
07/26/19	16.2088	ND	0.0198	0.0083	2.6900	3.7199	0.4648	0.1127	ND	0.3307	1.5249	ND	ND	0.0762	0.0245	ND	0.0024	0.0111	0.0207	0.0138
07/27/19	16.7219	ND	0.0198	ND	2.6872	3.2930	0.4059	0.1110	ND	0.2642	1.3286	ND	ND	0.0502	0.0198	ND	0.0020	ND	0.0168	0.0107
07/29/19	17.8887	ND	0.0154	0.0094	2.6682	3.6450	0.3986	0.1187	ND	0.2889	1.3796	ND	ND	0.0586	0.0226	0.0022	0.0020	0.0096	0.0197	0.0199
07/31/19	29.3523	0.1577	0.4043	0.6340	4.3734	5.1186	0.2493	0.0339	ND	0.6951	2.1841	0.0016	ND	0.1509	0.0323	0.0046	0.0026	0.0297	0.0384	0.0236
08/01/19	28.1829	0.1556	0.4158	0.6053	4.4146	5.0170	0.2482	0.0671	ND	0.5944	2.0362	0.0017	ND	0.1145	0.0272	0.0032	0.0026	0.0288	0.0201	0.0170
08/02/19	30.8509	0.1150	0.2387	0.3791	4.7064	3.7767	0.2270	0.0481	ND	0.3792	1.5294	0.0017	ND	0.0679	0.0178	0.0022	0.0020	0.0143	0.0080	0.0101
08/05/19	33.0394	0.0568	0.1190	0.1922	4.7616	2.3649	0.1846	0.0248	ND	0.1397	0.8980	0.0016	ND	0.0235	0.0076	0.0011	0.0018	0.0071	ND	ND

Table 5. Column 2 Effluent (GAC 2A) Table 3+ Results – Study #1

Date	PFMOAA	R-EVE	Byproduct 5	Byproduct 4	PMPA	PFO2HxA	PEPA	NVHOS	PFECA_B	PFO3OA	HFPO-DA	PES	PFECA_G	PFO4DA	EVE Acid	Hydro EVE	Byproduct 6	Byproduct 2	PFO5DA	Byproduct 1
	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)
MRL	0.0106	0.0107	0.0067	0.0073	0.0048	0.0048	0.0235	0.0114	0.0035	0.0092	0.0117	0.0012	0.0062	0.0082	0.0052	0.0020	0.0012	0.0073	0.0070	0.0094
6/14/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/15/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0012	ND	ND	ND
6/17/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0013	ND	ND	ND
6/19/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0013	ND	ND	ND
6/21/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0013	ND	ND	ND
6/24/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0012	ND	ND	ND
6/26/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0013	ND	ND	ND
6/28/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0013	ND	ND	ND
7/1/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0013	ND	ND	ND
7/3/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0010	ND	ND	ND
7/5/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0010	ND	ND	ND
7/8/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0010	ND	ND	ND
7/10/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.001	ND	ND	ND
7/12/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.001	ND	ND	ND
7/13/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.018	ND	ND	ND	ND	ND	0.001	ND	ND	ND
7/14/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.013	ND	ND	ND	ND	ND	0.001	ND	ND	ND
7/15/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.013	ND	ND	ND	ND	ND	0.001	ND	ND	ND
7/17/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.001	ND	ND	ND
7/19/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0013	ND	ND	ND
7/20/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0013	ND	ND	ND
7/22/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0013	ND	ND	ND
7/24/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0013	ND	ND	ND
7/25/19	ND	ND	ND	ND	0.0059	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0013	ND	ND	ND
7/26/19	ND	ND	ND	ND	0.0162	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0013	ND	ND	ND
7/27/19	ND	ND	ND	ND	0.0175	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0013	ND	ND	ND
7/29/19	0.0161	ND	ND	ND	0.0337	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0014	ND	ND	ND
7/31/19	0.0964	ND	ND	ND	0.1194	ND	ND	ND	ND	ND	ND	0.0020	ND	ND	ND	ND	0.0014	ND	ND	ND
8/1/19	0.1077	ND	ND	ND	0.1288	ND	ND	ND	ND	ND	ND	0.0016	ND	ND	ND	ND	0.0014	ND	ND	ND
8/2/19	0.1489	ND	ND	ND	0.1386	ND	ND	ND	ND	ND	ND	0.0016	ND	ND	ND	ND	0.0014	ND	ND	ND
8/5/19	0.1136	0.0122	ND	0.0088	0.1100	ND	ND	ND	ND	ND	ND	0.0016	ND	ND	ND	ND	0.0013	ND	ND	ND

Table 6. Column 3 Effluent (GAC 3A) Table 3+ Results – Study #1

Date	PFMOAA	R-EVE	Byproduct 5	Byproduct 4	PMPA	PFO2HxA	PEPA	NVHOS	PFECA_B	PFO3OA	HFPO-DA	PES	PFECA_G	PFO4DA	EVE Acid	Hydro EVE	Byproduct 6	Byproduct 2	PFO5DA	Byproduct 1
	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)
MRL	0.0106	0.0107	0.0067	0.0073	0.0048	0.0048	0.0235	0.0114	0.0035	0.0092	0.0117	0.0012	0.0062	0.0082	0.0052	0.0020	0.0012	0.0073	0.0070	0.0094
6/15/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0013	ND	ND	ND
6/17/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0013	ND	ND	ND
6/21/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0012	ND	ND	ND
6/24/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0013	ND	ND	ND
6/26/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0013	ND	ND	ND
6/28/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0013	ND	ND	ND
7/1/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0013	ND	ND	ND
7/3/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.001	ND	ND	ND
7/5/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0010	ND	ND	ND
7/8/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/12/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.001	ND	ND	ND
7/15/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/19/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0013	ND	ND	ND
7/22/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0013	ND	ND	ND
7/25/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0013	ND	ND	ND
7/29/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0013	ND	ND	ND
8/1/2019	ND	0.0202	ND	ND	0.0113	ND	ND	ND	ND	ND	0.0251	0.0016	ND	ND	ND	ND	0.0013	ND	ND	ND

Table 7. Column 4 Effluent (GAC 4A) Table 3+ Results – Study #1

Date	PFMOAA	R-EVE	Byproduct 5	Byproduct 4	PMPA	PFO2HxA	PEPA	NVHOS	PFECA_B	PFO3OA	HFPO-DA	PES	PFECA_G	PFO4DA	EVE Acid	Hydro EVE	Byproduct 6	Byproduct 2	PFO5DA	Byproduct 1
	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)
MRL	0.0106	0.0107	0.0067	0.0073	0.0048	0.0048	0.0235	0.0114	0.0035	0.0092	0.0117	0.0012	0.0062	0.0082	0.0052	0.0020	0.0012	0.0073	0.0070	0.0094
6/15/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0013	ND	ND	ND
6/17/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0013	ND	ND	ND
6/21/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0013	ND	ND	ND
6/24/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0013	ND	ND	ND
6/26/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0012	ND	ND	ND
6/28/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0012	ND	ND	ND
7/1/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0013	ND	ND	ND
7/5/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/8/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0010	ND	ND	ND
7/12/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0010	ND	ND	ND
7/15/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.018	ND	ND	ND	ND	ND	0.0010	ND	ND	ND
7/19/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0013	ND	ND	ND
7/22/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0013	ND	ND	ND
7/25/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0014	ND	ND	ND
7/29/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0013	ND	ND	ND
8/1/19	ND	ND	0.0085	ND	0.0059	ND	ND	ND	ND	ND	ND	0.0016	ND	ND	ND	ND	0.0013	ND	ND	ND

Table 8. Untreated Batch (INF) Mod 537 MAX Results – Study #1

Date	10:2 FTS	4:2 FTS	6:2 FTS	8:2 FTS	ADONA	F-35 Major	F-35 Minor	NaDONA	NEtFOSAA	NMeFOSAA	PFBS	PFBA	PFDS	PFDA	PFDoS	PFDoA
	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)
MRL	0.0020	0.020	0.020	0.020	0.0021	0.0020	0.0020	0.0021	0.020	0.020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020
6/13/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.083	ND	ND	ND	ND
6/20/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.086	ND	ND	ND	ND
6/28/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.078	ND	ND	ND	ND
7/18/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.078	ND	ND	ND	ND
7/30/19	ND	< 0.042	ND	ND	ND	ND	< 0.0026	ND	ND	< 0.025	ND	0.079	< 0.0026	< 0.0025	< 0.0037	< 0.0045
8/1/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.083	ND	ND	ND	ND
8/6/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.12	ND	ND	ND	ND

Date	PFHpS	PFHpA	PFHxS	PFHxA	PFHxDA	PFODA	PFNS	PFNA	FOSA	PFOS	PFOA	PFPeS	PFPeA	PFTeA	PFTriA	PFUnA
	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)
MRL	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020
6/13/19	ND	0.025	ND	0.017	ND	ND	ND	0.0079	ND	0.0023	0.037	ND	0.15	ND	ND	ND
6/20/19	ND	0.027	ND	0.018	ND	ND	ND	0.0049	ND	ND	0.031	ND	0.14	ND	ND	ND
6/28/19	ND	0.023	ND	0.016	ND	ND	ND	0.011	ND	0.0054	0.045	ND	0.14	ND	ND	ND
7/18/19	ND	0.024	ND	0.016	ND	ND	ND	0.0056	ND	0.0033	0.029	ND	0.14	ND	ND	ND
7/30/19	ND	0.025	ND	0.016	< 0.0073	<0.0038	ND	0.0049	<0.0029	0.0050	0.029	<0.0024	0.14	<0.0024	<0.011	<0.0090
8/1/19	ND	0.023	ND	0.017	ND	ND	ND	0.0039	ND	0.0022	0.026	ND	0.15	ND	ND	ND
8/6/19	ND	0.016	ND	0.019	ND	ND	ND	ND	ND	ND	0.012	ND	0.17	ND	ND	ND

Table 9. Pretreated (PRE-A) Mod 537 MAX Results – Study #1

Date	10:2 FTS (ppb)	4:2 FTS (ppb)	6:2 FTS (ppb)	8:2 FTS (ppb)	ADONA (ppb)	F-35 Major (ppb)	F-35 Minor (ppb)	NaDONA (ppb)	NEtFOSAA (ppb)	NMeFOSAA (ppb)	PFBS (ppb)	PFBA (ppb)	PFDS (ppb)	PFDA (ppb)	PFDoS (ppb)	PFDoA (ppb)
MRL	0.0020	0.020	0.020	0.020	0.0021	0.0020	0.0020	0.0021	0.020	0.020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020
6/14/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.083	ND	ND	ND	ND
6/17/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.083	ND	ND	ND	ND
6/21/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.085	ND	ND	ND	ND
6/24/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.079	ND	ND	ND	ND
7/1/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.078	ND	ND	ND	ND
7/5/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.081	ND	ND	ND	ND
7/12/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.082	ND	ND	ND	ND
7/15/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.085	ND	ND	ND	ND
7/19/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.076	ND	ND	ND	ND
7/22/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.082	ND	ND	ND	ND
7/25/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.082	ND	ND	ND	ND
7/29/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.078	ND	ND	ND	ND
8/1/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.083	ND	ND	ND	ND

Date	PFHpS (ppb)	PFHpA (ppb)	PFHxS (ppb)	PFHxA (ppb)	PFHxDA (ppb)	PFODA (ppb)	PFNS (ppb)	PFNA (ppb)	FOSA (ppb)	PFOS (ppb)	PFOA (ppb)	PFPeS (ppb)	PFPeA (ppb)	PFTeA (ppb)	PFTriA (ppb)	PFUnA (ppb)
MRL	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020
6/14/19	ND	0.025	ND	0.016	ND	ND	ND	0.0044	ND	<0.0020	0.035	ND	0.14	ND	ND	ND
6/17/19	ND	0.027	ND	0.017	ND	ND	ND	0.0039	ND	<0.0020	0.033	ND	0.15	ND	ND	ND
6/21/19	ND	0.028	ND	0.016	ND	ND	ND	0.0064	ND	0.0025	0.036	ND	0.14	ND	ND	ND
6/24/19	ND	0.025	ND	0.017	ND	ND	ND	0.0045	ND	<0.0020	0.029	ND	0.15	ND	ND	ND
7/1/19	ND	0.023	ND	0.016	ND	ND	ND	0.0055	ND	0.0029	0.032	ND	0.13	ND	ND	ND
7/5/19	ND	0.024	ND	0.016	ND	ND	ND	0.0067	ND	0.0029	0.032	ND	0.15	ND	ND	ND
7/12/19	ND	0.025	ND	0.016	ND	ND	ND	0.0057	ND	0.0031	0.031	ND	0.15	ND	ND	ND
7/15/19	ND	0.025	ND	0.017	ND	ND	ND	0.0054	ND	0.0036	0.032	ND	0.15	ND	ND	ND
7/19/19	ND	0.023	ND	0.016	ND	ND	ND	0.0042	ND	0.0025	0.027	ND	0.14	ND	ND	ND
7/22/19	ND	0.022	ND	0.016	ND	ND	ND	0.0038	ND	0.0026	0.027	ND	0.14	ND	ND	ND
7/25/19	ND	0.025	ND	0.016	ND	ND	ND	0.0060	ND	0.0032	0.030	ND	0.14	ND	ND	ND
7/29/19	ND	0.023	ND	0.016	ND	ND	ND	0.0060	ND	0.0031	0.030	ND	0.14	ND	ND	ND
8/1/19	ND	0.024	ND	0.016	ND	ND	ND	0.0046	ND	0.0029	0.028	ND	0.15	ND	ND	ND

Table 10. Column 1 Effluent (GAC 1A) Mod 537 MAX Results – Study #1

Date	10:2 FTS	4:2 FTS	6:2 FTS	8:2 FTS	ADONA	F-35 Major	F-35 Minor	NaDONA	NEtFOSAA	NMeFOSAA	PFBS	PFBA	PFDS	PFDA	PFDoS	PFDoA
	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)
MRL	0.0020	0.020	0.020	0.020	0.0021	0.0020	0.0020	0.0021	0.020	0.020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020
6/14/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/15/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/17/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/19/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/19/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/20/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/21/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/22/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/23/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/24/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/25/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/26/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/27/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/28/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/29/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/30/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/1/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0024	ND	ND	ND	ND
7/2/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0036	ND	ND	ND	ND
7/3/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/5/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.011	ND	ND	ND	ND
7/6/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.015	ND	ND	ND	ND
7/7/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.015	ND	ND	ND	ND
7/8/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.015	ND	ND	ND	ND
7/9/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.025	ND	ND	ND	ND
7/10/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.028	ND	ND	ND	ND
7/11/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.031	ND	ND	ND	ND
7/12/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.032	ND	ND	ND	ND
7/15/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.044	ND	ND	ND	ND
7/17/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.046	ND	ND	ND	ND
7/18/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.054	ND	ND	ND	ND
7/19/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.053	ND	ND	ND	ND
7/20/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.057	ND	ND	ND	ND
7/22/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.063	ND	ND	ND	ND
7/24/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.073	ND	ND	ND	ND
7/25/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.074	ND	ND	ND	ND
7/26/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.074	ND	ND	ND	ND
7/27/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.073	ND	ND	ND	ND
7/29/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.074	ND	ND	ND	ND
7/31/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.072	ND	ND	ND	ND
8/1/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.086	ND	ND	ND	ND
8/2/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.080	ND	ND	ND	ND
8/5/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.079	ND	ND	ND	0.0025

Table 10. Column 1 Effluent (GAC 1A) Mod 537 MAX Results – Study #1 (Continued)

Date	PFHpS (ppb)	PFHpA (ppb)	PFHxS (ppb)	PFHxA (ppb)	PFHxDA (ppb)	PFODA (ppb)	PFNS (ppb)	PFNA (ppb)	FOSA (ppb)	PFOS (ppb)	PFOA (ppb)	PFPeS (ppb)	PFPeA (ppb)	PFTeA (ppb)	PFTriA (ppb)	PFUnA (ppb)
MRL	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020
6/14/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/15/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/17/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/19/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/19/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/20/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/21/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/22/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/23/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/24/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/25/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/26/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/27/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/28/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/29/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/30/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/1/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/2/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/3/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/5/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0028	ND	ND	ND
7/6/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0036	ND	ND	ND
7/7/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0032	ND	ND	ND
7/8/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/9/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0074	ND	ND	ND
7/10/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0095	ND	ND	ND
7/11/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0069	ND	0.009	ND	ND	ND
7/12/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.004	ND	0.011	ND	ND	ND
7/15/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0031	ND	0.018	ND	ND	ND
7/17/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.021	ND	ND	ND
7/18/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.025	ND	ND	ND
7/19/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.027	ND	ND	ND
7/20/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.034	ND	ND	ND
7/22/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.032	ND	ND	ND
7/24/19	ND	0.0028	ND	0.0031	ND	ND	ND	ND	ND	ND	0.0028	ND	0.05	ND	ND	ND
7/25/19	ND	0.0031	ND	0.0036	ND	ND	ND	ND	ND	ND	0.0031	ND	0.052	ND	ND	ND
7/26/19	ND	0.0032	ND	0.0033	ND	ND	ND	ND	ND	ND	0.003	ND	0.052	ND	ND	ND
7/27/19	ND	0.0030	ND	0.0033	ND	ND	ND	ND	ND	ND	0.0026	ND	0.05	ND	ND	ND
7/29/19	ND	0.0031	ND	0.0033	ND	ND	ND	ND	ND	ND	0.0029	ND	0.053	ND	ND	ND
7/31/19	ND	0.0044	ND	0.0043	ND	ND	ND	ND	ND	ND	0.0046	ND	0.058	ND	ND	ND
8/1/19	ND	0.0055	ND	0.0056	ND	ND	ND	ND	ND	ND	0.0061	ND	0.073	ND	ND	ND
8/2/19	ND	0.0029	ND	0.0033	ND	ND	ND	ND	ND	ND	0.0024	ND	0.052	ND	ND	ND
8/5/19	ND	ND	ND	0.0020	ND	ND	ND	ND	ND	ND	ND	ND	0.041	ND	0.0021	ND

Table 11. Column 2 Effluent (GAC 2A) Mod 537 MAX Results – Study #1

Date	10:2 FTS	4:2 FTS	6:2 FTS	8:2 FTS	ADONA	F-35 Major	F-35 Minor	NaDONA	NEtFOSAA	NMeFOSAA	PFBS	PFBA	PFDS	PFDA	PFDoS	PFDoA
	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)
MRL	0.0020	0.020	0.020	0.020	0.0021	0.0020	0.0020	0.0021	0.020	0.020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020
6/15/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/17/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/19/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/21/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/24/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/26/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/28/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/1/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/3/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/5/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/8/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/10/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/12/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/15/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/17/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/18/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/19/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/20/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/22/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/24/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/25/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/26/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/27/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/29/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/31/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8/1/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8/2/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8/5/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Table 11. Column 2 Effluent (GAC 2A) Mod 537 MAX Results – Study #1 (Continued)

Date	PFHpS	PFHpA	PFHxS	PFHxA	PFHxDA	PFODA	PFNS	PFNA	FOSA	PFOS	PFOA	PFPeS	PFPeA	PFTeA	PFTriA	PFUnA
	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)
MRL	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020
6/15/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/17/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/19/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/21/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/24/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/26/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/28/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/1/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/3/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/5/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/8/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/10/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.024	ND	ND	ND	ND	ND
7/12/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0024	ND	ND	ND	ND	ND
7/15/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/17/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/18/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/19/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/20/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/22/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/24/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/25/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/26/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/27/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/29/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/31/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8/1/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8/2/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8/5/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Table 12. Column 3 Effluent (GAC 3A) Mod 537 MAX Results – Study #1 (Continued)

Date	10:2 FTS	4:2 FTS	6:2 FTS	8:2 FTS	ADONA	F-35 Major	F-35 Minor	NaDONA	NEtFOSAA	NMeFOSAA	PFBS	PFBA	PFDS	PFDA	PFDoS	PFDoA
	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)
MRL	0.0020	0.020	0.020	0.020	0.0021	0.0020	0.0020	0.0021	0.020	0.020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020
6/15/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/17/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/21/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/24/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/26/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/28/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/1/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/3/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/5/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/8/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/12/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/15/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/19/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/22/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/25/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/29/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8/1/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Date	PFHpS	PFHpA	PFHxS	PFHxA	PFHxDA	PFODA	PFNS	PFNA	FOSA	PFOS	PFOA	PFPeS	PFPeA	PFTeA	PFTriA	PFUnA
	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)
MRL	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020
6/15/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/17/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/21/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/24/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/26/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/28/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/1/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/3/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0042	ND	ND	ND
7/5/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/8/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/12/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/15/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/19/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/22/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/25/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/29/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8/1/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Table 13. Column 4 Effluent (GAC 4A) Mod 537 MAX Results – Study #1 (Continued)

Date	10:2 FTS (ppb)	4:2 FTS (ppb)	6:2 FTS (ppb)	8:2 FTS (ppb)	ADONA (ppb)	F-35 Major (ppb)	F-35 Minor (ppb)	NaDONA (ppb)	NEtFOSAA (ppb)	NMeFOSAA (ppb)	PFBS (ppb)	PFBA (ppb)	PFDS (ppb)	PFDA (ppb)	PFDoS (ppb)	PFDoA (ppb)
MRL	0.0020	0.020	0.020	0.020	0.0021	0.0020	0.0020	0.0021	0.020	0.020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020
6/15/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/17/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/21/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/24/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/26/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/28/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/1/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/5/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/8/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/12/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/15/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/19/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/22/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/25/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/29/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8/1/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Date	PFHpS (ppb)	PFHpA (ppb)	PFHxS (ppb)	PFHxA (ppb)	PFHxDA (ppb)	PFODA (ppb)	PFNS (ppb)	PFNA (ppb)	FOSA (ppb)	PFOS (ppb)	PFOA (ppb)	PFPeS (ppb)	PFPeA (ppb)	PFTeA (ppb)	PFTriA (ppb)	PFUnA (ppb)
MRL	0.0020	0.020	0.020	0.020	0.0021	0.0020	0.0020	0.0021	0.020	0.020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020
6/15/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/17/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/21/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/24/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/26/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/28/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/1/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/5/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/8/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/12/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0032	ND	ND	ND	ND	ND
7/15/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/19/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/22/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/25/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/29/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8/1/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Table 14. Treated Flow Data – Study #2
'A' Side

Date	Elapsed Time		Cumulative Flow		Empty Bed Contact Volumes (EBCVs)			
	(hr)	(d)	(L)	(Gal)	1 Column	2 Columns	3 Columns	4 Columns
8/7/2019	0	0.0	0	0	0	0	0	0
8/8/2019	23	1.0	579	153	281	140	94	70
8/9/2019	47	2.0	1086	287	526	263	175	131
8/10/2019	71	3.0	1279	338	620	310	207	155
8/11/2019	95	4.0	1304	344	631	316	210	158
8/12/2019	119	5.0	1310	346	635	317	212	159
8/13/2019	143	6.0	1584	418	767	384	256	192
8/14/2019	167	7.0	1915	506	928	464	309	232
8/15/2019	191	8.0	2243	593	1087	543	362	272
8/16/2019	215	9.0	2770	732	1342	671	447	335
8/17/2019	239	10.0	3321	877	1609	804	536	402
8/18/2019	263	11.0	3860	1020	1870	935	623	467
8/19/2019	287	12.0	4169	1101	2019	1010	673	505
8/20/2019	311	13.0	4699	1241	2276	1138	759	569
8/21/2019	335	14.0	5179	1368	2509	1254	836	627
8/22/2019	359	15.0	5665	1497	2744	1372	915	686
8/23/2019	383	16.0	6170	1630	2989	1494	996	747
8/24/2019	407	17.0	6689	1767	3240	1620	1080	810
8/25/2019	431	18.0	7212	1906	3494	1747	1165	873
8/26/2019	455	19.0	7742	2045	3750	1875	1250	938
8/27/2019	479	20.0	8260	2182	4001	2000	1334	1000
8/28/2019	503	21.0	8714	2302	4221	2111	1407	1055
8/29/2019	527	22.0	9233	2439	4472	2236	1491	1118
8/30/2019	551	23.0	9748	2575	4722	2361	1574	1180
8/31/2019	575	24.0	10264	2712	4972	2486	1657	1243

Table 14. Treated Flow Data – Study #2 (Continued)
'A' Side (Continued)

Date	Elapsed Time		Cumulative Flow		Empty Bed Contact Volumes (EBCVs)			
	(hr)	(d)	(L)	(Gal)	1 Column	2 Columns	3 Columns	4 Columns
9/1/2019	599	25.0	10808	2856	5236	2618	1745	1309
9/3/2019	647	27.0	11843	3129	5737	2868	1912	1434
9/4/2019	671	28.0	12363	3266	5989	2994	1996	1497
9/5/2019	695	29.0	12887	3405	6243	3121	2081	1561
9/6/2019	719	30.0	13415	3544	6498	3249	2166	1625
9/7/2019	743	31.0	13958	3688	6761	3381	2254	1690
9/8/2019	767	32.0	14504	3832	7026	3513	2342	1756
9/9/2019	791	33.0	15038	3973	7284	3642	2428	1821
9/10/2019	815	34.0	15374	4062	7447	3724	2482	1862
9/11/2019	839	35.0	15927	4208	7715	3857	2572	1929
9/12/2019	863	36.0	16510	4362	7997	3999	2666	1999
9/13/2019	887	37.0	17092	4516	8279	4140	2760	2070
9/14/2019	911	38.0	17624	4656	8537	4269	2846	2134
9/16/2019	959	40.0	18690	4938	9053	4527	3018	2263
9/17/2019	983	41.0	19237	5082	9318	4659	3106	2330
9/18/2019	1007	42.0	19772	5224	9578	4789	3193	2394
9/19/2019	1031	43.0	20316	5368	9841	4921	3280	2460
9/20/2019	1055	44.0	20843	5507	10096	5048	3365	2524
9/21/2019	1079	45.0	21384	5650	10358	5179	3453	2590
9/23/2019	1127	47.0	22467	5936	10883	5442	3628	2721
9/25/2019	1174	48.9	23393	6180	11332	5666	3777	2833

Table 14. Treated Flow Data – Study #2 (Continued)
'B' SIDE

Date	Elapsed Time		Cumulative Flow		Empty Bed Contact Volumes (EBCVs)			
	(hr)	(d)	(L)	(Gal)	1 Column	2 Columns	3 Columns	4 Columns
8/7/2019	0	0	0	0	0	0	0	0
8/8/2019	23	1	530	140	257	128	86	64
8/9/2019	47	2	1046	276	507	253	169	127
8/10/2019	71	3	1532	405	742	371	247	186
8/11/2019	95	4	1906	504	923	462	308	231
8/12/2019	119	5	2203	582	1067	534	356	267
8/13/2019	143	6	2581	682	1250	625	417	313
8/14/2019	167	7	3090	816	1497	748	499	374
8/15/2019	191	8	3677	971	1781	891	594	445
8/16/2019	215	9	4229	1117	2048	1024	683	512
8/17/2019	239	10	4756	1257	2304	1152	768	576
8/18/2019	263	11	5236	1383	2536	1268	845	634
8/19/2019	287	12	5748	1519	2785	1392	928	696
8/20/2019	311	13	6219	1643	3012	1506	1004	753
8/21/2019	335	14	6745	1782	3267	1634	1089	817
8/22/2019	359	15	7194	1901	3485	1742	1162	871
8/23/2019	383	16	7697	2034	3728	1864	1243	932
8/24/2019	407	17	8279	2187	4010	2005	1337	1003
8/25/2019	431	18	8873	2344	4298	2149	1433	1075
8/26/2019	455	19	9463	2500	4584	2292	1528	1146
8/27/2019	479	20	10029	2650	4858	2429	1619	1214
8/28/2019	503	21	10487	2771	5080	2540	1693	1270
8/29/2019	527	22	10716	2831	5191	2595	1730	1298
8/30/2019	551	23	11228	2966	5439	2719	1813	1360
8/31/2019	575	24	11767	3109	5700	2850	1900	1425

Table 14. Treated Flow Data – Study #2 (Continued)
'B' SIDE (Continued)

Date	Elapsed Time		Cumulative Flow		Empty Bed Contact Volumes (EBCVs)			
	(hr)	(d)	(L)	(Gal)	1 Column	2 Columns	3 Columns	4 Columns
9/1/2019	599	25	12319	3255	5967	2984	1989	1492
9/3/2019	647	27	13317	3518	6451	3225	2150	1613
9/4/2019	671	28	13855	3660	6711	3356	2237	1678
9/5/2019	695	29	14363	3795	6958	3479	2319	1739
9/6/2019	719	30	14894	3935	7215	3607	2405	1804
9/7/2019	743	31	15435	4078	7477	3738	2492	1869
9/8/2019	767	32	15993	4225	7747	3874	2582	1937
9/9/2019	791	33	16516	4363	8000	4000	2667	2000
9/10/2019	815	34	17039	4502	8254	4127	2751	2063
9/11/2019	839	35	17565	4641	8509	4254	2836	2127
9/12/2019	863	36	18098	4781	8767	4383	2922	2192
9/13/2019	887	37	18685	4937	9051	4526	3017	2263
9/14/2019	911	38	19226	5080	9313	4657	3104	2328
9/16/2019	959	40	20279	5358	9823	4912	3274	2456
9/17/2019	983	41	20776	5489	10064	5032	3355	2516
9/18/2019	1007	42	21301	5628	10318	5159	3439	2580
9/19/2019	1031	43	21845	5772	10582	5291	3527	2645
9/20/2019	1055	44	22371	5911	10837	5418	3612	2709
9/21/2019	1079	45	22924	6056	11104	5552	3701	2776
9/23/2019	1127	47	24035	6350	11643	5821	3881	2911
9/25/2019	1174	49	24947	6591	12084	6042	4028	3021

Table 15. Untreated Batch (INF) Table 3+ Results – Study #2

Date	PFMOAA	R-EVE	Byproduct 5	Byproduct 4	PMPA	PFO2HxA	PEPA	NVHOS	PFECA_B	PFO3OA	HFPO-DA	PES	PFECA_G	PFO4DA	EVE Acid	Hydro EVE	Byproduct 6	Byproduct 2	PFO5DA	Byproduct 1
	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)
MRL	0.0106	0.0107	0.0067	0.0073	0.0048	0.0048	0.0235	0.0114	0.0035	0.0092	0.0117	0.0012	0.0062	0.0082	0.0052	0.0020	0.0012	0.0073	0.0070	0.0094
08/06/19	23.9793	0.3591	1.3318	1.4030	4.1844	18.9882	0.7832	0.5864	ND	3.8361	4.9646	0.0024	ND	0.7411	0.1093	0.0091	0.0057	0.0852	0.1190	0.0244
08/08/19	22.0619	0.3594	1.3286	1.3829	4.1335	19.2401	0.7178	0.5618	ND	3.7469	4.8345	0.0024	ND	0.7352	0.1235	0.0105	0.0051	0.0998	0.1112	0.0281
08/14/19	31.4994	0.5673	1.7829	1.8848	3.8219	18.2107	0.7769	0.6857	ND	3.2418	4.5080	0.0014	ND	0.5711	0.1100	0.0090	0.0049	0.0792	0.0794	0.0211
08/19/19	24.3117	0.2550	1.5335	1.4737	3.1543	16.2538	0.6886	0.6481	ND	3.0627	4.0867	ND	ND	0.6555	0.1206	0.0093	0.0054	0.0845	0.0838	0.0182
08/20/19	17.8317	0.0420	1.3200	0.9968	2.9921	15.5132	0.5020	0.6137	ND	2.9120	3.9551	ND	ND	0.5117	0.0952	0.0072	0.0049	0.0683	0.0550	0.0172
08/26/19	31.7920	0.2160	1.0480	0.8000	3.4640	15.0820	0.9180	0.6100	ND	3.4660	5.2100	0.0100	ND	0.7880	0.1500	0.0080	0.0220	0.1460	0.1600	0.0140
AVERAGE(1)	25.2	0.30	1.39	1.32	3.63	17.2	0.73	0.62	< 0.0035	3.38	4.59	0.0031	< 0.0062	0.67	0.12	0.0089	0.0080	0.094	0.10	0.021

(1) Concentrations below reporting limit taken as equal to the reporting limit for calculating averages.

Additional data pending

Table 16. Pretreated Table 3+ Results – Study #2

'A' TRAIN (PRE-A)

Date	PFMOAA	R-EVE	Byproduct 5	Byproduct 4	PMPA	PFO2HxA	PEPA	NVHOS	PFECA_B	PFO3OA	HFPO-DA	PES	PFECA_G	PFO4DA	EVE Acid	Hydro EVE	Byproduct 6	Byproduct 2	PFO5DA	Byproduct 1
	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)
MRL	0.0106	0.0107	0.0067	0.0073	0.0048	0.0048	0.0235	0.0114	0.0035	0.0092	0.0117	0.0012	0.0062	0.0082	0.0052	0.0020	0.0012	0.0073	0.0070	0.0094
8/7/19	31.2152	0.3762	1.4163	1.4841	4.4976	19.1399	0.0671	0.2555	ND	3.9174	4.6800	0.0022	ND	0.8101	0.1246	0.0108	0.0054	0.1166	0.1529	0.0330
8/10/19	31.5423	0.3704	1.3908	1.4670	4.3923	19.0032	0.1283	0.2746	ND	3.6562	4.4886	0.0025	ND	0.7009	0.1243	0.0092	0.0052	0.1183	0.1273	0.0249
8/13/19	28.9500	0.1920	1.2246	0.7994	3.8180	17.9371	0.9801	0.7073	ND	3.5509	4.9872	0.0013	ND	0.6507	0.1197	0.0099	0.0064	0.1094	0.1350	0.0254
8/14/19	12.8493	0.0147	0.2206	0.1646	2.7950	17.1373	0.6963	0.6857	ND	3.3076	4.4864	0.0014	ND	0.6338	0.1176	0.0091	0.0055	0.1069	0.1162	0.0270
8/16/19	19.3977	ND	0.3179	0.1502	3.1276	15.0761	0.4979	0.6352	ND	3.1701	4.3206	ND	ND	0.6215	0.1118	0.0090	0.0056	0.1084	0.0942	0.0290
8/19/19	9.0655	ND	0.1681	0.1373	1.7708	14.9769	0.6455	0.6509	ND	3.1367	4.0831	ND	ND	0.6268	0.1175	0.0090	0.0058	0.1033	0.1142	0.0307
8/23/19	19.1480	ND	0.1460	0.0280	2.8880	14.2320	1.2440	0.7100	0.0140	3.5040	4.9680	0.0100	0.0080	0.6900	0.1340	0.0080	0.0220	0.1280	0.1460	0.0260
8/26/19	16.7820	ND	0.1820	0.0380	3.2720	14.6580	0.8040	0.6360	0.0140	3.5240	5.0020	0.0100	ND	0.7280	0.1280	0.0100	0.0220	0.1240	0.1280	0.0240
AVERAGE[1]	21.1	0.12	0.63	0.53	3.32	16.5	0.63	0.57	0.0061	3.47	4.63	0.0037	0.0064	0.68	0.12	0.0094	0.0097	0.11	0.13	0.028

'B' TRAIN (PRE B)

Date	PFMOAA	R-EVE	Byproduct 5	Byproduct 4	PMPA	PFO2HxA	PEPA	NVHOS	PFECA_B	PFO3OA	HFPO-DA	PES	PFECA_G	PFO4DA	EVE Acid	Hydro EVE	Byproduct 6	Byproduct 2	PFO5DA	Byproduct 1
	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)
MRL	0.0106	0.0107	0.0067	0.0073	0.0048	0.0048	0.0235	0.0114	0.0035	0.0092	0.0117	0.0012	0.0062	0.0082	0.0052	0.0020	0.0012	0.0073	0.0070	0.0094
8/7/19	32.4717	0.3310	1.4262	1.5456	4.5041	19.1952	0.1502	0.2411	ND	3.9023	4.6859	0.0022	ND	0.7568	0.1300	0.0109	0.0054	0.1156	0.1521	0.0282
8/10/19	31.8240	0.3693	1.4335	1.4623	4.4465	19.2375	0.2073	0.3312	ND	3.6943	4.6064	0.0020	ND	0.7335	0.1244	0.0100	0.0055	0.1149	0.1372	0.0302
8/13/19	26.5006	0.0220	0.7925	0.2535	3.6938	17.9126	0.8993	0.6987	ND	3.4926	4.9019	ND	ND	0.6309	0.1185	0.0080	0.0056	0.1094	0.1160	0.0301
8/14/19	16.3302	0.0118	0.1989	0.1615	2.5993	16.5955	0.6546	0.6612	ND	3.2898	4.4220	0.0012	ND	0.6210	0.1183	0.0073	0.0053	0.1081	0.0979	0.0264
8/16/19	20.1779	0.0151	0.4190	0.1283	2.9920	14.8633	0.4897	0.6441	ND	3.1700	4.3125	ND	ND	0.6151	0.1114	0.0089	0.0053	0.1050	0.1042	0.0319
8/19/19	13.5195	ND	0.1794	0.1685	1.5051	14.2993	0.6130	0.6418	ND	3.0968	4.0172	ND	ND	0.5999	0.1165	0.0094	0.0055	0.1013	0.1011	0.0278
8/23/19	19.0300	ND	0.1700	0.0340	3.1080	14.0880	1.1760	0.6620	0.0140	3.5040	5.0360	0.0080	ND	0.7020	0.1300	0.0060	0.0220	0.1280	0.1420	0.0300
8/26/19	16.2200	ND	0.1620	0.0320	3.1740	14.3540	0.8160	0.4400	0.0140	3.4320	4.8960	0.0080	0.0080	0.7060	0.1240	0.0060	0.0220	0.1220	0.1320	0.0180
AVERAGE[1]	22.0	0.10	0.60	0.47	3.25	16.3	0.63	0.54	0.0061	3.45	4.61	0.0031	0.0064	0.67	0.12	0.0083	0.0096	0.11	0.12	0.028

[1] Concentrations below reporting limit taken as equal to the reporting limit for calculating averages.

Additional data pending

Table 17. Column 1 Effluent Table 3+ Results – Study #2
'A' TRAIN (GAC 1A)

Date	PFMOAA	R-EVE	Byproduct 5	Byproduct 4	PMPA	PFO2HxA	PEPA	NVHOS	PFECA_B	PFO3OA	HFPO-DA	PES	PFECA_G	PFO4DA	EVE Acid	Hydro EVE	Byproduct 6	Byproduct 2	PFO5DA	Byproduct 1
	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)
MRL	0.0106	0.0107	0.0067	0.0073	0.0048	0.0048	0.0235	0.0114	0.0035	0.0092	0.0117	0.0012	0.0062	0.0082	0.0052	0.0020	0.0012	0.0073	0.0070	0.0094
08/07/19	0.2931	0.0138	ND	0.0113	0.0138	0.0209	ND	ND	ND	ND	ND	0.0016	ND	ND	ND	ND	0.0014	ND	ND	ND
08/08/19	0.2708	0.0119	ND	0.0142	0.0213	0.0264	ND	ND	ND	ND	ND	0.0016	ND	ND	ND	ND	0.0013	ND	ND	ND
08/09/19	0.1972	ND	ND	0.0109	0.0322	0.0183	ND	ND	ND	ND	ND	0.0016	ND	ND	ND	ND	0.0014	ND	ND	ND
08/10/19	0.3070	0.0217	ND	ND	0.0380	0.0293	ND	ND	ND	ND	ND	0.0016	ND	ND	ND	ND	0.0013	ND	ND	ND
08/13/19	0.0315	ND	ND	ND	ND	0.0055	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0016	ND	ND	ND
08/14/19	0.0345	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0016	ND	ND	ND
08/15/19	0.0259	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0016	ND	ND	ND
08/16/19	0.0121	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0019	ND	ND	ND
08/17/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0015	ND	ND	ND
08/18/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0015	ND	ND	ND
08/19/19	0.0122	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0015	ND	ND	ND
08/20/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0442	ND	0.0145	0.0015	ND	ND	ND
08/21/19	ND	ND	ND	ND	0.0064	ND	ND	ND	ND	ND	ND	ND	ND	0.0349	ND	0.0344	0.0016	ND	ND	ND
08/22/19	0.0260	ND	0.0120	ND	0.0420	0.0200	0.0240	0.0360	0.0140	ND	ND	0.0080	ND	ND	0.0120	ND	0.0200	0.0180	ND	ND
08/23/19	0.0360	ND	0.0120	ND	0.0520	0.0200	0.0280	0.0340	0.0140	ND	ND	0.0080	ND	0.0260	0.0120	ND	0.0180	0.0180	ND	ND
08/24/19	0.0420	ND	ND	ND	0.0780	0.0200	ND	0.0340	0.0140	ND	ND	0.0080	ND	ND	0.0140	ND	0.0180	0.0180	ND	ND
08/25/19	0.0920	ND	0.0120	ND	0.1240	0.0260	ND	0.0340	0.0140	ND	0.0140	0.0080	ND	ND	0.0120	ND	0.0180	0.0160	ND	ND
08/26/19	0.2100	ND	0.0120	ND	0.1920	0.0320	ND	0.0340	0.0140	ND	0.0140	0.0080	ND	ND	0.0120	ND	0.0180	0.0180	ND	ND
08/27/19	0.3320	ND	0.0120	ND	0.2480	0.0380	ND	0.0340	0.0140	ND	0.0140	0.0080	ND	ND	0.0120	ND	0.0100	0.0220	ND	ND

Additional data pending

Table 17. Column 1 Effluent Table 3+ Results – Study #2 (Continued)
'B' TRAIN (GAC 1B)

Date	PFMOAA	R-EVE	Byproduct 5	Byproduct 4	PMPA	PFO2HxA	PEPA	NVHOS	PFECA_B	PFO3OA	HFPO-DA	PES	PFECA_G	PFO4DA	EVE Acid	Hydro EVE	Byproduct 6	Byproduct 2	PFO5DA	Byproduct 1
	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)
MRL	0.0106	0.0107	0.0067	0.0073	0.0048	0.0048	0.0235	0.0114	0.0035	0.0092	0.0117	0.0012	0.0062	0.0082	0.0052	0.0020	0.0012	0.0073	0.0070	0.0094
08/07/19	0.0196	0.0156	ND	0.0074	0.0063	ND	ND	ND	ND	ND	ND	0.0016	ND	ND	ND	ND	0.0014	ND	0.0070	0.0094
08/08/19	10.1857	0.0173	ND	ND	1.5129	ND	ND	ND	ND	ND	ND	0.0017	ND	ND	ND	ND	0.0013	ND	0.0070	0.0094
08/09/19	19.6996	0.0115	ND	0.0125	2.6887	0.0403	ND	ND	ND	ND	ND	0.0017	ND	ND	ND	ND	0.0013	ND	0.0070	0.0094
08/10/19	22.7940	ND	ND	0.0101	3.1160	0.1570	0.0352	ND	ND	ND	0.0284	0.0016	ND	ND	ND	ND	0.0013	ND	0.0070	0.0094
08/12/19	21.7829	ND	ND	0.0101	2.6986	0.0897	0.0247	ND	ND	ND	ND	0.0016	ND	ND	ND	ND	0.0014	ND	0.0070	0.0094
08/13/19	12.3254	ND	0.0115	ND	2.5195	0.3161	0.2442	ND	ND	ND	0.1145	ND	ND	ND	ND	ND	0.0015	ND	0.0070	0.0094
08/14/19	18.9961	ND	0.0204	0.0075	2.0985	1.3176	0.2941	0.0174	ND	0.0130	0.4616	ND	ND	ND	ND	ND	0.0017	ND	0.0070	0.0094
08/15/19	16.4219	ND	0.0468	0.0119	2.7188	2.2289	0.2620	0.0347	ND	0.0369	0.8147	ND	ND	ND	ND	ND	0.0016	ND	0.0070	0.0094
08/16/19	16.0112	ND	0.0689	0.0266	2.6951	3.0187	0.2887	0.0410	ND	0.0605	1.0580	ND	ND	ND	ND	ND	0.0016	ND	0.0070	0.0094
08/17/19	7.6815	ND	0.0283	0.0181	1.8985	3.4971	0.4785	0.0685	ND	0.0764	1.1082	ND	ND	ND	0.0053	ND	0.0017	ND	0.0070	0.0094
08/18/19	6.5818	ND	0.0224	0.0207	1.6201	3.1040	0.4247	0.0612	ND	0.0641	1.1533	ND	ND	ND	ND	ND	0.0017	ND	0.0070	0.0094
08/19/19	14.3884	ND	0.0294	0.0132	1.4927	3.4569	0.4021	0.0846	ND	0.0902	1.1640	ND	ND	ND	ND	ND	0.0018	ND	0.0070	0.0094
08/20/19	11.2785	ND	0.0217	0.0222	2.5561	3.6777	0.3073	0.0797	ND	0.1053	1.2159	ND	ND	ND	0.0052	0.0356	0.0017	ND	0.0070	0.0094
08/21/19	11.1181	ND	0.0710	0.0284	2.5885	4.8345	0.3284	0.0926	ND	0.1908	1.5692	ND	ND	ND	0.0095	0.0497	0.0016	ND	0.0070	0.0094
08/22/19	17.8480	ND	0.0280	ND	2.5540	5.1140	1.0700	0.1720	0.0140	0.1980	1.9660	0.0080	ND	ND	0.0200	ND	0.0200	0.0200	0.0070	0.0094
08/23/19	15.6840	ND	0.0300	ND	3.0120	5.3640	0.7440	0.1340	0.0140	0.2560	1.9920	0.0080	ND	ND	0.0220	ND	0.0180	0.0200	0.0070	0.0094
08/24/19	14.8120	ND	0.0600	ND	2.9040	6.5200	0.5720	0.2000	0.0140	0.4680	2.5640	0.0080	ND	0.0280	0.0280	ND	0.0180	0.0220	0.0070	0.0094
08/25/19	14.5360	ND	0.0660	ND	2.9440	7.0480	0.6880	0.2180	0.0140	0.6320	2.7840	0.0080	ND	0.0460	0.0340	ND	0.0180	0.0280	0.0070	0.0094
08/26/19	14.5220	ND	0.0580	0.0080	2.9340	7.8900	0.6280	0.1740	0.0140	0.8080	2.9420	0.0080	ND	0.0720	0.0440	ND	0.0200	0.0300	0.0070	0.0094
08/27/19	14.4920	ND	0.0600	ND	3.0400	8.4960	0.5920	0.2200	0.0140	0.9760	2.9920	0.0080	ND	0.1020	0.0460	ND	0.0200	0.0340	0.0070	0.0094

Additional data pending

Table 18. Column 2 Effluent Table 3+ Results – Study #2

'A' TRAIN (GAC 2A)

Date	PFMOAA	R-EVE	Byproduct 5	Byproduct 4	PMPA	PFO2HxA	PEPA	NVHOS	PFECA_B	PFO3OA	HFPO-DA	PES	PFECA_G	PFO4DA	EVE Acid	Hydro EVE	Byproduct 6	Byproduct 2	PFO5DA	Byproduct 1
	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)
MRL	0.0106	0.0107	0.0067	0.0073	0.0048	0.0048	0.0235	0.0114	0.0035	0.0092	0.0117	0.0012	0.0062	0.0082	0.0052	0.0020	0.0012	0.0073	0.0070	0.0094
08/07/19	0.0366	0.0108	ND	ND	0.0241	ND	ND	ND	ND	ND	ND	0.0016	ND	ND	ND	ND	0.0014	ND	ND	ND
08/09/19	0.0519	0.0138	ND	0.0198	0.0107	ND	ND	ND	ND	ND	ND	0.0016	ND	ND	ND	ND	0.0014	ND	ND	ND
08/13/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0017	ND	ND	ND
08/14/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0017	ND	ND	ND
08/16/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0016	ND	ND	ND
08/19/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0016	0.0088	ND	ND
08/21/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0249	0.0069	0.0436	0.0015	ND	ND	ND
08/23/19	ND	ND	0.0120	ND	0.0180	0.0200	ND	0.0360	0.0140	ND	ND	ND	ND	ND	0.0120	ND	0.0180	0.0160	ND	ND
08/26/19	ND	ND	0.0120	ND	0.0180	0.0200	0.0240	0.0360	0.0140	ND	ND	ND	ND	ND	0.0120	ND	0.0180	0.0180	ND	ND

'B' TRAIN (GAC 2B)

Date	PFMOAA	R-EVE	Byproduct 5	Byproduct 4	PMPA	PFO2HxA	PEPA	NVHOS	PFECA_B	PFO3OA	HFPO-DA	PES	PFECA_G	PFO4DA	EVE Acid	Hydro EVE	Byproduct 6	Byproduct 2	PFO5DA	Byproduct 1
	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)
MRL	0.0106	0.0107	0.0067	0.0073	0.0048	0.0048	0.0235	0.0114	0.0035	0.0092	0.0117	0.0012	0.0062	0.0082	0.0052	0.0020	0.0012	0.0073	0.0070	0.0094
08/07/19	0.0047	0.0107	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0017	ND	ND	ND	ND	0.0014	ND	ND	ND
08/09/19	3.1165	0.0168	ND	ND	0.6707	ND	ND	ND	ND	ND	ND	0.0016	ND	ND	ND	ND	0.0013	ND	ND	ND
08/12/19	8.0491	ND	ND	ND	1.1702	ND	ND	ND	ND	ND	ND	0.0017	ND	ND	ND	ND	0.0014	ND	ND	ND
08/13/19	4.1777	ND	ND	ND	1.1520	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0015	ND	ND	ND
08/14/19	11.0963	ND	ND	ND	1.2337	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0018	ND	ND	ND
08/16/19	11.1875	ND	ND	ND	1.8532	ND	0.0416	ND	ND	ND	ND	ND	ND	ND	0.0061	ND	0.0016	ND	ND	ND
08/19/19	11.0842	ND	ND	ND	1.4422	0.0261	0.0968	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0016	ND	ND	ND
08/21/19	8.1834	ND	ND	ND	2.0066	0.0422	0.0891	ND	ND	ND	ND	ND	ND	0.0306	0.0075	0.0453	0.0016	ND	ND	ND
08/23/19	11.2020	ND	0.0120	ND	2.3800	0.0800	0.2280	0.0340	0.0140	ND	0.0340	0.0080	ND	ND	0.0120	ND	0.0180	0.0160	ND	ND
08/26/19	10.4640	ND	0.0120	ND	2.3500	0.1980	0.2700	0.0340	0.0140	ND	0.1580	0.0080	ND	0.0100	0.0120	ND	0.0180	0.0200	ND	ND

Additional data pending

Table 19. Column 3 Effluent Table 3+ Results – Study #2

'A' TRAIN (GAC 3A)

Date	PFMOAA	R-EVE	Byproduct 5	Byproduct 4	PMPA	PFO2HxA	PEPA	NVHOS	PFECA_B	PFO3OA	HFPO-DA	PES	PFECA_G	PFO4DA	EVE Acid	Hydro EVE	Byproduct 6	Byproduct 2	PFO5DA	Byproduct 1
	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)
MRL	0.0106	0.0107	0.0067	0.0073	0.0048	0.0048	0.0235	0.0114	0.0035	0.0092	0.0117	0.0012	0.0062	0.0082	0.0052	0.0020	0.0012	0.0073	0.0070	0.0094
08/07/19	ND	ND	ND	0.0103	0.0231	ND	ND	ND	ND	ND	ND	0.0016	ND	ND	ND	ND	0.0013	ND	ND	ND
08/09/19	ND	ND	ND	0.0075	0.0058	ND	ND	ND	ND	ND	ND	0.0016	ND	ND	ND	ND	0.0013	ND	ND	ND
08/14/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0015	ND	ND	ND
08/19/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0316	ND	ND	0.0018	ND	ND	ND
08/23/19	ND	ND	0.0120	ND	0.0200	0.0200	ND	0.0340	0.0140	ND	ND	0.0080	ND	ND	0.0120	ND	0.0180	0.0160	ND	ND
08/26/19	ND	ND	0.0120	ND	0.0180	0.0200	0.0240	0.0340	0.0140	ND	ND	0.0080	ND	ND	0.0120	ND	0.0180	0.0200	ND	ND

'B' TRAIN (GAC 3B)

Date	PFMOAA	R-EVE	Byproduct 5	Byproduct 4	PMPA	PFO2HxA	PEPA	NVHOS	PFECA_B	PFO3OA	HFPO-DA	PES	PFECA_G	PFO4DA	EVE Acid	Hydro EVE	Byproduct 6	Byproduct 2	PFO5DA	Byproduct 1
	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)
MRL	0.0106	0.0107	0.0067	0.0073	0.0048	0.0048	0.0235	0.0114	0.0035	0.0092	0.0117	0.0012	0.0062	0.0082	0.0052	0.0020	0.0012	0.0073	0.0070	0.0094
08/07/19	0.0126	0.0170	ND	0.0101	ND	ND	ND	ND	ND	ND	ND	0.0016	ND	ND	ND	ND	0.0014	ND	ND	ND
08/09/19	0.1274	0.0153	ND	0.0184	0.1105	ND	ND	ND	ND	ND	ND	0.0016	ND	ND	ND	ND	0.0013	ND	ND	ND
08/14/19	4.1784	ND	ND	ND	0.5786	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0018	ND	ND	ND
08/19/19	6.5831	ND	ND	ND	1.2108	ND	ND	ND	ND	ND	ND	ND	ND	0.0458	ND	ND	0.0017	ND	ND	ND
08/23/19	6.9180	ND	0.0120	ND	1.7420	0.0200	0.0360	0.0340	0.0140	ND	ND	0.0080	ND	ND	0.0160	ND	0.0180	0.0160	ND	ND
08/26/19	6.7880	ND	0.0120	ND	1.7280	0.0200	0.0520	0.0340	0.0140	ND	ND	0.0080	ND	ND	0.0140	ND	0.0180	0.0240	ND	ND

Additional data pending

Table 20. Column 4 Effluent Table 3+ Results – Study #2

'A' TRAIN (GAC 4A)

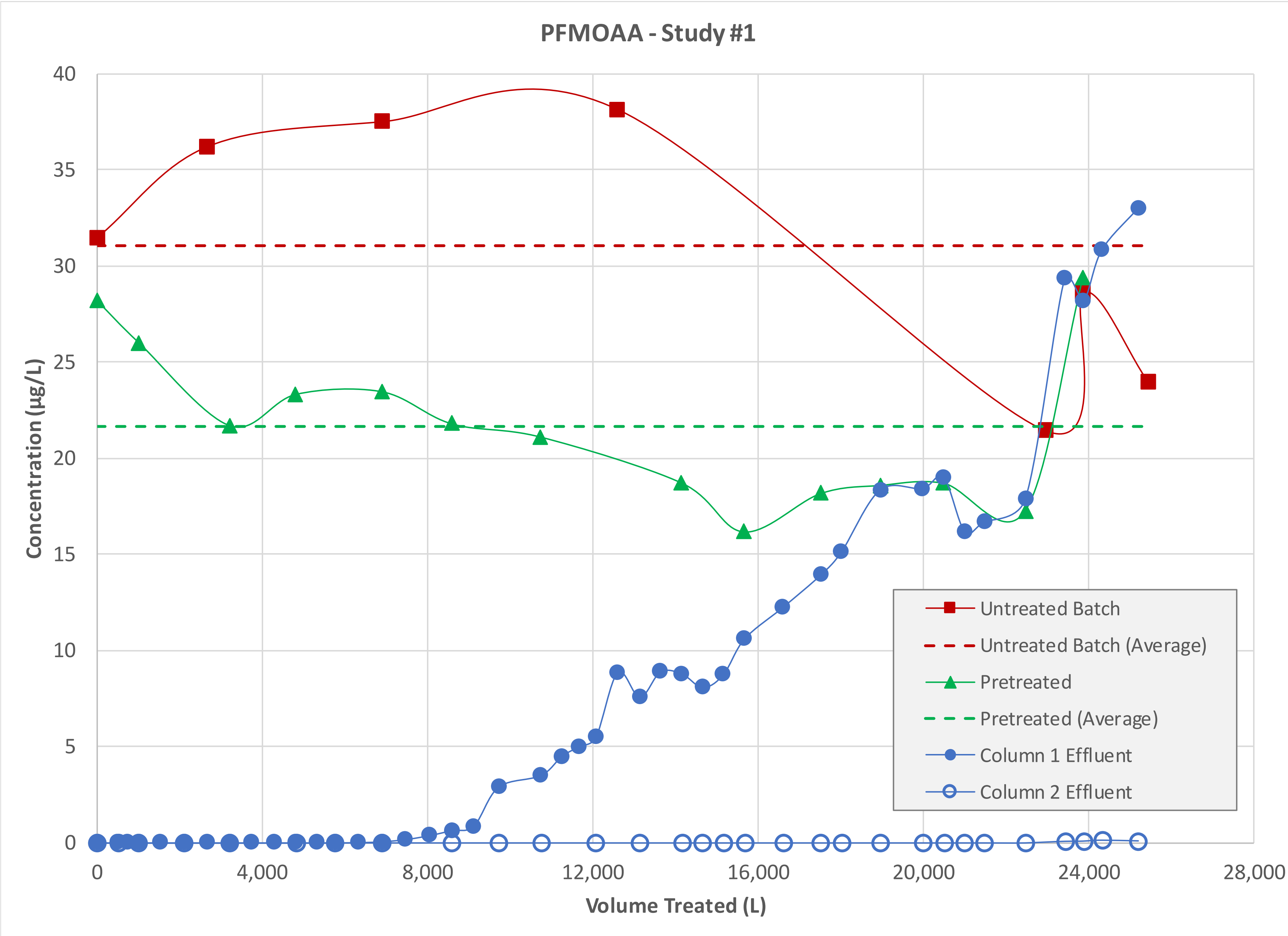
Date	PFMOAA	R-EVE	Byproduct 5	Byproduct 4	PMPA	PFO2HxA	PEPA	NVHOS	PFECA_B	PFO3OA	HFPO-DA	PES	PFECA_G	PFO4DA	EVE Acid	Hydro EVE	Byproduct 6	Byproduct 2	PFO5DA	Byproduct 1
	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)
MRL	0.0106	0.0107	0.0067	0.0073	0.0048	0.0048	0.0235	0.0114	0.0035	0.0092	0.0117	0.0012	0.0062	0.0082	0.0052	0.0020	0.0012	0.0073	0.0070	0.0094
08/07/19	ND	ND	ND	ND	0.0071	ND	ND	ND	ND	ND	ND	0.0016	ND	ND	ND	ND	0.0013	ND	ND	ND
08/09/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0016	ND	ND	ND	ND	0.0013	ND	ND	ND
08/14/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0017	ND	ND	ND
08/19/19	ND	ND	ND	0.0078	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0434	ND	ND	0.0014	ND	ND	ND
08/23/19	ND	ND	0.0120	ND	0.0220	0.0200	ND	0.0340	0.0140	ND	ND	0.0080	ND	ND	0.0120	ND	0.0180	0.0180	ND	ND
08/26/19	ND	ND	0.0120	ND	0.0180	0.0200	0.0240	0.0340	0.0140	ND	ND	0.0080	ND	ND	0.0140	ND	0.0180	0.0220	ND	ND

'B' TRAIN (GAC 4B)

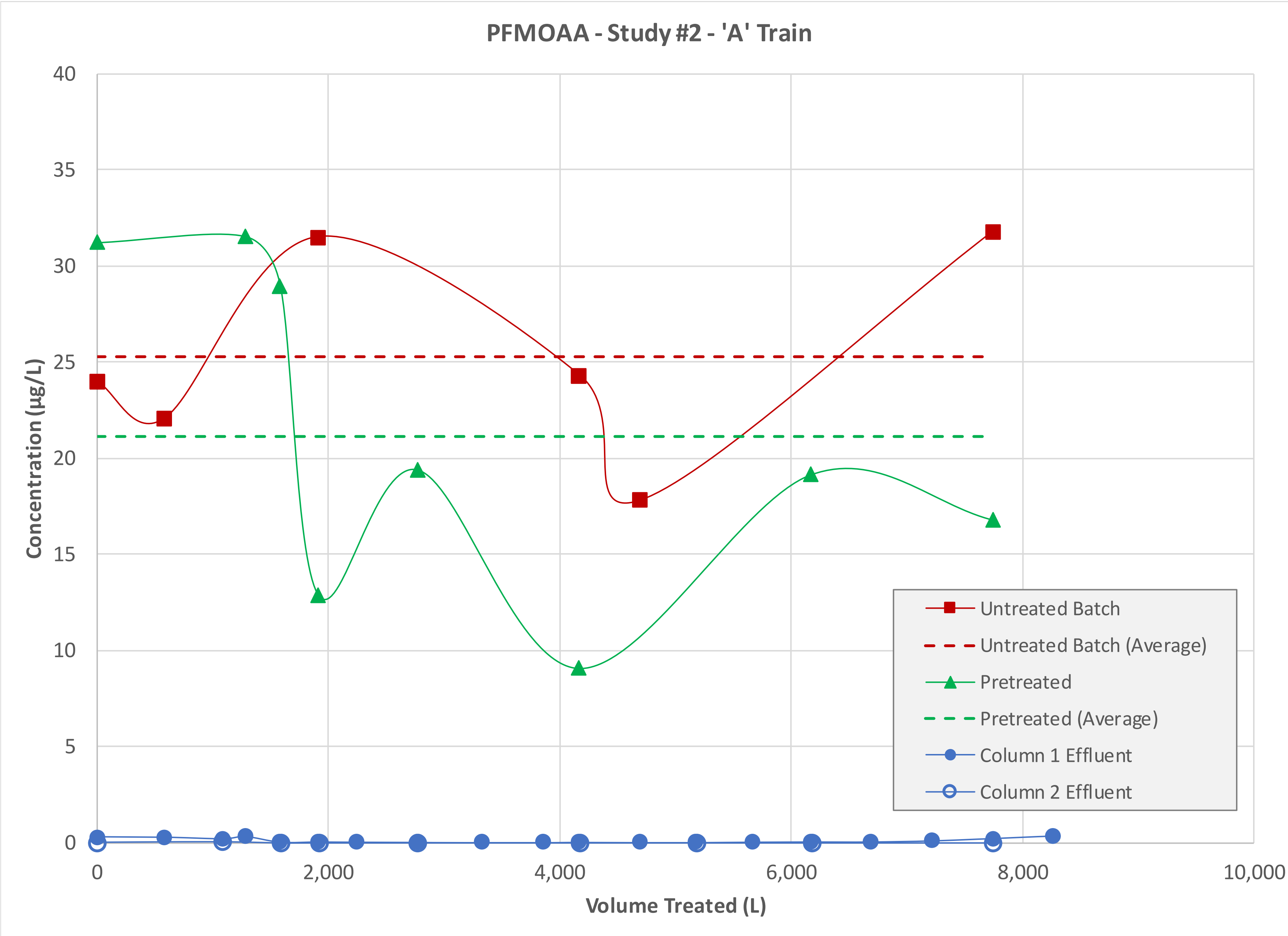
Date	PFMOAA	R-EVE	Byproduct 5	Byproduct 4	PMPA	PFO2HxA	PEPA	NVHOS	PFECA_B	PFO3OA	HFPO-DA	PES	PFECA_G	PFO4DA	EVE Acid	Hydro EVE	Byproduct 6	Byproduct 2	PFO5DA	Byproduct 1
	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)
MRL	0.0106	0.0107	0.0067	0.0073	0.0048	0.0048	0.0235	0.0114	0.0035	0.0092	0.0117	0.0012	0.0062	0.0082	0.0052	0.0020	0.0012	0.0073	0.0070	0.0094
08/07/19	ND	0.0108	ND	ND	0.0054	ND	ND	ND	ND	ND	ND	0.0016	ND	ND	ND	ND	0.0013	ND	ND	ND
08/09/19	ND	ND	ND	ND	0.0228	ND	ND	ND	ND	ND	ND	0.0016	ND	ND	ND	ND	0.0013	ND	ND	ND
08/14/19	0.9456	ND	ND	ND	0.2181	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0017	ND	ND	ND
08/19/19	3.7703	ND	ND	ND	0.7442	ND	ND	ND	ND	ND	ND	ND	ND	0.0116	ND	ND	0.0016	ND	ND	ND
08/23/19	3.9560	ND	0.0120	ND	1.1680	0.0200	ND	0.0340	0.0140	ND	ND	0.0080	ND	ND	0.0160	ND	0.0180	0.0160	ND	ND
08/26/19	4.3480	ND	0.0120	ND	1.2780	0.0200	ND	0.0340	0.0140	ND	ND	0.0080	ND	ND	0.0120	ND	0.0180	0.0180	ND	ND

Additional data pending

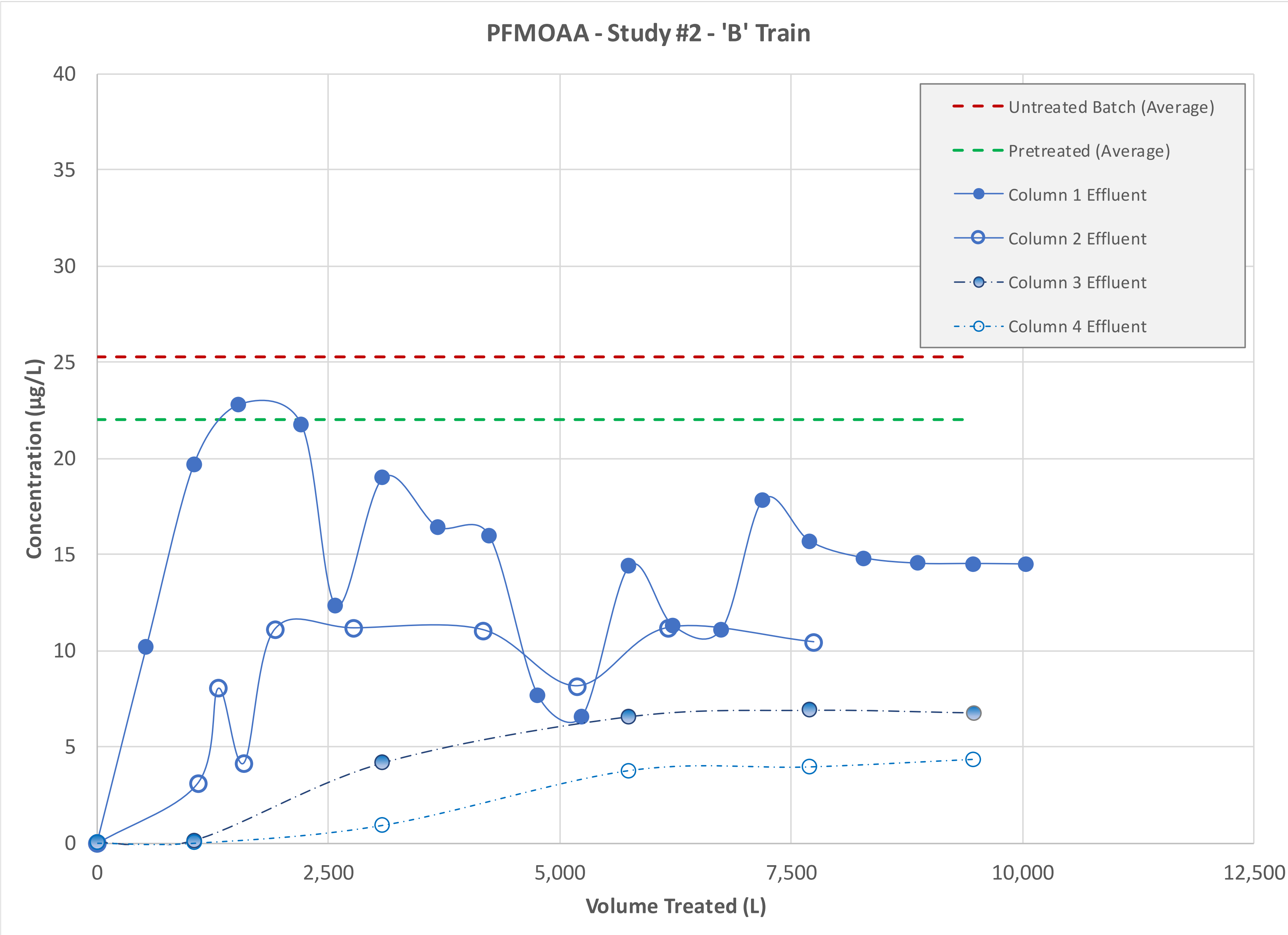
APPENDIX D
BREAKTHROUGH CURVES FOR PFMOAA, HFPO-DA, AND SELECT PARAMETERS

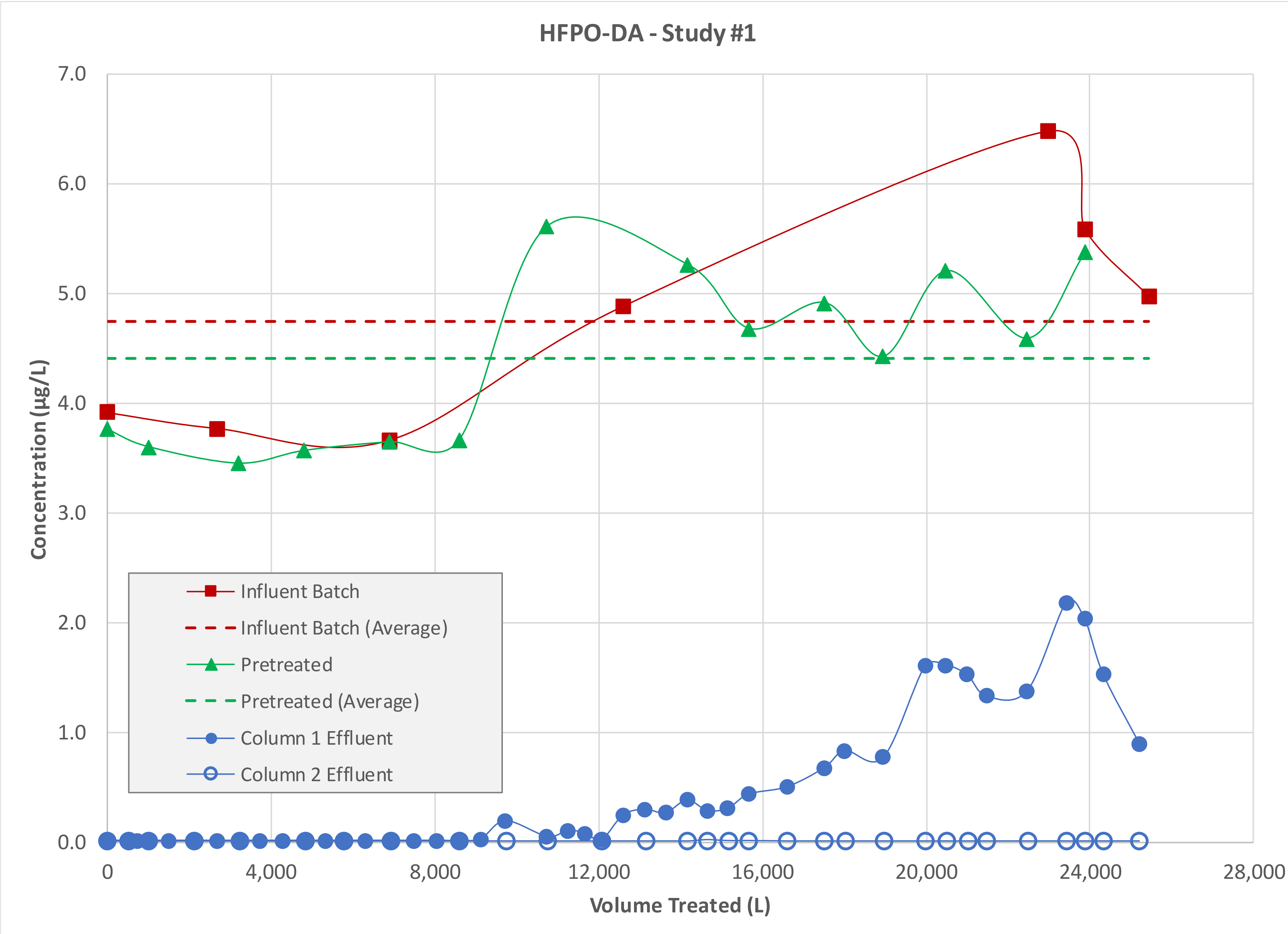


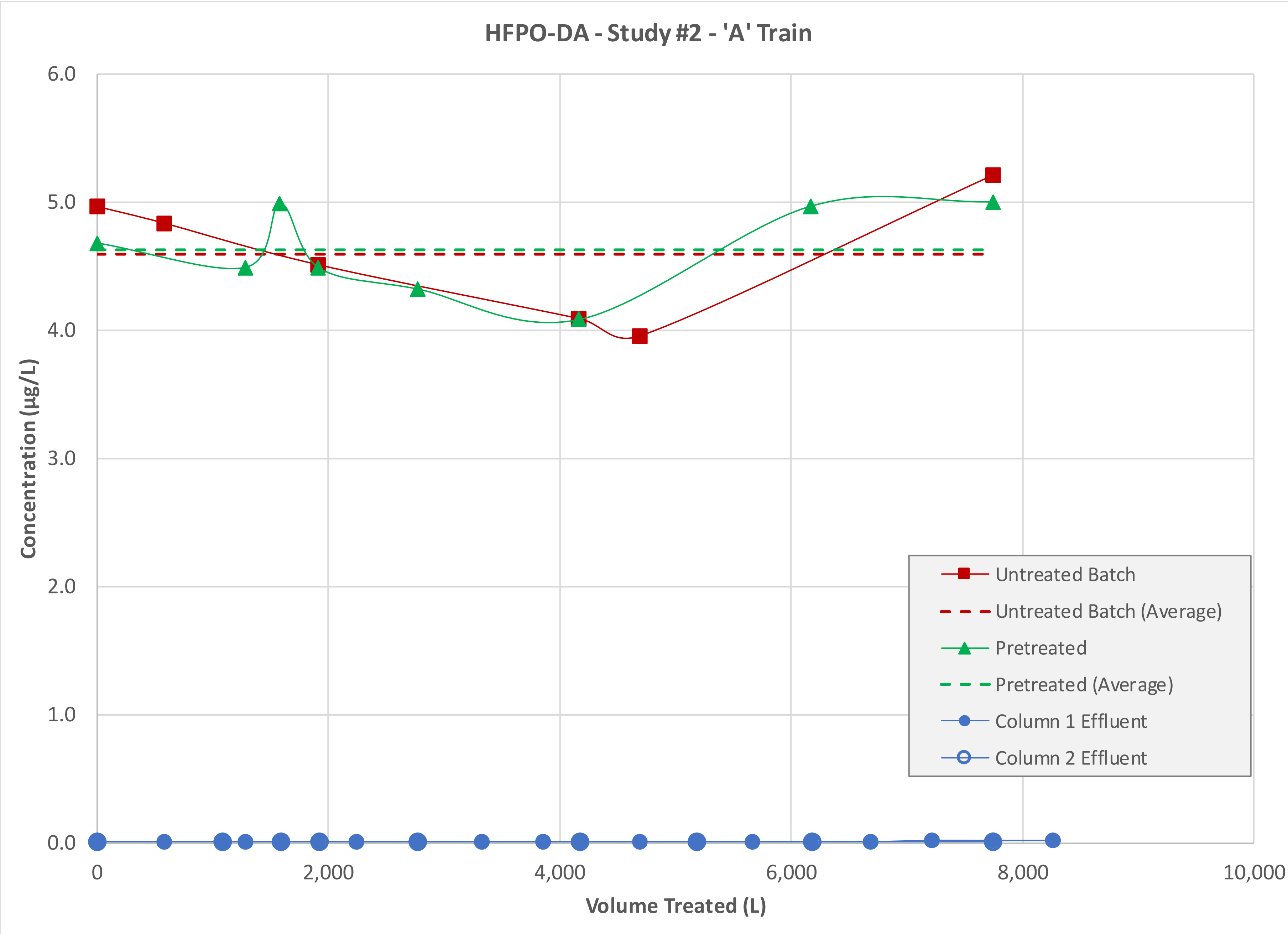
PFMOAA - Study #1
Concentration (µg/L)
Volume Treated (L)
0
5
10
15
20
25
30
35
40
0
4,000
8,000
12,000
16,000
20,000
24,000
28,000
Untreated Batch
Untreated Batch (Average)
Pretreated
Pretreated (Average)
Column 1 Effluent
Column 2 Effluent

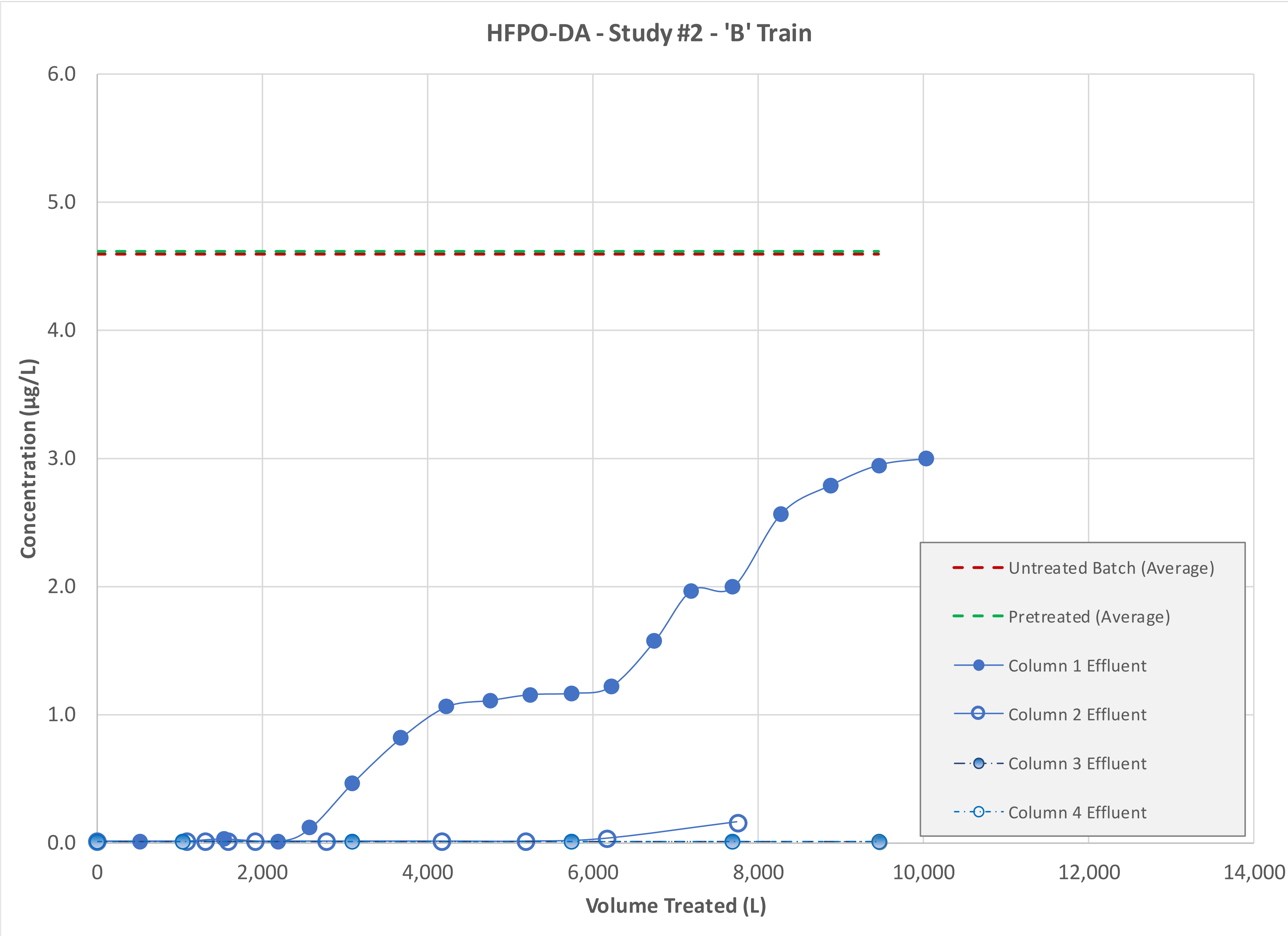


PFMOAA - Study #2 - 'A' Train
Concentration (µg/L)
40
35
30
25
20
15
10
5
0
0
2,000
4,000
6,000
8,000
10,000
Volume Treated (L)
Untreated Batch
Untreated Batch (Average)
Pretreated
Pretreated (Average)
Column 1 Effluent
Column 2 Effluent

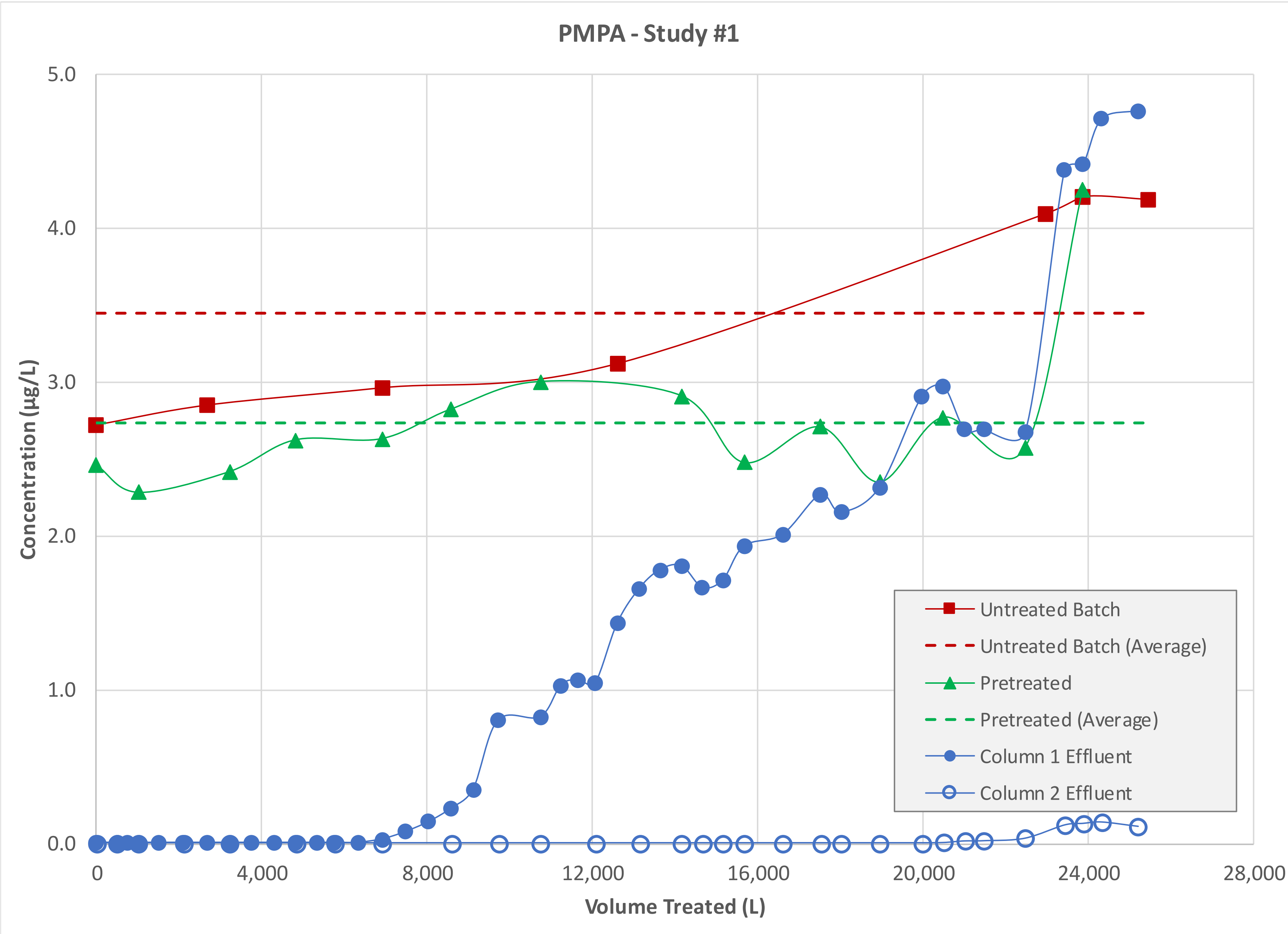

PFMOAA - Study #2 - 'B' Train
Untreated Batch (Average)
Pretreated (Average)
Column 1 Effluent
Column 2 Effluent
Column 3 Effluent
Column 4 Effluent
Concentration (µg/L)
Volume Treated (L)
0
5
10
15
20
25
30
35
40
0
2,500
5,000
7,500
10,000
12,500


HFPO-DA - Study #1
Concentration (µg/L)
Volume Treated (L)
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
0
4,000
8,000
12,000
16,000
20,000
24,000
28,000
Influent Batch
Influent Batch (Average)
Pretreated
Pretreated (Average)
Column 1 Effluent
Column 2 Effluent

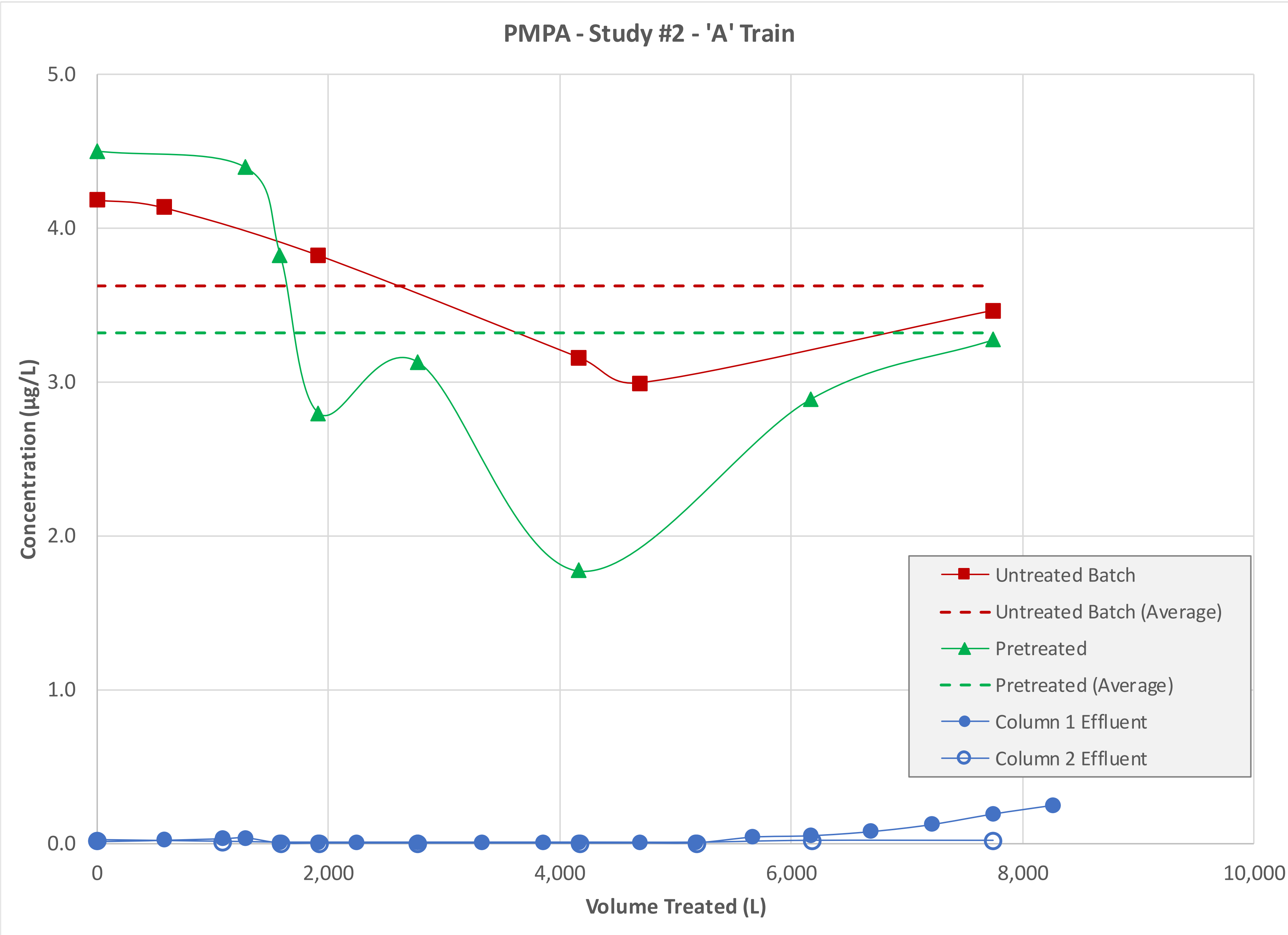

HFPO-DA - Study #2 - 'A' Train
6.0
5.0
4.0
3.0
2.0
1.0
0.0
Concentration (µg/L)
0
2,000
4,000
6,000
8,000
10,000
Volume Treated (L)
Untreated Batch
Untreated Batch (Average)
Pretreated
Pretreated (Average)
Column 1 Effluent
Column 2 Effluent



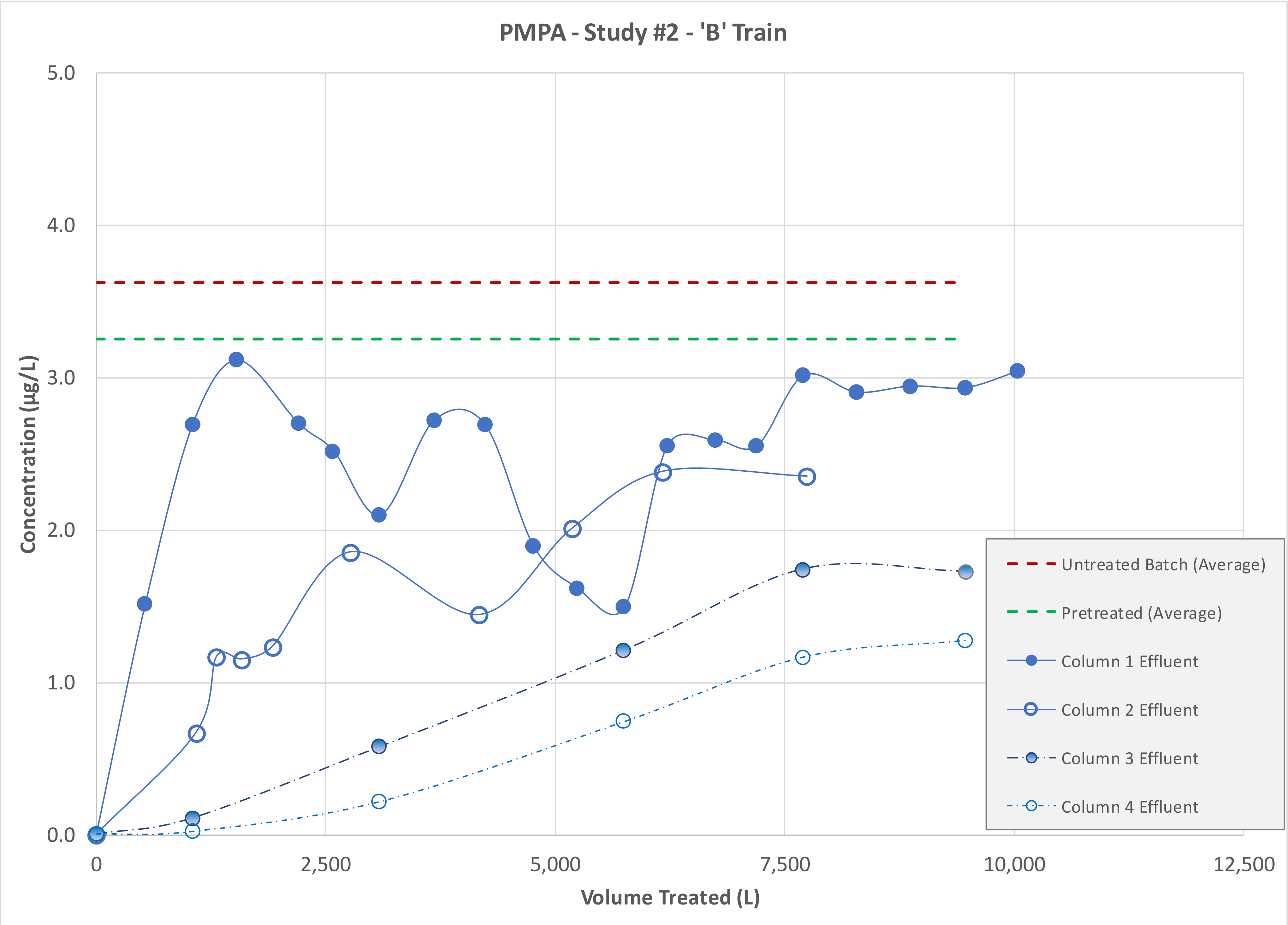
HFPO-DA - Study #2 - 'B' Train
Concentration (µg/L)
Volume Treated (L)
0.0
1.0
2.0
3.0
4.0
5.0
6.0
0
2,000
4,000
6,000
8,000
10,000
12,000
14,000
Untreated Batch (Average)
Pretreated (Average)
Column 1 Effluent
Column 2 Effluent
Column 3 Effluent
Column 4 Effluent

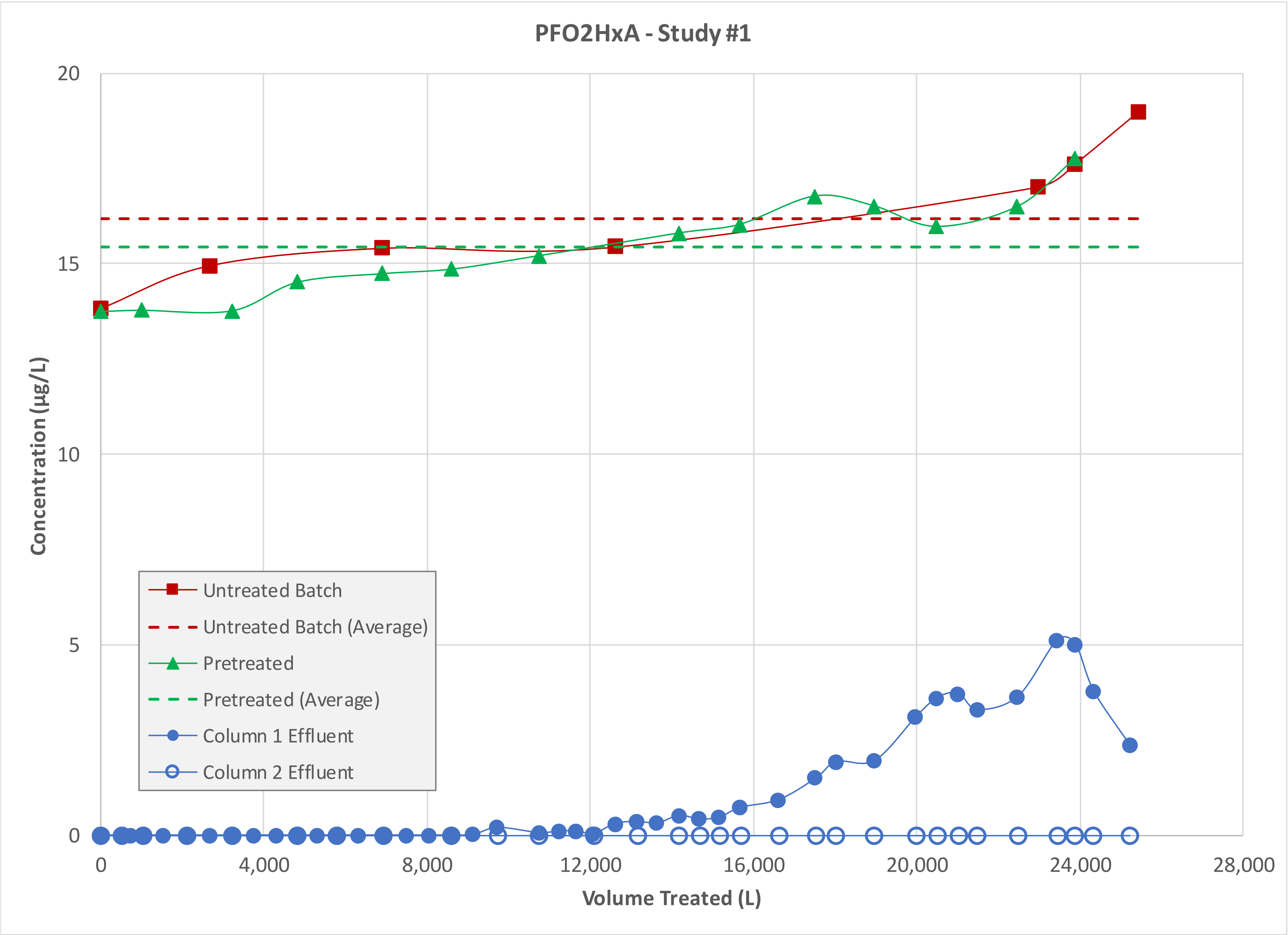


PMPA - Study #1
Concentration (µg/L)
Volume Treated (L)
5.0
4.0
3.0
2.0
1.0
0.0
0
4,000
8,000
12,000
16,000
20,000
24,000
28,000
Untreated Batch
Untreated Batch (Average)
Pretreated
Pretreated (Average)
Column 1 Effluent
Column 2 Effluent

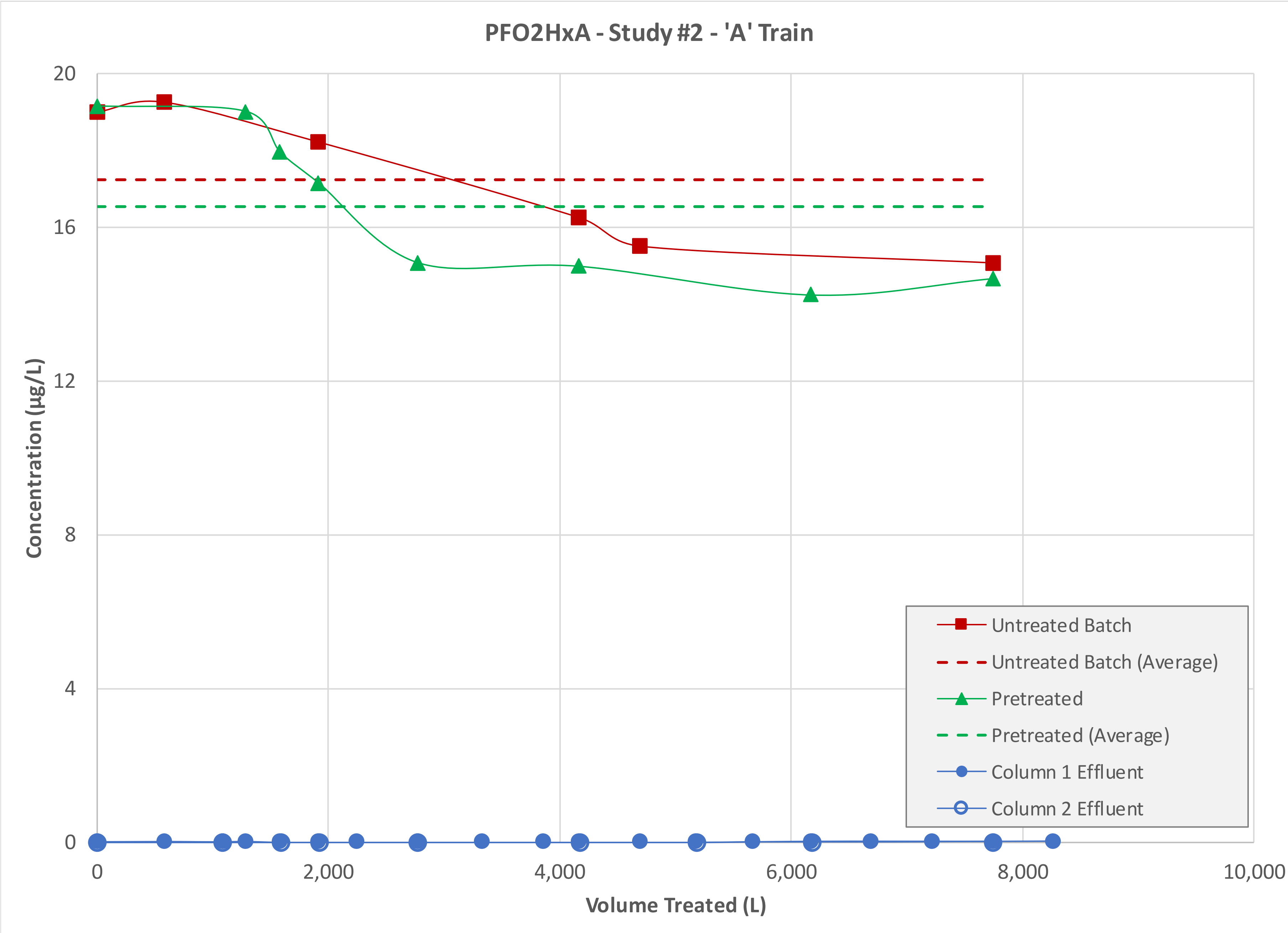


PMPA - Study #2 - 'A' Train
5.0
4.0
3.0
2.0
1.0
0.0
Concentration (µg/L)
0
2,000
4,000
6,000
8,000
10,000
Volume Treated (L)
Untreated Batch
Untreated Batch (Average)
Pretreated
Pretreated (Average)
Column 1 Effluent
Column 2 Effluent

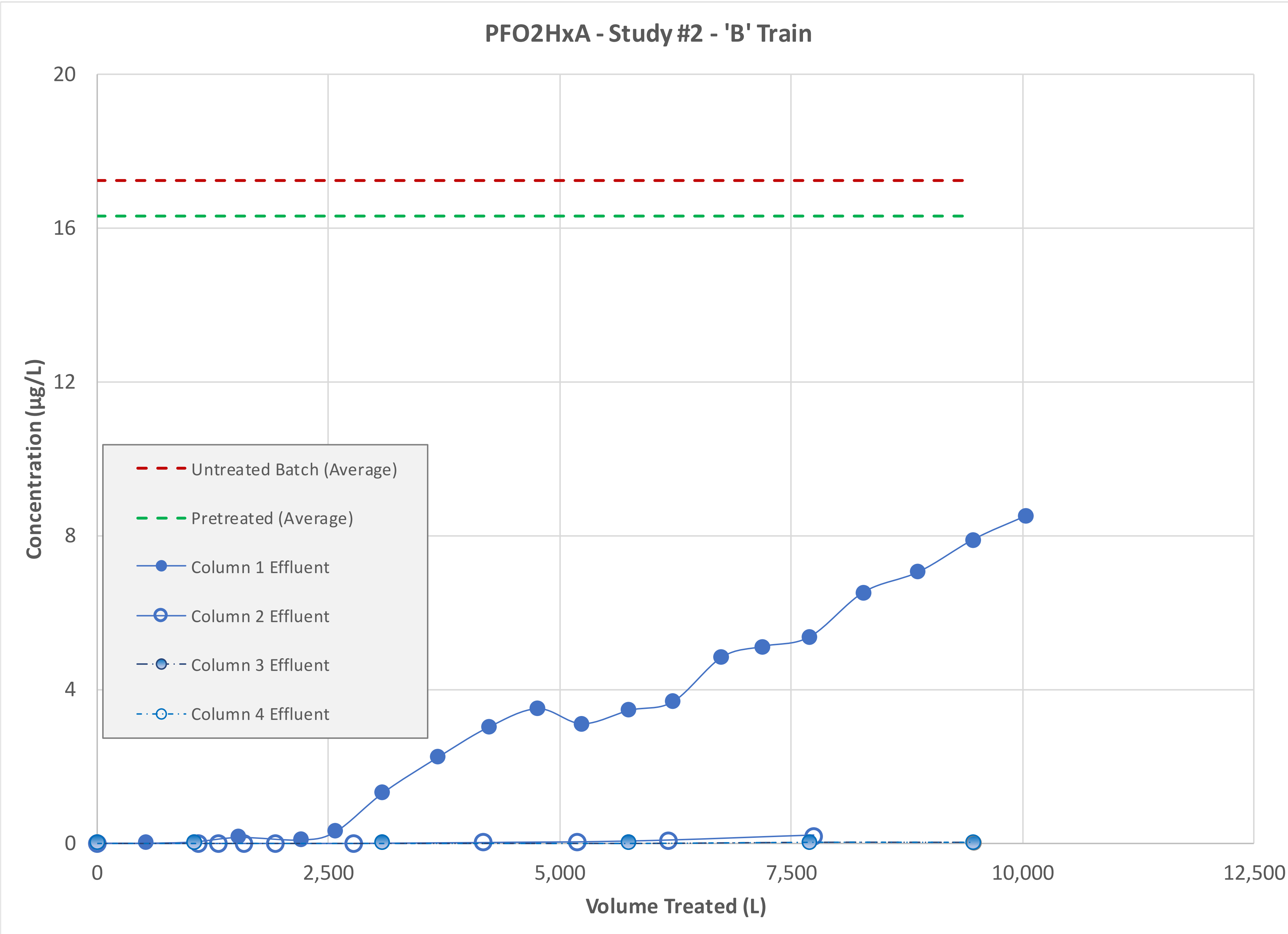

PMPA - Study #2 - 'B' Train
Concentration (µg/L)
5.0
4.0
3.0
2.0
1.0
0.0
0
2,500
5,000
7,500
10,000
12,500
Volume Treated (L)
Untreated Batch (Average)
Pretreated (Average)
Column 1 Effluent
Column 2 Effluent
Column 3 Effluent
Column 4 Effluent



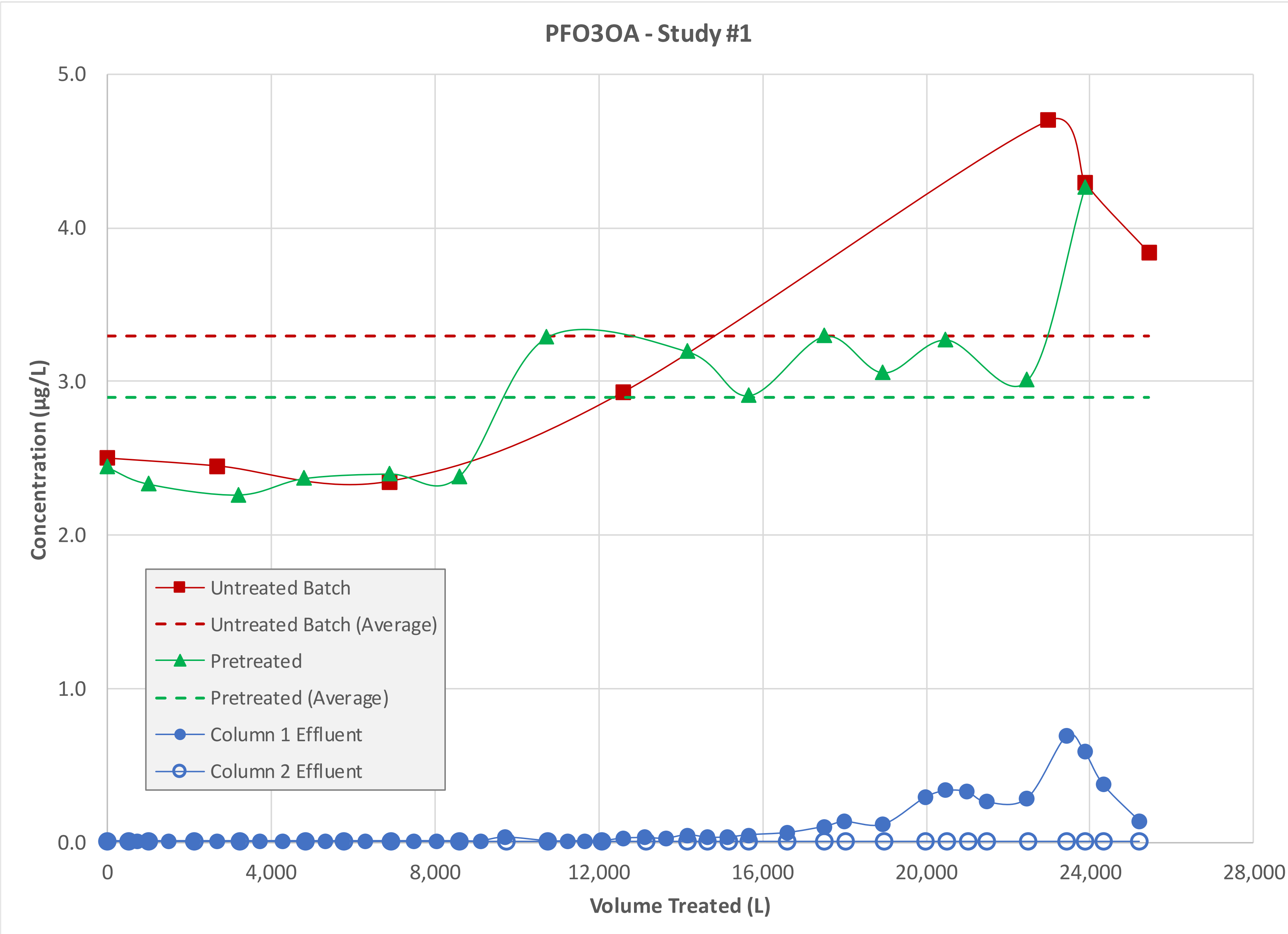
PFO2HxA - Study #1
Concentration (µg/L)
20
15
10
5
0
0
4,000
8,000
12,000
16,000
20,000
24,000
28,000
Volume Treated (L)
Untreated Batch
Untreated Batch (Average)
Pretreated
Pretreated (Average)
Column 1 Effluent
Column 2 Effluent

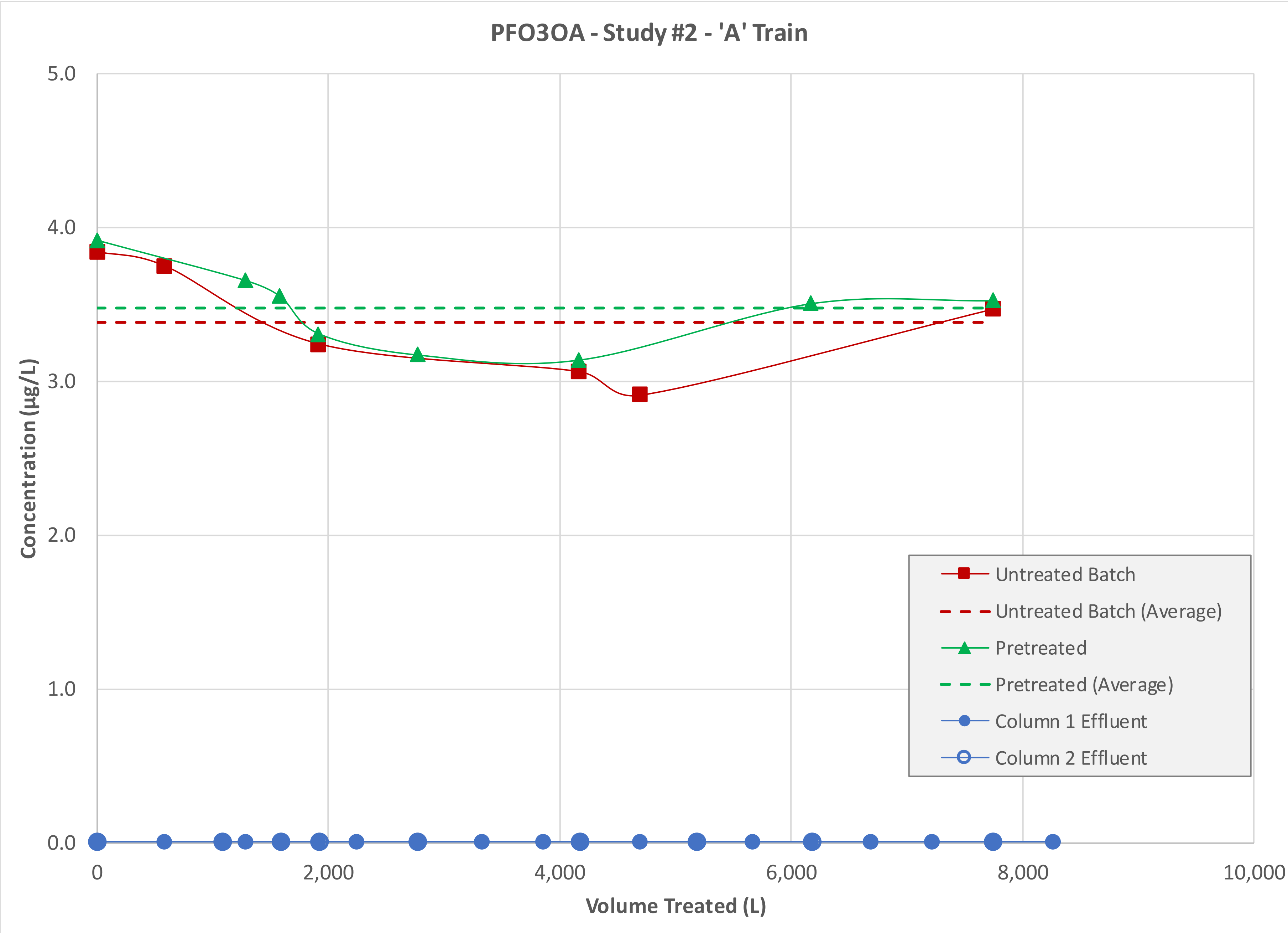


PFO2HxA - Study #2 - 'A' Train
Concentration (µg/L)
Volume Treated (L)
20
16
12
8
4
0
0
2,000
4,000
6,000
8,000
10,000
Untreated Batch
Untreated Batch (Average)
Pretreated
Pretreated (Average)
Column 1 Effluent
Column 2 Effluent

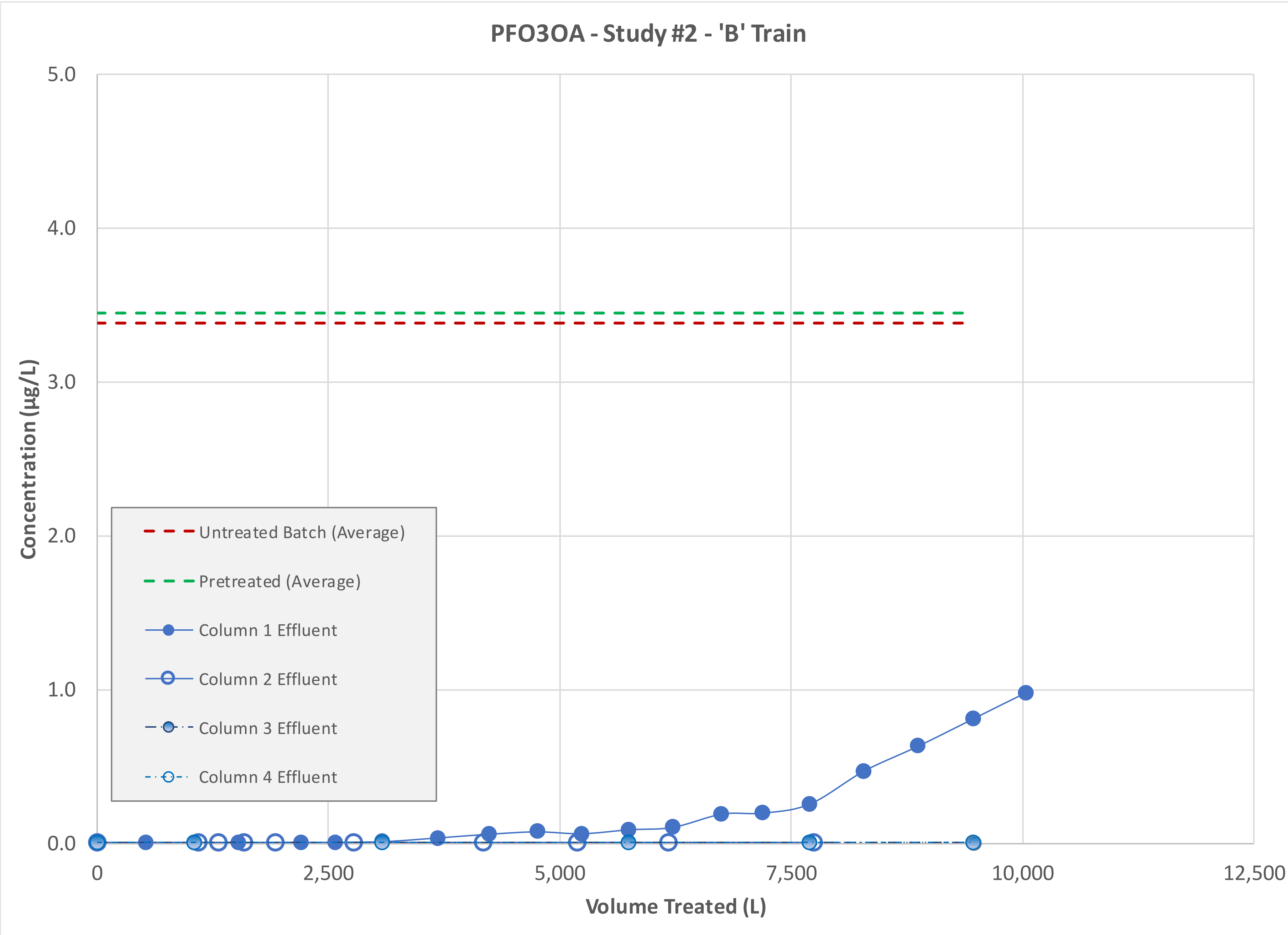


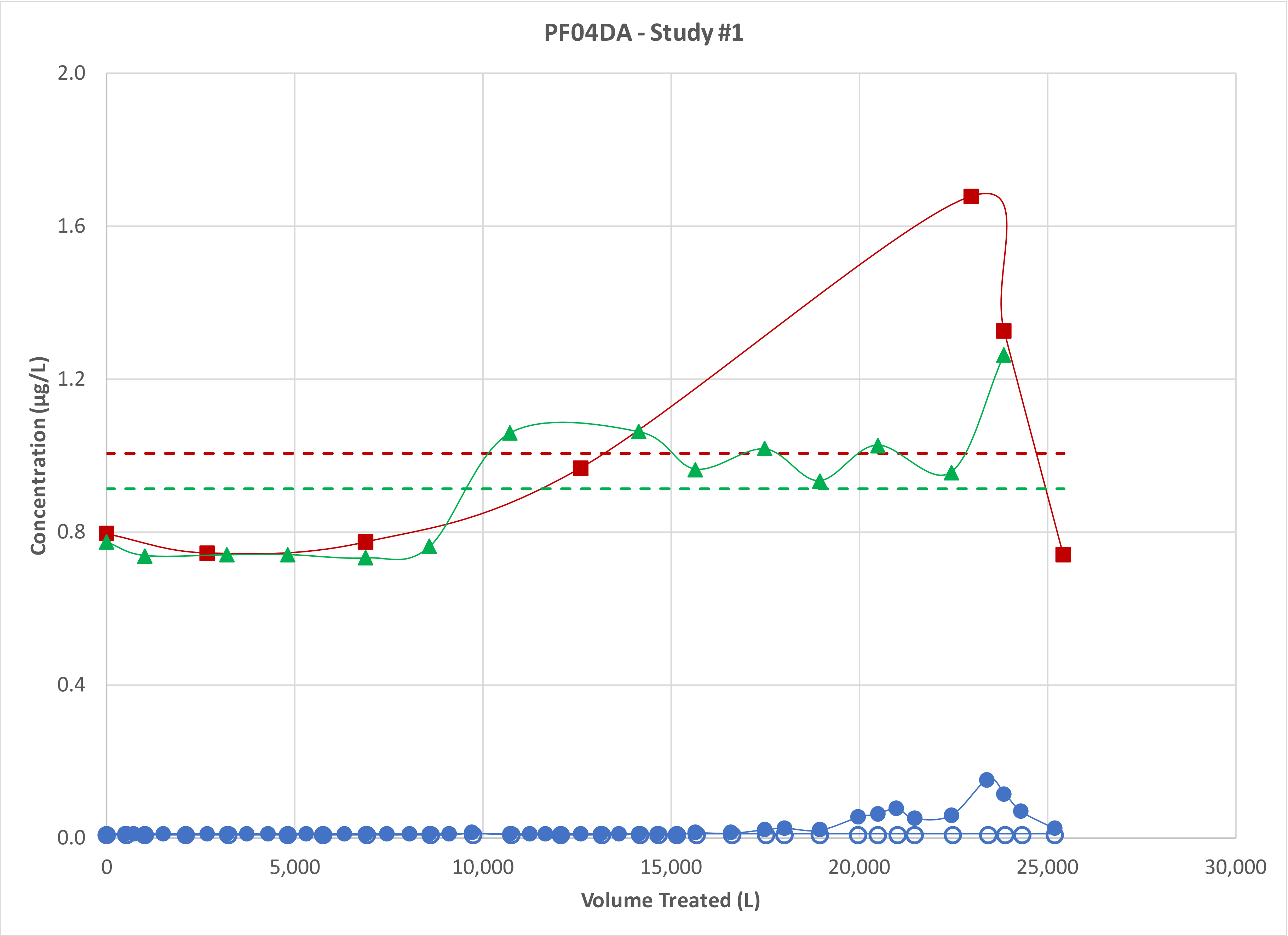
PFO2HxA - Study #2 - 'B' Train
Concentration (µg/L)
Volume Treated (L)
0
4
8
12
16
20
0
2,500
5,000
7,500
10,000
12,500
Untreated Batch (Average)
Pretreated (Average)
Column 1 Effluent
Column 2 Effluent
Column 3 Effluent
Column 4 Effluent


PFO3OA - Study #1
Concentration (µg/L)
Volume Treated (L)
5.0
4.0
3.0
2.0
1.0
0.0
0
4,000
8,000
12,000
16,000
20,000
24,000
28,000
Untreated Batch
Untreated Batch (Average)
Pretreated
Pretreated (Average)
Column 1 Effluent
Column 2 Effluent

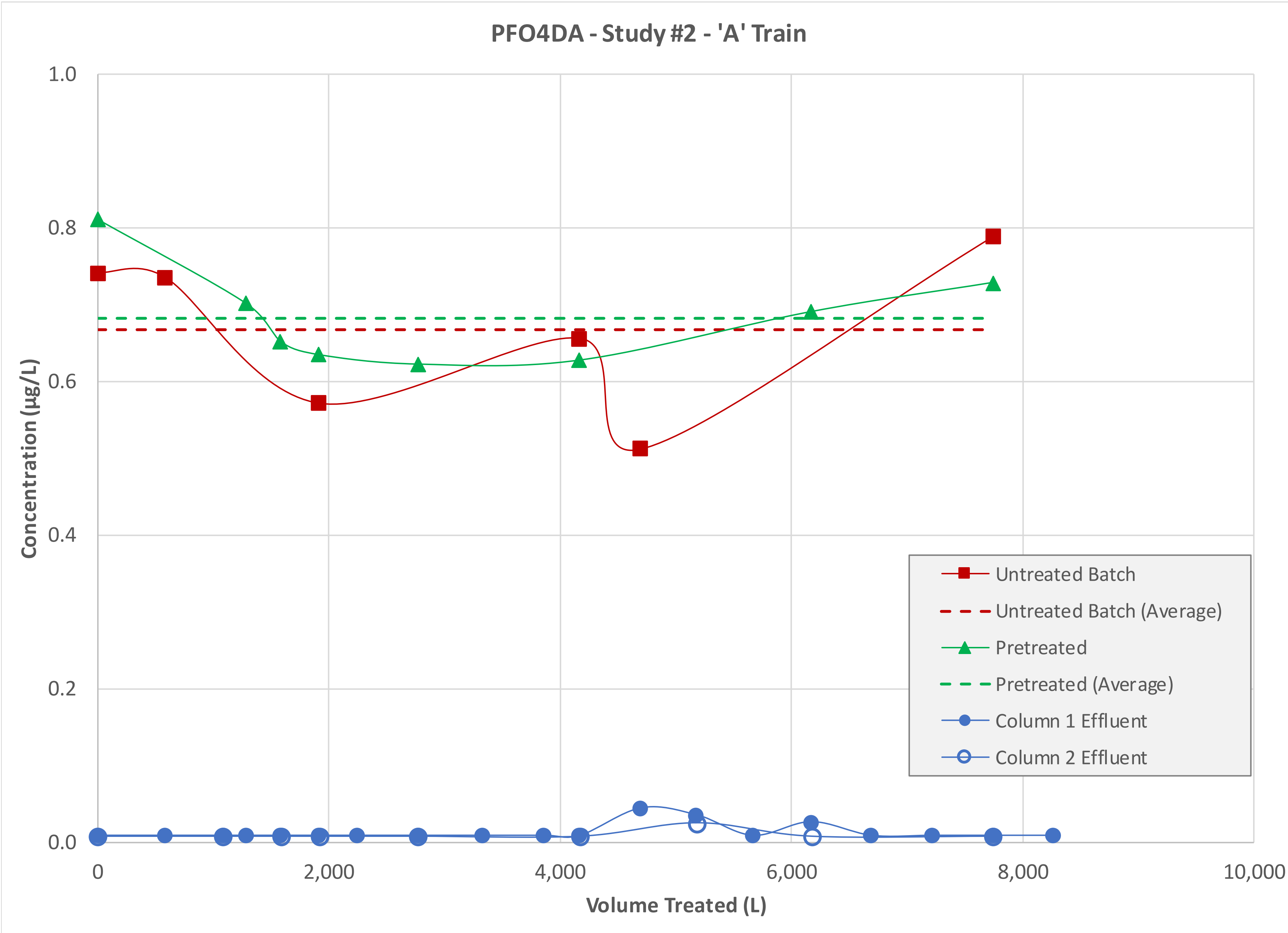


PFO3OA - Study #2 - 'A' Train
Concentration (µg/L)
5.0
4.0
3.0
2.0
1.0
0.0
0
2,000
4,000
6,000
8,000
10,000
Volume Treated (L)
Untreated Batch
Untreated Batch (Average)
Pretreated
Pretreated (Average)
Column 1 Effluent
Column 2 Effluent

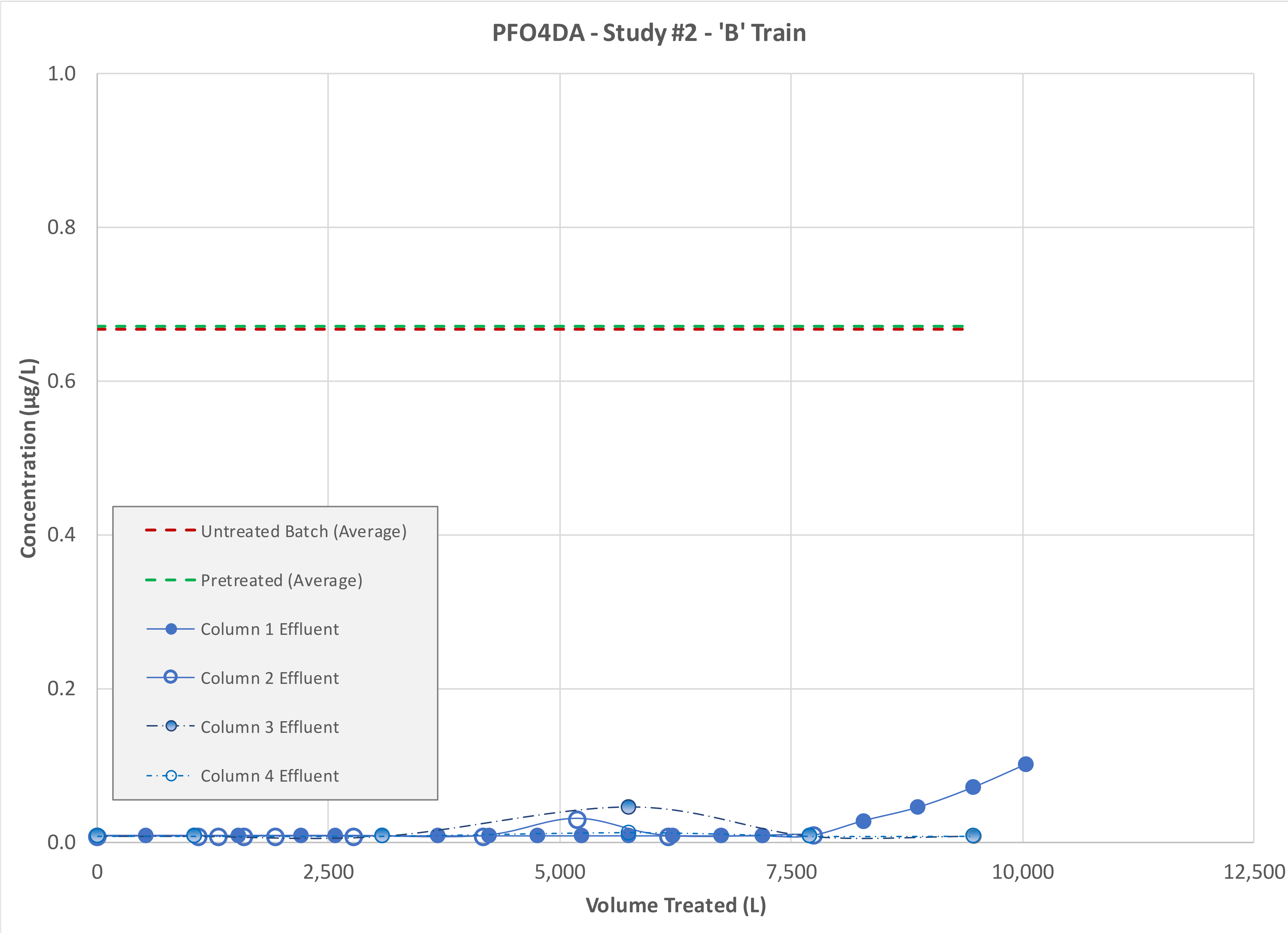

PFO3OA - Study #2 - 'B' Train
Concentration (µg/L)
Volume Treated (L)
5.0
4.0
3.0
2.0
1.0
0.0
0
2,500
5,000
7,500
10,000
12,500
Untreated Batch (Average)
Pretreated (Average)
Column 1 Effluent
Column 2 Effluent
Column 3 Effluent
Column 4 Effluent



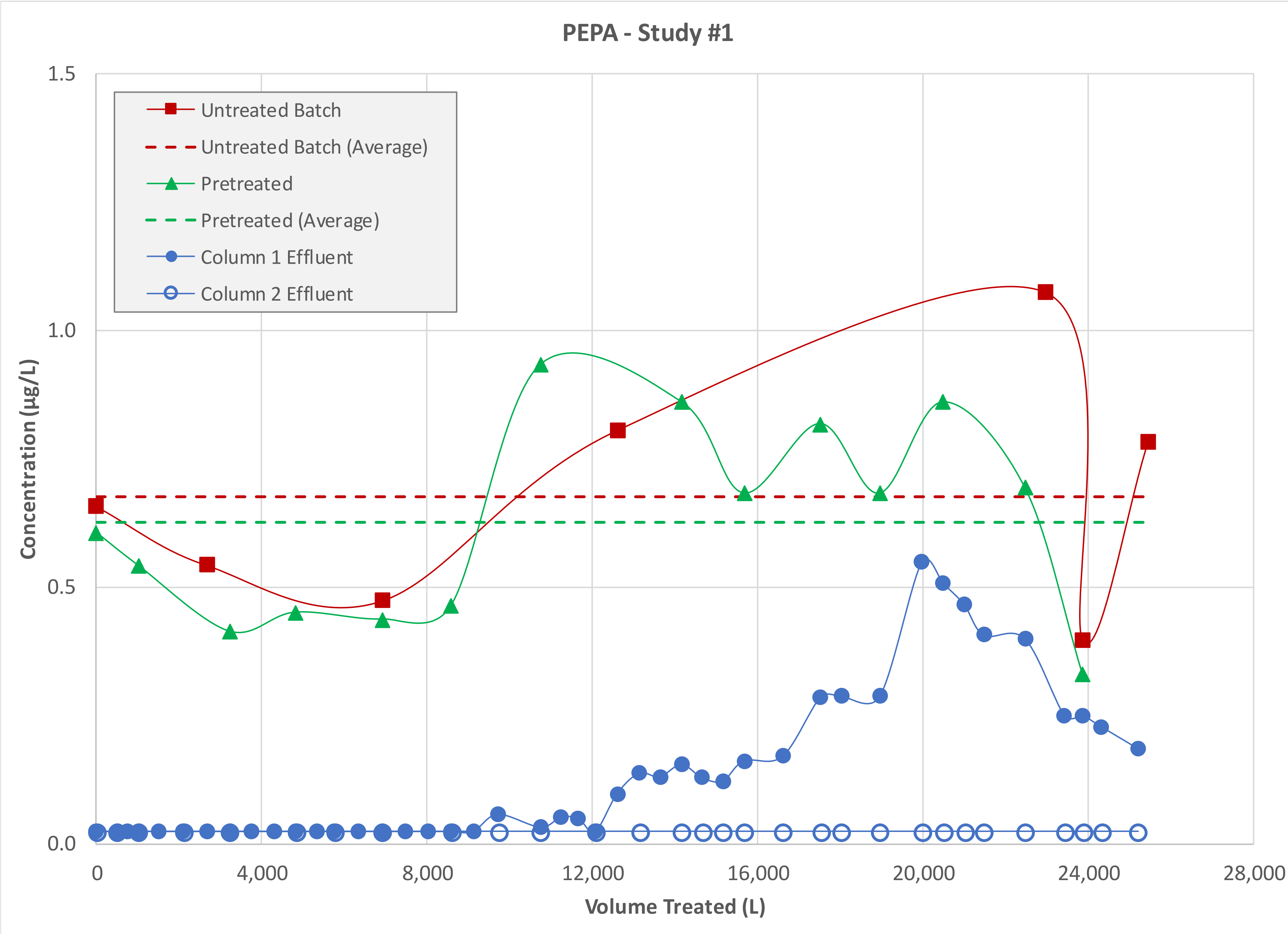
PF04DA - Study #1
Concentration (µg/L)
2.0
1.6
1.2
0.8
0.4
0.0
0
5,000
10,000
15,000
20,000
25,000
30,000
Volume Treated (L)

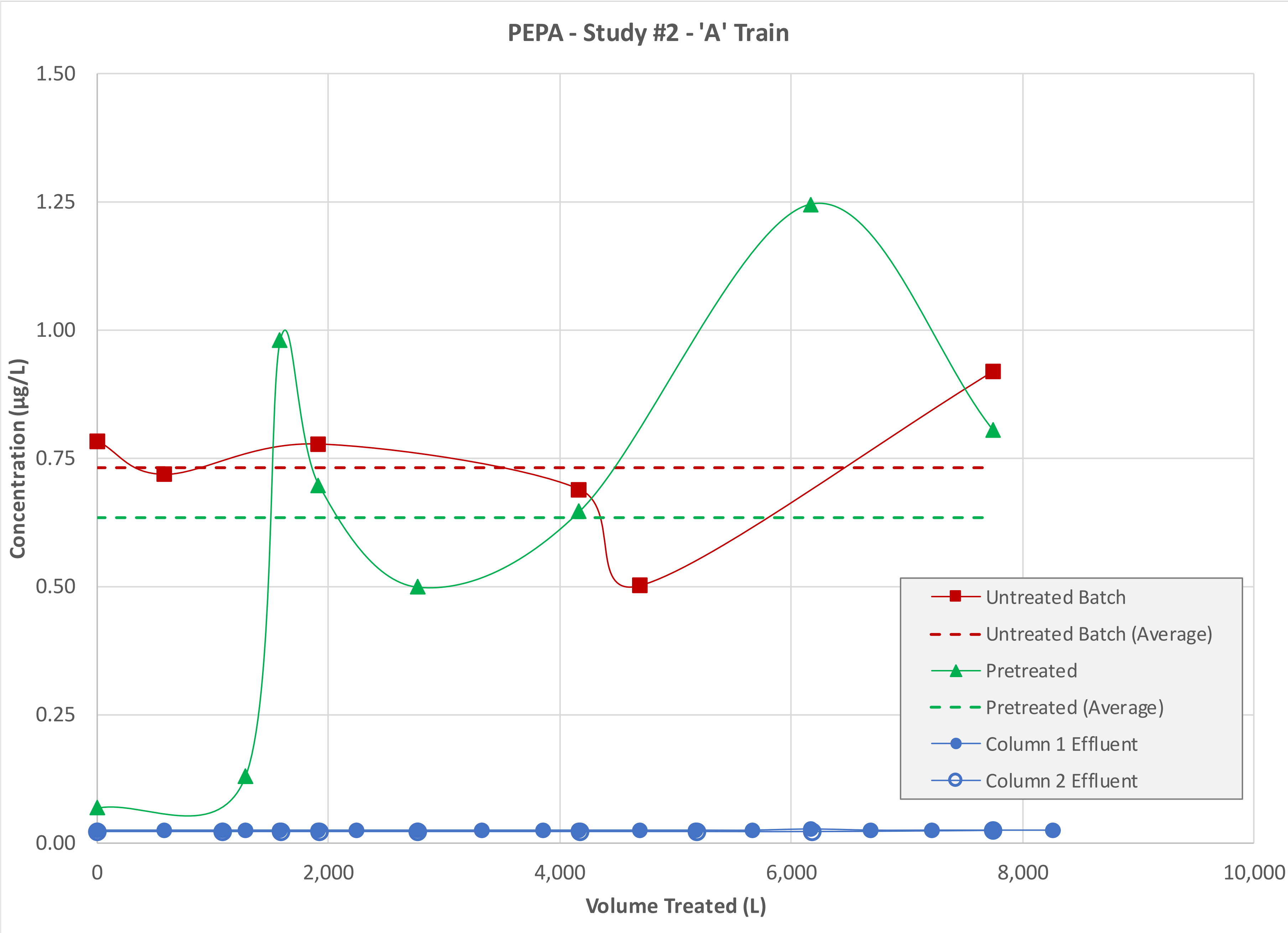


PFO4DA - Study #2 - 'A' Train
Concentration (µg/L)
1.0
0.8
0.6
0.4
0.2
0.0
0
2,000
4,000
6,000
8,000
10,000
Volume Treated (L)
Untreated Batch
Untreated Batch (Average)
Pretreated
Pretreated (Average)
Column 1 Effluent
Column 2 Effluent

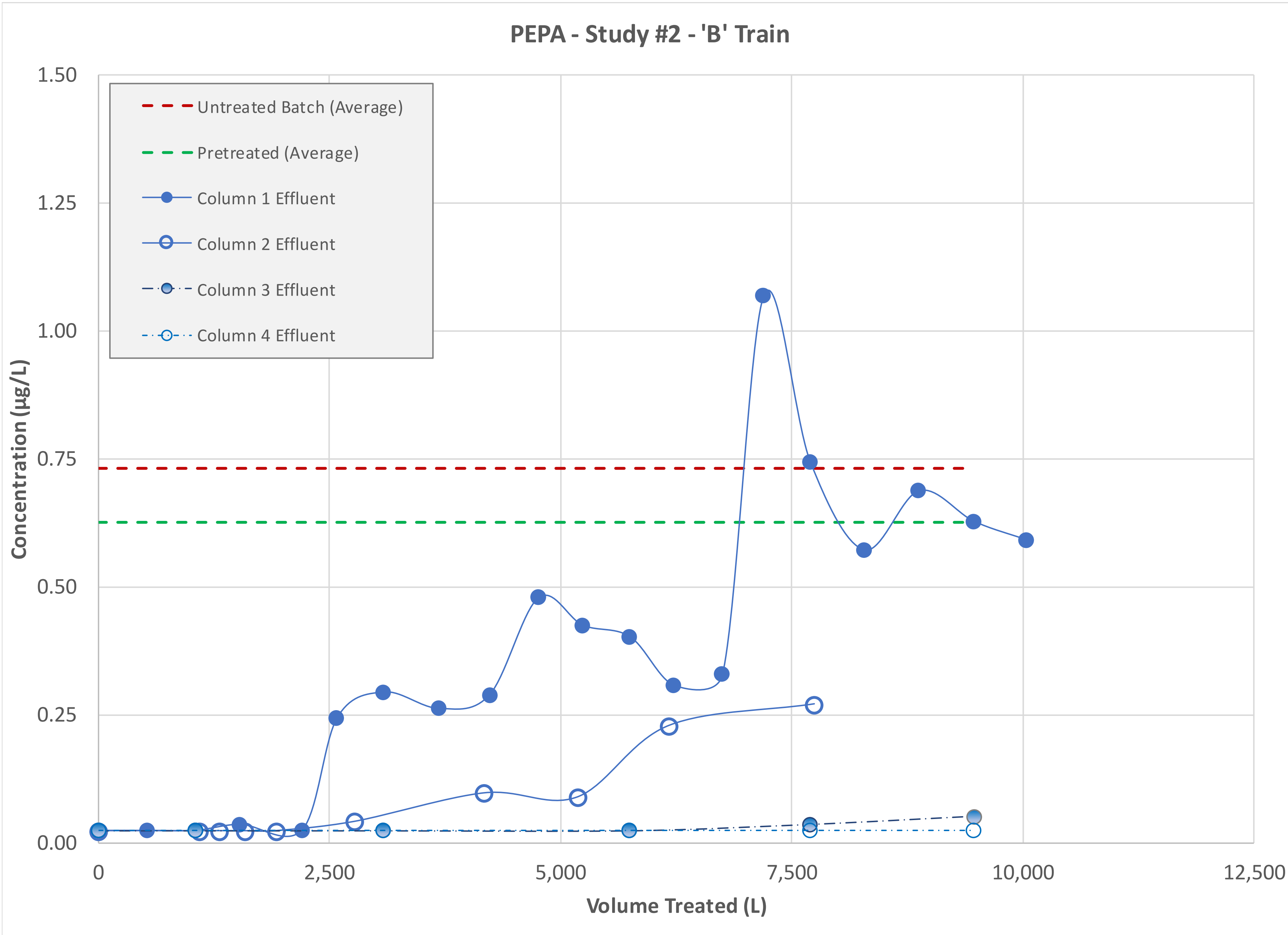


PFO4DA - Study #2 - 'B' Train
Concentration (µg/L)
Volume Treated (L)
0.0
0.2
0.4
0.6
0.8
1.0
0
2,500
5,000
7,500
10,000
12,500
Untreated Batch (Average)
Pretreated (Average)
Column 1 Effluent
Column 2 Effluent
Column 3 Effluent
Column 4 Effluent

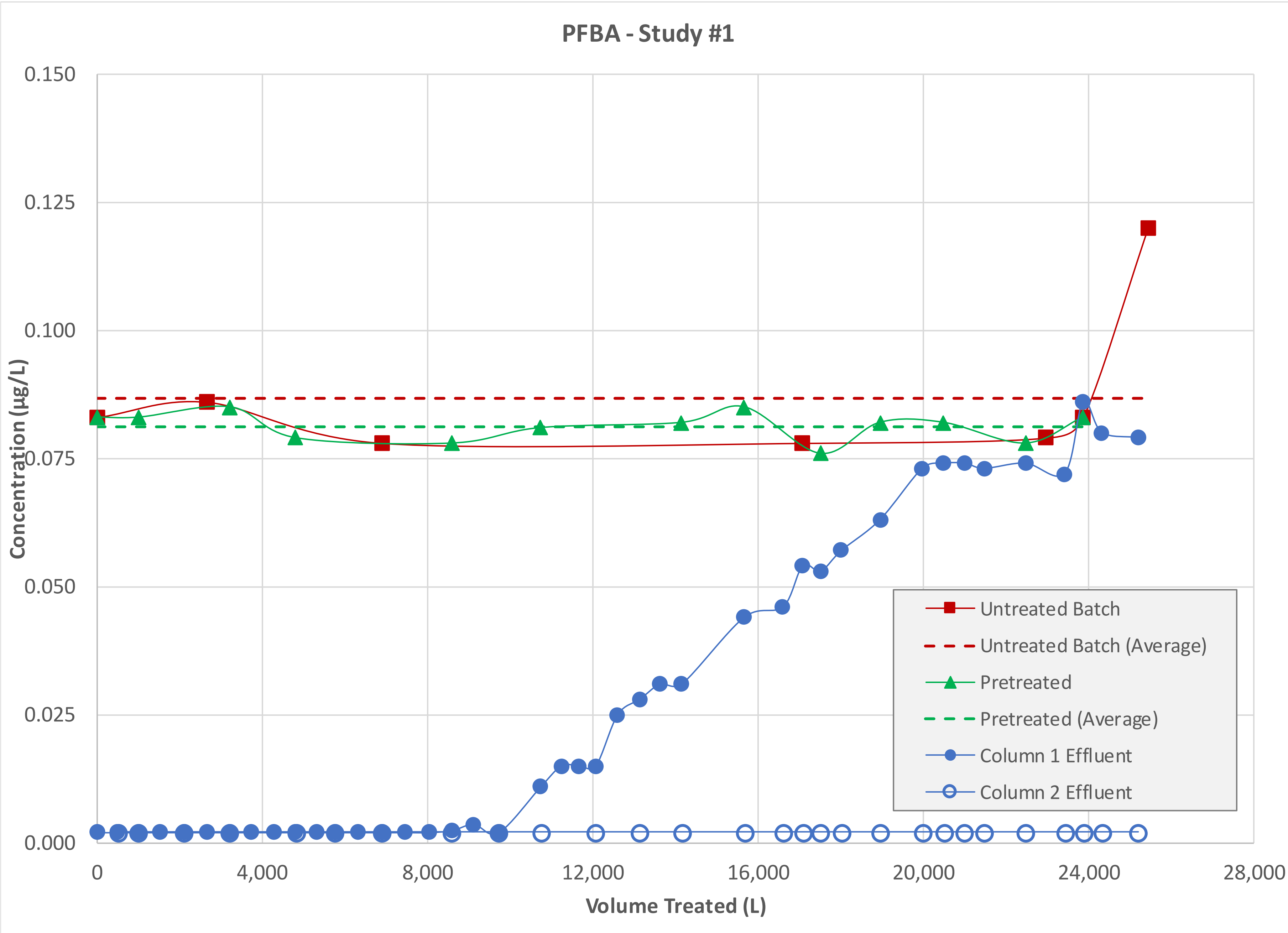

PEPA - Study #1
Untreated Batch
Untreated Batch (Average)
Pretreated
Pretreated (Average)
Column 1 Effluent
Column 2 Effluent
Concentration (µg/L)
1.5
1.0
0.5
0.0
0
4,000
8,000
12,000
16,000
20,000
24,000
28,000
Volume Treated (L)



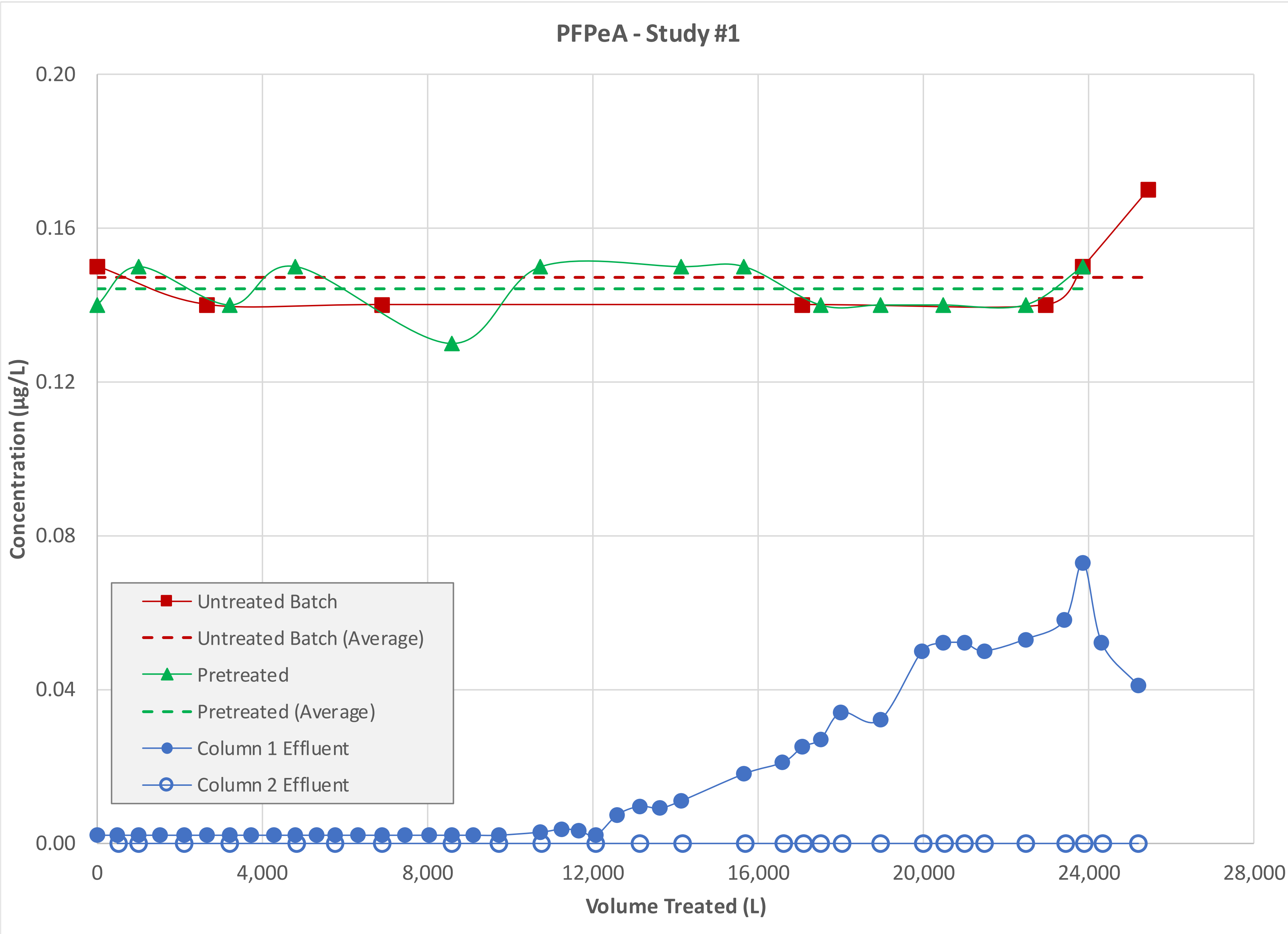
PEPA - Study #2 - 'A' Train
1.50
1.25
1.00
0.75
0.50
0.25
0.00
Concentration (µg/L)
0
2,000
4,000
6,000
8,000
10,000
Volume Treated (L)
Untreated Batch
Untreated Batch (Average)
Pretreated
Pretreated (Average)
Column 1 Effluent
Column 2 Effluent



PEPA - Study #2 - 'B' Train
Untreated Batch (Average)
Pretreated (Average)
Column 1 Effluent
Column 2 Effluent
Column 3 Effluent
Column 4 Effluent
Concentration (µg/L)
1.50
1.25
1.00
0.75
0.50
0.25
0.00
0
2,500
5,000
7,500
10,000
12,500
Volume Treated (L)



PFBA - Study #1
Concentration (µg/L)
0.150
0.125
0.100
0.075
0.050
0.025
0.000
0
4,000
8,000
12,000
16,000
20,000
24,000
28,000
Volume Treated (L)
Untreated Batch
Untreated Batch (Average)
Pretreated
Pretreated (Average)
Column 1 Effluent
Column 2 Effluent



PFPeA - Study #1
Concentration (µg/L)
0.20
0.16
0.12
0.08
0.04
0.00
0
4,000
8,000
12,000
16,000
20,000
24,000
28,000
Volume Treated (L)
Untreated Batch
Untreated Batch (Average)
Pretreated
Pretreated (Average)
Column 1 Effluent
Column 2 Effluent

APPENDIX E
COMPARISON OF CONTRACT AND ON-SITE ANALYTICAL LABORATORY RESULTS

Comparison of Contract Analytical Laboratory Field Duplicate to On-Site Analytical Lab Sample Analyses – Study #1

	Byproduct 1 (ppb)	Byproduct 2 (ppb)	Byproduct 4 (ppb)	Byproduct 5 (ppb)	HFPO-DA (ppb)	NVHOS (ppb)	PEPA (ppb)	PFMOAA (ppb)	PFO2HxA (ppb)	PFO3OA (ppb)	PFO4DA (ppb)	PFO5DA (ppb)	PMPA (ppb)
PRE-A SAMPLES													
PRE-A 6-28-19	0.1099	0.1972	0.0682	0.4249	3.6436	0.5852	0.44	23.4621	14.7435	2.4014	0.7303	0.2354	2.6294
PRE-A 6-28-19 Field Duplicate	0.30	0.30	0.51	1.2	6.6	0.84	1.9	95	17	4.4	1.5	0.51	5.6
Ratio	2.73	1.52	7.48	2.82	1.81	1.44	4.35	4.05	1.15	1.83	2.05	2.17	2.13
PRE-A 7-25-19	0.2121	0.3053	0.0284	0.1146	5.2034	0.7142	0.8593	18.7048	15.9752	3.2717	1.0256	0.2159	2.7686
PRE-A 7-25-19 Field Duplicate	0.26	0.28	0.32	0.75	5.3	0.77	1.8	77	17	4.4	1.4	0.47	5.3
Ratio	1.23	0.92	11.27	6.54	1.02	1.08	2.09	4.12	1.06	1.34	1.37	2.18	1.91
PRE-A 8-01-19	0.1902	0.2114	2.1235	1.3458	5.3694	0.3197	0.3282	29.4107	17.7462	4.2669	1.2615	0.3286	4.2440
PRE-A 8-01-19 Field Duplicate	0.25	0.34	0.47	1.3	–	0.74	2.0	91	19	4.8	1.6	0.52	5.8
Ratio	1.31	1.61	0.22	0.97	–	2.31	6.09	3.09	1.07	1.12	1.27	1.58	1.37
AVERAGE RATIO (PRE-A)	1.76	1.35	6.32	3.44	1.41	1.61	4.18	3.75	1.10	1.43	1.56	1.98	1.80
GAC 1A SAMPLES													
GAC 1A 6-19-19	< 0.0094	< 0.0073	< 0.0073	< 0.0067	< 0.0117	< 0.0114	< 0.0235	< 0.0106	< 0.0048	< 0.0092	< 0.0082	< 0.0070	< 0.0048
GAC 1A 6-19-19 Field Duplicate	<0.0020	<0.0020	<0.0020	<0.0020	–	<0.0020	<0.020	<0.0050	<0.0020	<0.0020	<0.0020	<0.0020	<0.010
Ratio	–	–	–	–	–	–	–	–	–	–	–	–	–
GAC 1A 7-17-19	< 0.0094	< 0.0073	< 0.0073	0.008	0.503	0.0250	0.1700	12.267	0.933	0.063	0.012	< 0.0070	2.007
GAC 1A 7-17-19 Field Duplicate	<0.027	<0.030	<0.16	0.31	0.71	<0.054	0.64	53	1.3	0.14	<0.079	<0.034	4.3
Ratio	–	–	–	–	1.41	–	3.76	4.32	1.39	2.22	–	–	2.14
GAC 1A 7-25-19	0.0182	0.0095	< 0.0073	0.0211	1.6123	0.1300	0.5065	19.0097	3.6103	0.3383	0.0614	0.0191	2.9709
GAC 1A 7-25-19 Field Duplicate	<0.027	0.032	<0.16	0.29	1.7	0.14	1.2	94	4.0	0.47	0.097	<0.034	5.7
Ratio	–	3.37	–	–	1.05	1.08	2.37	4.94	1.11	1.39	1.58	–	1.92
GAC 1A 8-01-19	0.0170	0.0288	0.6053	0.4158	2.0362	0.0671	0.2482	28.1829	5.0170	0.5944	0.1145	0.0201	4.4146
GAC	<0.027	0.030	<0.16	0.30	–	0.16	1.3	88	4.8	0.63	0.14	<0.034	5.3
Ratio	–	1.04	–	–	–	2.38	5.24	3.12	0.96	1.06	1.22	–	1.20
AVERAGE RATIO (GAC 1A)	–	2.21	–	–	1.23	1.73	3.79	4.13	1.15	1.56	1.40	–	1.75

Byproduct 6 was below method reporting limit in all field-duplicate samples analyzed by contract analytical laboratory.

PFECA B, PFECA G, and PES were below reporting limit all samples by both on-site and contract analytical laboratories.

R-EVE was reported below method reporting limit by on-site lab but with detectable concentrations from analytical lab; results for Aug 1 sample showed a detectable concentration which was higher than the contract lab. EVE and Hydro-EVE results were also inconsistent (but all << 1 µg/L in pretreated influent).