MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY
REMEDIATION AND REDEVELOPMENT DIVISION

FOR CASHIER'S USE ONLY

RESPONSE ACTIVITY REVIEW PANEL PETITION COVER SHEET

Authority: Section 20114e and Section 21315(7) of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended.

Submit this completed form and all supporting documentation (including a copy of the submitted fee) to: Kevin Schrems, Michigan Department of Environment, Great Lakes, and Energy, Constitution Hall, 525 West Allegan Street, P.O. Box 30426, Lansing, MI 48909-7973.

The petitioner must submit a fee (noted below) for the petition to be considered.

- A fee of $3,500.00 (Response Activity Plans (including Remedial Action Plans), No Further Action Reports, Request for Certificate of Completion, or Documentation of Due Care Compliance under Part 201). ***(ASC: Accounting Template 761RRDRARP201)***
- A fee of $300.00 (for Final Assessment Reports, Closure Reports, or Documentation of Due Care Compliance under Part 213 of Act 451). ***(ASC: Accounting Template 761RRDRARP213)***

  Please submit a copy of this completed form with the fee to: Michigan Department of Environment, Great Lakes, and Energy, Cashier's Office for EGLE, P.O. Box 30657, Lansing, Michigan 48909-8157.

The petitioner must be the person who submitted the plan or report that is in dispute. For questions, please contact Kevin Schrems, Compliance and Enforcement Section, Remediation and Redevelopment Division, EGLE, P.O. Box 30426, Lansing, Michigan 48909; or 517-275-1180; or SchremsK@Michigan.gov.

PLAN OR REPORT FOR WHICH PETITION IS BEING SUBMITTED: **Remedial Investigation Report dated 9.2.21**

(Example: April 1, 2011, Remedial Investigation Plan or April 7, 2011, No Further Action Report)

FACILITY NAME: City of Cedar Springs, MI Former Wastewater Treatment Lagoons Site

PART 201 SITE ID 41000010 PART 213 FACILITY ID n/a

FACILITY ADDRESS: 730 West Street

CITY: Cedar Springs ZIP CODE: 49319

PETITIONER NAME: City of Cedar Springs

CONTACT PERSON: Michael Womack, City Manager

CONTACT PHONE NO.: 616-696-1330

CONTACT E-MAIL: manager@cityofcedarsprings.org

RELATIONSHIP OF CONTACT PERSON TO PETITIONER: City Manager

SIGNATURE

The undersigned requests an appeal of the decision made by EGLE regarding a technical or scientific provision of the noted document as described in the backup documentation.

Signature of Petitioner	Printed Name of Petitioner	Date
[signature]	Mike Womack	2-14-22

Petition for Response Activity Panel Review
City of Cedar Springs

730 West Street PFAS Investigation

This Petition for Response Activity Panel review is submitted by the City of Cedar Springs ("**City**") with respect to property located at 730 West Street, Cedar Springs, Michigan ("**Site**") pursuant to Part 201 of Michigan's Public Act 451 of 1994, as amended ("**Part 201**"). This Petition seeks review by the Response Activity Review Panel of a dispute as defined in Section 20114e(13) of Part 201. The dispute consists of the City's disagreement with EGLE's determination that the City has not submitted sufficient information to EGLE to demonstrate delineation of the nature and extent of per- and polyfluoroalkyl substances ("**PFAS**") under Part 201 in groundwater at and in the vicinity of the Site.

Brief Background and Issue Presented.

The City formerly operated a wastewater treatment lagoon system at the Site. The lagoons were closed in place in 2002. In early 2020, the City discovered certain PFAS in groundwater at the Site. The PFAS were detected in certain former lagoon groundwater monitoring wells installed in the shallow aquifer at the Site. Subsequent to EGLE's promulgation of new PFAS groundwater cleanup criteria for the drinking water exposure pathway in August 2020, EGLE issued Violation Notice # 011095 dated October 2, 2020 ("**Violation Notice**") to the City with respect to perfluorooctanoic acid (PFOA) detected in certain of the monitoring wells on the Site. In response to the Violation Notice, the City, through its environmental consultant Fishbeck, submitted two work plans to EGLE and implemented the remedial investigation activities described in the work plans. The results of the City's remedial investigation activities are presented in Fishbeck's Remedial Investigation Report dated September 2, 2021 ("**RI Report**"), also provided to EGLE on September 2, 2021. The RI Report concludes that the City has delineated the nature and extent of the PFAS contamination at and in the vicinity of the Site, both horizontally and vertically.

On November 22, 2021, EGLE issued a Second Violation Notice No. SVN-01124 ("**Second Violation Notice**"), asserting that the City has failed to define the nature and extent of the PFAS contamination under Part 201 at and in the vicinity of the Site. On the same date, EGLE also issued to the City a letter entitled "*Disapproval Letter*" explaining the technical basis for EGLE's position ("**Disapproval Letter**"). The Disapproval letter cites the following three technical reasons for its position: (1) categorical rejection of the use of residential drinking water wells as delineation points; (2) rejection of groundwater flow data in support of a delineation boundary; and (3) a universal requirement that multiple aquifers must always be investigated as part of delineation, irrespective of documented geology and stratigraphy. The City disputes these technical positions and EGLE's conclusion that the City has not adequately completed delineation of the PFAS under Part 201. A copy of the Disapproval Letter is attached as Exhibit 1. Additional background is described below.

It should be noted that the Violation Notice and the Second Violation Notice also address a low level of PFOA detected in one monitoring well located within the City's current wastewater discharge field which the City operates under groundwater discharge permit GW1810233. The discharge field is located approximately one mile from the former lagoon area. EGLE's allegations and the City's position related to the discharge fields are not part of this Petition.

Additional Factual Background and Supporting Documentation.

Draft February 15, 2021 Work Plan and CSM ("**Work Plan**"). As part of this Work Plan, Fishbeck prepared a conceptual site model (CSM) for the Site and surrounding area. The geological cross-sections that support the CSM reflect the presence of three hydrostratigraphic units below the Site. The water table is located approximately 10 feet below ground surface ("**bgs**"). The upper groundwater aquifer extends to a depth of approximately 30 feet bgs and is underlain by a 40 to 70- foot thick clay layer. The clay unit acts as a confining layer and extends to a depth of approximately 100 feet bgs. A lower aquifer is present at depths below 100 feet bgs and extends to a depth of at least 120 feet bgs. The confined aquifer is separated from the upper aquifer due to the extensive overlying clay. Groundwater in the upper aquifer at and near the Site flows in a westerly direction.

The Work Plan describes remedial investigation activities performed between March 2021 and August 2021. The activities generally included: sampling of groundwater monitoring wells previously installed as part of the former lagoon evaluation and closure; installation and sampling of a new groundwater monitoring well (shallow aquifer); sampling of residential drinking water wells and evaluation of boring logs for those wells as available; and collection of a surface water sample from a nearby creek. The City provided interim updates to EGLE as the City performed these remedial investigation activities.

A copy of the Work Plan, including the CSM, is attached as Exhibit 2. Please refer to the Work Plan for additional information regarding the Site geology and groundwater.

September 2, 2021 Remedial Investigation Report ("**RI Report**"). In the RI Report, Fishbeck described the implementation of the remedial activities, the sampling results, and its interpretation of the data and related information. The RI Report also includes data generated as part of the City's Wellfield Wellhead Protection Area Delineation Report and other Wellhead Protection Areas which pertain to the Site and vicinity. Based on reported wellhead protection area data, groundwater flow in the lower aquifer is to the southwest. As noted above, groundwater flow in the upper aquifer is westerly. The RI Report documents the delineation of the nature and extent of the PFAS as follows: to the west at Cedar Creek; to the south at 16-Mile Road; to the east MW-2A and MW-8A; and to the north based on the lack of a northerly flow component (inferred boundary). The RI Report documents the vertical extent of PFAS at the base of the upper aquifer due to the presence of a clay layer that is 40-70 feet thick.

No wells were installed in the deep aquifer. The basis used to determine the vertical boundary is the clay layer; therefore, no deep wells are deemed necessary to delineate the vertical extent of the PFAS.

A copy of the RI Report is attached as Exhibit 3. Please refer to the RI Report for details associated with the implementation and findings of the remedial investigations and additional support for the City's position that it has fully delineated the PFAS.

Dispute.

The City's position is that the City has delineated the nature and extent of PFAS contamination under Part 201 at and in the vicinity of the Site based on the content of the RI Report. EGLE rejects this position for the reasons stated in the Disapproval Letter, claiming that the City has not provided sufficient information for EGLE to make a determination as to whether the City has completed delineation. EGLE demands that the City install multiple deep aquifer wells to evaluate the potential presence of PFAS in the lower aquifer. The Disapproval Letter cites the following two technical reasons in support of this demand:

- Drinking Water Wells. EGLE categorically rejects the use of residential drinking water wells as a basis for delineating groundwater contamination. The City disagrees with EGLE's categorical rejection and, more specifically, the City objects to EGLE's disregard of the data collected by the City from 14 residential wells, including data from those 11 wells with boring logs showing screens set in the lower aquifer, as reliable delineation points. The City believes that it has reliably delineated the southern boundary of the PFAS contamination within the shallow unconfined aquifer by using data from residential wells. The City also understands that EGLE relies on residential drinking water wells as delineation points when conducting its own groundwater investigations.

- Lower Aquifer. As a universal position and requirement, EGLE asserts that all aquifers must in all instances at all properties be investigated to complete delineation of groundwater contamination under Part 201. The City disagrees with this universal requirement and, in particular, rejects this position as applied to the City's investigative activities at and in the vicinity of the Site. For reasons presented in the CSM and supported in the RI Report, the City believes that the clay layer is sufficient for delineation of the vertical extent of PFAS at and in the vicinity of the Site and that the City has provided adequate documentation regarding the clay layer as the vertical boundary.

In addition, EGLE disputes the northern boundary of the PFAS delineation which relies on well-documented westerly groundwater flow in the upper aquifer. The City disagrees with EGLE's rejection of groundwater flow data to determine the northerly boundary of the PFAS. The City has significant data to substantiate the westerly flow of groundwater in the upper aquifer. That data serves as reliable and credible support for the northerly extent of the PFAS in the shallow aquifer.

Request.

The City believes that it has defined the nature and extent of PFAS at and in the vicinity of the Site compliant with Part 201. The City has relied on sound geologic principles and the extensive experience of its consultant to design and implement a remedial investigation to achieve delineation pursuant to Part 201. The data from the City's investigations and other sources document the City's delineation of PFAS horizontally and vertically. EGLE has rejected these methodologies and proclaimed new, universal standards for the groundwater investigation that are not consistent with Part 201 or common practices in the industry. Needless to say, the demand that the City investigate the lower aquifer poses a significant financial hardship for the City.

The City requests that the Response Activity Review Panel reverse EGLE's determination as set forth in the Disapproval Letter.

Attachments:

Exhibit 1: EGLE November 22, 2021 Disapproval Letter
Exhibit 2: Fishbeck Draft February 15, 2021 Work Plan (including the CSM)
Exhibit 3: Fishbeck September 2, 2021 Remedial Investigation Report

STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
LANSING

GRETCHEN WHITMER
GOVERNOR

EGLE
LIESL EICHLER CLARK
DIRECTOR

November 22, 2021

VIA E-MAIL

Mr. Mike Womack, City Manager
City of Cedar Springs
P.O. Box 310
Cedar Springs, Michigan 49313

Dear Mr. Womack:

SUBJECT: Remedial Investigation Report,
Cedar Springs Former Wastewater Treatment Lagoons Site
730 West Court Street, Cedar Springs, Michigan
Disapproval Letter

Thank you for our discussion on November 3, 2021, regarding the City of Cedar Springs' (City) responsibilities under Part 201, Environmental Remediation, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA); as owner or operator of the former Cedar Springs Wastewater Treatment Lagoons Facility (Facility).

On September 2, 2021, the Department of Environment, Great Lakes, and Energy (EGLE), Water Resources Division (WRD), received a Remedial Investigation (RI) report for the Facility, submitted by Fishbeck on behalf of the City. The RI report was submitted in response to Violation Notice No. VN-011095, dated October 2, 2020. The RI report summarized the findings from the work outlined in the draft Remedial Investigation/Feasibility Study (RI/FS) Work Plan submitted to EGLE on February 15, 2021. The City was informed that the work described in the work plan was insufficient for the completion of an RI. EGLE instructed the City to resubmit an approvable work plan. The City agreed to resubmit the work plan and was given two deadline extensions to do so. The submittal of the RI report was unanticipated by EGLE due to the lack of an approved work plan. The RI report as submitted is <u>not approved.</u>

As a responsibility under Part 201 of the NREPA, the City is required to define the nature and extent of contamination at the Facility, which includes full horizontal and vertical delineation of contamination in all aquifers. The RI report does not meet this requirement for the following reasons:

1. The horizontal extent of contamination in the upper unconfined aquifer has not been properly delineated to the south. As described in the RI report, shallow residential wells were sampled for Per- and Polyfluoroalkyl Substances (PFAS) and used to delineate the extent of contamination south of the Facility. The use of residential wells in delineation of contamination in groundwater is not acceptable. The installation of groundwater monitoring wells, designed and screened for the purpose of the investigation, is required.

2. The horizontal extent of contamination in the upper unconfined aquifer has not been properly delineated to the north. The RI report states that, "Based on the groundwater flow direction in the shallow aquifer, there does not appear to be a northern flow

component at the Site and groundwater impacted with PFAS exceeding Part 201 Cleanup Criteria would not be expected to migrate in a northerly direction." However, groundwater to the north has not been actively investigated for PFAS and therefore, the City cannot state with certainty that contamination is not present in groundwater to the north. The City acknowledges this point in Figure 1, as an inferred exceedance contour is used on the north side of the plume.

3. The RI report states that "three (3) hydrostratigraphic units have been identified beneath the Site," which includes an upper and lower aquifer. The vertical and horizontal extent of PFAS contamination in the lower aquifer has not been properly delineated. The RI report uses multiple lines of reasoning to infer that the lower aquifer has not been contaminated with PFAS, including residential well boring logs that show a 40- to 70-foot-thick clay unit, residential well sampling results from a limited number of wells installed in the lower aquifer, and estimated groundwater flow direction in the lower aquifer from Wellhead Protection Area information. While these lines of reasoning support the City's position that the lower aquifer has not been impacted, the City cannot state with certainty that PFAS contamination is not present in the lower aquifer. To do so, an active investigation that includes the installation of groundwater monitoring wells, designed and screened for the purpose of the investigation, is required to verify the groundwater flow direction and presence or absence of contaminants.

It is critical that the full horizontal and vertical extent of contamination in all aquifers be defined to ensure the protection of nearby residential and community water supply wells.

EGLE appreciates the City's continued efforts in addressing this matter. Should the City require further information regarding this letter, or you would like to arrange a meeting to discuss, please contact me at 517-281-5160; ChattersonE@Michigan.gov; or EGLE, WRD, Emerging Pollutants Section, P.O. Box 30473, Lansing, Michigan 48909-7973.

Sincerely,

Eric Chatterson, Geology Specialist
Groundwater Permits Unit
Water Resources Division

ec/sea

46105

Date	Invoice	Description/Detail	Amount
02/15/2022	021522	RESPONSE ACTIVITY REVIEW PANEL PETITION	3,500.00

02/15/22 CITY OF CEDAR SPRINGS ◦ GENERAL FUND 3,500.00

WARNING! DO NOT ACCEPT THIS CHECK UNLESS THE PINK LOCK & KEY ICONS FADE WHEN WARMED AND YOU CAN SEE A QUATREFOIL DUAL-TONE TRUE WATERMARK WHEN CHECK IS HELD TOWARD THE LIGHT

CITY OF CEDAR SPRINGS
GENERAL FUND
66 S. MAIN STREET P.O. BOX 310
CEDAR SPRINGS, MI 49319
616/696-1330

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ChoiceOne Bank
888-775-6687

74-843/724

46105

02/15/22

AMOUNT
$3,500.00

PAY
Three Thousand Five Hundred and NO/100 Dollars**********************************

TO THE ORDER OF

STATE OF MICHIGAN
CASHIER'S OFFICE FOR DEQ
PO BOX 30657
LANSING MI 48909-8157

RUB OR [redacted] OLOR DOES NOT FADE DO NOT ACCEPT

46105

Vendor: 744 STATE OF MICHIGAN

Date	Invoice	Description/Detail	Amount
02/15/2022	021522	RESPONSE ACTIVITY REVIEW PANEL PETITION	3,500.00

02/15/22 CITY OF CEDAR SPRINGS • GENERAL FUND Total 3,500.00

fishbeck
Engineers | Architects | Scientists | Constructors

1515 Arboretum Drive, SE
Grand Rapids, Michigan 49546

616.575.3824 | fishbeck.com

Revised Remedial Investigation and Feasibility Study Work Plan

Cedar Springs Former Wastewater Treatment Lagoons Site

730 West Court Street

Cedar Springs, Michigan

Prepared For:

City of Cedar Springs

February 15, 2021

Project No. 201460

Review Draft

List of Figures

List of Appendices

List of Abbreviations/Acronyms

CSM Conceptual Site Model

DRC	Declaration of Restrictive Covenant
EGLE	Michigan Department of Environment, Great Lakes, and Energy (formerly the MDEQ)
MDEQ	Michigan Department of Environmental Quality
PFAS	per-and polyfluoroalkyl substances
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid

1.0 Introduction

This revised Remedial Investigation/Feasibility Study Work Plan (Work Plan) has been prepared by Fishbeck on behalf of the City of Cedar Springs (City) in response to the Michigan Department of Environment, Great Lakes, and Energy (EGLE) letter sent in follow-up to the City's November 16, 2020 response to EGLE's October 2, 2020 Violation Notice No. VN-011095 (Violation Notice). This Work Plan is submitted in accordance with the extended deadline of February 15, 2021 set by EGLE per EGLE's email correspondence dated January 12, 2021. Fishbeck has completed the scope of work outlined in the draft work plan that the City submitted to EGLE on November 16, 2020. Based on the completion of those activities, the results of which are documented below, this Work Plan describes the additional activities that the City plans to perform with respect to the former wastewater lagoon area located at 725, 730, 750, and 755 West Court Street NE, Cedar Springs, Michigan. The location of the former wastewater treatment lagoons site (Site) is shown on Figure 1.This Work Plan is submitted in draft form for EGLE review and approval.

1.1 Background

In January 2020, in response to EGLE's request, the City collected groundwater samples from select monitoring wells located in the former wastewater lagoon area for analysis of Per- and Polyfluoroalkyl Substances (PFAS). The results of the January 2020 groundwater sampling event identified certain PFAS compounds in four monitoring wells. All PFAS detected were in concentrations below applicable drinking water cleanup criteria contained in the administrative rules of Part 201, effective in January 2020. On August 2, 2020, EGLE promulgated new Part 201 drinking water cleanup criteria for two PFAS compounds (PFOA and PFOS). On December 21, 2020 EGLE promulgated new Part 201 drinking water criteria for five (5) additional PFAS compounds (PFNA, PFHxA, PFHxS, PFBS, and Gen X). The Violation Notice references PFOA concentrations in the referenced four monitoring wells in concentrations slightly exceeding the August 2, 2020 cleanup criterion for PFOA.

1.2 Former Wastewater Lagoon History

The City's wastewater treatment lagoon system was constructed in 1965, expanded in the 1970's, and removed from service in 1999. The system consisted of three lagoons (two oxidation lagoons with clay-lined bottoms and one infiltration lagoon) and a standby infiltration area (shown on Figure 2). The wastewater lagoons were closed in place in 2002. Closure of the lagoon system consisted of several steps, including lime stabilization of biosolids associated with the operation of the lagoon system, removal of the lagoon infrastructure (piping and control structures), and construction of a cap above the biosolids. The cap consisted of sand and clay that was removed from the earthen berms surrounding the lagoons and placed above the biosolids, additional clean sand and gravel was added to bring the closed lagoons up to grade. A minimum of 1 foot of cover was placed over the stabilized biosolids remaining on the bottom of the former lagoons. The closure of the lagoons was performed pursuant to a Designation of Inertness issued by EGLE in January 2002 and a Declaration of Restrictive Covenant (DRC) approved by EGLE that the City executed and recorded against the lagoon property.

1.3 Review of Existing Geological and Hydrogeological Information

Multiple investigations have been conducted at or near the Site since 1979. Pursuant to the November 16, 2020 draft work plan, Fishbeck reviewed historical investigation reports for information regarding the geological and hydrogeological conditions near the Site. The investigation reports reviewed included:

- Report on Groundwater Investigation Wastewater Treatment Facility Cedar Springs, Michigan Stoll, Evans & Associates (for Progressive Engineering Consultants, August 1979
- Report of Hydrogeological Investigation Land Disposal of Wastewater Section 36, Nelson Township, Kent County, City of Cedar Springs, Michigan Hunter/Keck, August 1989

- Screening Site Inspection Report for Cedar Springs WWTP Cedar Springs, Michigan Ecology and Environment, Inc., June 1990
- A Study of Water Quality and Aquatic Habitat, Cedar Creek Watershed, Kent County Michigan, Grand Valley State University, March 1995
- Closure Plan for City of Cedar Springs Former Wastewater Treatment Lagoons, FTC&H, June 2000
- Part 201 Remedial Action Plan for former Cedar Springs Wastewater Treatment Lagoons, Cedar Springs, Michigan, FTC&H, December 2001
- City of Cedar Springs Former Wastewater Treatment Lagoon Closure Status Reports, FTC&H, 2005 - 2020

1.4 Surface Water Features

The nearest major surface water features include Cedar Creek, located approximately 800 feet west of the Site, and Little Cedar Creek, located approximately 5000 feet south of the Site. Other surface water features include an onsite stormwater retention basin and a small lake located approximately 1000 feet northwest of the Site (approximately 200 feet west of Cedar Creek). An unnamed drain is also located on the south and west sides of the Site.

1.5 Geology and Hydrostratigraphy

Pursuant to the November 16, 2020 draft work plan, Fishbeck generated six cross-sections (A-A' through F-F') using soil boring and residential well log information to aid in the visualization and understanding of the near surface geology at the Site. The geological cross-sections also show the well screen intervals. The cross-section locations are illustrated on Figure 3; the cross sections are presented in Figures 4 through 9. Based on these cross-sections, three (3) hydrostratigraphic units have been identified beneath the Site. Laterally continuous sand deposits form an upper unconfined aquifer across the Site. The unconfined aquifer is approximately 20 feet thick. The upper unconfined aquifer is underlain by a 40 to 70 thick clay unit beneath the Site. Based on the cross-sections, the clay unit may be thinner north and east of the Site. This underlying clay unit acts as an aquitard/confining layer to a confined aquifer located at approximately 100 feet bgs and extends to a depth of at least 120 feet bgs. The confined aquifer appears to be hydraulicly separated from the upper unconfined aquifer due to the overlying clay aquitard.

1.6 Groundwater Flow

Site-wide groundwater flow conditions are determined from static water elevations measured at onsite monitoring wells during annual closure monitoring conducted at the Site. Groundwater elevation contours based on October 15, 2019 measurements are shown on Figure 2. Groundwater elevations determined from the annual closure monitoring indicate that groundwater flow direction in the uppermost aquifer at the Site is toward the west (toward Cedar Creek). The groundwater surface at the Site is located approximately 10 feet bgs. The potentiometric surface and groundwater flow direction from the lower confined aquifer is not known.

1.7 Current PFAS Sampling Results

Groundwater samples were collected in 2020 by EGLE from various onsite monitoring wells and certain residential wells located near the Site and analyzed for PFAS compounds. PFOA was detected at concentrations exceeding Part 201 Generic Residential Drinking Water Criteria (GRDWC – 8 ng/L) at onsite monitoring wells MW-3A, MW-4A, MW-5A, MW-7a and at a shallow residential well located at 13466 White Creek Avenue, located west of the Site. All other wells sampled by EGLE in 2020 either contained PFAS compounds in concentrations less than Part 201 GRDWC, or PFAS was not detected. Except for one residential well located at 13470 White Creek Avenue which is installed in the deep aquifer, all wells sampled by EGLE in 2020 were installed within the shallow unconfined aquifer. The locations of wells sampled by EGLE in 2020 are shown on Figure 10. Based on the PFAS results, the extent of PFAS exceeding GRDWC in the shallow unconfined aquifer south of the Site has been determined. The extent of PFAS exceeding GRDWC in the shallow unconfined aquifer west (downgradient) of the Site has not been determined; however, it is likely that Cedar Creek acts as a converging groundwater discharge boundary and prevents groundwater in the shallow unconfined aquifer from flowing west of Cedar Creek.

1.8 Other Potential Sources of PFAS Contamination

As part of its pursuit of historical information in the vicinity of the Site, Fishbeck identified, an active Leaking Underground Storage Tank (LUST) site approximately 1000 feet east (upgradient) of the City's former lagoon Site. The LUST site is the location of the former Robinson Bulk Terminal and, according to public records that Fishbeck obtained, the facility managed both ASTs and USTs containing petroleum products. This site became an Act 307 site in the late 1980's when contaminated soil and groundwater were discovered. The responsible party with Act 307 liability is now bankrupt, and EGLE has completed some remediation activities at the site. Given the nature of the historical use, it is likely that the former bulk fuel storage facility utilized some type of fire suppression system. Petroleum bulk storage facilities can be a source of PFAS due to the use of aqueous film forming foams (AFFF) to fight potential petroleum fires. Review of EGLE files of the former facility did not indicate the occurrence of any past fires at the site, the type of fire suppression system used, or if any training using AFFF may have been conducted at the site. The potential contribution of this property to PFAS in the vicinity remains unknown at this time.

1.9 Conceptual Site Model

The former lagoons and existing monitoring wells at the Site are shown on Figure 2. Groundwater elevation contours (October 15, 2019) are also shown on Figure 2. Pursuant to the draft November 16, 2020 work plan, Fishbeck has prepared cross sections showing geological features at the Site shown on Figures 4-9. The cross-sections include information from historical documents that Fishbeck reviewed as part of the scope of the draft November 16, 2020 work plan. Also, pursuant to that work plan, Fishbeck has developed a hydrogeological conceptual site model (CSM) for the Site and surrounding area, with the following findings:

- Three hydrostratigraphic units have been identified beneath Site, two aquifers and one aquitard.
- Based on boring and monitoring well logs from historical investigations and residential well logs in the vicinity of the Site, an unconfined sand aquifer is present beneath the Site. The water table surface is located approximately 10 feet below ground surface (bgs). Groundwater in the upper aquifer near the site flows in a westerly direction. The upper unconfined aquifer extends to a depth of approximately 30 feet bgs.
- A clay aquitard is located beneath the upper unconfined aquifer. The clay aquitard is approximately 40 to 70 feet thick beneath the Site.
- A lower sand aquifer is located beneath the clay aquitard. Based on historical investigation boring logs and residential well logs in the vicinity of the Site, the lower aquifer is encountered at a depth of approximately 100 feet and extends to a depth of at least 120 feet bgs. The potentiometric surface and groundwater flow direction in the lower aquifer are unknown.
- Based on the PFAS results from the EGLE 2020 sampling of residential wells, the extent of PFAS exceeding GRDWC in the shallow unconfined aquifer south of the Site has been determined.
- The extent of PFAS exceeding GRDWC in the shallow unconfined aquifer west (downgradient) of the Site has not been determined.
- Potential impact by PFAs in the lower confined aquifer has not been determined.
- A potential upgradient source of PFAS (former Robinson Bulk Terminal) has been identified but has not yet been evaluated for the presence of PFAS.

2.0 Remedial investigation and Feasibility Study Work Plan

Based on the information that Fishbeck has generated as described above, Fishbeck proposes the following work as the next step with respect to investigating the presence of PFAS associated with the Site. The investigation methodologies and procedures to be followed during implementation of the tasks included in this Work Plan are described below.

2.1 Field Procedures

Field procedures that will be followed during completion of the work are described in Fishbeck's Standard Operating Procedures (SOPs) included in Appendix 1.

Where soil borings are advanced for geologic logging, the soils collected at each depth interval will be visually examined to describe and classify the geology encountered. Sample descriptions and classifications will be documented on boring logs in accordance with SOP 04-03, which is an adaptation of the Unified Soil Classification System (USCS).

Groundwater elevation measurements will be collected from onsite monitoring wells prior to sampling activities using a decontaminated, electronic water level indicator meter, and recorded to the nearest 0.01 foot from the marked survey point on the top of the well casing (SOP 18-04).

Groundwater sampling described below will be conducted in accordance with low-flow sampling procedures (e.g., SOPs 10-01 and 10-02) using a peristaltic pump or submersible bladder pump, as appropriate, based upon the depth to groundwater. All materials used for groundwater sampling will be Teflon and PFAS free. The pump will be used to purge each well at a rate of less than 500 milliliters per minute (mL/min). The purge water will be conveyed via a flow-through cell in which field parameters will be continuously monitored, including pH, specific conductance, Eh, and temperature. Turbidity will also be monitored (SOP 11-08).

2.2 Monitoring Well Installation

One new monitoring well will be installed at the upgradient location shown on Figure 10 to evaluate a potential upgradient PFAS source. Based on evaluation of existing information, the estimated base of the uppermost aquifer at this location is approximately 45 feet bgs and the depth to the groundwater surface is approximately 10 feet bgs. A well will be installed with a 5-foot long screen at the base of the uppermost aquifer.

The monitoring well will be installed using hollow-stem auger drilling techniques. Soil samples will be collected for geological description every 5 feet, or at a noticeable drilling rate change, with split barrel samplers. The samples will be described by a geologist from Fishbeck and a log prepared. The proposed monitoring well will be installed to the desired depth through the hollow stem augers. The monitoring well will be constructed using 2-inch diameter, PVC casing with a 5-foot long, 0.010-inch slot, PVC screen. An appropriately sized sand filter pack will be placed in the annulus surrounding the screen, from the base of the screen to approximately 1 to 2 feet above the top of the screen. A bentonite slurry will be placed into the remaining annulus of the deep wells by tremie grouting from the top of the sand pack to ground surface. The well will be equipped with an aboveground or flush mount locking protective casing and a vented cap. The monitoring well will be developed using pumping/surging techniques. Development will continue until the discharge water is visibly clear of fines and a minimum of ten volumes is removed. Investigation derived wastes will be place on the ground adjacent to the work area.

2.3 Groundwater Flow Mapping

Following installation of the additional monitoring well, a survey to establish the top-of-casing elevation of the new well will be completed. Static water levels will be collected from all existing onsite wells and the newly installed upgradient offsite well, using an electric tape and recorded to the nearest 0.01 foot. The static water level data will be converted to groundwater elevation data and used to generate a groundwater contour map to confirm groundwater flow direction and hydraulic gradient.

2.4 Groundwater Sampling

Groundwater samples will be collected from the newly installed monitoring well and downgradient existing monitoring wells MW-6A, GSI-1D, and GSI-2D (shown on Figure 10). Logs for these monitoring wells are included in Appendix 2. The new monitoring well will not be sampled for a minimum of five days following development. Groundwater samples will be collected with a peristaltic or bladder pump using low-flow/minimal drawdown methods in accordance with Fishbeck SOPs included in Appendix 1. All materials used for groundwater sampling will be Teflon and PFAS free. Field duplicates will be collected at a rate of 1 per 10 investigative samples. One field blank will be collected.

Dissolved oxygen, pH, Eh, specific conductivity, and temperature will be measured in the field using a calibrated flow-through cell. Sample turbidity will also be field monitored. These parameters will be used to verify stabilization of the purged groundwater in accordance with low-flow/minimal drawdown sampling procedures.

2.5 IDW Management

Investigation derived waste (IDW) generated from work activities will include soil cuttings from drilling, decontamination water, well development water, and purge water. Soil cuttings, decontamination water, and development water will be placed on the ground adjacent to the new well. Purge water will be placed on the ground adjacent to the well that it was purged.

2.6 Residential Well Sampling

Nine residential drinking water wells located west/southwest of the Site (see locations on Figure 10) will be sampled. These residential wells are all screened in the lower aquifer. The well logs for these residential wells are included in Appendix 2. These locations will determine if the lower aquifer west and south of the Site has been impacted by PFAS found in the upper aquifer. Samples will be collected from an outdoor spigot. One duplicate sample and one field blank sample will be collected for quality assurance/quality control (QA/QC) purposes.

To obtain permission to sample the proposed residential wells, request for sampling access letters will be sent for each location. EGLE will be copied on the requests for access. Access will be requested first using written US Mail requests, followed-up by door-to-door requests for residences that do not reply to the mailed request.

2.7 Laboratory Analysis

Monitoring well groundwater samples will be submitted for laboratory analysis of PFAS (28 compound list) using USEPA Method 537M. Residential well drinking water samples will be submitted for laboratory analysis of PFAS using USEPA Method 537 REV 1.1 for analysis of drinking water for 18 PFAS compounds.

2.8 Feasibility Study

The purpose of the feasibility study is to evaluate alternatives for remedial action and describe the rationale for the selected alternative. Following remedial investigation activities and determination of extent of groundwater impacted above applicable cleanup criteria, remedial alternatives will be evaluated. Remedial alternatives considered potentially applicable for the elimination of onsite and offsite exposure risk of PFAS in groundwater at the Cedar Springs Former Wastewater Lagoon Site will be identified. After consideration of all remedial alternatives, a remedial action alternative will be selected. The selected remedial alternative will be the most practical and cost-effective means to prevent unacceptable exposure to impacted groundwater, if present.

2.9 Report Preparation

A remedial investigation and feasibility study report will be prepared following completion of all field tasks and receipt of analytical data. The report will include a summary of field tasks completed, a groundwater flow map, descriptive well log for the proposed new well, an analytical summary table, copies of the laboratory data reports, and a feasibility study. Subject to the limitations referenced below, the report will be submitted to EGLE within 90 days following receipt of analytical data. The report will document those properties where access permission was not received, if any.

2.10 Schedule

It is anticipated that field activities will begin within 60 days following EGLE approval of the Work Plan, assuming with respect to the residential properties that weather conditions are such that outdoor sampling locations are available and subject to exclusion of samples from those residential properties where access permission has not been received, if any.

Figures

PLOT INFO: Z:\2020\201460\CAD\GIS\mapdoc\LocationMap.mxd Date: 2/5/2021 2:46:58 PM User: bahannah

PROJECT NO. 201460

FIGURE NO. 1

City of Cedar Springs

Kent County, Michigan

Remedial Investigation/Feasibility Study Work Plan

Hard copy is intended to be 8.5"x11" when plotted. Scale(s) indicated and graphic quality may not be accurate for any other size.

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City of Cedar Springs
Cedar Springs, Kent County, Michigan

Remedial Investigation/Feasibility Study Work Plan

PROJECT NO.
201460

FIGURE NO.
2


LEGEND
Monitoring Well
Residential Wells
Cross Section
KOW-1
KOW-2
KOW-3
KOW-4
KOW-5
KOW-6
KOW-7
KOW-8
B-1
B-2
B-3
B-4
B-5
B-11
KB-2
KT-4
MW-5A
MW-6A
MW-7A
CROSS SECTION LOCATION MAP
NORTH
0
500
1,000
FEET
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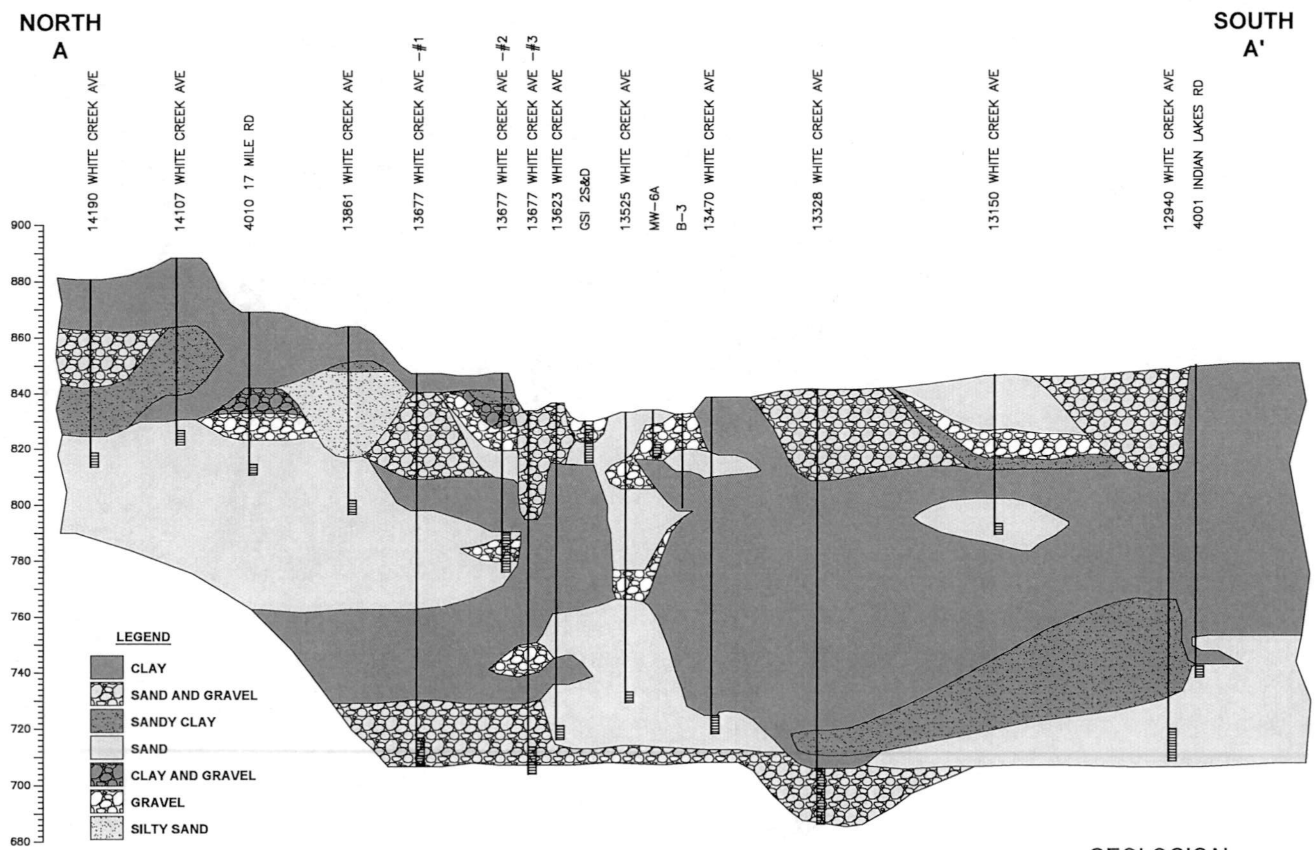
City of Cedar Springs
Cedar Springs, Kent County, Michigan
Remedial Investigation/Feasibility Study Work Plan
PROJECT NO.
201460
FIGURE NO.
3



GEOLOGICAL CROSS-SECTION A-A'

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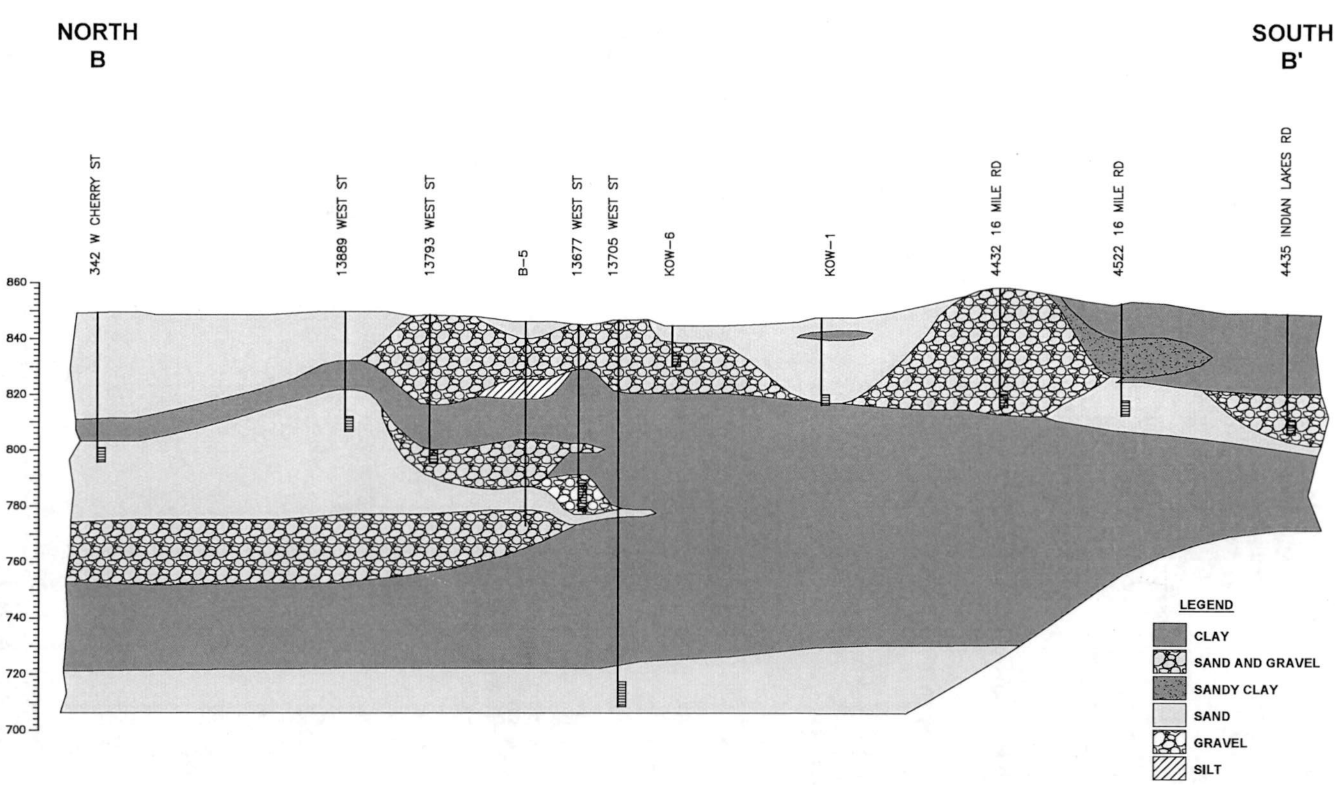
City of Cedar Springs
Kent County, Michigan

Remedial Investigation/Feasibility Study Work Plan

PROJECT NO. 201460

FIGURE NO. 4



GEOLOGICAL
CROSS-SECTION B-B'

City of Cedar Springs
Kent County, Michigan

Remedial Investigation/Feasibility Study Work Plan

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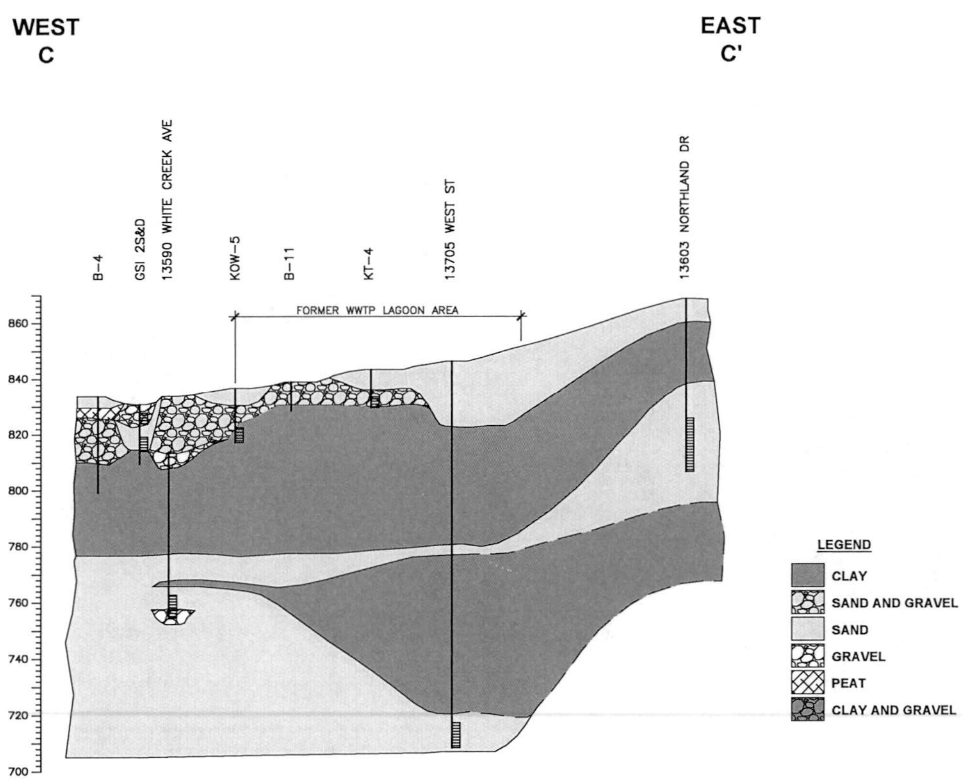
PROJECT NO.
201460

FIGURE NO.
5



GEOLOGICAL
CROSS-SECTION C-C'

City of Cedar Springs
Kent County, Michigan

Remedial Investigation/Feasibility Study Work Plan

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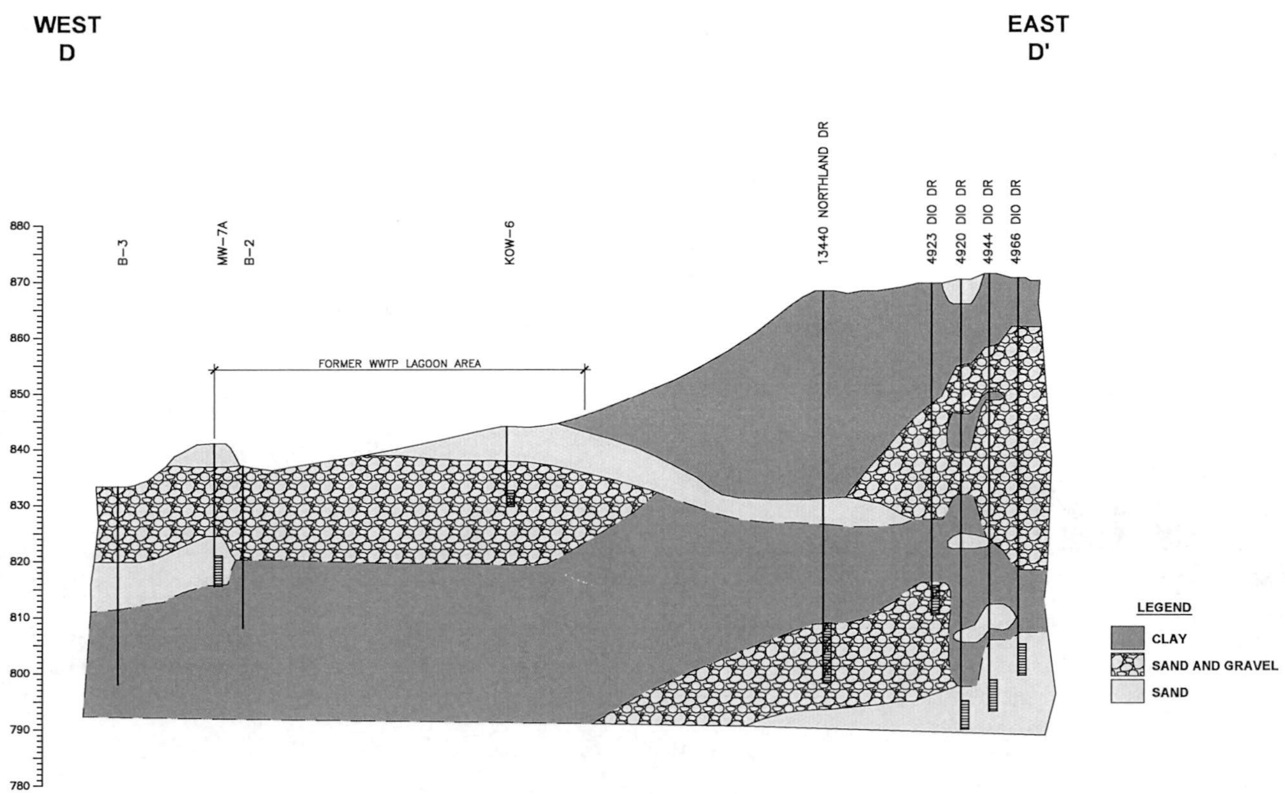
PROJECT NO. 201460

FIGURE NO. 6



GEOLOGICAL CROSS-SECTION D-D'

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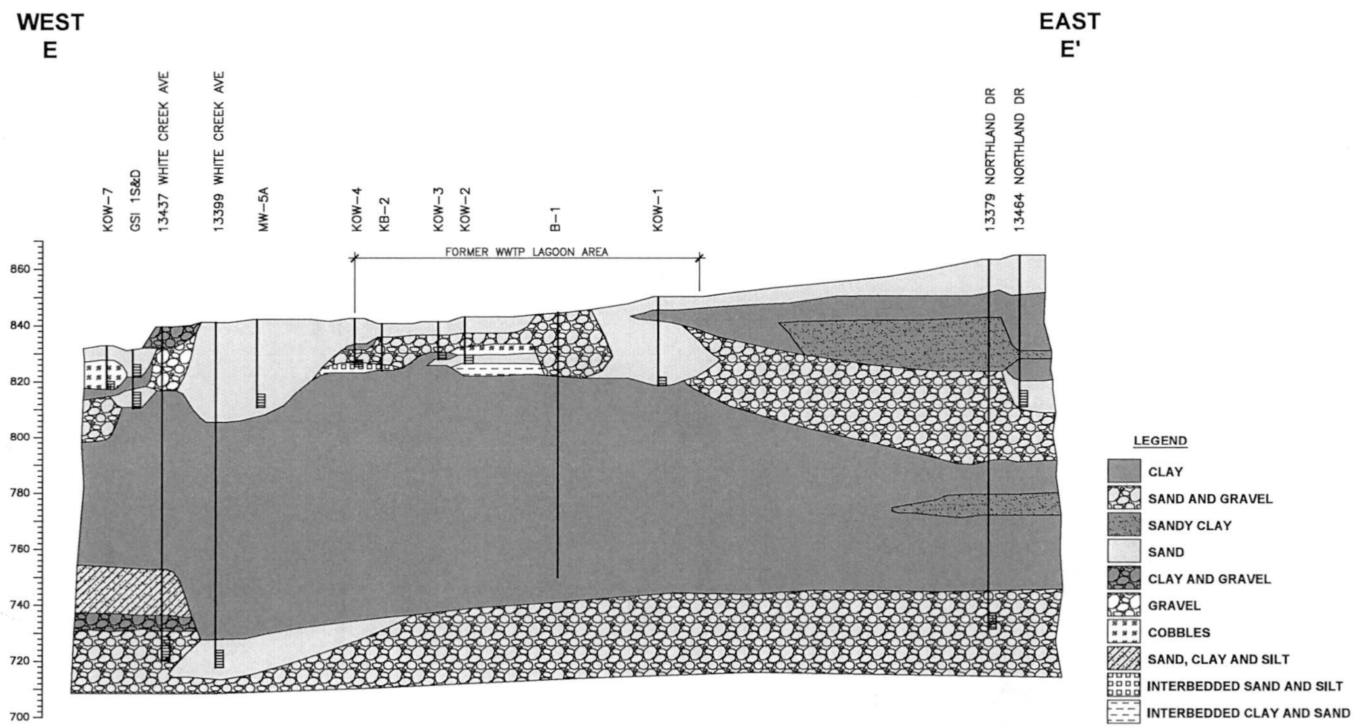
City of Cedar Springs
Kent County, Michigan

Remedial Investigation/Feasibility Study Work Plan

PROJECT NO. 201460

FIGURE NO. 7



GEOLOGICAL CROSS-SECTION E-E'

City of Cedar Springs
Kent County, Michigan

Remedial Investigation/Feasibility Study Work Plan

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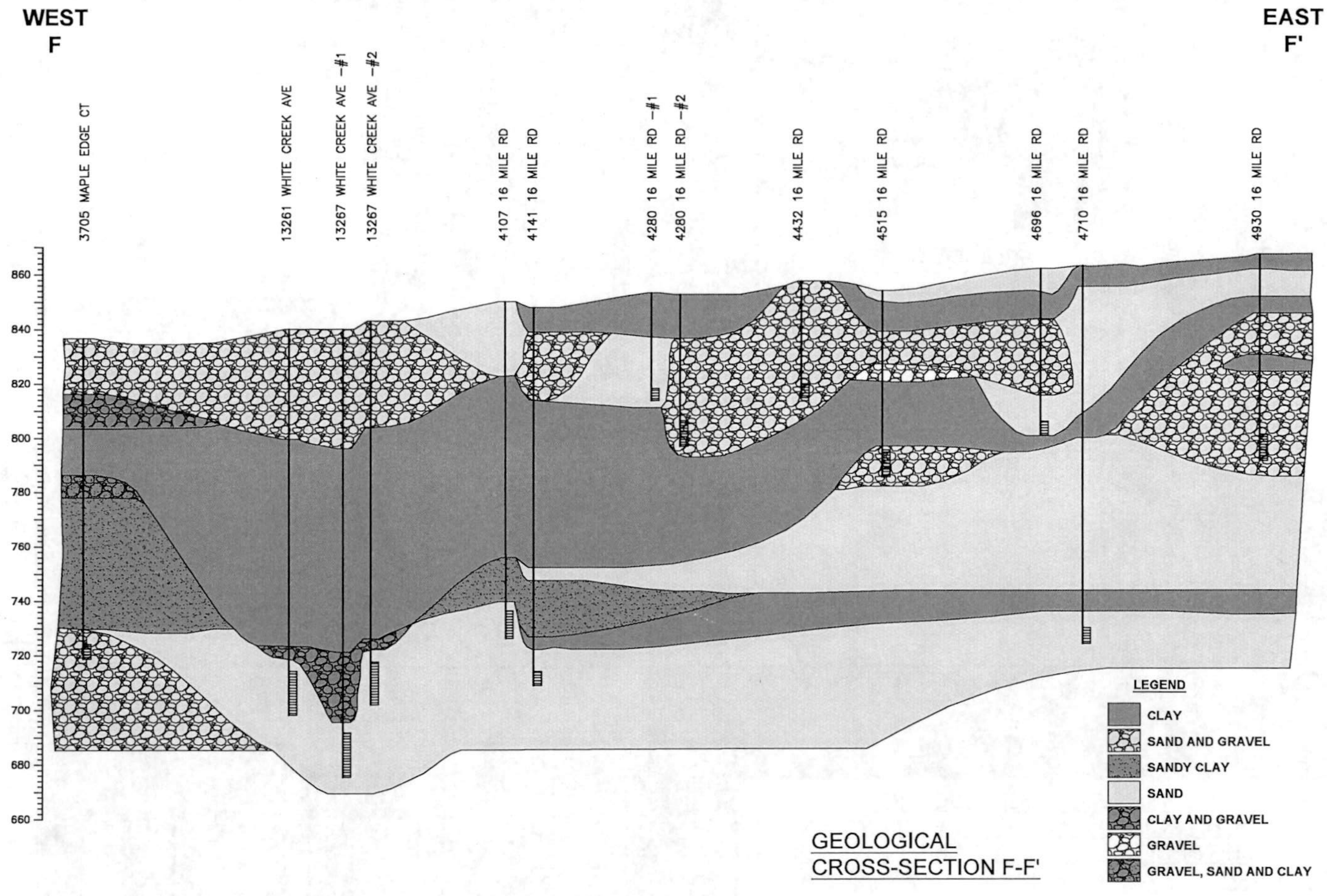
Hard copy is intended to be 11"x17" when plotted. Scale(s) indicated and graphic quality may not be accurate for any other size.

PROJECT NO. 201460

FIGURE NO. 8



GEOLOGICAL CROSS-SECTION F-F'

PLOT INFO: Z:\2020\201460\CAD\CD\Z001201460.DWG LAYOUT: CROSS SECTION F-F' DATE: 2/5/2021 TIME: 4:28:43 PM USER: RSECORD

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City of Cedar Springs
Kent County, Michigan

Remedial Investigation/Feasibility Study Work Plan

PROJECT NO. 201460

FIGURE NO. 9

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City of Cedar Springs
Cedar Springs, Kent County, Michigan

Remedial Investigation/Feasibility Study Work Plan

PROJECT NO. 201460

FIGURE NO. 10

Appendix 1

Appendix 1

Documentation of Field Activities
05/18/1998; revised 08/15/2017

Scope: This SOP provides guidance for proper documentation of all field activities.

Overview:

Field notes should contain an accurate record of all field activities, field equipment calibration, sample collection and handling, and field observations. Sufficient detail should be provided to allow others to know exactly when, where, and under what conditions the work was done.

General Information:

- Language used in field records should be objective, factual, and free of personal feelings or opinions or inappropriate terminology. Speculation or personal observations may be included if they are clearly identified as such.
- Photographs may be taken to provide evidence of visual observations, record site conditions, and assist with locating the sample site in the future.
- Sketches and drawings can be very useful. Rough sketches and diagrams add details and depth.
- All original data and records as well as reduced or manipulated forms of the original data must be kept as part of the field records for a project. For data not directly read from an instrument display and manually recorded, all outputs from automatic data recording devices must be retained and stored in electronic format (native file format and PDF) on the project drive. The records must link the data to the associated sample and the specific instrument used to take the measurement.

Requirements:

1. Documentation of all field activities, including visual observations, must be recorded for each project. Field documentation should include the following information, as applicable:
   a. Weather conditions.
   b. Names of the field sampling team members and any others present during the field event, along with contact information, and a summary of the content and conclusions of relevant meetings, discussions, and conversations with any individuals. The information should include the affiliations of all personnel involved.
   c. Level of personal protective equipment used.
   d. Sample collection equipment used, including the assigned equipment identification number.
   e. Field analytical equipment used, including the assigned equipment identification number.
   f. Equipment used for physical measurements, including the assigned equipment identification number.
   g. Calculations, calibration data, and results for field sampling, analytical, and physical measurement equipment.

   h. Type and number of samples collected along with sample location and unique sample identification number.
   i. Copies of the associated chain-of-custody forms.
   j. Sample handling, packaging, labeling, and shipping information, including destination.
   k. Description of equipment decontamination and investigation-derived waste disposal procedures.

2. Any deviations from the work plan or changes in sampling procedures should be documented. Problems, delays, or any unusual occurrences (e.g., equipment failure or malfunction) should be included, along with resolutions and recommendations.
3. All field records must be legible and should be made in waterproof, indelible ink – do **NOT** use pencil.
4. If errors are made, corrections must be made by crossing a single line through the error and entering the correct information. Do not erase or scratch out errors. All corrections should be initialed and dated. If possible, the correction should be made by the individual making the error.
5. Entries should be in chronological order – a time notation (in military time) should introduce each entry. At the end of each day's activity (or entry of a particular event, if appropriate), a diagonal line should be drawn at the conclusion of the entry and initialed.
6. If photographs are taken during field activities, a photo log must be created and included in the field documentation. All photographs must be identified with an accurate description of what the photograph shows; date, time and location that the photograph was taken; and the orientation (compass direction) of the photograph (e.g., looking southwest).
7. If information is entered onto sample tags, field forms, or sample containers utilizing stick-on labels, the labels should not be able to be removed without leaving obvious indications of the attempt. Do not place labels over previously recorded information. Any corrections to these labels should be made in accordance with Requirement 4 above.
8. The field notebook should be kept in a secure place during the field activities (e.g., in hand, in sight, locked in field vehicle).
9. Upon completion of the activity, the field notebook should be checked for completeness, signed and dated by appropriate field personnel, and submitted to the Environmental Division Quality Assurance Manager (or designee) for review (see SOP 20-01).

Chain-of-Custody

05/18/1998; revised 08/30/2017

Scope: This SOP describes the procedures and documentation required to trace possession and handling of samples from time of collection through receipt by the laboratory.

Equipment: Sample labels
Custody seals
Chain-of-Custody (COC) form – available as an electronic or 3-page carbonless form
Pen with waterproof, indelible ink

Definition: A sample is considered to be in custody if:

1. It is in one's actual possession.
2. It is in one's view after being in one's possession.
3. It was in one's possession and then secured to prevent tampering.
4. It is placed in a designated secure area.

Procedure:

1. The field team leader or designee is responsible for proper handling and custody of field samples until they are formally transferred to another person or facility.
    - As few people as possible should handle the samples during the field event.
    - Samples should be delivered to the laboratory as soon as possible after collection.
2. Sample labels (Figure 1) must be completed in waterproof, indelible ink and securely affixed to each sample container at the time of collection. All sample collection must be documented in the field notebook.
3. Samples should be securely wrapped in bubble packing or other suitable packaging material and placed in an insulated shipping container. Samples should be packed in such a way as to minimize the chance for breakage. Ice should be placed on top of the samples to maintain a temperature of 2°–6°C during transport.
4. Following sample collection, a COC form must be completed (Figure 2). The COC form must accompany the samples to the laboratory. If more than one sample shipping container is used, a separate COC form must be completed for each shipping container.
5. The COC form must be completed in waterproof, indelible ink. If errors are made, corrections should be made by crossing a single line through the error and entering the correct information. All corrections should be initialed and dated.
6. The COC form should include the following information:
    a. Project name, number, and location.
    b. Sampler(s) name(s).
    c. Name of project manager along with telephone number and email address.
    d. Sample date, time, identification, and matrix type.
    e. Total number of containers for each sample and type of preservative added.
    f. Analytical testing requirements (analytical parameters).
7. Transfer of the samples listed on the COC form must be documented in the spaces provided at the bottom of the form. One of the samplers listed under the sampler(s) section, or a designated field sample custodian who receives secured samples from the sampling team and maintains the samples under secure conditions, must be the person that originally relinquishes the samples. Both the person relinquishing the samples and

the person receiving them must sign the form. Typically, the last person receiving the samples should be the laboratory sample custodian. Examples of COC forms with documentation for the three basic routes by which samples are transported to the laboratory are provided as follows:

a. Hand delivered by a member of the FTCH sampling team (Figure 3A).

b. Samples are placed in the secured sample area at the FTCH offices, and the field sample custodian arranges for delivery to the laboratory (Figure 3B).

c. Samples are shipped via common carrier to the laboratory. In this case, the method of shipment and associated bill of lading number must be recorded in the appropriate space on the COC form (Figure 3C).

8. If using the 3-page carbonless form, the three copies should be distributed as follows:

   a. **Pink Copy** – Removed by FTCH sampling personnel once sample transfer has been documented. Retained for the project field notes.

   b. **Yellow Copy** – Retained by analytical laboratory.

   c. **White Copy** – Accompanies final data package from laboratory. Retained with data in project file.

9. If using the electronic COC form (single page form), scan or obtain a photocopy of the completed form for the project field notes. The original is included with the samples for the laboratory.

10. The completed COC form should be placed in a re-sealable plastic bag and placed inside the sample shipment container.

11. Custody seals (Figure 4) should be used to seal sample shipping containers that are ready to be transported by means other than the FTCH sampling team.

    a. Custody seals must be completed in waterproof, indelible ink.

    b. Custody seals should include the date sealed and the signature of the person relinquishing the samples.

    c. Custody seals should be placed on the shipping container so that it cannot be opened without breaking the seals. If shipping by common carrier (e.g., UPS, FedEx), the shipping container should also be securely taped shut.

Figure 1 – Sample Label

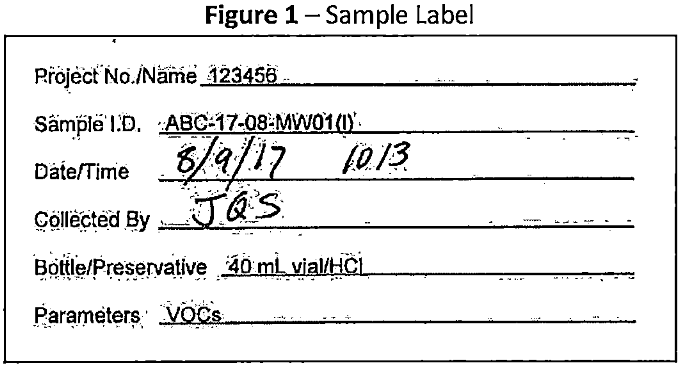
Project No./Name 123456
Sample I.D. ABC-17-08-MW01(I)
Date/Time 8/9/17 10:13
Collected By JQS
Bottle/Preservative 40 mL vial/HCl
Parameters VOCs

Figure 2 – Chain-of-Custody Form

CHAIN OF CUSTODY RECORD

Fishbeck, Thompson, Carr & Huber, Inc.
Address: 1515 Arboretum Drive, S.E.
Grand Rapids, Michigan 49546
Phone: 616.575.3824

Report to: M. Crosby-Davies
Email: mcdavies@ftch.com
Copy to:
Email:

Invoice to: M. Crosby-Davies
Email: mcdavies@ftch.com
Lab Quote
Reference:

PROJECT NAME: ABC Corporation Remediation	PROJECT NO.: 123456
PROJECT LOCATION: Anyville, MI	SAMPLER(S) NAME: JQS
PROJECT MANAGER: Bob Manager	PHONE: 616.464.1234
	EMAIL: rqmanager@ftch.com
ADDITIONAL INFORMATION	

PAGE 1 OF 1

STD TAT ■
RUSH TAT ☐
DATE DUE:

Sample Date	Sample Time	Sample Identification	Aqueous (Water)	Solid/Semi-Solid	Air	Nonaqueous Liquid	VOCs (HCl)	Total Metals* (HNO3)	Remarks
8/9/17	1013	ABC-17-08-MW01(I)	X				2	1	*As, Bd, Cd, Cr, Cu, Pb, Hg, Ni, Se, Ag, Zn
8/9/17	1147	ABC-17-08-MW04(I)	X				2	1	
8/9/17	—	ABC-17-08-TB01	X				1		

(Required Analyses / Preservative / Number of Containers Submitted)

Relinquished By	Date	Time	Relinquished By	Date	Time	Relinquished By	Date	Time	Method of Shipment/Bill of Lading
John Q. Sampler	8/9/17	1620	—			—			FTCH Delivered
Received By	**Date**	**Time**	**Received By**	**Date**	**Time**	**Received By**	**Date**	**Time**	**Received for Lab / Date / Time**
—			—			—			Jane Technician 8/9/17 1620

C:\USERS\...\DESKTOP\COC_FTCH_SAMPLE.DOCX

Figure 3A – Hand-delivery by member of sampling team

Relinquished By	Date	Time	Relinquished By	Date	Time	Relinquished By	Date	Time	Method of Shipment/Bill of Lading
Alex Forge	8/9/17	1620	—			—			FTCH Delivered
Received By	**Date**	**Time**	**Received By**	**Date**	**Time**	**Received By**	**Date**	**Time**	**Received for Lab / Date / Time**
—			—			—			John Smith 8/9/17 1620

WHITE Copy — Return with data package. YELLOW Copy — Forward to laboratory. PINK Copy — Field File / Project Documentation.

G 041416

Figure 3B – Samples placed in temporary locked storage prior to delivery to laboratory

RELINQUISHED BY	DATE	TIME	RELINQUISHED BY	DATE	TIME	RELINQUISHED BY	DATE	TIME	METHOD OF SHIPMENT/BILL OF LADING		
To storage John Q Sampler	8/9/17	15:00	John Q Sampler	8/10/17	1400						
RECEIVED BY	**DATE**	**TIME**	**RECEIVED BY**	**DATE**	**TIME**	**RECEIVED BY**	**DATE**	**TIME**	**RECEIVED FOR LAB**	**DATE**	**TIME**
from storage John Q Sampler	8/10/17	1000							John Technician	8/10/17	1400

C:\USERS\...\DESKTOP\COC_FTCH_SAMPLE.DOCX

Figure 3C – Samples shipped via common carrier to laboratory

RELINQUISHED BY	DATE	TIME	RELINQUISHED BY	DATE	TIME	RELINQUISHED BY	DATE	TIME	METHOD OF SHIPMENT/BILL OF LADING		
John Q Sampler	8/9/17	1620							FedEx 1234 56 7890 custody sealed		
RECEIVED BY	**DATE**	**TIME**	**RECEIVED BY**	**DATE**	**TIME**	**RECEIVED BY**	**DATE**	**TIME**	**RECEIVED FOR LAB**	**DATE**	**TIME**

C:\USERS\...\DESKTOP\COC_FTCH_SAMPLE.DOCX

Figure 4 – Custody Seal

CUSTODY SEAL
DATE ______________________
SIGNATURE ______________________

QEC
Quality Environmental Containers
800-255-3950 • 304-255-3900

ENVIRONMENTAL DIVISION
STANDARD OPERATING PROCEDURE — SOP 04-03

Soil Samples Description
07/14/1996; revised 02/16/2000

Scope: The following SOP presents soil description guidelines for logging soil samples collected during field activities. The guidance provided in this SOP is an adaptation of the USCS classification system and the ASTM (Visual-Manual) classification system, *ASTM Standard Method D 2488-93.*

Equipment: Geotechnical Gauge, manuf. By W.F. McCollough, Beltsville, MD

Procedure:

1. Record the following general information where applicable:
   a. Project name and number
   b. Site location
   c. Contractor
   d. Rig type
   e. Borehole purpose
   f. Total depth drilled
   g. Borehole diameter
   h. Drilling method
   i. Abandonment method
   j. Screening instrument
   k. Boring/well number
   l. Start date and time
   m. End date and time
   n. Ground elevation

2. Soil classifications should be documented in the field by the geologist at the time of sampling and should include the following:
   a. Formation breaks and depths.
      If depths are estimated, note on form. Typically, depths/heights should be recorded in feet or fractions thereof (tenths or hundredths). Use of metric measurements may be required for certain projects. Refer to the project work plan.
   b. Length of sampled interval and percentage of sample recovery for each driven (split spoon), thin wall (Shelby), or cored sample.
      Include the sampler type and size (diameter and length). Blow counts should be recorded for driven samplers; ease of penetration for push samplers.
   c. If bedrock is encountered, describe the lithology, mineralogy, degree of weathering and fracturing, and color of the rock. In addition, identify the formation, if known (e.g., Saginaw Formation, Parma Sandstone).
   d. Grain Size.
      Use the grain size gauge on the Geotechnical Gauge to determine grain size classification of sample.
   e. Percentage Composition.
      Refer to comparison chart on the Geotechnical Gauge to determine relative percentages of the different grain size classifications in sample.
   f. Roundness.
      Four categories are considered adequate: angular, sub-angular, sub-rounded or rounded. Refer to the comparison chart on the Geotechnical Gauge for classification.

g. Sorting
Three categories are considered adequate:

Well sorted	90% in 1 or 2 size classes
Moderately sorted	90% in 3 or 4 size classes
Poorly sorted	90% in 5 or more size classes

h. Density.
The density of the soil is based on the ease of penetration. In the case of a driven sampler, the blow counts are used to estimate the soil density.

Very loose	<5 blows per foot
Medium dense	11 to 30 blows per foot
Dense	31 to 50 blows per foot
Very dense	>51 blows per foot

i. Color.
For most projects, a qualitative description of color is all that is required. To maintain consistency in color designations, the standard colors shown on the Geotechnical Gauge should be used.

j. Water/Fluid Content.
The fluid content of a soil should be described and should include a description of the fluid (e.g., water, water with oily sheen, gasoline).

Dry	No wetness on hand when held
Moist	Slight wetness on hand when held
Saturated	Sample drips water or fluid

k. Other Constituents.
Soil samples may contain material other than clay, silt, sand or gravel. Organic matter or debris such as concrete, buried waste or other non-native material may be present. This material should be described in as much detail as possible.

l. Field Screening.
Any odor, staining, and/or PID measurements should be included in the sample description.

Soil Description Guidelines

1. The principal component of the sample should be described first, followed by other components in decreasing order of importance. For the first component, list the particle size (e.g., sand) in capital letters, and percentage rounded to the nearest 5%. This is followed by a modifier denoting grain size, a description of the color, and angularity/roundness. After a description of the principal component of the sample is completed, a description of the second most important constituent is given in a similar manner.
2. After all constituents have been described, the properties describing the sample as a whole are given. These include: sorting, moisture content, odor, staining, unusual color or sheen. Other possible descriptive properties may be sample density, bedding, cementation, mottles, oxidation, voids, plasticity, cohesiveness, other items (roots) and structure.

3. Examples of acceptable soil descriptions are given below:

   Example: SAND: coarse grained (15%), medium grained (80%), red, well sorted, sub-angular, very loose; Traces of gray, silty clay (5%). Moist, hydrocarbon odor, oil sheen.

   Example: CLAYEY SILT: Silt (50%); Clay (25%); Gravel (20%), medium to fine grained, sub-rounded; Sand (5%), coarse grained, rounded. Reddish-brown, very moist, very dense, slightly cohesive, no odor.

   In instances where fill material is encountered, first note that the material is fill, then describe the individual constituents.

   Example: FILL; Sand, coarse grained (50%), medium grained (20%), fine grained (20%), reddish-brown, sub-rounded, loose, moderately sorted, no cohesiveness, dry, no odor. Broken red bricks at 5'-6.5', approx. 2" in diameter.

4. Note that semicolons are used to separate constituents, and commas are used to separate descriptive elements of each constituent. Where applicable, optional descriptors or modifiers may be added (e.g., fossil contents, density, consistency).
5. Color should be indicated after each constituent, assuming that the colors are different for each constituent. However, when the sediment is best described with one overall color or where all constituents have the same color, then the color shall be indicated before the sorting and not after each constituent.
6. Avoid using nonstandard terms or abbreviations. Refer to ASTM Standard Method D 2488-93 or AGI Data Sheets for standard terms and abbreviations.
7. Certain federal and state environmental agencies or projects may require that descriptions strictly adhere to formal classification systems, such as the Unified Soil Classification System.
8. Classifications may be subject to change based upon laboratory tests and/or subsequent review. Any changes in reports and/or boring logs should be made by the project manager or project geologist.

Scope: Procedures outlined in the SOP are intended to provide general instruction for groundwater sampling activities. Field personnel should consult the project work plan for additional information.

Reference: Minnesota Pollution Control Agency, *Groundwater Sampling Guidance: Development of Sampling Plans, Protocols and Reports*, January 1995.

New Jersey Department of Environmental Protection and Energy, *Field Sampling Procedures Manual*, May 1992.

U.S. Environmental Protection Agency-Region IV, *U.S. EPA Environmental Compliance Branch Standard Operating Procedures and Quality Assurance Manual*, February 1, 1991.

Selection of Sampling Equipment:

Factors to consider in selection of appropriate sampling equipment for a project should be based on technical performance of the equipment. A listing of several sampling devices, in order of preference, and their expected degree of sampling alteration are contained in the following table:

Device	Purging	Sampling	Comments
Bladder Pump	Minimal to slight	Minimal to slight	Acceptable for all analyte groups Maximum depth: 100 ft. plus Minimum well diameter: 1.5 inches Requires portable power source (compressed gas)
Submersible Centrifugal Pump (Grundfos)	Minimal to slight	Minimal to slight	Acceptable for all analyte groups Maximum depth: 200 ft. plus Minimum well diameter: 1.75 inches Portable use may require winch or reel system
Submersible Pump (Whale)	Minimal to slight	Minimal to slight	Acceptable for all analyte groups Maximum depth: Up to 90 ft. Minimum well diameter: 2 inches
Suction Lift Pump (Peristaltic)	Slight to moderate	Moderate	Not suitable for VOC, SVOC, or dissolved gas sample collection Maximum depth: Up to 25 ft. Minimum well diameter: 0.5 inch
Bailer	High to very high	Moderate to high	Can cause substantial alteration of water chemistry; highly dependent on sampler's ability to minimize turbulence and aeration Maximum depth: 200 ft. Minimum well diameter: 0.5 inch

Procedure:

1. Determine the order in which the wells should be sampled. Typically, sampling order should proceed from the cleanest well to the most contaminated. When no historical water quality data are available, sample background wells first followed by the farthest downgradient wells. The wells expected to be most significantly contaminated should be sampled last. Sampling order is not as critical when a peristaltic pump is used, as the pump tubing is replaced after each use.

2. Obtain the following information prior to the sampling event:
   a. Well depth. If not previously measured, determine by subtracting the distance between ground surface and top-of-casing (stick-up) and add this distance to the installation screen depth.
   b. Screen length.
   c. Depth to bottom of screen and depth to top of screen from top-of-casing. Using this information, determine the depth to the midpoint of the well screen.

3. Record the condition of the well in the field notes. Additional information may be required for documentation before, during, and after groundwater sampling. Refer to the project work plan and SOP 10-03 for additional information.

4. Determine static water level using SOP 18-04. Record in the field notebook. Minimize disturbances of the stagnant water column during water level measurement.
   Water levels are measured prior to and possibly during a groundwater sampling event for the following reasons:
   a. To assess whether the static water column length is sufficient to allow purging and sampling to proceed in the normal manner, provided drawdown is moderate.
   b. To select the depth to which the pump intake, bailer, or other purging or sampling device should be lowered.
   c. To monitor the water level during purging and sampling.
   d. To determine groundwater flow directions.
   Unless stated in the work plan, groundwater from monitoring wells containing free product will not be sampled. (Free product refers to a mobile regulated substance that is present as a non-aqueous phase liquid.) If the groundwater must be sampled, use disposable equipment.

5. Rinse reusable sampling equipment with deionized water before inserting the equipment into the monitoring well.

6. Calibrate field measurement equipment as required by the project work plan.

7. Determine the volume of water to be purged prior to sample collection. The USEPA guidelines recommend that a minimum of three well volumes be purged before a representative sample can be collected.

Calculate the volume of water constituting three well volumes, first calculating the linear feet of water in the well (total depth of the well, ft. - depth to water, ft.). Then, calculate the amount of water within the well casing by multiplying the linear feet of water by the volume per foot for the proper diameter casing. The capacity of common casing diameters are as follows:

Casing Diameter	Gallons/Linear Foot
2-inch	0.1632
4-inch	0.6528
6-inch	1.4688
8-inch	2.6112
10-inch	4.0800
12-inch	5.8752

Example:

Total depth of well casing	100 ft.
Depth to water	-20 ft.
Linear feet of water	80 ft.
2-inch casing	x 0.1632
Amount of water in casing (gallons)	13.06

Multiply the volume of water in the casing by three (3) to determine the minimum volume to be purged from the well prior to sample collection. Record data in the field notes.

8. Rinse the sampling equipment with deionized water prior to inserting the equipment into the well. Dispose of all rinse water in accordance with the project work plan.

9. Insert the sampling equipment into the well and begin extracting groundwater. When using a sampling pump, the pump should be lowered into the well and set just below the water surface.
   During purging, lowering of the water level causes cascading of water into the well if the purge rate is greater than the recovery rate of the well. Keep cascading to a minimum by not drawing the water level in the well below the top of the screen. If the water level is already at the top of or within the well screen, select a purging rate that results in minimum drawdown while allowing the well to be purged in a reasonable length of time.
   If the pump begins to pump dry, lower it further into the well. Allow the well to recover to provide sufficient water to completely fill the appropriate sample containers, and collect the sample.

10. Record purging start time in the field notes. A calibrated 5-gallon bucket should be used to monitor the volume of water purged. Dispose of all purge water in accordance with the project work plan.

11. Obtain the necessary field parameter measurements after 1 well volume, 2 well volumes, and 3 well volumes have been purged.

12. Fill required sample containers in accordance with the procedures described in SOP 10-10. Record the type of bottle filled, preservatives added, and the time and date of collection in the field notebook. Samples should be collected in the following order:
    a. Field parameters.
    b. Volatile organics.
    c. Semivolatile organics (includes samples for pesticides, herbicides, and PCBs).
    d. General chemistry parameters.
    e. Metals.

    Refer to the project work plan for sample requirements.

13. Decontaminate the equipment after each use in accordance with procedures described in the equipment-specific SOPs. Dispose of all decontamination water in accordance with the project work plan.

STANDARD OPERATING PROCEDURE SOP 10-02
Low-Flow (Minimal Drawdown) Groundwater Sampling
06/10/1998; Revised 06/12/2006

Scope: This SOP describes a low-flow (minimal drawdown) technique used for groundwater sample collection. Procedures outlined in this SOP are intended to provide general instruction for groundwater sampling activities. Field personnel should consult the project work plan for additional information.

Discussion: Contaminant studies account for interaction between the mobile aqueous and immobile solid phase. The mobile, reactive solid phase (colloidal-size particles) is not accounted for and may be present in sufficient mass, possess high sorption reactivity, and remain stable in suspension; and thus, serve as an important mechanism to facilitate contaminant transport. Collection and processing of groundwater samples is required to determine the significance of collodial-size particles.

Colloidal-size particles (secondary clay minerals; hydrous iron, aluminum, and manganese oxides; dissolved and particulate organic materials; and viruses and bacteria) are reactive particles that have been shown to be mobile and may be required to be included in monitoring programs to identify the total mobile contaminant loading (dissolved + naturally suspended particles) at a site.

Conventional sampling methods (purging 3 to 5 well volumes) can cause an increase in turbidity, thus affecting the sample quality. Filtering to decrease turbidity of the sample may remove contaminant-associated mobile particles, thus artificially biasing contaminant concentrations low.

Purging is performed to remove water in the casing for the following reasons: oxygen concentration gradient between the top of the water column at the air interface to the bottom of the water column; loss of volatile compounds up the water column; leaching from or sorption to the casing or filter pack; chemical changes due to clay seals; or backfill and surface infiltration. Low-flow purging minimizes mixing between the overlying stagnant casing water and water within the screened interval.

Low-flow refers to the velocity of water from the pore water of the formation, through the well screen and into the pump intake. It does **not** necessarily refer to the flow rate of water discharged at the surface. Flow rates of 0.1 to 0.5 L/min (0.026 to 0.13 gpm or 100 to 500 mL/min) are typically used. If the pump intake is located within the screened interval, most of the water pumped will be drawn directly from the formation with little mixing of casing water or disturbance to the sampling zone.

Advantages of low-flow purging include:

- Representative samples (dissolved and colloid-associated).
- Minimal disturbance of the sampling point.
- Less operator variability; greater operator control.
- Less mixing of stagnant casing water with formation water.
- Smaller purging volume decreasing waste disposal costs.
- Increased sample consistency; reduced artificial sample variability.

Equipment: Pump (Bladder, Fultz, or Peristaltic)
Plastic graduated cylinder
Electric water level meter
Flowcell for field parameter measurements
Turbidimeter
Stop watch
Polyethylene bucket, 5-gallon

FID or PID (if appropriate)
Decontamination supplies
Precleaned, pre-preserved sample containers
Sample labels
Field notebook

References: U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, *Ground Water Issue: Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures*, EPA/540/S-95/504, April 1996.

Minnesota Pollution Control Agency, *Groundwater Sampling Guidance: Development of Sampling Plans, Protocols and Reports*, January 1995.

New Jersey Department of Environmental Protection and Energy, *Field Sampling Procedures Manual*, May 1992.

U.S. Environmental Protection Agency-Region IV, *U.S. EPA Environmental Compliance Branch Standard Operating Procedures and Quality Assurance Manual*, February 1, 1991.

Selection of Sampling Equipment

Factors to consider in selection of appropriate sampling equipment for a project should be based on technical performance of the equipment (e.g., how the equipment affects the chemistry of the water sample), and on how well the equipment will perform for the project.

Device	Comments
Bladder pump	Acceptable for all analyte groups Maximum depth to water: 250 ft. plus Minimum well diameter: 2 inches Requires portable power source (compressed gas)
Fultz pump	Submersible positive displacement pump Acceptable for all analyte groups (with exception of hydrogen) Maximum depth to water: 150 – 200 ft.(dependent on pump model) Minimum well diameter: 2 inches Requires portable power source (24 volts direct current power supply)
Peristaltic pump	Suction lift pump May not be acceptable for VOC sample collection; special collection technique may be required. Maximum depth to water: 25 ft Minimum well diameter: 0.5 inch

Procedure:

1. Determine the order in which the wells should be sampled. Typically, sampling order should proceed from the cleanest well to the most contaminated. When no historical water quality data are available, sample background wells first, followed by the farthest downgradient wells. The wells expected to be most significantly contaminated should be sampled last. Sampling order is not as critical when a peristaltic pump is used as the pump tubing may be dedicated to the well location or replaced after each use.

2. Obtain the following information prior to the sampling event:

   a. Well depth. If not previously measured, determine by subtracting the distance between ground surface and top-of-casing (stick-up) and add this distance to the installation screen depth.

   b. Screen length.

   c. Depth to bottom of screen and depth to top of screen from top-of-casing. Using this information, determine the depth to the midpoint of the well screen.

3. Record the condition of the monitoring well in the field notes. Additional information may be required for documentation before, during, and after groundwater sampling. Refer to the project-specific work plan and SOP 10-03 for additional information.

4. Determine static water level using SOP 18-04 and record in the field notebook. Every effort should be made to minimize disturbances of the stagnant water column during water level measurement.

   Water levels are measured prior to and during a groundwater sampling event for the following reasons:

   a. To assess whether the static water column length is sufficient to allow purging and sampling to proceed in a normal manner, provided that drawdown is moderate.

   b. To select the depth to which the pump intake or other purging or sampling device should be lowered.

   c. To monitor the water level during purging and sampling and determine the optimum pumping rate to minimize drawdown.

   d. To determine groundwater flow direction.

5. Rinse reusable sampling equipment with deionized water before inserting the equipment into the monitoring well. (This assumes full equipment decontamination was performed after last use.)

6. Calibrate field measurement equipment as required by the project work plan.

7. Note the depth to the top and bottom of the well screen (if known) from top-of-casing. Depth of the well should **not** be measured prior to purging as this may cause resuspension of settled solids from the formation and require longer purging times for turbidity equilibration. Measure the well depth after sample collection. Compare the static water level to the depth to the top of the screen. If the water level is above the screen, insert the pump intake to the middle or slightly above the middle of the screened interval. If the water level is across the well screen, place the pump near the top (within 0.5 ft) of the water column.

8. Lower the pump into the well slowly (to minimize disturbance) to the desired depth and begin to purge at a rate (0.026 to 0.13 gpm <u>or</u> 100 to 500 mL/min) that will minimize drawdown (<0.3 ft). Monitor drawdown during purging using an electric tape. Adjustments are best made in the first 5 to 15 minutes of pumping in order to minimize purging time.

   When purging wells screened in low-permeability formations (<0.1 L/min recharge), lowering of the water level can cause cascading of water into the well if the purge rate is greater than the recovery rate of the well. Cascading of water into the well can accelerate alteration of the water. Cascading should be kept to a minimum by not drawing the water level in the well below the top of the screen. If the water level is already at the top of or within the well screen, select a purging rate that results in minimum drawdown while allowing the well to be purged in a reasonable length of time.

Record purge start time in the field notebook. Monitor and record the water level and pumping rate every 3 – 5 minutes (or as appropriate) during purging. Use a plastic graduated cylinder or beaker to monitor the pumping rate and a 5-gallon bucket to monitor the volume of water purged. Dispose of purge water in accordance with the project work plan. Record any pumping rate adjustments on the sample collection form.

During pump start-up, drawdown may exceed the 0.3 ft. target and then recover as the pump flow adjustments are made. Purge volume calculations should utilize the stabilized drawdown value, not the initial drawdown.

9. If the minimal drawdown that can be achieved exceeds 0.3 ft but remains stable, continue purging until the field parameters stabilize. Drawdown should not proceed below the top of the pump. If a sustained pumping rate cannot be achieved and the monitoring well is evacuated, shut the pump off and allow the well to recover. When the well has recovered to the point that there is a sufficient volume of water stored, restart the pump and collect samples for field and laboratory analysis.

10. Monitor water quality parameters (pH, temperature, specific conductance, Eh, dissolved oxygen, and turbidity) every 3 to 5 minutes during purging to check for stabilization. These parameters should be recorded in conjunction with time, drawdown, flow rate, and volume pumped. Temperature and pH commonly have the same signature between stagnant casing water and formation water, but should be measured. Turbidity is a very conservative parameter and will require longer purge times for stabilization. Stabilization is reached when the field parameters are stable for three successive readings using the following criteria:

- ±0.1 s.u. for pH
- ±3% for temperature
- ±3% for specific conductance
- ±10 mV for Eh
- ±10% for dissolved oxygen
- ±10% for turbidity values >20 NTU

Field personnel should watch for particulate buildup within the flowcell. This buildup may affect the indicator parameter values measured within the cell and may cause an overestimation of turbidity values measured after the flowcell. If the cell requires cleaning during purging operations, continue pumping and disconnect the flowcell for cleaning. Reconnect the flowcell after cleaning and continue monitoring activities.

If stabilization of the field parameters is not achieved after 45 minutes of purging and all attempts have been made to minimize drawdown, check instrument condition and calibration, purging flow rate, and ability to achieve stable measurements. All measurements made during the attempt should be documented. A field decision must then be made to either continue purging or to collect the samples. If it is determined that significant stabilization can be achieved, continue purging until stabilization occurs or until it is determined that a reasonable effort has been made to maximize stabilization.

If the monitoring well is sampled repeatedly (quarterly, annually, etc.) for assessment of temporal variations in water quality with time, the pump should be set to the same depth, and purged at approximately the same rate and for the same volume of water during each subsequent sampling event. If the same purging criteria does not result in stabilization in subsequent sampling events, consider the following:

- Groundwater chemistry has changed over time.
- The monitoring well may need rehabilitation (redeveloped, replaced, etc.).
- Errors in field measurements may have been made during one or more sampling events.
- Collect a set of samples at the normal purging time and also collect time-series samples to compare with changes in field parameters.

It may not be possible in certain situations to reach stabilization due to:

- Nonuniform distribution of chemical and physical parameters in the water-yielding zone(s) being monitored.
- Previously undetected coalescing plumes.
- Multiple water-yielding zones screened by the monitoring well(s).
- Leaky confining layers, perched zones, etc., nearby.
- Poor well development (excessive fines in purge water)

11. Record field parameters (pH, temperature, specific conductance, Eh, turbidity, and dissolved oxygen) after stabilization.

12. Fill the required sample containers in accordance with the procedures described in SOP 10-10. Record the type of bottle filled, preservatives added, and the time and date of collection on the sample collection form. Samples should be collected in the following order:

    a. Field parameters.
    b. Volatile organics.
    c. Semivolatile organics (includes samples for pesticides, herbicides, and PCBs).
    d. General chemistry parameters.
    e. Metals.

    Fill all containers by allowing the pump discharge to flow gently down the inside of the container with minimal turbulence. Water samples for laboratory analysis should be collected before water has passed through the flowcell.

    Refer to the project work plan for sample requirements.

13. Decontaminate the equipment after each use in accordance with the procedures described in the equipment-specific SOPs.

14. Before securing the well, measure and record the well depth on the sample collection form.

Scope: This document provides guidance for proper documentation of groundwater sampling activities.

Reference: Minnesota Pollution Control Agency, *Groundwater Sampling Guidance: Development of Sampling Plans, Protocols and Reports*, January 1995.

USEPA Region IV, *USEPA Environmental Compliance Branch Standard Operating Procedures and Quality Assurance Manual*, February 1, 1991.

USEPA *Groundwater Issue, Low-Flow (Minimal Drawdown) Groundwater Sampling Procedures*, EPA/540/S-95/504, April 1996.

Procedure:

1. A number of forms have been developed for documentation of field data and sampling activities. These forms provide a means to verify whether or not the project required protocol was followed during a number of key steps in a groundwater sampling event. The chronological form design allows them to be used as a field task checklist to ensure the tasks are completed in the proper order. Additional documentation of field activities should be logged as needed on additional field note forms.

2. The groundwater documentation forms are divided into seven sections: project header, inspection, static water level measurement, well purging, field analysis, sample collection, and sampling personnel. These sections will be customized to meet specific project requirements, but the layout of the sections will remain consistent.

3. To fully implement the protocol verification feature of the forms, complete all entries before leaving the sampling point. This includes filling in all appropriate blanks and circling or checking all "yes" or "no" choices on the forms. Incomplete entries may result in an ambiguous record of what transpired in the field.

4. Complete comment fields when an event occurs that could impact data or the validity of the data.

5. Ditto marks or arrows may be used in any column to indicate "same as above". "NA" or a horizontal line may be used to indicate "not applicable".

6. Forms should be completed as follows:

   a. Project header
      - Record project name, number and location.
      - Indentify the sampling event (e.g., 1st quarter, 2nd quarter).
      - Record the well number.
      - Record the well type (flush-mount, well diameter, etc.).
      - Record the key number (if applicable).

   b. Inspection
      - Document well conditions.
      - Note any well maintenance issues and/or any repairs made.
      - Document additional information on additional field note forms.

c. Static water level
   - Record depth to water.
   - Indicate the measuring equipment used, including equipment number.
   - Note the date and time the reading was taken.
   - Note the method used to decontaminate the measuring equipment.

d. Well purging
   - Prior to groundwater sample collection, an appropriate volume of water must be removed from the well to ensure that the chemistry of the sample is representative of the actual groundwater chemistry. When using the conventional purge method, record the following information:
     - Calculation of three casing volumes
     - Actual volume purged
     - Purge method
     - Equipment number
     - Water quality stabilization readings (if required) and the time of measurement
     - Date and time of well purging

   - When the low-flow technique is used, record the following information:
     - Purge method
     - Date and time of well purging
     - Measured well depth, screen length, and depth to screen midpoint
     - Drawdown, pumping rate, volume purged, pH, temperature, specific conductance, Eh, turbidity, and dissolved oxygen at 3 to 5 minute intervals to monitor for stabilization

e. Field analyses
   - Record equipment calibration data on calibration form.
   - Record results of calibration checks on calibration verification forms. Calibration verification should be performed every 4 to 6 hours to confirm proper operation of the field instrumentation.
   - Record results of groundwater analysis and the date and time the measurements were taken.

f. Sample collection
   - Record groundwater appearance (color, clarity, etc.).
   - Record the date, time and sampling method used.
   - Record the number, size, and type of bottles used.
   - Note whether or not the sample was filtered and indicate the preservative used.
   - Document quality control sample collection (duplicate, matrix spike/matrix spike duplicate).
   - Record the chain-of-custody number associated with the samples.

g. Sampling personnel
   - Include signature of individuals involved in sample collection and date of collection on the bottom of the form.

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ENVIRONMENTAL SERVICES DIVISION
STANDARD OPERATING PROCEDURE **SOP 10-06**
Sample Collection Using Peristaltic Pump
06/10/1998; Revised 02/18/2000

Scope: The following SOP outlines the technique to be used to acquire groundwater samples from monitoring wells using a self-priming suction lift pump. This SOP is intended to provide general instruction. Consult the equipment manual and project work plan for additional information.

References: New Jersey Department of Environmental Protection and Energy, *Field Sampling Procedures Manual*, May 1992

USEPA Environmental Compliance Branch, *Standard Operating Procedures and Quality Assurance Manual*, February, 1991

Operators Manual, Masterflex Easy-Load Pump Head, Model 7518 Series, Cole-Parmer Instrument Company

Operating Manual, Masterflex L/S Portable Sampling Pump Drive, Model 7570-10, Cole-Parmer Instrument Company

Procedure:

1. Check pump tubing for cracks or leaks. Replace if necessary.
2. Feed a new piece (approximately 3 feet in length) of the flexible tubing through the rotor opening.
3. Lock the tubing (approximately mid-length) in place by pushing the loading lever 180° to the right. Allow the discharge end of the tubing to extend into a bucket.
4. Release the 2 tubing retainers from the retracted position by pushing them slightly into the body, then downward and firmly against the tubing. Adjust as necessary.
5. Unroll and cut off a new piece of rigid tubing with length equal to the well depth plus an additional 5 to 10 feet.
6. Insert the free end of the rigid tubing into the well just below the water surface, leaving the excess extending out of the well.
7. Secure the rigid tubing to the well casing or other suitable object to prevent the tubing from dropping in the well should the tubing come loose from the pump head.
8. Attach the rigid tubing to the piece of flexible tubing connected to the pump.
9. Turn on the pump to produce a vacuum on the well side of the pump head and begin purging. Observe the pump direction to ensure that a vacuum is being applied to the sample/purge line.
10. Refer to SOP 10-1 for guidance on standard groundwater sampling. Refer to SOP 10-2 for guidance on low-flow groundwater sampling.
11. Pump tubing must be replaced after each use. Place used tubing in a plastic trash bag for disposal. Wipe the pump unit down with a Liquinox® soap and water solution, followed by a deionized water wipe.

fTC&h **STANDARD OPERATING PROCEDURE** **SOP 10-07**
Groundwater Sample Collection Using Bailer
11/19/1996; Revised 11/19/1996

Scope: The following SOP outlines the technique required for groundwater sample collection using a single check valve bailer. Procedures outlined in this SOP are meant to provide general instruction for groundwater sampling activities. Field personnel should consult project work plan for additonal information.

Reference: New Jersey Department of Environmental Protection and Energy, *Field Sampling Procedures Manual*, May 1992

Procedure:

1. Attach a braided polypropylene line to the bailer. Rinse the bailer thoroughly with deionized water prior to use.

2. Lower the bailer into the monitoring well slowly until it contacts the water surface.

3. With a minimum of surface disturbance, allow the bailer to fill with water.

4. Slowly raise the bailer to the surface. Avoid contact of the bailer line to the well casing and/or ground. Transfer the water into a container to measure the volume of the water being excavated. Three bailer volumes of sample water must be rinsed through the bailer prior to sample acquistion.

5. Attach a bottom emptying device (stopcock with an attached sample line on a Teflon bailer or a draft valve and sample line on a disposable bailer). Insert the valve (in the open position) into the bottom of the bailer, pushing the check valve up and supplying water to the sample line. Close the valve after insertion.

6. At the completion of sample collection, decontaminate Teflon sampling bailers with a soap and water wash followed by a deionized water rinse. Disposable bailers should be discarded.

Standard Operating Procedure SOP 10-09
Low-Flow Groundwater Sample Collection Using a Bladder Pump
11/15/2002; Revised 00/00/0000

Scope: This SOP outlines a low-flow sampling technique for collecting groundwater samples from monitoring wells using a variable speed positive displacement bladder pump. This SOP is to be used in conjunction with other SOPs for the collection of water samples for analysis of specific parameters as stated in the project work plan.

Discussion: A bladder pump allows water to flow through an inlet check valve into the interior of the pump bladder due to the pressure gradient exerted by the hydrostatic head of the water it is submerged in. After the interior of the bladder is filled with water, compressed gas is applied to the exterior of the bladder to force the water to flow through an outlet check valve at the top of the pump and toward the surface. The compressed gas is delivered to the pump through a gas supply tube connected to a compressed gas source with a control device located at the wellhead, and the pump liquid discharge is delivered to the well head through a water discharge tube with both tubes terminated in a wellhead cap. The water is pumped and conveyed in a manner to minimize alteration of water quality in any way. When the pump bladder is squeezed sufficiently to empty it of water, the compressed gas control device stops the flow of compressed gas and vents the pump's gas supply tube to the atmosphere. This venting allows the pressure on the outside of the pump bladder to decrease to less than that of the hydrostatic head present a the pump inlet due to the pump's submergence. The pump bladder can thereby refill and repeat the cycle as needed to achieve desired flow for purging and sampling the well. The pump controller at the wellhead controls the sequencing of applying compressed gas to and venting of the pump. A compressed gas source at the wellhead provides the necessary flow of compressed gas to the controller. A water level meter is used to measure water levels in the well before and during pumping. A flow cell connected to the water discharge tube measures water quality parameters and provides indication of completion of well purging.

The Portable MicroPurge® pump is manufactured by QED Environmental Systems, P.O. Box 3726, Ann Arbor, MI 48106-3726, U.S., 1-800-624-2026. The pump has a diameter of 1.75 inches, a length of 14.76 inches, and weighs approximately 4 pounds. The pump body is constructed of 316 stainless steel. The inlet and discharge housing is 303 stainless steel, bladder is Teflon® or polyethylene (PE), and O-rings are Viton.

A 5 lb. compressed air cylinder provides enough gas for up to 3 hours of sampling and is refillable. An air compressor can also be used when a power source is available.

The pump is controlled by the Micropurge basics™ MP10 controller.

References: User's Guide for Sample Pro Portable MicroPurge pump, Part No. 95181, Revision 3-19-01

User's Guide for MicroPurge Model MP10 Controller, Part No. 95177, Revision 11-9-01

Ground-Water Data–Collection Protocols and Procedures for the National Water-Quality Assessment Program: Collection and Documentation of Water-Quality Samples and Related Data, Michael T. Koterba, et al., U.S. Geological Survey, Open-File Report 95-399, 1995.

Expendable Supplies:

Polyethylene bladder kit (10 per pkg)	Part No. 38360
O-Rings (10 per pkg)	Part No. 38362
Stainless steel screens (10 per pkg)	Part No. 38361
Teflon® check balls (5 per pkg)	Part No. 38408

Procedure:

A. Preparing the Pump

1. Install the following O-rings on the pump: 2 discharge O-rings, air tube O-ring, inlet O-ring, and 2 head O-rings. Refer to Figure 3 of the User's Guide for location of these O-rings.

2. Connect the bladder to the pump head. If a PE bladder will be used, push the bladder onto the pump head barb until the bladder fully covers the barb. Use a clamping collar (white ring) when the pump will be submerged over 50 feet to assure a leak-tight seal of the bladder. Pull the clamp collar over the pump head barb before pushing the bladder on, then pull the collar back down firmly over the bladder and barb. If a Teflon bladder is to be used, install it by inserting the cartridge nipple into the center hole in the bottom of the pump head barb.

3. Attach the pump head to the pump body by engaging the bayonet dimples into the grooves and twisting them together until the engagement snap is felt and the head and body alignment marks line up.

4. With the pump on its side, insert the inlet check ball into the side of the pump head, then press in the inlet valve seat by pushing and twisting with your thumb.

5. With the pump vertical, insert the discharge check ball into the top of the pump head, then press in the discharge ball seat by pushing and twisting with your thumb.

6. For the push-in fittings, place the thin metal lock disk in the "TOP" up position on the top of the pump head, with the lock disk edge slots lined up with the posts on the pump head. Place the upper plate on top of the lock disk with slots and posts lined up. Twist the pump cap onto the pump head until the engagement snap is felt and the hole in the side of the pump cap lines up with the inlet port. The cover and body alignment marks should line up.

7. For the compression nut fittings, place the compression fitting plate on the top of the pump head, with slots and posts lined up. Rotate or remove the fitting nuts to allow the pump cap to be placed over the compression fitting assembly. Twist the pump cap on to the pump head until the engagement snap is felt and the hole in the side of the pump cap lines up with the inlet port. The cover and body alignment marks should line up.

8. Use a new lock plate and fresh cut end of tubing to ensure proper pull-out strength of the tubing connection. The upper plate is marked "W" for water discharge, and "A" for the air supply tube. QED air supply tubing is shaded gray to distinguish it from the water discharge tube which is clear. Insert each tube separately into the proper opening in the pump head, pushing firmly so that the tube penetrates beyond first resistance at least ½-inch into the pump. To check, pull back on each tube to check that it is secure.

9. Connect the light blue coiled pump hose to the fitting labeled AIR OUT on the MP-10. Connect the red air supply hose to the compressed air source and connect it to the fitting labeled AIR IN on the MP-10.

B. Well Purging

1. Calibrate the flow-cell in accordance with SOP 11-10.

2. Determine the order in which the wells should be sampled. Typically, sampling order should proceed from the cleanest well to the most contaminated. When no historical water quality

data are available, sample background wells first, followed by the farthest downgradient wells. The wells expected to be most contaminated should be sampled last.

3. Determine the depth to the midpoint of the well screen . Record the condition of the monitoring well in the field notes. Additional information may be required for documentation before, during, or after groundwater sampling. Refer to the project work plan and SOP 10-03 for additional information.

4. Determine static water level using SOP 18-04 and record in the field notes. Minimize disturbances of the stagnant water column during water level measurement.

5. Note the depth to the top and bottom of the well screen (if known) from top-of-casing. Depth of the well should not be measured prior to purging as this may cause resuspension of settled solids from the formation and require longer purging times for turbidity equilibration. Measure the well depth after sample collection. Compare the static water level to the depth to the top of the screen. If the water level is above the screen, insert the pump to the middle or slightly above the middle of the screened interval. If the water level is across the screen, place the pump at the top of the water column.

6. Slowly insert the pump into the well to the desired depth. Open the lid on the MP10 to power it on. At this point, the MP 10 is in the micropurge mode (MP) but is not cycling the pump. Select the desired Cycles per Minute (CPM) with the arrow keys on the MP-10, turn the throttle to set depth on the gauge to 10 – 20 feet deeper than the pump location in the well, and press CYCLE to start pumping. Purge at a rate (100 mL to 500 mL/min) that will minimize drawdown (<0.1 m or <0.33 ft). Monitor drawdown during purging using an electric tape. Make adjustments to stabilize the flow rate as soon as possible.

7. When purging wells screened in low-permeability formations (<0.1 L/min recharge), lowering of the water level can cause cascading of water into the well if the purge rate is greater than the recovery rate of the well. Cascading of water into the well can accelerate alteration of the water. Cascading should be kept at a minimum by not drawing the water level in the well below the top of the screen. If the water level is already at the top of or within the well screen, select a purging rate that results in minimum drawdown while allowing the well to be purged in a reasonable length of time.

8. Record purge start time in the field notes. Use a plastic graduated cylinder or beaker to monitor the pumping rate and a 5-gallon bucket to monitor the volume of water purged. Dispose of purge water in accordance with the project work plan.

9. If drawdown is excessive during low-flow pumping, and the low-flow method is not feasible without dewatering the stored water in the well casing, the following procedure should be used:

    a. Pump the well down to the maximum extent possible with the pump set at the existing setting.

    b. Allow the pumping rate to increase to maximize removal of stored water in the well casing. Drawdown should not proceed below the top of the pump. (Maximum pumping rate with the bladder pump is 1 L/min.)

    c. If a sustained pumping rate can be achieved with drawdown not exceeding the depth to the top of the pump, continue pumping until three stored casing volumes have been excavated. Collect samples for field and laboratory analysis.

d. If a sustained pumping rate cannot be achieved and the monitoring well is evacuated, shut the pump off and allow the well to recover. When the well has recovered to the point that there is a sufficient volume of water stored, restart the pump and collect samples for field and laboratory analysis.

10. Monitor water quality parameters (pH, temperature, specific conductance, Eh, dissolved oxygen, and turbidity) every 3 to 5 minutes during purging to check for stabilization. These parameters should be recorded in conjunction with the time, drawdown, flow rate, and volume pumped. Temperature and pH commonly have the same signature between stagnant casing water and formation water, but should be measured. Turbidity is a very conservative parameter and will require longer purge times for stabilization. Stabilization is reached when at least three parameters are stable for three successive readings using the following criteria:

- ± 0.1 s.u. for pH
- ± 3% for specific conductance
- ± 10 mV for Eh
- ± 10% for dissolved oxygen
- ± 10% for turbidity

If stabilization of three field parameters is not achieved after three stored casing volumes have been evacuated, a field decision must be made to either continue purging or to collect the samples. If it is determined that significant stabilization can be achieved, continue purging until stabilization occurs or until it is determined that a reasonable effort has been made to maximize stabilization.

If the monitoring well is sampled repeatedly (quarterly, annually, etc.) for assessment of temporal variations in water quality with time, the pump should be set to the same depth, and purged at approximately the same rate and for the same volume of water during each sampling event. If the same purging criteria do not result in stabilization in subsequent events, consider the following:

- Groundwater chemistry has changed over time.
- The monitoring well may need rehabilitation (redeveloped, replaced, etc.).
- Errors in field measurements may have been made during one or more sampling events.
- Collect a set of samples at the normal purging time and also collect time-series samples to compare with changes in field parameters.

It may not be possible in certain situations to reach stabilization due to:

- Non-uniform distribution of chemical and physical parameters in the water-yielding zone(s) being monitored.
- Previously undetected coalescing plumes.
- Multiple water-yielding zones screened by the monitoring wells.
- Leaky confining layers, perched zones, etc., nearby.

11. Record field parameters after stabilization.

C. Sample Collection

1. Disconnect the flow cell and its tubing from the pump line before collecting samples. Use the PAUSE key to freeze the controller action, allowing time to collect a sample. When the PAUSE key is pressed, the controller enters the HOLD state, drive air is vented from the

pump and the pump fills and waits. Pressing the PAUSE key a second time causes the controller to immediately enter the SAMPLE state. Drive air is directed to the pump causing the pump to discharge its volume of liquid. Using the HOLD and SAMPLE states, fill required sample containers in accordance with the procedures described in SOP 10-10. Samples should be collected in the following order:

a. Field parameters
b Volatile organics
c. Semivolatile organics (includes samples for pesticides, herbicides, and PCBs)
d. General chemistry parameters
e. Metals.

Refer to the project work plan for sample requirements. Record the type of bottle filled, preservatives added, and the time and date of collection in the field notes.

2. When sampling is complete using a dedicated pump, remove the water level tape, disconnect the air supply line and water discharge line from the wellhead and close the wellhead assembly/protective casing. During cold weather months, insert the 0.125-inch OD flexible polyethylene tubing into the pump discharge tube at the well head, then connect the quick connect fitting to the compressed gas source and apply low pressure to force the water near the surface out of the water discharge line.

   After completing sample collection using a non-dedicated pump, remove the water level tape, disconnect the air supply line, remove the pump and tubing from the well, and close the wellhead assembly/protective casing. Store dedicated tubing in a large zip-lock bag with the well location clearly labeled. Non-dedicated tubing should be bagged for proper disposal.

D. Equipment Decontamination

1. Decontaminate non-dedicated pumps between each use. Decontamination should consist of cleaning the pump casing, Teflon checkball, and the inlet and outlet valves with a mild phosphate-free laboratory grade detergent solution and the supplied brushes. Rinse all parts with deionized water and flush deionized water through the Teflon checkball until the discharge water runs clear (no surfactant observed). When rinsing is complete, reassemble the pump with a new disposable bladder and new grab plate. Store the pump in an untreated plastic bag to eliminate potential contamination during transport and storage.

2. Decontaminate the water level tape after each use by wiping down the equipment body, probe, and cable with phosphate-free laboratory grade detergent solution, rinsing thoroughly with tap water, followed by a deionized water rinse. Store the water level meter in an untreated plastic bag to eliminate potential contamination during transport and storage.

Scope: This SOP outlines procedures for groundwater sample handling and preservation. Procedures outlined in this SOP are intended to provide general instruction for groundwater sampling activities. Refer to the project work plan for additional information.

References: *Minnesota Pollution Control Agency, Groundwater Sampling Guidance: Development of Sampling Plans, Protocols and Reports*, January 1995.

U.S. Environmental Protection Agency-Region IV, *USEPA Environmental Compliance Branch Standard Operating Procedures and Quality Assurance Manual*, February 1, 1991.

Procedure:

1. An appropriate volume of groundwater must be removed from the monitoring well prior to sample collection. Refer to SOP 10-01 for a general overview of groundwater sampling using the conventional (3 to 5 well volumes) purge method. Refer to SOP 10-02 for a general overview of low-flow purge method.
2. Field parameters (pH, specific conductance, Eh, dissolved oxygen, turbidity, and temperature) should be measured using a flow-through cell when possible. When ambient measurements are required, use a groundwater containment vessel of sufficient size to allow for temperature equilibration with the atmosphere but with a relatively small surface area exposed to the atmosphere. Measurements should be taken as soon as practical after the groundwater has been removed from the well.
3. After field parameters have been measured, groundwater samples may be collected. Samples should be collected in the following order:
   a. Volatile organics:
      (1) Three 40 mL vials with Teflon septa should be filled with the groundwater to be tested. Vials are pre-preserved with 1:1 hydrochloric acid solution. Hydrochloric acid is corrosive; gloves should be worn. If the sample preservative comes in contact with the skin, flush with water. Seek medical attention if necessary.
      (2) Tilt the vial slightly and with minimum turbulence; fill the vial until it just overflows.
      (3) Carefully set the cap in place and screw on firmly.
      (4) Invert the vial to check for air bubbles. If air bubbles are present, a new sample vial must filled until a sample is obtained with no trapped air.
      (5) Label each vial and place samples on ice in an insulated container to maintain sample temperature at 2° to 6°C.
   b. Semivolatile organics (includes samples for acid/base-neutral extractables, pesticides, herbicides, and PCBs):
      (1) A minimum of 1 liter amber-glass bottle is required per scan. No chemical preservation is required.
      (2) Fill bottle with the groundwater to be tested, allowing minimal headspace for expansion.
      (3) Label each bottle and place samples on ice in an insulated container to maintain sample temperature at 2° to 6°C.

c. General chemistry parameters:

(1) Container size and type and chemical preservative are dependent upon the analyses to be performed. Table 1 provides general information for routinely performed analyses. Refer to the project work plan for specific requirements. The laboratory will provide the required containers and preservatives for the project. Some preservatives are corrosive; gloves should be worn. If the sample preservative comes in contact with the skin, flush with water. Seek medical attention if necessary.

(2) Fill each bottle to the shoulder with the groundwater to be tested and cap tightly.

(3) Label each bottle and place samples on ice in an insulated container to maintain sample temperature at 2° to 6°C.

d. Metals:

(1) Typically, a 500 mL plastic bottle pre-preserved with 1:1 nitric acid will be supplied by the laboratory for metals. Nitric acid is corrosive; gloves should be worn. If the sample preservative comes in contact with the skin, flush with water. Seek medical attention if necessary.

(2) Samples for dissolved metals must be field-filtered prior to preservation.

(a) Attach a 0.45 µm in-line filter cartridge unit onto the discharge line from the sampling device and adjust the discharge and flow rate with a three-way valve system, if necessary. A new cartridge must be used at each sampling location.

(b) Discharge the required volume of filtered groundwater to waste as specified by the filter manufacturer.

(c) Fill the required sample container to the bottle shoulder with the filtered groundwater and cap tightly.

(d) Label the bottle and place sample on ice in an insulated container to maintain sample temperature at 2° to 6°C.

(3) When total metals are required, fill the sample container provided to the bottle shoulder with the groundwater to be tested and cap tightly.

(4) Label the bottle and place sample on ice in an insulated container to maintain sample temperature at 2° to 6°C.

Table 1 – Sample Container Type, Size, and Preservative Routine – Groundwater Analyses

Analysis	Container Type	Required Volume	Chemical Preservative
Alkalinity (all forms)	Plastic	100 mL	None
BOD	Plastic	500 mL	None
Chloride	Plastic	100 mL	None
COD	Plastic	50 mL	1:1 sulfuric acid
Chromium, Hexavalent	Plastic	100 mL	None
Cyanide	Plastic	250 mL	Sodium hydroxide
Fluoride	Plastic	100 mL	None
N, Ammonia	Plastic	250 mL	1:1 sulfuric acid
N, Total Kjeldahl	Plastic	250 mL	1:1 sulfuric acid
N, Nitrate	Plastic	100 mL	None
N, Nitrite	Plastic	100 mL	None
Phenols, Recoverable	Glass	500 mL	1:1 sulfuric acid
Phosphorus	Plastic	100 mL	1:1 sulfuric acid
Solids (all types)	Plastic	250 mL	None
Sulfate	Plastic	250 mL	None
TOC	Plastic	250 mL	1:1 sulfuric acid

Scope: This SOP outlines procedures for the collection of groundwater quality control samples. These samples may include equipment blanks, atmosphere blanks, filter blanks, duplicates, and matrix spike samples. Refer to the project work plan for specific information regarding the QC samples required.

References: Minnesota Pollution Control Agency, *Groundwater Sampling Guidance: Development of Sampling Plans*, Protocols and Reports, January 1995.

Procedure:

A. Equipment Blanks

Equipment blanks are collected to evaluate if the investigative groundwater samples may have been contaminated through contact with the sampling equipment. An impacted equipment blank sample may indicate inadequate decontamination procedures, or that parts of the sampling equipment (e.g., pump tubing) may have become contaminated through continued use and should be replaced. Equipment blanks are typically collected at a rate of 1 equipment blank per 10 investigative samples.

Equipment blank samples are collected by passing deionized water through the sampling equipment using the same procedure used to collect the investigative groundwater samples.

1. Prior to collecting the equipment blank sample, be sure that the sampling equipment has been decontaminated following standard procedures.

2. If a pump is used for sample collection, prepare the equipment blank by pumping deionized water from the final rinse container into the appropriate sample containers.

3. If a bailer is used for sample collection, pour deionized water (with as little agitation as possible) into the top of the bailer. The length of time the blank water has contact with the bailer should simulate the length of time that an actual groundwater sample would contact the bailer. If a disposable bailer is used, do not rinse it with deionized water prior to collection of the equipment blank.

4. Equipment blanks are analyzed for the same parameters as the groundwater samples and therefore an identical "set" of bottles should be filled. The bottles should be filled in the same order required for the groundwater samples. If field filtering is required, follow the procedures described in Section C below.

5. Standard decontamination procedures should be followed after collection of the equipment blank.

B. Atmosphere Blanks

Atmosphere blanks are collected during sampling events where dedicated equipment is used to collect groundwater samples (such as Well Wizard dedicated pumps).These samples are used to determine if contact with ambient air has impacted the groundwater samples.

1. Collect an atmosphere blank sample by pouring deionized water into the appropriate sample containers at the same rate and duration that it takes to collect a groundwater sample. Atmosphere blanks are analyzed for the same parameters as the groundwater samples and therefore an identical "set" of bottles should be filled.

2. The bottles should be filled in the same order and preserved in the same manner required for the groundwater samples. If field filtering is required, follow the procedures discussed in Section C below.

3. Atmosphere blanks should be collected at a rate of one per 10 investigative groundwater samples.

C. Filter Blanks

Filter blanks are collected when groundwater samples are filtered onsite. These samples are used to evaluate the impact of the filtering equipment on the groundwater samples.

1. Collect a filter blanks by running deionized water through decontaminated filtering equipment fitted with a new filter. Do not pass the sample through the sampling equipment. The filter blank is used to determine whether the filtering equipment has affected the groundwater sample, independent from the sampling equipment

2. Filter blanks will be analyzed for the same parameters as the filtered groundwater samples and therefore an identical "set" of bottles should be filled. The bottles should be filled in the same order required for the groundwater samples.

3. Filter blanks should be collected at a rate of one for every 10 investigative filtered groundwater samples.

D. Field Duplicates

Field duplicates are collected as a check of sampling and analytical reproducibility.

1. Sample duplicates should be collected using the same procedure as for the investigative samples. Sample duplicates will be analyzed for the same parameters as the investigative groundwater samples and therefore an identical "set" of bottles must be filled.

2. The parameter dictated bottle order should be followed, however the sample duplicate bottles for specific parameter analysis should be filled immediately after the "primary" groundwater sample bottles. Following this procedure, the "primary" sample and sample duplicate bottles are filled alternately, and the parameter dictated sampling order is maintained.

3. Field duplicates are typically collected at a rate of one for every 10 investigative groundwater samples.

E. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

MS/MSD samples are used to evaluate laboratory precision and accuracy. MS/MSD samples are typically analyzed by laboratory as part of their QA/QC program. To insure that project specific matrix spike analysis is performed, it must be requested from the analytical laboratory. Consult the project work plan for sample volume requirements. Typically, triple the normal sample volume is required for analysis.

MS/MSD samples are collected in the same manner as field duplicates. Refer to Section D of this SOP.

F. Trip Blanks

Trip blanks, consisting of deionized water in sealed 40 mL glass vials, are prepared by the laboratory prior to the sampling event and are included in each sample shipping container. Trip blanks must be kept with the investigative samples throughout the sampling event and shipment to the laboratory. Trip blanks are used to assess potential contamination of samples due to compound migration during sample handling, shipment, and storage.

ENVIRONMENTAL SERVICES DIVISION
STANDARD OPERATING PROCEDURE **SOP 11-08**
Field Measurement of Turbidity
12/07/1998; Revised 12/1/2010

Scope: This SOP outlines the technique required for the accurate field measurement of turbidity using the LaMotte turbidimeter Model 2020e.

Equipment: LaMotte turbidimeter Model 2020e
Turbidity tubes
Positioning rings
Turbidity standards (0.0 NTU and 10 NTU)
Distilled or deionized water
Field notebook
Kimwipes

Procedure:

A. Primary Inspection

This procedure should be performed daily or any time a new turbidity tube is put into use.

1. Place a positioning ring over the top of the turbidity tube until it is seated, aligning the squared off notch with the vertical index line on the glass tube. When properly installed, the positioning ring ensures that the turbidity tube is oriented consistently in the meter chamber (the two tapered notches on the ring must align with the notches in the meter chamber).

2. Press **ON** to power the unit.

3. Press ***|OK** to select **MEASURE**.

4. Rinse a clean turbidity tube 3 times with the 0.0 NTU standard.

5. Tilting the tube slightly to avoid air bubbles, pour the blank solution (0.0 NTU) down the inside of the turbidity tube and fill to the line. Gently mix the standard by inverting before taking the reading, but avoid introducing air bubbles.

6. Cap the tube and dry the outside of the tube with a Kimwipe to remove any moisture or fingerprints.

7. Open the meter lid and insert the tube into the chamber, aligning the index notch on the positioning ring with the index arrow on the meter.

8. Close the lid and press ***|OK** to select **SCAN BLANK**. Allow approximately 10 seconds for the meter to read the blank.

9. At the **SCAN SAMPLE** prompt, remove the 0.0 NTU standard from the chamber.

10. Prepare a second clean turbidity tube with the 10 NTU standard by rinsing the tube 3 times with the 10 NTU standard and filling to the line.

11. Cap the tube and dry the outside of the tube with a Kimwipe to remove any moisture or fingerprints.

12. Place the tube in the meter chamber, close the lid and press ***|OK** to **SCAN SAMPLE**. Record the result. If the 10 NTU standard reading is within the acceptance window of 9.0 – 11 NTU, the instrument calibration is acceptable. Proceed with sample analysis. If the 10 NTU standard reading is outside the acceptance window, the turbidimeter will need to be calibrated before any sample analysis may occur (see Section B).

B. Daily Calibration

1. If the primary inspection indicates that the meter is in need of calibration, press the up or down arrows while the result is shown on the meter display until the **CALIBRATE** prompt appears under the result and press ***|OK**. The tube with the 10 NTU standard should still be in the meter chamber.

2. Using the up or down arrows on the meter, change the highlighted digits on the display to match the concentration of the turbidity standard (10 NTU). Press ***|OK** to accept each digit and move to the next digit.

3. When the value on the display matches the concentration of the turbidity standard (10 NTU), press ***|OK** to select **SET**. The display will then return to the main menu.

4. Press ***|OK** at the **MEASURE** prompt and using the up or down arrows, select **SCAN SAMPLE** and press ***|OK** to get the new calibrated result. The acceptance window for calibration is 9.0 – 11 NTU.

C. Sample Analysis

1. Rinse a clean turbidity tube with a small volume of the sample to be tested and discard the rinse. Tilting the tube slightly to avoid air bubbles, slowly fill the tube to the mark with the sample. Release any air bubbles that form on the inside of the tube by gently tapping the tube or refill the tube with new sample.

2. Cap the tube and dry the outside with a Kimwipe to remove any moisture or fingerprints.

3. Insert the tube into the meter chamber, aligning the positioning ring notch/indexing line on the sample tube with the arrow on the top of the meter chamber, and press ***|OK.**

4. Record the displayed result.

   Note: If a negative number is displayed, verify that the sample tube was properly aligned and properly filled (to the line). Retest as necessary. If a negative value is still displayed, and calibration is verified by acceptable recovery of calibration standards, record the displayed result.

5. Repeat steps C.1 – C.4 for each sample to be tested.

6. When testing is complete, rinse the turbidity tubes with deionized water, shake to remove excess moisture, and cap.

D. Quality Control

1. Calibration of the turbidimeter must be verified every 4 hours and at the end of the day using the 10 NTU standard. If the calibration verification fails (outside the acceptance window of 9 – 11 NTU), repeat the check using a new standard. If the check is still outside the acceptance window, recalibrate prior to any further sample measurements.

2. A sample duplicate should be run at a frequency of 1 per 10 investigative samples. Verify that both sample tubes are properly cleaned prior to measurement. Duplicate readings should agree within ±10% for values greater than 10 NTU or ±1 NTU when sample turbidity is less than 10 NTU. If values fall outside this range, check the turbidimeter calibration and reanalyze the samples. Record all values.

E. Meter Options/Settings

When the unit is turned **ON**, select "**Options**" from the Main Menu by using the **Up/Down** arrow to scroll through the list and then press ***|OK** to select "**Options**".

1. Averaging – For the majority of groundwater sampling projects, the factory setting (feature disabled) is appropriate. However, if averaging is desired, use the **Up/Down** arrows to scroll through averaging options, then press ***|OK** to select choice. Press the left arrow button to return to main Options Menu.
2. Turbidity
   a. From the main Options menu, scroll down using **Up/Down** arrows and press the ***|OK** to select **Turbidity**. Then press the ***|OK** to select **Units**. Verify that the units selected are NTU. If units are different, scroll through unit options using **Up/Down** arrows and press ***|OK** to select **NTU**. Press the left arrow button twice to return to the main Options Menu.
   b. From the main Options menu, scroll down using **Up/Down** arrows and press the ***|OK** to select **Turbidity**. Then press the ***|OK** to select **Calibration**. Verify that the calibration method selected is Formazin. If calibration method is different, scroll through unit options using **Up/Down** arrows and press ***|OK** to select **Formazin**. Press the left arrow button twice to return to the main Options Menu.
3. Language – The factory default setting is English. If the displayed language requires changing, scroll down using **Up/Down** arrows and press the ***|OK** to select **Language**. Scroll through language options using **Up/Down** arrows and press ***|OK** to make selection. Press the left arrow button to return to main Options Menu
4. Auto Shutdown - At the main Options Menu, scroll down using **Up/Down** arrows and press the ***|OK** to select **Auto Shutdown**. Select from available shutdown options based on preference and battery power status. The LaMotte 2020e Turbidimeter will shut down if there is no user input within the selected auto shutdown time period (unless the feature is disabled). Press the left arrow button to return to main Options Menu.

F. Testing Tips

1. Analyze samples as soon as possible after collection.
2. The meter should be placed on a surface that is free from vibrations. Vibrations can cause high readings.
3. Carbon in a sample will absorb light and cause low readings.
4. Excessive color in a sample will absorb light and cause low readings.

G. Troubleshooting

Problem/Error Message	Reason	Solution
> On display	Over-range reading	Dilute sample and test again
Err1	Very low battery	Replace battery or switch to AC power. Press back arrow (<) to back out. Scan sample again.
Err2	Attempting calibration outside the allowable range of the meter.	Confirm standard was made correctly. The displayed reading can only be adjusted to ±50% of the factory calibration.
Err3	Attempting calibration with a zero sample	Calibrate the meter with a standard other than zero.
Err4	Processing error due to motion of suspended particles or air bubbles or by opening/closing lid during readings.	Scan sample until a reading is obtained.
Err5	No blank reading.	Meter has not been blanked for this test factor. Blank meter
Err6	Internal mathematical error.	Re-blank the meter and rescan the sample.
Err7	Configuration error.	Call LaMotte Tech Service. Meter may need repair.
Low battery	Low battery.	Replace battery.

ENVIRONMENTAL SERVICES DIVISION
STANDARD OPERATING PROCEDURE SOP 11-10

In-line Measurement of Temperature, Specific Conductance, pH, Eh, and Dissolved Oxygen - 05/15/1998; Revised 04/02/2010

Scope: This SOP outlines the technique required for the accurate field measurement of temperature, specific conductance, pH, Eh, and dissolved oxygen (DO), using the YSI Model 556 MPS multi-meter with in-line flow cell. The unit consists of a suite of three probes with five sensors mounted together inside a flow-through cell. As water is pumped through the cell, field parameters are simultaneously measured and displayed.

Equipment: Sampling Pump
YSI Model 556 MPS multi-meter equipped with probe module
3/8-inch diameter polyvinyl discharge tubing
Deionized water

Standards: Conductivity standards (147, 1412, 2765 µS/cm)
pH buffers (4.00, 7.00, 10.00 s.u. @ 25°C)
Eh standard (Zobell's Solution 428 mV @ 25°C)

Replace solutions by expiration date on label.

All solutions should be protected from freezing and physical damage. Zobell's solution will degrade when exposed to excessive temperature variation or light. Store it in a cool, dry area protected from light.

Safety: Review all material safety data sheets (MSDS) for the standard solutions prior to use. Chemical resistant gloves should be worn when handling these solutions.

Eh standard solution waste should be containerized for proper disposal. The solution contains cyanide compounds; contact with acid will liberate hydrogen cyanide, a very toxic, flammable gas.

General Information:

The multi-meter and sonde should be thoroughly checked for proper operation prior to leaving for job site. This should include a check of internal calibration, and any adjustments should be made as required. Procedures for internal calibration meter adjustments can be found in the operation manual.

When installing, removing, or replacing a sensor, the entire probe module and all sensors must be thoroughly dried prior to removal of a sensor or sensor port plug. This will prevent water from entering the port. When a sensor or plug is removed, examine the connector inside the port. If moisture is present, use compressed air to completely dry the connector. Do not use if the connector is corroded; service on the unit will be required.

The YSI multi-meter is capable of displaying the parameters in various units of measure. The desired reporting unit for each parameter should be selected prior to calibration – pH in s.u., dissolved oxygen in mg/L, Eh in mV, specific conductance in µS/cm, and temperature in °C.

Procedure:

A. Electrode Preparation

1. Temperature/Conductivity Probe

   Inspect the thermistor and electrodes for corrosion or fouling.

2. Dissolved Oxygen Probe

   Inspect the probe membrane. Replace the probe membrane when it becomes wrinkled, bubbled, dirty, torn, or otherwise damaged.

3. pH/Eh Probe

   Inspect probe for damage or fouling. Gently clean the bulb area with a very soft brush and Liquinox soap solution when obviously coated with oil, sediment, or biological growth. **Caution: The bulb glass is very fragile.**

B. Flow-cell Inspection

1. Inspect flow-cell for cleanliness. Disassemble and clean with a mild soap solution as necessary. Rinse well with clean tap water, followed by a deionized water rinse.

2. Inspect O-rings and O-ring seats for damage that may prevent sealing. Replace as necessary.

C. Meter Connection and Inspection

1. Connect the cable to the meter by lining up the pins and guides on the cable with the holes and indentations on the cable connector at the bottom of the instrument. While holding the cable firmly against the cable connector, turn the locking mechanism clockwise until it snaps into place.

2. Confirm that there is sufficient battery charge remaining (lower right corner of meter window) and that 4 replacement alkaline C batteries are available in the storage case. Typically, the YSI 556 will operate continuously for approximately 180 hours. Assuming a standard usage of 3 hours of "on" time in a typical day, the alkaline cells will last approximately 60 days. See Section 2 of the Operations Manual for battery replacement information.

D. Calibration

Calibration Tips:

Use the transport cup that comes with the probe module as the calibration chamber for all calibrations. Use a clamp or ring stand to secure the probe body and prevent it from tipping over.

With the exception of the dissolved oxygen sensor calibration, ensure that all sensors are immersed in the calibration solution. Many of the calibrations utilize readings from other sensors (e.g., temperature sensor).

Make certain that port plugs are installed in all ports where sensors are not installed. It is extremely important to keep these electrical connectors dry.

1. Dissolved Oxygen

   The membrane covering the tip of the DO probe should be gently wiped free of visible moisture with a Kim wipe before starting the air calibration (% saturation) sequence. Refer to the green calibration reference sheet (*Oxygen Solubility Values in Fresh Water*) provided in the field notebook for the correct DO/temperature correlation. The instrument must be on for at least 20 minutes before calibrating to polarize the DO sensor.

a. Turn the meter on by pressing the **On/off** key in the upper left corner of the key pad (small green vertical dash inside a green circle). The meter will be in Run mode.

b. Screw the calibration cup onto the probe. Pour approximately 1/8" of tap water into the bottom of the calibration cup, avoiding the DO membrane while pouring. Screw the cap onto the cup, engaging only 1 or 2 threads to allow venting to the atmosphere. Ensure that the DO and temperature sensors are not immersed in the water.

c. Allow approximately 10 minutes or more for the air in the cup to become water saturated and for the temperature to equilibrate before proceeding.

d. When the DO% and mg/L readings are stable, the meter is ready for calibration. From the Run mode menu, press the **Escape** key and use the down arrow to highlight **Calibrate**. Press the **Enter** key (a left pointing arrow). Arrow down to highlight **DO 2 mil PE,** and press the **Enter** key. Select *DO%* by pressing enter. The internal barometer's real time measurement in mmHg will be displayed. Press the **Enter** key to accept the calibration of dissolved oxygen.

e. Observe the DO mg/L and DO% readings. When there is no significant change in the readings (after approximately 30 seconds), record the temperature and DO (in mg/L) on the calibration form. The percent dissolved oxygen (DO%), should be within 90 – 110% of the theoretical value for acceptable calibration.

f. Rinse the sonde with deionized water and shake to remove excess water.

g. Calibration of the DO probe should be verified every 4 hours and at the end of each day. If calibration verification values fall outside the acceptance range, check the condition of the probe membrane. Clean or replace if necessary (see H.1), and recalibrate the probe prior to any further sample measurements.

2. Specific Conductance

a. Press the **On/off** key to display the run screen.

b. Rinse the calibration cup and conductivity probe with DI water and discard the rinse water. Rinse the cup and probe a second time using a small volume (10 – 15 mL) of the 1412 µS/cm conductivity standard in the calibration cup. Discard this rinse solution and refill the calibration cup with approximately 60 mL of 1412 µS/cm conductivity standard, ensuring that the calibration cup is sufficiently filled and covering the probe.

c. Press the **Escape** key to display the main menu screen and use the down arrow key to highlight **Calibrate.** Press the **Enter** key. The calibration screen is displayed.

d. Use the arrow keys to highlight the **Conductivity** selection and press **Enter**. Use the arrow key to highlight the **Specific Conductance** selection. Press **Enter**.

e. Use the keypad to enter the calibration value of the standard (1412 µS/cm) and press **Enter**. The conductivity calibration screen is displayed. Allow about 1 minute for temperature equilibration.

f. When the reading shows no significant change for approximately 30 seconds, press **Enter**. The specific conductance calibration will be accepted and display the newly calibrated reading on the screen. Record the specific conductance reading and temperature on the calibration form

g. Press the **Enter** key and continue to more calibration options, or press the **Escape** key 4 times to exit to the run mode.

h. The calibration standard may be saved for later calibration verification checks or discarded. Rinse the probe module with deionized water and shake to remove excess water.

i. Rinse the calibration cup and probe a second time with a small amount of 147 µS/cm conductivity standard. Discard the rinse solution and refill the calibration cup with the 147 µS/cm conductivity standard. When the reading shows no significant change for approximately 30 seconds, record the reading and temperature on the calibration form. Follow the same protocol for the 2765 µS/cm standard.

j. If any of the readings fall outside of the acceptable calibration verification range indicated on the calibration form, repeat calibration using new standards. If the calibration is still out of range, clean the conductivity probe using the procedure described in H.2, and repeat the calibration sequence.

k. Calibration of the conductivity probe should be verified every 4 hours and at the end of each day using the 1412 µS/cm standard. If the calibration verification value falls outside the acceptance window, repeat the check using a new standard. If the check is still outside the acceptance window, check the condition of the probe, clean if necessary, and recalibrate prior to any further sample measurements.

3. pH

Perform a 2-point calibration as indicated below. The pH buffers selected should bracket the anticipated pH range of the samples to be measured.

a. Press the **On/off** key to display the run screen.

b. With the calibration cup attached to the sonde, rinse the cup and probes with DI water. Discard the rinse water and shake any excess water from cup and probes. Rinse the probe and cup a second time with a small volume of pH 7 buffer and discard the rinse. Add approximately 60 mL of pH 7 buffer to the cup.

c. Press **Escape** and highlight the **Calibrate** selection using the arrow keys. Press **Enter** and use the arrow keys to highlight the **pH** selection. Press **Enter.**

d. Arrow down to highlight **2 point** and press **Enter**. The unit will prompt the entry of the first pH buffer standard to be entered. Using the keypad, press **7.00** and then press **Enter**.

e. Observe the readings for pH and temperature. When they show no significant change for approximately 30 seconds, press the **Enter** key to calibrate.

f. When the display indicates that the 7.00 pH calibration has been accepted, record the reading and temperature on the calibration form. Rinse the cup and probes with deionized water and discard the rinse water. Rinse the cup and probe a second time with small amount of the second (pH 4 or pH 10) buffer and discard the buffer rinse. Add approximately 60 mL of the second buffer to the cup.

g. Press **Enter** to continue. The screen will prompt for the entry of the second pH buffer value. Using the keypad, enter the value for the second pH standard (4.00 or 10.00) and press **Enter**.

h. Observe the readings for pH and temperature. When they show no significant change for approximately 30 seconds, press the **Enter** key to lock in those values.

i. When the display indicates that the second pH buffer calibration has been accepted, record the reading on the calibration form.

j. Rinse the cup and probes with deionized water and discard the rinse water. Rinse the cup and probe a second time using a small volume of the third pH buffer and discard the buffer rinse. Add approximately 60 mL of the third pH buffer to the cup.

k. Observe the readings for pH and temperature. When they show no significant change for approximately 30 seconds, record the readings on the calibration form.

l. Check the recorded readings to ensure that they are within the acceptable calibration verification windows. If pH values are out of the acceptance range following calibration, repeat the calibration using new standards. If the values are still out of range following recalibration, the pH probe may need to be reconditioned. Soak the probe in pH 4 buffer for 2 hours and repeat the calibration procedure.

m. Calibration of the pH probe should be verified every 4 hours and at the end of each day using the pH 7 buffer. If the calibration verification value falls outside the acceptance window, repeat the check using a new standard. If the check is still outside the acceptance window, check the condition of the probe, clean if necessary and recalibrate prior to any further sample measurements.

4. Eh (ORP)

The measurement of Eh is accomplished by using an electrode designed to measure ORP (oxidation reduction potential). Eh is calculated by adding an offset voltage (200mV) to the ORP reading obtained.

Refer to the green calibration reference sheet (*Zobell's Calibration Check Standard Values*) for the acceptance range at various temperatures.

a. Press the **On/off** key to display the run screen.

b. Rinse the cup and probe with a small volume (10 – 15 mL) of Zobell's solution and discard this rinse solution. (Zobell's solution must be containerized for proper disposal). Refill the calibration cup with approximately 60 mL of Zobell's solution, ensuring that the calibration cup is sufficiently filled and covering the probe.

c. Allow for temperature equilibration before proceeding. When the temperature and ORP readings show no significant change for approximately 30 seconds, the meter is ready to calibrate.

d. Press the **Escape** key and highlight the **Calibrate** selection with the arrow keys. Press **Enter**. Use the arrow keys to highlight **ORP** and press **Enter**.

e. With the ORP calibration screen displayed, enter the mV value from the green calibration reference sheet (*Zobell's Calibration Check Standard Values*) for Zobell's solution at the observed temperature (in °C) and press **Enter.**

f. Confirm that the temperature and the Zobell's solution value are correct and press **Enter**. Because the meter and probe are set to recognize the calibration as ORP, the meter will display the following message: "**Out of range, accept anyway? Yes or No**". Select "**Yes**" and press **Enter**. The measurement displayed is Eh (in mV).

g. Record the temperature and Eh values on the calibration form, ensuring that the Eh reading is within the acceptance window for that temperature. If the Eh value is out of the acceptance range following calibration, repeat the calibration using a new standard. If the Eh value is still out of range following recalibration, the Eh probe may need to be reconditioned.

h. Rinse the sonde with deionized water, containerizing all rinse water. The calibration standard may be saved for later use for calibration verification checks or containerized for proper disposal.

i. Calibration of the Eh probe should be verified every 4 hours and at the end of each day using Zobell's solution. If the calibration verification value falls outside the acceptance window, repeat the check using a new standard. If the check is still outside the acceptance window, check the condition of the probe, clean if necessary and recalibrate prior to any further sample measurements.

E. Sample Analysis using In-line Flow-through Cell

Air in the flow-cell will affect the readings, especially specific conductance and DO. To help prevent air in the flow cell, elevate the sonde end of the flow cell to allow any air bubbles to escape. Install the sonde so that the conductivity sensor vent is facing upward when the sonde and flow cell are oriented horizontally. In addition, ensure that all fittings/connections are tight to eliminate potential for air leaking into the system.

If the initial purge water is silty, continue pumping until the discharge water clears before taking in-line measurements.

1. Connect the 3/8" OD Tygon inflow tubing from the pump to the in-port on the flow cell, and the other end of the inflow tubing to the pump. Connect the 1/2" OD Tygon discharge tubing to the out-port of the flow cell; the other end of the outflow tubing may discharge to ground or into an appropriate receptacle if purge water must be containerized. Refer to the project work plan for purge water disposal requirements.

2. Power on the instrument and check the display for readings.

3. Start the sampling pump and check for leaks in the discharge lines or flow-through cell. If leaking is observed, stop the pump and repair the leak.

4. Examine the flow-through cell to determine whether discharge water is entering and exiting the cell properly. Once the air is purged from the pump and discharge hoses, the flow-through cell should be completely filled with water and a steady flow of water should be exiting the outflow line from the cell. Record the initial meter readings on the field form.

5. Continue pumping until the readings stabilize. When low flow sampling, field parameters should be recorded every 3 to 5 minutes until stabilization has been achieved. Record the value for each field parameter on the field form, checking that the units displayed for each parameter are as noted on the field form.

6. Once stabilization of the field parameters has been achieved, disconnect the flow cell inflow tubing from the pump tubing and fill the appropriate sample containers. Samples for laboratory analysis should never be collected from water passing through the flow cell.

7. When sample collection is complete, remove the suite of probes from the flow-through cell and rinse the probes, flow-through cell, and inflow and outflow lines well with deionized water.

8. Attach storage/calibration cup and cap with a wet sponge or trace of tap water inside to keep the probes in a humid environment.

F. Sample Analysis using Calibration Cup

1. Screw the calibration cup onto the multiprobe unit and rinse 2 – 3 times with deionized water.

2. With the sensors pointing up, remove the cap and discard the rinse water. Rinse the sensors twice with a small volume of the sample to be measured and discard the rinse.

3. Fill the cup with the sample to be tested. The multiprobe should be completely immersed.

4. Allow 1 - 3 minutes for the readings to stabilize and record.

5. Repeat Steps F.1 – F.4 for each sample to be measured.

G. Electrode Storage

1. Short term storage

For short term storage, all sensors on the instrument require a moist environment. Immersion of the probes can cause drift or result in shorter sensor lifetime, so store the sensors installed in the sonde with 1/2" of tap water or moistened sponge inside the sealed calibration cup. *Do not store directly in water.*

2. Long term storage

a. Dissolved Oxygen Probe

Remove the sensor, following the instructions provided in the YSI instrument manual. Store the sensor in water with the membrane in place. The membrane cap and KCl solution must be replaced prior to use.

b. Temperature/Conductivity Probe

The temperature/conductivity probe has no special storage requirements; it may be stored wet or dry. The probe should be cleaned thoroughly prior to storage.

c. pH/Eh Probe

Remove the sensor from the sonde, following the instructions provided in the YSI instrument manual. Store the probe in 2M KCl solution in the pH/ORP sensor storage bottle. Insert a port plug into the vacant port on the sonde to keep the electrical connector dry.

H. Electrode Maintenance

1. Dissolved Oxygen Probe

If the DO sensor will not hold a calibration or if gas bubbles appear under the membrane, the membrane cap may need to be changed.

a. Unscrew the old membrane cap and discard.

b. Rinse the sensor tip with DI water and wipe gently with a Kimwipe.

c. Fill a new membrane cap half full with prepared KCl electrolyte and screw the cap onto the sensor tip. The tip should just be tightened so that there are no bubbles visible under the membrane. A small amount of electrolyte should overflow.

d. Rinse the sensor with DI water and proceed with the calibration sequence.

Periodic cleaning of the silver anode and the gold cathode may be necessary. Refer to the YSI instrument manual for these specific procedures.

2. Temperature/Conductivity Probe

Clean the conductivity portion of the electrode with the small brush provided in the maintenance kit. Wet the brush with a Liquinox solution and insert it into each hole 15- 20 times. Rinse well with clean tap water, followed by a deionized water rinse. The temperature portion of the sensor requires no maintenance.

3. pH/Eh Probe

Gently clean the bulb area with a very soft brush or cotton swab and a Liquinox soap solution when coated with oil, sediment, or biological growth is observed. Rinse well with clean tap water, followed by a deionized water rinse.

If the pH is out of range after calibration, the pH probe may need to be reconditioned. Soak the probe in pH 4 buffer for 2 hours and retry the calibration.

If rehydration of the electrode junction is required, soak the probe in 2M KCl solution for eight hours.

Zobell's Calibration Check Standard Values

Temperature (°C)	mV (vs Ag-AgCl electrode)	Acceptance Range (mV)
0	460.5	450.5 - 470.5
1	459.2	449.2 - 469.2
2	457.9	447.9 - 467.9
3	456.6	446.6 - 466.6
4	455.3	445.3 - 465.3
5	454.0	444.0 - 464.0
6	452.7	442.7 - 462.7
7	451.4	441.4 - 461.4
8	450.1	440.1 - 460.1
9	448.8	438.8 - 458.8
10	447.5	437.5 - 457.5
11	446.2	436.2 - 456.2
12	444.9	434.9 - 454.9
13	443.6	433.6 - 453.6
14	442.3	432.3 - 452.3
15	441.0	431.0 - 451.0
16	439.7	429.7 - 449.7
17	438.4	428.4 - 448.4
18	437.1	427.1 - 447.1
19	435.8	425.8 - 445.8
20	434.5	424.5 - 444.5
21	433.2	423.2 - 443.2
22	431.9	421.9 - 441.9
23	430.6	420.6 - 440.6
24	429.3	419.3 - 439.3
25	428.0	418.0 - 438.0
26	426.7	416.7 - 436.7
27	425.4	415.4 - 435.4
28	424.1	414.1 - 434.1
29	422.8	412.8 - 432.8
30	421.5	411.5 - 431.5
31	420.2	410.2 - 430.2
32	418.9	408.9 - 428.9
33	417.6	407.6 - 427.6
34	416.3	406.3 - 426.3
35	415.0	405.0 - 425.0

Oxygen Solubility Values (Fresh Water)

Temperature (°C)	DO Solubility (mg/L)
0	14.62
1	14.22
2	13.83
3	13.46
4	13.11
5	12.77
6	12.45
7	12.14
8	11.84
9	11.56
10	11.29
11	11.03
12	10.78
13	10.54
14	10.31
15	10.08
16	9.87
17	9.67
18	9.47
19	9.28
20	9.09
21	8.92
22	8.74
23	8.58
24	8.42
25	8.26
26	8.11
27	7.97
28	7.83
29	7.69
30	7.56
31	7.43
32	7.31
33	7.18
34	7.07
35	6.95

Water Level Measurement – Electric Tape Method
11/20/1996; revised 08/31/2017

Scope: This SOP describes water level measurement using an electric tape. Data from these measurements are used to establish groundwater flow direction and gradients, and when used in conjunction with total well depth measurements, to determine the volume of water in a well casing prior to purging during groundwater sampling.

Equipment: Water level meter, QED Sample Pro® Model 6000 or Solinst Model 101
Paper toweling
Spray bottle of Liquinox® soap solution
Spray bottle of deionized, organic-free rinse water
Field notebook

Procedure:

1. Before each use, check the meter and tape for obvious damage.
2. Wash the tape with the soap solution and rinse well with deionized water prior to each measurement.
3. Verify the well location and record the date and time in the field notes. Remove the lock and carefully uncap the well to avoid introducing foreign material into the well. Allow the well to vent and equilibrate with the atmosphere prior to measurement.
4. Using the test button, verify that the audio response and the visual indicator are both operating.
5. Lower the probe into the well slowly until the audio or visual response is activated. The depth to water should be measured from the reference point marked at the top of the innermost well casing. If a reference point has not been marked at the top of casing (TOC), the reference point should be assumed to be at the top of the innermost casing on the north side of the casing. If the TOC cannot be seen, pinch the point on the tape at the well reference point with your fingers and record that measurement. Raise and lower the probe several times to obtain an accurate measurement.
6. Record the measurement where audio/visual response is activated to the nearest 0.01 foot. (See Figure 1).
7. Slowly rewind the tape onto the reel. When the tape and probe are out of the well, turn off the water level meter and decontaminate the tape and probe with the soap solution followed by a deionized water rinse.
8. Recap and lock the well.
9. Calculate the groundwater elevation using the following equation:
   - Water Elevation, feet (ft) mean sea level (msl) = (Reference Elevation, ft) – (Depth to water, ft)

Figure 1 – Static Water Level Documentation Form

STATIC WATER LEVEL DOCUMENTATION

Project Name: ______________________
Project Number: ______________________
Site Location: ______________________

Date	Time	Well Number	TOC Elevation (ft)	Depth to Water from TOC (ft)	Groundwater Elevation (ft)	Remarks

Completed by: ______________________ (signature)

______________________ (date)

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ENVIRONMENTAL SERVICES DIVISION
STANDARD OPERATING PROCEDURE **SOP 10-14**

Groundwater Sampling Procedure for Per and Polyfluoroalkyl (PFAs)
1/4/2019

Scope: The procedures outlined in this SOP are intended to provide instructions for groundwater sampling activities at monitoring well locations where PFAs contamination is suspected and is to be evaluated at a screening level. While USEPA Method 537 provides basic guidelines for PFAs in drinking water, precautionary procedures have been added to this document to avoid cross contamination when collecting groundwater or drinking water samples. Field personnel should carefully follow the steps described here and use the provided checklists to avoid cross contamination of the samples. Field personnel should also consult the project work plan for additional information.

Discussion: Per and Polyfluoroalkyl (PFAs) are a large group of synthetic fluorine-containing chemicals with unique properties. Perfluorooctane sulfonate (PFOS) and Perfluorooctanoic acid (PFOA) are the only PFAS currently regulated by U.S. EPA and MDEQ and in the past they were used in a wide variety of industrial and commercial products such as textiles, leathers, aqueous film forming foams (AFFF) (which may still be used in emergency scenarios), metal plating, semi-conductors, paper and food packaging, coating additives, cleaning products and pesticides. Well-known PFAs products are Teflon™, which is used in non-stick cookware, Gore-Tex® textiles, Stainmaster® carpets, and Scotchgard™. Further, PFOA and PFOS can also be created by the biotransformation of some fluorinated telomers (i.e., precursor compounds) used in firefighting foams and other surface protection products.

PFAS are very resistant to breakdown, migrate easily, and accumulate in the food chain. As a result, they may be found throughout the environment in groundwater, surface water, soil, and air, as well as in food, breast milk, and human blood serum. While PFAs persistence, bioaccumulation, and ecological toxicity have been proved, their human toxicity is still uncertain.

Sampling for PFAs should be considered at locations where the following activities may have occurred: facilities where PFAs have been manufactured or used; metal coating and plating facilities; former or current DoD sites; facilities storing firefighting foams and firefighting training areas; landfills where leaching of PFAs resulted in contamination to soil and groundwater; and large rail yards. The need to sample soil, groundwater, surface water, sediment, or drinking water for PFAS will depend on case-specific conditions and the disposal site Conceptual Site Model.

Because of the potential presence of PFAs in common consumer products and in equipment typically used to collect soil, groundwater, surface water, sediment, and drinking water samples as well as the need for very low reporting limits, special handling and care must be taken when collecting samples for PFAs analysis to avoid sample contamination.

Equipment:
Pump (Bladder or Peristaltic)
Portable Bladder Pump (Bladder Sampling Only)
Bladder Controller (Bladder Sampling Only)
Nitrogen Gas Cylinder (Bladder Sampling Only)
Flowcell for field parameter measurements
Turbidimeter and calibration kit
Electric water level meter

New High-Density Polyethylene (HPDE) tubing (if location not previously sampled for PFAs)
New Masterflex® silicone tubing (if location not previously sampled for PFAs)
Stop watch
Graduated cylinder
Polyethylene bucket, 5-gallon
Decontamination supplies
PFA-free sampling bottles
Powderless nitrile gloves
Sample labels and bags (for bagging samples bottles and collect sampling waste)
Ink pen for sample labels (no permanent markers)
Cooler containing PFAs-free ice packs
Field notebook

Field gear: Clothing: natural fibers (preferably cotton), laundered without the use of fabric softener (a minimum of 6 times from time of purchase).
Footwear: steel-toed boots made with polyurethane and polyvinyl chloride (PVC).
Disposable nitrile gloves

Field equipment, clothing and personal protective equipment

Field Equipment	
Prohibited	**Acceptable**
Teflon® containing materials	HDPE materials
Low density polyethylene (LDPE) materials	Acetate Liners
	Silicon Tubing
Waterproof field books	Loose paper (non-waterproof)
Plastic clipboards, binders, or spiral hard cover notebooks	Aluminum field clipboards or with Masonite
Sharpies®	Pens
Post-It Notes®	
Chemical (blue) ice packs	Regular ice or certified PFA
Equipment Decontamination	
Prohibited	**Acceptable**
Decon 90®	Alconox® and/or Liquinox®
Sample Containers	
Prohibited	**Acceptable**
LDPE or glass containers	HDPE or polypropylene
Teflon-lined caps	Unlined polypropylene caps
Field Clothing and PPE	
Prohibited	**Acceptable**
New cotton clothing or synthetic water resistant, waterproof, or stain-treated clothing, clothing containing Gore-Tex™	Well-laundered clothing made of natural fibers (preferably cotton)
Clothing laundered using fabric softener	No fabric softener

Boots containing Gore-Tex™	Boots made with polyurethane and PVC
Tyvek®	Cotton clothing
No cosmetics, moisturizers, hand cream, or other related products as part of personal cleaning/showering routine on the morning of sampling	Sunscreens - Alba Organics Natural Sunscreen, Yes To Cucumbers, Aubrey Organics, Jason Natural Sun Insect Repellents - Jason Natural Quit Bugging Me, Repel Lemon Eucalyptus Insect repellant, Herbal Armor, California Baby Natural Bug Spray, BabyGanics Sunscreen and insect repellant - Avon Skin So Soft Bug Guard Plus – SPF 30 Lotion
Rain Events	
Prohibited	**Acceptable**
Waterproof or resistant rain gear	Gazebo tent that is only touched or moved prior to and following sampling activities
Food Considerations	
Prohibited	**Acceptable**
All food and drink, with exceptions noted on right	Bottled water and hydration fluids (i.e, Gatorade® and Powerade®) to be brought and consumed only in the staging areas
Fast food wrappers and containers and pre-wrapped foods and snacks (chocolate bars, energy bars, granola bars, potato chips, etc.)	Use rigid plastic container or bags or stainless-steel containers for all food brought to site

Reference: USEPA Method 537
(https://cfpub.epa.gov/si/si_public_file_download.cfm?p_download_id=525468)

Navy Field Sampling Protocols for PFASs
(http://www.secnav.navy.mil/eie/Documents/15-12-24-BUMED-PFAS-Memo-Signed-w-Enclosures.pdf)

Interim Guideline on the Assessment and Management of Perfluoroalkyl and, Polyfluoroalkyl Substances (PFAS), Department of Environment Regulation, Western Australia, 2016.
(https://www.der.wa.gov.au/images/documents/your-environment/contaminated-sites/guidelines/Guideline-on-Assessment-and-Management-of-PFAS-.pdf)

FTCH Standard Operating Procedure SOP 10-01

FTCH Standard Operating Procedure SOP 10-03

FTCH Standard Operating Procedure SOP 10-02

FTCH Standard Operating Procedure SOP 10-06

FTCH Standard Operating Procedure SOP 10-07

FTCH Standard Operating Procedure SOP 10-09

FTCH Standard Operating Procedure SOP 10-11

FTCH Standard Operating Procedure SOP 11-08

FTCH Standard Operating Procedure SOP 11-10

Procedure:

1. Determine the order in which the wells should be sampled. Typically, sampling order should proceed from the cleanest well to the most contaminated. When no historical water quality data are available, sample background wells first, followed by the farthest downgradient wells. The wells expected to be most significantly contaminated should be sampled last. Sampling order is not as critical when a peristaltic pump is used as the pump tubing may be dedicated to the well location or replaced after each use.
2. Wash and dry hands (use PFAS-free deionized water and Liquinox solution for this purpose). Don powderless nitrile gloves. Disposable nitrile gloves must be worn at all times. A new pair of nitrile gloves should be donned prior to decontamination of re-usable sampling equipment, contact with sample bottles, completion of well purging, prior to sample collection, after handling of any non-dedicated sampling equipment, contact with non-decontaminated surfaces, or when judged necessary by field personnel.
3. Calibrate field measurement equipment as required by the project work plan.
4. Record the condition of the monitoring well in the field notes. Additional information may be required for documentation before, during, and after groundwater sampling. Refer to the project-specific work plan and SOP 10-03 for additional information.
5. Determine static water level using SOP 18-04 and record data in the field notebook. Every effort should be made to minimize disturbances of the stagnant water column during water level measurement.

   Water levels are measured prior to and during a groundwater sampling event for the following reasons:

   a. To assess whether the static water elevation is sufficient to allow purging and sampling after groundwater drawdown has stabilized.

   b. To select the depth to which the pump intake or other purging or sampling device should be lowered.

   c. To monitor the water level during purging and sampling and determine the optimum pumping rate to minimize drawdown.

   d. To determine groundwater flow direction.
6. Check condition of tubing before proceeding. If uncertain tubing is HDPE, then replace. If tubing appears to be old, friable, heavily stained, then replace.
7. If using a peristaltic pump, connect designated tubing to pump and adjust down hole tubing to desired screen depth using the steps described on FTCH SOP 10-02.

If using a bladder pump, remove existing tubing carefully and coil to prevent contact with ground (dirt, grass, debris, etc.). Connect tubing to pump and lower carefully into well to desired screen depth using SOP 10-02.

8. When purging wells screened in low-permeability formations (<0.1 L/min recharge), be cautious to not draw the water column below top of well screen. Introducing atmospheric conditions to the screened area has in some situations had adverse effects on water chemistry, biological activity, and even filter pack properties. Select a purging rate that results in minimum drawdown while allowing the well to be purged in a reasonable length of time. Refer to historical field sampling notes if available.

   Record purge start time in the field notebook. Monitor and record the water level and pumping rate every 3 – 5 minutes (or as appropriate) during purging. Use a plastic graduated cylinder or beaker to monitor the pumping rate and a 5-gallon bucket to monitor the volume of water purged. Dispose of purge water in accordance with the project work plan. Record any pumping rate adjustments on the sample collection form.

   During pump start-up, drawdown may exceed the 0.3 ft. target and then recover as the pump flow adjustments are made. Purge volume calculations should utilize the stabilized drawdown value, not the initial drawdown.

9. Pending clarity/aesthetics of water initially purged, connect tubing discharge end to the flow cell. Adjust flow from the spigot to not more than 0.5 liters per minute. Record values for pH, Eh, dissolved oxygen temperature and turbidity at approximately 3-minute intervals until parameter values indicate stability. While pH, Eh, dissolved oxygen, and turbidity are recorded for monitoring stability, temperature is only recorded but not used as an indicator for formation water. See FTCH SOP 10-02 and 11-10 for stabilization parameters and flow cell operation. If allowed, a minimum of 5 liters of water should be purged from the sample point prior to sampling. Complete and sign the groundwater collection sheet.

10. Once field parameters have stabilized or 45 minutes has lapsed from purge start. Disconnect tubing discharge end from flowcell. Collect all other water samples prior to PFAs samples following FTCH SOP 10-01, 10-10, 10-11.

11. Change nitrile gloves. For each sample location, typically two bottles of well water shall be collected. Volume collected may vary among laboratories. Fill the sample bottle to the shoulder. Cap the sample bottle when full.

12. Place sample bottle labels on the sample bottles. Time/date and initial the sample bottle labels. Sample bottle labels will be completed using pen (no markers) after caps have been placed and tightened on each bottle.

13. Sealed labeled bottles should be double bagged and placed in cooler containing ice. The samples must be kept sealed, double bagged, and on ice from time of collection and shipment until extraction.

14. Complete the chain of custody.

15. Disconnect tubing from peristaltic pump. Remove electric water level meter probe from well and re-insert tubing as initially found. Lock/Bolt down well cover.

    If using bladder pump, disconnect nitrogen line from bladder tubing. Remove electric water level meter probe from well. Remove bladder tubing/bladder pump from well to disconnect pump. Re-insert tubing as initially found and lock/Bolt down well cover. Decontaminate bladder pump and other equipment in accordance to FTCH SOP 10-01.

16. Remove nitrile gloves and wash hands (use di water and Liquinox solution for this purpose). Place gloves and associated solid wastes in a zip lock bag for disposal at FTCH.
17. Transport samples back to FTCH for packing and shipment to the appropriate analytical laboratory.

Sample shipment and storage:

Samples must be chilled during shipment and must not exceed 10 °C during the first 48 hours after collection. All samples must be sent for priority next day delivery and cannot be shipped on Fridays.

ENVIRONMENTAL SERVICES DIVISION
STANDARD OPERATING PROCEDURE — SOP 10-15

Residential Well Sampling Procedure for Per and Polyfluoroalkyl (PFAs)
10/24/2017; revised 10/31/2017

Scope: The procedures outlined in this SOP are intended to provide instructions for water sampling activities at residential locations where PFAs contamination is suspected and is to be evaluated at a screening level. While USEPA Method 537 provides basic guidelines for PFAs in drinking water, precautionary procedures have been added to this document to avoid cross contamination when collecting groundwater or drinking water samples. Field personnel should carefully follow the steps described here and use the provided checklists to avoid cross contamination of the samples. Field personnel should also consult the project work plan for additional information.

Discussion: Per and Polyfluoroalkyl (PFAs) are a large group of synthetic fluorine-containing chemicals with unique properties. Perfluorooctane sulfonate (PFOS) and Perfluorooctanoic acid (PFOA) are the most common PFAs used in a wide variety of industrial and commercial products such as textiles, leathers, aqueous film forming foams (AFFF), metal plating, semi-conductors, paper and food packaging, coating additives, cleaning products and pesticides. Well-known PFAs products are Teflon™, which is used in non-stick cookware, Gore-Tex® textiles, Stainmaster® carpets, and Scotchgard™. Further, PFOA and PFOS can also be created by the biotransformation of some fluorinated telomers (i.e., precursor compounds) used in firefighting foams and other surface protection products.

PFAS are very resistant to breakdown, migrate easily, and accumulate in the food chain. As a result, they may be found throughout the environment in groundwater, surface water, soil, and air, as well as in food, breast milk, and human blood serum. While PFAs persistence, bioaccumulation, and ecological toxicity have been proved, their human toxicity is still uncertain.

Sampling for PFAs should be considered at locations where the following activities may have occurred: facilities where PFAs have been manufactured or used; metal coating and plating facilities; former or current DoD sites; facilities storing firefighting foams and firefighting training areas; landfills where leaching of PFAs resulted in contamination to soil and groundwater; and large rail yards. The need to sample soil, groundwater, surface water, sediment, or drinking water for PFAS will depend on case-specific conditions and the disposal site Conceptual Site Model.

Because of the potential presence of PFAs in common consumer products and in equipment typically used to collect soil, groundwater, surface water, sediment, and drinking water samples as well as the need for very low reporting limits, special handling and care must be taken when collecting samples for PFAs analysis to avoid sample contamination.

Equipment:
Flowcell for field parameter measurements
Turbidimeter and calibration kit
Spigot adapter and high-density polyethylene (HPDE) food-grade tubing
Stop watch
Graduated cylinder
Polyethylene bucket, 5-gallon
Decontamination supplies
PFA-free sampling bottles

Sample labels and bags (for bagging samples bottles and collect sampling waste)
Cooler containing PFAs-free ice packs
Field notebook

Field gear: Clothing: natural fibers (preferably cotton), laundered without the use of fabric softener (a minimum of 6 times from time of purchase).
Footwear: steel-toed boots made with polyurethane and polyvinyl chloride (PVC).
Disposable nitrile gloves

Field equipment, clothing and personal protective equipment

Field Equipment	
Prohibited	**Acceptable**
Teflon® containing materials	HDPE materials
Low density polyethylene (LDPE) materials	Acetate Liners
	Silicon Tubing
Waterproof field books	Loose paper (non-waterproof)
Plastic clipboards, binders, or spiral hard cover notebooks	Aluminum field clipboards or with Masonite
Sharpies®	Pens
Post-It Notes®	
Chemical (blue) ice packs	Regular ice or certified PFA
Equipment Decontamination	
Prohibited	**Acceptable**
Decon 90®	Alconox® and/or Liquinox®
Sample Containers	
Prohibited	**Acceptable**
LDPE or glass containers	HDPE or polypropylene
Teflon-lined caps	Unlined polypropylene caps
Field Clothing and PPE	
Prohibited	**Acceptable**
New cotton clothing or synthetic water resistant, waterproof, or stain-treated clothing, clothing containing Gore-Tex™	Well-laundered clothing made of natural fibers (preferably cotton)
Clothing laundered using fabric softener	No fabric softener
Boots containing Gore-Tex™	Boots made with polyurethane and PVC
Tyvek®	Cotton clothing
No cosmetics, moisturizers, hand cream, or other related products as part of personal cleaning/showering routine on the morning of sampling	Sunscreens - Alba Organics Natural Sunscreen, Yes To Cucumbers, Aubrey Organics, Jason Natural Sun Insect Repellents - Jason Natural Quit Bugging Me, Repel Lemon Eucalyptus Insect repellant, Herbal Armor, California Baby Natural Bug Spray, BabyGanics Sunscreen and insect repellant - Avon Skin So Soft Bug Guard Plus – SPF 30 Lotion

Rain Events	
Prohibited	**Acceptable**
Waterproof or resistant rain gear	Gazebo tent that is only touched or moved prior to and following sampling activities
Food Considerations	
Prohibited	**Acceptable**
All food and drink, with exceptions noted on right	Bottled water and hydration fluids (i.e, Gatorade® and Powerade®) to be brought and consumed only in the staging areas
Fast food wrappers and containers and pre-wrapped foods and snacks (chocolate bars, energy bars, granola bars, potato chips, etc.)	Use rigid plastic container or bags or stainless steel containers for all food brought to site

Reference: USEPA Method 537 (https://cfpub.epa.gov/si/si_public_file_download.cfm?p_download_id=525468)

Navy Field Sampling Protocols for PFASs (http://www.secnav.navy.mil/eie/Documents/15-12-24-BUMED-PFAS-Memo-Signed-w-Enclosures.pdf)

Interim Guideline on the Assessment and Management of Perfluoroalkyl and, Polyfluoroalkyl Substances (PFAS), Department of Environment Regulation, Western Australia, 2016. (https://www.der.wa.gov.au/images/documents/your-environment/contaminated-sites/guidelines/Guideline-on-Assessment-and-Management-of-PFAS-.pdf)

Standard Operating Procedure (SOP) for Household and Community Water Sampling (Baseline and Follow-up Study) (https://data.lib.vt.edu/downloads/j67313767)

FTCH Standard Operating Procedure SOP 10-02

FTCH Standard Operating Procedure SOP 11-10

Procedure:

1. Introduce yourself to the resident and briefly explain the purpose for collecting the water sample. Ask the property owner for permission to proceed with sampling. If resident agrees, confirm that agreement has been read, signed, and returned to FTCH via email, and that payment has occurred (or receive form of payment from resident - check nominated to FTCH). If the resident refuses, or payment is not made, express your apologies and leave the residence.

2. Locate the outside spigot(s) indicated on the authorization form and confirm with the resident that they are okay with the selected sampling location. Confirm that the spigot provides cold, untreated water. Complete as much of the paperwork (labels, water collection form and chain of custody) as possible before initiating any sampling activities.

3. Wash and dry hands (use di water and Liquinox solution for this purpose). Don nitrile gloves. Disposable nitrile gloves must be worn at all times. A new pair of nitrile gloves should be donned prior to

decontamination of re-usable sampling equipment, contact with sample bottles, completion of well purging, prior to sample collection, after handling of any non-dedicated sampling equipment, contact with non-decontaminated surfaces, or when judged necessary by field personnel.

4. Install the spigot adapter and sample tubing on the spigot.
5. Connect tubing from the spigot adapter to the flow cell. Adjust flow from the spigot to not more than 0.5 liters per minute. Record values for pH, Eh, dissolved oxygen temperature and turbidity at approximately 3 minute intervals until parameter values indicate stability. While pH, Eh, dissolved oxygen, and turbidity are recorded for the purpose of monitoring stability, temperature is only recorded but not used as an indicator for formation water. See FTCH SOP 10-02 and 11-10 for stabilization parameters and flow cell operation. A minimum of 5 liters of water should be purged from the sample point prior to sampling. Complete and sign the groundwater collection sheet.
6. Remove the spigot adapter. Purge water can be disposed of on the ground.
7. Change nitrile gloves. For each sample location, two 60-milliliter bottles of well water shall be collected. Decrease the flow rate if necessary to prevent overfilling. Fill the sample bottle to the shoulder. Cap the sample bottle when full.
8. Place sample bottle labels on the sample bottles. Time/date and initial the sample bottle labels. Sample bottle labels will be completed using pen (no markers) after caps have been placed and tightened on each bottle.
9. Sealed labeled bottes should be double bagged and placed in cooler containing PFAs-free ice packs. The samples must be kept sealed and double bagged from time of collection and shipment until extraction.
10. Complete the chain of custody.
11. Remove nitrile gloves and wash hands (use di water and Liquinox solution for this purpose). Place gloves and associated solid wastes in a zip lock bag for disposal at FTCH. It is important not leave any sampling supplies behind in the household.
12. Thank the resident.
13. Transport samples back to FTCH for packing and shipment to the appropriate analytical laboratory.

Sample shipment and storage:

Samples must be chilled during shipment and must not exceed 10 °C during the first 48 hours after collection. All samples must be sent for priority next day delivery, and cannot be shipped on Fridays.

Appendix 2

Water Well And Pump Record

Completion is required under authority of Part 127 Act 368 PA 1978.
Failure to comply is a misdemeanor.

Wellogic

Import ID:

Tax No: | **Permit No:** | **County:** Kent | **Township:** Ada

Town/Range: 10N 11W | **Section:** 36 | **Well Status:** Active | **WSSN:** | **Source ID/Well No:**

Well ID: 41000015750

Elevation: 850 ft.
Latitude: 43.205849
Longitude: -85.568235
Method of Collection: Interpolation-Map

Distance and Direction from Road Intersection:
.25 MILE EAST OF WHITE CREEK ON NORTH SIDE OF 16 MILE ROAD

Well Owner: BOB & JOYCE KELLEY

Well Address:
4107 16 MILE RD
CEDAR SPRINGS, MI 49319

Owner Address:
4107 16 MILE RD
CEDAR SPRINGS, MI 49319

Drilling Method: Rotary
Well Depth: 125.00 ft. **Well Use:** Household
Well Type: Replacement **Date Completed:** 5/6/2004

Casing Type: PVC plastic **Height:**
Casing Joint: Unknown
Casing Fitting: None

Diameter: 5.00 in. to 125.00 ft. depth

Borehole: 8.50 in. to 125.00 ft. depth

Pump Installed: Yes **Pump Installation Only:** No
Pump Installation Date: **HP:** 0.50
Manufacturer: Berkeley **Pump Type:** Submersible
Model Number: 10KT051215 **Pump Capacity:** 10 GPM
Drop Pipe Length: 65.00 ft. **Pump Voltage:**
Drop Pipe Diameter: **Drilling Record ID:**
Draw Down Seal Used: No

Pressure Tank Installed: Yes
Pressure Tank Type: Unknown
Manufacturer: Well-Rite-Flexcon
Model Number: WR-120 **Tank Capacity:** 33.0 Gallons
Pressure Relief Valve Installed: No

Static Water Level: 12.00 ft. Below Grade
Well Yield Test: **Yield Test Method:** Air
Pumping level 80.00 ft. after 2.00 hrs. at 50 GPM

Formation Description	Thickness	Depth to Bottom
Sand	21.00	21.00
Sand Water Bearing	6.00	27.00
Gray Clay	68.00	95.00
Gray Sand & Clay	16.00	111.00
Sand Water Bearing	14.00	125.00

Screen Installed: Yes **Filter Packed:** Yes
Screen Diameter: 5.00 in. **Blank:**
Screen Material Type: PVC-slotted
Screen Installation Type: Attached

Slot	Length	Set Between
15.00	10.00 ft.	115.00 ft. and 125.00 ft.

Fittings: None

Well Grouted: Yes **Grouting Method:** Unknown

Grouting Material	Bags	Additives	Depth
Bentonite slurry	14.00	None	0.00 ft. to 115.00 ft.

Geology Remarks:

Wellhead Completion: Pitless adapter

Drilling Machine Operator Name: JOHN SCHMID
Employment: Employee

Nearest Source of Possible Contamination:

Type	Distance	Direction
Septic tank	100 ft.	West

Contractor Type: Water Well Drilling Contractor **Reg No:** 41-1561
Business Name: TRI NORTHERN WELL DRILLING
Business Address:

Abandoned Well Plugged: Yes

Casing Diameter: 1.25 in. **Casing Removed:** No
Plugging Material: Bentonite chips/pellets
No. of Bags: 0.50 **Well Depth:** 25 ft.

Water Well Contractor's Certification

This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor **Date**

General Remarks: GROUT TO BOTTOM OF WATER LINE; GROUT WEIGHT 9.5
Other Remarks:

Water Well And Pump Record

Completion is required under authority of Part 127 Act 368 PA 1978.
Failure to comply is a misdemeanor.

Wellogic

Import ID:

Tax No:	**Permit No:** W-12-41-0005	**County:** Kent	**Township:** Solon

Well ID: 41000023662

Elevation:

Latitude: 43.20562

Longitude: -85.56734

Method of Collection: GPS Std Positioning Svc SA Off

Town/Range:	**Section:**	**Well Status:**	**WSSN:**	**Source ID/Well No:**
10N 11W	36	Active	2097341	001

Distance and Direction from Road Intersection:

Well Owner: TRUSS TECHNOLOGIES

Well Address:
4141 16 MILE RD NE
CEDAR SPRINGS, MI 49319

Owner Address:
P.O. BOX A
CEDAR SPRINGS, MI 49319

Drilling Method: Rotary
Well Depth: 140.00 ft. **Well Use:** Type II public
Well Type: Replacement **Date Completed:** 8/2/2012

Casing Type: PVC plastic **Height:** 1.00 ft. above grade
Casing Joint: Solvent welded/glued
Casing Fitting: None

Diameter: 5.00 in. to 135.00 ft. depth SDR: 17.00

Borehole: 8.50 in. to 140.00 ft. depth

Pump Installed: Yes **Pump Installation Only:** No
Pump Installation Date: 8/2/2012 **HP:** 1.50
Manufacturer: Grundfos **Pump Type:** Submersible
Model Number: 22SQE15 **Pump Capacity:** 25 GPM
Drop Pipe Length: 80.00 ft. **Pump Voltage:** 230
Drop Pipe Diameter: 1.25 in. **Drilling Record ID:**
Draw Down Seal Used: No

Pressure Tank Installed: Yes
Pressure Tank Type: Diaphragm/bladder
Manufacturer: Well-X-Trol
Model Number: WX 105 **Tank Capacity:** 5.0 Gallons
Pressure Relief Valve Installed: Yes

Static Water Level: 22.00 ft. Below Grade
Well Yield Test: **Yield Test Method:** Air
Pumping level 120.00 ft. after 4.00 hrs. at 40 GPM

Formation Description	Thickness	Depth to Bottom
Clay	9.00	9.00
Sand & Gravel	25.00	34.00
Clay	62.00	96.00
Sand Fine	6.00	102.00
Clay Sandy	21.00	123.00
Clay	3.00	126.00
Sand Coarse	14.00	140.00

Screen Installed: Yes **Filter Packed:** Yes
Screen Diameter: 3.00 in. **Blank:**
Screen Material Type: Stainless steel-wire wrapped
Screen Installation Type: Attached

Slot	Length	Set Between
15.00	5.00 ft.	135.00 ft. and 140.00 ft.

Fittings: Other

Well Grouted: Yes **Grouting Method:** Grout pipe outside casing

Grouting Material	Bags	Additives	Depth
Neat cement	28.00	None	0.00 ft. to 125.00 ft.

Geology Remarks:

Wellhead Completion: Pitless adapter, 12 inches above grade

Drilling Machine Operator Name: CURT SILLIMAN
Employment: Employee
Pump Installer: ED ROBINSON

Nearest Source of Possible Contamination:

Type	Distance	Direction
Storm sewer	45 ft.	North-Northeast

Contractor Type: Water Well Drilling Contractor **Reg No:** 41-2351
Business Name: NORTH KENT WELL & PUMP
Business Address: 6085 17 MILE RD NE, CEDAR SPRINGS, MI, 49319

Abandoned Well Plugged: Yes

Latitude: 43.20564 **Longitude:** -85.56712
Casing Diameter: 4 in. **Casing Removed:** No
Plugging Material: Neat cement
No. of Bags: 16.00 **Well Depth:** 220 ft.

Water Well Contractor's Certification

This well/pump was constructed under my supervision and I hereby certify that the work complies with Part 127 Act 368 PA 1978 and the well code.

Signature of Registered Contractor **Date**

General Remarks: TWO WELL DRILLER'S ATTEMPTS TO REMOVE PUMP WERE UNSUCCESSFUL. PUMP DRIVEN TO TOP OF SCREEN AND WELL GROUTED BACK UP TO SURFACE

Other Remarks: Screen Fittings:BUSHING

Water Well And Pump Record

Completion is required under authority of Part 127 Act 368 PA 1978.
Failure to comply is a misdemeanor.

Import ID:

Tax No:	Permit No:	County: Kent	Township: Solon

Well ID: 41000027759

Elevation:

Latitude: 43.20785

Longitude: -85.56918

Method of Collection: GPS Std Positioning Svc SA Off

Town/Range:	Section:	Well Status:	WSSN:	Source ID/Well No:
10N 11W	36	Active		

Distance and Direction from Road Intersection:
891' NORTH AND 505' WEST FROM INTERSECTION OF 16 MILE RD NE AND WHITE CREEK AVE

Well Owner: MATT BAILEY

Well Address:
13328 WHITE CREEK AVE
CEDAR SPRINGS, MI 49319

Owner Address:
13328 WHITE CREEK AVE
CEDAR SPRINGS, MI 49319

Drilling Method: Rotary
Well Depth: 158.00 ft. **Well Use:** Type III public
Well Type: New **Date Completed:** 4/13/2017

Casing Type: PVC plastic **Height:** 1.00 ft. above grade
Casing Joint: Solvent welded/glued
Casing Fitting: Centralizer

Diameter: 5.00 in. to 138.00 ft. depth SDR: 21.00

Borehole: 8.50 in. to 162.00 ft. depth

Pump Installed: Yes **Pump Installation Only:** No
Pump Installation Date: 1/19/2017 **HP:** 5.00
Manufacturer: Grundfos **Pump Type:** Submersible
Model Number: 77S50-10 **Pump Capacity:** 77 GPM
Drop Pipe Length: 102.00 ft. **Pump Voltage:** 230
Drop Pipe Diameter: 2.00 in. **Drilling Record ID:**
Draw Down Seal Used: No

Pressure Tank Installed: Yes
Pressure Tank Type: Diaphragm/bladder
Manufacturer: Challenger
Model Number: PC66 **Tank Capacity:** 20.0 Gallons
Pressure Relief Valve Installed: Yes

Static Water Level: 13.00 ft. Below Grade
Well Yield Test: **Yield Test Method:** Air
Pumping level 156.00 ft. after 1.00 hrs. at 300 GPM

Formation Description	Thickness	Depth to Bottom
Topsoil	2.00	2.00
Sand & Gravel	31.00	33.00
Gray Clay	92.00	125.00
Sand W/Clay Gray	8.00	133.00
Gray Clay	5.00	138.00
Sand W/Gravel Coarse	24.00	162.00

Screen Installed: Yes **Filter Packed:** Yes
Screen Diameter: 5.00 in. **Blank:**
Screen Material Type: PVC-slotted
Screen Installation Type: Attached

Slot	Length	Set Between
0.15	20.00 ft.	138.00 ft. and 158.00 ft.

Fittings: Coupling

Well Grouted: Yes **Grouting Method:** Grout pipe outside casing

Grouting Material	Bags	Additives	Depth
Bentonite slurry	12.00	None	0.00 ft. to 132.00 ft.

Geology Remarks:

Wellhead Completion: Pitless adapter

Nearest Source of Possible Contamination:

Type	Distance	Direction
Septic tank	98 ft.	West

Drilling Machine Operator Name: JASON BROWN
Employment: Employee
Pump Installer: BRENT WINGER

Contractor Type: Water Well Drilling Contractor **Reg No:** 41-2028
Business Name: Buer Well Drilling Inc
Business Address: 239 E Main St, Caledonia, MI, 49316

Water Well Contractor's Certification

This well and/or pump installation was performed under my registration.

Signature of Registered Contractor **Date**

General Remarks:

Other Remarks:

Water Well And Pump Record

Completion is required under authority of Part 127 Act 368 PA 1978.
Failure to comply is a misdemeanor.

Import ID:

Tax No:	Permit No:	County: Kent	Township: Solon

Well ID: 41000016727

Elevation: 840 ft.
Latitude: 43.207883
Longitude: -85.571841
Method of Collection: Interpolation-Map

Town/Range:	Section:	Well Status:	WSSN:	Source ID/Well No:
10N 11W	35	Active		

Distance and Direction from Road Intersection:
2/10 MI NORTH OF 16 MI RD; 50 YDS WEST OF WHITE CREEK

Well Owner: TAILORED BLDG SYS

Well Address:
13353 WHITE CREEK AVE
Cedar Springs, MI 49319

Owner Address:
550 KIRTLAND ST SW
GRAND RAPIDS, MI 49507

Drilling Method: Rotary
Well Depth: 100.00 ft. **Well Use:** Type III public
Well Type: New **Date Completed:** 9/28/2004

Casing Type: PVC plastic **Height:**
Casing Joint: Unknown
Casing Fitting: None

Diameter: 5.00 in. to 100.00 ft. depth

Borehole: 8.50 in. to 100.00 ft. depth

Pump Installed: Yes **Pump Installation Only:** No
Pump Installation Date: **HP:** 0.50
Manufacturer: Goulds **Pump Type:** Submersible
Model Number: **Pump Capacity:** 12 GPM
Drop Pipe Length: 65.00 ft. **Pump Voltage:**
Drop Pipe Diameter: **Drilling Record ID:**
Draw Down Seal Used: No

Pressure Tank Installed: Yes
Pressure Tank Type: Unknown (Buried)
Manufacturer: Well-X-Trol
Model Number: 202UG **Tank Capacity:** 40.0 Gallons
Pressure Relief Valve Installed: No

Static Water Level: 11.00 ft. Below Grade
Well Yield Test: **Yield Test Method:** Air
Pumping level 65.00 ft. after 2.00 hrs. at 45 GPM

Formation Description	Thickness	Depth to Bottom
Sand & Gravel	34.00	34.00
Gray Clay	55.00	89.00
Sand Water Bearing	11.00	100.00

Screen Installed: Yes **Filter Packed:** Yes
Screen Diameter: 5.00 in. **Blank:**
Screen Material Type: PVC-slotted
Screen Installation Type: Attached

Slot	Length	Set Between
15.00	10.00 ft.	90.00 ft. and 100.00 ft.

Fittings: Unknown

Well Grouted: Yes **Grouting Method:** Unknown

Grouting Material	Bags	Additives	Depth
Bentonite slurry	13.00	None	0.00 ft. to 90.00 ft.

Geology Remarks:

Wellhead Completion: Pitless adapter, 12 inches above grade

Drilling Machine Operator Name: JOHN SCHMID
Employment: Employee

Nearest Source of Possible Contamination:

Type	Distance	Direction
Septic tank	100 ft.	Southeast

Contractor Type: Water Well Drilling Contractor **Reg No:** 41-1561
Business Name: TRI NORTHERN WELL DRLG
Business Address:

Water Well Contractor's Certification

This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor **Date**

General Remarks: GROUT TO BOTTOM OF WATER LINE GROUT WEIGHT 9.5
Other Remarks:

Water Well And Pump Record

Completion is required under authority of Part 127 Act 368 PA 1978.
Failure to comply is a misdemeanor.

Import ID:

Tax No:	Permit No:	County: Kent	Township: Solon

Well ID: 41000029746

Town/Range:	Section:	Well Status:	WSSN:	Source ID/Well No:
10N 11W	35	Active		

Elevation:

Latitude: 43.20889

Longitude: -85.57142

Method of Collection: GPS Std Positioning Svc SA Off

Distance and Direction from Road Intersection: west of white creek

Well Owner: car care center

Well Address: 13399 white creek, cedar springs, MI

Owner Address: 13399 white creek, cedar springs, MI 49307

Drilling Method: Rotary
Well Depth: 122.00 ft. **Well Use:** Household
Well Type: Replacement **Date Completed:** 6/15/2018

Casing Type: PVC plastic **Height:** 1.00 ft. above grade
Casing Joint: Solvent welded/glued
Casing Fitting:

Diameter: 5.00 in. to 117.00 ft. depth SDR: 21.00

Borehole: 8.50 in. to 122.00 ft. depth

Pump Installed: Yes **Pump Installation Only:** No
Pump Installation Date: 7/5/2018 **HP:** 0.50
Manufacturer: AquaDuty **Pump Type:** Submersible
Model Number: 10fb05 **Pump Capacity:** 10 GPM
Drop Pipe Length: 20.00 ft. **Pump Voltage:** 230
Drop Pipe Diameter: 1.00 in. **Drilling Record ID:**
Draw Down Seal Used: No

Pressure Tank Installed: Yes
Pressure Tank Type: Diaphragm/bladder
Manufacturer: Flex-Lite-Flexcon
Model Number: fl-7 **Tank Capacity:** 22.0 Gallons
Pressure Relief Valve Installed: Yes

Static Water Level: 6.00 ft. Below Grade
Well Yield Test: **Yield Test Method:** Air
Pumping level 100.00 ft. after 2.00 hrs. at 50 GPM

Formation Description	Thickness	Depth to Bottom
Sand	36.00	36.00
Clay	78.00	114.00
Sand	14.00	128.00

Screen Installed: Yes **Filter Packed:** Yes
Screen Diameter: 3.00 in. **Blank:**
Screen Material Type: Stainless steel-well point
Screen Installation Type: Attached

Slot	Length	Set Between
18.00	5.00 ft.	117.00 ft. and 122.00 ft.

Fittings: Coupling

Well Grouted: Yes **Grouting Method:** Grout pipe outside casing

Grouting Material	Bags	Additives	Depth
Bentonite slurry	11.00	None	0.00 ft. to 107.00 ft.

Geology Remarks:

Wellhead Completion: Pitless adapter, 12 inches above grade

Drilling Machine Operator Name: glenn merlington
Employment: Employee
Pump Installer: ed robinson

Nearest Source of Possible Contamination:

Type	Distance	Direction
Sanitary sewer	98 ft.	West

Contractor Type: Water Well Drilling Contractor **Reg No:** 41-2351
Business Name: North Kent Well and Pump Inc
Business Address: 6085 17 Mile Road, Cedar Springs, MI, 49319

Abandoned Well Plugged: Yes

Latitude: 43.20895 **Longitude:** -85.57144
Casing Diameter: 4 in. **Casing Removed:** No
Plugging Material: Bentonite chips/pellets
No. of Bags: 4.00 **Well Depth:** 31 ft.

Water Well Contractor's Certification

This well and/or pump installation was performed under my registration.

Signature of Registered Contractor **Date**

General Remarks:

Other Remarks:

Water Well And Pump Record

Completion is required under authority of Part 127 Act 368 PA 1978.
Failure to comply is a misdemeanor.

Wellogic

Import ID: 41101136007

Tax No:	**Permit No:**	**County:** Kent	**Township:** Solon

Well ID: 41000007463

Elevation: 839 ft.
Latitude: 43.210330735
Longitude: -85.570752393
Method of Collection: Interpolation-Map

Town/Range:	**Section:**	**Well Status:**	**WSSN:**	**Source ID/Well No:**
10N 11W	36			

Distance and Direction from Road Intersection:

Well Owner: BLAKE, THOMAS

Well Address:
13470 WHITE CRK AVE
CEDAR SPRINGS, MI 49319

Owner Address:
13470 WHITE CRK AVE
CEDAR SPRINGS, MI 49319

Drilling Method: Cable Tool
Well Depth: 122.00 ft. **Well Use:** Other
Well Type: Replacement **Date Completed:** 7/9/1977

Casing Type: Unknown **Height:**
Casing Joint: Threaded & coupled
Casing Fitting: Drive shoe

Diameter: 4.00 in. to 116.00 ft. depth

Borehole:

Pump Installed: Yes **Pump Installation Only:** No
Pump Installation Date: **HP:**
Manufacturer: Other **Pump Type:** Submersible
Model Number: **Pump Capacity:** 0 GPM
Drop Pipe Length: 42.00 ft. **Pump Voltage:**
Drop Pipe Diameter: **Drilling Record ID:**
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Relief Valve Installed: No

Static Water Level: 25.00 ft. Below Grade
Well Yield Test: **Yield Test Method:** Unknown
Pumping level 25.00 ft. after 1.00 hrs. at 40 GPM

Formation Description	Thickness	Depth to Bottom
Red Clay	22.00	22.00
Sand Wet/Moist	6.00	28.00
Blue Clay	87.00	115.00
Sand Wet/Moist	7.00	122.00

Screen Installed: Yes **Filter Packed:** No
Screen Diameter: 3.75 in. **Blank:** 0.00 ft. Above
Screen Material Type:
Screen Installation Type: Unknown

Slot	Length	Set Between
7.00	6.00 ft.	116.00 ft. and 122.00 ft.

Fittings: Neoprene packer

Well Grouted: No

Geology Remarks:

Wellhead Completion: Pitless adapter

Nearest Source of Possible Contamination:

Type	Distance	Direction
Septic tank	100 ft.	North

Drilling Machine Operator Name:
Employment: Unknown

Contractor Type: Unknown **Reg No:** 62-0374
Business Name:
Business Address:

Abandoned Well Plugged: No
Reason Not Plugged:

Water Well Contractor's Certification

This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor **Date**

General Remarks:
Other Remarks: Well Use:Commercial, Pump Manufacturer:DECATUR PUMP CO

Water Well And Pump Record

Completion is required under authority of Part 127 Act 368 PA 1978.
Failure to comply is a misdemeanor.

Wellogic

Import ID:

Tax No:	Permit No:	County: Kent	Township: Solon

Well ID: 41000019123

Elevation:

Latitude: 43.21188

Longitude: -85.57087

Method of Collection: GPS Std Positioning Svc SA Off

Town/Range:	Section:	Well Status:	WSSN:	Source ID/Well No:
10N 11W	36	Active		COMPASS COACH

Distance and Direction from Road Intersection:
100 FT EAST OF WHITE CREEK, 1/2 MILE NORTH OF 16 MILE RD.

Well Owner: TRENT STANGE/CO. DAVE BARNETT

Well Address:
13500 WHITE CREEK
CEDAR SPRINGS, MI 49319

Owner Address:
12505 NORTHLAND DR.
CEDAR SPRINGS, MI 49319

Drilling Method: Rotary
Well Depth: 82.00 ft. **Well Use:** Other
Well Type: New **Date Completed:** 4/20/2006

Casing Type: PVC plastic **Height:** 1.00 ft. above grade
Casing Joint: Solvent welded/glued
Casing Fitting: Centralizer

Diameter: 5.00 in. to 72.00 ft. depth

Borehole: 8.75 in. to 82.00 ft. depth

Pump Installed: Yes **Pump Installation Only:** No
Pump Installation Date: 5/26/2006 **HP:** 1.50
Manufacturer: Grundfos **Pump Type:** Submersible
Model Number: 25S07-5 **Pump Capacity:** 25 GPM
Drop Pipe Length: 60.00 ft. **Pump Voltage:**
Drop Pipe Diameter: 1.25 in. **Drilling Record ID:**
Draw Down Seal Used: No

Pressure Tank Installed: Yes
Pressure Tank Type: Diaphragm/bladder
Manufacturer: Amtrol
Model Number: WX-105-PS **Tank Capacity:** 5.3 Gallons
Pressure Relief Valve Installed: Yes

Static Water Level: 4.00 ft. Above Grade (Flowing)
Well Yield Test: **Yield Test Method:** Air
Pumping level 40.00 ft. after 4.00 hrs. at 100 GPM

Unrestricted Flow Rate:

Screen Installed: Yes **Filter Packed:** Yes
Screen Diameter: 4.50 in. **Blank:**
Screen Material Type: PVC-slotted
Screen Installation Type: Attached

Slot	Length	Set Between
12.00	10.00 ft.	72.00 ft. and 82.00 ft.

Fittings: Coupling

Formation Description	Thickness	Depth to Bottom
Sand & Gravel W/Stones	17.00	17.00
Gray Clay	44.00	61.00
Sand & Gravel	21.00	82.00

Geology Remarks:

Grouting Material	Bags	Additives	Depth
Bentonite slurry	6.00	Other	0.00 ft. to 68.00 ft.

Wellhead Completion: Pitless adapter, 12 inches above grade

Nearest Source of Possible Contamination:

Type	Distance	Direction
Septic tank	600 ft.	East

Drilling Machine Operator Name: JAKE WARNER
Employment: Employee
Pump Installer: CURT VISSER
Contractor Type: Water Well Drilling Contractor **Reg No:** 70-2055
Business Name: Raymer Company
Business Address: 1357 Comstock Street, Marne, MI, 49435

Water Well Contractor's Certification

This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor **Date**

General Remarks:

Other Remarks: Well Use:COMMERCIAL, Grouting Additive 1:EZ-MUD

Water Well And Pump Record

Completion is required under authority of Part 127 Act 368 PA 1978.
Failure to comply is a misdemeanor.

Wellogic

Import ID: 41101135007

Tax No:	Permit No:	County: Kent	Township: Solon

Well ID: 41000007457

Elevation: 833 ft.
Latitude: 43.2114884648
Longitude: -85.5714452712
Method of Collection: Interpolation-Map

Town/Range:	Section:	Well Status:	WSSN:	Source ID/Well No:
10N 11W	35			

Distance and Direction from Road Intersection: 0.25 MI N OF 16 MILE RD ON W SIDE OF WHTIE CREEK RD

Well Owner: BISHOP, CLARA

Well Address: 13525 WHITE CREEK RD, CEDAR SPRINGS, MI 49319

Owner Address: 13525 WHITE CREEK RD, CEDAR SPRINGS, MI 49319

Drilling Method: Cable Tool
Well Depth: 106.00 ft. **Well Use:** Household
Well Type: Replacement **Date Completed:** 7/2/1988

Casing Type: Steel - black **Height:**
Casing Joint: Welded
Casing Fitting: None

Diameter: 4.00 in. to 102.00 ft. depth

Borehole:

Pump Installed: Yes **Pump Installation Only:** No
Pump Installation Date: **HP:**
Manufacturer: Flint & Walling **Pump Type:** Submersible
Model Number: **Pump Capacity:** 0 GPM
Drop Pipe Length: 65.00 ft. **Pump Voltage:**
Drop Pipe Diameter: **Drilling Record ID:**
Draw Down Seal Used: No
Pressure Tank Installed: No
Pressure Relief Valve Installed: No

Static Water Level: 3.00 ft. Below Grade
Well Yield Test: **Yield Test Method:** Unknown

Formation Description	Thickness	Depth to Bottom
Topsoil	3.00	3.00
Sand Coarse	15.00	18.00
Gravel	10.00	28.00
Sand Coarse	30.00	58.00
Gravel	12.00	70.00
Sand Medium To Coarse	25.00	95.00
Sand Coarse Wet/Moist	11.00	106.00

Screen Installed: Yes **Filter Packed:** No
Screen Diameter: 3.00 in. **Blank:** 0.00 ft. Above
Screen Material Type:
Screen Installation Type: Unknown

Slot	Length	Set Between
10.00	4.00 ft.	102.00 ft. and 106.00 ft.

Fittings: Neoprene packer

Geology Remarks:

Well Grouted: No

Wellhead Completion: Pitless adapter

Drilling Machine Operator Name:
Employment: Unknown

Nearest Source of Possible Contamination:

Type	Distance	Direction
Septic tank	50 ft.	West

Contractor Type: Unknown **Reg No:**
Business Name:
Business Address:

Abandoned Well Plugged: Yes

Casing Removed:

Water Well Contractor's Certification

This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor Date

General Remarks:
Other Remarks:

Water Well And Pump Record

Completion is required under authority of Part 127 Act 368 PA 1978.
Failure to comply is a misdemeanor.

Wellogic

Import ID:

Tax No:	Permit No:	County: Kent	Township: Solon

Well ID: 41000013951

Elevation:

Latitude: 43.212312

Longitude: -85.570921

Method of Collection: Address Matching-House Number

Town/Range:	Section:	Well Status:	WSSN:	Source ID/Well No:
10N 11W	36	Active		

Distance and Direction from Road Intersection:
1/2 MILE S OF 17 MILE RD APPROX 150 FT E OF WHITE CREEK AVE

Well Owner: JIM AND VICKI COVELL

Well Address:
13590 WHITE CREEK AVE
CEDAR SPRINGS, MI 49319

Owner Address:
13590 WHITE CREEK AVE
CEDAR SPRINGS, MI 49319

Drilling Method: Cable Tool
Well Depth: 80.00 ft. **Well Use:** Household
Well Type: Replacement **Date Completed:** 6/12/2003

Casing Type: Steel - unknown **Height:**
Casing Joint: Threaded & coupled
Casing Fitting: Drive shoe

Diameter: 6.00 in. to 47.00 ft. depth
4.00 in. to 80.00 ft. depth

Borehole:

Pump Installed: Yes **Pump Installation Only:** No
Pump Installation Date: **HP:** 0.50
Manufacturer: A.Y. McDonald **Pump Type:** Submersible
Model Number: **Pump Capacity:** 12 GPM
Drop Pipe Length: 40.00 ft. **Pump Voltage:**
Drop Pipe Diameter: **Drilling Record ID:**
Draw Down Seal Used: No

Pressure Tank Installed: Yes
Pressure Tank Type: Unknown
Manufacturer: Well-X-Trol
Model Number: WX202 **Tank Capacity:**
Pressure Relief Valve Installed: No

Static Water Level: 0.50 ft. Below Grade
Well Yield Test: **Yield Test Method:** Plunger
Pumping level 0.50 ft. after 1.50 hrs. at 50 GPM

Formation Description	Thickness	Depth to Bottom
Topsoil	2.00	2.00
Sand & Gravel Silty	19.00	21.00
Hardpan W/Clay W/Gravel	4.00	25.00
Gray Clay Hard	33.00	58.00
Sand	9.00	67.00
Brown Clay Soft	1.00	68.00
Sand Coarse	8.00	76.00
Gravel Coarse	4.00	80.00

Screen Installed: Yes **Filter Packed:** No
Screen Diameter: 3.00 in. **Blank:** 1.50 ft. Above
Screen Material Type: Stainless steel-wire wrapped
Screen Installation Type: Telescoped

Slot	Length	Set Between
12.00	8.00 ft.	72.00 ft. and 80.00 ft.

Fittings: Neoprene packer

Well Grouted: Yes **Grouting Method:** Unknown

Grouting Material	Bags	Additives	Depth
Bentonite dry granular	10.00	None	0.00 ft. to 70.00 ft.

Geology Remarks:

Wellhead Completion: Pitless adapter

Drilling Machine Operator Name: MIKE WAHLFIELD
Employment: Employee

Nearest Source of Possible Contamination:

Type	Distance	Direction
Septic tank	50 ft.	Northeast

Contractor Type: Water Well Drilling Contractor **Reg No:** 41-0395
Business Name: WAHLFIELD DRILLING CO
Business Address:

Abandoned Well Plugged: Yes

Casing Removed:

Water Well Contractor's Certification

This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor **Date**

General Remarks: DOUBLE CASED WELL BOTH CASINGS WERE GROUTED ACCORDING TO MDEQ SPECS

Other Remarks:

fishbeck, thompson, carr & huber
engineers • scientists • architects

Grand Rapids (616) 575-3824
Lansing (517) 627-1141
Kalamazoo (616) 349-3717
Farmington Hills (248) 324-2090

BOREHOLE LOG

BORING/WELL ID: **GSI - 1d**

TOTAL DEPTH (ft.): **31'**

PROJECT: Cedar Springs Former Lagoon Closure
SITE LOCATION: Cedar Springs, MI
PROJECT NO.: G02126D
PROJECT MANAGER: Tim K. Patterson
LOGGED BY: Tim K. Patterson

START DATE: 11/24/03
END DATE: 11/24/03
TOC ELEV.: 833.52
GROUND ELEV.: 830.88
STATIC WATER LVL.: 826.69

DRILLING CO.: Stearns Drilling
DRILLER: John Verett
RIG TYPE: CME 1050
METHOD OF DRILLING: 4 1/4" HSA
SAMPLING METHODS: Split barrel sampler

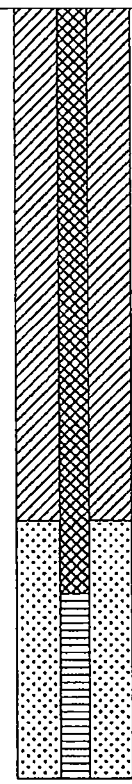
NOTES: GSI-1d is located 9' north of GSI-1soil boring, between 13421 and 13447 White Creek Ave, 18 ft. east of Cedar Creek.

▼ Static Water Level

DESCRIPTION	PID ppm	GRAPHIC LOG	DEPTH (ft. bgl)
TOPSOIL: Dark brown sandy loam, fine grained, trace silt, trace natural organics (roots), dry to moist			0 - 2
SAND: Sand, 100%, tan, fine grained, trace fine gravel, trace clay, dry			2 - 4
Sand, 100%, brown, coarse to fine grained, trace coarse to fine gravel, moist			4 - 9
Sand, 100%, brown, coarse to fine grained, wet			9 - 10.5
CLAY: Clay, 100%, brown to gray, slightly plastic, stiff, trace silt, dry			10.5 - 14
SAND: Sand, 100%, brown, medium to fine grained, trace fine gravel, wet			14 - 21
TILL: Clay, 80%, gray, slightly plastic to non-plastic, stiff; Sand, 20%, gray, fine grained, trace silt, trace fine gravel, dry			21 - 31

Static Water Level	Sample/ Revovery	Sample ID	Blows Counts
▼ 4	2.0		5-8-9-11
	1.5		4-4-4-6
	2.0		4-8-11-12
	2.0		3-5-4-4
	1.5		14-46-80-80
	1.5		15-24-34-37

WELL CONSTRUCTION DETAIL



2-inch daimeter PVC casing (+2.5' - 16')

Bentonite

Global #6 sand pack

2-inch diameter, slot-10, PVC screen (16' - 21')

BOREHOLE LOG

fTC&h — fishbeck, thompson, carr & huber — engineers • scientists • architects

Grand Rapids (616) 575-3824
Lansing (517) 627-1141
Kalamazoo (616) 349-3717
Farmington Hills (248) 324-2090

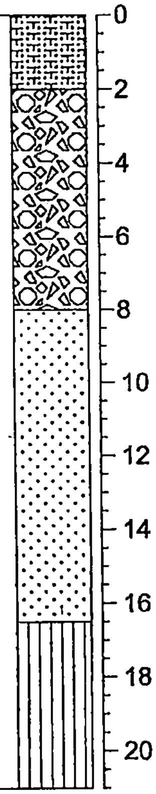
BORING/WELL ID: GSI-2d
TOTAL DEPTH (ft.): 21'

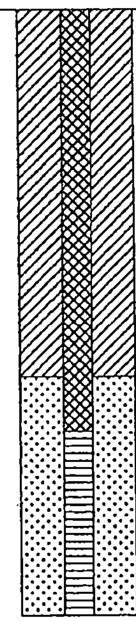
PROJECT: Cedar Springs Former Lagoon Closure	**START DATE:** 11/25/03	**DRILLING CO.:** Stearns Drilling
SITE LOCATION: Cedar Springs, MI	**END DATE:** 11/25/03	**DRILLER:** John Verett
PROJECT NO.: G02126D	**TOC ELEV.:** 832.51	**RIG TYPE:** CME 1050
PROJECT MANAGER: Tim K. Patterson	**GROUND ELEV.:** 830.28	**METHOD OF DRILLING:** 4 1/4" HSA
LOGGED BY: Tim K. Patterson	**STATIC WATER LVL.:** 828.83	**SAMPLING METHODS:** Split barrel sampler

NOTES: GSI-2d is located 10' east of Cedar Creek and 25' west of White Creek Ave., 10' south of drain.

Static Water Level — Page 1 of 1

DESCRIPTION	PID ppm	GRAPHIC LOG	DEPTH (ft. bgl)	Static Water Level	Sample/ Revovery	Sample ID	Blows Counts	WELL CONSTRUCTION DETAIL
TOPSOIL: Dark brown sandy loam, fine grained, trace silt, trace natural organics (roots), moist			0–2	▼				2-inch daimeter PVC casing (+2.5' - 11.5')
GRAVEL: Gravel, 80%, Coarse to fine; Sand, 10%, brownish gray, fine grained; Clay, 10%, brownish gray, wet			2–8		1.0		5-9-10-9	Bentonite
SAND: Sand, 100%, brown, fine grained, wet			8–16.5		2.0 2.0		3-6-8-8 5-17-26-31	Global #8 sand pack 2-inch diameter, slot-10, PVC screen (11.5' - 16.5')
TILL: Clay, 100%, gray, slightly plastic, stiff, trace fine sand, trace fine gravel, dry			16.5–21		2.0		5-12-16-20	





ftc&h
fishbeck, thompson, carr & huber
engineers • scientists • architects
6090 East Fulton Ave.
Ada, Michigan 49301
Ph: (616) 676-3824
Fax: (616) 676-8173

BOREHOLE LOG

BORING/WELL ID: MW-6A
TOTAL DEPTH (ft.): 20'

PROJECT: Cedar Springs/Lagoon Closure	**START DATE:** 12/8/99	**DRILLING CO.:** Stearns Drilling Co.
SITE LOCATION: Cedar Springs, Michigan	**END DATE:** 12/8/99	**DRILLER:** Duane / Bob
PROJECT NO.: F95342m	**TOC ELEV.:** - -	**RIG TYPE:** CME 850
PROJECT MANAGER: Ron C. Waybrant	**GROUND ELEV.:** - -	**METHOD OF DRILLING:** 4.25" I.D. Hollow Stem Auger
LOGGED BY: Bruce E. Gillett	**STATIC WATER LVL.:** - -	**SAMPLING METHODS:** Split Spoon

NOTES: - -

Static Water Level

DESCRIPTION	PID ppm	GRAPHIC LOG	DEPTH (ft. bgl)	Static Water Level	Sample/ Revovery	Sample ID	Blows Counts	WELL CONSTRUCTION DETAIL
TOPSOIL: with some Sand, dark brown, dry			0					
SAND: fine grained, tan, loose, moist			2					2" diameter PVC casing (+2.5 - 13.0 feet)
SAND AND GRAVEL: fine to coarse grained Sand, fine Gravel (trace of coarse), loose, moist			4		1.00'		2-4-5-5	
Note: Cobbles encountered during drilling			6					bentonite grout
SAND AND GRAVEL: fine to coarse grained Sand, fine Gravel (trace of coarse), loose, wet			8		0.75'		6-10-5-3	
			10					
			12					sand pack
SAND AND GRAVEL: fine to coarse grained Sand, fine Gravel (trace of coarse), loose, wet			14		1.50'		2-5-5-7	
			16					2" diameter 10 -slot PVC screen (13.0 - 18.0 feet)
			18					
CLAY: with some Silt, trace of fine Sand, slight trace of fine Gravel, gray, dense, moist			20		1.50'		4-7-14-17	

fishbeck
Engineers | Architects | Scientists | Constructors

1515 Arboretum Drive, SE
Grand Rapids, Michigan 49546
616.575.3824 | fishbeck.com

Remedial Investigation Report
Cedar Springs Former Wastewater Treatment Lagoons Site
730 West Court Street
Cedar Springs, Michigan

Prepared For:

City of Cedar Springs

September 2, 2021

Project No. 201460

List of Figures

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List of Abbreviations/Acronyms

CSM	Conceptual Site Model
DRC	Declaration of Restrictive Covenant
EGLE	Michigan Department of Environment, Great Lakes, and Energy (formerly the MDEQ)
MDEQ	Michigan Department of Environmental Quality
PFAS	per-and polyfluoroalkyl substances
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid

1.0 Introduction

This Remedial Investigation Report (RI Report) has been prepared by Fishbeck on behalf of the City of Cedar Springs (City). A draft Remedial Investigation/Feasibility Study Work Plan (Work Plan) was submitted to EGLE on February 15, 2021 and was the subject of discussion during a virtual meeting with EGLE held on March 2, 2021. Fishbeck has completed the scope of work outlined in the Work Plan. This RI Report describes the activities completed with respect to the former Cedar Springs wastewater lagoon area as described in the Work Plan and some additional evaluation as described below. The former wastewater treatment lagoons site (Site) and associated monitoring well locations are shown on Figure 1.

1.1 Background

In January 2020, in response to EGLE's request, the City collected groundwater samples from select monitoring wells (MW-2A, MW-3A, MW-4A, MW-5A, and MW-7A) located in the former wastewater lagoon area for analysis of Per- and Polyfluoroalkyl Substances (PFAS). These wells are all installed in the shallow unconfined aquifer at the Site. The results of the January 2020 groundwater sampling event identified certain PFAS compounds in four monitoring wells (MW-3A, MW-4A, MW-5A, and MW-7A). The location of these wells and associated PFAS concentrations are shown on Figure 1. PFAS detected at the wells were in concentrations below applicable drinking water cleanup criteria contained in the administrative rules of Part 201, effective in January 2020. On August 2, 2020, EGLE promulgated new Part 201 drinking water cleanup criteria for two PFAS compounds (PFOA and PFOS). On December 21, 2020 EGLE promulgated new Part 201 drinking water criteria for five (5) additional PFAS compounds (PFNA, PFHxA, PFHxS, PFBS, and Gen X). PFOA was detected in the January 2020 sampling event in the four referenced monitoring wells at concentrations slightly exceeding the August 2, 2020 cleanup criterion for PFOA. Due to these exceedances, EGLE issued a Violation Notice No. VN-011095 (Violation Notice) dated October 2, 2020 to the City.

1.2 Former Wastewater Lagoon History

The City's wastewater treatment lagoon system was constructed in 1965, expanded in the 1970's, and removed from service in 1999. The system consisted of three lagoons (two oxidation lagoons with clay-lined bottoms and one infiltration lagoon) and a standby infiltration area. The wastewater lagoons were closed in place in 2002. Closure of the lagoon system consisted of several steps, including lime stabilization of biosolids associated with the operation of the lagoon system, removal of the lagoon infrastructure (piping and control structures), and construction of a cap above the biosolids. The cap consisted of sand and clay that was removed from the earthen berms surrounding the lagoons and placed above the biosolids, additional clean sand and gravel was added to bring the closed lagoons up to grade. A minimum of 1 foot of cover was placed over the stabilized biosolids remaining on the bottom of the former lagoons. The closure of the lagoons was performed pursuant to a Designation of Inertness issued by EGLE in January 2002 and a Declaration of Restrictive Covenant (DRC) approved by EGLE that the City executed and recorded against the Site.

1.3 Hydrogeological Conceptual Site Model

The February 15, 2021 Work Plan included a hydrogeological conceptual site model (CSM) that Fishbeck prepared for the Site and surrounding area. Fishbeck generated six cross-sections using soil boring and drinking water well log information to aid in the visualization and understanding of the near surface geology at the Site. The geological cross-sections are included in the February 15, 2021 Work Plan. Based on these cross-sections, three (3) hydrostratigraphic units have been identified beneath the Site. Laterally continuous sand deposits form an upper unconfined aquifer across the Site. The unconfined aquifer is approximately 20 feet thick. The water table surface is located approximately 10 feet below ground surface (bgs). Groundwater in the upper aquifer near the Site flows in a westerly direction. The upper unconfined aquifer extends to a depth of approximately 30 feet bgs.

The upper unconfined aquifer is underlain by a 40 to 70 thick clay unit beneath the Site. Based on the cross-sections, the clay unit may be thinner north and east of the Site. This underlying clay unit acts as an aquitard/confining layer and extends to a depth of approximately 100 feet bgs. A lower confined aquifer is present at depths below 100 feet bgs and extends to a depth of at least 120 feet bgs. The confined aquifer appears to be hydraulicly separated from the upper unconfined aquifer due to the overlying clay aquitard.

A potential upgradient source of PFAS (former Robinson Bulk Terminal, which is a documented site of contamination by EGLE) has been identified but has not yet been evaluated for the presence of PFAS.

1.4 Surface Water Features

The nearest major surface water features include Cedar Creek, located approximately 800 feet west of the Site, and Little Cedar Creek, located approximately 5000 feet south of the Site. Other surface water features include an onsite stormwater retention basin and a small lake located approximately 1000 feet northwest of the Site (approximately 200 feet west of Cedar Creek). An unnamed drain is also located on the south and west sides of the Site, and a stream exists east of the Site south of MW8A.

2.0 Remedial Investigation Activities

The investigative activities described in the February 15, 2021 Work Plan were completed from March 2021 through August 2021. The City and Fishbeck provided interim updates to EGLE during the course of the investigation. The primary tasks completed as part of this investigation included:

- Installation of one new monitoring well (MW-8A) in the shallow aquifer upgradient of the Site.
- Collection and analysis of groundwater samples for PFAS from the new monitoring well (MW-8A) and three existing monitoring wells on the Site (MW-6A, GSI-1D, and GSI-2D).
- Collection and analysis of one surface water sample for PFAS from an unnamed creek flowing from the east onto the Site.
- Collection and analysis of water samples from fourteen drinking water wells located west/southwest of the Site.

The investigation activities were completed in accordance with the methodologies and procedures described in the February 15, 2021 Work Plan.

2.1 Monitoring Well Installation

One new monitoring well (MW-8A) was installed at the upgradient location shown on Figure 1 to evaluate a potential upgradient PFAS source. The monitoring well was installed by Job Site Services of Cedar Springs, Michigan on March 9, 2021 using hollow-stem auger drilling techniques. Soil samples were collected continuously for geological description from ground surface to the total depth of the boring using a macro-core sampler. The samples were described by a geologist from Fishbeck who prepared a log to document the findings. The well log for MW-8A is included in Attachment 1. The monitoring well was constructed using 2-inch diameter, PVC casing with a 5-foot long, 0.010-inch slot, PVC screen installed from 25 to 30 feet bgs. An appropriately sized sand filter pack was placed in the annulus surrounding the screen, from the base of the screen to approximately 5 feet above the top of the screen. A bentonite slurry was placed into the remaining annulus by tremie grouting from the top of the sand pack to ground surface. The well was equipped with an aboveground locking protective casing and a vented cap. The monitoring well was developed using pumping/surging techniques. Investigation derived wastes were placed on the ground adjacent to the monitoring well.

2.2 Groundwater Flow Mapping

Following installation of the additional monitoring well, a survey to establish the top-of-casing elevation of the new well was completed. Static water levels were collected from all existing onsite monitoring wells and the newly-installed upgradient monitoring well on March 17, 2021, using an electric tape and recorded to the nearest 0.01 foot. The March 17, 2021 static water level data was converted to groundwater elevation data and used to generate a groundwater contour map (Figure 1) to confirm groundwater flow direction and hydraulic gradient. The groundwater elevation data collected on March 17, 2021 is summarized in Table 1. The data documents a westerly groundwater flow.

2.3 Groundwater and Surface Water Sampling

Groundwater samples were collected from the newly installed monitoring well (MW-8A) and downgradient existing monitoring wells MW-6A, GSI-1D, and GSI-2D (shown on Figure 1) on March 12, 2021. Logs for these monitoring wells are included in Appendix 1. Groundwater samples were collected with a peristaltic pump using low-flow/minimal drawdown methods. All materials used for groundwater sampling were Teflon and PFAS free. One duplicate sample and one field blank were collected.

Dissolved oxygen, pH, Eh, specific conductivity, and temperature were measured in the field using a calibrated flow-through cell. Sample turbidity was also be field monitored. These parameters were used to verify stabilization of the purged groundwater in accordance with low-flow/minimal drawdown sampling procedures.

A surface water sample (SW-1) was also collected from a creek located approximately 50 feet south of MW-8A. The creek was flowing from the east to the west onto the Site.

A summary of groundwater and surface water PFAS results is included in Table 2.

2.4 Drinking Water Well Sampling

The City identified nineteen drinking water wells for sampling. The City provided the list of drinking water wells to EGLE in advance of collecting samples. To obtain permission to sample the proposed drinking water wells, the City mailed access permission letters to the nineteen drinking water well owners via U.S. Mail. Fourteen of the drinking water well owners responded with authorization to collect a sample from their wells. The City mailed a second letter to the five locations that did not respond to the initial request, followed-up by an attempt to contact these residences in person. As of the date of this RI Report, the City has not received any additional replies from the five residences.

The fourteen drinking water wells that Fishbeck sampled for PFAS are located west/southwest of the Site (see locations on Figure 2). Eleven of the drinking water wells were sampled on May 26, 2021, and three of the drinking water wells were sampled on July 28, 2021. Drinking water well samples were collected from an outdoor spigot. Well logs were located for eleven of the fourteen wells. Based on the well logs, these eleven drinking water wells are screened in the lower confined aquifer below the approximately 40-70 feet thick clay layer separating these wells from the upper aquifer. The well logs for these eleven drinking water wells are included in Appendix 2.

The owner of one well for which no log was located reported to Fishbeck that his well is screened at a shallow depth. According to the owner of the well at 13485 White Creek Avenue, the owner installed the well to a depth of approximately 35 feet below grade. This is the only drinking water well sampled that is known to have been installed in the shallow unconfined aquifer. As described below, this well is also the only drinking water well with a concentration of PFOA exceeding its EGLE Part 201 Drinking Water Criteria. . To confirm the PFAS concentrations detected from the May 26, 2021 sample collected at 13485 White Creek Avenue, this location was resampled on July 28, 2021.

2.5 Laboratory Analysis

Monitoring well groundwater samples were submitted for laboratory analysis of PFAS (28 compound list) using USEPA Method 537M. One duplicate sample and one field blank were collected during the groundwater sampling for quality assurance/quality control (QA/QC) purposes. Drinking water well drinking water samples were submitted for laboratory analysis of PFAS using USEPA Method 537.1 for analysis of drinking water for 18 PFAS compounds. Three duplicate samples and two field blank sample were collected during drinking water well sampling for QA/QC purposes. Part 201 drinking water criteria exist for seven PFAS compounds.

3.0 Groundwater and Surface Water Analytical Results

The March 12, 2021 PFAS analytical results for groundwater samples were collected from GSI-1D, GSI2D, MW-6A, and MW-8A and the surface water sample was collected from the upgradient creek are summarized in Table 2. The laboratory reports are included in Appendix 3. Perfluorooctanoic acid (PFOA) was detected at a concentration exceeding its current Part 201 Residential Drinking Water Criterion at monitoring wells GSI-2D and MW-6A. Perfluorooctane sulfonic acid (PFOS) was detected at a concentration exceeding its Part 201 Residential Drinking Water Criterion at monitoring well MW-6A and exceeding its GSI Criterion at GSI-2D and MW-6A. All other detectable PFAS concentrations were below applicable Part 201 cleanup criteria. The surface water sample (SW-1) collected from the creek flowing onto the eastern side of the Site contained 22.8 ng/L total PFAS compounds including 2.7 ng/L PFOA and 2.2 ng/L PFOS. Even though the PFAS concentrations at SW-1 did not exceed applicable Part 201 concentrations, the fact that PFAS was present in the upgradient creek flowing onto the Site is an indication that a source for PFAS exists east of the Site.

4.0 Drinking Water Well Analytical Results

The May 26, 2021 and July 28, 2021 drinking water well analytical results are summarized in Table 3. Well depths are also included on Table 3. The laboratory reports are included in Appendix 4. A total of fourteen wells were sampled. With one exception, none of the samples for the drinking water wells contained any concentrations of PFAS above drinking water criteria under Part 201. The location at 13485 White Creek Avenue (from the shallow water table aquifer) had a concentration of PFOA that exceeded its current Drinking Water maximum contaminant limit (MCL)/Part 201 drinking water criterion. A filtration system was installed by the City at the residence to eliminate the exposure risk to PFOA.

Eleven of these locations have well logs that indicated that these wells are installed in the lower confined aquifer. The well logs for these eleven drinking water wells are included in Appendix 2. Of these eleven wells, eight were non-detect for any PFAS compounds. The other three wells known to be installed in the lower aquifer contained low estimated concentrations of PFNA below the laboratory reporting limit. The field blank collected during the sampling of these three wells also contained a low estimated concentration of PFNA, indicating that low concentrations of PFNA at these three well locations are lab-related artifacts and not actually in the groundwater sampled at these wells. PFOA was identified at one of the known deep wells at a low estimated concentration of PFOA (0.65 ng/L) below the laboratory reporting limit, but since PFOA was not identified in any other known deep well, this PFOA concentration is likely a lab artifact or some other type of cross contamination of the sample.

5.0 Nature and Extent of PFAS Contamination

The lateral extent of PFAS contamination exceeding applicable Part 201 Cleanup Criteria in the shallow unconfined aquifer at the Site and surrounding area has been determined and is illustrated on Figure 1. Groundwater flow in the shallow unconfined aquifer is shown on Figure 1. The groundwater flow direction in the shallow unconfined aquifer is toward the west.

The groundwater sample collected at GSI-2D, located adjacent to Cedar Creek, indicates that PFOA and PFOS are present at concentrations exceeding applicable Part 201 criteria. Based on groundwater elevation data collected at GSI-1S&D and GSI-2S&D and the adjacent staff gages (SG-1 and SG-2) installed in Cedar Creek, it is apparent that Cedar Creek acts as a converging groundwater discharge boundary and prevents groundwater in the shallow unconfined aquifer from flowing west of Cedar Creek, thus establishing a westerly delineation boundary. Based on the PFAS results from the EGLE 2020 sampling of shallow drinking water wells along 16-mile road, the southern extent of PFAS exceeding applicable Part 201 Cleanup Criteria has also been determined. The sampling results from upgradient wells MW-2A and MW-8A at the Site indicated that PFAS was not present at these locations above applicable Part 201 Cleanup Criteria, and therefore the eastern extent of PFAS contaminated groundwater exceeding applicable Part 201 Cleanup Criteria has also been determined. (As noted above, a PFAS source exists to the east of the Site, as evidenced by the surface water sample from the creek). Based on the groundwater flow direction in the shallow aquifer, there does not appear to be a northern flow component at the Site and groundwater impacted with PFAS exceeding Part 201 Cleanup Criteria would not be expected to migrate in a northerly direction. Therefore, the horizontal extent of PFAS contamination in the shallow aquifer has been defined in all directions.

The vertical extent of PFAS contaminated groundwater at the Site is the base of the upper unconfined aquifer, due to the presence of an approximate 40-70-foot-thick clay unit that underlies the upper aquifer and acts as an aquitard/confining layer to the lower confined aquifer. As is evident in Fishbeck's CSM, the confined aquifer in the vicinity of the Site provides hydraulic separation from the upper unconfined aquifer due to the overlying clay aquitard. This interpretation is further substantiated by the drinking water well boring logs and sampling results. Well logs of eleven of the drinking water wells sampled by the City west and southwest of the Site indicate that these wells are installed in the lower confined aquifer. An additional well installed in the lower confined aquifer (13466 White Creek Avenue) was sampled by EGLE. The PFAS results indicate that the wells in stalled in the lower aquifer have not been impacted by PFAS.

The lateral and vertical extent of PFAS contaminated groundwater in the shallow unconfined aquifer has been determined and there are no current unacceptable exposure risks. A deed restriction is in place at the Site which prevents the installation of wells in the shallow unconfined aquifer. Drinking water well sampling conducted west of the Site indicated two drinking water wells exceeding the PFOA Drinking Water MCL (one sampled by the City; the other sampled by EGLE). Both of these wells are screened in the shallow aquifer. Both of these residences have been provided filtration systems to eliminate the drinking water exposure risk (one provided by the City; the other provided by EGLE). The City has contacted nineteen drinking water well owners located downgradient of the Site. Currently, five of the homeowners have not responded regarding the City's multiple requests to sample their wells. The City will make an additional attempt to elicit a response from these five residences.

There is no evidence that the lower confined aquifer in the vicinity of the Site has been impacted. Currently none of the drinking water wells sampled and installed in the lower confined aquifer have indications of being impacted by PFAS. The geology and hydrogeology at the Site explain the lack of impact in the lower confined aquifer. Hydrogeological conditions at the Site are such that vertical migration of the PFAS impacted groundwater found in the shallow unconfined aquifer, through the 40-70-foot clay aquitard and into the lower confined aquifer, would not occur.

In addition to the tasks identified in the Work Plan, Fishbeck has reviewed the City of Cedar Springs Wellfield Wellhead Protection Area Delineation Report (Fishbeck, 2002). The City wellfield (Wells 3, 4, and 5) are located approximately 1 mile northeast of the Site. Based on the information in the Cedar Springs Wellfield WHPA Delineation Report, static water levels were measured at 17 observation and drinking water wells covering approximately 22 sections in Nelson and Solon Townships. This information is summarized in Table 3 attached to the WHPA report (which table is included in Appendix 5 to this RI Report). Figure 7 from the WHPA report shows a potentiometric surface using the observed static water level elevations (Figure 7 is included in Appendix 5 to this RI Report). The observed groundwater elevation contour map indicates that the groundwater flow direction is to the southwest the Rogue River (Section 3 text from the WHPA report is included in Appendix 5).

Several Wellhead Protection Areas in the vicinity of the Site were identified on the state database (Geowebface.com). Figure 3 shows the location of several of the WHPAs in the vicinity of the Site. All WHPAs indicate at southwesterly flow direction in the lower confined aquifer. Based on that review of the City WHPA Delineation Report and WHPAs on the State database, Fishbeck finds that the groundwater movement in the lower confined aquifer is to the southwest. The flow pattern is southwesterly, not southerly. Therefore, based on the WHPA information, even if PFAS had encountered the lower confined aquifer (and there is no geological explanation for such a conclusion), the PFAS would flow to the west/southwest, not south to the neighborhood that is approximately one mile south of the Site.

Also, Fishbeck has identified a well log for a 12' diameter irrigation well for a large farm located approximately 3000 feet west of the Site. This irrigation well log is included in Appendix 5. The location of the irrigation well is shown on Figure 3. Based on information included on the irrigation well log, the well is installed in the lower confined aquifer and is capable of yielding 1000 gpm. This large irrigation well would influence groundwater flow conditions when it is operated in the summer months and would cause groundwater to flow from the Site towards the irrigation well in a westerly direction.

Finally, in the virtual meeting on March 2, 2021 with EGLE, EGLE representatives advised that they would share X-sections from areas near the Site that suggest a connection between the upper and lower aquifers. EGLE provided those X-section to Fishbeck on March 10, 2021. Fishbeck has reviewed those X-sections and does not find any content suggesting a connection between the two aquifers in the vicinity of the Site. The geological information from the one well in the vicinity of the Site on the cross sections indicates that this well is installed in the shallow unconfined aquifer and the well did not extend deep enough to encounter the clay aquitard at the base of the aquifer.

6.0 Conclusion

Fishbeck has completed the RI investigation described in the Work Plan, as discussed with EGLE. Fishbeck has completed certain evaluations in supplement to the Work Plan, as described above. As a result, the lateral and vertical extent of PFAS in the shallow aquifer has been delineated. Based on multiple lines of evidence, there is no basis to believe that there is a connection between the shallow and lower aquifers at the Site, and no basis to expect that PFAS detected in the shallow aquifer would be present in the lower aquifer at or in the proximity of the Site. Therefore, investigation of the lower aquifer is not warranted.

fishbeck
Engineers | Architects | Scientists | Constructors

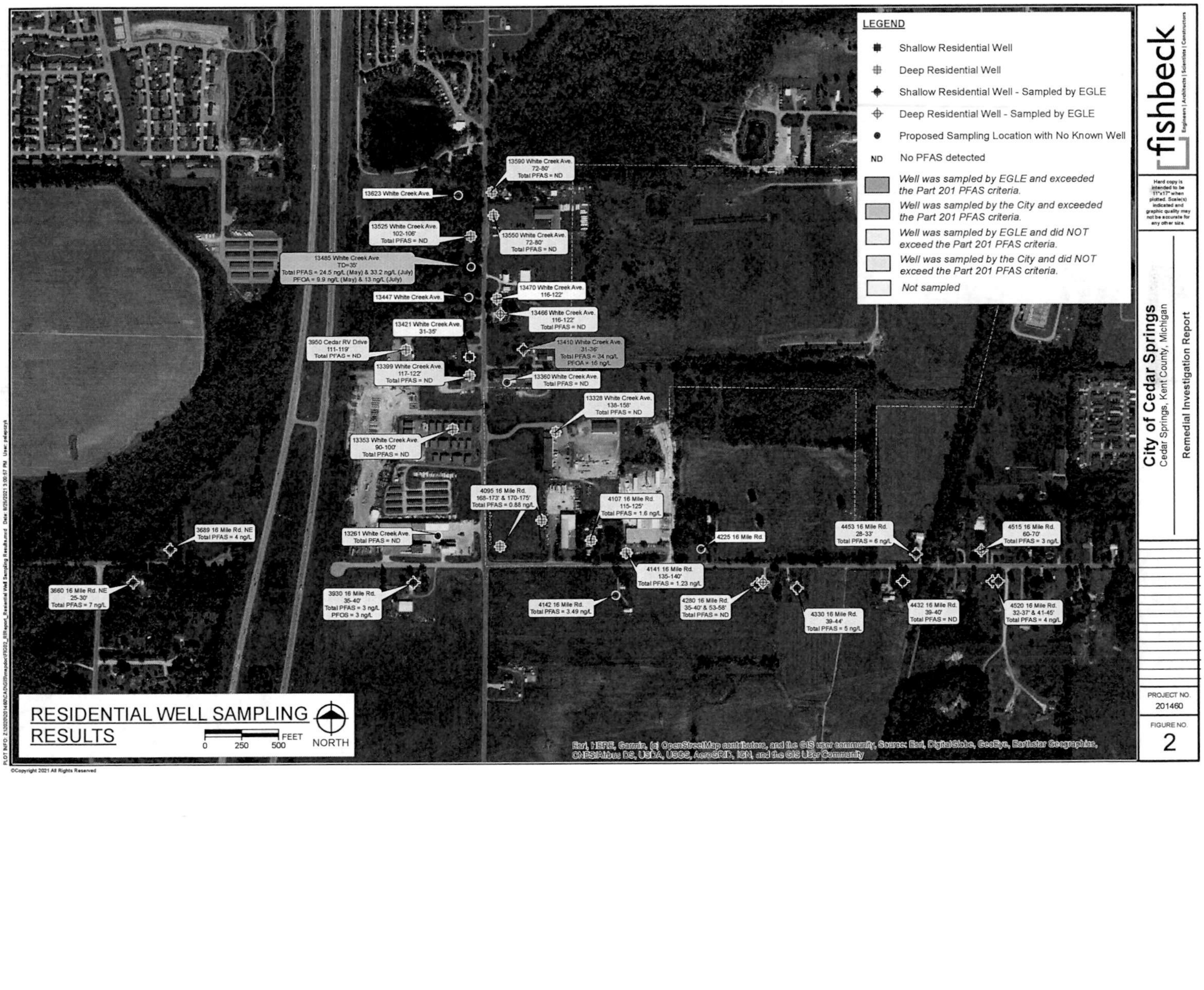
Hard copy is intended to be 11"x17" when plotted. Scale(s) indicated and graphic quality may not be accurate for any other size.

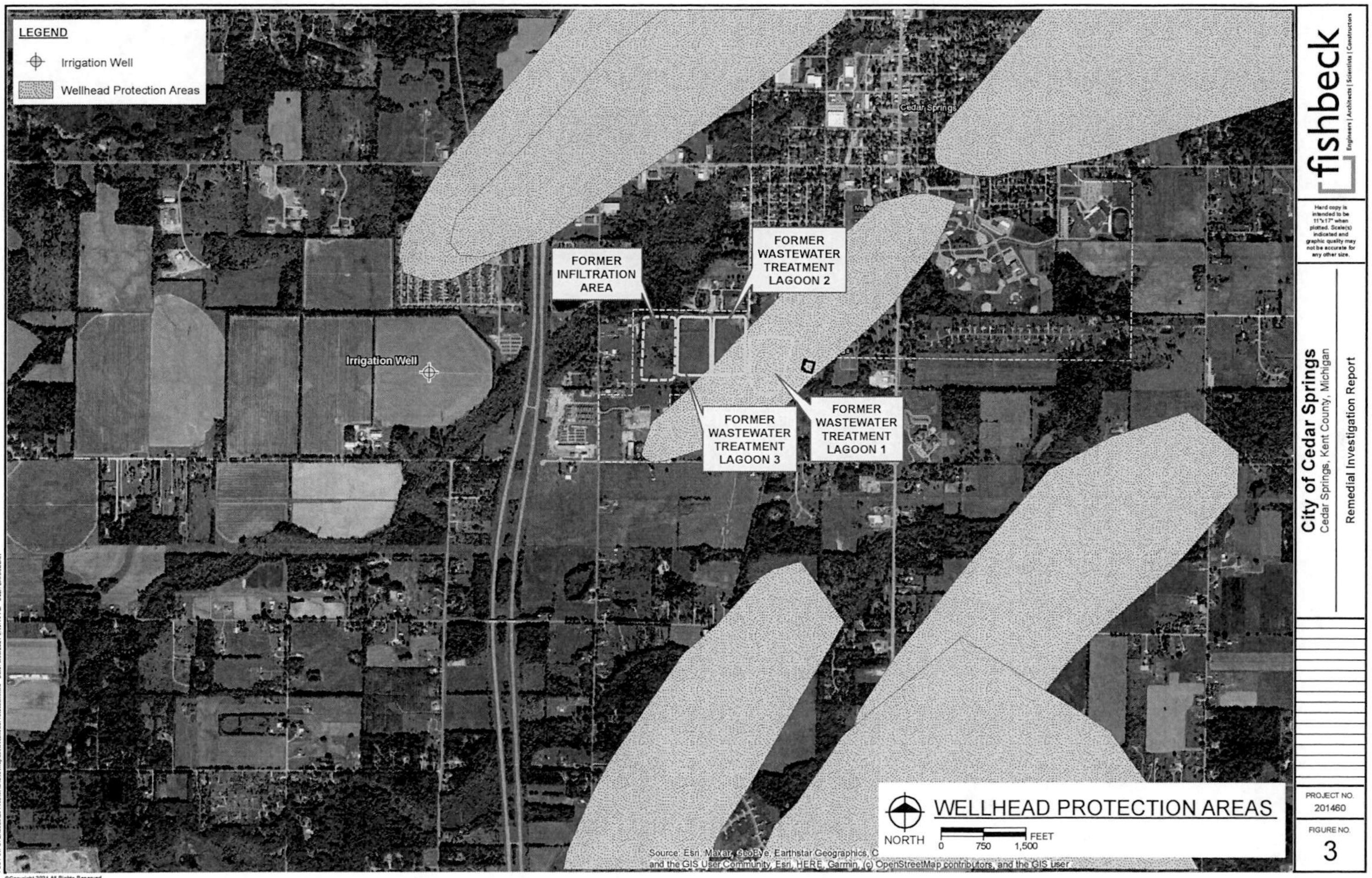
City of Cedar Springs
Cedar Springs, Kent County, Michigan

Remedial Investigation Report

PROJECT NO.
201460

FIGURE NO.
1


LEGEND
Shallow Residential Well
Deep Residential Well
Shallow Residential Well - Sampled by EGLE
Deep Residential Well - Sampled by EGLE
Proposed Sampling Location with No Known Well
ND No PFAS detected
Well was sampled by EGLE and exceeded the Part 201 PFAS criteria.
Well was sampled by the City and exceeded the Part 201 PFAS criteria.
Well was sampled by EGLE and did NOT exceed the Part 201 PFAS criteria.
Well was sampled by the City and did NOT exceed the Part 201 PFAS criteria.
Not sampled
13590 White Creek Ave. 72-80' Total PFAS = ND
13623 White Creek Ave.
13525 White Creek Ave. 102-106' Total PFAS = ND
13550 White Creek Ave. 72-80' Total PFAS = ND
13485 White Creek Ave. TD=35' Total PFAS = 24.5 ng/L (May) & 33.2 ng/L (July) PFOA = 9.9 ng/L (May) & 13 ng/L (July)
13447 White Creek Ave.
13470 White Creek Ave. 116-122'
13466 White Creek Ave. 116-122' Total PFAS = ND
13421 White Creek Ave. 31-35'
3950 Cedar RV Drive 111-119' Total PFAS = ND
13410 White Creek Ave. 31-36' Total PFAS = 34 ng/L PFOA = 16 ng/L
13399 White Creek Ave. 117-122' Total PFAS = ND
13360 White Creek Ave. Total PFAS = ND
13328 White Creek Ave. 138-158' Total PFAS = ND
13353 White Creek Ave. 90-100' Total PFAS = ND
4095 16 Mile Rd. 168-173' & 170-175' Total PFAS = 0.88 ng/L
4107 16 Mile Rd. 115-125' Total PFAS = 1.6 ng/L
3689 16 Mile Rd. NE Total PFAS = 4 ng/L
13261 White Creek Ave. Total PFAS = ND
4225 16 Mile Rd.
4453 16 Mile Rd. 28-33' Total PFAS = 6 ng/L
4515 16 Mile Rd. 60-70' Total PFAS = 3 ng/L
3660 16 Mile Rd. NE 25-30' Total PFAS = 7 ng/L
3930 16 Mile Rd. 35-40' Total PFAS = 3 ng/L PFOS = 3 ng/L
4141 16 Mile Rd. 135-140' Total PFAS = 1.23 ng/L
4142 16 Mile Rd. Total PFAS = 3.49 ng/L
4280 16 Mile Rd. 35-40' & 53-58' Total PFAS = ND
4330 16 Mile Rd. 39-44' Total PFAS = 5 ng/L
4432 16 Mile Rd. 39-40' Total PFAS = ND
4520 16 Mile Rd. 32-37' & 41-45' Total PFAS = 4 ng/L
RESIDENTIAL WELL SAMPLING RESULTS
0 250 500 FEET
NORTH
Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community, Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
fishbeck
Engineers | Architects | Scientists | Constructors
Hard copy is intended to be 11"x17" when plotted. Scale(s) indicated and graphic quality may not be accurate for any other size.
City of Cedar Springs
Cedar Springs, Kent County, Michigan
Remedial Investigation Report
PROJECT NO. 201460
FIGURE NO. 2



PLOT INFO: Z:\2020\201460\CAD\GIS\mapdoc\WellheadProtection.mxd Date: 8/30/2021 3:49:14 PM User: BAHANNAH

Tables

Table 1 - Summary of Monitoring Well Construction and Groundwater Elevations

2021 RI Report

Cedar Springs Former Wastewater Treatment Lagoons Site - Cedar Springs, Michigan

Monitoring Well	Screened Interval (ft bgs)	TOC Elevation (ft msl)	DTW (ft btoc) 03/17/21	Groundwater Elevation (ft msl) 03/17/21
GSI-1s	5.5-10.5	833.80	7.54	826.26
GSI-1d	16-21	833.51	6.72	826.79
GSI-2s	2-7	833.38	4.37	829.01
GSI-2d	11.5-16.5	832.51	3.49	829.02
MW-2A	33-38	856.38	13.03	843.35
MW-3A	33-38	850.64	13.72	836.92
MW-4A	29.5-34.5	844.91	10.10	834.81
MW-5A	27-32	843.79	13.37	830.42
MW-6A	13-18	839.03	9.52	829.51
MW-7A	20-25	842.57	11.58	830.99
MW-8A	25-30	852.21	*9.51	842.70
KOW-1	28.5-31.5	852.00	12.77	839.23
KOW-2	13-16	845.51	9.93	835.58
KOW-3	11-14	844.41	9.15	835.26
KOW-4	15-18	844.21	12.29	831.92
KOW-5	14-17	840.56	9.50	831.06
KOW-6	11.5-14.5	849.06	7.63	841.43
KOW-7	13-16	835.97	9.14	826.83
Well D	NA	843.39	7.11	836.28
Well E	NA	841.79	10.86	830.93
Well F	NA	846.94	9.40	837.54
B-2	NA	841.64	10.59	831.05
SG-1	NA	829.21	1.04	828.17
SG-2	NA	828.10	2.37	825.73

Footnotes:

*SWL collected 3/12/21

bgs - Below ground surface

btoc - Below top of casing

SWL - Static water level

NA - Not available

DTW - Depth to Water

ft msl - Feet above mean sea level

Table 2 - Groundwater Data Summary - Poly- and Perfluoroalkyl Substances (PFAS)
2021 Remedial Investigation
City of Cedar Springs, Kent County, Michigan

Monitoring Location:		GSI-1D	GSI-2D	MW-6A	MW-8A	MW-8A	SW-01	Field Blank	***Residential DWC*** [1]	***Nonresidential DWC*** [1]	***GSI Criteria*** [1]	***Residential Groundwater VIAIC*** [1]	***Nonresidential Groundwater VIAIC*** [1]	***Water Solubility*** [1]	***Flammability and Explosivity SL*** [1]	***Residential GW-Shallow VIAP SL*** [2]	***Residential GW-Not in Contact VIAP SL*** [2]	***Nonresidential GW-Shallow VIAP SL*** [2]	***Nonresidential GW-Not in Contact VIAP SL*** [2]
Field Duplicate:						Duplicate													
Laboratory ID:		21031444-04	21031444-05	21031444-01	21031444-02	21031444-03	21031444-06	21031444-07											
Collection Date:		03/12/21	03/12/21	03/12/21	03/12/21	03/12/21	03/12/21	03/12/21											
Compound	*CAS Number*																		
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	4.6 U	4.7 U	4.7 U	4.6 U	4.7 U	4.7 U	4.8 U	--	--	--	--	--	--	--	--	--	--	--
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	4.6 U	4.7 U	4.7 U	4.6 U	4.7 U	4.7 U	4.8 U	--	--	--	--	--	--	--	--	--	--	--
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	4.6 U	4.7 U	4.7 U	4.6 U	4.7 U	4.7 U	4.8 U	--	--	--	--	--	--	--	--	--	--	--
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	4.6 U	4.7 U	4.7 U	4.6 U	4.7 U	4.7 U	4.8 U	--	--	--	--	--	--	--	--	--	--	--
9-Chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	756426-58-1	4.6 U	4.7 U	4.7 U	4.6 U	4.7 U	4.7 U	4.8 U	--	--	--	--	--	--	--	--	--	--	--
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	763051-92-9	4.6 U	4.7 U	4.7 U	4.6 U	4.7 U	4.7 U	4.8 U	--	--	--	--	--	--	--	--	--	--	--
Hexafluoropropylene oxide dimer acid (HFPO-DA)(GenX)	13252-13-6	4.6 U	4.7 U	4.7 U	4.6 U	4.7 U	4.7 U	4.8 U	*370 (A)*	*370 (A)*	*NA*	*ID*	*ID*	*NA*	*NA*	--	--	--	--
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	4.6 U	5.2	2.4 J	4.6 U	4.7 U	4.7 U	4.8 U	--	--	--	--	--	--	--	--	--	--	--
N-Methyl perfluorooctane sulfonamido acetic acid (N-MeFOSAA)	2355-31-9	4.6 U	0.69 J	4.7 U	4.6 U	4.7 U	4.7 U	4.8 U	--	--	--	--	--	--	--	--	--	--	--
Perfluorobutane sulfonic acid (PFBS)	375-73-5	2.3 J	3.0 J	2.6 J	0.65 J	0.57 J	3.5 J	4.8 U	*420 (A)*	*420 (A)*	*NA*	*ID*	*ID*	*NA*	*NA*	--	--	--	--
Perfluorobutanoic acid (PFBA)	375-22-4	4.7	9.5	9.0	4.6 U	4.7 U	5.5	4.8 U	--	--	--	--	--	--	--	--	--	--	--
Perfluorodecane sulfonic acid (PFDS)	335-77-3	4.6 U	4.7 U	4.7 U	4.6 U	4.7 U	4.7 U	4.8 U	--	--	--	--	--	--	--	--	--	--	--
Perfluorodecanoic acid (PFDA)	335-76-2	4.6 U	4.7 U	4.7 U	4.6 U	4.7 U	4.7 U	4.8 U	--	--	--	--	--	--	--	--	--	--	--
Perfluorododecanoic acid (PFDoDA)	307-55-1	4.6 U	4.7 U	4.7 U	4.6 U	4.7 U	4.7 U	4.8 U	--	--	--	--	--	--	--	--	--	--	--
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.59 J	1.8 J	1.9 J	4.6 U	4.7 U	4.7 U	4.8 U	--	--	--	--	--	--	--	--	--	--	--
Perfluoroheptanoic acid (PFHpA)	375-85-9	1.5 J	8.1	9.4	4.6 U	4.7 U	1.4 J	4.8 U	--	--	--	--	--	--	--	--	--	--	--
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	3.6 J	9.1	12	0.88 J	0.42 J	1.7 J	0.66 J	*51 (A)*	*51 (A)*	*NA*	*ID*	*ID*	*NA*	*NA*	--	--	--	--
Perfluorohexanoic acid (PFHxA)	307-24-4	2.3 J	8.4	11	4.6 U	4.7 U	2.3 J	4.8 U	*4.00E+05 (A)*	*4.00E+05 (A)*	*NA*	*ID*	*ID*	*NA*	*NA*	--	--	--	--
Perfluorononane sulfonic acid (PFNS)	68259-12-1	4.6 U	4.7 U	4.7 U	4.6 U	4.7 U	4.7 U	4.8 U	--	--	--	--	--	--	--	--	--	--	--
Perfluorononanoic acid (PFNA)	375-95-1	4.6 U	1.6 J	2.0 J	4.6 U	4.7 U	4.7 U	4.8 U	*6.0 (A)*	*6.0 (A)*	*NA*	*ID*	*ID*	*NA*	*NA*	--	--	--	--
Perfluorooctane sulfonamide (PFOSA)	754-91-6	4.6 U	0.76 J	4.7 U	4.6 U	4.7 U	4.7 U	4.8 U	--	--	--	--	--	--	--	--	--	--	--
Perfluorooctane sulfonic acid (PFOS) (DD)	1763-23-1	5.7	**16**	**19**	1.9 U	1.9 U	2.2	1.9 U	*16 (A)*	*16 (A)*	*12 (X)*	*NLV*	*NLV*	*3,100*	*NA*	*NA*	*NA*	*NA*	*NA*
Perfluorooctanoic acid (PFOA) (DD)	335-67-1	5.6	**35**	**49**	1.9 U	1.9 U	2.7	1.9 U	*8.0 (A)*	*8.0 (A)*	*12,000 (X)*	*ID*	*ID*	*9.50E+09*	*NA*	*TX*	*TX*	*TX*	*TX*
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	1.3 J	1.1 J	1.3 J	4.6 U	4.7 U	4.7 U	4.8 U	--	--	--	--	--	--	--	--	--	--	--
Perfluoropentanoic acid (PFPeA)	2706-90-3	2.0 J	5.8	7.8	4.6 U	4.7 U	3.5 J	4.8 U	--	--	--	--	--	--	--	--	--	--	--
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	4.6 U	4.7 U	4.7 U	4.6 U	4.7 U	4.7 U	4.8 U	--	--	--	--	--	--	--	--	--	--	--
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	4.6 U	4.7 U	4.7 U	4.6 U	4.7 U	4.7 U	4.8 U	--	--	--	--	--	--	--	--	--	--	--
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	4.6 U	4.7 U	4.7 U	4.6 U	4.7 U	4.7 U	4.8 U	--	--	--	--	--	--	--	--	--	--	--

Results expressed in ng/L.
Bolded values exceed an applicable criterion.

Data Qualifiers:
J Estimated value
U Not detected

Footnotes/Abbreviations:
[1] *Part 201 Groundwater Generic Cleanup Criteria and Screening Levels, December 21, 2020.*
[2] *EGLE Volatilization to Indoor Air Pathway Screening Levels, September 4, 2020.*
(A) State of Michigan drinking water (DW) standard.
(X) Criterion is not protective for surface water used as a DW source.
(DD) Hazardous substance causes developmental effects. Residential direct contact criteria are protective of both prenatal and postnatal exposure. Nonresidential direct contact criteria are protective for a pregnant adult receptor.
DWC drinking water criterion
GSI groundwater surface water interface
ID Insufficient data to develop criterion.
NA not available
NLV Not likely to volatilize under most conditions.
SL screening level
TX The Remediation and Redevelopment Division Toxicology Unit has not identified an inhalation toxicity value for the hazardous substance at the date of publication of these values.
VIAIC volatilization to indoor air inhalation criteria
VIAP volatilization to indoor air pathway

Table 3 - Residential Well Sample Data Summary - Poly- and Perfluoroalkyl Substances (PFAS)
2021 Remedial Investigation
City of Cedar Springs, Kent County, Michigan
July 2021

Monitoring Location: *Field Duplicate:* *Well Depth (ft):* *Laboratory ID:* *Collection Date:*		***MCL / Residential DWC [1]***	***GSI Criteria [1]***	***Residential Groundwater VIAIC [1]***	***Water Solubility [1]***	***Flammability and Explosivity SL [1]***	***Residential GW-Shallow VIAP SL [2]***	***Residential GW-Not In Contact VIAP SL [2]***	13261 White Creek Avenue 141 21060077-02 05/26/21	13328 White Creek Avenue 158 21072346-02 07/28/21	13353 White Creek Avenue 100 21060077-03 05/26/21	13360 White Creek Avenue Unknown 21060077-01 05/26/21	13360 White Creek Avenue Duplicate Unknown 21060077-12 05/26/21	13399 White Creek Avenue 122 21060077-04 05/26/21	13485 White Creek Avenue 35 21060077-05 05/26/21
Compound	*CAS Number*														
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
9-Chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	756426-58-1	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	763051-92-9	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Hexafluoropropylene oxide dimer acid (HFPO-DA)(GenX)	13252-13-6	*370 (A)*	*NA*	*ID*	*NA*	*NA*	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
N-Ethyl perfluorooctane sulfonamido acetic acid (N-EtFOSAA)	2991-50-6	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	0.41 J
N-Methyl perfluorooctane sulfonamido acetic acid (N-MeFOSAA)	2355-31-9	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Perfluorobutane sulfonic acid (PFBS)	375-73-5	*420 (A)*	*NA*	*ID*	*NA*	*NA*	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	1.9 J
Perfluorodecanoic acid (PFDA)	335-76-2	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Perfluorododecanoic acid (PFDoDA)	307-55-1	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Perfluoroheptanoic acid (PFHpA)	375-85-9	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	1.4 J
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	*51 (A)*	*NA*	*ID*	*NA*	*NA*	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.8
Perfluorohexanoic acid (PFHxA)	307-24-4	*4.00E+05 (A)*	*NA*	*ID*	*NA*	*NA*	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	1.1 J
Perfluorononanoic acid (PFNA)	375-95-1	*6.0 (A)*	*NA*	*ID*	*NA*	*NA*	--	--	2.0 U	2.0 U	2.0 U	2.0 U	0.55 J	2.0 U	2.0 U
Perfluorooctane sulfonic acid (PFOS) (DD)	1763-23-1	*16 (A)*	*12 (X)*	*NLV*	*3,100*	*NA*	*NA*	*NA*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	7.0
Perfluorooctanoic acid (PFOA) (DD)	335-67-1	*8.0 (A)*	*12,000 (X)*	*ID*	*9.50E+09*	*NA*	*TX*	*TX*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	**9.9**
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U

Results expressed in ng/L.
Bolded values exceed an applicable criterion.

Data Qualifiers:
J Estimated value
U Not detected above the given limit.

Footnotes/Abbreviations:
[1] *Part 201 Groundwater Generic Cleanup Criteria and Screening Levels, December 21, 2020.*
[2] *EGLE Volatilization to Indoor Air Pathway Screening Levels, September 4, 2020.*
(A) State of Michigan drinking water (DW) standard.
(X) Criterion is not protective for surface water used as a DW source.
(DD) Hazardous substance causes developmental effects. Residential direct contact criteria are protective of both prenatal and postnatal exposure.
DWC drinking water criterion
GSI groundwater surface water interface
ID Insufficient data to develop criterion.
MCL maximum contaminant limit
NA not available
NLV Not likely to volatilize under most conditions.
SL screening level
TX The Remediation and Redevelopment Division Toxicology Unit has not identified an inhalation toxicity value for the hazardous substance at the date of publication of these values.
VIAIC volatilization to indoor air inhalation criteria
VIAP volatilization to indoor air pathway

Table 3 - Residential Well Sample Data Summary - Poly- and Perfluoroalkyl Substances (PFAS)
2021 Remedial Investigation
City of Cedar Springs, Kent County, Michigan
July 2021

Monitoring Location: / Field Duplicate: / Well Depth (ft): / Laboratory ID: / Collection Date:		***MCL / Residential DWC*** [(1)]	***GSI Criteria*** [(1)]	***Residential Groundwater VIAIC*** [(1)]	***Water Solubility*** [(1)]	***Flammability and Explosivity SL*** [(1)]	***Residential GW-Shallow VIAP SL*** [(2)]	***Residential GW-Not In Contact VIAP SL*** [(2)]	13485 White Creek Avenue / 35 / 21072346-04 / 07/28/21	13485 White Creek Avenue / Duplicate / 35 / 21072346-05 / 07/28/21	13525 White Creek Avenue / 106 / 21060077-06 / 05/26/21	13550 White Creek Avenue / 82 / 21072346-03 / 07/28/21	13590 White Creek Avenue / 80 / 21060077-07 / 05/26/21	3950 Cedar Rv Drive / 119 / 21072346-06 / 07/28/21	4095 16 Mile Rd / 173 / 21060077-08 / 05/26/21
Compound	*CAS Number*														
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
9-Chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	756426-58-1	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	763051-92-9	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Hexafluoropropylene oxide dimer acid (HFPO-DA)(GenX)	13252-13-6	*370 (A)*	*NA*	*ID*	*NA*	*NA*	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
N-Ethyl perfluorooctane sulfonamido acetic acid (N-EtFOSAA)	2991-50-6	--	--	--	--	--	--	--	1.0 J	1.2 J	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
N-Methyl perfluorooctane sulfonamido acetic acid (N-MeFOSAA)	2355-31-9	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Perfluorobutane sulfonic acid (PFBS)	375-73-5	*420 (A)*	*NA*	*ID*	*NA*	*NA*	--	--	2.6	2.5	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Perfluorodecanoic acid (PFDA)	335-76-2	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Perfluorododecanoic acid (PFDoDA)	307-55-1	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Perfluoroheptanoic acid (PFHpA)	375-85-9	--	--	--	--	--	--	--	1.7 J	1.8 J	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	*51 (A)*	*NA*	*ID*	*NA*	*NA*	--	--	3.7	3.9	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Perfluorohexanoic acid (PFHxA)	307-24-4	*4.00E+05 (A)*	*NA*	*ID*	*NA*	*NA*	--	--	1.2 J	1.4 J	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Perfluorononanoic acid (PFNA)	375-95-1	*6.0 (A)*	*NA*	*ID*	*NA*	*NA*	--	--	2.0 U	0.5 J	2.0 U	2.0 U	2.0 U	2.0 U	0.88 J
Perfluorooctane sulfonic acid (PFOS) (DD)	1763-23-1	*16 (A)*	*12 (X)*	*NLV*	*3,100*	*NA*	*NA*	*NA*	10	9.4	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Perfluorooctanoic acid (PFOA) (DD)	335-67-1	*8.0 (A)*	*12,000 (X)*	*ID*	*9.50E+09*	*NA*	*TX*	*TX*	**13**	**13**	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U

Results expressed in ng/L.
Bolded values exceed an applicable criterion.

Data Qualifiers:
J Estimated value
U Not detected above the given limit.

Footnotes/Abbreviations:
(1) Part 201 Groundwater Generic Cleanup Criteria and Screening Levels, December 21, 2020.
(2) EGLE Volatilization to Indoor Air Pathway Screening Levels, September 4, 2020.
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(X) Criterion is not protective for surface water used as a DW source.
(DD) Hazardous substance causes developmental effects. Residential direct contact criteria are protective of both prenatal and postnatal exposure.
DWC drinking water criterion
GSI groundwater surface water interface
ID Insufficient data to develop criterion.
MCL maximum contaminant limit
NA not available
NLV Not likely to volatilize under most conditions.
SL screening level
TX The Remediation and Redevelopment Division Toxicology Unit has not identified an inhalation toxicity value for the hazardous substance at the date of publication of these values.
VIAIC volatilization to indoor air inhalation criteria
VIAP volatilization to indoor air pathway

Table 3 - Residential Well Sample Data Summary - Poly- and Perfluoroalkyl Substances (PFAS)
2021 Remedial Investigation
City of Cedar Springs, Kent County, Michigan
July 2021

Monitoring Location: *Field Duplicate:* *Well Depth (ft):* *Laboratory ID:* *Collection Date:*		*MCL / Residential DWC* [1]	*GSI Criteria* [1]	*Residential Groundwater VIAIC* [1]	*Water Solubility* [1]	*Flammability and Explosivity SL* [1]	*Residential GW-Shallow VIAP SL* [2]	*Residential GW-Not in Contact VIAP SL* [2]	4095 16 Mile Rd Duplicate 173 21060077-14 05/26/21	4107 16 Mile Rd 125 21060077-09 05/26/21	4141 16 Mile Rd 140 21060077-10 05/26/21	4142 16 Mile Rd Unknown 21060077-11 05/26/21	Field Blank 21060077-13 05/26/21	Field Blank 21072346-01 07/28/21
Compound	*CAS Number*													
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
9-Chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	756426-58-1	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	763051-92-9	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Hexafluoropropylene oxide dimer acid (HFPO-DA)(GenX)	13252-13-6	*370 (A)*	*NA*	*ID*	*NA*	*NA*	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
N-Ethyl perfluorooctane sulfonamido acetic acid (N-EtFOSAA)	2991-50-6	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
N-Methyl perfluorooctane sulfonamido acetic acid (N-MeFOSAA)	2355-31-9	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Perfluorobutane sulfonic acid (PFBS)	375-73-5	*420 (A)*	*NA*	*ID*	*NA*	*NA*	--	--	2.0 U	2.0 U	2.0 U	0.85 J	2.0 U	2.0 U
Perfluorodecanoic acid (PFDA)	335-76-2	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Perfluorododecanoic acid (PFDoDA)	307-55-1	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Perfluoroheptanoic acid (PFHpA)	375-85-9	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	*51 (A)*	*NA*	*ID*	*NA*	*NA*	--	--	2.0 U	2.0 U	2.0 U	0.49 J	2.0 U	2.0 U
Perfluorohexanoic acid (PFHxA)	307-24-4	*4.00E+05 (A)*	*NA*	*ID*	*NA*	*NA*	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Perfluorononanoic acid (PFNA)	375-95-1	*6.0 (A)*	*NA*	*ID*	*NA*	*NA*	--	--	0.65 J	1.6 J	0.58 J	2.0 U	0.69 J	2.0 U
Perfluorooctane sulfonic acid (PFOS) (DD)	1763-23-1	*16 (A)*	*12 (X)*	*NLV*	*3,100*	*NA*	*NA*	*NA*	2.0 U	2.0 U	2.0 U	1.4 J	2.0 U	2.0 U
Perfluorooctanoic acid (PFOA) (DD)	335-67-1	*8.0 (A)*	*12,000 (X)*	*ID*	*9.50E+09*	*NA*	*TX*	*TX*	2.0 U	2.0 U	0.65 J	0.75 J	2.0 U	2.0 U
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U

Results expressed in ng/L.
Bolded values exceed an applicable criterion.

Data Qualifiers:
J Estimated value
U Not detected above the given limit.

Footnotes/Abbreviations:
[1] *Part 201 Groundwater Generic Cleanup Criteria and Screening Levels, December 21, 2020.*
[2] *EGLE Volatilization to Indoor Air Pathway Screening Levels, September 4, 2020.*
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GSI groundwater surface water interface
ID Insufficient data to develop criterion.
MCL maximum contaminant limit
NA not available
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SL screening level
TX The Remediation and Redevelopment Division Toxicology Unit has not identified an inhalation toxicity value for the hazardous substance at the date of publication of these values.
VIAIC volatilization to indoor air inhalation criteria
VIAP volatilization to indoor air pathway

Appendix 1

fishbeck, thompson, carr & huber
engineers • scientists • architects

Grand Rapids (616) 575-3824
Lansing (517) 627-1141
Kalamazoo (616) 349-3717
Farmington Hills (248) 324-2090

BOREHOLE LOG

BORING/WELL ID: **GSI - 1d**

TOTAL DEPTH (ft.): **31'**

PROJECT: Cedar Springs Former Lagoon Closure
SITE LOCATION: Cedar Springs, MI
PROJECT NO.: G02126D
PROJECT MANAGER: Tim K. Patterson
LOGGED BY: Tim K. Patterson

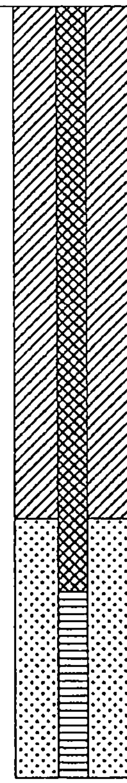
START DATE: 11/24/03
END DATE: 11/24/03
TOC ELEV.: 833.52
GROUND ELEV.: 830.88
STATIC WATER LVL.: 826.69

DRILLING CO.: Stearns Drilling
DRILLER: John Verett
RIG TYPE: CME 1050
METHOD OF DRILLING: 4 1/4" HSA
SAMPLING METHODS: Split barrel sampler

NOTES: GSI-1d is located 9' north of GSI-1soil boring, between 13421 and 13447 White Creek Ave, 18 ft. east of Cedar Creek.

▼ Static Water Level

DESCRIPTION	PID ppm	GRAPHIC LOG	DEPTH (ft. bgl)	Static Water Level	Sample/ Revovery	Sample ID	Blows Counts	WELL CONSTRUCTION DETAIL
TOPSOIL: Dark brown sandy loam, fine grained, trace silt, trace natural organics (roots), dry to moist			0–2.5					2-inch daimeter PVC casing (+2.5' - 16')
SAND: Sand, 100%, tan, fine grained, trace fine gravel, trace clay, dry				▼ (4)				
Sand, 100%, brown, coarse to fine grained, trace coarse to fine gravel, moist			4–6		2.0		5-8-9-11	Bentonite
Sand, 100%, brown, coarse to fine grained, wet			9–11		1.5		4-4-4-6	
CLAY: Clay, 100%, brown to gray, slightly plastic, stiff, trace silt, dry			10.5–14					
SAND: Sand, 100%, brown, medium to fine grained, trace fine gravel, wet			14–16		2.0		4-8-11-12	Global #6 sand pack
			19–21		2.0		3-5-4-4	2-inch diameter, slot-10, PVC screen (16' - 21')
TILL: Clay, 80%, gray, slightly plastic to non-plastic, stiff; Sand, 20%, gray, fine grained, trace silt, trace fine gravel, dry			24–26		1.5		14-46-80-80	
			29–31		1.5		15-24-34-37	



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Farmington Hills (248) 324-2090

BOREHOLE LOG

BORING/WELL ID: GSI-2d

TOTAL DEPTH (ft.): 21'

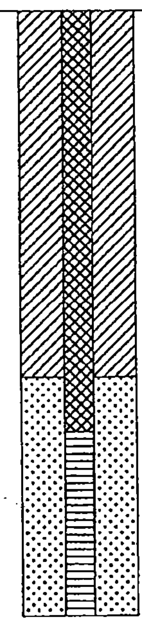
PROJECT: Cedar Springs Former Lagoon Closure	**START DATE:** 11/25/03	**DRILLING CO.:** Stearns Drilling
SITE LOCATION: Cedar Springs, MI	**END DATE:** 11/25/03	**DRILLER:** John Verett
PROJECT NO.: G02126D	**TOC ELEV.:** 832.51	**RIG TYPE:** CME 1050
PROJECT MANAGER: Tim K. Patterson	**GROUND ELEV.:** 830.28	**METHOD OF DRILLING:** 4 1/4" HSA
LOGGED BY: Tim K. Patterson	**STATIC WATER LVL.:** 828.83	**SAMPLING METHODS:** Split barrel sampler

NOTES: GSI-2d is located 10' east of Cedar Creek and 25' west of White Creek Ave., 10' south of drain.

▼ Static Water Level

Page 1 of 1

DESCRIPTION	PID ppm	GRAPHIC LOG	DEPTH (ft. bgl)	Static Water Level	Sample/ Revovery	Sample ID	Blows Counts	WELL CONSTRUCTION DETAIL
TOPSOIL: Dark brown sandy loam, fine grained, trace silt, trace natural organics (roots), moist			0–2	▼				2-inch daimeter PVC casing (+2.5' - 11.5')
GRAVEL: Gravel, 80%, Coarse to fine; Sand, 10%, brownish gray, fine grained; Clay, 10%, brownish gray, wet			2–8		1.0		5-9-10-9	Bentonite
SAND: Sand, 100%, brown, fine grained, wet			8–16.5		2.0		3-6-8-8	Global #8 sand pack
					2.0		5-17-26-31	2-inch diameter, slot-10, PVC screen (11.5' - 16.5')
TILL: Clay, 100%, gray, slightly plastic, stiff, trace fine sand, trace fine gravel, dry			16.5–21		2.0		5-12-16-20	



fishbeck, thompson, carr & huber
engineers ◦ scientists ◦ architects

6090 East Fulton Ave.
Ada, Michigan 49301
Ph: (616) 676-3824
Fax: (616) 676-8173

BOREHOLE LOG

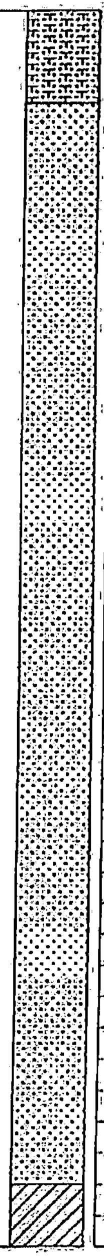
BORING/WELL ID: MW-6A
TOTAL DEPTH (ft.): 20'

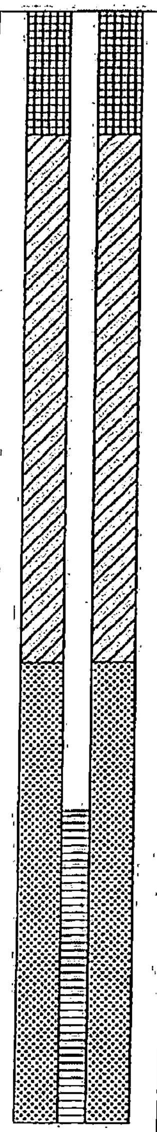
PROJECT: Cedar Springs/Lagoon Closure	**START DATE:** 12/8/99	**DRILLING CO.:** Steams Drilling Co.
SITE LOCATION: Cedar Springs, Michigan	**END DATE:** 12/8/99	**DRILLER:** Duane / Bob
PROJECT NO.: F95342m	**TOC ELEV.:** - -	**RIG TYPE:** CME 850
PROJECT MANAGER: Ron C. Waybrant	**GROUND ELEV.:** - -	**METHOD OF DRILLING:** 4.25" I.D. Hollow Stem Auger
LOGGED BY: Bruce E. Gillett	**STATIC WATER LVL.:** - -	**SAMPLING METHODS:** Split Spoon

NOTES: --

▼ Static Water Level

DESCRIPTION	PID ppm	GRAPHIC LOG	DEPTH (ft. bgl)	Static Water Level	Sample/ Revovery	Sample ID	Blows Counts	WELL CONSTRUCTION DETAIL
TOPSOIL: with some Sand, dark brown, dry			0					
SAND: fine grained, tan, loose, moist			2					
SAND AND GRAVEL: fine to coarse grained Sand, fine Gravel (trace of coarse), loose, moist			4		1.00'		2-4-5-5	2" diameter PVC casing (+2.5 - 13.0 feet)
Note: Cobbles encountered during drilling			6					bentonite grout
SAND AND GRAVEL: fine to coarse grained Sand, fine Gravel (trace of coarse), loose, wet			8		0.75'		6-10-5-3	
			10					
			12					sand pack
SAND AND GRAVEL: fine to coarse grained Sand, fine Gravel (trace of coarse), loose, wet			14		1.50'		2-5-5-7	
			16					2" diameter 10 -slot PVC screen (13.0 - 18.0 feet)
			18					
CLAY: with some Silt, trace of fine Sand, slight trace of fine Gravel, gray, dense, moist			20		1.50'		4-7-14-17	





Appendix 2

Water Well And Pump Record

Completion is required under authority of Part 127 Act 368 PA 1978.
Failure to comply is a misdemeanor.

Wellogic

Import ID:

Tax No:	Permit No:	County: Kent	Township: Solon

Well ID: 41000016625

Elevation:

Latitude: 43.209328

Longitude: -85.573034

Method of Collection: Interpolation-Map

Town/Range:	Section:	Well Status:	WSSN:	Source ID/Well No:
10N 11W	35	Active		

Distance and Direction from Road Intersection:
0.25 MILE NORTH OF 16 MILE ROAD; 600 FEET WEST OF WHITE CREEK AVENUE ON THE SOUTH OF R.V. DRIVE CUL-DE-SAC.

Well Owner: MARK HUGHEY

Well Address:
13437 WHITE CREEK
Cedar Springs, MI 49319

Owner Address:
5250 D-10
CEDAR SPRINGS, MI 49319

Drilling Method: Cable Tool
Well Depth: 119.00 ft. **Well Use:** Household
Well Type: New **Date Completed:** 9/3/2004

Casing Type: Steel - unknown **Height:**
Casing Joint: Threaded & coupled
Casing Fitting: Drive shoe

Diameter: 4.00 in. to 111.00 ft. depth
3.00 in. to 119.00 ft. depth

Borehole:

Pump Installed: Yes **Pump Installation Only:** No
Pump Installation Date: **HP:** 1.50
Manufacturer: Aermotor **Pump Type:** Submersible
Model Number: A+20-150 **Pump Capacity:** 20 GPM
Drop Pipe Length: 80.00 ft. **Pump Voltage:**
Drop Pipe Diameter: **Drilling Record ID:**
Draw Down Seal Used: No

Pressure Tank Installed: Yes
Pressure Tank Type: Unknown
Manufacturer: Well-X-Trol
Model Number: WX-103 **Tank Capacity:**
Pressure Relief Valve Installed: No

Static Water Level: 2.00 ft. Below Grade
Well Yield Test: **Yield Test Method:** Plunger
Pumping level 4.00 ft. after 2.00 hrs. at 70 GPM

Formation Description	Thickness	Depth to Bottom
Topsoil	4.00	4.00
Brown Clay W/Stones Hard	5.00	9.00
Gravel W/Cobbles	14.00	23.00
Gray Clay Hard	64.00	87.00
Sand Clay Silt Fine	17.00	104.00
Gray Clay W/Stones Hard	4.00	108.00
Brown Sand & Gravel Coarse	11.00	119.00

Screen Installed: Yes **Filter Packed:** No
Screen Diameter: 3.00 in. **Blank:** 2.00 ft. Above
Screen Material Type: Stainless steel-wire wrapped
Screen Installation Type: Telescoped

Slot	Length	Set Between
10.00	8.00 ft.	111.00 ft. and 119.00 ft.

Fittings: Neoprene packer

Well Grouted: Yes **Grouting Method:** Unknown

Grouting Material	Bags	Additives	Depth
Bentonite dry granular	8.00	None	0.00 ft. to 65.00 ft.

Geology Remarks:

Wellhead Completion: Pitless adapter, 12 inches above grade

Drilling Machine Operator Name: MIKE WAHLFIELD
Employment: Employee

Nearest Source of Possible Contamination:

Type	Distance	Direction
Septic tank	75 ft.	Southwest

Contractor Type: Water Well Drilling Contractor **Reg No:** 41-0395
Business Name: WAHLFIELD DRILLING COMPANY INC
Business Address:

Water Well Contractor's Certification

This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor **Date**

General Remarks:

Other Remarks:

Water Well And Pump Record

Completion is required under authority of Part 127 Act 368 PA 1978.
Failure to comply is a misdemeanor.

Wellogic

Import ID:

Tax No:	Permit No:	County: Kent	Township: Solon

Well ID: 41000045032

Elevation:

Latitude: 43.20578

Longitude: -85.57052

Method of Collection: Interpolation-Map

Town/Range:	Section:	Well Status:	WSSN:	Source ID/Well No:
10N 11W	36	Active		

Distance and Direction from Road Intersection:
155' NROHT OF 16 MILE RD. - EAST OF WHITE CREEK

Well Owner: PLYMOUTH TANK CO.

Well Address:
16 MILE RD. & WHITE CREEK
CEDAR SPRINGS, MI

Owner Address:
16 MILE RD. & WHITE CREEK
CEDAR SPRINGS, MI

Drilling Method: Rotary
Well Depth: 180.00 ft. **Well Use:** Household
Well Type: New **Date Completed:** 7/2/1991

Casing Type: Steel - unknown **Height:** 1.00 ft. above grade
Casing Joint: Threaded & coupled
Casing Fitting:

Diameter: 4.00 in. to 168.00 ft. depth

Borehole:

Pump Installed: No
Pressure Tank Installed: No
Pressure Relief Valve Installed:

Static Water Level: 8.75 ft.
Well Yield Test: **Yield Test Method:** Unknown
8.00 hrs. at 25 GPM

Unrestricted Flow Rate:

Formation Description	Thickness	Depth to Bottom
Topsoil Sandy	1.00	1.00
Sand & Gravel	24.00	25.00
Gray Clay	80.00	105.00
Gray Clay Sandy	14.00	119.00
Sand	31.00	150.00
Gravel	30.00	180.00

Screen Installed: Yes **Filter Packed:** Unknown
Screen Diameter: 4.00 in. **Blank:**
Screen Material Type: Stainless steel-wire wrapped
Screen Installation Type: Unknown

Slot	Length	Set Between
15.00	5.00 ft.	168.00 ft. and 173.00 ft.

Fittings: Other

Geology Remarks:

Grouting Material	Bags	Additives	Depth
Neat cement		Unknown	0.00 ft. to 160.00 ft.

Wellhead Completion: 12 inches above grade

Nearest Source of Possible Contamination:

Type	Distance	Direction
None		

Drilling Machine Operator Name:
Employment: Unknown

Contractor Type: Water Well Drilling Contractor **Reg No:**
Business Name: RAYMER COMPANY INC.
Business Address: 3311 THREE MILE RD N.W., GRAND RAPIDS, MI

Water Well Contractor's Certification

This well and/or pump installation was performed under my registration.

Signature of Registered Contractor **Date**

General Remarks: WELL DRILLER REGISTRATION NUMBER ENDING IN 0384
Other Remarks: Screen Fittings:SCREWED

Water Well And Pump Record

Completion is required under authority of Part 127 Act 368 PA 1978.
Failure to comply is a misdemeanor.

Wellogic

Import ID:

Tax No:	Permit No:	County: Kent	Township: Ada

Well ID: 41000015750

Elevation: 850 ft.
Latitude: 43.205849
Longitude: -85.568235
Method of Collection: Interpolation-Map

Town/Range:	Section:	Well Status:	WSSN:	Source ID/Well No:
10N 11W	36	Active		

Distance and Direction from Road Intersection:
.25 MILE EAST OF WHITE CREEK ON NORTH SIDE OF 16 MILE ROAD

Well Owner: BOB & JOYCE KELLEY

Well Address:
4107 16 MILE RD
CEDAR SPRINGS, MI 49319

Owner Address:
4107 16 MILE RD
CEDAR SPRINGS, MI 49319

Drilling Method: Rotary
Well Depth: 125.00 ft. **Well Use:** Household
Well Type: Replacement **Date Completed:** 5/6/2004

Casing Type: PVC plastic **Height:**
Casing Joint: Unknown
Casing Fitting: None

Diameter: 5.00 in. to 125.00 ft. depth

Borehole: 8.50 in. to 125.00 ft. depth

Pump Installed: Yes **Pump Installation Only:** No
Pump Installation Date: **HP:** 0.50
Manufacturer: Berkeley **Pump Type:** Submersible
Model Number: 10KT051215 **Pump Capacity:** 10 GPM
Drop Pipe Length: 65.00 ft. **Pump Voltage:**
Drop Pipe Diameter: **Drilling Record ID:**
Draw Down Seal Used: No

Pressure Tank Installed: Yes
Pressure Tank Type: Unknown
Manufacturer: Well-Rite-Flexcon
Model Number: WR-120 **Tank Capacity:** 33.0 Gallons
Pressure Relief Valve Installed: No

Static Water Level: 12.00 ft. Below Grade
Well Yield Test: **Yield Test Method:** Air
Pumping level 80.00 ft. after 2.00 hrs. at 50 GPM

Formation Description	Thickness	Depth to Bottom
Sand	21.00	21.00
Sand Water Bearing	6.00	27.00
Gray Clay	68.00	95.00
Gray Sand & Clay	16.00	111.00
Sand Water Bearing	14.00	125.00

Screen Installed: Yes **Filter Packed:** Yes
Screen Diameter: 5.00 in. **Blank:**
Screen Material Type: PVC-slotted
Screen Installation Type: Attached

Slot	Length	Set Between
15.00	10.00 ft.	115.00 ft. and 125.00 ft.

Fittings: None

Well Grouted: Yes **Grouting Method:** Unknown

Grouting Material	Bags	Additives	Depth
Bentonite slurry	14.00	None	0.00 ft. to 115.00 ft.

Geology Remarks:

Wellhead Completion: Pitless adapter

Drilling Machine Operator Name: JOHN SCHMID
Employment: Employee

Nearest Source of Possible Contamination:

Type	Distance	Direction
Septic tank	100 ft.	West

Contractor Type: Water Well Drilling Contractor **Reg No:** 41-1561
Business Name: TRI NORTHERN WELL DRILLING
Business Address:

Abandoned Well Plugged: Yes

Casing Diameter: 1.25 in. **Casing Removed:** No
Plugging Material: Bentonite chips/pellets
No. of Bags: 0.50 **Well Depth:** 25 ft.

Water Well Contractor's Certification

This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor **Date**

General Remarks: GROUT TO BOTTOM OF WATER LINE; GROUT WEIGHT 9.5

Other Remarks:

Water Well And Pump Record

Completion is required under authority of Part 127 Act 368 PA 1978.
Failure to comply is a misdemeanor.

Wellogic

Import ID:

Tax No: | **Permit No:** W-12-41-0005 | **County:** Kent | **Township:** Solon

Well ID: 41000023662

Elevation:

Latitude: 43.20562

Longitude: -85.56734

Method of Collection: GPS Std Positioning Svc SA Off

Town/Range:	Section:	Well Status:	WSSN:	Source ID/Well No:
10N 11W	36	Active	2097341	001

Distance and Direction from Road Intersection:

Well Owner: TRUSS TECHNOLOGIES

Well Address:
4141 16 MILE RD NE
CEDAR SPRINGS, MI 49319

Owner Address:
P.O. BOX A
CEDAR SPRINGS, MI 49319

Drilling Method: Rotary
Well Depth: 140.00 ft. **Well Use:** Type II public
Well Type: Replacement **Date Completed:** 8/2/2012

Casing Type: PVC plastic **Height:** 1.00 ft. above grade
Casing Joint: Solvent welded/glued
Casing Fitting: None

Diameter: 5.00 in. to 135.00 ft. depth SDR: 17.00

Borehole: 8.50 in. to 140.00 ft. depth

Pump Installed: Yes **Pump Installation Only:** No
Pump Installation Date: 8/2/2012 **HP:** 1.50
Manufacturer: Grundfos **Pump Type:** Submersible
Model Number: 22SQE15 **Pump Capacity:** 25 GPM
Drop Pipe Length: 80.00 ft. **Pump Voltage:** 230
Drop Pipe Diameter: 1.25 in. **Drilling Record ID:**
Draw Down Seal Used: No

Pressure Tank Installed: Yes
Pressure Tank Type: Diaphragm/bladder
Manufacturer: Well-X-Trol
Model Number: WX 105 **Tank Capacity:** 5.0 Gallons
Pressure Relief Valve Installed: Yes

Static Water Level: 22.00 ft. Below Grade
Well Yield Test: **Yield Test Method:** Air
Pumping level 120.00 ft. after 4.00 hrs. at 40 GPM

Formation Description	Thickness	Depth to Bottom
Clay	9.00	9.00
Sand & Gravel	25.00	34.00
Clay	62.00	96.00
Sand Fine	6.00	102.00
Clay Sandy	21.00	123.00
Clay	3.00	126.00
Sand Coarse	14.00	140.00

Screen Installed: Yes **Filter Packed:** Yes
Screen Diameter: 3.00 in. **Blank:**
Screen Material Type: Stainless steel-wire wrapped
Screen Installation Type: Attached

Slot	Length	Set Between
15.00	5.00 ft.	135.00 ft. and 140.00 ft.

Fittings: Other

Well Grouted: Yes **Grouting Method:** Grout pipe outside casing

Grouting Material	Bags	Additives	Depth
Neat cement	28.00	None	0.00 ft. to 125.00 ft.

Geology Remarks:

Wellhead Completion: Pitless adapter, 12 inches above grade

Drilling Machine Operator Name: CURT SILLIMAN
Employment: Employee
Pump Installer: ED ROBINSON

Nearest Source of Possible Contamination:

Type	Distance	Direction
Storm sewer	45 ft.	North-Northeast

Contractor Type: Water Well Drilling Contractor **Reg No:** 41-2351
Business Name: NORTH KENT WELL & PUMP
Business Address: 6085 17 MILE RD NE, CEDAR SPRINGS, MI, 49319

Abandoned Well Plugged: Yes

Latitude: 43.20564 **Longitude:** -85.56712
Casing Diameter: 4 in. **Casing Removed:** No
Plugging Material: Neat cement
No. of Bags: 16.00 **Well Depth:** 220 ft.

Water Well Contractor's Certification

This well/pump was constructed under my supervision and I hereby certify that the work complies with Part 127 Act 368 PA 1978 and the well code.

Signature of Registered Contractor **Date**

General Remarks: TWO WELL DRILLER'S ATTEMPTS TO REMOVE PUMP WERE UNSUCCESSFUL. PUMP DRIVEN TO TOP OF SCREEN AND WELL GROUTED BACK UP TO SURFACE

Other Remarks: Screen Fittings:BUSHING

Water Well And Pump Record

Completion is required under authority of Part 127 Act 368 PA 1978.
Failure to comply is a misdemeanor.

Wellogic

Import ID:

Tax No: 41-02-35-400-030-031 | **Permit No:** | **County:** Kent | **Township:** Solon

Town/Range: 10N 11W | **Section:** 35 | **Well Status:** | **WSSN:** | **Source ID/Well No:**

Well ID: 41000008016

Elevation:

Latitude: 43.20604597

Longitude: -85.571897

Method of Collection: Address Matching-Nearest Intersection

Distance and Direction from Road Intersection:
NW CORNER OF WHITE CREEK AVE. & 16 MILE

Well Owner: STERK BRO. REDI-MIX

Well Address: 13261 WHITE CREEK

Owner Address: 584 50TH ST., SW

Drilling Method: Rotary
Well Depth: 141.00 ft. **Well Use:** Other
Well Type: New **Date Completed:** 5/12/2000

Casing Type: Unknown **Height:**
Casing Joint: Unknown
Casing Fitting: None

Diameter: 6.00 in. to 138.00 ft. depth

Borehole: 11.75 in. to 141.00 ft. depth

Pump Installed: Yes **Pump Installation Only:** No
Pump Installation Date: **HP:** 7.50
Manufacturer: Webtrol **Pump Type:** Submersible
Model Number: 3 PHASE **Pump Capacity:** 150 GPM
Drop Pipe Length: 126.00 ft. **Pump Voltage:**
Drop Pipe Diameter: **Drilling Record ID:**
Draw Down Seal Used: No

Pressure Tank Installed: Yes
Pressure Tank Type: Galvanized steel
Manufacturer: Unknown
Model Number: **Tank Capacity:** 100.0 Gallons
Pressure Relief Valve Installed: No

Static Water Level: 20.00 ft. Below Grade
Well Yield Test: **Yield Test Method:** Air
at 150 GPM

Formation Description	Thickness	Depth to Bottom
Sand & Gravel	40.00	40.00
Gray Clay	78.00	118.00
Gravel & Clay Gray	3.00	121.00
Sand Coarse	20.00	141.00

Screen Installed: Yes **Filter Packed:** Yes
Screen Diameter: 6.00 in. **Blank:** *u
Screen Material Type:
Screen Installation Type: Unknown

Slot	Length	Set Between
15.00	15.00 ft.	138.00 ft. and 141.00 ft.

Fittings: Unknown

Well Grouted: Yes **Grouting Method:** Unknown

Grouting Material	Bags	Additives	Depth
Other	32.00	None	0.00 ft. to 128.00 ft.

Geology Remarks:

Wellhead Completion: Pitless adapter, 12 inches above grade

Drilling Machine Operator Name: DAVE POORE
Employment: Employee

Nearest Source of Possible Contamination:

Type	Distance	Direction
Unknown		

Contractor Type: Water Well Drilling Contractor **Reg No:** 41-1987
Business Name: BRASS-MAR WATER WELLS, INC.
Business Address: 13427 FRUIT RIDGE AVE, Kent City

Water Well Contractor's Certification

This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor **Date**

General Remarks: AS OF 5/17/00, SEPTIC SYSTEM NOT INSTALLED; SCREEN TYPE: STAINLESS;

Other Remarks: Well Use:PRODUCTION, Grouting Material 1:QUICK GROUT

Water Well And Pump Record

Completion is required under authority of Part 127 Act 368 PA 1978.
Failure to comply is a misdemeanor.

Wellogic

Import ID:

Tax No: | **Permit No:** | **County:** Kent | **Township:** Solon

Town/Range: 10N 11W | **Section:** 36 | **Well Status:** Active | **WSSN:** | **Source ID/Well No:**

Well ID: 41000027759

Elevation:

Latitude: 43.20785

Longitude: -85.56918

Method of Collection: GPS Std Positioning Svc SA Off

Distance and Direction from Road Intersection:
891' NORTH AND 505' WEST FROM INTERSECTION OF 16 MILE RD NE AND WHITE CREEK AVE

Well Owner: MATT BAILEY

Well Address:
13328 WHITE CREEK AVE
CEDAR SPRINGS, MI 49319

Owner Address:
13328 WHITE CREEK AVE
CEDAR SPRINGS, MI 49319

Drilling Method: Rotary
Well Depth: 158.00 ft. **Well Use:** Type III public
Well Type: New **Date Completed:** 4/13/2017

Casing Type: PVC plastic **Height:** 1.00 ft. above grade
Casing Joint: Solvent welded/glued
Casing Fitting: Centralizer

Diameter: 5.00 in. to 138.00 ft. depth SDR: 21.00

Borehole: 8.50 in. to 162.00 ft. depth

Pump Installed: Yes **Pump Installation Only:** No
Pump Installation Date: 1/19/2017 **HP:** 5.00
Manufacturer: Grundfos **Pump Type:** Submersible
Model Number: 77S50-10 **Pump Capacity:** 77 GPM
Drop Pipe Length: 102.00 ft. **Pump Voltage:** 230
Drop Pipe Diameter: 2.00 in. **Drilling Record ID:**
Draw Down Seal Used: No

Pressure Tank Installed: Yes
Pressure Tank Type: Diaphragm/bladder
Manufacturer: Challenger
Model Number: PC66 **Tank Capacity:** 20.0 Gallons
Pressure Relief Valve Installed: Yes

Static Water Level: 13.00 ft. Below Grade
Well Yield Test: **Yield Test Method:** Air
Pumping level 156.00 ft. after 1.00 hrs. at 300 GPM

Formation Description	Thickness	Depth to Bottom
Topsoil	2.00	2.00
Sand & Gravel	31.00	33.00
Gray Clay	92.00	125.00
Sand W/Clay Gray	8.00	133.00
Gray Clay	5.00	138.00
Sand W/Gravel Coarse	24.00	162.00

Screen Installed: Yes **Filter Packed:** Yes
Screen Diameter: 5.00 in. **Blank:**
Screen Material Type: PVC-slotted
Screen Installation Type: Attached

Slot	Length	Set Between
0.15	20.00 ft.	138.00 ft. and 158.00 ft.

Fittings: Coupling

Well Grouted: Yes **Grouting Method:** Grout pipe outside casing

Grouting Material	Bags	Additives	Depth
Bentonite slurry	12.00	None	0.00 ft. to 132.00 ft.

Geology Remarks:

Wellhead Completion: Pitless adapter

Nearest Source of Possible Contamination:

Type	Distance	Direction
Septic tank	98 ft.	West

Drilling Machine Operator Name: JASON BROWN
Employment: Employee
Pump Installer: BRENT WINGER

Contractor Type: Water Well Drilling Contractor **Reg No:** 41-2028
Business Name: Buer Well Drilling Inc
Business Address: 239 E Main St, Caledonia, MI, 49316

Water Well Contractor's Certification

This well and/or pump installation was performed under my registration.

Signature of Registered Contractor **Date**

General Remarks:

Other Remarks:

Water Well And Pump Record

Completion is required under authority of Part 127 Act 368 PA 1978.
Failure to comply is a misdemeanor.

Wellogic

Import ID:

Tax No:	Permit No:	County: Kent	Township: Solon

Well ID: 41000016727

Elevation: 840 ft.
Latitude: 43.207883
Longitude: -85.571841
Method of Collection: Interpolation-Map

Town/Range:	Section:	Well Status:	WSSN:	Source ID/Well No:
10N 11W	35	Active		

Distance and Direction from Road Intersection: 2/10 MI NORTH OF 16 MI RD; 50 YDS WEST OF WHITE CREEK

Well Owner: TAILORED BLDG SYS

Well Address: 13353 WHITE CREEK AVE, Cedar Springs, MI 49319

Owner Address: 550 KIRTLAND ST SW, GRAND RAPIDS, MI 49507

Drilling Method: Rotary
Well Depth: 100.00 ft. **Well Use:** Type III public
Well Type: New **Date Completed:** 9/28/2004

Casing Type: PVC plastic **Height:**
Casing Joint: Unknown
Casing Fitting: None

Diameter: 5.00 in. to 100.00 ft. depth

Borehole: 8.50 in. to 100.00 ft. depth

Pump Installed: Yes **Pump Installation Only:** No
Pump Installation Date: **HP:** 0.50
Manufacturer: Goulds **Pump Type:** Submersible
Model Number: **Pump Capacity:** 12 GPM
Drop Pipe Length: 65.00 ft. **Pump Voltage:**
Drop Pipe Diameter: **Drilling Record ID:**
Draw Down Seal Used: No

Pressure Tank Installed: Yes
Pressure Tank Type: Unknown (Buried)
Manufacturer: Well-X-Trol
Model Number: 202UG **Tank Capacity:** 40.0 Gallons
Pressure Relief Valve Installed: No

Static Water Level: 11.00 ft. Below Grade
Well Yield Test: **Yield Test Method:** Air
Pumping level 65.00 ft. after 2.00 hrs. at 45 GPM

Formation Description	Thickness	Depth to Bottom
Sand & Gravel	34.00	34.00
Gray Clay	55.00	89.00
Sand Water Bearing	11.00	100.00

Screen Installed: Yes **Filter Packed:** Yes
Screen Diameter: 5.00 in. **Blank:**
Screen Material Type: PVC-slotted
Screen Installation Type: Attached

Slot	Length	Set Between
15.00	10.00 ft.	90.00 ft. and 100.00 ft.

Fittings: Unknown

Well Grouted: Yes **Grouting Method:** Unknown

Grouting Material	Bags	Additives	Depth
Bentonite slurry	13.00	None	0.00 ft. to 90.00 ft.

Geology Remarks:

Wellhead Completion: Pitless adapter, 12 inches above grade

Nearest Source of Possible Contamination:

Type	Distance	Direction
Septic tank	100 ft.	Southeast

Drilling Machine Operator Name: JOHN SCHMID
Employment: Employee

Contractor Type: Water Well Drilling Contractor **Reg No:** 41-1561
Business Name: TRI NORTHERN WELL DRLG
Business Address:

Water Well Contractor's Certification

This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor Date

General Remarks: GROUT TO BOTTOM OF WATER LINE GROUT WEIGHT 9.5
Other Remarks:

Water Well And Pump Record

Completion is required under authority of Part 127 Act 368 PA 1978.
Failure to comply is a misdemeanor.

Wellogic

Import ID:

Tax No:	Permit No:	County: Kent	Township: Solon

Town/Range:	Section:	Well Status:	WSSN:	Source ID/Well No:
10N 11W	35	Active		

Well ID: 41000029746

Elevation:

Latitude: 43.20889

Longitude: -85.57142

Method of Collection: GPS Std Positioning Svc SA Off

Distance and Direction from Road Intersection:
west of white creek

Well Owner: car care center

Well Address:
13399 white creek
cedar springs, MI

Owner Address:
13399 white creek
cedar springs, MI 49307

Drilling Method: Rotary
Well Depth: 122.00 ft. **Well Use:** Household
Well Type: Replacement **Date Completed:** 6/15/2018

Casing Type: PVC plastic **Height:** 1.00 ft. above grade
Casing Joint: Solvent welded/glued
Casing Fitting:

Diameter: 5.00 in. to 117.00 ft. depth SDR: 21.00

Borehole: 8.50 in. to 122.00 ft. depth

Pump Installed: Yes **Pump Installation Only:** No
Pump Installation Date: 7/5/2018 **HP:** 0.50
Manufacturer: AquaDuty **Pump Type:** Submersible
Model Number: 10fb05 **Pump Capacity:** 10 GPM
Drop Pipe Length: 20.00 ft. **Pump Voltage:** 230
Drop Pipe Diameter: 1.00 in. **Drilling Record ID:**
Draw Down Seal Used: No

Pressure Tank Installed: Yes
Pressure Tank Type: Diaphragm/bladder
Manufacturer: Flex-Lite-Flexcon
Model Number: fl-7 **Tank Capacity:** 22.0 Gallons
Pressure Relief Valve Installed: Yes

Static Water Level: 6.00 ft. Below Grade
Well Yield Test: **Yield Test Method:** Air
Pumping level 100.00 ft. after 2.00 hrs. at 50 GPM

Formation Description	Thickness	Depth to Bottom
Sand	36.00	36.00
Clay	78.00	114.00
Sand	14.00	128.00

Screen Installed: Yes **Filter Packed:** Yes
Screen Diameter: 3.00 in. **Blank:**
Screen Material Type: Stainless steel-well point
Screen Installation Type: Attached

Slot	Length	Set Between
18.00	5.00 ft.	117.00 ft. and 122.00 ft.

Fittings: Coupling

Well Grouted: Yes **Grouting Method:** Grout pipe outside casing

Grouting Material	Bags	Additives	Depth
Bentonite slurry	11.00	None	0.00 ft. to 107.00 ft.

Geology Remarks:

Wellhead Completion: Pitless adapter, 12 inches above grade

Drilling Machine Operator Name: glenn merlington
Employment: Employee
Pump Installer: ed robinson

Nearest Source of Possible Contamination:

Type	Distance	Direction
Sanitary sewer	98 ft.	West

Contractor Type: Water Well Drilling Contractor **Reg No:** 41-2351
Business Name: North Kent Well and Pump Inc
Business Address: 6085 17 Mile Road, Cedar Springs, MI, 49319

Abandoned Well Plugged: Yes

Latitude: 43.20895 **Longitude:** -85.57144
Casing Diameter: 4 in. **Casing Removed:** No
Plugging Material: Bentonite chips/pellets
No. of Bags: 4.00 **Well Depth:** 31 ft.

Water Well Contractor's Certification

This well and/or pump installation was performed under my registration.

Signature of Registered Contractor **Date**

General Remarks:

Other Remarks:

Water Well And Pump Record

Completion is required under authority of Part 127 Act 368 PA 1978.
Failure to comply is a misdemeanor.

Wellogic

Import ID:

Tax No:	**Permit No:**	**County:** Kent	**Township:** Solon

Well ID: 41000019123

Elevation:

Latitude: 43.21188

Longitude: -85.57087

Method of Collection: GPS Std Positioning Svc SA Off

Town/Range:	**Section:**	**Well Status:**	**WSSN:**	**Source ID/Well No:**
10N 11W	36	Active		COMPASS COACH

Distance and Direction from Road Intersection:
100 FT EAST OF WHITE CREEK, 1/2 MILE NORTH OF 16 MILE RD.

Well Owner: TRENT STANGE/CO. DAVE BARNETT

Well Address:
13500 WHITE CREEK
CEDAR SPRINGS, MI 49319

Owner Address:
12505 NORTHLAND DR.
CEDAR SPRINGS, MI 49319

Drilling Method: Rotary
Well Depth: 82.00 ft. **Well Use:** Other
Well Type: New **Date Completed:** 4/20/2006

Casing Type: PVC plastic **Height:** 1.00 ft. above grade
Casing Joint: Solvent welded/glued
Casing Fitting: Centralizer

Diameter: 5.00 in. to 72.00 ft. depth

Borehole: 8.75 in. to 82.00 ft. depth

Pump Installed: Yes **Pump Installation Only:** No
Pump Installation Date: 5/26/2006 **HP:** 1.50
Manufacturer: Grundfos **Pump Type:** Submersible
Model Number: 25S07-5 **Pump Capacity:** 25 GPM
Drop Pipe Length: 60.00 ft. **Pump Voltage:**
Drop Pipe Diameter: 1.25 in. **Drilling Record ID:**
Draw Down Seal Used: No

Pressure Tank Installed: Yes
Pressure Tank Type: Diaphragm/bladder
Manufacturer: Amtrol
Model Number: WX-105-PS **Tank Capacity:** 5.3 Gallons
Pressure Relief Valve Installed: Yes

Static Water Level: 4.00 ft. Above Grade (Flowing)
Well Yield Test: **Yield Test Method:** Air
Pumping level 40.00 ft. after 4.00 hrs. at 100 GPM

Unrestricted Flow Rate:

Formation Description	Thickness	Depth to Bottom
Sand & Gravel W/Stones	17.00	17.00
Gray Clay	44.00	61.00
Sand & Gravel	21.00	82.00

Screen Installed: Yes **Filter Packed:** Yes
Screen Diameter: 4.50 in. **Blank:**
Screen Material Type: PVC-slotted
Screen Installation Type: Attached

Slot	Length	Set Between
12.00	10.00 ft.	72.00 ft. and 82.00 ft.

Fittings: Coupling

Geology Remarks:

Grouting Material	Bags	Additives	Depth
Bentonite slurry	6.00	Other	0.00 ft. to 68.00 ft.

Wellhead Completion: Pitless adapter, 12 inches above grade

Nearest Source of Possible Contamination:

Type	Distance	Direction
Septic tank	600 ft.	East

Drilling Machine Operator Name: JAKE WARNER
Employment: Employee
Pump Installer: CURT VISSER

Contractor Type: Water Well Drilling Contractor **Reg No:** 70-2055
Business Name: Raymer Company
Business Address: 1357 Comstock Street, Marne, MI, 49435

Water Well Contractor's Certification

This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor **Date**

General Remarks:

Other Remarks: Well Use:COMMERCIAL, Grouting Additive 1:EZ-MUD

Water Well And Pump Record

Completion is required under authority of Part 127 Act 368 PA 1978.
Failure to comply is a misdemeanor.

Import ID: 41101135007

Tax No:	Permit No:	County: Kent	Township: Solon

Well ID: 41000007457

Elevation: 833 ft.
Latitude: 43.2114884648
Longitude: -85.5714452712
Method of Collection: Interpolation-Map

Town/Range:	Section:	Well Status:	WSSN:	Source ID/Well No:
10N 11W	35			

Distance and Direction from Road Intersection:
0.25 MI N OF 16 MILE RD ON W SIDE OF WHTIE CREEK RD

Well Owner: BISHOP, CLARA

Well Address:
13525 WHITE CREEK RD
CEDAR SPRINGS, MI 49319

Owner Address:
13525 WHITE CREEK RD
CEDAR SPRINGS, MI 49319

Drilling Method: Cable Tool
Well Depth: 106.00 ft. **Well Use:** Household
Well Type: Replacement **Date Completed:** 7/2/1988

Casing Type: Steel - black **Height:**
Casing Joint: Welded
Casing Fitting: None

Diameter: 4.00 in. to 102.00 ft. depth

Borehole:

Pump Installed: Yes **Pump Installation Only:** No
Pump Installation Date: **HP:**
Manufacturer: Flint & Walling **Pump Type:** Submersible
Model Number: **Pump Capacity:** 0 GPM
Drop Pipe Length: 65.00 ft. **Pump Voltage:**
Drop Pipe Diameter: **Drilling Record ID:**
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Relief Valve Installed: No

Static Water Level: 3.00 ft. Below Grade
Well Yield Test: **Yield Test Method:** Unknown

Formation Description	Thickness	Depth to Bottom
Topsoil	3.00	3.00
Sand Coarse	15.00	18.00
Gravel	10.00	28.00
Sand Coarse	30.00	58.00
Gravel	12.00	70.00
Sand Medium To Coarse	25.00	95.00
Sand Coarse Wet/Moist	11.00	106.00

Screen Installed: Yes **Filter Packed:** No
Screen Diameter: 3.00 in. **Blank:** 0.00 ft. Above
Screen Material Type:
Screen Installation Type: Unknown

Slot	Length	Set Between
10.00	4.00 ft.	102.00 ft. and 106.00 ft.

Fittings: Neoprene packer

Well Grouted: No

Geology Remarks:

Wellhead Completion: Pitless adapter

Drilling Machine Operator Name:
Employment: Unknown

Nearest Source of Possible Contamination:

Type	Distance	Direction
Septic tank	50 ft.	West

Contractor Type: Unknown **Reg No:**
Business Name:
Business Address:

Abandoned Well Plugged: Yes

Casing Removed:

Water Well Contractor's Certification

This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor Date

General Remarks:
Other Remarks:

Water Well And Pump Record

Completion is required under authority of Part 127 Act 368 PA 1978.
Failure to comply is a misdemeanor.

Wellogic

Import ID:

Tax No:	Permit No:	County: Kent	Township: Solon

Town/Range:	Section:	Well Status:	WSSN:	Source ID/Well No:
10N 11W	36	Active		

Well ID: 41000013951

Elevation:

Latitude: 43.212312

Longitude: -85.570921

Method of Collection: Address Matching-House Number

Distance and Direction from Road Intersection:
1/2 MILE S OF 17 MILE RD APPROX 150 FT E OF WHITE CREEK AVE

Well Owner: JIM AND VICKI COVELL

Well Address:
13590 WHITE CREEK AVE
CEDAR SPRINGS, MI 49319

Owner Address:
13590 WHITE CREEK AVE
CEDAR SPRINGS, MI 49319

Drilling Method: Cable Tool
Well Depth: 80.00 ft. **Well Use:** Household
Well Type: Replacement **Date Completed:** 6/12/2003

Casing Type: Steel - unknown **Height:**
Casing Joint: Threaded & coupled
Casing Fitting: Drive shoe

Diameter: 6.00 in. to 47.00 ft. depth
4.00 in. to 80.00 ft. depth

Borehole:

Pump Installed: Yes **Pump Installation Only:** No
Pump Installation Date: **HP:** 0.50
Manufacturer: A.Y. McDonald **Pump Type:** Submersible
Model Number: **Pump Capacity:** 12 GPM
Drop Pipe Length: 40.00 ft. **Pump Voltage:**
Drop Pipe Diameter: **Drilling Record ID:**
Draw Down Seal Used: No

Pressure Tank Installed: Yes
Pressure Tank Type: Unknown
Manufacturer: Well-X-Trol
Model Number: WX202 **Tank Capacity:**
Pressure Relief Valve Installed: No

Static Water Level: 0.50 ft. Below Grade
Well Yield Test: **Yield Test Method:** Plunger
Pumping level 0.50 ft. after 1.50 hrs. at 50 GPM

Formation Description	Thickness	Depth to Bottom
Topsoil	2.00	2.00
Sand & Gravel Silty	19.00	21.00
Hardpan W/Clay W/Gravel	4.00	25.00
Gray Clay Hard	33.00	58.00
Sand	9.00	67.00
Brown Clay Soft	1.00	68.00
Sand Coarse	8.00	76.00
Gravel Coarse	4.00	80.00

Screen Installed: Yes **Filter Packed:** No
Screen Diameter: 3.00 in. **Blank:** 1.50 ft. Above
Screen Material Type: Stainless steel-wire wrapped
Screen Installation Type: Telescoped

Slot	Length	Set Between
12.00	8.00 ft.	72.00 ft. and 80.00 ft.

Fittings: Neoprene packer

Well Grouted: Yes **Grouting Method:** Unknown

Grouting Material	Bags	Additives	Depth
Bentonite dry granular	10.00	None	0.00 ft. to 70.00 ft.

Geology Remarks:

Wellhead Completion: Pitless adapter

Nearest Source of Possible Contamination:

Type	Distance	Direction
Septic tank	50 ft.	Northeast

Drilling Machine Operator Name: MIKE WAHLFIELD
Employment: Employee

Contractor Type: Water Well Drilling Contractor **Reg No:** 41-0395
Business Name: WAHLFIELD DRILLING CO
Business Address:

Abandoned Well Plugged: Yes

Casing Removed:

Water Well Contractor's Certification

This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor **Date**

General Remarks: DOUBLE CASED WELL BOTH CASINGS WERE GROUTED ACCORDING TO MDEQ SPECS

Other Remarks:

Appendix 3

22-Mar-2021

Penni Mahler
Fishbeck, Inc.
1515 Arboretum Dr SE
Grand Rapids, MI 49546

Re: **Cedar Springs /PFAS (201460)** Work Order: **21031444**

Dear Penni,

ALS Environmental received 7 samples on 15-Mar-2021 03:00 PM for the analyses presented in the following report.

The analytical data provided relates directly to the samples received by ALS Environmental - Holland and for only the analyses requested.

Sample results are compliant with industry accepted practices and Quality Control results achieved laboratory specifications. Any exceptions are noted in the Case Narrative, or noted with qualifiers in the report or QC batch information. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained from ALS Environmental. Samples will be disposed in 30 days unless storage arrangements are made.

The total number of pages in this report is 28.

If you have any questions regarding this report, please feel free to contact me:

ADDRESS: 3352 128th Avenue, Holland, MI, USA
PHONE: +1 (616) 399-6070 FAX: +1 (616) 399-6185

Sincerely,

Ehrland Bosworth

Electronically approved by: Ehrland Bosworth

Ehrland Bosworth
Project Manager

ALS Group, USA

Date: 22-Mar-21

Client: Fishbeck, Inc.
Project: Cedar Springs /PFAS (201460)
Work Order: 21031444

Work Order Sample Summary

Lab Samp ID	Client Sample ID	Matrix	Tag Number	Collection Date	Date Received	Hold
21031444-01	CS-21-03-MW-6A(I)	Water		3/12/2021 12:15	3/15/2021 15:00	☐
21031444-02	CS-21-03-MW-8A(I)	Water		3/12/2021 10:00	3/15/2021 15:00	☐
21031444-03	CS-21-03-MW-8A(D)	Water		3/12/2021 10:00	3/15/2021 15:00	☐
21031444-04	CS-21-03-GSI-1D(I)	Water		3/12/2021 13:02	3/15/2021 15:00	☐
21031444-05	CS-21-03-GSI-2D(I)	Water		3/12/2021 11:30	3/15/2021 15:00	☐
21031444-06	CS-21-03-SW-01(I)	Water		3/12/2021 10:20	3/15/2021 15:00	☐
21031444-07	CS-21-03-QCFB	Water		3/12/2021 09:30	3/15/2021 15:00	☐

Client: Fishbeck, Inc.
Project: Cedar Springs /PFAS (201460)
WorkOrder: 21031444

QUALIFIERS, ACRONYMS, UNITS

Qualifier	Description
*	Value exceeds Regulatory Limit
**	Estimated Value
a	Analyte is non-accredited
B	Analyte detected in the associated Method Blank above the Reporting Limit
E	Value above quantitation range
H	Analyzed outside of Holding Time
Hr	BOD/CBOD - Sample was reset outside Hold Time, value should be considered estimated.
J	Analyte is present at an estimated concentration between the MDL and Report Limit
ND	Not Detected at the Reporting Limit
O	Sample amount is > 4 times amount spiked
P	Dual Column results percent difference > 40%
R	RPD above laboratory control limit
S	Spike Recovery outside laboratory control limits
U	Analyzed but not detected above the MDL
X	Analyte was detected in the Method Blank between the MDL and Reporting Limit, sample results may exhibit background or reagent contamination at the observed level.

Acronym	Description
DUP	Method Duplicate
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LOD	Limit of Detection (see MDL)
LOQ	Limit of Quantitation (see PQL)
MBLK	Method Blank
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
PQL	Practical Quantitation Limit
RPD	Relative Percent Difference
TDL	Target Detection Limit
TNTC	Too Numerous To Count
A	APHA Standard Methods
D	ASTM
E	EPA
SW	SW-846 Update III

Units Reported	Description
ng/L	Nanograms per Liter

Client: Fishbeck, Inc.
Project: Cedar Springs /PFAS (201460)
Work Order: 21031444

Case Narrative

Samples for the above noted Work Order were received on 03/15/2021. The attached "Sample Receipt Checklist" documents the status of custody seals, container integrity, preservation, and temperature compliance.

Samples were analyzed according to the analytical methodology previously transmitted in the "Work Order Acknowledgement". Methodologies are also documented in the "Analytical Result" section for each sample. Quality control results are listed in the "QC Report" section. Sample association for the reported quality control is located at the end of each batch summary. If applicable, results are appropriately qualified in the Analytical Result and QC Report sections. The "Qualifiers" section documents the various qualifiers, units, and acronyms utilized in reporting. A copy of the laboratory's scope of accreditation is available upon request.

With the following exceptions, all sample analyses achieved analytical criteria.

Extractable Organics:
Batch 173579, Method E537 Mod, Sample CS-21-03-MW-6A(I) (21031444-01A): One or more surrogate recoveries were above the upper control limits. The sample was non-detect, therefore, no qualification is needed. (13C2-FtS 4:2, 13C2-FtS 6:2)

Batch 173579, Method E537 Mod, Sample CS-21-03-GSI-1D(I) (21031444-04A): One or more surrogate recoveries were above the upper control limits. The sample was non-detect, therefore, no qualification is needed. (13C2-FtS 4:2, 13C2-FtS 6:2)

Batch 173579, Method E537 Mod, Sample CS-21-03-GSI-2D(I) (21031444-05A): One or more surrogate recoveries were above the upper control limits. The sample was non-detect, therefore, no qualification is needed. (13C2-FtS 4:2, 13C2-FtS 6:2)

Batch 173579, Method E537 Mod, Sample CS-21-03-SW-01(I) (21031444-06A): One or more surrogate recoveries were above the upper control limits. The sample was non-detect, therefore, no qualification is needed. (13C2-FtS 4:2, 13C2-FtS 6:2)

Batch 173579, Method E537 Mod, Sample CS-21-03-QCFB (21031444-07A): One or more surrogate recoveries were above the upper control limits. The sample was non-detect, therefore, no qualification is needed. (13C2-PFTeA)

No other deviations or anomalies were noted.

ALS Group, USA

Date: *22-Mar-21*

Client: Fishbeck, Inc.
Project: Cedar Springs /PFAS (201460)
Sample ID: CS-21-03-MW-6A(I)
Collection Date: 3/12/2021 12:15 PM

Work Order: 21031444
Lab ID: 21031444-01
Matrix: WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
PFAS BY EPA 537 MODIFIED			Method: **E537 MOD**		Prep: E537 Mod / 3/17/21		Analyst: **SK**
Fluorotelomer Sulphonic Acid 4:2 (FtS 4:2)	U		0.88	4.7	ng/L	1	3/17/2021 15:51
Fluorotelomer Sulphonic Acid 6:2 (FtS 6:2)	U		0.62	4.7	ng/L	1	3/17/2021 15:51
Fluorotelomer Sulphonic Acid 8:2 (FtS 8:2)	U		1.1	4.7	ng/L	1	3/17/2021 15:51
Perfluorobutanesulfonic Acid (PFBS)	**2.6**	J	**0.33**	**4.7**	**ng/L**	1	3/17/2021 15:51
Perfluorobutanoic Acid (PFBA)	**9.0**		**2.4**	**4.7**	**ng/L**	1	3/17/2021 15:51
Perfluorodecanesulfonic Acid (PFDS)	U		1.3	4.7	ng/L	1	3/17/2021 15:51
Perfluorodecanoic Acid (PFDA)	U		1.2	4.7	ng/L	1	3/17/2021 15:51
Perfluorododecanoic Acid (PFDoA)	U		1.3	4.7	ng/L	1	3/17/2021 15:51
Perfluoroheptanesulfonic Acid (PFHpS)	**1.9**	J	**0.53**	**4.7**	**ng/L**	1	3/17/2021 15:51
Perfluoroheptanoic Acid (PFHpA)	**9.4**		**0.41**	**4.7**	**ng/L**	1	3/17/2021 15:51
Perfluorohexanesulfonic Acid (PFHxS)	**12**		**0.35**	**4.7**	**ng/L**	1	3/17/2021 15:51
Perfluorohexanoic Acid (PFHxA)	**11**		**1.1**	**4.7**	**ng/L**	1	3/17/2021 15:51
Perfluorononanesulfonic Acid (PFNS)	U		0.46	4.7	ng/L	1	3/17/2021 15:51
Perfluorononanoic Acid (PFNA)	**2.0**	J	**0.81**	**4.7**	**ng/L**	1	3/17/2021 15:51
Perfluorooctanesulfonamide (PFOSA)	U		0.67	4.7	ng/L	1	3/17/2021 15:51
Perfluorooctanesulfonic Acid (PFOS)	**19**		**0.84**	**1.9**	**ng/L**	1	3/17/2021 15:51
Perfluorooctanoic Acid (PFOA)	**49**		**0.66**	**1.9**	**ng/L**	1	3/17/2021 15:51
Perfluoropentanesulfonic Acid (PFPeS)	**1.3**	J	**0.52**	**4.7**	**ng/L**	1	3/17/2021 15:51
Perfluoropentanoic Acid (PFPeA)	**7.8**		**1.2**	**4.7**	**ng/L**	1	3/17/2021 15:51
Perfluorotetradecanoic Acid (PFTeA)	U		2.5	4.7	ng/L	1	3/17/2021 15:51
Perfluorotridecanoic Acid (PFTriA)	U		0.72	4.7	ng/L	1	3/17/2021 15:51
Perfluoroundecanoic Acid (PFUnA)	U		0.91	4.7	ng/L	1	3/17/2021 15:51
N-Ethylperfluorooctanesulfonamidoacetic Acid	**2.4**	J	**0.59**	**4.7**	**ng/L**	1	3/17/2021 15:51
N-Methylperfluorooctanesulfonamidoacetic Acid	U		0.60	4.7	ng/L	1	3/17/2021 15:51
Hexafluoropropylene oxide dimer acid (HFPO-DA)	U		1.1	4.7	ng/L	1	3/17/2021 15:51
4,8-Dioxa-3H-perfluorononanoic Acid (DONA)	U		0.53	4.7	ng/L	1	3/17/2021 15:51
11Cl-Pf3OUdS	U		0.44	4.7	ng/L	1	3/17/2021 15:51
9Cl-PF3ONS	U		0.42	4.7	ng/L	1	3/17/2021 15:51
Surr: 13C2-FtS 4:2	*293*	S		*50-150*	*%REC*	1	3/17/2021 15:51
Surr: 13C2-FtS 6:2	*171*	S		*50-150*	*%REC*	1	3/17/2021 15:51

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *22-Mar-21*

Client: Fishbeck, Inc.
Project: Cedar Springs /PFAS (201460)
Sample ID: CS-21-03-MW-6A(I)
Collection Date: 3/12/2021 12:15 PM

Work Order: 21031444
Lab ID: 21031444-01
Matrix: WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
Surr: 13C2-FtS 8:2	*120*			*50-150*	*%REC*	1	3/17/2021 15:51
Surr: 13C2-PFDA	*89.2*			*50-150*	*%REC*	1	3/17/2021 15:51
Surr: 13C2-PFDoA	*106*			*50-150*	*%REC*	1	3/17/2021 15:51
Surr: 13C2-PFHxA	*113*			*50-150*	*%REC*	1	3/17/2021 15:51
Surr: 13C2-PFTeA	*120*			*50-150*	*%REC*	1	3/17/2021 15:51
Surr: 13C2-PFUnA	*101*			*50-150*	*%REC*	1	3/17/2021 15:51
Surr: 13C3-HFPO-DA	*142*			*50-150*	*%REC*	1	3/17/2021 15:51
Surr: 13C3-PFBS	*110*			*50-150*	*%REC*	1	3/17/2021 15:51
Surr: 13C4-PFBA	*121*			*50-150*	*%REC*	1	3/17/2021 15:51
Surr: 13C4-PFHpA	*113*			*50-150*	*%REC*	1	3/17/2021 15:51
Surr: 13C4-PFOA	*111*			*50-150*	*%REC*	1	3/17/2021 15:51
Surr: 13C4-PFOS	*121*			*50-150*	*%REC*	1	3/17/2021 15:51
Surr: 13C5-PFNA	*109*			*50-150*	*%REC*	1	3/17/2021 15:51
Surr: 13C5-PFPeA	*115*			*50-150*	*%REC*	1	3/17/2021 15:51
Surr: 13C8-FOSA	*124*			*50-150*	*%REC*	1	3/17/2021 15:51
Surr: 18O2-PFHxS	*128*			*50-150*	*%REC*	1	3/17/2021 15:51
Surr: d5-N-EtFOSAA	*114*			*50-150*	*%REC*	1	3/17/2021 15:51
Surr: d3-N-MeFOSAA	*108*			*50-150*	*%REC*	1	3/17/2021 15:51

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *22-Mar-21*

Client: Fishbeck, Inc.
Project: Cedar Springs /PFAS (201460)
Sample ID: CS-21-03-MW-8A(I)
Collection Date: 3/12/2021 10:00 AM

Work Order: 21031444
Lab ID: 21031444-02
Matrix: WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
PFAS BY EPA 537 MODIFIED		Method: **E537 MOD**			Prep: E537 Mod / 3/17/21		Analyst: **SK**
Fluorotelomer Sulphonic Acid 4:2 (FtS 4:2)	U		0.87	4.6	ng/L	1	3/17/2021 16:01
Fluorotelomer Sulphonic Acid 6:2 (FtS 6:2)	U		0.61	4.6	ng/L	1	3/17/2021 16:01
Fluorotelomer Sulphonic Acid 8:2 (FtS 8:2)	U		1.0	4.6	ng/L	1	3/17/2021 16:01
Perfluorobutanesulfonic Acid (PFBS)	**0.65**	J	**0.32**	**4.6**	**ng/L**	1	3/17/2021 16:01
Perfluorobutanoic Acid (PFBA)	U		2.4	4.6	ng/L	1	3/17/2021 16:01
Perfluorodecanesulfonic Acid (PFDS)	U		1.3	4.6	ng/L	1	3/17/2021 16:01
Perfluorodecanoic Acid (PFDA)	U		1.1	4.6	ng/L	1	3/17/2021 16:01
Perfluorododecanoic Acid (PFDoA)	U		1.3	4.6	ng/L	1	3/17/2021 16:01
Perfluoroheptanesulfonic Acid (PFHpS)	U		0.52	4.6	ng/L	1	3/17/2021 16:01
Perfluoroheptanoic Acid (PFHpA)	U		0.41	4.6	ng/L	1	3/17/2021 16:01
Perfluorohexanesulfonic Acid (PFHxS)	**0.88**	J	**0.34**	**4.6**	**ng/L**	1	3/17/2021 16:01
Perfluorohexanoic Acid (PFHxA)	U		1.1	4.6	ng/L	1	3/17/2021 16:01
Perfluorononanesulfonic Acid (PFNS)	U		0.46	4.6	ng/L	1	3/17/2021 16:01
Perfluorononanoic Acid (PFNA)	U		0.81	4.6	ng/L	1	3/17/2021 16:01
Perfluorooctanesulfonamide (PFOSA)	U		0.66	4.6	ng/L	1	3/17/2021 16:01
Perfluorooctanesulfonic Acid (PFOS)	U		0.83	1.9	ng/L	1	3/17/2021 16:01
Perfluorooctanoic Acid (PFOA)	U		0.65	1.9	ng/L	1	3/17/2021 16:01
Perfluoropentanesulfonic Acid (PFPeS)	U		0.51	4.6	ng/L	1	3/17/2021 16:01
Perfluoropentanoic Acid (PFPeA)	U		1.2	4.6	ng/L	1	3/17/2021 16:01
Perfluorotetradecanoic Acid (PFTeA)	U		2.4	4.6	ng/L	1	3/17/2021 16:01
Perfluorotridecanoic Acid (PFTriA)	U		0.71	4.6	ng/L	1	3/17/2021 16:01
Perfluoroundecanoic Acid (PFUnA)	U		0.90	4.6	ng/L	1	3/17/2021 16:01
N-Ethylperfluorooctanesulfonamidoacetic Acid	U		0.58	4.6	ng/L	1	3/17/2021 16:01
N-Methylperfluorooctanesulfonamidoacetic Acid	U		0.60	4.6	ng/L	1	3/17/2021 16:01
Hexafluoropropylene oxide dimer acid (HFPO-DA)	U		1.1	4.6	ng/L	1	3/17/2021 16:01
4,8-Dioxa-3H-perfluorononanoic Acid (DONA)	U		0.52	4.6	ng/L	1	3/17/2021 16:01
11Cl-Pf3OUdS	U		0.43	4.6	ng/L	1	3/17/2021 16:01
9Cl-PF3ONS	U		0.41	4.6	ng/L	1	3/17/2021 16:01
Surr: 13C2-FtS 4:2	*122*			*50-150*	*%REC*	1	3/17/2021 16:01
Surr: 13C2-FtS 6:2	*108*			*50-150*	*%REC*	1	3/17/2021 16:01
Surr: 13C2-FtS 8:2	*120*			*50-150*	*%REC*	1	3/17/2021 16:01

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *22-Mar-21*

Client: Fishbeck, Inc.
Project: Cedar Springs /PFAS (201460)
Sample ID: CS-21-03-MW-8A(I)
Collection Date: 3/12/2021 10:00 AM

Work Order: 21031444
Lab ID: 21031444-02
Matrix: WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
Surr: 13C2-PFDA	*110*			*50-150*	*%REC*	1	3/17/2021 16:01
Surr: 13C2-PFDoA	*86.4*			*50-150*	*%REC*	1	3/17/2021 16:01
Surr: 13C2-PFHxA	*117*			*50-150*	*%REC*	1	3/17/2021 16:01
Surr: 13C2-PFTeA	*102*			*50-150*	*%REC*	1	3/17/2021 16:01
Surr: 13C2-PFUnA	*94.0*			*50-150*	*%REC*	1	3/17/2021 16:01
Surr: 13C3-HFPO-DA	*131*			*50-150*	*%REC*	1	3/17/2021 16:01
Surr: 13C3-PFBS	*95.9*			*50-150*	*%REC*	1	3/17/2021 16:01
Surr: 13C4-PFBA	*118*			*50-150*	*%REC*	1	3/17/2021 16:01
Surr: 13C4-PFHpA	*99.8*			*50-150*	*%REC*	1	3/17/2021 16:01
Surr: 13C4-PFOA	*138*			*50-150*	*%REC*	1	3/17/2021 16:01
Surr: 13C4-PFOS	*105*			*50-150*	*%REC*	1	3/17/2021 16:01
Surr: 13C5-PFNA	*94.3*			*50-150*	*%REC*	1	3/17/2021 16:01
Surr: 13C5-PFPeA	*95.2*			*50-150*	*%REC*	1	3/17/2021 16:01
Surr: 13C8-FOSA	*101*			*50-150*	*%REC*	1	3/17/2021 16:01
Surr: 18O2-PFHxS	*95.5*			*50-150*	*%REC*	1	3/17/2021 16:01
Surr: d5-N-EtFOSAA	*85.0*			*50-150*	*%REC*	1	3/17/2021 16:01
Surr: d3-N-MeFOSAA	*99.5*			*50-150*	*%REC*	1	3/17/2021 16:01

Note: See Qualifiers page for a list of qualifiers and their definitions.

Client: Fishbeck, Inc.
Project: Cedar Springs /PFAS (201460)
Sample ID: CS-21-03-MW-8A(D)
Collection Date: 3/12/2021 10:00 AM

Work Order: 21031444
Lab ID: 21031444-03
Matrix: WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
PFAS BY EPA 537 MODIFIED			Method: **E537 MOD**		Prep: E537 Mod / 3/17/21		Analyst: **SK**
Fluorotelomer Sulphonic Acid 4:2 (FtS 4:2)	U		0.88	4.7	ng/L	1	3/17/2021 16:12
Fluorotelomer Sulphonic Acid 6:2 (FtS 6:2)	U		0.63	4.7	ng/L	1	3/17/2021 16:12
Fluorotelomer Sulphonic Acid 8:2 (FtS 8:2)	U		1.1	4.7	ng/L	1	3/17/2021 16:12
Perfluorobutanesulfonic Acid (PFBS)	**0.57**	J	**0.33**	**4.7**	**ng/L**	1	3/17/2021 16:12
Perfluorobutanoic Acid (PFBA)	U		2.5	4.7	ng/L	1	3/17/2021 16:12
Perfluorodecanesulfonic Acid (PFDS)	U		1.3	4.7	ng/L	1	3/17/2021 16:12
Perfluorodecanoic Acid (PFDA)	U		1.2	4.7	ng/L	1	3/17/2021 16:12
Perfluorododecanoic Acid (PFDoA)	U		1.3	4.7	ng/L	1	3/17/2021 16:12
Perfluoroheptanesulfonic Acid (PFHpS)	U		0.53	4.7	ng/L	1	3/17/2021 16:12
Perfluoroheptanoic Acid (PFHpA)	U		0.42	4.7	ng/L	1	3/17/2021 16:12
Perfluorohexanesulfonic Acid (PFHxS)	**0.42**	J	**0.35**	**4.7**	**ng/L**	1	3/17/2021 16:12
Perfluorohexanoic Acid (PFHxA)	U		1.1	4.7	ng/L	1	3/17/2021 16:12
Perfluorononanesulfonic Acid (PFNS)	U		0.47	4.7	ng/L	1	3/17/2021 16:12
Perfluorononanoic Acid (PFNA)	U		0.82	4.7	ng/L	1	3/17/2021 16:12
Perfluorooctanesulfonamide (PFOSA)	U		0.67	4.7	ng/L	1	3/17/2021 16:12
Perfluorooctanesulfonic Acid (PFOS)	U		0.84	1.9	ng/L	1	3/17/2021 16:12
Perfluorooctanoic Acid (PFOA)	U		0.67	1.9	ng/L	1	3/17/2021 16:12
Perfluoropentanesulfonic Acid (PFPeS)	U		0.52	4.7	ng/L	1	3/17/2021 16:12
Perfluoropentanoic Acid (PFPeA)	U		1.2	4.7	ng/L	1	3/17/2021 16:12
Perfluorotetradecanoic Acid (PFTeA)	U		2.5	4.7	ng/L	1	3/17/2021 16:12
Perfluorotridecanoic Acid (PFTriA)	U		0.73	4.7	ng/L	1	3/17/2021 16:12
Perfluoroundecanoic Acid (PFUnA)	U		0.92	4.7	ng/L	1	3/17/2021 16:12
N-Ethylperfluorooctanesulfonamidoacetic Acid	U		0.59	4.7	ng/L	1	3/17/2021 16:12
N-Methylperfluorooctanesulfonamidoacetic Acid	U		0.61	4.7	ng/L	1	3/17/2021 16:12
Hexafluoropropylene oxide dimer acid (HFPO-DA)	U		1.1	4.7	ng/L	1	3/17/2021 16:12
4,8-Dioxa-3H-perfluorononanoic Acid (DONA)	U		0.53	4.7	ng/L	1	3/17/2021 16:12
11Cl-Pf3OUdS	U		0.44	4.7	ng/L	1	3/17/2021 16:12
9Cl-PF3ONS	U		0.42	4.7	ng/L	1	3/17/2021 16:12
Surr: 13C2-FtS 4:2	*146*			*50-150*	*%REC*	1	3/17/2021 16:12
Surr: 13C2-FtS 6:2	*144*			*50-150*	*%REC*	1	3/17/2021 16:12
Surr: 13C2-FtS 8:2	*108*			*50-150*	*%REC*	1	3/17/2021 16:12

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: 22-Mar-21

Client:	Fishbeck, Inc.		
Project:	Cedar Springs /PFAS (201460)	**Work Order:**	21031444
Sample ID:	CS-21-03-MW-8A(D)	**Lab ID:**	21031444-03
Collection Date:	3/12/2021 10:00 AM	**Matrix:**	WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
Surr: 13C2-PFDA	*87.6*			*50-150*	*%REC*	1	3/17/2021 16:12
Surr: 13C2-PFDoA	*101*			*50-150*	*%REC*	1	3/17/2021 16:12
Surr: 13C2-PFHxA	*96.6*			*50-150*	*%REC*	1	3/17/2021 16:12
Surr: 13C2-PFTeA	*126*			*50-150*	*%REC*	1	3/17/2021 16:12
Surr: 13C2-PFUnA	*102*			*50-150*	*%REC*	1	3/17/2021 16:12
Surr: 13C3-HFPO-DA	*118*			*50-150*	*%REC*	1	3/17/2021 16:12
Surr: 13C3-PFBS	*107*			*50-150*	*%REC*	1	3/17/2021 16:12
Surr: 13C4-PFBA	*108*			*50-150*	*%REC*	1	3/17/2021 16:12
Surr: 13C4-PFHpA	*89.6*			*50-150*	*%REC*	1	3/17/2021 16:12
Surr: 13C4-PFOA	*104*			*50-150*	*%REC*	1	3/17/2021 16:12
Surr: 13C4-PFOS	*121*			*50-150*	*%REC*	1	3/17/2021 16:12
Surr: 13C5-PFNA	*84.5*			*50-150*	*%REC*	1	3/17/2021 16:12
Surr: 13C5-PFPeA	*108*			*50-150*	*%REC*	1	3/17/2021 16:12
Surr: 13C8-FOSA	*114*			*50-150*	*%REC*	1	3/17/2021 16:12
Surr: 18O2-PFHxS	*104*			*50-150*	*%REC*	1	3/17/2021 16:12
Surr: d5-N-EtFOSAA	*112*			*50-150*	*%REC*	1	3/17/2021 16:12
Surr: d3-N-MeFOSAA	*101*			*50-150*	*%REC*	1	3/17/2021 16:12

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *22-Mar-21*

Client: Fishbeck, Inc.
Project: Cedar Springs /PFAS (201460)
Sample ID: CS-21-03-GSI-1D(I)
Collection Date: 3/12/2021 01:02 PM

Work Order: 21031444
Lab ID: 21031444-04
Matrix: WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
PFAS BY EPA 537 MODIFIED			Method: **E537 MOD**		Prep: E537 Mod / 3/17/21		Analyst: **SK**
Fluorotelomer Sulphonic Acid 4:2 (FtS 4:2)	U		0.87	4.6	ng/L	1	3/17/2021 16:22
Fluorotelomer Sulphonic Acid 6:2 (FtS 6:2)	U		0.62	4.6	ng/L	1	3/17/2021 16:22
Fluorotelomer Sulphonic Acid 8:2 (FtS 8:2)	U		1.1	4.6	ng/L	1	3/17/2021 16:22
Perfluorobutanesulfonic Acid (PFBS)	**2.3**	J	**0.33**	**4.6**	**ng/L**	1	3/17/2021 16:22
Perfluorobutanoic Acid (PFBA)	**4.7**		**2.4**	**4.6**	**ng/L**	1	3/17/2021 16:22
Perfluorodecanesulfonic Acid (PFDS)	U		1.3	4.6	ng/L	1	3/17/2021 16:22
Perfluorodecanoic Acid (PFDA)	U		1.2	4.6	ng/L	1	3/17/2021 16:22
Perfluorododecanoic Acid (PFDoA)	U		1.3	4.6	ng/L	1	3/17/2021 16:22
Perfluoroheptanesulfonic Acid (PFHpS)	**0.59**	J	**0.53**	**4.6**	**ng/L**	1	3/17/2021 16:22
Perfluoroheptanoic Acid (PFHpA)	**1.5**	J	**0.41**	**4.6**	**ng/L**	1	3/17/2021 16:22
Perfluorohexanesulfonic Acid (PFHxS)	**3.6**	J	**0.34**	**4.6**	**ng/L**	1	3/17/2021 16:22
Perfluorohexanoic Acid (PFHxA)	**2.3**	J	**1.1**	**4.6**	**ng/L**	1	3/17/2021 16:22
Perfluorononanesulfonic Acid (PFNS)	U		0.46	4.6	ng/L	1	3/17/2021 16:22
Perfluorononanoic Acid (PFNA)	U		0.81	4.6	ng/L	1	3/17/2021 16:22
Perfluorooctanesulfonamide (PFOSA)	U		0.66	4.6	ng/L	1	3/17/2021 16:22
Perfluorooctanesulfonic Acid (PFOS)	**5.7**		**0.83**	**1.9**	**ng/L**	1	3/17/2021 16:22
Perfluorooctanoic Acid (PFOA)	**5.6**		**0.66**	**1.9**	**ng/L**	1	3/17/2021 16:22
Perfluoropentanesulfonic Acid (PFPeS)	**1.3**	J	**0.52**	**4.6**	**ng/L**	1	3/17/2021 16:22
Perfluoropentanoic Acid (PFPeA)	**2.0**	J	**1.2**	**4.6**	**ng/L**	1	3/17/2021 16:22
Perfluorotetradecanoic Acid (PFTeA)	U		2.5	4.6	ng/L	1	3/17/2021 16:22
Perfluorotridecanoic Acid (PFTriA)	U		0.72	4.6	ng/L	1	3/17/2021 16:22
Perfluoroundecanoic Acid (PFUnA)	U		0.91	4.6	ng/L	1	3/17/2021 16:22
N-Ethylperfluorooctanesulfonamidoacetic Acid	U		0.58	4.6	ng/L	1	3/17/2021 16:22
N-Methylperfluorooctanesulfonamidoacetic Acid	U		0.60	4.6	ng/L	1	3/17/2021 16:22
Hexafluoropropylene oxide dimer acid (HFPO-DA)	U		1.1	4.6	ng/L	1	3/17/2021 16:22
4,8-Dioxa-3H-perfluorononanoic Acid (DONA)	U		0.52	4.6	ng/L	1	3/17/2021 16:22
11Cl-Pf3OUdS	U		0.43	4.6	ng/L	1	3/17/2021 16:22
9Cl-PF3ONS	U		0.42	4.6	ng/L	1	3/17/2021 16:22
Surr: 13C2-FtS 4:2	*180*	S		*50-150*	*%REC*	1	3/17/2021 16:22
Surr: 13C2-FtS 6:2	*163*	S		*50-150*	*%REC*	1	3/17/2021 16:22

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *22-Mar-21*

Client: Fishbeck, Inc.
Project: Cedar Springs /PFAS (201460)
Sample ID: CS-21-03-GSI-1D(I)
Collection Date: 3/12/2021 01:02 PM

Work Order: 21031444
Lab ID: 21031444-04
Matrix: WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
Surr: 13C2-FtS 8:2	*116*			*50-150*	*%REC*	1	3/17/2021 16:22
Surr: 13C2-PFDA	*97.1*			*50-150*	*%REC*	1	3/17/2021 16:22
Surr: 13C2-PFDoA	*98.9*			*50-150*	*%REC*	1	3/17/2021 16:22
Surr: 13C2-PFHxA	*91.6*			*50-150*	*%REC*	1	3/17/2021 16:22
Surr: 13C2-PFTeA	*138*			*50-150*	*%REC*	1	3/17/2021 16:22
Surr: 13C2-PFUnA	*109*			*50-150*	*%REC*	1	3/17/2021 16:22
Surr: 13C3-HFPO-DA	*120*			*50-150*	*%REC*	1	3/17/2021 16:22
Surr: 13C3-PFBS	*99.2*			*50-150*	*%REC*	1	3/17/2021 16:22
Surr: 13C4-PFBA	*109*			*50-150*	*%REC*	1	3/17/2021 16:22
Surr: 13C4-PFHpA	*90.8*			*50-150*	*%REC*	1	3/17/2021 16:22
Surr: 13C4-PFOA	*115*			*50-150*	*%REC*	1	3/17/2021 16:22
Surr: 13C4-PFOS	*125*			*50-150*	*%REC*	1	3/17/2021 16:22
Surr: 13C5-PFNA	*77.4*			*50-150*	*%REC*	1	3/17/2021 16:22
Surr: 13C5-PFPeA	*104*			*50-150*	*%REC*	1	3/17/2021 16:22
Surr: 13C8-FOSA	*111*			*50-150*	*%REC*	1	3/17/2021 16:22
Surr: 18O2-PFHxS	*96.9*			*50-150*	*%REC*	1	3/17/2021 16:22
Surr: d5-N-EtFOSAA	*112*			*50-150*	*%REC*	1	3/17/2021 16:22
Surr: d3-N-MeFOSAA	*109*			*50-150*	*%REC*	1	3/17/2021 16:22

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *22-Mar-21*

Client: Fishbeck, Inc.
Project: Cedar Springs /PFAS (201460)
Sample ID: CS-21-03-GSI-2D(I)
Collection Date: 3/12/2021 11:30 AM

Work Order: 21031444
Lab ID: 21031444-05
Matrix: WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
PFAS BY EPA 537 MODIFIED			Method: **E537 MOD**		Prep: E537 Mod / 3/17/21		Analyst: **SK**
Fluorotelomer Sulphonic Acid 4:2 (FtS 4:2)	U		0.87	4.7	ng/L	1	3/17/2021 16:33
Fluorotelomer Sulphonic Acid 6:2 (FtS 6:2)	U		0.62	4.7	ng/L	1	3/17/2021 16:33
Fluorotelomer Sulphonic Acid 8:2 (FtS 8:2)	U		1.1	4.7	ng/L	1	3/17/2021 16:33
Perfluorobutanesulfonic Acid (PFBS)	**3.0**	J	**0.33**	**4.7**	**ng/L**	1	3/17/2021 16:33
Perfluorobutanoic Acid (PFBA)	**9.5**		**2.4**	**4.7**	**ng/L**	1	3/17/2021 16:33
Perfluorodecanesulfonic Acid (PFDS)	U		1.3	4.7	ng/L	1	3/17/2021 16:33
Perfluorodecanoic Acid (PFDA)	U		1.2	4.7	ng/L	1	3/17/2021 16:33
Perfluorododecanoic Acid (PFDoA)	U		1.3	4.7	ng/L	1	3/17/2021 16:33
Perfluoroheptanesulfonic Acid (PFHpS)	**1.8**	J	**0.53**	**4.7**	**ng/L**	1	3/17/2021 16:33
Perfluoroheptanoic Acid (PFHpA)	**8.1**		**0.41**	**4.7**	**ng/L**	1	3/17/2021 16:33
Perfluorohexanesulfonic Acid (PFHxS)	**9.1**		**0.34**	**4.7**	**ng/L**	1	3/17/2021 16:33
Perfluorohexanoic Acid (PFHxA)	**8.4**		**1.1**	**4.7**	**ng/L**	1	3/17/2021 16:33
Perfluorononanesulfonic Acid (PFNS)	U		0.46	4.7	ng/L	1	3/17/2021 16:33
Perfluorononanoic Acid (PFNA)	**1.6**	J	**0.81**	**4.7**	**ng/L**	1	3/17/2021 16:33
Perfluorooctanesulfonamide (PFOSA)	**0.76**	J	**0.66**	**4.7**	**ng/L**	1	3/17/2021 16:33
Perfluorooctanesulfonic Acid (PFOS)	**16**		**0.83**	**1.9**	**ng/L**	1	3/17/2021 16:33
Perfluorooctanoic Acid (PFOA)	**35**		**0.66**	**1.9**	**ng/L**	1	3/17/2021 16:33
Perfluoropentanesulfonic Acid (PFPeS)	**1.1**	J	**0.52**	**4.7**	**ng/L**	1	3/17/2021 16:33
Perfluoropentanoic Acid (PFPeA)	**5.8**		**1.2**	**4.7**	**ng/L**	1	3/17/2021 16:33
Perfluorotetradecanoic Acid (PFTeA)	U		2.5	4.7	ng/L	1	3/17/2021 16:33
Perfluorotridecanoic Acid (PFTriA)	U		0.72	4.7	ng/L	1	3/17/2021 16:33
Perfluoroundecanoic Acid (PFUnA)	U		0.91	4.7	ng/L	1	3/17/2021 16:33
N-Ethylperfluorooctanesulfonamidoacetic Acid	**5.2**		**0.58**	**4.7**	**ng/L**	1	3/17/2021 16:33
N-Methylperfluorooctanesulfonamidoacetic Acid	**0.69**	J	**0.60**	**4.7**	**ng/L**	1	3/17/2021 16:33
Hexafluoropropylene oxide dimer acid (HFPO-DA)	U		1.1	4.7	ng/L	1	3/17/2021 16:33
4,8-Dioxa-3H-perfluorononanoic Acid (DONA)	U		0.52	4.7	ng/L	1	3/17/2021 16:33
11Cl-Pf3OUdS	U		0.44	4.7	ng/L	1	3/17/2021 16:33
9Cl-PF3ONS	U		0.42	4.7	ng/L	1	3/17/2021 16:33
Surr: 13C2-FtS 4:2	*327*	S		*50-150*	*%REC*	1	3/17/2021 16:33

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *22-Mar-21*

Client: Fishbeck, Inc.
Project: Cedar Springs /PFAS (201460)
Sample ID: CS-21-03-GSI-2D(I)
Collection Date: 3/12/2021 11:30 AM

Work Order: 21031444
Lab ID: 21031444-05
Matrix: WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
Surr: 13C2-FtS 6:2	*237*	S		*50-150*	*%REC*	1	3/17/2021 16:33
Surr: 13C2-FtS 8:2	*129*			*50-150*	*%REC*	1	3/17/2021 16:33
Surr: 13C2-PFDA	*103*			*50-150*	*%REC*	1	3/17/2021 16:33
Surr: 13C2-PFDoA	*106*			*50-150*	*%REC*	1	3/17/2021 16:33
Surr: 13C2-PFHxA	*104*			*50-150*	*%REC*	1	3/17/2021 16:33
Surr: 13C2-PFTeA	*147*			*50-150*	*%REC*	1	3/17/2021 16:33
Surr: 13C2-PFUnA	*117*			*50-150*	*%REC*	1	3/17/2021 16:33
Surr: 13C3-HFPO-DA	*126*			*50-150*	*%REC*	1	3/17/2021 16:33
Surr: 13C3-PFBS	*105*			*50-150*	*%REC*	1	3/17/2021 16:33
Surr: 13C4-PFBA	*120*			*50-150*	*%REC*	1	3/17/2021 16:33
Surr: 13C4-PFHpA	*93.3*			*50-150*	*%REC*	1	3/17/2021 16:33
Surr: 13C4-PFOA	*131*			*50-150*	*%REC*	1	3/17/2021 16:33
Surr: 13C4-PFOS	*136*			*50-150*	*%REC*	1	3/17/2021 16:33
Surr: 13C5-PFNA	*96.1*			*50-150*	*%REC*	1	3/17/2021 16:33
Surr: 13C5-PFPeA	*110*			*50-150*	*%REC*	1	3/17/2021 16:33
Surr: 13C8-FOSA	*115*			*50-150*	*%REC*	1	3/17/2021 16:33
Surr: 18O2-PFHxS	*113*			*50-150*	*%REC*	1	3/17/2021 16:33
Surr: d5-N-EtFOSAA	*125*			*50-150*	*%REC*	1	3/17/2021 16:33
Surr: d3-N-MeFOSAA	*117*			*50-150*	*%REC*	1	3/17/2021 16:33

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *22-Mar-21*

Client: Fishbeck, Inc.
Project: Cedar Springs /PFAS (201460)
Sample ID: CS-21-03-SW-01(I)
Collection Date: 3/12/2021 10:20 AM

Work Order: 21031444
Lab ID: 21031444-06
Matrix: WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
PFAS BY EPA 537 MODIFIED			Method: **E537 MOD**		Prep: E537 Mod / 3/17/21		Analyst: **SK**
Fluorotelomer Sulphonic Acid 4:2 (FtS 4:2)	U		0.88	4.7	ng/L	1	3/17/2021 16:43
Fluorotelomer Sulphonic Acid 6:2 (FtS 6:2)	U		0.62	4.7	ng/L	1	3/17/2021 16:43
Fluorotelomer Sulphonic Acid 8:2 (FtS 8:2)	U		1.1	4.7	ng/L	1	3/17/2021 16:43
Perfluorobutanesulfonic Acid (PFBS)	**3.5**	J	**0.33**	**4.7**	**ng/L**	1	3/17/2021 16:43
Perfluorobutanoic Acid (PFBA)	**5.5**		**2.4**	**4.7**	**ng/L**	1	3/17/2021 16:43
Perfluorodecanesulfonic Acid (PFDS)	U		1.3	4.7	ng/L	1	3/17/2021 16:43
Perfluorodecanoic Acid (PFDA)	U		1.2	4.7	ng/L	1	3/17/2021 16:43
Perfluorododecanoic Acid (PFDoA)	U		1.3	4.7	ng/L	1	3/17/2021 16:43
Perfluoroheptanesulfonic Acid (PFHpS)	U		0.53	4.7	ng/L	1	3/17/2021 16:43
Perfluoroheptanoic Acid (PFHpA)	**1.4**	J	**0.41**	**4.7**	**ng/L**	1	3/17/2021 16:43
Perfluorohexanesulfonic Acid (PFHxS)	**1.7**	J	**0.35**	**4.7**	**ng/L**	1	3/17/2021 16:43
Perfluorohexanoic Acid (PFHxA)	**2.3**	J	**1.1**	**4.7**	**ng/L**	1	3/17/2021 16:43
Perfluorononanesulfonic Acid (PFNS)	U		0.47	4.7	ng/L	1	3/17/2021 16:43
Perfluorononanoic Acid (PFNA)	U		0.82	4.7	ng/L	1	3/17/2021 16:43
Perfluorooctanesulfonamide (PFOSA)	U		0.67	4.7	ng/L	1	3/17/2021 16:43
Perfluorooctanesulfonic Acid (PFOS)	**2.2**		**0.84**	**1.9**	**ng/L**	1	3/17/2021 16:43
Perfluorooctanoic Acid (PFOA)	**2.7**		**0.66**	**1.9**	**ng/L**	1	3/17/2021 16:43
Perfluoropentanesulfonic Acid (PFPeS)	U		0.52	4.7	ng/L	1	3/17/2021 16:43
Perfluoropentanoic Acid (PFPeA)	**3.5**	J	**1.2**	**4.7**	**ng/L**	1	3/17/2021 16:43
Perfluorotetradecanoic Acid (PFTeA)	U		2.5	4.7	ng/L	1	3/17/2021 16:43
Perfluorotridecanoic Acid (PFTriA)	U		0.72	4.7	ng/L	1	3/17/2021 16:43
Perfluoroundecanoic Acid (PFUnA)	U		0.92	4.7	ng/L	1	3/17/2021 16:43
N-Ethylperfluorooctanesulfonamidoacetic Acid	U		0.59	4.7	ng/L	1	3/17/2021 16:43
N-Methylperfluorooctanesulfonamidoacetic Acid	U		0.61	4.7	ng/L	1	3/17/2021 16:43
Hexafluoropropylene oxide dimer acid (HFPO-DA)	U		1.1	4.7	ng/L	1	3/17/2021 16:43
4,8-Dioxa-3H-perfluorononanoic Acid (DONA)	U		0.53	4.7	ng/L	1	3/17/2021 16:43
11Cl-Pf3OUdS	U		0.44	4.7	ng/L	1	3/17/2021 16:43
9Cl-PF3ONS	U		0.42	4.7	ng/L	1	3/17/2021 16:43
Surr: 13C2-FtS 4:2	*320*	S		*50-150*	*%REC*	1	3/17/2021 16:43
Surr: 13C2-FtS 6:2	*281*	S		*50-150*	*%REC*	1	3/17/2021 16:43
Surr: 13C2-FtS 8:2	*143*			*50-150*	*%REC*	1	3/17/2021 16:43

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *22-Mar-21*

Client: Fishbeck, Inc.
Project: Cedar Springs /PFAS (201460)
Sample ID: CS-21-03-SW-01(I)
Collection Date: 3/12/2021 10:20 AM

Work Order: 21031444
Lab ID: 21031444-06
Matrix: WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
Surr: 13C2-PFDA	*90.6*			*50-150*	*%REC*	1	3/17/2021 16:43
Surr: 13C2-PFDoA	*95.8*			*50-150*	*%REC*	1	3/17/2021 16:43
Surr: 13C2-PFHxA	*94.6*			*50-150*	*%REC*	1	3/17/2021 16:43
Surr: 13C2-PFTeA	*87.1*			*50-150*	*%REC*	1	3/17/2021 16:43
Surr: 13C2-PFUnA	*108*			*50-150*	*%REC*	1	3/17/2021 16:43
Surr: 13C3-HFPO-DA	*108*			*50-150*	*%REC*	1	3/17/2021 16:43
Surr: 13C3-PFBS	*89.7*			*50-150*	*%REC*	1	3/17/2021 16:43
Surr: 13C4-PFBA	*97.7*			*50-150*	*%REC*	1	3/17/2021 16:43
Surr: 13C4-PFHpA	*87.3*			*50-150*	*%REC*	1	3/17/2021 16:43
Surr: 13C4-PFOA	*103*			*50-150*	*%REC*	1	3/17/2021 16:43
Surr: 13C4-PFOS	*112*			*50-150*	*%REC*	1	3/17/2021 16:43
Surr: 13C5-PFNA	*83.3*			*50-150*	*%REC*	1	3/17/2021 16:43
Surr: 13C5-PFPeA	*93.3*			*50-150*	*%REC*	1	3/17/2021 16:43
Surr: 13C8-FOSA	*103*			*50-150*	*%REC*	1	3/17/2021 16:43
Surr: 18O2-PFHxS	*103*			*50-150*	*%REC*	1	3/17/2021 16:43
Surr: d5-N-EtFOSAA	*145*			*50-150*	*%REC*	1	3/17/2021 16:43
Surr: d3-N-MeFOSAA	*116*			*50-150*	*%REC*	1	3/17/2021 16:43

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *22-Mar-21*

Client: Fishbeck, Inc.
Project: Cedar Springs /PFAS (201460)
Sample ID: CS-21-03-QCFB
Collection Date: 3/12/2021 09:30 AM

Work Order: 21031444
Lab ID: 21031444-07
Matrix: WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
PFAS BY EPA 537 MODIFIED			Method: **E537 MOD**		Prep: E537 Mod / 3/17/21		Analyst: **SK**
Fluorotelomer Sulphonic Acid 4:2 (FtS 4:2)	U		0.90	4.8	ng/L	1	3/17/2021 16:53
Fluorotelomer Sulphonic Acid 6:2 (FtS 6:2)	U		0.64	4.8	ng/L	1	3/17/2021 16:53
Fluorotelomer Sulphonic Acid 8:2 (FtS 8:2)	U		1.1	4.8	ng/L	1	3/17/2021 16:53
Perfluorobutanesulfonic Acid (PFBS)	U		0.34	4.8	ng/L	1	3/17/2021 16:53
Perfluorobutanoic Acid (PFBA)	U		2.5	4.8	ng/L	1	3/17/2021 16:53
Perfluorodecanesulfonic Acid (PFDS)	U		1.3	4.8	ng/L	1	3/17/2021 16:53
Perfluorodecanoic Acid (PFDA)	U		1.2	4.8	ng/L	1	3/17/2021 16:53
Perfluorododecanoic Acid (PFDoA)	U		1.4	4.8	ng/L	1	3/17/2021 16:53
Perfluoroheptanesulfonic Acid (PFHpS)	U		0.54	4.8	ng/L	1	3/17/2021 16:53
Perfluoroheptanoic Acid (PFHpA)	U		0.42	4.8	ng/L	1	3/17/2021 16:53
Perfluorohexanesulfonic Acid (PFHxS)	**0.66**	J	**0.35**	**4.8**	**ng/L**	1	3/17/2021 16:53
Perfluorohexanoic Acid (PFHxA)	U		1.2	4.8	ng/L	1	3/17/2021 16:53
Perfluorononanesulfonic Acid (PFNS)	U		0.48	4.8	ng/L	1	3/17/2021 16:53
Perfluorononanoic Acid (PFNA)	U		0.84	4.8	ng/L	1	3/17/2021 16:53
Perfluorooctanesulfonamide (PFOSA)	U		0.68	4.8	ng/L	1	3/17/2021 16:53
Perfluorooctanesulfonic Acid (PFOS)	U		0.86	1.9	ng/L	1	3/17/2021 16:53
Perfluorooctanoic Acid (PFOA)	U		0.68	1.9	ng/L	1	3/17/2021 16:53
Perfluoropentanesulfonic Acid (PFPeS)	U		0.53	4.8	ng/L	1	3/17/2021 16:53
Perfluoropentanoic Acid (PFPeA)	U		1.2	4.8	ng/L	1	3/17/2021 16:53
Perfluorotetradecanoic Acid (PFTeA)	U		2.5	4.8	ng/L	1	3/17/2021 16:53
Perfluorotridecanoic Acid (PFTriA)	U		0.74	4.8	ng/L	1	3/17/2021 16:53
Perfluoroundecanoic Acid (PFUnA)	U		0.94	4.8	ng/L	1	3/17/2021 16:53
N-Ethylperfluorooctanesulfonamidoacetic Acid	U		0.60	4.8	ng/L	1	3/17/2021 16:53
N-Methylperfluorooctanesulfonamidoacetic Acid	U		0.62	4.8	ng/L	1	3/17/2021 16:53
Hexafluoropropylene oxide dimer acid (HFPO-DA)	U		1.1	4.8	ng/L	1	3/17/2021 16:53
4,8-Dioxa-3H-perfluorononanoic Acid (DONA)	U		0.54	4.8	ng/L	1	3/17/2021 16:53
11Cl-Pf3OUdS	U		0.45	4.8	ng/L	1	3/17/2021 16:53
9Cl-PF3ONS	U		0.43	4.8	ng/L	1	3/17/2021 16:53
Surr: 13C2-FtS 4:2	*135*			*50-150*	*%REC*	1	3/17/2021 16:53
Surr: 13C2-FtS 6:2	*135*			*50-150*	*%REC*	1	3/17/2021 16:53
Surr: 13C2-FtS 8:2	*143*			*50-150*	*%REC*	1	3/17/2021 16:53

Note: See Qualifiers page for a list of qualifiers and their definitions.

Client: Fishbeck, Inc.
Project: Cedar Springs /PFAS (201460)
Sample ID: CS-21-03-QCFB
Collection Date: 3/12/2021 09:30 AM

Work Order: 21031444
Lab ID: 21031444-07
Matrix: WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
Surr: 13C2-PFDA	*111*			*50-150*	*%REC*	1	3/17/2021 16:53
Surr: 13C2-PFDoA	*86.1*			*50-150*	*%REC*	1	3/17/2021 16:53
Surr: 13C2-PFHxA	*101*			*50-150*	*%REC*	1	3/17/2021 16:53
Surr: 13C2-PFTeA	*158*	S		*50-150*	*%REC*	1	3/17/2021 16:53
Surr: 13C2-PFUnA	*96.6*			*50-150*	*%REC*	1	3/17/2021 16:53
Surr: 13C3-HFPO-DA	*146*			*50-150*	*%REC*	1	3/17/2021 16:53
Surr: 13C3-PFBS	*114*			*50-150*	*%REC*	1	3/17/2021 16:53
Surr: 13C4-PFBA	*113*			*50-150*	*%REC*	1	3/17/2021 16:53
Surr: 13C4-PFHpA	*113*			*50-150*	*%REC*	1	3/17/2021 16:53
Surr: 13C4-PFOA	*138*			*50-150*	*%REC*	1	3/17/2021 16:53
Surr: 13C4-PFOS	*103*			*50-150*	*%REC*	1	3/17/2021 16:53
Surr: 13C5-PFNA	*92.6*			*50-150*	*%REC*	1	3/17/2021 16:53
Surr: 13C5-PFPeA	*118*			*50-150*	*%REC*	1	3/17/2021 16:53
Surr: 13C8-FOSA	*116*			*50-150*	*%REC*	1	3/17/2021 16:53
Surr: 18O2-PFHxS	*87.5*			*50-150*	*%REC*	1	3/17/2021 16:53
Surr: d5-N-EtFOSAA	*111*			*50-150*	*%REC*	1	3/17/2021 16:53
Surr: d3-N-MeFOSAA	*131*			*50-150*	*%REC*	1	3/17/2021 16:53

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Client: Fishbeck, Inc.

Work Order: 21031444

Project: Cedar Springs /PFAS (201460)

Date: 22-Mar-21

QC BATCH REPORT

Batch ID: **173579** Instrument ID **LCMS1** Method: **E537 Mod**

MBLK Sample ID: **MBLK-173579-173579** Units: **ng/L** Analysis Date: **3/18/2021 12:32 PM**

Client ID: Run ID: **LCMS1_210318A** SeqNo: **7224697** Prep Date: **3/17/2021** DF: **1**

Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Fluorotelomer Sulphonic Acid	U	0.94	5.0								
Fluorotelomer Sulphonic Acid	U	0.66	5.0								
Fluorotelomer Sulphonic Acid	U	1.1	5.0								
Perfluorobutanesulfonic Acid (	U	0.35	5.0								
Perfluorobutanoic Acid (PFBA)	U	2.6	5.0								
Perfluorodecanesulfonic Acid (	U	1.4	5.0								
Perfluorodecanoic Acid (PFDA	U	1.2	5.0								
Perfluorododecanoic Acid (PFI	U	1.4	5.0								
Perfluoroheptanesulfonic Acid	U	0.57	5.0								
Perfluoroheptanoic Acid (PFH	U	0.44	5.0								
Perfluorohexanesulfonic Acid (	0.6816	0.37	5.0								J
Perfluorohexanoic Acid (PFHx	U	1.2	5.0								
Perfluorononanesulfonic Acid	U	0.5	5.0								
Perfluorononanoic Acid (PFNA	U	0.87	5.0								
Perfluorooctanesulfonamide (F	U	0.71	5.0								
Perfluorooctanesulfonic Acid (	U	0.89	2.0								
Perfluorooctanoic Acid (PFOA)	U	0.7	2.0								
Perfluoropentanesulfonic Acid	U	0.56	5.0								
Perfluoropentanoic Acid (PFPe	U	1.3	5.0								
Perfluorotetradecanoic Acid (F	U	2.6	5.0								
Perfluorotridecanoic Acid (PFT	U	0.77	5.0								
Perfluoroundecanoic Acid (PFI	U	0.97	5.0								
N-Ethylperfluorooctanesulfona	U	0.63	5.0								
N-Methylperfluorooctanesulfor	U	0.64	5.0								
Hexafluoropropylene oxide din	U	1.2	5.0								
4,8-Dioxa-3H-perfluorononano	U	0.56	5.0								
11Cl-Pf3OUdS	U	0.47	5.0								
9Cl-PF3ONS	U	0.45	5.0								
Surr: 13C2-FtS 4:2	*185.8*	0	0	*149.4*	0	*124*	*50-150*	0			
Surr: 13C2-FtS 6:2	*190.5*	0	0	*152*	0	*125*	*50-150*	0			
Surr: 13C2-FtS 8:2	*154.2*	0	0	*153.3*	0	*101*	*50-150*	0			
Surr: 13C2-PFDA	*139.7*	0	0	*160*	0	*87.3*	*50-150*	0			
Surr: 13C2-PFDoA	*145.2*	0	0	*160*	0	*90.8*	*50-150*	0			
Surr: 13C2-PFHxA	*154.1*	0	0	*160*	0	*96.3*	*50-150*	0			
Surr: 13C2-PFTeA	*164*	0	0	*160*	0	*102*	*50-150*	0			
Surr: 13C2-PFUnA	*150.4*	0	0	*160*	0	*94*	*50-150*	0			
Surr: 13C3-HFPO-DA	*188.8*	0	0	*160*	0	*118*	*50-150*	0			
Surr: 13C3-PFBS	*160.9*	0	0	*148.8*	0	*108*	*50-150*	0			
Surr: 13C4-PFBA	*176.7*	0	0	*160*	0	*110*	*50-150*	0			
Surr: 13C4-PFHpA	*145.8*	0	0	*160*	0	*91.2*	*50-150*	0			
Surr: 13C4-PFOA	*158.7*	0	0	*160*	0	*99.2*	*50-150*	0			

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client:	Fishbeck, Inc.		**QC BATCH REPORT**
Work Order:	21031444		
Project:	Cedar Springs /PFAS (201460)		

Batch ID: **173579** Instrument ID **LCMS1** Method: **E537 Mod**

Surr: 13C4-PFOS	*188.8*	0	0	*152.8*	0	*124*	*50-150*	0			
Surr: 13C5-PFNA	*142.9*	0	0	*160*	0	*89.3*	*50-150*	0			
Surr: 13C5-PFPeA	*178.5*	0	0	*160*	0	*112*	*50-150*	0			
Surr: 13C8-FOSA	*166.3*	0	0	*160*	0	*104*	*50-150*	0			
Surr: 18O2-PFHxS	*166.1*	0	0	*151.2*	0	*110*	*50-150*	0			
Surr: d5-N-EtFOSAA	*176.9*	0	0	*160*	0	*111*	*50-150*	0			
Surr: d3-N-MeFOSAA	*159.7*	0	0	*160*	0	*99.8*	*50-150*	0			

LCS Sample ID: **LCS-173579-173579** Units: **ng/L** Analysis Date: **3/18/2021 10:46 AM**

Client ID: Run ID: **LCMS1_210318A** SeqNo: **7224693** Prep Date: **3/17/2021** DF: **1**

Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Perfluorotridecanoic Acid (PF1	41.6	0.77	5.0	32	0	130	65-144	0			

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: Fishbeck, Inc.
Work Order: 21031444
Project: Cedar Springs /PFAS (201460)

QC BATCH REPORT

Batch ID: **173579** Instrument ID **LCMS1** Method: **E537 Mod**

LCS	Sample ID: **LCS-173579-173579**				Units: **ng/L**		Analysis Date: **3/17/2021 03:19 PM**				
Client ID:		Run ID: **LCMS1_210317A**			SeqNo: **7224701**		Prep Date: **3/17/2021**		DF: **1**		
Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Fluorotelomer Sulphonic Acid	28.86	0.94	5.0	29.9	0	96.5	63-143	0			
Fluorotelomer Sulphonic Acid	31.24	0.66	5.0	30.3	0	103	64-140	0			
Fluorotelomer Sulphonic Acid	32.63	1.1	5.0	30.7	0	106	67-138	0			
Perfluorobutanesulfonic Acid (	26.03	0.35	5.0	28.3	0	92	72-130	0			
Perfluorobutanoic Acid (PFBA)	34.48	2.6	5.0	32	0	108	73-129	0			
Perfluorodecanesulfonic Acid (	27.43	1.4	5.0	30.8	0	89	53-142	0			
Perfluorodecanoic Acid (PFDA	33.13	1.2	5.0	32	0	104	71-129	0			
Perfluorododecanoic Acid (PFI	39.48	1.4	5.0	32	0	123	72-134	0			
Perfluoroheptanesulfonic Acid	29.68	0.57	5.0	30.5	0	97.3	69-134	0			
Perfluoroheptanoic Acid (PFH	29.94	0.44	5.0	32	0	93.6	72-130	0			
Perfluorohexanesulfonic Acid (	28.03	0.37	5.0	29.1	0	96.3	68-131	0			
Perfluorohexanoic Acid (PFHx	32.53	1.2	5.0	32	0	102	72-129	0			
Perfluorononanesulfonic Acid (	27.17	0.5	5.0	30.7	0	88.5	69-127	0			
Perfluorononanoic Acid (PFNA	39.79	0.87	5.0	32	0	124	69-130	0			
Perfluorooctanesulfonamide (F	30.61	0.71	5.0	32	0	95.7	67-137	0			
Perfluorooctanesulfonic Acid (	32.48	0.89	2.0	29.7	0	109	65-140	0			
Perfluorooctanoic Acid (PFOA)	28.61	0.7	2.0	32	0	89.4	71-133	0			
Perfluoropentanesulfonic Acid	28	0.56	5.0	30	0	93.3	71-127	0			
Perfluoropentanoic Acid (PFPe	29.42	1.3	5.0	32	0	91.9	72-129	0			
Perfluorotetradecanoic Acid (F	40.14	2.6	5.0	32	0	125	71-132	0			
Perfluoroundecanoic Acid (PFI	25.68	0.97	5.0	32	0	80.2	69-133	0			
N-Ethylperfluorooctanesulfona	29.34	0.63	5.0	32	0	91.7	61-135	0			
N-Methylperfluorooctanesulfor	32.46i	0.64	5.0	32	0	101	65-136	0			
Hexafluoropropylene oxide din	33.43l	1.2	5.0	32	0	104	70-130	0			
4,8-Dioxa-3H-perfluorononano	33.39	0.56	5.0	30.1	0	111	70-130	0			
11Cl-Pf3OUdS	27.21	0.47	5.0	30.1	0	90.4	70-130	0			
9Cl-PF3ONS	35.78	0.45	5.0	29.8	0	120	70-130	0			
Surr: 13C2-FtS 4:2	*214.3*	0	0	*149.4*	0	*143*	*50-150*	0			
Surr: 13C2-FtS 6:2	*215.5*	0	0	*152*	0	*142*	*50-150*	0			
Surr: 13C2-FtS 8:2	*167.5*	0	0	*153.3*	0	*109*	*50-150*	0			
Surr: 13C2-PFDA	*151.3*	0	0	*160*	0	*94.6*	*50-150*	0			
Surr: 13C2-PFDoA	*181.1*	0	0	*160*	0	*113*	*50-150*	0			
Surr: 13C2-PFHxA	*174.6*	0	0	*160*	0	*109*	*50-150*	0			
Surr: 13C2-PFTeA	*186.2*	0	0	*160*	0	*116*	*50-150*	0			
Surr: 13C2-PFUnA	*173*	0	0	*160*	0	*108*	*50-150*	0			
Surr: 13C3-HFPO-DA	*209.9*	0	0	*160*	0	*131*	*50-150*	0			
Surr: 13C3-PFBS	*176*	0	0	*148.8*	0	*118*	*50-150*	0			
Surr: 13C4-PFBA	*197.9*	0	0	*160*	0	*124*	*50-150*	0			
Surr: 13C4-PFHpA	*171.5*	0	0	*160*	0	*107*	*50-150*	0			
Surr: 13C4-PFOA	*175.7*	0	0	*160*	0	*110*	*50-150*	0			
Surr: 13C4-PFOS	*201.7*	0	0	*152.8*	0	*132*	*50-150*	0			
Surr: 13C5-PFNA	*154.9*	0	0	*160*	0	*96.8*	*50-150*	0			
Surr: 13C5-PFPeA	*197*	0	0	*160*	0	*123*	*50-150*	0			

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client:	Fishbeck, Inc.
Work Order:	21031444
Project:	Cedar Springs /PFAS (201460)

QC BATCH REPORT

Batch ID: **173579** Instrument ID **LCMS1** Method: **E537 Mod**

Surr: 13C8-FOSA	*193.7*	0	0	*160*	0	*121*	*50-150*	0
Surr: 18O2-PFHxS	*193.9*	0	0	*151.2*	0	*128*	*50-150*	0
Surr: d5-N-EtFOSAA	*183.8*	0	0	*160*	0	*115*	*50-150*	0
Surr: d3-N-MeFOSAA	*170.5*	0	0	*160*	0	*107*	*50-150*	0

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client:	Fishbeck, Inc.	
Work Order:	21031444	
Project:	Cedar Springs /PFAS (201460)	

QC BATCH REPORT

Batch ID: **173579** Instrument ID **LCMS1** Method: **E537 Mod**

MS	Sample ID: **21031538-01A MS**					Units: **ng/L**			Analysis Date: **3/17/2021 03:30 PM**			
Client ID:		Run ID: **LCMS1_210317A**				SeqNo: **7224702**		Prep Date: **3/17/2021**			DF: **1**	
Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual	
Fluorotelomer Sulphonic Acid ·	25.42	0.89	4.7	28.31	0	89.8	63-143	0				
Fluorotelomer Sulphonic Acid ·	29.18	0.63	4.7	28.69	0	102	64-140	0				
Fluorotelomer Sulphonic Acid	32.92	1.1	4.7	29.07	0	113	67-138	0				
Perfluorobutanesulfonic Acid (	26.23	0.33	4.7	26.8	2.585	88.2	72-130	0				
Perfluorobutanoic Acid (PFBA	57.69	2.5	4.7	30.3	22.35	117	73-129	0				
Perfluorodecanesulfonic Acid (	22.33	1.3	4.7	29.17	0	76.6	53-142	0				
Perfluorodecanoic Acid (PFDA	29.3	1.2	4.7	30.3	0.3576	95.5	71-129	0				
Perfluorododecanoic Acid (PFI	35.07	1.4	4.7	30.3	0.2697	115	72-134	0				
Perfluoroheptanesulfonic Acid	26.25	0.54	4.7	28.88	0.3091	89.8	69-134	0				
Perfluoroheptanoic Acid (PFH	60.24	0.42	4.7	30.3	37.91	73.7	72-130	0				
Perfluorohexanesulfonic Acid (	27.5	0.35	4.7	27.56	1.336	94.9	68-131	0				
Perfluorohexanoic Acid (PFHx	60.51	1.1	4.7	30.3	29.56	102	72-129	0				
Perfluorononanesulfonic Acid ·	25.65	0.47	4.7	29.07	0	88.2	69-127	0				
Perfluorononanoic Acid (PFNA	35.97	0.82	4.7	30.3	0.2788	118	69-130	0				
Perfluorooctanesulfonamide (F	30.07	0.67	4.7	30.3	0.1303	98.8	67-137	0				
Perfluorooctanesulfonic Acid (	34.23	0.84	1.9	28.12	4.206	107	65-140	0				
Perfluorooctanoic Acid (PFOA	95.43	0.67	1.9	30.3	68.92	87.5	71-133	0				
Perfluoropentanesulfonic Acid	24.62	0.53	4.7	28.41	0.2939	85.6	71-127	0				
Perfluoropentanoic Acid (PFPe	32.28	1.2	4.7	30.3	6.997	83.4	72-129	0				
Perfluorotetradecanoic Acid (F	33.07	2.5	4.7	30.3	0	109	71-132	0				
Perfluorotridecanoic Acid (PFT	37.73	0.73	4.7	30.3	0.00303	125	65-144	0				
Perfluoroundecanoic Acid (PFI	23.5	0.92	4.7	30.3	0.1242	77.1	69-133	0				
N-Ethylperfluorooctanesulfona	26.93	0.59	4.7	30.3	0	88.9	61-135	0				
N-Methylperfluorooctanesulfor	30.3	0.61	4.7	30.3	0	100	65-136	0				
Hexafluoropropylene oxide din	28	1.1	4.7	30.3	0	92.4	70-130	0				
4,8-Dioxa-3H-perfluorononano	27.35	0.53	4.7	28.5	0	96	70-130	0				
11Cl-Pf3OUdS	24.83	0.44	4.7	28.5	0	87.1	70-130	0				
9Cl-PF3ONS	32.74	0.42	4.7	28.22	0	116	70-130	0				
Surr: 13C2-FtS 4:2	*240*	0	0	*141.5*	0	*170*	*50-150*	0			*S*	
Surr: 13C2-FtS 6:2	*211.6*	0	0	*143.9*	0	*147*	*50-150*	0				
Surr: 13C2-FtS 8:2	*176.4*	0	0	*145.2*	0	*122*	*50-150*	0				
Surr: 13C2-PFDA	*154.9*	0	0	*151.5*	0	*102*	*50-150*	0				
Surr: 13C2-PFDoA	*173.3*	0	0	*151.5*	0	*114*	*50-150*	0				
Surr: 13C2-PFHxA	*198.7*	0	0	*151.5*	0	*131*	*50-150*	0				
Surr: 13C2-PFTeA	*209.8*	0	0	*151.5*	0	*138*	*50-150*	0				
Surr: 13C2-PFUnA	*172.8*	0	0	*151.5*	0	*114*	*50-150*	0				
Surr: 13C3-HFPO-DA	*250.2*	0	0	*151.5*	0	*165*	*50-150*	0			*S*	
Surr: 13C3-PFBS	*185.7*	0	0	*140.9*	0	*132*	*50-150*	0				
Surr: 13C4-PFBA	*207.5*	0	0	*151.5*	0	*137*	*50-150*	0				
Surr: 13C4-PFHpA	*213*	0	0	*151.5*	0	*141*	*50-150*	0				
Surr: 13C4-PFOA	*180.1*	0	0	*151.5*	0	*119*	*50-150*	0				
Surr: 13C4-PFOS	*202.2*	0	0	*144.7*	0	*140*	*50-150*	0				
Surr: 13C5-PFNA	*172.9*	0	0	*151.5*	0	*114*	*50-150*	0				

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client:	Fishbeck, Inc.							
Work Order:	21031444							
Project:	Cedar Springs /PFAS (201460)							

QC BATCH REPORT

Batch ID: **173579** Instrument ID **LCMS1** Method: **E537 Mod**

Surr: 13C5-PFPeA	*208.2*	0	0	*151.5*	0	*137*	*50-150*	0
Surr: 13C8-FOSA	*220*	0	0	*151.5*	0	*145*	*50-150*	0
Surr: 18O2-PFHxS	*192*	0	0	*143.2*	0	*134*	*50-150*	0
Surr: d5-N-EtFOSAA	*207.3*	0	0	*151.5*	0	*137*	*50-150*	0
Surr: d3-N-MeFOSAA	*199*	0	0	*151.5*	0	*131*	*50-150*	0

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: Fishbeck, Inc.
Work Order: 21031444
Project: Cedar Springs /PFAS (201460)

QC BATCH REPORT

Batch ID: **173579** Instrument ID **LCMS1** Method: **E537 Mod**

DUP Sample ID: **21031530-02A DUP** Units: **ng/L** Analysis Date: **3/17/2021 05:25 PM**
Client ID: Run ID: **LCMS1_210317A** SeqNo: **7224713** Prep Date: **3/17/2021** DF: **1**

Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Fluorotelomer Sulphonic Acid ·	U	0.9	4.8	0	0	0	0-0	0	0	30	
Fluorotelomer Sulphonic Acid ·	U	0.64	4.8	0	0	0	0-0	0	0	30	
Fluorotelomer Sulphonic Acid	U	1.1	4.8	0	0	0	0-0	0	0	30	
Perfluorobutanesulfonic Acid (	2.105	0.34	4.8	0	0	0	0-0	2.354	0	30	J
Perfluorobutanoic Acid (PFBA)	18.76	2.5	4.8	0	0	0	0-0	18.78	0.0996	30	
Perfluorodecanesulfonic Acid (	U	1.3	4.8	0	0	0	0-0	0	0	30	
Perfluorodecanoic Acid (PFDA	U	1.2	4.8	0	0	0	0-0	0	0	30	
Perfluorododecanoic Acid (PFI	U	1.4	4.8	0	0	0	0-0	0.1405	0	30	
Perfluoroheptanesulfonic Acid	4.462	0.54	4.8	0	0	0	0-0	4.394	0	30	J
Perfluoroheptanoic Acid (PFHp	57.41	0.42	4.8	0	0	0	0-0	50.39	13	30	
Perfluorohexanesulfonic Acid (	5.551	0.35	4.8	0	0	0	0-0	6.55	16.5	30	
Perfluorohexanoic Acid (PFHx	24.29	1.2	4.8	0	0	0	0-0	25.33	4.21	30	
Perfluorononanesulfonic Acid (	U	0.48	4.8	0	0	0	0-0	0	0	30	
Perfluorononanoic Acid (PFNA	1.342	0.84	4.8	0	0	0	0-0	1.676	0	30	J
Perfluorooctanesulfonamide (F	0.7138	0.68	4.8	0	0	0	0-0	0.7359	0	30	J
Perfluorooctanesulfonic Acid (	76.98	0.86	1.9	0	0	0	0-0	78.44	1.88	30	
Perfluorooctanoic Acid (PFOA)	158.9	0.68	1.9	0	0	0	0-0	166.7	4.82	30	
Perfluoropentanesulfonic Acid	0.9692	0.53	4.8	0	0	0	0-0	0.974	0	30	J
Perfluoropentanoic Acid (PFPe	7.886	1.2	4.8	0	0	0	0-0	7.075	10.8	30	
Perfluorotetradecanoic Acid (F	U	2.5	4.8	0	0	0	0-0	0	0	30	
Perfluorotridecanoic Acid (PFT	U	0.74	4.8	0	0	0	0-0	0	0	30	
Perfluoroundecanoic Acid (PFI	U	0.94	4.8	0	0	0	0-0	0.09466	0	30	
N-Ethylperfluorooctanesulfona	3.031	0.6	4.8	0	0	0	0-0	3.615	0	30	J
N-Methylperfluorooctanesulfor	U	0.62	4.8	0	0	0	0-0	0	0	30	
Hexafluoropropylene oxide din	U	1.1	4.8	0	0	0	0-0	0	0	30	
4,8-Dioxa-3H-perfluorononano	U	0.54	4.8	0	0	0	0-0	0	0	30	
11Cl-Pf3OUdS	U	0.45	4.8	0	0	0	0-0	0	0	30	
9Cl-PF3ONS	U	0.43	4.8	0	0	0	0-0	0	0	30	
Surr: 13C2-FtS 4:2	*573.6*	0	0	*143.7*	0	*399*	*50-150*	581	*1.29*	*30*	*S*
Surr: 13C2-FtS 6:2	*392.1*	0	0	*146.2*	0	*268*	*50-150*	437.4	*10.9*	*30*	*S*
Surr: 13C2-FtS 8:2	*180.7*	0	0	*147.4*	0	*123*	*50-150*	205.1	*12.6*	*30*	
Surr: 13C2-PFDA	*165.7*	0	0	*153.8*	0	*108*	*50-150*	165	*0.418*	*30*	
Surr: 13C2-PFDoA	*125.6*	0	0	*153.8*	0	*81.6*	*50-150*	118.2	*6.02*	*30*	
Surr: 13C2-PFHxA	*137*	0	0	*153.8*	0	*89.1*	*50-150*	131.8	*3.92*	*30*	
Surr: 13C2-PFTeA	*192.7*	0	0	*153.8*	0	*125*	*50-150*	195.1	*1.23*	*30*	
Surr: 13C2-PFUnA	*155.1*	0	0	*153.8*	0	*101*	*50-150*	142.4	*8.57*	*30*	
Surr: 13C3-HFPO-DA	*170.6*	0	0	*153.8*	0	*111*	*50-150*	187.5	*9.46*	*30*	
Surr: 13C3-PFBS	*126.3*	0	0	*143.1*	0	*88.3*	*50-150*	133.9	*5.79*	*30*	
Surr: 13C4-PFBA	*157.9*	0	0	*153.8*	0	*103*	*50-150*	150.4	*4.86*	*30*	
Surr: 13C4-PFHpA	*131.5*	0	0	*153.8*	0	*85.5*	*50-150*	140.2	*6.36*	*30*	
Surr: 13C4-PFOA	*195.7*	0	0	*153.8*	0	*127*	*50-150*	183.2	*6.57*	*30*	
Surr: 13C4-PFOS	*166.5*	0	0	*146.9*	0	*113*	*50-150*	156.9	*5.94*	*30*	
Surr: 13C5-PFNA	*124.3*	0	0	*153.8*	0	*80.8*	*50-150*	119.8	*3.71*	*30*	

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client:	Fishbeck, Inc.	
Work Order:	21031444	
Project:	Cedar Springs /PFAS (201460)	

QC BATCH REPORT

Batch ID: **173579** Instrument ID **LCMS1** Method: **E537 Mod**

Surr: 13C5-PFPeA	*141.7*	0	0	*153.8*	0	*92.1*	*50-150*	149.2	*5.18*	*30*
Surr: 13C8-FOSA	*139.2*	0	0	*153.8*	0	*90.5*	*50-150*	152.7	*9.28*	*30*
Surr: 18O2-PFHxS	*130.6*	0	0	*145.4*	0	*89.8*	*50-150*	130.3	*0.225*	*30*
Surr: d5-N-EtFOSAA	*149.7*	0	0	*153.8*	0	*97.3*	*50-150*	164.7	*9.57*	*30*
Surr: d3-N-MeFOSAA	*165.3*	0	0	*153.8*	0	*107*	*50-150*	200.2	*19.1*	*30*

The following samples were analyzed in this batch:

21031444-01A	21031444-02A	21031444-03A
21031444-04A	21031444-05A	21031444-06A
21031444-07A		

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

L1031444

CHAIN OF CUSTODY RECORD

fishbeck
Address: 1515 Arboretum Dr. SE
Grand Rapids, MI 49546
Phone: 616.575.3824

Report to: Penni Mahler
Email: pdmahler@fishbeck.com
Copy to:
Email:

Invoice to: Accounts Payable
Email: acpay@fishbeck.com
Lab Quote Reference:

PROJECT NAME: Cedar Springs/PFAS	PROJECT NO.: 201460
PROJECT LOCATION: Cedar Springs, MI	SAMPLER(S) NAME: LNC
PROJECT MANAGER: Tim Patterson	PHONE: 616.464.3750
	EMAIL: tkpatterson@fishbeck.com
ADDITIONAL INFORMATION:	

PAGE 1 of 1

STD TAT: ■
RUSH TAT: ☐
DATE DUE:

Required analyses: PFAS/537M/28 list (Preservative: None) — NUMBER OF CONTAINERS SUBMITTED

SAMPLE DATE	SAMPLE TIME	SAMPLE IDENTIFICATION	AQUEOUS (WATER)	SOLID/SEMI-SOLID	AIR	NONAQUEOUS LIQUID	PFAS/537M/28 list	REMARKS
3/12/21	1215	CS-21-03-MW-6A(I)	X				2	
↓	1000	CS-21-03-MW-8A(I)	X				2	
	1000	CS-21-03-MW-8A(D)	X				2	
	1302	CS-21-03-GSI-1D (I)	X				2	
	1130	CS-21-03-GSI-2D (I)	X				2	
	1020	CS-21-03-SW-01(I)	X				1	
	930	CS-21-03-QCFB						

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RELINQUISHED BY	DATE	TIME	RELINQUISHED BY	DATE	TIME	RELINQUISHED BY	DATE	TIME	METHOD OF SHIPMENT/TRACKING NUMBER
L. C[illegible] Fishbeck Storage	3/12/21	1415	[signature]	3/15/21	09:30				COC Sealed/ALS Pick Up

RECEIVED BY	DATE	TIME	RECEIVED BY	DATE	TIME	RECEIVED BY	DATE	TIME	RECEIVED FOR LAB	DATE	TIME
From Storage [signature]	3/15/21	09:30							[signature]	3/15/21	1500

G-0312(60

3.8°C IR

ALS Group, USA

Sample Receipt Checklist

Client Name: **FTCH - GR** Date/Time Received: **15-Mar-21 15:00**

Work Order: **21031444** Received by: **KRW**

Checklist completed by *Keith Wierenga* (eSignature) 16-Mar-21 (Date) Reviewed by: *Ehland Bosworth* (eSignature) 16-Mar-21 (Date)

Matrices: Water
Carrier name: ALSHN

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on shipping container/cooler?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on sample bottles?	Yes ☐	No ☐	Not Present ☑
Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time?	Yes ☑	No ☐	
Container/Temp Blank temperature in compliance?	Yes ☑	No ☐	
Sample(s) received on ice?	Yes ☑	No ☐	
Temperature(s)/Thermometer(s):	3.8/4.8 C	IR3	
Cooler(s)/Kit(s):			
Date/Time sample(s) sent to storage:	3/16/2021 9:29:17 AM		
Water - VOA vials have zero headspace?	Yes ☐	No ☐	No VOA vials submitted ☑
Water - pH acceptable upon receipt?	Yes ☑	No ☐	N/A ☐
pH adjusted?	Yes ☐	No ☑	N/A ☐
pH adjusted by:	-		

Login Notes:

Client Contacted: Date Contacted: Person Contacted:

Contacted By: Regarding:

Comments:

CorrectiveAction:

Appendix 4

ALS Environmental

08-Jun-2021

Penni Mahler
Fishbeck, Inc.
1515 Arboretum Dr SE
Grand Rapids, MI 49546

Re: **Cedar Springs (201460)** Work Order: **21060077**

Dear Penni,

ALS Environmental received 14 samples on 28-May-2021 03:30 PM for the analyses presented in the following report.

The analytical data provided relates directly to the samples received by ALS Environmental - Holland and for only the analyses requested.

Sample results are compliant with industry accepted practices and Quality Control results achieved laboratory specifications. Any exceptions are noted in the Case Narrative, or noted with qualifiers in the report or QC batch information. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained from ALS Environmental. Samples will be disposed in 30 days unless storage arrangements are made.

The total number of pages in this report is 29.

If you have any questions regarding this report, please feel free to contact me:

ADDRESS: 3352 128th Avenue, Holland, MI, USA
PHONE: +1 (616) 399-6070 FAX: +1 (616) 399-6185

Sincerely,

Ehrland Bosworth

Electronically approved by: Ehrland Bosworth

Ehrland Bosworth
Project Manager

Report of Laboratory Analysis

Certificate No: MN 026-999-449

ALS Group, USA

Date: 08-Jun-21

Client: Fishbeck, Inc.
Project: Cedar Springs (201460)
Work Order: **21060077**

Work Order Sample Summary

Lab Samp ID	Client Sample ID	Matrix	Tag Number	Collection Date	Date Received	Hold
21060077-01	CS-21-05-DW-13360 White Creek Avenue (I)	Water		5/26/2021 09:40	5/28/2021 15:30	☐
21060077-02	CS-21-05-DW-13261 White Creek Avenue (I)	Water		5/26/2021 12:05	5/28/2021 15:30	☐
21060077-03	CS-21-05-DW-13353 White Creek Avenue (I)	Water		5/26/2021 11:46	5/28/2021 15:30	☐
21060077-04	CS-21-05-DW-13399 White Creek Avenue (I)	Water		5/26/2021 11:05	5/28/2021 15:30	☐
21060077-05	CS-21-05-DW-13485 White Creek Avenue (I)	Water		5/26/2021 10:45	5/28/2021 15:30	☐
21060077-06	CS-21-05-DW-13525 White Creek Avenue (I)	Water		5/26/2021 10:27	5/28/2021 15:30	☐
21060077-07	CS-21-05-DW-13590 White Creek Avenue (I)	Water		5/26/2021 10:06	5/28/2021 15:30	☐
21060077-08	CS-21-05-DW-4095 16 Mile Rd (I)	Water		5/26/2021 13:40	5/28/2021 15:30	☐
21060077-09	CS-21-05-DW-4107 16 Mile Rd (I)	Water		5/26/2021 13:06	5/28/2021 15:30	☐
21060077-10	CS-21-05-DW-4141 16 Mile Rd (I)	Water		5/26/2021 12:48	5/28/2021 15:30	☐
21060077-11	CS-21-05-DW-4142 16 Mile Rd (I)	Water		5/26/2021 12:32	5/28/2021 15:30	☐
21060077-12	CS-21-05-DW-13360 White Creek Avenue (D)	Water		5/26/2021 09:40	5/28/2021 15:30	☐
21060077-13	CS-21-05-QCFB-01	Water		5/26/2021 14:05	5/28/2021 15:30	☐
21060077-14	CS-21-05-DW-4095 16 Mile Rd (D)	Water		5/26/2021 13:40	5/28/2021 15:30	☐

ALS Group, USA

Date: 08-Jun-21

Client: Fishbeck, Inc.
Project: Cedar Springs (201460)
WorkOrder: 21060077

QUALIFIERS, ACRONYMS, UNITS

Qualifier	Description
*	Value exceeds Regulatory Limit
**	Estimated Value
a	Analyte is non-accredited
B	Analyte detected in the associated Method Blank above the Reporting Limit
E	Value above quantitation range
H	Analyzed outside of Holding Time
Hr	BOD/CBOD - Sample was reset outside Hold Time, value should be considered estimated.
J	Analyte is present at an estimated concentration between the MDL and Report Limit
ND	Not Detected at the Reporting Limit
O	Sample amount is > 4 times amount spiked
P	Dual Column results percent difference > 40%
R	RPD above laboratory control limit
S	Spike Recovery outside laboratory control limits
U	Analyzed but not detected above the MDL
X	Analyte was detected in the Method Blank between the MDL and Reporting Limit, sample results may exhibit background or reagent contamination at the observed level.

Acronym	Description
DUP	Method Duplicate
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LOD	Limit of Detection (see MDL)
LOQ	Limit of Quantitation (see PQL)
MBLK	Method Blank
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
PQL	Practical Quantitation Limit
RPD	Relative Percent Difference
TDL	Target Detection Limit
TNTC	Too Numerous To Count
A	APHA Standard Methods
D	ASTM
E	EPA
SW	SW-846 Update III

Units Reported	Description
ng/L	Nanograms per Liter

Client: Fishbeck, Inc.
Project: Cedar Springs (201460)
Work Order: 21060077

Case Narrative

Samples for the above noted Work Order were received on 05/28/2021. The attached "Sample Receipt Checklist" documents the status of custody seals, container integrity, preservation, and temperature compliance.

Samples were analyzed according to the analytical methodology previously transmitted in the "Work Order Acknowledgement". Methodologies are also documented in the "Analytical Result" section for each sample. Quality control results are listed in the "QC Report" section. Sample association for the reported quality control is located at the end of each batch summary. If applicable, results are appropriately qualified in the Analytical Result and QC Report sections. The "Qualifiers" section documents the various qualifiers, units, and acronyms utilized in reporting. A copy of the laboratory's scope of accreditation is available upon request.

With the following exceptions, all sample analyses achieved analytical criteria.

Extractable Organics:
No deviations or anomalies were noted.

ALS Group, USA

Date: *08-Jun-21*

Client: Fishbeck, Inc.
Project: Cedar Springs (201460)
Sample ID: CS-21-05-DW-13360 White Creek Avenue (I)
Collection Date: 5/26/2021 09:40 AM

Work Order: 21060077
Lab ID: 21060077-01
Matrix: WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
PFAS BY EPA 537.1			Method: **E537.1**		Prep: E537.1 / 6/2/21		Analyst: **SK**
Hexafluoropropylene oxide dimer acid (HFPO-DA)	U		0.6	2	ng/L	1	6/3/2021 17:03
N-Ethylperfluorooctanesulfonamidoacetic Acid	U		0.3	2	ng/L	1	6/3/2021 17:03
N-Methylperfluorooctanesulfonamidoacetic Acid	U		0.4	2	ng/L	1	6/3/2021 17:03
Perfluorobutanesulfonic Acid (PFBS)	U		0.3	2	ng/L	1	6/3/2021 17:03
Perfluorodecanoic Acid (PFDA)	U		0.6	2	ng/L	1	6/3/2021 17:03
Perfluorododecanoic Acid (PFDoA)	U		0.3	2	ng/L	1	6/3/2021 17:03
Perfluoroheptanoic Acid (PFHpA)	U		0.5	2	ng/L	1	6/3/2021 17:03
Perfluorohexanesulfonic Acid (PFHxS)	U		0.3	2	ng/L	1	6/3/2021 17:03
Perfluorohexanoic Acid (PFHxA)	U		0.6	2	ng/L	1	6/3/2021 17:03
Perfluorononanoic Acid (PFNA)	U		0.5	2	ng/L	1	6/3/2021 17:03
Perfluorooctanesulfonic Acid (PFOS)	U		0.2	2	ng/L	1	6/3/2021 17:03
Perfluorooctanoic Acid (PFOA)	U		0.5	2	ng/L	1	6/3/2021 17:03
Perfluorotetradecanoic Acid (PFTeA)	U		0.4	2	ng/L	1	6/3/2021 17:03
Perfluorotridecanoic Acid (PFTriA)	U		0.3	2	ng/L	1	6/3/2021 17:03
Perfluoroundecanoic Acid (PFUnA)	U		0.4	2	ng/L	1	6/3/2021 17:03
11Cl-Pf3OUdS	U		0.3	2	ng/L	1	6/3/2021 17:03
9Cl-PF3ONS	U		0.1	2	ng/L	1	6/3/2021 17:03
4,8-Dioxa-3H-perfluorononanoic Acid (DONA)	U		0.3	2	ng/L	1	6/3/2021 17:03
Surr: 13C2-PFHxA	*102*			*70-130*	*%REC*	1	6/3/2021 17:03
Surr: 13C2-PFDA	*100*			*70-130*	*%REC*	1	6/3/2021 17:03
Surr: d5-N-EtFOSAA	*88.7*			*70-130*	*%REC*	1	6/3/2021 17:03
Surr: 13C3-HFPO-DA	*96.6*			*70-130*	*%REC*	1	6/3/2021 17:03

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *08-Jun-21*

Client: Fishbeck, Inc.
Project: Cedar Springs (201460)
Sample ID: CS-21-05-DW-13261 White Creek Avenue (I)
Collection Date: 5/26/2021 12:05 PM

Work Order: 21060077
Lab ID: 21060077-02
Matrix: WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
PFAS BY EPA 537.1			Method: **E537.1**		Prep: E537.1 / 6/2/21		Analyst: **SK**
Hexafluoropropylene oxide dimer acid (HFPO-DA)	U		0.5	2	ng/L	1	6/3/2021 19:08
N-Ethylperfluorooctanesulfonamidoacetic Acid	U		0.2	2	ng/L	1	6/3/2021 19:08
N-Methylperfluorooctanesulfonamidoaceti c Acid	U		0.4	2	ng/L	1	6/3/2021 19:08
Perfluorobutanesulfonic Acid (PFBS)	U		0.3	2	ng/L	1	6/3/2021 19:08
Perfluorodecanoic Acid (PFDA)	U		0.6	2	ng/L	1	6/3/2021 19:08
Perfluorododecanoic Acid (PFDoA)	U		0.3	2	ng/L	1	6/3/2021 19:08
Perfluoroheptanoic Acid (PFHpA)	U		0.5	2	ng/L	1	6/3/2021 19:08
Perfluorohexanesulfonic Acid (PFHxS)	U		0.3	2	ng/L	1	6/3/2021 19:08
Perfluorohexanoic Acid (PFHxA)	U		0.6	2	ng/L	1	6/3/2021 19:08
Perfluorononanoic Acid (PFNA)	U		0.5	2	ng/L	1	6/3/2021 19:08
Perfluorooctanesulfonic Acid (PFOS)	U		0.2	2	ng/L	1	6/3/2021 19:08
Perfluorooctanoic Acid (PFOA)	U		0.4	2	ng/L	1	6/3/2021 19:08
Perfluorotetradecanoic Acid (PFTeA)	U		0.4	2	ng/L	1	6/3/2021 19:08
Perfluorotridecanoic Acid (PFTriA)	U		0.3	2	ng/L	1	6/3/2021 19:08
Perfluoroundecanoic Acid (PFUnA)	U		0.4	2	ng/L	1	6/3/2021 19:08
11Cl-Pf3OUdS	U		0.3	2	ng/L	1	6/3/2021 19:08
9Cl-PF3ONS	U		0.1	2	ng/L	1	6/3/2021 19:08
4,8-Dioxa-3H-perfluorononanoic Acid (DONA)	U		0.3	2	ng/L	1	6/3/2021 19:08
Surr: 13C2-PFHxA	*100*			*70-130*	*%REC*	1	6/3/2021 19:08
Surr: 13C2-PFDA	*96.9*			*70-130*	*%REC*	1	6/3/2021 19:08
Surr: d5-N-EtFOSAA	*74.6*			*70-130*	*%REC*	1	6/3/2021 19:08
Surr: 13C3-HFPO-DA	*92.1*			*70-130*	*%REC*	1	6/3/2021 19:08

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *08-Jun-21*

Client: Fishbeck, Inc.
Project: Cedar Springs (201460)
Sample ID: CS-21-05-DW-13353 White Creek Avenue (I)
Collection Date: 5/26/2021 11:46 AM

Work Order: 21060077
Lab ID: 21060077-03
Matrix: WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
PFAS BY EPA 537.1			Method: **E537.1**		Prep: E537.1 / 6/2/21		Analyst: **SK**
Hexafluoropropylene oxide dimer acid (HFPO-DA)	U		0.6	2	ng/L	1	6/3/2021 19:29
N-Ethylperfluorooctanesulfonamidoacetic Acid	U		0.3	2	ng/L	1	6/4/2021 11:57
N-Methylperfluorooctanesulfonamidoacetic Acid	U		0.4	2	ng/L	1	6/4/2021 11:57
Perfluorobutanesulfonic Acid (PFBS)	U		0.3	2	ng/L	1	6/3/2021 19:29
Perfluorodecanoic Acid (PFDA)	U		0.6	2	ng/L	1	6/3/2021 19:29
Perfluorododecanoic Acid (PFDoA)	U		0.3	2	ng/L	1	6/3/2021 19:29
Perfluoroheptanoic Acid (PFHpA)	U		0.5	2	ng/L	1	6/3/2021 19:29
Perfluorohexanesulfonic Acid (PFHxS)	U		0.3	2	ng/L	1	6/3/2021 19:29
Perfluorohexanoic Acid (PFHxA)	U		0.6	2	ng/L	1	6/3/2021 19:29
Perfluorononanoic Acid (PFNA)	U		0.5	2	ng/L	1	6/3/2021 19:29
Perfluorooctanesulfonic Acid (PFOS)	U		0.2	2	ng/L	1	6/3/2021 19:29
Perfluorooctanoic Acid (PFOA)	U		0.5	2	ng/L	1	6/3/2021 19:29
Perfluorotetradecanoic Acid (PFTeA)	U		0.4	2	ng/L	1	6/3/2021 19:29
Perfluorotridecanoic Acid (PFTriA)	U		0.3	2	ng/L	1	6/3/2021 19:29
Perfluoroundecanoic Acid (PFUnA)	U		0.4	2	ng/L	1	6/3/2021 19:29
11Cl-Pf3OUdS	U		0.3	2	ng/L	1	6/3/2021 19:29
9Cl-PF3ONS	U		0.1	2	ng/L	1	6/3/2021 19:29
4,8-Dioxa-3H-perfluorononanoic Acid (DONA)	U		0.3	2	ng/L	1	6/3/2021 19:29
Surr: 13C2-PFHxA	*115*			*70-130*	*%REC*	1	6/3/2021 19:29
Surr: 13C2-PFDA	*111*			*70-130*	*%REC*	1	6/3/2021 19:29
Surr: d5-N-EtFOSAA	*83.0*			*70-130*	*%REC*	1	6/4/2021 11:57
Surr: 13C3-HFPO-DA	*108*			*70-130*	*%REC*	1	6/3/2021 19:29

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *08-Jun-21*

Client: Fishbeck, Inc.
Project: Cedar Springs (201460)
Sample ID: CS-21-05-DW-13399 White Creek Avenue (I)
Collection Date: 5/26/2021 11:05 AM

Work Order: 21060077
Lab ID: 21060077-04
Matrix: WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
PFAS BY EPA 537.1			Method: **E537.1**		Prep: E537.1 / 6/2/21		Analyst: **SK**
Hexafluoropropylene oxide dimer acid (HFPO-DA)	U		0.6	2	ng/L	1	6/3/2021 19:40
N-Ethylperfluorooctanesulfonamidoacetic Acid	U		0.3	2	ng/L	1	6/3/2021 19:40
N-Methylperfluorooctanesulfonamidoacetic Acid	U		0.4	2	ng/L	1	6/3/2021 19:40
Perfluorobutanesulfonic Acid (PFBS)	U		0.3	2	ng/L	1	6/3/2021 19:40
Perfluorodecanoic Acid (PFDA)	U		0.6	2	ng/L	1	6/3/2021 19:40
Perfluorododecanoic Acid (PFDoA)	U		0.3	2	ng/L	1	6/3/2021 19:40
Perfluoroheptanoic Acid (PFHpA)	U		0.5	2	ng/L	1	6/3/2021 19:40
Perfluorohexanesulfonic Acid (PFHxS)	U		0.3	2	ng/L	1	6/3/2021 19:40
Perfluorohexanoic Acid (PFHxA)	U		0.6	2	ng/L	1	6/3/2021 19:40
Perfluorononanoic Acid (PFNA)	U		0.5	2	ng/L	1	6/3/2021 19:40
Perfluorooctanesulfonic Acid (PFOS)	U		0.2	2	ng/L	1	6/3/2021 19:40
Perfluorooctanoic Acid (PFOA)	U		0.5	2	ng/L	1	6/3/2021 19:40
Perfluorotetradecanoic Acid (PFTeA)	U		0.4	2	ng/L	1	6/3/2021 19:40
Perfluorotridecanoic Acid (PFTriA)	U		0.3	2	ng/L	1	6/3/2021 19:40
Perfluoroundecanoic Acid (PFUnA)	U		0.4	2	ng/L	1	6/3/2021 19:40
11Cl-Pf3OUdS	U		0.3	2	ng/L	1	6/3/2021 19:40
9Cl-PF3ONS	U		0.1	2	ng/L	1	6/3/2021 19:40
4,8-Dioxa-3H-perfluorononanoic Acid (DONA)	U		0.3	2	ng/L	1	6/3/2021 19:40
Surr: 13C2-PFHxA	*104*			*70-130*	*%REC*	1	6/3/2021 19:40
Surr: 13C2-PFDA	*98.4*			*70-130*	*%REC*	1	6/3/2021 19:40
Surr: d5-N-EtFOSAA	*77.0*			*70-130*	*%REC*	1	6/3/2021 19:40
Surr: 13C3-HFPO-DA	*98.4*			*70-130*	*%REC*	1	6/3/2021 19:40

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *08-Jun-21*

Client: Fishbeck, Inc.
Project: Cedar Springs (201460)
Sample ID: CS-21-05-DW-13485 White Creek Avenue (I)
Collection Date: 5/26/2021 10:45 AM

Work Order: 21060077
Lab ID: 21060077-05
Matrix: WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
PFAS BY EPA 537.1			Method: **E537.1**		Prep: E537.1 / 6/2/21		Analyst: **SK**
Hexafluoropropylene oxide dimer acid (HFPO-DA)	U		0.6	2	ng/L	1	6/3/2021 19:50
N-Ethylperfluorooctanesulfonamidoacetic Acid	**0.41**	J	**0.3**	**2**	**ng/L**	1	6/3/2021 19:50
N-Methylperfluorooctanesulfonamidoacetic Acid	U		0.4	2	ng/L	1	6/3/2021 19:50
Perfluorobutanesulfonic Acid (PFBS)	**1.9**	J	**0.3**	**2**	**ng/L**	1	6/3/2021 19:50
Perfluorodecanoic Acid (PFDA)	U		0.6	2	ng/L	1	6/3/2021 19:50
Perfluorododecanoic Acid (PFDoA)	U		0.3	2	ng/L	1	6/3/2021 19:50
Perfluoroheptanoic Acid (PFHpA)	**1.4**	J	**0.5**	**2**	**ng/L**	1	6/3/2021 19:50
Perfluorohexanesulfonic Acid (PFHxS)	**2.8**		**0.3**	**2**	**ng/L**	1	6/3/2021 19:50
Perfluorohexanoic Acid (PFHxA)	**1.1**	J	**0.6**	**2**	**ng/L**	1	6/3/2021 19:50
Perfluorononanoic Acid (PFNA)	U		0.5	2	ng/L	1	6/3/2021 19:50
Perfluorooctanesulfonic Acid (PFOS)	**7.0**		**0.2**	**2**	**ng/L**	1	6/3/2021 19:50
Perfluorooctanoic Acid (PFOA)	**9.9**		**0.5**	**2**	**ng/L**	1	6/3/2021 19:50
Perfluorotetradecanoic Acid (PFTeA)	U		0.4	2	ng/L	1	6/3/2021 19:50
Perfluorotridecanoic Acid (PFTriA)	U		0.3	2	ng/L	1	6/3/2021 19:50
Perfluoroundecanoic Acid (PFUnA)	U		0.4	2	ng/L	1	6/3/2021 19:50
11Cl-Pf3OUdS	U		0.3	2	ng/L	1	6/3/2021 19:50
9Cl-PF3ONS	U		0.1	2	ng/L	1	6/3/2021 19:50
4,8-Dioxa-3H-perfluorononanoic Acid (DONA)	U		0.3	2	ng/L	1	6/3/2021 19:50
Surr: 13C2-PFHxA	*107*			*70-130*	*%REC*	1	6/3/2021 19:50
Surr: 13C2-PFDA	*103*			*70-130*	*%REC*	1	6/3/2021 19:50
Surr: d5-N-EtFOSAA	*73.3*			*70-130*	*%REC*	1	6/3/2021 19:50
Surr: 13C3-HFPO-DA	*98.9*			*70-130*	*%REC*	1	6/3/2021 19:50

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *08-Jun-21*

Client: Fishbeck, Inc.
Project: Cedar Springs (201460)
Sample ID: CS-21-05-DW-13525 White Creek Avenue (I)
Collection Date: 5/26/2021 10:27 AM

Work Order: 21060077
Lab ID: 21060077-06
Matrix: WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
PFAS BY EPA 537.1			Method: **E537.1**		Prep: E537.1 / 6/2/21		Analyst: **SK**
Hexafluoropropylene oxide dimer acid (HFPO-DA)	U		0.5	2	ng/L	1	6/3/2021 20:01
N-Ethylperfluorooctanesulfonamidoacetic Acid	U		0.2	2	ng/L	1	6/4/2021 12:07
N-Methylperfluorooctanesulfonamidoacetic Acid	U		0.4	2	ng/L	1	6/4/2021 12:07
Perfluorobutanesulfonic Acid (PFBS)	U		0.3	2	ng/L	1	6/3/2021 20:01
Perfluorodecanoic Acid (PFDA)	U		0.6	2	ng/L	1	6/3/2021 20:01
Perfluorododecanoic Acid (PFDoA)	U		0.3	2	ng/L	1	6/3/2021 20:01
Perfluoroheptanoic Acid (PFHpA)	U		0.5	2	ng/L	1	6/3/2021 20:01
Perfluorohexanesulfonic Acid (PFHxS)	U		0.3	2	ng/L	1	6/3/2021 20:01
Perfluorohexanoic Acid (PFHxA)	U		0.6	2	ng/L	1	6/3/2021 20:01
Perfluorononanoic Acid (PFNA)	U		0.5	2	ng/L	1	6/3/2021 20:01
Perfluorooctanesulfonic Acid (PFOS)	U		0.2	2	ng/L	1	6/3/2021 20:01
Perfluorooctanoic Acid (PFOA)	U		0.4	2	ng/L	1	6/3/2021 20:01
Perfluorotetradecanoic Acid (PFTeA)	U		0.4	2	ng/L	1	6/3/2021 20:01
Perfluorotridecanoic Acid (PFTriA)	U		0.3	2	ng/L	1	6/3/2021 20:01
Perfluoroundecanoic Acid (PFUnA)	U		0.4	2	ng/L	1	6/3/2021 20:01
11Cl-Pf3OUdS	U		0.3	2	ng/L	1	6/3/2021 20:01
9Cl-PF3ONS	U		0.1	2	ng/L	1	6/3/2021 20:01
4,8-Dioxa-3H-perfluorononanoic Acid (DONA)	U		0.3	2	ng/L	1	6/3/2021 20:01
Surr: 13C2-PFHxA	*108*			*70-130*	*%REC*	1	6/3/2021 20:01
Surr: 13C2-PFDA	*98.0*			*70-130*	*%REC*	1	6/3/2021 20:01
Surr: d5-N-EtFOSAA	*71.5*			*70-130*	*%REC*	1	6/4/2021 12:07
Surr: 13C3-HFPO-DA	*103*			*70-130*	*%REC*	1	6/3/2021 20:01

Note: See Qualifiers page for a list of qualifiers and their definitions.

Client: Fishbeck, Inc.
Project: Cedar Springs (201460)
Sample ID: CS-21-05-DW-13590 White Creek Avenue (I)
Collection Date: 5/26/2021 10:06 AM

Work Order: 21060077
Lab ID: 21060077-07
Matrix: WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
PFAS BY EPA 537.1			Method: **E537.1**		Prep: E537.1 / 6/2/21		Analyst: **SK**
Hexafluoropropylene oxide dimer acid (HFPO-DA)	U		0.6	2	ng/L	1	6/3/2021 20:21
N-Ethylperfluorooctanesulfonamidoacetic Acid	U		0.3	2	ng/L	1	6/3/2021 20:21
N-Methylperfluorooctanesulfonamidoacetic Acid	U		0.4	2	ng/L	1	6/3/2021 20:21
Perfluorobutanesulfonic Acid (PFBS)	U		0.3	2	ng/L	1	6/3/2021 20:21
Perfluorodecanoic Acid (PFDA)	U		0.6	2	ng/L	1	6/3/2021 20:21
Perfluorododecanoic Acid (PFDoA)	U		0.3	2	ng/L	1	6/3/2021 20:21
Perfluoroheptanoic Acid (PFHpA)	U		0.5	2	ng/L	1	6/3/2021 20:21
Perfluorohexanesulfonic Acid (PFHxS)	U		0.3	2	ng/L	1	6/3/2021 20:21
Perfluorohexanoic Acid (PFHxA)	U		0.6	2	ng/L	1	6/3/2021 20:21
Perfluorononanoic Acid (PFNA)	U		0.5	2	ng/L	1	6/3/2021 20:21
Perfluorooctanesulfonic Acid (PFOS)	U		0.2	2	ng/L	1	6/3/2021 20:21
Perfluorooctanoic Acid (PFOA)	U		0.4	2	ng/L	1	6/3/2021 20:21
Perfluorotetradecanoic Acid (PFTeA)	U		0.4	2	ng/L	1	6/3/2021 20:21
Perfluorotridecanoic Acid (PFTriA)	U		0.3	2	ng/L	1	6/3/2021 20:21
Perfluoroundecanoic Acid (PFUnA)	U		0.4	2	ng/L	1	6/3/2021 20:21
11Cl-Pf3OUdS	U		0.3	2	ng/L	1	6/3/2021 20:21
9Cl-PF3ONS	U		0.1	2	ng/L	1	6/3/2021 20:21
4,8-Dioxa-3H-perfluorononanoic Acid (DONA)	U		0.3	2	ng/L	1	6/3/2021 20:21
Surr: 13C2-PFHxA	*107*			*70-130*	*%REC*	1	6/3/2021 20:21
Surr: 13C2-PFDA	*101*			*70-130*	*%REC*	1	6/3/2021 20:21
Surr: d5-N-EtFOSAA	*73.0*			*70-130*	*%REC*	1	6/3/2021 20:21
Surr: 13C3-HFPO-DA	*101*			*70-130*	*%REC*	1	6/3/2021 20:21

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *08-Jun-21*

Client: Fishbeck, Inc.
Project: Cedar Springs (201460)
Sample ID: CS-21-05-DW-4095 16 Mile Rd (I)
Collection Date: 5/26/2021 01:40 PM

Work Order: 21060077
Lab ID: 21060077-08
Matrix: WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
PFAS BY EPA 537.1			Method: **E537.1**		Prep: E537.1 / 6/3/21		Analyst: **SK**
Hexafluoropropylene oxide dimer acid (HFPO-DA)	U		0.6	2	ng/L	1	6/4/2021 15:53
N-Ethylperfluorooctanesulfonamidoacetic Acid	U		0.3	2	ng/L	1	6/4/2021 15:53
N-Methylperfluorooctanesulfonamidoacetic Acid	U		0.4	2	ng/L	1	6/4/2021 15:53
Perfluorobutanesulfonic Acid (PFBS)	U		0.3	2	ng/L	1	6/4/2021 15:53
Perfluorodecanoic Acid (PFDA)	U		0.6	2	ng/L	1	6/4/2021 15:53
Perfluorododecanoic Acid (PFDoA)	U		0.3	2	ng/L	1	6/4/2021 15:53
Perfluoroheptanoic Acid (PFHpA)	U		0.5	2	ng/L	1	6/4/2021 15:53
Perfluorohexanesulfonic Acid (PFHxS)	U		0.3	2	ng/L	1	6/4/2021 15:53
Perfluorohexanoic Acid (PFHxA)	U		0.6	2	ng/L	1	6/4/2021 15:53
Perfluorononanoic Acid (PFNA)	**0.88**	J	**0.5**	**2**	**ng/L**	1	6/4/2021 15:53
Perfluorooctanesulfonic Acid (PFOS)	U		0.2	2	ng/L	1	6/4/2021 15:53
Perfluorooctanoic Acid (PFOA)	U		0.4	2	ng/L	1	6/4/2021 15:53
Perfluorotetradecanoic Acid (PFTeA)	U		0.4	2	ng/L	1	6/4/2021 15:53
Perfluorotridecanoic Acid (PFTriA)	U		0.3	2	ng/L	1	6/4/2021 15:53
Perfluoroundecanoic Acid (PFUnA)	U		0.4	2	ng/L	1	6/4/2021 15:53
11Cl-Pf3OUdS	U		0.3	2	ng/L	1	6/4/2021 15:53
9Cl-PF3ONS	U		0.1	2	ng/L	1	6/4/2021 15:53
4,8-Dioxa-3H-perfluorononanoic Acid (DONA)	U		0.3	2	ng/L	1	6/4/2021 15:53
Surr: 13C2-PFHxA	*114*			*70-130*	*%REC*	1	6/4/2021 15:53
Surr: 13C2-PFDA	*103*			*70-130*	*%REC*	1	6/4/2021 15:53
Surr: d5-N-EtFOSAA	*87.3*			*70-130*	*%REC*	1	6/4/2021 15:53
Surr: 13C3-HFPO-DA	*109*			*70-130*	*%REC*	1	6/4/2021 15:53

Note: See Qualifiers page for a list of qualifiers and their definitions.

Client: Fishbeck, Inc.
Project: Cedar Springs (201460)
Sample ID: CS-21-05-DW-4107 16 Mile Rd (I)
Collection Date: 5/26/2021 01:06 PM

Work Order: 21060077
Lab ID: 21060077-09
Matrix: WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
PFAS BY EPA 537.1			Method: **E537.1**		Prep: E537.1 / 6/3/21		Analyst: **SK**
Hexafluoropropylene oxide dimer acid (HFPO-DA)	U		0.6	2	ng/L	1	6/4/2021 16:45
N-Ethylperfluorooctanesulfonamidoacetic Acid	U		0.3	2	ng/L	1	6/4/2021 16:45
N-Methylperfluorooctanesulfonamidoacetic Acid	U		0.4	2	ng/L	1	6/4/2021 16:45
Perfluorobutanesulfonic Acid (PFBS)	U		0.3	2	ng/L	1	6/4/2021 16:45
Perfluorodecanoic Acid (PFDA)	U		0.6	2	ng/L	1	6/4/2021 16:45
Perfluorododecanoic Acid (PFDoA)	U		0.3	2	ng/L	1	6/4/2021 16:45
Perfluoroheptanoic Acid (PFHpA)	U		0.5	2	ng/L	1	6/4/2021 16:45
Perfluorohexanesulfonic Acid (PFHxS)	U		0.3	2	ng/L	1	6/4/2021 16:45
Perfluorohexanoic Acid (PFHxA)	U		0.6	2	ng/L	1	6/4/2021 16:45
Perfluorononanoic Acid (PFNA)	**1.6**	J	**0.5**	**2**	**ng/L**	1	6/4/2021 16:45
Perfluorooctanesulfonic Acid (PFOS)	U		0.2	2	ng/L	1	6/4/2021 16:45
Perfluorooctanoic Acid (PFOA)	U		0.4	2	ng/L	1	6/4/2021 16:45
Perfluorotetradecanoic Acid (PFTeA)	U		0.4	2	ng/L	1	6/4/2021 16:45
Perfluorotridecanoic Acid (PFTriA)	U		0.3	2	ng/L	1	6/4/2021 16:45
Perfluoroundecanoic Acid (PFUnA)	U		0.4	2	ng/L	1	6/4/2021 16:45
11Cl-Pf3OUdS	U		0.3	2	ng/L	1	6/4/2021 16:45
9Cl-PF3ONS	U		0.1	2	ng/L	1	6/4/2021 16:45
4,8-Dioxa-3H-perfluorononanoic Acid (DONA)	U		0.3	2	ng/L	1	6/4/2021 16:45
Surr: 13C2-PFHxA	*114*			*70-130*	*%REC*	1	6/4/2021 16:45
Surr: 13C2-PFDA	*104*			*70-130*	*%REC*	1	6/4/2021 16:45
Surr: d5-N-EtFOSAA	*85.5*			*70-130*	*%REC*	1	6/4/2021 16:45
Surr: 13C3-HFPO-DA	*109*			*70-130*	*%REC*	1	6/4/2021 16:45

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *08-Jun-21*

Client: Fishbeck, Inc.
Project: Cedar Springs (201460) **Work Order:** 21060077
Sample ID: CS-21-05-DW-4141 16 Mile Rd (I) **Lab ID:** 21060077-10
Collection Date: 5/26/2021 12:48 PM **Matrix:** WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
PFAS BY EPA 537.1			Method: **E537.1**		Prep: E537.1 / 6/3/21		Analyst: **SK**
Hexafluoropropylene oxide dimer acid (HFPO-DA)	U		0.6	2	ng/L	1	6/4/2021 17:16
N-Ethylperfluorooctanesulfonamidoacetic Acid	U		0.3	2	ng/L	1	6/4/2021 17:16
N-Methylperfluorooctanesulfonamidoacetic Acid	U		0.4	2	ng/L	1	6/4/2021 17:16
Perfluorobutanesulfonic Acid (PFBS)	U		0.3	2	ng/L	1	6/4/2021 17:16
Perfluorodecanoic Acid (PFDA)	U		0.6	2	ng/L	1	6/4/2021 17:16
Perfluorododecanoic Acid (PFDoA)	U		0.3	2	ng/L	1	6/4/2021 17:16
Perfluoroheptanoic Acid (PFHpA)	U		0.5	2	ng/L	1	6/4/2021 17:16
Perfluorohexanesulfonic Acid (PFHxS)	U		0.3	2	ng/L	1	6/4/2021 17:16
Perfluorohexanoic Acid (PFHxA)	U		0.6	2	ng/L	1	6/4/2021 17:16
Perfluorononanoic Acid (PFNA)	**0.58**	J	**0.5**	**2**	**ng/L**	1	6/4/2021 17:16
Perfluorooctanesulfonic Acid (PFOS)	U		0.2	2	ng/L	1	6/4/2021 17:16
Perfluorooctanoic Acid (PFOA)	**0.65**	J	**0.4**	**2**	**ng/L**	1	6/4/2021 17:16
Perfluorotetradecanoic Acid (PFTeA)	U		0.4	2	ng/L	1	6/4/2021 17:16
Perfluorotridecanoic Acid (PFTriA)	U		0.3	2	ng/L	1	6/4/2021 17:16
Perfluoroundecanoic Acid (PFUnA)	U		0.4	2	ng/L	1	6/4/2021 17:16
11Cl-Pf3OUdS	U		0.3	2	ng/L	1	6/4/2021 17:16
9Cl-PF3ONS	U		0.1	2	ng/L	1	6/4/2021 17:16
4,8-Dioxa-3H-perfluorononanoic Acid (DONA)	U		0.3	2	ng/L	1	6/4/2021 17:16
Surr: 13C2-PFHxA	*111*			*70-130*	*%REC*	1	6/4/2021 17:16
Surr: 13C2-PFDA	*97.6*			*70-130*	*%REC*	1	6/4/2021 17:16
Surr: d5-N-EtFOSAA	*83.8*			*70-130*	*%REC*	1	6/4/2021 17:16
Surr: 13C3-HFPO-DA	*102*			*70-130*	*%REC*	1	6/4/2021 17:16

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *08-Jun-21*

Client: Fishbeck, Inc.
Project: Cedar Springs (201460)
Sample ID: CS-21-05-DW-4142 16 Mile Rd (I)
Collection Date: 5/26/2021 12:32 PM

Work Order: 21060077
Lab ID: 21060077-11
Matrix: WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
PFAS BY EPA 537.1			Method: **E537.1**		Prep: E537.1 / 6/3/21		Analyst: **SK**
Hexafluoropropylene oxide dimer acid (HFPO-DA)	U		0.6	2	ng/L	1	6/4/2021 17:27
N-Ethylperfluorooctanesulfonamidoacetic Acid	U		0.3	2	ng/L	1	6/4/2021 17:27
N-Methylperfluorooctanesulfonamidoacetic Acid	U		0.4	2	ng/L	1	6/4/2021 17:27
Perfluorobutanesulfonic Acid (PFBS)	**0.85**	J	**0.3**	**2**	**ng/L**	1	6/4/2021 17:27
Perfluorodecanoic Acid (PFDA)	U		0.6	2	ng/L	1	6/4/2021 17:27
Perfluorododecanoic Acid (PFDoA)	U		0.3	2	ng/L	1	6/4/2021 17:27
Perfluoroheptanoic Acid (PFHpA)	U		0.5	2	ng/L	1	6/4/2021 17:27
Perfluorohexanesulfonic Acid (PFHxS)	**0.49**	J	**0.3**	**2**	**ng/L**	1	6/4/2021 17:27
Perfluorohexanoic Acid (PFHxA)	U		0.6	2	ng/L	1	6/4/2021 17:27
Perfluorononanoic Acid (PFNA)	U		0.5	2	ng/L	1	6/4/2021 17:27
Perfluorooctanesulfonic Acid (PFOS)	**1.4**	J	**0.2**	**2**	**ng/L**	1	6/4/2021 17:27
Perfluorooctanoic Acid (PFOA)	**0.75**	J	**0.4**	**2**	**ng/L**	1	6/4/2021 17:27
Perfluorotetradecanoic Acid (PFTeA)	U		0.4	2	ng/L	1	6/4/2021 17:27
Perfluorotridecanoic Acid (PFTriA)	U		0.3	2	ng/L	1	6/4/2021 17:27
Perfluoroundecanoic Acid (PFUnA)	U		0.4	2	ng/L	1	6/4/2021 17:27
11Cl-Pf3OUdS	U		0.3	2	ng/L	1	6/4/2021 17:27
9Cl-PF3ONS	U		0.1	2	ng/L	1	6/4/2021 17:27
4,8-Dioxa-3H-perfluorononanoic Acid (DONA)	U		0.3	2	ng/L	1	6/4/2021 17:27
Surr: 13C2-PFHxA	*109*			*70-130*	*%REC*	1	6/4/2021 17:27
Surr: 13C2-PFDA	*98.7*			*70-130*	*%REC*	1	6/4/2021 17:27
Surr: d5-N-EtFOSAA	*76.8*			*70-130*	*%REC*	1	6/4/2021 17:27
Surr: 13C3-HFPO-DA	*107*			*70-130*	*%REC*	1	6/4/2021 17:27

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Client: Fishbeck, Inc.
Project: Cedar Springs (201460)
Sample ID: CS-21-05-DW-13360 White Creek Avenue (D)
Collection Date: 5/26/2021 09:40 AM

Work Order: 21060077
Lab ID: 21060077-12
Matrix: WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
PFAS BY EPA 537.1			Method: **E537.1**		Prep: E537.1 / 6/3/21		Analyst: **SK**
Hexafluoropropylene oxide dimer acid (HFPO-DA)	U		0.6	2	ng/L	1	6/4/2021 17:37
N-Ethylperfluorooctanesulfonamidoacetic Acid	U		0.3	2	ng/L	1	6/4/2021 17:37
N-Methylperfluorooctanesulfonamidoacetic Acid	U		0.4	2	ng/L	1	6/4/2021 17:37
Perfluorobutanesulfonic Acid (PFBS)	U		0.3	2	ng/L	1	6/4/2021 17:37
Perfluorodecanoic Acid (PFDA)	U		0.6	2	ng/L	1	6/4/2021 17:37
Perfluorododecanoic Acid (PFDoA)	U		0.3	2	ng/L	1	6/4/2021 17:37
Perfluoroheptanoic Acid (PFHpA)	U		0.5	2	ng/L	1	6/4/2021 17:37
Perfluorohexanesulfonic Acid (PFHxS)	U		0.3	2	ng/L	1	6/4/2021 17:37
Perfluorohexanoic Acid (PFHxA)	U		0.6	2	ng/L	1	6/4/2021 17:37
Perfluorononanoic Acid (PFNA)	**0.55**	J	**0.5**	**2**	**ng/L**	1	6/4/2021 17:37
Perfluorooctanesulfonic Acid (PFOS)	U		0.2	2	ng/L	1	6/4/2021 17:37
Perfluorooctanoic Acid (PFOA)	U		0.5	2	ng/L	1	6/4/2021 17:37
Perfluorotetradecanoic Acid (PFTeA)	U		0.4	2	ng/L	1	6/4/2021 17:37
Perfluorotridecanoic Acid (PFTriA)	U		0.3	2	ng/L	1	6/4/2021 17:37
Perfluoroundecanoic Acid (PFUnA)	U		0.4	2	ng/L	1	6/4/2021 17:37
11Cl-Pf3OUdS	U		0.3	2	ng/L	1	6/4/2021 17:37
9Cl-PF3ONS	U		0.1	2	ng/L	1	6/4/2021 17:37
4,8-Dioxa-3H-perfluorononanoic Acid (DONA)	U		0.3	2	ng/L	1	6/4/2021 17:37
Surr: 13C2-PFHxA	*113*			*70-130*	*%REC*	1	6/4/2021 17:37
Surr: 13C2-PFDA	*112*			*70-130*	*%REC*	1	6/4/2021 17:37
Surr: d5-N-EtFOSAA	*99.6*			*70-130*	*%REC*	1	6/4/2021 17:37
Surr: 13C3-HFPO-DA	*109*			*70-130*	*%REC*	1	6/4/2021 17:37

Note: See Qualifiers page for a list of qualifiers and their definitions.

Client:	Fishbeck, Inc.	
Work Order:	21060077	
Project:	Cedar Springs (201460)	

QC BATCH REPORT

Batch ID: **177808** Instrument ID **LCMS1** Method: **E537.1**

DUP Sample ID: **21060077-02A DUP** Units: **ng/L** Analysis Date: **6/3/2021 07:19 PM**

Client ID: **CS-21-05-DW-13261 White Creek Avenue (I)** Run ID: **LCMS1_210603A** SeqNo: **7455702** Prep Date: **6/2/2021** DF: **1**

Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Hexafluoropropylene oxide din	UI	0.6	2.0	0	0	0		0	0	30	
N-Ethylperfluorooctanesulfona	U	0.3	2.0	0	0	0		0	0	30	
N-Methylperfluorooctanesulfor	Ui	0.4	2.0	0	0	0		0.02709	0	30	
Perfluorobutanesulfonic Acid (	U	0.3	2.0	0	0	0		0	0	30	
Perfluorodecanoic Acid (PFDA	U	0.6	2.0	0	0	0		0	0	30	
Perfluorododecanoic Acid (PFI	U	0.3	2.0	0	0	0		0	0	30	
Perfluoroheptanoic Acid (PFH	U	0.5	2.0	0	0	0		0	0	30	
Perfluorohexanesulfonic Acid (	U	0.3	2.0	0	0	0		0	0	30	
Perfluorohexanoic Acid (PFHx	U	0.6	2.0	0	0	0		0	0	30	
Perfluorononanoic Acid (PFNA	U	0.5	2.0	0	0	0		0.01706	0	30	
Perfluorooctanesulfonic Acid (	U	0.2	2.0	0	0	0		0	0	30	
Perfluorooctanoic Acid (PFOA	U	0.5	2.0	0	0	0		0	0	30	
Perfluorotetradecanoic Acid (F	U	0.4	2.0	0	0	0		0	0	30	
Perfluorotridecanoic Acid (PFT	U	0.3	2.0	0	0	0		0	0	30	
Perfluoroundecanoic Acid (PFI	U	0.4	2.0	0	0	0		0	0	30	
11Cl-Pf3OUdS	U	0.3	2.0	0	0	0		0	0	30	
9Cl-PF3ONS	U	0.1	2.0	0	0	0		0	0	30	
4,8-Dioxa-3H-perfluorononano	U	0.3	2.0	0	0	0		0	0	30	
Surr: 13C2-PFHxA	*34*	0	0	*35.09*	0	*96.9*	*70-130*	33.6	*1.18*	*30*	
Surr: 13C2-PFDA	*33.74*	0	0	*35.09*	0	*96.2*	*70-130*	32.4	*4.04*	*30*	
Surr: d5-N-EtFOSAA	*111.2*	0	0	*140.4*	0	*79.2*	*70-130*	99.78	*10.8*	*30*	
Surr: 13C3-HFPO-DA	*31.9*	0	0	*35.09*	0	*90.9*	*70-130*	30.8	*3.49*	*30*	

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: Fishbeck, Inc.
Work Order: 21060077
Project: Cedar Springs (201460)

QC BATCH REPORT

Batch ID: **177808** Instrument ID **LCMS1** Method: **E537.1**

LCS2 Sample ID: **LCS2-177808-177808** Units: **ng/L** Analysis Date: **6/3/2021 04:42 PM**
Client ID: Run ID: **LCMS1_210603A** SeqNo: **7455687** Prep Date: **6/2/2021** DF: **1**

Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Hexafluoropropylene oxide din	18.21	0.7	2.0	20	0	91	70-130	0			
N-Ethylperfluorooctanesulfona	18.7	0.3	2.0	20	0	93.5	70-130	0			
N-Methylperfluorooctanesulfor	17.64	0.5	2.0	20	0	88.2	70-130	0			
Perfluorobutanesulfonic Acid (	14.76	0.4	2.0	17.68	0	83.5	70-130	0			
Perfluorodecanoic Acid (PFDA	18.62	0.7	2.0	20	0	93.1	70-130	0			
Perfluorododecanoic Acid (PFI	18.4	0.4	2.0	20	0	92	70-130	0			
Perfluoroheptanoic Acid (PFH	21.34	0.6	2.0	20	0	107	70-130	0			
Perfluorohexanesulfonic Acid (	18.19	0.3	2.0	18.2	0	100	70-130	0			
Perfluorohexanoic Acid (PFHx	19.39	0.7	2.0	20	0	96.9	70-130	0			
Perfluorononanoic Acid (PFNA	20.16	0.6	2.0	20	0	101	70-130	0			
Perfluorooctanesulfonic Acid (	18.4	0.2	2.0	18.56	0	99.1	70-130	0			
Perfluorooctanoic Acid (PFOA	19.69	0.5	2.0	20	0	98.4	70-130	0			
Perfluorotetradecanoic Acid (F	16.41	0.5	2.0	20	0	82.1	70-130	0			
Perfluorotridecanoic Acid (PFT	18.82	0.3	2.0	20	0	94.1	70-130	0			
Perfluoroundecanoic Acid (PFI	18.98	0.4	2.0	20	0	94.9	70-130	0			
11Cl-Pf3OUdS	16.27	0.4	2.0	18.84	0	86.4	70-130	0			
9Cl-PF3ONS	16.45	0.2	2.0	18.64	0	88.2	70-130	0			
4,8-Dioxa-3H-perfluorononano	18.38	0.3	2.0	18.84	0	97.5	70-130	0			
Surr: 13C2-PFHxA	*41.78*	0	0	*40*	0	*104*	*70-130*	0			
Surr: 13C2-PFDA	*40.97*	0	0	*40*	0	*102*	*70-130*	0			
Surr: d5-N-EtFOSAA	*146.2*	0	0	*160*	0	*91.4*	*70-130*	0			
Surr: 13C3-HFPO-DA	*39.13*	0	0	*40*	0	*97.8*	*70-130*	0			

The following samples were analyzed in this batch:

21060077-01A	21060077-02A	21060077-03A
21060077-04A	21060077-05A	21060077-06A
21060077-07A		

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: Fishbeck, Inc.
Work Order: 21060077
Project: Cedar Springs (201460)

QC BATCH REPORT

Batch ID: **177884** Instrument ID **LCMS1** Method: **E537.1**

MBLK	Sample ID: **MBLK-177884-177884**				Units: **ng/L**			Analysis Date: **6/4/2021 03:22 PM**			
Client ID:		Run ID: **LCMS1_210604C**			SeqNo: **7462993**			Prep Date: **6/3/2021**		DF: **1**	
Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Hexafluoropropylene oxide din	UI	0.7	2.0								
N-Ethylperfluorooctanesulfona	U	0.3	2.0								
N-Methylperfluorooctanesulfor	Ui	0.5	2.0								
Perfluorobutanesulfonic Acid (	U	0.4	2.0								
Perfluorodecanoic Acid (PFDA	U	0.7	2.0								
Perfluorododecanoic Acid (PFI	U	0.4	2.0								
Perfluoroheptanoic Acid (PFH	U	0.6	2.0								
Perfluorohexanesulfonic Acid (	U	0.3	2.0								
Perfluorohexanoic Acid (PFHx	U	0.7	2.0								
Perfluorononanoic Acid (PFNA	U	0.6	2.0								
Perfluorooctanesulfonic Acid (	U	0.2	2.0								
Perfluorooctanoic Acid (PFOA	U	0.5	2.0								
Perfluorotetradecanoic Acid (F	U	0.5	2.0								
Perfluorotridecanoic Acid (PFT	U	0.3	2.0								
Perfluoroundecanoic Acid (PFI	U	0.4	2.0								
11Cl-Pf3OUdS	U	0.4	2.0								
9Cl-PF3ONS	U	0.2	2.0								
4,8-Dioxa-3H-perfluorononano	U	0.3	2.0								
Surr: 13C2-PFHxA	*45.56*	0	0	*40*	0	*114*	*70-130*	0			
Surr: 13C2-PFDA	*43.6*	0	0	*40*	0	*109*	*70-130*	0			
Surr: d5-N-EtFOSAA	*160.9*	0	0	*160*	0	*101*	*70-130*	0			
Surr: 13C3-HFPO-DA	*43.77*	0	0	*40*	0	*109*	*70-130*	0			

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: Fishbeck, Inc.
Work Order: 21060077
Project: Cedar Springs (201460)

QC BATCH REPORT

Batch ID: **177884** Instrument ID **LCMS1** Method: **E537.1**

MS3 Sample ID: **21060077-08A MS3** Units: **ng/L** Analysis Date: **6/4/2021 03:43 PM**

Client ID: **CS-21-05-DW-4095 16 Mile Rd (I)** Run ID: **LCMS1_210604C** SeqNo: **7462995** Prep Date: **6/3/2021** DF: **1**

Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Hexafluoropropylene oxide din	86.91	0.6	2.0	86.51	0	100	70-130	0			
N-Ethylperfluorooctanesulfona	77.39	0.3	2.0	86.51	0	89.5	70-130	0			
N-Methylperfluorooctanesulfor	64.92i	0.4	2.0	86.51	0.03849	75	70-130	0			
Perfluorobutanesulfonic Acid (	71.24	0.3	2.0	76.47	0	93.2	70-130	0			
Perfluorodecanoic Acid (PFDA	81.44	0.6	2.0	86.51	0.03643	94.1	70-130	0			
Perfluorododecanoic Acid (PFI	80.75	0.3	2.0	86.51	0	93.3	70-130	0			
Perfluoroheptanoic Acid (PFH	100.1	0.5	2.0	86.51	0.06873	116	70-130	0			
Perfluorohexanesulfonic Acid (	83.15	0.3	2.0	78.72	0	106	70-130	0			
Perfluorohexanoic Acid (PFHx	92.42	0.6	2.0	86.51	0.04089	107	70-130	0			
Perfluorononanoic Acid (PFNA	93.96	0.5	2.0	86.51	0.8756	108	70-130	0			
Perfluorooctanesulfonic Acid (	75.68	0.2	2.0	80.28	0.03505	94.2	70-130	0			
Perfluorooctanoic Acid (PFOA	92.99	0.5	2.0	86.51	0	107	70-130	0			
Perfluorotetradecanoic Acid (F	74.58	0.4	2.0	86.51	0	86.2	70-130	0			
Perfluorotridecanoic Acid (PFT	80.42	0.3	2.0	86.51	0.06186	92.9	70-130	0			
Perfluoroundecanoic Acid (PFI	79.95	0.4	2.0	86.51	0.1859	92.2	70-130	0			
11Cl-Pf3OUdS	61.64	0.3	2.0	81.49	0	75.6	70-130	0			
9Cl-PF3ONS	69.98	0.1	2.0	80.62	0	86.8	70-130	0			
4,8-Dioxa-3H-perfluorononano	82.59	0.3	2.0	81.49	0	101	70-130	0			
Surr: 13C2-PFHxA	*42.03*	0	0	*34.6*	0	*121*	*70-130*	0			
Surr: 13C2-PFDA	*37.04*	0	0	*34.6*	0	*107*	*70-130*	0			
Surr: d5-N-EtFOSAA	*124.2*	0	0	*138.4*	0	*89.7*	*70-130*	0			
Surr: 13C3-HFPO-DA	*40.14*	0	0	*34.6*	0	*116*	*70-130*	0			

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: Fishbeck, Inc.
Work Order: 21060077
Project: Cedar Springs (201460)

QC BATCH REPORT

Batch ID: **177884**   Instrument ID **LCMS1**   Method: **E537.1**

DUP   Sample ID: **21060077-09A DUP**   Units: **ng/L**   Analysis Date: **6/4/2021 04:56 PM**
Client ID: **CS-21-05-DW-4107 16 Mile Rd (I)**   Run ID: **LCMS1_210604C**   SeqNo: **7463001**   Prep Date: **6/3/2021**   DF: **1**

Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Hexafluoropropylene oxide din	UI	0.6	2.0	0	0	0		0	0	30	
N-Ethylperfluorooctanesulfona	U	0.3	2.0	0	0	0		0	0	30	
N-Methylperfluorooctanesulfor	Ui	0.4	2.0	0	0	0		0	0	30	
Perfluorobutanesulfonic Acid (	U	0.3	2.0	0	0	0		0	0	30	
Perfluorodecanoic Acid (PFDA	U	0.6	2.0	0	0	0		0	0	30	
Perfluorododecanoic Acid (PFI	U	0.3	2.0	0	0	0		0	0	30	
Perfluoroheptanoic Acid (PFH|	U	0.5	2.0	0	0	0		0.1592	0	30	
Perfluorohexanesulfonic Acid (	U	0.3	2.0	0	0	0		0	0	30	
Perfluorohexanoic Acid (PFHx	U	0.6	2.0	0	0	0		0.2255	0	30	
Perfluorononanoic Acid (PFNA	0.6099	0.5	2.0	0	0	0		1.618	0	30	J
Perfluorooctanesulfonic Acid (	U	0.2	2.0	0	0	0		0.0432	0	30	
Perfluorooctanoic Acid (PFOA	U	0.4	2.0	0	0	0		0.316	0	30	
Perfluorotetradecanoic Acid (F	U	0.4	2.0	0	0	0		0	0	30	
Perfluorotridecanoic Acid (PFT	U	0.3	2.0	0	0	0		0.05816	0	30	
Perfluoroundecanoic Acid (PFI	U	0.4	2.0	0	0	0		0.2707	0	30	
11Cl-Pf3OUdS	U	0.3	2.0	0	0	0		0	0	30	
9Cl-PF3ONS	U	0.1	2.0	0	0	0		0	0	30	
4,8-Dioxa-3H-perfluorononano	U	0.3	2.0	0	0	0		0	0	30	
Surr: 13C2-PFHxA	*37.73*	0	0	*34.25*	0	*110*	*70-130*	38.78	*2.74*	*30*	
Surr: 13C2-PFDA	*36.56*	0	0	*34.25*	0	*107*	*70-130*	35.4	*3.21*	*30*	
Surr: d5-N-EtFOSAA	*119.7*	0	0	*137*	0	*87.4*	*70-130*	116.4	*2.87*	*30*	
Surr: 13C3-HFPO-DA	*34.96*	0	0	*34.25*	0	*102*	*70-130*	37.09	*5.91*	*30*	

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: Fishbeck, Inc.
Work Order: 21060077
Project: Cedar Springs (201460)

QC BATCH REPORT

Batch ID: **177884** Instrument ID **LCMS1** Method: **E537.1**

LCS3	Sample ID: **LCS3-177884-177884**				Units: **ng/L**			Analysis Date: **6/4/2021 03:32 PM**			
Client ID:		Run ID: **LCMS1_210604C**			SeqNo: **7462994**			Prep Date: **6/3/2021**		DF: **1**	
Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Hexafluoropropylene oxide din	108.1	0.7	2.0	100	0	108	70-130	0			
N-Ethylperfluorooctanesulfona	105.9	0.3	2.0	100	0	106	70-130	0			
N-Methylperfluorooctanesulfor	94.23	0.5	2.0	100	0	94.2	70-130	0			
Perfluorobutanesulfonic Acid (	88.42	0.4	2.0	88.4	0	100	70-130	0			
Perfluorodecanoic Acid (PFDA	104.5	0.7	2.0	100	0	105	70-130	0			
Perfluorododecanoic Acid (PFI	103.9	0.4	2.0	100	0	104	70-130	0			
Perfluoroheptanoic Acid (PFH	119.6	0.6	2.0	100	0	120	70-130	0			
Perfluorohexanesulfonic Acid (	100.6	0.3	2.0	91	0	111	70-130	0			
Perfluorohexanoic Acid (PFHx	114	0.7	2.0	100	0	114	70-130	0			
Perfluorononanoic Acid (PFNA	112.8	0.6	2.0	100	0	113	70-130	0			
Perfluorooctanesulfonic Acid (	97.24	0.2	2.0	92.8	0	105	70-130	0			
Perfluorooctanoic Acid (PFOA	112	0.5	2.0	100	0	112	70-130	0			
Perfluorotetradecanoic Acid (F	95.08	0.5	2.0	100	0	95.1	70-130	0			
Perfluorotridecanoic Acid (PFT	106.4	0.3	2.0	100	0	106	70-130	0			
Perfluoroundecanoic Acid (PFI	107.4	0.4	2.0	100	0	107	70-130	0			
11Cl-Pf3OUdS	89.25	0.4	2.0	94.2	0	94.8	70-130	0			
9Cl-PF3ONS	93.37	0.2	2.0	93.2	0	100	70-130	0			
4,8-Dioxa-3H-perfluorononano	103.4	0.3	2.0	94.2	0	110	70-130	0			
Surr: 13C2-PFHxA	*44.19*	0	0	*40*	0	*110*	*70-130*	0			
Surr: 13C2-PFDA	*42.74*	0	0	*40*	0	*107*	*70-130*	0			
Surr: d5-N-EtFOSAA	*156.2*	0	0	*160*	0	*97.6*	*70-130*	0			
Surr: 13C3-HFPO-DA	*42.9*	0	0	*40*	0	*107*	*70-130*	0			

The following samples were analyzed in this batch:

21060077-08A	21060077-09A	21060077-10A
21060077-11A	21060077-12A	21060077-13A
21060077-14A		

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

CHAIN OF CUSTODY RECORD

fishbeck
Address: 1515 Arboretum Dr. SE
Grand Rapids, MI 49546
Phone: 616.575.3824

Report to: Penni Mahler
Email: pdmahler@fishbeck.com
Copy to:
Email:

Invoice to: Accounts Payable
Email: acpay@fishbeck.com
Lab Quote Reference: 21060077

PROJECT NAME: Cedar Springs	PROJECT NO.: 201460
PROJECT LOCATION: Cedar Springs, MI	SAMPLER(S) NAME:
PROJECT MANAGER: Mike Ingersoll	PHONE: 616.464.3959
	EMAIL: mjingersoll@fishbeck.com
ADDITIONAL INFORMATION:	

PAGE 1 of 2

STD TAT ■
RUSH TAT ☐
DATE DUE:

Required analyses: ~~PFAS/537M/28 list~~ 537.1 (18 list)
Preservative: Trizma

DATE	TIME	SAMPLE IDENTIFICATION	AQUEOUS (WATER)	SOLID/SEMI-SOLID	AIR	NONAQUEOUS LIQUID	Number of containers submitted (537.1)	REMARKS
5/26/21	0940	CS-21-05-DW-13360 White Creek Avenue (I)	x				3	
	1205	CS-21-05-DW-13261 White Creek Avenue (I)	x				3	
	1146	CS-21-05-DW-13353 White Creek Avenue (I)	x				3	
	1105	CS-21-05-DW-13399 White Creek Ave (I)	x				3	
	1045	CS-21-05-DW-13485 White Creek Ave (I)	x				3	
	1027	CS-21-05-DW-13525 White Creek Ave (I)	x				3	
	1006	CS-21-05-DW-13590 White Creek Ave (I)	x				2	
	1340	CS-21-05-DW-4095 16 Mile Rd (I)	x				3	
	1306	CS-21-05-DW-4107 16 Mile Rd (I)	x				3	
	1248	CS-21-05-DW-4141 16 Mile Rd (I)	x				3	
	1232	CS-21-05-DW-4142 16 Mile Rd (I)	x				3	
	0940	CS-21-05-DW-13360 White Creek Ave. (D)	x				3	
	1405	CS-21-05-QCFB-01	x				2	EB

RELINQUISHED BY	DATE	TIME	~~RELINQUISHED BY~~	DATE	TIME	RELINQUISHED BY	DATE	TIME	METHOD OF SHIPMENT/TRACKING NUMBER
Bailey A.	5/26/21	14:58							COC Sealed / ALS Pickup
~~RECEIVED~~ BY	DATE	TIME	RECEIVED BY	DATE	TIME	RECEIVED BY	DATE	TIME	RECEIVED FOR LAB / DATE / TIME
TO STORAGE			From Storage	5/28/21	08:00				5/28/21 1530

3.8°C IR3

2021-05710-01

CHAIN OF CUSTODY RECORD

fishbeck
Address: 1515 Arboretum Dr. SE
Grand Rapids, MI 49546
Phone: 616.575.3824

Report to: Penni Mahler
Email: pdmahler@fishbeck.com
Copy to:
Email:

Invoice to: Accounts Payable
Email: acpay@fishbeck.com
Lab Quote Reference: 21060027

PROJECT NAME	PROJECT NO.
Cedar Springs	201460
PROJECT LOCATION: Cedar Springs, MI	SAMPLER(S) NAME:
PROJECT MANAGER: Mike Ingersoll	PHONE: 616.464.3959
	EMAIL: mingersoll@fishbeck.com
ADDITIONAL INFORMATION	

PAGE 2 of 2

STD TAT ■
RUSH TAT ☐
DATE DUE:

REQUIRED ANALYSES: PFAS/~~537M/28 list~~ 537.1/18 list

PRESERVATIVE: Trizma

SAMPLE DATE	SAMPLE TIME	SAMPLE IDENTIFICATION	AQUEOUS (WATER)	SOLID/SEMI-SOLID	AIR	NONAQUEOUS LIQUID	PFAS (Trizma) — NUMBER OF CONTAINERS SUBMITTED	REMARKS
		~~CS-21-05-DW- 16 Mile Rd(I)~~	~~X~~					
		~~CS-21-05-DW- 16 Mile Rd(I)~~	~~X~~					
		~~CS-21-05-DW- 16 Mile Rd(I)~~	X					
		~~CS-21-05-DW- 16 Mile Rd(I)~~	~~X~~					
5/26/21	1340	CS-21-05-DW-4095 16 Mile Rd (D)	X				3	
		~~CS-21-05-QCFB-01~~	X					
								EB

RELINQUISHED BY	DATE	TIME	~~RELINQUISHED BY~~	DATE	TIME	RELINQUISHED BY	DATE	TIME	METHOD OF SHIPMENT/TRACKING NUMBER
Bailey H.	5/26/21	14:58							COC Sealed/ALS Pickup
~~RECEIVED BY~~	DATE	TIME	RECEIVED BY	DATE	TIME	RECEIVED BY	DATE	TIME	RECEIVED FOR LAB / DATE / TIME
TO STORAGE			From Storage [signature]	5/28/21	08:00				[signature] 5/28/21 1530

2021 05718-07

ALS Group, USA

Sample Receipt Checklist

Client Name:	FTCH - GR	Date/Time Received:	28-May-21 15:30
Work Order:	21060077	Received by:	KRW

Checklist completed by Keith Wierenga (eSignature) 01-Jun-21 (Date) Reviewed by: Ehrland Bosworth (eSignature) 02-Jun-21 (Date)

Matrices: Water
Carrier name: ALSHN

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on shipping container/cooler?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on sample bottles?	Yes ☐	No ☐	Not Present ☑
Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time?	Yes ☑	No ☐	
Container/Temp Blank temperature in compliance?	Yes ☑	No ☐	
Sample(s) received on ice?	Yes ☑	No ☐	

Temperature(s)/Thermometer(s): 3.8/4.8 C IR3
Cooler(s)/Kit(s):
Date/Time sample(s) sent to storage: 6/1/2021 3:55:09 PM

Water - VOA vials have zero headspace?	Yes ☐	No ☐	No VOA vials submitted ☑
Water - pH acceptable upon receipt?	Yes ☑	No ☐	N/A ☐
pH adjusted?	Yes ☐	No ☑	N/A ☐

pH adjusted by: -

Login Notes:

Client Contacted: Date Contacted: Person Contacted:

Contacted By: Regarding:

Comments:

CorrectiveAction:

ALS Environmental

04-Aug-2021

Penni Mahler
Fishbeck, Inc.
1515 Arboretum Dr SE
Grand Rapids, MI 49546

Re: **Cedar Springs** Work Order: **21072346**

Dear Penni,

ALS Environmental received 6 samples on 28-Jul-2021 12:45 PM for the analyses presented in the following report.

The analytical data provided relates directly to the samples received by ALS Environmental - Holland and for only the analyses requested.

Sample results are compliant with industry accepted practices and Quality Control results achieved laboratory specifications. Any exceptions are noted in the Case Narrative, or noted with qualifiers in the report or QC batch information. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained from ALS Environmental. Samples will be disposed in 30 days unless storage arrangements are made.

The total number of pages in this report is 20.

If you have any questions regarding this report, please feel free to contact me:

ADDRESS: 3352 128th Avenue, Holland, MI, USA
PHONE: +1 (616) 399-6070 FAX: +1 (616) 399-6185

Sincerely,

Jodi Blouw

Electronically approved by: Jodi Blouw

Jodi Blouw

ALS Group, USA

Date: 04-Aug-21

Client: Fishbeck, Inc.
Project: Cedar Springs
Work Order: **21072346**

Work Order Sample Summary

Lab Samp ID	Client Sample ID	Matrix	Tag Number	Collection Date	Date Received	Hold
21072346-01	CS-21-07-QCFB-02	Water		7/28/2021 09:40	7/28/2021 12:45	☐
21072346-02	CS-21-07-DW-13328 White Creek Ave (I)	Water		7/28/2021 10:20	7/28/2021 12:45	☐
21072346-03	CS-21-07-DW-13550 White Creek Ave (I)	Water		7/28/2021 10:35	7/28/2021 12:45	☐
21072346-04	CS-21-07-DW-13485 White Creek Ave (I)	Water		7/28/2021 10:55	7/28/2021 12:45	☐
21072346-05	CS-21-07-DW-13485 White Creek Ave (D)	Water		7/28/2021 10:55	7/28/2021 12:45	☐
21072346-06	CS-21-07-DW-3950 Cedar Rv Dr (I MS/MSD)	Water		7/28/2021 11:15	7/28/2021 12:45	☐

Client:	Fishbeck, Inc.
Project:	Cedar Springs
WorkOrder:	**21072346**

QUALIFIERS, ACRONYMS, UNITS

Qualifier	Description
*	Value exceeds Regulatory Limit
**	Estimated Value
a	Analyte is non-accredited
B	Analyte detected in the associated Method Blank above the Reporting Limit
E	Value above quantitation range
H	Analyzed outside of Holding Time
Hr	BOD/CBOD - Sample was reset outside Hold Time, value should be considered estimated.
J	Analyte is present at an estimated concentration between the MDL and Report Limit
ND	Not Detected at the Reporting Limit
O	Sample amount is > 4 times amount spiked
P	Dual Column results percent difference > 40%
R	RPD above laboratory control limit
S	Spike Recovery outside laboratory control limits
U	Analyzed but not detected above the MDL
X	Analyte was detected in the Method Blank between the MDL and Reporting Limit, sample results may exhibit background or reagent contamination at the observed level.

Acronym	Description
DUP	Method Duplicate
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LOD	Limit of Detection (see MDL)
LOQ	Limit of Quantitation (see PQL)
MBLK	Method Blank
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
PQL	Practical Quantitation Limit
RPD	Relative Percent Difference
TDL	Target Detection Limit
TNTC	Too Numerous To Count
A	APHA Standard Methods
D	ASTM
E	EPA
SW	SW-846 Update III

Units Reported	Description
ng/L	Nanograms per Liter

Client:	Fishbeck, Inc.
Project:	Cedar Springs
Work Order:	21072346

Case Narrative

Samples for the above noted Work Order were received on 07/28/2021. The attached "Sample Receipt Checklist" documents the status of custody seals, container integrity, preservation, and temperature compliance.

Samples were analyzed according to the analytical methodology previously transmitted in the "Work Order Acknowledgement". Methodologies are also documented in the "Analytical Result" section for each sample. Quality control results are listed in the "QC Report" section. Sample association for the reported quality control is located at the end of each batch summary. If applicable, results are appropriately qualified in the Analytical Result and QC Report sections. The "Qualifiers" section documents the various qualifiers, units, and acronyms utilized in reporting. A copy of the laboratory's scope of accreditation is available upon request.

With the following exceptions, all sample analyses achieved analytical criteria.

Extractable Organics:
No deviations or anomalies were noted.

ALS Group, USA

Date: *04-Aug-21*

Client: Fishbeck, Inc.
Project: Cedar Springs
Sample ID: CS-21-07-QCFB-02
Collection Date: 7/28/2021 09:40 AM

Work Order: 21072346
Lab ID: 21072346-01
Matrix: WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
PFAS BY EPA 537.1		Method: **E537.1**			Prep: E537.1 / 7/30/21		Analyst: **SK**
Hexafluoropropylene oxide dimer acid (HFPO-DA)	U		0.6	2	ng/L	1	8/3/2021 21:26
N-Ethylperfluorooctanesulfonamidoacetic Acid	U		0.3	2	ng/L	1	8/3/2021 21:26
N-Methylperfluorooctanesulfonamidoacetic Acid	U		0.5	2	ng/L	1	8/3/2021 21:26
Perfluorobutanesulfonic Acid (PFBS)	U		0.3	2	ng/L	1	8/3/2021 21:26
Perfluorodecanoic Acid (PFDA)	U		0.6	2	ng/L	1	8/3/2021 21:26
Perfluorododecanoic Acid (PFDoA)	U		0.3	2	ng/L	1	8/3/2021 21:26
Perfluoroheptanoic Acid (PFHpA)	U		0.5	2	ng/L	1	8/3/2021 21:26
Perfluorohexanesulfonic Acid (PFHxS)	U		0.3	2	ng/L	1	8/3/2021 21:26
Perfluorohexanoic Acid (PFHxA)	U		0.6	2	ng/L	1	8/3/2021 21:26
Perfluorononanoic Acid (PFNA)	U		0.5	2	ng/L	1	8/3/2021 21:26
Perfluorooctanesulfonic Acid (PFOS)	U		0.2	2	ng/L	1	8/3/2021 21:26
Perfluorooctanoic Acid (PFOA)	U		0.5	2	ng/L	1	8/3/2021 21:26
Perfluorotetradecanoic Acid (PFTeA)	U		0.5	2	ng/L	1	8/3/2021 21:26
Perfluorotridecanoic Acid (PFTriA)	U		0.3	2	ng/L	1	8/3/2021 21:26
Perfluoroundecanoic Acid (PFUnA)	U		0.4	2	ng/L	1	8/3/2021 21:26
11Cl-Pf3OUdS	U		0.3	2	ng/L	1	8/3/2021 21:26
9Cl-PF3ONS	U		0.1	2	ng/L	1	8/3/2021 21:26
4,8-Dioxa-3H-perfluorononanoic Acid (DONA)	U		0.3	2	ng/L	1	8/3/2021 21:26
Surr: 13C2-PFHxA	*105*			*70-130*	*%REC*	1	8/3/2021 21:26
Surr: 13C2-PFDA	*98.3*			*70-130*	*%REC*	1	8/3/2021 21:26
Surr: d5-N-EtFOSAA	*89.6*			*70-130*	*%REC*	1	8/3/2021 21:26
Surr: 13C3-HFPO-DA	*93.8*			*70-130*	*%REC*	1	8/3/2021 21:26

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *04-Aug-21*

Client:	Fishbeck, Inc.		
Project:	Cedar Springs	**Work Order:**	21072346
Sample ID:	CS-21-07-DW-13328 White Creek Ave (I)	**Lab ID:**	21072346-02
Collection Date:	7/28/2021 10:20 AM	**Matrix:**	WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
PFAS BY EPA 537.1			Method: **E537.1**		Prep: E537.1 / 7/30/21		Analyst: **SK**
Hexafluoropropylene oxide dimer acid (HFPO-DA)	U		0.6	2	ng/L	1	8/4/2021 10:27
N-Ethylperfluorooctanesulfonamidoacetic Acid	U		0.3	2	ng/L	1	8/4/2021 10:27
N-Methylperfluorooctanesulfonamidoacetic Acid	U		0.4	2	ng/L	1	8/4/2021 10:27
Perfluorobutanesulfonic Acid (PFBS)	U		0.3	2	ng/L	1	8/4/2021 10:27
Perfluorodecanoic Acid (PFDA)	U		0.6	2	ng/L	1	8/4/2021 10:27
Perfluorododecanoic Acid (PFDoA)	U		0.3	2	ng/L	1	8/4/2021 10:27
Perfluoroheptanoic Acid (PFHpA)	U		0.5	2	ng/L	1	8/4/2021 10:27
Perfluorohexanesulfonic Acid (PFHxS)	U		0.3	2	ng/L	1	8/4/2021 10:27
Perfluorohexanoic Acid (PFHxA)	U		0.6	2	ng/L	1	8/4/2021 10:27
Perfluorononanoic Acid (PFNA)	U		0.5	2	ng/L	1	8/4/2021 10:27
Perfluorooctanesulfonic Acid (PFOS)	U		0.2	2	ng/L	1	8/4/2021 10:27
Perfluorooctanoic Acid (PFOA)	U		0.4	2	ng/L	1	8/4/2021 10:27
Perfluorotetradecanoic Acid (PFTeA)	U		0.4	2	ng/L	1	8/4/2021 10:27
Perfluorotridecanoic Acid (PFTriA)	U		0.3	2	ng/L	1	8/4/2021 10:27
Perfluoroundecanoic Acid (PFUnA)	U		0.4	2	ng/L	1	8/4/2021 10:27
11Cl-Pf3OUdS	U		0.3	2	ng/L	1	8/4/2021 10:27
9Cl-PF3ONS	U		0.1	2	ng/L	1	8/4/2021 10:27
4,8-Dioxa-3H-perfluorononanoic Acid (DONA)	U		0.3	2	ng/L	1	8/4/2021 10:27
Surr: 13C2-PFHxA	*103*			*70-130*	*%REC*	1	8/4/2021 10:27
Surr: 13C2-PFDA	*82.3*			*70-130*	*%REC*	1	8/4/2021 10:27
Surr: d5-N-EtFOSAA	*78.2*			*70-130*	*%REC*	1	8/4/2021 10:27
Surr: 13C3-HFPO-DA	*97.6*			*70-130*	*%REC*	1	8/4/2021 10:27

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *04-Aug-21*

Client: Fishbeck, Inc.
Project: Cedar Springs
Sample ID: CS-21-07-DW-13550 White Creek Ave (I)
Collection Date: 7/28/2021 10:35 AM

Work Order: 21072346
Lab ID: 21072346-03
Matrix: WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
PFAS BY EPA 537.1			Method: **E537.1**		Prep: E537.1 / 7/30/21		Analyst: **SK**
Hexafluoropropylene oxide dimer acid (HFPO-DA)	U		0.5	2	ng/L	1	8/3/2021 21:57
N-Ethylperfluorooctanesulfonamidoacetic Acid	U		0.3	2	ng/L	1	8/3/2021 21:57
N-Methylperfluorooctanesulfonamidoacetic Acid	U		0.4	2	ng/L	1	8/3/2021 21:57
Perfluorobutanesulfonic Acid (PFBS)	U		0.3	2	ng/L	1	8/3/2021 21:57
Perfluorodecanoic Acid (PFDA)	U		0.6	2	ng/L	1	8/3/2021 21:57
Perfluorododecanoic Acid (PFDoA)	U		0.3	2	ng/L	1	8/3/2021 21:57
Perfluoroheptanoic Acid (PFHpA)	U		0.5	2	ng/L	1	8/3/2021 21:57
Perfluorohexanesulfonic Acid (PFHxS)	U		0.3	2	ng/L	1	8/3/2021 21:57
Perfluorohexanoic Acid (PFHxA)	U		0.6	2	ng/L	1	8/3/2021 21:57
Perfluorononanoic Acid (PFNA)	U		0.5	2	ng/L	1	8/3/2021 21:57
Perfluorooctanesulfonic Acid (PFOS)	U		0.2	2	ng/L	1	8/3/2021 21:57
Perfluorooctanoic Acid (PFOA)	U		0.4	2	ng/L	1	8/3/2021 21:57
Perfluorotetradecanoic Acid (PFTeA)	U		0.4	2	ng/L	1	8/3/2021 21:57
Perfluorotridecanoic Acid (PFTriA)	U		0.3	2	ng/L	1	8/3/2021 21:57
Perfluoroundecanoic Acid (PFUnA)	U		0.4	2	ng/L	1	8/3/2021 21:57
11Cl-Pf3OUdS	U		0.3	2	ng/L	1	8/3/2021 21:57
9Cl-PF3ONS	U		0.1	2	ng/L	1	8/3/2021 21:57
4,8-Dioxa-3H-perfluorononanoic Acid (DONA)	U		0.3	2	ng/L	1	8/3/2021 21:57
Surr: 13C2-PFHxA	*108*			*70-130*	*%REC*	1	8/3/2021 21:57
Surr: 13C2-PFDA	*86.1*			*70-130*	*%REC*	1	8/3/2021 21:57
Surr: d5-N-EtFOSAA	*72.2*			*70-130*	*%REC*	1	8/3/2021 21:57
Surr: 13C3-HFPO-DA	*96.3*			*70-130*	*%REC*	1	8/3/2021 21:57

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *04-Aug-21*

Client: Fishbeck, Inc.
Project: Cedar Springs
Sample ID: CS-21-07-DW-13485 White Creek Ave (I)
Collection Date: 7/28/2021 10:55 AM

Work Order: 21072346
Lab ID: 21072346-04
Matrix: WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
PFAS BY EPA 537.1			Method: **E537.1**		Prep: E537.1 / 7/30/21		Analyst: **SK**
Hexafluoropropylene oxide dimer acid (HFPO-DA)	U		0.6	2	ng/L	1	8/3/2021 21:05
N-Ethylperfluorooctanesulfonamidoacetic Acid	**1.0**	J	**0.3**	**2**	**ng/L**	1	8/3/2021 21:05
N-Methylperfluorooctanesulfonamidoacetic Acid	U		0.5	2	ng/L	1	8/3/2021 21:05
Perfluorobutanesulfonic Acid (PFBS)	**2.6**		**0.3**	**2**	**ng/L**	1	8/3/2021 21:05
Perfluorodecanoic Acid (PFDA)	U		0.6	2	ng/L	1	8/3/2021 21:05
Perfluorododecanoic Acid (PFDoA)	U		0.3	2	ng/L	1	8/3/2021 21:05
Perfluoroheptanoic Acid (PFHpA)	**1.7**	J	**0.5**	**2**	**ng/L**	1	8/3/2021 21:05
Perfluorohexanesulfonic Acid (PFHxS)	**3.7**		**0.3**	**2**	**ng/L**	1	8/3/2021 21:05
Perfluorohexanoic Acid (PFHxA)	**1.2**	J	**0.6**	**2**	**ng/L**	1	8/3/2021 21:05
Perfluorononanoic Acid (PFNA)	U		0.5	2	ng/L	1	8/3/2021 21:05
Perfluorooctanesulfonic Acid (PFOS)	**10**		**0.2**	**2**	**ng/L**	1	8/3/2021 21:05
Perfluorooctanoic Acid (PFOA)	**13**		**0.5**	**2**	**ng/L**	1	8/3/2021 21:05
Perfluorotetradecanoic Acid (PFTeA)	U		0.5	2	ng/L	1	8/3/2021 21:05
Perfluorotridecanoic Acid (PFTriA)	U		0.3	2	ng/L	1	8/3/2021 21:05
Perfluoroundecanoic Acid (PFUnA)	U		0.4	2	ng/L	1	8/3/2021 21:05
11Cl-Pf3OUdS	U		0.4	2	ng/L	1	8/3/2021 21:05
9Cl-PF3ONS	U		0.1	2	ng/L	1	8/3/2021 21:05
4,8-Dioxa-3H-perfluorononanoic Acid (DONA)	U		0.3	2	ng/L	1	8/3/2021 21:05
Surr: 13C2-PFHxA	*111*			*70-130*	*%REC*	1	8/3/2021 21:05
Surr: 13C2-PFDA	*97.9*			*70-130*	*%REC*	1	8/3/2021 21:05
Surr: d5-N-EtFOSAA	*90.9*			*70-130*	*%REC*	1	8/3/2021 21:05
Surr: 13C3-HFPO-DA	*97.5*			*70-130*	*%REC*	1	8/3/2021 21:05

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *04-Aug-21*

Client: Fishbeck, Inc.
Project: Cedar Springs
Sample ID: CS-21-07-DW-13485 White Creek Ave (D)
Collection Date: 7/28/2021 10:55 AM

Work Order: 21072346
Lab ID: 21072346-05
Matrix: WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
PFAS BY EPA 537.1		Method: **E537.1**			Prep: E537.1 / 7/30/21		Analyst: **SK**
Hexafluoropropylene oxide dimer acid (HFPO-DA)	U		0.6	2	ng/L	1	8/3/2021 22:08
N-Ethylperfluorooctanesulfonamidoacetic Acid	**1.2**	J	**0.3**	**2**	**ng/L**	1	8/3/2021 22:08
N-Methylperfluorooctanesulfonamidoacetic Acid	U		0.4	2	ng/L	1	8/3/2021 22:08
Perfluorobutanesulfonic Acid (PFBS)	**2.5**		**0.3**	**2**	**ng/L**	1	8/3/2021 22:08
Perfluorodecanoic Acid (PFDA)	U		0.6	2	ng/L	1	8/3/2021 22:08
Perfluorododecanoic Acid (PFDoA)	U		0.3	2	ng/L	1	8/3/2021 22:08
Perfluoroheptanoic Acid (PFHpA)	**1.8**	J	**0.5**	**2**	**ng/L**	1	8/3/2021 22:08
Perfluorohexanesulfonic Acid (PFHxS)	**3.9**		**0.3**	**2**	**ng/L**	1	8/3/2021 22:08
Perfluorohexanoic Acid (PFHxA)	**1.4**	J	**0.6**	**2**	**ng/L**	1	8/3/2021 22:08
Perfluorononanoic Acid (PFNA)	**0.54**	J	**0.5**	**2**	**ng/L**	1	8/3/2021 22:08
Perfluorooctanesulfonic Acid (PFOS)	**9.4**		**0.2**	**2**	**ng/L**	1	8/3/2021 22:08
Perfluorooctanoic Acid (PFOA)	**13**		**0.4**	**2**	**ng/L**	1	8/3/2021 22:08
Perfluorotetradecanoic Acid (PFTeA)	U		0.4	2	ng/L	1	8/3/2021 22:08
Perfluorotridecanoic Acid (PFTriA)	U		0.3	2	ng/L	1	8/3/2021 22:08
Perfluoroundecanoic Acid (PFUnA)	U		0.4	2	ng/L	1	8/3/2021 22:08
11Cl-Pf3OUdS	U		0.3	2	ng/L	1	8/3/2021 22:08
9Cl-PF3ONS	U		0.1	2	ng/L	1	8/3/2021 22:08
4,8-Dioxa-3H-perfluorononanoic Acid (DONA)	U		0.3	2	ng/L	1	8/3/2021 22:08
Surr: 13C2-PFHxA	*104*			*70-130*	*%REC*	1	8/3/2021 22:08
Surr: 13C2-PFDA	*98.0*			*70-130*	*%REC*	1	8/3/2021 22:08
Surr: d5-N-EtFOSAA	*90.7*			*70-130*	*%REC*	1	8/3/2021 22:08
Surr: 13C3-HFPO-DA	*93.5*			*70-130*	*%REC*	1	8/3/2021 22:08

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *04-Aug-21*

Client: Fishbeck, Inc.
Project: Cedar Springs
Sample ID: CS-21-07-DW-3950 Cedar Rv Dr (I MS/MSD)
Collection Date: 7/28/2021 11:15 AM

Work Order: 21072346
Lab ID: 21072346-06
Matrix: WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
PFAS BY EPA 537.1			Method: **E537.1**		Prep: E537.1 / 8/3/21		Analyst: **SK**
Hexafluoropropylene oxide dimer acid (HFPO-DA)	U		0.6	2	ng/L	1	8/4/2021 01:36
N-Ethylperfluorooctanesulfonamidoacetic Acid	U		0.3	2	ng/L	1	8/4/2021 01:36
N-Methylperfluorooctanesulfonamidoacetic Acid	U		0.4	2	ng/L	1	8/4/2021 01:36
Perfluorobutanesulfonic Acid (PFBS)	U		0.3	2	ng/L	1	8/4/2021 01:36
Perfluorodecanoic Acid (PFDA)	U		0.6	2	ng/L	1	8/4/2021 01:36
Perfluorododecanoic Acid (PFDoA)	U		0.3	2	ng/L	1	8/4/2021 01:36
Perfluoroheptanoic Acid (PFHpA)	U		0.5	2	ng/L	1	8/4/2021 01:36
Perfluorohexanesulfonic Acid (PFHxS)	U		0.3	2	ng/L	1	8/4/2021 01:36
Perfluorohexanoic Acid (PFHxA)	U		0.6	2	ng/L	1	8/4/2021 01:36
Perfluorononanoic Acid (PFNA)	U		0.5	2	ng/L	1	8/4/2021 01:36
Perfluorooctanesulfonic Acid (PFOS)	U		0.2	2	ng/L	1	8/4/2021 01:36
Perfluorooctanoic Acid (PFOA)	U		0.5	2	ng/L	1	8/4/2021 01:36
Perfluorotetradecanoic Acid (PFTeA)	U		0.4	2	ng/L	1	8/4/2021 01:36
Perfluorotridecanoic Acid (PFTriA)	U		0.3	2	ng/L	1	8/4/2021 01:36
Perfluoroundecanoic Acid (PFUnA)	U		0.4	2	ng/L	1	8/4/2021 01:36
11Cl-Pf3OUdS	U		0.3	2	ng/L	1	8/4/2021 01:36
9Cl-PF3ONS	U		0.1	2	ng/L	1	8/4/2021 01:36
4,8-Dioxa-3H-perfluorononanoic Acid (DONA)	U		0.3	2	ng/L	1	8/4/2021 01:36
Surr: 13C2-PFHxA	*95.0*			*70-130*	*%REC*	1	8/4/2021 01:36
Surr: 13C2-PFDA	*79.9*			*70-130*	*%REC*	1	8/4/2021 01:36
Surr: d5-N-EtFOSAA	*73.4*			*70-130*	*%REC*	1	8/4/2021 01:36
Surr: 13C3-HFPO-DA	*82.5*			*70-130*	*%REC*	1	8/4/2021 01:36

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Client: Fishbeck, Inc.
Work Order: 21072346
Project: Cedar Springs

Date: 04-Aug-21

QC BATCH REPORT

Batch ID: **181137** Instrument ID **LCMS1** Method: **E537.1**

MBLK Sample ID: **MBLK-181137-181137** Units: **ng/L** Analysis Date: **8/3/2021 08:34 PM**

Client ID: Run ID: **LCMS1_210803B** SeqNo: **7636888** Prep Date: **7/30/2021** DF: **1**

Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Hexafluoropropylene oxide din	U	0.7	2.0								
N-Ethylperfluorooctanesulfona	U	0.3	2.0								
N-Methylperfluorooctanesulfor	U	0.5	2.0								
Perfluorobutanesulfonic Acid (	U	0.4	2.0								
Perfluorodecanoic Acid (PFDA	U	0.7	2.0								
Perfluorododecanoic Acid (PFI	U	0.4	2.0								
Perfluoroheptanoic Acid (PFH	U	0.6	2.0								
Perfluorohexanesulfonic Acid (	U	0.3	2.0								
Perfluorohexanoic Acid (PFHx	U	0.7	2.0								
Perfluorononanoic Acid (PFNA	U	0.6	2.0								
Perfluorooctanesulfonic Acid (I	0.2468	0.2	2.0								J
Perfluorooctanoic Acid (PFOA	U	0.5	2.0								
Perfluorotetradecanoic Acid (F	U	0.5	2.0								
Perfluorotridecanoic Acid (PFT	U	0.3	2.0								
Perfluoroundecanoic Acid (PFI	U	0.4	2.0								
11Cl-Pf3OUdS	U	0.4	2.0								
9Cl-PF3ONS	U	0.2	2.0								
4,8-Dioxa-3H-perfluorononano	U	0.3	2.0								
Surr: 13C2-PFHxA	*49.06*	0	0	*40*	0	*123*	*70-130*	0			
Surr: 13C2-PFDA	*43.42*	0	0	*40*	0	*109*	*70-130*	0			
Surr: d5-N-EtFOSAA	*165.6*	0	0	*160*	0	*103*	*70-130*	0			
Surr: 13C3-HFPO-DA	*42.64*	0	0	*40*	0	*107*	*70-130*	0			

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: Fishbeck, Inc.
Work Order: 21072346
Project: Cedar Springs

QC BATCH REPORT

Batch ID: **181137** Instrument ID **LCMS1** Method: **E537.1**

MS3 Sample ID: **21072346-04A MS** Units: **ng/L** Analysis Date: **8/4/2021 10:17 AM**

Client ID: **CS-21-07-DW-13485 White Creek Ave (I)** Run ID: **LCMS1_210804A** SeqNo: **7636941** Prep Date: **7/30/2021** DF: **1**

Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Hexafluoropropylene oxide din	88.31	0.6	2.0	86.81	0	102	70-130	0			
N-Ethylperfluorooctanesulfona	86.31	0.3	2.0	86.81	1.016	98.3	70-130	0			
N-Methylperfluorooctanesulfor	93.03	0.4	2.0	86.81	0	107	70-130	0			
Perfluorobutanesulfonic Acid (	70.98	0.3	2.0	76.74	2.581	89.1	70-130	0			
Perfluorodecanoic Acid (PFDA	96.49	0.6	2.0	86.81	0	111	70-130	0			
Perfluorododecanoic Acid (PFI	86.37	0.3	2.0	86.81	0	99.5	70-130	0			
Perfluoroheptanoic Acid (PFH	99.87	0.5	2.0	86.81	1.693	113	70-130	0			
Perfluorohexanesulfonic Acid (	91.23	0.3	2.0	78.99	3.681	111	70-130	0			
Perfluorohexanoic Acid (PFHx	83.5	0.6	2.0	86.81	1.201	94.8	70-130	0			
Perfluorononanoic Acid (PFNA	90.46	0.5	2.0	86.81	0	104	70-130	0			
Perfluorooctanesulfonic Acid (I	86.41	0.2	2.0	80.56	10.31	94.5	70-130	0			
Perfluorooctanoic Acid (PFOA	102.1	0.5	2.0	86.81	12.99	103	70-130	0			
Perfluorotetradecanoic Acid (F	77.97	0.4	2.0	86.81	0	89.8	70-130	0			
Perfluorotridecanoic Acid (PFT	81.75	0.3	2.0	86.81	0	94.2	70-130	0			
Perfluoroundecanoic Acid (PFI	92.12	0.4	2.0	86.81	0	106	70-130	0			
11Cl-Pf3OUdS	73.72	0.3	2.0	81.77	0	90.2	70-130	0			
9Cl-PF3ONS	74.1	0.1	2.0	80.9	0	91.6	70-130	0			
4,8-Dioxa-3H-perfluorononano	82.41	0.3	2.0	81.77	0	101	70-130	0			
Surr: 13C2-PFHxA	*27.85*	0	0	*34.72*	0	*80.2*	*70-130*	0			
Surr: 13C2-PFDA	*27.74*	0	0	*34.72*	0	*79.9*	*70-130*	0			
Surr: d5-N-EtFOSAA	*112.8*	0	0	*138.9*	0	*81.2*	*70-130*	0			
Surr: 13C3-HFPO-DA	*27.34*	0	0	*34.72*	0	*78.8*	*70-130*	0			

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: Fishbeck, Inc.
Work Order: 21072346
Project: Cedar Springs

QC BATCH REPORT

Batch ID: **181137** Instrument ID **LCMS1** Method: **E537.1**

DUP Sample ID: **21072346-02A DUP** Units: **ng/L** Analysis Date: **8/3/2021 09:47 PM**

Client ID: **CS-21-07-DW-13328 White Creek Ave (I)** Run ID: **LCMS1_210803B** SeqNo: **7636895** Prep Date: **7/30/2021** DF: **1**

Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Hexafluoropropylene oxide din	UI	0.6	2.0	0	0	0		0	0	30	
N-Ethylperfluorooctanesulfona	U	0.3	2.0	0	0	0		0	0	30	
N-Methylperfluorooctanesulfor	UI	0.4	2.0	0	0	0		0	0	30	
Perfluorobutanesulfonic Acid (	U	0.3	2.0	0	0	0		0	0	30	
Perfluorodecanoic Acid (PFDA	U	0.6	2.0	0	0	0		0.08919	0	30	
Perfluorododecanoic Acid (PFI	U	0.3	2.0	0	0	0		0.05709	0	30	
Perfluoroheptanoic Acid (PFH	U	0.5	2.0	0	0	0		0.103	0	30	
Perfluorohexanesulfonic Acid (	U	0.3	2.0	0	0	0		0	0	30	
Perfluorohexanoic Acid (PFHx	U	0.6	2.0	0	0	0		0	0	30	
Perfluorononanoic Acid (PFNA	U	0.5	2.0	0	0	0		0.08649	0	30	
Perfluorooctanesulfonic Acid (I	U	0.2	2.0	0	0	0		0	0	30	
Perfluorooctanoic Acid (PFOA	U	0.5	2.0	0	0	0		0.1547	0	30	
Perfluorotetradecanoic Acid (F	U	0.4	2.0	0	0	0		0.05912	0	30	
Perfluorotridecanoic Acid (PFT	U	0.3	2.0	0	0	0		0.05034	0	30	
Perfluoroundecanoic Acid (PFI	U	0.4	2.0	0	0	0		0.09088	0	30	
11Cl-Pf3OUdS	U	0.3	2.0	0	0	0		0	0	30	
9Cl-PF3ONS	U	0.1	2.0	0	0	0		0	0	30	
4,8-Dioxa-3H-perfluorononano	U	0.3	2.0	0	0	0		0	0	30	
Surr: 13C2-PFHxA	*40.23*	0	0	*34.48*	0	*117*	*70-130*	37.66	*6.6*	*30*	
Surr: 13C2-PFDA	*30.73*	0	0	*34.48*	0	*89.1*	*70-130*	29.4	*4.42*	*30*	
Surr: d5-N-EtFOSAA	*102.7*	0	0	*137.9*	0	*74.5*	*70-130*	90.07	*13.1*	*30*	
Surr: 13C3-HFPO-DA	*35.16*	0	0	*34.48*	0	*102*	*70-130*	34.02	*3.31*	*30*	

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: Fishbeck, Inc.
Work Order: 21072346
Project: Cedar Springs

QC BATCH REPORT

Batch ID: **181137** Instrument ID **LCMS1** Method: **E537.1**

LCS3	Sample ID: **LCS-181137-181137**				Units: **ng/L**			Analysis Date: **8/4/2021 10:06 AM**			
Client ID:		Run ID: **LCMS1_210804A**			SeqNo: **7636940**			Prep Date: **7/30/2021**		DF: **1**	
Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Hexafluoropropylene oxide din	102.9[	0.7	2.0	100	0	103	70-130	0			
N-Ethylperfluorooctanesulfona	97.56	0.3	2.0	100	0	97.6	70-130	0			
N-Methylperfluorooctanesulfor	100.6	0.5	2.0	100	0	101	70-130	0			
Perfluorobutanesulfonic Acid (	87.05	0.4	2.0	88.4	0	98.5	70-130	0			
Perfluorodecanoic Acid (PFDA	94.84	0.7	2.0	100	0	94.8	70-130	0			
Perfluorododecanoic Acid (PFI	94.61	0.4	2.0	100	0	94.6	70-130	0			
Perfluoroheptanoic Acid (PFH	96.02	0.6	2.0	100	0	96	70-130	0			
Perfluorohexanesulfonic Acid (	90.26	0.3	2.0	91	0	99.2	70-130	0			
Perfluorohexanoic Acid (PFHx	90.19	0.7	2.0	100	0	90.2	70-130	0			
Perfluorononanoic Acid (PFNA	88.46	0.6	2.0	100	0	88.5	70-130	0			
Perfluorooctanesulfonic Acid (I	97.89	0.2	2.0	92.8	0	105	70-130	0			
Perfluorooctanoic Acid (PFOA	96.39	0.5	2.0	100	0	96.4	70-130	0			
Perfluorotetradecanoic Acid (F	84.43	0.5	2.0	100	0	84.4	70-130	0			
Perfluorotridecanoic Acid (PFT	90.48	0.3	2.0	100	0	90.5	70-130	0			
Perfluoroundecanoic Acid (PFI	96.46	0.4	2.0	100	0	96.5	70-130	0			
11Cl-Pf3OUdS	89.14	0.4	2.0	94.2	0	94.6	70-130	0			
9Cl-PF3ONS	85.14	0.2	2.0	93.2	0	91.4	70-130	0			
4,8-Dioxa-3H-perfluorononano	85.62	0.3	2.0	94.2	0	90.9	70-130	0			
Surr: 13C2-PFHxA	*36.97*	0	0	*40*	0	*92.4*	*70-130*	0			
Surr: 13C2-PFDA	*35.79*	0	0	*40*	0	*89.5*	*70-130*	0			
Surr: d5-N-EtFOSAA	*161.3*	0	0	*160*	0	*101*	*70-130*	0			
Surr: 13C3-HFPO-DA	*37.77*	0	0	*40*	0	*94.4*	*70-130*	0			

The following samples were analyzed in this batch:

21072346-01A	21072346-02A	21072346-03A
21072346-04A	21072346-05A	

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Remedial Investigation Report
Cedar Springs Former Wastewater Treatment Lagoons Site
730 West Court Street
Cedar Springs, Michigan

Prepared For:

City of Cedar Springs

September 2, 2021

Project No. 201460

List of Figures

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List of Abbreviations/Acronyms

CSM	Conceptual Site Model
DRC	Declaration of Restrictive Covenant
EGLE	Michigan Department of Environment, Great Lakes, and Energy (formerly the MDEQ)
MDEQ	Michigan Department of Environmental Quality
PFAS	per-and polyfluoroalkyl substances
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid

1.0 Introduction

This Remedial Investigation Report (RI Report) has been prepared by Fishbeck on behalf of the City of Cedar Springs (City). A draft Remedial Investigation/Feasibility Study Work Plan (Work Plan) was submitted to EGLE on February 15, 2021 and was the subject of discussion during a virtual meeting with EGLE held on March 2, 2021. Fishbeck has completed the scope of work outlined in the Work Plan. This RI Report describes the activities completed with respect to the former Cedar Springs wastewater lagoon area as described in the Work Plan and some additional evaluation as described below. The former wastewater treatment lagoons site (Site) and associated monitoring well locations are shown on Figure 1.

1.1 Background

In January 2020, in response to EGLE's request, the City collected groundwater samples from select monitoring wells (MW-2A, MW-3A, MW-4A, MW-5A, and MW-7A) located in the former wastewater lagoon area for analysis of Per- and Polyfluoroalkyl Substances (PFAS). These wells are all installed in the shallow unconfined aquifer at the Site. The results of the January 2020 groundwater sampling event identified certain PFAS compounds in four monitoring wells (MW-3A, MW-4A, MW-5A, and MW-7A). The location of these wells and associated PFAS concentrations are shown on Figure 1. PFAS detected at the wells were in concentrations below applicable drinking water cleanup criteria contained in the administrative rules of Part 201, effective in January 2020. On August 2, 2020, EGLE promulgated new Part 201 drinking water cleanup criteria for two PFAS compounds (PFOA and PFOS). On December 21, 2020 EGLE promulgated new Part 201 drinking water criteria for five (5) additional PFAS compounds (PFNA, PFHxA, PFHxS, PFBS, and Gen X). PFOA was detected in the January 2020 sampling event in the four referenced monitoring wells at concentrations slightly exceeding the August 2, 2020 cleanup criterion for PFOA. Due to these exceedances, EGLE issued a Violation Notice No. VN-011095 (Violation Notice) dated October 2, 2020 to the City.

1.2 Former Wastewater Lagoon History

The City's wastewater treatment lagoon system was constructed in 1965, expanded in the 1970's, and removed from service in 1999. The system consisted of three lagoons (two oxidation lagoons with clay-lined bottoms and one infiltration lagoon) and a standby infiltration area. The wastewater lagoons were closed in place in 2002. Closure of the lagoon system consisted of several steps, including lime stabilization of biosolids associated with the operation of the lagoon system, removal of the lagoon infrastructure (piping and control structures), and construction of a cap above the biosolids. The cap consisted of sand and clay that was removed from the earthen berms surrounding the lagoons and placed above the biosolids, additional clean sand and gravel was added to bring the closed lagoons up to grade. A minimum of 1 foot of cover was placed over the stabilized biosolids remaining on the bottom of the former lagoons. The closure of the lagoons was performed pursuant to a Designation of Inertness issued by EGLE in January 2002 and a Declaration of Restrictive Covenant (DRC) approved by EGLE that the City executed and recorded against the Site.

1.3 Hydrogeological Conceptual Site Model

The February 15, 2021 Work Plan included a hydrogeological conceptual site model (CSM) that Fishbeck prepared for the Site and surrounding area. Fishbeck generated six cross-sections using soil boring and drinking water well log information to aid in the visualization and understanding of the near surface geology at the Site. The geological cross-sections are included in the February 15, 2021 Work Plan. Based on these cross-sections, three (3) hydrostratigraphic units have been identified beneath the Site. Laterally continuous sand deposits form an upper unconfined aquifer across the Site. The unconfined aquifer is approximately 20 feet thick. The water table surface is located approximately 10 feet below ground surface (bgs). Groundwater in the upper aquifer near the Site flows in a westerly direction. The upper unconfined aquifer extends to a depth of approximately 30 feet bgs.

The upper unconfined aquifer is underlain by a 40 to 70 thick clay unit beneath the Site. Based on the cross-sections, the clay unit may be thinner north and east of the Site. This underlying clay unit acts as an aquitard/confining layer and extends to a depth of approximately 100 feet bgs. A lower confined aquifer is present at depths below 100 feet bgs and extends to a depth of at least 120 feet bgs. The confined aquifer appears to be hydraulicly separated from the upper unconfined aquifer due to the overlying clay aquitard.

A potential upgradient source of PFAS (former Robinson Bulk Terminal, which is a documented site of contamination by EGLE) has been identified but has not yet been evaluated for the presence of PFAS.

1.4 Surface Water Features

The nearest major surface water features include Cedar Creek, located approximately 800 feet west of the Site, and Little Cedar Creek, located approximately 5000 feet south of the Site. Other surface water features include an onsite stormwater retention basin and a small lake located approximately 1000 feet northwest of the Site (approximately 200 feet west of Cedar Creek). An unnamed drain is also located on the south and west sides of the Site, and a stream exists east of the Site south of MW8A.

2.0 Remedial Investigation Activities

The investigative activities described in the February 15, 2021 Work Plan were completed from March 2021 through August 2021. The City and Fishbeck provided interim updates to EGLE during the course of the investigation. The primary tasks completed as part of this investigation included:

- Installation of one new monitoring well (MW-8A) in the shallow aquifer upgradient of the Site.
- Collection and analysis of groundwater samples for PFAS from the new monitoring well (MW-8A) and three existing monitoring wells on the Site (MW-6A, GSI-1D, and GSI-2D).
- Collection and analysis of one surface water sample for PFAS from an unnamed creek flowing from the east onto the Site.
- Collection and analysis of water samples from fourteen drinking water wells located west/southwest of the Site.

The investigation activities were completed in accordance with the methodologies and procedures described in the February 15, 2021 Work Plan.

2.1 Monitoring Well Installation

One new monitoring well (MW-8A) was installed at the upgradient location shown on Figure 1 to evaluate a potential upgradient PFAS source. The monitoring well was installed by Job Site Services of Cedar Springs, Michigan on March 9, 2021 using hollow-stem auger drilling techniques. Soil samples were collected continuously for geological description from ground surface to the total depth of the boring using a macro-core sampler. The samples were described by a geologist from Fishbeck who prepared a log to document the findings. The well log for MW-8A is included in Attachment 1. The monitoring well was constructed using 2-inch diameter, PVC casing with a 5-foot long, 0.010-inch slot, PVC screen installed from 25 to 30 feet bgs. An appropriately sized sand filter pack was placed in the annulus surrounding the screen, from the base of the screen to approximately 5 feet above the top of the screen. A bentonite slurry was placed into the remaining annulus by tremie grouting from the top of the sand pack to ground surface. The well was equipped with an aboveground locking protective casing and a vented cap. The monitoring well was developed using pumping/surging techniques. Investigation derived wastes were placed on the ground adjacent to the monitoring well.

2.2 Groundwater Flow Mapping

Following installation of the additional monitoring well, a survey to establish the top-of-casing elevation of the new well was completed. Static water levels were collected from all existing onsite monitoring wells and the newly-installed upgradient monitoring well on March 17, 2021, using an electric tape and recorded to the nearest 0.01 foot. The March 17, 2021 static water level data was converted to groundwater elevation data and used to generate a groundwater contour map (Figure 1) to confirm groundwater flow direction and hydraulic gradient. The groundwater elevation data collected on March 17, 2021 is summarized in Table 1. The data documents a westerly groundwater flow.

2.3 Groundwater and Surface Water Sampling

Groundwater samples were collected from the newly installed monitoring well (MW-8A) and downgradient existing monitoring wells MW-6A, GSI-1D, and GSI-2D (shown on Figure 1) on March 12, 2021. Logs for these monitoring wells are included in Appendix 1. Groundwater samples were collected with a peristaltic pump using low-flow/minimal drawdown methods. All materials used for groundwater sampling were Teflon and PFAS free. One duplicate sample and one field blank were collected.

Dissolved oxygen, pH, Eh, specific conductivity, and temperature were measured in the field using a calibrated flow-through cell. Sample turbidity was also be field monitored. These parameters were used to verify stabilization of the purged groundwater in accordance with low-flow/minimal drawdown sampling procedures.

A surface water sample (SW-1) was also collected from a creek located approximately 50 feet south of MW-8A. The creek was flowing from the east to the west onto the Site.

A summary of groundwater and surface water PFAS results is included in Table 2.

2.4 Drinking Water Well Sampling

The City identified nineteen drinking water wells for sampling. The City provided the list of drinking water wells to EGLE in advance of collecting samples. To obtain permission to sample the proposed drinking water wells, the City mailed access permission letters to the nineteen drinking water well owners via U.S. Mail. Fourteen of the drinking water well owners responded with authorization to collect a sample from their wells. The City mailed a second letter to the five locations that did not respond to the initial request, followed-up by an attempt to contact these residences in person. As of the date of this RI Report, the City has not received any additional replies from the five residences.

The fourteen drinking water wells that Fishbeck sampled for PFAS are located west/southwest of the Site (see locations on Figure 2). Eleven of the drinking water wells were sampled on May 26, 2021, and three of the drinking water wells were sampled on July 28, 2021. Drinking water well samples were collected from an outdoor spigot. Well logs were located for eleven of the fourteen wells. Based on the well logs, these eleven drinking water wells are screened in the lower confined aquifer below the approximately 40-70 feet thick clay layer separating these wells from the upper aquifer. The well logs for these eleven drinking water wells are included in Appendix 2.

The owner of one well for which no log was located reported to Fishbeck that his well is screened at a shallow depth. According to the owner of the well at 13485 White Creek Avenue, the owner installed the well to a depth of approximately 35 feet below grade. This is the only drinking water well sampled that is known to have been installed in the shallow unconfined aquifer. As described below, this well is also the only drinking water well with a concentration of PFOA exceeding its EGLE Part 201 Drinking Water Criteria. . To confirm the PFAS concentrations detected from the May 26, 2021 sample collected at 13485 White Creek Avenue, this location was resampled on July 28, 2021.

2.5 Laboratory Analysis

Monitoring well groundwater samples were submitted for laboratory analysis of PFAS (28 compound list) using USEPA Method 537M. One duplicate sample and one field blank were collected during the groundwater sampling for quality assurance/quality control (QA/QC) purposes. Drinking water well drinking water samples were submitted for laboratory analysis of PFAS using USEPA Method 537.1 for analysis of drinking water for 18 PFAS compounds. Three duplicate samples and two field blank sample were collected during drinking water well sampling for QA/QC purposes. Part 201 drinking water criteria exist for seven PFAS compounds.

3.0 Groundwater and Surface Water Analytical Results

The March 12, 2021 PFAS analytical results for groundwater samples were collected from GSI-1D, GSI2D, MW-6A, and MW-8A and the surface water sample was collected from the upgradient creek are summarized in Table 2. The laboratory reports are included in Appendix 3. Perfluorooctanoic acid (PFOA) was detected at a concentration exceeding its current Part 201 Residential Drinking Water Criterion at monitoring wells GSI-2D and MW-6A. Perfluorooctane sulfonic acid (PFOS) was detected at a concentration exceeding its Part 201 Residential Drinking Water Criterion at monitoring well MW-6A and exceeding its GSI Criterion at GSI-2D and MW-6A. All other detectable PFAS concentrations were below applicable Part 201 cleanup criteria. The surface water sample (SW-1) collected from the creek flowing onto the eastern side of the Site contained 22.8 ng/L total PFAS compounds including 2.7 ng/L PFOA and 2.2 ng/L PFOS. Even though the PFAS concentrations at SW-1 did not exceed applicable Part 201 concentrations, the fact that PFAS was present in the upgradient creek flowing onto the Site is an indication that a source for PFAS exists east of the Site.

4.0 Drinking Water Well Analytical Results

The May 26, 2021 and July 28, 2021 drinking water well analytical results are summarized in Table 3. Well depths are also included on Table 3. The laboratory reports are included in Appendix 4. A total of fourteen wells were sampled. With one exception, none of the samples for the drinking water wells contained any concentrations of PFAS above drinking water criteria under Part 201. The location at 13485 White Creek Avenue (from the shallow water table aquifer) had a concentration of PFOA that exceeded its current Drinking Water maximum contaminant limit (MCL)/Part 201 drinking water criterion. A filtration system was installed by the City at the residence to eliminate the exposure risk to PFOA.

Eleven of these locations have well logs that indicated that these wells are installed in the lower confined aquifer. The well logs for these eleven drinking water wells are included in Appendix 2. Of these eleven wells, eight were non-detect for any PFAS compounds. The other three wells known to be installed in the lower aquifer contained low estimated concentrations of PFNA below the laboratory reporting limit. The field blank collected during the sampling of these three wells also contained a low estimated concentration of PFNA, indicating that low concentrations of PFNA at these three well locations are lab-related artifacts and not actually in the groundwater sampled at these wells. PFOA was identified at one of the known deep wells at a low estimated concentration of PFOA (0.65 ng/L) below the laboratory reporting limit, but since PFOA was not identified in any other known deep well, this PFOA concentration is likely a lab artifact or some other type of cross contamination of the sample.

5.0 Nature and Extent of PFAS Contamination

The lateral extent of PFAS contamination exceeding applicable Part 201 Cleanup Criteria in the shallow unconfined aquifer at the Site and surrounding area has been determined and is illustrated on Figure 1. Groundwater flow in the shallow unconfined aquifer is shown on Figure 1. The groundwater flow direction in the shallow unconfined aquifer is toward the west.

The groundwater sample collected at GSI-2D, located adjacent to Cedar Creek, indicates that PFOA and PFOS are present at concentrations exceeding applicable Part 201 criteria. Based on groundwater elevation data collected at GSI-1S&D and GSI-2S&D and the adjacent staff gages (SG-1 and SG-2) installed in Cedar Creek, it is apparent that Cedar Creek acts as a converging groundwater discharge boundary and prevents groundwater in the shallow unconfined aquifer from flowing west of Cedar Creek, thus establishing a westerly delineation boundary. Based on the PFAS results from the EGLE 2020 sampling of shallow drinking water wells along 16-mile road, the southern extent of PFAS exceeding applicable Part 201 Cleanup Criteria has also been determined. The sampling results from upgradient wells MW-2A and MW-8A at the Site indicated that PFAS was not present at these locations above applicable Part 201 Cleanup Criteria, and therefore the eastern extent of PFAS contaminated groundwater exceeding applicable Part 201 Cleanup Criteria has also been determined. (As noted above, a PFAS source exists to the east of the Site, as evidenced by the surface water sample from the creek). Based on the groundwater flow direction in the shallow aquifer, there does not appear to be a northern flow component at the Site and groundwater impacted with PFAS exceeding Part 201 Cleanup Criteria would not be expected to migrate in a northerly direction. Therefore, the horizontal extent of PFAS contamination in the shallow aquifer has been defined in all directions.

The vertical extent of PFAS contaminated groundwater at the Site is the base of the upper unconfined aquifer, due to the presence of an approximate 40-70-foot-thick clay unit that underlies the upper aquifer and acts as an aquitard/confining layer to the lower confined aquifer. As is evident in Fishbeck's CSM, the confined aquifer in the vicinity of the Site provides hydraulic separation from the upper unconfined aquifer due to the overlying clay aquitard. This interpretation is further substantiated by the drinking water well boring logs and sampling results. Well logs of eleven of the drinking water wells sampled by the City west and southwest of the Site indicate that these wells are installed in the lower confined aquifer. An additional well installed in the lower confined aquifer (13466 White Creek Avenue) was sampled by EGLE. The PFAS results indicate that the wells in stalled in the lower aquifer have not been impacted by PFAS.

The lateral and vertical extent of PFAS contaminated groundwater in the shallow unconfined aquifer has been determined and there are no current unacceptable exposure risks. A deed restriction is in place at the Site which prevents the installation of wells in the shallow unconfined aquifer. Drinking water well sampling conducted west of the Site indicated two drinking water wells exceeding the PFOA Drinking Water MCL (one sampled by the City; the other sampled by EGLE). Both of these wells are screened in the shallow aquifer. Both of these residences have been provided filtration systems to eliminate the drinking water exposure risk (one provided by the City; the other provided by EGLE). The City has contacted nineteen drinking water well owners located downgradient of the Site. Currently, five of the homeowners have not responded regarding the City's multiple requests to sample their wells. The City will make an additional attempt to elicit a response from these five residences.

There is no evidence that the lower confined aquifer in the vicinity of the Site has been impacted. Currently none of the drinking water wells sampled and installed in the lower confined aquifer have indications of being impacted by PFAS. The geology and hydrogeology at the Site explain the lack of impact in the lower confined aquifer. Hydrogeological conditions at the Site are such that vertical migration of the PFAS impacted groundwater found in the shallow unconfined aquifer, through the 40-70-foot clay aquitard and into the lower confined aquifer, would not occur.

In addition to the tasks identified in the Work Plan, Fishbeck has reviewed the City of Cedar Springs Wellfield Wellhead Protection Area Delineation Report (Fishbeck, 2002). The City wellfield (Wells 3, 4, and 5) are located approximately 1 mile northeast of the Site. Based on the information in the Cedar Springs Wellfield WHPA Delineation Report, static water levels were measured at 17 observation and drinking water wells covering approximately 22 sections in Nelson and Solon Townships. This information is summarized in Table 3 attached to the WHPA report (which table is included in Appendix 5 to this RI Report). Figure 7 from the WHPA report shows a potentiometric surface using the observed static water level elevations (Figure 7 is included in Appendix 5 to this RI Report). The observed groundwater elevation contour map indicates that the groundwater flow direction is to the southwest the Rogue River (Section 3 text from the WHPA report is included in Appendix 5).

Several Wellhead Protection Areas in the vicinity of the Site were identified on the state database (Geowebface.com). Figure 3 shows the location of several of the WHPAs in the vicinity of the Site. All WHPAs indicate at southwesterly flow direction in the lower confined aquifer. Based on that review of the City WHPA Delineation Report and WHPAs on the State database, Fishbeck finds that the groundwater movement in the lower confined aquifer is to the southwest. The flow pattern is southwesterly, not southerly. Therefore, based on the WHPA information, even if PFAS had encountered the lower confined aquifer (and there is no geological explanation for such a conclusion), the PFAS would flow to the west/southwest, not south to the neighborhood that is approximately one mile south of the Site.

Also, Fishbeck has identified a well log for a 12' diameter irrigation well for a large farm located approximately 3000 feet west of the Site. This irrigation well log is included in Appendix 5. The location of the irrigation well is shown on Figure 3. Based on information included on the irrigation well log, the well is installed in the lower confined aquifer and is capable of yielding 1000 gpm. This large irrigation well would influence groundwater flow conditions when it is operated in the summer months and would cause groundwater to flow from the Site towards the irrigation well in a westerly direction.

Finally, in the virtual meeting on March 2, 2021 with EGLE, EGLE representatives advised that they would share X-sections from areas near the Site that suggest a connection between the upper and lower aquifers. EGLE provided those X-section to Fishbeck on March 10, 2021. Fishbeck has reviewed those X-sections and does not find any content suggesting a connection between the two aquifers in the vicinity of the Site. The geological information from the one well in the vicinity of the Site on the cross sections indicates that this well is installed in the shallow unconfined aquifer and the well did not extend deep enough to encounter the clay aquitard at the base of the aquifer.

6.0 Conclusion

Fishbeck has completed the RI investigation described in the Work Plan, as discussed with EGLE. Fishbeck has completed certain evaluations in supplement to the Work Plan, as described above. As a result, the lateral and vertical extent of PFAS in the shallow aquifer has been delineated. Based on multiple lines of evidence, there is no basis to believe that there is a connection between the shallow and lower aquifers at the Site, and no basis to expect that PFAS detected in the shallow aquifer would be present in the lower aquifer at or in the proximity of the Site. Therefore, investigation of the lower aquifer is not warranted.

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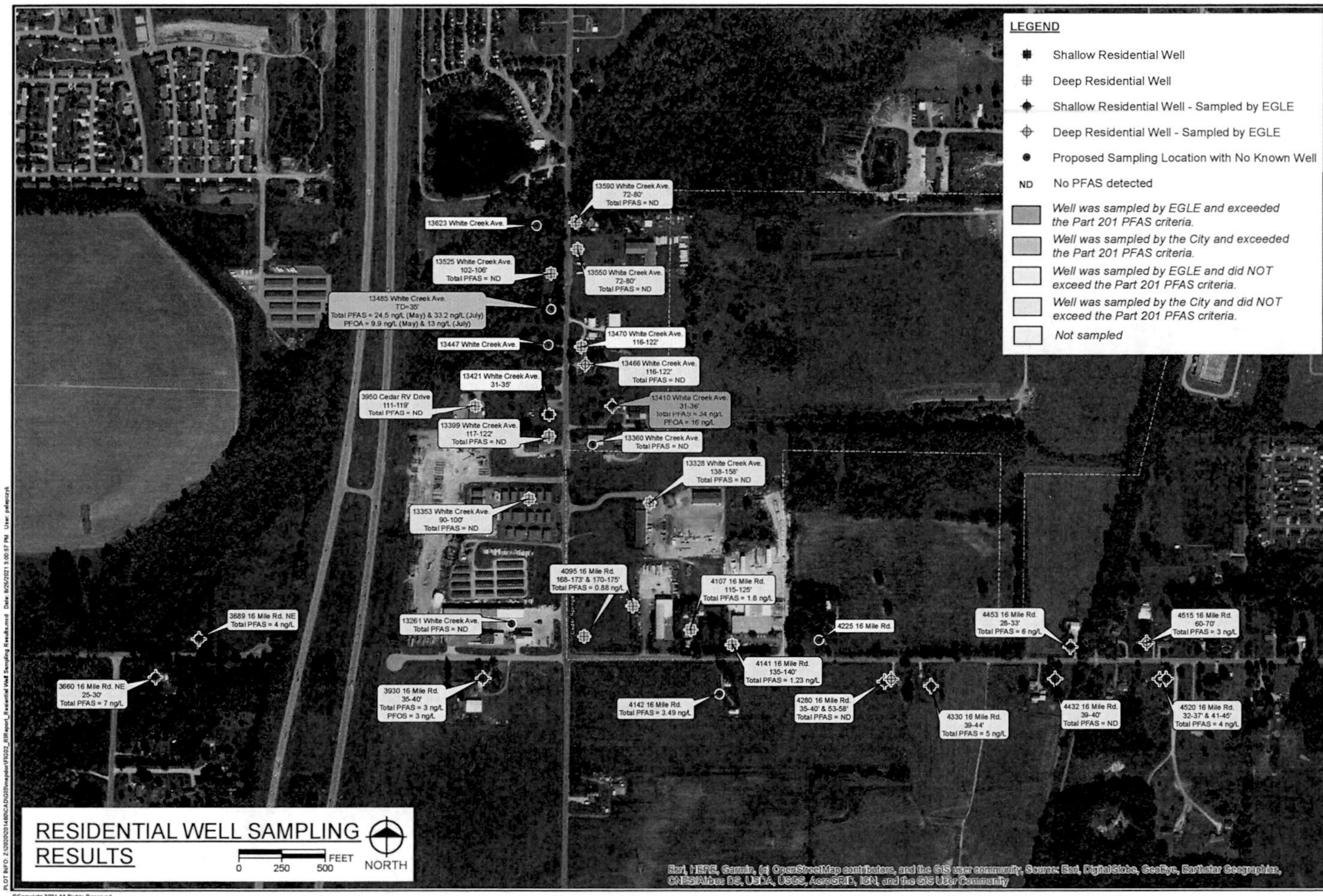
City of Cedar Springs
Cedar Springs, Kent County, Michigan

Remedial Investigation Report

PROJECT NO. 201460

FIGURE NO. 1

PLOT INFO: Z:\2020\201460\CAD\GIS\mapdoc\FIG01_RIReport_PFASExceedances_GWContour_2021_0825.mxd Date: 8/25/2021 4:55:30 PM User: palepczyk



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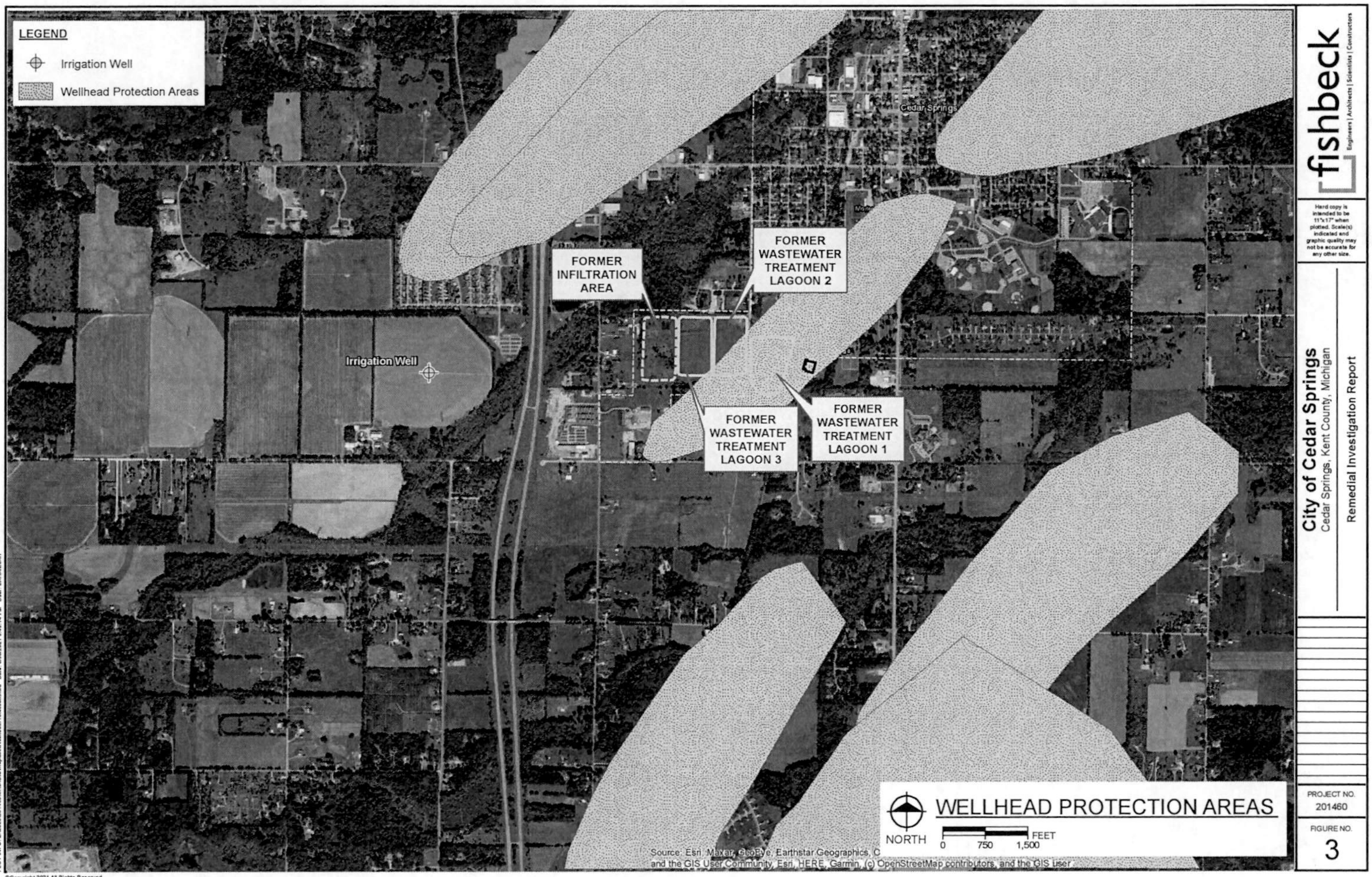
City of Cedar Springs
Cedar Springs, Kent County, Michigan

Remedial Investigation Report

PROJECT NO. 201460

FIGURE NO. 2


LEGEND
Irrigation Well
Wellhead Protection Areas
Cedar Springs
FORMER INFILTRATION AREA
FORMER WASTEWATER TREATMENT LAGOON 2
Irrigation Well
FORMER WASTEWATER TREATMENT LAGOON 3
FORMER WASTEWATER TREATMENT LAGOON 1
WELLHEAD PROTECTION AREAS
NORTH
0 750 1,500 FEET
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City of Cedar Springs
Cedar Springs, Kent County, Michigan
Remedial Investigation Report
PROJECT NO.
201460
FIGURE NO.
3

Tables

Table 1 - Summary of Monitoring Well Construction and Groundwater Elevations

2021 RI Report

Cedar Springs Former Wastewater Treatment Lagoons Site - Cedar Springs, Michigan

Monitoring Well	Screened Interval (ft bgs)	TOC Elevation (ft msl)	DTW (ft btoc) 03/17/21	Groundwater Elevation (ft msl) 03/17/21
GSI-1s	5.5-10.5	833.80	7.54	826.26
GSI-1d	16-21	833.51	6.72	826.79
GSI-2s	2-7	833.38	4.37	829.01
GSI-2d	11.5-16.5	832.51	3.49	829.02
MW-2A	33-38	856.38	13.03	843.35
MW-3A	33-38	850.64	13.72	836.92
MW-4A	29.5-34.5	844.91	10.10	834.81
MW-5A	27-32	843.79	13.37	830.42
MW-6A	13-18	839.03	9.52	829.51
MW-7A	20-25	842.57	11.58	830.99
MW-8A	25-30	852.21	*9.51	842.70
KOW-1	28.5-31.5	852.00	12.77	839.23
KOW-2	13-16	845.51	9.93	835.58
KOW-3	11-14	844.41	9.15	835.26
KOW-4	15-18	844.21	12.29	831.92
KOW-5	14-17	840.56	9.50	831.06
KOW-6	11.5-14.5	849.06	7.63	841.43
KOW-7	13-16	835.97	9.14	826.83
Well D	NA	843.39	7.11	836.28
Well E	NA	841.79	10.86	830.93
Well F	NA	846.94	9.40	837.54
B-2	NA	841.64	10.59	831.05
SG-1	NA	829.21	1.04	828.17
SG-2	NA	828.10	2.37	825.73

Footnotes:

*SWL collected 3/12/21

bgs - Below ground surface

btoc - Below top of casing

SWL - Static water level

NA - Not available

DTW - Depth to Water

ft msl - Feet above mean sea level

Table 2 - Groundwater Data Summary - Poly- and Perfluoroalkyl Substances (PFAS)
2021 Remedial Investigation
City of Cedar Springs, Kent County, Michigan

Monitoring Location:		GSI-1D	GSI-2D	MW-6A	MW-8A	MW-8A	SW-01	Field Blank	***Residential DWC*** [1]	***Nonresidential DWC*** [1]	***GSI Criteria*** [1]	***Residential Groundwater VIAIC*** [1]	***Nonresidential Groundwater VIAIC*** [1]	***Water Solubility*** [1]	***Flammability and Explosivity SL*** [1]	***Residential GW-Shallow VIAP SL*** [2]	***Residential GW-Not in Contact VIAP SL*** [2]	***Nonresidential GW-Shallow VIAP SL*** [2]	***Nonresidential GW-Not in Contact VIAP SL*** [2]
Field Duplicate:						Duplicate													
Laboratory ID:		21031444-04	21031444-05	21031444-01	21031444-02	21031444-03	21031444-06	21031444-07											
Collection Date:		03/12/21	03/12/21	03/12/21	03/12/21	03/12/21	03/12/21	03/12/21											
Compound	*CAS Number*																		
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	4.6 U	4.7 U	4.7 U	4.6 U	4.7 U	4.7 U	4.8 U	–	–	–	–	–	–	–	–	–	–	–
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	4.6 U	4.7 U	4.7 U	4.6 U	4.7 U	4.7 U	4.8 U	–	–	–	–	–	–	–	–	–	–	–
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	4.6 U	4.7 U	4.7 U	4.6 U	4.7 U	4.7 U	4.8 U	–	–	–	–	–	–	–	–	–	–	–
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	4.6 U	4.7 U	4.7 U	4.6 U	4.7 U	4.7 U	4.8 U	–	–	–	–	–	–	–	–	–	–	–
9-Chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	756426-58-1	4.6 U	4.7 U	4.7 U	4.6 U	4.7 U	4.7 U	4.8 U	–	–	–	–	–	–	–	–	–	–	–
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	763051-92-9	4.6 U	4.7 U	4.7 U	4.6 U	4.7 U	4.7 U	4.8 U	–	–	–	–	–	–	–	–	–	–	–
Hexafluoropropylene oxide dimer acid (HFPO-DA)(GenX)	13252-13-6	4.6 U	4.7 U	4.7 U	4.6 U	4.7 U	4.7 U	4.8 U	370 (A)	370 (A)	NA	ID	ID	NA	NA	–	–	–	–
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	4.6 U	5.2	2.4 J	4.6 U	4.7 U	4.7 U	4.8 U	–	–	–	–	–	–	–	–	–	–	–
N-Methyl perfluorooctane sulfonamido acetic acid (N-MeFOSAA)	2355-31-9	4.6 U	0.69 J	4.7 U	4.6 U	4.7 U	4.7 U	4.8 U	–	–	–	–	–	–	–	–	–	–	–
Perfluorobutane sulfonic acid (PFBS)	375-73-5	2.3 J	3.0 J	2.6 J	0.65 J	0.57 J	3.5 J	4.8 U	420 (A)	420 (A)	NA	ID	ID	NA	NA	–	–	–	–
Perfluorobutanoic acid (PFBA)	375-22-4	4.7	9.5	9.0	4.6 U	4.7 U	5.5	4.8 U	–	–	–	–	–	–	–	–	–	–	–
Perfluorodecane sulfonic acid (PFDS)	335-77-3	4.6 U	4.7 U	4.7 U	4.6 U	4.7 U	4.7 U	4.8 U	–	–	–	–	–	–	–	–	–	–	–
Perfluorodecanoic acid (PFDA)	335-76-2	4.6 U	4.7 U	4.7 U	4.6 U	4.7 U	4.7 U	4.8 U	–	–	–	–	–	–	–	–	–	–	–
Perfluorododecanoic acid (PFDoDA)	307-55-1	4.6 U	4.7 U	4.7 U	4.6 U	4.7 U	4.7 U	4.8 U	–	–	–	–	–	–	–	–	–	–	–
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.59 J	1.8 J	1.9 J	4.6 U	4.7 U	4.7 U	4.8 U	–	–	–	–	–	–	–	–	–	–	–
Perfluoroheptanoic acid (PFHpA)	375-85-9	1.5 J	8.1	9.4	4.6 U	4.7 U	1.4 J	4.8 U	–	–	–	–	–	–	–	–	–	–	–
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	3.6 J	9.1	12	0.88 J	0.42 J	1.7 J	0.66 J	51 (A)	51 (A)	NA	ID	ID	NA	NA	–	–	–	–
Perfluorohexanoic acid (PFHxA)	307-24-4	2.3 J	8.4	11	4.6 U	4.7 U	2.3 J	4.8 U	4.00E+05 (A)	4.00E+05 (A)	NA	ID	ID	NA	NA	–	–	–	–
Perfluorononane sulfonic acid (PFNS)	68259-12-1	4.6 U	4.7 U	4.7 U	4.6 U	4.7 U	4.7 U	4.8 U	–	–	–	–	–	–	–	–	–	–	–
Perfluorononanoic acid (PFNA)	375-95-1	4.6 U	1.6 J	2.0 J	4.6 U	4.7 U	4.7 U	4.8 U	6.0 (A)	6.0 (A)	NA	ID	ID	NA	NA	–	–	–	–
Perfluorooctane sulfonamide (PFOSA)	754-91-6	4.6 U	0.76 J	4.7 U	4.6 U	4.7 U	4.7 U	4.8 U	–	–	–	–	–	–	–	–	–	–	–
Perfluorooctane sulfonic acid (PFOS) (DD)	1763-23-1	5.7	**16**	**19**	1.9 U	1.9 U	2.2	1.9 U	16 (A)	16 (A)	12 (X)	NLV	NLV	3,100	NA	NA	NA	NA	NA
Perfluorooctanoic acid (PFOA) (DD)	335-67-1	5.6	**35**	**49**	1.9 U	1.9 U	2.7	1.9 U	8.0 (A)	8.0 (A)	12,000 (X)	ID	ID	9.50E+09	NA	TX	TX	TX	TX
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	1.3 J	1.1 J	1.3 J	4.6 U	4.7 U	4.7 U	4.8 U	–	–	–	–	–	–	–	–	–	–	–
Perfluoropentanoic acid (PFPeA)	2706-90-3	2.0 J	5.8	7.8	4.6 U	4.7 U	3.5 J	4.8 U	–	–	–	–	–	–	–	–	–	–	–
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	4.6 U	4.7 U	4.7 U	4.6 U	4.7 U	4.7 U	4.8 U	–	–	–	–	–	–	–	–	–	–	–
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	4.6 U	4.7 U	4.7 U	4.6 U	4.7 U	4.7 U	4.8 U	–	–	–	–	–	–	–	–	–	–	–
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	4.6 U	4.7 U	4.7 U	4.6 U	4.7 U	4.7 U	4.8 U	–	–	–	–	–	–	–	–	–	–	–

Results expressed in ng/L.
Bolded values exceed an applicable criterion.

Data Qualifiers:
J Estimated value
U Not detected

Footnotes/Abbreviations:
[1] *Part 201 Groundwater Generic Cleanup Criteria and Screening Levels, December 21, 2020.*
[2] *EGLE Volatilization to Indoor Air Pathway Screening Levels, September 4, 2020.*
(A) State of Michigan drinking water (DW) standard.
(X) Criterion is not protective for surface water used as a DW source.
(DD) Hazardous substance causes developmental effects. Residential direct contact criteria are protective of both prenatal and postnatal exposure. Nonresidential direct contact criteria are protective for a pregnant adult receptor.
DWC drinking water criterion
GSI groundwater surface water interface
ID Insufficient data to develop criterion.
NA not available
NLV Not likely to volatilize under most conditions.
SL screening level
TX The Remediation and Redevelopment Division Toxicology Unit has not identified an inhalation toxicity value for the hazardous substance at the date of publication of these values.
VIAIC volatilization to indoor air inhalation criteria
VIAP volatilization to indoor air pathway

Table 3 - Residential Well Sample Data Summary - Poly- and Perfluoroalkyl Substances (PFAS)
2021 Remedial Investigation
City of Cedar Springs, Kent County, Michigan
July 2021

Monitoring		*MCL / Residential DWC* [1]	*GSI Criteria* [1]	*Residential Groundwater VIAIC* [1]	*Water Solubility* [1]	*Flammability and Explosivity SL* [1]	*Residential GW-Shallow VIAP SL* [2]	*Residential GW-Not in Contact VIAP SL* [2]							
Location:									13261 White Creek Avenue	13328 White Creek Avenue	13353 White Creek Avenue	13360 White Creek Avenue	13360 White Creek Avenue	13399 White Creek Avenue	13485 White Creek Avenue
Field Duplicate:													Duplicate		
Well Depth (ft):									141	158	100	Unknown	Unknown	122	35
Laboratory ID:									21060077-02	21072346-02	21060077-03	21060077-01	21060077-12	21060077-04	21060077-05
Collection Date:									05/26/21	07/28/21	05/26/21	05/26/21	05/26/21	05/26/21	05/26/21
Compound	*CAS Number*														
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
9-Chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	756426-58-1	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	763051-92-9	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Hexafluoropropylene oxide dimer acid (HFPO-DA)(GenX)	13252-13-6	*370 (A)*	*NA*	*ID*	*NA*	*NA*	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
N-Ethyl perfluorooctane sulfonamido acetic acid (N-EtFOSAA)	2991-50-6	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	0.41 J
N-Methyl perfluorooctane sulfonamido acetic acid (N-MeFOSAA)	2355-31-9	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Perfluorobutane sulfonic acid (PFBS)	375-73-5	*420 (A)*	*NA*	*ID*	*NA*	*NA*	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	1.9 J
Perfluorodecanoic acid (PFDA)	335-76-2	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Perfluorododecanoic acid (PFDoDA)	307-55-1	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Perfluoroheptanoic acid (PFHpA)	375-85-9	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	1.4 J
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	*51 (A)*	*NA*	*ID*	*NA*	*NA*	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.8
Perfluorohexanoic acid (PFHxA)	307-24-4	*4.00E+05 (A)*	*NA*	*ID*	*NA*	*NA*	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	1.1 J
Perfluorononanoic acid (PFNA)	375-95-1	*6.0 (A)*	*NA*	*ID*	*NA*	*NA*	--	--	2.0 U	2.0 U	2.0 U	2.0 U	0.55 J	2.0 U	2.0 U
Perfluorooctane sulfonic acid (PFOS) (DD)	1763-23-1	*16 (A)*	*12 (X)*	*NLV*	*3,100*	*NA*	*NA*	*NA*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	7.0
Perfluorooctanoic acid (PFOA) (DD)	335-67-1	*8.0 (A)*	*12,000 (X)*	*ID*	*9.50E+09*	*NA*	*TX*	*TX*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	**9.9**
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U

Results expressed in ng/L.
Bolded values exceed an applicable criterion.

Data Qualifiers:
J Estimated value
U Not detected above the given limit.

Footnotes/Abbreviations:
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(DD) Hazardous substance causes developmental effects. Residential direct contact criteria are protective of both prenatal and postnatal exposure.
DWC drinking water criterion
GSI groundwater surface water interface
ID Insufficient data to develop criterion.
MCL maximum contaminant limit
NA not available
NLV Not likely to volatilize under most conditions.
SL screening level
TX The Remediation and Redevelopment Division Toxicology Unit has not identified an inhalation toxicity value for the hazardous substance at the date of publication of these values.
VIAIC volatilization to indoor air inhalation criteria
VIAP volatilization to indoor air pathway

Table 3 - Residential Well Sample Data Summary - Poly- and Perfluoroalkyl Substances (PFAS)
2021 Remedial Investigation
City of Cedar Springs, Kent County, Michigan
July 2021

Monitoring Location: / Field Duplicate: / Well Depth (ft): / Laboratory ID: / Collection Date:		*MCL / Residential DWC [1]*	*GSI Criteria [1]*	*Residential Groundwater VIAIC [1]*	*Water Solubility [1]*	*Flammability and Explosivity SL [1]*	*Residential GW-Shallow VIAP SL [2]*	*Residential GW-Not In Contact VIAP SL [2]*	13485 White Creek Avenue / 35 / 21072346-04 / 07/28/21	13485 White Creek Avenue / Duplicate / 35 / 21072346-05 / 07/28/21	13525 White Creek Avenue / 106 / 21060077-06 / 05/26/21	13550 White Creek Avenue / 82 / 21072346-03 / 07/28/21	13590 White Creek Avenue / 80 / 21060077-07 / 05/26/21	3950 Cedar Rv Drive / 119 / 21072346-06 / 07/28/21	4095 16 Mile Rd / 173 / 21060077-08 / 05/26/21
Compound	*CAS Number*														
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
9-Chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	756426-58-1	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	763051-92-9	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Hexafluoropropylene oxide dimer acid (HFPO-DA)(GenX)	13252-13-6	*370 (A)*	*NA*	*ID*	*NA*	*NA*	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
N-Ethyl perfluorooctane sulfonamido acetic acid (N-EtFOSAA)	2991-50-6	--	--	--	--	--	--	--	1.0 J	1.2 J	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
N-Methyl perfluorooctane sulfonamido acetic acid (N-MeFOSAA)	2355-31-9	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Perfluorobutane sulfonic acid (PFBS)	375-73-5	*420 (A)*	*NA*	*ID*	*NA*	*NA*	--	--	2.6	2.5	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Perfluorodecanoic acid (PFDA)	335-76-2	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Perfluorododecanoic acid (PFDoDA)	307-55-1	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Perfluoroheptanoic acid (PFHpA)	375-85-9	--	--	--	--	--	--	--	1.7 J	1.8 J	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	*51 (A)*	*NA*	*ID*	*NA*	*NA*	--	--	3.7	3.9	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Perfluorohexanoic acid (PFHxA)	307-24-4	*4.00E+05 (A)*	*NA*	*ID*	*NA*	*NA*	--	--	1.2 J	1.4 J	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Perfluorononanoic acid (PFNA)	375-95-1	*6.0 (A)*	*NA*	*ID*	*NA*	*NA*	--	--	2.0 U	0.5 J	2.0 U	2.0 U	2.0 U	2.0 U	0.88 J
Perfluorooctane sulfonic acid (PFOS) (DD)	1763-23-1	*16 (A)*	*12 (X)*	*NLV*	*3,100*	*NA*	*NA*	*NA*	10	9.4	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Perfluorooctanoic acid (PFOA) (DD)	335-67-1	*8.0 (A)*	*12,000 (X)*	*ID*	*9.50E+09*	*NA*	*TX*	*TX*	**13**	**13**	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U

Results expressed in ng/L.
Bolded values exceed an applicable criterion.

Data Qualifiers:
J Estimated value
U Not detected above the given limit.

Footnotes/Abbreviations:
[1] *Part 201 Groundwater Generic Cleanup Criteria and Screening Levels, December 21, 2020.*
[2] *EGLE Volatilization to Indoor Air Pathway Screening Levels, September 4, 2020.*
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(DD) Hazardous substance causes developmental effects. Residential direct contact criteria are protective of both prenatal and postnatal exposure.
DWC drinking water criterion
GSI groundwater surface water interface
ID Insufficient data to develop criterion.
MCL maximum contaminant limit
NA not available
NLV Not likely to volatilize under most conditions.
SL screening level
TX The Remediation and Redevelopment Division Toxicology Unit has not identified an inhalation toxicity value for the hazardous substance at the date of publication of these values.
VIAIC volatilization to indoor air inhalation criteria
VIAP volatilization to indoor air pathway

Table 3 - Residential Well Sample Data Summary - Poly- and Perfluoroalkyl Substances (PFAS)
2021 Remedial Investigation
City of Cedar Springs, Kent County, Michigan
July 2021

Monitoring Location: / Field Duplicate: / Well Depth (ft): / Laboratory ID: / Collection Date:		*MCL / Residential DWC [1]*	*GSI Criteria [1]*	*Residential Groundwater VIAIC [1]*	*Water Solubility [1]*	*Flammability and Explosivity SL [1]*	*Residential GW-Shallow VIAP SL [2]*	*Residential GW-Not In Contact VIAP SL [2]*	4095 16 Mile Rd / Duplicate / 173 / 21060077-14 / 05/26/21	4107 16 Mile Rd / 125 / 21060077-09 / 05/26/21	4141 16 Mile Rd / 140 / 21060077-10 / 05/26/21	4142 16 Mile Rd / Unknown / 21060077-11 / 05/26/21	Field Blank / 21060077-13 / 05/26/21	Field Blank / 21072346-01 / 07/28/21
Compound	*CAS Number*													
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
9-Chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	756426-58-1	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	763051-92-9	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Hexafluoropropylene oxide dimer acid (HFPO-DA)(GenX)	13252-13-6	370 (A)	NA	ID	NA	NA	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
N-Ethyl perfluorooctane sulfonamido acetic acid (N-EtFOSAA)	2991-50-6	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
N-Methyl perfluorooctane sulfonamido acetic acid (N-MeFOSAA)	2355-31-9	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Perfluorobutane sulfonic acid (PFBS)	375-73-5	420 (A)	NA	ID	NA	NA	--	--	2.0 U	2.0 U	2.0 U	0.85 J	2.0 U	2.0 U
Perfluorodecanoic acid (PFDA)	335-76-2	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Perfluorododecanoic acid (PFDoDA)	307-55-1	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Perfluoroheptanoic acid (PFHpA)	375-85-9	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	51 (A)	NA	ID	NA	NA	--	--	2.0 U	2.0 U	2.0 U	0.49 J	2.0 U	2.0 U
Perfluorohexanoic acid (PFHxA)	307-24-4	4.00E+05 (A)	NA	ID	NA	NA	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Perfluorononanoic acid (PFNA)	375-95-1	6.0 (A)	NA	ID	NA	NA	--	--	0.65 J	1.6 J	0.58 J	2.0 U	0.69 J	2.0 U
Perfluorooctane sulfonic acid (PFOS) (DD)	1763-23-1	16 (A)	12 (X)	NLV	3,100	NA	NA	NA	2.0 U	2.0 U	2.0 U	1.4 J	2.0 U	2.0 U
Perfluorooctanoic acid (PFOA) (DD)	335-67-1	8.0 (A)	12,000 (X)	ID	9.50E+09	NA	TX	TX	2.0 U	2.0 U	0.65 J	0.75 J	2.0 U	2.0 U
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	--	--	--	--	--	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U

Results expressed in ng/L.
Bolded values exceed an applicable criterion.

Data Qualifiers:
J Estimated value
U Not detected above the given limit.

Footnotes/Abbreviations:
[1] *Part 201 Groundwater Generic Cleanup Criteria and Screening Levels, December 21, 2020.*
[2] *EGLE Volatilization to Indoor Air Pathway Screening Levels, September 4, 2020.*
(A) State of Michigan drinking water (DW) standard.
(X) Criterion is not protective for surface water used as a DW source.
(DD) Hazardous substance causes developmental effects. Residential direct contact criteria are protective of both prenatal and postnatal exposure.
DWC drinking water criterion
GSI groundwater surface water interface
ID Insufficient data to develop criterion.
MCL maximum contaminant limit
NA not available
NLV Not likely to volatilize under most conditions.
SL screening level
TX The Remediation and Redevelopment Division Toxicology Unit has not identified an inhalation toxicity value for the hazardous substance at the date of publication of these values.
VIAIC volatilization to indoor air inhalation criteria
VIAP volatilization to indoor air pathway

Appendix 1

fishbeck, thompson, carr & huber
engineers • scientists • architects

Grand Rapids (616) 575-3824
Lansing (517) 627-1141
Kalamazoo (616) 349-3717
Farmington Hills (248) 324-2090

BOREHOLE LOG

BORING/WELL ID: **GSI - 1d**

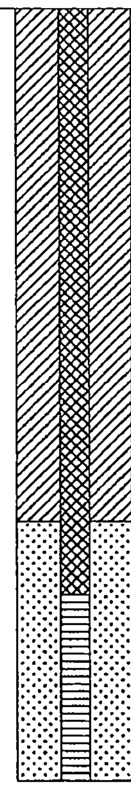
TOTAL DEPTH (ft.): **31'**

PROJECT: Cedar Springs Former Lagoon Closure	**START DATE:** 11/24/03	**DRILLING CO.:** Steams Drilling
SITE LOCATION: Cedar Springs, MI	**END DATE:** 11/24/03	**DRILLER:** John Verett
PROJECT NO.: G02126D	**TOC ELEV.:** 833.52	**RIG TYPE:** CME 1050
PROJECT MANAGER: Tim K. Patterson	**GROUND ELEV.:** 830.88	**METHOD OF DRILLING:** 4 1/4" HSA
LOGGED BY: Tim K. Patterson	**STATIC WATER LVL.:** 826.69	**SAMPLING METHODS:** Split barrel sampler

NOTES: GSI-1d is located 9' north of GSI-1soil boring, between 13421 and 13447 White Creek Ave, 18 ft. east of Cedar Creek.

▼ Static Water Level

DESCRIPTION	PID ppm	GRAPHIC LOG	DEPTH (ft. bgl)	Static Water Level	Sample/ Revovery	Sample ID	Blows Counts	WELL CONSTRUCTION DETAIL
TOPSOIL: Dark brown sandy loam, fine grained, trace silt, trace natural organics (roots), dry to moist			0					
SAND: Sand, 100%, tan, fine grained, trace fine gravel, trace clay, dry			2					2-inch daimeter PVC casing (+2.5' - 16')
			4	▼				
Sand, 100%, brown, coarse to fine grained, trace coarse to fine gravel, moist					2.0		5-8-9-11	Bentonite
			6					
			8					
Sand, 100%, brown, coarse to fine grained, wet			10		1.5		4-4-4-6	
CLAY: Clay, 100%, brown to gray, slightly plastic, stiff, trace silt, dry			12					
SAND: Sand, 100%, brown, medium to fine grained, trace fine gravel, wet			14		2.0		4-8-11-12	Global #6 sand pack
			16					
			18					2-inch diameter, slot-10, PVC screen (16' - 21')
			20		2.0		3-5-4-4	
TILL: Clay, 80%, gray, slightly plastic to non-plastic, stiff; Sand, 20%, gray, fine grained, trace silt, trace fine gravel, dry			22					
			24		1.5		14-46-80-80	
			26					
			28					
			30		1.5		15-24-34-37	



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Farmington Hills (248) 324-2090

BOREHOLE LOG

BORING/WELL ID: GSI-2d

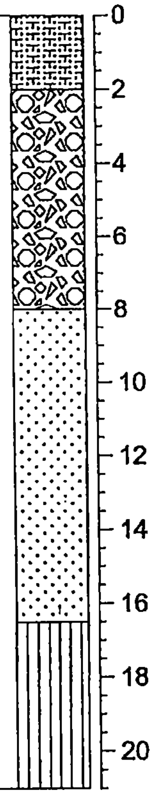
TOTAL DEPTH (ft.): 21'

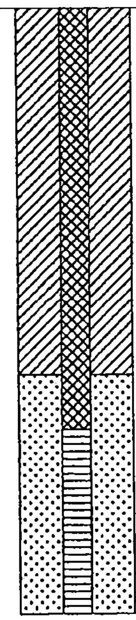
PROJECT: Cedar Springs Former Lagoon Closure	**START DATE:** 11/25/03	**DRILLING CO.:** Stearns Drilling
SITE LOCATION: Cedar Springs, MI	**END DATE:** 11/25/03	**DRILLER:** John Verett
PROJECT NO.: G02126D	**TOC ELEV.:** 832.51	**RIG TYPE:** CME 1050
PROJECT MANAGER: Tim K. Patterson	**GROUND ELEV.:** 830.28	**METHOD OF DRILLING:** 4 1/4" HSA
LOGGED BY: Tim K. Patterson	**STATIC WATER LVL.:** 828.83	**SAMPLING METHODS:** Split barrel sampler

NOTES: GSI-2d is located 10' east of Cedar Creek and 25' west of White Creek Ave., 10' south of drain.

▼ Static Water Level

DESCRIPTION	PID ppm	GRAPHIC LOG	DEPTH (ft. bgl)	Static Water Level	Sample/ Revovery	Sample ID	Blows Counts	WELL CONSTRUCTION DETAIL
TOPSOIL: Dark brown sandy loam, fine grained, trace silt, trace natural organics (roots), moist			0–2	▼				2-inch daimeter PVC casing (+2.5' - 11.5')
GRAVEL: Gravel, 80%, Coarse to fine; Sand, 10%, brownish gray, fine grained; Clay, 10%, brownish gray, wet			2–8		1.0		5-9-10-9	Bentonite
SAND: Sand, 100%, brown, fine grained, wet			8–16.5		2.0		3-6-8-8	Global #8 sand pack
					2.0		5-17-26-31	2-inch diameter, slot-10, PVC screen (11.5' - 16.5')
TILL: Clay, 100%, gray, slightly plastic, stiff, trace fine sand, trace fine gravel, dry			16.5–21		2.0		5-12-16-20	





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engineers ◦ scientists ◦ architects

6090 East Fulton Ave.
Ada, Michigan 49301
Ph: (616) 676-3824
Fax: (616) 676-8173

BOREHOLE LOG

BORING/WELL ID: MW-6A
TOTAL DEPTH (ft.): 20'

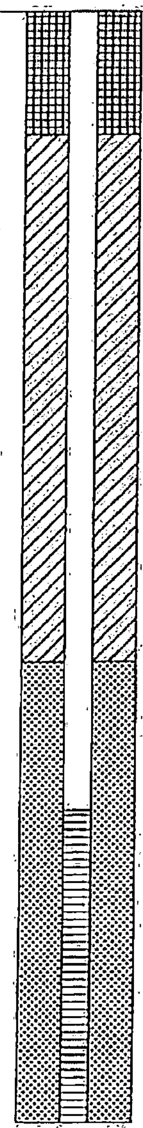
PROJECT: Cedar Springs/Lagoon Closure	**START DATE:** 12/8/99	**DRILLING CO.:** Stearns Drilling Co.
SITE LOCATION: Cedar Springs, Michigan	**END DATE:** 12/8/99	**DRILLER:** Duane / Bob
PROJECT NO.: F95342m	**TOC ELEV.:** - -	**RIG TYPE:** CME 850
PROJECT MANAGER: Ron C. Waybrant	**GROUND ELEV.:** - -	**METHOD OF DRILLING:** 4.25" I.D. Hollow Stem Auger
LOGGED BY: Bruce E. Gillett	**STATIC WATER LVL.:** - -	**SAMPLING METHODS:** Split Spoon

NOTES: - -

▼ Static Water Level

DESCRIPTION	PID ppm	GRAPHIC LOG	DEPTH (ft. bgl)	Static Water Level	Sample/ Revovery	Sample ID	Blows Counts
TOPSOIL: with some Sand, dark brown, dry			0				
SAND: fine grained, tan, loose, moist			2				
			4		1.00'		2-4-5-5
SAND AND GRAVEL: fine to coarse grained Sand, fine Gravel (trace of coarse), loose, moist							
Note: Cobbles encountered during drilling			6				
			8		0.75'		6-10-5-3
SAND AND GRAVEL: fine to coarse grained Sand, fine Gravel (trace of coarse), loose, wet			10				
			12				
SAND AND GRAVEL: fine to coarse grained Sand, fine Gravel (trace of coarse), loose, wet			14		1.50'		2-5-5-7
			16				
			18		1.50'		4-7-14-17
CLAY: with some Silt, trace of fine Sand, slight trace of fine Gravel, gray, dense, moist			20				

WELL CONSTRUCTION DETAIL



2" diameter PVC casing (+2.5 - 13.0 feet)

bentonite grout

sand pack

2" diameter 10 -slot PVC screen (13.0 - 18.0 feet)

BOREHOLE LOG

fishbeck

BORING/WELL ID: **MW-08A**

TOTAL DEPTH (ft.): **45**

PROJECT: Former Wastewater Treatment Lagoon	**START DATE:** 03/09/21	**DRILLING CO.:** Job Site Services
SITE LOCATION: Cedar Springs, MI	**END DATE:** 03/09/21	**DRILLER:** Bob
PROJECT NO.: 201460	**TOC ELEV.:**	**RIG TYPE:** Mobile Drill EQ0022
PROJECT MANAGER: T. Patterson	**GROUND ELEV.:**	**METHOD OF DRILLING:** Hollow Stem Auger
LOGGED BY: L. Chwojnicki	**STATIC WATER LVL.:** ~7.7' bgs	**SAMPLING METHODS:** 5' Macrocore

NOTES: NR - no recovery

Static Water Level

DESCRIPTION	PID ppm	GRAPHIC LOG	DEPTH (ft. bgl)	Static Water Level	Sample/ Revovery	Sample ID	Blow Counts	WELL CONSTRUCTION DETAIL
SAND: Medium grained with trace fine grains (5%). Tan/brown, well sorted, moist.			0–5		1.8'			2" PVC Casing with 3.1' ags Stick-up; 3/8" Bentonite Chips Hole Plug (0–4); Quick Grout (4–20)
SANDY CLAY: Clay (70%); Sand (30%). Rusty brown, high plasticity, medium cohesiveness, stiff, slightly moist.			5–7		3.0'			
CLAY WITH SAND: Clay (80%); some Sand (20%). Light brown, medium plasticity, medium cohesiveness, loose, moist.			7–9.5	▼ (~7.7)				
SAND: Medium grained. Tan, very well sorted, moist. SAND: Same as above. Saturated.			9.5–15		4.5'			
SAND WITH GRAVEL: Sand (60%), medium grained; Gravel (40%), angular. Tan, poorly sorted, saturated.			15–17		2.0'			
SAND: Medium grained. Tan, well sorted, saturated.			17–20					
SAND: Medium to coarse grained (75/25). Tan, poorly sorted, saturated.			20–		3.5'			Sand

BOREHOLE LOG

fishbeck

BORING/WELL ID: MW-08A

TOTAL DEPTH (ft.): 45

PROJECT: Former Wastewater Treatment Lagoon	**START DATE:** 03/09/21	**DRILLING CO.:** Job Site Services
SITE LOCATION: Cedar Springs, MI	**END DATE:** 03/09/21	**DRILLER:** Bob
PROJECT NO.: 201460	**TOC ELEV.:**	**RIG TYPE:** Mobile Drill EQ0022
PROJECT MANAGER: T. Patterson	**GROUND ELEV.:**	**METHOD OF DRILLING:** Hollow Stem Auger
LOGGED BY: L. Chwojnicki	**STATIC WATER LVL.:** ~7.7' bgs	**SAMPLING METHODS:** 5' Macrocore

NOTES: NR - no recovery

Static Water Level

DESCRIPTION	PID ppm	GRAPHIC LOG	DEPTH (ft. bgl)	Static Water Level	Sample/ Revovery	Sample ID	Blow Counts	WELL CONSTRUCTION DETAIL
SAND: Medium to coarse grained (20/80) with trace cobbles (angular). Tan, poorly sorted, saturated.			24					2" PVC Casing; Sand
SAND: Fine grained. Tan, well sorted, saturated.			26, 28		5.0'			2" PVC Screen (10 Slot)
GRAVEL AND SAND: Gravel (50%), angular; Sand (50%), fine grained. Saturated.			30					
NOTE: No Recovery: Unconsolidated Gravel is probable.			32, 34		NR			
SAND: Fine grained; trace Gravel, angular. Tan, poorly sorted.								
CLAY: (90%); little Silt (10%). Gray to light brown, medium plasticity, high cohesiveness.			36, 38		4.5'			
CLAY: (95%); trace Silt (5%). Gray/brown, high plasticity, high cohesiveness, moist.			40, 42, 44		5.0'			

Appendix 2

Water Well And Pump Record

Completion is required under authority of Part 127 Act 368 PA 1978.
Failure to comply is a misdemeanor.

Wellogic

Import ID:

Tax No:	**Permit No:**	**County:** Kent	**Township:** Solon

Well ID: 41000016625

Elevation:

Latitude: 43.209328

Longitude: -85.573034

Method of Collection: Interpolation-Map

Town/Range:	**Section:**	**Well Status:**	**WSSN:**	**Source ID/Well No:**
10N 11W	35	Active		

Distance and Direction from Road Intersection:
0.25 MILE NORTH OF 16 MILE ROAD; 600 FEET WEST OF WHITE CREEK AVENUE ON THE SOUTH OF R.V. DRIVE CUL-DE-SAC.

Well Owner: MARK HUGHEY

Well Address:
13437 WHITE CREEK
Cedar Springs, MI 49319

Owner Address:
5250 D-10
CEDAR SPRINGS, MI 49319

Drilling Method: Cable Tool
Well Depth: 119.00 ft. **Well Use:** Household
Well Type: New **Date Completed:** 9/3/2004

Casing Type: Steel - unknown **Height:**
Casing Joint: Threaded & coupled
Casing Fitting: Drive shoe

Diameter: 4.00 in. to 111.00 ft. depth
3.00 in. to 119.00 ft. depth

Borehole:

Pump Installed: Yes **Pump Installation Only:** No
Pump Installation Date: **HP:** 1.50
Manufacturer: Aermotor **Pump Type:** Submersible
Model Number: A+20-150 **Pump Capacity:** 20 GPM
Drop Pipe Length: 80.00 ft. **Pump Voltage:**
Drop Pipe Diameter: **Drilling Record ID:**
Draw Down Seal Used: No

Pressure Tank Installed: Yes
Pressure Tank Type: Unknown
Manufacturer: Well-X-Trol
Model Number: WX-103 **Tank Capacity:**
Pressure Relief Valve Installed: No

Static Water Level: 2.00 ft. Below Grade
Well Yield Test: **Yield Test Method:** Plunger
Pumping level 4.00 ft. after 2.00 hrs. at 70 GPM

Formation Description	Thickness	Depth to Bottom
Topsoil	4.00	4.00
Brown Clay W/Stones Hard	5.00	9.00
Gravel W/Cobbles	14.00	23.00
Gray Clay Hard	64.00	87.00
Sand Clay Silt Fine	17.00	104.00
Gray Clay W/Stones Hard	4.00	108.00
Brown Sand & Gravel Coarse	11.00	119.00

Screen Installed: Yes **Filter Packed:** No
Screen Diameter: 3.00 in. **Blank:** 2.00 ft. Above
Screen Material Type: Stainless steel-wire wrapped
Screen Installation Type: Telescoped

Slot	Length	Set Between
10.00	8.00 ft.	111.00 ft. and 119.00 ft.

Fittings: Neoprene packer

Well Grouted: Yes **Grouting Method:** Unknown

Grouting Material	Bags	Additives	Depth
Bentonite dry granular	8.00	None	0.00 ft. to 65.00 ft.

Wellhead Completion: Pitless adapter, 12 inches above grade

Nearest Source of Possible Contamination:

Type	Distance	Direction
Septic tank	75 ft.	Southwest

Geology Remarks:

Drilling Machine Operator Name: MIKE WAHLFIELD
Employment: Employee

Contractor Type: Water Well Drilling Contractor **Reg No:** 41-0395
Business Name: WAHLFIELD DRILLING COMPANY INC
Business Address:

Water Well Contractor's Certification

This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor **Date**

General Remarks:

Other Remarks:

Water Well And Pump Record

Completion is required under authority of Part 127 Act 368 PA 1978.
Failure to comply is a misdemeanor.

Wellogic

Import ID:

Tax No:	Permit No:	County: Kent	Township: Solon

Town/Range:	Section:	Well Status:	WSSN:	Source ID/Well No:
10N 11W	36	Active		

Well ID: 41000045032

Elevation:

Latitude: 43.20578

Longitude: -85.57052

Method of Collection: Interpolation-Map

Distance and Direction from Road Intersection:
155' NROHT OF 16 MILE RD. - EAST OF WHITE CREEK

Well Owner: PLYMOUTH TANK CO.

Well Address:
16 MILE RD. & WHITE CREEK
CEDAR SPRINGS, MI

Owner Address:
16 MILE RD. & WHITE CREEK
CEDAR SPRINGS, MI

Drilling Method: Rotary
Well Depth: 180.00 ft. **Well Use:** Household
Well Type: New **Date Completed:** 7/2/1991
Casing Type: Steel - unknown **Height:** 1.00 ft. above grade
Casing Joint: Threaded & coupled
Casing Fitting:

Diameter: 4.00 in. to 168.00 ft. depth

Borehole:

Pump Installed: No
Pressure Tank Installed: No
Pressure Relief Valve Installed:

Static Water Level: 8.75 ft.
Well Yield Test: **Yield Test Method:** Unknown
8.00 hrs. at 25 GPM

Unrestricted Flow Rate:

Formation Description	Thickness	Depth to Bottom
Topsoil Sandy	1.00	1.00
Sand & Gravel	24.00	25.00
Gray Clay	80.00	105.00
Gray Clay Sandy	14.00	119.00
Sand	31.00	150.00
Gravel	30.00	180.00

Screen Installed: Yes **Filter Packed:** Unknown
Screen Diameter: 4.00 in. **Blank:**
Screen Material Type: Stainless steel-wire wrapped
Screen Installation Type: Unknown

Slot	Length	Set Between
15.00	5.00 ft.	168.00 ft. and 173.00 ft.

Fittings: Other

Geology Remarks:

Grouting Material	Bags	Additives	Depth
Neat cement		Unknown	0.00 ft. to 160.00 ft.

Wellhead Completion: 12 inches above grade

Nearest Source of Possible Contamination:

Type	Distance	Direction
None		

Drilling Machine Operator Name:
Employment: Unknown

Contractor Type: Water Well Drilling Contractor **Reg No:**
Business Name: RAYMER COMPANY INC.
Business Address: 3311 THREE MILE RD N.W., GRAND RAPIDS, MI

Water Well Contractor's Certification

This well and/or pump installation was performed under my registration.

Signature of Registered Contractor **Date**

General Remarks: WELL DRILLER REGISTRATION NUMBER ENDING IN 0384
Other Remarks: Screen Fittings:SCREWED

Water Well And Pump Record

Completion is required under authority of Part 127 Act 368 PA 1978.
Failure to comply is a misdemeanor.

Wellogic

Import ID:

Tax No:	Permit No:	County: Kent	Township: Ada

Well ID: 41000015750

Elevation: 850 ft.
Latitude: 43.205849
Longitude: -85.568235
Method of Collection: Interpolation-Map

Town/Range:	Section:	Well Status:	WSSN:	Source ID/Well No:
10N 11W	36	Active		

Distance and Direction from Road Intersection:
.25 MILE EAST OF WHITE CREEK ON NORTH SIDE OF 16 MILE ROAD

Well Owner: BOB & JOYCE KELLEY

Well Address:
4107 16 MILE RD
CEDAR SPRINGS, MI 49319

Owner Address:
4107 16 MILE RD
CEDAR SPRINGS, MI 49319

Drilling Method: Rotary
Well Depth: 125.00 ft. **Well Use:** Household
Well Type: Replacement **Date Completed:** 5/6/2004

Casing Type: PVC plastic **Height:**
Casing Joint: Unknown
Casing Fitting: None

Diameter: 5.00 in. to 125.00 ft. depth

Borehole: 8.50 in. to 125.00 ft. depth

Pump Installed: Yes **Pump Installation Only:** No
Pump Installation Date: **HP:** 0.50
Manufacturer: Berkeley **Pump Type:** Submersible
Model Number: 10KT051215 **Pump Capacity:** 10 GPM
Drop Pipe Length: 65.00 ft. **Pump Voltage:**
Drop Pipe Diameter: **Drilling Record ID:**
Draw Down Seal Used: No

Pressure Tank Installed: Yes
Pressure Tank Type: Unknown
Manufacturer: Well-Rite-Flexcon
Model Number: WR-120 **Tank Capacity:** 33.0 Gallons
Pressure Relief Valve Installed: No

Static Water Level: 12.00 ft. Below Grade
Well Yield Test: **Yield Test Method:** Air
Pumping level 80.00 ft. after 2.00 hrs. at 50 GPM

Formation Description	Thickness	Depth to Bottom
Sand	21.00	21.00
Sand Water Bearing	6.00	27.00
Gray Clay	68.00	95.00
Gray Sand & Clay	16.00	111.00
Sand Water Bearing	14.00	125.00

Screen Installed: Yes **Filter Packed:** Yes
Screen Diameter: 5.00 in. **Blank:**
Screen Material Type: PVC-slotted
Screen Installation Type: Attached

Slot	Length	Set Between
15.00	10.00 ft.	115.00 ft. and 125.00 ft.

Fittings: None

Well Grouted: Yes **Grouting Method:** Unknown

Grouting Material	Bags	Additives	Depth
Bentonite slurry	14.00	None	0.00 ft. to 115.00 ft.

Geology Remarks:

Wellhead Completion: Pitless adapter

Drilling Machine Operator Name: JOHN SCHMID
Employment: Employee

Nearest Source of Possible Contamination:

Type	Distance	Direction
Septic tank	100 ft.	West

Contractor Type: Water Well Drilling Contractor **Reg No:** 41-1561
Business Name: TRI NORTHERN WELL DRILLING
Business Address:

Abandoned Well Plugged: Yes

Casing Diameter: 1.25 in. **Casing Removed:** No
Plugging Material: Bentonite chips/pellets
No. of Bags: 0.50 **Well Depth:** 25 ft.

Water Well Contractor's Certification

This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor **Date**

General Remarks: GROUT TO BOTTOM OF WATER LINE; GROUT WEIGHT 9.5
Other Remarks:

Water Well And Pump Record

Completion is required under authority of Part 127 Act 368 PA 1978.
Failure to comply is a misdemeanor.

Wellogic

Import ID:

Tax No: | **Permit No:** W-12-41-0005 | **County:** Kent | **Township:** Solon

Well ID: 41000023662

Town/Range: 10N 11W | **Section:** 36 | **Well Status:** Active | **WSSN:** 2097341 | **Source ID/Well No:** 001

Elevation:
Latitude: 43.20562
Longitude: -85.56734
Method of Collection: GPS Std Positioning Svc SA Off

Distance and Direction from Road Intersection:

Well Owner: TRUSS TECHNOLOGIES

Well Address:
4141 16 MILE RD NE
CEDAR SPRINGS, MI 49319

Owner Address:
P.O. BOX A
CEDAR SPRINGS, MI 49319

Drilling Method: Rotary
Well Depth: 140.00 ft. **Well Use:** Type II public
Well Type: Replacement **Date Completed:** 8/2/2012

Casing Type: PVC plastic **Height:** 1.00 ft. above grade
Casing Joint: Solvent welded/glued
Casing Fitting: None

Diameter: 5.00 in. to 135.00 ft. depth SDR: 17.00

Borehole: 8.50 in. to 140.00 ft. depth

Pump Installed: Yes **Pump Installation Only:** No
Pump Installation Date: 8/2/2012 **HP:** 1.50
Manufacturer: Grundfos **Pump Type:** Submersible
Model Number: 22SQE15 **Pump Capacity:** 25 GPM
Drop Pipe Length: 80.00 ft. **Pump Voltage:** 230
Drop Pipe Diameter: 1.25 in. **Drilling Record ID:**
Draw Down Seal Used: No

Pressure Tank Installed: Yes
Pressure Tank Type: Diaphragm/bladder
Manufacturer: Well-X-Trol
Model Number: WX 105 **Tank Capacity:** 5.0 Gallons
Pressure Relief Valve Installed: Yes

Static Water Level: 22.00 ft. Below Grade
Well Yield Test: **Yield Test Method:** Air
Pumping level 120.00 ft. after 4.00 hrs. at 40 GPM

Formation Description	Thickness	Depth to Bottom
Clay	9.00	9.00
Sand & Gravel	25.00	34.00
Clay	62.00	96.00
Sand Fine	6.00	102.00
Clay Sandy	21.00	123.00
Clay	3.00	126.00
Sand Coarse	14.00	140.00

Screen Installed: Yes **Filter Packed:** Yes
Screen Diameter: 3.00 in. **Blank:**
Screen Material Type: Stainless steel-wire wrapped
Screen Installation Type: Attached

Slot	Length	Set Between
15.00	5.00 ft.	135.00 ft. and 140.00 ft.

Fittings: Other

Well Grouted: Yes **Grouting Method:** Grout pipe outside casing

Grouting Material	Bags	Additives	Depth
Neat cement	28.00	None	0.00 ft. to 125.00 ft.

Geology Remarks:

Wellhead Completion: Pitless adapter, 12 inches above grade

Drilling Machine Operator Name: CURT SILLIMAN
Employment: Employee
Pump Installer: ED ROBINSON

Nearest Source of Possible Contamination:

Type	Distance	Direction
Storm sewer	45 ft.	North-Northeast

Contractor Type: Water Well Drilling Contractor **Reg No:** 41-2351
Business Name: NORTH KENT WELL & PUMP
Business Address: 6085 17 MILE RD NE, CEDAR SPRINGS, MI, 49319

Abandoned Well Plugged: Yes

Latitude: 43.20564 **Longitude:** -85.56712
Casing Diameter: 4 in. **Casing Removed:** No
Plugging Material: Neat cement
No. of Bags: 16.00 **Well Depth:** 220 ft.

Water Well Contractor's Certification

This well/pump was constructed under my supervision and I hereby certify that the work complies with Part 127 Act 368 PA 1978 and the well code.

Signature of Registered Contractor **Date**

General Remarks: TWO WELL DRILLER'S ATTEMPTS TO REMOVE PUMP WERE UNSUCCESSFUL. PUMP DRIVEN TO TOP OF SCREEN AND WELL GROUTED BACK UP TO SURFACE

Other Remarks: Screen Fittings:BUSHING

Water Well And Pump Record

Completion is required under authority of Part 127 Act 368 PA 1978.
Failure to comply is a misdemeanor.

Wellogic

Import ID:

Tax No: 41-02-35-400-030-031	Permit No:	County: Kent	Township: Solon

Well ID: 41000008016

Elevation:

Latitude: 43.20604597

Longitude: -85.571897

Method of Collection: Address Matching-Nearest Intersection

Town/Range:	Section:	Well Status:	WSSN:	Source ID/Well No:
10N 11W	35			

Distance and Direction from Road Intersection: NW CORNER OF WHITE CREEK AVE. & 16 MILE

Well Owner: STERK BRO. REDI-MIX

Well Address: 13261 WHITE CREEK

Owner Address: 584 50TH ST., SW

Drilling Method: Rotary
Well Depth: 141.00 ft. **Well Use:** Other
Well Type: New **Date Completed:** 5/12/2000

Casing Type: Unknown **Height:**
Casing Joint: Unknown
Casing Fitting: None

Diameter: 6.00 in. to 138.00 ft. depth

Borehole: 11.75 in. to 141.00 ft. depth

Pump Installed: Yes **Pump Installation Only:** No
Pump Installation Date: **HP:** 7.50
Manufacturer: Webtrol **Pump Type:** Submersible
Model Number: 3 PHASE **Pump Capacity:** 150 GPM
Drop Pipe Length: 126.00 ft. **Pump Voltage:**
Drop Pipe Diameter: **Drilling Record ID:**
Draw Down Seal Used: No

Pressure Tank Installed: Yes
Pressure Tank Type: Galvanized steel
Manufacturer: Unknown
Model Number: **Tank Capacity:** 100.0 Gallons
Pressure Relief Valve Installed: No

Static Water Level: 20.00 ft. Below Grade
Well Yield Test: **Yield Test Method:** Air
at 150 GPM

Formation Description	Thickness	Depth to Bottom
Sand & Gravel	40.00	40.00
Gray Clay	78.00	118.00
Gravel & Clay Gray	3.00	121.00
Sand Coarse	20.00	141.00

Screen Installed: Yes **Filter Packed:** Yes
Screen Diameter: 6.00 in. **Blank:** *u
Screen Material Type:
Screen Installation Type: Unknown

Slot	Length	Set Between
15.00	15.00 ft.	138.00 ft. and 141.00 ft.

Fittings: Unknown

Well Grouted: Yes **Grouting Method:** Unknown

Grouting Material	Bags	Additives	Depth
Other	32.00	None	0.00 ft. to 128.00 ft.

Wellhead Completion: Pitless adapter, 12 inches above grade

Nearest Source of Possible Contamination:

Type	Distance	Direction
Unknown		

Geology Remarks:

Drilling Machine Operator Name: DAVE POORE
Employment: Employee

Contractor Type: Water Well Drilling Contractor **Reg No:** 41-1987
Business Name: BRASS-MAR WATER WELLS, INC.
Business Address: 13427 FRUIT RIDGE AVE, Kent City

Water Well Contractor's Certification

This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor **Date**

General Remarks: AS OF 5/17/00, SEPTIC SYSTEM NOT INSTALLED; SCREEN TYPE: STAINLESS;

Other Remarks: Well Use:PRODUCTION, Grouting Material 1:QUICK GROUT

Water Well And Pump Record

Completion is required under authority of Part 127 Act 368 PA 1978.
Failure to comply is a misdemeanor.

Wellogic

Import ID:

Tax No: **Permit No:**

County: Kent **Township:** Solon

Town/Range: 10N 11W **Section:** 36 **Well Status:** Active **WSSN:** **Source ID/Well No:**

Well ID: 41000027759

Elevation:

Latitude: 43.20785

Longitude: -85.56918

Method of Collection: GPS Std Positioning Svc SA Off

Distance and Direction from Road Intersection:
891' NORTH AND 505' WEST FROM INTERSECTION OF 16 MILE RD NE AND WHITE CREEK AVE

Well Owner: MATT BAILEY

Well Address:
13328 WHITE CREEK AVE
CEDAR SPRINGS, MI 49319

Owner Address:
13328 WHITE CREEK AVE
CEDAR SPRINGS, MI 49319

Drilling Method: Rotary
Well Depth: 158.00 ft. **Well Use:** Type III public
Well Type: New **Date Completed:** 4/13/2017

Casing Type: PVC plastic **Height:** 1.00 ft. above grade
Casing Joint: Solvent welded/glued
Casing Fitting: Centralizer

Diameter: 5.00 in. to 138.00 ft. depth SDR: 21.00

Borehole: 8.50 in. to 162.00 ft. depth

Pump Installed: Yes **Pump Installation Only:** No
Pump Installation Date: 1/19/2017 **HP:** 5.00
Manufacturer: Grundfos **Pump Type:** Submersible
Model Number: 77S50-10 **Pump Capacity:** 77 GPM
Drop Pipe Length: 102.00 ft. **Pump Voltage:** 230
Drop Pipe Diameter: 2.00 in. **Drilling Record ID:**
Draw Down Seal Used: No

Pressure Tank Installed: Yes
Pressure Tank Type: Diaphragm/bladder
Manufacturer: Challenger
Model Number: PC66 **Tank Capacity:** 20.0 Gallons
Pressure Relief Valve Installed: Yes

Static Water Level: 13.00 ft. Below Grade
Well Yield Test: **Yield Test Method:** Air
Pumping level 156.00 ft. after 1.00 hrs. at 300 GPM

Formation Description	Thickness	Depth to Bottom
Topsoil	2.00	2.00
Sand & Gravel	31.00	33.00
Gray Clay	92.00	125.00
Sand W/Clay Gray	8.00	133.00
Gray Clay	5.00	138.00
Sand W/Gravel Coarse	24.00	162.00

Screen Installed: Yes **Filter Packed:** Yes
Screen Diameter: 5.00 in. **Blank:**
Screen Material Type: PVC-slotted
Screen Installation Type: Attached

Slot	Length	Set Between
0.15	20.00 ft.	138.00 ft. and 158.00 ft.

Fittings: Coupling

Well Grouted: Yes **Grouting Method:** Grout pipe outside casing

Grouting Material	Bags	Additives	Depth
Bentonite slurry	12.00	None	0.00 ft. to 132.00 ft.

Geology Remarks:

Wellhead Completion: Pitless adapter

Nearest Source of Possible Contamination:

Type	Distance	Direction
Septic tank	98 ft.	West

Drilling Machine Operator Name: JASON BROWN
Employment: Employee
Pump Installer: BRENT WINGER

Contractor Type: Water Well Drilling Contractor **Reg No:** 41-2028
Business Name: Buer Well Drilling Inc
Business Address: 239 E Main St, Caledonia, MI, 49316

Water Well Contractor's Certification

This well and/or pump installation was performed under my registration.

Signature of Registered Contractor **Date**

General Remarks:
Other Remarks:

Water Well And Pump Record

Completion is required under authority of Part 127 Act 368 PA 1978.
Failure to comply is a misdemeanor.

Wellogic

Import ID:

Tax No:	Permit No:	County: Kent			Township: Solon	
		Town/Range: 10N 11W	Section: 35	Well Status: Active	WSSN:	Source ID/Well No:

Well ID: 41000016727

Elevation: 840 ft.
Latitude: 43.207883
Longitude: -85.571841
Method of Collection: Interpolation-Map

Distance and Direction from Road Intersection:
2/10 MI NORTH OF 16 MI RD; 50 YDS WEST OF WHITE CREEK

Well Owner: TAILORED BLDG SYS

Well Address:
13353 WHITE CREEK AVE
Cedar Springs, MI 49319

Owner Address:
550 KIRTLAND ST SW
GRAND RAPIDS, MI 49507

Drilling Method: Rotary
Well Depth: 100.00 ft. **Well Use:** Type III public
Well Type: New **Date Completed:** 9/28/2004

Casing Type: PVC plastic **Height:**
Casing Joint: Unknown
Casing Fitting: None

Diameter: 5.00 in. to 100.00 ft. depth

Borehole: 8.50 in. to 100.00 ft. depth

Pump Installed: Yes **Pump Installation Only:** No
Pump Installation Date: **HP:** 0.50
Manufacturer: Goulds **Pump Type:** Submersible
Model Number: **Pump Capacity:** 12 GPM
Drop Pipe Length: 65.00 ft. **Pump Voltage:**
Drop Pipe Diameter: **Drilling Record ID:**
Draw Down Seal Used: No

Pressure Tank Installed: Yes
Pressure Tank Type: Unknown (Buried)
Manufacturer: Well-X-Trol
Model Number: 202UG **Tank Capacity:** 40.0 Gallons
Pressure Relief Valve Installed: No

Static Water Level: 11.00 ft. Below Grade
Well Yield Test: **Yield Test Method:** Air
Pumping level 65.00 ft. after 2.00 hrs. at 45 GPM

Formation Description	Thickness	Depth to Bottom
Sand & Gravel	34.00	34.00
Gray Clay	55.00	89.00
Sand Water Bearing	11.00	100.00

Screen Installed: Yes **Filter Packed:** Yes
Screen Diameter: 5.00 in. **Blank:**
Screen Material Type: PVC-slotted
Screen Installation Type: Attached

Slot	Length	Set Between
15.00	10.00 ft.	90.00 ft. and 100.00 ft.

Fittings: Unknown

Well Grouted: Yes **Grouting Method:** Unknown

Grouting Material	Bags	Additives	Depth
Bentonite slurry	13.00	None	0.00 ft. to 90.00 ft.

Geology Remarks:

Wellhead Completion: Pitless adapter, 12 inches above grade

Drilling Machine Operator Name: JOHN SCHMID
Employment: Employee

Nearest Source of Possible Contamination:

Type	Distance	Direction
Septic tank	100 ft.	Southeast

Contractor Type: Water Well Drilling Contractor **Reg No:** 41-1561
Business Name: TRI NORTHERN WELL DRLG
Business Address:

Water Well Contractor's Certification

This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor **Date**

General Remarks: GROUT TO BOTTOM OF WATER LINE GROUT WEIGHT 9.5
Other Remarks:

Water Well And Pump Record

Completion is required under authority of Part 127 Act 368 PA 1978.
Failure to comply is a misdemeanor.

Wellogic

Import ID:

Tax No:	Permit No:	County: Kent	Township: Solon

Well ID: 41000029746

Elevation:

Latitude: 43.20889

Longitude: -85.57142

Method of Collection: GPS Std Positioning Svc SA Off

Town/Range:	Section:	Well Status:	WSSN:	Source ID/Well No:
10N 11W	35	Active		

Distance and Direction from Road Intersection:
west of white creek

Well Owner: car care center

Well Address:
13399 white creek
cedar springs, MI

Owner Address:
13399 white creek
cedar springs, MI 49307

Drilling Method: Rotary
Well Depth: 122.00 ft. **Well Use:** Household
Well Type: Replacement **Date Completed:** 6/15/2018

Casing Type: PVC plastic **Height:** 1.00 ft. above grade
Casing Joint: Solvent welded/glued
Casing Fitting:

Diameter: 5.00 in. to 117.00 ft. depth SDR: 21.00

Borehole: 8.50 in. to 122.00 ft. depth

Pump Installed: Yes **Pump Installation Only:** No
Pump Installation Date: 7/5/2018 **HP:** 0.50
Manufacturer: AquaDuty **Pump Type:** Submersible
Model Number: 10fb05 **Pump Capacity:** 10 GPM
Drop Pipe Length: 20.00 ft. **Pump Voltage:** 230
Drop Pipe Diameter: 1.00 in. **Drilling Record ID:**
Draw Down Seal Used: No

Pressure Tank Installed: Yes
Pressure Tank Type: Diaphragm/bladder
Manufacturer: Flex-Lite-Flexcon
Model Number: fl-7 **Tank Capacity:** 22.0 Gallons
Pressure Relief Valve Installed: Yes

Static Water Level: 6.00 ft. Below Grade
Well Yield Test: **Yield Test Method:** Air
Pumping level 100.00 ft. after 2.00 hrs. at 50 GPM

Formation Description	Thickness	Depth to Bottom
Sand	36.00	36.00
Clay	78.00	114.00
Sand	14.00	128.00

Screen Installed: Yes **Filter Packed:** Yes
Screen Diameter: 3.00 in. **Blank:**
Screen Material Type: Stainless steel-well point
Screen Installation Type: Attached

Slot	Length	Set Between
18.00	5.00 ft.	117.00 ft. and 122.00 ft.

Fittings: Coupling

Well Grouted: Yes **Grouting Method:** Grout pipe outside casing

Grouting Material	Bags	Additives	Depth
Bentonite slurry	11.00	None	0.00 ft. to 107.00 ft.

Geology Remarks:

Wellhead Completion: Pitless adapter, 12 inches above grade

Drilling Machine Operator Name: glenn merlington
Employment: Employee
Pump Installer: ed robinson

Nearest Source of Possible Contamination:

Type	Distance	Direction
Sanitary sewer	98 ft.	West

Contractor Type: Water Well Drilling Contractor **Reg No:** 41-2351
Business Name: North Kent Well and Pump Inc
Business Address: 6085 17 Mile Road, Cedar Springs, MI, 49319

Abandoned Well Plugged: Yes

Latitude: 43.20895 **Longitude:** -85.57144
Casing Diameter: 4 in. **Casing Removed:** No
Plugging Material: Bentonite chips/pellets
No. of Bags: 4.00 **Well Depth:** 31 ft.

Water Well Contractor's Certification

This well and/or pump installation was performed under my registration.

Signature of Registered Contractor **Date**

General Remarks:

Other Remarks:

Water Well And Pump Record

Completion is required under authority of Part 127 Act 368 PA 1978.
Failure to comply is a misdemeanor.

Wellogic

Import ID:

Tax No:	Permit No:	County: Kent	Township: Solon

Well ID: 41000019123

Elevation:

Latitude: 43.21188

Longitude: -85.57087

Method of Collection: GPS Std Positioning Svc SA Off

Town/Range:	Section:	Well Status:	WSSN:	Source ID/Well No:
10N 11W	36	Active		COMPASS COACH

Distance and Direction from Road Intersection:
100 FT EAST OF WHITE CREEK, 1/2 MILE NORTH OF 16 MILE RD.

Well Owner: TRENT STANGE/CO. DAVE BARNETT

Well Address:
13500 WHITE CREEK
CEDAR SPRINGS, MI 49319

Owner Address:
12505 NORTHLAND DR.
CEDAR SPRINGS, MI 49319

Drilling Method: Rotary
Well Depth: 82.00 ft. **Well Use:** Other
Well Type: New **Date Completed:** 4/20/2006

Casing Type: PVC plastic **Height:** 1.00 ft. above grade
Casing Joint: Solvent welded/glued
Casing Fitting: Centralizer

Diameter: 5.00 in. to 72.00 ft. depth

Borehole: 8.75 in. to 82.00 ft. depth

Pump Installed: Yes **Pump Installation Only:** No
Pump Installation Date: 5/26/2006 **HP:** 1.50
Manufacturer: Grundfos **Pump Type:** Submersible
Model Number: 25S07-5 **Pump Capacity:** 25 GPM
Drop Pipe Length: 60.00 ft. **Pump Voltage:**
Drop Pipe Diameter: 1.25 in. **Drilling Record ID:**
Draw Down Seal Used: No

Pressure Tank Installed: Yes
Pressure Tank Type: Diaphragm/bladder
Manufacturer: Amtrol
Model Number: WX-105-PS **Tank Capacity:** 5.3 Gallons
Pressure Relief Valve Installed: Yes

Static Water Level: 4.00 ft. Above Grade (Flowing)
Well Yield Test: **Yield Test Method:** Air
Pumping level 40.00 ft. after 4.00 hrs. at 100 GPM

Unrestricted Flow Rate:

Formation Description	Thickness	Depth to Bottom
Sand & Gravel W/Stones	17.00	17.00
Gray Clay	44.00	61.00
Sand & Gravel	21.00	82.00

Screen Installed: Yes **Filter Packed:** Yes
Screen Diameter: 4.50 in. **Blank:**
Screen Material Type: PVC-slotted
Screen Installation Type: Attached

Slot	Length	Set Between
12.00	10.00 ft.	72.00 ft. and 82.00 ft.

Fittings: Coupling

Geology Remarks:

Grouting Material	Bags	Additives	Depth
Bentonite slurry	6.00	Other	0.00 ft. to 68.00 ft.

Wellhead Completion: Pitless adapter, 12 inches above grade

Nearest Source of Possible Contamination:

Type	Distance	Direction
Septic tank	600 ft.	East

Drilling Machine Operator Name: JAKE WARNER
Employment: Employee
Pump Installer: CURT VISSER

Contractor Type: Water Well Drilling Contractor **Reg No:** 70-2055
Business Name: Raymer Company
Business Address: 1357 Comstock Street, Marne, MI, 49435

Water Well Contractor's Certification

This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor **Date**

General Remarks:

Other Remarks: Well Use:COMMERCIAL, Grouting Additive 1:EZ-MUD

Water Well And Pump Record

Completion is required under authority of Part 127 Act 368 PA 1978.
Failure to comply is a misdemeanor.

Wellogic

Import ID: 41101135007

Tax No: | **Permit No:** | **County:** Kent | **Township:** Solon

Town/Range:	Section:	Well Status:	WSSN:	Source ID/Well No:
10N 11W	35			

Well ID: 41000007457

Elevation: 833 ft.
Latitude: 43.2114884648
Longitude: -85.5714452712
Method of Collection: Interpolation-Map

Distance and Direction from Road Intersection:
0.25 MI N OF 16 MILE RD ON W SIDE OF WHTIE CREEK RD

Well Owner: BISHOP, CLARA

Well Address:
13525 WHITE CREEK RD
CEDAR SPRINGS, MI 49319

Owner Address:
13525 WHITE CREEK RD
CEDAR SPRINGS, MI 49319

Drilling Method: Cable Tool
Well Depth: 106.00 ft. **Well Use:** Household
Well Type: Replacement **Date Completed:** 7/2/1988

Casing Type: Steel - black **Height:**
Casing Joint: Welded
Casing Fitting: None

Diameter: 4.00 in. to 102.00 ft. depth

Borehole:

Pump Installed: Yes **Pump Installation Only:** No
Pump Installation Date: **HP:**
Manufacturer: Flint & Walling **Pump Type:** Submersible
Model Number: **Pump Capacity:** 0 GPM
Drop Pipe Length: 65.00 ft. **Pump Voltage:**
Drop Pipe Diameter: **Drilling Record ID:**
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Relief Valve Installed: No

Static Water Level: 3.00 ft. Below Grade
Well Yield Test: **Yield Test Method:** Unknown

Formation Description	Thickness	Depth to Bottom
Topsoil	3.00	3.00
Sand Coarse	15.00	18.00
Gravel	10.00	28.00
Sand Coarse	30.00	58.00
Gravel	12.00	70.00
Sand Medium To Coarse	25.00	95.00
Sand Coarse Wet/Moist	11.00	106.00

Screen Installed: Yes **Filter Packed:** No
Screen Diameter: 3.00 in. **Blank:** 0.00 ft. Above
Screen Material Type:
Screen Installation Type: Unknown

Slot	Length	Set Between
10.00	4.00 ft.	102.00 ft. and 106.00 ft.

Fittings: Neoprene packer

Well Grouted: No

Geology Remarks:

Wellhead Completion: Pitless adapter

Drilling Machine Operator Name:
Employment: Unknown

Nearest Source of Possible Contamination:

Type	Distance	Direction
Septic tank	50 ft.	West

Contractor Type: Unknown **Reg No:**
Business Name:
Business Address:

Abandoned Well Plugged: Yes

Casing Removed:

Water Well Contractor's Certification

This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor **Date**

General Remarks:
Other Remarks:

Water Well And Pump Record

Completion is required under authority of Part 127 Act 368 PA 1978.
Failure to comply is a misdemeanor.

Wellogic

Import ID:

Tax No:	Permit No:	County: Kent	Township: Solon

Well ID: 41000013951

Elevation:

Latitude: 43.212312

Longitude: -85.570921

Method of Collection: Address Matching-House Number

Town/Range:	Section:	Well Status:	WSSN:	Source ID/Well No:
10N 11W	36	Active		

Distance and Direction from Road Intersection: 1/2 MILE S OF 17 MILE RD APPROX 150 FT E OF WHITE CREEK AVE

Well Owner: JIM AND VICKI COVELL

Well Address: 13590 WHITE CREEK AVE CEDAR SPRINGS, MI 49319

Owner Address: 13590 WHITE CREEK AVE CEDAR SPRINGS, MI 49319

Drilling Method: Cable Tool
Well Depth: 80.00 ft. **Well Use:** Household
Well Type: Replacement **Date Completed:** 6/12/2003

Casing Type: Steel - unknown **Height:**
Casing Joint: Threaded & coupled
Casing Fitting: Drive shoe

Diameter: 6.00 in. to 47.00 ft. depth
4.00 in. to 80.00 ft. depth

Borehole:

Pump Installed: Yes **Pump Installation Only:** No
Pump Installation Date: **HP:** 0.50
Manufacturer: A.Y. McDonald **Pump Type:** Submersible
Model Number: **Pump Capacity:** 12 GPM
Drop Pipe Length: 40.00 ft. **Pump Voltage:**
Drop Pipe Diameter: **Drilling Record ID:**
Draw Down Seal Used: No

Pressure Tank Installed: Yes
Pressure Tank Type: Unknown
Manufacturer: Well-X-Trol
Model Number: WX202 **Tank Capacity:**
Pressure Relief Valve Installed: No

Static Water Level: 0.50 ft. Below Grade
Well Yield Test: **Yield Test Method:** Plunger
Pumping level 0.50 ft. after 1.50 hrs. at 50 GPM

Formation Description	Thickness	Depth to Bottom
Topsoil	2.00	2.00
Sand & Gravel Silty	19.00	21.00
Hardpan W/Clay W/Gravel	4.00	25.00
Gray Clay Hard	33.00	58.00
Sand	9.00	67.00
Brown Clay Soft	1.00	68.00
Sand Coarse	8.00	76.00
Gravel Coarse	4.00	80.00

Screen Installed: Yes **Filter Packed:** No
Screen Diameter: 3.00 in. **Blank:** 1.50 ft. Above
Screen Material Type: Stainless steel-wire wrapped
Screen Installation Type: Telescoped

Slot	Length	Set Between
12.00	8.00 ft.	72.00 ft. and 80.00 ft.

Fittings: Neoprene packer

Well Grouted: Yes **Grouting Method:** Unknown

Grouting Material	Bags	Additives	Depth
Bentonite dry granular	10.00	None	0.00 ft. to 70.00 ft.

Geology Remarks:

Wellhead Completion: Pitless adapter

Drilling Machine Operator Name: MIKE WAHLFIELD
Employment: Employee

Nearest Source of Possible Contamination:

Type	Distance	Direction
Septic tank	50 ft.	Northeast

Contractor Type: Water Well Drilling Contractor **Reg No:** 41-0395
Business Name: WAHLFIELD DRILLING CO
Business Address:

Abandoned Well Plugged: Yes

Casing Removed:

Water Well Contractor's Certification

This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor **Date**

General Remarks: DOUBLE CASED WELL BOTH CASINGS WERE GROUTED ACCORDING TO MDEQ SPECS

Other Remarks:

Appendix 3

ALS Environmental

22-Mar-2021

Penni Mahler
Fishbeck, Inc.
1515 Arboretum Dr SE
Grand Rapids, MI 49546

Re: **Cedar Springs /PFAS (201460)** Work Order: **21031444**

Dear Penni,

ALS Environmental received 7 samples on 15-Mar-2021 03:00 PM for the analyses presented in the following report.

The analytical data provided relates directly to the samples received by ALS Environmental - Holland and for only the analyses requested.

Sample results are compliant with industry accepted practices and Quality Control results achieved laboratory specifications. Any exceptions are noted in the Case Narrative, or noted with qualifiers in the report or QC batch information. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained from ALS Environmental. Samples will be disposed in 30 days unless storage arrangements are made.

The total number of pages in this report is 28.

If you have any questions regarding this report, please feel free to contact me:

ADDRESS: 3352 128th Avenue, Holland, MI, USA
PHONE: +1 (616) 399-6070 FAX: +1 (616) 399-6185

Sincerely,

Ehrland Bosworth

Electronically approved by: Ehrland Bosworth

Ehrland Bosworth
Project Manager

ALS Group, USA

Date: 22-Mar-21

Client: Fishbeck, Inc.
Project: Cedar Springs /PFAS (201460)
Work Order: **21031444**

Work Order Sample Summary

Lab Samp ID	Client Sample ID	Matrix	Tag Number	Collection Date	Date Received	Hold
21031444-01	CS-21-03-MW-6A(I)	Water		3/12/2021 12:15	3/15/2021 15:00	☐
21031444-02	CS-21-03-MW-8A(I)	Water		3/12/2021 10:00	3/15/2021 15:00	☐
21031444-03	CS-21-03-MW-8A(D)	Water		3/12/2021 10:00	3/15/2021 15:00	☐
21031444-04	CS-21-03-GSI-1D(I)	Water		3/12/2021 13:02	3/15/2021 15:00	☐
21031444-05	CS-21-03-GSI-2D(I)	Water		3/12/2021 11:30	3/15/2021 15:00	☐
21031444-06	CS-21-03-SW-01(I)	Water		3/12/2021 10:20	3/15/2021 15:00	☐
21031444-07	CS-21-03-QCFB	Water		3/12/2021 09:30	3/15/2021 15:00	☐

ALS Group, USA

Date: 22-Mar-21

Client: Fishbeck, Inc.
Project: Cedar Springs /PFAS (201460)
WorkOrder: 21031444

QUALIFIERS, ACRONYMS, UNITS

Qualifier	Description
*	Value exceeds Regulatory Limit
**	Estimated Value
a	Analyte is non-accredited
B	Analyte detected in the associated Method Blank above the Reporting Limit
E	Value above quantitation range
H	Analyzed outside of Holding Time
Hr	BOD/CBOD - Sample was reset outside Hold Time, value should be considered estimated.
J	Analyte is present at an estimated concentration between the MDL and Report Limit
ND	Not Detected at the Reporting Limit
O	Sample amount is > 4 times amount spiked
P	Dual Column results percent difference > 40%
R	RPD above laboratory control limit
S	Spike Recovery outside laboratory control limits
U	Analyzed but not detected above the MDL
X	Analyte was detected in the Method Blank between the MDL and Reporting Limit, sample results may exhibit background or reagent contamination at the observed level.

Acronym	Description
DUP	Method Duplicate
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LOD	Limit of Detection (see MDL)
LOQ	Limit of Quantitation (see PQL)
MBLK	Method Blank
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
PQL	Practical Quantitation Limit
RPD	Relative Percent Difference
TDL	Target Detection Limit
TNTC	Too Numerous To Count
A	APHA Standard Methods
D	ASTM
E	EPA
SW	SW-846 Update III

Units Reported	Description
ng/L	Nanograms per Liter

Client:	Fishbeck, Inc.
Project:	Cedar Springs /PFAS (201460)
Work Order:	21031444

Case Narrative

Samples for the above noted Work Order were received on 03/15/2021. The attached "Sample Receipt Checklist" documents the status of custody seals, container integrity, preservation, and temperature compliance.

Samples were analyzed according to the analytical methodology previously transmitted in the "Work Order Acknowledgement". Methodologies are also documented in the "Analytical Result" section for each sample. Quality control results are listed in the "QC Report" section. Sample association for the reported quality control is located at the end of each batch summary. If applicable, results are appropriately qualified in the Analytical Result and QC Report sections. The "Qualifiers" section documents the various qualifiers, units, and acronyms utilized in reporting. A copy of the laboratory's scope of accreditation is available upon request.

With the following exceptions, all sample analyses achieved analytical criteria.

Extractable Organics:
Batch 173579, Method E537 Mod, Sample CS-21-03-MW-6A(I) (21031444-01A): One or more surrogate recoveries were above the upper control limits. The sample was non-detect, therefore, no qualification is needed. (13C2-FtS 4:2, 13C2-FtS 6:2)

Batch 173579, Method E537 Mod, Sample CS-21-03-GSI-1D(I) (21031444-04A): One or more surrogate recoveries were above the upper control limits. The sample was non-detect, therefore, no qualification is needed. (13C2-FtS 4:2, 13C2-FtS 6:2)

Batch 173579, Method E537 Mod, Sample CS-21-03-GSI-2D(I) (21031444-05A): One or more surrogate recoveries were above the upper control limits. The sample was non-detect, therefore, no qualification is needed. (13C2-FtS 4:2, 13C2-FtS 6:2)

Batch 173579, Method E537 Mod, Sample CS-21-03-SW-01(I) (21031444-06A): One or more surrogate recoveries were above the upper control limits. The sample was non-detect, therefore, no qualification is needed. (13C2-FtS 4:2, 13C2-FtS 6:2)

Batch 173579, Method E537 Mod, Sample CS-21-03-QCFB (21031444-07A): One or more surrogate recoveries were above the upper control limits. The sample was non-detect, therefore, no qualification is needed. (13C2-PFTeA)

No other deviations or anomalies were noted.

ALS Group, USA

Date: *22-Mar-21*

Client: Fishbeck, Inc.
Project: Cedar Springs /PFAS (201460)
Sample ID: CS-21-03-MW-6A(I)
Collection Date: 3/12/2021 12:15 PM

Work Order: 21031444
Lab ID: 21031444-01
Matrix: WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
PFAS BY EPA 537 MODIFIED		Method: **E537 MOD**			Prep: E537 Mod / 3/17/21		Analyst: **SK**
Fluorotelomer Sulphonic Acid 4:2 (FtS 4:2)	U		0.88	4.7	ng/L	1	3/17/2021 15:51
Fluorotelomer Sulphonic Acid 6:2 (FtS 6:2)	U		0.62	4.7	ng/L	1	3/17/2021 15:51
Fluorotelomer Sulphonic Acid 8:2 (FtS 8:2)	U		1.1	4.7	ng/L	1	3/17/2021 15:51
Perfluorobutanesulfonic Acid (PFBS)	**2.6**	J	**0.33**	**4.7**	**ng/L**	1	3/17/2021 15:51
Perfluorobutanoic Acid (PFBA)	**9.0**		**2.4**	**4.7**	**ng/L**	1	3/17/2021 15:51
Perfluorodecanesulfonic Acid (PFDS)	U		1.3	4.7	ng/L	1	3/17/2021 15:51
Perfluorodecanoic Acid (PFDA)	U		1.2	4.7	ng/L	1	3/17/2021 15:51
Perfluorododecanoic Acid (PFDoA)	U		1.3	4.7	ng/L	1	3/17/2021 15:51
Perfluoroheptanesulfonic Acid (PFHpS)	**1.9**	J	**0.53**	**4.7**	**ng/L**	1	3/17/2021 15:51
Perfluoroheptanoic Acid (PFHpA)	**9.4**		**0.41**	**4.7**	**ng/L**	1	3/17/2021 15:51
Perfluorohexanesulfonic Acid (PFHxS)	**12**		**0.35**	**4.7**	**ng/L**	1	3/17/2021 15:51
Perfluorohexanoic Acid (PFHxA)	**11**		**1.1**	**4.7**	**ng/L**	1	3/17/2021 15:51
Perfluorononanesulfonic Acid (PFNS)	U		0.46	4.7	ng/L	1	3/17/2021 15:51
Perfluorononanoic Acid (PFNA)	**2.0**	J	**0.81**	**4.7**	**ng/L**	1	3/17/2021 15:51
Perfluorooctanesulfonamide (PFOSA)	U		0.67	4.7	ng/L	1	3/17/2021 15:51
Perfluorooctanesulfonic Acid (PFOS)	**19**		**0.84**	**1.9**	**ng/L**	1	3/17/2021 15:51
Perfluorooctanoic Acid (PFOA)	**49**		**0.66**	**1.9**	**ng/L**	1	3/17/2021 15:51
Perfluoropentanesulfonic Acid (PFPeS)	**1.3**	J	**0.52**	**4.7**	**ng/L**	1	3/17/2021 15:51
Perfluoropentanoic Acid (PFPeA)	**7.8**		**1.2**	**4.7**	**ng/L**	1	3/17/2021 15:51
Perfluorotetradecanoic Acid (PFTeA)	U		2.5	4.7	ng/L	1	3/17/2021 15:51
Perfluorotridecanoic Acid (PFTriA)	U		0.72	4.7	ng/L	1	3/17/2021 15:51
Perfluoroundecanoic Acid (PFUnA)	U		0.91	4.7	ng/L	1	3/17/2021 15:51
N-Ethylperfluorooctanesulfonamidoacetic Acid	**2.4**	J	**0.59**	**4.7**	**ng/L**	1	3/17/2021 15:51
N-Methylperfluorooctanesulfonamidoacetic Acid	U		0.60	4.7	ng/L	1	3/17/2021 15:51
Hexafluoropropylene oxide dimer acid (HFPO-DA)	U		1.1	4.7	ng/L	1	3/17/2021 15:51
4,8-Dioxa-3H-perfluorononanoic Acid (DONA)	U		0.53	4.7	ng/L	1	3/17/2021 15:51
11Cl-Pf3OUdS	U		0.44	4.7	ng/L	1	3/17/2021 15:51
9Cl-PF3ONS	U		0.42	4.7	ng/L	1	3/17/2021 15:51
Surr: 13C2-FtS 4:2	*293*	S		*50-150*	*%REC*	1	3/17/2021 15:51
Surr: 13C2-FtS 6:2	*171*	S		*50-150*	*%REC*	1	3/17/2021 15:51

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *22-Mar-21*

Client: Fishbeck, Inc.
Project: Cedar Springs /PFAS (201460)
Sample ID: CS-21-03-MW-6A(I)
Collection Date: 3/12/2021 12:15 PM

Work Order: 21031444
Lab ID: 21031444-01
Matrix: WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
Surr: 13C2-FtS 8:2	*120*			*50-150*	*%REC*	1	3/17/2021 15:51
Surr: 13C2-PFDA	*89.2*			*50-150*	*%REC*	1	3/17/2021 15:51
Surr: 13C2-PFDoA	*106*			*50-150*	*%REC*	1	3/17/2021 15:51
Surr: 13C2-PFHxA	*113*			*50-150*	*%REC*	1	3/17/2021 15:51
Surr: 13C2-PFTeA	*120*			*50-150*	*%REC*	1	3/17/2021 15:51
Surr: 13C2-PFUnA	*101*			*50-150*	*%REC*	1	3/17/2021 15:51
Surr: 13C3-HFPO-DA	*142*			*50-150*	*%REC*	1	3/17/2021 15:51
Surr: 13C3-PFBS	*110*			*50-150*	*%REC*	1	3/17/2021 15:51
Surr: 13C4-PFBA	*121*			*50-150*	*%REC*	1	3/17/2021 15:51
Surr: 13C4-PFHpA	*113*			*50-150*	*%REC*	1	3/17/2021 15:51
Surr: 13C4-PFOA	*111*			*50-150*	*%REC*	1	3/17/2021 15:51
Surr: 13C4-PFOS	*121*			*50-150*	*%REC*	1	3/17/2021 15:51
Surr: 13C5-PFNA	*109*			*50-150*	*%REC*	1	3/17/2021 15:51
Surr: 13C5-PFPeA	*115*			*50-150*	*%REC*	1	3/17/2021 15:51
Surr: 13C8-FOSA	*124*			*50-150*	*%REC*	1	3/17/2021 15:51
Surr: 18O2-PFHxS	*128*			*50-150*	*%REC*	1	3/17/2021 15:51
Surr: d5-N-EtFOSAA	*114*			*50-150*	*%REC*	1	3/17/2021 15:51
Surr: d3-N-MeFOSAA	*108*			*50-150*	*%REC*	1	3/17/2021 15:51

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *22-Mar-21*

Client: Fishbeck, Inc.
Project: Cedar Springs /PFAS (201460)
Sample ID: CS-21-03-MW-8A(I)
Collection Date: 3/12/2021 10:00 AM

Work Order: 21031444
Lab ID: 21031444-02
Matrix: WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
PFAS BY EPA 537 MODIFIED			Method: **E537 MOD**		Prep: E537 Mod / 3/17/21		Analyst: **SK**
Fluorotelomer Sulphonic Acid 4:2 (FtS 4:2)	U		0.87	4.6	ng/L	1	3/17/2021 16:01
Fluorotelomer Sulphonic Acid 6:2 (FtS 6:2)	U		0.61	4.6	ng/L	1	3/17/2021 16:01
Fluorotelomer Sulphonic Acid 8:2 (FtS 8:2)	U		1.0	4.6	ng/L	1	3/17/2021 16:01
Perfluorobutanesulfonic Acid (PFBS)	**0.65**	J	**0.32**	**4.6**	**ng/L**	1	3/17/2021 16:01
Perfluorobutanoic Acid (PFBA)	U		2.4	4.6	ng/L	1	3/17/2021 16:01
Perfluorodecanesulfonic Acid (PFDS)	U		1.3	4.6	ng/L	1	3/17/2021 16:01
Perfluorodecanoic Acid (PFDA)	U		1.1	4.6	ng/L	1	3/17/2021 16:01
Perfluorododecanoic Acid (PFDoA)	U		1.3	4.6	ng/L	1	3/17/2021 16:01
Perfluoroheptanesulfonic Acid (PFHpS)	U		0.52	4.6	ng/L	1	3/17/2021 16:01
Perfluoroheptanoic Acid (PFHpA)	U		0.41	4.6	ng/L	1	3/17/2021 16:01
Perfluorohexanesulfonic Acid (PFHxS)	**0.88**	J	**0.34**	**4.6**	**ng/L**	1	3/17/2021 16:01
Perfluorohexanoic Acid (PFHxA)	U		1.1	4.6	ng/L	1	3/17/2021 16:01
Perfluorononanesulfonic Acid (PFNS)	U		0.46	4.6	ng/L	1	3/17/2021 16:01
Perfluorononanoic Acid (PFNA)	U		0.81	4.6	ng/L	1	3/17/2021 16:01
Perfluorooctanesulfonamide (PFOSA)	U		0.66	4.6	ng/L	1	3/17/2021 16:01
Perfluorooctanesulfonic Acid (PFOS)	U		0.83	1.9	ng/L	1	3/17/2021 16:01
Perfluorooctanoic Acid (PFOA)	U		0.65	1.9	ng/L	1	3/17/2021 16:01
Perfluoropentanesulfonic Acid (PFPeS)	U		0.51	4.6	ng/L	1	3/17/2021 16:01
Perfluoropentanoic Acid (PFPeA)	U		1.2	4.6	ng/L	1	3/17/2021 16:01
Perfluorotetradecanoic Acid (PFTeA)	U		2.4	4.6	ng/L	1	3/17/2021 16:01
Perfluorotridecanoic Acid (PFTriA)	U		0.71	4.6	ng/L	1	3/17/2021 16:01
Perfluoroundecanoic Acid (PFUnA)	U		0.90	4.6	ng/L	1	3/17/2021 16:01
N-Ethylperfluorooctanesulfonamidoacetic Acid	U		0.58	4.6	ng/L	1	3/17/2021 16:01
N-Methylperfluorooctanesulfonamidoacetic Acid	U		0.60	4.6	ng/L	1	3/17/2021 16:01
Hexafluoropropylene oxide dimer acid (HFPO-DA)	U		1.1	4.6	ng/L	1	3/17/2021 16:01
4,8-Dioxa-3H-perfluorononanoic Acid (DONA)	U		0.52	4.6	ng/L	1	3/17/2021 16:01
11Cl-Pf3OUdS	U		0.43	4.6	ng/L	1	3/17/2021 16:01
9Cl-PF3ONS	U		0.41	4.6	ng/L	1	3/17/2021 16:01
Surr: 13C2-FtS 4:2	*122*			*50-150*	*%REC*	1	3/17/2021 16:01
Surr: 13C2-FtS 6:2	*108*			*50-150*	*%REC*	1	3/17/2021 16:01
Surr: 13C2-FtS 8:2	*120*			*50-150*	*%REC*	1	3/17/2021 16:01

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *22-Mar-21*

Client: Fishbeck, Inc.
Project: Cedar Springs /PFAS (201460)
Sample ID: CS-21-03-MW-8A(I)
Collection Date: 3/12/2021 10:00 AM

Work Order: 21031444
Lab ID: 21031444-02
Matrix: WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
Surr: 13C2-PFDA	*110*			*50-150*	*%REC*	1	3/17/2021 16:01
Surr: 13C2-PFDoA	*86.4*			*50-150*	*%REC*	1	3/17/2021 16:01
Surr: 13C2-PFHxA	*117*			*50-150*	*%REC*	1	3/17/2021 16:01
Surr: 13C2-PFTeA	*102*			*50-150*	*%REC*	1	3/17/2021 16:01
Surr: 13C2-PFUnA	*94.0*			*50-150*	*%REC*	1	3/17/2021 16:01
Surr: 13C3-HFPO-DA	*131*			*50-150*	*%REC*	1	3/17/2021 16:01
Surr: 13C3-PFBS	*95.9*			*50-150*	*%REC*	1	3/17/2021 16:01
Surr: 13C4-PFBA	*118*			*50-150*	*%REC*	1	3/17/2021 16:01
Surr: 13C4-PFHpA	*99.8*			*50-150*	*%REC*	1	3/17/2021 16:01
Surr: 13C4-PFOA	*138*			*50-150*	*%REC*	1	3/17/2021 16:01
Surr: 13C4-PFOS	*105*			*50-150*	*%REC*	1	3/17/2021 16:01
Surr: 13C5-PFNA	*94.3*			*50-150*	*%REC*	1	3/17/2021 16:01
Surr: 13C5-PFPeA	*95.2*			*50-150*	*%REC*	1	3/17/2021 16:01
Surr: 13C8-FOSA	*101*			*50-150*	*%REC*	1	3/17/2021 16:01
Surr: 18O2-PFHxS	*95.5*			*50-150*	*%REC*	1	3/17/2021 16:01
Surr: d5-N-EtFOSAA	*85.0*			*50-150*	*%REC*	1	3/17/2021 16:01
Surr: d3-N-MeFOSAA	*99.5*			*50-150*	*%REC*	1	3/17/2021 16:01

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *22-Mar-21*

Client: Fishbeck, Inc.
Project: Cedar Springs /PFAS (201460)
Sample ID: CS-21-03-MW-8A(D)
Collection Date: 3/12/2021 10:00 AM

Work Order: 21031444
Lab ID: 21031444-03
Matrix: WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
PFAS BY EPA 537 MODIFIED			Method: **E537 MOD**		Prep: E537 Mod / 3/17/21		Analyst: **SK**
Fluorotelomer Sulphonic Acid 4:2 (FtS 4:2)	U		0.88	4.7	ng/L	1	3/17/2021 16:12
Fluorotelomer Sulphonic Acid 6:2 (FtS 6:2)	U		0.63	4.7	ng/L	1	3/17/2021 16:12
Fluorotelomer Sulphonic Acid 8:2 (FtS 8:2)	U		1.1	4.7	ng/L	1	3/17/2021 16:12
Perfluorobutanesulfonic Acid (PFBS)	**0.57**	J	**0.33**	**4.7**	**ng/L**	1	3/17/2021 16:12
Perfluorobutanoic Acid (PFBA)	U		2.5	4.7	ng/L	1	3/17/2021 16:12
Perfluorodecanesulfonic Acid (PFDS)	U		1.3	4.7	ng/L	1	3/17/2021 16:12
Perfluorodecanoic Acid (PFDA)	U		1.2	4.7	ng/L	1	3/17/2021 16:12
Perfluorododecanoic Acid (PFDoA)	U		1.3	4.7	ng/L	1	3/17/2021 16:12
Perfluoroheptanesulfonic Acid (PFHpS)	U		0.53	4.7	ng/L	1	3/17/2021 16:12
Perfluoroheptanoic Acid (PFHpA)	U		0.42	4.7	ng/L	1	3/17/2021 16:12
Perfluorohexanesulfonic Acid (PFHxS)	**0.42**	J	**0.35**	**4.7**	**ng/L**	1	3/17/2021 16:12
Perfluorohexanoic Acid (PFHxA)	U		1.1	4.7	ng/L	1	3/17/2021 16:12
Perfluorononanesulfonic Acid (PFNS)	U		0.47	4.7	ng/L	1	3/17/2021 16:12
Perfluorononanoic Acid (PFNA)	U		0.82	4.7	ng/L	1	3/17/2021 16:12
Perfluorooctanesulfonamide (PFOSA)	U		0.67	4.7	ng/L	1	3/17/2021 16:12
Perfluorooctanesulfonic Acid (PFOS)	U		0.84	1.9	ng/L	1	3/17/2021 16:12
Perfluorooctanoic Acid (PFOA)	U		0.67	1.9	ng/L	1	3/17/2021 16:12
Perfluoropentanesulfonic Acid (PFPeS)	U		0.52	4.7	ng/L	1	3/17/2021 16:12
Perfluoropentanoic Acid (PFPeA)	U		1.2	4.7	ng/L	1	3/17/2021 16:12
Perfluorotetradecanoic Acid (PFTeA)	U		2.5	4.7	ng/L	1	3/17/2021 16:12
Perfluorotridecanoic Acid (PFTriA)	U		0.73	4.7	ng/L	1	3/17/2021 16:12
Perfluoroundecanoic Acid (PFUnA)	U		0.92	4.7	ng/L	1	3/17/2021 16:12
N-Ethylperfluorooctanesulfonamidoacetic Acid	U		0.59	4.7	ng/L	1	3/17/2021 16:12
N-Methylperfluorooctanesulfonamidoacetic Acid	U		0.61	4.7	ng/L	1	3/17/2021 16:12
Hexafluoropropylene oxide dimer acid (HFPO-DA)	U		1.1	4.7	ng/L	1	3/17/2021 16:12
4,8-Dioxa-3H-perfluorononanoic Acid (DONA)	U		0.53	4.7	ng/L	1	3/17/2021 16:12
11Cl-Pf3OUdS	U		0.44	4.7	ng/L	1	3/17/2021 16:12
9Cl-PF3ONS	U		0.42	4.7	ng/L	1	3/17/2021 16:12
Surr: 13C2-FtS 4:2	*146*			*50-150*	*%REC*	1	3/17/2021 16:12
Surr: 13C2-FtS 6:2	*144*			*50-150*	*%REC*	1	3/17/2021 16:12
Surr: 13C2-FtS 8:2	*108*			*50-150*	*%REC*	1	3/17/2021 16:12

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *22-Mar-21*

Client: Fishbeck, Inc.
Project: Cedar Springs /PFAS (201460)
Sample ID: CS-21-03-MW-8A(D)
Collection Date: 3/12/2021 10:00 AM

Work Order: 21031444
Lab ID: 21031444-03
Matrix: WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
Surr: 13C2-PFDA	*87.6*			*50-150*	*%REC*	1	3/17/2021 16:12
Surr: 13C2-PFDoA	*101*			*50-150*	*%REC*	1	3/17/2021 16:12
Surr: 13C2-PFHxA	*96.6*			*50-150*	*%REC*	1	3/17/2021 16:12
Surr: 13C2-PFTeA	*126*			*50-150*	*%REC*	1	3/17/2021 16:12
Surr: 13C2-PFUnA	*102*			*50-150*	*%REC*	1	3/17/2021 16:12
Surr: 13C3-HFPO-DA	*118*			*50-150*	*%REC*	1	3/17/2021 16:12
Surr: 13C3-PFBS	*107*			*50-150*	*%REC*	1	3/17/2021 16:12
Surr: 13C4-PFBA	*108*			*50-150*	*%REC*	1	3/17/2021 16:12
Surr: 13C4-PFHpA	*89.6*			*50-150*	*%REC*	1	3/17/2021 16:12
Surr: 13C4-PFOA	*104*			*50-150*	*%REC*	1	3/17/2021 16:12
Surr: 13C4-PFOS	*121*			*50-150*	*%REC*	1	3/17/2021 16:12
Surr: 13C5-PFNA	*84.5*			*50-150*	*%REC*	1	3/17/2021 16:12
Surr: 13C5-PFPeA	*108*			*50-150*	*%REC*	1	3/17/2021 16:12
Surr: 13C8-FOSA	*114*			*50-150*	*%REC*	1	3/17/2021 16:12
Surr: 18O2-PFHxS	*104*			*50-150*	*%REC*	1	3/17/2021 16:12
Surr: d5-N-EtFOSAA	*112*			*50-150*	*%REC*	1	3/17/2021 16:12
Surr: d3-N-MeFOSAA	*101*			*50-150*	*%REC*	1	3/17/2021 16:12

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *22-Mar-21*

Client: Fishbeck, Inc.
Project: Cedar Springs /PFAS (201460)
Sample ID: CS-21-03-GSI-1D(I)
Collection Date: 3/12/2021 01:02 PM

Work Order: 21031444
Lab ID: 21031444-04
Matrix: WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
PFAS BY EPA 537 MODIFIED			Method: **E537 MOD**		Prep: E537 Mod / 3/17/21		Analyst: **SK**
Fluorotelomer Sulphonic Acid 4:2 (FtS 4:2)	U		0.87	4.6	ng/L	1	3/17/2021 16:22
Fluorotelomer Sulphonic Acid 6:2 (FtS 6:2)	U		0.62	4.6	ng/L	1	3/17/2021 16:22
Fluorotelomer Sulphonic Acid 8:2 (FtS 8:2)	U		1.1	4.6	ng/L	1	3/17/2021 16:22
Perfluorobutanesulfonic Acid (PFBS)	**2.3**	J	**0.33**	**4.6**	**ng/L**	1	3/17/2021 16:22
Perfluorobutanoic Acid (PFBA)	**4.7**		**2.4**	**4.6**	**ng/L**	1	3/17/2021 16:22
Perfluorodecanesulfonic Acid (PFDS)	U		1.3	4.6	ng/L	1	3/17/2021 16:22
Perfluorodecanoic Acid (PFDA)	U		1.2	4.6	ng/L	1	3/17/2021 16:22
Perfluorododecanoic Acid (PFDoA)	U		1.3	4.6	ng/L	1	3/17/2021 16:22
Perfluoroheptanesulfonic Acid (PFHpS)	**0.59**	J	**0.53**	**4.6**	**ng/L**	1	3/17/2021 16:22
Perfluoroheptanoic Acid (PFHpA)	**1.5**	J	**0.41**	**4.6**	**ng/L**	1	3/17/2021 16:22
Perfluorohexanesulfonic Acid (PFHxS)	**3.6**	J	**0.34**	**4.6**	**ng/L**	1	3/17/2021 16:22
Perfluorohexanoic Acid (PFHxA)	**2.3**	J	**1.1**	**4.6**	**ng/L**	1	3/17/2021 16:22
Perfluorononanesulfonic Acid (PFNS)	U		0.46	4.6	ng/L	1	3/17/2021 16:22
Perfluorononanoic Acid (PFNA)	U		0.81	4.6	ng/L	1	3/17/2021 16:22
Perfluorooctanesulfonamide (PFOSA)	U		0.66	4.6	ng/L	1	3/17/2021 16:22
Perfluorooctanesulfonic Acid (PFOS)	**5.7**		**0.83**	**1.9**	**ng/L**	1	3/17/2021 16:22
Perfluorooctanoic Acid (PFOA)	**5.6**		**0.66**	**1.9**	**ng/L**	1	3/17/2021 16:22
Perfluoropentanesulfonic Acid (PFPeS)	**1.3**	J	**0.52**	**4.6**	**ng/L**	1	3/17/2021 16:22
Perfluoropentanoic Acid (PFPeA)	**2.0**	J	**1.2**	**4.6**	**ng/L**	1	3/17/2021 16:22
Perfluorotetradecanoic Acid (PFTeA)	U		2.5	4.6	ng/L	1	3/17/2021 16:22
Perfluorotridecanoic Acid (PFTriA)	U		0.72	4.6	ng/L	1	3/17/2021 16:22
Perfluoroundecanoic Acid (PFUnA)	U		0.91	4.6	ng/L	1	3/17/2021 16:22
N-Ethylperfluorooctanesulfonamidoacetic Acid	U		0.58	4.6	ng/L	1	3/17/2021 16:22
N-Methylperfluorooctanesulfonamidoacetic Acid	U		0.60	4.6	ng/L	1	3/17/2021 16:22
Hexafluoropropylene oxide dimer acid (HFPO-DA)	U		1.1	4.6	ng/L	1	3/17/2021 16:22
4,8-Dioxa-3H-perfluorononanoic Acid (DONA)	U		0.52	4.6	ng/L	1	3/17/2021 16:22
11Cl-Pf3OUdS	U		0.43	4.6	ng/L	1	3/17/2021 16:22
9Cl-PF3ONS	U		0.42	4.6	ng/L	1	3/17/2021 16:22
Surr: 13C2-FtS 4:2	*180*	S		*50-150*	*%REC*	1	3/17/2021 16:22
Surr: 13C2-FtS 6:2	*163*	S		*50-150*	*%REC*	1	3/17/2021 16:22

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *22-Mar-21*

Client: Fishbeck, Inc.
Project: Cedar Springs /PFAS (201460)
Sample ID: CS-21-03-GSI-1D(I)
Collection Date: 3/12/2021 01:02 PM

Work Order: 21031444
Lab ID: 21031444-04
Matrix: WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
Surr: 13C2-FtS 8:2	*116*			*50-150*	*%REC*	1	3/17/2021 16:22
Surr: 13C2-PFDA	*97.1*			*50-150*	*%REC*	1	3/17/2021 16:22
Surr: 13C2-PFDoA	*98.9*			*50-150*	*%REC*	1	3/17/2021 16:22
Surr: 13C2-PFHxA	*91.6*			*50-150*	*%REC*	1	3/17/2021 16:22
Surr: 13C2-PFTeA	*138*			*50-150*	*%REC*	1	3/17/2021 16:22
Surr: 13C2-PFUnA	*109*			*50-150*	*%REC*	1	3/17/2021 16:22
Surr: 13C3-HFPO-DA	*120*			*50-150*	*%REC*	1	3/17/2021 16:22
Surr: 13C3-PFBS	*99.2*			*50-150*	*%REC*	1	3/17/2021 16:22
Surr: 13C4-PFBA	*109*			*50-150*	*%REC*	1	3/17/2021 16:22
Surr: 13C4-PFHpA	*90.8*			*50-150*	*%REC*	1	3/17/2021 16:22
Surr: 13C4-PFOA	*115*			*50-150*	*%REC*	1	3/17/2021 16:22
Surr: 13C4-PFOS	*125*			*50-150*	*%REC*	1	3/17/2021 16:22
Surr: 13C5-PFNA	*77.4*			*50-150*	*%REC*	1	3/17/2021 16:22
Surr: 13C5-PFPeA	*104*			*50-150*	*%REC*	1	3/17/2021 16:22
Surr: 13C8-FOSA	*111*			*50-150*	*%REC*	1	3/17/2021 16:22
Surr: 18O2-PFHxS	*96.9*			*50-150*	*%REC*	1	3/17/2021 16:22
Surr: d5-N-EtFOSAA	*112*			*50-150*	*%REC*	1	3/17/2021 16:22
Surr: d3-N-MeFOSAA	*109*			*50-150*	*%REC*	1	3/17/2021 16:22

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *22-Mar-21*

Client: Fishbeck, Inc.
Project: Cedar Springs /PFAS (201460)
Sample ID: CS-21-03-GSI-2D(I)
Collection Date: 3/12/2021 11:30 AM

Work Order: 21031444
Lab ID: 21031444-05
Matrix: WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
PFAS BY EPA 537 MODIFIED			Method: **E537 MOD**		Prep: E537 Mod / 3/17/21		Analyst: **SK**
Fluorotelomer Sulphonic Acid 4:2 (FtS 4:2)	U		0.87	4.7	ng/L	1	3/17/2021 16:33
Fluorotelomer Sulphonic Acid 6:2 (FtS 6:2)	U		0.62	4.7	ng/L	1	3/17/2021 16:33
Fluorotelomer Sulphonic Acid 8:2 (FtS 8:2)	U		1.1	4.7	ng/L	1	3/17/2021 16:33
Perfluorobutanesulfonic Acid (PFBS)	**3.0**	J	**0.33**	**4.7**	**ng/L**	1	3/17/2021 16:33
Perfluorobutanoic Acid (PFBA)	**9.5**		**2.4**	**4.7**	**ng/L**	1	3/17/2021 16:33
Perfluorodecanesulfonic Acid (PFDS)	U		1.3	4.7	ng/L	1	3/17/2021 16:33
Perfluorodecanoic Acid (PFDA)	U		1.2	4.7	ng/L	1	3/17/2021 16:33
Perfluorododecanoic Acid (PFDoA)	U		1.3	4.7	ng/L	1	3/17/2021 16:33
Perfluoroheptanesulfonic Acid (PFHpS)	**1.8**	J	**0.53**	**4.7**	**ng/L**	1	3/17/2021 16:33
Perfluoroheptanoic Acid (PFHpA)	**8.1**		**0.41**	**4.7**	**ng/L**	1	3/17/2021 16:33
Perfluorohexanesulfonic Acid (PFHxS)	**9.1**		**0.34**	**4.7**	**ng/L**	1	3/17/2021 16:33
Perfluorohexanoic Acid (PFHxA)	**8.4**		**1.1**	**4.7**	**ng/L**	1	3/17/2021 16:33
Perfluorononanesulfonic Acid (PFNS)	U		0.46	4.7	ng/L	1	3/17/2021 16:33
Perfluorononanoic Acid (PFNA)	**1.6**	J	**0.81**	**4.7**	**ng/L**	1	3/17/2021 16:33
Perfluorooctanesulfonamide (PFOSA)	**0.76**	J	**0.66**	**4.7**	**ng/L**	1	3/17/2021 16:33
Perfluorooctanesulfonic Acid (PFOS)	**16**		**0.83**	**1.9**	**ng/L**	1	3/17/2021 16:33
Perfluorooctanoic Acid (PFOA)	**35**		**0.66**	**1.9**	**ng/L**	1	3/17/2021 16:33
Perfluoropentanesulfonic Acid (PFPeS)	**1.1**	J	**0.52**	**4.7**	**ng/L**	1	3/17/2021 16:33
Perfluoropentanoic Acid (PFPeA)	**5.8**		**1.2**	**4.7**	**ng/L**	1	3/17/2021 16:33
Perfluorotetradecanoic Acid (PFTeA)	U		2.5	4.7	ng/L	1	3/17/2021 16:33
Perfluorotridecanoic Acid (PFTriA)	U		0.72	4.7	ng/L	1	3/17/2021 16:33
Perfluoroundecanoic Acid (PFUnA)	U		0.91	4.7	ng/L	1	3/17/2021 16:33
N-Ethylperfluorooctanesulfonamidoacetic Acid	**5.2**		**0.58**	**4.7**	**ng/L**	1	3/17/2021 16:33
N-Methylperfluorooctanesulfonamidoacetic Acid	**0.69**	J	**0.60**	**4.7**	**ng/L**	1	3/17/2021 16:33
Hexafluoropropylene oxide dimer acid (HFPO-DA)	U		1.1	4.7	ng/L	1	3/17/2021 16:33
4,8-Dioxa-3H-perfluorononanoic Acid (DONA)	U		0.52	4.7	ng/L	1	3/17/2021 16:33
11Cl-Pf3OUdS	U		0.44	4.7	ng/L	1	3/17/2021 16:33
9Cl-PF3ONS	U		0.42	4.7	ng/L	1	3/17/2021 16:33
Surr: 13C2-FtS 4:2	*327*	S		*50-150*	*%REC*	1	3/17/2021 16:33

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *22-Mar-21*

Client: Fishbeck, Inc.
Project: Cedar Springs /PFAS (201460)
Sample ID: CS-21-03-GSI-2D(I)
Collection Date: 3/12/2021 11:30 AM

Work Order: 21031444
Lab ID: 21031444-05
Matrix: WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
Surr: 13C2-FtS 6:2	*237*	S		*50-150*	*%REC*	1	3/17/2021 16:33
Surr: 13C2-FtS 8:2	*129*			*50-150*	*%REC*	1	3/17/2021 16:33
Surr: 13C2-PFDA	*103*			*50-150*	*%REC*	1	3/17/2021 16:33
Surr: 13C2-PFDoA	*106*			*50-150*	*%REC*	1	3/17/2021 16:33
Surr: 13C2-PFHxA	*104*			*50-150*	*%REC*	1	3/17/2021 16:33
Surr: 13C2-PFTeA	*147*			*50-150*	*%REC*	1	3/17/2021 16:33
Surr: 13C2-PFUnA	*117*			*50-150*	*%REC*	1	3/17/2021 16:33
Surr: 13C3-HFPO-DA	*126*			*50-150*	*%REC*	1	3/17/2021 16:33
Surr: 13C3-PFBS	*105*			*50-150*	*%REC*	1	3/17/2021 16:33
Surr: 13C4-PFBA	*120*			*50-150*	*%REC*	1	3/17/2021 16:33
Surr: 13C4-PFHpA	*93.3*			*50-150*	*%REC*	1	3/17/2021 16:33
Surr: 13C4-PFOA	*131*			*50-150*	*%REC*	1	3/17/2021 16:33
Surr: 13C4-PFOS	*136*			*50-150*	*%REC*	1	3/17/2021 16:33
Surr: 13C5-PFNA	*96.1*			*50-150*	*%REC*	1	3/17/2021 16:33
Surr: 13C5-PFPeA	*110*			*50-150*	*%REC*	1	3/17/2021 16:33
Surr: 13C8-FOSA	*115*			*50-150*	*%REC*	1	3/17/2021 16:33
Surr: 18O2-PFHxS	*113*			*50-150*	*%REC*	1	3/17/2021 16:33
Surr: d5-N-EtFOSAA	*125*			*50-150*	*%REC*	1	3/17/2021 16:33
Surr: d3-N-MeFOSAA	*117*			*50-150*	*%REC*	1	3/17/2021 16:33

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *22-Mar-21*

Client:	Fishbeck, Inc.		
Project:	Cedar Springs /PFAS (201460)	**Work Order:**	21031444
Sample ID:	CS-21-03-SW-01(I)	**Lab ID:**	21031444-06
Collection Date:	3/12/2021 10:20 AM	**Matrix:**	WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
PFAS BY EPA 537 MODIFIED			Method: **E537 MOD**		Prep: E537 Mod / 3/17/21		Analyst: **SK**
Fluorotelomer Sulphonic Acid 4:2 (FtS 4:2)	U		0.88	4.7	ng/L	1	3/17/2021 16:43
Fluorotelomer Sulphonic Acid 6:2 (FtS 6:2)	U		0.62	4.7	ng/L	1	3/17/2021 16:43
Fluorotelomer Sulphonic Acid 8:2 (FtS 8:2)	U		1.1	4.7	ng/L	1	3/17/2021 16:43
Perfluorobutanesulfonic Acid (PFBS)	**3.5**	J	**0.33**	**4.7**	**ng/L**	1	3/17/2021 16:43
Perfluorobutanoic Acid (PFBA)	**5.5**		**2.4**	**4.7**	**ng/L**	1	3/17/2021 16:43
Perfluorodecanesulfonic Acid (PFDS)	U		1.3	4.7	ng/L	1	3/17/2021 16:43
Perfluorodecanoic Acid (PFDA)	U		1.2	4.7	ng/L	1	3/17/2021 16:43
Perfluorododecanoic Acid (PFDoA)	U		1.3	4.7	ng/L	1	3/17/2021 16:43
Perfluoroheptanesulfonic Acid (PFHpS)	U		0.53	4.7	ng/L	1	3/17/2021 16:43
Perfluoroheptanoic Acid (PFHpA)	**1.4**	J	**0.41**	**4.7**	**ng/L**	1	3/17/2021 16:43
Perfluorohexanesulfonic Acid (PFHxS)	**1.7**	J	**0.35**	**4.7**	**ng/L**	1	3/17/2021 16:43
Perfluorohexanoic Acid (PFHxA)	**2.3**	J	**1.1**	**4.7**	**ng/L**	1	3/17/2021 16:43
Perfluorononanesulfonic Acid (PFNS)	U		0.47	4.7	ng/L	1	3/17/2021 16:43
Perfluorononanoic Acid (PFNA)	U		0.82	4.7	ng/L	1	3/17/2021 16:43
Perfluorooctanesulfonamide (PFOSA)	U		0.67	4.7	ng/L	1	3/17/2021 16:43
Perfluorooctanesulfonic Acid (PFOS)	**2.2**		**0.84**	**1.9**	**ng/L**	1	3/17/2021 16:43
Perfluorooctanoic Acid (PFOA)	**2.7**		**0.66**	**1.9**	**ng/L**	1	3/17/2021 16:43
Perfluoropentanesulfonic Acid (PFPeS)	U		0.52	4.7	ng/L	1	3/17/2021 16:43
Perfluoropentanoic Acid (PFPeA)	**3.5**	J	**1.2**	**4.7**	**ng/L**	1	3/17/2021 16:43
Perfluorotetradecanoic Acid (PFTeA)	U		2.5	4.7	ng/L	1	3/17/2021 16:43
Perfluorotridecanoic Acid (PFTriA)	U		0.72	4.7	ng/L	1	3/17/2021 16:43
Perfluoroundecanoic Acid (PFUnA)	U		0.92	4.7	ng/L	1	3/17/2021 16:43
N-Ethylperfluorooctanesulfonamidoacetic Acid	U		0.59	4.7	ng/L	1	3/17/2021 16:43
N-Methylperfluorooctanesulfonamidoacetic Acid	U		0.61	4.7	ng/L	1	3/17/2021 16:43
Hexafluoropropylene oxide dimer acid (HFPO-DA)	U		1.1	4.7	ng/L	1	3/17/2021 16:43
4,8-Dioxa-3H-perfluorononanoic Acid (DONA)	U		0.53	4.7	ng/L	1	3/17/2021 16:43
11Cl-Pf3OUdS	U		0.44	4.7	ng/L	1	3/17/2021 16:43
9Cl-PF3ONS	U		0.42	4.7	ng/L	1	3/17/2021 16:43
Surr: 13C2-FtS 4:2	*320*	S		*50-150*	*%REC*	1	3/17/2021 16:43
Surr: 13C2-FtS 6:2	*281*	S		*50-150*	*%REC*	1	3/17/2021 16:43
Surr: 13C2-FtS 8:2	*143*			*50-150*	*%REC*	1	3/17/2021 16:43

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *22-Mar-21*

Client: Fishbeck, Inc.
Project: Cedar Springs /PFAS (201460)
Sample ID: CS-21-03-SW-01(I)
Collection Date: 3/12/2021 10:20 AM

Work Order: 21031444
Lab ID: 21031444-06
Matrix: WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
Surr: 13C2-PFDA	*90.6*			*50-150*	*%REC*	1	3/17/2021 16:43
Surr: 13C2-PFDoA	*95.8*			*50-150*	*%REC*	1	3/17/2021 16:43
Surr: 13C2-PFHxA	*94.6*			*50-150*	*%REC*	1	3/17/2021 16:43
Surr: 13C2-PFTeA	*87.1*			*50-150*	*%REC*	1	3/17/2021 16:43
Surr: 13C2-PFUnA	*108*			*50-150*	*%REC*	1	3/17/2021 16:43
Surr: 13C3-HFPO-DA	*108*			*50-150*	*%REC*	1	3/17/2021 16:43
Surr: 13C3-PFBS	*89.7*			*50-150*	*%REC*	1	3/17/2021 16:43
Surr: 13C4-PFBA	*97.7*			*50-150*	*%REC*	1	3/17/2021 16:43
Surr: 13C4-PFHpA	*87.3*			*50-150*	*%REC*	1	3/17/2021 16:43
Surr: 13C4-PFOA	*103*			*50-150*	*%REC*	1	3/17/2021 16:43
Surr: 13C4-PFOS	*112*			*50-150*	*%REC*	1	3/17/2021 16:43
Surr: 13C5-PFNA	*83.3*			*50-150*	*%REC*	1	3/17/2021 16:43
Surr: 13C5-PFPeA	*93.3*			*50-150*	*%REC*	1	3/17/2021 16:43
Surr: 13C8-FOSA	*103*			*50-150*	*%REC*	1	3/17/2021 16:43
Surr: 18O2-PFHxS	*103*			*50-150*	*%REC*	1	3/17/2021 16:43
Surr: d5-N-EtFOSAA	*145*			*50-150*	*%REC*	1	3/17/2021 16:43
Surr: d3-N-MeFOSAA	*116*			*50-150*	*%REC*	1	3/17/2021 16:43

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *22-Mar-21*

Client:	Fishbeck, Inc.		
Project:	Cedar Springs /PFAS (201460)	**Work Order:**	21031444
Sample ID:	CS-21-03-QCFB	**Lab ID:**	21031444-07
Collection Date:	3/12/2021 09:30 AM	**Matrix:**	WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
PFAS BY EPA 537 MODIFIED			Method: **E537 MOD**		Prep: E537 Mod / 3/17/21		Analyst: **SK**
Fluorotelomer Sulphonic Acid 4:2 (FtS 4:2)	U		0.90	4.8	ng/L	1	3/17/2021 16:53
Fluorotelomer Sulphonic Acid 6:2 (FtS 6:2)	U		0.64	4.8	ng/L	1	3/17/2021 16:53
Fluorotelomer Sulphonic Acid 8:2 (FtS 8:2)	U		1.1	4.8	ng/L	1	3/17/2021 16:53
Perfluorobutanesulfonic Acid (PFBS)	U		0.34	4.8	ng/L	1	3/17/2021 16:53
Perfluorobutanoic Acid (PFBA)	U		2.5	4.8	ng/L	1	3/17/2021 16:53
Perfluorodecanesulfonic Acid (PFDS)	U		1.3	4.8	ng/L	1	3/17/2021 16:53
Perfluorodecanoic Acid (PFDA)	U		1.2	4.8	ng/L	1	3/17/2021 16:53
Perfluorododecanoic Acid (PFDoA)	U		1.4	4.8	ng/L	1	3/17/2021 16:53
Perfluoroheptanesulfonic Acid (PFHpS)	U		0.54	4.8	ng/L	1	3/17/2021 16:53
Perfluoroheptanoic Acid (PFHpA)	U		0.42	4.8	ng/L	1	3/17/2021 16:53
Perfluorohexanesulfonic Acid (PFHxS)	**0.66**	J	**0.35**	**4.8**	**ng/L**	1	3/17/2021 16:53
Perfluorohexanoic Acid (PFHxA)	U		1.2	4.8	ng/L	1	3/17/2021 16:53
Perfluorononanesulfonic Acid (PFNS)	U		0.48	4.8	ng/L	1	3/17/2021 16:53
Perfluorononanoic Acid (PFNA)	U		0.84	4.8	ng/L	1	3/17/2021 16:53
Perfluorooctanesulfonamide (PFOSA)	U		0.68	4.8	ng/L	1	3/17/2021 16:53
Perfluorooctanesulfonic Acid (PFOS)	U		0.86	1.9	ng/L	1	3/17/2021 16:53
Perfluorooctanoic Acid (PFOA)	U		0.68	1.9	ng/L	1	3/17/2021 16:53
Perfluoropentanesulfonic Acid (PFPeS)	U		0.53	4.8	ng/L	1	3/17/2021 16:53
Perfluoropentanoic Acid (PFPeA)	U		1.2	4.8	ng/L	1	3/17/2021 16:53
Perfluorotetradecanoic Acid (PFTeA)	U		2.5	4.8	ng/L	1	3/17/2021 16:53
Perfluorotridecanoic Acid (PFTriA)	U		0.74	4.8	ng/L	1	3/17/2021 16:53
Perfluoroundecanoic Acid (PFUnA)	U		0.94	4.8	ng/L	1	3/17/2021 16:53
N-Ethylperfluorooctanesulfonamidoacetic Acid	U		0.60	4.8	ng/L	1	3/17/2021 16:53
N-Methylperfluorooctanesulfonamidoacetic Acid	U		0.62	4.8	ng/L	1	3/17/2021 16:53
Hexafluoropropylene oxide dimer acid (HFPO-DA)	U		1.1	4.8	ng/L	1	3/17/2021 16:53
4,8-Dioxa-3H-perfluorononanoic Acid (DONA)	U		0.54	4.8	ng/L	1	3/17/2021 16:53
11Cl-Pf3OUdS	U		0.45	4.8	ng/L	1	3/17/2021 16:53
9Cl-PF3ONS	U		0.43	4.8	ng/L	1	3/17/2021 16:53
Surr: 13C2-FtS 4:2	*135*			*50-150*	*%REC*	1	3/17/2021 16:53
Surr: 13C2-FtS 6:2	*135*			*50-150*	*%REC*	1	3/17/2021 16:53
Surr: 13C2-FtS 8:2	*143*			*50-150*	*%REC*	1	3/17/2021 16:53

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *22-Mar-21*

Client: Fishbeck, Inc.
Project: Cedar Springs /PFAS (201460)
Sample ID: CS-21-03-QCFB
Collection Date: 3/12/2021 09:30 AM

Work Order: 21031444
Lab ID: 21031444-07
Matrix: WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
Surr: 13C2-PFDA	*111*			*50-150*	*%REC*	1	3/17/2021 16:53
Surr: 13C2-PFDoA	*86.1*			*50-150*	*%REC*	1	3/17/2021 16:53
Surr: 13C2-PFHxA	*101*			*50-150*	*%REC*	1	3/17/2021 16:53
Surr: 13C2-PFTeA	*158*	S		*50-150*	*%REC*	1	3/17/2021 16:53
Surr: 13C2-PFUnA	*96.6*			*50-150*	*%REC*	1	3/17/2021 16:53
Surr: 13C3-HFPO-DA	*146*			*50-150*	*%REC*	1	3/17/2021 16:53
Surr: 13C3-PFBS	*114*			*50-150*	*%REC*	1	3/17/2021 16:53
Surr: 13C4-PFBA	*113*			*50-150*	*%REC*	1	3/17/2021 16:53
Surr: 13C4-PFHpA	*113*			*50-150*	*%REC*	1	3/17/2021 16:53
Surr: 13C4-PFOA	*138*			*50-150*	*%REC*	1	3/17/2021 16:53
Surr: 13C4-PFOS	*103*			*50-150*	*%REC*	1	3/17/2021 16:53
Surr: 13C5-PFNA	*92.6*			*50-150*	*%REC*	1	3/17/2021 16:53
Surr: 13C5-PFPeA	*118*			*50-150*	*%REC*	1	3/17/2021 16:53
Surr: 13C8-FOSA	*116*			*50-150*	*%REC*	1	3/17/2021 16:53
Surr: 18O2-PFHxS	*87.5*			*50-150*	*%REC*	1	3/17/2021 16:53
Surr: d5-N-EtFOSAA	*111*			*50-150*	*%REC*	1	3/17/2021 16:53
Surr: d3-N-MeFOSAA	*131*			*50-150*	*%REC*	1	3/17/2021 16:53

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: 22-Mar-21

Client: Fishbeck, Inc.
Work Order: 21031444
Project: Cedar Springs /PFAS (201460)

QC BATCH REPORT

Batch ID: **173579** Instrument ID **LCMS1** Method: **E537 Mod**

MBLK Sample ID: **MBLK-173579-173579** Units: **ng/L** Analysis Date: **3/18/2021 12:32 PM**

Client ID: Run ID: **LCMS1_210318A** SeqNo: **7224697** Prep Date: **3/17/2021** DF: **1**

Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Fluorotelomer Sulphonic Acid ·	U	0.94	5.0								
Fluorotelomer Sulphonic Acid ‹	U	0.66	5.0								
Fluorotelomer Sulphonic Acid	U	1.1	5.0								
Perfluorobutanesulfonic Acid (	U	0.35	5.0								
Perfluorobutanoic Acid (PFBA)	U	2.6	5.0								
Perfluorodecanesulfonic Acid (	U	1.4	5.0								
Perfluorodecanoic Acid (PFDA	U	1.2	5.0								
Perfluorododecanoic Acid (PFI	U	1.4	5.0								
Perfluoroheptanesulfonic Acid	U	0.57	5.0								
Perfluoroheptanoic Acid (PFH|	U	0.44	5.0								
Perfluorohexanesulfonic Acid (	0.6816	0.37	5.0								J
Perfluorohexanoic Acid (PFHx	U	1.2	5.0								
Perfluorononanesulfonic Acid (	U	0.5	5.0								
Perfluorononanoic Acid (PFNA	U	0.87	5.0								
Perfluorooctanesulfonamide (F	U	0.71	5.0								
Perfluorooctanesulfonic Acid (	U	0.89	2.0								
Perfluorooctanoic Acid (PFOA)	U	0.7	2.0								
Perfluoropentanesulfonic Acid	U	0.56	5.0								
Perfluoropentanoic Acid (PFPe	U	1.3	5.0								
Perfluorotetradecanoic Acid (F	U	2.6	5.0								
Perfluorotridecanoic Acid (PFT	U	0.77	5.0								
Perfluoroundecanoic Acid (PFI	U	0.97	5.0								
N-Ethylperfluorooctanesulfona	U	0.63	5.0								
N-Methylperfluorooctanesulfor	U	0.64	5.0								
Hexafluoropropylene oxide din	U	1.2	5.0								
4,8-Dioxa-3H-perfluorononano	U	0.56	5.0								
11Cl-Pf3OUdS	U	0.47	5.0								
9Cl-PF3ONS	U	0.45	5.0								
Surr: 13C2-FtS 4:2	*185.8*	0	0	*149.4*	0	*124*	*50-150*	0			
Surr: 13C2-FtS 6:2	*190.5*	0	0	*152*	0	*125*	*50-150*	0			
Surr: 13C2-FtS 8:2	*154.2*	0	0	*153.3*	0	*101*	*50-150*	0			
Surr: 13C2-PFDA	*139.7*	0	0	*160*	0	*87.3*	*50-150*	0			
Surr: 13C2-PFDoA	*145.2*	0	0	*160*	0	*90.8*	*50-150*	0			
Surr: 13C2-PFHxA	*154.1*	0	0	*160*	0	*96.3*	*50-150*	0			
Surr: 13C2-PFTeA	*164*	0	0	*160*	0	*102*	*50-150*	0			
Surr: 13C2-PFUnA	*150.4*	0	0	*160*	0	*94*	*50-150*	0			
Surr: 13C3-HFPO-DA	*188.8*	0	0	*160*	0	*118*	*50-150*	0			
Surr: 13C3-PFBS	*160.9*	0	0	*148.8*	0	*108*	*50-150*	0			
Surr: 13C4-PFBA	*176.7*	0	0	*160*	0	*110*	*50-150*	0			
Surr: 13C4-PFHpA	*145.8*	0	0	*160*	0	*91.2*	*50-150*	0			
Surr: 13C4-PFOA	*158.7*	0	0	*160*	0	*99.2*	*50-150*	0			

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client:	Fishbeck, Inc.
Work Order:	21031444
Project:	Cedar Springs /PFAS (201460)

QC BATCH REPORT

Batch ID: **173579** Instrument ID **LCMS1** Method: **E537 Mod**

Surr: 13C4-PFOS	*188.8*	0	0	*152.8*	0	*124*	*50-150*	0		
Surr: 13C5-PFNA	*142.9*	0	0	*160*	0	*89.3*	*50-150*	0		
Surr: 13C5-PFPeA	*178.5*	0	0	*160*	0	*112*	*50-150*	0		
Surr: 13C8-FOSA	*166.3*	0	0	*160*	0	*104*	*50-150*	0		
Surr: 18O2-PFHxS	*166.1*	0	0	*151.2*	0	*110*	*50-150*	0		
Surr: d5-N-EtFOSAA	*176.9*	0	0	*160*	0	*111*	*50-150*	0		
Surr: d3-N-MeFOSAA	*159.7*	0	0	*160*	0	*99.8*	*50-150*	0		

LCS Sample ID: **LCS-173579-173579** Units: **ng/L** Analysis Date: **3/18/2021 10:46 AM**

Client ID: Run ID: **LCMS1_210318A** SeqNo: **7224693** Prep Date: **3/17/2021** DF: **1**

Analyte	Result	MDL	PQL	SPK-Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Perfluorotridecanoic Acid (PFT	41.6	0.77	5.0	32	0	130	65-144	0			

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: Fishbeck, Inc.
Work Order: 21031444
Project: Cedar Springs /PFAS (201460)

QC BATCH REPORT

Batch ID: **173579** Instrument ID **LCMS1** Method: **E537 Mod**

LCS	Sample ID: **LCS-173579-173579**				Units: **ng/L**		Analysis Date: **3/17/2021 03:19 PM**				
Client ID:		Run ID: **LCMS1_210317A**			SeqNo: **7224701**		Prep Date: **3/17/2021**		DF: **1**		
Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Fluorotelomer Sulphonic Acid ·	28.86	0.94	5.0	29.9	0	96.5	63-143	0			
Fluorotelomer Sulphonic Acid ·	31.24	0.66	5.0	30.3	0	103	64-140	0			
Fluorotelomer Sulphonic Acid	32.63	1.1	5.0	30.7	0	106	67-138	0			
Perfluorobutanesulfonic Acid (	26.03	0.35	5.0	28.3	0	92	72-130	0			
Perfluorobutanoic Acid (PFBA)	34.48	2.6	5.0	32	0	108	73-129	0			
Perfluorodecanesulfonic Acid (	27.43	1.4	5.0	30.8	0	89	53-142	0			
Perfluorodecanoic Acid (PFDA	33.13	1.2	5.0	32	0	104	71-129	0			
Perfluorododecanoic Acid (PFI	39.48	1.4	5.0	32	0	123	72-134	0			
Perfluoroheptanesulfonic Acid	29.68	0.57	5.0	30.5	0	97.3	69-134	0			
Perfluoroheptanoic Acid (PFH|	29.94	0.44	5.0	32	0	93.6	72-130	0			
Perfluorohexanesulfonic Acid (	28.03	0.37	5.0	29.1	0	96.3	68-131	0			
Perfluorohexanoic Acid (PFHx	32.53	1.2	5.0	32	0	102	72-129	0			
Perfluorononanesulfonic Acid (	27.17	0.5	5.0	30.7	0	88.5	69-127	0			
Perfluorononanoic Acid (PFNA	39.79	0.87	5.0	32	0	124	69-130	0			
Perfluorooctanesulfonamide (F	30.61	0.71	5.0	32	0	95.7	67-137	0			
Perfluorooctanesulfonic Acid (	32.48	0.89	2.0	29.7	0	109	65-140	0			
Perfluorooctanoic Acid (PFOA)	28.61	0.7	2.0	32	0	89.4	71-133	0			
Perfluoropentanesulfonic Acid	28	0.56	5.0	30	0	93.3	71-127	0			
Perfluoropentanoic Acid (PFPe	29.42	1.3	5.0	32	0	91.9	72-129	0			
Perfluorotetradecanoic Acid (F	40.14	2.6	5.0	32	0	125	71-132	0			
Perfluoroundecanoic Acid (PFI	25.68	0.97	5.0	32	0	80.2	69-133	0			
N-Ethylperfluorooctanesulfona	29.34	0.63	5.0	32	0	91.7	61-135	0			
N-Methylperfluorooctanesulfor	32.46	0.64	5.0	32	0	101	65-136	0			
Hexafluoropropylene oxide din	33.43	1.2	5.0	32	0	104	70-130	0			
4,8-Dioxa-3H-perfluorononano	33.39	0.56	5.0	30.1	0	111	70-130	0			
11Cl-Pf3OUdS	27.21	0.47	5.0	30.1	0	90.4	70-130	0			
9Cl-PF3ONS	35.78	0.45	5.0	29.8	0	120	70-130	0			
Surr: 13C2-FtS 4:2	*214.3*	0	0	*149.4*	0	*143*	*50-150*	0			
Surr: 13C2-FtS 6:2	*215.5*	0	0	*152*	0	*142*	*50-150*	0			
Surr: 13C2-FtS 8:2	*167.5*	0	0	*153.3*	0	*109*	*50-150*	0			
Surr: 13C2-PFDA	*151.3*	0	0	*160*	0	*94.6*	*50-150*	0			
Surr: 13C2-PFDoA	*181.1*	0	0	*160*	0	*113*	*50-150*	0			
Surr: 13C2-PFHxA	*174.6*	0	0	*160*	0	*109*	*50-150*	0			
Surr: 13C2-PFTeA	*186.2*	0	0	*160*	0	*116*	*50-150*	0			
Surr: 13C2-PFUnA	*173*	0	0	*160*	0	*108*	*50-150*	0			
Surr: 13C3-HFPO-DA	*209.9*	0	0	*160*	0	*131*	*50-150*	0			
Surr: 13C3-PFBS	*176*	0	0	*148.8*	0	*118*	*50-150*	0			
Surr: 13C4-PFBA	*197.9*	0	0	*160*	0	*124*	*50-150*	0			
Surr: 13C4-PFHpA	*171.5*	0	0	*160*	0	*107*	*50-150*	0			
Surr: 13C4-PFOA	*175.7*	0	0	*160*	0	*110*	*50-150*	0			
Surr: 13C4-PFOS	*201.7*	0	0	*152.8*	0	*132*	*50-150*	0			
Surr: 13C5-PFNA	*154.9*	0	0	*160*	0	*96.8*	*50-150*	0			
Surr: 13C5-PFPeA	*197*	0	0	*160*	0	*123*	*50-150*	0			

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Batch ID: **173579** Instrument ID **LCMS1** Method: **E537 Mod**

Surr: 13C8-FOSA	*193.7*	0	0	*160*	0	*121*	*50-150*	0
Surr: 18O2-PFHxS	*193.9*	0	0	*151.2*	0	*128*	*50-150*	0
Surr: d5-N-EtFOSAA	*183.8*	0	0	*160*	0	*115*	*50-150*	0
Surr: d3-N-MeFOSAA	*170.5*	0	0	*160*	0	*107*	*50-150*	0

Client: Fishbeck, Inc.
Work Order: 21031444
Project: Cedar Springs /PFAS (201460)

QC BATCH REPORT

Batch ID: **173579** Instrument ID **LCMS1** Method: **E537 Mod**

MS	Sample ID: **21031538-01A MS**				Units: **ng/L**			Analysis Date: **3/17/2021 03:30 PM**			
Client ID:		Run ID: **LCMS1_210317A**			SeqNo: **7224702**			Prep Date: **3/17/2021**		DF: **1**	
Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Fluorotelomer Sulphonic Acid ·	25.42	0.89	4.7	28.31	0	89.8	63-143	0			
Fluorotelomer Sulphonic Acid ·	29.18	0.63	4.7	28.69	0	102	64-140	0			
Fluorotelomer Sulphonic Acid	32.92	1.1	4.7	29.07	0	113	67-138	0			
Perfluorobutanesulfonic Acid (	26.23	0.33	4.7	26.8	2.585	88.2	72-130	0			
Perfluorobutanoic Acid (PFBA)	57.69	2.5	4.7	30.3	22.35	117	73-129	0			
Perfluorodecanesulfonic Acid (	22.33	1.3	4.7	29.17	0	76.6	53-142	0			
Perfluorodecanoic Acid (PFDA	29.3	1.2	4.7	30.3	0.3576	95.5	71-129	0			
Perfluorododecanoic Acid (PFI	35.07	1.4	4.7	30.3	0.2697	115	72-134	0			
Perfluoroheptanesulfonic Acid	26.25	0.54	4.7	28.88	0.3091	89.8	69-134	0			
Perfluoroheptanoic Acid (PFHp	60.24	0.42	4.7	30.3	37.91	73.7	72-130	0			
Perfluorohexanesulfonic Acid (	27.5	0.35	4.7	27.56	1.336	94.9	68-131	0			
Perfluorohexanoic Acid (PFHx	60.51	1.1	4.7	30.3	29.56	102	72-129	0			
Perfluorononanesulfonic Acid (	25.65	0.47	4.7	29.07	0	88.2	69-127	0			
Perfluorononanoic Acid (PFNA	35.97	0.82	4.7	30.3	0.2788	118	69-130	0			
Perfluorooctanesulfonamide (F	30.07	0.67	4.7	30.3	0.1303	98.8	67-137	0			
Perfluorooctanesulfonic Acid (	34.23	0.84	1.9	28.12	4.206	107	65-140	0			
Perfluorooctanoic Acid (PFOA)	95.43	0.67	1.9	30.3	68.92	87.5	71-133	0			
Perfluoropentanesulfonic Acid	24.62	0.53	4.7	28.41	0.2939	85.6	71-127	0			
Perfluoropentanoic Acid (PFPe	32.28	1.2	4.7	30.3	6.997	83.4	72-129	0			
Perfluorotetradecanoic Acid (F	33.07	2.5	4.7	30.3	0	109	71-132	0			
Perfluorotridecanoic Acid (PFT	37.73	0.73	4.7	30.3	0.00303	125	65-144	0			
Perfluoroundecanoic Acid (PFI	23.5	0.92	4.7	30.3	0.1242	77.1	69-133	0			
N-Ethylperfluorooctanesulfona	26.93	0.59	4.7	30.3	0	88.9	61-135	0			
N-Methylperfluorooctanesulfor	30.3	0.61	4.7	30.3	0	100	65-136	0			
Hexafluoropropylene oxide din	28	1.1	4.7	30.3	0	92.4	70-130	0			
4,8-Dioxa-3H-perfluorononano	27.35	0.53	4.7	28.5	0	96	70-130	0			
11Cl-Pf3OUdS	24.83	0.44	4.7	28.5	0	87.1	70-130	0			
9Cl-PF3ONS	32.74	0.42	4.7	28.22	0	116	70-130	0			
Surr: 13C2-FtS 4:2	*240*	0	0	*141.5*	0	*170*	*50-150*	0			*S*
Surr: 13C2-FtS 6:2	*211.6*	0	0	*143.9*	0	*147*	*50-150*	0			
Surr: 13C2-FtS 8:2	*176.4*	0	0	*145.2*	0	*122*	*50-150*	0			
Surr: 13C2-PFDA	*154.9*	0	0	*151.5*	0	*102*	*50-150*	0			
Surr: 13C2-PFDoA	*173.3*	0	0	*151.5*	0	*114*	*50-150*	0			
Surr: 13C2-PFHxA	*198.7*	0	0	*151.5*	0	*131*	*50-150*	0			
Surr: 13C2-PFTeA	*209.8*	0	0	*151.5*	0	*138*	*50-150*	0			
Surr: 13C2-PFUnA	*172.8*	0	0	*151.5*	0	*114*	*50-150*	0			
Surr: 13C3-HFPO-DA	*250.2*	0	0	*151.5*	0	*165*	*50-150*	0			*S*
Surr: 13C3-PFBS	*185.7*	0	0	*140.9*	0	*132*	*50-150*	0			
Surr: 13C4-PFBA	*207.5*	0	0	*151.5*	0	*137*	*50-150*	0			
Surr: 13C4-PFHpA	*213*	0	0	*151.5*	0	*141*	*50-150*	0			
Surr: 13C4-PFOA	*180.1*	0	0	*151.5*	0	*119*	*50-150*	0			
Surr: 13C4-PFOS	*202.2*	0	0	*144.7*	0	*140*	*50-150*	0			
Surr: 13C5-PFNA	*172.9*	0	0	*151.5*	0	*114*	*50-150*	0			

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: Fishbeck, Inc.
Work Order: 21031444
Project: Cedar Springs /PFAS (201460)

QC BATCH REPORT

Batch ID: **173579** Instrument ID **LCMS1** Method: **E537 Mod**

Surr: 13C5-PFPeA	*208.2*	0	0	*151.5*	0	*137*	*50-150*	0
Surr: 13C8-FOSA	*220*	0	0	*151.5*	0	*145*	*50-150*	0
Surr: 18O2-PFHxS	*192*	0	0	*143.2*	0	*134*	*50-150*	0
Surr: d5-N-EtFOSAA	*207.3*	0	0	*151.5*	0	*137*	*50-150*	0
Surr: d3-N-MeFOSAA	*199*	0	0	*151.5*	0	*131*	*50-150*	0

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: Fishbeck, Inc.
Work Order: 21031444
Project: Cedar Springs /PFAS (201460)

QC BATCH REPORT

Batch ID: **173579** Instrument ID **LCMS1** Method: **E537 Mod**

DUP Sample ID: **21031530-02A DUP** Units: **ng/L** Analysis Date: **3/17/2021 05:25 PM**

Client ID: Run ID: **LCMS1_210317A** SeqNo: **7224713** Prep Date: **3/17/2021** DF: **1**

Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Fluorotelomer Sulphonic Acid	U	0.9	4.8	0	0	0	0-0	0	0	30	
Fluorotelomer Sulphonic Acid	U	0.64	4.8	0	0	0	0-0	0	0	30	
Fluorotelomer Sulphonic Acid	U	1.1	4.8	0	0	0	0-0	0	0	30	
Perfluorobutanesulfonic Acid (	2.105	0.34	4.8	0	0	0	0-0	2.354	0	30	J
Perfluorobutanoic Acid (PFBA)	18.76	2.5	4.8	0	0	0	0-0	18.78	0.0996	30	
Perfluorodecanesulfonic Acid	U	1.3	4.8	0	0	0	0-0	0	0	30	
Perfluorodecanoic Acid (PFDA	U	1.2	4.8	0	0	0	0-0	0	0	30	
Perfluorododecanoic Acid (PFI	U	1.4	4.8	0	0	0	0-0	0.1405	0	30	
Perfluoroheptanesulfonic Acid	4.462	0.54	4.8	0	0	0	0-0	4.394	0	30	J
Perfluoroheptanoic Acid (PFH	57.41	0.42	4.8	0	0	0	0-0	50.39	13	30	
Perfluorohexanesulfonic Acid	5.551	0.35	4.8	0	0	0	0-0	6.55	16.5	30	
Perfluorohexanoic Acid (PFHx	24.29	1.2	4.8	0	0	0	0-0	25.33	4.21	30	
Perfluorononanesulfonic Acid	U	0.48	4.8	0	0	0	0-0	0	0	30	
Perfluorononanoic Acid (PFNA	1.342	0.84	4.8	0	0	0	0-0	1.676	0	30	J
Perfluorooctanesulfonamide (F	0.7138	0.68	4.8	0	0	0	0-0	0.7359	0	30	J
Perfluorooctanesulfonic Acid (	76.98	0.86	1.9	0	0	0	0-0	78.44	1.88	30	
Perfluorooctanoic Acid (PFOA)	158.9	0.68	1.9	0	0	0	0-0	166.7	4.82	30	
Perfluoropentanesulfonic Acid	0.9692	0.53	4.8	0	0	0	0-0	0.974	0	30	J
Perfluoropentanoic Acid (PFPe	7.886	1.2	4.8	0	0	0	0-0	7.075	10.8	30	
Perfluorotetradecanoic Acid (F	U	2.5	4.8	0	0	0	0-0	0	0	30	
Perfluorotridecanoic Acid (PFT	U	0.74	4.8	0	0	0	0-0	0	0	30	
Perfluoroundecanoic Acid (PFI	U	0.94	4.8	0	0	0	0-0	0.09466	0	30	
N-Ethylperfluorooctanesulfona	3.031	0.6	4.8	0	0	0	0-0	3.615	0	30	J
N-Methylperfluorooctanesulfor	Ui	0.62	4.8	0	0	0	0-0	0	0	30	
Hexafluoropropylene oxide din	UI	1.1	4.8	0	0	0	0-0	0	0	30	
4,8-Dioxa-3H-perfluorononano	U	0.54	4.8	0	0	0	0-0	0	0	30	
11Cl-Pf3OUdS	U	0.45	4.8	0	0	0	0-0	0	0	30	
9Cl-PF3ONS	U	0.43	4.8	0	0	0	0-0	0	0	30	
Surr: 13C2-FtS 4:2	*573.6*	0	0	*143.7*	0	*399*	*50-150*	581	*1.29*	*30*	*S*
Surr: 13C2-FtS 6:2	*392.1*	0	0	*146.2*	0	*268*	*50-150*	437.4	*10.9*	*30*	*S*
Surr: 13C2-FtS 8:2	*180.7*	0	0	*147.4*	0	*123*	*50-150*	205.1	*12.6*	*30*	
Surr: 13C2-PFDA	*165.7*	0	0	*153.8*	0	*108*	*50-150*	165	*0.418*	*30*	
Surr: 13C2-PFDoA	*125.6*	0	0	*153.8*	0	*81.6*	*50-150*	118.2	*6.02*	*30*	
Surr: 13C2-PFHxA	*137*	0	0	*153.8*	0	*89.1*	*50-150*	131.8	*3.92*	*30*	
Surr: 13C2-PFTeA	*192.7*	0	0	*153.8*	0	*125*	*50-150*	195.1	*1.23*	*30*	
Surr: 13C2-PFUnA	*155.1*	0	0	*153.8*	0	*101*	*50-150*	142.4	*8.57*	*30*	
Surr: 13C3-HFPO-DA	*170.6*	0	0	*153.8*	0	*111*	*50-150*	187.5	*9.46*	*30*	
Surr: 13C3-PFBS	*126.3*	0	0	*143.1*	0	*88.3*	*50-150*	133.9	*5.79*	*30*	
Surr: 13C4-PFBA	*157.9*	0	0	*153.8*	0	*103*	*50-150*	150.4	*4.86*	*30*	
Surr: 13C4-PFHpA	*131.5*	0	0	*153.8*	0	*85.5*	*50-150*	140.2	*6.36*	*30*	
Surr: 13C4-PFOA	*195.7*	0	0	*153.8*	0	*127*	*50-150*	183.2	*6.57*	*30*	
Surr: 13C4-PFOS	*166.5*	0	0	*146.9*	0	*113*	*50-150*	156.9	*5.94*	*30*	
Surr: 13C5-PFNA	*124.3*	0	0	*153.8*	0	*80.8*	*50-150*	119.8	*3.71*	*30*	

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client:	Fishbeck, Inc.
Work Order:	21031444
Project:	Cedar Springs /PFAS (201460)

QC BATCH REPORT

Batch ID: **173579** Instrument ID **LCMS1** Method: **E537 Mod**

Surr: 13C5-PFPeA	*141.7*	0	0	*153.8*	0	*92.1*	*50-150*	149.2	*5.18*	*30*
Surr: 13C8-FOSA	*139.2*	0	0	*153.8*	0	*90.5*	*50-150*	152.7	*9.28*	*30*
Surr: 18O2-PFHxS	*130.6*	0	0	*145.4*	0	*89.8*	*50-150*	130.3	*0.225*	*30*
Surr: d5-N-EtFOSAA	*149.7*	0	0	*153.8*	0	*97.3*	*50-150*	164.7	*9.57*	*30*
Surr: d3-N-MeFOSAA	*165.3*	0	0	*153.8*	0	*107*	*50-150*	200.2	*19.1*	*30*

The following samples were analyzed in this batch:

21031444-01A	21031444-02A	21031444-03A
21031444-04A	21031444-05A	21031444-06A
21031444-07A		

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

L1031444

CHAIN OF CUSTODY RECORD

fishbeck
Address: 1515 Arboretum Dr. SE, Grand Rapids, MI 49546
Phone: 616.575.3824

Report to: Penni Mahler
Email: pdmahler@fishbeck.com
Copy to:
Email:

Invoice to: Accounts Payable
Email: acpay@fishbeck.com
Lab Quote Reference:

PROJECT NAME: Cedar Springs/PFAS	PROJECT NO.: 201460
PROJECT LOCATION: Cedar Springs, MI	SAMPLER(S) NAME: LNC
PROJECT MANAGER: Tim Patterson	PHONE: 616.464.3750
	EMAIL: tkpatterson@fishbeck.com
ADDITIONAL INFORMATION:	

PAGE 1 of 1

STD TAT ■
RUSH TAT ☐
DATE DUE:

MATRIX TYPE / REQUIRED ANALYSES: PFAS/537M/28 list (Preservative: None)

SAMPLE DATE	SAMPLE TIME	SAMPLE IDENTIFICATION	AQUEOUS (WATER)	SOLID/SEMI-SOLID	AIR	NONAQUEOUS LIQUID	PFAS/537M/28 list (NUMBER OF CONTAINERS SUBMITTED)	REMARKS
3/12/21	1215	CS-21-03-MW-6A(I)	X				2	
	1000	CS-21-03-MW-8A(I)	X				2	
	1000	CS-21-03-MW-8A(D)	X				2	
	1302	CS-21-03-GSI-1D (I)	X				2	
	1130	CS-21-03-GSI-2D (I)	X				2	
	1020	CS-21-03-SW-01(I)	X				1	
	930	CS-21-03-QCFB						

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RELINQUISHED BY	DATE	TIME	RELINQUISHED BY	DATE	TIME	RELINQUISHED BY	DATE	TIME	METHOD OF SHIPMENT/TRACKING NUMBER
L. Chapin; Fishbeck Storage	3/12/21	1415	[signature]	3/15/21	09:30				COC Sealed/ALS Pick Up

RECEIVED BY	DATE	TIME	RECEIVED BY	DATE	TIME	RECEIVED BY	DATE	TIME	RECEIVED FOR LAB	DATE	TIME
From Storage [signature]	3/15/21	09:30							[signature]	3/15/21	1500

G-0312 60

3.8°C IR

ALS Group, USA

Sample Receipt Checklist

Client Name: **FTCH - GR**

Date/Time Received: **15-Mar-21 15:00**

Work Order: **21031444**

Received by: **KRW**

Checklist completed by *Keith Wierenga* (eSignature) 16-Mar-21 (Date)

Reviewed by: *Ehland Bosworth* (eSignature) 16-Mar-21 (Date)

Matrices: Water

Carrier name: ALSHN

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on shipping container/cooler?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on sample bottles?	Yes ☐	No ☐	Not Present ☑
Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time?	Yes ☑	No ☐	
Container/Temp Blank temperature in compliance?	Yes ☑	No ☐	
Sample(s) received on ice?	Yes ☑	No ☐	
Temperature(s)/Thermometer(s):	3.8/4.8 C	IR3	
Cooler(s)/Kit(s):			
Date/Time sample(s) sent to storage:	3/16/2021 9:29:17 AM		
Water - VOA vials have zero headspace?	Yes ☐	No ☐	No VOA vials submitted ☑
Water - pH acceptable upon receipt?	Yes ☑	No ☐	N/A ☐
pH adjusted?	Yes ☐	No ☑	N/A ☐
pH adjusted by:	-		

Login Notes:

Client Contacted:

Date Contacted:

Person Contacted:

Contacted By:

Regarding:

Comments:

CorrectiveAction:

Appendix 4

08-Jun-2021

Penni Mahler
Fishbeck, Inc.
1515 Arboretum Dr SE
Grand Rapids, MI 49546

Re: **Cedar Springs (201460)** Work Order: **21060077**

Dear Penni,

ALS Environmental received 14 samples on 28-May-2021 03:30 PM for the analyses presented in the following report.

The analytical data provided relates directly to the samples received by ALS Environmental - Holland and for only the analyses requested.

Sample results are compliant with industry accepted practices and Quality Control results achieved laboratory specifications. Any exceptions are noted in the Case Narrative, or noted with qualifiers in the report or QC batch information. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained from ALS Environmental. Samples will be disposed in 30 days unless storage arrangements are made.

The total number of pages in this report is 29.

If you have any questions regarding this report, please feel free to contact me:

ADDRESS: 3352 128th Avenue, Holland, MI, USA
PHONE: +1 (616) 399-6070 FAX: +1 (616) 399-6185

Sincerely,

Ehrland Bosworth

Electronically approved by: Ehrland Bosworth

Ehrland Bosworth
Project Manager

ALS Group, USA

Date: 08-Jun-21

Client: Fishbeck, Inc.
Project: Cedar Springs (201460)
Work Order: **21060077**

Work Order Sample Summary

Lab Samp ID	Client Sample ID	Matrix	Tag Number	Collection Date	Date Received	Hold
21060077-01	CS-21-05-DW-13360 White Creek Avenue (I)	Water		5/26/2021 09:40	5/28/2021 15:30	☐
21060077-02	CS-21-05-DW-13261 White Creek Avenue (I)	Water		5/26/2021 12:05	5/28/2021 15:30	☐
21060077-03	CS-21-05-DW-13353 White Creek Avenue (I)	Water		5/26/2021 11:46	5/28/2021 15:30	☐
21060077-04	CS-21-05-DW-13399 White Creek Avenue (I)	Water		5/26/2021 11:05	5/28/2021 15:30	☐
21060077-05	CS-21-05-DW-13485 White Creek Avenue (I)	Water		5/26/2021 10:45	5/28/2021 15:30	☐
21060077-06	CS-21-05-DW-13525 White Creek Avenue (I)	Water		5/26/2021 10:27	5/28/2021 15:30	☐
21060077-07	CS-21-05-DW-13590 White Creek Avenue (I)	Water		5/26/2021 10:06	5/28/2021 15:30	☐
21060077-08	CS-21-05-DW-4095 16 Mile Rd (I)	Water		5/26/2021 13:40	5/28/2021 15:30	☐
21060077-09	CS-21-05-DW-4107 16 Mile Rd (I)	Water		5/26/2021 13:06	5/28/2021 15:30	☐
21060077-10	CS-21-05-DW-4141 16 Mile Rd (I)	Water		5/26/2021 12:48	5/28/2021 15:30	☐
21060077-11	CS-21-05-DW-4142 16 Mile Rd (I)	Water		5/26/2021 12:32	5/28/2021 15:30	☐
21060077-12	CS-21-05-DW-13360 White Creek Avenue (D)	Water		5/26/2021 09:40	5/28/2021 15:30	☐
21060077-13	CS-21-05-QCFB-01	Water		5/26/2021 14:05	5/28/2021 15:30	☐
21060077-14	CS-21-05-DW-4095 16 Mile Rd (D)	Water		5/26/2021 13:40	5/28/2021 15:30	☐

Client:	Fishbeck, Inc.	**QUALIFIERS, ACRONYMS, UNITS**
Project:	Cedar Springs (201460)	
WorkOrder:	**21060077**	

Qualifier	Description
*	Value exceeds Regulatory Limit
**	Estimated Value
a	Analyte is non-accredited
B	Analyte detected in the associated Method Blank above the Reporting Limit
E	Value above quantitation range
H	Analyzed outside of Holding Time
Hr	BOD/CBOD - Sample was reset outside Hold Time, value should be considered estimated.
J	Analyte is present at an estimated concentration between the MDL and Report Limit
ND	Not Detected at the Reporting Limit
O	Sample amount is > 4 times amount spiked
P	Dual Column results percent difference > 40%
R	RPD above laboratory control limit
S	Spike Recovery outside laboratory control limits
U	Analyzed but not detected above the MDL
X	Analyte was detected in the Method Blank between the MDL and Reporting Limit, sample results may exhibit background or reagent contamination at the observed level.

Acronym	Description
DUP	Method Duplicate
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LOD	Limit of Detection (see MDL)
LOQ	Limit of Quantitation (see PQL)
MBLK	Method Blank
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
PQL	Practical Quantitation Limit
RPD	Relative Percent Difference
TDL	Target Detection Limit
TNTC	Too Numerous To Count
A	APHA Standard Methods
D	ASTM
E	EPA
SW	SW-846 Update III

Units Reported	Description
ng/L	Nanograms per Liter

Client: Fishbeck, Inc.
Project: Cedar Springs (201460)
Work Order: 21060077

Case Narrative

Samples for the above noted Work Order were received on 05/28/2021. The attached "Sample Receipt Checklist" documents the status of custody seals, container integrity, preservation, and temperature compliance.

Samples were analyzed according to the analytical methodology previously transmitted in the "Work Order Acknowledgement". Methodologies are also documented in the "Analytical Result" section for each sample. Quality control results are listed in the "QC Report" section. Sample association for the reported quality control is located at the end of each batch summary. If applicable, results are appropriately qualified in the Analytical Result and QC Report sections. The "Qualifiers" section documents the various qualifiers, units, and acronyms utilized in reporting. A copy of the laboratory's scope of accreditation is available upon request.

With the following exceptions, all sample analyses achieved analytical criteria.

Extractable Organics:
No deviations or anomalies were noted.

ALS Group, USA

Date: *08-Jun-21*

Client:	Fishbeck, Inc.		
Project:	Cedar Springs (201460)	**Work Order:**	21060077
Sample ID:	CS-21-05-DW-13360 White Creek Avenue (I)	**Lab ID:**	21060077-01
Collection Date:	5/26/2021 09:40 AM	**Matrix:**	WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
PFAS BY EPA 537.1			Method: **E537.1**		Prep: E537.1 / 6/2/21		Analyst: **SK**
Hexafluoropropylene oxide dimer acid (HFPO-DA)	U		0.6	2	ng/L	1	6/3/2021 17:03
N-Ethylperfluorooctanesulfonamidoacetic Acid	U		0.3	2	ng/L	1	6/3/2021 17:03
N-Methylperfluorooctanesulfonamidoacetic Acid	U		0.4	2	ng/L	1	6/3/2021 17:03
Perfluorobutanesulfonic Acid (PFBS)	U		0.3	2	ng/L	1	6/3/2021 17:03
Perfluorodecanoic Acid (PFDA)	U		0.6	2	ng/L	1	6/3/2021 17:03
Perfluorododecanoic Acid (PFDoA)	U		0.3	2	ng/L	1	6/3/2021 17:03
Perfluoroheptanoic Acid (PFHpA)	U		0.5	2	ng/L	1	6/3/2021 17:03
Perfluorohexanesulfonic Acid (PFHxS)	U		0.3	2	ng/L	1	6/3/2021 17:03
Perfluorohexanoic Acid (PFHxA)	U		0.6	2	ng/L	1	6/3/2021 17:03
Perfluorononanoic Acid (PFNA)	U		0.5	2	ng/L	1	6/3/2021 17:03
Perfluorooctanesulfonic Acid (PFOS)	U		0.2	2	ng/L	1	6/3/2021 17:03
Perfluorooctanoic Acid (PFOA)	U		0.5	2	ng/L	1	6/3/2021 17:03
Perfluorotetradecanoic Acid (PFTeA)	U		0.4	2	ng/L	1	6/3/2021 17:03
Perfluorotridecanoic Acid (PFTriA)	U		0.3	2	ng/L	1	6/3/2021 17:03
Perfluoroundecanoic Acid (PFUnA)	U		0.4	2	ng/L	1	6/3/2021 17:03
11Cl-Pf3OUdS	U		0.3	2	ng/L	1	6/3/2021 17:03
9Cl-PF3ONS.	U		0.1	2	ng/L	1	6/3/2021 17:03
4,8-Dioxa-3H-perfluorononanoic Acid (DONA)	U		0.3	2	ng/L	1	6/3/2021 17:03
Surr: 13C2-PFHxA	*102*			*70-130*	*%REC*	1	6/3/2021 17:03
Surr: 13C2-PFDA	*100*			*70-130*	*%REC*	1	6/3/2021 17:03
Surr: d5-N-EtFOSAA	*88.7*			*70-130*	*%REC*	1	6/3/2021 17:03
Surr: 13C3-HFPO-DA	*96.6*			*70-130*	*%REC*	1	6/3/2021 17:03

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *08-Jun-21*

Client: Fishbeck, Inc.
Project: Cedar Springs (201460)
Sample ID: CS-21-05-DW-13261 White Creek Avenue (I)
Collection Date: 5/26/2021 12:05 PM

Work Order: 21060077
Lab ID: 21060077-02
Matrix: WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
PFAS BY EPA 537.1			Method: **E537.1**		Prep: E537.1 / 6/2/21		Analyst: **SK**
Hexafluoropropylene oxide dimer acid (HFPO-DA)	U		0.5	2	ng/L	1	6/3/2021 19:08
N-Ethylperfluorooctanesulfonamidoacetic Acid	U		0.2	2	ng/L	1	6/3/2021 19:08
N-Methylperfluorooctanesulfonamidoacetic Acid	U		0.4	2	ng/L	1	6/3/2021 19:08
Perfluorobutanesulfonic Acid (PFBS)	U		0.3	2	ng/L	1	6/3/2021 19:08
Perfluorodecanoic Acid (PFDA)	U		0.6	2	ng/L	1	6/3/2021 19:08
Perfluorododecanoic Acid (PFDoA)	U		0.3	2	ng/L	1	6/3/2021 19:08
Perfluoroheptanoic Acid (PFHpA)	U		0.5	2	ng/L	1	6/3/2021 19:08
Perfluorohexanesulfonic Acid (PFHxS)	U		0.3	2	ng/L	1	6/3/2021 19:08
Perfluorohexanoic Acid (PFHxA)	U		0.6	2	ng/L	1	6/3/2021 19:08
Perfluorononanoic Acid (PFNA)	U		0.5	2	ng/L	1	6/3/2021 19:08
Perfluorooctanesulfonic Acid (PFOS)	U		0.2	2	ng/L	1	6/3/2021 19:08
Perfluorooctanoic Acid (PFOA)	U		0.4	2	ng/L	1	6/3/2021 19:08
Perfluorotetradecanoic Acid (PFTeA)	U		0.4	2	ng/L	1	6/3/2021 19:08
Perfluorotridecanoic Acid (PFTriA)	U		0.3	2	ng/L	1	6/3/2021 19:08
Perfluoroundecanoic Acid (PFUnA)	U		0.4	2	ng/L	1	6/3/2021 19:08
11Cl-Pf3OUdS	U		0.3	2	ng/L	1	6/3/2021 19:08
9Cl-PF3ONS	U		0.1	2	ng/L	1	6/3/2021 19:08
4,8-Dioxa-3H-perfluorononanoic Acid (DONA)	U		0.3	2	ng/L	1	6/3/2021 19:08
Surr: 13C2-PFHxA	*100*			*70-130*	*%REC*	1	6/3/2021 19:08
Surr: 13C2-PFDA	*96.9*			*70-130*	*%REC*	1	6/3/2021 19:08
Surr: d5-N-EtFOSAA	*74.6*			*70-130*	*%REC*	1	6/3/2021 19:08
Surr: 13C3-HFPO-DA	*92.1*			*70-130*	*%REC*	1	6/3/2021 19:08

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *08-Jun-21*

Client: Fishbeck, Inc.
Project: Cedar Springs (201460)
Sample ID: CS-21-05-DW-13353 White Creek Avenue (I)
Collection Date: 5/26/2021 11:46 AM

Work Order: 21060077
Lab ID: 21060077-03
Matrix: WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
PFAS BY EPA 537.1			Method: **E537.1**		Prep: E537.1 / 6/2/21		Analyst: **SK**
Hexafluoropropylene oxide dimer acid (HFPO-DA)	U		0.6	2	ng/L	1	6/3/2021 19:29
N-Ethylperfluorooctanesulfonamidoacetic Acid	U		0.3	2	ng/L	1	6/4/2021 11:57
N-Methylperfluorooctanesulfonamidoacetic Acid	U		0.4	2	ng/L	1	6/4/2021 11:57
Perfluorobutanesulfonic Acid (PFBS)	U		0.3	2	ng/L	1	6/3/2021 19:29
Perfluorodecanoic Acid (PFDA)	U		0.6	2	ng/L	1	6/3/2021 19:29
Perfluorododecanoic Acid (PFDoA)	U		0.3	2	ng/L	1	6/3/2021 19:29
Perfluoroheptanoic Acid (PFHpA)	U		0.5	2	ng/L	1	6/3/2021 19:29
Perfluorohexanesulfonic Acid (PFHxS)	U		0.3	2	ng/L	1	6/3/2021 19:29
Perfluorohexanoic Acid (PFHxA)	U		0.6	2	ng/L	1	6/3/2021 19:29
Perfluorononanoic Acid (PFNA)	U		0.5	2	ng/L	1	6/3/2021 19:29
Perfluorooctanesulfonic Acid (PFOS)	U		0.2	2	ng/L	1	6/3/2021 19:29
Perfluorooctanoic Acid (PFOA)	U		0.5	2	ng/L	1	6/3/2021 19:29
Perfluorotetradecanoic Acid (PFTeA)	U		0.4	2	ng/L	1	6/3/2021 19:29
Perfluorotridecanoic Acid (PFTriA)	U		0.3	2	ng/L	1	6/3/2021 19:29
Perfluoroundecanoic Acid (PFUnA)	U		0.4	2	ng/L	1	6/3/2021 19:29
11Cl-Pf3OUdS	U		0.3	2	ng/L	1	6/3/2021 19:29
9Cl-PF3ONS	U		0.1	2	ng/L	1	6/3/2021 19:29
4,8-Dioxa-3H-perfluorononanoic Acid (DONA)	U		0.3	2	ng/L	1	6/3/2021 19:29
Surr: 13C2-PFHxA	*115*			*70-130*	*%REC*	1	6/3/2021 19:29
Surr: 13C2-PFDA	*111*			*70-130*	*%REC*	1	6/3/2021 19:29
Surr: d5-N-EtFOSAA	*83.0*			*70-130*	*%REC*	1	6/4/2021 11:57
Surr: 13C3-HFPO-DA	*108*			*70-130*	*%REC*	1	6/3/2021 19:29

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *08-Jun-21*

Client: Fishbeck, Inc.
Project: Cedar Springs (201460)
Sample ID: CS-21-05-DW-13399 White Creek Avenue (I)
Collection Date: 5/26/2021 11:05 AM

Work Order: 21060077
Lab ID: 21060077-04
Matrix: WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
PFAS BY EPA 537.1			Method: **E537.1**		Prep: E537.1 / 6/2/21		Analyst: **SK**
Hexafluoropropylene oxide dimer acid (HFPO-DA)	U		0.6	2	ng/L	1	6/3/2021 19:40
N-Ethylperfluorooctanesulfonamidoacetic Acid	U		0.3	2	ng/L	1	6/3/2021 19:40
N-Methylperfluorooctanesulfonamidoacetic Acid	U		0.4	2	ng/L	1	6/3/2021 19:40
Perfluorobutanesulfonic Acid (PFBS)	U		0.3	2	ng/L	1	6/3/2021 19:40
Perfluorodecanoic Acid (PFDA)	U		0.6	2	ng/L	1	6/3/2021 19:40
Perfluorododecanoic Acid (PFDoA)	U		0.3	2	ng/L	1	6/3/2021 19:40
Perfluoroheptanoic Acid (PFHpA)	U		0.5	2	ng/L	1	6/3/2021 19:40
Perfluorohexanesulfonic Acid (PFHxS)	U		0.3	2	ng/L	1	6/3/2021 19:40
Perfluorohexanoic Acid (PFHxA)	U		0.6	2	ng/L	1	6/3/2021 19:40
Perfluorononanoic Acid (PFNA)	U		0.5	2	ng/L	1	6/3/2021 19:40
Perfluorooctanesulfonic Acid (PFOS)	U		0.2	2	ng/L	1	6/3/2021 19:40
Perfluorooctanoic Acid (PFOA)	U		0.5	2	ng/L	1	6/3/2021 19:40
Perfluorotetradecanoic Acid (PFTeA)	U		0.4	2	ng/L	1	6/3/2021 19:40
Perfluorotridecanoic Acid (PFTriA)	U		0.3	2	ng/L	1	6/3/2021 19:40
Perfluoroundecanoic Acid (PFUnA)	U		0.4	2	ng/L	1	6/3/2021 19:40
11Cl-Pf3OUdS	U		0.3	2	ng/L	1	6/3/2021 19:40
9Cl-PF3ONS	U		0.1	2	ng/L	1	6/3/2021 19:40
4,8-Dioxa-3H-perfluorononanoic Acid (DONA)	U		0.3	2	ng/L	1	6/3/2021 19:40
Surr: 13C2-PFHxA	*104*			*70-130*	*%REC*	1	6/3/2021 19:40
Surr: 13C2-PFDA	*98.4*			*70-130*	*%REC*	1	6/3/2021 19:40
Surr: d5-N-EtFOSAA	*77.0*			*70-130*	*%REC*	1	6/3/2021 19:40
Surr: 13C3-HFPO-DA	*98.4*			*70-130*	*%REC*	1	6/3/2021 19:40

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *08-Jun-21*

Client: Fishbeck, Inc.
Project: Cedar Springs (201460)
Sample ID: CS-21-05-DW-13485 White Creek Avenue (I)
Collection Date: 5/26/2021 10:45 AM

Work Order: 21060077
Lab ID: 21060077-05
Matrix: WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
PFAS BY EPA 537.1			Method: **E537.1**		Prep: E537.1 / 6/2/21		Analyst: **SK**
Hexafluoropropylene oxide dimer acid (HFPO-DA)	U		0.6	2	ng/L	1	6/3/2021 19:50
N-Ethylperfluorooctanesulfonamidoacetic Acid	**0.41**	J	**0.3**	**2**	**ng/L**	1	6/3/2021 19:50
N-Methylperfluorooctanesulfonamidoacetic Acid	U		0.4	2	ng/L	1	6/3/2021 19:50
Perfluorobutanesulfonic Acid (PFBS)	**1.9**	J	**0.3**	**2**	**ng/L**	1	6/3/2021 19:50
Perfluorodecanoic Acid (PFDA)	U		0.6	2	ng/L	1	6/3/2021 19:50
Perfluorododecanoic Acid (PFDoA)	U		0.3	2	ng/L	1	6/3/2021 19:50
Perfluoroheptanoic Acid (PFHpA)	**1.4**	J	**0.5**	**2**	**ng/L**	1	6/3/2021 19:50
Perfluorohexanesulfonic Acid (PFHxS)	**2.8**		**0.3**	**2**	**ng/L**	1	6/3/2021 19:50
Perfluorohexanoic Acid (PFHxA)	**1.1**	J	**0.6**	**2**	**ng/L**	1	6/3/2021 19:50
Perfluorononanoic Acid (PFNA)	U		0.5	2	ng/L	1	6/3/2021 19:50
Perfluorooctanesulfonic Acid (PFOS)	**7.0**		**0.2**	**2**	**ng/L**	1	6/3/2021 19:50
Perfluorooctanoic Acid (PFOA)	**9.9**		**0.5**	**2**	**ng/L**	1	6/3/2021 19:50
Perfluorotetradecanoic Acid (PFTeA)	U		0.4	2	ng/L	1	6/3/2021 19:50
Perfluorotridecanoic Acid (PFTriA)	U		0.3	2	ng/L	1	6/3/2021 19:50
Perfluoroundecanoic Acid (PFUnA)	U		0.4	2	ng/L	1	6/3/2021 19:50
11Cl-Pf3OUdS	U		0.3	2	ng/L	1	6/3/2021 19:50
9Cl-PF3ONS	U		0.1	2	ng/L	1	6/3/2021 19:50
4,8-Dioxa-3H-perfluorononanoic Acid (DONA)	U		0.3	2	ng/L	1	6/3/2021 19:50
Surr: 13C2-PFHxA	*107*			*70-130*	*%REC*	1	6/3/2021 19:50
Surr: 13C2-PFDA	*103*			*70-130*	*%REC*	1	6/3/2021 19:50
Surr: d5-N-EtFOSAA	*73.3*			*70-130*	*%REC*	1	6/3/2021 19:50
Surr: 13C3-HFPO-DA	*98.9*			*70-130*	*%REC*	1	6/3/2021 19:50

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *08-Jun-21*

Client: Fishbeck, Inc.
Project: Cedar Springs (201460)
Sample ID: CS-21-05-DW-13525 White Creek Avenue (I)
Collection Date: 5/26/2021 10:27 AM

Work Order: 21060077
Lab ID: 21060077-06
Matrix: WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
PFAS BY EPA 537.1			Method: **E537.1**		Prep: E537.1 / 6/2/21		Analyst: **SK**
Hexafluoropropylene oxide dimer acid (HFPO-DA)	U		0.5	2	ng/L	1	6/3/2021 20:01
N-Ethylperfluorooctanesulfonamidoacetic Acid	U		0.2	2	ng/L	1	6/4/2021 12:07
N-Methylperfluorooctanesulfonamidoacetic Acid	U		0.4	2	ng/L	1	6/4/2021 12:07
Perfluorobutanesulfonic Acid (PFBS)	U		0.3	2	ng/L	1	6/3/2021 20:01
Perfluorodecanoic Acid (PFDA)	U		0.6	2	ng/L	1	6/3/2021 20:01
Perfluorododecanoic Acid (PFDoA)	U		0.3	2	ng/L	1	6/3/2021 20:01
Perfluoroheptanoic Acid (PFHpA)	U		0.5	2	ng/L	1	6/3/2021 20:01
Perfluorohexanesulfonic Acid (PFHxS)	U		0.3	2	ng/L	1	6/3/2021 20:01
Perfluorohexanoic Acid (PFHxA)	U		0.6	2	ng/L	1	6/3/2021 20:01
Perfluorononanoic Acid (PFNA)	U		0.5	2	ng/L	1	6/3/2021 20:01
Perfluorooctanesulfonic Acid (PFOS)	U		0.2	2	ng/L	1	6/3/2021 20:01
Perfluorooctanoic Acid (PFOA)	U		0.4	2	ng/L	1	6/3/2021 20:01
Perfluorotetradecanoic Acid (PFTeA)	U		0.4	2	ng/L	1	6/3/2021 20:01
Perfluorotridecanoic Acid (PFTriA)	U		0.3	2	ng/L	1	6/3/2021 20:01
Perfluoroundecanoic Acid (PFUnA)	U		0.4	2	ng/L	1	6/3/2021 20:01
11Cl-Pf3OUdS	U		0.3	2	ng/L	1	6/3/2021 20:01
9Cl-PF3ONS	U		0.1	2	ng/L	1	6/3/2021 20:01
4,8-Dioxa-3H-perfluorononanoic Acid (DONA)	U		0.3	2	ng/L	1	6/3/2021 20:01
Surr: 13C2-PFHxA	*108*			*70-130*	*%REC*	1	6/3/2021 20:01
Surr: 13C2-PFDA	*98.0*			*70-130*	*%REC*	1	6/3/2021 20:01
Surr: d5-N-EtFOSAA	*71.5*			*70-130*	*%REC*	1	6/4/2021 12:07
Surr: 13C3-HFPO-DA	*103*			*70-130*	*%REC*	1	6/3/2021 20:01

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *08-Jun-21*

Client: Fishbeck, Inc.
Project: Cedar Springs (201460)
Sample ID: CS-21-05-DW-13590 White Creek Avenue (I)
Collection Date: 5/26/2021 10:06 AM

Work Order: 21060077
Lab ID: 21060077-07
Matrix: WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
PFAS BY EPA 537.1			Method: **E537.1**		Prep: E537.1 / 6/2/21		Analyst: **SK**
Hexafluoropropylene oxide dimer acid (HFPO-DA)	U		0.6	2	ng/L	1	6/3/2021 20:21
N-Ethylperfluorooctanesulfonamidoacetic Acid	U		0.3	2	ng/L	1	6/3/2021 20:21
N-Methylperfluorooctanesulfonamidoacetic Acid	U		0.4	2	ng/L	1	6/3/2021 20:21
Perfluorobutanesulfonic Acid (PFBS)	U		0.3	2	ng/L	1	6/3/2021 20:21
Perfluorodecanoic Acid (PFDA)	U		0.6	2	ng/L	1	6/3/2021 20:21
Perfluorododecanoic Acid (PFDoA)	U		0.3	2	ng/L	1	6/3/2021 20:21
Perfluoroheptanoic Acid (PFHpA)	U		0.5	2	ng/L	1	6/3/2021 20:21
Perfluorohexanesulfonic Acid (PFHxS)	U		0.3	2	ng/L	1	6/3/2021 20:21
Perfluorohexanoic Acid (PFHxA)	U		0.6	2	ng/L	1	6/3/2021 20:21
Perfluorononanoic Acid (PFNA)	U		0.5	2	ng/L	1	6/3/2021 20:21
Perfluorooctanesulfonic Acid (PFOS)	U		0.2	2	ng/L	1	6/3/2021 20:21
Perfluorooctanoic Acid (PFOA)	U		0.4	2	ng/L	1	6/3/2021 20:21
Perfluorotetradecanoic Acid (PFTeA)	U		0.4	2	ng/L	1	6/3/2021 20:21
Perfluorotridecanoic Acid (PFTriA)	U		0.3	2	ng/L	1	6/3/2021 20:21
Perfluoroundecanoic Acid (PFUnA)	U		0.4	2	ng/L	1	6/3/2021 20:21
11Cl-Pf3OUdS	U		0.3	2	ng/L	1	6/3/2021 20:21
9Cl-PF3ONS	U		0.1	2	ng/L	1	6/3/2021 20:21
4,8-Dioxa-3H-perfluorononanoic Acid (DONA)	U		0.3	2	ng/L	1	6/3/2021 20:21
Surr: 13C2-PFHxA	*107*			*70-130*	*%REC*	1	6/3/2021 20:21
Surr: 13C2-PFDA	*101*			*70-130*	*%REC*	1	6/3/2021 20:21
Surr: d5-N-EtFOSAA	*73.0*			*70-130*	*%REC*	1	6/3/2021 20:21
Surr: 13C3-HFPO-DA	*101*			*70-130*	*%REC*	1	6/3/2021 20:21

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *08-Jun-21*

Client: Fishbeck, Inc.
Project: Cedar Springs (201460) **Work Order:** 21060077
Sample ID: CS-21-05-DW-4095 16 Mile Rd (I) **Lab ID:** 21060077-08
Collection Date: 5/26/2021 01:40 PM **Matrix:** WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
PFAS BY EPA 537.1			Method: **E537.1**		Prep: E537.1 / 6/3/21		Analyst: **SK**
Hexafluoropropylene oxide dimer acid (HFPO-DA)	U		0.6	2	ng/L	1	6/4/2021 15:53
N-Ethylperfluorooctanesulfonamidoacetic Acid	U		0.3	2	ng/L	1	6/4/2021 15:53
N-Methylperfluorooctanesulfonamidoacetic Acid	U		0.4	2	ng/L	1	6/4/2021 15:53
Perfluorobutanesulfonic Acid (PFBS)	U		0.3	2	ng/L	1	6/4/2021 15:53
Perfluorodecanoic Acid (PFDA)	U		0.6	2	ng/L	1	6/4/2021 15:53
Perfluorododecanoic Acid (PFDoA)	U		0.3	2	ng/L	1	6/4/2021 15:53
Perfluoroheptanoic Acid (PFHpA)	U		0.5	2	ng/L	1	6/4/2021 15:53
Perfluorohexanesulfonic Acid (PFHxS)	U		0.3	2	ng/L	1	6/4/2021 15:53
Perfluorohexanoic Acid (PFHxA)	U		0.6	2	ng/L	1	6/4/2021 15:53
Perfluorononanoic Acid (PFNA)	**0.88**	J	**0.5**	**2**	**ng/L**	1	6/4/2021 15:53
Perfluorooctanesulfonic Acid (PFOS)	U		0.2	2	ng/L	1	6/4/2021 15:53
Perfluorooctanoic Acid (PFOA)	U		0.4	2	ng/L	1	6/4/2021 15:53
Perfluorotetradecanoic Acid (PFTeA)	U		0.4	2	ng/L	1	6/4/2021 15:53
Perfluorotridecanoic Acid (PFTriA)	U		0.3	2	ng/L	1	6/4/2021 15:53
Perfluoroundecanoic Acid (PFUnA)	U		0.4	2	ng/L	1	6/4/2021 15:53
11Cl-Pf3OUdS	U		0.3	2	ng/L	1	6/4/2021 15:53
9Cl-PF3ONS	U		0.1	2	ng/L	1	6/4/2021 15:53
4,8-Dioxa-3H-perfluorononanoic Acid (DONA)	U		0.3	2	ng/L	1	6/4/2021 15:53
Surr: 13C2-PFHxA	*114*			*70-130*	*%REC*	1	6/4/2021 15:53
Surr: 13C2-PFDA	*103*			*70-130*	*%REC*	1	6/4/2021 15:53
Surr: d5-N-EtFOSAA	*87.3*			*70-130*	*%REC*	1	6/4/2021 15:53
Surr: 13C3-HFPO-DA	*109*			*70-130*	*%REC*	1	6/4/2021 15:53

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *08-Jun-21*

Client:	Fishbeck, Inc.		
Project:	Cedar Springs (201460)	**Work Order:**	21060077
Sample ID:	CS-21-05-DW-4107 16 Mile Rd (I)	**Lab ID:**	21060077-09
Collection Date:	5/26/2021 01:06 PM	**Matrix:**	WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
PFAS BY EPA 537.1			Method: **E537.1**		Prep: E537.1 / 6/3/21		Analyst: **SK**
Hexafluoropropylene oxide dimer acid (HFPO-DA)	U		0.6	2	ng/L	1	6/4/2021 16:45
N-Ethylperfluorooctanesulfonamidoacetic Acid	U		0.3	2	ng/L	1	6/4/2021 16:45
N-Methylperfluorooctanesulfonamidoacetic Acid	U		0.4	2	ng/L	1	6/4/2021 16:45
Perfluorobutanesulfonic Acid (PFBS)	U		0.3	2	ng/L	1	6/4/2021 16:45
Perfluorodecanoic Acid (PFDA)	U		0.6	2	ng/L	1	6/4/2021 16:45
Perfluorododecanoic Acid (PFDoA)	U		0.3	2	ng/L	1	6/4/2021 16:45
Perfluoroheptanoic Acid (PFHpA)	U		0.5	2	ng/L	1	6/4/2021 16:45
Perfluorohexanesulfonic Acid (PFHxS)	U		0.3	2	ng/L	1	6/4/2021 16:45
Perfluorohexanoic Acid (PFHxA)	U		0.6	2	ng/L	1	6/4/2021 16:45
Perfluorononanoic Acid (PFNA)	**1.6**	J	**0.5**	**2**	**ng/L**	1	6/4/2021 16:45
Perfluorooctanesulfonic Acid (PFOS)	U		0.2	2	ng/L	1	6/4/2021 16:45
Perfluorooctanoic Acid (PFOA)	U		0.4	2	ng/L	1	6/4/2021 16:45
Perfluorotetradecanoic Acid (PFTeA)	U		0.4	2	ng/L	1	6/4/2021 16:45
Perfluorotridecanoic Acid (PFTriA)	U		0.3	2	ng/L	1	6/4/2021 16:45
Perfluoroundecanoic Acid (PFUnA)	U		0.4	2	ng/L	1	6/4/2021 16:45
11Cl-Pf3OUdS	U		0.3	2	ng/L	1	6/4/2021 16:45
9Cl-PF3ONS	U		0.1	2	ng/L	1	6/4/2021 16:45
4,8-Dioxa-3H-perfluorononanoic Acid (DONA)	U		0.3	2	ng/L	1	6/4/2021 16:45
Surr: 13C2-PFHxA	*114*			*70-130*	*%REC*	1	6/4/2021 16:45
Surr: 13C2-PFDA	*104*			*70-130*	*%REC*	1	6/4/2021 16:45
Surr: d5-N-EtFOSAA	*85.5*			*70-130*	*%REC*	1	6/4/2021 16:45
Surr: 13C3-HFPO-DA	*109*			*70-130*	*%REC*	1	6/4/2021 16:45

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *08-Jun-21*

Client:	Fishbeck, Inc.		
Project:	Cedar Springs (201460)	**Work Order:**	21060077
Sample ID:	CS-21-05-DW-4141 16 Mile Rd (I)	**Lab ID:**	21060077-10
Collection Date:	5/26/2021 12:48 PM	**Matrix:**	WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
PFAS BY EPA 537.1			Method: **E537.1**		Prep: E537.1 / 6/3/21		Analyst: **SK**
Hexafluoropropylene oxide dimer acid (HFPO-DA)	U		0.6	2	ng/L	1	6/4/2021 17:16
N-Ethylperfluorooctanesulfonamidoacetic Acid	U		0.3	2	ng/L	1	6/4/2021 17:16
N-Methylperfluorooctanesulfonamidoacetic Acid	U		0.4	2	ng/L	1	6/4/2021 17:16
Perfluorobutanesulfonic Acid (PFBS)	U		0.3	2	ng/L	1	6/4/2021 17:16
Perfluorodecanoic Acid (PFDA)	U		0.6	2	ng/L	1	6/4/2021 17:16
Perfluorododecanoic Acid (PFDoA)	U		0.3	2	ng/L	1	6/4/2021 17:16
Perfluoroheptanoic Acid (PFHpA)	U		0.5	2	ng/L	1	6/4/2021 17:16
Perfluorohexanesulfonic Acid (PFHxS)	U		0.3	2	ng/L	1	6/4/2021 17:16
Perfluorohexanoic Acid (PFHxA)	U		0.6	2	ng/L	1	6/4/2021 17:16
Perfluorononanoic Acid (PFNA)	**0.58**	J	**0.5**	**2**	**ng/L**	1	6/4/2021 17:16
Perfluorooctanesulfonic Acid (PFOS)	U		0.2	2	ng/L	1	6/4/2021 17:16
Perfluorooctanoic Acid (PFOA)	**0.65**	J	**0.4**	**2**	**ng/L**	1	6/4/2021 17:16
Perfluorotetradecanoic Acid (PFTeA)	U		0.4	2	ng/L	1	6/4/2021 17:16
Perfluorotridecanoic Acid (PFTriA)	U		0.3	2	ng/L	1	6/4/2021 17:16
Perfluoroundecanoic Acid (PFUnA)	U		0.4	2	ng/L	1	6/4/2021 17:16
11Cl-Pf3OUdS	U		0.3	2	ng/L	1	6/4/2021 17:16
9Cl-PF3ONS	U		0.1	2	ng/L	1	6/4/2021 17:16
4,8-Dioxa-3H-perfluorononanoic Acid (DONA)	U		0.3	2	ng/L	1	6/4/2021 17:16
Surr: 13C2-PFHxA	*111*			*70-130*	*%REC*	1	6/4/2021 17:16
Surr: 13C2-PFDA	*97.6*			*70-130*	*%REC*	1	6/4/2021 17:16
Surr: d5-N-EtFOSAA	*83.8*			*70-130*	*%REC*	1	6/4/2021 17:16
Surr: 13C3-HFPO-DA	*102*			*70-130*	*%REC*	1	6/4/2021 17:16

Note: See Qualifiers page for a list of qualifiers and their definitions.

Client: Fishbeck, Inc.
Project: Cedar Springs (201460)
Sample ID: CS-21-05-DW-4142 16 Mile Rd (I)
Collection Date: 5/26/2021 12:32 PM

Work Order: 21060077
Lab ID: 21060077-11
Matrix: WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
PFAS BY EPA 537.1			Method: **E537.1**		Prep: E537.1 / 6/3/21		Analyst: **SK**
Hexafluoropropylene oxide dimer acid (HFPO-DA)	U		0.6	2	ng/L	1	6/4/2021 17:27
N-Ethylperfluorooctanesulfonamidoacetic Acid	U		0.3	2	ng/L	1	6/4/2021 17:27
N-Methylperfluorooctanesulfonamidoacetic Acid	U		0.4	2	ng/L	1	6/4/2021 17:27
Perfluorobutanesulfonic Acid (PFBS)	**0.85**	J	**0.3**	**2**	**ng/L**	1	6/4/2021 17:27
Perfluorodecanoic Acid (PFDA)	U		0.6	2	ng/L	1	6/4/2021 17:27
Perfluorododecanoic Acid (PFDoA)	U		0.3	2	ng/L	1	6/4/2021 17:27
Perfluoroheptanoic Acid (PFHpA)	U		0.5	2	ng/L	1	6/4/2021 17:27
Perfluorohexanesulfonic Acid (PFHxS)	**0.49**	J	**0.3**	**2**	**ng/L**	1	6/4/2021 17:27
Perfluorohexanoic Acid (PFHxA)	U		0.6	2	ng/L	1	6/4/2021 17:27
Perfluorononanoic Acid (PFNA)	U		0.5	2	ng/L	1	6/4/2021 17:27
Perfluorooctanesulfonic Acid (PFOS)	**1.4**	J	**0.2**	**2**	**ng/L**	1	6/4/2021 17:27
Perfluorooctanoic Acid (PFOA)	**0.75**	J	**0.4**	**2**	**ng/L**	1	6/4/2021 17:27
Perfluorotetradecanoic Acid (PFTeA)	U		0.4	2	ng/L	1	6/4/2021 17:27
Perfluorotridecanoic Acid (PFTriA)	U		0.3	2	ng/L	1	6/4/2021 17:27
Perfluoroundecanoic Acid (PFUnA)	U		0.4	2	ng/L	1	6/4/2021 17:27
11Cl-Pf3OUdS	U		0.3	2	ng/L	1	6/4/2021 17:27
9Cl-PF3ONS	U		0.1	2	ng/L	1	6/4/2021 17:27
4,8-Dioxa-3H-perfluorononanoic Acid (DONA)	U		0.3	2	ng/L	1	6/4/2021 17:27
Surr: 13C2-PFHxA	*109*			*70-130*	*%REC*	1	6/4/2021 17:27
Surr: 13C2-PFDA	*98.7*			*70-130*	*%REC*	1	6/4/2021 17:27
Surr: d5-N-EtFOSAA	*76.8*			*70-130*	*%REC*	1	6/4/2021 17:27
Surr: 13C3-HFPO-DA	*107*			*70-130*	*%REC*	1	6/4/2021 17:27

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *08-Jun-21*

Client:	Fishbeck, Inc.		
Project:	Cedar Springs (201460)	**Work Order:**	21060077
Sample ID:	CS-21-05-DW-13360 White Creek Avenue (D)	**Lab ID:**	21060077-12
Collection Date:	5/26/2021 09:40 AM	**Matrix:**	WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
PFAS BY EPA 537.1			Method: **E537.1**		Prep: E537.1 / 6/3/21		Analyst: **SK**
Hexafluoropropylene oxide dimer acid (HFPO-DA)	U		0.6	2	ng/L	1	6/4/2021 17:37
N-Ethylperfluorooctanesulfonamidoacetic Acid	U		0.3	2	ng/L	1	6/4/2021 17:37
N-Methylperfluorooctanesulfonamidoacetic Acid	U		0.4	2	ng/L	1	6/4/2021 17:37
Perfluorobutanesulfonic Acid (PFBS)	U		0.3	2	ng/L	1	6/4/2021 17:37
Perfluorodecanoic Acid (PFDA)	U		0.6	2	ng/L	1	6/4/2021 17:37
Perfluorododecanoic Acid (PFDoA)	U		0.3	2	ng/L	1	6/4/2021 17:37
Perfluoroheptanoic Acid (PFHpA)	U		0.5	2	ng/L	1	6/4/2021 17:37
Perfluorohexanesulfonic Acid (PFHxS)	U		0.3	2	ng/L	1	6/4/2021 17:37
Perfluorohexanoic Acid (PFHxA)	U		0.6	2	ng/L	1	6/4/2021 17:37
Perfluorononanoic Acid (PFNA)	**0.55**	J	**0.5**	**2**	**ng/L**	1	6/4/2021 17:37
Perfluorooctanesulfonic Acid (PFOS)	U		0.2	2	ng/L	1	6/4/2021 17:37
Perfluorooctanoic Acid (PFOA)	U		0.5	2	ng/L	1	6/4/2021 17:37
Perfluorotetradecanoic Acid (PFTeA)	U		0.4	2	ng/L	1	6/4/2021 17:37
Perfluorotridecanoic Acid (PFTriA)	U		0.3	2	ng/L	1	6/4/2021 17:37
Perfluoroundecanoic Acid (PFUnA)	U		0.4	2	ng/L	1	6/4/2021 17:37
11Cl-Pf3OUdS	U		0.3	2	ng/L	1	6/4/2021 17:37
9Cl-PF3ONS	U		0.1	2	ng/L	1	6/4/2021 17:37
4,8-Dioxa-3H-perfluorononanoic Acid (DONA)	U		0.3	2	ng/L	1	6/4/2021 17:37
Surr: 13C2-PFHxA	*113*			*70-130*	*%REC*	1	6/4/2021 17:37
Surr: 13C2-PFDA	*112*			*70-130*	*%REC*	1	6/4/2021 17:37
Surr: d5-N-EtFOSAA	*99.6*			*70-130*	*%REC*	1	6/4/2021 17:37
Surr: 13C3-HFPO-DA	*109*			*70-130*	*%REC*	1	6/4/2021 17:37

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *08-Jun-21*

Client:	Fishbeck, Inc.		
Project:	Cedar Springs (201460)	**Work Order:**	21060077
Sample ID:	CS-21-05-QCFB-01	**Lab ID:**	21060077-13
Collection Date:	5/26/2021 02:05 PM	**Matrix:**	WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
PFAS BY EPA 537.1			Method: **E537.1**		Prep: E537.1 / 6/3/21		Analyst: **SK**
Hexafluoropropylene oxide dimer acid (HFPO-DA)	U		0.6	2	ng/L	1	6/7/2021 11:10
N-Ethylperfluorooctanesulfonamidoacetic Acid	U		0.3	2	ng/L	1	6/7/2021 11:10
N-Methylperfluorooctanesulfonamidoacetic Acid	U		0.4	2	ng/L	1	6/7/2021 11:10
Perfluorobutanesulfonic Acid (PFBS)	U		0.3	2	ng/L	1	6/7/2021 11:10
Perfluorodecanoic Acid (PFDA)	U		0.6	2	ng/L	1	6/7/2021 11:10
Perfluorododecanoic Acid (PFDoA)	U		0.3	2	ng/L	1	6/7/2021 11:10
Perfluoroheptanoic Acid (PFHpA)	U		0.5	2	ng/L	1	6/7/2021 11:10
Perfluorohexanesulfonic Acid (PFHxS)	U		0.3	2	ng/L	1	6/7/2021 11:10
Perfluorohexanoic Acid (PFHxA)	U		0.6	2	ng/L	1	6/7/2021 11:10
Perfluorononanoic Acid (PFNA)	**0.69**	J	**0.5**	**2**	**ng/L**	1	6/7/2021 11:10
Perfluorooctanesulfonic Acid (PFOS)	U		0.2	2	ng/L	1	6/7/2021 11:10
Perfluorooctanoic Acid (PFOA)	U		0.5	2	ng/L	1	6/7/2021 11:10
Perfluorotetradecanoic Acid (PFTeA)	U		0.4	2	ng/L	1	6/7/2021 11:10
Perfluorotridecanoic Acid (PFTriA)	U		0.3	2	ng/L	1	6/7/2021 11:10
Perfluoroundecanoic Acid (PFUnA)	U		0.4	2	ng/L	1	6/7/2021 11:10
11Cl-Pf3OUdS	U		0.3	2	ng/L	1	6/7/2021 11:10
9Cl-PF3ONS	U		0.1	2	ng/L	1	6/7/2021 11:10
4,8-Dioxa-3H-perfluorononanoic Acid (DONA)	U		0.3	2	ng/L	1	6/7/2021 11:10
Surr: 13C2-PFHxA	*98.1*			*70-130*	*%REC*	1	6/7/2021 11:10
Surr: 13C2-PFDA	*95.7*			*70-130*	*%REC*	1	6/7/2021 11:10
Surr: d5-N-EtFOSAA	*84.4*			*70-130*	*%REC*	1	6/7/2021 11:10
Surr: 13C3-HFPO-DA	*93.5*			*70-130*	*%REC*	1	6/7/2021 11:10

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *08-Jun-21*

Client: Fishbeck, Inc.
Project: Cedar Springs (201460)
Sample ID: CS-21-05-DW-4095 16 Mile Rd (D)
Collection Date: 5/26/2021 01:40 PM

Work Order: 21060077
Lab ID: 21060077-14
Matrix: WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
PFAS BY EPA 537.1			Method: **E537.1**		Prep: E537.1 / 6/3/21		Analyst: **SK**
Hexafluoropropylene oxide dimer acid (HFPO-DA)	U		0.6	2	ng/L	1	6/7/2021 11:20
N-Ethylperfluorooctanesulfonamidoacetic Acid	U		0.3	2	ng/L	1	6/7/2021 11:20
N-Methylperfluorooctanesulfonamidoacetic Acid	U		0.4	2	ng/L	1	6/7/2021 11:20
Perfluorobutanesulfonic Acid (PFBS)	U		0.3	2	ng/L	1	6/7/2021 11:20
Perfluorodecanoic Acid (PFDA)	U		0.6	2	ng/L	1	6/7/2021 11:20
Perfluorododecanoic Acid (PFDoA)	U		0.3	2	ng/L	1	6/7/2021 11:20
Perfluoroheptanoic Acid (PFHpA)	U		0.5	2	ng/L	1	6/7/2021 11:20
Perfluorohexanesulfonic Acid (PFHxS)	U		0.3	2	ng/L	1	6/7/2021 11:20
Perfluorohexanoic Acid (PFHxA)	U		0.6	2	ng/L	1	6/7/2021 11:20
Perfluorononanoic Acid (PFNA)	**0.65**	J	**0.5**	**2**	**ng/L**	1	6/7/2021 11:20
Perfluorooctanesulfonic Acid (PFOS)	U		0.2	2	ng/L	1	6/7/2021 11:20
Perfluorooctanoic Acid (PFOA)	U		0.4	2	ng/L	1	6/7/2021 11:20
Perfluorotetradecanoic Acid (PFTeA)	U		0.4	2	ng/L	1	6/7/2021 11:20
Perfluorotridecanoic Acid (PFTriA)	U		0.3	2	ng/L	1	6/7/2021 11:20
Perfluoroundecanoic Acid (PFUnA)	U		0.4	2	ng/L	1	6/7/2021 11:20
11Cl-Pf3OUdS	U		0.3	2	ng/L	1	6/7/2021 11:20
9Cl-PF3ONS	U		0.1	2	ng/L	1	6/7/2021 11:20
4,8-Dioxa-3H-perfluorononanoic Acid (DONA)	U		0.3	2	ng/L	1	6/7/2021 11:20
Surr: 13C2-PFHxA	*127*			*70-130*	*%REC*	1	6/7/2021 11:20
Surr: 13C2-PFDA	*107*			*70-130*	*%REC*	1	6/7/2021 11:20
Surr: d5-N-EtFOSAA	*80.8*			*70-130*	*%REC*	1	6/7/2021 11:20
Surr: 13C3-HFPO-DA	*124*			*70-130*	*%REC*	1	6/7/2021 11:20

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: 08-Jun-21

Client: Fishbeck, Inc.

Work Order: 21060077

Project: Cedar Springs (201460)

QC BATCH REPORT

Batch ID: **177808** Instrument ID **LCMS1** Method: **E537.1**

MBLK Sample ID: **MBLK-177808-177808** Units: **ng/L** Analysis Date: **6/3/2021 04:32 PM**

Client ID: Run ID: **LCMS1_210603A** SeqNo: **7455683** Prep Date: **6/2/2021** DF: **1**

Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Hexafluoropropylene oxide din	UI	0.7	2.0								
N-Ethylperfluorooctanesulfona	U	0.3	2.0								
N-Methylperfluorooctanesulfor	Ui	0.5	2.0								
Perfluorobutanesulfonic Acid (	U	0.4	2.0								
Perfluorodecanoic Acid (PFDA	U	0.7	2.0								
Perfluorododecanoic Acid (PFI	U	0.4	2.0								
Perfluoroheptanoic Acid (PFH	U	0.6	2.0								
Perfluorohexanesulfonic Acid (	U	0.3	2.0								
Perfluorohexanoic Acid (PFHx	U	0.7	2.0								
Perfluorononanoic Acid (PFNA	U	0.6	2.0								
Perfluorooctanesulfonic Acid (	U	0.2	2.0								
Perfluorooctanoic Acid (PFOA	U	0.5	2.0								
Perfluorotetradecanoic Acid (F	U	0.5	2.0								
Perfluorotridecanoic Acid (PFT	U	0.3	2.0								
Perfluoroundecanoic Acid (PFI	U	0.4	2.0								
11Cl-Pf3OUdS	U	0.4	2.0								
9Cl-PF3ONS	U	0.2	2.0								
4,8-Dioxa-3H-perfluorononano	U	0.3	2.0								
Surr: 13C2-PFHxA	*43.38*	0	0	*40*	0	*108*	*70-130*	0			
Surr: 13C2-PFDA	*42.25*	0	0	*40*	0	*106*	*70-130*	0			
Surr: d5-N-EtFOSAA	*159.6*	0	0	*160*	0	*99.8*	*70-130*	0			
Surr: 13C3-HFPO-DA	*39.02*	0	0	*40*	0	*97.5*	*70-130*	0			

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: Fishbeck, Inc.
Work Order: 21060077
Project: Cedar Springs (201460)

QC BATCH REPORT

Batch ID: **177808** Instrument ID **LCMS1** Method: **E537.1**

MS2 Sample ID: **21060077-01A MS2** Units: **ng/L** Analysis Date: **6/3/2021 04:53 PM**

Client ID: **CS-21-05-DW-13360 White Creek Avenue (I)** Run ID: **LCMS1_210603A** SeqNo: **7455688** Prep Date: **6/2/2021** DF: **1**

Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Hexafluoropropylene oxide din	16.25	0.6	2.0	17.61	0	92.3	70-130	0			
N-Ethylperfluorooctanesulfona	16.82	0.3	2.0	17.61	0	95.5	70-130	0			
N-Methylperfluorooctanesulfor	15.98	0.4	2.0	17.61	0.02632	90.6	70-130	0			
Perfluorobutanesulfonic Acid (	13.14	0.3	2.0	15.56	0	84.4	70-130	0			
Perfluorodecanoic Acid (PFDA	17.07	0.6	2.0	17.61	0	97	70-130	0			
Perfluorododecanoic Acid (PFI	16.64	0.3	2.0	17.61	0	94.5	70-130	0			
Perfluoroheptanoic Acid (PFH	19.92	0.5	2.0	17.61	0	113	70-130	0			
Perfluorohexanesulfonic Acid (	16.37	0.3	2.0	16.02	0	102	70-130	0			
Perfluorohexanoic Acid (PFHx	17.56	0.6	2.0	17.61	0	99.8	70-130	0			
Perfluorononanoic Acid (PFNA	18.44	0.5	2.0	17.61	0.08211	104	70-130	0			
Perfluorooctanesulfonic Acid (	16.78	0.2	2.0	16.34	0.1077	102	70-130	0			
Perfluorooctanoic Acid (PFOA	18.03	0.5	2.0	17.61	0	102	70-130	0			
Perfluorotetradecanoic Acid (F	14.31	0.4	2.0	17.61	0.01684	81.2	70-130	0			
Perfluorotridecanoic Acid (PFT	16.41	0.3	2.0	17.61	0	93.2	70-130	0			
Perfluoroundecanoic Acid (PFI	17.6	0.4	2.0	17.61	0	100	70-130	0			
11Cl-Pf3OUdS	14.54	0.3	2.0	16.58	0	87.7	70-130	0			
9Cl-PF3ONS	15.26	0.1	2.0	16.41	0	93	70-130	0			
4,8-Dioxa-3H-perfluorononano	16.55	0.3	2.0	16.58	0	99.8	70-130	0			
Surr: 13C2-PFHxA	*36.32*	0	0	*35.21*	0	*103*	*70-130*	0			
Surr: 13C2-PFDA	*35.97*	0	0	*35.21*	0	*102*	*70-130*	0			
Surr: d5-N-EtFOSAA	*132.9*	0	0	*140.8*	0	*94.4*	*70-130*	0			
Surr: 13C3-HFPO-DA	*34.01*	0	0	*35.21*	0	*96.6*	*70-130*	0			

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client:	Fishbeck, Inc.
Work Order:	21060077
Project:	Cedar Springs (201460)

QC BATCH REPORT

Batch ID: **177808** Instrument ID **LCMS1** Method: **E537.1**

DUP Sample ID: **21060077-02A DUP** Units: **ng/L** Analysis Date: **6/3/2021 07:19 PM**

Client ID: **CS-21-05-DW-13261 White Creek Avenue (I)** Run ID: **LCMS1_210603A** SeqNo: **7455702** Prep Date: **6/2/2021** DF: **1**

Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Hexafluoropropylene oxide din	UI	0.6	2.0	0	0	0		0	0	30	
N-Ethylperfluorooctanesulfona	U	0.3	2.0	0	0	0		0	0	30	
N-Methylperfluorooctanesulfor	Ui	0.4	2.0	0	0	0		0.02709	0	30	
Perfluorobutanesulfonic Acid (	U	0.3	2.0	0	0	0		0	0	30	
Perfluorodecanoic Acid (PFDA	U	0.6	2.0	0	0	0		0	0	30	
Perfluorododecanoic Acid (PFI	U	0.3	2.0	0	0	0		0	0	30	
Perfluoroheptanoic Acid (PFH	U	0.5	2.0	0	0	0		0	0	30	
Perfluorohexanesulfonic Acid (	U	0.3	2.0	0	0	0		0	0	30	
Perfluorohexanoic Acid (PFHx	U	0.6	2.0	0	0	0		0	0	30	
Perfluorononanoic Acid (PFNA	U	0.5	2.0	0	0	0		0.01706	0	30	
Perfluorooctanesulfonic Acid (	U	0.2	2.0	0	0	0		0	0	30	
Perfluorooctanoic Acid (PFOA	U	0.5	2.0	0	0	0		0	0	30	
Perfluorotetradecanoic Acid (F	U	0.4	2.0	0	0	0		0	0	30	
Perfluorotridecanoic Acid (PFT	U	0.3	2.0	0	0	0		0	0	30	
Perfluoroundecanoic Acid (PFI	U	0.4	2.0	0	0	0		0	0	30	
11Cl-Pf3OUdS	U	0.3	2.0	0	0	0		0	0	30	
9Cl-PF3ONS	U	0.1	2.0	0	0	0		0	0	30	
4,8-Dioxa-3H-perfluorononano	U	0.3	2.0	0	0	0		0	0	30	
Surr: 13C2-PFHxA	*34*	0	0	*35.09*	0	*96.9*	*70-130*	33.6	*1.18*	*30*	
Surr: 13C2-PFDA	*33.74*	0	0	*35.09*	0	*96.2*	*70-130*	32.4	*4.04*	*30*	
Surr: d5-N-EtFOSAA	*111.2*	0	0	*140.4*	0	*79.2*	*70-130*	99.78	*10.8*	*30*	
Surr: 13C3-HFPO-DA	*31.9*	0	0	*35.09*	0	*90.9*	*70-130*	30.8	*3.49*	*30*	

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: Fishbeck, Inc.
Work Order: 21060077
Project: Cedar Springs (201460)

QC BATCH REPORT

Batch ID: **177808** Instrument ID **LCMS1** Method: **E537.1**

LCS2	Sample ID: **LCS2-177808-177808**					Units: **ng/L**			Analysis Date: **6/3/2021 04:42 PM**		
Client ID:			Run ID: **LCMS1_210603A**			SeqNo: **7455687**		Prep Date: **6/2/2021**		DF: **1**	
Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Hexafluoropropylene oxide din	18.21	0.7	2.0	20	0	91	70-130	0			
N-Ethylperfluorooctanesulfona	18.7	0.3	2.0	20	0	93.5	70-130	0			
N-Methylperfluorooctanesulfor	17.64	0.5	2.0	20	0	88.2	70-130	0			
Perfluorobutanesulfonic Acid (	14.76	0.4	2.0	17.68	0	83.5	70-130	0			
Perfluorodecanoic Acid (PFDA	18.62	0.7	2.0	20	0	93.1	70-130	0			
Perfluorododecanoic Acid (PFI	18.4	0.4	2.0	20	0	92	70-130	0			
Perfluoroheptanoic Acid (PFH	21.34	0.6	2.0	20	0	107	70-130	0			
Perfluorohexanesulfonic Acid (	18.19	0.3	2.0	18.2	0	100	70-130	0			
Perfluorohexanoic Acid (PFHx	19.39	0.7	2.0	20	0	96.9	70-130	0			
Perfluorononanoic Acid (PFNA	20.16	0.6	2.0	20	0	101	70-130	0			
Perfluorooctanesulfonic Acid (	18.4	0.2	2.0	18.56	0	99.1	70-130	0			
Perfluorooctanoic Acid (PFOA	19.69	0.5	2.0	20	0	98.4	70-130	0			
Perfluorotetradecanoic Acid (F	16.41	0.5	2.0	20	0	82.1	70-130	0			
Perfluorotridecanoic Acid (PFT	18.82	0.3	2.0	20	0	94.1	70-130	0			
Perfluoroundecanoic Acid (PFI	18.98	0.4	2.0	20	0	94.9	70-130	0			
11Cl-Pf3OUdS	16.27	0.4	2.0	18.84	0	86.4	70-130	0			
9Cl-PF3ONS	16.45	0.2	2.0	18.64	0	88.2	70-130	0			
4,8-Dioxa-3H-perfluorononano	18.38	0.3	2.0	18.84	0	97.5	70-130	0			
Surr: 13C2-PFHxA	*41.78*	0	0	*40*	0	*104*	*70-130*	0			
Surr: 13C2-PFDA	*40.97*	0	0	*40*	0	*102*	*70-130*	0			
Surr: d5-N-EtFOSAA	*146.2*	0	0	*160*	0	*91.4*	*70-130*	0			
Surr: 13C3-HFPO-DA	*39.13*	0	0	*40*	0	*97.8*	*70-130*	0			

The following samples were analyzed in this batch:

21060077-01A	21060077-02A	21060077-03A
21060077-04A	21060077-05A	21060077-06A
21060077-07A		

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: Fishbeck, Inc.
Work Order: 21060077
Project: Cedar Springs (201460)

QC BATCH REPORT

Batch ID: **177884** Instrument ID **LCMS1** Method: **E537.1**

MBLK	Sample ID: **MBLK-177884-177884**					Units: **ng/L**		Analysis Date: **6/4/2021 03:22 PM**			
Client ID:		Run ID: **LCMS1_210604C**				SeqNo: **7462993**		Prep Date: **6/3/2021**		DF: **1**	
Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Hexafluoropropylene oxide din	UI	0.7	2.0								
N-Ethylperfluorooctanesulfona	U	0.3	2.0								
N-Methylperfluorooctanesulfor	Ui	0.5	2.0								
Perfluorobutanesulfonic Acid (	U	0.4	2.0								
Perfluorodecanoic Acid (PFDA	U	0.7	2.0								
Perfluorododecanoic Acid (PFI	U	0.4	2.0								
Perfluoroheptanoic Acid (PFH|	U	0.6	2.0								
Perfluorohexanesulfonic Acid (	U	0.3	2.0								
Perfluorohexanoic Acid (PFHx	U	0.7	2.0								
Perfluorononanoic Acid (PFNA	U	0.6	2.0								
Perfluorooctanesulfonic Acid (	U	0.2	2.0								
Perfluorooctanoic Acid (PFOA	U	0.5	2.0								
Perfluorotetradecanoic Acid (F	U	0.5	2.0								
Perfluorotridecanoic Acid (PFT	U	0.3	2.0								
Perfluoroundecanoic Acid (PFI	U	0.4	2.0								
11Cl-Pf3OUdS	U	0.4	2.0								
9Cl-PF3ONS	U	0.2	2.0								
4,8-Dioxa-3H-perfluorononano	U	0.3	2.0								
Surr: 13C2-PFHxA	*45.56*	0	0	*40*	0	*114*	*70-130*	0			
Surr: 13C2-PFDA	*43.6*	0	0	*40*	0	*109*	*70-130*	0			
Surr: d5-N-EtFOSAA	*160.9*	0	0	*160*	0	*101*	*70-130*	0			
Surr: 13C3-HFPO-DA	*43.77*	0	0	*40*	0	*109*	*70-130*	0			

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: Fishbeck, Inc.
Work Order: 21060077
Project: Cedar Springs (201460)

QC BATCH REPORT

Batch ID: **177884** Instrument ID **LCMS1** Method: **E537.1**

MS3 Sample ID: **21060077-08A MS3** Units: **ng/L** Analysis Date: **6/4/2021 03:43 PM**

Client ID: **CS-21-05-DW-4095 16 Mile Rd (I)** Run ID: **LCMS1_210604C** SeqNo: **7462995** Prep Date: **6/3/2021** DF: **1**

Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Hexafluoropropylene oxide din	86.91	0.6	2.0	86.51	0	100	70-130	0			
N-Ethylperfluorooctanesulfona	77.39	0.3	2.0	86.51	0	89.5	70-130	0			
N-Methylperfluorooctanesulfor	64.92	0.4	2.0	86.51	0.03849	75	70-130	0			
Perfluorobutanesulfonic Acid (	71.24	0.3	2.0	76.47	0	93.2	70-130	0			
Perfluorodecanoic Acid (PFDA	81.44	0.6	2.0	86.51	0.03643	94.1	70-130	0			
Perfluorododecanoic Acid (PFI	80.75	0.3	2.0	86.51	0	93.3	70-130	0			
Perfluoroheptanoic Acid (PFH	100.1	0.5	2.0	86.51	0.06873	116	70-130	0			
Perfluorohexanesulfonic Acid (	83.15	0.3	2.0	78.72	0	106	70-130	0			
Perfluorohexanoic Acid (PFHx	92.42	0.6	2.0	86.51	0.04089	107	70-130	0			
Perfluorononanoic Acid (PFNA	93.96	0.5	2.0	86.51	0.8756	108	70-130	0			
Perfluorooctanesulfonic Acid (	75.68	0.2	2.0	80.28	0.03505	94.2	70-130	0			
Perfluorooctanoic Acid (PFOA	92.99	0.5	2.0	86.51	0	107	70-130	0			
Perfluorotetradecanoic Acid (F	74.58	0.4	2.0	86.51	0	86.2	70-130	0			
Perfluorotridecanoic Acid (PFT	80.42	0.3	2.0	86.51	0.06186	92.9	70-130	0			
Perfluoroundecanoic Acid (PFI	79.95	0.4	2.0	86.51	0.1859	92.2	70-130	0			
11Cl-Pf3OUdS	61.64	0.3	2.0	81.49	0	75.6	70-130	0			
9Cl-PF3ONS	69.98	0.1	2.0	80.62	0	86.8	70-130	0			
4,8-Dioxa-3H-perfluorononano	82.59	0.3	2.0	81.49	0	101	70-130	0			
Surr: 13C2-PFHxA	*42.03*	0	0	*34.6*	0	*121*	*70-130*	0			
Surr: 13C2-PFDA	*37.04*	0	0	*34.6*	0	*107*	*70-130*	0			
Surr: d5-N-EtFOSAA	*124.2*	0	0	*138.4*	0	*89.7*	*70-130*	0			
Surr: 13C3-HFPO-DA	*40.14*	0	0	*34.6*	0	*116*	*70-130*	0			

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: Fishbeck, Inc.
Work Order: 21060077
Project: Cedar Springs (201460)

QC BATCH REPORT

Batch ID: **177884** Instrument ID **LCMS1** Method: **E537.1**

DUP Sample ID: **21060077-09A DUP** Units: **ng/L** Analysis Date: **6/4/2021 04:56 PM**
Client ID: **CS-21-05-DW-4107 16 Mile Rd (I)** Run ID: **LCMS1_210604C** SeqNo: **7463001** Prep Date: **6/3/2021** DF: **1**

Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Hexafluoropropylene oxide din	UI	0.6	2.0	0	0	0		0	0	30	
N-Ethylperfluorooctanesulfona	U	0.3	2.0	0	0	0		0	0	30	
N-Methylperfluorooctanesulfor	Ui	0.4	2.0	0	0	0		0	0	30	
Perfluorobutanesulfonic Acid (	U	0.3	2.0	0	0	0		0	0	30	
Perfluorodecanoic Acid (PFDA	U	0.6	2.0	0	0	0		0	0	30	
Perfluorododecanoic Acid (PFI	U	0.3	2.0	0	0	0		0	0	30	
Perfluoroheptanoic Acid (PFH	U	0.5	2.0	0	0	0		0.1592	0	30	
Perfluorohexanesulfonic Acid (	U	0.3	2.0	0	0	0		0	0	30	
Perfluorohexanoic Acid (PFHx	U	0.6	2.0	0	0	0		0.2255	0	30	
Perfluorononanoic Acid (PFNA	0.6099	0.5	2.0	0	0	0		1.618	0	30	J
Perfluorooctanesulfonic Acid (	U	0.2	2.0	0	0	0		0.0432	0	30	
Perfluorooctanoic Acid (PFOA	U	0.4	2.0	0	0	0		0.316	0	30	
Perfluorotetradecanoic Acid (F	U	0.4	2.0	0	0	0		0	0	30	
Perfluorotridecanoic Acid (PFT	U	0.3	2.0	0	0	0		0.05816	0	30	
Perfluoroundecanoic Acid (PFI	U	0.4	2.0	0	0	0		0.2707	0	30	
11Cl-Pf3OUdS	U	0.3	2.0	0	0	0		0	0	30	
9Cl-PF3ONS	U	0.1	2.0	0	0	0		0	0	30	
4,8-Dioxa-3H-perfluorononano	U	0.3	2.0	0	0	0		0	0	30	
Surr: 13C2-PFHxA	*37.73*	0	0	*34.25*	0	*110*	*70-130*	38.78	*2.74*	*30*	
Surr: 13C2-PFDA	*36.56*	0	0	*34.25*	0	*107*	*70-130*	35.4	*3.21*	*30*	
Surr: d5-N-EtFOSAA	*119.7*	0	0	*137*	0	*87.4*	*70-130*	116.4	*2.87*	*30*	
Surr: 13C3-HFPO-DA	*34.96*	0	0	*34.25*	0	*102*	*70-130*	37.09	*5.91*	*30*	

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: Fishbeck, Inc.
Work Order: 21060077
Project: Cedar Springs (201460)

QC BATCH REPORT

Batch ID: **177884** Instrument ID **LCMS1** Method: **E537.1**

LCS3 Sample ID: **LCS3-177884-177884** Units: **ng/L** Analysis Date: **6/4/2021 03:32 PM**
Client ID: Run ID: **LCMS1_210604C** SeqNo: **7462994** Prep Date: **6/3/2021** DF: **1**

Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Hexafluoropropylene oxide din	108.1	0.7	2.0	100	0	108	70-130	0			
N-Ethylperfluorooctanesulfona	105.9	0.3	2.0	100	0	106	70-130	0			
N-Methylperfluorooctanesulfor	94.23	0.5	2.0	100	0	94.2	70-130	0			
Perfluorobutanesulfonic Acid (	88.42	0.4	2.0	88.4	0	100	70-130	0			
Perfluorodecanoic Acid (PFDA	104.5	0.7	2.0	100	0	105	70-130	0			
Perfluorododecanoic Acid (PFI	103.9	0.4	2.0	100	0	104	70-130	0			
Perfluoroheptanoic Acid (PFH	119.6	0.6	2.0	100	0	120	70-130	0			
Perfluorohexanesulfonic Acid (	100.6	0.3	2.0	91	0	111	70-130	0			
Perfluorohexanoic Acid (PFHx	114	0.7	2.0	100	0	114	70-130	0			
Perfluorononanoic Acid (PFNA	112.8	0.6	2.0	100	0	113	70-130	0			
Perfluorooctanesulfonic Acid (	97.24	0.2	2.0	92.8	0	105	70-130	0			
Perfluorooctanoic Acid (PFOA	112	0.5	2.0	100	0	112	70-130	0			
Perfluorotetradecanoic Acid (F	95.08	0.5	2.0	100	0	95.1	70-130	0			
Perfluorotridecanoic Acid (PFT	106.4	0.3	2.0	100	0	106	70-130	0			
Perfluoroundecanoic Acid (PFI	107.4	0.4	2.0	100	0	107	70-130	0			
11Cl-Pf3OUdS	89.25	0.4	2.0	94.2	0	94.8	70-130	0			
9Cl-PF3ONS	93.37	0.2	2.0	93.2	0	100	70-130	0			
4,8-Dioxa-3H-perfluorononano	103.4	0.3	2.0	94.2	0	110	70-130	0			
Surr: 13C2-PFHxA	*44.19*	0	0	*40*	0	*110*	*70-130*	0			
Surr: 13C2-PFDA	*42.74*	0	0	*40*	0	*107*	*70-130*	0			
Surr: d5-N-EtFOSAA	*156.2*	0	0	*160*	0	*97.6*	*70-130*	0			
Surr: 13C3-HFPO-DA	*42.9*	0	0	*40*	0	*107*	*70-130*	0			

The following samples were analyzed in this batch:

21060077-08A	21060077-09A	21060077-10A
21060077-11A	21060077-12A	21060077-13A
21060077-14A		

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

CHAIN OF CUSTODY RECORD

fishbeck		Report to: Penni Mahler	Invoice to: Accounts Payable
Address:	1515 Arboretum Dr. SE	Email: pdmahler@fishbeck.com	Email: acpay@fishbeck.com
	Grand Rapids, MI 49546	Copy to:	Lab Quote
Phone:	616.575.3824	Email:	Reference: 21060077

PROJECT NAME Cedar Springs	PROJECT NO. 201460	PAGE 1 of 2
PROJECT LOCATION Cedar Springs, MI	SAMPLER(S) NAME	STD TAT ■
PROJECT MANAGER Mike Ingersoll	PHONE 616.464.3959	RUSH TAT ☐
	EMAIL mingersoll@fishbeck.com	DATE DUE:
ADDITIONAL INFORMATION		

MATRIX TYPE: AQUEOUS (WATER), SOLID/SEMI-SOLID, AIR, NONAQUEOUS LIQUID

REQUIRED ANALYSES: ~~PFAS/537M/28 list~~ 537.1 (18 list)

PRESERVATIVE: Trizma

NUMBER OF CONTAINERS SUBMITTED

DATE	TIME	SAMPLE IDENTIFICATION	AQUEOUS (WATER)	SOLID/SEMI-SOLID	AIR	NONAQUEOUS LIQUID	537.1 (18 list)										REMARKS
5/26/21	0940	CS-21-05-DW-13360 White Creek Avenue (I)	x				3										
	1205	CS-21-05-DW-13261 White Creek Avenue (I)	x				3										
	1146	CS-21-05-DW-13353 White Creek Avenue (I)	x				3										
	1105	CS-21-05-DW-13399 White Creek Ave (I)	x				3										
	1045	CS-21-05-DW-13485 White Creek Ave (I)	x				3										
	1027	CS-21-05-DW-13525 White Creek Ave (I)	x				3										
	1006	CS-21-05-DW-13590 White Creek Ave (I)	x				2										
	1340	CS-21-05-DW-4095 16 Mile Rd (I)	x				3										
	1306	CS-21-05-DW-4107 16 Mile Rd (I)	x				3										
	1248	CS-21-05-DW-4141 16 Mile Rd (I)	x				3										
	1232	CS-21-05-DW-4142 16 Mile Rd (I)	x				3										
	0940	CS-21-05- DW-13360 White Creek Ave. (D)	x				3										
	1405	CS-21-05-QCFB-01	x				2										EB

RELINQUISHED BY	DATE	TIME	~~RELINQUISHED BY~~	DATE	TIME	RELINQUISHED BY	DATE	TIME	METHOD OF SHIPMENT/TRACKING NUMBER
Bailey Ar	5/26/21	14:58							COC Sealed / ALS Pick Up
~~RECEIVED~~ BY	DATE	TIME	RECEIVED BY	DATE	TIME	RECEIVED BY	DATE	TIME	RECEIVED FOR LAB / DATE / TIME
TO STORAGE			From Storage	5/28/21	08:00				5/28/21 1530

2021_05260_01

3.8°C IR3

CHAIN OF CUSTODY RECORD

fishbeck
Address: 1515 Arboretum Dr. SE
Grand Rapids, MI 49546
Phone: 616.575.3824

Report to: Penni Mahler
Email: pdmahler@fishbeck.com
Copy to:
Email:

Invoice to: Accounts Payable
Email: acpay@fishbeck.com
Lab Quote Reference: 21060077

PROJECT NAME	PROJECT NO.	
Cedar Springs	201460	
PROJECT LOCATION: Cedar Springs, MI	SAMPLER(S) NAME	
PROJECT MANAGER: Mike Ingersoll	PHONE	616.464.3959
	EMAIL	mingersoll@fishbeck.com
ADDITIONAL INFORMATION		

MATRIX TYPE: AQUEOUS (WATER), SOLID/SEMI-SOLID, AIR, NONAQUEOUS LIQUID

REQUIRED ANALYSES: PFAS/~~537mod/28 list~~ 537.1/18 list

PRESERVATIVE: Trizma

PAGE 2 of 2

STD TAT ■
RUSH TAT ☐
DATE DUE:

SAMPLE DATE	SAMPLE TIME	SAMPLE IDENTIFICATION	AQUEOUS (WATER)	SOLID/SEMI-SOLID	AIR	NONAQUEOUS LIQUID	PFAS 537.1/18 list (Trizma)									REMARKS
		~~CS-21-05-DW- 16 Mile Rd(I)~~	~~X~~													
		~~CS-21-05-DW- 16 Mile Rd(I)~~	~~X~~													
		~~CS-21-05-DW- 16 Mile Rd(I)~~	X													
		~~CS-21-05-DW- 16 Mile Rd(I)~~	~~X~~													
5/26/21	1340	CS-21-05-DW-4095 16 Mile Rd (D)	X				3									
		~~CS-21-05-QCFB-01~~	X													

EB

RELINQUISHED BY	DATE	TIME	~~RELINQUISHED BY~~	DATE	TIME	RELINQUISHED BY	DATE	TIME	METHOD OF SHIPMENT/TRACKING NUMBER
Bailey Ha	5/26/21	14:58							COC Sealed/ALS Pickup
~~RECEIVED BY~~ TO STORAGE	DATE	TIME	RECEIVED BY From Storage [signature]	5/28/21	08:00	RECEIVED BY	DATE	TIME	RECEIVED FOR LAB [signature] 5/28/21 1530

0021 05718-07

ALS Group, USA

Sample Receipt Checklist

Client Name: **FTCH - GR**

Date/Time Received: **28-May-21 15:30**

Work Order: **21060077**

Received by: **KRW**

Checklist completed by Keith Wierenga (eSignature) 01-Jun-21 (Date)

Reviewed by: Ehrland Bosworth (eSignature) 02-Jun-21 (Date)

Matrices: Water

Carrier name: ALSHN

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on shipping container/cooler?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on sample bottles?	Yes ☐	No ☐	Not Present ☑
Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time?	Yes ☑	No ☐	
Container/Temp Blank temperature in compliance?	Yes ☑	No ☐	
Sample(s) received on ice?	Yes ☑	No ☐	
Temperature(s)/Thermometer(s):	3.8/4.8 C	IR3	
Cooler(s)/Kit(s):			
Date/Time sample(s) sent to storage:	6/1/2021 3:55:09 PM		
Water - VOA vials have zero headspace?	Yes ☐	No ☐	No VOA vials submitted ☑
Water - pH acceptable upon receipt?	Yes ☑	No ☐	N/A ☐
pH adjusted?	Yes ☐	No ☑	N/A ☐
pH adjusted by:	-		

Login Notes:

Client Contacted: Date Contacted: Person Contacted:

Contacted By: Regarding:

Comments:

CorrectiveAction:

ALS Environmental

04-Aug-2021

Penni Mahler
Fishbeck, Inc.
1515 Arboretum Dr SE
Grand Rapids, MI 49546

Re: **Cedar Springs** Work Order: **21072346**

Dear Penni,

ALS Environmental received 6 samples on 28-Jul-2021 12:45 PM for the analyses presented in the following report.

The analytical data provided relates directly to the samples received by ALS Environmental - Holland and for only the analyses requested.

Sample results are compliant with industry accepted practices and Quality Control results achieved laboratory specifications. Any exceptions are noted in the Case Narrative, or noted with qualifiers in the report or QC batch information. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained from ALS Environmental. Samples will be disposed in 30 days unless storage arrangements are made.

The total number of pages in this report is 20.

If you have any questions regarding this report, please feel free to contact me:

ADDRESS: 3352 128th Avenue, Holland, MI, USA
PHONE: +1 (616) 399-6070 FAX: +1 (616) 399-6185

Sincerely,

Jodi Blouw

Electronically approved by: Jodi Blouw

Jodi Blouw

Client: Fishbeck, Inc.
Project: Cedar Springs
Work Order: **21072346**

Work Order Sample Summary

Lab Samp ID	Client Sample ID	Matrix	Tag Number	Collection Date	Date Received	Hold
21072346-01	CS-21-07-QCFB-02	Water		7/28/2021 09:40	7/28/2021 12:45	☐
21072346-02	CS-21-07-DW-13328 White Creek Ave (I)	Water		7/28/2021 10:20	7/28/2021 12:45	☐
21072346-03	CS-21-07-DW-13550 White Creek Ave (I)	Water		7/28/2021 10:35	7/28/2021 12:45	☐
21072346-04	CS-21-07-DW-13485 White Creek Ave (I)	Water		7/28/2021 10:55	7/28/2021 12:45	☐
21072346-05	CS-21-07-DW-13485 White Creek Ave (D)	Water		7/28/2021 10:55	7/28/2021 12:45	☐
21072346-06	CS-21-07-DW-3950 Cedar Rv Dr (I MS/MSD)	Water		7/28/2021 11:15	7/28/2021 12:45	☐

ALS Group, USA

Date: 04-Aug-21

Client: Fishbeck, Inc.
Project: Cedar Springs
WorkOrder: **21072346**

QUALIFIERS, ACRONYMS, UNITS

Qualifier	Description
*	Value exceeds Regulatory Limit
**	Estimated Value
a	Analyte is non-accredited
B	Analyte detected in the associated Method Blank above the Reporting Limit
E	Value above quantitation range
H	Analyzed outside of Holding Time
Hr	BOD/CBOD - Sample was reset outside Hold Time, value should be considered estimated.
J	Analyte is present at an estimated concentration between the MDL and Report Limit
ND	Not Detected at the Reporting Limit
O	Sample amount is > 4 times amount spiked
P	Dual Column results percent difference > 40%
R	RPD above laboratory control limit
S	Spike Recovery outside laboratory control limits
U	Analyzed but not detected above the MDL
X	Analyte was detected in the Method Blank between the MDL and Reporting Limit, sample results may exhibit background or reagent contamination at the observed level.

Acronym	Description
DUP	Method Duplicate
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LOD	Limit of Detection (see MDL)
LOQ	Limit of Quantitation (see PQL)
MBLK	Method Blank
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
PQL	Practical Quantitation Limit
RPD	Relative Percent Difference
TDL	Target Detection Limit
TNTC	Too Numerous To Count
A	APHA Standard Methods
D	ASTM
E	EPA
SW	SW-846 Update III

Units Reported	Description
ng/L	Nanograms per Liter

Client:	Fishbeck, Inc.
Project:	Cedar Springs
Work Order:	21072346

Case Narrative

Samples for the above noted Work Order were received on 07/28/2021. The attached "Sample Receipt Checklist" documents the status of custody seals, container integrity, preservation, and temperature compliance.

Samples were analyzed according to the analytical methodology previously transmitted in the "Work Order Acknowledgement". Methodologies are also documented in the "Analytical Result" section for each sample. Quality control results are listed in the "QC Report" section. Sample association for the reported quality control is located at the end of each batch summary. If applicable, results are appropriately qualified in the Analytical Result and QC Report sections. The "Qualifiers" section documents the various qualifiers, units, and acronyms utilized in reporting. A copy of the laboratory's scope of accreditation is available upon request.

With the following exceptions, all sample analyses achieved analytical criteria.

Extractable Organics:
No deviations or anomalies were noted.

ALS Group, USA

Date: *04-Aug-21*

Client:	Fishbeck, Inc.		
Project:	Cedar Springs	**Work Order:**	21072346
Sample ID:	CS-21-07-QCFB-02	**Lab ID:**	21072346-01
Collection Date:	7/28/2021 09:40 AM	**Matrix:**	WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
PFAS BY EPA 537.1			Method: **E537.1**		Prep: E537.1 / 7/30/21		Analyst: **SK**
Hexafluoropropylene oxide dimer acid (HFPO-DA)	U		0.6	2	ng/L	1	8/3/2021 21:26
N-Ethylperfluorooctanesulfonamidoacetic Acid	U		0.3	2	ng/L	1	8/3/2021 21:26
N-Methylperfluorooctanesulfonamidoacetic Acid	U		0.5	2	ng/L	1	8/3/2021 21:26
Perfluorobutanesulfonic Acid (PFBS)	U		0.3	2	ng/L	1	8/3/2021 21:26
Perfluorodecanoic Acid (PFDA)	U		0.6	2	ng/L	1	8/3/2021 21:26
Perfluorododecanoic Acid (PFDoA)	U		0.3	2	ng/L	1	8/3/2021 21:26
Perfluoroheptanoic Acid (PFHpA)	U		0.5	2	ng/L	1	8/3/2021 21:26
Perfluorohexanesulfonic Acid (PFHxS)	U		0.3	2	ng/L	1	8/3/2021 21:26
Perfluorohexanoic Acid (PFHxA)	U		0.6	2	ng/L	1	8/3/2021 21:26
Perfluorononanoic Acid (PFNA)	U		0.5	2	ng/L	1	8/3/2021 21:26
Perfluorooctanesulfonic Acid (PFOS)	U		0.2	2	ng/L	1	8/3/2021 21:26
Perfluorooctanoic Acid (PFOA)	U		0.5	2	ng/L	1	8/3/2021 21:26
Perfluorotetradecanoic Acid (PFTeA)	U		0.5	2	ng/L	1	8/3/2021 21:26
Perfluorotridecanoic Acid (PFTriA)	U		0.3	2	ng/L	1	8/3/2021 21:26
Perfluoroundecanoic Acid (PFUnA)	U		0.4	2	ng/L	1	8/3/2021 21:26
11Cl-Pf3OUdS	U		0.3	2	ng/L	1	8/3/2021 21:26
9Cl-PF3ONS	U		0.1	2	ng/L	1	8/3/2021 21:26
4,8-Dioxa-3H-perfluorononanoic Acid (DONA)	U		0.3	2	ng/L	1	8/3/2021 21:26
Surr: 13C2-PFHxA	*105*			*70-130*	*%REC*	1	8/3/2021 21:26
Surr: 13C2-PFDA	*98.3*			*70-130*	*%REC*	1	8/3/2021 21:26
Surr: d5-N-EtFOSAA	*89.6*			*70-130*	*%REC*	1	8/3/2021 21:26
Surr: 13C3-HFPO-DA	*93.8*			*70-130*	*%REC*	1	8/3/2021 21:26

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *04-Aug-21*

Client: Fishbeck, Inc.
Project: Cedar Springs
Sample ID: CS-21-07-DW-13328 White Creek Ave (I)
Collection Date: 7/28/2021 10:20 AM

Work Order: 21072346
Lab ID: 21072346-02
Matrix: WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
PFAS BY EPA 537.1			Method: **E537.1**		Prep: E537.1 / 7/30/21		Analyst: **SK**
Hexafluoropropylene oxide dimer acid (HFPO-DA)	U		0.6	2	ng/L	1	8/4/2021 10:27
N-Ethylperfluorooctanesulfonamidoacetic Acid	U		0.3	2	ng/L	1	8/4/2021 10:27
N-Methylperfluorooctanesulfonamidoacetic Acid	U		0.4	2	ng/L	1	8/4/2021 10:27
Perfluorobutanesulfonic Acid (PFBS)	U		0.3	2	ng/L	1	8/4/2021 10:27
Perfluorodecanoic Acid (PFDA)	U		0.6	2	ng/L	1	8/4/2021 10:27
Perfluorododecanoic Acid (PFDoA)	U		0.3	2	ng/L	1	8/4/2021 10:27
Perfluoroheptanoic Acid (PFHpA)	U		0.5	2	ng/L	1	8/4/2021 10:27
Perfluorohexanesulfonic Acid (PFHxS)	U		0.3	2	ng/L	1	8/4/2021 10:27
Perfluorohexanoic Acid (PFHxA)	U		0.6	2	ng/L	1	8/4/2021 10:27
Perfluorononanoic Acid (PFNA)	U		0.5	2	ng/L	1	8/4/2021 10:27
Perfluorooctanesulfonic Acid (PFOS)	U		0.2	2	ng/L	1	8/4/2021 10:27
Perfluorooctanoic Acid (PFOA)	U		0.4	2	ng/L	1	8/4/2021 10:27
Perfluorotetradecanoic Acid (PFTeA)	U		0.4	2	ng/L	1	8/4/2021 10:27
Perfluorotridecanoic Acid (PFTriA)	U		0.3	2	ng/L	1	8/4/2021 10:27
Perfluoroundecanoic Acid (PFUnA)	U		0.4	2	ng/L	1	8/4/2021 10:27
11Cl-Pf3OUdS	U		0.3	2	ng/L	1	8/4/2021 10:27
9Cl-PF3ONS	U		0.1	2	ng/L	1	8/4/2021 10:27
4,8-Dioxa-3H-perfluorononanoic Acid (DONA)	U		0.3	2	ng/L	1	8/4/2021 10:27
Surr: 13C2-PFHxA	*103*			*70-130*	*%REC*	1	8/4/2021 10:27
Surr: 13C2-PFDA	*82.3*			*70-130*	*%REC*	1	8/4/2021 10:27
Surr: d5-N-EtFOSAA	*78.2*			*70-130*	*%REC*	1	8/4/2021 10:27
Surr: 13C3-HFPO-DA	*97.6*			*70-130*	*%REC*	1	8/4/2021 10:27

Note: See Qualifiers page for a list of qualifiers and their definitions.

Client: Fishbeck, Inc.
Project: Cedar Springs
Sample ID: CS-21-07-DW-13550 White Creek Ave (I)
Collection Date: 7/28/2021 10:35 AM

Work Order: 21072346
Lab ID: 21072346-03
Matrix: WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
PFAS BY EPA 537.1			Method: **E537.1**		Prep: E537.1 / 7/30/21		Analyst: **SK**
Hexafluoropropylene oxide dimer acid (HFPO-DA)	U		0.5	2	ng/L	1	8/3/2021 21:57
N-Ethylperfluorooctanesulfonamidoacetic Acid	U		0.3	2	ng/L	1	8/3/2021 21:57
N-Methylperfluorooctanesulfonamidoacetic Acid	U		0.4	2	ng/L	1	8/3/2021 21:57
Perfluorobutanesulfonic Acid (PFBS)	U		0.3	2	ng/L	1	8/3/2021 21:57
Perfluorodecanoic Acid (PFDA)	U		0.6	2	ng/L	1	8/3/2021 21:57
Perfluorododecanoic Acid (PFDoA)	U		0.3	2	ng/L	1	8/3/2021 21:57
Perfluoroheptanoic Acid (PFHpA)	U		0.5	2	ng/L	1	8/3/2021 21:57
Perfluorohexanesulfonic Acid (PFHxS)	U		0.3	2	ng/L	1	8/3/2021 21:57
Perfluorohexanoic Acid (PFHxA)	U		0.6	2	ng/L	1	8/3/2021 21:57
Perfluorononanoic Acid (PFNA)	U		0.5	2	ng/L	1	8/3/2021 21:57
Perfluorooctanesulfonic Acid (PFOS)	U		0.2	2	ng/L	1	8/3/2021 21:57
Perfluorooctanoic Acid (PFOA)	U		0.4	2	ng/L	1	8/3/2021 21:57
Perfluorotetradecanoic Acid (PFTeA)	U		0.4	2	ng/L	1	8/3/2021 21:57
Perfluorotridecanoic Acid (PFTriA)	U		0.3	2	ng/L	1	8/3/2021 21:57
Perfluoroundecanoic Acid (PFUnA)	U		0.4	2	ng/L	1	8/3/2021 21:57
11Cl-Pf3OUdS	U		0.3	2	ng/L	1	8/3/2021 21:57
9Cl-PF3ONS	U		0.1	2	ng/L	1	8/3/2021 21:57
4,8-Dioxa-3H-perfluorononanoic Acid (DONA)	U		0.3	2	ng/L	1	8/3/2021 21:57
Surr: 13C2-PFHxA	*108*			*70-130*	*%REC*	1	8/3/2021 21:57
Surr: 13C2-PFDA	*86.1*			*70-130*	*%REC*	1	8/3/2021 21:57
Surr: d5-N-EtFOSAA	*72.2*			*70-130*	*%REC*	1	8/3/2021 21:57
Surr: 13C3-HFPO-DA	*96.3*			*70-130*	*%REC*	1	8/3/2021 21:57

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *04-Aug-21*

Client:	Fishbeck, Inc.		
Project:	Cedar Springs	**Work Order:**	21072346
Sample ID:	CS-21-07-DW-13485 White Creek Ave (I)-	**Lab ID:**	21072346-04
Collection Date:	7/28/2021 10:55 AM	**Matrix:**	WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
PFAS BY EPA 537.1		Method: **E537.1**			Prep: E537.1 / 7/30/21		Analyst: **SK**
Hexafluoropropylene oxide dimer acid (HFPO-DA)	U		0.6	2	ng/L	1	8/3/2021 21:05
N-Ethylperfluorooctanesulfonamidoacetic Acid	**1.0**	J	**0.3**	**2**	**ng/L**	1	8/3/2021 21:05
N-Methylperfluorooctanesulfonamidoacetic Acid	U		0.5	2	ng/L	1	8/3/2021 21:05
Perfluorobutanesulfonic Acid (PFBS)	**2.6**		**0.3**	**2**	**ng/L**	1	8/3/2021 21:05
Perfluorodecanoic Acid (PFDA)	U		0.6	2	ng/L	1	8/3/2021 21:05
Perfluorododecanoic Acid (PFDoA)	U		0.3	2	ng/L	1	8/3/2021 21:05
Perfluoroheptanoic Acid (PFHpA)	**1.7**	J	**0.5**	**2**	**ng/L**	1	8/3/2021 21:05
Perfluorohexanesulfonic Acid (PFHxS)	**3.7**		**0.3**	**2**	**ng/L**	1	8/3/2021 21:05
Perfluorohexanoic Acid (PFHxA)	**1.2**	J	**0.6**	**2**	**ng/L**	1	8/3/2021 21:05
Perfluorononanoic Acid (PFNA)	U		0.5	2	ng/L	1	8/3/2021 21:05
Perfluorooctanesulfonic Acid (PFOS)	**10**		**0.2**	**2**	**ng/L**	1	8/3/2021 21:05
Perfluorooctanoic Acid (PFOA)	**13**		**0.5**	**2**	**ng/L**	1	8/3/2021 21:05
Perfluorotetradecanoic Acid (PFTeA)	U		0.5	2	ng/L	1	8/3/2021 21:05
Perfluorotridecanoic Acid (PFTriA)	U		0.3	2	ng/L	1	8/3/2021 21:05
Perfluoroundecanoic Acid (PFUnA)	U		0.4	2	ng/L	1	8/3/2021 21:05
11Cl-Pf3OUdS	U		0.4	2	ng/L	1	8/3/2021 21:05
9Cl-PF3ONS	U		0.1	2	ng/L	1	8/3/2021 21:05
4,8-Dioxa-3H-perfluorononanoic Acid (DONA)	U		0.3	2	ng/L	1	8/3/2021 21:05
Surr: 13C2-PFHxA	*111*			*70-130*	*%REC*	1	8/3/2021 21:05
Surr: 13C2-PFDA	*97.9*			*70-130*	*%REC*	1	8/3/2021 21:05
Surr: d5-N-EtFOSAA	*90.9*			*70-130*	*%REC*	1	8/3/2021 21:05
Surr: 13C3-HFPO-DA	*97.5*			*70-130*	*%REC*	1	8/3/2021 21:05

Note: See Qualifiers page for a list of qualifiers and their definitions.

Client: Fishbeck, Inc.
Project: Cedar Springs
Sample ID: CS-21-07-DW-13485 White Creek Ave (D)
Collection Date: 7/28/2021 10:55 AM

Work Order: 21072346
Lab ID: 21072346-05
Matrix: WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
PFAS BY EPA 537.1			Method: **E537.1**		Prep: E537.1 / 7/30/21		Analyst: **SK**
Hexafluoropropylene oxide dimer acid (HFPO-DA)	U		0.6	2	ng/L	1	8/3/2021 22:08
N-Ethylperfluorooctanesulfonamidoacetic Acid	**1.2**	J	**0.3**	**2**	**ng/L**	1	8/3/2021 22:08
N-Methylperfluorooctanesulfonamidoacetic Acid	U		0.4	2	ng/L	1	8/3/2021 22:08
Perfluorobutanesulfonic Acid (PFBS)	**2.5**		**0.3**	**2**	**ng/L**	1	8/3/2021 22:08
Perfluorodecanoic Acid (PFDA)	U		0.6	2	ng/L	1	8/3/2021 22:08
Perfluorododecanoic Acid (PFDoA)	U		0.3	2	ng/L	1	8/3/2021 22:08
Perfluoroheptanoic Acid (PFHpA)	**1.8**	J	**0.5**	**2**	**ng/L**	1	8/3/2021 22:08
Perfluorohexanesulfonic Acid (PFHxS)	**3.9**		**0.3**	**2**	**ng/L**	1	8/3/2021 22:08
Perfluorohexanoic Acid (PFHxA)	**1.4**	J	**0.6**	**2**	**ng/L**	1	8/3/2021 22:08
Perfluorononanoic Acid (PFNA)	**0.54**	J	**0.5**	**2**	**ng/L**	1	8/3/2021 22:08
Perfluorooctanesulfonic Acid (PFOS)	**9.4**		**0.2**	**2**	**ng/L**	1	8/3/2021 22:08
Perfluorooctanoic Acid (PFOA)	**13**		**0.4**	**2**	**ng/L**	1	8/3/2021 22:08
Perfluorotetradecanoic Acid (PFTeA)	U		0.4	2	ng/L	1	8/3/2021 22:08
Perfluorotridecanoic Acid (PFTriA)	U		0.3	2	ng/L	1	8/3/2021 22:08
Perfluoroundecanoic Acid (PFUnA)	U		0.4	2	ng/L	1	8/3/2021 22:08
11Cl-Pf3OUdS	U		0.3	2	ng/L	1	8/3/2021 22:08
9Cl-PF3ONS	U		0.1	2	ng/L	1	8/3/2021 22:08
4,8-Dioxa-3H-perfluorononanoic Acid (DONA)	U		0.3	2	ng/L	1	8/3/2021 22:08
Surr: 13C2-PFHxA	*104*			*70-130*	*%REC*	1	8/3/2021 22:08
Surr: 13C2-PFDA	*98.0*			*70-130*	*%REC*	1	8/3/2021 22:08
Surr: d5-N-EtFOSAA	*90.7*			*70-130*	*%REC*	1	8/3/2021 22:08
Surr: 13C3-HFPO-DA	*93.5*			*70-130*	*%REC*	1	8/3/2021 22:08

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *04-Aug-21*

Client: Fishbeck, Inc.
Project: Cedar Springs
Sample ID: CS-21-07-DW-3950 Cedar Rv Dr (I MS/MSD)
Collection Date: 7/28/2021 11:15 AM

Work Order: 21072346
Lab ID: 21072346-06
Matrix: WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
PFAS BY EPA 537.1			Method: **E537.1**		Prep: E537.1 / 8/3/21		Analyst: **SK**
Hexafluoropropylene oxide dimer acid (HFPO-DA)	U		0.6	2	ng/L	1	8/4/2021 01:36
N-Ethylperfluorooctanesulfonamidoacetic Acid	U		0.3	2	ng/L	1	8/4/2021 01:36
N-Methylperfluorooctanesulfonamidoaceti c Acid	U		0.4	2	ng/L	1	8/4/2021 01:36
Perfluorobutanesulfonic Acid (PFBS)	U		0.3	2	ng/L	1	8/4/2021 01:36
Perfluorodecanoic Acid (PFDA)	U		0.6	2	ng/L	1	8/4/2021 01:36
Perfluorododecanoic Acid (PFDoA)	U		0.3	2	ng/L	1	8/4/2021 01:36
Perfluoroheptanoic Acid (PFHpA)	U		0.5	2	ng/L	1	8/4/2021 01:36
Perfluorohexanesulfonic Acid (PFHxS)	U		0.3	2	ng/L	1	8/4/2021 01:36
Perfluorohexanoic Acid (PFHxA)	U		0.6	2	ng/L	1	8/4/2021 01:36
Perfluorononanoic Acid (PFNA)	U		0.5	2	ng/L	1	8/4/2021 01:36
Perfluorooctanesulfonic Acid (PFOS)	U		0.2	2	ng/L	1	8/4/2021 01:36
Perfluorooctanoic Acid (PFOA)	U		0.5	2	ng/L	1	8/4/2021 01:36
Perfluorotetradecanoic Acid (PFTeA)	U		0.4	2	ng/L	1	8/4/2021 01:36
Perfluorotridecanoic Acid (PFTriA)	U		0.3	2	ng/L	1	8/4/2021 01:36
Perfluoroundecanoic Acid (PFUnA)	U		0.4	2	ng/L	1	8/4/2021 01:36
11Cl-Pf3OUdS	U		0.3	2	ng/L	1	8/4/2021 01:36
9Cl-PF3ONS	U		0.1	2	ng/L	1	8/4/2021 01:36
4,8-Dioxa-3H-perfluorononanoic Acid (DONA)	U		0.3	2	ng/L	1	8/4/2021 01:36
Surr: 13C2-PFHxA	*95.0*			*70-130*	*%REC*	1	8/4/2021 01:36
Surr: 13C2-PFDA	*79.9*			*70-130*	*%REC*	1	8/4/2021 01:36
Surr: d5-N-EtFOSAA	*73.4*			*70-130*	*%REC*	1	8/4/2021 01:36
Surr: 13C3-HFPO-DA	*82.5*			*70-130*	*%REC*	1	8/4/2021 01:36

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Client: Fishbeck, Inc.

Work Order: 21072346

Project: Cedar Springs

Date: 04-Aug-21

QC BATCH REPORT

Batch ID: **181137** Instrument ID **LCMS1** Method: **E537.1**

MBLK Sample ID: **MBLK-181137-181137** Units: **ng/L** Analysis Date: **8/3/2021 08:34 PM**

Client ID: Run ID: **LCMS1_210803B** SeqNo: **7636888** Prep Date: **7/30/2021** DF: **1**

Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Hexafluoropropylene oxide din	U	0.7	2.0								
N-Ethylperfluorooctanesulfona	U	0.3	2.0								
N-Methylperfluorooctanesulfor	U	0.5	2.0								
Perfluorobutanesulfonic Acid (	U	0.4	2.0								
Perfluorodecanoic Acid (PFDA	U	0.7	2.0								
Perfluorododecanoic Acid (PFI	U	0.4	2.0								
Perfluoroheptanoic Acid (PFH|	U	0.6	2.0								
Perfluorohexanesulfonic Acid (	U	0.3	2.0								
Perfluorohexanoic Acid (PFHx	U	0.7	2.0								
Perfluorononanoic Acid (PFNA	U	0.6	2.0								
Perfluorooctanesulfonic Acid (I	0.2468	0.2	2.0								J
Perfluorooctanoic Acid (PFOA	U	0.5	2.0								
Perfluorotetradecanoic Acid (F	U	0.5	2.0								
Perfluorotridecanoic Acid (PFT	U	0.3	2.0								
Perfluoroundecanoic Acid (PFI	U	0.4	2.0								
11Cl-Pf3OUdS	U	0.4	2.0								
9Cl-PF3ONS	U	0.2	2.0								
4,8-Dioxa-3H-perfluorononano	U	0.3	2.0								
Surr: 13C2-PFHxA	*49.06*	0	0	*40*	0	*123*	*70-130*	0			
Surr: 13C2-PFDA	*43.42*	0	0	*40*	0	*109*	*70-130*	0			
Surr: d5-N-EtFOSAA	*165.6*	0	0	*160*	0	*103*	*70-130*	0			
Surr: 13C3-HFPO-DA	*42.64*	0	0	*40*	0	*107*	*70-130*	0			

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client:	Fishbeck, Inc.	
Work Order:	21072346	
Project:	Cedar Springs	

QC BATCH REPORT

Batch ID: **181137** Instrument ID **LCMS1** Method: **E537.1**

MS3 Sample ID: **21072346-04A MS** Units: **ng/L** Analysis Date: **8/4/2021 10:17 AM**

Client ID: **CS-21-07-DW-13485 White Creek Ave (I)** Run ID: **LCMS1_210804A** SeqNo: **7636941** Prep Date: **7/30/2021** DF: **1**

Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Hexafluoropropylene oxide din	88.31	0.6	2.0	86.81	0	102	70-130	0			
N-Ethylperfluorooctanesulfona	86.31	0.3	2.0	86.81	1.016	98.3	70-130	0			
N-Methylperfluorooctanesulfor	93.03	0.4	2.0	86.81	0	107	70-130	0			
Perfluorobutanesulfonic Acid (	70.98	0.3	2.0	76.74	2.581	89.1	70-130	0			
Perfluorodecanoic Acid (PFDA	96.49	0.6	2.0	86.81	0	111	70-130	0			
Perfluorododecanoic Acid (PFI	86.37	0.3	2.0	86.81	0	99.5	70-130	0			
Perfluoroheptanoic Acid (PFH	99.87	0.5	2.0	86.81	1.693	113	70-130	0			
Perfluorohexanesulfonic Acid (	91.23	0.3	2.0	78.99	3.681	111	70-130	0			
Perfluorohexanoic Acid (PFHx	83.5	0.6	2.0	86.81	1.201	94.8	70-130	0			
Perfluorononanoic Acid (PFNA	90.46	0.5	2.0	86.81	0	104	70-130	0			
Perfluorooctanesulfonic Acid (I	86.41	0.2	2.0	80.56	10.31	94.5	70-130	0			
Perfluorooctanoic Acid (PFOA	102.1	0.5	2.0	86.81	12.99	103	70-130	0			
Perfluorotetradecanoic Acid (F	77.97	0.4	2.0	86.81	0	89.8	70-130	0			
Perfluorotridecanoic Acid (PFT	81.75	0.3	2.0	86.81	0	94.2	70-130	0			
Perfluoroundecanoic Acid (PFI	92.12	0.4	2.0	86.81	0	106	70-130	0			
11Cl-Pf3OUdS	73.72	0.3	2.0	81.77	0	90.2	70-130	0			
9Cl-PF3ONS	74.1	0.1	2.0	80.9	0	91.6	70-130	0			
4,8-Dioxa-3H-perfluorononano	82.41	0.3	2.0	81.77	0	101	70-130	0			
Surr: 13C2-PFHxA	*27.85*	0	0	*34.72*	0	*80.2*	*70-130*	0			
Surr: 13C2-PFDA	*27.74*	0	0	*34.72*	0	*79.9*	*70-130*	0			
Surr: d5-N-EtFOSAA	*112.8*	0	0	*138.9*	0	*81.2*	*70-130*	0			
Surr: 13C3-HFPO-DA	*27.34*	0	0	*34.72*	0	*78.8*	*70-130*	0			

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client:	Fishbeck, Inc.
Work Order:	21072346
Project:	Cedar Springs

QC BATCH REPORT

Batch ID: **181137** Instrument ID **LCMS1** Method: **E537.1**

DUP Sample ID: **21072346-02A DUP** Units: **ng/L** Analysis Date: **8/3/2021 09:47 PM**

Client ID: **CS-21-07-DW-13328 White Creek Ave (I)** Run ID: **LCMS1_210803B** SeqNo: **7636895** Prep Date: **7/30/2021** DF: **1**

Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Hexafluoropropylene oxide din	UI	0.6	2.0	0	0	0		0	0	30	
N-Ethylperfluorooctanesulfona	U	0.3	2.0	0	0	0		0	0	30	
N-Methylperfluorooctanesulfor	U	0.4	2.0	0	0	0		0	0	30	
Perfluorobutanesulfonic Acid (	U	0.3	2.0	0	0	0		0	0	30	
Perfluorodecanoic Acid (PFDA	U	0.6	2.0	0	0	0		0.08919	0	30	
Perfluorododecanoic Acid (PFI	U	0.3	2.0	0	0	0		0.05709	0	30	
Perfluoroheptanoic Acid (PFH	U	0.5	2.0	0	0	0		0.103	0	30	
Perfluorohexanesulfonic Acid (	U	0.3	2.0	0	0	0		0	0	30	
Perfluorohexanoic Acid (PFHx	U	0.6	2.0	0	0	0		0	0	30	
Perfluorononanoic Acid (PFNA	U	0.5	2.0	0	0	0		0.08649	0	30	
Perfluorooctanesulfonic Acid (I	U	0.2	2.0	0	0	0		0	0	30	
Perfluorooctanoic Acid (PFOA	U	0.5	2.0	0	0	0		0.1547	0	30	
Perfluorotetradecanoic Acid (F	U	0.4	2.0	0	0	0		0.05912	0	30	
Perfluorotridecanoic Acid (PFT	U	0.3	2.0	0	0	0		0.05034	0	30	
Perfluoroundecanoic Acid (PFI	U	0.4	2.0	0	0	0		0.09088	0	30	
11Cl-Pf3OUdS	U	0.3	2.0	0	0	0		0	0	30	
9Cl-PF3ONS	U	0.1	2.0	0	0	0		0	0	30	
4,8-Dioxa-3H-perfluorononano	U	0.3	2.0	0	0	0		0	0	30	
Surr: 13C2-PFHxA	*40.23*	0	0	*34.48*	0	*117*	*70-130*	37.66	*6.6*	*30*	
Surr: 13C2-PFDA	*30.73*	0	0	*34.48*	0	*89.1*	*70-130*	29.4	*4.42*	*30*	
Surr: d5-N-EtFOSAA	*102.7*	0	0	*137.9*	0	*74.5*	*70-130*	90.07	*13.1*	*30*	
Surr: 13C3-HFPO-DA	*35.16*	0	0	*34.48*	0	*102*	*70-130*	34.02	*3.31*	*30*	

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: Fishbeck, Inc.
Work Order: 21072346
Project: Cedar Springs

QC BATCH REPORT

Batch ID: **181137** Instrument ID **LCMS1** Method: **E537.1**

LCS3	Sample ID: **LCS-181137-181137**					Units: **ng/L**			Analysis Date: **8/4/2021 10:06 AM**			
Client ID:		Run ID: **LCMS1_210804A**				SeqNo: **7636940**			Prep Date: **7/30/2021**		DF: **1**	
Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual	
Hexafluoropropylene oxide din	102.9	0.7	2.0	100	0	103	70-130	0				
N-Ethylperfluorooctanesulfona	97.56	0.3	2.0	100	0	97.6	70-130	0				
N-Methylperfluorooctanesulfor	100.6	0.5	2.0	100	0	101	70-130	0				
Perfluorobutanesulfonic Acid (	87.05	0.4	2.0	88.4	0	98.5	70-130	0				
Perfluorodecanoic Acid (PFDA	94.84	0.7	2.0	100	0	94.8	70-130	0				
Perfluorododecanoic Acid (PFI	94.61	0.4	2.0	100	0	94.6	70-130	0				
Perfluoroheptanoic Acid (PFH	96.02	0.6	2.0	100	0	96	70-130	0				
Perfluorohexanesulfonic Acid (	90.26	0.3	2.0	91	0	99.2	70-130	0				
Perfluorohexanoic Acid (PFHx	90.19	0.7	2.0	100	0	90.2	70-130	0				
Perfluorononanoic Acid (PFNA	88.46	0.6	2.0	100	0	88.5	70-130	0				
Perfluorooctanesulfonic Acid (I	97.89	0.2	2.0	92.8	0	105	70-130	0				
Perfluorooctanoic Acid (PFOA	96.39	0.5	2.0	100	0	96.4	70-130	0				
Perfluorotetradecanoic Acid (F	84.43	0.5	2.0	100	0	84.4	70-130	0				
Perfluorotridecanoic Acid (PFT	90.48	0.3	2.0	100	0	90.5	70-130	0				
Perfluoroundecanoic Acid (PFI	96.46	0.4	2.0	100	0	96.5	70-130	0				
11Cl-Pf3OUdS	89.14	0.4	2.0	94.2	0	94.6	70-130	0				
9Cl-PF3ONS	85.14	0.2	2.0	93.2	0	91.4	70-130	0				
4,8-Dioxa-3H-perfluorononano	85.62	0.3	2.0	94.2	0	90.9	70-130	0				
Surr: 13C2-PFHxA	*36.97*	0	0	*40*	0	*92.4*	*70-130*	0				
Surr: 13C2-PFDA	*35.79*	0	0	*40*	0	*89.5*	*70-130*	0				
Surr: d5-N-EtFOSAA	*161.3*	0	0	*160*	0	*101*	*70-130*	0				
Surr: 13C3-HFPO-DA	*37.77*	0	0	*40*	0	*94.4*	*70-130*	0				

The following samples were analyzed in this batch:

21072346-01A	21072346-02A	21072346-03A
21072346-04A	21072346-05A	

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: Fishbeck, Inc.
Work Order: 21072346
Project: Cedar Springs

QC BATCH REPORT

Batch ID: **181312** Instrument ID **LCMS1** Method: **E537.1**

MBLK Sample ID: **MBLK-181312-181312** Units: **ng/L** Analysis Date: **8/4/2021 12:55 AM**
Client ID: Run ID: **LCMS1_210803B** SeqNo: **7636913** Prep Date: **8/3/2021** DF: **1**

Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Hexafluoropropylene oxide din	U	0.7	2.0								
N-Ethylperfluorooctanesulfona	U	0.3	2.0								
N-Methylperfluorooctanesulfor	U	0.5	2.0								
Perfluorobutanesulfonic Acid (	U	0.4	2.0								
Perfluorodecanoic Acid (PFDA	U	0.7	2.0								
Perfluorododecanoic Acid (PFI	U	0.4	2.0								
Perfluoroheptanoic Acid (PFH	U	0.6	2.0								
Perfluorohexanesulfonic Acid (	U	0.3	2.0								
Perfluorohexanoic Acid (PFHx	U	0.7	2.0								
Perfluorononanoic Acid (PFNA	U	0.6	2.0								
Perfluorooctanesulfonic Acid (I	U	0.2	2.0								
Perfluorooctanoic Acid (PFOA	U	0.5	2.0								
Perfluorotetradecanoic Acid (F	U	0.5	2.0								
Perfluorotridecanoic Acid (PFT	U	0.3	2.0								
Perfluoroundecanoic Acid (PFI	U	0.4	2.0								
11Cl-Pf3OUdS	U	0.4	2.0								
9Cl-PF3ONS	U	0.2	2.0								
4,8-Dioxa-3H-perfluorononano	U	0.3	2.0								
Surr: 13C2-PFHxA	*40.65*	0	0	*40*	0	*102*	*70-130*	0			
Surr: 13C2-PFDA	*36.71*	0	0	*40*	0	*91.8*	*70-130*	0			
Surr: d5-N-EtFOSAA	*135*	0	0	*160*	0	*84.4*	*70-130*	0			
Surr: 13C3-HFPO-DA	*35.78*	0	0	*40*	0	*89.4*	*70-130*	0			

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client:	Fishbeck, Inc.
Work Order:	21072346
Project:	Cedar Springs

QC BATCH REPORT

Batch ID: **181312** Instrument ID **LCMS1** Method: **E537.1**

MS1 Sample ID: **21072346-06AMS1** Units: **ng/L** Analysis Date: **8/4/2021 01:16 AM**

Client ID: **CS-21-07-DW-3950 Cedar Rv Dr (I MS/MSD)** Run ID: **LCMS1_210803B** SeqNo: **7636915** Prep Date: **8/3/2021** DF: **1**

Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Hexafluoropropylene oxide din	1.783I	0.6	2.0	1.689	0	106	50-150	0			J
N-Ethylperfluorooctanesulfona	1.449	0.3	2.0	1.689	0	85.8	50-150	0			J
N-Methylperfluorooctanesulfor	1.36	0.4	2.0	1.689	0	80.5	50-150	0			J
Perfluorobutanesulfonic Acid (	1.466	0.3	2.0	1.495	0	98	50-150	0			J
Perfluorodecanoic Acid (PFDA	1.722	0.6	2.0	1.689	0.04586	99.2	50-150	0			J
Perfluorododecanoic Acid (PFI	1.47	0.3	2.0	1.689	0.06828	83	50-150	0			J
Perfluoroheptanoic Acid (PFH|	2.118	0.5	2.0	1.689	0.1014	119	50-150	0			
Perfluorohexanesulfonic Acid (	1.385	0.3	2.0	1.537	0	90.1	50-150	0			J
Perfluorohexanoic Acid (PFHx	2.036	0.6	2.0	1.689	0	121	50-150	0			
Perfluorononanoic Acid (PFNA	1.9	0.5	2.0	1.689	0.08103	108	50-150	0			J
Perfluorooctanesulfonic Acid (I	1.582	0.2	2.0	1.571	0	101	50-150	0			J
Perfluorooctanoic Acid (PFOA	1.82	0.4	2.0	1.689	0.09586	102	50-150	0			J
Perfluorotetradecanoic Acid (F	1.52	0.4	2.0	1.689	0.05345	86.8	50-150	0			J
Perfluorotridecanoic Acid (PFT	1.462	0.3	2.0	1.689	0.04724	83.8	50-150	0			J
Perfluoroundecanoic Acid (PFI	1.643	0.4	2.0	1.689	0.07345	92.9	50-150	0			J
11Cl-Pf3OUdS	1.072	0.3	2.0	1.588	0	67.5	50-150	0			J
9Cl-PF3ONS	1.346	0.1	2.0	1.571	0	85.7	50-150	0			J
4,8-Dioxa-3H-perfluorononano	1.766	0.3	2.0	1.588	0	111	50-150	0			J
Surr: 13C2-PFHxA	*35.42*	0	0	*33.78*	0	*105*	*70-130*	0			
Surr: 13C2-PFDA	*30.82*	0	0	*33.78*	0	*91.2*	*70-130*	0			
Surr: d5-N-EtFOSAA	*99.51*	0	0	*135.1*	0	*73.6*	*70-130*	0			
Surr: 13C3-HFPO-DA	*31.1*	0	0	*33.78*	0	*92.1*	*70-130*	0			

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: Fishbeck, Inc.
Work Order: 21072346
Project: Cedar Springs

QC BATCH REPORT

Batch ID: **181312** Instrument ID **LCMS1** Method: **E537.1**

MSD1 Sample ID: **21072346-06AMSD1** Units: **ng/L** Analysis Date: **8/4/2021 10:48 AM**

Client ID: **CS-21-07-DW-3950 Cedar Rv Dr (I MS/MSD)** Run ID: **LCMS1_210804A** SeqNo: **7636944** Prep Date: **8/3/2021** DF: **1**

Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Hexafluoropropylene oxide din	1.654	0.6	2.0	1.712	0	96.6	50-150	0			J
N-Ethylperfluorooctanesulfona	2.035	0.3	2.0	1.712	0	119	50-150	0			
N-Methylperfluorooctanesulfor	1.734	0.4	2.0	1.712	0	101	50-150	0			J
Perfluorobutanesulfonic Acid (	1.578	0.3	2.0	1.515	0	104	50-150	0			J
Perfluorodecanoic Acid (PFDA	1.718	0.6	2.0	1.712	0	100	50-150	0			J
Perfluorododecanoic Acid (PFI	1.592	0.3	2.0	1.712	0	93	50-150	0			J
Perfluoroheptanoic Acid (PFH	2.184	0.5	2.0	1.712	0	128	50-150	0			
Perfluorohexanesulfonic Acid (	2.079	0.3	2.0	1.558	0	133	50-150	0			
Perfluorohexanoic Acid (PFHx	1.847	0.6	2.0	1.712	0	108	50-150	0			J
Perfluorononanoic Acid (PFNA	1.608	0.5	2.0	1.712	0	93.9	50-150	0			J
Perfluorooctanesulfonic Acid (I	1.774	0.2	2.0	1.592	0	111	50-150	0			J
Perfluorooctanoic Acid (PFOA	1.856	0.4	2.0	1.712	0	108	50-150	0			J
Perfluorotetradecanoic Acid (F	1.316	0.4	2.0	1.712	0	76.9	50-150	0			J
Perfluorotridecanoic Acid (PFT	1.395	0.3	2.0	1.712	0	81.5	50-150	0			J
Perfluoroundecanoic Acid (PFI	1.721	0.4	2.0	1.712	0	100	50-150	0			J
11Cl-Pf3OUdS	1.409	0.3	2.0	1.61	0	87.5	50-150	0			J
9Cl-PF3ONS	1.466	0.1	2.0	1.592	0	92.1	50-150	0			J
4,8-Dioxa-3H-perfluorononano	1.765	0.3	2.0	1.61	0	110	50-150	0			J
Surr: 13C2-PFHxA	*32.21*	0	0	*34.25*	0	*94.1*	*70-130*	0			
Surr: 13C2-PFDA	*27.38*	0	0	*34.25*	0	*80*	*70-130*	0			
Surr: d5-N-EtFOSAA	*107.4*	0	0	*137*	0	*78.4*	*70-130*	0			
Surr: 13C3-HFPO-DA	*29.15*	0	0	*34.25*	0	*85.1*	*70-130*	0			

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: Fishbeck, Inc.
Work Order: 21072346
Project: Cedar Springs

QC BATCH REPORT

Batch ID: **181312** Instrument ID **LCMS1** Method: **E537.1**

LCS1	Sample ID: **LCS1-181312-181312**						Units: **ng/L**		Analysis Date: **8/4/2021 01:05 AM**		
Client ID:		Run ID: **LCMS1_210803B**					SeqNo: **7636914**		Prep Date: **8/3/2021**	DF: **1**	
Analyte	**Result**	**MDL**	**PQL**	**SPK Val**	**SPK Ref Value**	**%REC**	**Control Limit**	**RPD Ref Value**	**%RPD**	**RPD Limit**	**Qual**
Hexafluoropropylene oxide din	2.006I	0.7	2.0	2	0	100	50-150	0			
N-Ethylperfluorooctanesulfona	2.028	0.3	2.0	2	0	101	50-150	0			
N-Methylperfluorooctanesulfor	1.802	0.5	2.0	2	0	90.1	50-150	0			J
Perfluorobutanesulfonic Acid (	1.702	0.4	2.0	1.77	0	96.2	50-150	0			J
Perfluorodecanoic Acid (PFDA	2.077	0.7	2.0	2	0	104	50-150	0			
Perfluorododecanoic Acid (PFI	1.748	0.4	2.0	2	0	87.4	50-150	0			J
Perfluoroheptanoic Acid (PFH	2.496	0.6	2.0	2	0	125	50-150	0			
Perfluorohexanesulfonic Acid (	2.123	0.3	2.0	1.82	0	117	50-150	0			
Perfluorohexanoic Acid (PFHx	2.011	0.7	2.0	2	0	101	50-150	0			
Perfluorononanoic Acid (PFNA	2.176	0.6	2.0	2	0	109	50-150	0			
Perfluorooctanesulfonic Acid (I	1.892	0.2	2.0	1.86	0	102	50-150	0			J
Perfluorooctanoic Acid (PFOA	2.236	0.5	2.0	2	0	112	50-150	0			
Perfluorotetradecanoic Acid (F	1.792	0.5	2.0	2	0	89.6	50-150	0			J
Perfluorotridecanoic Acid (PFT	1.68	0.3	2.0	2	0	84	50-150	0			J
Perfluoroundecanoic Acid (PFI	1.979	0.4	2.0	2	0	98.9	50-150	0			J
11Cl-Pf3OUdS	1.58	0.4	2.0	1.88	0	84.1	50-150	0			J
9Cl-PF3ONS	1.626	0.2	2.0	1.86	0	87.4	50-150	0			J
4,8-Dioxa-3H-perfluorononano	2.024	0.3	2.0	1.88	0	108	50-150	0			
Surr: 13C2-PFHxA	*36.28*	0	0	*40*	0	*90.7*	*70-130*	0			
Surr: 13C2-PFDA	*34.33*	0	0	*40*	0	*85.8*	*70-130*	0			
Surr: d5-N-EtFOSAA	*134.7*	0	0	*160*	0	*84.2*	*70-130*	0			
Surr: 13C3-HFPO-DA	*31.97*	0	0	*40*	0	*79.9*	*70-130*	0			

The following samples were analyzed in this batch: 21072346-06A

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

fTC&H **CHAIN OF CUSTODY RECORD**

Fishbeck, Thompson, Carr & Huber, Inc.
Address ______
Phone ______

Report to Penni Mahler
Email pd mahler@fishbeck
Copy to ______
Email ______

Invoice to ______
Email ______
Lab Quote Reference 21072346

PROJECT NAME	PROJECT NO.	PAGE 1 OF 1
Cedar Springs	210460	
PROJECT LOCATION: Cedar Springs, MI	SAMPLER(S) NAME: BAH	STD TAT ☒
PROJECT MANAGER: TKP	PHONE	RUSH TAT ☐
	EMAIL	DATE DUE:

ADDITIONAL INFORMATION

MATRIX TYPE — REQUIRED ANALYSES: PFAS/537.1 18 list — PRESERVATIVE: Trizma — NUMBER OF CONTAINERS SUBMITTED

SAMPLE DATE	SAMPLE TIME	SAMPLE IDENTIFICATION	AQUEOUS (WATER)	SOLID/SEMI-SOLID	AIR	NONAQUEOUS LIQUID	PFAS/537.1 18 list (Trizma)										REMARKS
7/23/21	0940	CS-21-07-QCFB-02	X				2										
	1020	CS-21-07-DW-13328 (White Creek Ave)	X				3										
	1035	CS-21-07-DW-13550 White Creek Ave (I)	X				3										
	1055	CS-21-07-DW-13485 White Creek Ave (I)	X				3										
	1055	CS-21-07-DW-13485 White Creek Ave (D)	X				3										
	1115	CS-21-07-DW-3950 Cedar Rd Dr (2 MS MSD)	X				6										

RELINQUISHED BY	DATE	TIME	RELINQUISHED BY	DATE	TIME	RELINQUISHED BY	DATE	TIME	METHOD OF SHIPMENT/BILL OF LADING
Bailey A. [signature]	7/28/21	12:45							JW
RECEIVED BY	DATE	TIME	RECEIVED BY	DATE	TIME	RECEIVED BY	DATE	TIME	RECEIVED FOR LAB [signature] DATE 7/28/21 TIME 1245

WHITE Copy — Return with data package. YELLOW Copy — field File / Project Documentation.

G 042363

2.7°C IR3

ALS Group, USA

Sample Receipt Checklist

Client Name: **FTCH - GR** Date/Time Received: **28-Jul-21 12:45**

Work Order: **21072346** Received by: **DS**

Checklist completed by Lydia Sweet (eSignature) 28-Jul-21 (Date) Reviewed by: Jodi Blouw (eSignature) 29-Jul-21 (Date)

Matrices: Water

Carrier name: Client

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on shipping container/cooler?	Yes ☐	No ☐	Not Present ☑
Custody seals intact on sample bottles?	Yes ☐	No ☐	Not Present ☑
Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time?	Yes ☑	No ☐	
Container/Temp Blank temperature in compliance?	Yes ☑	No ☐	
Sample(s) received on ice?	Yes ☑	No ☐	
Temperature(s)/Thermometer(s):	2.7/3.7C	IR3	
Cooler(s)/Kit(s):			
Date/Time sample(s) sent to storage:	7/28/2021 1:27:41 PM		
Water - VOA vials have zero headspace?	Yes ☐	No ☐	No VOA vials submitted ☑
Water - pH acceptable upon receipt?	Yes ☐	No ☐	N/A ☑
pH adjusted?	Yes ☐	No ☐	N/A ☑
pH adjusted by:	-		

Login Notes:

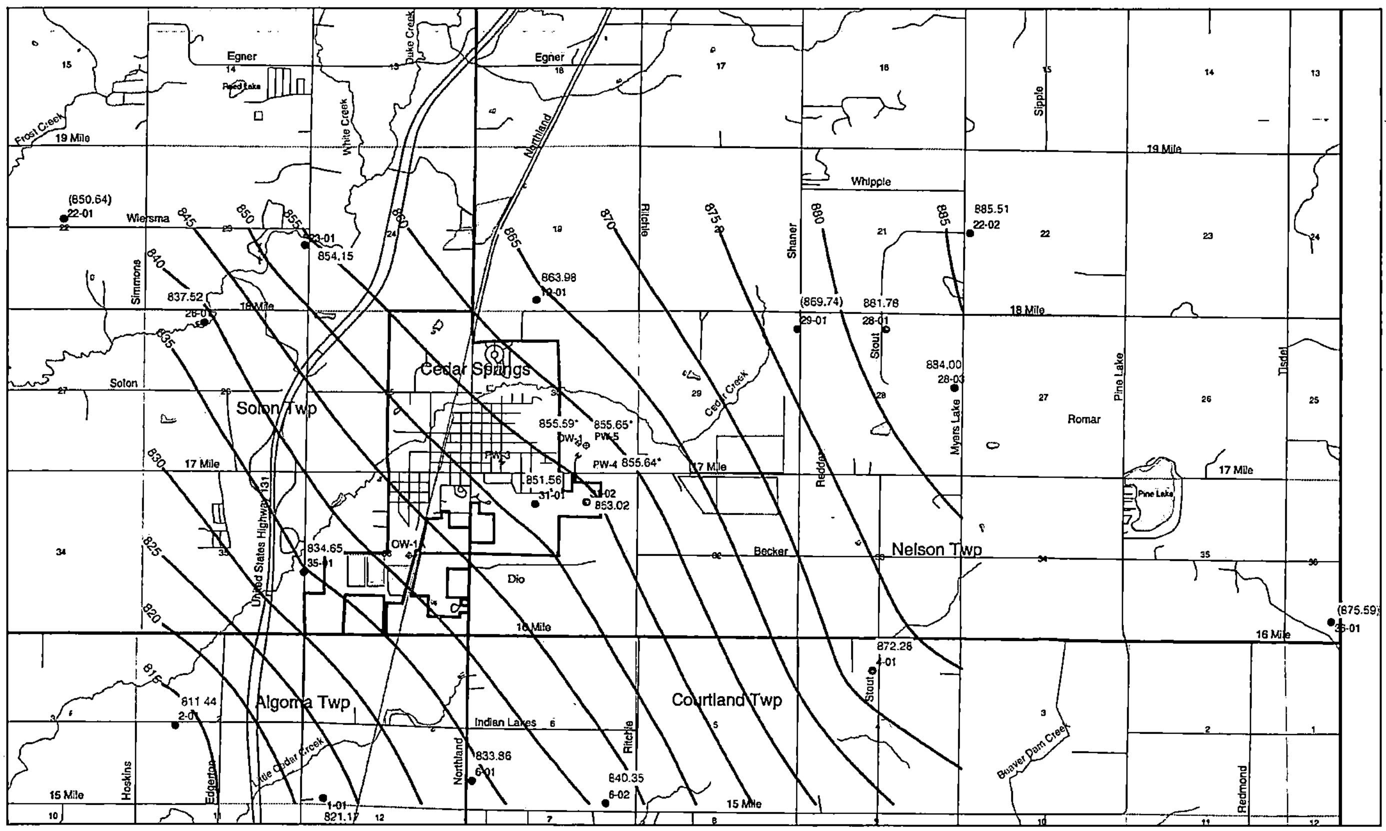
Client Contacted: Date Contacted: Person Contacted:

Contacted By: Regarding:

Comments:

CorrectiveAction:

Appendix 5



LEGEND

- POTENTIOMETRIC SURFACE CONTOUR
- • WATER WELL USED FOR WATER LEVEL DATA COLLECTION
- 821.17 STATIC WATER LEVEL ELEVATION (FT AMSL)
- (869.74) VALUES NOT USED IN CONTOURING
- 855.64* MEASURED 1/25/02

0 3,000 Feet

DATA SOURCES:
BASEMAP: MICHIGAN DEPARTMENT OF NATURAL RESOURCES, MICHIGAN GEOGRAPHIC FRAMEWORK VERSION 2A, 2002.

OBSERVED GROUNDWATER ELEVATION CONTOUR MAP

MEASURED JULY 2002

PROJECT NO. G02066

FIGURE NO. 7

City of Cedar Springs
Kent County, Michigan

Wellhead Protection Plan

ftc&h Fishbeck, Thompson, Carr & Huber
Engineers • Scientists • Architects
Kalamazoo, Michigan

3.0 OBSERVED GROUNDWATER ELEVATIONS AND HYDROLOGY

Static water level elevations were measured at 17 observation and residential wells covering approximately 22 sections in Nelson and Solon Townships as summarized in Table 3. The static water level elevations were measured to the nearest 0.01oot using an electronic water level meter. Figure 7 shows a potentiometric surface constructed from the observed static water level elevations. The observed groundwater elevation contour map confirms the groundwater flow direction is to the southwest toward Cedar Creek and the Rogue River at a gradient of approximately 2.65E-03 feet per feet (ft/ft).

GEOLOGICAL SURVEY NO.

MICHIGAN DEPARTMENT OF PUBLIC HEALTH
WATER WELL AND PUMP RECORD

PERMIT NUMBER

1 LOCATION OF WELL

County	Township Name	Fraction	Section Number	Town Number	Range Number
Kent	Solom	1/4 1/4 1/4	35	10 N/S	11 E/W

Distance And Direction From Road Intersection

Street Address & City of Well Location

Locate with "X" in Section Below — Sketch Map: Edgerton; 16 Mile Rd; N, S, E, W; 1/2 MI.; 1 MILE

3 OWNER OF WELL: Pine Border Farm
Address 3391 16 mile Rd
Cedar Springs MI 49319
Address Same As Well Location? [X] Yes [ ] No

4 WELL DEPTH: 108 FT. Date Completed MO. 2 DAY 22 YEAR 88 [X] New Well [ ] Replacement Well

5 [ ] Cable tool [X] Rotary [ ] Driven [ ] Dug [ ] Hollow rod [ ] Auger [ ] Jetted [ ] ______

6 USE: [ ] Domestic [ ] Type I Public [ ] Type III Public [X] Irrigation [ ] Type IIa Public [ ] Heat pump [ ] Test Well [ ] Type IIb Public [ ] ______

7 CASING: Diameter [X] Steel [ ] Threaded [ ] Plastic [X] Welded
12 in. to 78 ft. depth
______ in. to ______ ft. depth
Height: Above/Below Surface 1 1/2 ft.
Weight 52 lbs./ft.
Grouted Drill Hole Diameter 18 in. to 35 ft. depth
______ in. to ______ ft. depth
Drive Shoe [ ] Yes [X] No

2 FORMATION DESCRIPTION

FORMATION DESCRIPTION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Gravel	0	8
Clay	8	54
Sand	54	60
Clay	60	75
Small Gravel	75	110
Fine sand	110	—

USE A 2ND SHEET IF NEEDED

8 SCREEN: [ ] Not Installed
Type SS Diameter 10 3/4
Slot/Gauze .030 Length 30'
Set between 78 ft. and 108 ft.
FITTINGS: [ ] K-Packer [ ] Lead Packer [ ] Bremer Check
[ ] Blank above screen ______ ft. Other Weld

9 STATIC WATER LEVEL:
5 ft. below land surface [ ] Flow

10 PUMPING LEVEL: below land surface
67 ft. after 3 hrs. pumping at 1000 G.P.M.
______ ft. after ______ hrs. pumping at ______ G.P.M.

11 WELL HEAD COMPLETION: [ ] Pitless adapter [X] 12" above grade [ ] Basement offset [ ] Approved pit

12 WELL GROUTED? [ ] No [X] Yes From 0 to 35 ft.
[ ] Neat cement [X] Bentonite [ ] Other ______
No. of bags of cement ______ Additives ______

13 Nearest source of possible contamination
Type None Distance ______ ft. Direction ______
Well disinfected upon completion? [X] Yes [ ] No
Was old well plugged? [ ] Yes [ ] No

14 PUMP: [ ] Not Installed [X] Pump Installation Only
Manufacturer's name Jacuzzi
Model number 25NS8YCL HP 25 Volts 480
Length of Drop Pipe 77' ft. capacity 1000 G.P.M.
TYPE: [X] Submersible [ ] Jet ______
PRESSURE TANK:
Manufacturer's name none
Model number ______ Capacity ______ Gallons

15. Remarks, elevation, source of data, etc.

16. WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Joe Brown Drilling 91-1817
REGISTERED BUSINESS NAME — REGISTRATION NO.
Address ______
Signed Joseph R. Brown Date Feb 26, 88
AUTHORIZED REPRESENTATIVE

17. Rig Operator's Name: Dalton Davis

D67d 12/86

Authority: Act 368 PA 1978
Completion: Required
Penalty: Conviction of a violation of any provision is a misdemeanor.

GEOLOGICAL SURVEY COPY

Table 3 - Static Water Elevation Summary
Wellhead Protection Area Delineation
City of Cedar Springs, Michigan

Well ID	Address	Measuring Point Elevation (ft msl)	Static Water Level (ft bgl)	Groundwater Elevation (ft msl)
2-01	3380 Indian Lake	847.84	36.4	811.44
1-01	12410 White Creek	859.49	38.32	821.17
35-01	13525 White Creek	837.87	3.22	834.65
31-01	Bus Garage Facility	873.60	22.04	851.56
31-02	New High School	875.42	22.4	853.02
22-01	2791 Wiersma	893.85	43.21	850.64
22-02	15224 Myers Lake	896.29	10.78	885.51
36-01	9015 16 Mile	877.62	2.03	875.59
29-01	14715 Shaner	878.31	8.57	869.74
4-01	13121 Stout	902.62	30.34	872.28
28-01	14700 Stout	932.80	51.02	881.78
28-03	14417 Myers Lake	968.80	84.8	884.00
19-01	5151 18 Mile	902.02	38.04	863.98
26-01	3500 18 Miles	839.56	2.04	837.52
23-01	15135 White Creek	878.75	24.6	854.15
6-01	12550 Northland	860.49	26.63	833.86
6-02	5497 15 Mile	877.05	36.7	840.35

Notes:
ft msl - feet above mean sea level
ft bgl - feet below ground level

City of Cedar Springs
66 S. Main Street, P.O. Box 310
Cedar Springs, Michigan 49319-0310

CERTIFIED MAIL®

7020 2450 0002 2417 4295

US POSTAGE
$ 016.05⁰
FEB 15 2022
ZIP CODE 49319

RECEIVED
FEB 17 2022
Remediation and Redevelopment Division
Compliance and Enforcement

EGLE - Kevin Schrems
525 West Allegan Street
PO Box 30426
Lansing, MI 48909-7973

PLACE STICKER AT TOP OF ENVELOPE TO THE RIGHT OF THE RETURN ADDRESS. FOLD AT DOTTED LINE