6.4.7 Chain-of-Custody

Custody of samples, sample collection details (e.g., date, time, ID, requested analyses), shipment information, laboratory receipt, and laboratory custody until completion of analyses will be documented on a COC form. The COC will include the signature of the individuals collecting, shipping, and receiving each sample. Each sample will be entered on the COC. The COC will accompany each set of samples shipped to the laboratory. Each time sample custody changes, the receiving and relinquishing parties will sign, date, and add the time to the COC.

Upon receipt at the laboratory, the contents of the cooler will be compared with the COC. Any discrepancies will be noted on the COC or the laboratory's sample receipt form. If discrepancies occur, the samples in question will be segregated from normal sample storage and the field personnel notified for clarification. COC records will be maintained as part of the project records.

6.5 PURGE WATER

Buckets or other suitable containers will be used to collect purge water from each POET port prior to sample collection. The collected water then will be disposed into the nearest sink or drain at each residence. Discharge of the purge water to the septic system or ground surface is consistent with EGLE interoffice communication regarding purge water disposal from well sampling and development (EGLE, 1999).

6.6 SAMPLE SHIPPING

Sample bottles will be placed into the cooler and packed with double-bagged wet ice immediately following collection. Packing material will be used as necessary. A temperature blank will be placed in the cooler prior to shipment. The cooler shall be addressed to the appropriate laboratory and dispatched as soon as practical to ensure timely arrival.

6.6.1 Custody Seals

In cases where samples are to be shipped to the laboratory by a commercial carrier (e.g., FedEx), a custody seal will be placed on the sample shipping container to ensure the samples have not been disturbed during transport. One seal will be placed on the front of the cooler, across the opening. The seals will be signed and dated by the sampling personnel.

6.7 DATA MANAGEMENT

The objectives of data management include:

- Review of data quality, also known as data validation; and
- Data processing, or tracking and organizing the data using a database management system to facilitate reporting and prevent processing errors.

6.7.1 Preparation for Sampling

A monitoring checklist will be completed for water sample collection at each private well, which also includes information on project contacts and required equipment and supplies. All equipment and supplies, including bottle ware, should be PFAS free.

6.7.2 Data Validation

Data validation will be conducted in accordance with The National Functional Guidelines for Organic and Inorganic Data Review (NFG; EPA, 2008 and 2010) and the revised Project Specific QAPP. A Level 2a review for verification and validation based on completeness and compliance checks of sample receipt conditions and sample-related quality control results. A brief overview of procedures for data validation includes:

- Holding Times: Compare the time and date the sample was collected (on the COC) to the date analyzed in the laboratory report. Verify the dates are within the recommended holding times for the particular method;
- Blank Data (Method, Field, Trip): Verify through blank sample data results that no significant contamination issues exist from sampling activities, sample transport, storage at the sampling site, or laboratory analyses (where applicable);
- Laboratory Control Sample Data, Matrix Spike Data, and/or Surrogate Data: Verify the percent recovery of the spiked compounds is within acceptable laboratory criteria included in each laboratory report;
- Duplicate Analysis Data: Calculate the relative percent difference (RPD) of target compounds where both the native and field duplicate sample concentrations are greater than five times the reporting limit to demonstrate acceptable precision and reproducibility of the laboratory and/or field procedures. Laboratory duplicate RPD values will be compared to laboratory criteria. Field duplicate RPD values will be compared to a criterion of 30 percent for this project; and
- Overall Data Assessment: Examine the data package as a whole and compare it to (1) the COC to verify completeness, (2) the historical data to verify representativeness, and (3) the other Site data to verify comparability is being achieved.

Qualification of the data may result if the evaluation criteria are not met. Data qualification(s) will be presented in the sampling report.

6.7.3 Data Processing/Management

R&W/GZA maintains a database to house information relevant to the POET system monitoring.

6.8 REPORTING

R&W/GZA will call homeowners within approximately two weeks of receipt of the analytical results to report the results to individual property owners served by a POET system. Results are also provided via mail or email. R&W/GZA will provide data to the EGLE as required for their database, as outlined in Section 7.13 of the CD. EGLE will be provided periodic updates regarding progress and notifications of POET system changes.

6.8.1 POET System Reporting

A detection of PFOS+PFOA in the POET effluent will be reviewed promptly. If the concentration is less than 10 ppt PFOS+PFOA (or any applicable criteria) and found on start-up, subsequent sampling will be completed. If an effluent sampling result is greater than 10 ppt PFOS+PFOA (or greater than any applicable criteria), the response will include changing out the lead and lag GAC vessels, and resampling. Following the receipt of resampling results, water chemistry and water usage data will be reviewed, the system performance will be evaluated, and adjustments made to the system as necessary.

The results of each monitoring event for each POET system will be communicated by R&W/GZA to the property owner served by a POET system. The reporting methods are listed in Section 6.8.

If a mid-point sample exceeds 35 ppt for PFOS+PFOA, EGLE will be notified as soon as possible. If an effluent sample concentration is greater than 10 ppt, EGLE will be notified. These notifications will be made within 24 hours of receipt of the analytical data.

6.8.2 Periodic Reporting

Per Section 7.15 of the CD, Wolverine will provide EGLE with quarterly progress reports which will include the information pertaining to filters as outlined in Section 7.15(e)I, ii, iii, iv, and v. Additionally, sampling data will be shared with EGLE as outlined in Section 7.13(b)(ii), on at least a monthly basis.

7.0 CESSATION

Under the CD, the following cessation plan was established.

- Wolverine will stop providing POET system monitoring and/or carbon changeout (as specified above) when the individual residence is connected to municipal water. Wolverine will offer the POET to the homeowner if they wish to continue the O&M. In accordance with 7.5(g) of the CD, Wolverine will remove the POETs, as applicable. In the case of a POET system with known concentrations above 10 ppt PFOS+PFOA, the lead GAC vessel will be removed prior to the continued use of the POET system by the owner.

- At the locations with Type II water supplies (i.e. Armory and Convent), the POET systems will be maintained and monitored within their permit requirements until municipal water connections are provided.

- After the Effective Date of the CD, in filter areas (as established in the CD), if a parcel has not had influent/raw water PFOS+PFOA concentrations exceeding 10 ppt (or other applicable criteria for PFAS), Wolverine will offer to remove the POET system at Wolverine's expense, or the resident may choose to keep the POET system if they assume operation and maintenance.

Wolverine will continue notifying homeowners in writing of the changes to the POET system O&M regarding the offers to remove or retain POETs. Owners may indicate their choice to remove or retain the POET via either a provided form, email, or verbally. These will be tracked by R&W/GZA.

TABLE 1
PFAS ANALYTICAL PARAMETERS AND REPORTING LIMITS

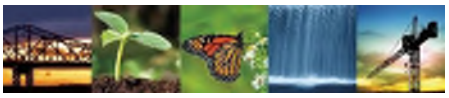
PFAS by EPA Method 537 (rev. 1.1)	CAS	Approximate Reporting Limit
N-ethylperfluoro-1-octanesulfonamidoacetic acid (EtFOSAA)	2991-50-6	4
N-methylperfluoro-1-octanesulfonamidoacetic acid (MeFOSAA)	2355-31-9	4
Perfluoro-1-butane sulfonic acid (PFBS)	375-73-5	4
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	4
Perfluoro-n-decanoic acid (PFDA)	335-76-2	4
Perfluoro-n-dodecanoic acid (PFDoA)	307-55-1	4
Perfluoro-n-heptanoic acid (PFHpA)	375-85-9	4
Perfluoro-n-hexanoic acid (PFHxA)	307-24-4	4
Perfluoro-n-nonanoic acid (PFNA)	375-95-1	4
Perfluoro-n-octanoic acid (PFOA)	335-67-1	4
Perfluoro-n-tetradecanoic acid (PFTeDA)	376-06-7	4
Perfluoro-n-tridecanoic acid (PFTrDA)	72629-94-8	4
Perfluoro-n-undecanoic acid (PFUdA)	2058-94-8	4
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	4

APPENDIX A – POINT-OF-USE FILTER MAINTENANCE MEMORANDUM

Rose & Westra
A Division of GZA

GEOTECHNICAL
ENVIRONMENTAL
ECOLOGICAL
WATER
CONSTRUCTION MANAGEMENT

The Widdicomb Building
601 Fifth Street NW
Suite 102
Grand Rapids, MI 49504
T: 616.956.6123
F: 616.288.3327
www.rosewestra.com
www.gza.com



MEMORANDUM

To: Karen Vorce, EGLE

From: Loretta Powers, R&W/GZA

Date: May 15, 2018, Revised April 6, 2020 and September 16, 2020

File No.: 16.0062335.51/16.0062961.60

Re: Aquasana 5300+ Point-of-Use Filtration Maintenance (POET O&M Appendix)

This memorandum pertains to Aquasana 5300+ point-of-use (POU) filters installed in the North Kent Study Area (NKSA) at residences by Wolverine World Wide, Inc. (Wolverine). This memorandum was updated April 6, 2020 to address changes established in the Consent Decree No. 1:18-cv-00039-JTM-ESC (CD), effective February 19, 2020. The changes made to the POU filter Operation and Maintenance (O&M) are established in Section 7.5 and Appendix L of the CD. The CD establishes both filter and municipal water areas within the NKSA. Refer to the CD for additional definition of these areas.

Aquasana 5300+ POU filters are an activated carbon-based filtration system with NSF International certification for the reduction of perfluoro-n-octanoic acid and perfluorooctane sulfonic acid (PFOA+PFOS) to below 70 parts per trillion (ppt) for influent concentrations up to 1,500 ppt. The POUs installed at locations with over 1,500 ppt influent PFOS+PFOA are installed after a point-of-entry treatment filter system. POU systems are not the stand-alone filtration for locations with influent concentrations above 1,500 ppt PFOS+PFOA.

The POU filter life is 800 gallons (approximately six months of typical use). There is a meter in the POU filter that alerts (via either auditory beep, flashing light, or mobile app) when it is time to replace the filter cartridges if the 800-gallon flow occurs before the six-month life expectancy.

R&W/GZA tracked POU filter installation dates. Prior to the effective date of the CD, approximately two weeks prior to the six-month mark, R&W/GZA contacted residents to provide the replacement cartridges. If a filter replacement was needed prior to the six-month schedule (i.e., usage tracking alerts the residents), the residents were instructed to contact R&W/GZA or Wolverine and replacement cartridges were dropped off.

As of the effective date of the CD, the following POU protocol will be implemented and followed:

- In filter areas at residences where influent concentrations are above 10 ppt for PFOS+PFOA (unless and until new applicable criteria for PFAS compounds become effective) as well as in municipal water areas, Wolverine will continue to provide replacement cartridges for the POU filters, as specified by manufacturer. Two sets of replacement cartridges will be provided each year to each residence. Wolverine will stop providing POU replacement cartridges when an individual residence is connected to municipal water. Additionally, if connected to municipal water,

Wolverine will offer to remove the POU filter at Wolverine's expense, or the resident may choose to keep it if they assume O&M.

- In filter areas, if a parcel has not had PFOS+PFOA concentrations exceeding 10 ppt, Wolverine will offer to remove the POU filter at Wolverine's expense, or the resident may choose to keep it if they assume O&M.

- In filter areas, if a parcel is resampled and the PFOS+PFOA is greater than 10 ppt or other applicable PFAS criterion is identified as defined in the CD, that resident will be offered a POU filter which Wolverine will maintain as stated above.

According to the EGLE's December 5, 2017 Fact Sheet: PFAS In-Home Filtration Systems, the POU granular activated carbon filters are general household refuse and can be disposed of as such in the resident's refuse to be removed and disposed in a licensed landfill. If a resident does not have refuse service, they may request removal of the spent filters.

Consistent with procedures used by EGLE/MDHHS/County health departments in areas of Michigan where they have provided POU filters, Wolverine will not be conducting performance monitoring of the POUs. Based on the NSF certification, the manufacturer recommended maintenance, and understood operating protocols at other locations in Michigan where these POU filters are being used. This POU maintenance program is sufficient for the Wolverine-installed POU filter systems.

R&W/GZA will continue to provide POU filter installation addresses and dates to EGLE through GIS data updates to AECOM. R&W/GZA will also continue to track replacement cartridge distribution and provide that information to EGLE via the GIS updates as well. This will be completed monthly as outlined in Section 7.13 of the CD.

APPENDIX B – SAMPLE RESIDENT INFORMATION CARD

POET FILTER INFORMATION CARD

Helpful Websites

- Wolverine groundwater project website http://www.WeAreWolverine.com/
- KCHD website https://www.accesskent.com/Health/PFAS/belmont.htm
- MDHHS https://www.michigan.gov/mdhhs/
- Plainfield Charter Township https://www.plainfieldmi.org
- Algoma Township https://www.algomatwp.org
- MPART Michigan PFAS Action Response Team https://www.michigan.gov/pfasresponse

Contact Numbers

Wolverine – 616-866-5627 - HouseStreet@wwwinc.com

GZA GeoEnvironmental, Inc. – 616-956-6123 - House.Street@gza.com

Kaat's Culligan – 616-791-7150

Greenville Culligan – 616-754-3858

Bayes Water Treatment – 616-887-9378

Gordon Water Systems – 616-776-3800

If the POET filter system remains dormant for more than three weeks, water should be flushed for a minimum of 25 minutes or 200 gallons or more prior to use.

APPENDIX C - CULLIGAN OWNER'S MANUAL

(INCLUDED FOR REFERENCE/INFORMATION ONLY)

Installation and Operation Manual

Exchange Carbon Filter System

Contents

Overview 2

System Design – Typical Operation 2

I. FILLING PROCEEDURES: 4

II. RECOMMENDED START UP PROCEDURE: 4

Carbon Filter Component Parts: 6

Filter Cartridge Replacement Procedures 7

UV Sterilizer # S8Q-PA-C (#D1022214) 8

Overview

This Portable Exchange Carbon Filtration System is designed to be installed in residential applications for the reduction of traces of organic chemical contamination from well water supplies. The system provides maximum flow rate of up to 8 GPM and includes a cartridge type sediment pre-filter (Dual Gradient 50-5 micron), a dual Carbon Filter system containing a total of 4 Ft^3 of a Filtrasorb F600AW Bituminous Coal Acid Washed Granular Activated Carbon (Culligan Cullar F600AW), cartridge type sediment post-filter (Dual Gradient 50-5 micron) and a final UV Light Water Sterilizer rated at 8 GPM flow rate. The system incorporates test ports in the inlet, in between the two carbon vessels and at the outlet of the system for monitoring the system efficiency. Also, a water totalizing meter is included in the outlet of the system to record water usage and facilitate service monitoring.

System Design – Typical Operation

System is installed on the main water line of the residence after the well pressure tank as indicated in the system flow diagram (Fig. 1) below. The first sediment filter is used for the removal of sediments and suspended matter. Then water flows through two (2) 10"x54" vessels in series each containing 2.0 Ft^3 of the Cullar F600AW (#SPC10776) Granular Activated Carbon media for the adsorption of traces of organic contaminants. The dual filter approach provides for a continuous back contingency. Following the carbon filter vessels a secondary cartridge type sediment filter is utilized to provide clean water to the residence. Finally, a UV light water sterilization unit is providing microbiological control prior to distribution of the water to the household.

The system operation is designed to be simple and maintenance free. Periodic exchange of the carbon filters is performed by your local Culligan dealer. Sampling ports are included during the installation to facilitate testing the system efficacy and determine when the carbon filter(s) need to be replaced. The spent carbon should be disposed according to applicable local and federal requirements as it may contain the contaminants being removed in the process and has to be treated accordingly.

Refer to this manual for further details and instructions for the system components.

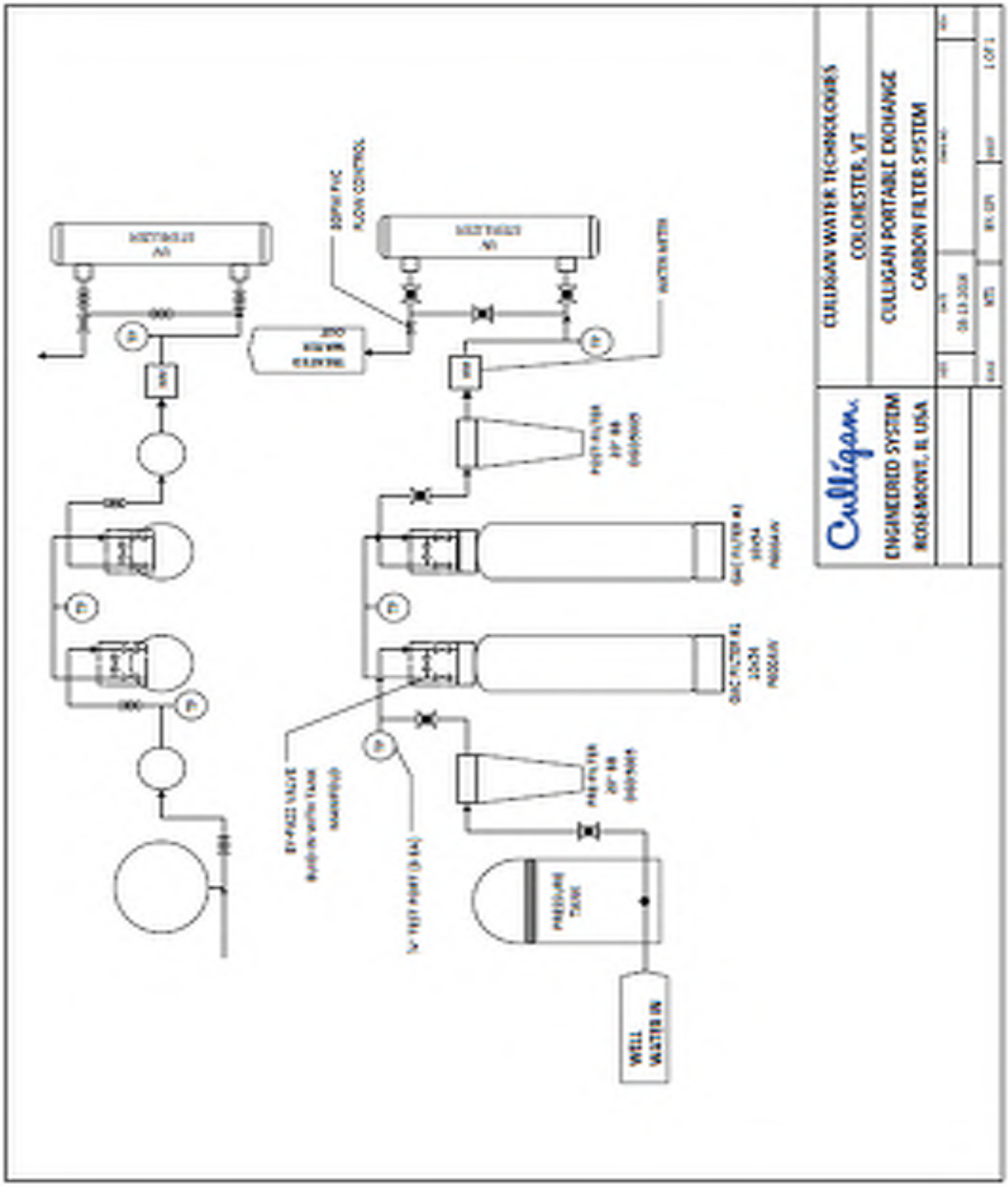


Figure 1: System Flow Diagram

PORTABLE EXCHANGE CARBON FILTERS

FILLING AND START UP PROCEEDURES

The following procedures should be followed every time a new Portable Exchange carbon filter is installed or exchange for an application. Every filter needs to be prepared according to the following instructions before it is placed in service.

I. FILLING PROCEEDURES:

1. Insert the Outlet distributor manifold in the tank and make sure it is properly centered
2. Cover the opening of the manifold with a clean rag.
3. Place a wide-mouth funnel in the tank opening.
4. Open one (1) 55 lbs. bag of Filtrasorb F600AW carbon. Slowly pour the carbon into the tank via the funnel. Fill the carbon within 2" – 3" from the top. Each tank depending on the size used should take 2 Ft^3 of carbon.
5. Fill the tank with water and allow the media to soak for 24-48 hours. The water level in the tank will decrease as the media soaks up water. Add water to the tank to keep the media submerged so all the media gets saturated.
6. Thread the tank closure with the inlet strainer into the tank; be careful not to miss thread.

II. RECOMMENDED START UP PROCEDURE:

1. It is advisable that every new filter is backwashed for 10 - 15 minutes at a flow rate of 5 – 8 GPM.
2. Easiest way to backwash the PE Carbon Tanks is utilizing a backwash funnel assembly, usually installed in a Culligan dealership. Backwash the media in the funnel for 10-15 minutes to make sure water is clean and all carbon fines are washed out.
3. Drop media back in the tank, drain excess water. Unit is ready to set in service.
4. If a backwash funnel is not available reverse the flow of the water on the tank manifold. Flow backwards to drain for 10-15 minutes at a flow rate no more than 5 GPM. If flow starts diminishing is because media is lifted around the top manifold. After 10-15 minutes make sure that the water to drain comes out clear. Reverse the flow and run to drain for another 5 min at 5 GPM to settle the bed.
5. You are ready to place the unit to service.
6. When installing the unit make sure that the Inlet & Outlet are hooked up correctly.

For servicing of the system contact the Culligan Dealer in your area.

Portable Exchange Carbon Filtration
Specifications and Operating Data

Cullar Portable Exchange Carbon Unit – 10x54 FRP Tank, 2.0 Ft^3

The 10"x54"-CARB FRP 1" will Provide:

Superior Quality Flow, gpm	: 3.1 @ 2 psi loss
High Quality Flow, gpm	: 4.7 @ 4 psi loss
Utility Quality Flow, gpm	: 6.3 @ 6 psi loss
Carbon Volume, ft^3	: 2.0

Miscellaneous Design Data:

Tank Size, in.	: 10x54
Tank Area, ft^2	: 0.54
Operating Pressure, psi	: 0-150
Oper. Temperature, °F	: 33-120

The 10"-CARB FRP 1" System Requirements:

Voltage	: None*
Pipe Conn, in NPT...	
Inlet	: 1.0
Outlet	: 1.0
Weight per tank, lbs...	
Shipping	: 132.0
Operating	: 195.0
Overall Dimensions, in....	
Width	: 11.0
Depth	: 12.0
Height	: 56.0

* Note: Voltage may be required for water quality instruments.

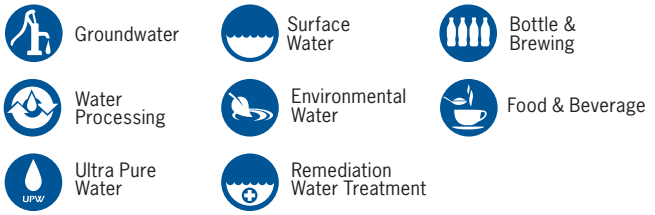
Cullar – Filtrasorb F600AW Activated Carbon Media:

The Filtrasorb F600AW media is a granular activated carbon for the removal of dissolved organic compounds from water. Such contaminants include taste and odor compounds, organic color, Total organic Carbon (TOC), and industrial organic compounds such as TCE, PCE and others. The F600AW is made of selected grades of bituminous coal and it is acid wash to provide cleanliness. See attached factory data sheet for more details.

FILTRASORB® 600

Granular Activated Carbon

Applications



With its enhanced high energy pore structure, FILTRASORB 600 is ideally suited for trace removal applications and offers a significant performance advantage over traditional activated carbon products used in these types of applications.

Specific applications include:

- Removal of MTBE
- Removal of DBCP
- Removal of THMs
- Removal of pesticides and herbicides
- Removal of other organics at concentrations < 1 ppm
- Potable water treatment
- Groundwater treatment
- Ultrapure water treatment

Description

FILTRASORB 600 is a granular activated carbon for the removal of dissolved organic compounds from water and wastewater as well as industrial and food processing streams. These contaminants include taste and odor compounds, organic color, total organic carbon (TOC), and industrial organic compounds such as TCE and PCE.

This activated carbon is made from select grades of bituminous coal through a process known as reagglomeration to produce a high activity, durable, granular product capable of withstanding the abrasion associated with repeated backwashing, hydraulic transport, and reactivation for reuse. Activation is carefully controlled to produce a significant volume of both low and high energy pores for effective adsorption of a broad range of high and low molecular weight organic contaminants.

FILTRASORB 600 is formulated to comply with all the applicable provisions of the AWWA Standard for Granular Activated Carbon (B604) and Food Chemicals Codex. This product may also be certified to the requirements of ANSI/NSF Standard 61 for use in municipal water treatment facilities. Only products bearing the NSF Mark are certified to the NSF/ANSI 61 - Drinking Water System Components - Health Effects standard. Certified Products will bear the NSF Mark on packaging or documentation shipped with the product.

Features / Benefits

- Produced from a pulverized blend of high quality bituminous coals resulting in a consistent, high quality product.
- Carbon granules are uniformly activated through the whole granule, not just the outside, resulting in excellent adsorption properties and constant adsorption kinetics.
- The reagglomerated structure ensures proper wetting while also eliminating floating material.
- High mechanical strength relative to other raw materials, thereby reducing the generation of fines during backwashing and hydraulic transport.
- Carbon bed segregation is retained after repeated backwashing, ensuring the adsorption profile remains unchanged and therefore maximizing the bed life.
- Reagglomerated with a high abrasion resistance, which provides excellent reactivation performance.
- High density carbon resulting in a greater adsorption capacity per unit volume.

Specifications[1]	FILTRASORB 600
Iodine Number, mg/g	850 (min)
Moisture by Weight	2% (max)
Abrasion Number	80 (min)
Trace Capacity Number, mg/g	16 (min)
Screen Size by Weight, US Sieve Series	
On 12 mesh	5% (max)
Through 40 mesh	4% (max)

[1]Calgon Carbon test method

Typical Properties*	FILTRASORB 600
Apparent Density (tamped)	0.62 g/cc
Water Extractables	<1%
Non-Wettable	<1%

*For general information only, not to be used as purchase specifications.

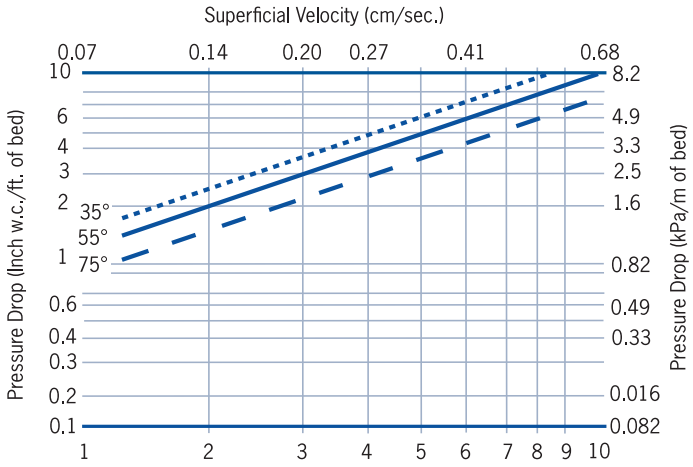
Safety Message

Wet activated carbon can deplete oxygen from air in enclosed spaces. If use in an enclosed space is required, procedures for work in an oxygen deficient environment should be followed.

DS-FILTRA60015-EIN-E1

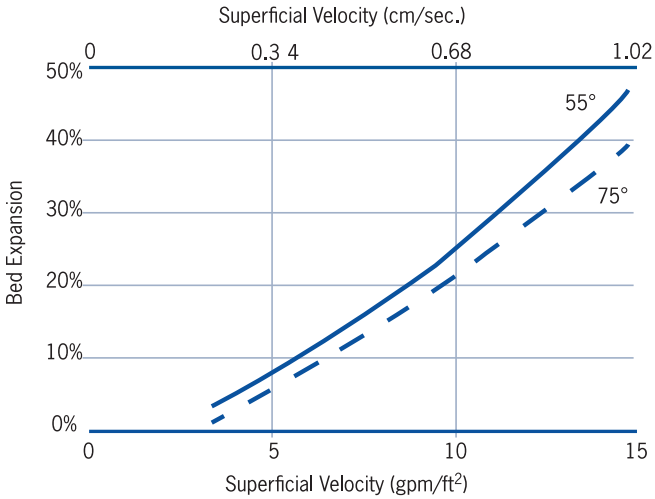
Typical Pressure Drop

Based on a backwashed and segregated bed



Typical Bed Expansion During Backwash

Based on a backwashed and segregated bed



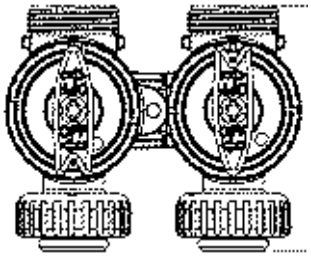
Safety Message

Wet activated carbon can deplete oxygen from air in enclosed spaces. If use in an enclosed space is required, procedures for work in an oxygen deficient environment should be followed.

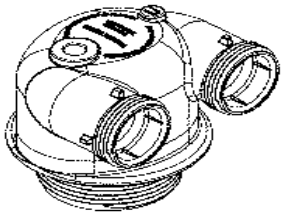
1.800.4CARBON calgoncarbon.com

DS-FILTRA60015-EIN-E1

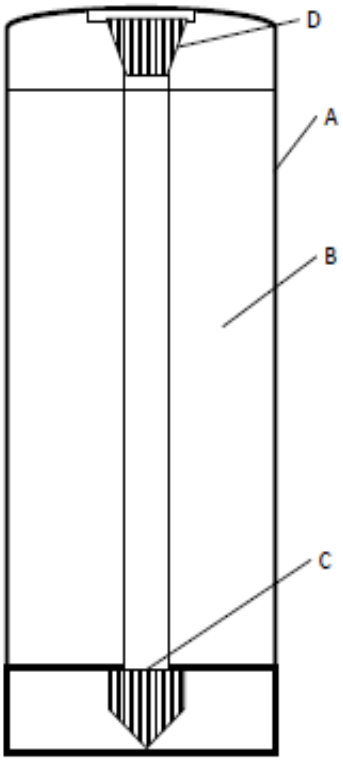
Carbon Filter Component Parts:



By-Pass Valve WS1 (#SPC10762)



In & Out Tank Head (#SPC10761)



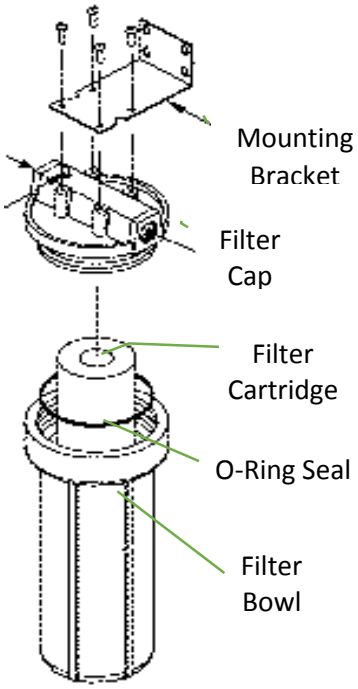
A. Filter Tank, FRP, 10”x54” (#SPC10770)

B. Carbon Media, 2 Ft^3, Cullar F600AW (#SPC10776)

C. Distributor Manifold (#SPC10773)

D. Top Distributor Basket (#SPC10765)

Filter Cartridge Replacement Procedures



The pre and post filter cartridges need to be replaced when a significant pressure drop across the filter increases, or in a regular intervals as determine by local water conditions.

1. Turn off water supply to filter. Depress red pressure-relief button to relief the pressure from the filter.
2. Using the filter wrench provided (#MS010522), unscrew the filter bowl.
3. Remove and discard old filter cartridge.
4. Clean the filter bowl with a damp cloth and rinse thoroughly.
5. Remove the wrapper from the new cartridge (#MS004512). Install the cartridge in the bowl, making sure it seals in the bottom of the bowl.
6. Check the O-ring seal (#MS404498) for dryness and cuts. Replace the seal if necessary and use silicone lube as needed.

   CAUTION! Do not use petroleum-based lubricants, which destroy the synthetic rubber seal.

7. Screw the filter bowl onto the filter cap and hand tighten. DO NOT OVER-TIGHTEN.
8. Slowly turn on the water supply to allow filter to fill with water and then press the red pressure-relief button on top of the filter cap to release trapped air.

UV Sterilizer # S8Q-PA-C (#D1022214)

Models:

S2Q-PA, S5Q-PA, S8Q-PA, S2Q-P/12VDC, S5Q-P/12VDC

NSF Standard 55 Class B Validated Models:

SV5Q-PA, SV8Q-PA

Powered by Sterilight

125 Clair Rd. W, Guelph, Ontario, Canada N1L 1R1
. (+1) 519.763.1032 • tf. (+1) 800.265.7246 (US and Canada only)
. (+31) 73 747 0144 (Europe only) • f. (+1) 519.763.5069
e-mail: info@viqua.com
www.viqua.com

Section 1 Safety Information

These are the original instructions. Please read this entire manual before operating this equipment. Pay attention to all danger, warning, and caution statements in this manual. Failure to do so could result in serious personal injury or damage to the equipment.

Make sure that the protection provided by this equipment is not impaired. DO NOT use or install this equipment in any manner other than that specified in the installation manual.

1.1 Potential Hazards:

Read all labels and tags attached to the system. Personal injury or damage to the system could occur if not observed.

	Waste electrical and electronic equipment (WEEE). This symbol indicates that you should not discard wasted electrical or electronic equipment (WEEE) in the trash. For proper disposal, contact your local recycling/reuse or hazardous waste center.		This symbol indicates not to store any combustible or flammable material close to the system.
	This symbol indicates there is Mercury present.		This symbol indicates that the contents of the transport package are fragile and the package should be handled with care.
	This is the safety alert symbol. Obey all safety messages that follow this symbol to avoid potential injury. When on the equipment, refer to the Operational and Maintenance manual for additional safety information.		This symbol indicates safety glasses with side protection is required for protection against UV exposure.
	This symbol indicates a risk of electrical shock and/or electrocution exists.		This symbol indicates gloves must be worn.
	This symbol indicates the marked equipment may contain a component that can eject forcibly. Obey all procedures to safely depressurize.		This symbol indicates safety boots must be worn.
	This symbol indicates the system is under pressure.		This symbol indicates the operator must read all available documentation to perform required procedures.
	This symbol indicates there is a potential UV hazard. Proper protection must be worn.		This symbol indicates the plumber must use copper piping.
	This symbol indicates the marked item could be hot and should not be touched without care.		This symbol indicates that the system should only be connected to a properly grounded, grounding-type controller receptacle that is protected by a Ground Fault Circuit Interrupter (GFCI).
	This symbol indicates there is a potential for VERY hot water when flow is started.		

Warning: This product may contain chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

1.2 Safety Precautions:

⚠DANGER

Failure to follow these instructions will result in serious injury or death.

- **Electric Shock:** To avoid possible electric shock, special care should be taken since water is present near the electrical equipment. Unless a situation is encountered that is explicitly addressed by the provided maintenance and troubleshooting sections, DO NOT attempt repairs yourself, refer to an authorized service facility.
- **GROUNDING:** This product must be grounded. If it should malfunction or breakdown, grounding provides a path of least resistance for electric current to reduce the risk of electrical shock. This system is equipped with a cord having an equipment-grounding conductor and a grounding plug. The plug must be plugged into an appropriate outlet that is properly installed and grounded in accordance with all local codes and ordinances. Improper connection of the equipment-grounding conductor can result in a risk of electrocution. Check with a qualified electrician or service personnel if you are in doubt as to whether the outlet is properly grounded. DO NOT modify the plug provided with this system – if it does not fit in the outlet, have a proper outlet installed by a qualified electrician. DO NOT use any type of adapter with this system.
- **GROUND FAULT CIRCUIT INTERRUPTER PROTECTION**: To comply with the National Electrical Code (NFPA 70) and to provide additional protection from the risk of electric shock, this system should only be connected to a properly grounded, grounding-type controller receptacle that is protected by a Ground Fault Circuit Interrupter (GFCI) or to a residual current device (RCD) having a rated residual operating current not exceeding 30 mA. Inspect operation of GFCI as per manufacturer's suggested maintenance schedule.
- DO NOT operate the disinfection system if it has a damaged cord or plug, if it is malfunctioning or if it has been dropped or damaged in any manner.
- DO NOT use this disinfection system for other than intended use (potable water applications). The use of attachments not recommended or sold by the manufacturer / distributor may cause an unsafe condition.
- DO NOT install this disinfection system where it will be exposed to the weather or to temperatures below freezing.
- DO NOT store this disinfection system where it will be exposed to the weather.
- DO NOT store this disinfection system where it will be exposed to temperatures below freezing unless all water has been drained from it and the water supply has been disconnected.

⚠WARNING

- During extended periods of no water flow, the water in your chamber can become very hot (Approx. 60 °C) and potentially lead to scalding. It is recommended to run your water until this hot water has been purged from your chamber. Do not allow water to contact your skin during this time. To eliminate this condition, a temperature management valve can be installed at the outlet of your UV system.
- This system contains a UV Lamp. Do not operate the UV Lamp when it is removed from the chamber. Unintended use or damage of the system may result in the exposure of dangerous UV radiation. UV radiation may, even in little doses, cause harm to the eyes and skin.
- Changes or modifications made to this system without the consent of the manufacturer could render the system unsafe for operation and may void the manufacturer's warranty.

⚠CAUTION

Failure to follow these instructions could result in minor or moderate injury.

- Carefully examine the disinfection system after installation. It should not be plugged in if there is water on parts not intended to be wet such as, the controller or lamp connector.
- Due to thermal expansion concerns and potential material degradation due to UV exposure, it is recommended to use metal fittings and at least 10" of copper pipe on the outlet of your UV chamber.
- **Hg EXPOSURE**: The UV lamp contains mercury. If the lamp breaks, then avoid inhalation or ingestion of the debris and avoid exposure to eyes and skin. Never use a vacuum cleaner to clean up a broken lamp as this may scatter the spilled mercury. Obey local regulations and guidelines for the removal and disposal of mercury waste.

NOTICE

- The UV lamp inside the disinfection system is rated at an effective life of approximately 9000 hours. To ensure continuous protection, replace the UV lamp annually.
- The UV system is not to be used or played with by children. Persons with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, are also not to handle the UV system unless they have been given supervision or instruction.
- This system is intended to be permanently connected to the water lines.
- This system is not intended to be used in or above water or outdoors or used in swimming pools when persons are in the pool.
- **EXTENSION CORDS**: If an extension cord is necessary, use only 3-wire extension cords that have 3-prong grounding-type plugs and 3-pole cord connectors that accept the plug from this system. Use only extension cords that are intended for outdoor use. Use only extension cords having an electrical rating not less than the rating of the system. A cord rated for less amperes or watts than this system rating may overheat. Exercise caution when arranging the cord so that it will not be tripped over or pulled. DO NOT use damaged extension cords. Examine extension cord before using and replace if damaged. DO NOT abuse extension cord. Keep extension cord away from heat and sharp edges. Always disconnect the extension cord from the receptacle before disconnecting this system from the extension cord. Never yank cord to pull plug from outlet. Always grasp the plug and pull to disconnect.
- If the supply cord is damaged, it must be replaced by a special cord or assembly available from the manufacturer or its service agent.
- **SYSTEM PROTECTION:** To protect your Controller, a UL1449 certified (or equivalent) transient voltage surge suppressor is strongly recommended.
- The UV lamp in this system conforms to the applicable provisions of the Code of Federal Regulations (CFR) requirements including, Title 21, Chapter 1, Subchapter J, Radiological Health.
- Read and understand the Owner's Manual before operating and performing any maintenance on this equipment.

1.3 Water Chemistry

Water quality is extremely important for the optimum performance of your UV system. The following levels are recommended for installation:

Water Quality and Minerals	Level
Iron	< 0.3 ppm (0.3 mg/L)
Hardness*	< 7 gpg (120 mg/L)
Turbidity	< 1 NTU
Manganese	< 0.05 ppm (0.05 mg/L)
Tannins	< 0.1 ppm (0.1 mg/L)
UV Transmittance	> 75% (call factory for recommendations on applications where UVT < 75%)

* Where total hardness is less than 7 gpg, the UV unit should operate efficiently provided the quartz sleeve is cleaned periodically. If total hardness exceeds 7 gpg, the water should be softened. If your water chemistry contains levels in excess of those mentioned above, proper pre-treatment is recommended to correct these water problems prior to the installation of your UV disinfection system. These water quality parameters can be tested by your local dealer, or by most private analytical laboratories. *Proper pre-treatment is essential for the UV disinfection system to operate as intended*.

Section 2 General Information

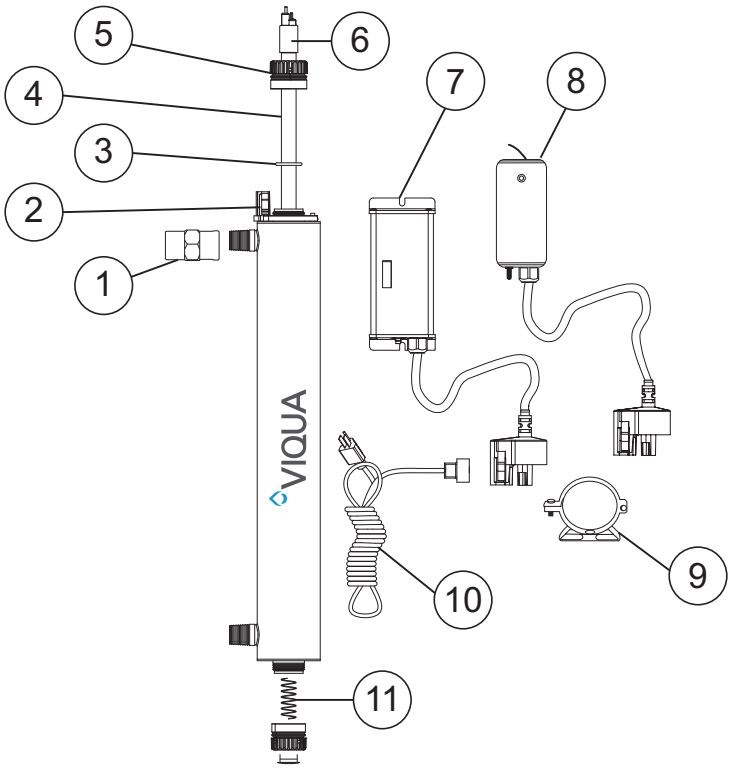


Figure 1 System Components

Item	Description	Part Number	UV Systems
1	Flow restrictor (Only for certified models)	440263-R	SV5Q-PA
		440264-R	SV8Q-PA
2	Lamp connector base	270276-R	Used on all systems
3	O-ring	410867	Used on all systems
4	Open-ended, 214 fused quartz sleeves with fire polished ends	QS-001	S1Q-PA
		QS-330	S2Q-PA
		QS-463	S5Q-PA, SV5Q-PA
		QS-810	S8Q-PA, SV8Q-PA
5	Retaining nut	RN-001	Used on all systems
6	Hard glass, coated Sterilumze®-EX UV lamps for long, consistent life (9000 hours)	S330RL	S2Q-PA
		S463RL	S5Q-PA, SV5Q-PA
		S810RL	S8Q-PA, SV8Q-PA
7	Controller (for 100-240V models only)	BA-ICE-S	S5Q-PA, S8Q-PA, SV5Q-PA, SV8Q-PA
8	Controller (for 12VDC models only)	BA-RO/P/12	S2Q-P/12VDC, S5Q-P/12VDC
9	2.5” Mounting brackets	410958-R	Used on all systems
10	IEC replacement power cords for VIQUA ICE Controller (sold separately)	260010	NORTH AMERICAN (NEMA 5-15P), 3-PRONG GROUNDED
		602637	CONTINENTAL EUROPEAN (CEE 7/7) 2-PIN WITH GROUND, “SCHUKO”
		260012	UK VERSION (BS 1363) 3-PRONG GROUNDED (5 AMP FUSE)
		260013	AUSTRALIAN VERSION (AS 3112) 3-PRONG GROUNDED
		260019	NO CONNECTOR, 3-WIRE, BARE LEADS
11	Spring	SP008	Used on all systems

Section 3 Installation

3.1 UV Disinfection System

⚠CAUTION

⚠ Electronic controller must be connected to a Ground Fault Protected Circuit (GFCI) receptacle. Ensure green ground wire ring terminal is securely fastened to ground stud on UV chamber.

The disinfection system is designed to be mounted either horizontally or vertically at the point-of-use or point-of-entry depending on the specific flow rate of the unit.

Note: *The ideal installation is vertical with the lamp connector on top. This is to prevent water damage from occurring on the lamp pins and lamp connector.*

- The controller should be mounted either above or beside the UV chamber. Always mount controller horizontally to prevent moisture from running down cordage and causing a potential fire hazard. Drip loops in all cordage connected to controller is highly recommended. Refer to Figure 5.
- The complete water system, including any pressure or hot water tanks, must be sterilized before start up by flushing with chlorine (household bleach) to destroy any residual contamination. Refer to Section 3.2.
- The disinfection system is intended for indoor use only. DO NOT install disinfection system where it may be exposed to the weather.
- Install the disinfection system on cold water line only, before any branched lines.
- A 5 micron sediment filter must precede the disinfection system. Ideally, the disinfection system should be the last treatment the water receives before it reaches the faucet.

Procedure:

1. Figure 2 shows the installation of a typical disinfection system and the related components that may be used for the installation. The use of a by-pass assembly is recommended in case the system requires “off-line” maintenance. In this case, note the system requires supplementary disinfection for the distribution system if any water is used during by-pass condition. In addition, during by-pass, the water will NOT be disinfected and a “DO NOT CONSUME THE WATER” tag should be physically installed on the by-pass assembly until such time as the system is sanitized and returned to service. For more information, refer to Section 3.2. If the water is to be consumed while the system is off-line, the water must be boiled for two minutes prior to consumption.

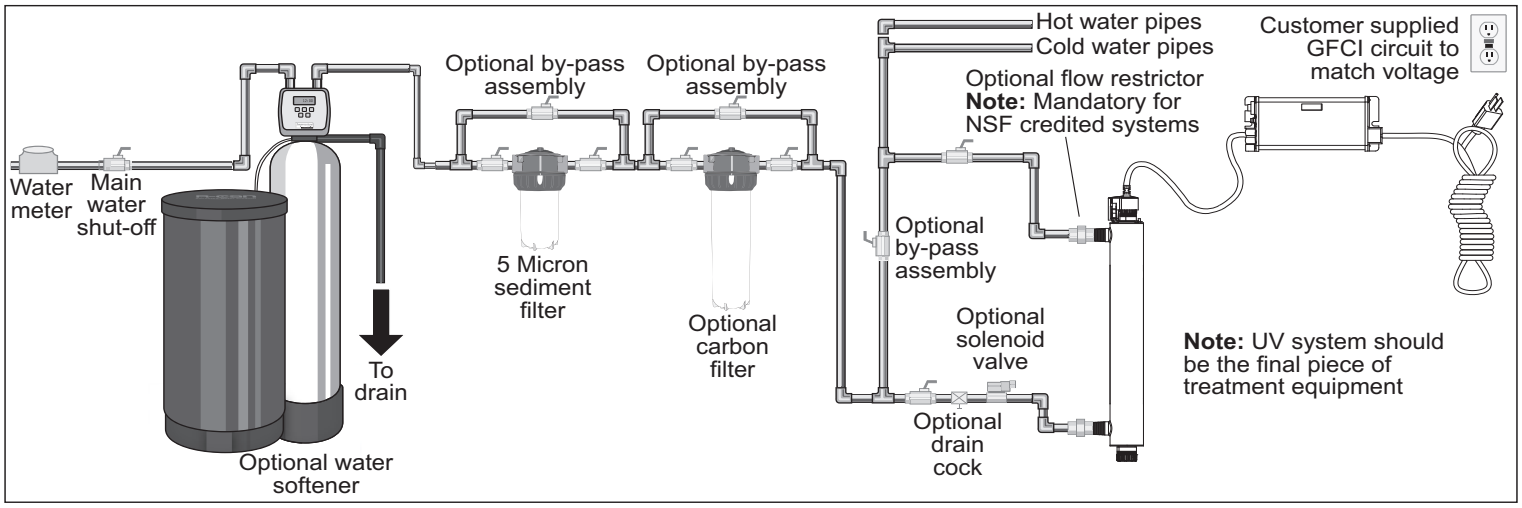


Figure 2 Disinfection System

2. Select a suitable location for the disinfection system and its related components. As it is recommended to install a GFCI, make sure that this is taken into consideration prior to any installation. The system can either be installed vertically (inlet port at the bottom) as shown in Figure 3 A, or horizontally as shown in Figure 3 B. However, the vertical installation is the most preferred method. When selecting a mounting location, leave enough space to allow the removal of the UV lamp and/or quartz sleeve (typically leave a space equal to the size of the UV chamber itself).

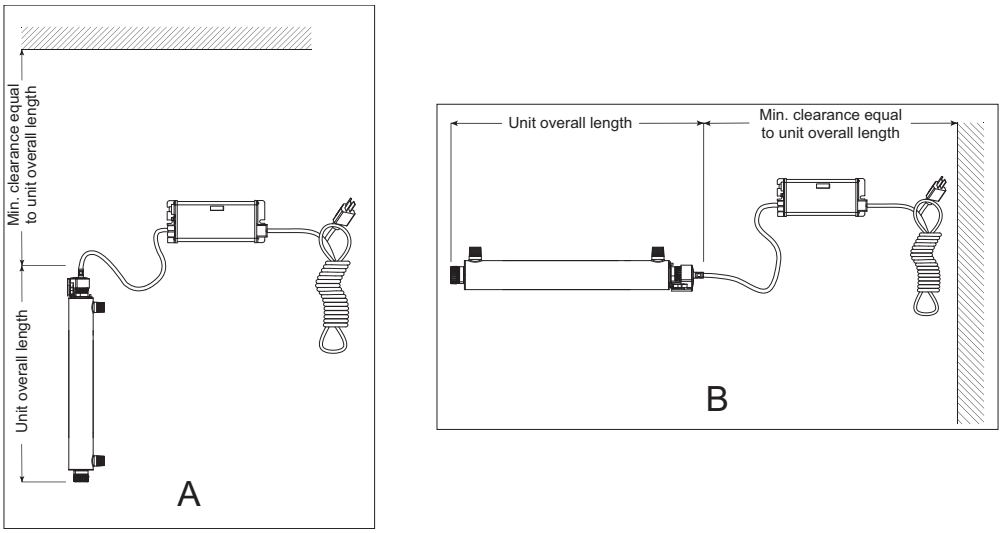


Figure 3 Disinfection Installation - Vertical and Horizontal

3. Mount the system to the wall using the supplied clamps. Various connection methods can be used to connect the water source to the system, however union type connectors are recommended. The use of a flow restrictor device will help to maintain the manufacturers rated flow. The flow restrictor should be installed on the outlet port and is designed to be installed in one direction only. Ensure that the flow of the water matches the flow direction as indicated on the flow restrictor. Refer to Figure 4.

   Note: *DO NOT solder connections while attached to the system as this could damage the O-ring seals.*

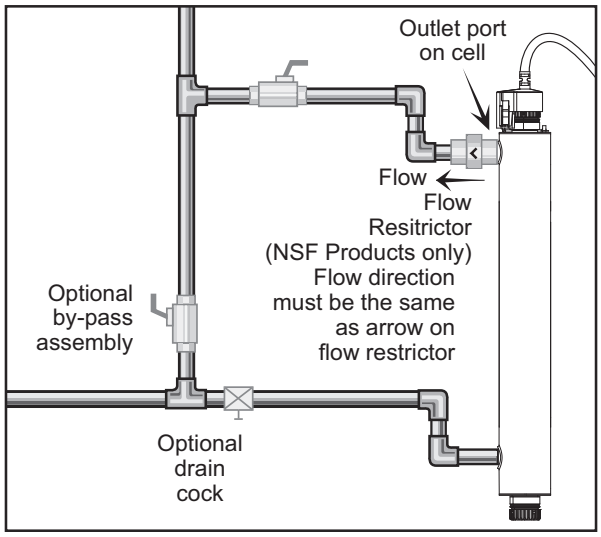


Figure 4 Flow Restrictor

4. Mount the VIQUA ICE controller horizontally to the wall, near the UV chamber. Ideally place the controller above the chamber and away from any water connection point, to prevent any water from potentially leaking onto the controller by means of a leak at a connection point or a “sweating” system. Make sure you allow for a “drip-loop” as shown in Figure 5 on the UV lamp, UV sensor, and power cord, again, to prevent any water from potentially entering the controller.

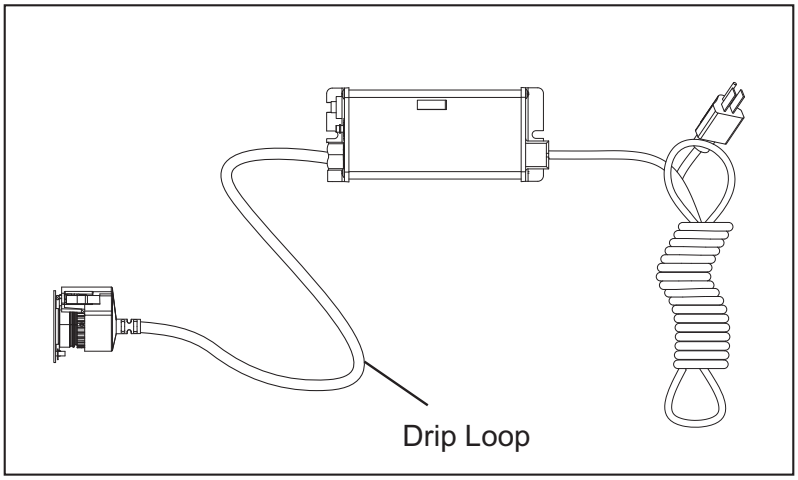


Figure 5 Drip Loop

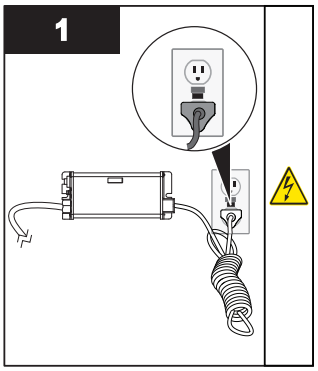
5. Install the UV lamp. Refer to Section 4.1.
6. When all plumbing connections are complete, slowly turn on the water supply and check for leaks. The most likely cause of leaks is from the O-ring seal. In case of a leak, shut water off, drain cell, remove the retaining nut, wipe the O-ring and threads. Clean and re-install.
7. Once it is determined that there are no leaks, plug the system into the ground fault interrupter and check controller to ensure the system is operating properly. The controller should illuminate without any alarms.

   Note: *DO NOT look directly at the glowing UV lamp.*
8. Allow the water to run for a few minutes to clear any air or dust that may be in the UV chamber.

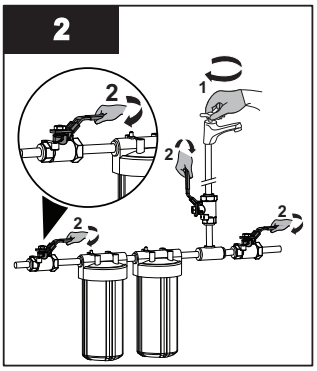
   Note: *When there is no flow, the water in the cell will become warm, as the UV lamp is always on. To remedy this, run a cold water tap anywhere in the house for a minute to flush out the warm water.*

3.2 Disinfection Procedure

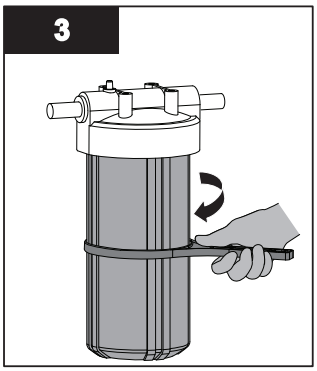
UV disinfection is a physical disinfection process and does not add any potentially harmful chemicals to the water. As UV does not provide a disinfection residual, it is imperative that the entire distribution system located after the UV be chemically disinfected to ensure that the plumbing system is free from any bacteriological contaminants. The disinfection process must be performed immediately after the UV unit is installed and repeated thereafter whenever the UV is shut down for service, without power, or inoperative for any reason. The procedure for sanitizing the plumbing system is readily accomplished as follows:



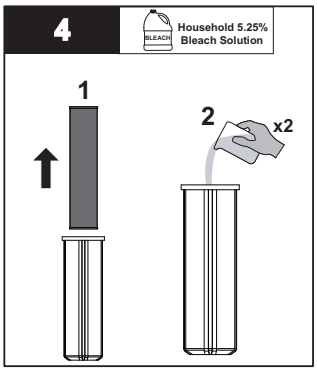
- Ensure the controller is plugged in for entire disinfection process.



- Shut off the water supply.
- Close each faucet.

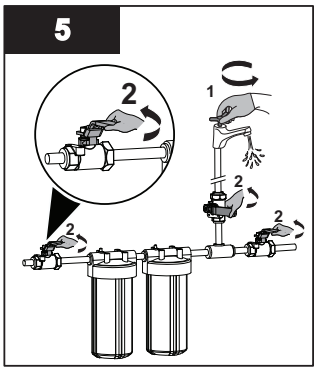


- Remove filter cartridge(s).

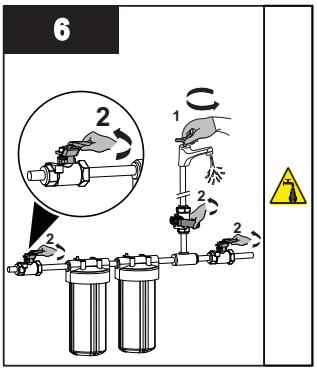


- Pour 2 cups of household bleach solution into the filter housing(s).

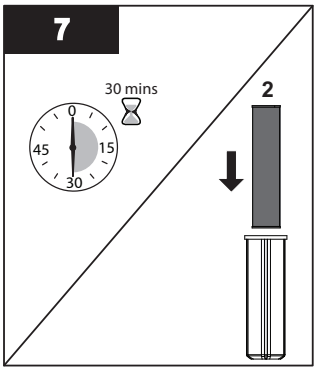
  Note: *DO NOT use Hydrogen Peroxide.*



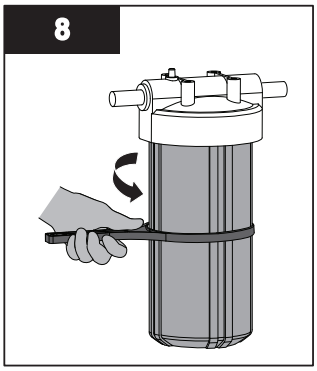
- Re-install the housings.
- Turn on the cold water supply.
- Open each faucet and all water openings until you smell the bleach and then close the faucets.



- Turn on the hot water supply.
- Open each faucet and all water openings until you smell the bleach and then close the faucets.



- DO NOT use water for 30 minutes.
- Flush the system until no chlorine smell is detectable and reinstall the filters.



- Reinstall filter housing(s).

Notes: *1) The addition of chlorine (bleach) to a hot water tank that has in the past been fed with untreated raw water with high levels of other contaminants (iron, manganese, hydrogen sulphide, organics, etc.) will result in oxidation of these contaminants and may require repeated flushing of the hot water tank. This contingency must be dealt with independently under the start-up procedure for any other conditioners that may form a part of the pre-treatment for the UV unit.*

2) The above disinfection procedure will result in a massive chlorine residual far in excess of the 0.5 to 1.0 mg/L typically present in municipally chlorinated water and of a magnitude consistent with the minimum 50 mg/L chlorine solution recommended for the disinfection of distribution systems known to be contaminated. DO NOT consume water until complete system has been flushed.

Section 4 Maintenance

⚠WARNING

- Always disconnect power before performing any work on the disinfection system.
- Always shut-off water flow and release water pressure before servicing.
- Regularly inspect your disinfection system to ensure that the power indicators are on and no alarms are present.
- Replace the UV lamp annually (or biennially if seasonal home use) to ensure maximum disinfection.
- Always drain the chamber when closing a seasonal home or leaving the unit in an area subject to freezing temperatures.

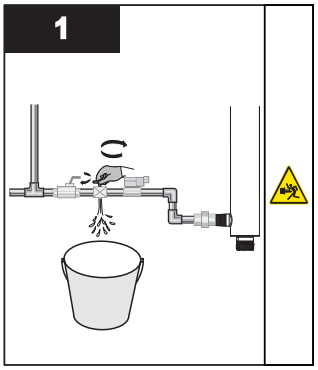
4.1 Replacing UV Lamp

NOTICE

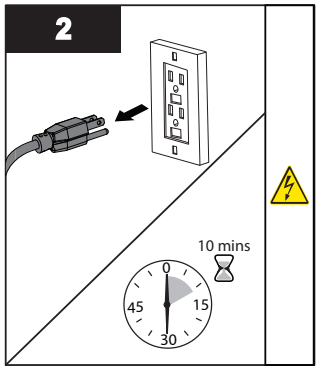
- Reset UV lamp life timer after UV lamp replacement. Refer to Section 5.1.3. Refer to www.lamprecycle.org for UV lamp disposal.
- DO NOT use water during replacement of UV lamp.

UV lamp replacement is a quick and simple procedure requiring no special tools. The UV lamp must be replaced after 9000 hours of continuous operation (approximately one year) in order to ensure adequate disinfection.

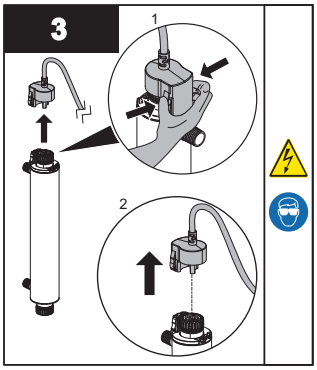
Procedure:



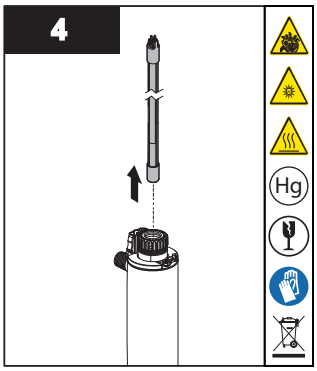
- Shut off the water line to chamber and release system pressure before servicing.



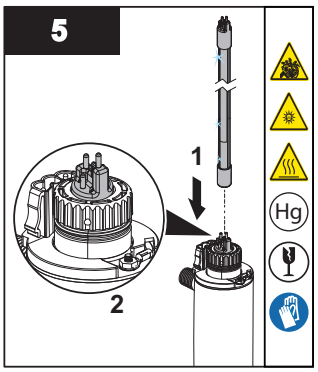
- Disconnect main power source and allow the unit to cool for 10 minutes.



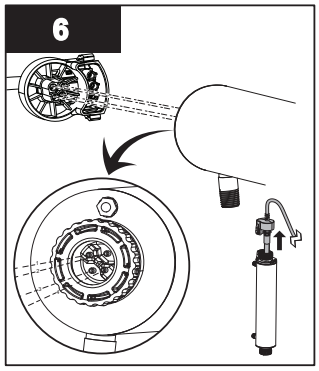
- Remove the lamp connector by squeezing the plastic locking tabs on the side of the connector.



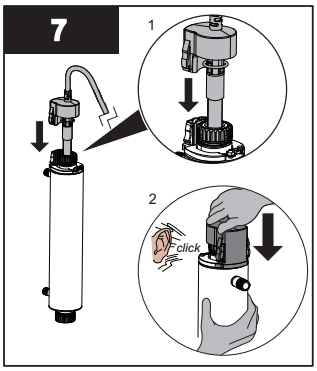
- Remove the lamp in upward direction from the chamber and lamp connector base.
- Always hold the lamp at the ceramic ends.



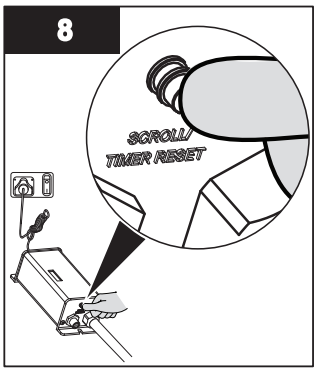
- Insert the new lamp fully into the chamber leaving about two inches of the lamp protruding from the chamber.



- Attach the connector to the lamp and note that the connector will only allow correct installation in one position.



- Push the lamp connector against lamp connector base together until an audible click is heard.
- Re-pressurize the system to check for leaks.



- Hold down the timer reset button and reapply power to the controller until you see rSEt, then release timer reset button.
- A 5 second delay will occur until you hear an audible tone and LED display will read once again 365.

VIQUA

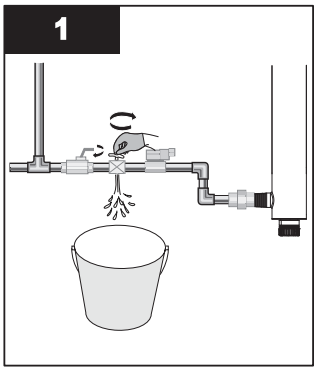
4.2 Cleaning and Replacing Quartz Sleeve

Note: *Minerals in the water slowly form a coating on the quartz sleeve. This coating must be removed because it reduces the amount of UV light reaching the water, thereby reducing disinfection performance. If the sleeve can not be cleaned, it must be replaced.*

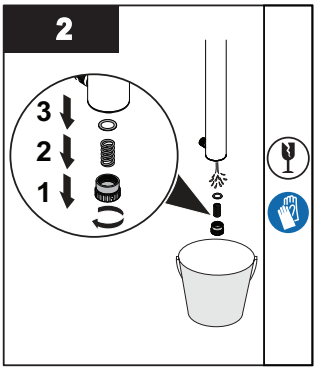
Prerequisites:

- Shut off water supply and drain all lines.
- Remove the UV lamp. Refer to Section 4.1.

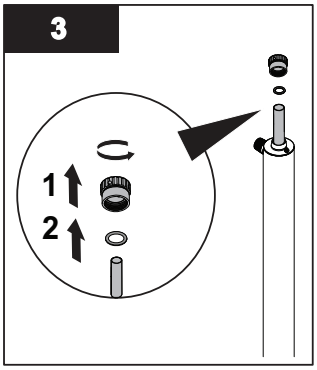
Procedure:



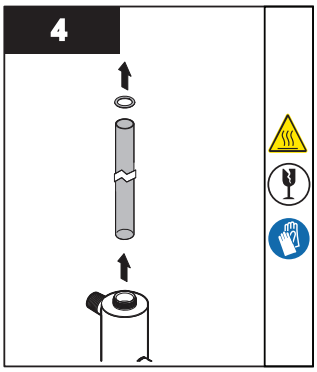
- Drain the chamber by using the drain port.



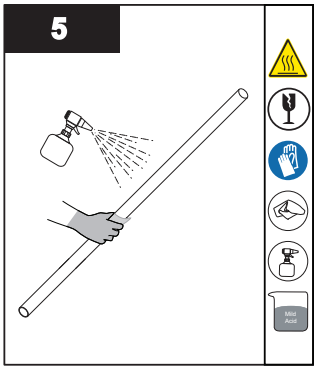
- Remove the bottom retaining nut, floating spring, and O-ring.



- Remove the top retaining nut and O-ring.

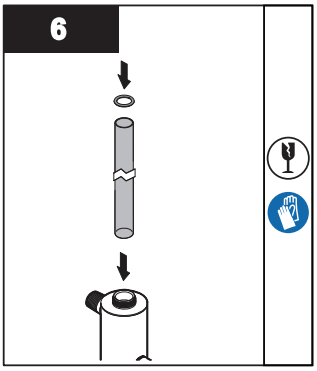


- Carefully, remove O-ring adhering to the quartz sleeve.
- Remove the quartz sleeve.

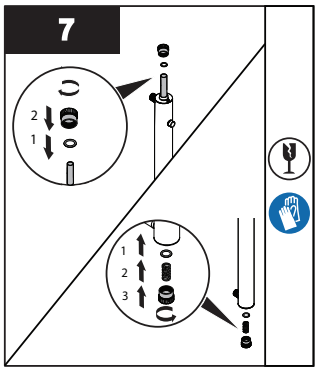


- Clean the quartz sleeve with a cloth soaked in CLR, vinegar or some other mild acid and then rinse with water.

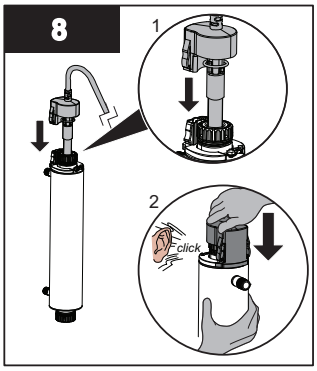
  Note: *If sleeve cannot be cleaned completely or it is scratched or cracked, then replace the sleeve.*



- Reinstall the quartz sleeve in the chamber allowing the sleeve to protrude an equal distance at both ends of the chamber.
- Slide supplied O-rings onto each end of the quartz sleeve.



- Reinstall the top and bottom retaining nuts, floating spring, and O-rings respectively.
- When service is complete, assemble the prerequisites in the reverse order of disassembly.



- Push the lamp connector against lamp connector base together until an audible click is heard.
- Plug in controller and verify the POWER-ON LED display.
- Re-pressurize the system to check for leaks.

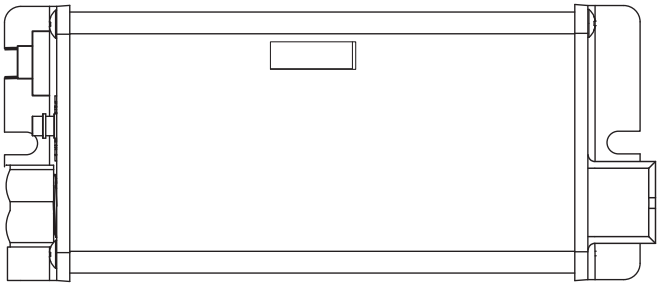
Note: *After replacing the UV lamp or quartz sleeve perform the disinfection procedure, refer to Section 3.2.*

Section 5 Operation

⚠ WARNING

The advanced warning system has been installed to provide the optimum protection against microbiological contamination in water. DO NOT disregard the warning signals. The best way to ensure optimum UV performance is to have the water microbiologically tested by a recognized testing agency on a regular basis.

5.1 Basic Systems Incorporating BA-ICE-S Controller



5.1.1 UV lamp Life Remaining (days)

365 The controller tracks the number of days of operation of the UV lamp and the controller. The default screen will display the total UV lamp life remaining (in days). The controller will count down the number of days remaining until the UV lamp requires changing (365 days to 1 day). At “0” days, the controller will display A3 and sound an intermittent audible chirp (1 second on, 5 seconds off), indicating the need to change the UV lamp.

5.1.2 Understanding your “A3” Code

A3 ***DEFERRAL*** - Once the “A3” or end of UV lamp life message is shown on the LED display, the audible alarm can be deferred up to 4 separate times. The delay is designed to allow you time to address the alarm while you obtain a new UV lamp. This can be done by simply depressing the timer reset button for 5 seconds, which is located on the left side of the controller. Each time the timer reset button is pressed the controller alarm is deferred seven days. Once the final 7 day deferral has been reached the alarm can only be silenced by changing the UV lamp and manually resetting the controller timer, refer to Section 4.1.

5.1.3 Resetting UV lamp Life

Refer to Section 4.1.

Note: *Even though the alarm on the system can be deferred for a period of time, it is important to address each and every alarm condition as they are indicating that there is a potential problem with the system and should be remedied.*

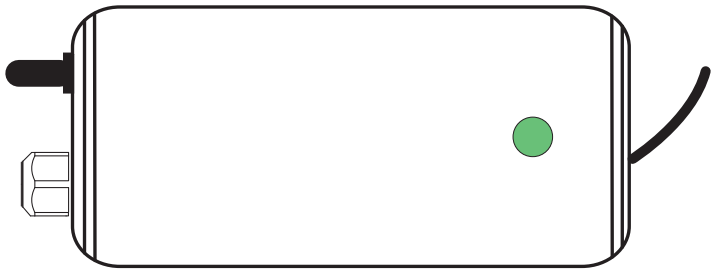
5.1.4 Total Days of Operation

1680 The controller also displays the total running time of the controller. To obtain this reading, press the push-button once. The total running time of the controller will be numerically displayed in days. This information will remain displayed for ten seconds and will then revert back to the UV lamp life remaining default screen. It should be noted that this value cannot be reset.

5.1.5 UV lamp Failure (Blank Screen)

When the system recognizes UV LAMP FAILURE (no current running through the UV lamp), the display will be blank (no default UV LAMP LIFE REMAINING screen) and the system will sound an intermittent audible tones (1 second on,1 second off). The system will remain in this state, until this condition is remedied.

5.2 12VDC Systems Incorporating BA-RO/P/12 Controller



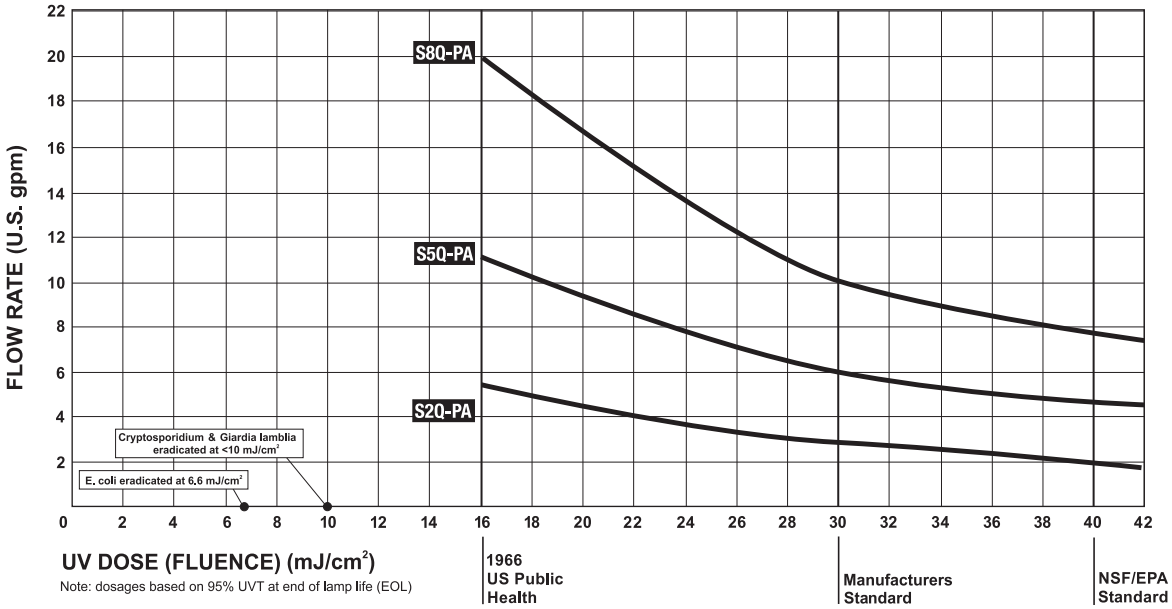
Green LED indicates UV lamp “ON”.

Section 6 Troubleshooting

Symptom	Possible Causes	Solutions
Pressure Drop	Sediment pre-filter clogged	Replace filter cartridge with appropriate 5 micron cartridge. ***Note:*** *Check source water supply as fluctuations may occur in source pressure.*
	Flow regulator	Flow regulator will result in pressure drop when approaching full flow.
High Bacteria Counts	Quartz sleeve is stained or dirty	Clean sleeve with scale cleaner and eliminate source of staining problem (ie. soften hard water, refer to Section 4.2.
	Change in feed water quality	Have source water tested to ensure that water quality is still within allowable limits for this system.
	Contamination in water lines after UV system (eg. power failures, plumbing	Disinfection system must have a bacterial free distribution system to work effectively. Refer to Section 3.2
	Possible break-through of sediment through pre-filter	Have source water tested for turbidity - may need stepped filtration in order to catch all sediment entering water system (20 micron filter followed by a 5 micron filter followed by UV
Heated Product Water	Common problem caused by infrequent use of water	Run water until it returns to ambient temperature.
Water Appears Milky	Caused by air in the water lines	Run water until air is purged.
Unit Leaking Water	Problem with O-ring seal (on retaining nut and/or UV sensor)	Ensure O-ring is in place, check for cuts or abrasions, clean O-ring, moisten with water/ lubricant and re-install, replace if necessary (410867).
	Condensation on UV chamber caused by excessive humidity & cold water	Check location of disinfection system and control humidity.
	Inadequate inlet/outlet port connections	Check thread connections, reseal with Teflon® tape and re-tighten.
System Shutting Down Intermittently	Interrupted controller	• Ensure system has been installed on its own circuit, as other equipment may be drawing power away from UV (ie. pump or fridge). • UV system should not be installed on a circuit which is incorporated into a light switch.
UV lamp Failure Alarm on - New lamp	Loose connection between UV lamp and connector	Disconnect UV lamp from connector and reconnect, ensuring that a tight fit is accomplished
	Moisture build up in connector may keep UV lamp and connector from making a solid connection	Eliminate chance of any moisture getting to the connector and/or lamp pins

DISPLAY FAULT MODES	
LED display reads “A3”	• UV lamp life expired - countdown is at “0” days. Refer to Section 5.1.2, Understanding your A3 Code. • Press reset button for a deferred alarm, replace UV lamp
LED display is blank	• Controller is in UV lamp failure mode. Refer to Section 5.1.5, UV Lamp Failure. Replace UV Lamp, refer to Section 4.1. • Power system down, allowing it to reset itself; apply power in order to confirm that the controller is able to power UV lamp • Check to see if there is sufficient power to the UV system
Green LED off (12 VDC only)	• UV lamp failure. Replace UV Lamp, refer to Section 4.1. • No input voltage to controller

Section 7 Manufacturer's Dose Flow Chart



Section 8 Specifications: Standard and Validated

Model		S2Q-P/12VDC/ S2Q-PA		S5Q-P/12VDC/ S5Q-PA/SV5Q-PA*		S8Q-PA/ SV8Q-PA*
Flow Rate	*NSF Class B Certified 16mJ/cm² @ 70% UVT	-		3.6 gpm (13.6 lpm) (0.8 m³/hr)		7 gpm (26.5 lpm) (1.6 m³/hr)
	US Public Health 16mJ/cm² @ 95% UVT	5 gpm (19 lpm) (1.1 m³/hr)		11 gpm (42 lpm) (2.5 m³/hr)		20 gpm (75 lpm) (4.5 m³/hr)
	VIQUA Standard 30 mJ/cm² @ 95% UVT	3 gpm (11 lpm) (0.7 m³/hr)		6 gpm (23 lpm) (1.4 m³/hr)		10 gpm (38 lpm) (2.3 m³/hr)
	NSF/EPA 40mJ/cm² @ 95% UVT	2 gpm (7 lpm) (0.4 m³/hr)		4.5 gpm (17 lpm) (1.0 m³/hr)		8 gpm (29 lpm) (1.8 m³/hr)
Dimensions	Chamber	43.2 cm x 6.4 cm (17" x 2.5")		56 cm x 6.4 cm (22" x 2.5")		90 cm x 6.4 cm (35" x 2.5")
	Controller 100-250 VAC	18.6 cm x 8.1 cm x 6.4 cm (7.3" x 3.2" x 2.5")		18.6 cm x 8.1 cm x 6.4 cm (7.3" x 3.2" x 2.5")		18.6 cm x 8.1 cm x 6.4 cm (7.3" x 3.2" x 2.5")
	Controller 12 VDC	13.5 cm x 4.3 cm x 5.8 cm (5.3" x 1.7" x 2.3")		13.5 cm x 4.3 cm x 5.8 cm (5.3" x 1.7" x 2.3")		-
Inlet/Outlet Port Size[1]		1/2" MNPT		3/4" MNPT"		3/4" MNPT
Shipping Weight		2.7 kg (6 lbs)		2.7 kg (6 lbs)		4.5 kg (10 lbs)
Electrical	Voltage[2]	100-240 V / 50/60 Hz	12 VDC	100-240 V / 50/60 Hz	12 VDC	100-240 V / 50/60 Hz
	Max. Current	0.6 Amp	1.8 Amp	0.6 Amp	1.8 Amp	0.6 Amp
	Power Consumption	22 W	20 W	30 W	27 W	46 W
	UV lamp Watts	17 W	15 W	25 W	20 W	37 W
Maximum Operating Pressure		125 psi (861 kPa)		125psi (861 kPa)		125 psi (861 kPa)
Minimum Operating Pressure		15 psi (103 kPa)		15psi (103 kPa)		15 psi (103 kPa)
Ambient Water Temperature		2-40 ºC (36-104 ºF)		2-40 ºC (36-104 ºF)		2-40 ºC (36-104 ºF)
UV Lamp Type		Sterilume™-EX (standard-output)		Sterilume™-EX (standard-output)		Sterilume™-EX (standard-output)
UV Chamber Material		304 SS		304 SS		304 SS

[1] Units ending in "/2B" have BSPT connections.

[2] Units ending in "/2" are for 230V applications.

Section 9 Manufacturer's Warranty

Our Commitment

VIQUA is committed to ensuring your experience with our products and organization exceeds your expectations. We have manufactured your UV disinfection system to the highest quality standards and value you as our customer. Should you need any support, or have questions about your system, please contact our Technical Support team at 1.800.265.7246 or technicalsupport@viqua.com and we will be happy to assist you. We sincerely hope you enjoy the benefits of clean, safe drinking water after the installation of your VIQUA disinfection system.

How to Make a Warranty Claim

Note: *To maximise the disinfection performance and reliability of your VIQUA product, the system must be properly sized, installed and maintained. Guidance on the necessary water quality parameters and maintenance requirements can be found in your Owner's Manual.*

In the event that repair or replacement of parts covered by this warranty are required, the process will be handled by your dealer. If you are unsure whether an equipment problem or failure is covered by warranty, contact our Technical Support team at 1.800.265.7246 or e-mail technicalsupport@viqua.com. Our fully trained technicians will help you troubleshoot the problem and identify a solution. Please have available the model number (system type), the date of purchase, the name of the dealer from whom you purchased your VIQUA product ("the source dealer"), as well as a description of the problem you are experiencing. To establish proof of purchase when making a warranty claim, you will either need your original invoice, or have previously completed and returned your product registration card via mail or online.

Specific Warranty Coverage

Warranty coverage is specific to the VIQUA range of products. Warranty coverage is subject to the conditions and limitations outlined under "General Conditions and Limitations".

Ten-Year Limited Warranty for VIQUA UV Chamber

VIQUA warrants the UV chamber on the VIQUA product to be free from defects in material and workmanship for a period of ten (10) years from the date of purchase. During this time, VIQUA will repair or replace, at its option, any defective VIQUA UV chamber. Please return the defective part to your dealer who will process your claim.

Three-Year Limited Warranty for Electrical and Hardware Components

VIQUA warrants the electrical (controller) and hardware components to be free from defects in material and workmanship for a period of three (3) years from the date of purchase. During this time, VIQUA will repair or replace, at its option, any defective parts covered by the warranty. Please return the defective part to your dealer who will process your claim.

One-Year Limited Warranty for UV lamps, Sleeves, and UV Sensors

VIQUA warrants UV lamps, sleeves, and UV sensors to be free from defects in material and workmanship for a period of one (1) year from the date of purchase. During this time, VIQUA will repair or replace, at its option, any defective parts covered by the warranty.Your dealer will process your claim and advise whether the defective item needs to be returned for failure analysis.

Note: *Use only genuine VIQUA replacement lamps and sleeves in your system. Failure to do so may seriously compromise disinfection performance and affect warranty coverage.*

General Conditions and Limitations

None of the above warranties cover damage caused by improper use or maintenance, accidents, acts of God or minor scratches or imperfections that do not materially impair the operation of the product. The warranties also do not cover products that are not installed as outlined in the applicable Owner's Manual.

Parts repaired or replaced under these warranties will be covered under warranty up to the end of the warranty period applicable to the original part.

The above warranties do not include the cost of shipping and handling of returned items.The limited warranties described above are the only warranties applicable to the VIQUA range of products. These limited warranties outline the exclusive remedy for all claims based on a failure of or defect in any of these products, whether the claim is based on contract, tort (including negligence), strict liability or otherwise. These warranties are in lieu of all other warranties whether written, oral, implied or statutory. Without limitation, no warranty of merchantability or of fitness for a particular purpose shall apply to any of these products.

VIQUA does not assume any liability for personal injury or property damage caused by the use or misuse of any of the above products. VIQUA shall not in any event be liable for special, incidental, indirect or consequential damages. VIQUA's liability shall, in all instances, be limited to repair or replacement of the defective product or part and this liability will terminate upon expiration of the applicable warranty period.

APPENDIX D - BACTERIAL GROWTH IN GRANULAR ACTIVATED CARBON FILTERS; HUMAN HEALTH AND DISINFECTION

Appendix D
Additional Information
Bacterial Growth in Granular Activated Carbon (GAC) Filters
Human Health and Disinfection
October 10, 2018, Revision March 6, 2019

As stated in the MDEQ's August 9, 2018 letter and as discussed in our July 25, 2018 meeting, several comments made by the MDEQ regarding the, *Alternate Water Supply Management Plan, Point-of-Entry Treatment Systems, Wolverine Worldwide, Inc.* (POET O&M Plan) may be addressed by additional information related to the bacteriological risks from the carbon filter systems as well as information regarding the operation of the ultra-violet (UV) lamp during interruptions in operation. Specific references in the MDEQ letter include; BP-4 and -12, Section 6.1.2.

The fundamental question/concern relates to the need for disinfection of the well water after GAC use. The POET system installation was designed with an UV light reactor that disinfects the treated water as a final step. R&W/GZA has indicated that the use of the UV on the filtered water is precautionary and not necessary for well water not contaminated with fecal bacteria. The use of the UV is a conservative measure to further ensure water quality but is not necessary to protect public health.

Bacterial Control – Well Water Systems

None of the well water systems that the POET system was installed had disinfection systems installed to control bacteria prior to the installation of the POET. In general, disinfection systems are not installed on residential well water supplies. Testing for coliform bacteria may be performed when the well is initially installed, following repairs or modification, and periodically as required by health agencies.

The premise that disinfection is required is based on the addition of the carbon filtration system. The MDEQ has made the following comments to argue the systems require disinfection:

- The source water bacteriological water quality is unknown and a moving target.
- Even if wells tested non-detect initially, they can become contaminated in a number of ways.
- Compared to a home without treatment, a GAC filter provides an excellent medium for bacteriological attachment and growth if exposure occurs.
- Bacteriological contamination poses an acute health risk.

The initial two and fourth bullet points are true for a well water supply with or without a GAC treatment system. These arguments would support a requirement to install a disinfection system on any private well water supply (with or without treatment) thus do not justify the addition of a disinfection system based on the installation of GAC treatment alone. Since a well system can become contaminated at any time, by a variety of ways, and bacteriological contamination is an acute health risk, periodic testing of the well water supply is performed in the absence of a carbon treatment system. The concern that differentiates the POET system from any residential well water system is stated in the third bullet point, *"Compared to a home without treatment, a GAC filter provides an excellent medium for bacteriological attachment and growth if exposure occurs."*

The statement may (or may not) have some merit, however, if exposure occurs (the well becomes contaminated), there is likely little difference in the acute health risk to the users of the well water if the system has a carbon filtration system or no treatment.

Although bacteria are known to colonize on the GAC (Point-of-Use [POU] or POE), the bacteria do not pose a health risk when the water being treated meets acceptable water quality standards. EPA and the World Health Organization (WHO) have opined that the use of disinfection in POU and POE systems is not required when the water entering the POE and/or POU meets acceptable water quality standards.

The WHO states, "Exposure to HPC (Heterotrophic Plate Count) microbiota is far greater in foodstuffs than through drinking-water." Exposure to HPC occurs through the air and other environmental sources. Section 1.4.2 Epidemiology in-part states, "The available body of evidence supports the conclusion that, in the absence of fecal contamination, there is no direct relationship between HPC values in ingested water and human health effects in the population at large. This conclusion is also supported indirectly by evidence from exposures to HPC in foodstuffs, where there is no evidence for a health effects link in the absence of pathogen contamination."

In summary, the use of GAC will increase the area for bacteria to regrow in a water system. However, in the absence of pathogenic contamination, bacteria do not pose a health risk. There is no evidence that has found health effects linked to non-pathogenic contamination. If the well were contaminated, an acute health risk would exist with or without a GAC system.

The WHO report includes a chapter (Chapter 8) on the immunocompromised individuals. The executive summary of the report includes recommendations that more study is required for, ". . the immunocompromised (especially infection control in health care facilities and susceptible persons in the public at large)." As summarized by the EPA, "Normal drinking water is not always suitable for all such individuals for all uses (e.g., wound irrigation). This relates to water safety in general and not to growth or HPC organisms in particular. Advice should be provided by public health authorities to at-risk groups in general and by practitioners responsible for individuals discharged to home care."

In summary, infections from HPCs of immunocompromised patients in the general community is unclear.

Bacterial Control – Carbon Systems

EPA states in a report entitled, *Water Health Series – Filtration Facts* that 4/10 Americans use a home water treatment. Most of these are Point-of-Use (POU) system that use carbon and do not include disinfection system. POU devices are commonly designed for a twelve-month service life.

Section 1.3.2 of the WHO Report states;

> Bacterial growth occurs in plumbed-in domestic water devices (including water softeners, carbon filters, etc.) and plumbed-in commercial devices, such as beverage vending machines. HPC values in water samples typically increase in such devices. Increases of HPC (due to growth) in these devices therefore do not indicate the existence of a health risk, as long as the entry water meets acceptable microbial water quality norms (e.g., WHO *Guidelines for Drinking-water Quality*).

Section 12.4 of the WHO Report states,

> "Health Canada, the US Environmental Protection Agency (EPA), the US Consumer Product Safety Commission and the Italian government have all, at one time or another, proposed banning activated carbon filters used in home drinking-water treatment devices because of the growth of HPC bacteria on the carbon media and subsequent rises in HPC counts in the filtered water (Regunathan and Beauman 1994). After further study, however, all four decided against banning the filters. At Health Canada, the decision was made following consultations with stakeholders and was based on the absence of evidence of any illness linked to such devices."

Similar to the regrowth of biofilms in water distribution systems, increased levels of HPC are not generally a health concern in drinking water treatment devices. Some experimental evidence has shown that the presence of heterotrophic bacteria HPC bacteria in POU and POE devices may be beneficial, since ordinary bacterial growth may reduce the number of disease-causing organisms through dilution, competition or predation inside the treatment device — i.e., in carbon filters, resin beds, bladder tanks, etc. (Rollinger and Dott 1987).

Snyder et.al, evaluated the water quality of POU powdered activated carbon (PAC) filters, ". . .to determine how such treatment might impact the bacteriological quality of private, residential drinking water supplies." Snyder's work concluded that PAC treatment does not compromise the bacteriological quality of drinking water from well water supplies. A number of additional results from this study follow:

- First draw samples (following overnight static periods) from well water supplies were only slightly higher than their corresponding influent counts.
- Snyder reported work performed by others (Geldreich and Reasoner) found that a six-week no-flow period increased bacterial counts 1,000 – 10,000-fold. Although this was indicated as a concern by some referenced reports, Snyder reported that several authors, ". . .suggest that activated carbon has no significant effect on bacterial levels in drinking water on the basis of their findings that bacterial densities were similarly increased in unfiltered water after periods of no use." Finally, Snyder reported, "An epidemiological study by Calderon gave little evidence to associate any health risks with the use of carbon filters."
- Fiore and Babineau (7) also found that a 2-minute flushing period reduced bacterial populations in filter effluents. As such, Snyder concludes that, "any potential public health concern from exposure to elevated HPC in POU filter effluents following periods of no use may be reduced or eliminated by flushing the POU device before use."
- Snyder references two studies (Camper and Reasoner) that suggested high densities of heterotrophs may prevent pathogenic bacteria from colonizing and persisting on GAC beds.

EPA Document Summary

As summarized in our previous response, an EPA document entitled, *Point-of-Use or Point-of-Entry Treatment Options for Small Drinking Water Systems* (EPA Document) summarizes that the use of disinfection for POU and POE systems is not required when the water entering the POE and/or POU meets acceptable water quality standards. Specifically, EPA states;

> ***"In view of these conclusions, it is appropriate to recognize that although bacterial growth occurs in POU and POE water treatment devices, the increase of HPC in these devices does not indicate that a health risk exists, so long as the water entering the device meets acceptable water quality standards."***

Although, this conclusion seems to be based on the WHO report and conclusions, the EPA report seems to contradict this conclusion in several locations. Specifically, when referencing regulations for drinking water the following text is included/referenced; " . . . *GAC media are prone to microbial colonization (heterotrophic bacteria) on the GAC media. Some form of HPC monitoring and/or disinfection should be considered when using POU GAC and when using POE GAC*. "

Although the references to the regulations raising concerns related to HPC's are accurate, the source of the HPC concerns related to GAC is found verbatum in the 1987 and 1988 Federal Register, 52 FR 25716, July 8, 1987; 53 FR 25111, July 1, 1988].

> As noted by the WHO, several countries including the USEPA proposed banning activated carbon filters used in home drinking-water treatment devices because of the growth of HPC bacteria. It would appear the scientific evidence as presented in the WHO report has concluded the HPC bacteria growth is not a health concern.

Summary

- EPA and the WHO have opined that the use of disinfection in POU and POE systems is not required when the water entering the POE and/or POU meets acceptable water quality standards.
- Exposure to HPC microbiota is far greater in foodstuffs than through drinking-water.
- 4/10 Americans use a home water treatment. Most of these are POU system that use carbon and do not include disinfection system.
- Bacterial growth occurs in carbon filters. HPC values in water samples typically increase in such devices. Increases of HPC (due to growth) in these devices do not indicate the existence of a health risk, as long as the entry water meets acceptable microbial water quality norms.
- The WHO report stated the EPA, the US Consumer Product Safety Commission proposed banning activated carbon filters used in home drinking-water treatment devices because of the growth of HPC bacteria on the carbon media and subsequent rises in HPC counts in the filtered water. However, after further study, decided against banning the filters.
- Snyder et.al, evaluated the water quality of POU PAC filters, ". . .to determine how such treatment might impact the bacteriological quality of private, residential drinking water supplies." Snyder's work concluded that PAC treatment does not compromise the bacteriological quality of drinking water from well water supplies.
- EPA document entitled, Point-of-Use or Point-of-Entry Treatment Options for Small Drinking Water Systems (EPA Document) summarizes that the use of disinfection for POU and POE systems is not required when the water entering the POE and/or POU meets acceptable water quality standards. Specifically, EPA states; "In view of these conclusions, it is appropriate to recognize that although bacterial growth occurs in POU and POE water treatment devices, the increase of HPC in these devices does not indicate that a health risk exists, so long as the water entering the device meets acceptable water quality standards."

- Infections from HPCs of immunocompromised patients in the general community is unclear. The EPA recommends that advice should be provided by public health authorities to at-risk groups in general and by practitioners responsible for individuals discharged to home care."

Although the WHO, Snyder et.al, and EPA Report present that the HPCs do not pose a health risk, both the EPA and Snyder suggest the users of the POE systems should be instructed to run water at full flow for at least 30 seconds before use after a prolonged period of quiescence. The EPA report states, ***"The system may want to consider post-treatment disinfection to ensure customer safety."*** This has been added to Section 4.3 of the POET O&M Plan.

References

Criteria and Procedures for Public Water Systems Using Point-of-Entry Devices. 53rd Fed Reg. July 1, 1988.

Snyder, Joseph W., et.al. September 20, 1995. Effect of Point-of-Use, Activated Carbon Filters on the Bacteriological Quality of Rural Groundwater Supplies. Applied and Environmental Microbiology, Dec, 1995 p. 4291-4295.

United States Environmental Protection Agency. April 2006. Point-of-Use or Point-of-Entry Treatment Options for Small Drinking Water Systems. Prepared by The Cadmus Group, Inc.; Arlington, VA.

World Health Organization. 2003. Heterotrophic Plate Counts and Drinking-water Safety. The Significance of HPCs for Water Quality and Human Health. IWZ Publishing; London, UK

Use of Non-Centralized Treatment Devices. 52 Fed Reg. 25716. July 8th, 1987.

United States Environmental Protection Agency. September 2005. Water Health Series – Filtration Facts. (816-K-05-002)

APPENDIX E - GRANULAR ACTIVATED CARBON DESIGN

Appendix E
Additional Information
Granular Activated Carbon Design
October 10, 2018, Revision March 6, 2019

As stated in the MDEQ's August 9, 2018 letter and as discussed in our July 25, 2018 meeting, several comments made by the MDEQ may be addressed by additional information related to the design of the carbon life based on flow, empty bed contact time (EBCT), and PFAS concentration. In addition, questions and concerns related to the calculation of predictive life of the carbon would support the frequency of sampling that was selected and changes to sampling frequency as discussed in the performance monitoring section (Section 6.1.3.2) of the "*Alternate Water Supply Management Plan, Point-of-Entry Treatment Systems, Wolverine Worldwide, Inc.*" (POET O&M Plan). Specific references in the MDEQ letter include; BP-8, 1. Section 1.2, 2. Section 4.1, 14. Section 6.1.3.2, and 15. Section 6.1.3.3.

Whole House Filter – Conceptual Design

The criteria mandated by Wolverine, when the decision was made to provide Whole House Filters (WHF), was the technology must be proven and used successfully for similar applications. Literature identified that both granular activated carbon (GAC) and reverse osmosis (RO) were effective for removal of PFAS compounds. R&W/GZA rejected the use of RO because the reject stream from the RO unit would need to be collected or discharged to the on-site septic system that discharges to the groundwater. Removing the PFAS from the groundwater and returning the concentrated PFAS back to the groundwater was not an acceptable solution. Based on this design criterion (not returning removed PFAS compounds to the groundwater), the use of RO was not acceptable. For the same reason, backwashing GAC columns was not be considered.

A number of factors that resulted in the recommendation by R&W/GZA of the Point-of-Entry Treatment (POET) system as developed by Culligan, utilizing Calgon Filtrasorb 600 GAC are summarized below:

- The system had been installed and operated at 500 homes in New Jersey and New York. Both the design and operation of the POET system for removal of PFAS has been demonstrated. No other supplier has equivalent experience with the two-stage GAC system.

- The system is generally in compliance and conforms with the document entitled, *"New York State Department of Environmental Conservation (Department) Point of Entry Treatment (POET) System Specification."*

- The system uses Filtrasorb 600 GAC from Calgon which is specified in the New York POET specification identified above. Filtratsorb 600 has been tested for PFAS removal and demonstrated to be effective. No other supplier provided information to confirm the proposed GAC has been used for and proven for removal of PFAS.

- Culligan had experience operating and maintaining hundreds of POETs in Bennington County, Vermont. We deemed it unlikely Culligan would agree to perform operation and maintenance on a system they have not supplied.

- Over 255 POETs were installed in Bennington County, Vermont by November 16, 2016. The highest concentration reported was 4,600 ppt PFOA (the concentration of other PFAS were not available). Following three months of monthly monitoring, no breakthrough was measure at the mid-point sampling point.

Whole House Filter – Detailed Design

Based on the above, R&W/GZA prepared a specification for the WHFs. The specification was delivered to the MDEQ on November 24, 2017 in response to the MDEQ's request. In general, the system is a two-stage granular activated carbon system equipped with pre- and post-sediment filters, an ultraviolet (UV) disinfection lamp, and flow meter.

R&W/GZA initially recommended performing an Accelerated Carbon Test (ACT) to assess GAC capacity using western Michigan groundwater. However, the ACT test would have delayed the installation of the WHF unit by two months. In the absence of an ACT, R&W/GZA used results from an isotherm study performed for Hoosick Falls, New York and the information available from the Bennington County, Vermont GAC systems. In the absence of an ACT for western Michigan groundwater, this data was used conservatively as will become evident in the following discussions.

Working with Culligan's plant design specialist, assuming similar flows and loadings, and low TOC concentration, Culligan believed that the two-stage, 4.0 cubic-foot system had been demonstrated for loadings up to 7,500 ppt PFAS using an EBCT of approximately 3.75 minutes (nominally 4 minutes). As stated in our prior correspondence, for high PFAS concentrations (defined as greater than 7,500 ppt), the EBCT was increased to 7.5 minutes (nominally 8 minutes) by installing four columns in a 2 x 2 configuration.

Although literature from Calgon recommended an EBCT of 8-10 minutes in the absence of an ACT, this general statement did not apply to the Wolverine design for the following reasons:

- The flow from a residential well is not continuous. Culligan's plant design specialist discounted this 8 to 10-minute EBCT stated in general Calgon literature since the flow is on-off and averages much less than the maximum flow of 8 gpm for the POET system.

- Culligan has hundreds of POET systems installed for residential purposes using the EBCT of 3.75 minutes.

- The groundwater did not contain detectable organic compounds which would compete with the PFAS adsorption.

- RW/GZA believed that periodic testing would be the best way to determine capacity and prepared an O&M manual that included performance monitoring.

The nominal EBCT for a standard POET system is 4 minutes. This is controlled by restricting the maximum flow through the system to 8 gallons per minute (gpm). If it is determined that the user requires more than 8 gpm, two systems will be installed in parallel (four GAC columns) to provide a "high flow" water use of 16 gpm.

Installations with total PFOA+PFOS concentrations that exceed 7,500 ppt were identified as "high concentration" installations. The nominal EBCT for high concentration installations is 8 minutes. This is performed by using four tanks. Although similar to the high flow system, the flow is restricted to 8.0 gpm which effectively doubles the EBCT.

Table 1 summarizes the POET system installations:

Table 1
POET System
Alternate Configurations

POET Configuration	GAC Columns	EBCT (minutes)	Max Flow (gpm)
Standard	Lead (2 CF) Lag (2 CF)	4	8
High Flow	Lead (4 CF) Lag (4 CF)	4	16
High Concentration	Lead (4 CF) Lag (4 CF)	8	8
High Flow & Concentration	Lead (8 CF) Lag (8 CF)	8	16

Periodic Testing-Performance Monitoring

The O&M plan includes recommendations for sampling frequency and locations (influent, mid-point, and effluent) for the POET systems. The recommendations are based on a combination of the influent concentration and estimated breakthrough time for PFOA+PFOS (through the lead carbon column.) The following sections provide additional information related to the sampling frequency and sample points.

Sampling Frequency

In order to establish the testing frequency, an estimate of the carbon life is needed. To estimate the carbon life, R&W/GZA used an equation from Metcalf & Eddy (M&E) Wastewater Engineering Treatment, Disposal, Reuse, 3rd Edition, page 323. The time of breakthrough (tb) was calculated using various concentrations of PFOA+PFOS, the X/M isotherm from Hooksick Falls, and the variables (flow and carbon mass) related to EBCT outlined above. The M&E equation includes a variable for the "% of carbon used." When calculating tb in the absence of known data for % of carbon used, M&E recommends using 25%. R&W/GZA used assumed an average residential flow of 350 gpd for calculation of tb.

Excerpt of M&E tb equation:

$$t_b = \frac{(x/m)_b M}{Q\{C - (C_b/2)\}\{8.34\ \text{lb/Mgal} \cdot (\text{mg/L})\}}$$

The following table summarizes the safety factors used for establishing the initial sampling frequencies:

Table 2
Carbon Breakthrough Calculations
Safety Factors Used

Description/Parameter	Values	Safety Factor (SF)
% Carbon Used	M&E recommends 0.25% - RW/GZA used 0.125%	2.0
Calculated Breakthrough of Lead Only	Recommended for normal operation – lag column provides 100% back-up	2.0
Adjust tb from calculation	Divide result by 2.0 to provide a safety factor of 2.0	2.0
Total Safety Factor		**8.0 (multiplicative)**

Table 3 summarizes the results of the calculation of tb for the lead column for various concentrations of PFOA+PFOS and the adjusted tb based on the SF applied to the calculation.

Table 3
Carbon Breakthrough Calculations
Summary of Results

PFOS+PFOA Concentration (ppt)	Cubic Foot GAC (CF)	tb (days)	tb Lead Column (days)	SF	tb Used (days)	Sampling Frequency/Notes
70	4	18,323	9,162	4	2,290	***70-200, Semi-annual***/annual seems appropriate, however in the absence of a column test – seems too long
200	4	5,271	2,635	4	659	***200-1,000, Quarterly***/quarterly is required for 1,000 ppt based on tb
1,000	4	979	490	4	122	***1,000-7,500, Monthly/***monthly required for tb at 7,500 ppt
7,500	8	257	127	4	32	***7,500-35,000, Weekly/***weekly required for tb at 35,000 ppt
35,000	8	55	28	4	7	

In the absence of any safety factors, the highest PFOA+PFOS concentration (35,000 ppt) was calculated to breakthrough in 55 days or detected at the mid-point sample tap in four weeks (28 days). The conservative approach used and outlined above requires sampling weekly.

Sampling Points

As stated in the Plan, "*Performance monitoring will be conducted to establish lead canister breakthrough time (and an associated treated water volume) to establish an appropriate schedule for routine monitoring and carbon change out*." More specifically, breakthrough (to mid-point) based on site-specific operating conditions is used to establish routine monitoring frequencies.

The rational for the sample points was summarized in our prior response letter dated May 15, 2018. In addition to that response, we have included additional rational for each range presented in Section 6.1.3.2 of the May 2018 O&M Plan:

- Homes with previous non-detect (ND) PFOS+PFOA well sample: annual sampling of the influent. If low level PFOS+PFOA is observed in the influent, then the home will be placed into the 1 – 70 ppt group.

Rational: Sampling of the effluent or mid-point of the POET system is unnecessary when the concentration of PFOS+PFOA in the influent is ND because no treatment is required. Thus, no demonstration of PFOS+PFOA removal is needed (when the concentration is ND). The rationale for sampling the influent is to verify no treatment is required. If sampling finds concentrations >1 ppt, the monitoring of influent and mid-point will be initiated on a semi-annual basis.

- Homes with 1 – 70 ppt total PFOS+PFOA: semi-annual sampling (influent and mid-point). Similarly, if changes to the influent concentration falls into a different concentration range, the sampling frequency will be adjusted accordingly;

Rational: Sampling of the effluent of the POET system is unnecessary when the concentration of PFOS+PFOA is 1-70 ppt because no treatment is required to protect public health. Thus, no demonstration of PFOS+PFOA removal is need (when the concentration is between1-70 ppt). The rationale for sampling the influent and mid-point is to verify that that no treatment is required. If sampling finds PFOS+PFOA concentrations >70 ppt, influent and mid-point monitoring will be initiated on a quarterly basis.

- Homes with 71 – 1,000 ppt total PFOS+PFOA: Quarterly sampling (influent, mid-point);

Rational: Sampling of the influent and mid-point is needed to monitor the system performance and calculate breakthrough. As stated above, the combination of the influent concentration and calculation of the time of PFOA+PFOS breakthrough from the lead carbon column is used to monitor the system. Breakthrough of the higher loadings (see below) will be used as a guide to estimate the loadings with concentrations that are less than 1,000 ppt. If sampling finds concentrations >1,000 ppt PFOS+PFOA, the monitoring of this system will be moved to a monthly basis.

- Homes with 1,001 – 7,499 ppt total PFOS+PFOA: Monthly sampling (influent, mid-point, and effluent); and

Rational: Sampling of the influent and mid-point is needed to monitor the system performance and calculate breakthrough. As stated above, the combination of the influent concentration and calculation of the time of PFOA+PFOS breakthrough from the lead carbon column is used to monitor the system. Although effluent sampling from the lag column is technically not needed for operation, the effluent sampling was included to verify that the filter system is operating effectively.

- Homes with 7,500+ ppt PFOS+PFOA: Weekly sampling (influent, mid-point, effluent).

Rational: Sampling of the influent and mid-point is needed to monitor the system performance and calculate breakthrough. As stated above, the combination of the influent concentration and calculation of the time of PFOA+PFOS breakthrough from the lead carbon column is used to monitor the system. Although effluent sampling from the lag column is technically not needed for operation, the effluent sampling was included to verify that the filter system is operating effectively.

GAC Performance Review

A review of the performance of two of the POET systems with the highest PFOA+PFOS loadings and comparison to the predicted performance discussed above is summarized in the following Table 4.

Table 4
Carbon Performance Review
Sampling Results as of August 3, 2018

Description	POET System #1	POET System #2
Days of Operation (days)	189	187
Total Flow Treated (gallon)	22,665	39,368
Average daily flow (gallon/day)	120	210
Average PFOA+PFOS Influent Concentration (ppt)	49,056	23,845
Predicted Operation Prior to Start-up		
Calculated days until breakthrough (days)	55	72
Safety Factor Used – lead column breakthrough	4	4
Estimated tb – breakthrough used for Performance Monitoring	14	18
Ratio - Actual tb: Estimated tb (as of August 3, 2018)	13.5:1	10.4:1

The WHF installations with the highest loadings (currently sampled weekly) have not experienced breakthrough

following six months of operation. Although we have not yet had breakthrough, the assumptions and safety factors used to calculate the days until breakthrough (tb) were conservative by over an order of magnitude. Stated another way, if we had conservatively calculated breakthrough to be one week, the actual time to breakthrough would be over ten weeks. Or if we had conservatively calculated breakthrough in one month, the actual time to breakthrough would be over ten months.

Routine Monitoring

As summarized in our May 15, 2108 response to your questions related to sample frequency in Section 6.1.3.3. of the O&M Plan, we reviewed the performance of the systems (based on three months of operation) and concluded, "*Based on the review of the performance monitoring as part of this response, we have modified the plan to require weekly sampling for homes with concentrations of PFOA+PFOS above 30,001 ppt. We will revise the monthly sampling range to 1,001 – 30,000 ppt and review this frequency following 9 months of operation.*"

The review outlined above is based on six months of weekly sampling data. The review of performance supports the prior conclusion to revise the monthly sampling range as discussed above.

Summary

The MDEQ's August 9, 2018 response to our May 15, 2018 letter simply repeated a number of prior comments included in the MDEQ's April 3, 2018 letter without commenting, discussing, or presenting any additional comments in response to our explanations and presentation of information related to the MDEQ's comments. The MDEQ include the following statement following a several of the repeated comments from the April 3, 2018 letter.

> "During the July 25, 2018 meeting, R&W/GZA agreed to include in the Plan the assumptions and calculations used as the basis to develop mid-stage breakthrough time estimates and the filter system designs for the anticipated contaminant loading and flow rates."

We believe the discussion of the assumptions and safety factors responds to both the initial design and monitoring plan and the proposed routine monitoring based on the performance of the first six months of operation.

Appendix C

Williams & Works Tech Memo I

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TECHNICAL PROJECT MEMORANDUM

To:	**Susan Knepper, P.E., and Steve Warren, P.E., OHM Advisors**
Date:	July 5, 2023
From:	Dan Whalen, P.E.
RE:	Phase I - Village of Pellston Preliminary Groundwater Resource Evaluation

The purpose of this technical memo is to provide a preliminary groundwater resource evaluation of the areas surrounding the Village of Pellston for use as a Type I municipal water well site. A large area around the Pellston Airport and Village limits is currently under investigation by the Michigan Department of Environment, Great Lakes and Energy (EGLE) and consultants for the County to study the severity and extent of per- and polyfluoroalkyl substances contamination in the local shallow groundwater system. For the purpose of this assignment, these studies have sufficiently defined the lateral extent of contamination to provide the “no-go” area of zero hydraulic influence from the simulated or actual effects of pumping wells at various locations.

This preliminary groundwater resource evaluation was completed as a desktop study to determine potential Type I water well locations that will initially serve the Village of Pellston and the Pellston Regional Airport, and ultimately accommodate expansion into the adjacent townships if necessary. The goal of this evaluation was to provide targeted exploratory-test drilling locations in areas that are conservatively distant from the known areas of groundwater contamination without being unfeasibly distant from the proposed water service area.

The conclusions presented in this technical memo were based on available geologic information which included; Wellogic water well records, interviews with local water well drillers, and the various reports generated by EGLE and the County with regard to the extent and nature of groundwater contamination in the general area.

Given the numerous variables associated with geology, aquifer properties and groundwater flow patterns, we maintained a highly conservative factor of safety in our analysis - as is generally appropriate for any municipal wellfield - but in this case to particularly avoid constructing a new Type I wellfield that could become contaminated after prolonged use.

Regional Setting

The Village of Pellston lies within the mid-section of the Maple River Basin - a significant sub-basin of the Cheboygan River Basin - that drains much of north central Emmet County and west central Cheboygan County into the Crooked, Burt and Mullett lake chain system (see Figure 1).

The surface topography in the near region and along the river drainageways is generally flat lying with low surface relief and an average elevation of 700 feet, but

quickly changes in elevation and relief toward the east, west and north in accordance with changes in glacial landforms and morphology.

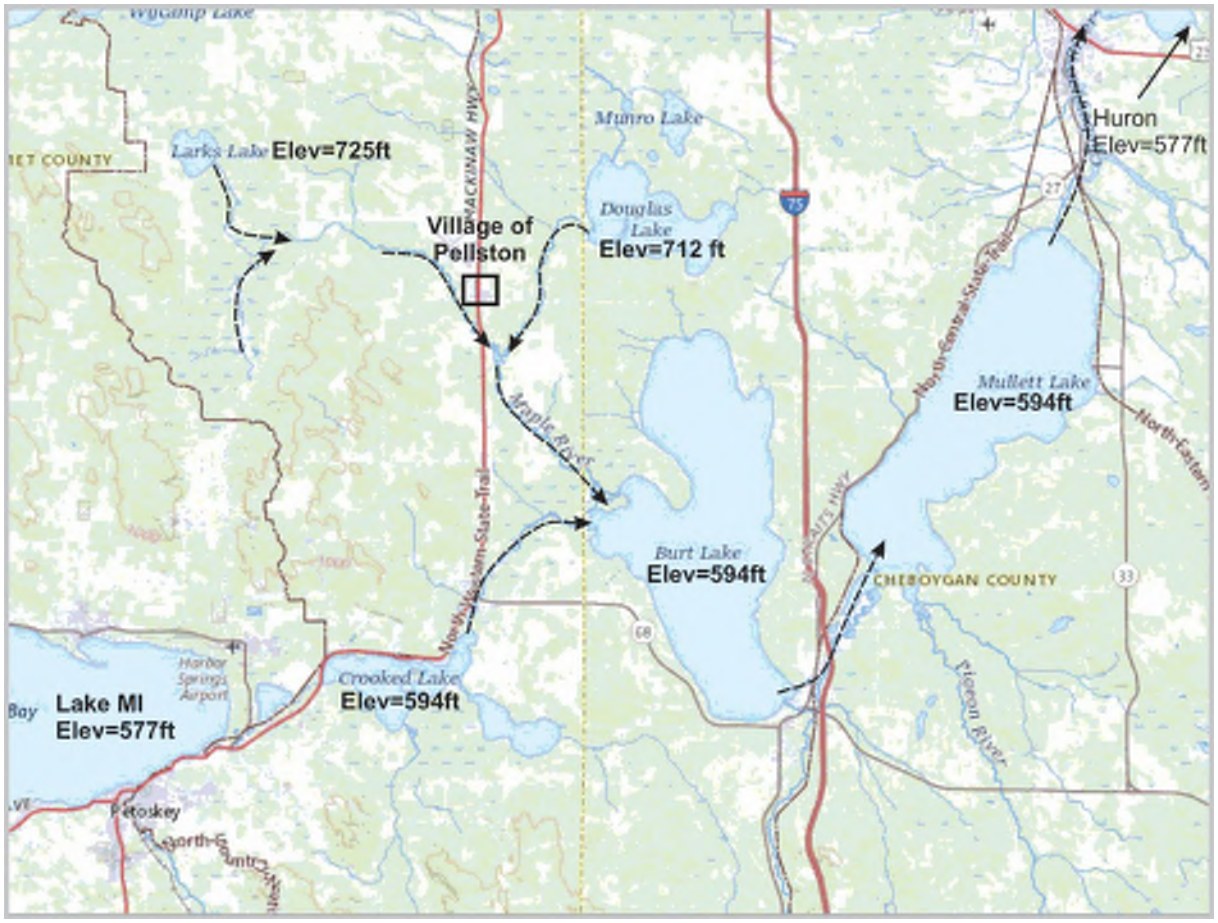

Figure 1. Regional Surficial Drainage in Central Emmet County

The Village lies within the Algonquin Lake Plain physiographic region which is characterized by broad tracts of low relief and thick deposits of lacustrine sands and gravels. This lake depositional area is flanked by broad till plains to the north and east, with discontinuous bands of glacial outwash along the west. This is the typical glacial setting throughout much of Emmet and Cheboygan Counties (see Figure 2).

The glacial drift thickness in the region is estimated to be 800 feet or more[1], but likely varies depending on topography and the top of bedrock structure contours. The actual drift thickness is generally inferred given the lack of wells deeper than 200 feet throughout most this local area.

Local Hydrogeologic Setting

The local geology typically consists of a very thick package of sand and occasional gravely soils from the surface to a depth of at least 200 feet. Certain drilling records will occasionally indicate layers of “hardpan” at various locations and depths. These “hardpan” layers are better described as “densely compacted fine sand layers”, but in either case they behave more like an aquitard than an aquifer. The characteristics of

[1] Apple, B. A., and Reeves, H. W., 2007, Summary of Hydrogeologic Conditions by County for the State of Michigan. U.S. Geological Survey Open-File Report 2007-1236, 78 p.

the glacial drift below 200 feet is largely unknown, and thus, the lower boundary of the drift package is also unknown.

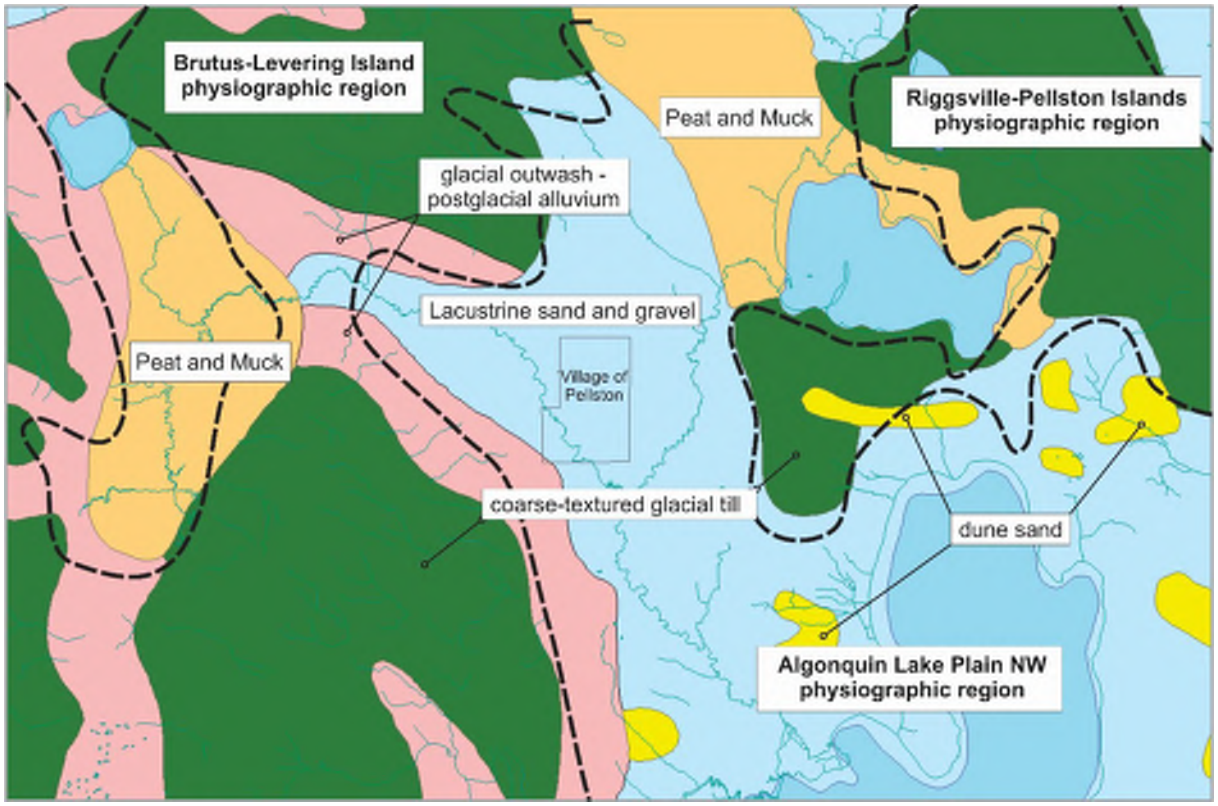

Figure 2. Glacial Deposits in Central Emmet and Cheboygan Counties (after W.R. Farrand and D.L. Bell, 1982[2])

An extensive aquifer exists under water table conditions within the thick sand and gravel package with static water levels averaging about 15 feet below the surface in most areas. There are numerous private wells installed in this shallow groundwater system, and most are less than 100 feet in depth. Deep well records that could otherwise delineate the lateral and vertical boundaries of the drift aquifer are rare in this area, and thus, complete mapping of the shallow aquifer is imperfect based on the limits of data. Well records farther east (east of East Branch Maple River) and west (beyond Durklic Road) tend to show increasing clayey soils coinciding with the change in lacustrine to till plain terrain, which also may coincide with the lateral limits of the local shallow aquifer.

The regional groundwater flow patterns in this area were mapped using the Michigan GIS database Wellogic data. Water level elevations from each well record were mapped over a large area surrounding the Village and extending beyond the assumed boundaries of the drift aquifer such as; large lakes (Douglas, Burt, and Larks Lakes), the Maple River Branches, and obvious surficial basinal boundary lines. All wells used in this mapping were only the wells completed in the glacial drift (although there are very few bedrock wells in this region). Each well was assigned an elevation using the associated DEM elevation value and reported static water level. The data set was

[2] Farrand, W.R. and Bell, D.L., 1982, Quaternary Geology of Southern Michigan: Ann Arbor, Michigan, Department of Geological Sciences, University of Michigan

visually inspected and pruned of obvious inconsistencies - for example where water level elevations were exceptionally high or low when compared to neighboring data points. The groundwater elevations were then interpolated onto a regular grid of 400 x 400-foot cells using an ordinary kriging algorithm. The resultant grid was further refined by using a sliding averaging gate filter to remove “noise” in the data and smooth the contours. The resulting regional map covers about 69 square miles as shown below in Figure 3.

Examination of the groundwater elevations in Figure 3 reveals that groundwater flow appears to be influenced by the hydraulic strength of the West Branch Maple River as far northwest as Larks Lake and continues its influence to the outfall at Burt Lake. The East Branch Maple River appears to have less influence on the groundwater system, however this could be a relic of scarce data in areas between the Village and Douglas Lake.

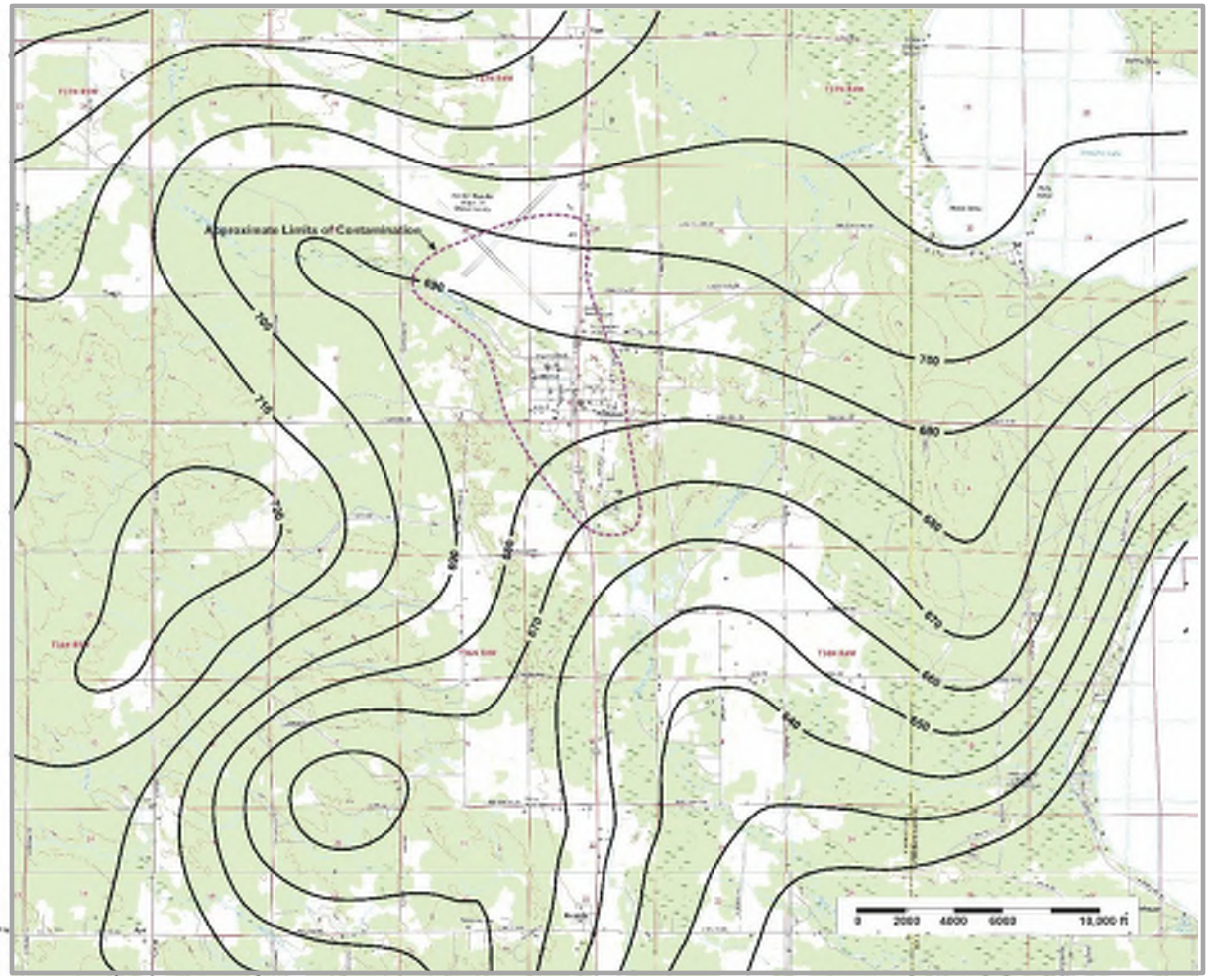

Figure 3. Regional Drift Aquifer Water Level Elevations in Central Emmet and Cheboygan Counties (based on Michigan Geographic Data Library – Wellogic Database)

The groundwater elevations and flow field patterns in Figure 3 agree very well with the actual groundwater elevation measurements presented in the EGLE VAS study[3] and the most recent report prepared for the County[4].

Figure 3 also shows a dashed area which indicates the general limits of all PFAS/PFOS/PFOA detections in groundwater, regardless of concentration, in accordance with the most recent EGLE and County studies. The area includes a section of the West Branch Maple River which acknowledges the low detections found at various points along the river segment. **It is this limiting area that will be used as the no-go area of zero hydraulic influence when modeling groundwater withdrawals.**

Simulation of Groundwater Withdrawals

The main objective of this phase is to simulate high capacity wells at various locations around the periphery of the Village, while simultaneously avoiding hydraulic influence on the contaminated areas which could potentially cause contaminants to be drawn into the well. There are numerous choices for well locations, but for obvious reasons we avoided anywhere south of the Village (downgradient) and anywhere nearby the West Branch Maple River due to the PFAS detections found in the river. Everywhere else on all but the south sides of the village were found to be favorable as long as they are located away from existing private wells.

Generally, if we assume all geologic characteristics are similar – which is the baseline model assumption when limited data is available – each of the indicated locations are favorable to site a Type I water well. However, each simulation presented in this report was modeled without regard to land ownership or availability. In this regard, every location can be readily adjusted to accommodate parcel availability.

The effects from pumping wells were based on a semi-analytical approach where pumping well drawdowns were simulated and added to the flow field in Figure 3. In this case, WINFLOW (an analytic element flow model) was used to generate drawdowns on a “infinite” uniform single layer grid representing a flat aquifer domain with a zero gradient. Each pumping well simulation produced a grid with a simple “cone of depression” which was arithmetically added to the flow field grid with the same cell dimensions shown in Figure 3. Using the resulting “stressed” grid, a particle mover program (GWPATH) was used to calculate groundwater velocities using a porosity of 0.20, and to depict particle paths over a period of 10 years (3650 days).

The analytic element model was setup with the following parameters and assumptions;

- **General Model.** The model area covers an area of about 69 square miles and is centered over the Village as shown in Figure 3. Although the hydraulic boundaries of the aquifer are largely unknown, we extended the model domain far enough laterally so that any simulated pumping stresses did not propagate to the edge of the model domain. All internal “constant head” river boundaries which would otherwise reduce the modeled capture areas were ignored to keep the capture

[3] EGLE Geological Services Section, April 11, 2022, Pellston Regional Airport, Emmet County, Site ID #24000139 GSS Job #1198, Vertical Aquifer Sampling-September/October 2021

[4] LimnoTech, 2022, Revised Response Activity Plan for Phase 4 Groundwater Investigation at Pellston Regional Airport (PLN)

areas conservatively large. The model grid is referenced to the central zone of the Michigan State Plane Coordinate System.

- **Grid Dimensions.** The model was discretized into an equally spaced grid, each grid with a uniform dimension of 400 feet by 400 feet.
- **Aquifer Thickness (b).** The model thickness (b) was 80 feet. We chose 80 feet based on interviews with local drillers who reported that wells greater than 100 feet in depth tend to have unacceptable levels of iron in most places. Using 80 feet as the aquifer thickness keeps the transmissivity more conservative.
- **Hydraulic Conductivity (K).** Given the absence of published aquifer parameters for the shallow aquifer, we used a single hydraulic conductivity zone for the entire model, and varied its value between 30 ft/day to 100 ft/day in accordance with the "typical" published range of values for fine to coarse sand (after Domenico and Schwartz, 1990[5], and Heath, 1983[6]). We ultimately settled on the lowest value for hydraulic conductivity, 30 ft/day, to account for the "fine-medium sands" which appear regularly in a number of well records.
- **Specific Yield of the Unconfined Aquifer (S_y)**. Generally, the specific yield of an unconfined aquifer will range between 0.1 and 0.3 and averages about 0.2. There are several historical papers that address this subject, and most seem to agree on the same range; for fine sands this range typically lies between 0.1 and 0.28 with an average value of 0.21 (see Johnson, 1967[7], and Lohman, 1972[8]). Specific yield will affect the lateral distance-drawdown behavior, so we lowered this average value one order of magnitude down to 0.01 to eliminate any uncertainty. The assumed porosity of the aquifer was set to 0.20.
- **Pumping Rate.** The simulated pumping rate was set based on the projected 5-year demand (267,000 gpd) and 20 year demand (364,500 gpd) as published in a separate document[9]. As a guide, we assumed that the max day demand should always be less than 80% of the firm capacity which will minimize pump run times during periods of peak demand. A pumping rate of 400 gpm was chosen based on this assumption, which will provide three times the max day demand initially, and about 1.6 times the max day demand into the 20-year demand projection (the max day demand will be about 60% of the firm capacity at 20 years).[10]
- **Pumping Duration.** The pumping duration was set equal to 100 days which matches the EGLE Community Water Supply Program benchmark requirement for

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[5] Domenico, P.A. and F.W. Schwartz, 1990. Physical and Chemical Hydrogeology, John Wiley & Sons, New York, 824 p.

[6] Heath, R.C., 1983. Basic ground-water hydrology, U.S. Geological Survey Water-Supply Paper 2220, 86p

[7] Johnson, A.I., 1967, Compilation of Specific Yields for Various Materials, Hydrologic Properties of Earth Materials, Geological Survey Water Supply Paper 1662-D

[8] Lohman, S.W., 1972. Ground-water hydraulics, U.S. Geological Survey Prof. Paper 708, 70p.

[9] OHM Advisors, May 10, 2023 email communication, Table of Demand Estimates for Two Scenarios

[10] EGLE Community Water Supply Program district engineers will typically request additional source capacity when the max day demand reaches 80% of the firm capacity.

rating the capacity of new wells. In general, Type I production wells will never be pumped continuously for 100 days so this is considered a conservative run time.

- **Capture Areas.** The resultant "capture areas" for each simulation are similar to wellhead protection areas. These show the limits of groundwater capture assuming the well was operated continuously for 100 days, and its upgradient distance corresponding to the 10-year time of travel. In all cases, the hydraulic conductivity and specific yield govern the width of the capture area, while the hydraulic conductivity governs the length of the capture area.

The composite results of analytical modeling for capture areas distributed on all sides of the Village are shown in Figure 4. The capture areas in each case show the limits of influence that each simulated well will have on the aquifer using the most conservative aquifer parameters; K=30 ft/day, b=80 ft, and T=2400 ft^2/day, pumping duration=100 days, time of travel area=10 years. In all cases, we iteratively adjusted the locations of pumping centers until the capture areas approached the limits of contamination.

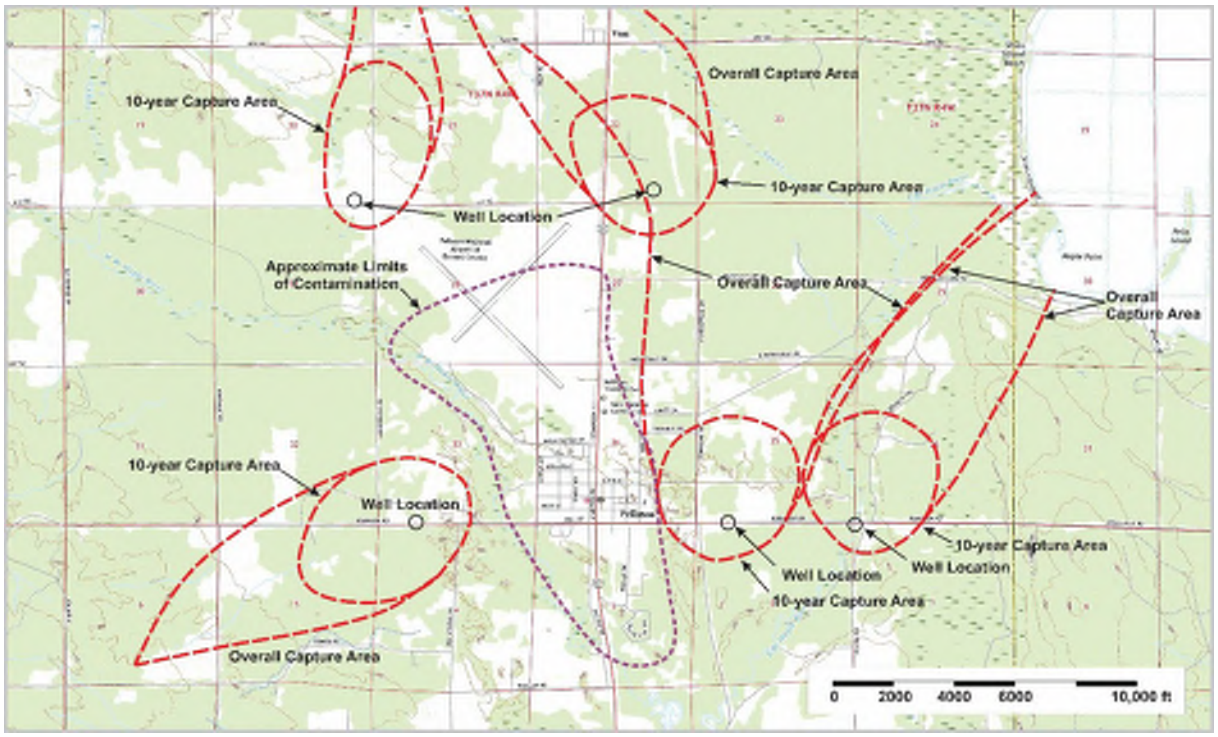

Figure 4. Simulated 10-year Capture Areas for Various High-Capacity Water Well Locations using Aquifer Formation Constants; K=30 ft/day, b=80 ft (T=2400ft^2/day) and 100 days of Continuous Pumping

Proposed Exploration-Test Areas

The bold outline in Figure 5 was derived from the iterative well modeling approach to indicate areas suitable for additional groundwater exploration. In all cases, the inside

boundary closest to the Village is conservatively distant from the limits of groundwater contamination. Under the restrictions of the model, a pumping well located along the inside boundary would have a low probability of drawing contaminants toward the well. The remaining exploration-test area was delineated based on well records that showed consistent geologic characteristics, and also based on similar landform features. For example, the demarcation where lacustrine sands and gravels transition to till plains and ground moraines.

The outside limits of the area east of the Village generally terminates at the East Branch Maple River and the coincident change in geology east of the river where clay layers and clayey soils begin to appear.

The lateral limits of the area west of the Village terminate based on the change in geology associated with the mapped till plains and their typical clayey soils. There are a few scattered well logs in this area and most are spread quite far apart.

The lateral limits of the area north of the Village terminate based on geomorphology and wetlands, but very few well records are available in this area except along Hwy 31.

Finally, the southern limits of the exploration-test area were terminated based on the unknown and eventual migration path of contamination.

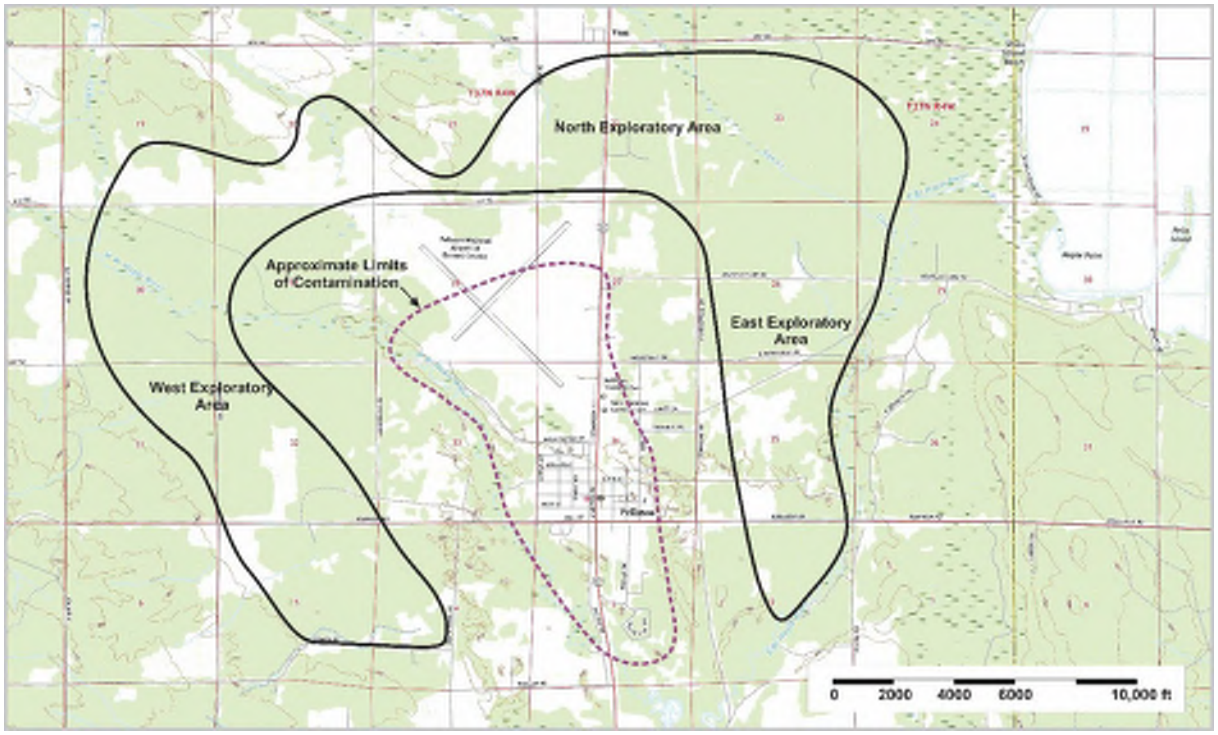

Figure 5. Proposed Areas for Exploration-Test Wells

Appendix D

Williams & Works Tech Memo II

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TECHNICAL MEMORANDUM

To:	**Steve Warren, P.E., Alisha Busuttil, P.E.**
Date:	July 17, 2025
From:	Dan Whalen, P.E., Braxton Murphy
RE:	Village of Pellston Phase II Exploration Test Wells - Preliminary Groundwater Resource Evaluation Results

This purpose of this technical memorandum is to summarize the results of exploratory drilling and testing at three potential Type I water well sites in the vicinity of the Village of Pellston. Each site was selected based on a combination of geological mapping, groundwater modeling using conservative aquifer parameters, and their distance from known PFAS contamination in the local aquifer (see our Phase I technical memorandum which led to site selection[1]). The purpose of each exploration/test well was to provide a "first look" at the geology at each location, and determine the viability of each site to host a Type I wellsite for the Village of Pellston. The work included; i) drilling and logging the local formation, ii) construction and development of a test well, and, iii) pumping and sampling the well to determine general yield characteristics and local groundwater quality. Note here; the pumping testing that followed the construction of each well were not meant to be an "official" aquifer test that would satisfy the EGLE Policy/Procedure ODWMA-399-003[2], but instead were performed to provide a "go/no go" decision on the general capacity and water quality of the aquifer at each location. The discussion that follows provides a summary of the drilling and testing results at each exploratory location.

The exploratory plan was consistent for all three sites;

- Drill an exploratory boring to a depth of at least 100 feet - this depth was based on interviews with local drillers who reported that wells greater than 100 feet in depth tend to have unacceptable levels of iron and elevated aesthetic parameters.
- Construct a 6.9-inch diameter PVC test well with 20 feet of SSWW screen – generally at a nominal depth of 100 feet. Well construction conformed to EGLE water well construction standards under Part 127[3], and were grouted in accordance with EGLE Policy and Procedure ODWMA-399-016[4].

[1] Williams & Works, July 5, 2023, Technical Project Memorandum, Phase I - Village of Pellston Preliminary Groundwater Resource Evaluation

[2] Aquifer Test Requirements for Public Water Supply Wells, revised 2004, Michigan Department of Environmental Quality- ODWMA-Field Operations Section and Environmental Health Section, Policy/Procedure ODWMA-399-003

[3] Part 127 of the Public Health Code Act 368 of 1978, Water Supply and Sewer Systems, and Administrative Rules, which are collectively known as the "Michigan Water Well Construction and Pump Installation Code."

[4] Grouting of Community Water Supply Wells, Michigan Department of Environmental Quality- Office of Drinking Water and Municipal Assistance, Policy/Procedure ODWMA-399-016

- Test pumping each well at a rate of at least 100 gpm for a period of at least 8-hours, followed by a recovery period of at least 8-hours. Water levels were monitored in each well throughout the pumping and recovery periods.
- Collection of groundwater samples at the end of the pumping period and analysis in conformance with the complete Type I water well analyte list (dated March 2025).

Site No. 1 is located on MDNR property west of the West Branch Maple River on the south side of Robinson Rd., Site No. 2 is located on Pellston School property about ½ mile east of Townline Road on the south side of Robinson Rd., and, Site No. 3 is located on MDNR property east of the intersection of US-31 and Ely Road at the east edge of the airport runway runout (see Figure 1).

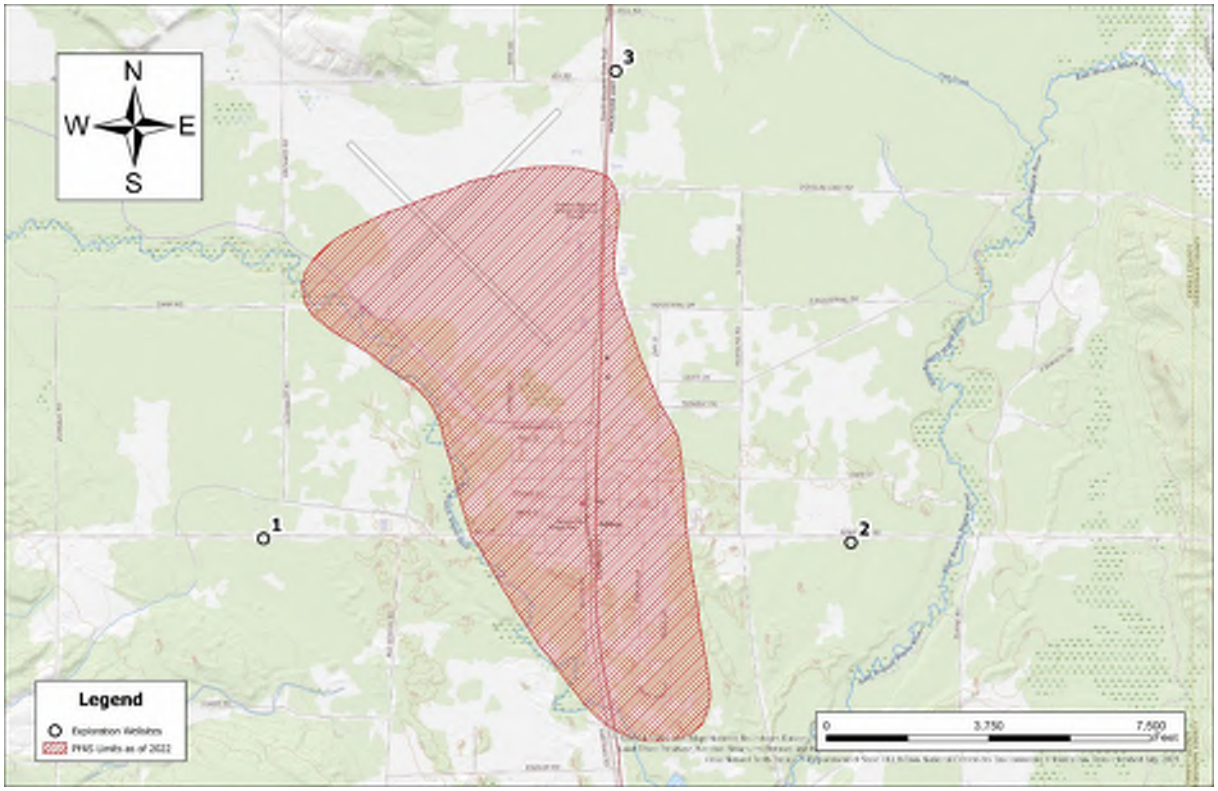

Figure 1. Pellston Exploration/Test Well Locations

Generalized Local Geology and Hydrogeologic Setting

The local geology typically consists of a thick package of sand and occasional gravely soils from the surface to a depth of at least 200 feet. Certain drilling records will occasionally indicate layers of “hardpan” at various locations and depths. These “hardpan” layers are better described as densely compacted fine sand layers, and are effectively an aquitard more so than they are an aquifer. The characteristics of the glacial drift below 200 feet is largely unexplored in this area – mainly due to poor aesthetic groundwater quality at depth - and thus, the lower boundary of the drift package is largely unknown.

An extensive aquifer exists under water table conditions within the sand and gravel package with static water levels averaging about 15 feet below the surface in most areas. There are numerous private wells installed in this shallow groundwater system, and most are less than

100 feet in depth. Deep well records that could otherwise delineate the lateral and vertical boundaries of the drift aquifer are rare in this area, and thus, complete mapping of the shallow aquifer is imperfect based on the limits of data. Well records farther east (east of East Branch Maple River) and west (especially beyond Durklic Road) show increasing clayey soils in the drift coinciding with the change in lacustrine to till plain terrain, which we used to limit our area of exploration.

The upper drift geology, well construction, and pumping testing results at the three exploratory sites is summarized as follows;

Site No. 1 (MDNR Property).

The geology at this location consists of sand and coarse sand from the surface to about 55 feet, followed by laminated clays and thin sand layers with occasional “hardpan” layers from 55 feet to the top of the bedrock at 150 feet. The top of bedrock is described as shale on the well log; however, the Dundee Limestone and the Detroit River Group are the underlying formations in this area. From a groundwater supply prospective, this location had “poor” conditions for high-capacity groundwater development, therefore, the boring was grouted and sealed and the site was abandoned for further exploration.

Site No. 2 (School Property).

The geology at this location consists of medium to coarse sand from the surface to a depth of 110 feet (depth of the well). A lower clay boundary of unknown thickness was encountered at 110 feet.

Well Construction. An exploration/test well was constructed within the boring with the following characteristics;

a. The total depth of the well is 110 feet

b. The well casing is 90 feet of 6.25-inch ID PVC well casing (there is a two-foot stickup).

c. The screen length is 20 feet and constructed of 0.020 slot stainless steel wire wound screen. The bottom of the screen is set at 110 feet below grade.

d. The annulus was grouted with neat cement grout from the top of the gravel pack (about 85 feet below grade) to the surface.

e. The static water level in the well is about 19 feet below the top of casing, or about 17 feet below grade at this location.

Pumping Testing. A basic pumping test was performed on the Site No. 2 test well with a continuous pumping rate of 125 gpm over a period of 8 hours, followed by about 14-hours of recovery. Drawdown and recovery behavior was recorded using a data logging transducer (see Figure 2 below). At the end of the pumping period groundwater samples were collected and analyzed for the complete Type I water well analyte list (these results are summarized further below).

Examination of Figure 2 shows that early drawdowns quickly “stabilize” within five minutes of pumping time – after five minutes of pumping time the rate of drawdown versus time is essentially zero and the pumping water level maintains a constant level to the end of the pumping period. We note that the drawdown data oscillates over a two-foot range throughout the pumping period which can only be attributed to the test pump power source (portable

generator). This is supported by two reasons; i) there are no other pumping wells in the area, and, ii) the recovery data shows a smooth and uniform trend over the same period.

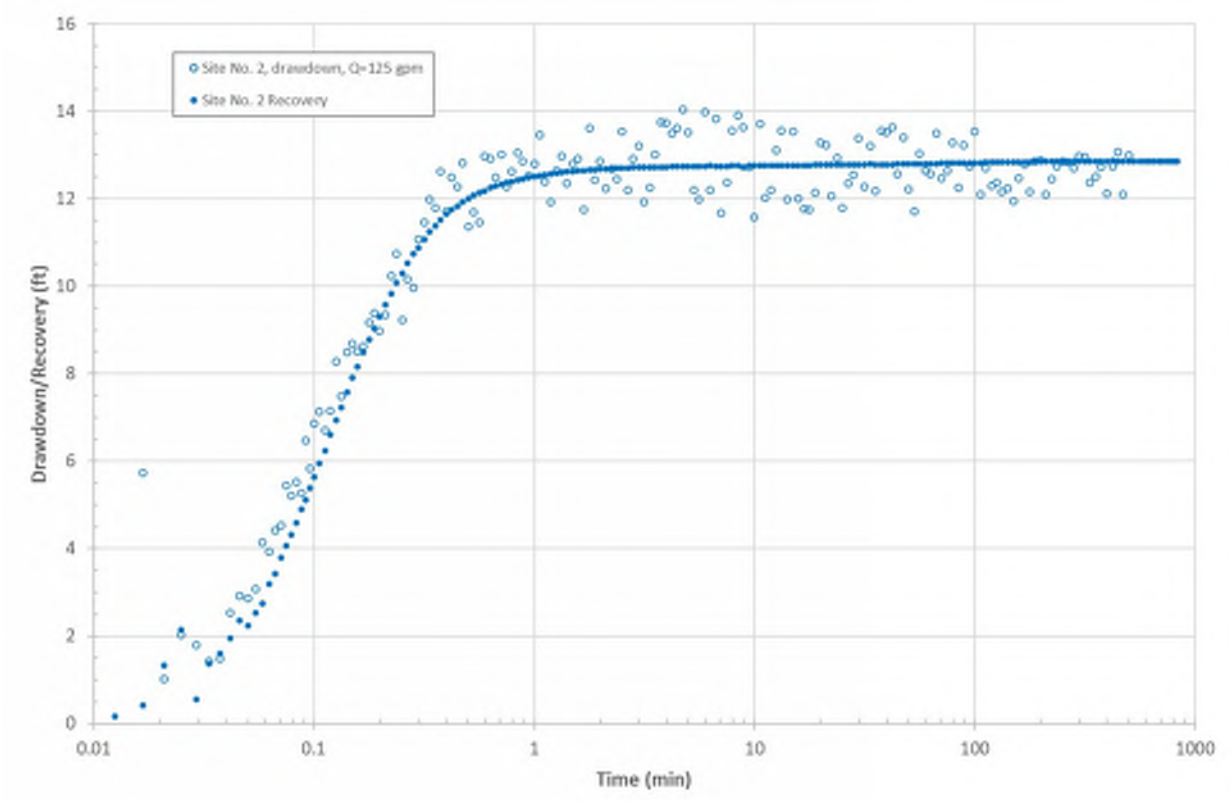

Figure 2. Single Well Pumping Test on Exploration/Test Well at Site No. 2 (School Property) Q=125 gpm

The resulting 8-hour drawdown in the pumping well is about 13 feet – the pumping water level was about 30 feet below grade - resulting in an 8-hour specific capacity of about 9.6 gpm/ft[5]. This means (roughly) that for every incremental increase in pumpage of about 9.6 gpm, the water level in the well will decrease one additional foot over the course of 8-hours. As an example, if the well was pumped at 300 gpm, the water level in the well will change by about 32 feet ((300 gpm)/(9.6 gpm/ft) = 31.25 ft). Since the well has about 68 feet of available drawdown[6], this test well could theoretically be pumped at or near 300 gpm. Indeed, this is not an appropriate nor compatible pumping rate for a 6-inch well, but it shows the potential pumping capacity of an appropriately sized water well at this location[7].

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[5] Specific Capacity (S_c) is the unit pumping capacity per foot of drawdown. Sc=Q(gpm)/drawdown(ft); S_c=125 gpm/13 ft=9.6 gpm/ft

[6] The top of the screen is at 90 feet below grade, and the static water level is about 17 feet below grade. The maximum allowable drawdown in a Type I well is five feet above the screen, therefore, $Drawdown_{max}$=(90ft) – (17ft) – (5ft) = 68ft

[7] Normally, a larger diameter well with a screen design based on the formation grain size will have much better performance. Therefore, a direct one-to-one relationship using the performance of a small well to predict large well performance is not always possible.

Site No. 3 (Airport Site – MDNR Property).

The geology at this location consists of medium to coarse sand and fine gravel from the surface to a depth of at least 100 feet (depth of the well).

Well Construction. An exploration/test well was constructed within the boring with the following characteristics;

a. Total depth of the well is 100 feet

b. The well casing is 80 feet of 6.25-inch ID PVC well casing (there is a two-foot stickup).

c. The screen length is 20 feet and constructed of 0.012 slot stainless steel wire wound screen. The bottom of the screen is set at 100 feet below grade.

d. The annulus was grouted with neat cement grout from the top of the gravel pack (about 70 feet below grade) to the surface.

e. The static water level in the well is about 5 feet below the top of casing, or about 3 feet below grade at this location.

Pumping Testing. A basic pumping test was performed on the Site No. 3 test well with a continuous pumping rate of 105 gpm over a period of about 16 hours, followed by 24-hours of recovery. Drawdown and recovery behavior was recorded using a data logging transducer (see Figure 3 below). At the end of the pumping period groundwater samples were collected and analyzed for the complete Type I water well analyte list (these results are summarized further below).

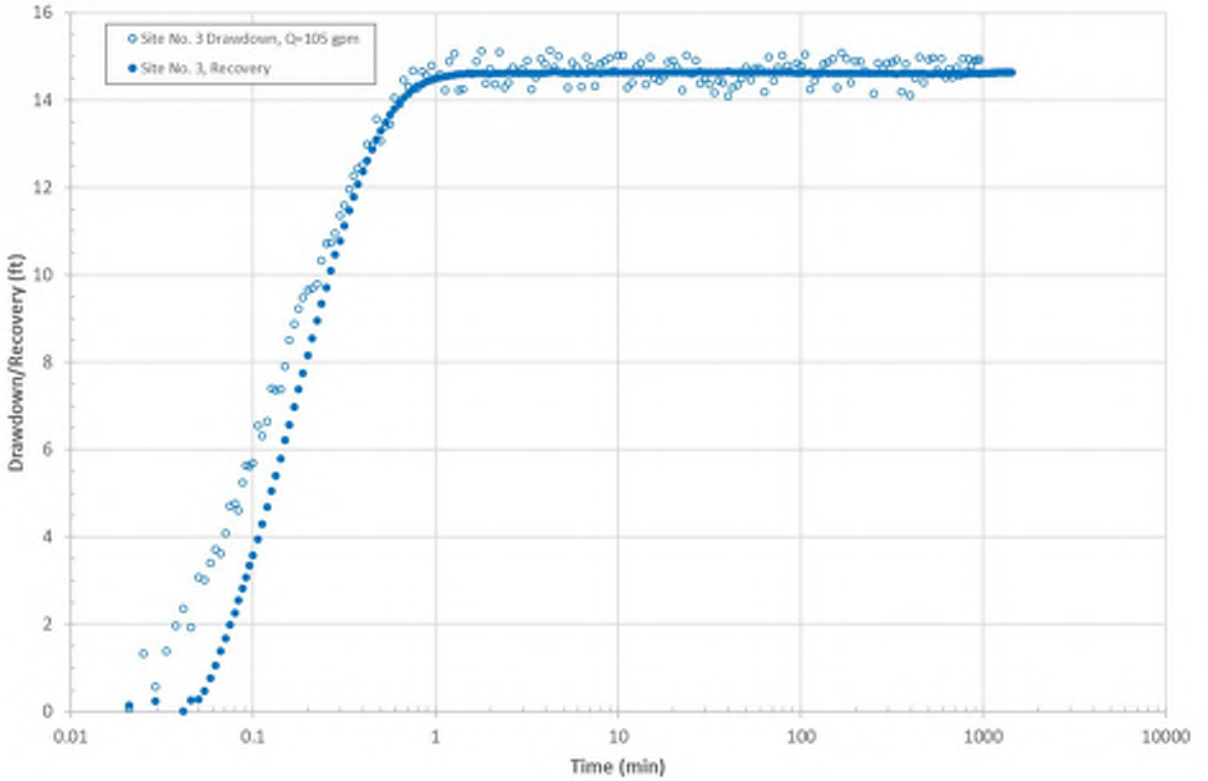

Figure 3. Single Well Pumping Test on Exploration/Test Well at Site No. 3 (Airport Property) Q=105 gpm

Examination of Figure 3 shows (again) that early drawdowns quickly "stabilize" within several minutes of pumping time – after three minutes of pumping time the rate of drawdown versus time is essentially zero and the pumping water level maintains a constant level to the end of the pumping period. We note again that the drawdown data oscillates over a one-foot range throughout the pumping period which again we will attribute to the test pump power source (in this case it was a smaller portable generator than used at the Site No. 2). The same reasons for this are equally supportable; i) there are no other pumping wells in the area, and, ii) the recovery data shows a smooth and uniform trend over the same period.

The resulting 14-hour drawdown in the pumping well was about 15 feet – the pumping water level was about 17 feet below grade - resulting in a 14-hour specific capacity of about 7.1 gpm/ft[8]. If this well were pumped at 300 gpm, the water level in the well will change by about 43 feet ((300 gpm)/(7.1 gpm/ft) = 42.25 ft). Since the well has about 72 feet of available drawdown[9], this test well could theoretically be pumped at or near 300 gpm, indicating the potential pumping capacity from a single well at this site.

Groundwater Quality

At the end of each pumping test at both sites, groundwater samples were collected and analyzed for aesthetic and regulated parameters; this includes VOC's, SOC's (herbicides/pesticides), metals, aesthetic parameters (cations/anions and minerals), nitrate, nitrite, radionuclides, PFAS compounds, and Uranium. Approximately four weeks after the drilling and sampling work was completed, we collected a second set of groundwater samples from both wells – the second set was analyzed only for PFAS compounds. The complete laboratory reports are attached to this memo.

Aesthetically, the groundwater quality results from both exploratory sites are similar – both sites have nuisance levels of iron and manganese concentrations, low sodium, low chloride and low sulfate concentrations. Neither site has any detectable VOC's or SOC's, and both sites have minimal to insignificant radiological activity. Site No. 3 has a low detection of nitrite. Ultimately, PFAS compounds were our main concern during the evaluation of exploratory sites. PFAS compounds were all non-detect at Site No. 2 (School property), but PFBS was detected at Site No. 3 (Airport property).

The second round of groundwater sample analyses for PFAS compounds from both sites confirmed no detectable PFAS compounds are present at Site No. 2, but confirmed PFBS is present at Site No. 3. *The MCL for PFBS in drinking water has not been established, however, the presence of this compound in the groundwater at Site No. 3 is concerning enough to disqualify this site for further exploration.*

The following table shows the groundwater quality comparison between the two exploratory sites.

[8] Specific Capacity (Sc) is the unit pumping capacity per foot of drawdown. Sc=Q(gpm)/drawdown(ft); Sc=105 gpm/14.7 ft=7.1 gpm/ft

[9] The top of the screen is at 80 feet below grade, and the static water level is about 3 feet below grade. When we subtract the additional 5-feet allowance above the top of the screen, the maximum allowable drawdown in this well is; $Drawdown_{max}$=(80ft) – (3ft) – (5ft) = 72ft

Parameter	Site No. 2 (School Property) Sample DateMay 2025	Site No. 3 (MDNR - Airport Property) Sample Date May 2025	Units	MCL
* Arsenic	0.00206	< 0.00100	mg/L	0.010 mg/L
Chloride	2.98	14.2	mg/L	objectionable over 250 mg/L
Nitrite	< 0.100	< 0.100	mg/L	1.0 mg/L
Nitrate	< 0.100	0.491	mg/L	10.0 mg/L
Calcium	40.20	47.9	mg/L	
Manganese	0.0342	0.0305	mg/L	objectionable over 0.050 mg/L
Hardness	178	188	mg/L	objectionable over 250 mg/L
Iron	0.454	0.515	mg/L	objectionable above 0.5 mg/L
Sodium	4.44	9.04	mg/L	objectionable over 160 mg/L
Sulfate	6.84	5.36	mg/L	objectionable over 250 mg/L
Alkalinity	173	154	mg/L	
Specific Conductivity	364	407	µmhos/cm	
Total Orthophosphate	< 0.0750	< 0.0750	mg/L	
** PFAS Compounds	All non-detect	(PFBS) 6 and 3.7	ng/L	varies by parameter
* VOC	All non-detect	All non-detect	µg/L	varies by parameter
* SOC	All non-detect	All non-detect	µg/L	varies by parameter
* Gross Alpha	-0.338 ± 0.918	-1.90 ± 0.879	pCi/L	15 pCi/L
* Radium 226	0.0293 ± 0.543	0.162 ± 0.410	pCi/L	5 pCi/L
* Radium 228	0.101 ± 0.248	0.698 ± 0.364	pCi/L	5 pCi/L
* Uranium	<0.001	<0.001	mg/L	

* regulated parameters
** both sites were sampled twice for PFAS compounds - four weeks apart

Conclusions and Recommendations

The results of Phase II exploratory drilling and pumping testing show that two of the three exploratory locations have the potential to supply the water use demands of the proposed water system for the Village of Pellston. These sites are known as Site Nos. 2 and 3 – the school property and the MDNR property at the Pellston Airport runway runout. Both locations have acceptable groundwater quality - including aesthetic and regulated parameters - however the concentrations of iron and manganese at both sites are near nuisance levels. Site No. 3, however, has a detectable concentration of PFBS – a type of per and polyfluoroalkyl substance – which effectively disqualifies this location for further investigation. This was particularly concerning to the authors of this memorandum since there were no previous detections of PFAS compounds anywhere near this area. Further, with the exception of several houses north of this area, the region to the north and northeast (hydraulically upgradient direction of groundwater flow) is largely undeveloped. However, deliberating on the source of PFBS at Site No. 3 is beyond the scope of this assignment.

To summarize;

- The goal of Phase II was to follow-up on targeted exploratory drilling locations identified in Phase I. In particular, targeted areas were conservatively distant from the known areas of groundwater contamination without being unfeasibly distant from the proposed water service area. Given the numerous variables associated with geology, aquifer properties and groundwater flow patterns, we maintained a highly conservative factor of safety in our site selection - as would be appropriate for any municipal wellfield - but in this case

particularly to avoid constructing a new Type I wellfield that could become contaminated or alter the natural groundwater flow patterns within the contaminated areas.

- The local aquifers at Site Nos. 2 and 3 are part of the regional water table aquifer system surrounding the Village of Pellston (see Phase I Technical Memorandum which provides a regional description of the hydrogeologic setting).
- The mineral and aesthetic chemistry of the groundwater at Site Nos. 2 and 3 are “fundamentally” similar (except for PFBS at Site No. 3).
- Site Nos. 2 and 3 both have the potential to produce groundwater at the capacity needed to meet the proposed water use demands for the Village of Pellston. Site No. 2 has an apparent slightly higher capacity than Site No. 3, however not enough to out rank Site No. 3 when ranking on well capacity alone.
- Because Site No. 3 has detectable levels of PFBS, we do not recommend Site No. 3 for further exploration.

Attachments Attachment A - Exploration/Test Well Records
Attachment B - Groundwater Quality Analyses (May and June 2025)

Attachment A - Exploration/Test Well Records

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: 24-09-14-05-200-003	**Permit No:** E24-267	**County:** Emmet		**Township:** Maple River
		Town/Range: 36N 04W	**Section:** 4	**Well Status:** Inactive	**WSSN:**	**Source ID/Well No:** Site No. 1

Well ID: 24000009884

Elevation:
Latitude: 45.550726
Longitude: -84.8090139
Method of Collection: Interpolation-Map

Distance and Direction from Road Intersection:
.3 of a mile east of the intersection of Red School Rd. and Robinson Rd. on the south side of the Rd.

Well Owner: Michigan DNR

Well Address:	**Owner Address:**
E. Robinson Rd. Pellston, MI 49769	E. Robinson Rd. Pellston, MI 49769

Drilling Method: Rotary
Well Depth: 150.00 ft. **Well Use:** Test well
Well Type: Boring (No Casing) **Date Completed:** 4/23/2025

Casing Type: None **Height:**
Casing Joint:
Casing Fitting:

Diameter:

Borehole: 10.00 in. to 150.00 ft. depth

Pump Installed: No
Pressure Tank Installed: No
Pressure Relief Valve Installed: Yes

Static Water Level: 0.00 ft. Below Grade
Well Yield Test: **Yield Test Method:**

Screen Installed: **Filter Packed:**
Screen Diameter: in. **Blank:**
Screen Material Type:
Screen Installation Type:
Slot **Length** **Set Between**

Fittings:

Formation Description	Thickness	Depth to Bottom
Sand Medium	8.00	8.00
Sand Coarse	11.00	19.00
Sand & Gravel Medium	36.00	55.00
Sand & Clay Medium	3.00	58.00
Sand Medium	7.00	65.00
Clay	1.00	66.00
Sand & Clay	11.00	77.00
Sand & Gravel Medium	2.00	79.00
Hardpan Sandy	23.00	102.00
Hardpan Clayey	2.00	104.00
Sand Fine	2.00	106.00
Hardpan Sandy	2.00	108.00
Hardpan Stoney	24.00	132.00

(Continued On Page 2)

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

Grouting Material	Bags	Additives	Depth
Bentonite slurry	14.00	None	0.00 ft. to 150.00 ft.

Geology Remarks:

Wellhead Completion:

Drilling Machine Operator Name: William Ramsby
Employment: Employee

Nearest Source of Possible Contamination:
Type **Distance** **Direction**

(Continued on page 2)

Abandoned Well Plugged: Yes

Casing Removed: Yes

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: 24-09-14-05-200-003	**Permit No:** E24-267	**County:** Emmet			**Township:** Maple River
Town/Range: 36N 04W	**Section:** 4	**Well Status:** Inactive	**WSSN:**	**Source ID/Well No:** Site No. 1	

Well ID: 24000009884

Elevation:

Latitude: 45.550726

Longitude: -84.8090139

Method of Collection: Interpolation-Map

Distance and Direction from Road Intersection:
.3 of a mile east of the intersection of Red School Rd. and Robinson Rd. on the south side of the Rd.

Well Owner: Michigan DNR

Well Address:	**Owner Address:**
E. Robinson Rd. Pellston, MI 49769	E. Robinson Rd. Pellston, MI 49769

(Continued from Page 1)

Formation Description	Thickness	Depth to Bottom
Hardpan Sandy	2.00	134.00
Sand Medium	4.00	138.00
Hardpan Sandy	1.00	139.00
Sand & Gravel Fine To Medium	4.00	143.00
Hardpan Sandy	3.00	146.00
Sand Medium To Coarse	3.00	149.00
Brown Shale	1.00	150.00

Contractor Type: Water Well Drilling Contractor **Reg No:** 16-2600
Business Name: Ramsby Drilling Inc
Business Address: 1865 S Straits Hwy, Indian River, MI, 49749

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**

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: 24-09-14-02-100-001	**Permit No:** E24-269	**County:** Emmet		**Township:** Maple River
Town/Range: 36N 04W	**Section:** 2	**Well Status:** Active	**WSSN:**	**Source ID/Well No:** Site No. 2

Well ID: 24000009885

Elevation:

Latitude: 45.5506853

Longitude: -84.7615244

Method of Collection: Interpolation-Map

Distance and Direction from Road Intersection:
.48 of a mile east of the intersection of Robinson Rd. and Townline Rd. on the south side of the Rd.

Well Owner: Pellston Public Schools

Well Address:	**Owner Address:**
Robinson Rd. Pellston, MI 49769	Robinson Rd. Pellston, MI 49769

Drilling Method: Rotary
Well Depth: 110.00 ft. **Well Use:** Test well
Well Type: New **Date Completed:** 4/29/2025

Casing Type: PVC plastic **Height:** 2.00 ft. above grade
Casing Joint: Solvent welded/glued
Casing Fitting: Other

Diameter: 6.25 in. to 90.00 ft. depth SDR: 21.00

Borehole: 10.00 in. to 110.00 ft. depth

Pump Installed: No
Pressure Tank Installed: No
Pressure Relief Valve Installed: No

Static Water Level: 17.00 ft. Below Grade
Well Yield Test: **Yield Test Method:** Air
Pumping level 90.00 ft. after 3.00 hrs. at 125 GPM

Formation Description	Thickness	Depth to Bottom
Sand Medium	17.00	17.00
Sand Medium To Coarse	33.00	50.00
Sand Medium	52.00	102.00
Sand Medium To Coarse	8.00	110.00

Screen Installed: Yes **Filter Packed:** Yes
Screen Diameter: 6.00 in. **Blank:** 0.00 ft.
Screen Material Type: Stainless steel-wire wrapped
Screen Installation Type: Attached

Slot	Length	Set Between
20.00	20.00 ft.	90.00 ft. and 110.00 ft.

Fittings: Bottom plug

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

Grouting Material	Bags	Additives	Depth
Neat cement	21.00	None	3.00 ft. to 85.00 ft.

Wellhead Completion: 12 inches above grade

Nearest Source of Possible Contamination:

Type	Distance	Direction
None		

Geology Remarks:
110+ is medium sand w/clay

Drilling Machine Operator Name: William Ramsby
Employment: Employee

Contractor Type: Water Well Drilling Contractor **Reg No:** 16-2600
Business Name: Ramsby Drilling Inc
Business Address: 1865 S Straits Hwy, Indian River, MI, 49749

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: Casing Fitting:sch 80 thread fitting

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: 24-10-10-22-300-011	**Permit No:** E24-268	**County:** Emmet		**Township:** Bear Creek
Town/Range: 34N 05W	**Section:** 22	**Well Status:** Active	**WSSN:**	**Source ID/Well No:** Site No. 3

Well ID: 24000009883

Elevation:
Latitude: 45.5809336
Longitude: -84.7823833
Method of Collection: Interpolation-Map

Distance and Direction from Road Intersection:
directly east of the intersection of US-31 and Ely Rd.

Well Owner: Michigan DNR

Well Address:	**Owner Address:**
US 31 Hwy Pellston, MI 49769	US 31 Hwy Pellston, MI 49769

Drilling Method: Rotary
Well Depth: 100.00 ft. **Well Use:** Test well
Well Type: New **Date Completed:** 4/21/2025

Casing Type: PVC plastic **Height:** 2.00 ft. above grade
Casing Joint: Solvent welded/glued
Casing Fitting: Other

Diameter: 6.25 in. to 80.00 ft. depth SDR: 21.00

Borehole: 10.00 in. to 100.00 ft. depth

Pump Installed: No
Pressure Tank Installed: No
Pressure Relief Valve Installed: No

Static Water Level: 3.00 ft. Below Grade
Well Yield Test: **Yield Test Method:** Test pump
Pumping level 17.00 ft. after 8.00 hrs. at 100 GPM

Formation Description	Thickness	Depth to Bottom
Sand Medium	15.00	15.00
Sand & Gravel Fine To Coarse	5.00	20.00
Sand & Gravel Medium	45.00	65.00
Sand Medium To Coarse	35.00	100.00

Screen Installed: Yes **Filter Packed:** Yes
Screen Diameter: 6.00 in. **Blank:** 0.00 ft.
Screen Material Type: Stainless steel-wire wrapped
Screen Installation Type: Attached

Slot	Length	Set Between
12.00	20.00 ft.	80.00 ft. and 100.00 ft.

Fittings: Bottom plug

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

Grouting Material	Bags	Additives	Depth
Neat cement	18.00	None	3.00 ft. to 75.00 ft.

Wellhead Completion: 12 inches above grade

Nearest Source of Possible Contamination:

Type	Distance	Direction
None		

Geology Remarks:
100'+ is medium sand

Drilling Machine Operator Name: William Ramsby
Employment: Employee

Contractor Type: Water Well Drilling Contractor **Reg No:** 16-2600
Business Name: Ramsby Drilling Inc
Business Address: 1865 S Straits Hwy, Indian River, MI, 49749

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: Casing Fitting:Sch 80 thread fitting

Attachment B - Groundwater Quality Analyses (May and June 2025)

Site No. 2 – School Property.

Complete Type I Water Well Analyte List

Prein&Newhof
Engineers • Surveyors • Environmental • Laboratory

May 28, 2025

Williams & Works
549 Ottawa Ave.
Grand Rapids, MI 49503

RE: Pellston

Order No.: 2505067

Dear Mr. Dan Whalen:

Guide to Reading Lab Result

Prein&Newhof Laboratory received 2 sample(s) on 5/1/2025 on your behalf. Your test results are provided in your Prein&Newhof Laboratory analytical report. Please carefully review your analytical report, noting the following.

- You can be assured that the sample results meet the Safe Drinking Water Criteria as no analyte tested exceeds the EPA Maximum Contaminant Level unless indicated by an " * " in the “Qual” column.
- You can be assured that all samples were received and analyzed within required holding times unless noted by a "H" in the “Qual” column.
- You can be assured that all quality control data is within laboratory-defined or method-specified acceptance limits unless defined by the addition of an attached Case Narrative document.
- When testing for PFHxS, PFOA, PFOS, MeFOSAA, and EtFOSAA results include both branched and linear isotopes. We extract a Method Blank and analyze it with the preparation batch. Method Blank analytes are within the Reporting Limit (RL).

We use EPA Approved Methods for all regulated parameters. EPA Lab #: MI000014

We are certified by the State of Michigan for Drinking Water Analysis for: Coliform Bacteria, Metals, Cyanide, Minerals, Anions, Volatile Organics, THM's, Haloacetic Acids, and PFAS.
Michigan Lab ID#: 0020

To learn more about interpreting your Drinking Water Test Results and reading your Lab Report, follow the link above to view our "Guide to Reading Lab Results". If you have any concerns about your test results or need additional help, please call: 616-364-7600 or email me: sbylsma@preinnewhof.com.

Thank you for trusting Prein&Newhof with your testing needs.

Sincerely,

Steve Bylsma
Laboratory Manager

Original

3260 Evergreen Drive, NE Grand Rapids, MI 49525 t.616-364-7600 www.preinnewhof.com

Analytical Report

(DW)

WO#: **2505067**

Date Reported: **5/28/2025**

CLIENT:	Williams & Works	**Collection Date**	5/1/2025 9:30:00 AM
Project:	Pellston	**Received Date:**	5/1/2025 1:50:00 PM
Lab ID:	2505067-01	**Matrix:**	DRINKING WATER
Client Sample ID:	Well No. 2, School Property	**Sampled By:**	BJM
Location:			

Analyses	Result	RL	Qual	Units	MCL	Date Analyzed
METALS, DRINKING WATER				**EPA 200.7**		Analyst: **DV**
Iron	0.454	0.0400		mg/L		5/2/2025 2:39:51 PM
Sodium	4.44	2.00		mg/L		5/2/2025 2:39:51 PM
URANIUM, DRINKING WATER				**EPA 200.8**		Analyst: **AS**
Uranium, Total	< 0.00100	0.00100		mg/L		5/5/2025 11:15:07 PM
VOLATILE ORGANICS, DRINKING WATER				**EPA 524.2**		Analyst: **JS**
1,1,1,2-Tetrachloroethane	< 0.000500	0.000500		mg/L		5/2/2025 4:48:00 AM
1,1,1-Trichloroethane	< 0.000500	0.000500		mg/L	0.200	5/2/2025 4:48:00 AM
1,1,2,2-Tetrachloroethane	< 0.000500	0.000500		mg/L		5/2/2025 4:48:00 AM
1,1,2-Trichloroethane	< 0.000500	0.000500		mg/L	0.0050	5/2/2025 4:48:00 AM
1,1-Dichloroethane	< 0.000500	0.000500		mg/L		5/2/2025 4:48:00 AM
1,1-Dichloroethene	< 0.000500	0.000500		mg/L	0.0070	5/2/2025 4:48:00 AM
1,1-Dichloropropene	< 0.000500	0.000500		mg/L		5/2/2025 4:48:00 AM
1,2,3-Trichlorobenzene	< 0.000500	0.000500		mg/L		5/2/2025 4:48:00 AM
1,2,3-Trichloropropane	< 0.000500	0.000500		mg/L		5/2/2025 4:48:00 AM
1,2,4-Trichlorobenzene	< 0.000500	0.000500		mg/L	0.0700	5/2/2025 4:48:00 AM
1,2,4-Trimethylbenzene	< 0.000500	0.000500		mg/L		5/2/2025 4:48:00 AM
1,2-Dibromo-3-chloropropane	< 0.000500	0.000500		mg/L		5/2/2025 4:48:00 AM
1,2-Dibromoethane	< 0.000500	0.000500		mg/L		5/2/2025 4:48:00 AM
1,2-Dichloroethane	< 0.000500	0.000500		mg/L	0.0050	5/2/2025 4:48:00 AM
1,2-Dichloropropane	< 0.000500	0.000500		mg/L	0.0050	5/2/2025 4:48:00 AM
1,3,5-Trimethylbenzene	< 0.000500	0.000500		mg/L		5/2/2025 4:48:00 AM
1,3-Dichloropropane	< 0.000500	0.000500		mg/L		5/2/2025 4:48:00 AM
2,2-Dichloropropane	< 0.000500	0.000500		mg/L		5/2/2025 4:48:00 AM
2-Butanone	< 0.00100	0.00100		mg/L		5/2/2025 4:48:00 AM
2-Chlorotoluene	< 0.000500	0.000500		mg/L		5/2/2025 4:48:00 AM
4-Chlorotoluene	< 0.000500	0.000500		mg/L		5/2/2025 4:48:00 AM
4-Isopropyltoluene	< 0.000500	0.000500		mg/L		5/2/2025 4:48:00 AM
4-Methyl-2-pentanone	< 0.00100	0.00100		mg/L		5/2/2025 4:48:00 AM
Benzene	< 0.000500	0.000500		mg/L	0.0050	5/2/2025 4:48:00 AM
Bromobenzene	< 0.000500	0.000500		mg/L		5/2/2025 4:48:00 AM
Bromochloromethane	< 0.000500	0.000500		mg/L		5/2/2025 4:48:00 AM

Qualifiers:

<	Not Detected at the Reporting Limit	H	Holding times for preparation or analysis exceeded
MCL	Maximum Contaminant Level	PL	Permit Limit
RL	Reporting Limit	S	Spike Recovery outside accepted recovery limits

Original

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Analytical Report

(DW)

WO#: **2505067**

Date Reported: **5/28/2025**

CLIENT:	Williams & Works	**Collection Date**	5/1/2025 9:30:00 AM
Project:	Pellston	**Received Date:**	5/1/2025 1:50:00 PM
Lab ID:	2505067-01	**Matrix:**	DRINKING WATER
Client Sample ID:	Well No. 2, School Property	**Sampled By:**	BJM
Location:			

Analyses	Result	RL	Qual	Units	MCL	Date Analyzed
VOLATILE ORGANICS, DRINKING WATER			**EPA 524.2**			Analyst: **JS**
Bromodichloromethane	< 0.000500	0.000500		mg/L	0.0800	5/2/2025 4:48:00 AM
Bromoform	< 0.000500	0.000500		mg/L	0.0800	5/2/2025 4:48:00 AM
Bromomethane	< 0.000500	0.000500		mg/L		5/2/2025 4:48:00 AM
Carbon tetrachloride	< 0.000500	0.000500		mg/L	0.0050	5/2/2025 4:48:00 AM
Chloroethane	< 0.000500	0.000500		mg/L		5/2/2025 4:48:00 AM
Chloroform	< 0.000500	0.000500		mg/L	0.0800	5/2/2025 4:48:00 AM
Chloromethane	< 0.000500	0.000500		mg/L		5/2/2025 4:48:00 AM
cis-1,2-Dichloroethene	< 0.000500	0.000500		mg/L	0.0700	5/2/2025 4:48:00 AM
cis-1,3-Dichloropropene	< 0.000500	0.000500		mg/L		5/2/2025 4:48:00 AM
Dibromochloromethane	< 0.000500	0.000500		mg/L	0.0800	5/2/2025 4:48:00 AM
Dibromomethane	< 0.000500	0.000500		mg/L		5/2/2025 4:48:00 AM
Dichlorodifluoromethane	< 0.000500	0.000500		mg/L		5/2/2025 4:48:00 AM
Ethylbenzene	< 0.000500	0.000500		mg/L	0.0700	5/2/2025 4:48:00 AM
Hexachlorobutadiene	< 0.000500	0.000500		mg/L		5/2/2025 4:48:00 AM
Isopropylbenzene	< 0.000500	0.000500		mg/L		5/2/2025 4:48:00 AM
m-Dichlorobenzene	< 0.000500	0.000500		mg/L		5/2/2025 4:48:00 AM
Methyl tert-butyl ether	< 0.00100	0.00100		mg/L		5/2/2025 4:48:00 AM
Methylene chloride	< 0.00100	0.00100		mg/L	0.0050	5/2/2025 4:48:00 AM
Monochlorobenzene	< 0.000500	0.000500		mg/L	0.100	5/2/2025 4:48:00 AM
Naphthalene	< 0.000500	0.000500		mg/L		5/2/2025 4:48:00 AM
n-Butylbenzene	< 0.000500	0.000500		mg/L		5/2/2025 4:48:00 AM
n-Propylbenzene	< 0.000500	0.000500		mg/L		5/2/2025 4:48:00 AM
o-Dichlorobenzene	< 0.000500	0.000500		mg/L	0.600	5/2/2025 4:48:00 AM
p-Dichlorobenzene	< 0.000500	0.000500		mg/L	0.0750	5/2/2025 4:48:00 AM
sec-Butylbenzene	< 0.000500	0.000500		mg/L		5/2/2025 4:48:00 AM
Styrene	< 0.000500	0.000500		mg/L	0.100	5/2/2025 4:48:00 AM
tert-Butylbenzene	< 0.000500	0.000500		mg/L		5/2/2025 4:48:00 AM
Tetrachloroethene	< 0.000500	0.000500		mg/L	0.0050	5/2/2025 4:48:00 AM
Tetrahydrofuran	< 0.0100	0.0100		mg/L		5/2/2025 4:48:00 AM
Toluene	< 0.000500	0.000500		mg/L	1.00	5/2/2025 4:48:00 AM
trans-1,2-Dichloroethene	< 0.000500	0.000500		mg/L	0.100	5/2/2025 4:48:00 AM
trans-1,3-Dichloropropene	< 0.000500	0.000500		mg/L		5/2/2025 4:48:00 AM
Trichloroethene	< 0.000500	0.000500		mg/L	0.0050	5/2/2025 4:48:00 AM
Trichlorofluoromethane	< 0.000500	0.000500		mg/L		5/2/2025 4:48:00 AM

Qualifiers:

<	Not Detected at the Reporting Limit	H	Holding times for preparation or analysis exceeded
MCL	Maximum Contaminant Level	PL	Permit Limit
RL	Reporting Limit	S	Spike Recovery outside accepted recovery limits

Original

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Analytical Report

(DW)

WO#: **2505067**

Date Reported: **5/28/2025**

CLIENT:	Williams & Works	**Collection Date**	5/1/2025 9:30:00 AM
Project:	Pellston	**Received Date:**	5/1/2025 1:50:00 PM
Lab ID:	2505067-01	**Matrix:**	DRINKING WATER
Client Sample ID:	Well No. 2, School Property	**Sampled By:**	BJM
Location:			

Analyses	Result	RL	Qual	Units	MCL	Date Analyzed
VOLATILE ORGANICS, DRINKING WATER				**EPA 524.2**		Analyst: **JS**
Vinyl chloride	< 0.000500	0.000500		mg/L	0.0020	5/2/2025 4:48:00 AM
m,p-Xylene	< 0.000500	0.000500		mg/L	10.0	5/2/2025 4:48:00 AM
o-Xylene	< 0.000500	0.000500		mg/L	10.0	5/2/2025 4:48:00 AM
Trihalomethanes, Total	< 0.000500	0.000500		mg/L	0.0800	5/2/2025 4:48:00 AM
Xylenes, Total	< 0.00150	0.00150		mg/L	10.0	5/2/2025 4:48:00 AM
Surr: 1,2-Dichlorobenzene-d4	91.1	80 - 120		%Rec		5/2/2025 4:48:00 AM
Surr: 4-Bromofluorobenzene	91.2	80 - 120		%Rec		5/2/2025 4:48:00 AM
METALS, DRINKING WATER				**EPA 200.7**		Analyst: **DV**
Calcium	40.2	0.100		mg/L		5/7/2025 9:53:20 AM
MERCURY, DRINKING WATER				**EPA 245.1**		Analyst: **DV**
Mercury	< 0.000200	0.000200		mg/L	0.0020	5/5/2025 2:40:44 PM
METALS, DRINKING WATER				**EPA 200.8**		Analyst: **AS**
Antimony	< 0.00100	0.00100		mg/L	0.0060	5/5/2025 11:09:37 PM
Arsenic	0.00206	0.00100		mg/L	0.0100	5/5/2025 11:09:37 PM
Barium	0.0204	0.00100		mg/L	2.00	5/5/2025 11:09:37 PM
Beryllium	< 0.00100	0.00100		mg/L	0.0040	5/5/2025 11:09:37 PM
Cadmium	< 0.000200	0.000200		mg/L	0.0050	5/5/2025 11:09:37 PM
Chromium	0.00126	0.00100		mg/L	0.100	5/5/2025 11:09:37 PM
Copper	0.00192	0.00100		mg/L	1.30	5/5/2025 11:09:37 PM
Lead	< 0.00100	0.00100		mg/L	0.0150	5/5/2025 11:09:37 PM
Manganese	0.0342	0.00100		mg/L		5/5/2025 11:09:37 PM
Nickel	< 0.00100	0.00100		mg/L		5/5/2025 11:09:37 PM
Selenium	< 0.00200	0.00200		mg/L	0.0500	5/5/2025 11:09:37 PM
Thallium	< 0.00100	0.00100		mg/L	0.0020	5/5/2025 11:09:37 PM
Zinc	0.00586	0.00300		mg/L		5/5/2025 11:09:37 PM
PFAS, DRINKING WATER				**EPA 537.1**		Analyst: **JS**
PFBS	< 2.0	2.0		ng/L		5/7/2025 8:43:00 AM
PFHxA	< 2.0	2.0		ng/L		5/7/2025 8:43:00 AM

Qualifiers:

<	Not Detected at the Reporting Limit	H	Holding times for preparation or analysis exceeded
MCL	Maximum Contaminant Level	PL	Permit Limit
RL	Reporting Limit	S	Spike Recovery outside accepted recovery limits

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Analytical Report

(DW)

WO#: **2505067**

Date Reported: **5/28/2025**

CLIENT:	Williams & Works	**Collection Date**	5/1/2025 9:30:00 AM
Project:	Pellston	**Received Date:**	5/1/2025 1:50:00 PM
Lab ID:	2505067-01	**Matrix:**	DRINKING WATER
Client Sample ID:	Well No. 2, School Property	**Sampled By:**	BJM
Location:			

Analyses	Result	RL	Qual	Units	MCL	Date Analyzed
PFAS, DRINKING WATER				**EPA 537.1**		Analyst: **JS**
HFPO-DA	< 2.0	2.0		ng/L	10	5/7/2025 8:43:00 AM
PFHxS	< 2.0	2.0		ng/L	10	5/7/2025 8:43:00 AM
PFHpA	< 2.0	2.0		ng/L		5/7/2025 8:43:00 AM
ADONA	< 2.0	2.0		ng/L		5/7/2025 8:43:00 AM
PFOA	< 2.0	2.0		ng/L	4.0	5/7/2025 8:43:00 AM
PFOS	< 2.0	2.0		ng/L	4.0	5/7/2025 8:43:00 AM
PFNA	< 2.0	2.0		ng/L	10	5/7/2025 8:43:00 AM
9Cl-PF3ONS	< 2.0	2.0		ng/L		5/7/2025 8:43:00 AM
PFDA	< 2.0	2.0		ng/L		5/7/2025 8:43:00 AM
NMeFOSAA	< 2.0	2.0		ng/L		5/7/2025 8:43:00 AM
NEtFOSAA	< 2.0	2.0		ng/L		5/7/2025 8:43:00 AM
PFUnA	< 2.0	2.0		ng/L		5/7/2025 8:43:00 AM
11Cl-PF3OUdS	< 2.0	2.0		ng/L		5/7/2025 8:43:00 AM
PFDoA	< 2.0	2.0		ng/L		5/7/2025 8:43:00 AM
PFTrDA	< 2.0	2.0		ng/L		5/7/2025 8:43:00 AM
PFTA	< 2.0	2.0		ng/L		5/7/2025 8:43:00 AM
PFAS Hazard Index	< 0.20	0.20		ng/L	1.0	5/7/2025 8:43:00 AM
Surr: d5-N-EtFOSAA	75.0	70 - 130		%Rec		5/7/2025 8:43:00 AM
Surr: M3HFPO-DA	94.7	70 - 130		%Rec		5/7/2025 8:43:00 AM
Surr: MPFDA	107	70 - 130		%Rec		5/7/2025 8:43:00 AM
Surr: MPFHxA	84.4	70 - 130		%Rec		5/7/2025 8:43:00 AM
ALKALINITY				**EPA 310.2**		Analyst: **AB**
Alkalinity, Total (As CaCO3)	173	4.00		mg/L CaCO3		5/2/2025 1:18:55 PM
ANIONS BY ION CHROMATOGRAPHY				**EPA 300.0**		Analyst: **DV**
Fluoride	0.134	0.100		mg/L	4.00	5/1/2025 4:20:00 PM
Chloride	2.98	0.200		mg/L		5/1/2025 4:20:00 PM
Nitrite	< 0.100	0.100		mg/L	1.00	5/1/2025 4:20:00 PM
Nitrate	< 0.100	0.100		mg/L	10.0	5/1/2025 4:20:00 PM
Sulfate	6.84	0.500		mg/L		5/1/2025 4:20:00 PM

Qualifiers:

<	Not Detected at the Reporting Limit	H	Holding times for preparation or analysis exceeded
MCL	Maximum Contaminant Level	PL	Permit Limit
RL	Reporting Limit	S	Spike Recovery outside accepted recovery limits

Original

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Analytical Report

(DW)

WO#: **2505067**

Date Reported: **5/28/2025**

CLIENT:	Williams & Works	**Collection Date**	5/1/2025 9:30:00 AM
Project:	Pellston	**Received Date:**	5/1/2025 1:50:00 PM
Lab ID:	2505067-01	**Matrix:**	DRINKING WATER
Client Sample ID:	Well No. 2, School Property	**Sampled By:**	BJM
Location:			

Analyses	Result	RL	Qual	Units	MCL	Date Analyzed
CYANIDE, DRINKING WATER			**SM4500CN-E-2021**			Analyst: **TE**
Cyanide, Total	< 0.00600	0.00600		mg/L	0.200	5/5/2025 12:59:36 PM
HARDNESS, TOTAL			**EPA 130.1**			Analyst: **AB**
Hardness (As CaCO3)	178	10.0		mg/L CaCO3		5/5/2025 2:48:28 PM
HYDROGEN ION (PH)			**SM 4500-H+B**			Analyst: **KF**
pH	8.14	0		pH Units		5/1/2025 4:20:14 PM
PHOSPHOROUS, ORTHO AS PO4			**SM4500-PF-2021**			Analyst: **AB**
Phosphorus, Total Orthophosphate (As PO4)	< 0.0750	0.0750		mg/L		5/1/2025 3:16:59 PM
SPECIFIC CONDUCTANCE			**EPA 120.1**			Analyst: **KF**
Specific Conductivity	364	1.00		µmhos/cm		5/1/2025 4:22:26 PM
TEMPERATURE			**SM2550B-2010**			Analyst: **KF**
Temperature	11.4	0		°C		5/1/2025 4:20:14 PM

Qualifiers:

<	Not Detected at the Reporting Limit	H	Holding times for preparation or analysis exceeded
MCL	Maximum Contaminant Level	PL	Permit Limit
RL	Reporting Limit	S	Spike Recovery outside accepted recovery limits

Original

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Analytical Report

(DW)

WO#: **2505067**

Date Reported: **5/28/2025**

CLIENT:	Williams & Works	**Collection Date**	
Project:	Pellston	**Received Date:**	5/1/2025 1:50:00 PM
Lab ID:	2505067-02	**Matrix:**	TRIP BLANK
Client Sample ID:	Trip Blank	**Sampled By:**	Lab
Location:			

Analyses	Result	RL	Qual	Units	MCL	Date Analyzed
VOLATILE ORGANICS, DRINKING WATER				**EPA 524.2**		Analyst: **JS**
1,1,1,2-Tetrachloroethane	< 0.000500	0.000500		mg/L		5/2/2025 12:36:00 AM
1,1,1-Trichloroethane	< 0.000500	0.000500		mg/L	0.200	5/2/2025 12:36:00 AM
1,1,2,2-Tetrachloroethane	< 0.000500	0.000500		mg/L		5/2/2025 12:36:00 AM
1,1,2-Trichloroethane	< 0.000500	0.000500		mg/L	0.0050	5/2/2025 12:36:00 AM
1,1-Dichloroethane	< 0.000500	0.000500		mg/L		5/2/2025 12:36:00 AM
1,1-Dichloroethene	< 0.000500	0.000500		mg/L	0.0070	5/2/2025 12:36:00 AM
1,1-Dichloropropene	< 0.000500	0.000500		mg/L		5/2/2025 12:36:00 AM
1,2,3-Trichlorobenzene	< 0.000500	0.000500		mg/L		5/2/2025 12:36:00 AM
1,2,3-Trichloropropane	< 0.000500	0.000500		mg/L		5/2/2025 12:36:00 AM
1,2,4-Trichlorobenzene	< 0.000500	0.000500		mg/L	0.0700	5/2/2025 12:36:00 AM
1,2,4-Trimethylbenzene	< 0.000500	0.000500		mg/L		5/2/2025 12:36:00 AM
1,2-Dibromo-3-chloropropane	< 0.000500	0.000500		mg/L		5/2/2025 12:36:00 AM
1,2-Dibromoethane	< 0.000500	0.000500		mg/L		5/2/2025 12:36:00 AM
1,2-Dichlorobenzene	< 0.000500	0.000500		mg/L	0.600	5/2/2025 12:36:00 AM
1,2-Dichloroethane	< 0.000500	0.000500		mg/L	0.0050	5/2/2025 12:36:00 AM
1,2-Dichloropropane	< 0.000500	0.000500		mg/L	0.0050	5/2/2025 12:36:00 AM
1,3,5-Trimethylbenzene	< 0.000500	0.000500		mg/L		5/2/2025 12:36:00 AM
1,3-Dichlorobenzene	< 0.000500	0.000500		mg/L		5/2/2025 12:36:00 AM
1,3-Dichloropropane	< 0.000500	0.000500		mg/L		5/2/2025 12:36:00 AM
1,4-Dichlorobenzene	< 0.000500	0.000500		mg/L	0.0750	5/2/2025 12:36:00 AM
2,2-Dichloropropane	< 0.000500	0.000500		mg/L		5/2/2025 12:36:00 AM
2-Butanone	0.00311	0.00100		mg/L		5/2/2025 12:36:00 AM
2-Chlorotoluene	< 0.000500	0.000500		mg/L		5/2/2025 12:36:00 AM
4-Chlorotoluene	< 0.000500	0.000500		mg/L		5/2/2025 12:36:00 AM
4-Isopropyltoluene	< 0.000500	0.000500		mg/L		5/2/2025 12:36:00 AM
4-Methyl-2-pentanone	< 0.00100	0.00100		mg/L		5/2/2025 12:36:00 AM
Benzene	< 0.000500	0.000500		mg/L	0.0050	5/2/2025 12:36:00 AM
Bromobenzene	< 0.000500	0.000500		mg/L		5/2/2025 12:36:00 AM
Bromochloromethane	< 0.000500	0.000500		mg/L		5/2/2025 12:36:00 AM
Bromodichloromethane	< 0.000500	0.000500		mg/L	0.0800	5/2/2025 12:36:00 AM
Bromoform	< 0.000500	0.000500		mg/L	0.0800	5/2/2025 12:36:00 AM
Bromomethane	< 0.000500	0.000500		mg/L		5/2/2025 12:36:00 AM
Carbon tetrachloride	< 0.000500	0.000500		mg/L	0.0050	5/2/2025 12:36:00 AM
Chlorobenzene	< 0.000500	0.000500		mg/L	0.100	5/2/2025 12:36:00 AM

Qualifiers:

<	Not Detected at the Reporting Limit
MCL	Maximum Contaminant Level
RL	Reporting Limit
H	Holding times for preparation or analysis exceeded
PL	Permit Limit
S	Spike Recovery outside accepted recovery limits

Original

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Analytical Report

(DW)

WO#: **2505067**

Date Reported: **5/28/2025**

CLIENT:	Williams & Works	**Collection Date**	
Project:	Pellston	**Received Date:**	5/1/2025 1:50:00 PM
Lab ID:	2505067-02	**Matrix:**	TRIP BLANK
Client Sample ID:	Trip Blank	**Sampled By:**	Lab
Location:			

Analyses	Result	RL	Qual	Units	MCL	Date Analyzed
VOLATILE ORGANICS, DRINKING WATER				**EPA 524.2**		Analyst: **JS**
Chloroethane	< 0.000500	0.000500		mg/L		5/2/2025 12:36:00 AM
Chloroform	< 0.000500	0.000500		mg/L	0.0800	5/2/2025 12:36:00 AM
Chloromethane	< 0.000500	0.000500		mg/L		5/2/2025 12:36:00 AM
cis-1,2-Dichloroethene	< 0.000500	0.000500		mg/L	0.0700	5/2/2025 12:36:00 AM
cis-1,3-Dichloropropene	< 0.000500	0.000500		mg/L		5/2/2025 12:36:00 AM
Dibromochloromethane	< 0.000500	0.000500		mg/L	0.0800	5/2/2025 12:36:00 AM
Dibromomethane	< 0.000500	0.000500		mg/L		5/2/2025 12:36:00 AM
Dichlorodifluoromethane	< 0.000500	0.000500		mg/L		5/2/2025 12:36:00 AM
Ethylbenzene	< 0.000500	0.000500		mg/L	0.0700	5/2/2025 12:36:00 AM
Hexachlorobutadiene	< 0.000500	0.000500		mg/L		5/2/2025 12:36:00 AM
Isopropylbenzene	< 0.000500	0.000500		mg/L		5/2/2025 12:36:00 AM
Methyl tert-butyl ether	< 0.00100	0.00100		mg/L		5/2/2025 12:36:00 AM
Methylene chloride	< 0.00100	0.00100		mg/L	0.0050	5/2/2025 12:36:00 AM
Naphthalene	< 0.000500	0.000500		mg/L		5/2/2025 12:36:00 AM
n-Butylbenzene	< 0.000500	0.000500		mg/L		5/2/2025 12:36:00 AM
n-Propylbenzene	< 0.000500	0.000500		mg/L		5/2/2025 12:36:00 AM
sec-Butylbenzene	< 0.000500	0.000500		mg/L		5/2/2025 12:36:00 AM
Styrene	< 0.000500	0.000500		mg/L	0.100	5/2/2025 12:36:00 AM
tert-Butylbenzene	< 0.000500	0.000500		mg/L		5/2/2025 12:36:00 AM
Tetrachloroethene	< 0.000500	0.000500		mg/L	0.0050	5/2/2025 12:36:00 AM
Tetrahydrofuran	< 0.0100	0.0100		mg/L		5/2/2025 12:36:00 AM
Toluene	< 0.000500	0.000500		mg/L	1.00	5/2/2025 12:36:00 AM
trans-1,2-Dichloroethene	< 0.000500	0.000500		mg/L	0.100	5/2/2025 12:36:00 AM
trans-1,3-Dichloropropene	< 0.000500	0.000500		mg/L		5/2/2025 12:36:00 AM
Trichloroethene	< 0.000500	0.000500		mg/L	0.0050	5/2/2025 12:36:00 AM
Trichlorofluoromethane	< 0.000500	0.000500		mg/L		5/2/2025 12:36:00 AM
Vinyl chloride	< 0.000500	0.000500		mg/L	0.0020	5/2/2025 12:36:00 AM
m,p-Xylene	< 0.000500	0.000500		mg/L	10.0	5/2/2025 12:36:00 AM
o-Xylene	< 0.000500	0.000500		mg/L	10.0	5/2/2025 12:36:00 AM
Trihalomethanes, Total	< 0.000500	0.000500		mg/L	0.0800	5/2/2025 12:36:00 AM
Xylenes, Total	< 0.00150	0.00150		mg/L	10.0	5/2/2025 12:36:00 AM
Surr: 1,2-Dichlorobenzene-d4	94.5	80 - 120		%Rec		5/2/2025 12:36:00 AM
Surr: 4-Bromofluorobenzene	87.9	80 - 120		%Rec		5/2/2025 12:36:00 AM

Qualifiers:

<	Not Detected at the Reporting Limit	H	Holding times for preparation or analysis exceeded
MCL	Maximum Contaminant Level	PL	Permit Limit
RL	Reporting Limit	S	Spike Recovery outside accepted recovery limits

Original

3260 Evergreen Drive, NE Grand Rapids, MI 49525 t.616-364-7600 www.preinnewhof.com

Trace Analytical Laboratories, Inc.
2241 Black Creek Road
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TRACE
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May 15, 2025

Mr. Steve Bylsma
Prein and Newhof
3260 Evergreen Drive NE
Grand Rapids, MI 49525

RE: Trace Project 25E0093
Client Project 2505067

Dear Mr. Bylsma:

Enclosed are your analytical results. The results of this report relate only to the samples listed in the body of this report.

All reports were examined through Trace's validation process to ensure that requirements for quality and completeness were satisfied. All reported analytical results were obtained in accordance with the methods referenced on the reports. Every practical effort was made to meet the reporting limit specifications for this work, however, some limits may have been raised due to high analyte concentrations or interferences.

Trace is certified by the State of Michigan for Drinking Water Analyis.

If you have questions concerning this report, please contact me at 231.773.5998 or by email at jmink@trace-labs.com.

Sincerely,

Jon Mink
Senior Project Manager
Enclosures

STATE OF MICHIGAN LABORATORY ID: 8001

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SAMPLE SUMMARY

Trace Project ID: 25E0093
Client Project ID: 2505067

Trace ID	Sample ID	Matrix	Collected By	Date Collected	Date Received
25E0093-01	2505067-01A	Drinking Water	Client	05/01/25 09:30	05/02/25 09:39

CERTIFICATE OF ANALYSIS

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ANALYTICAL RESULTS

Sample Location: 2505067

Trace ID: 25E0093-01 **Date Collected:** 05/01/25 09:30
Sample Point Description: 2505067-01A **Date Received:** 05/02/25 09:39

PARAMETERS	RESULTS	RDL	UNITS	PREPARED	BY	ANALYZED	BY	NOTES	Reg Level
CARBAMATES BY HPLC EPA 531.2									
Analysis Method: EPA 531.2									
Batch: T166557									
Aldicarb	Not Detected	0.0010	mg/L	5/6/25 12:43	jh	5/6/25 21:17	jh		0.0030
Aldicarb sulfone	Not Detected	0.00060	mg/L	5/6/25 12:43	jh	5/6/25 21:17	jh		0.0020
Aldicarb sulfoxide	Not Detected	0.0010	mg/L	5/6/25 12:43	jh	5/6/25 21:17	jh		0.0040
Propoxur	Not Detected	0.0010	mg/L	5/6/25 12:43	jh	5/6/25 21:17	jh		No MCL
Carbaryl	Not Detected	0.0010	mg/L	5/6/25 12:43	jh	5/6/25 21:17	jh		No MCL
Carbofuran	Not Detected	0.00090	mg/L	5/6/25 12:43	jh	5/6/25 21:17	jh		0.040
3-Hydroxycarbofuran	Not Detected	0.0010	mg/L	5/6/25 12:43	jh	5/6/25 21:17	jh		No MCL
Methiocarb	Not Detected	0.0010	mg/L	5/6/25 12:43	jh	5/6/25 21:17	jh		No MCL
Methomyl	Not Detected	0.0010	mg/L	5/6/25 12:43	jh	5/6/25 21:17	jh		No MCL
Oxamyl	Not Detected	0.0010	mg/L	5/6/25 12:43	jh	5/6/25 21:17	jh		0.20
Surrogates:									
BDMC	107 %	70-130		5/6/25 12:43	jh	5/6/25 21:17	jh		
SEMI-VOLATILE ORGANIC COMPOUNDS BY GC-MS									
Analysis Method: EPA 525.3									
Batch: T166530									
Alachlor	Not Detected	0.00019	mg/L	5/6/25 8:50	av	5/8/25 12:53	av		0.0020
Atrazine	Not Detected	0.00019	mg/L	5/6/25 8:50	av	5/8/25 12:53	av		0.0030
Benzo (a) pyrene	Not Detected	0.000038	mg/L	5/6/25 8:50	av	5/8/25 12:53	av		0.00020
Chlordane (tech)	Not Detected	0.00042	mg/L	5/6/25 8:50	av	5/8/25 12:53	av		0.0020
Di(2-ethylhexyl)adipate	Not Detected	0.0012	mg/L	5/6/25 8:50	av	5/8/25 12:53	av		0.40
Di(2-ethylhexyl)phthalate	Not Detected	0.0012	mg/L	5/6/25 8:50	av	5/8/25 12:53	av		0.0060
Endrin	Not Detected	0.000019	mg/L	5/6/25 8:50	av	5/8/25 12:53	av		0.0020
Heptachlor	Not Detected	0.000076	mg/L	5/6/25 8:50	av	5/8/25 12:53	av		0.00040
Heptachlor epoxide	Not Detected	0.000038	mg/L	5/6/25 8:50	av	5/8/25 12:53	av		0.00020

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ANALYTICAL RESULTS

Sample Location: 2505067

Trace ID: 25E0093-01 **Date Collected:** 05/01/25 09:30
Sample Point Description: 2505067-01A **Date Received:** 05/02/25 09:39

PARAMETERS	RESULTS	RDL	UNITS	PREPARED	BY	ANALYZED	BY	NOTES	Reg Level
SEMI-VOLATILE ORGANIC COMPOUNDS BY GC-MS									
Hexachlorobenzene	Not Detected	0.000095	mg/L	5/6/25 8:50	av	5/8/25 12:53	av		0.0010
Hexachlorocyclopentadiene	Not Detected	0.00019	mg/L	5/6/25 8:50	av	5/8/25 12:53	av		0.050
gamma-BHC (Lindane)	Not Detected	0.000038	mg/L	5/6/25 8:50	av	5/8/25 12:53	av		0.00020
Methoxychlor	Not Detected	0.000095	mg/L	5/6/25 8:50	av	5/8/25 12:53	av		0.040
Simazine	Not Detected	0.00013	mg/L	5/6/25 8:50	av	5/8/25 12:53	av		0.0040
Toxaphene	Not Detected	0.00095	mg/L	5/6/25 8:50	av	5/8/25 12:53	av		0.0030
PCBs (screen)	<0.000095	0.000095	mg/L	5/6/25 8:50	av	5/8/25 12:53	av		0.00050
Surrogates:									
1,3-Dimethyl-2-nitrobenzene	83 %	70-130		5/6/25 8:50	av	5/8/25 12:53	av		
Triphenyl phosphate	124 %	70-130		5/6/25 8:50	av	5/8/25 12:53	av		
Benzo (a) pyrene-d12	127 %	70-130		5/6/25 8:50	av	5/8/25 12:53	av		
SEMI-VOLATILE COMPOUNDS BY GC									
Analysis Method: EPA 515.4									
Batch: T166832									
Acifluorfen	Not Detected	0.0040	mg/L	5/12/25 7:49	av	5/14/25 19:37	av		No MCL
Bentazon	Not Detected	0.0020	mg/L	5/12/25 7:49	av	5/14/25 19:37	av		No MCL
2,4-D	Not Detected	0.00022	mg/L	5/12/25 7:49	av	5/14/25 19:37	av		0.070
DCPA acid metabolites	Not Detected	0.0010	mg/L	5/12/25 7:49	av	5/14/25 19:37	av		No MCL
Dicamba	Not Detected	0.0020	mg/L	5/12/25 7:49	av	5/14/25 19:37	av		No MCL
Dinoseb	Not Detected	0.00020	mg/L	5/12/25 7:49	av	5/14/25 19:37	av		0.0070
Pentachlorophenol	Not Detected	0.000040	mg/L	5/12/25 7:49	av	5/14/25 19:37	av		0.0010
Picloram	Not Detected	0.00020	mg/L	5/12/25 7:49	av	5/14/25 19:37	av		0.50
2,4,5-T	Not Detected	0.0020	mg/L	5/12/25 7:49	av	5/14/25 19:37	av		No MCL
2,4,5-TP (Silvex)	Not Detected	0.00020	mg/L	5/12/25 7:49	av	5/14/25 19:37	av		0.050
Surrogates:									
2,4-Dichlorophenylacetic acid	72 %	70-130		5/12/25 7:49	av	5/14/25 19:37	av		

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ANALYTICAL RESULTS

Sample Location: 2505067

Trace ID: 25E0093-01 **Date Collected:** 05/01/25 09:30
Sample Point Description: 2505067-01A **Date Received:** 05/02/25 09:39

PARAMETERS	RESULTS	RDL	UNITS	PREPARED	BY	ANALYZED	BY	NOTES	Reg Level

SEMI-VOLATILE COMPOUNDS BY GC

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QUALITY CONTROL RESULTS

Trace Project ID: 25E0093
Client Project ID: 2505067

QC Batch: T166832
QC Batch Method: EPA 515.4
Analysis Description: SOC Herbicides
Analysis Method: EPA 515.4

METHOD BLANK: T166832-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Acifluorfen	mg/L	<0.0040	0.0040	
Bentazon	mg/L	<0.0020	0.0020	
2,4-D	mg/L	<0.00022	0.00022	
DCPA acid metabolites	mg/L	<0.0010	0.0010	
Dicamba	mg/L	<0.0020	0.0020	
Dinoseb	mg/L	<0.00020	0.00020	
Pentachlorophenol	mg/L	<0.000040	0.000040	
Picloram	mg/L	<0.00020	0.00020	
2,4,5-T	mg/L	<0.0020	0.0020	
2,4,5-TP (Silvex)	mg/L	<0.00020	0.00020	
2,4-Dichlorophenylacetic acid (S)	%	107	70-130	

Trace Project ID: 25E0093
Client Project ID: 2505067

QC Batch: T166530
QC Batch Method: EPA 525.3
Analysis Description: SOC - EPA 525.3
Analysis Method: EPA 525.3

METHOD BLANK: T166530-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Alachlor	mg/L	<0.00020	0.00020	
Atrazine	mg/L	<0.00020	0.00020	
Benzo (a) pyrene	mg/L	<0.000040	0.000040	
Chlordane (tech)	mg/L	<0.00044	0.00044	
Di(2-ethylhexyl)adipate	mg/L	<0.0013	0.0013	
Di(2-ethylhexyl)phthalate	mg/L	<0.0013	0.0013	
Endrin	mg/L	<0.000020	0.000020	
Heptachlor	mg/L	<0.000080	0.000080	
Heptachlor epoxide	mg/L	<0.000040	0.000040	
Hexachlorobenzene	mg/L	<0.00010	0.00010	
Hexachlorocyclopentadiene	mg/L	<0.00020	0.00020	

CERTIFICATE OF ANALYSIS

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METHOD BLANK: T166530-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
gamma-BHC (Lindane)	mg/L	<0.000040	0.000040	
Methoxychlor	mg/L	<0.00010	0.00010	
Simazine	mg/L	<0.00014	0.00014	
Toxaphene	mg/L	<0.0010	0.0010	
PCBs (screen)	mg/L	<0.00010	0.00010	
1,3-Dimethyl-2-nitrobenzene (S)	%	86	70-130	
Triphenyl phosphate (S)	%	111	70-130	
Benzo (a) pyrene-d12 (S)	%	119	70-130	

LABORATORY CONTROL SAMPLE: T166530-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Alachlor	mg/L	0.000600	0.000755	126	70-130	
Atrazine	mg/L	0.000600	0.000739	123	70-130	
Benzo (a) pyrene	mg/L	0.00120	0.00142	118	70-130	
Di(2-ethylhexyl)adipate	mg/L	0.0600	0.0531	88	70-130	
Di(2-ethylhexyl)phthalate	mg/L	0.0600	0.0542	90	70-130	
Endrin	mg/L	0.000600	0.000776	129	70-130	
Heptachlor	mg/L	0.000600	0.000685	114	70-130	
Heptachlor epoxide	mg/L	0.000600	0.000716	119	70-130	
Hexachlorobenzene	mg/L	0.00120	0.00115	96	60-140	
Hexachlorocyclopentadiene	mg/L	0.000600	0.000550	92	60-140	
gamma-BHC (Lindane)	mg/L	0.000600	0.000691	115	70-130	
Methoxychlor	mg/L	0.000600	0.000757	126	70-130	
Simazine	mg/L	0.000600	0.000763	127	70-130	
1,3-Dimethyl-2-nitrobenzene (S)	%	0.000500	0.000446	89	70-130	
Triphenyl phosphate (S)	%	0.000500	0.000468	94	70-130	
Benzo (a) pyrene-d12 (S)	%	0.000500	0.000643	129	70-130	

LABORATORY CONTROL SAMPLE: T166530-BS2

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Toxaphene	mg/L	0.00600	0.00761	127	70-130	
1,3-Dimethyl-2-nitrobenzene (S)	%	0.000500	0.000411	82	70-130	
Triphenyl phosphate (S)	%	0.000500	0.000551	110	70-130	
Benzo (a) pyrene-d12 (S)	%	0.000500	0.000572	114	70-130	

CERTIFICATE OF ANALYSIS

STATE OF MICHIGAN LABORATORY ID: 8001

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MATRIX SPIKE / MATRIX SPIKE DUPLICATE: T166530-MSD1 Original: **25E0093-01**

Parameter	Units	Original Result	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD	Notes
Toxaphene	**mg/L**	**0**	**0.00567**	**0.00758**	**0.00806**	**133**	**142**	**70-130**	**6**	**30**	**MS05**
1,3-Dimethyl-2-nitrobenzene (S)	%		0.000473	0.000381	0.000398	80	84	70-130			
Triphenyl phosphate (S)	%		0.000473	0.000554	0.000567	117	120	70-130			
Benzo (a) pyrene-d12 (S)	%		0.000473	0.000562	0.000590	119	125	70-130			

Trace Project ID: 25E0093
Client Project ID: 2505067

QC Batch: T166557
QC Batch Method: EPA 531.2

Analysis Description: Carbamates by HPLC
Analysis Method: EPA 531.2

METHOD BLANK: T166557-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Aldicarb	mg/L	<0.0010	0.0010	
Aldicarb sulfone	mg/L	<0.00060	0.00060	
Aldicarb sulfoxide	mg/L	<0.0010	0.0010	
Propoxur	mg/L	<0.0010	0.0010	
Carbaryl	mg/L	<0.0010	0.0010	
Carbofuran	mg/L	<0.00090	0.00090	
3-Hydroxycarbofuran	mg/L	<0.0010	0.0010	
Methiocarb	mg/L	<0.0010	0.0010	
Methomyl	mg/L	<0.0010	0.0010	
Oxamyl	mg/L	<0.0010	0.0010	
BDMC (S)	%	104	70-130	

LABORATORY CONTROL SAMPLE: T166557-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Aldicarb	mg/L	0.00200	0.00228	114	70-130	
Aldicarb sulfone	mg/L	0.00200	0.00248	124	70-130	
Aldicarb sulfoxide	mg/L	0.00200	0.00256	128	70-130	
Propoxur	mg/L	0.00200	0.00228	114	70-130	
Carbaryl	mg/L	0.00200	0.00216	108	70-130	
Carbofuran	mg/L	0.00200	0.00231	115	70-130	
3-Hydroxycarbofuran	mg/L	0.00200	0.00253	126	70-130	
Methiocarb	mg/L	0.00200	0.00224	112	70-130	
Methomyl	mg/L	0.00200	0.00240	120	70-130	

CERTIFICATE OF ANALYSIS

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LABORATORY CONTROL SAMPLE: T166557-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Oxamyl	mg/L	0.00200	0.00246	123	70-130	
BDMC (S)	%	0.00200	0.00221	111	70-130	

MATRIX SPIKE / MATRIX SPIKE DUPLICATE: T166557-MSD1 Original: **25E0093-01**

Parameter	Units	Original Result	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD	Notes
Aldicarb	mg/L	0	0.00200	0.00236	0.00226	118	113	70-130	4	30	
Aldicarb sulfone	mg/L	0	0.00200	0.00245	0.00221	123	111	70-130	10	30	
Aldicarb sulfoxide	mg/L	0	0.00200	0.00252	0.00224	126	112	70-130	12	30	
Propoxur	mg/L	0	0.00200	0.00235	0.00221	117	110	70-130	6	30	
Carbaryl	mg/L	0	0.00200	0.00221	0.00206	110	103	70-130	7	30	
Carbofuran	mg/L	0	0.00200	0.00236	0.00226	118	113	70-130	5	30	
3-Hydroxycarbofuran	mg/L	0	0.00200	0.00247	0.00226	124	113	70-130	9	30	
Methiocarb	mg/L	0	0.00200	0.00242	0.00221	121	110	70-130	9	30	
Methomyl	mg/L	0	0.00200	0.00240	0.00249	120	124	70-130	4	30	
Oxamyl	mg/L	0	0.00200	0.00244	0.00220	122	110	70-130	10	30	
BDMC (S)	%		0.00200	0.00212	0.00213	106	106	70-130			

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888-979-4469 Fax
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AN EXPLANATION OF TERMS AND SYMBOLS WHICH MAY OCCUR IN THIS REPORT

DEFINITIONS

MS	Matrix Spike
RPD	Relative Percent Difference
DUP	Matrix Duplicate
RDL	Reporting Detection Limit
MCL	Maximum Contamination Level as set by the Federal Safe Drinking Water Act
AL	Action Level as set by the Federal Safe Drinking Water Act
Not Detected	Indicates that the compound was not detected at the RDL
TNTC	Too Numerous To Count
Reg Level	Reg Level for all analytes except Lead and Copper is the MCL, for Lead and Copper it is the AL

Results that are reported in bold or red have equalled or exceeded the regulatory level.

DATA QUALIFIERS

Trace ID: T166530-MSD1

Analysis: EPA 525.3

Toxaphene	Note MS05 : The MS and MSD were out of control high. Because there was no positive result in the non-spiked version of the sample, no data require qualification.

CERTIFICATE OF ANALYSIS

STATE OF MICHIGAN LABORATORY ID: 8001

The Reg level for all analytes with the exception of Lead and Copper is the MCL, for Lead and Copper it is the AL.

Trace Analytical Laboratories, Inc.
2241 Black Creek Road
Muskegon, MI 49444-2673

TRACE ANALYTICAL LABORATORIES, INC.

231-773-5998 Phone
888-979-4469 Fax
www.trace-labs.com

Prein&Newhof

25E0093
CHAIN OF CUSTODY RECORD
LB: MCL

COC ID: 2025 | PAGE: 1 | OF: 1

ADDRESS
Prein&Newhof Laboratory
3260 Evergreen Dr NE
Grand Rapids, MI 49525
TEL: (616) 364-7600
FAX:
Website: www.preinnewhof.com

Please Include Email Address of Report Recipient Whenever Possible!!!

SUB CONTRACTOR: Trace Analytical COMPANY: Trace Analytical Laboratories, Inc.
ADDRESS: 2241 Black Creek Road
CITY, STATE, ZIP: Muskegon, MI 49444-2673
PHONE: (231) 773-5998 FAX:
ACCOUNT #: 25E0071 EMAIL:

SPECIAL INSTRUCTIONS / COMMENTS:
After analysis, the samples do not need to be returned and can be disposed per your standard laboratory practices.

ANALYTICAL PARAMETERS:

ITEM #	SAMPLE ID	Client Sample ID	MATRIX	DATE COLLECTED	NUMBER OF CONTAINERS	SOC	COMMENTS Methanol Preserved Weights; HOT Sample Notation; Additional Sample Description, etc.
1	2505067-01A	2505067-01A	Drinking water	5/1/2025 9:30:00 AM	8	√	

Relinquished By:	Date:	Time:	Received By:	Date:	Time:
[signature]	5/2	0635	[signature]	5/2/25	9:34
Relinquished By:	Date:	Time:	Received By:	Date:	Time:
Relinquished By:	Date:	Time:	Received By:	Date:	Time:

TAT: Standard ☐ RUSH Next BD ☐ 2nd BD ☐ 3rd BD ☐
Note: RUSH requests will incur surcharges!

REPORT TRANSMITTAL DESIRED:
☐ HARDCOPY (extra cost) ☐ FAX ☐ EMAIL ☐ ONLINE

FOR LAB USE ONLY
Temp of samples: 3.9 °C Attempt to Cool?
Comments:

CERTIFICATE OF ANALYSIS

STATE OF MICHIGAN LABORATORY ID: 8001

The Reg level for all analytes with the exception of Lead and Copper is the MCL, for Lead and Copper it is the AL.

Trace Analytical Laboratories, Inc.
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Muskegon, MI 49444-2673

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www.trace-labs.com

TRACE ANALYTICAL LABORATORIES, INC.

Sample Log In Checklist

25E0093
Prein and Newhof
Project Manager: Jon Mink

	Original Observation	Corrected Temperature	IR-9 (CF: +0.1°C)	IR-12 (CF: 0.0°C)	IR-13 (CF: 0.0°C)	SR1 (CF: -0.4°C)	SR2 (CF: -0.1°C)	Temp Blank	Client Sample
Date: 5/2/25									
Time: 1306									
Initials: CN									
Package Description: Cooler									
Package Temp °C	2.9	2.8		X					
Representative Sample Temp °C	3.1	3.1		X					X

Sample Receipt

Yes	No		
X		Received on ice or other coolant	
X		Ice still present upon receipt	
	X	Custody seals present	Yes / No Custody seals intact (if applicable)
		Trace Courier	X Client Drop-off / UPS / Fed Ex / US Mail / Other

Sample Condition

Yes	No	N/A	
X			All sample containers arrived unbroken and labeled
X			Sufficient sample to run requested analyses
X			Correct chemical preservative added to samples
	X		Samples preserved at Trace
			Chemical preservation verified, check EMD pH test strip used (if applicable)
			pH 0-2.5 (Lot: HC311850) / pH 11.0-13.0 (Lot: HC022540) / Other
			Air bubbles absent from VOAs

Chain of Custody (COC)

Yes	No	
		All bottle labels agree with COC
		COC filled out properly
		COC signed by client

Notes:

Form 70-A.57
Effective 2/20/25

TRACE Analytical Laboratories, Inc.

CERTIFICATE OF ANALYSIS

STATE OF MICHIGAN LABORATORY ID: 8001

The Reg level for all analytes with the exception of Lead and Copper is the MCL, for Lead and Copper it is the AL.

Pace Analytical Services, LLC
225 Industrial Park RD
Beaver, WV 25813
(800)999-0105

May 27, 2025

Stephen Bylsma
Prein & Newhof
3260 Evergreen Drive NE
Grand Rapids, MI 49525

RE: Project: 2505067
Pace Project No.: 30776384

Dear Stephen Bylsma:

Enclosed are the analytical results for sample(s) received by the laboratory on May 05, 2025. The results relate only to the samples included in this report. Results reported herein conform to the applicable TNI/NELAC Standards and the laboratory's Quality Manual, where applicable, unless otherwise noted in the body of the report.

The test results provided in this final report were generated by each of the following laboratories within the Pace Network:

- Pace Analytical Services - Greensburg

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Skyler C. Richmond
skyler.richmond@pacelabs.com
(724)850-5600
Project Manager

Enclosures

Pace Analytical Services, LLC
225 Industrial Park RD
Beaver, WV 25813
(800)999-0105

CERTIFICATIONS

Project: 2505067
Pace Project No.: 30776384

Pace Analytical Services Pennsylvania
1638 Roseytown Rd Suites 2,3&4, Greensburg, PA 15601
ANAB DOD-ELAP Rad Accreditation #: L2417
ANABISO/IEC 17025:2017 Rad Cert#: L24170
Alabama Certification #: 41590
Arizona Certification #: AZ0734
Arkansas Certification
California Certification #: 2950
Colorado Certification #: PA01547
Connecticut Certification #: PH-0694
EPA Region 4 DW Rad
Florida/TNI Certification #: E87683
Georgia Certification #: C040
Guam Certification
Hawaii Certification
Idaho Certification
Illinois Certification
Indiana Certification
Iowa Certification #: 391
Kansas Certification #: E-10358
Kentucky Certification #: KY90133
KY WW Permit #: KY0098221
KY WW Permit #: KY0000221
Louisiana DHH/TNI Certification #: LA010
Louisiana DEQ/TNI Certification #: 04086
Maine Certification #: 2023021
Maryland Certification #: 308
Massachusetts Certification #: M-PA1457
Michigan/PADEP Certification #: 9991
Missouri Certification #: 235
Montana Certification #: Cert0082
Nebraska Certification #: NE-OS-29-14
Nevada Certification #: PA014572023-03
New Hampshire/TNI Certification #: 297622
New Jersey/TNI Certification #: PA051
New Mexico Certification #: PA01457
New York/TNI Certification #: 10888
North Carolina Certification #: 42706
North Dakota Certification #: R-190
Ohio EPA Rad Approval: #41249
Oregon/TNI Certification #: PA200002-015
Pennsylvania/TNI Certification #: 65-00282
Puerto Rico Certification #: PA01457
Rhode Island Certification #: 65-00282
South Dakota Certification
Tennessee Certification #: TN02867
Texas/TNI Certification #: T104704188-22-18
Utah/TNI Certification #: PA014572223-14
USDA Soil Permit #: 525-23-67-77263
Vermont Dept. of Health: ID# VT-0282
Virgin Island/PADEP Certification
Virginia/VELAP Certification #: 460198
Washington Certification #: C868
West Virginia DEP Certification #: 143
West Virginia DHHR Certification #: 9964C
Wisconsin Approve List for Rad

Pace Analytical Services, LLC
225 Industrial Park RD
Beaver, WV 25813
(800)999-0105

SAMPLE SUMMARY

Project: 2505067
Pace Project No.: 30776384

Lab ID	Sample ID	Matrix	Date Collected	Date Received
30776384001	**2505067-01A**	Drinking Water	05/01/25 09:30	05/05/25 09:35

Pace Analytical Services, LLC
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Beaver, WV 25813
(800)999-0105

SAMPLE ANALYTE COUNT

Project: 2505067
Pace Project No.: 30776384

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
30776384001	**2505067-01A**	EPA 900.0	GCN	1	PASI-PA
		EPA 903.1	CLM	1	PASI-PA
		EPA 904.0	ZPC	1	PASI-PA

PASI-PA = Pace Analytical Services - Greensburg

Pace Analytical Services, LLC
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Beaver, WV 25813
(800)999-0105

PROJECT NARRATIVE

Project: 2505067
Pace Project No.: 30776384

Method: **EPA 900.0**
Description: 900.0 Gross Alpha/Beta
Client: Prein & Newhof
Date: May 27, 2025

General Information:
1 sample was analyzed for EPA 900.0 by Pace Analytical Services Greensburg. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

Pace Analytical Services, LLC
225 Industrial Park RD
Beaver, WV 25813
(800)999-0105

PROJECT NARRATIVE

Project: 2505067
Pace Project No.: 30776384

Method: **EPA 903.1**
Description: 903.1 Radium 226, DW
Client: Prein & Newhof
Date: May 27, 2025

General Information:
1 sample was analyzed for EPA 903.1 by Pace Analytical Services Greensburg. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

Pace Analytical Services, LLC
225 Industrial Park RD
Beaver, WV 25813
(800)999-0105

PROJECT NARRATIVE

Project: 2505067
Pace Project No.: 30776384

Method: **EPA 904.0**
Description: 904.0 Radium 228, DW
Client: Prein & Newhof
Date: May 27, 2025

General Information:
1 sample was analyzed for EPA 904.0 by Pace Analytical Services Greensburg. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

This data package has been reviewed for quality and completeness and is approved for release.

Pace Analytical Services, LLC
225 Industrial Park RD
Beaver, WV 25813
(800)999-0105

ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: 2505067
Pace Project No.: 30776384

Sample: 2505067-01A **Lab ID: 30776384001** Collected: 05/01/25 09:30 Received: 05/05/25 09:35 Matrix: Drinking Water
PWS: Site ID: Sample Type:

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
	Pace Analytical Services - Greensburg					
Gross Alpha	EPA 900.0	**-0.338 ± 0.918 (1.89) C:NA T:NA**	pCi/L	05/22/25 16:07	12587-46-1	
	Pace Analytical Services - Greensburg					
Radium-226	EPA 903.1	**0.0293 ± 0.543 (0.993) C:NA T:92%**	pCi/L	05/20/25 14:37	13982-63-3	
	Pace Analytical Services - Greensburg					
Radium-228	EPA 904.0	**0.101 ± 0.248 (0.554) C:91% T:87%**	pCi/L	05/20/25 11:01	15262-20-1	

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225 Industrial Park RD
Beaver, WV 25813
(800)999-0105

QUALITY CONTROL - RADIOCHEMISTRY

Project: 2505067
Pace Project No.: 30776384

QC Batch: 745250
QC Batch Method: EPA 900.0
Analysis Method: EPA 900.0
Analysis Description: 900.0 Gross Alpha/Beta
Laboratory: Pace Analytical Services - Greensburg
Associated Lab Samples: 30776384001

METHOD BLANK: 3628517 Matrix: Drinking Water
Associated Lab Samples: 30776384001

Parameter	Act ± Unc (MDC) Carr Trac	Units	Analyzed	Qualifiers
Gross Alpha	-1.35 ± 0.245 (2.29) C:NA T:NA	pCi/L	05/23/25 08:16	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

Pace Analytical Services, LLC
225 Industrial Park RD
Beaver, WV 25813
(800)999-0105

QUALITY CONTROL - RADIOCHEMISTRY

Project: 2505067
Pace Project No.: 30776384

QC Batch: 743744
QC Batch Method: EPA 904.0
Analysis Method: EPA 904.0
Analysis Description: 904.0 Radium 228, DW
Laboratory: Pace Analytical Services - Greensburg
Associated Lab Samples: 30776384001

METHOD BLANK: 3619681 Matrix: Drinking Water
Associated Lab Samples: 30776384001

Parameter	Act ± Unc (MDC) Carr Trac	Units	Analyzed	Qualifiers
Radium-228	0.473 ± 0.326 (0.646) C:82% T:87%	pCi/L	05/20/25 14:21	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

Pace Analytical Services, LLC
225 Industrial Park RD
Beaver, WV 25813
(800)999-0105

QUALITY CONTROL - RADIOCHEMISTRY

Project: 2505067
Pace Project No.: 30776384

QC Batch: 743743
QC Batch Method: EPA 903.1
Analysis Method: EPA 903.1
Analysis Description: 903.1 Radium-226, DW
Laboratory: Pace Analytical Services - Greensburg
Associated Lab Samples: 30776384001

METHOD BLANK: 3619680 Matrix: Drinking Water
Associated Lab Samples: 30776384001

Parameter	Act ± Unc (MDC) Carr Trac	Units	Analyzed	Qualifiers
Radium-226	0.273 ± 0.350 (0.585) C:NA T:100%	pCi/L	05/20/25 13:57	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

Pace Analytical Services, LLC
225 Industrial Park RD
Beaver, WV 25813
(800)999-0105

QUALIFIERS

Project: 2505067
Pace Project No.: 30776384

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Reported results are not rounded until the final step prior to reporting. Therefore, calculated parameters that are typically reported as "Total" may vary slightly from the sum of the reported component parameters.

Act - Activity

Unc - Uncertainty: For Safe Drinking Water Act (SDWA) analyses, the reported Unc. Is the calculated Count Uncertainty (95% confidence interval) using a coverage factor of 1.96. For all other matrices (non-SDWA), the reported Unc. is the calculated Expanded Uncertainty (aka Combined Standard Uncertainty, CSU), reported at the 95% confidence interval using a coverage factor of 1.96.

Gamma Spec: The Unc. reported for all gamma-spectroscopy analyses (EPA 901.1), is the calculated Expanded Uncertainty (CSU) at the 95.4% confidence interval, using a coverage factor of 2.0.

(MDC) - Minimum Detectable Concentration

Trac - Tracer Recovery (%)

Carr - Carrier Recovery (%)

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

Pace Analytical Services, LLC
225 Industrial Park RD
Beaver, WV 25813
(800)999-0105

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: 2505067
Pace Project No.: 30776384

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
30776384001	**2505067-01A**	EPA 900.0	745250		
30776384001	**2505067-01A**	EPA 903.1	743743		
30776384001	**2505067-01A**	EPA 904.0	743744		

Prein&Newhof
Engineers • Surveyors • Environmental • Laboratory

CHAIN OF CUSTODY RECORD

COC ID: 2026	PAGE: 1	OF: 1

ADDRESS
Prein&Newhof Laboratory
3260 Evergreen Dr NE
Grand Rapids, MI 49525
TEL: (616) 364-7600
FAX:
Website: www.preinnewhof.com

sbylsma@preinnewhof.com

Please Include Email Address of Report Recipient Whenever Possible!!!

SUB CONTRATOR: **Pace** COMPANY:
ADDRESS:
CITY, STATE, ZIP:
PHONE: FAX:
ACCOUNT #: EMAIL:

SPECIAL INSTRUCTIONS / COMMENTS:
After analysis, the samples do not need to be returned and can be disposed per your standard laboratory practices.

ITEM #	SAMPLE ID	Client Sample ID	MATRIX	DATE COLLECTED	NUMBER OF CONTAINERS	ANALYTICAL PARAMETERS: GROSS ALPHA	RADIUM 226	RADIUM 228	COMMENTS: Methanol Preserved Weights, HOT Sample Notation, Additional Sample Description, etc.
1	2505067-01A	2505067-01A	Drinking water	5/1/2025 9:30:00 AM	1	√	√	√	901

WO# : 30776384

30776384

Received by Pace Greensburg
Therm ID Corr Factor +/-
Receipt Temp
Corrected Temp
Correct Preservation Y / N

Relinquished By:	Date:	Time:	Received By:	Date:	Time:
KF	5/1/25	1500	[illegible]	5/6/25	935
Relinquished By:	Date:	Time:	Received By:	Date:	Time:
Relinquished By:	Date:	Time:	Received By:	Date	Time:

TAT: Standard ☐ RUSH Next BD ☐ 2nd BD ☐ 3rd BD ☐
Note: RUSH requests will incur surcharges!

REPORT TRANSMITTAL DESIRED:
☐ HARDCOPY (extra cost) ☐ FAX ☐ EMAIL ☐ ONLINE

FOR LAB USE ONLY
Temp of samples ____ °C Attempt to Cool ? ____
Comments: ____

DC#_Title: ENV-FRM-GBUR-0088 v07_Sample Condition Upon Receipt
Greensburg

Effective Date: 01/04/2024

WO#: 30776384

PM: SCR Due Date: 05/27/25

CLIENT: BV-PREINNEWH

Client Name: Pfizer & Neuhof

Courier: ☐ Fed Ex ☑ UPS ☐ USPS ☐ Client ☐ Commercial ☐ Pace ☐ Other

Tracking Number: 1Z 4H0 565 03 8484 0393

Initial / Date

Examined By: JM 5/15/25

Labeled By: JM 5/15/25

Temped By:

Custody Seal on Cooler/Box Present: ☐ Yes ☑ No Seals Intact: ☐ Yes ☑ No

Thermometer Used: _____ Type of Ice: Wet Blue None

Cooler Temperature: Observed Temp _____ °C Correction Factor: _____ °C Final Temp: _____ °C

Temp should be above freezing to 6°C

pH paper Lot# 10D3241 D.P.D. Residual Chlorine Lot #

	Yes	No	NA	
Comments:				1.
Chain of Custody Present	✓			2.
Chain of Custody Filled Out:				
-Were client corrections present on COC		✓		
Chain of Custody Relinquished	✓			3.
Sampler Name & Signature on COC:		✓		4.
Sample Labels match COC:	✓			5.
-Includes date/time/ID				
Matrix: DW				
Samples Arrived within Hold Time:	✓			6.
Short Hold Time Analysis (<72hr remaining):		✓		7.
Rush Turn Around Time Requested:		✓		8.
Sufficient Volume:	✓			9.
Correct Containers Used:	✓			10.
-Pace Containers Used		✓		
Containers Intact:	✓			11.
Orthophosphate field filtered:			✓	12.
Hex Cr Aqueous samples field filtered:			✓	13.
Organic Samples checked for dichlorination			✓	14:
Filtered volume received for dissolved tests:			✓	15:
All containers checked for preservation:	✓			16. pH<2
exceptions: VOA, coliform, TOC, O&G, Phenolics, Radon, non-aqueous matrix				
All containers meet method preservation requirements:	✓			Initial when completed JM Date/Time of Preservation
				Lot# of added Preservative
8260C/D: Headspace in VOA Vials (> 6mm)			✓	17.
624.1: Headspace in VOA Vials (0mm)			✓	18.
Radon: Headspace in RAD Vials (0mm)			✓	19.
Trip Blank Present:			✓	Trip blank custody seal present? YES or NO
Rad Samples Screened <.05 mrem/hr.	✓			Initial when completed PS Date: 5/15/25 Survey Meter SN: 25014380

Comments:

Note: For NC compliance samples with discrepancies, a copy of this form must be sent to the DEHNR Certification office.
PM Review is documented electronically in LIMS through the SRF Review schedule in the Workorder Edit Screen.

Page 1 of 1

Qualtrax ID: 55680

lient

ite 25050167

Page 1 of 1

Profile/EZ Login Number 19342

Notes

Sample Line Item	Matrix	Amber Glass					Plastic								Vials					Other									
		AG1H	AG3S	AG3U	AG5U	AG5T	BP1N	BP1U	BP2S	BP2U	BP3B	BP3N	BP3S	BP3U	DG9S	VG9H	VG9T	VG9U	VOAK	WGFU	WGKU	ZPLC	GCUB	GJN	12GN	AG1L	BG1U	BP2N	
001	DW						3																					

Container Codes

Glass

GJN	1 Gallon Jug with HNO3	DG9S	40mL amber VOA vial H2SO4
AG5U	100mL amber glass unpreserved	VG9U	40mL clear VOA vial
AG5T	100mL amber glass Na Thiosulfate	VG9T	40mL clear VOA vial Na Thiosulfate
GJN	1 Gallon Jug	VG9H	40mL clear VOA vial HCl
AG1S	1L amber glass H2SO4	JGFU	4oz amber wide jar
AG1H	1L amber glass HCl	WGFU	4oz wide jar unpreserved
AG1T	1L amber glass NA Thiosulfate	BG2U	500mL clear glass unpreserved
BG1U	1L clear glass unpreserved	AG2U	500mL amber glass unpreserved
AG3S	250mL amber glass H2SO4	WGKU	8oz wide jar unpreserved
AG3U	250mL amber glass unpreserved	GN	General

Plastic/Misc.

GCUB	1 gallon cubitainer
12GN	1/2 gallon cubitainer
SP5T	120mL coliform Na Thiosulfate
BP1N	1L plastic HNO3
BP1U	1L plastic unpreserved
BP3S	250mL plastic H2SO4
BP3N	250mL plastic HNO3
BP3U	250mL plastic unpreserved
BP3B	250mL plastic NAOH
BP2S	500mL plastic H2SO4
BP2U	500mL plastic unpreserved

EVELIN

W
SI
OI
W

WO#: 30776384

PM: SCR
CLIENT: BV-PREINNEWH

Due Date: 05/27/25

olid

Qualtrax ID: 55678

Prein&Newhof
Engineers ▪ Surveyors ▪ Environmental ▪ Laboratory

3260 Evergreen Drive, NE
Grand Rapids, MI 49525
t. 616-364-7600
f. 616-364-6955

Client Name: Pellston Williams & Works
Billing Address:
Phone Number: 616-988-3535
Email Report to:
Email Invoice to:
Project Name: Pellston
Project Number:
Sampling Personnel: Braxton Murphy BJM

CHAIN OF CUSTODY

No. 58625

Wastewater	W
Drinking Water	D
Groundwater	G
Soil	S
Sludge	L
Other	X

LAB USE	Sample Information				Preservative						Analysis Requested													
Lab Sample ID #	Date Collected	Time Collected	Sample Description and Location (e.g. MW-1)	MATRIX	None	H2SO4	HNO3	HCL	NaOH	Other	Unf 37+	Red	SOC	PFAS										
5067-1	5/1/25	9:30	Well No. 2, School Property	G																				
-2	Trip Blank			G																				

Comments:

6°C

Relinquished By: (Signature)	Date	Time	Received By: (Signature)	Date	Time
	5/1/25				
Relinquished By: (Signature)	Date	Time	Received for Laboratory By: (Signature)	Date	Time
				5/1/25	1352

Site No. 3 – MDNR Property near the Pellston Airport.

Complete Type I Water Well Analyte List

Prein&Newhof
Engineers • Surveyors • Environmental • Laboratory

May 21, 2025

Williams & Works
549 Ottawa Ave.
Grand Rapids, MI 49503

RE: Pellston

Order No.: 2504J14

Dear Mr. Dan Whalen:

Guide to Reading Lab Result

Prein&Newhof Laboratory received 4 sample(s) on 4/25/2025 on your behalf. Your test results are provided in your Prein&Newhof Laboratory analytical report. Please carefully review your analytical report, noting the following.

- You can be assured that the sample results meet the Safe Drinking Water Criteria as no analyte tested exceeds the EPA Maximum Contaminant Level unless indicated by an " * " in the “Qual” column.
- You can be assured that all samples were received and analyzed within required holding times unless noted by a "H" in the “Qual” column.
- You can be assured that all quality control data is within laboratory-defined or method-specified acceptance limits unless defined by the addition of an attached Case Narrative document.
- When testing for PFHxS, PFOA, PFOS, MeFOSAA, and EtFOSAA results include both branched and linear isotopes. We extract a Method Blank and analyze it with the preparation batch. Method Blank analytes are within the Reporting Limit (RL).

We use EPA Approved Methods for all regulated parameters. EPA Lab #: MI000014

We are certified by the State of Michigan for Drinking Water Analysis for: Coliform Bacteria, Metals, Cyanide, Minerals, Anions, Volatile Organics, THM's, Haloacetic Acids, and PFAS.
Michigan Lab ID#: 0020

To learn more about interpreting your Drinking Water Test Results and reading your Lab Report, follow the link above to view our "Guide to Reading Lab Results". If you have any concerns about your test results or need additional help, please call: 616-364-7600 or email me: sbylsma@preinnewhof.com.

Thank you for trusting Prein&Newhof with your testing needs.

Sincerely,

Steve Bylsma
Laboratory Manager

Original

3260 Evergreen Drive, NE Grand Rapids, MI 49525 t.616-364-7600 www.preinnewhof.com

Analytical Report

(DW)

WO#: **2504J14**

Date Reported: **5/21/2025**

CLIENT:	Williams & Works	**Collection Date**	4/24/2025 8:45:00 AM
Project:	Pellston	**Received Date:**	4/25/2025 3:00:00 PM
Lab ID:	2504J14-01	**Matrix:**	DRINKING WATER
Client Sample ID:	Test Well - Site 3	**Sampled By:**	BJM
Location:			

Analyses	Result	RL	Qual	Units	MCL	Date Analyzed
METALS, DRINKING WATER				**EPA 200.7**		Analyst: **DV**
Iron	0.515	0.0400		mg/L		4/30/2025 11:21:01 AM
Sodium	9.04	2.00		mg/L		4/30/2025 11:21:01 AM
URANIUM, DRINKING WATER				**EPA 200.8**		Analyst: **AS**
Uranium, Total	< 0.00100	0.00100		mg/L		4/28/2025 5:20:42 PM
VOLATILE ORGANICS, DRINKING WATER				**EPA 524.2**		Analyst: **JS**
1,1,1,2-Tetrachloroethane	< 0.000500	0.000500		mg/L		4/30/2025 3:45:00 AM
1,1,1-Trichloroethane	< 0.000500	0.000500		mg/L	0.200	4/30/2025 3:45:00 AM
1,1,2,2-Tetrachloroethane	< 0.000500	0.000500		mg/L		4/30/2025 3:45:00 AM
1,1,2-Trichloroethane	< 0.000500	0.000500		mg/L	0.0050	4/30/2025 3:45:00 AM
1,1-Dichloroethane	< 0.000500	0.000500		mg/L		4/30/2025 3:45:00 AM
1,1-Dichloroethene	< 0.000500	0.000500		mg/L	0.0070	4/30/2025 3:45:00 AM
1,1-Dichloropropene	< 0.000500	0.000500		mg/L		4/30/2025 3:45:00 AM
1,2,3-Trichlorobenzene	< 0.000500	0.000500		mg/L		4/30/2025 3:45:00 AM
1,2,3-Trichloropropane	< 0.000500	0.000500		mg/L		4/30/2025 3:45:00 AM
1,2,4-Trichlorobenzene	< 0.000500	0.000500		mg/L	0.0700	4/30/2025 3:45:00 AM
1,2,4-Trimethylbenzene	< 0.000500	0.000500		mg/L		4/30/2025 3:45:00 AM
1,2-Dibromo-3-chloropropane	< 0.000500	0.000500		mg/L		4/30/2025 3:45:00 AM
1,2-Dibromoethane	< 0.000500	0.000500		mg/L		4/30/2025 3:45:00 AM
1,2-Dichloroethane	< 0.000500	0.000500		mg/L	0.0050	4/30/2025 3:45:00 AM
1,2-Dichloropropane	< 0.000500	0.000500		mg/L	0.0050	4/30/2025 3:45:00 AM
1,3,5-Trimethylbenzene	< 0.000500	0.000500		mg/L		4/30/2025 3:45:00 AM
1,3-Dichloropropane	< 0.000500	0.000500		mg/L		4/30/2025 3:45:00 AM
2,2-Dichloropropane	< 0.000500	0.000500		mg/L		4/30/2025 3:45:00 AM
2-Butanone	< 0.00100	0.00100		mg/L		4/30/2025 3:45:00 AM
2-Chlorotoluene	< 0.000500	0.000500		mg/L		4/30/2025 3:45:00 AM
4-Chlorotoluene	< 0.000500	0.000500		mg/L		4/30/2025 3:45:00 AM
4-Isopropyltoluene	< 0.000500	0.000500		mg/L		4/30/2025 3:45:00 AM
4-Methyl-2-pentanone	< 0.00100	0.00100		mg/L		4/30/2025 3:45:00 AM
Benzene	< 0.000500	0.000500		mg/L	0.0050	4/30/2025 3:45:00 AM
Bromobenzene	< 0.000500	0.000500		mg/L		4/30/2025 3:45:00 AM
Bromochloromethane	< 0.000500	0.000500		mg/L		4/30/2025 3:45:00 AM

Qualifiers:

<	Not Detected at the Reporting Limit	H	Holding times for preparation or analysis exceeded
MCL	Maximum Contaminant Level	PL	Permit Limit
RL	Reporting Limit	S	Spike Recovery outside accepted recovery limits

Original

3260 Evergreen Drive, NE Grand Rapids, MI 49525 t.616-364-7600 www.preinnewhof.com

CLIENT:	Williams & Works	**Collection Date**	4/24/2025 8:45:00 AM
Project:	Pellston	**Received Date:**	4/25/2025 3:00:00 PM
Lab ID:	2504J14-01	**Matrix:**	DRINKING WATER
Client Sample ID:	Test Well - Site 3	**Sampled By:**	BJM
Location:			

Analyses	Result	RL	Qual	Units	MCL	Date Analyzed
VOLATILE ORGANICS, DRINKING WATER				**EPA 524.2**		Analyst: **JS**
Bromodichloromethane	< 0.000500	0.000500		mg/L	0.0800	4/30/2025 3:45:00 AM
Bromoform	< 0.000500	0.000500		mg/L	0.0800	4/30/2025 3:45:00 AM
Bromomethane	< 0.000500	0.000500		mg/L		4/30/2025 3:45:00 AM
Carbon tetrachloride	< 0.000500	0.000500		mg/L	0.0050	4/30/2025 3:45:00 AM
Chloroethane	< 0.000500	0.000500		mg/L		4/30/2025 3:45:00 AM
Chloroform	< 0.000500	0.000500		mg/L	0.0800	4/30/2025 3:45:00 AM
Chloromethane	< 0.000500	0.000500		mg/L		4/30/2025 3:45:00 AM
cis-1,2-Dichloroethene	< 0.000500	0.000500		mg/L	0.0700	4/30/2025 3:45:00 AM
cis-1,3-Dichloropropene	< 0.000500	0.000500		mg/L		4/30/2025 3:45:00 AM
Dibromochloromethane	< 0.000500	0.000500		mg/L	0.0800	4/30/2025 3:45:00 AM
Dibromomethane	< 0.000500	0.000500		mg/L		4/30/2025 3:45:00 AM
Dichlorodifluoromethane	< 0.000500	0.000500		mg/L		4/30/2025 3:45:00 AM
Ethylbenzene	< 0.000500	0.000500		mg/L	0.0700	4/30/2025 3:45:00 AM
Hexachlorobutadiene	< 0.000500	0.000500		mg/L		4/30/2025 3:45:00 AM
Isopropylbenzene	< 0.000500	0.000500		mg/L		4/30/2025 3:45:00 AM
m-Dichlorobenzene	< 0.000500	0.000500		mg/L		4/30/2025 3:45:00 AM
Methyl tert-butyl ether	< 0.00100	0.00100		mg/L		4/30/2025 3:45:00 AM
Methylene chloride	< 0.00100	0.00100		mg/L	0.0050	4/30/2025 3:45:00 AM
Monochlorobenzene	< 0.000500	0.000500		mg/L	0.100	4/30/2025 3:45:00 AM
Naphthalene	< 0.000500	0.000500		mg/L		4/30/2025 3:45:00 AM
n-Butylbenzene	< 0.000500	0.000500		mg/L		4/30/2025 3:45:00 AM
n-Propylbenzene	< 0.000500	0.000500		mg/L		4/30/2025 3:45:00 AM
o-Dichlorobenzene	< 0.000500	0.000500		mg/L	0.600	4/30/2025 3:45:00 AM
p-Dichlorobenzene	< 0.000500	0.000500		mg/L	0.0750	4/30/2025 3:45:00 AM
sec-Butylbenzene	< 0.000500	0.000500		mg/L		4/30/2025 3:45:00 AM
Styrene	< 0.000500	0.000500		mg/L	0.100	4/30/2025 3:45:00 AM
tert-Butylbenzene	< 0.000500	0.000500		mg/L		4/30/2025 3:45:00 AM
Tetrachloroethene	< 0.000500	0.000500		mg/L	0.0050	4/30/2025 3:45:00 AM
Tetrahydrofuran	< 0.0100	0.0100		mg/L		4/30/2025 3:45:00 AM
Toluene	< 0.000500	0.000500		mg/L	1.00	4/30/2025 3:45:00 AM
trans-1,2-Dichloroethene	< 0.000500	0.000500		mg/L	0.100	4/30/2025 3:45:00 AM
trans-1,3-Dichloropropene	< 0.000500	0.000500		mg/L		4/30/2025 3:45:00 AM
Trichloroethene	< 0.000500	0.000500		mg/L	0.0050	4/30/2025 3:45:00 AM
Trichlorofluoromethane	< 0.000500	0.000500		mg/L		4/30/2025 3:45:00 AM

Qualifiers:

<	Not Detected at the Reporting Limit	H	Holding times for preparation or analysis exceeded
MCL	Maximum Contaminant Level	PL	Permit Limit
RL	Reporting Limit	S	Spike Recovery outside accepted recovery limits

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Analytical Report

(DW)

WO#: **2504J14**

Date Reported: **5/21/2025**

CLIENT:	Williams & Works	**Collection Date**	4/24/2025 8:45:00 AM
Project:	Pellston	**Received Date:**	4/25/2025 3:00:00 PM
Lab ID:	2504J14-01	**Matrix:**	DRINKING WATER
Client Sample ID:	Test Well - Site 3	**Sampled By:**	BJM
Location:			

Analyses	Result	RL	Qual	Units	MCL	Date Analyzed
VOLATILE ORGANICS, DRINKING WATER				**EPA 524.2**		Analyst: **JS**
Vinyl chloride	< 0.000500	0.000500		mg/L	0.0020	4/30/2025 3:45:00 AM
m,p-Xylene	< 0.000500	0.000500		mg/L	10.0	4/30/2025 3:45:00 AM
o-Xylene	< 0.000500	0.000500		mg/L	10.0	4/30/2025 3:45:00 AM
Trihalomethanes, Total	< 0.000500	0.000500		mg/L	0.0800	4/30/2025 3:45:00 AM
Xylenes, Total	< 0.00150	0.00150		mg/L	10.0	4/30/2025 3:45:00 AM
Surr: 1,2-Dichlorobenzene-d4	88.9	80 - 120		%Rec		4/30/2025 3:45:00 AM
Surr: 4-Bromofluorobenzene	82.6	80 - 120		%Rec		4/30/2025 3:45:00 AM
METALS, DRINKING WATER				**EPA 200.7**		Analyst: **DV**
Calcium	47.9	0.100		mg/L		4/30/2025 2:19:06 PM
MERCURY, DRINKING WATER				**EPA 245.1**		Analyst: **DV**
Mercury	< 0.000200	0.000200		mg/L	0.0020	4/30/2025 3:24:04 PM
METALS, DRINKING WATER				**EPA 200.8**		Analyst: **AS**
Antimony	< 0.00100	0.00100		mg/L	0.0060	4/28/2025 5:15:15 PM
Arsenic	< 0.00100	0.00100		mg/L	0.0100	4/28/2025 5:15:15 PM
Barium	0.0136	0.00100		mg/L	2.00	4/28/2025 5:15:15 PM
Beryllium	< 0.00100	0.00100		mg/L	0.0040	4/28/2025 5:15:15 PM
Cadmium	< 0.000200	0.000200		mg/L	0.0050	4/28/2025 5:15:15 PM
Chromium	0.00237	0.00100		mg/L	0.100	4/28/2025 5:15:15 PM
Copper	0.00246	0.00100		mg/L	1.30	4/28/2025 5:15:15 PM
Lead	< 0.00100	0.00100		mg/L	0.0150	4/28/2025 5:15:15 PM
Manganese	0.0305	0.00100		mg/L		4/28/2025 5:15:15 PM
Nickel	< 0.00100	0.00100		mg/L		4/28/2025 5:15:15 PM
Selenium	< 0.00200	0.00200		mg/L	0.0500	4/28/2025 5:15:15 PM
Thallium	< 0.00100	0.00100		mg/L	0.0020	4/28/2025 5:15:15 PM
Zinc	0.0112	0.00300		mg/L		4/28/2025 5:15:15 PM
ALKALINITY				**EPA 310.2**		Analyst: **AB**
Alkalinity, Total (As CaCO3)	154	4.00		mg/L CaCO3		4/28/2025 11:12:21 AM

Qualifiers:

<	Not Detected at the Reporting Limit	H	Holding times for preparation or analysis exceeded
MCL	Maximum Contaminant Level	PL	Permit Limit
RL	Reporting Limit	S	Spike Recovery outside accepted recovery limits

Original

3260 Evergreen Drive, NE Grand Rapids, MI 49525 t.616-364-7600 www.preinnewhof.com

Analytical Report

(DW)

WO#: **2504J14**

Date Reported: **5/21/2025**

CLIENT:	Williams & Works	**Collection Date**	4/24/2025 8:45:00 AM
Project:	Pellston	**Received Date:**	4/25/2025 3:00:00 PM
Lab ID:	2504J14-01	**Matrix:**	DRINKING WATER
Client Sample ID:	Test Well - Site 3	**Sampled By:**	BJM
Location:			

Analyses	Result	RL	Qual	Units	MCL	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY				**EPA 300.0**		Analyst: **DV**
Fluoride	< 0.100	0.100		mg/L	4.00	4/25/2025 6:28:00 PM
Chloride	14.2	0.200		mg/L		4/25/2025 6:28:00 PM
Nitrite	< 0.100	0.100		mg/L	1.00	4/25/2025 6:28:00 PM
Nitrate	0.491	0.100		mg/L	10.0	4/25/2025 6:28:00 PM
Sulfate	5.36	0.500		mg/L		4/25/2025 6:28:00 PM
CYANIDE, DRINKING WATER				**SM4500CN-E-2021**		Analyst: **TE**
Cyanide, Total	< 0.00600	0.00600		mg/L	0.200	4/29/2025 1:35:11 PM
HARDNESS, TOTAL				**EPA 130.1**		Analyst: **AB**
Hardness (As CaCO3)	188	10.0		mg/L CaCO3		4/28/2025 3:39:20 PM
HYDROGEN ION (PH)				**SM 4500-H+B**		Analyst: **SC**
pH	7.78	0		pH Units		4/25/2025 4:50:08 PM
PHOSPHOROUS, ORTHO AS PO4				**SM4500-PF-2021**		Analyst: **AB**
Phosphorus, Total Orthophosphate (As PO4)	< 0.0750	0.0750		mg/L		4/25/2025 4:00:00 PM
SPECIFIC CONDUCTANCE				**EPA 120.1**		Analyst: **KF**
Specific Conductivity	407	1.00		µmhos/cm		4/25/2025 4:52:20 PM
TEMPERATURE				**SM2550B-2010**		Analyst: **SC**
Temperature	18.0	0	H	°C		4/25/2025 4:51:11 PM

Qualifiers:

<	Not Detected at the Reporting Limit	H	Holding times for preparation or analysis exceeded
MCL	Maximum Contaminant Level	PL	Permit Limit
RL	Reporting Limit	S	Spike Recovery outside accepted recovery limits

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Prein&Newhof
Engineers ▪ Surveyors ▪ Environmental ▪ Laboratory

Analytical Report

(DW)

WO#: **2504J14**

Date Reported: **5/21/2025**

CLIENT:	Williams & Works	**Collection Date**	4/24/2025 8:30:00 AM
Project:	Pellston	**Received Date:**	4/25/2025 3:00:00 PM
Lab ID:	2504J14-02	**Matrix:**	DRINKING WATER
Client Sample ID:	Test Well - Site 3	**Sampled By:**	BJM
Location:			

Analyses	Result	RL	Qual	Units	MCL	Date Analyzed
PFAS, DRINKING WATER			**EPA 537.1**			Analyst: **JS**
PFBS	6.0	2.0		ng/L		5/7/2025 12:22:00 AM
PFHxA	< 2.0	2.0		ng/L		5/7/2025 12:22:00 AM
HFPO-DA	< 2.0	2.0		ng/L	10	5/7/2025 12:22:00 AM
PFHxS	< 2.0	2.0		ng/L	10	5/7/2025 12:22:00 AM
PFHpA	< 2.0	2.0		ng/L		5/7/2025 12:22:00 AM
ADONA	< 2.0	2.0		ng/L		5/7/2025 12:22:00 AM
PFOA	< 2.0	2.0		ng/L	4.0	5/7/2025 12:22:00 AM
PFOS	< 2.0	2.0		ng/L	4.0	5/7/2025 12:22:00 AM
PFNA	< 2.0	2.0		ng/L	10	5/7/2025 12:22:00 AM
9Cl-PF3ONS	< 2.0	2.0		ng/L		5/7/2025 12:22:00 AM
PFDA	< 2.0	2.0		ng/L		5/7/2025 12:22:00 AM
NMeFOSAA	< 2.0	2.0		ng/L		5/7/2025 12:22:00 AM
NEtFOSAA	< 2.0	2.0		ng/L		5/7/2025 12:22:00 AM
PFUnA	< 2.0	2.0		ng/L		5/7/2025 12:22:00 AM
11Cl-PF3OUdS	< 2.0	2.0		ng/L		5/7/2025 12:22:00 AM
PFDoA	< 2.0	2.0		ng/L		5/7/2025 12:22:00 AM
PFTrDA	< 2.0	2.0		ng/L		5/7/2025 12:22:00 AM
PFTA	< 2.0	2.0		ng/L		5/7/2025 12:22:00 AM
PFAS Hazard Index	< 0.19	0.19		ng/L	1.0	5/7/2025 12:22:00 AM
Surr: d5-N-EtFOSAA	76.2	70 - 130		%Rec		5/7/2025 12:22:00 AM
Surr: M3HFPO-DA	107	70 - 130		%Rec		5/7/2025 12:22:00 AM
Surr: MPFDA	110	70 - 130		%Rec		5/7/2025 12:22:00 AM
Surr: MPFHxA	92.6	70 - 130		%Rec		5/7/2025 12:22:00 AM

Qualifiers:

<	Not Detected at the Reporting Limit	H	Holding times for preparation or analysis exceeded
MCL	Maximum Contaminant Level	PL	Permit Limit
RL	Reporting Limit	S	Spike Recovery outside accepted recovery limits

Original

3260 Evergreen Drive, NE Grand Rapids, MI 49525 t.616-364-7600 www.preinnewhof.com

Analytical Report

(DW)

WO#: **2504J14**

Date Reported: **5/21/2025**

CLIENT:	Williams & Works	**Collection Date**	
Project:	Pellston	**Received Date:**	4/25/2025 3:00:00 PM
Lab ID:	2504J14-03	**Matrix:**	TRIP BLANK
Client Sample ID:	Trip Blank	**Sampled By:**	BJM
Location:			

Analyses	Result	RL	Qual	Units	MCL	Date Analyzed
VOLATILE ORGANICS, DRINKING WATER				**EPA 524.2**		Analyst: **JS**
1,1,1,2-Tetrachloroethane	< 0.000500	0.000500		mg/L		4/29/2025 7:20:00 PM
1,1,1-Trichloroethane	< 0.000500	0.000500		mg/L	0.200	4/29/2025 7:20:00 PM
1,1,2,2-Tetrachloroethane	< 0.000500	0.000500		mg/L		4/29/2025 7:20:00 PM
1,1,2-Trichloroethane	< 0.000500	0.000500		mg/L	0.0050	4/29/2025 7:20:00 PM
1,1-Dichloroethane	< 0.000500	0.000500		mg/L		4/29/2025 7:20:00 PM
1,1-Dichloroethene	< 0.000500	0.000500		mg/L	0.0070	4/29/2025 7:20:00 PM
1,1-Dichloropropene	< 0.000500	0.000500		mg/L		4/29/2025 7:20:00 PM
1,2,3-Trichlorobenzene	< 0.000500	0.000500		mg/L		4/29/2025 7:20:00 PM
1,2,3-Trichloropropane	< 0.000500	0.000500		mg/L		4/29/2025 7:20:00 PM
1,2,4-Trichlorobenzene	< 0.000500	0.000500		mg/L	0.0700	4/29/2025 7:20:00 PM
1,2,4-Trimethylbenzene	< 0.000500	0.000500		mg/L		4/29/2025 7:20:00 PM
1,2-Dibromo-3-chloropropane	< 0.000500	0.000500		mg/L		4/29/2025 7:20:00 PM
1,2-Dibromoethane	< 0.000500	0.000500		mg/L		4/29/2025 7:20:00 PM
1,2-Dichlorobenzene	< 0.000500	0.000500		mg/L	0.600	4/29/2025 7:20:00 PM
1,2-Dichloroethane	< 0.000500	0.000500		mg/L	0.0050	4/29/2025 7:20:00 PM
1,2-Dichloropropane	< 0.000500	0.000500		mg/L	0.0050	4/29/2025 7:20:00 PM
1,3,5-Trimethylbenzene	< 0.000500	0.000500		mg/L		4/29/2025 7:20:00 PM
1,3-Dichlorobenzene	< 0.000500	0.000500		mg/L		4/29/2025 7:20:00 PM
1,3-Dichloropropane	< 0.000500	0.000500		mg/L		4/29/2025 7:20:00 PM
1,4-Dichlorobenzene	< 0.000500	0.000500		mg/L	0.0750	4/29/2025 7:20:00 PM
2,2-Dichloropropane	< 0.000500	0.000500		mg/L		4/29/2025 7:20:00 PM
2-Butanone	< 0.00100	0.00100		mg/L		4/29/2025 7:20:00 PM
2-Chlorotoluene	< 0.000500	0.000500		mg/L		4/29/2025 7:20:00 PM
4-Chlorotoluene	< 0.000500	0.000500		mg/L		4/29/2025 7:20:00 PM
4-Isopropyltoluene	< 0.000500	0.000500		mg/L		4/29/2025 7:20:00 PM
4-Methyl-2-pentanone	< 0.00100	0.00100		mg/L		4/29/2025 7:20:00 PM
Benzene	< 0.000500	0.000500		mg/L	0.0050	4/29/2025 7:20:00 PM
Bromobenzene	< 0.000500	0.000500		mg/L		4/29/2025 7:20:00 PM
Bromochloromethane	< 0.000500	0.000500		mg/L		4/29/2025 7:20:00 PM
Bromodichloromethane	< 0.000500	0.000500		mg/L	0.0800	4/29/2025 7:20:00 PM
Bromoform	< 0.000500	0.000500		mg/L	0.0800	4/29/2025 7:20:00 PM
Bromomethane	< 0.000500	0.000500		mg/L		4/29/2025 7:20:00 PM
Carbon tetrachloride	< 0.000500	0.000500		mg/L	0.0050	4/29/2025 7:20:00 PM
Chlorobenzene	< 0.000500	0.000500		mg/L	0.100	4/29/2025 7:20:00 PM

Qualifiers:

<	Not Detected at the Reporting Limit
MCL	Maximum Contaminant Level
RL	Reporting Limit
H	Holding times for preparation or analysis exceeded
PL	Permit Limit
S	Spike Recovery outside accepted recovery limits

Original

3260 Evergreen Drive, NE Grand Rapids, MI 49525 t.616-364-7600 www.preinnewhof.com

Analytical Report

(DW)

WO#: **2504J14**

Date Reported: **5/21/2025**

CLIENT:	Williams & Works	**Collection Date**	
Project:	Pellston	**Received Date:**	4/25/2025 3:00:00 PM
Lab ID:	2504J14-03	**Matrix:**	TRIP BLANK
Client Sample ID:	Trip Blank	**Sampled By:**	BJM
Location:			

Analyses	Result	RL	Qual	Units	MCL	Date Analyzed
VOLATILE ORGANICS, DRINKING WATER				**EPA 524.2**		Analyst: **JS**
Chloroethane	< 0.000500	0.000500		mg/L		4/29/2025 7:20:00 PM
Chloroform	< 0.000500	0.000500		mg/L	0.0800	4/29/2025 7:20:00 PM
Chloromethane	< 0.000500	0.000500		mg/L		4/29/2025 7:20:00 PM
cis-1,2-Dichloroethene	< 0.000500	0.000500		mg/L	0.0700	4/29/2025 7:20:00 PM
cis-1,3-Dichloropropene	< 0.000500	0.000500		mg/L		4/29/2025 7:20:00 PM
Dibromochloromethane	< 0.000500	0.000500		mg/L	0.0800	4/29/2025 7:20:00 PM
Dibromomethane	< 0.000500	0.000500		mg/L		4/29/2025 7:20:00 PM
Dichlorodifluoromethane	< 0.000500	0.000500		mg/L		4/29/2025 7:20:00 PM
Ethylbenzene	< 0.000500	0.000500		mg/L	0.0700	4/29/2025 7:20:00 PM
Hexachlorobutadiene	< 0.000500	0.000500		mg/L		4/29/2025 7:20:00 PM
Isopropylbenzene	< 0.000500	0.000500		mg/L		4/29/2025 7:20:00 PM
Methyl tert-butyl ether	< 0.00100	0.00100		mg/L		4/29/2025 7:20:00 PM
Methylene chloride	< 0.00100	0.00100		mg/L	0.0050	4/29/2025 7:20:00 PM
Naphthalene	< 0.000500	0.000500		mg/L		4/29/2025 7:20:00 PM
n-Butylbenzene	< 0.000500	0.000500		mg/L		4/29/2025 7:20:00 PM
n-Propylbenzene	< 0.000500	0.000500		mg/L		4/29/2025 7:20:00 PM
sec-Butylbenzene	< 0.000500	0.000500		mg/L		4/29/2025 7:20:00 PM
Styrene	< 0.000500	0.000500		mg/L	0.100	4/29/2025 7:20:00 PM
tert-Butylbenzene	< 0.000500	0.000500		mg/L		4/29/2025 7:20:00 PM
Tetrachloroethene	< 0.000500	0.000500		mg/L	0.0050	4/29/2025 7:20:00 PM
Tetrahydrofuran	< 0.0100	0.0100		mg/L		4/29/2025 7:20:00 PM
Toluene	< 0.000500	0.000500		mg/L	1.00	4/29/2025 7:20:00 PM
trans-1,2-Dichloroethene	< 0.000500	0.000500		mg/L	0.100	4/29/2025 7:20:00 PM
trans-1,3-Dichloropropene	< 0.000500	0.000500		mg/L		4/29/2025 7:20:00 PM
Trichloroethene	< 0.000500	0.000500		mg/L	0.0050	4/29/2025 7:20:00 PM
Trichlorofluoromethane	< 0.000500	0.000500		mg/L		4/29/2025 7:20:00 PM
Vinyl chloride	< 0.000500	0.000500		mg/L	0.0020	4/29/2025 7:20:00 PM
m,p-Xylene	< 0.000500	0.000500		mg/L	10.0	4/29/2025 7:20:00 PM
o-Xylene	< 0.000500	0.000500		mg/L	10.0	4/29/2025 7:20:00 PM
Trihalomethanes, Total	< 0.000500	0.000500		mg/L	0.0800	4/29/2025 7:20:00 PM
Xylenes, Total	< 0.00150	0.00150		mg/L	10.0	4/29/2025 7:20:00 PM
Surr: 1,2-Dichlorobenzene-d4	95.9	80 - 120		%Rec		4/29/2025 7:20:00 PM
Surr: 4-Bromofluorobenzene	91.7	80 - 120		%Rec		4/29/2025 7:20:00 PM

Qualifiers:

<	Not Detected at the Reporting Limit	H	Holding times for preparation or analysis exceeded
MCL	Maximum Contaminant Level	PL	Permit Limit
RL	Reporting Limit	S	Spike Recovery outside accepted recovery limits

Original

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Prein&Newhof
Engineers ▪ Surveyors ▪ Environmental ▪ Laboratory

Analytical Report

(DW)

WO#: **2504J14**

Date Reported: **5/21/2025**

CLIENT:	Williams & Works	**Collection Date**	4/25/2025 8:30:00 AM
Project:	Pellston	**Received Date:**	4/25/2025 3:00:00 PM
Lab ID:	2504J14-04	**Matrix:**	BLANK
Client Sample ID:	Field Blank	**Sampled By:**	BJM
Location:			

Analyses	Result	RL	Qual	Units	MCL	Date Analyzed
PFAS, DRINKING WATER				**EPA 537.1**		Analyst: **JS**
PFBS	< 2.0	2.0		ng/L		5/12/2025 2:19:00 PM
PFHxA	< 2.0	2.0		ng/L		5/12/2025 2:19:00 PM
HFPO-DA	< 2.0	2.0		ng/L	10	5/12/2025 2:19:00 PM
PFHxS	< 2.0	2.0		ng/L	10	5/12/2025 2:19:00 PM
PFHpA	< 2.0	2.0		ng/L		5/12/2025 2:19:00 PM
ADONA	< 2.0	2.0		ng/L		5/12/2025 2:19:00 PM
PFOA	< 2.0	2.0		ng/L	4.0	5/12/2025 2:19:00 PM
PFOS	< 2.0	2.0		ng/L	4.0	5/12/2025 2:19:00 PM
PFNA	< 2.0	2.0		ng/L	10	5/12/2025 2:19:00 PM
9Cl-PF3ONS	< 2.0	2.0		ng/L		5/12/2025 2:19:00 PM
PFDA	< 2.0	2.0		ng/L		5/12/2025 2:19:00 PM
NMeFOSAA	< 2.0	2.0		ng/L		5/12/2025 2:19:00 PM
NEtFOSAA	< 2.0	2.0		ng/L		5/12/2025 2:19:00 PM
PFUnA	< 2.0	2.0		ng/L		5/12/2025 2:19:00 PM
11Cl-PF3OUdS	< 2.0	2.0		ng/L		5/12/2025 2:19:00 PM
PFDoA	< 2.0	2.0		ng/L		5/12/2025 2:19:00 PM
PFTrDA	< 2.0	2.0		ng/L		5/12/2025 2:19:00 PM
PFTA	< 2.0	2.0		ng/L		5/12/2025 2:19:00 PM
Surr: d5-N-EtFOSAA	83.6	70 - 130		%Rec		5/12/2025 2:19:00 PM
Surr: M3HFPO-DA	92.1	70 - 130		%Rec		5/12/2025 2:19:00 PM
Surr: MPFDA	104	70 - 130		%Rec		5/12/2025 2:19:00 PM
Surr: MPFHxA	89.4	70 - 130		%Rec		5/12/2025 2:19:00 PM

Qualifiers:

<	Not Detected at the Reporting Limit	H	Holding times for preparation or analysis exceeded
MCL	Maximum Contaminant Level	PL	Permit Limit
RL	Reporting Limit	S	Spike Recovery outside accepted recovery limits

Original

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TRACE
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www.trace-labs.com

May 12, 2025

Mr. Steve Bylsma
Prein and Newhof
3260 Evergreen Drive NE
Grand Rapids, MI 49525

RE: Trace Project 25D2085
Client Project 2504J14

Dear Mr. Bylsma:

Enclosed are your analytical results. The results of this report relate only to the samples listed in the body of this report.

All reports were examined through Trace's validation process to ensure that requirements for quality and completeness were satisfied. All reported analytical results were obtained in accordance with the methods referenced on the reports. Every practical effort was made to meet the reporting limit specifications for this work, however, some limits may have been raised due to high analyte concentrations or interferences.

Trace is certified by the State of Michigan for Drinking Water Analyis.

If you have questions concerning this report, please contact me at 231.773.5998 or by email at jmink@trace-labs.com.

Sincerely,

Jon Mink
Senior Project Manager
Enclosures

STATE OF MICHIGAN LABORATORY ID: 8001

The Reg level for all analytes with the exception of Lead and Copper is the MCL, for Lead and Copper it is the AL.

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SAMPLE SUMMARY

Trace Project ID: 25D2085
Client Project ID: 2504J14

Trace ID	Sample ID	Matrix	Collected By	Date Collected	Date Received
25D2085-01	2504J14-01A	Drinking Water	Client	04/24/25 08:45	04/29/25 08:04

CERTIFICATE OF ANALYSIS

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ANALYTICAL RESULTS

Sample Location: 2504J14

Trace ID: 25D2085-01 **Date Collected:** 04/24/25 08:45
Sample Point Description: 2504J14-01A **Date Received:** 04/29/25 08:04

PARAMETERS	RESULTS	RDL	UNITS	PREPARED	BY	ANALYZED	BY	NOTES	Reg Level
CARBAMATES BY HPLC EPA 531.2									
Analysis Method: EPA 531.2									
Batch: T166557									
Aldicarb	Not Detected	0.0010	mg/L	5/6/25 12:43	jh	5/6/25 19:02	jh		0.0030
Aldicarb sulfone	Not Detected	0.00060	mg/L	5/6/25 12:43	jh	5/6/25 19:02	jh		0.0020
Aldicarb sulfoxide	Not Detected	0.0010	mg/L	5/6/25 12:43	jh	5/6/25 19:02	jh		0.0040
Propoxur	Not Detected	0.0010	mg/L	5/6/25 12:43	jh	5/6/25 19:02	jh		No MCL
Carbaryl	Not Detected	0.0010	mg/L	5/6/25 12:43	jh	5/6/25 19:02	jh		No MCL
Carbofuran	Not Detected	0.00090	mg/L	5/6/25 12:43	jh	5/6/25 19:02	jh		0.040
3-Hydroxycarbofuran	Not Detected	0.0010	mg/L	5/6/25 12:43	jh	5/6/25 19:02	jh		No MCL
Methiocarb	Not Detected	0.0010	mg/L	5/6/25 12:43	jh	5/6/25 19:02	jh		No MCL
Methomyl	Not Detected	0.0010	mg/L	5/6/25 12:43	jh	5/6/25 19:02	jh		No MCL
Oxamyl	Not Detected	0.0010	mg/L	5/6/25 12:43	jh	5/6/25 19:02	jh		0.20
Surrogates:									
BDMC	104 %	70-130		5/6/25 12:43	jh	5/6/25 19:02	jh		
SEMI-VOLATILE ORGANIC COMPOUNDS BY GC-MS									
Analysis Method: EPA 525.3									
Batch: T166530									
Alachlor	Not Detected	0.00019	mg/L	5/6/25 8:50	av	5/8/25 13:36	av		0.0020
Atrazine	Not Detected	0.00019	mg/L	5/6/25 8:50	av	5/8/25 13:36	av		0.0030
Benzo (a) pyrene	Not Detected	0.000038	mg/L	5/6/25 8:50	av	5/8/25 13:36	av		0.00020
Chlordane (tech)	Not Detected	0.00042	mg/L	5/6/25 8:50	av	5/8/25 13:36	av		0.0020
Di(2-ethylhexyl)adipate	Not Detected	0.0012	mg/L	5/6/25 8:50	av	5/8/25 13:36	av		0.40
Di(2-ethylhexyl)phthalate	Not Detected	0.0012	mg/L	5/6/25 8:50	av	5/8/25 13:36	av		0.0060
Endrin	Not Detected	0.000019	mg/L	5/6/25 8:50	av	5/8/25 13:36	av		0.0020
Heptachlor	Not Detected	0.000075	mg/L	5/6/25 8:50	av	5/8/25 13:36	av		0.00040
Heptachlor epoxide	Not Detected	0.000038	mg/L	5/6/25 8:50	av	5/8/25 13:36	av		0.00020

CERTIFICATE OF ANALYSIS

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ANALYTICAL RESULTS

Sample Location: 2504J14

Trace ID: 25D2085-01 **Date Collected:** 04/24/25 08:45
Sample Point Description: 2504J14-01A **Date Received:** 04/29/25 08:04

PARAMETERS	RESULTS	RDL	UNITS	PREPARED	BY	ANALYZED	BY	NOTES	Reg Level
SEMI-VOLATILE ORGANIC COMPOUNDS BY GC-MS									
Hexachlorobenzene	Not Detected	0.000094	mg/L	5/6/25 8:50	av	5/8/25 13:36	av		0.0010
Hexachlorocyclopentadiene	Not Detected	0.00019	mg/L	5/6/25 8:50	av	5/8/25 13:36	av		0.050
gamma-BHC (Lindane)	Not Detected	0.000038	mg/L	5/6/25 8:50	av	5/8/25 13:36	av		0.00020
Methoxychlor	Not Detected	0.000094	mg/L	5/6/25 8:50	av	5/8/25 13:36	av		0.040
Simazine	Not Detected	0.00013	mg/L	5/6/25 8:50	av	5/8/25 13:36	av		0.0040
Toxaphene	Not Detected	0.00094	mg/L	5/6/25 8:50	av	5/8/25 13:36	av		0.0030
PCBs (screen)	<0.000094	0.000094	mg/L	5/6/25 8:50	av	5/8/25 13:36	av		0.00050
Surrogates:									
1,3-Dimethyl-2-nitrobenzene	81 %	70-130		5/6/25 8:50	av	5/8/25 13:36	av		
Triphenyl phosphate	116 %	70-130		5/6/25 8:50	av	5/8/25 13:36	av		
Benzo (a) pyrene-d12	124 %	70-130		5/6/25 8:50	av	5/8/25 13:36	av		
SEMI-VOLATILE COMPOUNDS BY GC									
Analysis Method: EPA 515.4									
Batch: T166228									
Acifluorfen	Not Detected	0.0040	mg/L	4/30/25 8:10	av	5/1/25 15:35	av		No MCL
Bentazon	Not Detected	0.0020	mg/L	4/30/25 8:10	av	5/1/25 15:35	av		No MCL
2,4-D	Not Detected	0.00022	mg/L	4/30/25 8:10	av	5/1/25 15:35	av		0.070
DCPA acid metabolites	Not Detected	0.0010	mg/L	4/30/25 8:10	av	5/1/25 15:35	av		No MCL
Dicamba	Not Detected	0.0020	mg/L	4/30/25 8:10	av	5/1/25 15:35	av		No MCL
Dinoseb	Not Detected	0.00020	mg/L	4/30/25 8:10	av	5/1/25 15:35	av		0.0070
Pentachlorophenol	Not Detected	0.000040	mg/L	4/30/25 8:10	av	5/1/25 15:35	av		0.0010
Picloram	Not Detected	0.00020	mg/L	4/30/25 8:10	av	5/1/25 15:35	av		0.50
2,4,5-T	Not Detected	0.0020	mg/L	4/30/25 8:10	av	5/1/25 15:35	av		No MCL
2,4,5-TP (Silvex)	Not Detected	0.00020	mg/L	4/30/25 8:10	av	5/1/25 15:35	av		0.050
Surrogates:									
2,4-Dichlorophenylacetic acid	78 %	70-130		4/30/25 8:10	av	5/1/25 15:35	av		

CERTIFICATE OF ANALYSIS

STATE OF MICHIGAN LABORATORY ID: 8001

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ANALYTICAL RESULTS

Sample Location: 2504J14

Trace ID: 25D2085-01
Sample Point Description: 2504J14-01A

Date Collected: 04/24/25 08:45
Date Received: 04/29/25 08:04

PARAMETERS	RESULTS	RDL	UNITS	PREPARED	BY	ANALYZED	BY	NOTES	Reg Level

SEMI-VOLATILE COMPOUNDS BY GC

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QUALITY CONTROL RESULTS

Trace Project ID: 25D2085
Client Project ID: 2504J14

QC Batch: T166228
QC Batch Method: EPA 515.4
Analysis Description: SOC Herbicides
Analysis Method: EPA 515.4

METHOD BLANK: T166228-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Acifluorfen	mg/L	<0.0040	0.0040	
Bentazon	mg/L	<0.0020	0.0020	
2,4-D	mg/L	<0.00022	0.00022	
DCPA acid metabolites	mg/L	<0.0010	0.0010	
Dicamba	mg/L	<0.0020	0.0020	
Dinoseb	mg/L	<0.00020	0.00020	
Pentachlorophenol	mg/L	<0.000040	0.000040	
Picloram	mg/L	<0.00020	0.00020	
2,4,5-T	mg/L	<0.0020	0.0020	
2,4,5-TP (Silvex)	mg/L	<0.00020	0.00020	
2,4-Dichlorophenylacetic acid (S)	%	112	70-130	

MATRIX SPIKE / MATRIX SPIKE DUPLICATE: T166228-MSD1

Original: **25D2085-01**

Parameter	Units	Original Result	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD	Notes
Acifluorfen	mg/L	0	0.00100	0.00114	<0.0040	114	126	70-130	9	30	
Bentazon	mg/L	0	0.0100	0.00924	0.0109	92	109	70-130	16	30	
2,4-D	mg/L	0	0.00300	0.00343	0.00382	114	127	70-130	11	30	
DCPA acid metabolites	mg/L	0	0.00100	0.00107	0.00122	107	122	70-130	13	30	
Dicamba	mg/L	0	0.00100	0.000843	<0.0020	84	102	70-130	19	30	
Dinoseb	mg/L	0	0.00200	0.00199	0.00229	99	115	70-130	14	30	
Pentachlorophenol	mg/L	0	0.00100	0.00107	0.00118	107	118	70-130	10	30	
Picloram	**mg/L**	**0**	**0.00100**	**0.00117**	**0.00131**	**117**	**131**	**70-130**	**11**	**30**	**MS01**
2,4,5-T	mg/L	0	0.00100	0.00115	<0.0020	115	129	70-130	12	30	
2,4,5-TP (Silvex)	mg/L	0	0.00100	0.00106	0.00115	106	115	70-130	8	30	
2,4-Dichlorophenylacetic acid (S)	%		0.0250	0.0188	0.0200	75	80	70-130			

Trace Project ID: 25D2085
Client Project ID: 2504J14

CERTIFICATE OF ANALYSIS

STATE OF MICHIGAN LABORATORY ID: 8001

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QC Batch: T166303
QC Batch Method: EPA 525.3

Analysis Description: SOC - EPA 525.3
Analysis Method: EPA 525.3

Trace Project ID: 25D2085
Client Project ID: 2504J14

QC Batch: T166530
QC Batch Method: EPA 525.3

Analysis Description: SOC - EPA 525.3
Analysis Method: EPA 525.3

METHOD BLANK: T166530-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Alachlor	mg/L	<0.00020	0.00020	
Atrazine	mg/L	<0.00020	0.00020	
Benzo (a) pyrene	mg/L	<0.000040	0.000040	
Chlordane (tech)	mg/L	<0.00044	0.00044	
Di(2-ethylhexyl)adipate	mg/L	<0.0013	0.0013	
Di(2-ethylhexyl)phthalate	mg/L	<0.0013	0.0013	
Endrin	mg/L	<0.000020	0.000020	
Heptachlor	mg/L	<0.000080	0.000080	
Heptachlor epoxide	mg/L	<0.000040	0.000040	
Hexachlorobenzene	mg/L	<0.00010	0.00010	
Hexachlorocyclopentadiene	mg/L	<0.00020	0.00020	
gamma-BHC (Lindane)	mg/L	<0.000040	0.000040	
Methoxychlor	mg/L	<0.00010	0.00010	
Simazine	mg/L	<0.00014	0.00014	
Toxaphene	mg/L	<0.0010	0.0010	
PCBs (screen)	mg/L	<0.00010	0.00010	
1,3-Dimethyl-2-nitrobenzene (S)	%	86	70-130	
Triphenyl phosphate (S)	%	111	70-130	
Benzo (a) pyrene-d12 (S)	%	119	70-130	

LABORATORY CONTROL SAMPLE: T166530-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Alachlor	mg/L	0.000600	0.000755	126	70-130	
Atrazine	mg/L	0.000600	0.000739	123	70-130	
Benzo (a) pyrene	mg/L	0.00120	0.00142	118	70-130	
Di(2-ethylhexyl)adipate	mg/L	0.0600	0.0531	88	70-130	
Di(2-ethylhexyl)phthalate	mg/L	0.0600	0.0542	90	70-130	
Endrin	mg/L	0.000600	0.000776	129	70-130	

CERTIFICATE OF ANALYSIS

STATE OF MICHIGAN LABORATORY ID: 8001

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2241 Black Creek Road
Muskegon, MI 49444-2673

231-773-5998 Phone
888-979-4469 Fax
www.trace-labs.com

LABORATORY CONTROL SAMPLE: T166530-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Heptachlor	mg/L	0.000600	0.000685	114	70-130	
Heptachlor epoxide	mg/L	0.000600	0.000716	119	70-130	
Hexachlorobenzene	mg/L	0.00120	0.00115	96	60-140	
Hexachlorocyclopentadiene	mg/L	0.000600	0.000550	92	60-140	
gamma-BHC (Lindane)	mg/L	0.000600	0.000691	115	70-130	
Methoxychlor	mg/L	0.000600	0.000757	126	70-130	
Simazine	mg/L	0.000600	0.000763	127	70-130	
1,3-Dimethyl-2-nitrobenzene (S)	%	0.000500	0.000446	89	70-130	
Triphenyl phosphate (S)	%	0.000500	0.000468	94	70-130	
Benzo (a) pyrene-d12 (S)	%	0.000500	0.000643	129	70-130	

LABORATORY CONTROL SAMPLE: T166530-BS2

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Toxaphene	mg/L	0.00600	0.00761	127	70-130	
1,3-Dimethyl-2-nitrobenzene (S)	%	0.000500	0.000411	82	70-130	
Triphenyl phosphate (S)	%	0.000500	0.000551	110	70-130	
Benzo (a) pyrene-d12 (S)	%	0.000500	0.000572	114	70-130	

Trace Project ID: 25D2085
Client Project ID: 2504J14

QC Batch: T166557
QC Batch Method: EPA 531.2

Analysis Description: Carbamates by HPLC
Analysis Method: EPA 531.2

METHOD BLANK: T166557-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Aldicarb	mg/L	<0.0010	0.0010	
Aldicarb sulfone	mg/L	<0.00060	0.00060	
Aldicarb sulfoxide	mg/L	<0.0010	0.0010	
Propoxur	mg/L	<0.0010	0.0010	
Carbaryl	mg/L	<0.0010	0.0010	
Carbofuran	mg/L	<0.00090	0.00090	
3-Hydroxycarbofuran	mg/L	<0.0010	0.0010	
Methiocarb	mg/L	<0.0010	0.0010	
Methomyl	mg/L	<0.0010	0.0010	
Oxamyl	mg/L	<0.0010	0.0010	

CERTIFICATE OF ANALYSIS

STATE OF MICHIGAN LABORATORY ID: 8001

The Reg level for all analytes with the exception of Lead and Copper is the MCL, for Lead and Copper it is the AL.

Trace Analytical Laboratories, Inc.
2241 Black Creek Road
Muskegon, MI 49444-2673

231-773-5998 Phone
888-979-4469 Fax
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METHOD BLANK: T166557-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
BDMC (S)	%	104	70-130	

LABORATORY CONTROL SAMPLE: T166557-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Aldicarb	mg/L	0.00200	0.00228	114	70-130	
Aldicarb sulfone	mg/L	0.00200	0.00248	124	70-130	
Aldicarb sulfoxide	mg/L	0.00200	0.00256	128	70-130	
Propoxur	mg/L	0.00200	0.00228	114	70-130	
Carbaryl	mg/L	0.00200	0.00216	108	70-130	
Carbofuran	mg/L	0.00200	0.00231	115	70-130	
3-Hydroxycarbofuran	mg/L	0.00200	0.00253	126	70-130	
Methiocarb	mg/L	0.00200	0.00224	112	70-130	
Methomyl	mg/L	0.00200	0.00240	120	70-130	
Oxamyl	mg/L	0.00200	0.00246	123	70-130	
BDMC (S)	%	0.00200	0.00221	111	70-130	

CERTIFICATE OF ANALYSIS

STATE OF MICHIGAN LABORATORY ID: 8001

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AN EXPLANATION OF TERMS AND SYMBOLS WHICH MAY OCCUR IN THIS REPORT

DEFINITIONS

MS	Matrix Spike
RPD	Relative Percent Difference
DUP	Matrix Duplicate
RDL	Reporting Detection Limit
MCL	Maximum Contamination Level as set by the Federal Safe Drinking Water Act
AL	Action Level as set by the Federal Safe Drinking Water Act
Not Detected	Indicates that the compound was not detected at the RDL
TNTC	Too Numerous To Count
Reg Level	Reg Level for all analytes except Lead and Copper is the MCL, for Lead and Copper it is the AL

Results that are reported in bold or red have equalled or exceeded the regulatory level.

DATA QUALIFIERS

Trace ID: T166228-MSD1

Analysis: EPA 515.4

Picloram	Note MS01 : One of the following: MS, MSD or RPD was out of control. Because two of the results are in control, no data requires qualification.

CERTIFICATE OF ANALYSIS

STATE OF MICHIGAN LABORATORY ID: 8001

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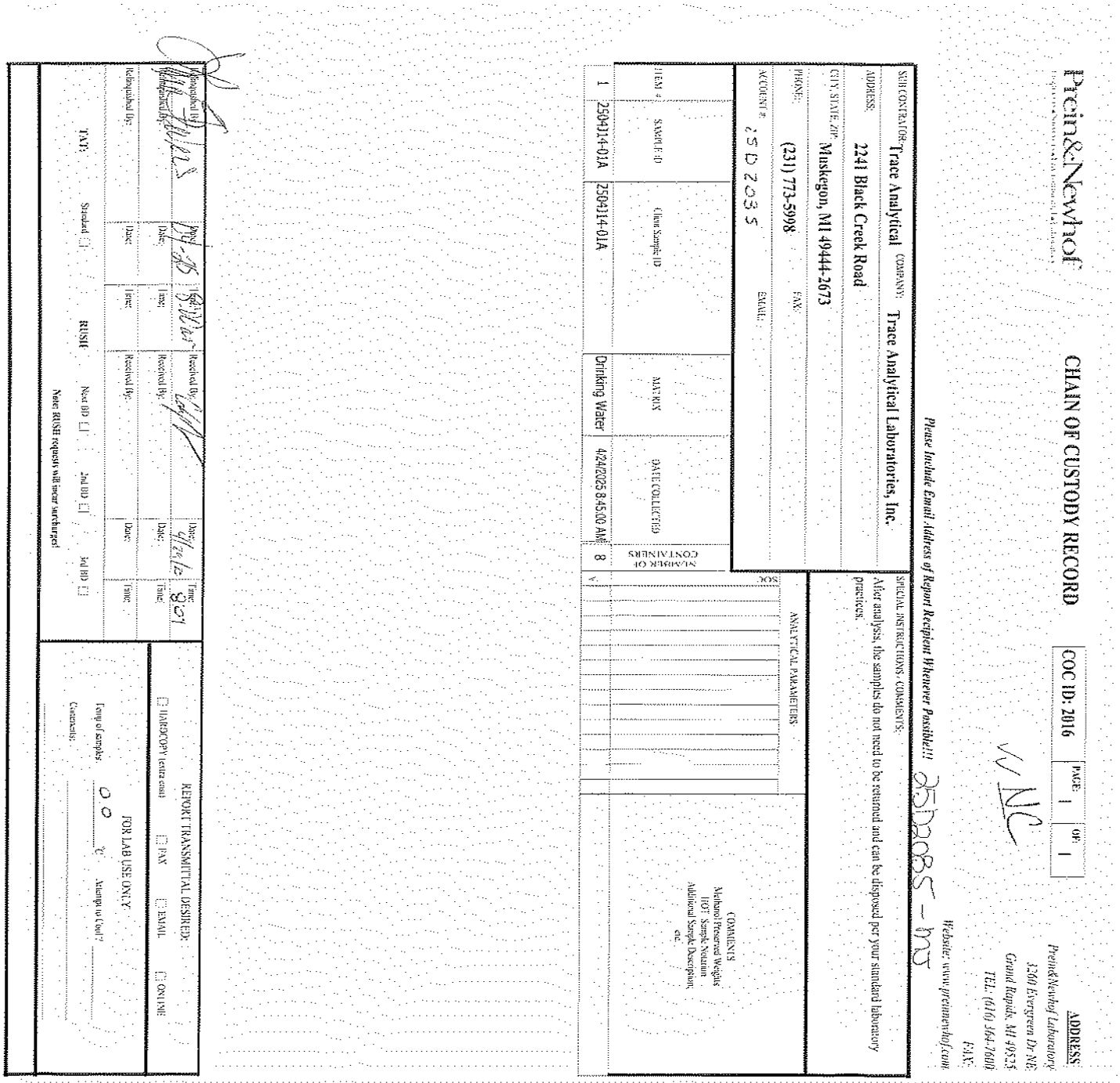

CERTIFICATE OF ANALYSIS

STATE OF MICHIGAN LABORATORY ID: 8001

The Reg level for all analytes with the exception of Lead and Copper is the MCL, for Lead and Copper it is the AL.

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25D2085
Prein and Newhof
Project Manager: Jon Mink

Sample Log In Checklist

	Original Observation	Corrected Temperature	IR-9 (CF: +0.1°C)	IR-12 (CF: 0.0°C)	IR-13 (CF: 0.0°C)	SR1 (CF: -0.4°C)	SR2 (CF: -0.1°C)	Temp Blank	Client Sample
Date: 4/29/25									
Time: 804									
Initials: CM									
Package Description: Bagged cooler									
Package Temp °C	0.6	0.6		X					
Representative Sample Temp °C	1.1	1.1		X					X

Sample Receipt

Yes No
- [x] [ ] Received on ice or other coolant
- [x] [ ] Ice still present upon receipt
- [ ] [x] Custody seals present — [ ] Yes [ ] No Custody seals intact (if applicable)
- [ ] Trace Courier [x] Client Drop-off [ ] UPS [ ] Fed Ex [ ] US Mail [ ] Other

Sample Condition

Yes No N/A
- [x] [ ] [ ] All sample containers arrived unbroken and labeled
- [x] [ ] [ ] Sufficient sample to run requested analyses
- [x] [ ] [ ] Correct chemical preservative added to samples
- [ ] [x] [ ] Samples preserved at Trace
- [ ] [ ] [x] Chemical preservation verified, check EMD pH test strip used (if applicable)
  - [ ] pH 0-2.5 (Lot: HC311850) [ ] pH 11.0-13.0 (Lot: HC022540) [ ] Other
- [x] [ ] [ ] Air bubbles absent from VOAs

Chain of Custody (COC)

Yes No
- [x] [ ] All bottle labels agree with COC
- [x] [ ] COC filled out properly
- [x] [ ] COC signed by client

Notes:

Form 70-A.57
Effective 2/20/25

TRACE Analytical Laboratories, Inc.

CERTIFICATE OF ANALYSIS

STATE OF MICHIGAN LABORATORY ID: 8001

The Reg level for all analytes with the exception of Lead and Copper is the MCL, for Lead and Copper it is the AL.

Pace Analytical Services, LLC
225 Industrial Park RD
Beaver, WV 25813
(800)999-0105

May 21, 2025

Stephen Bylsma
Prein & Newhof
3260 Evergreen Drive NE
Grand Rapids, MI 49525

RE: Project: 2504J14
Pace Project No.: 30775005

Dear Stephen Bylsma:

Enclosed are the analytical results for sample(s) received by the laboratory on April 29, 2025. The results relate only to the samples included in this report. Results reported herein conform to the applicable TNI/NELAC Standards and the laboratory's Quality Manual, where applicable, unless otherwise noted in the body of the report.

The test results provided in this final report were generated by each of the following laboratories within the Pace Network:

- Pace Analytical Services - Greensburg

(Greensburg, PA) - Revision 1 - This report replaces the 5/20/25 report. This project was revised on 5/21/25 to correct the sample ID.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Skyler C. Richmond
skyler.richmond@pacelabs.com
(724)850-5600
Project Manager

Enclosures

Pace Analytical Services, LLC
225 Industrial Park RD
Beaver, WV 25813
(800)999-0105

CERTIFICATIONS

Project: 2504J14
Pace Project No.: 30775005

Pace Analytical Services Pennsylvania
1638 Roseytown Rd Suites 2,3&4, Greensburg, PA 15601
ANAB DOD-ELAP Rad Accreditation #: L2417
ANABISO/IEC 17025:2017 Rad Cert#: L24170
Alabama Certification #: 41590
Arizona Certification #: AZ0734
Arkansas Certification
California Certification #: 2950
Colorado Certification #: PA01547
Connecticut Certification #: PH-0694
EPA Region 4 DW Rad
Florida/TNI Certification #: E87683
Georgia Certification #: C040
Guam Certification
Hawaii Certification
Idaho Certification
Illinois Certification
Indiana Certification
Iowa Certification #: 391
Kansas Certification #: E-10358
Kentucky Certification #: KY90133
KY WW Permit #: KY0098221
KY WW Permit #: KY0000221
Louisiana DHH/TNI Certification #: LA010
Louisiana DEQ/TNI Certification #: 04086
Maine Certification #: 2023021
Maryland Certification #: 308
Massachusetts Certification #: M-PA1457
Michigan/PADEP Certification #: 9991
Missouri Certification #: 235
Montana Certification #: Cert0082
Nebraska Certification #: NE-OS-29-14
Nevada Certification #: PA014572023-03
New Hampshire/TNI Certification #: 297622
New Jersey/TNI Certification #: PA051
New Mexico Certification #: PA01457
New York/TNI Certification #: 10888
North Carolina Certification #: 42706
North Dakota Certification #: R-190
Ohio EPA Rad Approval: #41249
Oregon/TNI Certification #: PA200002-015
Pennsylvania/TNI Certification #: 65-00282
Puerto Rico Certification #: PA01457
Rhode Island Certification #: 65-00282
South Dakota Certification
Tennessee Certification #: TN02867
Texas/TNI Certification #: T104704188-22-18
Utah/TNI Certification #: PA014572223-14
USDA Soil Permit #: 525-23-67-77263
Vermont Dept. of Health: ID# VT-0282
Virgin Island/PADEP Certification
Virginia/VELAP Certification #: 460198
Washington Certification #: C868
West Virginia DEP Certification #: 143
West Virginia DHHR Certification #: 9964C
Wisconsin Approve List for Rad

Pace Analytical Services, LLC
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Beaver, WV 25813
(800)999-0105

SAMPLE SUMMARY

Project: 2504J14
Pace Project No.: 30775005

Lab ID	Sample ID	Matrix	Date Collected	Date Received
30775005001	**2504J14-01A**	Drinking Water	04/24/25 08:45	04/29/25 10:20

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SAMPLE ANALYTE COUNT

Project: 2504J14
Pace Project No.: 30775005

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
30775005001	**2504J14-01A**	EPA 900.0	REH1	1	PASI-PA
		EPA 903.1	LL1	1	PASI-PA
		EPA 904.0	JJS1	1	PASI-PA

PASI-PA = Pace Analytical Services - Greensburg

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PROJECT NARRATIVE

Project: 2504J14
Pace Project No.: 30775005

Method: **EPA 900.0**
Description: 900.0 Gross Alpha/Beta
Client: Prein & Newhof
Date: May 21, 2025

General Information:
1 sample was analyzed for EPA 900.0 by Pace Analytical Services Greensburg. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

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Beaver, WV 25813
(800)999-0105

PROJECT NARRATIVE

Project: 2504J14
Pace Project No.: 30775005

Method: **EPA 903.1**
Description: 903.1 Radium 226, DW
Client: Prein & Newhof
Date: May 21, 2025

General Information:
1 sample was analyzed for EPA 903.1 by Pace Analytical Services Greensburg. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

Pace Analytical Services, LLC
225 Industrial Park RD
Beaver, WV 25813
(800)999-0105

PROJECT NARRATIVE

Project: 2504J14
Pace Project No.: 30775005

Method: **EPA 904.0**
Description: 904.0 Radium 228, DW
Client: Prein & Newhof
Date: May 21, 2025

General Information:
1 sample was analyzed for EPA 904.0 by Pace Analytical Services Greensburg. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

This data package has been reviewed for quality and completeness and is approved for release.

Pace Analytical Services, LLC
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Beaver, WV 25813
(800)999-0105

ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: 2504J14
Pace Project No.: 30775005

Sample: 2504J14-01A **Lab ID: 30775005001** Collected: 04/24/25 08:45 Received: 04/29/25 10:20 Matrix: Drinking Water
PWS: Site ID: Sample Type:

Comments: • Matrix not listed on chain of custody confirmed via email.

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
	Pace Analytical Services - Greensburg					
Gross Alpha	EPA 900.0	**-1.90 ± 0.879 (2.06) C:NA T:NA**	pCi/L	05/19/25 19:05	12587-46-1	
	Pace Analytical Services - Greensburg					
Radium-226	EPA 903.1	**0.162 ± 0.410 (0.761) C:NA T:94%**	pCi/L	05/16/25 15:23	13982-63-3	
	Pace Analytical Services - Greensburg					
Radium-228	EPA 904.0	**0.698 ± 0.364 (0.685) C:83% T:78%**	pCi/L	05/16/25 10:50	15262-20-1	

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QUALITY CONTROL - RADIOCHEMISTRY

Project: 2504J14
Pace Project No.: 30775005

QC Batch: 743046
QC Batch Method: EPA 903.1
Analysis Method: EPA 903.1
Analysis Description: 903.1 Radium-226, DW
Laboratory: Pace Analytical Services - Greensburg
Associated Lab Samples: 30775005001

METHOD BLANK: 3616036 Matrix: Drinking Water
Associated Lab Samples: 30775005001

Parameter	Act ± Unc (MDC) Carr Trac	Units	Analyzed	Qualifiers
Radium-226	0.128 ± 0.346 (0.643) C:NA T:92%	pCi/L	05/16/25 15:11	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

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(800)999-0105

QUALITY CONTROL - RADIOCHEMISTRY

Project: 2504J14
Pace Project No.: 30775005

QC Batch: 744061
QC Batch Method: EPA 900.0
Analysis Method: EPA 900.0
Analysis Description: 900.0 Gross Alpha/Beta
Laboratory: Pace Analytical Services - Greensburg
Associated Lab Samples: 30775005001

METHOD BLANK: 3621581 Matrix: Drinking Water
Associated Lab Samples: 30775005001

Parameter	Act ± Unc (MDC) Carr Trac	Units	Analyzed	Qualifiers
Gross Alpha	-0.513 ± 0.558 (1.99) C:NA T:NA	pCi/L	05/16/25 12:03	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

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(800)999-0105

QUALITY CONTROL - RADIOCHEMISTRY

Project: 2504J14
Pace Project No.: 30775005

QC Batch: 743048
QC Batch Method: EPA 904.0
Analysis Method: EPA 904.0
Analysis Description: 904.0 Radium 228, DW
Laboratory: Pace Analytical Services - Greensburg
Associated Lab Samples: 30775005001

METHOD BLANK: 3616037 Matrix: Drinking Water
Associated Lab Samples: 30775005001

Parameter	Act ± Unc (MDC) Carr Trac	Units	Analyzed	Qualifiers
Radium-228	0.895 ± 0.344 (0.578) C:81% T:87%	pCi/L	05/16/25 10:48	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

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Beaver, WV 25813
(800)999-0105

QUALIFIERS

Project: 2504J14
Pace Project No.: 30775005

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Reported results are not rounded until the final step prior to reporting. Therefore, calculated parameters that are typically reported as "Total" may vary slightly from the sum of the reported component parameters.

Act - Activity

Unc - Uncertainty: For Safe Drinking Water Act (SDWA) analyses, the reported Unc. Is the calculated Count Uncertainty (95% confidence interval) using a coverage factor of 1.96. For all other matrices (non-SDWA), the reported Unc. is the calculated Expanded Uncertainty (aka Combined Standard Uncertainty, CSU), reported at the 95% confidence interval using a coverage factor of 1.96.

Gamma Spec: The Unc. reported for all gamma-spectroscopy analyses (EPA 901.1), is the calculated Expanded Uncertainty (CSU) at the 95.4% confidence interval, using a coverage factor of 2.0.

(MDC) - Minimum Detectable Concentration

Trac - Tracer Recovery (%)

Carr - Carrier Recovery (%)

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

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Beaver, WV 25813
(800)999-0105

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: 2504J14
Pace Project No.: 30775005

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
30775005001	**2504J14-01A**	EPA 900.0	744061		
30775005001	**2504J14-01A**	EPA 903.1	743046		
30775005001	**2504J14-01A**	EPA 904.0	743048		

Prein&Newhof

WO#: 30775005

30775005

CHAIN OF CUSTODY RECORD

COC ID: 2015	PAGE: 1	OF: 1

ADDRESS
Prein&Newhof Laboratory
3260 Evergreen Dr NE
Grand Rapids, MI 49525
TEL: (616) 364-7600
FAX:
Website: www.preinnewhof.com

sbylsma@preinnewhof.com

Please Include Email Address of Report Recipient Whenever Possible!!!

SUB CONTRATOR: **Pace** COMPANY:

ADDRESS:

CITY, STATE, ZIP:

PHONE: FAX:

ACCOUNT #: EMAIL:

SPECIAL INSTRUCTIONS / COMMENTS:
After analysis, the samples do not need to be returned and can be disposed per your standard laboratory practices.

ITEM #	SAMPLE ID	Client Sample ID	MATRIX	DATE COLLECTED	NUMBER OF CONTAINERS	ANALYTICAL PARAMETERS: GROSS ALPHA	RADIUM 226	RADIUM 228	COMMENTS: Methanol Preserved Weights, HOT Sample Notation, Additional Sample Description, etc.
1	2504J14-01A	2504J14-01A		4/24/2025 8:45:00 AM	1	√	√	√	001

Received by Pace Greensburg
Therm ID ___ Corr Factor +/- ___
Receipt Temp ___
Corrected Temp ___
Correct Preservation Y/N

Relinquished By:	Date: 4/25/25	Time: 1530	Received By: BKH	Date: 4.29.25	Time: 1020
Relinquished By:	Date:	Time:	Received By:	Date:	Time:
Relinquished By:	Date:	Time:	Received By:	Date:	Time:

TAT: Standard ☐ RUSH Next BD ☐ 2nd BD ☐ 3rd BD ☐

Note: RUSH requests will incur surcharges!

REPORT TRANSMITTAL DESIRED:
☐ HARDCOPY (extra cost) ☐ FAX ☐ EMAIL ☐ ONLINE

FOR LAB USE ONLY
Temp of samples ____ °C Attempt to Cool ? ____
Comments: ____

Pace ANALYTICAL SERVICES

DC#_Title: ENV-FRM-GBUR-0088 v07_Samp' Greensburg

Effective Date: 01/04/2024

WO# : 30775005

PM: SCR Due Date: 05/20/25

CLIENT: BV-PREINNEWH

Client Name: Prem and Newhof

Courier: ☐ Fed Ex ☒ UPS ☐ USPS ☐ Client ☐ Commercial ☐ Pace ☐ Other

Tracking Number: 1Z 466 595 03 5251 9484

Initial / Date

Examined By: VB 4.29.25

Labeled By: VB 4.29.25

Temped By: ____

Custody Seal on Cooler/Box Present: ☐ Yes ☒ No Seals Intact: ☐ Yes ☒ No

Thermometer Used: ____ Type of Ice: Wet Blue (None)

Cooler Temperature: Observed Temp ____ °C Correction Factor: ____ °C Final Temp: ____ °C

Temp should be above freezing to 6°C

pH paper Lot# 160344 | D.P.D. Residual Chlorine Lot #

Comments:	Yes	No	NA	
Chain of Custody Present	X			1.
Chain of Custody Filled Out:	X			2.
-Were client corrections present on COC		X		
Chain of Custody Relinquished	X			3.
Sampler Name & Signature on COC:		X		4.
Sample Labels match COC:	X			5.
-Includes date/time/ID				
Matrix: DW				No matrix on COC logged as DW per PM.
Samples Arrived within Hold Time:	X			6.
Short Hold Time Analysis (<72hr remaining):		X		7.
Rush Turn Around Time Requested:		X		8.
Sufficient Volume:	X			9.
Correct Containers Used:	X			10.
-Pace Containers Used		X		
Containers Intact:	X			11.
Orthophosphate field filtered:			X	12.
Hex Cr Aqueous samples field filtered:			>	13.
Organic Samples checked for dichlorination			X	14:
Filtered volume received for dissolved tests:			X	15:
All containers checked for preservation:	X			16.
exceptions: VOA, coliform, TOC, O&G, Phenolics, Radon, non-aqueous matrix				pH<2
All containers meet method preservation requirements:	X			Initial when completed VB Date/Time of Preservation
				Lot# of added Preservative
8260C/D: Headspace in VOA Vials (> 6mm)			X	17.
624.1: Headspace in VOA Vials (0mm)			X	18.
Radon: Headspace in RAD Vials (0mm)			X	19.
Trip Blank Present:			X	Trip blank custody seal present? YES or NO
Rad Samples Screened <.05 mrem/hr.	✓			Initial when completed BSC Date: 4.29.25 Survey Meter SN: 350143380

Comments:

Note: For NC compliance samples with discrepancies, a copy of this form must be sent to the DEHNR Certification office.
PM Review is documented electronically in LIMS through the SRF Review schedule in the Workorder Edit Screen.

Qualtrax ID: 55680

Client

Site 2504524

Page 1 of 1

Profile/EZ Login Number 19342

Notes

Sample Line Item	Matrix	Amber Glass					Plastic								Vials					Other									
		AG1H	AG3S	AG3U	AG5U	AG5T	BP1N	BP1U	BP2S	BP2U	BP3B	BP3N	BP3S	BP3U	DG9S	VG9H	VG9T	VG9U	VOAK	WGFU	WGKU	ZPLC	GCUB	GJN	12GN	AG1U	BG1U	BP2N	
001	DW						3																						

Container Codes

Glass

GJN	1 Gallon Jug with HNO3	DG9S	40mL amber VOA vial H2SO4
AG5U	100mL amber glass unpreserved	VG9U	40mL clear VOA vial
AG5T	100mL amber glass Na Thiosulfate	VG9T	40mL clear VOA vial Na Thiosulfate
GJN	1 Gallon Jug	VG9H	40mL clear VOA vial HCl
AG1S	1L amber glass H2SO4	JGFU	4oz amber wide jar
AG1H	1L amber glass HCl	WGFU	4oz wide jar unpreserved
AG1T	1L amber glass NA Thiosulfate	BG2U	500mL clear gl[illegible]reserved
BG1U	1L clear glass unpreserved	AG2U	500mL amber
AG3S	250mL amber glass H2SO4	WGKU	8oz wide jar
AG3U	250mL amber glass unpreserved	GN	General

Plastic/Misc.

GCUB	1 gallon cubitainer
12GN	1/2 gallon cubitainer
SP5T	120mL coliform Na Thiosulfate
BP1N	1L plastic HNO3
BP1U	1L plastic unpreserved
BP3S	250mL plastic H2SO4
BP3N	250mL plastic HNO3
[illegible]	250mL plastic unpreserved
[illegible]	0mL plastic NAOH
[illegible]	0mL plastic H2SO4
[illegible]	0mL plastic unpreserved

EZI	5g Encore
VOAK	Kit Volatile Solid
I	Wipe/Swab
ZPLC	Siploc Bag

WT	Water
SL	Solid
OL	Non-Aq Liquid
WP	Wipe

WO#: 30775005
PM: SCR Due Date: 05/20/25
CLIENT: BV-PREINNEWH

Qualtrax ID: 55678

Prein&Newhof
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3260 Evergreen Drive, NE
Grand Rapids, MI 49525
t. 616-364-7600
f. 616-364-6955

Client Name: Williams & Works
Billing Address:
Phone Number:
Email Report to:
Email Invoice to:
Project Name: Pellston
Project Number:
Sampling Personnel: Braxton Murphy, BJM

CHAIN OF CUSTODY

No. 58624

Wastewater	W
Drinking Water	D
Groundwater	G
Soil	S
Sludge	L
Other	X

Lab Use	Sample Information				Preservative						Analysis Requested															
Lab Sample ID #	Date Collected	Time Collected	Sample Description and Location (e.g. MW-1)	MATRIX	None	H2SO4	HNO3	HCL	NaOH	Other	Unit 37			PFAS												
4514-1	4/24/25	8:45am	Test Well - Site 3								X															
-2	4/24/25	8:30am	Test Well - Site 3											X												
-3	VOC trip blank																									

16

Comments:

9°C

Relinquished By: (Signature)	Date	Time	Received By: (Signature)	Date	Time
Relinquished By: (Signature)	Date	Time	Received for Laboratory By: (Signature)	Date	Time
	04/25/25	3:00PM	KEB	4/25/25	1500

PFAS Compound Analyses Second Confirmation Round

Site Nos. 2 and 3

Prein&Newhof
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June 09, 2025

Williams & Works
549 Ottawa Ave.
Grand Rapids, MI 49503

RE: Pellston

Order No.: 2505J92

Dear Mr. Dan Whalen:

Guide to Reading Lab Result

Prein&Newhof Laboratory received 3 sample(s) on 5/30/2025 on your behalf. Your test results are provided in your Prein&Newhof Laboratory analytical report. Please carefully review your analytical report, noting the following.

There were no problems with the analytical events associated with this report unless noted in the Case Narrative.

Any analyte that exceeds the client provided permit level are noted on the report with an "*" in the Qual field. Quality control data is within laboratory defined or method specified acceptance limits except if noted.

When testing for PFHxS, PFOA, PFOS, MeFOSAA, and EtFOSAA results include both branched and linear isotopes. We extract a Method Blank and analyze it with the preparation batch. Method Blank analytes are within the Reporting Limit (RL).

To learn more about interpreting your Lab Report, follow the link above to view our "Guide to Reading Lab Results". If you have any concerns about your test results or need additional help, please call: 616-364-7600 or email me: sbylsma@preinnewhof.com.

We use EPA Approved Methods for all regulated parameters. EPA Lab #: MI000014

Thank you for trusting Prein&Newhof with your testing needs.

Sincerely,

Steve Bylsma
Laboratory Manager

Original

3260 Evergreen Drive, NE Grand Rapids, MI 49525 t.616-364-7600 www.preinnewhof.com

CLIENT:	Williams & Works	**Collection Date:**	5/28/2025 1:10:00 PM
Project:	Pellston	**Received Date:**	5/30/2025 8:45:00 AM
Lab ID:	2505J92-01	**Matrix:**	DRINKING WATER
Client Sample ID:	Church Site	**Sampled By:**	BJM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
PFAS, DRINKING WATER			**EPA 537.1**			Analyst: **JS**
PFBS	< 2.0	2.0		ng/L	1	6/3/2025 9:59:00 AM
PFHxA	< 2.0	2.0		ng/L	1	6/3/2025 9:59:00 AM
HFPO-DA	< 2.0	2.0		ng/L	1	6/3/2025 9:59:00 AM
PFHxS	< 2.0	2.0		ng/L	1	6/3/2025 9:59:00 AM
PFHpA	< 2.0	2.0		ng/L	1	6/3/2025 9:59:00 AM
ADONA	< 2.0	2.0		ng/L	1	6/3/2025 9:59:00 AM
PFOA	< 2.0	2.0		ng/L	1	6/3/2025 9:59:00 AM
PFOS	< 2.0	2.0		ng/L	1	6/3/2025 9:59:00 AM
PFNA	< 2.0	2.0		ng/L	1	6/3/2025 9:59:00 AM
9Cl-PF3ONS	< 2.0	2.0		ng/L	1	6/3/2025 9:59:00 AM
PFDA	< 2.0	2.0		ng/L	1	6/3/2025 9:59:00 AM
NMeFOSAA	< 2.0	2.0		ng/L	1	6/3/2025 9:59:00 AM
NEtFOSAA	< 2.0	2.0		ng/L	1	6/3/2025 9:59:00 AM
PFUnA	< 2.0	2.0		ng/L	1	6/3/2025 9:59:00 AM
11Cl-PF3OUdS	< 2.0	2.0		ng/L	1	6/3/2025 9:59:00 AM
PFDoA	< 2.0	2.0		ng/L	1	6/3/2025 9:59:00 AM
PFTrDA	< 2.0	2.0		ng/L	1	6/3/2025 9:59:00 AM
PFTA	< 2.0	2.0		ng/L	1	6/3/2025 9:59:00 AM
PFAS Hazard Index	< 0.20	0.20		ng/L	1	6/3/2025 9:59:00 AM
Surr: d5-N-EtFOSAA	88.1	70 - 130		%Rec	1	6/3/2025 9:59:00 AM
Surr: M3HFPO-DA	91.5	70 - 130		%Rec	1	6/3/2025 9:59:00 AM
Surr: MPFDA	106	70 - 130		%Rec	1	6/3/2025 9:59:00 AM
Surr: MPFHxA	84.5	70 - 130		%Rec	1	6/3/2025 9:59:00 AM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	<	Not Detected at the Reporting Limit
H	Holding times for preparation or analysis exceeded	MCL	Maximum Contaminant Level
PL	Permit Limit	RL	Reporting Limit
S	Spike Recovery outside accepted recovery limits		

Original

3260 Evergreen Drive, NE Grand Rapids, MI 49525 t.616-364-7600 www.preinnewhof.com

Analytical Report

(consolidated)

Site No. 3 - MDNR Property near the airport

WO#: **2505J92**

Date Reported: **6/9/2025**

CLIENT:	Williams & Works	**Collection Date:**	5/28/2025 3:30:00 PM
Project:	Pellston	**Received Date:**	5/30/2025 8:45:00 AM
Lab ID:	2505J92-03	**Matrix:**	DRINKING WATER
Client Sample ID:	Airport Site	**Sampled By:**	BJM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
PFAS, DRINKING WATER			**EPA 537.1**		Analyst: **JS**	
PFBS	3.7	2.0		ng/L	1	6/3/2025 10:58:00 AM
PFHxA	< 2.0	2.0		ng/L	1	6/3/2025 10:58:00 AM
HFPO-DA	< 2.0	2.0		ng/L	1	6/3/2025 10:58:00 AM
PFHxS	< 2.0	2.0		ng/L	1	6/3/2025 10:58:00 AM
PFHpA	< 2.0	2.0		ng/L	1	6/3/2025 10:58:00 AM
ADONA	< 2.0	2.0		ng/L	1	6/3/2025 10:58:00 AM
PFOA	< 2.0	2.0		ng/L	1	6/3/2025 10:58:00 AM
PFOS	< 2.0	2.0		ng/L	1	6/3/2025 10:58:00 AM
PFNA	< 2.0	2.0		ng/L	1	6/3/2025 10:58:00 AM
9Cl-PF3ONS	< 2.0	2.0		ng/L	1	6/3/2025 10:58:00 AM
PFDA	< 2.0	2.0		ng/L	1	6/3/2025 10:58:00 AM
NMeFOSAA	< 2.0	2.0		ng/L	1	6/3/2025 10:58:00 AM
NEtFOSAA	< 2.0	2.0		ng/L	1	6/3/2025 10:58:00 AM
PFUnA	< 2.0	2.0		ng/L	1	6/3/2025 10:58:00 AM
11Cl-PF3OUdS	< 2.0	2.0		ng/L	1	6/3/2025 10:58:00 AM
PFDoA	< 2.0	2.0		ng/L	1	6/3/2025 10:58:00 AM
PFTrDA	< 2.0	2.0		ng/L	1	6/3/2025 10:58:00 AM
PFTA	< 2.0	2.0		ng/L	1	6/3/2025 10:58:00 AM
PFAS Hazard Index	< 0.19	0.19		ng/L	1	6/3/2025 10:58:00 AM
Surr: d5-N-EtFOSAA	85.1	70 - 130		%Rec	1	6/3/2025 10:58:00 AM
Surr: M3HFPO-DA	98.1	70 - 130		%Rec	1	6/3/2025 10:58:00 AM
Surr: MPFDA	103	70 - 130		%Rec	1	6/3/2025 10:58:00 AM
Surr: MPFHxA	91.2	70 - 130		%Rec	1	6/3/2025 10:58:00 AM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	<	Not Detected at the Reporting Limit
H	Holding times for preparation or analysis exceeded	MCL	Maximum Contaminant Level
PL	Permit Limit	RL	Reporting Limit
S	Spike Recovery outside accepted recovery limits		

Original

3260 Evergreen Drive, NE Grand Rapids, MI 49525 t.616-364-7600 www.preinnewhof.com

CLIENT:	Williams & Works	**Collection Date:**	5/28/2025 3:30:00 PM
Project:	Pellston	**Received Date:**	5/30/2025 8:45:00 AM
Lab ID:	2505J92-04	**Matrix:**	BLANK
Client Sample ID:	Airport - Field Blank	**Sampled By:**	BJM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
PFAS, DRINKING WATER			**EPA 537.1**			Analyst: **JS**
PFBS	< 2.0	2.0		ng/L	1	6/6/2025 9:26:00 PM
PFHxA	< 2.0	2.0		ng/L	1	6/6/2025 9:26:00 PM
HFPO-DA	< 2.0	2.0		ng/L	1	6/6/2025 9:26:00 PM
PFHxS	< 2.0	2.0		ng/L	1	6/6/2025 9:26:00 PM
PFHpA	< 2.0	2.0		ng/L	1	6/6/2025 9:26:00 PM
ADONA	< 2.0	2.0		ng/L	1	6/6/2025 9:26:00 PM
PFOA	< 2.0	2.0		ng/L	1	6/6/2025 9:26:00 PM
PFOS	< 2.0	2.0		ng/L	1	6/6/2025 9:26:00 PM
PFNA	< 2.0	2.0		ng/L	1	6/6/2025 9:26:00 PM
9Cl-PF3ONS	< 2.0	2.0		ng/L	1	6/6/2025 9:26:00 PM
PFDA	< 2.0	2.0		ng/L	1	6/6/2025 9:26:00 PM
NMeFOSAA	< 2.0	2.0		ng/L	1	6/6/2025 9:26:00 PM
NEtFOSAA	< 2.0	2.0		ng/L	1	6/6/2025 9:26:00 PM
PFUnA	< 2.0	2.0		ng/L	1	6/6/2025 9:26:00 PM
11Cl-PF3OUdS	< 2.0	2.0		ng/L	1	6/6/2025 9:26:00 PM
PFDoA	< 2.0	2.0		ng/L	1	6/6/2025 9:26:00 PM
PFTrDA	< 2.0	2.0		ng/L	1	6/6/2025 9:26:00 PM
PFTA	< 2.0	2.0		ng/L	1	6/6/2025 9:26:00 PM
Surr: d5-N-EtFOSAA	84.5	70 - 130		%Rec	1	6/6/2025 9:26:00 PM
Surr: M3HFPO-DA	89.0	70 - 130		%Rec	1	6/6/2025 9:26:00 PM
Surr: MPFDA	95.2	70 - 130		%Rec	1	6/6/2025 9:26:00 PM
Surr: MPFHxA	92.1	70 - 130		%Rec	1	6/6/2025 9:26:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	<	Not Detected at the Reporting Limit
H	Holding times for preparation or analysis exceeded	MCL	Maximum Contaminant Level
PL	Permit Limit	RL	Reporting Limit
S	Spike Recovery outside accepted recovery limits		

Original

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Church Site

Prein&Newhof
Engineers ▪ Surveyors ▪ Environmental ▪ Laboratory

3260 Evergreen Drive, NE
Grand Rapids, MI 49525
t. 616-364-7600
f. 616-364-6955

Client Name: Williams + Works
Billing Address:
Phone Number:
Email Report to:
Email Invoice to:
Project Name: Pellston Site
Project Number:
Sampling Personnel: Bradley Murphy BJM

CHAIN OF CUSTODY

No. 58606

Wastewater	W
Drinking Water	D
Groundwater	G
Soil	S
Sludge	L
Other	X

Lab Use	Sample Information				Preservative							Analysis Requested																
Lab Sample ID #	Date Collected	Time Collected	Sample Description and Location (e.g. MW-1)	MATRIX	None	H2SO4	HNO3	HCL	NaOH	Other	1,4 Dioxane																	
5192-1	5/28	1:10 pm									X																	

Comments:

Relinquished By: (Signature)	Date	Time	Received By: (Signature)	Date	Time
	5/30/25	8:45			
Relinquished By: (Signature)	Date	Time	Received for Laboratory By: (Signature)	Date	Time
			S. Dixon	5/30/25	08:45

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3260 Evergreen Drive, NE
Grand Rapids, MI 49525
t. 616-364-7600
f. 616-364-6955

Client Name: Williams + Works
Billing Address:
Phone Number:
Email Report to:
Email Invoice to:
Project Name: Pullston
Project Number:
Sampling Personnel: Braxton Murphy BJM

CHAIN OF CUSTODY

No. 58767

Wastewater	W
Drinking Water	D
Groundwater	G
Soil	S
Sludge	L
Other	X

LAB USE	Sample Information				Preservative						Analysis Requested															
Lab Sample ID #	Date Collected	Time Collected	Sample Description and Location (e.g. MW-1)	MATRIX	None	H2SO4	HNO3	HCL	NaOH	Other	PFAS															
592-3	5/28/25	3:30pm	Airport Site								✓															

Comments:

Relinquished By: (Signature)	Date	Time	Received By: (Signature)	Date	Time
Braxton Murphy	5/30/25	8:45			
Relinquished By: (Signature)	Date	Time	Received for Laboratory By: (Signature)	Date	Time
			G. Dian	5/30/25	08:45

Appendix E

Alternative 2: O&M Cost Memo

Technical Memorandum

To:	Alisha Busuttil, PE, Project Manager - OHM Advisors
From:	Shannon Saramaa, PE
Date:	12/5/2025 - FINAL
Subject:	Village of Pellston – O&M Cost Estimate

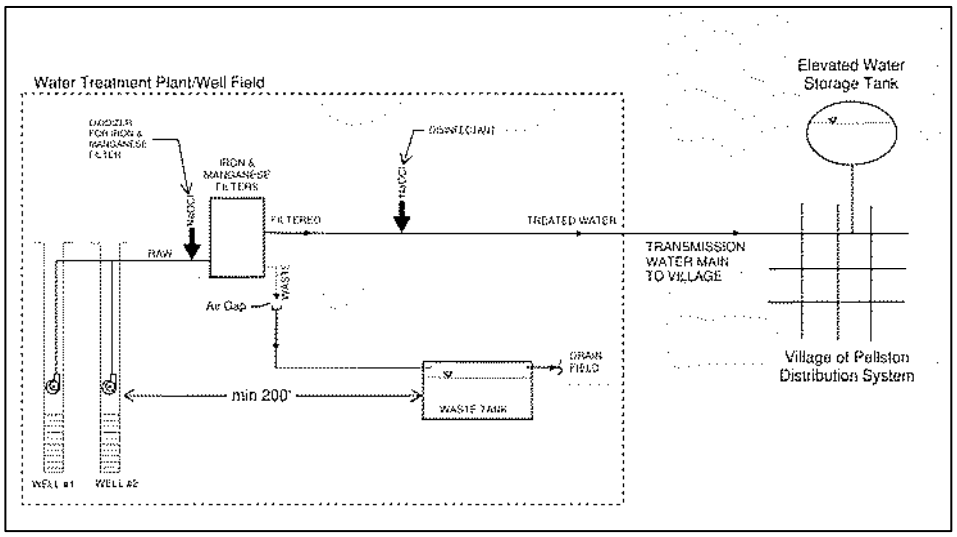
1. Introduction and Background

OHM Advisors (OHM) was hired by the Village of Pellston (Village) to complete a preliminary water system design for a new community water system. The system would be intended to serve potable water to residential and commercial areas within the current Village limits and potentially serving the adjacent residential community. OHM has asked Mead & Hunt (M&H) to provide support on the development of the annual Operations and Maintenance (O&M) costs associated with their concept design. O&M costs are based on conceptual water system design and therefore are estimates at this time and would need to be refined during design, construction, and implementation of the system.

Based on the State of Michigan, Environment, Great Lakes, and Energy (EGLE) and Safe Drinking Water Act regulations for public drinking water systems and the documentation provided by OHM, M&H has identified annual O&M costs to support a Community (Type I) Water Supply, supplied by groundwater.

The new community water system will include a well field, transmission piping, appurtenances, distribution piping, and water services. Treatment will include chlorine treatment to oxidize iron and manganese, followed by physical filtration for metals removal. An additional chlorine feed will serve as primary disinfection prior to conveying the treated water to an elevated storage tank. No treatment other than chlorination and iron and manganese filtration is assumed. Distribution pressure is provided to the Village from a 150,000 gallon elevated storage tank. See **Figure 1** for the process flow diagram.

FIGURE 1: PROCESS FLOW DIAGRAM



Four demand scenarios were considered for estimating O&M costs: Existing, 5-Year, 20-Year, and 51% Connection. This technical memorandum summarizes the assumptions and calculations used to determine these costs.

1.1 Basis of Design

The new community water system is assumed to include 401 service connections and serve a population of 851 residents. Demand calculations assume a max day demand factor of 2 and a peak hour factor of 4. These assumptions were provided by OHM and included in **Attachment A**. The average day, maximum day, and peak hour demands for each scenario are summarized in **Table 1**.

TABLE 12: WATER DEMANDS

	Average Day (gpm)		Max Day (gpm)		Peak Hour (gpm)		MGD
	Low End	High End	Low End	High End	Low End	High End	Average
Existing	67	80	134	161	261	313	0.106
5-YR	94	113	188	225	368	442	0.149
20-YR	131	157	262	315	517	620	0.208
51%	49		-	-	-	-	0.071

The demand in million gallons per day (MGD) was calculated by taking the average of the low-end and high-end average day and converting to MGD. For the 51% connection scenario an average day demand of 49 gpm and 0.071 MGD was assumed based on information provided by

OHM. These flow demands and quantities are included in **Attachment A**.

Additionally, the following information was provided by OHM (**Attachment A**):

- Elevated Water Storage Tank size, height from ground, and type
- Counts, size, and length of piping for the water and transmission main
- Counts and size of piping for the service lead
- Count of hydrants
- Count and size of valves

2. O&M Cost Summary

Totals costs for each scenario were determined based on the following categories:

- Labor
- Vehicle/Equipment
- Utilities
- Other Direct Costs
- Planning/Studies
- Administrative

The Other Direct Costs category includes:

- Well Test, Inspection Maintenance, Repair
- Well Pump Test, Inspection, Maintenance & Repair
- Storage Tank Inspection, Maintenance & Repair
- Treatment - Inspection, Maintenance, & Repair
- Treatment - Chemicals
- Distribution System Maintenance & Repair
- Distribution System Leak Detection
- Generator Load Testing
- Disposal Fees
- Miss Digs Annual Subscription
- Lab Analysis Fees

Cost variances between the scenarios stem from fluctuating electrical demand, chemical demand, and lab analysis fees. All other costs are expected to be consistent despite changes in demand. A summary of these costs comparing each scenario is provided in **Table 2,** variable costs categories are in the grey columns. Detailed breakdowns of each scenario - Existing, 5-Year, 20-Year, and 51% Connection – can be found in **Attachment B.**

TABLE 2: O&M COST ESTIMATE SUMMARY

	Labor	Vehicle	Utilities	Other Direct Costs	Planning/ Studies	Admin	Total
Existing	$104,000	$17,500	$28,443	$191,487	$4,900	$36,200	**$382,530**
5-Year	$104,000	$17,500	$35,789	$206,764	$4,900	$36,200	**$405,153**
20-Year	$104,000	$17,500	$45,988	$232,089	$4,900	$36,200	**$440,677**
51%	$104,000	$17,500	$22,332	$176,188	$4,900	$36,200	**$361,120**

2.1 Labor

Operations are expected to be contracted with a certified water operator with an estimated hourly rate of $75 per hour and full-time equivalent (FTE) of 50%, meaning they would work 20-hour weeks. Labor also includes the cost of project management at $140/hour with an FTE of 6% and an internal billing clerk at 15% FTE. The billing clerk is assumed to be part-time with no benefits. Total annual costs for labor are estimated at $104,000. Breakdown is included under the labor sections in **Attachment B**.

2.2 Vehicles and Equipment

Vehicle and equipment costs consist of vehicle fuel and mileage from the contract operator. The rate is assumed to be $0.70 per mile based on the 2025 federal rate with an estimated annual milage of 25,000. All scenarios will have the same estimated costs. See **Attachment B** for full details.

2.3 Utilities

2.3.1 Generator Fuel

A 400-KW generator will supply emergency power to all wells and plant equipment during outages. Generator sizing was provided by OHM. At 100% load, with a diesel consumption of 28.6 gallons per hour and run time of 8 hours monthly, the annual fuel use totals 3,746 gallons. The cost per gallon of diesel is assumed to be $3.70 based on the current cost of diesel in Michigan. Calculations and correspondence can be found in **Attachment C**.

2.3.2 Electricity

Electrical cost is directly related to the operation of 50-brake horsepower (BHP) submersible well pumps, and varies based on average daily water usage. The pumps have a capacity of 315 gallons per minute. The daily run time is determined by dividing the water usage by the pumping rate. The cost per kilowatt hour (KWH) is set at $0.19 according to a generalized for Michigan,

with motor efficiency estimated at 80%. Kilowatt usage is calculated by multiplying BHP by the ratio of 0.746 over the motor efficiency, then multiplying this result by the cost per KWH to determine the hourly cost, which can be extended to calculate the annual cost. See **Attachment D** for full details for each flow scenario.

2.4 Other Direct Costs

2.4.1 Well Maintenance

Well maintenance costs are organized by task frequency – daily or weekly, monthly, annual or seasonally, less than once a year, and corrective maintenance. Direct costs and frequencies are listed where available; otherwise, it is indicated that task costs are included with labor estimates. Non-labor costs include weekly ground maintenance costing $100, for a total of $5,200 annually, a general charge of $600 for monthly O&M items, and $2,500 to review source water quality test results annually. Every ten years television inspection of the well interior and well screens, and corrective maintenance on the well to remove mineral fouling is expected, which have an annual cost of $300 and $1,500 respectively. The total annual cost is estimated at $15,900. Detailed tasks and costs can be found in **Attachment E**.

2.4.2 Well Pump Maintenance

Well pump maintenance costs are organized the same as well maintenance. Direct cost include $600 for monthly preventive maintenance and $700 for pump overhaul, which is expected to be needed every 5 years. Total annual costs are estimated at $1,300. Refer to **Attachment F** for full breakdown.

2.4.3 Storage Tank

The storage tank maintenance estimate follows the format of well and pump sheets. Repainting, assumed every 15 years, is the largest direct cost—calculated at $58/SF for 8,398 SF assuming cylindrical geometry using the given diameter and height of tank. Annual costs are estimated at $34,247. See **Attachment G**.

2.4.4 Treatment: Inspection, Maintenance, Repair

Also, with the same format as previous task-based estimates, the most significant cost for iron and manganese treatment (inspection, maintenance, and repair) is the sand replacement for the drain field accepting the backwash waste stream, which is estimated to occur every three years and costs $25,000 per year. This cost should be revisited once the final design is complete, and the sizing and design of the backwash drain field is known. Filter media will also need to be replaced in the metal filtration vessels every 10 years, which would cost $20,000 with an annualized cost of $2,000. Another $600 is budgeted for monthly preventative maintenance, $375 for annual or seasonal storage tank interior inspection, $100 for valve repairs, and $700 to drain, inspect, clean and disinfect the storage tank every three to five years. Total annual costs are

estimated at $37,350. Detailed information can be found in **Attachment H**.

2.4.5 Chemicals

Chemical costs were determined for each flow scenario assuming a unit rate of $5.00 per gallon for 12.5% sodium hypochlorite. This cost is assumed from nearby system rates and bulk quantities. The sodium hypochlorite will serve as an iron and manganese oxidizer for physical filtration and residual disinfectant. Demand was calculated based on raw water quality data for manganese and iron concentrations and a target residual chlorine concentration of 0.5 mg/L. Full calculations can be found in **Attachment I**.

2.4.6 Distribution

Costs for distribution are organized in the same manner as treatment. Localized repairs for leaks or breaks in the system make up the most significant cost at an estimated cost of $24,000 for four lump sum events. The cost of hydrant flow testing, performed every three years, is the second highest contributing costs at an estimated $7,700 annually. Other direct costs include annual preventative maintenance on nine main magnetic flow meters for $1,800, and annual preventive maintenance on backflow prevention assemblies for $600. Total annual costs are estimated at $34,100 per year. See **Attachment J** for details.

2.4.7 Lab Analysis

Lab fees reflect EGLE's typical sampling for Community (Type I) Water Supplies using groundwater. A system with 51% connection has the same requirements as existing supplies. TTHM/Haa5, lead and copper, and PFAS testing may be reduced if initial results meet compliance limits. 5-Year fee estimates assume compliance is met, allowing TTHM/Haa5 sampling to shift from annual to every three years after three years; lead and copper move from semi-annual to tri-annual after one year; PFAS reduces from quarterly to annual.

For the 20-Year scenario, these reductions also apply, and required lead and copper samples drop from twenty to ten per sampling event. See **Attachment K** for full lab analysis fee details for all scenarios.

2.5 Planning & Studies

Planning and Studies costs include updates to the following items at the specified frequency:

- Wellhead or Watershed Protection Plan – every 10 years
- O&M Manual – every 5 years
- Reliability Study – every 5 years
- General Plan – every 5 years

These costs assume there are minimal updates, and the work is completed by consultants. Costs

are included in the Planning/Studies section of the summaries in **Attachment B**.

2.6 Administrative

Administrative fees include the following:

- Ordinances/Legal Support
- EGLE Annual Public Water System Fee
- Insurance
- Advanced Metering Infrastructure (AMI) Meter Subscription/Billing Program Subscription Cost

Advanced metering infrastructure (AMI) meter subscription/billing program subscription cost is based on the fixed cost of a Badger Cell water meter subscription from a M&H project in a nearby city. Individual costs are included in the summaries in **Attachment B**.

Attachment A – System Overview

Village of Pellston - Conceptual Water System
System Overview

Number of Services:	401		
Population:	851	(2020 census plus seasonal population per Alisha)	2.1 people per SFU

Peaking Factors	
Max Day Demand Peaking Factor	2
Peak Hour Peaking Factor	4

	Average Day (gpm)		Max Day (gpm)		Peak Hour (gpm)	
	Low End	**High End**	**Low End**	**High End**	**Low End**	**High End**
Existing	67	80	134	161	261	313
5-YR	94	113	188	225	368	442
20-YR	131	157	hb	315	517	620

	103	gpm		74	gpm		144	gpm		49 gpm
5-YR	148,560	gpd	**Existing**	105,980	gpd	**20-YR**	207,679	gpd	**51%**	70,560 gpd
	0.149	MGD		0.106	MGD		0.208	MGD		0.071 MGD

Low End Demand:	83	GPCD	200	GPD/REU
High End Demand	100	GPCD	240	GPD/REU

Storage Size	150,000	gallons
Height from Ground	170	feet
Type	Pedestal Spheroid - Steel	

Water Main Diameter	**Length (ft)**	**Length (miles)**
6"	46,511	8.8
8"	19,546	3.7
Total	66,057	12.5
Service Lead Diameter	**Count**	
0.75"	334	
2"	64	
3"	3	
Total	401	
Hydrant Count	134	
Valves Diameter	**Count**	
6"	150	
8"	68	
Total	218	
Transmission Main Diameter	**Length (ft)**	**Length (miles)**
12"	10,000	1.9
TM Valves Diameter	**Count**	
12"	15	
TM Hydrant Count	20	

Attachment B –Cost Summaries

Village of Pellston - Conceptual Water System - Operations and Maintenance Charges
Existing

Labor

	Hourly Rate	Full Time Annual Wage	Benefits (60%)	% FTE	Annual Direct Wages with Benefits	Notes/Source
Certified Water Operator- (Contractor Operator)	$ 75.00	$ 156,000.00	$ -	50%	$ 78,000	Mead & Hunt Rate; updated 9/26/25
Project Manager	$ 140.00	$ 291,200.00		6%	$ 18,200	
Billing Clerk (Internal)	$ 25.00	$ 52,000.00	$ -	15%	$ 7,800	Assumed; part time; no beneftis
TOTAL LABOR				71%	**$ 104,000**	

Vehicle/Equipment

	Units	Cost	Estimated Miles	Total	
Vehicle Fuel/Mileage	per mile	$0.70	25,000	$ 17,500	Federal Rate
TOTAL VEHICLES/EQUIPMENT				**$ 17,500**	

Utilities (See Detailed Sheets for Assumptions)

	Units	Cost	Estimated Quantities	Total	
Electricity				$ 18,284	See Supporting Calcuation Sheet
Generator Fuel	gal	$3.70	2,746	$ 10,159	See Supporting Calcuation Sheet
TOTAL UTILITIES				**$ 28,443**	

Other Direct Costs *(See Detailed Sheets for Assumptions)*

	Units	Cost	Estimated Quantities	Total	
Well Test, Inspection Maintenance, Repair	each	$ 15,900.00	2	$ 31,800	See Supporting Calcuation Sheet
Well Pump Test, Inspection, Maintenance & Repair	each	$ 1,300.00	2	$ 2,600	See Supporting Calcuation Sheet
Storage Tank Inspection, Maintenance & Repair	each	$ 34,247.27	1	$ 34,247	See Supporting Calcuation Sheet
Treatment - Inspection, Maintenance, & Repair	each	$ 29,350.00	1	$ 29,350	See Supporting Calcuation Sheet
Treatment - Chemicals	LS	$ 45,774.69	1	$ 45,775	See Supporting Calcuation Sheet; updated 9/26/25
Distribution System Maintenance & Repair	LS	$ 34,100.00	1	$ 34,100	See Supporting Calcuation Sheet
Distribution System Leak Detection	Day	$ 300.00	3.0	$ 900	$300 leak detection per day through MRWA; on as-needed basis
Generator Load Testing	each	$ 2,745.60	1	$ 2,746	See Supporting Calcuation Sheet
Disposal Fees	LS	$ 1,000.00	1	$ 1,000	M&H Estimate
Miss Digs Annual Subscription	each	$ 1,000.00	1	$ 1,000	Required
Lab Analysis Fees	LS	$ 7,969.58	1	$ 7,970	See Supporting Calcuation Sheet
TOTAL OTHER DIRECT COSTS				**$ 191,487**	

Planning/Studies	Units	Cost	Frequency (yrs)	Total	
Emergency Response Plan	each	$ -	1	$ -	Included in operator's normal business hours
Wellhead or Watershed Protection Plan	each	$ 15,000.00	10	$ 1,500	
Sampling Plans - Bacteria, Lead & Copper, DBP	each	$ -	1	$ -	Included in operator's normal business hours
O&M Manual	each	$ 2,000.00	5	$ 400	Initial in design; Updates included in operator's normal business hours
Reliability Study	each	$ 7,500.00	5	$ 1,500	Assuming minimal updates and hired by consultants
General Plan	each	$ 7,500.00	5	$ 1,500	Assuming minimal updates and hired by consultants
Cross Connection Plan	each	$ -	1	$ -	Included in operator's normal business hours
Asset Management Plan (Water Audit)	each	$ -	5	$ -	In design contract; updates by operator and clerk in norm bus hours
TOTAL PLANNING				**$ 4,900**	

Administrative	Units	Cost	Frequency (yrs)	Total	
Ordinances/Legal support	each	$ 5,000.00	1	$ 5,000	M&H Estimate
ArcGIS Annual Subscription	each	$ -	1	$ -	
EGLE Annual Fee	each	$ 1,700.00	1	$ 1,700	
Insurance	each	$ 16,000.00	1	$ 16,000	
AMI Meter Subscription/Billing Program Subscription Cost	each	$ 20,200.00	1	$ 20,200	Badger Cell Based Fixed Cost; matched pricing From CHARLEVOIX TOWNSHIP METER ANALYSIS
SCADA Annual Fees	each		1	$ -	
TOTAL ADMINISTRATIVE				**$ 36,200**	

TOTAL ANNUAL O&M COSTS	**$ 382,530**

Village of Pellston - Conceptual Water System - Operations and Maintenance Charges
5-Year

Labor

	Hourly Rate	Full Time Annual Wage	Benefits (60%)	% FTE	Annual Direct Wages with Benefits	Notes/Source
Certified Water Operator- (Contractor Operator)	$ 75.00	$156,000.00	$ -	50%	$ 78,000	Mead & Hunt Rate; updated 9/26/25
Project Manager	$ 140.00	$291,200.00		6%	$ 18,200	
Billing Clerk (Internal)	$ 25.00	$ 52,000.00	$ -	15%	$ 7,800	Assumed; part time; no beneftis
TOTAL LABOR				71%	**$ 104,000**	

Vehicle/Equipment

	Units	Cost	Estimated Miles	Total	
Vehicle Fuel/Mileage	per mile	$0.70	25,000	$ 17,500	Federal Rate
TOTAL VEHICLES/EQUIPMENT				**$ 17,500**	

Utilities (See Detailed Sheets for Assumptions)

	Units	Cost	Estimated Quantities	Total	
Electricity				$ 25,630	See Supporting Calcuation Sheet
Generator Fuel	gal	$3.70	2,746	$ 10,159	See Supporting Calcuation Sheet
TOTAL UTILITIES				**$ 35,789**	

Other Direct Costs (*See Detailed Sheets for Assumptions*)

	Units	Cost	Estimated Quantities	Total	
Well Test, Inspection Maintenance, Repair	each	$ 15,900.00	2	$ 31,800	See Supporting Calcuation Sheet
Well Pump Test, Inspection, Maintenance & Repair	each	$ 1,300.00	2	$ 2,600	See Supporting Calcuation Sheet
Storage Tank Inspection, Maintenance & Repair	each	$ 34,247.27	1	$ 34,247	See Supporting Calcuation Sheet
Treatment - Inspection, Maintenance, & Repair	each	$ 29,350.00	1	$ 29,350	See Supporting Calcuation Sheet
Treatment - Chemicals	LS	$ 64,165.39	1	$ 64,165	See Supporting Calcuation Sheet; updated 9/26/25
Distribution System Maintenance & Repair	LS	$ 34,100.00	1	$ 34,100	See Supporting Calcuation Sheet
Distribution System Leak Detection	Day	$ 300.00	3.0	$ 900	$300 leak detection per day through MRWA; on as-needed basis
Generator Load Testing	each	$ 2,745.60	1	$ 2,746	See Supporting Calcuation Sheet
Disposal Fees	LS	$ 1,000.00	1	$ 1,000	M&H Estimate
Miss Digs Annual Subscription	each	$ 1,000.00	1	$ 1,000	Required
Lab Analysis Fees	LS	$ 7,969.58	1	$ 4,856	See Supporting Calcuation Sheet
TOTAL OTHER DIRECT COSTS				**$ 206,764**	

Planning/Studies	Units	Cost	Frequency (yrs)	Total	
Emergency Response Plan	each	$ -	1	$ -	Included in operator's normal business hours
Wellhead or Watershed Protection Plan	each	$ 15,000.00	10	$ 1,500	
Sampling Plans - Bacteria, Lead & Copper, DBP	each	$ -	1	$ -	Included in operator's normal business hours
O&M Manual	each	$ 2,000.00	5	$ 400	Initial in design; Updates included in operator's normal business hours
Reliability Study	each	$ 7,500.00	5	$ 1,500	Assuming minimal updates and hired by consultants
General Plan	each	$ 7,500.00	5	$ 1,500	Assuming minimal updates and hired by consultants
Cross Connection Plan	each	$ -	1	$ -	Included in operator's normal business hours
Asset Management Plan (Water Audit)	each	$ -	5	$ -	In design contract; updates by operator and clerk in norm bus hours
TOTAL PLANNING				**$ 4,900**	

Administrative	Units	Cost	Frequency (yrs)	Total	
Ordinances/Legal support	each	$ 5,000.00	1	$ 5,000	M&H Estimate
ArcGIS Annual Subscription	each	$ -	1	$ -	
EGLE Annual Fee	each	$ 1,700.00	1	$ 1,700	
Insurance	each	$ 16,000.00	1	$ 16,000	
AMI Meter Subscription/Billing Program Subscription Cost	each	$ 20,200.00	1	$ 20,200	Badger Cell Based Fixed Cost; matched pricing From CHARLEVOIX TOWNSHIP METER ANALYSIS
SCADA Annual Fees	each		1	$ -	
TOTAL ADMINISTRATIVE				**$ 36,200**	

TOTAL ANNUAL O&M COSTS	**$ 405,153**

Village of Pellston - Conceptual Water System - Operations and Maintenance Charges
20-Year

Labor

	Hourly Rate	Full Time Annual Wage	Benefits (60%)	% FTE	Annual Direct Wages with Benefits	Notes/Source
Certified Water Operator- (Contractor Operator)	$ 75.00	$ 156,000.00	$ -	50%	$ 78,000	Mead & Hunt Rate; updated 9/26/25
Project Manager	$ 140.00	$ 291,200.00		6%	$ 18,200	
Billing Clerk (Internal)	$ 25.00	$ 52,000.00	$ -	15%	$ 7,800	Assumed; part time; no beneftis
TOTAL LABOR				71%	**$ 104,000**	

Vehicle/Equipment

	Units	Cost	Estimated Miles	Total	Notes/Source
Vehicle Fuel/Mileage	per mile	$0.70	25,000	$ 17,500	Federal Rate
TOTAL VEHICLES/EQUIPMENT				**$ 17,500**	

Utilities (See Detailed Sheets for Assumptions)

	Units	Cost	Estimated Quantities	Total	Notes/Source
Electricity				$ 35,829	See Supporting Calcuation Sheet
Generator Fuel	gal	$3.70	2,746	$ 10,159	See Supporting Calcuation Sheet
TOTAL UTILITIES				**$ 45,988**	

Other Direct Costs (*See Detailed Sheets for Assumptions*)

	Units	Cost	Estimated Quantities	Total	Notes/Source
Well Test, Inspection Maintenance, Repair	each	$ 15,900.00	2	$ 31,800	See Supporting Calcuation Sheet
Well Pump Test, Inspection, Maintenance & Repair	each	$ 1,300.00	2	$ 2,600	See Supporting Calcuation Sheet
Storage Tank Inspection, Maintenance & Repair	each	$ 34,247.27	1	$ 34,247	See Supporting Calcuation Sheet
Treatment - Inspection, Maintenance, & Repair	each	$ 29,350.00	1	$ 29,350	See Supporting Calcuation Sheet
Treatment - Chemicals	LS	$ 89,700.22	1	$ 89,700	See Supporting Calcuation Sheet; updated 9/26/25
Distribution System Maintenance & Repair	LS	$ 34,100.00	1	$ 34,100	See Supporting Calcuation Sheet
Distribution System Leak Detection	Day	$ 300.00	3.0	$ 900	$300 leak detection per day through MRWA; on as-needed basis
Generator Load Testing	each	$ 2,745.60	1	$ 2,746	See Supporting Calcuation Sheet
Disposal Fees	LS	$ 1,000.00	1	$ 1,000	M&H Estimate
Miss Digs Annual Subscription	each	$ 1,000.00	1	$ 1,000	Required
Lab Analysis Fees	LS	$ 7,969.58	1	$ 4,646	See Supporting Calcuation Sheet
TOTAL OTHER DIRECT COSTS				**$ 232,089**	

Planning/Studies	Units	Cost	Frequency (yrs)	Total	Notes/Source
Emergency Response Plan	each	$ -	1	$ -	Included in operator's normal business hours
Wellhead or Watershed Protection Plan	each	$ 15,000.00	10	$ 1,500	
Sampling Plans - Bacteria, Lead & Copper, DBP	each	$ -	1	$ -	Included in operator's normal business hours
O&M Manual	each	$ 2,000.00	5	$ 400	Initial in design; Updates included in operator's normal business hours
Reliability Study	each	$ 7,500.00	5	$ 1,500	Assuming minimal updates and hired by consultants
General Plan	each	$ 7,500.00	5	$ 1,500	Assuming minimal updates and hired by consultants
Cross Connection Plan	each	$ -	1	$ -	Included in operator's normal business hours
Asset Management Plan (Water Audit)	each	$ -	5	$ -	In design contract; updates by operator and clerk in norm bus hours
TOTAL PLANNING				**$ 4,900**	

Administrative	Units	Cost	Frequency (yrs)	Total	Notes/Source
Ordinances/Legal support	each	$ 5,000.00	1	$ 5,000	M&H Estimate
ArcGIS Annual Subscription	each	$ -	1	$ -	
EGLE Annual Fee	each	$ 1,700.00	1	$ 1,700	
Insurance	each	$ 16,000.00	1	$ 16,000	
AMI Meter Subscription/Billing Program Subscription Cost	each	$ 20,200.00	1	$ 20,200	Badger Cell Based Fixed Cost; matched pricing From CHARLEVOIX TOWNSHIP METER ANALYSIS
SCADA Annual Fees	each		1	$ -	
TOTAL ADMINISTRATIVE				**$ 36,200**	

TOTAL ANNUAL O&M COSTS	**$ 440,677**	

Village of Pellston - Conceptual Water System - Operations and Maintenance Charges
51% Connection

Labor

	Hourly Rate	Full Time Annual Wage	Benefits (60%)	% FTE	Annual Direct Wages with Benefits	Notes/Source
Certified Water Operator- (Contractor Operator)	$ 75.00	$156,000.00	$ -	50%	$ 78,000	Mead & Hunt Rate; updated 9/26/25
Project Manager	$ 140.00	$291,200.00		6%	$ 18,200	
Billing Clerk (Internal)	$ 25.00	$ 52,000.00	$ -	15%	$ 7,800	Assumed; part time; no beneftis
TOTAL LABOR				71%	**$ 104,000**	

Vehicle/Equipment

	Units	Cost	Estimated Miles	Total	
Vehicle Fuel/Mileage	per mile	$0.70	25,000	$ 17,500	Federal Rate
TOTAL VEHICLES/EQUIPMENT				**$ 17,500**	

Utilities (See Detailed Sheets for Assumptions)

	Units	Cost	Estimated Quantities	Total	
Electricity				$ 12,173	See Supporting Calcuation Sheet
Generator Fuel	gal	$3.70	2,746	$ 10,159	See Supporting Calcuation Sheet
TOTAL UTILITIES				**$ 22,332**	

Other Direct Costs (*See Detailed Sheets for Assumptions*)

	Units	Cost	Estimated Quantities	Total	
Well Test, Inspection Maintenance, Repair	each	$ 15,900.00	2	$ 31,800	See Supporting Calcuation Sheet
Well Pump Test, Inspection, Maintenance & Repair	each	$ 1,300.00	2	$ 2,600	See Supporting Calcuation Sheet
Storage Tank Inspection, Maintenance & Repair	each	$ 34,247.27	1	$ 34,247	See Supporting Calcuation Sheet
Treatment - Inspection, Maintenance, & Repair	each	$ 29,350.00	1	$ 29,350	See Supporting Calcuation Sheet
Treatment - Chemicals	LS	$ 45,774.69	1	$ 30,476	See Supporting Calcuation Sheet; updated 9/26/25
Distribution System Maintenance & Repair	LS	$ 34,100.00	1	$ 34,100	See Supporting Calcuation Sheet
Distribution System Leak Detection	Day	$ 300.00	3.0	$ 900	$300 leak detection per day through MRWA; on as-needed basis
Generator Load Testing	each	$ 2,745.60	1	$ 2,746	See Supporting Calcuation Sheet
Disposal Fees	LS	$ 1,000.00	1	$ 1,000	M&H Estimate
Miss Digs Annual Subscription	each	$ 1,000.00	1	$ 1,000	Required
Lab Analysis Fees	LS	$ 7,969.58	1	$ 7,970	See Supporting Calcuation Sheet
TOTAL OTHER DIRECT COSTS				**$ 176,188**	

Planning/Studies	Units	Cost	Frequency (yrs)	Total	
Emergency Response Plan	each	$ -	1	$ -	Included in operator's normal business hours
Wellhead or Watershed Protection Plan	each	$ 15,000.00	10	$ 1,500	M&H Estimate
Sampling Plans - Bacteria, Lead & Copper, DBP	each	$ -	1	$ -	Included in operator's normal business hours
O&M Manual	each	$ 2,000.00	5	$ 400	Initial in design; Updates included in operator's normal business hours
Reliability Study	each	$ 7,500.00	5	$ 1,500	Assuming minimal updates and hired by consultants
General Plan	each	$ 7,500.00	5	$ 1,500	Assuming minimal updates and hired by consultants
Cross Connection Plan	each	$ -	1	$ -	Included in operator's normal business hours
Asset Management Plan (Water Audit)	each	$ -	5	$ -	In design contract; updates by operator and clerk in norm bus hours
TOTAL PLANNING				**$ 4,900**	

Administrative	Units	Cost	Frequency (yrs)	Total	
Ordinances/Legal support	each	$ 5,000.00	1	$ 5,000	M&H Estimate
ArcGIS Annual Subscription	each	$ -	1	$ -	
EGLE Annual Fee	each	$ 1,700.00	1	$ 1,700	
Insurance	each	$ 16,000.00	1	$ 16,000	
AMI Meter Subscription/Billing Program Subscription Cost	each	$ 20,200.00	1	$ 20,200	Badger Cell Based Fixed Cost; matched pricing From CHARLEVOIX TOWNSHIP METER ANALYSIS
SCADA Annual Fees	each		1	$ -	
TOTAL ADMINISTRATIVE				**$ 36,200**	

TOTAL ANNUAL O&M COSTS	**$ 361,120**	

Attachment C – Generator Fuel Demands

Annual Costs: Generator Fuel

Generator Fuel Usage

KW	400
Assumed Load	100%
Diesel (gal/hr)	28.6
Run Time (hr/mo)	8
Annual Fuel (gal)	2,746 {Runtime x diesel x 12-mo}

From: Matt Kennedy <Matt.Kennedy@ohm-advisors.com>
Sent: Monday, March 31, 2025 6:31:57 PM
To: Andrea Boyd <Andrea.Boyd@meadhunt.com>; Alisha Busuttil <Alisha.Busuttil@ohm-advisors.com>; Susan Knepper <Susan.Knepper@ohm-advisors.com>; Shannon Saramaa <Shannon.Saramaa@meadhunt.com>; Tammi Gall <Tammi.Gall@meadhunt.com>
Subject: RE: Village of Pellston Supporting Information

You don't often get email from matt.kennedy@ohm-advisors.com. Learn why this is important

Matt's missing data:
(2) submersible well pumps with 50 HP. 315gpm@500ft TDH: HP = (TDH x Q x SG) / 3960 = (500 feet x 315 gpm x 1.0) / 3960 = 40HP -→ 50HP to be conservative
(1) generator, 400kw – powers wells and all plant equipment.

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Matt.Kennedy@ohm-advisors.com | **OHM**-Advisors.com

Generator Size (kW)	1/4 Load (gal/hr)	1/2 Load (gal/hr)	3/4 Load (gal/hr)	Full Load (gal/hr)
20	0.6	0.9	1.3	1.6
30	1.3	1.8	2.4	2.9
40	1.6	2.3	3.2	4.0
60	1.8	2.9	3.8	4.8
75	2.4	3.4	4.6	6.1
100	2.6	4.1	5.8	7.4
125	3.1	5.0	7.1	9.1
135	3.3	5.4	7.6	9.8
150	3.6	5.9	8.4	10.9
175	4.1	6.8	9.7	12.7
200	4.7	7.7	11.0	14.4
230	5.3	8.8	12.5	16.6
250	5.7	9.5	13.6	18.0
300	6.8	11.3	16.1	21.5
350	7.9	13.1	18.7	25.1
400	8.9	14.9	21.3	28.6

*Consumption estimates from here: http://www.dieselserviceandsupply.com/Diesel_Fuel_Consumption.aspx

Attachment D – Electrical Demands

Annual Costs: Electricity
Existing

Annual Electrical Cost

Average gallons per day water use		105,980	See OHM estimate System Overview tab
gpm well pumping rate		315	See OHM estimate below
well run time per day (minutes)		336	
well run time per day (hours)		5.6	
cost per KWH		$0.19	per general search
BHP		50	from OHM, below, assume only 1 runs at a time
Motor Efficiency		80%	conservative
KW		46.63	{KW = BHP x 0.746/motor efficiency}
Cost per hour		$8.93	{KW x $/KWH}
Cost per day	$	50.09	
Cost per year	$	18,283.99	

From: Matt Kennedy <Matt.Kennedy@ohm-advisors.com>
Sent: Monday, March 31, 2025 6:31:57 PM
To: Andrea Boyd <Andrea.Boyd@meadhunt.com>; Alisha Busuttil <Alisha.Busuttil@ohm-advisors.com>; Susan Knepper <Susan.Knepper@ohm-advisors.com>; Shannon Saramaa <Shannon.Saramaa@meadhunt.com>; Tammi Gall <Tammi.Gall@meadhunt.com>
Subject: RE: Village of Pellston Supporting Information

You don't often get email from matt.kennedy@ohm-advisors.com. Learn why this is important

Matt's missing data:
(2) submersible well pumps with 50 HP. 315gpm@500ft TDH: HP = (TDH x Q x SG) / 3960 = (500 feet x 315 gpm x 1.0) / 3960 = 40HP -→ 50HP to be conservative
(**1) generator, 400kw** – powers wells and all plant equipment.

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Matt.Kennedy@ohm-advisors.com | **OHM**-Advisors.com

Annual Costs: Electricity
5-Year

Annual Electrical Cost

Average gallons per day water use		148,560	See OHM estimate System Overview tab; assume average of 5 year values
gpm well pumping rate		315	See OHM estimate below
well run time per day (minutes)		472	
well run time per day (hours)		7.9	
cost per KWH		$0.19	per general search
BHP		50	from OHM, below, assume only 1 runs at a time
Motor Efficiency		80%	conservative
KW		46.63	{KW = BHP x 0.746/motor efficiency}
Cost per hour		$8.93	{KW x $/KWH}
Cost per day	$	70.22	
Cost per year	$	25,629.86	

From: Matt Kennedy <Matt.Kennedy@ohm-advisors.com>
Sent: Monday, March 31, 2025 6:31:57 PM
To: Andrea Boyd <Andrea.Boyd@meadhunt.com>; Alisha Busuttil <Alisha.Busuttil@ohm-advisors.com>; Susan Knepper <Susan.Knepper@ohm-advisors.com>; Shannon Saramaa <Shannon.Saramaa@meadhunt.com>; Tammi Gall <Tammi.Gall@meadhunt.com>
Subject: RE: Village of Pellston Supporting Information

You don't often get email from matt.kennedy@ohm-advisors.com. Learn why this is important

Matt's missing data:
(2) submersible well pumps with 50 HP. 315gpm@500ft TDH: HP = (TDH x Q x SG) / 3960 = (500 feet x 315 gpm x 1.0) / 3960 = 40HP -→ 50HP to be conservative
(**1) generator, 400kw** – powers wells and all plant equipment.

MATT KENNEDY, PE, LEED AP | **OHM** Advisors
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Annual Costs: Electricity
20-Year

Annual Electrical Cost

Average gallons per day water use		207,679	See OHM estimate System Overview tab; assume average of 5 year values
gpm well pumping rate		315	See OHM estimate below
well run time per day (minutes)		659	
well run time per day (hours)		11.0	
cost per KWH		$0.19	per general search
BHP		50	from OHM, below, assume only 1 runs at a time
Motor Efficiency		80%	conservative
KW		46.63	{KW = BHP x 0.746/motor efficiency}
Cost per hour		$8.93	{KW x $/KWH}
Cost per day	$	98.16	
Cost per year	$	35,829.35	

From: Matt Kennedy <Matt.Kennedy@ohm-advisors.com>
Sent: Monday, March 31, 2025 6:31:57 PM
To: Andrea Boyd <Andrea.Boyd@meadhunt.com>; Alisha Busuttil <Alisha.Busuttil@ohm-advisors.com>; Susan Knepper <Susan.Knepper@ohm-advisors.com>; Shannon Saramaa <Shannon.Saramaa@meadhunt.com>; Tammi Gall <Tammi.Gall@meadhunt.com>
Subject: RE: Village of Pellston Supporting Information

You don't often get email from matt.kennedy@ohm-advisors.com. Learn why this is important

Matt's missing data:
(2) submersible well pumps with 50 HP. 315gpm@500ft TDH: HP = (TDH x Q x SG) / 3960 = (500 feet x 315 gpm x 1.0) / 3960 = 40HP -→ 50HP to be conservative
(**1) generator, 400kw** – powers wells and all plant equipment.

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Annual Costs: Electricity
51% Connection

Annual Electrical Cost

Average gallons per day water use		70,560	See OHM estimate System Overview tab
gpm well pumping rate		315	See OHM estimate below
well run time per day (minutes)		224	
well run time per day (hours)		3.7	
cost per KWH		$0.19	per general search
BHP		50	from OHM, below, assume only 1 runs at a time
Motor Efficiency		80%	conservative
KW		46.63	{KW = BHP x 0.746/motor efficiency}
Cost per hour		$8.93	{KW x $/KWH}
Cost per day	$	33.35	
Cost per year	$	12,173.18	

From: Matt Kennedy <Matt.Kennedy@ohm-advisors.com>
Sent: Monday, March 31, 2025 6:31:57 PM
To: Andrea Boyd <Andrea.Boyd@meadhunt.com>; Alisha Busuttil <Alisha.Busuttil@ohm-advisors.com>; Susan Knepper <Susan.Knepper@ohm-advisors.com>; Shannon Saramaa <Shannon.Saramaa@meadhunt.com>; Tammi Gall <Tammi.Gall@meadhunt.com>
Subject: RE: Village of Pellston Supporting Information

You don't often get email from matt.kennedy@ohm-advisors.com. Learn why this is important

Matt's missing data:
(2) submersible well pumps with 50 HP. 315gpm@500ft TDH: HP = (TDH x Q x SG) / 3960 = (500 feet x 315 gpm x 1.0) / 3960 = 40HP -→ 50HP to be conservative
(**1) generator, 400kw** – powers wells and all plant equipment.

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Attachment E – Well Maintenance

Annual Costs: Wells

	Annual Direct Cost	Annual Frequency	Total Direct Cost	Assumptions/Notes
Recommended O&M schedule for groundwater sources (per well				
Daily or weekly				
□ Check well house interior and grounds for general cleanliness and condition, and for any threats to water quality.				labor only
□ Check any warning lights or alarms – low water level in the well, intrusion, power outage, pump failure, etc.				labor only
□ Read source water meter. Record water-production data in well house log.				labor only
□ Read pump run hour meters and record data in well house log (unless automatic data storage is available).				labor only
□ Check pump-cycling rate. If it runs continuously or cycles more than 6 times per hour, see pump troubleshooting.				labor only
□ Check well house buildings for signs of security problems – graffiti, vandalism, doors or locks damaged, entry, etc.				labor only
□ Check wells source site after any adverse weather – high winds, heavy snow, ice, rains, etc.				labor only
□ Grounds maintenance	$100	52.00	$5,200	Weekly mowing at Tank/Pump Station/Well \site
Monthly				
□ Check well water level if source capacity is marginal or there are drought conditions				labor only
□ Check area for excessive vegetation or dangerous conditions – uncut grass, brush, dead trees, fire hazard, etc.				labor only
□ Check well house control valves for proper positions, open or closed. This information should be posted.				labor only
□ Check source control system – pressure switch settings, cycling, pressure tanks, storage tank water levels, etc.				labor only
□ Check well house control valves for damage or leaks.				labor only
□ Check for leaks – read source meter when you expect the water usage to be zero.				labor only
□ Check source pump cycling and pressure switch settings, on/off pressures and line pressures.				
General Charge for above	**$600**	1.00	$600	
Subtotal Preventative Maintenance	**$600**	1.00	**$5,800**	**Assume generally $50/mo for misc maintenance**
Annually or seasonally			$0	
□ Check well site for water ponding, poor drainage areas, excessive vegetation, unhealthy trees, fire hazards, etc.			$0	
□ Check source facilities conditions – corrosion, vent screens, vehicular or other damage, animal activity, etc.			$0	
□ Check cold weather protection – insulation, heating system, alarm system, etc.			$0	
□ Verify sanitary integrity of the sources – screened vents, no unprotected openings, electrical box sealed, etc.			$0	
□ Evaluate source use designations (permanent, seasonal, emergency, or inactive).			$0	
□ Exercise valves and test run emergency source wells to waste. Do not supply distribution system without WQ tests.			$0	
□ Review source related customer complaints and evaluate corrective actions and planning.			$0	
□ Implement seasonal start-up or shut-down procedures as outlined in your Seasonal Operations Plan			$0	
□ Review source water quality test results for trends, such as increasing nitrate or seasonal coliform problems.	$2,500	1.00	$2,500	M&H Estimate
Less than once a year			$0	
□ Measure source pump capacity in gallons per minute (GPM) to detect pump output problems.			$0	
□ Evaluate general source capacity to meet water system demand. Use water use and production records.			$0	
□ Evaluate capacity of source water to provide water of a reliable quantity and quality acceptable to customers			$0	
□ Consider television inspection of the well interior and the well screens	$3,000	0.10	$300	well TVd every 10 years
Corrective Maintenance - Well Screen	$15,000	0.10	$1,500	well maintenance for the high iron and calcium creating mineral fouling of well screen as well.
TOTAL			**$15,900**	

Source: Michigan, EGLE, Suggested Practice For Water Works Design, Construction and Operation for Type I Public Water Supplie
Note: See pump section for pump/motor maintenance

Attachment F – Well Pump Maintenance

Annual Costs: Well Pumps

	Annual Direct Cost	Annual Frequency	Total Direct Cost	Assumptions/Notes
Recommended O&M schedule for pumps and pumping facilities (per well pump)				
Daily or weekly				labor only
□ Check motor for unusual pump motor conditions, such as:				labor only
• Unusual pump noises in operation, hum, chattering, clicking, rapid knocking, etc.				labor only
• Motor fails to start or to come up to speed normally.				labor only
• Blackened or excessive sparking at commutator or brushes.				labor only
• Fine dust under couplings with rubber butters or pins.				labor only
• Smoke or charred insulation.				labor only
• Excessive vibration.				labor only
□ Check any warning lights or alarms for low pressure, pump failure, intrusion, power outage, etc.				labor only
□ Check pump house interior and grounds for general cleanliness and condition				labor only
□ Check pumps for leaks or seepage for pumps that are not water lubricated.				labor only
□ Check pump cycle rate – troubleshoot excessive pump cycling (about 6 cycles per hour).				labor only
□ Verify start and stop pressure settings and operability of water pressure gauges - reference O&M manual.				labor only
□ Check bearing temperatures – if a temperature gauge is available. Take care when checking how hot it may be.				labor only
□ Check pump run hours – if this information is available.				labor only
□ Check condition of the pump house and booster pump stations for damage and deterioration.				labor only
□ Check area around the pump house and booster station for security concerns, vandalism or unauthorized access.				labor only
Monthly				
□ Check oil or grease lubricant reservoirs for proper levels and any leakage or unusual conditions.				
□ Measure the pump capacity, compare with the expected output – from performance records or design parameter.				labor only
□ Perform routine operation of emergency generator (diesel, gas or propane) per manufacturer's instructions.				under generator cost
□ Check condition of emergency generator batteries, fuel levels, oil levels, instruments and controls.				fuels cost under generator cost
□ Check that existing pressure gauges, pump run meters and flow meters are functioning properly.				labor only
□ Check that pump controls are functioning properly – reference your operations and maintenance (O&M) manual.				labor only
□ Check pump house lighting, ventilation, heating and animal proofing (bats, birds, rodents).				labor only
Subtotal Preventative Maintenance	**$600**	1.00	**$600**	Assume generally $50/mo for misc maintenance
Annually or seasonally				
□ Seasonal water systems – follow start-up and shut-down procedures.				labor only
□ Review the adequacy, reliability and redundancy of the current pumping facilities and plan for improvements.				Part of Master Plan
□ Review financial capacity to complete expected maintenance or replacement to existing pumping facilities.				Part of Master Plan
□ Measure source pump capacity in gallons per minute (GPM) to detect pump output problems.				labor only
□ Evaluate the design of existing pump facilities and plan for improvements.				Part of Master Plan
□Verify that pressure gauges are available to monitor pump capacity.				labor only
Corrective Maintenance				
□ Evaluate the working condition of all pumps and schedule maintenance, overhaul or replace.	$3,500	0.20	$700	pump overhauled every 5 years
TOTAL			**$1,300**	

Source: Michigan, EGLE, Suggested Practice For Water Works Design, Construction and Operation for Type I Public Water Supplies

Attachment G – Storage Tank

Annual Costs: Storage Tanks

	Annual Direct Cost	Annual Frequency	Total Direct Cost	Assumptions/Notes
Recommended O&M schedule for storage facilities (per storage tank)				
Daily or weekly				labor only
□ Check any warning lights or alarms – low water level, high water level, intrusion, power outage, and so on.				labor only
□ Check storage tank for signs of security breaches – damaged fences, open gates, graffiti, vandalism, etc.				labor only
□ Check water level indicator – functioning, adequate amount of stored water, excessive water use.				labor only
□ Check the overflow line, vents, ladder access locks, roof access hatches, and controls that are readily visible from the ground for damage, vandalism, or other conditions.				labor only
□ Check storage tank and site after any adverse weather – high winds, heavy snow, ice, rains, etc.				labor only
Monthly				
□ Check water level indicator.				labor only
□ Verify all openings are protected from surface runoff, windblown contaminants, insects, birds and animals.				labor only
□ Check tank overflow lines for signs of damage, such as, screens, flapper valves, check valves, splash plate , etc.				labor only
□ Check area for excessive vegetation or dangerous conditions – uncut grass, brush, dead trees, fire hazard, etc.				labor only
□ Check control valves for proper positions, open or closed.				labor only
□ Check control valves for damage or leaks.				labor only
□ Check low water temperature alarm – cold weather only.				labor only
□ Check high water temperature limit switch – when heating system in service.				labor only
Quarterly				
□ Check water level indicator.				labor only
□Visually inspect tank exterior and roof for signs of damage, corrosion, degradation, leakage, or structural problems, with particular focus on all openings into the reservoir: reservoir roof and side wall vents, access hatch, and overflow outlet.				labor only
□ Check tank supporting structure for signs of damage, corrosion, degradation, structural or seismic inadequacy.				labor only
□ Check tank foundation for signs of damage, corrosion, degradation, structural inadequacy.				labor only
□ Tank catwalks/ladders free from signs of damage, corrosion, degradation, structural condition, vandalism, etc.				labor only
□ Tank area for water ponding, poor drainage areas, excessive vegetation, unhealthy tress, fire hazards, etc.				labor only
□ Tank area free from combustible storage, trash, debris, brush, or other material that could present a fire hazard.				labor only
□ Tank area free of accumulation of material on or near parts possibly resulting in accelerated corrosion or rot.				labor only
□ Tank and support free of ice buildup.				labor only
□ Check earth embankments for erosion, burrowing animals, improper drainage and leakage.				labor only
Subtotal Preventative Maintenance	**$600**	1.00	**$600**	Assume generally $50/mo for misc maintenance
Annually or seasonally				
□ Check storage tank structural, seismic and sanitary integrity – leaks, corrosion, cracks, supports, warping, etc.				in cost below
□ Inspect storage tank interior for pitting, concrete spalling, rot, corrosion, rust, water level sensors, biofilm build-up	$750	0.50	$375	MS Tank Verbal quoted $750 a few years ago; assume $1500
□ Exercise valves and make repairs as needed.	$1,000	0.10	$100	Assume repair every 10 years
□ Document inspection and maintenance activity as part of an O&M program.				
□ Inventory and evaluate storage facilities capacity, condition, replacement costs and plan for improvements.				
□ Evaluate stored water for clarity, sediments, floating materials or films, unusual odors, insects, birds or animals.				
□ Plan for storage facility improvements and budget for the associated cost.				
Three to five year inspections				
□ Tank indicator inspected – every three years for steel storage tanks without corrosion protection.				
□ Tank indicator inspected – every five years for storage tanks other than steel without corrosion protection.				
□ **Drain, inspect, clean and disinfect storage tank** or use a diving maintenance service without draining tank.	$3,500	0.20	$700	MS Rural Tank verbal quote $3000 including disinfection a few years ago; assume 3500
□ Respond to any evidence of storage tank problems				
Corrective Maintenance - Repainting	$487,084	1/15	$32,472	M&H Estimate
TOTAL			**$34,247**	

8,398	SF	Area of tank to be repainted
$58	$/SF	Backed into this value based on rough quote below
$487,084	Repainting cost	

Attachment H – Treatment: Inspection, Maintenance, Repair

Annual Costs: Treatment - Inspection, Maintenance, Repairs

	Annual Direct Cost	Annual Frequency	Total Direct Cost	Assumptions/Notes
Recommended O&M schedule for chlorine disinfection treatment				
Daily				labor only
□ Check for any security issues at the treatment plant and surrounding area- fences, gates, doors, locks, any				labor only
evidence of tampering or vandalism.				labor only
□ Verify that the supply chemicals is adequate for normal operation– 30 to 60 days.				labor only
□ Check for leaks or excessive chlorine smell – locate and repair any leaks and improve ventilation if needed.				labor only
□ Check chemical feel pump for unusual vibrations or warmth indicating bearings or gears may be worn or damaged				labor only
Take carewhen checking how hot it may be.				labor only
□ Test for free chlorine residual in the distribution system using an EPA approved test kit– evaluate and log results				labor only
into a monthly chlorination residual report form. Are free chlorine levels consistent?				labor only
□Adjust the pump feed rate control as needed to meet residual requirements				labor only
□ Record results of all tests, chemical use, water production, and maintenance in a daily logbook.				labor only
□ Check records of logbooks for unusual data, trends and other indicators or possible problems.				labor only
□ Keep copy of chlorination treatment system O&M manual in treatment building.				labor only
Quarterly				
□ Calibrate chemical feed pump to verify the performance of the pump output– follow manufacturer's instructions.				labor only
□Wash and clean the chlorine solution tank if there is any sediment build-up. Clean the chlorinator, lines and foot				labor only
valve as needed - follow manufacturer's instructions.				labor only
Subtotal Preventative Maintenance			**$250**	
Annually or seasonally			$0	
□Clean the chemical feed pump replace the O-rings, valves and worn or damaged parts – use the spare parts kit to	$100	1.00	$100	
make repairs and follow manufacturer's instructions. You should have a back-up chemical feed pump to provide			$0	
Continuous chemical feed			$0	
Replace sand in drain field	$75,000	1/3	$25,000	M&H estimate
Replace filter media in filter vessel	$20,000	1/10	$2,000	
Pump out waste tank (backwash tank)	$1,600	1.00	$1,600	M&H estimate
Corrective Maintenance	$400	1.00	$400	
TOTAL			**$29,350**	

Source: Michigan, EGLE, Suggested Practice For Water Works Design, Construction and Operation for Type I Public Water Supplies

Orthophasphate will be same schedule as chlorine, follow manufacturer guidelines on softening and iron removal tanks

Attachment I – Distribution System

Annual Costs: Distribution System

	Annual Direct Cost	Annual Frequency	Total Direct Cost	Assumptions/Notes
Recommended O&M schedule for distribution systems				
Daily				
□ Check any warning lights or annunciators – low water level, high water level, power outage, pump failure, etc.				labor only
□ Investigate any customer complaints related to distribution system – low pressure, water quality problems, taste and				labor only
odor, etc.				labor only
□ Check free chlorine residuals in distribution system (if chlorinating) – evaluate high and low levels.				labor only
□ Measure and record water production to monitor water demands and calculate leakage				labor only
□ Check and log distribution system conditions – storage tank water levels, leaks, vandalism, etc.				labor only
Monthly				
□ Check service pressures throughout distribution systems – investigate the cause of any low pressures.				labor only
□ Read service meters for billing, determining water demand, detecting leaks, monitoring conservation, etc.				labor only
□ Collect routine bacteriological samples and test for total coliform – follow up on unsatisfactory sample results.				labor only
□ Conduct distribution system maintenance and keep records of all repairs and changes.				labor only
Quarterly				
□ Flush the distribution system as necessary based on the potential for sediments such as iron and manganese				labor only
Subtotal			$0	
Annually or seasonally			$0	
□ Evaluate condition of the distribution system, including pressure, and flow capacity.			$0	
□ Exercise distribution system valves – record inspections and repairs in logbook.			$0	
□ Do a water audit and calculate unaccounted-for-water by comparing water production and usage – goal of < 10%.			$0	
□ Prepare system for seasonal start up and shut down. See your O&M manual or Start-up and Shut-down			$0	
□ Conduct a preventive maintenance program on nine (9) main mag meters – calibration, replacement, etc.	$1,800	1.00	$1,800	
□ Evaluate safety programs and equipment – traffic safety, trench safety, confined space, ladder safety, etc.			$0	
□ Evaluate Emergency Response Plan – loss of water pressure, contamination, cross connections, overfeeds, etc.			$0	
□ Update system map of the distribution system – lines (size, material, age), valves, meters, hydrants, etc.			$0	
□ Evaluate capacity to conduct flushing as needed – training, equipment, availability of hydrants or blowoffs.			$0	
□ Have backflow prevention assemblies tested by certified backflow assembly tester (BAT) – record results and take	$150	4.00	$600	
corrective maintenance as needed.			$0	
□ Determine daily and monthly peak water demand periods.			$0	
Less than once a year			$0	
□ Perform flow tests on all fire hydrants at least once every three years– with local fire departments.	$23,100	1/3	$7,700	
□ Develop an Asset Management Plan to ensure financial capacity to serve safe and reliable water.			$0	
□ Develop a Strategic Plan to guide you in planning for important capital improvements, priorities, and resources. See			$0	
			$0	
Localized repairs for leaks/breaks in the system	$6,000	4.00	$24,000	
TOTAL			**$34,100**	

Attachment J – Chemicals

Annual Costs: Chemicals Summary

		Unit Price	Unit	{see calculated demand tabs} Annual Demand	Total	
Exisiting	Sodium Hypchlorite 12.5% (NaOCl) (for disinfection and Fe/Mn Oxidizer)	$5.00	gal	9,155	$45,775	Assumed bulk supplied
5-YR	Sodium Hypchlorite 12.5% (NaOCl) (for disinfection and Fe/Mn Oxidizer)	$5.00	gal	12,833	$64,165	Assumed bulk supplied
20-YR	Sodium Hypchlorite 12.5% (NaOCl) (for disinfection and Fe/Mn Oxidizer)	$5.00	gal	17,940	$89,700	Assumed bulk supplied
51%	Sodium Hypchlorite 12.5% (NaOCl) (for disinfection and Fe/Mn Oxidizer)	$5.00	gal	6,095	$30,476	Assumed bulk supplied

Annual Costs: Chemicals Summary
Existing

	Average Daily Demand	0.10598	MGD	See OHM estimate below; Assume averge of 5 year values
(r)	Desired Residual	0.5	mg/L	
(s)	Purity of CL	0.125		
	Specific Gravity 12.5%	$ 1.20		
	Cost per gal of 12.5%	$ 5.00		See chemical summary sheet
(t)	Iron	1	mg/L	Some references say 0.64, 0.62, and others say 1-2 parts chlorine to 1 part iron ;go with 1.0 for now
(u)	Manganese	1.3	mg/L	
(v)	Ammonia	7.6	mg/L	
	Hydrogen Sulfide	2.2	mg/L	

Chlorine Demand Calcs - Iron precipitation and Chlorination

	(a) x (s)		(b) x (t)		(c) x (u)	A + B + C	(D) + (r)					
(a)	(A)	(b)	(B)	(c)	(C)	(D)						
Iron	Iron Demand	Manganese	Manganese Demand	Ammonia	Ammonia Demand	Total Demand	Chlorine Requirement					
mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	lbs/Day of Pure	lbs/Day of 12.5%	lbs/year of 12.5%	Gallons per year of 12.5%	Cost Per Year 12.5%
3.8	3.8	24	31.2		0	35.0	35.5	31.4	251.0	91,623	9,155	$45,774.69

Annual Costs: Chemicals Summary
5-Year

	Average Daily Demand		0.14856 MGD	See OHM estimate below; Assume averge of 5 year values
(r)	Desired Residual		0.5 mg/L	
(s)	Purity of CL		0.125	
	Specific Gravity 12.5%	$	1.20	
	Cost per gal of 12.5%	$	5.00	See chemical summary sheet
(t)	Iron		1 mg/L	Some references say 0.64, 0.62, and others say 1-2 parts chlorine to 1 part iron; go with 1.0 for now
(u)	Manganese		1.3 mg/L	
(v)	Ammonia		7.6 mg/L	
	Hydrogen Sulfide		2.2 mg/L	

Chlorine Demand Calcs - Iron precipitation and Chlorination

(a)	(a) x (s) (A)	(b)	(b) x (t) (B)	(c)	(c) x (u) (C)	A + B + C (D)	(D) + (r)					
Iron	Iron Demand	Manganese	Manganese Demand	Ammonia	Ammonia Demand	Total Demand	Chlorine Requirement					
mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	lbs/Day of Pure	lbs/Day of 12.5%	lbs/year of 12.5%	Gallons per year of 12.5%	Cost Per Year 12.5%
3.8	3.8	24	31.2		0	35.0	35.5	44.0	351.9	128,433	12,833	$64,165.39

Annual Costs: Chemicals Summary
20-Year

	Average Daily Demand	0.20768	MGD	See OHM estimate below; Assume averge of 5 year values
(r)	Desired Residual	0.5	mg/L	
(s)	Purity of CL	0.125		
	Specific Gravity 12.5%	$ 1.20		
	Cost per gal of 12.5%	$ 5.00		See chemical summary sheet
(t)	Iron	1	mg/L	Some references say 0.64, 0.62, and others say 1-2 parts chlorine to 1 part iron; go with 1.0 for now
(u)	Manganese	1.3	mg/L	
(v)	Ammonia	7.6	mg/L	
	Hydrogen Sulfide	2.2	mg/L	

Chlorine Demand Calcs - Iron precipitation and Chlorination

(a)	(a) x (s) (A)	(b)	(b) x (t) (B)	(c)	(c) x (u) (C)	A + B + C (D)	(D) + (r)					
Iron	Iron Demand	Manganese	Manganese Demand	Ammonia	Ammonia Demand	Total Demand	Chlorine Requirement					
mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	lbs/Day of Pure	lbs/Day of 12.5%	lbs/year of 12.5%	Gallons per year of 12.5%	Cost Per Year 12.5%
3.8	3.8	24	31.2		0	35.0	35.5	61.5	491.9	179,544	17,940	$89,700.22

Annual Costs: Chemicals Summary
51% Connection

	Average Daily Demand		0.07056 MGD	See OHM estimate below; Assume averge of 5 year values
(r)	Desired Residual		0.5 mg/L	
(s)	Purity of CL		0.125	
	Specific Gravity 12.5%	$	1.20	
	Cost per gal of 12.5%	$	5.00	See chemical summary sheet
(t)	Iron		1 mg/L	Some references say 0.64, 0.62, and others say 1-2 parts chlorine to 1 part iron; go with 1.0 for now
(u)	Manganese		1.3 mg/L	
(v)	Ammonia		7.6 mg/L	
	Hydrogen Sulfide		2.2 mg/L	

Chlorine Demand Calcs - Iron precipitation and Chlorination

	(a) x (s)		(b) x (t)		(c) x (u)	A + B + C	(D) + (r)					
(a)	(A)	(b)	(B)	(c)	(C)	(D)						
Iron	Iron Demand	Manganese	Manganese Demand	Ammonia	Ammonia Demand	Total Demand	Chlorine Requirement					
mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	lbs/Day of Pure	lbs/Day of 12.5%	lbs/year of 12.5%	Gallons per year of 12.5%	Cost Per Year 12.5%
3.8	3.8	24	31.2		0	35.0	35.5	20.9	167.1	61,001	6,095	$30,476.04

Attachment K – Lab Analysis

Annual Costs: Lab Analysis Fees
Existing

Required Sampling per EGLE

Distribution	# Samples	Frequency	Price per sample	Total	Test Location	Notes	
Routine Total Coliform	2/month		$25	$1,000	Local Health Dept	alotted extra for Boil advisories	
Chlorine Residual	when sample for total coliform		in house		in house		
TTHM/Haa5	1/yearly		$214	$214	Trace Analytics Labs		*may be put on reduced monitoring
Lead & Copper	20/6 months		$32	$1,260	Trace Analytics Labs		*may be put on reduced monitoring
WQP (pH, alkalinity, sulfate, chloride, orthophosphate)	2/quarter		$91	$0	Trace Analytics Labs		eliminated this since not feeding ortho
Chlorine residual	daily		in house		in house		*EGLE will establish frequency
Phosphate residual	daily		in house		in house		eliminated this since not feeding ortho
Iron	monthly		in house		in house		*EGLE will establish frequency
				$1,474	outside lab cost for distribution		

Entry Point/Well House	# Samples	Frequency	Price per sample	total	Test Location	notes	notes
complete metals	1/9 years		$126	$126	Trace Analytics Labs		
cyanide	1/9 years		$32	$32	Trace Analytics Labs		
Fluoride	1/3 years		$45	$45	Trace Analytics Labs	included in Partial Chem	
Gross Alpha (Rad)	1/9 years		$257	$257	Trace Analytics Labs		
Nitrate	1/year				Trace Analytics Labs	included in Partial Chem	
Nitrite	1/3 years				Trace Analytics Labs	included in Partial Chem	
PFAS	1/yearly		$400	$1,200	Trace Analytics Labs		*may be required quarterly first year
Radium 226& 228	1/9 years		$365	$365	Trace Analytics Labs		
SOC carbamates	1/3 years		$450	$450	Trace Analytics Labs	SOC Package	
SOC Herbicides	1/3 years				Trace Analytics Labs	SOC Package	
SOC pesticides	1/3 years				Trace Analytics Labs	SOC Package	
Sodium	1/3 years				Trace Analytics Labs	included in Partial Chem	
Uranium	1/9 years		$32	$32	Trace Analytics Labs		
Volatile Organic Compour	1/3 years		$98	$98	Trace Analytics Labs		
WQP (pH, sulfate, chloride, orthophospate dosage, orthophospate	1/2 weeks		$91	$0	Trace Analytics Labs		eliminated this since not feeding ortho
Chlorine residual	daily		in house		in house		*EGLE will establish frequency
Phosphate residual	daily		in house		in house		eliminated this since not feeding ortho
Iron before treatment	daily/weekly		in house		in house		*EGLE will establish frequency
Iron after treatment	daily/weekly		in house		in house		*EGLE will establish frequency
Hardness(ion exchange)	daily/weekly		in house?		in house		*EGLE will establish frequency
Sodium(Ion exchange)	monthly		31.5	$378	Trace Analytics Labs		*EGLE will establish frequency
Langlier Index (pH, TDS, Ca, temp, Alkalinity)	monthly				Trace Analytics Labs	included with WQP	*EGLE will establish frequency
				$6,930	Outside lab cost for entry point/well house		

In House Testing	Cost per Test		QTY	Annual Total	
DR3900	7000				
Alkalinity	70/25pk		1	0	eliminated this since not feeding ortho
Hardness	106/25pk		3	0	eliminated this since not feeding ortho
Chlorine residual-free	28.55/100pk		6	171.3	
Chlorine residual-total	31.00/100pk		6	186	
Phospahte	55.85/100pk		6	335.1	
Iron	37.59/100pk		2	75.18	
Sulfate	52.05/ 100pk		1	0	eliminated this since not feeding ortho
chloride	110/24 pk		3	0	eliminated this since not feeding ortho
calcium	included w/ hardness				eliminated this since not feeding ortho
yearly service plan	1000			0	eliminated this since not feeding ortho
pocket DR300	700				
Chlorine residual-free	28.55/100pk		accounted for above		
Chlorine residual-total	31.00/100pk		accounted for above		
Hach HQ2200 pH meter/t	3100				
pH buffer 4,7,10 kit	136		2	272	
TDS Std	20.15		4	0	eliminated this since not feeding ortho
				1039.58	total for year
				$7,970	Total for lab testing

Annual Costs: Lab Analysis Fees
5-Year

Required Sampling per EGLE

Distribution	# Samples	Frequency	Price per sample	Total	Test Location	Notes	
Routine Total Coliform	2/month		$25	$1,000	Local Health Dept	alotted extra for Boil advisories	
Chlorine Residual	when sample for total coliform		in house		in house		
TTHM/Haa5	1/yearly		$214	$107	Trace Analytics Labs		after 3 years of annual, move to every 3 years reduced schedule
Lead & Copper	20/6 months		$32	$210	Trace Analytics Labs		after 1 year of 6-mo, move to 20 unit annual for 3 years, then 10 unit every three years
WQP (pH, alkalinity, sulfate, chloride, orthophosphate)	2/quarter		$91	$0	Trace Analytics Labs		eliminated this since not feeding ortho
Chlorine residual	daily		in house		in house		*EGLE will establish frequency
Phosphate residual	daily		in house		in house		eliminated this since not feeding ortho
Iron	monthly		in house		in house		*EGLE will establish frequency
				$317	outside lab cost for distribution		

Entry Point/Well House	# Samples	Frequency	Price per sample	total	Test Location	notes	notes
complete metals	1/9 years		$126	$126	Trace Analytics Labs		
cyanide	1/9 years		$32	$32	Trace Analytics Labs		
Fluoride	1/3 years		$45	$45	Trace Analytics Labs	included in Partial Chem	
Gross Alpha (Rad)	1/9 years		$257	$257	Trace Analytics Labs		
Nitrate	1/year				Trace Analytics Labs	included in Partial Chem	
Nitrite	1/3 years				Trace Analytics Labs	included in Partial Chem	
PFAS	1/yearly		$400	$400	Trace Analytics Labs		*may be required quarterly first year
Radium 226& 228	1/9 years		$365	$365	Trace Analytics Labs		
SOC carbamates	1/3 years		$450	$450	Trace Analytics Labs	SOC Package	
SOC Herbicides	1/3 years				Trace Analytics Labs	SOC Package	
SOC pesticides	1/3 years				Trace Analytics Labs	SOC Package	
Sodium	1/3 years				Trace Analytics Labs	included in Partial Chem	
Uranium	1/9 years		$32	$32	Trace Analytics Labs		
Volatile Organic Compour	1/3 years		$98	$98	Trace Analytics Labs		
WQP (pH, sulfate, chloride, orthophospate dosage, orthophospate	1/2 weeks		$91	$0	Trace Analytics Labs		eliminated this since not feeding ortho
Chlorine residual	daily		in house		in house		*EGLE will establish frequency
Phosphate residual	daily		in house		in house		eliminated this since not feeding ortho
Iron before treatment	daily/weekly		in house		in house		*EGLE will establish frequency
Iron after treatment	daily/weekly		in house		in house		*EGLE will establish frequency
Hardness(ion exchange)	daily/weekly		in house?		in house		*EGLE will establish frequency
Sodium(Ion exchange)	monthly		31.5	$378	Trace Analytics Labs		*EGLE will establish frequency
Langlier Index (pH, TDS, Ca, temp, Alkalinity)	monthly				Trace Analytics Labs	included with WQP	*EGLE will establish frequency
				$3,816	Outside lab cost for entry point/well house		

In House Testing	Cost per Test		QTY	Annual Total	
DR3900	7000				
Alkalinity	70/25pk		1	0	eliminated this since not feeding ortho
Hardness	106/25pk		3	0	eliminated this since not feeding ortho
Chlorine residual-free	28.55/100pk		6	171.3	
Chlorine residual-total	31.00/100pk		6	186	
Phospahte	55.85/100pk		6	335.1	
Iron	37.59/100pk		2	75.18	
Sulfate	52.05/ 100pk		1	0	eliminated this since not feeding ortho
chloride	110/24 pk		3	0	eliminated this since not feeding ortho
calcium	included w/ hardness				eliminated this since not feeding ortho
yearly service plan	1000			0	eliminated this since not feeding ortho
pocket DR300	700				
Chlorine residual-free	28.55/100pk		accounted for above		
Chlorine residual-total	31.00/100pk		accounted for above		
Hach HQ2200 pH meter/t	3100				
pH buffer 4,7,10 kit	136		2	272	
TDS Std	20.15		4	0	eliminated this since not feeding ortho
				1039.58	total for year
				$4,856	Total for lab testing

Annual Costs: Lab Analysis Fees
20-Year

Required Sampling per EGLE

Distribution	# Samples	Frequency	Price per sample	Total	Test Location	Notes	
Routine Total Coliform	2/month		$25	$1,000	Local Health Dept	alotted extra for Boil advisories	
Chlorine Residual	when sample for total coliform		in house		in house		
TTHM/Haa5	1/yearly		$214	$107	Trace Analytics Labs		after 3 years of annual, move to every 3 years reduced schedule
Lead & Copper	20/6 months		$32	$105	Trace Analytics Labs		after 1 year of 6-mo, move to 20 unit annual for 3 years, then 10 unit every three years
WQP (pH, alkalinity, sulfate, chloride, orthophosphate)	2/quarter		$91	$0	Trace Analytics Labs		eliminated this since not feeding ortho
Chlorine residual	daily		in house		in house		*EGLE will establish frequency
Phosphate residual	daily		in house		in house		eliminated this since not feeding ortho
Iron	monthly		in house		in house		*EGLE will establish frequency
				$212	outside lab cost for distribution		

Entry Point/Well House	# Samples	Frequency	Price per sample	total	Test Location	notes	notes
complete metals	1/9 years		$126	$126	Trace Analytics Labs		
cyanide	1/9 years		$32	$32	Trace Analytics Labs		
Fluoride	1/3 years		$45	$45	Trace Analytics Labs	included in Partial Chem	
Gross Alpha (Rad)	1/9 years		$257	$257	Trace Analytics Labs		
Nitrate	1/year				Trace Analytics Labs	included in Partial Chem	
Nitrite	1/3 years				Trace Analytics Labs	included in Partial Chem	
PFAS	1/yearly		$400	$400	Trace Analytics Labs		*may be required quarterly first year
Radium 226& 228	1/9 years		$365	$365	Trace Analytics Labs		
SOC carbamates	1/3 years		$450	$450	Trace Analytics Labs	SOC Package	
SOC Herbicides	1/3 years				Trace Analytics Labs	SOC Package	
SOC pesticides	1/3 years				Trace Analytics Labs	SOC Package	
Sodium	1/3 years				Trace Analytics Labs	included in Partial Chem	
Uranium	1/9 years		$32	$32	Trace Analytics Labs		
Volatile Organic Compou	1/3 years		$98	$98	Trace Analytics Labs		
WQP (pH, sulfate, chloride, orthophospate dosage,	1/2 weeks		$91	$0	Trace Analytics Labs		eliminated this since not feeding ortho
Chlorine residual	daily		in house		in house		*EGLE will establish frequency
Phosphate residual	daily		in house		in house		eliminated this since not feeding ortho
Iron before treatment	daily/weekly		in house		in house		*EGLE will establish frequency
Iron after treatment	daily/weekly		in house		in house		*EGLE will establish frequency
Hardness(ion exchange)	daily/weekly		in house?		in house		*EGLE will establish frequency
Sodium(Ion exchange)	monthly		31.5	$378	Trace Analytics Labs		*EGLE will establish frequency
Langlier Index (pH, TDS, Ca, temp, Alkalinity)	monthly				Trace Analytics Labs	included with WQP	*EGLE will establish frequency
				$3,606	Outside lab cost for entry point/well house		

In House Testing	Cost per Test		QTY	Annual Total	
DR3900	7000				
Alkalinity	70/25pk		1	0	eliminated this since not feeding ortho
Hardness	106/25pk		3	0	eliminated this since not feeding ortho
Chlorine residual-free	28.55/100pk		6	171.3	
Chlorine residual-total	31.00/100pk		6	186	
Phospahte	55.85/100pk		6	335.1	
Iron	37.59/100pk		2	75.18	
Sulfate	52.05/ 100pk		1	0	eliminated this since not feeding ortho
chloride	110/24 pk		3	0	eliminated this since not feeding ortho
calcium	included w/ hardness				eliminated this since not feeding ortho
yearly service plan	1000			0	eliminated this since not feeding ortho
pocket DR300	700				
Chlorine residual-free	28.55/100pk		accounted for above		
Chlorine residual-total	31.00/100pk		accounted for above		
Hach HQ2200 pH meter/	3100				
pH buffer 4,7,10 kit	136		2	272	
TDS Std	20.15		4	0	eliminated this since not feeding ortho
				1039.58	total for year
				$4,646	Total for lab testing

Appendix F

Alternative 3: Regional Wholesale Provider Evaluation

Alternative 3: Regional Wholesale Provider Evaluation

Option 3 Analysis: A municipal water system that purchases water from a nearby water supplier
A regionalization alternative was evaluated for the Village of Pellston, involving the Village purchasing water from a nearby supplier. Several municipalities were considered for this alternative. Figure 1 displays a map of the nearby public water supply locations. The Village of Mackinaw City and the City of Cheboygan are approximately 17 miles and 19 miles away, respectively and were excluded from further analysis due to the distance to the Village of Pellston and the lack of population density that potentially could be connected along the route. The City of Petoskey and the City of Harbor Springs are situated at roughly the same distance from the Village. This analysis focused on the City of Harbor Springs as a wholesale supplier, assuming that similar costs and facilities would be required for either City. The City of Harbor Springs is located approximately 18 miles from the Village and has greater opportunity for higher density populations along the route to the Village for establishing future connections than Mackinaw City and the City of Cheboygan. A high-level analysis of the City of Harbor Springs public water system's capacity was completed.

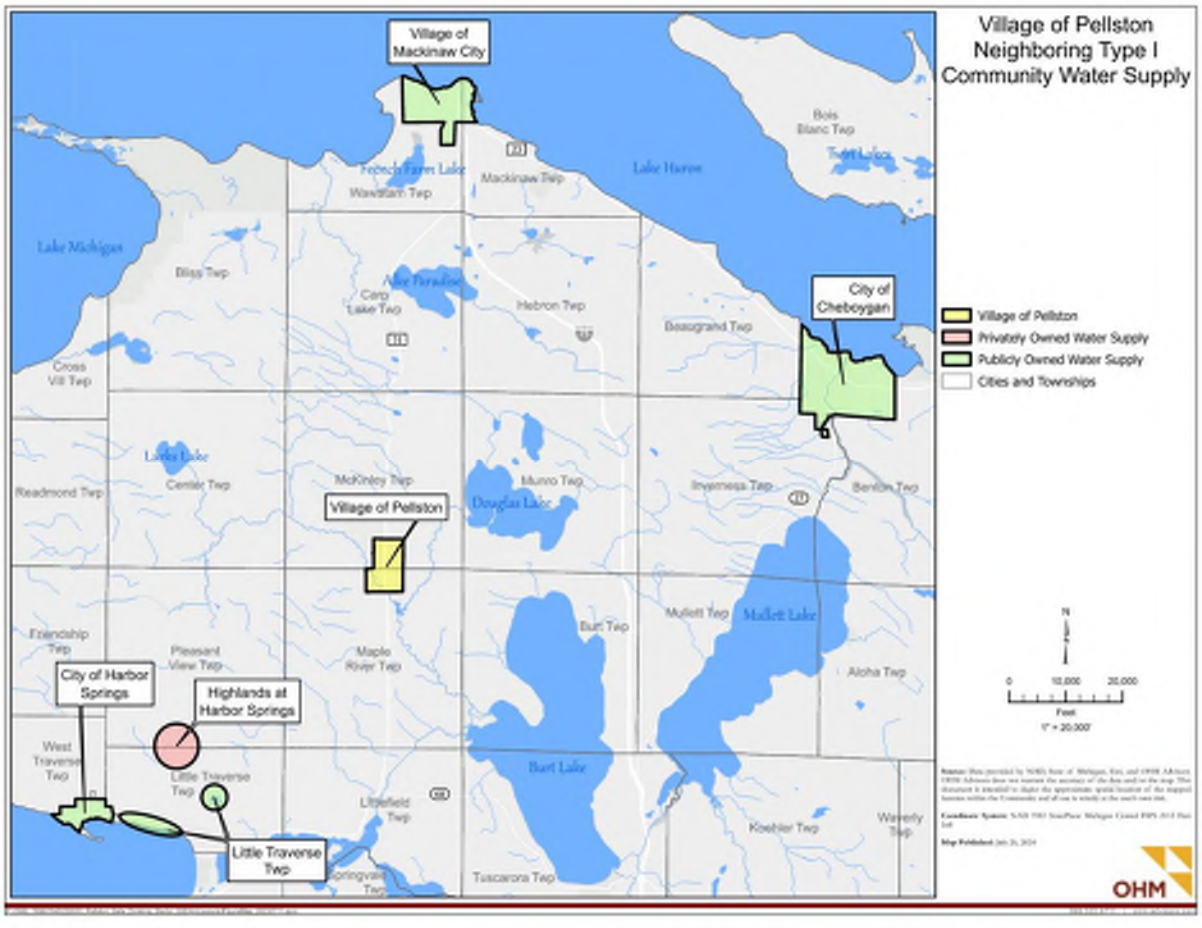

Figure 1. Neighboring Community Water Supply.

The City of Harbor Springs owns and operates a Type I public water system. The system is supplied by 4 wells, has 2 storage tanks, and currently serves approximately 1,412 customers. The system is

connected to West Traverse Township, and the Township purchases bulk water from the City for an additional 173 customers. The existing firm capacity of the wells is 1,480 gallons per minute and a total capacity of 2,150 gpm. The existing max day usage is 1,231 gpm and the 5-year usage is 1,248 gpm. For the Village of Pellston, the estimated existing and 5-year max day usage is 161 gpm and 225 gpm, respectively. Table 1 summarizes the combined demand and the wells' available capacity.

Table 1. Harbor Springs, Pellston, and PLN Airport Max Day Demand and Wells' Available Capacity.

	Max Day (gpm)	
	Existing	5-Yr
Harbor Springs	1,231	1,248
Pellston + PLN Airport	161	225
Total Demand	1,392	1,473
Harbor Springs Firm Capacity	1,480	1,480
Available Capacity	88	7
Total Capacity Harbor Springs	2,150	2,150
Available Capacity	758	677

An analysis was performed to assess the well capacity involving the Village of Pellston, McKinley Township, and Maple River Township. Table 2 summarizes the max day demand. A new well would be needed to meet the max day demand.

Table 2. Max Day Demand and Available Well Capacity

	Max Day (gpm)	
	Existing	5-Year
Harbor Springs	1,231	1,248
Pellston & All*	416	486
Total Demand	1,647	1,734
Harbor Springs Firm Capacity	1,480	1,480
Available Capacity	-167	-254
Total Capacity Harbor Springs	2,150	2,150
Available Capacity	503	416

*Includes PLN Airport, McKinley Township, and Maple River Township

Several municipalities are located along the route from Harbor Springs to Pellston and could have the opportunity to connect in the future. Figure 2 displays the locations of the municipalities along the route from Harbor Springs to Pellston. Little Traverse Township is one of the municipalities located along the route and has two well supplies. It is possible that a connection can occur to the Little Traverse Township wells to utilize available capacity. There may be an option in the future for a regionalization effort if this option is further pursued.

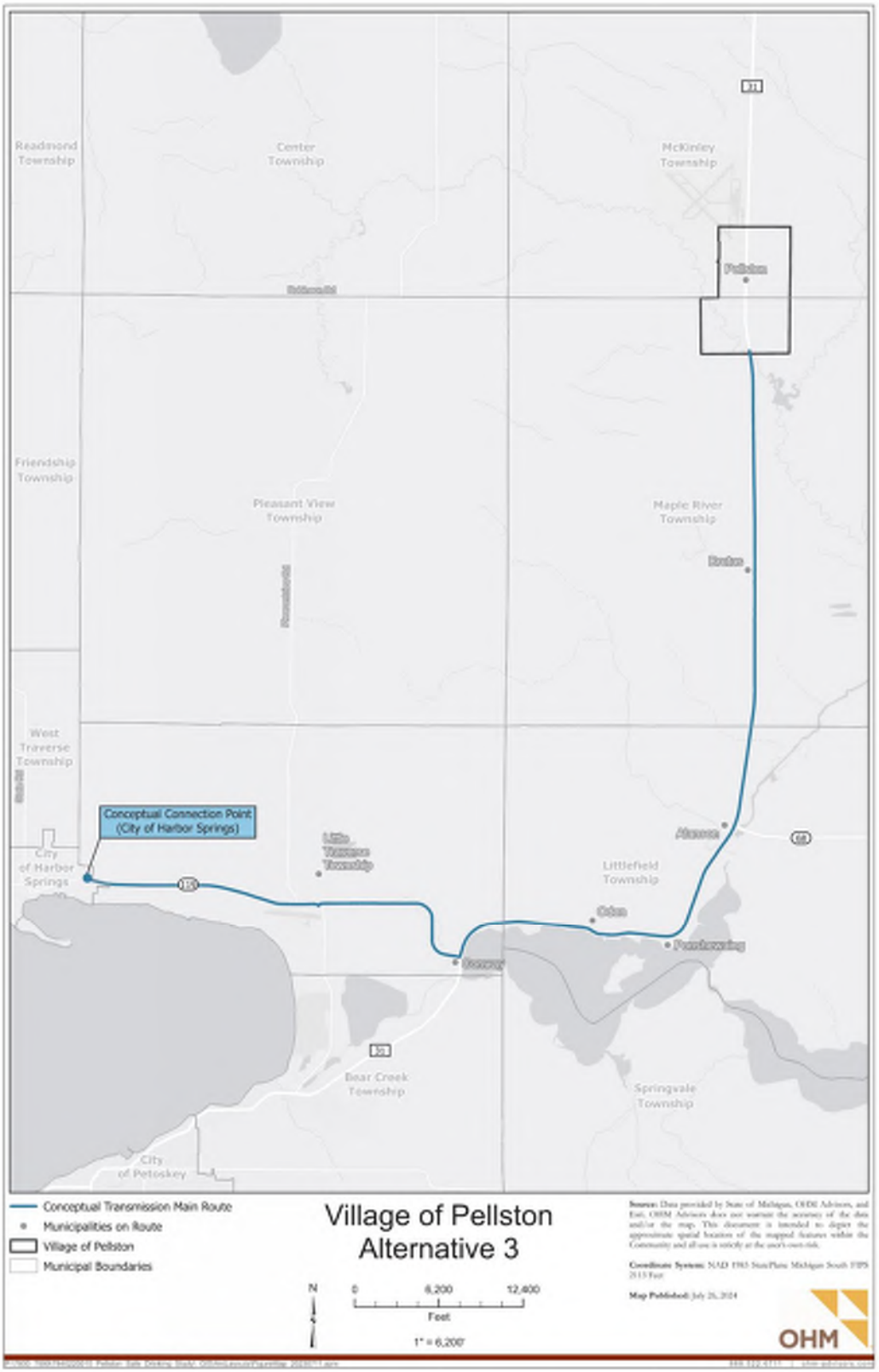

Figure 2. Conceptual Water Main layout for Regionalization Alternative.

The municipalities that are along route are listed in Table 3 along with their estimated max daily and peak hour demand. The max daily demand was calculated using the population from the 2020 census and a peaking factor of two. A portion of the total Little Traverse Bay population was used. It was assumed that the average water usage was 100 gallons per day per person. The peak hour was calculated using a peaking factor of four. Table 4 summarizes the max day demand and peak hour for the 5-year population estimates.

Table 3. Max Day Demand and Peak Hour for Existing Population

	Existing Population (2020 Census)	Max Day Demand (gal/day)	Max Day Demand (gpm)	Peak Hour (gal/day)	Peak Hour (gpm)
Little Traverse Bay	399	79,800	55	159,600	111
Conway	338	67,600	47	135,200	94
Oden	358	71,600	50	143,200	99
Ponshewaing	126	25,200	18	50,400	35
Alanson	778	155,600	108	311,200	216
Brutus	202	40,400	28	80,800	56
Total	**1,802**	**360,400**	**250**	**720,800**	**501**

Table 4. Max Day Demand and Peak Hour for 5-Year Population Estimates

	5-Year Population*	5-Year Max Daily Demand (gal/day)	5-Year Max Daily Demand (gpm)	5-Year Peak Hour (gal/day)	5-Year Peak Hour (gpm)
Little Traverse Bay	408	81,600	57	163,200	113
Conway	345	69,000	48	138,000	96
Oden	366	73,200	51	146,400	102
Ponshewaing	129	25,800	18	51,600	36
Alanson	795	159,000	110	318,000	221
Brutus	206	41,200	29	82,400	57
Total	**2,249**	**449,800**	**312**	**899,600**	**625**

*Emmet County's projected population increase of 0.44% was used.

The existing max day demand for each municipality was added to the demand for Harbor Springs and Pellston to analyze the available capacity. The available max day demand and peak hour are summarized in Table 5 for the existing and 5-year populations. An additional well(s) would be needed to meet the total max daily demand.

Table 5. Max Day and Peak Hour Demand for Harbor Springs, Pellston & All, and Municipalities Along Route.

	Existing		5-Year	
	Max Day (gpm)	Peak Hour (gpm)	Max Day (gpm)	Peak Hour (gpm)
Harbor Springs	1,231	1,847	1,248	1,872
Pellston & All*	416	824	486	964
Municipalities along Route**	306	611	312	625

Total Demand	1,953	3,282	2,046	3,461
Harbor Springs Firm Capacity	1,480		1,480	
Available Capacity	-473		-566	
Total Capacity Harbor Springs	2,150		2,150	
Available Capacity	**197**		**104**	

*Includes PLN Airport, McKinley Township, and Maple River Township
**Includes Little Traverse Township, Conway, Oden, Ponshewaing, Alanson, and Brutus

Pressure Evaluation

A high-level pressure analysis was completed to assess if facilities were likely needed along the water main route. An initial pressure of 50 psi was used to estimate the pressures at each municipality from Harbor Springs to Petoskey. Calculated pressures ranged from 40 to 83 psi. At this stage, it is believed that a booster station would be needed near the Harbor Springs Airport to increase pressures within Little Traverse Township area and in the Brutus and Pellston area. This would then likely result in the need of pressure reducing valves (PRVs) at the supply points of the communities between Little Traverse Township and Brutus. Or, alternatively, if pressures within Little Traverse Township are deemed acceptable then it is possible that only one booster station would be needed in Brutus to boost pressures to Brutus and Pellston. Figure 3 displays a graphic of the pressures and topographic elevations at each municipality.

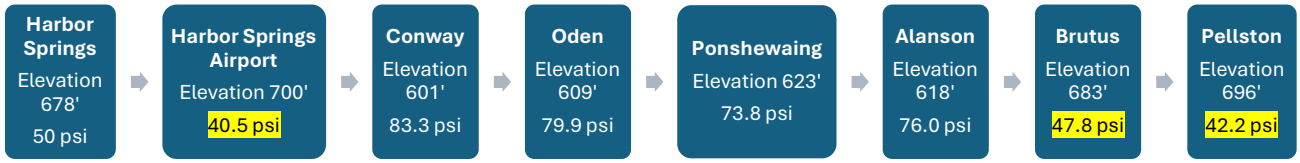

Figure 3. Pressure and Topographic Elevations at Each Municipality.

It is understood that Little Traverse Township currently has public drinking water wells that serve small portions of their community. If this regionalization alternative was further pursued, discussions on incorporating LTT's public wells, which serve a small portion of their community, should occur. This may remove the need for a booster station near Harbor Springs Airport and reduce the needed well capacity to supply this alternative.

Costs

A high- level cost estimate to run water main from Harbor Springs to Pellston along US-131 was completed. The concept cost estimate for a 92,400-foot 24-inch water main is approximately $80 million. Figure 4 summarizes the estimated cost and the assumptions. No additional investigation was completed for the booster stations or other facilities as it was deemed unfeasible.

OHM

PELLSTON CONCEPTUAL WATER MAIN LAYOUT

ORCHARD, HILTZ & McCLIMENT, INC.

300 East Mitchell Street Suite 2, Petoskey, Michigan, 49770 Telephone: (231) 344-1150

PROJECT: Pellston Wholesale Alternative Conceptual Water Main Layout

DATE: Jul 11, 2024
PROJECT NO. 7849-22-0010
ESTIMATOR: SK
CHECKED BY: AR
CURRENT ENR:

BASIS FOR ESTIMATE: [X] CONCEPTUAL [ ] PRELIMINARY [ ] FINAL

WORK: Conceptual 24-inch water main layout for the wholesale alternative from Harbor Springs to Pellston. Includes associated appurtenances and restoration.

Item	Description	Estimated Quantity	Unit Price	Amount
1	Mobilization, Max 10%	1 LSUM	$4,451,000	$4,451,000.00
2	Traffic Maintenance and Control	1 LSUM	$2,226,000	$2,226,000.00
3	Soil Erosion and Sedimentation Control	1 LSUM	$141,000	$141,000.00
4	Clearing	26 Acre	$16,000	$410,400.00
5	Pavt, Rem	3500 Syd	$10	$35,000.00
6	Sidewalk, Rem	400 Syd	$12	$4,800.00
7	Driveway, Rem	8500 Syd	$14	$119,000.00
8	Aggregate Base, 8 inch	3000 Syd	$19	$57,000.00
9	Aggregate Surface Course, 12 inch, 21AA, Modified	700 Syd	$30	$21,000.00
10	Approach, CI II, 4 inch	2000 Syd	$12	$24,000.00
11	HMA Approach	1,500 Ton	$158	$237,000.00
12	HMA, 4EL	700 Ton	$100	$70,000.00
13	Driveway, Nonreinf Conc, 6 inch	500 Syd	$62	$31,000.00
14	Detectable Warning Surface	100 Ft	$52	$5,200.00
15	Sidewalk Ramp, Conc, 6 inch, Modified	2,000 Sft	$7	$14,000.00
16	Sidewalk, Conc, Modified	3,500 Sft	$5	$17,500.00
17	Water Main, DI, 24 inch, Directional Drill	17,800 Ft	$455	$8,099,000.00
18	Water Main, DI, 24 inch, Tr Det G, Modified	3,300 Ft	$420	$1,386,000.00
19	Water Main, DI, 24 inch, Tr Det F, Modified	71,300 Ft	$405	$28,876,500.00
20	Valve and Well, 24 inch	125 Ea	$35,000	$4,375,000.00
21	Turf Establishment, Performance	73,600 Syd	$6	$441,600.00
22	Emergent Wetland Seed Mix	1,100 Syd	$10	$11,000.00
23	Wetland Mitigation	1.0 Acre	$130,000	$130,000.00
		Construction Amount		$51,190,000.00
		Contingency (30%)		$15,357,000.00
		Total Construction Cost		$66,547,000.00
	Design			$4,658,290.00
	Construction Engineering/Administration			$7,985,640.00
	Geotechnical Services			$332,735.00
			Soft Costs Total	$12,977,000.00
			Total Project Cost	**$79,600,000.00**

ASSUMPTIONS:

1. **The water distribution system and storage tank costs for the Village of Pellston are not included in this estimate.**
2. Engineering design estimate is for budgeting purposes and is calculated without contingency.
3. Geotechnical service costs are estimated for budgeting purposes.
4. Property acquisition and easement costs are unknown and not included in this cost estimate.
5. Construction engineering and administration costs include construction observation, material testing, and survey layout.
6. It is assumed that all the work being performed will not be in conflict with any utilities.
7. A full wetland delineation will have to be performed during design.
8. Soil erosion and sedimentation control costs are estimated for budgeting purposes.
9. Traffic maintenance and control costs are estimated for budgeting purposes.
10. It was assumed that water main will be installed using directional drilling in areas where water main crosses M-119 and where wetlands exist. Water main is assumed to be installed using open cut installation in all other locations.
11. Costs do not include any service lines, curb stop boxes, water meters, or fire hydrants.
12. Water main will extend from the western end of the Harbor Springs village limits to the southern end of the Pellston village limits.
13. Costs to connect other communities along the route from Harbor Springs to Pellston to the system are not included in this estimate.
14. Ten States Standards were used to determine valve quantities.
15. The quantity of driveways within the project limits was estimated and would need to be reviewed during design.
16. A percentage of each surface type was assumed for driveways and roads that are crossed by water main. Existing materials, specifically driveway and road surface types, would need to be verified during the design phase. It was assumed that driveways and roads would be replaced in-kind.
17. Trees for removal, as well as their sizes, would need to be further reviewed during design.
18. ADA ramps will be removed and replaced with detectable warning surfaces in areas impacted by water main installation.

Figure 4. Conceptual Cost Estimate for Regionalization Alternative.

Appendix G

Cost Estimates

Cost Estimate A: Well Abandonment

Coste Estimate B: Well Treatment and Elevate Storage

Cost Estimate C: Well Transmission Main

Cost Estimate D: Local Distribution

Cost Estimate E: Wholesale Transmission

Project Summary
Engineer's Opinion of Probable Project Cost

Owner:	**Village of Pellston**	**Date:**	**4/18/2025**
Project:	**Feasibility Study**	**Project No.**	**7840-22-0010**
Work:	**Private Well Abandonment**	**Prepared By:**	**IVB**
	Within Village Limits	**Reviewer:**	**KMT**
	[X] Conceptual [ ] Preliminary [ ] Final	**Current ENR:**	**13547**

Item No.	Item Description	Est. Quantity	Unit	Unit Price	Total Cost
1	Private Well Abandonment	448	Ea	$1,500	$672,000
				SUBTOTAL:	**$672,000**
	CONTRACTUAL REQUIREMENTS				
	General Conditions	10%			$68,000
	General Requirements	5%			$34,000
	Contingencies	50%			$336,000
				TOTAL CONSTRUCTION COST:	$1,110,000
	PROJECT COSTS				
	Design and Construction Engineering	20%			$222,000
	Finance and Legal	5%			$56,000
	Geotechnical Services	0.0%			$0
				TOTAL PROJECT COSTS:	$278,000
	ENGINEER'S OPINION OF PROJECT COST				**$1,400,000**

Project Summary
Engineer's Opinion of Probable Project Costs

Owner:	**Village of Pellston, Michigan**	**Date:**	**4/18/2025**
Project:	**Feasibility Study**	**Project No.**	**7840-22-0010**
Work:	**Well Supply, Treatment, Elevated Storage**	**Prepared By:**	**ATG**
	Conceptual Project Costs (Level 5 Opinion)	**Reviewer:**	**MMK**
		Current ENR:	**13547**

Item No.	Item Description	Est. Quantity	Unit	Unit Price	Total Cost
1	Wells				$820,000
2	Water Treatment Plant				$5,000,000
3	Elevated Water Storage				$2,137,000
			TRADES SUBTOTAL		**$7,137,000**
	CONTRACTUAL REQUIREMENTS				
	General Conditions	10%			$720,000
	General Requirements	5%			$360,000
					$8,217,000
	Project Contingencies	50%			$4,108,500
	Opinion of Probable Construction Cost				**$12,325,500**
	PROJECT COSTS				
	Soil Borings/geotechnical for WTP	1	LS		$65,000
	Land Acquisition Allowance for Well Field/WTP	5	acre	$ 40,000	$200,000
	Engineering (Design and Construction Services)	30%			$4,000,000
	Project Management				$0
	Finance and Legal	5%			$617,000
				TOTAL:	**$17,207,500**
	CCI Adjustment				$0
	ENGINEER'S OPINION OF TOTAL PROJECT COST				**$17,300,000**

Project Summary
Engineer's Opinion of Probable Project Cost

Owner:	**Village of Pellston**	**Date:**	**4/18/2025**
Project:	**Feasibility Study**	**Project No.**	**7840-22-0010**
Work:	**Water Main Installation to Potential Well Field Site**	**Prepared By:**	**AKB**
		Reviewer:	**SK**
	[X] Conceptual [ ] Preliminary [ ] Final	**Current ENR:**	**13547**

Item No.	Item Description	Est. Quantity	Unit	Unit Price	Total Cost
1	Mobilization, Max 5%	1	LSUM	$97,000	$97,000
2	Audio Video Route Survey	1	LSUM	$5,000	$5,000
3	Traffic Maintenance and Control	1	LSUM	$10,000	$10,000
4	Soil Erosion and Sedimentation Control	1	LSUM	$30,000	$30,000
5	Water Main, CL-54, DI, 8 inch, Open Cut	9,500	Ft	$130	$1,235,000
6	Water Main, CL-54, DI, 8 inch, Directional Drill (Stream Crossing)	500	Ft	$520	$260,000
7	Fire Hydrant	20	Ea	$6,000	$120,000
8	Gate Valve and Box, 8 inch	15	Ea	$5,000	$75,000
9	Connections	2	Ea	$4,500	$9,000
10	Restoration	30,000	Syd	$6	$180,000
				SUBTOTAL:	**$2,021,000**
	Contingencies	15%			$304,000
				TOTAL CONSTRUCTION COST:	$2,330,000
	PROJECT COSTS				
	Design	10%			$233,000
	Construction Engineering/Administration	15%			$349,500
	Geotechnical Services	1%			$23,300
				TOTAL PROJECT COSTS:	$605,800
	ENGINEER'S OPINION OF CONSTRUCTION COST				**$3,000,000**

PELLSTON CONCEPTUAL WATER MAIN LAYOUT

ORCHARD, HILTZ & McCLIMENT, INC.

300 East Mitchell Street Suite 2, Petoskey, Michigan, 49770 **Telephone: (231) 344-1150**

PROJECT: **Pellston Conceptual Water Main Layout Version 6**

DATE:	**Oct 30, 2025**
PROJECT NO.	**7840-22-0010**
ESTIMATOR:	**SK**
CHECKED BY:	**SLW**
CURRENT ENR:	**13547**

BASIS FOR ESTIMATE: [X] CONCEPTUAL [ ] PRELIMINARY [ ] FINAL

WORK: Conceptual water main layout for the Village of Pellston including 6 and 8-inch water main. Includes associated appurtenances and restoration.

Item	Description	Estimated Quantity		Unit Price	Amount
1	Mobilization, Max 10%	1	LSUM	$1,488,000	$1,488,000.00
2	Traffic Maintenance and Control	1	LSUM	$85,000	$85,000.00
3	Soil Erosion and Sedimentation Control	1	LSUM	$10,000	$10,000.00
4	Clearing	21	Acre	$16,000	$336,000.00
5	Pavt, Rem	23233	Syd	$10	$232,330.00
6	Sidewalk, Rem	1447	Syd	$12	$17,364.00
7	Driveway, Rem	9677	Syd	$14	$135,478.00
8	Aggregate Base, 8 inch	23127	Syd	$19	$439,413.00
9	Aggregate Surface Course, 12 inch, 21AA, Modified	106	Syd	$30	$3,180.00
10	Approach, Cl II, 4 inch	6604	Syd	$12	$79,248.00
11	HMA Approach	569	Ton	$158	$89,902.00
12	HMA, 4EL	5,597	Ton	$100	$559,700.00
13	Driveway, Nonreinf Conc, 6 inch	80	Syd	$62	$4,960.00
14	Detectable Warning Surface	350	Ft	$52	$18,200.00
15	Sidewalk Ramp, Conc, 6 inch, Modified	7,290	Sft	$7	$51,030.00
16	Sidewalk, Conc, Modified	7,055	Sft	$5	$35,275.00
17	Water Main, DI, 8 inch, Directional Drill	525	Ft	$315	$165,375.00
18	Water Main, DI, 8 inch, Tr Det G, Modified	19,021	Ft	$130	$2,472,730.00
19	Water Main, DI, 6 inch, Directional Drill	4,575	Ft	$275	$1,258,125.00
20	Water Main, DI, 6 inch, Tr Det G, Modified	41,936	Ft	$100	$4,193,600.00
21	Fire Hydrant w/ Valve Assembly	134	Ea	$6,000	$804,000.00
22	Gate Valve and Box, 8 inch, Modified	68	Ea	$5,000	$340,000.00
23	Gate Valve and Box, 6 inch, Modified	150	Ea	$2,000	$300,000.00
24	Water Serv, 3/4 inch, Long	190	Ea	$3,500	$665,000.00
25	Water Serv, 3/4 inch, Private	334	Ea	$3,500	$1,169,000.00
26	Water Serv, 3/4 inch, Short	144	Ea	$1,500	$216,000.00
27	Water Serv, 2 inch, Long	43	Ea	$5,000	$215,000.00
28	Water Serv, 2 inch, Private	64	Ea	$7,500	$480,000.00
29	Water Serv, 2 inch, Short	21	Ea	$2,500	$52,500.00
30	Water Serv, 3 inch, Long	3	Ea	$5,500	$16,500.00
31	Water Serv, 3 inch, Private	3	Ea	$8,750	$26,250.00
32	Turf Establishment, Performance	67607	Syd	$6	$405,642.00

Construction Amount	$16,370,000.00
Contingency (10%)	$1,637,000.00
Total Construction Cost	$18,007,000.00

Design	$1,700,000.00
Construction Engineering/Administration	$2,500,000.00
Geotechnical Services	$0.00
Soft Costs Total	$4,200,000.00
Total Project Cost	**$22,300,000.00**

ASSUMPTIONS:

1. Source, treatment, transmission from the source, and storage tank costs are not included in this estimate.
2. Engineering design estimate is for budgeting purposes and is calculated without contingency.
3. Geotechnical service costs are estimated for budgeting purposes.
4. Property acquisition and easement costs are unknown and not included in this cost estimate.
5. Construction engineering and administration costs include construction observation, material testing, and survey layout.
6. It is assumed that all the work being performed will not be in conflict with any utilities.
7. A full wetland delineation will have to be performed during design.
8. Soil erosion and sedimentation control costs are estimated for budgeting purposes.
9. Traffic maintenance and control costs are estimated for budgeting purposes.
10. It was assumed that water main will be installed using directional drilling in areas where water main crosses US-31 and the areas along Lahti Lane, Bogardus Street, and near White Pine Drive where a large length of water main will cross through private property. Water main is assumed to be installed using open cut installation in all other locations.
11. Water service lines were included for developed land. Costs do not include service lines for future growth areas including planned residential development.
12. Service line sizes were determined using Pellston zoning and assigned REU values.
13. Water main will extend to the developable land within Village limits where applicable.
14. Water main will extend outside of Village limits to wells located at the Pellston airport for tie-in to the system.
15. Ten States Standards were used to determine valve and hydrant quantities.
16. Service line costs include curb stop boxes. Private service line costs include water meter costs.
17. Service leads to hydrants are included in hydrant costs.
18. Existing materials, specifically driveway and road surface types, will need to be verified during the design phase. It was assumed that driveways and roads would be replaced in-kind.
19. Trees for removal, as well as their sizes, will need to be further reviewed during design.
20. ADA ramps will be removed and replaced with detectable warning surfaces in areas where intersections are impacted by water main installation.

PELLSTON CONCEPTUAL WATER MAIN LAYOUT

ORCHARD, HILTZ & McCLIMENT, INC.

300 East Mitchell Street Suite 2, Petoskey, Michigan, 49770 **Telephone: (231) 344-1150**

PROJECT: **Pellston Wholesale Alternative Conceptual Water Main Layout**

BASIS FOR ESTIMATE: [X] CONCEPTUAL [ ] PRELIMINARY [ ] FINAL

DATE:	**Jul 11, 2024**
PROJECT NO.	**7840-22-0010**
ESTIMATOR:	**SK**
CHECKED BY:	**AB**
CURRENT ENR:	

WORK: Conceptual 24-inch water main layout for the wholesale alternative from Harbor Springs to Pellston. Includes associated appurtenances and restoration.

Item	Description	Estimated Quantity	Unit	Unit Price	Amount
1	Mobilization, Max 10%	1	LSUM	$4,451,000	$4,451,000.00
2	Traffic Maintenance and Control	1	LSUM	$2,226,000	$2,226,000.00
3	Soil Erosion and Sedimentation Control	1	LSUM	$141,000	$141,000.00
4	Clearing	26	Acre	$16,000	$410,400.00
5	Pavt, Rem	3500	Syd	$10	$35,000.00
6	Sidewalk, Rem	400	Syd	$12	$4,800.00
7	Driveway, Rem	8500	Syd	$14	$119,000.00
8	Aggregate Base, 8 inch	3000	Syd	$19	$57,000.00
9	Aggregate Surface Course, 12 inch, 21AA, Modified	700	Syd	$30	$21,000.00
10	Approach, Cl II, 4 inch	2000	Syd	$12	$24,000.00
11	HMA Approach	1,500	Ton	$158	$237,000.00
12	HMA, 4EL	700	Ton	$100	$70,000.00
13	Driveway, Nonreinf Conc, 6 inch	500	Syd	$62	$31,000.00
14	Detectable Warning Surface	100	Ft	$52	$5,200.00
15	Sidewalk Ramp, Conc, 6 inch, Modified	2,000	Sft	$7	$14,000.00
16	Sidewalk, Conc, Modified	3,500	Sft	$5	$17,500.00
17	Water Main, DI, 24 inch, Directional Drill	17,800	Ft	$455	$8,099,000.00
18	Water Main, DI, 24 inch, Tr Det G, Modified	3,300	Ft	$420	$1,386,000.00
19	Water Main, DI, 24 inch, Tr Det F, Modified	71,300	Ft	$405	$28,876,500.00
20	Valve and Well, 24 inch	125	Ea	$35,000	$4,375,000.00
21	Turf Establishment, Performance	73,600	Syd	$6	$441,600.00
22	Emergent Wetland Seed Mix	1,100	Syd	$10	$11,000.00
23	Wetland Mitigation	1.0	Acre	$130,000	$130,000.00

Construction Amount	$51,190,000.00
Contingency (30%)	$15,357,000.00
Total Construction Cost	$66,547,000.00

Design	$4,658,290.00
Construction Engineering/Administration	$7,985,640.00
Geotechnical Services	$332,735.00
Soft Costs Total	$12,977,000.00
Total Project Cost	**$79,600,000.00**

ASSUMPTIONS:

1. The water distribution system and storage tank costs for the Village of Pellston are not included in this estimate.
2. Engineering design estimate is for budgeting purposes and is calculated without contingency.
3. Geotechnical service costs are estimated for budgeting purposes.
4. Property acquisition and easement costs are unknown and not included in this cost estimate.
5. Construction engineering and administration costs include construction observation, material testing, and survey layout.
6. It is assumed that all the work being performed will not be in conflict with any utilities.
7. A full wetland delineation will have to be performed during design.
8. Soil erosion and sedimentation control costs are estimated for budgeting purposes.
9. Traffic maintenance and control costs are estimated for budgeting purposes.
10. It was assumed that water main will be installed using directional drilling in areas where water main crosses M-119 and where wetlands exist. Water main is assumed to be installed using open cut installation in all other locations.
11. Costs do not include any service lines, curb stop boxes, water meters, or fire hydrants.
12. Water main will extend from the western end of the Harbor Springs village limits to the southern end of the Pellston village limits.
13. Costs to connect other communities along the route from Harbor Springs to Pellston to the system are not included in this estimate.
14. Ten States Standards were used to determine valve quantities.
15. The quantity of driveways within the project limits was estimated and would need to be reviewed during design.
16. A percentage of each surface type was assumed for driveways and roads that are crossed by water main. Existing materials, specifically driveway and road surface types, would need to be verified during the design phase. It was assumed that driveways and roads would be replaced in-kind.
17. Trees for removal, as well as their sizes, would need to be further reviewed during design.
18. ADA ramps will be removed and replaced with detectable warning surfaces in areas impacted by water main installation.

Appendix H

Rate Study Report

Bendzinski & Co.
MUNICIPAL FINANCE ADVISORS
A MICHIGAN FIRM, WORKING FOR MICHIGAN.

Memo

To: ***Village of Pellston***
From: ***Andy Campbell, CPA***
Date: ***December 2, 2025***
Re: ***Potential Pellston Water Project***

This memo is being written to give a synopsis of our work to date related to the potential Village of Pellston water project.

Over the past year, we have worked with the Village (through their engineer, OHM Advisors) on potential special assessments and user rates related to the potential water project. A review of both are below:

Special Assessment District (SAD) Analysis
For the SAD analysis, we looked at various options for the potential $44 million project. These scenarios ranged from 0% grant (or principal forgiveness) to 80% grant. These analyses were performed to give the Village and OHM an estimate of the yearly costs related to the SAD and building the system. Specific analysis was provided in February and September related to these estimates. Following the release of the final Intended Use Plan (IUP) for the State Revolving Fund (SRF), the Village would receive a 100% grant for the project construction and thus an SAD would not be required. No final analysis is given on this at this is no longer required.

User Rate Analysis
For the user rate analysis, we looked at a couple options for the Village, 100% connected to the system and 51% connected to the system. EGLE informed the Village that they would be requiring the Village to obtain 51% or more connections to the system to fund the construction of the system. With this in mind, we ran the scenario showing this minimum requirement. We also ran the scenario with 100% connections to show what is estimated as the minimum monthly bill needed to operate and maintain the system. These calculations are attached to this memo.

If you have any questions or require additional information, please do not hesitate to contact us.

2390 Woodlake Drive • Suite 300 • Okemos, Michigan 48864
(517) 580-0277
E-mail • acampbell@bendzinski.com

VILLAGE OF PELLSTON
COUNTY OF EMMET, STATE OF MICHIGAN
Proof of Rates

Ready-to-Serve Charge - Domestic

Meter Size	Meter Rate	Meter Count	Meter Ratio	Meter Equivalents	Totals
5/8"	$42.00	0	1.00	0.00	$0.00
3/4"	42.00	334	1.00	334.00	$14,028.00
1"	74.67	0	1.78	0.00	$0.00
1 1/2"	168.00	0	4.00	0.00	$0.00
2"	298.67	64	7.11	455.11	$19,114.67
3"	672.00	3	16.00	48.00	$2,016.00
4"	1,194.67	0	28.44	0.00	$0.00
6"	2,688.00	0	64.00	0.00	$0.00
		401		837.11	
Subtotal					$35,158.67
Times (monthly)					12
Total Ready-to-Serve Charge - Domestic Revenue					$421,904.00

Ready-to-Serve Charge - Fire Line

Meter Size	Meter Rate	Meter Count	Meter Ratio	Meter Equivalents	Totals
4"	$42.00	0	1.00	0.00	$0.00
6"	63.00	1	1.50	1.50	$63.00
8"	126.00	0	3.00	0.00	$0.00
				1.50	
Subtotal					$63.00
Times (monthly)					12
Total Ready-to-Serve Charge - Fire Line Revenue					$756.00

Commodity Charge

Annual Billable Flow Assumption (1,000)	17,959
Commodity Charge (per 1,000 gals)	$7.00
Total Commodity Charge Revenue	$125,714

Total Rate Revenue	$547,618

Total Rate Revenue	$547,618
Mead & Hunt O&M Budget Estimate	$469,105
Difference	$78,513

Typical Homeowner's Monthly Bill (assuming 4,000 gallons/month)	Ready-to-Serve Charge	$42.00
	Commodity Charge	$28.00
	Total Monthly Estimated Bill	$70.00

VILLAGE OF PELLSTON
COUNTY OF EMMET, STATE OF MICHIGAN
Proof of Rates - 51% of Users Connected

Ready-to-Serve Charge - Domestic

Meter Size	Meter Rate	Meter Count	Meter Ratio	Meter Equivalents	Totals
5/8"	$58.00	0	1.00	0.00	$0.00
3/4"	58.00	167	1.00	167.00	$9,686.00
1"	103.11	0	1.78	0.00	$0.00
1 1/2"	232.00	0	4.00	0.00	$0.00
2"	412.44	32	7.11	227.56	$13,198.22
3"	928.00	3	16.00	48.00	$2,784.00
4"	1,649.78	0	28.44	0.00	$0.00
6"	3,712.00	0	64.00	0.00	$0.00
		202		442.56	
Subtotal					$25,668.22
Times (monthly)					12
Total Ready-to-Serve Charge - Domestic Revenue					$308,018.67

Ready-to-Serve Charge - Fire Line

Meter Size	Meter Rate	Meter Count	Meter Ratio	Meter Equivalents	Totals
4"	$58.00	0	1.00	0.00	$0.00
6"	87.00	1	1.50	1.50	$87.00
8"	174.00	0	3.00	0.00	$0.00
				1.50	
Subtotal					$87.00
Times (monthly)					12
Total Ready-to-Serve Charge - Fire Line Revenue					$1,044.00

Commodity Charge

Annual Billable Flow Assumption (1,000)	10,777
Commodity Charge (per 1,000 gals)	$10.00
Total Commodity Charge Revenue	$107,771

Total Rate Revenue	$415,790

Total Rate Revenue	$415,790
Mead & Hunt O&M Budget Estimate	$362,690
Difference	$53,100

Typical Homeowner's Monthly Bill (assuming 4,000 gallons/month)	Ready-to-Serve Charge	$58.00
	Commodity Charge	$40.00
	Total Monthly Estimated Bill	$98.00